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FINAL REPORT OF THE SYNOPTIC SUBPOPULATION ANALYSIS, PHASE I: REPORT ON THE FEASIBILITY OF USING INNATE TAGS TO IDENTIFY STRIPED BASS (*Morone saxatilis*) FROM VARIOUS SPAWNING RIVERS

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[redacted]

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SUMMARY

During 1974, Texas Instruments Incorporated performed a study to assess the feasibility of using meristic, morphometric, and biochemical characters as innate tags to segregate striped bass from various spawning rivers. Representative samples of the spawning populations of four Chesapeake tributaries (Potomac, Rappahannock, Choptank, and Elk Rivers) and the Hudson River were collected. Despite extensive sampling efforts in the Delaware River, only three striped bass were collected. Laboratory analyses provided data on 41 meristic and morphometric characters, 45 protein characters, and 28 enzyme systems involving 52 genetic loci. Linear and quadratic discriminant function analyses were employed to evaluate the discriminatory power of the meristic and morphometric characters. The discriminatory power of the biochemical characters was evaluated with univariate techniques.

Twenty-one meristic and morphometric characters were highly correlated with length and were rejected from the character sets used in discriminant analyses. Two additional characters were highly cross correlated and similarly rejected from further analysis, as was the number of spines on the first dorsal fin (a constant in 849 of the 857 fish examined). The remaining 17 characters possessed discriminatory power, but the addition of more than 10 characters in a discriminant function failed to provide additional separation.

It was not possible to separate the spawning populations within Chesapeake Bay due to overlap of the character sets. The sample values from the Chesapeake tributaries were pooled and entered in a discriminant function with values from the Hudson River population. Four characters

(first annulus to second annulus distance/focus to first annulus distance ratio, snout length/head length ratio, internostril width/head length ratio, and number of scales along lateral line) provided maximum separation between Chesapeake Bay and Hudson River striped bass. Discriminant analysis with all fish collected in the study resulted in 80% correct classification of fish into the appropriate spawning populations.

Protein and isozyme analyses have shown striped bass to be one of the most genetically homogeneous species ever studied. Of the 52 loci examined, only two were variant. The variant gene frequencies were low in all populations but were clinal. Isocitrate dehydrogenase was fixed in the Hudson River population; consequently, all variant alleles uniquely classified fish of non-Hudson origin. All fish classified as Hudson in the discriminant analysis which possessed a variant allele were redefined as non-Hudson, and overall correct classification increased to 83%.

An experimental design has been developed to sample the Atlantic fishery from Cape Hatteras to Maine and to generate an estimate of the relative contribution of Hudson River striped bass to the Atlantic fishery. The spawning populations previously sampled will be sampled again to verify the discriminant functions. The Delaware and Roanoke River populations will be sampled to establish discriminant functions for their respective spawning populations.

A spatial and temporal stratified sampling design will be employed to collect a representative sample of the Atlantic fishery. Meristic, morphometric, and biochemical analyses will be performed on the collected fish. Discriminant function analyses will be employed to assign a spawning origin to each fish, and an estimate of the relative contribution of the Hudson River population will be made.

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SECTION I

INTRODUCTION

Most published work on striped bass has concluded that the Chesapeake Bay system is the major contributor to the mid-Atlantic fishery (Merriman, 1941; Vladykov and Wallace, 1952; Alperin, 1966; Schaefer, 1968; Porter and Saila, 1969; and Raney, 1972). Recent challenges to those works (Clark, 1972, and Goodyear, 1974) have suggested that the Hudson River may also contribute significantly.

Assessment of the relative contribution of Hudson River striped bass requires identification of individuals in the Atlantic fishery that originated in the Hudson River. Studies by Raney et al (1953, 1954) demonstrated that meristic characters allowed separation of a high percentage (70-80%) of striped bass originating in the Hudson from those originating in the tributaries of Chesapeake Bay. Furthermore, several studies (Moller, 1966; Drilhan et al, 1967; Jamieson, 1967; Fugino, 1969; Morgan et al, 1973) have shown that biochemical characters allow identification of fish from various sources of origin.

In February 1974, Texas Instruments began a study to determine the feasibility of using biochemical, meristic, and morphometric characters as innate tags to identify striped bass subpopulations among the major spawning areas of the Hudson River and tributaries of the Delaware and Chesapeake Bay systems.

The study objectives were to

- Identify a set of characters (innate tags) that would characterize a typical fish from each spawning area

- Formulate probability statements concerning the degree of certainty with which those character sets would identify the origin of a particular fish

- Design a sampling regime to collect a representative sample of the Atlantic striped bass fishery which will facilitate assessment of the Hudson River contribution

SECTION II

METHODS

A. FIELD COLLECTION

During the spring spawning season of 1974, 150 to 250 striped bass were collected from the spawning areas of each of the following: Rappahannock, Potomac, Elk, Choptank, and Hudson Rivers (Figure II-1). Sampling was restricted to the Delaware spawning grounds above the Chesapeake and Delaware Canal entrance to ensure that those striped bass collected were spawning in the Delaware River rather than migrating to the canal, which was sampled as part of the Elk River system, to spawn. Very little commercial fishing is directed toward striped bass in the Delaware River. Two commercial fishermen were employed to collect striped bass, but their efforts provided only three specimens (two specimens were immature). Based on the hypothesis that striped bass, like salmon, home to their natal stream to spawn, an assumption was made that a sexually ripe striped bass collected in the spawning area of a particular river during the spawning season originated in that river. Immature fish were occasionally collected but were not used in the study.

All fish from the Chesapeake region were purchased from commercial fishermen. Specimens from the Hudson River were obtained from commercial fishermen and sampling by Texas Instruments. Various types of fishing gear were used to collect the specimens: pound nets in the Rappahannock, stake gill nets in the Potomac, haul seines in the Choptank, drift gill nets in the Elk, and stake and anchor gill nets in the Hudson.

B. SPECIMEN PROCESSING IN FIELD

A numbered jaw tag was attached, and blood, liver, and muscle tissue samples were obtained from each fish in the field for isozyme analysis.

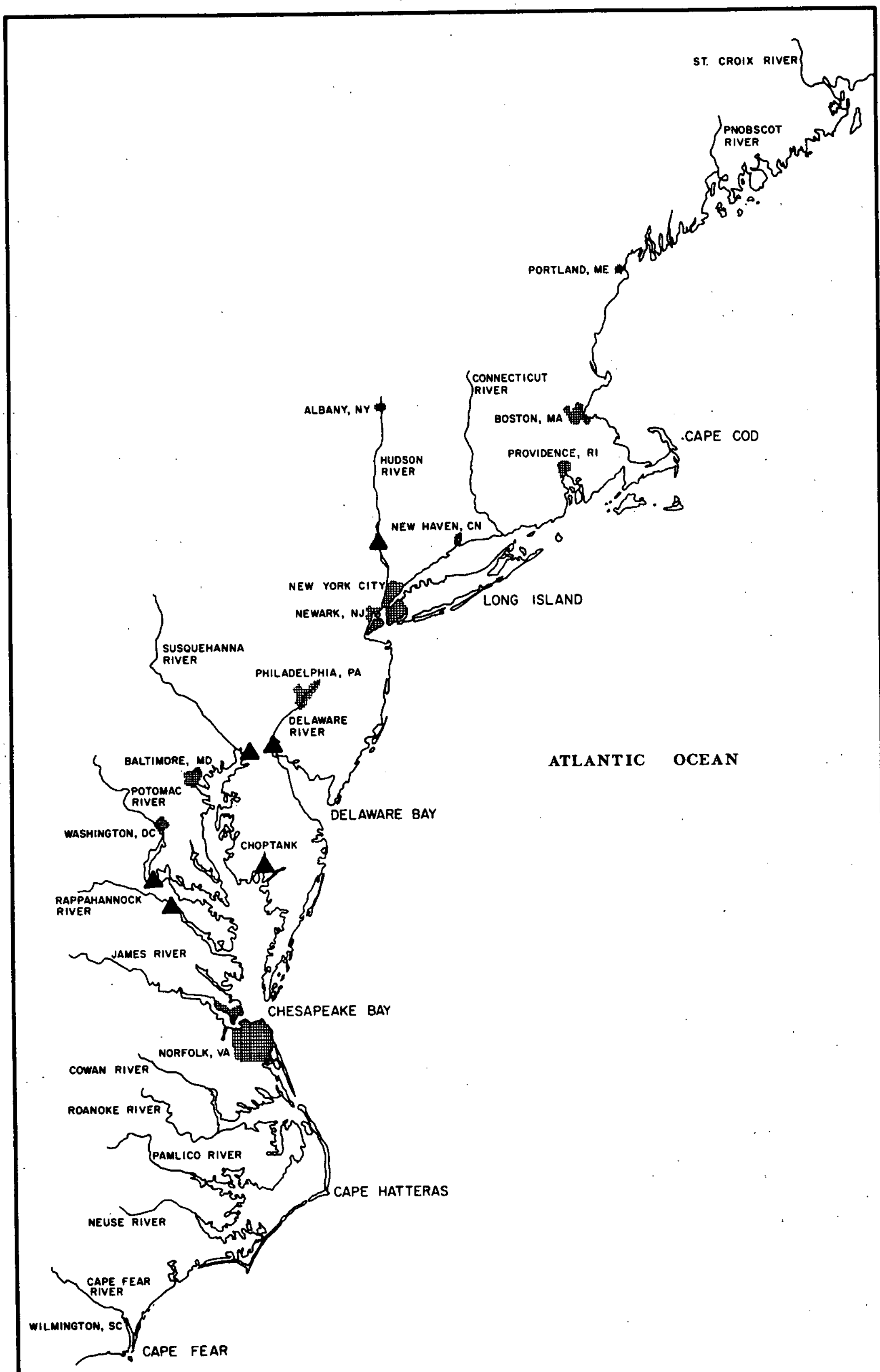


Figure II-1. Spawning River Collection Sites (indicated by ▲)

Using a syringe, 1 to 2 mℓ of blood was collected from the cardiac region, placed in a test tube, and centrifuged to separate the cellular and serum fractions. The serum was transferred to another test tube. Both fractions were stored on ice as long as 2 weeks while in the field and afterwards refrigerated in the laboratory at 40°F until processed. A strip of muscle tissue excised from the region between the first and second dorsal fins across the lateral line and a lobe of liver tissue were placed in separate whirl pack bags and stored in liquid nitrogen until processed. The samples from each fish were labeled with the number of the jaw tag. The biochemical samples were processed at Johns Hopkins University by Dr. Dennis A. Powers.

Scale samples for age and growth analysis were obtained from a key location above the lateral line between the first and second dorsal fins. The scale samples were stored in labeled envelopes. Jaw tag number, sex, and state of maturity were recorded for each fish. The fish were then preserved in 20% formalin and transferred to the Verplanck (New York) laboratory where meristic and morphometric analyses were performed.

C. SPECIMEN PROCESSING IN LABORATORY

After approximately 1 month's storage in formalin, the fish were soaked from 1 to 2 days in water to reduce the preservation fumes prior to processing. Thirty meristic counts and morphometric measurements were made on each fish. Scales along lateral line, scales above lateral line, scales below lateral line, scales around caudal peduncle, spines on first dorsal fin, and soft rays on the second dorsal and anal fins were enumerated in the manner prescribed by Hubbs and Lagler (1947). Formalin obscured the last two rays on the second dorsal and anal fins, causing the last three ray elements to appear as one; consequently, reported anal and second dorsal soft ray counts are one less than actual. For the left and right pectoral fins, all the rays including the rudiments were counted.

Gill rakers were enumerated on the first arch both excluding and including rudimentary rakers. A gill raker was considered complete if its height was greater than the diameter of its base; otherwise, it was considered rudimentary. A gill raker straddling the arch was counted with the lower arm.

Total length, standard length, snout length, length of upper jaw, head length, orbit to angle of preopercle length, length of orbital, interorbital width (least fleshy width), predorsal length, length of caudal peduncle, depth of caudal peduncle, length of base of second dorsal fin, length of first spine of second dorsal fin, length of base of anal fin, and length of first spine of anal fin were measured as prescribed by Hubbs and Lagler (1947). Fork length was measured from the most anteriorly projecting part of the head to the deepest fork of the caudal fin. The internostril width was the least fleshy distance between the excurrent nares.

Measurements of total, fork, and standard length were taken to the nearest millimeter on a fish-measuring board mounted with a metric rule. The remaining morphometric measurements were taken to the nearest millimeter with a pair of dividers and a metric rule.

Three scales (nonregenerated) were cleaned and mounted. Some scales were mounted wet between glass microscope slides. Most scales were mounted permanently on 6-in. x 3-in. x 0.02-in. acetate strips with a heat press. Mounting specifications were: temperature of upper heating plate, 220°F; temperature of lower heating plate, 180°F; pressure, 6000 psi; duration of pressing, 1 min. Differences in measurements from the focus to the first and second annuli between wet mounts and acetate mounts were found to be nonsignificant ($P = 0.95$) with a paired t-test.

The mounted scales were placed on a scale projector that magnified the scale image 47.5 times. Age determinations and measurements from the focus to the first and second annuli were made on the projected scale image.

D. ISOZYME ANALYSES

Starch gel electrophoresis was employed to identify all protein characters useful in discriminating among striped bass subpopulations. Forty-five protein systems, including 16 serum proteins and hemoglobins, were examined. In addition, 28 enzyme systems involving 52 loci were elucidated (Table II-1).

E. ANALYTICAL PROCESSING

The choice of characters to be used in segregating subpopulations of striped bass followed three stages of statistical analysis: analysis of correlation between each character and length, discriminant analyses, and analyses of the effects of sex and time of capture on each character. Only specimens with a complete set of measures for the characters of interest were used in the discriminant analyses; all specimens were used in the other analyses.

1. Correlation Analyses

Spawning populations contain fish of all mature age classes. Sampling gear differentially captures the various age classes. Year-class strength and gear selectivity would cause bias if age-specific meristic and morphometric characters were used to characterize the population. Length is a good indication of age (Mansueti, 1961); therefore, all characters were correlated with length. The difficulties presented by year-class strength and gear selectivity were avoided by eliminating from further analysis any character correlated with length above a minimal degree.

Table II-1

Enzyme Systems

Enzyme System	Abbreviation	No. of Loci
α-napthyl acetate esterase	α-nap·acetate-EST	1
α-napthyl butyrate esterase	α-nap·but-EST	4
Serum esterase	ser-EST	1
Phosphoglucomutase	PGM	1
Phosphohexoseisomerase	PHI	2
Isocitrate dehydrogenase	IDH	1
Alcohol dehydrogenase	ADH	2
Glucose 6-phosphate dehydrog.	G6PDH	1
Alkaline phosphatase	ALK PHOS.	1
Acid phosphatase	ACID PHOS.	1
Glucokinase	GK	1
Glutamate dehydrogenase	GDH	2
α-glycerophosphate dehydrog.	α-GPDH	2
6-phosphogluconate dehydrog.	6PGDH	2
Lactate dehydrogenase	LDH	2
Superoxide dismutase	SOD	2
Leucine aminopeptidase	LAP	1
Fructose 1,6 diphosphatase	F1,6DiPhos	2
Creatine kinase	CK	2
Adenylate kinase	AK	2
Aspartate aminotransferase	AAT	3
Xanthine dehydrogenase	XDH	1
Sorbitol dehydrogenase	SDH	2
Glyceraldehyde 3 phosphate dehydrogenase	G3-P DH	2
Monoamine oxidase	MO	2
Malate dehydrogenase	MDH	2
Peroxidase	Per	5
β-hydroxybutyrate dehydrogenase	βOHbutDH	2
Total systems - 28	Total loci	- 52

A computer program for linear correlation analysis (BMD03D, UCLA Biomedical Program) provided the correlation coefficients between each character and fork length and also between every pair of characters. Data from each river were analyzed separately. A pooled correlation coefficient was calculated by using the Fisher "z" transformation for each character. The test for homogeneity of correlation coefficients (Steel and Torrie, 1960) was used to determine if a pooled correlation coefficient was valid. A character was considered independent of length (i) if its pooled correlation coefficient indicated less than 5% variation attributable to length ($r = 0.224$) or (ii), in cases where the pooled correlation coefficient was invalid, if the variation attributable to length in any river was less than 10% ($r = 0.316$). If two characters were highly correlated with each other ($r = 0.70$), then only the character showing a lower correlation with length was retained.

2. Discriminant Analyses

Discriminant function analysis provides a method of classifying individuals from a mixed sample into their respective subpopulations. A set of meristic counts and morphometric measurements from individuals of a subpopulation are used to determine a discriminant function for that subpopulation. The number of discriminant functions determined equals the number of subpopulations.

In classifying an individual of unknown origin from a mixed population, the individual's values for these characters are applied to each function. A posterior probability is determined for each function which states the degree of certainty with which that function will identify the origin of the individual. The individual is classified as belonging to the subpopulation for which the posterior probability is greatest. The term posterior probability refers to that probability based on the data, rather than, for example, a probability obtained before the data are taken based on parameters of the underlying distribution.

Two types of discriminant functions are available: a linear discriminant function and a quadratic discriminant function. The linear discriminant analysis requires that the data come from multivariate normal distributions with common variance-covariance matrices within spawning populations to which individuals are classified and that each individual originate in one of the spawning populations to which individuals are assigned. The quadratic discriminant analysis is more general and does not require common variance-covariance matrices within spawning populations. Thorough treatments of linear and quadratic discriminant analyses are found in Anderson (1958) and Kendall and Stuart (1968) respectively.

Three stages were involved in the discriminant analyses: (i) discriminant functions were determined for a randomly selected subsample of specimens; (ii) the validity of these functions was tested with the remaining independent sample of specimens; (iii) discriminant functions were determined with the entire set of specimens.

In the first stage, 100 specimens from the Rappahannock, Potomac, Elk, and Hudson Rivers and 50 specimens from the Choptank were randomly subsampled. The assumption of common variance-covariance matrices within the five rivers and within the Chesapeake and Hudson regions was tested with a chi-square statistic for those characters that fulfilled the correlation criteria. When the assumption was not satisfied on a particular set of characters, a smaller set of characters as determined from the stepwise linear discriminant analysis program (BMD07M, UCLA Biomedical Program) was tested. The stepwise linear discriminant analysis program, run for the five and then for the two regions, entered characters in the order of their discriminating potential, thus providing information on the importance of each character. The quadratic discriminant program did not have this stepwise potential; therefore, the quadratic analysis was performed on various sets of characters in the order of importance in the stepwise linear discriminant program. The quadratic discriminant analysis program was also run for five rivers and then for the two regions.

After the discriminant functions were established, each program reanalyzed the specimens of known origin which had determined the functions and classified these specimens into various subpopulations. The percentage of specimens misclassified provided a measure of the classification error inherent in the functions. This procedure provided the percentage of correct classification shown in the results.

In the second stage, the remaining independent specimens were applied to the functions determined in the first stage to test their validity. These discriminant functions included only those characters that provided virtually all of the discriminating power. The final stage used the entire set of specimens to determine the coefficients of our final discriminant functions.

3. Sex and Time-of-Capture Analyses

Extraneous variations in the final set of characters used in the discriminant analyses due to sex and time of capture within each river were investigated using univariate techniques. Mean and variances for each capture period of a given sex and river were calculated for each discriminant character. Homogeneity of variance between capture periods within rivers and sexes was tested with Bartlett's test (Winer, 1971). When the assumption of common variance was satisfied, the effect of time of capture was tested with analysis of variance; but, when it was not satisfied, the Kruskal-Wallis nonparametric analysis (Winer, 1971) was used. The effect of sex on a character was tested with a paired t-test for each river and the Chesapeake and Hudson regions.

SECTION III

RESULTS

A. CORRELATION ANALYSES

A total of 41 potential meristic and morphometric discriminating characters was generated (Table III-1). The set of 41 characters was reduced by those 21 highly correlated with length; i.e., those characters highly correlated with length were not entered in a discriminant function analysis.

The scale ratio character (41) slightly exceeded the limits of correlation criteria for the Rappahannock and Potomac samples; however, it was retained because the Hudson River striped bass exhibited a compensatory growth strategy during their first 2 years and the Chesapeake striped bass did not, thus making it a potentially good discriminatory character.

High correlations occurred between the snout/fork length (12) and snout/head length (13) ratios and between the internostril width-fork length (23) and internostril width/head length (24) ratios, but characters 12 and 23 had a higher correlation with length and therefore were removed.

The number of spines on the first dorsal fin was nine in 849 of the 857 specimens (one had eight spines and seven had 10 spines); therefore, character 7 was removed.

B. DISCRIMINANT ANALYSES

1. Analyses for Five Subpopulations

A stepwise linear discriminant analysis for the five subpopulations was performed on the 450 randomly selected specimens for the remaining 17 characters (1, 2, 3, 4, 5, 6, 8, 9, 13, 16, 24, 32, 35, 36, 38, 39, and 41). Fifteen specimens with an incomplete measure for character 41 were

Table III-1

List of Characters Generated from Meristic Counts and Morphometric Measurements

Character Code	Character Description
* 1-LL	Scales along lateral line
* 2-AL	Scales above lateral line
* 3-BL	Scales below lateral line
* 4-ACP	Scales around caudal peduncle
* 5-LP	Rays on left pectoral fin
* 6-RP	Rays on right pectoral fin
7-FDOR	Spines on first dorsal fin
* 8-DOR	Soft rays on second dorsal fin
* 9-ANL	Soft rays on anal fin
10-TL/F	Total/fork length ratio
11-SL/F	Standard/fork length ratio
12-SNT/F	Snout/fork length ratio
*13-SNT/H	Snout/head length ratio
14-UJAW/F	Upper jaw/fork length ratio
15-UJAW/H	Upper jaw/head length ratio
*16-H/F	Head/fork length ratio
17-OP/F	Orbit-preopercle/fork length ratio
18-OP/H	Orbit-preopercle/head length ratio
19-ORB/F	Orbit/fork length ratio
20-ORB/H	Orbit/head length ratio
21-INO/F	Interorbital width/fork length ratio
22-INO/H	Interorbital width/head length ratio
23-NOS/F	Internostril width/fork length ratio
*24-NOS/H	Internostril width/head length ratio
25-PDOR/F	Predorsal/fork length ratio
26-CAUL/F	Caudal/fork length ratio
27-CAUW/CAUL	Caudal width/caudal length ratio
28-CAUL/F	Caudal width/fork length ratio
29-BDOR/F	Base second dorsal fin/fork length ratio
30-SDOR/F	First spine second dorsal/fork length ratio
31-SDOR/BDOR	First spine second dorsal/base second dorsal length ratio
*32-BANL/F	Base anal fin/fork length ratio
33-SANL/F	Second spine anal fin/fork length ratio
34-SANL/BANL	Second spine anal fin/base anal fin length ratio
*35-UGC	Upper arm gill rakers excluding rudimentary rakers
*36-UGR	Upper arm gill rakers including rudimentary rakers
37-LGC	Lower arm gill rakers excluding rudimentary rakers
*38-LGR	Lower arm gill rakers including rudimentary rakers
*39-FA	Focus to first annulus measure
40-SA	First annulus to second annulus measure
*41-SA/FA	First annulus to second annulus/focus for first annulus measure ratio

Note: Those characters fulfilling the criteria of the correlation analysis (Appendix A) are designated by an asterisk preceding the character code.

included in the analysis for 17 characters but, since these specimens account for only 3.3% of the sample size, their effect on the results was minimal. The variance-covariance matrices were significantly different at the 99% confidence level among the five subpopulations for four or more characters. A quadratic discriminant analysis was performed on the 4, 5 and 10 most important characters as determined by the stepwise linear discriminant analysis. The percentages of correct classification for the five subpopulations of the striped bass are shown in Table III-2.

Table III-2

Correct Classification of the Five Subpopulations by Linear and Quadratic Discriminant Analyses

Characters Entered	Character Codes (in order of importance)	Type of Analysis	Percent Correct Classification						
			Hudson	Rappahannock	Potomac	Choptank	Elk	Overall Chesapeake	Overall Total
4	41, 36, 13, 24	Linear	70.0	7.0	21.0	48.0	43.0	27.1	36.7
		Quadratic	69.0	15.0	18.0	48.0	52.0	31.1	40.0
5	41, 36, 13, 24, 2	Linear	69.0	37.0	21.0	46.0	36.0	33.4	41.3
		Quadratic	68.0	28.0	21.0	52.0	54.0	36.9	43.8
10	41, 36, 13, 24, 2, 3, 1, 16, 6, 39	Linear	71.0	39.0	44.0	54.0	41.0	43.1	49.3
		Quadratic	71.0	57.0	33.0	74.0	39.0	47.4	52.7
16	41, 36, 13, 24, 2, 3, 1, 16, 6, 39, 8, 4, 38, 35, 9, 32	Linear	70.0	45.0	45.0	54.0	33.0	42.9	48.9

The linear discriminant analysis showed that addition of more than 10 characters did not improve the overall discrimination among the five subpopulations. The quadratic discriminant analysis improved the overall correct classification, but only a few percentage points. The low probability of correct classification within the Chesapeake region indicated that, based on the data available, discrimination between the four subpopulations was not possible for classification purposes.

2. Analysis for Two Regions

The specimens used in the previous analyses from the four Chesapeake rivers were combined to form a sample for the Chesapeake region. A stepwise linear discriminant analysis for the Hudson and Chesapeake regions was performed for the same 17 characters. The variance-covariance matrices were significantly different at the 95% confidence level between the two regions for six or more characters. A quadratic discriminant analysis was performed in a stepwise manner on the two through eight most important characters as determined by the stepwise linear discriminant analysis. The percentages of correct classification for the subpopulations of striped bass from the two regions are shown in Table III-3.

Table III-3

Correct Classification of Hudson and Chesapeake Subpopulations by Linear and Quadratic Discriminant Analyses

Characters Entered	Character Codes (in order of importance)	Type of Analysis	Percent Correct Classification		
			Hudson	Chesapeake	Overall
2	41, 13	Linear	71.0	72.9	72.4
		Quadratic	73.0	72.3	72.4
3	41, 13, 24	Linear	76.0	75.1	75.3
		Quadratic	77.0	74.9	75.3
4	41, 13, 24, 1	Linear	79.0	75.1	76.0
		Quadratic	70.0	77.1	77.6
5	41, 13, 24, 1, 36	Linear	76.0	74.6	74.9
		Quadratic	79.0	74.3	75.3
6	41, 13, 24, 1, 36, 39	Linear	77.0	75.4	75.8
		Quadratic	83.0	72.3	74.7
7	41, 13, 24, 1, 36, 39, 16	Linear	77.0	74.6	75.1
		Quadratic	86.0	74.9	77.3
8	41, 13, 24, 1, 36, 39, 16, 32	Linear	76.0	74.9	75.1
		Quadratic	85.0	76.0	78.0
13	41, 13, 24, 1, 36, 39, 16, 32, 8, 9, 35, 38, 5	Linear	79.0	77.4	77.8

When six or more characters were used, the assumptions of the linear discriminant analysis were not satisfied and the quadratic discriminant provided better classification within regions. Both discriminant techniques showed that four characters were the "best" discriminators between the two spawning populations and that additional characters did not improve the overall discrimination between the Hudson and Chesapeake spawning striped bass.

A new data file containing mature specimens with a complete set of measures for the four "best" discriminant characters was created. A new random sample of 450 specimens was processed in linear and quadratic discriminant analyses for these four characters. The percentages of correct classification for the Hudson and Chesapeake spawning populations were:

	Hudson	Chesapeake	Overall
Linear	80.0	80.0	80.0
Quadratic	83.0	79.4	80.2

The linear and quadratic discriminant functions were:

Linear for Hudson:

$$F_h = 12.70508W + 1359.47080X + 803.47649Y + 10.95542Z - 691.81492$$

Linear for Chesapeake:

$$F_c = 12.91537W + 1440.07970X + 737.84938Y + 8.69158Z - 715.01360$$

Quadratic for Hudson:

$$F_h = -765.792737 - (0.090488W^2 + 3181.385707X^2 + 4454.296082Y^2 + 2.385884Z^2 + 4.428150WX - 0.051704WY + 0.199158WZ - 2661.672704XY - 0.034823XZ + 12.836756YZ) + 12.796752W + 1731.546908X + 954.514043Y + 21.529989Z$$

Quadratic for Chesapeake:

$$F_c = -693.390444 - (0.107606W^2 + 2531.472727X^2 + 3719.231750Y^2 + 3.191504Z^2 + 0.313982WX - 2.259715WY + 0.028192WZ - 1704.280787XY + 2.516731XZ - 22.544127YZ) + 13.173173W + 1341.307945X + 716.629158Y + 4.562999Z$$

where

F = discriminant score

W = lateral line scale count

X = snout/head length ratio

Y = internostril/head length ratio

Z = first annulus to second annulus/focus to first annulus measure ratio

The validity of these functions was checked with an independent file of specimens which were not used in determining the function. The percentages of correct classification for the Hudson and Chesapeake spawning populations were:

	Hudson	Chesapeake	Overall
Linear	73.6	80.0	78.6
Quadratic	72.4	78.1	76.9

The overall correct classification was lower than that for the specimens used to determine the functions, but the agreement between the two sets of data has shown that the techniques used were valid.

The entire set of 857 specimens having a complete set of measurements for the four characters was processed in linear and quadratic discriminant analyses and the final discriminant functions obtained. The percentages of correct classification for the Hudson and Chesapeake spawning populations were:

	Hudson	Chesapeake	Overall
Linear	77.5	78.5	78.3
Quadratic	79.7	78.2	78.5

The final linear and quadratic discriminant functions were:

Linear for Hudson

$$F_h = 11.37071W + 1449.33620X + 970.99374Y + 4.96371Z - 676.70158$$

Linear for Chesapeake

$$F_c = 11.55886W + 1517.35630X + 919.73629Y + 2.80536Z - 698.73614$$

Quadratic for Hudson

$$F_h = -725.111712 - (0.084818W^2 + 2984.908970X^2 + 3972.379025Y^2 + 2.297438Z^2 + 4.281602WX - 0.475769WY + 0.121288WZ - 1912.330302XY - 22.722956XZ + 0.689404YZ) + 11.839444W + 1729.269530X + 943.759217Y + 6.963189Z$$

Quadratic for Chesapeake

$$F_c = -675.634936 - (0.094820W^2 + 2547.820634X^2 + 3634.695748Y^2 + 2.720402Z^2 - 0.053239WX - 1.786265WY + 0.014482WZ - 1071.465753XY - 4.935841XZ - 15.112246YZ) + 11.512824W + 1442.712280X + 923.493087Y + 1.838425Z$$

where

F = discriminant score

W = lateral line scale count

X = snout/head length ratio

Y = internostril/head length ratio

Z = first annulus to second annulus/focus to first annulus measure ratio

C. ISOZYME ANALYSES

Isozyme analyses were completed following the completion of the multivariate discriminant analyses and were analyzed with univariate techniques. Isozyme analyses have shown striped bass to be one of the most homogeneous species ever studied. Of the 52 isozyme loci examined, only isocitrate dehydrogenase (IDH) and α-glycerophosphate dehydrogenase (α-GPDH) were variant. Serum transferrin was also variant but was too labile to be used.

Both variant enzyme systems showed clinal changes in gene frequency with latitude (Table III-4). Although the gene frequencies were low, each population had a unique value. IDH appeared to be fixed at a frequency of 1.00 in the Hudson River population, while its degree of variation increased in southern populations. For α-GPDH, the degree of variation was greater in the Hudson River than in southern populations.

Table III-4

Gene Frequencies for Most Common Allele in Enzymes α-GPDH and IDH

River	Gene Frequency	
	α-GPDH	IDH
Hudson	0.883	1.000
Elk	0.910	0.945
Choptank	0.932	0.977
Potomac	0.976	0.966
Rappahannock	0.983	0.944

Fixation at the IDH locus in the Hudson River striped bass provided a mechanism to uniquely classify a fraction of fish as "non-Hudson" in origin. All specimens characterized with a variant IDH allele came from rivers other than the Hudson. Consequently, all fish classified as Hudson in the final discriminant analysis and possessing a variant IDH allele were redefined as fish of Chesapeake, and overall correct classification increased 3%. Results from α-GPDH can be used in a similar manner but the analyses are statistical and have not been performed.

D. SEX AND TIME-OF-CAPTURE ANALYSES

The effects of time of capture and sex on the final four discriminant characters are given in Tables III-5 and III-6 respectively and are coded as follows:

		Variances	
		Equal	Unequal
Means	Equal	A	C
	Unequal	B	D

The letters A and C indicate that, at the 95% confidence level, no significant difference occurred in a character's values between different capture periods or sexes within spawning populations.

Table III-5

Effects of Time of Capture on Discriminant Characters within the Five Subpopulations

River	Sex	Capture Periods Analyzed	1-LL	13-SNT/HL	24-NOS/HL	41-SA/FA
			Characters (Coded)			
Rappahannock	Male	1, 2, 3	A	D	B	C
	Female	1, 2, 3	A	A	B	A
Potomac	Male	1, 2, 3, 4	A	C	A	A
	Female	2, 3, 4	A	A	A	A
Choptank	Male	1, 2, 3	A	A	A	A
	Female	2 3	?	A	A	A
Elk	Male	1, 2, 3, 4	A	B	B	A
	Female	3, 4	A	A	A	B
Hudson	Male	1, 2, 3	C	A	C	A
	Female	1, 2, 3	A	A	A	A

[1]A indicates equal variances and equal means
B indicates equal variances and unequal means
C indicates unequal variances and equal means
D indicates unequal variances and unequal means

Table III-6

Effects of Sex on Discriminant Characters within the Five Subpopulations and the Chesapeake Region

River	1-LL	13-SNT/HL	24-NOS/HL	41-SA/FA
	Characters (Coded)			
Rappahannock	A	*	*	B
Potomac	B	C	D	D
Choptank	*	A	A	A
Elk	A	*	*	*
Hudson	B	A	C	B
Chesapeake	A	C	D	B

[1]A indicates equal variances and equal means
B indicates equal variances and unequal means
C indicates unequal variances and equal means
D indicates unequal variances and unequal means
* indicates that test could not be made since time of capture was significant for either male or female for that river

The time of capture was significant for characters within the rivers of Chesapeake Bay. In the final discriminant analyses, these four rivers were pooled together and these differences were not critical.

Significant character value difference occurred between male and female striped bass in each river and region, but the results are inconclusive. Only the scale ratio character (41) had a significant difference within both the Hudson and Chesapeake regions. Since the discriminant functions deal with a mean vector of character values rather than individual character values, the use of univariate techniques may produce misleading results.

SECTION IV
DISCUSSION

Multivariate discriminant analyses were applied to meristic and morphometric characters, first and second year growth rates, and appropriate transformations of those characters to assess the feasibility of using such characters to identify subpopulations of striped bass. A "best" set of characters was identified to characterize a typical fish from each sampled spawning area. That character set was established independent of size, sex, and time of capture, producing the most generally applicable set of characters for fish in the Hudson and fish spawning in the Chesapeake area. It was not possible to segregate among striped bass sampled from the tributaries of Chesapeake Bay.

Comparisons of linear and quadratic discriminant functions produced similar results when six or fewer characters were used. For more than six characters, the quadratic function produced better results because the assumptions of the linear models were not met. Four characters provided virtually all the discriminatory power contained in the character sets for fish of Hudson or Chesapeake origin; these characters were first annulus to second annulus distance/focus to first annulus distance ratio; snout length/head length ratio; internostril width/head-length ratio; and number of scales along lateral line. The probability of correctly classifying a fish with four characters from a mixed population from the Chesapeake and Hudson subpopulations was 80%.

The use of discriminant function analysis with meristic characters for separating populations of fish has been successful in numerous studies. Hill (1959) correctly classified 81% of shad into their respective Hudson and Connecticut River populations based on six meristic characters. Fukuhara et al (1962) correctly classified 77% of sockeye salmon into their respective Asian and North American populations based on seven meristic characters.

Amos et al (1963) correctly classified 72% of pink salmon into their respective Asian and North American populations based on only three meristic characters. Most recently, Parsons (1972) contrasted autumn and spring herring, correctly classifying from 80.6 to 86.2% for autumn herring spawners and from 79.4 to 90.7% for spring herring spawners based on three meristic characters.

The results for striped bass compare favorably with those of previous stock discrimination studies in which meristic and morphometric characters were employed. However, there are potential limitations in using the results to assess the relative contribution of the Hudson River to the mid-Atlantic fishery.

Fish at large in the fishery come from spawning areas other than those sampled in the current study. Indeed, striped bass spawn in most of the major rivers from Florida north to the Hudson (Raney, 1972). Results of tagging studies (Vladykov and Wallace, 1952; Alperin, 1966; Shaefer, 1968; Florence, 1974; Campbell et al, in preparation; and ongoing American Littoral Society programs) suggest that fish from all spawning sources north of Cape Hatteras utilize the entire coast north of their respective spawning areas to Maine. The relative contribution of all other spawning areas to the Atlantic fishery is unknown and undoubtedly will affect the probability of correctly identifying fish of Hudson River origin. Fish from any spawning population that has a significant overlap in the character sets with Hudson River fish will cause incorrect classification as a fish of Hudson origin, thereby inflating the estimate of Hudson contribution. Consequently, to minimize the potential problems, the following steps have been taken:

- The sampling regime for 1975 collections in the Atlantic fishery (see Section V for a full discussion) has been designed to maximize sampling efforts in areas where fish of Hudson River origin are expected to provide maximum contribution. In addition, sampling will occur over the entire fishery from Cape Hatteras to Maine.

- Samples of the spawning populations in the Roanoke and Delaware Rivers will be collected to provide specimens to characterize fish of these two other important spawning sources.

- Samples from the spawning areas previously sampled during 1974 will be collected to verify past results.

- Measurements of 10 useful meristic and morphometric characters will be made for all fish collected to allow identification of fish from sources other than those characterized in the current study.

- Isozyme analyses will be performed for IDH and α-GPDH in all fish collected.

The biochemical genetic structure of striped bass is one of the most homogeneous ever studied. However, the fixation of IDH and the clinal nature of both IDH and α-GPDH provide discriminating power beyond the meristic and morphometric characters. IDH fixation allows unique "non-Hudson" classification of specimens with variant alleles. The clinal nature of enzyme frequencies, when extrapolated to more southerly populations, allows correct identification of a greater number of "non-Hudson" fish originating in the more southerly spawning area.

In addition to morphometric, meristic, and biochemical analyses, a critical scale analysis has been performed at the University of Rhode Island (Taub, 1975). Scales from all striped bass collected during this study have been forwarded to the University of Rhode Island for analysis. Results from this study will be incorporated into the multivariate discriminant functions.

In summary, character sets have been established which characterize typical fish in the Hudson River and Chesapeake spawning populations. The probability of correctly identifying a fish from a mixed sample using those characters was 80-83%. The experimental design for sampling the Atlantic fishery and performing analyses on specimens collected from the fishery has maximized the probability of correctly classifying fish of Hudson River origin.

SECTION V
1975 EXPERIMENTAL DESIGN

Assessment of the relative contribution of the Hudson River striped bass population to the Atlantic fishery requires collection of striped bass samples representative of the composition of the fishery. The sampling regime must provide samples from the entire fishery and must consider the migratory nature of the striped bass. To fulfill the above objectives, a spatially and temporally stratified sampling design will be employed. Geographic stratification reduces variance and thereby provides more precise estimates of the composition of the populations within the geographic strata of interest. Furthermore, if the results warrant such analysis, stratification provides a precise estimate across strata (i.e., the composition of the entire Atlantic fishery). Geographic strata are defined based on three criteria:

- Stratification is based on the availability of accessory data useful for the objectives. Commerical catch data, in particular, are reported by state, and strata generally are aligned along state boundries.

- Stratification is based on real habitat differences which may lead to differences in the composition of the populations occupying those habitats. The mouths of the Chesapeake and Delaware Bays, Cape Cod, and Long Island are geographic barriers which may separate populations. Consequently, some strata are defined along geographic barriers.

- Finally, stratification is based on area-specific gear use. In certain areas, due to regulation or habitat, the commercial fishery uses only one type of gear (e.g., the eastern Long Island Sound fishery has no pound nets, and the New England fishery uses only hook and line).

Figure V-1 illustrates the strata to be sampled during 1975. In general, state boundaries describe the strata. Since is is reasonable to assume that the majority of the Hudson River striped bass inhabit the areas adjacent to the mouth of the river, a greater number of finer strata are defined in the New York Bight and Long Island areas. Collections within strata will be taken from two to three substrata to assess the variation in the composition of each stratum.

Temporal stratification is necessary due to the migratory nature of the striped bass. The year is generally stratified into six 2-month periods to provide precise estimates of the composition of the populations of each stratum at various times of the year and to demonstrate potential changes in composition throughout the year. Due to the behavior of the striped bass, certain geographic-time strata will be unfilled (e.g., striped bass do not frequent New England waters during the winter months). The sampling schedule is shown in Table V-1.

Table V-1

Number of Fish To Be Collected Per Geographic Stratum and Per Time Stratum

STRATUM	JAN–FEB	MAR–APR	MAY–JUN	JUL–AUG	SEP–OCT	NOV–DEC
I			100 (MAY–JUL)		100 (AUG–OCT)	
II			100 (MAY–JUL)		100 (AUG–OCT)	
III		100	100	100	100	100
IV		100	100	100	100	100
V		100	100	100	100	100
VI		100	100	100	100	100
VII	100	100	100	100	100	100
VIII	100	100	100	100	100	100
IX	100 (JAN–MAR)	100 (APR–JUN)		100 (JUL–SEP)	100 (OCT–DEC)	

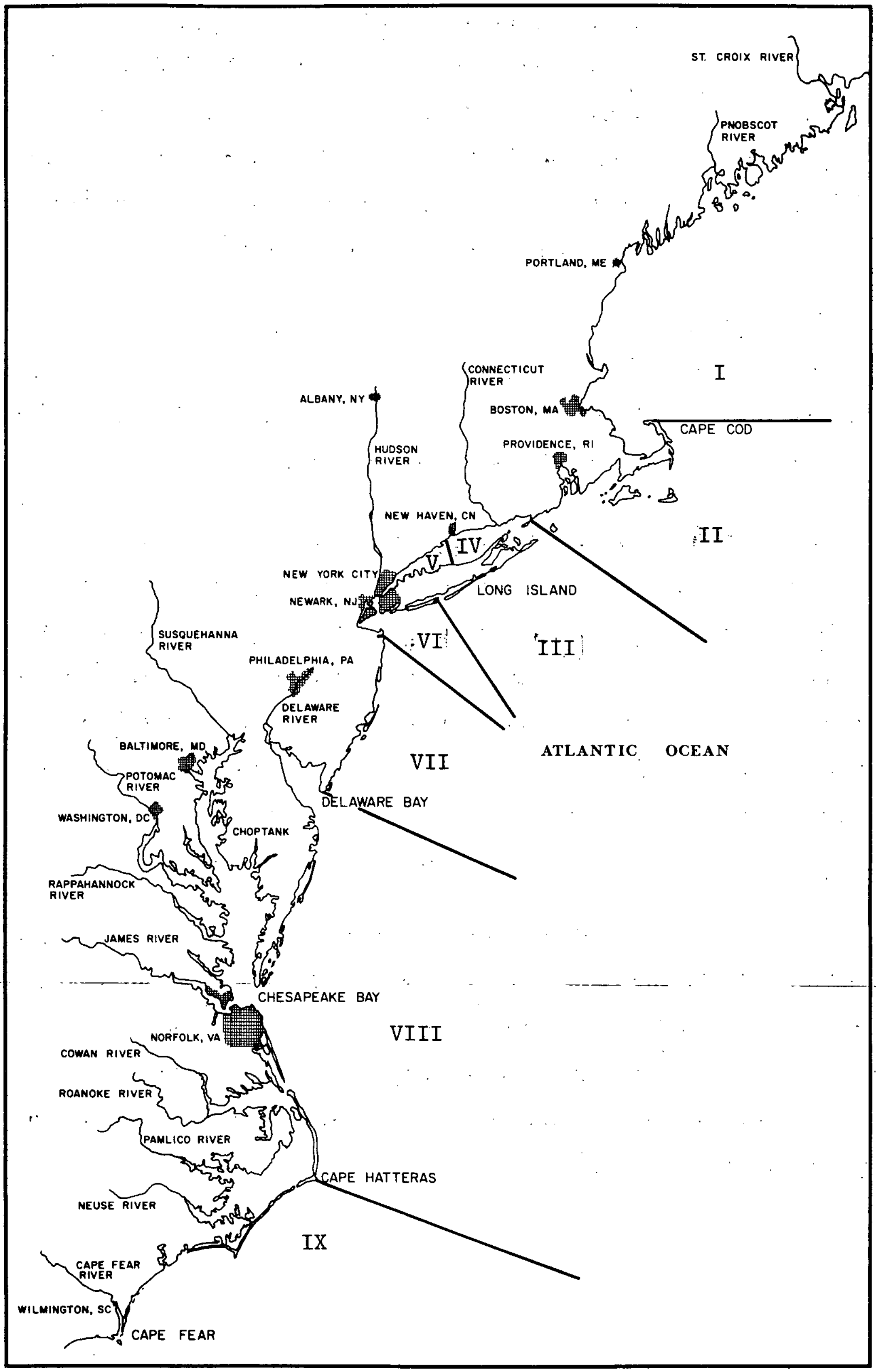


Figure V-1. Atlantic Sampling Strata

In addition to coastal sampling, some collections will be made from spawning areas. The populations of the Roanoke and Delaware Rivers represent potentially major contributors to the Atlantic fishery, and samples of the spawning populations will be collected to characterize those populations. Samples will be collected also from the spawning areas sampled in the current study to provide verification of the character sets.

Collections in the field will be obtained primarily by purchase of fish from sport and commercial fishermen. Supplementary collections will be provided by TI fishing efforts. Haul seines and gill nets will be used in areas where commercial fisheries do not exist.

Upon collection, all meristic and morphometric characters identified as having discriminatory power will be quantified in the field. Subsequently, the same analyses will be performed on a subsample of preserved fish. Scale samples will be taken for subsequent age and growth rate determinations in the laboratory, and a duplicate set of scales will be forwarded to the University of Rhode Island. Tissues samples will be collected, frozen, and forwarded to Dr. Powers at Johns Hopkins University for isozyme analyses.

The character values obtained from the samples collected during 1975 will be entered in a multivariate discriminant function. The results of the function will identify the fish, within the associated probabilities, as typical of the Hudson River population or the Chesapeake Bay population or as atypical of either. All atypical fish will be classified as having an "other" source of origin.

SECTION VI

CITED LITERATURE

Alperin, I.M. 1966. Dispersal, migration, and origins of striped bass from Great South Bay, Long Island, New York. N.Y. Fish and Game J. 13(1): 79-112.

Amos, M.H., R.E. Anas, and R.E. Pearson. 1963. Use of discriminant function in the morphological separation of Asian and North American races of pink salmon, *Oncorhynchus gorbuscha*, (Walbaum). Bull. 11. Int. North. Pac. Fish. Comm., pp. 73-100.

Anderson, T.W. 1958. An introduction to multivariate statistical analysis. John Wiley and Sons, Inc., New York.

Campbell, K.P., R.J. Klauda, and D. MacKenzie. Movements of striped bass tagged in the Hudson River. In preparation.

Clark, J. 1972. Testimony before the USAEC. Docket 50-247. Oct. 30.

Dixon, W.J. (ed.). 1971. BMD. Biomedical computer programs. Univ. of Calif. Press, Berkeley.

Drilhon, A., J.M. Fine, P. Amouch, and G.A. Boffa. 1967. Les groupes de transferrines chez *Anguilla anguilla*. Etude de deux populations Mediterraneenes d'origine geographique differante. Compt. Rend. Acad. Sci., Paris. 265: 1096-1098.

Florence, B. 1974. Tag returns from 1375 large striped bass tagged in two Maryland spawning rivers. Outdoor Message Oct. Organized Sportsmen of Mass.

Fujino, K. 1969. Atlantic skipjack tuna genetically distinct from the Pacific specimens. Copeia. 1969 (3): 626-629.

Fukuhara, F.M., S. Murai, J.J. LaLorre, and A. Sribhibdadh. 1962. Continental origin of red salmon as determined from morphological characters. Bull. 8. Int. North. Pac. Fish. Comm., pp. 15-109.

Goodyear, C.P. 1974. Origin of the striped bass of the middle Atlantic Coast. Testimony presented to the Committee on Merchant Marine Fisheries of the U.S. House of Representatives. Feb. 19.

Hill, D.R. 1959. Some uses of statistical analysis in classifying races of American shad *(Alosa sapidissima)*. U.S. Fish. Bull. 147. Vol. 59. pp. 269-286.

Hubbs, C.L. and K.F. Lagler. 1947. Fishes of the Great Lakes region. Bull. Cranbrook Inst. Sci. 26. 186 pp.

Jamieson, A. 1967. Two races of cod at Faroe. Heredity 22: 610-612.

Kendall, M.G. and A. Stuart. 1968. The advanced theory of statistics. Vol. 3. Hafner Publ. Co., New York.

Mansueti, R. 1961. Age, growth, and movements of the striped bass, *Roccus saxatilis*, taken in size selective fishing gear in Maryland. Ches. Sci. 2 (1-2): 37-44.

Merriman, D. 1941. Studies on the striped bass, *Roccus saxatilis* , of the Atlantic coast. U.S. Fish and Wildl. Serv. Fish. Bull. 50(35): 1-77.

Moller, D. 1966. Genetic differences between cod groups in the Loften area. Nature 212:824.

Morgan, R.P., T.S.Y. Koo, and G.E. Krantz. 1973. Electrophoretic determination of populations of the striped bass *Morone saxatilis* in the upper Chesapeake Bay. Trans. Am. Fish. Soc. 102 (1): 21-32.

Parsons, L.S. 1972. Use of meristic characters and a discriminant function for classifying spring and autumn spawning Atlantic herring. Int. Conn. N.W. Atl. Fish. Res. Bull. 9. pp. 5-9.

Porter, J. and S.B. Saila. 1969. Final report for the cooperative striped bass migration study. U.S. Fish and Wildl. Ser.

Raney, E.C. and D.P. deSylva. 1953. Racial investigations of the striped bass, *Roccus saxatilis* (Walbaum). J. Wild. Mgt. 17(4): 495-509.

Raney, E.C., W.S. Coolcott, and A.G. Mehring. 1954. Migratory patterns and racial structure of Atlantic coast striped bass. Trans. 19th N.A. Wildl. Conf. pp. 376-396.

Raney, E.C. 1972. The striped bass, *Morone saxatilis*, of the Atlantic coast of the United States with particular reference to the population found in the Hudson River. Testimony before USAEC. Docket 50-247. Oct. 30.

Schaefer, R.H. 1968. Size, age composition and migration of striped bass from the surf waters of Long Island, New York. N.Y. Fish and Game J. 15 (1): 1-51.

Steel, R.D.G. and J.H. Torrie. 1960. Principles and procedures of statistics. McGraw-Hill, New York.

Taub, E.S. 1975. Racial investigation of the striped bass using critical scale analysis. Univ. of R. Is. Grad. School of Oceanog. Rpt.

Vladykov, V.D. and D.H. Wallace. 1952. Studies of the striped bass, *Roccus saxatilis* (Walbaum), with special reference to the Chesapeake Bay region during 1936-1938. Bull. Bingham Oceanog. Coll. 14(1): 132-177.

Winer, B.J. 1971. Statistical principles in experimental design. McGraw-Hill, New York.

APPENDIX A

CORRELATION ANALYSIS RESULTS

Table A-1

Correlation of Characters with Length of Fish, Chi-Square, Tests for Common Correlation, Average r and Average r^2; (Sample Size in Parentheses)

LOCALTIY	1-LL	2-AL	3-BL	4-ACP	5-LP	6-RP
Rappahannock	-.13415 (156)	-.00181 (155)	.02655 (156)	-.10284 (156)	-.04050 (156)	.15531 (155)
Potomac	-.17709 (202)	-.09425 (202)	.22427 (202)	-.06833 (202)	-.10157 (202)	-.12718 (200)
Choptank	-.28069 (92)	.10958 (92)	.30464 (92)	-.18878 (92)	-.12453 (92)	.10497 (92)
Elk	.08586 (250)	.09268 (250)	.25270 (250)	.06399 (250)	.12097 (249)	.06038 (247)
Hudson	-.20834 (192)	-.03712 (192)	.09014 (192)	-.21198 (191)	.17469 (190)	.12265 (190)
x^2	15.296	5.200	8.708	9.772	12.442	9.256
x^2 .95 (4 d.f.)	9.49	9.49	9.49	9.49	9.49	9.49
Average r[a]	NV	.00758	.17862	NV	NV	.05264
Average r^2		.00006	.03190			.00277
Percent variation attributable to length[b]	m7.88	0.006	3.19	m4.49	m3.05	0.28

LOCALITY	7-FDOR	8-DOR	9-ANL	10-TL/F	11-SL/F	12-SNT/F
Rappahannock	.03025 (156)	.10138 (156)	.05858 (156)	-.47612 (155)	-.00415 (156)	-.10800 (156)
Potomac	-.06530 (202)	.04804 (202)	.10569 (202)	-.56142 (192)	.08087 (202)	-.01862 (202)
Choptank	-.08734 (92)	.04758 (92)	.01142 (92)	-.68047 (92)	.45229 (92)	-.04859 (92)
Elk	-.05059 (250)	.12824 (250)	.08920 (249)	-.41851 (250)	.31458 (250)	-.09549 (250)
Hudson	-.00278 (192)	.06114 (192)	.13127 (192)	-.31556 (191)	-.02330 (192)	.26452 (192)
x^2	1.335	1.019	1.085	19.392	28.006	15.342
x^2 .95 (4 d.f.)	9.49	9.49	9.49	9.49	9.49	9.49
Average r[a]	-.03329	.08281	.08887	NV	NV	NV
Average r^2	.00111	.00686	.00790			
Percent variation attributable to length[b]	0.11	0.69	0.79	m46.30	m20.46	m7.00

a. The letters NV designate that an average correlation coefficient is not valid.

b. The letter m designates that the value shown is the maximum variation attributable to length observed in any of the localities.

Table A-1 (Contd)

LOCALITY	13-SNT/H	14-UJAW/F	15-UJAW/H	16-H/F	17-OP/F	18-OP/H
Rappahannock	.01099 (156)	-.39791 (156)	-.30694 (156)	-.21426 (156)	.40102 (156)	.50033 (156)
Potomac	-.06693 (202)	-.35304 (202)	-.39139 (202)	.06104 (202)	.52723 (202)	.43343 (202)
Choptank	.01366 (92)	-.38126 (92)	-.31288 (92)	-.12649 (92)	.33657 (92)	.33700 (92)
Elk	.13079 (250)	-.22254 (250)	-.23518 (250)	-.02266 (250)	.32014 (250)	.31169 (250)
Hudson	.23349 (192)	.06623 (192)	.00250 (192)	.08296 (192)	.08387 (192)	.01447 (192)
x^2	10.778	28.384	18.565	44.305	25.401	29.836
x^2 .95 (4 d.f.)	9.49	9.49	9.49	9.49	9.49	9.49
Average r[a]	NV	NV	NV	NV	NV	NV
Average r^2						
Percent variation attributable to length[b]	m5.45	m15.83	m15.32	m4.59	m27.80	m25.03

LOCALITY	19-ORB/F	20-ORB/H	21-INO/F	22-INO/H	23-NOS/F	24-NOS/H
Rappahannock	-.84533 (156)	-.84551 (156)	.64971 (156)	.69914 (156)	.07158 (156)	.15368 (156)
Potomac	-.93763 (202)	-.93304 (202)	.80519 (202)	.76958 (202)	.34512 (202)	.29886 (202)
Choptank	-.86556 (92)	-.87108 (92)	.77051 (92)	.73732 (92)	.00816 (92)	.07237 (92)
Elk	-.83422 (250)	-.82746 (250)	.62664 (250)	.62864 (250)	.04339 (250)	.05802 (250)
Hudson	-.75906 (192)	-.77679 (192)	.46259 (192)	.37121 (192)	.04607 (192)	-.00862 (192)
x^2	55.385	46.126	41.907	44.030	15.396	11.513
x^2 .95 (4 d.f.)	9.49	9.49	9.49	9.49	9.49	9.49
Average r[a]	NV	NV	NV	NV	NV	NV
Average r^2						
Percent variation attributable to length[b]	m87.92	m87.06	m64.83	m59.23	m11.91	m8.93

a. The letters NV designate that an average correlation coefficient is not valid.

b. The letter m designates that the value shown is the maximum variation attributable to length observed in any of the localities.

Table A-1 (Contd)

LOCALITY	25-PDOR/F	26-CAUL/F	27-CAUW/CAUL	28-CAUW/F	29-BDOR/F	30-SDOR/F
Rappahannock	.40958 (156)	.22369 (156)	-.45006 (156)	-.47829 (156)	.27158 (156)	-.56349 (154)
Potomac	.50958 (202)	.31989 (202)	-.61825 (202)	-.66535 (202)	.28729 (202)	-.74492 (198)
Choptank	.16608 (92)	.09170 (92)	-.26278 (92)	-.27546 (92)	.40475 (92)	-.75998 (92)
Elk	-.0505 (250)	.12975 (250)	-.23839 (250)	-.22789 (250)	.27485 (250)	-.53784 (249)
Hudson	.17144 (192)	.02187 (192)	-.19009 (192)	-.23957 (192)	.15342 (192)	-.63207 (191)
x^2	48.628	10.757	37.326	46.889	4.948	21.380
x^2 .95 (4 d.f.)	9.49	9.49	9.49	9.49	9.49	9.49
Average r[a]	NV	NV	NV	NV	.26550	NV
Average r^2					.07049	
Percent variation attributable to to length[b]	m25.97	m10.23	m38.22	m44.27	7.05	m57.76

LOCALITY	31-SDOR/BDOR	32-BANL/F	33-SANL/F	34-SANL/BANL	35-UGC	36-UGR
Rappahannock	-.57988 (154)	.15851 (156)	-.70016 (154)	-.68851 (154)	.23190 (146)	.16226 (146)
Potomac	-.76464 (198)	.09015 (202)	-.85247 (201)	-.85303 (201)	.15609 (189)	.02401 (189)
Choptank	-.78935 (92)	.20023 (92)	-.85290 (89)	-.87172 (89)	.29059 (82)	.33484 (82)
Elk	-.56593 (249)	-.00320 (250)	-.66689 (250)	-.64805 (250)	.01381 (245)	-.07827 (245)
Hudson	-.68021 (191)	-.18187 (192)	-.61966 (188)	-.55697 (188)	.10624 (167)	-.11463 (167)
x^2	23.940	14.887	43.908	61.029	7.367	16.807
x^2 .95 (4 d.f.)	9.49	9.49	9.49	9.49	9.49	9.49
Average r[a]	NV	NV	NV	NV	.13132	NV
Average r^2					.01724	
Percent variation attributable to length[b]	m62.31	m4.01	m72.74	m75.99	1.72	m11.21

a. The letters NV designate that an average correlation coefficient is not valid.

b. The letter m designates that the value shown is the maximum variation attributable to length observed in any of the localities.

Table A-1 (Contd)

LOCALITY	37-LGC	38-LGR	39-FA	40-SA	41- SA/FA
Rappahannock	-.04930 (156)	.00613 (156)	.11862 (152)	.46084 (152)	.32790 (152)
Potomac	-.29223 (201)	-.21385 (201)	.16310 (185)	.50421 (185)	.34368 (185)
Choptank	-.43053 (92)	-.25052 (92)	-.12408 (88)	.19126 (88)	.20050 (88)
Elk	-.15544 (250)	-.17369 (250)	.10319 (245)	.23899 (245)	.12828 (245)
Hudson	.09411 (192)	.04909 (192)	.00054 (187)	-.01800 (187)	-.04992 (187)
x^2	25.941	12.072	6.358	37.995	20.010
x^2 .95 (4 d.f.)	9.49	9.49	9.49	9.49	9.49
Average r[a]	NV	NV	.07382	NV	NV
Average r^2			.00545		
Percent variation attributable to length[b]	m18.54	m6.28	0.54	m25.42	m11.81

a. The letters NV designate that an average correlation coefficient is not valid.

b. The letter m designates that the value shown is the maximum variation attributable to length observed in any of the localities.

19-5B

Measurements were made at depth intervals of ~10 ft (3 m). If the last interval brought the sensor package within 1 m of the bottom, no readings were made.

2. 1974 Program

a. Methods Associated with Ichthyoplankton Sampling

Collection and analysis procedures for water samples were unchanged from the 1973 program. Since the same instrumentation was used, the same correction factors were applied to conductivity and dissolved-oxygen measurements.

b. Methods Associated with Fisheries Efforts

During 1974, concurrency between biological sampling and water-quality measurement and sampling was increased by *in situ* measurement and water-sampling from operating trawl and seine boats. Since the frequency of biological sampling was weekly at a minimum and the trawling and beach-seine stations coincided closely with previously used water-quality standard stations, there was no deviation from basic sampling patterns. The net result was an increase in data concurrency with a decrease in boat usage.

1) Water-Quality Measurement Associated with Standard-Station Trawls

During these efforts (surface and bottom trawls), water-quality measurements were made by towing the Hydrolab sensor package above and in front of the trawl gear during each tow. Measurement began when the trawl was set and continued until all parameters (temperature, specific conductance, dissolved oxygen, and pH) were measured at all depths (3-m intervals as in 1973). Sampling locations are indicated in Figure III-13.

In 1974 the use of percent transmittance as a measure of turbidity was discontinued in favor of more sensitive standardized nephelometric methods. Concurrent with this change, surface samples were taken during trawling operations and were returned to the Verplanck laboratory. These were analyzed using the Hack 2100A turbidimeter.

2) Water-Quality Measurements Associated with Interregional Bottom-Trawl Surveys

Since interregional and standard-station trawl tows were made on alternate weeks, the same water-quality sampling methods were applied to both trawling efforts. These included the same parameters, depth intervals, and essentially the same sampling locations (Figure III-13) except for additional stations outside the Indian Point region.

3) Water-Quality Sampling during Standard-Station Beach Seining

Water samples were taken in 500-ml polyethylene bottles at each beach-seine site (Figure III-13). Numbered bottles were filled and capped under the surface of the water and returned to the laboratory for determination of specific conductance, pH, and turbidity.

Temperature was measured *in situ* at each station with a mercury thermometer. Specific conductance was measured with a YSI Model 31 conductivity bridge. Hydrogen ion concentration (pH) was measured using a Sargent-Welch Model PBL pH meter. Turbidity was measured using a Hach 2100A turbidimeter. Dissolved-oxygen concentrations were also measured if the delay in returning the sample was minimal; however, such dissolved-oxygen data were questionable and were not used in statistical analyses. The only value of such data was to indicate extreme depletion of oxygen.

4) Water-Quality Sampling during Whole-River Beach-Seine Surveys

The same water-sampling methods were used during standard-station beach-seine and beach-seine survey water sampling. Except for sending a YSI Model 54 dissolved-oxygen meter with the beach-seine crews to determine dissolved-oxygen concentrations, the same analyses were made.

SECTION IV

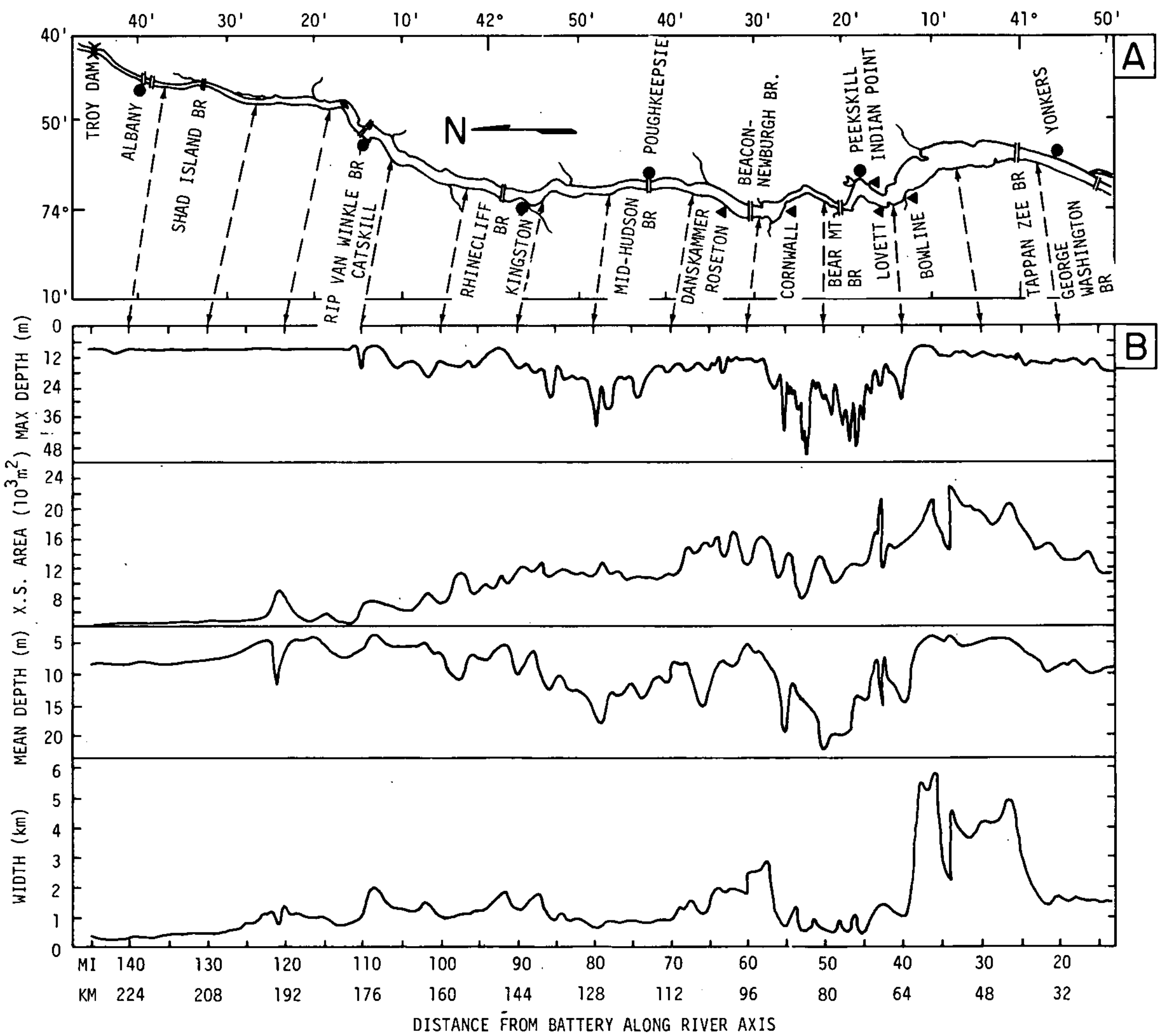
DESCRIPTION OF STUDY AREA

A. HUDSON RIVER ESTUARY

1. Physical Description

The Hudson River estuary is defined as the tidal region of the Hudson River, a region that stretches 240 kilometers (150 miles) northward from the Battery on Manhattan Island to the Troy Dam near Albany, New York (Figure IV-1). It is a narrow salt-intruded river channel that has been greatly influenced by the Pleistocene ice sheets which covered the region in earlier geologic times (Schuberth, 1968). The estuary has extreme depths of about 53 meters (175 feet) but is usually much shallower, with depths of 10 to 20 m (33 to 65 ft) being most common. Distinct relationships exist between longitudinal depth, width, and cross-sectional area profiles (Figure IV-1); in general, as the depth increases, the width and cross-sectional area decrease. This is directly attributable to the presence or absence of mountainous terrain. The deepest region of the estuary is near West Point, New York, where the river cuts through the Hudson highlands; the estuary in this region is confined to a deep, narrow gorge.

The channel of the Hudson River was developed in the glacial till that blankets the entire region (Fenneman, 1938; Schuberth, 1968). The till greatly reduced the depth of a deep gorge cut in the native rock of the region; the effect of this filling was to produce a slightly inclined river basin with the channel bottom approximately at sea level in the Albany area. Dredging and silting periodically modify the exact elevation. The depth at which solid rock is encountered gradually increases from Albany southward, but this trend is broken where the gorge cuts through the highlands. When the Catskill aqueduct was built, solid rock was not encountered until more than



[A] AREA MAP OF ESTUARY

[B] CHANNEL MORPHOMETRIC INDICES

▲ POWER-GENERATING PLANTS

● LANDMARK CITIES

Figure IV-1. Major Morphometric Characteristics of Lower Hudson River Estuary

230 m (765 ft) below the present sea level. The depth of the channel is shallower south of the highlands where the channel resumes its gradual descent toward the edge of the continental shelf, eventually forming the Hudson River canyon (Fenneman, 1938). The glacial debris which fills the ancient gorge forms several sill-like shallow areas across the channel of the estuary; these shallow areas seem to influence the distribution of saline waters in the estuary, as will be discussed later.

2. Climatic Influences

The average annual air temperature of the lower Hudson basin is 9°C (48°F) (Busby, 1966). The average January low air temperatures range from -11°C to -4°C (12° to 24°F); low temperatures for July average from 12°C to 19°C (54° to 66°F), and highs range from 26°C to 30°C (78° to 86°F). Precipitation averages range from 102 to 122 centimeters (40 to 44 inches) per year (Frost, Leary, and Thompson, 1970). Water temperatures in the estuary generally follow the seasonal air temperatures. During the winter, ice may completely cover the estuary as far south as Peekskill, although it is broken up by shipping and tidal action. Maximum summer water temperature is approximately 25°C (77°F).

Within the New York State area, stream flows (as evidenced by stream discharges) tend to exhibit a bimodal pattern with respect to time (USGS Surface Water Records). Discharges into the Hudson estuary follow the same pattern: summer discharges are low, followed by a peak discharge in November and December; a mid-winter depression is followed by a second generally higher peak discharge during March, April, and May, apparently responding to combined spring thaws and precipitation peaks.

3. Hydrology

Freshwater flow into the estuary is partially controlled by the Troy Dam and other flood-control and water-supply reservoirs in the Hudson drainage basin. Approximately 60% of the net flow of the Hudson estuary passes the Green Island gage below the Troy Dam. The drainage basin below Troy contributes the remainder, principally from the tributaries in the south-eastern Catskill Mountains. The average flow at Green Island is 354 cubic meters per second (12,500 cubic feet per second). Flows from the Troy Dam are greater than 113 m^3/sec (3990 ft^3/sec) 90% of the time. The lowest 7-day average flow for a 10-year recurrence interval is 82 m^3/sec (2900 ft^3/sec). These values are subject to considerable influence by releases from reservoirs in the watershed and could be modified by changes in the release schedules (Darmer, 1969).

The mean freshwater flow at New York City amounts to about 580 m^3/sec (20,480 ft^3/sec). Floods are of importance only in the extreme north end of the estuary where the channel is relatively narrow. Record floods occur infrequently. Flows for the last significant floods at Green Island were: (1) 6100 m^3/sec in 1936; (2) 5130 m^3/sec in 1948; and (3) 3820 m^3/sec in 1960. These extraordinarily high flows of fresh water are damped out by tidal influence and the increasing cross section of the channel within 30 to 50 km (19 to 31 mi) below Albany (Darmer, 1969).

The oscillating tidal flow of the Hudson is much greater than the net freshwater flow: the usual tidal flow is from 10 to 100 times the fresh-water flow, ranging from about 5670 to 8500 m^3/sec; but exceptional tidal flows may be $>$ 14,000 m^3/sec (Busby, 1966). As a consequence, the net flow of the Hudson drainage is completely masked by the tidal flows superimposed on it. Even the estuary's very large tidal flow can be suppressed by unusual weather conditions. Strong wind from the north and south quadrants will push water into or out of the estuary, obscuring the true tidal regime (Busby, 1966).

Tidal activity at any given time increases longitudinally in either direction from West Point (Figure IV-2). This characteristic has been demonstrated by Gross (1972) for both the Hudson and Potomac estuaries. In the Hudson, the mean tidal amplitude increases from 82 cm (2.7 ft) at West Point to approximately 137 cm (4.5 ft) at both Albany and Battery Park. This condition apparently results from a reflection of the tidal wave at the landward end of the progressively narrowing channel. The same longitudinal pattern exists for amplitude extremes, tide-current velocities (Figure IV-3).

4. Water Quality and Salt Intrusion

Although the Hudson River has been subject to significant pollution, the overall water quality is good with a few exceptions (e.g., infrequent oxygen depletions in some areas). The fresh water of the Hudson basin is slightly hard, with 50 to 100 mg/l hardness (as $CaCO_3$) and < 100 mg/l chloride (USGS Surface Water Records).

The Hudson River has served as the major water supply for towns along the Hudson from Poughkeepsie northward. The influence of salt water is rarely seen as far north as Poughkeepsie, although the leading edge of the saline waters may reach that point during exceptional years when freshwater flows are very low (Darmer, 1969). Typically, the salt front [defined here as the area where salinity is 0.1 parts per thousand ($^o/oo$)] usually extends upstream no further than Newburgh — and it reaches that point only occasionally during a typical year.

Salinities greater than 1.0 $^o/oo$ rarely occur above Cornwall, New York. At Indian Point, however, the salinity regularly exceeds 1.0 $^o/oo$ during low freshwater flows and, conversely, the water is fresh during high net flow periods. Salinity is usually above 1 or 2 $^o/oo$ below the Tappan Zee Bridge at Tarrytown, New York, with only occasional elimination of salt water from the region by flood conditions (Darmer, 1969).

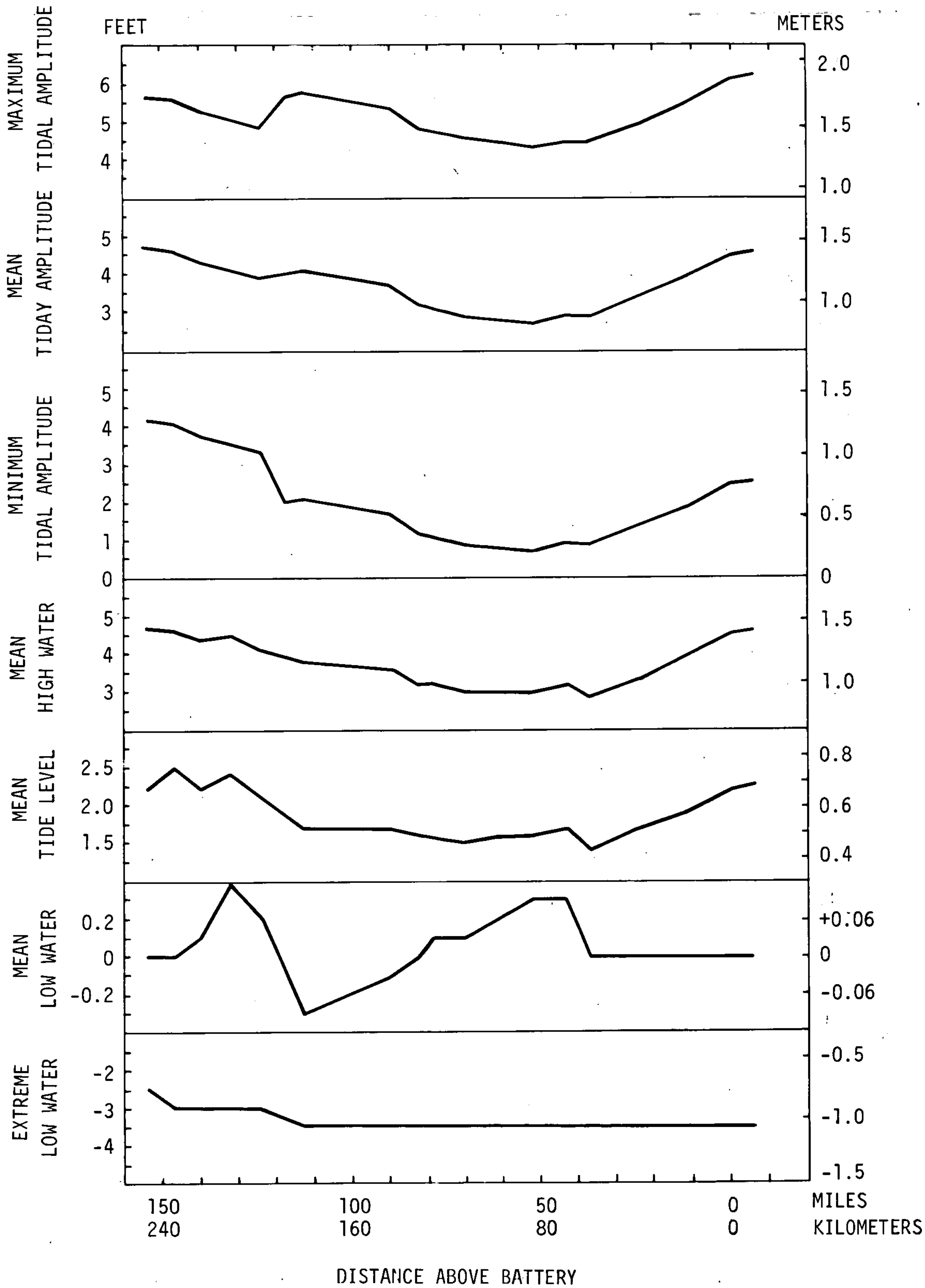


Figure IV-2. Longitudinal Changes in Major Indices of Tidal Activity (Data courtesy USCGS hydrographic charts)

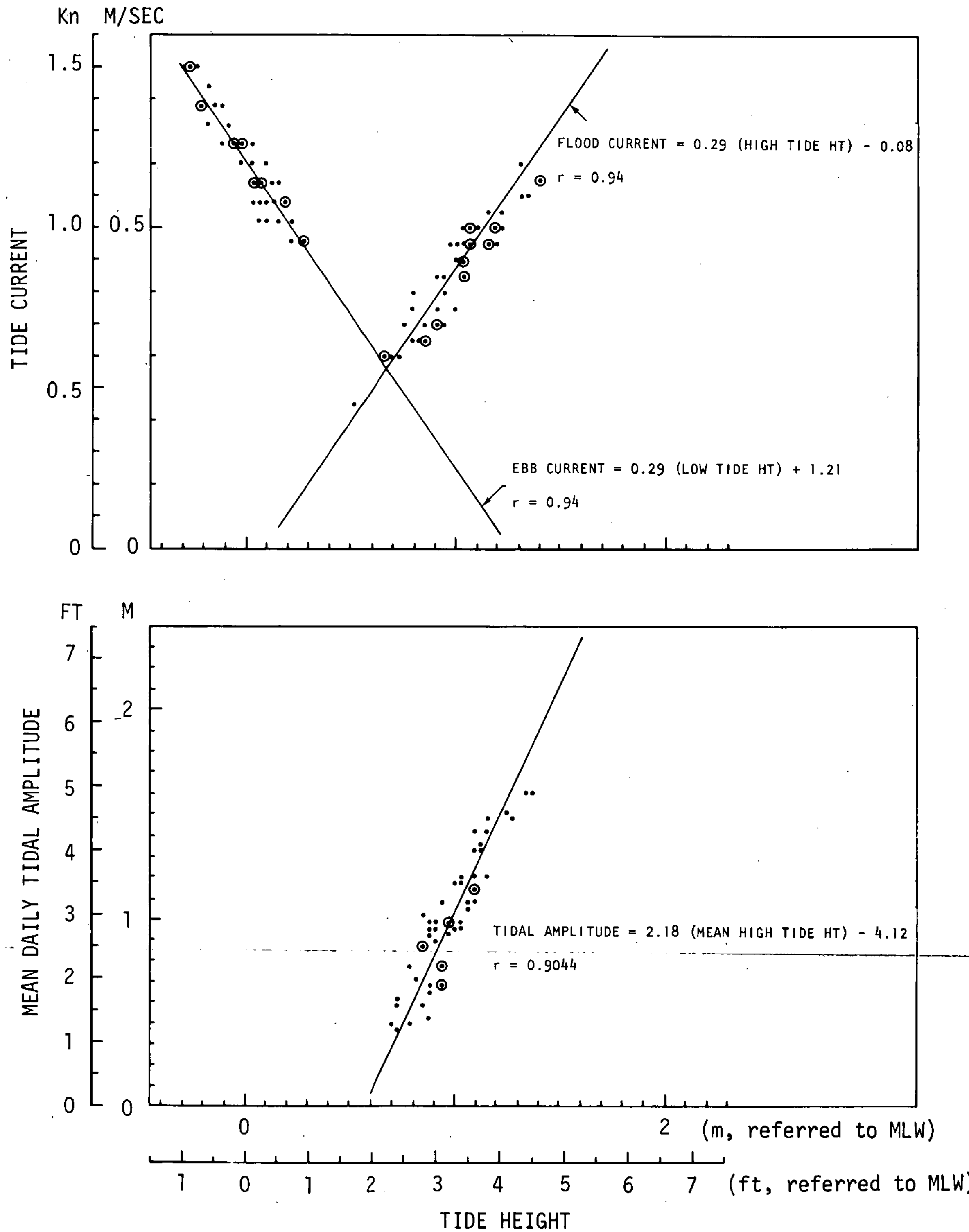


Figure IV-3. Relationships between Tidal Currents, Heights, and Amplitudes at Peekskill, New York. (Points indicate corresponding values for every seventh day of 1973; circles indicate multiple data points). (Courtesy National Ocean Survey tide-prediction tables)

Mixing of fresh and salt water due to tidal action in the lower estuary is also influenced by shallow areas that border the channel or deeper areas. The channel water attains higher velocities and moves earlier than the shoal areas. The result of reduced circulation and delay in mixing is a less variable salinity in bay areas. Intrusion into bay areas is also delayed by the tendency for denser, more saline water to follow deeper areas of the channel during intrusion. As tidal mixing increases, the intruded salt is diluted by freshwater flows and simultaneously introduced into shallower areas by upper-level circulation patterns. Flushing of backwater bay areas is also less abrupt than channel flushing due to reduced circulation of tidal and freshwater flows through these areas (Texas Instruments Incorporated, 1974b).

Variables having the greatest influence on the intensity of salt intrusion are freshwater flow, tidal mixing, and river morphometry (Figure IV-4). Secondary influences are imposed by meteorological conditions (wind, relative humidity and air temperature) interacting with water temperatures. Freshwater flows provide the dilutant for salt intrusion, while tidal activity (indicated by amplitudes) serves to mix fresh and saline water. Rapid changes in the river basin shape, especially the presence of sill structures, tend to accentuate mixing by increasing turbulence.

The distributions of hydrogen ion concentrations (pH), dissolved-oxygen concentrations, and turbidity do not appear to change rapidly under most conditions between Tappan Zee and Coeymans [RM 132 (km 212)]. Spatial changes in dissolved-oxygen concentrations are generally restricted to 1 to 2 parts per million decreases with depth. More extreme reductions have occurred, although infrequently and apparently restricted to warm months. Occasional reductions occur also in warm backwater bays where circulation is limited and temperatures elevated.

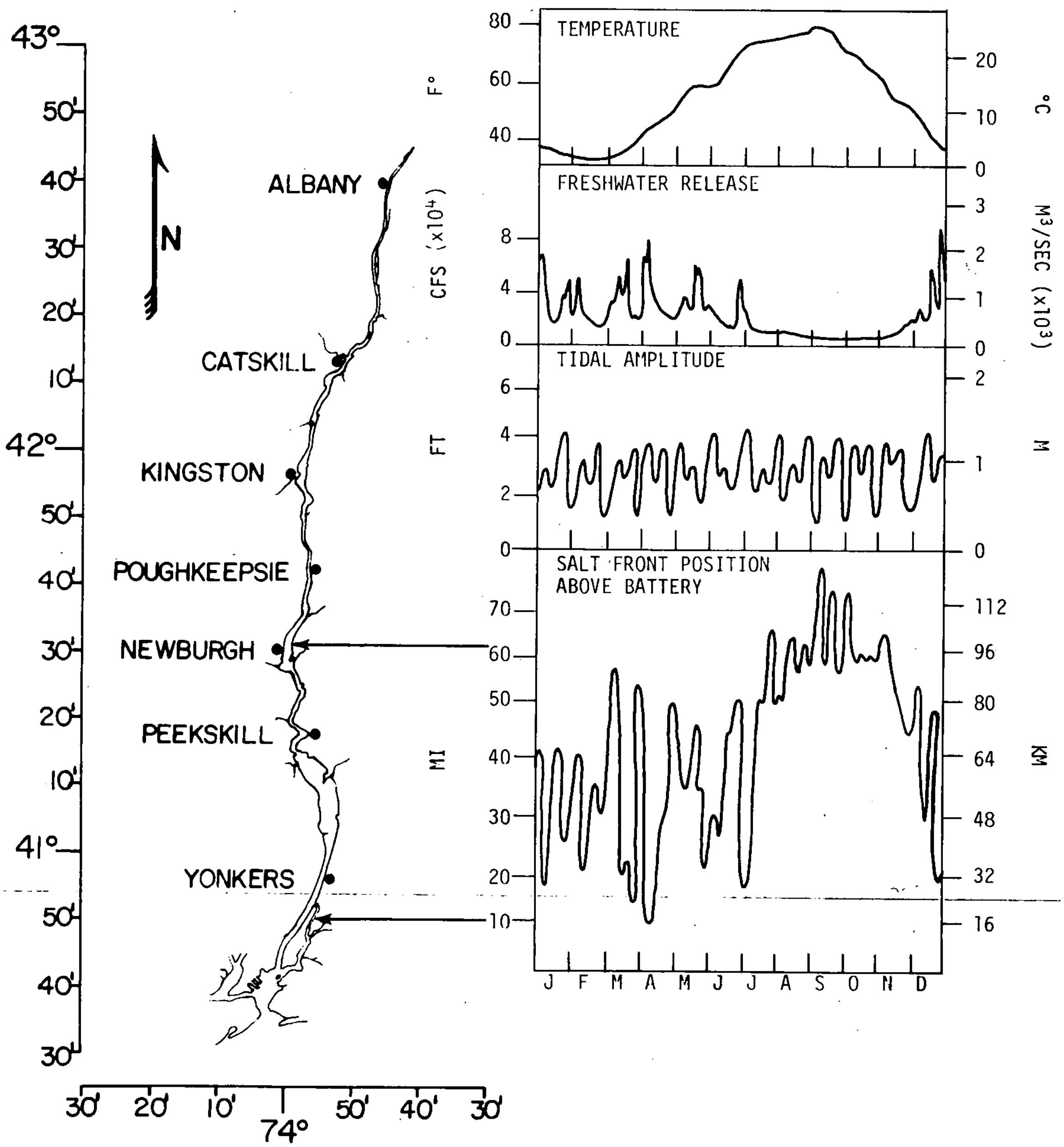
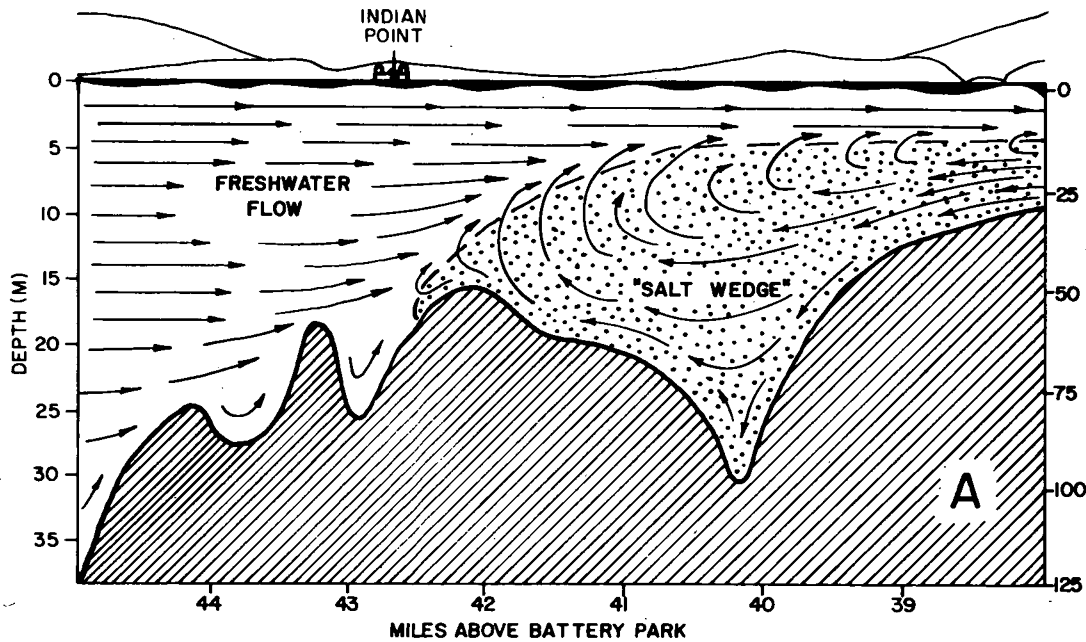


Figure IV-4. Semidiagrammatic Representation of Variables Influencing Salinity Intrusion within Lower Hudson Estuary. (Plot derived from 1973 data)

Temporal changes in dissolved-oxygen concentrations are directly influenced by water-temperature effects on solubility and biological activity. Percent saturation averages range between 60% (~5 ppm) during the summer months and 95% (~14 ppm) during the winter months. Changes in percent saturation are attributable to changes in biological activity, while the changes described by the harmonic model of Berger and Zobler (1973) are attributable to the annual temperature cycle.

5. Characterization of Estuary

Depending on freshwater flow, tidal activity, and location, the estuary encompasses all estuarine types or descriptions. Consequently, subjective definitions of the estuarine nature of the Hudson River have been of little value. At low tidal amplitudes (< 2.0 ft or 60 cm), a distinct salt wedge forms, resulting in virtually complete stratification of flows. This condition is evidenced by the very rapid intrusions of the salt wedge during the winter and spring and occasionally the summer (Figure IV-5). The estuary proceeds through partially stratified to completely mixed conditions at high tidal activities [120 to 150 cm (4 to 5 ft) tidal amplitudes]. These estuary types have been described by Pritchard (1952, 1955), Weyl (1970), Gross (1972), Simmons (1966), and Lauff (1967). Duxbury (1971) has extended the concept by numerically identifying three types and including the concept of the Coriolis effect (the tendency for a gas or liquid to be deflected by the earth's rotational acceleration). Duxbury's Type I estuary involves high freshwater discharge, high mixing, and salt entrainment by "waves" on the wedge surface; his Type II estuary involves tidal control of mixing, partial stratification, and slight Coriolis effects producing a gradual upward surface incline toward the east (in the northern hemisphere); and Type III estuaries exhibit extreme gradients in salinity, from fresh to salt water, with an extremely intense inclination of the surface such that saline water intrudes along the east side of the channel, with freshwater discharges along the west side. Recent field evidence suggests that



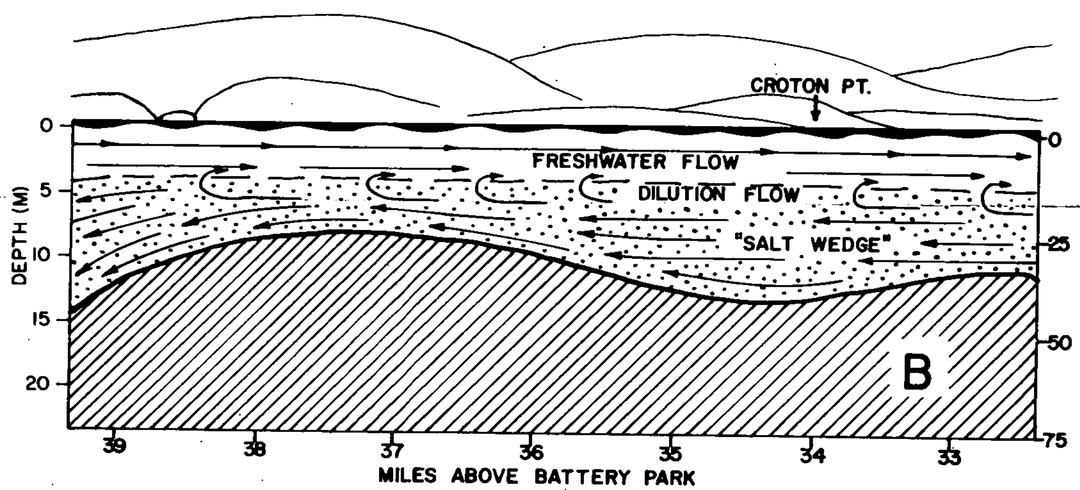


Figure IV-5. Schematic of Salt-Wedge Intrusion in Lower Hudson Estuary even this extreme type of estuary may be demonstrated in the wide areas of Tappan Zee and HaverstrawBay — at least during low tidal activity.

The presence of the sill complex between RM 39 and 43 (km 63 and 69) presents an additional facet of the estuary. The portion of the estuary between Indian Point and Storm King Mountain can be described as fjord-like (Boyle, 1969). As indicated by Gross (1972), a fjord is an estuary in which a sill tends to restrict communication between saline water and a significant volume of bottom water upstream of the sill. A zone of intense mixing occurs at the peak of the sill at Indian Point (described for the Hudson estuary by Simpson et al, 1973).

B. POWER PLANTS

1. Bowline Point Generating Station*

Bowline Point generating station located on the west bank of the Hudson River at RM 37 (km 60) in the town and village of Haverstraw, New York (Figure IV-6), is jointly owned by Consolidated Edison Company of New York and Orange and Rockland Utilities, which supervises maintenance and operation of this plant on behalf of both tenants. The plant began commercial operation in September 1972 and now consists of two fossil-fueled steam-electric units (Table IV-1). Cooling water is drawn from Bowline Point Pond, circulated through the condensers, and returned through a discharge diffuser system to the Hudson River upstream from the plant site (Figure IV-7). Bowline Point Pond is connected with the Hudson River, permitting a free exchange of river water. Dimensions of the Bowline Point Pond inlet channel were selected to achieve low water velocities generally in the range of 15 cm/sec (0.50 ft/sec) or less.

Units 1 and 2 each draw water through a common intake structure. Openings are located on the side as well as in front of the intake

*Adapted from QLM (1974b) Hudson River aquatic ecology studies at Bowline.

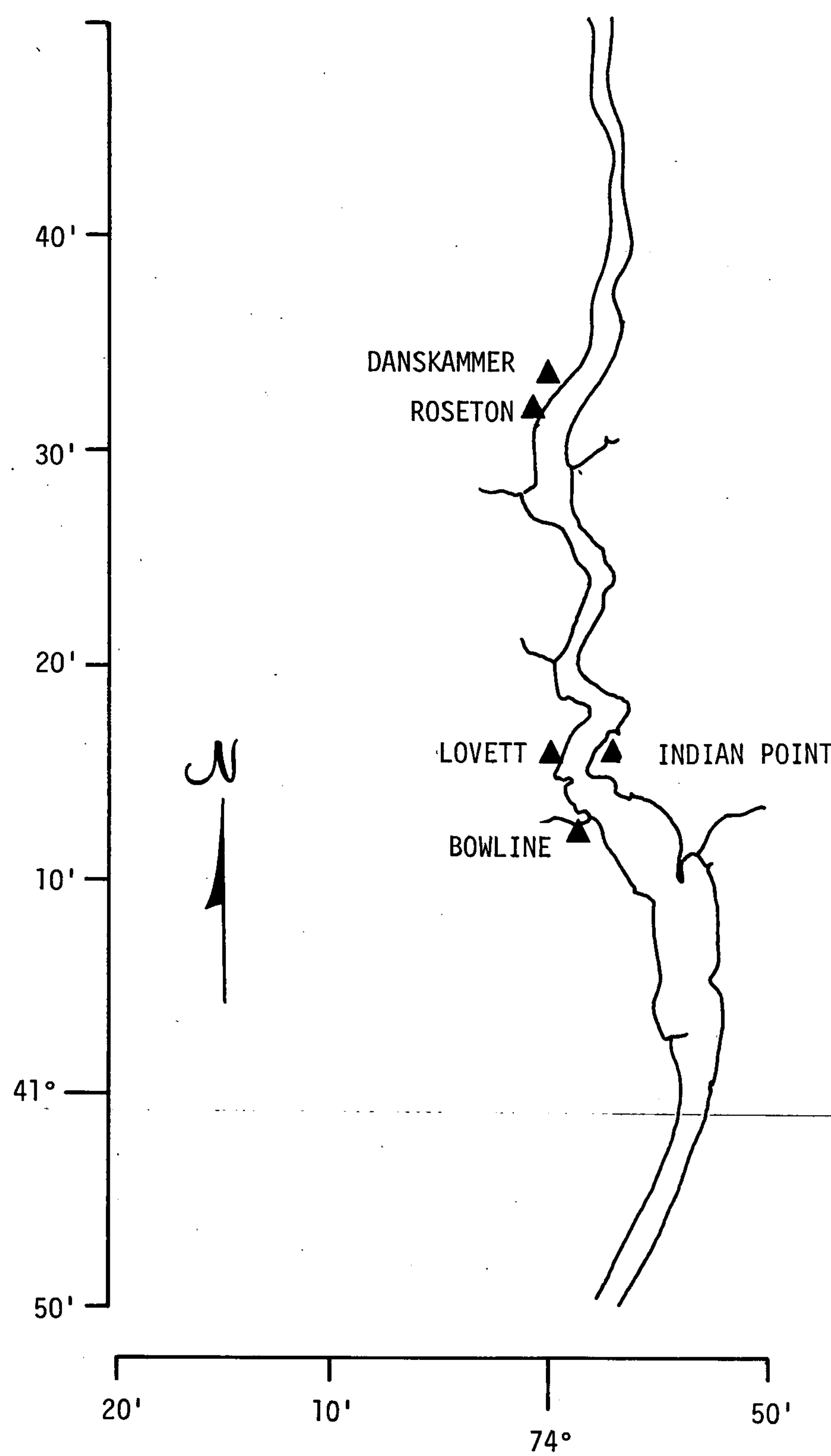


Figure IV-6. Location of the Bowline, Lovett, Indian Point, Roseton, and Danskammer Power-Generating Stations on the Lower Hudson River Estuary

Table IV-1

Plant Operational Data

Plant	Unit	Date of Initial Operation	Maximum Generating Capacity (MWe)	Maximum Pumping Capacity ($m^3 \times 10^3$/day)
Bowline	1	1972	600	2094
	2	1974	600	2094
Total			1200	4188
Lovett	1	1949	19	137
	2	1951	20	137
	3	1955	68	229
	4	1966	195	569
	5	1969	202	654
Total			504	1726
Indian Point	1	1962	265	1733
	2	1973	873	4742
	3	1975	1033	4742
Total			2171	11217
Roseton	1	1975	600	1788
	2	1974	600	1788
Total			1200	3576
Danskammer	1	1951	66	229
	2	1954	66	229
	3	1959	125	523
	4	1967	225	818
Total			482	1799
Multiplant Total			5557	22506

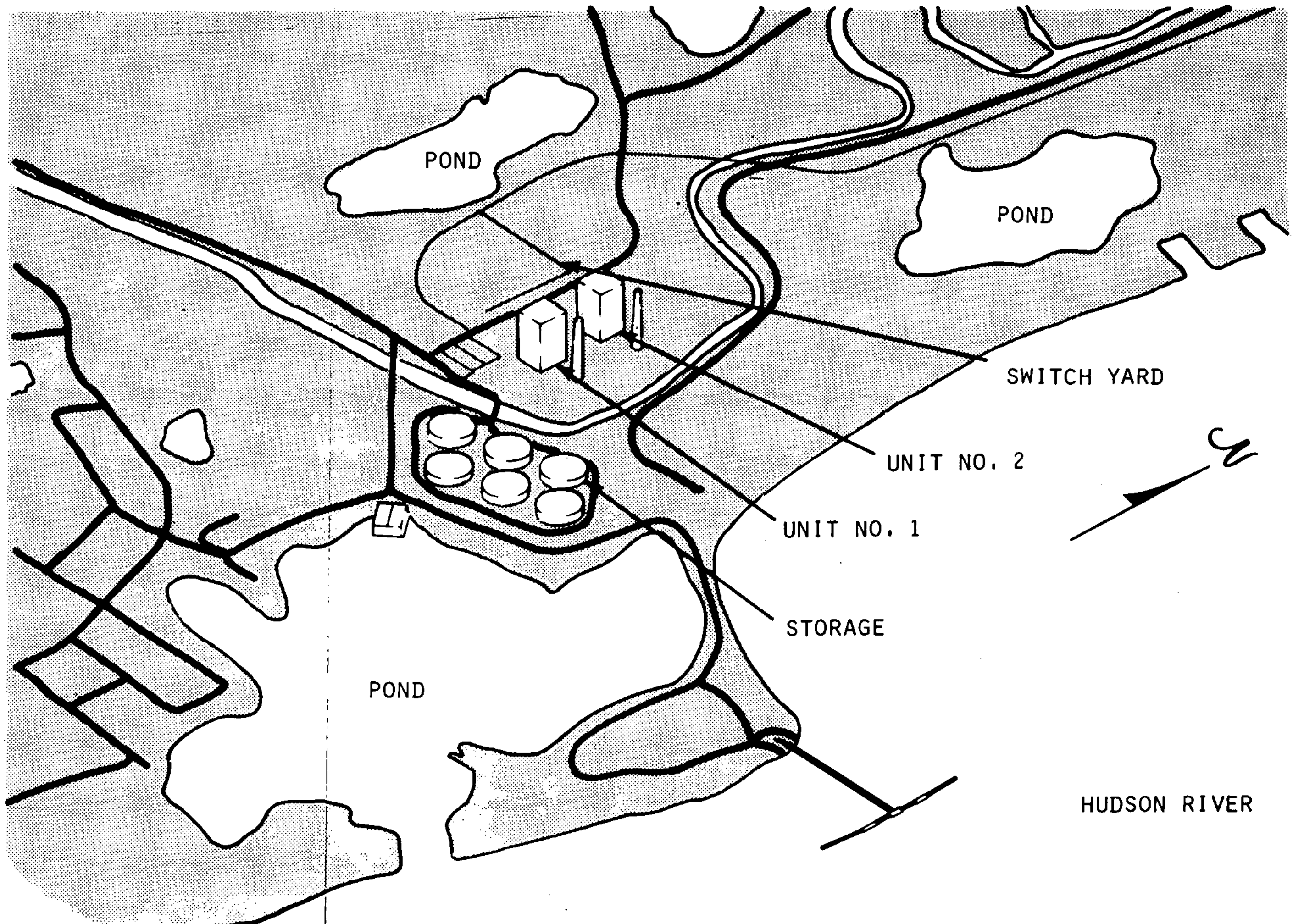


Figure IV-7. Bowline Point Generating-Station Plant Diagram structure to decrease approach velocity and provide a 3-dimensional escape route for fish. Bar racks at each opening prevent large floating debris from entering the intakes. Behind the bar racks at each unit are three traveling screens [0.953-cm (0.375-in.) mesh] which prevent the passage of smaller objects and fish. The traveling screens are periodically washed to remove debris and reduce head loss. At mean low water with all circulator pumps operating at full capacity, the maximum approach velocity to the traveling screens is 23 cm/sec (0.77 ft/sec).

2. Lovett Generating Station

Lovett generating station located on the west bank of the Hudson River at RM 41 (km 66) in the town of Tompkins Cove, New York (Figure IV-6) is owned and operated by Orange and Rockland Utilities. The plant began commercial operation in 1949 and now consists of five fossil-fueled steam-electric units (Table IV-1).

Cooling water is drawn from the Hudson River, circulated through the condensers, and returned to the river downstream from the plant site for Units 1, 2, 3, and 4 and upstream from the plant site for Unit 5 (Figure IV-8). Units 1 and 2 draw water through a common intake, while Units 3, 4, and 5 draw water through individual structures. Bar racks at each opening prevent large floating debris from entering the intakes. Behind the bar racks at each intake are two traveling screens [0.953-cm (0.375-in.) mesh] which prevent the passage of smaller objects and fish. The traveling screens are periodically washed to remove accumulated debris and reduce head loss.

Calculated average intake velocity at the traveling screens under full flow conditions at each unit is as follows:

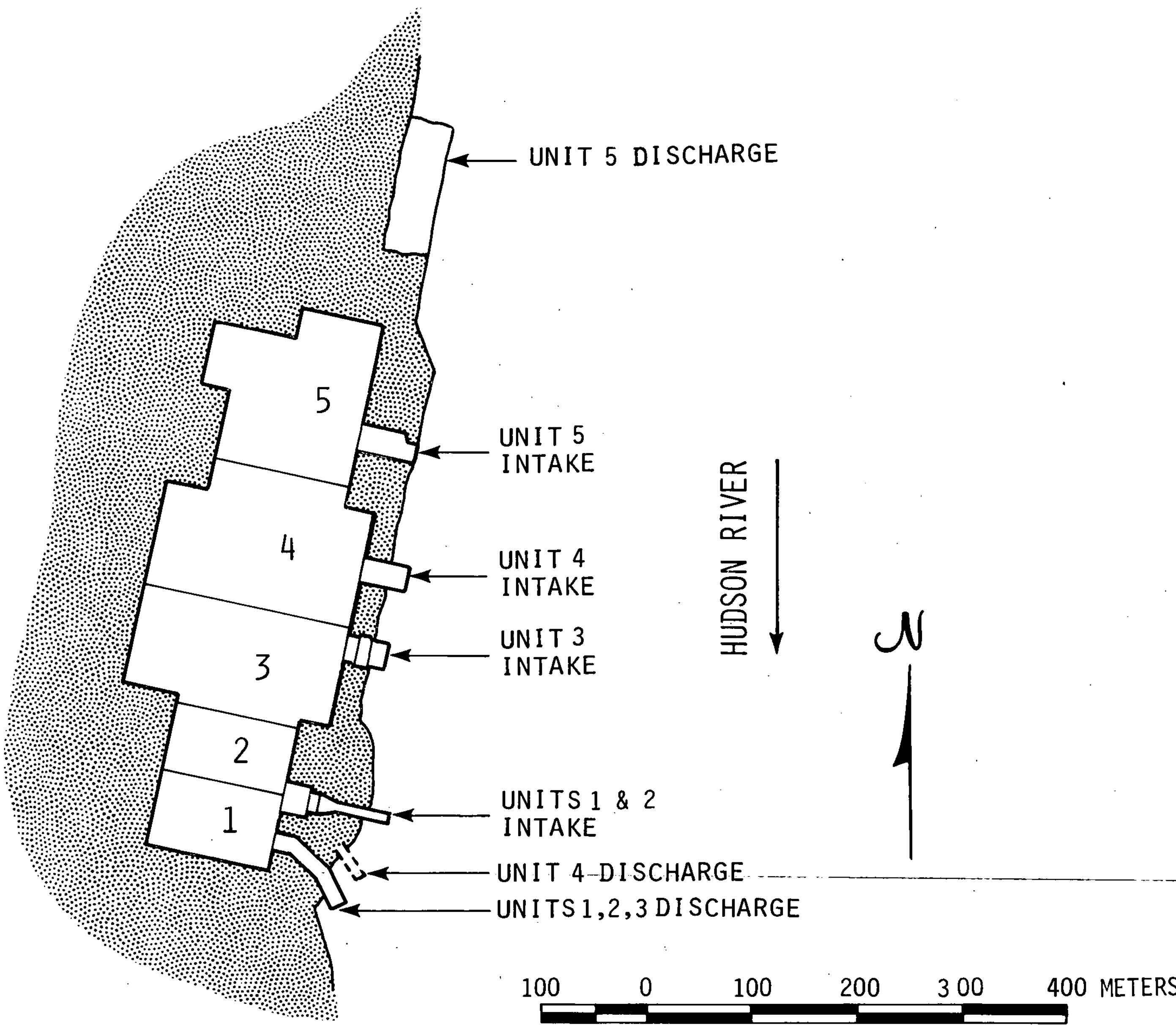


Figure IV-8. Lovett Generating-Station Plant Diagram

Units 1 and 2	- 46 cm/sec (1.52 ft/sec)
Unit 3	- 56 cm/sec (1.83 ft/sec)
Unit 4	- 50 cm/sec (1.64 ft/sec)
Unit 5	- 61 cm/sec (2.00 ft/sec)

3. Indian Point Nuclear Generating Station*

The Indian Point nuclear generating plant owned and operated by Consolidated Edison Company of New York, Inc., is located on the east bank of the Hudson River at RM 42 (km 68) in the village of Buchanan, New York (Figure IV-1). The plant began commercial operation in 1962, and the site now consists of two nuclear reactors and associated power-generating and water-circulating apparatus. A third reactor (Unit 3) is near completion (Table IV-1).

Cooling water is drawn from the Hudson River, circulated through the condensers, and returned to the river downstream from the plant site (Figure IV-9). Units 1, 2, and 3 draw water through separate intake structures. Bar racks at each opening prevent large floating debris from entering intakes. Behind the bar racks at Units 1 and 2, fixed screens prevent the passage of smaller objects. Behind these fixed screens, four vertical traveling screens at Unit 1 and six screens at Unit 2 prevent objects from entering the intakes during times of fixed-screen washings. At Unit 3, six traveling screens alone prevent the entrance of smaller objects. All fine-mesh fixed and traveling screens are 0.953-cm (0.375-in.) mesh. The fixed screens and traveling screens are periodically washed to remove accumulated debris and reduce head loss.

*Adapted from Texas Instruments Incorporated (1974) Indian Point impingement study report.

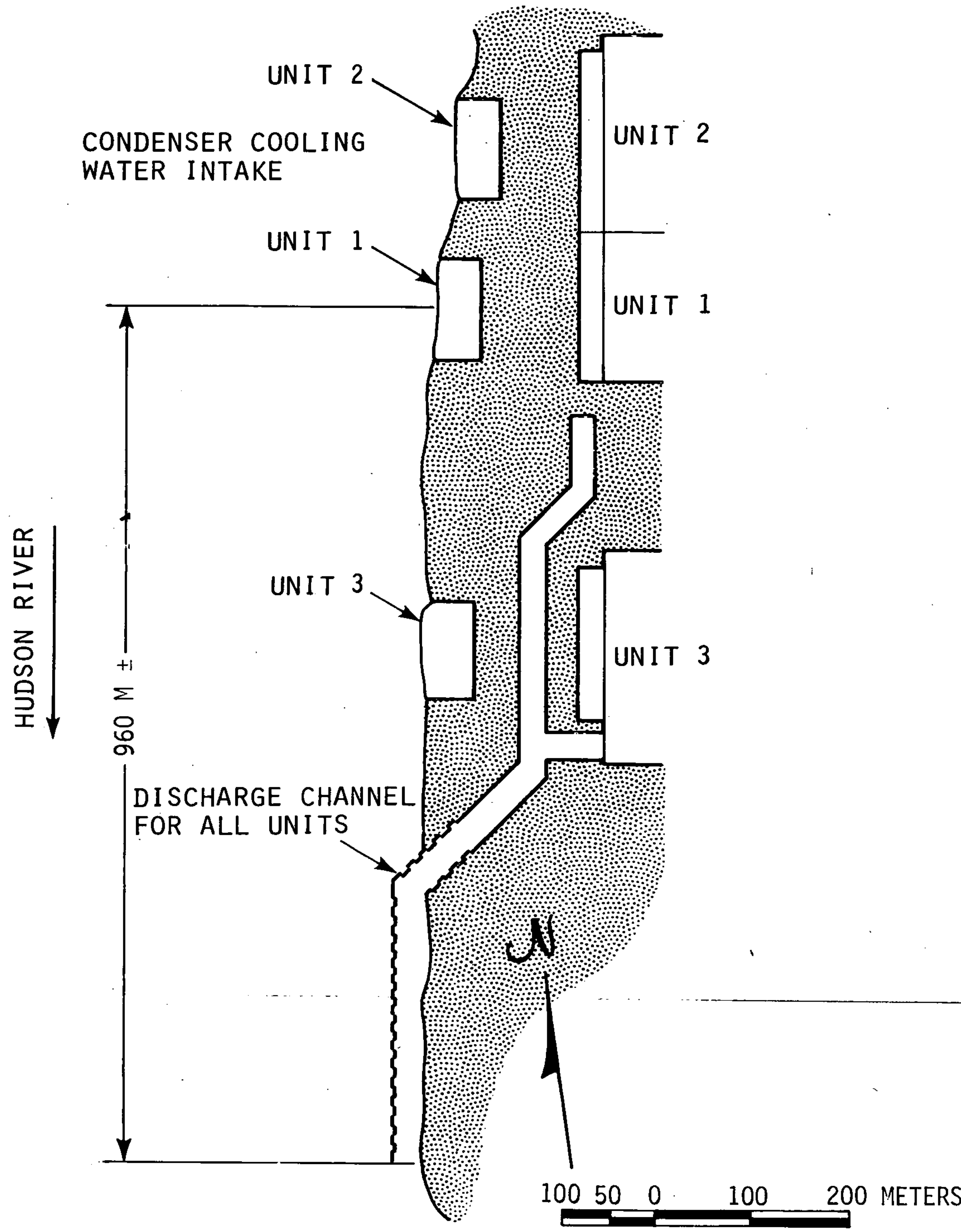


Figure IV-9. Indian Point Nuclear Generating-Station Plant Diagram

Approach velocities for Unit 1 are 21 cm/sec (0.7 ft/sec) for circulator pumps operating at full flow and 9 cm/sec (0.3 ft/sec) for pumps operating at 60% flow. Approach velocities for Unit 2 are 30 cm/sec (1.0 ft/sec) and 15 cm/sec (0.5 ft/sec) for circulator pumps operating at full and 60% flow rate respectively.

4. Roseton Generating Station

Roseton generating station is jointly owned by Consolidated Edison Company of New York, Niagara Mohawk Power Corporation, and Central Hudson Gas and Electric Corporation, which supervises maintenance and operation of this plant on behalf of all tenants. Roseton is located on the west bank of the Hudson River at RM 65 (km 105) in the village of Roseton, New York (Figure IV-1). Unit 2 began commercial operation in September 1974, with Unit 1 following in December 1974 (Table IV-1).

Cooling water is drawn from the Hudson River, circulated through the condensers, and returned through a submerged discharge diffuser system to the river downstream from the plant site (Figure IV-10). Units 1 and 2 draw water through a common intake structure. Openings are located on the side as well as in front of the intake structure to decrease approach velocity and provide a 2-dimensional escape route for fish. Bar racks at each opening prevent large floating debris from entering the intakes. Behind the bar racks at each unit are four traveling screens [0.953-cm (0.375-in.) mesh] which prevent the passage of smaller objects and fish. The traveling screens are periodically washed to remove accumulated debris and reduce head loss.

Hydraulic model studies of this plant indicate that approach velocities under full circulator flow will be <21 cm/sec (0.7 ft/sec) (Burns and Roe, 1970).

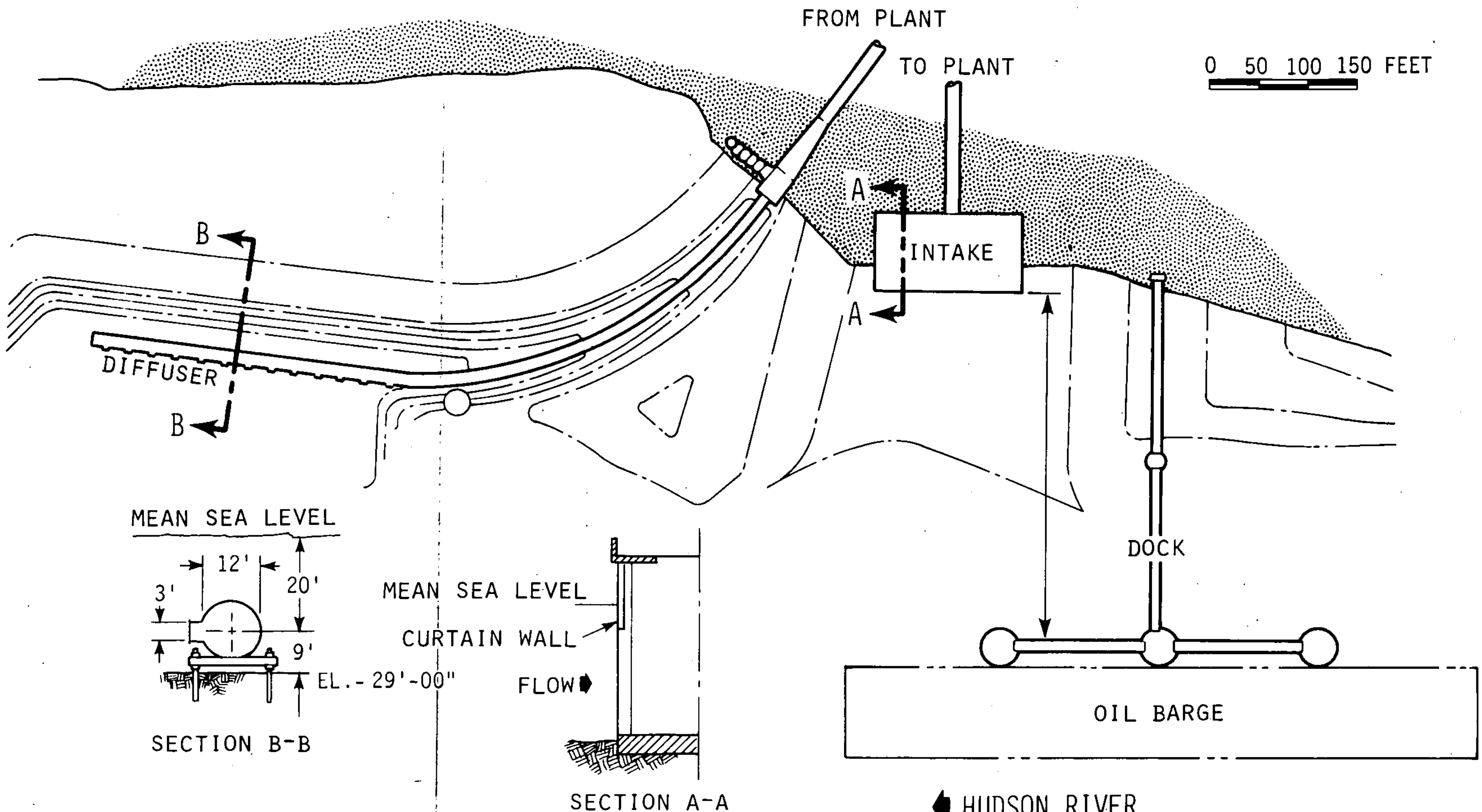


Figure IV-10. Roseton Generating-Station Plant Diagram

5. Danskammer Point Generating Station*

Danskammer Point generating station located on the west bank of the Hudson River at RM 66 (km 106) in the village of Roseton, New York (Figure IV-1), is owned and operated by Central Hudson Gas and Electric Corporation. The plant began commercial operation in 1951 and now consists of four steam-electric units (Table IV-1).

Cooling water is drawn from the Hudson River, circulated through the condensers, and returned to the river downstream from the plant site (Figure IV-11). Water is drawn from the Hudson River for all four units through a common intake channel 10 m (34 ft) wide and 3 m (10.5 ft) deep at mean sea level. At the end of this channel, two intakes draw water for Units 1 and 2 and Units 3 and 4, respectively. A floating log boom at the entrance to the channel prevents large floating objects from entering the intake system. Behind the log boom, bar racks prevent large debris from entering the channel. At the entrance of the intake are six traveling screens [0.953-cm (0.375-in.) mesh] which prevent the passage of smaller objects and fish. The traveling screens are periodically washed to remove accumulated debris and reduce head loss. Debris and impinged organisms are removed from the screens by a pressurized backwash system and returned to the Hudson River in the screen wash discharge. Maximum approach velocities of 0.65 m/sec (2.1 ft/sec) are encountered through the trash-rack openings during periods of full circulator flow. Maximum channel velocities are 0.57 m/sec (1.9 ft/sec) at mean low water with all pumps at all units operating at full flow.

*Adapted from QLM (1974a) Danskammer Point generating station 1972 fish impingement study.

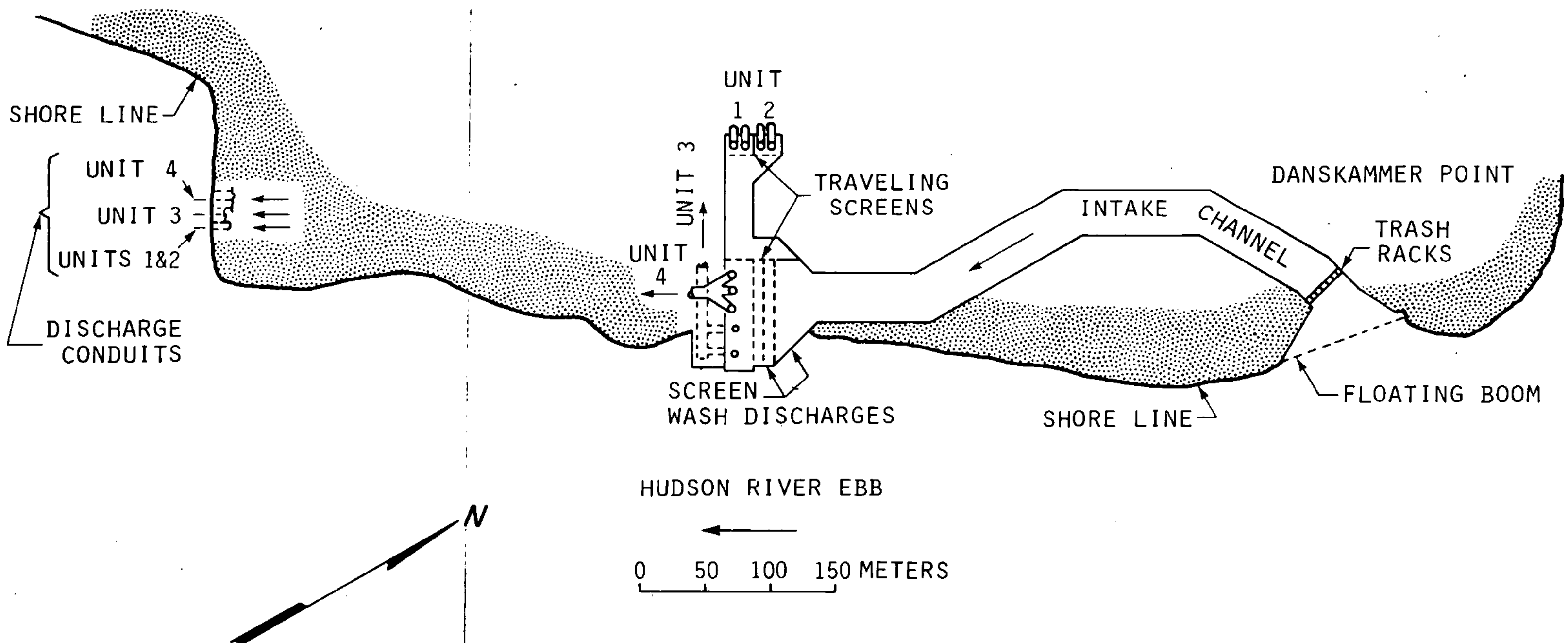


Figure IV-11. Danskammer Point Generating-Station Plant Diagram

SECTION V

HISTORICAL DATA BASE

A. INTRODUCTION

Complete evaluation of power-plant impact on key Hudson River fish stocks requires consideration of trends in fish abundance and the extent to which these trends are influenced by factors other than power plants. To evaluate the relative effects that power plants, biological factors, and environmental factors have on abundance trends, data on these factors and on abundances of key species were gathered from a variety of sources and combined to form the historical data base. The historical data base for the Hudson River estuary consists of four components: ecological surveys, commercial-fishery landings, water-quality monitoring, and power-plant operating data. Data from each of these components have been compiled and selected subsets analyzed to describe fluctuations in the estuary's biological, chemical, and physical systems. This sections examines subsets of the data base with respect to the following objectives:

- Describe trends in abundance of striped bass, white perch, and American shad spawning stocks in the Hudson River based on commercial fishery records from 1931 to 1972
- Describe fluctuations in year-class abundance of striped bass and white perch in the Hudson River from 1965 through 1974, excluding 1971
- Examine relationships between year-class abundance and water temperature and freshwater flow
- Examine potential effects of cannibalism and predation on year-class abundance
- Examine relationships between combined power-plant operations and year-class abundance
- Describe species composition of beach-seine catches from 1965 to 1974, excluding 1971

B. COMMERCIAL FISHERY TRENDS

1. Objective

- Describe trends in abundance of striped bass, white perch, and American shad spawning stocks in the Hudson River based on commercial fishery records from 1931 to 1972

2. Methods

Annual records of reported commercial landings in pounds were available intermittently from 1913 to 1972 (Fred Blossum, National Marine Fisheries Services, personal communication). All data were taken in the region extending from Weehawken, New Jersey, north to Hudson, New York — an area encompassing about 100 river miles (160 km). Annual records kept since 1931 included total square yards licensed for both stake and drift gill nets, number of licensed nets of each type, and number of licensed fishermen. Information on maximum hours of fishing allowed per week was obtained from the New York State Department of Environmental Conservation, Albany.

To estimate the relative fishing effort in the years 1931-1972, an index of fishing intensity was developed. The best available measure of the contribution of gear to fishing effort was the number of square yards of licensed gill nets. Since the weekly duration of fishing was regulated, the influence of maximal time in which the gear could be operated was included in addition to yardage of licensed gear (Burdick, 1954). Fishing intensity (f) was calculated as the product of square yards of licensed gill nets and x hours of legal fishing per week x a scaling factor:

$$f = yd^2 \times hr \times 10^{-6}$$

A catch-per-unit-effort (CPUE) index of abundance was developed to estimate relative magnitudes of standing crops of striped bass, white perch, and American shad over the years. Effort was represented by fishing intensity (f), and catch was the reported commercial landings in pounds (lb). The CPUE for each of the three species was estimated by

$$\text{CPUE} = \frac{\text{lb landed}}{f}$$

3. Results

a. Gear, Fishing Intensity, Validity of Relative Abundance Estimates

Numbers of licensed gill nets in the Hudson River (Figure V-1) increased greatly during the depression years, reaching a peak in 1936 when an exceptionally high proportion of small stake nets were licensed (Figures V-2 and V-3). Numbers remained high throughout World War II and during the immediate postwar years but declined steadily after 1950, reaching the lowest recorded levels in the late 1960s and early 1970s.

There has been a similar decline in total square yards of licensed gill nets, but the pattern prior to 1950 differed somewhat from that seen for number of nets (Figure V-1). After a peak of nearly 900,000 yd^2 in 1938, square yardage declined rapidly to less than 400,000 yd^2 in 1942. Yardage reached an all-time high of 1,300,000 yd^2 in 1947 but subsequently fell to just over 400,000 yd^2 by 1953. A slower but persistent decline lasted into the late 1960s. Since then, between 100,000 and 150,000 yd^2 of gill nets have been licensed annually (Table V-1).

Fishing was permitted for 108 hr weekly from 1931 to 1941 (Figure V-1). Hours increased during World War II until 1944 when temporal restrictions were removed. From 1945 to 1950, 130 hr of fishing were permitted. In 1951, a reduction to 96 hr was made, a level that was maintained through 1958. From 1959 to the present, 120 hr of fishing per week have been permitted.

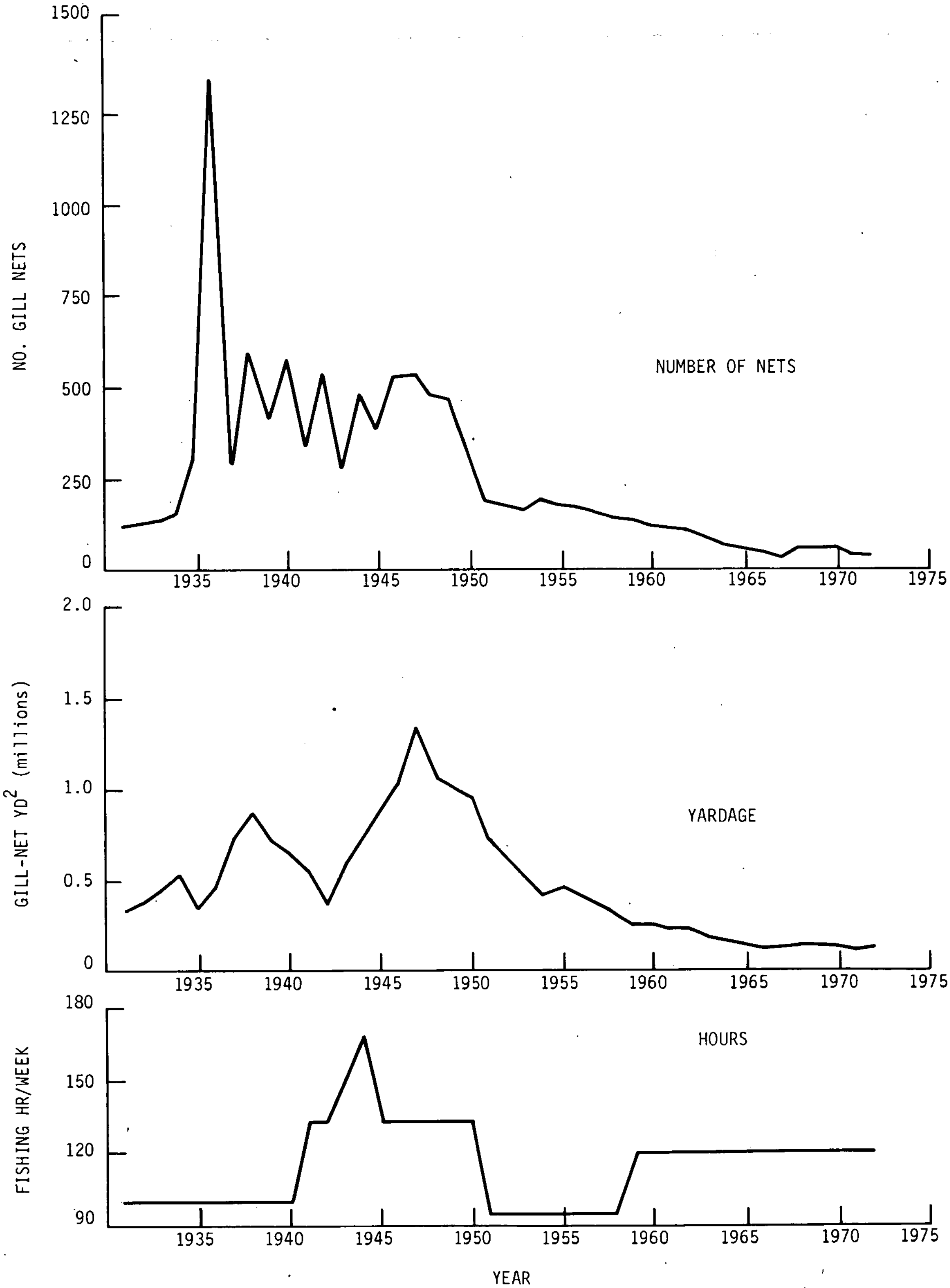


Figure V-1. Number and Square Yards of Licensed Gill Nets and Hours of Fishing Permitted per Week in Hudson River, 1931-1972

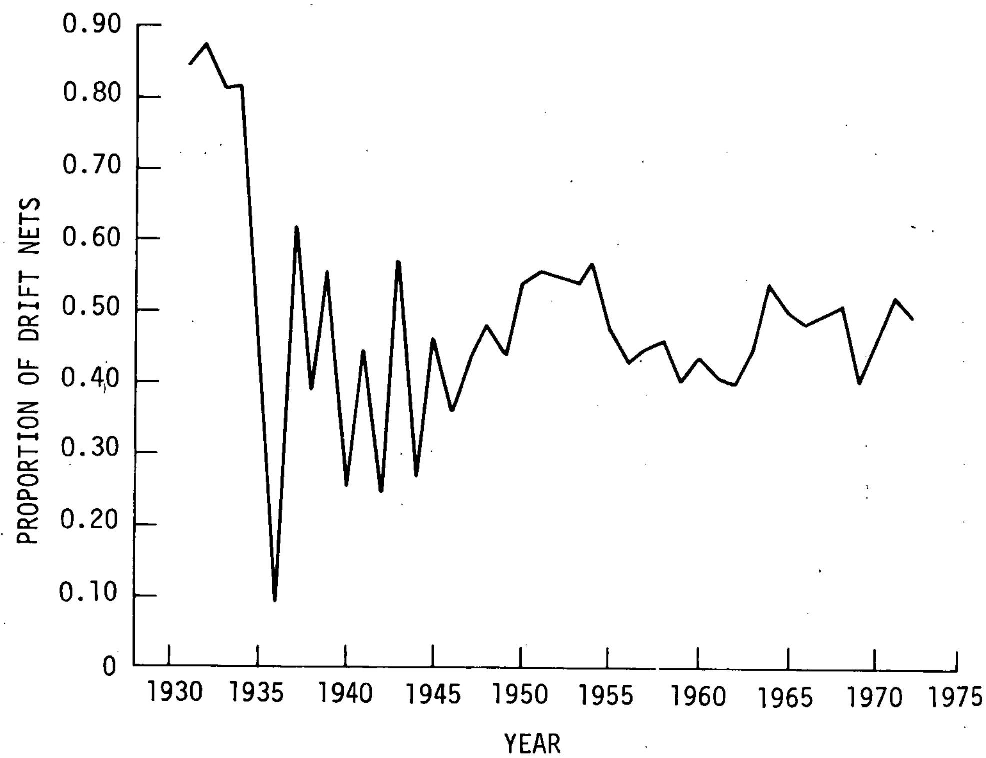


Figure V-2. Proportion of Licensed Gill Nets Used in Hudson River 1931-1972 That Were Drift Type

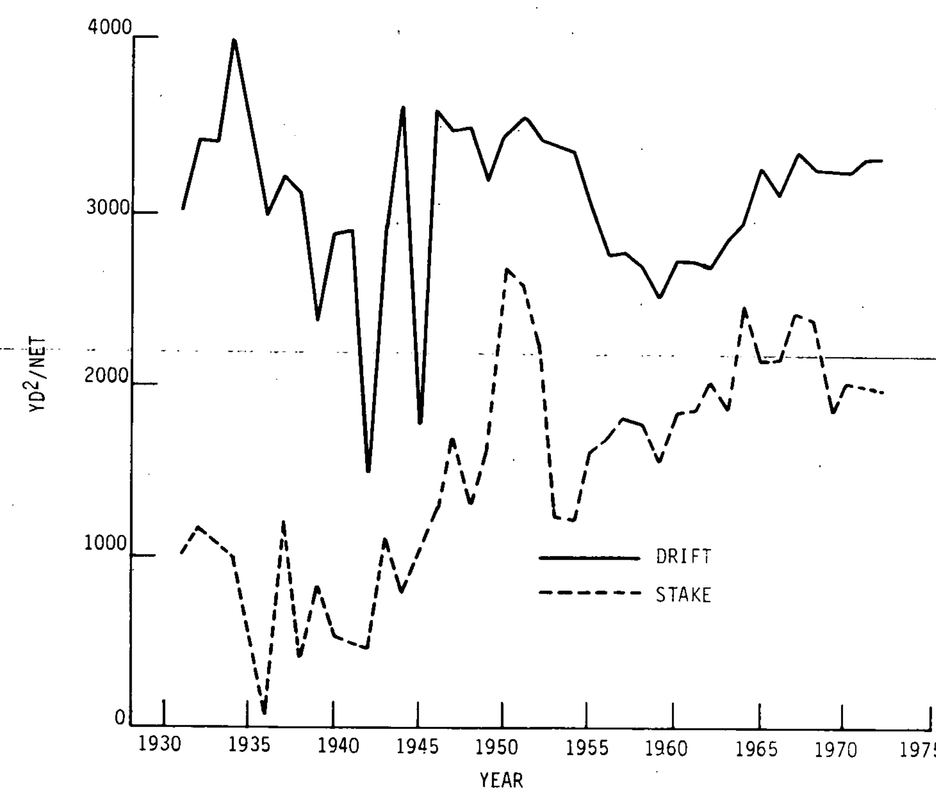


Figure V-3. Square Yards per Net for Licensed Drift and Stake Gill Nets Used in Hudson River, 1931-1972

Table V-1

Commercial Fishery Statistics for Striped Bass, White Perch, and American Shad Taken from Hudson River, 1931-1972

	Reported Landings (lbs)			Gear				Catch per Unit Effort		
Date	Striped Bass	White Perch	American Shad	Licensed Fishermen	No. of Gill Nets	Yd^2 of Gill Nets	Fishing Hr Allowed Weekly	Striped Bass	White Perch	American Shad
1931	5,330	14,436	342,611	252	123	334,465	108	147	400	9,490
1932	4,508	16,325	397,754	274	126	395,632	108	106	382	9,315
1933	13,616	19,235	347,656	317	146	435,631	108	290	409	7,397
1934	10,905	31,225	314,200	322	154	532,380	108	190	543	5,464
1935	18,667	60,552	453,300	498	307	353,735	108	489	1,585	11,866
1936	20,120	46,856	834,400	476	1,347	471,670	108	395	921	16,393
1937	28,854	26,538	976,000	613	299	734,904	108	363	334	12,292
1938	24,579	35,421	972,500	875	599	880,583	108	258	372	10,226
1939	29,937	24,479	1,516,400	647	417	712,014	108	389	318	19,719
1940	34,634	39,856	1,297,700	648	584	663,187	108	484	557	18,124
1941	21,336	46,426	1,341,000	650	332	526,617	132	307	668	19,295
1942	—	--	1,294,800	549	527	374,384	132	--	--	26,211
1943	30,889	30,155	1,640,000	608	275	595,829	150	346	337	18,345
1944	60,918	13,848	1,651,200	533	489	760,436	168	477	108	12,920
1945	79,350	17,166	2,091,300	545	383	892,100	132	674	146	17,753
1946	50,622	8,458	1,446,900	936	526	1,103,300	132	348	58	9,938
1947	48,453	2,249	957,400	1172	533	1,325,360	132	277	13	5,474
1948	38,830	21,028	1,121,600	959	476	1,122,520	132	262	142	7.568
1949	—	--	748,800	845	468	1,079,186	132	—	--	5,255
1950	--	--	413,600	522	313	970,908	132	-	--	3,226
1951	--	--	413,400	419	197	615,615	96	-	--	6,995
1952	29,501	2,901	487,600	374	180	520,127	96	591	58	9,772
1953	19,352	9,320	465,000	363	173	415,855	96	485	234	11,654
1954	--	-	584,580	391	198	484,156	96	-	--	12,572
1955	73,400	9,206	503,696	322	176	402,785	96	1,897	238	13,015
1956	92,824	3,446	579,734	308	175	378,977	96	2,550	95	15,927
1957	84,500	6,000	468,205	276	160	358,408	96	2,456	174	13,611
1958	77,100	12,500	433,463	229	147	323,561	96	2,479	402	13,938
1959	133,100	8,400	492,468	234	143	278,247	120	3,985	252	14,745
1960	132,900	4,350	273,936	211	121	270,572	120	4,089	134	8,429
1961	70,700	6,300	236,445	191	112	248,534	120	2,372	211	7,934
1962	48,100	4,100	218,149	168	105	240,340	120	1,670	142	7,575
1963	46,700	5,800	132,564	142	83	191,015	120	2,039	253	5,789
1964	29,500	5,700	78,200	125	65	178,039	120	1,378	266	3,654
1965	36,700	3,600	237,521	94	58	157,025	120	1,952	191	12,634
1966	44,342	1,600	166,332	69	50	130,271	120	2,842	103	10,662
1967	54,642	1,490	176,358	71	44	126,641	120	3,595	98	11,602
1968	60,800	1,700	254,372	81	53	149,275	120	3,397	95	14,211
1969	77,155	2,600	243,104	76	55	132,599	120	4,852	164	15,290
1970	45,900	1,400	232,271	65	57	146,439	120	2,608	80	13,197
1971	24,747	345	170,798	45	44	118,226	120	1,743	24	12,028
1972	17,946	0	288,760	52	47	123,309	120	1,213	0	19,511

As previously described, effort (here, termed fishing intensity) equals square yards of nets x hours of fishing permitted. Effort increased until the late 1930s (Figure V-4); a rapid decline followed until a low occurred in 1942. Fishing intensities then rose rapidly to the highest recorded level in 1947 when yardage was at its peak and 130 hr fishing were allowed. Effort remained high through 1950 but fell abruptly in 1951. A gradual decline continued through the 1950s and early 1960s, followed by stabilization in the late 1960s and early 1970s at the lowest recorded levels.

Several factors other than actual changes in population densities could have produced some of the observed fluctuations in commercial CPUE. Had shifts in the relative commercial value of a species occurred, fishermen might have reported a lower portion of their catches and/or altered deployment of their gear in a manner which lowered the catch efficiency for that species. Because the commercial value of white perch reportedly declined during the 1960s (Department of Environmental Conservation, Albany, New York, unpublished data), changes in white perch CPUE may not represent true changes in white perch abundance.

An important change in fishing gear took place in the early to middle 1950s when natural fiber nets were replaced by synthetic fiber (nylon) nets. Because the catch efficiency of nylon nets differs from that of natural fiber nets (Mugaas, 1959; Molin, 1959; Saetersdal, 1959), the switch to nylon nets produced an unknown change in CPUE indices, a change independent of abundance. Hogman (1973), for example, reported that relative catch efficiencies (nylon vs cotton) differed between species, ranging from 3.2 to 0.8 for the four species he studied. The gear change probably had different effects on the relative abundance estimates of striped bass, white perch, and American shad. In Chesapeake Bay, nylon anchor gill nets caught twice as many American shad as did linen nets of the same length and mesh sizes (Muncy, 1960).

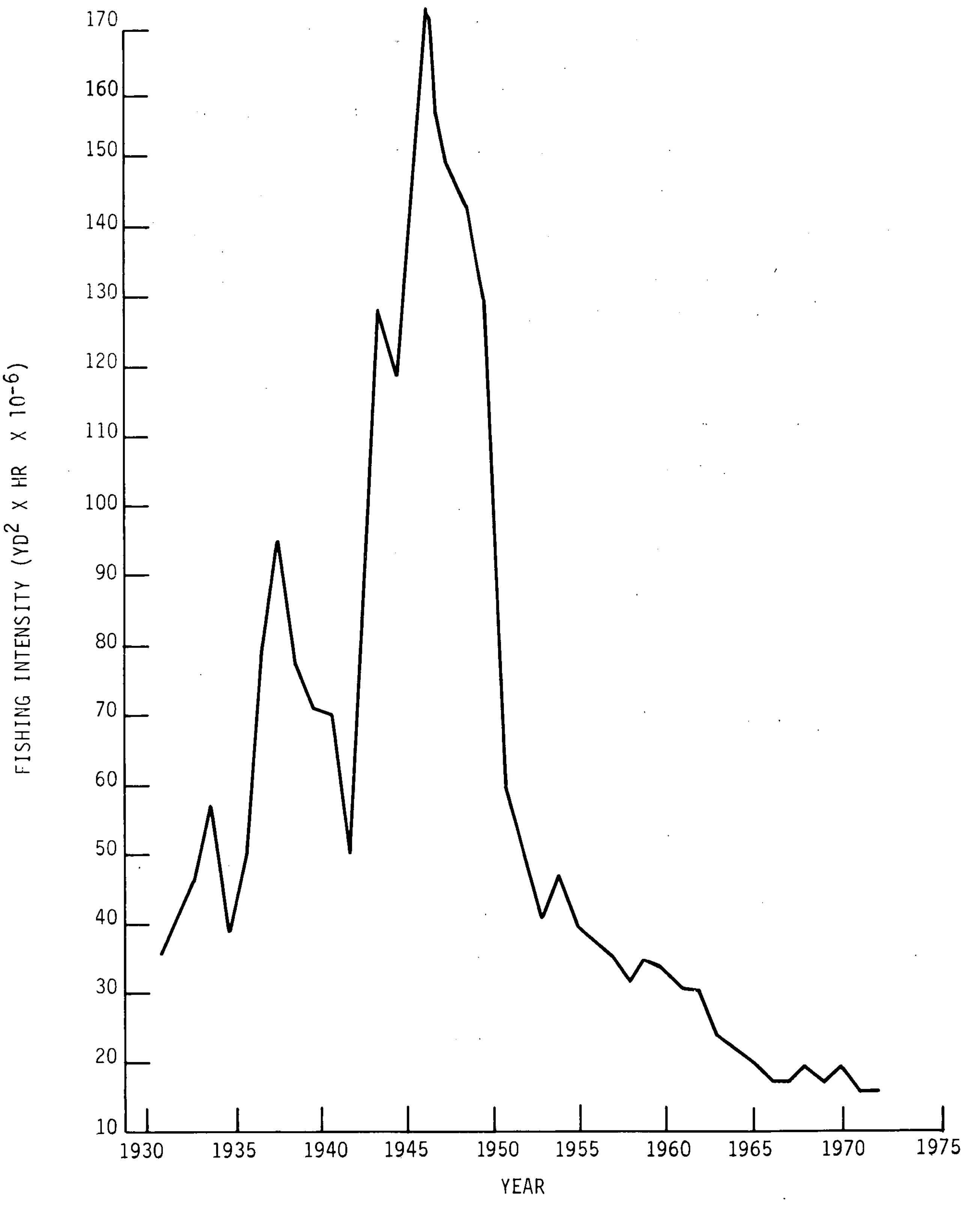


Figure V-4. Index of Effort (Fishing Intensity) Expended in Hudson River Commercial Fishery, 1931-1972

The switch to nylon nets very likely resulted in an increase in relative efficiency in capturing Hudson River American shad, but it is not known whether a similar increase occurred for striped bass and white perch.

In the absence of direct gear-efficiency comparisons, abundance estimates for the three species prior to 1955 were considered separately from those thereafter. All commercial fishermen on the Hudson were assumed to have switched to nylon gill nets by 1955 (Bob Gabrielson, Hudson River commercial fisherman, personal communication) although it is likely that a few natural fiber nets were still in use. Changes in CPUE during the middle 1950s could not be attributed solely to fluctuations in either density or gear efficiency because effects of the two variables were inextricably confounded.

Other factors which may have influenced CPUE values were: (1) changes in catch record-collection procedures, perhaps associated with changes in survey personnel; (2) the outlawing of commercial haul seines and fyke-hoop nets for striped bass in February 1949; (3) variations in annual environmental conditions possibly affecting catch efficiency; (4) change of legal minimum size for striped bass from 12 to 16 in. in the late 1930s or early 1940s; and (5) elimination of commercial fishing for striped bass from December 1 to March 15 after 1949.

b. Striped Bass Trends

From 1931 to 1953, striped bass abundance indices fluctuated between 100 and 600 but showed no persistent increase or decline (Figure V-5). By 1955, CPUE values had jumped abruptly to nearly 1900; thereafter, it varied between 1200 and 4900. The replacement of natural fiber gill nets by nylon nets in the mid-1950s may have produced an increase in CPUE not based entirely on true abundance trends. However, a real increase in abundance probably did occur, since the dramatic increase in CPUE in 1955 occurred 5 years after two changes in striped bass commercial fishing regulations: the elimination of haul seines and fyke nets in February 1949 and the closing

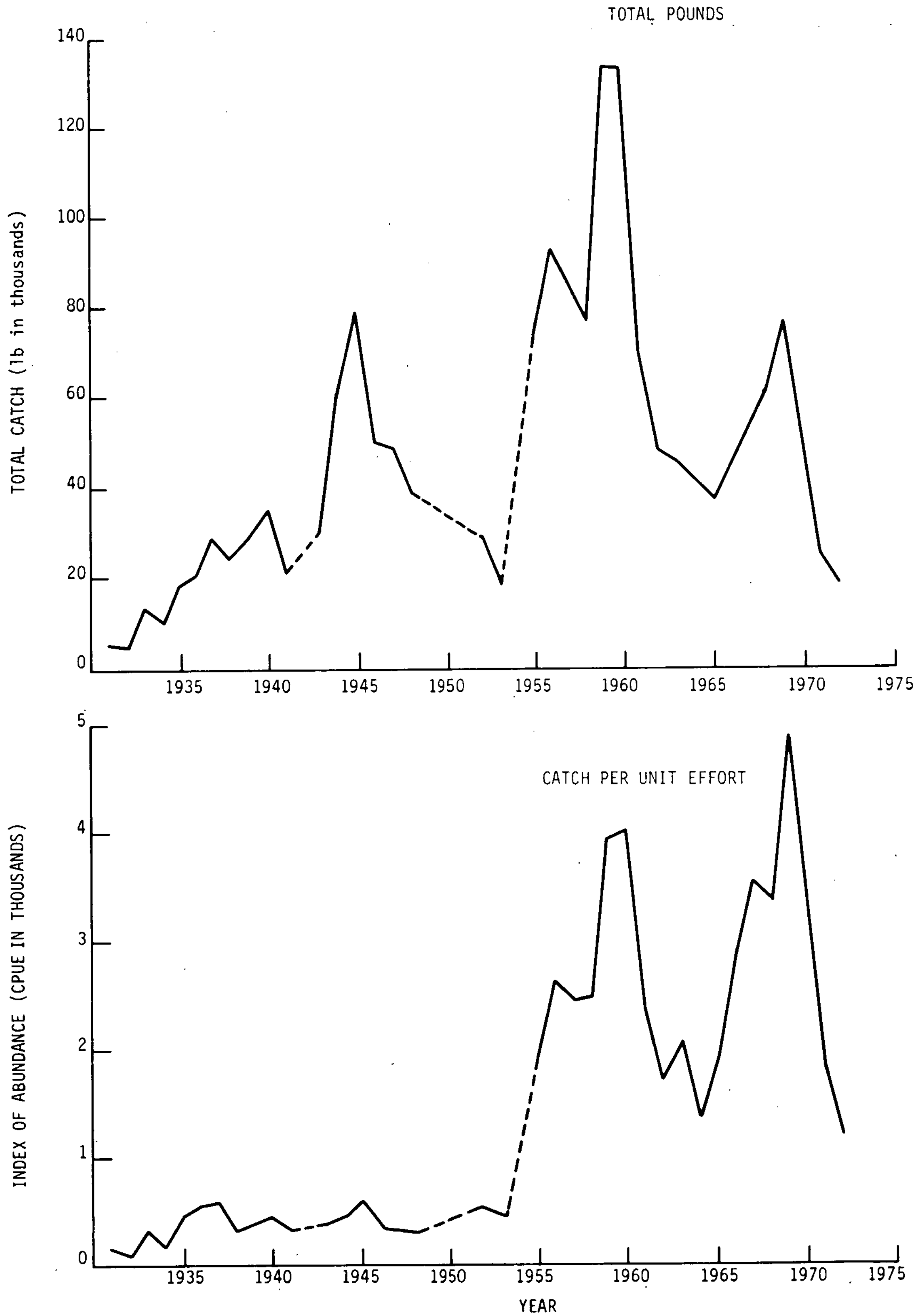


Figure V-5. Abundance of Hudson River Striped Bass, 1931-1972, Based on Commercial Landings (Dotted lines are estimates of missing records) of the winter season in 1950. Reduced fishing pressure in 1949, in 1950, and in subsequent years may have allowed increased escapement and spawning success first reflected in the commercial catch 5 to 6 years later when the 1949 and 1950 year classes were fully recruited to the fishery.

Although the 1972 abundance index was the lowest recorded since 1955, it would be premature to conclude that the striped bass population in the Hudson is diminishing. The 1972 CPUE value is not much lower than that of 1964, which was followed 5 years later by the highest recorded peak (1969). Thus, the 1972 value appears to lie within the normal range of variation in CPUE since 1955. Preliminary unpublished records of the National Marine Fishery Service also suggest markedly increased striped bass landings from the Hudson River in 1973 (Fred Blossom, commercial catch-records biologist, National Marine Fishery Service, personal communication).

c. White Perch Trends

White perch abundance indices declined during the years between 1931 and 1955 (Figure V-6), increased slightly to approximately 400 in 1958, and since then have undergone an irregular decline lasting into the early 1970s. An unknown portion of the abundance changes might be attributed to declining desirability of white perch by commercial fishermen (Charlie White, Hudson River commercial fisherman, personal communication); however, since white perch landings reported in recent years were incidentally caught, for the most part, in gill nets set for American shad and striped bass, desirability would have little influence on landings unless fishermen reported smaller proportions of their actual catches or changed gear. At least one commercial fisherman (Bob Gabrielson, personal communication) has increased the mesh size of gill nets to avoid the numerous small white perch of low commercial value. Therefore, commercial CPUE indices in recent years may not accurately reflect white perch abundance trends.

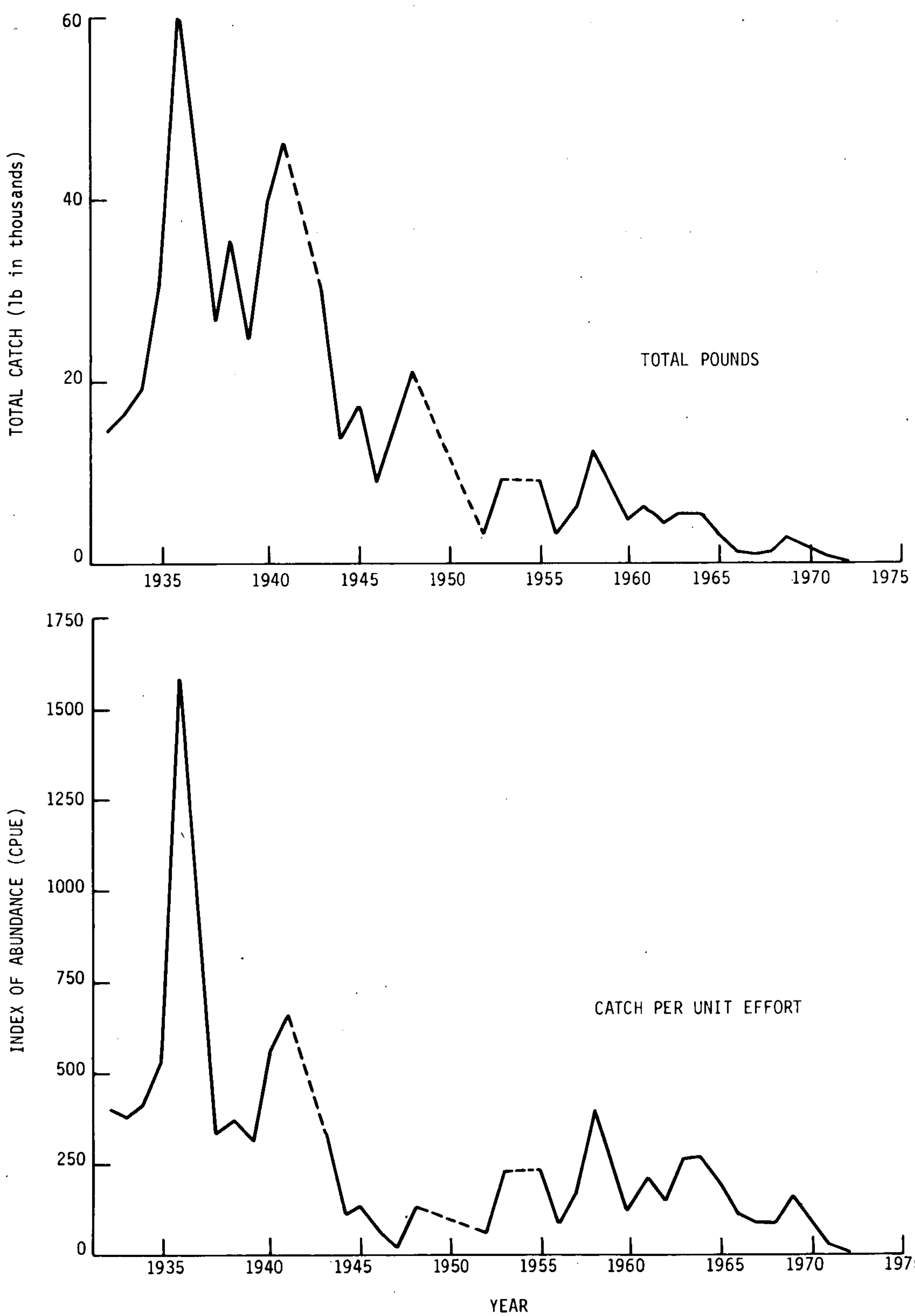


Figure V-6. Abundance of Hudson River White Perch, 1931-1972, Based on Commercial Landings. (Dotted lines are estimates of missing records)

d. American Shad Trends

From 1931 through 1972, American shad abundance estimates oscillated with a period of 14-16 years (Figure V-7). Years of high abundance were 1942, 1956, and 1972; lows occurred in 1935, 1950, and 1964. Hudson River shad abundances reported from an earlier but overlapping period (Talbot, 1954) agree approximately with those given here. Minor disagreements could be expected because the gear component of Talbot's effort index was number of gill nets rather than square yardage. Talbot reported that American shad abundance was relatively low from 1915 until the early 1930s; after that time, Talbot's data and that presented here indicate that densities have increased. High densities were maintained until the middle 1940s, which marked the beginning of a decline which reached a low in 1950. This low was followed by an increase in the early 1950s, the magnitude of which is confounded with gear-efficiency changes produced by the switch to synthetic (nylon) gill nets. Abundance indices decreased during the late 1950s and early 1960s to a low in 1964. From 1964 to 1972, shad abundance increased.

4. Summary

The preceding results can be summarized as follows:

- Commercial fishing intensity on the Hudson River has declined drastically since the mid-1940s.
- From 1931 through 1954, striped bass abundance indices fluctuated irregularly at a relatively low level.
- From 1955 through 1972, striped bass abundance indices fluctuated at levels higher than before 1955 with peaks occurring in 1960 and 1969.

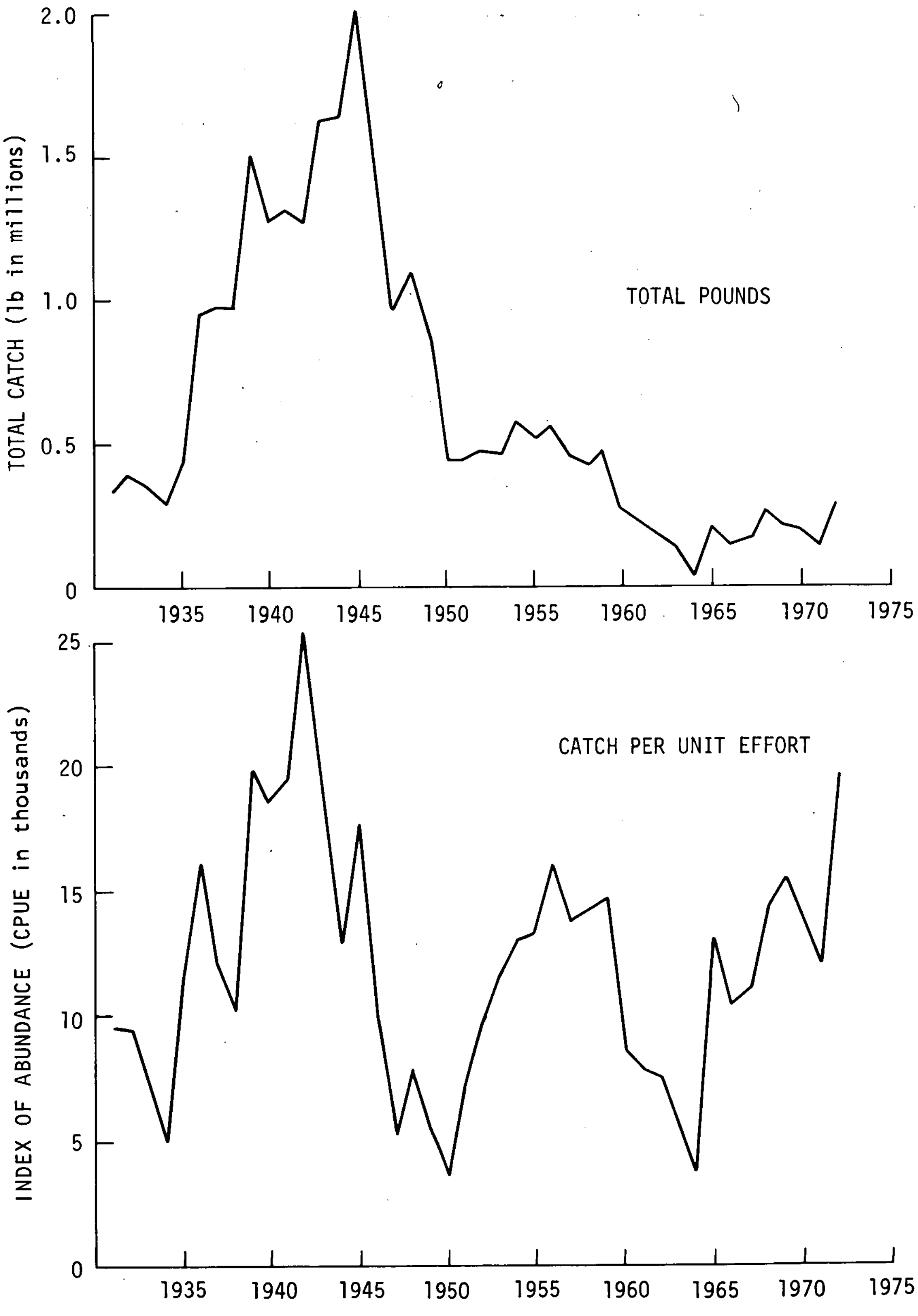


Figure V-7. Abundance of American Shad in Hudson River, 1931-1972, Based on Commercial Landings

- White perch abundance indices decreased drastically from 1931 through 1954 and, despite brief increases, have continued to decline through 1972. A generally diminishing market demand and adjustments of fishing gear and effort to avoid white perch could explain this apparent population decline.

- Between 1931 and 1954, American shad abundance indices peaked at the highest recorded level in 1942, declined until 1950, and subsequently increased.

- Shad abundance indices between 1955 and 1972 declined from a peak in 1956 to a nadir in 1964. They then increased irregularly through 1972.

- Changes in gear and fishing regulations between 1940 and 1954 (discussed in text) may partially explain fluctuations in abundance indices for striped bass and American shad.

C. YEAR-CLASS ABUNDANCE

1. Objective

- Describe fluctuations in year-class abundance of striped bass and white perch in the Hudson River from 1965 through 1974, excluding 1971

Since 1936, there have been 12 years of ecological surveys of various aspects of the Hudson River biological communities. Subsets of this data base were examined to describe the fluctuations in year-class abundance of striped bass and white perch in the Hudson River during the years 1965 through 1974 (1971 excluded). Bluefish trends were examined for comparison with striped bass and white perch trends in a subsequent section (V-D).

2. Methods

Data used in this assessment are from magnetic tapes of raw data from the Hudson River Fisheries Investigations (HRFI) conducted by Northeast Biologists, 1965-68 (Carlson and McCann, 1969); the New York University (NYU) beach-seine surveys, 1965-69 (Perlmutter et al, 1966, 1967, 1968); Raytheon Company studies in the area of Indian Point (RAY), 1969-70 (Raytheon, 1971); and the Hudson River ecology study by Texas Instruments (TI), 1972-1974 (Texas Instruments,1973a-d and 1974a-c). Data from the 1955 study (Rathjen and Miller, 1957) and the 1936 survey (Greeley et al, 1937) are presented only in summary in the respective reports and are not available for magnetic-tape storage. Data gathered by Lawler, Matusky, and Skelly Engineers (LMS, formerly Quirk, Lawler, and Matusky, QLM) are available as raw data sheets, data summaries, and published reports. For a detailed summary of these surveys, refer to Appendix C, Tables C-1 through C-5.

Efficient and valid analysis and interpretation of the historical ecological survey data base requires that all subsets be accurate and comparable; thus, all subsets were examined carefully for keypunch errors, coding errors, etc. Comparability is being assured by converting all data subsets to a similar format within the original constraints of each subset. At this time, all subsets have been examined, but keypunch and coding corrections are not yet completed.

The analyses presented in this report use only those subsets already corrected and reformatted for comparability. Specifically, these are the beach-seine catch data from the NYU surveys, 1965-69; the RAY studies in the vicinity of Indian Point, 1969-70; and the TI studies, 1972-74. Additional ichthyoplankton and trawl data from the HRFI subset, 1965-68, and the RAY and TI subsets will be forthcoming. Because of their basically qualitative nature, fisheries data from the 1936 survey and Rathjen and Miller's 1955 study were not analyzed in this report.

The beach-seine data discussed herein included the years 1965 through 1974 except for 1971 (Table V-2). Catches were analyzed to describe variations in year-class abundance for juvenile (young-of-the-year) striped bass and white perch and abundance indices for yearling and older age groups. Also examined were annual fluctuations in abundance of bluefish *(Pomatomus saltatrix)*, a potential predator of juvenile striped bass and white perch. Since the surveys sampled different portions of the river (and, for NYU, primarily during the summer months), fluctuations in abundance were examined for three sets of data:

- 1969-74, Same Standard Stations, Indian Point Area, August-October
- 1965-74, Similar Stations, Indian Point Area, July-August
- 1965-74, Riverwide, July-August

Table V-2

Beach-Seine Information from Ecological Survey Subsets of Hudson River Historical Data Base Used To Assess Annual Fluctuations in Key Species Abundances, 1965-1974

Study (Data-Base Subset)	Year	Months Sampled	Length (ft) †	Seine Deployment Method	Sampling Station		Shore
					Identification Number	River Mile††	
New York University (NYU)	1965	Jun Jul Aug	50 (15.0)	Pulled parallel to shoreline from distance offshore where depth ≤ 4 ft (1.2 m)	IW3 IIW1 IIW2 IIW2A IIIW2 IVW1	27 (43) 41 (66) 45 (72) 57 (91) 68 (109) 87 (139)	West West West West West West
	1966	Jun Jul Aug	50 (15.0)	Pulled parallel to shoreline from distance offshore where depth ≥ 4 ft (1.2 m)	IW3 IIW1 IIE1 IIE3 IIW2 IIW2A IIIW2 IVW1 IVW2 IVW3 IVW4	27 (43) 41 (66) 41 (66) 44 (70) 45 (72) 57 (91) 60 (96) 87 (139) 96 (154) 102 (163) 105 (168)	West West West East West West West West West West West
	1967	Jun Jul Aug	50 (15.0)	Pulled parallel to shoreline from distance offshore where depth ≥ 4 ft (1.2 m)	IW3 IIW1 IIW2 IIW2A IIIW2 IVW1 IVW2	27 (43) 41 (66) 45 (72) 57 (91) 68 (109) 87 (139) 96 (154)	West West West West West West West
	1968	Jun Jul Aug	50 (15.0)	Pulled parallel to shoreline from distance offshore where depth ≤ 4 ft (1.2 m)	IW3 IIE1 IIW1 IIW2 IIW2A IVW1 IVW2 IVW3 IVW4	27 (43) 41 (66) 41 (66) 45 (72) 57 (91) 87 (139) 96 (154) 103 (165) 105 (168)	West East West West West West West West West
	1969	Apr May Jun Jul Aug Sep	50 (15.0)	Pulled parallel to shoreline from distance offshore where depth ≥ 4 ft (1.2 m)	IIE1 IIW1 IIW2A IVW1	41 (66) 41 (66) 57 (91) 87 (139)	East West West West

Table V-2 (Contd)

Study (Data-Base Subset)	Year	Months Sampled	Length (ft)†	Seine Deployment Method	Sampling Station Identification Number	Sampling Station River Mile††	Shore
Raytheon	1969	Jun	75 (22.5)	Set perpendicular to	31	35 (56)	West
(RAY)		Jul	until Sep	shoreline and then	32	35 (56)	East
		Aug	10, then	towed around in a semi-	33	40 (64)	East
Studies in		Sep	100 (30.5)	circle to shore	34	42 (67)	East
vicinity		Oct			35	43 (69)	West
of		Nov			36	44 (70)	East
Indian Point		Dec			37	47 (75)	West
					38	40 (64)	West
					39	41 (66)	East
	1970	Apr	100 (30.5)	Set perpendicular to	31	35 (56)	West
		May		shoreline and then	32	35 (56)	East
		Jun		towed around in a semi-	33	40 (64)	East
		Jul		circle to shore	34	42 (67)	East
		Aug			35	43 (69)	West
		Sep			36	44 (70)	East
		Oct			37	47 (75)	West
					38	40 (64)	West
					39	41 (66)	East
Texas	1972	Apr	75 (22.5)	Set perpendicular to	6	35 (56)	East
Instruments		May	at	shoreline and then	7	32 (51)	East
(TI)		Jun	stations	towed around in a semi-	7A	34 (54)	East
Hudson River		Jul	6, 7, 7A	circle to shore	8	43 (69)	East
Ecological		Aug			9	42 (67)	West
Study		Sep	100 (30.5)		10	42 (67)	East
		Oct	at		11	40 (64)	West
		Nov	stations		12	40 (64)	East
		Dec	8-12		IB*	52 (83)	East
					CNM*	54 (86)	West
					LSP*	55 (88)	East
					CN*	57 (91)	West
					PP*	58 (93)	West
					DP*	59 (94)	East
					13*	38 (61)	East
					14*	38 (61)	West
	1973	Apr	100 (30.5)	Set perpendicular to	8	43 (69)	East
		May		shoreline and then	9	42 (67)	West
		Jun		towed around in a semi-	10	42 (67)	East
		Jul		circle to shore	11	40 (64)	West
		Aug			12	40 (64)	East
		Sep			Plus	Sites	East
		Oct			random-site	from	
		Nov			beach-seine	RM	and
		Dec			survey	12 to	
						153	West
						(19-245 km)	
	1974	Apr	100 (30.5)	Set perpendicular to	8	43 (69)	East
		May		shoreline and then	9	42 (67)	West
				towed around in a semi-	10	42 (67)	East
				circle to shore	11	40 (64)	West
					12	40 (64)	East
					20	40 (64)	East
					21	40 (64)	East
					20	40 (64)	East
					21	40 (64)	East
					Plus		
					random-site	Sites	East
					beach-seine	from	
					survey	RM	and
						12 to 153	West
						(19-245 km)	

* Sampled from Sep-Dec only

† Numbers in parenthesis indicate meters

†† Numbers in parenthesis indicate kilometers

a. 1969-74, Same Standard Stations, Indian Point Area, August-October

Five years of beach-seine data collected by RAY (1969-70) and TI (1972-74) from the same four stations in the vicinity of Indian Point were compared using mean catch per unit effort (CPUE) for August, September, and October of each year as the index of abundance for juvenile striped bass and white perch. RAY stations 34, 35, 36, and 38 coincide with TI stations 8, 9, 10, and 11 (Table V-2). Seine size (100 ft, 30.5 m) was comparable for all 5 years except for August 1-September 10, 1969, when RAY used 75-ft (22.5-m) seines. Catches made with the 75-ft (22.5-m) seines were converted to the equivalent of 100-ft (30.5-m) seine catches as follows:

$$\text{75-ft CPUE} \times 1.77 = \text{100-ft CPUE}$$

where

$$1.77 = \frac{100^2}{75^2}$$

Seine-deployment techniques were comparable for all 5 years (Table V-2). A comparison of the total number of tows (units of effort) during August, September, and October (day/night combined) yielded the following:

Study	Year	Stations	No. of tows, Aug-Sep-Oct
RAY	1969	34, 35, 36, 38	43
RAY	1970	34, 35, 36, 38	102
TI	1972	8, 9, 10, 11	87
TI	1973	8, 9, 10, 11	71
TI	1974	8, 9, 10, 11	48

Year-class abundance differences among the 5 years were analyzed by a Friedman 2-way analysis-of-variance (Miller, 1966; Conover, 1971). In each of the 5 years, mean CPUE was calculated for juveniles in each of 12 successive weeks beginning with the first week in August. Since no tows were taken in the seventh week during 1969, a CPUE value was estimated by conventional methods for a randomized block design (Snedecor and Cochran, 1967). Each weekly period was then ranked among years and analyzed with the Friedman ANOVA.

The assumptions for this analysis were:

- Any day-sampling vs night-sampling differences in CPUE are similar among years.
- The abundances of key species in the vicinity of Indian Point during August, September, and October reflect abundances throughout the entire river and equally among years.
- Gear efficiency and selectivity are similar for both 75-ft (22.5-m) and 100-ft (30.5-m) beach seines.

b. 1965-74, Similar Stations, Indian Point Area, July-August

Nine years of beach-seine data collected by NYU (1965-69), RAY (1969-70), and TI (1972-74) from similar but not identical stations in the vicinity of Indian Point were compared. The index of abundance for juvenile striped bass and white perch used in the analyses was mean catch/10,000 ft^2 (930 m^2) of surface area swept (CPUA) during the combined months of July and August in each year. CPUA was used instead of CPUE because NYU's catch/tow figures were not comparable to RAY's and TI's. NYU used 50-ft (15.0-m) beach seines set parallel to shore (Table V-2) whereas both RAY and TI used 75-ft (22.5-m) and 100-ft (30.5-m) seines set perpendicular to shore. NYU, however, provided a basis for comparison since the surface area swept (ft^2) for each seine tow was measured and recorded. The RAY and TI 75-ft and 100-ft beach-seine catches were therefore converted from CPUE to CPUA.

From measurements of ten 100-ft (30.5-m) beach-seine tows, the average surface area swept per tow was estimated to be 4844 ft^2 (644 m^2) (TI, 1975). Assuming that the 75-ft (22.5-m) seine swept an area similar in shape to that swept by the 100-ft (30.5-m) seine, the average surface area swept per tow for a 75-ft seine is 2713 ft^2 (361 m^2) as follows:

$$\frac{75^2}{100^2} \times 4844 = 2713$$

Since NYU did not sample in the fall during 1965, 1966, 1967, and 1968, abundance of the key species was estimated by the combined mean CPUA in July and August. July and August means from NYU and RAY catch data for 1969 were adjusted for total area swept to obtain weighted monthly mean CPUAs. A simple average of the weighted monthly means is the estimated mean CPUA for the entire July-August 1969 period.

A comparison of the total surface area swept during July and August (day and night combined) yielded the following:

			Total Surface Area Swept (Jul-Aug)	
Study	Year	Station	(Ft^2)	(m^2)
NYU	1965	II W1	20,750	1,930
NYU	1966	IIE1, IIW1	63,750	5,929
NYU	1967	II W1	39,375	3,662
NYU	1968	IIE1, IIW1	70,950	6,598
NYU, RAY	1969	IIE1, IIW1 34, 35, 36, 38	62,834	5,844
RAY	1970	34, 35, 36, 38	507,456	47,193
TI	1972	8, 9, 10, 11	291,920	27,149
TI	1973	8, 9, 10, 11	248,124	23,076
TI	1974	8, 9, 10, 11	155,008	14,146

The assumptions for this analysis were:

- Any day-sampling vs night-sampling differences in CPUA are similar among years.

- The abundance of a key species in the vicinity of Indian Point during July and August reflects abundances throughout the entire river and equally among years.
- Gear efficiency and selectivity are similar for 50-ft (15.0-m), 75-ft (22.5-m), and 100-ft (30.5-m) beach seines.
- NYU, RAY, and TI stations in the Indian Point area are comparable.

c. 1965-74, Riverwide, July-August

Nine years of beach-seine data collected by NYU (1965-69), RAY (1969-70), and TI (1972-74) from larger portions of the river were compared using mean catch/10,000 ft^2 (930 m^2) of surface area swept (CPUA) during the combined months of July and August of each year as indices of abundance for juvenile striped bass, white perch, bluefish and older striped bass and white perch. NYU and RAY catch data from 1969 were combined as in data analysis b. A comparison of river area sampled and total surface area swept during July and August (day only) yielded the following:

		River Area Sampled		Total Surface Area Swept (Jul-Aug)	
Study	Year	(RM)	(km)	(Ft^2)	(m^2)
NYU	1965	27-87	43-139	167,500	15,578
NYU	1966	27-105	43-168	512,850	47,695
NYU	1967	27-96	43-154	311,250	28,946
NYU	1968	27-105	43-168	464,700	43,217
NYU, RAY	1969	35-87	56-139	136,483	12,693
RAY	1970	35-47	56-75	489,244	45,500
TI	1972	32-43	51-69	358,850	33,373
TI	1973	12-153	19-245	2,349,340	218,490
TI	1974	12-153	19-245	2,891,868	268,940

The assumptions for this analysis were:

- The abundance of each age group of a key species in the sampled areas of the river during July and August reflects abundance in the entire river and equally among years.

- Gear efficiency and selectivity are similar for 50-ft (15.0-m), 75-ft (22.5-m), and 100-ft (30.5-m) beach seines.

3. Results

Annual variations in the abundance of juvenile (young-of-the-year) striped bass and white perch taken in beach seines were used as estimates of fluctuations in year-class size between 1965 and 1974 excluding 1971. The following paragraphs examine three analyses of beach-seine catch data.

a. Statistical Test of Year-Class Abundance, Vicinity of Indian Point, 1969-1974, August-October

Although year-class abundance in striped bass and white perch has been reported to fluctuate considerably (Turner and Chadwick, 1972; Schaeffer, 1972; Wallace, 1971; St. Pierre and Davis, 1972), the statistical significance of differences between year classes has not been tested because such tests require more extensive data than are usually available. Such data were available for the Hudson River populations of juvenile striped bass and white perch from 1969 through 1970 and from 1972 through 1974. A Friedman analysis of variance of beach-seine catches provided a statistical test of year-class differences. Because the data used in the statistical test were highly comparable over the 5 years, results reflected true annual differences in abundance at the stations sampled. The catch per unit effort (CPUE) estimates of juvenile abundance were comparable because

- All catches were made at the same four seining stations.

- Samples were taken each year at comparable times throughout the same three months (August, September, and October).

- The same beach-seine size and deployment procedures were used at all times except during August and part of September 1969 when Raytheon employed 75-ft (22.5-m) seines.

From 1969 to 1974, overall differences between striped bass year classes were highly significant ($\chi^2 = 21.5$, df = 4, $p<0.01$). The 1974 year class was smaller than the 1973 year class, but not quite significantly so ($0.10>p>0.05$). No significant differences occurred among the stronger year classes of 1969, 1970, and 1973 or between the weaker ones of 1972 and 1974:

Striped Bass

Year	Mean Rank
1969	3.0
1970	3.8
1972	1.5
1973	4.2
1974	2.5

Differences

	1969	1970	1972	1973	1974
1969	0	-0.8	1.5	-1.2	0.5
1970		0	2.3*	-0.4	1.3
1972			0	-2.7*	-1.0
1973				0	1.7
1974					0

Least significant difference ($p \leq 0.05$) is 1.8.

*Significant difference between years ($p < 0.05$)

White perch also showed significant variations in year-class strength ($\chi^2 = 20.0$, df = 4, $p<0.001$) from 1965 through 1974. Relatively strong year classes occurred in 1969, 1970, and 1973, with poor year classes in 1972 and 1974. The 1974 year class was significantly weaker than those of 1970 and 1973 ($p<0.05$). The 1972 year class, the second lowest, was significantly different from the 1970 year class ($p< 0.05$) and almost significantly lower than the year class of 1973 ($0.10 > p > 0.05$). None of the other year classes differed significantly among themselves, although the 1969 vs 1974 difference approached significance ($0.10 > p > 0.05$).

Year	Mean Rank
1969	3.4
1970	4.0
1972	2.0
1973	3.7
1974	1.8

White Perch

	Differences				
	1969	1970	1972	1973	1974
1969	0	-0.6	1.4	-0.3	1.6
1970		0	2.0*	0.3	2.2*
1972			0	-1.7	0.2
1973				0	1.9*
1974					0

Least significant difference ($p < 0.05$) is 1.8.

*Significant difference between years ($p < 0.05$).

Based on beach-seine catches in the vicinity of Indian Point from 1969 through 1974 both striped bass and white perch appear to have had relatively weak year classes in 1972 and 1974 and relatively strong year classes in 1970 and 1973. CPUEs of the highest and lowest year classes differed by factors of 4.3 for striped bass and 8.5 for white perch. The Indian Point area, however, may not always reflect abundances in the entire river.

b. Year-Class Abundance, Vicinity of Indian Point, 1965-1974, July-August

Additional juvenile striped bass and white perch abundance figures were available for estimating year-class size over a slightly longer time span than the analysis just discussed. While abundance data from 1965 through 1974 could not be analyzed statistically for differences between years because of insufficient measurement of variability within years, they do provide further insight into year-class abundances.

The catch data are limited to the Indian Point area and restricted to the months of July and August. Because beach-seine size and deployment differed over the years, it was necessary to use an abundance index other than average catch per unit effort (CPUE). As already described, the average catch-per-unit surface area swept per beach-seine tow (CPUA) was developed to adjust for the gear differences.

For the years 1965 to 1974 (excluding 1971), the abundance (CPUA) of juvenile striped bass in the vicinity of Indian Point varied over sixty fold (Table V-3). Following apparently poor year classes from 1965 through 1968, relative abundance increased greatly in 1969 and has since fluctuated at higher than pre-1969 levels. Since 1969, there have been relatively weak year classes in 1972 and 1974 and strong year classes in 1970 and 1973.

Table V-3

Year-Class Abundance Indices for Striped Bass and White Perch Based on Beach-Seine Catches during July and August, Vicinity of Indian Point, Hudson River, 1965-74

	Abundance Index	
	Mean Catch per Unit Area Swept (CPUA)	
Year	Striped Bass	White Perch
1965	9.1	54.0
1966	0	8.6
1967	8.2	143.6
1968	1.7	23.0
1969	61.3	22.5
1970	47.0	21.2
1971	*	*
1972	20.8	3.8
1973	78.8	26.9
1974	17.2	3.4

*No samples

In the NYU data for 1966, no juvenile striped bass were taken at Indian Point; however, HRFI beach-seine collections from 1966 (Carlson and McCann, 1969) contained juvenile striped bass at all stations [RM 36-125 (km 58-200)]. Apparently, NYU beach-seine samples failed to detect juvenile fish which were actually present near Indian Point. This failure may have been due to a combination of factors, e.g., low seining effort, avoidance of the short (50-ft, 15-m) beach seines, a relatively small year class, and distribution of juveniles in the river.

White perch juvenile CPUEs were even more variable from 1965 through 1974 than were those of striped bass (Table V-3); they ranged from a high of 143.6 in 1967 to lows of 3.8 and 3.4 in 1973 and 1974 respectively. Annual abundance indices for 1968, 1969, 1970, and 1973 were remarkably similar, varying between 21.2 and 26.9.

c. Year-Class Abundance, Riverwide, 1965-1974, July-August

Variations in spatial distributions probably influence assessment of relative year-class size in the river based on sampling restricted to the Indian Point vicinity. Perhaps a more accurate assessment results from analysis of riverwide beach-seine catches (for specific segments, see Methods, subsection c).

Striped bass again fluctuated greatly (Table V-4). Weak year classes were produced between 1975 and 1968. The largest year class, 1969, was followed by lower but similar ones until 1974 when CPUA dropped to < 30% of the 1973 level and < 15% of the 1969 peak.

White perch year-class abundance fluctuated less than did striped bass (Table V-4). Six years were quite similar, ranging from 18.8-32.4 CPUA; only 1968, 1972, and 1974 had indices ≤ 10, with 1972 producing the lowest. White perch year-class size from 1965 through 1968 was generally high compared to that of other years and to the relatively poor year classes for striped bass from 1965 through 1968. Since 1969, variations in the annual abundance of white perch and striped bass have followed similar peaks and troughs.

Bluefish abundance in the Hudson River fluctuated at low levels from 1965-69, increased in 1970, and has continued to increase through 1974 (Table V-4). Peak years occurred in 1972 and 1974. The 1974 year class was almost twice as large as the 1972 year class. No bluefish were collected in 1966 and 1969.

Table V-4

Year-Class Abundance Indices for Striped Bass, White Perch, and Bluefish Based on Riverwide Beach-Seine Catches during July-August Hudson River. 1965-74 (1971 Excluded)

	Abundance Index		
	Mean Catch per Unit Area Swept (CPUA)		
Year	Striped Bass	White Perch	Bluefish
1965	3.6	32.4	0.3
1966	5.9	20.3	0
1967	3.2	28.7	0.1
1968	1.1	10.0	0.1
1969	61.3	23.5	0
1970	26.1	19.6	0.7
1971	*	*	*
1972	17.3	3.7	3.1
1973	26.9	18.8	1.3
1974	7.3	5.2	5.9

*No extensive riverwide samples

4. Summary

From the preceding results, the following summary statements can be made:

- Striped bass year-class abundance from 1965 through 1974 was highly variable (Table V-5).

- Weak year classes of striped bass occurred in 1965, 1966, 1967, 1968, 1972, and 1974; stronger year classes occurred in 1969, 1970, and 1973.
- Estimates of year-class abundance of striped bass based only on sampling in the Indian Point vicinity were fairly representative of river-wide abundance except in 1973.
- White perch had relatively weak year classes in 1968, 1972, and 1974; stronger year classes occurred in 1965, 1966, 1967, 1969, 1970, and 1973 (Table V-5).
- Samples of white perch taken in the Indian Point vicinity were not representative of the entire estuary in absolute magnitude, but they were when placed on a rank basis.
- Bluefish abundance fluctuated at low levels from 1965-69, increased in 1970, and have continued to increase through 1974.

Table V-5

Comparison of Year-Class Abundance Indices for Striped Bass and White Perch, Based on Three Combinations of Beach-Seine Catch Data, Hudson River, 1965-74 (1971 Excluded)

	Indian Point Aug-Sep-Oct CPUE		Indian Point Jul-Aug CPUA		Riverwide Jul-Aug CPUA	
Year	Striped Bass	White Perch	Striped Bass	White Perch	Striped Bass	White Perch
1965	*	*	9.1	54.0	3.6	32.4
1966	*	*	0	8.6	5.9	20.3
1967	*	*	8.2	143.6	3.2	28.7
1968	*	*	1.7	23.0	1.1	10.0
1969	17.4	21.3	61.3	22.5	61.3	23.5
1970	29.2	33.9	47.0	21.2	26.1	19.6
1971	*	*	*	*	*	*
1972	8.8	5.5	20.8	3.8	17.3	3.7
1973	37.8	24.7	78.8	26.9	26.9	18.8
1974	9.3	4.8	17.2	3.4	7.3	5.2

*No extensive riverwide samples

D. FACTORS INFLUENCING YEAR-CLASS ABUNDANCE

1. Objectives

- Examine relationships between year-class abundance and water temperature and freshwater flow
- Examine potential effects of cannibalism and predation on year-class abundance
- Examine relationships between combined power-plant operations and year-class abundances

A preliminary examination of several factors potentially influencing striped bass and white perch year-class abundance was completed for the years 1965 through 1974. Year-class size is determined initially by the number of eggs spawned and then by the magnitude of mortality on successive life stages (Forney, 1971). The paucity of reliable estimates of striped bass and white perch annual egg production prompted the use of juvenile densities as annual indices of year-class abundance.

Three groups of factors were related to year-class size graphically and by simple linear correlation analysis.

- Environmental factors including water temperature and freshwater flow
- Biological factors including predation by bluefish and cannibalism by yearling and older bass and perch
- Power-plant factors including entrainment of eggs and larvae and impingement of juvenile, yearling, and older fish during cooling-water withdrawal

There was no attempt to demonstrate cause-and-effect relationships; rather where the data indicated a possible association between two variables at a certain statistical confidence level, it was stated as such.

Graphical trends were examined to suggest the existence of associations within the data.

2. Methods

a. Environmental Factors

The annual environmental conditions prevailing in the Hudson River estuary from 1965 through 1974 were summarized (Appendix C) as a basis for evaluating the relationships between environmental factors and year-class abundance of striped bass and white perch.

Aquatic physical and chemical data for the Hudson River estuary were collected from various sources including surveys by governmental agencies and privately funded studies:

- New York State Conservation Department (NYSCD) Survey of the Lower Hudson Watershed, 1936
- United States Geological Survey (USGS) Water-Quality Records, 1964-1972
- United States Geological Survey (USGS) Surface-Water Records, 1947-1974
- Environmental Protection Agency (EPA) Water-Quality Surveillance Data, 1964-1973
- United States National Ocean Survey (USNOS) Tide Tables, 1964-1974
- Hudson River Fisheries Investigations (HRFI), Carlson and McCann, 1965-1968
- The Raytheon (RAY) Indian Point Ecological Survey, 1969-1970
- Texas Instruments Incorporated (TI) Hudson River Ecological Study, 1972-1974

Salinity, freshwater flow, tidal mixing, temperature, dissolved oxygen, and turbidity were the variables measured by all of these surveys and those most likely to influence year-class abundance of key fish species. Data comparability among years was a prerequisite to assessing long-term changes in water-quality variables; therefore to maximize comparability, variables were converted to common units whenever possible. All temperature data were converted to degrees centigrade (°C), as necessary.

Investigators on the Hudson River have employed various methods of determining ionic concentration, including: chlorinity (g/l Cl^-) used by NYSCD, HRFI and USGS; inductance salinometry (a type of conductance measurement used by RAY); and specific conductance (used by TI and USGS). Section III described the equations utilized in converting conductivity to salinity; by rearranging the terms, conversion from salinity to specific conductance (C) becomes:

$$C_{25} = 178500 - 178500\, e^{-S/100}$$

where

C_{25} = specific conductance (µmhos/cm @ 25 C)

S = salinity (°/oo)

This equation, which was derived by curve-fitting with nonlinear regression analysis, provides a close approximation of the true relationship.

To convert chlorinity to salinity Knudson's (1962) linear equation was used:

$$S = 0.030\,Cl + 1.805$$

where

$$S = \text{salinity } (^{o}/oo)$$

$$Cl = \text{chlorinity } (g/l\ Cl^{-})$$

Chlorinity was converted to conductivity by successive application of the equations converting chlorinity to salinity and salinity to conductivity. When salinity (S) falls below 1.0 $^{o}/oo$, however, interconversions are invalid and conversion of specific conductance to chlorinity yields an inflated value, since conductance measurements respond to all ionic species (Mangelsdorf, 1967).

Conversion factors were not applied to dissolved-oxygen concentrations or turbidities: dissolved oxygen is an estimate of absolute concentration which is not subject to change in reference values; and turbidity cannot be converted to common units because there is no known conversion for the numerous units used by the various surveys.

For this report, indices of year-class abundance in striped bass and white perch, 1965-1974, were compared to measurements of two environmental factors that were available and comparable among all years and considered to be potentially important to survival in the early life stages of the two species:

- Freshwater inflow to the river was measured by water released from the Green Island Dam at Troy, New York [RM 153 (km 245)]. Mean daily freshwater inflow for March through July was used for comparisons with year-class abundance (Table V-6)

- Water temperature was measured in the vicinity of Indian Point [RM 42 (km 67)]. Daily surface temperatures from mid-April through July were used for the comparisons with year-class abundance (Table V-7).

Table V-6

Mean Daily Freshwater Inflow by Month, March-April 1965-74, in Hudson River at Green Island Dam, Troy, New York, [RM 153 (km 245)]

Year	Mar		Apr		May		Jun		Jul	
	$\frac{ft^3 \times 10^3}{sec}$	$\frac{m^3 \times 10^3}{sec}$	$\frac{ft^3 \times 10^3}{sec}$	$\frac{m^3 \times 10^3}{sec}$	$\frac{ft^3 \times 10^3}{sec}$	$\frac{m^3 \times 10^3}{sec}$	$\frac{ft^3 \times 10^3}{sec}$	$\frac{m^3 \times 10^3}{sec}$	$\frac{ft^3 \times 10^3}{sec}$	$\frac{m^3 \times 10^3}{sec}$
1965	9,123	258	19,280	546	8,309	235	3,573	101	3,082	87
1966	23,090	653	15,630	442	19,410	549	8,270	234	3,674	104
1967	11,360	322	30,940	876	17,060	483	6,197	175	5,074	144
1968	24,860	704	18,300	518	18,490	523	15,710	445	9,795	277
1969	17,470	494	40,730	1,153	20,910	592	9,995	283	5,430	154
1970	15,060	426	39,350	1,114	14,550	412	6,404	181	5,997	170
1971	20,220	572	37,270	1,055	35,240	997	7,334	208	6,233	176
1972	26,860	760	37,960	1,074	40,520	1,147	29,630	839	18,380	520
1973	29,500	835	30,933	875	27,542	779	13,023	369	10,232	290
1974	17,423	493	30,440	862	22,790	645	8,773	248	11,371	322

Table V-7

Mean Biweekly Surface Temperatures (°C) in Hudson River Measured in Vicinity of Indian Point, River Mile 42 (km 67), 1965-74

Year	Biweekly Interval						
	Apr 16-30	May 1-15	May 16-31	Jun 1-15	Jun 16-30	Jul 1-15	Jul 16-31
1965	8.0	11.5	15.0	18.5	21.5	23.0	23.5
1966	8.7	11.0	14.3	19.2	22.7	25.5	25.5
1967	9.0	11.5	14.5	18.0	22.0	24.0	25.6
1968	12.0	15.0	17.0	19.0	22.3	24.5	25.8
1969	10.0	12.5	17.7	20.5	22.5	23.3	24.0
1970	8.8	10.2	16.5	19.0	21.5	23.0	24.0
1971	8.0	9.5	14.0	18.0	22.0	24.7	25.0
1972	8.8	10.7	15.5	19.7	19.7	20.5	23.5
1973	8.5	12.5	14.5	16.5	20.5	22.0	23.5
1974	8.7	14.0	16.5	20.0	21.5	23.5	24.8

b. Biological Factors

The potential mortality to juvenile striped bass and white perch by cannibalism and bluefish predation was examined with simple linear correlation analysis of riverwide abundance indices and studies of bluefish and yearling and older striped bass and white perch food habits. Probable gear differences in the ability to capture bluefish, yearling and older striped bass, or yearling and older white perch occur between the data set representing 50-ft (15-m) beach seines (1965-1968) and the set representing primarily 75-ft (22.5-m) and 100-ft (30.5-m) beach seines (1969-1974). Hence, for analyses of the possible influences of cannibalism and bluefish predation, these data sets have been considered separately.

c. Power-Plant Factors

Simple linear correlation and covariance analyses were used to examine the relationships between power-plant operations and year-class abundance in striped bass and white perch. Riverwide beach-seine data were used to calculate juvenile abundance indices. Since the processes of entrainment and impingement of eggs, larvae, and juveniles are directly related to the intake of power-plant cooling water, maximum combined daily water withdrawal by all operating units at Bowline, Lovett, Indian Point, and Danskammer was used as the annual index of power-plant operation. The assumption was made that the volume of water withdrawn is directly proportional to capacity. Indian Point Unit 2 withdrew cooling water at $<$ 100% capacity in 1973 and 1974, as did Bowline Unit 2 in 1974. For details, refer to Section VII. The assumption of maximum daily water withdrawal is valid for other operating units.

A unit was considered to have potential impact on the year-class strength during a given year if the unit went on-line prior to July 1 of that year. Since year-class abundance indices were based on July-August mean CPUAs, any unit which went on-line after July 1 was added to the following year's index of power-plant operations. Since Roseton Units 1 and 2 went on-line after

July 1, 1974, they were not included in the 1974 index of power-plant operations and are not considered in this report.

3. Results

a. Environmental Factors

1) Freshwater Inflow

Freshwater inflow influences water temperatures in estuarine environments and is a potentially important factor in the survival of striped bass and white perch eggs and larvae. Turner and Chadwick (1972) concluded that year-class abundance of striped bass in late summer in the Sacramento-San Joaquin estuary in California was closely related to the freshwater inflow in May, June, and July. High flow years were associated with greater year-class abundance, although several mechanisms controlling this relationship may have been operating. In the Potomac River, Maryland, indices of juvenile striped bass abundance based on seine hauls were also significantly correlated with April and May flows (r = 0.86) for the years 1961-71 (mentioned in California Department of Fish and Game et al, 1974). Analysis of catches on striped bass party boats indicated that juvenile survival was better when river flows in the spring and summer were high (California Department of Fish and Game et al, 1974). No similar data relating river flow to white perch year-class abundance are available although Mansueti (1961) suggested that heavy spring (February-May) rains depressed first-year growth.

The widest range of mean daily freshwater inflows in the Hudson River for the years 1965 through 1974 occurred during April and May (Figure V-8). Based on April mean daily inflows, 1965, 1966, and 1968 were relatively low flow years; 1969-1972 were relatively high flow years. Intermediate flows occurred in 1967, 1973, and 1974. Based on May mean daily inflows, 1965 was low and 1971 and 1972 were high. The remaining years were intermediate. Except for 1972, all years had similar mean daily freshwater inflows during June and July.

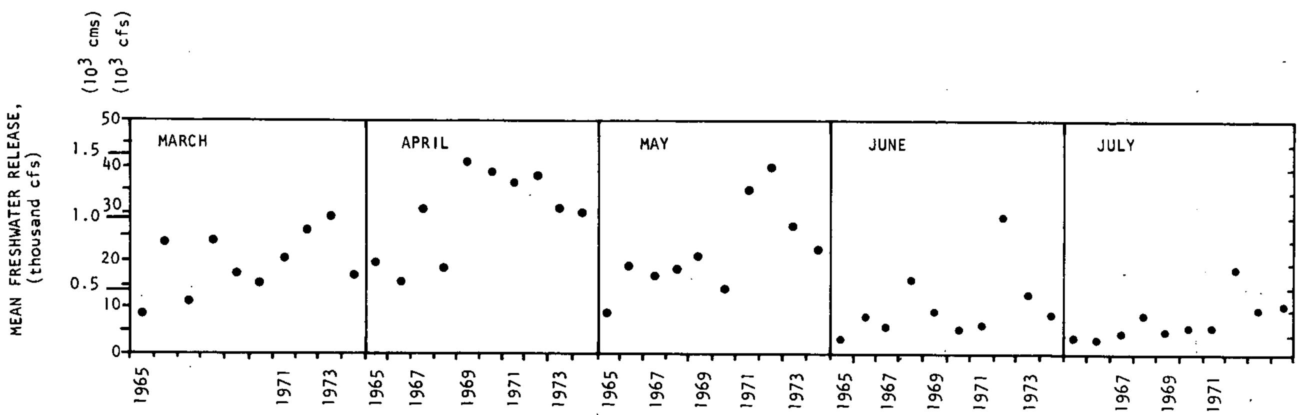


Figure V-8. Mean Daily Freshwater Inflow into Hudson River during March through July 1965-74. [Measured as flow releases at Green Island Dam, Troy, New York, RM 153 (km 245)]

As indicated in Figure V-9, striped bass year-class abundance was positively related to mean daily river inflow during April (correlation coefficient r = 0.711, p = 0.32, 2-tailed test) indicating striped bass juveniles were more abundant during higher flow years. Juvenile striped bass abundance, however, was not significantly correlated to river inflow during March, May, June, or July.

White perch year-class abundance was negatively related to river inflows during all months except April (Figure V-9) as follows:

March:	r = -0.641, p = 0.063	2-tailed tests
April:	r = -0.170, p = 0.663	
May:	r = -0.717, p = 0.030	
June:	r = -0.728, p = 0.026	
July:	r = -0.861, p = 0.003	

The generally higher correlations with summer flows suggest that high river inflows in July may be more detrimental to white perch year-class than high flows in March, April, May, or June.

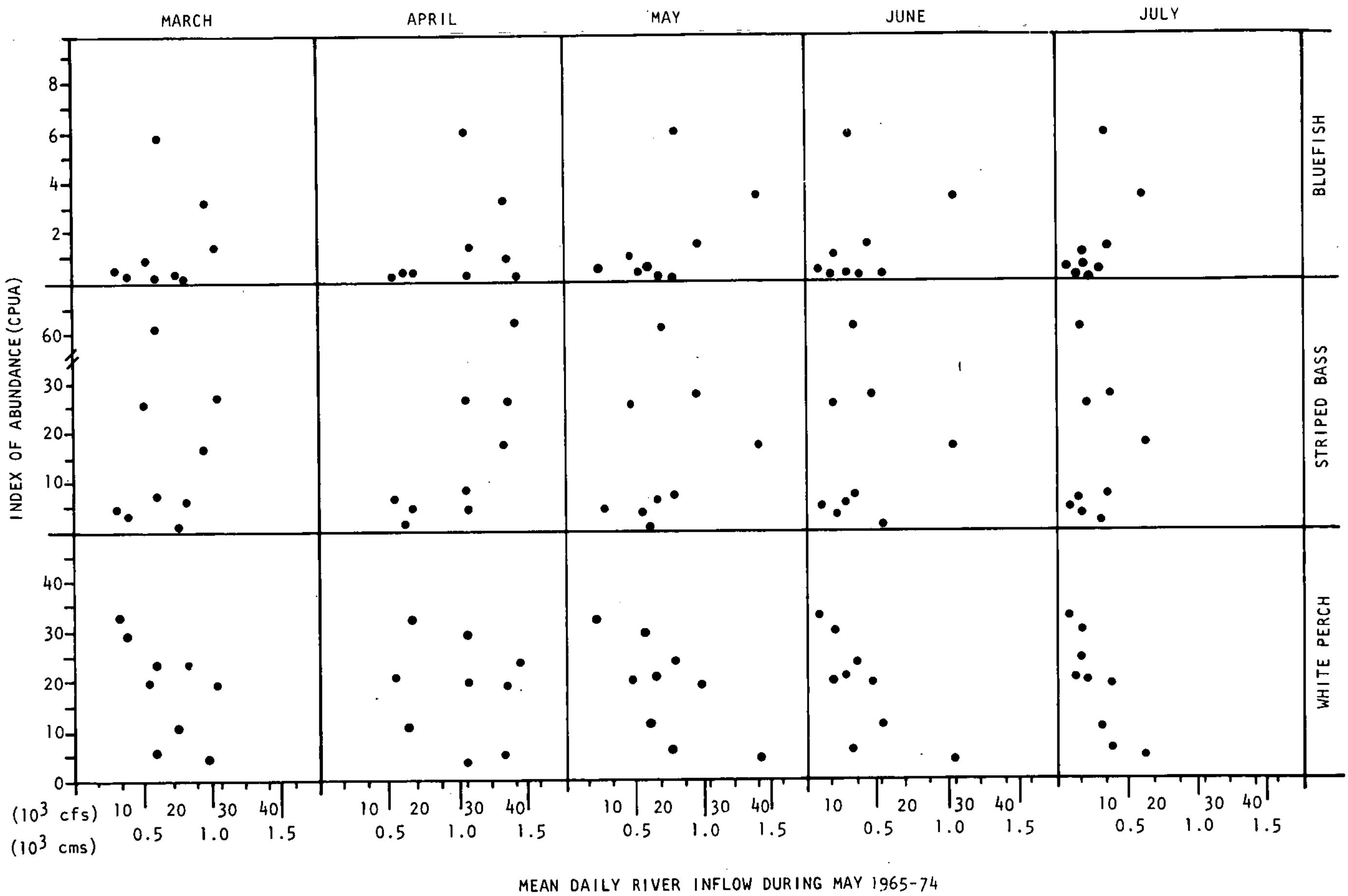


Figure V-9. Relationship between Striped Bass, White Perch, and Bluefish Year-Class Abundance and Freshwater Inflow in Hudson River during March through July 1965-74

2) Water Temperature

Water temperature influences time of spawning in striped bass (Farley, 1966; Talbot, 1966). In the Sacramento-San Joaquin estuary of California (Turner and Chadwick, 1972), depressed June-July water temperatures during high flow years resulted in later spawning and generally greater year-class abundance.

Indices of year-class abundance for striped bass and white perch were unrelated to mean daily river temperatures in the area of Indian Point for biweekly intervals from mid-April through July 1965-74.

b. Biological Factors

1) Predation

Young bluefish occur in the lower Hudson River estuary (RM 12-61, km 19-98) from mid-June through mid-October (TI, 1975) and, as active piscivores (Bigelow and Schroeder, 1953), are potential predators on juvenile striped bass and white perch. Bluefish abundance indices increased between 1965 and 1974 (Table V-8).

Table V-8

Annual Abundance Indices (CPUA), 1965-74, for Juvenile Bluefish, Striped Bass, and White Perch, Hudson River Estuary Based on Riverwide Beach-Seine Catches, July-August

Year	Mean Catch per Unit Area (CPUA)		
	Bluefish	Striped Bass	White Perch
1965	0.3	3.6	32.4
1966	0	5.9	20.3
1967	0.1	3.2	28.7
1968	0.1	1.1	10.0
1969	0	61.3	23.5
1970	0.7	26.1	19.6
1971	*	*	*
1972	3.1	17.3	3.7
1973	1.3	26.9	18.8
1974	5.9	7.3	5.2

*No extensive riverwide samples

From 1965 through 1968 (Figure V-10), bluefish and juvenile striped bass abundance indices were unrelated ($r = -0.290$, $p = 0.355$, 1-tailed test). During those years of generally low river inflows, both species were scarce (Figure V-9). Striped bass year-class abundance during 1965-68 was

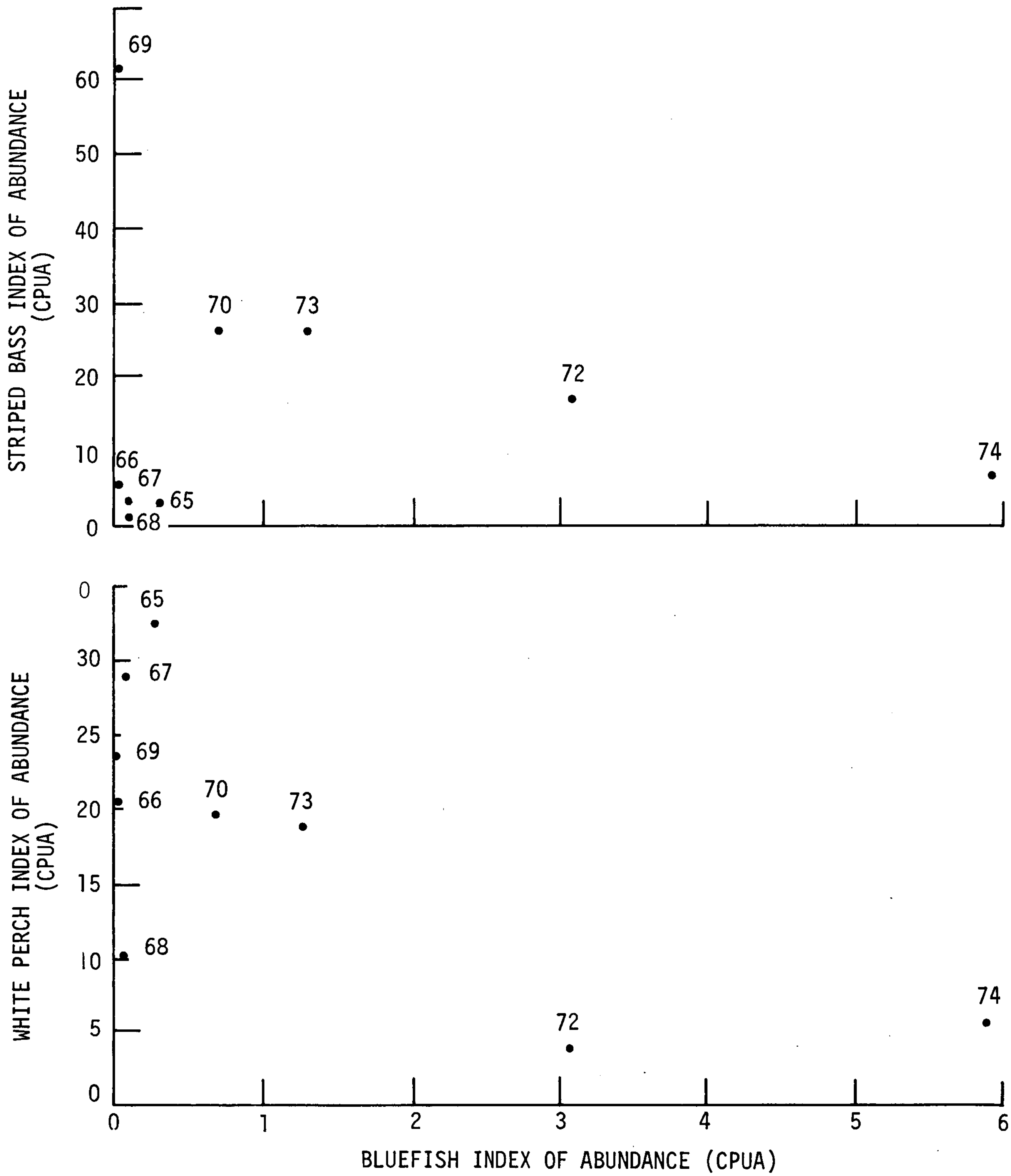


Figure V-10. Relationship between Striped Bass and White Perch Year-Class Abundance Indices and Bluefish Index of Abundance in Hudson River, 1965-74 (1971 Excluded) probably most heavily influenced by the low river inflows. The association between striped bass and bluefish abundance indices from 1969 through 1974 was significant (r = -0.808, p = 0.049, 1-tailed test) indicating that juvenile striped bass abundance was low during the years when bluefish abundance was high.

Paralleling the results with striped bass, a negative association was found between juvenile white perch abundance and bluefish abundance (Figure V-10) from 1969 through 1974 (r = -0.880, 1-tail, p = 0.024); however, no significant relationship existed from 1965 through 1968 (r = 0.576, 1-tail, p = 0.212).

The possibility that bluefish prey on juvenile striped bass and white perch and influence year-class abundance was also investigated by examining bluefish food habits. Limited 1973 data (TI, unpublished) suggested that bluefish do consume juvenile striped bass and white perch; however, more extensive studies in 1974 (TI, unpublished) found almost no evidence of bluefish predation on striped bass and white perch even though bluefish were very abundant in the Hudson River during 1974 (Table V-8). In 1974, bluefish primarily consumed bay anchovy, American shad, and Atlantic tomcod. Striped bass and white perch juveniles were less abundant (Table V-9) and concentrated further upstream in 1974 (see Section VI) and essentially less available to bluefish predation.

The regulation of bluefish abundance in the Hudson River is likely to be very different from that of juvenile striped bass and white perch abundance since bluefish eggs are spawned in the ocean and the larvae migrate into the estuarine nursery areas (Bigelow and Schroeder, 1953). Bluefish, apparently opportunistic predators, may be potentially important predators of juvenile striped bass and white perch but probably only under certain conditions. If juvenile bass or white perch were concentrated below RM 50 (area of bluefish distribution in the Hudson River) by late July during a year when bluefish populations were very high and other prey species (bay anchovy, shad, tomcod, etc.) were low in abundance, bluefish predation could become an important source of mortality of juvenile striped bass and white perch.

Table V-9

Annual Abundances Indices (CPUA), 1965-74, for Yearling and Older Striped Bass and White Perch, Hudson River Estuary, Based on Riverwide Beach-Seine Catches, July-August

Year	Mean Catch per Unit Area (CPUA)	
	Striped Bass	White Perch
1965	0.4	7.9
1966	0.1	2.2
1967	0.2	8.6
1968	0	8.1
1969	0.3	21.1
1970	1.3	17.0
1971	*	*
1972	0.8	8.9
1973	0.8	7.2
1974	2.5	26.2

*No extensive riverwide samples

2) Cannibalism

Cannibalism by yearling and older age groups is a potentially important source of mortality of juvenile striped bass and white perch. From 1965 through 1974, yearling and older striped bass abundance indices fluctuated only about twofold whereas yearling and older white perch abundance indices were much higher and varied over tenfold (Table V-9). These abundance differences probably reflect the anadromous vs semiresident life cycles for striped bass and white perch respectively. Yearling and older striped bass appear to concentrate outside the sampling area (below RM 14) while white perch tend to remain in the river. Furthermore, adult white perch were commonly taken in beach seines while adult striped bass were rarely caught in seines.

Juvenile striped bass abundance was unrelated to yearling and older abundance from 1965 through 1968, low river inflow years when all striped bass age-group abundance indices were low (Figure V-11). During 1969-74, however, the association was apparently inverse, indicating that during those years when yearling and older abundance was high, juvenile abundance was low. In the Sacramento-San Joaquin estuary of California (Stevens, 1966; Thomas, 1967), yearling and older striped bass were cannibalistic on juveniles. Food-habit studies of yearling and older striped bass from the Hudson are limited, but some evidence of cannibalism has been reported (TI, 1974b).

Abundance indices of white perch juveniles and indices of yearling and older white perch were unrelated (Figure V-11). Food-habit studies during 1972-73 demonstrated that fish were an insignificant component of yearling and older white perch stomach contents (TI, 1974b).

Cannibalism appeared to be an unimportant influence on white perch year-class size; in striped bass, however, cannibalism may function as an important source of mortality late in the first year when concentrations of juveniles and yearlings merge in the lower river. Cannibalism is most likely to influence year-class size in striped bass when the density of yearling and older striped bass is high and competition for prey is intense. Detection of the influence of cannibalism within a year class is more difficult.

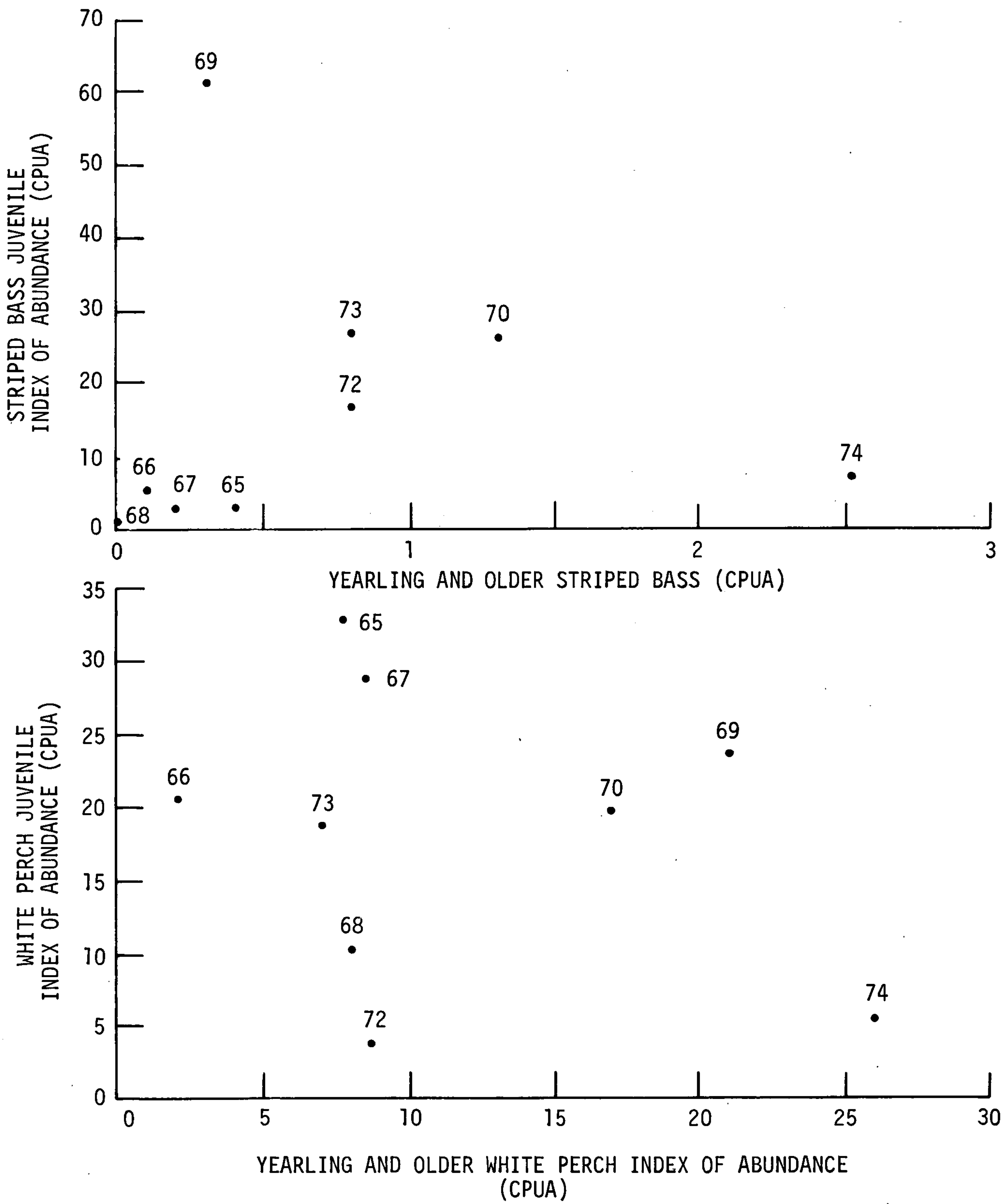


Figure V-11. Relationship between Indices of Abundance for Juvenile Striped Bass and White Perch and Yearling and Older Striped Bass and White Perch in Hudson River, 1965-74 (1971 Excluded)

c. Power-Plant Factors

The number of electrical generating units withdrawing Hudson River water for cooling purposes has increased since 1949 when Lovett Unit 1 went on-line (Table V-10). Since unit size expanded, the combined daily capacity of all five power plants [located between RM 37 and 66 (km 59 and 106)] to withdraw cooling water has also increased, particularly from 1972 to 1973.

Table V-10

Index of Combined Power-Plant Operations on Hudson River Estuary [RM 37-66 (km 59-106)], 1949-74, Based On Maximum Daily Water Withdrawal When All Units Are Operating at 100% Capacity

Year	No. of Generating Units On Line	Unit Location*	Maximum Daily Water Withdrawal ($m^3 \times 10^3$/day)
1949	1	L1	137
1950	1	L1	137
1951	1	L1	137
1952	3	L1, L2, D1	503
1953	3	L1, L2, D1	503
1954	3	L1, L2, D1	503
1955	5	L1, L2, L3, D1, D2	961
1956	5	L1, L2, L3, D1, D2	961
1957	5	L1, L2, L3, D1, D2	961
1958	5	L1, L2, L3, D1, D2	961
1959	5	L1, L2, L3, D1, D2	961
1960	6	L1, L2, L3, D1, D2, D3	1,484
1961	6	L1, L2, L3, D1, D2, D3	1,484
1962	6	L1, L2, L3, D1, D2, D3	1,484
1963	7	L1, L2, L3, D1, D2, D3, I1	3,217
1964	7	L1, L2, L3, D1, D2, D3, I1	3,217
1965	7	L1, L2, L3, D1, D2, D3, I1	3,217
1966	8	L1, L2, L3, L4, D1, D2, D3, I1	3,786
1967	8	L1, L2, L3, L4, D1, D2, D3, I1	3,786
1968	9	L1, L2, L3, L4, D1, D2, D3, D4, I1	4,604
1969	10	L1, L2, L3, L4, L5, D1, D2, D3, D4, I1	5,258
1970	10	L1, L2, L3, L4, L5, D1, D2, D3, D4, I1	5,258
1971	10	L1, L2, L3, L4, L5, D1, D2, D3, D4, I1	5,258
1972	10	L1, L2, L3, L4, L5, D1, D2, D3, D4, I1	5,258
1973	12	L1, L2, L3, L4, L5, D1, D2, D3, D4, I1, I2	12,094
1974	13	L1, L2, L3, L4, L5, D1, D2, D3, D4, I1, I2, B1, B2	14,188

L = Lovett, B = Bowline, I = Indian Point, D = Danskammer, R = Roseton

*Roseton Units 1 and 2 did not begin operation until after July 1974 (See Section IV).

Juvenile striped bass abundance indices and power-plant operation indices from 1965 through 1974 were unrelated ($r = 0.092$, $p = 0.814$, 2-tailed test, Figure V-12). Juvenile white perch abundance indices and power-plant operation indices (Figure V-12) had a weak but nonsignificant inverse relationship ($r = -0.486$, $p = 0.184$, 2-tailed test). As indicated in Figure V-13, however, mean daily river inflows (May, for example) and annual indices of power-plant operations are positively related. Thus, if white perch abundance is negatively related to May river inflows as previous analyses suggest (Figure V-9), an inverse association between white perch year-class abundance and power-plant operations may be spurious.

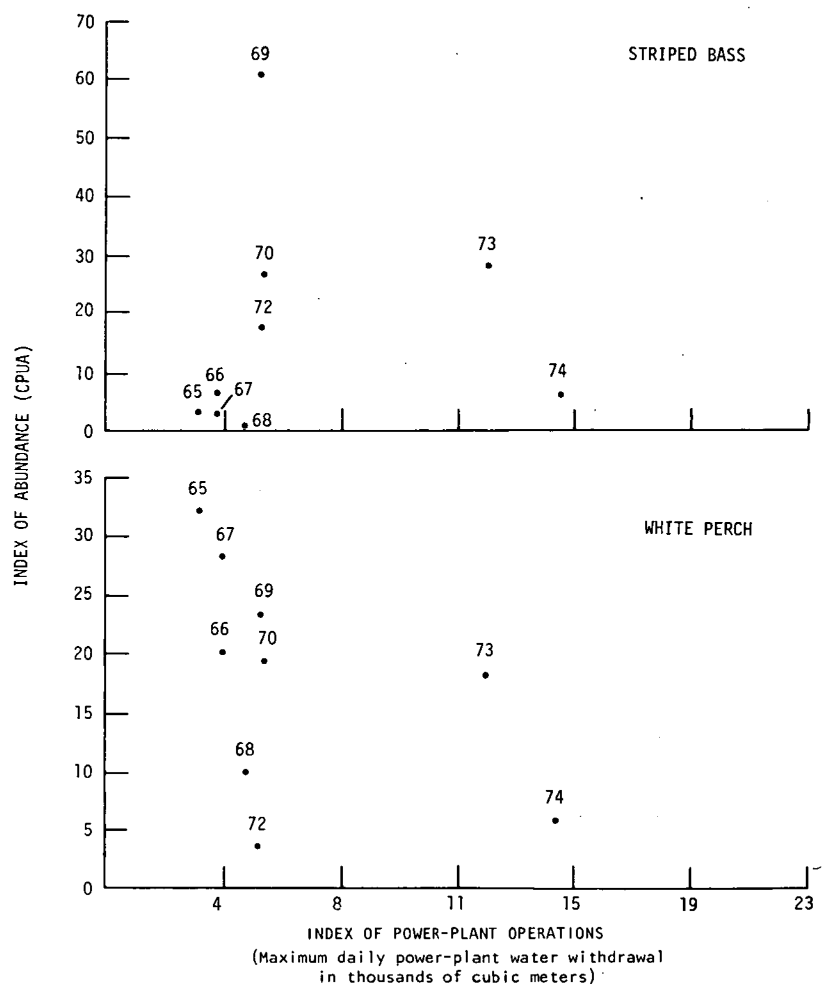


Figure V-12. Relationship between Indices of Abundance for Juvenile Striped Bass and White Perch and Indices of Power-Plant Operations on Hudson River, 1965-74 (1971 Excluded)

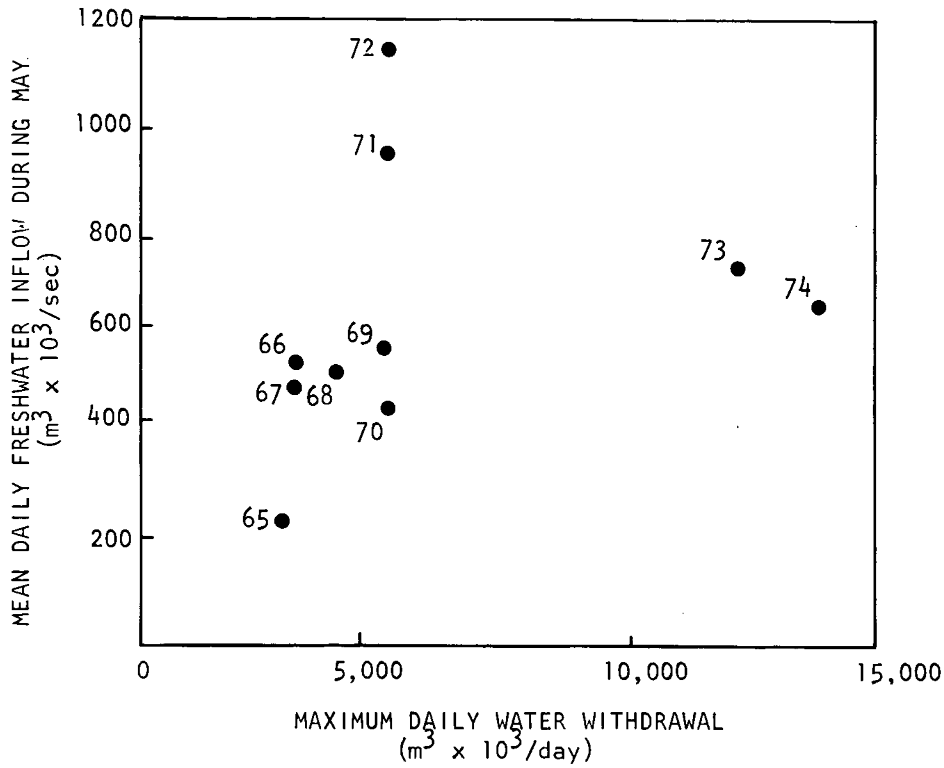


Figure V-13. Relationship between Mean Daily River Inflow during May and Index of Power-Plant Operations on Hudson River, 1965-74

The association between white perch juvenile abundance and power-plant operations was further examined by first adjusting the annual CPUA indices by covariance analysis to remove the negative effect of May river inflow on year-class strength and then re-evaluating the effects of power-plant operations. The results of the analysis can be summarized as follows:

Source	df	Sum of Squares	Mean Squares	F
Regression	2	460.9	230.5	4.16*
May inflow	1	407.2	407.2	7.36**
Power-plant withdrawal after removing effects of May inflow	1	53.7	53.7	0.97*
Residual error	6	332.0		
Total	8	792.9		

*Not significant
**Significant at $p < 0.05$

Power-plant operations had no significant effect on white perch year-class abundance after the negative effect of May freshwater inflow was removed by regression.

4. Summary

Based on this preliminary examination of several factors potentially influencing striped bass and white perch year-class abundance, 1965-74, the following observations can be made:

- Environmental Factors
  - Annual abundance of striped bass juveniles was positively associated with river inflow during April ($r = 0.711$, $p = 0.032$, 2-tailed test). However, the observed correlation may have a spuriously high level of significance because correlations and significance tests were conducted independently in five months during which there was no *a priori* basis for postulating a particular relationship between flow and abundance. Abundance was not associated with river inflows during March, May, and June or July.
  - Annual abundance of white perch juveniles was negatively associated with river inflow during all spring and early summer months except April, with the highest correlation in July ($r = -0.861$, $p = 0.003$, 2-tailed test).
  - Annual abundances of striped bass and white perch juveniles were unrelated to mean daily water temperatures (mid-April through July) in the area of Indian Point.
- Biological Factors
  - During the years 1969-1974, abundances of bluefish were negatively associated with abundances of striped bass juveniles ($r = -0.808$, $p = 0.049$, 1-tailed test) and white perch juveniles ($r = -0.880$, $p = 0.024$, 1-tailed test). Bluefish and juvenile bass and white perch abundances were unrelated from 1965 through 1968.

- Bluefish food-habit studies showed evidence of predation on juvenile striped bass and white perch in 1973 but less predation in 1974.
- Abundances of yearling and older striped bass were unrelated to abundances of striped bass juveniles from 1965 through 1968, but the abundances were negatively associated from 1969 through 1974.
- Abundances of yearling and older white perch were unrelated to abundances of white perch juveniles.
- Food-habit studies indicated evidence of cannibalism by yearling and older striped bass but not by white perch.

• Power-Plant Factors

- Abundances of striped bass juveniles were unrelated to combined power-plant water withdrawal from 1965 through 1974.
- Abundances of white perch juveniles were weakly negatively associated with combined power-plant water withdrawal from 1965 through 1974 ($r = -0.486$, $p = 0.185$, 2-tailed test), but the association was confounded by the relationship between white perch abundance and river inflow. After effects of the relationship between river inflow and year-class strength were removed, abundances of white perch juveniles were unrelated to combined power-plant water withdrawal.

E. FISH SPECIES COMPOSITION

1. Objective

• Describe species composition of beach-seine catches from 1965 to 1974, excluding 1971

Besides affecting abundances of a few key fish species, power-plant operations could conceivably alter the species composition of the Hudson's fish community. This section, therefore, examines the lists of species caught in beach seines in each of the years between 1965 and 1974 for evidence of any decline in species richness potentially attributable to power-plant operations.

2. Methods

A list of all species caught in beach seines was developed from data collected by New York University in the years 1965 to 1969, by the Hudson River Fisheries Investigations from 1965 to 1968, by Raytheon in 1969 and 1970, and by Texas Instruments from 1972 to 1974. Further data were obtained from reports by Lawler, Matusky, and Skelly Engineers in 1969 and 1971-1973 (Lawler, Matusky, and Skelly, 1974; Quirk, Lawler and Matusky, 1973a, 1973b, and 1974b). For each of the years between 1965 and 1974, a list of species present was prepared from all ecological study data pertaining to the given year (Tables V-2 and V-11).

Table V-11

Beach-Seine Information Used in Combination with That Presented in Table V-2 To Determine Species Composition

Study (Data-Base Subset)	Month and Year Sampled	Length (ft)	Seine Deployment Method	Sampling Station		Shore
				Identification	River Mile	
Lawler, Matusky, and Skelly Engineers (LMS)	Aug, 1969 Sep, 1969 Oct, 1969	50	Set parallel to shore about 50 ft offshore	Danskammer Discharge	66	West
Formerly Quirk, Lawler, and Matusky (QLM)	May, 1971 Jun. 1971 Jul, 1971 Aug, 1971 Sep, 1971 Oct, 1971 Nov, 1971 Dec, 1971	50	Set parallel to shore about 50 ft offshore	Bowline Pond Roseton Kingston West Kingston East	37 66 95 95	West West West East
	May, 1972 Jun, 1972 Jul, 1972 Aug, 1972 Sep, 1972 Oct, 1972 Nov, 1972 Dec, 1972	50, 100 in Dec at stations on river miles 66-67	Set parallel to shore about 50 ft offshore	Bowline Pond Kingston West Kingston East Danskammer	37 95 95 66 67 67	West West East West West East
	May, 1973 Jun, 1973 Jul, 1973 Aug, 1973 Sep, 1973 Oct, 1973 Nov, 1973 Dec, 1973	100	Set perpendicular to shore and then towed around in a semi-circle to shore	BPI BPS BPN LS LE	37 37 37 41 41	West West West West East

3. Results and Discussion

Eighty-five species were identified from beach-seine catches at some time between 1965 and 1974 (Table V-12). Since all but three of these species (butterfish, scup, and green sunfish) were caught in 1973 or 1974 and since the butterfish and scup are transient marine species and the green sunfish is rather difficult to identify, there is no evidence that power-plant operations have reduced the number of species accessible to beach seines.

Table V-12

Species Captured in Beach Seines between 1965 and 1974

Scientific Name	Common Name	Year 65	66	67	68	69	70	71	72	73	74
Petromyzon marinus	Sea lamprey										X
Acipenser brevirostrum	Shortnose sturgeon								X		
Acipenser oxyrhynchus	Atlantic sturgeon		X	X					X		X
Anguilla rostrata	American eel	X	X	X	X	X	X	X	X	X	X
Alosa aestivalis	Blueback herring	X	X	X	X	X	X	X	X	X	X
Alosa pseudoharengus	Alewife	X	X	X	X	X	X	X	X	X	X
Alosa sapidissima	American shad	X	X	X	X	X	X	X	X	X	X
Brevoortia tyrannus	Atlantic menhaden	X	X	X		X	X	X	X	X	X
Dorosoma cepedianum	Gizzard shad								X	X	X
Anchoa mitchilli	Bay anchovy	X	X	X		X	X		X	X	X
Salmo trutta	Brown trout								X	X	
Salvelinus fontinalis	Brook trout									X	
Osmerus mordax	Rainbow smelt		X	X		X	X		X	X	X
Esox americanus	Redfin pickerel									X	X
Esox lucius	Northern pike								X	X	X
Esox niger	Chain pickerel		X	X	X	X			X	X	X
Carrassius auratus	Goldfish	X	X	X	X	X	X	X	X	X	X
Cyprinus carpio	Carp	X	X	X	X	X	X	X	X	X	X
Exoglossum maxillingua	Cutlips minnow									X	X
Hybognathus nuchalis	Silvery minnow						X			X	X
Notemigonus crysoleucas	Golden shiner	X	X	X	X	X	X	X	X	X	X
Notropis amoenus	Comely shiner										X
Notropis analostanus	Satinfin shiner		X							X	X
Notropis atherinoides	Emerald shiner		X	X	X	X				X	X
Notropis bifrenatus	Bridle shiner									X	X
Notropis cornutus	Common shiner										X
Notropis hudsonius	Spottail shiner	X	X	X	X	X	X	X	X	X	X
Notropis rubellus	Rosyface shiner										X
Notropis spilopterus	Spotfin shiner										X
Notropis volucellus	Mimic shiner									X	X
Pimephales promelas	Fathead minnow										X
Rhinichthys atratulus	Blacknose dace									X	X
Semotilus corporalis	Fallfish								X		X
Catostomus commersoni	White sucker	X	X	X	X	X	X		X	X	X
Hypentelium nigricans	Northern hogsucker									X	X
Ictalurus catus	White catfish	X	X	X		X	X	X	X	X	X

Table V-12 (Contd)

Scientific Name	Common Name	Year									
		65	66	67	68	69	70	71	72	73	74
Ictalurus nebulosus	Brown bullhead	X	X	X	X	X	X	X	X	X	X
Ictalurus punctatus	Channel catfish										X
Percopsis omiscomaycus	Trout-perch									X	X
Merluccius bilineatus	Silver hake										X
Microgadus tomcod	Atlantic tomcod	X	X	X	X	X	X		X	X	X
Urophycis chuss	Red hake										X
Stongylura marina	Atlantic needlefish	X	X				X		X	X	X
Fundulus diaphanus	Banded killifish	X	X	X	X	X	X	X	X	X	X
Fundulus heteroclitus	Mummichog	X	X	X	X	X	X	X	X	X	X
Fundulus majalis	Striped killifish							X	X		
Menidia beryllina	Tidewater silverside	X	X	X		X	X	X		X	X
Menidia menidia	Atlantic silverside	X	X	X		X	X	X	X	X	X
Apeltes quadracus	Fourspine stickleback	X	X	X	X	X	X		X	X	X
Culaea inconstans	Brook stickleback									X	X
Gasterosteus aculeatus	Threespine stickleback									X	X
Syngnathus fuscus	Northern pipefish	X	X	X	X	X	X		X	X	X
Morone americana	White perch	X	X	X	X	X	X	X	X	X	X
Morone saxatilis	Striped bass	X	X	X	X	X	X	X	X	X	X
Ambloplites rupestris	Rock bass		X		X				X	X	X
Lepomis auritus	Redbreast sunfish	X	X	X	X	X	X	X	X	X	X
Lepomis cyanellus	Green sunfish								X		
Lepomis gibbosus	Pumpkinseed	X	X	X	X	X	X	X	X	X	X
Lepomis macrochirus	Bluegill		X	X	X	X	X	X	X	X	X
Micropterus dolomieui	Smallmouth bass		X	X	X				X	X	X
Micropterus salmoides	Largemouth bass	X	X	X	X	X	X		X	X	X
Pomoxis annularis	White crappie						X		X	X	X
Pomoxis nigromaculatus	Black crappie	X	X	X	X				X	X	X
Etheostoma olmstedi	Tessellated darter*	X	X	X	X	X	X	X	X	X	X
Perca flavescens	Yellow perch	X	X	X	X	X	X	X	X	X	X
Percina caprodes	Logperch									X	X
Stizostedion vitreum vitreum	Walleye									X	
Pomatomus saltatrix	Bluefish	X	X	X	X	X	X		X	X	X
Caranx hippos	Crevalle jack	X	X	X		X	X	X	X	X	X
Selene vomer	Lookdown										X
Stenotomus chrysops	Scup					X	X				
Bairdiella chrysura	Silver perch								X	X	X
Cynoscion regalis	Weakfish							X	X	X	X
Leiostomus xanthurus	Spot									X	X
Menticirrhus saxatilis	Northern kingfish									X	X
Micropogon undulatus	Atlantic croaker									X	X
Mugil cephalus	Striped mullet						X			X	X
Mugil curema	White mullet										X
Dormitator maculatus	Fat sleeper									X	X
Peprilus triacanthus	Butterfish								X		
Prionotus carolinus	Northern searobin									X	
Prionotus evolans	Striped searobin									X	
Paralichthys dentatus	Summer flounder										X
Pseudopleuronectes americanus	Winter flounder										X
Trinectes maculatus	Hogchoker	X	X	X		X	X	X	X	X	X
No. of species		32	40	37	29	35	37	26	48	65	75

*Identified by investigators prior to 1971 as the Johnny darter *(Etheostoma nigrum)*.

From 1965 to 1972, the number of species caught annually in beach seines varied irregularly between 26 and 48. In 1973, the number of species increased to 65 and in 1974 to 75. This substantial increase is not attributable to effects of power plants but is very likely due to increases in total seining effort, area of the river sampled, and number of months in which seining occurred (see page V-22 and subsection III-B). The species not detected prior to TI's extensive studies are primarily marine fish which are occasional visitors to the Hudson and freshwater fish which are relatively scarce or likely to be found upstream of earlier sampling efforts.

4. Summary

- Between 1965 and 1974, 85 fish species were identified from beach-seine catches in the Hudson

- There is no evidence that power-plant operations have affected species richness

In this section, several related matters requiring information from a series of years are discussed. Among these are trends in size of the Hudson River's spawning stocks of striped bass, white perch, and American shad, trends in abundance of young-of-the-year striped bass and white perch, and relationships of these trends to physicochemical, biotic, and power-plant operational factors; and trends in species composition in the Hudson as determined from beach-seine catches.

Trends in spawning stocks were revealed in series of catch-per-unit-effort estimates of relative abundance based on Hudson River commercial fishery records from 1931 to 1972. Striped bass abundance fluctuated irregularly and at a fairly low level from 1931 to 1954 but increased substantially in the mid-1950s and has since fluctuated at high levels. White perch abundance indices decreased drastically from 1931 to 1954 and have continued to decline at a less rapid pace; some of the apparent decline may actually represent altered fishing strategies due to diminishing market demand. American shad abundance oscillated widely from 1931 through 1972, with recent lows occurring in 1950 and 1964 and highs in 1956 and 1972.

Abundance of juvenile striped bass was quite variable from 1965 to 1974 and did not appear to be strongly controlled by the physical and biotic factors examined. Between 1965 and 1968, juvenile striped bass were relatively scarce. Riverwide abundance was much higher from 1969 to 1973 but declined in 1974. Year-class strength was not significantly related to maximum daily withdrawal of water by power plants, water temperature, or to net freshwater flow in March, April, May, June, or July. Although bluefish and older striped bass were shown to prey upon juvenile striped bass, the relationship between the abundance of bluefish and older striped bass abundance and juvenile striped bass abundance was not statistically significant.

Abundance of juvenile white perch from 1965 to 1974 varied considerably, appearing to be strongly affected by freshwater flow. Riverwide abundance was generally higher between 1965 and 1969 than subsequently. There was a strong negative linear relationship between abundance of juvenile white perch and net freshwater flow in all spring and early summer months except April, suggesting that much of the variation in abundance is produced by fluctuations in runoff. Abundance was unrelated to water temperature or to water withdrawal by power plants. Bluefish preyed upon juvenile white perch, but the relationship between bluefish abundance and juvenile white perch abundance was not statistically significant.

Eighty-five fish species were identified from beach-seine catches in the Hudson between 1965 and 1974. There is no evidence that power-plant operations have affected species composition.

SECTION VI

VULNERABILITY ASSESSMENT

A. INTRODUCTION

The magnitude of power-plant-induced mortality on fish populations in the Hudson River estuary during a given year directly relates to the vulnerability of each species to entrainment of eggs and larvae and impingement of young and yearlings by the power plants. Some of the factors which influence vulnerability are the life history, physiology, and behavior of the fishes; the temporal and spatial abundance and distribution patterns of the various life stages; and power plant locations, intake designs, and operations.

The life history, physiology, and behavior of the fishes offer a qualitative assessment of potential vulnerability to the power plants. Biological features that influence the time period when each life stage is in the estuary and predict their relative ability to avoid and/or survive entrainment and impingement are particularly important in this regard.

Temporal and spatial abundance and distribution patterns reveal when and where the various life stages occur in the estuary. Temporal abundance patterns provide the best estimate of the size of the total river population available to potential entrainment and impingement and indicate when and for how long each life stage occurs. Longitudinal river distribution patterns indicate where each life stage occurs, the key environmental variables that influence their distribution, and how much movement occurs. Vertical and lateral distribution patterns offer additional information on where each life stage occurs and indicate the degree of exposure of each life stage to the plant intakes, those life stages that are most susceptible to plant-induced mortality, and how exposure changes through time.

Power-plant location and design influence the intake withdrawal zone, the effectiveness of the screens or other diversion devices protecting the intakes, how much water can be withdrawn, the approach velocities at the screen face, and the size of particles that can be entrained through the intakes. The operational schedules at each plant determine the actual volume of water withdrawn, the season of maximum pumping rates, and changes in discharge water temperature, etc.

The summation of these factors determines the relative vulnerability of each species' life stages to power-plant-induced mortality. Annual variations in any of the factors can be expected to influence annual estimates of direct impact. Knowledge of how these factors interact in determining the magnitude of plant-induced mortality provides the basis for explaining annual differences in the empirical estimates of direct impact.

Assessment of the vulnerability of striped bass, white perch, and Atlantic tomcod in the Hudson River to plant-induced mortality at the Bowline, Lovett, Indian Point, Roseton, and Danskammer electrical generating stations is accomplished by presenting the results of analyses of ichthyoplankton, fisheries, and water-quality data with respect to the factors discussed above. Specific objectives addressed in this section include:

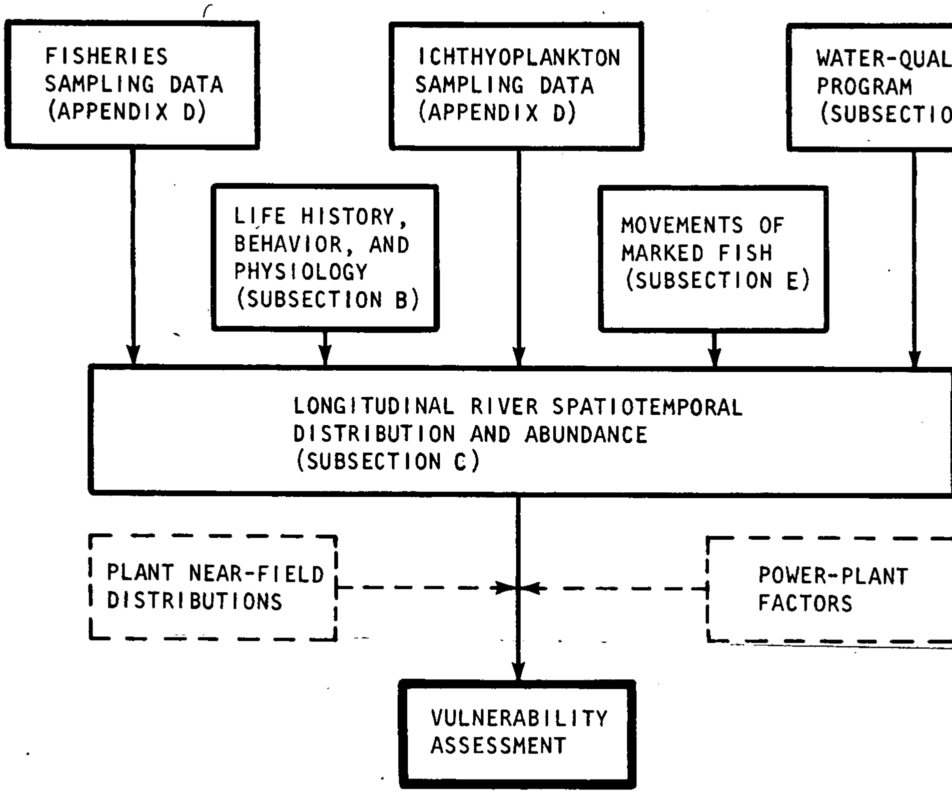
- Synthesis of the fisheries literature and data from the Hudson River and other estuaries to construct a life history/behavior description for striped bass, white perch, and Atlantic tomcod and describe those biological features that may influence the potential vulnerability of each life stage to power-plant-induced mortality

- Description of the longitudinal and temporal abundance and distribution patterns for the various life stages of striped bass, white perch, and Atlantic tomcod from 1973 and through September 1974 in the river [river miles 12-153 (km 19-245)] and in the vicinity of each power plant, and a comparison of the results from 1973 and 1974

- Examination of the relationships between life-stage distribution and water-quality variables such as temperature, conductivity, and dissolved oxygen during 1974

- Description of the seasonal movements of individually marked striped bass, white perch, and Atlantic tomcod during 1973 and 1974

This section contains a separate discussion for each objective. The following diagram illustrates the overall study organization used to assess the potential vulnerability of fishes to power plants.

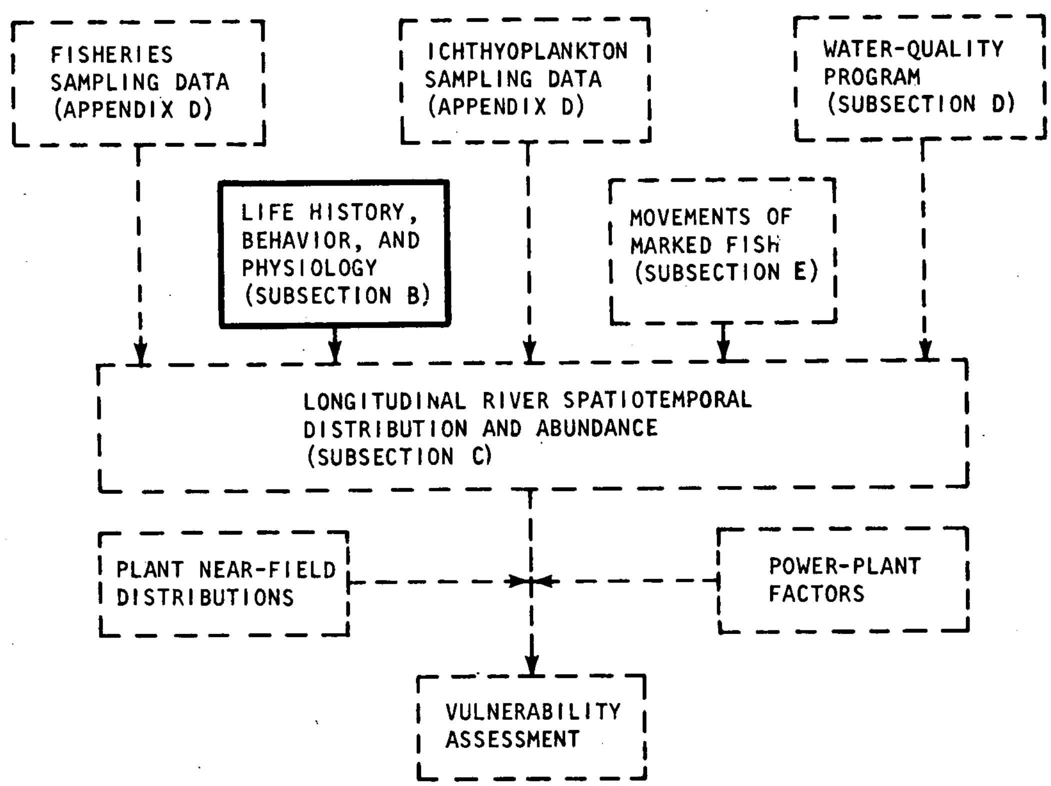


Vertical and lateral abundance and distribution patterns in the power-plant near-field areas will be discussed in a forthcoming report. Sections IV and VII of this report discuss data on power-plant locations, intake designs, and operations.

B. LIFE HISTORY/BEHAVIOR DESCRIPTION

1. Objectives

Fisheries literature and data from the Hudson River and other estuaries have been synthesized to construct a life history/behavior description for striped bass, white perch, and Atlantic tomcod and to describe biological features that may influence the potential vulnerability of each life stage to power-plant-induced mortality. Data presented in the life history/behavior description also indicate biological features that may influence sampling-gear efficiency in collecting the various life stages.



2. Methods

From an examination of the basic fisheries literature on striped bass, white perch, and Atlantic tomcod (subsection F), data on when and where these species occur or could be expected to occur in the Hudson River estuary and pertinent biological features (type of egg, incubation period, larval size at initial motility, larval response to light, swimming speed capabilities) were integrated to generate a life history/behavior description.

3. Results

Based on their use of the estuary and life-stage characteristics (Table VI-1), striped bass, white perch, and Atlantic tomcod differ in their total potential vulnerability to power-plant intakes.

a. Striped Bass

Striped bass, an anadromous species, uses the estuary only as spawning, nursery, and, to some extent, overwintering areas. Susceptibility to power plants is concentrated primarily on the egg, larval, and juvenile (young-of-year) stages. The eggs and yolk-sac larvae are pelagic and vulnerable to entrainment. Egg development is rapid (about 2-3 days) and the larvae become motile at 5-6 mm (total length). The motile post yolk-sac and juvenile stages are positively phototropic (Doroshev, 1970) and may alter their vertical distribution during a 24-hr period. Swimming-speed capabilities increase directly with body length and water temperature (Table VI-2).

b. White Perch

White perch, a resident estuarine species, is susceptible, to some degree, to power plants during all life stages and age groups. Because spawning is concentrated generally in the shoal and shore-zone areas the the eggs are demersal and adhesive (Mansueti, 1964), the egg and larval stages are less vulnerable to power-plant intakes than are striped bass eggs and larvae. Egg development is rapid and the larvae become motile at a total length 3-4 mm (Mansueti, 1964). Like striped bass, post yolk-sac larval and juvenile white perch are positively phototropic (Mansueti, 1964). Swimming-speed capabilities also increase directly with body length and water temperature (Table VI-3).

Table VI-1

Life History/Behavior Information for Key Hudson River Fish Species

Species	Use of Estuary: Adults – Life History	Adults – Spawning Period	Adults – Spawning Areas	Young – Nursery Period	Young – Nursery Areas	Pertinent Life Stage Characteristics: Eggs – Type	Eggs – Incubation Period	Larvae – Life Stage Length Division*	Larvae – Size of Initial Motility	Larvae – Response to Light	Young-of-Year, Yearlings and Older – Swimming-Speed Capability
Striped bass *(Morone saxatilis)*	Anadromous	Apr-Jun	Approx RM 34-85 (km 54-136)	Jul-Oct	Shoal and shore-zone areas from approx RM 12-46 (km 19-74)	Pelagic (specific gravity = 1.0005), non-adhesive, 3-4.5 mm in dia (water hardened)	74 hr at 14.4°C 48 hr at 18.3°C 26 hr at 26.7°C	Yolk-sac: 3.1-6.2 mm (SL) Post-yolk-sac: 6.3-14.3 mm (SL) Juveniles: 14.4+ mm (SL)	Approx 5-6 mm (TL)	Positively phototropic	See Table VI-2
White perch *(Morone americana)*	Estuarine	Mid-Apr-Jul	Approx RM 12-153 (km 19-245); probably also in tributaries	Jul-Oct	Shoal and shore-zone areas from approx RM 12-85 (km 19-136)	Demersal, adhesive prior to water hardening, 1-2 mm in dia (water hardened)	144 hr at 11.1°C 48 hr at 17.2°C 22 hr at 20.6°C	Yolk-sac: 2.1-4.3 mm (SL) Post-yolk-sac: 4.4-10.2 mm (SL) Juveniles: 10.3+ mm (SL)	Approx 3-4 mm (TL)	Positively phototropic	See Table VI-3
Atlantic tomcod *(Microgadus tomcod)*	Anadromous	Dec-Feb	Probably in littoral zone or mouths of tributaries from approx RM 39-76 (km 62-122)	Mar-Oct	Channel-bottom and shoal-bottom areas from approx RM 12-46 (km 19-74)	Demersal, may be adhesive, 1-2 mm in dia (water hardened)	30 days at 4.4°C 24 days at 6.1°C	Yolk-sac: 4.0-5.9 mm (SL) Post-yolk-sac: 6.0-15.5 mm (SL)	No data available but larvae hatch at about 5-6 mm (TL)	No data available	No data available

*As defined by Texas Instruments:
Yolk-sac larvae possess a definite yolk-sac but an incomplete digestive tract.
Post yolk-sac larvae, regardless of the degree of yolk-sac absorption, possess a complete digestive tract but have not completed transformation so do not have any adult morphometric characterisitics.
Juveniles have completed transformation but have not reached one year of age.
SL = standard length; TL = total length

Table VI-2

Swimming-Speed Capability for Striped Bass

Body Length (mm)	Swimming-Speed Performance	Test Apparatus	No. of Individuals Tested	Mean Water Temperature during Tests (°C)	Mean Salinity during Tests (ppt)
10.1-12.5	51.6% still swimming at end of 4-min exposure to velocity of 12.2 cm/sec	Beamish Respirometer (Beamish, 1966)	201	unknown	unknown
25.1-30.0	88.4% still swimming at end of 2-min exposure to velocity of 15.2 cm/sec		266		
	18.6% still swimming at end of 4-min exposure to velocity of 30.5 cm/sec		361		
30.1-40.0	94.9% still swimming at end of 4-min exposure to velocity of 15.2 cm/sec		310		
	42.7% still swimming at end of 4-min exposure to velocity of 30.5 cm/sec		904		
40.1-50.0	91.5% still swimming at end of 4-min exposure to velocity of 24.4 cm/sec	Beamish Respirometer (Beamish, 1966)	222	unknown	unknown
32-40 (FL) mean = 35.4	Maximum swimming speed (S/Max.)*: range = 18.3-27.4 cm/sec mean = 24.4 cm/sec	Modified MacLeod Apparatus (MacLeod 1967)	9 groups of 3 fish per group	24	3
32-42 (FL) mean = 35.7	S/Max: range = 18.3-27.4 cm/sec mean = 21.3 cm/sec	Modified MacLeod Apparatus (MacLeod 1967)	12 groups of 3 fish per group	27	3
143-224 (TL) mean = 176.7	Critical swimming speed (CSS)**: range = 22.9-122.0 cm/sec mean = 55.9 cm/sec	Beamish Respirometer (Beamish, 1966)	3	18	0
107-174 (TL) mean = 141.7	CSS: range = 30.5-45.7 mean = 34.5 cm/sec	Beamish Respirometer (Beamish, 1966)	6	16	6
158 (TL)	CSS = 53.9 cm/sec	Beamish Respirometer (Beamish 1966)	1	9	12

*S/Max (ft/sec) = $\frac{M-L}{M} \times V$

and $M = \frac{N \times T \times V}{c}$

where L = laps lost
V = current velocity (ft/sec)
N = number of fish per group
T = time of test (sec)
c = circumference of test chamber (ft)

FL = fork length; TL = total length

**CSS = $VI + \frac{TNI}{IT} \times \Delta V$

where VI = velocity of previous time interval
TNI = time into next time interval
IT = interval time
ΔV = velocity increment

recommended IT = 60 min. (Brett, 1964)

Table VI-3

Swimming-Speed Capability for White Perch

Body Length (mm)	Swimming-Speed Performance	Test Apparatus	No. of Individuals Tested	Mean Water Temperature during Tests (°C)	Mean Salinity during Tests (ppt)
31-41 (FL) mean = 36.4	Maximum swimming speed (S/Max)*: range = 9.1-24.4 cm/sec mean = 18.3 cm/sec	Modified MacLeod apparatus (MacLeod, 1967)	9 groups of 3 fish per group	24	4
31-43 (FL) mean = 36.5	S/Max: range = 15.2-24.4 cm/sec mean = 21.3 cm/sec	↑	8 groups of 3 fish per group	27	4
34-50 (FL) mean = 44.1	S/Max: range = 18.3-39.6 cm/sec mean = 27.4 cm/sec		9 groups of 3 fish per group	29	4
mean = 82.8 (FL)	S/Max: mean = 19.8 cm/sec		12	6	3-4
mean = 59.0 (FL)	S/Max: mean = 21.9 cm/sec		6	10	3-4
mean = 93.0 (FL)	S/Max: mean = 33.2 cm/sec	↓	4	16	3-4
mean = 72.1 (FL)	S/Max: mean = 21.0 cm/sec	Modified MacLeod apparatus (MacLeod, 1967)	22	12	7-8
83-105 (FL) mean = 89.3	Critical swimming speed (CSS)**: range = 32.3-47.2 cm/sec mean = 38.1 cm/sec	Beamish Respirometer (Beamish, 1966)	8	12	3
72-94 (FL) mean = 83.4	CSS: range = 24.7-33.2 cm/sec mean = 29.6 cm/sec	↑	10	7	3
77-95 (FL) mean = 82.6	CSS: range = 18.0-32.6 cm/sec mean = 25.9 cm/sec		10	5	3
137-221 (TL) mean = 155.4	CSS: range = 23.2-99.4 cm/sec mean = 52.9 cm/sec		30	20	0
128-197 (TL) mean = 154.0	CSS: range = 30.5-107.0 cm/sec mean = 54.4 cm/sec	↓	22	21	6
134-166 (TL) mean = 148.6	CSS: range = 23.2-115.0 cm/sec mean = 54.4 cm/sec	Beamish Respirometer (Beamish, 1966)	10	15	12

$$*S/Max\ (ft/sec) = \frac{M-L}{M} \times V$$

$$\text{and } M = \frac{N \times T \times V}{c}$$

where
- L = laps lost
- V = current velocity (ft/sec)
- N = number of fish per group
- T = time of test (sec)
- c = circumference of test chamber (ft)

FL = fork length; TL = total length

$$**CSS = VI + \frac{TNI}{IT} \times \Delta V$$

where
- VI = velocity of previous time interval
- TNI = time into next time interval
- IT = interval time
- ΔV = velocity increment

recommended IT = 60 min (Brett, 1964)

c. Atlantic Tomcod

The anadromous species Atlantic tomcod uses the estuary as a spawning and nursery area. This species may be exposed, to some degree, to power plants during almost every life stage. Spawning adult tomcod are small, most from 115-250 mm in total length (Texas Instruments, unpublished data), and are vulnerable to impingement. However, the eggs are demersal and probably adhesive, although there is some controversy about the adhesiveness (Bigelow and Schroeder, 1953; Booth, 1967; Scott and Crossman, 1973). Eggs and yolk-sac larvae are probably never vulnerable to power-plant intakes. Egg development is slow since spawning occurs during the winter months. No data are available on larval size at initial motility, larval response to light, or swimming-speed capability. Nichols and Breder (1927) state that the tomcod is not an active swimmer.

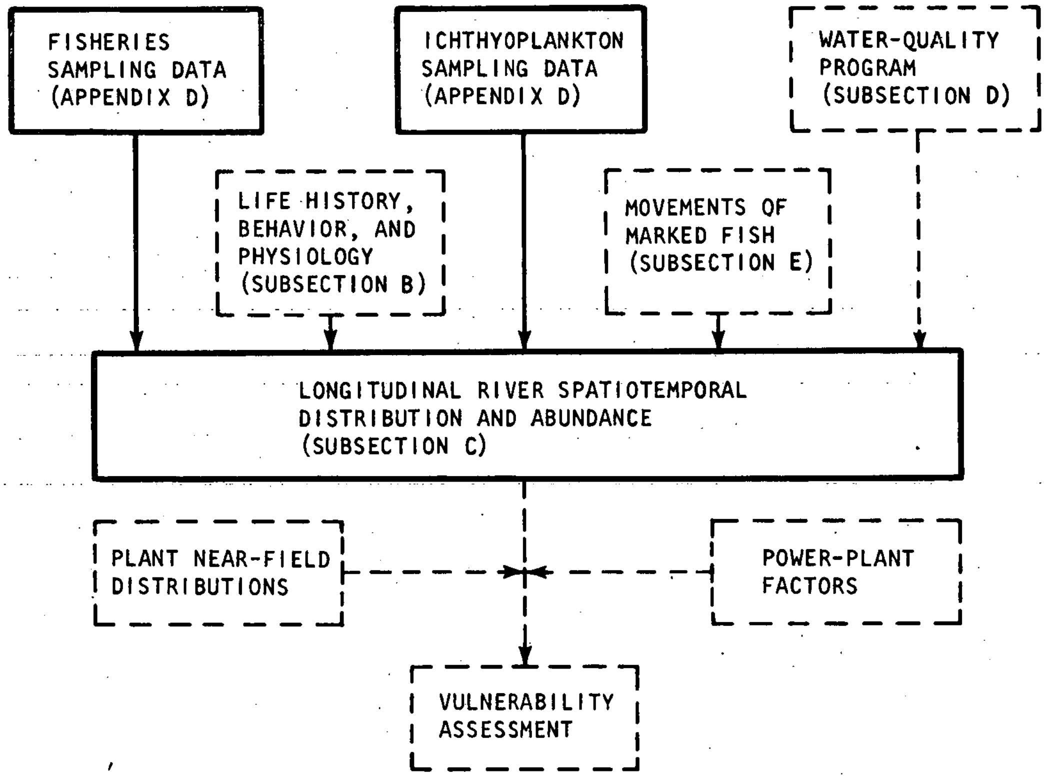
4. Discussion

The life history/behavior description data are used qualitatively, in combination with the abundance, distribution, and movement data collected in 1973 and 1974 (presented in the following subsections), to assess the potential vulnerability to power-plant entrainment and impingement of the various life stages of striped bass, white perch, and Atlantic tomcod in the Hudson River estuary.

C. SPATIOTEMPORAL DISTRIBUTION AND ABUNDANCE

1. Objectives

This subsection describes the longitudinal and temporal abundance and distribution patterns of the various life stages of striped bass, white perch, and Atlantic tomcod for 1973 through September 1974 in the river [RM 12-153 (km 19-245)] and in the vicinity of each power plant and compares the results from 1973 and 1974.



2. Methods

Ichthyoplankton and fisheries field samples collected in the Hudson River estuary during 1973 (April through December) and 1974 (April through September) were analyzed to determine the spatiotemporal distribution and abundance patterns for the various life stages of striped bass, white perch, and Atlantic tomcod and to evaluate their degree of potential exposure to power-plant entrainment and impingement. Appendix D presents formulas used in calculation of abundance estimates and other details of computation. This subsection presents only overview descriptions of general methods. Also, Section III presents a complete description of the field-sampling design, techniques, and equipment.

a. Ichthyoplankton (Day and Night Samples), 1973

1) Geographical-Region Density Estimates

An estimate of the mean density in each of two strata (bottom and channel) within each of six geographical regions was calculated for each ichthyoplankton life stage over biweekly intervals from April to December. Table VI-4 shows geographical region boundaries.

Table VI-4

River-Stratum Volumes (m^3) in Six Geographical Regions of Hudson River Estuary Used To Calculate 1973 Ichthyoplankton Standing-Crop Estimates

Geographical Region	River Miles*	Regional Stratum Volumes (m^3)† Bottom	Channel	Total
Yonkers-Tappan Zee	14-33 (22-53)	269,600,000	281,500,000	551,100,000
Croton-Haverstraw-Indian Point	34-46 (54-74)	132,400,000	223,600,000	356,000,000
West Point-Cornwall	47-61 (75-98)	73,500,000	273,700,000	347,200,000
Poughkeepsie-Hyde Park	62-85 (99-136)	103,500,000	356,200,000	459,700,000
Kingston-Saugerties	86-106 (137-170)	110,900,000	272,700,000	383,600,000
Catskill-Albany	107-140 (171-224)	115,900,000	115,900,000	231,800,000
Total	14-140 (22-224)			2,329,400,000

*Numbers in parentheses indicate kilometers.

†All values rounded to nearest 100,000 m^3.

Volumes were calculated initially for each of three strata in each river mile segment: shoal stratum — the area < 20 ft (6 m) deep; bottom stratum — the area from 10 ft (3 m) above the bottom down to the bottom in water deeper than 20 ft (6 m); and channel stratum — the area not included in the shoal and bottom strata. For analysis, the shoal and bottom strata were combined in 1973. Figure VI-1 illustrates the general area of the two strata used in 1973 in a hypothetical cross section of the river.

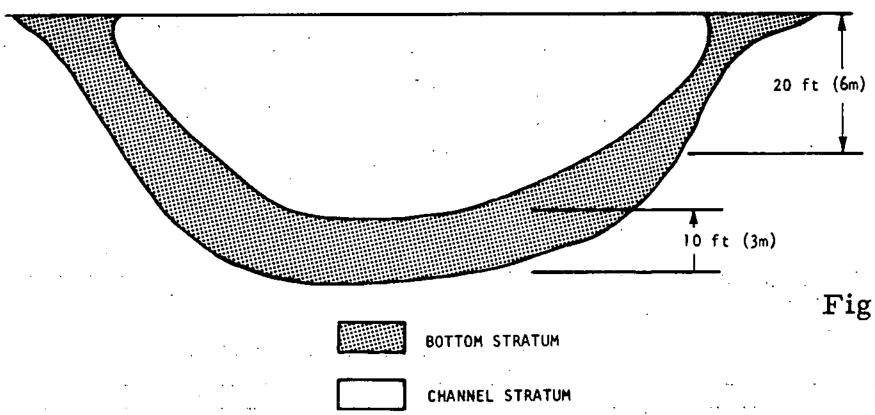


Figure VI-1. 1973 River Depth Strata

Volumes of strata by river mile [RM 14-140 (km 22-224)] appear in Appendix D, Table D-1.

2) Geographical-Region Standing-Crop Estimates

Standing-crop estimates for each region were calculated from the weighted mean densities of the bottom and channel strata. Standing-crop estimates for the entire river were taken as the sum of the regional standing crops. Appendix D contains details.

3) Plant-Region Standing-Crop Estimates

The 1973 ichthyoplankton standing crops by life stage were estimated for biweekly intervals at each of the five power-plant regions (Table VI-5). The 13-mi plant region extends approximately 6.5 mi (10.5 km) above and 6.5 mi below each plant site and is based on an estimated maximum tidal excursion (data adapted from Shepley, 1974).

Table VI-5

Site Locations and Boundaries for Power-Plant Regions Included in Multiplant Impact Study on Hudson River Estuary

Power Plant	Site (river mile)	Location of Plant Region (river miles)*	
Bowline	37	31-43	(50-69)
Lovett	41	35-47	(56-75)
Indian Point	42	36-48	(58-77)
Roseton	65	59-71	(94-114)
Danskammer	66	60-72	(96-114)

*Numbers in parentheses indicate kilometers.

The following assumptions are needed if there is to be valid application of both geographical and plant-region ichthyoplankton standing-crop estimates:

- The populations did not change in abundance or move during the time interval involved in the standing-crop estimate.
- There was no gear avoidance.
- Sampling locations were chosen randomly.
- Strata within a geographical region and the geographical-region standing crop is simply the sum of the stratum variances. There is the same assumption of independence among geographical regions; so, the variance of the entire river standing crop is the sum of the geographical region variances.
- There was no daylight-darkness effect on the sampling.

Assumption violation implications are discussed in later sections of this report wherever appropriate.

4) Plant Exposure Tables

From 1973 ichthyoplankton standing-crop estimates, plant exposure tables were generated to assess the degree of exposure to the five power plants of the total standing crop of each life stage during a given time interval. The percent of the entire river [RM 14-140 (km 22-224)] standing crop of each life stage occurring below, within, and above each 13-mi plant region during each biweekly interval comprises a plant-exposure table.

b. Ichthyoplankton (Day and Night Samples), 1974

1) Density and Standing-Crop Estimates

The 1974 ichthyoplankton densities and standing crops were estimated by essentially the same methods used in 1973 with these differences:

- Estimates were made by river run and by weekly intervals in 1974
- The number of geographical regions considered was increased to 12 (Table VI-6) although the area sampled was the same [RM 14-140 (km 22-224)].
- The number of intraregional strata was increased as follows:

  shoal stratum — the area < 20 ft (6 m) deep; bottom stratum — the area >20 ft (6 m) deep and ≤ 10 ft (3 m) from the bottom where shoals are defined to exist, as well as the area ≤ 10 ft (3 m) from the bottom where shoals are defined not to exist; and channel stratum — the area > 20 ft (6 m) deep and more than 10 ft (3 m) from the bottom where shoals are defined to exist, as well as the area > 10 ft (3 m) from the bottom where shoals are defined not to exist (Figure VI-2).

Volumes of strata by river mile appear in Appendix D, Table D-2.

Table VI-6

River-Stratum Volumes (m^3) in 12 Geographical Regions of Hudson River Estuary Used to Calculate 1974 Ichthyoplankton Standing-Crop Estimates

Geographical Region	River Miles*	Shoals	Bottom	Channel	Total
Yonkers	14-23 (22-37)	26,700,000	202,800,000†		229,500,000
Tappan Zee	24-33 (38-53)	121,700,000	61,900,000	138,800,000	321,600,000
Croton-Haverstraw	34-38 (54-61)	53,900,000	32,500,000	61,300,000	147,700,000
Indian Point	39-46 (62-74)	12,600,000	33,400,000	162,300,000	208,300,000
West Point	47-55 (75-88)	**	28,600,000	178,800,000	207,400,000
Cornwall	56-61 (89-98)	8,100,000	36,800,000	94,900,000	139,800,000
Poughkeepsie	62-76 (99-122)	**	69,200,000	229,000,000	298,200,000
Hyde Park	77-85 (123-136)	**	34,300,000	127,200,000	161,500,000
Kingston	86-93 (137-149)	**	47,800,000	93,700,000	141,500,000
Saugerties	94-106 (150-170)	**	63,100,000	179,000,000	242,100,000
Catskill	107-124 (171-198)	**	76,800,000	83,900,000	160,100,000
Albany	125-140 (199-224)	**	71,100,000†		71,100,000
Total	14-140 (22-224)				2,329,400,000

*Numbers in parentheses indicate kilometers.

**Stratum defined as zero; actual volume added to bottom stratum.

†Bottom- and channel-strata volumes combined.

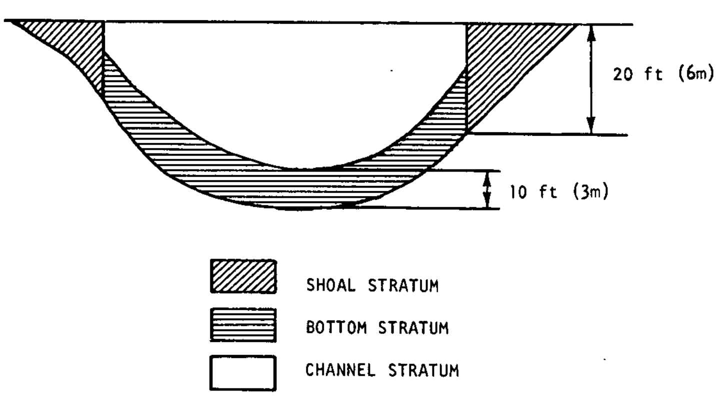


Figure VI-2. 1974 River Depth Strata

2) Shoals-Survey Density Estimates

The 1974 fall shoals-survey density estimates were also analyzed for this report. Sampling with epibenthic sled covered the time interval 19 August through 26 September and included the shoals stratum from RM 14-76 (km 22-122). The shoals-survey density estimates were calculated in the same manner as the 1974 ichthyoplankton-density estimates except only the shoal stratum was sampled.

3) Plant-Exposure Tables

Plant-exposure tables were generated from 1974 ichthyoplankton samples using the same methods as for 1973 and were based only on those river runs which sampled the entire river from RM 14-140 (km 22-224) (Table III-2).

c. Fisheries (Day Samples Only, 1973; and Day and Night Samples, 1974)

1) Geographical-Region Catch-per-Unit-Effort Values

Catch-per-unit-effort (CPUE) values were determined for juveniles (young-of-the-year) and yearling and older from beach-seine samples for biweekly intervals in the 12 geographical regions during 1973 and 1974. CPUE values were calculated from bottom-trawl catches for monthly intervals in five geographical regions, Tappan Zee through Cornwall in 1973, and in six geographical regions, Yonkers through Cornwall in 1974. Bottom-trawl sampling occurred during daytime only. During 4-10 August 1974, beach-seine samples were taken at night in four regions in Croton/Haverstraw through the Cornwall regions. As in 1973, most beach-seining effort in 1974 occurred during the daylight hours.

2) Geographical-Region Standing-Crop Estimates

Standing crops of juveniles were estimated from the 100-ft (30.5-m) beach-seine hauls based on surface area shoreward of the 10-ft (3-m) depth contours. Estimates were made for each of the twelve geographical regions and the entire estuary from the daytime hauls. Separate standing-crop estimates were made for each of the four regions sampled at night in 1974 (Croton/Haverstraw through Cornwall) for comparison with the day-time estimates.

3) Plant-Region Standing-Crop Estimates

Beach-Seine standing-crop estimates (day samples) for juveniles were used to calculate the standing crops in each of the five 13-mi power-plant regions.

Standing-crop estimates based on beach-seine catches for geographical and plant regions assume that:

- The concentration of juvenile fish per unit of shore-zone surface area sampled by the 100-ft (30.5-m) beach seine was the same from depths of 0 to 10 ft (3 m).

- The sampling sites were chosen randomly.

- There was no gear avoidance.

- Populations did not move between regions or change in abundance during a biweekly time interval.

- All fish occurred within the shore-zone area at the time of sampling.

Assumption violation implications are discussed in later sections of this report wherever appropriate.

4) Plant-Exposure Tables

Plant-exposure tables were generated from 1973 and 1974 beach-seine standing-crop estimates of juveniles for each of the five power plants. The percent of the entire river [RM 14-152 (km 22-243)] juvenile standing-crop occurring below, within, and above each 13-mi plant region during a biweekly interval comprises a plant-exposure table.

3. Results

The results of the analyses presented in this section describe general trends in the abundance and distribution of the various life stages of striped bass, white perch, and Atlantic tomcod in the Hudson River estuary during 1973 and 1974. Major emphasis is placed on the egg, larvae, and juvenile (young-of-the-year) life stages because their size, behavior, and time spent in the estuary (see subsection B) make them generally more vulnerable to power-plant-induced mortality than older individuals.

Longitudinal river abundance and distribution data on eggs, larvae, juveniles, yearling, and older were analyzed and the patterns were examined to answer the following questions:

- When was a specific life stage of a particular species first collected in the river?
- When was the maximum total standing crop of that life stage collected in the river and what was the peak standing-crop estimate?
- In what longitudinal river region(s) was the peak standing crop of that life stage collected?
- How long was that life stage collected in the river?
- What was the range of longitudinal river distribution for that life stage?

Longitudinal river abundance and distribution data on eggs, larvae, and juveniles were further analyzed with respect to the 13-mi region at Bowline, Lovett, Indian Point, Roseton, and Danskammer power plants to answer the following questions:

- When was a specific life stage of a particular species first collected in each of the five 13-mi power-plant regions?

- During the total river standing-crop period for that stage, what was the standing crop of that life stage present within each power-plant region and what percent of the total river standing crop did each plant-region standing crop represent?

- When did the peak standing crop of that life stage occur in each power plant region and how large was that standing crop?

- When was the last-collected life stage in each power plant region?

Details concerning the abundance and distribution patterns may be found in Appendix D, Tables D-4 through D-135 and Figures D-1 through D-49.

a. 1973 Longitudinal River Regions

1) Striped Bass

a) Eggs

Striped bass eggs were collected during the first sampling period (29 April to 12 May), but the peak standing crop occurred between 13 and 26 May (Figure D-1) when the standing-crop estimate was about 270,000,000. No eggs were collected after 23 June.

Although striped bass eggs were collected in every river region, most occurred in the Croton/Haverstraw-Indian Point through Poughkeepsie-Hyde Park regions. The West Point-Cornwall region produced the greatest number of eggs followed by Croton/Haverstraw-Indian Point and Cornwall. Standing crops of eggs were always low in the Yonkers-Tappan Zee, Kingston-Saugerties, and Catskill-Albany regions (Figure D-1).

b) Yolk-Sac Larvae

Striped bass yolk-sac larvae appeared in low numbers during the first sampling interval (29 April to 12 May) with recruitment increasing steadily until the period of 10-23 June when the standing crop was highest at about 96,000,000. Most yolk-sac larvae occurred in the Croton/Haverstraw-Indian Point through Poughkeepsie-Hyde Park regions during the 10-23 June peak period. After that time, no yolk-sac larvae were collected (Figure D-2).

Yolk-sac larvae were collected in every river region, but highest standing crops generally occurred in the regions from Poughkeepsie-Hyde Park downstream through Yonkers-Tappan Zee. During an initial high-abundance period (27 May to 9 June) about 76% of the total standing crop of 81,000,000 yolk-sac larvae occurred in the Poughkeepsie-Hyde Park regions. Standing crops were always low in the Kingston-Saugerties and Catskill-Albany regions. Based on the entire ichthyoplankton-sampling period (29 April to 10 August), the largest standing crops of yolk-sac larvae occurred in the Poughkeepsie-Hyde Park region.

c) Post Yolk-Sac Larvae

Striped bass post yolk-sac larvae were first collected during the 13-26 May sampling period (Figure D-3). Abundance peaked during the 24 June-7 July period at a standing-crop estimate over 17,000,000 followed by a precipitous decline. No post yolk-sac larvae were collected after 4 August.

In general, the highest standing crops of post yolk-sac larvae were found in areas of the river south of Kingston, i.e. from Poughkeepsie-Hyde Park through the Yonkers-Tappan Zee regions. During the peak period (24 June to 7 July), however, about 9,000,000 post yolk-sac larvae occurred in the upper river Kingston-Saugerties region. Standing crops never exceeded 600,000 in the Catskill-Albany region. During the entire ichthyoplankton-sampling period (29 April-18 August), most post yolk-sac larvae occurred in the Poughkeepsie-Hyde Park region.

d) Juveniles

Juveniles first appeared in ichthyoplankton gear and beach seines in mid- to late June (Figures D-4 and D-5). Ichthyoplankton sampling ended by 18 August but beach-seine sampling continued through the middle of December. Juvenile abundance in ichthyoplankton samples peaked twice during the 8-21 July and 5-18 August intervals at estimated standing crops of about 15,500,000. The beach-seine standing-crop estimate was highest during 9-22 September (about 8,000,000). Juvenile striped bass were collected in beach seines until mid-December.

Juvenile striped bass were generally most abundant in ichthyoplankton samples in areas of the river below the Catskill-Albany region and above the Yonkers-Tappan Zee region except during 5-18 August when about 92% of the estimated 15,000,000 juveniles were collected in the Yonkers-Tappan Zee region. In beach-seine samples, most juveniles were collected below the West Point region. Substantial numbers of juveniles were first present in the shore zone between 1 and 14 July in the Tappan Zee and Croton-Haverstraw regions. Few were found in ichthyoplankton samples in these regions during this time. Mean total length for all juveniles collected by beach seines between 1 and 14 July was 34 mm in the Tappan Zee region and 40 mm in the Croton-Haverstraw region.

Juvenile abundance in beach-seine samples continued to increase through the summer to the 9-22 September peak period. High standing crops were associated with the river regions possessing extensive shoal habitat (e.g., the Croton-Haverstraw and Tappan Zee regions). Upstream areas were only sparsely populated with juvenile striped bass, particularly after 6 October. Standing crops declined markedly in the 4-17 November interval and continued to decline through 15 December.

e) Yearling and Older (Age I and Older)

Yearling and older striped bass were collected by beach seines in every river region throughout the 8 April-15 December sampling period. During April and May, concentrations in the shore-zone areas occurred in the lower river in the Yonkers and Tappan Zee regions (Figure D-6). Between June and late October, yearling and older striped bass were distributed throughout all regions but the peak catch per unit effort occurred during 7-20 October in the Tappan Zee region. After 20 October, densities decreased in all regions. None were collected north of the Poughkeepsie region.

Bottom-trawl catches from areas of the river between RM 12 and 62 (km 19 and 99) were not separated into age groups during 1973 (Figure D-7); consequently, little can be concluded about the distribution of yearling and older striped bass from trawl samples.

2) White Perch

a) Eggs

Relatively few white perch eggs were collected during the earliest sampling period (29 April-12 May) but numbers steadily increased until the peak period of 27 May-9 June when the standing-crop estimate was almost 10,000 (Figure D-8). Egg numbers decreased in the 10-23 June sampling interval and none were collected in subsequent samples.

The Kingston-Saugerties and Catskill-Albany regions had much higher standing crops than did any of the lower river regions, particularly during the peak 10-23 June time period. No white perch eggs were taken in the Yonkers-Tappan Zee region and very few were collected in the Croton/Haverstraw-Indian Point region.

b) Yolk-Sac Larvae

White perch yolk-sac larvae were scarce during the first sampling period (29 April-12 May) but increased to a peak of over 13,000,000 between 10 and 23 June (Figure D-9) with about 77% of the total standing crop occurring in the Kingston-Saugerties region. This period of peak yolk-sac larvae abundance immediately followed the peak in egg abundance. Numbers of yolk-sac larvae then declined precipitously to a low during the 24 June-7 July interval, after which none were collected.

With the exception of the period 13-26 May when about half of the total yolk-sac larvae standing crop occurred in the Croton/Haverstraw-Indian Point region, concentrations of white perch yolk-sac larvae were restricted primarily to regions north of West Point-Cornwall.

c) Post Yolk-Sac Larvae

White perch post yolk-sac larvae were collected during the first sampling period, 29 April-12 May (Figure D-10). Numbers increased substantially to a peak standing crop of about 50,000,000 during the 24 June-7 July interval, the sampling period immediately following the peak yolk-sac larvae period. Abundance declined through July; no post yolk-sac larvae were taken after 4 August.

Post yolk-sac larvae were first collected upstream from the Poughkeepsie-Hyde Park region. Later, peak standing crops occurred from the Poughkeepsie-Hyde Park region downstream through the Yonkers-Tappan Zee region. During the peak period (24 June-7 July), about 96% of the total post yolk-sac larvae standing crop occurred in the Yonkers-Tappan Zee through Poughkeepsie-Hyde Park regions.

d) Juveniles

Juvenile white perch first appeared in relatively low numbers in ichthyoplankton and beach-seine samples during early July (Figures D-11 and D-12). They were most abundant in ichthyoplankton samples during the last sampling period, 5-18 August. The standing-crop estimate during 5-18 August was nearly 3,000,000 with about 45% of the juveniles concentrated in the Yonkers-Tappan Zee region. Beach-seine standing-crop estimates were highest during the 23 September-9 October interval at just over 7,000,000. Most of these juveniles were collected in the Tappan Zee and Croton-Haverstraw regions.

When juvenile white perch first appeared in the shore zone during 1-14 July, they were collected primarily in the upper river above the Poughkeepsie region and had a mean total length of 21.1 mm. By mid-August and thereafter, the distribution pattern in the shore zone shifted to a concentration in the lower river (Croton-Haverstraw and Tappan Zee regions). Following the peak standing-crop period (23 September-6 October), abundance declined until by late November few juvenile white perch were collected in the shore zone.

e) Yearling and Older (Age I and Older)

Beach seines collected yearling and older white perch during the 8 April-15 December period in all river regions (Figure D-13). Densities in the shore zone increased throughout the river during May and June to an overall peak during the 3-16 June interval. From July to September, densities decreased in the upper river regions but gradually increased in the lower river (Croton-Haverstraw and Tappan Zee regions); this trend continued through October and early November. No yearlings and older white perch were taken in beach seines after 1 December.

Interregional bottom-trawl catches from areas of the river between RM 24 and 62 (km 38 and 99) were not separated into age groups during 1973. The age distribution of standard-station bottom-trawl catches in the area of Indian Point during 1973 (Texas Instruments, 1974b) indicated that most of the catch was yearlings (age I) and older. White perch were collected primarily in the lower river areas during April but were present throughout the regions sampled from May to December (Figure D-14). A relatively high density occurred in the Indian Point region during December.

3) Atlantic Tomcod

a) Eggs and Yolk-Sac Larvae

No Atlantic tomcod eggs or yolk-sac larvae were collected in the 1973 ichthyoplankton longitudinal river survey. The spatial distribution and abundance of eggs and yolk-sac larvae in the Hudson River estuary during 1973 are unknown but presumably are similar to that of the post yolk-sac larvae.

b) Post Yolk-Sac Larvae

Post yolk-sac larvae were collected only during the first sampling interval (29 April-12 May). They were collected in the West Point-Cornwall region downstream through the Yonkers-Tappan Zee region with highest standing crops occurring in Croton/Haverstraw-Indian Point and Yonkers-Tappan Zee (Figure D-15).

c) Juveniles

Juvenile Atlantic tomcod were collected during the first ichthyoplankton-sampling period (29 April-12 May), primarily in the lower river (Yonkers-Tappan Zee and Croton/Haverstraw-Indian Point regions; Figure D-16). Peak standing-crop estimates occurred between 29 April and 27 May at about 130,000,000 to 140,000,000 juveniles concentrated in the Yonkers-Tappan Zee and Croton/Haverstraw-Indian Point regions. Only a few juvenile Atlantic tomcod were taken in the upper river regions (Kingston-Saugerties and Catskill-Albany).

Because juvenile Atlantic tomcod are demersal (Table VI-1), they are not readily available to beach-seine sampling in the shore zone (Figure D-17). Peak tomcod densities in bottom-trawl catches occurred during April in the Tappan Zee and Indian Point regions (Figure D-18). Although interregional bottom-trawl catches in 1973 were not separated into age groups, it is likely that the majority of the tomcod collected by bottom trawls between

April and November were juveniles since adults are probably in the river only during the spawning period from November through March (Table VI-1). Few juvenile tomcod were taken in the West Point and Cornwall regions, the most upstream regions sampled by bottom trawl.

4) Summary

Dates and locations of first, peak, and last collections of striped bass, white perch, and Atlantic tomcod eggs, larvae, and juveniles taken in epibenthic sleds, Tucker trawls, and beach seines in the Hudson River estuary during 1973 are summarized in Tables VI-7, VI-8, and VI-9.

b. 1973 Power-Plant Regions

Based on the longitudinal river abundance and distribution patterns, the degree of potential exposure for the 1973 river populations of the various life stages of striped bass, white perch, and Atlantic tomcod was estimated from the percent of the peak total river standing crops which occurred within each 13-mi plant region. With the exception of the juvenile stage and its lengthy duration, the peak total river standing crops for the other early life stages (eggs and larvae) generally represented the major portion of the estimated population of each life stage produced in the estuary during 1973. When two nearly equal peaks occurred, two percentages were calculated. Percentages during other time periods may be found in Appendix D.

This percentage represented the index for the degree of potential exposure of each life stage to each power plant. The larger the percentage, the greater the estimated degree of potential exposure and potential for plant-induced mortalities in the population and vice-versa. Although Roseton was not operating during 1973, the standing crops in the plant region were estimated; these crops would have been available for entrainment and impingement at Roseton had this power plant been operating.

Table VI-7

Summary of Distribution and Abundance Data for Early Life Stages of Striped Bass in Hudson River Estuary [RM 12-152 (km 19-243)] during 1973

Distribution and Abundance Summary		Eggs	Yolk-Sac Larvae	Post Yolk-Sac Larvae	Juveniles: Ichthyoplankton Gear	Juveniles: Beach Seines
First Collection	Date (Interval)	Apr 29-May 12*	Apr 29-May 12*	May 13-26	Jun 24-Jul 7	Jun 17-30
	Location	RM 34-140 (km 54-224); most from RM 47-85 (km 75-136)	RM 34-140 (km 54-224); most from RM 34-106 (km 54-170)	RM 14-85 (km 22-136); most from RM 14-23 (km 22-37)	RM 34-106 (km 54-170); most from RM 47-61 (km 75-98)	RM 12-23 (km 19-37) and RM 39-46 (km 62-74)
Peak Collection	Date (Interval)	May 13-26	Jun 10-23; early, smaller peak between May 27 and June 9	Jun 24-Jul 7	Two peaks: Jul 8-21 and Aug 5-18	Sep 9-22
	Location	RM 34-85 (km 54-136)	RM 34-85 (km 54-136) and RM 62-85 (km 99-136) for early smaller peak	RM 14-85 (km 22-136)	RM 62-106 (km 99-170) and RM 14-46 (km 22-74)	RM 24-38 (km 38-61)
	Total Standing-Crop Estimate	270,068,964	96,123,346; 81,332,444 (smaller peak)	171,531,454	15,880,690 and 15,411,550	8,243,258
Last Collection	Date (Interval)	Jun 10-23	Jun 10-23	Jul 22-Aug 4	Aug 5-18**	Dec 2-15†
	Location	RM 34-85 (km 54-136) and RM 107-140 (km 171-224)	RM 14-106 (km 22-170)	RM 14-140 (km 22-224)	RM 14-85 (km 22-136)	RM 12-55 (km 19-88)
Range of Longitudinal Distribution		RM 14-140 (km 22-224)	RM 14-140 (km 22-224)	RM 14-140 (km 22-224)	RM 14-140 (km 22-224)	RM 12-152 (km 19-243)

*First sampling period, some may have been present earlier.

**Represents only the last longitudinal river ichthyoplankton-sampling run, not the last date juveniles were present in the river.

†Sampling after December 15 limited to only the Indian Point region where no juveniles were collected.

Table VI-8

Summary of Distribution and Abundance Data for Early Life Stages of White Perch in Hudson River Estuary [RM 12-152 (km 19-243)] during 1973

Distribution and Abundance Summary		Eggs	Yolk-Sac Larvae	Post Yolk-Sac Larvae	Juveniles: Ichthyoplankton Gear	Juveniles: Beach Seines
First Collection	Date (Interval)	Apr 29-May 5*	Apr 29-May 5*	Apr 29-May 5*	Jul 8-21	Jul 1-14
	Location	RM 47-140 (km 75-224)	RM 62-140 (km 99-224)	RM 86-140 (km 137-224)	RM 34-106 (km 54-170)	RM 62-140 (km 99-224)
Peak Collection	Date (Interval)	May 27-Jun 9	Jun 10-23	Jun 24-Jul 7	Aug 5-18**	Sep 23-Oct 6
	Location	RM 86-140 (km 137-224)	RM 86-106 (km 137-170)	RM 14-85 (km 22-136)	RM 14-33 (km 22-53)	RM 24-38 (km 38-61)
	Total Standing-Crop Estimate	9,967,115	13,435,945	50,093,143	2,899,915	7,348,505
Last Collection	Date (Interval)	Jun 10-23	Jun 24-Jul 7	Jul 22-Aug 4	Aug 5-18**	Dec 2-15†
	Location	RM 34-61 (km 54-98) RM 86-140 (km 138-224)	RM 62-85 (km 99-136) RM 107-140 (km 171-224)	RM 62-85 (km 99-136)	RM 14-106 (km 22-170)	RM 14-23 (km 22-37) RM 47-55 (km 75-88)
Range of Longitudinal Distribution		RM 34-140 (km 54-224)	RM 14-140 (km 22-224)	RM 14-140 (km 22-224)	RM 14 106 (km 22-170)	RM 14-140 (km 22-224)

*First sampling period, some may have been present earlier

**Represents only the last longitudinal river ichthyoplankton-sampling run, not the peak period or last date juveniles were present in the river

†Sampling after December 15 limited to only the Indian Point region where an estimated standing crop of only about 1,800 juveniles occurred

Table VI-9

Summary of Distribution and Abundance Data for Early Life Stages of Atlantic Tomcod in Hudson River Estuary [RM 12-152 (km 19-243)] during 1973

Distribution and Abundance Summary		Eggs*	Yolk-Sac* Larvae	Post Yolk-Sac Larvae	Juveniles: Ichthyoplankton Gear	Juveniles: Beach†† Seines
First Collection	Date (Interval)	-	-	Apr 29-May 12**	Apr 29-May 12**	Aug 12-25
	Location	-	-	RM 14-61 (km 22-98)	RM 14-106 (km 22-170)	RM 12-33 (km 19-53)
Peak Collection	Date (Interval)	-	-	Apr 29-May 12**	Apr 29-May 26	Aug 12-25
	Location	-	-	RM 14-46 (km 22-74)	RM 14-46 (km 22-74)	RM 24-33 (km 38-53)
	Total Standing-Crop Estimate	-	-	2,231,631	128,835,440 and 142,610,974	312,494
Last Collection	Date (Interval)	-	-	Apr 29-May 12	Aug 5-18†	Nov 4-17
	Location	-	-	RM 14-46 (km 22-74)	RM 14-85 (km 22-136)	RM 24-33 (km 38-53)
Range of Longitudinal Distribution		-	-	RM 14-46 (km 22-74)	RM 14-140 (km 22-224)	RM 12-33 (km 19-53)

*None collected

**During first sampling period, post yolk-sac larvae and juveniles were likely present in the river earlier in greater numbers

†Represents only the last longitudinal river ichthyoplankton-sampling run, not the last date juveniles were present in the river

††Because Atlantic tomcod are demersal fish, they are not readily accessible to beach-seine sampling in the shore-zone areas; therefore, standing-crop estimates based on beach-seine catches are undoubtedly biased low.

1) Striped Bass

Figure VI-3 summarizes exposure indices for each life stage at each power plant. Details may be found in Appendix D, Tables D-145 through D-149.

a) Eggs, Yolk-Sac Larvae, and Post Yolk-Sac Larvae

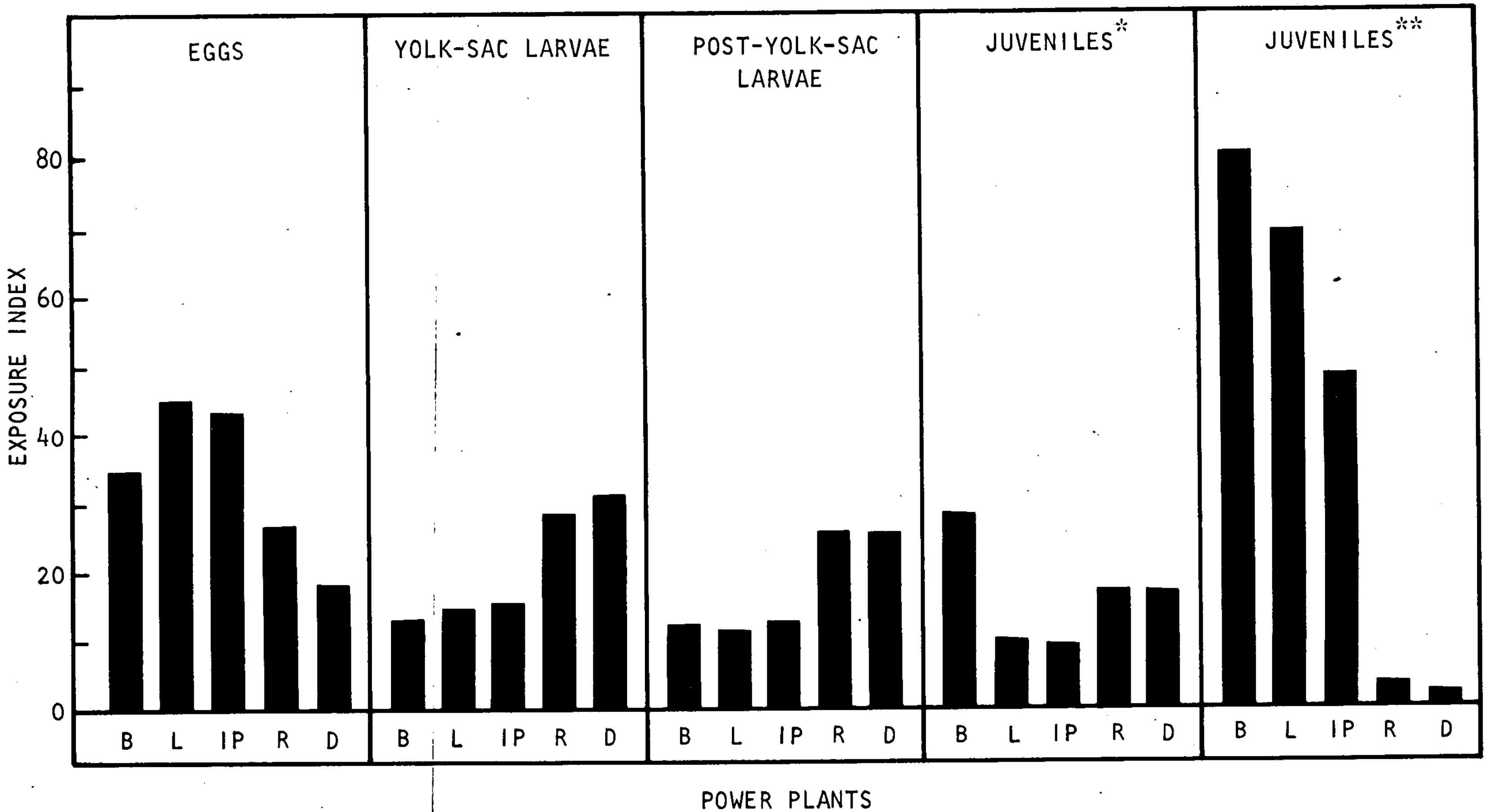
Striped bass eggs and larvae were present in all five power-plant regions and thus were potentially available for entrainment from at least 29 April to 4 August (about 16 weeks). Egg exposure to power plants was highest at the lower river plants (Bowline, Lovett, and Indian Point) with the exposure index at Lovett (42.3) and Indian Point (39.8) slightly higher than Bowline (35.1). For yolk-sac and post yolk-sac larvae, exposure was highest at the most upstream power plants (Danskammer and Roseton) with almost no differences between the two plants.

b) Juveniles

Striped bass juveniles were present in all five power-plant regions and thus potentially available for entrainment and impingement from 24 June to 1 December at Roseton and Danskammer, and from 24 June to about 15 December at Bowline, Lovett, and Indian Point. Exposure was highest at Roseton and Danskammer during July but shifted to the lower river plants (Bowline, Lovett, and Indian Point) during the remainder of the year. Juvenile exposure to the lower river plants during the fall was highest at Bowline.

2) White Perch

Figure VI-4 summarizes exposure indices for each life stage at each power plant. Details may be found in Appendix D, Tables D-150 through D-154.



*FROM ICHTHYOPLANKTON SAMPLING
**FROM BEACH-SEINE SAMPLING

Figure VI-3. Exposure Index (Percent of Peak Total River Standing Crop in Each Plant Region) of Striped Bass for Bowline (B), Lovett (L), Indian Point (IP), Roseton (R), and Danskammer (D) Power Plants during 1973

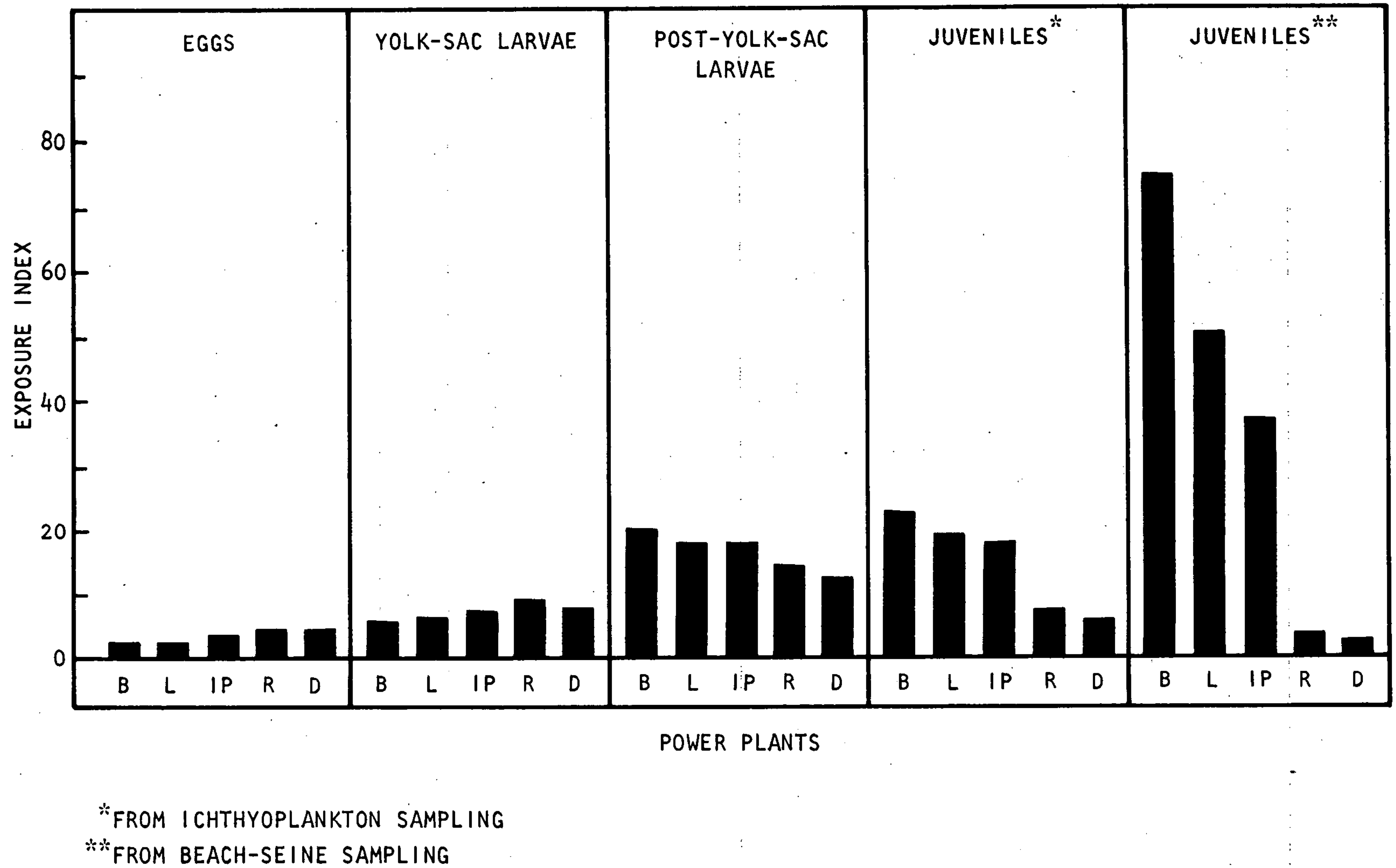


Figure VI-4. Exposure Index (Percent of Peak Total River Standing Crop in Each Plant Region) of White Perch for Bowline (B), Lovett (L), Indian Point (IP), Roseton (R), and Danskammer (D) Power Plants during 1973

a) Eggs, Yolk-Sac Larvae, and Post Yolk-Sac Larvae

White perch eggs and larvae were present and thus potentially available for entrainment at Bowline from 13 May to 21 July (about 12 weeks), from at least 29 April to 21 July (about 14 weeks) at Lovett and Indian Point, and from at least 29 April to 4 August (about 16 weeks) at Roseton and Danskammer. At all five plants, egg and yolk-sac larvae exposure to power plants was uniformly low. Exposure for post yolk-sac larvae was slightly higher than for eggs and yolk-sac larvae but again similar at all five power plants.

b) Juveniles

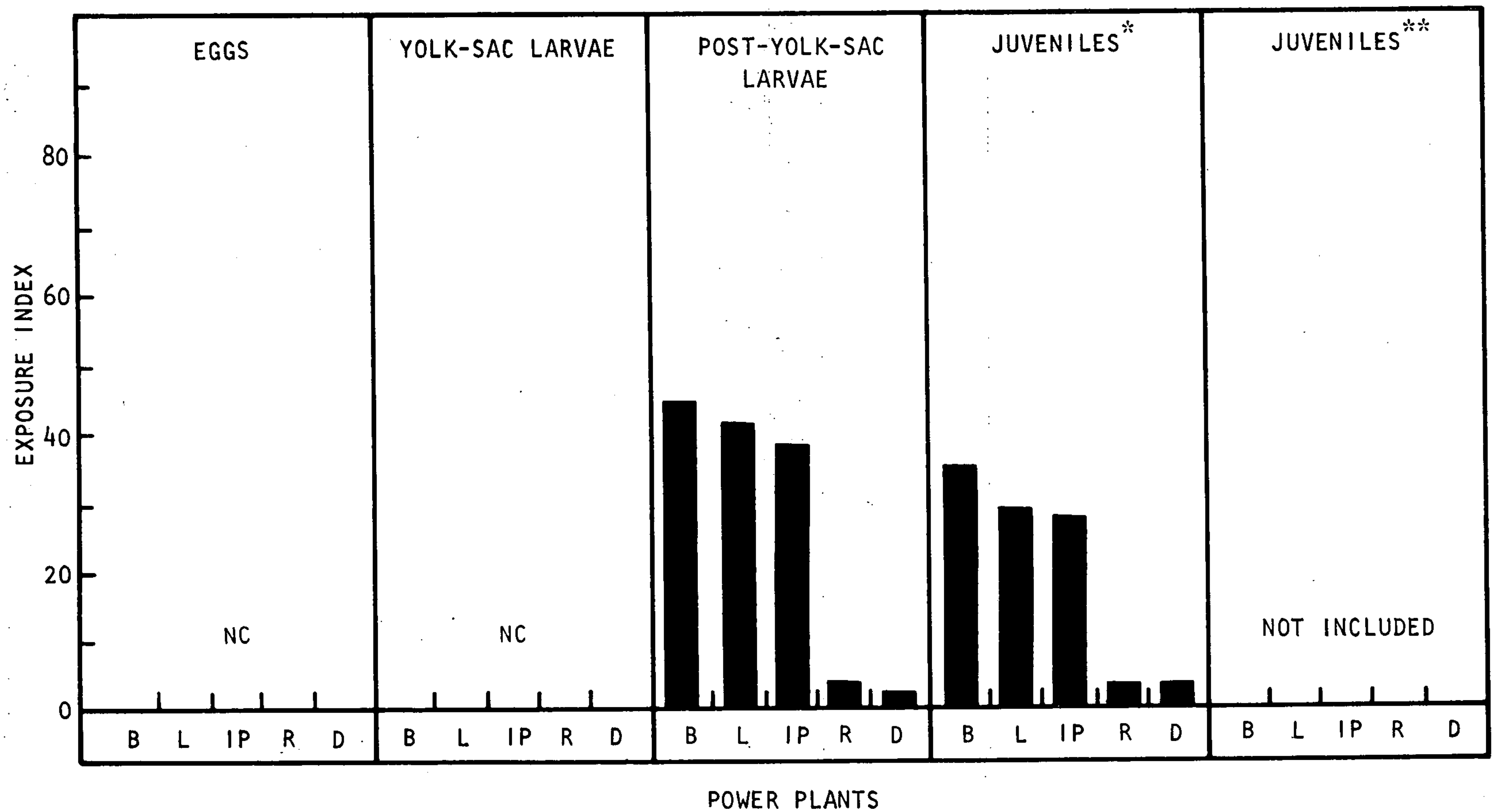
Present in all five power-plant regions, juvenile white perch were potentially available for entrainment and impingement from 8 July to 1 December at Roseton, Lovett, Bowline, and Danskammer, and from 8 July to about 15 December at Indian Point. Exposure was highest at the lower river plants (Bowline, Lovett, and Indian Point) with Bowline the highest of the three.

3) Atlantic Tomcod

Figure VI-5 summarizes exposure indices for each life stage at each power plant. Details may be found in Appendix D, Tables D-155 through D-159.

a) Post-Yolk-Sac Larvae

Present at all five power-plant regions, Atlantic tomcod post yolk-sac larvae were potentially available for entrainment for at least two weeks — 29 April-12 May, the first sampling period. Exposure was very low at Danskammer and Roseton because the post yolk-sac larvae were concentrated in the lower river. The 1973 ichthyoplankton-sampling program started too late to adequately sample tomcod larvae.



*FROM ICHTHYOPLANKTON SAMPLING

**FROM BEACH-SEINE SAMPLING

NC = NO CATCH

Figure VI-5. Exposure Index (Percent of Peak Total River Standing Crop in Each Plant Region) of Atlantic Tomcod for Bowline (B), Lovett (L), Indian Point (IP), Roseton (R), and Danskammer (D) Power Plants during 1973

b) Juveniles

Also present in all five power-plant regions, juvenile Atlantic tomcod were potentially available for entrainment and impingement from at least 29 April to 18 August (first and last ichthyoplankton sampling periods). Exposure was restricted to Bowline, Lovett, and Indian Point with the juvenile exposure index highest at Bowline.

c. 1974 Longitudinal River Regions

1) Striped Bass

a) Eggs

Striped bass eggs were first collected in the West Point and Cornwall regions during the 29 April-6 May sampling period and were found in all subsequent periods through 27 June (Figure D-19). Peak egg abundance occurred from 15-18 May when the standing crop estimate was almost 350,000,000.

Eggs were found in all regions except Yonkers. Most were collected in the Croton-Haverstraw through Catskill regions. During the peak total standing-crop period (15-18 May), over 90% of the eggs occurred in the Indian Point and West Point regions. For about two weeks after the peak standing crop occurred, egg standing crops increased in the upper river regions (Poughkeepsie through Catskill). A small late peak occurred in the Albany region during the period 10-14 June. Based on the entire ichthyoplankton-sampling period (16 April-15 August), the highest standing crops of striped bass eggs occurred in the Indian Point and West Point regions.

b) Yolk-Sac Larvae

Striped bass yolk-sac larvae were first collected during the period 6-11 May in the Indian Point, West Point, Kingston, and Catskill regions (Figure D-20). About 96% of the larvae occurred in the West Point region. Peak abundance of yolk-sac larvae (157,000,000) occurred between 28-31 May and were distributed from the Tappan Zee through Saugerties regions with the highest standing crops occurring in the Cornwall and Poughkeepsie regions.

Yolk-sac larvae were collected in all regions but were generally concentrated between the Croton-Haverstraw and Hyde Park regions. Few yolk-sac larvae were taken in the Tappan Zee and Albany regions. Overall yolk-sac larvae standing-crop estimates were highest in the Poughkeepsie region followed by the Cornwall, Indian Point, and West Point regions.

c) Post Yolk-Sac Larvae

Striped bass post yolk-sac larvae were first collected in the 13-18 May sampling period (Figure D-21). Abundance increased steadily to a peak standing crop of almost 325,000,000 during 17-23 June. No post yolk-sac larvae were collected after the 5-9 August sampling period.

Post yolk-sac larvae first appeared in the downriver regions and were eventually collected in every region although standing crops were very low in the Tappan Zee and Albany regions. During the peak period (17-23 June), the highest post yolk-sac larvae standing crops occurred in the Poughkeepsie, West Point, and Indian Point regions. Abundance of post yolk-sac larvae was also consistently high in the Cornwall regions.

d) Juveniles

Juveniles were first collected in mid- to late June by ichthyoplankton gear and beach seines (Figures D-22 and D-23). Juvenile standing-crop estimates based on ichthyoplankton sampling increased sharply during mid-July and reached a peak abundance of about 4,000,000 in the sampling period 22-26 July. Beach-seine standing-crop estimates peaked during the 25 August-7 September interval at about 2,500,000 juveniles. Beach-seine standing-crop estimates for juveniles were declining through the last sampling period included in this report (22 September-5 October).

Juveniles were caught in all regions in ichthyoplankton gear and beach seines, but were most abundant in the Tappan Zee and Croton-Haverstraw regions. Juveniles were least abundant in the Yonkers and Hyde Park regions. Mean total length for juveniles first taken in the shore zone (23 and 29 June) was 24 mm with individuals ranging from 18-30 mm (Table D-175).

Epibenthic-sled samples taken from 19 August-26 September in the shoal stratum from RM 14-76 (km 22-122) contained juveniles in all regions sampled except West Point (Figure D-25). Juveniles were concentrated in the Croton-Haverstraw region.

Catches of juveniles in bottom-trawl samples taken from river mile 12-61 (km 19-98) were infrequent. Juveniles were collected from mid-July to mid-August (Figure D-28) only in the Indian Point and West Point regions.

e) Yearlings (Age I)

Yearling striped bass were present in the river during all sampling periods included in this report (24 March-5 October) based on beach-seine and bottom-trawl data (Figures D-26 and D-29). Bottom-trawl catches of yearlings were highest between 24 March-20 April and concentrated in the Tappan Zee region. Yearling abundance in trawl samples declined slightly in May, and by June and thereafter, was low. Beach-seine catches of yearlings were highest early in the season (21 April-4 May) and concentrated in the lower river, primarily the Yonkers region. Catches increased during the period 2-15 June with the highest densities in the Tappan Zee and Indian Point regions. From early April to early June, yearlings were collected only downriver from the Cornwall region. Distribution expanded upriver during June, July, and August into the shore zone of all regions sampled. Beach-seine catches declined in all regions during September.

f) Age II and Older

Striped bass 2 yr old and older were first collected during 7-21 April in bottom-trawl sampling and during 21 April-4 May in beach seines (Figures D-27 and D-30). Trawl catches were low, infrequent, and restricted to the Yonkers and Tappan Zee regions. Beach-seine catches were highest in the 21 April-4 May sampling period in the Yonkers region, in the 2-15 June period in the Tappan Zee, Croton-Haverstraw, and Poughkeepsie regions, and in the 11-24 August period in the Poughkeepsie, Saugerties, and Catskill regions.

From mid-April to mid-May, age II and older striped bass were collected only in the lower river regions — Yonkers through West Point — but distribution expanded during the summer. By 1 June, they were taken as far north as the Poughkeepsie region, and by 13 July, as far north as the Albany region. Catches declined in all regions after 24 August.

2) White Perch

a) Eggs

White perch eggs were first collected in the estuary from 6-11 May (Figure D-31). Peak standing crops occurred during 21-24 May, 30 May-5 June, and 10-14 June; the highest standing crop (almost 190,000,000) occurred during the 30 May-5 June period. No eggs were collected after 5 July.

Most eggs were collected in the Tappan Zee and Croton-Haverstraw regions in the lower river and in the Saugerties, Albany, and Catskill regions in the upper estuary. Fairly large standing crops also occurred in the West Point, Cornwall, and Poughkeepsie regions. While eggs were collected in all regions except Yonkers, most were taken in the Croton-Haverstraw region with the Albany region having the next greatest abundance.

b) Yolk-Sac Larvae

White perch yolk-sac larvae were first collected during 6-11 May in lower and upper river regions (Figure D-32). Peak abundance (almost

110,000,000) occurred in the period 21-24 May with concentrations primarily in the Tappan Zee and Kingston regions although yolk-sac larvae standing crops were also high in the Croton-Haverstraw, Poughkeepsie, Hyde Park, and Saugerties regions. No yolk-sac larvae were collected after 11 July.

Yolk-sac larvae were collected in all river regions but standing crops were low in the Yonkers region. Later collections occurred below the Cornwall region. Overall, the highest yolk-sac larvae standing crops occurred in the Saugerties and Hyde Park regions followed by the Tappan Zee region.

c) Post Yolk-Sac Larvae

White perch post yolk-sac larvae first appeared in ichthyoplankton samples during 13-18 May with most of the initial standing crop in the Tappan Zee and West Point regions (Figure D-33). The peak standing crop (about 420,000,000) occurred in the interval 12-17 June although fairly high standing crops occurred during the 3-wk period from 4 through 27 June. No post yolk-sac larvae were collected after 9 August.

Post yolk-sac larvae occurred in all river regions but standing crops were low in the Yonkers and Albany regions. During the primary peak period (12-17 June), about 67% of the post yolk-sac larvae occurred in the West Point, Poughkeepsie, and Kingston regions. Late post yolk-sac larvae collections were taken in the middle river regions (Cornwall through Hyde Park).

d) Juveniles

Juvenile white perch (young-of-the-year) were collected in ichthyoplankton gear from 12-17 June through 12-15 August, the last longitudinal survey sampling period (Figure D-34). The peak standing crop based on ichthyoplankton sampling occurred during the interval 29 July-2 August and was estimated at about 6,000,000. Juveniles first appeared in beach-seine samples in the period 30 June-13 July and were most abundant from 11 August-7 September. However, peak standing-crop estimates were low, only about 800,000.

Juveniles were collected primarily in the upper river in ichthyoplankton gear but throughout all regions in beach seines although standing crops were highest in the Saugerties and Catskill regions. Standing crops were consistently low in the Yonkers region. During the last beach-seine sampling period analyzed for this report (22 September-5 October), juvenile abundance was shifting downstream into the Tappan Zee and Indian Point regions. Mean total length for juveniles when they were first taken in the shore-zone areas (7-13 July) was 21 mm (range, 13-41 mm; Table D-176).

Epibenthic-sled samples taken from 19 August-26 September in the shoal stratum from RM 14-76 (km 22-122) contained juveniles in primarily only the Cornwall region (Figure D-37). Densities were uniform throughout the 19 August-26 September sampling period.

Juveniles were infrequently taken in bottom-trawl samples in the Yonkers through Cornwall regions (Figure D-40). During the period 28 July-10 August, they were collected only in the Croton-Haverstraw and Indian Point regions. In mid-September they were collected only in the Cornwall region.

e) Yearlings (Age I)

Yearling white perch were collected by bottom trawls during the first sampling period (24 March-6 April) and about a month later in beach seines (21 April-4 May), below the West Point region (Figures D-41 and D-38). Peak catches of yearlings in bottom trawls occurred during the 7-20 April sampling period and were concentrated in the Tappan Zee region. Bottom-trawl catches increased in the West Point and Cornwall regions during 21 April-4 May and then declined sharply through the last sampling date included in this report, 5 October. Peak catches in beach seines occurred during the 2-15 June interval when yearlings were distributed throughout the river. Abundance was highest in the Croton-Haverstraw region. Beach-seine catches of yearlings decreased from June through September and the distribution shifted to the lower river regions (Tappan Zee and Croton-Haverstraw).

f) Age II and Older

Older white perch appeared in the first bottom-trawl sampling period (24 March-6 April) and also in the first beach-seine-sampling period (7-20 April). Older white perch were taken in bottom trawls (Figure D-42) in all regions sampled (Yonkers through Cornwall). Peak catches occurred during 7-20 April with the highest catch per unit efforts in the Croton-Haverstraw region. Older white perch catches decreased sharply in bottom trawls after 1 June. Beach seines captured older white perch in every river region with peak abundances during the interval 19 May-13 July (Figure D-39). Catches prior to June were highest in the upper river regions (Cornwall through Kingston) but the distribution then generally shifted to the lower river although some older white perch were still taken in all regions from April through September.

3) Atlantic Tomcod

a) Eggs, Yolk-Sac Larvae, and Post Yolk-Sac Larvae

No Atlantic tomcod eggs or larvae were collected in 1974. The spatial distribution and abundance of eggs and larvae in the Hudson River estuary in 1974 are unknown.

b) Juveniles

The first collection and also the largest standing crop of juvenile Atlantic tomcod was taken in ichthyoplankton gear (over 1,000,000,000) during the 29 April-4 May sampling period (Figure D-43). Subsequent standing crops declined although juveniles were taken through the last ichthyoplankton-sampling period (12-15 August). Although tomcod are not readily available to beach seines, juveniles were first collected in the 5-18 May period and standing-crop estimates reached a peak of almost 2,500,000 during the period 30 June-13 July (Figure D-44).

Juvenile Atlantic tomcod were taken by ichthyoplankton gear in all regions but were concentrated in the lower river (Yonkers and Tappan Zee regions). No juveniles were taken in beach seines above the West Point region. Mean total length for juveniles when they were first taken in the shore zone (5-11 May) was 43 mm (range, 38-47 mm; Table D-177).

Epibenthic-sled samples taken from 19 August-26 September in the shoal stratum from RM 14-76 (km 22-122) contained juveniles in all regions sampled. The highest densities occurred during the 9-22 August sampling period in the Cornwall region. Catches in all regions were low during the last included sampling period (23-26 September).

Juvenile Atlantic tomcod were also taken in bottom trawls in all of the regions sampled (Yonkers through Cornwall) but catch per unit efforts were highest in the Tappan Zee region (Figure D-48). Catches were highest during the interval 5-18 May and declined steadily through the last included sampling period (22 September-5 October). Mean total length for juveniles first collected in the bottom-trawl sampling program (5-11 May) was 26 mm (range, 15-38 mm; Table D-178).

c) Yearling and Older (Age I and Older)

A few yearling and older Atlantic tomcod were taken in bottom trawls and beach seines (Figures D-47 and D-49). Peak catches in both gear occurred in the Yonkers and Tappan Zee regions (early April in bottom trawls and mid-June in beach seines) although some yearling and older tomcod occurred as far upstream as the West Point region in August.

d) Summary

Dates and locations of first, peak, and last collections of striped bass, white perch, and Atlantic tomcod eggs, larvae, and juveniles taken in epibenthic sleds, Tucker trawls, and beach seines in the Hudson River estuary through September 1974 are summarized in Tables VI-10, VI-11, and VI-12.

d. 1974 Power-Plant Regions

Based on the longitudinal river abundance and distribution patterns, the degree of potential exposure for the 1974 river populations of the various life stages is estimated from the percent of the peak river standing crops which occurred within each 13-mi plant region. With the exception of the juvenile stage and its lengthy duration, the peak total river standing crop for the other early life stages (eggs and larvae) generally represented the major portion of the estimated population of each life stage produced in the estuary during 1974. When two nearly equal peaks occurred, two percentages were calculated; percentages during other time periods may be found in Appendix D.

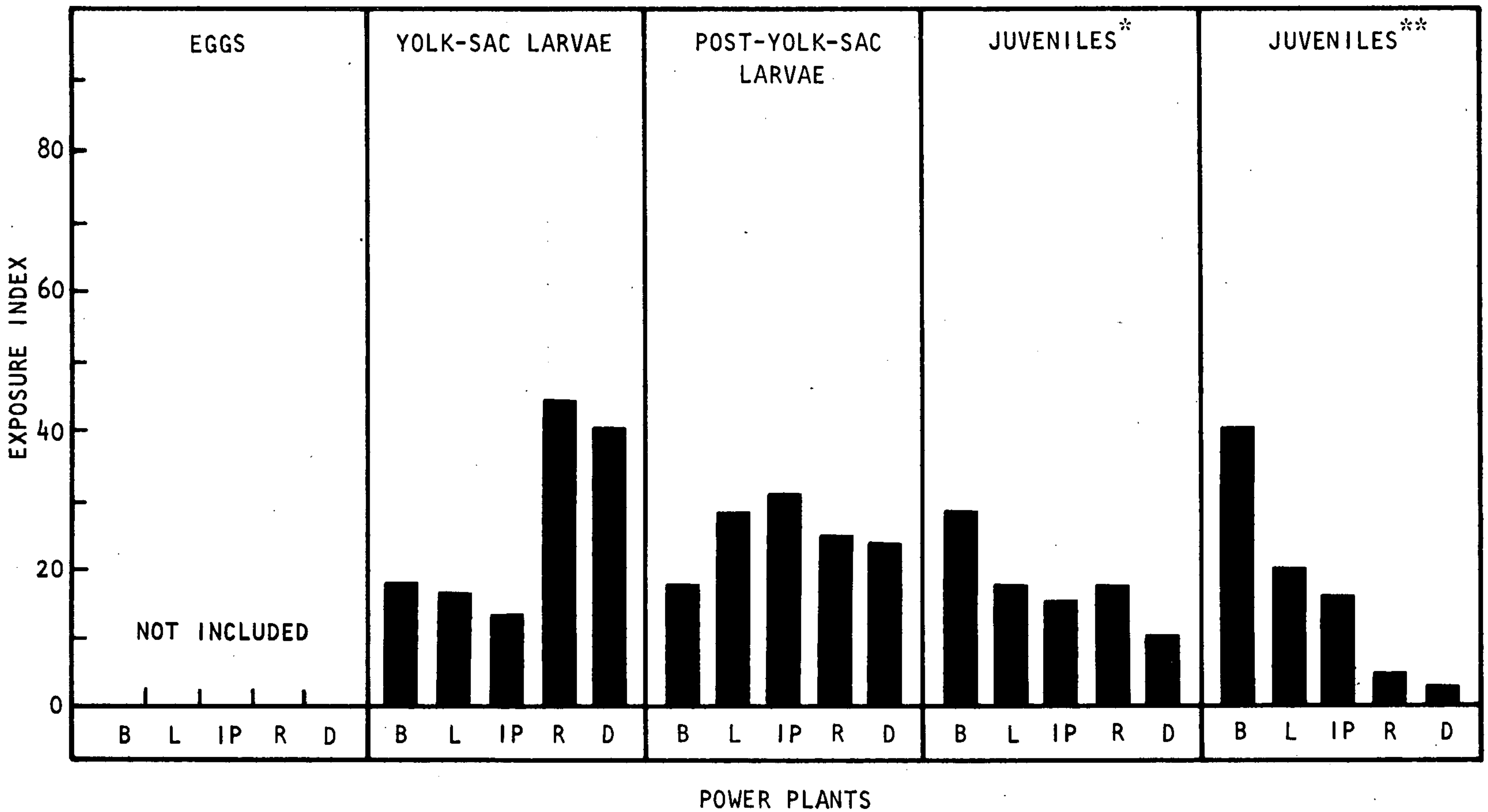
This percentage represented the index for the degree of potential exposure of each life stage to each power plant. The larger the percentage, the greater the potential for plant-induced mortalities in the population and vice-versa. Although Roseton was not operating during 1973, the standing crops in the plant region were estimated; these crops would have been available for entrainment and impingement at Roseton had this power plant been operating.

1) Striped Bass

Figure VI-6 summarizes exposure indices for each life stage at each power plant. Details may be found in Appendix D, Tables D-160 through D-164.

a) Eggs, Yolk-Sac Larvae, and Post Yolk-Sac Larvae

Present in all five power-plant regions, striped bass eggs and larvae were potentially available for entrainment from at least 29 April to 26 July (about 12 weeks) at Lovett and Indian Point, from at least 29 April to 9 August (about 14 weeks) at Danskammer and Roseton, and from 6 May to 27 July (about 11 weeks) at Bowline. The peak river standing crop for eggs occurred during a sampling period when only a portion of the river [RM 29-140 (km 46-224)] was sampled. Consequently, valid exposure indices were not



*FROM ICHTHYOPLANKTON SAMPLING
**FROM BEACH-SEINE SAMPLING

Figure VI-6. Exposure Index (Percent of Peak Total River Standing Crop in Each Plant Region) of Striped Bass for Bowline (B), Lovett (L), Indian Point (IP), Roseton (R), and Danskammer (D) Power Plants during 1974 calculated; however, during the peak period, egg standing crops of the power-plant regions were highest at Lovett and Indian Point. Egg standing crops were probably also high in the Bowline region. Yolk-sac larvae exposure was highest at Roseton and Danskammer. Post yolk-sac larvae exposure was similar at all five plants with Indian Point slightly higher than the rest.

b) Juveniles

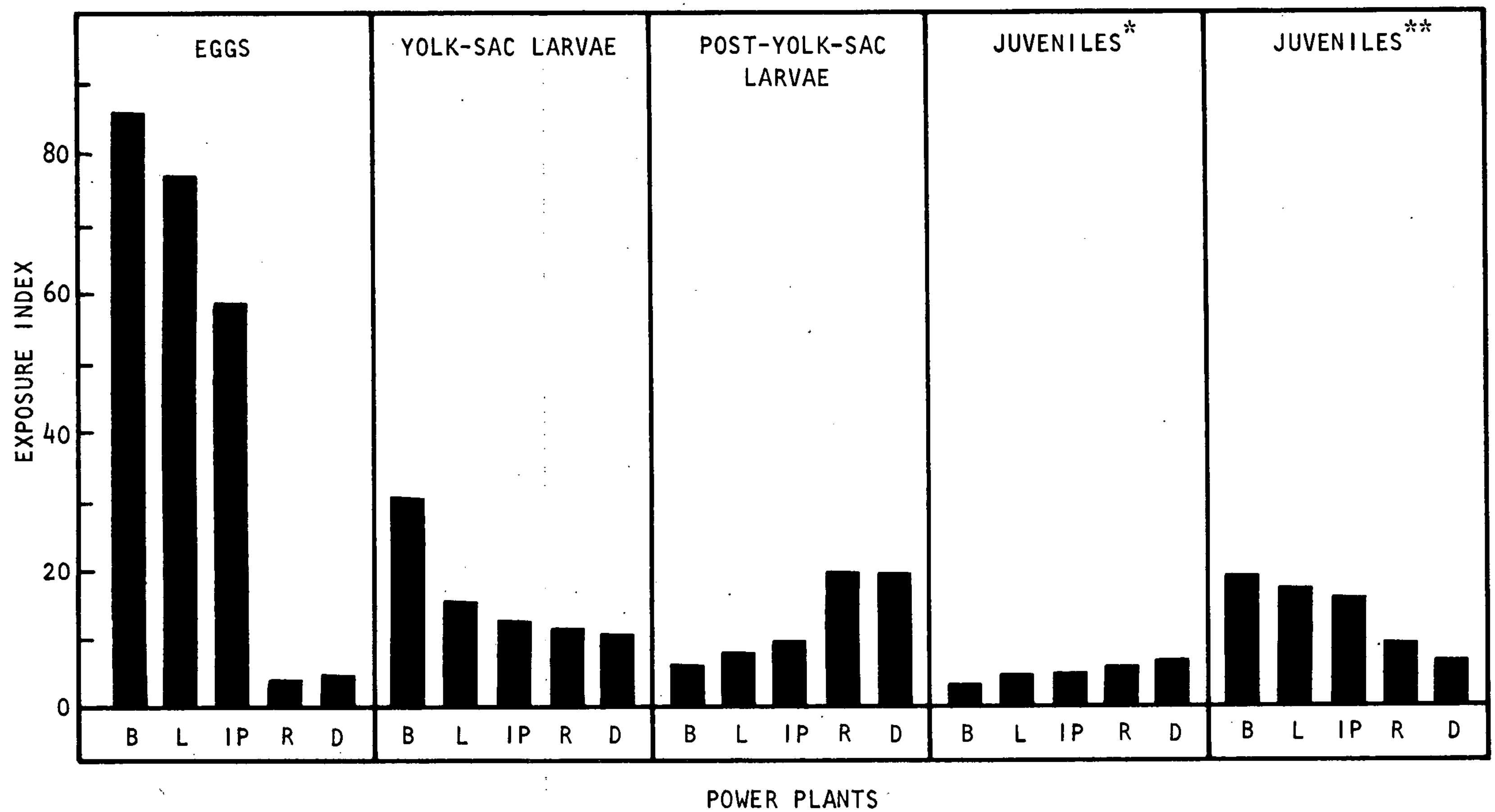
Present in all five power-plant regions, striped bass juveniles were potentially available for entrainment and impingement beginning about 12 June at the upper plants (Roseton and Danskammer), and about one week later, 16 June, at Bowline, Lovett, and Indian Point. Through the last sampling period included in this report, 22 September-5 October, juvenile exposure was highest at the lower river power plants (Lovett, Indian Point, and particularly Bowline).

2) White Perch

Figure VI-7 summarizes exposure indices for each life stage at each power plant. Details may be found in Appendix D, Tables D-165 through D-169.

a) Eggs, Yolk-Sac Larvae, and Post Yolk-Sac Larvae

White perch eggs and larvae were present and thus potentially available for entrainment at Bowline from 6 May to 26 July (about 11 weeks), at Lovett and Indian Point from 13 May to 2 August (about 11 weeks), and at Roseton and Danskammer from 6 May to 9 August (about 12 weeks). Egg exposure was highest at Lovett, Indian Point, and particularly Bowline. Yolk-sac larvae exposure was also highest at Bowline while exposure indices at the other plants were very similar to one another. The highest post yolk-sac exposure occurred at Danskammer and Roseton.



*FROM ICHTHYOPLANKTON SAMPLING
**FROM BEACH-SEINE SAMPLING

Figure VI-7. Exposure Index (Percent of Peak Total River Standing Crop in Each Plant Region) of White Perch for Bowline (B), Lovett (L), Indian Point (IP), Roseton (R), and Danskammer (D) Power Plants during 1974

b) Juveniles

Juvenile white perch were present in all five power-plant regions but were potentially available for entrainment and impingement first at Roseton and Danskammer (12-17 June), later at Bowline (17-23 June), and still later at Lovett and Indian Point (24-27 June). Through the last sampling period included in this report, 22 September-5 October, juvenile exposure was generally low at all power plants with Bowline, Lovett, and Indian Point slightly higher than Roseton and Danskammer.

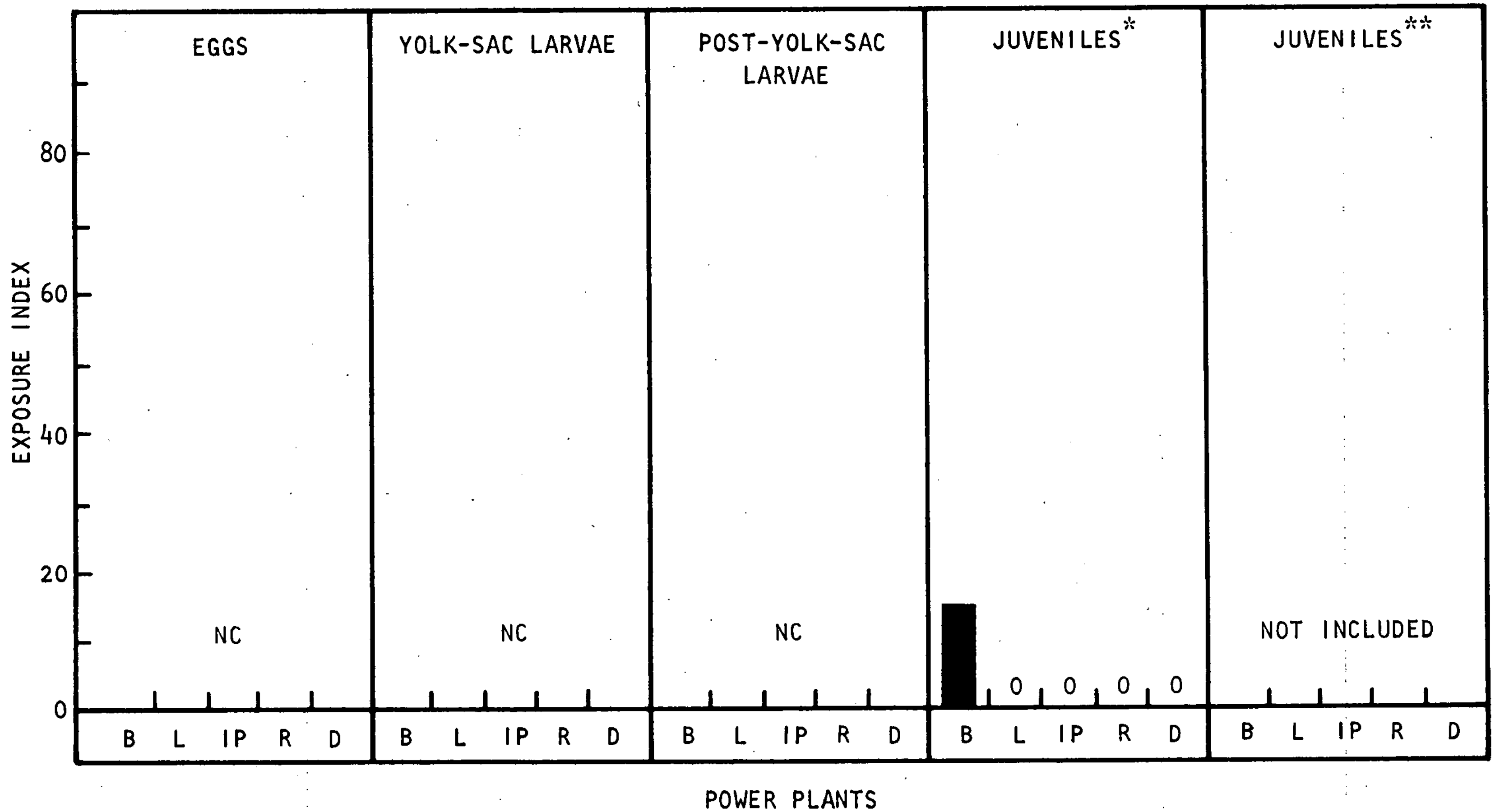
3) Atlantic Tomcod — Juveniles

Figure VI-8 summarizes exposure indices for Atlantic tomcod juveniles at each power plant. Details may be found in Appendix D, Tables D-170 through D-174.

Juvenile Atlantic tomcod were present and thus potentially available for entrainment and impingement only at Bowline beginning during the first sampling period, 29 April-4 May. Exposure at Bowline was rather low since most juveniles were concentrated downstream from the Bowline plant region.

4. Discussion

The general trends in the abundance and distribution patterns of the early life stages (egg through juvenile) of striped bass, white perch, and Atlantic tomcod in the Hudson River estuary during 1973 and 1974 reveal several similarities as well as differences; many of which represent real differences. Some differences, however, are likely the result of improvements in the longitudinal river ichthyoplankton-sampling program initiated in 1974. The two major improvements were increased sampling effort in the shoals stratum and night-only sampling beginning during the period 12-17 June (for details, refer to Section III). Consequently, standing-crop differences of life stages for some species cannot be directly compared between years.



*FROM ICHTHYOPLANKTON SAMPLING
**FROM BEACH-SEINE SAMPLING
NC = NO CATCH

Figure VI-8. Exposure Index (Percent of Peak Total River Standing Crop in Each Plant Region) of Atlantic Tomcod for Bowline (B), Lovett (L), Indian Point (IP), Roseton (R), and Danskammer (D) Power Plants during 1974

Table VI-10

Summary of Distribution and Abundance Data for Early Life Stages of Striped Bass in Hudson River Estuary [RM 12-152 (km 19-243)] April through September 1974

Distribution and Abundance Summary		Eggs	Yolk-Sac Larvae	Post Yolk-Sac Larvae	Juveniles: Ichthyoplankton Gear	Juveniles: Beach Seines
First Collection	Date (Interval)	Apr 29-May 4	May 6-11	May 13-18	Jun 12-17	Jun 16-29
	Location	RM 47-61 (km 75-98)	RM 39-55 (km 62-88), RM 86-93 (km 137-149), RM 107-124 (km 171-198)	RM 39-46 (km 62-74)	RM 62-76 (km 99-122)	RM 34-38 (km 54-61) RM 47-61 (km 75-98)
Peak Collection	Date (Interval)	May 15-18	May 28-31	Jun 17-23	Jul 22-26	Aug 25-Sep 7
	Location	RM 39-55 (km 62-88)	RM 56-76 (km 89-122)	RM 39-76 (km 62-122)	RM 24-33 (km 38-53) and RM 56-61 (km 89-98)	RM 24-33 (km 38-53)
	Total Standing-Crop Estimate	348,933,700	157,649,098	326,445,620	4,053,956	2,415,500
Last Collection	Date (Interval)	Jun 24-27	Jul 1-5	Aug 5-9	Aug 12-15*	Sep 22-Oct 5*
	Location	RM 47-61 (km 75-98)	RM 39-46 (km 62-74)	RM 62-76 (km 99-122)	RM 24-33 (km 38-53), RM 56-61 (km 89-98), RM 86-93 (km 137-149), RM 107-124 (km 171-198)	RM 12-85 (km 19-136) RM 94-152 (km 150-243)
Range of Longitudinal Distribution		At least RM 24-140 (km 38-224)	RM 14-140 (km 22-224)	RM 14-140 (km 22-224)	RM 14-140 (km 22-224)	RM 12-152 (km 19-243)

*Represents only the last sampling period included in this report and not the last date juveniles were present in the river

Table VI-11

Summary of Distribution and Abundance Data for Early Life Stages of White Perch in Hudson River Estuary [RM 12-152 (km 19-243) April through September 1974

Distribution and Abundance Summary		Eggs	Yolk-Sac Larvae	Post Yolk-Sac Larvae	Juveniles Ichthyoplankton Gear	Juveniles Beach Seines
First Collection	Date (Interval)	May 6-11	May 6-11	May 13-18	Jun 12-17	Jun 30-Jul 13
	Location	RM 24-33 (km 38-53) RM 62-76 (km 99-122)	RM 24-33 (km 38-53) RM 47-55 (km 75-122) RM 86-106 (km 138-170)	RM 14-38 (km 22-61) RM 47-76 (km 75-122)	RM 56-61 (km 89-98)	RM 47-55 (km 75-88) RM 62-124 (km 99-198)
Peak Collection	Date (Interval)	May 30-Jun 5	May 21-24	Jun 12-17	Jul 29- Aug 2	Aug 25-Sep 7
	Location	RM 24-38 (km 38-61)	RM 24-38 (km 38-61) RM 86-106 (km 138-170)	RM 39-106 (km 62-170)	RM 94-106 (km 150-170)	RM 94-124 (km 150-198)
	Total Standing-Crop Estimate	188,692,170	108,325,607	421,434,660	6,305,752	810,009 832,657
Last Collection	Date (Interval)	Jul 1-5	Jul 8-11	Aug 5-9	Aug 12-15*	Sep 22-Oct 5*
	Location	RM 34-46 (km 38-224) RM 62-76 (km 99-122)	RM 39-46 (km 62-74)	RM 56-85 (km 89-136)	RM 56-106 (km 89-170)	RM 12-152 (km 19-243)
Range of Longitudinal Distribution		RM 24-140 (km 38-224)	RM 14-140 (km 22-224)	RM 14-140 (km 22-224)	RM 24-140 (km 38-224)	RM 12-152 (km 19-243)

*Represents only the last sampling period included in this report and not the last date juveniles were present in the river.

Table VI-12

Summary of Distribution and Abundance Data for Juvenile Atlantic Tomcod in Hudson River Estuary [RM 12-152 (km 19-243)] April through September 1974

Distribution and Abundance Summary		Eggs*	Yolk-Sac* Larvae	Post Yolk-Sac* Larvae	Juveniles: Ichthyoplankton Gear	Juveniles: Beach†† Seines
First Collection	Date (Interval)	-	-	-	Apr 29-May 4**	May 5-18
	Location	-	-	-	RM 14-46 (km 22-74)	RM 12-33 (km 19-53)
Peak Collection	Date (Interval)	-	-	-	Apr 29-May 4**	Jun 30-Jul 17
	Location	-	-	-	RM 14-33 (km 22-53)	RM 24-33 (km 38-53)
	Total Standing-Crop Estimate	-	-	-	1,214,386,640	2,408,666
Last Collection	Date (Interval)	-	-	-	Aug 12-15†	Sep 22-Oct 5
	Location	-	-	-	RM 14-93 (km 22-149)	RM 12-36 (km 19-58)
Range of Longitudinal Distribution		-	-	-	RM 14-140 (km 22-224)	RM 12-55 (km 19-88)

*None collected

**Represents first sample taken below Indian Point region, juveniles were probably present earlier

†Represents only the last sampling period included and not the last date juveniles were present in the river

††Because Atlantic tomcod are demersal fishes, they are not readily accessible to beach-seine sampling in the shore-zone areas; therefore, standing-crop estimates based on beach-seine catches are undoubtedly biased low

The beach-seine survey sampling designs were similar in 1973 and 1974; therefore, juvenile standing crops calculated from beach-seine catches in both years can be directly compared. This section presents identification and discussion of the real and nonreal differences in abundance and distribution in 1973 and 1974.

a. Striped Bass

The 1973 and 1974 longitudinal river ichthyoplankton-sampling programs were designed to collect striped bass early life stages, particularly eggs and yolk-sac larvae. Eggs and yolk-sac larvae were concentrated on the bottom and channel strata (Table VI-13); they are pelagic and accessible to sampling gear that operates effectively near the bottom. Post yolk-sac larvae are also concentrated primarily in the bottom and channel strata but 10.9% of the estimated post yolk-sac larvae standing crops in 1974 occurred in the shoals stratum. Juveniles were almost evenly divided between the shoals and the bottom and channel strata. Therefore, the modified 1974 ichthyoplankton-sampling program which included more effort in the shoals stratum and shifted the sampling to the night hours in mid-June has provided insight on striped bass activity in the shoals and should have increased the efficiency of capturing the motile post yolk-sac larvae and juveniles.

Table VI-13

Mean Percentage of All Standing-Crop Estimates of Key Species Early Life Stages Occurring in Shoals Stratum [< 20-ft (6-m) deep] by Ichthyoplankton Gear during 1974 (29 April-15 August)

Species	Life Stage			
	Eggs	Yolk-Sac Larvae	Post Yolk-Sac Larvae	Juveniles
Striped bass	5.3	4.7	10.9	44.3
White perch	28.6	20.6	7.9	11.1
Atlantic tomcod	*	*	*	15.5

*None collected

Comparisons between 1973 and 1974 striped bass egg and yolk-sac larvae standing crops are the most valid comparisons of all the early life stages. Post yolk-sac larval and juvenile standing crops in 1973 were probably biased low because these life stages are more concentrated in the shoals than eggs or yolk-sac larvae. The increased shoal and night sampling in 1974 likely reduced gear avoidance and increased the catches of post yolk-sac larvae and juveniles.

Juvenile standing crops based on beach-seine catches are directly comparable between the two years; however, daytime catch estimates appeared to be underestimates of juvenile striped bass in the shore zone in 1974. Night beach-seine standing crops in four geographical regions (Croton Haverstraw, Indian Point, West Point, and Cornwall) were significantly higher (Wilcoxon Signed-Rank Test, $p < 0.01$) than daytime standing-crop estimates in these regions for the same time intervals (Figures D-23 and D-24). The length-frequency distributions were similar (Tables D-175 and D-179), indicating that gear avoidance was either nonexistent or comparable between day and night sampling. Juvenile striped bass apparently moved into the shore zone in greater numbers at night, at least after 4 August 1974, in the Croton/Haverstraw through Cornwall regions.

There were two basic differences in striped bass longitudinal distribution and abundance in 1973 and 1974. Peak egg abundance was similar in both years but the distribution extended further upstream through the Poughkeepsie-Hyde Park region in 1973. Egg abundance was relatively high in the Indian Point and West Point regions in both 1973 and 1974. Peak juvenile standing crops in 1974 were only about 25% as large as 1973 standing crops although the distribution patterns were similar. Because egg and larvae standing crops were basically similar in 1973 and 1974, the low juvenile abundance in 1974 suggests a decline in the population during the transition from the post yolk-sac larvae to juvenile life stages.

During 1974, peak yolk-sac larvae and post yolk-sac larvae standing crops occurred two and four weeks after the peak egg period, respectively, but further upstream. This apparent upriver displacement suggests a hydrologic transport mechanism(s): however, another explanation is plausible. Egg incubation time in early to mid-June should have been shortened by the near 20°C water temperatures. Consequently, several egg depositions could have occurred between the ichthyoplankton river runs and not be sampled. Life stage duration of yolk-sac larvae and post yolk-sac larvae at various temperatures are unknown but both stages are probably of longer duration than the eggs at water temperatures near 20°C.

Between 1973 and 1974, the degree of exposure of the various life stages of striped bass to each of the five power plants also differed. Because the entire river was not sampled during the peak egg standing-crop period in 1974 (15-18 May), plant exposure indices were not calculated. However, eggs were apparently more concentrated in the Bowline, Indian Point, and Lovett plant regions in 1974 than in 1973. Striped bass eggs were most abundant in the channel and bottom strata; hence, vulnerability should be highest at Indian Point and Lovett because these plants are located near the channel. Egg vulnerability at Bowline, which withdraws cooling water from Bowline Pond, is reduced.

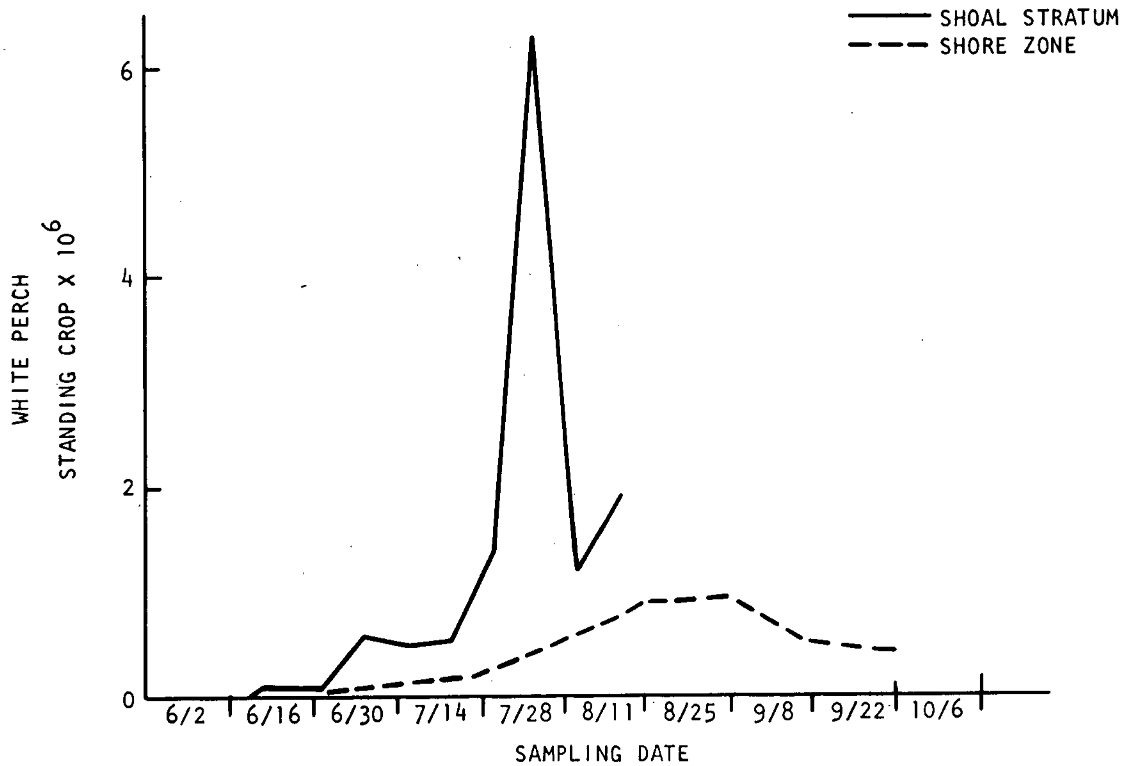
A higher percentage of the peak yolk-sac larvae and post yolk-sac larvae standing crop occurred within the five plant regions in 1974, mostly at Roseton and Danskammer, although exposure indices for post yolk-sac larvae were higher in 1974 at Bowline, Lovett, and Indian Point. Motility begins in the post yolk-sac larvae stage and movements from the less vulnerable bottom and channel strata to the shoals may occur. Post yolk-sac larvae vulnerability should be similar at all five plants. Since the motile post yolk-sac larvae are also reportedly positively phototropic (Doroshev, 1970), their vertical distributions are more dispersed through the water column at night

(Texas Instruments, 1974c) and they become more vulnerable to plants entraining water from the surface layers.

Exposure indices for juveniles were reduced in 1974, particularly at the lower river plants — Bowline, Lovett, and Indian Point — because juvenile distribution was somewhat dispersed and less concentrated in the lower river than in 1973. Juveniles were bimodally distributed in 1974 with peaks in the Tappan Zee-Croton/Haverstraw and Cornwall regions. Exposure was still highest at the lower river plants, particularly Bowline, but the actual vulnerability of juvenile striped bass to either entrainment or impingement is unresolved. If they move into the shoals and shore zone, vulnerability to power plants is probably minimized unless they are attracted to the intake areas.

Striped bass juveniles in 1974 appeared to move into the shoal stratum after they metamorphosed from the post yolk-sac larvae stage. Only 10.9% of all standing-crop estimates of post yolk-sac larvae based on ichthyoplankton occurred in the shoal stratum, but the percentage of juveniles in the shoals increased to 44.3% (Table VI-13). The shoals stratum represents only about 10% of the total river volume. During July, about 80% of the juvenile standing crops taken in ichthyoplankton gear came from the shoals stratum, about the same time that juvenile standing crops were increasing in the shore zone (Table D-143). Standing crops in the shore zone increased to a peak in late August concomitant with a decrease in the standing crops in the bottom, channel, and shoal areas (Figure VI-9). These data support the hypothesis that striped bass young move from the channel to the shoals and shore zone after they transform into juveniles, but the movement is apparently gradual as the population moves downstream.

Juvenile striped bass averaged 24 mm in total length (range 18-30 mm) when first taken in daytime beach seines in late June 1974 and 76 mm (range 34-119 mm) when peak shore-zone standing crops occurred in late August (Table D-175). Entrainment studies by New York University at Indian



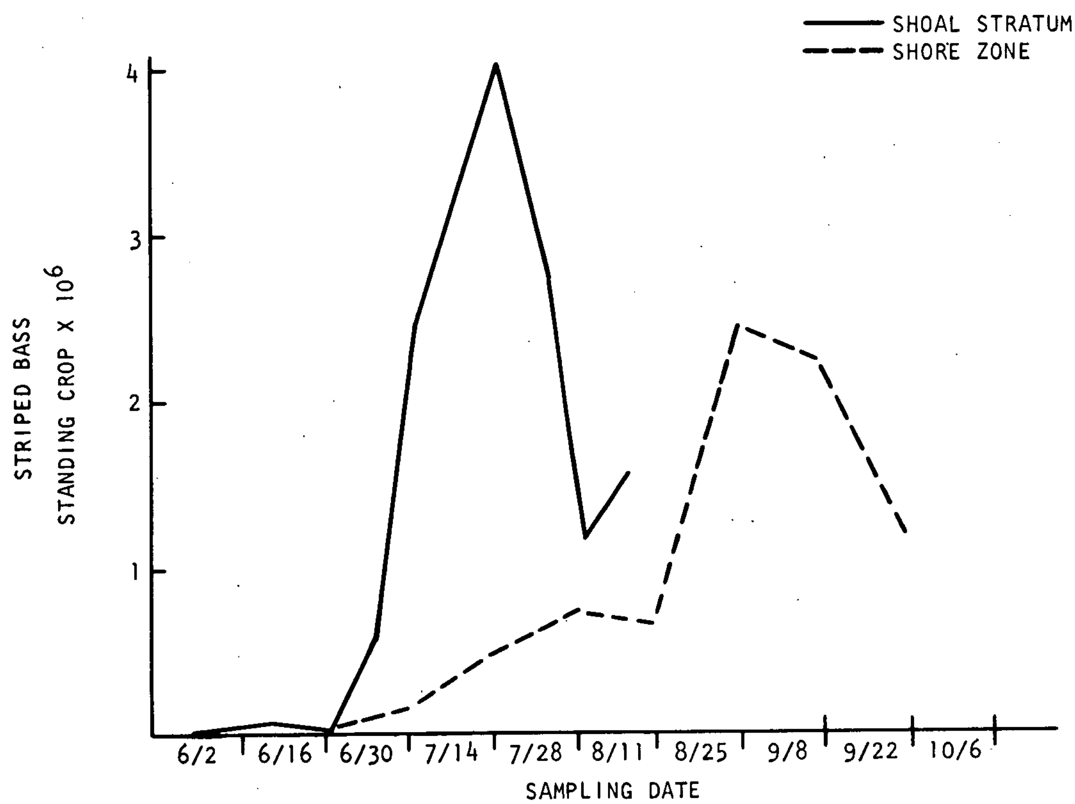


Figure VI-9. Distribution of Juvenile Striped Bass and White Perch in Shoals and Shore Zone in 1974

Point (NYU, unpublished data, 1973) indicated that the maximum entrainment of striped bass larvae occurs from 5-15 mm in length. Thus, it seems logical to conclude that striped bass are no longer entrainable when they move into the shoal and shore-zone areas at about 30-40 mm (total length). They should also be able to tolerate an intake velocity of 0.5 ft/sec (14.2 cm/sec) and avoid being impinged unless attraction to the intakes, parasites, diseases, or rapidly changing environmental conditions reduce their swimming abilities and increase their vulnerability to impingement.

b. White Perch

Neither the 1973 nor 1974 longitudinal river ichthyoplankton sampling programs were designed to adequately collect all early life stages of white perch. Major spawning sites for white perch in the Hudson River estuary have not been completely defined, but 1974 Texas Instruments sampling data and data from other estuaries (Mansueti, 1964) suggest that shoals and freshwater tributaries are important spawning areas. Even though no sampling was done in the tributaries in 1973 and 1974, the increased ichthyoplankton sampling effort in the shoals during 1974 probably explains most of the large increase in egg and larvae standing crops in 1974. White perch eggs are demersal and adhesive and difficult to sample with the gear used in this study. Standing-crop estimates and yolk-sac larvae for eggs in 1974 are surely low even if no spawning occurred in the freshwater tributaries. Standing-crop estimates for the more motile post yolk-sac larvae and juveniles during 1974 were probably also biased low but less so than for eggs and yolk-sac larvae. White perch standing-crop estimates based on ichthyoplankton sampling are therefore not highly comparable between 1973 and 1974.

Juvenile standing-crop estimates from nighttime beach-seine catches were significantly higher (Wilcoxon Signed-Rank Test, $p < 0.01$) than daytime estimates during the same time periods in the same regions (Figures

D-35 and D-36). White perch juveniles exhibited the same diel pattern of shore-zone occupancy exhibited by striped bass juveniles — higher abundances at night.

There were four basic differences in white perch longitudinal distribution and abundance in 1973 and 1974. Peak egg standing crops were almost 20 times greater in 1974 and concentrated in the most upstream region (Albany) in mid-May and in the lower river in early June. During 1973, the small egg standing crops were restricted to the upper river. It is impossible to separate the differences between 1973 and 1974 into real population size differences and nonreal differences due to changes in the 1974 sampling program. However, because white perch eggs are demersal and adhesive, they are probably relatively invulnerable to power plants.

Peak larval standing crops were almost 10 times greater in 1974. Post yolk-sac larvae standing crops in both years greatly exceeded egg and yolk-sac larvae standing crops, suggesting that the relatively motile post yolk-sac larvae are more vulnerable to sampling gear than the egg and yolk-sac larvae stages. Most post yolk-sac larvae were taken in the bottom and channel areas (Table VI-13), suggesting a movement of post yolk-sac larvae into the deeper bottom and channel areas or into the shallow shoal areas not sampled with the ichthyoplankton gear.

Juvenile standing-crop estimates in the shore zone in 1974 were only about 10% of the 1973 standing crops. Juveniles were concentrated in the lower river in 1973. However, in 1974, even though the post yolk-sac larvae were concentrated in the lower- and middle-river regions (Indian Point through Kingston), the juveniles were concentrated in the upper-river regions (Kingston and Saugerties), suggesting an upstream movement or poor survival of post yolk-sac larvae and/or early juveniles downriver.

Juveniles first appeared in the shore zone in 1974 during the period 7-13 July and averaged 21 mm in total length (range, 13-41 mm). The percent of the juvenile standing crop based on ichthyoplankton sampling in 1974 which occurred in the shoals stratum was 11.1%, a slight increase over 7.9% for post yolk-sac larvae. Ichthyoplankton standing crops reached a peak in late July and then decreased (Table D-144). Concomitantly, white perch juvenile standing crops increased in the shore zone (Figure VI-9), suggesting a gradual movement of juveniles to the shoals and shore zone in late July-early August. Because white perch apparently spawn in the shoal areas of the Hudson River and presumably in the tributaries, juveniles may move directly to the shallow shoals and shore zone and spend almost no time in the regions where they would be susceptible to power plants.

Exposure of white perch life stages to power plants differed somewhat between 1973 and 1974. Exposure indices were much higher in 1974 for eggs and yolk-sac larvae, especially in the Bowline, Lovett, and Indian Point plant regions. Overall exposure of post yolk-sac larvae was similar in both years, but in 1974 exposure increased at Roseton and Danskammer and decreased at Bowline, Lovett, and Indian Point. Juvenile exposure indices were lower during 1974 at all power plants, reflecting the upper river concentration.

The white perch is a resident of the Hudson River estuary, so the cumulative degree of exposure to power plant across all life stages and age groups is much greater than for the anadromous striped bass and Atlantic tomcod. However, the eggs and yolk-sac larvae should be relatively invulnerable to power plants due to the adhesive, demersal characteristics of the egg, the apparent use of shoals and probable use of shore-zone and tributary areas as spawning sites. Juvenile movements to the shoals and shore zone should greatly reduce their vulnerability. Swimming-speed data suggest that juvenile white perch are generally able to maintain position in a plant-intake area with an approach velocity of 0.5 ft/sec (15.2 cm/sec) when they are 30-40 mm in length.

Swimming-speed ability is influenced by several factors, including temperature, salinity, and condition of the fish; therefore, rapid changes in salinity during periods of low water temperature could decrease the ability of overwintering juvenile white perch to avoid impingement, a phenomenon which has been observed at Indian Point (Texas Instruments, 1974a). Post yolk-sac larvae appear to be the white perch early life stage most vulnerable to power plant-induced mortality via entrainment. Any use of tributary streams and shallow cove areas for spawning and nursery habitat would reduce the direct impact of the power plants on the total population even though segments of the population may be highly vulnerable.

c. Atlantic Tomcod

The 1973 and 1974 longitudinal river ichthyoplankton sampling program began in mid-late April in both years. Since Atlantic tomcod spawn from December through February in the Hudson River and egg development takes about a month, neither program was designed to collect tomcod eggs and larvae. Juveniles were collected in the first river runs during both years. Hence, conclusions regarding the peak standing crops are speculative.

Atlantic tomcod spawn in the shallow, shore zone of the Hudson River above the salt-fresh water interface (Booth, 1967; Table VI-1). The eggs are demersal and perhaps adhesive, although the adhesive question is unresolved. Consequently, the egg and yolk-sac larvae stages were not collected in the 1973-74 studies and were relatively invulnerable to power-plant intakes. Post yolk-sac larvae are probably more vulnerable, but the abundance and distribution patterns for this life stage in the Hudson River during 1973 and 1974 are unknown.

The basic difference in Atlantic tomcod juvenile abundance and distribution between 1973 and 1974 was a peak standing crop about 1000 times greater in 1974. A part of this difference can be attributed to increased sampling effort in the shoals in 1974, since 15.5% of the 1974 juvenile standing crop estimates occurred in the shoal stratum (Table VI-13). Juvenile tomcod were concentrated in the lower river in both years and appeared to restrict their distribution throughout the summer to those regions exposed to the salt front. Juvenile vulnerability to power-plant entrainment and impingement should be greatest at the plants located in the lower river — Bowline, Lovett, and Indian Point. Vulnerability should be highest at Lovett and Indian Point since Atlantic tomcod are demersal fishes, never abundant in the shore zone.

Adult tomcod are relatively small fish (180-250 mm) and should be highly vulnerable to impingement when they are spawning in the shoals from about river mile 39-76 (km 62-122). Swimming ability of the Atlantic tomcod is unknown, but because they are bottom-feeding fishes rather than pursuing predators like the striped bass, their capability to avoid impingement on plant intake screens, especially when laden with reproductive products, may be reduced.

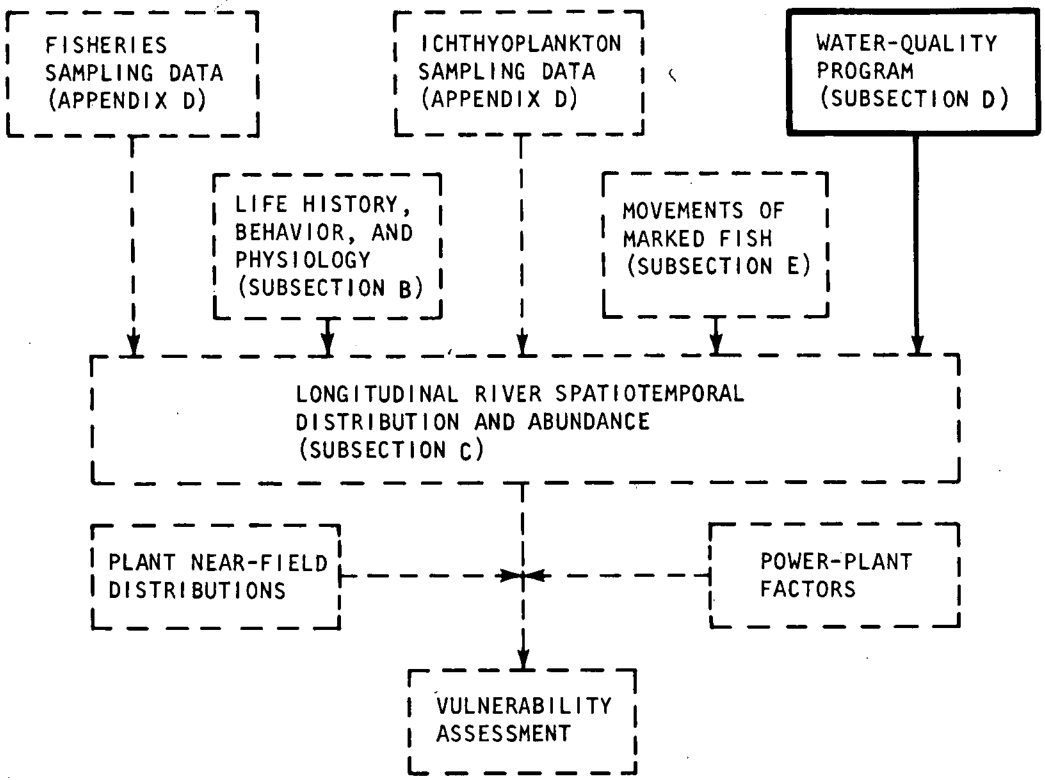
D. SPATIOTEMPORAL DISTRIBUTION AND ABUNDANCE IN RELATION TO CHEMICAL-PHYSICAL VARIABLES

1. Objectives

The relationships of life-stage distribution and abundance of striped bass eggs to water-quality variables such as temperature, conductivity, and dissolved-oxygen during 1974 were examined and are discussed in this report to determine how these variables influence spawning time and location. Additional life stages of striped bass, white perch, and Atlantic tomcod will be examined in a later report.

2. Methods

Measurements of water temperature, conductivity, and dissolved oxygen taken concurrently (same depth and time) with ichthyoplankton Tucker-trawl and epibenthic-sled samples from April through June 1974 were



analyzed with their respective catches of striped bass eggs in catch per tow. The dissolved-oxygen levels in areas where eggs were collected were also examined.

Striped bass egg densities (catch per tow) were computed separately for each gear for all river runs between 29 April-17 June. Densities were grouped with the corresponding water quality variables as follows:

- Water temperature in 1°C intervals
- Conductivity in 20-µmhos/cm intervals
- Dissolved-oxygen concentration in 1.0 mg/l intervals

After an initial examination of the data revealed similar catch patterns, sled and trawl data were combined across river runs into separate summaries for May and June.

3. Results

Striped bass eggs were collected in 1974 ichthyoplankton samples from late April until mid-June. Highest standing crops occurred in mid- to late May (Figure D-19). Eggs were collected across a wide range of temperatures, conductivity, and dissolved-oxygen conditions; however, peak densities (catch per tow) occurred within relatively narrow segments of the ranges.

a. Water Temperature

Striped bass eggs were collected in water temperatures from 10.8°C in April to 22.3°C in June (Figure VI-10). Ichthyoplankton sampling from late April through June spanned a temperature range of 10.8 to 25.0°C. However, peak densities (catch per tow, 52.8) occurred in mid- to late May at temperatures of 15 to 16°C. In June, egg densities were low at all temperatures.

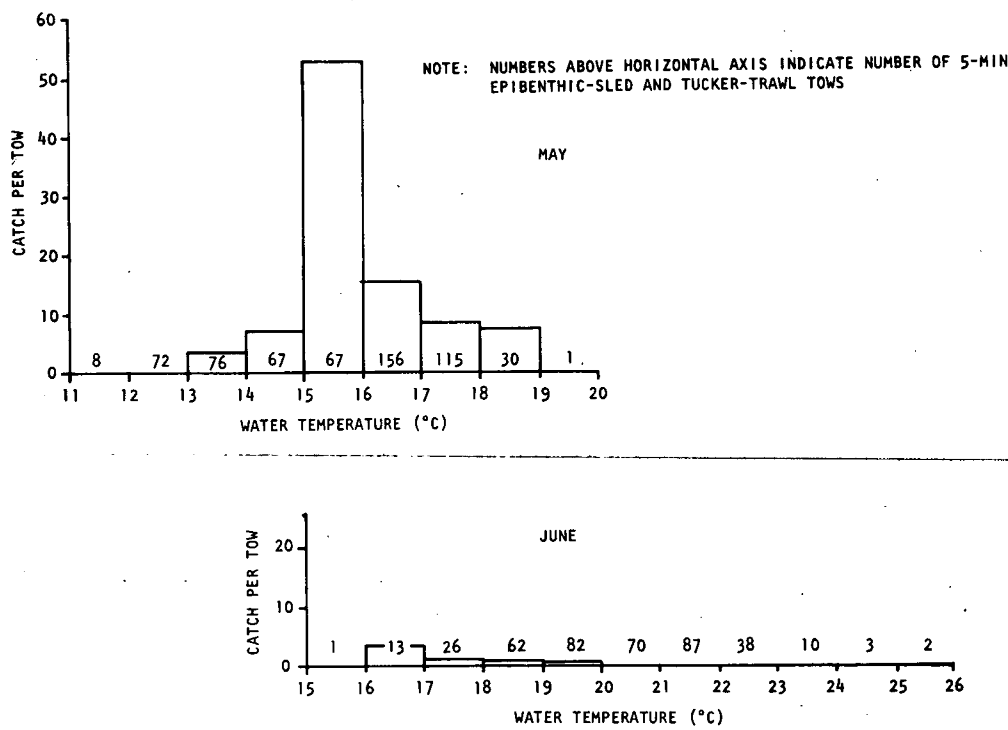


Figure VI-10. Relationship of Water Temperature and Striped Bass Egg Density in Hudson River, 1974

b. Conductivity

Striped bass eggs were associated with low conductivities (Figure VI-11). Ichthyoplankton samples from late April through June were taken in water in which conductivities ranged from just above 100 to 25,518 µmhos/cm. One striped bass egg was collected in an area in which conductivity was 521 µmhos/cm, but all others were collected in areas in which conductivity was below 340 µmhos/cm. Peak density (catch per tow) occurred in May in the conductivity range of 160-180 µmhos/cm, with the bulk of the catches being in the 140-220 µmhos/cm range.

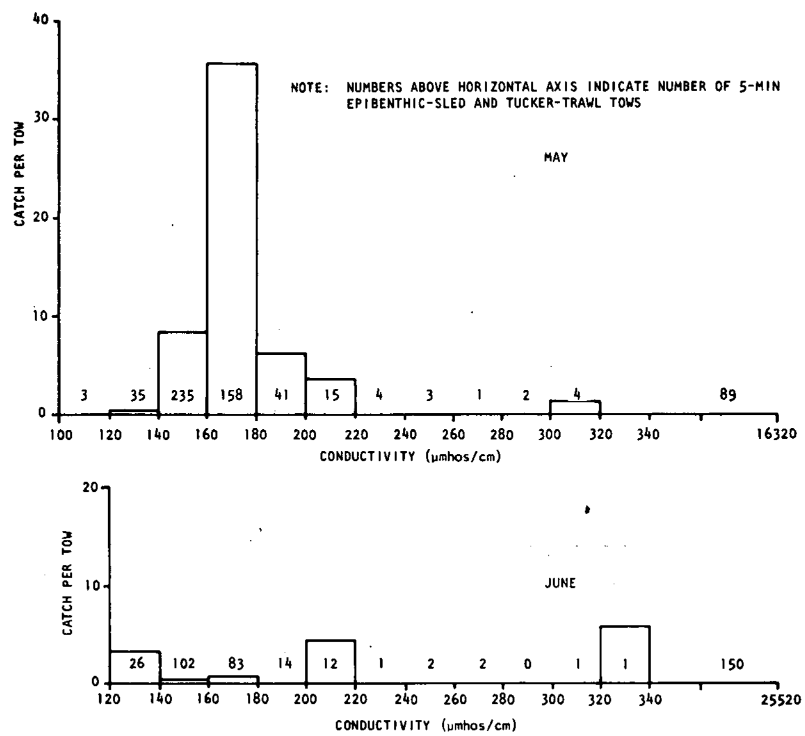


Figure VI-11. Relationship between Conductivity and Striped Bass Egg Density in Hudson River, 1974

c. Dissolved Oxygen

Striped bass eggs were collected from a rather wide range of dissolved-oxygen concentrations (Figure VI-12). Ichthyoplankton samples from late April through June were taken in areas in which dissolved-oxygen concentrations ranged from 1.7 to 12.5 mg/l; however, several tows in late May sampled areas in which dissolved-oxygen concentrations were below 4.0 mg/1 and egg densities reached a peak of over 40 eggs/tow. The second highest peak occurred in mid-May in areas of the river where dissolved-oxygen levels ranged from 9.0 to 9.9 mg/l.

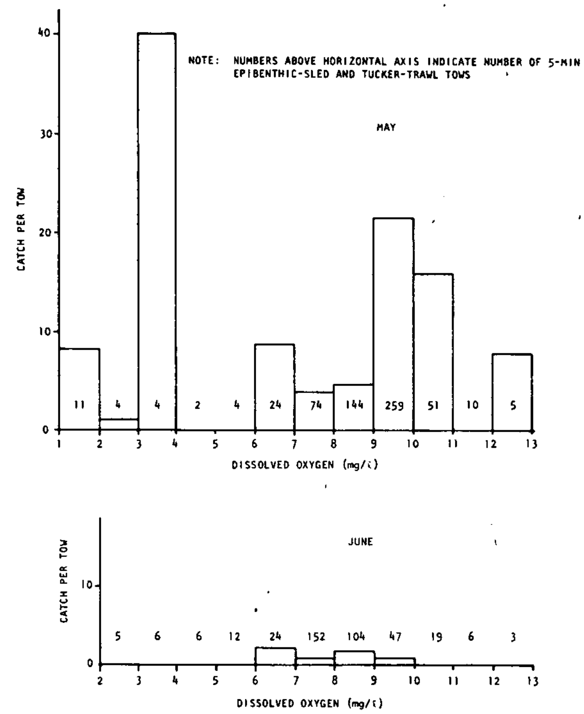


Figure VI-12. Relationships between Striped Bass Egg Density and Dissolved-Oxygen Concentration (mg/1) in the Hudson River, 1974

4. Discussion

The minimal spawning temperature for striped bass, based on egg collections, has been reported to be about 14.4°C (Talbot, 1966; Albrecht, 1964; Farley, 1966) but eggs have been reported in water temperatures down to 10.0°C (Farley, 1966). Peak spawning for striped bass in the San Joaquin-Sacramento estuary, California, occurs from 15.6 to 19.4°C (Talbot, 1966; Albrecht, 1964). Mansueti and Hollis (1963) reported peak spawning in

Chesapeake Bay at about 18.3°C. Peak spawning of Hudson River striped bass during 1974 occurred at slightly lower temperatures (15° to 17°C) than in the Sacramento-San Joaquin and Chesapeake estuaries. Data analyzed in this report indicate that most Hudson River striped bass began spawning when water temperatures were 13 to 14 C. Insignificant spawning activity occurred below 14°C or above 19°C.

In estuaries, striped bass usually spawn within the first 25 mi (40 km) of fresh water, with little or no spawning in brackish water (Talbot, 1966). Hudson River striped bass also appear to spawn only in fresh water.

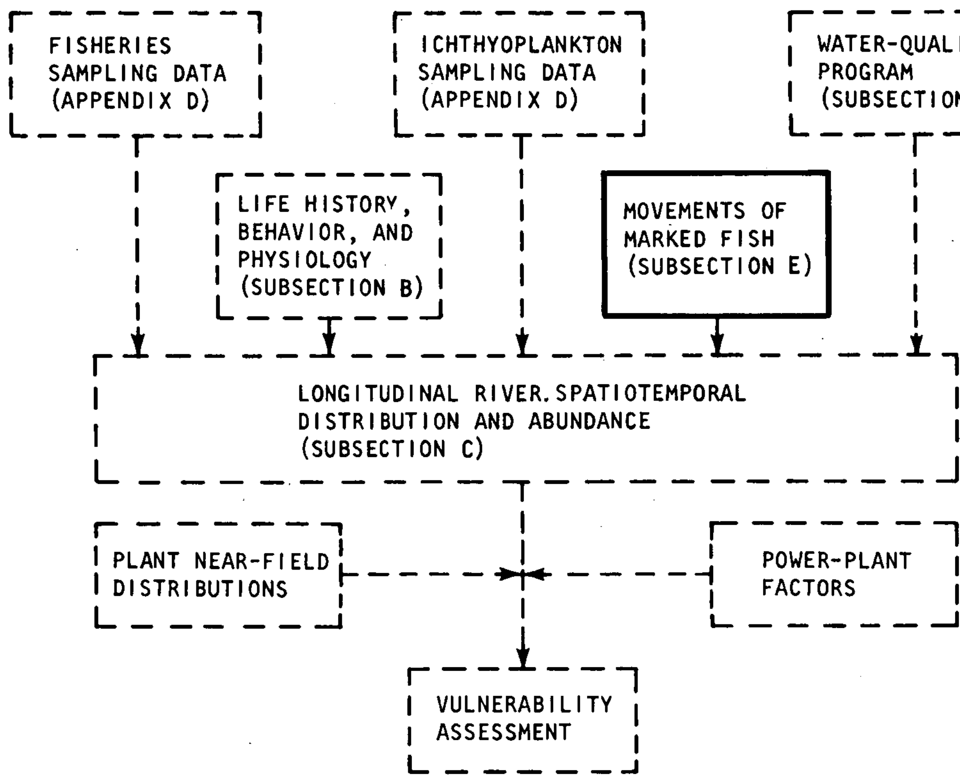
Dissolved-oxygen levels below 4.0 mg/l may be lethal to striped bass eggs (Talbot, 1966). Doroshev (1970) reported that 1.65 mg/l at 19°C was the critical dissolved-oxygen level at which high mortality of 10-12 mm larvae occurred; exposure time was not given, however. Doroshev suggested that striped bass eggs have a similar lower tolerance level for low dissolved-oxygen concentrations. Striped bass eggs in areas of the Hudson River in 1974 where the dissolved-oxygen levels ranged from 1 to 4 mg/l may have had lower survival rates than did eggs in other parts of the river during the same time period. Low dissolved-oxygen levels were detected from RM 50-90 (km 80-144) on 28 and 29 May.

Striped bass spawning activity in the Hudson River estuary is strongly influenced by chemical-physical variables. Annual variations in the location and time of peak egg concentrations can alter the potential annual impact of an individual power plant by shifting the distribution of eggs in relation to the plant region. The distribution of eggs will also determine the distribution of the relatively nonmotile yolk-sac larvae. Periods of low dissolved-oxygen levels in the bottom layers of the river, such as the conditions measured on 28 and 29 May, could substantially increase egg natural mortality in localized areas and subsequently shift the peak concentrations of viable eggs to other segments of the river and again alter the degree of egg and larval exposure to potential plant-induced mortality.

E. MOVEMENTS OF MARKED FISH

1. Objective

This subsection describes seasonal movements of striped bass, white perch, and Atlantic tomcod marked with either tags or fin clips during 1973 and 1974.



2. Methods

Recaptures of individual striped bass, white perch, and Atlantic tomcod, marked in conjunction with the mark-recapture program (for details, see Section III), were analyzed to discern spatial and temporal trends in the movements of individuals. Numbered tags allowed more precise information on the movement of individual fish than did fin clips. Recorded for each recapture of a tagged individual were such variables as distance between sites of release and recapture, direction of movement, time at large, total length of the fish at time of release and recapture, and rate of movement.

For recaptures of fin-clipped individuals, the sites and dates of recapture were compared to the original sites and dates of release of the particular fin-clip type.

Four marking areas were established for the fin-clipped individuals (Figure VI-13):

Area 1 [RM 12-38 (km 19-61)]
Area 2 [RM 39-46 (km 62-74)]
Area 3 [RM 47-61 (km 75-98)]
Area 4 [RM 62-153 (km 99-245)]

The effect of season on distance and direction movement of tagged white perch was analyzed using tag returns from January-December 1973 and January-September 1974. The recapture data were divided into three subsets: tags released and recaptured within the 15 September-31 December period; tags released and recaptured within the periods of 1 January-31 May 1973 and 1974; and tags released and recaptured within the period of 1 June-15 September 1973 and 1974. Recapture data that overlapped these three periods were excluded.

Data from the recapture of fin-clipped Atlantic tomcod marked during the December 1973-March 1974 spawning season were not analyzed for this report. Recapture effort for fin-clipped tomcod was distributed only within a limited area of the river and would tend to bias the interpretations of movement. Limited data on movements of tagged tomcod were analyzed.

3. Results

a. Fin-Clipped Striped Bass

Juvenile (young-of-the-year) striped bass moved both upriver and downriver during their first year (Figure VI-14). Most recaptures were below the West Point region. The marked population dispersed across regions

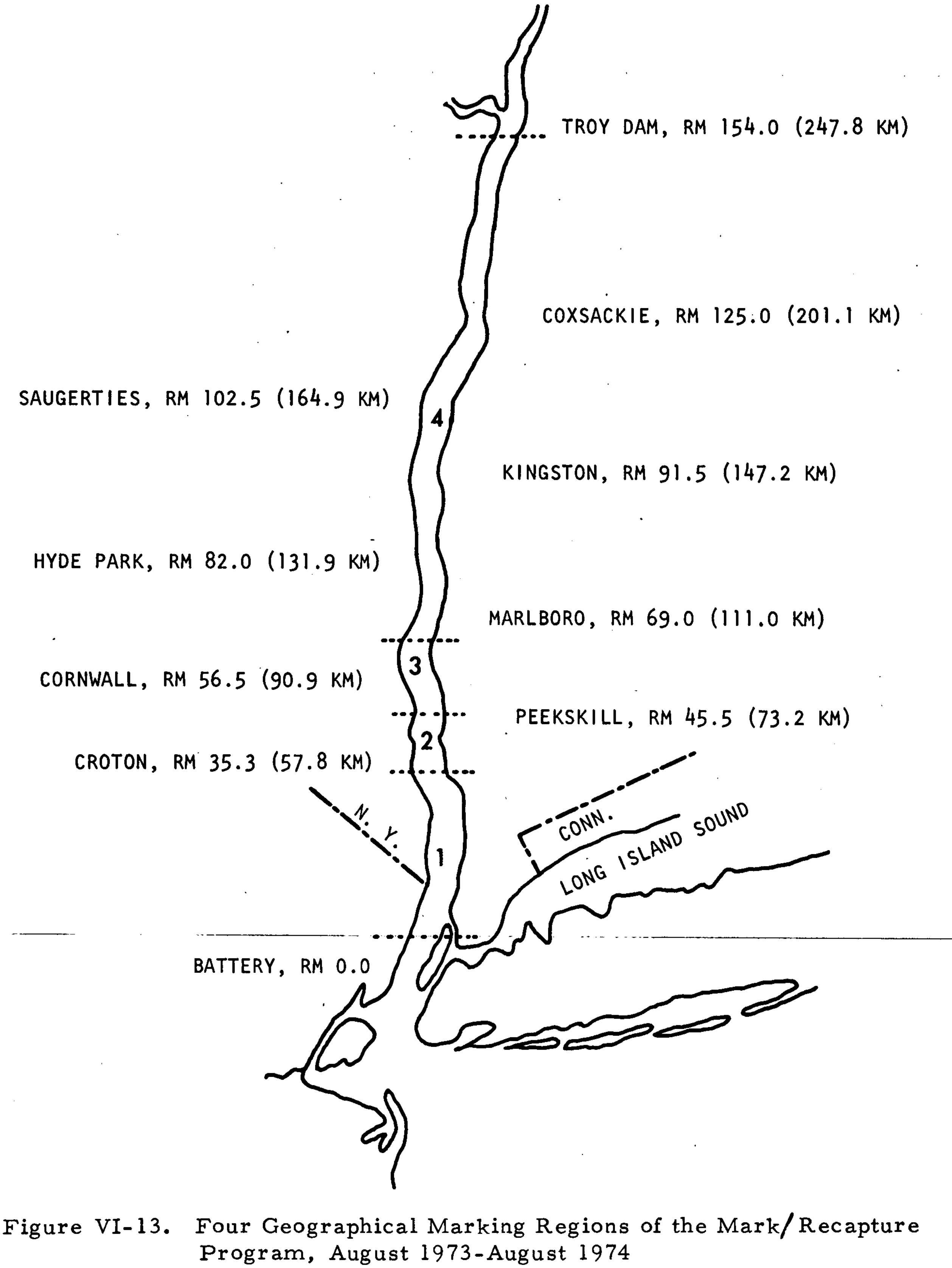


Figure VI-13. Four Geographical Marking Regions of the Mark/Recapture Program, August 1973-August 1974

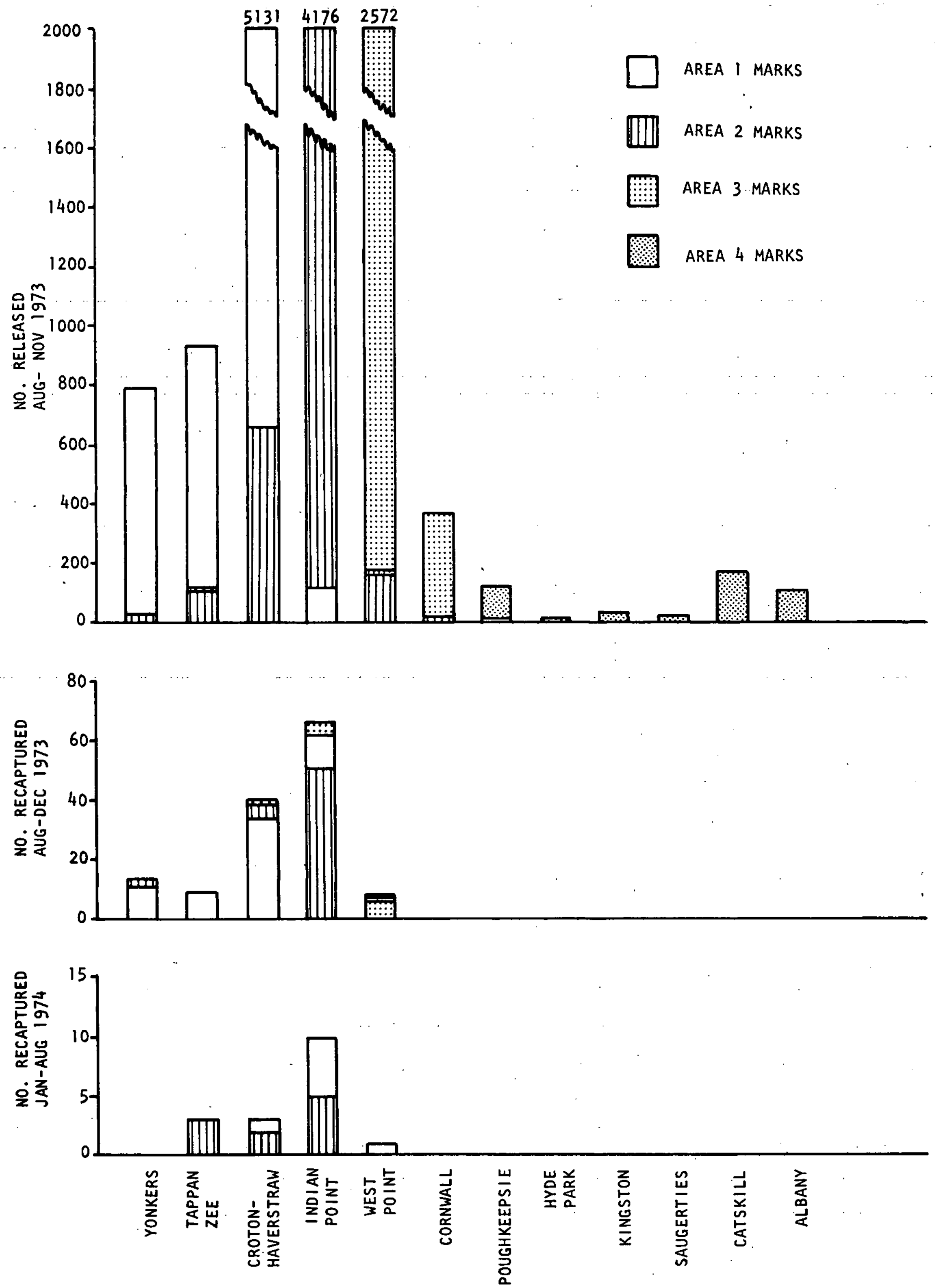


Figure VI-14. Movements of Striped Bass Young-of-the-Year Marked from August through November 1973 in the fall, especially the Croton-Haverstraw, Indian Point, and West Point regions. There were no recaptures above the West Point region.

b. Fin-Clipped White Perch

Juvenile white perch also moved between regions during August-November 1973 (Figure VI-15). Fish from marking area 1 [RM 12-38 (km 19-61)] were recaptured as far upriver as the Cornwall region [RM 56-62 (km 90-99)]; those from marking area 2 [RM 39-46 (km 62-74)] as far as the Poughkeepsie region [RM 62-77 (km 99-113)]. Fish from marking area 3 [RM 47-61 (km 75-98)] moved downriver into the Tappan Zee region [RM 24-34 (km 38-54)] and Croton-Haverstraw region [RM 34-39 (km 54-62)]. By spring 1974, young perch from all four marking areas had been recaptured within the Indian Point region. During the 1974 spring-summer sampling, January-September, there were no recaptures of fall 1973 fin-clipped white perch above the Indian Point region.

c. Tagged White Perch

The greatest movement of tagged white perch occurred during the winter and spring, 1 January-31 May in both years (Figure VI-16). The data indicated three groups of tag returns: a group of 27 white perch had restricted movements within a range of 3 mi (5 km) for up to 23 days at large; a group of six perch, at large for 23 to 48 days, had moved 26 to 48 mi (42 to 77 km) upriver; and a group of five perch, at large for only 5 to 11 days, had moved downriver 10 to 24 mi (16 to 39 km). The group moving upriver consisted primarily of fish released from the lower marking areas 1 and 2 [RM 12-46 (19-74 km)]; the group moving downriver consisted primarily of fish released from the upper marking areas 3 and 4 [RM 47-153 (75-245 km)].

Tagged white perch were fairly sedentary during the summer months, 1 June-15 September (Figure VI-17). Most recaptures occurred within 4 mi (6 km) of the release site for up to 104 days at large. There were

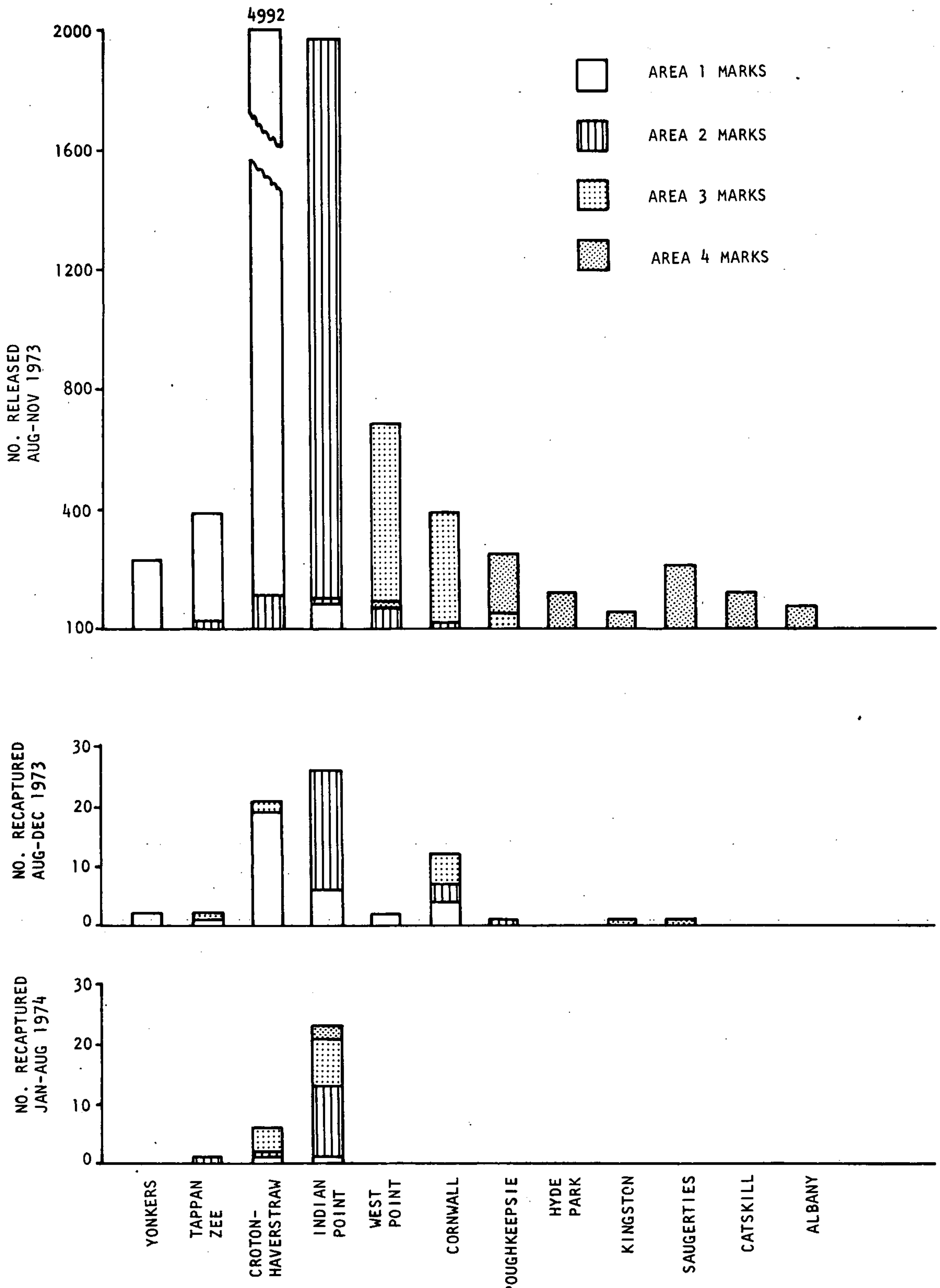


Figure VI-15. Movements of White Perch Young-of-the-Year Marked from August through November 1973

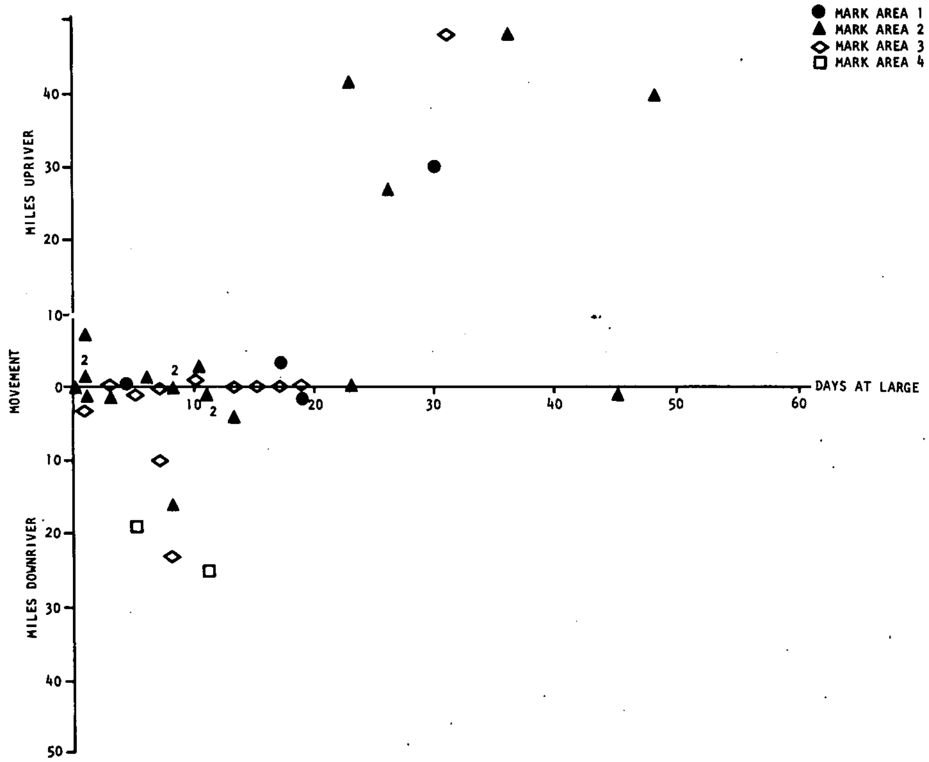


Figure VI-16. Movement of Tagged White Perch during Period of 1 January-31 May 1973 and 1974

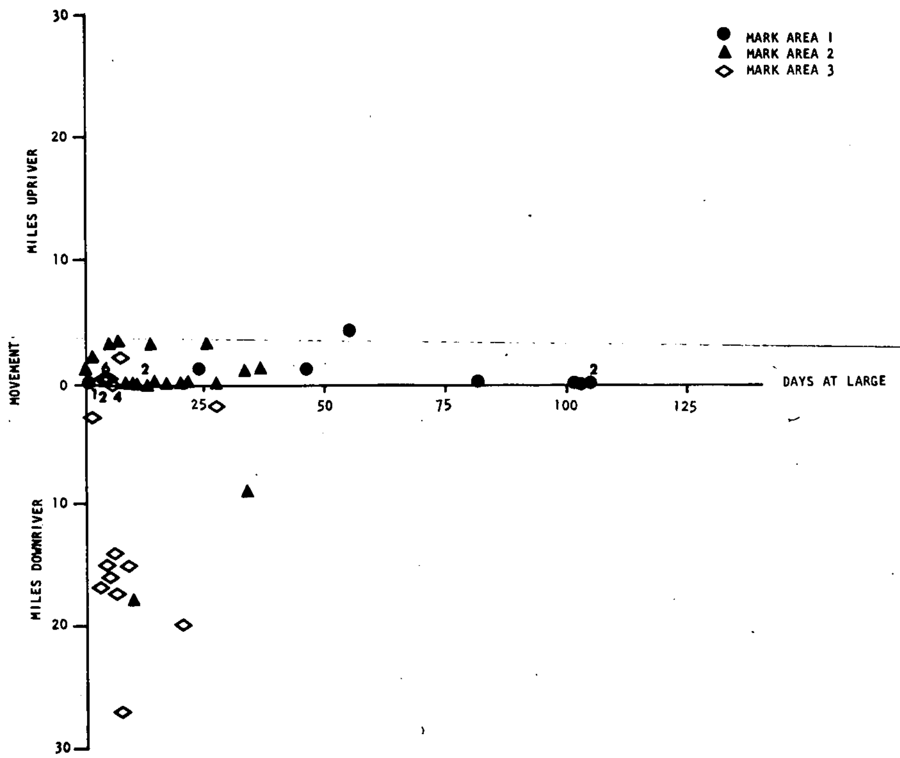


Figure VI-17. Movement of Tagged White Perch during Period of 1 June-15 September 1973 and 1974 exceptions: 10 tagged white perch were recaptured 9 to 27 mi (14 to 43 km) downriver from their site of release.

Long-range movements appeared to increase again in the fall months (15 September-31 December) in a downriver direction (Figure VI-18). Four fish were recaptured within 40 days after release at distances of 8 to 19 mi downstream from the site of release.

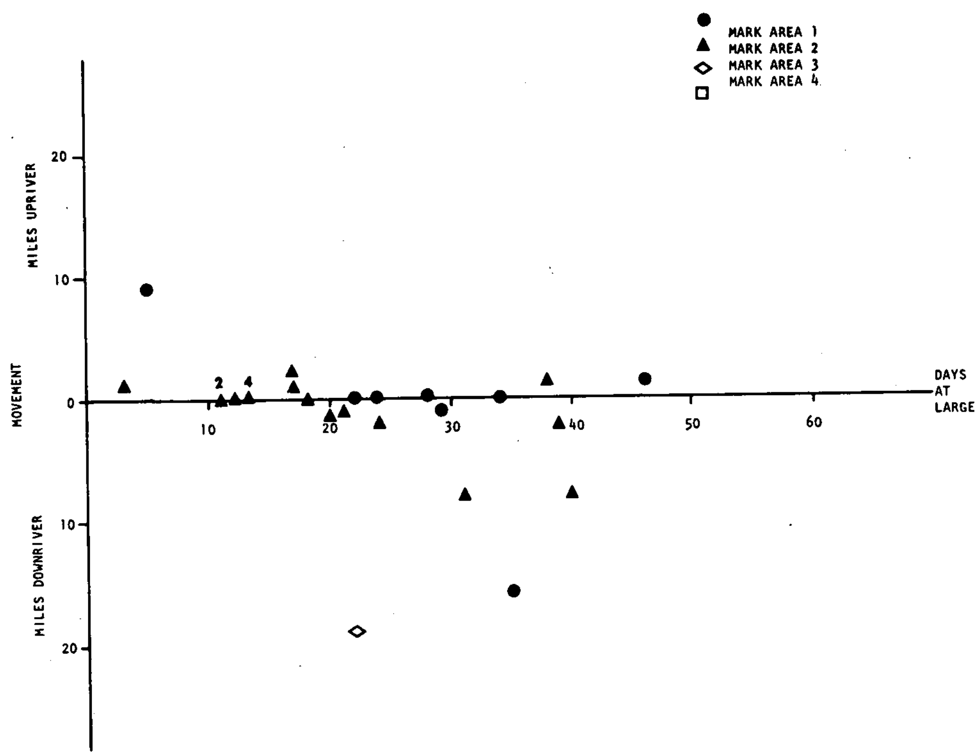


Figure VI-18. Movement of Tagged White Perch during Period of 15 September-31 December 1973

The range of movement in the adult white perch population was extensive. Perch tagged and released in fall 1973 in three of the four marking areas (1, 2, and 4) were recaptured the following spring and summer outside their original region of release (Figures VI-19, VI-20, and VI-21). The farthest distance traveled was 112 mi (179 km) in 194 days from Verplanck (RM 40) to just below Troy Dam (RM 152). Other white perch apparently remained

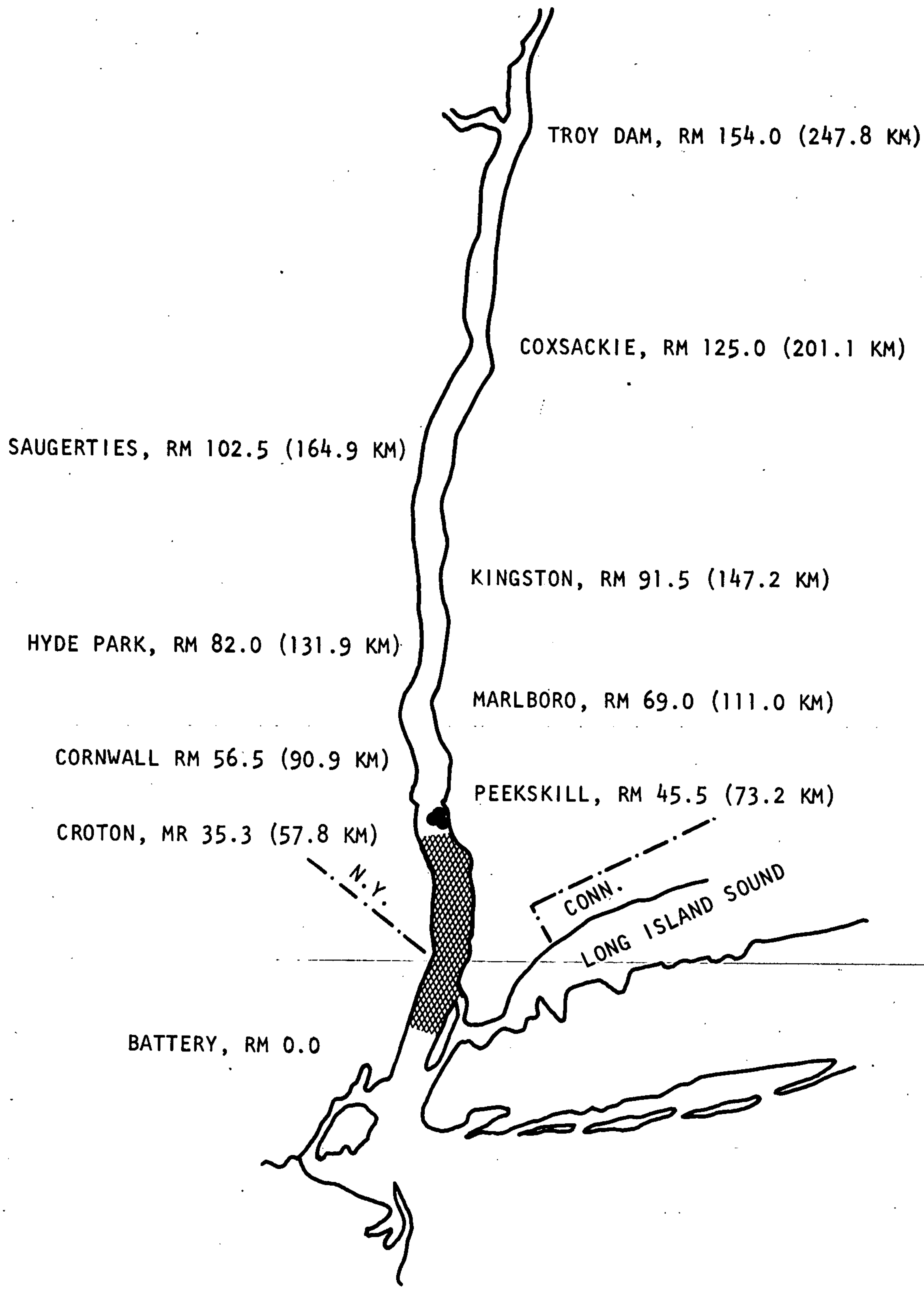


Figure VI-19. White Perch Tagged in 1973 in Area 1 (RM 12-39) and Recovered in 1974 Outside Area

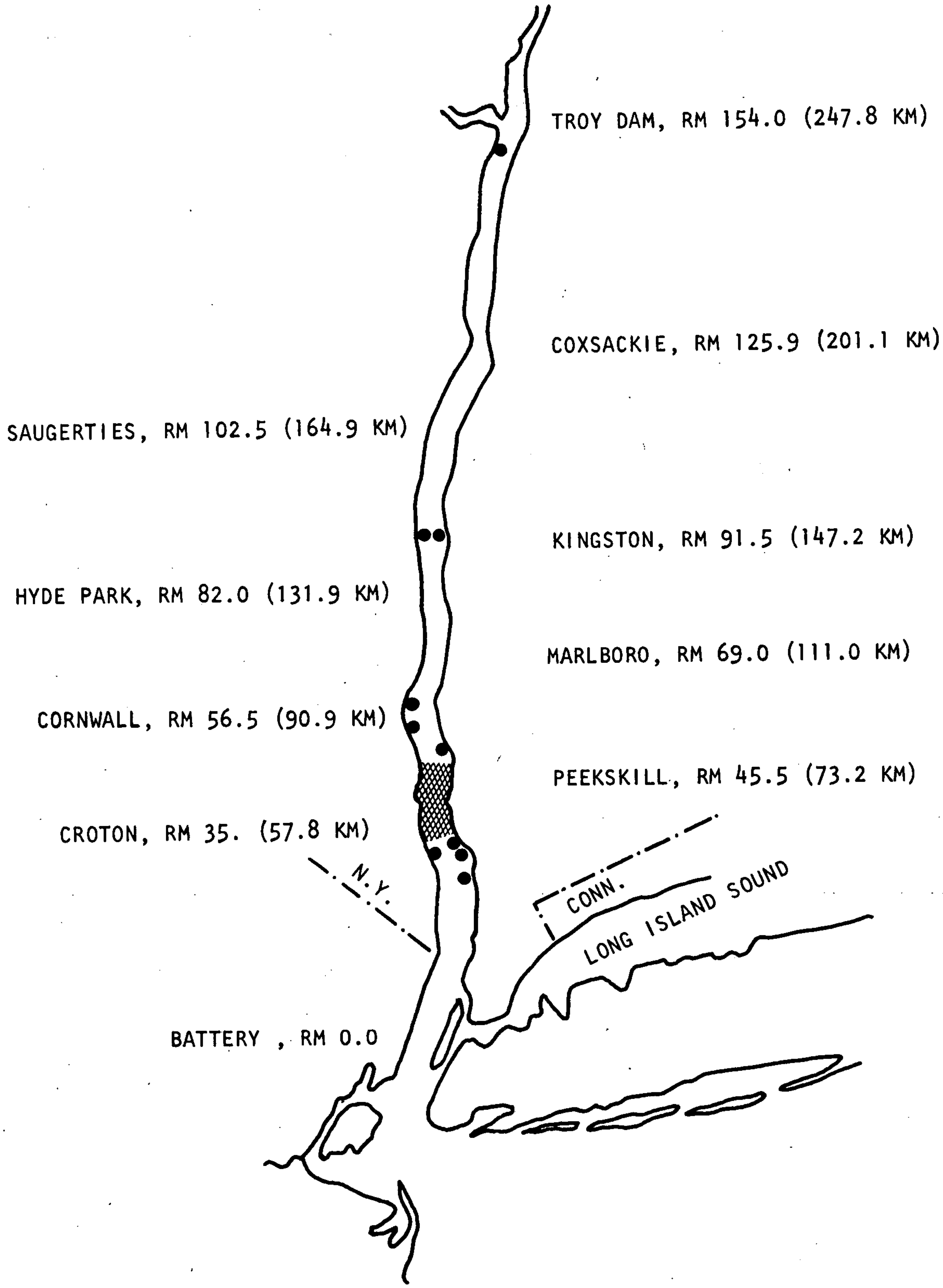


Figure VI-20. White Perch Tagged in 1973 in Area 2 (RM 39-46) and Recovered in 1974 Outside Area

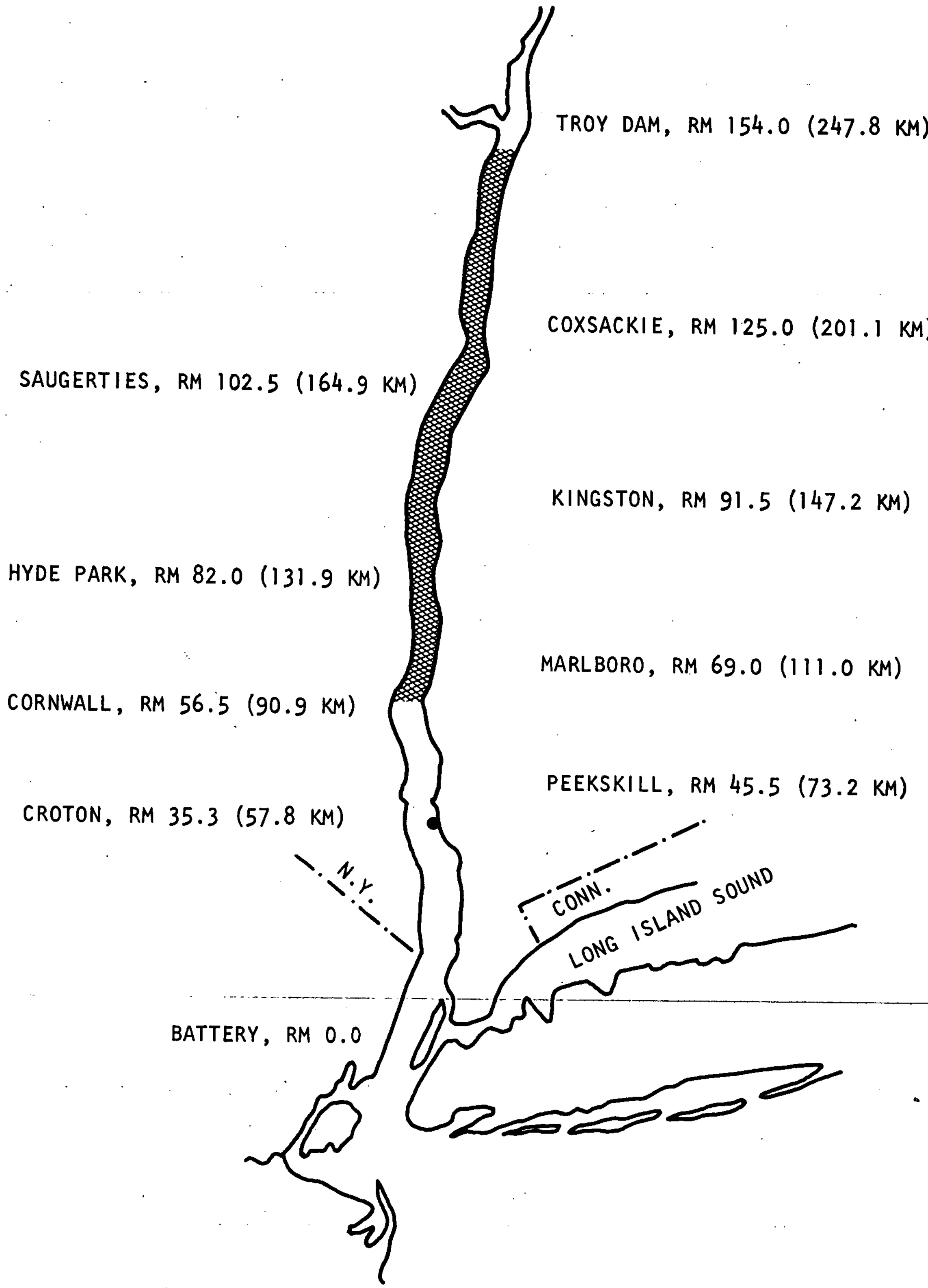


Figure VI-21. White Perch Tagged in 1973 in Area 4 (RM 62-153) and Recovered in 1974 Outside Area

near their site of release for long periods of time; one fish, for example, was released in RM 38 (km 59) and recaptured 283 days later at the same river mile.

There were also extensive movements across marking areas of white perch both tagged and recaptured during 1974 (Figures VI-22, VI-23, VI-24, and VI-25). Recaptures of tags in fall 1973 showed similar extensive movements (Texas Instruments, 1974b). For a complate record of tag recaptures during 1973 and January-September 1974, refer to Appendix D, Tables D-136 through D-140.

d. Tagged Atlantic Tomcod

Two of the six Atlantic tomcod tagged and recaptured during early 1974 had moved great distances downriver from their site of release (Appendix D, Table D-96): one had moved 29 mi (46 km) in 89 days and the other had moved 38 mi (61 km) in 45 days; both were recaptured at or below the George Washington Bridge [RM 12 (km 19)].

4. Discussion

Recaptures of marked striped bass, white perch, and Atlantic tomcod have shown that these species can undergo movements of considerable distance and that there are apparent patterns in their movements. If mass movements could be predicted in advance, changes in fish distribution and potential vulnerability to impingement at each power plant could also be more accurately predicted. How these movements might occur is as follows:

a. Juvenile Striped Bass and White Perch

Juveniles of both white perch and striped bass seem to undergo a gradual displacement downriver in the summer and fall of their first year. By late fall, many of the young striped bass may have left the river for overwintering in the area of the New York Bays and Long Island. Juvenile white

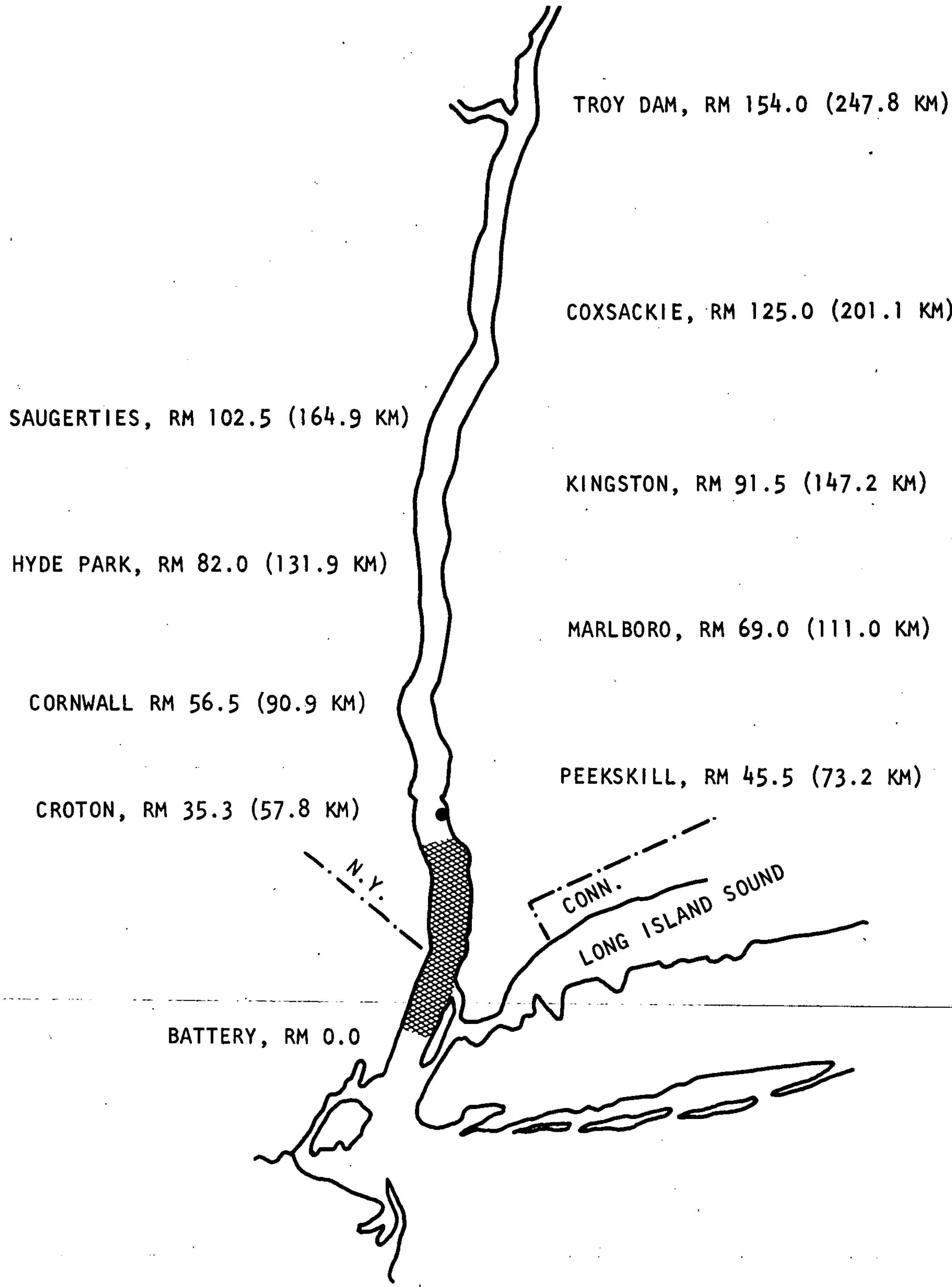


Figure VI-22. White Perch Tagged in 1974 in Area 1 (RM 12-38) and Recovered Outside Area in 1974

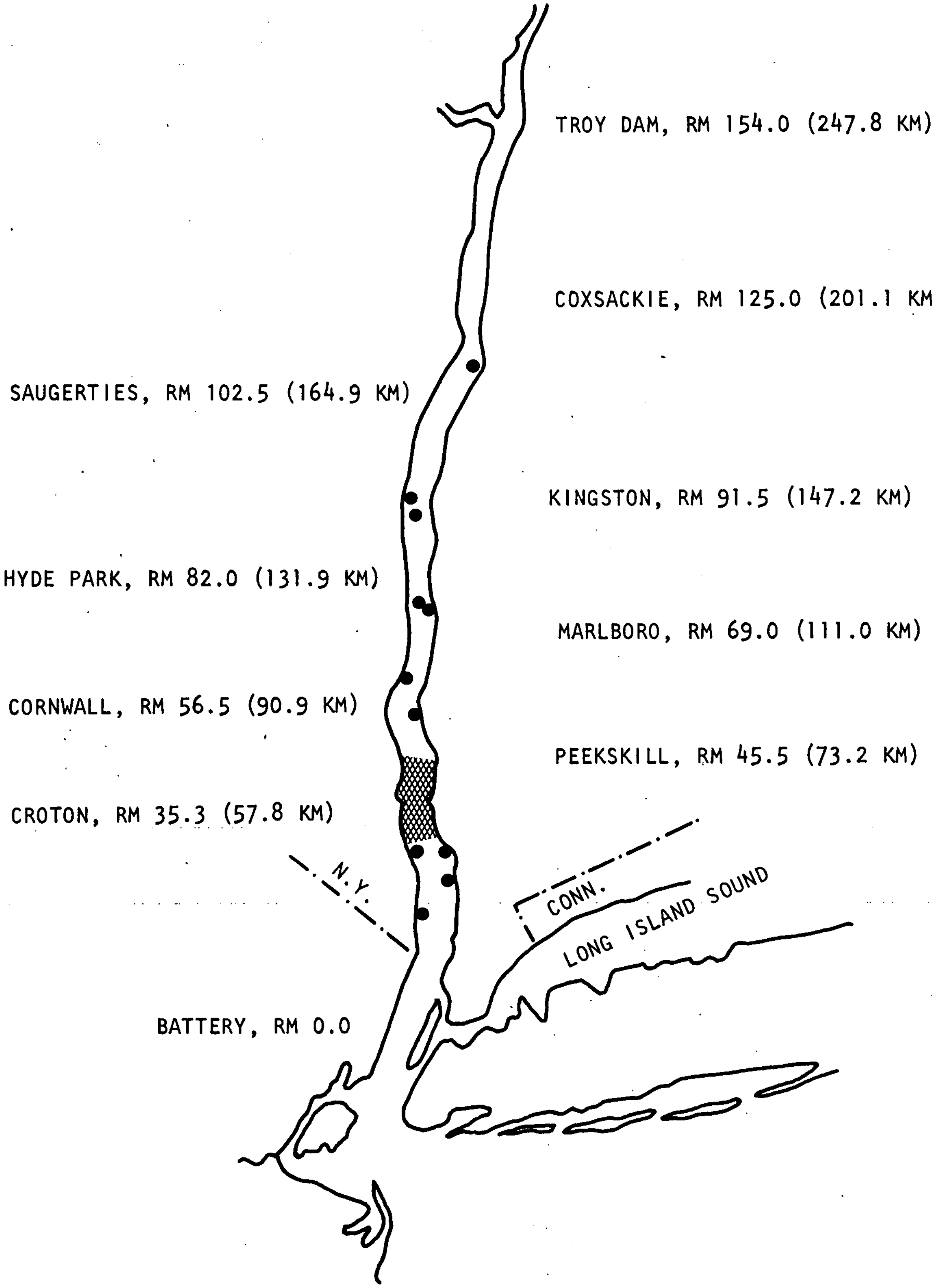


Figure VI-23. White Perch Tagged in 1974 in Area 2 (RM 39-46) and Recovered Outside Area in 1974

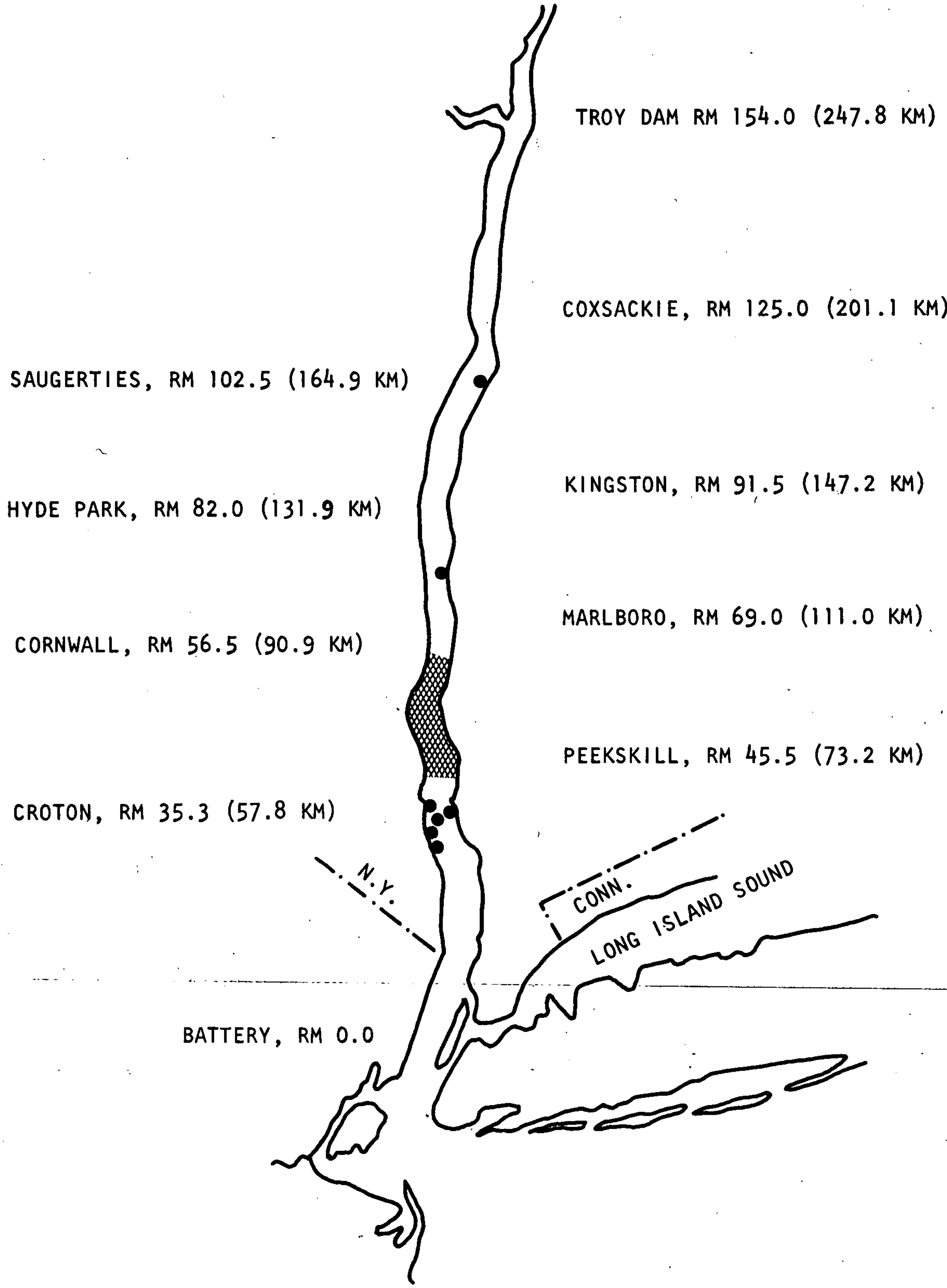


Figure VI-24. White Perch Tagged in 1974 in Area 3 (RM 47-61) and Recovered Outside Area in 1974

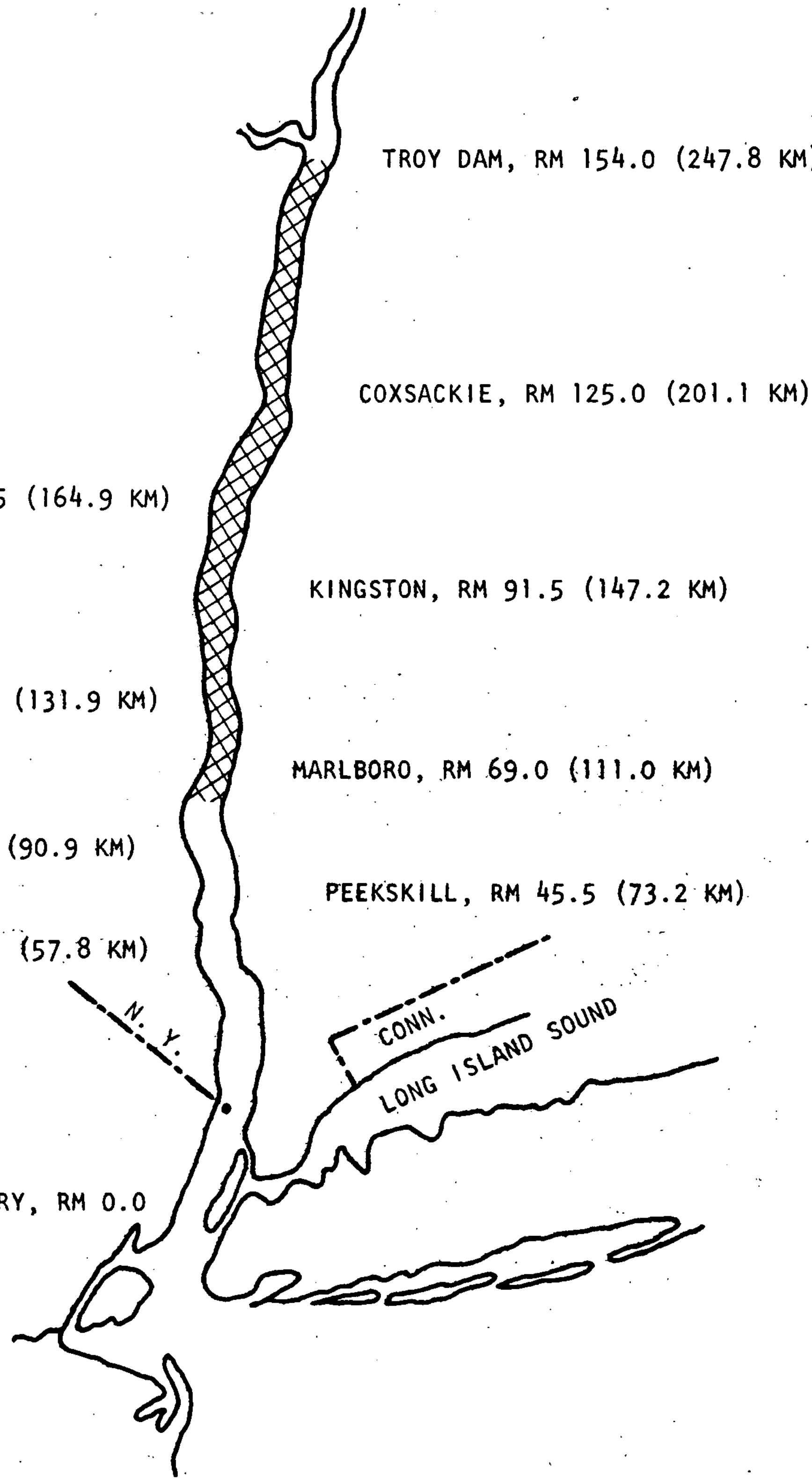


Figure VI-25. White Perch Tagged in 1974 in Area 4 (RM 62-153) and Recovered Outside Area in 1974

perch probably restrict their fall movements with the river, with many over-wintering in the Croton-Haverstraw and Indian Point regions. In the following spring, many of these same striped bass and white perch may move back upriver.

b. Subadult and Adult White Perch

The pronounced movements of tagged white perch in the spring may have been associated with a spawning migration because almost all of the perch observed migrating January-May were 150 mm or larger in total length (Figures VI-26 and VI-27) and probably mature. Most of the tag recaptures during 1 June-15 September (Figure VI-17) that demonstrated long-range movement may also have been spawning fish; 8 of the 10 migrating perch had been released early in June within marking area 3. Their movement probably coincided with the final weeks of the spawning season.

Mansueti (1961) attributed an increased spring movement of tagged white perch in the Patuxent River, Maryland, to a spawning migration from brackish to fresh water. He also found that white perch in autumn in the Patuxent River move to deeper water downriver from their spawning area after displaying little long-range movement during the summer. Hudson River white perch apparently have a similar annual cycle, moving primarily upriver to spawn in the spring and downriver in the fall to feed and overwinter. If the spring movement is primarily upriver, as indicated, this would tend to counterbalance the generally downriver movements of juvenile white perch.

The extensive movements displayed by these tag returns suggest a single population of white perch within the Hudson River estuary or, if there are subpopulations, a considerable exchange of individuals between them. Subpopulations, if they exist, may be based on the segregation of spawning individuals among possible foci of spawning activity such as the major tributaries to the Hudson River. It is presently unknown if white perch home to their natal spawning grounds. Such homing would be necessary for genetic isolation and

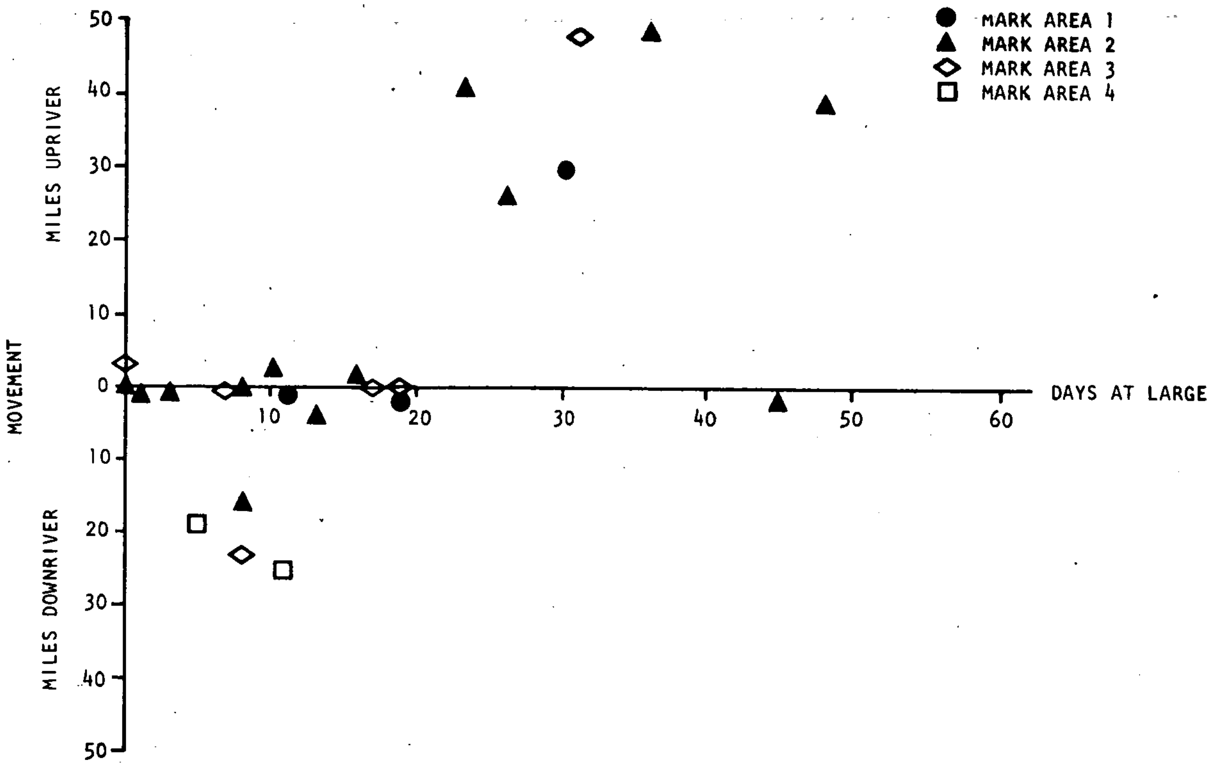


Figure VI-26. Movement of Tagged White Perch > 150 mm in Total Length during Period of 1 January-31 May 1973 and 1974

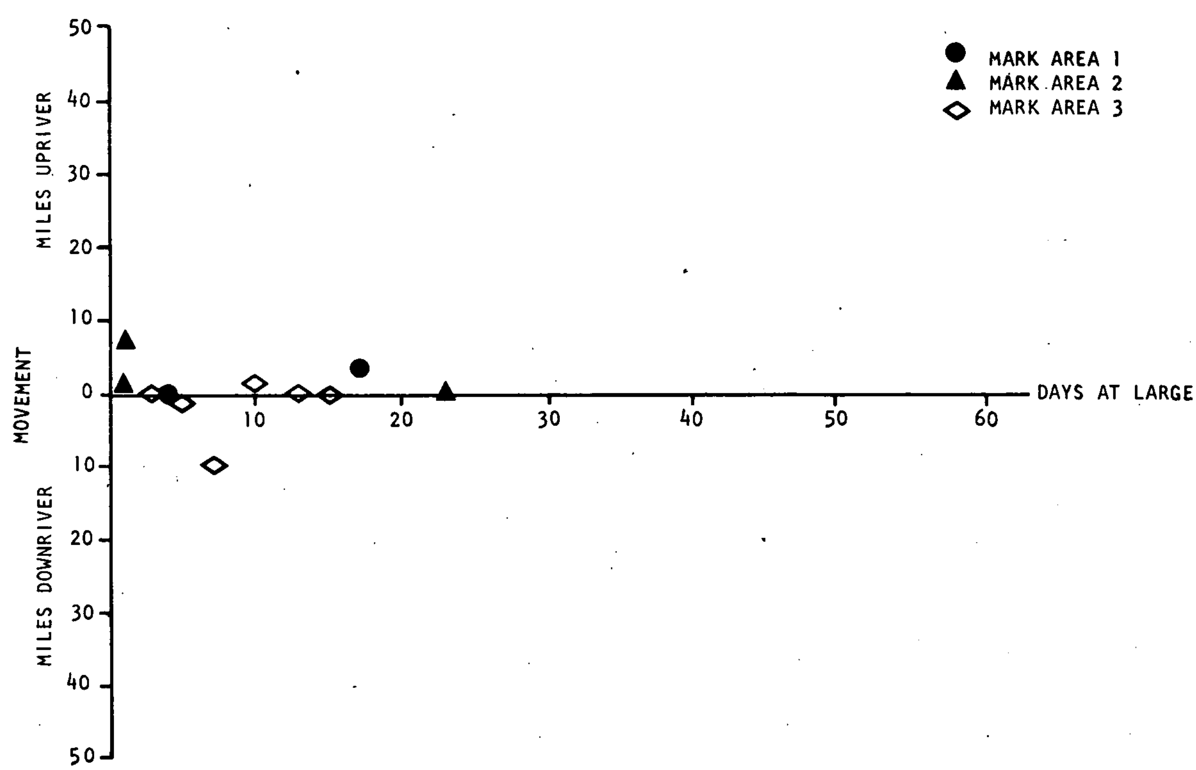


Figure VI-27. Movement of Tagged White Perch < 150 mm in Total Length during Period of 1 January-31 May 1973 and 1974 the subsequent development of subpopulations or races. Whether or not subpopulations exist, it is apparent that many white perch, because of their extensive movement, may become potentially vulnerable to impingement at most or all of the power plants during their lifespan.

c. Atlantic Tomcod

The seasonal movements of Atlantic tomcod suggest peak impingement periods. A winter impingement could occur when adult tomcod move into the shoal and shore zones to spawn, and a summer impingement could occur when young-of-the-year tomcod reach an impingeable size during their late-spring, primarily downriver movement. The limited number of tag returns during spring 1974 indicates that many, if not most, of the adult tomcod move downriver after spawning and thus are removed from the influence of the power plants. The movement during spring may represent a return to more saline waters following the winter spawning in the freshwater areas of the estuary. The fate of these migrating adult tomcod has yet to be defined since it is apparent that few return during the following winter to spawn in the vicinity of the power plants in the Hudson River (Texas Instruments, unpublished data).

5. Conclusions

The life history/behavior descriptions for striped bass, white perch, and Atlantic tomcod suggest that some life stages are relatively invulnerable to entrainment and impingement at power plants in the Hudson River. For other life stages, vulnerability is closely related to the annual spatio-temporal distribution and abundance patterns. These patterns of the various life stages of striped bass, white perch, and Atlantic tomcod in the Hudson River estuary during 1973 and 1974 demonstrated several important differences between years.

a. Striped Bass

Yolk-sac larvae, post yolk-sac larvae, and early juveniles (15-20 mm total length) are the life stages of striped bass most vulnerable to power-plant-induced mortality in the Hudson River estuary. Eggs and yolk-sac larvae are concentrated in the channel-bottom areas and are relatively invulnerable except to those plants that are located near the channel and entrain water from the deep strata. Juveniles apparently began to move to the shoals and shore zone in early July when they are about 25 mm in total length and are relatively invulnerable to entrainment. Most of the juveniles appeared to migrate downstream and out of the river in late fall, although a portion of the population remained in the river and were vulnerable to impingement.

In 1973 and 1974, striped bass eggs were concentrated in the Indian Point and West Point regions but were distributed further upstream in 1974 through the Hyde Park region [RM 85 (km 136)] where they were exposed to entrainment at Danskammer. Since pumping capacity is greatest at Indian Point, overall striped bass egg vulnerability to entrainment was probably greatest in 1974 at Indian Point.

Vertical and lateral distribution data are needed to determine what proportion of the striped bass egg population was vulnerable to the plant intakes. These data will be included and discussed in a later report.

Peak yolk-sac larval standing crops in 1974 were concentrated in the West Point, Cornwall, and Poughkeepsie regions [RM 47-76 (km 75-122)]. Yolk-sac larval standing crops were relatively high in these same regions in 1973 and also downstream through the Croton/Haverstraw-Indian Point regions. Yolk-sac larvae exposure to power plants was similar in 1973 and 1974 at Danskammer and Roseton and lower in 1974 at Lovett, Indian Point, and Bowline.

Juvenile abundance was concentrated in the lower river in both 1973 and 1974 but was reduced in 1974, suggesting higher mortalities in the late post yolk-sac larval and juvenile stages. Some of the factors influencing striped bass year-class strength are discussed in Section V.

b. White Perch

Post yolk-sac larvae and early juveniles (10-15 mm total length) are the white perch life stages most vulnerable to entrainment in the Hudson River estuary. The juveniles and yearlings that overwinter in the vicinity of power plants are vulnerable to impingement during the winter and early spring seasons. The demersal, adhesive eggs and yolk-sac larvae, apparently concentrated in the shoal and shore zone (perhaps tributaries), are relatively invulnerable. Juveniles apparently move to the shoals and shore zone in late July at about 20 mm total length and, unless attracted to plant intake areas, are relatively invulnerable. Unlike juvenile striped bass, white perch juveniles apparently remained in the river year-round and were vulnerable to impingement through several life stages and age groups.

Direct comparisons of the distributions and abundances of white perch eggs and larvae between 1973 and 1974 tend to be misleading since the increased ichthyoplankton sampling effort in the shoals and night sampling schedules after mid-June in 1974 greatly increased the probability of collecting white perch eggs and larvae. Juvenile abundance was greatly reduced in 1974 and concentrated in the upper river regions above all power plants considered in this report. Some of the factors influencing white perch year-class strength are discussed in Section V.

c. Atlantic Tomcod

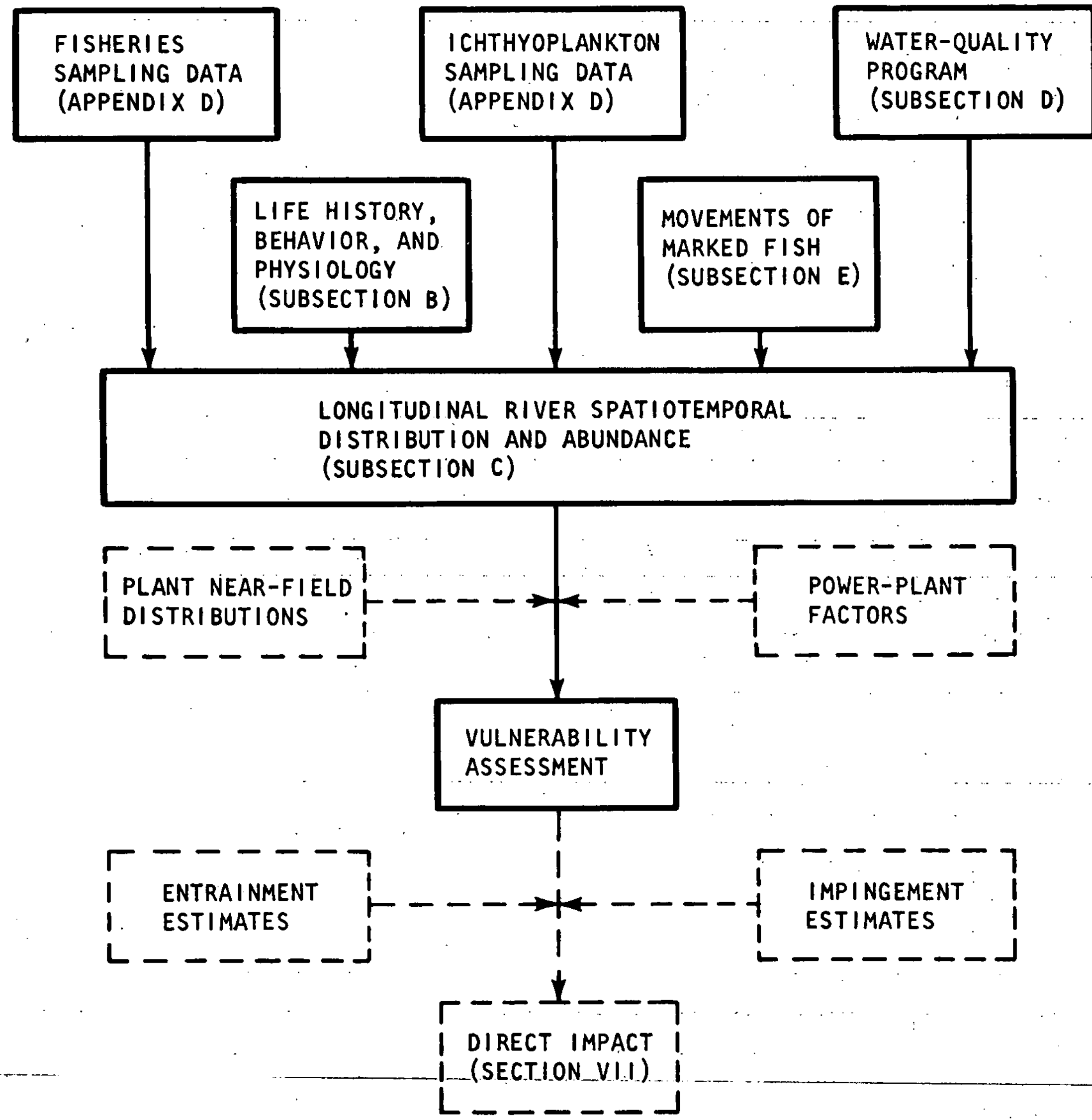
Post yolk-sac larvae, juveniles, and adults are the Atlantic tomcod life stages most vulnerable to entrainment and impingement at power plants in the Hudson River estuary. Tomcod spawn during winter, presumably in the shallow shore zone and tributaries, so the demersal eggs and yolk-sac larvae are relatively invulnerable. Post yolk-sac larvae and juveniles were found in the bottom, channel, and shoal areas in the lower river [generally below RM 46 (km 74)] in both 1973 and 1974, so these life stages were vulnerable only at Bowline, Lovett, and Indian Point. Juvenile year-class strength was much greater in 1974. The adults migrate into the river in November and December and spawn from about RM 39-76 (km 62-122), so they are vulnerable to impingement at all power plants during this period but particularly at those plants withdrawing water from the shoals.

d. Role of Vulnerability Assessment in the Estimate of Power-Plant Impact

To provide a qualitative evaluation of exposure to individual or combined plant impact on a fish species, one first needs to know the spawning and nursery requirements of that species. This information is derived from an analysis of the relationships between water-quality variables (temperature, salinity, dissolved oxygen) and the distribution of the eggs, larvae, juveniles in addition to general knowledge contained in the scientific literature. Such an analysis for striped bass eggs is presented in subsection C in this Section. Further analyses for the various life stages of other species will be discussed in a later report.

Given that one knows when organisms should be present in the vicinity of a plant's intakes, the actual numbers entrained or impinged will depend on the day/night near-field vertical and lateral distribution patterns, the intake avoidance and attraction factors, cooling-water withdrawal depths, plant pumping rates, and plant operating schedules. Through the combination of sound field-sampling programs, intake-design modification, and manipulation of the plant pumping rates and schedules, power-plant impact of the striped bass, white perch, and Atlantic tomcod populations in the Hudson River estuary can be minimized.

The direct impact estimates for 1973 and 1974 are discussed in Section VII.


FISHERIES SAMPLING DATA (APPENDIX D)
ICHTHYOPLANKTON SAMPLING DATA (APPENDIX D)
WATER-QUALITY PROGRAM (SUBSECTION D)
LIFE HISTORY, BEHAVIOR, AND PHYSIOLOGY (SUBSECTION B)
MOVEMENTS OF MARKED FISH (SUBSECTION E)
LONGITUDINAL RIVER SPATIOTEMPORAL DISTRIBUTION AND ABUNDANCE (SUBSECTION C)
PLANT NEAR-FIELD DISTRIBUTIONS
POWER-PLANT FACTORS
VULNERABILITY ASSESSMENT
ENTRAINMENT ESTIMATES
IMPINGEMENT ESTIMATES
DIRECT IMPACT (SECTION VII)

F. LITERATURE SOURCES

Literature sources examined to generate a life history/behavior description for striped bass, white perch, and Atlantic tomcod in the Hudson River estuary follow:

Bigelow, H.B. and W.C. Schroeder. 1953. Fishes of the Gulf of Maine. U.S. Fish Wildl. Serv. Fish. Bull. 53 (74): 577.

Booth, R.A. 1967. A description of the larval stages of the tomcod, *Microgadus tomcod*, with comments on its spawning ecology. Ph.D. Thesis (ms.), Univ. of Conn., 53 pp.

Carlson, R.T. and J.A. McCann. 1969. Evaluation of a proposed pumped-storage project at Cornwall, New York, in relation to fish in the Hudson River: Hudson River Fisheries Investigations, 1965-1968. Hudson River Policy Committee, NYSCD. 50 pp.

Doroshev, S.I. 1970. Biological features of the eggs, larvae and young of the striped bass, *Roccus saxatilis* (Walbaum), in connection with the problems of its acclimatization in the USSR. J. Ichthy. 10: 235-248.

Kerr, J.E. 1953. Studies on fish preservation at the Contra Costa Steam Plant of the Pacific Gas and Electric Company. Calif. Dept. Fish and Game, Fish Bull. 92: 66.

King, L.R. 1970a. Preliminary results of swimming speed and endurance studies on white perch as determined by the Beamish respirometer. Ichthyological Associates Report to Consolidated Edison Company of New York, Inc.

King, L.R. 1970b. Results of swimming speed and endurance studies on white perch as determined by the Beamish respirometer. Ichthyological Associates Report to Consolidated Edison Company of New York, Inc.

King, L.R. 1970c. Supplementary results of swimming speed and endurance studies on white perch as determined by the Beamish respirometer. Ichthyological Associates Report to Consolidated Edison Company of New York, Inc.

Leon, K.A. 1971. Low temperature swim-speed study of white perch, *Morone americana*, using a modified MacLeod apparatus. Ichthyological Associates Report to Consolidated Edison Company of New York, Inc.

Mansueti, R.J. 1958. Eggs, larvae, and young of the striped bass, *Roccus saxitilis*. Ches. Biol. Lab. Contr. 112: 35.

Mansueti, R.J. 1964. Eggs, larvae, and young of the white perch, *Roccus americanus*, with comments on its ecology in the estuary. Ches. Sci. 5 (1-2): 3-45.

Meldrim, J.W., J.J. Gift, and B.R. Petrosky. 1974. The effect of temperature and chemical pollutants on the behavior of several estuarine organisms. Ichthyological Associates, Inc., Bull. 11: 129.

Nichols, J.T. and C.M. Breder, Jr. 1927. The Marine fishes of New York and southern New England, Zoologica: N.Y. Zool. Soc. 9 (1): 166.

Perlmutter, A., E.E. Schmidt, and E. Leff. 1967. Distribution and abundance of fish along the shores of the lower Hudson River during the summer of 1965. N.Y. Fish and Game J. 14 (1): 47-74.

Rathjen, W.F. and L.C. Miller. 1957. Aspects of the early life history of the striped bass, *Roccus saxatilis*, in the Hudson River. N.Y. Fish and Game J. 4 (1): 43-60.

Sazaki, M., W. Heubach, and J.E. Skinner. 1972. Some preliminary results on the swimming ability and impingement tolerance of young-of-the-year steelhead trout, king salmon, and striped bass. Final Rpt. Anadromous Fish. Act Proj., Calif. AFS-13: 34.

Tathan, T.R. 1970. Swimming speed of white perch, *M. americana*, striped bass, *M. saxatilis*, and other estuarine fishes. Consolidated Edison Company of New York, Inc.

Thomson, K.S., W.H. Week III, and A.G. Taruski. 1971. Saltwater fishes of Connecticut. State Geol. and Nat. Hist. Sur. of Conn. Bull 105: 165.

Scott, W.B. and E.J. Crossman. 1973. Freshwater fishes of Canada. Fish. Res. Bd. of Can. Bull. 84.

Texas Instruments Incorporated. 1974. Fisheries survey of the Hudson River, March-December, 1973, V. IV. Prepared for Consolidated Edison Company of New York, Inc.

SECTION VII
DIRECT IMPACT ASSESSMENT

A. INTRODUCTION

The withdrawal of water by the power plants on the Hudson River may have an adverse effect on the fish populations in the river as a result of the entrainment of ichthyoplankton and the impingement of older fish. The effect of entrainment and impingement on the fish populations must be assessed to evaluate whether these populations can withstand the entrainment and impingement mortality from existing and additional power plants. The proportion of the fish populations cropped by entrainment and impingement can be considered the direct impact of the power plants; "direct" refers to entrainment or impingement rather than to indirect effects from such phenomena as increased temperature caused by heated effluents. Direct impact would be equivalent to cropping due to entrainment and impingement or to probability of dying from these causes of mortality. In the absence of compensatory changes in survival, impact could be defined as the proportional reduction in survival rate which is equivalent to the proportional reduction of the final population size. Our estimates of impact do not account for a possible compensatory increase in survival rate following impact; there is the potential for various density-dependent mechanisms to totally compensate for the reduction in the population due to entrainment and impingement, so the final population size could be the same after impact as it would have been in the absence of impact. The effective reduction of the population in the presence of compensation would be less than the proportion cropped as estimated by these methods, therefore, and must be evaluated in light of the evidence for compensation in the Hudson River population (Section VIII).

Mortality due to entrainment or impingement from the standpoint of fish population dynamics is essentially analogous to the cropping of a fish population through fishing; therefore, the evaluation of power-plant direct impact is parallel to some extent to evaluation of the effects of fishing mortality on a population. In the case of impingement, the same analytical procedures can be used. However, the dropping of young fish probably has a lesser effect on the population than does the cropping of adults, because the fish remaining after the cropping of some young may compensate to some extent before reproducing.

There have been several attempts to model the effects of power plants on the Hudson River fish populations, the most recent of which are the NRC and LMS models. TI's approach differs in that the power-plant impact evaluation is based more directly on empirical data and estimates of what has happened rather than predicting what will happen. For example, TI uses the empirical distributions of ichthyoplankton during the year in which the impact occurs rather than the initial distribution modified through time by a mathematical model of the river's hydrology to simulate the actual distributions over the long-term; also, TI's analysis uses the actual volumes of withdrawal by each operating plant in order to evaluate what actually occurred rather than estimate what might have occurred under the hypothetical conditions of maximal operation.

The direct impact estimates are determined from the numbers of fish entrained and impinged from the populations and are expressed as the proportion of the population cropped by each power plant and by the combination of plants which began operation after the 1972 entrainment season (Bowline and Indian Point Units 2). Actual numbers of organisms used in our assessment were determined by us; however, three parameters (withdrawal ratios, mortality, and recirculation) needed for estimating the number of ichthyoplankton cropped were evaluated theoretically and from preliminary data of other contractors, pending further studies.

The direct impact assessment presented in the section considers entrainment and impingement for striped bass and white perch but only impingement for other species. The 1973 ichthyoplankton survey was designed specifically to study striped bass; the entrainment impact on the 1974 year class of ichthyoplankton is being evaluated for striped bass, white perch, American shad, and other *Alosa* spp. For 1974, only striped bass and white perch entrainment are included in the report, since the data processing for the other species has not been completed. The numbers of striped bass, white perch, Atlantic tomcod, American shad, and other *Alosa* spp. impinged were estimated in the report by 3-month intervals from January 1973 through September 1974. Impingement impact was evaluated for striped bass, white perch, American shad, and other *Alosa* spp. for the year July 1973-June 1974 and, with the exception of white perch, reflects the impact on the 1973 year class of these species. Estimation of impingement impact on the 1974 year class of these species will not be completed until impingement through June 1975 has been evaluated and the fall 1974 mark/recapture population estimate of white perch and striped bass is completed in 1975.

The combined impact of entrainment and impingement was given only for the 1973 year class of striped bass, since no entrainment estimates were made on the 1973 year class of the other species. Combined direct impact on the 1974 year class will be presented in a later report after the impingement impact on the year class is evaluated.

B. ENTRAINMENT IMPACT ASSESSMENT

1. Introduction

Entrainment impact assessment is an estimation of the percentage of a year class of ichthyoplankton cropped by entrainment; it is a function of the temporal and spatial distribution and abundance of the ichthyoplankton and the temporal distribution and magnitude of the volumes of water withdrawn by the power plants. The water mass movement in the vicinity of the power plants and the ability of entrained fish to survive during passage through the plant also contribute to the magnitude of the impact. Entrainment impact can be expressed as the proportion of the ichthyoplankton that has been cropped by entrainment during the time from recruitment as eggs until the juveniles are no longer vulnerable to entrainment. This estimate is calculated from the population sizes and the numbers cropped throughout the entrainment season.

In assessing entrainment direct impact, the population size of the year class of ichthyoplankton entrained was determined from the empirically estimated standing crop that was adjusted for the proportion of the eggs of that year class which were spawned later in the spring. The proportion of the eggs producing the year class that were still in the ovaries of the parent stock during estimation intervals in the early part of the entrainment season (May and June) were calculated from the proportion of the year class of eggs that were present in the river after that estimation interval. The numbers of ichthyoplankton cropped by entrainment were determined from both empirical estimates and approximations. The densities of ichthyoplankton in the vicinity of each plant were estimated biweekly in 1973 and weekly in 1974; to allow for movement of the ichthyoplankton by tidal action, 13-mi regions centered at each plant were chosen as the basis for these densities. The volumes of water withdrawn by each plant were obtained from the plant operation logs. Because the ratios of the density of the ichthyoplankton in the withdrawn water to the density in the water in the plant river regions have not been empirically defined, the parameter was determined on the basis of theoretical considerations (Section II). The survival of the entrained ichthyoplankton through the plant was estimated from data collected by NYU at Indian Point in 1973, and the proportion of the ichthyoplankton recirculated after initial entrainment was determined from theoretical considerations on the basis of indirect empirical evidence for the existence of some recirculation of heated water at the Alden Laboratories physical model study of Indian Point (Larson, 1969).

Estimates of the proportion of striped bass ichthyoplankton cropped by entrainment in 1973 were made for 2-week intervals for each operating plant (Lovett, Bowline, Indian Point, and Danskammer). Estimates of the proportion of the striped bass and the white perch ichthyoplankton cropped by entrainment in 1974 were made for weekly intervals with the same methods for each operating plant (Lovett, Bowline, Indian Point, and Danskammer). Roseton began operation after the end of the 1974 entrainment season and thus is not included in the entrainment impact estimate in this report.

The objectives of entrainment direct impact estimation in the report are to:

- Estimate the proportion of the striped bass ichthyoplankton population cropped by entrainment in 1973 and 1974 at each of the power plants along the Hudson River

- Estimate the proportion of white perch ichthyoplankton population cropped by entrainment in 1974 at each of the power plants along the Hudson River

2. Methods

a. Ichthyoplankton Standing Crop and Population Estimation

To estimate the effective population size of the year class of ichthyoplankton during each sampling interval, the standing crop was estimated by the methods given in Appendix D and then adjusted for the recruitment to the year class that occurred subsequently. Before all the eggs producing a year class have been spawned (through June), the effective size of that year class is greater than the standing crop; thus, the proportion of the entire river standing crop that is entrained is greater than the corresponding effect on the population during this time period. For example, if only 10% of the eggs have been spawned up to and including an interval during which 10% of the ichthyoplankton present is entrained, the effective impact on the population would be only 1% and not 10%. To estimate the effect on the entire year class of all life stages, one must include the entire year class in the population even though some of the animals of the year class are not yet present in the standing crop. However, because the probability of survival to the juvenile stage is greater for later stages of ichthyoplankton than for earlier stages, the estimated number of unspawned eggs must be adjusted for the mortality previously experienced by the ichthyoplankton in the river. To estimate the proportional effect of entrainment during this time, a correction was applied to the standing crop to account for the eggs which had not yet been spawned so the effect on the entire year class could be estimated. The adjusted population size is the standing crop of all life stages of ichthyoplankton divided by the proportion of the total spawn which the standing crop represents.

Let

N_i = total standing crop of ichthyoplankton during i^{th} time interval

e_i or e_j = standing crop of eggs during i^{th} or j^{th} time interval

N_i^* = total standing crop during i^{th} time interval adjusted for eggs not yet spawned

s = number of time intervals during entrainment

t_i and t_j = number of days in i^{th} time interval (divides out because it was constant)

h_i and h_j = duration in days of egg stage from egg's deposition to hatching (divides out because it was assumed to be constant)

$$N_i^* = N_i \frac{\sum_{j=1}^{s} \frac{e_j t_j}{h_j}}{\frac{\frac{1}{2} e_i t_i}{h_i} + \sum_{j=1}^{i-1} \frac{e_j t_j}{h_j}}$$

$$\overset{*}{N}_i = N_i \frac{\sum_{j=1}^{s} e_j}{\frac{1}{2} e_i + \sum_{j=1}^{i-1} e_j}$$

For the first time interval in which ichthyoplankton are collected, the second term in the denominator is zero.

To evaluate the effect of the *Morone* ichthyoplankton that could not be identified to species, standing crops and densities of striped bass and white perch were estimated both with and without the inclusion of the unidentified *Morone*. The presence of unidentified *Morone* resulted from the difficulty in identifying some individuals in the post yolk-sac larval stage and from damage to some of the larvae during collection. The standing-crop estimates and densities including unidentified *Morone* are given in Appendix E.

b. Procedures for Estimating Number Cropped by Entrainment

1) Density Estimates

The geographical regions for which the densities were estimated in Appendix D do not correspond to the 13-mi regions in the vicinity of the plant; the densities in these 13-mi plant regions were estimated from a weighted average of the densities in the geographic regions that were partially included in the 13-mi plant regions. These plant-region density estimates (d_p) were calculated by life stages for each time interval from geographic river-region densities (the geographic river regions overlap plant regions) as follows:

$$d_p = \sum_r \frac{d_r b_r}{13}$$

where

b_r = overlap (in river miles) of r^{th} geographical region with plant region

d_r = density in r^{th} geographical region

The standard errors of the plant-region densities were calculated from

$$S_{d_p} = \sqrt{\sum_r \frac{b_r^2 \; S_{d_r}^2}{13^2}}$$

where

$S_{d_r}^2$ = variance of density in r^{th} geographical region

Estimates were made both with and without the inclusion of the *Morone* that could not be identified to species (Appendix E).

2) Volume of Water Withdrawn

The actual volume of water withdrawn by each plant was obtained from the respective plant operational logs (Appendix E). These values reflect the water withdrawn by the plants during their actual operation and are not the volumes that the plant would have withdrawn if the plants had been operating at maximum output.

3) Estimation of Number of Ichthyoplankton Entrained

Estimates of the number of ichthyoplankton entrained during an entrainment interval were calculated for each plant. To estimate the number entrained in the absence of recirculation and possible differences in the density of ichthyoplankton in the river water and intake water, each of the plant-region mean densities of ichthyoplankton was multiplied by the volume of water pumped during the interval of estimation (2 weeks in 1973 and 1 week in 1974) as follows:

$$E_p = V_p d_p$$

where

E_p = estimated number of entrained ichthyoplankton for specific plant unit without adjusting for ratio of density in intake to river, recirculation, or in-plant survival

V_p = volume of water pumped through plant during time interval for which ichthyoplankton density was calculated

d_p = estimated density of ichthyoplankton in 13-mi region of plant

Because the ichthyoplankton are not uniformly distributed laterally or vertically in the river (TI, 1974b), the density of ichthyoplankton in entrained water is probably not the same as the average density in the river water. The ratio of the density of ichthyoplankton in the entrained water to the density of ichthyoplankton in the plant region is represented by W; values of 0.5 and 1.0 are used for W_p in estimating entrainment to test the sensitivity of the estimates to the parameter. Our best working estimate is 0.5 (Section II). To allow for the likelihood that $W \neq 1$, we redefine the number of ichthyoplankton entrained to be

$$E_p = V_p d_p W$$

4) Effects of Recirculation and In-Plant Survival

More realistic estimates may be obtained by considering effects of various recirculation (reentrainment of previously entrained organisms) factors and in-plant survival regimes. Without detailed knowledge of the functional relationships between the Hudson River's hydrological and temperature and other parameters and ichthyoplankton in-plant mortality existing at each power plant, it is difficult to determine the degree to which entrainment cropping is reduced by recirculation of ichthyoplankton through the plants and by survival of entrained organisms; however, by making certain simplifying assumptions, it is possible to approximate the effects of recirculation and in-plant survival on entrainment kill. First, it is assumed that, of the total number of organisms in a power plant at a given time, a constant proportion R has been recirculated; thus, 1-R of the total are in the plant for the first time, (1-R)R of the total for the second time, and $(1-R)R^2$ for the third, etc. Next, it is assumed that a constant proportion q_p of the ichthyoplankton in a given life stage is cropped when they pass through the power plant.

To develop an expression accounting for both survival and recirculation, one can consider the entire volume of entrained water in a power plant at a given time. Two assumptions are needed:

- The proportion of water which has been recirculated is constant
- Proportional mortality is constant for all passages of ichthyoplankton through the plant

The total number of ichthyoplankton cropped (E_{ki}) in the i^{th} time interval may be estimated from the product of the number entrained, the once-through mortality, and the proportion of the total water volume which has been recirculated. For example, letting

R and q_p = recirculation and mortality factors defined

$(1-q_p)$ = proportion of ichthyoplankton surviving passage through plant

E_p = number of organisms entrained during the interval

E_1 = number cropped on first passage

Then,

$$E_1 = E_p q_p (1-R)$$

On later passages,

$$E_2 = E_p q_p (1-R) \; R(1-q_p)$$

$$E_3 = E_p q_p (1-R) \; R^2(1-q_p)^2$$

$$E_n = E_p q_p (1-R) \; R^{n-1}(1-q_p)^{n-1}$$

Summing all the terms above,

$$E_{ki} = E_p q_p (1-R) \sum_{j=0}^{n-1} \left[R(1-q_p)\right]^j$$

where

E_{ki} = total number of animals cropped by entrainment during i^{th} time interval

j = passage through plant of recirculated ichthyoplankton during i^{th} time interval

The sum of the infinite geometric series is

$$\sum_{j=0}^{\infty} \left[R\ (1-q_p)\right] = \frac{1}{1-R+R_{q_p}}$$

Therefore,

$$E_{ki} = E_p \frac{q_p - Rq_p}{1-R + Rq_p}$$

Evidence for the recirculation of water (Larson, 1969) indicates that, although some recirculation of water does occur at Indian Point during flood tides, the amount is low. We have chosen a value of 10% recirculation as our working estimate and have also used 0% recirculation as an alternate value. These values are in agreement with the NRC staff's (FES-IP3) assumption of no recirculation in their model and their statement that 10% is probably a more realistic value.

Data for survival through the plant from NYU's 1973 study of entrainment survival at Indian Point (NYU, 1974) indicated in-plant survival of approximately 20% for eggs, 40% for yolk-sac and post yolk-sac larvae, and 30% for early juveniles and will be referred to here as the NYU values. Similar values were used in the NRC model. Studies of entrainment of various species at other plants (Marcy, 1975) indicated in-plant survival to be very low, so a second value of no in-plant survival was used as an alternative to examine the sensitivity of this parameter. This is undoubtedly too low, but the maximum entrainment estimates without these adjustments provide an estimate that can be adjusted using the functional relationship of recirculation and in-plant mortality (Figure VII-1) to derive an estimate of proportion cropped at other intermediate values of in-plant survival and recirculation.

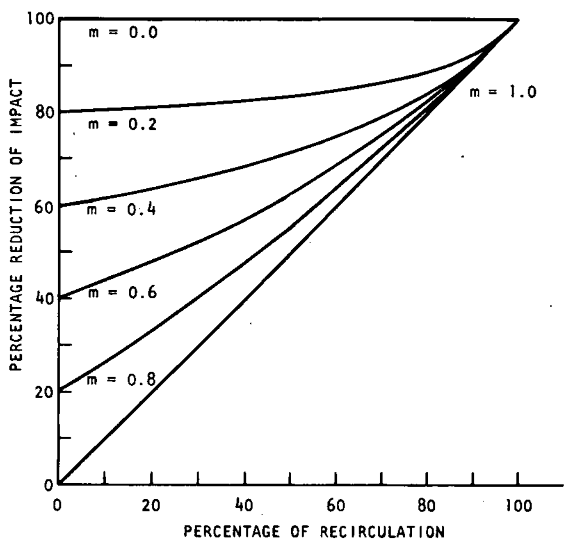


Figure VII-1

Relationship between Recirculation and Percentage Reduction of Entrainment Impact for Six Levels of In-Plant Mortality (m)

c. Entrainment Impact Estimation

Since the organisms entrained at an early life stage do not contribute to the proportional reduction of the population as much as do the organisms entrained at a later life stage, the proportion cropped cannot be estimated by summing the numbers cropped across time. Estimation of the proportion entrained within each time interval (2 weeks in 1973 and 1 week in 1974) permits an estimate of proportion entrained over the season, allowing for unequal probabilities of "natural" survival of ichthyoplankton of different ages. Combination of proportions rather than numbers across time accounts for natural mortality without requiring an estimate of natural mortality during each life stage. Changes in estimates of density and population size taken biweekly (1973) or weekly (1974) include natural mortality. The proportion cropped (all entrainable life stages combined) during each time interval is the ratio of the number cropped to the adjusted population during each time interval; thus,

$$q_{ie} = \frac{E_{ki}}{\overset{*}{N}_i}$$

Since the plants are competing sources of mortality during the time interval, q_{ie} does not represent the probability of an organism being cropped at the plant during that time interval in the absence of other plants. All estimates of proportion cropped by any plant are made against the background of all other sources of existing mortality including other operating plants. Within each time interval, the effects of the various plants are therefore additive. The proportion cropped by a plant during a time interval is the sum of proportions cropped by each of the units of the plant during the time interval.

When estimates of proportion cropped are combined across time, the interactions of the effects of the plants and other sources of mortality across time are reflected in the changes in the population size and densities. The proportion cropped by a plant during a time interval can be considered as the probability of being cropped during the time interval when these proportions are combined across time. For example, in estimating the seasonal impact of a plant,

$$q_e = 1 - \prod_{i=1}^{t} (1-q_{ie})$$

where

q_e = seasonal proportion cropped by plant

t = number of time intervals (i) included in estimate

q_{ie} = proportion of population cropped by plant in i^{th} time interval

3. Results

a. Striped Bass

1) Entrainment Impact in 1973

Estimates for the proportion of the striped bass ichthyoplankton population cropped by entrainment varied both among plants and among the biweekly intervals (Table VII-1). During 1973, the striped bass entrainment impact was highest at Danskammer under all the combinations of assumptions (Tables VII-1 and VII-2). Based on our best estimates of recirculation, mortality, and withdrawal, 6.6% of the striped bass ichthyoplankton were cropped by the combined entrainment at all plants in 1973. The post-1972 power plants (Bowline Unit 1 and Indian Point Unit 2) cropped 2.2% of the population.

Table VII-1

Estimates of Proportion of Striped Bass Ichthyoplankton Entrained during Each 2-Week Sampling Interval in 1973 Using Best Working Estimates of Assumptions (W, R, q_p)

Date	Post-1972 Plants (all units)	Bowline (Unit 1)	Lovett (all units)	Indian Point (Unit 2)	Indian Point (all units)	Danskammer (all units)	Multiplant (all units)
4/29-5/12	0.0002	< 0.0001	0.0001	0.0001	0.0002	0.0004	0.0008
5/13-26	0.0072	0.0053	0.0041	0.0019	0.0048	0.0025	0.0168
5/27-6/9	0.0020	0.0008	0.0007	0.0012	0.0018	0.0071	0.0104
6/10-23	0.0065	0.0029	0.0046	0.0036	0.0047	0.0039	0.0161
6/24-7/7	0.0034	0.0013	0.0014	0.0020	0.0024	0.0064	0.0116
7/8-21	0.0034	0.0011	0.0014	0.0022	0.0025	0.0073	0.0124
Total Proportion Entrained	0.0224	0.0115	0.0123	0.0104	0.0163	0.0274	0.0662

Table VII-2

Estimates* of Entrainment Impact on Striped Bass during 1973 Using Various Combinations of Assumptions (W, R, q_p)

In-Plant Mortality (q_p)	Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation	0.1		0.0		0.1		0.0	
Plant \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
Bowline (Unit 1)	0.0115	0.0230	0.0124	0.0247	0.0165	0.0327	0.0183	0.0363
Lovett (all units)	0.0123	0.0245	0.0132	0.0264	0.0181	0.0357	0.0200	0.0396
Indian Point (Unit 2)	0.0109	0.0218	0.0117	0.0233	0.0164	0.0326	0.0182	0.0362
Indian Point (all units)	0.0163	0.0325	0.0175	0.0348	0.0238	0.0472	0.0264	0.0523
Danskammer (all units)	0.0274	0.0541	0.0293	0.0579	0.0411	0.0808	0.0456	0.0895
Multiplant (all units)	0.0662	0.1289	0.0710	0.1379	0.0965	0.1854	0.1067	0.2042
Post-1972 plants (all units)	0.0224	0.0443	0.0240	0.0476	0.0326	0.0645	0.0362	0.0714

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

For all plants except Danskammer in 1973, the biweekly time periods having the highest entrainment cropping were May 13-26 and June 10-23; at Danskammer, entrainment cropping of striped bass was highest from May 27 to June 9 and from June 24 to July 14. After mid-July, entrainment is probably negligible, as indicated by the length-frequency distribution of entrained ichthyoplankton after this time at Indian Point (NYU data). An overestimation of impact may exist during the interval July 14-21 because some of the juveniles estimated to be entrained might actually have been impinged and thus included in the impingement impact analysis.

In addition to the estimates just discussed, other estimates were made using alternative values of the withdrawal, recirculation, and in-plant survival not directly measured by TI to determine the sensitivity of the estimates to these parameters (Table VII-2). Of these three parameters, the effect of using the alternative estimate rather than the more realistic estimate is greatest in the case of withdrawal because of the relatively larger difference between the best estimate and the alternative value. Difficulties in collecting data to estimate withdrawal are discussed in Section II-F.2 and in the FES-IP3 (pages V-89 through V-101.) Some of the problems include the use of different gear in the intakes and discharge versus the river, measurement of the volume of water strained in the intake and discharge collections, and differences in the velocity of the water through the nets among the intake, discharge, and river samples (causing probable differences of net avoidance among these samples). Setting withdrawal to 1.0 almost doubles the estimate; e.g., the 1973 entrainment impact estimate for the post-1972 plants goes from 2.2% to 4.4%. The value assigned to in-plant survival has a lesser effect but, in the alternative case of no in-plant survival, it would increase the estimate of the proportion cropped by entrainment by slightly less than 50%, which means the estimate of the entrainment impact of the post-1972 plants would increase from 2.2% to 3.3%. The alternative value of no recirculation would increase the estimate of the proportion cropped by less than 10%, which means the 1973 impact of the post-1972 plants goes from 2.2% to 2.4%.

2) Entrainment Impact in 1974

During the 1974 striped bass entrainment season, the proportion of striped bass cropped by entrainment during each week was fairly constant from May 20 through July 14 (Table VII-3). The proportion of striped bass ichthyoplankton population cropped by entrainment at Bowline Unit 1 was similar to that cropped in 1973 (Tables VII-1 through VII-4). The proportion cropped by entrainment at Lovett was almost one-third higher in 1974 than in 1973 but in both years was less than 2% of the population. The proportion cropped by entrainment at Danskammer in 1974 (1.3%) was less than half of the proportion cropped by entrainment there in 1973; on the other hand, Indian Point Unit 2 increased its proportion cropped by entrainment fivefold from 1973 to 1974. The 1974 estimate of the proportion entrained and cropped at Indian Point Unit 2 was 5.7%. Only about half of this increase at Indian Point Unit 2 is attributable to the increase in flow through the plant (Appendix E); the remaining increase is due to differences in distribution of the striped bass ichthyoplankton population in 1974 relative to the distribution in 1973. In 1974, the post-1972 plant entrainment cropping was estimated to be 8.1% of the striped bass population. The 1974 multiplant entrainment cropping was estimated to be 12.8%.

b. White Perch Entrainment

In contrast to the entrainment cropping estimates for striped bass, the proportion of the white perch ichthyoplankton population cropped by entrainment increased from May 6 through June 30 (Tables VII-5 and VII-7), with peak entrainment cropping occurring during the week of June 24-30 and then decreasing for the remaining 2-week periods of the entrainment season (May through mid-July). This pattern was similar at all of the plants.

The impact was < 5% at all of the plants, but even this may be an overestimate if some of the white perch ichthyoplankton life stages remain in Hudson River tributaries and hence are not included in the population estimate and also are not subject to entrainment.

Table VII-3

Estimates of Proportion of Striped Bass Ichthyoplankton Entrained during Each Weekly Interval in 1974 Using Best Working Estimates of Assumptions (W, R, q_p)

Date	Post-1972 Plants (all units)	Bowline (Unit 1)	Bowline (Unit 2)	Bowline (all units)	Lovett (all units)	Indian Point (Unit 2)	Indian Point (all units)	Danskammer (all units)	Multiplant (all units)
4/29-5/5	<0.0001	0.0	0.0	0.0	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/6-12	0.0005	0.0	<0.0001	<0.0001	0.0001	0.0005	0.0006	0.0	0.0008
5/13-19	0.0037	0.0	0.0012	0.0012	0.0018	0.0026	0.0039	0.0002	0.0070
5/20-26	0.0083	0.0	0.0	0.0	0.0024	0.0083	0.0117	0.0005	0.0145
5/27-6/2	0.0042	0.0	0.0	0.0	0.0010	0.0042	0.0057	0.0031	0.0098
6/3-9	0.0083	0.0005	0.0023	0.0028	0.0015	0.0055	0.0075	0.0023	0.0141
6/10-16	0.0115	0.0010	0.0021	0.0031	0.0029	0.0084	0.0120	0.0012	0.0192
6/17-23	0.0102	0.0016	0.0016	0.0033	0.0026	0.0069	0.0098	0.0020	0.0176
6/24-30	0.0121	0.0020	0.0025	0.0045	0.0024	0.0075	0.0101	0.0013	0.0183
7/1-7	0.0108	0.0020	0.0023	0.0042	0.0022	0.0065	0.0088	0.0011	0.0164
7/8-14	0.0143	0.0032	0.0034	0.0066	0.0019	0.0076	0.0092	0.0009	0.0186
Total Proportion Entrained	0.0808	0.0103	0.0154	0.0255	0.0186	0.0566	0.0765	0.0127	0.1285

Table VII-4

Estimates* of Entrainment Impact on Striped Bass in 1974 Using Various Combinations of Assumptions (W, R, q_p)

In-Plant Mortality (q_p)	Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation	0.1		0.0		0.1		0.0	
Plant \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
Bowline (Unit 1)	0.0103	0.0204	0.0109	0.0218	0.0161	0.0321	0.0179	0.0356
Bowline (Unit 2)	0.0154	0.0305	0.0164	0.0326	0.0238	0.0471	0.0263	0.0522
Bowline (all units)	0.0255	0.0504	0.0272	0.0538	0.0396	0.0779	0.0439	0.0863
Lovett (all units)	0.0186	0.0369	0.0199	0.0394	0.0280	0.0554	0.0311	0.0614
Indian Point (Unit 2)	0.0566	0.1103	0.0605	0.1177	0.0853	0.1641	0.0944	0.1808
Indian Point (all units)	0.0765	0.1479	0.0817	0.1576	0.1147	0.2176	0.1267	0.2390
Danskammer (all units)	0.0127	0.0252	0.0135	0.0268	0.0200	0.0396	0.0222	0.0439
Multiplant (all units)	0.1285	0.2422	0.1370	0.2571	0.1914	0.3498	0.2105	0.3810
Post-1972 plants (all units)	0.0808	0.1558	0.0862	0.1658	0.1219	0.2307	0.1346	0.2532

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table VII-5

Estimates of Proportion of White Perch Ichthyoplankton Entrained (Eggs Not Entrainable) during Each Weekly Interval in 1974 Using Best Working Estimates of Assumptions (W, R, q_p)

Date	Post-1972 Plants (all units)	Bowline (Unit 1)	Bowline (Unit 2)	Bowline (all units)	Lovett (all units)	Indian Point (Unit 2)	Indian Point (all units)	Danskammer (all units)	Multiplant (all units)
4/29-5/5.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-12	<0.0001	0.0	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0	<0.0001
5/13-19	<0.0001	0.0	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/20-26	0.0002	0.0	0.0	0.0	<0.0001	0.0002	0.0003	<0.0001	0.0005
5/27-6/2	0.0003	0.0	0.0	0.0	<0.0001	0.0003	0.0005	0.0003	0.0008
6/3-9	0.0005	<0.0001	0.0002	0.0002	<0.0001	0.0003	0.0004	0.0005	0.0012
6/10-16	0.0030	0.0003	0.0007	0.0010	0.0006	0.0020	0.0029	0.0009	0.0054
6/17-23	0.0096	0.0015	0.0015	0.0030	0.0024	0.0066	0.0093	0.0014	0.0162
6/24-30	0.0162	0.0026	0.0031	0.0057	0.0036	0.0105	0.0141	0.0009	0.0243
7/1-7	0.0104	0.0017	0.0020	0.0037	0.0024	0.0067	0.0090	0.0017	0.0167
7/8-14	0.0048	0.0010	0.0011	0.0020	0.0008	0.0028	0.0033	0.0028	0.0089
Total Proportion Entrained	0.0443	0.0071	0.0084	0.0155	0.0100	0.0292	0.0392	0.0086	0.0719

Table VII-6

Estimates* of Entrainment Impact on White Perch in 1974 (Eggs Not Entrainable) Using Various Combinations of Assumptions (W, R, q_p)

In-Plant Mortality (q_p)	Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation	0.1		0.0		0.1		0.0	
Plant \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
Bowline (Unit 1)	0.0071	0.0141	0.0076	0.0151	0.0113	0.0225	0.0126	0.0250
Bowline (Unit 2)	0.0084	0.0168	0.0090	0.0179	0.0134	0.0267	0.0149	0.0297
Bowline (all units)	0.0155	0.0308	0.0165	0.0328	0.0246	0.0488	0.0273	0.0541
Lovett (all units)	0.0100	0.0199	0.0106	0.0212	0.0159	0.0316	0.0177	0.0351
Indian Point (Unit 2)	0.0292	0.0577	0.0311	0.0614	0.0463	0.0910	0.0513	0.1007
Indian Point (all units)	0.0392	0.0773	0.0418	0.0823	0.0622	0.1214	0.0689	0.1342
Danskammer (all units)	0.0086	0.0171	0.0092	0.0183	0.0137	0.0273	0.0152	0.0303
Multiplant (all units)	0.0719	0.1398	0.0766	0.1486	0.1131	0.2160	0.1250	0.2376
Post-1972 plants (all units)	0.0443	0.0871	0.0472	0.0927	0.0701	0.1364	0.0776	0.1506

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table VII-7

Estimates of Proportion of White Perch Ichthyoplankton Entrained (Eggs Entrainable) during Each Weekly Interval in 1974 Using Best Working Estimates of Assumptions (W, R, q_p)

Date	Post-1972 Plants (all units)	Bowline (Unit 1)	Bowline (Unit 2)	Bowline (all units)	Lovett (all units)	Indian Point (Unit 2)	Indian Point (all units)	Danskammer (all units)	Multiplant (all units)
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-12	<0.0001	0.0	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/13-19	<0.0001	0.0	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002
5/20-26	0.0003	0.0	0.0	0.0	0.0001	<0.0003	0.0004	<0.0001	0.0005
5/27-6/2	0.000	0.0	0.0	0.0	0.0001	0.0008	0.0010	0.0004	0.0016
6/3-9	0.0069	0.0005	0.0024	0.0029	0.0008	0.0040	0.0055	0.0006	0.0098
6/10-16	0.0067	0.0009	0.0020	0.0028	0.0010	0.0039	0.0056	0.0009	0.0104
6/17-23	0.0097	0.0015	0.0015	0.0031	0.0025	0.0066	0.0093	0.0014	0.0163
6/24-30	0.0166	0.0026	0.0032	0.0058	0.0037	0.0108	0.0145	0.0010	0.0249
7/1-7	0.0105	0.0017	0.0020	0.0037	0.0024	0.0068	0.0091	0.0017	0.0169
7/8-14	0.0048	0.0010	0.0011	0.0020	0.0008	0.0028	0.0033	0.0028	0.0089
Total Proportion Entrained	0.0549	0.0082	0.0120	0.0202	0.0113	0.0354	0.0478	0.0090	0.0862

The values assigned to recirculation, in-plant survival, and withdrawal were the same as those used in the striped bass estimation. Because of this, the relative effect of these parameters on the entrainment cropping estimate is similar to the effects in the striped bass entrainment cropping estimate.

Hypothetically, considering eggs to be entrainable had little effect on the estimates (Tables VII-6 and VII-8). The estimate which we consider to be realistic (R = 0.1, q_p = 1973 NYU data for striped bass, and W = 0.5) was increased from 4.4% to 5.5% by the inclusion of eggs for the plants that began operation after the 1972 entrainment season (Tables VII-5 and VII-7). For multiplant as a whole, these estimates increased from 7.2% to 8.6%.

Table VII-8

Estimates of Entrainment Impact on White Perch in 1974 (Eggs Entrainable) Using Various Combinations of Assumptions (W, R, q_p)

In-Plant Mortality (q_p)	Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation	0.1		0.0		0.1		0.0	
Plant \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
Bowline (Unit 1)	0.0082	0.0164	0.0088	0.0175	0.0127	0.0252	0.0141	0.0280
Bowline (Unit 2)	0.0120	0.0240	0.0129	0.0257	0.0178	0.0354	0.0198	0.0393
Bowline (all units)	0.0202	0.0400	0.0216	0.0428	0.0303	0.0599	0.0337	0.0664
Lovett (all units)	0.0113	0.0225	0.0121	0.0241	0.0175	0.0348	0.0195	0.0386
Indian Point (Unit 2)	0.0354	0.0697	0.0378	0.0745	0.0538	0.1052	0.0596	0.1163
Indian Point (all units)	0.0478	0.0937	0.0510	0.1000	0.0723	0.1404	0.0801	0.1550
Danskammer (all units)	0.0090	0.0179	0.0096	0.0190	0.0142	0.0282	0.0157	0.0312
Multiplant (all units)	0.0862	0.1662	0.0920	0.1770	0.1297	0.2455	0.1433	0.2695
Post-1972 plants (all units)	0.0549	0.1074	0.0587	0.1147	0.0828	0.1599	0.0916	0.1764

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

4. Discussion

The shift in the distribution of striped bass ichthyoplankton between 1973 and 1974 (Section VI) increased the vulnerability of the ichthyoplankton to Indian Point in 1974 relative to 1973 and decreased their vulnerability to Danskammer in 1974 relative to 1973. ~~In both 1973 and 1974, the temporal~~ pattern of vulnerability of striped bass to entrainment at Danskammer differed from the temporal patterns at Lovett, Bowline, and Indian Point. The seasonal pattern of vulnerability to entrainment at Danskammer was more uniform in 1974, and the peak times of vulnerability (Appendix E) were later than at the other plants. Since Roseton is located close to Danskammer, the vulnerability to Roseton would probably have been similar to that of Danskammer had Roseton been operating during the 1974 entrainment season (May through mid-July). These changes in distribution of the striped bass ichthyoplankton are reflected in the increased entrainment impact at Bowline, Lovett, and Indian Point and the decrease in the entrainment impact at Danskammer in 1974 from 1973 relative to the volumes of water pumped. The differences in the relative impact of the plants in 1973 relative to 1974 indicate considerable variations from year to year on a plant-specific basis.

Because the 1973 ichthyoplankton sampling program was not designed to estimate the white perch ichthyoplankton population (it was designed specifically for striped bass), only the 1974 entrainment cropping estimate is available at the present time. In general, the pattern of vulnerability of white perch ichthyoplankton was more uniform at all of the plants, reaching maximal densities in the vicinity of the plants between June 10 and June 30. Densities in the vicinity of the plants were higher in the earlier part of the period at Danskammer and in the later part of the period at Bowline, with Indian Point and Lovett intermediate (Tables VII-6 and VII-7). The peak entrainment season at these plants (June 17-July 7) was also approximately 1 week later than at Danskammer. The high entrainment for July 1-7 reflects the lower population size at the time and the similarity of the densities in the vicinities of the plants during this week with the two previous weeks. However, the proportion of white perch ichthyoplankton population cropped by entrainment during 1974 was low (4.4-5.5%) because of the low entrainment cropping during the remainder of the entrainment season regardless of whether eggs are considered to be entrainable.

One can conclude from these patterns that entrainment impact is dependent on spatial and temporal distribution of the ichthyoplankton with respect to the pumping schedules of the various power plants. The spatial and temporal patterns of ichthyoplankton distribution vary from season to season and may depend on such things as tidal patterns, freshwater flow, and water temperature, which may act through the time and location of spawning or the redistribution of eggs and larvae.

Entrainment impact is limited to approximately the first 2.5 months of a striped bass' or white perch's life. This estimate of direct impact should not be viewed as the end effect of the power plants on the population of these species. The effect of the power plants on the population may be higher due to impingement impact later in the fish's life or lower if compensation is greater than the magnitude of entrainment. Evidence for a strong compensatory mechanism in striped bass has been found (Section VIII); hence, these estimates of impact should not be considered to be estimates of population reduction.

C. IMPINGEMENT DIRECT IMPACT

1. Introduction

Impingement direct impact can be viewed as the annual reduction of the fish population due to impingement, assuming the absence of other sources of mortality and not including the ameliorating effects of compensation. The impingement impact was estimated by the method described by Ricker (1958, page 24) for analyzing mortality in a fishery. Impingement is a function of the temporal and spatial distribution and abundance of the fish, the volumes of water withdrawn, the intake velocities at the plants, and swim speed and diel movements of the fish. Impingement impact is expressed as the probability of a fish being impinged during a year and is analogous to the entrainment direct impacts estimated earlier in the section. The interval between July 1973 and June 1974 was chosen in order to include a year of impact on the 1973 year class.

The estimate of impingement impact was calculated from the estimated population sizes in the fall of 1973 and the number of fish impinged between July 1973 and June 1974. The fall population sizes of white perch and striped bass were estimated from a mark/recapture study. The fall population sizes of American shad and other *Alosa* spp. were estimated from an extrapolation of the catch per unit area by the beach seines. Fish impinged at

Indian Point were counted daily; thus, no estimation was needed. The numbers of fish impinged at Bowline, Lovett, Roseton, and Danskammer were estimated from counts on sample days and the volumes of water withdrawn, using a ratio estimation method. Although not included in the direct impact estimation in the report, the numbers of striped bass, white perch, American shad, and other *Alosa* spp. impinged from January through June 1973 and from July through September 1974 were also estimated, as were the number of Atlantic tomcod impinged between January 1973 and September 1974. The objectives of impingement impact assessment in this report were to:

- Estimate the number of striped bass, white perch, Atlantic tomcod, and other *Alosa* spp. (alewife and blueback herring) impinged at each operating plant (by units if possible) from 1 January 1973 through September 1974

- Estimate fall standing crop of striped bass, white perch, American shad, and other *Alosa* spp. subject to impingement from 1 July 1973 through June 1974

- Estimate the proportion of the fall 1973 populations of striped bass, white perch, American shad, and other *Alosa* spp. (alewife and blueback herring) impinged at each operating plant (by units if possible) from 1 July 1973 through June 1974. (This is the annual expectation of death from impingement)

- Estimate the direct impact of impingement on striped bass, white perch, American shad, and other *Alosa* spp. (alewife and blueback herring) from 1 July 1973 through June 1974. (This is the annual mortality rate from impingement)

2. Methods

a. Impingement Estimation

Impingement monitoring by LMS provided data for estimating the number of fish impinged at the Bowline, Lovett, and Danskammer plants. Impingement of striped bass, white perch, Atlantic tomcod, American shad, and other *Alosa* spp. for each unit was estimated based on data from the LMS impingement monitoring program (Appendix F) and plant pumping rates. Orange and Rockland Utilities Inc. and Central Hudson Gas and Electric Corporation provided plant pumping rates (Appendix F). Daily impingement monitoring at Indian Point provided actual counts of impinged fishes, so no estimation was required.

Estimates of the number of fish impinged for the period January 1973-September 1974 were made for 3-month intervals to minimize the variance due to short-term changes in impingement. The following usual ratio estimation procedure was used:

$$Y_T = \sum_j Y_j$$

$$Y_j = Z_j R_j$$

where

Y_j = number of fish impinged in j^{th} 3-month interval

Z_j = circulator flow for j^{th} 3-month interval

R_j = ratio of fish impinged to circulator flow for j^{th} 3-month interval

Y_T = total number of fish impinged

and

$$R_j = \frac{\sum_i y_i}{\sum_i z_i}$$

where

y_i = number of fish impinged during i^{th} sample period

z_i = circulator flow during i^{th} sample period

These usual ratio estimates were believed to be more accurate than alternative estimates (simple expansion, individual ratio, and individual ratio with correction; see Appendix F) since correlation between daily impingement and flow rates probably existed.

The variances S_y^2 and standard errors S_y of the estimates were calculated as follows:

$$S_{y_j}^2 = \frac{N_j (N_j - n_j)}{n_j (n_j - 1)} \left(\sum_i y_i^2 + R_j^2 \sum_i z_i^2 - 2R_j \sum_i y_i z_i\right)$$

$$S_y \text{ total} = \sqrt{\Sigma S_{y_j}^2}$$

where

n_j = number of sampled days during j^{th} 3-month interval

N_j = number of plant operational days during j^{th} 3-month interval

The assumptions necessary in utilizing this ratio estimator and corresponding variance estimate are presented in Appendix F.

b. Population Estimation

Petersen estimates (see Appendix F for computational methods) of the size of the fall 1973 populations of young-of-the-year, yearling, and older white perch and young-of-the-year striped bass were derived from a mark/recapture program which has been in continuous operation since April 1972 (Section III). An interval of about 6 months was allowed between the time of release of the majority of marked fish and their recovery; the long separation between release and recovery periods helped to insure random mixing of marked and unmarked individuals in the population. The population was stratified by size to avoid differential recapture rates due to gear selectivity, marking methods, or fish distribution. Young-of-the-year and older fishes were estimated separately.

Petersen estimates of the fall 1973 populations of young-of-the-year, yearling, and older white perch and young-of-the-year striped bass were made using the following spring as a recovery period. The estimates were compared to earlier estimates of the same fall 1973 populations (TI, 1974b) based on recapture of fish both marked and recovered in the fall of 1973; these earlier estimates had been made using the Petersen method and the Schumacher-Eschmeyer method (see Appendix F for computational methods).

The 1973 populations of juvenile American shad, blueback herring, and alewife were estimated using catch per unit effort (CPUE) for each of these species by 31-m (100-ft) beach seine. Standing crops within the shore zone [defined as the surface area associated with depths of ≤ 3 m in each of the 12 river regions (Appendix D)] were calculated biweekly as follows:

$$\text{Regional standing crop} = \text{CPUE} \times A_R / A_S$$

where

CPUE = mean biweekly catch per unit effort within region

A_R = estimated surface area within regions for depths of 0 to 10 ft (3 m)

A_S = estimated surface area swept by 100-ft (30.5-m) beach seine set perpendicular to shoreline and towed in semicircle to beach (~ 450 m^2)

The highest biweekly standing crop computed for each species during late summer and early fall was chosen as the population estimate for that species; this method gives an estimate which is biased low because some fish do occur in water deeper than 3 m. For a valid estimate of the total standing crop by this method, one must assume that

- All fish occur within the 0- to 3-m stratum at the time of sampling
- The mean sample concentration (expressed as catch per unit area) is an unbiased estimate of the mean concentration in the 0- to 10-ft stratum of the whole region

c. Direct Impact Estimation

Impingement direct impact (q_e) is expressed as the annual probability of a fish being killed by impingement or as the annual mortality rate from impingement. The following equation was used to calculate direct impact:

$$\%\,\text{direct impact} = \left[1 - \frac{(1 - q_T)}{(1 - q_n)}\right] \times 100 = q_e \times 100$$

where

q_T = observed annual mortality rate (proportion dying)

q_n = annual mortality rate expected in absence of impingement (natural mortality rate)

The natural mortality rate may be calculated as follows (derivation in Appendix F):

$$q_n = 1 - (1 - q_T)^{\left[1 - \frac{D_I}{q_T}\right]}$$

where

D_I = expectation of death from impingement (actual proportion of initial population dying from impingement), not per-interval mortality rate due to impingement in absence of other mortality; i.e.,

$$D_I = \frac{\text{number of fish impinged}}{\text{initial population size}}$$

In this analysis, the natural mortality rate is assumed to be constant; i.e., there are no compensatory changes as the mortality rate from impingement changes.

From the impingement estimates and the population estimates, the expectation of death due to impingement (D_I) at each power plant was calculated for striped bass, white perch, American shad, and other *Alosa* spp. Since no estimates of the annual probability of dying from all causes (q_t) are presently available for any of the species in the Hudson River, the annual probability of dying from nonimpingement causes (q_n) was calculated for each D_I at various levels of q_t over the range of 0.10-0.90; the resultant values of q_n and their corresponding values of q_t were used to calculate the percent direct impact for each D_I over the entire range of q_n.

In the impingement estimates presented, it was assumed that all fish impinged were collected on the day of impingement; however, some fish may have been impinged and subsequently washed back into the river by either tidal action or by the screen-washing process. There was also the possibility that some of the impingement collection at plants where daily collections were not made was composed of fish impinged but not collected on previous days. These two sources of error may have caused either an overestimate or an underestimate of the actual impingement rate and, together, constitute collection efficiency, which is defined as follows:

$$\% \text{ collection efficiency} = (1 - \emptyset + P) \times 100$$

where

$\emptyset$ = probability of an impinged fish being lost before collection

P = probability of an impinged fish being reimpinged after its initial screen loss

Direct impact on juvenile striped bass was estimated for several hypothetical values of collection efficiency ranging from 10% to 150% and for several values of nonimpingement mortality ranging from 0.05 to 0.95 at D_I = 0.05.

3. Results

a. Impingement Estimates

The impingement estimates with standard errors for striped bass, white perch, Atlantic tomcod, American shad, and other *Alosa* spp. for each power plant and each 3-month period from January 1973 through September 1974 are presented in Appendix F, as are the power-plant flow rates associated with these estimates.

Seasonal trends were noted in the impingement of striped bass and white perch, with impingement generally heaviest at Danskammer, Indian Point, and Lovett in the fall and becoming heaviest at Bowline in the winter and early spring. This pattern may reflect a downriver movement of juvenile striped bass and white perch with the approach of winter. An upriver movement of both species probably occurred in the spring after they overwintered in Haverstraw Bay and the Indian Point regions. Impingement usually increased at Lovett, Indian Point, and Danskammer from the January-March period to the April-June period in both 1973 and 1974. From July-September through October-December 1973, there was an apparent increase of impingement of both striped bass and white perch at all plants. Roseton began operation in August 1974, and the impingement of all species at this plant was similar to or lower than that at nearby Danskammer.

Atlantic tomcod impingement greatly decreased from January-March to April-June 1973 for all plants except Indian Point. Adult tomcod movement downstream after spawning might explain this decrease (Section VII, subsection D). Tomcod impingement during April-June 1973 at Indian Point was due primarily to young-of-the-year impinged during late spring (TI, 1974a). A drop in impingement at Danskammer was apparent from January-March to April-June 1974. The other plants incurred increased tomcod impingement during this period, following the Indian Point 1973 pattern, as young-of-the-year grew to impingeable size. At all plants but Danskammer, impingement of tomcod was substantially greater during July-September 1974 than during the same period in 1973.

American shad impingement estimates were generally too small to show any definitive pattern. The highest single period of impingement of shad occurred during April-June 1974 at Indian Point. Shad impingement was higher at all plants combined during July-September 1974 (primarily the 1974 year class) than during July-September 1973 (primarily the 1973 year class).

Impingement estimates for other *Alosa* spp. were much higher in April-June than in January-March 1973 in all plants, a pattern again repeated for the January-March and April-June 1974 period for all plants except Bowline. Except for Indian Point, impingement of *Alosa* spp. other than shad was lower during July-September 1974 than during July-September 1973.

b. Population Estimates

Petersen estimates of young-of-the-year and yearling and older white perch calculated from spring recaptures of fall marks (Table VII-9) were four to five times larger than Petersen and Schumacher-Eschmeyer estimates of the same populations in fall 1973. Although the fall estimates were not made for the entire estuary, the majority of young-of-the-year white perch occur between RM 12 and 62 (Section VI) after mid-August; therefore, the fall and spring estimates of the fall population are roughly comparable.

Differences in the estimates can be examined in terms of the assumptions that must be met for valid estimates by mark/recapture techniques (Ricker, 1958). The assumption of random mixing of marked and unmarked fish in the population appeared to be the most probable source for the difference between fall and spring estimates of the fall 1973 populations. The 6-month interval between release and recovery of the majority of the marked fish in the spring recapture period allowed sufficient time for mixing within the population and between river regions. Recoveries of fin-clipped and tagged white perch throughout this time indicated considerable movement by fish of all age groups (Section VI, mark/recapture results). Insufficient mixing probably occurred during the fall estimation period, causing an under-estimate of the population size. Appendix F discusses the extent to which other assumptions were met.

Table VII-9

Population Estimates of White Perch in Hudson River Estuary for Fall 1973

Population	River Miles*	Estimate	95% Confidence Interval	Type Estimate	Marking Period	Recapture Period
Young-of-the-year	12-153 (19-245)	7,824,000†	5,652,000 - 12,704,000	Petersen	Mid-Aug - Nov 1973	Jan - June 1974
Young-of-the-year	12-62 (19-99)	1,992,000‡	1,579,000 - 2,773,000	Petersen	Sep - Oct 1973	Nov - Dec 1973
Young-of-the-year	12-62 (19-99)	1,549,000‡	906,000 - 5,345,000	Schumacher -Eschmeyer	Mid-Aug - Oct 1973	Mid-Aug - Oct 1973
Young-of-the-year	12-62 (19-99)	2,340,000†	1,731,000 - 3,609,000	Petersen	Mid-Aug - Sep 1973	Mid-Oct - Dec 1973
Yearling and older	12-153 (19-245)	7,225,000†	4,615,000 - 16,631,000	Petersen	Mid-Aug - Nov 1973	Jan -June 1974
Yearling and older	12-62 (19-99)	1,467,000‡	995,000 - 2,801,000	Petersen	Mid-Aug - Oct 1973	Nov - Dec 1973
Yearling and older	12-62 (19-99)	1,367,000‡	764,000 - 6,501,000	Schumacher -Eschmeyer	Sep - Nov 1973	Sep - Nov 1973

*Numbers in parentheses indicate kilometers.

†Excludes impingement catch and recaptures; excludes right and left pelvic fin clips and double pelvic fin clips.

‡From 2nd Annual Report, Texas Instruments Incorporated, 1974.

The spring estimate of the young-of-the-year striped bass population (Table VII-10) was not greater than the fall estimate as was the case with the white perch estimates. There are at least two possible explanations for this: either the marked and unmarked striped bass were more randomly mixed during the fall than were the white perch or marked and unmarked bass were lost from the populations at unequal rates. A disproportionate emigration of marked and unmarked individuals from the study area may have occurred if most of the marks were applied to fish in the most upstream portion of the population, i.e., the portion least likely to emigrate from the study area by the spring recovery period. Because of these possible violations of assumptions in the spring estimate, the fall population estimate of 1,680,000 was used for computing impingement direct impact.

Table VII-10

Population Estimates of Striped Bass Young-of-the-Year in Hudson River Estuary for Fall 1973

Population	River Miles*	Estimate	95% Confidence Internal	Type Estimate	Marking Period	Recapture Period
Young-of-the year	12-153 (19-245)	1,387,000	841,000 - 3,964,000	Petersen	Mid-Aug-Nov 1973	Jan-May 1974
Young-of-the year	12-62 (19-99)	1,680,000‡	1,290,000 - 2,405,000	Petersen	Mid-Aug-Nov 1973	Dec 1973
Young-of-the year	12-62 (19-99)	1,641,000†	1,110,000 - 3,144,000	Schumacher-Eschmeyer	Mid-Aug-Oct 1973	Mid-Aug-Oct 1973

*Numbers in parentheses indicate kilometers.
†From 2nd Annual Report, Texas Instruments, 1974.
‡Used for calculating impingement direct impact.

Inasmuch as only the shore zone was included and gear avoidance was likely, standing-crop estimates of young-of-the-year clupeids (Table VII-11) represent minimum numbers of each species present in the estuary during the time intervals; older fish of that species or young-of-the-year occupying the channel, bottom, and shoal zones of the river in depths > 10 ft (3 m) are not included.

Table VII-11

Young-of-the-Year Clupeid Standing-Crop Estimates Determined from Daytime Beach-Seine Survey of Hudson River Estuary, RM 12-153 (km 19-245) for 1973

Species	Age Group	Time Interval	Mean Standing Crop
American shad	Young-of-the-year	15 Jul-28 Jul	4,829,000
Alewife	Young-of-the-year	29 Jul-11 Aug	3,114,000
Blueback herring	Young-of-the-year	26 Aug-8 Sep	29,386,000

c. Impingement Direct Impact

The direct impact of impingement on striped bass, white perch, American shad, and other *Alosa* spp. for each power plant from July 1973 through June 1974 is presented graphically in Figures VII-2 through VII-5. Figures VII-5 through VII-8 show the impact of all plants combined and of plants that began operation after 1972 (Bowline and Indian Point Unit 2) for the same 12-month period. Estimates are for percent direct impact for any hypothetical value of nonimpingement mortality (q_n) within the range of 0.10 to 0.95 for a specific level of expectation of death from impingement (D_I); values of D_I were calculated for each species from impingement data and population estimates and are presented within the figures. The direct impact on striped bass, American shad, and other *Alosa* spp. was considered to be on the most recent year class or those fish spawned during 1973. Juvenile and older white perch, because of their year-long residence in the estuary, were combined for estimates of direct impact. Since no appropriate population estimates of Atlantic tomcod were available for use in computing direct impact of impingement, tomcod are not included.

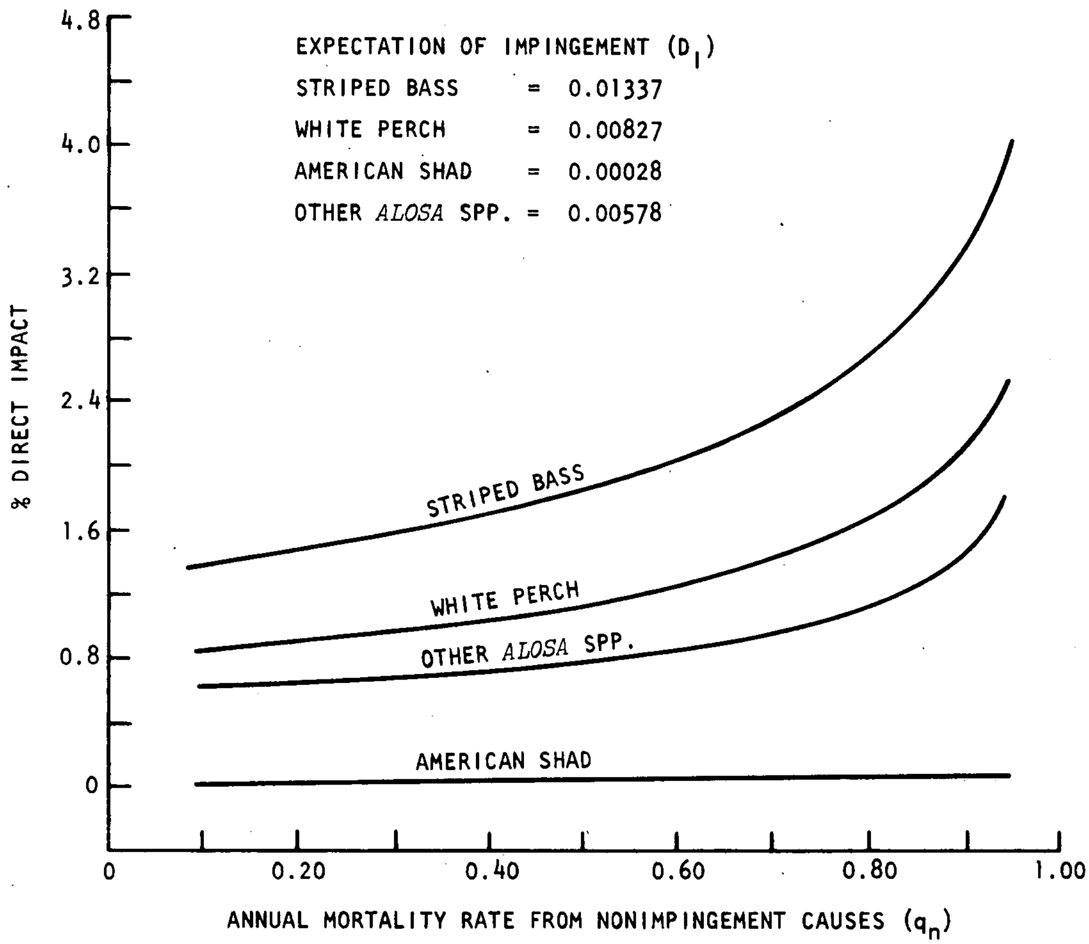


Figure VII-2. Relationship between Annual Mortality Rates from Nonimpingement Causes and Percent Direct Impact on Striped Bass, White Perch, American shad, and Other *Alosa* spp. Based on Estimated Expectations of Death from Impingement at Danskammer Generating Station, July 1973-June 1974

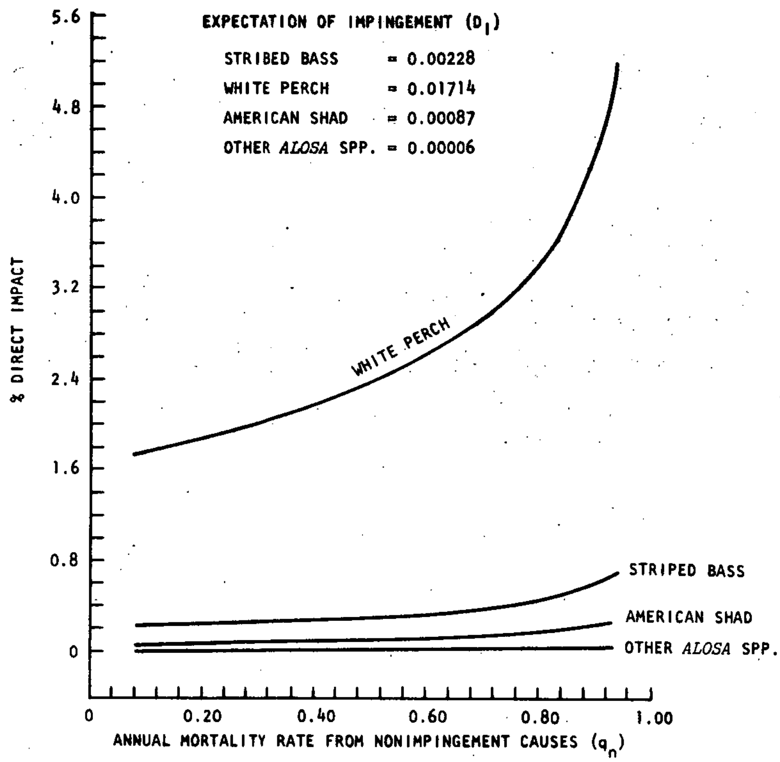


Figure VII-3. Relationship between Annual Mortality Rates from Nonimpingement Causes and Percent Direct Impact on Striped Bass, White Perch, American Shad, and Other *Alosa* spp. Based on Estimated Expectations of Death from Impingement at Indian Point Generating Station, Units 1 and 2, July 1973-June 1974

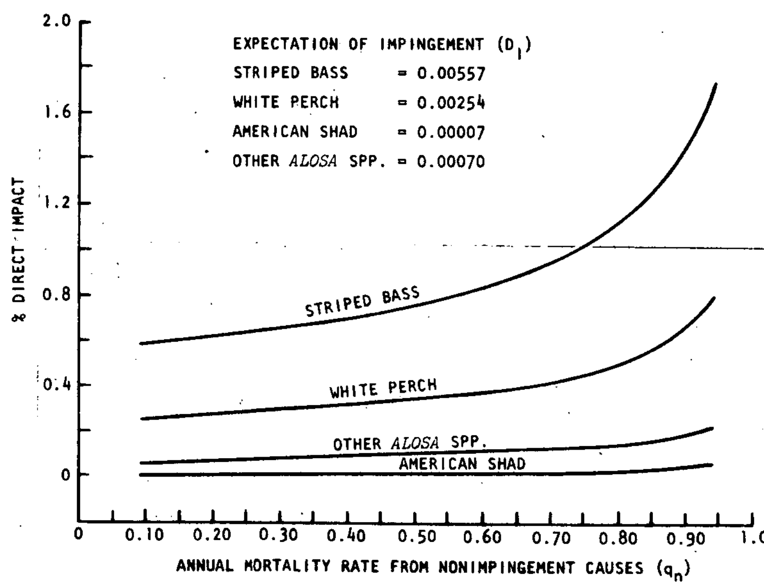


Figure VII-4. Relationship between Annual Mortality Rates from Nonimpingement Causes and Percent Direct Impact on Striped Bass, White Perch, American Shad, and Other *Alosa* spp. Based on Estimated Expectations of Death from Impingement at Lovett Generating Station, July 1973-June 1974

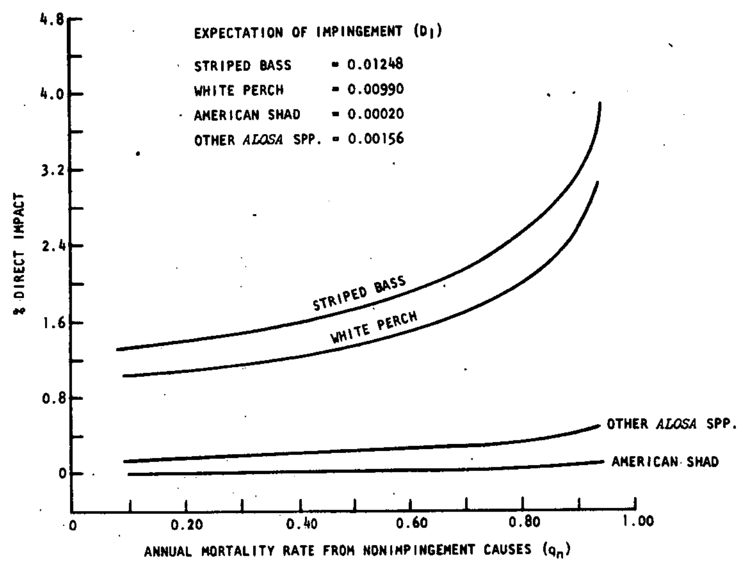


Figure VII-5. Relationship between Annual Mortality Rates from Nonimpingement Causes and Percent Direct Impact on Striped Bass, White Perch, American Shad, and Other *Alosa* spp. Based on Estimated Expectations of Death from Impingement at Bowline Generating Station, July 1973-June 1974

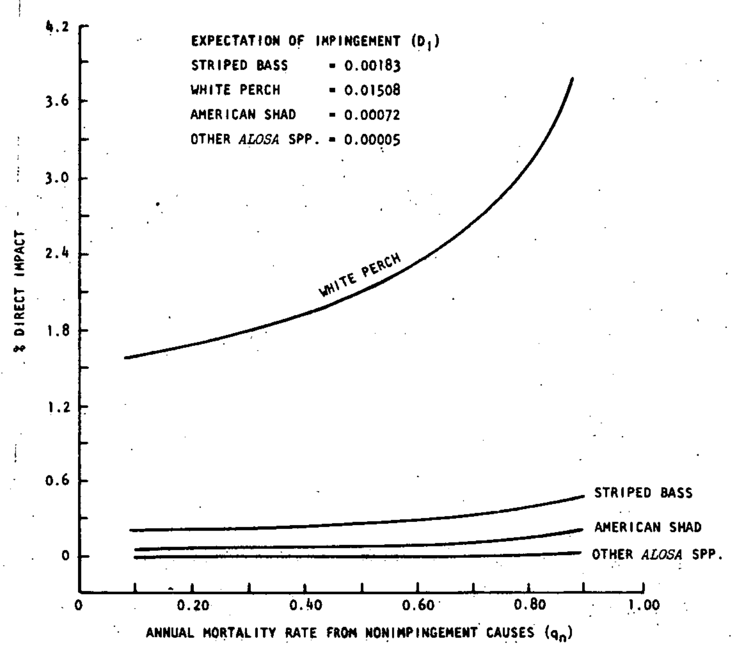


Figure VII-6. Relationship between Annual Mortality Rates from Nonimpingement Causes and Percent Direct Impact on Striped Bass, White Perch, American Shad, and Other *Alosa* spp. Based on Estimated Expectations of Death from Impingement at Indian Point Generating Station, Unit 2, July 1973-June 1974

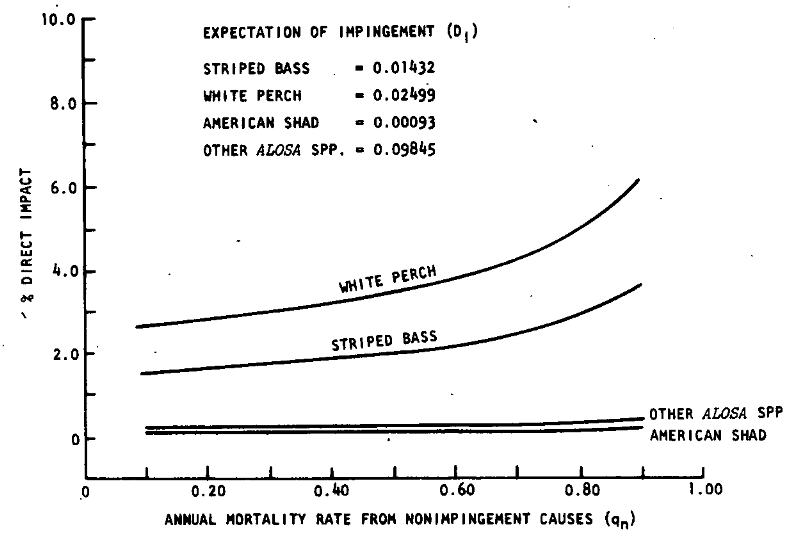


Figure VII-7. Relationship between Annual Mortality Rate from Nonimpingement Causes and Percent Direct Impact on Striped Bass, White Perch, American Shad, and Other *Alosa* spp. Based on Estimated Expectations of Impingement at Power Plants That Began Operation after 1972, Bowline and Indian Point, Unit 2, July 1973-June 1974

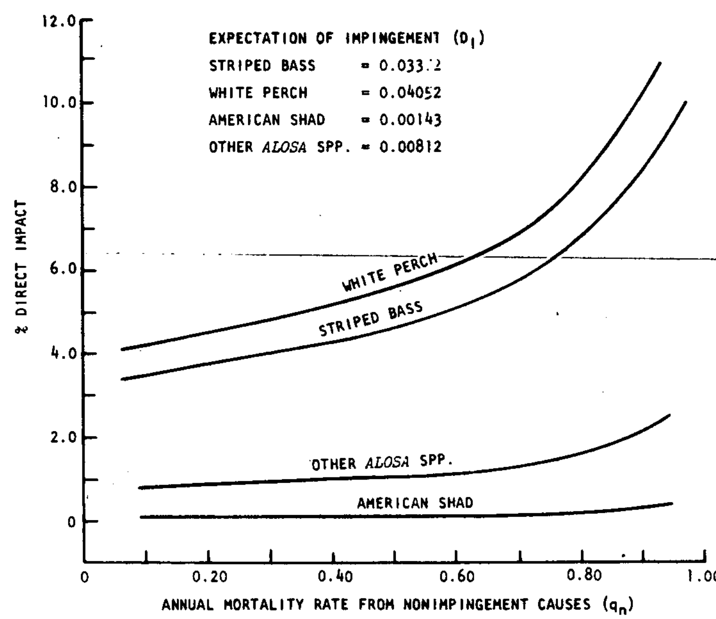


Figure VII-8. Relationship between Annual Mortality Rates from Nonimpingement Causes and Percent Direct Impact on Striped Bass, White Perch, American Shad, and Other *Alosa* spp. Based on Estimated Expectations of Death from Impingement at All Power Plants Combined, July 1973-June 1974

Since actual values of nonimpingement mortality rates (q_n) in the Hudson River are presently unknown, an alternative was to choose a range of realistic values. Assuming that the real q_n fell between 0.40 and 0.80 for each species, direct impact for the four plants combined (Figure VII-8) would range as follows:

	% Direct Impact
Striped bass	4.3-6.7
White perch	5.2-8.2
American shad	0.1-0.2
Other *Alosa* spp.	1.0-1.6

Thus, over the range of q_n (0.40-0.80), impingement direct impact for any species was no more than 8.2%; only at extremely high (and probably unrealistic) values of q_n did impact values increase at a more rapid rate.

Plants that began operation after 1972 (Bowline Units 1 and 2 and Indian Point Unit 2) were responsible for a major portion of the impact on white perch and American shad (Figure VII-7). Impact values for these plants, assuming a range of q_n from 0.40 to 0.80 were as follows:

	% Direct Impact
Striped bass	1.8-2.8
White perch	3.2-5.0
American shad	0.1-0.2
Other *Alosa* spp.	0.2-0.3

Impingement direct impact was higher at all plants for striped bass and white perch than for American shad and other *Alosa* spp. Also, impact on striped bass was higher than on white perch at all plants except Indian Point where the reverse was true. Striped bass juveniles and white perch spend a greater portion of the year within the vicinity of the power plants on the Hudson River than do the young of American shad and other *Alosa* spp. and are therefore probably more vulnerable to impingement. The interrelationship between factors such as fish distribution, physiological states of impingeable fish, and physical and chemical properties of the environment that blend to cause impingement to increase is as yet unclear.

The effect of collection efficiency (loss of impinged fish before collection and reimpingement of fish previously lost from screens) on the estimates of direct impact on striped bass juveniles for all plants combined is graphically illustrated in Figure VII-9 for hypothetical values of collection efficiency ranging from 10 to 150% and $D_I = 0.05$. Efficiency values greater than 100% signify the importance of reimpinged fish from previous days in a daily collection sample. This presumably would not have affected the impingement data at Indian Point where collections were made every day. The effects of screen loss and reimpingement were most pronounced for values of collection efficiency below 40%. Actual values of collection efficiency at any one plant are presently unknown.

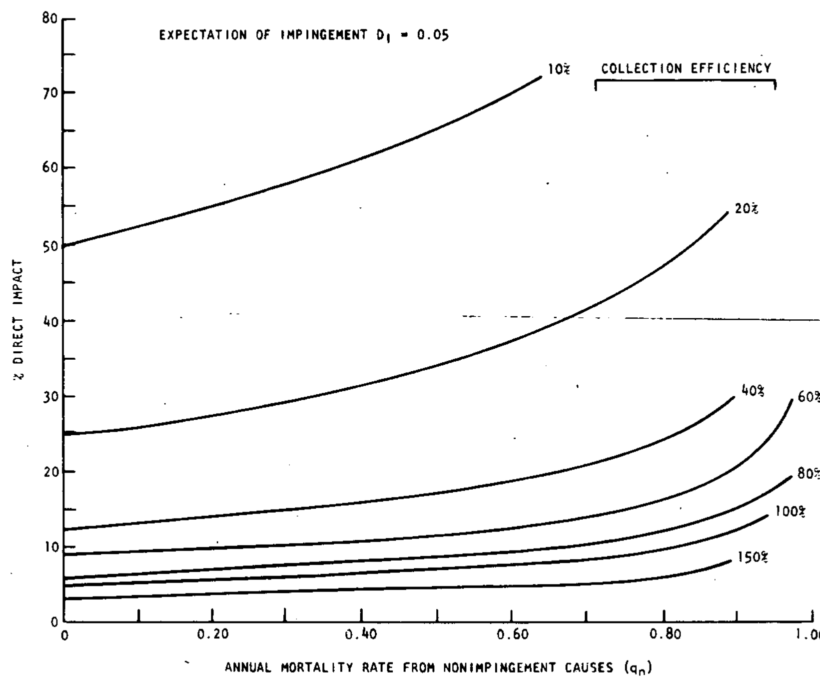


Figure VII-9. Relationship between Annual Mortality Rate from Nonimpingement Causes and Percent Direct Impact on Striped Bass Juveniles for Various Levels of Correction Efficiency at All Generating Stations, July 1973-June 1974

The direct impact estimates presented in this section assumed that all of the impinged fish were alive at time of impingement and were subsequently killed by impingement. If impingement of dead fish or survival of impinged fish occurred, our method of impact estimation would tend to overestimate actual impingement impact.

Two additional sources of error in estimating impingement impact possibly arise when computing the annual expectation of death from impingement (D_I). One must assume that impingement mortality and nonimpingement mortality are distributed proportionately within the year (Ricker, 1958), and this assumption may not have been met since nonimpingement mortality was probably greatest for young-of-the-year during their initial summer months and impingement mortality, in many cases, was greatest later in the year. Also, fall population levels rather than the initial (summer) population size were used to compute D_I; the fall population had already experienced considerable mortality, so resulting D_I values would be overestimates of expectation of death of impingement. The effect of underestimating the impingeable-size population was offset somewhat by using justifiably lower mortality rates for these older fish.

D. DIRECT IMPACT ASSESSMENT

The direct impact of the power plants includes both entrainment impact and impingement impact. Both are expressed as probabilities so they can be readily combined. The precision of the combined impact assessment is dependent on the precision of the entrainment impact and impingement impact estimates and is subject to the qualifications associated with each.

Since a fish cropped by entrainment is not available to be cropped by impingement, these two sources of impact must be considered as competing sources of mortality; therefore, the total direct impact is less than the sum of the entrainment and impingement direct impacts.

The only direct impact estimates presented here are for the 1973 year class of striped bass, since no estimates of entrainment in 1973 are available for other species. The combined direct impacts on the 1974 year classes cannot be estimated until the impingement data through June 1975 are available, so these estimates for striped bass, white perch, American shad, and other *Alosa* spp. will appear in a subsequent report.

The combined impact of entrainment and impingement was estimated by using the equation

$$q_{e_c} = q_{e_I} + q_{e_e} - q_{e_I} q_{e_e}$$

where

q_{e_c} = combined proportional direct impact

q_{e_I} = impingement proportional direct impact

q_{e_e} = entrainment proportional direct impact

The combined direct impact on the 1973 year class of striped bass by the post-1972 power plants through July 1974 was estimated to be 5.0%; for the combined effect of multiplant, the estimated direct impact was 12.8%. These estimates were made under the assumption of an 80% juvenile probability of dying and over best working estimates of the entrainment parameters (W, R, q_p). In Table VII-12 are estimates for individual plants and other juveniles' probability of dying. These estimates of power-plant impact are based on the combined probabilities of entrainment and impingement and do not include the ameliorating effect of compensation discussed in Section VIII.

Table VII-12

Estimate of Percent Combined Impact (q_{e_c} x 100) of Entrainment and Impingement on 1973 Year Class of Striped Bass through July 1974 for Four Assumed Levels of Juvenile Mortality and Entrainment Parameters Considered Most Reasonable at This Time

Plant	Juvenile Mortality			
	$q_t = 0.40$	$q_t = 0.60$	$q_t = 0.80$	$q_t = 0.90$
Bowline (all units)	2.71	3.02	3.60	4.25
Lovett (all units)	1.93	2.07	2.34	2.63
Indian Point (Unit 2)	1.32	1.37	1.46	1.55
Indian Point (all units)	1.92	1.97	2.08	2.20
Danskammer (all units)	4.38	4.70	5.32	6.01
Multiplant (all units)	10.56	11.31	12.75	14.34
Post-1972 Plants (all units)	4.01	4.35	5.02	5.76

E. COMPARISON OF TI METHOD OF DIRECT IMPACT ESTIMATION WITH LMS AND NRC MODELS

In addition to TI's estimates, estimates of the power-plant impact on the Hudson River striped bass population have recently been made by LMS (1973, 1974) and NRC (1975). TI's estimate refers to the proportion of a year class that is cropped by entrainment and impingement through June of their second year of life; LMS and NRC estimates include this, as well as continued monitoring of effects in the adult population. The adult models include compensation in the values presented as direct impact; thus, effects of entrainment and impingement are reduced. In addition to compensation, the LMS and NRC models require estimates of life-stage duration, natural mortality, fecundity, and age at maturity for which precise data are not yet available. Life-stage duration and natural mortality of ichthyoplankton are inherently included in TI's method so that estimates of these parameters are not needed. Since TI has not used an adult model, estimates of fecundity and age of maturity are also not needed.

In all three methods, the numbers of entrained ichthyoplankton were estimated from ichthyoplankton densities and plant flow rates. Estimation of the intake density from river densities requires knowledge of the near-field (plant region) (TI) or transect (LMS or NRC) ichthyoplankton density as well as the relationship between the near-field (plant region) and intake densities. In the LMS and NRC entrainment models, entrainment was based on "full" flow rates, whereas TI used actual flow rates from 1973 and 1974; thus, TI estimates are of actual impact, while the others are predictive. TI's 1973 and 1974 impact estimates cannot be utilized to simply predict impact under future regimes of differing flow rates and river distributions of the organisms.

Also, an area of difference between the three estimates of direct impact is the relationship between the near-field (plant region) ichthyoplankton density and the intake ichthyoplankton density [LMS's $f_1 \cdot f_2$ factor, NRC's f_1 factor, and TI's W factor (here referred to as the withdrawal factor)]. LMS derived the $f_1 \cdot f_2$ factor utilizing ichthyoplankton transect data for each life stage and at each power plant; these values ranged from 0.1 to 0.6 among the various life stages and power plants. NRC assumed that the f_1 factor was < 1.0 and > 0.5 and calculated impact for the two extreme values (0.5 and 1.0). TI assumed that the W factor was < 1.0 and utilized 0.5 as a best estimate.

Therefore, differences in the estimated percentages (TI, LMS, and NRC) arise principally from the use of corrections for compensation, differences in withdrawal factors, the use of actual vs maximal pumping rates of the power plants, and potential differences in spatiotemporal distribution as the result of using a hydrological transport model rather than observed distribution. Because compensation has not been included in TI estimates of impact, these estimates do not represent actual reductions in the population size.

F. CONCLUSIONS

- Striped bass ichthyoplankton entrainment impact estimates for the post-1972 power plants, using the assumptions that seem to be most reasonable, were 2.2% in 1973 and 8.1% in 1974. For multiplant as a whole, these estimates were 6.6% in 1973 and 12.8% in 1974.

- Upon applying the same assumptions used for post-1972 plants, white perch ichthyoplankton impact estimates for 1974 were 4.4% under the additional assumption that the eggs are adhesive and thus not entrainable and 5.5% under the assumption that the eggs collected in the ichthyoplankton samples were entrainable. These estimates for multiplant were 7.2% and 8.6%, respectively.

- The direct impact of impingement on striped bass, white perch, American shad, and other *Alosa* spp. was small.

- The combined impact of entrainment and impingement on the 1973 striped bass year class was estimated to be 5.0% for the post-1972 power plants and 12.8% for multiplant, using the assumption of an 80% juvenile mortality rate and the best working estimates of entrainment cropping.

SECTION VIII

COMPENSATION

A. INTRODUCTION

In contrast to the immediate or direct impact of power plants on key Hudson River fish stocks, long-term impact is determined largely by the extent to which chronic plant-induced mortality is offset by counteractive changes in the populations' vital statistics. These consecutive changes are generally termed "compensatory". This section examines the possibility that such compensatory processes occur in the striped bass, white perch, and American shad populations.

Density-independent mortality imposed by power plants (i.e., mortality which at any particular time removes a fixed proportion of the population regardless of density) would, over a prolonged period, retard the growth of, reduce, or totally eliminate affected populations unless their demographic parameters were otherwise altered. This is true for any level of density-independent mortality, no matter how small. Extinction of a population is certain only if the rate of density-independent mortality exceeds a population's intrinsic rate of increase. Even then, extinction might be avoided if some portion of the population were to reside in refugia in which the density-independent mortality factor did not operate.

The various processes by which populations of organisms persist when subjected to density-independent mortality are collectively termed "compensatory mechanisms." In general, these mechanisms adjust the numbers, biomass, and/or energy content of populations toward equilibrial values by making the birth rates, survival rates, and/or productivity inverse functions of density. When densities are reduced, compensatory mechanisms tend to restore them by a variety of means increasing birth, survival, and production rates. Thus, by density-dependent regulation of demographic parameters, compensatory processes protect populations from catastrophic overexpansion and, within limits, buffer the impact of increases in mortality.

Since compensation was not a primary subject of study by previous investigators on the Hudson, data of the type required to detect density-dependent population processes are severely limited. At this time, few of the many potential compensatory mechanisms are subject to empirical scrutiny. Only two topics are discussed here in any detail with regard to compensation:

- Density dependence in historical commercial catch data
- The relationship between growth and abundance in young-of-the-year fish

B. STOCK-RECRUITMENT RELATIONSHIPS

1. Objectives

Compensatory regulation in a fish population would be firmly established if appropriate functional relationships could be shown to connect size of adult standing crop with recruitment; i.e., addition of new members to the population. The objective of this section is to determine stock-recruitment relationships of striped bass, white perch, and American shad as revealed by records of the Hudson River commercial fishery.

2. Methods

Stock-recruitment relationships in the Hudson River's striped bass, white perch, and American shad populations were studied by graphical and linear regression analysis. Historical commerical abundance records examined for these species (CPUE, Section V-B) covered the period between 1931 and 1972. The CPUE estimates were available for American shad for all years, but omissions occurred in 1942, 1949-1951, and 1954 for striped bass and white perch. Based on life-history data, several potential intervals between stock and recruitment were scrutinized.

3. Results and Discussion

During the years 1931-1972, the relationship of striped bass abundance to abundance 5 years later closely approximates a Ricker (1958) stock-recruitment curve (Figure VIII-1). As depicted, the Ricker curve has two limbs: an ascending left limb on which stock and recruitment are positively related and a descending right limb on which they are negatively related. Since CPUE values remained below 1000 prior to 1955 but have been over 1000 since 1955, the entire left limb consists of points in which stock was measured before 1955 and the entire right limb consists of points measured since 1955. All points representing stock measurements from 1931 through 1948 lie in the extreme lower left corner of Figure VIII-1. Plotted separately in Figure VIII-2, these points (1931-1948) appear as a random scatter. In support of this observation, there was no significant linear correlation between CPUE and the CPUE 5 years later ($r = 0.356$, $df = 11$, $p = 0.232$). However, in such a narrow range of abundance, a true relationship could easily have been obscured by environmental fluctuations. Half way up the left limb of the Ricker curve (Figure VIII-1) are two points produced during the transition to higher density which occurred in the mid-1950s (Figure V-5). They represent stocks measured during the period of low abundance and recruitments during the later years of greater abundance.

Based on these observations, it also seems likely that striped bass population density is regulated by a Ricker-like stock-recruitment function (Ricker, 1958) in which recruitment is measured 5 years after stock. However, it must be noted that Ricker's theoretical formulation does not apply strictly to striped bass because these fish survive for several breeding seasons after the age of initial recruitment.

Between 1955 and 1972, there was a highly significant negative linear relationship between CPUE and the CPUE 5 years later ($r = -0.811$, $df = 11$, $p = 0.00078$). Thus, the striped bass population appears to have changed in a density-dependent manner over the abundance range represented

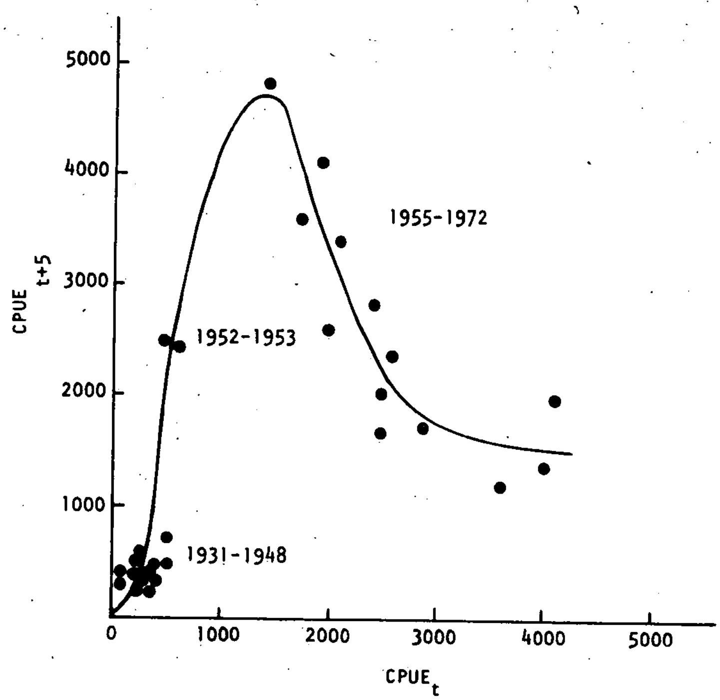


Figure VIII-1. Striped Bass Abundance Vs Abundance 5 Years Later for All Available Years between 1931 and 1972. (The curve is a freehand approximation of a Ricker stock-recruitment relationship for these data)

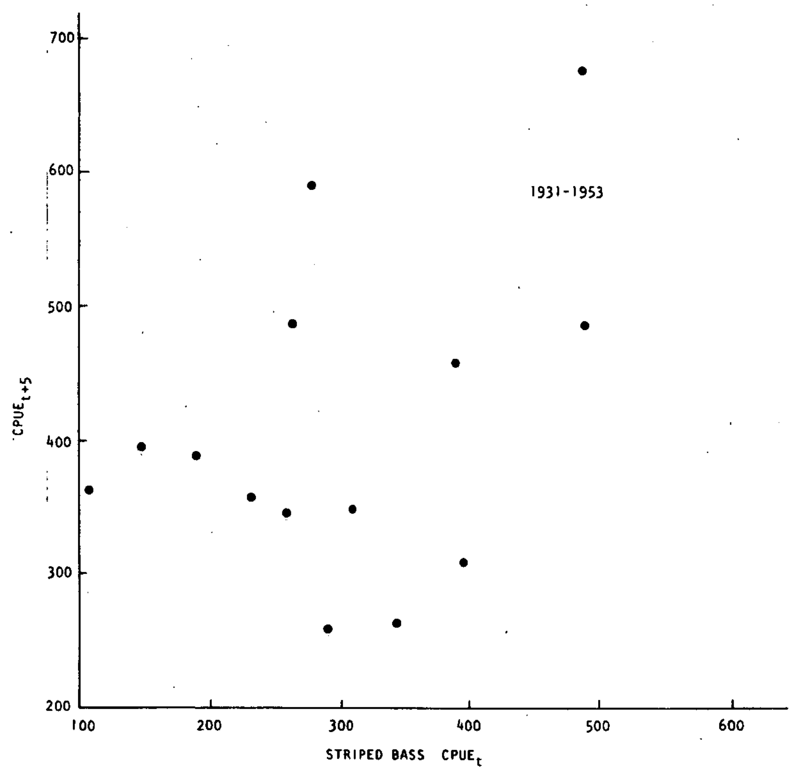


Figure VIII-2. Striped Bass Abundance Vs Abundance 5 Years Later during 1931-1953 by the Ricker curve's right limb (Figure VIII-3). Although density-independent factors may have contributed to population shifts since 1955, the magnitude of their contribution is unknown. In view of the strong stock-recruitment relationship, it seems likely that some truly density-dependent population changes occurred. These changes would indicate that the Hudson River striped bass population probably has the capacity to compensate to some extent for increased mortality such as that imposed by power plants. This compensation would seem to occur over a wide range of stock densities (roughly two-thirds of the entire observed range).

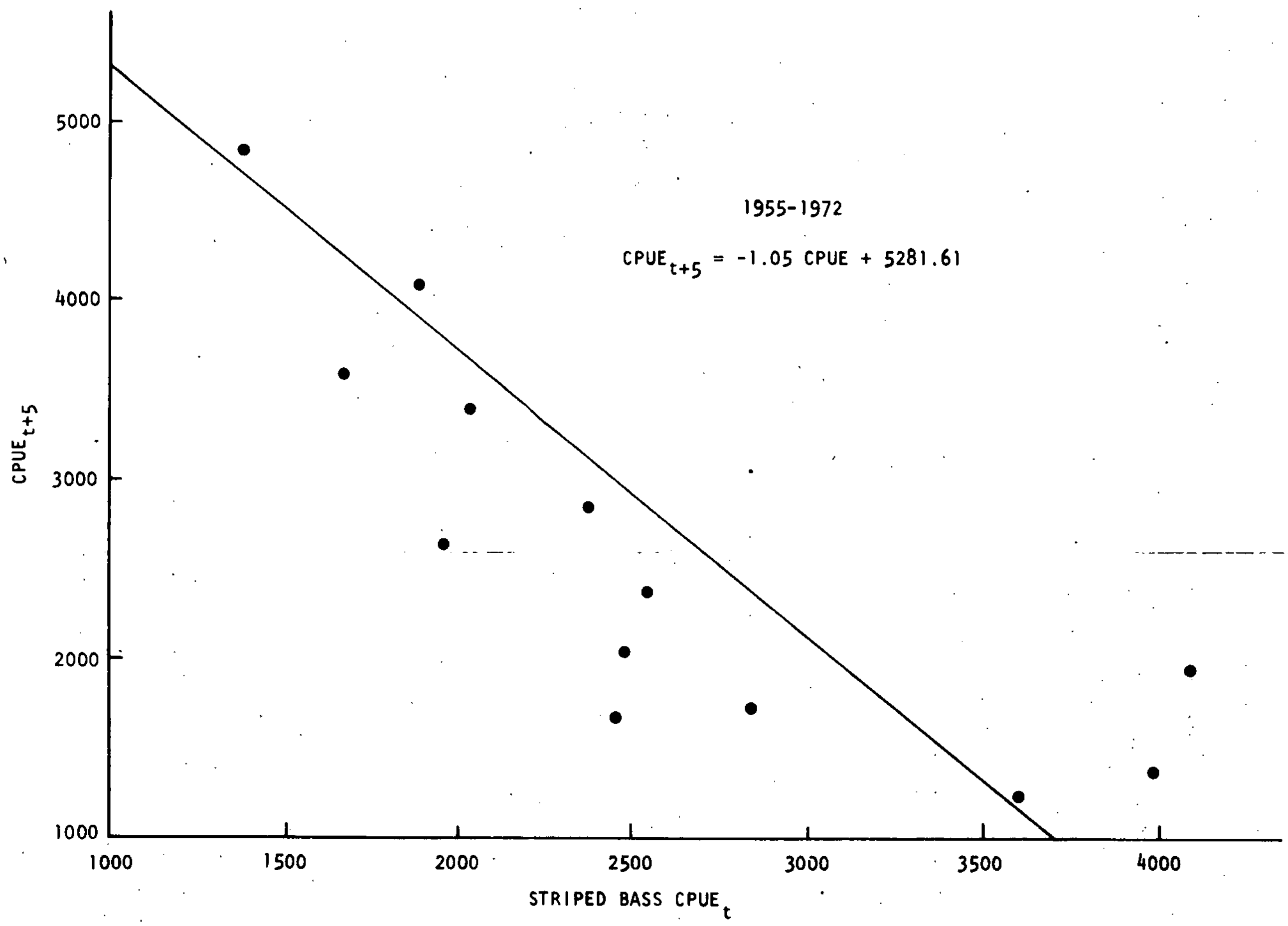


Figure VIII-3. Striped Bass Abundance Vs Abundance 5 Years Later during 1955-1972

The probable biological basis for the strong relationship using the 5-year lag between stock and recruitment is that the majority of the Hudson's female striped bass mature at age 5 and these 5-year-old females contribute the predominant fraction of the population's total natality. Assuming that recruited female striped bass suffer an annual mortality of 50%, 5-year-old females account for 41% of the total natality (Table VIII-1). Given such a stock-recruitment function, compensatory mechanisms must be operant at some time prior to maturation.

Table VIII-1

Partial-Life Table for Hudson River Striped Bass
(annual mortality assumed to be 50% among fish 4 years of age and older)

Age	Initial Recruits Alive l_x (%)	Mature Females* (%)	X Mean Egg Count/Female** (in thousands)	= Fecundity m_x	Natality $l_x m_x$	Total Natality† (%)
4	1.00	0	0	C	0	0
5	0.50	0.8	780	624	312	41
6	0.25	1.0	650	650	163	22
7	0.13	1.0	830	830	104	14
8	0.07	1.0	1370	1370	86	11
9	0.03	1.0	1540	1540	48	6
10	0.02	1.0	1810	1810	28	4
11	0.01	1.0	1770	1770	14	2

*Determinations of percentages of mature females in the several age classes were based on fish collected in May and June 1973-1974 (TI, unpublished data).

**Mean egg counts were derived from fish captured from March to June 1973-1974 (TI, unpublished data).

†Figures are slightly higher than they would have been if data were available for older fish.

The curve sketched in Figure VIII-1 is a freehand representation of a possible Ricker curve fit based on the striped bass commercial fishery data. A statistically derived curve was not calculated because CPUE values prior to the middle 1950s may not be directly comparable to those in later years. The potential lack of comparability is due to gear-efficiency changes during the early 1950s when fishermen switched from natural-fiber to nylon gill nets and certain regulatory changes (Section V).

In agreement with current findings, investigators in waters other than the Hudson have reported strong indications of density-dependence in striped bass. Koo (1970) found that commercial landings and catch-per-unit gear in Maryland fluctuated cyclically with a period of 6 years between successive maxima, which occurred when dominant year classes were fully recruited. Merriman (1941) thought that such oscillations were due to unusually strong year classes which dominated catches for several years. Koo (1970) hypothesized that there was an inverse relationship between striped bass stock and recruitment in the Chesapeake Bay, i.e., that the striped bass population was compensatorially regulated. During the years studied, each dominant year class raised the stock density for 2 or 3 years. The population then decreased concurrently with the declining influence of the dominant year class, producing lower densities until a new dominant year class was recruited from relatively low stock. Subsequently published data on young-of-the-year densities of striped bass in the Chesapeake (Schaefer, 1972) showed peaks in the years predicted by Koo's hypothesis. In California waters, Sommani (1972) found by nonlinear multiple regression that the physical environment and stock density jointly influenced recruitment variations over a 6-year period. Most of the variance was explained by a physical factor, but there was a significant negative relationship at the 1% level between stock and recruitment.

a. White Perch

No density dependence was discovered in white perch stock-recruitment relationships with recruitment measured 3, 4, or 5 years after stock.

b. American Shad

No density dependence was discovered in the stock-recruitment relationships of American shad when recruitment was measured 4, 5, and 6 years after stock.

C. DENSITY-DEPENDENT GROWTH

1. Objectives

Compensation may be effected not only by maintaining an inverse stock-recruitment relationship but by adjusting the growth rates of individuals. A population's biomass may thereby be regulated by making individual growth inversely proportional to population density. The reality and importance of density-dependent growth have been demonstrated repeatedly by the association of substantially reduced growth rates with high densities in many species with varying life histories. This phenomenon has been reported, for example, in sockeye salmon (Foerster, 1938; Johnson, 1965), haddock (Beverton and Holt, 1957), brown trout (LeCren, 1965), and bluegill (Swingle and Smith, 1942).

Regulation of a population's biomass by density-dependent growth is not to be confused with another recurrent size relationship among fish — growth compensation (alias compensatory growth). The latter refers to the inverse relationship of sizes attained by individuals during a given growing season to their growth rates during a subsequent period. Growth compensation has been aptly described as the tendency of smaller individuals to catch up with larger individuals of similar age (Nicholson, 1964). Although growth compensation has been shown to occur in striped bass from Albemarle Sound (Nicholson, 1964), density-dependent regulation of growth has not been previously reported in a striped bass population. The objective of this section is to determine the relationships between growth rates and abundance of young-of-the-year striped bass and white perch.

2. Methods

The relationship between density and growth in young-of-the-year striped bass and white perch was studied by simple correlation under the hypothesis that a significant negative correlation would indicate active compensation. All probabilities presented in relation to significance tests are 2-tailed unless otherwise specified.

Densities were estimated for young-of-the-year fish at Indian Point as the mean July-August beach-seine catch per unit surface area towed (CPUA) during the years between 1965 and 1974 (1971 excluded). Details are given in Section V on year-class strength. Estimates of growth were based on measurements of fish captured in the same beach-seine tows used to estimate densities. Since growth in length and weight show a close functional relationship, lengths were used in the absence of weights to indicate growth. In each year, growth was computed as the change in mean total length between July and August; i.e., mean total length in August minus mean total length in July. Data from the early years of this study were insufficient for calculation of growth at shorter intervals or over a longer portion of the growing season. Because no striped bass were recorded near Indian Point in July and August of 1966, no growth measurements were available for striped bass in that year. Therefore, the 1966 data were not used for comparisons of density and growth in striped bass. Since the New York University size data (1965-1967) were given as standard length (mm), they were converted to total length (mm) by the following experimentally determined equations (TI, unpublished data) prior to analysis:

$$\text{Striped bass total length} = 1.19 \text{ standard length} + 5.21$$

$$\text{White perch total length} = 1.23 \text{ standard length} + 2.24$$

Since uncontrolled variation in water temperature could have obscured the growth-density function, the effects of this environmental variable were held constant by partial correlation. The temperature variable used in these correlations was minimal daily mean centigrade surface-water temperature in June (Appendix C).

3. Results and Discussion

The uncorrected correlation coefficient relating young-of-the-year density and growth for striped bass was $r = -0.719$ ($df = 6$, 2-tail $p < 0.05$), indicating a significant negative linear correlation of growth with density (Figure VIII-4). A stronger relationship between growth and density in young-of-the-year striped bass emerged when fluctuations related to water temperature were removed by partial correlation. The partial correlation between growth and density with temperature effects held constant was highly significant using either 1-tailed or the more conservative 2-tailed tests ($r = -0.866$, $df = 5$, 2-tail $p = 0.0117$, 1-tail $p = 0.0058$). Holding temperature effects constant increased the correlation between growth and density because temperature was negatively (but not significantly) related to both CPUA ($r = -0.387$, $df = 6$, $p = 0.344$) and growth ($r = -0.174$, $df = 6$, $p = 0.680$). Some of the increase in the growth-abundance correlation may have been obtained by removing effects of the relationship between temperature and time of spawning. However, temperature and growth were not strongly related in this study.

Both simple and partial correlations lead to the conclusion that growth and abundance of young-of-the-year striped bass in the Indian Point area were negatively related; i.e., their growth was density-dependent in the years studied. Although the relationship observed at Indian Point in all probability holds in the striped bass population throughout the Hudson, year-to-year variations in fish distribution make extrapolations from Indian Point to the Hudson as a whole unreliable in a particular year. It is also possible that the apparent growth-abundance relationship was produced by size-selective density-dependent migration affecting the Indian Point region. If during years of low abundance relatively large young-of-the-year striped bass tended to predominate at Indian

Point because of a net positive size balance of immigration and emigration during July and August and if during years of high abundance migration's net effect on young-of-the-year size was negative, locally observed size changes would not truly represent growth within the region. However, there is no evidence of such a migratory pattern, and its occurrence seems rather improbable.

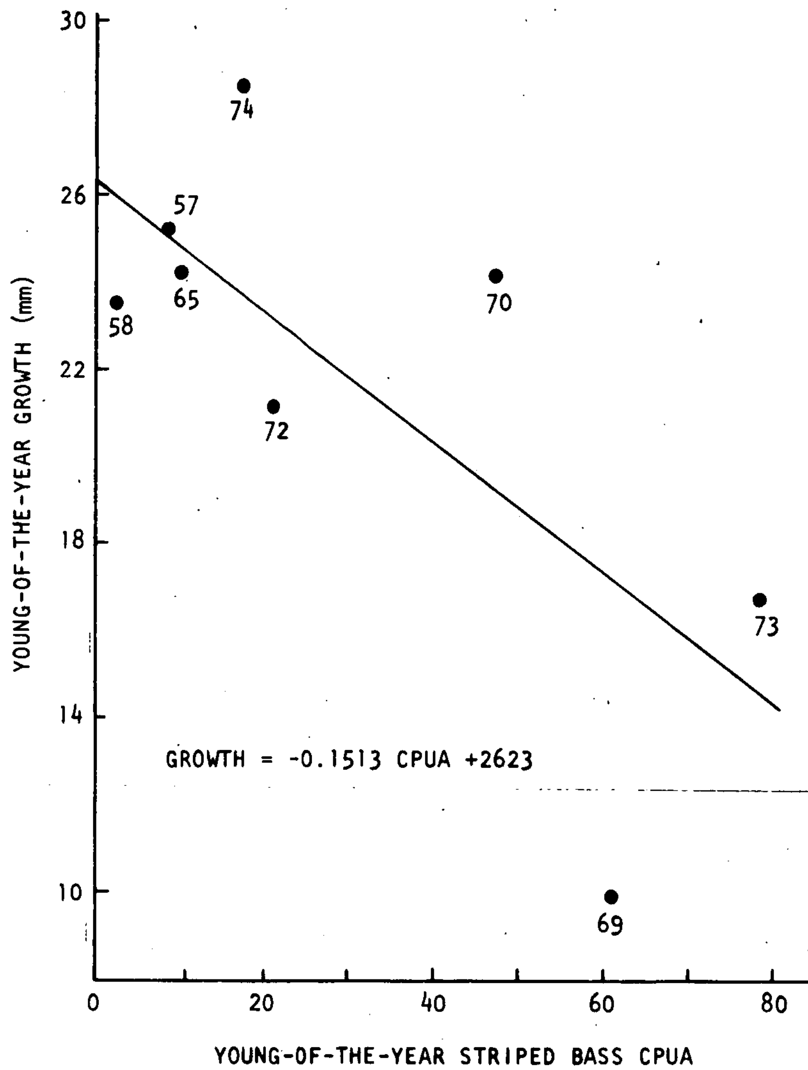


Figure VIII-4. Young-of-the-Year Striped Bass Growth Vs Abundance

For white perch, no relation between growth and abundance was discernible. Neither the uncorrected correlation between young-of-the-year growth and CPUA ($r = 0.057$, $df = 7$, $p = 0.885$) nor the partial correlation of these two variables with temperature effects held constant ($r = 0.049$, $df = 6$, $p = 0.925$) differed significantly from zero. Although no evidence of density-dependent growth appears in the current analysis, it would be unwise to conclude that growth of young-of-the-year white perch is not density-dependent in the Hudson River. Investigators in other river systems have reported density-dependent growth in young-of-the-year white perch. In the Patuxent estuary, Mansueti (1961) found a significant negative linear correlation between young-of-the-year growth and abundance of white perch in commercial haul seines 5 years later. During the 13 years from 1942 to 1954, the correlation coefficient was $r = -0.753$ ($p < 0.01$), indicating higher growth in years of low density. Wallace (1971) obtained some qualitative evidence of a similar relationship in the Delaware River.

D. GENERAL DISCUSSION

Despite the paucity of relevant studies, evidence of compensation has been found in the striped bass population. In studies conducted for this report, compensation via density-dependent growth was tentatively confirmed for young-of-the-year striped bass in the Hudson River. Older striped bass in the Hudson were shown to maintain a functional relationship between stock and recruitment. These results confirm independent studies on Atlantic (Koo, 1970) and Pacific (Sommani, 1972) coastal populations indicating that striped bass maintain compensatory stock-recruitment relationships.

White perch data did not reveal density-dependent growth of individual young-of-the-year fish or density-dependent population growth.

American shad data gave no indication of density-dependent population growth. Individual growth of American shad was not examined.

Although the mechanisms underlying stock-recruitment functions were not determined, preliminary evidence suggests that striped bass may have two or more compensatory mechanisms at their disposal. In addition to the density-dependent growth of individuals observed in the Hudson, other potential mechanisms are cannibalism, which has been reported in California (Stevens, 1966), and density-dependent predation.

Due to the relative unimportance of white perch to commercial and sport fishermen, compensation in this species has received little attention. There are no published studies relating white perch stock and recruitment, but there is evidence that the growth of young-of-the-year white perch in the Patuxent estuary is negatively related to population density (Mansueti, 1961).

Although striped bass and white perch populations may be regulated by compensatory processes, they are not necessarily immune to detrimental impact by sources of protracted density-independent mortality such as power plants. In fact, the range of mortality rates which could be offset by compensatory responses is not precisely known. However, an approximate estimate of allowable exploitation has been developed in Section II based on the Ricker stock-recruitment curve developed in this section. This analysis indicates that the Hudson River striped bass can withstand substantial fishing pressure with maximum sustainable yield occurring at an exploitation rate of 73%. Exploitation above this rate would tend to reduce yields in the striped bass fishery. The approximate nature of this analysis is caused by uncertainties in our measures of abundance (see Section V) and by a lack of knowledge of population age structure and the ages exploited.

Fish populations may be regulated by diverse compensatory mechanisms in addition to the negative feedback between density and growth just discussed. Examples may be found in LeCren's (1965) review of population regulation in freshwater fish. LeCren cites studies implicating factors such as predation, cannibalism, and territorial behavior as important determinants of survival rates in young fish. Although modulation of juvenile survival seems to be the primary method by which compensation is achieved in many fish populations, factors affecting numbers and survival of eggs and adults are important in others.

E. CONCLUSIONS

- Evidence of density-dependent abundance changes over 5-year intervals was found in striped bass commercial fishery data from the Hudson River.
- There was no evidence of density-dependent changes in white perch or American shad abundance in the Hudson River
- Growth of individual young-of-the-year striped bass was shown to be negatively density-dependent in the Hudson River population.
- When the effects of temperature fluctuations were removed by partial correlation, the relationship between individual growth and density in young-of-the-year striped bass was strengthened.
- Neither simple nor partial correlation analysis revealed a consistent relationship between individual growth and density of young-of-the-year white perch in the Hudson River.
- The ranges and magnitudes of compensatory responses by the individual life stages of fish in the Hudson River are unknown, but the presence of a Ricker-type stock-recruitment relation in the striped-bass population allows approximate calculation of maximum sustainable yield and the exploitation rate necessary to achieve maximum sustainable yield.

SECTION IX

CITED LITERATURE

Albrecht, A.B. 1964. Some observations on factors associated with survival of striped bass eggs and larvae. Calif. Fish and Game. 50(2): 100-113.

Bayless, J.D. 1972. Artificial propagation and hybridization of striped bass, *Morone saxatilis*, (Walbaum). S.C. Wildl. and Marine Res. Dept. 135 pp.

Beamish, F.W.H. 1966. Swimming endurance of some Northwest Atlantic fishes. J. Fish Res. Bd. Can. 23(3): 341-347.

Berger, T.E., and L. Zobler. 1973. Variations in dissolved oxygen in the Hudson River at Chelsea, N.Y. In: Hudson River ecology, third symposium held at Bear Mountain, New York. The Hudson River Environmental Society.

Berverton, R.J.H., and S.J. Holt. 1957. On the dynamics of exploited fish populations. Fish. Invest. London. Ser. 2, 19: 1-533.

Bigelow, H.R., and W.C. Schroeder. 1953. Fisheries of the Gulf of Maine. U.S. Fish and Wildl. Serv. Fish. Bull. 53(74): 577 pp.

Booth, R.A. 1967. A description of larval stages of the tomcod, *Microgadus tomcod*, with comments on its spawning ecology. Ph.D. Thesis. (ms.) Univ. of Conn. 53 pp.

Boyle, R.H. 1969. The Hudson River. W.W. Norton and Co., Inc. New York.

Brett, J.R. 1964. The respiratory metabolism and swimming performance of young sockeye salmon. J. Fish Res. Bd. Can. 21(5): 1183-1226.

Burdick, G.E. 1954. An analysis of factors, including pollution, having possible influence on the abundance of shad in the Hudson River. N.Y. Fish and Game J. 1(2): 188-205.

Burns and Roe Incorporated. 1970. Roseton generating station, hydraulic model of intake. Prepared for Central Hudson Gas and Electric Corp. of New York.

Busby, Mark W. 1966. Flow, quality, and salinity in the Hudson River estuary In: Hudson River Ecology, Hudson River Valley Comm. of N.Y. pp. 135-146.

California Department of Fish and Game, California Department of Water Resources, U.S. Fish and Wildl. Serv., and the U.S. Bureau of Reclamation. 1974. Interagency ecological study program for Sacramento San Joaquin estuary. 3rd. Annual Rpt. (1973), 81 pp.

Carline, R.F., and O.M. Brynildson. 1972. Effects of the Floy anchor tag on the growth and survival of brooktrout *(Salvelinus fontinalis)*. J. Fish Res. Bd. Can., Ottawa. 29(4): 458-460.

Carlson, F.T., and J.A. McCann. 1969. Evaluation of a proposed pumped-storage project at Cornwall, New York, in relation to fish in the Hudson River: Hudson River Fisheries Investigations, 1965-1968. Hudson River Policy Committee, NYSCD. 50 pp.

Chadwick, H.K. 1964. Annual abundance of young striped bass, *Roccus saxatilis*, in the Sacramento-San Joaquin Delta, California. Calif. Fish and Game. 50:69-99.

Clutter, R.T., and M. Anraka. 1968. Avoidance of samplers in zooplankton sampling. (monograph on oceanographic methodology). UNESCO. Paris. p. 57-76.

Coble, Daniel W. 1971. Effects of fin clipping and other factors on survival and growth of smallmouth bass. Trans. Amer. Fish Soc. 100(3): 460-473.

Coble, Daniel W. 1972. Vulnerability of fin-clipped bluegill to largemouth bass predation in tanks. Trans. Amer. Fish. Soc. 101(3): 563-565.

Conover, W.J. 1971. Practical non-parametric statistics. John Wiley and Sons, New York. 462 p.

Curran, H.W., and D.T. Ries. 1937. IV. Fisheries investigations in the lower Hudson River. In: A biological survey of the lower Hudson watershed, NYSCD. p. 124-145.

Cushing, D.H. 1973. A link between science and management in fisheries. Fish. Bull. 72(4): 859-864.

Darmer, Kenneth I. 1969. Hydrologic characteristics of the Hudson River estuary In: G.P. Howell and G.J. Lauer, eds. Hudson River ecology, N.Y. State Dept. Environmental Conservation: p. 40-55.

Doroshev, S.I. 1970. Biological features of the eggs, larvae, and young of the striped bass, *Roccus saxatilis*, (Walbaum), in connection with the problems of its acclimatization in the U.S.S.R. J. Ichthyology. 10: 235-278.

Duxbury, A.C. 1971. The Earth and its resources. Addison-Wesley Publ. Co., Reading Mass.

Farley, T.C. 1966. Striped bass, *Roccus saxatilis*, spawning in the Sacramento-San Joaquin River system during 1963 and 1964. In: Ecological studies of the Sacramento-San Joaquin estuary, Part II. Calif. Fish and Game Dept., Fish Bull. 136: 28-43.

Fenneman, Nevin M. 1938. Physiography of Eastern United States. McGraw-Hill, New York, XIV: 714 pp.

Fleener, G.G., J.L. Funk, and P.E. Robinson. 1974. The fishery of Big Piney River and the effects of stocking fingerling smallmouth bass. Missouri Dept. of Cons. Aquatic series no. 9: 32 pp.

Foerster, R.E. 1938. Mortality trend among young sockeye salmon *Oncorhynchus nerka* during various stages of lake residence. J. Fish. Res. Bd. of Canada, 4: 184-191.

Forney, J.L. 1971. Development of dominant year classes in a yellow perch population. Trans. Amer. Fish. Soc., 100(4): 739-749.

Frost, James A., John J. Leary, and John H. Thompson. 1970. New York. In: World book encyclopedia. 14: 238-258.

Graham, M. 1935. Modern theory of exploiting a fishery and application to North Sea trawling J. Conseil Expl. Mer.; 10: 244-274 (cited by Ricker).

Greeley, J.R. 1937. II. Fishes of the area with annotated list. In: A biological survey of the lower Hudson watershed, NYSCD. p. 44-103.

Gross, M.G. 1972. Oceanography: A view of the earth. Prentice-Hall, Inc., Englewood Cliffs, New Jersey.

Hile, R. 1954. Fluctuations in growth and year class strength of the walleye in Saginaw Bay. U.S. Fish and Wildl. Serv. Fish. Bull. 91: 7-59.

Hogman, W.J. 1973. The relative efficiency of nylon gill nets after transition from cotton nets in a multispecies fishery. Trans. Amer. Fish. Soc. 102(4): 778-785.

Hynes, H.B.N. 1970. The ecology of running waters. Univ. of Toronto Press. 555 pp.

Johnson W.E. 1965. On mechanisms of self-regulation of population abundance in *Oncorhynchus nerka*. Mitt. int. Verein. theor. angew. Limnol., 13: 66-87.

Knudson, M. 1962. Hydrographical tables. Reprinted in: The determination of chlorinity by the Knudson method. G.F. Mfg. Co., New York.

Koo, T.S.Y. 1970. The striped bass fishery in the Atlantic states. Ches. Sci., 11(2): 73-93.

Larson, P.A. 1969. Indian Point Model No. 2. Cooling Water Studies for Consolidated Edison Company of New York, N.Y. Alden Research Laboratories, Worcester Poly. Inst. May 1969.

Lauff, G.H., ed. 1967. Estuaries. Amer. Assn. Adv. Sci. Washington, D.C.

Lawler, Matusky, and Skelly. 1974. Hudson River aquatic ecology studies, Bowline Point and Lovett generating stations. Prepared for Orange and Rockland Utilities, Inc.

Lawler, Matusky, and Skelly. Central Hudson report for 1973. (unpublished)

LeCren, E.D. 1965. Some factors regulating the size of populations of freshwater fish. Mitt. Internat. Verein. Limnol. 13: 88-105.

Li, C.C. 1964. Introduction to experimental statistics. McGraw-Hill, N.Y. p. 207-226.

Macleod, J.C. 1967. A new apparatus for measuring maximum swimming speeds of small fish. J. Fish Res. Bd. Can. 24(6): 1241-1252.

Mangelsdorf, P.C. 1967. Salinity measurements in estuaries. In: Estuaries. G.N. Lauff, ed. Amer. Assn. Adv. Sci., Washington, D.C.

Mansuetti, A.J. 1974. Early development of the yellow perch *Perca flavescens*. Ches. Sci. 5(1-2): 46-66.

Mansueti, R.J. 1958. Eggs, larvae, and young of the striped bass, *Roccus saxatilis*. Ches. Biol. Lab. Contr. 112: 35 p.

Mansueti, R.J. 1961. Movements, reproduction, and mortality of the white perch, *Roccus americanus*, in the Patuxent estuary, Maryland. Ches. Sci. 2: 142-205.

Mansueti, R.J. 1964. Eggs, larvae, and young of the white perch, *Roccus americanus*, with comments on its ecology in the estuary. Ches. Sci. 5(1-2): 3-45.

Mansueti, R.J., and E.H. Hollis. 1963. Striped bass in Maryland tidewater. Nat. Res. Inst., Univ. Md. Ed. Series 61: 28 p.

Marcy, B.C. Jr. 1975. Entrainment of organisms at power plants, with emphasis on fishes — overview, p. 89-106. In: Fisheries and energy production — a symposium. S.B. Saila (Ed.). D.C. Heath and Co. Mass. 300 pp.

McCoy, Edward G. 1959. Quantitative sampling of striped bass, *Roccus saxatilis*, (Walbaum) eggs in the Roanoke River, North Carolina, M.S. Thesis. No. Carolina State College, Raleigh. 135 pp.

McFadden, James T., and Harry G. Woodbury. 1973. Indian Point Studies to determine the environmental effects of once through vs. closed cycle cooling at Indian Point Unit No. 2. Testimony before USAEC. Docket 50-247, Feb. 5, 1973.

Merriman, D. 1941. Studies on the striped bass *(Roccus saxatilis)* of the Atlantic Coast. U.S. Fish and Wildl. Serv. Fish. Bull. 35: 1-77.

Miller, R.G. 1966. Simultaneous statistical inference. McGraw-Hill, New York. 272 p.

Molin, G. 1959. Test with nylon fishing tackle in Swedish inland fisheries. In: Modern fishing gear of the world. H. Kristjonsson (Ed.). p. 156-158.

Mugaas, N. 1959. Experience with synthetic materials in the Norwegian fisheries. In: Modern fishing gear of the world. H. Kristjonsson (Ed.). p. 159-160.

Muncy, R.J. 1960. A study of the comparative efficiency between nylon and linen gillnets. Ches. Sci., 1(2): 96-109.

Murphy, G.I. 1966. Population biology of the Pacific sardine *(Sardinops caerulea)*. Proc. Calif. Acad. Sci. 34: 1-84.

New York University. 1974. Hudson River ecosystem studies-effects of entrainment by the Indian Point power plant on the biota of the Hudson River estuary. Progress report for 1973. Prepared for Consolidated Edison Company of New York, Inc.

Nicholson, W. R. 1964. Growth compensation in four year classes of striped bass, *Roccus saxatilis*, from Albemarle Sound, N. C. Ches. Sci. 5(3): 145-149.

Nicola, Stephen J., and Almo J. Cordone. 1973. Effects of fin removal on survival and growth of rainbow trout *(Salmo gairdneri)* in a natural environment. Trans. Am. Fish. Soc. 102(4): 753-758.

Perlmutter, A., E. Leff, E.E. Schmidt, R. Heller, and M. Siciliano. 1966. Distribution and abundance of fishes along the shores of the lower Hudson River during the summer of 1966. In: Hudson River ecology, Hudson River Valley Comm. of N.Y.: 147-200.

Perlmutter, A., E.E. Schmidt, and E. Leff. 1967. Distribution and abundance of fish along the shores of the lower Hudson River during the summer of 1965. N.Y. Fish and Game J. 14(1): 47-75.

Perlmutter, A., E.E. Schmidt, R. Heller, F.C. Ford, and S. Sininsky. 1968. Distribution and abundance of fish along the shores of the lower Hudson during the summer of 1967. Ecological survey of the Hudson River Progress Rpt. 3: 2-1, 2-42.

Pijanowski, B.S. 1973. Salinity corrections for dissolved oxygen measurements. Env. Sci. and Tech. 7(10): 957-958.

Pritchard, D. W. 1952. Salinity distribution and circulation in the Chesapeake Bay estuarine system. J. Mar. Res. 11: 106-123.

Pritchard, D. W. 1955. Estuarine circulation patterns, Proc. Am. Soc. of Civil Eng. 81:717.

Quirk, Lawler, and Matusky. 1973a. Aquatic ecology studies Kingston, New York, 1971-1972. Prepared for Central Hudson Gas and Electric Corporation.

Quirk, Lawler, and Matusky. 1973b. Roseton/Danskammer Point generating stations aquatic ecology studies 1971-1972. Prepared for Central Hudson Gas and Electric Corporation, Consolidated Edison Company New York, Inc., and Niagara Mohawk Power Corporation.

Quirk, Lawler, and Matusky. 1974a. Danskammer Point generating station 1972 fish impingement study. Prepared for Central Hudson Gas and Electric Corp.

Quirk, Lawler, and Matusky. 1974b. Hudson River aquatic ecology studies at Bowline, Bowline unit I pre-operational studies. Prepared for Orange and Rockland Utilities, Inc.

Quirk, Lawler, and Matusky. 1974c. Progress report for January-March, 1974. Winter environmental programs. Report 5. Prepared for Orange and Rockland Utilities, Inc.

Raney, E.C. 1952. The life history of striped bass, *Roccus saxatilis* (Walbaum). Bull. Bing. Ocean. Coll. 14(1): 5-97.

Rathjen, W.F., and L.C. Miller. 1957. Aspects of the early life history of the striped bass (*Roccus saxatilis*) in the Hudson River. N.Y. Fish and Game J. 4(1): 43-60.

Raytheon Incorporated. 1971. Indian Point ecology survey. Final Rpt. to Consolidated Edison Co. of N.Y., Inc.

Ricker, W.E., 1954. Stock and recruitment. J. Fish. Res. Bd. Can. 11: 559-623.

Ricker, W.E. 1958. Handbook of computations for biological statistics of fish populations. Fish. Res. Bd. Canada Bull. 119.

Saetersdal, G. 1959. On the fishing power of nylon gillnets. In: Modern fishing gear of the world, H. Kristjonsson, (Ed.). p. 161-163.

St. Pierre, R.A., and J. Davis. 1972. Age, growth, and mortality of the white perch, *Morone americana*, in the James and York Rivers, Virginia. Ches. Sci., 13(4): 272-281.

Schaefer, M.B. 1954. Some aspects of the dynamics of populations important to the management of the commercial marine fisheries. Bull. Inter. American Tropical Tuna Commission 1(2): 27-56. La Jolla, Calif.

Schaeffer, R.H. 1972. A short-range forecast function for predicting the relative abundance of striped bass in Long Island waters. N.Y. Fish and Game J., 19(2): 178-181.

Scheffe, H. 1959. The analysis of variance. John Wiley and Sons, Inc. New York. 288 pp.

Schuberth, Christopher J. 1968. The geology of New York City and environs. Natural History Press, Garden City, N.Y. 34 pp.

Scott, W.B., and E.J. Crossman. 1973. Freshwater fishes of Canada. Fish. Res. Bd. Can. Bull. 184. 966 pp.

Scotton, L.N., R.E. Smith, N.S. Smith, K.S. Price, and D.P. deSylva. 1973. Pictorial guide to fish larvae of Delaware Bay, with information and bibliographics useful for the study of fish larvae. Delaware Bay Rep. Ser. Coll. Mar. Stud., Univ. of Del. 7: 206.

Shepley, J.M. 1974. Testimony on: Cornwall pumped storage plant in the matter of Consolidated Edison Company of New York, Inc. Project 2338 (remanded). Hearing before the Federal Power Commission, 27 Nov. 1974. Transcript 3460-3536.

Shetter, David S. 1967. Effects of jaw tags and fin excision upon the growth, survival, and exploitation of hatchery rainbow trout fingerlings in Michigan. Trans. Amer. Fish. Soc. 96(4): 394-399.

Simmons, H.B. 1966. Field experience in estuaries. In: Estuary and coastline hydrodynamics, A.T. Ippen, ed. McGraw-Hill Book Co., Inc., New York.

Snedecor, G.W., and W.G. Cochran. 1967. Statistical methods. Iowa State Univ. Press, Ames, Ia. 593 pp.

Sommani, P. 1972. A study on the population dynamics of striped bass, *Morone saxatilis*, (Walbaum) in the San Francisco Bay estuary. Doctoral dissertation, Univ. of Wash.

Stevens, D.E. 1966. Food habits of striped bass, *Roccus saxatilis*, in the Sacramento-San Joaquin Delta. Calif. Fish and Game Fish. Bull. 52: 68-97.

Swingle, H.S., and E.V. Smith. 1942. Management of farm fish ponds. Bull. of the Ala. Agr. Exp. Sta. 254.

Talbot, G.B. 1954. Factors associated with fluctuations in abundance of Hudson River shad. U.S. Fish and Wildl. Serv. Fish. Bull. 101(56): 373-413.

Talbot, G.B. 1966. Estuarine requirements and limiting factors for striped bass. Amer. Fish. Soc., Spec. Publ. 3, Estuarine Symp. p. 37-49.

Texas Instruments Incorporated. 1972a. Hudson River ecological study in the area of Indian Point. First Semiannual Rpt., v. 1-Biological sampling. Prepared for Consolidated Edison Company of New York, Inc.

Texas Instruments Incorporated. 1972b. Hudson River ecological study in the area of Indian Point. First Semiannual Rpt. v. II-Standard procedures. Prepared for Consolidated Edison Company of New York, Inc.

Texas Instruments Incorporated. 1973a. Hudson River ecological study in the area of Indian Point for the period January 1 to June 30, 1973. Second Semiannual Rpt. Prepared for Consolidated Edison Company of New York, Inc.

Texas Instruments Incorporated. 1973b. Hudson River environmental study in the area of Ossining. Final Rpt.

Texas Instruments Incorporated. 1973c. Hudson River ecological study in the area of Indian Point. First Annual Rpt. Prepared for Consolidated Edison Co. of New York, Inc.

Texas Instruments Incorporated, 1973. Vol. III. Fisheries Survey of the Hudson River, March-July, 1973. Prepared for Consolidated Edison Company of New York, Inc.

Texas Instruments Incorporated. 1974a. Indian Point impingement study report for the period June 18, 1972 through Dec. 31, 1973. Prepared for Consolidated Edison Co. of New York, Inc.

Texas Instruments Incorporated. 1974b. Hudson River ecological study in the area of Indian Point. 1973 annual report. Prepared for Consolidated Edison Co. of New York, Inc.

Texas Instruments Incorporated. 1974c. Fisheries survey of the Hudson River, March-December 1973. Vol. IV. Prepared for Consolidated Edison Company of New York, Inc.

Texas Instruments Incorporated. 1974d. Benthic landfill studies, Cornwall, final report, August 1974. Prepared for Consolidated Edison Company of New York, Inc.

Texas Instruments Incorporated. 1974e. First annual progress report on evaluation of potential entrainment and impact of the proposed Cornwall pumped-storage project on Hudson River fish, Nov. 1974. Prepared for Consolidated Edison Company of New York, Inc.

Thomas, B.D., T.G. Thompson, and C.L. Utterback. 1934. The electric conductivity of sea water. Conseil Perm. Interm. Expl. Mer., J. Conseil. 9: 28-35.

Thomas, J.L. 1967. The diet of juvenile and adult striped bass, *Roccus saxatilis*, in the Sacramento-San Joaquin river system. Calif. Fish and Game. 53(1): 49-62.

Tranter, D.J., and P.E. Smith. 1968. Filtration performance. In: Zooplankton sampling. UNESCO (1968): 27-56.

Turner, J.L., and H.K. Chadwick. 1972. Distribution and abundance of young-of-the-year striped bass, *Morone saxatilis*, in relation to river flow in the Sacramento-San Joaquin Estuary. Trans. Am. Fish. Soc., 101(3): 442-452.

UNESCO. 1968. Monograph on Oceanographic Methodology: Zooplankton Sampling. Imprimaries Populaires. Geneva. 1974 pp.

U.S. Department Interior Geological Survey. Water resources data for New York. Part 1-Surface water records. 1964-1974.

U.S. Department Interior Geological Survey. Water resources data for New York. Part 2-Water quality records. 1965-1972.

U.S. Naval Oceanographic Office. 1970. Instruction manual for obtaining oceanographic data. Pub. 607, 3rd ed.

U.S. Nuclear Regulatory Commission Office of Nuclear Reactor, Regulation. 1975. Final Environmental statement related to operation of Indian Point Nuclear Generating Plant Unit No. 3, Consolidated Edison Company of New York, Inc. Docket No. 50-286, 2 volumes (Short references = FES).

Wallace, D.C. 1971. Age, growth, year class strength, and survival rates of the white perch, *Morone americana* (Gmelin) in the Delaware River in the vicinity of Artificial Island. Ches. Sci. 12(4): 205-218.

Weyl, P.K. 1970. Oceanography: An introduction to the marine environment. John Wiley and Sons, Inc., New York. p. 465-471.

White, John. 1975. The continuous fish sampler — part II. Paper presented at the Annual meeting of the Atlantic Estuarine Research Society, Annapolis, Md. 3 May 1975.

Woodhull, C. 1947. Spawning of the striped bass, *Roccus saxatilis*, in California waters. Calif. Fish and Game J. 44(2) 97-102.

Yamane, Taro. 1967. Elementary sample theory, Prentice-Hall, Inc. Englewood Cliffs, N.J. 346 p.

SUPPLEMENT 2

TO

ENVIRONMENTAL REPORT

TO ACCOMPANY APPLICATION FOR

FACILITY LICENSE AMENDMENT

FOR

EXTENSION OF OPERATION WITH

ONCE-THROUGH COOLING

FOR

INDIAN POINT UNIT No. 2

VOLUME 2 of 2

July 1975

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.

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FIRST ANNUAL REPORT FOR THE MULTIPLANT IMPACT STUDY OF THE HUDSON RIVER ESTUARY

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APPENDICES

JULY 1975

Prepared under contract with

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APPENDIX A

1974 QUALITY-ASSURANCE/QUALITY-CONTROL PROGRAM

APPENDIX A

1974 QUALITY-ASSURANCE/QUALITY-CONTROL PROGRAM

The role of quality assurance/quality control within the Ecological Services Group is to insure the reliability and validity of data obtained in field and laboratory efforts. Quality assurance (QA) includes selection of appropriate methods and techniques, selection or design of analytical and sampling equipment, evaluation and review of these items, and establishment of standard operating procedures (SOPs). Quality control (QC) includes inspection of procedures, equipment, and data.

For the selected techniques and equipment, emphasis is placed on uniformity of approach, but their descriptions remain flexible enough to respond to study specifications; changes in regulations; and advances in methods, materials, and techniques. SOPs are issued from the QA section and updated as necessary.

QC continually monitors all aspects of the program to insure the quality of data acquisition. Monitoring consists of review of data sheets before their submission to the Data Center and random quality-control checks, during which the procedures followed are compared to the SOPs.

SOPs exist for each phase of sample acquisition and data collection for all field and laboratory efforts; they serve as a training device for new personnel as well as reference for other employees on site. Personnel orientation includes direct observation of another employee's work, discussion of problem areas with others, and direct supervision by the task leader or another biologist.

Data are recorded on standard data sheets according to written SOPs. Before submission for keypunching, the sheets are examined by the individual recording the data, by a data clerk, and by QA personnel in order to reduce recording errors. To reduce errors further, the key-punched cards are verified before being read into the computer and various data checks are incorporated into programs.

Each program used in the Data Center is documented with a program listing, a listing of the test file and test output, computations involved in the program, and a log of corrections made to files. Task personnel review the computer output by spot-checking it against raw data and hand-calculated results.

A. FISHERIES

In addition to the SOPs, the Fisheries Group maintains a reference collection of fish specimens. To aid in identifying fishes, the following identification guides are available:

Andrews, J. C. 1973. An annotated list of the salt water fishes of Nantucket. The Nantucket Maria Mitchell Association. Nantucket, Massachusetts. 48 p.

Beebe, W., and J. Tee-Van. 1970. Field book of the shore fishes of Bermuda and the West Indies. Dover Publications Inc., New York. 337 p.

Bigelow, H. B., and W. C. Schroeder. 1953. Fishes of the Gulf of Maine. U.S. Fish and Wildl. Serv. Fish. Bull. 53(74): 577 p.

Breder, C.M. 1948. Field book of marine fishes of the Atlantic coast from Labrador to Texas. G. P. Putnam's Sons, New York. 332 p.

Eddy, S. 1969. How to know the freshwater fishes. Wm. C. Brown Company Publishers, Dubuque, Iowa. 286 p.

Hildebrand, S.F., and W.C. Schroeder. 1972. Fishes of the Chesapeake Bay. Reprinted for the Smithsonian Institution by TFH Publications, Inc., Neptune, New Jersey. 388 p.

Hubbs, C.L., and K.T. Lagler. 1970. Fishes of the Great Lakes Region. The University of Michigan Press, Ann Arbor. 213 p.

Jordan, D.S., and B.W. Evermann. 1969. American food and game fishes. Dover Publications Inc., New York. 574 p.

Jordan, D.S., and B.W. Evermann. 1963. The fishes of North and Middle America. Reprinted for the Smithsonian Institution by TFH Publications Inc., Jersey City, New Jersey. 3313 p.

Leim, A.H., and W.B. Scott. 1966. Fishes of the Atlantic Coast of Canada. Bull. 155. Fish Res. Bd. of Canada, Ottawa. 485 p.

Mansueti, A.J., and J.D. Hardy Jr. 1967. Development of fishes of the Chesapeake Bay Region. Pt. I. Nat. Res. Inst., Union, Md., Solomans. 202 p.

Mansueti, R.J. 1964. Eggs, larvae, and young of white perch, *Roccus americanus*, with comments on its ecology in the estuary. Ches. Sci. 5(1-2): 46-66.

Scott, W.B., and E.J. Crossman. 1973. Freshwater fishes of Canada. Bull. 184. Fish. Res. Bd. of Canada, Ottawa. 966 p.

Water-Quality personnel, in accordance with manufacturers' specifications, calibrate thermometers and dissolved oxygen meters used by the Fisheries Group. The Mettler balance is periodically checked against known weights to determine its accuracy; if there are problems, a service representative is contacted.

Quality control includes random checks of field and laboratory procedures. Identifications made in the laboratory and field are randomly rechecked and identifications of unusual fishes verified by experienced biologists. Without prior knowledge of data collected from a particular sample, task and group leaders recheck entire samples from beach-seine surveys for quality control. Counts and length and weight measurements are compared to original data to determine accuracy.

A label including date of capture, total length, time, river mile, site, and collection gear is filled out for each fish preserved for fin-clip verification. The fish are carefully examined for all possible clipped fins. All questionable fin clips are examined by at least two persons until a consensus is reached utilizing established criteria for identification of fin clips. The fin-clip type is recorded on a data sheet and the fish preserved with a unique numbered tag for future reference.

B. ICHTHYOPLANKTON

A reference collection of the various life stages of fish encountered in the ichthyoplankton samples supplements the published SOPs for ichthyoplankton identification.

The following are publications used for the identification of eggs and larvae collected in the Hudson River during 1973 and 1974:

Alperin, I.M. 1967. Notes concerning the occurrence of the snake fish (*Trachinocephalus myops*) in Long Island waters. N.Y. Fish and Game J. 14 (1): 86-88.

Alperin, I.M., and R.H. Schaefer. 1965. Marine fishes new or uncommon to Long Island, New York. N.Y. Fish and Game J. 12(1): 1-16.

Bayless, J.D. 1972. Artificial propagation and hybridization of striped bass, *Morone saxatilis* (Walbaum). S.C. Wildl. and Marine Res. Dept. 135 p.

Bigelow, H.B., and W.C. Schroeder. 1953. Fishes of the Gulf of Maine. U.S. Fish and Wildl. Serv. Fish. Bull. 53(74): 577 p.

Breder, C.M. Jr. 1944. The metamorphosis of *Synodus foetens* (Linneaus). Zoologica, New York. 29(3): 13-15.

Booth, R.A. 1967. A description of larval studies of the tomcod, *Microgadus tomcod*, with comments on its spawning ecology. Ph.D. Thesis. (ms.) Univ. of Conn. 1967. 53 p.

Chambers, J.R., J. Davis, and J.A. Musick. 1969. Methods of distinguishing larval alewife from larval blueback herring (Pisces, Clupeidae). In: Completion Report: Anadromous Fish. Proj., Virginia, AFC-1, Appendix III. Oct '69 to Sep '70. p. 1-13.

Cianci, J.M. 1969. Larval development of the alewife, *Alosa pseudoharengus* (Wilson), and the glut herring, *Alosa aestivalis* (Mitchill). M.S. Thesis (ms.). Univ. of Conn. 1969. 62 p.

Deuel, D.G., J.R. Clark, and A.J. Mansueti. 1966. Description of embryonic and early larval stages of bluefish *Pomatomus saltatrix* Trans-Am. Fish. Soc. 95(3): 264-271.

Doroshev, S.I. 1970. Biological features of the eggs, larvae, and young of the striped bass *Roccus saxatilis* (Walbaum) in connection with the problems of its acclimatization in the USSR. J. Ichthy. 10: 235-278.

Dovel, W.L. 1960. Larval development of the oyster toadfish, *Opsanus tau*. Ches. Sci. 1(3-4): 187-195.

Dovel, W.L. 1973. Larval development of clingfish, *Gobiesox strumosus* 4.0 to 12.0 millimeters total length. Ches. Sci. 4(4): 161-166.

Fish, M.P. 1932. Contributions to early life histories of sixty-two species of fishes from Lake Erie and its tributary waters. Bull., Bur. Fisheries. 47(10): 293-398.

Hildebrand, S.F., and W.C. Schroeder. 1928. Fishes of Chesapeake Bay. U.S. Bur. Fish. Bull. 43(Part I). 366 p.

Kretser, W.A. 1973. Aspects of striped bass larvae *Morone saxatilis* Captured in the Hudson River near Cornwall, New York, April-August 1968. (ms.). Rpt for Consolidated Edison Company of New York Inc. 33 p.

Kuntz, A., and L. Radcliffe. 1918. Notes on the embryology and larval development of twelve teleostean fishes. U.S. Bull. Bur. Fish. 35: 87-134.

Leim, A.H. 1924. The life history of the shad [*Alosa sapidissima* (Wilson)] with special reference to the factors limiting its abundance. Contrib. Canadian Biol. n.s. 2(11): 161-284.

Mansueti, A.J. 1964. Early development of yellow perch, *Perca flavescens*. Ches. Sci. 5(1-2): 161-284.

Mansueti, A.J., and J.D. Hardy Jr. 1967. Development of fishes of the Ches. Bay region. Pt. I. Nat. Res. Inst., Union, Md., Solomans. 202 p.

Mansueti, R.J. 1958. Eggs, larvae, and young of the striped bass, *Roccus saxatilis*. Md. Dept. Res. and Ed. Contrib. 112-133 p.

Mansueti, R.J. 1962. Eggs, larvae, and young of the hickory shad, *Alosa mediocris*, with comments on its ecology in the estuary. Ches. Sci. 3(3): 173-205.

Mansueti, R.J. 1964. Eggs, larvae, and young of the white perch, *Roccus americanus*, with comments on its ecology in the estuary: Ches. Sci. 5(1-2): 46-66.

Raney, E.C., E.F. Tresselt, E.H. Hollis, V.D. Vladykov, and D.H. Wallace. 1952. The striped bass *Roccus saxatilis*. Bull. Bingham Oceanog. Coll., 14(1): 177 p.

Scotton, L.N., R.E. Smith, N.S. Smith, K.S. Price, and D.P. de Sylva. 1973. Pictorial guide to fish larvae of Delaware Bay, with information and bibliographies useful for the study of fish larvae. Delaware Bay Rep. Series, vl. 7. College Marine Studies, Univ. of Delaware. 206 p.

Thompson, K.S., W.H. Week III, and Algis G. Taruski. 1971. Saltwater fishes of Connecticut. Dept. of Ag. and Nat. Res. Bull. 105. 165 p.

During 1974, extensive quality-control techniques were developed and applied to insure maximum quality of the ichthyoplankton laboratory and identification efforts. These efforts, which are presented in detail in Appendix B, can be summarized as follows.

After picking was completed, at least 5% of the samples completed by an individual were reworked; the number of organisms originally found was compared to the total number of organisms found in the repicking effort. The average laboratory accuracy at this point was 87.84% for the year. The initial correction process was to repick all of the samples of those individuals who were less efficient than the overall laboratory accuracy of 87.84%. Further analysis of results indicated three general areas of picking error; when one of these types of errors was encountered, all samples picked by that individual were entirely repicked. Upon completion of this repicking effort, the weighted average picking accuracy in the laboratory was estimated at 97.38%.

Identification consistency tests involved all current personnel participating in larvae identification. The test determined consistency among the identifiers in separating *Morone* into white perch and striped bass.

Water-quality personnel measure water-quality parameters from samples taken in conjunction with the ichthyoplankton samples. All equipment used for these measurements is calibrated regularly in the water-quality laboratory (see Section IV).

C. IMPINGEMENT

The following identification guides are available on-site to aid in identifying rare fish:

Eddy, S. 1969. How to know the freshwater fishes. W.C. Brown Company Publishers, Dubuque, Iowa. 286 p.

Bigelow, H.B., and W.C. Schroeder. 1953. Fishes of the Gulf of Maine. U.S. Fish and Wildl. Serv. Fish. Bull 53(74).

In addition to these books, the reference collection at the Verplanck laboratory is available. Fish which cannot be identified by Impingement personnel are submitted to biologists at the Verplanck laboratory for identification.

Quality-control checks include random checks by biologists or trained technicians on fish identifications, counts, length and weight measurements, and detection of fin clips.

Instruments used by Impingement personnel are calibrated according to manufacturers' recommendations.

D. WATER QUALITY

SOPs for all calibration, maintenance, and field procedures are available at the Verplanck laboratory to all Water-Quality personnel. Instruments are calibrated on a regular basis according to the manufacturers' recommendations.

1. Model 6D Hydrolab Surveyor (Hydrolab Corporation, Austin, Texas)

This *in-situ* water-quality analyzer is used to measure water temperature, dissolved-oxygen concentration, pH, and conductivity for fisheries trawling efforts and standard-station chemistry measurements. To insure accuracy of readings, all parameters capable of measurement by the Hydrolab unit are calibrated in the laboratory before field use according to procedures presented in the instrument manual and the SOP for the Hydrolab. The theoretical oxygen concentrations for saturated distilled water are taken from Strickland and Parsons (1968).*

2. Model 651S Current Speed and Model 652S Current Direction Measuring System (Hydroproducts, San Diego, California)

These are used to measure current speed and direction during 26-hr studies and other miscellaneous studies conducted by the Water-Quality

*A Practical Handbook of Seawater Analysis. Fish. Res. Bd. Can., Bull. 167. 293 p.

group. The system is calibrated according to the procedures outlined in the instrument manual. While in use, it is calibrated as deemed necessary.

3. Weston and Stack Dissolved Oxygen/Temperature Meter

This is calibrated aboard the research vessel. Meters are calibrated against oxygen-saturated distilled water before each sampling effort, once during, and whenever errors are suspected. Electrodes are cleaned and membranes replaced on Monday of each sampling week. Thermistors are calibrated at each dissolved-oxygen calibration using a precision mercury thermometer. In the lab, the instrument's accuracy is frequently checked during the day. Maintenance is conducted on a weekly basis according to the manual.

4. Model 33 Salinity-Conductivity-Temperature Meter (Yellow Springs Instrument Company)

The probe is cleaned with distilled water and checked against a sodium chloride solution of known conductivity. Readings from the meter and the solution concentration are recorded and filed. This calibration occurs at the beginning of each sampling week. Shipboard calibration consists of "red lining" the instrument before each sample is read.

5. Model 175 Porto-matic pH Meter (Instrumentation Laboratories)

This is calibrated on Monday of each sampling week, during which the probe's reference chamber is flushed with fresh KCl solution. Shipboard calibration consists of calibration with appropriate buffer before use and random calibration throughout the sampling period.

6. Model PBL pH Meter (Sargent-Welch)

This is used in the lab to determine the pH of the water samples. The instrument is calibrated daily using buffers of known pH.

7. Model 31 Conductivity Bridge (Yellow Springs Instrument Company)

Conductivity is measured in the lab with this meter. The accuracy is checked periodically with a Wheatstone bridge as described in the manual and is checked weekly against standard solutions of known conductivity.

8. Model 2100A Turbidimeter (Nephelometer) (Hach Chemical Company)

Turbidity is determined with this instrument, which is standardized daily with formazin solutions prepared every other day in the laboratory.

APPENDIX B

ICHTHYOPLANKTON
SAMPLING GEAR, LABORATORY QUALITY CONTROL,
AND SAMPLING-SITE SELECTION;
FISHERIES GEAR AND DEPLOYMENT

APPENDIX B

ICHTHYOPLANKTON SAMPLING GEAR, LABORATORY QUALITY CONTROL, AND SAMPLING-SITE SELECTION; FISHERIES GEAR AND DEPLOYMENT

A. ICHTHYOPLANKTON SAMPLING-GEAR DESCRIPTION

1. Epibenthic Sled

The construction of the epibenthic sled was primarily of 6061-T6 aluminum. Two 12.0-ft x 1.5-ft (4.0-m x 0.46-m) lengths of 1.3-in. (3.2-mm) sheet aluminum were bent to form runners. The carriage and support were constructed of 1.5-in. x 1.5-in. (38-mm x 38-mm) aluminum angle 0.125-in. (3.2-mm) thick, and 1-in. (25-mm) OD aluminum tubing. Drop bars were made of 1.25-in. (32-mm) square tubing. Wire cable [0.375-in. (4.8-mm)] was used for the drop guides, with optimal tension being maintained with adjustable eyebolts. Nets were fastened to the drop bars with nylon twine and to the drop-guides with 1.75-in. (44-mm) S hooks. The epibenthic sled was designed to sample the water strata 1 to 4 ft (30 to 122 cm) from the bottom. Changing mesh sizes and lengths of the nets attached to the sled carriage permitted the collection of different life stages of fishes, from eggs to adults. Incorporation of a double trip mechanism allowed collection of either single or multiple samples during each tow. Digital and electronic flowmeters were attached to monitor the volume strained by the net and the relative gear speed through the water.

During the 1973 ichthyoplankton river survey, the epibenthic sled (Figures B-1 and B-2) was rigged to consecutively sample with three nets. The mesh sizes increased (505, 1000, 1800, 3000 μ) as the sampling season progressed, and the gauze-opening/mouth-opening ratio (open-area ratio) varied with the different mesh sizes to maintain an optimum filtration efficiency.

In the 1974 ichthyoplankton river survey, the epibenthic sled (Figures B-3 and B-4) was rigged with a single net. Only the 505-μ mesh net with an 8/1 gauze-opening/mouth-opening ratio was used. This open-area ratio maintained maximum filtration efficiency. Tranter and Smith (1968) stated that any conical net made from a modern gauze will filter at more than 85% efficiency

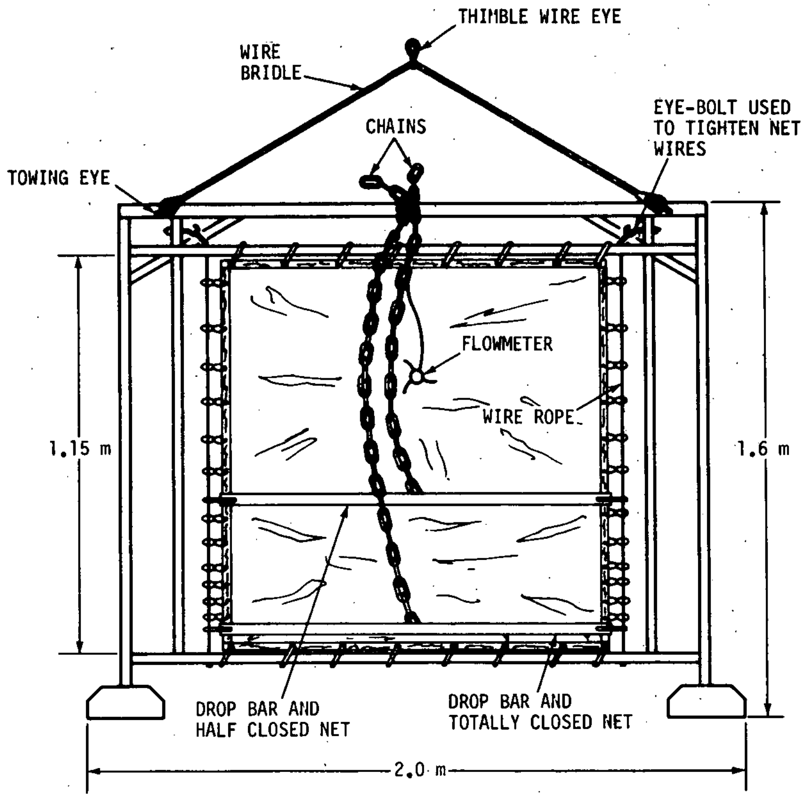

Figure B-1. Epibenthic Sled Used in 1973 Ichthyoplankton River Survey. Front view depicts operation of closing nets.

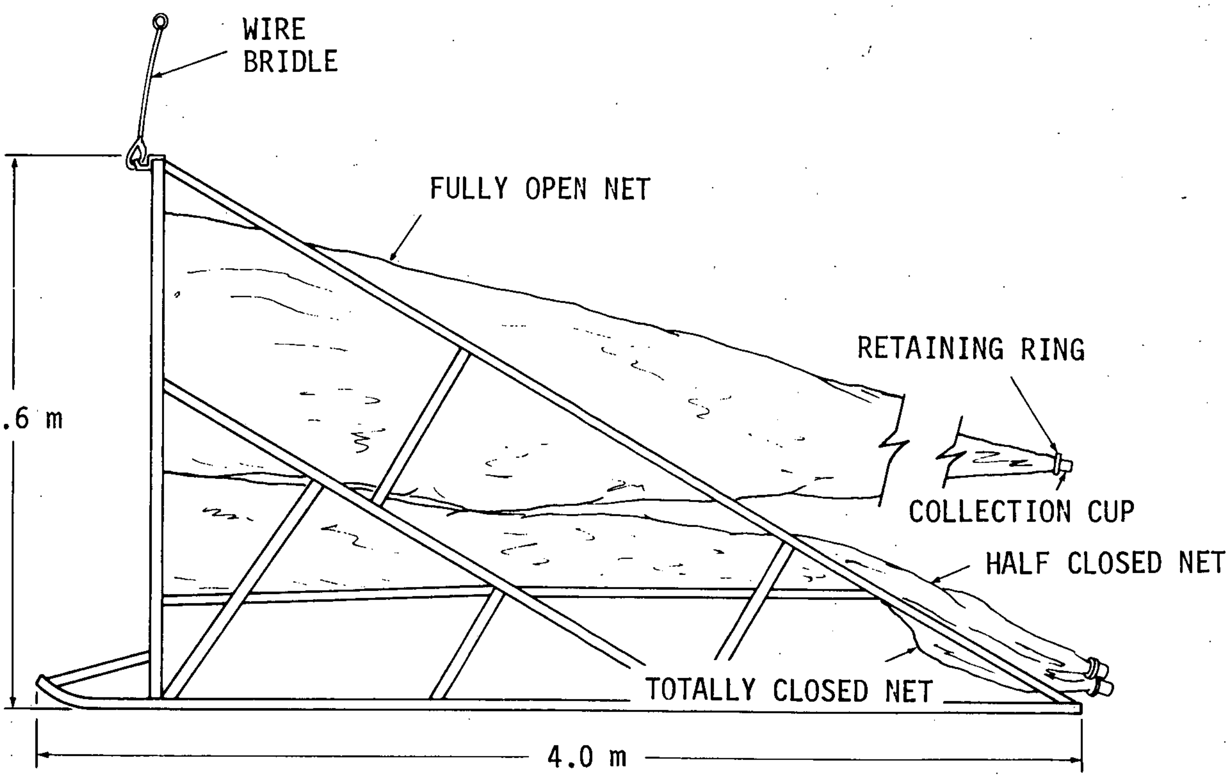

Figure B-2. Side View of Epibenthic Sled Used in 1973

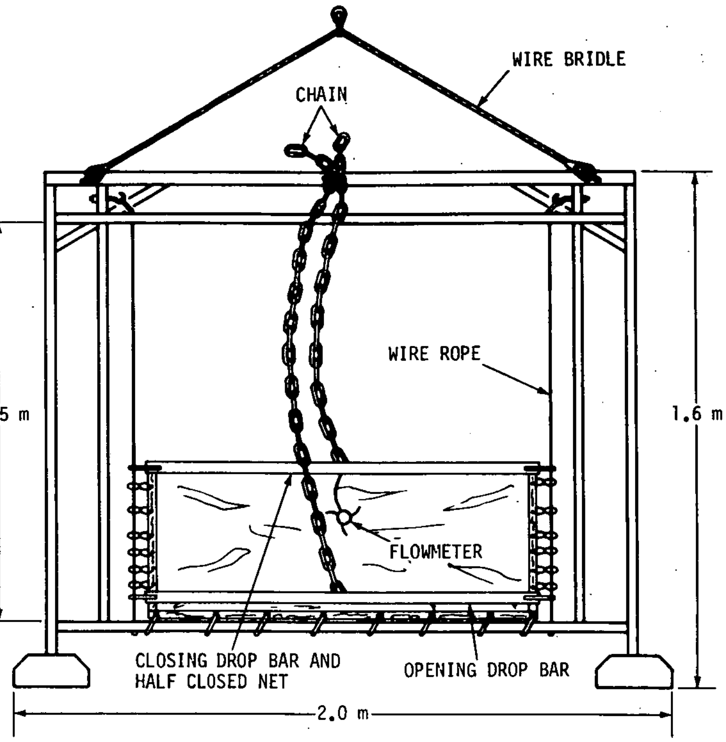

Figure B-3. Front View of Epibenthic Sled Used in 1974

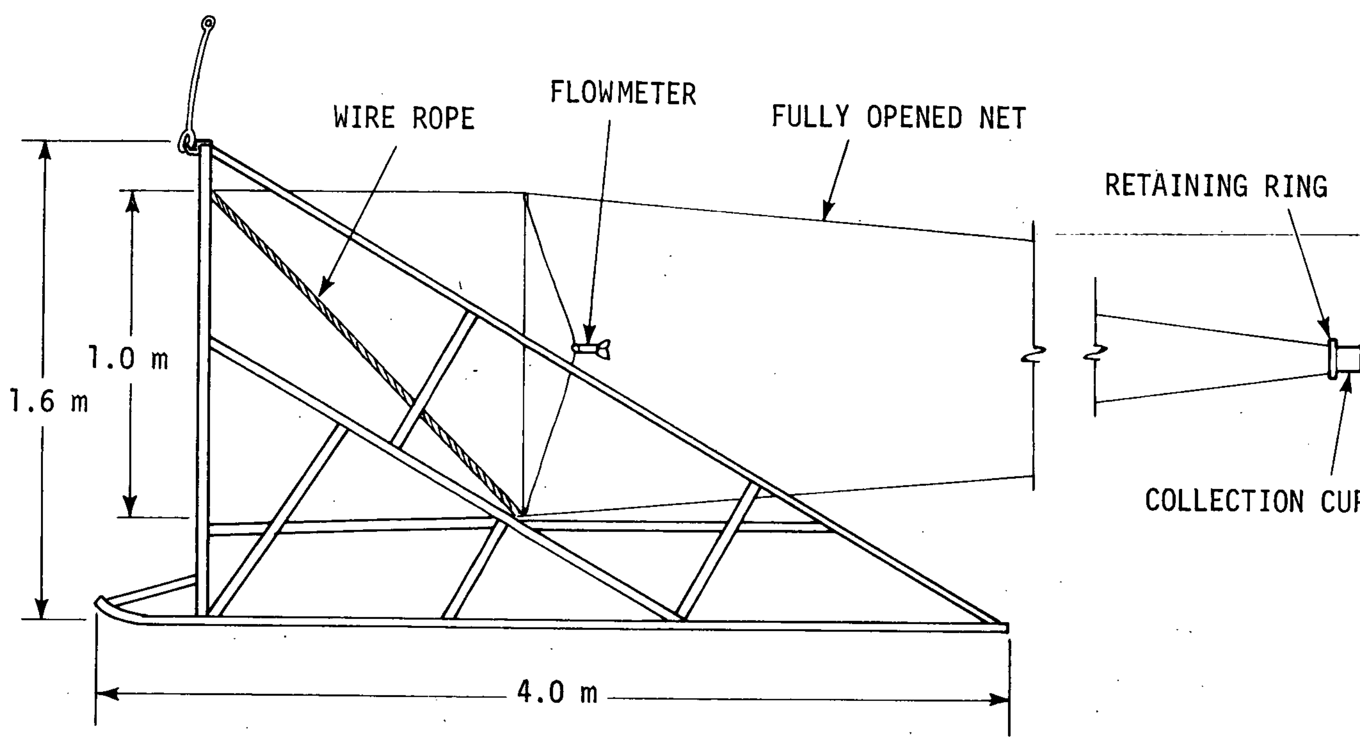

Figure B-4. Side View of Epibenthic Sled Used in 1974 if the open-area ratio is greater than 3 and that nets with an open-area ratio greater than 5 can filter to 95% efficiency. Nets used in this study with an open-area ratio of 8/1 were probably not much more than 95% efficient since a mouth-reducing cone was not used.

During the fall shoals survey, the epibenthic sled was adapted for catching larger fishes more effectively. The sled was rigged with a 3000-μ mesh net with a modified fyke cod end. This design reduced the water velocity through the cod end of the net, increasing survival of the organisms caught. In Figure B-5 is a side view of this epibenthic sled and modified net. This type of net was used in both 1973 and 1974.

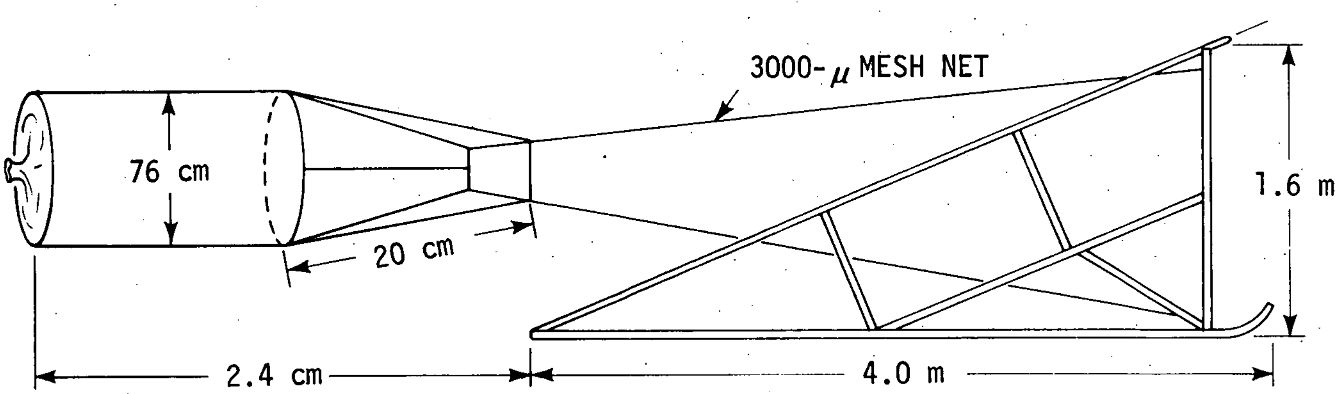

Figure B-5. Epibenthic Sled Used for Collecting Juvenile Fishes in Shoal Areas of Hudson River Estuary, 1973 and 1974. Side view shows single net and modified fyke cod end.

2. Tucker Trawl

The frame design of the Tucker trawl was essentially the same as that of the sled mouth frame. The top and bottom were constructed of standard 0.25-in. (6.5-mm) wall aluminum pipe (75 mm and 89 mm ID respectively). The trawl's drop leads were constructed of 0.375-in (9.5-mm) wire cable; drop bars were made of steel pipe. The plankton nets were fastened to the drop leads with 1.75-in. (44-mm) S hooks and to the drop bars with nylon twine. The mouth frame of the trawl, when sampling, moved through the water at a 45° angle to the vertical, measured with a wire angle indicator at the junction of the towing wire and boom sheave. Plankton nets mounted to the trawl's frame were cut on a bias to maintain a square mouth opening while being towed.

The Tucker trawl was designed to sample the pelagic zone of the water column (i.e., the open-water areas from the surface to 3 m above the bottom of the estuary in depths >6 m). Since nets can be easily mounted and removed from the trawl's frame, modification of mesh sizes and net lengths permitted the collection of various species and life stages of aquatic organisms. Incorporation of a double trip mechanism permitted collection of single or multiple samples from each tow. Digital and electronic flowmeters were attached to monitor the volume strained by the net and the relative gear speed through the water, respectively.

The 1973 ichthyoplankton river survey used two Tucker trawls with individual mouth-frame dimensions of 1.4 m x 1.0 m and 2.8 m x 2.0 m. The smaller trawl, which was used throughout the estuary to sample fish eggs and larvae, had an effective mouth opening of 1 m^2 and was rigged with three 505-μ mesh plankton nets; it was stabilized with 59 kg (130 lb) of lead weights enclosed in the bottom tube of the frame. The larger trawl had an effective mouth opening of 4 m^2 and was also rigged with three plankton nets. Mesh sizes were increased from 1800 μ to 3000 μ during the sampling season. For stabilization 141 kg (310 lb) of lead weights were enclosed in the bottom tube of the frame. Front and side views of the 1-m^2 Tucker trawl used in 1973 are presented in Figures B-6 and B-7; except for an increase in the dimensions listed, these also represent the 2-m^2 Tucker trawl.

Only the 1-m^2 Tucker trawl was used during the 1974 ichthyoplankton river survey. This trawl was used throughout the estuary to sample fish eggs and larvae. It was rigged with a single 505-μ mesh plankton net and was stabilized with two 55-kg (120-lb) tubes of lead weights enclosed in the bottom of the frame. Front and side views of the Tucker trawl used in 1974 appear in Figures B-8 and B-9.

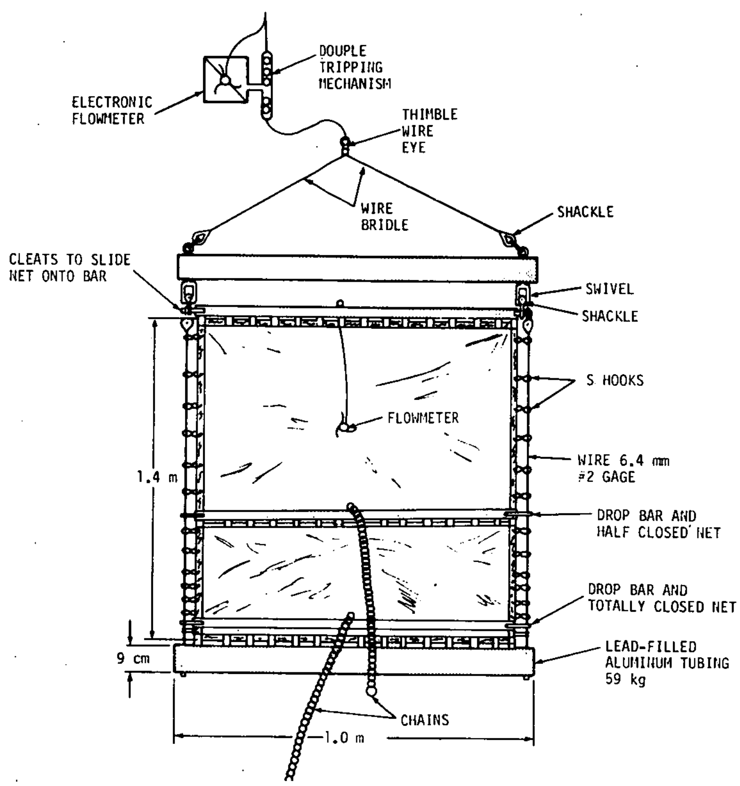

Figure B-6. Tucker Trawl Used in 1973 Sampling. Front view depicts operation of closing nets.

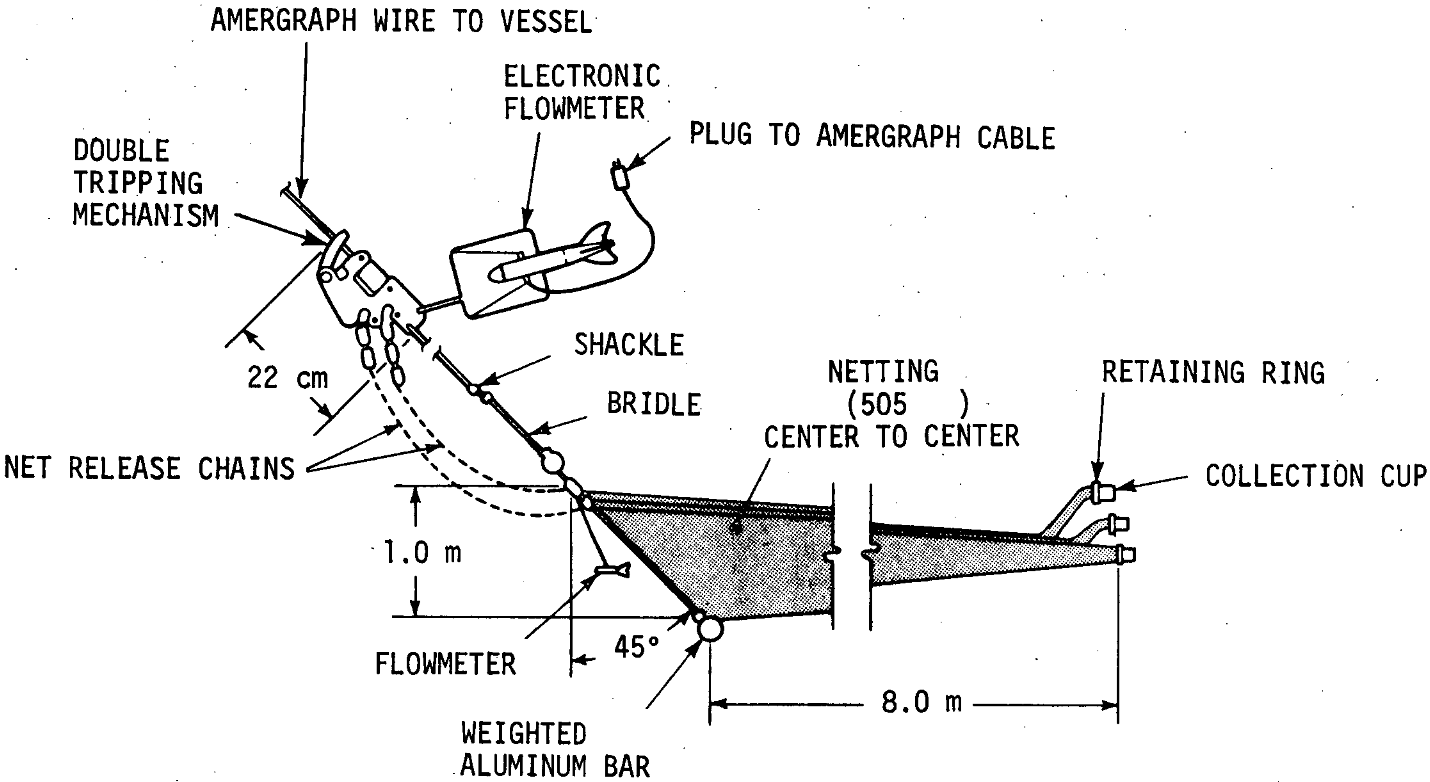

Figure B-7. Side View of Trip Release Mechanism and Mounted Electronic Flowmeter Attached to Tucker Trawl Used in 1973

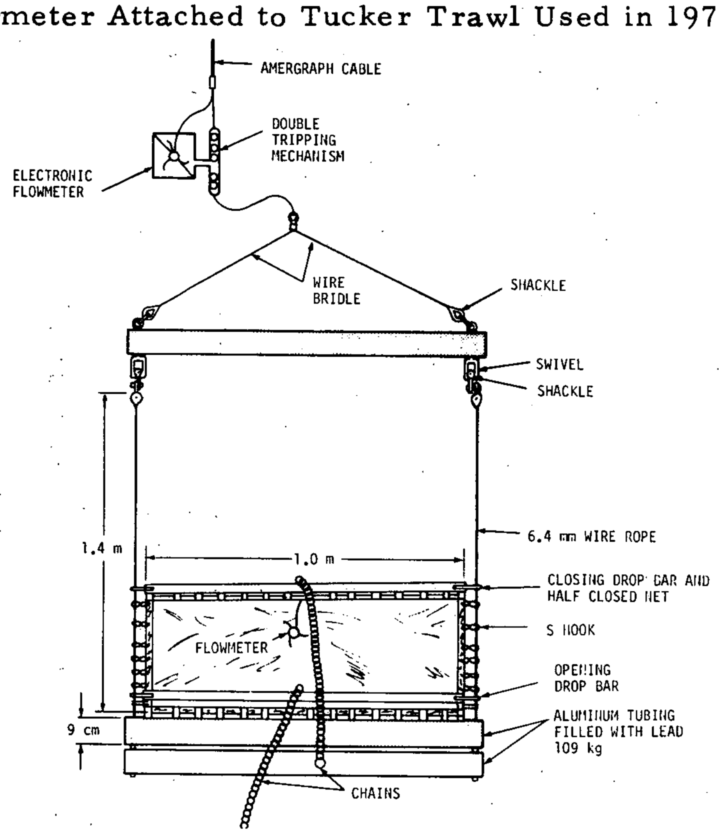

Figure B-8. Tucker Trawl Used in 1974 Sampling. Front view depicts operation of closing net.

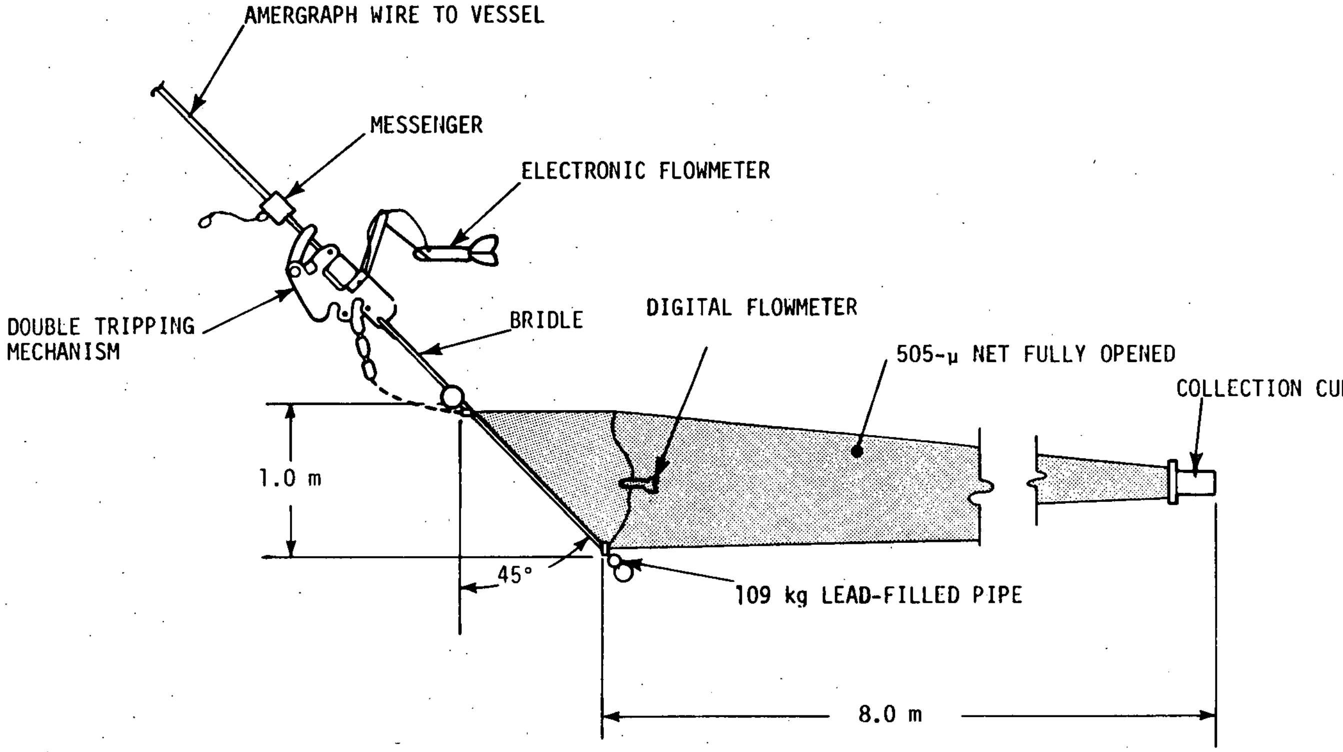

Figure B-9. Side View of Tucker Trawl Used in 1974 Sampling

3. Plankton Nets

Plankton nets of several types were used for sampling throughout 1973 and 1974. The open-area ratio of the nets, the type of gauze, the type of weave, and filtration efficiency varied as mesh sizes and mouth openings changed. The various nets used during both years are described in Table B-1.

Table B-1

Plankton Nets Used in 1973 and 1974 Sampling Programs

Sampling Program	Mesh					Open-Area Ratio	Modification	Estimated Filtration Efficiency (%)
	Size (μ)	Aperture	Weave	Material	Net Design			
1973 Ichthyoplankton								
1-m² epibenthic sled	505	Square	Plain	Nytex	Truncated pyramid	8	None	95
	1000	Square	Plain	Nytex		5.8	None	95
	1800	Square	Plain	Nytex		6.1	None	95
	3000	Hexagonal	Twist-locking braid	Knotless nylon		5	None	95
1-m² Tucker trawl	505	Square	Plain	Nytex		8	None	95+
4-m² Tucker trawl	1800	Square	Plain	Nytex		4.9	None	95
	3000	Hexagonal	Twist-locking braid	Knotless nylon		5	None	95
1974 Ichthyoplankton								
1-m² epibenthic sled	505	Square	Plain	Nytex		8	None	95+
1-m² Tucker trawl	505	Square	Plain	Nytex		8	None	95+
1973 & 1974 Fall Shoals								
1-m² epibenthic sled	3000	Hexagonal	Twist-locking braid	Knotless nylon	Truncated pyramid	5	Conical fyke cod end extending 7 ft beyond net. Dimensions: 2-ft diameter x 3-ft cylinder tapering by 3-ft gradient	95 to fyke 100+ through fyke

B. LABORATORY QUALITY-CONTROL TECHNIQUES

During 1974, extensive quality-control procedures were developed and applied to insure maximum quality of the data generated from the ichthyoplankton laboratory picking and identification efforts. These procedures are described separately in this appendix under the categories of picking and identification techniques.

1. Quality-Control Techniques on Picking Efficiency

A total of 1576 samples were picked by 54 different individuals during the summer and fall of 1974. The individuals included permanent laboratory personnel, temporary personnel employed during the summer months (undergraduate students from various local colleges and universities), and other temporary personnel employed by other operations groups but given some ichthyoplankton laboratory experience before returning to school. The number of samples picked per individual, generally a function of the length of time each worked in the laboratory, ranged from 1 to 94 samples.

Throughout the summer and early fall, individuals involved in the laboratory work were instructed in standard operating procedures and informed of revisions to these procedures if changes were instituted. Individual progress and sample difficulty were continually reviewed, but no sample rechecking was initiated until all 1576 samples had been completed. Once all the samples were picked, a checking process was initiated to determine the accuracy of the picking effort. At least 5% of the samples completed by each individual were repicked, and the number of organisms originally found was compared to the total number of organisms found following the repicking effort. Samples were repicked for *Morone* eggs and larvae. A sample which was repicked was assumed to no longer contain any *Morone* upon completion.

The average laboratory accuracy was described as a percentage. The formula is as follows:

$$\frac{N}{N+R} \times 100 = \text{percent laboratory picking accuracy}$$

where

N = total number of eggs and larvae originally picked

R = total number eggs and larvae found in repicks

The entire laboratory picking accuracy was found to be 87.8% for the entire year.

The checking process disclosed that an overall laboratory accuracy percentage could not be used as a conversion factor, since many individuals originally picked all of the *Morone* they encountered whereas a few individuals picked less than 50% of what was actually in the sample. The initial correction process was to repick all of the samples of those individuals who were less efficient than the average laboratory accuracy of 87.8%.

Further analysis of results indicated three general categories of picking error. The first category included individuals who were consistently below average in their picking effort and missed specimens in every sample. The second error category included individuals who exceeded overall laboratory accuracy but occasionally missed specimens in difficult samples (i.e., samples with many invertebrates, much detritus, etc.). In these cases, individual picking accuracy was sometimes below the laboratory average although, in some samples, all organisms were picked accurately. The third category of picking error comprised a few individuals who missed some specimens in every sample but had picking accuracy equal to or above the overall laboratory average. Whenever one of these three types of error was encountered, all of the samples picked by that individual were repicked and the additional data added to the original data sheet when warranted. This effort necessitated repicking 575 of the 1576 samples worked by the laboratory. Upon completion of these samples, the picking effort in the laboratory was considerably better than 87.8% for the year. Since each of the repicked samples checked contained no more ichthyoplankters, the weighted mean picking effort for the laboratory personnel was estimated as 97.4%.

2. Quality-Control Techniques on Species Identification

The 1974 picking effort reduced 1576 samples, 1219 of which contained organisms that required identification; the remaining samples contained no fish eggs or larvae. Identification of the organisms was conducted by 15 individuals trained by persons previously experienced in identifying Hudson River ichthyoplankton.

a. Consistency Test

All current personnel (six) were involved in an identification consistency test conducted in mid-October to determine how consistent the identifiers were in separating *Morone* encountered in the samples into white perch and striped bass. *Morone* were selected because of their relative importance to the study and because of the difficulty that occurred in distinguishing these closely related species, particularly post yolk-sac larvae. The consistency test was conducted on specimens ranging from 7.0 to 15.00 mm in total length, since *Morone* larvae of this size are most difficult to separate to species.

From 1973 samples, 25 specimens were removed and placed in serially numbered vials. The specimens were representative of the river collections and covered the important size range. Each person examined each larva and attempted to identify it using available information. Additionally, the identifier recorded the particular reasons for an identification for later reference. No identifiers communicated their results until the test was completed. Each larva remained in the same vial throughout the test.

Initially, each person made all 25 identifications within a 1-hr time limit (fast method); later, each person reidentified all 25 specimens at his leisure (slow method) but without referring to his original results. After all identifiers had completed both methods, a group identification (consensus method) was conducted. The consensus method included a review by all identifiers of previous results and reidentification of each specimen by the group. Each person explained his criteria for making a particular identification and argued his points with the others. Agreement in this method had to be unanimous; an individual changed his identification only when phenotypic characters on the fish were pointed out. Unanimous agreement was obtained on 24 out of 25 larvae. The one specimen where unresolved disagreement occurred was deleted from the final analysis of consistency.

The results of this test were analyzed in two manners. Initially, the total number of fish agreed upon by each identifier for the fast method and the slow method was totaled and the sums recorded and then compared using the formula:

$$\frac{\Sigma X}{\Sigma Y} \times 100 = \text{relative percent individual consistency}$$

where

ΣX = sum of individual agreement with other identifiers

ΣY = largest sum of agreement recorded by individual identifiers

Thus, the relative percent individual consistency was determined (Table B-2). This analysis indicated that four of the six identifiers were with 90% consistency of each other.

Table B-2

Number of Times An Individual Agreed on a Specimen Relative to Other Identifiers, including Relative Percent Individual Consistency

	Identifier	1	2	3	4	5	6	Σ	%	Rank
Fast Method	1	X	13	11	12	10	13	59	81.9	5
	2	13	X	6	12	9	7	47	65.3	6
	3	11	6	X	12	21	16	66	91.7	4
	4	12	12	12	X	17	17	70	97.2	2
	5	10	9	21	17	X	15	72	100.0	1
	6	13	7	16	17	15	X	68	94.4	3
Slow Method	1	X	10	15	12	15	16	68	81.9	5
	2	10	X	14	17	8	9	58	69.9	6
	3	15	14	X	18	18	18	83	100.0	1
	4	12	17	18	X	16	17	80	96.4	3
	5	15	8	18	16	X	22	79	95.2	4
	6	16	9	18	17	22	X	82	98.8	2

The second analysis involved comparing the agreement of each identifier with the consensus method. A percent agreement with the consensus was developed using the formula:

$$\frac{N}{n} \times 100 = \text{percent agreement with consensus method}$$

where

N = number of individual fish an identifier had in agreement with consensus and

n = 24; number of fish on which a consensus was reached

Results from both the fast and slow methods were compared to determine a percent agreement with consensus (Table B-3). This analysis indicated not only that five of the six identifiers were relatively consistent in individual identification technique, but that a higher percent agreement was achieved with the slow method.

Table B-3

Individual Percent Agreement with Consensus Method

	Identifier	%	Rank
Fast Method	1	70.8	4
	2	37.5	6
	3	75.0	2 (tie)
	4	75.0	2 (tie)
	5	66.6	5
	6	79.1	1
Slow Method	1	70.8	4 (tie)
	2	45.8	6
	3	91.6	1
	4	70.8	4 (tie)
	5	87.5	2
	6	83.3	3

b. Application of Consistency Test to Actual Laboratory Identification

Difficulty was encountered in designing and conducting the consistency test, since it was not entirely identical to the identification procedures used in the laboratory. Rarely was a single post yolk-sac larva of *Morone* encountered in a sample. The previous identification of a large number of a particular species in a given sample could influence remaining identifications in that sample. Another difference was that, during normal laboratory procedures, identifiers would ask the opinion of others when a particularly difficult specimen was encountered. During identification tests, this discussion was not permitted until the consensus method testing procedure was conducted. Additionally, the fast method included potential bias, since the identifiers felt compelled to finish and could not spend as much time on the difficult specimens as they would have normally spent.

Another test was developed to determine the consistency of actual laboratory identification. When the consistency test was conducted, 9 of the 15 people involved in ichthyoplankton identification were not available and their identifications needed to be checked.

Initially, there was a random check of 5% of all samples stratified by individual identifier. Two of the four individuals found from the relative percent individual consistency data to be above the 90% consistency level checked all other persons involved in identification. Neither identifier checked his own laboratory work. The original identification of all other persons had to be 90% consistent with the reidentification of these two people. Due to the random selection of samples and the nonrandom distribution of *Morone* larvae, many of the samples selected for checking contained no *Morone* larvae; as a result, the check yielded very little data on the identification ability of some individuals. However, based on the consistency test and the additional data supplied by the random check, the identifications of the four individuals who ranked above 90% in the relative percent individual consistency data were considered acceptable and not subject to further question.

Another check was conducted by examining the original data sheets submitted by individuals whose identifications were still in question. Quotas of 5% of the total *Morone* eggs, yolk-sac larvae, and juveniles and 10% of the post yolk-sac larvae were established for reidentification. Again, the original identification had to be 90% consistent with the reidentification if the work of a questionable identifier was to be considered acceptable. This check determined that the identifications of six individuals (including identifier 2 in the consistency test) were unacceptable. These six individuals had identified a total of 249 samples containing *Morone*, all of which were reidentified by persons who had demonstrated acceptable consistency. The major problem encountered was erroneous identification of *Morone*, but other species (notably yolk-sac darters and post yolk-sac gobies) were sometimes identified as *Morone*. The original data sheets were replaced with the data sheets produced from these reidentifications.

The overall effect of these checks and the subsequent reidentifications was to increase the consistency of *Morone* identifications made in the laboratory. The guidelines established for deciding whether to reidentify an individual's samples should increase overall laboratory consistency to over 90%.

C. 1974 SAMPLING-SITE SELECTION

The Hudson River estuary between Yonkers and Troy, New York, was divided into 12 regions and each region divided into at least two depth strata (epibenthic and pelagic zones). Many regions also included a shoal zone in which shallow-water areas [depths of ≤ 20 ft (6 m)] were accessible to sampling. Figure B-10 shows a cross section of the estuary in which each depth stratum is defined and represented.

Samples were allotted to particular regions by combining the calculated volume (m^3) of a specific region and its strata with the proportionate probability of capturing a particular life stage of striped bass as predicted from the 1973 data analysis. Table B-4 defines the various regions, the corresponding river miles (kilometers), and the calculated volumes for each stratum.

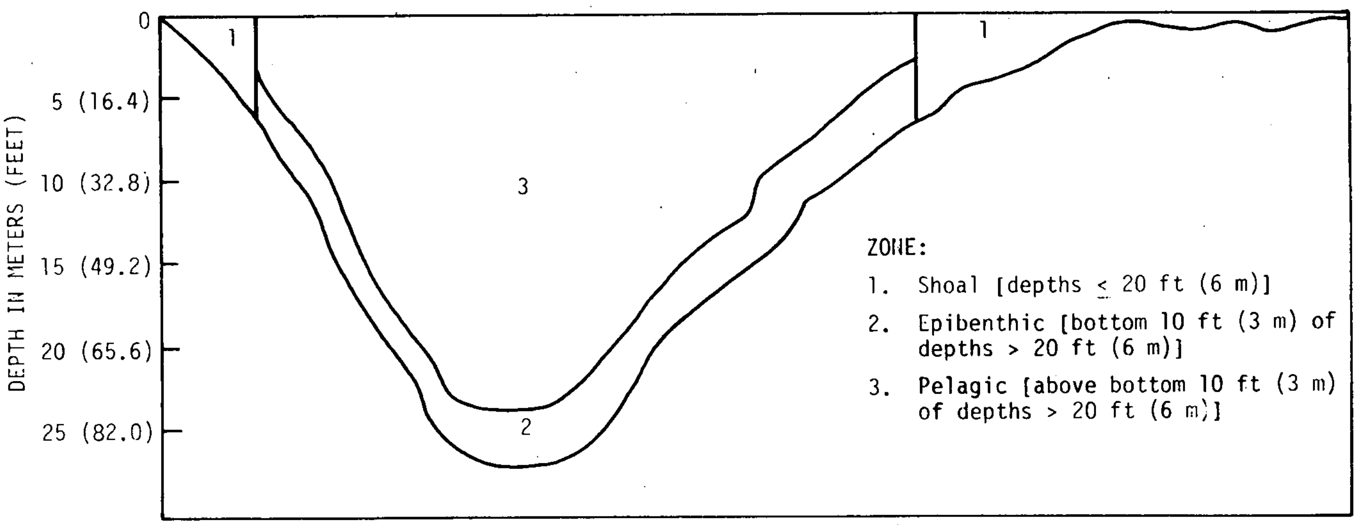

Figure B-10. Diagrammatic Cross-Section of Hudson River Estuary

The frequency of sampling in a particular stratum with a specific gear changed as the sampling season progressed. Early in the season, major emphasis was placed on sampling the epibenthic zone with the epibenthic sled to capture striped bass eggs and yolk-sac larvae. Later, as the striped bass developed to early post yolk-sac larvae, increased emphasis was placed on sampling the pelagic zone with the Tucker trawl. During the period in which the post yolk-sac and early juveniles were the predominant life stages, emphasis was placed on sampling the shoal areas with both the epibenthic sled and the Tucker trawl. Throughout the sampling season, all strata were sampled with the appropriate gear to monitor the development and movement of striped bass during early life stages (from relative catch-per-tow information) to insure that emphasis shifts occurred at appropriate times. The numbers of samples allocated by region and strata for each period of emphasis appear in Tables B-5 through B-8.

Table B-4

Volume (m^3) for Each Stratum Sampled in Each Region of Hudson River Estuary

Region	River Miles† (inclusive)	Strata: Shoal Zone [depths ≤20 ft (6 m)]	Epibenthic Zone [bottom 10 ft (3 m) of depths >20 ft (6 m)]	Pelagic Zone [above bottom 10 ft (3 m) of depths ≤ 20 ft (6 m)]
Yonkers	14-23 (22.4-36.8)	26,700,000	NS;* added to pel. zone	202,800,000
Tappan Zee	24-33 (38.4-52.8)	121,700,000	61,900,000	138,000,000
Croton-Haverstraw	34-38 (54.4-60.8)	53,900,000	32,500,000	61,300,000
Indian Point	39-46 (62.4-73.6)	12,600,000	33,400,000	162,300,000
West Point	47-55 (75.2-88.0)	NS; added to epi. zone	28,600,000	178,800,000
Cornwall	56-61 (89.6-97.6)	8,100,000	36,800,000	94,900,000
Poughkeepsie	62-76 (99.2-121.6)	NS; added to epi. zone	69,200,000	229,000,000
Hyde Park	77-85 (123.2-136.0)	NS; added to epi. zone	34,300,000	127,200,000
Kingston	86-93 (137.6-148.8)	NS; added to epi. zone	47,800,000	93,700,000
Saugerties	94-106 (150.4-169.6)	NS; added to epi. zone	63,100,000	179,000,000
Catskill	107-124 (171.2-198.4)	NS; added to epi. zone	76,800,000	83,900,000
Albany	125-154 (200.0-224.0)	NS; added to epi. zone	71,100,000	NS; added to epi. zone

*NS = areas not available for sampling.
†Numbers in parentheses indicate kilometers

Table B-5

Stratified Sample Allocation Effective April 29, 1974, When Major Emphasis Was Placed on Sampling Epibenthic Zone

Region	Strata: Shoal Zone	Epibenthic Zone	Pelagic Zone
Yonkers	2	NS*	9
Tappan Zee	10	7	3
Croton-Haverstraw	5	3	1
Indian Point	1	4	4
West Point	NS	2	3
Cornwall	1	4	2
Poughkeepsie	NS	7	4
Hyde Park	NS	3	2
Kingston	NS	4	2
Saugerties	NS	4	3
Catskill	NS	5	3
Albany	NS	2	NS

*NS = no areas available for sampling.

Table B-6

Stratified Sample Allocation Effective May 15, 1974, When Major Emphasis Was Placed on Sampling Pelagic Zone

Region	Strata		
	Shoal Zone	Epibenthic Zone	Pelagic Zone
Yonkers	2	NS*	5
Tappan Zee	10	4	5
Croton-Haverstraw	5	2	2
Indian Point	3	2	6
West Point	NS	2	5
Cornwall	2	2	3
Poughkeepsie	NS	4	7
Hyde Park	NS	2	4
Kingston	NS	2	4
Saugerties	NS	3	7
Catskill	NS	3	3
Albany	NS	2	NS

*NS = no areas available for sampling.

Table B-7

Stratified Sample Allocation Effective June 21, 1974, When Sampling Was Limited to Lower Estuary

Region	Strata		
	Shoal Zone	Epibenthic Zone	Pelagic Zone
Yonkers	11	NS*	6
Tappan Zee	22	3	6
Croton-Haverstraw	11	3	6
Indian Point	3	7	11
West Point	NS	6	8
Cornwall	3	5	3
Poughkeepsie	NS	8	8
Hyde Park	NS	8	6
Kingston	NS	10	3
Saugerties	NS	0	0
Catskill	NS	0	0
Albany	NS	0	NS

*NS = no areas available for sampling.

Table B-8

Stratified Sample Allocation Effective July 24, 1974, When Major Emphasis Was Placed on Sampling Shoals Zone

Region	Strata		
	Shoal Zone	Epibenthic Zone	Pelagic Zone
Yonkers	10	NS*	6
Tappan Zee	20	3	7
Croton-Haverstraw	10	3	6
Indian Point	3	7	10
West Point	NS	5	7
Cornwall	4	4	4
Poughkeepsie	NS	8	9
Hyde Park	NS	7	5
Kingston	NS	8	4
Saugerties	NS	2	3
Catskill	NS	2	2
Albany	NS	2	NS

*NS = no areas available for sampling.

The specific location of a particular sampling site was selected from a random-number table using coordinates of current U.S. Department of Commerce navigation charts for the Hudson River. Charts of each river region were enclosed in a rectangle in order to plot coordinates. The first three digits of the random number determined the ordinant and the last two the abscissa. The lower left-hand corner of each regional chart was considered the origin; from this point, measurements in tenths of centimeters were made. This system provided equitable selection of any point up to 99.9 cm from the origin along the vertical axis and 9.9 cm in length. Two of the 12 regions were wider than 9.9 cm. The origin on these two charts was alternated between the lower left of the chart and the upper right-hand corners of the rectangle to insure that all areas were equally available for selection. Typically, all sampling sites for one gear were selected before progressing to the next gear type.

Depths for Tucker trawl samples were chosen randomly from nine equal depth strata from 0.1 to 0.9 x total depth. The last digit of the random number was used to determine the depth increment sampled. The increments varied with the river depth at a particular site [i.e., at a depth of 50 ft (15 m), 2 indicated sampling 10 ft (3 m) below the surface; at 100 ft (30 m), 2 indicated sampling 20 ft (6 m) below the surface]. Occasionally, a selected site proved unsuitable for sampling: this usually occurred when the coordinates selected were outside the sampling area or because of an obstruction listed on the navigation chart. When this occurred, another random number for that stratum was selected. If there was an obstruction not listed on the navigation chart and recognizable only in the field (dredging, commercial gill nets, duck blinds, etc.), the sample was collected as close to the designated area as possible and the change recorded on the navigation chart so the obstruction could be considered for further reference in selecting sites until it had been removed.

D. FLOWMETER EVALUATION

In 1974, a test was conducted to determine the factors influencing the performance of new flowmeters under actual sampling conditions. Three flowmeters were mounted in the mouths of a 1.0-m^2 epibenthic sled and a 1.0-m^2 Tucker trawl, as illustrated in Figure B-11, and digital readings recorded after each of 24 tows, each of 5-min duration, conducted with both gear (i.e., 12 tows per gear). Six of the tows for each gear were made in shallow water (< 5 m) and six in deep water (> 30 m). Tidal flow effects were examined by towing with the tidal flow in 50% of the tows within each gear and depth combination and against tidal flow in the remainder. The resulting experimental design (Table B-9) was a changeover design with a series of Latin Squares as further blocks (Li, 1964).

Table B-9
Raw Data Used in Flowmeter Calculation

Depth	Position		Epibenthic Sled						Tucker Trawl					
			Against Tide			With Tide			With Tide			Against Tide		
		Tow No.	1	2	3	4	5	6	7	8	9	10	11	12
> 30 m	A	Flowmeter No.	6	7	8	6	7	8	7	6	8	7	8	6
		Flowmeter Reading	8387	9851	10326	7845	10672	11338	12704	11525	12532	12080	24202	11213
	B	Flowmeter No.	7	8	6	8	6	7	8	7	6	6	7	8
		Flowmeter Reading	8931	10773	10464	7636	11549	10976	12568	11408	12754	12426	24514	11415
	C	Flowmeter No.	8	6	7	7	8	6	6	8	7	8	6	7
		Flowmeter Reading	8494	10429	10451	8728	10963	12078	13426	11150	12656	12816	24750	11654
		Tow Total	25812	31053	31241	24209	33184	34392	38698	34083	37942	37322	73466	34282
		Block Total			88106			91785			110723			145070
		Tow No.	16	17	18	13	14	15	19	20	21	22	23	24
< 5 m	A	Flowmeter No.	7	6	8	8	7	6	6	8	7	8	6	7
		Flowmeter Reading	9370	10804	10164	11740	11002	10920	9890	9311	8071	7597	9331	8978
	B	Flowmeter No.	6	8	7	6	8	7	7	6	8	7	8	6
		Flowmeter Reading	11590	10726	11191	10578	10975	11437	10767	9963	9286	9069	9261	9572
	C	Flowmeter No.	8	7	6	7	6	8	8	7	6	6	7	8
		Flowmeter Reading	11353	10586	11109	10394	21807	10397	10814	9572	9459	9318	9705	9352
		Tow Total	32313	32116	32464	32712	43784	32754	31471	28846	26816	25984	28297	27902
		Block Total			96893			109250			87133			82183

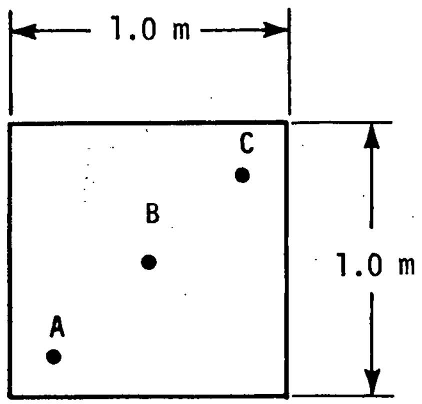

Figure B-11. Approximate Position of Flowmeters in Mouth of Net during Flowmeter Test

An analysis of the resulting data (Table B-10) yielded the following conclusions:

(1) There was no significant difference among flowmeters according to the analysis of variance; however, a Friedman analysis of variance showed that flowmeter 6 ranked higher than 7 which ranked higher than 8 ($p = 0.0137$). One may conclude that some flowmeters yield higher readings than others but that the differences are small. The estimated standard deviation of flowmeters in terms of volume was 1.55 m^3/tow which implies that flowmeter error is within 2% of the mean calculated volume (306 m^3 in this experiment) 99% of the time.

(2) There was a significant gear-x-depth interaction which means that the two gears behaved differently in deep and shallow water Flowmeter readings for sled tows were lower in shallow water than in deep water, while values for trawl tows were lower in deep water than in shallow water (Figure B-12).

(3) There was no significant difference due to the direction of the tow with respect to the tide.

(4) According to the analysis of variance, there was no significant difference due to position in the mouth of the net; however, a nonparametric Friedman analysis of variance detected a small but significant difference between positions.

(5) Differences among tows contributed the most variability to the flowmeter readings, but this difference could not be attributed to depth of tow, type of gear, tow direction with respect to tidal flow, or any combination of these variables. Within this experiment, one would expect that 99% of all tows would be within 127 m^3 of the mean (306 m^3) on the basis of the tow variable.

Table B-10

Summary of Analysis of Variance of Flowmeter Experiment

Source	df	Effects	F
Gear G	1	Fixed	0.90††
Depth sample D	1	Fixed	2.11††
Tow Direction T	1	Fixed	0.11††
G x D	1		7.44*
G x T	1		1.21
D x T	1		1.34
G x D x T	1		1.35
Position P	2	Fixed	2.76
P x D	2		0.83
P x T	2		0.78
P x G	2		0.48
Tow (c) U (c)†	16	Random	13.44***
Flowmeter B	2	Random	2.07
B x D	2		1.02
B x T	2		0.83
B x G	2		0.88
Error	32		

† (c) = (G, D, T, G x D, G x T, D x T, G x D x T)
†† Approximate ratio based on EMS (Scheffe', H., 1959)
* $P < 0.05$
** $P < 0.01$
*** $P < 0.001$

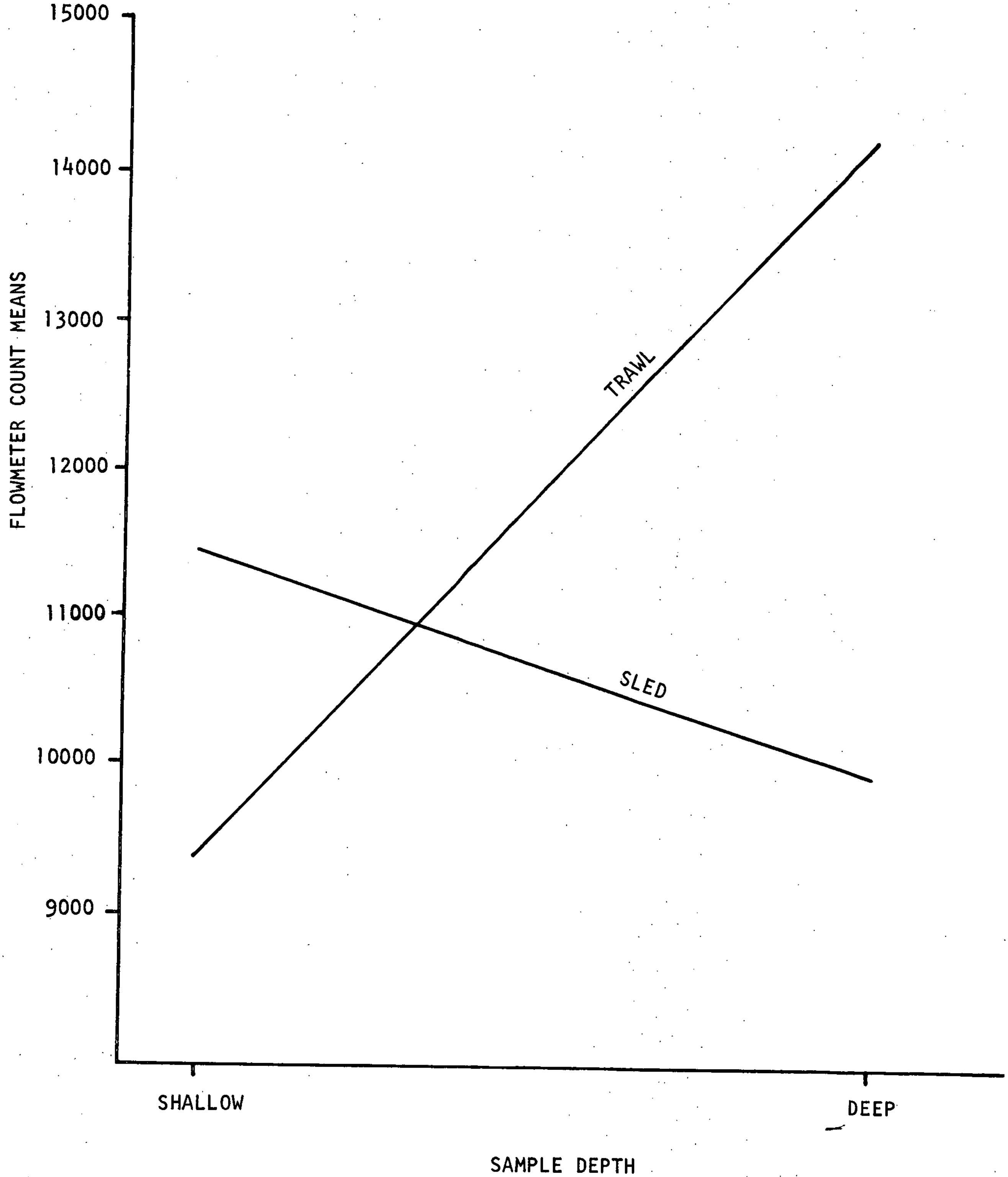

Figure B-12. Gear/Sample-Depth Interaction

E. FISHERIES GEAR AND DEPLOYMENT

The following presents the specifications of each type of gear and the standard procedures for deployment.

Description	Method
Beach Seines	
50-ft (15.2-m) beach seine 50 ft x 4 ft (15.2 m x 1.2 m) 0.125-in. (3.2-mm) mesh	(1) Set parallel to shore, no more than 100 ft (30.5 m) from shoreline, at depth no greater than 3 ft (0.9 m). (2) Walk seine to shore. (3) Collect sample and record catch data and water-quality parameters as well as distance from shore and depth at which seine was set.
100-ft (30.5-m) beach seine Wings: 40 ft x 8 ft (12.2 m x 2.4 m) 0.375-in. (9.5-mm) mesh Bag: 20 ft x 10 ft (6.1 m x 3.0 m) 0.25-in (6.4-mm) mesh Tow line: 16 ft (4.9 m)	(1) Set perpendicular to shore. (2) With one end held in place on shore, tow other end to beach, forming semicircle. (3) Collect sample and record catch data and water-quality parameters.
200-ft beach seine Wings: 90 ft x 12 ft (27.4 m x 3.7 m) 0.375-in. (9.5-mm) mesh Bag: 20 ft x 15 ft (6.1 m x 4.6 m) 0.25-in. (6.4-mm) mesh Tow line: tow, 16 ft (4.9 mm) haul, 100 ft (30.5 m)	
Tow	(1) Set perpendicular to shore. (2) With one end held in place on shore, tow other end to beach, forming semicircle. (3) Collect sample and record data and water-quality parameters.

Description	Method
Haul	(1) Set parallel to shore no more than 100 ft (30.5 m) from shoreline.
	(2) Haul seine to shore.
	(3) Collect sample and record catch data and water-quality parameters.
Trap Nets	
3-ft x 6-ft (0.9-m x 1.8-m) box, 50-ft (15.2-m) lead, 20-ft (66.1-mm) wings [0.375-in. (9.5-mm) mesh; 4-in. (0.1-m) mouth]	(1) Set trap at shallow-water site at depth sufficient to submerge trap
	(2) Set lead anchor and float, paying out lead perpendicular to expected patterns of fish movement.
	(3) Set anchors and floats of wings on each side of lead.
	(4) Lay trap, set back anchor and float.
	(5) Stretch lead and wings until net is taut and in proper position.
	(6) To tend, pull trap alongside boat, open zipper, and remove fish with dip net.
	(7) Record catch data and water-quality parameters.
4-ft x 8-ft (1.2-m x 2.4-m) box, 50-ft (15.2-m) wings [box, 0.5-in. (12.7-m) mesh; wings, 2-in. (50.8-mm) mesh; 4-in. (0.1-m) mouth]	(1) Set trap at shallow-water site at depth sufficient to submerge trap.
	(2) Set anchors and floats of wings.
	(3) Lay trap, set back anchor and float.
	(4) Stretch wings until net is taut and in proper position.
	(5) To tend, pull trap alongside boat, open zipper, and remove fish with dip net.
	(6) Record catch data and water-quality parameters.

Description	Method
3-ft x 6-ft (0.9-m x 1.8-m) box; double fyke with 4-in. (0.1-m) mouth; four 6-ft (1.8-m) lengths reinforced by steel rods	(1) Set traps from shore where depths are 4 to 30 ft (1.2 to 9.1 m) at low slack tide. (2) Lower trap into water by wire rope attached to bridle. (3) After trap is set parallel to shore, attach wire rope to solid structure. (4) To tend, pull trap from shore, open zipper, and remove fish with dip net. (5) Record catch data and water-quality parameters.
Gill Nets	
300 ft x 8 ft (91.5 m x 2.4 m) [3-in. (76.2-mm) bar mesh]	(1) Set net perpendicular to expected patterns of fish movement in 8 to 20 ft (2.4 to 6.1 m) of water. (2) Set anchor and float at starting point; back boat slowly, paying out float and lead line. Drop second anchor and float when net is set.
300 ft x 12 ft (91.5 m x 3.7 m) [4-in. (10.0-m) bar mesh]	(1) Set as above except at depths of 12 to 20 ft (3.7 to 6.1 m).
Bottom and Surface Trawls	
Bottom-trawl deployment	(1) Interregional trawl survey (a) Before deployment, tie off cod end of otter-type bottom trawl (see bottom-trawl dimensions) as well as end of cod-end cover (see bottom-trawl dimensions). (b) Tow in stern-trawling manner with doors measuring 2.5 ft x 4 ft (0.8 m x 1.2 m) against tide at speed of 1.3 m/sec for 5 min.

Description	Method

(c) While towing, maintain minimum 3/1 cable length/depth ratio. Determine water-quality parameters during tow.

(d) After completing tow, remove sample from cod-end cover and record catch data.

(e) Untie cod end of trawl, remove sample, and record catch data.

(2) Standard-station trawl survey

(a) Tow otter-type bottom trawl in a stern-trawling manner (see bottom-trawl dimensions) with doors measuring 1.25 ft x 2.5 ft (0.4 m x 0.8 m) against tide at speed of 1.0 m/sec for 10 min.

(b) While towing, maintain 4/1 cable length/depth ratio. Determine water-quality parameters during tow.

(c) After completing tow, remove sample from trawl, preserve in 10% formalin, and return to laboratory for analysis.

(d) On day preceding or following standard-station bottom trawls, collect sample at same stations in same manner but with liner (see bottom-trawl dimensions) inserted in trawl. Determine water-quality parameters during tow. After completing tow, remove sample from liner, preserve in 10% formalin, and return to laboratory for analysis.

Description	Method
Surface-trawl deployment	(1) Station two boats approximately 150 ft (45.7 m) apart, with 100-ft (33.3-m) tow lines attached to modified midwater trawl (see surface-trawl dimensions); tow lines form angle of approximately 45° to length of trawl body. (2) Tow against tide at speed of 1.0 m/sec for 10 min. Determine water-quality parameters during tow. (3) After completing tow, remove sample from trawl, preserve in 10% formalin, and return to laboratory for analysis.

Bottom-Trawl and Surface-Trawl Dimensions

	Bottom Trawl	Surface Trawl
Total length	13.5 m (44.3 ft)	15 m (49.2 ft)
Head rope		
Length	7.8 m (25.6 ft)	5.3 m (17.4 ft)
Diameter	1 cm (0.4 in.)	1 cm (0.4 in.)
Material	Nylon	Nylon
Head rope float		
Size	4 cm x 8 cm (1.6 in. x 3.2 in.)	12 cm x 14 cm (4.7 in. x 5.5 in.)
Number	6	8
Material	Spongex	Spongex
Spreader Bar		
Length	—	3.28 m x 33 mm (10 ft x 1.2 in.
Diameter	—	16 cm x 40 cm (6.3 in. x 15.7 in.)
Spreader Bar Float		
Size	—	16 cm x 40 cm (6.3 in. x 15.7 in.)
Number	—	2
Material	—	Spongex

	Bottom Trawl	Surface Trawl
Foot rope		
Length	9.3 m (30.5 ft)	5.3 m (17.4 ft)
Diameter	1 cm (0.4 in.)	1 cm (0.4 in.)
Material	Nylon	Nylon
Weights	13.2 m (43.3 ft) of 0.6-cm (0.2-in.) galvanized chain	38-9 link tickler chains of 0.6-cm (0.2-in.) galvanized chain
First section		
Length	10 m (32.8 ft)	2.1 m (6.9 ft)
Mesh (stretch)	3.8 cm (1.5 in.)	4.3 cm (1.7 in.)
Second section		
Length	—	3.3 m (10.8 ft)
Mesh (stretch)	—	3.5 cm (1.4 in.)
Third section		
Length	—	3.0 m (9.8 ft)
Mesh (stretch)	—	3.0 cm (1.2 in.)
Fourth section		
Length	—	3.7 m (12.1 ft)
Mesh (stretch)	—	2.5 cm (1.0 in.)
Cod end		
Length	3.5 m (11.5 ft)	2.9 m (9.5 ft)
Mesh (stretch)	3.2 cm (1.3 in.)	4 mm (0.2 in.)
Liner mesh (stretch)	1.6 cm (0.6 in.)	—
Trawl doors		
Standard station	0.4 m x 0.8 m (1.25 ft x 2.5 ft)	—
Interregional	0.8 m x 1.2 m (2.5 ft x 4.0 ft)	—
Cod-end cover		
Length	6.7 m (22.0 ft)	—
Mesh (stretch)	6 mm (0.2 in.)	—
Chafing cloth	3 m x 6.7 m (9.8 ft x 22.0 ft)	—

APPENDIX C

HUDSON RIVER ECOLOGICAL SURVEY AND WATER-QUALITY HISTORICAL DATA BASES

APPENDIX C

LIST OF TABLES AND FIGURES

Topic	Number
HISTORICAL DATA BASE FOR HUDSON RIVER ESTUARY	
ECOLOGICAL SURVEY	Tables C-1 through C-5
WATER QUALITY	Figures C-1 through C-10

Table C-1

Code Descriptions Used in Summary Descriptions of Hudson River Ecological Survey Data Base

Gear Codes	Deployment Codes	Sampling-Frequency Codes
1 = 0.5-m conical plankton net	31 = anchored to buoy line	51 = daily
2 = 1.0-m conical plankton net	32 = towed for 20 min	52 = twice weekly
3 = 1.0-m^2 Tucker trawl	33 = towed for 10 min	53 = weekly
4 = 2.0-m^2 Tucker trawl	34 = towed for 5 min, occasional 2-min tow	54 = biweekly
5 = 1.0-m^2 epibenthic sled	35 = towed for 5 min	55 = monthly
6 = small bottom trawl on runners	36 = towed for 7 min	56 = irregular
7 = 25-ft (8-m) beach seine primarily, but also 10-ft (3-m) and 60-ft (18-m) seines	37 = pulled parallel to shore	57 = day only
8 = 50-ft (15-m) beach seine	38 = pulled perpendicular to shore	58 = night only
9 = 75-ft (23-m) beach seine	39 = anchored	59 = day and night
10 = 100-ft (30-m) beach seine	40 = drifted	
11 = 200-ft (61-m) beach seine	42 = sediment sample	
12 = 25-ft (8-m) semiballoon bottom trawl; 0.5-in. (1.3-cm) liner		
13 = 25-ft (8-m) semiballoon bottom trawl; no liner		
14 = 25-ft (8-m) surface trawl; liner		
15 = 25-ft (8-m) surface trawl; no liner		
16 = 16-ft x 16-ft (5-m x 5-m) modified midwater trawl		
17 = box traps (several sizes)		
18 = gill nets (several sizes)		
19 = several sizes of beach seines, gill nets, traps nets, minnow traps		
20 = 25-ft (8-m) semiballoon bottom trawl; 0.25-in. (0.6-cm) liner		
21 = artificial substrate samplers		
22 = Thorson jars		
23 = Emory bottom dredge		
24 = 0.5-m^2 epibenthic sled		
25 = small biological dredge		
26 = Petersen bottom dredge		
27 = Phleger gravity corer		

Table C-2

Summary Description of Hudson River Ichthyoplankton Ecological Survey Data Base*

Study	Year	Region of River (river mile)†	Gear Code	Deployment Code	Months Sampled J	F	M	A	M	J	J	A	S	O	N	D	Sampling-Frequency Code
Rathjen and Miller	1955	14-124 (23-200)	1,6	31,32					x	x							53
Hudson River Fisheries Investigations (HRFI)	1966	34-124 (55-200)	1	31				x	x	x	x						52,53,57
	1967	45-103 (72-166)	1	33				x	x	x	x						52,53,59
	1968	56-57 (90-92)	1	33				x	x	x	x						51,59
Raytheon (RAY)	1969	35-47 (56-76)	1	33							x	x	x	x	x	x	55,57
	1970	35-47 (56-76)	1	33	x	x	x	x	x	x	x	x	x	x			53,54,59
Texas Instruments (TI)	1972	31-35 (50-56)	1,2	33					x	x	x	x	x	x	x	x	54,59
	1973	17-140 (27-225)	3,4,5	34				x	x	x	x	x					53,59
	1973	12-70 (19-113)	5	35								x		x	x	x	53,58
	1974	14-143 (23-230)	3,5	35				x	x	x	x	x					53,59
	1974	14-76 (23-122)	5	35								x	x	x	x	x	53,59

*For more specific details, refer to study reports listed in Literature Cited, Section IX.

†Numbers in parentheses indicate kilometers.

Table C-3

Summary Description of Hudson River Fisheries Ecological Survey Data Base*

Study	Year	Region of River (river miles)†	Gear Code	Deployment Code	J	F	M	A	M	J	J	A	S	O	N	D	Sampling Frequency Code
New York Conservation Department Survey of the Lower Hudson Watershed	1936	22-117 (35-188)	19	NR‡				x	x	x	x	x	x				NR,59
Rathjen and Miller	1955	14-124 (23-200)	7	NR						x	x	x					54,49
New York University (NYU)	1964	23-76 (37-122)	8	37						x	x	x					53,57
	1965	27-87 (43-140)	8	37						x	x	x					54,47
	1966	27-105 (43-169	8	37						x	x	x					53,57
	1967	27-96 (43-154)	8	37						x	x	x					53,57
	1968	27-105 (43-169)	8	37						x	x	x					53,57
	1968	40-41 (64-66)	8	37				x	x	x	x	x	x	x	x	x	55,57
	1969	40-87 (64-140)	8	37				x	x	x	x	x	x	x			55,57
Hudson River Fisheries Investigation (HRFI)	1965	56-58 (90-93)	9	37										x	x	x	53,57
	1965	56-57 (90-92)	12,15,16	33											x	x	53,57
	1966	56-58 (90-93)	12,15,16	33							x	x	x	x	x		53,57
	1966	35-125 (56-201)	9	37							x	x	x	x	x		53,57
	1967	35-125 (56-201)	9	37								x	x	x			53,59
	1967	43-68 (69-109)	12,15,16	33								x	x	x			53,54,59
	1968	17-132 (27-212)	9	37							x	x	x	x			54,47
	1968	17-132 (27-212)	12,15,16	33							x	x	x	x			53,59

*For more specific details, refer to study reports listed in Literature Cited, Section IX.

†Numbers in parentheses indicate kilometers.

‡NR = not reported.

Table C-3 (Contd)

Study	Year	Region of River (river mile)†	Gear Code	Deployment Code	J	F	M	A	M	J	J	A	S	O	N	D	Sampling Frequency Code
Raytheon (RAY)	1969	35-47 (56-76)	9,10	38						x	x	x	x	x	x	x	53,55,59
	1969	35-47 (56-76)	12,16	33,36						x	x	x	x	x	x	x	53,55,59
	1970	35-47 (56-76)	10	38				x	x	x	x	x	x	x			54,55,59
	1970	35-47 (56-76)	12,16	36			x	x	x	x	x	x	x	x			53,54,55,59
	1970	42 (68)	17	39		x	x	x	x	x	x	x	x	x			56,59
	1970	42 (68)	18	40				x	x	x							56,59
Texas Instruments (TI)	1972	32-59 (51-95)	9,10	38				x	x	x	x	x	x	x	x	x	53,54,59
	1972	30-58 (48-93)	13,16,23	33				x	x	x	x	x	x	x	x	x	53,54,59
	1972	36-61 (58-98)	17	39				x	x	x	x	x	x	x	x	x	56,59
	1972	36-61 (58-98)	18	39				x	x	x							56,59
	1973	12-153 (19-246)	8	37						x	x	x					54,59
	1973	12-153 (19-246)	10	38				x	x	x	x	x	x	x	x	x	53,54,59
	1973	35-47 (56-76)	11	38							x	x	x	x			56,57
	1973	40-43) (64-69)	13,16	33				x	x	x	x	x	x	x	x	x	54,57
	1973	12-62 (19-100)	13	35				x	x	x	x	x	x	x	x	x	54,57
	1973	36-61 (58-98)	17	39				x	x	x	x	x	x	x	x	x	56,59
	1973	36-61 (58-98)	18	39			x	x	x								56, 9
	1974	12-153 (19-246)	10	38				x	x	x	x	x	x	x	x	x	53,54,59
	1974	12-153 (19-246)	11	38					x	x	x						56,57
	1974	40-43 (64-69)	12,13,16	33				x	x	x	x	x	x	x	x	x	54,57
	1974	12-62 (19-100)	20	35				x	x	x	x	x	x	x	x	x	54,57
	1974	25-91 (40-146)	17	39				x	x	x	x	x	x	x	x	x	56,59
	1974	36-61 (58-98)	18	39			x	x	x	x							56,59

*For more specific details, refer to study reports listed in Literature Cited, Section IX.

†Numbers in parentheses indicate kilometers.

‡NR = not reported.

Table C-4

Summary Description of Hudson River Invertebrate Ecological Survey Data Base*

Study	Year	Region of River (river mile)†	Gear Code	Deployment Code	J	F	M	A	M	J	J	A	S	O	N	D	Sampling Frequency Code
Raytheon (RAY)	1969	35-47 (56-76)	1	33							x	x	x	x	x	x	55,57
	1969	38-45 (61-72)	21,22	39								x	x	x	x	x	55,59
	1969	35-47 (56-76)	24	42								x	x	x	x	x	55,57
	1970	35-47 (56-76)	1	33	x	x	x	x	x	x	x	x	x	x			53,54,55,59
	1970	38-45 (61-72)	21,22	39	x		x	x	x	x	x	x	x	x			55,59
	1970	35-47 (56-76)	24	42			x	x	x	x	x	x	x	x			55,57
Texas Instruments (TI)	1972	31-43 (50-69)	21,29,27 26,28	42				x	x	x	x	x	x	x	x	x	55,57
	1972	31-35 (50-56)	1,2	33					x	x	x	x	x	x	x	x	54,49
	1973	41-58 (66-93)	27,21,25	42				x	x	x	x	x	x	x	x	x	55,57
	1974	41-58 (66-93)	27,21, 25,1	42				x	x	x	x	x	x	x	x	x	55,57

*For more specific details, refer to study reports listed in Literature Cited, Section IX.

†Numbers in parentheses indicate kilometers.

Table C-5

Summary Description of Hudson River Ichthyoplankton, Fisheries and Invertebrate Ecological Survey Data Base*

Sampling Location	River Region (River Mile)	Year	Months Sampled	Sampling Frequency Code	Gear or Type of Data
Albany Power Station	142 (227)†	1970	Jul - Oct	56 (12 times)	Gill net (fish)
Albany Power Station	142 (227)	1970	Aug - Oct	56 (11 times)	Phyto-, zooplankton
Albany Power Station	142 (227)	1970	Aug - Oct	56 (23 times)	Dredge (benthos)
Kingston (Terry brick yard)	95 (152)	1970	Jul, Aug	53	Gill net, seine (fish)
Cruger Island	99 (158)	1970	Undetermined	60	Gill net, seine (fish)
Greene Point	110.4 (177)	1970	Undetermined	60	Gill net, seine (fish)
Greene Point	110.4 (177)	1970	Undetermined	53	Dredge (benthos)
Greene Point	110.4 (177)	1970	Undetermined	53	Phyto-, zooplankton
Bowline Point	37.5 (60)	1970	Jun	53 (2 times)	Dredge (benthos)
Bowline Point	37.5 (60)	1970	Jul - Oct	55 (3 times)	Dredge (benthos)
Bowline Point	37.5 (60)	1970	Jun	53 (2 times)	Gill net (fish)
Bowline Point	37.5 (60)	1970	Jul - Oct	53	Gill net (fish)
Bowline Point	37.5 (60)	1970	Jun - Oct	53 (2 times)	Phyto-, zoo-, ichthyoplankton
Bowline Point	37.5 (60)	1970	Jul, Aug	53	Phyto-, zoo-, ichthyoplankton
Bowline Point	37.5 (60)	1970	Sep, Oct	54	Phyto-, zoo-, ichthyoplankton
Lovett Point	42 (67)	1970	Jun - Oct	53 (2 times)	Seine (fish)
Lovett Point	42 (67)	1970	Jun - Oct	53	Mud scap (benthos)
Kingston	94-96 (150-154)	1971	Undetermined	61	Phyto-, zoo-, ichthyoplankton
Kingston	94-96 (150-154)	1971	Fall-Winter	54	Grab (benthos)
Kingston	95 (151)	1971	May - Dec	54, 55	Trawl, seine, gill net, fyke net (fish)
Kingston	95 (151)	1971	May - Aug	55	Ichthyoplankton
Roseton/Danskammer	63-68 (101-109)	1971	Aug	55	Phytoplankton and zooplankton
Roseton/Danskammer	63-68 (101-109)	1971	Oct	54	Phyto-, zooplankton
Roseton/Danskammer	63-68 (101-109)	1971	Nov, Dec	55	Phyto-, zooplankton
Roseton/Danskammer	68 (109)	1971	May	55 (3 times)	Ichthyoplankton
Roseton/Danskammer	66-68 (105-109)	1971	Oct - Dec	55	Grab (benthos)
Roseton/Danskammer	65-68 (104-109)	1971	May - Dec	55	Seine, trawl, gill net (fish)

*Generated information supplied to Texas Instruments by Lawler, Matusky, and Skelly Engineers (QLM Laboratories, Inc.) on June 30, 1975. For more specific details, refer to study reports listed in Literature Cited, Section IX.

†Numbers in parentheses represent kilometer.

Table C-5 (Contd)

Sampling Location	River Region (River Mile)	Year	Months Sampled	Sampling Frequency Code	Gear or Type of Data
Bowline Pond	37 (59)[†]	1971	Apr - Dec	56	Seine, surface trawl, gill net (fish)
Bowline Pond Inlet	35-43 (56-69)	1971	Jun	55	Zooplankton
Middle of Bowline Pond	35-43 (56-69)	1971	Aug	55	Juday plankton net (phytoplankton)
Bowline (pond)	36-39 (58-62)	1971	May	55	Eckman dredge (benthos)
Bowline (river)	36-39 (58-62)	1971	Jun, Aug	55 (5 times)	Benthos
Bowline Power Station	36-39 (58-62)	1971	Apr, May, Jun, Aug	55	Fish larvae
Roseton/Danskammer	63-68 (101-109)	1972	May, Jun, Aug Jul - Oct	55 54	Phytoplankton and zooplankton
Roseton/Danskammer	66-68 (105-109)	1972	Jun, Aug, Oct, Dec	55	Grab (benthos)
Roseton/Danskammer	65-68 (104-109)	1972	Apr, Sep, Dec	55	Seine, trawl, gill net (fish)
Roseton/Danskammer	65-66 (104-105)	1972	May - Sep	54, 55, 56	Seine, trawl, gill net (fish)
Bowline Bay	37 (59)	1972	Apr - Dec	56	Bottom trawl, (fish)
Bowline Intake-Discharge	37 (59)	1972	Apr - Dec	56	Bottom trawl, surface trawl (fish)
Bowline (river transects)	35-43 (56-69)	1972	May, Jul - Oct	55, 62	Wisconsin plankton net (plankton)
Bowline (river)		1972	May, Aug, Oct, Dec	56	Ponar grab (benthos)
Croton Point-Green Flats	34-110 (54-177)	1972	May - Aug	56	Entrainment, plankton nets
Bowline Pond, Bowline River, Lovett		1973	Jun - Dec	55	Ponar grab (benthos)
Bowline/Lovett		1973	Jan-Mar, May-Dec	56	Seine, surface and bottom trawl, floating gill net (fish)
Bowline Point	37.5 (60)	1973	Jan - Dec		Traveling screens
Bowline Intake-Discharge	36-42 (58-67)	1973	Jun - Oct May, Nov, Dec	54 55	Phytoplankton Phytoplankton
Bowline/Lovett		1973	Jun - Aug	56	0.5-m dia and 1-m Hensen nets (macrozooplankton and ichthyoplankton)
Roseton/Danskammer vicinity	62-68 (99-109)	1973	Mar - Dec	Seasonal	Otter trawl, beach seine, gill nets, fyke nets, frame nets (fish)
Roseton/Danskammer	62-68 (99-109)	1973	May - Dec	55	Wisconsin net (phytoplankton)
Roseton/Danskammer	62-68 (99-109)	1973	Jun - Dec	55	Ponar dredge (benthos)
Roseton/Danskammer	62-68 (99-109)	1973	Mar - Aug	62 24-hr periods, every other wk	Hensen net (larvae)

[†]Numbers in parentheses represent kilometer.

WATER-QUALITY HISTORICAL DATA FOR HUDSON RIVER ESTUARY

Data illustrating spatial and temporal trends in key water-quality variables for the Hudson River estuary are presented. Data sources are discussed in Sections III and V of Volume I.

Freshwater releases were measured at Green Island Dam near Troy, New York. Water-temperature variables were measured in the Peekskill or Poughkeepsie, New York, areas; salinity-related variables were measured in the Peekskill area. Tidal amplitudes represent data for the river in the Peekskill area. Saltfront positions (defined as 300 μmhos/cm conductivity) were calculated using the equation

$$M_s = -17.33\ (\ln U_5) + 25.59/A_4 + 78.17$$

where

M_s = saltfront position in river miles above Battery (300 μmhos/cm @ 25°C) at time t days

U_5 = freshwater release (thousands cfs) at time (t) - 5 days

A_4 = tidal amplitude (ft) at Indian Point at time (t) - 4 days

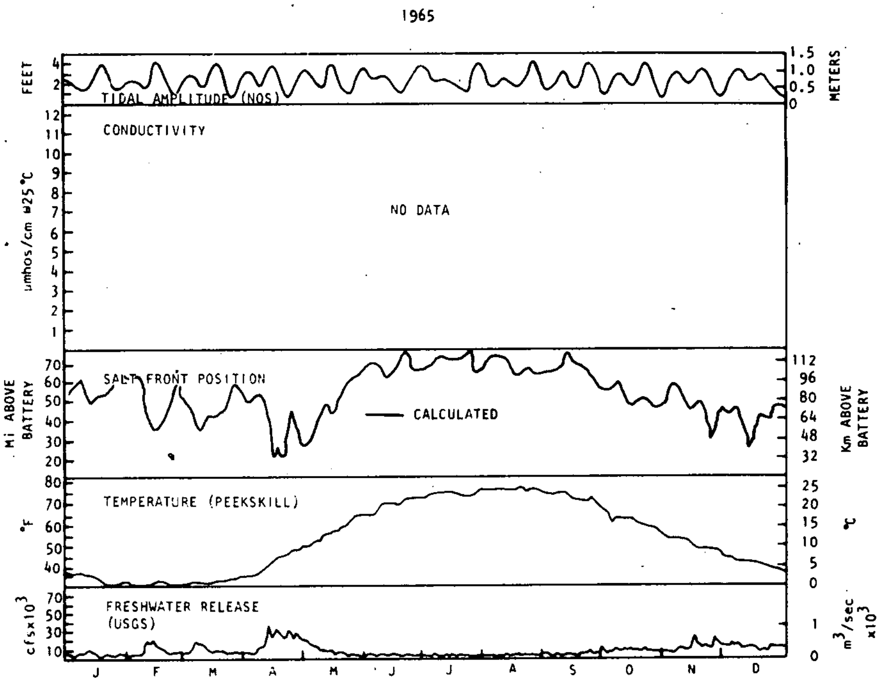

Figure C-1. Temporal Distribution of Freshwater Release, Water Temperature, Saltfront Position, Conductivity, and Tidal Amplitude in 1965

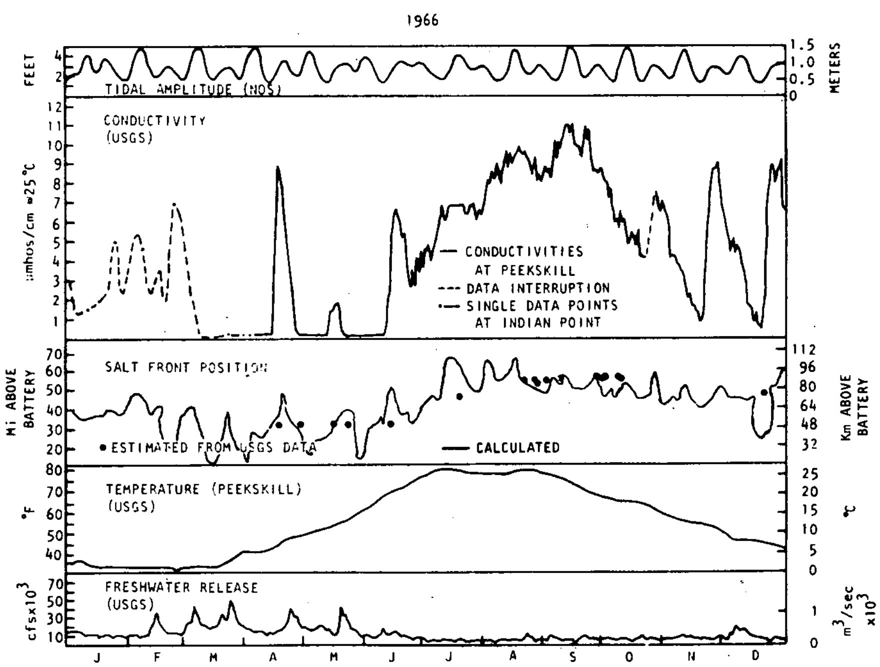

Figure C-2. Temporal Distribution of Freshwater Release, Water Temperature, Saltfront Position, Conductivity, and Tidal Amplitude in 1966

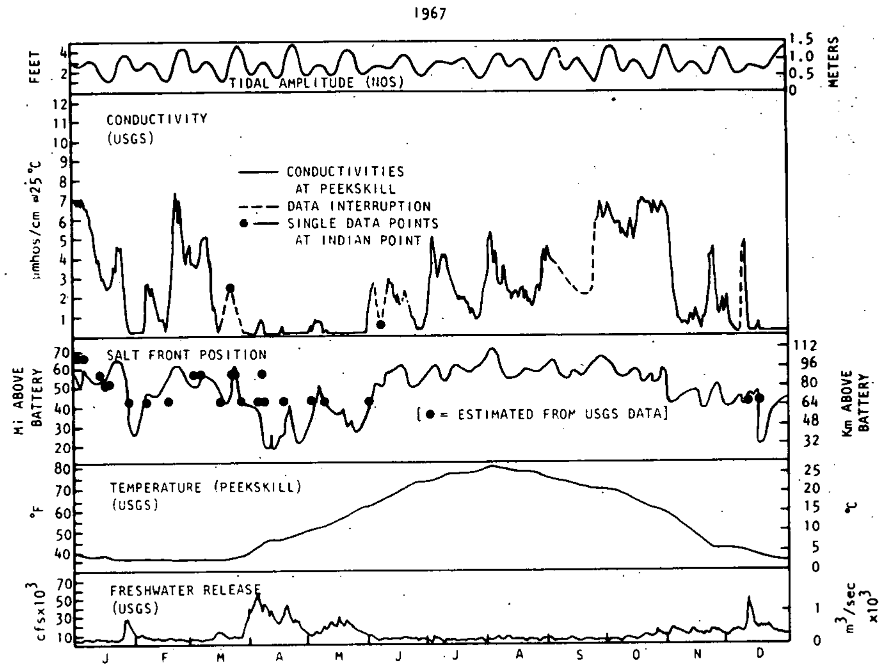

Figure C-3. Temporal Distribution of Freshwater Release, Water Temperature, Saltfront Position, Conductivity, and Tidal Amplitude in 1967

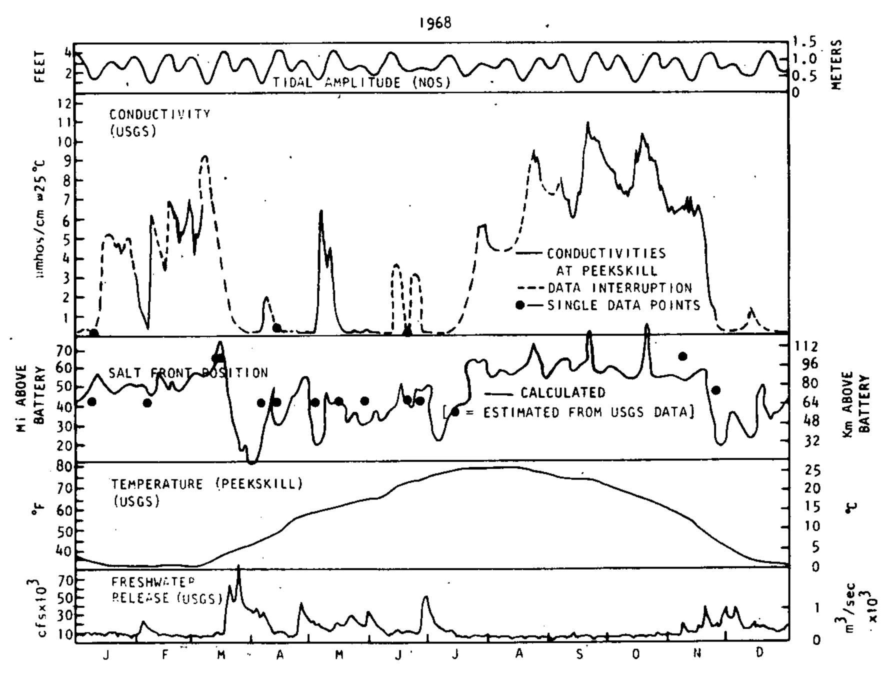

Figure C-4. Temporal Distribution of Freshwater Release, Water Temperature, Saltfront Position, Conductivity, and Tidal Amplitude in 1968

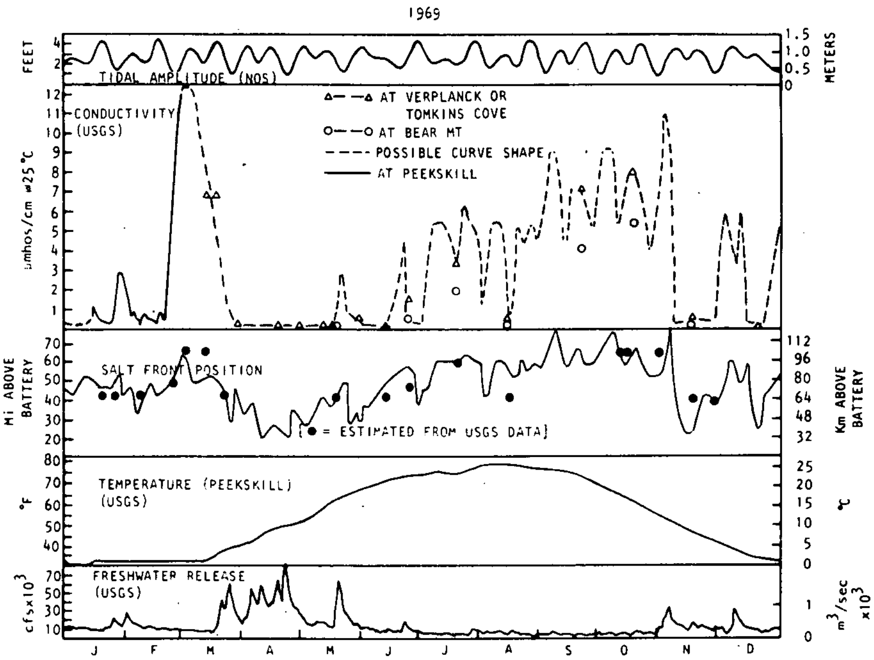

Figure C-5. Temporal Distribution of Freshwater Release, Water Temperature, Saltfront Position, Conductivity, and Tidal Amplitude in 1969

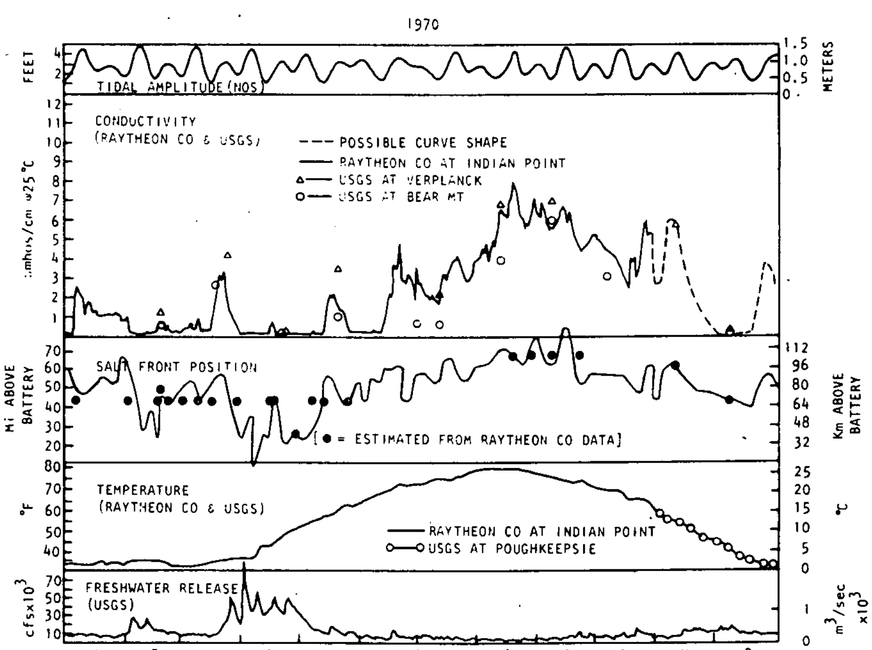

Figure C-6. Temporal Distribution of Freshwater Release, Water Temperature, Saltfront Position, Conductivity, and Tidal Amplitude in 1970

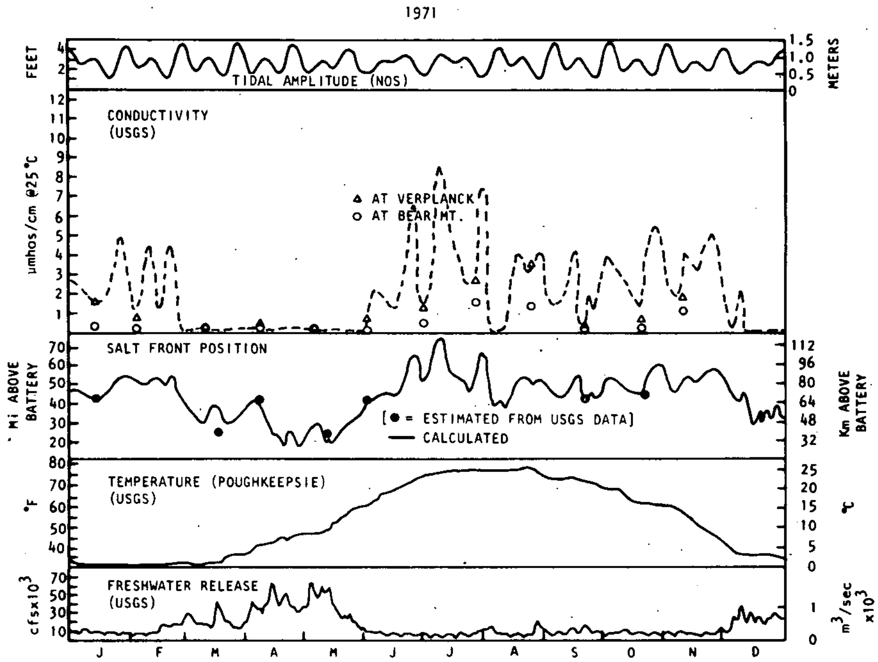

Figure C-7. Temporal Distribution of Freshwater Release, Water Temperature, Saltfront Position, Conductivity, and Tidal Amplitude in 1971

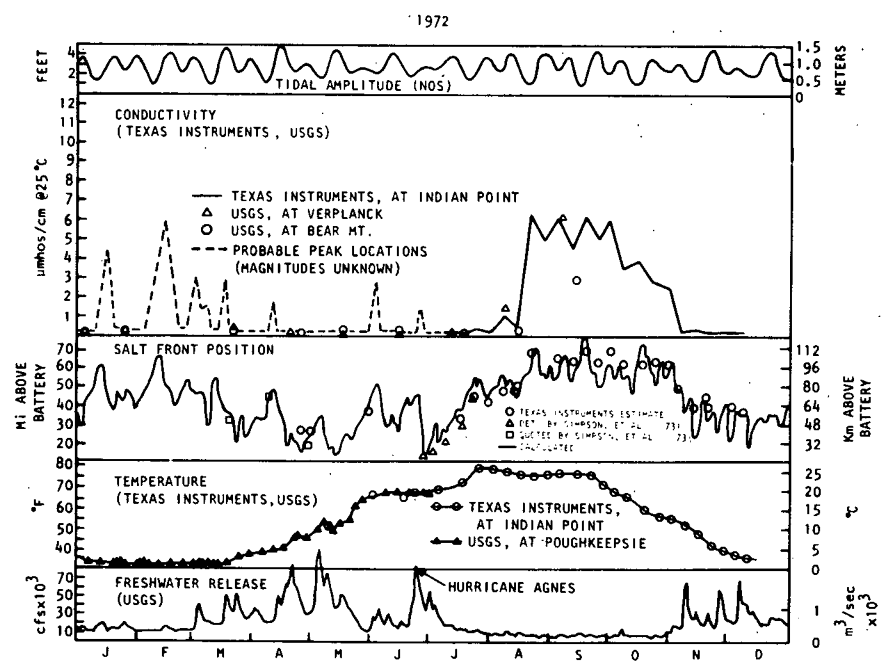

Figure C-8. Temporal Distribution of Freshwater Release, Water Temperature, Saltfront Position, Conductivity, and Tidal Amplitude in 1972

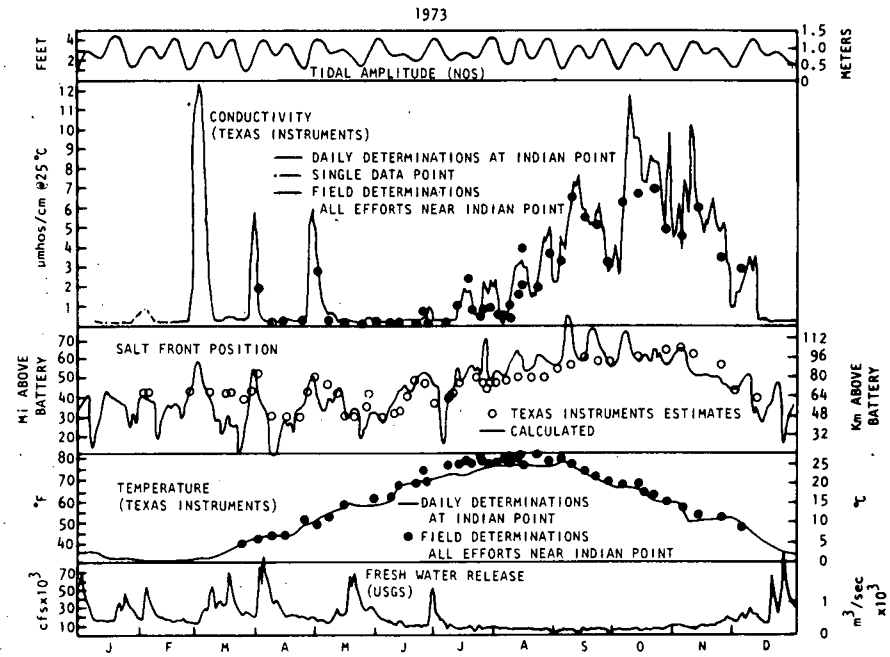

Figure C-9. Temporal Distribution of Freshwater Release, Water Temperature, Saltfront Position, Conductivity, and Tidal Amplitude in 1973

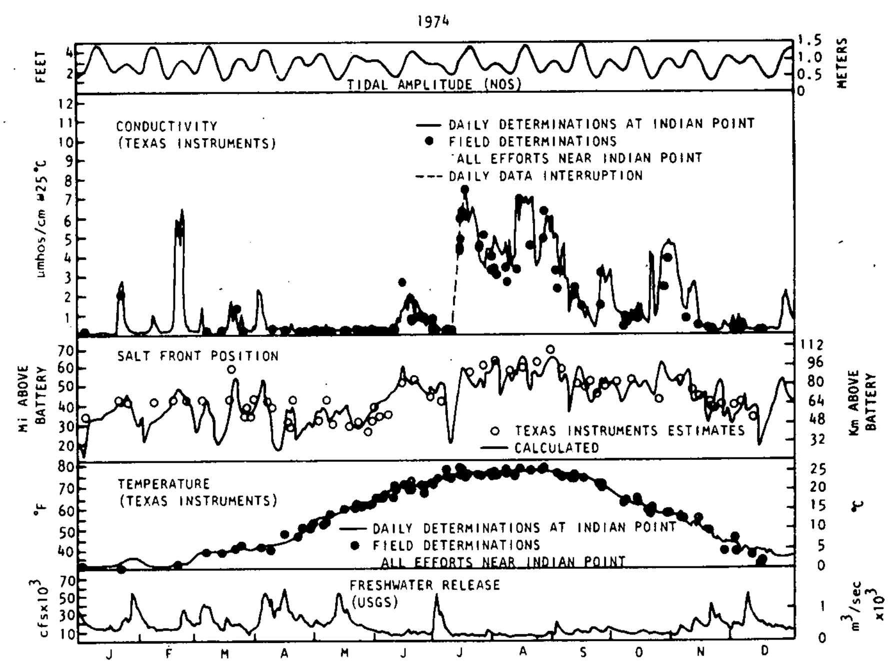

Figure C-10. Temporal Distribution of Freshwater Release, Water Temperature, Saltfront Position, Conductivity, and Tidal Amplitude in 1973

APPENDIX D

DENSITIES, CATCH PER UNIT EFFORTS, AND STANDING CROPS

APPENDIX D

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METHODS AND FORMULAS FOR COMPUTATION OF SPATIOTEMPORAL DISTRIBUTION AND ABUNDANCE

A. ICHTHYOPLANKTON, 1973 (DAY AND NIGHT SAMPLES)

1. Geographical Region Density Estimates

A density estimate (d_i) by life stage for ichthyoplankton captured in each tow was calculated for biweekly intervals in 1973 as follows:

$$d_i = \frac{C_i}{V_i}$$

where

C_i = sum of number of ichthyoplankton organisms (eggs, larvae, etc.) captured in the i^{th} subsample

V_i = sum of volumes (m^3) of water strained in i^{th} subsample

When two or three net tows were taken sequentially in the same stratum in the same region, the data for the two or three tows were combined to form one sample. An estimate of the mean density ($\bar{d}_k$) in each stratum (K) within a geographical region was calculated by:

$$\bar{d}_k = \frac{\sum_i d_i}{n}$$

where

n = number of samples taken in stratum

The variance of the mean density was calculated as:

$$S^2_{\bar{d}_k} = \frac{\sum_i \left(d_i - \bar{d}_k\right)^2}{n(n-1)}$$

The volume of water in the Hudson River for each 1-mi segment from river mile 14-140 (km 22-224) and for three strata within each mile was calculated from the surface area and depths recorded on United States Geological Survey (USGS) maps of the river. (In the analyses, the shoal and bottom strata were combined into the bottom stratum.) A polar planimeter was used to integrate over the irregular shoreline boundaries and estimate (in hectares) the total surface area of each mile segment. A grid was placed over each segment, and the number of units at each recorded river depth was tabulated. Depths, number of units at each depth, and surface hectares were recorded for each river mile. Volume (V_i) in cubic meters for each river segment was computed as follows:

$$V_i = \frac{A_i}{n_i} \Sigma n_j d_j$$

where

i = river-mile segment, $14 \le i \le 140$

n_i = total number of units tabulated in i^{th} segment

A_i = area (in hectares) of i^{th} segment

j = depth index as recorded on USGS map

d_j = depth of j^{th} recorded depth

n_j = number of grid units counted for d_{ij}; $\Sigma n_{ij} = n$

The volume of water strained by each ichthyoplankton net tow in 1973 was examined for abnormally high or low values prior to using the catch data in the density calculations. Each tow was metered to measure the volume sampled in cubic meters. Occasional flowmeter readings were erratic due to meter clogging, malfunction, or damage. From the observed readings — given the net opening, tow speed, and average duration — volumes for standard 5-min tows were considered to be valid only between 100 and 1000 m^3. Tows with calculated volumes outside this range were considered outliers, and the average volume of valid tows (between 100 and 1000 m^3) was substituted for the outlier subsample volume. Variation in volume measurements contributes to variation in density estimates; however, calculated mean volume sampled is probably close to the true mean volume samples, and bias in density estimates due to volume measured is probably minimal. The mean uncorrected flowmeter readings (by gear and weekly survey) and associated standard-error (SE) calculations (Table VI-6) indicate a 0.95 probability of the mean flowmeter readings for a river run varying <20%.

Geographical region density estimates (d_r) and the estimated variances ($S^2_{d_r}$) were calculated from the strata densities (d_k) by the following formulas:

$$d_r = \frac{\sum_k V_k d_k}{\sum_k V_k}$$

and

$$S^2_{d_r} = \sum_k \left(\frac{V_k}{V_r}\right)^2 S^2_{d_k}$$

where

V_k = river volume (m^3) of the k^{th} stratum

V_r = sum of volumes (ΣV_i) of river-mile segments within r^{th} geographical region (Volume I; Table VI-5)

2. Geographical Region Standing-Crop Estimates

In 1973, for biweekly intervals in six geographical regions, ichthyoplankton standing crops by life stage were estimated from the weighted mean densities of bottom and channel strata. Standing-crop estimates in each geographical region (N_r) and the variances of the standing crops ($S^2_{N_r}$) were calculated as follows:

$$N_r = \sum_k V_k d_k$$

$$S^2_{N_r} = \sum_k V^2_k S^2_{d_k}$$

A standing-crop estimate for the entire river (N) and the associated variance (S_N^2) were calculated as follows:

$$N = \sum_r N_r$$

$$S_N^2 = \sum_r S_{N_r}^2$$

where

$$S_{N_r}^2 = \sum_k S_{N_k}^2$$

3. Plant Region Standing-Crop Estimates

Plant region standing crops (N_p) are based on a volumetric proportion of the standing-crop estimates for the adjacent geographical regions as follows:

$$N_p = \sum_r PV_r \, N_r$$

where

PV_r = proportion of total volume in geographical region r contained in plant region p

N_r = standing-crop estimate for geographic region r contained in plant region p

The associated variance ($S_{N_p}^2$) was calculated from the relationship:

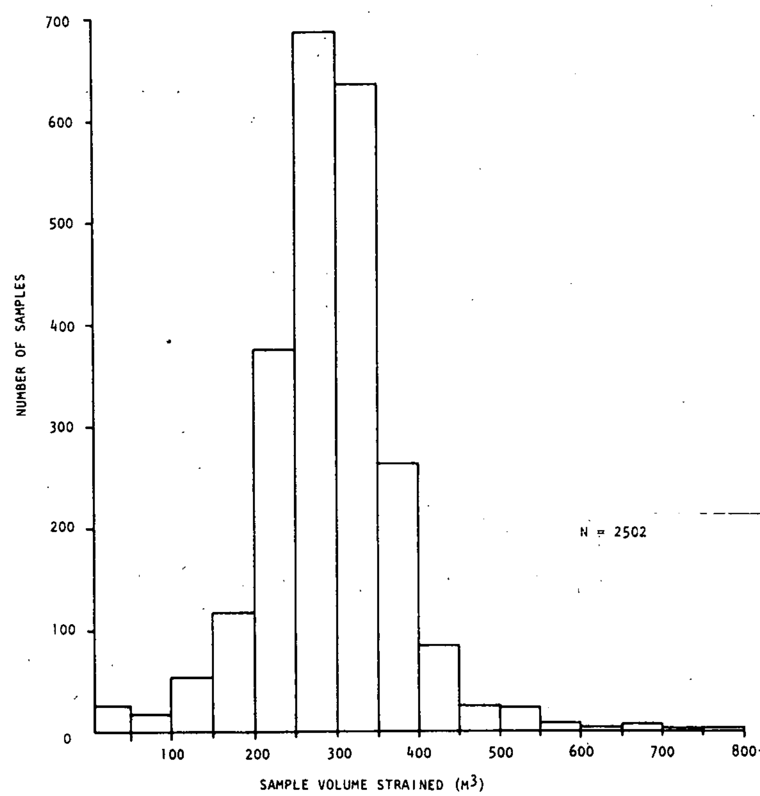
$$S_{N_p}^2 = \sum_r PV_r^2 \, S_{N_r}^2$$

where

$S_{N_p}^2$ = variance of the standing-crop estimate for the geographical region r contained in plant region p

B. ICHTHYOPLANKTON, 1974

The density and standing-crop analyses did not include 117 ichthyoplankton samples taken in 1974 with volumes of water strained $< 97\ m^3$ or $517\ m^3$. A total of 2502 samples were taken. Exclusion criteria were defined as one standard deviation ($210\ m^3$) above and below the mean volume of all 5-min tows taken in 1974 (mean = $307\ m^3$, n = 2502). The frequency distribution of 1974 sample volume strained is illustrated below:



Distribution of Sample Volume Strained (m^3)
for 1974 Ichthyoplankton Tows (n = 2502)

1. Geographical Region — CPUE

Beach-seine CPUE values were calculated as follows:

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

where

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

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

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

$$S^2_{CPUE} = \frac{\Sigma_n (C_i - CPUE)^2}{n(n-1)}$$

Bottom-trawl CPUE values were calculated as follows:

$$CPUE = \frac{\Sigma C_i \times F_T}{n}$$

where

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

n = total number of tows made in i^{th} time interval

C_i was multiplied by F_T (a constant) to provide comparability of the inter-regional trawl CPUEs with the standard-station CPUEs. The derivation of F_T is as follows:

- Interregional trawl tows had a 5-min (300 sec) duration at a tow speed of 1.3 m/sec or 390 m/tow
- Standard-station trawl tows had a 10-min (600 sec) duration at a tow speed of 1.0 m/sec or 600 m/tow

Therefore, to make the interregional and standard-station bottom-trawl catches comparable, interregional trawl catches were multipled by 600 ÷ 390 or 1.53; thus F_T = 1.53. The variance of the trawl CPUEs was calculated similarly to the beach-seine CPUE variance.

2. Geographical Region Standing-Crop Estimates

From the 100-ft (30.5-m) beach-seine CPUE values, standing-crop estimates (N_r) and the associated variances ($S^2_{N_r}$) of juvenile fish in 1973 and 1974 were calculated for biweekly intervals in each of the 12 geographical regions as follows:

$$N_r = CPUE_r \times \frac{A_r}{A_s}$$

where

$CPUE_r$ = mean biweekly catch per unit effort within the geographical region r

A_r = estimated shore-zone surface area (m^2) from 0 to 10 ft (3 m) deep for region r

A_s = estimated surface area (m^2) sampled by 100-ft (30.5-m) beach seine set perpendicular to shoreline and towed in a semicircle to beach (450 m^2)

and

$$S^2_{N_r} = \left(\frac{A_r}{A_s}\right)^2 \times \frac{\sum_n (C_i - CPUE_r)^2}{n(n-1)}$$

where

C_i = catch of i^{th} seine haul for a biweekly interval within the region r

n = number of seine hauls taken during a biweekly interval within the region r

The shore-zone surface area (m^2) from 0 to 10 ft (3 m) deep for each of the 127 river-mile segments from 14-140 (km 22-224) was calculated from USGS depth contour maps of the Hudson River. A polar planimeter was used to integrate the irregular shoreline boundaries and estimate the total shore-zone surface area for each mile segment in square meters. Surface areas of shore zone for mile segments 141-152 (km 225-243) were estimated as the mean of segments 135-140 (km 216-224). Shore-zone surface area estimates by river mile (Appendix D, Table D-3) were summed into a total shore-zone area estimate for each of the 12 geographical regions (Table VI-7).

Standing-crop estimates for each geographical region (N_r) were summed to generate a standing-crop estimate for the entire river (N) as follows:

$$N = \sum_r N_r$$

3. Plant Region Standing-Crop Estimates

Standing crops of juvenile fish from 100-ft (30.5-m) beach-seine catches in 1973 and 1974 were estimated for biweekly intervals at each of the 13-mi power-plant regions (Table VI-6). Plant region standing crops (N_p) were based on an areal population of the standing-crop estimates for the adjacent geographical regions as follows:

$$N_p = \sum_r PA_r N_r$$

where

PA_r = proportion of total volume in geographical region r contained in plant region p

N_r = standing-crop estimate for geographic region r contained in plant region p

The associated variance ($S^2_{N_p}$) was calculated from the relationship:

$$S^2_{N_p} = \sum_r PV^2_r S^2_{N_r}$$

where

$S^2_{N_p}$ = variance of the standing-crop estimate for the geographical region r contained in plant region p

Table D-1
River Stratum Volumes (m^3) by River Mile in Hudson River Estuary [RM 14-140 (km 22-224)] Used To Calculate 1973 Ichthyoplankton Standing-Crop Estimates

River Mile	Strata Volumes (m^3)* Bottom	Channel	Total
14	8,400,000	10,500,000	18,900,000
15	8,200,000	11,000,000	19,200,000
16	9,500,000	15,600,000	25,100,000
17	9,000,000	15,100,000	24,100,000
18	8,500,000	16,300,000	24,800,000
19	8,600,000	16,200,000	24,800,000
20	8,100,000	13,000,000	21,100,000
21	8,700,000	16,400,000	25,100,000
22	8,400,000	16,000,000	24,400,000
23	8,600,000	13,000,000	21,600,000
24	11,100,000	13,500,000	24,600,000
25	12,100,000	10,500,000	22,600,000
26	19,900,000	13,200,000	33,100,000
27	22,900,000	16,000,000	39,900,000
28	22,000,000	14,300,000	36,300,000
29	20,600,000	15,400,000	36,000,000
30	24,400,000	9,200,000	33,600,000
31	16,200,000	12,000,000	28,200,000
32	15,500,000	16,800,000	32,300,000
33	18,800,000	17,200,000	36,000,000
34	9,400,000	11,800,000	21,200,000
35	20,700,000	11,900,000	32,600,000
36	22,500,000	12,100,000	34,600,000
37	19,700,000	12,500,000	32,200,000
38	14,000,000	13,000,000	27,000,000
39	10,300,000	19,100,000	29,400,000
40	6,300,000	21,400,000	27,700,000
41	5,800,000	20,000,000	25,800,000
42	6,800,000	17,600,000	24,400,000
43	8,200,000	24,100,000	32,300,000
44	3,700,000	20,300,000	24,000,000
45	2,300,000	21,300,000	23,600,000
46	2,700,000	18,600,000	21,300,000
47	2,200,000	18,600,000	20,800,000
48	3,200,000	17,000,000	20,200,000
49	2,900,000	20,400,000	23,300,000
50	2,600,000	17,100,000	19,700,000
51	3,000,000	17,000,000	20,000,000
52	3,100,000	30,500,000	33,600,000
53	3,500,000	19,300,000	22,800,000
54	3,800,000	19,600,000	23,400,000
55	4,200,000	18,900,000	23,100,000
56	5,800,000	14,900,000	20,700,000
57	8,400,000	15,600,000	24,000,000
58	8,500,000	15,800,000	24,300,000
59	8,000,000	16,700,000	24,700,000
60	6,600,000	15,700,000	22,300,000
61	7,500,000	16,300,000	23,800,000
62	7,400,000	15,800,000	23,200,000
63	6,600,000	17,600,000	24,200,000
64	5,900,000	17,000,000	22,900,000
65	5,000,000	15,700,000	20,700,000
66	5,200,000	19,100,000	24,300,000
67	4,000,000	16,800,000	20,800,000
68	6,100,000	17,500,000	23,600,000
69	3,900,000	15,000,000	18,900,000
70	3,000,000	13,700,000	16,700,000
71	3,700,000	13,800,000	17,500,000
72	3,600,000	12,800,000	16,400,000
73	3,100,000	13,100,000	16,200,000
74	3,700,000	14,300,000	18,000,000
75	3,500,000	14,000,000	17,500,000

Table D-1 (Contd)

River Mile	Strata Volumes (m^3)* Bottom	Channel	Total
76	4,000,000	12,600,000	16,600,000
77	3,400,000	15,600,000	19,000,000
78	3,600,000	14,000,000	17,600,000
79	3,400,000	17,600,000	21,000,000
80	3,100,000	13,900,000	17,000,000
81	4,100,000	14,600,000	18,700,000
82	4,200,000	13,300,000	17,500,000
83	3,800,000	14,200,000	18,000,000
84	5,200,000	13,500,000	18,700,000
85	4,200,000	14,200,000	18,400,000
86	4,200,000	12,900,000	17,100,000
87	5,600,000	14,400,000	20,000,000
88	6,000,000	12,900,000	18,900,000
89	5,800,000	12,300,000	18,100,000
90	6,900,000	12,600,000	19,500,000
91	5,500,000	10,000,000	15,500,000
92	8,400,000	9,100,000	17,500,000
93	5,500,000	9,400,000	14,900,000
94	5,000,000	11,000,000	16,000,000
95	4,800,000	9,800,000	14,600,000
96	5,700,000	7,600,000	13,300,000
97	6,200,000	12,100,000	18,300,000
98	7,400,000	11,400,000	18,800,000
99	5,500,000	8,500,000	14,000,000
100	4,700,000	7,200,000	11,900,000
101	3,600,000	9,600,000	13,200,000
102	4,400,000	9,900,000	14,300,000
103	4,300,000	7,300,000	11,600,000
104	4,200,000	6,400,000	10,600,000
105	3,600,000	6,900,000	10,500,000
106	4,000,000	5,400,000	9,400,000
107	6,100,000	5,500,000	11,600,000
108	5,100,000	6,600,000	11,700,000
109	5,300,000	6,500,000	11,800,000
110	5,500,000	6,600,000	12,100,000
111	2,400,000	5,100,000	7,500,000
112	3,400,000	4,100,000	7,500,000
113	3,400,000	3,300,000	6,700,000
114	3,800,000	4,500,000	8,300,000
115	4,400,000	5,300,000	9,700,000
116	4,100,000	3,100,000	7,200,000
117	3,300,000	3,400,000	6,700,000
118	3,900,000	3,700,000	7,600,000
119	4,900,000	3,700,000	8,600,000
120	5,000,000	6,900,000	11,900,000
121	9,600,000	6,000,000	15,600,000
122	4,400,000	4,500,000	8,900,000
123	3,700,000	2,400,000	6,100,000
124	3,400,000	2,500,000	5,900,000
125	2,900,000	3,300,000	6,200,000
126	3,400,000	3,500,000	6,900,000
127	3,000,000	1,800,000	4,800,000
128	3,200,000	2,500,000	5,700,000
129	3,500,000	2,000,000	5,500,000
130	2,600,000	2,000,000	4,600,000
131	2,800,000	2,900,000	5,700,000
132	2,600,000	1,600,000	4,200,000
133	2,800,000	1,600,000	4,400,000
134	2,000,000	1,800,000	3,800,000
135	1,700,000	900,000	2,600,000
136	1,800,000	1,400,000	3,200,000
137	2,000,000	1,500,000	3,500,000
138	1,700,000	1,600,000	3,300,000
139	1,700,000	1,900,000	3,600,000
140	1,300,000	1,700,000	3,000,000

*Rounded to nearest 100,000 m^3.

Table D-2

River Stratum Volumes (m^3) by River Mile in Hudson River Estuary [RM 14-140 (km 22-224)] Used To Calculate 1974 Ichthyoplankton Standing-Crop Estimates

River Mile	Shoals	Bottom	Channel	Total
14	3,300,000	5,100,000	10,500,000	18,900,000
15	2,700,000	5,500,000	11,000,000	19,200,000
16	2,700,000	6,800,000	15,600,000	25,100,000
17	2,300,000	6,700,000	15,100,000	24,100,000
18	1,800,000	6,700,000	16,300,000	24,800,000
19	2,100,000	6,500,000	16,200,000	24,800,000
20	2,300,000	5,800,000	13,000,000	21,100,000
21	2,200,000	6,500,000	16,400,000	25,100,000
22	3,000,000	5,400,000	16,000,000	24,400,000
23	4,200,000	4,400,000	13,000,000	21,600,000
24	6,800,000	4,300,000	13,500,000	24,600,000
25	7,900,000	4,200,000	10,500,000	22,600,000
26	14,400,000	5,500,000	13,200,000	33,100,000
27	15,800,000	7,100,000	16,000,000	39,900,000
28	16,000,000	6,000,000	14,300,000	36,300,000
29	13,600,000	7,000,000	15,400,000	36,000,000
30	20,700,000	3,700,000	9,200,000	33,600,000
31	8,900,000	7,300,000	12,000,000	28,200,000
32	6,900,000	8,600,000	16,800,000	32,300,000
33	10,500,000	8,300,000	17,200,000	36,000,000
34	4,900,000	4,500,000	11,800,000	21,200,000
35	15,300,000	5,400,000	11,900,000	32,600,000
36	14,600,000	7,900,000	12,100,000	34,600,000
37	11,800,000	7,900,000	12,500,000	32,200,000
38	7,200,000	6,800,000	13,000,000	27,000,000
39	3,700,000	6,600,000	19,100,000	29,400,000
40	2,500,000	3,800,000	21,400,000	27,700,000
41	1,100,000	4,700,000	20,000,000	25,800,000
42	1,100,000	5,700,000	17,600,000	24,000,000
43	3,000,000	5,200,000	24,100,000	32,300,000
44	600,000	3,100,000	20,300,000	24,000,000
45	0	2,300,000	21,300,000	23,600,000
46	600,000	2,100,000	18,600,000	21,300,000
47	0	2,200,000	18,600,000	20,800,000
48	500,000	2,700,000	17,000,000	20,200,000
49	200,000	2,700,000	20,400,000	23,300,000
50	0	2,600,000	17,100,000	19,700,000
51	0	3,000,000	17,000,000	20,000,000
52	200,000	2,900,000	30,500,000	33,600,000
53	800,000	2,700,000	19,300,000	22,800,000
54	600,000	3,200,000	19,600,000	23,400,000
55	400,000	3,800,000	18,900,000	23,100,000
56	1,200,000	4,600,000	14,900,000	20,700,000
57	2,100,000	6,300,000	15,500,000	24,000,000
58	1,800,000	6,700,000	15,800,000	24,300,000
59	1,400,000	6,600,000	16,700,000	24,700,000
60	600,000	6,000,000	15,700,000	22,300,000
61	1,200,000	6,300,000	16,300,000	23,800,000
62	1,200,000	6,200,000	15,800,000	23,200,000
63	800,000	5,800,000	17,600,000	24,200,000
64	600,000	5,300,000	17,000,000	22,900,000
65	400,000	4,600,000	15,700,000	20,700,000
66	900,000	4,300,000	19,100,000	24,300,000
67	300,000	3,700,000	16,800,000	20,800,000
68	300,000	5,800,000	17,500,000	23,600,000
69	0	3,900,000	15,000,000	18,900,000
70	0	3,000,000	13,700,000	16,700,000
71	0	3,700,000	13,800,000	17,500,000
72	0	3,600,000	12,800,000	16,400,000
73	0	3,100,000	13,100,000	16,200,000
74	0	3,700,000	14,300,000	18,000,000
75	0	3,500,000	14,000,000	17,500,000

Table D-2 (Contd)

River Mile	Shoals	Bottom	Channel	Total
76	1,200,000	2,800,000	12,600,000	16,600,000
77	0	3,400,000	15,600,000	19,000,000
78	0	3,600,000	14,000,000	17,600,000
79	0	2,400,000	17,600,000	20,000,000
80	300,000	2,800,000	13,900,000	17,000,000
81	300,000	3,800,000	14,600,000	18,700,000
82	400,000	3,800,000	13,300,000	17,500,000
83	100,000	3,700,000	14,200,000	18,000,000
84	500,000	4,700,000	13,500,000	18,700,000
85	500,000	3,700,000	14,200,000	18,400,000
86	1,700,000	2,500,000	12,900,000	17,100,000
87	1,800,000	3,800,000	14,400,000	20,000,000
88	1,300,000	4,700,000	12,900,000	18,900,000
89	1,100,000	4,700,000	12,300,000	18,100,000
90	2,600,000	4,300,000	12,600,000	19,500,000
91	700,000	4,800,000	10,000,000	15,500,000
92	1,900,000	6,500,000	9,100,000	17,500,000
93	1,200,000	4,300,000	9,400,000	14,900,000
94	1,200,000	3,800,000	11,000,000	16,000,000
95	1,300,000	3,500,000	9,800,000	14,600,000
96	1,900,000	3,800,000	7,600,000	13,300,000
97	1,800,000	4,400,000	12,100,000	18,300,000
98	2,400,000	5,000,000	11,400,000	18,800,000
99	3,100,000	2,400,000	8,500,000	14,000,000
100	1,100,000	3,600,000	7,200,000	11,900,000
101	1,100,000	2,500,000	9,600,000	13,200,000
102	1,400,000	3,000,000	9,900,000	14,300,000
103	1,200,000	3,100,000	7,800,000	11,600,000
104	1,300,000	2,900,000	6,400,000	10,600,000
105	900,000	2,700,000	6,900,000	10,500,000
106	1,800,000	2,200,000	5,400,000	9,400,000
107	3,000,000	3,100,000	5,500,000	11,600,000
108	1,100,000	4,000,000	6,600,000	11,700,000
109	1,500,000	3,800,000	6,500,000	11,800,000
110	2,300,000	3,200,000	6,600,000	12,100,000
111	200,000	2,200,000	5,100,000	7,500,000
112	1,600,000	1,800,000	4,100,000	7,500,000
113	2,000,000	1,400,000	3,300,000	6,700,000
114	1,500,000	2,300,000	4,500,000	8,300,000
115	1,700,000	2,700,000	5,300,000	9,700,000
116	2,500,000	1,600,000	3,100,000	7,200,000
117	2,600,000	1,700,000	3,400,000	7,700,000
118	2,200,000	1,700,000	3,700,000	7,600,000
119	3,100,000	1,800,000	3,700,000	8,600,000
120	2,000,000	3,000,000	6,900,000	11,900,000
121	700,000	8,900,000	6,000,000	15,600,000
122	1,700,000	2,700,000	4,500,000	8,900,000
123	2,700,000	1,000,000	2,400,000	6,100,000
124	2,100,000	1,300,000	2,500,000	5,900,000
125	1,500,000	1,400,000	3,300,000	6,200,000
126	1,900,000	1,500,000	3,500,000	6,900,000
127	2,300,000	700,000	1,800,000	4,800,000
128	2,200,000	1,000,000	2,500,000	5,700,000
129	2,700,000	800,000	2,000,000	5,500,000
130	1,600,000	1,000,000	2,000,000	4,600,000
131	1,500,000	1,300,000	2,900,000	5,700,000
132	1,900,000	700,000	1,600,000	4,200,000
133	2,200,000	600,000	1,600,000	4,400,000
134	1,200,000	800,000	1,800,000	3,800,000
135	1,300,000	400,000	900,000	2,600,000
136	1,200,000	600,000	1,400,000	3,200,000
137	1,400,000	600,000	1,500,000	3,500,000
138	1,100,000	600,000	1,600,000	3,300,000
139	1,000,000	700,000	1,900,000	3,600,000
140	600,000	700,000	1,700,000	3,000,000

Table D-3

Surface Area (m^2) of Shoreline 0 to 10 ft Deep by River Mile in Hudson River Estuary [RM 14-152 (km 22-243)] Used To Calculate 1973 and 1974 Standing-Crop Estimates from Beach-Seine Catches

River Mile	Shoreline Surface Area from 0 to 10 Ft Deep	River Mile	Shoreline Surface Area from 0 to 10 Ft Deep
14	135,000	83	181,000
15	318,000	84	167,000
16	321,000	85	63,000
17	165,000	86	691,000
18	95,000	87	1,361,000
19	237,000	88	383,000
20	153,000	89	102,000
21	367,000	90	338,000
22	415,000	91	146,000
23	696,000	92	490,000
24	931,000	93	363,000
25	2,031,000	94	560,000
26	2,697,000	95	788,000
27	4,581,000	96	261,000
28	373,000	97	364,000
29	855,000	98	441,000
30	1,752,000	99	832,000
31	1,368,000	100	507,000
32	1,472,000	101	517,000
33	4,386,000	102	933,000
34	1,258,000	103	596,000
35	3,305,000	104	569,000
36	3,260,000	105	669,000
37	1,961,000	106	863,000
38	2,317,000	107	602,000
39	1,459,000	108	1,371,000
40	517,000	109	832,000
41	120,000	110	173,000
42	62,000	111	250,000
43	1,610,000	112	254,000
44	198,000	113	429,000
45	53,000	114	558,000
46	128,000	115	327,000
47	0	116	275,000
48	63,000	117	289,000
49	166,000	118	354,000
50	0	119	557,000
51	69,000	120	272,000
52	196,000	121	617,000
53	275,000	122	507,000
54	143,000	123	321,000
55	274,000	124	366,000
56	246,000	125	246,000
57	1,232,000	126	232,000
58	1,332,000	127	230,000
59	1,102,000	128	265,000
60	599,000	129	238,000
61	282,000	130	128,000
62	552,000	131	609,000
63	738,000	132	446,000
64	438,000	133	585,000
65	135,000	134	295,000
66	319,000	135	155,000
67	226,000	136	127,000
68	244,000	137	164,000
69	90,000	138	172,000
70	107,000	139	157,000
71	80,000	140	155,000
72	61,000	141	155,000**
73	109,000	142	155,000**
74	0	143	155,000**
75	94,000	144	155,000**
76	0	145	155,000**
77	93,000	146	155,000**
78	0	147	155,000**
79	54,000	148	155,000**
80	0	149	155,000**
81	0	150	155,000**
82	0	151	155,000**
		152	155,000**

** $\bar{X}$ of RM 135-140

Table D-4

Density Estimates (No./1000 m^3) of Striped Bass Eggs within Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Combined Day and Night Sampling by Epibenthic Sled and Tucker Trawl during 1973

Region (RM)	29 Apr 12 May	13 May 26 May	27 May 9 Jun	10 Jun 23 Jun	24 Jun 7 Jul	8 Jul 21 Jul	22 Jul 4 Aug	5 Aug 18 Aug	
Yonkers-Tappan Zee (14-33)	0 (0)	2.99 (2.20)	0.16 (0.16)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	Density SE
Croton, Haverstraw-Indian Pt. (34-46)	1.81 (1.57)	329.31 (190.38)	3.84 (2.39)	4.47 (2.42)					Density SE
West Point-Cornwall (47-61)	172.20 (68.60)	193.29 (68.17)	21.21 (10.67)	0.28 (0.28)					Density SE
Poughkeepsie-Hyde Park (62-85)	14.99 (9.29)	171.21 (76.94)	14.03 (4.09)	0.24 (0.24)					Density SE
Kingston-Saugerties (86-106)	2.41 (1.11)	10.44 (6.24)	7.67 (4.35)	0 (0)					Density SE
Catskill-Albany (107-140)	1.16 (0.84)	5.89 (3.24)	1.04 (0.47)	0.05 (0.05)	0 (0)	0 (0)	0 (0)	0 (0)	Density SE

SE = one standard error

Table D-5

Density Estimates (No./1000 m^3) of Striped Bass Yolk-Sac Larvae within Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Combined Day and Night Sampling by Epibenthic Sled and Tucker Trawl during 1973

Region (RM)	29 Apr 12 May	13 May 26 May	27 May 9 Jun	10 Jun 23 Jun	24 Jun 7 Jul	8 Jul 21 Jul	22 Jul 4 Aug	5 Aug 18 Aug	
Yonkers-Tappan Zee (14-33)	0 (0)	29.24 (9.43)	18.45 (13.09)	7.70 (7.43)	0 (0)	0 (0)	0 (0)	0 (0)	Density SE
Croton, Haverstraw-Indian Pt. (34-46	1.58 (0.22)	44.38 (21.05)	6.21 (3.60)	65.98 (37.28)					Density SE
West Point-Cornwall (47-61)	0.78 (0.39)	13.18 (3.12)	18.43 (12.11)	123.18 (97.02)					Density SE
Poughkeepsie-Hyde Park (62-85)	0.65 (0.38)	25.27 (10.75)	132.82 (79.30)	54.07 (35.35)					Density SE
Kingston-Saugerties (86-106)	0.56 (0.30)	4.77 (2.25	2.89 (1.16)	2.00 (2.00)					Density SE
Catskill-Albany (107-140)	0.07 (0.07)	0.20 (0.14)	1.69 (0.94)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	Density SE

SE = One standard error

Table D-6

Density Estimates (No./1000 m^3) of Striped Bass Post Yolk-Sac Larvae within Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Combined Day and Night Sampling by Epibenthic Sled and Tucker Trawl during 1973

Region (RM)	29 Apr 12 May	13 May 26 May	27 May 9 Jun	10 Jun 23 Jun	24 Jun 7 Jul	8 Jul 21 Jul	22 Jul 4 Aug	5 Aug 18 Aug	
Yonkers-Tappan	0	2.17	0.33	0.60	62.28	0.32	0.02	0	Density
Zee (14-33)	(0)	(1.37)	(0.21)	(0.09)	(48.64)	(0.27)	(0.02)	(0)	SE
Croton, Haverstraw-		0.45	0	58.00	32.19	4.78	0.85		Density
Indian Pt. (34-46)		(0.45)	(0)	(32.70)	(13.61)	(1.97)	(0.55)		SE
West Point-		0.25	0	142.10	103.58	3.53	0.04		Density
Cornwall (47-61)		(0.19	(0)	(28.99)	(36.12)	(1.32)	(0.03)		SE
Poughkeepsie-Hyde		0.11	0.16	25.88	175.50	8.86	0.91		Density
Park (62-85)		(0.11)	(0.14)	(18.20)	(128.97)	(3.61)	(0.46)		SE
Kingston-		0	0	5.11	23.28	3.65	0.35		Density
Saugerties (86-106)		(0)	(0)	(3.06)	(11.94)	(1.44)	(0.30)		SE
Catskill-	0	0	0	2.41	0.76	0.51	0.15	0	Density
Albany (107-140)	(0)	(0)	(0)	(2.35)	(0.54)	(0.17)	(0.15)	(0)	SE

SE = One standard error

Table D-7

Density Estimates (No./1000 m^3) of Striped Bass Juveniles within Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Combined Day and Night Sampling by Epibenthic Sled and Tucker Trawl during 1973

Region (RM)	29 Apr 12 May	13 May 26 May	27 May 9 Jun	10 Jun 23 Jun	24 Jun 7 Jul	8 Jul 21 Jul	22 Jul 4 Aug	5 Aug 18 Aug	
Yonkers-Tappan	0	0	0	0	0	0	0	22.93	Density
Zee (14-33)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(7.83)	SE
Croton, Haverstraw-					0.30	0.73	0.84	6.67	Density
Indian Pt. (34-46)					(0.18)	(0.54)	(0.68)	(1.56)	SE
West Point-					6.10	1.93	0.30	0.77	Density
Cornwall (47-61)					(5.42)	(0.62)	(0.14)	(0.27)	SE
Poughkeepsie-Hyde					0.38	19.33	1.21	0.29	Density
Park (62-85)					(0.27)	(12.93)	(0.50)	(0.14)	SE
Kingston-					1.23	15.70	1.12	0	Density
Saugerties (86-106)					(0.87)	(5.38)	(0.51)	(0)	SE
Catskill-	0	0	0	0	0	0.20	0.08	0	Density
Albany (107-140)	(0)	(0)	(0)	(0)	(0)	(0.16)	(0.08)	(0)	SE

SE = One standard error

Table D-8

Catch per Unit Effort of Juvenile Striped Bass by 100-ft (30.5-m) Beach Seine, Hudson River Estuary [RM 12-153 (km 19-245)] during Daytime, 1973

Region		8 Apr 21 Apr	22 Apr 5 May	6 May 19 May	20 May 2 Jun	3 Jun 16 Jun	17 Jun 30 Jun	1 Jul 14 Jul	15 Jul 28 Jul	29 Jul 11 Aug	12 Aug 25 Aug	26 Aug 8 Sep	9 Sep 22 Sep	23 Sep 6 Oct	7 Oct 20 Oct	21 Oct 3 Nov	4 Nov 17 Nov	18 Nov 1 Dec	2 Dec 15 Dec	16 Dec 29 Dec
Yonkers	C/f*	0	0	0	0	0	1.00	0	46.80	33.67	57.73	13.78	47.38	11.38	25.25	6.75	5.00	2.82	2.50	--
	N	1	5	7	4	2	4	2	5	15	11	9	8	8	8	4	9	11	6	NS†
	SE	0	0	0	0	0	0.58	0	31.66	7.84	18.22	4.84	29.94	4.36	14.60	3.97	0.82	1.12	1.12	--
Tappan Zee	C/f	0	0	0	0	0	0	17.50	12.83	14.88	7.67	11.00	22.50	20.67	25.40	21.00	7.83	4.67	2.00	--
	N	2	1	2	22	3	3	2	6	8	12	4	4	3	5	3	6	6	2	NS
	SE	0	0	0	0	0	0	15.50	5.16	4.65	2.41	3.67	9.80	17.75	11.66	10.79	3.16	2.16	2.00	--
Croton-Haverstraw Bays	C/f	0	0	0	0	0	0	14.00	11.40	12.00	41.61	17.60	231.29	94.62	10.78	39.17	6.14	2.19	1.67	--
	N	2	2	7	22	6	4	2	5	4	9	10	14	11	9	12	7	16	6	NS
	SE	0	0	0	0	0	0	1.00	5.50	9.11	19.83	4.33	83.39	57.40	2.90	21.33	3.33	0.73	0.67	--
Indian Point	C/f	--	0	0	0	0	0.04	7.57	4.75	74.00	13.08	12.30	14.00	8.50	8.64	3.73	8.67	2.95	1.33	0
	N	NS	6	25	35	41	54	7	4	14	12	10	10	12	14	11	15	21	3	5
	SE	--	0	0	0	0	0.04	4.79	2.59	39.01	3.05	4.79	4.20	1.48	2.80	1.74	2.09	1.08	0.88	0
West Point	C/f	0	0	0	0	0	0	2.50	33.60	7.60	6.11	8.18	92.00	88.50	11.71	14.62	4.40	3.28	5.71	--
	N	6	17	13	23	2	11	2	5	10	9	11	6	12	7	13	5	18	7	NS
	SE	0	0	0	0	0	0	2.50	19.82	2.49	2.84	5.82	88.57	66.80	4.13	5.86	1.12	0.88	3.80	--
Cornwall	C/f	0	0	0	0	0	0	1.50	11.43	61.00	16.64	12.00	11.82	7.36	3.38	3.62	0.88	0.25	0	--
	N	7	31	15	29	12	12	2	7	11	14	6	11	11	8	13	8	12	3	NS
	SE	0	0	0	0	0	0	1.50	6.99	46.21	6.43	5.45	2.00	3.14	1.32	1.87	0.48	0.13	0	--
Poughkeepsie	C/f	0	0	0	0	0	0	8.20	11.33	4.38	2.46	3.27	1.13	0.89	1.67	0	0	1.67	0	--
	N	6	17	2	8	1	3	5	9	21	24	15	16	9	6	8	2	9	6	NS
	SE	0	0	0	0	0	0	3.50	3.34	1.28	0.77	1.64	0.46	0.45	1.09	0	0	1.67	0	--
Hyde Park	C/f	0	0	0	0	0	0	8.50	3.67	4.22	1.60	0.33	0.83	3.00	0	0	0	0	0	--
	N	6	7	6	4	2	2	2	3	7	5	6	6	2	5	2	2	2	1	NS
	SE	0	0	0	0	0	0	4.50	1.86	3.37	1.03	0.33	0.31	1.00	0	0	0	0	0	--
Kingston	C/f	0	0	0	0	--	0	0	1.67	5.60	2.80	0.50	4.00	3.00	0	0	0	0	0	--
	N	2	3	1	3	NS	2	2	3	5	5	4	4	2	2	1	2	2	2	NS
	SE	0	0	0	0	--	0	0	0.67	1.75	1.16	0.50	2.16	3.00	0	0	0	0	0	--
Saugerties	C/f	0	0	0	0	0	0	1.00	1.29	2.67	1.13	1.60	0.88	0.33	0	0	0.67	0	0	--
	N	6	10	9	6	1	2	5	7	12	8	5	8	3	2	5	3	NS	3	NS
	SE	0	0	0	0	0	0	0.55	0.81	0.71	0.52	0.51	0.40	0.33	0	0	0.33	0	0	--
Catskill	C/f	0	0	0	0	0	0	0	4.00	4.54	6.64	5.63	4.80	3.50	0.20	0.67	0	0	0	--
	N	6	14	8	8	4	3	4	7	13	11	8	10	4	5	6	5	5	5	NS
	SE	0	0	0	0	0	0	0	2.73	1.57	3.84	3.13	2.19	1.32	0.20	0.49	0	0	0	--
Albany	C/f	0	0	0	0	0	0	0.13	0.22	2.83	4.54	2.82	2.36	--	0	0.14	0	0	0	--
	N	11	20	11	12	9	3	8	9	18	13	11	11	NS	5	7	8	7	4	NS
	SE	0	0	0	0	0	0	0.13	0.22	1.45	2.40	1.52	1.61	--	0	0.14	0	0	0	--

*C/f = catch per unit effort; N = number of tows; SE = one standard error

† NS = no sample

Table D-9

Catch per Unit Effort of Striped Bass (All Ages Combined) by Bottom Trawl, Hudson River Estuary [RM 24-62 (km 38-99)] during Daytime, 1973

Region		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Tappan Zee	C/f*	9.30	0	0.58	0	0.53	0.13	0.40	0	0
	N	8	5	11	18	12	12	12	1	7
	SE	5.26	0	0.32	0	0.41	0.13	0.28	0	0
Croton-Haverstraw Bay	C/f	--	0.40	0.45	0	0	0	0	1.06	1.06
	N	NS†	8	7	9	6	6	6	3	3
	SE	--	0.26	0.45	0	0	0	0	1.06	1.06
Indian Point	C/f	0	8.22	0.22	0.10	2.55	1.01	1.81	0.33	1.58
	N	3	16	22	33	23	22	21	11	11
	SE	0	3.90	0.12	0.07	1.14	0.52	0.58	0.22	1.13
West Point	C/f	0	12.08	0	0	0.86	0	5.47	0	0
	N	2	8	10	14	11	11	11	4	5
	SE	0	11.85	0	0	0.72	0	4.14	0	0
Cornwall	C/f	--	1.58	0.63	0.11	0.53	9.66	10.21	0.26	0
	N	NS	2	10	15	9	10	9	6	4
	SE	--	0	0.48	0.11	0.53	6.61	8.71	0.26	0

*C/f = catch per unit effort; N = number of tows; SE = one standard error

† NS = no sample

Table D-10

Catch per Unit Effort of Yearling and Older Striped Bass by 100-ft (30.5-m) Beach Seine, Hudson River Estuary [RM 12-153 (km 19-245)] during Daytime, 1973

Region		8 Apr 21 Apr	22 Apr 5 May	6 May 19 May	20 May 2 Jun	3 Jun 16 Jun	17 Jun 30 Jun	1 Jul 14 Jul	15 Jul 28 Jul	29 Jul 11 Aug	12 Aug 25 Aug	26 Aug 8 Sep	9 Sep 22 Sep	23 Sep 6 Oct	7 Oct 20 Oct	21 Oct 3 Nov	4 Nov 17 Nov	18 Nov 1 Dec	2 Dec 15 Dec	16 Dec 29 Dec
Yonkers	C/f*	2.00	6.20	5.14	3.00	0	0.25	0.50	0.20	0	0.18	0.11	0.50	0.13	6.63	0.25	0	0	0	--
	N	1	5	7	4	2	4	2	5	15	11	9	8	8	8	4	9	11	6	NS
	SE	0	2.27	1.77	0.82	0	0.25	0.50	0.20	0	0.12	0.11	0.27	0.13	4.59	0.25	0	0	0	--
Tappan Zee	C/f	0.50	2.50	0	1.64	0.33	0	0.50	0.17	0	0.58	0	0	1.00	20.40	0	0	0	0	--
	N	2	1	2	22	3	3	2	6	8	12	4	4	3	5	3	6	6	2	NS
	SE	0.50	0	0	0.77	0.33	0	0.50	0.17	0	0.40	0	0	1.00	13.48	0	0	0	0	--
Croton-Haverstraw Bays	C/f	0	0.50	0.29	1.23	3.50	3.00	0.50	1.00	1.00	1.11	0	0.07	0.18	0.11	0.08	0.14	0	0	--
	N	2	2	7	22	6	4	2	5	4	9	10	14	11	9	12	7	16	6	NS
	SE	0	0.50	0.18	0.74	1.79	1.47	0.50	0.63	0.41	0.99	0	0.07	0.18	0.11	0.08	0.14	0	0	--
Indian Point	C/f	--	0.33	1.96	0.34	1.15	4.93	0.43	0.50	0	0.17	0	0	0	0.07	0.18	0.20	0	0	0
	N	NS	6	25	35	41	54	7	4	14	12	10	10	12	14	11	15	21	3	5
	SE	--	0.21	0.82	0.12	0.37	0.98	0.30	0.29	0	0.11	0	0	0	0.07	0.18	0.14	0	0	0
West Point	C/f	0	0.12	0.08	0.04	0.50	0.09	0	0.20	0.20	0.11	0.09	0	0.08	0	0.23	0.40	0.11	0	--
	N	6	17	13	23	2	11	2	5	10	9	11	6	12	7	13	5	18	7	NS
	SE	0	0.08	0.08	0.04	0.50	0.09	0	0.20	0.20	0.11	0.09	0	0.08	0	0.17	0.24	0.11	0	--
Cornwall	C/f	0	0.03	0	0.07	0.25	0.08	0	0.71	0.91	0.36	0	0.09	0.36	0	0	0	0.08	0	--
	N	7	31	15	29	12	12	2	7	11	14	6	11	11	8	13	8	12	3	NS
	SE	0	0.03	0	0.05	0.18	0.08	0	0.57	0.58	0.13	0	0.09	0.24	0	0	0	0.08	0	--
Poughkeepsie	C/f	0	0	0	0	0	0	0.40	0	0.24	0	0.13	0.19	0	0	0	0.50	0	0	--
	N	6	17	2	8	1	3	5	9	21	24	15	16	9	6	8	2	9	6	NS
	SE	0	0	0	0	0	0	0.40	0	0.15	0	0.13	0.19	0	0	0	0.50	0	0	--
Hyde Park	C/f	0	0	0	0.25	0	0	0	0	0	0	0	0.50	1.00	0	0	0	0	0	--
	N	6	7	6	4	2	2	2	3	7	5	6	6	2	5	2	2	2	1	NS
	SE	0	0	0	0.25	0	0	0	0	0	0	0	0.50	1.00	0	0	0	0	0	--
Kingston	C/f	0	0	1.00	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0	--
	N	2	3	1	3	NS	2	2	3	5	5	4	4	2	2	1	2	2	2	NS
	SE	0	0	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0	--
Saugerties	C/f	0	0	0	0.33	0	0	0.60	0.57	0.17	0.50	0.60	0	0	0.50	0	0	--	0	--
	N	6	10	9	6	1	2	5	7	12	8	5	8	3	2	5	3	NS	3	NS
	SE	0	0	0	0.33	0	0	0.40	0.57	0.11	0.50	0.60	0	0	0.50	0	0	--	0	--
Catskill	C/f	0	0	0	0	0	0.33	1.75	2.71	0.38	0.36	0.13	0.20	0	0	0	0	0	0	--
	N	6	14	8	8	4	3	4	7	13	11	8	10	4	5	6	5	5	5	NS
	SE	0	0	0	0	0	0.33	0.63	2.71	0.31	0.28	0.13	0.13	0	0	0	0	0	0	--
Albany	C/f	0	0	0	0.17	0	3.67	3.38	2.56	0.39	0.38	0.09	0.82	--	0	0	0	0	0	--
	N	11	20	11	12	9	3	8	9	18	13	11	11	NS	5	7	8	7	4	NS
	SE	0	0	0	0.11	0	3.67	1.35	1.74	0.24	0.18	0.09	0.82	--	0	0	0	0	0	--

*C/f = catch per unit effort; N = number of samples; SE = one standard error

† NS = no sample

Table D-11

Standing Crop of Striped Bass Eggs within Six Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Combined Day and Night Sampling by Epibenthic Sled and Tucker Trawl during 1973

	Region						
Date	YK-TZ	CH-IP	WP-CW	PK-HP	KG-SG	CS-AL	Total
4/29-5/12	0 (0)*	645,935 (558,692)	59,786,249 (23,818,517)	6,891,312 (4,268,163)	926,106 (425,546)	267,857 (194,864)	68,517,455 (24,208,885)
5/13-5/26	1,647,897 (1,212,860)	117,232,478 (67,773,551	67,110,746 (23,667,910)	78,705,603 (35,367,040)	4,006,342 (2,393,833)	1,365,906 (751,832)	270,068,964 (80,075,079)
5/27-6/ 9	86,445 (86,445)	1,367,098 (851,326)	7,365,314 (3,703,578)	6,448,795 (1,878,470)	2,942,343 (1,671,012)	241,889 (108,778)	18,451,883 (4,558,670)
6/10-6/23	0 (0)	1,591,067 (861,874)	98,491 (98,491)	110,262 (110,262)	0 (0)	11,017 (11,017)	1,810,837 (874,532)
6/24-7/ 7	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7/ 8-7/21	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7/22-8/ 4	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
8/ 5-8/18	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

*Numbers in parentheses represent one standard error

Table D-12

Standing Crop of Striped Bass Yolk-Sac Larvae within Six Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Combined Day and Night Sampling by Epibenthic Sled and Tucker Trawl during 1973

	Region						
Date	YK-TZ	CH-IP	WP-CW	PK-HP	KG-SG	CS-AL	Total
4/29-5/12	0 (0)*	565,584 (78,674)	268,917 (135,400)	299,173 (175,557)	214,390 (116,865)	16,123 (16,123)	1,364,187 (263,174)
5/13-5/26	16,112,033 (5,198,839)	15,799,140 (7,492,954)	4,574,780 (1,083,643)	11,617,472 (4,941,922)	1,832,012 864,118)	45,310 (32,108)	49,980,745 (10,465,032)
5/27-6/ 9	10,169,403 (7,2]2,384)	2,210,715 (1,279,811)	6,398,510 (4,203,076)	61,054,882 (36,455,859)	1,108,258 (447,984)	390,679 (217,756)	81,332,444 (37,424,591)
6/10-6/23	4,242,679 (4,091,962)	23,489,945 (13,271,502)	42,768,675 (33,684,620)	24,854,513 (16,252,142)	767,538 (767,538)	0 (0)	96,123,346 (39,903,030)
6/24-7/ 7	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7/ 8-7/21	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7/22 8/ 4	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
8/ 5 8/18	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

*Numbers in parentheses represent one standard error

Table D-13

Standing Crop of Striped Bass Post Yolk-Sac Larvae within Six Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Sampling by Epibenthic Sled and Tucker Trawl during Daytime, 1973

	Region						
Date	YK-TZ	CH-IP	WP-CW	PK-HP	KG-SG	CS-AL	Total
4/29-5/12	0 (0)*	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/13-5/26	1,195,040 (755,816)	159,844 (159,844)	86,266 (65,974)	48,846 (48,846)	0 (0)	0 (0)	1,489,997 (776,882)
5/27-6/ 9	182,816 (114,940)	0 (0)	0 (0)	71,791 (62,444)	0 (0)	0 (0)	254,607 (130,807)
6/10-6/23	332,646 (50,641)	20,647,355 (11,640,616)	49,336,506 (10,066,614)	11,898,905 (8,364,839)	1,962,846 (1,175,106)	557,807 (545,509)	84,736,061 (17,563,946)
6/24-7/ 7	34,321,347 (26,804,854)	11,459,551 (4,845,801)	35,963,520 (12,540,924)	80,676,935 (59,289,023)	8,933,286 (4,583,554)	176,821 (126,459)	171,531,454 (66,599,323)
7/ 8-7/21	178,199 (151,309)	1,703,158 (699,783)	1,226,873 (457,732)	4,074,414 (1,660,971)	1,399,644 (551,485)	101,938 (37,455)	8,684,226 (1,945,886)
7/22-8/ 4	12,770 (12,770)	303,488 (194,878)	14,691 (10,126)	418,291 (212,260)	133,067 (115,876)	33,711 (33,711)	916,018 (312,828)
8/ 5-8/18	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

*Numbers in parentheses represent one standard error

Table D-14

Standing Crop of Juvenile Striped Bass within Six Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Combined Day and Night Sampling by Epibenthic Sled and Tucker Trawl during 1973

	Region						
Date	YK-TZ	CH-IP	WP-CW	PK-HP	KG-SG	CS-AL	Total
4/29-5/12	0 (0)*	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/13-5/26	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/27-6/ 9	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
6/10-6/23	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
6/24-7/ 7	0 (0)	106,193 (65,085)	2,117,053 (1,883,098)	176,150 (124,803)	473,444 (334,823)	0 (0)	2,872,840 (1,917,805)
7/ 8 7/21	0 (0)	259,137 (192,205)	668,302 (213,543)	8,886,236 (5,941,891)	6,026,627 (2,066,337)	40,387 (31,577)	15,880,690 (6,297,568)
7/22-8/ 4	0 (0)	297,423 (240,680)	104,950 (49,866)	558,061 (227,706)	431,118 (196,448)	17,697 (17,697)	1,409,249 (388,804)
8/ 5-8/18	12,634,953 (4,314,987)	2,375,875 (556,183)	266,031 (93,557)	134,691 (64,948)	0 (0)	0 (0)	15,411,550 (4,352,175)

*Numbers in parentheses represent one standard error

Table D-15

Standing Crop of Juvenile Striped Bass within 12 Geographical Regions of Hudson River Estuary [RM 12-153 (km 19-245)] Based on Daytime Sampling by 100-ft (30.5-m) Beach Seine during 1973

Date	Region YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	TOTAL
6/17- 6/30	6,449 (3,723)**	0 (0)	0 (0)	341 (341)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	6,790 (3,738)
7/ 1- 7/14	0 (0)	795,122 (704,251)	376,476 (26,891)	69,775 (44,098)	6,589 (6,589)	15,977 (15,977)	58,184 (24,824)	10,540 (5,580)	0 (0)	17,556 (9,616)	0 (0)	1,698 (1,698)	1,351,915 (706,879)
7/15- 7/28	301,808 (204,191)	583,090 (234,457)	306,559 (147,926)	43,774 (23,906)	88,555 (52,245)	121,727 (74,408)	80,416 (23,711)	4,547 (2,301)	14,348 (5,739)	22,571 (14,187)	78,702 (53,627)	3,019 (3,019	1,649,115 (362,035)
7/29- 8/11	217,113 (50,582)	675,854 (211,102)	322,693 (244,990)	681,951 359,457)	20,030 (6,565)	649,718 (492,232)	31,085 (9,061)	5,236 (4,173)	48,210 (15,059)	46,815 (12,476)	89,297 (30,919)	38,496 (19,749)	2,826,496 (693,192)
8/12- 8/25	265,049 (53,148)	348,339 (109,500)	1,120,463 (533,209)	120,570 (28,142)	16,106 (7,473)	177,265 (68,516)	17,443 (5,486)	1,984 (1,277)	24,105 (9,966)	19,750 (9,048)	130,574 (75,473)	61,663 (32,548)	2,303,311 (558,244)
8/26- 9/ 8	121,096 (31,221)	499,791 (166,941)	473,284 (116,335)	113,351 (44,133)	21,564 (15,338)	127,813 (58,079)	23,179 (11,659)	413 (413)	4,304 (4,304)	28,089 (8,952)	110,675 (61,542)	38,290 (21,272)	1,561,848 (228,929)
9/ 9- 9/22	305,516 (193,098)	1,022,300 (445,369)	6,219,530 (2,242,441)	129,018 (38,661)	255,649 (233,432)	125,877 (74,514)	7,983 (3,231)	1,033 (381)	34,436 (18,597)	15,361 (6,989)	94,443 (43,187)	32,114 (21,852)	8,243,258 (2,308,347)
9/23- 10/ 6	73,356 (28,108)	939,001 (806,543)	2,549,766 (1,543,465)	78,332 (13,636)	222,704 (176,060)	78,431 (33,475)	6,307 (3,227)	3,720 (1,240)	25,827 (25,827)	5,852 (5,852)	68,864 (26,028)	NS	4,052,161 (1,751,365)
10/ 7- 10/20	162,834 (94,132)	1,154,063 (529,982)	289,826 (77,987)	79,649 (25,807)	30,874 (10,878)	35,947 (14,081)	11,826 (7,700)	0 (0)	0 (0)	0 (0)	3,935 (3,935)	0 (0)	1,763,954 (544,867)
10/21 11/ 3	43,530 (25,576)	954,147 (490,059)	1,053,235 (573,577)	34,349 (16,063)	38,520 (15,442)	38,508 (19,910)	0 (0)	0 (0)	0 (0)	0 (0)	13,117 (9,728)	1,941 (1,941)	2,177,346 (755,508)
11/ 4- 11/17	32,244 (5,265)	355,912 (143,400)	165,188 (89,655)	79,868 (19,240)	12,519 (3,935)	9,320 (5,107)	0 (0)	0 (0)	0 (0)	11,704 (5,852)	0 (0)	0 (0)	666,754 (170,515)
11/18- 12/ 1	18,174 (7,214)	212,033 (97,918)	58,824 (19,672)	27,208 (9,984)	8,639 (2,313)	2,663 (1,391)	11,826 (11,826)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	339,366 (101,359)
12/ 2- 12/15	16,122 (7,210)	90,871 (90,871)	44,819 (17,927)	12,287 (8,127)	15,060 (10,006)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	179,159 (93,792)
12/16- 12/29	NS*	NS	NS	0 (0)	NS	NS	NS	NS	NS	NS	NS	NS	0 (0)

*NS = no samples taken
**Numbers in parentheses represent one standard error

Table D-16

Density Estimates (No./1000 m^3) of White Perch Eggs within Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Combined Day and Night Sampling by Epibenthic Sled and Tucker Trawl during 1973

Region (RM)	29 Apr 12 May	13 May 26 May	27 May 9 Jun	10 Jun 23 Jun	24 Jun 7 Jul	8 Jul 21 Jul	22 Jul 4 Aug	5 Aug 18 Aug	
Yonkers-Tappan Zee (14-33)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	Density SE
Croton, Haverstraw- Indian Pt. (34-46)	0 (0)	0.11 (0.11)	0.19 (0.19)	0.18 (0.18)					Density SE
West Point- Cornwall (47-61)	0.05 (0.05)	0 (0)	0 (0)	1.31 (1.31)					Density SE
Poughkeepsie-Hyde Park (62-85)	0.39 (0.32)	0.49 (0.27)	0.88 (0.46)	0 (0)					Density SE
Kingston Saugerties (86-106)	0.05 (0.05)	0.27 (0.21)	14.99 (7.49)	0.50 (0.50)					Density SE
Catskill- Albany (107-140)	0.45 (0.35)	4.55 (2.85)	16.16 (12.67)	0.55 (0.48)	0 (0)	0 (0)	0 (0)	0 (0)	Density SE

SE = One standard error

Table D-17

Density Estimates (No./1000 m^3) of White Perch Yolk-Sac Larvae within Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Combined Day and Night Sampling by Epibenthic Sled and Tucker Trawl during 1973

Region (RM)	29 Apr 12 May	13 May 26 May	27 May 9 Jun	10 Jun 23 Jun	24 Jun 7 Jul	8 Jul 21 Jul	22 Jul 4 Aug	5 Aug 18 Aug	
Yonkers-Tappan Zee (14-33)	0 (0)	0.49 (0.27)	0.31 (0.31)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	Density SE
Croton, Haverstraw- Indian Pt. (34-46)	0 (0)	9.39 (6.31)	0.42 (0.31)	1.56 (1.19)	0 (0)				Density SE
West Point- Cornwall (47-61)	0 (0)	1.76 (0.99)	0 (0)	0.47 (0.47)	0 (0)				Density SE
Poughkeepsie-Hyde Park (62-85)	0.25 (0.25)	0.64 (0.27)	2.86 (1.29)	4.03 (3.91)	0.06 (0.06)				Density SE
Kingston- Saugerties (86-106)	0.25 (0.25)	4.67 (3.13)	4.01 (2.88)	26.09 (26.00)	0 (0)				Density SE
Catskill- Albany (107-140)	0.17 (0.10)	0.61 (0.29)	1.34 (0.64)	3.69 (2.62)	0.49 (0.49)	0 (0)	0 (0)	0 (0)	Density SE

SE = One standard error

Table D-18

Density Estimates (No./1000 m^3) of White Perch Post Yolk-Sac Larvae within Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Combined Day and Night Sampling by Epibenthic Sled and Tucker Trawl during 1973

Region (RM)	29 Apr 12 May	13 May 26 May	27 May 9 Jun	10 Jun 23 Jun	24 Jun 7 Jul	8 Jul 21 Jul	22 Jul 4 Aug	5 Aug 18 Aug	
Yonkers-Tappan Zee (14-33)	0	0.37	0.90	0	30.89	0.68	0	0	Density
	(0)	(0.37)	(0.65)	(0)	(9.53)	(0.48)	(0)	(0)	SE
Croton, Haverstraw-Indian Pt. (34-46)	0	0.43	0.83	1.03	23.06	3.31	0	0	Density
	(0)	(0.43)	(0.75)	(0.67)	(11.58)	(1.04)	(0)	(0)	SE
West Point-Cornwall (47-61)	0	1.04	0	1.26	46.56	0.24	0	0	Density
	(0)	(0.97)	(0)	(0.52)	(19.93)	(0.14)	(0)	(0)	SE
Poughkeepsie-Hyde Park (62-85)	0	0.03	0.51	24.84	15.03	1.00	0.01	0	Density
	(0)	(0.03)	(0.38	(8.32)	(9.38)	(0.66)	(0.01)	(0)	SE
Kingston-Saugerties (86-106)	0.28	0.70	2.49	20.13	4.03	0.14	0	0	Density
	(0.25)	(0.70)	(1.64)	(14.45)	(2.06)	(0.09)	(0)	(0)	SE
Catskill-Albany (107-140)	0.67	0.52	0.60	2.19	1.03	0.09	0	0	Density
	(0.67)	(0.25)	(0.33)	(0.84)	(0.44)	(0.06)	(0)	(0)	SE

SE = One standard error

Table D-19

Density Estimates (No./1000 m^3) of Juvenile White Perch within Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Combined Day and Night Sampling by Epibenthic Sled and Tucker Trawl during 1973

Region (RM)	29 Apr 12 May	13 May 26 May	27 May 9 Jun	10 Jun 23 Jun	24 Jun 7 Jul	8 Jul 21 Jul	22 Jul 4 Aug	5 Aug 18 Aug	
Yonkers-Tappan Zee (14-33)	0	0	0	0	0	0	0	2.36	Density
	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(1.25)	SE
Croton, Haverstraw-Indian Pt. (34-46)						0.40	0.18	1.54	Density
						(0.30)	(0.09)	(0.49)	SE
West Point-Cornwall (47-61)						0.42	0.63	1.28	Density
						(0.30)	(0.33)	(0.56)	SE
Poughkeepsie-Hyde Park (62-85)						1.38	0.21	0.14	Density
						(1.08)	(0.08)	(0.06)	SE
Kingston-Saugerties (86-106)						0.23	1.55	1.41	Density
						0.16	0.72	(1.05)	SE
Catskill-Albany (107-140)	0	0	0	0	0	0	0	0	Density
	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	SE

SE = One standard error

Table D-20

Catch per Unit Effort of Juvenile White Perch by 100-ft (30.5-m) Beach Seine, Hudson River Estuary [RM 12-153 (km 19-245)] during Daytime, 1973

Region		8 Apr 21 Apr	22 Apr 5 May	6 May 19 May	20 May 2 Jun	3 Jun 16 Jun	17 Jun 30 Jun	1 Jul 14 Jul	15 Jul 28 Jul	29 Jul 11 Aug	12 Aug 25 Aug	26 Aug 8 Sep	9 Sep 22 Sep	23 Sep 6 Oct	7 Oct 20 Oct	21 Oct 3 Nov	4 Nov 17 Nov	18 Nov 1 Dec	2 Dec 15 Dec	16 Dec 29 Dec
Yonkers	C/f*	0	0	0	0	0	0	0	0.20	8.67	5.00	8.00	18.63	2.38	13.63	2.00	0.56	0	0.17	—†
	N	1	5	7	4	2	4	2	5	15	11	9	8	8	8	4	9	11	6	NS
	SE	0	0	0	0	0	0	0	0.20	3.62	2.43	6.27	17.51	1.19	12.91	2.00	0.44	0	0.17	—
Tappan Zee	C/f	0	0	0	0	0	0	0	3.83	5.80	4.83	40.20	17.25	67.67	35.60	10.67	0	0	0	—
	N	2	1	2	22	3	3	2	6	8	12	4	4	3	5	3	6	6	2	NS
	SE	0	0	0	0	0	0	0	1.60	1.94	1.94	19.54	4.13	63.67	21.95	8.21	0	0	0	—
Croton-Haverstraw Bays	C/f	0	0	0	0	0	0	0.56	2.00	1.50	36.73	28.20	121.00	141.45	11.56	22.25	5.43	0	0	—
	N	2	2	7	22	6	4	2	5	4	9	10	14	11	9	12	7	16	6	NS
	SE	0	0	0	0	0	0	0.50	1.76	0.87	24.53	14.67	36.96	59.35	7.69	13.90	5.43	0	0	—
Indian Point	C/f	--	0	0	0	0	0	6.14	0.75	2.50	8.83	6.70	37.80	20.25	11.86	4.45	0.20	0.52	0	—
	N	NS	6	25	35	41	54	7	4	14	12	10	10	12	14	11	15	21	3	NS
	SE	--	0	0	0	0	0	0.55	0.75	1.30	5.64	3.97	13.18	10.97	6.18	2.85	0.14	0.27	0	—
West Point	C/f	0	0	0	0	0	0	0	58.60	5.60	13.22	17.53	17.00	26.67	8.43	17.23	9.80	9.33	13.71	—
	N	6	17	13	23	2	11	2	5	10	9	11	6	12	7	13	5	18	7	NS
	SE	0	0	0	0	0	0	0	30.80	1.51	6.02	4.67	6.19	7.14	2.18	5.04	3.22	3.32	12.56	—
Cornwall	C/f	0	0	0	0	0	0	0	1.43	2.36	10.07	8.33	12.27	7.45	3.63	1.31	1.13	0	0	—
	N	7	31	15	29	12	12	2	7	11	14	6	11	11	8	13	8	12	3	NS
	SE	0	0	0	0	0	0	0	0.81	0.89	3.60	3.33	4.81	2.41	1.97	0.84	1.13	0	0	—
Poughkeepsie	C/f	0	0	0	0	0	0	14.80	10.44	8.24	9.21	2.53	0.75	1.89	0.17	0.38	0	6.67	0	—
	N	6	17	2	8	1	3	5	9	21	24	15	16	9	6	8	2	9	6	NS
	SE	0	0	0	0	0	0	11.43	5.77	3.77	4.08	1.54	0.39	1.43	0.17	0.26	0	6.30	0	—
Hyde Park	C/f	0	0	0	0	0	0	1.50	54.33	22.11	22.00	2.67	9.00	0.50	0	0	0	0	0	—
	N	6	7	6	4	2	2	2	3	9	5	6	6	2	5	2	2	2	1	NS
	SE	0	0	0	0	0	0	0.50	41.14	5.32	10.10	1.58	4.84	0.50	0	0	0	0	0	—
Kingston	C/f	0	0	0	0	--	0	10.50	18.00	11.20	7.60	4.75	4.50	3.00	0	0	0	0	0	—
	N	2	3	1	3	NS	2	2	3	5	5	4	4	2	2	1	2	2	2	NS
	SE	0	0	0	0	--	0	10.50	15.51	6.15	4.06	1.31	3.20	1.00	0	0	0	0	0	—
Saugerties	C/f	0	0	0	0	0	0	1.80	22.57	12.83	22.38	8.00	8.38	0	0	0	0	--	0	—
	N	6	10	9	6	1	2	5	7	12	8	5	8	3	2	5	3	NS	3	NS
	SE	0	0	0	0	0	0	1.56	11.48	3.83	9.25	4.48	3.50	0	0	0	0	--	0	—
Catskill	C/f	0	0	0	0	0	0	0.25	0.57	5.46	9.00	5.75	3.40	4.00	0	1.33	0.40	0	0	—
	N	6	14	8	8	4	3	4	7	13	11	8	10	4	5	6	5	5	5	NS
	SE	0	0	0	0	0	0	0.25	0.57	3.20	4.35	2.95	1.85	1.08	0	1.33	0.24	0	0	—
Albany	C/f	0	0	0	0	0	0	0.13	1.56	0.28	4.69	1.91	0.09	--	0.20	0.14	0	0	0	—
	N	11	20	11	12	9	8	8	9	18	13	11	11	NS	5	7	8	7	4	NS
	SE	0	0	0	0	0	0	0.13	1.56	0.28	3.72	1.81	0.09	--	0.20	0.14	0	0	0	—

*C/f = catch per unit effort; N = number of tows; SE = one standard error

† NS = no sample

Table D-21

Catch per Unit Effort of White Perch (All Ages Combined) by Bottom Trawl, Hudson River Estuary [RM 24-62 (km 38-99)] during Daytime, 1973

Region		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Tappan Zee	C/f*	214.20	1.90	54.42	10.65	0.13	0.79	0	1.58	1.81
	N	8	5	11	18	12	12	12	1	7
	SE	82.26	1.27	28.78	7.81	0.13	0.41	0	0	1.56
Croton-Haverstraw Bays	C/f	--	11.88	16.74	14.78	0	1.58	0	5.28	36.43
	N	NS†	8	7	9	6	6	6	3	3
	SE	--	5.59	11.06	9.48	0	1.29	0	3.70	34.84
Indian Point	C/f	7.92	85.13	3.89	5.33	7.64	3.89	7.99	6.72	173.35
	N	3	16	22	33	23	22	21	11	11
	SE	2.42	45.76	1.37	1.41	2.88	2.02	2.95	1.80	91.08
West Point	C/f	0	140.06	1.27	15.16	5.04	2.30	25.77	7.52	9.50
	N	2	8	10	14	11	11	11	4	5
	SE	0	130.47	0.74	6.02	2.90	0.69	13.46	2.45	2.79
Cornwall	C/f	--	8.71	2.69	1.16	7.92	11.40	39.24	45.66	13.46
	N	NS	2	10	15	9	10	9	6	4
	SE	--	0.79	2.02	0.50	5.48	5.29	26.63	22.76	7.36

*C/f = catch per unit effort; N = number of tows; SE = one standard error

† NS = no sample

Table D-22

Catch per Unit Effort of Yearling and Older White Perch by 100-ft (30.5-m) Beach Seine, Hudson River Estuary [RM 12-153 (km 19-245)], during Daytime, 1973

Region		8 Apr 21 Apr	22 Apr 5 May	6 May 19 May	20 May 2 Jun	3 Jun 16 Jun	17 Jun 30 Jun	1 Jul 14 Jul	15 Jul 28 Jul	29 Jul 11 Aug	12 Aug 25 Aug	26 Aug 8 Sep	9 Sep 22 Sep	23 Sep 6 Oct	7 Oct 20 Oct	21 Oct 3 Nov	4 Nov 17 Nov	18 Nov 1 Dec	2 Dec 15 Dec	16 Dec 29 Dec
Yonkers	C/f*	13.00	16.80	23.14	9.00	6.50	1.25	0.50	4.80	9.00	11.00	6.56	2.63	13.38	3.13	4.75	0.56	0.45	0	--
	N	1	5	7	4	2	4	2	5	15	11	9	8	8	8	4	9	11	6	NS†
	SE	0	3.99	8.63	2.48	6.50	0.75	0.50	2.96	2.83	7.39	2.14	1.08	9.85	0.85	3.77	0.38	0.28	0	--
Tappan Zee	C/f	6.00	18.00	30.50	25.95	4.33	26.00	5.00	9.00	21.63	2.67	14.00	111.25	6.00	30.60	1.00	3.17	1.33	0	--
	N	2	1	2	22	3	3	2	6	8	12	4	4	3	5	3	6	6	2	NS
	SE	2.00	0	27.50	7.97	1.67	22.55	5.00	6.49	10.98	1.24	5.55	110.58	2.65	24.21	1.00	1.87	0.80	0	--
Croton-	C/f	0.50	10.00	3.43	10.55	36.33	14.00	4.00	5.20	6.75	13.89	2.50	36.36	65.73	11.11	30.00	0.57	0.31	0	--
Haverstraw	N	2	2	7	22	6	4	2	5	4	9	10	14	11	9	12	7	16	6	NS
Bays	SE	0.50	10.00	2.18	3.35	30.51	10.86	4.00	4.27	3.12	9.65	1.71	31.01	46.63	9.78	17.58	0.30	0.25	0	--
Indian Point	C/f	--	1.67	4.84	5.51	32.17	34.30	4.14	16.25	3.21	2.00	0.70	1.10	0.67	1.71	1.27	1.13	0.57	0	0
	N	NS	6	25	35	41	54	7	4	14	12	10	10	12	14	11	15	21	3	5
	SE	--	1.31	2.52	2.32	17.03	15.53	1.92	15.59	2.26	1.13	0.42	0.69	0.45	0.57	0.81	1.06	0.30	0	0
West Point	C/f	0	1.88	6.77	9.30	19.00	11.64	2.00	2.80	1.00	0.22	0.36	0.33	0.75	0.71	1.00	1.40	0.06	0	--
	N	6	17	13	23	2	11	2	5	10	9	11	6	12	7	13	5	18	7	NS
	SE	0	1.03	3.59	3.25	13.00	4.99	2.00	1.83	0.37	0.22	0.36	0.33	0.30	0.47	0.45	0.68	0.06	0	--
Cornwall	C/f	4.86	5.39	9.73	14.86	37.08	12.25	5.50	14.14	3.82	0.21	0.33	0.73	1.36	0.38	0.46	0.38	0.17	0	--
	N	7	31	15	29	12	12	2	7	11	14	6	11	11	8	13	8	12	3	NS
	SE	3.71	2.61	3.83	4.04	11.87	4.80	2.50	6.26	2.32	0.15	0.21	0.41	0.59	0.18	0.27	0.18	0.17	0	--
Poughkeepsie	C/f	7.83	5.41	6.50	23.38	46.00	1.67	5.20	5.00	0.76	0.25	6.20	0.31	0.11	0.33	0	0	0.33	0	--
	N	6	17	2	8	1	3	5	9	21	24	15	16	9	6	8	2	9	6	NS
	SE	7.83	2.26	2.50	11.88	0	0.88	4.02	3.06	0.40	1.15	1.01	0.20	0.11	0.33	0	0	0.33	0	--
Hyde Park	C/f	0	3.00	14.83	33.75	21.00	7.50	3.00	0.33	0.67	0.40	1.83	3.83	2.50	0.20	0	0	0	0	--
	N	6	7	6	4	2	2	2	3	9	5	6	6	2	5	2	2	2	1	NS
	SE	0	0.72	6.31	14.95	20.00	7.50	3.00	0.33	0.33	0.24	1.64	3.64	2.50	0.20	0	0	0	0	--
Kingston	C/f	0	3.33	109.00	2.67	--	7.00	13.50	4.00	1.00	0.20	1.25	0.75	0	0	0	0	0	0	--
	N	2	3	1	3	NS	2	2	3	5	5	4	4	2	2	1	2	2	2	NS
	SE	0	1.67	0	1.76	--	7.00	6.50	1.73	1.00	0.20	1.25	0.25	0	0	0	0	0	0	--
Saugerties	C/f	0.33	1.00	6.11	16.67	19.00	0	12.20	2.14	3.08	0.63	1.40	0.88	0	0	0	0	--	0	--
	N	6	10	9	6	1	2	5	7	12	8	5	8	3	2	5	3	NS	3	NS
	SE	0.21	0.42	3.05	6.48	0	0	8.77	1.34	0.85	0.42	0.93	0.48	0	0	0	0	--	0	--
Catskill	C/f	0.17	0.43	2.63	0.88	0.75	16.33	2.00	6.29	1.00	1.09	0	0.50	0.25	0.60	0	0.20	0	0	--
	N	6	14	8	8	4	3	4	7	13	11	8	10	4	5	6	5	5	5	NS
	SE	0.17	0.36	2.20	0.35	0.75	15.84	1.41	2.39	0.69	0.46	0	0.22	0.25	0.24	0	0.20	0	0	--
Albany	C/f	0	0	0	7.00	0.33	4.00	1.63	1.67	0.94	2.15	0.18	0.09	--	0	0.43	0	0	0	--
	N	11	20	11	12	9	3	8	9	18	13	11	11	NS	5	7	8	7	4	NS
	SE	0	0	0	6.19	0.24	4.00	0.80	0.94	0.65	2.15	0.18	0.09	--	0	0.43	0	0	0	--

*C/f = catch per unit effort; N = number of tows; SE = one standard error

† NS = no sample

Table D-23

Standing Crop of White Perch Eggs within Six Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Combined Day and Night Sampling by Epibenthic Sled and Tucker Trawl during 1973

	Region						
Date	YK-TZ	CH-IP	WP-CW	PK-HP	KG-SG	CS-AL	Total
4/29- 5/12	0 (0)*	0 (0)	16,119 (16,119)	177,137 (146,644)	18,186 (18,186)	104,807 (81,420)	316,249 (169,482)
5/13- 5/26	0 (0)	39,961 (39,961)	0 (0)	223,791 (122,556)	102,488 (78,832)	1,054,055 (660,886)	1,420,295 (677,939)
5/27- 6/ 9	0 (0)	66,434 (66,434)	0 (0)	402,501 (212,398)	5,753,242 (2,873,501)	3,744,938 2,935,700)	9,967,115 (4,113,985)
6/10- 6/23	0 (0)	64,963 (64,963)	455,520 (455,520)	0 (0)	191,884 (191,884)	128,011 (111,396)	840,378 (510,830)
6/24- 7/ 7	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7/ 8- 7/21	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7/22- 8/ 4	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
8/ 5- 8/18	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

*Numbers in parentheses represent one standard error

Table D-24

Standing Crop of White Perch Yolk-Sac Larvae within Six Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Combined Day and Night Sampling by Epibenthic Sled and Tucker Trawl during 1973

	Region						
Date	YK-TZ	CH-IP	WP-CW	PK-HP	KG-SG	CS-AL	Total
4/29- 5/12	0 (0)*	0 (0)	0 (0)	115,297 (115,297)	95,316 (95,316)	40,112 (23,418)	250,725 (151,416)
5/13- 5/26	270,025 (149,776)	3,340,995 (2,247,842)	610,120 (342,253)	293,484 (121,846)	1,792,382 (1,202,750)	140,367 (66,162)	6,447,374 (2,580,348)
5/27- 6/ 9	172,889 (172,889)	149,313 (108,475)	0 (0)	1,312,244 (594,931)	1,539,600 (1,103,684)	311,638 (149,333)	3,485,685 (1,279,070)
6/10- 6/23	0 (0)	554,971 (423,245)	164,435 (164,435)	1,850,122 (1,799,432)	10,011,926 (9,978,050)	854,492 (606,390)	13,435,945 (10,167,267)
6/24- 7/ 7	0 (0)	0 (0)	0 (0)	25,866 (25,866)	0 (0)	113,303 (113,303)	139,170 (116,219)
7/ 8- 7/21	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7/22- 8/ 4	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
8/ 5- 8/18	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

*Numbers in parentheses represent one standard error

Table D-25

Standing Crop of White Perch Post Yolk-Sac Larvae within Six Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Combined Day and Night Sampling by Epibenthic Sled and Tucker Trawl during 1973

	Region						
Date	YK-TZ	CH-IP	WP-CW	PK-HP	KG-SG	CS-AL	Total
4-29-5/12	0 (0)*	0 (0)	0 (0)	0 (0)	107,264 (95,440)	156,177 (156,177)	263,442 (183,030)
5/13-5/26	201,099 (201,099)	152,917 (152,917)	359,562 (334,924)	11,542 (11,542)	268,374 (268,374)	120,058 (58,144)	1,113,551 501,535)
5/27-6/ 9	496,501 (357,980)	296,487 (267,508)	0 (0)	232,427 (175,620)	954,606 (629,983)	139,227 (77,459)	2,119,248 (795,884)
6/10-6/23	0 (0)	366,834 (240,928)	436,375 (181,639)	11,418,732 (3,823,464)	7,726,154 (5,543,900)	507,368 (195,417)	20,455,462 (6,744,104)
6/24-7/ 7	17,025,408 (5,251,169)	8,209,203 (4,122,504)	16,166,026 (6,921,182)	6,907,344 (4,309,925)	1,547,493 (790,211)	237,670 (100,847)	50,093,143 (10,568,000)
7/ 8-7/21	371,912 (263,235)	1,177,811 (369,371)	82,724 (49,459)	458,810 (305,407)	53,563 (33,192)	21,537 (14,246)	2,166,356 (550,229)
7/22-8/ 4	0 (0)	0 (0)	0 (0)	2,483 (2,483)	0 (0)	0 (0)	2,483 (2,483)
8/ 5-8/18	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

*Numbers in parentheses represent one standard error

Table D-26

Standing Crop of Juvenile White Perch within Six Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Combined Day and Night Sampling by Epibenthic Sled and Tucker Trawl during 1973

	Region						
Date	YK-TZ	CH-IP	WP-CW	PK-HP	KG-SG	CS-AL	Total
4/29-5/12	0 (0)*	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/13-5/26	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/27-6/ 9	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
6/10-6/23	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
6/24-7/ 7	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7/ 8 7/21	0 (0)	143,331 (106,627)	144,182 (103,559)	635,370 (494,825)	87,670 (61,833)	0 (0)	1,010,552 (520,355)
7/22-8/ 4	0 (0)	63,033 (33,575)	220,090 (114,564)	94,260 (38,604)	594,742 (276,316)	0 (0)	972,124 (303,468)
8/ 5-8/18	1,298,723 (691,207)	547,772 (172,919)	444,752 (195,239)	65,820 (28,556)	542,848 (402,382)	0 (0)	2,899,915 (841,733)

*Numbers in parentheses represent one standard error

Table D-27

Standing Crop of Juvenile White Perch within 12 Geographical Regions of Hudson River Estuary [RM 12-153 (km 19-245)] Based on Daytime Sampling by 100-ft (30.5-m) Beach Seine during 1973

	Region												
Date	YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
6/17- 6/30	0 (0)*	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7/ 1- 7/14	0 (0)	0 (0)	13,446 (13,446)	10,532 (5,099)	0 (0)	0 (0)	105,014 (81,070)	1,860 (620)	90,393 (90,393)	31,600 (27,423)	4,919 (4,919)	1,698 (1,698)	259,462 (125,417)
7/15- 7/28	1,290 (1,290)	174,170 (72,713)	53,782 (47,347)	6,912 (6,912)	154,444 (81,167)	15,216 (8,652)	74,109 (40,934)	67,373 (51,008)	154,960 (134,015)	396,254 (201,547)	11,243 (11,243)	21,135 (21,135)	1,130,887 (278,698)
7/29- 8/11	55,890 (23,359)	266,934 (88,169)	40,337 (23,288)	23,039 (11,979)	14,759 (3,972)	25,175 (9,448)	58,454 (26,765)	27,418 (6,602)	96,420 (52,957)	225,296 (67,227)	107,459 (62,879)	3,774 (3,774)	944,954 (145,471)
8/12- 8/25	35,469 (16,960)	219,605 (88,045)	988,995 (659,728)	81,404 (51,931)	34,848 (15,879)	107,272 (38,394)	65,338 (28,930)	27,280 (12,523)	65,428 (34,927)	392,806 (162,361)	177,080 (85,682)	63,753 (50,589)	2,259,277 (697,265)
8/26- 9/ 8	51,591 (40,459)	1,828,781 (887,909)	758,329 (394,419)	61,744 (36,607)	46,242 (12,348)	88,759 (35,504)	17,975 (10,902)	3,307 (1,965)	40,892 (11,320)	140,444 78,707)	113,134 (58,052)	25,938 (24,610)	3,177,138 (979,162)
9/ 9- 9/22	120,111 (112,921)	783,763 (187,680)	3,253,824 (993,772)	348,348 (121,490)	44,804 (16,304)	130,718 (51,284)	5,322 (2,786)	11,160 (6,007)	38,740 (27,562)	147,028 (61,528)	66,897 (36,422)	1,235 (1,235)	4,951,950 (1,029,141)
9/23- 10/ 6	15,316 (7,702)	3,074,473 (2,892,730	3,803,870 1,595,984)	186,615 (101,130)	70,281 (18,825)	79,399 (25,666)	13,403 (10,135)	620 (620)	25,827 (8,609)	0 (0)	78,702 (21,252)	NS	7,348,505 (3,305,598)
10/ 7- 10/20	87,866 (83,284)	1,617,506 (997,370)	310,742 (206,900)	109,270 (56,971)	22,214 (5,747)	38,610 (21,009)	1,183 (1,183)	0 (0)	0 (0)	0 (0)	0 (0)	2,717 (2,717)	2,190,107 (1,023,825)
10/21 11- 3	12,898 (12,898)	484,646 (373,138)	598,327 (373,849)	41,051 (26,224)	45,413 (13,279)	13,928 (8,894)	2,661 (1,867)	0 (0)	0 (0)	0 (0)	26,234 (26,234)	1,941 (1,941)	1,227,098 (529,905)
11/ 4- 11/17	3,583 (2,866)	0 (0)	145,980 (145,980)	1,843 (1,334)	23,720 (10,597)	11,982 (11,982)	0 (0)	0 (0)	0 (0)	0 (0)	7,870 (4,820)	0 (0)	194,978 (146,967)
11/18- 12/ 1	0 (0)	0 (0)	0 (0)	4,827 (2,513)	24,599 (8,749)	0 (0)	47,304 (44,705)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	76,729 (45,621)
12/ 2- 12/ 15	1,075 (1,075)	0 (0)	0 (0)	0 (0)	36,145 (33,102)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0	0 (0)	37,219 (33,119)
12/16- 12-29	NS**	NS	NS	1,843 (1,843)	NS	NS	NS	NS	NS	NS	NS	NS	1,843) (1,843)

*Numbers in parentheses represent one standard error
**NS = no samples taken

Table D-28

Density Estimates (No./1000 m^3) of Atlantic Tomcod Post Yolk-Sac Larvae within Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Combined Day and Night Sampling by Epibenthic Sled and Tucker Trawl during 1973

Region (RM)	29 Apr 12 May	13 May 26 May	27 May 9 Jun	10 Jun 23 Jun	24 Jun 7 Jul	8 Jul 21 Jul	22 Jul 4 Aug	5 Aug 18 Aug	
Yonkers-Tappan Zee (14-33)	2.08 (0.58)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	Density SE
Croton, Haverstraw-Indian Pt. (34-46)	2.54 (0.07)								Density SE
West Point-Cornwall (47-61)	0.53 (0.36)								Density SE
Poughkeepsie-Hyde Park (62-85)	0 (0)								Density SE
Kingston-Saugerties (86-106)	0 (0)								Density SE
Catskill-Albany (107-140)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	Density SE

SE = One standard error

Table D-29

Density Estimates (No./1000 m^3) of Juvenile Atlantic Tomcod within Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Combined Day and Night Sampling by Epibenthic Sled and Tucker Trawl during 1973

Region (RM)	29 Apr 12 May	13 May 26 May	27 May 9 Jun	10 Jun 23 Jun	24 Jun 7 Jul	8 Jul 21 Jul	22 Jul 4 Aug	5 Aug 18 Aug	
Yonkers-Tappan Zee (14-33)	125.25 (35.00)	210.22 (82.12)	7.98 (3.87)	8.69 (1.04)	1.51 (1.51)	0.06 (0.04)	0.10 (0.06)	8.93 (3.28)	Density SE
Croton, Haverstraw-Indian Pt. (34-46)	138.39 (64.36)	45.04 (17.61)	9.82 (9.82)	8.36 (2.64)	5.71 (5.20)	0.15 (0.15)	2.31 (2.21)	1.93 (1.21)	Density SE
West Point-Cornwall (47-61)	24.79 (9.09)	24.53 (8.11)	37.50 (34.29)	2.45 (1.19)	3.32 (3.21)	0.14 (0.14)	0.46 (0.37)	0.08 (0.06)	Density SE
Poughkeepsie-Hyde Park (62-85)	4.11 (1.85)	4.69 (1.70)	1.55 (0.67)	0.32 (0.32)	0.66 (0.42)	0.32 (0.32)	0.11 (0.11)	0.50 (0.50)	Density SE
Kingston-Saugerties (86-106)	0.14 (0.14)	0 (0)	1.29 (0.80)	0.09 (0.09)	0.34 (0.24)	0 (0)	0 (0)	0 (0)	Density SE
Catskill-Albany (107-140)	0 (0)	0.21 (0.14)	0.07 (0.07)	0 (0)	0.12 (0.12)	0 (0)	0 (0)	0 (0)	Density SE

SE = One standard error

Table D-30

Catch per Unit Effort of Juvenile Atlantic Tomcod by 100-ft (30.5-m) Beach Seine, Hudson River Estuary [RM 12-153 (km 19-245)] during Daytime, 1973

Region		8 Apr 21 Apr	22 Apr 5 May	6 May 19 May	20 May 2 Jun	3 Jun 16 Jun	17 Jun 30 Jun	1 Jul 14 Jul	15 Jul 28 Jul	29 Jul 11 Aug	12 Aug 25 Aug	26 Aug 8 Sep	9 Sep 22 Sep	23 Sep 6 Oct	7 Oct 20 Oct	21 Oct 3 Nov	4 Nov 17 Nov	18 Nov 1 Dec	2 Dec 15 Dec	16 Dec 29 Dec
Yonkers	C/f*	0	6.00	5.71	10.50	0	47.75	0	0.40	0	0.82	0	0	0	0.25	0.25	0	0	0	—
	N	1	5	7	4	2	4	2	5	15	11	9	8	8	8	4	9	11	6	NS
	SE	0	2.17	1.82	5.07	0	20.58	0	0.40	0	0.58	0	0	0	0.25	0.25	0	0	0	—
Tappan Zee	C/f	0	4.00	0	0.18	0	0	0.50	0	0	6.75	0.25	0.50	0.67	1.80	0	0.50	0	0	—
	N	2	1	2	22	3	3	2	6	8	12	4	4	3	5	3	6	6	2	NS
	SE	0	0	0	0.11	0	0	0.50	0	0	5.95	0.25	0.50	0.67	0.97	0	0.34	0	0	—
Croton-Haverstraw Bays	C/f	0	0	0	0.77	0.33	0	0	0	0	0	0	0	0	0	0.08	0	0	0	—
	N	2	2	7	22	6	4	2	5	4	9	10	14	11	9	12	7	16	6	NS
	SE	0	0	0	0.73	0.83	0	0	0	0	0	0	0	0	0	0.08	0	0	0	—
Indian Point	C/f	—	0	0.28	0.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	—
	N	NS	6	25	35	41	54	7	4	14	12	10	10	12	14	11	15	21	3	NS
	SE	—	0	0.11	0.11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	—
West Point	C/f	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	—
	N	6	17	13	23	2	11	2	5	10	9	11	6	12	7	13	5	18	7	NS
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	—
Cornwall	C/f	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	—
	N	7	31	15	29	12	12	2	7	11	14	6	11	11	8	13	8	12	3	NS
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	—
Poughkeepsie	C/f	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	—
	N	6	17	2	8	1	3	5	9	21	24	15	16	9	6	8	2	9	6	NS
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	—
Hyde Park	C/f	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	—
	N	6	7	6	4	2	2	2	3	9	5	6	6	2	5	2	2	2	1	NS
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	—
Kingston	C/f	0	0	0	0	—	0	0	0	0	0	0	0	0	0	0	0	0	0	—
	N	2	3	1	5	NS	2	2	3	5	5	4	4	2	2	1	2	2	2	NS
	SE	0	0	0	0	—	0	0	0	0	0	0	0	0	0	0	0	0	0	—
Saugerties	C/f	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	—
	N	6	10	9	6	1	2	5	7	12	8	5	8	3	2	5	3	0	3	NS
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	—
Catskill	C/f	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	—
	N	6	14	8	8	4	3	4	7	13	11	8	10	4	5	6	5	5	5	NS
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	—
Albany	C/f	0	0	0	0	0	0	0	0	0	0	0	0	—	0	0	0	0	0	—
	N	11	20	11	12	9	3	8	9	18	13	11	11	NS	5	7	8	7	4	NS
	SE	0	0	0	0	0	0	0	0	0	0	0	0	—	0	0	0	0	0	—

*C/f = catch per unit effort; N = number of tows; SE = one standard error

† NS = no sample

Table D-31

Catch per Unit Effort of Atlantic Tomcod (All Ages Combined) by Bottom Trawl, Hudson River Estuary [RM 24-62 (km 38-99)] during Daytime, 1973

Region		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Tappan Zee	C/f*	137.19	0.32	44.49	15.66	0	0.26	0	0	0
	N	8	5	11	18	12	12	12	1	7
	SE	36.29	0.32	36.86	8.07	0	0.26	0	0	0
Croton-Haverstraw Bay	C/f	--	6.73	1.13	34.67	0	0	0.26	2.11	0.53
	N	NS†	8	7	9	6	6	6	3	3
	SE	--	4.76	0.90	23.38	0	0	0.26	2.11	0.53
Indian Point	C/f	105.32	51.37	20.66	16.80	90.83	1.22	8.07	2.92	19.29
	N	3	16	22	33	23	22	21	11	11
	SE	86.80	29.31	11.46	11.02	70.19	0.63	5.66	1.58	8.98
West Point	C/f	0	9.90	3.01	1.92	5.90	0	4.75	2.38	0
	N	2	8	10	14	11	11	11	4	5
	SE	0	6.49	2.33	1.13	5.03	0	1.81	1.02	0
Cornwall	C/f	--	0	0.79	0.74	0.18	0.16	1.23	5.81	0
	N	NS	2	10	15	9	10	9	6	4
	SE	--	0	0.43	0.74	0.18	0.16	0.63	4.66	0

*C/f = catch per unit effort; N = number of tows; SE = one standard error

† NS = no sample

Table D-32

Standing Crop of Atlantic Tomcod Post Yolk-Sac Larvae within Six Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Day Sampling by Epibenthic Sled and Tucker Trawl during 1973

Date	Region: YK-TZ	CH-IP	WP-CW	PK-HP	KG-SG	CS-AL	Total
4/29-5/12	1,143,648 (318,842)*	903,246 (23,026)	184,737 (126,641)	0 0	0 0	0 0	2,231,631 (343,843)
5/13-5/26	0 0	0 0	0 0	0 0	0 0	0 0	0 0
5/27-6/ 9	0 0	0 0	0 0	0 0	0 0	0 0	0 0
6/10-6/23	0 0	0 0	0 0	0 0	0 0	0 0	0 0
6/24-7/ 7	0 0	0 0	0 0	0 0	0 0	0 0	0 0
7/ 8-7/21	0 0	0 0	0 0	0 0	0 0	0 0	0 0
7/22-8/ 4	0 0	0 0	0 0	0 0	0 0	0 0	0 0
8/ 5-8/18	0 0	0 0	0 0	0 0	0 0	0 0	0 0

*Numbers in parentheses represent one standard error

Table D-33

Standing Crop of Juvenile Atlantic Tomcod within Six Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Day Sampling by Epibenthic Sled and Tucker Trawl during 1973

Date	Region: YK-TZ	CH-IP	WP-CW	PK-HP	KG-SG	CS-AL	Total
4/29-5/12	69,024,962 (19,285,617)*	49,262,561 (22,910,822)	8,606,388 (3,151,878)	1,889,373 (851,731)	52,159 (52,159)	0 (0)	128,835,440 (30,124,794)
5/13-5/26	115,853,075 (45,258,187)	16,033,055 (6,269,277)	8,517,884 (2,814,759)	2,157,684 (781,520)	0 (0)	49,281 (32,818)	142,610,974 (45,783,643)
5/27-6/ 9	4,395,684 (2,132,156)	3,494,471 (3,494,471)	13,018,224 (11,901,458)	710,633 (308,438)	496,042 (305,924)	17,167 (17,167)	22,132,220 (12,593,297)
6/10-6/23	4,787,128 (570,975)	2,974,429 (939,538)	850,349 (412,768)	146,734 (146,734)	33,934 (33,934)	0 (0)	8,792,574 (1,183,978)
6/24-7/ 7	833,650 (833,650)	2,031,078 (1,850,225)	1,152,747 (1,113,817)	304,305 (192,977)	132,387 (92,414)	28,353 (28,353)	4,482,521 (2,324,968)
7/ 8-7/21	33,028 (22,021)	51,622 (51,622)	48,467 (48,467)	148,728 (148,728)	0 (0)	0 (0)	281,844 (166,189)
7/22-8/ 4	55,597 (34,168)	823,494 (787,686)	159,023 (127,991)	0 (0)	0 (0)	0 (0)	1,038,114 (798,748)
8/ 5-8/18	4,919,336 (1,809,755)	686,540 (429,653)	29,275 (20,403)	230,411 (230,411)	0 (0)	0 (0)	5,865,562 (1,874,386)

*Numbers in parentheses represent one standard error

Table D-34

Standing Crop of Juvenile Atlantic Tomcod within 12 Geographical Regions of Hudson River Estuary [RM 12-153 (km 19-245)] Based on Day Sampling by 100-ft (30.5-m) Beach Seine during 1973

	Region												
Date	YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
6/17-6/30	0 (0)*	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7/ 1-7/14	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7/15-7/28	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7/29-8/11	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
8/12-8/25	5,804 (4,129)	306,690 (270,142)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	312,494 (270,174)
8/26-9/ 8	0 (0)	11,359 (11,359)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	11,359 (11,359)
9/ 9-9/22	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
9/23-10/ 6	0 (0)	30,290 (30,290)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	NS	30,290 (30,290)
10/ 7-10/20	0 (0)	36,348 (26,493)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	36,348 (26,493)
10/21-11/3	1,612 (1,612)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1,612 (1,612)
11/ 4-11/17	0 (0)	7,573 (7,573)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	7,573 (7,573)
11/18-12/ 1	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
12/ 2-12/15	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
12/16-12/29	NS**	NS	NS	0 (0)	NS	NS	NS	NS	NS	NS	NS	NS	0 (0)

*Number in parentheses represent one standard error
**NS = no samples taken

Table D-35

Density Estimates (No./1000 m^3) of Striped Bass Eggs within Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Day or Night Sampling by Epibenthic Sled and Tucker Trawl during 1974

Date	Time*		Regions YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL
4/29 - 5/ 4	N	Den.	0	0	0	0	4.74	1.34	0	0	0	0	0	0
		SE**	0	0	0	0	1.09	0.93	0	0	0	0	0	0
5/ 6 - 5/11	N	Den.	0	0	0.25	21.33	233.55	0	0	0	0	0.17	0	0
		SE	0	0	0.25	21.04	1.45	0	0	0	0	0.17	0	0
5/13 - 5/18	N	Den.	0	0.08	55.20	17.17	5.35	4.62	1.64	16.5	0	0.17	0	0
		SE	0	0.08	51.31	11.16	3.48	4.62	1.64	15.1	0	0.17	0	0
5/15 - 5/18	D	Den.	0	0	0	725.83	829.51	48.24	57.04	0	13.79	0	0	0
		SE	0	0	0	717.62	177.82	20.93	42.29	0	11.92	0	0	0
5/21 - 5/24	D	Den.	0	0.88	414.19	330.41	12.24	37.01	14.23	55.10	222.48	4.47	0.23	0
		SE	0	0.78	216.68	95.19	10.75	16.51	6.91	26.88	214.69	2.74	0.23	0
5/23 - 5/29	N	Den.	0	0.13	0.92	2.09	8.87	0.70	1.30	38.37	96.52	58.27	77.85	0
		SE	0	0.13	0.92	1.38	7.50	0.70	0.93	28.91	50.82	53.77	55.22	0
5/28 - 5/31	D	Den.	0	0	10.71	0.34	8.13	11.08	7.52	74.97	1.64	12.49	8.66	0
		SE	0	0	7.61	0.34	6.74	8.20	5.00	37.73	0.88	10.76	8.12	0
5/30 - 6/ 5	N	Den.	0	0	0	0.10	5.50	6.67	18.46	16.17	2.97	11.87	4.40	0
		SE	0	0	0	0.10	2.56	4.45	17.84	16.17	2.97	1.52	0.44	0
6/ 4 - 6/ 7	D	Den.	0	0	0	0	3.30	2.66	0.38	0	0	0	1.69	0
		SE	0	0	0	0	1.71	2.30	0.27	0	0	0	1.69	0
6/10 - 6/14	D	Den.	0	0	0	0	0.15	0	0	0	0	0	0	29.41
		SE	0	0	0	0	0.15	0	0	0	0	0	0	0
6/12 - 6/17	N	Den.	0	0	0	0	3.90	0.21	0.19	0	0	0	0	0
		SE	0	0	0	0	3.90	0.21	0.19	0	0	0	0	0
6/17 - 6/23	N	Den.	0	0	0	0	0.17	4.99	0	0	0	0.21	0	0
		SE	0	0	0	0	0.17	4.99	0	0	0	0.21	0	0
6/24 - 6/27	N	Den.	0	0	0	0	0.11	0.20	0	0	0	0	0	0
		SE	0	0	0	0	0.11	0.20	0	0	0	0	0	0
7/ 1 - 7/ 5	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
7/ 6 - 7/11	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
7/15 - 7/18	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
7/22 - 7/26	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
7/29 - 8/ 2	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
8/ 5 - 8/ 9	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
8/12 - 8/12	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0

*N = night samples, D = day samples
**SE = one standard error

Table D-36

Density Estimates (No./1000 m^3) of Striped Bass Yolk-Sac Larvae within Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Day or Night Sampling by Epibenthic Sled or Tucker Trawl during 1974

			Regions											
Date	Time*		YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL
4/29- 5/ 4	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE**	0	0	0	0	0	0	0	0	0	0	0	0
5/ 6- 5/11	N	Den.	0	0	0	1.12	23.08	0	0	0	0.17	0	0.31	0
		SE	0	0	0	1.05	0.07	0	0	0	0.17	0	0.31	0
5/13- 5/18	N	Den.	2.18	1.12	2.54	4.23	0.28	0	0.14	0.24	0	0	0	0
		SE	1.19	0.52	0.64	3.83	0.28	0	0.14	0.24	0	0	0	0
5/15- 5/18	D	Den.	0	0	0	0	1.90	2.76	0.12	1.23	1.16	5.50	0	0
		SE	0	0	0	0	1.90	2.09	0.12	1.23	1.16	5.39	0	0
5/21- 5/24	D	Den.	0	14.85	159.08	35.21	1.74	5.89	45.56	45.09	20.93	2.39	0	0
		SE	0	4.60	75.72	11.29	1.03	1.34	23.82	35.81	7.82	1.19	0	0
5/23- 5/29	N	Den.	0	15.16	8.52	10.06	3.16	28.79	20.69	44.16	11.88	5.20	3.45	0
		SE	0	3.77	5.12	5.09	1.92	18.47	10.01	34.63	6.78	4.70	3.45	0
5/28- 5/31	D	Den.	0	9.38	127.75	36.93	38.42	242.39	214.68	121.06	9.02	5.66	0	0
		SE	0	3.82	25.56	5.41	22.64	96.60	106.67	16.65	0.81	3.88	0	0
5/30- 6/ 5	N	Den.	0	0.14	2.70	0.22	42.94	208.47	202.55	35.95	13.99	0	0	0
		SE	0	0.14	1.21	0.14	19.81	187.74	93.06	10.59	4.26	0	0	0
6/ 4- 6/ 7	D	Den.	0	2.17	6.92	11.57	15.67	143.70	126.20	4.75	3.61	2.48	1.41	1.26
		SE	0	1.56	2.65	2.78	11.85	78.37	63.15	3.36	0.80	2.48	0.84	1.26
6/10- 6/14	D	Den.	0	0.13	19.42	210.55	145.07	115.87	61.37	0	3.80	0.32	2.05	0
		SE	0	0.13	17.37	166.77	91.18	46.22	29.52	0	3.09	0.23	1.01	0
6/12- 6/17	N	Den.	0	0	0.39	0.81	13.90	17.60	35.37	6.94	0	3.12	0	0
		SE	0	0	0.39	0.81	7.27	13.31	34.16	6.38	0	1.17	0	0
6/17- 6/23	N	Den.	0	0.13	0	12.47	19.69	2.46	0.08	0	0	0	0	0
		SE	0	0.13	0	8.04	8.30	1.56	0.08	0	0	0	0	0
6/24- 6/27	N	Den.	0	0	0.59	2.62	0.33	2.09	0	0.22	0	0	0	0
		SE	0	0	0.33	1.04	0.16	1.08	0	0.15	0	0	0	0
7/ 1- 7/ 5	N	Den.	0	0	0	0.15	0	0	0	0	0	0	0	0
		SE	0	0	0	0.12	0	0	0	0	0	0	0	0
7/ 8- 7/11	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
7/15- 7/18	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
7/22- 7/26	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
7/29- 8/ 2	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
8/ 5- 8/ 9	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
8/12- 8/15	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0

*N = night samples, D = day samples
**SE = one standard error

Table D-37

Density Estimates (No./1000 m^3) of Striped Bass Post Yolk-Sac Larvae within Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Day or Night Sampling by Epibenthic Sled and Tucker Trawl during 1974

			Regions											
Date	Time*		YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL
4/29-5/4	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE**	0	0	0	0	0	0	0	0	0	0	0	0
5/6-5/11	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
5/13-5/18	N	Den.	0	0	0	0.31	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
5/15-5/18	D	Den.	0	0	0	0	0	0.52	0	0	0	0	0	0
		SE	0	0	0	0	0	0.40	0	0	0	0	0	0
5/21-5/24	D	Den.	0.76	1.30	2.07	0	0	0	0	0	0	0	0	0
		SE	0.76	0.82	1.16	0	0	0	0	0	0	0	0	0
5/23-5/29	N	Den.	0.35	2.92	1.90	1.07	0	0.52	0	0	0	0	0	0
		SE	0	0.99	1.11	1.07	0	0.52	0	0	0	0	0	0
5/28-5/31	D	Den.	0.87	13.90	6.41	63.13	39.40	8.11	15.25	2.32	0	0	0	0
		SE	0.43	7.90	1.36	7.56	37.65	4.40	12.11	0.71	0	0	0	0
5/30-6/5	N	Den.	0	13.12	317.56	67.60	142.64	50.44	40.62	3.60	2.57	0	0	0
		SE	0	6.43	5.33	27.02	71.69	19.73	10.79	2.14	2.57	0	0	0
6/4-6/7	D	Den.	0	120.50	62.80	64.59	40.25	55.80	27.66	4.83	1.06	0.83	0	0
		SE	0	43.39	50.43	24.26	31.39	12.07	15.80	3.95	1.06	0.83	0	0
6/10-6/14	D	Den.	0.20	4.17	64.60	551.69	213.40	134.81	79.96	4.49	2.03	0.42	2.14	0
		SE	0.20	1.99	20.52	240.20	89.82	55.79	27.92	2.75	1.12	0.29	1.81	0
6/12-6/17	N	Den.	0	0.65	22.14	93.71	491.26	339.63	183.28	115.47	211.88	5.02	0	0
		SE	0	0.46	1.73	46.57	143.43	75.31	75.04	79.50	64.13	1.89	0	0
6/17-6/23	N	Den.	0	8.65	23.80	376.66	335.73	183.90	303.38	67.77	154.61	58.60	54.80	0.81
		SE	0	3.64	2.02	70.10	98.15	50.17	119.57	21.00	41.40	18.99	10.59	0.81
6/24-6/27	N	Den.	0.79	13.49	85.54	118.66	64.13	220.34	40.01	46.23	48.85	3.21	0	0
		SE	0.63	2.92	18.64	17.05	1.76	51.68	3.87	8.59	13.07	0	0	0
7/1-7/5	N	Den.	0.34	2.89	13.61	20.31	0.66	24.81	6.50	20.93	36.16	0	0	0
		SE	0.34	1.45	6.30	11.63	0.33	8.22	1.71	9.85	16.93	0	0	0
7/8-7/11	N	Den.	0	3.05	20.06	5.99	3.36	6.88	3.90	9.78	5.65	0	0	0
		SE	0	1.10	8.98	1.28	0.92	2.23	1.53	4.79	1.93	0	0	0
7/15-7/18	N	Den.	0	0	0	0	1.76	6.78	6.22	4.32	26.00	0	0	0
		SE	0	0	0	0	0.62	1.79	2.65	1.81	17.74	0	0	0
7/22-7/26	N	Den.	0	0	0	0.28	0	0.21	0	0.96	1.09	0	0	0
		SE	0	0	0	0.28	0	0.16	0	0.72	0.42	0	0	0
7/29-8/2	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
8/5-8/9	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
8/12-8/15	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0

*N = night samples, D = day samples
**SE = one standard error

Table D-38

Density Estimates (No./1000 m^3) of Juvenile Striped Bass within Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Day or Night Sampling by Epibenthic Sled and Tucker Trawl during 1974

			Region											
Date	Time*		YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL
4/29-5/ 4	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE**	0	0	0	0	0	0	0	0	0	0	0	0
5/ 6-5/11	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
5/13-5/18	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
5/15-5/18	D	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
5/21-5/24	D	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
5/23-5/29	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
5/28-5/31	D	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
5/30-6/ 5	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
6/ 4-6/ 7	D	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
6/10-6/14	D	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
6/12-6/17	N	Den.	0	0	0	0	0	0	0.20	0	0	0	0	0
		SE	0	0	0	0	0	0	0.20	0	0	0	0	0
6/17-6/23	N	Den.	0	0	0	0	0	0	0	0	0	0	0.19	0
		SE	0	0	0	0	0	0	0	0	0	0	0.19	0
6/24-6/27	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
7/ 1-7/ 5	N	Den.	0	0.74	0.91	0.42	0.26	0.06	0	0.28	0	0	0	0
		SE	0	0.52	0.65	0.30	0.26	0.06	0	0.20	0	0	0	0
7/ 8-7/11	N	Den.	0	3.22	8.26	0.18	0.33	0	0	0	0.56	0	0	0
		SE	0	1.83	4.12	0.13	0.21	0	0	0	0.43	0	0	0
7/15-7/18	N	Den.	0.38	3.12	5.39	0	0.58	2.75	0.49	0.10	4.83	0	0	0
		SE	0.32	2.11	1.75	0	0.50	0.47	0.40	0.10	3.08	0	0	0
7/22-7/26	N	Den.	0	5.83	2.84	0.75	0.56	6.19	0.19	0.87	1.39	0.96	0	0
		SE	0	2.84	0.82	0.54	0.28	2.80	0.12	0.71	0.60	0.96	0	0
7/29-8/ 2	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
8/ 5-8/ 9	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
8/12-8/15	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0

*N = night samples, D = day samples
**SE = one standard error

Table D-39

Density Estimates of Juvenile Striped Bass (No./1000 m^3) within Seven Geographical Regions of Hudson River Estuary [RM 14-76 (km 22-122)] Based on Night Sampling in the Shoals by Epibenthic Sled during 1974

	Region						
Date	YK	TZ	CH	IP	WP	CW	PK
8/19 - 8/22	0 (0)*	.820 (.332)	5.412 (1.217)	.291 (.143)	0 (0)	2.232 (1.903)	0 (0)
8/26 - 8/29	0 (0)	.845 (.612)	1.185 (.503)	.326 (.085)	0 (0)	.119 (.041)	0 (0)
9/ 3 - 9/ 6	.122 (.054)	.949 (.417)	5.033 (1.999)	.455 (.155)	0 (0)	.648 (.554)	0 (0)
9/ 9 - 9/12	.062 (.043)	.330 (.146)	2.211 (.701)	.673 (.196)	0 (0)	.027 (.027)	0 (0)
9/16 - 9/19	.027 (.027)	1.805 (.713)	4.734 (1.176)	1.417 (.724)	0 (0)	.102 (.034)	0 (0)
9/23 - 9/26	0 (0)	.512 (.247)	1.428 (.775)	.084 (.084)	0 (0)	.302 (.302)	0 (0)

*Numbers in parentheses represent one standard error.

Catch per Unit Effort of Juvenile Striped Bass within 12 Geographical Regions of Hudson River Estuary [RM 12-153 (km 19-245)] Based on Day Sampling by 100-ft (30.5-m) Beach Seine during 1974

Date		Region YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
3/24-4/ 6	CPUE*	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	0	0	0	0	0	0	0	0	0	0	0
4/ 7-4/20	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	8	5	10	6	0	1	3	4	9	7	53
4/21-5/ 4	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	7	7	13	13	13	11	8	2	0	0	0	1	75
5/ 5-5/18	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	14	8	16	9	8	6	3	3	3	4	5	8	87
5/19-6/ 1	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	11	5	14	16	12	6	8	2	2	2	5	8	91
6/ 2-6/15	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	11	9	21	18	20	8	15	8	6	8	13	20	155
6/16-6/29	CPUE	0	0	0.08	0	2.40	0.44	0	0	0	0	0	0	0.27
	SE	0	0	0.08	0	2.26	0.34	0	0	0	0	0	0	0.22
	n	13	8	13	15	15	9	16	9	6	13	16	20	153
6/30-7/13	CPUE	0	1.00	0.40	1.25	1.40	2.00	3.83	1.25	0.33	0.67	0.70	0.16	0.85
	SE	0	0.50	0.22	0.73	0.65	1.55	2.33	0.75	0.33	0.33	0.37	0.12	0.19
	n	16	8	10	8	10	5	6	4	3	6	10	19	105
7/14-7/27	CPUE	0.33	2.00	1.42	4.35	8.33	6.63	1.56	1.38	0.80	3.40	4.69	1.65	3.14
	SE	0.14	0.63	0.60	1.52	3.05	2.41	0.66	0.65	0.58	2.75	2.11	1.25	0.52
	n	12	12	12	17	15	8	16	8	5	10	13	20	148
7/28-8/10	CPUE	0.50	1.31	2.69	4.88	8.30	12.00	3.36	8.63	5.50	1.70	9.44	5.31	5.07
	SE	0.17	0.46	1.02	0.74	2.71	4.14	1.29	7.92	2.60	1.01	5.05	4.92	0.87
	n	20	16	16	26	20	12	14	8	4	10	16	16	178
8/11-8/24	CPUE	0.94	4.17	1.60	8.76	3.78	10.14	2.86	0.57	0.50	1.00	6.92	1.83	3.74
	SE	0.37	1.77	0.62	1.53	1.43	3.25	0.66	0.20	0.29	0.41	2.16	0.66	0.45
	n	17	12	15	21	9	7	14	7	4	9	13	24	152
8/25-9/ 7	CPUE	1.75	34.67	12.93	18.88	3.20	10.67	1.47	0.67	1.67	1.00	5.80	2.07	7.11
	SE	0.37	20.10	2.84	4.19	1.36	6.76	0.45	0.49	0.99	0.44	2.25	1.28	1.42
	n	8	6	15	8	5	6	15	6	6	9	15	15	114
9/ 8-9/21	CPUE	1.10	32.44	21.48	6.55	2.63	0.40	1.64	0.11	0.50	0.88	1.46	1.12	7.37
	SE	0.78	19.34	5.46	1.29	0.75	0.24	0.79	0.11	0.50	0.30	0.64	0.63	1.64
	n	10	9	23	29	8	5	11	9	4	8	13	17	146
9/22-10/5	CPUE	1.35	11.69	18.00	9.75	1.89	2.09	0.46	0.14	0	0.33	0.44	0.60	3.59
	SE	0.44	3.28	4.52	3.58	0.61	0.58	0.22	0.14	0	0.24	0.16	0.25	0.65
	n	26	13	8	12	9	11	13	7	4	9	16	15	143

*CPUE = catch per unit effort
SE = standard error
n = number of tows

Table D-41

Catch per Unit Effort of Juvenile Striped Bass within Four Geographical Regions of Hudson River Estuary [RM 34-61 (km 54-98)] Based on Night Sampling by 100-ft (30.5-m) Beach Seine during 1974

Date		Region YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
3/24–4/ 6	CPUE*	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	0	0	0	0	0	0	0	0	0	0	0
4/ 7–4/20	CPUE													
	SE													
	n													
4/21–5/ 4	CPUE													
	SE													
	n													
5/ 5–5/18	CPUE													
	SE													
	n													
5/19–6/ 1	CPUE													
	SE													
	n													
6/ 2–6/15	CPUE													
	SE													
	n													
6/16–6/29	CPUE													
	SE													
	n													
6/30–7/13	CPUE													
	SE													
	n													
7/14–7/27	CPUE			0	0	0	0							0
	SE			0	0	0	0							0
	n			0	0	0	0							0
7/28–8/10	CPUE			17.00	14.86	21.33	23.33							18.21
	SE			0	3.53	20.84	4.91							4.36
	n			1	7	3	3							14
8/11–8/24	CPUE			4.00	15.21	7.83	9.33							11.85
	SE			0	4.18	2.39	1.65							2.32
	n			1	14	6	6							27
8/25–9/ 7	CPUE			0	15.80	6.60	21.50							14.23
	SE			0	3.94	2.20	12.50							2.98
	n			0	15	5	2							22
9/ 8–9/21	CPUE			15.50	17.23	9.75	15.00							15.41
	SE			5.50	3.68	6.25	5.89							2.56
	n			2	13	4	3							22
9/22–10/5	CPUE	0	0	28.50	16.17	5.00	5.67	0	0	0	0	0	0	12.71
	SE	0	0	25.50	4.56	2.65	1.48	0	0	0	0	0	0	3.12
	n	0	0	2	12	4	6	0	0	0	0	0	0	24

*CPUE = catch per unit effort
SE = standard error
n = number of tows

Table D-42

Catch per Unit Effort of Juvenile Striped Bass within Six Geographical Regions of Hudson River Estuary [RM 12-61 (km 19-98)] Based on Day Sampling by Bottom Trawl during 1974

		Region												
Date		YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
3/24-4/6	CPUE*	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	2	1	3	0	0	0	0	0	0	0	0	6
4/7-4/20	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	1	6	5	9	1	3	0	0	0	0	0	0	25
4/21-5/4	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	0	6	6	5	0	0	0	0	0	0	17
5/5-5/18	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	9	3	3	0	0	0	0	0	0	0	0	15
6/2-6/15	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	5	8	3	5	3	10	0	0	0	0	0	0	34
6/16-6/29	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	4	10	3	10	4	5	0	0	0	0	0	0	36
6/30-7/13	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	4	10	3	9	5	4	0	0	0	0	0	0	35
7/14-7/27	CPUE	0	0	0	0	0.26	0	0	0	0	0	0	0	0.04
	SE	0	0	0	0	0.26	0	0	0	0	0	0	0	0.04
	n	4	8	3	12	6	5	0	0	0	0	0	0	38
7/28-8/10	CPUE	0	0	0	0.44	0	0	0	0	0	0	0	0	0.11
	SE	0	0	0	0.44	0	0	0	0	0	0	0	0	0.11
	n	4	4	4	7	5	3	0	0	0	0	0	0	27
8/11-8/24	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	3	3	10	4	6	0	0	0	0	0	0	26
8/25-9/7	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	4	8	2	8	3	6	0	0	0	0	0	0	31
9/8-9/21	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	3	11	6	2	5	5	0	0	0	0	0	0	32
9/22-10/5	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	2	9	1	0	0	0	0	0	0	0	12

*CPUE = catch per unit effort
SE = standard error
n = number of tows

Table D-43

Catch per Unit Effort of Yearling Striped Bass within 12 Geographical Regions of Hudson River Estuary [RM 12-153 (km 19-245)] Based on Day Sampling by 100-ft (30.5-m) Beach Seine during 1974

		Region												
Date		YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
3/24–4/ 6	CPUE*	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	0	0	0	0	0	0	0	0	0	0	0
4/ 7–4/20	CPUE	0	0	0.13	0.20	0	0	0	0	0	0	0	0	0.04
	SE	0	0	0.13	0.20	0	0	0	0	0	0	0	0	0.03
	n	0	0	8	5	10	6	0	0	0	0	0	0	53
4/21–5/ 4	CPUE	26.29	2.14	1.62	0.85	0	0	0	0	0	0	0	0	3.08
	SE	5.77	0.83	1.38	0.41	0	0	0	0	0	0	0	0	1.04
	n	7	7	13	13	13	11	8	2	0	0	0	0	75
5/ 5–5/18	CPUE	8.07	3.38	0.38	0	0.50	0	0	0	0	0	0	0.13	1.72
	SE	3.36	2.57	0.20	0	0.27	0	0	0	0	0	0	0.13	0.65
	n	14	8	16	9	8	6	3	3	3	4	5	8	87
5/19–6/ 1	CPUE	4.91	2.40	0.64	2.69	0.06	0.67	0.75	0	0	0	0	0.13	1.43
	SE	1.63	1.69	0.50	1.29	0.08	0.49	0.49	0	0	0	0	0.13	0.36
	n	11	5	14	16	12	6	8	2	2	2	5	8	91
6/ 2–6/15	CPUE	1.09	10.71	2.76	9.39	0.50	0.13	0.60	0.13	0.17	0.13	0.77	1.15	2.39
	SE	0.73	6.80	0.98	6.84	0.18	0.13	0.40	0.13	0.17	0.13	0.43	0.49	0.88
	n	11	7	21	18	20	8	15	8	2	8	13	20	155
6/16–6/29	CPUE	1.46	1.25	3.69	1.67	1.27	1.22	1.19	3.33	0.50	0.31	1.63	3.40	1.84
	SE	0.67	0.62	1.49	0.68	0.87	0.66	0.88	3.21	0.50	0.17	0.66	1.32	0.33
	n	13	8	13	15	15	9	16	9	6	13	16	20	153
6/30–7/13	CPUE	2.19	1.25	2.40	1.38	0.40	0.80	3.17	3.25	0.67	2.00	2.00	1.42	1.72
	SE	0.63	0.53	0.85	0.60	0.22	0.80	1.38	1.25	0.67	1.61	0.60	0.69	0.24
	n	16	8	10	8	10	5	6	4	3	6	10	19	105
7/14–7/27	CPUE	0.58	0.42	0.75	0.59	1.93	0.88	2.69	0.13	0.40	0.10	1.00	1.30	1.03
	SE	0.26	0.19	0.43	0.23	0.94	0.52	1.97	0.13	0.40	0.10	0.41	0.52	0.25
	n	12	12	12	17	15	8	16	8	5	10	13	20	148
7/28–8/10	CPUE	1.00	0.13	0.63	0.46	0.10	1.08	1.36	0.38	0	0.70	0.75	1.13	0.66
	SE	0.40	0.13	0.35	0.15	0.07	0.34	0.71	0.26	0	0.47	0.23	0.38	0.10
	n	20	16	16	26	20	12	14	8	4	10	16	16	178
8/11–8/24	CPUE	1.82	1.92	2.73	0.90	0.78	1.29	0.79	1.14	0	0.11	0.77	1.38	1.27
	SE	0.99	0.77	1.40	0.29	0.32	0.61	0.15	0.83	0	0.11	0.41	0.69	0.23
	n	17	12	15	21	9	7	14	7	4	9	13	24	152
8/25–9/ 7	CPUE	0.25	10.67	5.53	1.13	0.40	1.83	0.40	0.67	0.50	0.11	0.60	0.73	1.80
	SE	0.16	5.72	2.31	0.58	0.24	1.05	0.16	0.42	0.34	0.11	0.25	0.41	0.49
	n	8	6	15	8	5	6	15	6	6	9	15	15	114
9/ 8–9/21	CPUE	0.40	1.56	0.74	0.21	0.25	0.20	0.36	0	0	0	0.38	0.71	0.45
	SE	0.31	0.69	0.33	0.17	0.16	0.20	0.20	0	0	0	0.18	0.28	0.09
	n	10	9	23	29	8	5	11	9	4	9	13	17	146
9/22–10/5	CPUE	1.15	0.77	0.13	0.08	0	0.36	0.15	0	0	0.11	0.69	0.27	0.45
	SE	0.55	0.38	0.13	0.08	0	0.20	0.10	0	0	0.11	0.28	0.15	0.12
	n	26	13	8	12	9	11	13	7	4	9	16	15	143

*CPUE = catch per unit effort
SE = standard error
n = number of tows

Table D-44

Catch per Unit Effort of Yearling Striped Bass within Four Geographical Regions of Hudson River Estuary [RM 34-61 (km 54-98)] Based on Night Sampling by 100-ft (30.5-m) Beach Seine during 1974

Date		Region YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
3/24–	CPUE*	0	0	0	0	0	0	0	0	0	0	0	0	0
4/ 6	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	0	0	0	0	0	0	0	0	0	0	0
4/ 7–	CPUE													
4/20	SE													
	n													
4/21–	CPUE													
5/ 4	SE													
	n													
5/ 5	CPUE													
5/18	SE													
	n													
5/19–	CPUE													
6/ 1	SE													
	n													
6/ 2	CPUE													
6/15	SE													
	n													
6/16–	CPUE													
6/29	SE													
	n													
6/30–	CPUE													
7/13	SE													
	n													
7/14–	CPUE			0	0	0	0							0
7/27	SE			0	0	0	0							0
	n			0	0	0	0							0
7/28–	CPUE			3.00	3.00	2.00	3.67							2.93
8/10	SE			0	1.65	1.15	0.88							0.85
	n			1	7	3	3							14
8/11–	CPUE			1.00	1.29	3.67	4.33							2.48
8/24	SE			0	0.64	2.69	1.38							0.76
	n			1	14	6	6							27
8/25–	CPUE	0	0	0	0.73	1.20	2.00	0	0	0	0	0	0	0.95
9/ 7	SE	0	0	0	0.32	0.80	2.00	0	0	0	0	0	0	0.31
	n	0	0	0	15	5	2	0	0	0	0	0	0	22
9/ 8–	CPUE	0.40	1.56	0.74	0.21	0.25	0.20	0.36	0	0	0	0.38	0.71	0.45
9/21	SE	0.31	0.69	0.33	0.17	0.16	0.20	0.20	0	0	0	0.18	0.28	0.09
	n	10	9	23	29	8	5	11	9	4	8	13	17	146
9/22–	CPUE	1.15	0.77	0.13	0.08	0	0.36	0.15	0	0	0.11	0.69	0.27	0.45
10/5	SE	0.55	0.38	0.13	0.08	0	0.20	0.10	0	0	0.11	0.28	0.15	0.12
	n	26	13	8	12	9	11	13	7	4	9	16	15	143

*CPUE = catch per unit effort
SE = standard error
n = number of tows

Table D-45

Catch per Unit Effort of Yearling Striped Bass within Six Geographical Regions of Hudson River Estuary [RM 12-61 (km 19-98)] Based on Day Sampling by Bottom Trawl during 1974

		Region												
Date		YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
3/24-	CPUE*	0	4.59	0	1.02	0	0	0	0	0	0	0	0	2.04
4/ 6	SE	0	0	0	1.02	0	0	0	0	0	0	0	0	0.94
	n	0	2	1	3	0	0	0	0	0	0	0	0	6
4/ 7-	CPUE	0	6.88	0	0.17	0	0	0	0	0	0	0	0	1.71
4/20	SE	0	4.83	0	0.17	0	0	0	0	0	0	0	0	1.23
	n	1	6	5	9	1	3	0	0	0	0	0	0	25
4/21-	CPUE	0	0	0	1.53	0	0							0.54
5/ 4	SE	0	0	0	0.79	0	0							0.32
	n	0	0	0	6	6	5							17
5/ 5-	CPUE	0	2.21	3.06	0	0	0							1.94
5/18	SE	0	1.30	1.53	0	0	0							0.85
	n	0	9	3	3	0	0							15
6/ 2-	CPUE	0	0	0	0	0	0							0
6/15	SE	0	0	0	0	0	0							0
	n	5	8	3	5	3	10							34
6/16-	CPUE	0.38	0	1.53	0	0	0.61							0.26
6/29	SE	0.38	0	1.53	0	0	0.37							0.14
	n	4	10	2	10	4	5							36
6/30-	CPUE	0	0	0	0	0.31	0							0.04
7/13	SE	0	0	0	0	0.31	0							0.04
	n	4	10	3	9	5	4							35
7/14-	CPUE	0	0	0	0	0	0							0
7/27	SE	0	0	0	0	0	0							0
	n	4	8	3	12	6	5							38
7/28-	CPUE	0	0.38	0	0	0.31	0.51							0.17
8/10	SE	0	0.38	0	0	0.31	0.51							0.09
	n	4	4	4	7	5	3							27
8/11-	CPUE	0	0	0	0.15	0	0.26							0.12
8/24	SE	0	0	0	0.15	0	0.26							0.08
	n	0	3	3	10	4	6							26
8/25-	CPUE	0	0	0	0	0	0							0
9/ 7	SE	0	0	0	0	0	0							0
	n	4	8	2	8	3	6							31
9/ 8-	CPUE	0	0.14	0	0	0	0							0.05
9/21	SE	0	0.14	0	0	0	0							0.05
	n	3	11	6	2	5	5							32
9/22-	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
10/5	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	2	9	1	0	0	0	0	0	0	0	13

*CPUE = catch per unit effort
SE = standard error
n = number of tows

Table D-46

Catch per Unit Effort of Age II and Older Striped Bass within 12 Geographical Regions of Hudson River Estuary [RM 12-153 (km 19-245)] Based on Day Sampling by 100-ft (30.5-m) Beach Seine during 1974

Date		Region YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
3/24-4/6	CPUE*	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	0	0	0	0	0	0	0	0	0	0	0
4/7-4/20	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	8	5	10	6	0	1	3	4	9	7	53
4/21-5/4	CPUE	3.86	0.14	0	0.31	0	0	0	0	0	0	0	0	0.43
	SE	1.98	0.14	0	0.17	0	0	0	0	0	0	0	0	0.22
	n	7	7	13	13	13	11	8	2	0	0	0	1	75
5/5-5/18	CPUE	0.14	0	0.06	0	0.38	0	0	0	0	0	0	0	0.07
	SE	0.10	0	0.06	0	0.18	0	0	0	0	0	0	0	0.03
	n	14	8	16	9	8	6	3	3	3	4	5	8	87
5/19-6/1	CPUE	0	0	0.21	0.13	0.08	0.50	0.13	0	0	0	0	0	0.11
	SE	0	0	0.21	0.09	0.08	0.50	0.13	0	0	0	0	0	0.05
	n	11	5	14	16	12	6	8	2	2	2	5	8	91
6/2-6/15	CPUE	0	3.14	1.24	0.28	0	0.25	2.33	0.25	0	0.13	0	0	0.60
	SE	0	3.14	1.24	0.28	0	0.16	2.33	0.25	0	0.13	0	0	0.31
	n	11	7	21	18	20	8	15	8	6	8	13	20	155
6/16-6/29	CPUE	0	0	1.38	0.07	0	0.11	0	0	0	0	0.25	0	0.16
	SE	0	0	1.16	0.07	0	0.11	0	0	0	0	0.19	0	0.10
	n	13	8	13	15	15	9	16	9	6	13	16	20	153
6/30-7/13	CPUE	0	0	0	0	0	0.20	0	0	0.33	0	0	0.11	0.04
	SE	0	0	0	0	0	0.20	0	0	0.33	0	0	0.07	0.02
	n	16	8	10	8	10	5	6	4	3	6	10	19	105
7/14-7/27	CPUE	0	0	0.08	0	0	0	0	0	0	0	0.08	0	0.01
	SE	0	0	0.08	0	0	0	0	0	0	0	0.08	0	0.01
	n	12	12	12	17	15	8	16	8	5	10	13	20	148
7/28-8/10	CPUE	0	0	0	0	0.15	0.08	0	0	0	0	0	0	0.02
	SE	0	0	0	0	0.15	0.08	0	0	0	0	0	0	0.02
	n	20	16	16	26	20	12	14	8	4	10	16	16	178
8/11-8/24	CPUE	0	0.08	0	0.05	0.11	0	0.64	0	0	1.44	1.00	0	0.25
	SE	0	0.08	0	0.05	0.11	0	0.64	0	0	1.44	1.00	0	0.13
	n	17	12	15	21	9	7	14	7	4	9	13	24	152
8/25-9/7	CPUE	0.50	0	0	0	0	0	0	0	0	0	0	0	0.04
	SE	0.50	0	0	0	0	0	0	0	0	0	0	0	0.04
	n	8	6	15	8	5	6	15	6	6	9	15	15	114
9/8-9/21	CPUE	0	0.11	0.04	0	0	0	0.09	0	0	0	0	0.06	0.03
	SE	0	0.11	0.04	0	0	0	0.09	0	0	0	0	0.06	0.01
	n	10	9	23	29	8	5	11	9	4	8	13	17	146
9/22-10/5	CPUE	0.12	0.08	0	0	0	0.09	0	0	0	0	0.13	0	0.05
	SE	0.08	0.08	0	0	0	0.09	0	0	0	0	0.09	0	0.02
	n	26	13	8	12	9	11	13	7	4	9	16	15	143

*CPUE = catch per unit effort
SE = standard error
n = number of tows

Table D-47

Catch per Unit Effort of Age II and Older Striped Bass within Four Geographical Regions of Hudson River Estuary [RM 34-61 (km 54-98)] Based on Night Sampling by 100-ft (30.5-m) Beach Seine during 1974

Date		YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
		Region												
3/24-4/6	CPUE*	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	0	0	0	0	0	0	0	0	0	0	0
4/7-4/20	CPUE													
	SE													
	n													
4/21-5/4	CPUE													
	SE													
	n													
5/5-5/18	CPUE													
	SE													
	n													
5/19-6/1	CPUE													
	SE													
	n													
6/2-6/15	CPUE													
	SE													
	n													
6/16-6/29	CPUE													
	SE													
	n													
6/30-7/13	CPUE													
	SE													
	n													
7/14-7/27	CPUE													
	SE													
	n													
7/28-8/10	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	1	7	3	3	0	0	0	0	0	0	14
8/11-8/24	CPUE	0	0	0	0.07	0	0.17	0	0	0	0	0	0	0.07
	SE	0	0	0	0.07	0	0.17	0	0	0	0	0	0	0.05
	n	0	0	1	14	6	6	0	0	0	0	0	0	27
8/25-9/7	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	0	15	5	2	0	0	0	0	0	0	22
9/8-9/21	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	2	13	4	3	0	0	0	0	0	0	22
9/22-10/5	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	2	12	4	6	0	0	0	0	0	0	24

*CPUE = catch per unit effort
SE = standard error
n = number of tows

Table D-48

Catch per Unit Effort of Age II and Older Striped Bass within Six Geographical Regions of Hudson River Estuary [RM 12-61 (km 19-98)] Based on Day Sampling by Bottom Trawl during 1974

Date		Region												
		YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
3/24-4/ 6	CPUE*	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	2	1	3	0	0	0	0	0	0	0	0	6
4/ 7-4/20	CPUE	1.53	4.84	0	0	0	0	0	0	0	0	0	0	1.22
	SE	0	4.84	0	0	0	0	0	0	0	0	0	0	1.16
	n	1	6	5	9	1	3	0	0	0	0	0	0	25
4/21-5/ 4	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	0	6	6	5	0	0	0	0	0	0	17
5/ 5-5/18	CPUE	0	0.17	0	0	0	0	0	0	0	0	0	0	0.10
	SE	0	0.17	0	0	0	0	0	0	0	0	0	0	0.10
	n	0	9	3	3	0	0	0	0	0	0	0	0	15
6/ 2-6/15	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	5	8	3	5	3	10	0	0	0	0	0	0	34
6/16-6/29	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	4	10	3	9	5	4	0	0	0	0	0	0	36
6/30-7/13	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	4	10	3	9	5	4	0	0	0	0	0	0	35
7/14-7/27	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	4	8	3	12	6	5	0	0	0	0	0	0	38
7/28-8/10	CPUE	0.38	0	0	0	0	0	0	0	0	0	0	0	0.06
	SE	0.38	0	0	0	0	0	0	0	0	0	0	0	0.06
	n	4	4	4	7	5	3	0	0	0	0	0	0	27
8/11-8/24	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	3	3	10	4	6	0	0	0	0	0	0	26
8/25-9/ 7	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	4	8	2	8	3	6	0	0	0	0	0	0	31
9/ 8-9/21	CPUE	0	0.14	0	0	0	0	0	0	0	0	0	0	0.05
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0.15
	n	3	11	6	2	5	5	0	0	0	0	0	0	32
9/22-10/5	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	2	9	1	0	0	0	0	0	0	0	12

*CPUE = catch per unit effort
SE = standard error
n = number of tows

Table D-49

Standing Crop of Striped Bass Eggs within 12 Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Day or Night Sampling by Epibenthic Sled and Tucker Trawl during 1974

Date	Time*	YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
		Region												
4/16-4/17	D	NS**	NS	NS	NS	NS	NS	0 (0)†	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
4/23-4/25	D	NS	NS	NS	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
4/29-5/4	N	0 (0)	0 (0)	0 (0)	0 (0)	982,691 (226,506)	187,637 (130,248)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1,170,328 (261,284)
5/6-5/11	N	0 (0)	0 (0)	37,546 (37,546)	4,442,061 (4,382,324)	48,437,514 (301,027)	0 (0)	0 (0)	0 (0)	0 (0)	41,562 (41,562)	0 (0)	0 (0)	52,958,683 (4,393,008)
5/13-5/18	N	0 (0)	26,915 (26,915)	8,152,354 (7,578,504)	3,577,307 (2,323,533)	1,110,499 (720,707)	646,305 (646,305)	487,513 (487,513)	2,671,376 (2,444,312)	0 (0)	42,124 (42,124)	0 (0)	0 (0)	16,714,393 (8,365,673)
5/15-5/18	D	NS	NS	NS	151,190,270 (149,480,682)	172,039,318 (36,880,270)	6,744,116 (2,926,519)	17,009,027 (12,609,974)	0 (0)	1,950,982 (1,687,167)	0 (0)	0 (0)	0 (0)	348,933,700 (154,515,536)
5/21-5/24	D	0 (0)	282,690 (251,912)	61,175,291 (32,003,710)	68,825,156 (19,828,521)	2,538,320 (2,229,488)	5,173,307 (2,307,476)	4,242,651 (2,060,380)	8,898,778 (4,341,773)	31,481,040 (30,379,094)	1,085,592 (664,148)	37,677 (37,677)	0 (0)	183,737,490 (48,725,703)
5/23-5/29	N	0 (0)	41,352 (41,352)	136,299 (136,299)	435,834 (287,498)	1,839,015 (1,555,857)	97,117 (97,117)	388,473 (276,051)	6,195,985 (4,668,404)	13,657,439 (7,191,254)	14,119,757 (13,027,300)	12,511,112 (8,874,161)	0 (0)	49,422,382 (18,016,068)
5/28-5/31	D	0 (0)	0 (0)	1,581,234 (1,124,151)	71,392 (71,392)	1,686,697 (1,397,920)	1,548,252 (1,146,603)	2,243,329 (1,490,271)	12,107,974 (6,093,047)	231,604 (123,786)	3,026,720 (2,606,727	1,390,900 (1,305,195)	0 (0)	23,888,101 (7,238,626)
5/30-6/5	N	0 (0)	0 (0)	0 (0)	21,032 (21,032)	1,139,944 (530,441)	1,212,210 (622,498)	5,505,469 (5,319,654)	2,611,344 (2,611,344)	419,966 (419,966)	2,876,863 (369,166)	707,644 (69,855)	0 (0)	14,494,472 (6,008,717)
6/4-6/7	D	0 (0)	0 (0)	0 (0)	0 (0)	683,567 (354,348)	372,458 (320,977)	112,929 (79,335)	0 (0)	0 (0)	0 (0)	271,206 (271,206)	0 (0)	1,440,160 (555,370)
6/10-6/14	D	0 (0)	0 (0)	0 (0)	0 (0)	30,140 (30,140)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2,091,176 (0)	2,121,317 (30,140)
6/12-6/17	N	0 (0)	0 (0)	0 (0)	0 (0)	809,630 (809,630)	29,209 (29,209)	56,057 (56,057)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	894,896 812,094)
6/17-6/23	N	0 (0)	0 (0)	0 (0)	0 (0)	35,424 (35,424)	696,912 (696,912)	0 (0)	0 (0)	0 (0)	51,503 51,503	0 (0)	0 (0)	783,840 (699,710)
6/24-6/27	N	0 (0)	0 (0)	0 (0)	0 (0)	22,196 (22,196)	28,370 (28,370)	0 (0)	0 (0)	0 (0)	NS	NS	NS	50,566 (36,021)
7/1-7/5	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	NS	NS	NS	0 (0)
7/8-7/11	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	NS	NS	NS	0 (0)
7/15-7/18	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	NS	NS	NS	0 (0)
7/22-7/26	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7/29-8/2	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
8/5-8/9	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
8/12-8/15	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

*N = night samples, D = day samples
**NS = no samples taken
†Numbers in parentheses represent one standard error

Table D-50

Standing Crop of Striped Bass Yolk-Sac Larvae within 12 Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Day or Night Sampling by Epibenthic Sled or Tucker Trawl during 1974

		Region												
Date	Time*	YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
4/16-4/17	D	NS**	NS	NS	NS	NS	NS	0 (0)†	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
4/23-4/25	D	NS	NS	NS	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
4/29-5/ 4	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/ 6-5/11	N	0 (0)	0 (0)	0 (0)	233,908 (219,610)	4,786,474 (14,657)	0 (0)	0 (0)	0 (0)	24,248 (24,248)	0 (0)	49,163 (49,164)	0 (0)	5,093,793 (226,822)
5/13-5/18	N	500,351 (273,163)	360,709 (168,291)	375,586 (93,996)	880,675 (797,873)	57,225 (57,225)	0 (0)	40,626 (40,626)	38,010 (38,010	0 (0)	0 (0)	0 (0)	0 (0)	2,253,182 (868,761)
5/15-5/18	D	NS	NS	NS	0 (0)	394,741 (334,741)	385,102 (292,436)	34,365 (34,365)	197,914 (197,914)	163,564 (163,564)	1,333,613 (1,305,353)	0 (0)	0 (0)	2,509,299 (1,418,587)
5/21-5/24	D	0 (0)	4,774,666 (1,477,758)	23,496,592 (11,183,923)	7,334,992 (2,352,058)	360,495 (213,240)	824,002 (186,624)	13,586,646 (7,103,925)	7,281,743 (5,782,604)	2,961,075 (1,106,752)	579,054 (288,568)	0 (0)	0 (0)	61,199,261 (14,767,830)
5/23-5/29	N	0 (0)	4,873,901 (1,212,489)	1,257,936 (756,635)	2,095,410 (1,059,371)	656,309 (397,597)	4,025,289 (2,581,899)	6,170,996 (2,986,004)	7,131,242 (5,593,299	1,681,469 (958,835)	1,259,336 (1,138,439)	554,059 (554,059)	0 (0)	29,705,945 (7,260,357)
5/28-5/31	D	0 (0)	3,016,875 (1,228,899)	18,868,424 (3,775,545)	7,691,846 (1,127,334)	7,969,158 (4,696,180)	33,886,265 (13,504,260	64,017,522 (31,867,874)	19,550,966 (3,011,423)	1,276,608 (114,095)	1,371,444 (940,682)	0 (0)	0 (0)	157,649,098 (35,312,644)
5/30-6/ 5	N	0 (0)	45,154 (45,154)	398,589 (177,942)	46,041 (28,610)	8,905,519 (4,108,214)	29,143,498 (26,246,356)	60,400,579 (27,749,603)	5,805,544 (1,710,941)	1,979,947 (603,058)	0 (0)	0 (0)	0 (0)	106,724,870 (38,459,258)
6/ 4-6/ 7	D	0 (0)	699,170 (502,945)	1,022,387 (390,987)	2,408,971 (579,278)	3,250,157 (2,458,122)	20,089,367 (10,955,512)	37,632,861 (12,831,540)	767,062 (545,087)	510,695 (112,645)	601,605 (601,605)	226,032 (134,497)	89,661 (89,661)	67,297,964 (21,957,499)
6/10-6/14	D	0 (0)	41,672 (41,672)	2,867,985 (2,566,129)	43,857,124 (34,737,858)	30,087,336 (18,909,278)	16,198,231 (6,461,946)	18,299,877 (8,802,326)	0 (0)	537,199 (436,650)	78,344 (55,163)	328,953 (162,378)	0 (0)	112,296,717 (41,113,550)
6/12-6/17	N	0 (0)	0 (0)	57,088 (57,088)	168,634 (168,634)	2,883,129 (1,507,433)	2,446,091 (1,860,510)	10,547,490 (10,186,926)	1,121,264 (1,031,024)	0 (0)	754,762 (283,704)	0 (0)	0 (0)	17,978,457 (10,520,576)
6/17-6/23	N	0 (0)	40,748 (40,748)	0 (0)	2,596,673 (1,675,611)	4,083,861 (1,722,027)	344,205 (218,539)	22,649 (22,649)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	7,088,136 (2,413,086)
6/24-6/27	N	0 (0)	0 (0)	86,755 (48,864)	544,933 (215,503)	67,751 (33,536)	291,437 (151,500)	0 (0)	35,715 (23,878)	0 (0)	NS	NS	NS	1,026,591 (271,065)
7/ 1-7/ 5	N	0 (0)	0 (0)	0 (0)	32,053 (24,136)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	NS	NS	NS	32,053 (24,136)
7/ 8-7/11	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	NS	NS	NS	0 (0)
7/15-7/18	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	NS	NS	NS	0 (0)
7/22-7/26	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7/29-8/ 2	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
8/ 5-8/ 9	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
8/12-8/15	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

*N = night samples, D = day samples
**NS = no samples taken
†Numbers in parentheses represent one standard error

Table D-51

Standing Crop of Striped Bass Post Yolk-Sac Larvae within 12 Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Day or Night Sampling by Epibenthic Sled or Tucker Trawl during 1974

Date	Time*	Region: YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
4/16-4/17	D	NS**	NS	NS	NS	NS	NS	0 (0)†	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
4/23-4/25	D	NS	NS	NS	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
4/29-5/ 4	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/ 6-5/11	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/13-5/18	N	0 (0)	0 (0)	0 (0)	64,002 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	64,002 (0)
5/15-5/18	D	NS	NS	NS	0 (0)	0 (0)	72,742 (55,665)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	72,742 (55,665)
5/21-5/24	D	174,555 (174,555)	417,479 (263,732)	305,818 (171,977)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	897,852 (360,000)
5/23-5/29	N	80,315 (0)	938,311 (319,021)	280,129 (164,012)	222,445 (222,445)	0 (0)	72,838 (72,838)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1,594,037 (428,324)
5/28-5/31	D	199,517 (97,560)	4,470,962 (2,541,350)	946,584 (200,644)	13,149,095 (1,574,115)	8,170,616 (7,807,959)	1,133,055 (614,917)	4,548,204 (3,610,127)	375,351 (113,832)	0 (0)	0 (0)	0 (0)	0 (0)	32,993,383 (9,130,958)
5/30-6/ 5	N	0 (0)	4,218,171 (2,068,384)	46,903,769 (787,738)	14,081,211 (5,628,433)	29,583,092 (14,867,887)	7,051,911 (2,757,848)	12,111,710 (3,218,727)	581,999 (345,573)	363,347 (363,347)	0 (0)	0 (0)	0 (0)	114,895,206 (16,608,716)
6/ 4-6/ 7	D	0 (0)	38,751,080 (13,955,645)	9,276,061 (7,448,181)	13,454,822 (5,053,352)	8,347,780 (6,510,406)	7,800,791 (1,687,003)	8,246,805 (4,711,861)	780,593 (638,423)	149,232 (149,232)	200,535 (200,535)	0 (0)	0 (0)	87,007,692 (18,538,470)
6/10-6/14	D	44,815 (44,815)	1,341,876 (641,264)	9,541,967 (3,031,211)	114,915,907 (50,033,050	44,271,291 (18,627,687)	18,846,760 (7,798,987)	23,842,838 (8,324,548)	725,046 (444,729)	286,495 (158,574)	102,464 (71,247)	344,181 (291,295)	0 (0)	214,263,628 (54,683,939)
6/12-6/17	N	0 (0)	209,768 (147,536)	3,269,744 (255,793)	19,519,919 (9,700,599)	101,886,554 (29,746,789	47,479,592 (10,528,221)	54,653,262 (22,377,034)	18,648,950 (12,839,022)	29,981,460 (9,074,527)	1,217,322 (458,969)	0 (0)	0 (0)	276,866,560 (42,872,293)
6/17-6/23	N	0 (0)	2,780,680 (1,169,830)	3,515,198 (298,996)	78,458,858 (14,601,210)	69,630,349 (20,355,716)	25,708,694 (7,013,710)	90,467,176 (35,656,013)	10,944,687 (3,391,321)	21,877,935 (5,857,353)	14,198,520 (4,599,973)	8,806,218 (1,701,747)	57,333 (57,333)	326,445,620 (44,937,961)
6/24-6/27	N	181,723 (143,831)	4,339,118 (938,909)	12,633,604 (2,753,540)	24,717,271 (3,550,517)	13,337,240 (364,876)	30,803,374 (7,224,105)	11,931,330 (1,154,802)	7,466,127 (1,387,851)	6,911,850 (1,849,477)	NS	NS	NS	113,098,270 (8,949,384)
7/ 1-7/ 5	N	77,597 (77,597)	928,360 (466,113)	2,010,506 (930,097)	4,231,433 (2,422,595)	137,660 (69,227)	3,469,033 (1,149,689)	1,938,469 (509,523)	3,380,644 (1,591,397)	5,117,024 (2,395,972)	NS	NS	NS	21,290,723 (4,100,823)
7/ 8-7/11	N	0 (0)	980,711 (352,922)	2,962,223 (1,326,598)	1,247,541 (267,380)	697,270 (191,591)	962,280 (312,005)	1,164,256 (456,986)	1,579,850 (774,235)	799,515 (273,298)	NS	NS	NS	10,393,746 (1,724,219)
7/15-7/18	N	0 (0)	0 (0)	0 (0)	0 (0)	365,090 (127,526)	948,388 (250,749)	1,853,664 (788,607)	696,919 (291,818)	3,678,424 (2,510,642)	NS	NS	NS	7,542,484 (2,662,615)
7/22-7/26	N	0 (0)	0 (0)	0 (0)	58,588 (58,588)	0 (0)	29,338 (21,820)	0 (0)	155,549 (116,814)	154,498 (60,009)	0 (0)	0 (0)	0 (0)	397,973 (145,449)
7/29-8/ 2	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
8/ 5-8/ 9	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	28,155 (28,155)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	28,155 (28,155)
8/12-8/15	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

*N = night samples, D = day samples
**NS = no samples taken
†Numbers in parentheses represent one standard error

Table D-52

Standing Crop of Juvenile Striped Bass within 12 Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Day or Night Sampling by Epibenthic Sled or Tucker Trawl during 1974

Date	Time*	YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
		Region												
4/16-4/17	D	NS**	NS	NS	NS	NS	NS	0 (0)†	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
4/23-4/25	D	NS	NS	NS	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
4/29-5/ 4	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/ 6-5/11	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/13-5/18	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/15-5/18	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/21-5/24	D	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/23-5/29	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/26-5/31	D	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/30-6/ 5	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
6/ 4-6/ 7	D	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
6/10-6/14	D	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
6/12-6/17	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	59,110 (59,110)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	59,110 (59,110)
6/17-6/23	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	30,956 (30,956)	0 (0)	30,956 (30,956)
6/24-6/27	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	NS	NS	NS	0 (0)
7/ 1-7/ 5	N	0	238,596 (165,770)	134,261 (95,573)	87,657 (62,028)	52,883 (52,883)	8,283 (8,283	0 (0)	45,809 (32,474)	0 (0)	NS	NS	NS	567,489 (210,669)
7/ 8-7/11	N	0	1,036,812 (586,908)	1,219,502 (608,302)	38,170 (26,496)	69,000 (43,642)	0 (0)	0 (0)	0 (0)	79,349 (60,753)	NS	NS	NS	2,442,833 (848,994)
7/15-7/18	N	87,831 (72,550)	1,002,129 (677,856)	795,563 (258,522)	0 (0)	120,038 (103,232)	384,538 (65,591)	147,102 (120,475)	16,805 (16,805)	682,671 (435,085)	NS	NS	NS	3,236,676 (866,395)
7/22-7/26	N	0 (0)	1,873,475 (912,704)	418,719 (120,489)	155,974 (112,482)	116,527 (58,662)	864,656 (391,636)	55,544 (36,742)	140,236 (114,346)	197,193 (84,743)	231,632 (231,632)	0 (0)	0 (0)	4,053,956 (1,045,121)
7/29-8/ 2	N	0 (0)	362,518 (215,058)	186,968 (90,140)	133,003 (66,509)	0 (0)	36,043 (0)	130,652 (130,652)	172,353 (141,826)	518,869 (285,164)	466,858 (326,220)	467,757 (125,978)	222,132 (222,132)	2,697,154 (5[illegible],707)
8/ 5-8/ 9	N	14,620 (14,620)	291,349 (197,371)	293,770 (114,106)	80,481 (80,481)	16,366 (16,366)	246,602 (109,206)	0 (0)	60,880 (41,915	132,362 (78,392)	0 (0)	0 (0)	0 (0)	1,136,430 (280,646)
8/12-8/15	N	0 (0)	74,014 (52,028)	1,003,542 (428,841)	209,082 (139,995)	0 (0)	45,335 (45,335)	0 (0)	0 (0)	26,069 (26,069)	0 (0)	167,766 (167,766)	0 (0)	1,525,808 (486,919)

*N = night samples, D = day samples
**NS = no samples taken
†Numbers in parentheses represent one standard error

Table D-53

Standing Crop of Juvenile Striped Bass within Each Geographical Region in Hudson River Estuary [RM 12-153 (km 19-245)] Based on 100-ft (30.5-m) Beach Seine during Daytime, 1974

Date	YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
	Region												
4/ 7- 4/20	NS*	NS	0 (0)**	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
4/21- 5/ 4	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	NS	NS	NS	0 (0)	0 (0)
5/ 5- 5/18	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/19- 6/ 1	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
6/ 2- 6/15	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
6/16- 6/29	0 (0)	0 (0)	2,069 (2,069)	0 (0)	6,325 (5,954)	4,734 (3,599)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	13,127 (7,258)
6/30- 7/13	0 (0)	40,387 (20,661)	10,756 (5,946)	11,519 (6,689)	3,690 (1,722)	21,302 (16,501)	27,200 (16,531)	1,550 (930)	2,870 (2,870)	11.704 (5,852)	13,773 (7,214)	2,145 (1,563)	146,896 (33,960)
7/14- 7/27	2,150 (917)	90,871 (28,517)	38,096 (16,032)	40,115 (14,024)	21,963 (8,026)	70,564 (25,694)	11,087 (4,714)	1,705 (810)	6,887 (5,020)	59,689 (48,270)	92,324 (41,463)	22,418 (16,966)	457,867 (79,858)
7/28- 8/10	3,224 (1,097)	59,634 (21,034)	72,270 (27,305)	45,014 (6,826)	21,875 (7,154)	127,813 (44,111)	23,821 (9,189)	10,695 (9,822)	47,349 (22,367)	29,844 (17,759)	185,688 (99,405)	72,179 (66,811)	699,407 (136,287)
8/11- 8/24	6,070 (2,377)	189,315 (80,238)	43,026 (16,763)	80,746 (14,090)	9,957 (3,773)	108,033 (34,586)	20,273 (4,696)	709 (251)	4,304 (2,485)	17,556 (7,167)	136,215 (42,531)	24,909 (9,021)	641,111 (100,517)
8/25- 9/ 7	11,286 (2,360)	1,575,099 (913,444)	347,792 (76,442)	173,944 (38,647)	8,434 (3,575)	113,612 (71,960)	10,407 (3,163)	827 (613)	14,348 (8,513)	17,556 (7,741)	114,118 (44,338)	28,079 (17,413)	2,415,500 (921,588)
9/ 8- 9/21	7,094 (5,037)	1,474,131 (878,620)	577,574 (146,938)	60,378 (11,923)	6,918 (1,988)	4,260 (2,609)	11,611 (5,601)	138 (138)	4,304 (4,304)	15,361 (5,180)	28,757 (12,526)	15,185 (8,552)	2,205,711 (891,094)
9/22- 10/5	8,681 (2,815)	531,246 (149,049)	484,040 (121,649)	89,852 (32,977)	4,978 (1,611)	22,271 (6,170)	3,275 (1,528)	177 (177)	0 (0)	5,852 (4,138)	8,608 (3,095)	8,152 3,458)	1,167,132 (195,425)

*NS = no samples taken
**Numbers in parentheses represent one standard error

Table D-54

Standing Crop of Juvenile Striped Bass within Four Geographical Regions of Hudson River Estuary [RM 34-61 (km 54-98)] Based on Night Sampling by 100-ft (30.5-m) Beach Seine during 1974

	Region												
Date	YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
4/21 - 5/ 4	NS*	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/ 5 - 5/18	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/19 - 6/ 1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
6/ 2 - 6/15	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
6/16 - 6/29	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
6/30 - 7/13	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7/14 - 7/27	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7/28 - 8/10	NS	NS	457,149 (0)**	136,917 (32,515)	56,225 (54,913)	248,526 (52,300)	NS	NS	NS	NS	NS	NS	898,816 (82,510)
8/11 - 8/24	NS	NS	107,564 (0)	140,208 (38,523)	20,645 (6,289)	99,410 (17,538)	NS	NS	NS	NS	NS	NS	367,828 (42,792)
8/25 - 9/ 7	NS	NS	NS	145,606 (36,312)	17,395 (5,810)	228,999 (133,139)	NS	NS	NS	NS	NS	NS	391,999 (138,124)
9/ 8 - 9/21	NS	NS	416,812 (147,901)	158,791 (33,879)	25,697 (16,472)	159,767 (62,712)	NS	NS	NS	NS	NS	NS	761,066 (165,004)
9/22 - 10/ 5	NS	NS	766,397 (685,723)	148,985 (42,030)	13,178 (6,973)	60,356 (15,718)	NS	NS	NS	NS	NS	NS	988,915 (687,225)

*NS = no samples taken
**Numbers in parentheses represent one standard error

Table D-55

Density Estimates (No./1000 m^3) of White Perch Eggs within Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Day or Night Sampling by Epibenthic Sled and Tucker Trawl during 1974

Date	Time*		YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL
			Region											
4/29-5/ 4	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE**	0	0	0	0	0	0	0	0	0	0	0	0
5/ 6-5/11	N	Den.	0	0.17	0	0	0	0	0.10	0	0	0	0	0
		SE	0	0.11	0	0	0	0	0.10	0	0	0	0	0
5/13-5/18	N	Den.	0	0.23	8.36	1.54	5.05	0	14.69	10.60	16.34	6.45	0	0
		SE	0	0.17	3.50	0	4.24	0	8.43	9.40	4.59	6.45	0	0
5/15-5/18	D	Den.	0	0	0	0	90.82	27.05	0.23	8.23	3.15	15.47	1.57	0
		SE	0	0	0	0	64.04	22.50	0.16	8.23	2.20	11.53	0	0
5/21-5/24	D	Den.	0	42.08	6.07	2.61	0	2.68	0.73	2.45	3.97	0.73	47.06	1269.23
		SE	0	40.90	4.25	2.16	0	1.26	0.60	1.49	0.44	0.73	29.86	1269.23
5/23-5/29	N	Den.	0	12.98	150.13	0	3.10	22.65	2.77	0.75	36.72	20.29	3.90	69.95
		SE	0	11.38	131.18	0	1.25	22.65	2.77	0.75	25.19	8.62	3.90	69.95
5/28-5/31	D	Den.	0	12.42	3.82	0	8.92	88.51	12.25	3.77	1.00	19.15	0	0
		SE	0	11.23	3.82	0	8.92	87.50	12.25	2.15	1.00	9.10	0	0
5/30-6/ 5	N	Den.	0	3.47	1194.71	0	7.89	0.20	15.44	1.54	5.28	14.82	1.63	0
		SE	0	2.97	755.26	0	6.75	0.20	9.99	1.26	3.76	8.68	1.63	0
6/ 4-6/ 7	D	Den.	0	55.76	2.18	0	2.91	1.84	12.95	0.61	5.89	27.90	5.56	43.57
		SE	0	32.87	1.83	0	1.14	1.63	8.44	0.61	5.89	19.27	2.60	38.84
6/10-6/14	D	Den.	0	4.16	766.55	5.69	18.01	0	24.71	1.04	0	115.21	105.31	0
		SE	0	2.23	699.55	4.34	14.24	0	24.71	1.04	0	56.99	59.78	0
6/12-6/17	N	Den.	0	13.73	46.48	23.01	37.92	37.17	0.20	0	0	3.07	0	0
		SE	0	8.22	39.94	22.29	34.82	36.39	0.20	0	0	2.85	0	0
6/17-6/23	N	Den.	0	0	0	1.64	1.95	3.07	0.07	0	0	0.31	0.73	0
		SE	0	0	0	1.54	1.05	1.67	0.07	0	0	0.31	0.73	0
6/24-6/27	N	Den.	0	0	0	5.19	2.39	4.47	0.33	0	0.24	0	0	0
		SE	0	0	0	3.44	1.59	0.20	0.26	0	0.24	0	0	0
7/ 1-7/ 5	N	Den.	0	0	0.08	0.25	0	0	0.43	0	0	0	0	0
		SE	0	0	0.08	0.25	0	0	0.43	0	0	0	0	0
7/ 8-7/11	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
7/15-7/18	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
7/22-7/26	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
7/29-8/ 2	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
8/ 5-8/ 9	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
8/12-8/15	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0

*N = night samples, D = day samples
**SE = one standard error

Table D-56

Density Estimates (No./1000 m^3) of White Perch Yolk-Sac Larvae within Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Day or Night Sampling by Epibenthic Sled and Tucker Trawl during 1974

Date	Time*		Region YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL
4/29-5/4	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE**	0	0	0	0	0	0	0	0	0	0	0	0
5/6-5/11	N	Den.	0	0.79	0	0	9.20	0	0	0	0.34	1.79	0	0
		SE	0	0.79	0	0	0	0	0	0	0.34	1.10	0	0
5/13-5/18	N	Den.	0.30	0.38	2.34	0.21	0	3.99	1.44	0.55	3.37	0	0	0
		SE	0.30	0.21	1.95	0.21	0	2.34	1.10	0.55	2.54	0	0	0
5/15-5/18	D	Den.	0	0	0	11.22	8.10	14.90	2.43	7.12	28.25	5.18	3.13	0
		SE	0	0	0	11.22	1.79	4.14	1.07	0.30	12.61	3.15	0	0
5/21-5/24	D	Den.	0	70.67	103.67	9.03	15.70	24.03	47.47	84.40	153.94	40.64	10.78	9.03
		SE	0	10.68	31.05	2.00	13.39	2.84	19.91	45.53	38.50	13.88	3.08	4.58
5/23-5/29	N	Den.	0	24.34	3.38	0.83	2.83	2.61	2.29	11.80	56.96	13.96	31.80	2.69
		SE	0	6.01	0.25	0.58	1.89	2.39	1.19	7.43	24.50	9.19	13.47	2.69
5/28-5/31	D	Den.	0	14.00	14.37	0	1.56	2.89	10.39	45.81	55.58	109.19	42.30	32.68
		SE	0	5.36	7.63	0	1.38	1.36	6.22	9.25	27.48	33.11	25.17	32.68
5/30-6/5	N	Den.	0	0.23	0.22	0	2.24	0.81	8.32	6.53	16.10	42.44	10.66	0
		SE	0	0.23	0.22	0	2.24	0.32	7.11	5.70	12.14	1.04	1.53	0
6/4-6/7	D	Den.	0	5.37	5.36	1.25	1.12	26.16	1.99	5.05	9.29	29.47	19.91	11.11
		SE	0	2.30	2.41	1.04	0.96	20.15	1.61	2.93	6.57	16.32	5.31	7.64
6/10-6/14	D	Den.	0.20	8.10	62.65	2.50	4.38	0.27	1.51	1.10	22.95	4.50	8.90	0
		SE	0.20	3.25	27.52	0.62	2.65	0.27	0.70	1.10	7.59	2.44	3.75	0
6/12-6/17	N	Den.	0	0.47	0	5.03	45.41	4.53	0.38	157.87	1.79	0.70	0.70	2.11
		SE	0	0.31	0	3.71	31.18	3.32	0.38	157.87	1.79	0.70	0.70	2.11
6/17-6/23	N	Den.	0	0.15	1.11	4.99	3.46	1.29	0.34	0.71	0	1.12	0	1.52
		SE	0	0.10	0.97	2.79	2.28	0.70	0.27	0.52	0	0.90	0	0.88
6/24-6/27	N	Den.	0	0	0.28	5.39	0	0	0	0	0	0	0	0
		SE	0	0	0.28	4.91	0	0	0	0	0	0	0	0
7/1-7/5	N	Den.	0	0.06	2.70	3.03	0.46	0	0	0	0	0	0	0
		SE	0	0.06	2.64	2.01	0.46	0	0	0	0	0	0	0
7/8-7/11	N	Den.	0	0	0	0.04	0	0	0	0	0	0	0	0
		SE	0	0	0	0.04	0	0	0	0	0	0	0	0
7/15-7/18	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
7/22-7/26	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
7/29-8/2	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
8/5-8/9	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
8/12-8/15	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0

*N = night samples, D = day samples
**SE = one standard error

Table D-57

Density Estimates (No./1000 m^3) of White Perch Post Yolk Sac Larvae within Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Day or Night Sampling by Epibenthic Sled and Tucker Trawl during 1974

Date	Time*		Region: YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL
4/29-5/ 4	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE**	0	0	0	0	0	0	0	0	0	0	0	0
5/ 6-5/11	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
5/13-5/18	N	Den.	0.21	1.34	0.54	0	0.91	0.22	0.14	0	0	0	0	0
		SE	0.21	0.78	0.54	0	0.91	0.22	0.14	0	0	0	0	0
5/15-5/18	D	Den.	0	0	0	4.77	4.75	2.53	0	0	0	0	1.57	0
		SE	0	0	0	2.71	2.20	1.60	0	0	0	0	0	0
5/21-5/24	D	Den.	0	49.56	16.33	5.94	1.60	18.79	3.05	2.24	1.80	0.08	0	0
		SE	0	4.95	4.41	3.38	0.34	1.14	1.45	2.24	0.11	0.08	0	0
5/23-5/29	N	Den.	4.54	47.71	3.20	4.12	2.96	27.75	4.58	17.46	31.28	1.34	0	0
		SE	3.84	9.58	1.65	1.75	2.22	4.16	2.09	10.80	29.51	1.18	0	0
5/28-5/31	D	Den.	0	19.80	29.04	9.11	18.85	42.06	67.38	180.43	105.19	10.33	0	0
		SE	0	5.46	2.04	0.58	8.53	20.49	34.51	52.71	32.57	9.27	0	0
5/30-6/ 5	N	Den.	0	4.85	5.04	5.90	64.31	24.16	34.78	75.13	93.17	0.21	1.38	0
		SE	0	2.22	2.85	4.71	36.27	9.80	5.91	18.32	45.75	0.21	1.38	0
6/ 4-6/ 7	D	Den.	0	71.08	33.08	25.49	12.28	248.10	82.97	67.13	67.56	27.22	1.85	0.
		SE	0	40.35	7.60	13.17	10.04	68.36	21.08	46.05	26.41	15.98	1.20	0
6/10-6/14	D	Den.	0	5.44	109.33	217.32	73.06	284,32	205.78	213.80	504.62	46.08	80.05	0
		SE	0	3.95	23.73	77.76	38.75	27.76	77.20	113.34	275.79	20.38	6.29	0
6/12-6/17	N	Den.	0.48	0.22	38.70	93.00	318.61	193.84	333.17	242.79	842.53	142.22	64.12	6.33
		SE	0.48	0.22	0.77	39.53	124.19	69.22	201.00	161.99	98.20	46.41	7.44	6.33
6/17-6/23	N	Den.	0.17	3.87	17.71	354.63	347.90	98.56	223.28	253.98	167.89	51.06	74.22	13.13
		SE	0.17	1.85	3.60	73.47	127.50	22.51	40.09	47.36	72.14	16.39	11.16	10.72
6/24-6/27	N	Den.	0	3.45	80.93	254.14	39.33	119.57	50.12	151.51	66.31	3.21	0	0
		SE	0	0.89	25.88	48.84	20.12	27.54	7.38	32.52	20.81	0	0	0
7/ 1-7/ 5	N	Den.	0.59	1.16	8.07	26.76	1.02	23.58	15.83	27.48	40.44	0	0	0
		SE	0.39	0.75	2.71	10.36	0.56	3.30	3.63	12.46	4.71	0	0	0
7/ 8-7/11	N	Den.	0.95	6.61	11.69	6.33	6.13	18.41	26.21	33.60	14.18	0	0	0
		SE	0.78	2.21	3.89	1.43	1.64	7.04	7.44	9.09	5.04	0	0	0
7/15-7/18	N	Den.	3.65	1.24	0.38	0.59	5.54	5.98	3.76	7.66	13.44	0	0	0
		SE	2.81	0.78	0.27	0.30	1.90	1.57	1.38	2.64	10.66	0	0	0
7/22-7/26	N	Den.	0.89	0	0	0.34	2.07	1.67	1.48	2.99	16.36	9.46	9.56	0
		SE	0.89	0	0	0.30	1.11	0.52	0.64	0.95	1.34	3.05	2.35	0
7/29-8/ 2	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
8/ 5-8/ 9	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
8/12-8/15	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0

*N = night samples, D = day samples
**SE = one standard error

Table D-58

Density Estimates (No./1000 m^3) of Juvenile White Perch within Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Day or Night Sampling by Epibenthic Sled and Tucker Trawl during 1974

Date	Time*		YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL
			Region											
4/29-5/4	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE**	0	0	0	0	0	0	0	0	0	0	0	0
5/6-5/11	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
5/13-5/18	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
5/15-5/18	D	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
5/21-5/24	D	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
5/23-5/29-	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
5/28-5/31	D	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
5/30-6/5	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
6/4-6/7	D	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
6/10-6/14	D	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
6/12-6/17	N	Den.	0	0	0	0	0	0.42	0	0	0	0	0	0
		SE	0	0	0	0	0	0.42	0	0	0	0	0	0
6/17-6/23	N	Den.	0	0.07	0	0	0	0	0	0	0	0	0	0
		SE	0	0.07	0	0	0	0	0	0	0	0	0	0
6/24-6/27	N	Den.	0	0	0	0.17	0	0	0	0	0	0	0	0
		SE	0	0	0	0.17	0	0	0	0	0	0	0	0
7/1-7/5	N	Den.	0	0	0	0	0.86	1.05	0	1.13	0.25	0	0	0
		SE	0	0	0	0	0.86	1.05	0	0.66	0.17	0	0	0
7/8-7/11	N	Den.	0	0.61	1.01	0.05	0	0	0	0	0.36	0	0	0
		SE	0	0.53	0.53	0.05	0	0	0	0	0.36	0	0	0
7/15-7/18	N	Den.	0	0	0	0	0	0	0.41	1.79	1.49	0	0	0
		SE	0	0	0	0	0	0	0.41	0.82	1.33	0	0	0
7/22-7/26	N	Den.	0	0.14	0	0	0	0	1.48	0.80	0.84	1.91	1.20	0
		SE	0	0	0	0	0	0	0.83	0.71	0.40	1.91	1.20	0
7/29-8/2	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
8/5-8/9	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
8/12-8/15	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0

*N = night samples, D = day samples
**SE = one standard error

Table D-59

Density Estimates (No./1000 m^3) of Juvenile White Perch within Seven Geographical Regions of Hudson River Estuary [RM 14-76 (km 22-122)] Based on Night Sampling in Shoals by Epibenthic Sled during 1974

	Region						
Date	YK	TZ	CH	IP	WP	CW	PK
8/19 - 8/22	0 (0)*	0 (0)	.061 (.061)	0 (0)	0 (0)	2.705 (1.141)	.115 (.115)
8/26 - 8/29	0 (0)	.133 (.063)	0 (0)	.031 (.031)	0 (0)	1.256 (.985)	.124 (.124)
9/ 3 - 9/ 6	0 (0)	.029 (.029)	0 (0)	.029 (.029)	0 (0)	4.488 (2.197)	.254 (.147)
9/ 9 - 9/12	0 (0)	0 (0)	0 (0)	.398 (.299)	.202 (.083)	1.437 (.884)	.212 (.212)
9/16 - 9/19	0 (0)	0 (0)	.100 (.068)	.060 (.060)	0 (0)	2.721 (2.315)	.327 (.164)
9/23 - 9/26	0 (0)	0 (0)	.173 (.125)	0 (0)	.390 (.209)	4.252 (.398)	.462 (.319)

*Numbers in parentheses represent one standard error

Table D-60

Catch per Unit Effort of Juvenile White Perch within 12 Geographical Regions of Hudson River Estuary [RM 12-153 (km 19-245)] Based on Day Sampling by 100-ft (30.5-m) Beach Seine during 1974

Date		YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
3/24-4/ 6	CPUE*	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	0	0	0	0	0	0	0	0	0	0	0
4/ 7-4/20	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	8	5	10	6	0	1	3	4	9	7	53
4/21-5/ 4	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	7	7	13	13	13	11	8	2	0	0	0	0	75
5/ 5-5/18	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	14	8	16	9	8	6	3	3	3	4	5	8	87
5/19-6/ 1	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	11	5	14	16	12	6	8	2	2	2	5	8	91
6/ 2-6/15	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	11	7	21	18	20	8	15	8	6	8	13	20	155
6/16-6/29	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	13	8	13	15	15	9	16	9	6	13	16	20	153
6/30 7/13	CPUE	0	0	0	0	0.40	0	6.17	1.25	0.67	1.83	0.10	0	0.57
	SE	0	0	0	0	0.22	0	3.92	0.95	0.67	1.22	0.10	0	0.26
	n	16	8	10	8	10	5	6	4	3	6	10	19	105
7/14-7/27	CPUE	0	0.42	0	0.06	0.47	0.13	0.63	8.75	1.40	1.60	2.38	1.00	1.14
	SE	0	0.42	0	0.06	0.24	0.13	0.26	4.03	1.17	1.01	2.14	0.64	0.34
	n	12	12	12	17	15	8	16	8	5	10	13	20	148
7/28-8/10	CPUE	0.05	0.25	0	0.15	1.50	4.92	6.71	4.63	1.50	13.50	3.25	0.44	2.41
	SE	0.05	0.14	0	0.12	0.46	3.19	2.14	2.59	0.87	8.08	1.57	0.38	0.60
	n	20	16	16	26	20	12	14	8	4	10	16	16	178
8/11-8/24	CPUE	0.06	0.25	0	2.52	4.44	5.71	8.71	17.00	3.00	22.78	7.92	2.79	5.03
	SE	0.06	0.13	0	1.12	2.02	2.83	2.47	7.37	1.22	9.43	3.49	1.28	0.92
	n	17	12	15	21	9	7	14	7	4	9	13	24	152
8/25-9/ 7	CPUE	0	1.00	1.27	12.38	1.80	8.33	4.53	8.67	7.67	16.22	6.80	1.33	5.41
	SE	0	0.37	0.56	5.82	1.36	2.79	1.72	4.08	4.70	5.97	3.61	0.76	0.96
	n	8	6	15	8	5	6	15	6	6	9	15	15	114
9/ 8 9/21	CPUE	0	0.78	3.43	8.48	6.38	2.20	2.18	15.22	3.00	2.63	3.62	0.12	4.36
	SE	0	0.57	1.49	4.23	4.61	1.74	1.18	11.43	2.68	1.12	1.62	0.08	1.18
	n	10	9	23	29	8	5	11	9	4	8	13	17	146
9/22-10/5	CPUE	0.15	1.23	0.50	5.42	1.67	3.18	2.08	3.71	0.75	4.67	2.63	0.40	1.99
	SE	0.15	0.63	0.27	2.57	0.91	1.70	1.20	2.17	0.75	2.94	1.17	0.27	0.39
	n	26	13	8	12	9	11	13	7	4	9	16	15	143

*CPUE = catch per unit effort
SE = standard error
n = number of tows

Table D-61

Catch per Unit Effort of Juvenile White Perch within Four Geographical Regions of Hudson River Estuary [RM 34-61 (km 54-98)] Based on Night Sampling by 100-ft (30.5-m) Beach Seine during 1974

		Region												
Date		YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
3/24–4/ 6	CPUE*	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	0	0	0	0	0	0	0	0	0	0	0
4/ 7–4/20	CPUE													
	SE													
	n													
4/21–5/ 4	CPUE													
	SE													
	n													
5/ 5–5/18	CPUE													
	SE													
	n													
5/19–6/ 1	CPUE													
	SE													
	n													
6/ 2–6/15	CPUE													
	SE													
	n													
6/16–6/29	CPUE													
	SE													
	n													
6/30–7/13	CPUE													
	SE													
	n													
7/14–7/27	CPUE			0	0	0	0							0
	SE			0	0	0	0							0
	n			0	0	0	0							0
7/28–8/10	CPUE			2.00	3.29	6.33	6.00							4.43
	SE			0	1.66	3.38	2.65							1.19
	n			1	7	3	3							14
8/11–8/24	CPUE			1.00	4.14	6.33	4.83							4.67
	SE			0	1.56	2.99	1.87							1.10
	n			1	14	6	6							27
8/25–9/ 7	CPUE			0	5.67	8.20	9.00							6.55
	SE			0	2.66	2.31	2.00							1.89
	n			0	15	5	2							22
9/ 8–9/21	CPUE			4.50	11.77	18.50	8.00							11.82
	SE			4.50	2.91	7.60	5.69							2.36
	n			2	13	4	3							22
9/22–10/ 5	CPUE	0	0	1.50	8.92	12.25	10.17	0	0	0	0	0	0	9.17
	SE	0	0	1.50	1.75	3.42	3.13	0	0	0	0	0	0	1.35
	n	0	0	2	12	4	6	0	0	0	0	0	0	24

*CPUE = catch per unit effort
SE = standard error
n = number of tows

Table D-62

Catch per Unit Effort of Juvenile White Perch within Six Geographical Regions of Hudson River Estuary [RM 12-61 (km 19-98)] Based on Day Sampling by Bottom Trawl during 1974

Date		Region YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
3/24-	CPUE*	0	0	0	0	0	0	0	0	0	0	0	0	0
4/ 6	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	2	1	3	0	0	0	0	0	0	0	0	6
4/ 7-	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
4/20	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	1	6	5	9	1	3	0	0	0	0	0	0	25
4/21-	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ 4	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	0	6	6	4	0	0	0	0	0	0	17
5/ 5-	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
5/18	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	9	3	3	0	0	0	0	0	0	0	0	15
6/ 2-	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
6/15	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	5	8	3	5	3	10	0	0	0	0	0	0	34
6/16-	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
6/29	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	4	10	3	10	4	5	0	0	0	0	0	0	36
6/30-	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
7/13	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	4	10	3	9	5	4	0	0	0	0	0	0	35
7/14-	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
7/27	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	4	8	3	12	6	5	0	0	0	0	0	0	38
7/28-	CPUE	0	0	0.38	0.44	0	0	0	0	0	0	0	0	0.17
8/10	SE	0	0	0.38	0.44	0	0	0	0	0	0	0	0	0.12
	n	4	4	4	7	5	3	0	0	0	0	0	0	27
8/11-	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
8/24	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	3	3	10	4	6	0	0	0	0	0	0	26
8/25	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
9/ 7	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	4	8	2	8	3	6	0	0	0	0	0	0	31
9/ 8-	CPUE	0	0	0	0	0	0.31	0	0	0	0	0	0	0.05
9/21	SE	0	0	0	0	0	0.31	0	0	0	0	0	0	0.05
	n	3	11	6	2	5	5	0	0	0	0	0	0	32
9/22-	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
10/5	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	2	9	1	0	0	0	0	0	0	0	12

*CPUE = catch per unit effort
SE = standard error
n = number of tows

Table D-63

Catch per Unit Effort of Yearling White Perch within 12 Geographical Regions of Hudson River Estuary [RM 12-153 (km 19-245)] Based on Day Sampling by 100-ft (30.5-m) Beach Seine during 1974

		Region												
Date		YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
3/24-	CPUE*	0	0	0	0	0	0	0	0	0	0	0	0	0
4/ 6	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	0	0	0	0	0	0	0	0	0	0	0
4/ 7-	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
4/ 20	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	8	5	10	6	0	1	3	4	9	7	53
4/21-	CPUE	2.14	0.71	2.54	1.00	0	0.09	0	0	0	0	0	0	0.89
5/ 4	SE	0.63	0.42	1.81	0.70	0	0.09	0	0	0	0	0	0	0.35
	n	7	7	13	13	13	11	8	2	0	0	0	1	75
5/ 5-	CPUE	1.64	1.88	1.13	0.67	1.00	0	1.00	1.00	0	0	0	0	0.87
5/18	SE	0.43	1.03	0.34	0.29	0.57	0	1.00	1.00	0	0	0	0	0.16
	n	14	3	16	9	8	6	3	3	3	4	5	8	87
5/19-	CPUE	0.73	4.00	1.93	5.69	1.83	16.83	7.88	6.00	18.00	5.00	1.40	0	4.36
6/ 1	SE	0.47	2.51	0.47	2.69	0.79	11.99	4.24	6.00	17.00	5.00	1.17	0	1.10
	n	11	5	14	16	12	6	8	2	2	2	5	8	91
6/ 2-	CPUE	0.18	35.43	205.05	66.33	14.10	51.63	19.40	12.38	31.50	14.75	7.62	3.15	47.12
6/15	SE	0.12	16.55	162.89	29.68	4.88	15.14	5.08	4.75	25.16	5.73	4.05	1.73	22.56
	n	11	7	21	18	20	8	15	8	6	8	13	20	155
6/16-	CPUE	0.23	10.13	72.54	6.53	10.60	5.33	1.69	8.78	2.33	15.62	4.06	3.20	11.66
6/29	SE	0.17	4.05	27.50	3.07	4.14	1.38	0.64	4.51	1.76	10.20	2.59	2.17	2.94
	n	13	8	13	15	15	9	16	9	6	13	16	20	153
6/30-	CPUE	0.13	40.63	45.30	7.75	45.10	2.20	8.33	2.25	10.33	16.67	9.20	30.95	20.70
7/13	SE	0.13	16.81	18.23	4.35	31.67	2.20	5.80	0.48	8.41	3.26	4.82	27.28	6.25
	n	16	8	10	8	10	5	6	4	2	6	10	19	105
7/14-	CPUE	0.17	25.25	9.50	5.53	5.93	4.13	0.81	2.50	1.40	9.60	7.38	3.10	6.28
7/27	SE	0.11	9.52	4.44	2.74	1.86	2.01	0.38	1.15	0.60	3.06	2.80	1.16	1.10
	n	12	12	12	17	15	8	16	8	5	10	13	20	148
7/28-	CPUE	0.10	11.06	3.75	21.12	2.20	4.92	2.29	4.00	10.00	5.90	7.63	1.44	6.74
8/10	SE	0.07	3.50	1.19	17.70	0.61	0.93	0.72	1.38	4.34	1.90	2.74	1.10	2.63
	n	20	16	16	26	20	12	14	8	4	10	16	16	178
8/11-	CPUE	0	25.58	1.80	1.10	1.11	7.00	5.43	1.71	1.00	17.44	4.15	8.75	6.11
8/24	SE	0	9.81	0.74	0.47	0.75	5.72	1.52	0.92	1.00	6.25	1.99	3.91	1.23
	n	17	12	15	21	9	7	14	7	4	9	13	24	152
8/25-	CPUE	0	135.00	39.47	11.63	1.80	3.50	1.33	1.17	1.17	5.56	4.07	3.13	15.06
9/ 7	SE	0	85.30	15.92	4.31	0.80	2.92	0.46	0.65	0.48	2.13	1.57	2.05	5.46
	n	8	6	15	8	5	6	15	6	6	9	15	15	114
9/ 8-	CPUE	0	9.78	89.83	1.31	3.75	2.80	0.45	1.67	4.25	1.38	3.31	1.41	16.10
9/21	SE	0	8.43	50.67	0.40	1.99	1.53	0.21	0.60	2.36	0.91	1.55	0.98	8.29
	n	10	9	23	29	8	7	11	9	4	8	13	17	146
9/22-	CPUE	0.12	3.08	5.13	5.42	1.11	4.55	1.85	1.57	1.50	4.22	4.56	3.47	2.89
10/5	SE	0.08	1.29	2.55	3.16	0.48	2.39	0.61	0.48	1.19	1.56	1.71	2.29	0.50
	n	26	13	8	12	9	11	13	7	4	9	16	15	143

*CPUE = catch per unit effort
SE = standard error
n = number of tows

Table D-64

Catch per Unit Effort of Yearling White Perch within Four Geographical Regions of Hudson River Estuary [RM 34-61 (km 54-98)] Based on Night Sampling by 100-ft (30.5-m) Beach Seine during 1974

		Region												
Date		YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
3/24-4/ 6	CPUE*	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	0	0	0	0	0	0	0	0	0	0	0
4/ 7-4/20	CPUE	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	SE													
	n													
4/21-5/ 4	CPUE													
	SE													
	n													
5/ 5-5/18	CPUE													
	SE													
	n													
5/19-6/ 1	CPUE													
	SE													
	n													
6/ 2-6/15	CPUE													
	SE													
	n													
6/16-6/29	CPUE													
	SE													
	n													
6/30-7/13	CPUE													
	SE													
	n													
7/14-7/27	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	0	0	0	0	0	0	0	0	0	0	0
7/28-8/10	CPUE	0	0	11.00	15.57	6.67	16.67	0	0	0	0	0	0	13.57
	SE	0	0	0	6.61	3.84	3.84	0	0	0	0	0	0	3.49
	n	0	0	1	7	3	3	0	0	0	0	0	0	14
8/11-8/24	CPUE	0	0	0	11.71	18.17	15.33	0	0	0	0	0	0	13.52
	SE	0	0	0	3.68	4.22	5.41	0	0	0	0	0	0	2.46
	n	0	0	1	14	6	6	0	0	0	0	0	0	27
8/25-9/ 7	CPUE	0	0	0	3.53	14.20	25.00	0	0	0	0	0	0	7.91
	SE	0	0	0	1.16	5.80	0	0	0	0	0	0	0	2.09
	n	0	0	0	15	5	2	0	0	0	0	0	0	22
9/ 8-9/21	CPUE	0	0	6.00	15.00	16.25	10.67	0	0	0	0	0	0	13.82
	SE	0	0	3.00	4.00	9.46	2.33	0	0	0	0	0	0	2.87
	n	0	0	2	13	4	3	0	0	0	0	0	0	22
9/22-10/5	CPUE	0	0	6.00	6.33	3.75	6.17	0	0	0	0	0	0	5.85
	SE	0	0	3.00	1.70	3.09	1.85	0	0	0	0	0	0	1.07
	n	0	0	2	12	4	6	0	0	0	0	0	0	24

*CPUE = catch per unit effort
SE = standard error
n = number of tows

services group

Table D-65

Catch per Unit Effort of Yearling White Perch within Six Geographical Regions of Hudson River Estuary [RM 12-61 (km 19-98)] Based on Day Sampling by Bottom Trawl during 1974

		Region												
Date		YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
3/24- 4/ 6	CPUE *	0	10.71	6.12	1.02	0	0	0	0	0	0	0	0	5.10
	SE	0	0	0	1.02	0	0	0	0	0	0	0	0	2.00
	n	0	2	1	3	0	0	0	0	0	0	0	0	6
4/ 7- 4/20	CPUE	6.12	49.72	10.71	27.20	0	13.26							25.70
	SE	0	34.28	10.71	8.62	0	2.55							9.04
	n	1	6	5	9	1	3							25
4/21- 5/ 4	CPUE	0	0	0	41.05	25.24	11.02							26.64
	SE	0	0	0	8.99	5.51	1.84							4.65
	n	0	0	0	6	6	5							17
5/ 5- 5/18	CPUE	0	6.01	5.10	6.63	0	0							5.95
	SE	0	2.15	1.84	2.70	0	0							1.38
	n	0	9	3	3	0	0							15
6/ 2- 6/15	CPUE	0	0.19	0	0	0.51	0							0.09
	SE	0	0.19	0	0	0.51	0							0.06
	n	5	8	3	5	3	10							34
6/16- 6/29	CPUE	0	0	1.53	0	3.44	8.87							1.74
	SE	0	0	0.88	0	2.01	5.75							0.91
	n	4	10	3	10	4	5							36
6/30- 7/13	CPUE	0	0	0	0.34	0	0							0.09
	SE	0	0	0	0.22	0	0							0.06
	n	4	10	3	9	5	4							35
7/14- 7/27	CPUE	0	0	0	0	0	0.31							0.04
	SE	0	0	0	0	0	0.31							0.04
	n	4	8	3	12	6	5							38
7/28- 8/10	CPUE	0	0	0	0	0.31	0							0.06
	SE	0	0	0	0	0.31	0							0.06
	n	4	4	4	7	5	3							27
8/11- 8/24	CPUE	0	0	0	0	0.38	0							0.06
	SE	0	0	0	0	0.38	0							0.06
	n	0	3	3	10	4	6							26
8/25- 9/ 7	CPUE	0	0	0	0	0.51	0							0.05
	SE	0	0	0	0	0.51	0							0.05
	n	4	8	2	8	3	6							31
9/ 8- 9/21	CPUE	0	0	0	0	0.92	0.31							0.19
	SE	0	0	0	0	0.61	0.31							0.11
	n	3	11	6	2	5	5							32
9/22- 10/5	CPUE	0	0	0	2.38	0	0	0	0	0	0	0	0	1.79
	SE	0	0	0	2.20	0	0	0	0	0	0	0	0	1.65
	n	0	0	2	9	1	0	0	0	0	0	0	0	12

*CPUE = catch per unit effort
SE = standard error
n = number of tows

Table D-66

Catch per Unit Effort of Age II and Older White Perch within 12 Geographical Regions of Hudson River Estuary [RM 12-153 (km 19-245)] Based on Day Sampling by 100-ft (30.5-m) Beach Seine during 1974

Date		Region: YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
3/24- 4/ 6	CPUE*	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	0	0	0	0	0	0	0	0	0	0	0
4/ 7- 4/20	CPUE	0	0	3.13	0.80	0.20	0	0	3.00	0	0	0	0	0.64
	SE	0	0	2.07	0.80	0.20	0	0	0	0	0	0	0	0.34
	n	0	0	8	5	10	6	0	1	3	4	9	7	53
4/21- 5/ 4	CPUE	5.43	2.14	2.69	4.31	0.23	6.73	3.63	13.50	0	0	0	0	3.69
	SE	2.45	0.91	0.96	2.38	0.17	3.56	2.16	13.50	0	0	0	0	0.83
	n	7	7	13	13	13	11	8	2	0	0	0	1	75
5/ 5- 5/18	CPUE	1.00	2.25	3.38	0.67	3.25	4.83	8.33	10.33	19.67	1.25	0.40	0	3.09
	SE	0.23	1.11	1.22	0.29	2.83	3.09	2.40	7.33	11.05	1.25	0.40	0	0.70
	n	14	8	16	9	8	6	3	3	3	4	5	8	87
5/19- 6/ 1	CPUE	0.09	1.20	8.43	2.06	5.33	15.33	17.25	10.00	37.00	6.00	3.20	0.88	6.38
	SE	0.09	0.58	6.60	0.92	2.67	5.44	8.10	9.00	26.00	5.00	2.33	0.74	1.56
	n	11	5	14	16	12	6	8	2	2	2	5	8	91
6/ 2- 6/15	CPUE	0.73	9.29	13.05	4.61	3.45	15.63	14.53	24.38	2.17	13.00	3.38	1.25	7.89
	SE	0.73	2.93	4.14	1.86	1.18	5.77	5.19	9.44	1.17	9.58	1.97	0.58	1.20
	n	11	7	21	18	20	8	15	8	6	8	13	20	155
6/16- 6/29	CPUE	9.31	10.75	24.69	2.47	1.40	4.33	4.50	3.11	2.17	3.77	4.13	1.55	5.78
	SE	7.17	4.02	11.37	1.08	0.40	1.49	2.07	1.58	1.51	1.04	2.49	1.19	1.30
	n	13	8	13	15	15	9	16	9	6	13	16	20	153
6/30- 7/13	CPUE	14.06	21.25	22.50	1.50	17.60	0.40	0.83	1.00	1.67	8.00	0.20	3.42	3.94
	SE	5.47	11.84	12.47	0.73	15.03	0.24	0.48	0.58	1.67	3.13	0.13	1.89	2.31
	n	16	8	10	8	10	5	6	4	3	6	10	19	105
7/14- 7/27	CPUE	8.25	3.58	1.25	1.65	0.67	2.63	1.38	0.38	2.20	5.30	8.62	1.80	3.06
	SE	2.84	1.37	0.66	0.67	0.30	2.01	0.78	0.38	1.28	1.68	5.44	1.32	0.63
	n	12	12	12	17	15	8	16	8	5	10	13	20	148
7/28 8/10	CPUE	10.90	1.31	1.31	0.65	0.85	0.92	0.86	0.50	3.25	4.90	0.25	0.31	2.20
	SE	3.15	0.65	0.55	0.27	0.42	0.47	0.47	0.33	2.29	1.54	0.11	0.22	0.45
	n	20	16	16	26	20	12	14	8	4	10	16	16	178
8/11- 8/24	CPUE	4.24	1.42	1.13	4.81	0.78	0.57	1.43	0.29	0.50	6.67	0.08	0.08	2.01
	SE	1.48	0.61	0.63	4.51	0.55	0.30	1.06	0.18	0.50	2.68	0.08	0.06	0.68
	n	17	12	15	21	9	7	14	7	4	9	13	24	152
8/25- 9/ 7	CPUE	4.38	10.67	45.87	0.38	0	4.00	0.33	0.50	0.17	2.00	0.40	0.40	7.48
	SE	2.41	7.77	25.31	0.38	0	2.14	0.21	0.34	0.17	0.90	0.24	0.34	3.56
	n	8	6	15	8	5	6	15	6	6	9	15	15	114
9/ 8- 9/21	CPUE	13.60	1.22	0.61	0.17	0.13	0.20	0.36	0.11	0	1.63	0.62	0.12	1.34
	SE	6.83	0.98	0.31	0.11	0.13	0.20	0.28	0.11	0	0.60	0.46	0.08	0.53
	n	10	9	23	29	8	5	11	9	4	8	13	17	146
9/22- 10/ 5	CPUE	7.54	0.54	0.63	1.00	0.11	0.64	0.23	0.86	0	1.33	0.50	0.27	1.83
	SE	2.18	0.40	0.50	1.00	0.11	0.54	0.12	0.55	0	0.55	0.44	0.15	0.47
	N	26	13	8	12	9	11	13	7	4	9	16	15	143

*CPUE = catch per unit effort
SE = standard error
n = number of tows

Table D-67

Catch per Unit Effort of Age II and Older White Perch within Four Geographical Regions of Hudson River Estuary [RM 34-61 (km 54-98)] Based on Night Sampling by 100-ft (30.5-m) Beach Seine during 1974

Date		YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
		Region												
3/24-4/ 6	CPUE*	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	0	0	0	0	0	0	0	0	0	0	0
4/ 7-4/20	CPUE													
	SE													
	n													
4/21-5/ 4	CPUE													
	SE													
	n													
5/ 5-5/18	CPUE													
	SE													
	n													
5/19-6/ 1	CPUE													
	SE													
	n													
6/ 2-6/15	CPUE													
	SE													
	n													
6/16-6/29	CPUE													
	SE													
	n													
6/30-7/13	CPUE													
	SE													
	n													
7/14-7/27	CPUE			0	0	0	0							0
	SE			0	0	0	0							0
	n			0	0	0	0							0
7/28-8/10	CPUE			0	1.29	0.33	0.33							0.79
	SE			0	0.81	0.33	0.33							0.42
	n			1	7	3	3							14
8/11-8/24	CPUE			0	5.50	1.67	0.17							3.26
	SE			0	1.89	0.56	0.17							1.08
	n			1	14	6	6							27
8/25-9/ 7	CPUE			0	5.73	1.60	5.50							4.77
	SE			0	1.33	0.93	1.50							0.99
	n			0	15	5	2							22
9/ 8-9/21	CPUE			0	1.92	1.25	0.67							1.45
	SE			0	0.80	0.95	0.67							0.52
	n			2	13	4	3							22
9/22-10/5	CPUE	0	0	1.50	2.67	0.75	0.17	0	0	0	0	0	0	1.63
	SE	0	0	0.50	1.05	0.48	0.17	0	0	0	0	0	0	0.57
	n	0	0	2	12	4	6	0	0	0	0	0	0	24

*CPUE = catch per unit effort
SE = standard error
n - number of tows

Table D-68

Catch per Unit Effort of Age II and Older White Perch within Six Geographical Regions of Hudson River Estuary [RM 12-61 (km 19-98)] Based on Day Sampling by Bottom Trawl during 1974

		Region												
Date		YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
3/24-	CPUE*	0	1.53	12.24	8.16	0	0	0	0	0	0	0	0	6.63
4/16	SE	0	0	0	6.01	0	0	0	0	0	0	0	0	3.20
	n	0	2	1	3	0	0	0	0	0	0	0	0	6
4/7-	CPUE	1.53	13.51	28.46	7.48	0	9.18							12.79
4/20	SE	0	6.48	28.46	3.25	0	4.92							5.80
	n	1	6	5	9	1	3							25
4/21-	CPUE	0	0	0	5.36	2.04	5.81							4.32
5/ 4	SE	0	0	0	3.13	1.02	4.06							1.61
	n	0	0	0	6	6	5							17
5/ 5-	CPUE	0	9.35	2.55	0.51	0	0							6.22
5/18	SE	0	6.95	2.55	0.51	0	0							4.22
	n	0	9	3	3	0	0							15
6/ 2-	CPUE	0	0.38	0	0.31	0	0							0.14
6/15	SE	0	0.25	0	0.31	0	0							0.08
	n	5	8	3	5	3	10							34
6/16-	CPUE	0.76	0.92	1.53	0.76	0.38	6.73							1.66
6/29	SE	0.44	0.52	1.53	0.34	0.38	6.36							0.90
	n	4	10	3	10	4	5							36
6/30-	CPUE	0	0	0	0.34	0	0							0.09
7/13	SE	0	0	0	0.22	0	0							0.06
	n	4	10	3	9	5	4							35
7/14-	CPUE	0	0.19	0	0	0	0							0.04
7/27	SE	0	0.19	0	0	0	0							0.04
	n	4	8	3	12	6	5							38
7/28-	CPUE	0	0	0	0.22	0	0							0.06
8/10	SE	0	0	0	0.22	0	0							0.06
	n	4	4	4	7	5	3							27
8/11-	CPUE	0	0	0	0	0	0							0
8/24	SE	0	0	0	0	0	0							0
	n	0	3	3	10	4	6							26
8/25-	CPUE	0	0	0	0	0.51	0							0.05
9/ 7	SE	0	0	0	0	0.51	0							0.05
	n	4	8	2	8	3	6							31
9/ 8 -	CPUE	0	0.14	1.02	0	0	0							0.24
9/21	SE	0	0.14	1.02	0	0	0							0.20
	n	3	11	6	2	5	5							32
9/22-	CPUE	0	0	0	3.74	0	0	0	0	0	0	0	0	2.81
10/5	SE	0	0	0	3.55	0	0	0	0	0	0	0	0	2.67
	n	0	0	2	9	1	0	0	0	0	0	0	0	12

*CPUE = catch per unit effort
SE = standard error
n = number of tows

Table D-69

Standing Crop of White Perch Eggs within 12 Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Day or Night Sampling by Epibenthic Sled and Tucker Trawl during 1974

Date	Time*	YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
		Region												
4/16-4/17	D	NS**	NS	NS	NS	NS	NS	0 (0)†	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
4/23-4/25	D	NS	NS	NS	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
4/29-5/ 4	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/ 6-5/11	N	0 (0)	55,745 (36,255)	0 (0)	0 (0)	0 (0)	0 (0)	28,857 (28,857)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	84,602 (46,337)
5/13-5/18	N	0 (0)	72,939 (53,316)	1,234,399 (516,313)	320,008 (0)	1,046,848 (878,825)	0 (0)	4,379,058 (2,513,266)	1,712,273 (1,517,437)	2,312,500 (648,775)	1,563,540 (1,563,540)	0 (0)	0 (0)	12,641,564 (3,539,272)
5/15-5/18	D	NS	NS	NS	0 (0)	18,835,209 (13,282,308)	3,781,263 (3,145,377)	69,882 (46,598)	1,328,861 (1,328,861)	445,268 (311,242)	3,749,401 (2,793,599)	251,657 (0)	0 (0)	28,461,540 (13,999,364)
5/21-5/24	D	0 (0)	13,533,979 (13,153,790)	896,298 (627,297)	543,436 (450,688)	0 (0)	374,382 (175,487)	216,748 (179,220)	395,074 (240,043)	561,711 (62,854)	176,293 (176,293)	7,562,914 (4,798,992)	90,242,071 (90,242,071)	114,502,905 (91,325,988)
5/23-5/29	N	0 (0)	4,174,693 (3,660,029)	22,173,800 (19,375,483)	0 (0)	641,849 (258,976)	3,165,709 (3,165,709)	826,085 (826,085)	121,450 (121,450)	5,196,280 (3,564,576)	4,915,660 (2,089,645)	626,836 (626,836)	4,973,098 (4,973,098)	46,815,458 (21,018,766)
5/28-5/31	D	0 (0)	3,995,507 (3,610,520)	564,720 (564,720)	0 (0)	1,848,897 (1,848,897)	12,373,456 (12,232,963)	3,652,169 (3,652,169)	608,591 (347,072)	141,053 (141,053)	4,639,331 (2,204,006	0 (0)	0 (0)	27,823,724 (13,592,457)
5/30-6/ 5	N	0 (0)	11,155,161 (9,545,051	76,458,984 (11,551,613)	0 (0)	1,635,509 (1,400,694)	27,505 (27,505)	4,604,550 (2,979,461)	248,948 (203,169)	747,430 (532,545)	3,591,567 (2,102,736)	262,170 (262,170)	0 (0)	188,692,170 (111,625,838)
6/ 4-6/ 7	D	0 (0)	17,932,557 (10,570,633)	322,430 (269,917)	0 (0)	603,983 (235,659)	257,001 (227,853)	3,862,888 (2,517,537)	98,648 (98,648)	833,166 (833,166)	6,760,549 (4,670,147)	894,014 (417,413)	3,098,038 (2,761,816)	34,663,274 (12,189,036)
6/10-6/14	D	0 (0)	1,338,948 (718,204)	113,219,498 (103,322,746)	1,185,805 (903,765)	3,734,729 (2,953,821)	0 (0)	7,369,482 (7,369,482)	167,263 (167,263)	0 (0)	27,916,184 13,807,791)	16,923,140 (9,606,439)	0 (0)	171,855,042 104,990,108)
6/12-6/17	N	0 (0)	4,414,579 (2,644,733)	6,864,527 (5,899,578)	4,792,346 (4,642,424)	7,864,169 (7,221,066)	5,196,440 (5,087,615)	59,110 (59,110)	0 (0)	0 (0)	743,366 (689,277)	0 (0)	0 (0)	29,934,536 (11,910,414)
6/17-6/23	N	0 (0)	0 (0)	0 (0)	340,535 (321,334)	405,150 (217,299)	429,578 (233,473)	21,951 (21,951)	0 (0)	0 (0)	73,830 (73,830)	116,937 (116,937)	0 (0)	1,387,981 (473,910)
6/24-6/27	N	0 (0)	0 (0)	0 (0)	1,079,949 (715,835)	496,545 (330,473)	624,459 (28,370)	99,009 (77,692)	0 (0)	33,756 (33,756)	NS	NS	NS	2,333,718 (793,481)
7/ 1-7/ 5	N	0 (0)	0 (0)	11,622 (11,622)	51,465 (51,465)	0 (0)	0 (0)	128,685 (128,685)	0 (0)	0 (0)	NS	NS	NS	191,771 (139,081)
7/ 8-7/11	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	NS	NS	NS	0 (0)
7/15-7/18	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	NS	NS	NS	0 (0)
7/22-7/26	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7/29-8/ 2	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
8/ 5-8/ 9	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
8/12-8/15	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

*N = night samples, D = day samples
**NS = no samples taken
†Numbers in parentheses represent one standard error

Table D-70

Standing Crop of White Perch Yolk-Sac Larvae within 12 Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Day or Night Sampling by Epibenthic Sled and Tucker Trawl during 1974

		Region												
Date	Time*	YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
4/16-4/17	D	NS**	NS	NS	NS	NS	NS	0 (0)†	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
4/23-4/25	D	NS	NS	NS	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
4/29-5/4	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/6-5/11	N	0 (0)	253,499 (253,499)	0 (0)	0 (0)	1,908,727 (0)	0 (0)	0 (0)	0 (0)	48,496 (48,496)	432,877 (267,584)	0 (0)	0 (0)	2,643,599 (371,772)
5/13-5/18	N	69,838 (69,838)	122,718 (68,849)	344,962 (287,342)	43,815 (43,815)	0 (0)	557,477 (326,910)	430,187 (328,554)	88,457 (88,457)	476,635 (359,338)	0 (0)	0 (0)	0 (0)	2,134,088 (667,734)
5/15-5/16	D	NS	NS	NS	2,336,821 (2,336,821)	1,679,384 (370,761)	2,082,308 (578,953)	723,283 (318,334)	1,149,795 (48,232)	3,996,652 (1,783,868)	1,254,901 (764,183)	503,314 (0)	0 (0)	13,726,458 (3,131,007)
5/21-5/24	D	0 (0)	22,727,535 3,433,791)	15,312,196 (4,585,610)	1,881,107 (416,529)	3,256,209 (2,776,506)	3,359,722 (397,360)	14,156,323 (5,937,502)	13,630,323 (7,352,930)	21,782,179 (5,447,161)	9,846,276 (3,362,283)	1,731,955 (494,402)	642,062 (325,628)	108,325,607 (13,096,014)
5/23-5/29	N	0 (0)	7,827,901 (1,931,460)	499,782 (36,219)	173,489 (121,414)	586,844 (391,482)	364,557 (334,599)	683,761 (353,739)	1,905,278 (1,200,374)	8,059,508 (3,466,077)	3,382,569 (2,226,656)	5,109,593 (2,163,912)	191,273 (191,273)	28,784,555 (5,221,937)
5/28-5/31	D	0 (0)	4,502,518 (1,723,852)	2,121,897 (1,127,158)	0 (0)	324,093 287,030)	403,483 (190,069)	3,097,715 (1,855,102)	7,398,068 (1,494,052)	7,864,709 (3,888,105)	26,456,757 (8,023,120)	6,796,848 (4,044,192)	2,323,529 (2,323,529)	61,289,616 (10,548,761)
5/30-6/5	N	0 (0)	72,835 (72,835)	31,946 (31,946)	0 (0)	465,171 (465,171)	112,786 (44,962)	2,431,270 (2,119,338)	1,054,556 (920,979)	2,278,387 (1,718,433)	10,281,965 (251,178)	1,713,091 (246,359)	0 (0)	18,492,006 (2,939,612)
6/4-6/7	D	0 (0)	1,725,820 (738,999)	791,448 (356,264)	260,018 (216,335)	232,104 (199,402)	3,657,216 (2,817,051)	593,900 (481,165)	816,284 (473,422)	1,314,319 (929,649)	7,140,629 (3,954,843)	3,198,752 (852,848)	789,713 (543,395)	20,520,202 (5,165,141)
6/10-6/14	D	44,815 (44,815)	2,605,956 (1,043,931)	9,253,901 (4,064,783)	521,165 (130,061)	907,411 (549,685)	38,076 (38,076)	449,364 (207,806)	178,261 (178,261)	3,246,658 (1,073,722)	1,089,216 (592,258)	1,430,363 (601,983)	0 (0)	19,765,184 (4,458,225)
6/12-6/17	N	0 (0)	152,217 (100,193)	0 (0)	1,047,613 (771,675)	9,417,913 (6,465,923)	632,630 (464,339)	112,115 (112,115)	25,495,783 (25,495,783)	253,909 (253,909)	170,504 (170,504)	111,712 (111,712)	150,057 (150,057)	37,544,451 (26,321,195)
6/17-6/23	N	0 (0)	46,946 (32,148)	164,006 (142,903)	1,038,357 (580,367)	717,262 (471,977)	179,872 (98,312)	100,481 (81,540)	115,272 (83,117)	0 (0)	271,053 (218,359)	0 (0)	107,968 (62,575)	2,741,217 (809,853)
6/24-6/27	N	0 (0)	0 (0)	41,378 (41,378)	1,123,022 (1,023,124)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	NS	NS	NS	1,164,400 (1,023,961)
7/1-7/5	N	0 (0)	18,600 (18,600)	398,980 (389,250)	631,158 (418,411)	95,327 (95,327)	0 (0)	0 (0)	0 (0)	0 (0)	NS	NS	NS	1,144,065 (579,670)
7/8-7/11	N	0 (0)	0 (0)	0 (0)	8,318 (8,318)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	NS	NS	NS	8,318 (8,318)
7/15-7/18	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	NS	NS	NS	0 (0)
7/22-7/26	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7/29-8/2	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
8/5-8/9	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
8/12-8/15	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

*N = night samples, D = day samples
**NS = no samples taken
†Numbers in parentheses represent one standard error

Table D-71

Standing Crop of White Perch Post Yolk-Sac Larvae within 12 Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Day or Night Sampling by Epibenthic Sled and Tucker Trawl during 1974

		Region												
Date	Time*	YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
4/16-4/17	D	NS**	NS	NS	NS	NS	NS	0 (0)†	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
4/23-4/25	D	NS	NS	NS	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
4/29-5/ 4	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/ 6-5/11	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/13-5/18	N	47,022 (47,022)	430,836 (250,671)	79,813 (79,813)	0 (0)	188,470 (188,470)	30,461 (30,461)	40,626 (40,626)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	817,227 (330,932)
5/15-5/18	D	NS	NS	NS	992,639 (565,241)	984,561 (456,310)	353,730 (223,224)	0 (0)	0 (0)	0 (0)	0 (0)	251,657 (0)	0 (0)	2,582,587 (759,964)
5/21-5/24	D	0 (0)	15,937,554 (1,592,488)	2,411,511 (650,627)	1,237,726 (704,178)	330,832 (69,529)	2,627,433 (159,810)	910,201 (433,066)	361,847 (361,847)	255,092 (15,303)	20,127 (20,127)	0 (0)	0 (0)	24,092,322 (1,950,562)
5/23-5/29	N	1,041,206 (880,575)	15,342,347 (3,080,301)	472,338 (244,218)	857,896 (363,933)	514,771 (460,554)	3,879,468 (581,793)	1,364,283 (622,246)	2,819,441 (1,744,025)	4,426,675 (4,175,013)	325,512 (286,008)	0 (0)	0 (0)	31,143,935 (5,652,229)
5/28-5/31	D	0 (0)	6,366,886 (1,754,973)	4,289,115 (301,383)	1,897,230 (121,060)	3,910,005 (1,769,081)	5,880,437 (2,864,377)	20,092,189 (10,290,523)	29,139,220 (8,511,957)	14,884,780 (4,608,515)	2,502,534 (2,246,992)	0 (0)	0 (0)	88,962,392 (14,803,897)
5/30-6/ 5	N	0 (0)	1,558,519 (712,657)	744,062 (421,463)	1,228,419 (981,834)	13,338,551 (7,522,772)	3,376,806 (1,369,377)	10,370,348 (1,763,095)	12,133,603 (2,958,832)	13,182,853 (6,473,212)	50,236 (50,236)	221,556 (221,556)	0 (0)	56,204,950 (10,673,990)
6/ 4-6/ 7	D	0 (0)	22,860,296 (12,977,145)	4,886,187 (1,121,851)	5,310,272 (2,743,483)	2,547,142 (2,081,308)	34,684,447 (9,556,622)	24,740,195 (6,285,946)	10,840,755 (7,436,460)	9,559,904 (3,736,860)	6,596,117 (3,872,854)	296,491 (193,431)	0 (0)	122,321,799 (19,916,500)
6/10-6/14	D	0 (0)	1,748,262 (1,270,167)	16,148,100 (3,505,370)	45,267,217 (16,196,323)	15,152,584 (8,036,647)	39,747,795 (3,880,448)	61,364,248 (23,021,981)	34,528,203 (18,304,209)	71,403,409 (39,024,702)	11,164,641 (4,938,129)	12,863,720 (1,010,417)	0 (0)	309,388,164 (52,623,725)
6/12-6/17	N	108,944 (108,944)	69,211 (69,211	5,715,387 (113,805)	19,370,836 (8,233,457)	66,080,499 (25,756,716)	27,098,154 (9,676,915)	99,350,450 (59,936,933)	39,210,516 (26,162,066)	119,217,757 (13,894,784)	34,459,255 (11,245,226)	10,303,495 (1,195,358)	450,171 (450,171)	421,434,660 (73,640,421)
6/17-6/23	N	39,039 (39,039)	1,244,648 (593,359)	2,615,172 (532,165)	73,870,107 (15,303,249)	72,154,180 (26,443,039)	13,778,725 (3,147,463)	66,582,291 (11,955,239)	41,017,117 (7,648,014)	23,755,680 (10,207,253)	12,372,737 (3,970,282)	11,926,358 (1,793,305)	933,666 (761,892)	320,289,692 (35,624,913)
6/24-6/27	N	0 (0)	1,108,253 (285,391)	11,953,429 (3,822,357)	52,937,649 (10,172,777)	8,157,669 (4,172,523)	16,716,447 (3,850,460)	14,946,657 (2,201,228)	24,468,595 (5,251,806)	9,382,781 (2,943,893)	NS	NS	NS	140,448,112 (13,838,591)
7/ 1-7/ 5	N	135,969 (90,055)	374,357 (239,715)	1,192,243 (400,064)	5,574,469 (2,158,597)	210,430 (117,053)	3,296,912 (461,437)	4,720,570 (1,081,424)	4,437,512 (2,011,459)	5,721,682 (667,029)	NS	NS	NS	25,664,144 (3,282,097)
7/ 8-7/11	N	217,201 (178,521)	2,124,860 (711,952)	1,726,571 (574,443)	1,318,619 (297,715)	1,270,434 (340,359)	2,573,225 (984,281)	7,815,117 (2,217,090)	5,425,513 (1,467,251)	2,006,492 (712,656)	NS	NS	NS	24,478,030 (3,101,324)
7/15-7/18	N	836,571 (645,216)	397,614 (250,294)	55,523 (40,517)	122,007 (62,529)	1,148,632 (394,696)	835,328 (219,269)	1,119,887 (411,492)	1,236,633 (426,059)	1,901,773 (1,507,651)	NS	NS	NS	7,653,969 (1,819,953)
7/22-7/26	N	203,694 (203,694)	0 (0)	0 (0)	70,560 (61,457)	429,497 (229,497)	233,593 (71,950)	441,795 (191,392)	483,022 (153,990)	2,315,218 (190,206)	2,293,203 (738,673)	1,535,946 (377,517)	0 (0)	8,006,528 (942,232)
7/29-8/ 2	N	0 (0)	0 (0)	0 (0)	0 (0)	16,461 (16,461)	19,705 (19,705)	99,703 (57,031)	268,006 (150,043)	640,548 (179,534)	449,374 (260,947)	0 (0)	0 (0)	1,493,797 (356,021)
8/ 5-8/ 9	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	22,295 (22,295)	121,267 (121,267)	41,793 (41,793)	0 (0)	0 (0)	0 (0)	0 (0)	185,355 (130,190)
8/12-8/15	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

*N = night samples, D = day samples
**NS = no samples taken
†Numbers in parentheses represent one standard error

Table D-72

Standing Crop of Juvenile White Perch within 12 Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Day or Night Sampling by Epibenthic Sled and Tucker Trawl during 1974

Date	Time*	YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
4/16-4/17	D	NS**	NS	NS	NS	NS	NS	0 (0)†	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
4/23-4/25	D	NS	NS	NS	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
4/29-5/4	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/6-5/11	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/13-5/18	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/15-5/18	D	NS	NS	NS	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/21-5/24	D	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/23-5/29	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/28-5/31	D	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/30-6/5	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
6/4-6/7	D	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
6/10-6/14	D	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
6/12-6/17	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	58,417 (58,417)	0 (0)	0 (0)	0 (0)	0 (0	0 (0)	0 (0)	58,417 (58,417)
6/17-6/23	N	0 (0)	23,059 (23,059)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0	0 (0)	0 (0)	23,059 (23,059)
6/24-6/27	N	0 (0)	0 (0)	0 (0)	35,131 (35,131)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	NS	NS	NS	35,131 (35,131)
7/1-7/5	N	0 (0)	0 (0)	0 (0)	0 (0)	178,066 (178,066)	147,112 (147,112)	0 (0)	181,626 (106,517)	35,457 (24,234)	NS	NS	NS	542,261 (255,505)
7/8-7/11	N	0 (0)	195,392 (170,838)	149,784 (78,349)	10,201 (10,201)	0 (0)	0 (0)	0 (0)	0 (0)	50,674 (50,674)	NS	NS	NS	406,051 (194,926)
7/15-7/18	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	120,872 (120,872)	289,310 (131,930)	211,138 (188,406)	NS	NS	NS	621,320 (259,832)
7/22-7/26	N	0 (0)	45,874 (45,874)	0 (0)	0 (0)	0 (0)	0 (0)	440,056 (246,876)	128,844 (114,005)	119,418 (57,101)	463,265 (463,265)	193,072 (193,072)	0 (0)	1,390,528 (575,500)
7/29-8/2	N	0 (0)	0 (0)	0 (0)	204,609 (191,663)	0 (0)	0 (0)	351,341 (303,612)	182,443 (89,096)	779,871 (209,945)	4,223,577 (622,725)	341,779 (0)	222,132 (222,132)	6,305,752 (786,167)
8/5-8/9	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	22,152 (22,152)	32,126 (32,126)	40,395 (26,097)	110,158 (66,288)	761,984 (648,983)	0 (0)	177,007 (177,007)	1,143,822 (677,575)
8/12-8/15	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	107,435 (81,462)	246,820 (152,407)	150,617 (136,240)	625,868 (352,733)	681,851 (567,963)	0 (0)	0 (0)	1,812,592 (703,866)

*N = night samples, D = day samples
**NS = no samples taken
†Numbers in parentheses represent one standard error

Table D-73

Standing Crop of Juvenile White Perch within 12 Geographical Regions of Hudson River Estuary [RM 12-153 (km 19-245)] Based on Daytime Sampling by 100-ft (30.5-m) Beach Seine during 1974

	Region												
Date	YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
4/ 7- 4/20	NS*	NS	0 (0)**	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
4/21- 5/ 4	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	NS	NS	NS	0 (0)	0 (0)
5/ 5- 5/18	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/19- 6/ 1	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
6/ 2- 6/15	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
6/16- 6/29	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
6/30- 7/13	0 (0)	0 (0)	0 (0)	0 (0)	1,054 (583)	0 (0)	43,756 (27,810)	1,550 (1,174)	5,739 (5,739)	32,185 (21,461)	1,968 (1,968)	0 (0)	86,252 (35,672)
7/14- 7/27	0 (0)	18,931 (18,931)	0 (0)	542 (542)	1,230 (623)	1,331 (1,331)	4,435 (1,818)	10,850 (5,003)	12,052 (10,040)	28,089 (17,788)	46,919 (42,125)	13,587 (8,649)	137,966 (51,533)
7/28- 8/10	322 (322)	11,359 (6,558)	0 (0)	1,418 (1,107)	3,953 (1,202)	52,368 (33,973)	47,642 (15,161)	5,735 (3,213)	12,913 (7,456)	237,000 (141,882)	63,946 (30,876)	5,944 (5,109)	442,600 (150,351)
8/11- 8/24	379 (379)	11,359 (5,932)	0 (0)	23,258 (10,345)	11,714 (5,328)	60,863 (30,190)	61,833 (17,530)	21,080 (9,140)	25,827 (10,544)	399,877 (165,561)	155,891 (68,683)	37,929 (17,406)	810,009 (184,431)
8/25- 9/ 7	0 (0)	45,436 (16,591)	34,062 (14,953)	114,042 (53,649)	4,744 (3,575)	88,759 (29,705)	32,167 (12,209)	10,747 (5,059)	66,001 (40,420)	284,790 (104,835)	133,794 (71,050)	18,116 (10,327)	832,657 (149,083)
9/ 8- 9/21	0 (0)	35,339 (25,988)	92,365 (40,180)	78,173 (38,947)	16,802 (12,159)	23,432 (18,571)	15,481 (8,386)	18,876 (14,171)	25,827 (23,047)	46,083 (19,610)	71,135 (31,939)	1,598 (1,094)	425,111 (80,669)
9/22- 10/5	992 (992)	55,921 (28,715)	13,446 (7,187)	49,918 (23,671)	4,393 (2,406)	33,890 (18,099)	14,737 (8,482)	4,606 (2,688)	6,457 (6,457)	81,926 (51,599)	51,648 (22,993)	5,435 (3,703)	323,366 (71,390)

*NS = no samples taken
**Numbers in parentheses represent one standard error

Table D-74

Standing Crop of Juvenile White Perch within Four Geographical Regions of Hudson River Estuary [RM 34-61 (km 54-98)] Based on Night Sampling by 100-ft (30.5-m) Beach Seine during 1974

Date	Region: YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
4/21 - 5/ 4	NS*	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/ 5 - 5/18	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/19 - 6/ 1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
6/ 2 - 6/15	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
6/16 - 6/29	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
6/30 - 7/13	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7/14 - 7/27	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7/28 - 8/10	NS	NS	53,782 (0)**	30,280 (15,278)	16,692 (8,916)	63,907 (28,180)	NS	NS	NS	NS	NS	NS	164,660 (33,271)
8/11 - 8/24	NS	NS	26,891 (0)	38,179 (14,389)	16,692 (7,868)	51,480 (19,911)	NS	NS	NS	NS	NS	NS	133,242 (25,794)
8/25 - 9/ 7	NS	NS	NS	52,221 (24,558)	21,612 (6,090)	95,860 (21,302)	NS	NS	NS	NS	NS	NS	169,693 (33,075)
9/ 8 - 9/21	NS	NS	121,010 (121,010)	108,460 (26,830)	48,758 (20,028)	85,209 (60,565)	NS	NS	NS	NS	NS	NS	363,436 (139,400)
9/22 -10/ 5	NS	NS	40,337 (40,337)	82,172 (16,101)	32,286 (9,026)	108,286 (33,390)	NS	NS	NS	NS	NS	NS	263,080 (55,521)

*NS = no samples taken
**Numbers in parentheses represent one standard error

Table D-75

Density Estimates (No. /1000 m^3) of Juvenile Atlantic Tomcod within Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Day or Night Sampling by Epibenthic Sled and Tucker Trawl during 1974

Date	Time*		YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL
			Region											
4/29-5/ 4	N	Den.	3642.10	1176.55	0.76	0.16	0	0	0	0	0	0	0	0
		SE**	3021.37	578.58	0.42	0.12	0	0	0	0	0	0	0	0
5/ 6-5/11	N	Den.	391.08	157.99	16.80	0.13	5.54	0.17	1.01	3.55	1.95	0	0	0
		SE	22.32	71.46	9.74	0.13	0.38	0.17	1.01	0.90	0	0	0	0
5/13-5/18	N	Den.	0.96	378.16	16.74	25.02	2.04	0.48	2.76	3.34	0	0	0	0
		SE	0.69	185.81	11.11	22.43	0.16	0.28	1.55	2.66	0	0	0	0
5/15-5/18	D	Den.	0	0	0	0	9.75	0	0.96	0.21	0	0	0	0
		SE	0	0	0	0	4.11	0	0.64	0.21	0	0	0	0
5/21-5/24	D	Den.	141.62	102.48	47.49	8.07	1.84	1.59	0.46	1.16	0.81	0.15	0	0
		SE	67.93	36.25	41.42	4.84	1.84	1.10	0.22	1.16	0.81	0.15	0	0
5/23-5/29	N	Den.	532.21	110.94	10.35	4.76	6.81	2.23	1.06	0	0	0	0	0
		SE	198.37	50.67	7.09	1.56	2.41	1.67	0.97	0	0	0	0	0
5/28-5/31	D	Den.	21.19	150.21	54.91	80.87	25.44	7.36	5.30	0.35	0	0	0	0
		SE	7.05	61.54	51.69	24.63	9.82	4.16	3.01	0.35	0	0	0	0
5/30-6/ 5	N	Den.	108.85	191.93	58.38	37.81	27.88	1.04	2.29	0.20	0	0.42	0	0
		SE	29.73	55.03	15.58	18.75	26.07	0.63	1.53	0.20	0	0.24	0	0
6/ 4-6/ 7	D	Den.	36.27	71.73	153.38	49.03	19.32	6.20	3.40	0.61	1.51	0	0	2.52
		SE	19.98	47.37	0	20.57	4.58	3.75	1.05	0.61	0.91	0	0	2.52
6/10-6/14	D	Den.	12.99	10.85	124.05	21.79	34.22	0.40	12.09	0	0	0	0.31	0
		SE	12.72	9.26	122.81	7.04	16.72	0.40	10.25	0	0	0	0.31	0
6/12-6/17	N	Den.	0	343.60	402.92	137.78	21.72	9.59	7.64	0	0	0	0	0
		SE	0	88.53	375.22	92.78	13.71	4.88	6.03	0	0	0	0	0
6/17-6/23	N	Den.	146.64	66.60	83.84	23.53	21.15	8.47	0	0	0	0	0	0
		SE	50.44	27.53	51.14	7.09	8.03	7.27	0	0	0	0	0	0
6/24-6/27	N	Den.	333.98	139.02	59.70	87.83	18.00	69.93	11.59	2.39	0.61	0	0	0
		SE	198.50	49.00	18.39	28.06	6.06	12.98	4.49	0.91	0.33	0	0	0
7/ 1-7/ 5	N	Den.	346.54	21.00	45.91	12.76	8.23	23.42	6.57	1.55	0.77	0	0	0
		SE	162.42	9.21	26.96	3.49	2.91	7.33	1.84	1.15	0.42	0	0	0
7/ 8-7/11	N	Den.	229.91	86.74	11.46	20.09	14.16	6.37	3.80	2.33	1.01	0	0	0
		SE	118.15	50.71	7.83	8.11	10.32	3.05	1.76	1.20	0.88	0	0	0
7/15-7/18	N	Den.	303.00	40.40	21.86	26.35	42.19	20.19	10.06	0.54	0.34	0	0	0
		SE	204.48	16.11	6.70	10.14	24.43	11.66	2.93	0.36	0.23	0	0	0
7/22-7/26	N	Den.	195.60	34.60	2.55	17.25	54.94	14.29	1.12	0.16	0.71	0	1.99	0
		SE	62.08	26.59	1.36	6.14	21.66	7.02	0.45	0.11	0.60	0	1.99	0
7/29-8/ 2	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
8/ 5-8/ 9	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0
8/12-8/15	N	Den.	0	0	0	0	0	0	0	0	0	0	0	0
		SE	0	0	0	0	0	0	0	0	0	0	0	0

*N = night samples, D = day samples
**SE = one standard error

Table D-76

Density Estimates (No. /1000 m^3) of Juvenile Atlantic Tomcod within Seven Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-122)] Based on Night Sampling in the Shoals by Epibenthic Sled during 1974

	Region						
Date	YK	TZ	CH	IP	WP	CW	PK
8/19 - 8/22	7.186 (3.547)*	11.042 (3.433)	6.252 (.406)	2.751 (.041)	0 (0)	44.522 (28.190)	1.243 (.938)
8/26 - 8/29	0 (0)	0 (0)	.148 (.148	2.618 (1.933)	1.687 (.698)	26.836 (.459)	1.446 (1.145)
9/ 3 - 9/ 6	0 (0)	0 (0)	2.576 (1.497)	14.461 (4.978)	22.314 (0)	27.590 (12.328)	.394 (.253)
9/ 9 - 9/12	.022 (.022)	0 (0)	.514 (.336)	7.299 (3.831)	3.125 (1.294)	8.205 (6.190)	1.694 (.970)
9/16 - 9/19	.094 (.050)	6.209 (1.683)	9.425 (2.558)	10.413 (7.178)	3.747 (1.009)	8.906 (6.062)	.787 (.418)
9/23 - 9/26	.065 (.065)	0 (0)	.862 (.471)	2.526 (.895)	.164 (.164)	2.161 (1.459)	1.601 (1.159)

*Numbers in parentheses represent one standard error

Table D-77

Catch per Unit Effort of Juvenile Atlantic Tomcod within 12 Geographical Regions of Hudson River Estuary [RM 12-153 (km 19-245)] Based on Day Sampling by 100-ft (30.5-m) Beach Seine during 1974

		Region												
Date		YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
3/24– 4/ 6	CPUE*	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	0	0	0	0	0	0	0	0	0	0	0
4/ 7– 4/20	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	8	5	10	6	0	1	3	4	9	7	53
4/21– 5/ 4	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	7	7	13	13	13	11	8	2	0	0	0	1	75
5/5– 5/18	CPUE	6.00	0.88	0	0	0	0	0	0	0	0	0	0	1.05
	SE	2.57	0.61	0	0	0	0	0	0	0	0	0	0	0.47
	n	14	8	16	9	8	6	3	3	3	4	5	8	87
5/19– 6/ 1	CPUE	57.45	2.80	0.14	0	0	0	0	0	0	0	0	0	7.12
	SE	21.41	1.36	0.14	0	0	0	0	0	0	0	0	0	3.17
	n	11	5	0.14	16	12	6	8	2	2	2	5	8	91
6/ 2– 6/15	CPUE	44.91	12.86	3.48	0.28	0	0	0	0	0	0	0	0	4.27
	SE	15.28	6.23	3.05	0.14	0	0	0	0	0	0	0	0	1.48
	n	11	7	21	18	20	8	15	8	6	8	13	20	155
6/16– 6/29	CPUE	147.62	5.50	0	1.80	0.53	0	0	0	0	0	0	0	13.06
	SE	48.13	3.26	0	0.90	0.34	0	0	0	0	0	0	0	5.16
	n	13	8	13	15	15	9	16	9	6	13	16	20	153
6/30– 7/13	CPUE	31.94	54.00	0.30	0	0	0	0	0	0	0	0	0	9.01
	SE	12.78	32.62	0.21	0	0	0	0	0	0	0	0	0	3.45
	n	16	8	10	8	10	5	6	4	3	6	10	19	105
7/14– 7/27	CPUE	1.67	5.08	0.08	0	0	0	0	0	0	0	0	0	0.55
	SE	0.48	2.15	0.08	0	0	0	0	0	0	0	0	0	0.21
	n	12	12	12	17	15	8	16	8	5	10	13	20	148
7/28– 8/10	CPUE	0.25	0.38	0.06	0.04	0	0	0	0	0	0	0	0	0.07
	SE	0.12	0.18	0.06	0.04	0	0	0	0	0	0	0	0	0.02
	n	20	16	16	26	20	12	14	8	4	10	16	16	178
8/11– 8/24	CPUE	1.00	0.42	0.13	0.33	0	0	0	0	0	0	0	0	0.20
	SE	0.41	0.19	0.13	0.24	0	0	0	0	0	0	0	0	0.06
	n	17	12	15	21	9	7	14	7	4	9	13	24	152
8/25– 9/ 7	CPUE	0	0.17	0	0.13	0.20	0	0	0	0	0	0	0	0.03
	SE	0	0.17	0	0.13	0.20	0	0	0	0	0	0	0	0.02
	n	8	6	15	8	5	6	15	6	6	9	15	15	114
9/ 8– 9/21	CPUE	0	0	0	0.07	0	0	0	0	0	0	0	0	0.01
	SE	0	0	0	0.05	0	0	0	0	0	0	0	0	0.01
	n	10	9	23	29	8	5	11	9	4	8	13	17	146
9/22– 10/5	CPUE	0.04	0.62	0.38	0.08	0	0	0	0	0	0	0	0	0.09
	SE	0.04	0.33	0.38	0.08	0	0	0	0	0	0	0	0	0.04
	n	26	13	8	12	9	11	13	7	4	9	16	15	143

*CPUE = catch per unit effort
SE = standard error
n = number of tows

Table D-78

Catch per Unit Effort of Juvenile Atlantic Tomcod within Four Geographical Regions of Hudson River Estuary [RM 34-61 (km 54-98)] Based on Night Sampling by 100-ft (30.5-m) Beach Seine during 1974

		Region												
Date		YK	TZ	CH	IP	WP	CW	PK	HP	KG	ST	CK	AL	Total
3/24-	CPUE*	0	0	0	0	0	0	0	0	0	0	0	0	0
4/ 6	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	0	0	0	0	0	0	0	0	0	0	0
4/ 7-	CPUE													
4/20	SE													
	n													
4/21-	CPUE													
5/ 4	SE													
	n													
5/ 5-	CPUE													
5/18	SE													
	n													
5/19-	CPUE													
6/ 1	SE													
	n													
6/ 2-	CPUE													
6/15	SE													
	n													
6/16-	CPUE													
6/29	SE													
	n													
6/30-	CPUE													
7/13	SE													
	n													
7/14-	CPUE			0	0	0	0							0
7/27	SE			0	0	0	0							0
	n			0	0	0	0							0
7/28-	CPUE			0	0.86	0	0							0.43
8/10	SE			0	0.70	0	0							0.36
	n			1	7	3	3							0.14
8/11-	CPUE			0	0.21	0	0							0.11
8/24	SE			0	0.11	0	0							0.06
	n			1	14	6	6							27
8/25-	CPUE			0	0.07	0	0							0.05
9/ 7	SE			0	0.07	0	0							0.05
	n			0	15	5	2							22
9/ 8	CPUE			0	0.15	0	0							0.09
9/21	SE			0	0.10	0	0							0.06
	n			2	13	4	3							22
9/22-	CPUE	0	0	0	0.33	0	0	0	0	0	0	0	0	0.17
10/5	SE	0	0	0	0.26	0	0	0	0	0	0	0	0	0.13
	n	0	0	2	12	4	6	0	0	0	0	0	0	24

*CPUE = catch per unit effort
SE = standard error
n = number of tows

services group

Table D-79

Catch per Unit Effort of Juvenile Atlantic Tomcod within Six Geographical Regions of Hudson River Estuary [RM 12-61 (km 19-98)] Based on Day Sampling by Bottom Trawl during 1974

Date		YK	TZ	CH	IP	WP	CW	PK	HP	KG	ST	CK	AL	Total
		Region												
3/24-	CPUE*	0	0	0	0	0	0	0	0	0	0	0	0	0
4/ 6	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	2	1	3	0	0	0	0	0	0	0	0	6
4/ 7-	CPUE	0	0	0	0	0	0							0
4/20	SE	0	0	0	0	0	0							0
	n	1	6	5	9	1	3							25
4/21-	CPUE	0	0	0	0	0	0							0
5/ 4	SE	0	0	0	0	0	0							0
	n	0	0	0	6	6	5							17
5/ 5-	CPUE	0	678.30	2.04	1.53	0	0							407.69
5/18	SE	0	331.95	2.04	1.53	0	0							213.60
	n	0	9	3	3	0	0							15
6/ 2-	CPUE	0.61	5.74	1.02	0	4.59	2.91							2.79
6/15	SE	0.37	3.44	0.51	0	3.85	1.22							0.96
	n	5	8	3	5	3	10							34
6/16-	CPUE	9.18	35.95	59.16	52.63	3.82	1.84							31.24
6/29	SE	3.95	12.91	27.26	12.83	0.44	1.22							6.36
	n	4	10	3	10	4	5							36
6/30-	CPUE	0	0	0	0	0	0.38							0.04
7/13	SE	0	0	0	0	0	0.38							0.04
	n	4	10	3	9	5	4							35
7/14-	CPUE	0	0.38	0	26.65	19.64	0							11.60
7/27	SE	0	0.25	0	9.50	12.04	0							3.95
	n	4	8	3	12	6	5							38
7/28-	CPUE	1.53	0.76	0	73.22	41.92	0							27.09
8/10	SE	0.88	0.76	0	36.24	22.10	0							11.41
	n	4	4	4	7	5	3							27
8/11-	CPUE	0	0	0	18.97	72.29	0							18.42
8/24	SE	0	0	0	11.66	18.71	0							6.04
	n	0	3	3	10	4	6							26
8/25-	CPUE	0	0	0	9.56	121.89	0							14.26
9/ 7	SE	0	0	0	7.16	26.21	0							7.03
	n	4	8	2	8	3	6							31
9/ 8-	CPUE	0	0	0	1.53	7.65	0							1.29
9/21	SE	0	0	0	1.53	2.11	0							0.58
	n	3	11	6	2	5	5							32
9/22-	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
10/5	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	2	9	1	0	0	0	0	0	0	0	12

*CPUE = catch per unit effort
SE = standard error
n = number of tows

Table D-80

Catch per Unit Effort of Yearling and Older Atlantic Tomcod within 12 Geographical Regions of Hudson River Estuary [RM 12-153 (km 19-245)] Based on Day Sampling by 100-ft (30.5-m) Beach Seine during 1974

Date		YK	TZ	CH	IP	WP	CW	PK	HP	KG	ST	CK	AL	Total
		Region												
3/24-	CPUE*	0	0	0	0	0	0	0	0	0	0	0	0	0
4/ 6	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	0	0	0	0	0	0	0	0	0	0	0
4/ 7-	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
4/20	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	8	5	10	6	0	1	3	4	9	7	53
4/21-	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ 4	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	7	7	13	13	13	11	8	2	0	0	0	1	75
5/ 5-	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
5/18	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	14	8	16	9	8	6	3	3	3	4	5	8	87
5/19-	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
6/ 1	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	11	5	14	16	12	6	8	2	2	2	5	8	91
6/ 2-	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
6/15	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	11	7	21	18	20	8	15	8	6	8	13	20	155
6/16-	CPUE	0.15	0	0	0	0.07	0	0	0	0	0	0	0	0.02
6/29	SE	0.15	0	0	0	0.07	0	0	0	0	0	0	0	0.01
	n	13	8	13	15	15	9	16	9	6	13	16	20	153
6/30-	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
7/13	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	16	8	10	8	10	5	6	4	3	6	10	19	105
7/14-	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
7/27	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	12	12	12	17	15	8	16	8	5	10	13	20	148
7/28-	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
8/10	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	20	16	16	26	20	12	14	8	4	10	16	16	178
8/11-	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
8/24	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	17	12	15	21	9	7	14	7	4	9	13	24	152
8/25-	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
9/ 7	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	8	6	15	8	5	6	15	6	6	9	15	15	114
9/ 8-	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
9/21	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	10	9	23	29	8	5	11	9	4	8	13	17	146
9/22-	CPUE	0	0.08	0	0	0	0	0	0	0	0	0	0	0.01
10/5	SE	0	0.08	0	0	0	0	0	0	0	0	0	0	0.01
	n	26	13	8	12	9	11	13	7	4	9	16	15	143

*CPUE = catch per unit effort
SE = standard error
n = number of tows

Table D-81

Catch per Unit Effort of Yearling and Older Atlantic Tomcod within Four Geographical Regions of Hudson River Estuary [RM 34-61 (km 54-98)] Based on Night Sampling by 100-ft (30.5-m) Beach Seine during 1974

Date		Region YK	TZ	CH	IP	WP	CW	PK	HP	KG	ST	CK	AL	Total
3/24–4/ 6	CPUE*	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	0	0	0	0	0	0	0	0	0	0	0
4/ 7–4/20	CPUE													
	SE													
	n													
4/21–5/ 4	CPUE													
	SE													
	n													
5/ 5–5/18	CPUE													
	SE													
	n													
5/19–6/ 1	CPUE													
	SE													
	n													
6/ 2–6/15	CPUE													
	SE													
	n													
6/16–6/29	CPUE													
	SE													
	n													
6/30–7/13	CPUE													
	SE													
	n													
7/14–7/27	CPUE			0	0	0	0							0
	SE			0	0	0	0							0
	n			0	0	0	0							0
7/28–8/10	CPUE			0	0	0	0							0
	SE			0	0	0	0							0
	n			1	7	3	3							14
8/11–8/24	CPUE			0	0	0	0							0
	SE			0	0	0	0							0
	n			1	14	6	6							27
8/25–9/ 7	CPUE			0	0	0.20	0.50							0.09
	SE			0	0	0.20	0.50							0.06
	n			0	15	5	2							22
9/ 8–9/21	CPUE			0	0	0	0							0
	SE			0	0	0	0							0
	n			2	13	4	3							22
9/22–10/5	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	2	12	4	6	0	0	0	0	0	0	24

*CPUE = catch per unit effort
SE = standard error
n = number of tows

Table D-82

Catch per Unit Effort of Yearling and Older Atlantic Tomcod within Six Geographical Regions of Hudson River Estuary [RM 12-61 (km 19-98)] Based on Day Sampling by Bottom Trawl during 1974

		Region												
Date		YK	TZ	CH	IP	WP	CW	PK	HP	KG	ST	CK	AL	Total
3/24-	CPUE*	0	0	0	0	0	0	0	0	0	0	0	0	0
4/ 6	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	2	1	3	0	0	0	0	0	0	0	0	6
4/ 7-	CPUE	4.59	0.76	0	0.17	0	0							0.43
4/20	SE	0	0.76	0	0.17	0	0							0.26
	n	1	6	5	9	1	3							25
4/21-	CPUE	0	0	0	0	0	0							0
5/ 4	SE	0	0	0	0	0	0							0
	n	0	0	0	6	6	5							17
5/ 5-	CPUE	0	1.81	0.51	0	0	0							1.19
5/18	SE	0	1.09	0.51	0	0	0							0.63
	n	0	9	3	3	0	0							15
6/ 2-	CPUE	0	0	0	0	0	0							0
6/15	SE	0	0	0	0	0	0							0
	n	5	8	3	5	3	10							34
6/16-	CPUE	0	0.31	2.04	0	0	0							0.26
6/29	SE	0	0.31	2.04	0	0	0							0.19
	n	4	10	3	10	4	5							36
6/30-	CPUE	0.38	0.46	0	0	0	0							0.17
7/13	SE	0.38	0.33	0	0	0	0							0.10
	n	4	10	3	9	5	4							35
7/14-	CPUE	0	0	0	0.13	0	0							0.04
7/27	SE	0	0	0	0.13	0	0							0.04
	n	4	8	3	12	6	5							38
7/28-	CPUE	0	0	0	0.22	0.61	0							0.17
8/10	SE	0	0	0	0.22	0.37	0							0.09
	n	4	4	4	7	5	3							27
8/11-	CPUE	0	0	0	0	0	0							0
8/24	SE	0	0	0	0	0	0							0
	n	0	3	3	10	4	6							26
8/25-	CPUE	0	0	0	0	0	0							0
9/ 7	SE	0	0	0	0	0	0							0
	n	4	8	2	8	3	6							31
9/ 8	CPUE	0	0	0	0	0	0							0
9/21	SE	0	0	0	0	0	0							0
	n	3	11	6	2	5	5							32
9/22-	CPUE	0	0	0	0	0	0	0	0	0	0	0	0	0
10/5	SE	0	0	0	0	0	0	0	0	0	0	0	0	0
	n	0	0	2	9	1	0	0	0	0	0	0	0	12

*CPUE = catch per unit effort
SE = standard error
n = number of tows

Table D-83

Standing Crop of Juvenile Atlantic Tomcod within 12 Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Day or Night Sampling by Epibenthic Sled and Tucker Trawl during 1974

		Region												
Date	Time*	YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
4/16-4/17	D	NS**	NS	NS	NS	NS	NS	0 (0)†	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
4/23-4/25	D	NS	NS	NS	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
4/29-5/4	N	835,862,056 (693,403,688)	378,377,544 (186,072,074)	112,497 (62,664)	34,578 (23,915)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1,214,386,640 (717,935,568)
5/6-5/11	N	89,751,778 (5,123,155)	50,808,500 (22,982,879)	2,481,855 (1,438,071)	27,623 (27,623)	1,148,874 (79,538)	23,724 (23,724)	300,604 (300,604)	572,926 (144,779)	276,075 (0)	0 (0)	0 (0)	0 (0)	145,391,946 (23,593,356)
5/13-5/18	N	220,345 (159,147)	121,615,863 (59,756,361)	2,472,743 (1,640,151)	5,211,005 (4,671,227)	423,797 (34,005)	66,889 (38,863)	822,186 (463,225)	538,611 (429,656)	0 (0)	0 (0)	0 (0)	0 (0)	131,371,433 (59,964,658)
5/15-5/18	D	NS	NS	NS	0 (0)	2,022,430 (852,038)	0 (0)	286,883 (189,695)	33,342 (33,342)	0 (0)	0 (0)	0 (0)	0 (0)	2,342,655 (873,536)
5/21-5/24	D	32,502,754 (15,589,074)	32,957,639 (11,658,598)	7,014,190 (6,117,093)	1,681,167 (1,008,560)	381,547 (381,547)	221,931 (153,769)	138,062 (65,123)	187,136 (187,136)	114,390 (114,390)	35,376 (35,376)	0 (0)	0 (0)	75,234,186 (20,435,287)
5/23-5/29	N	122,141,600 (45,525,595)	35,678,058 (16,296,001)	1,528,726 (1,047,346)	992,075 (324,029)	1,411,458 (500,336)	312,108 (233,313)	316,010 (288,626)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	162,380,018 (48,370,411)
5/28-5/31	D	4,863,376 (1,617,573)	48,306,695 (19,792,182)	8,109,724 (7,634,096)	16,844,375 (5,130,447)	5,276,159 (2,036,839)	1,028,352 (581,625)	1,579,856 (898,756)	56,916 (56,916)	0 (0)	0 (0)	0 (0)	0 (0)	86,065,453 (22,005,588)
5/30-6/5	N	24,979,878 (6,823,570)	61,723,278 (17,697,170)	8,622,108 (2,301,449)	7,875,006 (3,905,872)	5,782,704 (5,406,293)	145,209 (87,997)	683,308 (455,659)	31,767 (31,767)	0 (0)	100,611 (58,088)	0 (0)	0 (0)	109,943,865 (20,242,311)
6/4-6/7	D	8,323,806 (4,585,844)	23,069,803 (15,234,556)	22,654,850 (0)	10,212,763 (4,284,523)	4,006,229 (949,974)	866,735 (523,704)	1,012,695 (312,670)	98,580 (98,580)	213,380 (128,899)	0 (0)	0 (0)	179,321 (179,321)	70,638,158 (16,517,014)
6/10-6/14	D	2,981,632 (2,919,612)	3,489,506 (2,976,371)	18,322,044 (18,139,180)	4,539,245 (1,466,956)	7,098,106 (3,467,704)	55,735 (55,735)	3,605,683 (3,055,317)	0 (0)	0 (0)	0 (0)	49,877 (49,877)	0 (0)	40,141,827 (19,233,570)
6/12-6/17	N	0 (0)	110,501,659 (28,472,456)	59,511,680 (55,420,230)	28,698,914 (19,326,268)	4,505,489 (2,842,568)	1,340,452 (682,057)	2,277,846 (1,796,984)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	206,836,032 (65,325,047)
6/17-6/23	N	33,654,693 (11,575,455)	21,406,443 (8,853,324)	12,383,754 (7,553,266)	4,901,368 (1,476,307)	4,387,346 (1,665,982)	1,183,536 (1,016,637)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	77,919,134 (16,595,567)
6/24-6/27	N	76,648,243 (45,555,425)	44,707,258 (15,756,974)	8,817,555 (2,716,695)	18,294,238 (5,845,820)	3,732,658 (1,256,310)	9,775,585 (1,814,555)	3,455,549 (1,338,332)	385,856 (147,069)	86,532 (46,170)	NS	NS	NS	165,903,454 (48,701,320)
7/1-7/5	N	79,529,971 (37,274,199)	6,754,907 (2,963,202)	6,780,923 (3,981,746)	2,658,108 (725,851)	1,706,128 (602,884)	3,273,868 (1,024,060)	1,959,106 (549,220)	251,031 (185,008)	109,262 (59,241)	NS	NS	NS	103,023,294 (37,633,483)
7/8-7/11	N	52,763,535 (27,114,306)	27,894,698 (16,306,580)	1,692,717 (1,156,776)	4,183,686 (1,689,896)	2,936,295 (2,141,093)	890,078 (426,548)	1,131,650 (524,531)	376,344 (193,927)	143,255 (124,138)	NS	NS	NS	92,012,248 (31,786,449)
7/15-7/18	N	69,537,756 (46,927,744)	12,993,126 (5,181,321)	3,228,667 (990,121)	5,488,235 (2,112,524)	8,750,756 (5,066,906)	2,823,059 (1,629,464)	3,000,774 (875,018)	87,343 (58,865)	47,819 (31,885)	NS	NS	NS	105,957,528 (47,577,316)
7/22-7/26	N	44,889,351 (14,246,821)	11,127,586 (8,550,217)	376,152 (200,114)	3,592,055 (1,277,841)	11,394,998 (4,492,082)	1,997,860 (981,247)	334,234 (134,176)	26,077 (17,469)	99,886 (85,386)	0 (0)	318,910 (318,910)	0 (0)	74,157,102 (17,292,194)
7/29-8/2	N	12,741,539 (11,737,487)	7,828,774 (6,000,966)	1,775,439 (747,175)	1,677,010 (770,895)	3,350,514 (1,319,604)	2,072,781 (667,630)	1,506,892 (545,462)	249,026 (101,811)	64,239 (32,775)	310,991 (228,256)	0 (0)	164,279 (164,279	31,741,484 (13,323,208)
8/5-8/9	N	20,400,371 (6,847,196)	17,865,814 (5,985,016)	2,433,630 (1,429,850)	5,588,812 (2,796,326)	2,470,745 (1,656,182)	2,565,577 (1,200,754)	780,613 (317,376)	21,859 (21,859)	99,747 (64,517)	77,212 (77,212)	188,671 (113,546)	0 (0)	52,493,053 (9,842,631
8/12-8/15	N	828,287 (282,032)	24,544,081 (15,425,143)	957,313 (639,604)	10,587,460 (3,197,433)	14,098,838 (5,382,144)	1,083,077 (755,606)	764,932 (374,785)	38,843 (19,587)	84,188 (62,635)	0 (0)	0 (0)	0 (0)	52,987,018 (16,683,237)

*N = night samples, D = day samples
**NS = no samples taken
†Numbers in parentheses represent one standard error

Table D-84

Standing Crop of Juvenile Atlantic Tomcod within 12 Geographical Regions of Hudson River Estuary [RM 12-153 (km 19-245)] Based on Daytime Sampling by 100-ft (30.5-m) Beach Seine during 1974

Date	Region: YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
4/ 7-4/20	NS*	NS	0 (0)**	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
4/21-5/ 4	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	NS	NS	NS	0 (0)	0 (0)
5/ 5-5/18	38,693 (16,545)	39,756 (27,741)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	78,449 (32,299)
5/19-6/ 1	370,518 (138,060)	127,220 (61,632)	3,842 (3,842)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	501,579 (151,240)
6/ 2-6/15	289,614 (98,528)	590,662 (334,911)	93,479 (82,020)	2,560 (1,248)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	976,314 (358,610)
6/16-6/29	951,955 (310,362)	249,896 (148,226)	0 (0)	16,588 (8,301)	1,406 (886)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1,219,844 (344,042)
6/30-7/13	219,692 (86,901)	2,180,907 (1,335,184)	8,067 (5,740)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2,408,666 (1,338,020)
7/14-7/27	10,748 (3,108)	230,964 (97,746)	2,241 (2,241)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	243,953 (97,821)
7/28-8/10	1,612 (793)	17,038 (8,165)	1,681 (1,681)	354 (354)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	20,685 (8,381)
8/11-8/24	6,449 (2,652)	18,931 (8,769)	3,585 (3,585)	3,072 (2,233)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	32,037 (10,088)
8/25-9/ 7	0 (0)	7,573 (7,573)	0 (0)	1,152 (1,152)	527 (527)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	9,251 (7,677)
9/ 8-9/21	0 (0)	0 (0)	0 (0)	636 (441)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	635 (441)
9/22-10/5	248 (248)	27,960 (15,033)	10,084 (10,084)	768 (768)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	39,060 (18,119)

*NS = no samples taken
**Numbers in parentheses represent one standard error

Table D-85

Standing Crop of Juvenile Atlantic Tomcod within Four Geographical Regions of Hudson River Estuary [RM 34-61 (km 54-98)] Based on Night Sampling by 100-ft (30.5-m) Beach Seine during 1974

	Region												
Date	YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL	Total
4/21 -5/ 4	NS*	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/ 5 -5/18	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/19 -6/ 1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
6/ 2 -6/15	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
6/16 -6/29	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7/ 0 -7/13	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7/14 -7/27	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7/28 -8/10	NS	NS	0 (0)**	7,899 (6,494)	0 (0)	0 (0)	NS	NS	NS	NS	NS	NS	7,899 (6,494)
8/11 -8/24	NS	NS	0 (0)	1,975 (1,049)	0 (0)	0 (0)	NS	NS	NS	NS	NS	NS	1,975 (1,049)
8/25 -9/ 7	NS	NS	NS	614 (614)	0 (0)	0 (0)	NS	NS	NS	NS	NS	NS	614 (614)
9/ 8 -9/21	NS	NS	0 (0)	1,418 (960)	0 (0)	0 (0)	NS	NS	NS	NS	NS	NS	1,418 (960)
9/22-10/ 5	NS	NS	0 (0)	3,072 (2,361)	0 (0)	0 (0)	NS	NS	NS	NS	NS	NS	3,072 (2,361)

*NS = no samples taken
**Numbers in parentheses represent one standard error

POWER-PLANT REGION LOCATIONS

Plant	Site (River Mile)	Region River Miles	Region Kilometers
Bowline	37	37-43	50-69
Lovett	41	35-47	56-75
Indian Point	42	36-48	58-77
Roseton	65	59-71	94-114
Danskammer	66	60-72	96-114

Table D-86

Standing Crop of Striped Bass Eggs in Hudson River Estuary [RM 14-140 (km 22-224)] within Bowline, Lovett, Indian Point, Roseton, and Danskammer Power-Plant Regions, Based on Ichthyoplankton Sampling during 1973

Date	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/29-5/12	520,623 (450,305)*	4,194,353 (1,522,551)	7,603,175 (2,850,329)	15,393,963 (5,247,071)	11,397,226 (3,819,641)
5/13-5/26	94,777,757 (54,625,893)	114,225,173 (63,722,962)	107,449,441 (57,607,482)	50,209,991 (17,105,852)	48,278,530 (17,961,506)
5/27-6/ 9	1,117,008 (686,335)	1,726,991 (830,525)	2,029,773 (844,625)	4,494,764 (1,153,485)	4,203,984 (1,060,562)
6/10-6/23	1,282,400 (694,670)	1,501,512 (810,182)	1,362,437 (731,822)	71,253 (54,965)	68,230 (56,666)
6/24-7/ 7	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7/ 8-7/21	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7/22-8/ 4	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
8/ 5-8/18	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

*Numbers in parentheses represent one standard error

Table D-87

Standing Crop of Striped Bass Yolk-Sac Larvae in Hudson River Estuary [RM 14-140 (km 22-224)] within Bowline, Lovett, Indian Point, Roseton and Danskammer Power-Plant Regions, Based on Ichthyoplankton Sampling during 1973

Date	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/29-5/12	455,860 (63,411)*	547,783 (74,398)	511,912 (68,678)	193,675 (86,014)	185,352 (89,606)
5/13-5/26	15,553,712 (6,107,465)	15,125,677 (7,043,677)	13,953,293 (6,362,803)	6,323,761 (2,303,683)	6,417,181 (2,475,160)
5/27-6/ 9	3,561,481 (1,630,066)	2,461,982 (1,229,170)	2,631,921 (1,194,399)	29,634,760 (16,937,235)	31,378,442 (18,236,499)
6/10-6/23	19,675,363 (10,720,773)	24,646,668 (12,637,866)	24,989,666 (11,948,037)	20,257,303 (10,202,271)	18,115,490 (9,279,219)
6/24-7/ 7	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7/ 8-7/21	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7/22-8/ 4	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
8/ 5-8/18	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

*Numbers in parentheses represent one standard error

Table D-88

Standing Crop of Striped Bass Post Yolk-Sac Larvae in Hudson River Estuary [RM 14-140 (km 22-224)] within Bowline, Lovett, Indian Point, Roseton, and Danskammer Power-Plant Regions, Based on Ichthyoplankton Sampling during 1973

Date	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/29-5/12	0 (0)*	0 (0)	0 (0)	0 (0)	0 (0)
5/13-5/26	337,966 (184,643)	155,429 (150,305)	145,887 (135,931)	40,263 (26,359)	35,896 (25,951)
5/27-6/ 9	31,992 (20,114)	0 (0)	0 (0)	33,311 (28,974)	35,895 (31,222)
6/10-6/23	16,699,980 (9,382,340)	22,368,703 (10,958,836)	23,351,311 (9,954,013)	15,585,738 (4,391,082)	12,511,207 (4,391,489)
6/24-7/ 7	15,242,633 (6,103,989)	12,929,788 (4,616,784)	13,972,853 (4,372,138)	44,770,655 (27,628,809)	45,121,615 (29,691,397)
7/ 8-7/21	1,403,930 (564,646)	1,674,581 (658,368)	1,590,752 (596,565)	2,140,810 (776,326)	2,200,380 (832,713)
7/22-8/ 4	246,846 (157,087)	286,160 (183,185)	259,395 (165,455)	197,083 (98,510)	211,099 (106,138)
8/ 5-8/18	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

*Numbers in parentheses represent one standard error

Table D-89

Standing Crop of Juvenile Striped Bass in Hudson River Estuary [RM 14-140 (km 22-224)] within Bowline, Lovett, Indian Point, Roseton, and Danskammer Power-Plant Regions, Based on Ichthyoplankton Sampling during 1973

Date	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/29-5/12	0 (0)*	0 (0)	0 (0)	0 (0)	0 (0)
5/13-5/26	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/27-6/ 9	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
6/10-6/23	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
6/24-7/ 7	85,591 (52,458)	226,844 (128,486)	339,970 (228,973)	513,612 (388,492)	369,642 (258,108)
7/ 8-7/21	208,864 (154,917)	283,687 (181,126)	298,867 (165,116)	4,259,547 (2,757,381)	4,532,002 (2,971,081)
7/22-8/ 4	239,722 (193,988)	285,874 (226,259)	264,896 (204,422)	280,350 (106,144)	292,988 (114,045)
8/ 5-8/18	4,126,071 (878,161)	2,249,283 (522,841)	2,048,509 (472,328)	116,767 (35,670)	102,727 (34,776)

*Numbers in parentheses represent one standard error

Table D-90

Standing Crop of Juvenile Striped Bass in Hudson River Estuary [RM 12-153 (km 19-245)] within Bowline, Lovett, Indian Point, Roseton, and Danskammer Power-Plant Regions, Based on Beach-Seine Sampling during 1973

Region	6/17-6/30	7/1-7/14	7/15-7/28	7/29-8/11	8/12-8/25	8/26-9/8	9/9-9/22	9/23-10/6	10/7-10/20	10/21-11/13	11/4-11/17	11/18-12/1	12/2-12/15
Bowline	310 (310)*	720,579 (253,243)	552,179 (170,891)	1,181,163 (415,134)	1,353,025 (535,219)	752,746 (136,440)	6,697,678 (2,248,220)	2,952,437 (1,569,552)	769,611 (204,040)	1,421,272 (599,273)	363,425 (104,433)	158,403 (40,793)	88,065 (37,482)
Lovett	341 (341)	407,097 (50,251)	318,450 (134,679)	971,084 (421,182)	1,124,504 (478,582)	537,413 (113,194)	5,701,716 (2,009,599)	2,362,922 (1,383,011)	339,333 (74,489)	978,047 (514,175)	227,876 (82,603)	79,914 (20,257)	52,444 (18,002)
Indian Point	341 (341)	304,668 (47,174)	239,453 (95,247)	884,050 (390,519)	819,472 (333,379)	409,349 (84,860)	4,017,334 (1,397,630)	1,678,639 (961,720)	261,846 (55,017)	692,555 (357,700)	183,443 (59,076)	64,313 (15,808)	41,007 (13,823)
Roseton	0 (0)	59,968 (23,705)	124,136 (37,705)	297,488 (203,953)	89,383 (28,808)	74,169 (26,314)	59,432 (30,990)	38,254 (14,171)	25,726 (9,156)	15,942 (8,242)	3,848 (2,114)	11,946 (10,859)	0 (0)
Danskammer	0 (0)	57,399 (23,420)	97,667 (26,076)	148,643 (90,966)	48,943 (13,612)	45,213 (15,273)	30,632 (14,040)	20,334 (6,860)	17,683 (7,659)	7,085 (3,663)	1,714 (939)	11,559 (11,072)	0 (0)

*Numbers in parentheses represent one standard error

Table D-91

Percentage of Total Standing Crop (from Ichthyoplankton Sampling) of Striped Bass Eggs in Hudson River Estuary [RM 14-140 (km 22-224)] Below, Within, and Above Each Power-Plant Region during 1973

Date	Region	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/29-5/12	Below	0	0.1	0.1	70.4	76.6
	Within	0.8	6.1	11.1	22.5	16.6
	Above	99.2	93.8	88.8	7.1	6.8
5/13-5/26	Below	0.5	3.2	7.2	63.8	65.6
	Within	35.1	42.3	39.8	18.6	17.9
	Above	64.4	54.5	53.0	17.6	16.6
5/27-6/ 9	Below	0.4	0.9	1.6	39.7	42.5
	Within	6.1	9.4	11.0	24.4	22.8
	Above	93.6	89.7	87.4	36.0	34.7
6/10-6/23	Below	0	5.3	13.3	92.2	92.6
	Within	70.8	82.9	75.2	3.9	3.8
	Above	29.2	11.8	11.5	3.9	3.7
6/24-7/ 7	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
7/ 8-7/21	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
7/22-8/ 4	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
8/ 5-8/18	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0

Table D-92

Percentage of Total Standing Crop (from Ichthyoplankton Sampling) of Striped Bass Yolk-Sac Larvae in Hudson River Estuary [RM 14-140 (km 22-224)] Below, Within, and Above Each Power-Plant Region during 1973

Date	Region	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/29-5/12	Below	0	2.5	6.3	57.2	58.6
	Within	33.4	40.2	37.5	14.2	13.6
	Above	66.6	57.4	56.2	28.7	27.9
5/13-5/26	Below	26.6	34.1	37.0	71.1	71.8
	Within	31.1	30.3	27.9	12.7	12.8
	Above	42.3	35.6	35.1	16.2	15.4
5/27-6/ 9	Below	10.3	12.7	12.9	21.5	22.0
	Within	4.4	3.0	3.2	36.4	38.6
	Above	85.3	84.3	83.9	42.1	39.4
6/10-6/23	Below	3.6	5.9	8.1	64.3	67.4
	Within	20.5	25.6	26.0	21.1	18.8
	Above	75.9	68.5	65.9	14.7	13.7
6/24-7/ 7	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
7/ 8-7/21	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
7/22-8/ 4	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
8/ 5-8/18	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0

Table D-93

Percentage of Total Standing Crop (from Ichthyoplankton Sampling) of Striped Bass Post Yolk-Sac Larvae in Hudson River Estuary [RM 14-140 (km 22-224)] Below, Within, and Above Each Power-Plant Region during 1973

Date	Region	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/29-5/12	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
5/13-5/26	Below	66.2	80.8	81.8	95.5	96.0
	Within	22.7	10.4	9.8	2.7	2.4
	Above	11.1	8.7	8.4	1.8	1.6
5/27-6/ 9	Below	59.2	71.8	71.8	71.8	71.8
	Within	12.6	0	0	13.1	14.1
	Above	28.2	28.2	28.2	15.1	14.1
6/10-6/23	Below	0.3	1.9	4.1	71.1	75.2
	Within	19.7	26.4	27.6	18.4	14.8
	Above	80.0	71.7	68.4	10.5	10.0
6/24-7/ 7	Below	16.3	20.4	21.0	43.4	44.9
	Within	8.9	7.5	8.1	26.1	26.3
	Above	74.6	72.1	70.8	30.5	28.8
7/ 8-7/21	Below	1.7	3.2	5.0	32.9	33.9
	Within	16.2	19.3	18.3	24.7	25.3
	Above	82.1	77.5	76.7	42.4	40.7
7/22-8/ 4	Below	1.2	3.4	6.4	35.8	35.9
	Within	26.9	31.2	28.3	21.5	23.0
	Above	71.9	65.4	65.3	42.7	41.0
8/ 5-8/18	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0

Table D-94

Percentage of Total Standing Crop (from Ichthyoplankton Sampling) of Juvenile Striped Bass in Hudson River Estuary [RM 14-140 (km 22-224)] Below, Within, and Above Each Power-Plant Region during 1973

Date	Region	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/29-5/12	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
5/13-5/26	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
5/27-6/ 9	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
6/10-6/23	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
6/24-7/ 7	Below	0	0.2	0.6	62.4	67.6
	Within	3.0	7.9	11.8	17.9	12.9
	Above	97.0	91.9	87.6	19.8	19.5
7/ 8-7/21	Below	0	0.1	0.2	5.0	5.3
	Within	1.3	1.8	1.9	26.8	28.5
	Above	98.7	98.1	97.9	68.2	66.2
7/22-8/ 4	Below	0	1.3	3.2	27.0	27.6
	Within	17.0	20.3	18.8	19.9	20.8
	Above	83.0	78.4	78.0	53.1	51.6
8/ 5-8/18	Below	67.6	82.9	84.3	98.8	98.9
	Within	26.8	14.6	13.3	0.8	0.7
	Above	5.6	2.5	2.4	0.5	0.4

Table D-95

Percentage of Total Standing Crop (from Beach Seine Sampling) of Juvenile Striped Bass in Hudson River Estuary [RM 14-140 (km 22-224)] Below, Within, and Above Each Power-Plant Region during 1973

Date	Region	Bowline	Lovett	Indian Point	Roseton	Danskammer
6/17-6/30	Below	95.0	95.0	95.0	100.0	100.0
	Within	4.6	5.0	5.0	0	0
	Above	0.5	0	0	0	0
7/ 1-7/14	Below	38.1	61.7	69.3	93.0	93.3
	Within	53.3	30.1	22.5	4.4	4.2
	Above	8.6	8.2	8.2	2.6	2.5
7/15-7/28	Below	41.2	55.6	60.7	84.6	86.3
	Within	33.5	19.3	14.5	7.5	5.9
	Above	25.3	25.1	24.8	7.9	7.8
7/29-8/11	Below	23.2	32.8	35.9	81.3	86.6
	Within	41.8	34.4	31.3	10.5	5.3
	Above	35.1	32.9	32.8	8.2	8.1
8/12-8/25	Below	21.3	31.7	45.0	85.7	87.5
	Within	58.7	48.8	35.6	3.9	2.1
	Above	20.0	19.5	19.5	10.4	10.4
8/26 9/ 8	Below	28.5	42.9	51.2	83.5	85.4
	Within	48.2	34.4	26.2	4.7	2.9
	Above	23.3	22.7	22.6	11.8	11.7
9/ 9-9/22	Below	11.7	24.0	44.6	97.1	97.5
	Within	81.3	69.2	48.7	0.7	0.4
	Above	7.0	6.9	6.7	2.2	2.2
9/23-10/ 6	Below	16.8	31.5	48.7	96.5	96.9
	Within	72.9	58.3	41.4	0.9	0.5
	Above	10.3	10.2	9.9	2.6	2.6
10/ 7-10/20	Below	51.4	76.1	80.6	98.3	98.7
	Within	43.5	19.2	14.8	1.5	1.0
	Above	5.1	4.7	4.6	0.3	0.3
10/21-11/3	Below	30.4	50.9	64.1	98.6	99.0
	Within	65.3	44.9	31.8	0.7	0.3
	Above	4.4	4.2	4.1	0.7	0.7
11/ 4-11/17	Below	39.4	60.8	67.6	97.7	98.0
	Within	54.5	34.2	27.5	0.6	0.3
	Above	6.1	5.0	4.9	1.8	1.8
11/18-12/ 1	Below	45.8	69.6	74.4	96.2	96.4
	Within	46.7	23.5	19.0	3.5	3.4
	Above	7.5	6.8	6.7	0.3	0.2
12/ 2-12/15	Below	41.8	62.3	69.2	100.0	100.0
	Within	49.2	29.3	22.9	0	0
	Above	9.0	8.4	8.0	0	0

Table D-98

Standing Crop of White Perch Post Yolk-Sac Larvae in Hudson River Estuary [RM 14-140 (km 22-224)] within Bowline, Lovett, Indian Point, Roseton, and Danskammer Power-Plant Regions, Based on Ichthyoplankton Sampling during 1973

Date	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/29-5/12	0 (0)*	0 (0)	0 (0)	0 (0)	0 (0)
5/13-5/26	158,443 (128,176)	165,315 (145,139)	172,254 (135,708)	78,705 (68,534)	53,592 (44,917)
5/27-6/ 9	325,856 (224,528)	278,698 (251,457)	251,717 (227,114)	107,846 (81,487)	116,213 (87,809)
6/10-6/23	295,667 (194,187)	371,006 (226,734)	362,934 (205,667)	5,387,312 (1,774,474)	5,767,403 (1,911,884)
6/24-7/ 7	9,596,063 (3,447,472)	8,686,612 (3,897,340)	8,877,204 (3,594,028)	6,502,876 (2,448,007)	5,603,753 (2,343,334)
7/ 8-7/21	1,014,400 (301,255)	1,112,105 (347,221)	1,009,723 (313,650)	229,763 (142,067)	240,407 (152,845)
7/22-8/ 4	0 (0)	0 (0)	0 (0)	1,152 (1,152)	1,241 (1,241)
8/ 5-8/18	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

*Numbers in parentheses represent one standard error

Table D-99

Standing Crop of Juvenile White Perch in Hudson River Estuary [RM 14-140 (km 22-224)] within Bowline, Lovett, Indian Point, Roseton, and Danskammer Power-Plant Regions, Based on Ichthyoplankton Sampling during 1973

Date	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/29-5/12	0 (0)*	0 (0)	0 (0)	0 (0)	
5/13-5/26	0 (0)	0 (0)	0 (0)	0 (0)	
5/27-6/ 9	0 (0)	0 (0)	0 (0)	0 (0)	
6/10-6/23	0 (0)	0 (0)	0 (0)	0 (0)	
6/24-7/ 7	0 (0)	0 (0)	0 (0)	0 (0)	
7/ 8-7/21	115,524 (85,941)	143,381 (100,421)	138,701 (91,347)	324,224 (230,568)	336,861 (247,795)
7/22-8/ 4	50,804 (27,061)	72,456 (32,300)	79,485 (31,548)	88,635 (29,445)	76,402 (24,591)
8/ 5-8/18	668,780 (184,543)	541,591 (162,965)	517,539 (148,604)	121,269 (41,974)	92,061 (29,633)

*Numbers in parentheses represent one standard error

Table D-96

Standing Crop of White Perch Eggs in Hudson River Estuary [RM 14-140 (km 22-224)] within Bowline, Lovett, Indian Point, Roseton, and Danskammer Power-Plant Regions, Based on Ichthyoplankton Sampling during 1973

Date	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/29-5/12	0 (0)*	967 (967)	1,902 (1,902)	85,479 (68,122)	90,712 (73,353)
5/13-5/26	32,208 (32,208)	37,563 (37,563)	33,926 (33,926)	103,838 (56,866)	111,895 (61,278)
5/27-6/ 9	53,545 (53,545)	62,447 (62,447)	56,402 (56,402)	186,760 (98,552)	201,250 (106,198)
6/10-6/23	52,359 (52,359)	88,396 (66,902)	108,904 (77,013)	92,926 (92,926)	60,584 (60,584)
6/24-7/ 7	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7/ 8-7/21	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7/22-8/ 4	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
8/ 5-8/18	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

*Numbers in parentheses represent one standard error

Table D-97

Standing Crop of White Perch Yolk-Sac Larvae in Hudson River Estuary [RM 14-140 (km 22-224)] within Bowline, Lovett, Indian Point, Roseton, and Danskammer Power-Plant Regions, Based on Ichthyoplankton Sampling during 1973

Date	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/29-5/12	0 (0)*	0 (0)	0 (0)	53,497 (53,497)	57,648 (57,648)
5/13-5/26	2,740,096 (1,811,950)	3,177,142 (2,113,071)	2,908,499 (1,908,845)	260,640 (89,839)	227,887 (76,050)
5/27-6/ 9	150,602 (92,517)	140,354 (101,966)	126,767 (92,095)	608,881 (276,048)	656,121 (297,465)
6/10-6/23	447,306 (341,135)	531,538 (397,972)	490,573 (359,858)	892,001 (835,609)	946,930 (899,981)
6/24-7/ 7	0 (0)	0 (0)	0 (0)	12,001 (12,001)	12,933 (12,933)
7/ 8-7/21	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7/22-8/ 4	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
8/ 5-8/18	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

*Numbers in parentheses represent one standard error

Table D-100

Standing Crop of Juvenile White Perch in Hudson River Estuary [RM 12-152 (km 19-245)] within Bowline, Lovett, Indian Point, Roseton, and Danskammer Power-Plant Regions, Based on Beach-Seine Sampling during 1973

Plant	6/17-6/30	7/1-7/14	7/15-7/28	7/29-8/11	8/12-8/25	8/26-9/8	9/9-9/22	9/23-10/6	10/7-10/20	10/21-11/3	11/4-11/17	11/18-12/1	12/2-12/15
Bowline	0 (0)*	23,019 (14,221)	121,546 (54,221)	155,506 (40,368)	1,140,512 (662,144)	1,460,014 (504,889)	3,847,141 (1,002,082)	5,058,791 (1,896,926)	981,047 (411,635)	806,722 (397,090)	147,655 (145,985)	4,387 (2,284)	0 (0)
Lovett	0 (0)	22,579 (13,081)	55,100 (42,981)	59,180 (24,060)	967,543 (593,392)	741,207 (355,290)	3,263,774 (898,669)	3,594,882 (1,433,573)	387,694 (193,939)	577,152 (335,993)	132,641 (130,805)	4,827 (2,513)	0 (0)
Indian Point	0 (0)	18,908 (9,806)	48,603 (30,599)	48,950 (18,815)	699,395 (414,278)	536,634 (248,435)	2,377,855 (630,928)	2,560,150 (999,428)	304,039 (140,928)	416,215 (234,380)	94,046 (90,957)	6,130 (2,555)	1,915 (1,754)
Roseton	0 (0)	96,298 (74,340)	74,257 (37,706)	64,024 (24,852)	104,325 (30,926)	53,229 (17,776)	58,997 (21,384)	45,161 (14,116)	17,069 (8,765)	8,206 (4,060)	4,960 (4,960)	43,377 (40,994)	0 (0)
Danskammer	0 (0)	98,293 (75,881)	72,165 (38,347)	59,345 (25,111)	80,894 (27,984)	33,156 (12,116)	29,033 (9,789)	27,154 (10,596)	8,211 (4,021)	5,053 (2,393)	2,204 (2,204)	44,276 (41,843)	0 (0)

*Numbers in parentheses represent one standard error

Table D-101

Percentage of Total Standing Crop (from Ichthyoplankton Sampling) of White Perch Eggs in Hudson River Estuary [RM 14-140 (km 22-224)] Below, Within, and Above Each Power-Plant Region during 1973

Date	Region	Bowline	Lovett	Indian Point	Roseton	Danskammer
29 Apr 12 May	Below	0	0	0	4.1	4.4
	Within	0	0.3	0.6	27.0	28.6
	Above	100	99.7	99.4	68.9	67.0
13 May- 26 May	Below	0	0.2	0.4	2.8	2.8
	Within	2.3	2.6	2.5	7.3	7.8
	Above	97.7	97.2	97.2	89.9	89.4
27 May- 9 Jun	Below	0	0	0.1	0.7	0.7
	Within	0.5	0.6	0.6	1.9	2.0
	Above	99.5	99.3	99.3	97.5	97.3
10 Jun- 23 Jun	Below	0	0.5	1.0	50.9	54.8
	Within	6.2	10.5	13.1	11.0	7.2
	Above	93.8	89.0	85.9	38.0	38.1
24 Jun 7 Jul	Below	-	-	-	-	-
	Within	-	-	-	-	-
	Above	-	-	-	-	-
8 Jul- 21 Jul	Below	-	-	-	-	-
	Within	-	-	-	-	-
	Above	-	-	-	-	-
22 Jul- 4 Aug	Below	-	-	-	-	-
	Within	-	-	-	-	-
	Above	-	-	-	-	-
5 Aug- 18 Aug	Below	-	-	-	-	-
	Within	-	-	-	-	-
	Above	-	-	-	-	-

Table D-102

Percentage of Total Standing Crop (from Ichthyoplankton Sampling) of White Perch Yolk-Sac Larvae in Hudson River Estuary [RM 14-140 (km 22-224)] Below, Within and Above Each Power-Plant Region during 1973

Date	Region	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/29-5/12	Below	0	0	0	0	0
	Within	0	0	0	21.3	23.0
	Above	100	100	100	78.7	77.0
5/13-5/26	Below	3.5	7.3	12.0	63.5	64.2
	Within	42.5	49.3	45.1	4.0	3.5
	Above	54.0	43.4	42.9	32.4	32.3
5/27-6/ 9	Below	4.1	5.2	5.6	9.2	9.2
	Within	4.3	4.0	3.6	17.5	18.8
	Above	91.6	90.8	90.8	73.3	71.9
6/10-6/23	Below	0	0.2	0.6	5.1	5.2
	Within	3.3	4.0	3.7	6.6	7.0
	Above	96.7	95.8	95.7	88.3	87.8
6/24-7/ 7	Below	0	0	0	0	0
	Within	0	0	0	8.6	9.3
	Above	100	100	100	91.4	90.7
7/ 8-7/21	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
7/22-8/ 4	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
8/ 5-8/18	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0

Table D-103

Percentage of Total Standing Crop (from Ichthyoplankton Sampling) of White Perch Post Yolk-Sac Larvae in Hudson River Estuary [RM 14-140 (km 22-224)] Below, Within, and Above Each Power-Plant Region during 1973

Date	Region	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/29-5/12	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	100	100	100	100	100
5/13-5/26	Below	14.9	18.9	20.1	57.5	59.8
	Within	14.2	14.8	15.5	7.1	4.8
	Above	70.9	66.3	64.4	35.4	35.4
5/27-6/ 9	Below	19.3	24.3	25.5	37.4	37.4
	Within	15.4	13.2	11.9	5.1	5.5
	Above	65.3	62.6	62.6	57.5	57.1
6/10-6/23	Below	0	0.1	0.3	3.5	3.6
	Within	1.4	1.8	1.8	26.3	28.2
	Above	98.6	98.1	98.0	70.2	68.2
6/24-7/ 7	Below	28.0	35.0	36.5	76.1	78.4
	Within	19.2	17.3	17.7	13.0	11.2
	Above	52.8	47.7	45.8	11.0	10.5
7/ 8-7/21	Below	14.2	20.4	25.4	74.6	74.8
	Within	46.8	51.3	46.6	10.6	11.1
	Above	39.0	28.2	28.0	14.8	14.1
7/22-8/ 4	Below	0	0	0	0	0
	Within	0	0	0	46.4	50.0
	Above	100	100	100	53.6	50.0
8/ 5-8/18	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0

Table D-104

Percentage of Total Standing Crop (from Ichthyoplankton Sampling) of Juvenile White Perch in Hudson River Estuary [RM 14-140 (km 22-224)] Below, Within, and Above Each Power-Plant Region during 1973

Date	Region	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/29-5/12	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
5/13-5/26	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
5/27-6/ 9	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
6/10-6/23	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
6/24-7/ 7	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
7/ 8-7/21	Below	0	0.9	2.1	25.5	26.6
	Within	11.4	14.2	13.7	32.1	33.3
	Above	88.6	85.0	84.1	42.4	40.1
7/22-8/ 4	Below	0	0.4	1.0	24.5	26.1
	Within	5.2	7.5	8.2	9.1	7.9
	Above	94.8	92.2	90.8	66.4	66.0
8/ 5-8/18	Below	36.9	45.9	47.6	75.9	77.0
	Within	23.1	18.7	17.8	4.2	3.2
	Above	40.0	35.4	34.5	19.9	19.9

Table D-105

Percentage of Total Standing Crop (from Beach-Seine Sampling) of Juvenile White Perch in Hudson River Estuary [RM 14-140 (km 22-224)] Below, Within, and Above Each Power-Plant Region during 1973

Date	Region	Bowline	Lovett	Indian Point	Roseton	Danskammer
6/17-	Below	0	0	0	0	0
6/30	Within	0	0	0	0	0
	Above	0	0	0	0	0
7/ 1-	Below	0	0.5	2.0	9.2	9.2
7/14	Within	8.9	8.7	7.3	37.1	37.9
	Above	91.1	90.8	90.8	53.6	52.9
7/15-	Below	10.1	16.0	17.3	35.3	35.6
7/28	Within	10.7	4.9	4.3	6.6	6.4
	Above	79.2	79.1	78.4	58.1	58.0
7/29-	Below	24.2	34.6	35.8	44.0	44.6
8/11	Within	16.5	6.3	5.2	6.8	6.3
	Above	59.4	59.1	59.0	49.2	49.1
8/12-	Below	7.9	15.8	27.8	63.0	64.1
8/25	Within	50.5	42.8	31.0	4.6	3.6
	Above	41.7	41.3	41.3	32.4	32.3
8/26-	Below	38.9	61.7	68.2	88.1	88.7
9/ 8	Within	46.0	23.3	16.9	1.7	1.0
	Above	15.2	15.0	14.9	10.2	10.2
9/ 9-	Below	12.7	25.1	43.0	93.4	94.1
9/22	Within	77.7	65.9	48.0	1.2	0.6
	Above	9.6	9.0	9.0	5.4	5.4
9/23-	Below	27.3	47.4	61.6	97.9	98.2
10/ 6	Within	68.8	48.9	34.8	0.6	0.4
	Above	3.9	3.7	3.6	1.4	1.4
10/ 7-	Below	51.8	79.3	83.2	99.1	99.5
10/20	Within	44.8	17.7	13.9	0.8	0.4
	Above	3.4	3.0	2.9	0.1	0.1
10/21-	Below	26.6	45.6	58.9	97.0	97.3
11/ 3	Within	65.7	47.0	33.9	0.7	0.4
	Above	7.7	7.3	7.2	2.3	2.3
11/ 4-	Below	1.8	9.6	30.1	93.4	94.8
11/17	Within	75.7	68.0	48.2	2.5	1.1
	Above	22.4	22.3	21.7	4.0	4.0
11/18-	Below	0	0	0	38.3	38.3
12/ 1	Within	5.7	6.3	8.0	56.5	57.7
	Above	94.3	93.7	92.0	5.1	3.9
12/ 2-	Below	2.9	2.9	2.9	100.0	100.0
12/15	Within	0	0	5.1	0	0
	Above	97.1	97.1	92.0	0	0

Table D-106

Standing Crop of Atlantic Tomcod Post Yolk-Sac Larvae in Hudson River Estuary [RM 14-140 (km 22-224)] within Bowline, Lovett, Indian Point, Roseton, and Danskammer Power-Plant Regions, Based on Ichthyoplankton Sampling during 1973

Date	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/29-5/12	928,154 (58,802)*	860,135 (22,939)	788,654 (24,606)	37,686 (25,834)	24,570 (16,843)
5/13-5/26	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/27-6/ 9	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
6/10-6/23	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
6/24-7/ 7	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7/ 8-7/21	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7/22-8/ 4	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
8/ 5-8/18	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

*Numbers in parentheses represent one standard error

Table D-107

Standing Crop of Juvenile Atlantic Tomcod in Hudson River Estuary [RM 14-140 (km 22-224)] within Bowline, Lovett, Indian Point, Roseton, and Danskammer Power-Plant Regions, Based on Ichthyoplankton Sampling during 1973

Date	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/29-5/12	51,784,991 (18,772,004)*	46,823,189 (21,537,002)	42,839,467 (19,454,842)	2,632,372 (754,726)	2,089,335 (597,569)
5/13-5/26	33,196,930 (9,394,811)	15,582,145 (5,895,539)	14,617,174 (5,332,968)	2,738,813 (679,128)	2,211,720 (541,147)
5/27-6/ 9	3,585,788 (2,841,151)	4,065,896 (3,361,525)	4,502,956 (3,282,407)	2,985,451 (2,432,111)	2,086,740 (1,590,388)
6/10-6/23	3,235,137 (763,831)	2,846,984 (883,512)	2,625,631 (799,153)	241,555 (108,286)	186,463 (91,632)
6/24-7/ 7	1,782,938 (1,498,400)	1,978,378 (1,740,494)	1,860,409 (1,576,329)	376,357 (244,225)	305,467 (176,790)
7/ 8-7/21	47,387 (41,785)	51,432 (48,611)	49,546 (44,198)	78,896 (69,714)	80,809 (74,642)
7/22-8/ 4	673,465 (634,902)	783,625 (740,464)	717,911 (668,915)	32,440 (26,110)	21,150 (17,022)
8/ 5-8/18	1,414,235 (469,284)	647,104 (403,875)	586,327 (364,783)	112,882 (106,991)	119,098 (115,237)

*Numbers in parentheses represent one standard error

Table D-108

Standing Crop of Juvenile Atlantic Tomcod in Hudson River Estuary [RM 12-153 (km 19-245)] within Bowline, Lovett, Indian Point, Roseton, and Danskammer Power-Plant Regions, Based on Beach-Seine Sampling during 1973

Plant	6/17-6/30	7/1-7/14	7/15-7/28	7/29-8/11	8/12-8/25	8/26-9/8	9/9-9/22	9/23-10/6	10/7-10/20	10/21-11/3	11/4-11/17	11/18-12/1	12/2-12/15
Bowline	0 (0)*	0 (0)	0 (0)	0 (0)	108,261 (95,360)	4,009 (4,009)	0 (0)	10,692 (10,692)	12,831 (9,352)	0 (0)	2,673 (2,673)	0 (0)	0 (0)
Lovett	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Indian Point	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Roseton	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Danskammer	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

*Numbers in parentheses represent one standard error

Table D-109

Percentage of Total Standing Crop (from Ichthyoplankton Sampling) of Atlantic Tomcod Post Yolk-Sac Larvae in Hudson River Estuary [RM 14-140 (km 22-224)] Below, Within, and Above Each Power-Plant Region during 1973

Date	Region	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/29-5/12	Below	42.3	53.7	57.4	98.3	98.9
	Within	41.6	38.5	35.3	1.7	1.1
	Above	16.1	7.8	7.3	0	0
5/13-5/26	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
5/27-6/ 9	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
6/10-6/23	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
6/24-7/ 7	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
7/ 8-7/21	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
7/22-8/ 4	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
8/ 5-8/18	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0

Table D-110

Percentage of Total Standing Crop (from Ichthyoplankton Sampling) of Juvenile Atlantic Tomcod in Hudson River Estuary [RM 14-140 (km 22-224)] Below, Within, and Above Each Power-Plant Region during 1973

Date	Region	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/29-5/12	Below	44.2	55.9	59.3	97.1	97.6
	Within	40.2	36.3	33.3	2.0	1.6
	Above	15.6	7.8	7.4	0.8	0.8
5/13-5/26	Below	67.0	81.9	82.9	97.2	97.7
	Within	23.3	10.9	10.2	1.9	1.6
	Above	9.7	7.2	6.8	0.8	0.8
5/27-6/ 9	Below	16.4	20.8	22.2	82.5	86.6
	Within	16.2	18.4	20.3	13.5	9.4
	Above	67.4	60.8	57.4	4.0	3.9
6/10-6/23	Below	44.9	56.5	59.6	96.0	96.7
	Within	36.8	32.4	29.9	2.7	2.1
	Above	18.3	11.1	10.6	1.3	1.2
6/24-7/ 7	Below	15.3	21.3	25.4	84.4	86.2
	Within	39.8	44.1	41.5	8.4	6.8
	Above	44.9	34.5	33.1	7.2	7.0
7/ 8-7/21	Below	9.7	12.8	14.5	43.7	44.9
	Within	16.8	18.2	17.6	28.0	28.7
	Above	73.5	68.9	67.9	28.3	26.4
7/22-8/ 4	Below	4.4	10.1	17.3	96.9	98.0
	Within	64.9	75.5	69.2	3.1	2.0
	Above	30.7	14.4	13.5	0	0
8/ 5-8/18	Below	69.2	84.6	85.6	96.0	96.0
	Within	24.1	11.0	10.0	1.9	2.0
	Above	6.7	4.4	4.4	2.1	2.0

Table D-111

Percentage of Total Standing Crop (from Beach-Seine Sampling) of Juvenile Atlantic Tomcod in Hudson River Estuary [RM 14-140 (km 22-224)] Below, Within, and Above Each Power-Plant Region during 1973

DATES	Region	BOWLINE	LOVETT	INDIAN POINT	ROSETON	DANSKAMMER
6/17-6/30	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
7/1-7/14	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
7/15-7/28	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
7/29-8/11	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
8/12-8/25	Below	65.4	100.0	100.0	100.0	100.0
	Within	34.6	0	0	0	0
	Above	0	0	0	0	0
8/26-9/8	Below	64.7	100.0	100.0	100.0	100.0
	Within	35.3	0	0	0	0
	Above	0	0	0	0	0
9/9-9/22	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
9/23-10/6	Below	64.7	100.0	100.0	100.0	100.0
	Within	35.3	0	0	0	0
	Above	0	0	0	0	0
10/7-10/20	Below	64.7	100.0	100.0	100.0	100.0
	Within	35.3	0	0	0	0
	Above	0	0	0	0	0
10/21-11/3	Below	100.0	100.0	100.0	100.0	100.0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
11/4-11/17	Below	64.7	100.0	100.0	100.0	100.0
	Within	35.3	0	0	0	0
	Above	0	0	0	0	0
11/18-12/1	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
12/2-12/15	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0

Table D-112

Standing Crop of Striped Bass Eggs within Each Power-Plant Region in Hudson River Estuary Based on Day or Night Sampling by Epibenthic Sled and Tucker Trawl during 1974

Date	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/29- 5/ 4	0 (0)*	98,269 (22,650)	194,572 (44,848)	105,827 (73,459)	61,920 (42,981)
5/ 6- 5/11	3,009,285 (2,932,015)	9,317,952 (4,382,545)	14,056,530 (4,382,794)	0 (0)	0 (0)
5/13- 5/18	10,553,646 (7,736,283)	10,666,771 (6,891,135)	8,973,930 (5,345,828)	713,575 (504,692)	589,153 (432,167)
5/15- 5/18	NS**	168,394,200 (149,526,172)	185,254,054 (149,658,938)	15,982,144 (9,178,371)	15,339,517 (9,770,137)
5/21- 5/24	107,304,126 (34,644,059)	121,445,036 (33,818,864)	108,174,052 (28,396,535)	5,955,483 (1,967,230)	4,978,275 (1,761,627)
5/23- 5/29	440,277 (236,060)	736,407 (347,094)	886,509 (430,170)	332,920 (205,101)	331,560 (215,234)
5/28- 5/31	1,628,995 (1,125,165)	1,593,597 (974,991)	1,409,441 (768,940)	2,479,437 (1,247,702)	2,240,529 (1,209,697)
5/30- 6/ 5	14,070 (14,070)	135,026 (57,061)	246,740 (107,112)	4,625,602 (3,825,019)	4,644,745 (4,106,594)
6/ 4- 6/ 7	0 (0)	68,356 (35,434)	135,346 (70,160)	290,923 (189,733)	209,979 (122,315)
6/10- 6/14	0 (0)	3,014 (3,014)	5,967 (5,967)	0 (0)	0 (0)
6/12- 6/17	0 (0)	80,962 (80,962)	160,306 (160,306)	56,610 (43,386)	52,859 (44,281)
6/17- 6/23	0 (0)	3,542 (3,542)	7,013 (7,013)	393,058 (393,058)	229,981 (229,981)
6/24- 6/27	0 (0)	2,219 (2,219)	4,394 (4,394)	16,000 (16,000)	9,362 (9,362)
7/1- 7/5	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7/ 8- 7/11	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7/15- 7/18	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7/22- 7/26	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7/29- 8/ 2	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
8/ 5- 8/ 9	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
8/12- 8/15	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

*Numbers in parentheses represent one standard error
**NS = no samples taken

Table D-113

Standing Crop of Striped Bass Yolk-Sac Larvae within Each Power-Plant Region in Hudson River Estuary Based on Day or Night Sampling by Epibenthic Sled and Tucker Trawl during 1974

Date	Time*	Bowline	Lovett	Indian Point	Roseton	Danskammer
4-29- 5/ 4	N	0 (0)**	0 (0)	0 (0)	0 (0)	0 (0)
5/ 6- 5/11	N	156,484 (146,919)	712,555 (219,615)	1,181,630 (219,629)	0 (0)	0 (0)
5/13- 5/18	N	1,072,970 (544,336)	1,207,899 (801,939)	1,130,503 (800,182)	29,088 (29,088)	31,322 (31,322)
5/15- 5/18	D	NS†	39,474 (39,474)	78,158 (78,158)	241,802 (166,759)	153,579 (100,074)
5/21- 5/24	D	29,836,100 (11,302,772)	27,484,123 (9,858,161)	22,326,705 (7,481,269)	10,192,775 (5,087,498)	10,747,224 (5,477,472)
5/23- 5/29	N	4,121,935 (1,098,676)	3,237,834 (1,242,311)	3,024,148 (1,165,894)	6,688,695 (2,586,782)	6,086,182 (2,454,814)
5/28- 5/31	N	24,919,330 (3,867,745)	24,640,132 (3,454,906)	21,251,188 (2,807,731)	64,948,398 (24,055,003)	60,539,975 (24,971,000)
5/30- 6/ 5	N	442,937 (179,480)	1,277,785 (439,082)	2,062,438 (821,734)	59,683,746 (24,776,864)	56,186,199 (23,081,630
6/ 4- 6/ 7	D	2,843,739 (570,808)	3,609,149 (712,741)	3,701,717 (796,297)	38,275,531 (14,831,740)	35,644,426 (14,962,463)
6/10- 6/14	D	32,220,902 (23,380,877)	49,320,852 (34,858,563)	51,635,586 (34,977,018)	22,238,514 (7,280,365)	19,454,621 (7,113,729)
6/12- 6/17	N	169,903 (126,437)	505,813 (231,406)	775,744 (344,727)	8,931,598 (7,368,933)	8,939,324 (7,878,081)
6/17- 6/23	N	1,749,398 (1,121,050)	3,005,058 (1,684,436)	3,405,277 (1,709,949)	210,348 (124,318)	131,050 (74,201)
6/24- 6/27	N	451,314 (152,227)	625,970 (219,550)	613,437 (217,826)	164,370 (85,446)	96,174 (49,995)
7/ 1- 7/ 5	N	21,443 (16,146)	32,052 (24,135)	32,052 (24,135)	0 (0)	0 (0)
7/ 8- 7/11	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7/15- 7/18	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7/22- 7/26	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7/29- 8/ 2	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
8/ 5- 8/ 9	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
8/12- 8/15	N	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

*N = night samples, D = day samples
**Numbers in parentheses represent one standard error
†NS = no samples

Table D-114

Standing Crop of Striped Bass Post Yolk-Sac Larvae within Each Power-Plant Region in Hudson River Estuary Based on Day or Night Sampling by Epibenthic Sled and Tucker Trawl during 1974

Date	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/29- 5/ 4	0 (0)*	0 (0)	0 (0)	0 (0)	0 (0)
5/ 6- 5/11	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/13- 5/18	42,817 (0)	64,001 (0)	64,001 (0)	0 (0)	0 (0)
5/15- 5/18	NS**	0 (0)	0 (0)	41,026 (31,395)	24,004 (18,369)
5/21- 5/24	431,061 (189,304)	261,780 (147,212)	194,194 (109,205)	0 (0)	0 (0)
5/23- 5/29	710,437 (241,258)	462,234 (263,043)	400,326 (245,618)	41,080 (41,080)	24,036 (24,036)
5/28- 5/31	11,084,616 (1,315,486)	14,776,432 (1,765,496)	15,367,957 (2,210,003)	3,895,556 (2,608,013)	3,880,573 (2,790,795)
5/30- 6/ 5	57,589,550 (3,896,661)	57,189,146 (5,860,416)	49,722,556 (6,371,473)	12,649,262 (2,780,390)	11,665,258 (2,643,254)
6/ 4- 6/ 7	29,902,660 (9,188,737)	22,229,908 (8,161,436)	20,997,981 (7,040,391)	10,304,358 (3,505,295)	8,932,547 (3,675,253)
6/10- 6/14	86,823,271 (33,609,632)	127,510,960 (50,134,903)	129,740,771 (50,205,721)	27,701,044 (7,407,699)	24,602,258 (6,915,011)
6/12- 6/17	16,391,500 (6,494,890)	32,507,475 (10,148,806)	41,769,744 (11,349,824)	65,910,224 (17,086,893)	57,605,929 (17,599,041)
6/17- 6/23	56,838,377 (9,779,083)	88,430,901 (14,744,638)	94,477,817 (15,148,456)	79,274,200 (25,834,350)	78,234,060 (27,588,046)
6/24- 6/27	30,471,193 (3,647,376)	36,865,359 (4,261,818)	35,380,382 (3,958,362)	25,915,934 (4,157,445)	19,364,168 (2,544,792)
7/ 1- 7/ 5	5,119,842 (1,873,860)	5,966,191 (2,550,076)	5,535,360 (2,493,586)	3,344,478 (744,007)	2,639,340 (546,138)
7/ 8- 7/11	4,091,041 (1,342,783)	3,852,931 (1,166,778)	3,266,612 (884,619)	1,376,333 (371,519)	1,215,193 (367,072)
7/15- 7/18	0 (0)	36,508 (12,752)	72,287 (25,250)	1,862,113 (582,083)	1,742,142 (613,620)
7/22- 7/26	39,195 (39,195)	58,587 (58,587)	58,587 (58,587)	16,546 (12,306)	9,681 (7,200)
8/ 5- 8/ 9	0 (0)	0 (0)	0 (0)	20,159 (20,159)	21,707 (21,707)
8/12- 8/15	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

*Numbers in parentheses represent one standard error
**NS = no samples

Table D-115

Standing Crop of Juvenile Striped Bass within Each Power-Plant Region in Hudson River Estuary Based on Day or Night Sampling by Epibenthic Sled and Tucker Trawl during 1974

Date	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/29- 5/ 4	0 (0)*	0 (0)	0 (0)	0 (0)	0 (0)
5/ 6- 5/11	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/13- 5/18	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/15- 5/18	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/21- 5/24	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/23- 5/29	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/28 5/31	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/30 6/ 5	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
6/ 4- 6/ 7	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
6/10- 6/14	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
6/12- 6/17	0 (0)	0 (0)	0 (0)	42,322 (42,322)	45,573 (45,573)
6/17- 6/23	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7/ 1- 7/ 5	264,482 (115,453)	207,873 (102,803)	183,383 (87,408)	4,671 (4,671)	2,733 (2,733
7/ 8- 7/11	1,556,081 (633,519)	1,088,964 (521,398)	826,216 (387,275)	0 (0)	0 (0)
7/15- 7/18	1,096,202 (328,918)	693,006 (221,535)	528,950 (165,429)	322,204 (93,858)	240,313 (95,375)
7/22- 7/26	1,085,107 (308,468)	526,050 (152,722)	444,933 (136,531)	527,435 (222,444)	328,160 (132,308)
7/29- 8/ 2	384,702 (119,446)	293,047 (101,868)	251,727 (87,748)	113,875 (93,547)	112,627 (100,732)
8/ 5- 8/ 9	435,016 (139,373)	333,584 (126,570)	270,265 (108,340)	139,083 (61,592)	81,378 (36,037)
8/12- 8/15	1,165,621 (439,226)	1,068,113 (392,876)	846,330 (306,191)	25,568 (25,568)	14,960 (14,960

*Numbers in parentheses represent one standard error

Table D-116

Standing Crop of Juvenile Striped Bass within Each Power-Plant Region in Hudson River Estuary [RM 12-153 (km 19-245)] Based on Daytime Sampling by 100-ft (30.5-m) Beach Seine during 1974

Plant	4/21- 5/ 4	5/ 5 5/18	5/19- 6/ 1	6/ 2- 6/15	6/16- 6/29	6/30- 7/13	7/14- 7/27	7/28- 8/10	8/11 8/24	8/25- 9/ 7	9/ 8- 9/21	9/22- 10/5
Bowline	0 (0)*	0 (0)	0 (0)	0 (0)	2,068 (2,068)	35,484 (11,203)	106,637 (22,822)	134,238 (28,968)	183,251 (35,316)	1,0619.16 (333,239)	1,152,826 (343,370)	753,245 (135,886)
Lovett	0 (0)	0 (0)	0 (0)	0 (0)	1,853 (1,853)	21,157 (8,551)	74,248 (20,075)	109,768 (25,399)	119,296 (20,593)	485,564 (78,643)	577,884 (132,194)	523,551 (113,876)
Indian Point	0 (0)	0 (0)	0 (0)	0 (0)	1,623 (1,326)	18,416 (7,646)	65,012 (17,222)	91,197 (18,333)	108,078 17,539	391,064 (61,332)	420,573 (92,315)	391,672 (82,650)
Roseton	0 (0)	0 (0)	0 (0)	0 (0)	1,959 (1,490)	33,761 (16,627)	39,379 (11,482)	74,758 (20,112)	63,315 (14,952)	56,578 (29,932)	12,411 (5,248)	12,223 (2,913)
Danskammer	0 (0)	0 (0)	0 (0)	0 (0)	871 (662)	29,378 (15,768)	23,360 (6,466)	45,813 (11,825)	38,853 (7,734)	30,645 (13,567)	11,651 (5,264)	7,163 (1,825)

*Numbers in parentheses represent one standard error

Table D-117

Percentage of Total Standing Crop (from Ichthyoplankton Sampling) of Striped Bass Eggs in Hudson River Estuary Below, Within, and Above Power-Plant Regions during 1974

Date	Region	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/29-	Below	0	0	0	91.0	94.7
5/ 4	Within	0	8.4	16.6	9.0	5.3
	Above	100	91.6	83.4	0	0
5/ 6-	Below	0	0	0	99.9	99.9
5/11	Within	5.7	17.6	26.5	0	0
	Above	94.3	82.4	73.4	0.1	0.1
5/13-	Below	0.1	7.2	18.0	78.7	79.6
5/18	Within	63.1	63.8	53.7	4.3	3.5
	Above	36.7	29.0	28.3	17.1	16.9
5/21-	Below	0.1	4.9	12.3	73.5	74.2
5/24	Within	58.4	66.1	58.9	3.2	2.7
	Above	41.5	29.0	28.8	23.2	23.1
5/23-	Below	0.1	0.1	0.2	5.0	5.1
5/29	Within	0.9	1.5	1.8	0.7	0.7
	Above	99.1	98.4	98.0	94.3	94.2
5/28-	Below	0	1.0	2.4	16.8	18.3
5/31	Within	6.8	6.7	5.9	10.4	9.4
	Above	93.2	92.4	91.7	72.8	72.3
5/30-	Below	0	0	0	11.7	13.6
6/ 5	Within	0.1	0.9	1.7	31.9	32.0
	Above	99.9	99.1	98.3	56.4	54.3
6/ 4-	Below	0	0	0	58.7	64.8
6/ 7	Within	0	4.7	9.4	20.2	14.6
	Above	100	95.3	90.6	21.1	20.6
6/10-	Belwo	0	0	0	1.4	1.4
6/14	Within	0	0.1	0.3	0	0
	Above	100	99.9	99.7	98.6	98.6
6/12-	Below	0	0	0	91.9	92.7
6/17	Within	0	9.0	17.9	6.3	5.9
	Above	100	91.0	82.1	1.8	1.4
6/17-	Below	0	0	0	43.3	64.1
6/23	Within	0	0.5	0.9	50.1	29.3
	Above	100	99.5	99.1	6.6	6.6
7/22-	Below	0	0	0	0	0
7/26	Within	0	0	0	0	0
	Above	0	0	0	0	0
7/29-	Below	0	0	0	0	0
8/ 2	Within	0	0	0	0	0
	Above	0	0	0	0	0
8/ 5-	Below	0	0	0	0	0
8/ 9	Within	0	0	0	0	0
	Above	0	0	0	0	0
8/12-	Below	0	0	0	0	0
8/15	Within	0	0	0	0	0
	Above	0	0	0	0	0

Table D-118

Percentage of Total Standing Crop (from Ichthyoplankton Sampling) of Striped Bass Yolk-Sac Larvae in Hudson River Estuary Below, Within, and Above Power-Plant Regions during 1974

Date	Region	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/29-5/4	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
5/ 6-5/11	Below	0	0	0	98.6	98.6
	Within	3.1	14.0	23.2		
	Above	96.9	86.0	76.8	1.4	1.4
5/13-5/18	Below	33.4	40.6	44.3	96.5	96.5
	Within	47.6	53.6	50.2	1.3	1.4
	Above	19.0	5.8	5.5	2.2	2.1
5/21-5/24	Below	5.5	13.3	21.8	59.4	59.7
	Within	48.8	44.9	36.5	16.7	17.6
	Above	45.8	41.8	41.7	24.0	22.8
5/23-5/29	Below	11.5	17.0	18.0	35.8	39.0
	Within	13.9	10.9	10.2	22.5	20.5
	Above	74.6	72.1	71.9	41.7	40.5
5/28-5/31	Below	1.3	3.6	6.3	33.2	38.2
	Within	15.8	15.6	13.5	41.2	38.4
	Above	82.9	80.7	80.2	25.6	23.4
6/ 4-6/ 7	Below	0.7	1.3	1.6	24.0	31.0
	Within	4.2	5.4	5.5	56.9	53.0
	Above	95.0	93.4	92.9	19.1	16.1
5/30-6/ 5	Below	0	0.1	0.2	20.7	27.1
	Within	0.4	1.2	1.9	55.9	52.6
	Above	99.6	98.7	97.9	23.4	20.3
6/10-6/14	Below	0	0.4	1.0	74.7	78.1
	Within	28.7	43.9	46.0	19.8	17.3
	Above	71.3	55.7	53.0	5.5	4.6
6/12-6/17	Below	0	0	0.1	23.2	26.4
	Within	0.9	2.8	4.3	49.7	49.7
	Above	99.1	97.1	95.6	27.1	23.9
6/17-6/23	Below	0.4	0.6	0.6	96.9	98.1
	Within	24.7	42.4	48.0	3.0	1.8
	Above	74.9	57.0	51.4	0.1	0.1
7/22-7/26	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
7/29-8/2	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
8/ 5-8/ 9	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
8/12-8/15	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0

Table D-119

Percentage of Total Standing Crop (from Ichthyoplankton Sampling) of Striped Bass Post Yolk-Sac Larvae in Hudson River Estuary Below, Within, and Above Power-Plant Regions during 1974

Date	Region	Bowline	Lovett	Indian Point	Roseton	Danskammer
4-29-5/ 4	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
5/ 6-5/11	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
5/13-5/18	Below	0	0	0	100	100
	Within	66.9	100	100	0	0
	Above	33.1	0	0	0	0
5/21-5/24	Below	52.0	70.8	78.4	100	100
	Within	48.0	29.2	21.6	0	0
	Above	0	0	0	0	0
5/23-5/29	Below	46.2	66.4	70.3	97.4	98.5
	Within	44.6	29.0	25.1	2.6	1.5
	Above	9.2	4.6	4.6	0	0
5/28-5/31	Below	10.1	14.6	15.2	83.1	83.9
	Within	33.6	44.8	46.6	11.8	11.8
	Above	56.3	40.6	38.2	5.1	4.3
5/30-6/ 5	Below	2.6	9.5	18.6	85.2	86.6
	Within	50.1	49.8	43.3	11.0	10.2
	Above	47.3	40.7	38.2	3.8	3.2
6/ 4-6/ 7	Below	31.2	46.1	48.4	84.2	86.3
	Within	34.4	25.5	24.1	11.8	10.3
	Above	34.5	28.4	27.4	4.0	3.5
6/10-6/14	Below	0.5	1.3	2.3	83.2	85.3
	Within	40.5	59.5	60.6	12.9	11.5
	Above	59.0	39.2	37.2	3.8	3.2
6/12-6/17	Below	0.1	0.2	0.5	52.6	56.6
	Within	5.9	11.7	15.1	23.8	20.9
	Above	94.0	88.0	84.4	23.6	22.5
6/17-6/23	Below	0.6	1.0	1.2	50.7	52.6
	Within	17.4	27.1	28.9	24.3	24.0
	Above	82.0	71.9	69.8	25.0	23.5
7/22-7/26	Below	0	0	0	17.9	19.7
	Within	9.8	14.7	14.7	4.2	2.4
	Above	90.2	85.3	85.3	77.9	77.9
8/ 5-8/ 9	Below	0	0	0	0	0
	Within	0	0	0	71.6	77.1
	Above	100	100	100	28.4	22.9
8/12-8/15	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0

Table D-120

Percentage of Total Standing Crop (from Ichthyoplankton Sampling) of Juvenile Striped Bass in Hudson River Estuary Below, Within, and Above Power-Plant Regions during 1974

Date	Region	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/29-5/ 4	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
5/ 6-5/11	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
5/13-5/18	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
5/21-5/24	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
5/23-5/29	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
5/28-5/31	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
5/30 6/ 5-	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
6/ 4-6/ 7	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
6/10-6/14	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
6/12-6/17	Below	0	0	0	0	0
	Within	0	0	0	71.6	77.1
	Above	100	100	100	28.4	22.9
6/17-6/23	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	100	100	100	100	100
7/22-7/26	Below	32.3	47.7	50.0	72.6	77.6
	Within	26.8	13.0	11.0	13.0	8.1
	Above	40.9	39.3	39.0	14.4	14.4
7/29-8/ 2	Below	9.4	14.4	16.0	25.9	26.2
	Within	14.3	10.9	9.3	4.2	4.2
	Above	76.3	74.7	74.7	69.9	69.6
8/ 5-8/ 9	Below	19.2	30.6	36.4	70.8	75.8
	Within	38.3	29.4	23.8	12.2	7.2
	Above	42.5	40.0	39.9	17.0	17.0
8/12-8/15	Below	3.4	14.3	28.9	85.6	86.3
	Within	76.4	70.0	55.5	1.7	1.0
	Above	20.2	15.7	15.7	12.7	12.7

Table D-121

Percentage of Total Standing Crop (from Beach-Seine Sampling) of Juvenile Striped Bass in Hudson River Estuary Below, Within and Above Power-Plant Regions during 1974

Date	Region	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/21-	Below	0	0	0	0	0
5/ 4	Within	0	0	0	0	0
	Above	0	0	0	0	0
5/ 5-	Below	0	0	0	0	0
5/18	Within	0	0	0	0	0
	Above	0	0	0	0	0
5/19-	Below	0	0	0	0	0
6/ 1	Within	0	0	0	0	0
	Above	0	0	0	0	0
6/ 2-	Below	0	0	0	0	0
6/15	Within	0	0	0	0	0
	Above	0	0	0	0	0
6/16-	Below	0	1.6	5.9	85.1	93.4
6/29	Within	15.8	14.1	12.4	14.9	6.6
	Above	84.2	84.2	81.7	0	0
6/30-	Below	17.8	28.3	30.3	53.7	57.0
7/13	Within	24.2	14.4	12.5	23.0	20.0
	Above	58.1	57.3	57.2	23.3	23.0
7/14-	Below	13.3	21.2	23.5	51.2	54.8
7/27	Within	23.3	16.2	14.2	8.6	5.1
	Above	63.4	62.6	62.3	40.2	40.1
7/28-	Below	6.0	10.1	12.9	39.6	43.8
8/10	Within	19.2	15.7	13.0	10.7	6.6
	Above	74.8	74.2	74.1	49.7	49.7
8/11-	Below	20.1	31.2	33.0	61.2	65.1
8/24	Within	28.6	18.6	16.9	9.9	6.1
	Above	51.4	50.2	50.1	28.9	28.9
8/25-	Below	42.7	67.2	71.1	90.4	91.5
9/ 7	Within	44.0	20.1	16.2	2.3	1.3
	Above	13.4	12.7	12.7	7.3	7.3
9/ 8-	Below	43.6	69.9	77.0	96.5	96.5
9/21	Within	52.3	26.2	19.1	0.6	0.5
	Above	4.2	3.9	3.9	2.9	2.9
9/22-	Below	30.2	50.6	61.9	97.0	97.4
10/5	Within	64.5	44.9	33.6	1.0	0.6
	Above	5.3	4.6	4.5	2.0	2.0

Table D-122

Standing Crop of White Perch Eggs within Each Power-Plant Region in Hudson River Estuary Based on Day or Night Sampling by Epibenthic Sled and Tucker Trawl during 1974

Date	Bowline	Lovett	Indian Point	Roseton	Danskammer
4-29- 5-4	0 (0)*	0 (0)	0 (0)	0 (0)	0 (0)
5-6- 5-11	16,723 (10,876)	0 (0)	0 (0)	20,661 (20,661)	22,248 (22,248)
5-13- 5-18	1,470,365 (516,560)	1,481,338 (450,616)	1,311,127 (371,173)	3,135,405 (1,799,498)	3,376,253 (1,937,728)
5-15- 5-18	NS**	1,883,520 (1,328,230)	3,729,371 (2,629,896)	2,182,668 (1,774,306)	1,301,696 (1,038,595)
5-21- 5-24	5,320,050 (4,007,044)	1,310,666 (701,036)	1,112,584 (601,489)	366,343 (162,056)	290,658 (149,822)
5-23- 5-29	23,426,207 (19,406,569)	19,044,957 (16,585,433)	14,207,448 (12,303,538)	2,376,936 (1,880,880)	1,681,595 (1,223,528)
5-28- 5-31	1,763,372 (1,221,530)	668,290 (517,552)	724,679 (512,452)	9,593,581 (7,378,317)	6,899,062 (4,921,913)
5-30- 6-5	176,793,638 (111,551,980)	151,212,440 (95,488,283)	112,375,284 (70,835,817)	3,012,371 (2,133,350)	3,559,135 (2,297,182)
6-4- 6-7	5,702,197 (3,182,656)	336,398 (232,247)	324,331 (177,635)	2,910,776 (1,807,131)	3,063,097 (1,942,476)
6-10- 6-14	114,414,485 (103,324,738)	98,475,166 (88,449,380)	73,819,660 (65,618,773)	5,276,549 (5,276,549)	5,681,870 (5,681,870)
6-12- 6-17	11,394,979 (6,714,195)	11,454,797 (6,897,567)	10,708,425 (6,134,378)	2,973,114 (2,869,726)	1,760,398 (1,679,531)
6-17- 6-23	227,818 (214,972)	381,050 (322,067)	420,755 (324,201)	257,998 (132,613)	158,684 (78,883)
6-24- 6-27	722,486 (478,893)	1,129,603 (716,597)	1,178,265 (718,819)	432,085 (57,882)	282,407 (60,627)
7-1- 7-5	46,051 (36,338)	61,413 (52,417)	58,844 (51,991)	92,138 (92,138)	99,216 (99,216)
7-22- 7-26	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7-29- 8-2	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
8-5- 8-9	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
8-12- 8-15	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

*Numbers in parentheses represent one standard error
**NS = no samples taken

Table D-123

Standing Crop of White Perch Yolk-Sac Larvae within Each Power-Plant Region in Hudson River Estuary Based on Day or Night Sampling by Epibenthic Sled and Tucker Trawl during 1974

Date	Bowline	Lovett	Indian Point	Roseton	Danskammer
4-29- 5- 4	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5-6- 5-11	76.049 (76,049)	190,872 (0)	377,927 (0)	0 (0)	0 (0)
5-13 5-18	411,089 (289,570)	339,101 (249,836)	262,865 (187,648)	622,430 (298,889)	515,641 (275,330)
5-15 5-18	NS	2,504,759 (2,337,114)	2,669,338 (2,337,973)	1,692,292 (398,211)	1,244,812 (311,031)
5-21 5-24	23,388,917 (4,708,147)	15,313,967 (3,957,072)	12,249,081 (2,992,434)	12,030,810 (4,257,154)	12,023,233 (4,579,691)
5-23- 5-29	2,964,216 (586,223)	659,987 (131,282)	607,045 (145,872)	695,183 (315,851)	647,483 (294,236)
5-28- 5-31	3,472,652 (1,240,135)	1,848,752 (965,274)	1,411,574 (717,998)	2,445,528 (1,332,571)	2,521,487 (1,431,657)
5-30- 6-5	53,796 (38,704)	73,863 (53,959)	112,389 (94,311)	1,840,200 (1,517,657)	1,950,278 (1,634,076)
6-4- 6-7	1,483,146 (443,870)	960,708 (374,433)	808,544 (315,497)	2,487,901 (1,625,739)	1,664,777 (1,000,914)
6-10- 6-14	10,384,346 (4,077,757)	8,533,244 (3,482,317)	6,577,058 (2,586,702)	343,219 (150,330)	359,024 (160,710)
6-12- 6-17	746,518 (517,124)	1,989,404 (1,006,758)	2,912,360 (1,494,234)	437,077 (273,914)	295,208 (175,931)
6-17 6-23	872,750 (413,841)	1,250,472 (594,993)	1,284,518 (594,805)	173,391 (80,517)	136,828 (70,745)
6-24- 6-27	792,679 (685,719)	1,158,441 (1,023,737)	1,149,296 (1,023,461)	0 (0)	0 (0)
7-1- 7-5	826,804 (479,479)	982,217 (534,957)	903,385 (486,332)	0 (0)	0 (0)
7-8- 7-11	5,564 (5,564)	8,318 (8,318)	8,318 (8,318)	0 (0)	0 (0)
7-15- 7-18	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7-22- 7-26	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
7-29- 8-2	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
8-5- 8/9	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
8-12- 8-15	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

*Numbers in parentheses represent one standard error
**NS = no samples taken

Table D-124

Standing Crop of White Perch Post Yolk-Sac Larvae within Each Power-Plant Region in Hudson River Estuary Based on Day or Night Sampling by Epibenthic Sled and Tucker Trawl during 1974

Date	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/29- 5/ 4	0 (0)*	0 (0)	0 (0)	0 (0)	0 (0)
5/ 6- 5/11	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/13- 5/18	209,063 (109,659)	87,166 (70,871)	87,998 (62,937)	46,268 (33,782)	41,374 (32,896)
5/15 5/18	NS**	1,091,095 (567,080)	1,187,582 (572,416)	199,503 (125,898)	116,730 (73,663)
5/21- 5/24	8,020,816 (934,605)	3,335,063 (897,826)	2,834,540 (816,545)	2,133,575 (322,909)	1,568,817 (338,033)
5/23- 5/29	5,648,974 (986,338)	1,323,694 (422,220)	1,279,555 (405,970)	3,164,846 (553,322)	2,332,086 (516,741)
5/28- 5/31	7,468,427 (612,033)	5,959,713 (335,421)	5,394,999 (417,104)	17,702,573 (7,543,043)	17,431,621 (7,990,101)
5/30- 6/ 5	2,033,430 (809,189)	3,199,191 (1,288,439)	4,341,931 (1,803,956)	9,329,687 (1,479,893)	9,109,883 (1,432,490)
6/ 4- 6/ 7	15,296,847 (4,447,895)	9,747,561 (2,914,138)	8,917,334 (2,864,263)	37,276,007 (7,021,967)	30,520,557 (5,782,209)
6/10- 6/14	46,956,346 (11,394,621)	60,005,248 (16,491,522)	58,521,471 (16,425,822)	66,354,557 (16,628,393)	60,428,607 (17,796,078)
6/12- 6/17	18,695,238 (5,509,397)	30,871,256 (8,627,478)	36,084,044 (9,685,210)	86,418,280 (43,260,503)	85,541,586 (46,321,581)
6/17- 6/23	52,407,667 (10,253,240)	83,324,111 (15,536,707)	89,817,268 (16,177,651)	55,444,121 (8,742,081)	55,881,925 (9,275,824)
6/24- 6/27	47,701,191 (7,806,008)	63,985,550 (10,694,160)	62,143,294 (10,490,911)	20,129,881 (2,683,305)	17,040,299 (2,120,109)
7/ 1- 7/ 5	5,033,869 (1,500,217)	6,616,071 (2,185,623)	6,373,208 (2,173,617)	5,239,386 (816,865)	4,727,540 (847,568)
7/ 8- 7/11	3,246,184 (644,416)	2,923,606 (575,833)	2,666,536 (475,640)	7,046,922 (1,681,704)	6,374,619 (1,739,963)
7/15- 7/18	256,430 (95,025)	284,397 (81,673)	384,693 (103,340)	1,272,964 (319,530)	1,139,091 (325,407)
7/22- 7/26	47,204 (41,114)	113,509 (65,601)	155,600 (76,431)	448,071 (142,918)	417,709 (149,461)
7/29- 8/ 2	0 (0)	1,646 (1,646)	3,259 (3,259)	82,500 (42,319)	83,373 (44,449)
8/ 5- 8/ 9	0 (0)	0 (0)	0 (0)	99,401 (87,733)	100,854 (93,786)
8/12- 8/15	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

*Numbers in parentheses represent one standard error
**NS = no samples

Table D-125

Standing Crop of Juvenile White Perch within Each Power-Plant Region in Hudson River Estuary Based on Day or Night Sampling by Epibenthic Sled and Tucker Trawl during 1974

Date	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/29- 5/ 4	0 (0)*	0 (0)	0 (0)	0 (0)	0 (0)
5/ 6- 5/11	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/13- 5/18	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/15- 5/18	NS**	0 (0)	0 (0)	0 (0)	0 (0)
5/21- 5/24	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/23- 5/29	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/28- 5/31	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5/30- 6/ 5	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
6/ 4- 6/ 7	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
6/10- 6/14	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
6/12- 6/17	0 (0)	0 (0)	0 (0)	32,947 (32,947)	19,277 (19,277)
6/17- 6/23	6,917 (6,917)	0 (0)	0 (0)	0 (0)	0 (0)
6/24- 6/27	23,502 (23,502)	35,130 (35,130)	35,130 (35,130)	0 (0)	0 (0)
7/ 1- 7/ 5	0 (0)	17,806 (17,806)	35,257 (35,257)	82,971 (82,971)	48,546 (48,546)
7/ 8- 7/11	215,226 (93,871)	138,416 (67,838)	105,314 (50,786)	0 (0)	0 (0)
7/15- 7/18	0 (0)	0 (0)	0 (0)	86,544 (86,544)	93,192 (93,192)
7/22- 7/26	13,762 (13,762)	0 (0)	0 (0)	315,079 (176,762)	339,282 (190,341)
7/29- 8/ 2	136,883 (128,222)	204,608 (191,663)	204,608 (191,663)	251,560 (217,386)	270,884 (234,085)
8/ 5- 8/ 9	0 (0)	0 (0)	0 (0)	35,496 (26,176)	32,079 (25,825)
8/12- 8/15	0 (0)	0 (0)	0 (0)	237,316 (118,401)	225,751 120,541)

*Numbers in parentheses represent one standard error
**NS = no samples taken

Table D-126

Standing Crop of Juvenile White Perch within Each Power-Plant Region in Hudson River Estuary [RM 12-153 (km 19-245)] Based on Daytime Sampling by 100-ft (30.5-m) Beach Seine during 1974

Plant	4/21- 5/ 4	5/ 5- 5/18	5/19- 6/ 1	6/ 2- 6/15	6/16- 6/29	6/30- 7/13	7/14- 7/27	7/28- 8/10	8/11- 8/24	8/25 9/ 7	9/ 8- 9/21	9/22 10/5
Bowline	0 (0)*	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	7,175 (6,700)	5,298 (2,524)	25,151 (9,633)	153,765 (51,343)	175,899 (54,331)	78,560 (24,847)
Lovett	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	542 (542)	1,417 (1,107)	23,258 (10,344)	144,562 (55,296)	160,932 (53,037)	61,964 (24,531
Indian Point	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	55 (30)	607 (543)	1,627 (1,109)	23,879 (10,348)	135,514 (54,452)	136,607 (46,302)	58,526 (24,091)
Roseton	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	40,124 (25,501)	4,617 (1,755)	65,367 (19,775)	81,898 (20,362)	66,243 (16,630)	23,897 (10,873)	27,544 (10,800)
Danskammer	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	40,955 (26,029)	4,395 (1,718)	54,228 (15,506)	69,074 (17,322)	46,439 (12,667)	18,801 (8,560)	20,029 (8,609)

*Numbers in parentheses represent one standard error

Table D-127

Percentage of Total Standing Crop (from Ichthyoplankton Sampling) of White Perch Eggs in Hudson River Estuary Below, Within, and Above Power-Plant Regions during 1974

Date	Region	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/29-5/4	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
5/ 6-5/11	Below	46.1	65.9	65.9	65.9	65.9
	Within	19.8	0	0	24.4	26.3
	Above	34.1	34.1	34.1	9.7	7.8
5/13-5/18	Below	0.4	2.0	4.1	21.2	21.2
	Within	11.6	11.7	10.4	24.8	26.7
	Above	88.0	86.3	85.5	54.0	52.1
5/21-5/24	Below	8.3	11.9	12.1	13.2	13.3
	Within	4.6	1.1	1.0	0.3	0.3
	Above	87.1	86.9	86.9	86.5	86.4
5/23-5/29	Below	6.2	15.7	26.2	60.6	62.2
	Within	50.0	40.7	30.3	5.1	3.6
	Above	43.7	43.6	43.4	34.3	34.2
5/28-5/31	Below	10.1	14.7	15.1	42.4	52.8
	Within	6.3	2.4	2.6	34.5	24.8
	Above	83.6	82.9	82.3	23.1	22.4
5/30-6/ 5	Below	0.4	14.1	34.7	95.0	95.0
	Within	93.7	80.1	59.6	1.8	1.9
	Above	5.9	5.8	5.7	3.3	3.1
6/ 4-6/ 7	Below	36.2	51.9	52.1	54.7	54.9
	Within	16.5	1.0	0.9	8.4	8.8
	Above	47.3	47.2	47.0	36.9	36.3
6/10-6/14	Below	0.5	10.3	24.8	69.5	69.5
	Within	66.6	57.3	43.0	3.1	3.3
	Above	32.9	32.4	32.2	27.4	27.2
6/12-6/17	Below	10.3	18.0	23.1	87.5	91.6
	Within	38.1	38.3	35.8	9.9	5.9
	Above	51.6	43.7	41.1	2.5	2.5
6/17-6/23	Below	0	0	0	67.2	74.5
	Within	16.4	27.5	30.3	18.6	11.4
	Above	83.6	72.5	69.7	14.2	14.1
6/24-6/27	Below	0	0	0	79.2	85.5
	Within	31.0	48.4	50.5	18.1	12.1
	Above	69.0	51.6	49.5	2.7	2.4
7/ 8-7/11	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
7/15-7/18	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
7/22-7/26	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
7/29-8/ 2	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
8/ 5-8/ 9	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
8/12-8/15	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0

Table D-128

Percentage of Total Standing Crop (from Ichthyoplankton Sampling) of White Perch Yolk-Sac Larvae in Hudson River Estuary Below, Within, and Above Power-Plant Regions during 1974

Date	Region	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/29-5/ 4	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
5/ 6-5/11	Below	6.7	9.6	9.6	81.8	81.8
	Within	2.9	7.2	14.3	0	0
	Above	90.4	83.2	76.1	18.2	18.2
5/13-5/18	Below	7.3	11.4	14.9	38.6	44.7
	Within	19.3	15.9	12.3	29.2	24.2
	Above	73.4	72.8	72.8	32.2	31.1
5/21-5/24	Below	14.7	23.0	26.1	41.2	41.9
	Within	21.6	14.1	11.3	11.1	11.1
	Above	63.7	62.8	62.6	47.7	47.0
5/23-5/29	Below	19.0	27.4	27.8	32.1	32.4
	Within	10.3	2.3	2.1	2.4	2.2
	Above	70.7	70.3	70.1	65.5	65.3
5/28-5/31	Below	5.1	7.8	8.6	11.6	11.8
	Within	5.7	3.0	2.3	4.0	4.1
	Above	89.2	89.1	89.1	84.4	84.1
5/30-6/ 5	Below	0.3	0.4	0.5	3.3	3.5
	Within	0.3	0.4	0.6	10.0	10.5
	Above	99.4	99.2	98.9	86.7	86.0
6/ 4-6/ 7	Below	5.9	9.0	9.8	22.4	26.6
	Within	7.2	4.7	3.9	12.1	8.1
	Above	86.9	86.4	86.2	65.4	65.3
6/10-6/14	Below	9.5	20.2	30.5	67.5	67.6
	Within	52.5	43.2	33.3	1.7	1.8
	Above	38.0	36.7	36.2	30.7	30.6
6/12-6/17	Below	0.3	0.4	0.4	29.0	29.4
	Within	2.0	5.3	7.8	1.2	0.8
	Above	97.7	94.3	91.8	69.8	69.8
6/17-6/23	Below	1.2	2.6	3.9	74.6	76.1
	Within	31.8	45.6	46.9	6.3	5.0
	Above	67.0	51.8	49.2	19.1	18.9
7/22-7/26	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
7/29-8/ 2	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
8/ 5-8/ 9	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
8/12-8/15	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0

Table D-129

Percentage of Total Standing Crop (from Ichthyoplankton Sampling) of White Perch Post Yolk-Sac Larvae in Hudson River Estuary Below, Within, and Above Power-Plant Regions during 1974

Date	Region	Bowline	Lovett	Indian Point	Roseton	Danskammer
5/ 6- 5/11	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
5/13- 5/18	Below	42.7	59.9	62.0	92.9	93.8
	Within	25.6	10.7	10.8	5.7	5.1
	Above	31.8	29.5	27.2	1.4	1.1
5/21- 5/24	Below	46.3	67.6	69.8	87.4	90.0
	Within	33.3	13.8	11.8	8.9	6.5
	Above	20.4	18.6	18.4	3.7	3.5
5/23- 5/29	Below	37.8	52.8	53.2	64.3	67.2
	Within	18.1	4.3	4.1	10.2	7.5
	Above	44.0	42.9	42.7	25.6	25.3
5/28- 5/31	Below	5.0	7.9	8.9	21.4	22.9
	Within	8.4	6.7	6.1	19.9	19.6
	Above	86.6	85.4	85.0	58.7	57.5
5/30- 6/ 5	Below	1.9	3.0	3.3	32.6	34.0
	Within	3.6	5.7	7.7	16.6	16.2
	Above	94.4	91.3	89.0	50.8	49.8
6/ 4- 6/ 7	Below	13.1	19.3	20.1	41.5	48.1
	Within	12.5	8.0	7.3	30.5	25.0
	Above	74.4	72.8	72.6	28.1	26.9
6/10- 6/14	Below	0.4	1.3	2.5	30.9	33.9
	Within	15.2	19.6	18.9	21.4	19.5
	Above	84.4	79.1	78.6	47.6	46.5
6/12- 6/17	Below	0	0.2	0.5	24.5	26.0
	Within	4.4	7.3	8.6	20.5	20.3
	Above	95.5	92.4	90.9	55.0	53.7
6/17- 6/23	Below	0.3	0.5	0.7	48.7	49.7
	Within	16.4	26.0	28.0	17.3	17.4
	Above	83.4	73.5	71.3	34.0	32.9
7/22- 7/26	Below	2.5	2.5	2.5	10.1	10.7
	Within	0.6	1.4	1.9	5.6	5.2
	Above	96.9	96.0	95.5	84.3	84.0
7/29- 8/ 2	Below	0	0	0	1.7	2.0
	within	0	0.1	0.2	5.5	5.6
	Above	100	99.9	99.8	92.8	92.4
8/ 5- 8/ 9	Below	0	0	0	5.2	8.1
	Within	0	0	0	53.6	54.4
	Above	100	100	100	41.1	37.5
8/12-	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0

Table D-130

Percentage of Total Standing Crop (from Ichthyoplankton Sampling) of Juvenile White Perch in Hudson River Estuary Below, Within, and Above Power-Plant Regions during 1974

Date	Region	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/29-5/4	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
5/6-5/11	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
5/13-5/18	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
5/21-5/24	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
5/23-5/29	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
5/28-5/31	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
5/30-6/5	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
6/4-6/7	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
6/10-6/14	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
6/12-6/17	Below	0	0	0	43.6	67.0
	Within	0	0	0	56.4	33.0
	Above	100	100	100	0	0
6/17-6/23	Below	70.0	100	100	100	100
	Within	30.0	0	0	0	0
	Above	.0	0	0	0	0
7/22-7/26	Below	2.3	3.3	3.3	3.3	3.3
	Within	1.0	0	0	22.7	24.4
	Above	96.7	96.7	96.7	74.0	72.3
7/29-8/2	Below	0	0	0	3.2	3.2
	Within	2.2	3.2	3.2	4.0	4.3
	Above	97.8	96.8	96.8	92.8	92.5
8/5-8/9	Below	0	0	0	0.8	1.3
	Within	0	0	0	3.1	2.8
	Above	100	100	100	96.1	95.9
8/12-8/15	Below	0	0	0	2.6	4.0
	Within	0	0	0	13.1	12.5
	Above	100	100	100	84.3	83.6

Table D-131

Percentage of Total Standing Crop (from Beach-Seine Sampling) of Juvenile White Perch in Hudson River Estuary Below, Within, and Above Power-Plant Regions during 1974

Date	Region	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/21-5/ 4	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
5/ 5-5/18	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
5/19-6/ 1	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
6/ 2-6/15	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
6/16-6/29	Below	0	0	0	0	0
	Within	0	0	0	0	0
	Above	0	0	0	0	0
6/30-7/13	Below	0	0	0	1.2	1.2
	Within	0	0	0.1	46.5	47.5
	Above	100.0	100.0	99.9	52.3	51.3
7/14-7/27	Below	8.9	13.7	13.7	15.6	15.8
	Within	5.2	0.4	0.4	3.3	3.2
	Above	85.9	85.9	85.8	81.1	81.0
7/28-8/10	Below	1.7	2.6	2.6	10.8	13.5
	Within	1.2	0.3	0.4	14.8	12.3
	Above	97.1	97.0	97.0	74.4	74.2
8/11-8/24	Below	1.0	1.4	1.4	10.2	11.9
	Within	3.1	2.9	2.9	10.1	8.5
	Above	95.9	95.7	95.6	79.7	79.6
8/25-9/ 7	Below	3.5	5.9	7.0	30.1	32.5
	Within	18.5	17.4	16.3	8.0	5.6
	Above	78.0	76.8	76.7	62.0	61.9
9/ 8-9/21	Below	5.4	10.6	16.5	55.6	56.9
	Within	41.4	37.9	32.1	5.6	4.4
	Above	53.2	51.6	51.4	38.8	38.7
9/22-10/5	Below	11.5	18.0	19.2	44.7	47.1
	Within	24.3	19.2	18.1	8.5	6.2
	Above	64.2	62.8	62.7	46.8	46.7

Table D-132

Standing Crop of Juvenile Atlantic Tomcod within Each Plant Region of Hudson River Estuary Based on Day or Night Sampling by Epibenthic Sled and Tucker Trawl during 1974

Date	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/29- 5/ 4	113,648,890 (55,821,658)*	130,875 (58,729)	106,013 (46,425)	0 (0)	0 (0)
5/ 6- 5/11	17,742,884 (7,043,261)	2,266,978 (1,231,324)	1,831,077 (913,728)	228,612 (215,647)	239,594 (231,897)
5/13- 5/18	42,443,663 (18,271,017)	7,370,051 (4,877,653)	6,865,107 (4,785,929)	626,410 (332,392)	655,978 (357,377)
5/15- 5/18	NS**	202,243 (85,203)	400,441 (168,703)	205,407 (135,821)	221,186 (146,255)
5/21- 5/24	18,026,182 (7,078,639)	7,723,468 (5,332,613)	6,210,723 (4,013,864)	224,021 (98,465)	179,683 (71,385)
5/23- 5/29	12,895,840 (5,004,134)	2,441,809 (954,599)	2,242,284 (746,404)	402,291 (244,994)	346,639 (235,474)
5/28- 5/31	33,870,618 (10,262,340)	24,313,914 (8,310,619)	23,038,728 (7,069,925)	1,711,167 (722,296)	1,557,425 (719,031)
5/30- 6/ 5	32,407,470 (6,349,146)	15,833,801 (4,407,853)	14,495,020 (4,305,512)	571,146 (330,005)	574,749 (352,511)
6/ 4- 6/ 7	36,408,128 (5,394,829)	30,005,937 (4,285,575)	25,391,825 (4,288,649)	1,213,927 (370,622)	1,066,810 (296,617)
6/10- 6/14	22,405,650 (18,187,640)	20,932,725 (15,600,135)	17,579,167 (11,031,700)	2,613,103 (2,187,832)	2,798,374 (2,355,720)
6/12- 6/17	111,861,749 (57,545,888)	80,091,459 (51,226,088)	67,380,916 (40,153,299)	2,386,952 (1,342,915)	2,198,568 (1,403,637)
6/17- 6/23	22,085,301 (8,067,316)	15,940,595 (6.634,091)	13,633,745 (5,029,216)	667,514 (573,383)	390,566 (335,490)
6/24- 6/27	34,468,576 (6,709,739)	26,215,330 (6,292,638)	24,632,451 (6,100,119)	7,987,602 (1,401,998)	5,890,170 (1,193,016)
7/ 1- 7/ 5	10,585,669 (4,108,570)	8,633,190 (3,485,327)	7,301,807 (2,633,241)	3,249,181 (698,731)	2,590,847 (541,767)
7/ 8- 7/11	12,860,011 (5,152,442)	5,926,281 (1,970,301)	5,839,947 (1,890,777)	1,312,265 (446,008)	1,166,227 (428,209)
7/15- 7/18	10,798,233 (2,322,464)	9,127,049 (2,331,913)	9,271,068 (2,421,685)	3,740,759 (1,112,255)	3,245,205 (862,719)
7/22- 7/26	6,117,512 (2,711,165)	5,053,540 (1,365,286)	6,087,121 (1,562,086)	1,366,104 (561,700)	916,988 (339,934)
7/29- 8/ 2	5,245,991 (2,016,256)	3,531,837 (1,010,325)	3,467,816 (942,154)	2,247,982 (542,507)	1,845,831 (474,766)
8/ 5- 8/ 9	11,532,289 (2,961,077)	7,919,073 (3,056,946)	7,623,374 (2,958,268)	2,005,904 (714,333)	1,448,493 (465,714)
8/12- 8/15	15,403,548 (5,137,987)	12,816,804 (3,283,313)	13,986,924 (3,394,727)	1,158,546 (503,610)	947,177 (381,671)

*Numbers in parentheses represent one standard error
**NS = no samples

Table D-133

Standing Crop of Juvenile Atlantic Tomcod within Each Power-Plant Region of Hudson River Estuary [RM 12-153 (km 19-245)] Based on Daytime Sampling by 100-ft (30.5-m) Beach Seine during 1974

Plant	4/21- 5/ 4	5/ 5 5/18	5/19- 6/ 1	6/ 2- 6/15	6/16- 6/29	6/30- 7/13	7/14- 7/27	7/28- 8/10	8/11- 8/24	8/25- 9/ 7	9/ 8- 9/21	9/22 10/5
Bowline	0 (0)*	14,033 (9,792)	48,750 (22,092)	304,309 (143,893)	103,291 (52,865)	777,927 (471,354)	83,771 (34,577)	8,017 (3,351)	13,060 (5,153)	3,720 (2,870)	577 (401)	20,652 (11,416)
Lovett	0 (0)	0 (0)	3,442 (3,442)	86,316 (73,500)	16,587 (8,301)	7,228 (5,142)	2,007 (2,007)	1,860 (1,547)	6,284 (3,912)	1,151 (1,151)	635 (441)	9,803 (9,067)
Indian Point	0 (0)	0 (0)	2,393 (2,393)	60,797 (51,113)	16,662 (8,301)	5,025 (3,575)	1,396 (1,396)	1,401 (1,105)	5,305 (3,158)	1,179 (1,152)	635 (441)	7,050 (6,329)
Roseton	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Danskammer	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

*Numbers in parentheses represent one standard error

Table D-134

Percentage of Total Standing Crop (from Ichthyoplankton Sampling) of Juvenile Atlantic Tomcod in Hudson River Estuary Below, Within, and Above Power-Plant Regions during 1974

Date	Region	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/29-	Below	90.6	100	100	100	100
5/ 4	Within	9.4	0	0	0	0
	Above	0	0	0	0	0
5/ 6-	Below	86.2	96.9	97.3	99.2	99.2
5/11	Within	12.2	1.6	1.3	0.2	0.2
	Above	1.6	1.5	1.4	0.6	0.6
5/13-	Below	65.0	93.0	93.4	98.9	98.9
5/18	Within	32.3	5.6	5.2	0.5	0.5
	Above	2.7	1.4	1.3	0.6	0.6
5/21-	Below	73.9	88.4	90.4	99.2	99.3
5/24	Within	24.0	10.3	8.3	0.3	0.2
	Above	2.2	1.4	1.3	0.5	0
5/23-	Below	90.6	97.3	97.5	99.7	99.7
5/29	Within	7.9	1.5	1.4	0.2	0.2
	Above	1.5	1.2	1.1	0.1	0.5
5/28-	Below	44.9	63.1	65.2	97.4	97.7
5/31	Within	39.4	28.3	26.8	2.0	1.8
	Above	15.7	8.6	8.0	0.6	0.5
5/30-	Below	62.0	80.0	81.7	99.2	99.2
6/ 5	Within	29.5	14.4	13.2	0.5	0.5
	Above	8.5	5.6	5.1	0.3	0.3
6/ 4-	Below	34.6	49.1	56.1	97.2	97.5
6/ 7	Within	51.5	42.5	35.9	1.7	1.5
	Above	13.8	8.5	7.9	1.1	1.0
6/10-	Below	13.5	22.7	32.8	90.8	90.8
6/14	Within	55.8	52.1	43.8	6.5	7.0
	Above	30.7	25.2	23.4	2.7	2.2
6/12-	Below	37.4	57.6	63.9	98.5	98.7
6/17	Within	54.1	38.7	32.6	1.2	1.1
	Above	8.5	3.7	3.5	0.3	0.3
6/17-	Below	62.4	73.0	76.5	99.1	99.5
6/23	Within	28.3	20.5	17.5	0.9	0.5
	Above	9.2	6.6	6.0	0	0
7/22-	Below	71.0	75.6	75.7	97.4	98.1
7/26	Within	8.2	6.8	8.2	1.8	1.2
	Above	20.7	17.6	16.1	0.7	0.7
7/29-	Below	57.4	65.6	66.8	89.1	90.6
8/ 2	Within	16.5	11.1	10.9	7.1	5.8
	Above	26.1	23.3	22.2	3.8	3.6
8/ 5-	Below	62.7	73.6	74.6	95.0	96.2
8/ 9	Within	22.0	15.1	14.5	3.8	2.8
	Above	15.3	11.3	10.9	1.2	1.1
8/12-	Below	34.0	48.1	48.5	97.2	97.6
8/15	Within	29.1	24.2	26.4	2.2	1.8
	Above	36.9	27.7	25.1	0.6	0.6

Table D-135

Percentage of Total Standing Crop (from Beach-Seine Sampling) of Juvenile Atlantic Tomcod in Hudson River Estuary Below, Within, and Above Power-Plant Regions during 1974

Date	Region	Bowline	Lovett	Indian Point	Roseton	Danskammer
4/21-	Below	0	0	0	0	0
5/ 4	Within	0	0	0	0	0
	Above	0	0	0	0	0
5/ 5-	Below	82.1	100.0	100.0	100.0	100.0
5/18	Within	17.9	0	0	0	0
	Above	0	0	0	0	0
5/19-	Below	90.3	99.3	99.5	100.0	100.0
6/ 1	Within	9.7	0.7	0.5	0	0
	Above	0	0	0	0	0
6/ 2-	Below	68.8	91.2	93.8	100.0	100.0
6/15	Within	31.2	8.8	6.2	0	0
	Above	0	0	0	0	0
6/16-	Below	91.3	98.5	98.5	100.0	100.0
6/29	Within	8.5	1.4	1.4	0	0
	Above	0.2	0.1	0.1	0	0
6/30-	Below	67.7	99.7	99.8	100.0	100.0
7/13	Within	32.3	0.3	0.2	0	0
	Above	0	0	0	0	0
7/14-	Below	65.7	99.2	99.4	100.0	100.0
7/27	Within	34.3	0.8	0.6	0	0
	Above	0	0	0	0	0
7/28-	Below	61.1	91.0	93.2	100.0	100.0
8/10	Within	38.8	9.0	6.8	0	0
	Above	0.2	0	0	0	0
8/11-	Below	58.4	80.4	83.4	100.0	100.0
8/24	Within	40.8	19.6	16.6	0	0
	Above	0.9	0	0	0	0
8/25-	Below	53.0	81.9	81.9	100.0	100.0
9/ 7	Within	40.2	12.5	12.8	0	0
	Above	6.8	5.7	5.4	0	0
9/ 8-	Below	0	0	0	0	0
9/21	Within	90.9	100.0	100.0	100.0	100.0
	Above	9.1	0	0	0	0
9/22-	Below	46.9	74.9	82.0	100.0	100.0
10/ 5	Within	52.9	25.1	18.0	0	0
	Above	0.2	0	0	0	0

Table D-136

1973 White Perch Tag Recovery

Release Date	Location Released (RM)	Length at Time of Release (mm)	Recovery Date (1973)	Location Recovered (RM)	Direction* of Movement	Distance Traveled (mi)	Time at Large (days)	Velocity (mi/day)
Apr '73								
10	40	182	Apr 11	39	D	1	1	1.00
20	39	172	May 16	65	U	26	26	1.00
10	40	211	May 25	39	D	1	45	0.02
20	27	187	May 20	57	U	30	30	1.00
24	52	110	May 1	42	D	10	7	1.43
May '73								
8	39	115	May 9	40	U	1	1	1.00
8	39	114	May 9	40	U	1	1	1.00
25	32	122	May 29	32	N	0	4	0
10	40	180	May 18	40	N	0	8	0
4	40	161	May 14	42	U	2	10	0.20
9	43	158	May 24	39	D	4	13	0.31
22	40	197	May 25	39	D	1	3	0.33
7	41	194	May 18	40	D	1	11	0.09
7	40	138	May 30	40	N	0	23	0
7	40	180	May 15	40	N	0	8	0
11	41	168	May 19	25	D	16	8	2.00
8	41	136	May 9	48	N	7	1	7.00
2	64	162	May 13	39	D	25	11	2.27
3	23	178	May 22	22	D	1	19	0.05
9	57	167	May 9	54	D	3	0.5	6.00
9	57	178	May 26	57	N	0	17	0
11	77	158	May 16	58	D	19	5	3.80
14	33	166	May 25	32	D	1	11	0.09
18	52	176	May 25	52	N	0	7	0
14	59	186	May 22	36	D	23	8	2.89
16	59	122	May 29	59	N	0	13	0
16	58	133	May 21	57	D	1	5	0.20
16	58	121	May 31	58	N	0	15	0
21	57	108	May 31	58	U	1	10	0.10
21	57	109	May 24	57	N	0	3	0
May '73								
10	40	130	Jun 15	40	N	0	36	0
25	39	125	Jun 13	39	N	0	19	0
25	39	163	Jun 1	39	N	0	7	0
25	39	131	Jun 13	39	N	0	19	0
31	40	165	Jun 21	40	N	0	21	0
22	40	146	Jun 6	39	D	1	15	0.07
10	40	171	Jun 26	40	N	0	47	0
25	34	145	Jun 30	34	N	0	36	0
25	38	170	Jun 30	33	D	5	36	0.14
25	33	155	Jun 29	34	U	1	35	0.03
8	39	154	Jun 21	39	N	0	44	0
30	40	137	Jun 29	40	N	0	30	0
11	39	163	Jun 29	39	N	0	49	0
11	41	129	Jun 8	40	D	1	28	0.04
8	39	187	Jun 1	39	N	0	24	0
4	39	161	Jun 13	39	N	0	40	0
25	38	162	Jun 5	34	D	4	11	0.36
16	59	152	Jun 2	59	U	1	17	0.06
2	64	176	Jun 10	64	N	0	39	0
3	35	165	Jun 12	34	D	1	40	0.03
1	83	180	Jun 8	93	N	0	38	0
25	63	183	Jun 10	64	U	1	16	0.06
31	98	166	Jun 26	40	D	58	26	2.23
29	58	154	Jun 5	59	U	1	7	0.14
16	58	176	Jun 1	58	N	0	16	0
14	33	165	Jun 3	34	U	1	20	0.05
16	58	162	Jun 9	58	N	0	24	0
22	40	121	Jun 13	39	D	1	22	0.05

*D = downstream, U = upstream, N = no movement

Table D-136 (Contd)

Release Date	Location Released (RM)	Length at Time of Release (mm)	Recovery Date (1973)	Location Recovered (RM)	Direction* of Movement	Distance Traveled (mi)	Time at Large (days)	Velocity (mi/day)
May '73								
31	58	107	Jun 8	58	N	0	8	0
31	58	117	Jun 6	57	D	1	6	0.17
31	40	135	Jun 14	40	N	0	14	0
25	32	160	Jul 20	32	N	0	56	0
30	40	151	Jul 5	40	N	0	36	0
1	83	180	Jul 25	66	D	17	85	0.20
25	81	153	Jul 27	81	N	0	63	0
16	54	182	Jul 9	8	D	46	54	0.85
18	52	117	Jul 24	66	U	14	67	0.21
23	36	131	Jul 13	35	D	1	51	0.02
30	27	122	Jul 15	27	N	0	46	0
May '73								
3	60	184	Aug 2	59	D	1	91	0.01
14	59	155	Aug 2	59	N	0	80	0
May '73								
8	39	149	Sep 12	39	N	0	127	0
30	29	174	Sep 7	30	U	1	100	0.01
May '73								
23	57	147	Oct 1	42	D	15	131	0.15
18	58	100	Oct 31	37	D	21	166	0.13
May								
25/72	42	135	Nov 1	52	U	10	14	0
24/73	37	146	Nov 8	39	N	0	168	0
4/73	39	196	Nov 13	33	D	6	193	0.03
14/73	52	174	Nov 11	39	D	13	181	0.07
Jun '73								
12	42	131	Jun 26	42	N	0	14	0
12	42	130	Jun 13	42	N	0	1	0
8	40	146	Jun 21	40	N	0	13	0
8	39	132	Jun 8	40	U	1	0.5	2.00
1	40	155	Jun 7	40	N	0	6	0
1	40	120	Jun 14	40	N	0	13	0
1	40	135	Jun 7	40	N	0	6	0
14	40	172	Jun 26	40	N	0	12	0
1	40	170	Jun 7	40	N	0	6	0
14	40	186	Jun 22	40	N	0	8	0
5	40	184	Jun 14	40	N	0	9	0
5	40	196	Jun 22	40	N	0	17	0
7	42	177	Jun 21	42	N	0	14	0
7	42	161	Jun 29	42	N	0	22	0
26	40	184	Jun 27	42	U	2	1	2.00
8	57	142	Jun 28	37	D	20	20	1.00
5	57	188	Jun 13	30	D	27	8	3.38
7	58	188	Jun 11	41	D	17	4	4.25
19	57	173	Jun 26	59	U	2	7	0.29
19	57	226	Jun 20	54	D	3	1	3.00
6	58	173	Jun 9	41	D	17	3	5.67
1	58	215	Jun 7	58	N	0	6	0
1	58	164	Jun 6	58	N	0	5	0
4	58	152	Jun 7	58	N	0	3	0
7	57	196	Jun 14	43	D	14	7	2.00
1	58	122	Jun 4	58	N	0	3	0
18	58	120	Jun 23	42	D	16	5	3.20
Jun '73								
15	38	112	Jul 18	39	U	1	33	0.03
1	37	165	Jul 26	41	U	4	55	0.07
1	38	142	Jul 18	39	U	1	47	0.02
6	59	194	Jul 3	57	D	2	27	0.07
14	44	135	Jul 11	44	N	0	27	0
Jun '73								
1	38	160	Aug 22	38	N	0	82	0

*D = downstream, U = upstream, N = no movement

Table D-136 (Contd)

Release Date	Location Released (RM)	Length at Time of Release (mm)	Recovery Date (1973)	Location Recovered (RM)	Direction* of Movement	Distance Traveled (mi)	Time at Large (days)	Velocity (mi/day)
Jun '73								
1	37	124	Sep 12	37	N	0	103	0
1	37	120	Sep 13	37	N	0	104	0
1	37	166	Sep 13	37	N	0	104	0
1	37	150	Sep 10	37	N	0	101	0
4	54	182	Sep 18	37	D	17	106	0.16
Jun '73								
8	40	127	Oct 13	38	D	2	127	0.02
17	40	172	Oct 30	38	D	2	135	0.01
Jun '73								
26	40	179	Nov 13	33	D	7	109	0.06
Jul '73								
3	42	180	Jul 7	24	D	18	4	4.50
20	34	179	Sep 27	34	N	0	69	0
Aug '73								
1	57	147	Oct 1	42	D	15	61	0.25
24	42	180	Nov 7	39	D	3	75	0.04
24	42	157	Nov 15	33	D	9	83	0.11
Sep '73								
7	84	180	Sep 20	84	N	0	13	0
7	84	193	Sep 20	84	N	0	13	0
27	34	188	Nov 15	35	U	1	46	0.02
Oct								
14/72	39	164	Aug 20	39	N	0	310	0
30/73	38	122	Nov 12	38	N	0	13	0
16	43	126	Nov 5	42	D	1	20	0.05
30	38	127	Nov 12	38	N	0	13	0
30	38	135	Nov 12	38	N	0	13	0
10	57	147	Nov 1	38	D	19	22	0.86
25	40	154	Nov 12	40	N	0	18	0
30	42	172	Nov 23	40	D	2	24	0.08
12	40	210	Nov 12	32	D	8	31	0.26
11	41	176	Nov 19	39	D	2	39	0.05
15	32	177	Nov 12	32	N	0	28	0
15	34	185	Nov 13	33	D	1	29	0.03
30	38	176	Nov 12	38	N	0	13	0
31	34	205	Nov 24	34	N	0	24	0
10	38	136	Nov 1	38	N	0	22	0
11	35	168	Nov 15	19	D	16	35	0.46
14/72	37	140	Oct 25/73	38	U	1	376	0.003
Oct								
31/73	43	160	Dec 10	35	D	8	40	0.20
30/73	38	164	Dec 3	38	N	0	34	0
24/72	38	129	Feb 22	42	U	4	121	0.03
Nov								
1/73	38	135	Nov 12	38	N	0	11	0
15/72	43	152	Mar 26	42	D	1	132	0.01
1/72	36	135	Jun 12	34	D	2	223	0.01
1/73	42	132	Nov 13	42	N	0	12	0
15	33	176	Nov 20	42	U	9	5	1.80
2	42	179	Nov 19	43	U	1	17	0.06
2	42	189	Nov 5	43	U	1	3	0.33
2	42	184	Nov 19	44	U	2	17	0.08
1	40	160	Nov 12	40	N	0	11	0
1/72	37	158	Dec 6	36	D	1	400	0.003
1/72	37	152	Dec 6	36	D	1	400	0.003
2/73	42	184	Dec 10	43	U	1	38	0.03
19	44	184	Dec 10	43	D	1	21	0.05

*D = downstream, U = upstream, N = no movement

Table D-137

Number of White Perch Fin-Clipped and Released* from August through November 1973 by Mark Region Type

River Mile	Geographic Region	Region† 1	2	3	4	Total
12-23	Yonkers	224	0	0	0	224
24-33	Tappan Zee	374	17	0	0	391
34-38	Croton-Haverstraw Bays	4,881	111	0	0	4,992
39-46	Indian Point	87	1,872	15	0	1,974
47-55	West Point	0	76	603	13	679
56-61	Cornwall	0	7	376	4	387
62-76	Poughkeepsie	0	0	48	275	323
72-85	Hyde Park	0	0	0	118	118
86-93	Kingston	0	0	0	55	55
94-106	Saugerties	0	0	0	213	213
107-124	Catskill	0	0	0	119	119
125-152	Albany	0	0	0	71	71
						9,546

*Not corrected for 14-day marking mortality; totals do not include pelvic fin clips.

†Mark region 1, RM 12-38 (km 19-61)
Mark region 2, RM 39-46 (km 62-74)
Mark region 3, RM 47-61 (km 75-99)
Mark region 4, RM 62-153 (km 100-245)

Table D-138

Number of Striped Bass Fin-Clipped and Released* from August through November 1973 by Mark Region Type

River Mile	Geographic Region	Region†				
		1	2	3	4	Total
12-23	Yonkers	764	23	0	0	787
24-33	Tappan Zee	824	103	8	0	935
34-38	Croton-Haverstraw Bays	4,471	660	0	0	5,131
39-46	Indian Point	108	4,065	3	0	4,176
47-55	West Point	0	159	2,402	11	2,572
56-61	Cornwall	0	12	353	6	371
62-76	Poughkeepsie	0	0	10	109	119
77-85	Hyde Park	0	0	0	15	15
86-93	Kingston	0	0	0	35	35
94-106	Saugerties	0	0	0	20	20
107-124	Catskill	0	0	0	165	165
125-152	Albany	0	0	0	109	109
						14,435

*Not corrected for 14-day marking mortality.

†Mark region 1, RM 12-38 (km 19-61)
Mark region 2, RM 39-46 (km 62-74)
Mark region 3, RM 47-61 (km 75-99)
Mark region 4, RM 62-153 (km 100-245)

Table D-139

1974 White Perch Tag Recoveries

Release Date	Location Released (RM)	Length at Time of Release (mm)	Recovery Date	Location Recovered (RM)	Direction of Movement*	Distance Traveled (mi)	Time at Large (days)	Velocity (mi/day)
1973								
Aug 24	42	137	5/30/74	39	D	3	279	0.01
24	42	146	7/25/74	39	D	3	335	0.009
Sep 20	84	180	7/13/74	42	D	42	297	0.73
27	34	188	7/23/74	42	U	8	299	0.03
Oct 22	34	172	3/21/74	42	U	8	149	0.05
8	45	156	6/ 6/74	48	U	3	241	0.01
10	41	146	6/ 7/74	42	U	1	240	0.004
16	41	142	6/ 8/74	35	D	6	235	0.02
16	31	186	6/16/74	38	U	7	243	0.03
5	40	137	6/18/74	40	N	0	256	0
11	35	164	6/24/74	35	N	0	256	0
19	19	175	7/ 2/74	20	U	1	256	0.004
16	31	192	7/ 7/74	28	D	3	264	0.01
25	40	134	8/ 8/74	42	U	2	287	0.007
26	34	155	8/16/74	42	U	8	294	0.03
30	38	152	6/ ?/74	38	N	0	–	–
30	37	157	8/ 9/74	37	N	0	283	0
26	34	156	9/11/74	42	U	8	320	0.02
Nov 15	34	189	3/18/74	42	U	8	122	0.06
21	16	191	5/12/74	32	U	16	172	0.09
15	33	159	5/19/74	34	U	1	185	0.005
15	34	156	5/19/74	72	U	38	185	0.20
19	39	161	5/22/74	90	U	51	194	0.26
2	42	158	5/24/74	43	U	1	203	0.005
19	40	174	6/ 1/74	152	U	112	194	0.58
26	39	173	6/ 4/74	37	D	2	190	0.01
15	33	176	6/ 8/74	36	U	3	205	0.01
16	35	133	6/ 8/74	39	U	4	204	0.02
15	33	176	6/11/74	34	U	1	208	0.005
7	35	161	6/11/74	39	U	4	216	0.02
19	40	196	9/10/74	60	U	20	295	0.07
19	40	166	9/ 5/74	42	U	2	290	0.007
16	38	160	6/12/74	43	U	5	208	0.02
9	23	157	6/19/74	42	U	19	222	0.08
14	34	155	6/23/74	43	U	9	221	0.05
28	40	156	7/ 1/74	36	D	4	215	0.02
19	40	178	7/ 8/74	40	N	0	231	0
30	37	163	8/ 7/74	41	U	4	250	0.02
28	39	160	8/16/74	42	U	3	261	0.01
28	39	160	8/21/74	42	U	3	266	0.01
15	33	150	5/17/74	34	U	1	183	0.005
3	42	181	5/29/74	43	U	1	207	0.005
26	43	167	5/29/74	43	N	0	184	0
16	40	189	7/18/74	43	U	3	245	0.01
Dec 7	39	150	5/10/74	34	D	5	154	0.03
4	39	190	5/19/74	57	U	18	166	0.11
14	42	178	5/22/74	90	U	48	159	0.30
4	28	184	9/3/74	42	U	14	273	0.05

*U = upstream; D = downstream; N = no net movement

Table D-139 (Contd)

Release Date	Location Released (RM)	Length at Time of Release (mm)	Recovery Date	Location Recovered (RM)	Direction of Movement*	Distance Traveled (mi)	Time at Large (days)	Velocity (mi/day)
1974								
Apr 18	42	158	4/18/74	42	N	0	0	0
23	27	144	5/10/74	30	U	3	17	0.18
29	61	172	5/18/74	61	N	0	19	0
19	42	153	5/25/74	90	U	48	36	1.33
24	58	177	5/25/74	106	U	48	31	1.55
9	42	208	5/27/74	81	U	39	48	0.81
29	60	249	6/ 1/74	61	U	1	33	0.03
23	40	188	6/ 3/74	41	U	1	41	0.02
22	40	182	6/ 3/74	42	U	2	42	0.05
23	27	162	6/ 4/74	30	U	3	42	0.07
5	42	165	6/ 4/74	69	U	27	60	0.45
17	36	162	6/ 8/74	36	N	0	52	0
16	40	157	6/ 8/74	33	D	7	54	0.13
25	40	170	6/13/74	87	U	47	49	0.96
22	40	209	6/26/74	40	N	0	65	0
26	40	172	9/11/74	42	U	2	138	0.01
22	40	154	7/ 6/74	39	D	1	75	0.01
9	42	174	7/14/74	40	D	2	96	0.02
4	40	148	7/20/74	40	N	0	107	0
30	58	180	7/22/74	82	U	24	83	0.29
8	42	174	8/15/74	42	N	0	129	0
8	42	183	6/ ?/74	59	U	17	-	-
16	40	170	7/ ?/74	116	U	76	-	-
29	40	155	7/ ?/74	40	N	0	-	-
24	42	151	9/20/74	42	N	0	149	0
May 8	42	181	5/24/74	43	U	1	16	0.06
7	40	182	5/30/74	81	U	41	23	0.78
23	48	140	6/ 6/74	48	N	0	14	0
30	39	185	6/ 7/74	42	U	3	8	0.38
17	30	159	6/ 8/74	40	U	10	21	0.48
13	43	172	6/ 8/74	43	N	0	25	0
16	57	189	6/ 8/74	57	N	0	24	0
21	35	132	6/11/74	34	D	1	21	0.05
2	40	170	6/17/74	35	D	5	46	0.11
16	60	161	6/18/74	62	U	2	33	0.06
29	40	159	6/19/74	42	U	2	21	0.09
7	42	195	6/21/74	43	U	1	45	0.02
31	39	178	7/ ?/74	42	U	3	-	-
15	59	186	7/ 4/74	59	N	0	50	0
23	54	162	7/12/74	40	D	14	50	0.28
8	86	163	8/13/74	69	D	17	97	0.18
16	60	150	8/ 6/74	42	D	18	82	0.22
24	40	151	8/ 8/74	42	U	2	76	0.03
23	57	130	7/14/74	57	N	0	51	0
17	62	157	7/28/74	64	U	2	72	0.03
7	42	174	8/ 9/74	37	D	5	94	0.05
30	66	161	9/25/74	18	D	48	118	0.41
Jun 1	39	159	6/ 3/74	42	U	3	2	1.50
7	34	188	6/ 8/74	34	N	0	1	0
8	57	172	6/12/74	37	D	20	4	5.0
1	39	186	6/14/74	42	U	3	13	0.23
5	57	154	6/14/74	42	D	15	9	1.67
10	39	158	6/14/74	42	U	3	4	0.75
10	57	137	6/15/74	42	D	15	5	3.0
5	42	164	6/25/74	42	N	0	20	0
1	39	176	6/26/74	42	U	3	25	0.12
7	35	122	7/ 1/74	36	U	1	24	0.04
3	41	185	7/ 9/74	42	U	1	36	0.03
8	39	166	7/10/74	30	D	9	33	0.27

*U = upstream; D = downstream; N = no net movement

Table D-140

1974 Atlantic Tomcod Tag Recoveries

Release Date	Location Released (RM)	Length at Time of Release (mm)	Recovery Date	Location Recovered (RM)	Direction of Movement*	Distance Traveled (mi)	Time at Large (days)	Velocity (mi/day)
1974								
Jan 21	41	173	1/24/74	42	U	1	3	0.33
30	41	240	1/31/74	41	N	0	1	0
31	41	239	2/ 1/74	41	N	0	1	0
31	41	235	4/30/74	12	D	29	89	0.32
Feb 1	41	218	2/ 1/74	41	N	0	0.5	0
8	41	204	3/25/74	3	D	38	45	0.84

*U = upstream; D = downstream; N = no net movement

Table D-141

Mean Flowmeter Readings (Volume Strained) and Associated 95% Confidence Interval for 18 Sampling Periods during 1973 Ichthyoplankton Survey

Sampling Period	Epibenthic Sled n*	Epibenthic Sled $\bar{v}$†	Tucker Trawl n	Tucker Trawl $\bar{v}$
1	49	216	19	419
2	71	225	52	466
3	39	178	24	342
4	60	247	37	386
5	32	316	23	480
6	37	350	32	445
7	42	225	41	443
8	25	262	2	923
9	34	293	20	409
10	27	255	24	333
11	41	433	38	645
12	49	263	51	797
13	38	247	53	1102
14	44	206	51	494
15	37	212	54	516
16	42	524	50	882
17	98	122	49	653
18	163	307	64	616
Overall Mean Volume	271		575	
$\pm t_{(16, 0.05)}$ SE	±46		±110	

*n = subsample size

†$\bar{v}$ = mean volume sampled (m^3)

Table D-142

Extent of Shore-Zone Area (m^2) from 0 to 10 ft (3 m) Deep in 12 Geographical Regions of Hudson River Estuary Used To Calculate 1973 and 1974 Standing-Crop Estimates from Beach-Seine Catches

Geographical Region	River Mile*	Shore-Zone Surface Area (m^3)
Yonkers	14-23 (22-37)	2,902,000
Tappan Zee	24-33 (38-53)	20,446,000
Croton-Haverstraw	34-38 (54-61)	12,101,000
Indian Point	39-46 (62-74)	4,147,000
West Point	47-55 (75-88)	1,186,000
Cornwall	56-61 (89-98)	4,793,000
Poughkeepsie	62-76 (99-122)	3,193,000
Hyde Park	77-85 (123-136)	558,000
Kingston	86-93 (137-149)	3,874,000
Saugerties	94-106 (150-170)	7,900,000
Catskill	107-124 (171-198)	8,854,000
Albany	125-152 (199-224)	6,114,000
Total	14-152 (22-224)	78,068,000

*Numbers in parentheses indicate kilometers.

Table D-143

Lateral Distribution of Striped Bass Juveniles Based on Night Sampling by Epibenthic Sled or Tucker Trawl and Day Sampling by 100-Ft (30.5-m) Beach Seine, Hudson River Estuary [RM 12-153 (km 19-245)], 1974

Epibenthic Sled or Tucker Trawl*			Beach Seine**	
Sampling Period	Total River Standing-Crop Estimate	Total Standing Crop in Shoals (%)	Sampling Period	Total River Standing-Crop Estimate in Shore Zone
5/30-6/5	0			
6/12-6/17	59,109	0		
6/17-6/23	30,956	0	6/16-6/29	13,127
6/24-6/27	0	—		
7/1-7/5	567,489	74.6	6/30-7/13	146,896
7/8-7/11	2,442,833	93.9		
7/15-7/18	3,236,676	66.2	7/14-7/27	457,867
7/22-7/26	4,053,956	73.6		
7/29-8/2	2,697,154	24.2	7/28-8/10	699,407
8/5-8/9	1,136,430	47.1		
8/12-8/15	1,525,808	38.8	8/11-8/24	641,111
			8/25-9/7	2,415,500
			9/8-9/21	2,205,711
			9/22-10/5	1,167,132

*Night sampling

**Day sampling

Table D-144

Lateral Distribution of White Perch Juveniles Based on Night Sampling by Epibenthic Sled or Tucker Trawl and Day Sampling by 100-Ft (30.5-m) Beach Seine, Hudson River Estuary [RM 12-153 (km 19-245)], 1974

Epibenthic Sled or Tucker Trawl*			Beach Seine**	
Sampling Period	Total River Standing-Crop Estimate	Total Standing Crop in Shoals (%)	Sampling Period	Total River Standing-Crop Estimate in Shore Zone
6/10-6/14	0	—	6/2-6/15	0
6/12-6/17	58,417	0		
6/17-6/23	23,059	100	6/12-6/29	0
6/24-6/27	35,131	100		
7/1-7/5	542,261	0		
7/8-7/11	406,051	87.5	6/30-7/13	86,252
7/15-7/18	621,320	0		
7/22-7/26	1,390,528	3.3	7/14-7/27	137,966
7/29-8/2	6,305,752	0.2	7/28-8/10	442,600
8/5-8/9	1,143,822	0		
8/12-8/15	1,812,592	0	8/11-8/24	810,009
			8/25-9/7	832,657
			9/8-9/21	425,111
			9/22-10/5	323,366

*Night sampling

**Day sampling

Table D-145

Striped Bass Exposure in Bowline Plant Region Based on Time Interval of Maximum Riverwide Standing Crop during 1973

Life Stage	Collection Dates in Plant Region		Estimates Based on Maximum Riverwide Standing Crop		
	First	Last	Time Interval	Plant-Region Standing Crop	% in Plant Region (Exposure Index)
Eggs	4/29-5/12	6/10-6/23	5/13-5/26	94,777,757	35.1
Yolk-sac larvae	4/29-5/12	6/10-6/23	5/27-6/9 6/10-6/23	3,561,481 19,675,363	4.4 20.5
Post-yolk-sac larvae	5/13-5/26	7/22-8/4	6/24-7/7	15,242,633	8.9
Juveniles (from ichthyo-plankton samples)	6/24-7/7	*	7/8-7/21 8/5-8/18	208,864 4,126,071	1.3 26.8
Juveniles (from beach-seine samples)	6/17-6/30	12/2-12/15	9/9-9/22	6,697,678	81.3

*Not applicable because juveniles were still present during last sampling period included in this report

Table D-146

Striped Bass Exposure in Lovett Plant Region Based on Time Interval of Maximum Riverwide Standing Crop during 1973

Life Stage	Collection Dates in Plant Region		Estimates Based on Maximum Riverwide Standing Crop		
	First	Last	Time Interval	Plant-Region Standing Crop	% in Plant Region (Exposure Index)
Eggs	4/29-5/5	6/10-6/23	5/13-5/26	114,225,173	42.3
Yolk-sac larvae	4/29-5/5	6/10-6/23	5/27-6/9 6/10-6/23	2,461,982 24,646,668	3.0 25.6
Post-yolk-sac larvae	5/13-5/26	7/22-8/4	6/24-7/7	12,929,788	7.5
Juveniles (from ichthyo-plankton samples)	6/24-7/7	*	7/8-7/21 8/5-8/18	283,687 2,249,283	1.8 14.6
Juveniles (from beach-seine samples)	6/17-6/30	12/2-12/15	9/9-9/22	5,701,716	69.2

*Not applicable because juveniles were still present during last sampling period included in this report

Table D-147

Striped Bass Exposure in Indian Point Plant Region Based on Time Interval of Maximum Riverwide Standing Crop during 1973

Life Stage	Collection Dates in Plant Region		Estimates Based on Maximum Riverwide Standing Crop		
	First	Last	Time Interval	Plant-Region Standing Crop	% in Plant Region (Exposure Index)
Eggs	4/29-5/12	6/10-6/23	5/13-5/26	107,449,441	39.8
Yolk-sac larvae	4/29-5/12	6/10-6/23	5/27-6/9 6/10-6/23	2,631,921 24,989,666	3.2 26.0
Post-yolk-sac larvae	5/13-5/26	7/22-8/4	6/24-7/4	13,972,853	8.1
Juveniles (from ichthyo-plankton samples)	6/24-7/7	*	7/8-7/21 8/5-8/18	298,867 2,048,509	1.9 13.3
Juveniles (from beach-seine samples)	6/17-6/30	12/2-12/15	9/9-9/22	4,017,334	48.7

*Not applicable because juveniles were still present during last sampling period included in this report

Table D-148

Striped Bass Exposure in Roseton Plant Region Based on Time Interval of Maximum Riverwide Standing Crop during 1973

Life Stage	Collection Dates in Plant Region		Estimates Based on Maximum Riverwide Standing Crop		
	First	Last	Time Interval	Plant-Region Standing Crop	% in Plant Region (Exposure Index)
Eggs	4/29-5/12	6/10-6/23	5/13-5/26	50,209,991	18.6
Yolk-sac larvae	4/29-5/12	6/10-6/23	5/27-6/9 6/10-6/23	29,634,760 20,257,303	36.4 21.1
Post-yolk-sac larvae	5/13-5/26	7/22-8/4	6/24-7/7	44,770,655	26.1
Juveniles (from ichthyo-plankton samples)	6/24-7/7	*	7/8-7/21 8/5-8/18	4,259,547 116,767	26.8 0.8
Juveniles (from beach-seine samples)	7/1-7/14	11/18-12/1	9/9-9/22	59,432	0.7

*Not applicable because juveniles were still present during last sampling period included in this report

Table D-149

Striped Bass Exposure in Danskammer Plant Region Based on Time Interval of Maximum Riverwide Standing Crop during 1973

Life Stage	Collection Dates in Plant Region		Estimates Based on Maximum Riverwide Standing Crop		
	First	Last	Time Interval	Plant-Region Standing Crop	% in Plant Region (Exposure Index)
Eggs	4/29-5/12	6/10-6/23	5/13-5/26	48,278,530	17.9
Yolk-sac larvae	4/29-5/12	6/10-6/23	5/27-6/9 6/10-6/23	31,378,442 18,115,490	38.6 18.8
Post-yolk-sac larvae	5/13-5/26	7/22-8/4	6/24-7/7	45,121,615	26.3
Juveniles (from ichthyo-plankton samples)	6/24-7/7	*	7/8-7/21 8/5-8/18	4,532,002 102,727	28.5 0.7
Juveniles (from beach-seine samples)	7/1-7/14	11/18-12/1	9/9-9/22	30,632	0.4

*Not applicable because juveniles were still present during last sampling period included in this report

Table D-150

White Perch Exposure in Bowline Plant Region Based on Time Interval of Maximum Riverwide Standing Crop during 1973

Life Stage	Collection Dates in Plant Region		Estimates Based on Maximum Riverwide Standing Crop		
	First	Last	Time Interval	Plant-Region Standing Crop	% in Plant Region (Exposure Index)
Eggs	5/13-5/26	6/10-6/23	5/27-6/9	53,545	0.5
Yolk-sac larvae	5/13-5/26	6/10-6/23	6/10-6/23	447,306	3.3
Post-yolk-sac larvae	5/13-5/26	7/8-7/21	6/24-7/7	9,596,063	19.2
Juveniles (from ichthyo-plankton samples)	7/8-7/21	*	8/5-8/18	668,780	23.1
Juveniles (from beach-seine samples)	7/1-7/14	11/18-12/1	9-23/10/6	5,058,791	68.8

*Not applicable because juveniles were still present during last sampling period included in this report

Table D-151

White Perch Exposure in Lovett Plant Region Based on Time Interval of Maximum Riverwide Standing Crop during 1973

Life Stage	Collection Dates in Plant Region		Estimates Based on Maximum Riverwide Standing Crop		
	First	Last	Time Interval	Plant-Region Standing Crop	% in Plant Region (Exposure Index)
Eggs	4/29-5/12	6/10-6/23	5/27-6/9	62,447	0.6
Yolk-sac larvae	5/13-5/26	6/10-6/23	6/10-6/23	531,538	4.0
Post-yolk-sac larvae	5/13-5/26	7/8-7/21	6/24-7/7	8,686,612	17.3
Juveniles (from ichthyo-plankton samples)	7/8-7/21	*	8/5-8/18	541,591	18.7
Juveniles (from beach-seine samples)	7/1-7/14	11/18-12/1	9/23-10/6	3,594,882	48.9

*Not applicable because juveniles were still present during last sampling period included in this report

Table D-152

White Perch Exposure in Indian Point Plant Region Based on Time Interval of Maximum Riverwide Standing Crop during 1973

Life Stage	Collection Dates in Plant Region		Estimates Based on Maximum Riverwide Standing Crop		
	First	Last	Time Interval	Plant-Region Standing Crop	% in Plant Region (Exposure Index)
Eggs	4/29-5/12	6/10-6/23	5/27-6/9	56,402	0.6
Yolk-sac larvae	5/13-5/26	6/10-6/23	6/10-6/23	490,573	3.7
Post-yolk-sac larvae	5/13-5/26	7/8-7/21	6/24-7/7	8,877,204	17.7
Juveniles (from ichthyo-plankton samples)	7/8-7/21	*	8/5-8/18	517,539	17.8
Juveniles (from beach-seine samples)	7/1-7/14	12/2-12/15	9/23-10/6	2,560,150	34.8

*Not applicable because juveniles were still present during last sampling period included in this report

Table D-153

White Perch Exposure in Roseton Plant Region Based on Time Interval of Maximum Riverwide Standing Crop during 1973

Life Stage	Collection Dates in Plant Region		Estimates Based on Maximum Riverwide Standing Crop		
	First	Last	Time Interval	Plant-Region Standing Crop	% in Plant Region (Exposure Index)
Eggs	4/29-5/12	6/10-6/23	5/27-6/9	186,760	1.9
Yolk-sac larvae	4/29-5/12	6/24-7/7	6/10-6/23	892,001	6.6
Post-yolk-sac larvae	5/13-5/26	7/22-8/4	6/24-7/7	6,502,876	13.0
Juveniles (from ichthyo-plankton samples)	7/8-7/21	*	8/5-8/18	121,269	4.2
Juveniles (from beach-seine samples)	7/1-7/14	11/18-12/1	9/23-10/6	45,161	0.6

*Not applicable because juveniles were still present during last sampling period included in this report

Table D-154

White Perch Exposure in Danskammer Plant Region Based on Time Interval of Maximum Riverwide Standing Crop during 1973

Life Stage	Collection Dates in Plant Region		Estimates Based on Maximum Riverwide Standing Crop		
	First	Last	Time Interval	Plant-Region Standing Crop	% in Plant Region (Exposure Index)
Eggs	4/29-5/12	6/10-6/23	5/27-6/9	201,250	2.0
Yolk-sac larvae	4/29-5/12	6/24-7/7	6/10-6/23	946,930	7.0
Post-yolk-sac larvae	5/13-5/26	7/22-8/4	6/24-7/7	5,603,753	11.2
Juveniles (from ichthyo-plankton samples)	7/8-7/21	*	8/5-8/18	92,061	3.2
Juveniles (from beach-seine samples)	7/1-7/14	11/18-12/1	9/23-10/6	27,154	0.4

*Not applicable because juveniles were still present during last sampling period included in this report

Table D-155

Atlantic Tomcod Exposure in Bowline Plant Region Based on Time Interval of Maximum Riverwide Standing Crop during 1973

Life Stage	Collection Dates in Plant Region		Estimates Based on Maximum Riverwide Standing Crop		
	First	Last	Time Interval	Plant-Region Standing Crop	% in Plant Region (Exposure Index)
Eggs*	–	–	–	–	–
Yolk-sac* larvae	–	–	–	–	–
Post-yolk-sac larvae	4/29-5/12**	4/29-5/12	4/29-5/12	860,135	38.5
Juveniles (from ichthyo-plankton samples)	4/29-5/12**	***	4/29-5/12 5/13-5/26	46,823,189 15,582,145	36.3 10.9

*None collected
**Probably present much earlier
***Not applicable because juveniles were still present during last sampling period included in this report

Table D-156

Atlantic Tomcod Exposure in Lovett Plant Region Based on Time Interval of Maximum Riverwide Standing Crop during 1973

Life Stage	Collection Dates in Plant Region		Estimates Based on Maximum Riverwide Standing Crop		
	First	Last	Time Interval	Plant-Region Standing Crop	% in Plant Region (Exposure Index)
Eggs*	-	-	-	-	-
Yolk-sac* larvae	-	-	-	-	-
Post-yolk-sac larvae	4/29-5/12**	4/29-5/12	4/29-5/12	928,154	41.6
Juveniles (from ichthyo-plankton samples)	4/29-5/12**	***	4/29-5/12 5/13-5/26	51,784,991 33,196,930	40.2 23.3

*None collected
**Probably present much earlier
***Not applicable because juveniles were still present during last sampling period included in this report

Table D-157

Atlantic Tomcod Exposure in Indian Point Plant Region Based on Time Interval of Maximum Riverwide Standing Crop during 1973

Life Stage	Collection Dates in Plant Region		Estimates Based on Maximum Riverwide Standing Crop		
	First	Last	Time Interval	Plant-Region Standing Crop	% in Plant Region (Exposure Index)
Eggs*	–	–	–	–	–
Yolk-sac* larvae	–	–	–	–	–
Post-yolk-sac larvae	4/29-5/12**	4/29-5/12	4/29-5/12	788,654	35.3
Juveniles (from ichthyo-plankton samples)	4/29-5/12**	***	4/29-5/12 5/13-5/26	42,839,467 14,617,174	33.3 10.2

*None collected
**Probably present much earlier
***Not applicable because juveniles were still present during last sampling period included in this report

Table D-158

Atlantic Tomcod Exposure in Roseton Plant Region Based on Time Interval of Maximum Riverwide Standing Crop during 1973

Life Stage	Collection Dates in Plant Region		Estimates Based on Maximum Riverwide Standing Crop		
	First	Last	Time Interval	Plant-Region Standing Crop	% in Plant Region (Exposure Index)
Eggs*	–	–	–	–	–
Yolk-sac** larvae	–	–	–	–	–
Post-yolk-sac larvae	4/29-5/12**	4/29-5/12	4/29-5/12	37,686	1.7
Juveniles (from ichthyo-plankton samples)	4/29-5/12**	***	4/29-5/12 5/13-5/26	2,632,372 2,738,813	2.0 0.8

*None collected
**Probably present much earlier
***Not applicable because juveniles were still present during last sampling period included in this report

Table D-159

Atlantic Tomcod Exposure in Danskammer Plant Region Based on Time Interval of Maximum Riverwide Standing Crop during 1973

Life Stage	Collection Dates in Plant Region		Estimates Based on Maximum Riverwide Standing Crop		
	First	Last	Time Interval	Plant-Region Standing Crop	% in Plant Region (Exposure Index)
Eggs*	–	–	–	–	–
Yolk-sac** larvae	–	–	–	–	–
Post-yolk-sac larvae	4/29-5/12**	4/29-5/12	4/29-5/12	24,570	1.1
Juveniles (from ichthyoplankton samples)	4/29-5/12**	***	4/29-5/12 5/13-5/26	2,089,335 2,211,720	1.6 0.8

*None collected
**Probably present much earlier
***Not applicable because juveniles were still present during last sampling period included in this report

Table D-160

Striped Bass Exposure in Bowline Plant Region Based on Time Interval of Maximum Riverwide Standing Crop during 1974

Life Stage	Collection Dates in Plant Region		Estimates Based on Maximum Riverwide Standing Crop		
	First	Last	Time Interval	Plant-Region Standing Crop	% in Plant Region (Exposure Index)
Eggs	5/6-5/11	5/30-6/5	5/15-5/18	*	**
Yolk-sac larvae	5/6-5/11	7/1-7/5	5/28-5/31	4,121,935	15.8
Post-yolk-sac larvae	5/13-5/18	7/22-7/26	6/17-6/23	56,838,377	17.4
Juveniles (from ichthyoplankton samples)	7/1-7/5	***	7/22-7/26	1,085,107	26.8
Juveniles (from beach-seine samples)	6/16-6/29	***	8/25-9/7	1,061,916	44.0

*No sample
**Not determined since entire river not sampled during May 15-18
***Not applicable because juveniles were still present during last sampling period included in this report

Table D-161

Striped Bass Exposure in Lovett Plant Region Based on Time Interval of Maximum Riverwide Standing Crop during 1974

Life Stage	Collection Dates in Plant Region		Estimates Based on Maximum Riverwide Standing Crop		
	First	Last	Time Interval	Plant-Region Standing Crop	% in Plant Region (Exposure Index)
Eggs	4/29-5/4	6/24-6/27	5/15-5/18	168,394,200	ND*
Yolk-sac larvae	5/6-5/11	7/1-7/5	5/28-5/31	24,640,132	15.6
Post-yolk-sac larvae	5/13-5/18	7/22-7/26	6/17-6/23	88,430,901	27.1
Juveniles (from ichthyo-plankton samples)	7/1- 7/5	**	7/22-7/26	526,050	13.0
Juveniles (from beach-seine samples)	6/6-6/29	**	8/25-9/7	485,564	20.1

*Not determined since entire river not sampled during May 14-18

**Not applicable because juveniles were still present during last sampling period included in this report

Table D-162

Striped Bass Exposure in Indian Point Plant Region Based on Time Interval of Maximum Riverwide Standing Crop during 1974

Life Stage	Collection Dates in Plant Region		Estimates Based on Maximum Riverwide Standing Crop		
	First	Last	Time Interval	Plant-Region Standing Crop	% in Plant Region (Exposure Index)
Eggs	4/29-5/4	6/24-6/27	5/15-5/18	185,254,054	ND*
Yolk-sac larvae	5/6-5/11	7/1-7/5	5/28-5/31	21,251,188	13.5
Post-yolk-sac larvae	5/13-5/18	7/22-7/26	6/17-6/23	94,477,817	28.9
Juveniles (from ichthyo-plankton samples)	7/1-7/5	**	7/22-7/26	444,933	11.0
Juveniles (from beach-seine samples)	6/16-7/29	**	8/25-9/7	391,064	16.2

*Not determined since entire river not sampled during May 15-18

**Not applicable because juveniles were still present during last sampling period included in this report

Table D-163

Striped Bass Exposure in Roseton Plant Region Based on Time Interval of Maximum Riverwide Standing Crop during 1974

Life Stage	Collection Dates in Plant Region		Estimates Based on Maximum Riverwide Standing Crop		
	First	Last	Time Interval	Plant-Region Standing Crop	% in Plant Region (Exposure Index)
Eggs	4/29-5/4	6/24-6/27	5/15-5/18	15,982,144	ND*
Yolk-sac larvae	5/13-5/18	6/24-6/27	5/28-5/31	64,948,398	41.2
Post-yolk-sac larvae	5/15-5/18	8/5-8/9	6/17-6/23	79,274,200	24.3
Juveniles (from ichthyo-plankton samples)	6/12-6/17	**	7/22-7/26	527,435	13.0
Juveniles (from beach-seine samples)	6/16-6/29	**	8/25-9/7	56,578	2.3

*Not determined since entire river not sampled during May 15-18
**Not applicable because juveniles were still present during last sampling period included in this report

Table D-164

Striped Bass Exposure in Danskammer Plant Region Based on Time Interval of Maximum Riverwide Standing Crop during 1974

Life Stage	Collection Dates in Plant Region		Estimates Based on Maximum Riverwide Standing Crop		
	First	Last	Time Interval	Plant-Region Standing Crop	% in Plant Region (Exposure Index)
Eggs	4/29-5/4	6/24-6/27	5/15-5/18	15,339,517	ND*
Yolk-sac larvae	5/13-5/18	6/24-6/27	5/28-5/31	60,539,975	38.4
Post-yolk-sac larvae	5/15-5/18	8/5-8/9	6/17-6/23	78,234,060	24.0
Juveniles (from ichthyo-plankton samples)	6/12-6/17	**	7/22-7/26	328,160	8.1
Juveniles (from beach-seine samples)	6/16-6/29	**	8/25-9/7	30,645	1.3

*Not determined since entire river not sampled during May 15-18
**Not applicable because juveniles were still present during last sampling period included in this report

Table D-165

White Perch Exposure in Bowline Plant Region Based on Time Interval of Maximum Riverwide Standing Crop during 1974

Life Stage	Collection Dates in Plant Region		Estimates Based on Maximum Riverwide Standing Crop		
	First	Last	Time Interval	Plant-Region Standing Crop	% in Plant Region (Exposure Index)
Eggs	5/6-5/11	7/1-7/5	5/30-6/5	176,793,638	93.7
Yolk-sac larvae	5/6-5/11	7/8-7/11	5/21-5/24	23,388,917	33.3
Post-yolk-sac larvae	5/13-5/18	7/22-7/26	6/12-6/17	18,695,238	4.4
Juveniles (from ichthyo-plankton samples)	6/17-6/23	8/5-8/9	7/29-8/2	136,883	2.2
Juveniles (from beach-seine samples)	7/14-7/27	*	8/25-9/7	153,765	18.5

*Not applicable because juveniles were still present during last sampling period included in this report

Table D-166

White Perch Exposure in Lovett Plant Region Based on Time Interval of Maximum Riverwide Standing Crop during 1974

Life Stage	Collection Dates in Plant Region		Estimates Based on Maximum Riverwide Standing Crop		
	First	Last	Time Interval	Plant-Region Standing Crop	% in Plant Region (Exposure Index)
Eggs	5/13-5/18	7/1-7/5	5/30-6/5	151,212,400	80.1
Yolk-sac larvae	5/6-5/11	7/8-7/11	5/21-5/24	15,313,967	14.1
Post-yolk-sac larvae	5/13-5/18	7/29-8/2	6/12-6/17	30,871,256	7.3
Juveniles (from ichthyo-plankton samples)	6/24-6/27	7/29-8/2	7/29-8/2	204,608	3.2
Juveniles (from beach-seine samples)	7/14-7/27	*	8/25-9/7	144,562	17.4

*Not applicable because juveniles were still present during last sampling period included in this report

Table D-167

White Perch Exposure in Indian Point Plant Region Based on Time Interval of Maximum Riverwide Standing Crop during 1974

Life Stage	Collection Dates in Plant Region		Estimates Based on Maximum Riverwide Standing Crop		
	First	Last	Time Interval	Plant-Region Standing Crop	% in Plant Region (Exposure Index)
Eggs	5/13-5/18	7/1-7/5	5/30-6/5	112,375,284	59.6
Yolk-sac larvae	5/6-5/11	7/8-7/11	5/21-5/24	12,249,081	11.3
Post-yolk-sac larvae	5/13-5/18	7/29-8/2	6/12-6/17	36,084,044	8.6
Juveniles (from ichthyo-plankton samples)	6/24-6/27	7/29-8/2	7/29-8/2	204,608	3.2
Juveniles (from beach-seine samples)	6/30-7/13	*	8/25-9/7	135,514	16.3

*Not applicable because juveniles were still present during last sampling period included in this report

Table D-168

White Perch Exposure in Roseton Plant Region Based on Time Interval of Maximum Riverwide Standing Crop during 1974

Life Stage	Collection Dates in Plant Region		Estimates Based on Maximum Riverwide Standing Crop		
	First	Last	Time Interval	Plant-Region Standing Crop	% in Plant Region (Exposure Index)
Eggs	5/6-5/11	7/1-7/5	5/30-6/5	3,012,371	1.8
Yolk-sac larvae	5/13-5/18	6/17-6/23	5/21-5/24	12,030,810	11.1
Post-yolk-sac larvae	5/13-5/18	8/5-8/9	6/12-6/17	86,418,280	20.5
Juveniles (from ichthyo-plankton samples)	6/12-6/17	*	7/29-8/2	251,560	4.0
Juveniles (from beach-seine samples)	6/30-7/13	*	8/25-9/7	66,243	8.0

*Not applicable because juveniles were still present during last sampling period included in this report

Table D-169

White Perch Exposure in Danskammer Plant Region Based on Time Interval of Maximum Riverwide Standing Crop during 1974

Life Stage	Collection Dates in Plant Region		Estimates Based on Maximum Riverwide Standing Crop		
	First	Last	Time Interval	Plant-Region Standing Crop	% in Plant Region (Exposure Index)
Eggs	5/6-5/11	7/1-7/5	5/30-6/5	3,559,185	1.9
Yolk-sac larvae	5/13-5/18	6/17-6/23	5/21-5/24	12,023,233	11.1
Post-yolk-sac larvae	5/13-5/18	8/5-8/9	6/12-6/17	85,541,586	20.3
Juveniles (from ichthyo-plankton samples)	6/12-6/17	*	7/29-8/2	270,884	4.3
Juveniles (from beach-seine samples)	6/30-7/13	*	8/25-9/7	46,439	5.6

*Not applicable because juveniles were still present during last sampling period included in this report

Table D-170

Atlantic Tomcod Exposure in Bowline Plant Region Based on Time Interval of Maximum Riverwide Standing Crop during 1974

Life Stage	Collection Dates in Plant Region		Estimates Based on Maximum Riverwide Standing Crop		
	First	Last	Time Interval	Plant-Region Standing Crop	% in Plant Region (Exposure Index)
Eggs*	–	–	–	–	–
Yolk-sac* larvae	–	–	–	–	–
Post-yolk-sac* larvae	–	–	–	–	–
Juveniles (from ichthyo-plankton samples)	4/29-5/4**	***	4/29-5/4**	113,648,890	9.4

*None collected
**Probably present much earlier
***Not applicable because juveniles were still present during last sampling period included in this report

Table D-171

Atlantic Tomcod Exposure in Lovett Plant Region Based on Time Interval of Maximum Riverwide Standing Crop during 1974

Life Stage	Collection Dates in Plant Region		Estimates Based on Maximum Riverwide Standing Crop		
	First	Last	Time Interval	Plant-Region Standing Crop	% in Plant Region (Exposure Index)
Eggs*	—	—	—	—	—
Yolk-sac* larvae	—	—	—	—	—
Post-yolk-sac* larvae	—	—	—	—	—
Juveniles (from ichthyoplankton samples)	4/29-5/4**	***	4/29-5/4**	130,875	0

*None collected
**Probably present much earlier
***Not applicable because juveniles were still present during last sampling period included in this report

Table D-172

Atlantic Tomcod Exposure in Indian Point Plant Region Based on Time Interval of Maximum Riverwide Standing Crop during 1974

Life Stage	Collection Dates in Plant Region		Estimates Based on Maximum Riverwide Standing Crop		
	First	Last	Time Interval	Plant-Region Standing Crop	% in Plant Region (Exposure Index)
Eggs*	—	—	—	—	—
Yolk-sac* larvae	—	—	—	—	—
Post-yolk-sac* larvae	—	—	—	—	—
Juveniles (from ichthyoplankton samples)	4/29-5/4**	***	4/29-5/4**	106,013	0

*None collected
**Probably present much earlier
***Not applicable because juveniles were still present during last sampling period included in this report

Table D-173

Atlantic Tomcod Exposure in Roseton Plant Region Based on Time Interval of Maximum Riverwide Standing Crop during 1974

Life Stage	Collection Dates in Plant Region		Estimates Based on Maximum Riverwide Standing Crop		
	First	Last	Time Interval	Plant-Region Standing Crop	% in Plant Region (Exposure Index)
Eggs*	–	–	–	–	–
Yolk-sac* larvae	–	–	–	–	–
Post-yolk-sac* larvae	–	–	–	–	–
Juveniles (from ichthyo-plankton samples)	5/6-5/11	***	4/29-5/4**	0	0

*None collected
**Probably present much earlier
***Not applicable because juveniles were still present during last sampling period included in this report

Table D-174

Atlantic Tomcod Exposure in Danskammer Plant Region Based on Time Interval of Maximum Riverwide Standing Crop during 1974

Life Stage	Collection Dates in Plant Region		Estimates Based on Maximum Riverwide Standing Crop		
	First	Last	Time Interval	Plant-Region Standing Crop	% in Plant Region (Exposure Index)
Eggs*	–	–	–	–	–
Yolk-sac* larvae	–	–	–	–	–
Post-yolk-sac* larvae	–	–	–	–	–
Juveniles (from ichthyo-plankton samples)	5/6-5/11	***	4/29-5/4**	0	0

*None Collected
**Probably present much earlier
***Not applicable because juveniles were still present during last sampling period included in this report

Table D-175

Length-Frequency Distribution of Juvenile Striped Bass Based on Day Sampling by 100-ft (30.5-m) Beach Seine in Hudson River Estuary during April-September 1974

Date	Total Length Interval (mm)																		Summary				
	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-110	111-120	121-130	131-140	141-150	151-160	161-170	>170	Total Meas.	Mean Leng.	Std. Error	Min. Leng.	Max. Leng.
4/28-6/22*																							
6/23-6/29	0	16	84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	24	0.51	18	30
6/30-7/6	0	0	67	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	28	1.45	21	35
7/7-7/13	0	0	44	45	11	0	0	0	0	0	0	0	0	0	0	0	0	0	80	33	0.68	22	45
7/14-7/20	0	0	6	46	39	9	1	0	0	0	0	0	0	0	0	0	0	0	123	41	0.67	28	63
7/21-7/27	0	**	4	29	37	25	5	0	0	0	0	0	0	0	0	0	0	0	325	45	0.51	20	70
7/28-8/3	0	0	4	19	21	35	19	3	0	**	0	0	0	0	0	0	0	0	326	51	0.66	23	99
8/4-8/10	0	0	1	2	19	43	31	4	**	0	0	0	0	0	0	0	0	0	369	57	0.45	24	83
8/11-8/17	0	0	0	0	5	26	44	19	5	2	0	0	0	0	0	0	**	0	293	66	0.66	44	170
8/18-8/24	0	0	0	0	3	18	41	31	7	0	0	0	0	0	0	0	0	0	272	68	0.54	41	86
8/25-8/31	0	0	0	**	**	6	21	40	27	5	1	1	0	0	0	0	0	0	474	76	0.47	34	119
9/1-9/7	0	0	0	1	0	2	20	37	25	8	2	4	0	0	0	0	0	0	188	79	0.93	32	117
9/8-9/14	0	0	0	**	**	2	11	16	31	27	8	5	0	0	0	0	0	0	415	87	0.66	40	119
9/15-9/21	0	0	0	0	0	1	8	29	35	18	4	3	2	0	0	0	0	0	268	85	0.77	51	129
9/22-9/28	0	0	0	0	0	0	5	16	31	23	17	2	6	0	0	0	0	0	313	92	0.80	62	130

*No catch
**Less than 1%

Table D-176

Length-Frequency Distribution for Juvenile White Perch Based on Day Sampling by 100-ft (30.5-m) Beach Seine in Hudson River Estuary during April-September 1974

Date	Total Length (mm)																Summary				
	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-110	111-120	121-130	131-140	141-150	>150	Total Meas.	Mean Leng.	Std. Error	Min Leng.	Max Leng.
4/28-7/6*																					
7/7-7/13	0	44	54	0	2	0	0	0	0	0	0	0	0	0	0	0	46	21	0.58	13	41
7/14-7/20	0	3	73	20	4	0	0	0	0	0	0	0	0	0	0	0	90	28	0.60	20	50
7/21-7/27	0	1	41	45	10	3	0	0	0	0	0	0	0	0	0	0	73	32	0.82	20	58
7/28-8/3	0	0	19	54	25	1	0	0	0	0	0	0	0	0	0	0	98	37	0.64	22	55
8/4-8/10	0	0	7	30	42	18	2	**	0	0	0	0	0	0	0	0	248	44	0.57	21	71
8/11-8/17	0	0	6	17	33	40	4	**	0	0	0	0	0	0	0	0	242	47	0.57	24	74
8/18-8/24	0	0	**	9	26	38	22	4	0	0	0	0	0	0	0	0	377	54	0.49	30	84
8/25-8/31	0	0	**	3	13	31	44	8	0	0	0	0	0	0	0	0	291	60	0.54	25	80
9/1-9/7	0	0	0	1	18	32	37	10	1	0	0	0	0	0	0	0	237	59	0.58	36	83
9/8-9/14	0	0	0	2	8	17	49	24	1	0	0	0	0	0	0	0	192	64	0.65	32	82
9/15-9/21	0	0	0	0	13	29	45	12	1	0	0	0	0	0	0	0	197	62	0.62	42	89
9/22-9/28	0	0	0	**	2	18	48	26	6	0	0	0	0	0	0	0	206	67	0.67	37	90

*No catch

**Less than 1%

Table D-177

Length-Frequency Distribution for Juvenile Atlantic Tomcod Based on Day Sampling by 100-ft (30.5-m) Beach Seine in Hudson River Estuary during April-September 1974

Date	Total Length Interval (mm)																Summary				
	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-110	111-120	121-130	131-140	141-150	>150	Total Meas.	Mean Leng.	Std. Error	Min. Leng.	Max. Leng.
4/28-5/4*																					
5/5-5/11	0	0	0	50	50	0	0	0	0	0	0	0	0	0	0	0	2	43	4.50	38	47
5/12-5/18	0	0	0	6	63	31	0	0	0	0	0	0	0	0	0	0	87	48	0.58	32	58
5/19-5/25	0	0	0	2	18	61	19	0	0	0	0	0	0	0	0	0	128	55	0.54	38	67
5/26-6/1	0	0	0	0	1	31	49	19	0	0	0	0	0	0	0	0	99	64	0.65	45	77
6/2-6/8*																					
6/9-6/15	0	0	0	0	0	18	50	28	4	0	0	0	0	0	0	0	111	68	0.73	52	88
6/16-6/22	0	0	0	0	0	**	5	31	42	17	5	0	0	0	0	0	95	84	0.96	56	110
6/23-6/29	0	0	0	0	0	**	4	35	39	19	3	0	0	0	0	0	207	84	0.57	57	108
6/30-7/6	0	0	0	0	0	**	4	24	46	21	4	1	0	0	0	0	225	85	0.60	56	118
7/7-7/13	0	0	0	0	0	0	0	55	45	0	0	0	0	0	0	0	22	80	1.07	73	90
7/14-7/20	0	0	0	0	0	0	0	24	43	16	16	0	0	0	0	0	37	87	1.66	73	110
7/21-7/27	0	0	0	0	0	0	2	13	40	33	11	0	0	0	0	0	45	89	1.23	69	104
7/28-8/3	0	0	0	0	0	0	33	17	17	33	0	0	0	0	0	0	6	80	5.75	63	94
8/4-8/10	0	0	0	0	0	0	0	0	43	29	29	0	0	0	0	0	7	94	3.20	84	107
8/11-8/17	0	0	0	0	0	0	0	29	24	12	29	0	6	0	0	0	17	92	3.47	71	121
8/18-8/24	0	0	0	0	0	0	0	21	57	7	14	0	0	0	0	0	14	86	2.83	71	107
8/25-8/31	0	0	0	0	0	0	33	0	33	33	0	0	0	0	0	0	3	84	8.89	67	97
9/1-9/7*																					
9/8-9/14*																					
9/15-9/21	0	0	0	0	0	0	0	50	50	0	0	0	0	0	0	0	2	78	3.50	74	81
9/22-9/28	0	0	0	0	0	0	0	27	36	9	9	18	0	0	0	0	11	92	4.75	74	117

*No catch
**Less than 1%

Table D-178

Length-Frequency Distribution for Juvenile Atlantic Tomcod Based on Day Sampling by Bottom Trawl in Hudson River Estuary during April-September 1974

Date	Total Length Interval (mm)																Summary				
	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-110	111-120	121-130	131-140	141-150	>150	Total Meas.	Mean Leng.	Std. Error	Min. Leng.	Max. Leng.
4/28-5/4*																					
5/5-5/11	0	6	89	6	0	0	0	0	0	0	0	0	0	0	0	0	140	26	0.28	15	38
5/12-5/18*																					
5/19-5/25*																					
5/26-6/1*																					
6/2-6/8	0	0	0	0	0	11	58	32	0	0	0	0	0	0	0	0	19	68	1.41	55	80
6/9-6/15	0	0	0	0	0	14	35	30	19	2	0	0	0	0	0	0	43	71	1.56	52	91
6/16-6/22*																					
6/23-6/29	0	0	0	0	**	2	23	41	22	12	1	0	0	0	0	0	426	78	0.47	48	105
6/30-7/6*																					
7/7-7/13	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0	0	1	58	0	58	58
7/14-7/20*																					
7/21-7/27	0	0	0	0	0	1	23	52	14	7	2	**	0	0	0	0	201	77	0.65	56	112
7/28-8/3*																					
8/4-8/10	0	0	0	0	0	1	17	42	29	10	2	**	0	0	0	0	165	79	0.73	55	120
8/11-8/17*																					
8/18-8/24	0	0	0	0	0	0	9	36	36	17	3	0	0	0	0	0	195	82	0.64	64	108
8/25-8/31*																					
9/1-9/7	0	0	0	0	0	0	22	48	24	4	1	0	0	0	0	0	140	77	0.69	63	104
9/8-9/14*																					
9/15-9/21	0	0	0	0	0	0	30	44	19	4	0	4	0	0	0	0	27	77	2.19	62	120
9/22-9/28*																					

*No samples taken
**Less than 1%

Table D-179

Length-Frequency Distribution for Juvenile Striped Bass Based on Night Sampling by 100-ft (30.5-m) Beach Seine in Hudson River Estuary during April-September 1974

Date	Total Length Interval (mm)																Summary				
	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-110	111-120	121-130	131-140	141-150	>150	Total Meas.	Mean Leng.	Std. Error	Min. Leng.	Max. Leng.
4/28-8/3*																					
8/4-8/10	0	0	**	5	20	34	28	13	0	0	0	0	0	0	0	0	204	58	0.72	30	80
8/11-8/17	0	0	0	0	10	42	34	9	4	1	0	0	0	0	0	0	155	61	0.75	44	99
8/18-8/24	0	0	0	0	3	32	46	19	0	0	0	0	0	0	0	0	124	63	0.65	48	80
8/25-8/31	0	0	0	0	2	31	42	17	8	0	0	0	0	0	0	0	82	66	0.98	50	85
9/1-9/7	0	0	0	0	3	18	26	28	12	7	2	4	0	0	0	0	173	74	1.16	45	120
9/8-9/14	0	0	0	**	2	14	36	29	11	5	1	1	0	0	0	0	200	71	0.88	31	115
9/15-9/21	0	0	0	0	1	5	33	42	11	4	2	1	0	0	0	0	96	74	1.16	48	119
9/22-9/28	0	0	0	0	0	4	23	35	22	8	1	4	3	0	0	0	107	80	1.44	57	129

*No samples taken
**Less than 1%

Table D-180

Length-Frequency Distribution for Juvenile White Perch Based on Night Sampling by 100-ft (30.5-m) Beach Seine in Hudson River Estuary during April-September 1974

Date	Total Length Interval (mm)																Summary				
	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-110	111-120	121-130	131-140	141-150	>150	Total Meas.	Mean Leng.	Std. Error	Min. Leng.	Max. Leng.
4/28-8/3*																					
8/4-8/10	0	5	8	3	60	24	0	0	0	0	0	0	0	0	0	0	62	44	1.23	19	60
8/11-8/17	0	0	2	4	27	63	4	0	0	0	0	0	0	0	0	0	49	52	0.92	30	63
8/18-8/24	0	0	1	12	14	52	19	1	0	0	0	0	0	0	0	0	77	53	1.02	29	71
8/25-8/31	0	0	0	19	19	19	44	0	0	0	0	0	0	0	0	0	16	55	2.80	39	70
9/1-9/7	0	0	0	2	7	24	42	26	0	0	0	0	0	0	0	0	113	65	0.89	38	80
9/8-9/14	0	0	0	1	17	23	43	17	0	0	0	0	0	0	0	0	166	61	0.73	34	80
9/15-9/21	0	0	0	0	3	19	37	41	0	0	0	0	0	0	0	0	66	67	0.97	45	80
9/22-9/28	0	0	0	0	0	12	43	39	6	0	0	0	0	0	0	0	121	70	0.70	52	87

*No samples taken

Table D-181

Length-Frequency Distribution for Juvenile Atlantic Tomcod Based on Night Sampling by 100-ft (30.5-m) Beach Seine in Hudson River Estuary during April-September 1974

Date	Total Length Interval (mm)																Summary				
	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-110	111-120	121-130	131-140	141-150	>150	Total Meas.	Mean Leng.	Std. Error	Min Leng.	Max Leng.
4/28-8/3*																					
8/4-8/10	0	0	0	0	0	0	0	0	33	67	0	0	0	0	0	0	6	91	2.86	82	100
8/11-8/17	0	0	0	0	0	0	0	50	50	0	0	0	0	0	0	0	2	85	4.50	80	89
8/18-8/24	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0	1	68	0	68	68
8/25-8/31	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	1	79	0	79	79
9/1-9/7**																					
9/8-9/14	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	1	96	0	96	96
9/15-9/21	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	1	73	0	73	73
9/22-9/28	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	1	85	0	85	85

*No samples taken
**No catch

LONGITUDINAL RIVER DISTRIBUTION
AND ABUNDANCE HISTOGRAMS

REMARKS

Within a given life stage for each species, all histograms are drawn on the same vertical scale so that standing crops, densities, or CPUEs can be compared through space and time. The histograms present only those time periods in which a given life stage was collected.

The one standard error around the standing crop, density, and CPUE estimates has been omitted on the histograms but does appear elsewhere in tables of this appendix.

Abbreviations and related information used in the histograms follow.

Geographical Region	Abbreviation	River Miles*
Yonkers	YK	14-23 (22-37)
Tappan Zee	TZ	24-33 (38-53)
Croton-Haverstraw	CH	34-38 (54-61)
Indian Point	IP	39-46 (62-74)
West Point	WP	37-55 (75-88)
Cornwall	CW	56-61 (89-98)
Poughkeepsie	PK	62-76 (99-122)
Hyde Park	HP	77-85 (123-136)
Kingston	KG	86-93 (137-149)
Saugerties	SG	94-106 (150-170)
Catskill	CS	107-124 (171-198)
Albany	AL	125-140 (199-224)

*Numbers in parentheses indicate kilometers

NC = no catch

NS = no samples taken

D = day samples, N = night samples

The absence of NC, NS, and histogram for a given region indicates that the value for that standing crop, density, or CPUE estimate is small. For these small numbers and the exact numbers for all estimates, refer to the appropriate tables in this appendix.

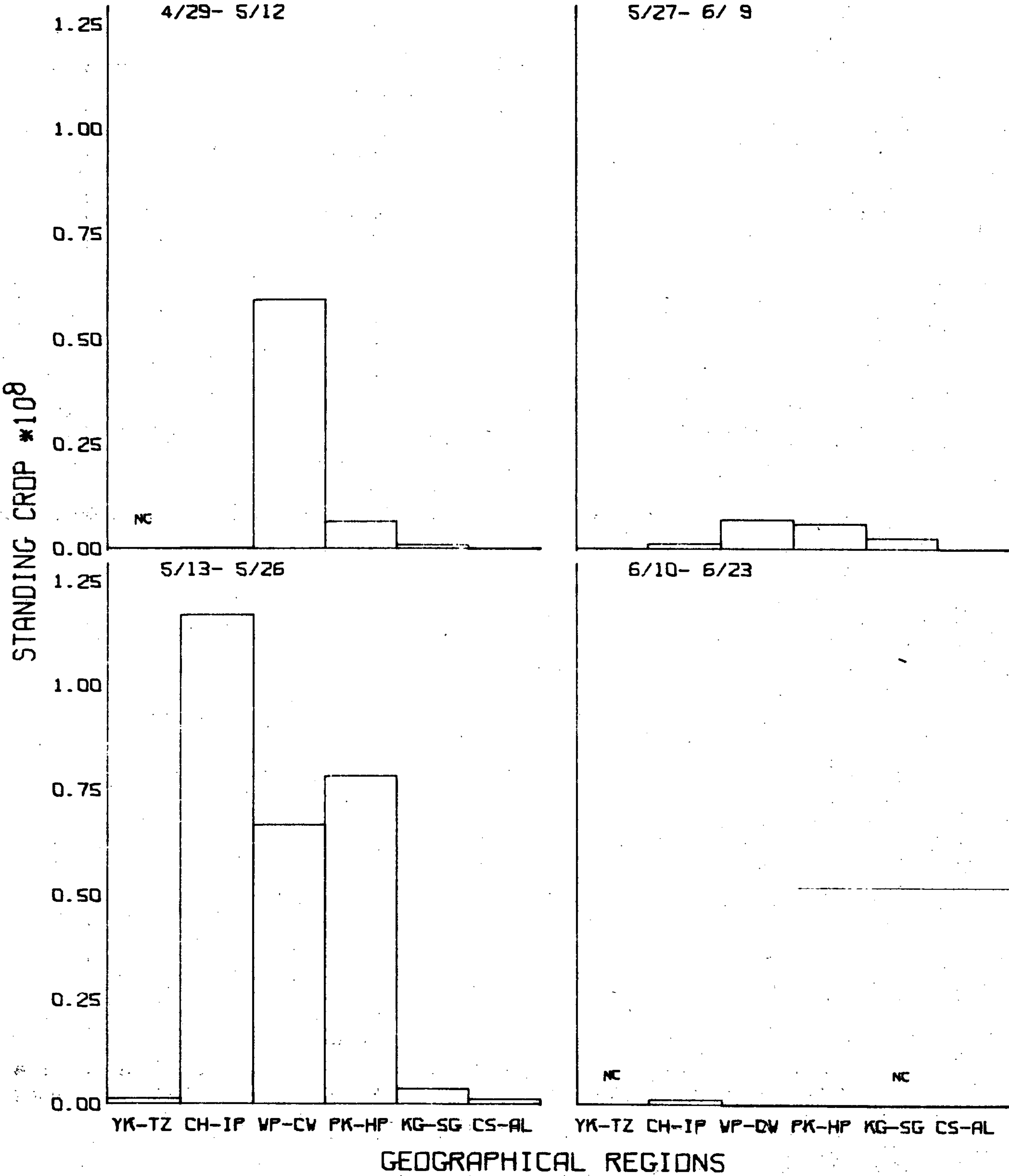


Figure D-1. Standing Crop of Striped Bass Eggs within Six Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Combined Day and Night Sampling by Epibenthic Sled and Tucker Trawl during 1973

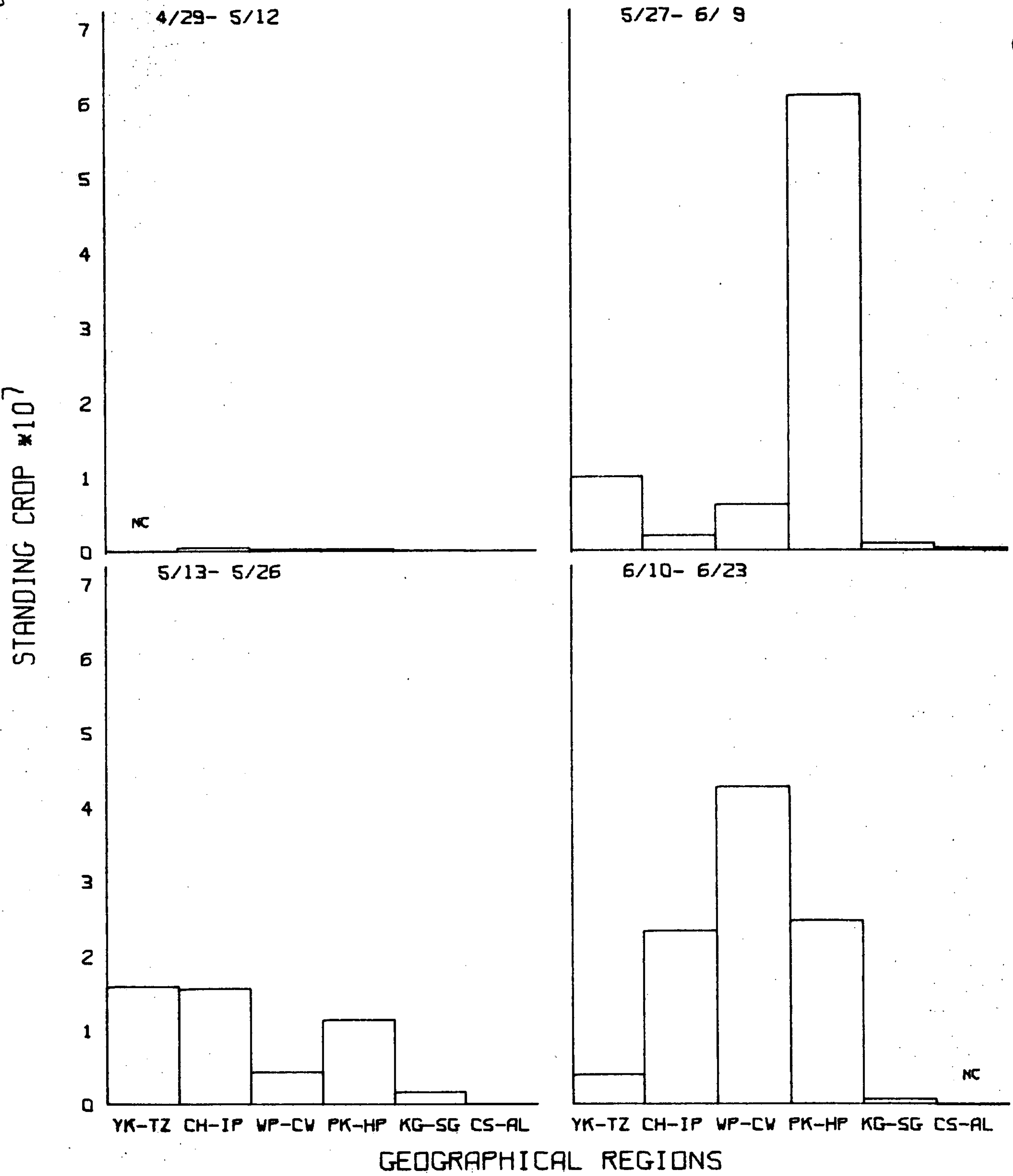


Figure D-2. Standing Crop of Striped Bass Yolk-Sac Larvae within Six Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Combined Day and Night Sampling by Epibenthic Sled and Tucker Trawl during 1973

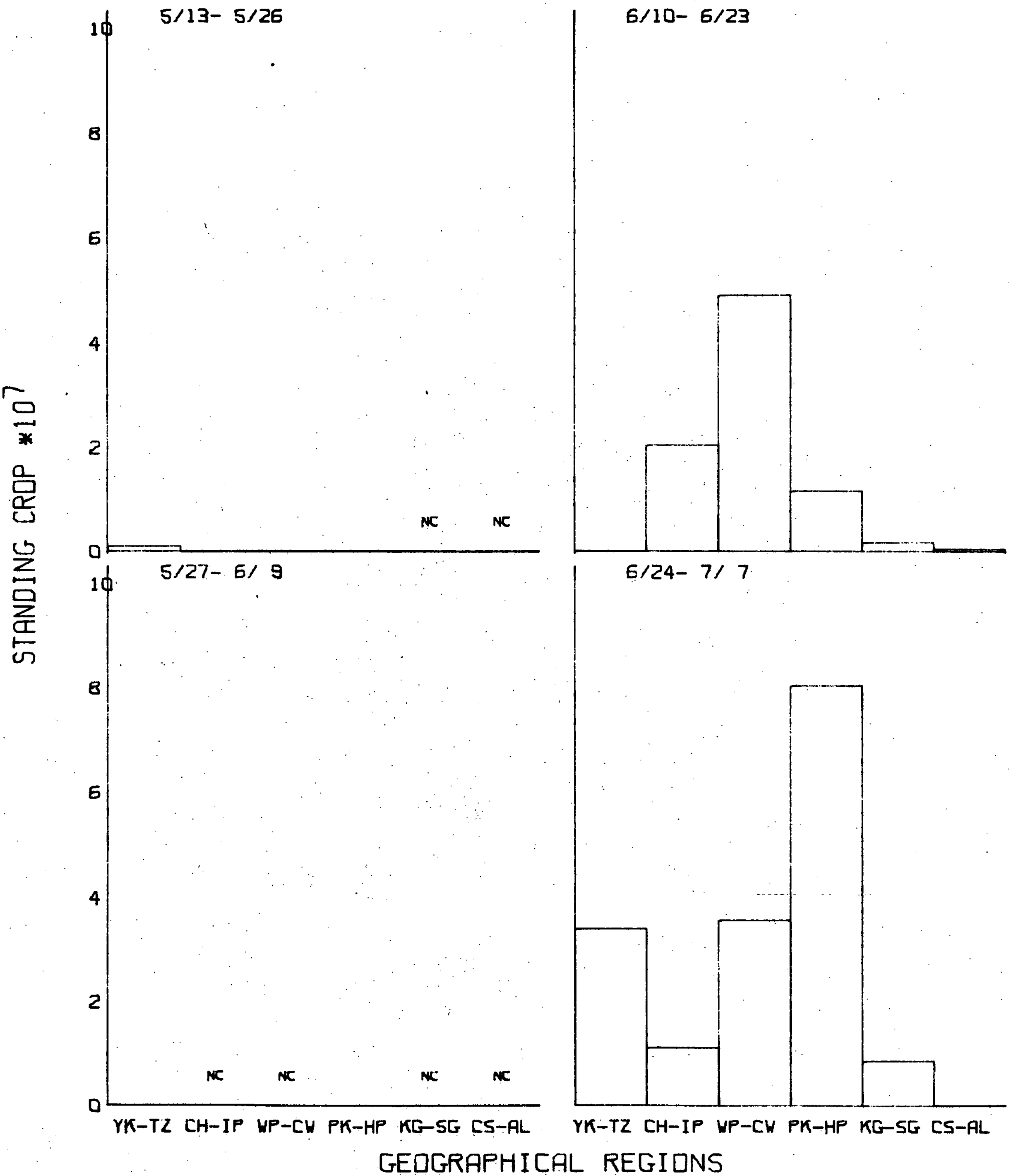


Figure D-3. Standing Crop of Striped Bass Post Yolk-Sac Larvae within Six Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Combined Day and Night Sampling by Epibenthic Sled and Tucker Trawl during 1973

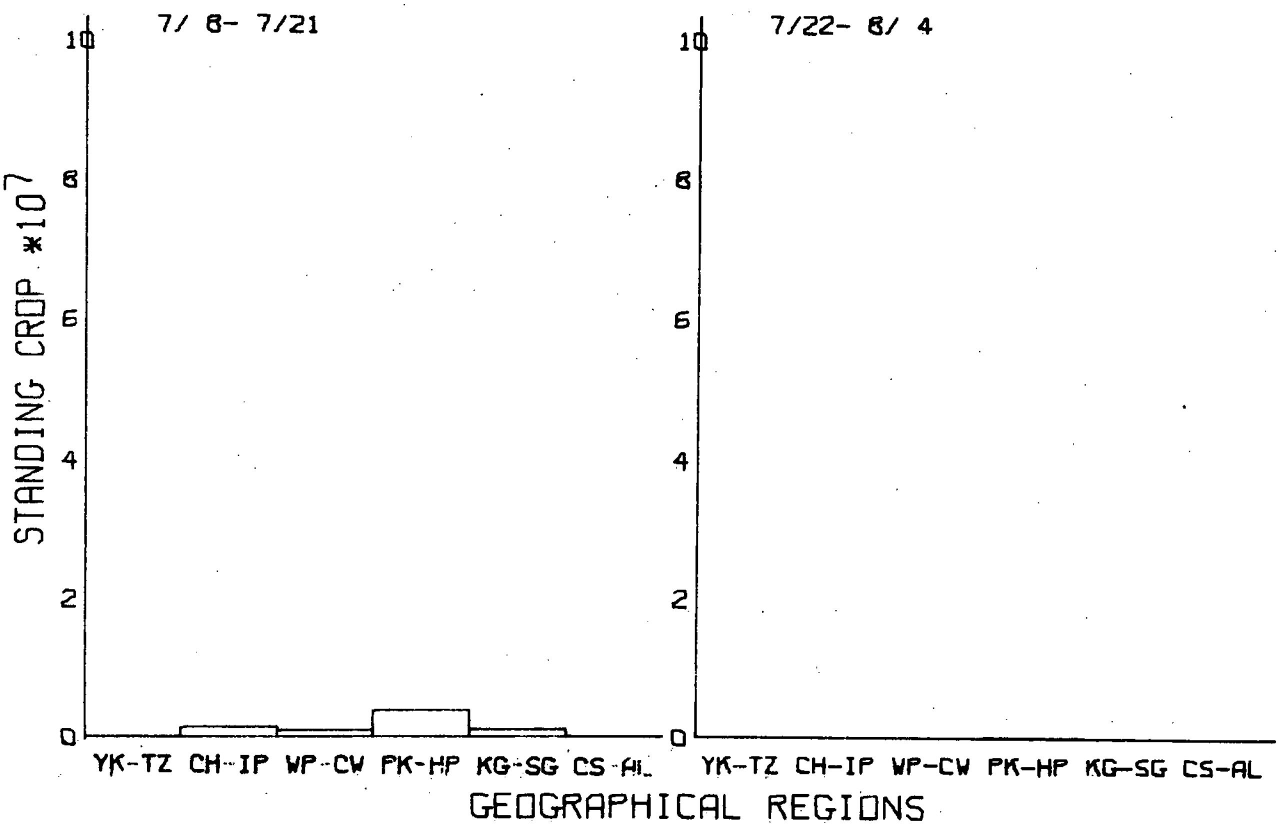


Figure D-3. Page 2 of 2

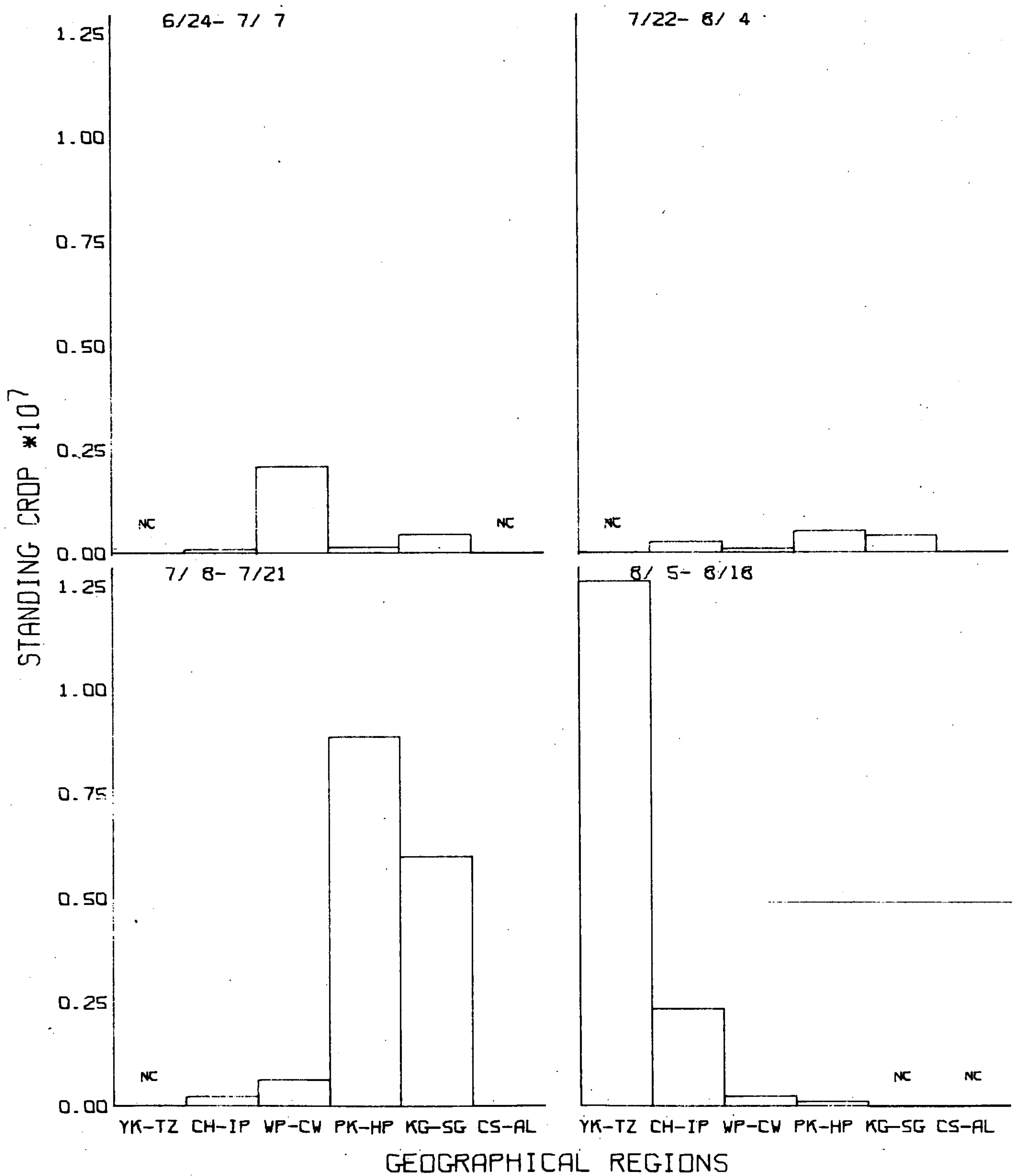


Figure D-4. Standing Crop of Juvenile Striped Bass within Six Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Combined Day and Night Sampling by Epibenthic Sled and Tucker Trawl during 1973

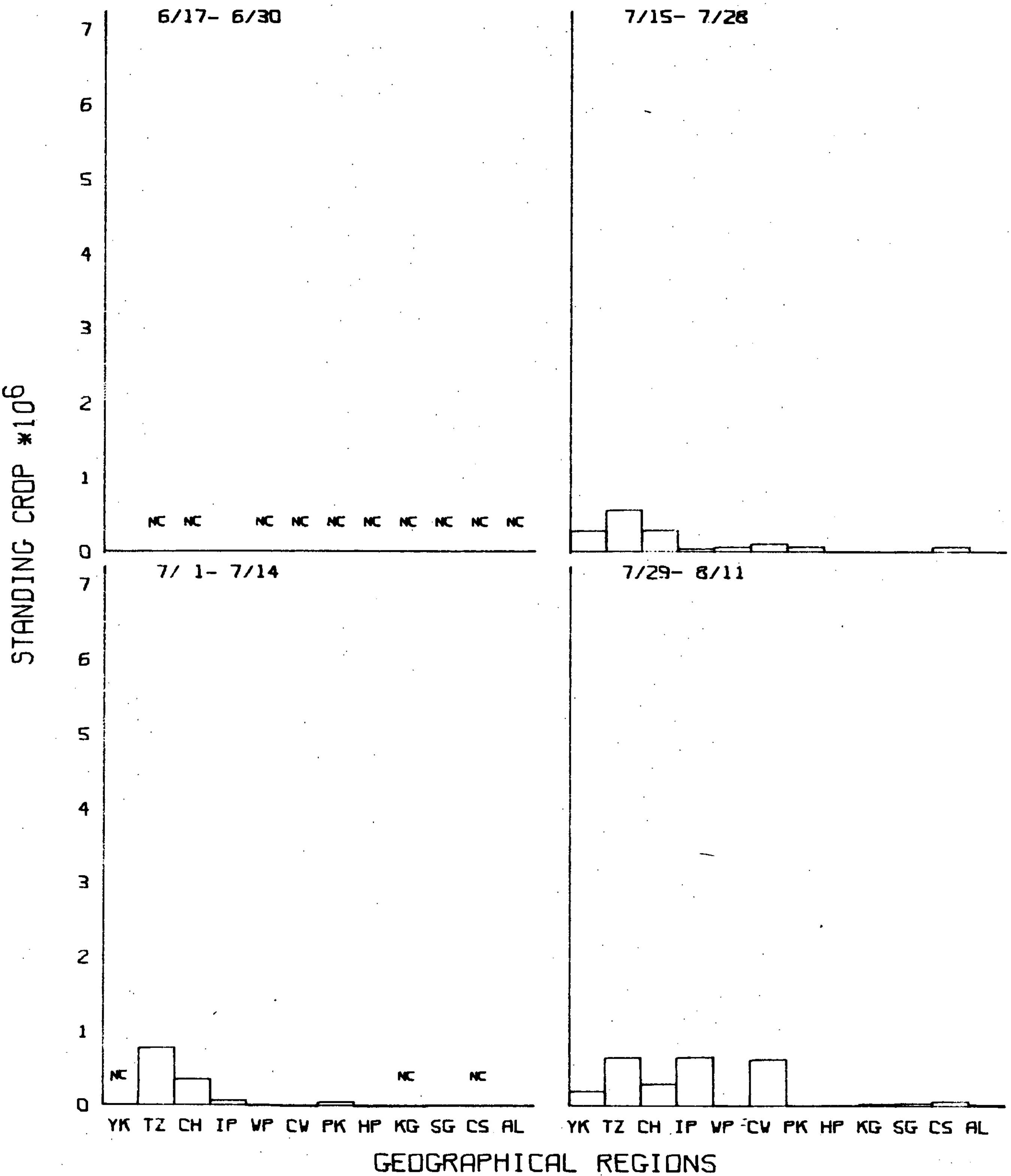


Figure D-5. Standing Crop of Juvenile Striped Bass within 12 Geographical Regions of Hudson River Estuary [RM 12-153 (km 19-245)] Based on Day Sampling by 100-ft (30.5-m) Beach Seine during 1975

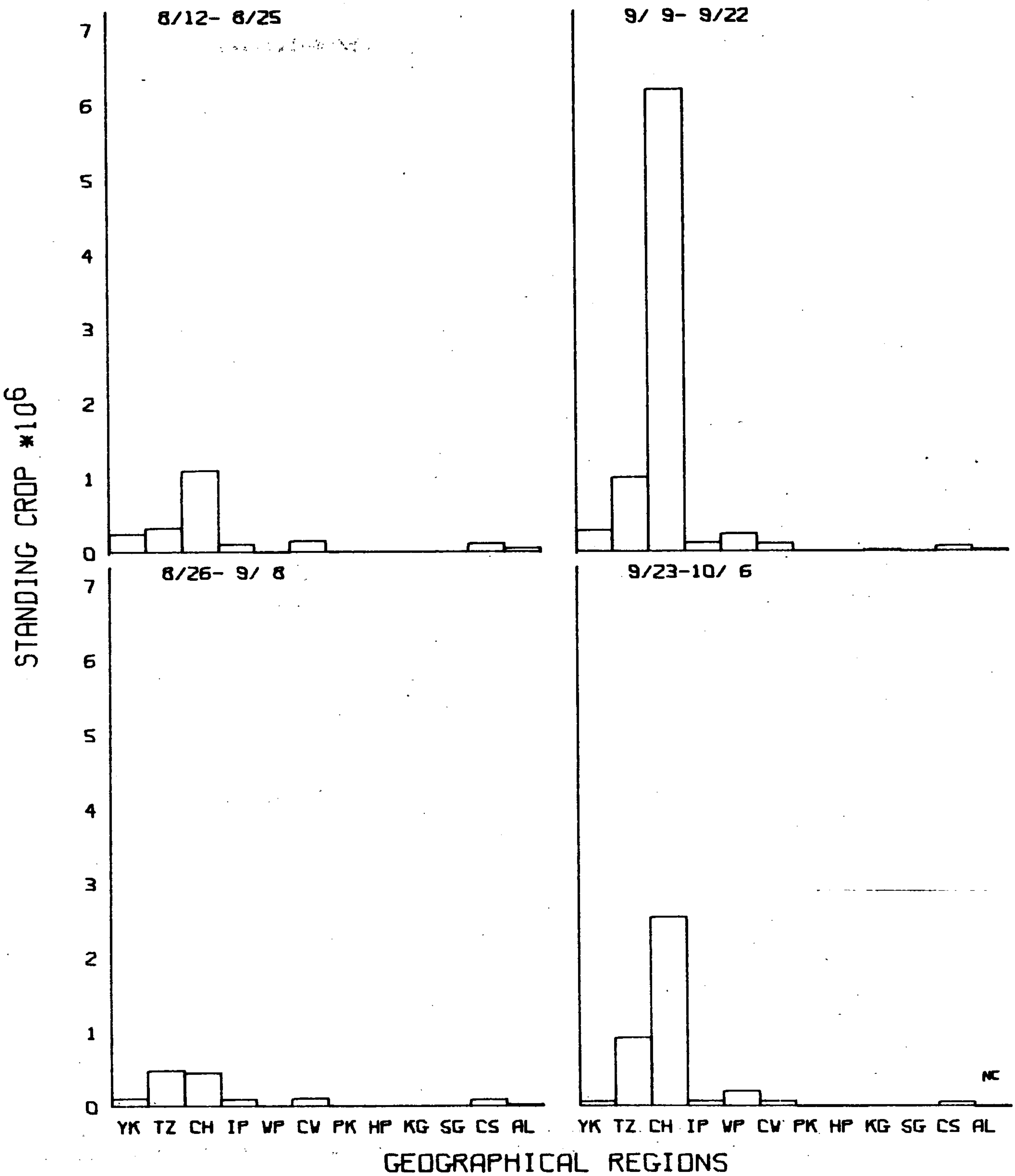


Figure D-5. Page 2 of 4

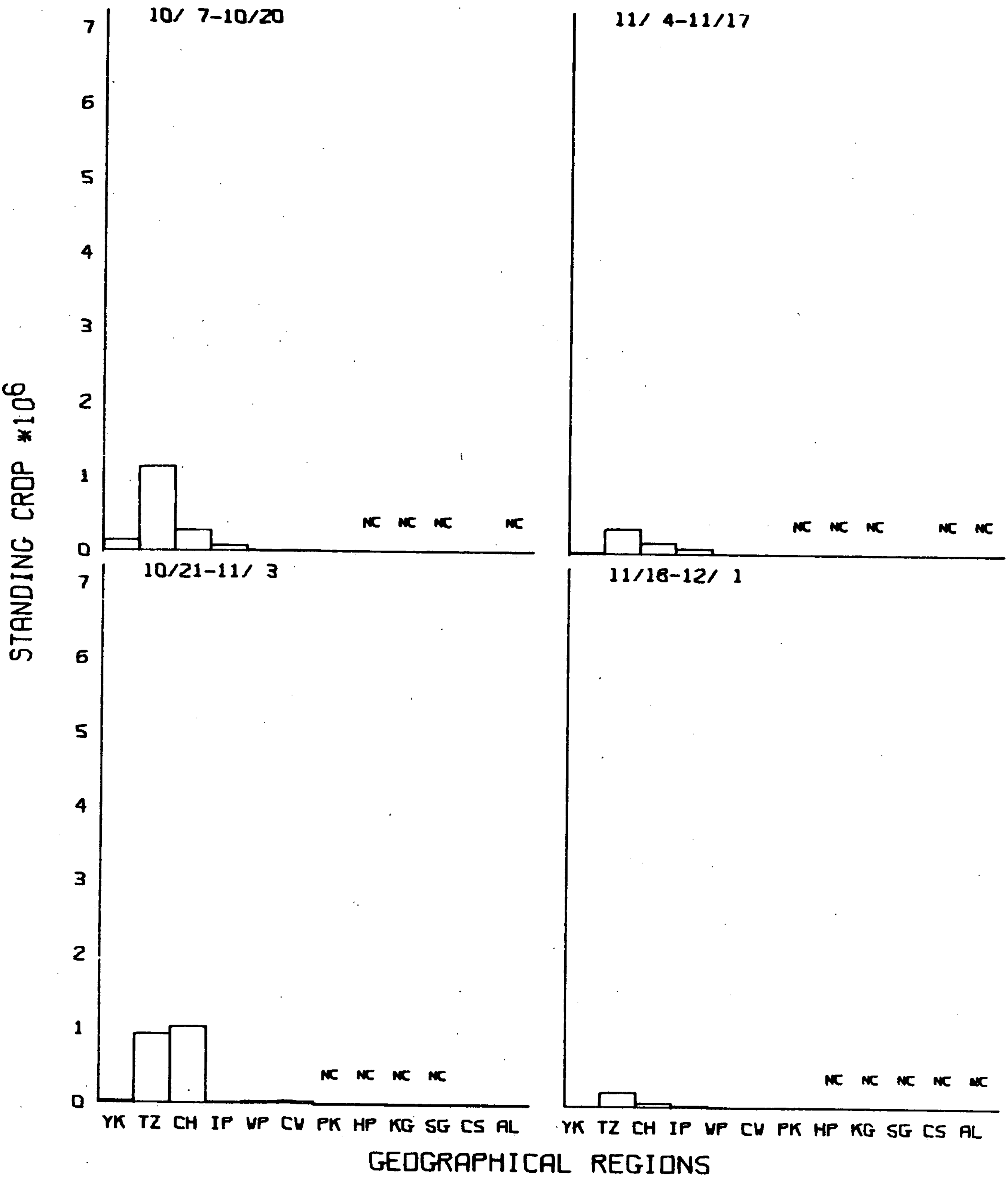


Figure D-5. Page 3 of 4

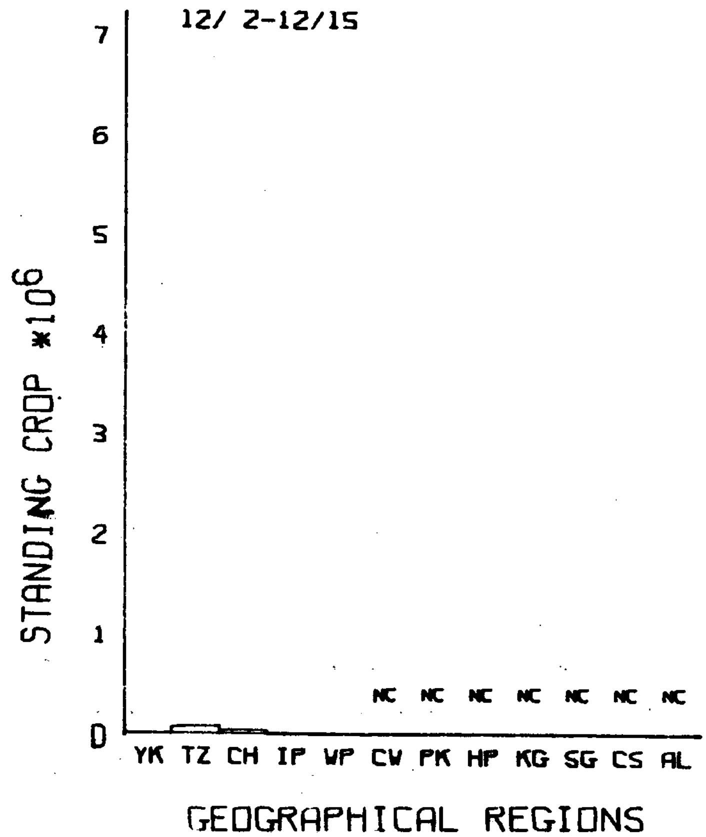


Figure D-5. Page 4 of 4

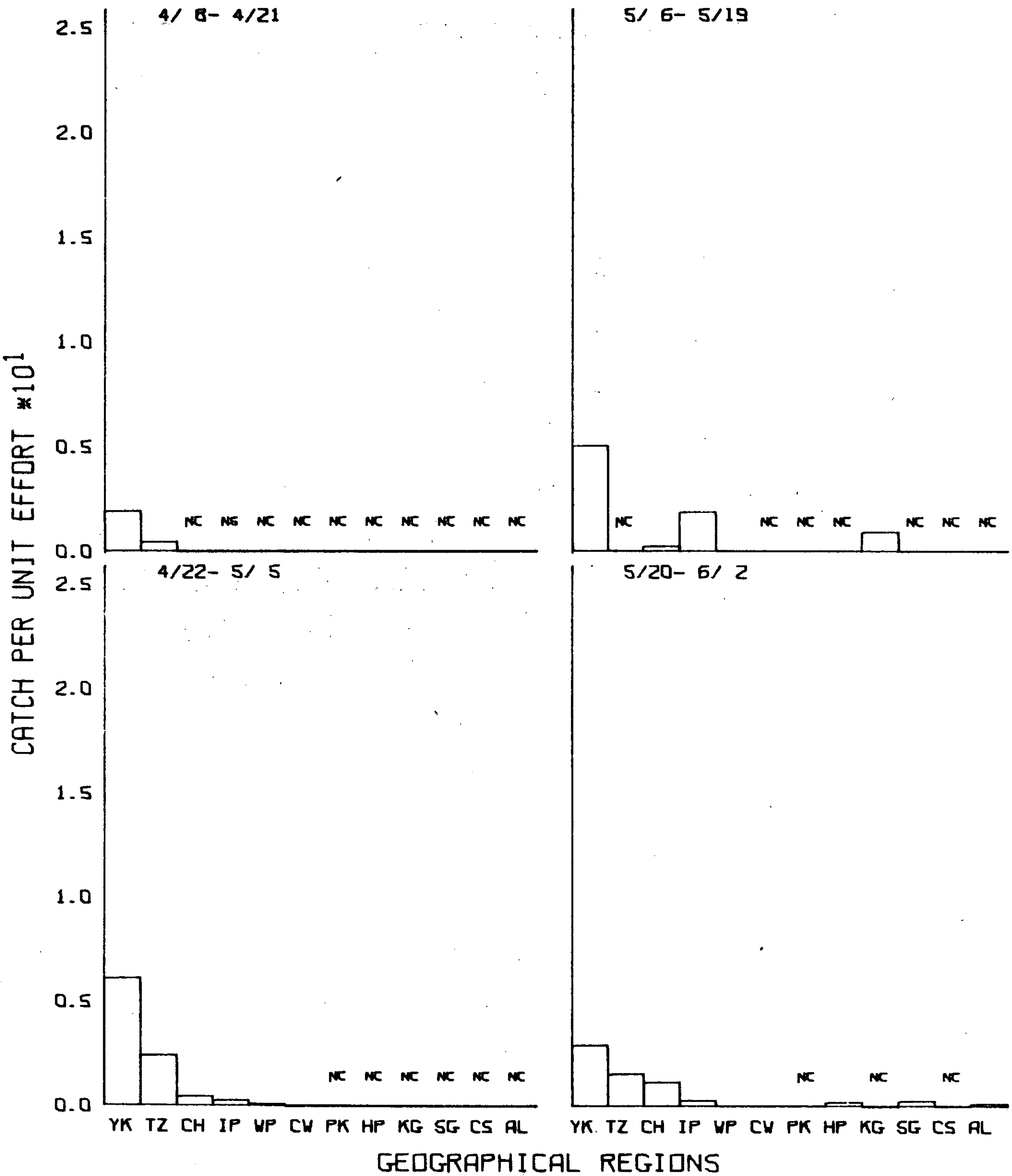


Figure D-6. Catch per Unit Effort of Yearling and Older Striped Bass within 12 Geographical Regions of Hudson River Estuary [RM 12-153 (km 19-245)] Based on Day Sampling by 100-ft (30.5-m) Beach Seine during 1973

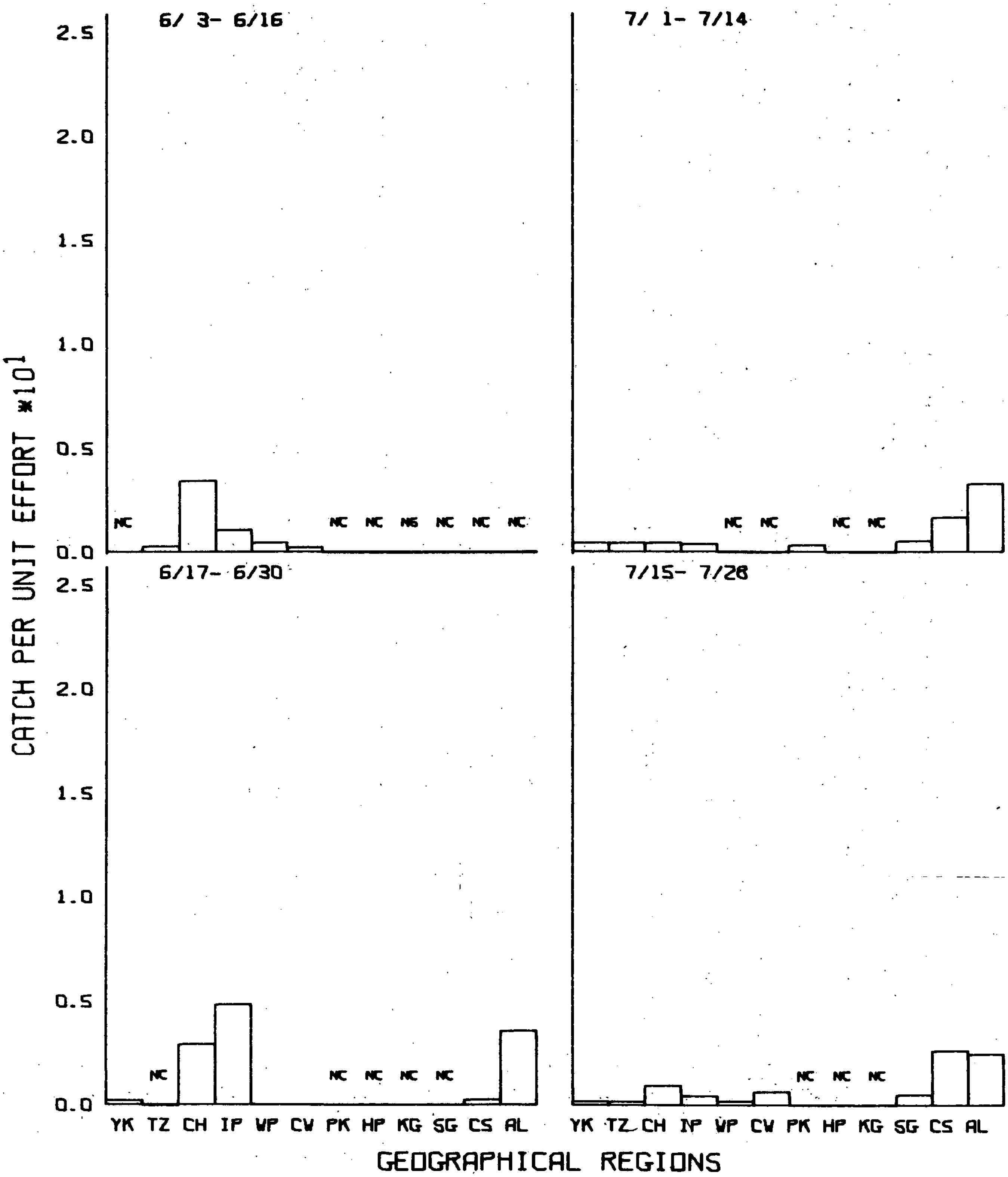


Figure D-6. Page 2 of 5

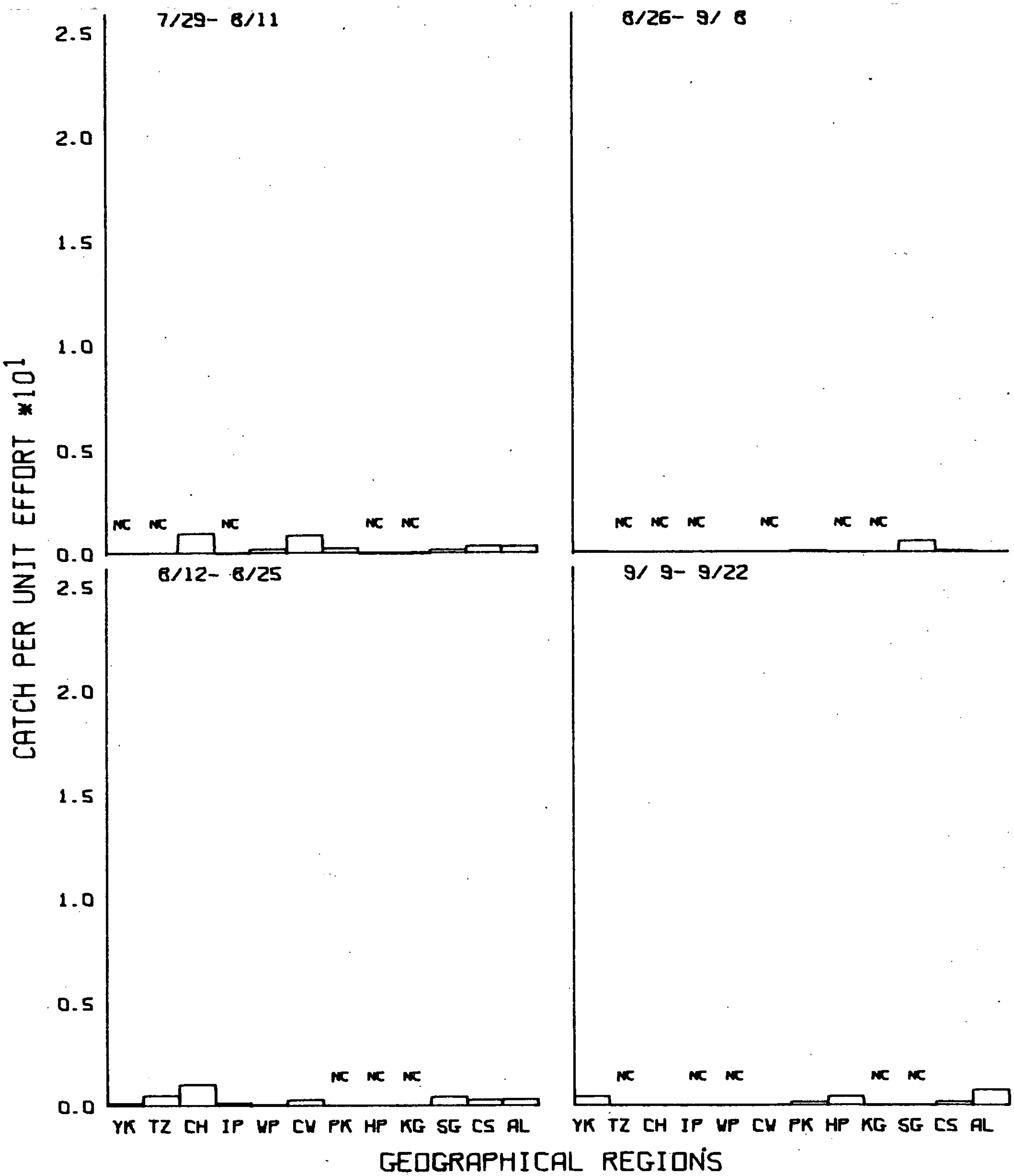


Figure D-6. Page 3 of 5

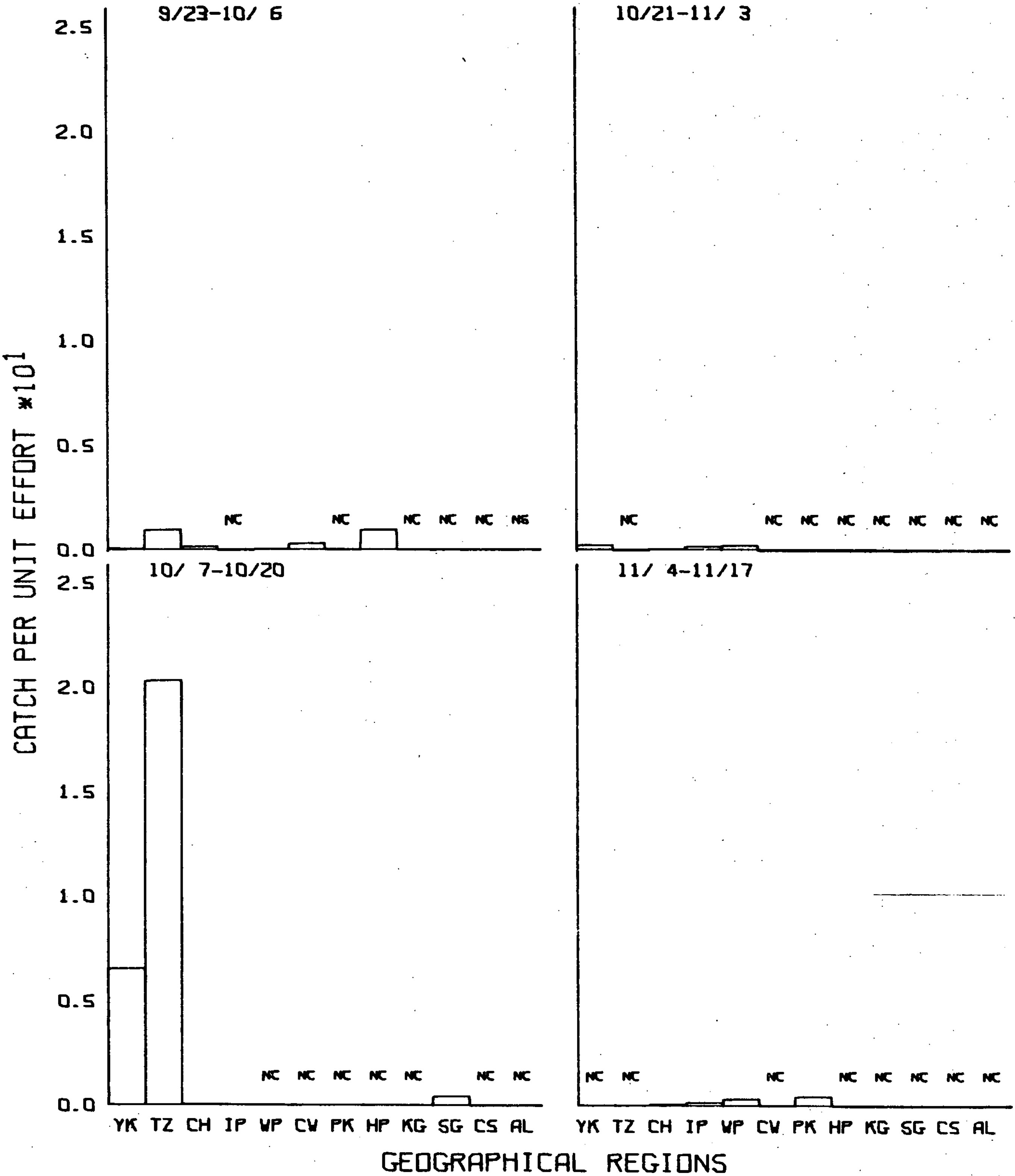


Figure D-6. Page 4 of 5

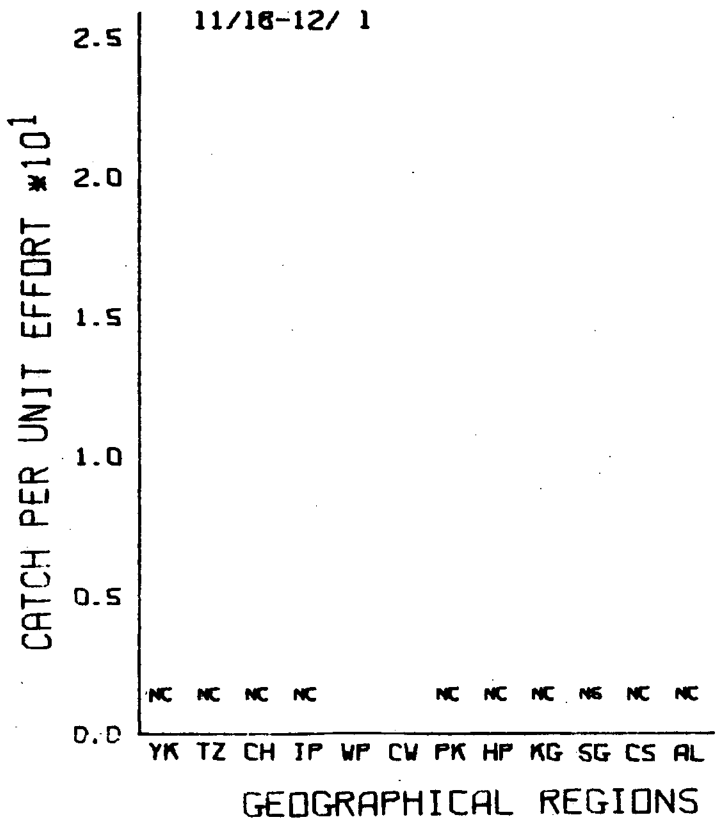


Figure D-6. Page 5 of 5

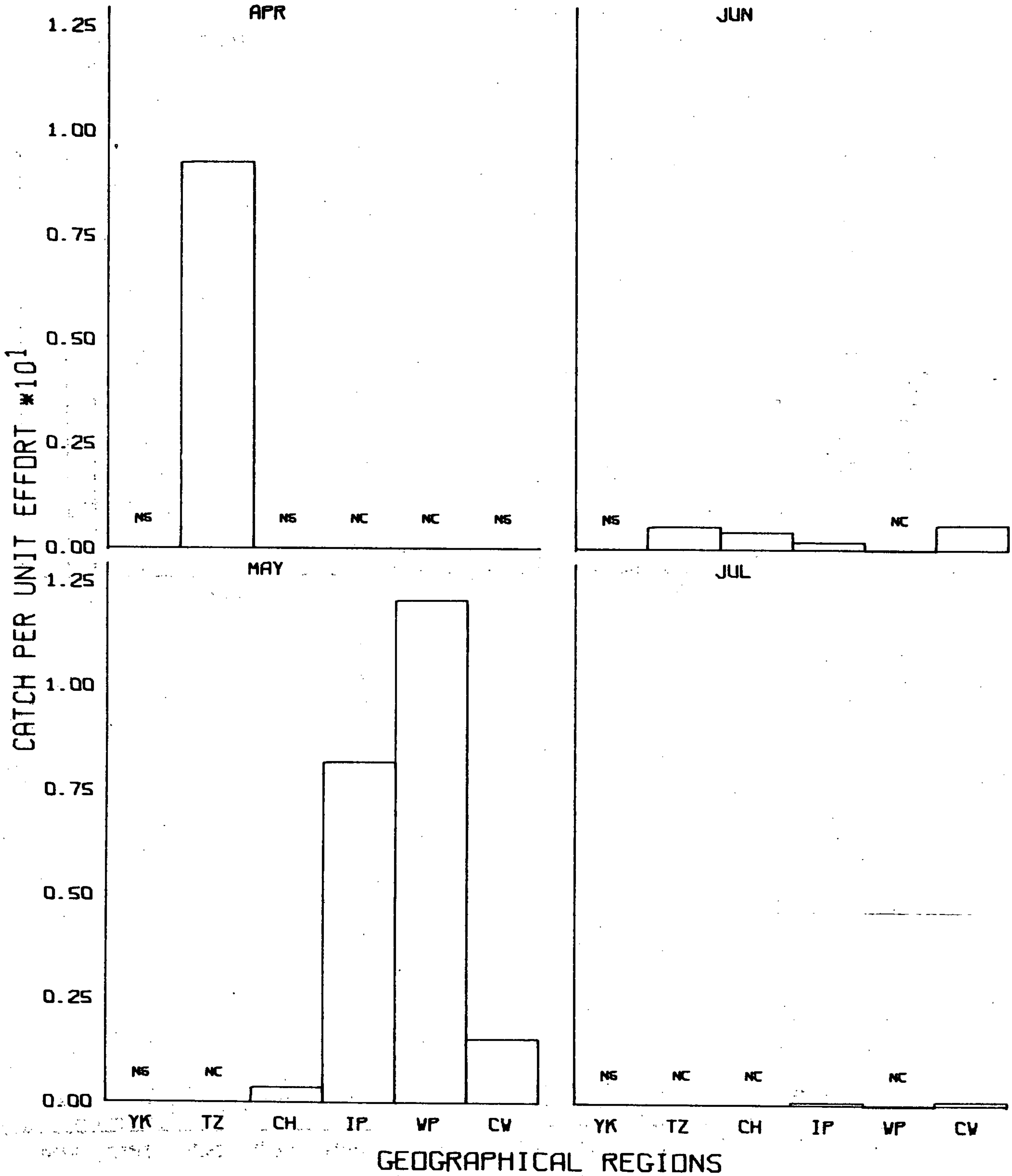


Figure D-7. Catch per Unit Effort of Striped Bass (All Ages Combined) within Five Geographical Regions of Hudson River Estuary [RM 24-62 (km 38-99)] Based on Day Sampling by Bottom Trawl during 1973

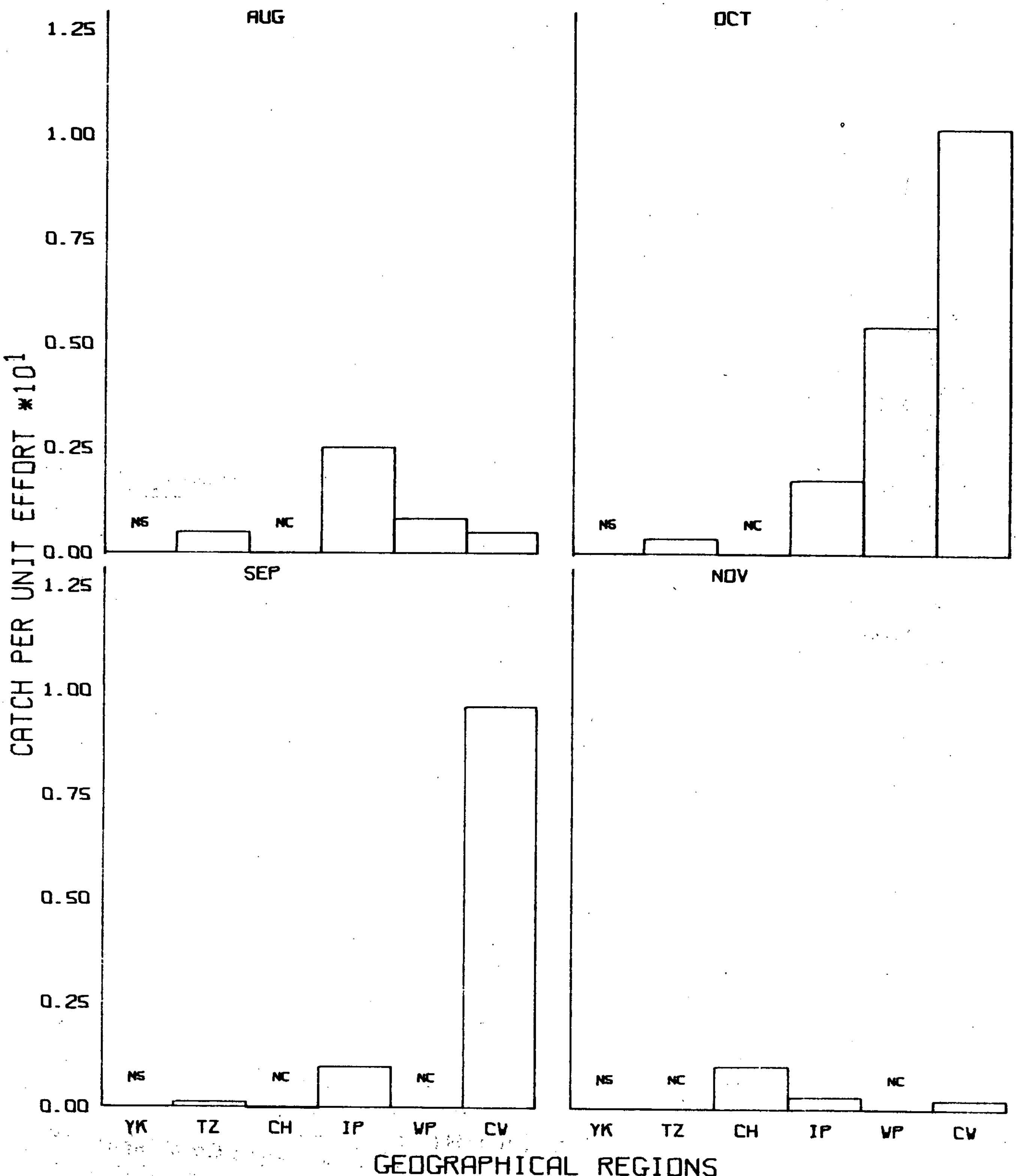


Figure D-7. Page 2 of 3

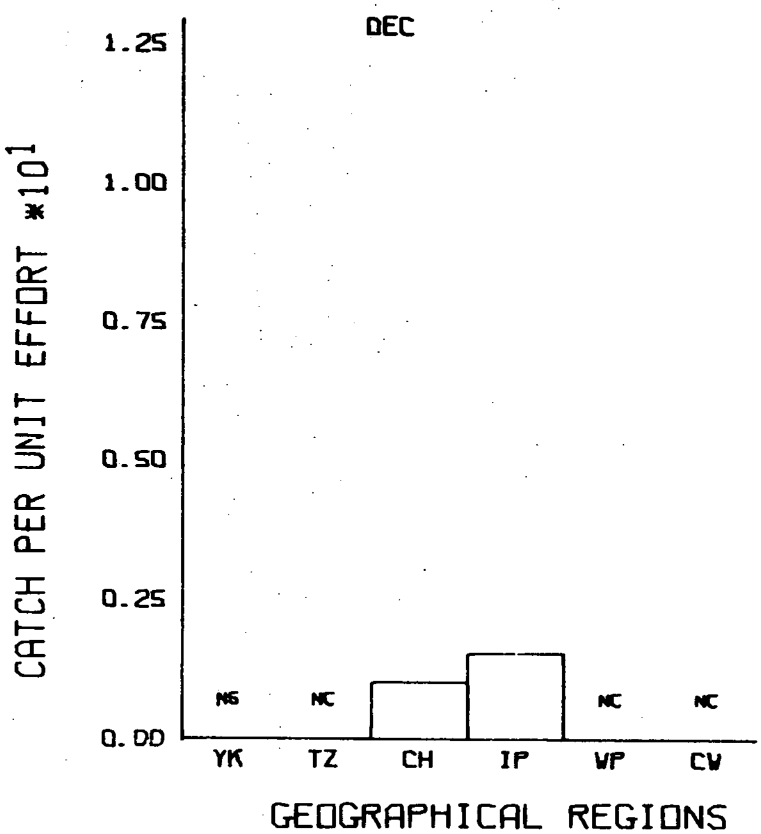


Figure D-7. Page 3 of 3

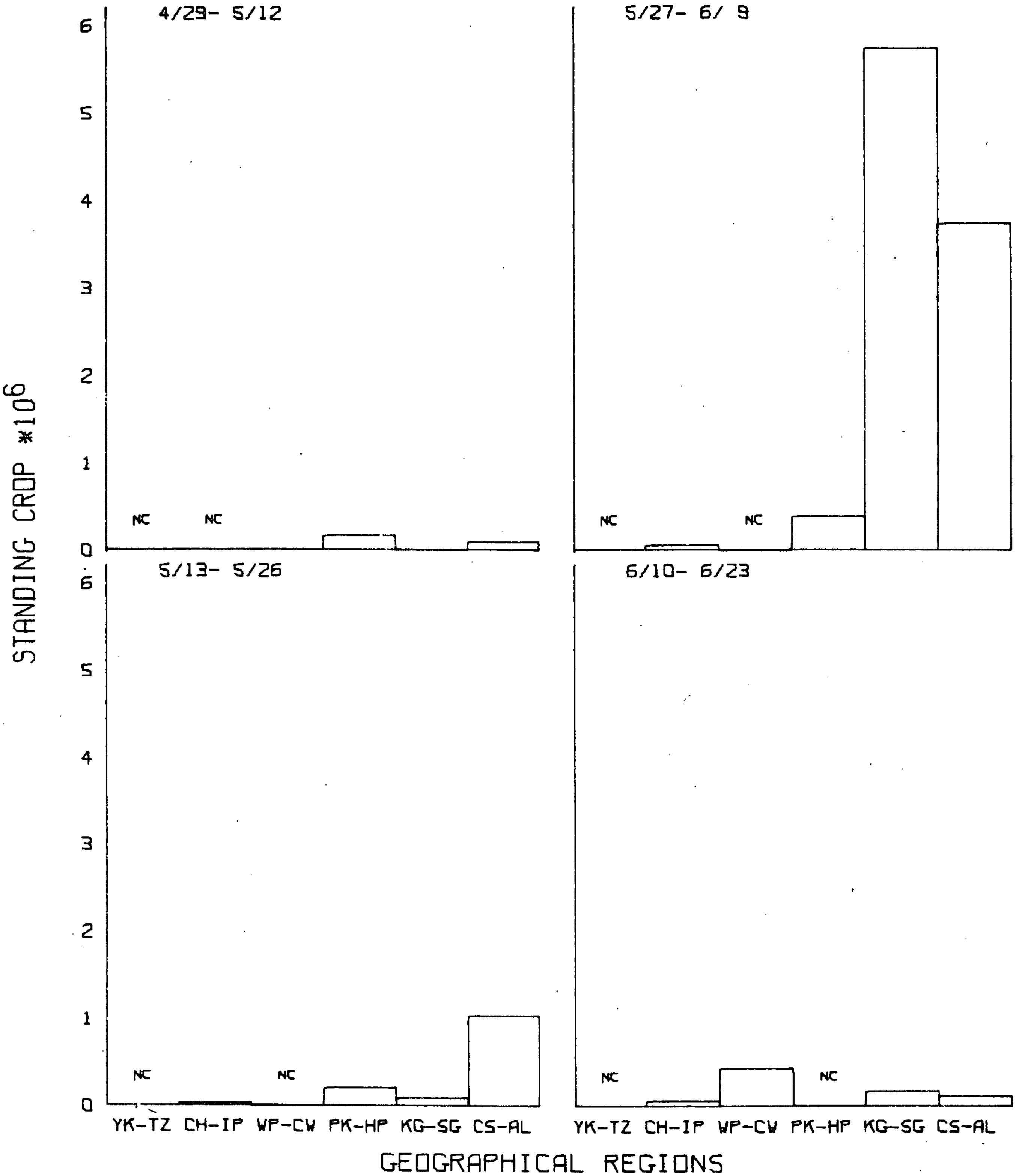


Figure D-8. Standing Crop of White Perch Eggs within Six Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Combined Day and Night Sampling by Epibenthic Sled and Tucker Trawl during 1973

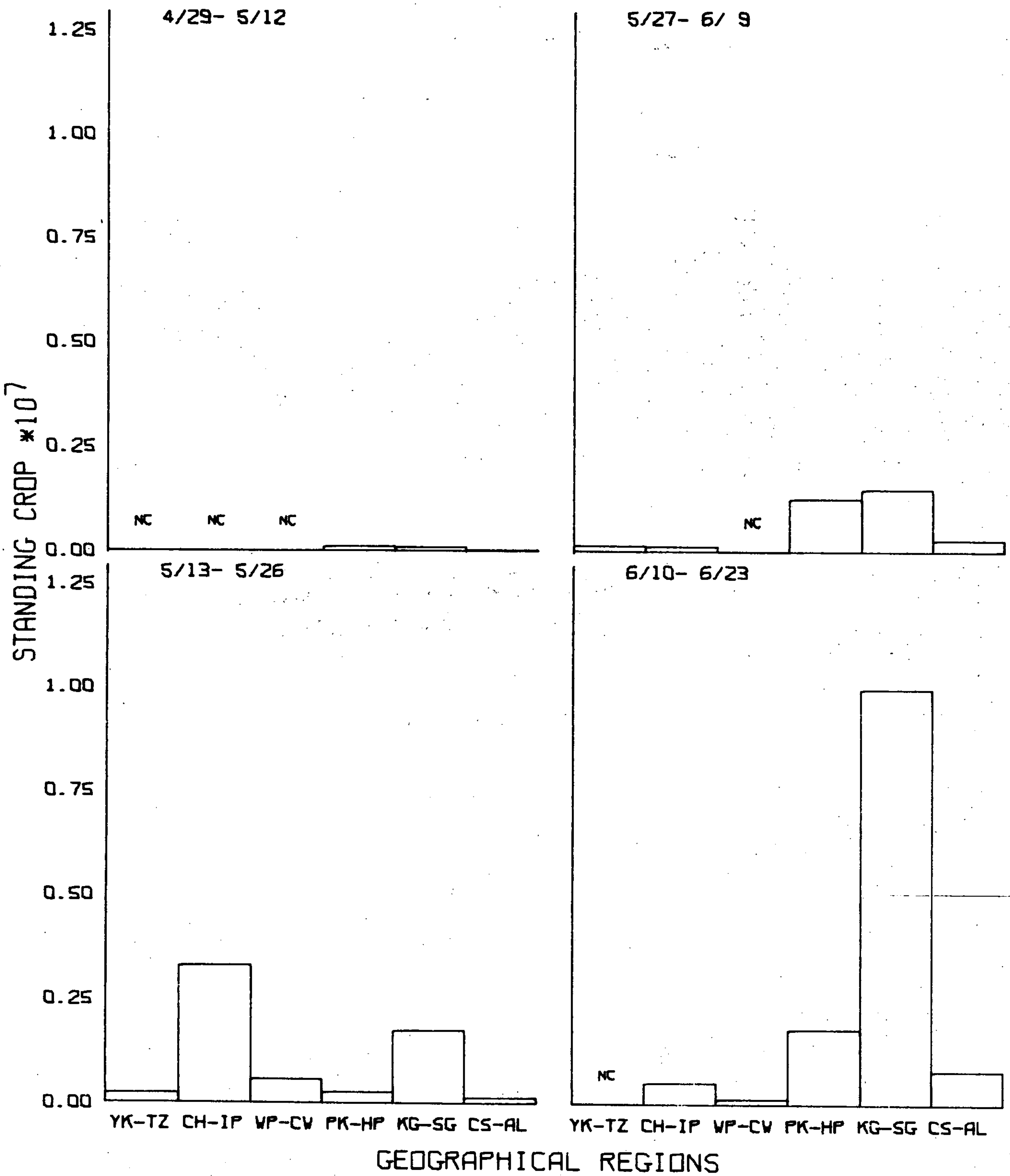
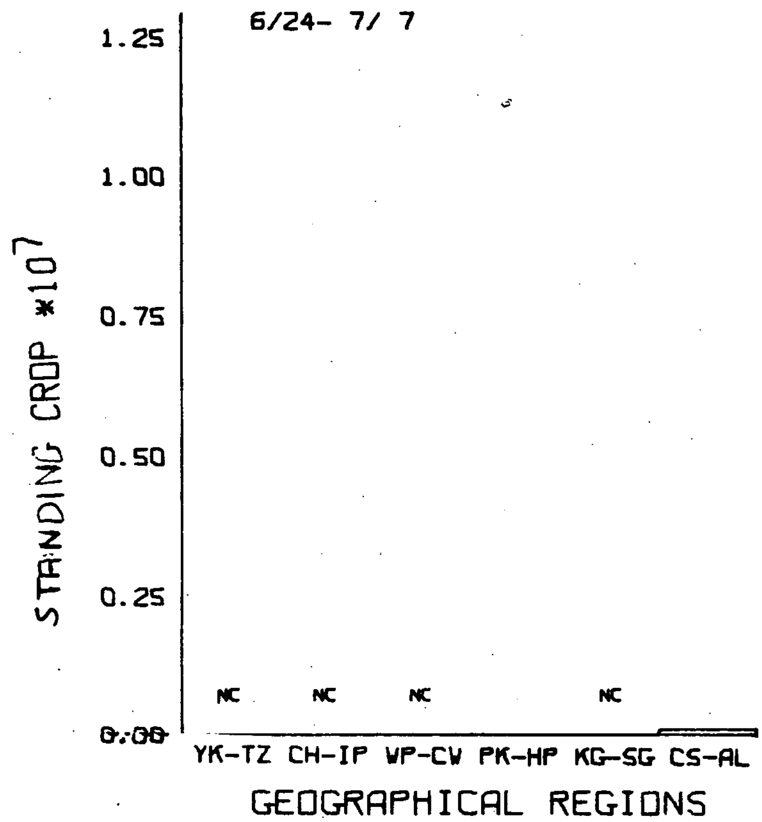


Figure D-9. Standing Crop of White Perch Yolk-Sac Larvae within Six Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Combined Day and Night Sampling by Epibenthic Sled and Tucker Trawl during 1973



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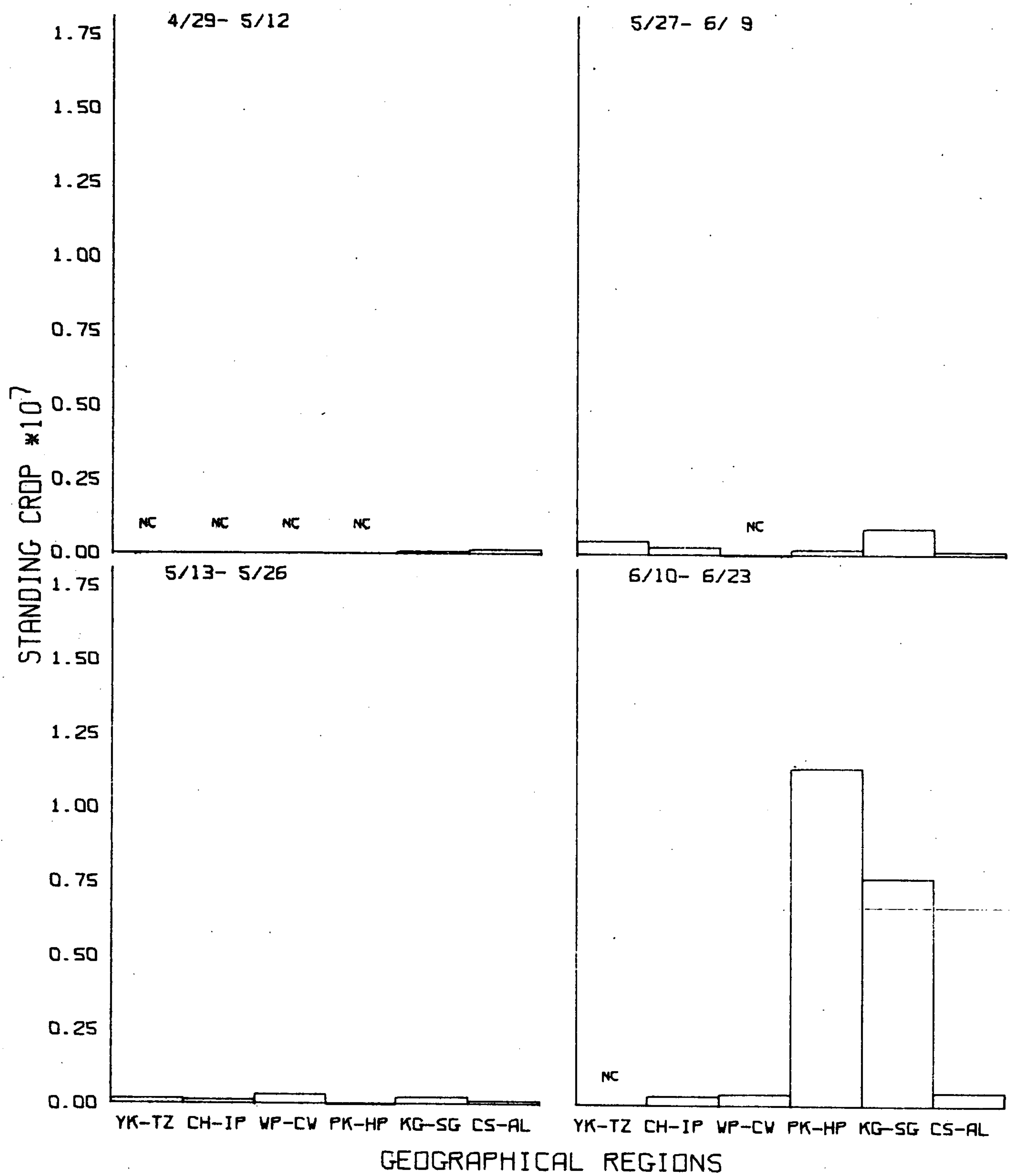
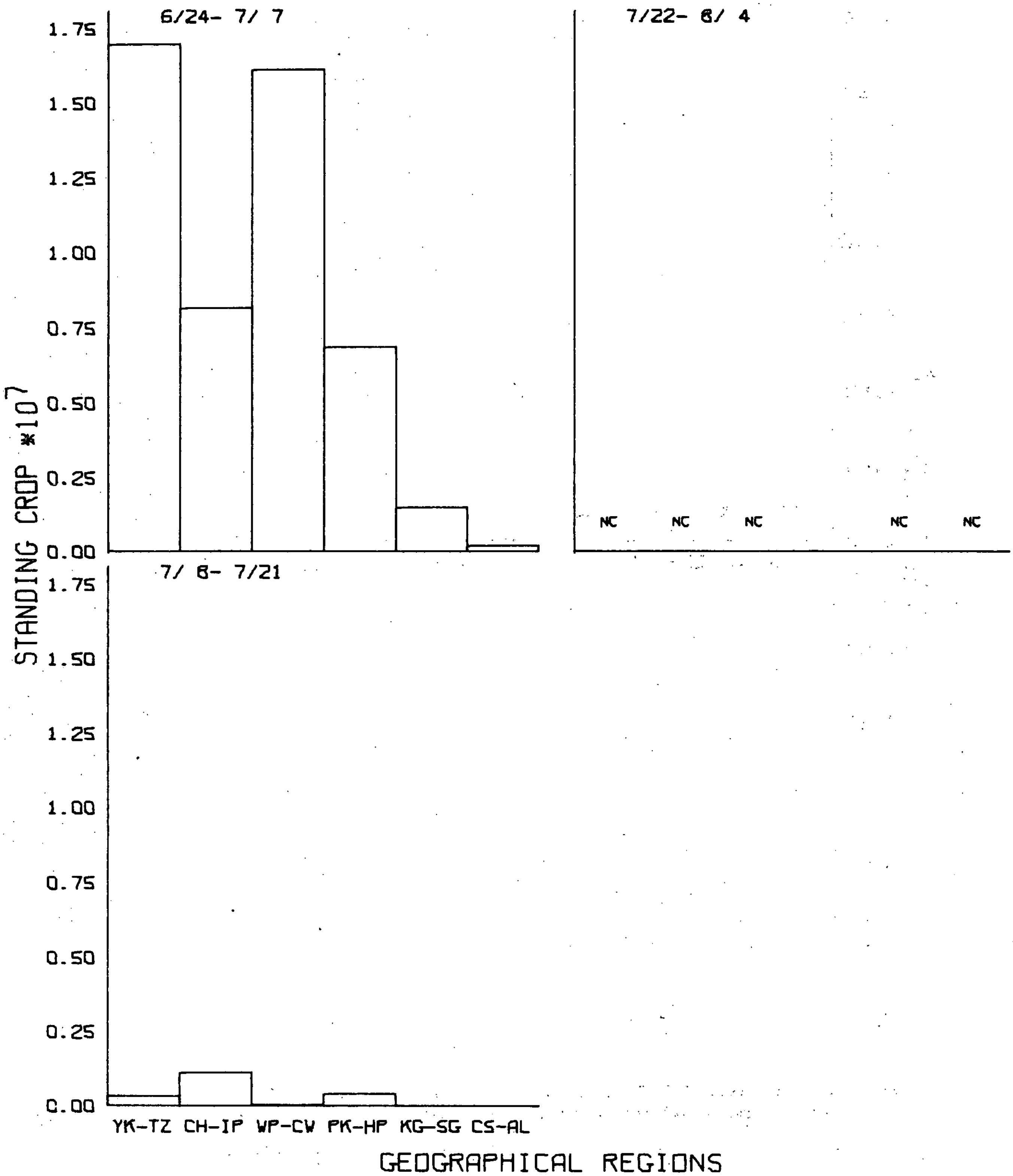


Figure D-10. Standing Crop of White Perch Post Yolk-Sac Larvae within Six Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Combined Day and Night Sampling by Epibenthic Sled and Tucker Trawl during 1973



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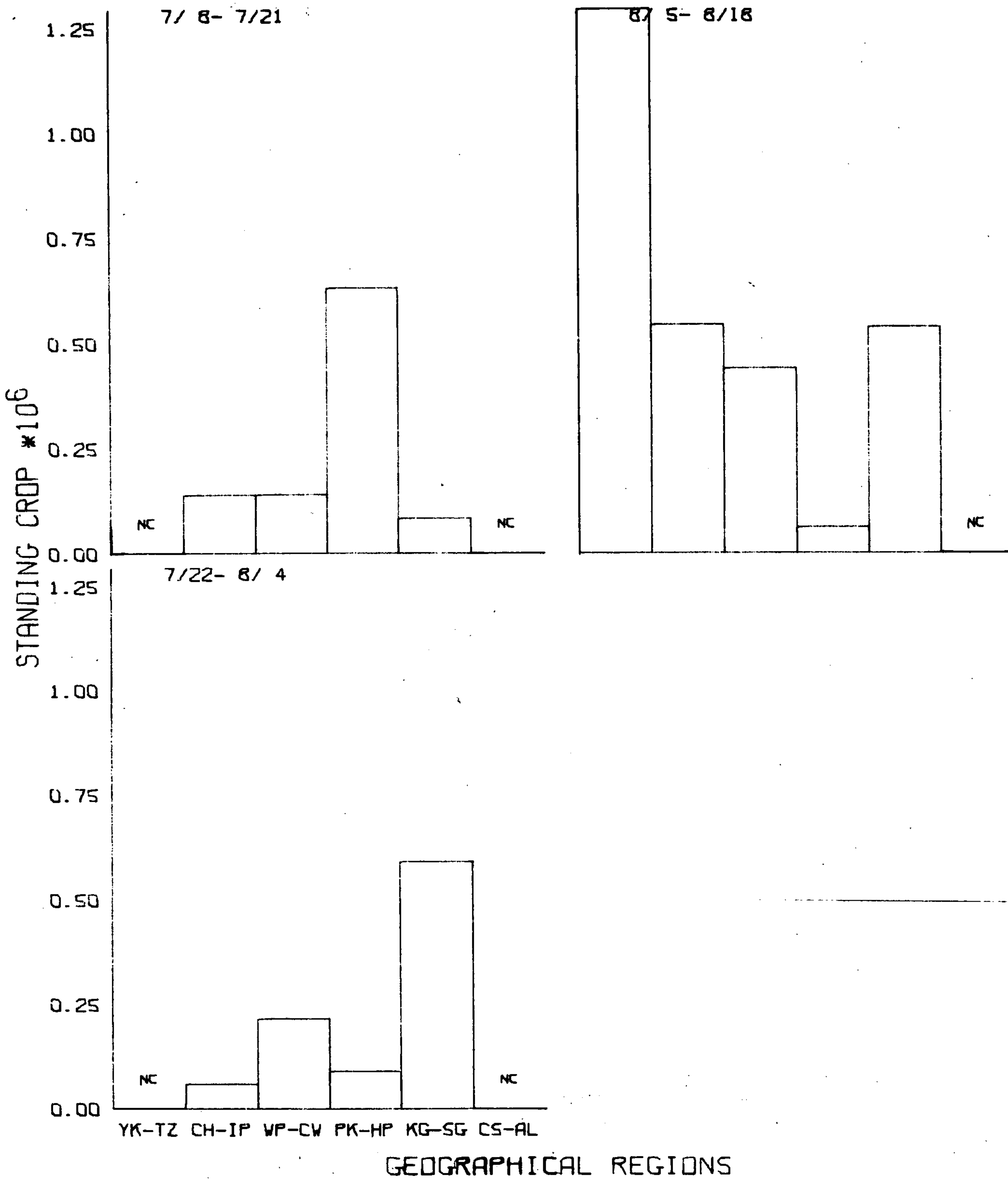


Figure D-11. Standing Crop of Juvenile White Perch within Six Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Combined Day and Night Sampling by Epibenthic Sled and Tucker Trawl during 1973

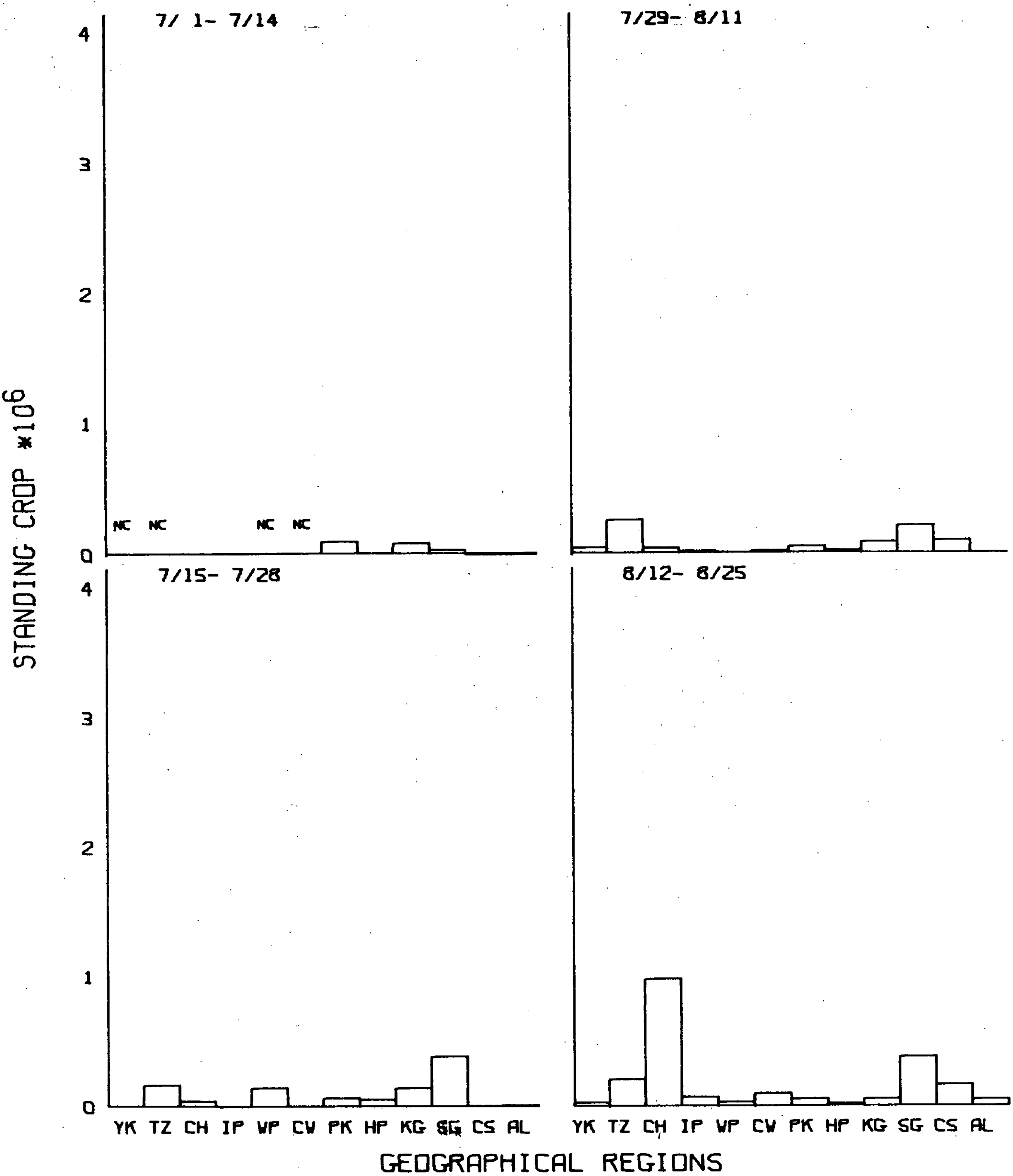
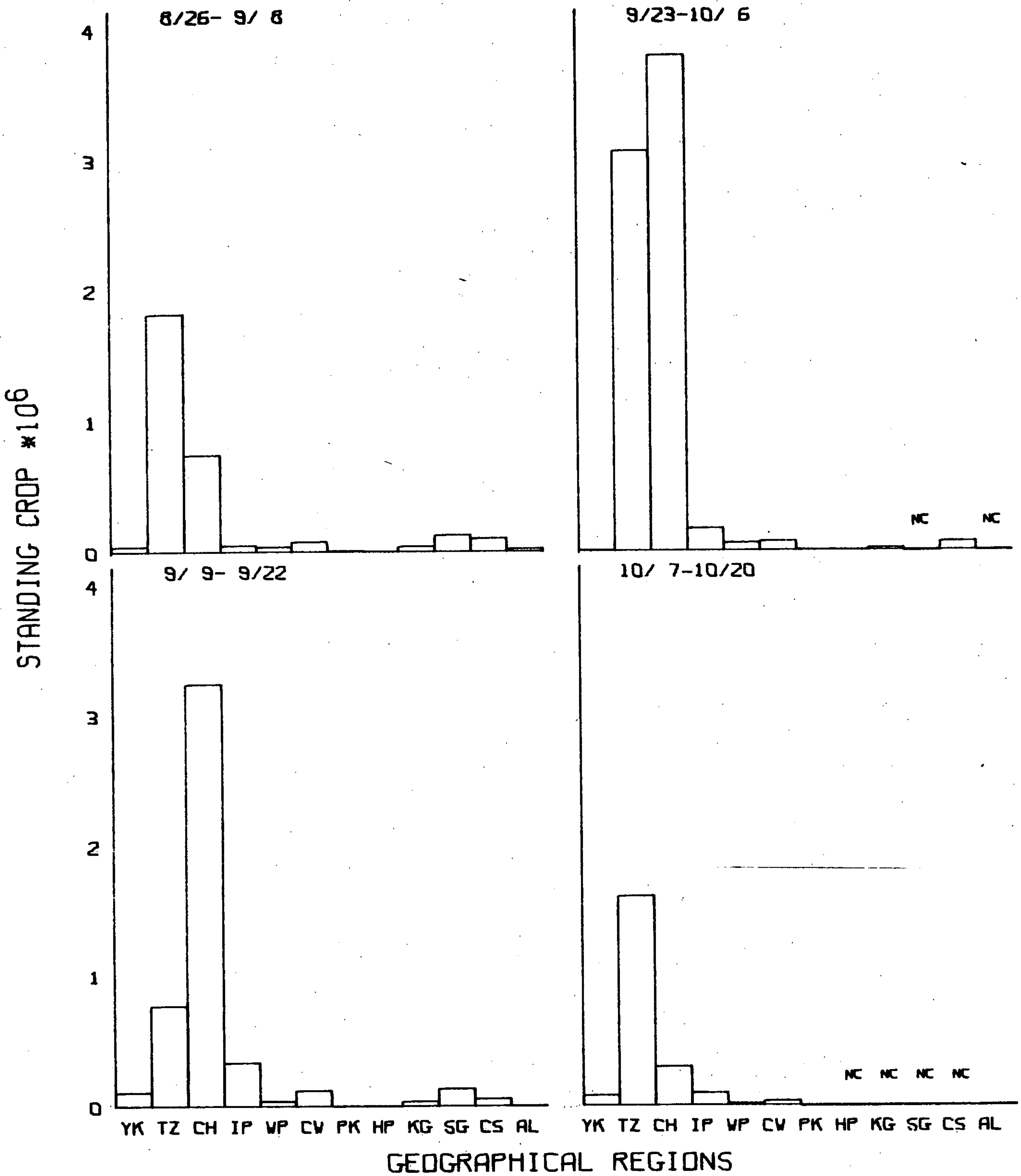


Figure D-12. Standing Crop of Juvenile White Perch within 12 Geographical Regions of Hudson River Estuary [RM 12-153 (km 19-245)] Based on Day Sampling by 100-ft (30.5-m) Beach Seine during 1973



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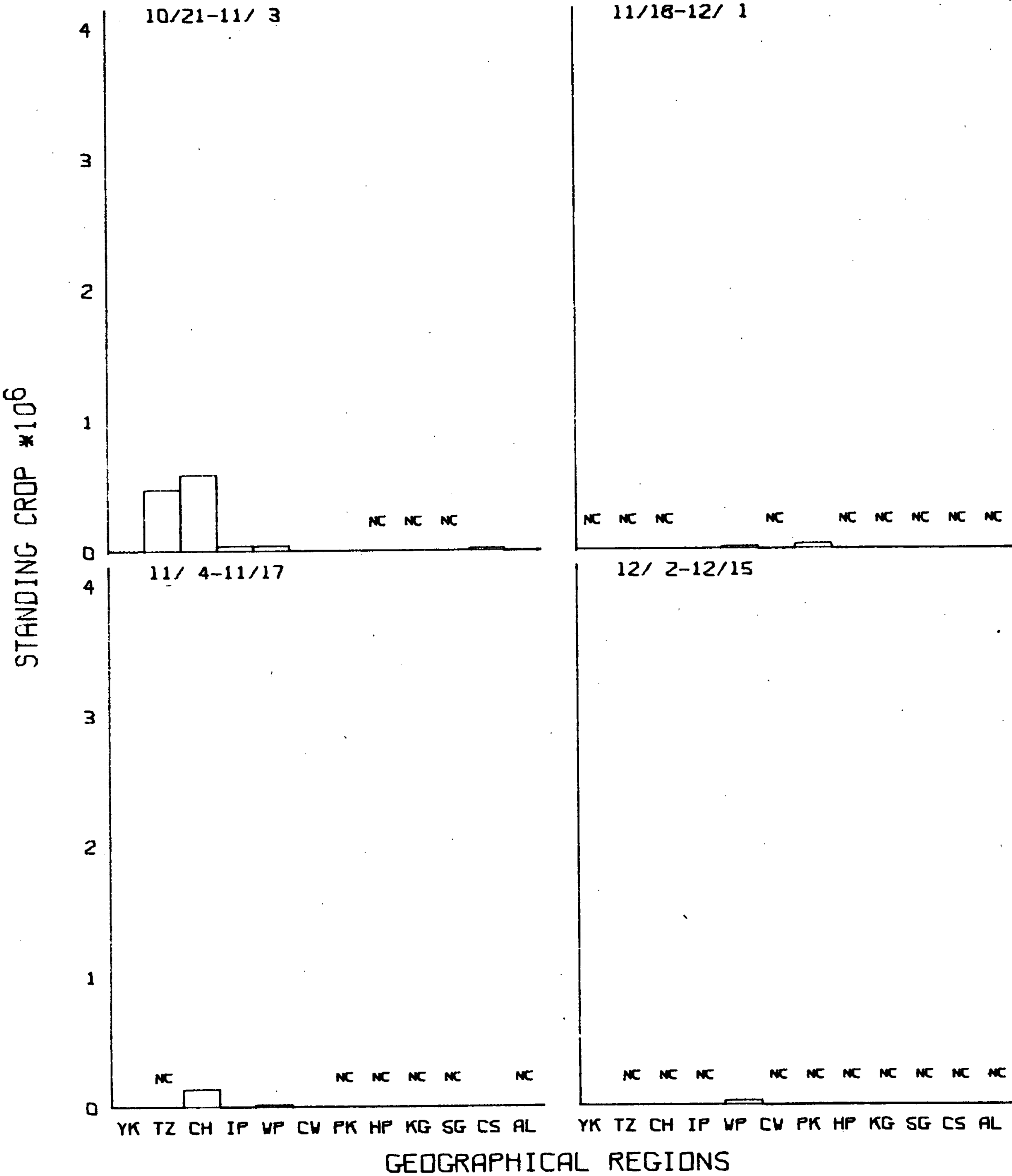

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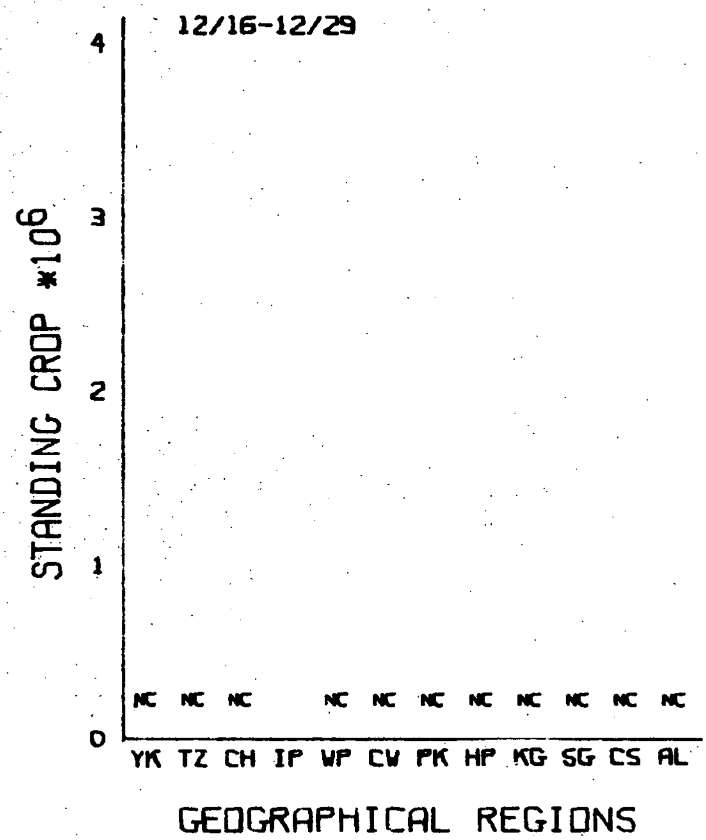

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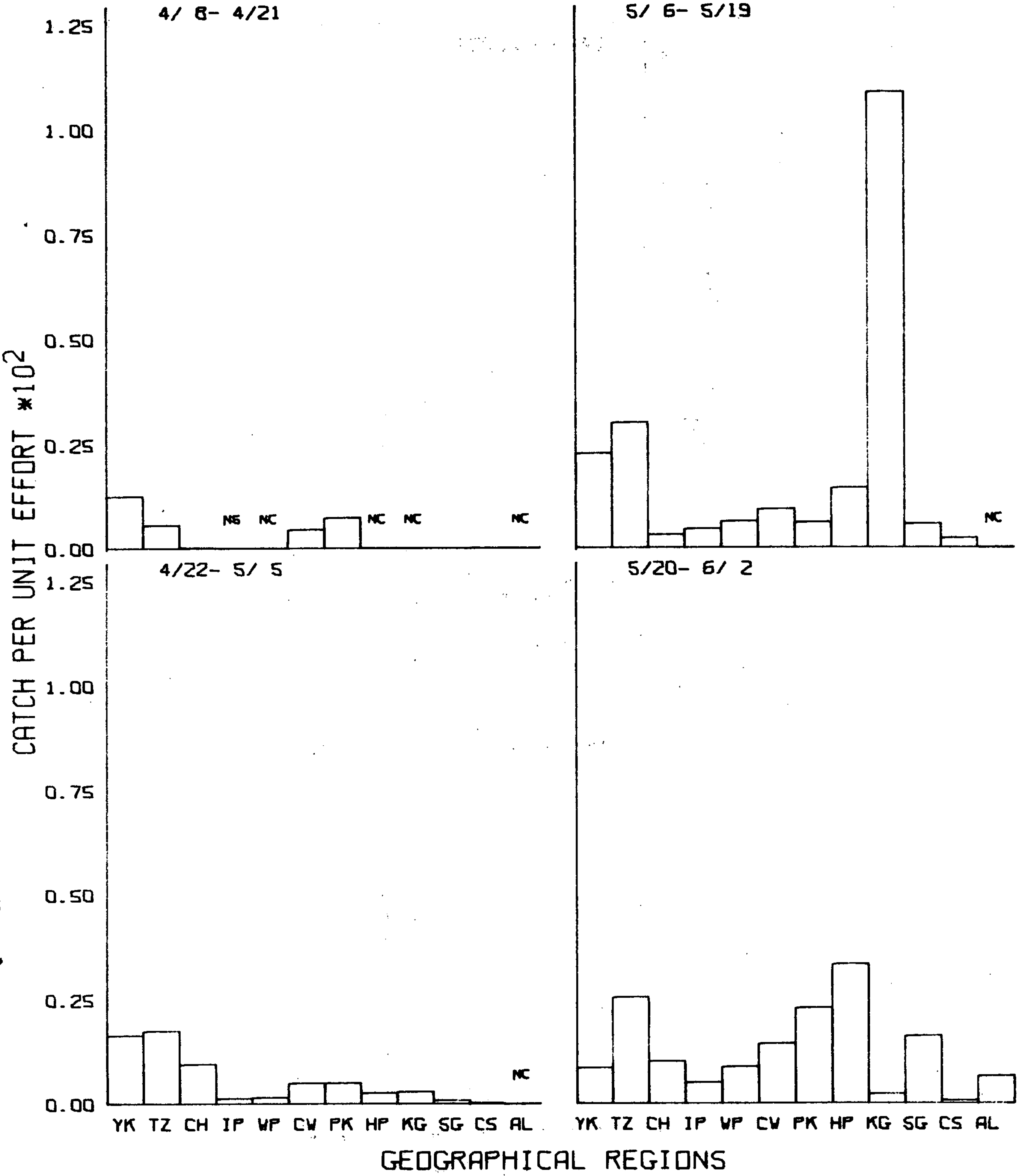
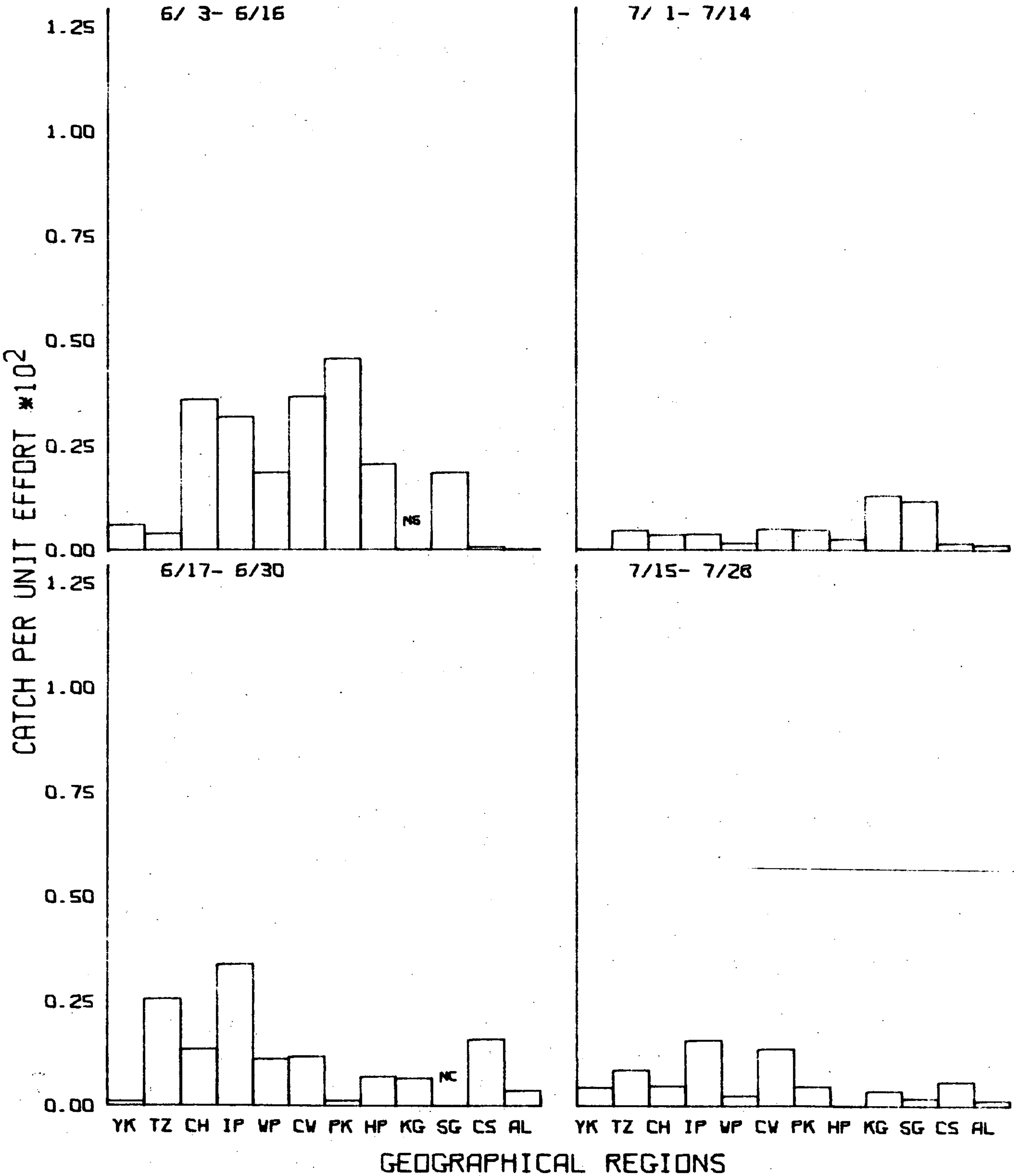


Figure D-13. Catch per Unit Effort of Yearling and Older White Perch within 12 Geographical Regions of Hudson River Estuary [RM 12-153 (km 19-245)] Based on Day Sampling by 100-ft (30.5-m) Beach Seine during 1973



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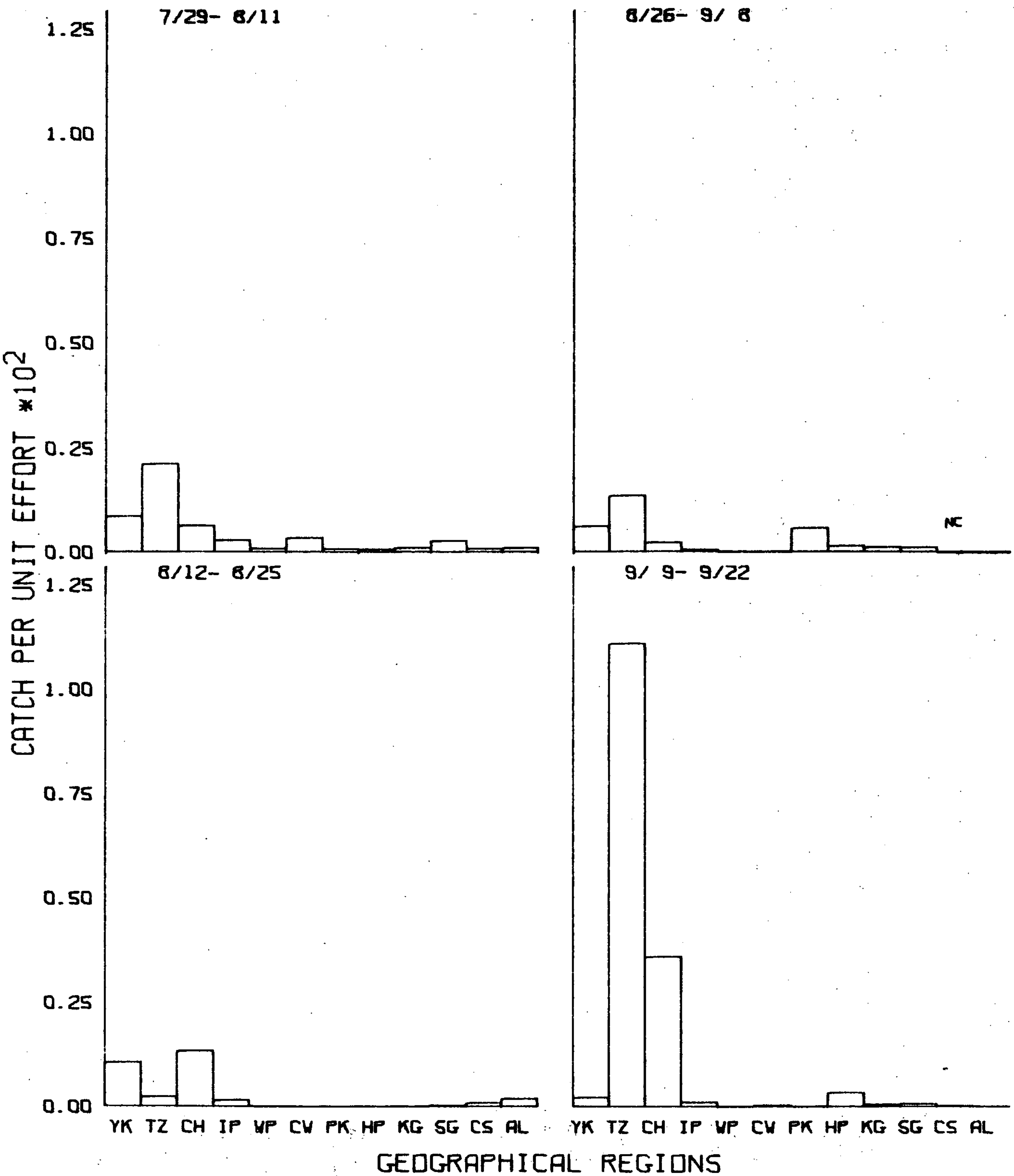

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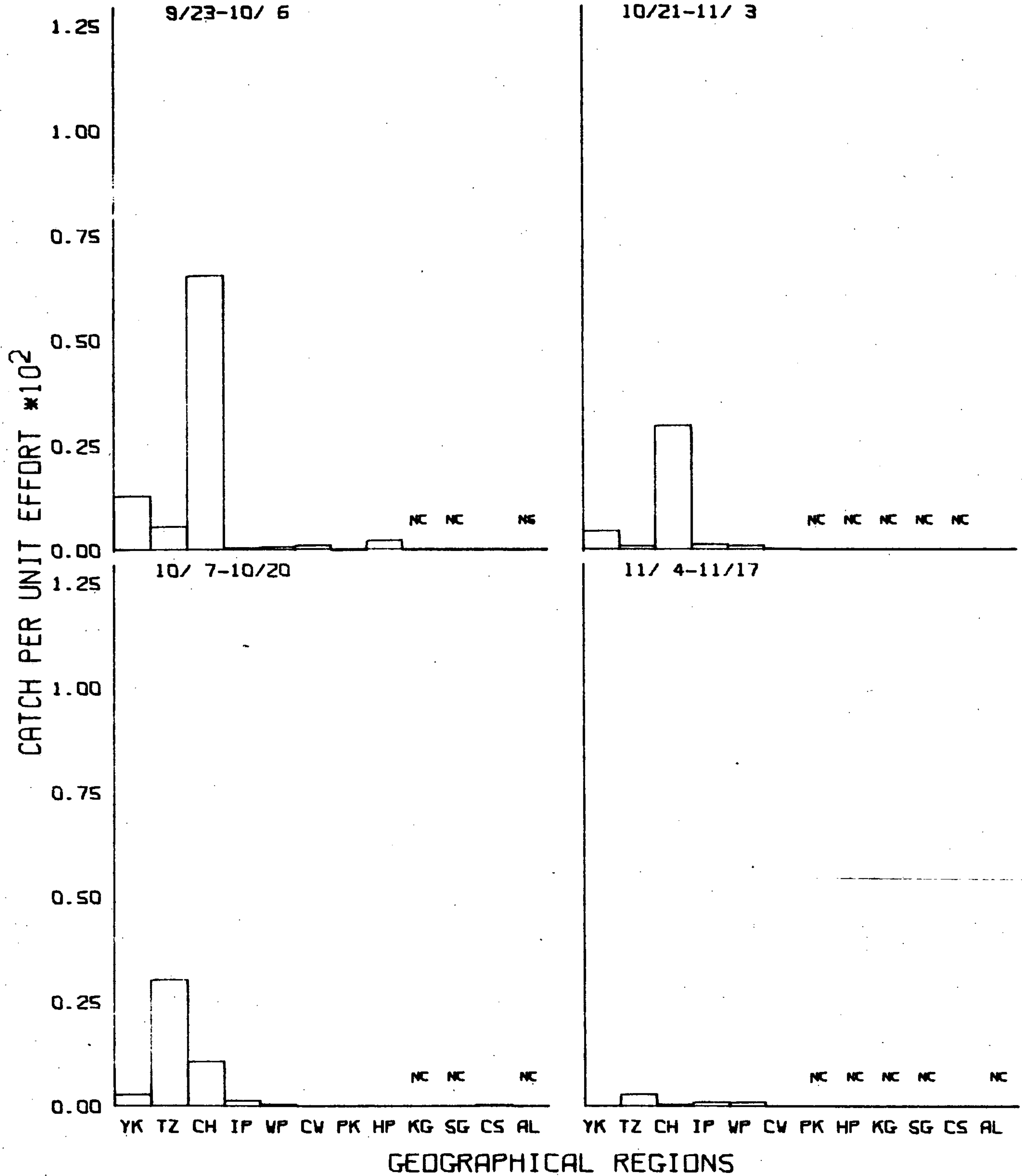

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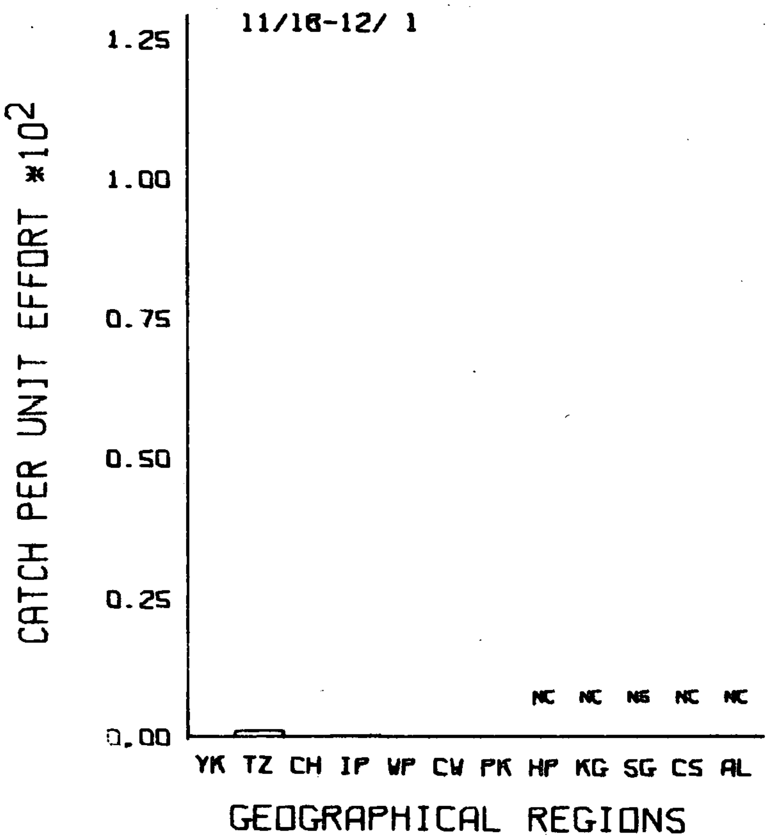

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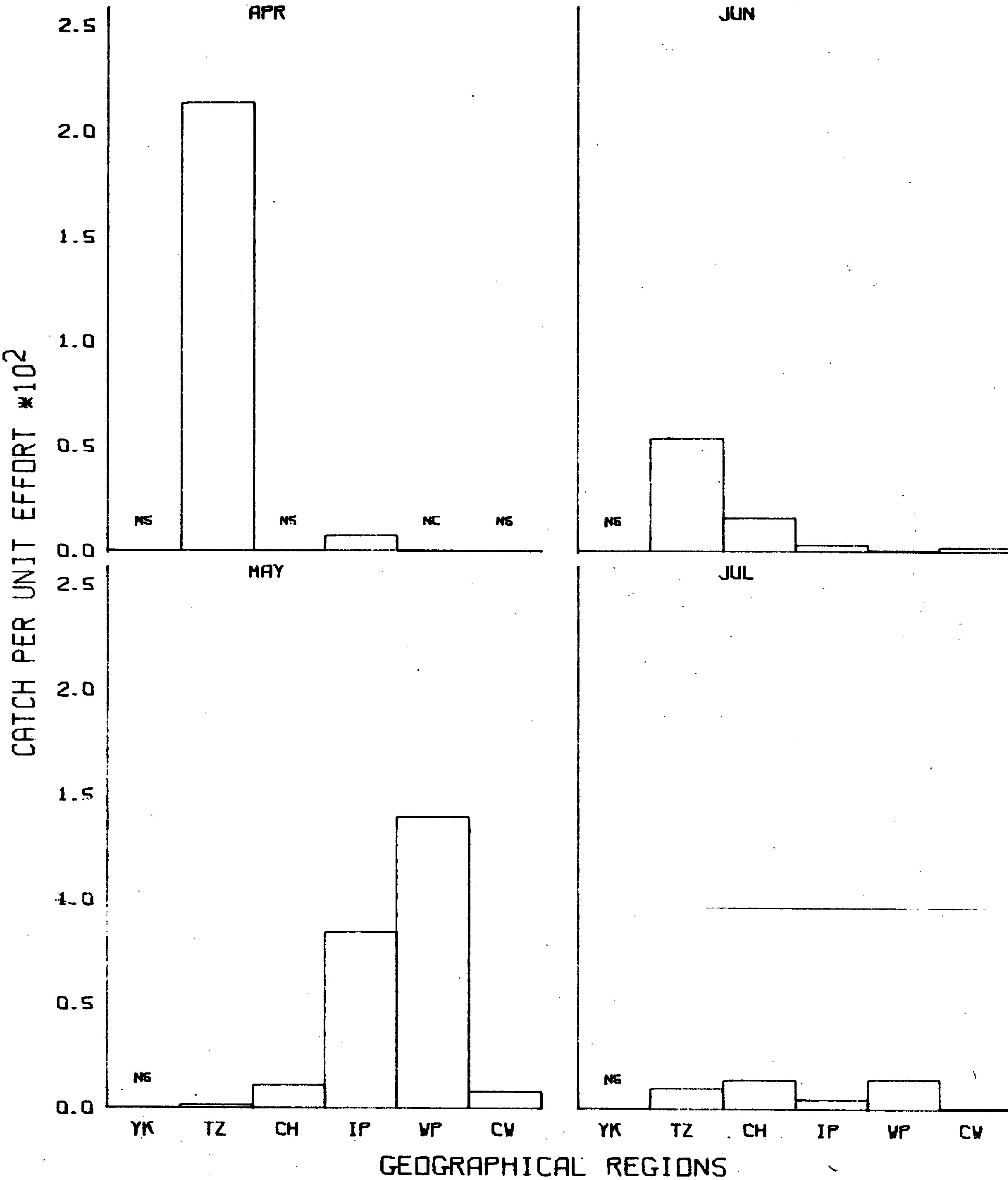
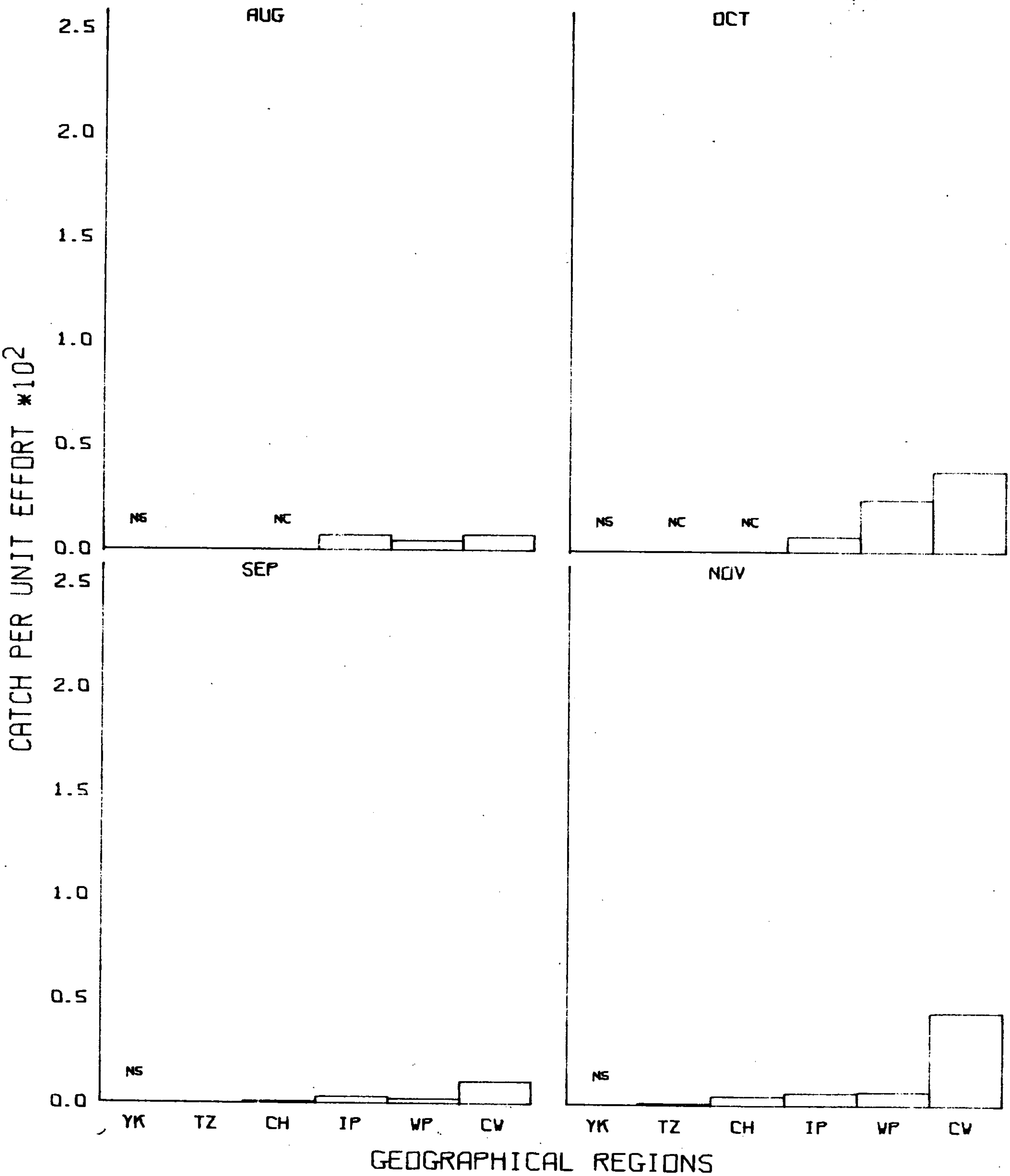


Figure D-14. Catch per Unit Effort of White Perch (All Ages Combined) within Five Geographical Regions of Hudson River Estuary [RM 24-62 (km 38-99)] Based on Day Sampling by Bottom Trawl during 1973



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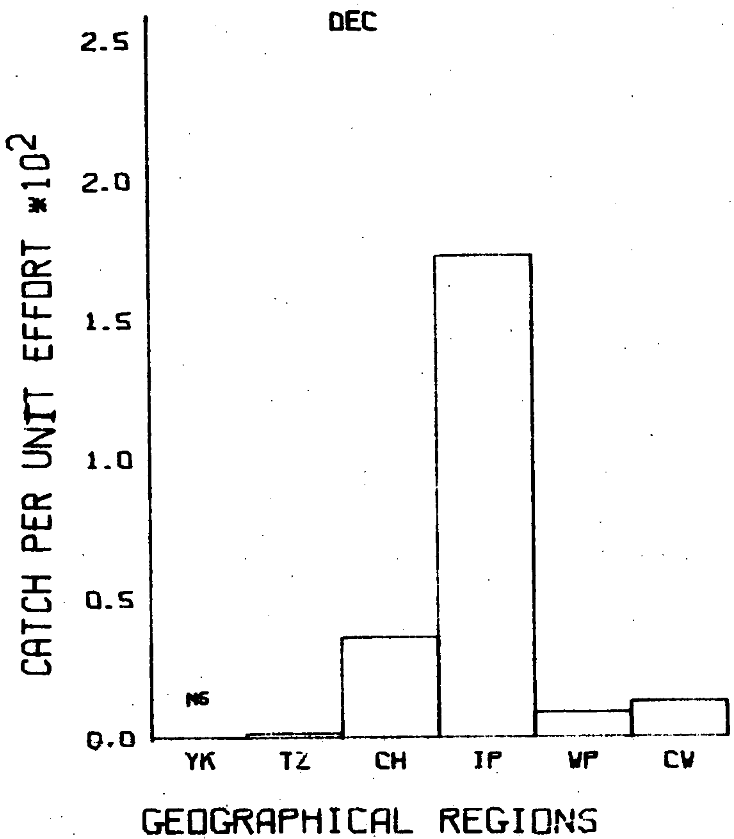

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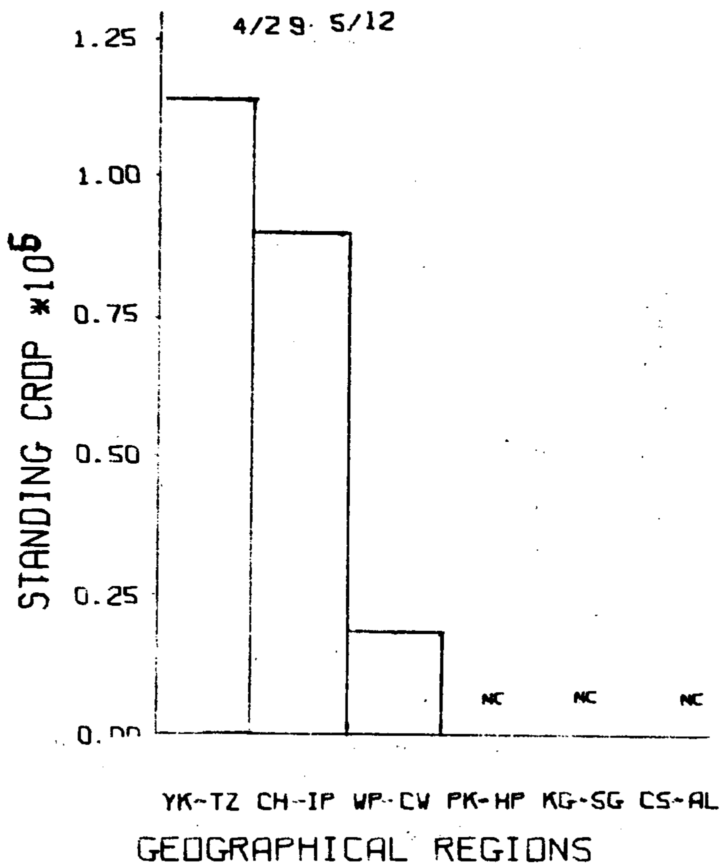


Figure D-15. Standing Crop of Atlantic Tomcod Post Yolk-Sac Larvae within Six Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Combined Day and Night Sampling by Epibenthic Sled and Tucker Trawl during 1973

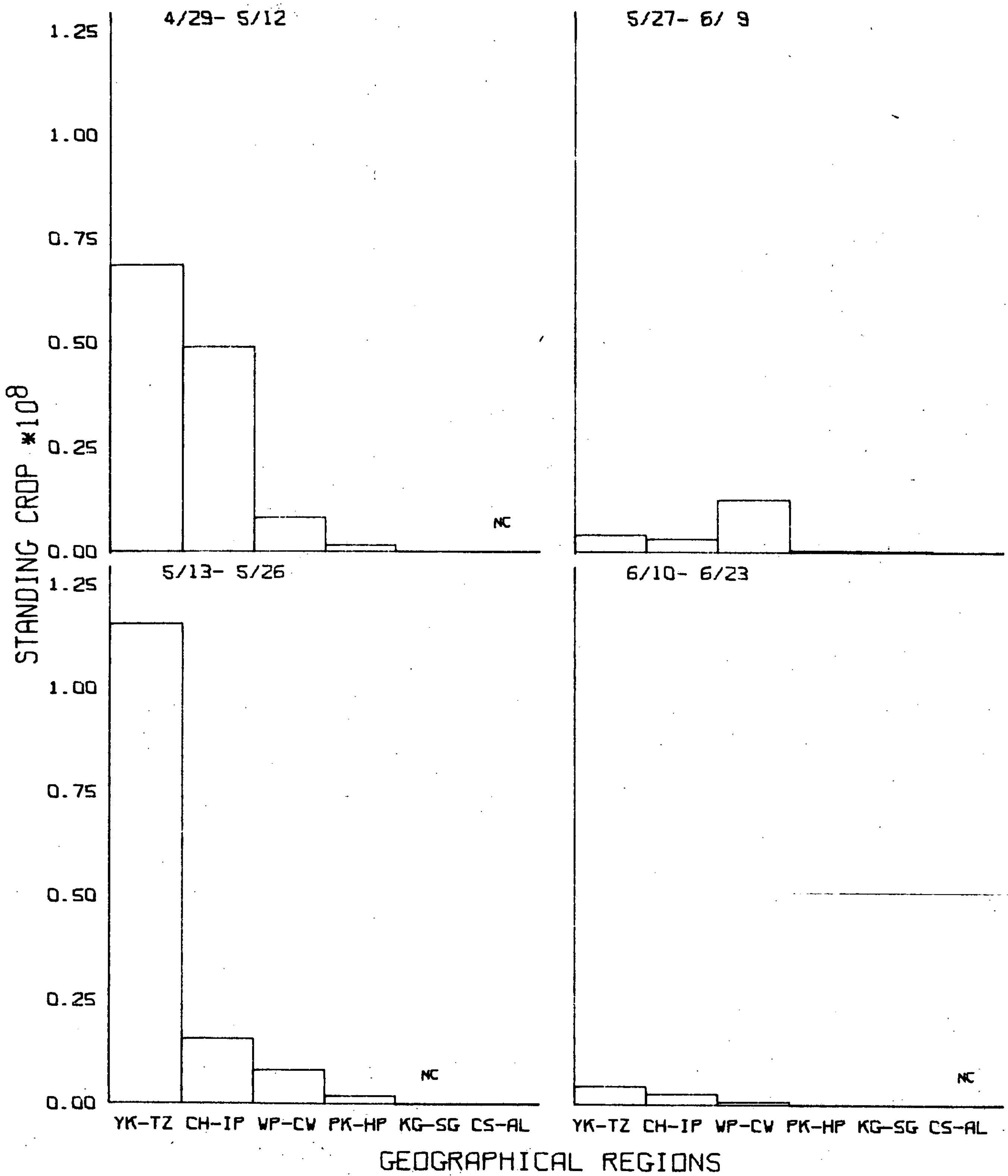
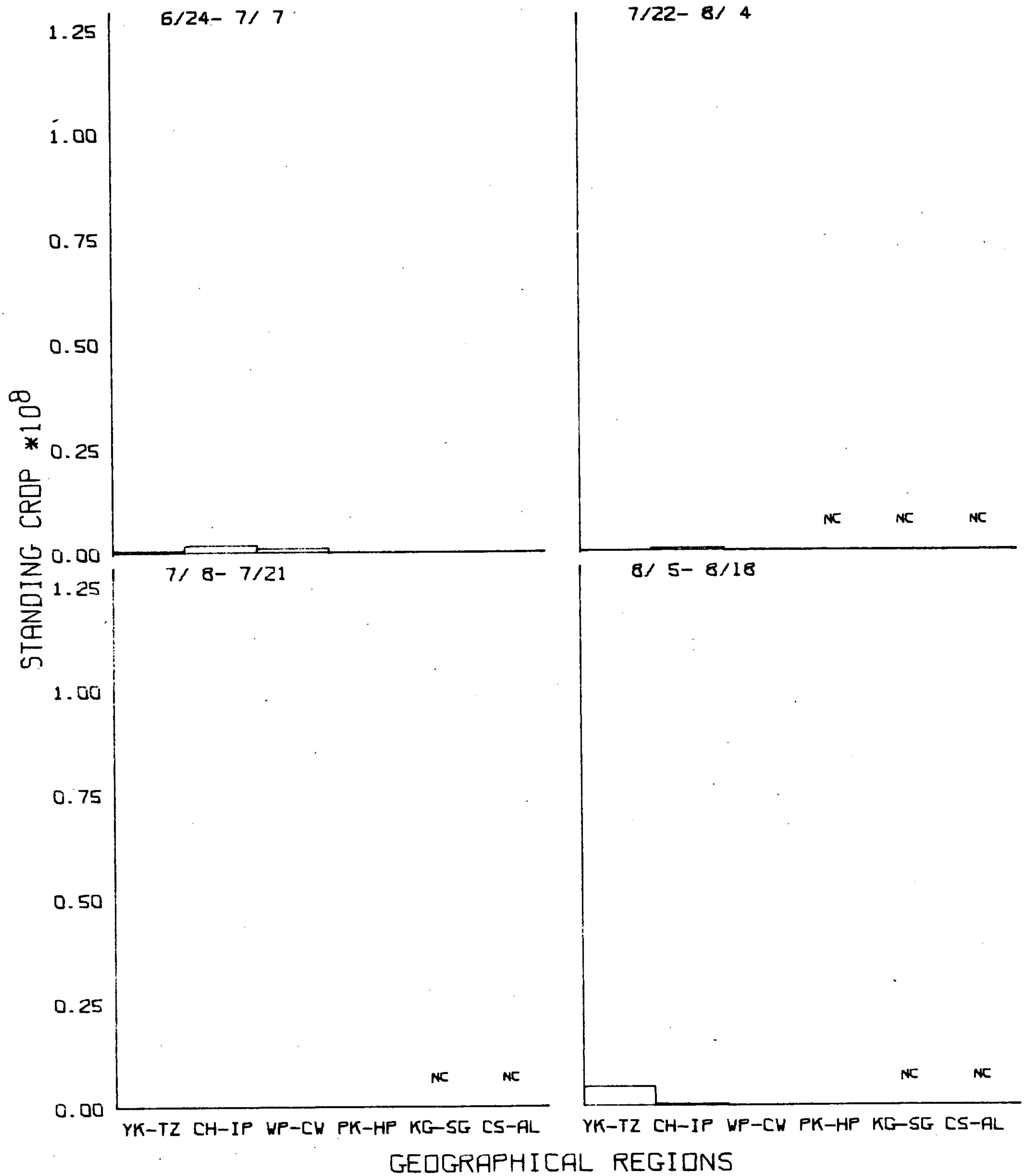


Figure D-16. Standing Crop of Juvenile Atlantic Tomcod within Six Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Combined Day and Night Sampling by Epibenthic Sled and Tucker Trawl during 1973



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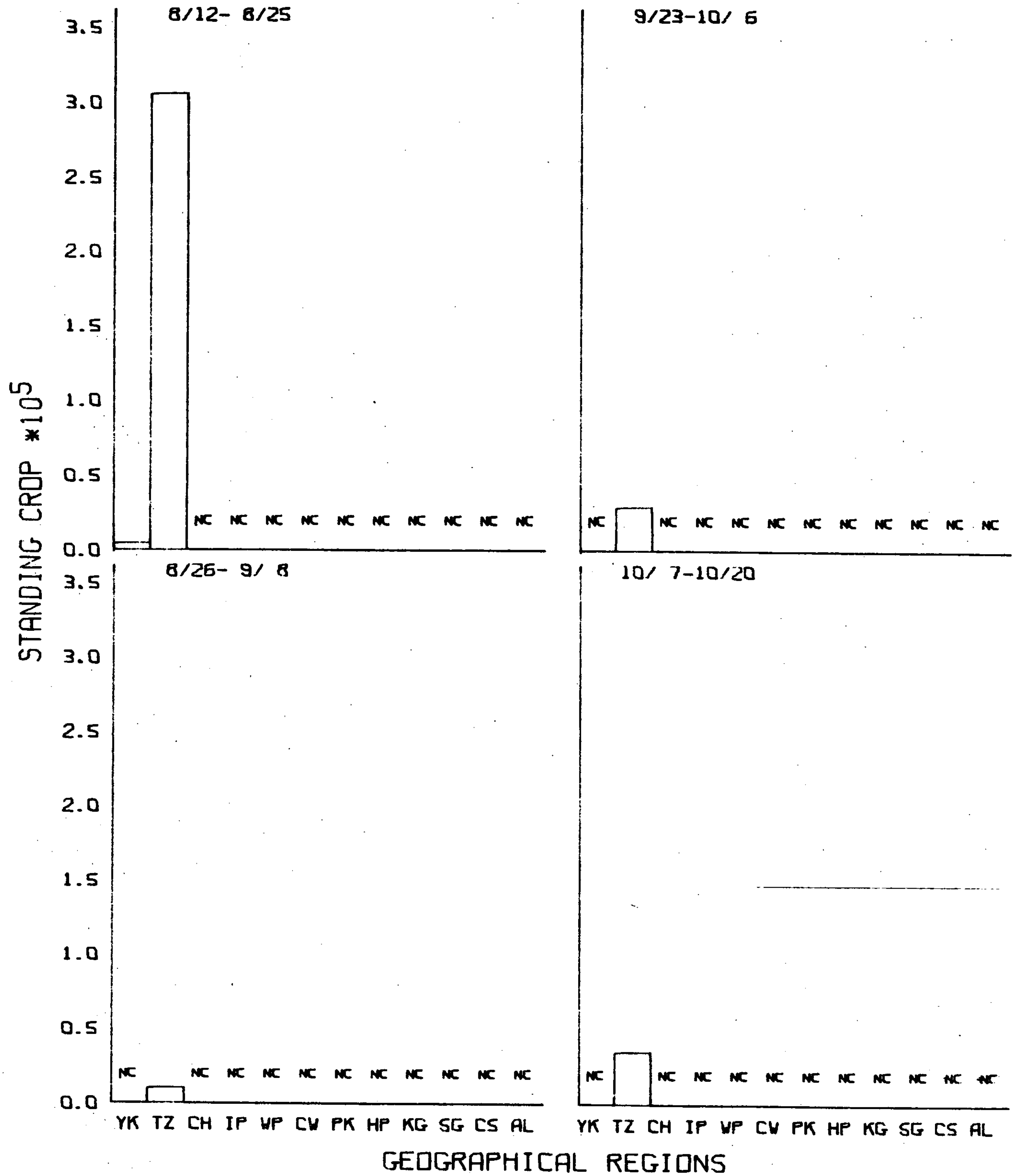
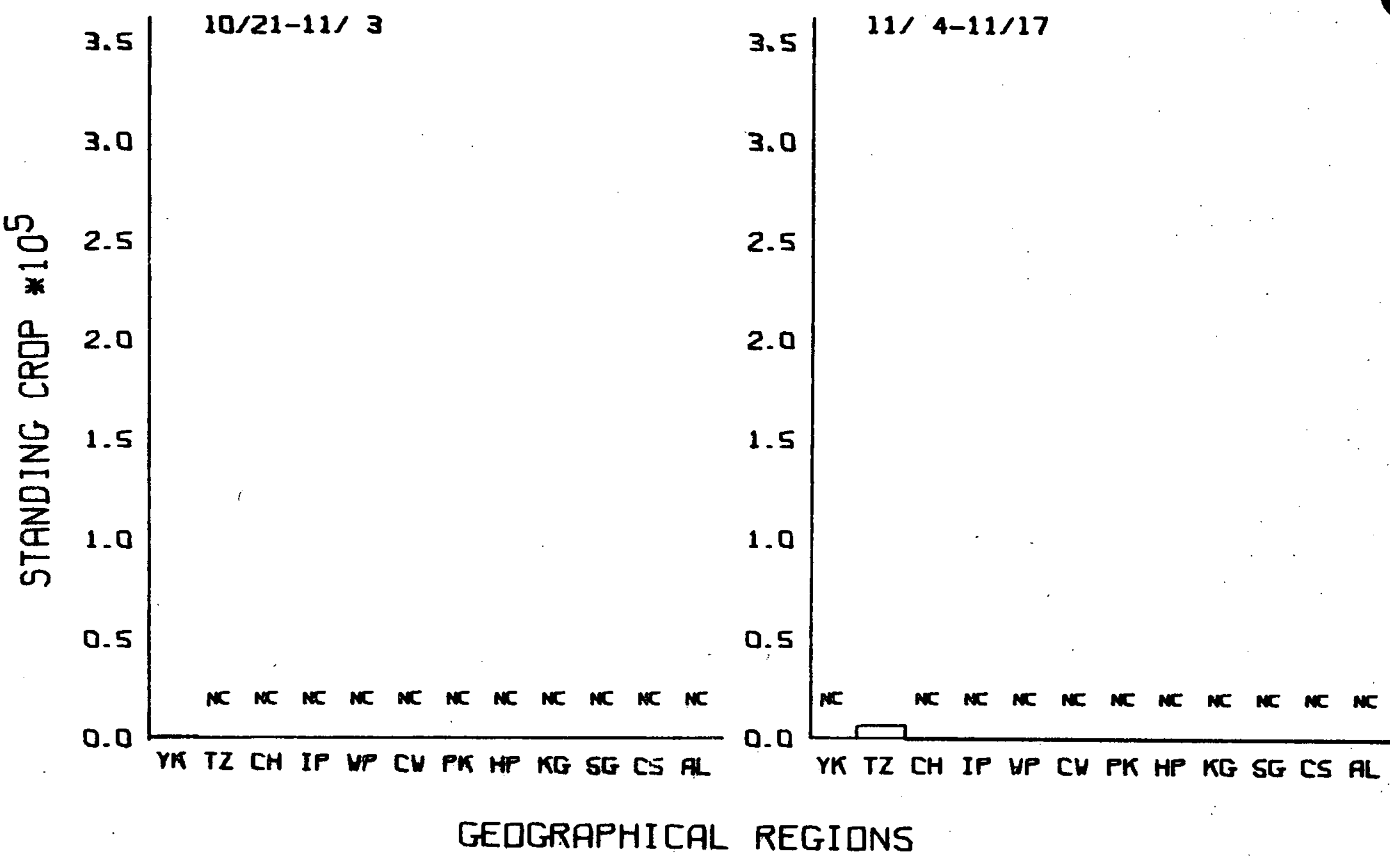


Figure D-17. Standing Crop of Juvenile Atlantic Tomcod within 12 Geographical Regions of Hudson River Estuary [RM 12-153 (km 19-245)] Based on Day Sampling by 100-ft (30.5-m) Beach Seine during 1973



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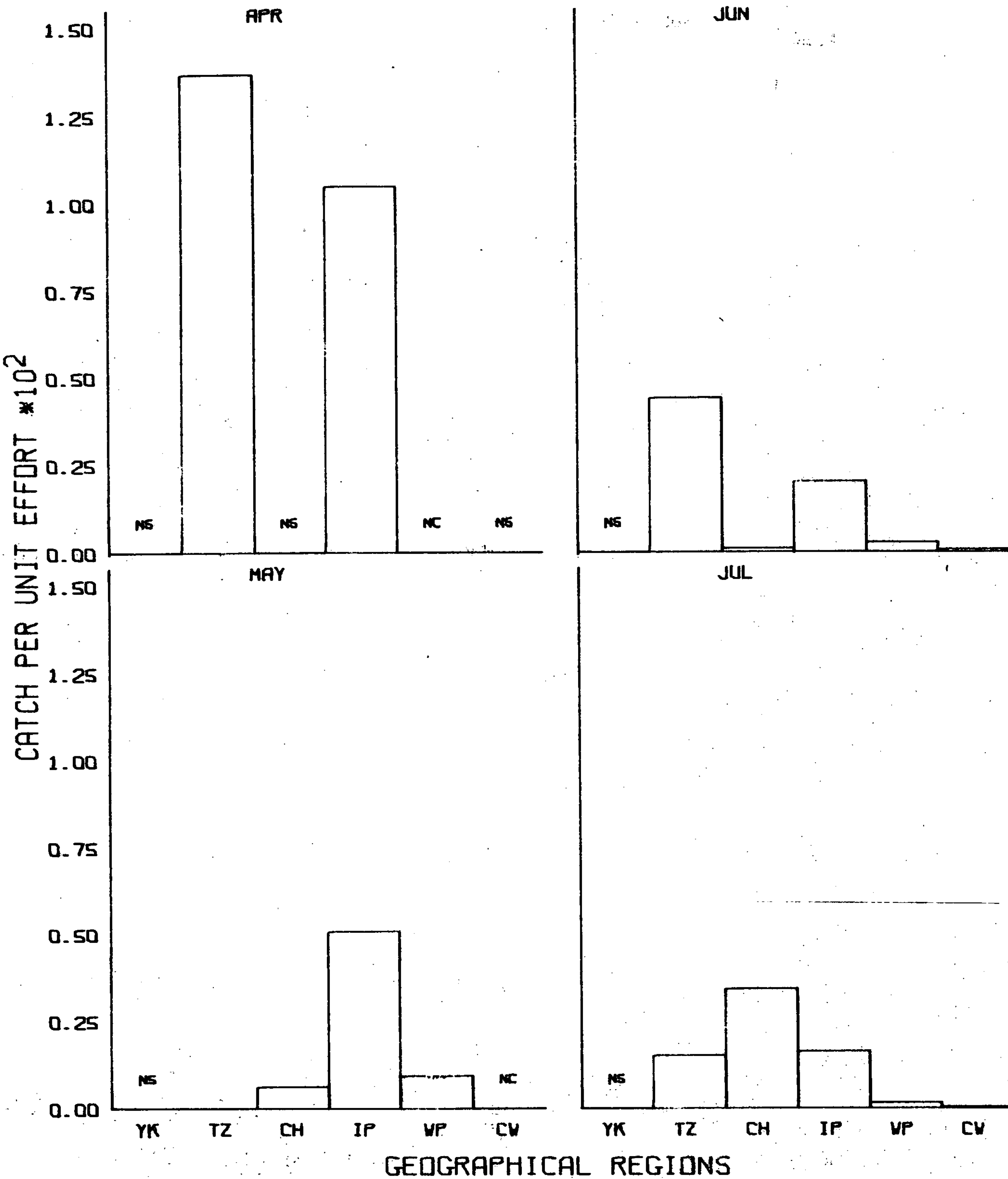
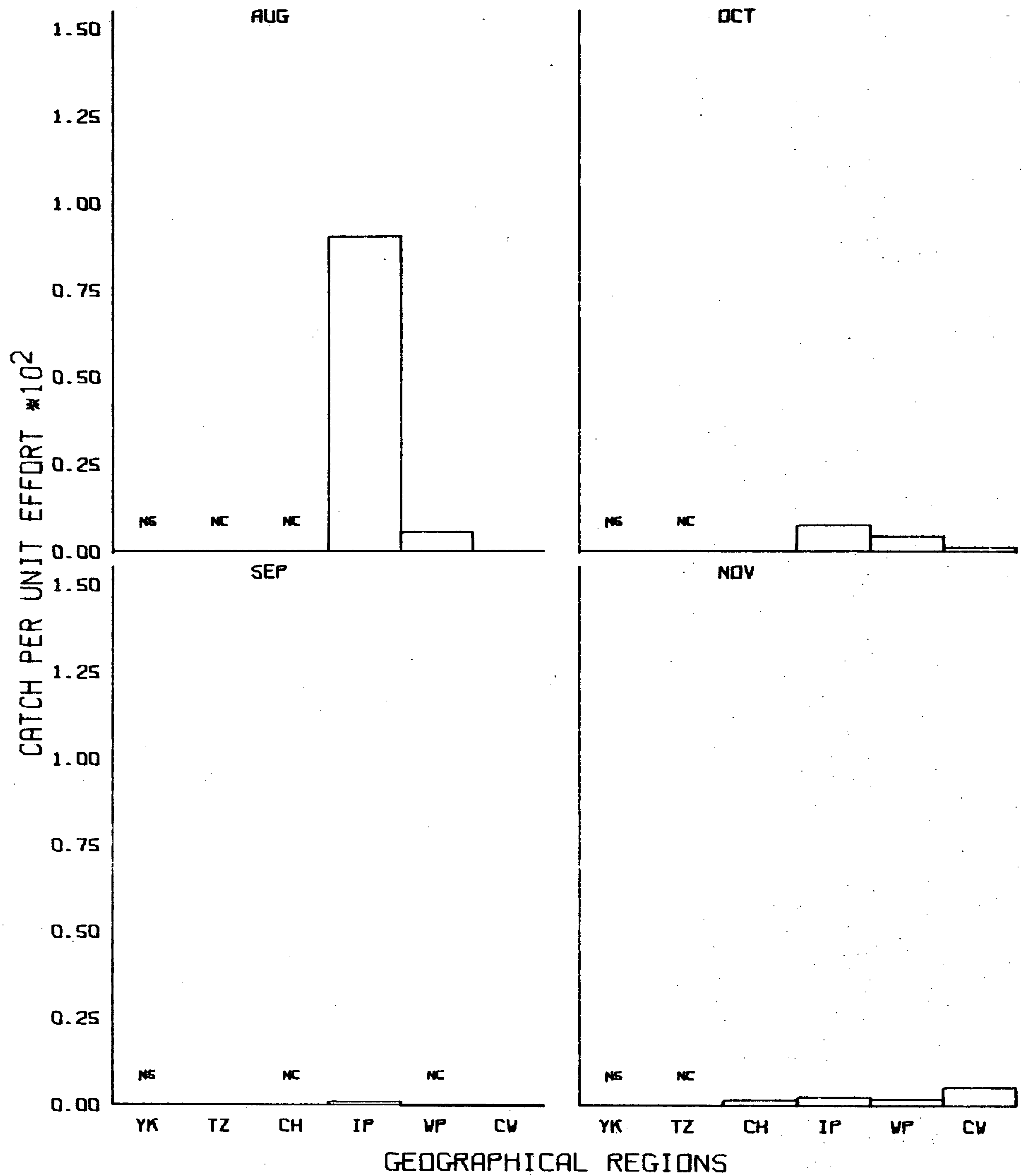


Figure D-18. Catch per Unit Effort of Atlantic Tomcod (All Ages Combined) within Five Geographical Regions of Hudson River Estuary [RM 24-62 (km 38-99)] Based on Day Sampling by Bottom Trawl during 1973



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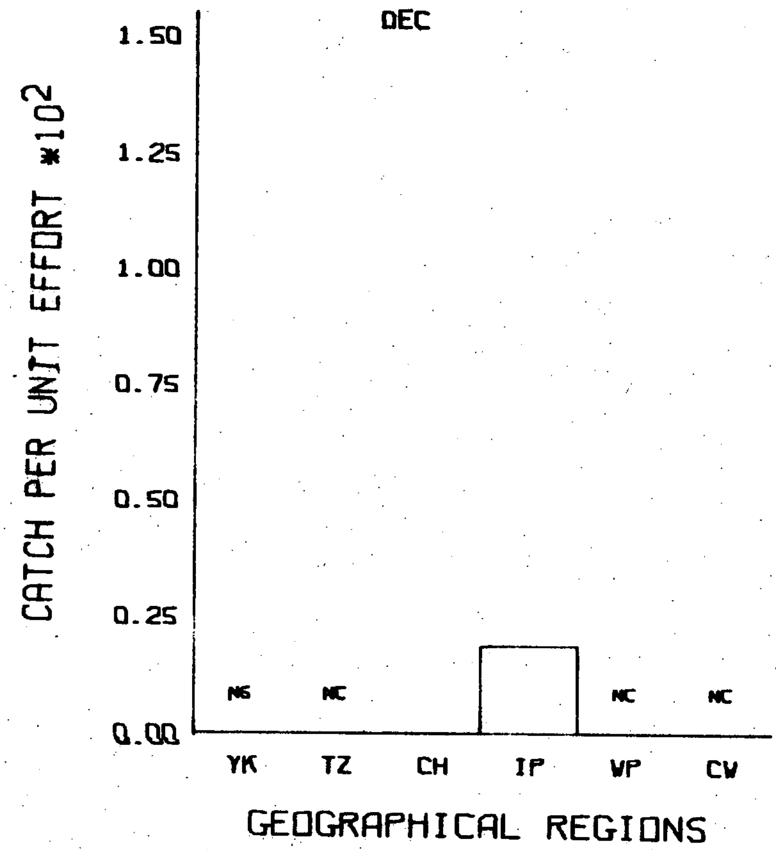

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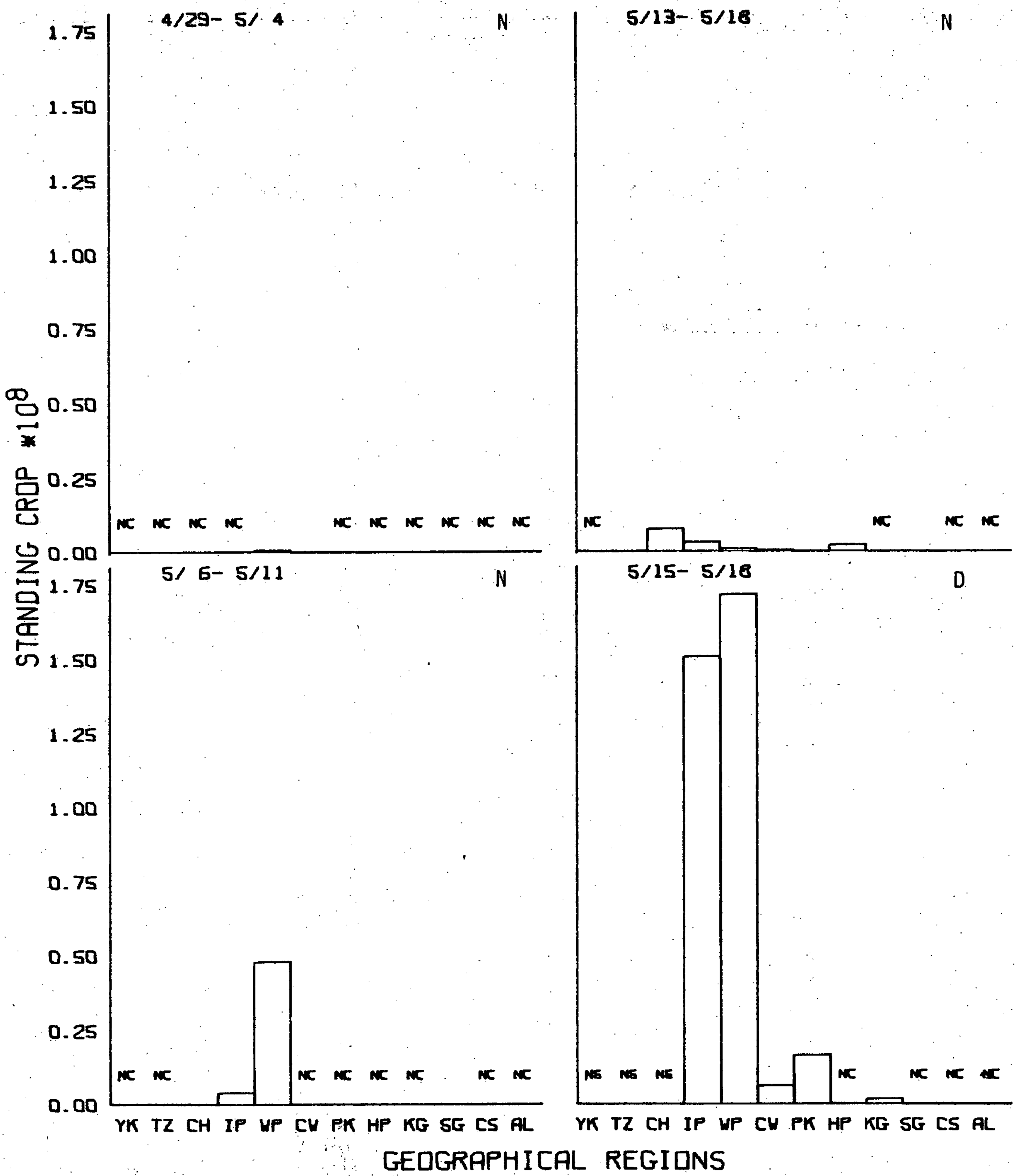
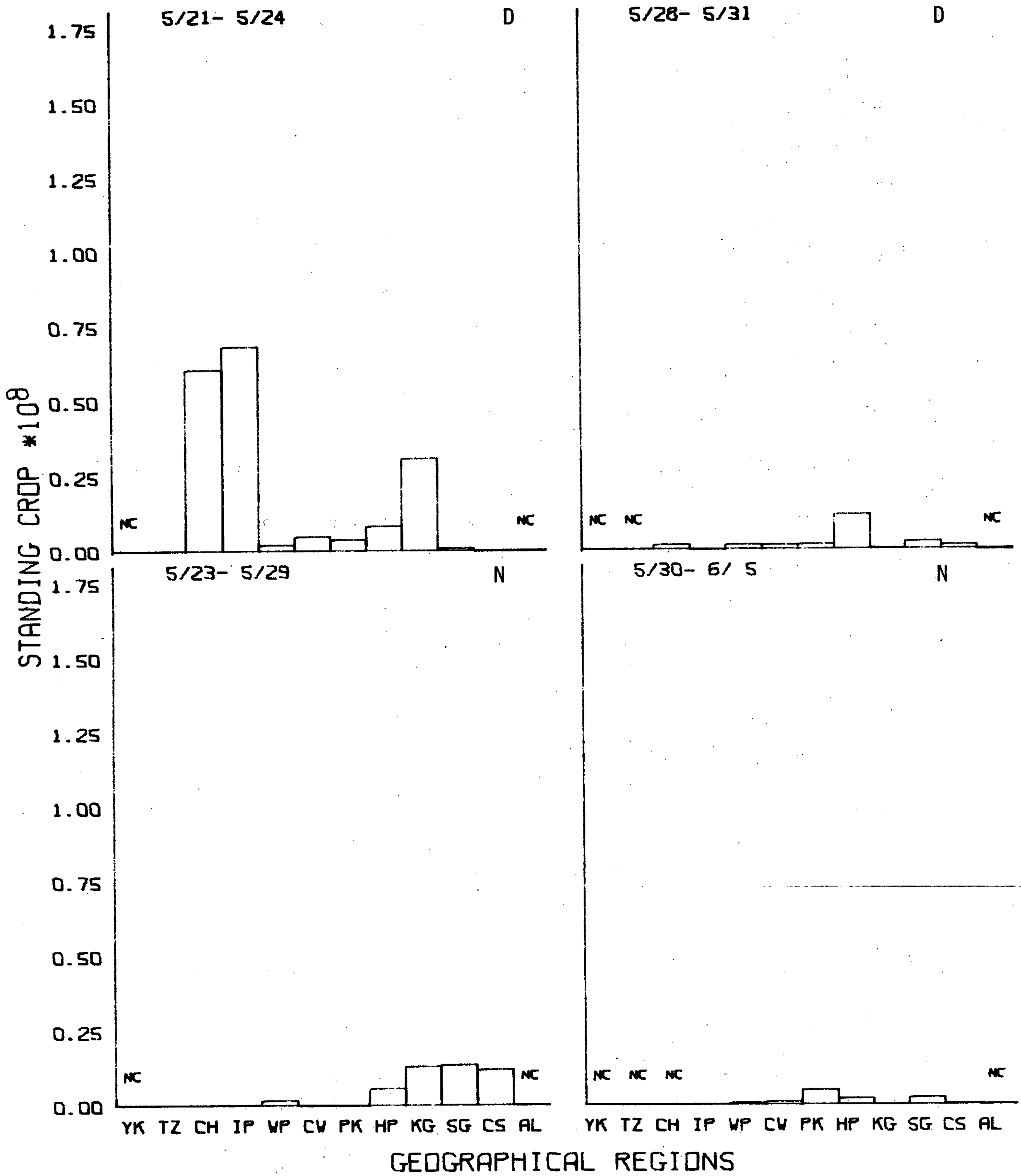


Figure D-19. Standing Crop of Striped Bass Eggs within 12 Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Day or Night Sampling by Epibenthic Sled or Tucker Trawl during 1974



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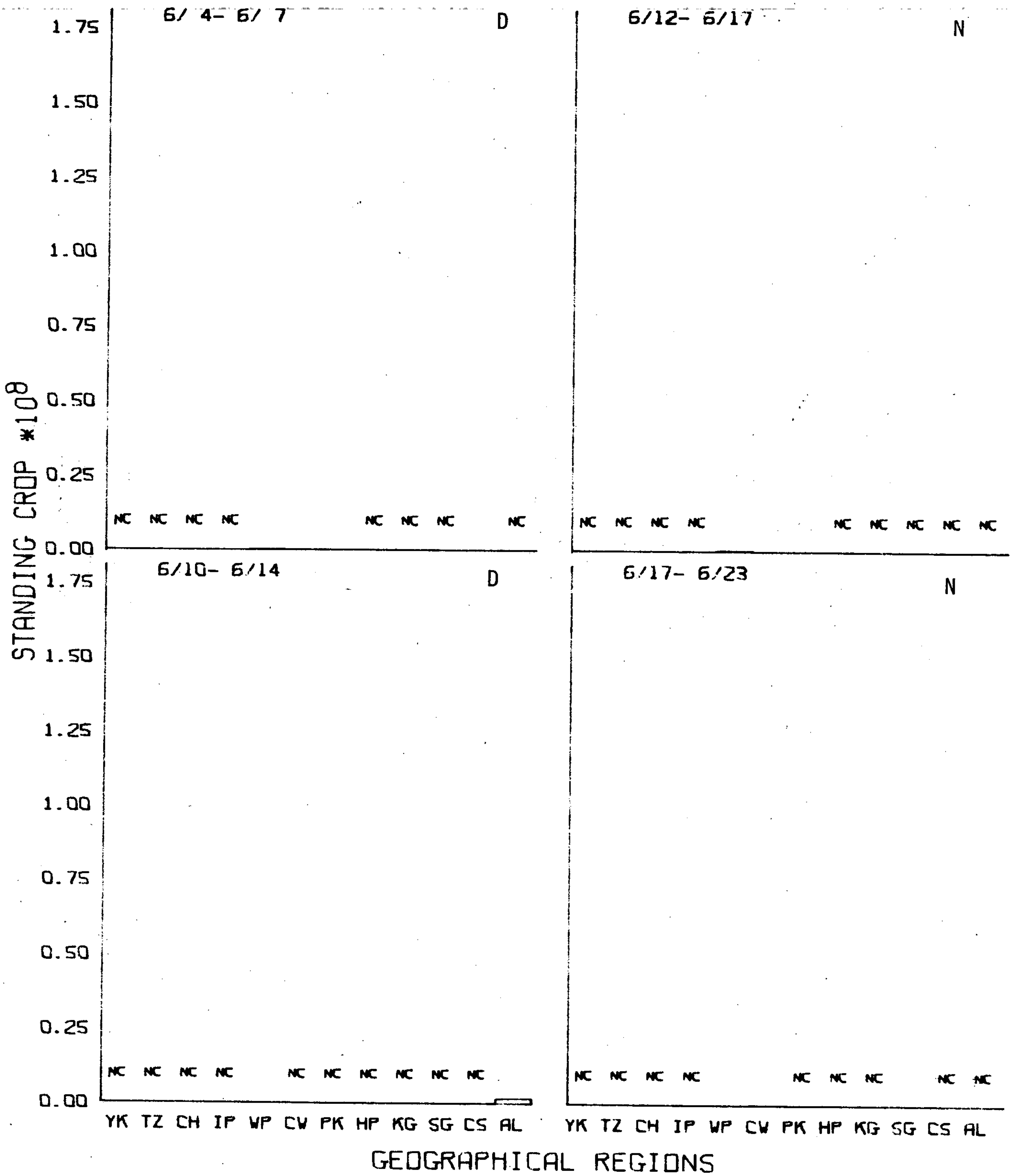

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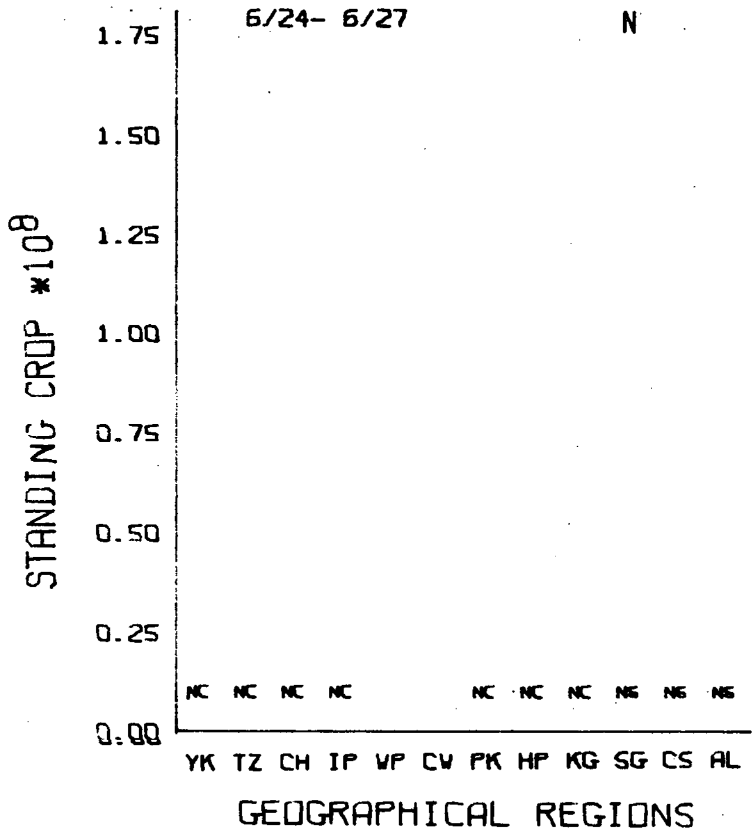

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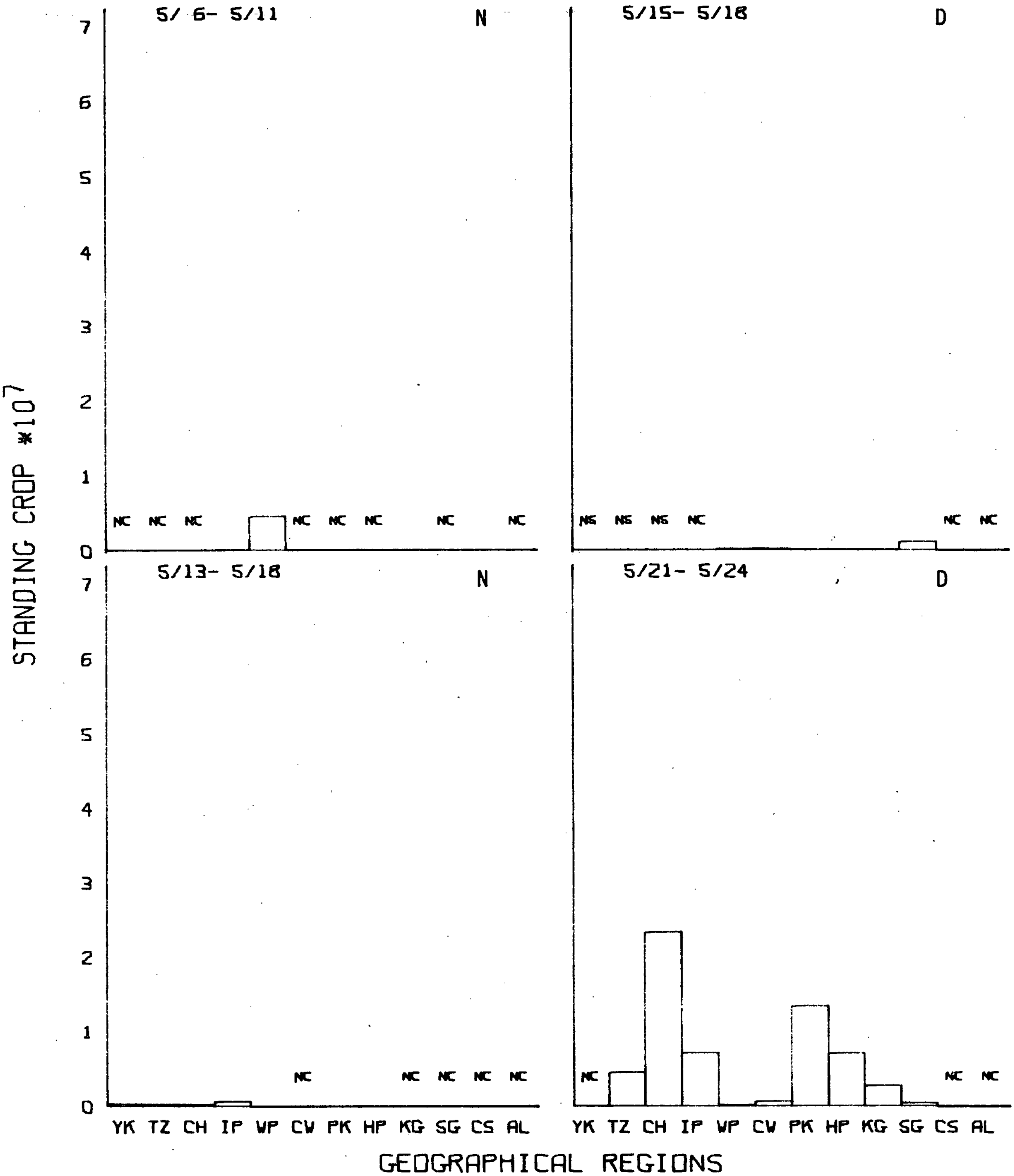
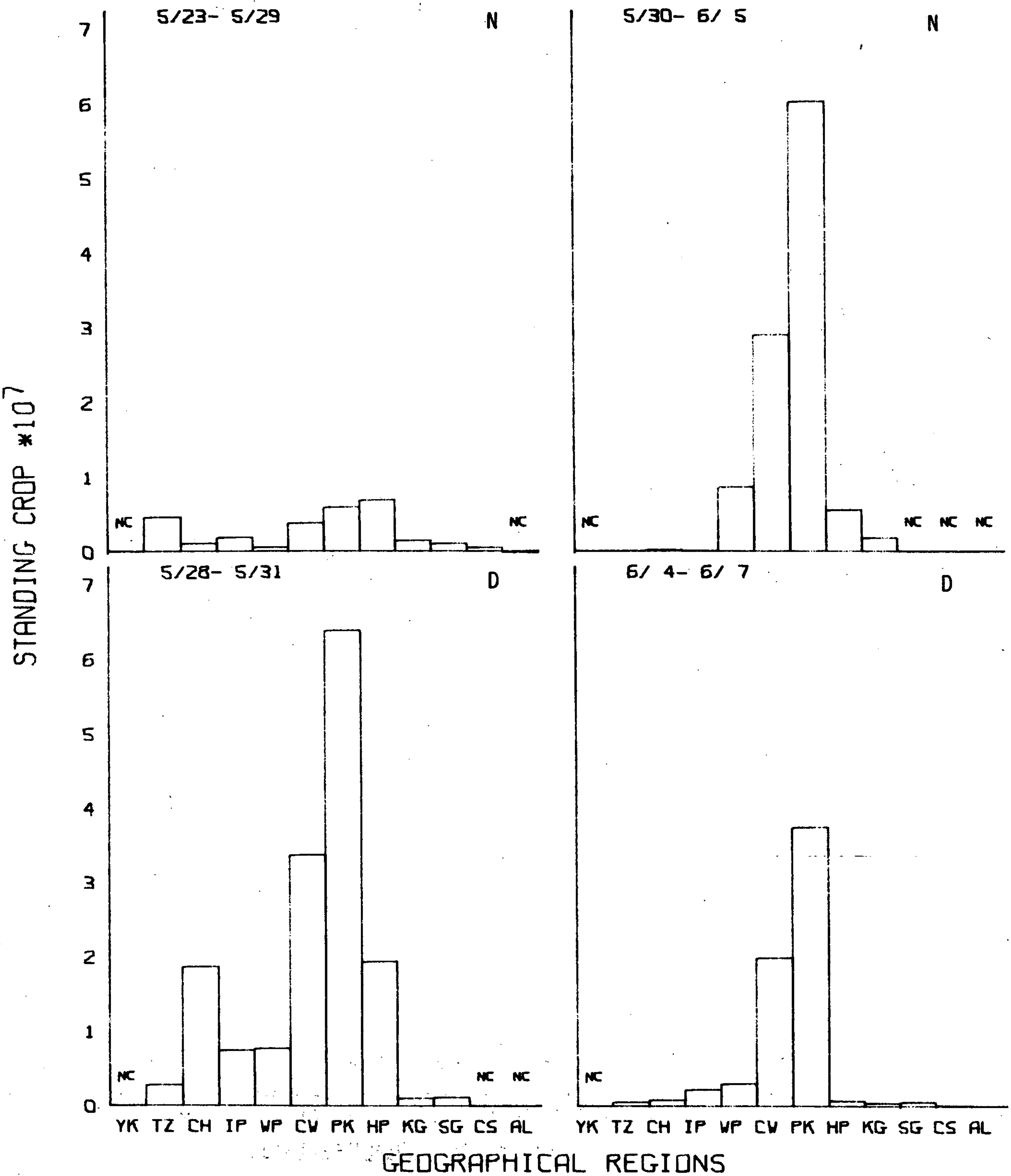


Figure D-20. Standing Crop of Striped Bass Yolk-Sac Larvae within 12 Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Day or Night Sampling by Epibenthic Sled or Tucker Trawl during 1974



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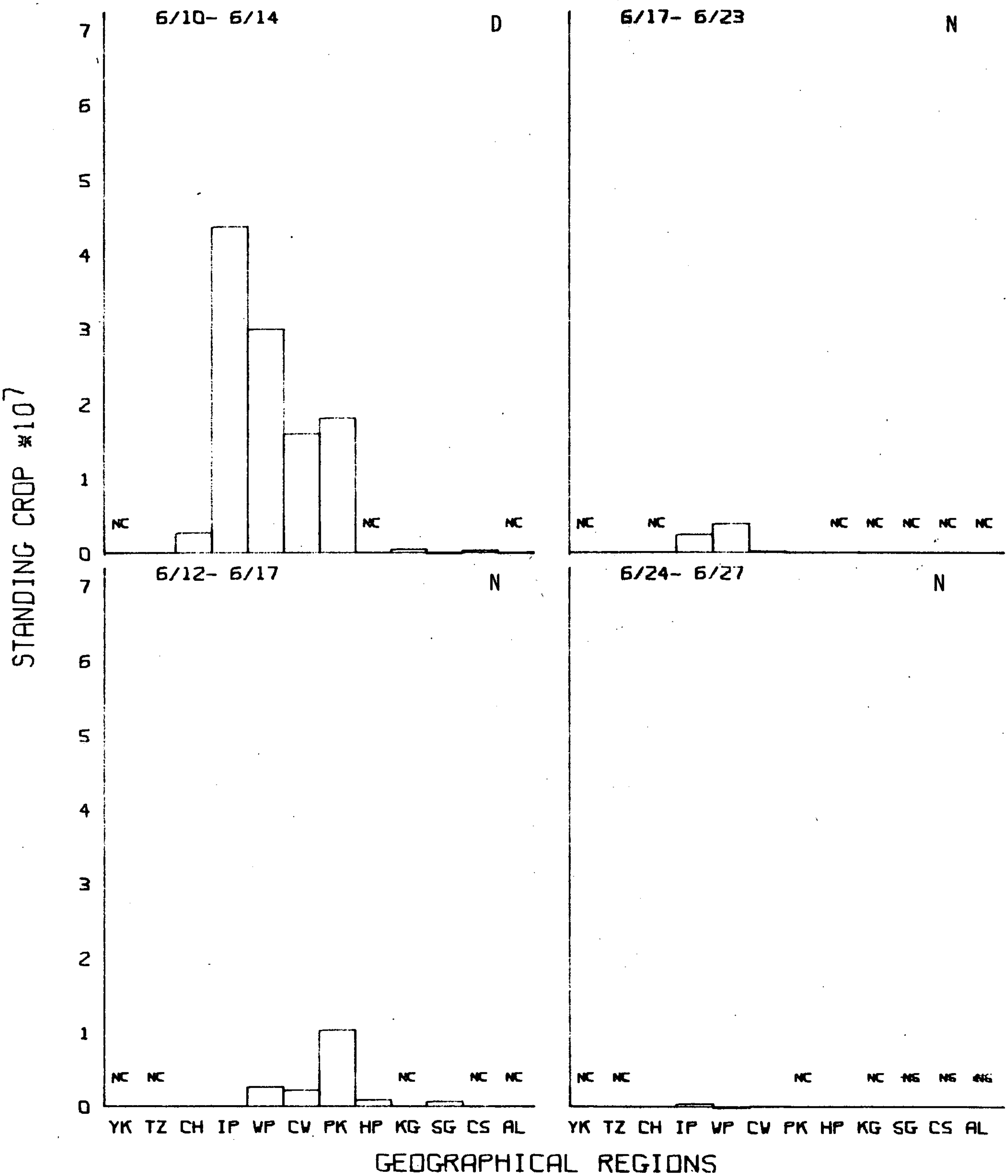

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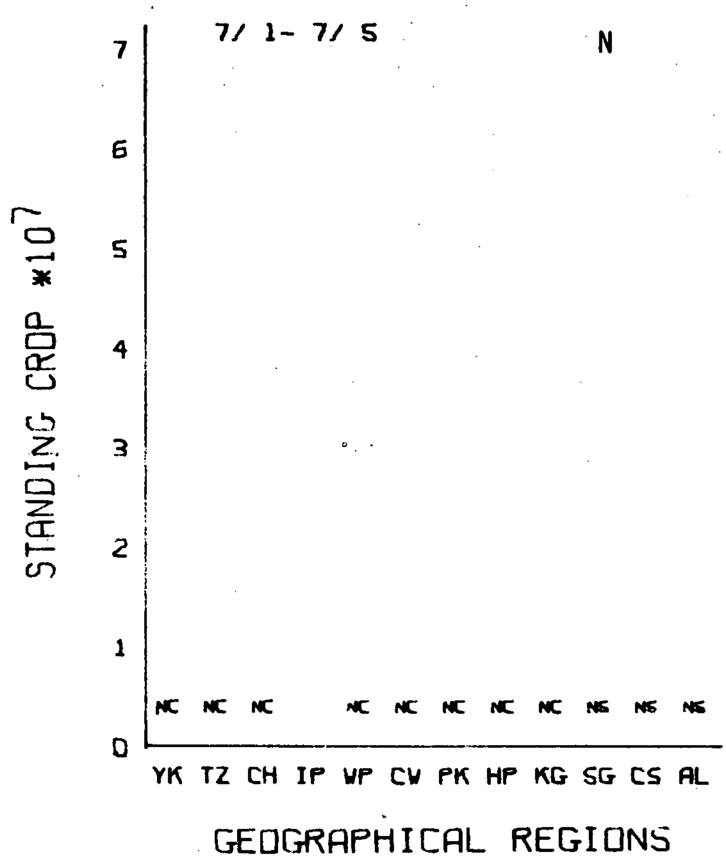

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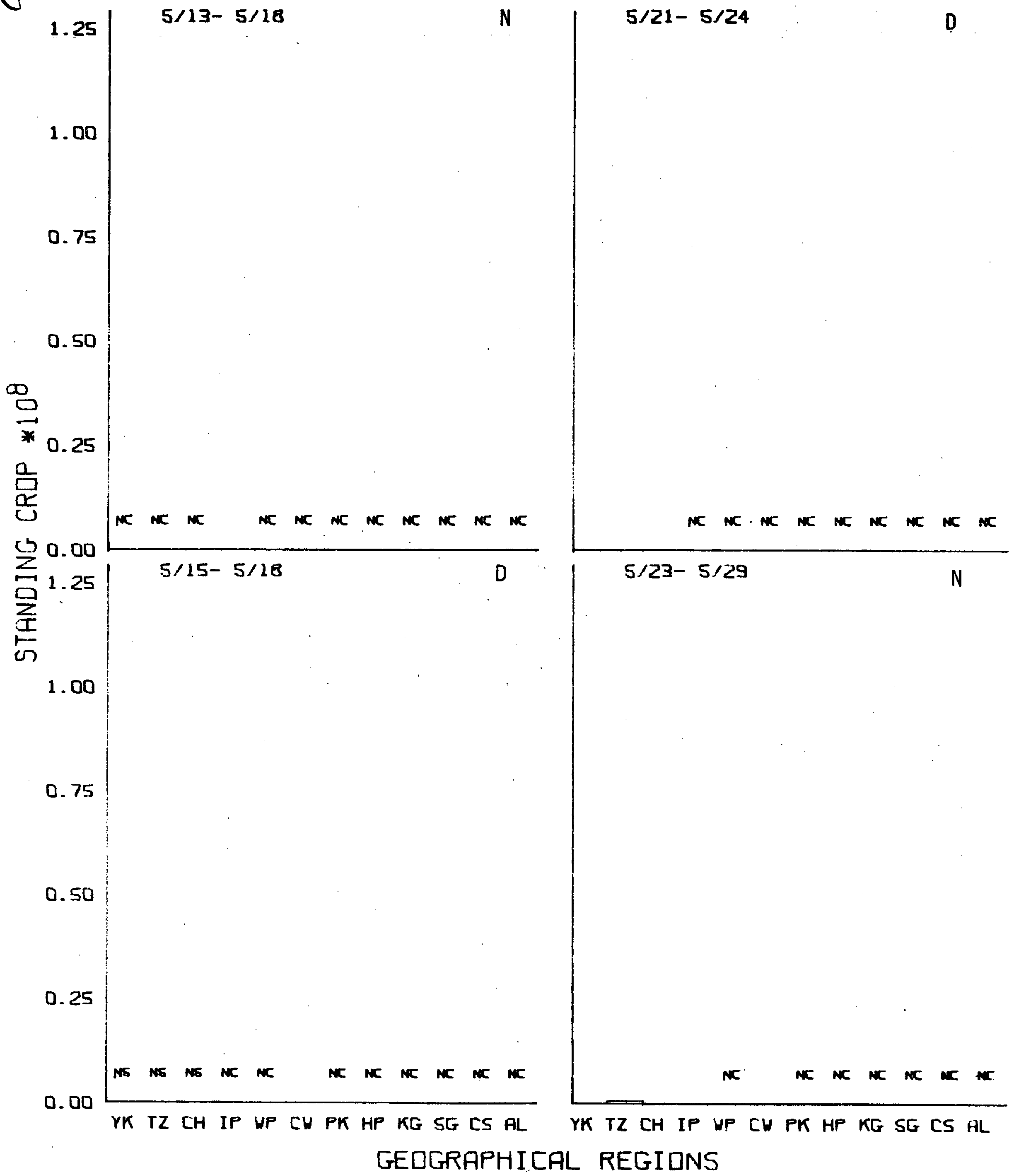
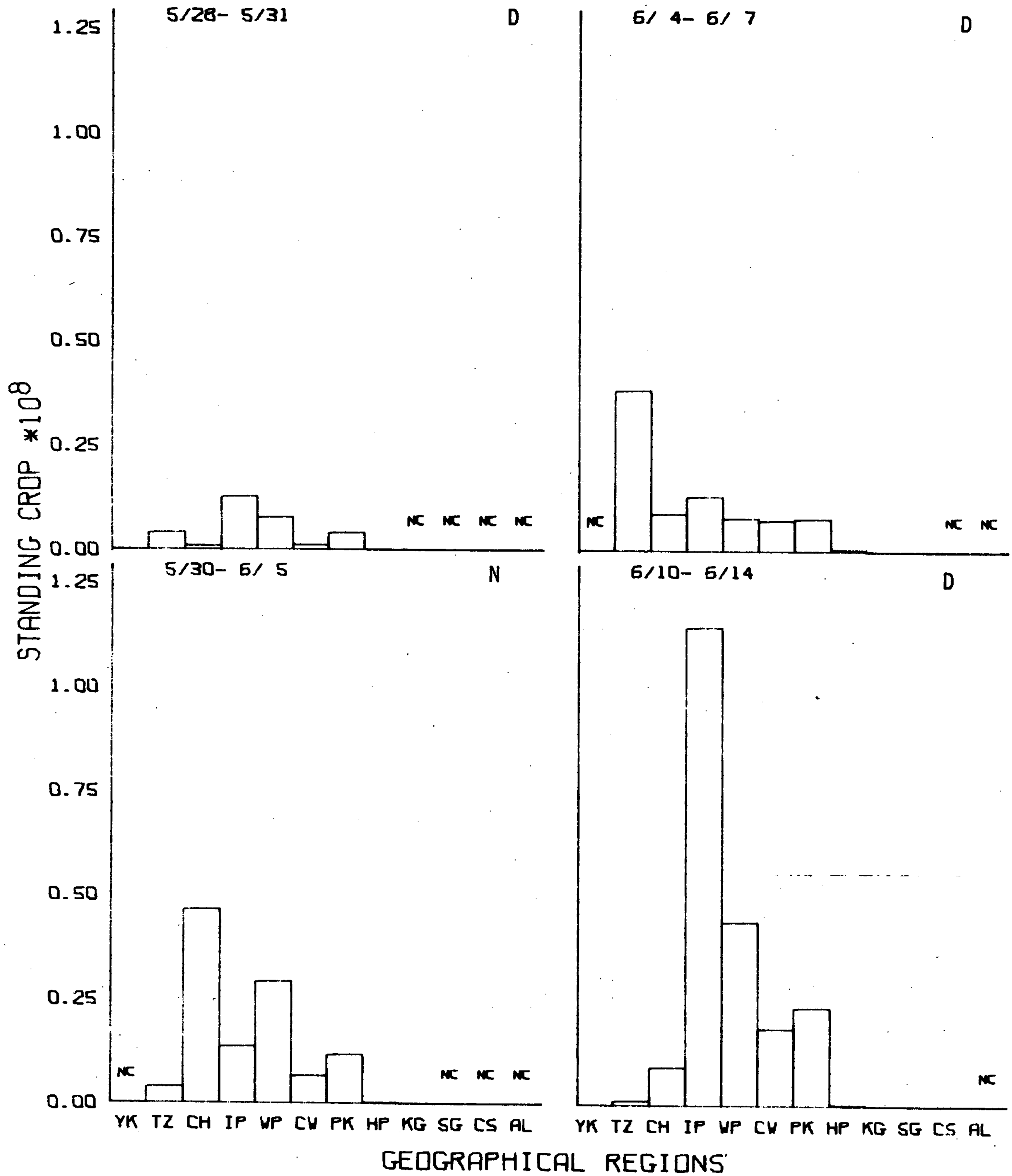


Figure D-21. Standing Crop of Striped Bass Post Yolk-Sac Larvae within 12 Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Day or Night Sampling by Epibenthic Sled or Tucker Trawl during 1974



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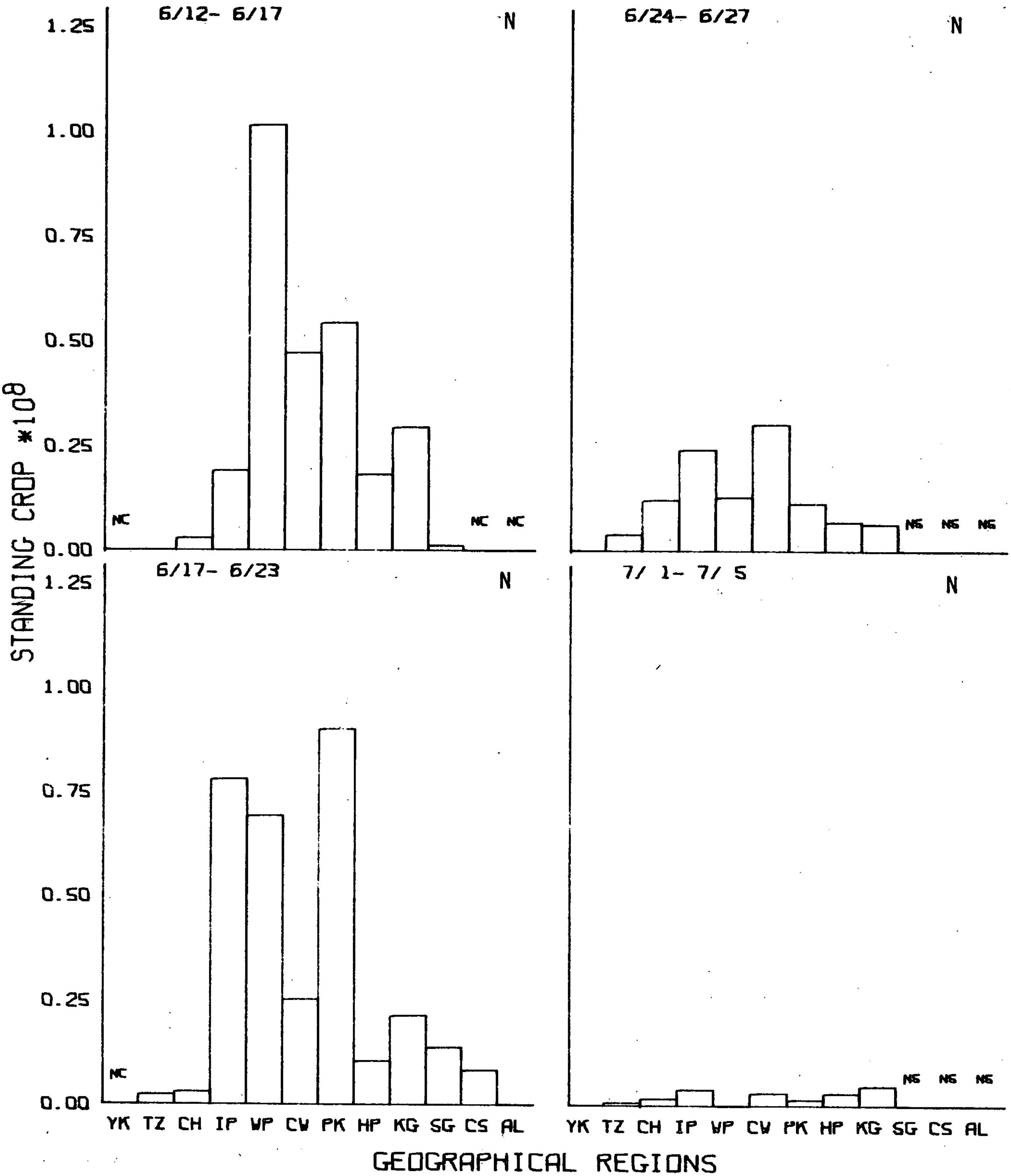

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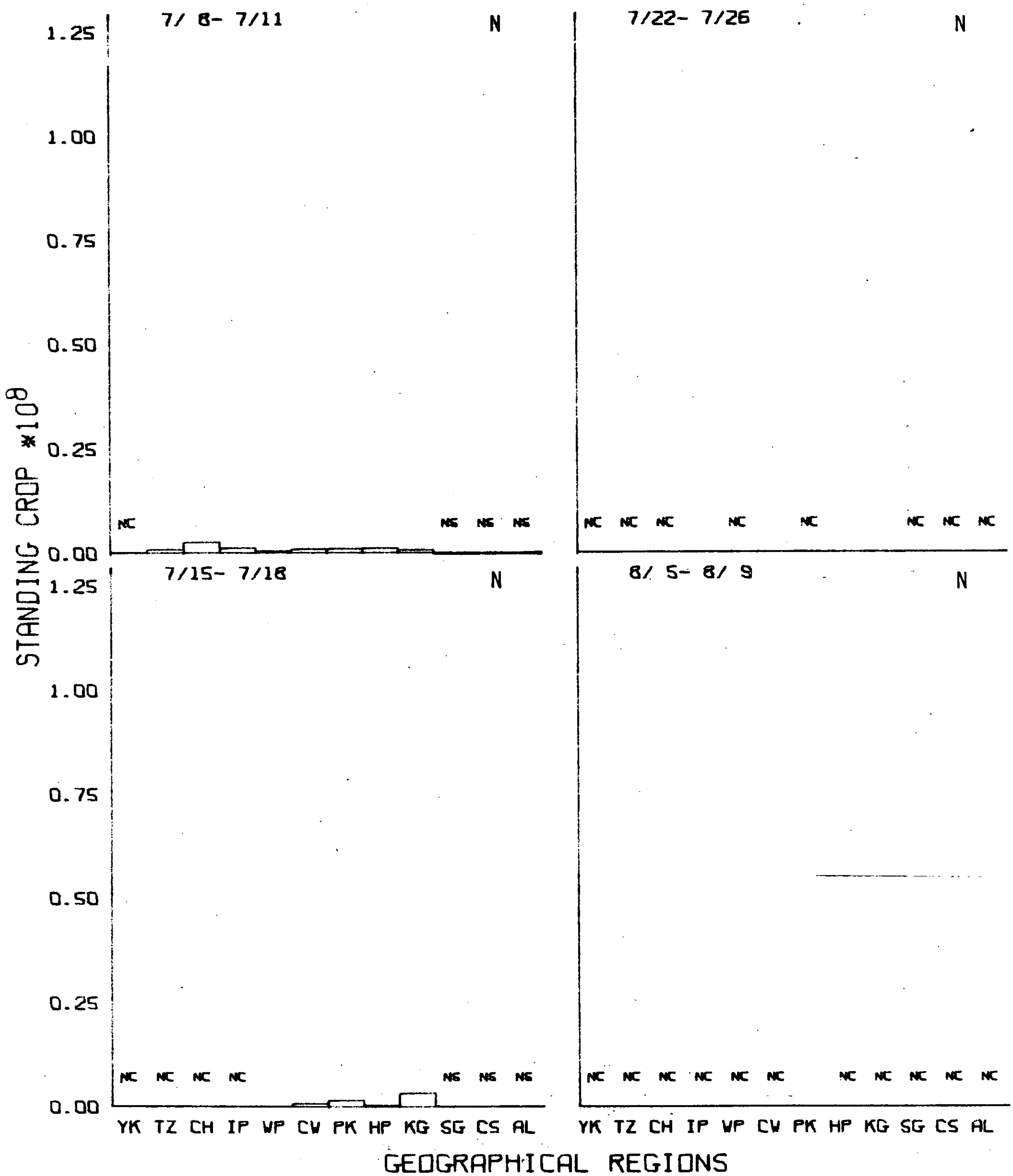

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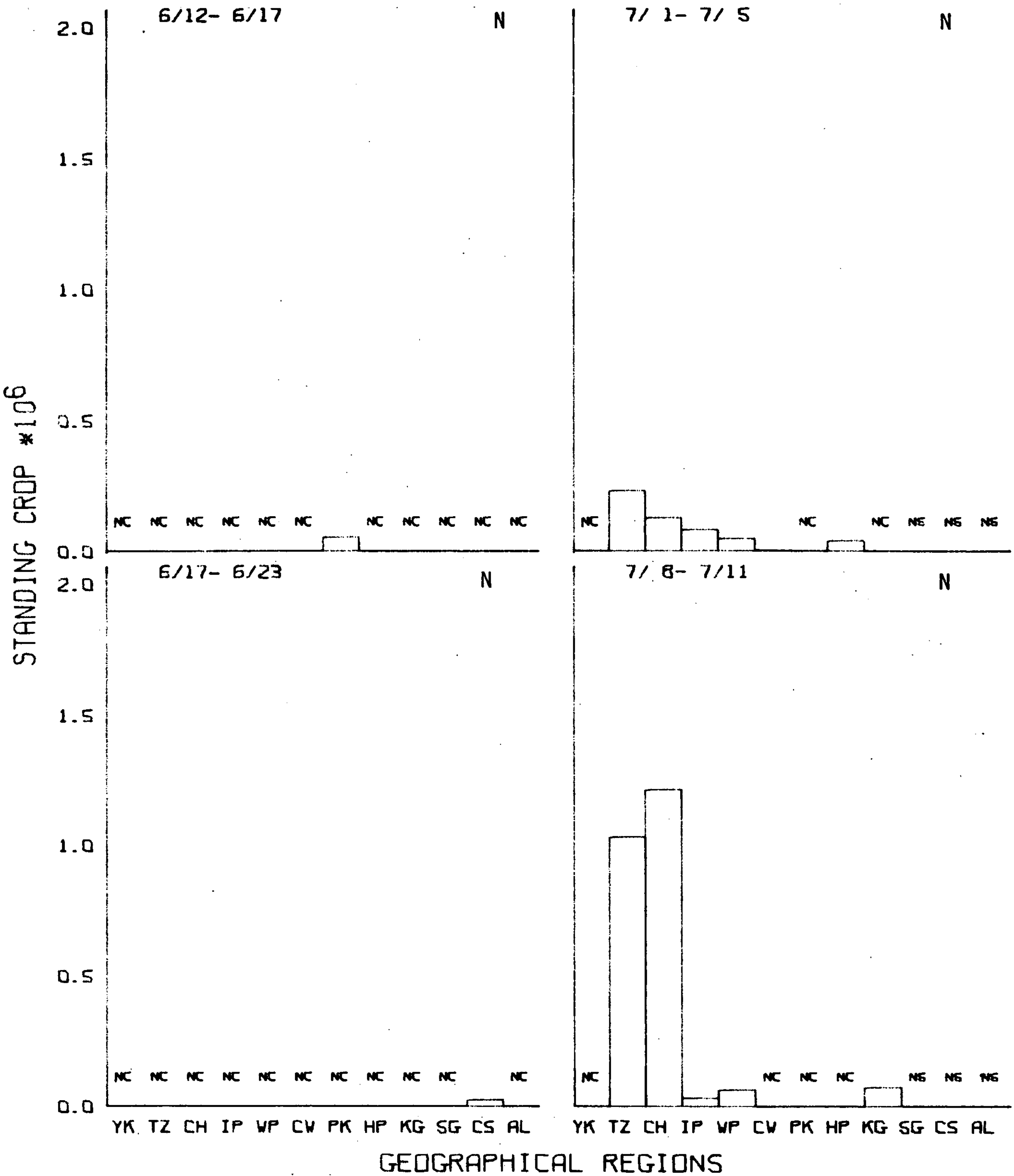
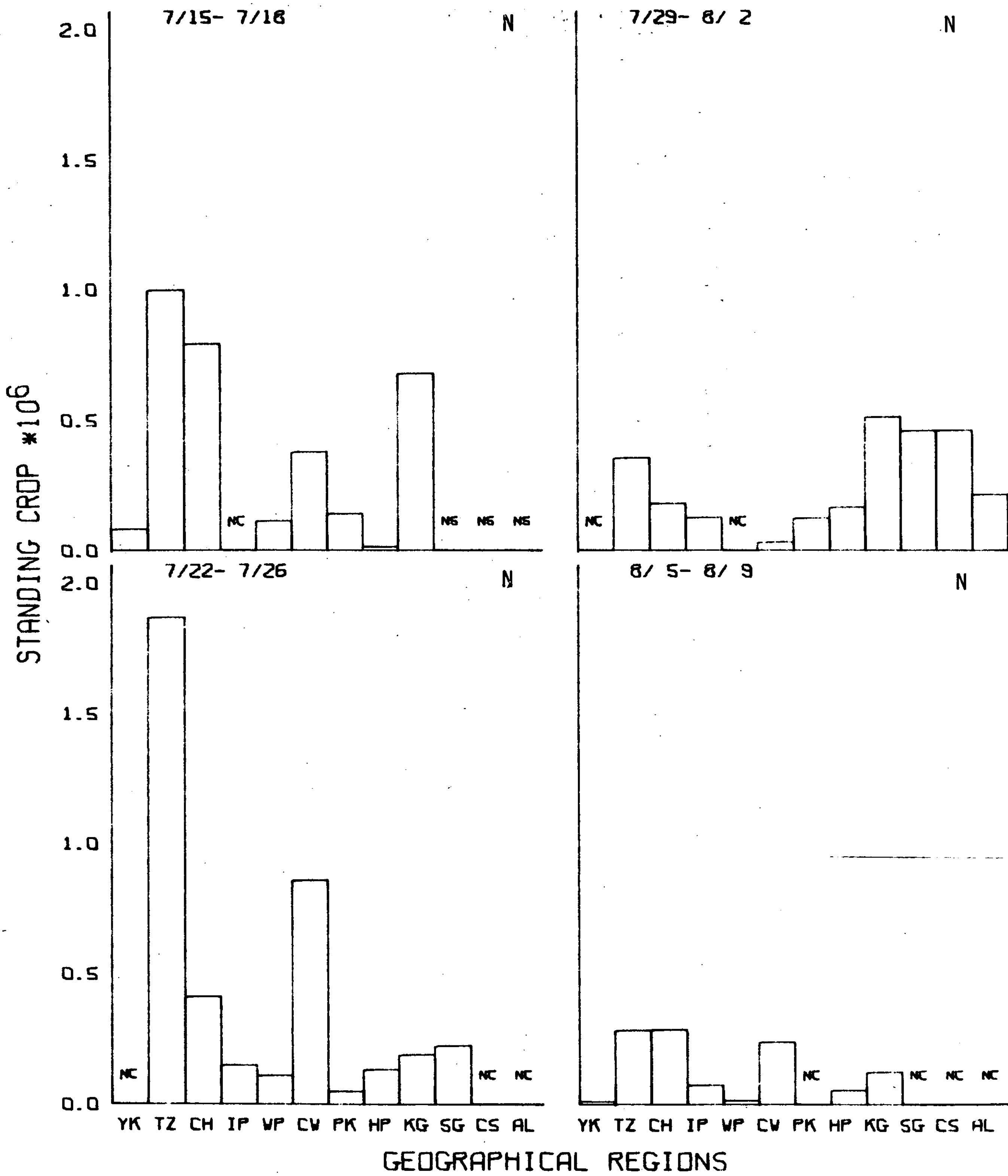


Figure D-22. Standing Crop of Juvenile Striped Bass within 12 Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Day or Night Sampling by Epibenthic Sled or Tucker Trawl during 1974



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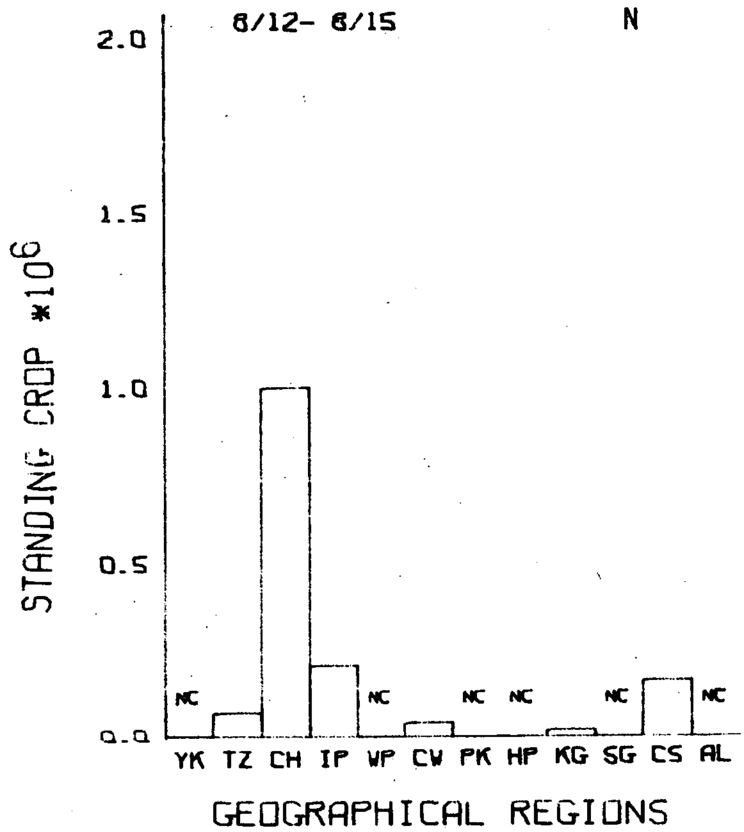

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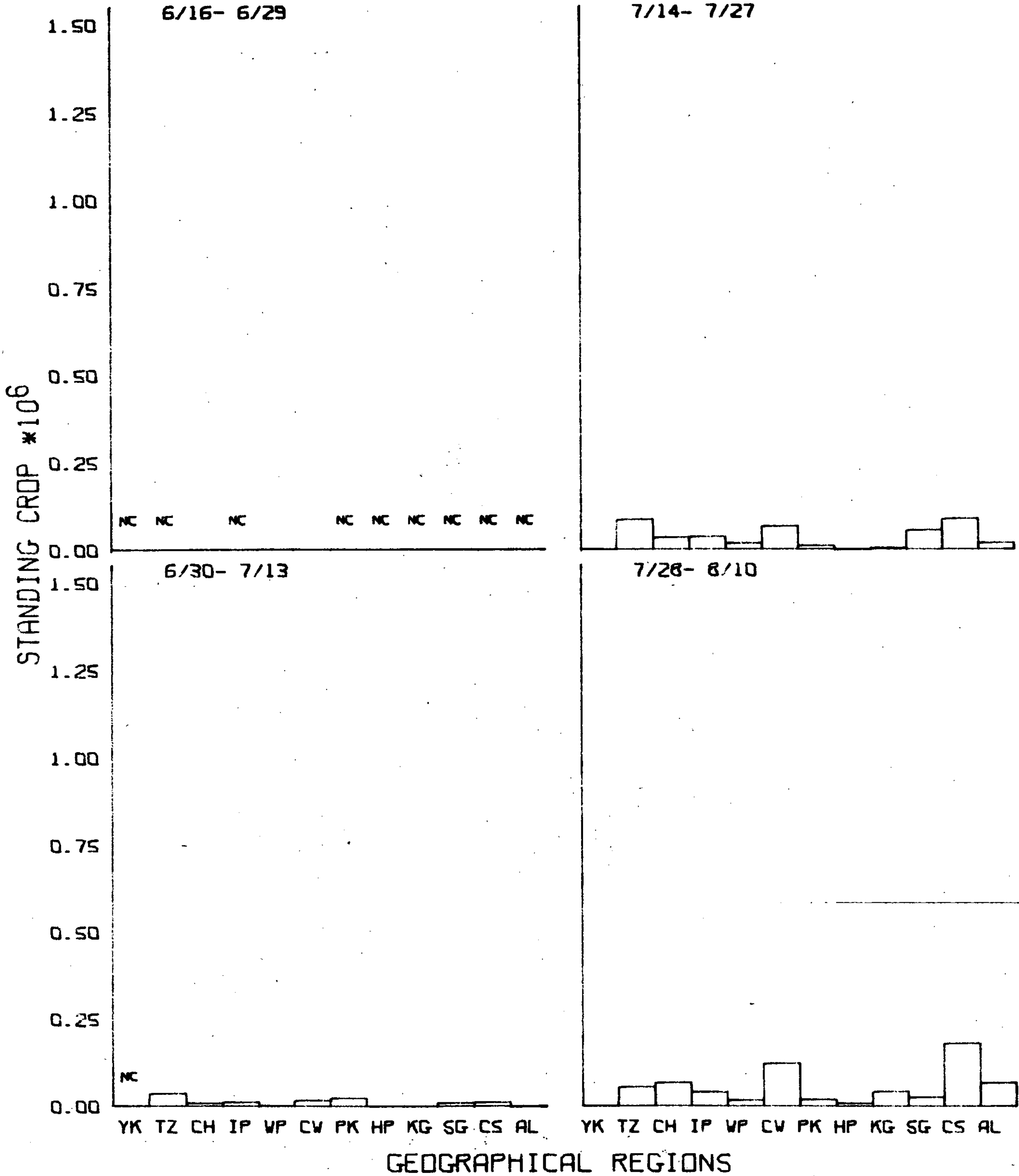
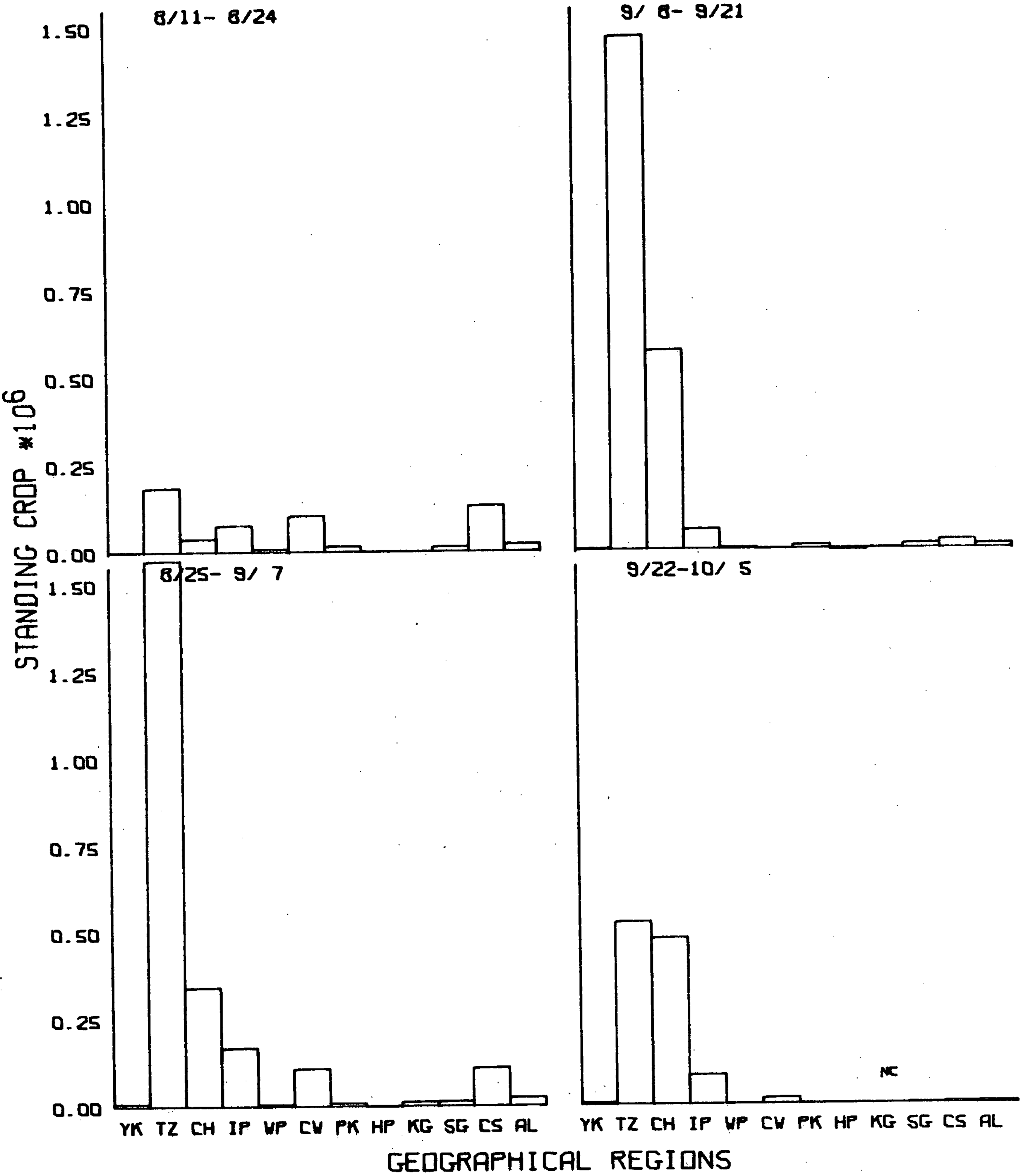


Figure D-23. Standing Crop of Juvenile Striped Bass within 12 Geographical Regions of Hudson River Estuary [RM 12-153 (km 19-245)] Based on Day Sampling by 100-ft (30.5-m) Beach Seine during 1974



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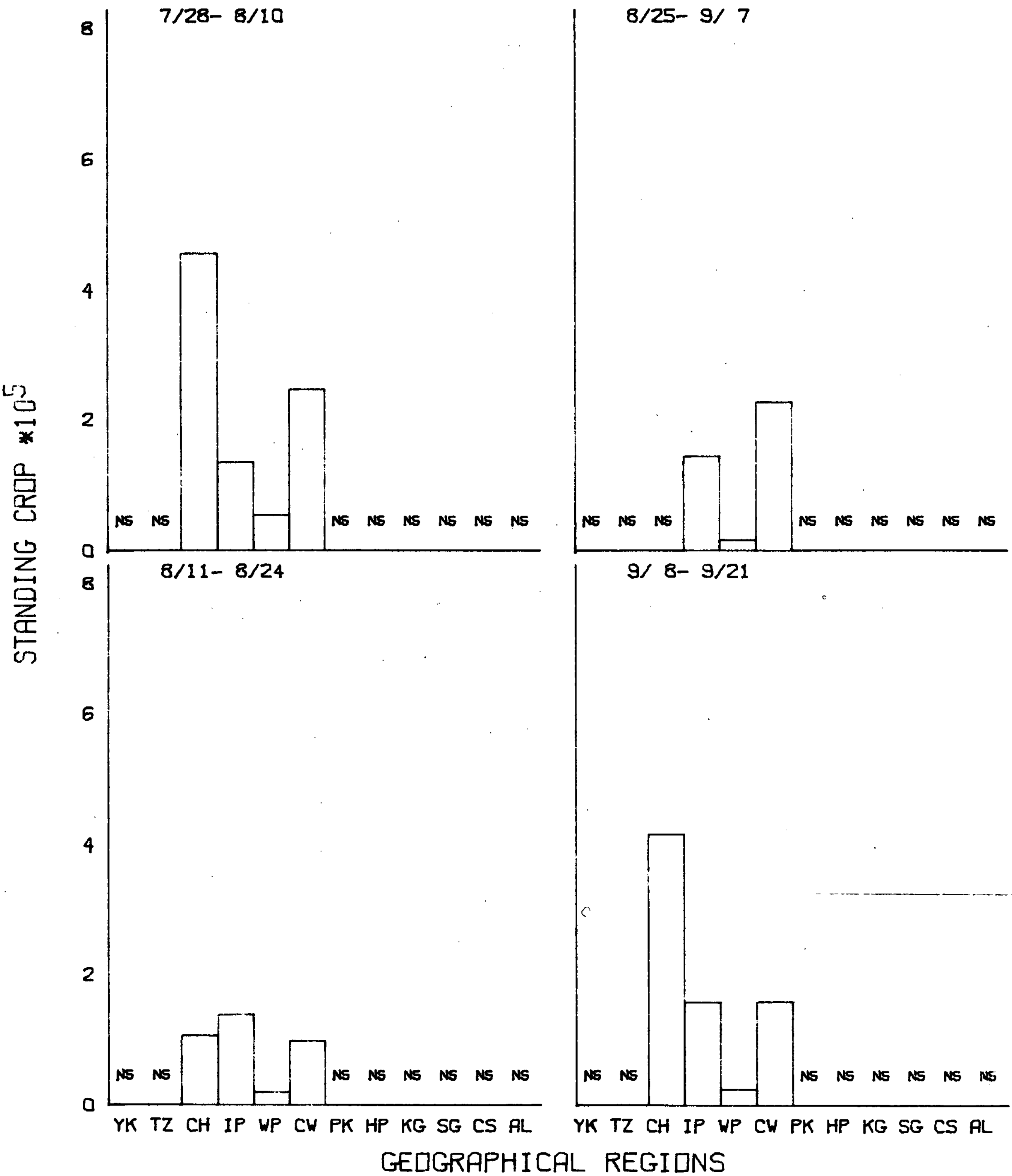
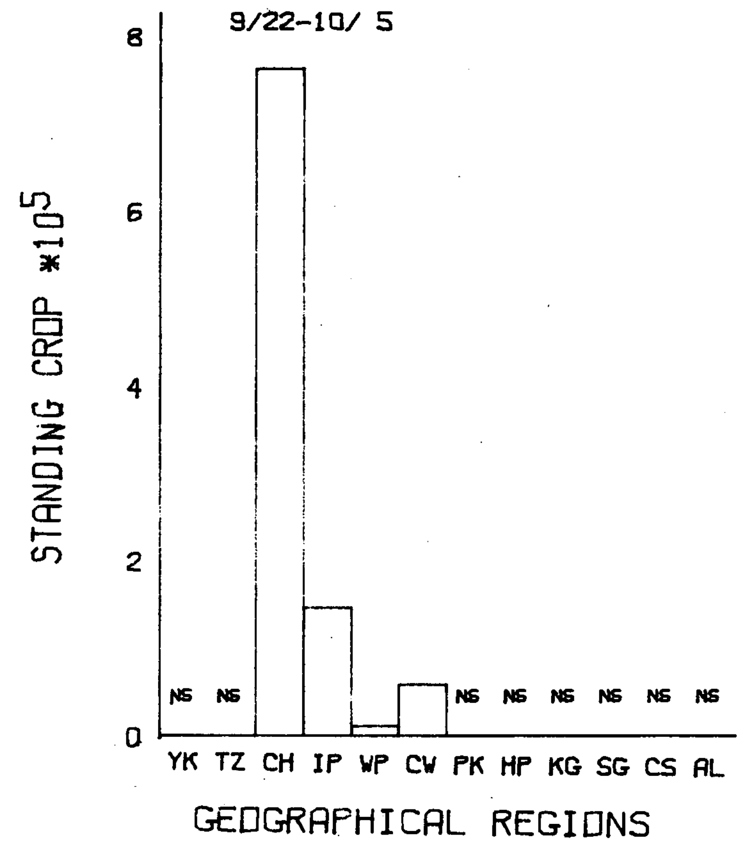


Figure D-24. Standing Crop of Juvenile Striped Bass within Four Geographical Regions of Hudson River Estuary [RM 34-61 (km 54-98)] Based on Night Sampling by 100-ft (30.5-m) Beach Seine during 1974



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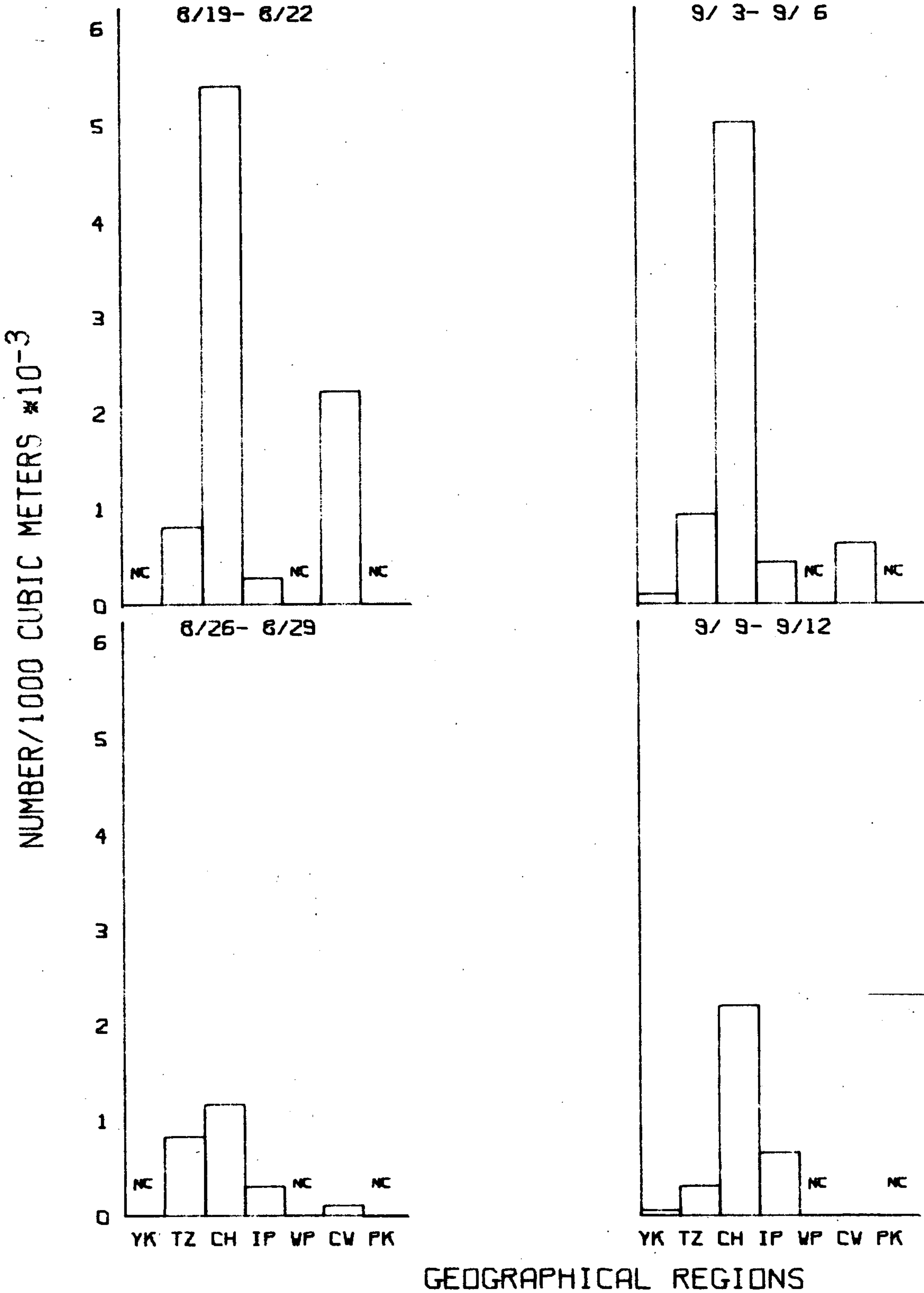
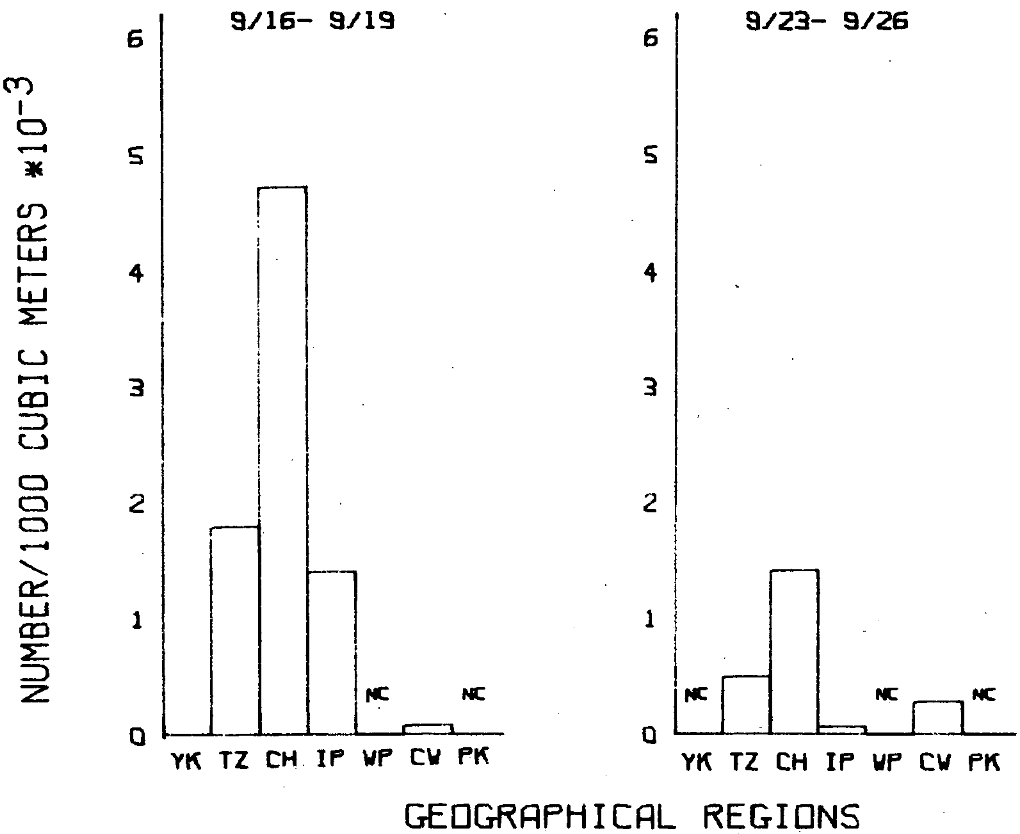


Figure D-25. Density of Juvenile Striped Bass (No./1000 m^3) within Seven Geographical Regions of Hudson River Estuary [RM 14-76 (km 22-122)] Based on Night Sampling in the Shoals by Epibenthic Sled during 1974



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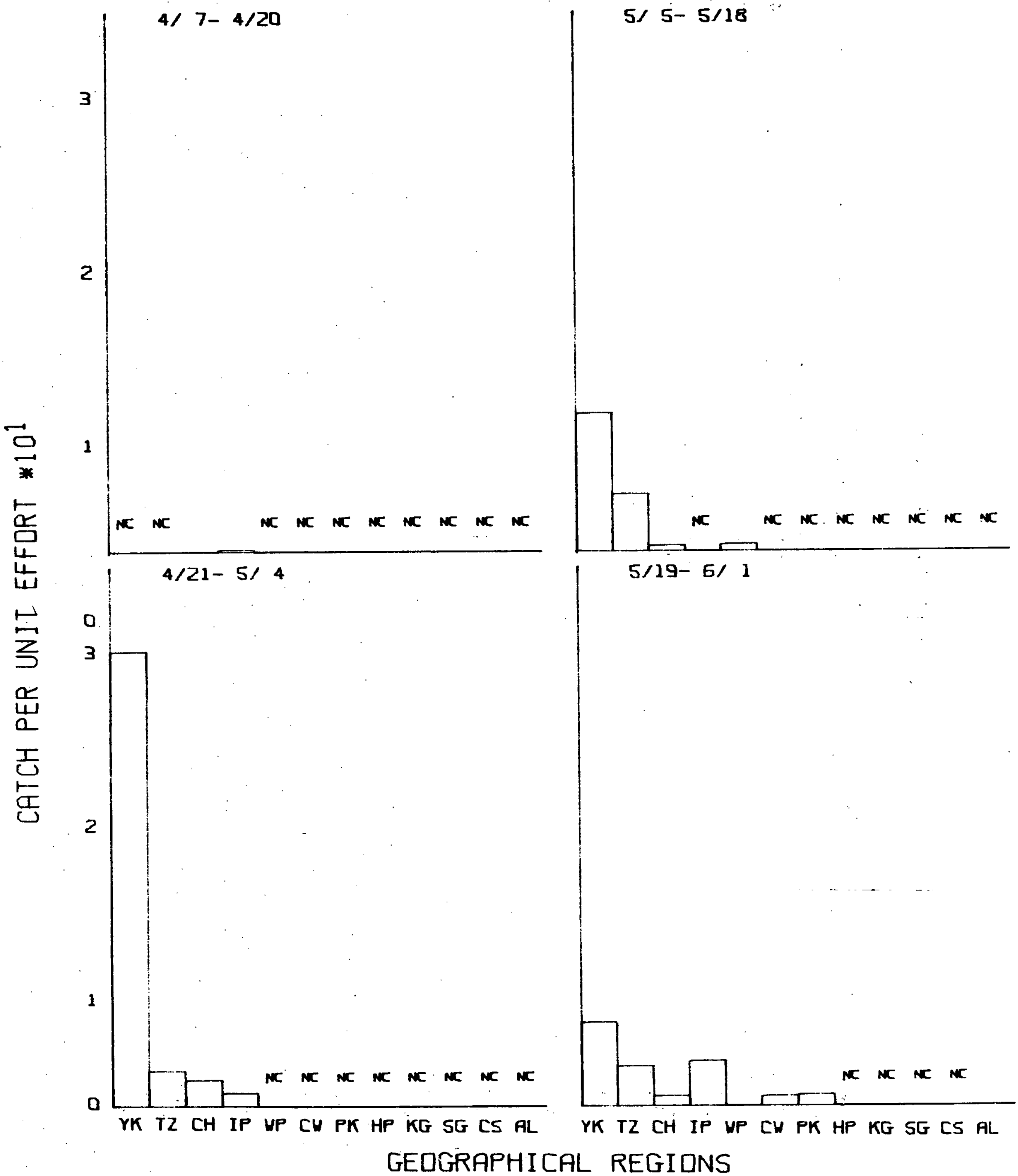
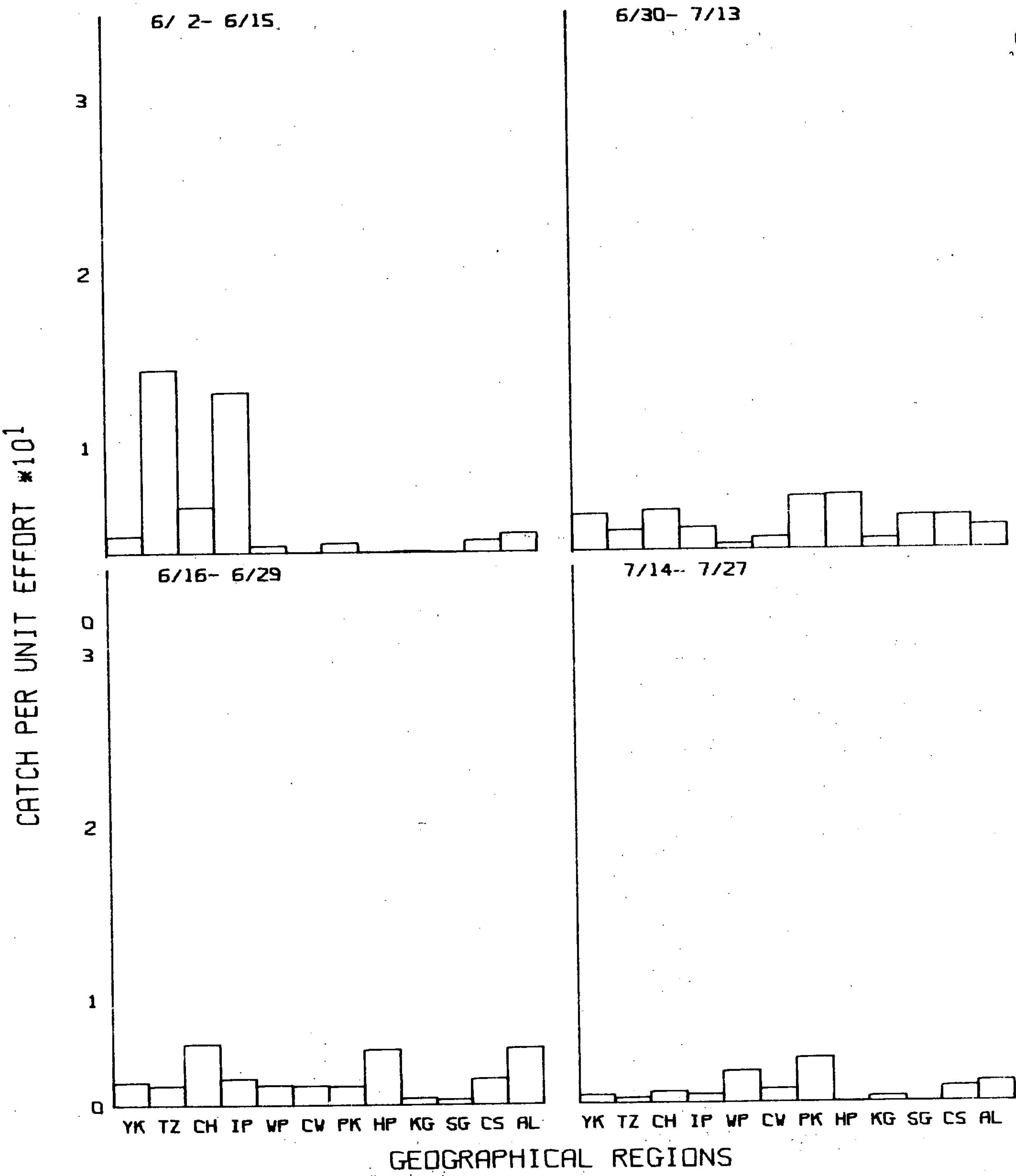


Figure D-26. Catch per Unit Effort of Yearling Striped Bass within 12 Geographical Regions of Hudson River Estuary [RM 12-153 (km 19-245)] Based on Day Sampling by 100-ft (30.5-m) Beach Seine during 1974



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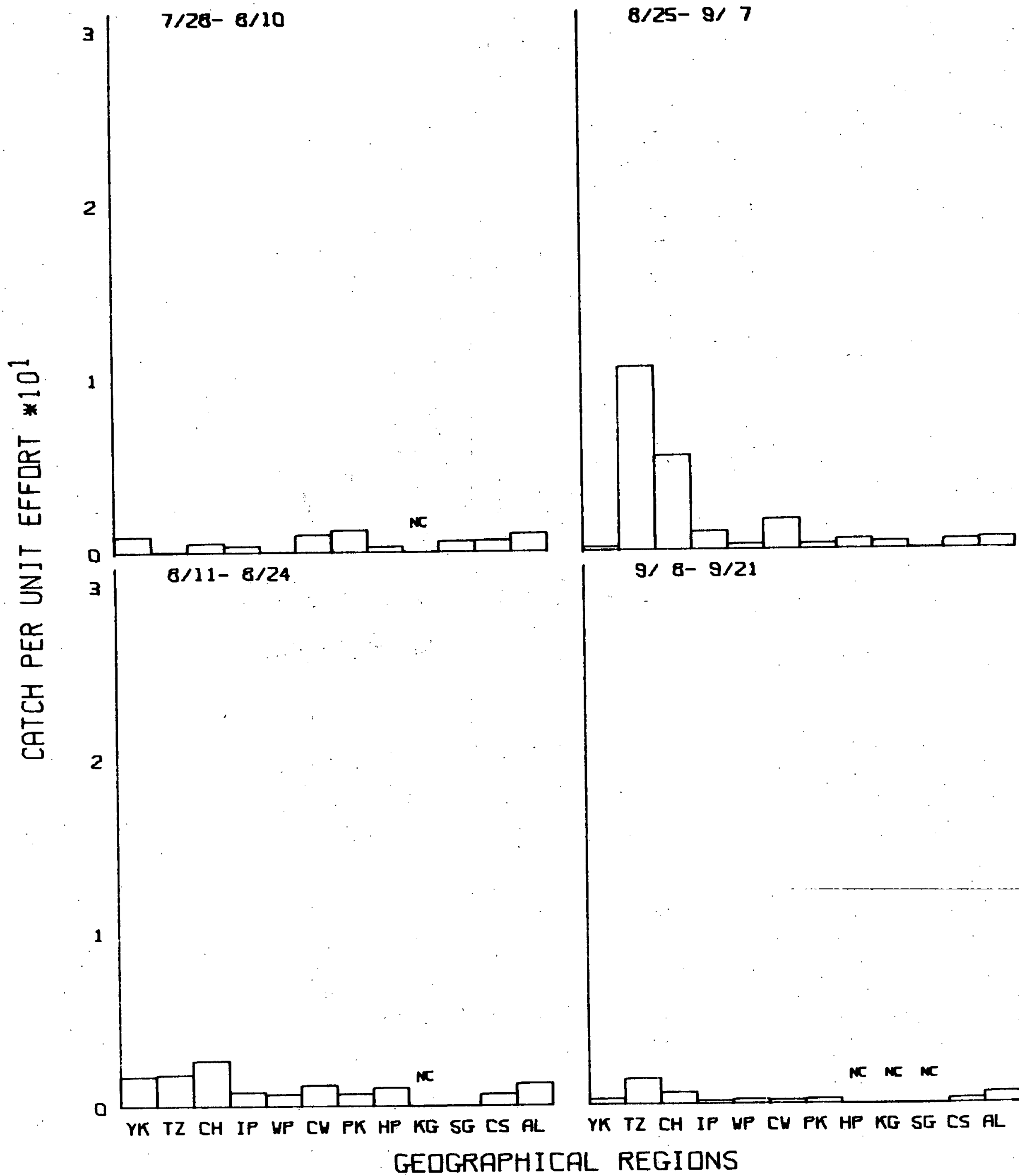

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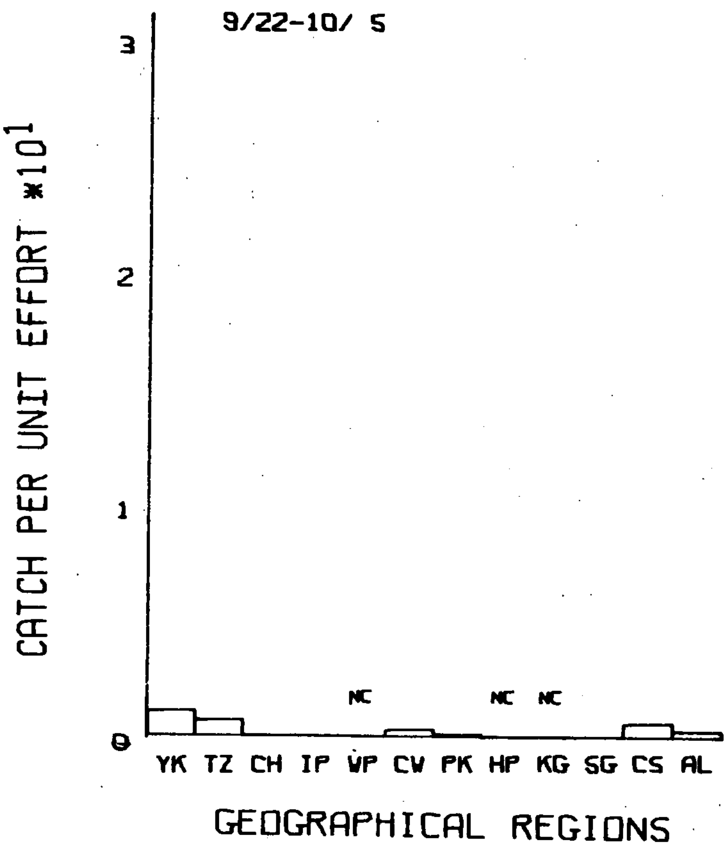

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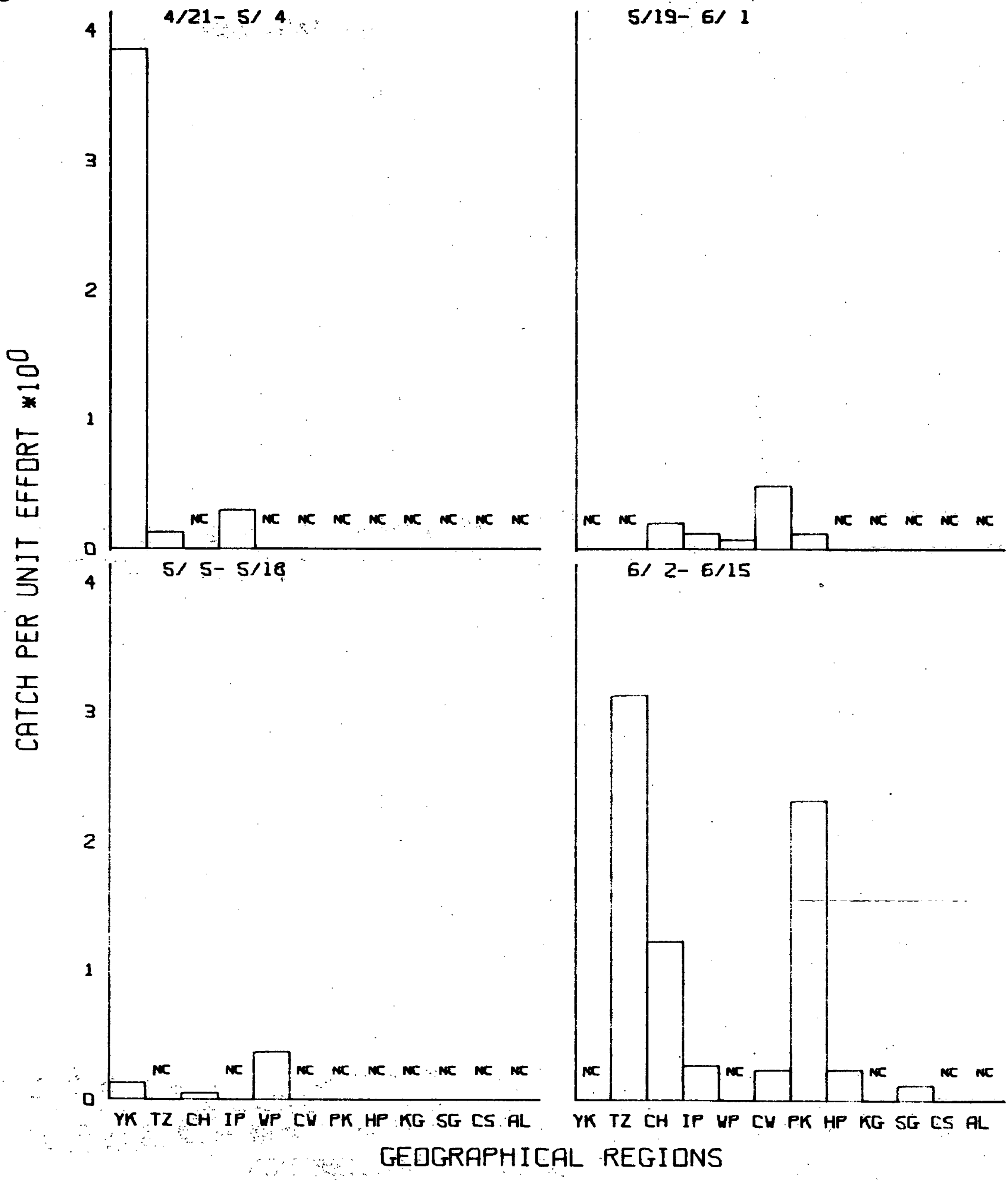
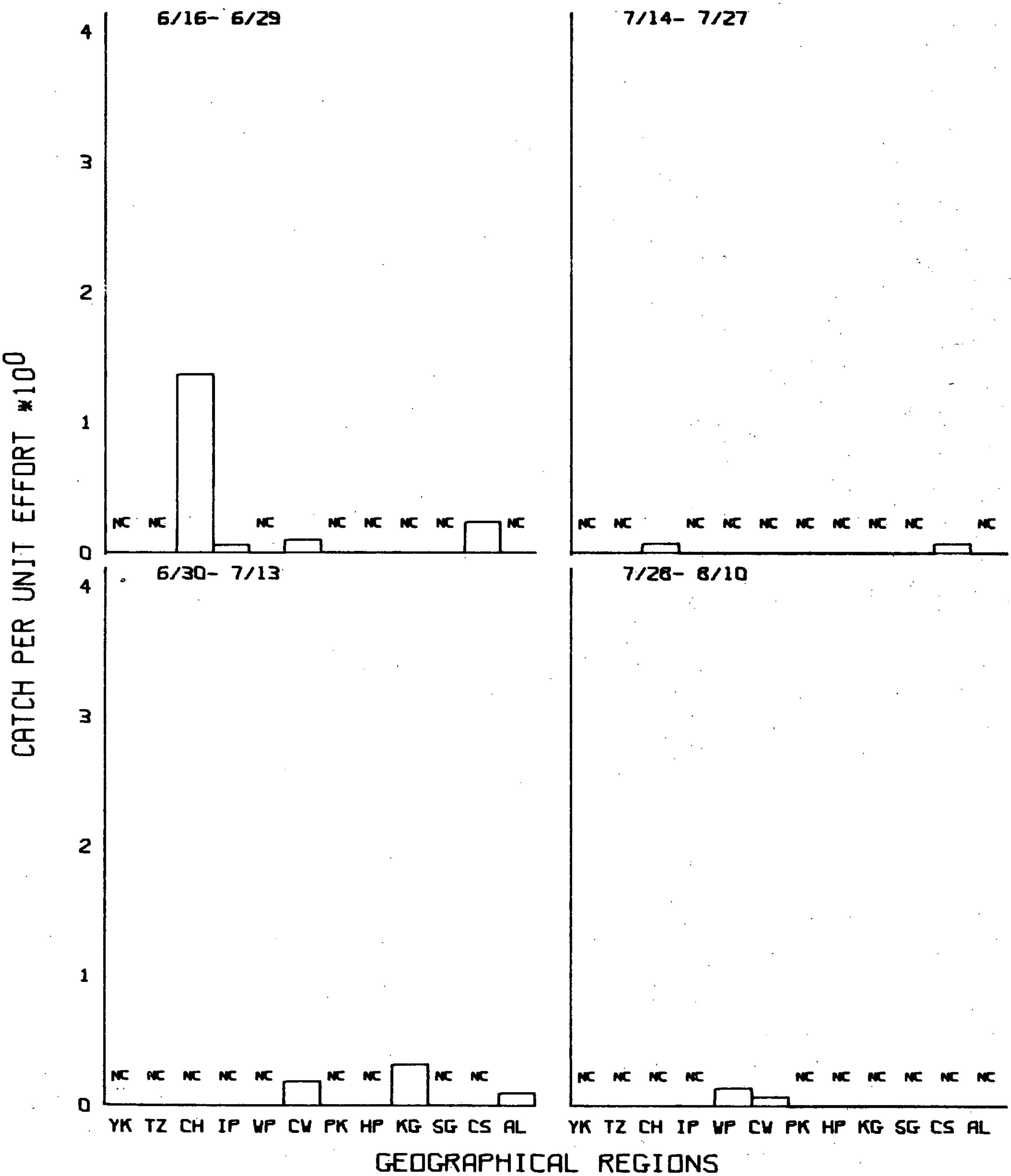


Figure D-27. Catch per Unit Effort of Age II and Older Striped Bass within 12 Geographical Regions of Hudson River Estuary [RM 12-153 (km 19-245)] Based on Day Sampling by 100-ft (30.5-m) Beach Seine during 1974



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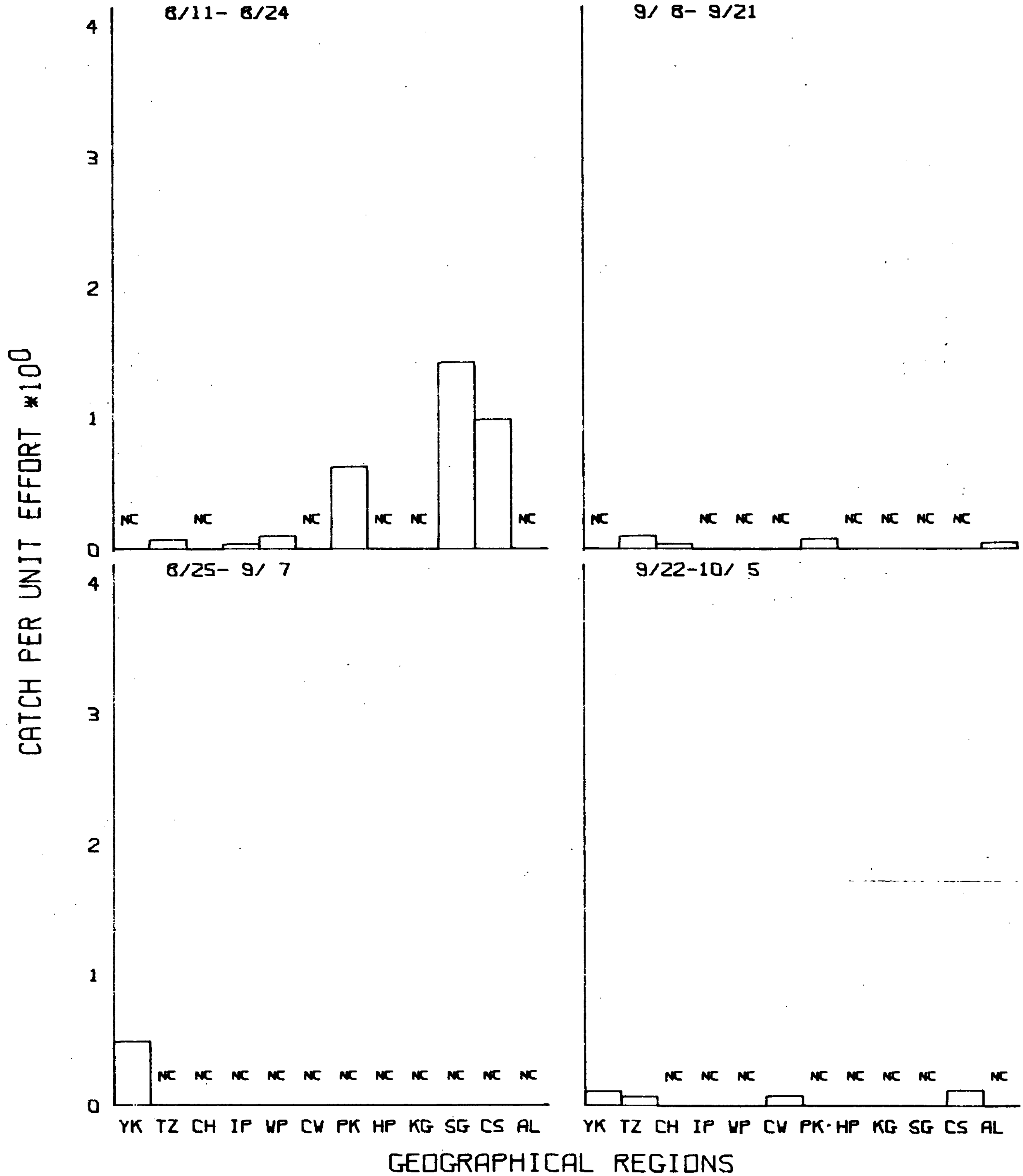

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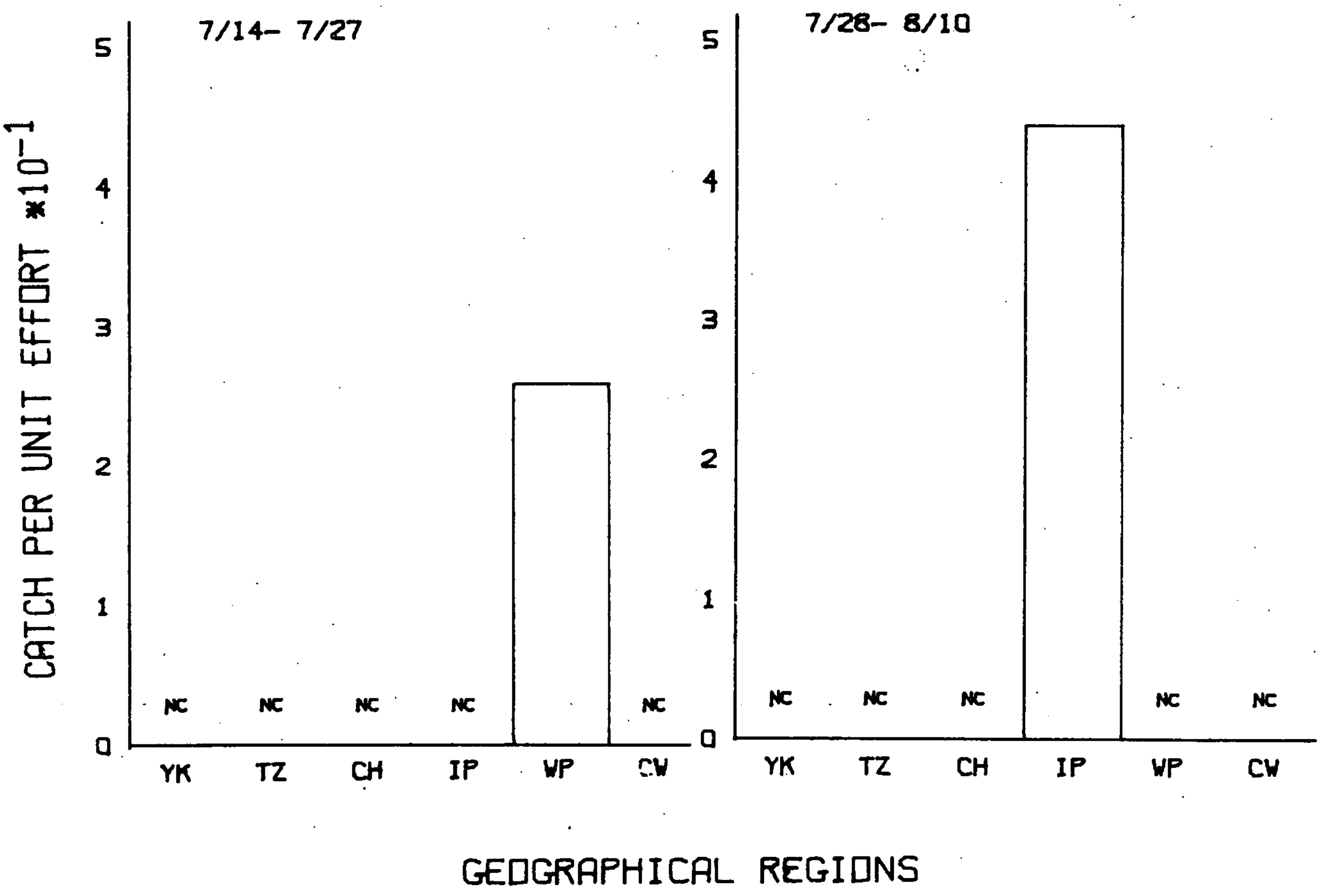


Figure D-28. Catch per Unit Effort of Juvenile Striped Bass within Six Geographical Regions of Hudson River Estuary [RM 12-61 (km 19-98)] Based on Day Sampling by Bottom Trawl (Cod End/ Cover Combined) during 1974

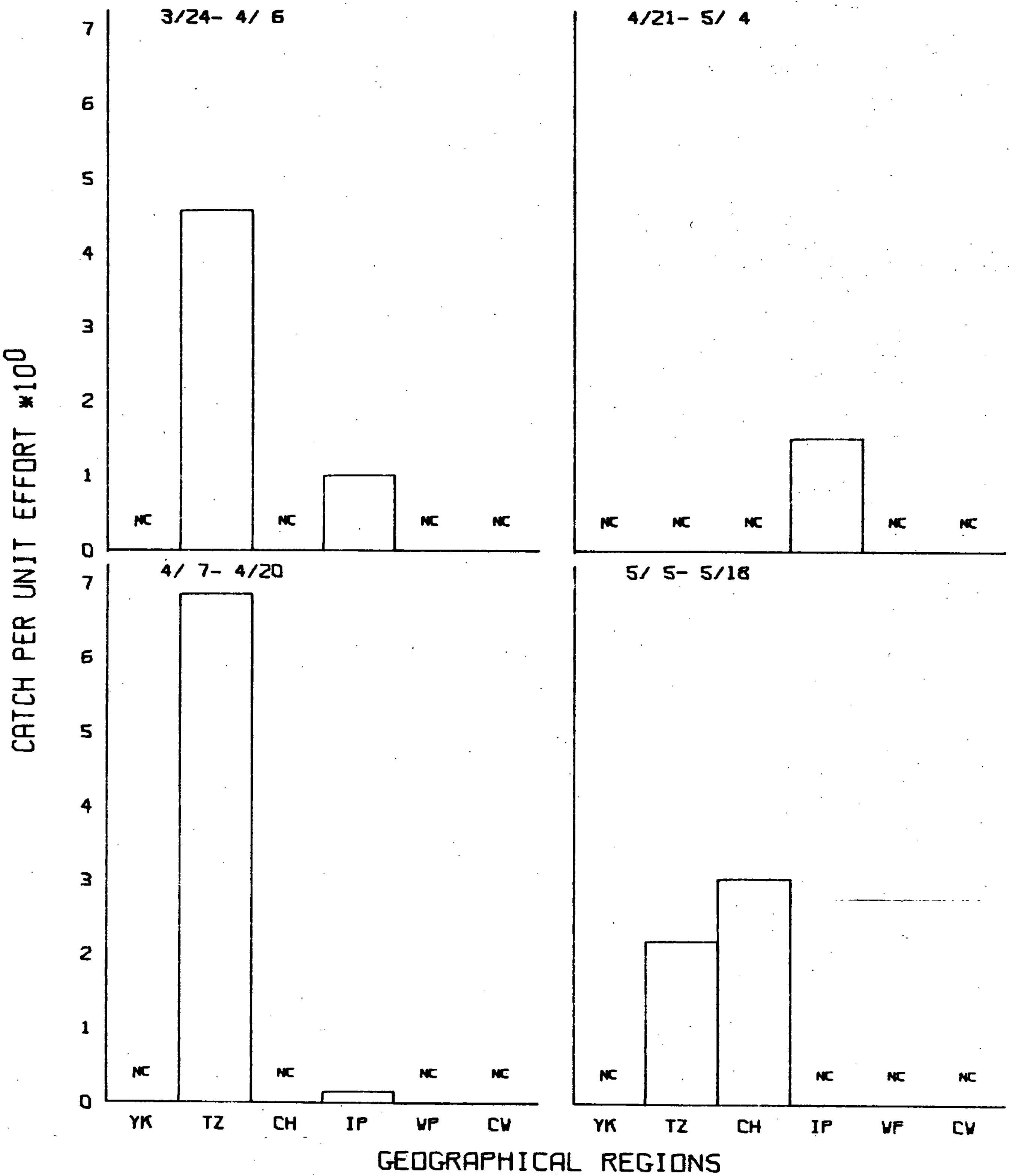
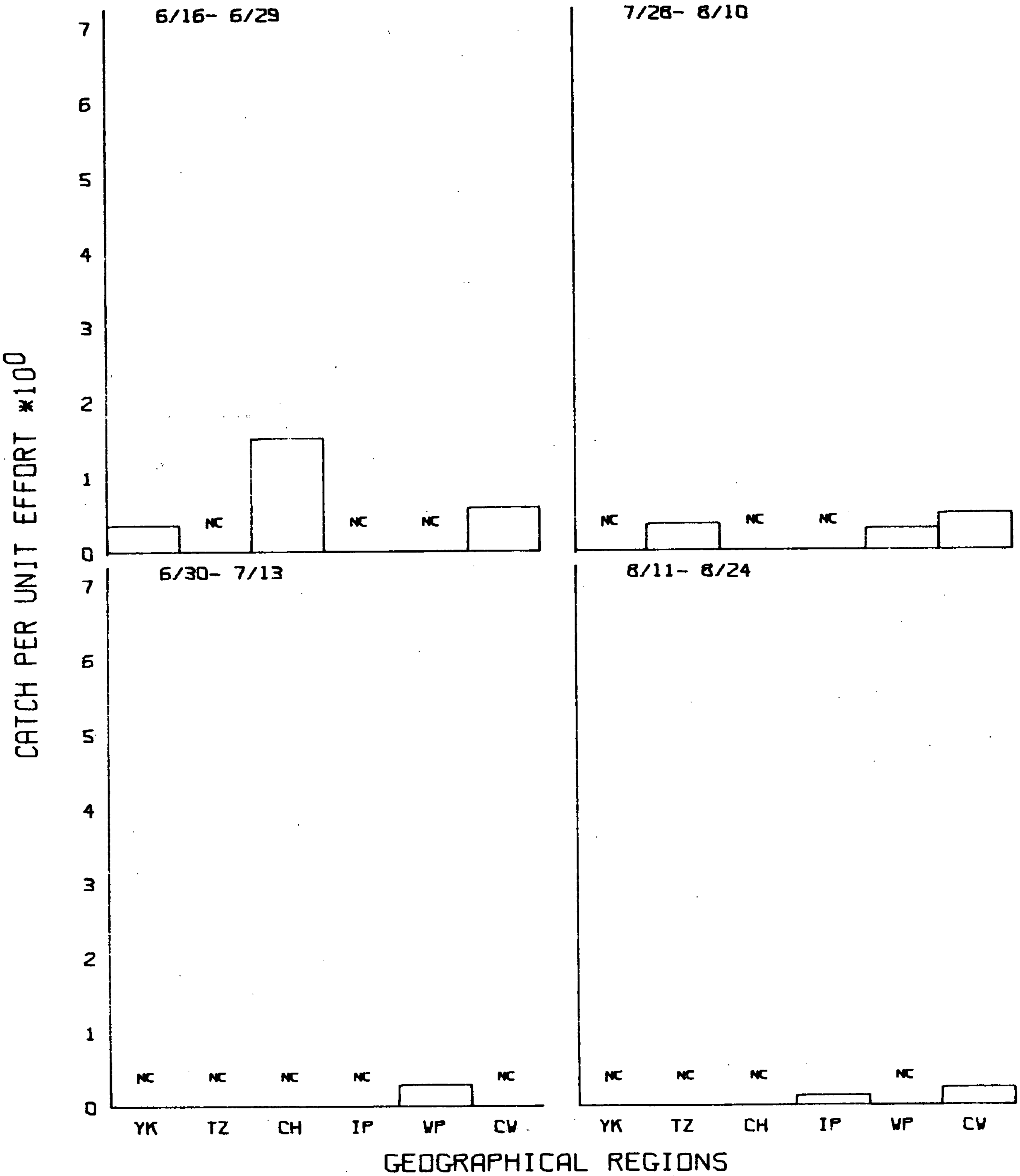


Figure D-29. Catch per Unit Effort of Yearling Striped Bass within Six Geographical Regions of Hudson River Estuary [RM 12-61 (km 19-98)] Based on Day Sampling by Bottom Trawl (Cod End/ Cover Combined) during 1974



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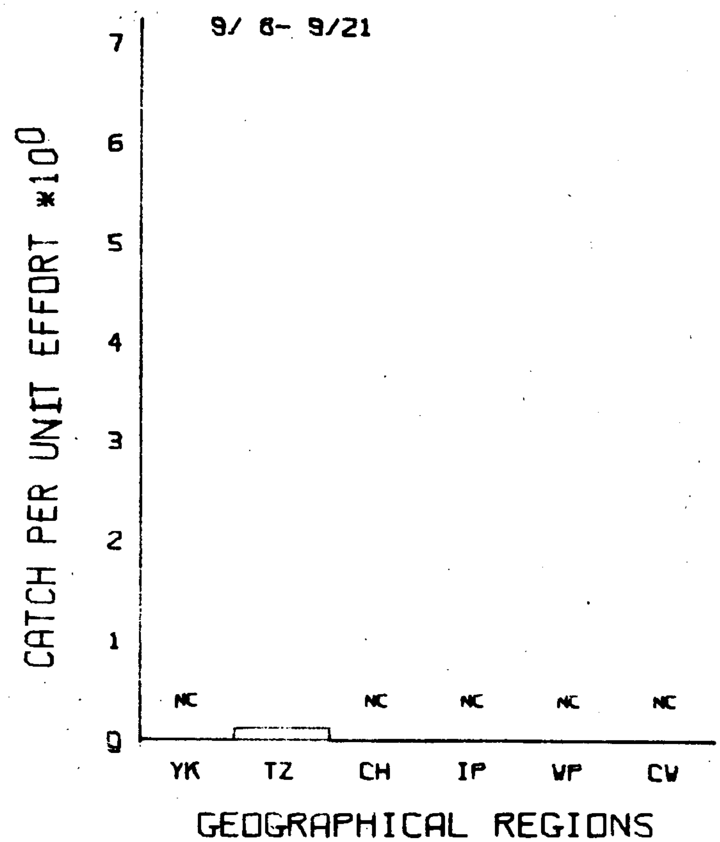

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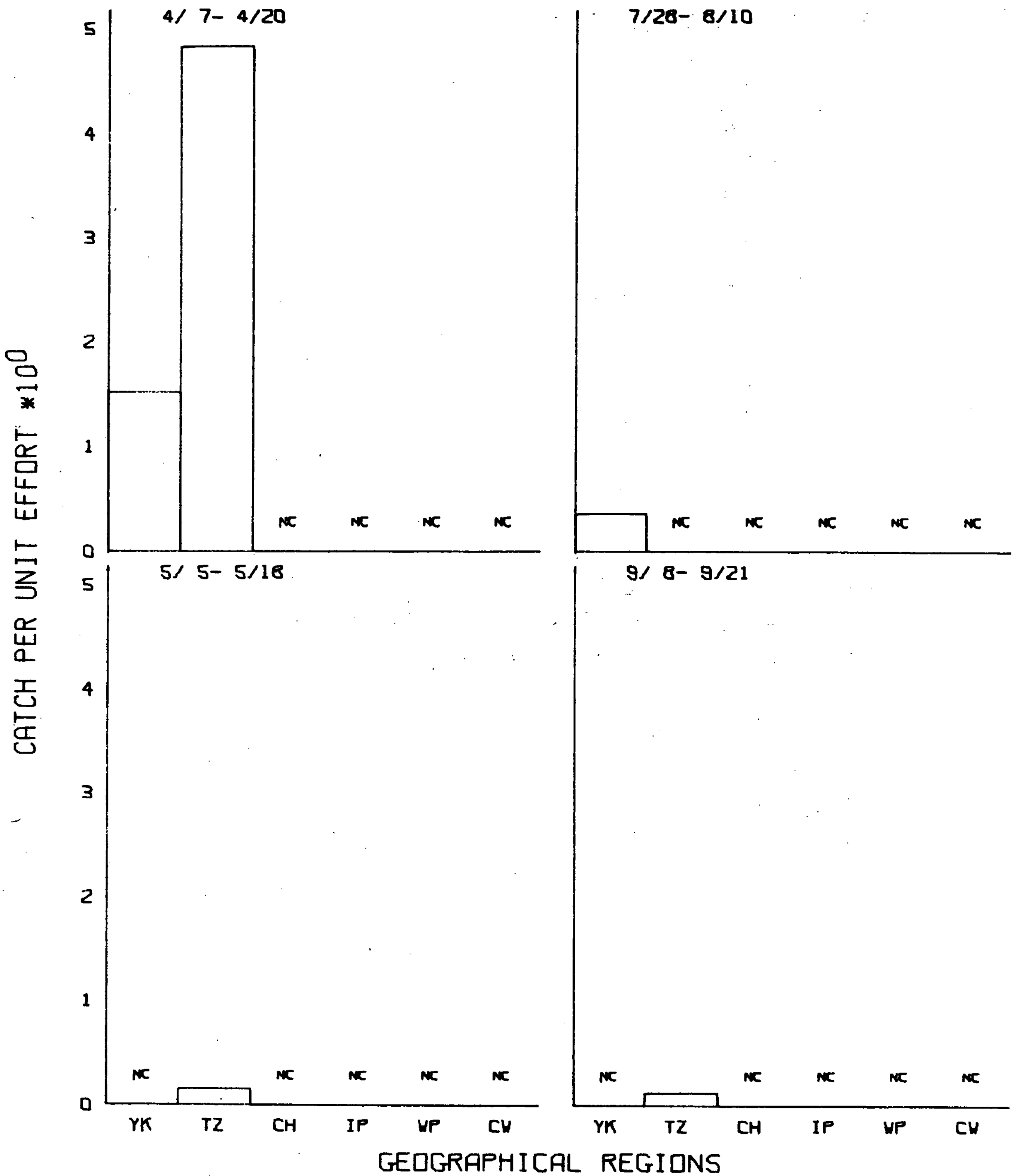


Figure D-30. Catch per Unit Effort of Age II and Older Striped Bass within Six Geographical Regions of Hudson River Estuary [RM 12-61 (km 19-98)] Based on Day Sampling by Bottom Trawl (Cod End/ Cover Combined) during 1974

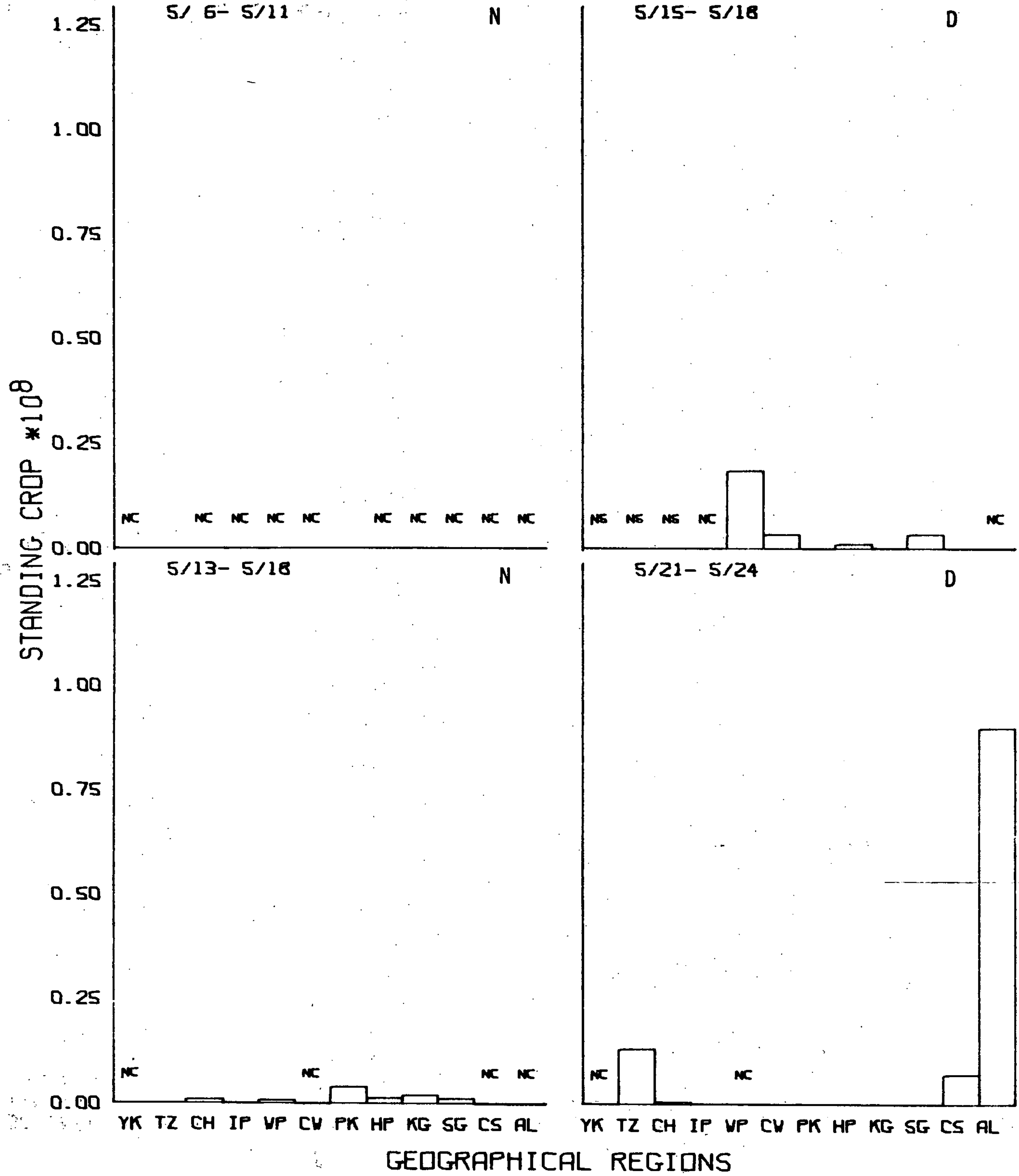
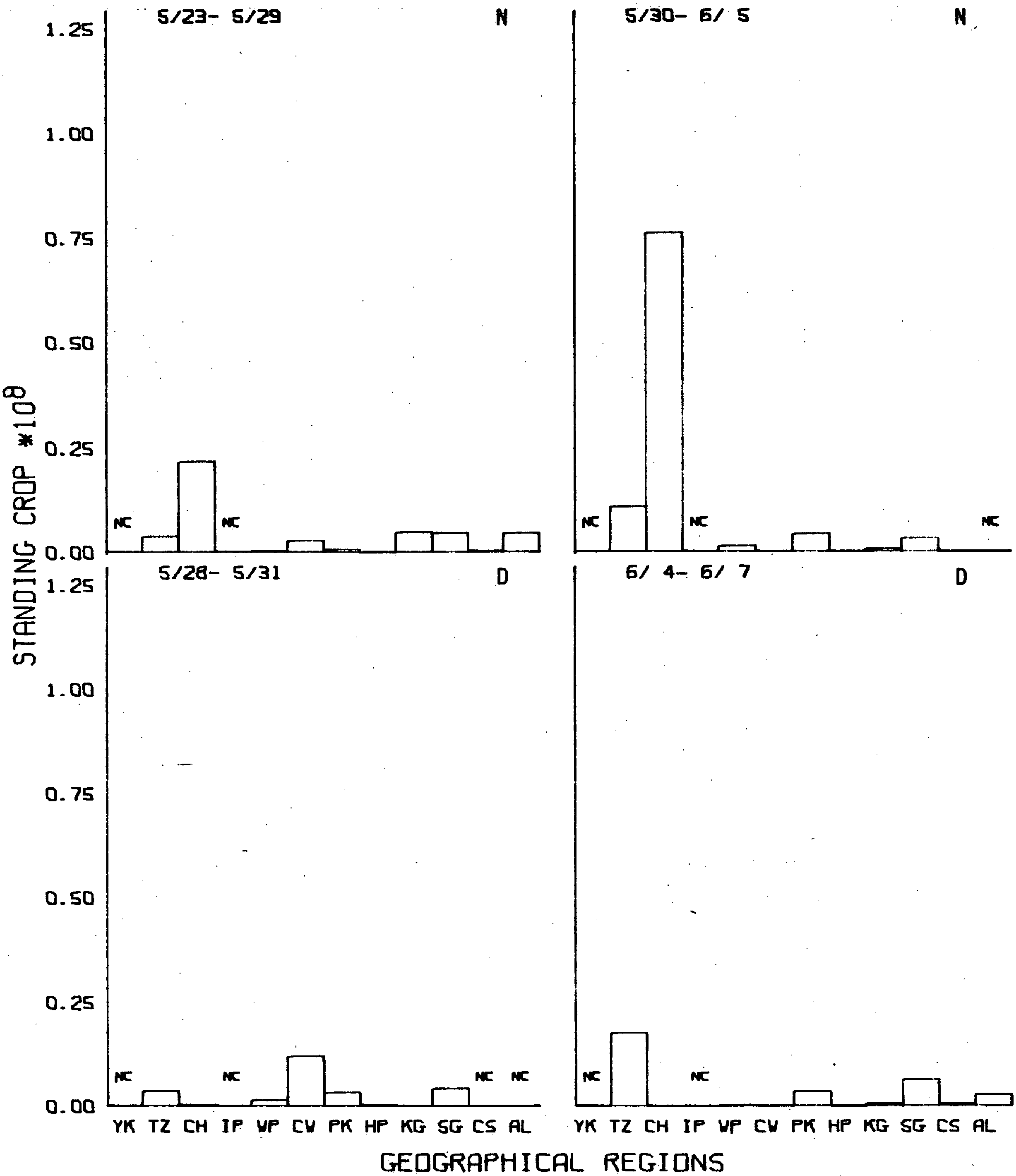


Figure D-31. Standing Crop of White Perch Eggs within 12 Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Day or Night Sampling by Epibenthic Sled or Tucker Trawl during 1974



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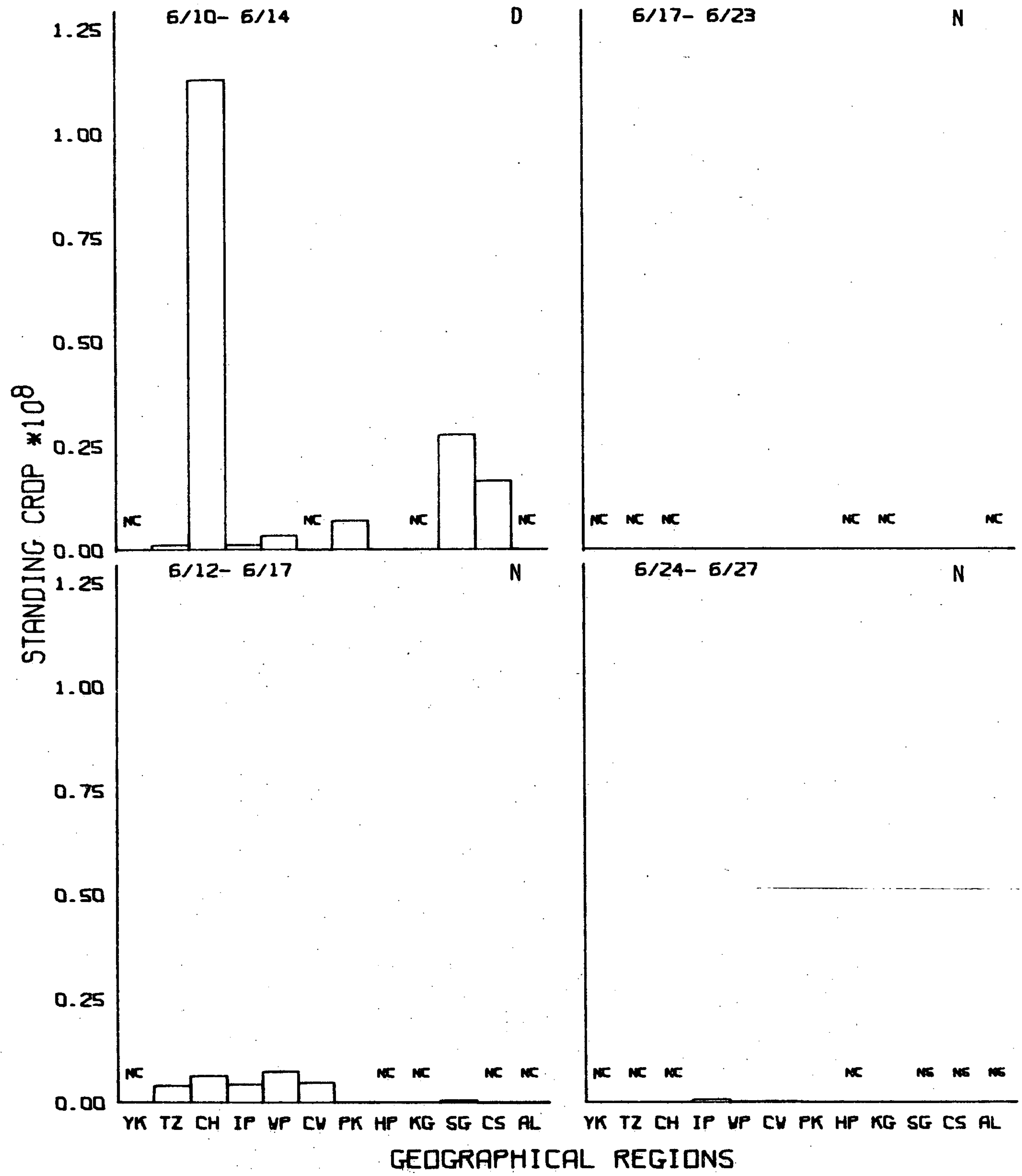

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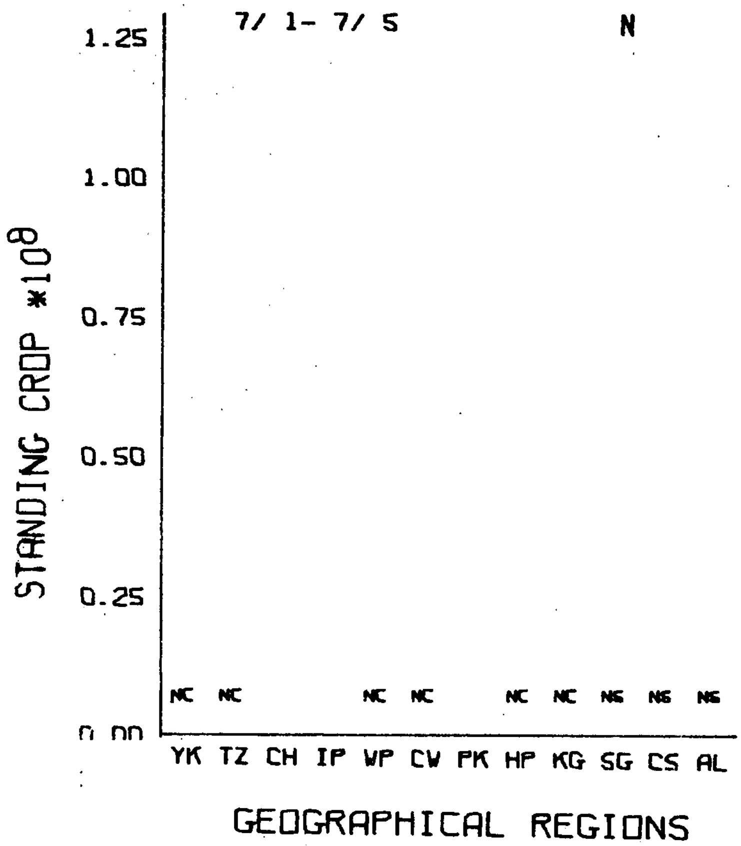

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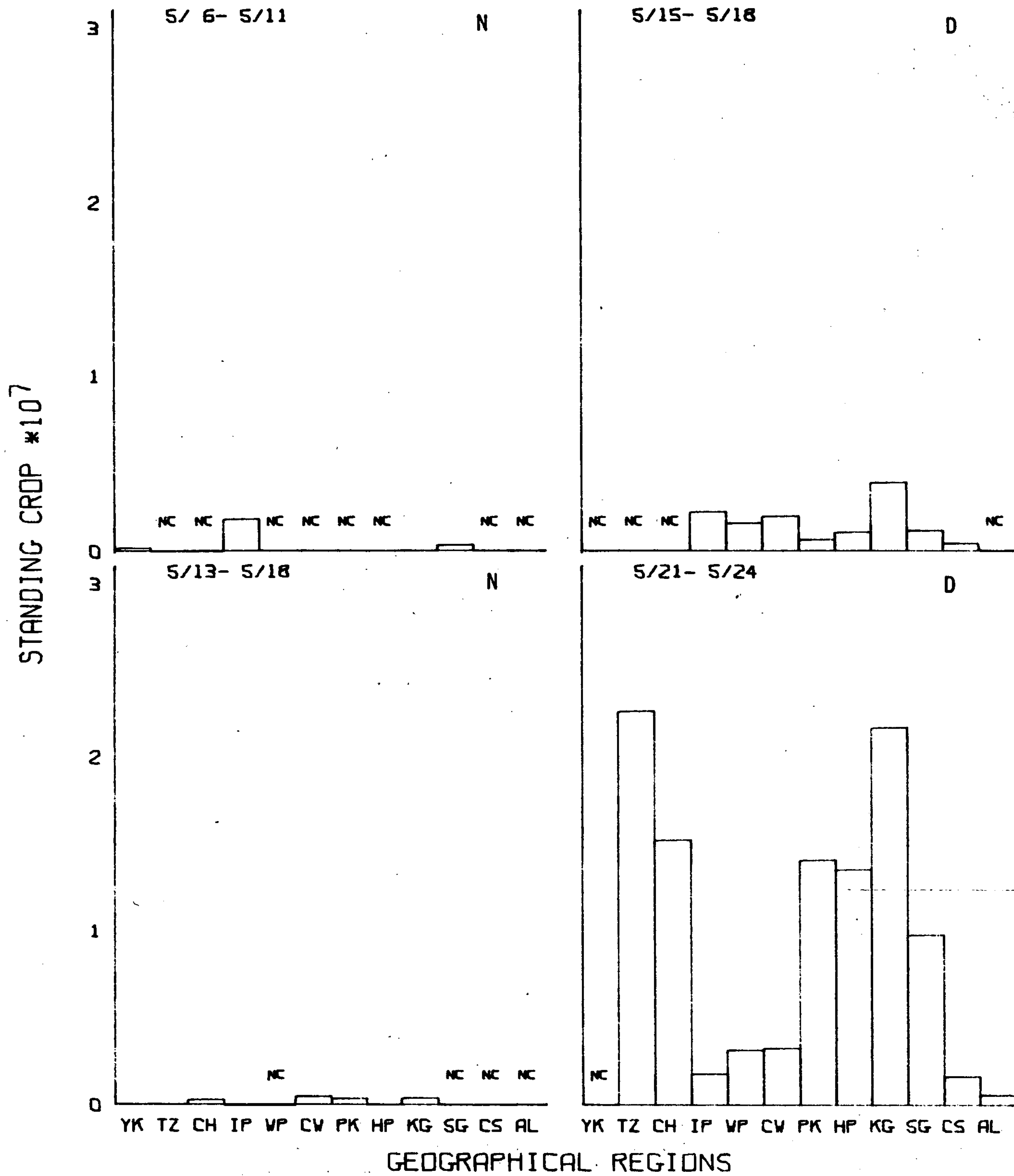
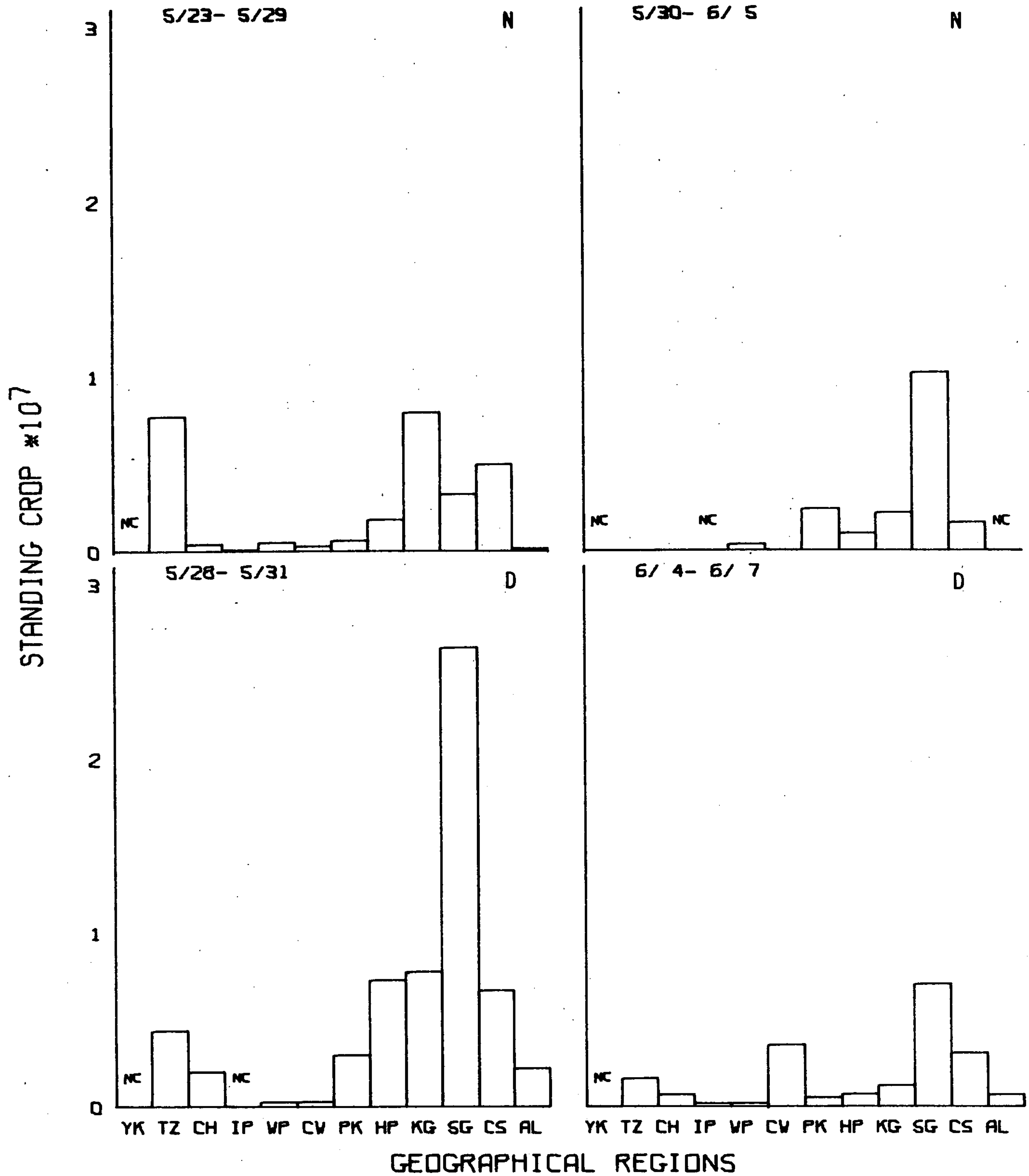


Figure D-32. Standing Crop of White Perch Yolk-Sac Larvae within 12 Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Day or Night Sampling by Epibenthic Sled or Tucker Trawl during 1974



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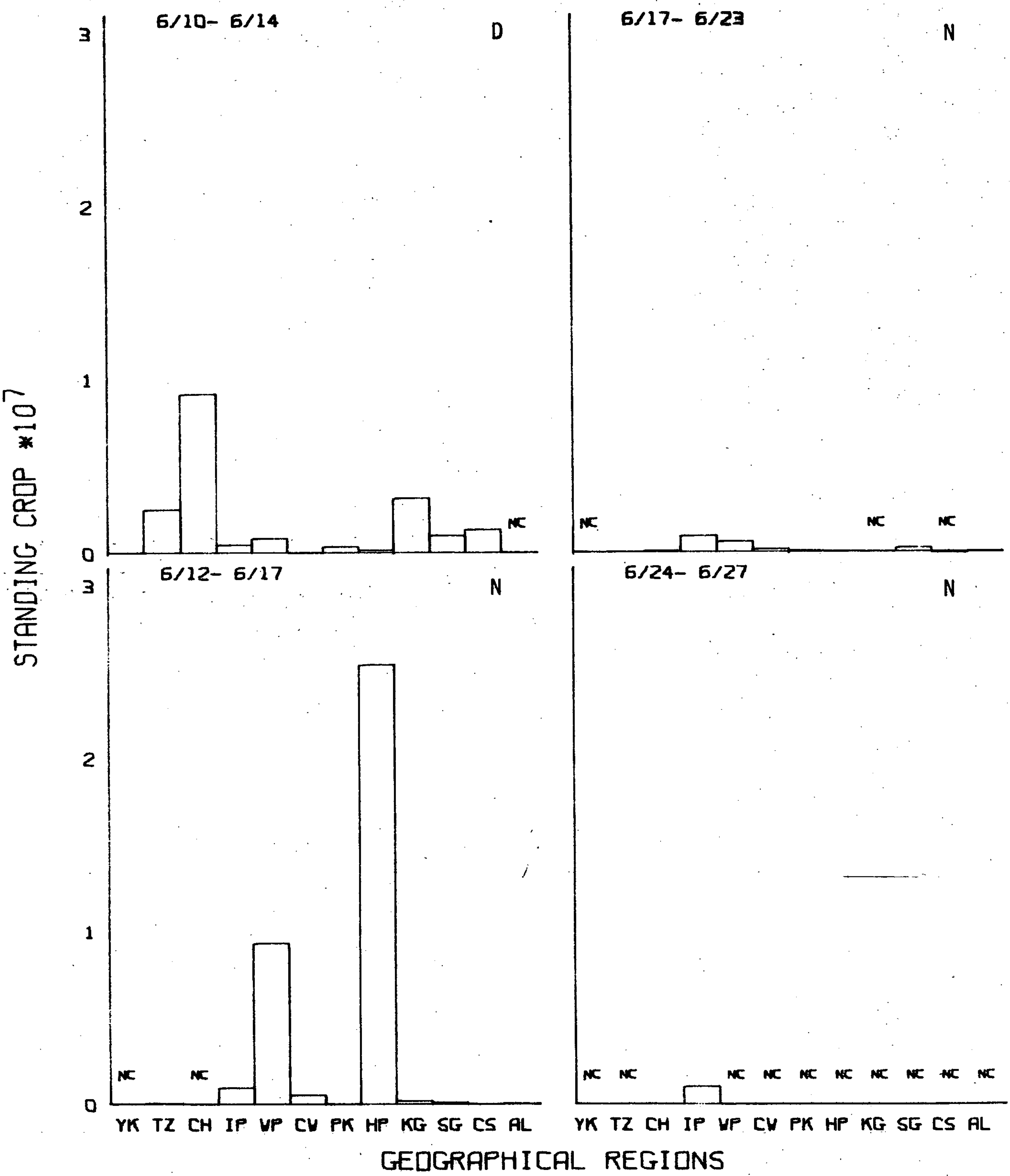

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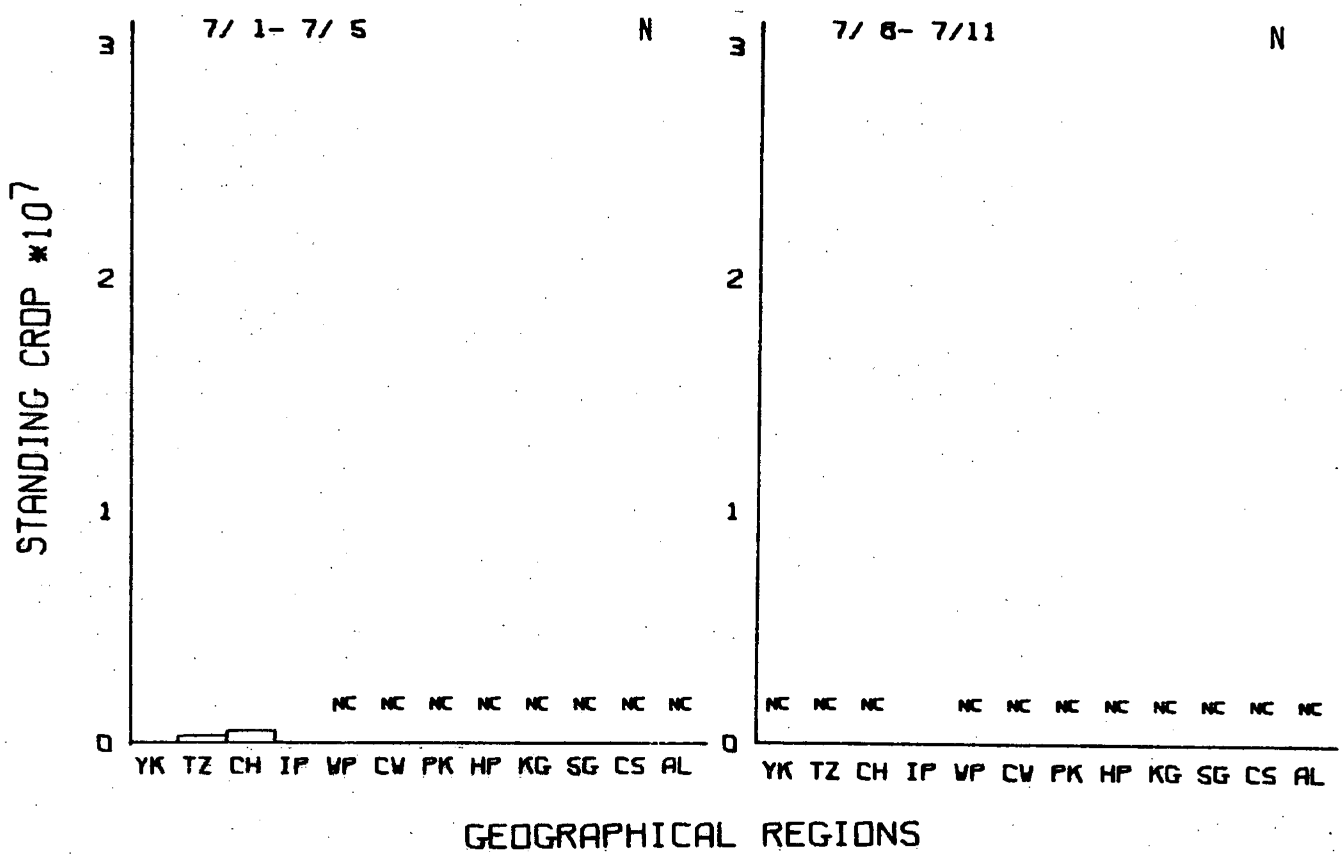

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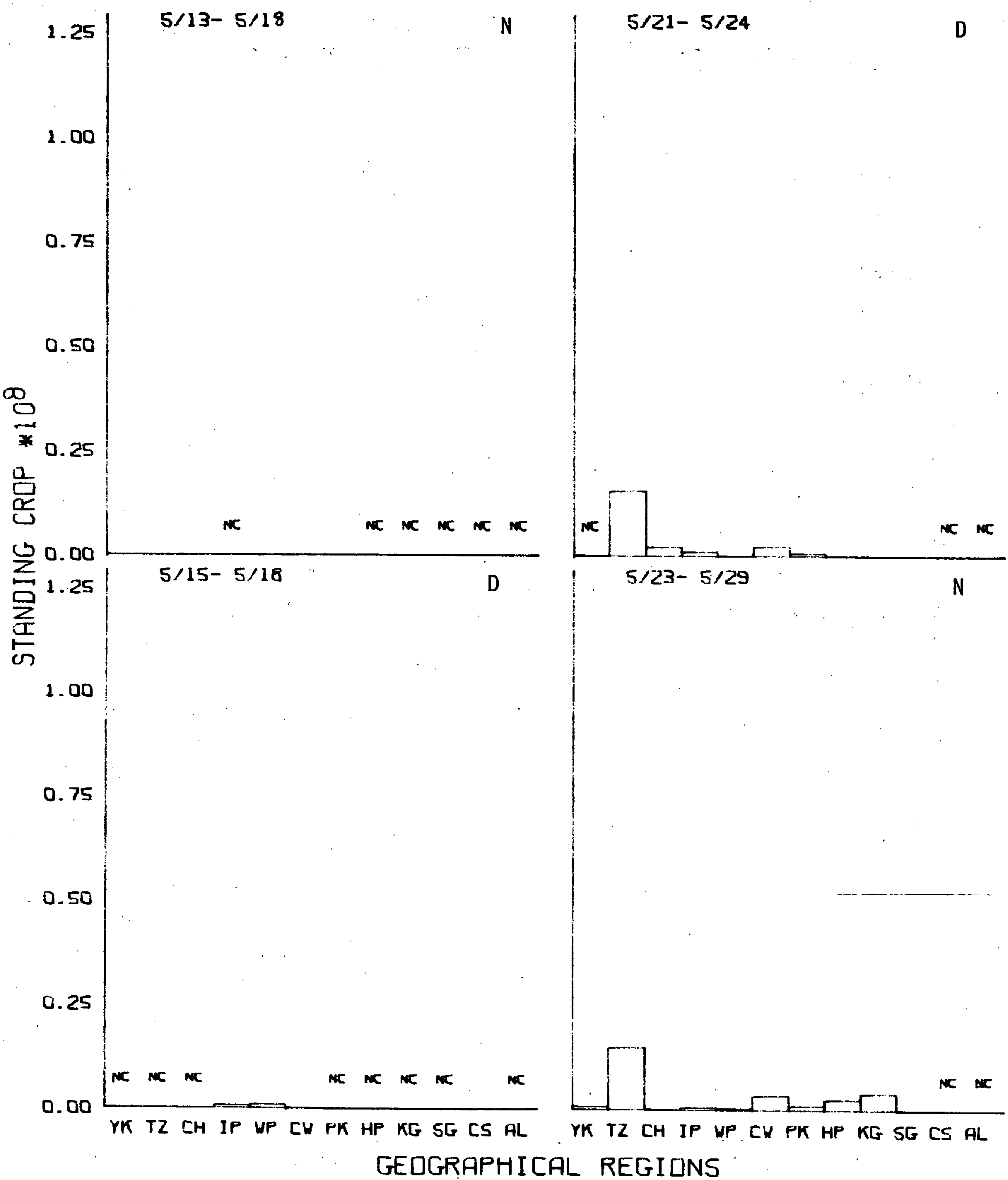
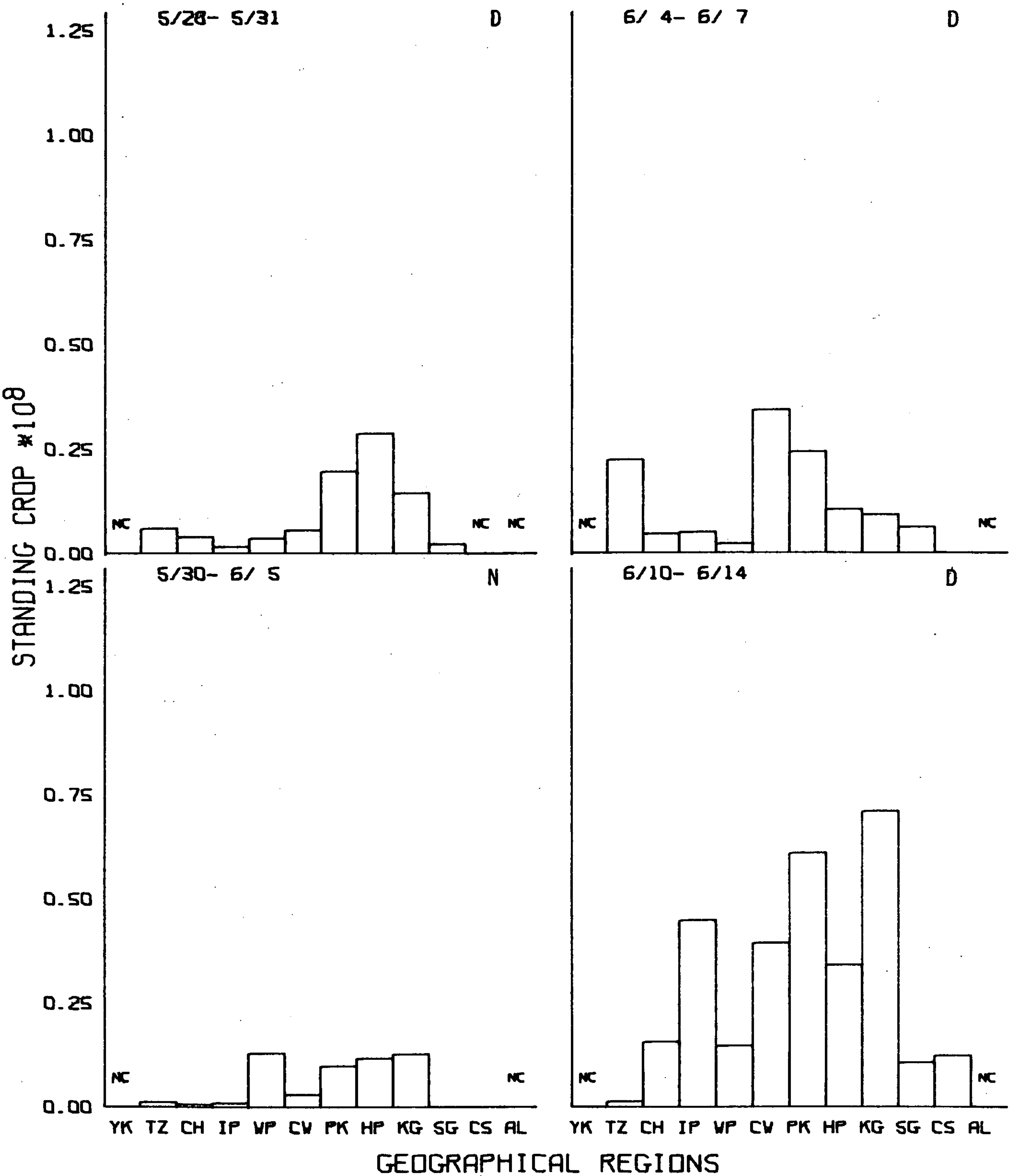


Figure D-33. Standing Crop of White Perch Post Yolk-Sac Larvae within 12 Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Day or Night Sampling by Epibenthic Sled or Tucker Trawl during 1974



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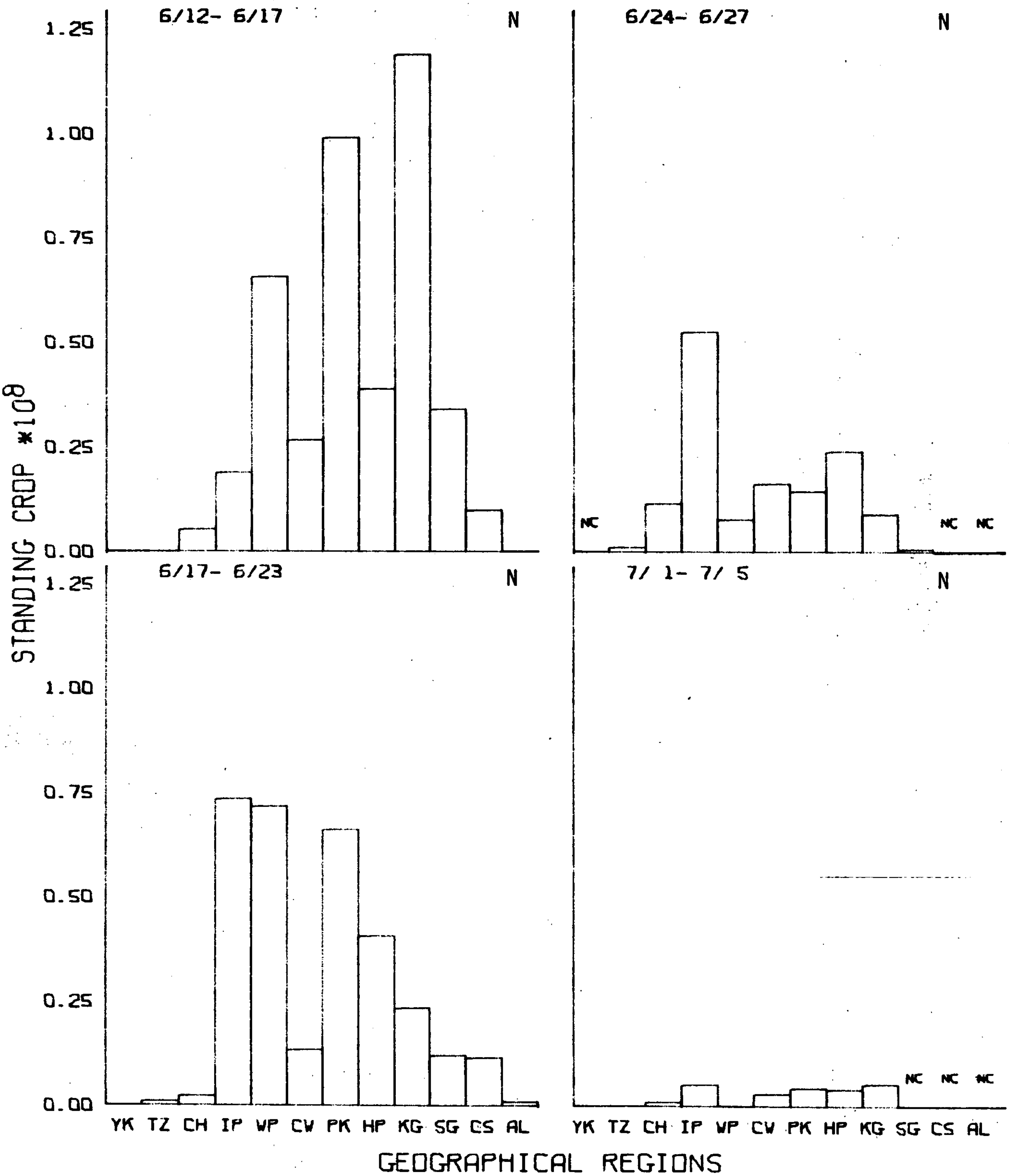

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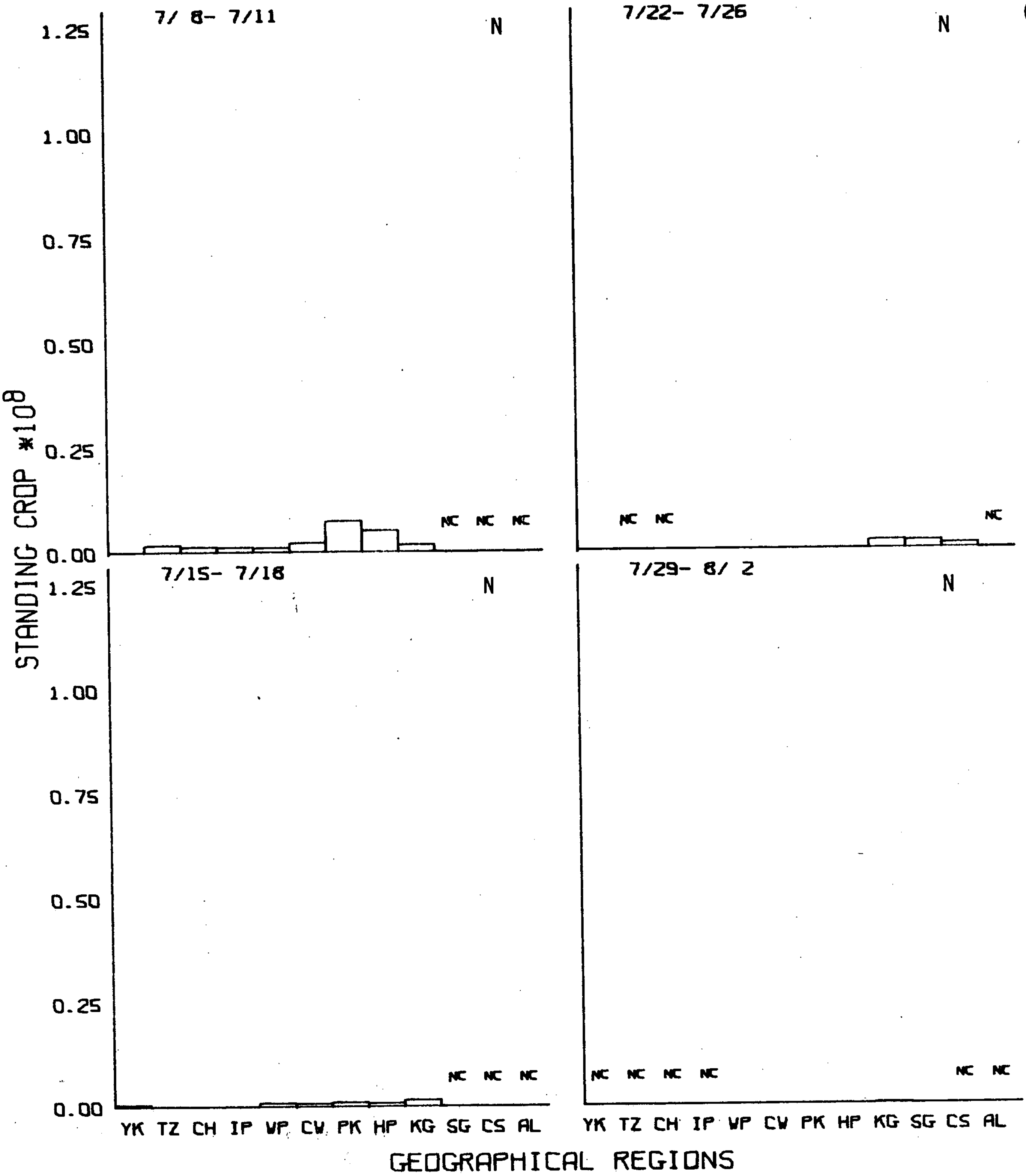

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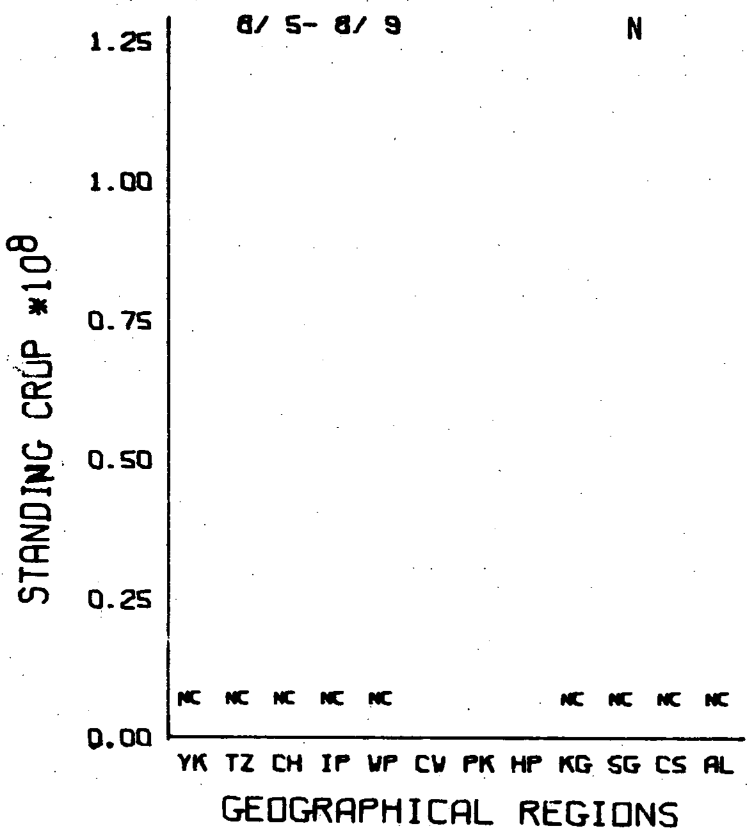

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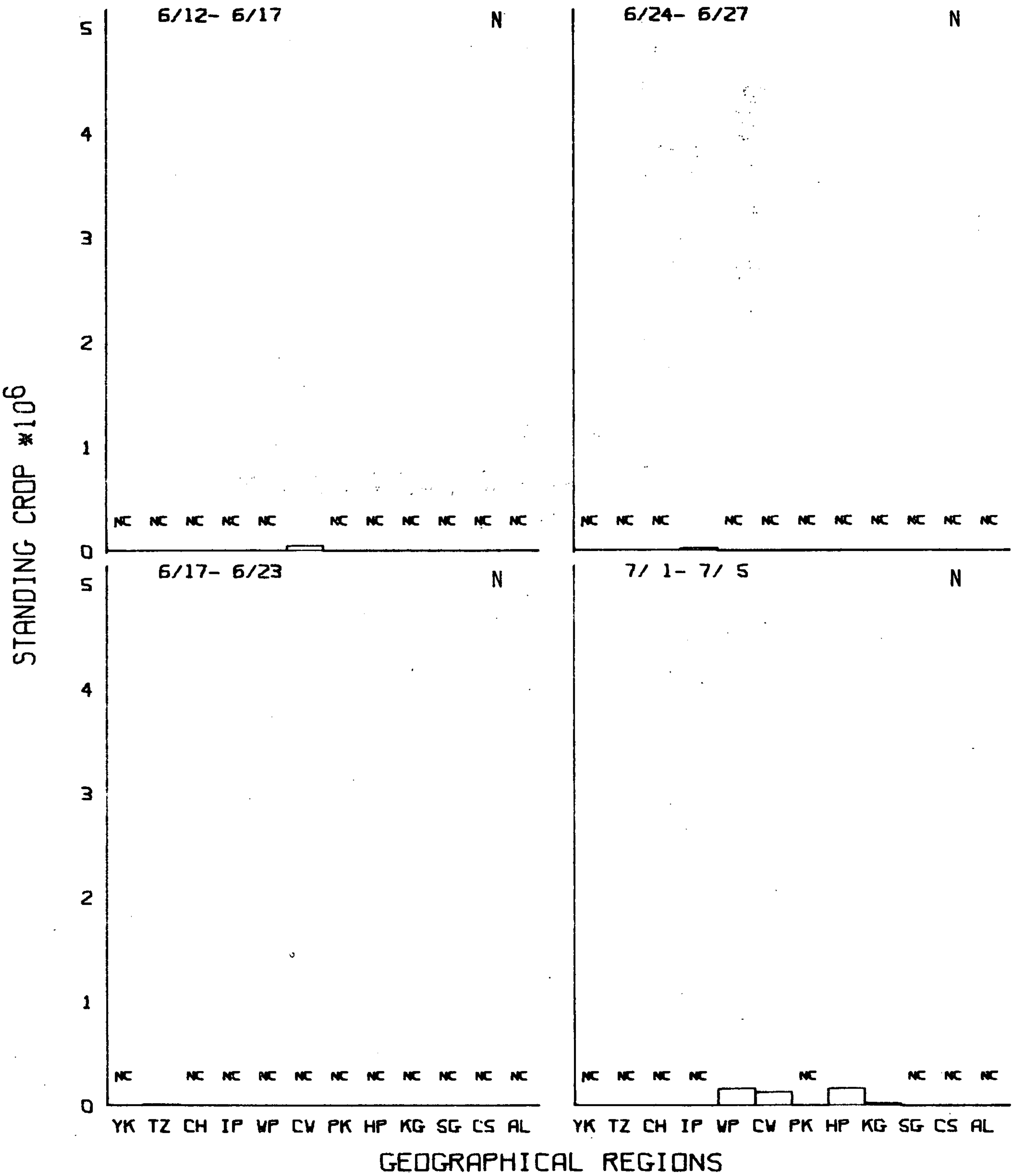
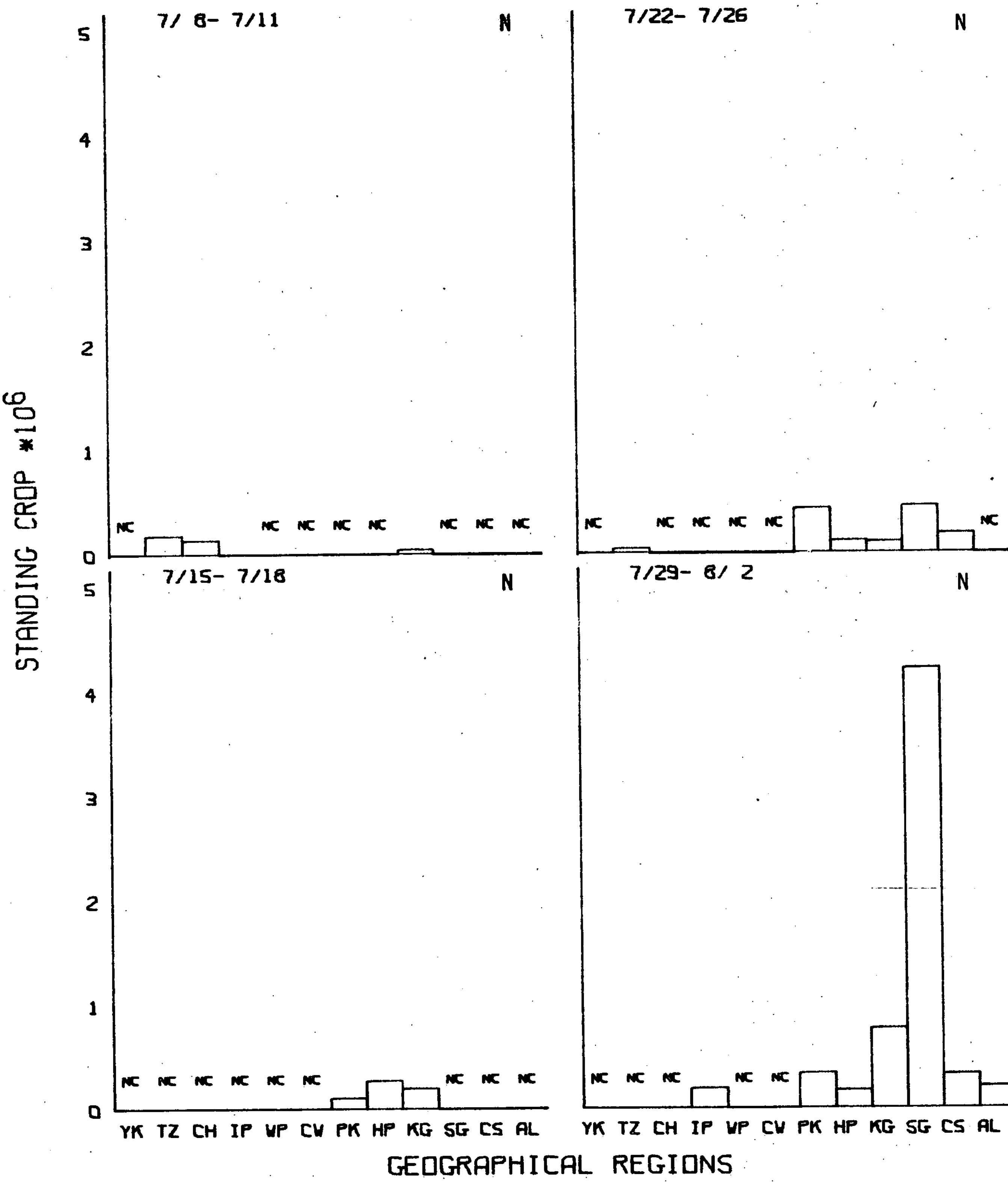


Figure D-34. Standing Crop of Juvenile White Perch within 12 Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Day or Night Sampling by Epibenthic Sled or Tucker Trawl during 1974



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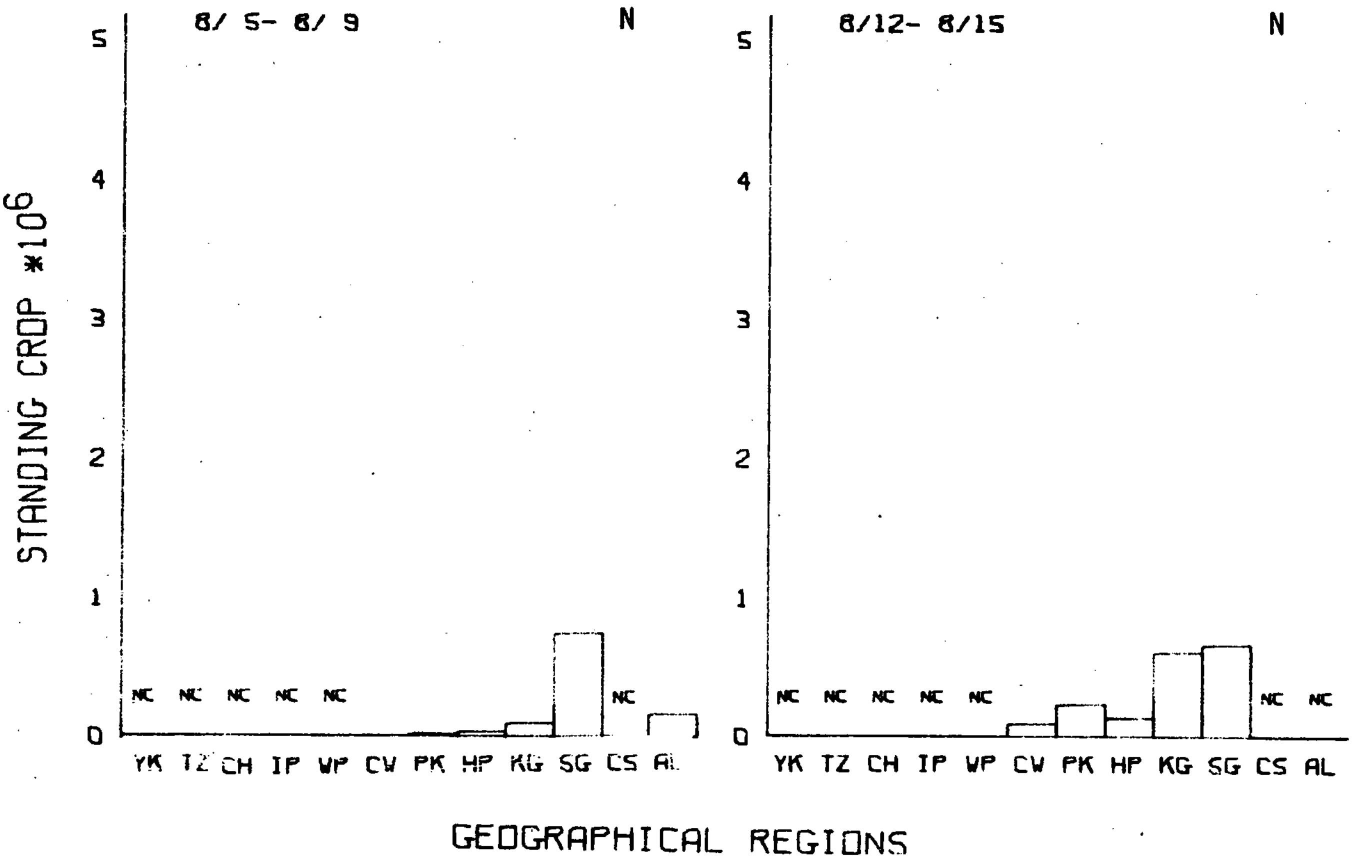

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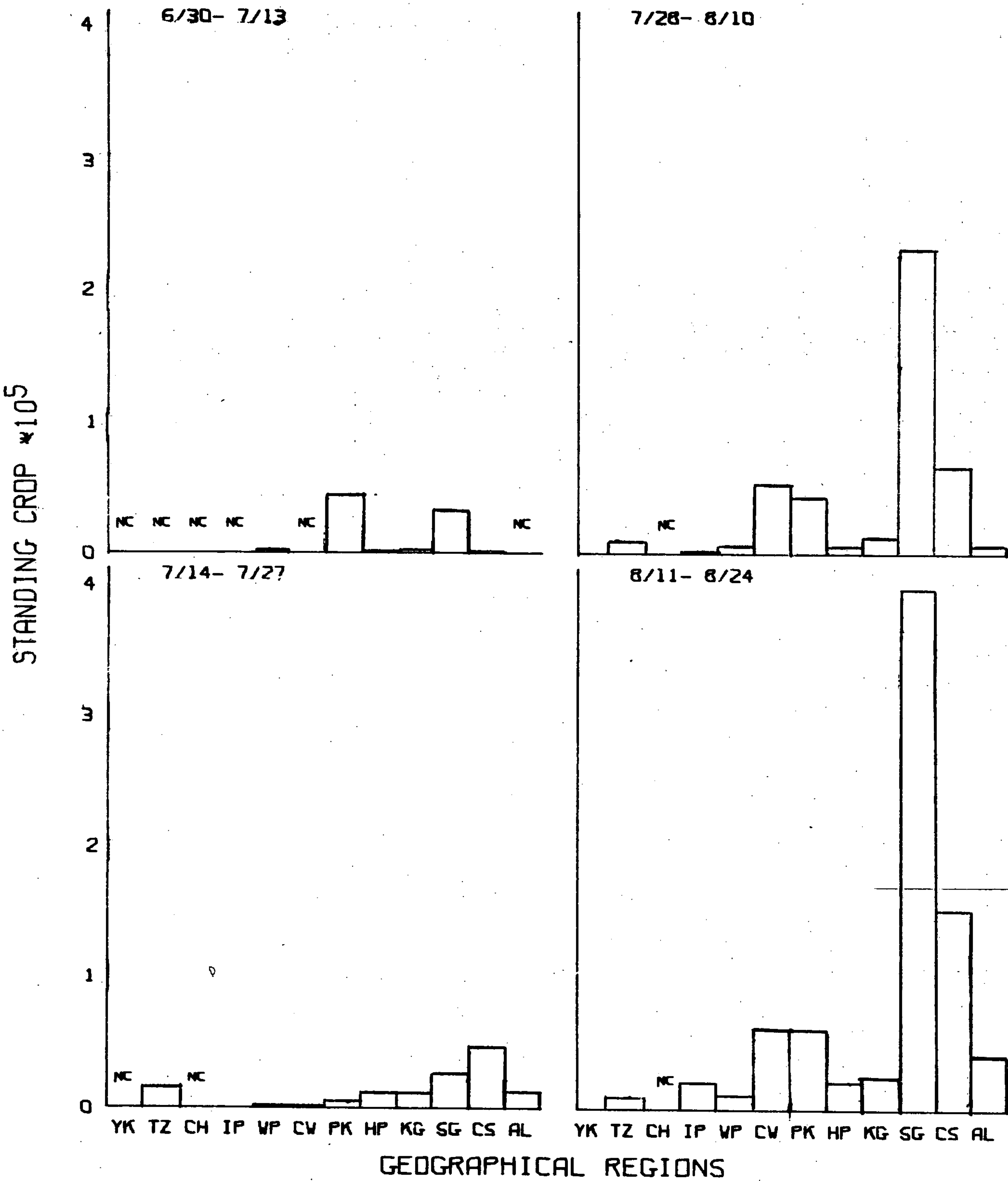
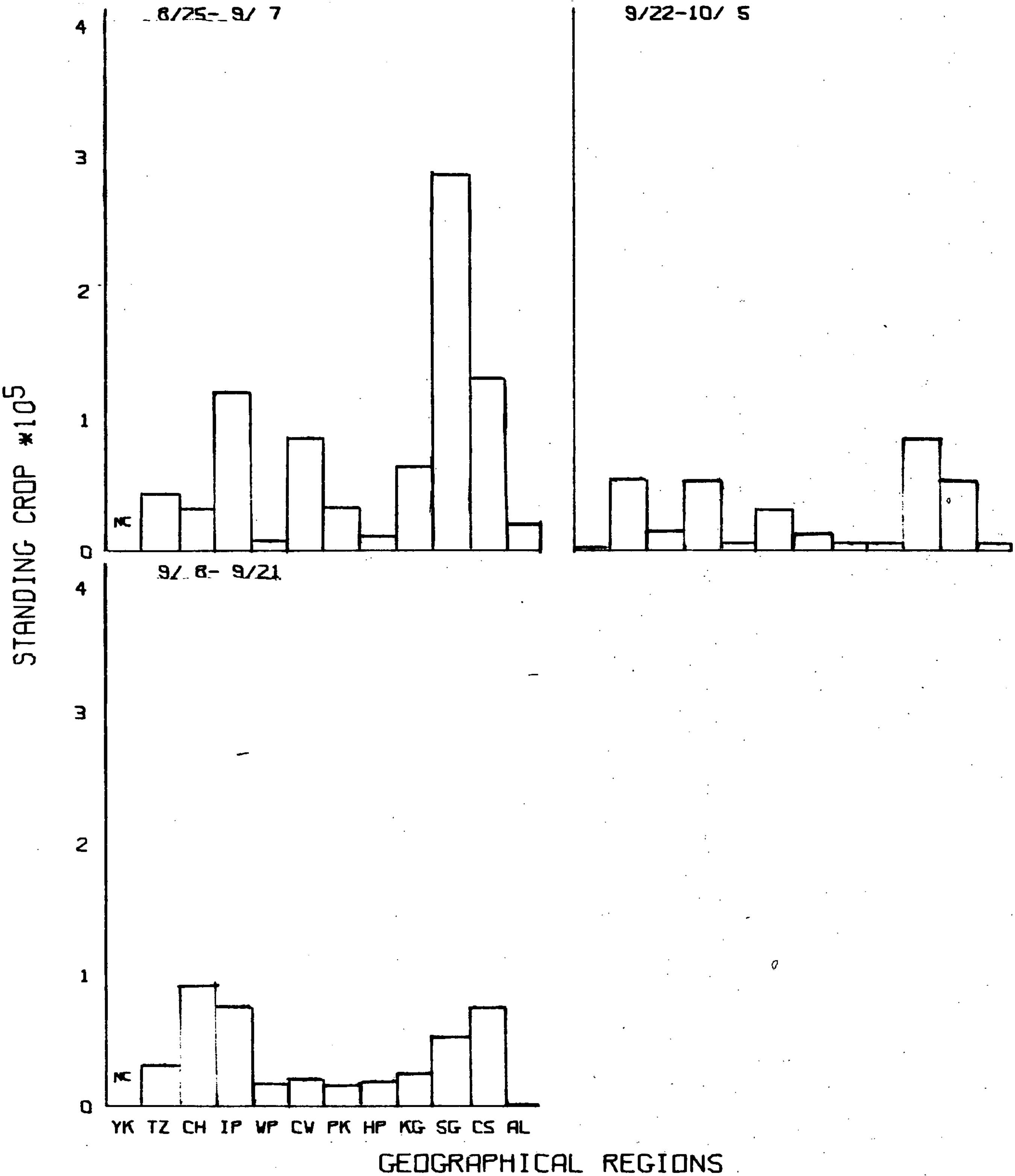


Figure D-35. Standing Crop of Juvenile White Perch within 12 Geographical Regions of Hudson River Estuary [RM 12-153 (km 19-245)] Based on Day Sampling by 100-ft (30.5-m) Beach Seine during 1974



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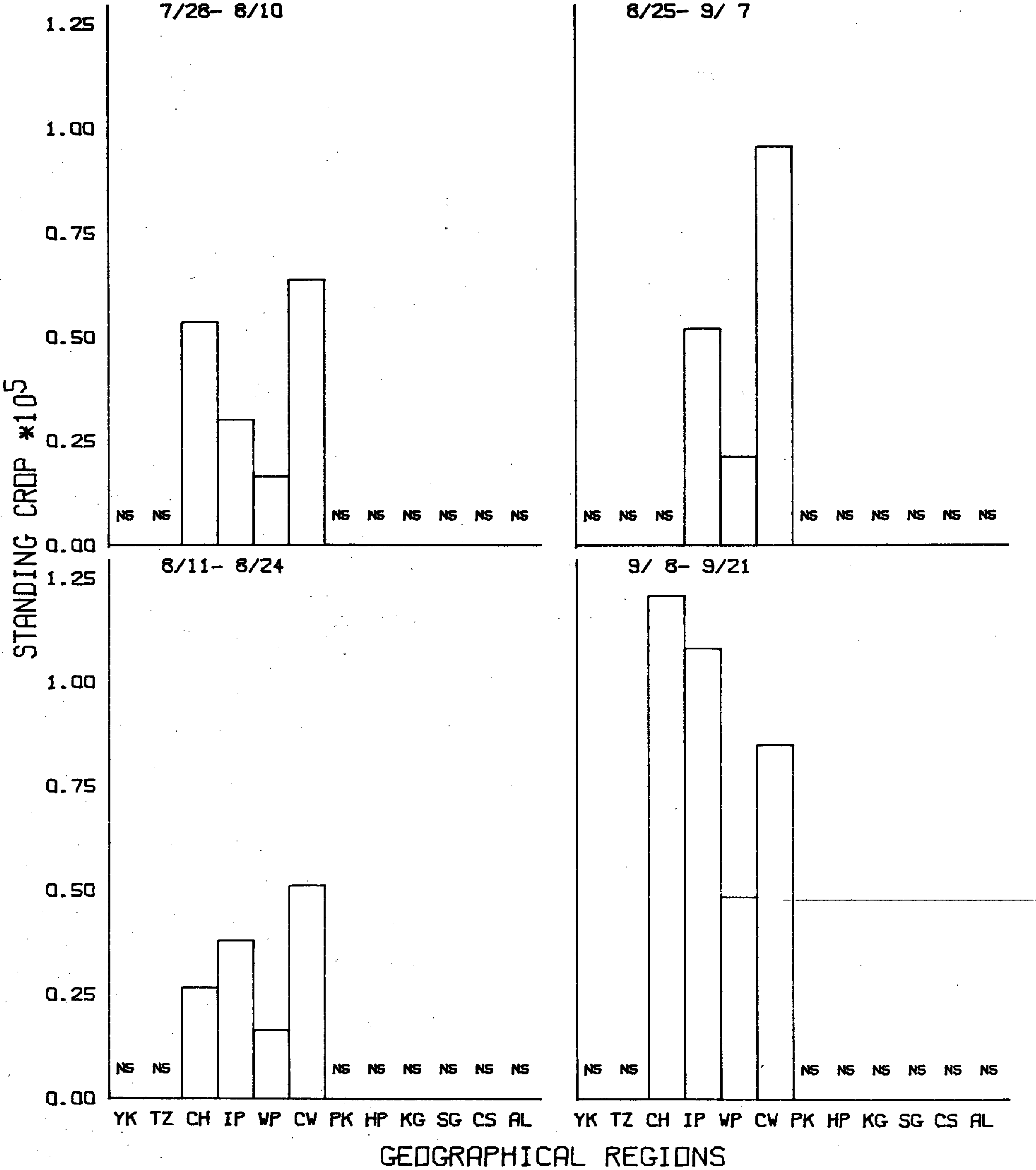
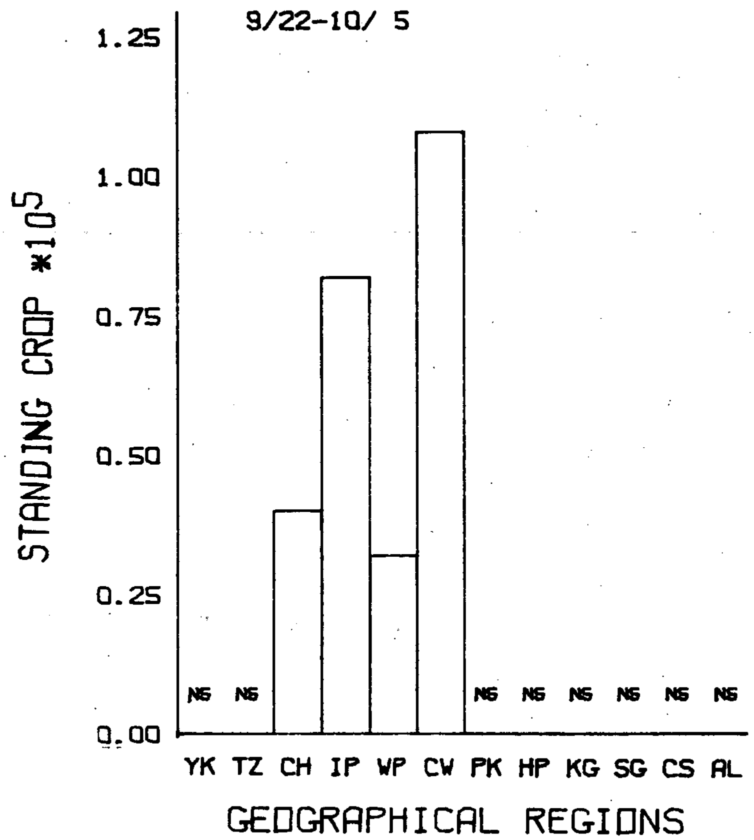


Figure D-36. Standing Crop of Juvenile White Perch within Four Geographical Regions of Hudson River Estuary [RM 34-61 (km 54-98)] Based on Night Sampling by 100-ft (30.5-m) Beach Seine during 1974



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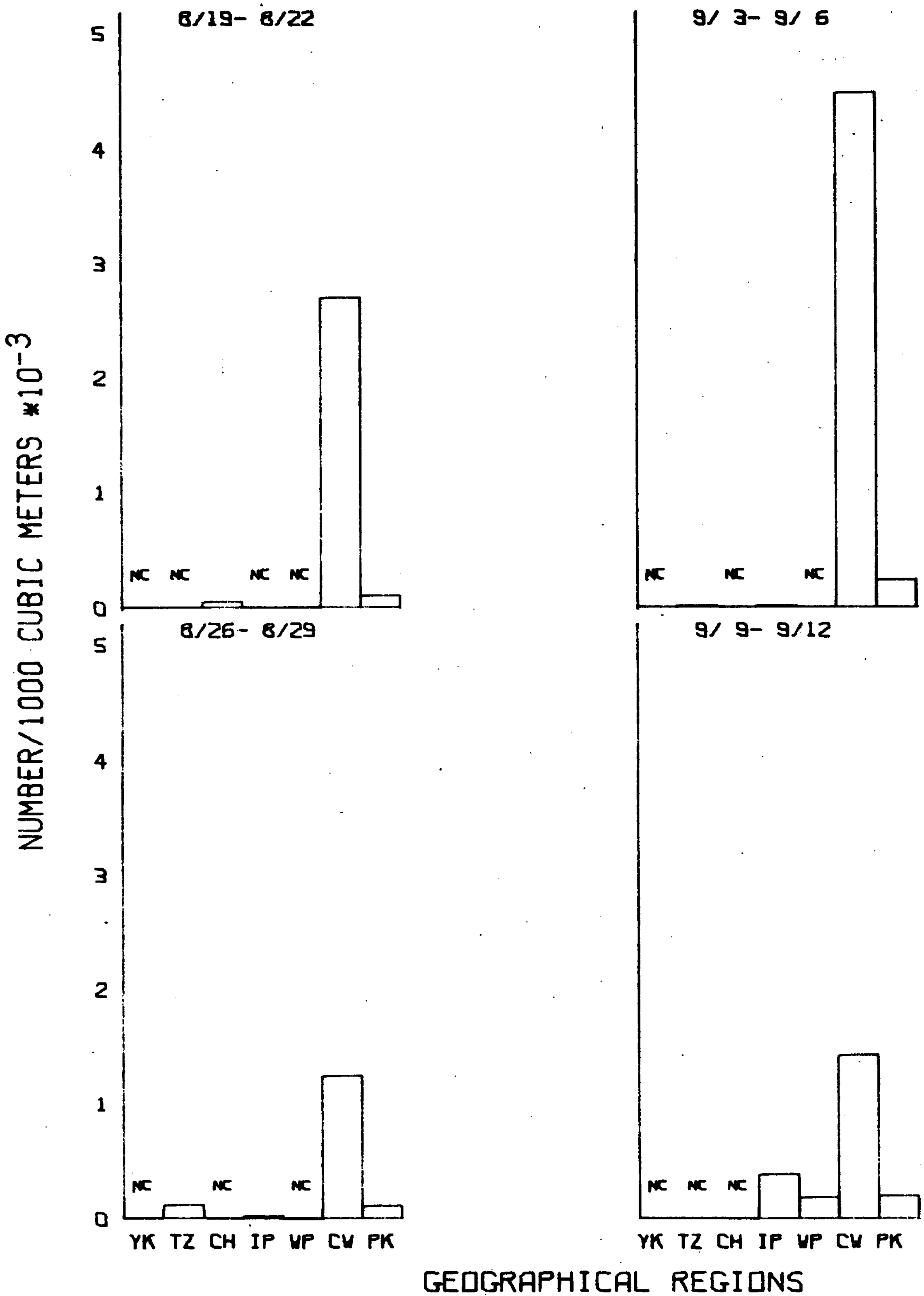
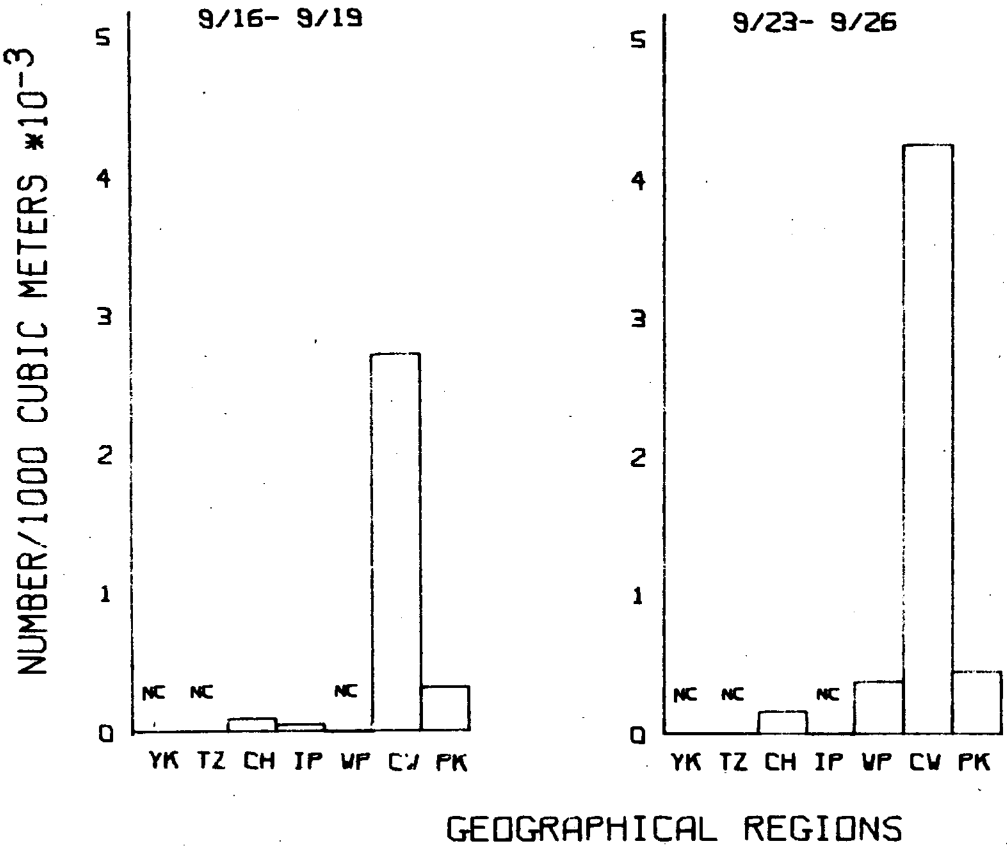


Figure D-37. Density of Juvenile White Perch (No./1000 m^3) within Seven Geographical Regions of Hudson River Estuary [RM 14-76 (km 22-122)] Based on Night Sampling in the Shoals by Epibenthic Sled during 1974



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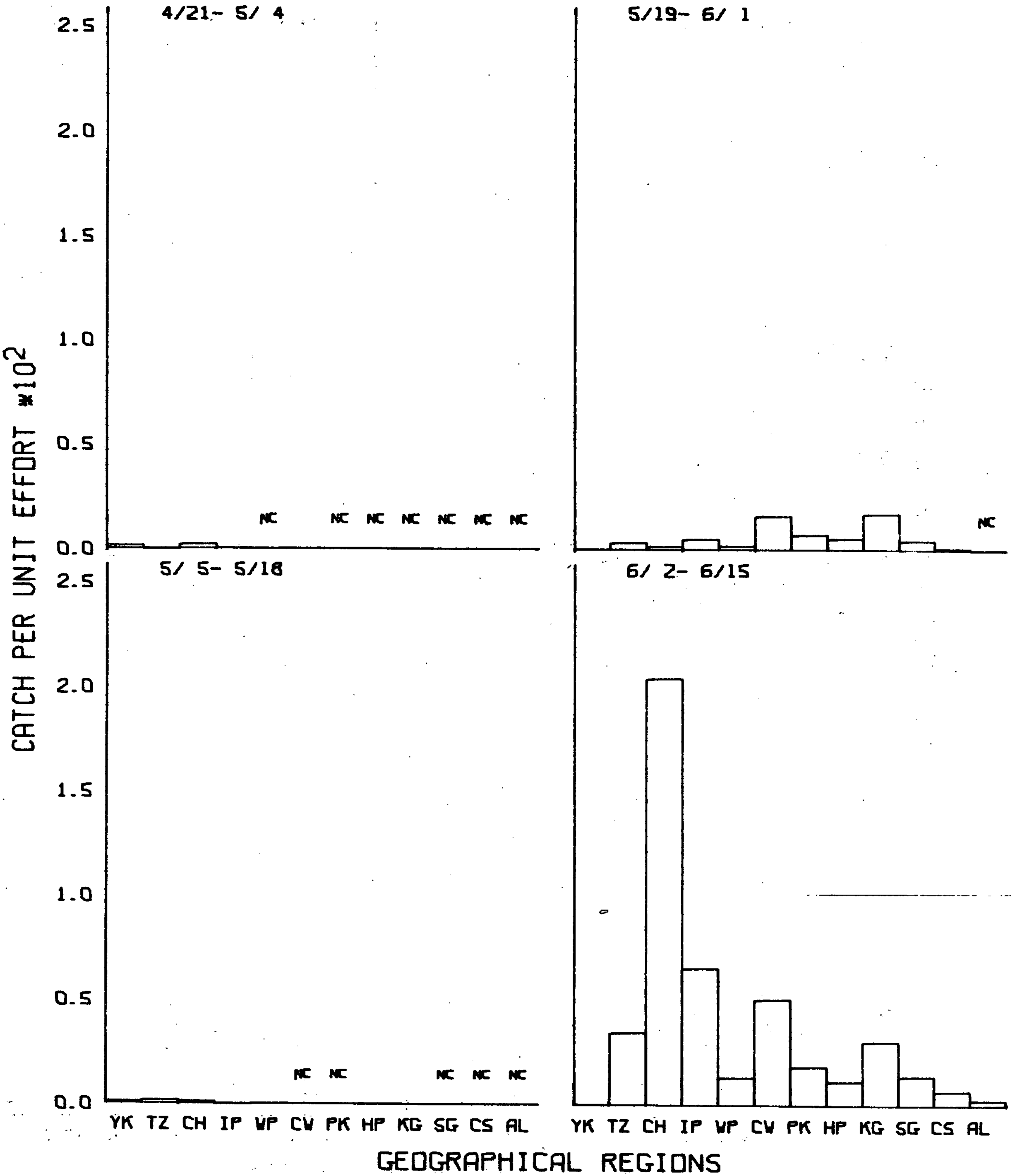
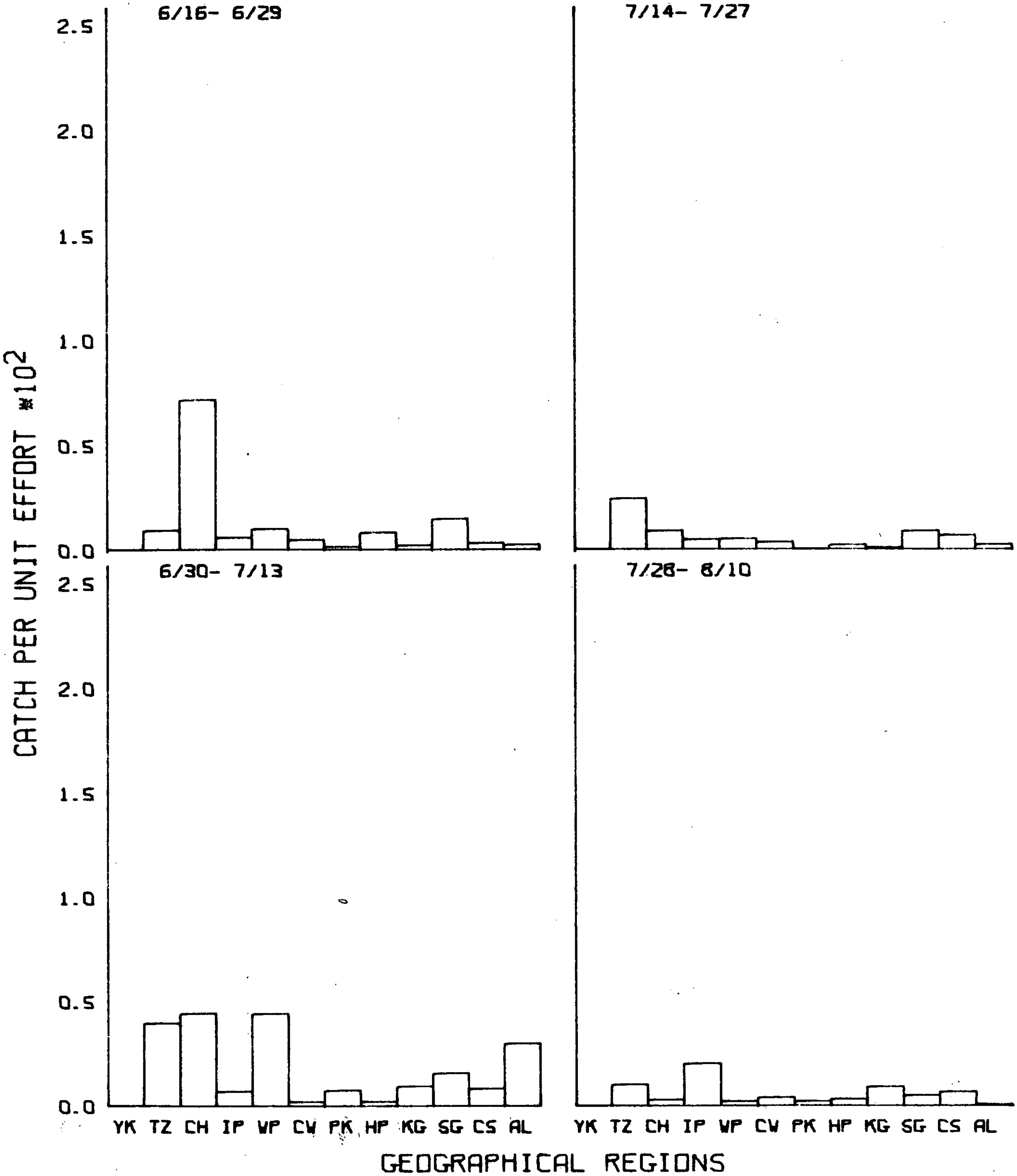


Figure D-38. Catch per Unit Effort of Yearling White Perch within 12 Geographical Regions of Hudson River Estuary [RM 12-153 (km 19-245)] Based on Day Sampling by 100-ft (30.5-m) Beach Seine during 1974



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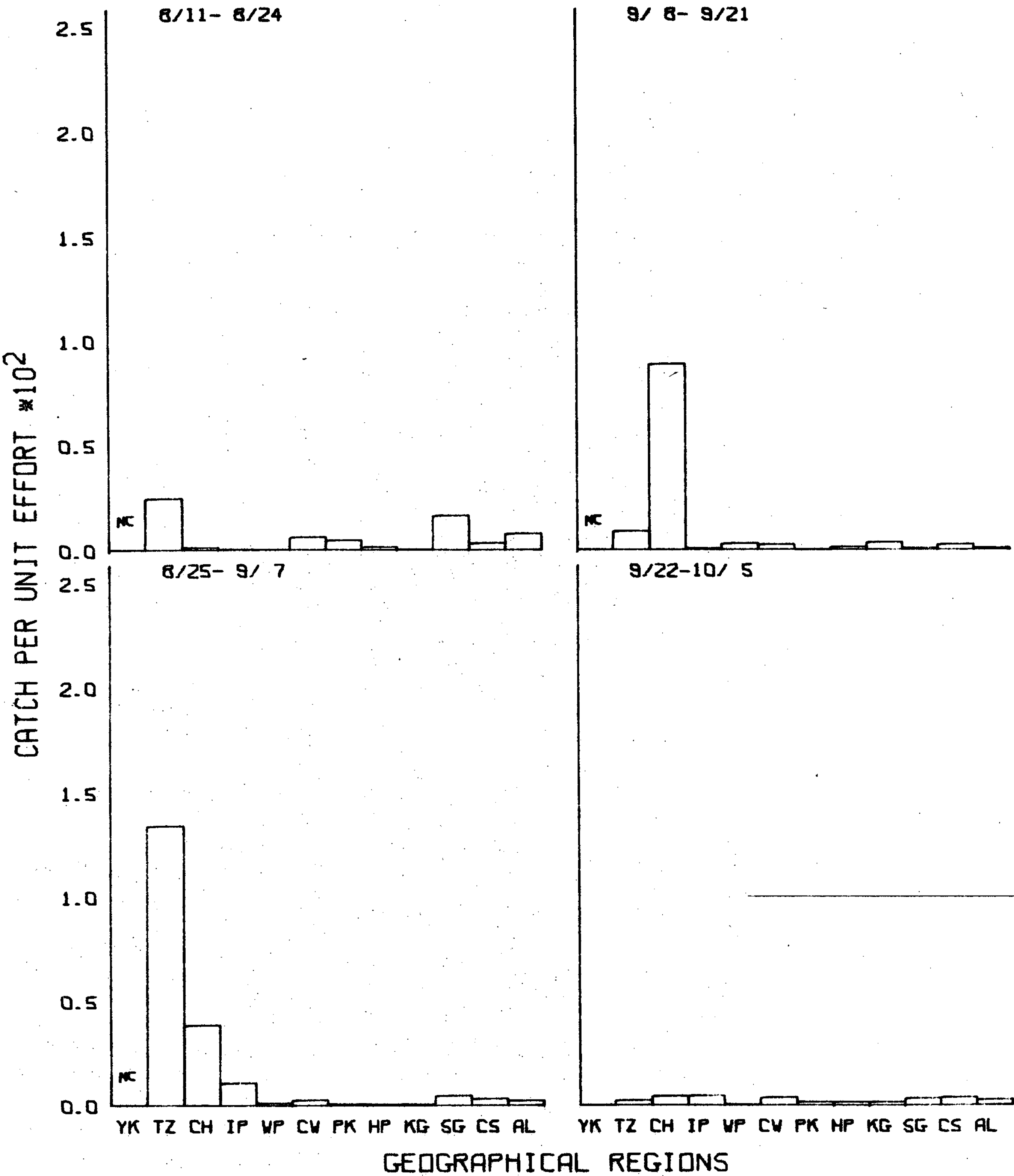

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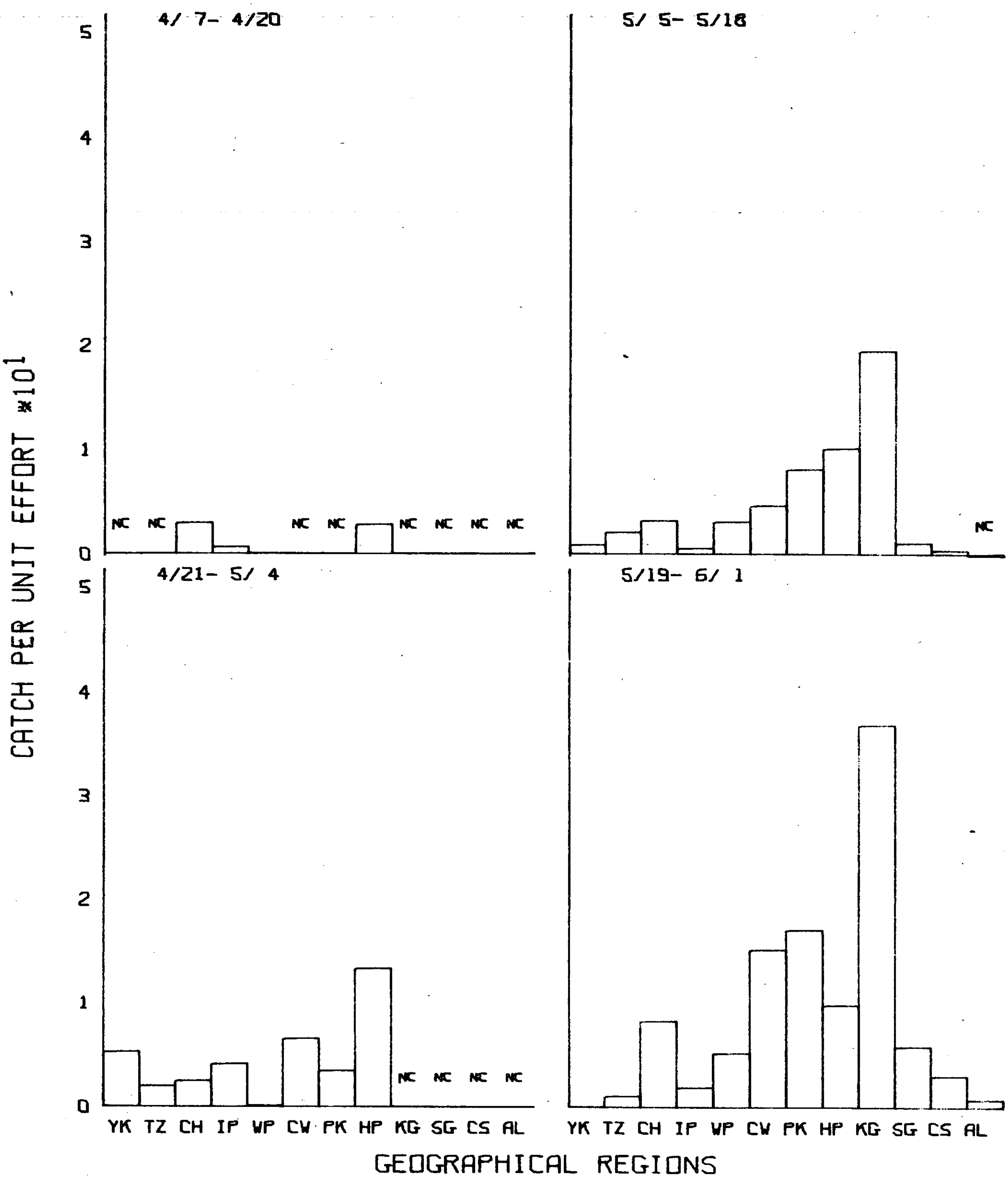
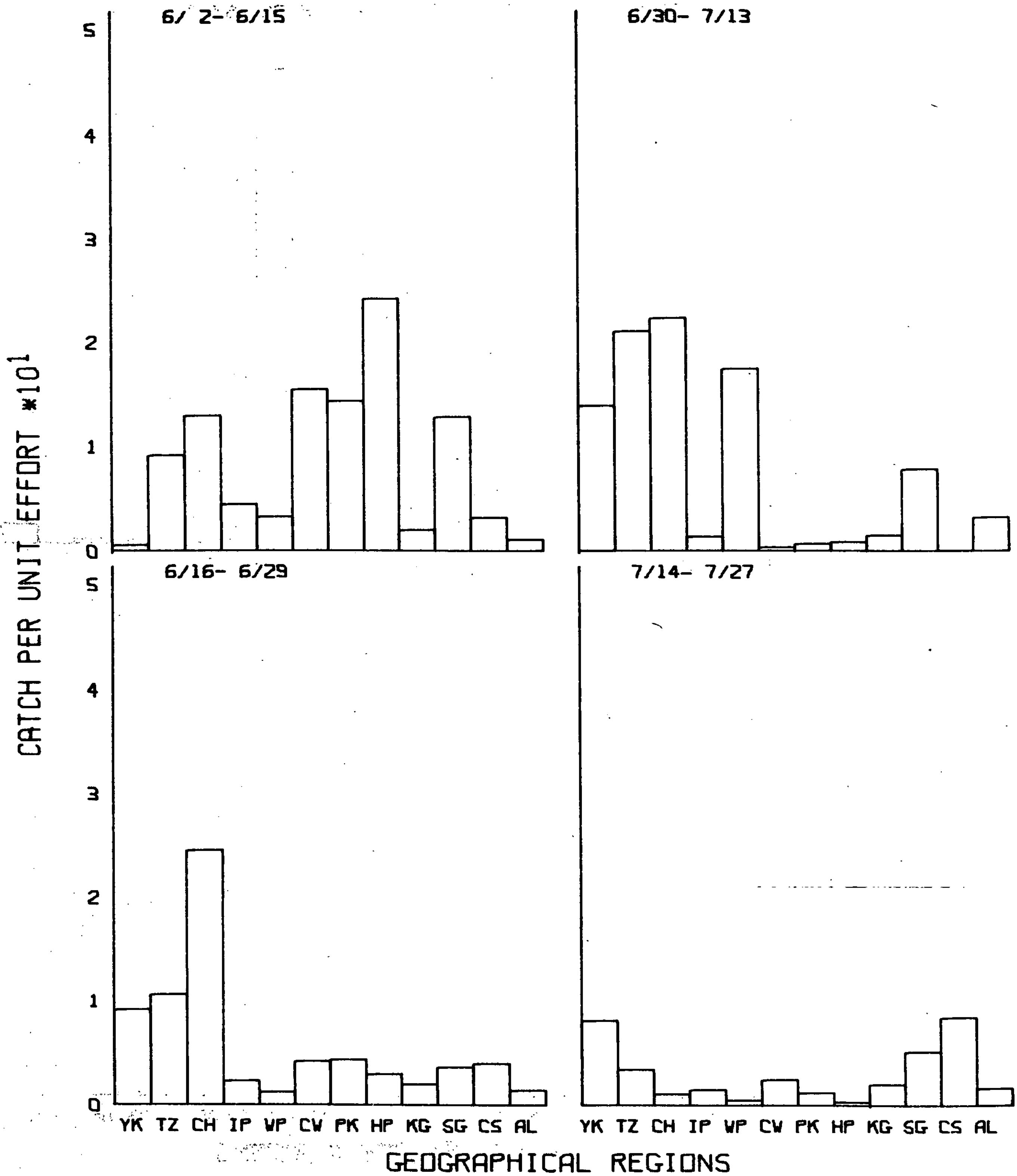


Figure D-39. Catch per Unit Effort of Age II and Older White Perch within 12 Geographical Regions of Hudson River Estuary [RM 12-153 (km 19-245)] Based on Day Sampling by 100-ft (30.5-m) Beach Seine during 1974



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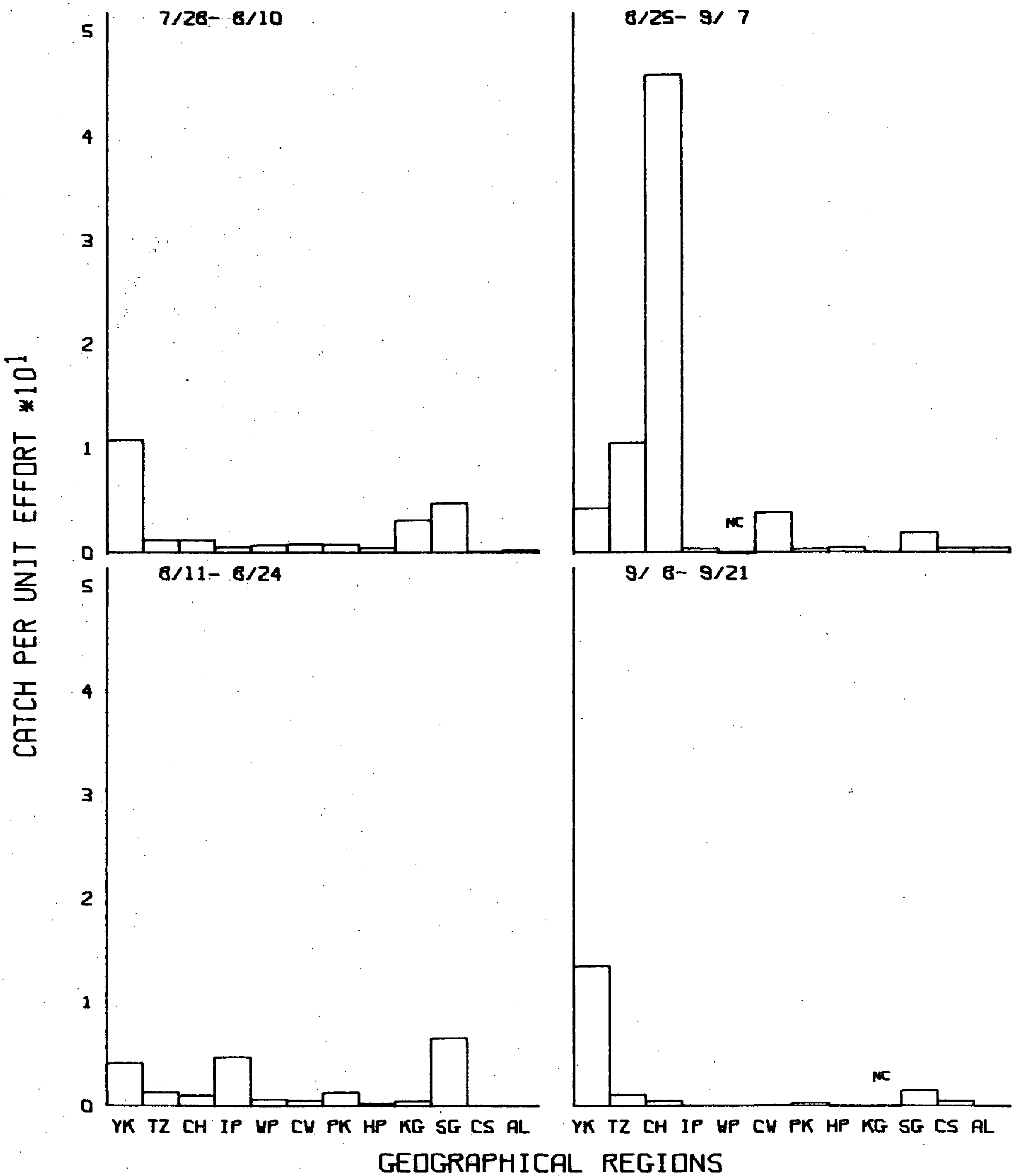

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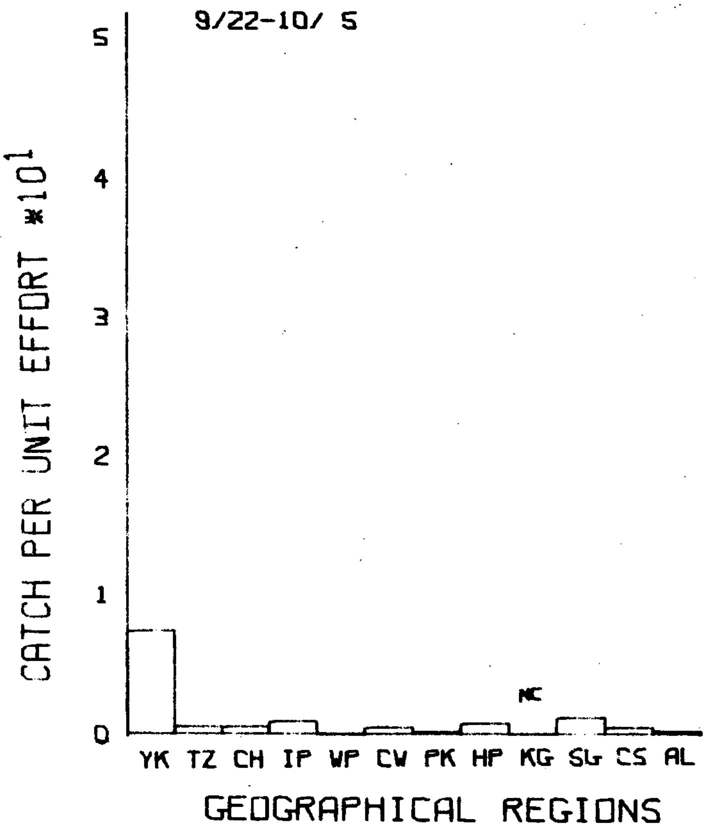

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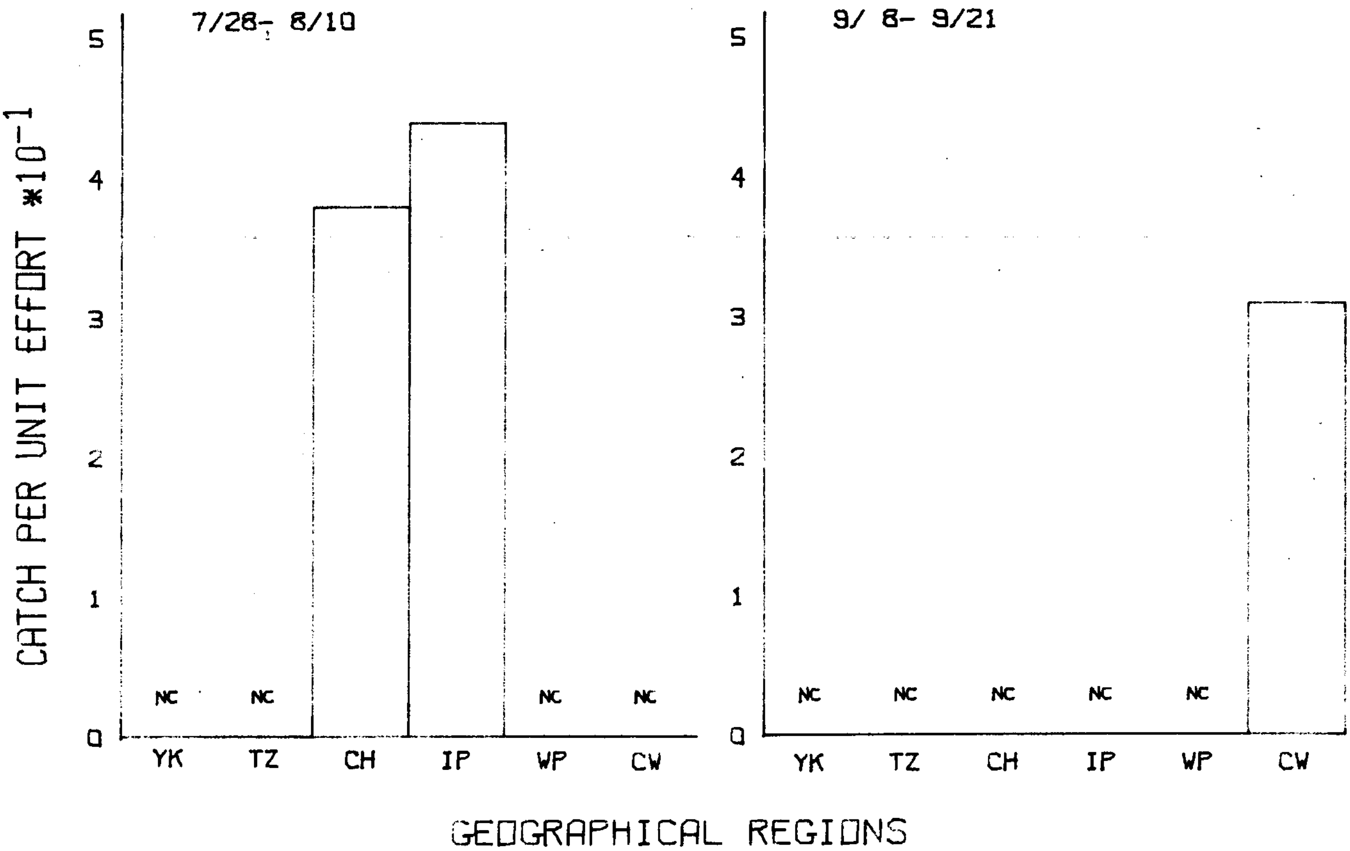


Figure D-40. Catch per Unit Effort of Juvenile White Perch within Six Geographical Regions of Hudson River Estuary [RM 12-61 (km 19-98)] Based on Day Sampling by Bottom Trawl (Cod End/Cover Combined) during 1974

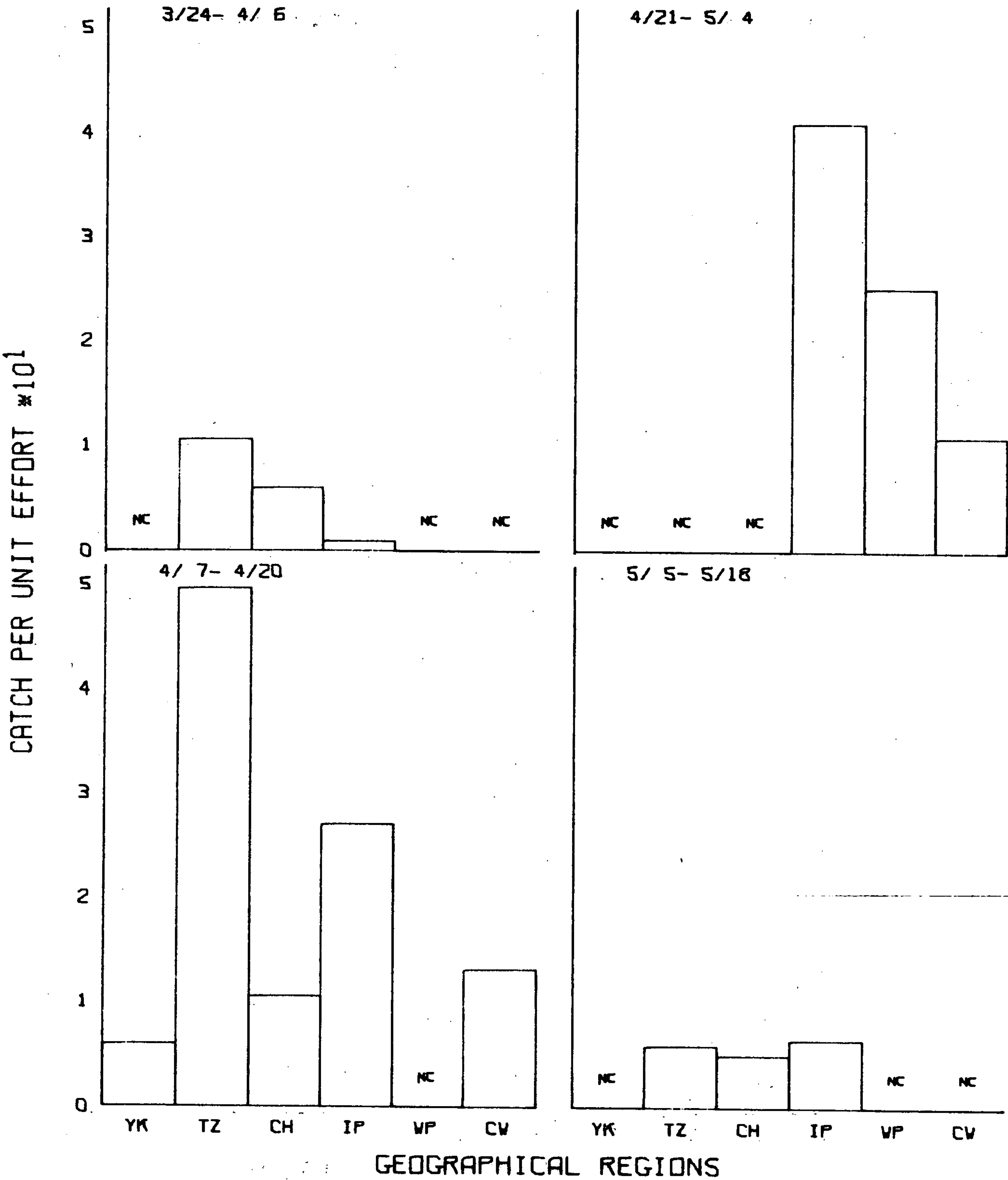
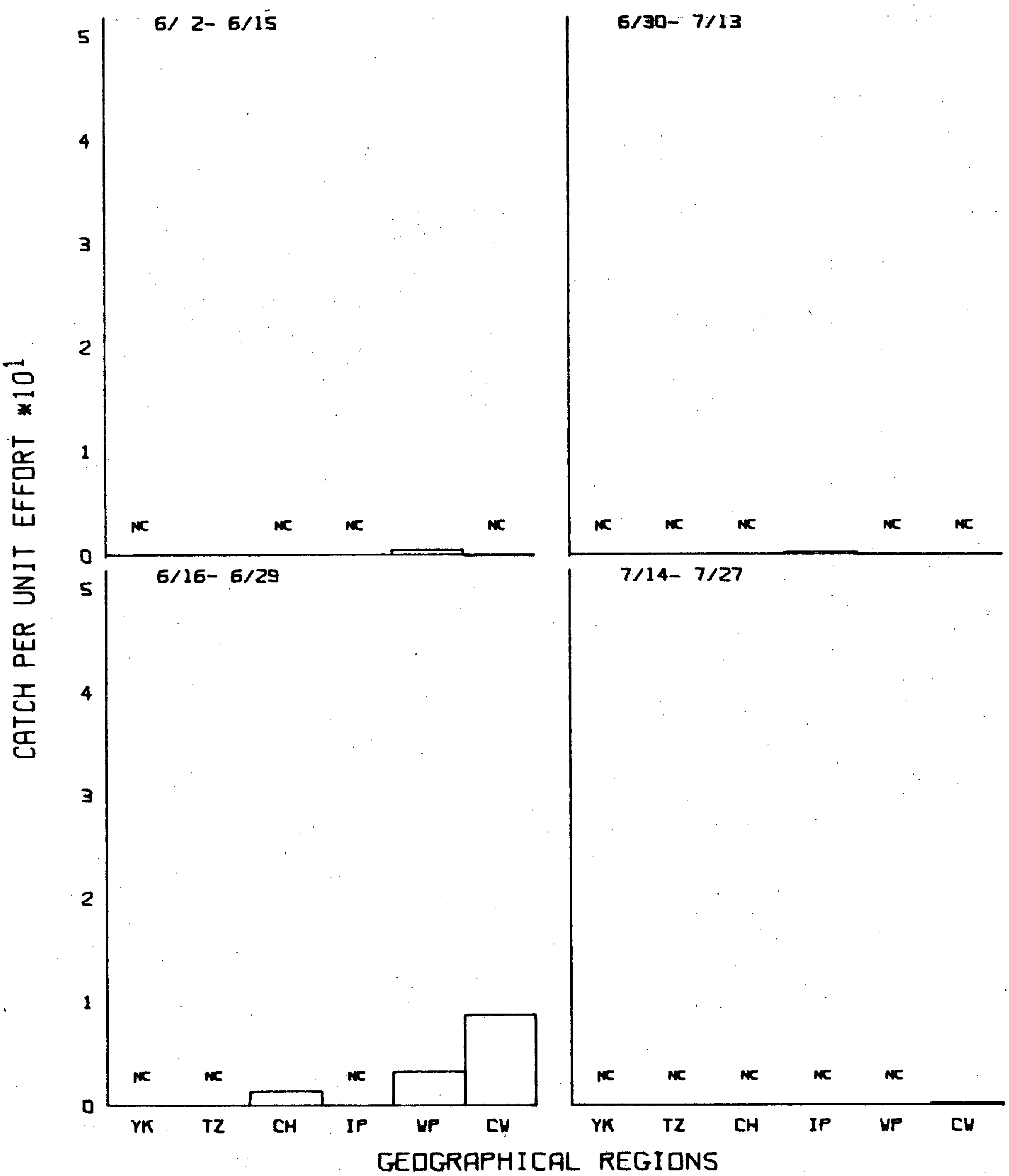


Figure D-41. Catch per Unit Effort of Yearling White Perch within Six Geographical Regions of Hudson River Estuary [RM 12-61 (km 19-98)] Based on Day Sampling by Bottom Trawl (Cod End/ Cover Combined) during 1974



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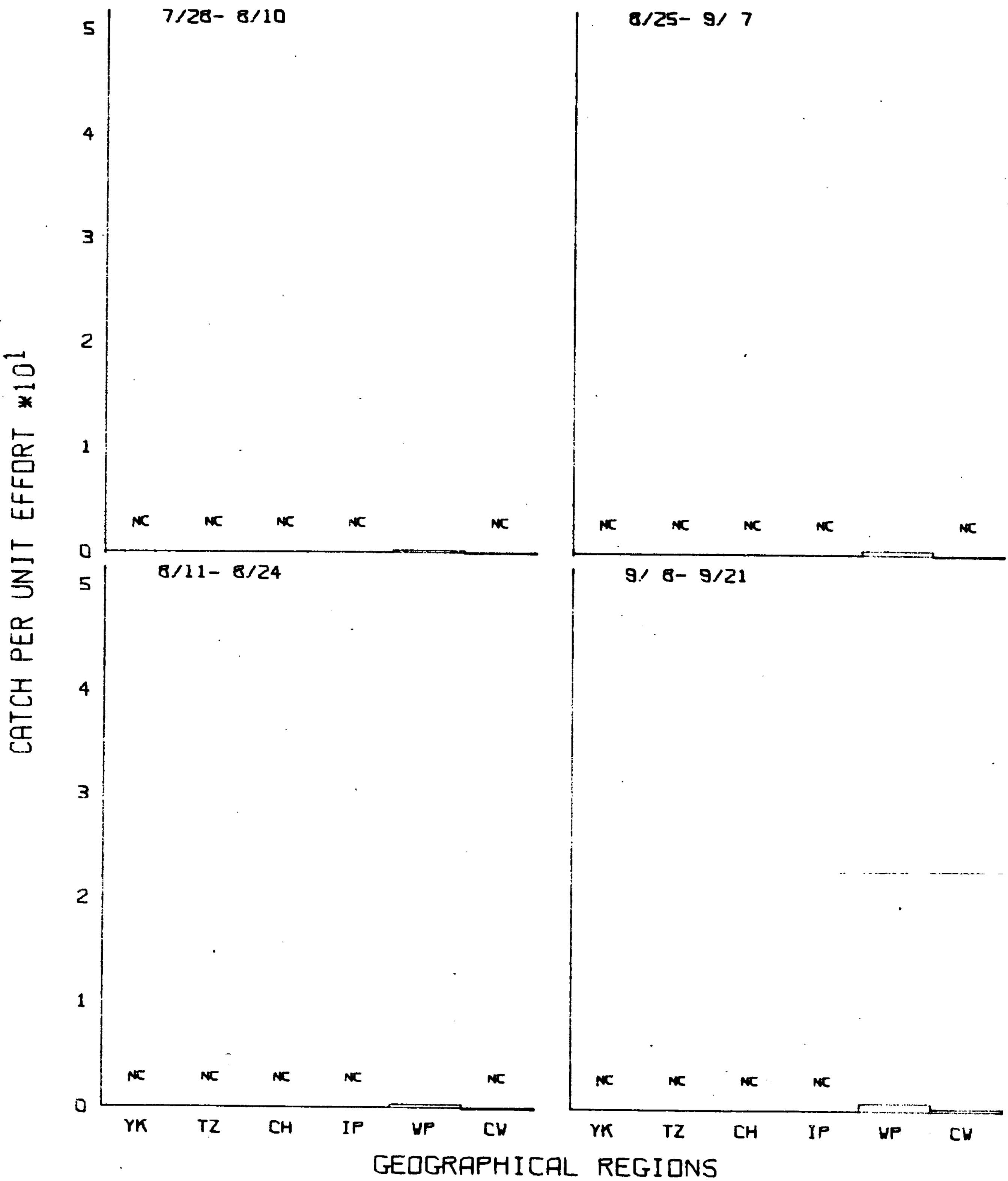

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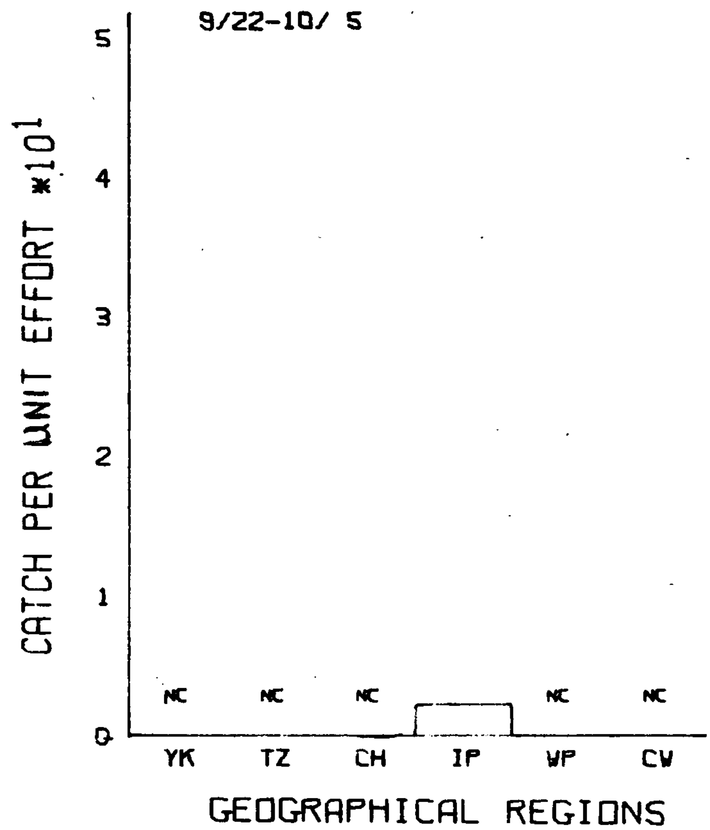

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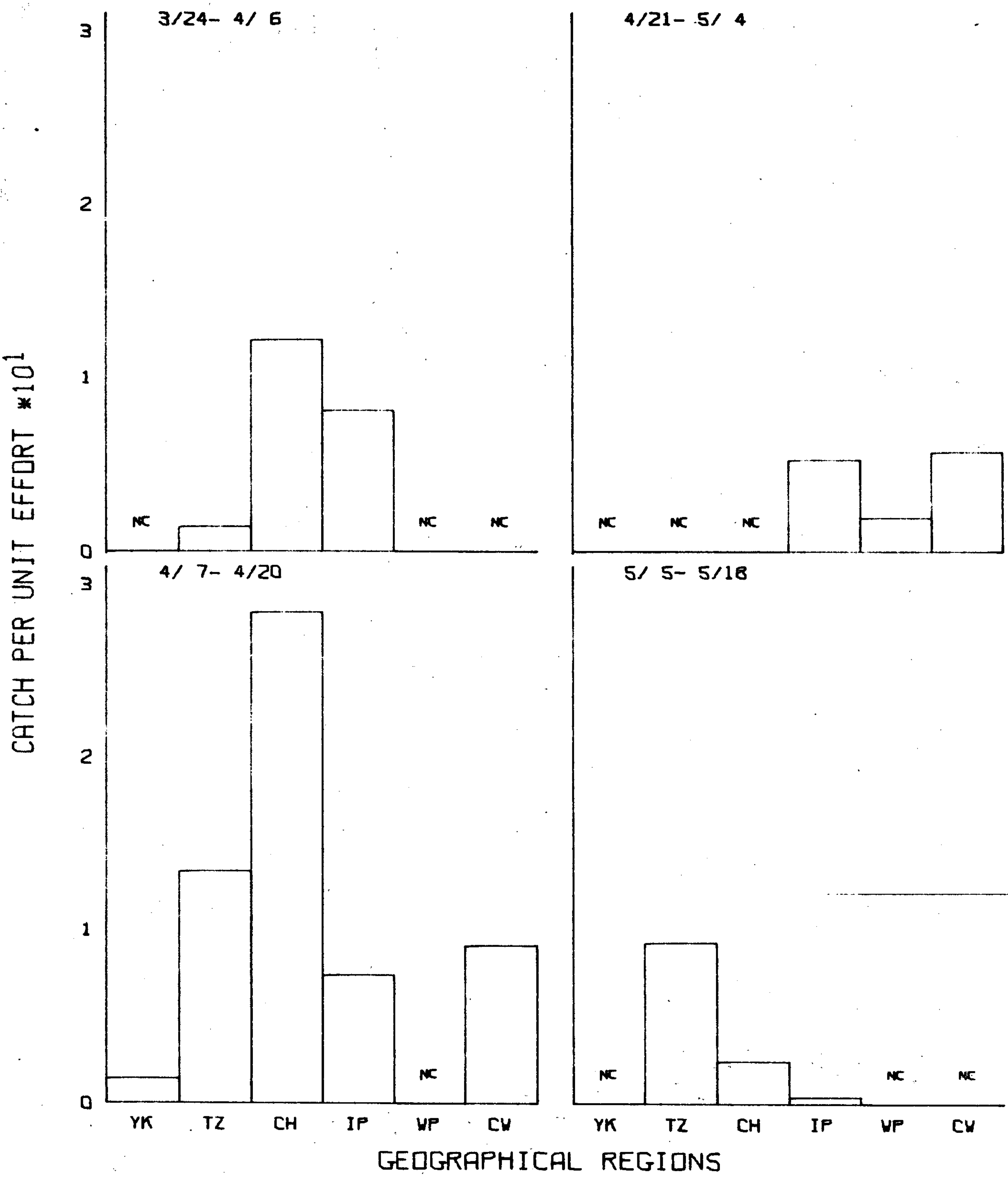
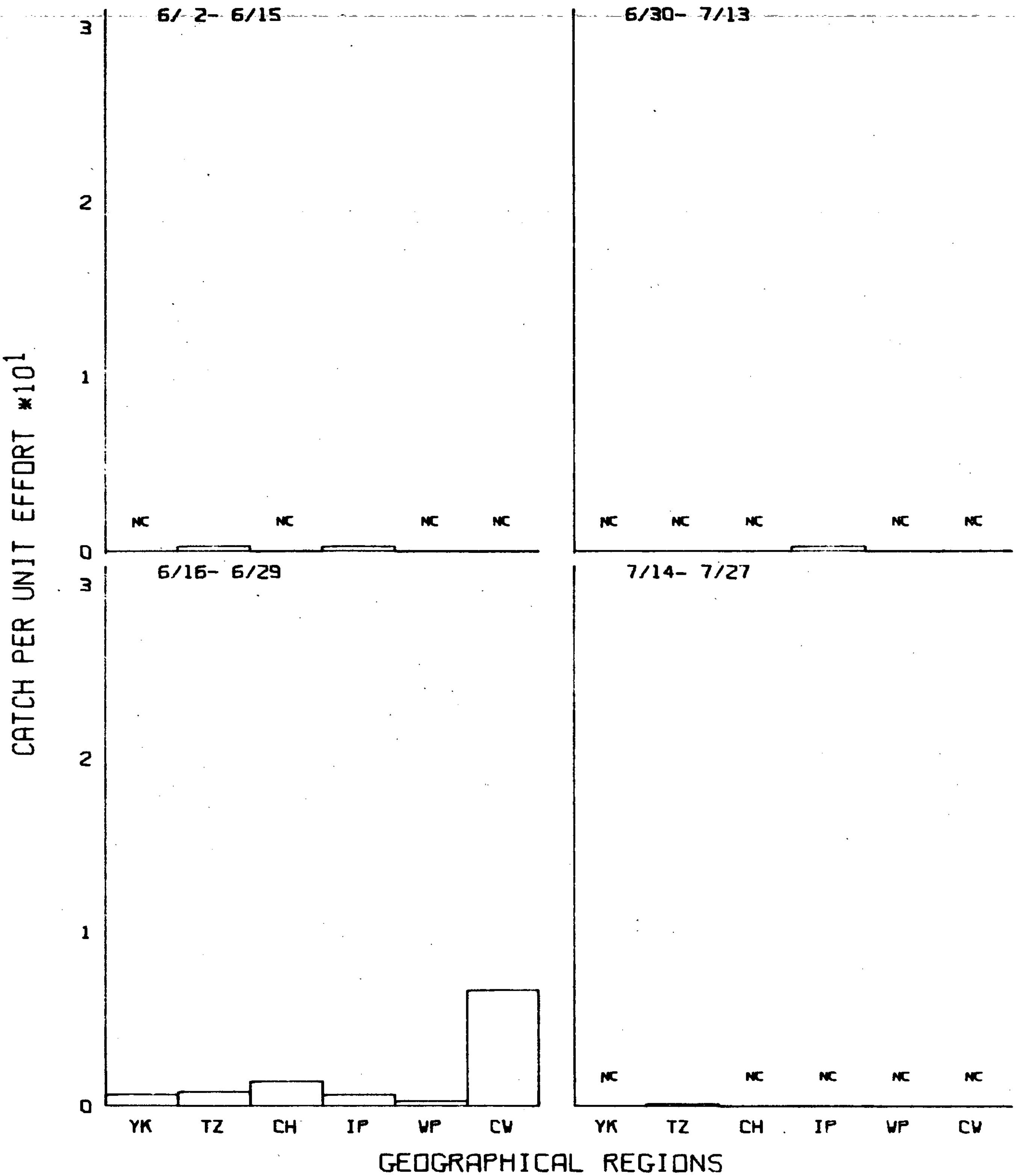


Figure D-42. Catch per Unit Effort of Age II and Older White Perch within Six Geographical Regions of Hudson River Estuary [RM 12-61 (km 19-98)] Based on Day Sampling by Bottom Trawl (Cod End/ Cover Combined) during 1974



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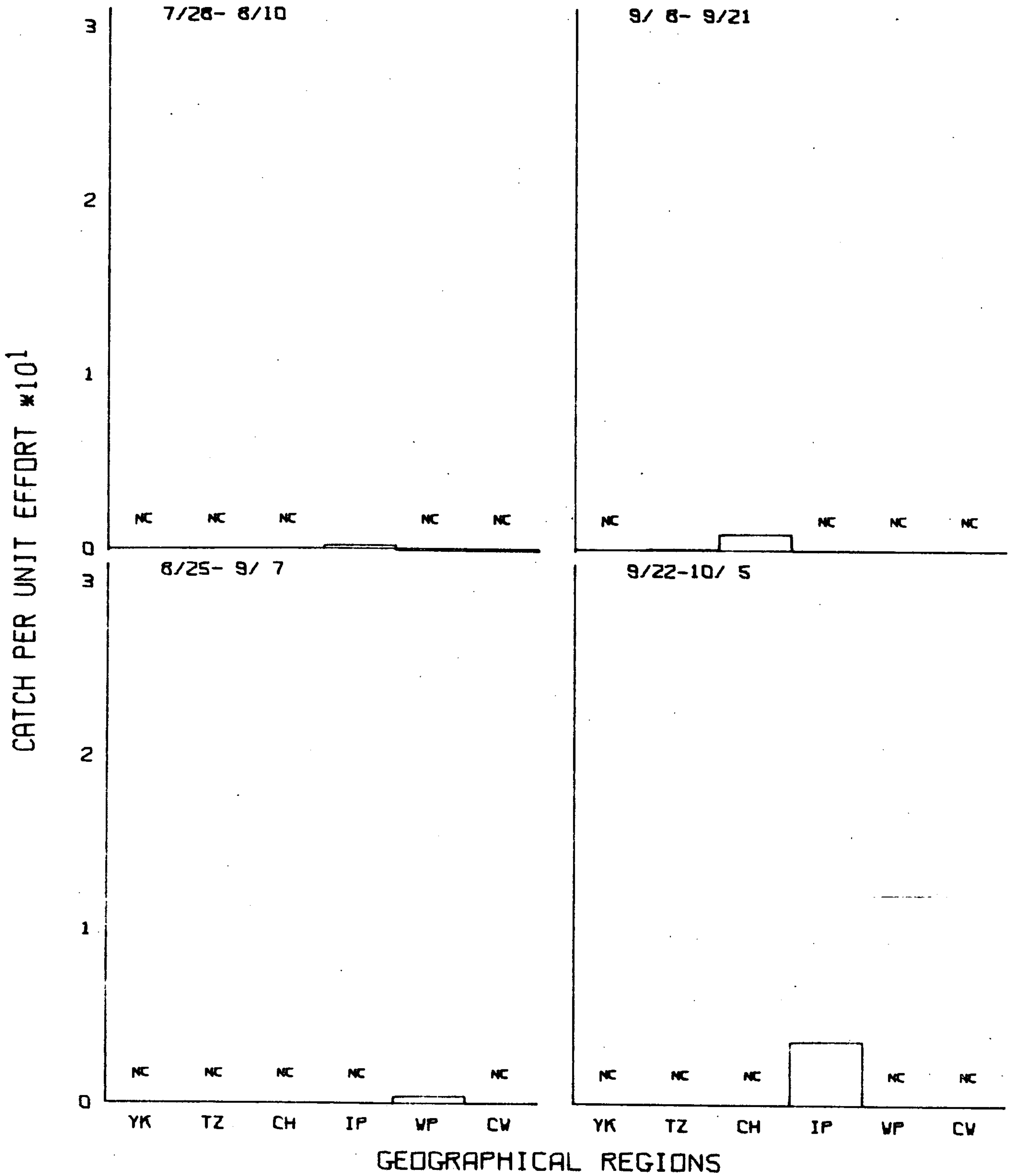

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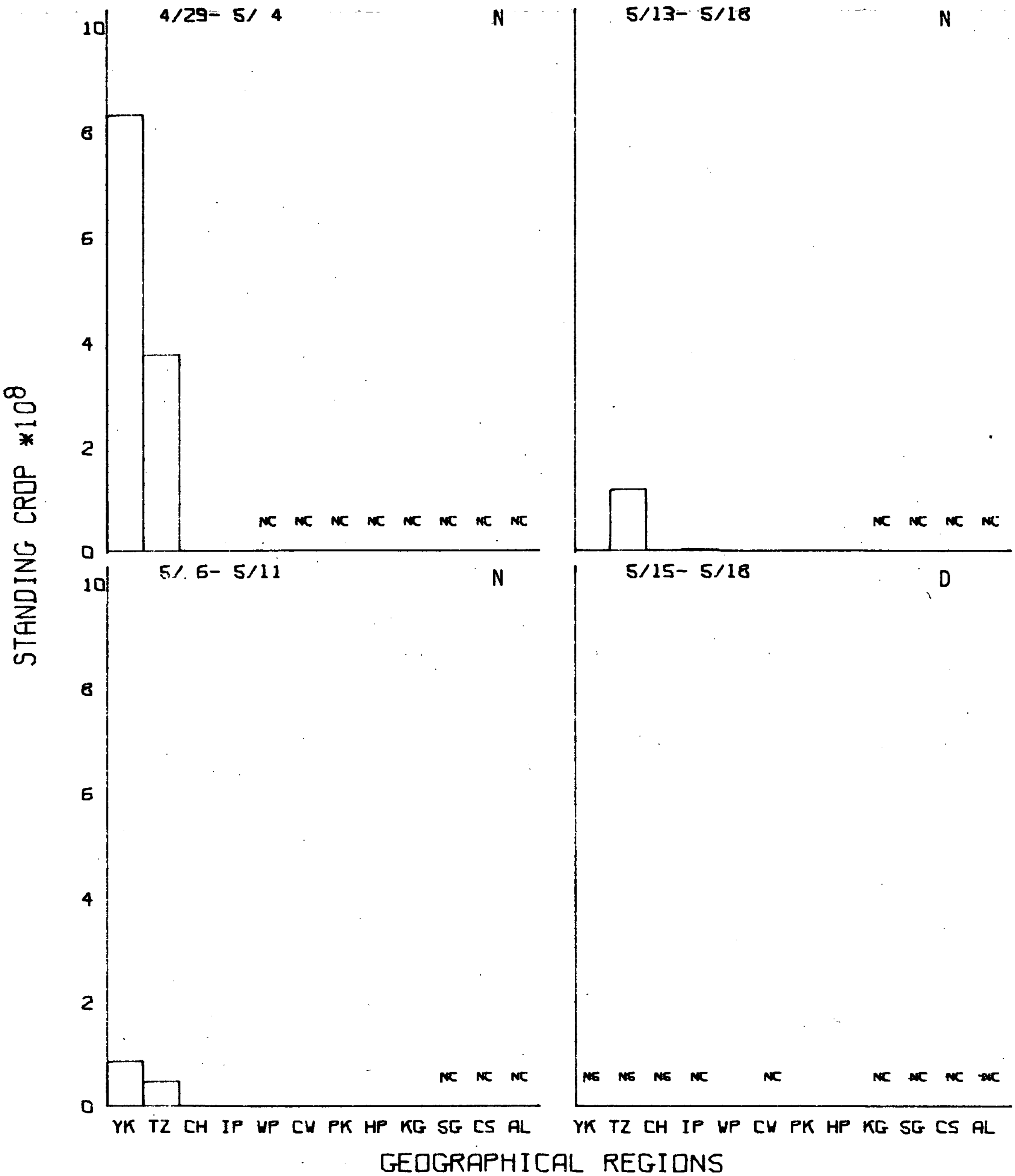
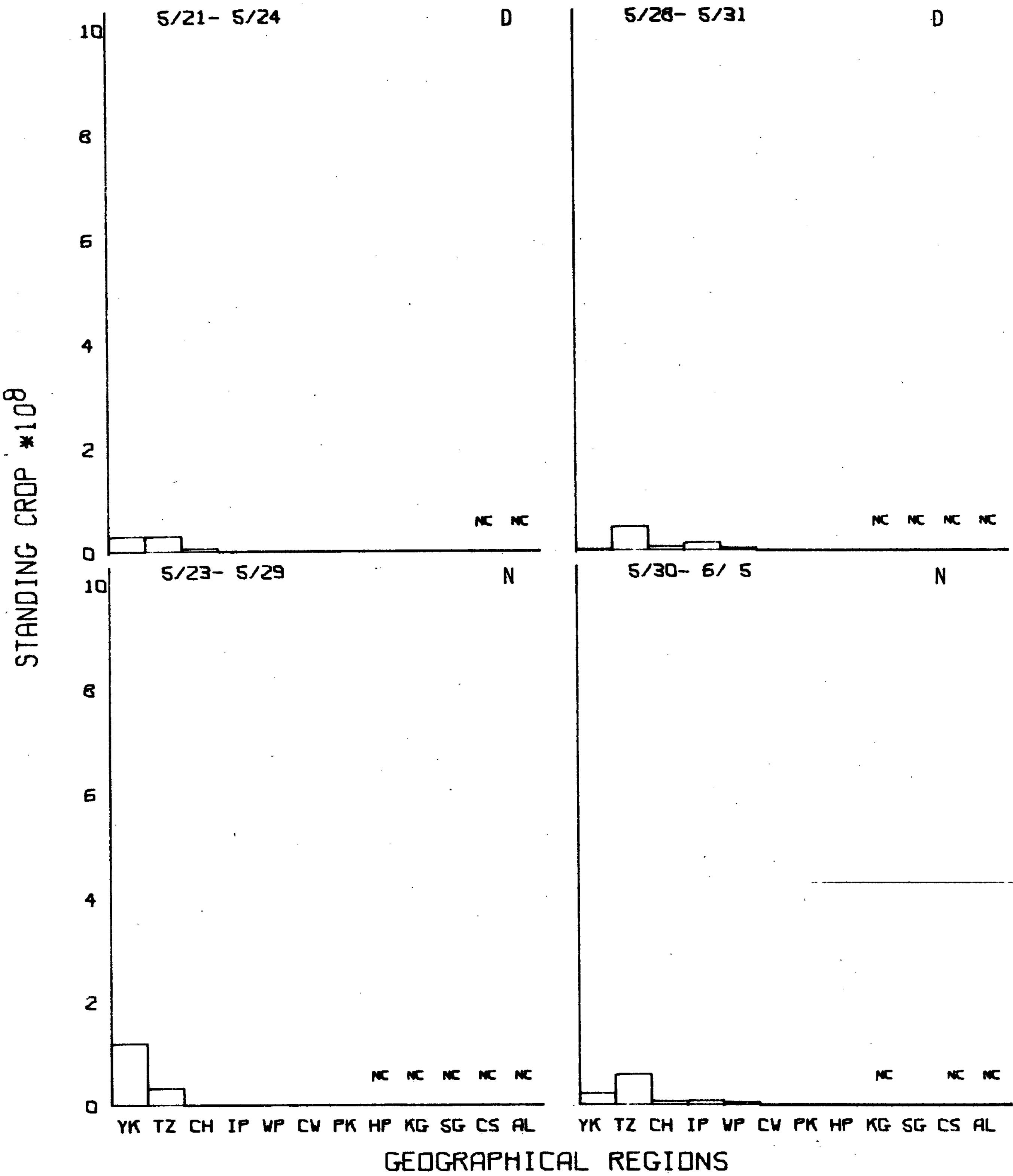


Figure D-43. Standing Crop of Juvenile Atlantic Tomcod within 12 Geographical Regions of Hudson River Estuary [RM 14-140 (km 22-224)] Based on Day or Night Sampling by Epibenthic Sled and Tucker Trawl during 1974



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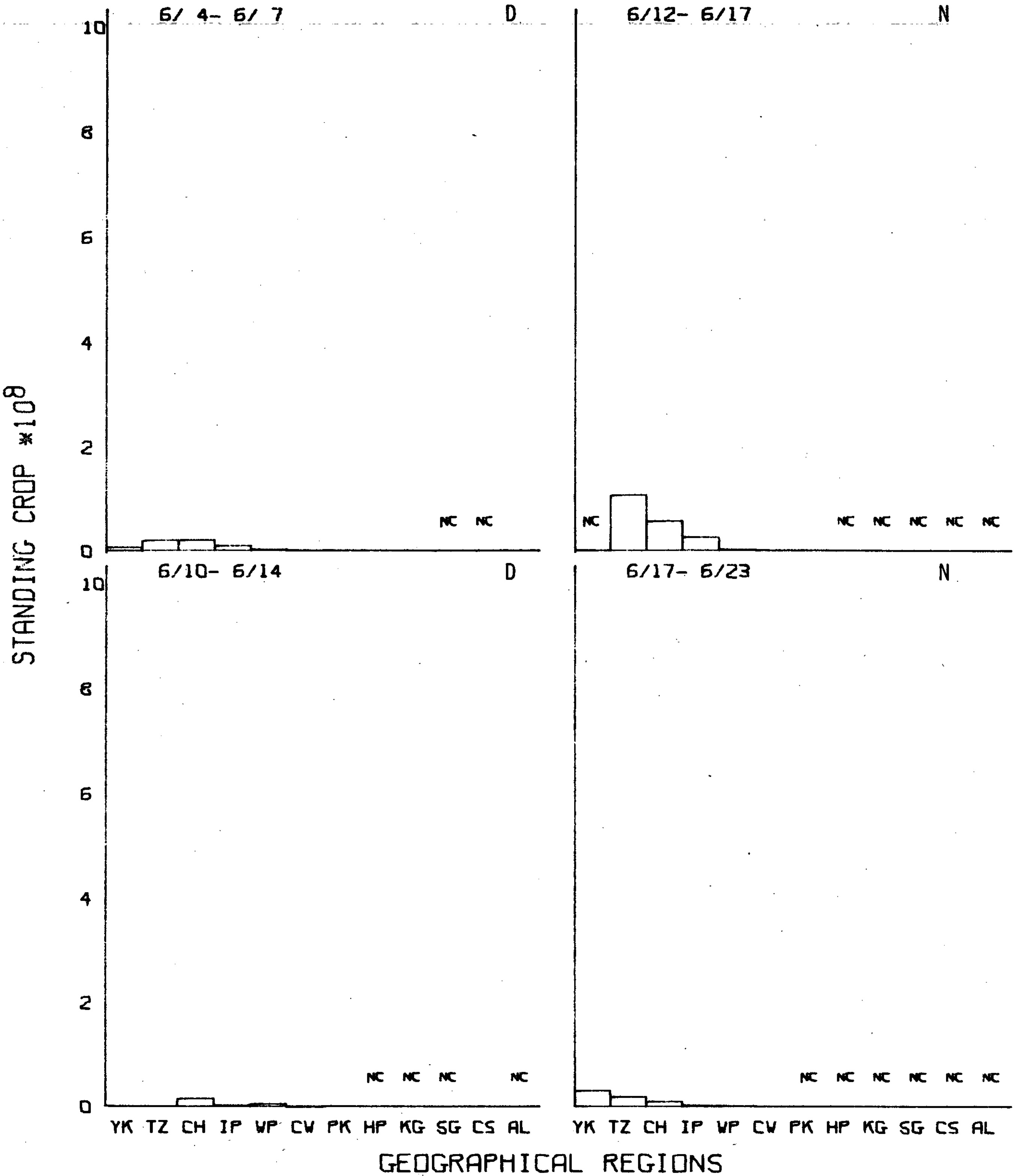

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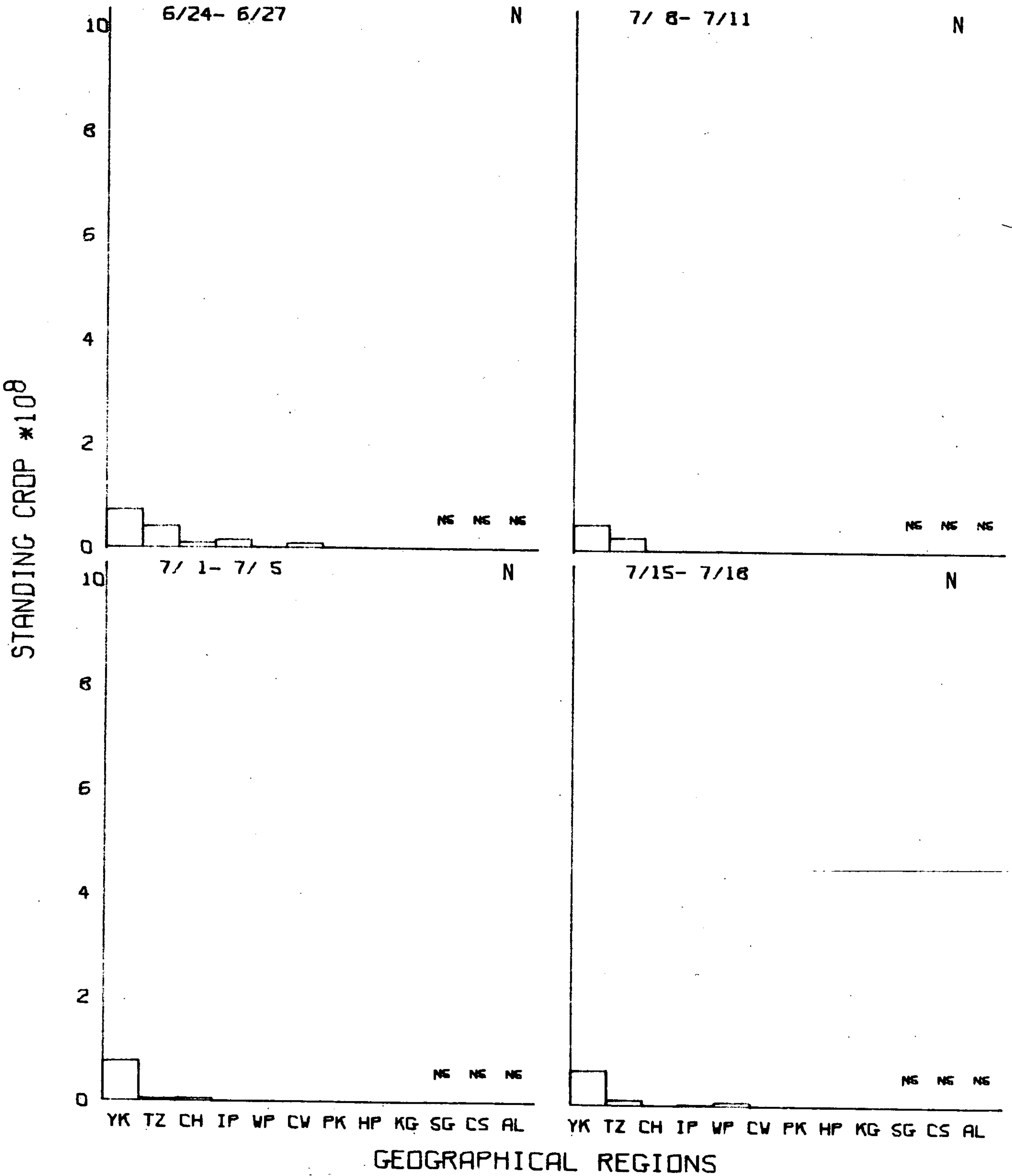

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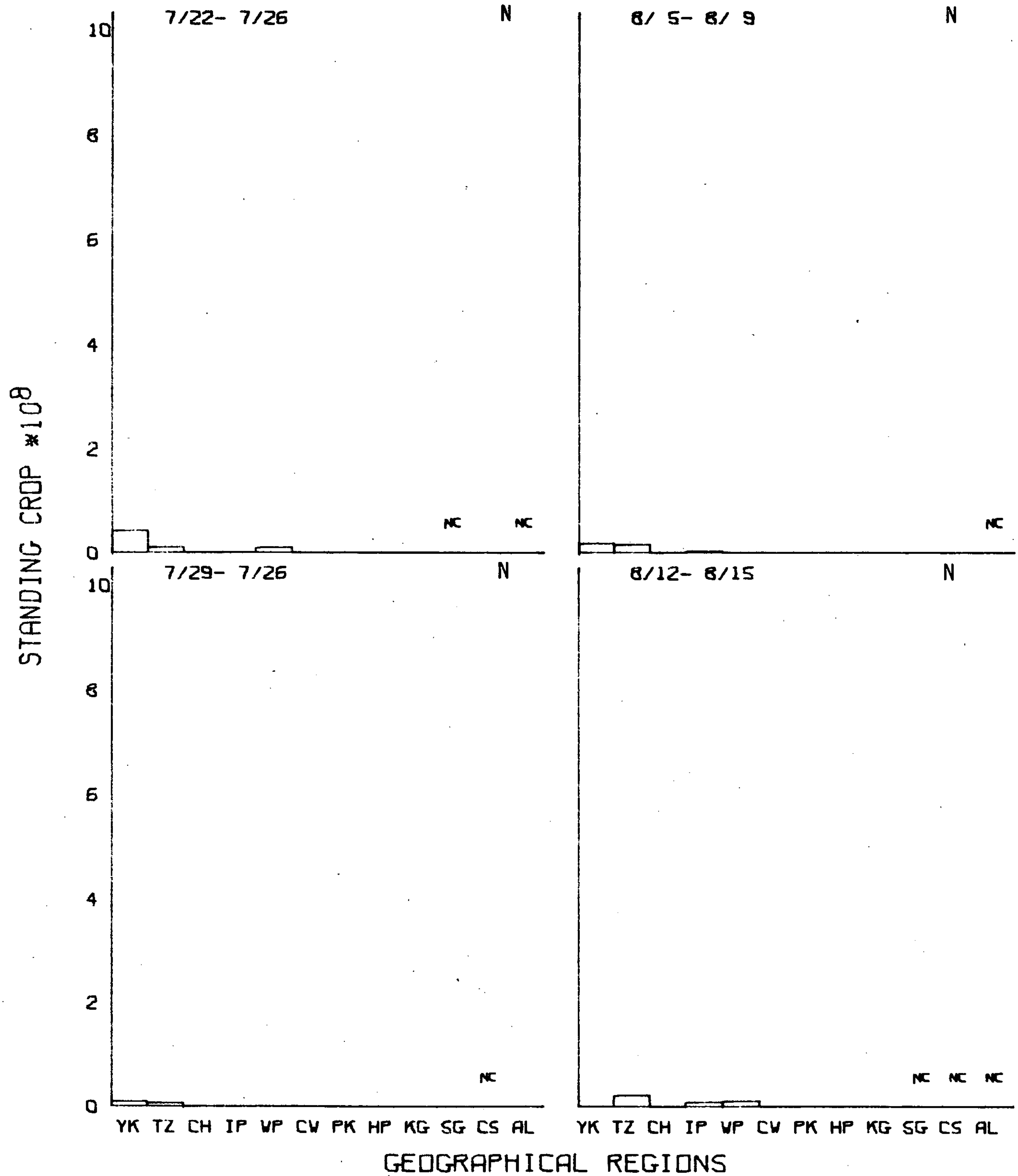

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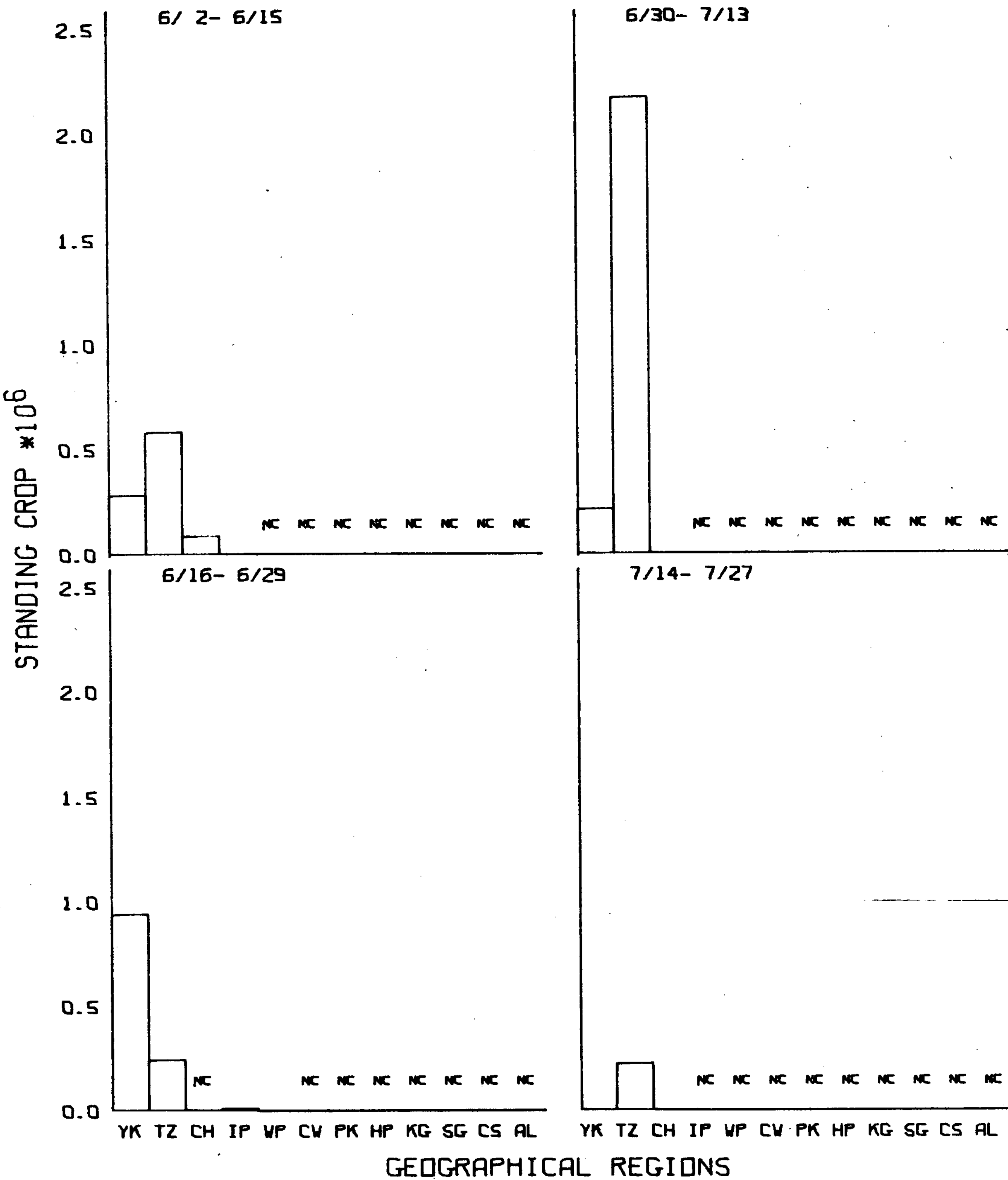
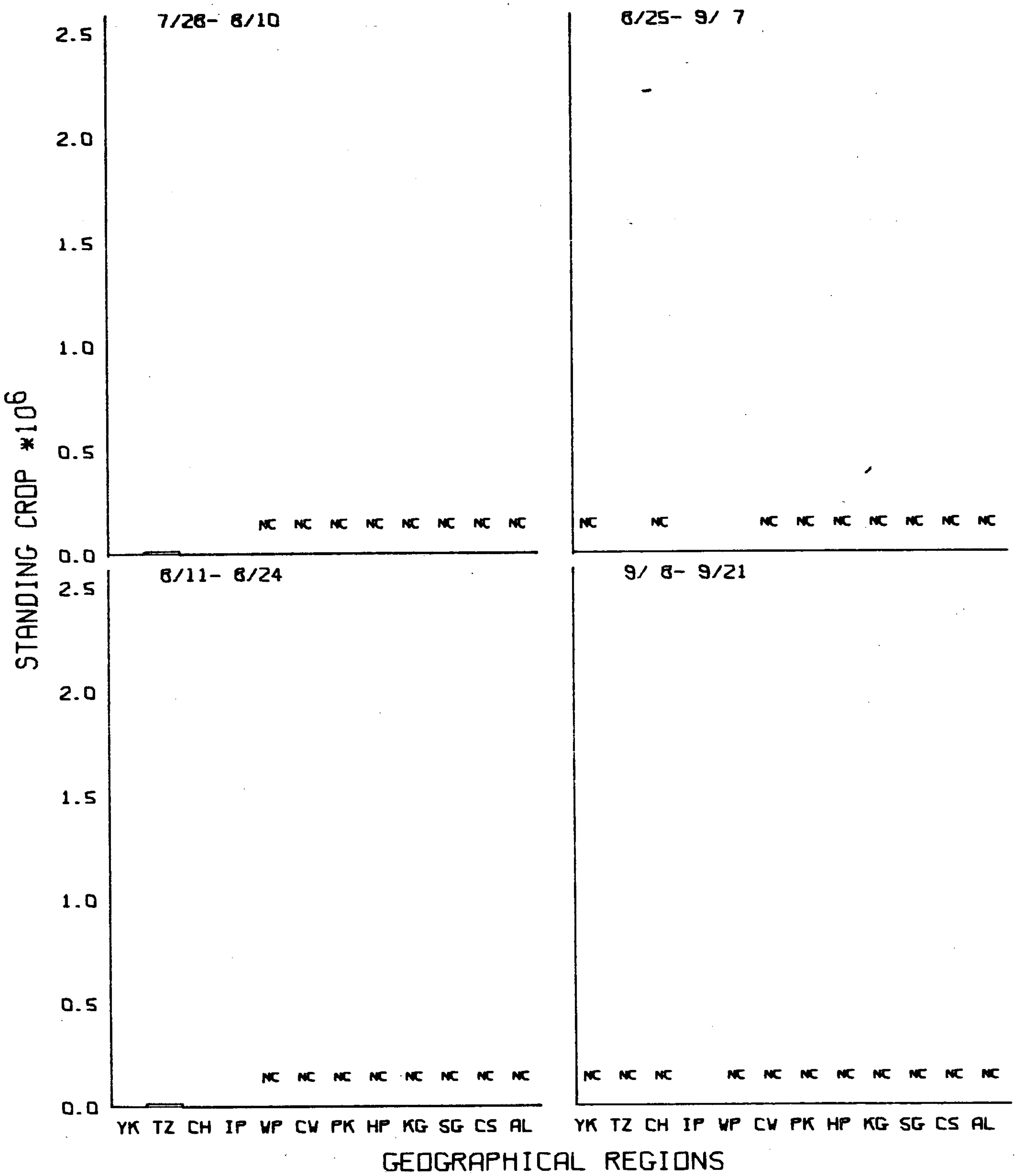


Figure D-44. Standing Crop of Juvenile Atlantic Tomcod within 12 Geographical Regions of Hudson River Estuary [RM 12-153 (km 19-245)] Based on Day Sampling by 100-ft (30.5-m) Beach Seine during 1974



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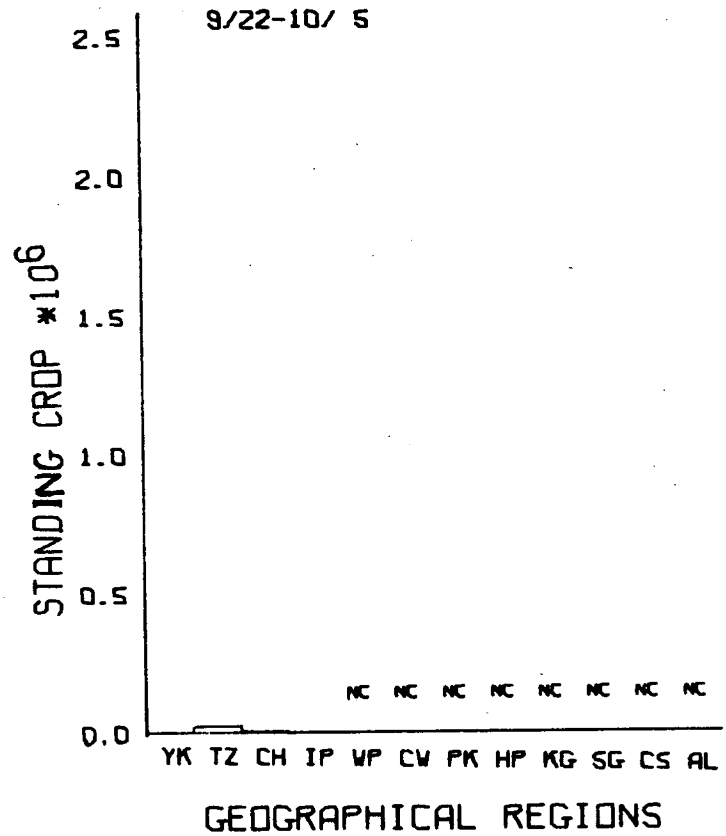

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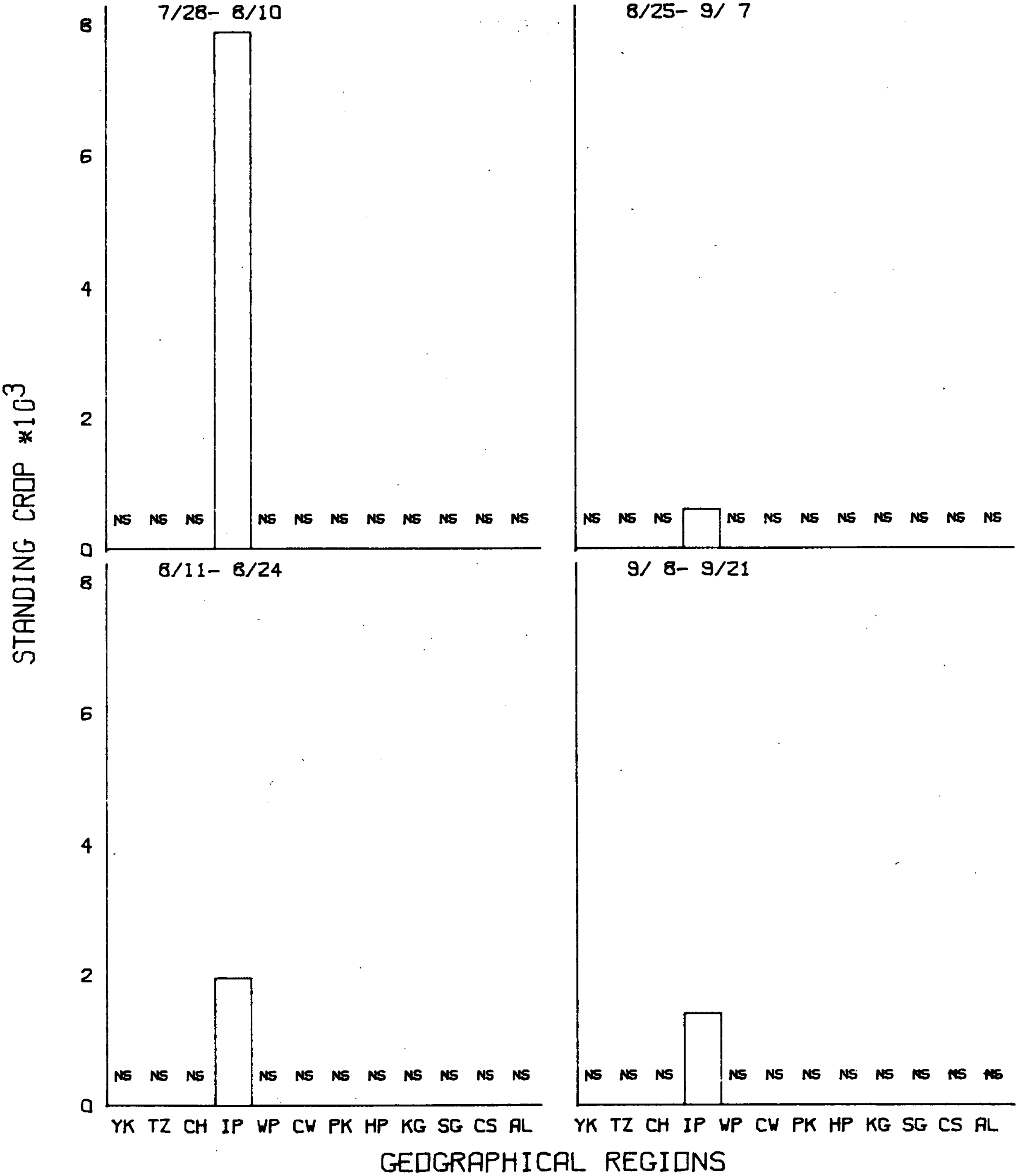
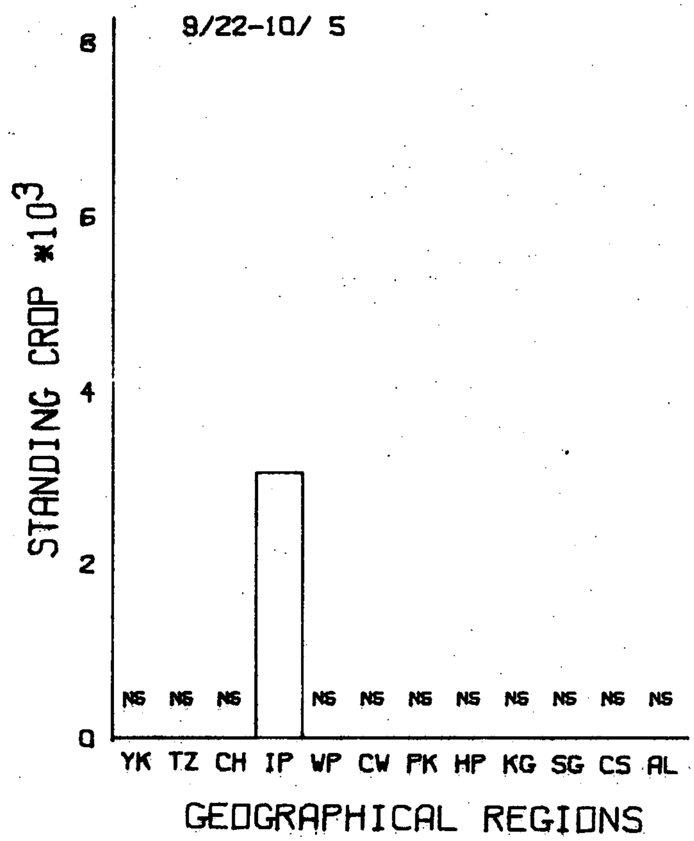


Figure D-45. Standing Crop of Juvenile Atlantic Tomcod within Four Geographical Regions of Hudson River Estuary [RM 34-61 (km 54-98)] Based on Night Sampling by 100-ft (30.5-m) Beach Seine during 1974



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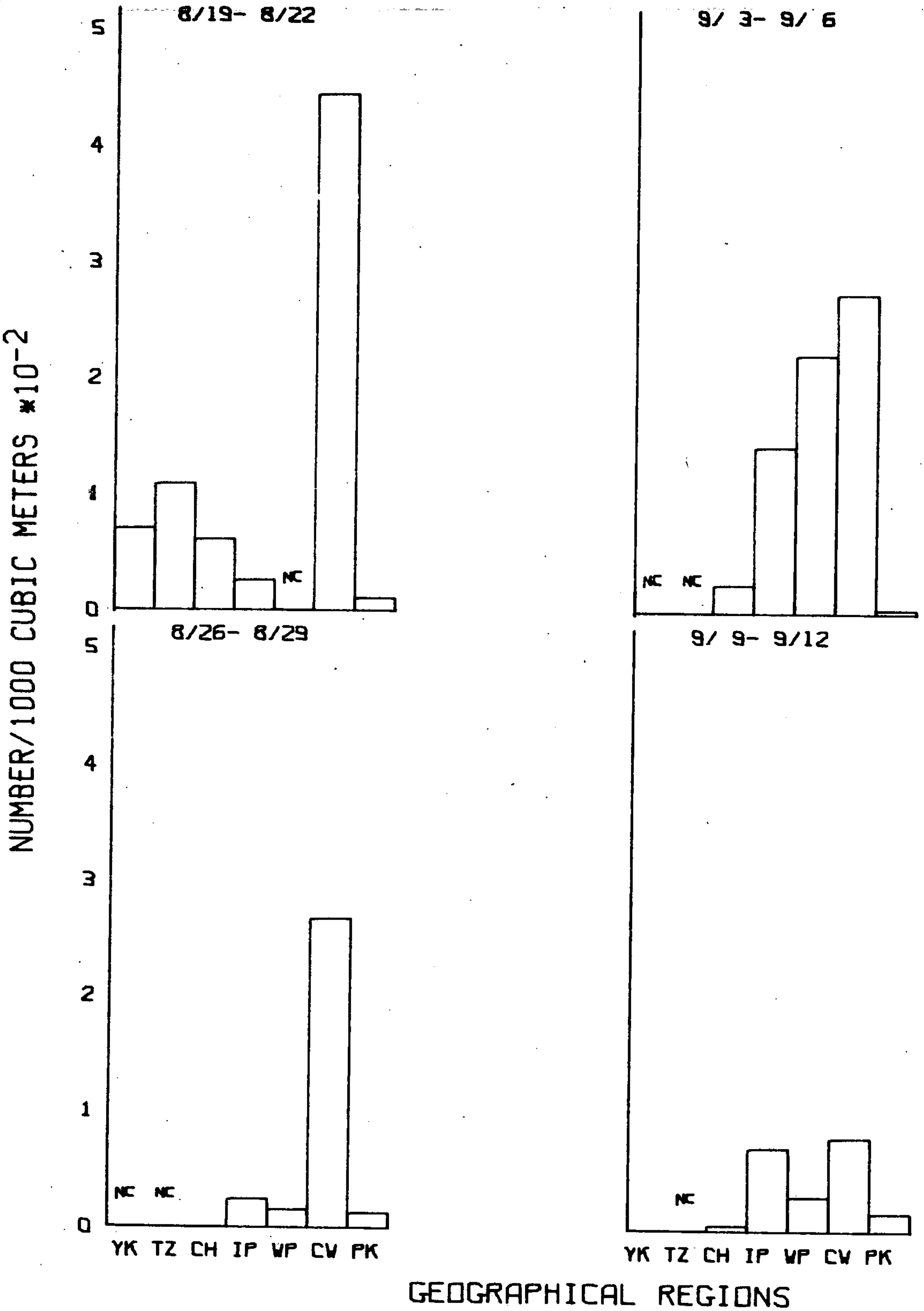
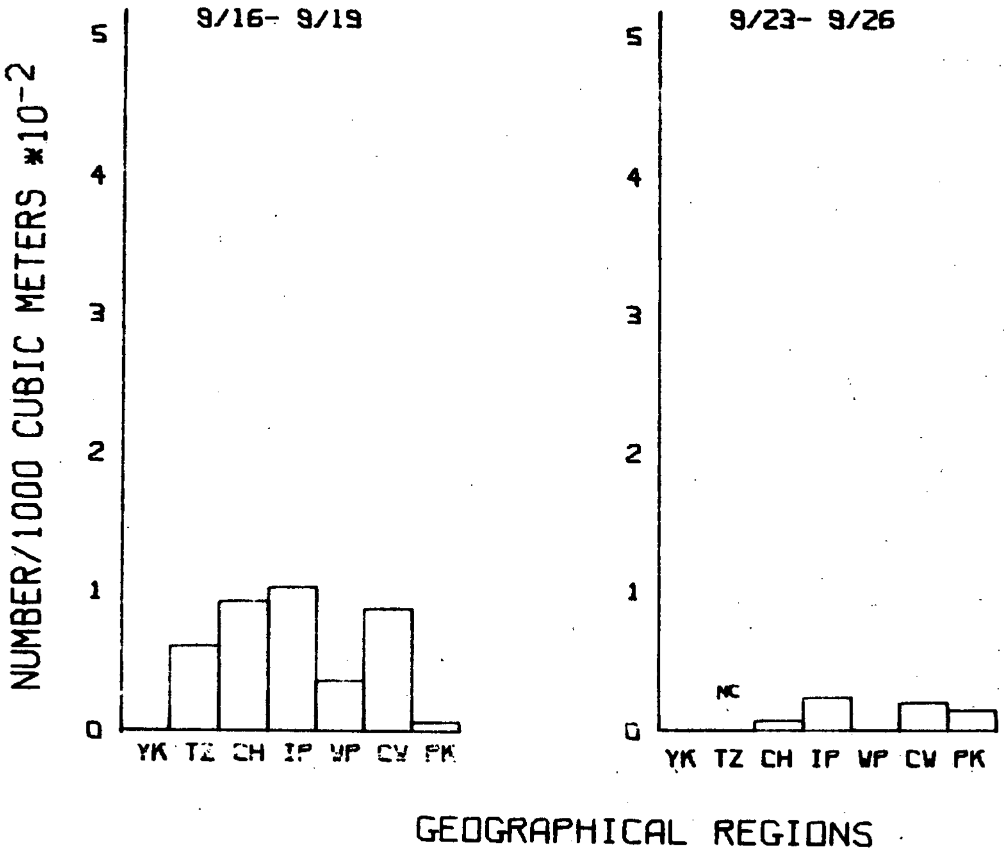


Figure D-46. Density of Juvenile Atlantic Tomcod (No./1000 m^3) within Seven Geographical Regions of Hudson River Estuary [RM 14-76 (km 22-122)] Based on Night Sampling in the Shoals by Epibenthic Sled during 1974



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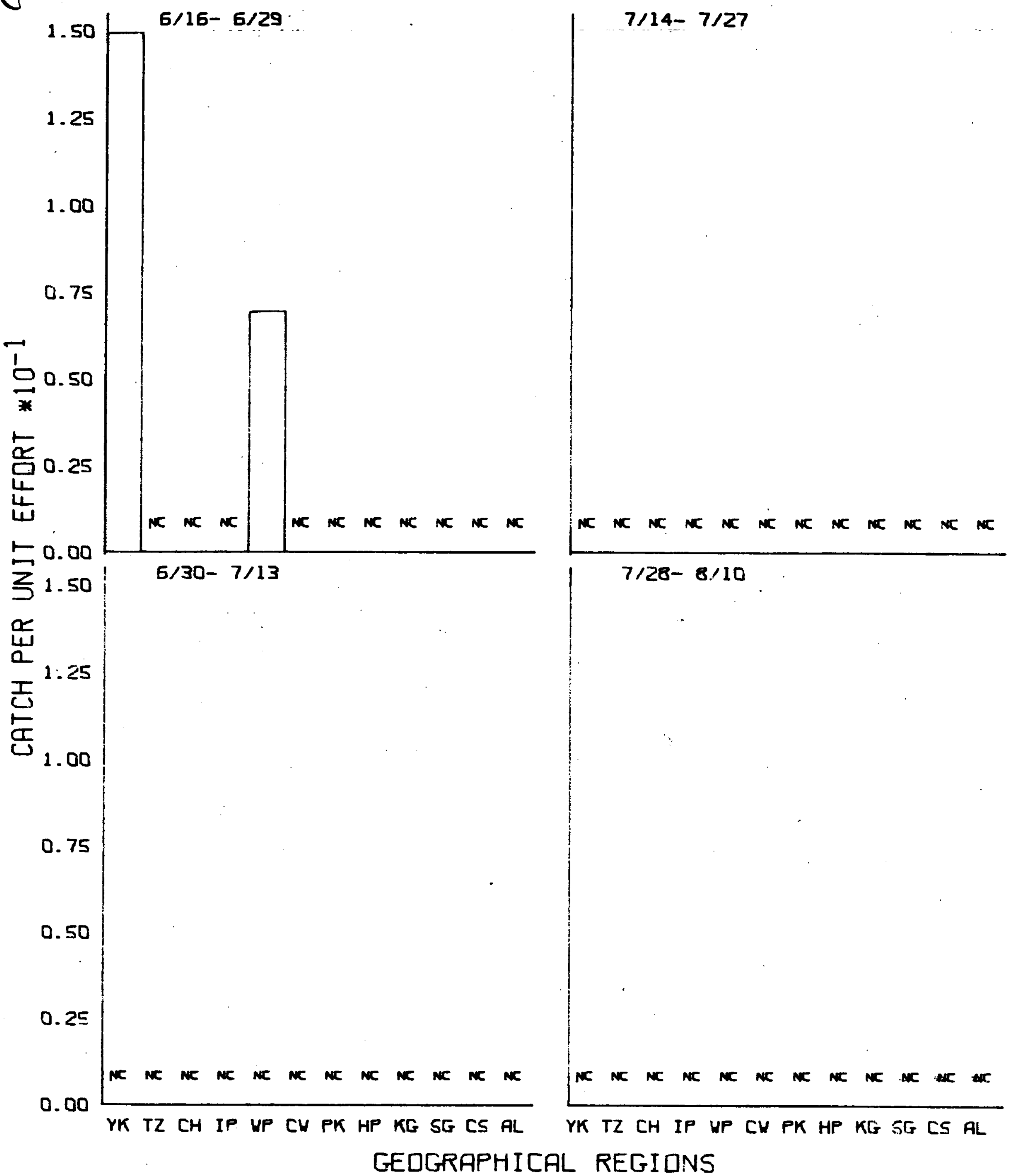
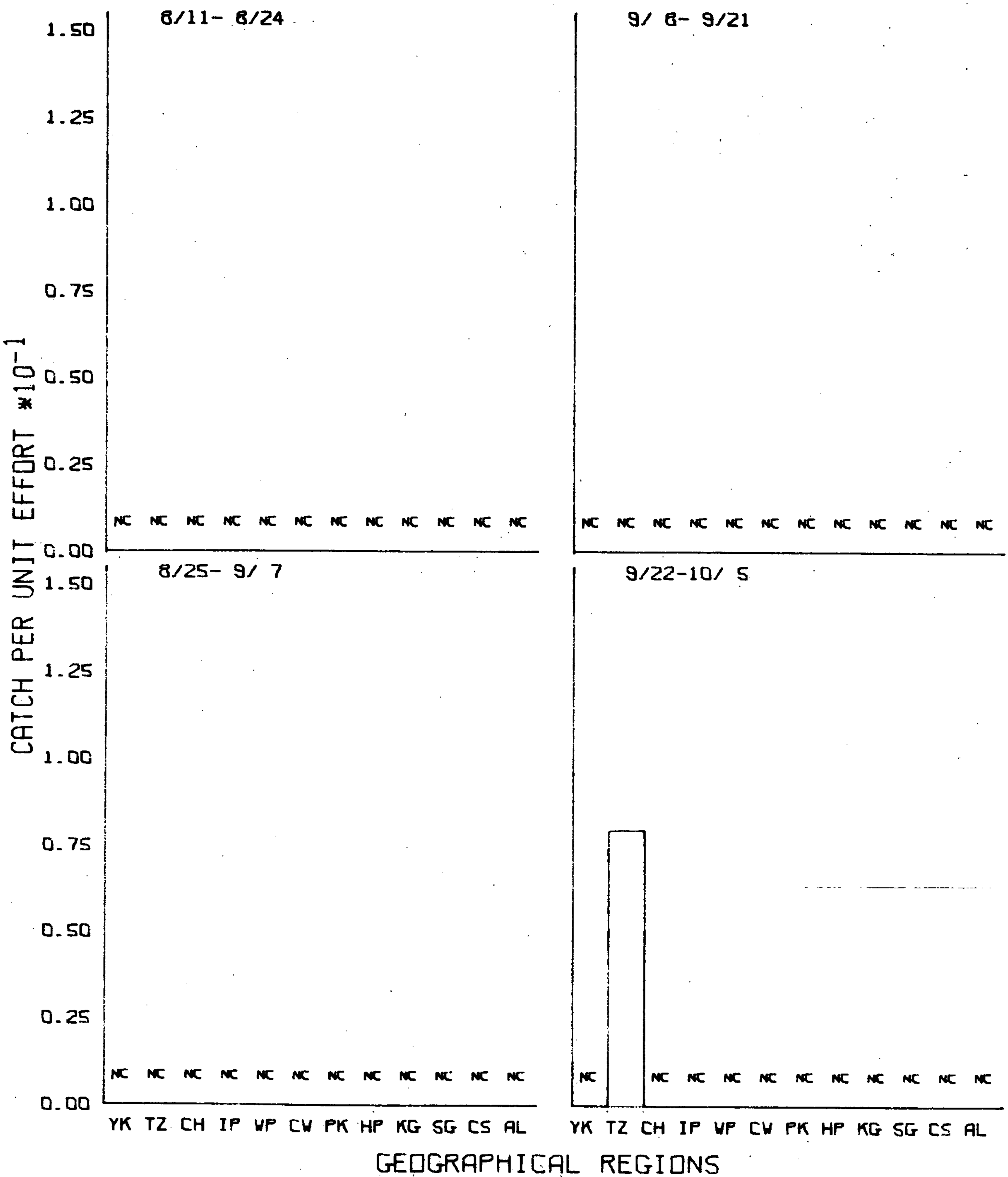


Figure D-47. Catch per Unit Effort of Yearling and Older Atlantic Tomcod within 12 Geographical Regions of Hudson River Estuary [RM 12-153 (km 19-234)] Based on Day Sampling by 100-ft (30.5-m) Beach Seine during 1974



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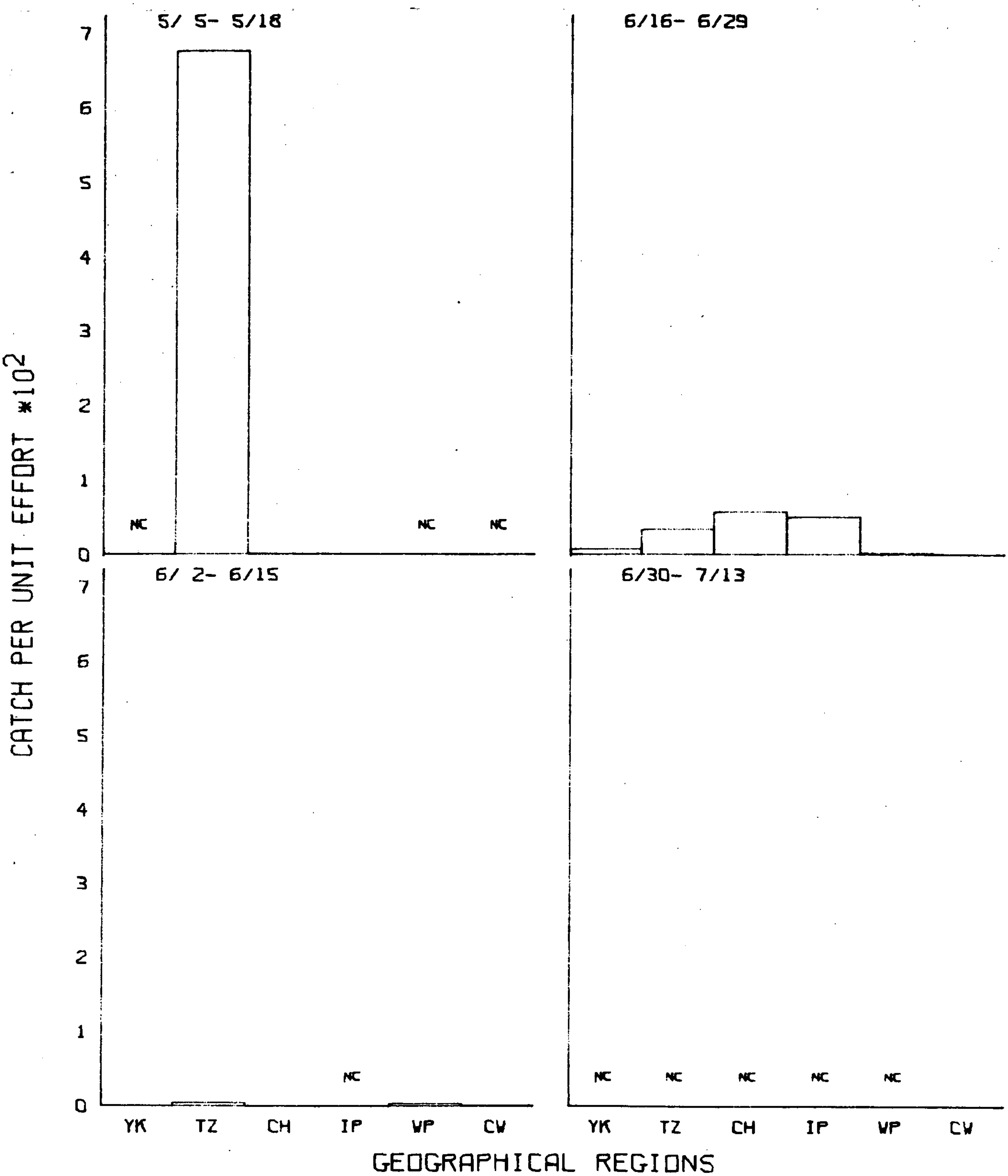
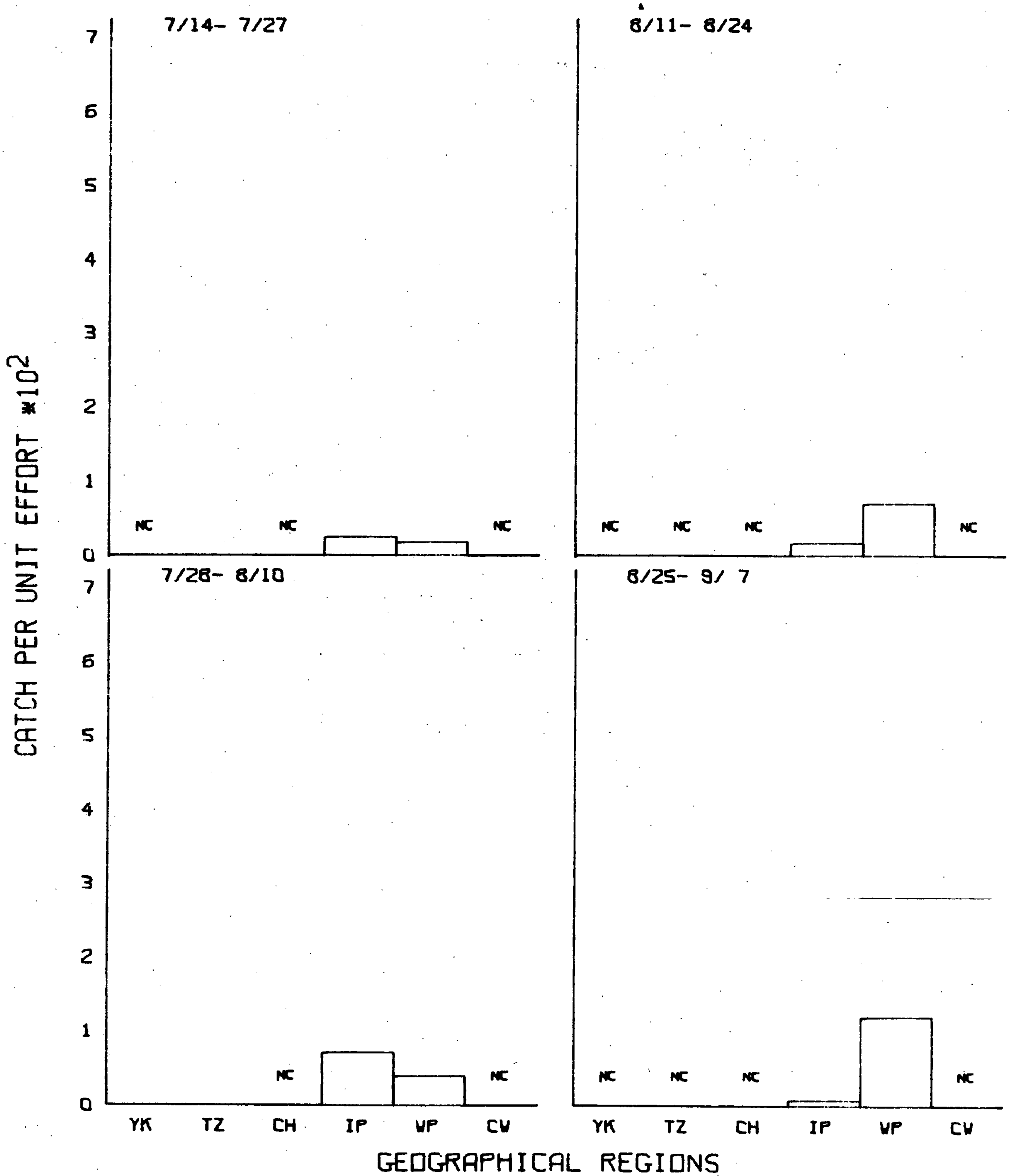


Figure D-48. Catch per Unit Effort of Juvenile Atlantic Tomcod within Six Geographical Regions of Hudson River Estuary [RM 12-61 (km 19-98)] Based on Day Sampling by Bottom Trawl (Cod End/ Cover Combined) during 1974



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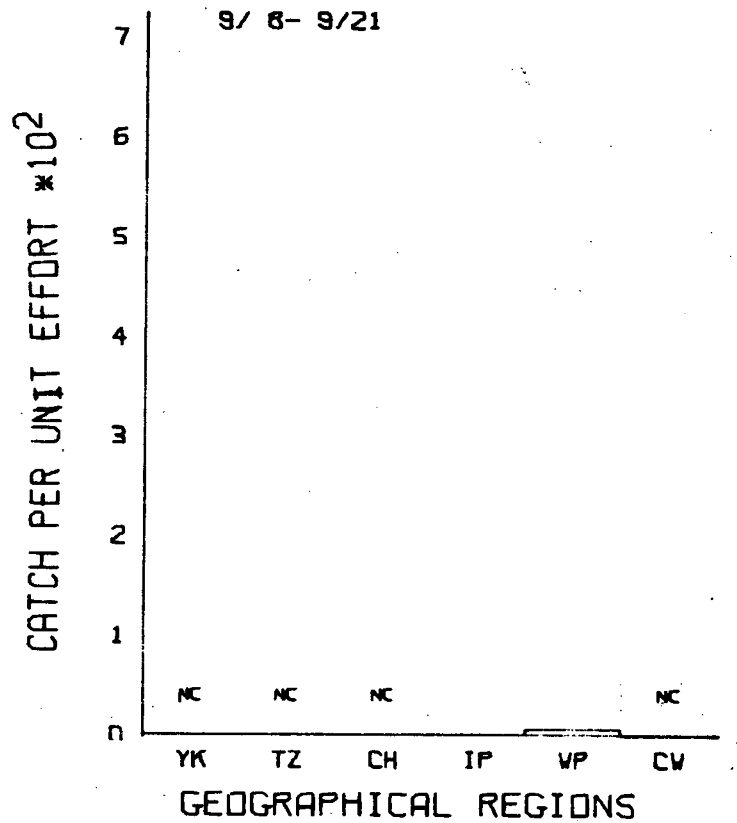

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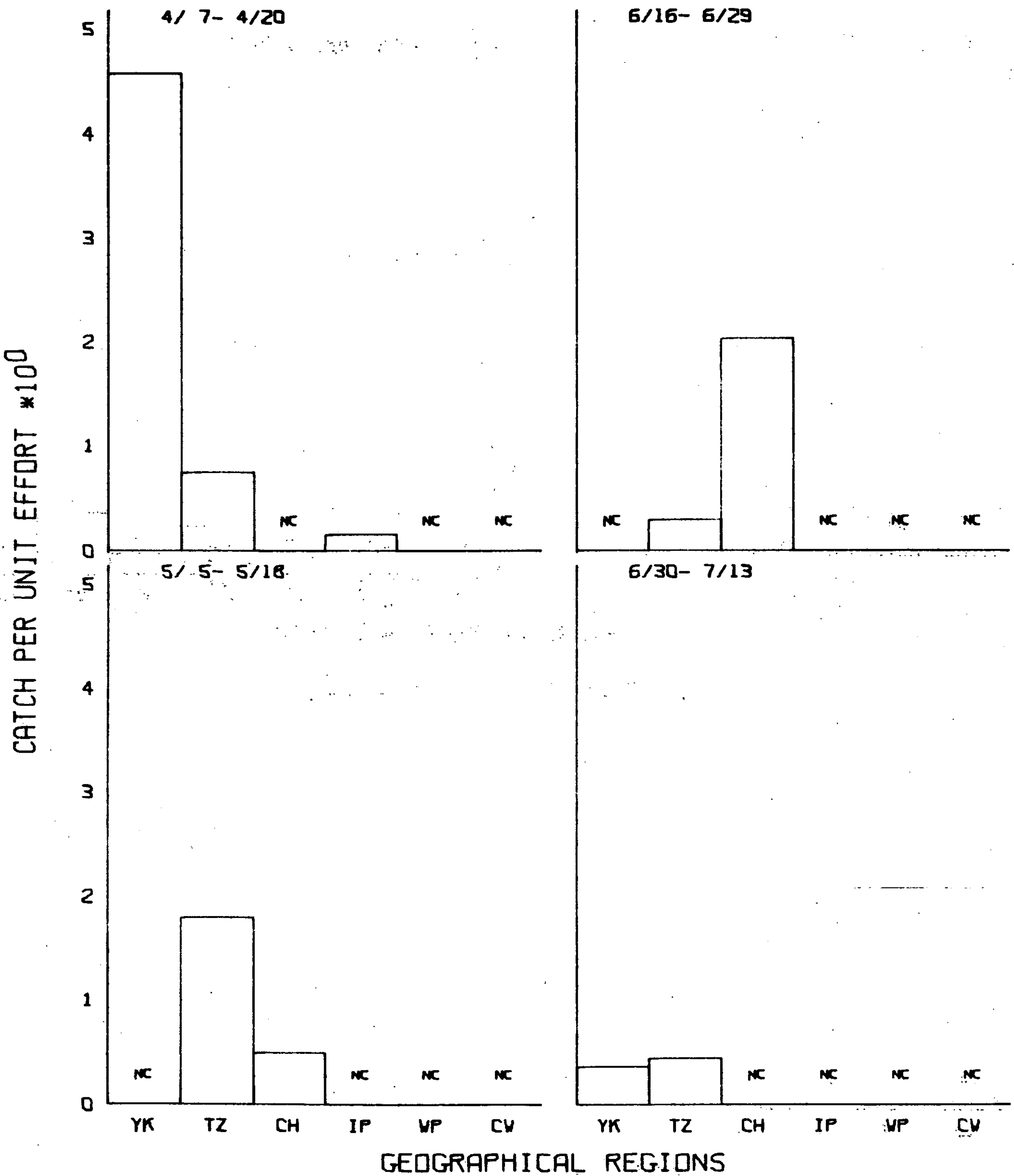
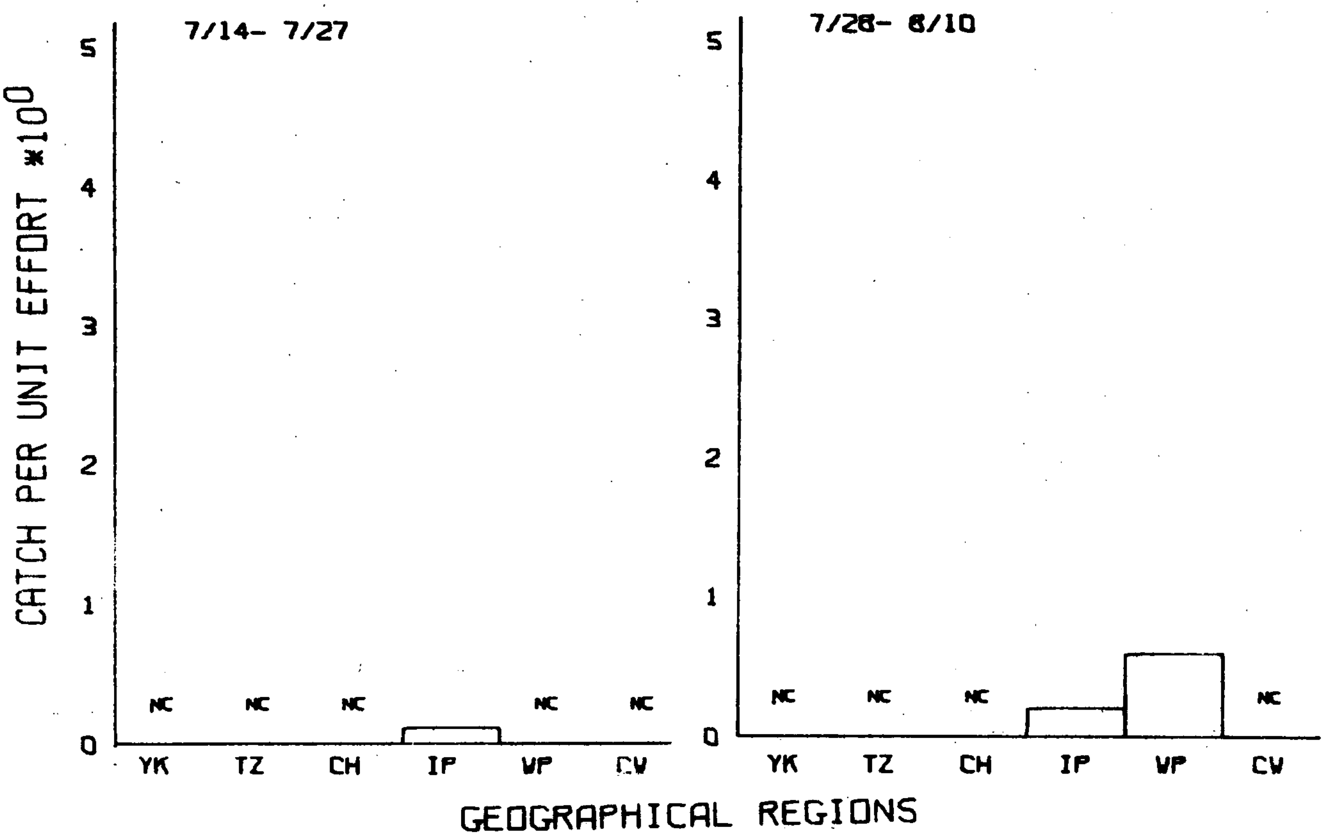


Figure D-49. Catch per Unit Effort of Yearling and Older Atlantic Tomcod within Six Geographical Regions of Hudson River Estuary [RM 12-61 (km 19-98)] Based on Day Sampling by Bottom Trawl (Cod End/Cover Combined) during 1974



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APPENDIX E

ENTRAINMENT DIRECT IMPACT

APPENDIX E

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Proportion	E-28 through E-34
Cumulative Proportion	E-35 through E-41
STRIPED BASS ICHTHYOPLANKTON CROPPED BY ENTRAINMENT, 1974	
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Cumulative Numbers	E-51 through E-59
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Table E-1

Actual Plant Flow and Maximum Pumping Capacity of Bowline (Unit 1) by 2-Wk Intervals during 1973 Entrainment period

Time Interval	Actual Flow ($\times 10^3 m^3$)	Maximum Flow ($\times 10^3 m^3$)	% of Maximum Flow
4/29-5/12	27,018	29,311	82.2
5/13-5/26	28,809	29,311	98.3
5/27-6/9	22,789	29,311	77.7
6/10-6/23	18,610	29,311	63.5
6/24-7/7	21,213	29,311	72.4
7/8-7/21	22,675	29,311	77.4
Total	141,114	175,866	80.2

Table E-2

Actual Plant Flow and Maximum Pumping Capacity of Lovett (All Units Combined) by 2-Wk Intervals during 1973 Entrainment Period

Time Interval	Actual Flow ($\times 10^3 m^3$)	Maximum Flow ($\times 10^3 m^3$)	% of Maximum Flow
4/29-5/12	18,797	24,168	77.8
5/13-5/26	17,474	24,168	72.3
5/27-6/9	19,463	24,168	80.5
6/10-6/23	21,230	24,168	87.8
6/24-7/7	22,250	24,168	92.1
7/8-7/21	22,115	24,168	91.5
Total	121,329	145,008	83.7

Table E-3

Actual Plant Flow and Maximum Pumping Capacity of Indian Point (Unit 2) by 2-Wk Intervals during 1973 Entrainment Period

Time Interval	Actual Flow ($x\ 10^3 m^3$)	Maximum Flow ($x\ 10^3 m^3$)	% of Maximum Flow
4/29-5/12	8,870	66,391	13.4
5/13-5/26	8,425	66,391	12.7
5/27-6/9	25,815	66,391	38.9
6/10-6/23	15,529	66,391	23.4
6/24-7/7	28,114	66,391	42.3
7/8-7/21	34,184	66,391	51.5
Total	120,937	398,346	30.4

Table E-4

Actual Plant Flow and Maximum Pumping Capacity of Indian Point (All Units Combined) by 2-Wk Intervals during 1973 Entrainment Period

Time Interval	Actual Flow ($x\ 10^3 m^3$)	Maximum Flow ($x\ 10^3 m^3$)	% of Maximum Flow
4/29-5/12	15,601	90,658	17.2
5/13-5/26	22,002	90,658	24.3
5/27-6/9	38,701	90,658	42.7
6/10-6/23	20,400	90,658	22.5
6/24-7/7	33,043	90,658	36.4
7/8-7/21	39,124	90,658	43.2
Total	168,871	543,948	31.0

Table E-5

Actual Plant Flow and Maximum Pumping Capacity of Danskammer (All Units Combined) by 2-Wk Intervals during 1973 Entrainment Period

Time Interval	Actual Flow (x $10^3 m^3$)	Maximum Flow (x $10^3 m^3$)	% of Maximum Flow
4/29-5/12	18,608	25,183	73.9
5/13-5/26	20,159	25,183	80.0
5/27-6/9	19,356	25,183	76.9
6/10-6/23	23,157	25,183	92.0
6/24-7/7	24,096	25,183	95.7
7/8-7/21	23,507	25,183	93.3
Total	128,883	151,098	85.3

Table E-6

Actual Plant Flow and Maximum Pumping Capacity of Bowline (Unit 1) by 1-Wk Intervals during 1974 Entrainment Period

Time Interval	Actual Flow (x $10^3 m^3$)	Maximum Flow (x $10^3 m^3$)	% of Maximum Flow
4/29-5/5	0	14,656	0
5/6-5/12	0	14,656	0
5/13-5/19	0	14,656	0
5/20-5/26	0	14,656	0
5/27-6/2	0	14,656	0
6/3-6/9	2,256	14,656	15.4
6/10-6/16	5,385	14,656	36.7
6/17-6/23	12,057	14,656	82.3
6/24-6/30	10,028	14,656	68.4
7/1-7/7	10,593	14,656	72.3
7/8-7/14	9,538	14,656	65.1
Total	49,857	87,936	56.7

Table E-7

Actual Plant Flow and Maximum Pumping Capacity of Bowline (Unit 2) by 1-Wk Intervals during 1974 Entrainment Period

Time Interval	Actual Flow (x $10^3 m^3$)	Maximum Flow (x $10^3 m^3$)	% of Maximum Flow
4/29-5/5	12,057	14,656	82.3
5/6-5/12	12,057	14,656	82.3
5/13-5/19	11,293	14,656	75.5
5/20-5/26	0	14,656	0
5/27-6/2	0	14,656	0
6/3-6/9	11,035	14,656	75.3
6/10-6/16	12,057	14,656	82.3
6/17-6/23	12,073	14,656	82.4
6/24-6/30	12,057	14,656	82.3
7/1-7/7	12,057	14,656	82.3
7/8-7/14	10,217	14,656	69.7
Total	104,903	131,904	79.5

Table E-8

Actual Plant Flow and Maximum Pumping Capacity of Bowline (All Units Combined) by 1-Wk Intervals during 1974 Entrainment Period

Time Interval	Actual Flow (x $10^3 m^3$)	Maximum Flow (x $10^3 m^3$)	% of Maximum Flow
4/29-5/5	12,057	29,312	41.1
5/6-5/12	12,057	29,312	41.1
5/13-5/19	11,293	29,312	38.5
5/20-5/26	0	29,312	0
5/27-6/2	0	29,312	0
6/3-6/9	13,291	29,312	45.3
6/10-6/16	17,442	29,312	59.5
6/17-6/23	24,130	29,312	82.3
6/24-6/30	22,085	29,312	75.3
7/1-7/7	22,650	29,312	77.3
7/8-7/14	19,755	29,312	67.4
Total	154,760	322,432	48.0

Table E-9

Actual Plant Flow and Maximum Pumping Capacity of Lovett (All Units Combined) by 1-Wk Intervals during 1974 Entrainment Period

Time Interval	Actual Flow (x $10^3 m^3$)	Maximum Flow (x $10^3 m^3$)	% of Maximum Flow
4/29-5/5	8,558	12,084	70.8
5/6-5/12	8,558	12,084	70.8
5/13-5/19	8,558	12,084	70.8
5/20-5/26	8,897	12,084	73.6
5/27-6/2	8,218	12,084	68.0
6/3-6/9	9,070	12,084	75.1
6/10-6/16	8,261	12,084	68.4
6/17-6/23	9,331	12,084	77.2
6/24-6/30	8,558	12,084	70.8
7/1-7/7	9,402	12,084	77.8
7/8-7/14	8,993	12,084	74.4
Total	96,404	132,924	72.5

Table E-10

Actual Plant Flow and Maximum Pumping Capacity of Indian Point (Unit 2) by 1-Wk Intervals during the 1974 Entrainment Period

Time Interval	Actual Flow (x $10^3 m^3$)	Maximum Flow (x $10^3 m^3$)	% of Maximum Flow
4/29-5/5	21,865	33,196	65.9
5/6-5/12	19,253	33,196	58.0
5/13-5/19	12,824	33,196	38.6
5/20-5/26	27,834	33,196	83.8
5/27-6/2	32,403	33,196	97.6
6/3-6/9	31,022	33,196	93.5
6/10-6/16	26,374	33,196	79.5
6/17-6/23	27,399	33,196	82.5
6/24-6/30	29,327	33,196	88.3
7/1-7/7	31,009	33,196	93.4
7/8-7/14	31,029	33,196	93.5
Total	290,339	365,156	79.5

Table E-11

Actual Plant Flow and Maximum Pumping Capacity of Indian Point (All Units Combined) by 1-Wk Intervals during 1974 Entrainment Period

Time Interval	Actual Flow ($\times 10^3 m^3$)	Maximum Flow ($\times 10^3 m^3$)	% of Maximum Flow
4/29-5/5	30,509	45,330	67.3
5/6-5/12	24,223	45,330	53.4
5/13-5/19	19,452	45,330	42.9
5/20-5/26	39,300	45,330	86.7
5/27-6/2	43,747	45,330	96.5
6/3-6/9	42,488	45,330	93.7
6/10-6/16	37,858	45,330	83.5
6/17-6/23	38,829	45,330	85.7
6/24-6/30	39,226	45,330	86.5
7/1-7/7	41,586	45,330	91.7
7/8-7/14	37,273	45,330	82.2
Total	394,491	498,630	79.1

Table E-12

Actual Plant Flow and Maximum Pumping Capacity of Danskammer (All Units Combined) by 1-Wk Intervals during 1974 Entrainment Period

Time Interval	Actual Flow ($\times 10^3 m^3$)	Maximum Flow ($\times 10^3 m^3$)	% of Maximum Flow
4/29-5/5	9,152	12,591	72.7
5/6-5/12	7,914	12,591	62.9
5/13-5/19	8,463	12,591	67.2
5/20-5/26	9,386	12,591	74.5
5/27-6/2	9,348	12,591	74.2
6/3-6/9	7,938	12,591	63.0
6/10-6/16	7,092	12,591	56.3
6/17-6/23	8,156	12,591	64.8
6/24-6/30	8,018	12,591	63.7
7/1-7/7	9,578	12,591	76.1
7/8-7/14	9,860	12,591	78.3
Total	94,905	138,501	68.5

Table E-13

Standing Crops* of Striped Bass and White Perch Ichthyoplankton Including Unidentified *Morone* spp. by 1-Wk Intervals during 1974

Time Interval	Striped Bass Including Unidentified *Morone* spp. Number*	±	Standard Error*	White Perch Including Unidentified *Morone* spp. Number*	±	Standard Error*
4/29-5/5	1,170,000	±	261,000	0	±	0
5/6-5/12	58,306,000	±	4,619,000	2,982,000	±	577,000
5/13-5/19	177,787,000	±	74,046,000	32,790,000	±	7,734,000
5/20-5/26	200,083,000	±	46,243,000	204,321,000	±	56,826,000
5/27-6/2	240,998,000	±	40,259,000	177,929,000	±	20,137,000
6/3-6/9	783,419,000	±	35,113,000	282,182,000	±	69,852,000
6/10-6/16	338,044,000	±	58,218,000	528,995,000	±	76,016,000
6/17-6/23	338,878,000	±	45,850,000	330,868,000	±	36,314,000
6/24-6/30	119,410,000	±	9,265,000	149,216,000	±	14,495,000
7/1-7/7	22,719,000	±	4,199,000	28,370,000	±	3,030,000
7/8-7/14	14,227,000	±	2,026,000	26,283,000	±	3,227,000

*Numbers are rounded to nearest thousand

Table E-14

Estimates* of Number of Striped Bass Ichthyoplankton Cropped by Entrainment at Bowline (Unit 1) by 2-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1973

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/12	0.707	23,000	46,000	25,000	50,000	32,000	64,000	35,000	71,000
5/13-5/26	0.772	3,029,000	6,058,000	3,289,000	6,578,000	3,834,000	7,668,000	4,260,000	850,000
5/27-6/9	0.649	83,000	167,000	89,000	179,000	124,000	248,000	138,000	276,000
6/10-6/23	0.607	533,000	1,066,000	569,000	1,138,000	844,000	1,687,000	937,000	1,875,000
6/24-7/7	0.601	235,000	470,000	252,000	502,000	376,000	751,000	417,000	835,000
7/8-7/21	0.613	28,000	56,000	30,000	60,000	44,000	88,000	49,000	98,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-15

Estimates* of Number of Striped Bass Ichthyoplankton Cropped by Entrainment at Lovett (All Units Combined) by 2-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1973

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/12	0.781	111,000	222,000	120,000	241,000	139,000	278,000	155,000	309,000
5/13-5/26	0.777	2,342,000	4,684,000	2,544,000	5,089,000	2,947,000	5,894,000	3,275,000	6,549,000
5/27-6/9	0.684	74,000	147,000	79,000	159,000	104,000	209,000	116,000	232,000
6/10-6/23	0.606	838,000	1,675,000	894,000	1,788,000	1,328,000	2,656,000	1,475,000	2,951,000
6/24-7/7	0.602	241,000	482,000	257,000	515,000	385,000	769,000	427,000	855,000
7/8-7/21	0.615	35,000	70,000	37,000	75,000	55,000	110,000	61,000	122,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-16

Estimates* of Number of Striped Bass Ichthyoplankton Cropped by Entrainment at Indian Point (Unit 2) by 2-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1973

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/12	0.790	95,000	190,000	103,000	207,000	118,000	235,000	131,000	262,000
5/13-5/26	0.777	1,050,000	2,099,000	1,140,000	2,280,000	1,321,000	2,642,000	1,468,000	2,935,000
5/27-6/9	0.689	121,000	241,000	130,000	260,000	170,000	339,000	188,000	377,000
6/10-6/23	0.605	658,000	1,316,000	702,000	1,405,000	1,045,000	2,090,000	1,161,000	2,322,000
6/24-7/7	0.603	352,000	705,000	376,000	752,000	561,000	1,123,000	624,000	1,247,000
7/8-7/21	0.617	54,000	109,000	58,000	116,000	85,000	169,000	94,000	188,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-17

Estimates* of Number of Striped Bass Ichthyoplankton Cropped by Entrainment at Indian Point (All Units Combined) by 2-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1973

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/12	0.790	167,000	334,000	182,000	363,000	207,000	414,000	230,000	460,000
5/13-5/26	0.777	2,741,000	5,482,000	2,978,000	5,956,000	3,449,000	6,898,000	3,832,000	7,665,000
5/27-6/9	0.689	181,000	362,000	195,000	389,000	254,000	509,000	283,000	566,000
6/10-6/23	0.605	865,000	1,729,000	923,000	1,846,000	1,373,000	2,746,000	1,525,000	3,051,000
6/24-7/7	0.603	414,000	828,000	442,000	884,000	660,000	1,319,000	733,000	1,466,000
7/8-7/21	0.617	62,000	124,000	66,000	133,000	97,000	194,000	108,000	215,000
7/22-8/1	0.651	18,000	36,000	20,000	39,000	27,000	54,000	30,000	60,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-18

Estimates* of Number of Striped Bass Ichthyoplankton Cropped by Entrainment at Danskammer (All Units Combined) by 2-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1973

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/12	0.797	271,000	543,000	295,000	591,000	334,000	667,000	371,000	741,000
5/13-5/26	0.776	1,427,000	2,854,000	1,550,000	3,100,000	1,797,000	3,595,000	1,997,000	3,994,000
5/27-6/9	0.623	736,000	1,472,000	787,000	1,573,000	1,137,000	2,273,000	1,263,000	2,526,000
6/10-6/23	0.600	708,000	1,416,000	755,000	1,510,000	1,133,000	2,266,000	1,259,000	2,571,000
6/24-7/7	0.601	1,125,000	2,249,000	1,200,000	2,400,000	1,797,000	3,593,000	1,996,000	3,993,000
7/8-7/21	0.667	180,000	360,000	194,000	387,000	261,000	522,000	290,000	581,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-19

Estimates* of Number of Striped Bass Ichthyoplankton Cropped by Entrainment at Multiplant by 2-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1973

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/12	0.788	573,000	1,146,000	623,000	1,246,000	712,000	1,423,000	791,000	1,581,000
5/13-5/26	0.775	9,539,000	19,078,000	10,361,000	20,721,000	12,028,000	24,055,000	13,364,000	26,728,000
5/27-6/9	0.639	1,074,000	2,148,000	1,150,000	2,300,000	1,619,000	3,239,000	1,799,000	3,598,000
6/10-6/23	0.604	2,943,000	5,887,000	3,141,000	6,282,000	4,677,000	9,354,000	5,197,000	10,394,000
6/24-7/7	0.602	2,015,000	4,031,000	2,150,000	4,300,000	3,217,000	6,434,000	3,574,000	7,148,000
7/8-7/21	0.645	306,000	611,000	327,000	655,000	457,000	914,000	508,000	1,016,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-20

Estimates* of Number of Striped Bass Ichthyoplankton Cropped by Entrainment at Post-1972 Plants by 2-Wk Intervals for each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1973

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/12	0.779	118,000	236,000	128,000	257,000	150,000	299,000	166,000	332,000
5/13-5/26	0.774	4,078,000	8,157,000	4,429,000	8,858,000	5,155,000	10,309,000	5,727,000	11,455,000
5/27-6/9	0.676	204,000	408,000	219,000	439,000	294,000	587,000	326,000	653,000
6/10-6/23	0.606	1,191,000	2,382,000	1,271,000	2,543,000	1,889,000	3,777,000	2,098,000	4,197,000
6/24-7/7	0.602	588,000	1,175,000	627,000	1,254,000	937,000	1,874,000	1,041,000	2,082,000
7/8-7/21	0.616	82,000	165,000	88,000	176,000	129,000	257,000	143,000	286,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-21

Estimates* of Cumulative Number of Striped Bass Ichthyoplankton Cropped by Entrainment at Bowline (Unit 1) by 2-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1973

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/12	0.707	23,000	46,000	25,000	50,000	32,000	64,000	35,000	71,000
5/13-5/26	0.772	3,052,000	6,104,000	3,314,000	6,627,000	3,866,000	7,732,000	4,295,000	8,591,000
5/27-6/9	0.649	3,136,000	6,271,000	3,403,000	6,806,000	3,990,000	7,980,000	4,433,000	8,866,000
6/10-6/23	0.607	3,668,000	7,337,000	3,972,000	7,944,000	4,833,000	9,667,000	5,370,000	10,741,000
6/24-7/7	0.601	3,904,000	7,807,000	4,223,000	8,446,000	5,209,000	10,418,000	5,788,000	11,576,000
7/8-7/21	0.613	3,932,000	7,864,000	4,253,000	8,506,000	5,253,000	10,506,000	5,837,000	11,674,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-22

Estimates* of Cumulative Number of Striped Bass Ichthyoplankton Cropped by Entrainment at Lovett (All Units Combined) by 2-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1973

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/12	0.781	111,000	222,000	121,000	241,000	139,000	278,000	155,000	309,000
5/13-5/26	0.777	2,453,000	4,906,000	2,665,000	5,330,000	3,086,000	6,172,000	3,429,000	6,858,000
5/27-6/9	0.684	2,527,000	5,054,000	2,744,000	5,489,000	3,190,000	6,381,000	3,545,000	7,090,000
6/10-6/23	0.606	3,365,000	6,729,000	3,638,000	7,277,000	4,518,000	9,037,000	5,020,000	10,041,000
6/24-7/7	0.602	3,606,000	7,212,000	3,896,000	7,792,000	4,903,000	9,806,000	5,448,000	10,896,000
7/8-7/21	0.615	3,641,000	7,282,000	3,933,000	7,867,000	4,958,000	9,916,000	5,509,000	11,018,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-23

Estimates* of Cumulative Number of Striped Bass Ichthyoplankton Cropped by Entrainment at Indian Point (Unit 2) by 2-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1973

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/12	0.790	95,000	190,000	103,000	207,000	118,000	235,000	131,000	262,000
5/13-5/26	0.777	1,145,000	2,289,000	1,244,000	2,487,000	1,438,000	2,877,000	1,598,000	3,197,000
5/27-6/9	0.689	1,265,000	2,531,000	1,373,000	2,747,000	1,608,000	3,216,000	1,787,000	3,574,000
6/10-6/23	0.605	1,923,000	3,847,000	2,076,000	4,152,000	2,653,000	5,306,000	2,948,000	5,896,000
6/24-7/7	0.603	2,276,000	4,552,000	2,452,000	4,904,000	3,214,000	6,429,000	3,572,000	7,143,000
7/8-7/21	0.617	2,330,000	4,660,000	2,510,000	5,020,000	3,299,000	6,598,000	3,666,000	7,331,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-24

Estimates* of Cumulative Number of Striped Bass Ichthyoplankton Cropped by Entrainment at Indian Point (All Units Combined) by 2-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1973

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/12	0.790	167,000	334,000	182,000	363,000	207,000	414,000	230,000	460,000
5/13-5/26	0.777	2,908,000	5,816,000	3,160,000	6,319,000	3,656,000	7,312,000	4,062,000	8,125,000
5/27-6/9	0.689	3,089,000	6,178,000	3,354,000	6,708,000	3,910,000	7,821,000	4,345,000	8,690,000
6/10-6/23	0.605	3,954,000	7,908,000	4,277,000	8,554,000	5,283,000	10,567,000	5,870,000	11,741,000
6/24-7/7	0.603	4,368,000	8,736,000	4,719,000	9,438,000	5,943,000	11,886,000	6,603,000	13,207,000
7/8-7/21	0.617	4,430,000	8,860,000	4,785,000	9,571,000	6,040,000	12,080,000	6,711,000	13,422,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-25

Estimates* of Cumulative Number of Striped Bass Ichthyoplankton Cropped by Entrainment at Danskammer (All Units Combined) by 2-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1973

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/12	0.797	271,000	543,000	295,000	591,000	334,000	667,000	371,000	741,000
5/13-5/26	0.776	1,698,000	3,396,000	1,845,000	3,691,000	2,131,000	4,262,000	2,368,000	4,736,000
5/27-6/9	0.623	2,434,000	4,868,000	2,632,000	5,264,000	3,268,000	6,535,000	3,631,000	7,261,000
6/10-6/23	0.600	3,142,000	6,284,000	3,387,000	6,774,000	4,400,000	8,801,000	4,889,000	9,779,000
6/24-7/7	0.601	4,267,000	8,533,000	4,587,000	9,174,000	6,197,000	12,394,000	6,886,000	13,771,000
7/8-7/21	0.667	4,447,000	8,894,000	4,781,000	9,561,000	6,458,000	12,917,000	7,176,000	14,352,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-26

Estimates* of Cumulative Number of Striped Bass Ichthyoplankton Cropped by Entrainment at Multiplant by 2-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1973

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/12	0.788	573,000	1,146,000	623,000	1,246,000	712,000	1,423,000	791,000	1,581,000
5/13-5/26	0.775	10,112,000	20,223,000	10,984,000	21,967,000	12,739,000	25,479,000	14,155,000	28,310,000
5/27-6/9	0.639	11,185,000	22,371,000	12,134,000	24,267,000	14,359,000	28,717,000	15,954,000	31,908,000
6/10-6/23	0.604	14,129,000	28,258,000	15,275,000	30,550,000	19,036,000	38,071,000	21,151,000	42,302,000
6/24-7/7	0.602	16,144,000	32,288,000	17,425,000	34,850,000	22,253,000	44,505,000	24,725,000	49,450,000
7/8-7/21	0.645	16,450,000	32,900,000	17,752,000	35,505,000	22,709,000	45,419,000	25,233,000	50,466,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-27

Estimates* of Cumulative Number of Striped Bass Ichthyoplankton Cropped by Entrainment at Post-1972 Plants by 2-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1973

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/12	0.779	118,000	236,000	128,000	257,000	150,000	299,000	166,000	332,000
5/13-5/26	0.774	4,197,000	8,393,000	4,557,000	9,114,000	5,304,000	10,608,000	5,894,000	11,787,000
5/27-6/9	0.676	4,401,000	8,802,000	4,777,000	9,553,000	5,598,000	11,196,000	6,220,000	12,440,000
6/10-6/23	0.606	5,592,000	11,184,000	6,048,000	12,096,000	7,487,000	14,973,000	8,318,000	16,637,000
6/24-7/7	0.602	6,180,000	12,359,000	6,675,000	13,350,000	8,424,000	16,847,000	9,359,000	18,719,000
7/8-7/21	0.616	6,262,000	12,524,000	6,763,000	13,526,000	8,552,000	17,104,000	9,502,000	19,005,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-28

Estimates* of Proportion of Striped Bass Ichthyoplankton Cropped by Entrainment at Bowline (Unit 1) by 2-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1973

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/12	0.707	<0.0001	0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	0.0001
5/13-5/26	0.772	0.0053	0.0107	0.0058	0.0116	0.0068	0.0135	0.0075	0.0150
5/27-6/9	0.649	0.0008	0.0016	0.0009	0.0017	0.0012	0.0024	0.0013	0.0027
6/10-6/23	0.607	0.0029	0.0058	0.0031	0.0062	0.0046	0.0092	0.0051	0.0102
6/24-7/7	0.601	0.0013	0.0027	0.0014	0.0029	0.0022	0.0043	0.0024	0.0048
7/8-7/21	0.613	0.0011	0.0023	0.0012	0.0024	0.0018	0.0036	0.0020	0.0040

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-29

Estimates* of Proportion of Striped Bass Ichthyoplankton Cropped by Entrainment at Lovett (All Units Combined) by 2-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1973

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/12	0.781	0.0001	0.0003	0.0002	0.0003	0.0002	0.0004	0.0002	0.0004
5/13-5/26	0.777	0.0041	0.0083	0.0045	0.0090	0.0052	0.0104	0.0058	0.0116
5/27-6/9	0.684	0.0007	0.0014	0.0008	0.0015	0.0010	0.0020	0.0011	0.0022
6/10-6/23	0.606	0.0046	0.0091	0.0049	0.0098	0.0073	0.0145	0.0081	0.0161
6/24-7/7	0.602	0.0014	0.0028	0.0015	0.0030	0.0022	0.0044	0.0025	0.0049
7/8-7/21	0.615	0.0014	0.0029	0.0015	0.0030	0.0022	0.0045	0.0025	0.0050

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-30

Estimates* of Proportion of Striped Bass Ichthyoplankton Cropped by Entrainment at Indian Point (Unit 2) by 2-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1973

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/12	0.790	0.0001	0.0003	0.0001	0.0003	0.0002	0.0003	0.0002	0.0004
5/13-5/26	0.777	0.0019	0.0037	0.0020	0.0040	0.0023	0.0047	0.0026	0.0052
5/27-6/9	0.689	0.0012	0.0023	0.0013	0.0025	0.0016	0.0033	0.0018	0.0037
6/10-6/23	0.605	0.0036	0.0072	0.0038	0.0077	0.0057	0.0114	0.0063	0.0127
6/24-7/7	0.603	0.0020	0.0040	0.0022	0.0043	0.0032	0.0064	0.0036	0.0072
7/8-7/21	0.617	0.0022	0.0044	0.0024	0.0047	0.0034	0.0069	0.0038	0.0077

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-31

Estimates* of Proportion of Striped Bass Ichthyoplankton Cropped by Entrainment at Indian Point (All Units Combined) by 2-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1973

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/12	0.790	0.0002	0.0004	0.0002	0.0005	0.0003	0.0006	0.0003	0.0006
5/13-5/26	0.777	0.0048	0.0097	0.0053	0.0105	0.0060	0.0122	0.0068	0.0135
5/27-6/9	0.689	0.0018	0.0035	0.0019	0.0038	0.0025	0.0049	0.0027	0.0055
6/10-6/23	0.605	0.0047	0.0094	0.0050	0.0101	0.0075	0.0150	0.0083	0.0167
6/24-7/7	0.603	0.0024	0.0048	0.0025	0.0051	0.0038	0.0076	0.0042	0.0084
7/8-7/21	0.617	0.0025	0.0051	0.0027	0.0054	0.0040	0.0079	0.0044	0.0088

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-32

Estimates* of Proportion of Striped Bass Ichthyoplankton Cropped by Entrainment at Danskammer (All Units Combined) by 2-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1973

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/12	0.797	0.0004	0.0007	0.0004	0.0008	0.0005	0.0009	0.0005	0.0010
5/13-5/26	0.776	0.0025	0.0050	0.0027	0.0052	0.0032	0.0063	0.0035	0.0070
5/27-6/9	0.623	0.0071	0.0143	0.0076	0.0152	0.0110	0.0220	0.0122	0.0245
6/10-6/23	0.600	0.0039	0.0077	0.0041	0.0082	0.0062	0.0124	0.0069	0.0137
6/24-7/7	0.601	0.0064	0.0129	0.0069	0.0138	0.0103	0.0206	0.0114	0.0229
7/8-7/21	0.667	0.0073	0.0147	0.0079	0.0157	0.0106	0.0213	0.0118	0.0236

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-33

Estimates* of Proportion of Striped Bass Ichthyoplankton Cropped by Entrainment at Multiplant by 2-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1973

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/12	0.788	0.0008	0.0016	0.0009	0.0017	0.0010	0.0019	0.0011	0.0022
5/13-5/26	0.775	0.0168	0.0337	0.0183	0.0366	0.0212	0.0424	0.0236	0.0472
5/27-6/9	0.639	0.0104	0.0208	0.0111	0.0223	0.0157	0.0314	0.0174	0.0349
6/10-6/23	0.604	0.0161	0.0321	0.0172	0.0343	0.0255	0.0511	0.0284	0.0568
6/24-7/7	0.602	0.0116	0.0231	0.0123	0.0247	0.0184	0.0369	0.0205	0.0410
7/8-7/21	0.645	0.0124	0.0249	0.0133	0.0266	0.0186	0.0372	0.0207	0.0413

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-34

Estimates* of Proportion of Striped Bass Ichthyoplankton Cropped by Entrainment at Post-1972 Plants by 2-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1973

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/12	0.779	0.0002	0.0003	0.0002	0.0003	0.0002	0.0004	0.0002	0.0005
5/13-5/26	0.774	0.0072	0.0144	0.0078	0.0156	0.0091	0.0182	0.0101	0.0202
5/27-6/9	0.676	0.0020	0.0040	0.0021	0.0043	0.0028	0.0057	0.0032	0.0063
6/10-6/23	0.606	0.0065	0.0130	0.0069	0.0139	0.0103	0.0206	0.0115	0.0229
6/24-7/7	0.602	0.0034	0.0067	0.0036	0.0072	0.0054	0.0107	0.0060	0.0119
7/8-7/21	0.616	0.0034	0.0067	0.0036	0.0072	0.0052	0.0105	0.0058	0.0116

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-35

Estimates* of Cumulative Proportion of Striped Bass Ichthyoplankton Cropped by Entrainment at Bowline (Unit 1) by 2-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1973

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/12	0.707	<0.0001	0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	0.0001
5/13-5/26	0.772	0.0054	0.0107	0.0058	0.0117	0.0068	0.0136	0.0076	0.0151
5/27-6/9	0.649	0.0062	0.0123	0.0067	0.0134	0.0800	0.0160	0.0089	0.0178
6/10-6/23	0.607	0.0091	0.0181	0.0098	0.0195	0.0126	0.0251	0.0140	0.0278
6/24-7/7	0.601	0.0104	0.0207	0.0112	0.0023	0.0147	0.0293	0.0163	0.0325
7/8-7/21	0.613	0.0115	0.0230	0.0124	0.0247	0.0165	0.0327	0.0183	0.0363

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-36

Estimates* of Cumulative Proportion of Striped Bass Ichthyoplankton Cropped by Entrainment at Lovett (All Units Combined) by 2-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1973

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/12	0.781	0.0001	0.0003	0.0001	0.0003	0.0001	0.0003	0.0002	0.0004
5/13-5/26	0.777	0.0043	0.0086	0.0047	0.0093	0.0054	0.0108	0.0060	0.0120
5/27-6/9	0.684	0.0050	0.0100	0.0054	0.0108	0.0064	0.0128	0.0710	0.0142
6/10-6/23	0.606	0.0095	0.0190	0.0103	0.0205	0.0136	0.0271	0.0151	0.0301
6/24-7/7	0.602	0.0109	0.0218	0.0117	0.0234	0.0158	0.0314	0.0175	0.0348
7/8-7/21	0.615	0.0123	0.0245	0.0132	0.0264	0.0181	0.0357	0.0200	0.0396

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-37

Estimates* of Cumulative Proportion of Striped Bass Ichthyoplankton Cropped by Entrainment at Indian Point (Unit 2) by 2-Wk Intervals for Each Combination or Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1973

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/12	0.790	0.0001	0.0003	0.0001	0.0003	0.0002	0.0003	0.0002	0.0004
5/13-5/26	0.777	0.0020	0.0040	0.0022	0.0043	0.0025	0.0050	0.0028	0.0055
5/27-6/9	0.689	0.0031	0.0063	0.0034	0.0068	0.0041	0.0083	0.0046	0.0092
6/10-6/23	0.605	0.0067	0.0134	0.0072	0.0144	0.0098	0.0196	0.0109	0.0217
6/24-7/7	0.603	0.0087	0.0174	0.0094	0.0187	0.0130	0.0259	0.0144	0.0287
7/8-7/21	0.617	0.0109	0.0218	0.0117	0.0233	0.0164	0.0326	0.0182	0.0362

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-38

Estimates* of Cumulative Proportion of Striped Bass Ichthyoplankton Cropped by Entrainment at Indian Point (All Units Combined) by 2-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1973

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/12	0.790	0.0002	0.0005	0.0002	0.0005	0.0003	0.0006	0.0003	0.0006
5/13-5/26	0.777	0.0051	0.0101	0.0055	0.0110	0.0064	0.0127	0.0070	0.0141
5/27-6/9	0.689	0.0068	0.0136	0.0074	0.0147	0.0088	0.0176	0.0098	0.0195
6/10-6/23	0.605	0.0115	0.0229	0.0124	0.0247	0.0162	0.0323	0.0180	0.0359
6/24-7/7	0.603	0.0138	0.0275	0.0149	0.0296	0.0200	0.0396	0.0222	0.0440
7/8-7/21	0.617	0.0163	0.0325	0.0175	0.0348	0.0238	0.0472	0.0264	0.0523

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-39

Estimates* of Cumulative Proportion of Striped Bass Ichthyoplankton Cropped by Entrainment at Danskammer (All Units Combined) by 2-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1973

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/12	0.797	0.0004	0.0007	0.0004	0.0008	0.0005	0.0009	0.0005	0.0010
5/13-5/26	0.776	0.0029	0.0058	0.0031	0.0063	0.0036	0.0072	0.0040	0.0081
5/27-6/9	0.623	0.0100	0.0199	0.0107	0.0214	0.0146	0.0291	0.0162	0.0323
6/10-6/23	0.600	0.0138	0.0275	0.0148	0.0295	0.0207	0.0411	0.0230	0.0456
6/24-7/7	0.601	0.0202	0.0401	0.0216	0.0428	0.0308	0.0609	0.0342	0.0675
7/8-7/21	0.667	0.0274	0.0541	0.0293	0.0579	0.0411	0.0808	0.0456	0.0895

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-40

Estimates* of Cumulative Proportion of Striped Bass Ichthyoplankton Cropped by Entrainment at Multiplant by 2-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1973

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/12	0.788	0.0008	0.0016	0.0009	0.0017	0.0010	0.0019	0.0011	0.0022
5/13-5/26	0.775	0.0176	0.0352	0.0191	0.0382	0.0222	0.0443	0.0246	0.0492
5/27-6/9	0.639	0.0278	0.0552	0.0300	0.0596	0.0375	0.0743	0.0416	0.0824
6/10-6/23	0.604	0.0434	0.0856	0.0467	0.0919	0.0621	0.1216	0.0688	0.1344
6/24-7/7	0.602	0.0545	0.1067	0.0584	0.1143	0.0794	0.1540	0.0879	0.1699
7/8-7/21	0.645	0.0662	0.1289	0.0710	0.1379	0.0965	0.1854	0.1067	0.2042

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-41

Estimates* of Cumulative Proportion of Striped Bass Ichthyoplankton Cropped by Entrainment at Post-1972 Plants by 2-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1973

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/12	0.779	0.0002	0.0003	0.0002	0.0004	0.0002	0.0004	0.0002	0.0005
5/13-5/26	0.774	0.0074	0.0147	0.0080	0.0160	0.0093	0.0186	0.0103	0.0207
5/27-6/9	0.676	0.0093	0.0186	0.0101	0.0202	0.0121	0.0242	0.0135	0.0268
6/10-6/23	0.606	0.0158	0.0314	0.0170	0.0338	0.0223	0.0443	0.0248	0.0491
6/24-7/7	0.602	0.0191	0.0379	0.0205	0.0407	0.0276	0.0546	0.0306	0.0605
7/8-7/21	0.616	0.0224	0.0443	0.0240	0.0476	0.0326	0.0645	0.0362	0.0714

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-42

Estimates* of Number of Striped Bass Ichthyoplankton Cropped by Entrainment at Bowline (Unit 1) by 1-Wk Intervals for Each Combination of Recircualtion, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.790	0	0	0	0	0	0	0	0
5/13-5/19	0.797	0	0	0	0	0	0	0	0
5/20-5/26	0.750	0	0	0	0	0	0	0	0
5/27-6/2	0.608	0	0	0	0	0	0	0	0
6/3-6/9	0.600	74,000	148,000	79,000	158,000	119,000	237,000	132,000	264,000
6/10-6/16	0.600	314,000	628,000	335,000	670,000	502,000	1,004,000	558,000	1,116,000
6/17-6/23	0.600	543,000	1,087,000	580,000	1,159,000	870,000	1,739,000	966,000	1,932,000
6/24-6/30	0.600	234,000	468,000	249,000	499,000	374,000	748,000	416,000	831,000
7/1-7/7	0.605	43,000	87,000	46,000	93,000	69,000	138,000	77,000	153,000
7/8-7/14	0.627	41,000	82,000	44,000	88,000	63,000	126,000	70,000	140,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-43

Estimates* of Number of Striped Bass Ichthyoplankton Cropped by Entrainment at Bowline (Unit 2) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.790	38,000	76,000	42,000	83,000	47,000	95,000	53,000	105,000
5/13-5/19	0.797	569,000	1,138,000	619,000	1,239,000	699,000	1,398,000	777,000	1,554,000
5/20-5/26	0.750	0	0	0	0	0	0	0	0
5/27-6/2	0.608	0	0	0	0	0	0	0	0
6/3-6/9	0.600	363,000	725,000	387,000	773,000	580,000	1,160,000	645,000	1,289,000
6/10-6/16	0.600	703,000	1,406,000	750,000	1,499,000	1,125,000	2,249,000	1,250,000	2,499,000
6/17-6/23	0.600	544,000	1,088,000	580,000	1,161,000	871,000	1,741,000	967,000	1,935,000
6/24-6/30	0.600	281,000	562,000	300,000	600,000	450,000	899,000	500,000	999,000
7/1-7/7	0.605	49,000	99,000	53,000	105,000	78,000	157,000	87,000	174,000
7/8-7/14	0.627	44,000	88,000	47,000	94,000	68,000	135,000	75,000	150,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-44

Estimates* of Number of Striped Bass Ichthyoplankton Cropped by Entrainment at Bowline (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.790	39,000	76,000	42,000	83,000	47,000	95,000	53,000	105,000
5/13-5/19	0.797	569,000	1,138,000	619,000	1,238,000	699,000	1,398,000	777,000	1,554,000
5/20-5/26	0.750	0	0	0	0	0	0	0	0
5/27-6/2	0.608	0	0	0	0	0	0	0	0
6/2-6/9	0.600	437,000	873,000	466,000	931,000	699,000	1,397,000	776,000	1,552,000
6/10-6/16	0.600	1,017,000	2,034,000	1,085,000	2,169,000	1,627,000	3,254,000	1,818,000	3,615,000
6/17-6/23	0.600	1,088,000	2,175,000	1,160,000	2,320,000	1,740,000	3,480,000	1,934,000	2,867,000
6/24-6/30	0.600	515,000	1,030,000	549,000	1,098,000	824,000	1,647,000	915,000	1,831,000
7/1-7/7	0.605	93,000	186,000	99,000	198,000	148,000	295,000	164,000	327,000
7/8-7/14	0.672	85,000	170,000	91,000	182,000	131,000	262,000	145,000	291,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-45

Estimates* of Number of Striped Bass Ichthyoplankton Cropped by Entrainment at Lovett (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.800	1,000	2,000	1,000	2,000	1,000	3,000	2,000	3,000
5/6-5/12	0.786	115,000	229,000	125,000	249,000	143,000	285,000	159,000	317,000
5/13-5/16	0.798	869,000	1,737,000	946,000	1,891,000	1,066,000	2,133,000	1,185,000	2,370,000
5/20-5/26	0.762	599,000	1,199,000	650,000	1,300,000	768,000	1,535,000	853,000	1,706,000
5/27-6/2	0.604	242,000	484,000	258,000	517,000	385,000	770,000	428,000	856,000
6/3-6/9	0.601	229,000	459,000	245,000	490,000	366,000	733,000	407,000	814,000
6/10-6/16	0.600	934,000	1,869,000	997,000	1,993,000	1,495,000	2,990,000	1,661,000	3,322,000
6/17-6/23	0.600	8,667,000	1,734,000	925,000	1,849,000	1,387,000	2,774,000	1,541,000	3,082,000
6/24-6/30	0.600	268,000	537,000	286,000	573,000	429,000	859,000	477,000	954,000
7/1-7/7	0.603	49,000	98,000	52,000	104,000	78,000	155,000	86,000	173,000
7/8-7/14	0.615	24,000	49,000	26,000	52,000	38,000	76,000	42,000	84,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-46

Estimates* of Number of Striped Bass Ichthyoplankton Cropped by Entrainment at Indian Point (Unit 2) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.800	6,000	12,000	6,000	13,000	7,000	14,000	8,000	16,000
5/6-5/12	0.784	370,000	741,000	403,000	805,000	462,000	924,000	514,000	1,027,000
5/13-5/19	0.798	1,252,000	2,504,000	1,363,000	2,726,000	1,537,000	3,074,000	1,708,000	3,416,000
5/20-5/26	0.757	2,088,000	4,175,000	2,263,000	4,527,000	2,691,000	5,382,000	2,990,000	5,980,000
5/27-6/2	0.606	985,000	1,971,000	1,052,000	2,103,000	1,562,000	3,124,000	1,735,000	3,471,000
6/3-6/9	0.601	856,000	1,711,000	913,000	1,826,000	1,367,000	2,734,000	1,519,000	3,038,000
6/10-6/16	0.600	2,746,000	5,492,000	2,929,000	5,859,000	4,394,000	8,788,000	4,882,000	9,764,000
6/17-6/23	0.600	2,310,000	4,618,000	2,463,000	4,926,000	3,695,000	7,389,000	4,105,000	8,210,000
6/24-6/30	0.600	862,000	1,723,000	919,000	1,838,000	1,379,000	2,757,000	1,532,000	3,064,000
7/1-7/7	0.603	143,000	286,000	153,000	306,000	228,000	456,000	253,000	507,000
7/8-7/14	0.619	98,000	196,000	105,000	209,000	152,000	304,000	169,000	338,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-47

Estimates* of Number of Striped Bass Ichthyoplankton Cropped by Entrainment at Indian Point (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.800	8,000	16,000	9,000	18,000	10,000	20,000	11,000	22,000
5/6-5/12	0.784	466,000	932,000	507,000	1,013,000	582,000	1,163,000	646,000	1,292,000
5/13-5/19	0.798	1,899,000	3,798,000	2,067,000	4,135,000	2,332,000	4,663,000	2,591,000	5,181,000
5/20-5/26	0.757	2,948,000	5,895,000	3,196,000	6,391,000	3,799,000	7,598,000	4,221,000	8,443,000
5/27-6/2	0.606	1,330,000	2,660,000	1,420,000	2,840,000	2,109,000	4,217,000	2,343,000	4,686,000
6/3-6/9	0.601	1,172,000	2,344,000	1,250,000	2,500,000	1,872,000	3,744,000	2,080,000	4,161,000
6/10-6/16	0.600	3,942,000	7,884,000	4,205,000	8,410,000	6,307,000	12,614,000	7,008,000	14,016,000
6/17-6/23	0.600	3,273,000	6,545,000	3,491,000	6,981,000	5,236,000	10,472,000	5,818,000	11,636,000
6/24-6/30	0.600	1,153,000	2,305,000	1,229,000	2,459,000	1,844,000	3,688,000	2,049,000	4,098,000
7/1-7/7	0.603	192,000	384,000	205,000	410,000	306,000	612,000	340,000	680,000
7/8-7/14	0.619	118,000	235,000	126,000	252,000	183,000	366,000	203,000	406,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-48

Estimates* of Number of Striped Bass Ichthyoplankton Cropped by Entrainment at Danskammer (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.800	1,000	1,000	1,000	2,000	1,000	2,000	1,000	2,000
5/6-5/12	0	0	0	0	0	0	0	0	0
5/13-5/19	0.797	100,000	200,000	109,000	218,000	123,000	246,000	136,000	273,000
5/20-5/26	0.642	124,000	247,000	132,000	265,000	186,000	371,000	206,000	412,000
5/27-6/2	0.610	720,000	1,440,000	769,000	1,537,000	1,134,000	2,268,000	1,260,000	2,520,000
6/3-6/9	0.601	361,000	723,000	386,000	771,000	577,000	1,155,000	641,000	1,283,000
6/10-6/16	0.600	398,000	795,000	424,000	848,000	636,000	1,272,000	707,000	1,413,000
6/17-6/23	0.601	658,000	1,315,000	701,000	1,403,000	1,050,000	2,101,000	1,167,000	2,334,000
6/24-6/30	0.600	154,000	307,000	164,000	328,000	246,000	491,000	273,000	546,000
7/1-7/7	0.600	25,000	50,000	27,000	54,000	40,000	80,000	45,000	89,000
7/8-7/14	0.600	12,000	24,000	13,000	26,000	19,000	39,000	22,000	43,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-49

Estimates* of Number of Striped Bass Ichthyoplankton Cropped by Entrainment at Multiplant by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.800	10,000	20,000	11,000	22,000	12,000	25,000	14,000	27,000
5/6-5/12	0.785	619,000	1,238,000	673,000	1,346,000	772,000	1,543,000	857,000	1,715,000
5/13-5/19	0.798	3,436,000	6,872,000	3,741,000	7,482,000	4,220,000	8,440,000	4,689,000	9,378,000
5/20-5/26	0.753	3,670,000	7,341,000	3,978,000	7,956,000	4,752,000	9,505,000	5,281,000	10,561,000
5/27-6/2	0.607	2,292,000	4,584,000	2,447,000	4,894,000	3,628,000	7,255,000	4,031,000	8,062,000
6/3-6/9	0.601	2,199,000	4,399,000	2,346,000	4,692,000	3,515,000	7,029,000	3,905,000	7,810,000
6/10-6/16	0.600	6,291,000	12,581,000	6,710,000	13,420,000	10,065,000	20,130,000	11,183,000	22,366,000
6/17-6/23	0.600	5,885,000	11,769,000	6,277,000	12,554,000	9,414,000	18,827,000	10,460,000	20,919,000
6/24-6/30	0.600	2,089,000	4,179,000	2,229,000	4,457,000	3,343,000	6,686,000	3,714,000	7,429,000
7/1-7/7	0.603	359,000	718,000	383,000	766,000	571,000	1,142,000	635,000	1,269,000
7/8-7/14	0.620	239,000	478,000	256,000	511,000	371,000	742,000	412,000	824,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-50

Estimates* of Number of Striped Bass Ichthyoplankton Cropped by Entrainment at Post-1972 Plants by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.800	6,000	12,000	6,000	13,000	7,000	14,000	8,000	16,000
5/6-5/12	0.784	409,000	817,000	444,000	889,000	510,000	1,019,000	566,000	1,132,000
5/13-5/19	0.798	1,821,000	3,641,000	1,982,000	3,964,000	2,236,000	4,473,000	2,485,000	4,970,000
5/20-5/26	0.757	2,088,000	4,175,000	2,263,000	4,527,000	2,691,000	5,382,000	2,990,000	5,980,000
5/27-6/2	0.606	985,000	1,971,000	1,052,000	2,103,000	1,562,000	3,124,000	1,735,000	3,471,000
6/3-6/9	0.601	1,292,000	2,585,000	1,379,000	2,757,000	2,066,000	4,131,000	2,295,000	4,590,000
6/10-6/16	0.600	3,763,000	7,526,000	4,014,000	8,028,000	6,021,000	12,042,000	6,690,000	13,379,000
6/17-6/23	0.600	3,397,000	6,794,000	3,623,000	7,246,000	5,435,000	10,870,000	6,039,000	12,077,000
6/24-6/30	0.600	1,376,000	2,753,000	1,468,000	2,937,000	2,202,000	4,405,000	2,447,000	4,894,000
7/1-7/7	0.604	236,000	472,000	252,000	504,000	375,000	751,000	417,000	834,000
7/8-7/14	0.622	183,000	366,000	196,000	392,000	283,000	566,000	314,000	629,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-51

Estimates* of Cumulative Number of Striped Bass Ichthyoplankton Cropped by Entrainment at Bowline (Unit 1) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-7/12	0.790	0	0	0	0	0	0	0	0
5/13-5/19	0.797	0	0	0	0	0	0	0	0
5/20-7/26	0.750	0	0	0	0	0	0	0	0
5/27-6/2	0.608	0	0	0	0	0	0	0	0
6/3-6/9	0.600	74,000	148,000	79,000	158,000	119,000	237,000	132,000	264,000
6/10-6/16	0.600	388,000	776,000	414,000	828,000	621,000	1,242,000	690,000	1,380,000
6/17-6/23	0.600	931,000	1,863,000	994,000	1,987,000	1,490,000	2,981,000	1,656,000	3,312,000
6/24-6/30	0.600	1,165,000	2,330,000	1,243,000	2,486,000	1,864,000	3,729,000	2,072,000	4,143,000
7/1-7/7	0.605	1,209,000	2,417,000	1,289,000	2,578,000	1,933,000	3,867,000	2,148,000	4,296,000
7/8-7/14	0.627	1,250,000	2,500,000	1,333,000	2,666,000	1,996,000	3,993,000	2,218,000	4,437,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-52

Estimates* of Cumulative Number of Striped Bass Ichthyoplankton Cropped by Entrainment at Bowline (Unit 2) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.790	38,000	76,000	42,000	83,000	47,000	95,000	53,000	105,000
5/13-5/19	0.797	607,000	1,214,000	661,000	1,321,000	747,000	1,493,000	829,000	1,659,000
5/20-5/26	0.750	607,000	1,214,000	661,000	1,321,000	747,000	1,493,000	829,000	1,659,000
5/27-6/2	0.608	607,000	1,214,000	661,000	1,321,000	747,000	1,493,000	829,000	1,659,000
6/3-6/9	0.600	970,000	1,939,000	1,047,000	2,095,000	1,327,000	2,653,000	1,474,000	2,948,000
6/10-6/16	0.600	1,672,000	3,345,000	1,797,000	3,594,000	2,451,000	4,902,000	2,723,000	5,447,000
6/17-6/23	0.600	2,217,000	4,433,000	2,378,000	4,755,000	3,322,000	6,644,000	3,691,000	7,382,000
6/24-6/30	0.600	2,498,000	4,995,000	2,677,000	5,355,000	3,771,000	7,543,000	4,191,000	8,381,000
7/1-7/7	0.605	2,547,000	5,094,000	2,730,000	5,460,000	3,850,000	7,700,000	4,278,000	8,555,000
7/8-7/14	0.627	2,591,000	5,182,000	2,777,000	5,554,000	3,918,000	7,835,000	4,353,000	8,706,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-53

Estimates* of Cumulative Number of Striped Bass Ichthyoplankton Cropped by Entrainment at Bowline (All Units Combined) by 1-Wk Intervals for Each Combination of Recircualtion, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.790	38,000	76,000	42,000	83,000	47,000	95,000	53,000	105,000
5/13-5/19	0.797	607,000	1,214,000	661,000	1,321,000	747,000	1,493,000	829,000	1,659,000
5/20-5/26	0.750	607,000	1,214,000	661,000	1,321,000	747,000	1,493,000	829,000	1,659,000
5/27-6/2	0.608	607,000	1,214,000	661,000	1,321,000	747,000	1,493,000	829,000	1,659,000
6/2-6/9	0.600	1,044,000	2,087,000	1,126,000	2,253,000	1,445,000	2,890,000	1,606,000	3,211,000
6/10-6/16	0.600	2,060,000	4,121,000	2,211,000	4,422,000	3,072,000	6,144,000	3,413,000	6,827,000
6/17-6/23	0.600	3,148,000	6,296,000	3,371,000	6,742,000	4,812,000	9,624,000	5,347,000	10,694,000
6/24-6/30	0.600	3,663,000	7,326,000	3,920,000	7,841,000	5,636,000	11,272,000	6,262,000	12,524,000
7/1-7/7	0.605	3,756,000	7,511,000	4,019,000	8,039,000	5,783,000	11,567,000	6,426,000	12,852,000
7/8-7/14	0.672	3,841,000	7,682,000	4,110,000	8,221,000	5,914,000	11,828,000	6,571,000	13,142,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-54

Estimates* of Cumulative Number of Striped Bass Ichthyoplankton Cropped by Entrainment at Lovett (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.800	1,000	2,000	1,000	2,000	1,000	3,000	2,000	3,000
5/6-5/12	0.786	116,000	231,000	126,000	252,000	144,000	288,000	160,000	320,000
5/13-5/19	0.798	984,000	1,969,000	1,071,000	2,143,000	1,210,000	2,421,000	1,345,000	2,690,000
5/20-5/26	0.762	1,584,000	3,167,000	1,721,000	3,443,000	1,978,000	3,956,000	2,198,000	4,396,000
5/27-6/2	0.604	1,826,000	3,651,000	1,980,000	3,960,000	2,363,000	4,726,000	2,626,000	5,252,000
6/3-6/9	0.601	2,055,000	4,110,000	2,225,000	4,449,000	2,730,000	5,459,000	3,033,000	6,066,000
6/10-6/16	0.600	2,989,000	5,979,000	3,221,000	6,442,000	4,225,000	8,449,000	4,694,000	9,388,000
6/17-6/23	0.600	3,856,000	7,713,000	4,146,000	8,292,000	5,612,000	11,223,000	6,235,000	12,470,000
6/24-6/30	0.600	4,125,000	8,249,000	4,432,000	8,864,000	6,041,000	12,082,000	6,712,000	13,425,000
7/1-7/7	0.603	4,174,000	8,347,000	4,484,000	8,968,000	6,119,000	12,238,000	6,799,000	13,598,000
7/8-7/14	0.615	4,198,000	8,396,000	4,510,000	9,020,000	6,157,000	12,314,000	6,841,000	13,682,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-55

Estimates* of Cumulative Number of Striped Bass Ichthyoplankton Cropped by Entrainment at Indian Point (Unit 2) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.800	6,000	12,000	6,000	13,000	7,000	14,000	8,000	16,000
5/6-5/12	0.784	376,000	753,000	409,000	818,000	469,000	939,000	522,000	1,043,000
5/13-5/19	0.798	1,628,000	3,256,000	1,772,000	3,544,000	2,007,000	4,013,000	2,230,000	4,459,000
5/20-5/26	0.757	3,716,000	7,432,000	4,035,000	8,071,000	4,697,000	9,395,000	5,219,000	10,439,000
5/27-6/2	0.606	4,701,000	9,402,000	5,087,000	10,174,000	6,259,000	12,518,000	6,955,000	13,909,000
6/3-6/9	0.601	5,557,000	11,114,000	6,000,000	1,200,000	7,626,000	15,252,000	8,474,000	16,947,000
6/10-6/16	0.600	8,303,000	16,606,000	8,929,000	17,858,000	12,020,000	24,040,000	13,356,000	26,711,000
6/17-6/23	0.600	10,612,000	21,224,000	11,392,000	22,784,000	15,715,000	31,430,000	17,461,000	34,922,000
6/24-6/30	0.600	11.474,000	22,948,000	12,311,000	24,622,000	17,C93,000	34,187,000	18,993,000	37,985,000
7/1-7/7	0.603	11,617,000	23,234,000	12,464,000	24,928,000	17,322,000	34,643,000	19,246,000	38,492,000
7/8-7/14	0.619	11,715,000	23,430,000	12,569,000	25,137,000	17,474,000	34,947,000	19,415,000	38,831,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-56

Estimates* of Cumulative Number of Striped Bass Ichthyoplankton Cropped by Entrainment at Indian Point (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.800	8,000	16,000	9,000	18,000	10,000	20,000	11,000	22,000
5/6-5/12	0.784	474,000	948,000	516,000	1,031,000	592,000	1,183,000	657,000	1,315,000
5/13-5/19	0.798	2,373,000	4,746,000	2,583,000	5,166,000	2,923,000	5,846,000	3,248,000	6,496,000
5/20-5/26	0.757	5,321,000	10,642,000	5,778,000	11,557,000	6,722,000	13,445,000	7,469,000	14,939,000
5/27-6/2	0.606	6,651,000	13,302,000	7,198,000	14,396,000	8,831,000	17,662,000	9,812,000	19,624,000
6/3-6/9	0.601	7,823,000	15,646,000	8,448,000	16,897,000	10,703,000	21,407,000	11,893,000	23,785,000
6/10-6/16	0.600	11,765,000	23,530,000	12,653,000	25,306,000	17,010,000	34,021,000	18,900,000	37,801,000
6/17-6/23	0.600	15,038,000	30,075,000	16,144,000	32,288,000	22,246,000	44,493,000	24,718,000	49,437,000
6/24-6/30	0.600	16,190,000	32,380,000	17,373,000	34,747,000	24,090,000	48,181,000	26,767,000	53,534,000
7/1-7/7	0.603	16,382,000	32,764,000	17,578,000	35,156,000	24,396,000	48,793,000	27,107,000	54,214,000
7/8-7/14	0.619	16,500,000	33,000,000	17,704,000	35,408,000	24,579,000	49,158,000	27,310,000	54,620,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-57

Estimates* of Cumulative Number of Striped Bass Ichthyoplankton Cropped by Entrainment at Danskammer (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.800	1,000	1,000	1,000	2,000	1,000	2,000	1,000	2,000
5/6-5/12	0	1,000	1,000	1,000	2,000	1,000	2,000	1,000	2,000
5/13-5/19	0.797	101,000	201,000	110,000	220,000	124,000	247,000	137,000	275,000
5/20-5/26	0.642	224,000	448,000	242,000	484,000	309,000	618,000	344,000	687,000
5/27-6/2	0.610	944,000	1,888,000	1,010,000	2,021,000	1,443,000	2,886,000	1,604,000	3,207,000
6/3-6/9	0.601	1,305,000	2,611,000	1,396,000	2,792,000	2,021,000	4,041,000	2,245,000	4,490,000
6/10-6/16	0.600	1,703,000	3,406,000	1,820,000	3,640,000	2,657,000	5,313,000	2,952,000	5,904,000
6/17-6/23	0.601	2,360,000	4,721,000	2,521,000	5,043,000	3,707,000	7,414,000	4,119,000	8,238,000
6/24-6/30	0.600	2,514,000	5,028,000	2,685,000	5,371,000	3,953,000	7,905,000	4,392,000	8,784,000
7/1-7/7	0.600	2,539,000	5,078,000	2,712,000	5,424,000	3,993,000	7,986,000	4,437,000	8,873,000
7/8-7/14	0.600	2,551,000	5,102,000	2,725,000	5,450,000	4,012,000	8,025,000	4,458,000	8,916,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-58

Estimates* of Cumulative Number of Striped Bass Ichthyoplankton Cropped by Entrainment at Multiplant by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.800	10,000	20,000	11,000	22,000	12,000	25,000	14,000	27,000
5/6-5/12	0.785	629,000	1,258,000	684,000	1,367,000	784,000	1,568,000	871,000	1,742,000
5/13-5/19	0.798	4,065,000	8,130,000	4,425,000	8,849,000	5,004,000	10,008,000	5,560,000	11,120,000
5/20-5/26	0.753	7,736,000	15,471,000	8,402,000	16,805,000	9,756,000	19,513,000	10,840,000	21,681,000
5/27-6/2	0.607	10,028,000	20,055,000	10,849,000	21,699,000	13,384,000	26,768,000	14,871,000	29,742,000
6/3-6/9	0.601	12,227,000	24,454,000	13,195,000	26,391,000	16,899,000	33,797,000	18,776,000	37,553,000
6/10-6/16	0.600	18,518,000	37,035,000	19,905,000	39,811,000	26,964,000	53,927,000	29,959,000	59,919,000
6/17-6/23	0.600	24,402,000	48,804,000	26,182,000	52,365,000	36,377,000	72,754,000	40,419,000	80,838,000
6/24-6/30	0.600	26,492,000	52,983,000	28,411,000	56,822,000	39,720,000	79,440,000	44,134,000	88,267,000
7/1-7/7	0.603	26,850,000	53,701,000	28,794,000	57,588,000	40,291,000	80,583,000	44,768,000	89,536,000
7/8-7/14	0.602	27,090,000	54,179,000	29,050,000	58,099,000	40,662,000	81,325,000	45,181,000	90,361,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-59

Estimates* of Cumulative Number of Striped Bass Ichthyoplankton Cropped by Entrainment at Post-1972 Plants by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.800	6,000	12,000	6,000	13,000	7,000	14,000	8,000	16,000
5/6-5/12	0.784	414,000	829,000	451,000	901,000	517,000	1,034,000	574,000	1,148,000
5/13-5/19	0.798	2,235,000	4,470,000	2,433,000	4,865,000	2,753,000	5,506,000	3,059,000	6,118,000
5/20-5/26	0.757	4,323,000	8,646,000	4,696,000	9,392,000	5,444,000	10,888,000	6,049,000	12,098,000
5/27-6/2	0.606	5,308,000	10,616,000	5,748,000	11,495,000	7,006,000	14,011,000	7,784,000	15,568,000
6/3-6/9	0.601	6,600,000	13,201,000	7,126,000	14,252,000	9,071,000	18,143,000	10,079,000	20,158,000
6/10-6/16	0.600	10,363,000	20,727,000	11,140,000	22,280,000	15,092,000	30,184,000	16,769,000	33,538,000
6/17-6/23	0.600	13,760,000	27,520,000	14,763,000	29,526,000	20,527,000	41,054,000	22,808,000	45,615,000
6/24-6/30	0.600	15,137,000	30,273,000	16,231,000	32,463,000	22,729,000	45,459,000	25,255,000	50,509,000
7/1-7/7	0.604	15,373,000	30,745,000	16,483,000	32,967,000	23,105,000	46,209,000	25,672,000	51,344,000
7/8-7/14	0.622	15,556,000	31,112,000	16,679,000	33,358,000	23,388,000	46,775,000	25,986,000	51,973,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-60

Estimates* of Proportion of Striped Bass Ichthyoplankton Cropped by Entrainment at Bowline (Unit 1) by 1-Wk Intervals for each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.790	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/13-5/19	0.797	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/20-5/26	0.750	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/27-6/2	0.608	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/3-6/9	0.600	0.0005	0.0010	0.0005	0.0010	0.0008	0.0015	0.0008	0.0017
6/10-6/16	0.600	0.0010	0.0019	0.0010	0.0020	0.0015	0.0031	0.0017	0.0034
6/17-6/23	0.600	0.0016	0.0033	0.0017	0.0035	0.0026	0.0052	0.0029	0.0058
6/24-6/30	0.600	0.0020	0.0041	0.0022	0.0044	0.0033	0.0066	0.0036	0.0073
7/1-7/7	0.605	0.0020	0.0040	0.0021	0.0042	0.0031	0.0063	0.0035	0.0070
7/8-7/14	0.627	0.0032	0.0064	0.0034	0.0069	0.0049	0.0098	0.0055	0.0109

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-61

Estimates* of Proportion of Striped Bass Ichthyoplankton Cropped by Entrainment at Bowline (Unit 2) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.790	<0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
5/13-5/19	0.797	0.0012	0.0023	0.0013	0.0025	0.0014	0.0029	0.0016	0.0032
5/20-5/26	0.750	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/27-6/2	0.608	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/3-6/9	0.600	0.0023	0.0047	0.0025	0.0050	0.0037	0.0074	0.0041	0.0083
6/10-6/16	0.600	0.0021	0.0043	0.0023	0.0046	0.0034	0.0069	0.0038	0.0076
6/17-6/23	0.600	0.0016	0.0033	0.0017	0.0035	0.0026	0.0052	0.0029	0.0058
6/24-6/30	0.600	0.0025	0.0049	0.0026	0.0053	0.0039	0.0079	0.0044	0.0088
7/1-7/7	0.605	0.0023	0.0045	0.0024	0.0048	0.0036	0.0072	0.0040	0.0080
7/8-7/14	0.627	0.0034	0.0069	0.0037	0.0073	0.0053	0.0105	0.0059	0.0117

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-62

Estimates* of Proportion of Striped Bass Ichthyoplankton Cropped by Entrainment at Bowline (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.790	<0.0001	0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	0.0001
5/13-5/19	0.797	0.0012	0.0023	0.0013	0.0025	0.0014	0.0029	0.0016	0.0032
5/20-5/26	0.750	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/27-6/2	0.608	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/3-6/9	0.600	0.0028	0.0056	0.0030	0.0060	0.0045	0.0090	0.0050	0.0100
6/10-6/16	0.600	0.0031	0.0062	0.0033	0.0066	0.0050	0.0099	0.0055	0.0110
6/17-6/23	0.600	0.0033	0.0065	0.0034	0.0069	0.0052	0.0104	0.0058	0.0116
6/24-6/30	0.600	0.0045	0.0090	0.0048	0.0096	0.0072	0.0144	0.0080	0.0160
7/1-7/7	0.605	0.0042	0.0085	0.0045	0.0090	0.0067	0.0135	0.0075	0.0150
7/8-7/14	0.672	0.0066	0.0133	0.0071	0.0142	0.0133	0.0204	0.0113	0.0226

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-63

Estimates* of Proportion of Striped Bass Ichthyoplankton Cropped by Entrainment at Lovett (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.800	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/6-5/12	0.786	0.0001	0.0003	0.0002	0.0003	0.0002	0.0003	0.0002	0.0004
5/13-5/19	0.798	0.0018	0.0036	0.0019	0.0039	0.0022	0.0044	0.0024	0.0049
5/20-5/26	0.762	0.0024	0.0047	0.0026	0.0052	0.0030	0.0061	0.0034	0.0068
5/27-6/2	0.604	0.0010	0.0020	0.0011	0.0022	0.0017	0.0033	0.0018	0.0037
6/3-6/9	0.601	0.0015	0.0029	0.0016	0.0031	0.0024	0.0047	0.0026	0.0052
6/10-6/16	0.600	0.0029	0.0057	0.0030	0.0061	0.0046	0.0091	0.0051	0.0101
6/17-6/23	0.600	0.0026	0.0052	0.0028	0.0055	0.0042	0.0083	0.0046	0.0092
6/24-6/30	0.600	0.0024	0.0047	0.0025	0.0050	0.0038	0.0075	0.0042	0.0084
7/1-7/7	0.603	0.0022	0.0045	0.0024	0.0048	0.0036	0.0071	0.0040	0.0079
7/8-7/14	0.615	0.0019	0.0038	0.0020	0.0040	0.0030	0.0059	0.0033	0.0066

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-64

Estimates* of Proportion of Striped Bass Ichthyoplankton Cropped by Entrainment at Indian Point (Unit 2) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.800	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/6-5/12	0.784	0.0005	0.0009	0.0005	0.0010	0.0006	0.0011	0.0006	0.0013
5/13-5/19	0.798	0.0026	0.0051	0.0028	0.0056	0.0031	0.0063	0.0035	0.0070
5/20-5/26	0.757	0.0083	0.0165	0.0090	0.0179	0.0107	0.0213	0.0118	0.0237
5/27-6/2	0.606	0.0042	0.0085	0.0045	0.0090	0.0067	0.0134	0.0074	0.0149
6/3-6/9	0.601	0.0055	0.0110	0.0059	0.0117	0.0088	0.0175	0.0097	0.0195
6/10-6/16	0.600	0.0084	0.0168	0.0089	0.0179	0.0134	0.0268	0.0149	0.0298
6/17-6/23	0.600	0.0069	0.0138	0.0074	0.0148	0.0111	0.0221	0.0123	0.0246
6/24-6/30	0.600	0.0075	0.0151	0.0080	0.0161	0.0121	0.0241	0.0134	0.0268
7/1-7/7	0.603	0.0065	0.0131	0.0070	0.0140	0.0104	0.0208	0.0116	0.0232
7/8-7/14	0.619	0.0076	0.0153	0.0082	0.0163	0.0119	0.0237	0.0132	0.0263

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-65

Estimates* of Proportion of Striped Bass Ichthyoplankton Cropped by Entrainment at Indian Point (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.800	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/6-5/12	0.784	0.0006	0.0011	0.0006	0.0012	0.0007	0.0014	0.0008	0.0016
5/13-5/19	0.798	0.0039	0.0078	0.0042	0.0085	0.0048	0.0095	0.0053	0.0106
5/20-5/26	0.757	0.0117	0.0234	0.0127	0.0253	0.0151	0.0301	0.0167	0.0335
5/27-6/2	0.606	0.0057	0.0114	0.0061	0.0122	0.0090	0.0181	0.0100	0.0201
6/3-6/9	0.601	0.0075	0.0150	0.0080	0.0160	0.0120	0.0240	0.0133	0.0267
6/10-6/16	0.600	0.0120	0.0241	0.0128	0.0257	0.0193	0.0385	0.0214	0.4280
6/17-6/23	0.600	0.0098	0.0196	0.0104	0.0209	0.0157	0.0314	0.0174	0.0348
6/24-6/30	0.600	0.0101	0.0202	0.0108	0.0215	0.0161	0.0323	0.0179	0.0359
7/1-7/7	0.603	0.0088	0.0176	0.0094	0.0187	0.0140	0.0280	0.0155	0.0311
7/8-7/14	0.619	0.0092	0.0183	0.0098	0.0196	0.0142	0.0285	0.0158	0.0317

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-66

Estimates* of Proportion of Striped Bass Ichthyoplankton Cropped by Entrainment at Danskammer (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.800	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/6-5/12	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/13-5/19	0.797	0.0002	0.0004	0.0002	0.0004	0.0003	0.0005	0.0003	0.0006
5/20-5/26	0.642	0.0005	0.0010	0.0005	0.0010	0.0007	0.0015	0.0008	0.0016
5/27-6/2	0.610	0.0031	0.0062	0.0033	0.0066	0.0049	0.0097	0.0054	0.0108
6/3-6/9	0.601	0.0023	0.0046	0.0025	0.0049	0.0037	0.0074	0.0041	0.0082
6/10-6/16	0.600	0.0012	0.0024	0.0013	0.0026	0.0019	0.0039	0.0022	0.0043
6/17-6/23	0.601	0.0020	0.0039	0.0021	0.0042	0.0031	0.0063	0.0035	0.0070
6/24-6/30	0.600	0.0013	0.0027	0.0014	0.0029	0.0022	0.0043	0.0024	0.0048
7/1-7/7	0.600	0.0011	0.0023	0.0012	0.0024	0.0018	0.0037	0.0020	0.0041
7/8-7/14	0.600	0.0009	0.0019	0.0010	0.0020	0.0015	0.0030	0.0017	0.0034

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-67

Estimates* of Proportion of Striped Bass Ichthyoplankton Cropped by Entrainment at Multiplant by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.800	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/6-5/12	0.785	0.0008	0.0015	0.0008	0.0016	0.0009	0.0019	0.0011	0.0021
5/13-5/19	0.798	0.0070	0.0141	0.0077	0.0153	0.0086	0.0173	0.0096	0.0192
5/20-5/26	0.753	0.0145	0.0291	0.0158	0.0315	0.0188	0.0377	0.0209	0.0419
5/27-6/2	0.607	0.0098	0.0197	0.0105	0.0210	0.0155	0.0311	0.0173	0.0346
6/3-6/9	0.601	0.0141	0.0282	0.0151	0.0301	0.0225	0.0451	0.0251	0.0501
6/10-6/16	0.600	0.0192	0.0384	0.0205	0.0410	0.0307	0.0615	0.0341	0.0683
6/17-6/23	0.600	0.0176	0.0352	0.0188	0.0376	0.0282	0.0564	0.0313	0.0626
6/24-6/30	0.600	0.0183	0.0366	0.0195	0.0390	0.0293	0.0586	0.0325	0.0651
7/1-7/7	0.603	0.0164	0.0328	0.0175	0.0350	0.0261	0.0522	0.0290	0.0580
7/8-7/14	0.620	0.0186	0.0373	0.0199	0.0398	0.0289	0.0578	0.0321	0.0642

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-68

Estimates* of Proportion of Striped Bass Ichthyoplankton Cropped by Entrainment at Post-1972 Plants by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.800	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/6-5/12	0.784	0.0005	0.0010	0.0005	0.0011	0.0006	0.0012	0.0007	0.0014
5/13-5/19	0.798	0.0037	0.0075	0.0041	0.0081	0.0046	0.0092	0.0051	0.0102
5/20-5/26	0.757	0.0083	0.0165	0.0090	0.0179	0.0107	0.0213	0.0118	0.0237
5/27-6/2	0.606	0.0042	0.0085	0.0045	0.0090	0.0067	0.0134	0.0074	0.0149
6/3-6/9	0.601	0.0083	0.0166	0.0088	0.0177	0.0133	0.0265	0.0147	0.0294
6/10-6/16	0.600	0.0115	0.0230	0.0123	0.0245	0.0184	0.0368	0.0204	0.0409
6/17-6/23	0.600	0.0102	0.0203	0.0109	0.0217	0.0163	0.0326	0.0181	0.0362
6/24-6/30	0.600	0.0121	0.0241	0.0129	0.0257	0.0193	0.0386	0.0214	0.0429
7/1-7/7	0.604	0.0108	0.0216	0.0115	0.0230	0.0172	0.0343	0.0191	0.0381
7/8-7/14	0.622	0.0143	0.0285	0.0153	0.0305	0.0220	0.0441	0.0245	0.0490

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-69

Estimates* of Cumulative Proportion of Striped Bass Ichthyoplankton Cropped by Entrainment at Bowline (Unit 1) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.790	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/13-5/19	0.797	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/20-5/26	0.750	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/27-6/2	0.608	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/3-6/9	0.600	0.0005	0.0010	0.0005	0.0010	0.0008	0.0015	0.0008	0.0017
6/10-6/16	0.600	0.0014	0.0029	0.0015	0.0031	0.0023	0.0046	0.0025	0.0051
6/17-6/23	0.600	0.0031	0.0061	0.0033	0.0065	0.0049	0.0098	0.0054	0.0108
6/24-6/30	0.600	0.0051	0.0102	0.0054	0.0109	0.0082	0.0163	0.0091	0.0181
7/1-7/7	0.605	0.0071	0.0141	0.0075	0.0150	0.0113	0.0224	0.0125	0.0249
7/8-7/14	0.627	0.0103	0.0204	0.0109	0.0218	0.0161	0.0321	0.0179	0.0356

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-70

Estimates* of Cumulative Proportion of Striped Bass Ichthyoplankton Cropped by Entrainment at Bowline (Unit 2) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.790	<0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
5/13-5/19	0.797	0.0012	0.0024	0.0013	0.0026	0.0015	0.0030	0.0017	0.0033
5/20-5/26	0.750	0.0012	0.0024	0.0013	0.0026	0.0015	0.0030	0.0017	0.0033
5/27-6/2	0.608	0.0012	0.0024	0.0013	0.0026	0.0015	0.0030	0.0017	0.0033
6/3-6/9	0.600	0.0035	0.0071	0.0038	0.0076	0.0052	0.0104	0.0058	0.0116
6/10-6/16	0.600	0.0057	0.0113	0.0061	0.0121	0.0086	0.0172	0.0096	0.0191
6/17-6/23	0.600	0.0073	0.0145	0.0078	0.0156	0.0112	0.0223	0.0124	0.0248
6/24-6/30	0.600	0.0097	0.0194	0.0104	0.0207	0.0151	0.0300	0.0168	0.0333
7/1-7/7	0.605	0.0120	0.0238	0.0128	0.0254	0.0186	0.0370	0.0207	0.0410
7/8-7/14	0.627	0.0154	0.0305	0.0164	0.0326	0.0238	0.0471	0.0263	0.0522

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-71

Estimates* of Cumulative Proportion of Striped Bass Ichthyoplankton Cropped by Entrainment at Bowline (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.790	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/13-5/19	0.797	0.0012	0.0024	0.0013	0.8026	0.0015	0.0030	0.0017	0.0033
5/20-5/26	0.750	0.0012	0.0024	0.0013	0.0026	0.0015	0.0030	0.0017	0.0033
5/27-6/2	0.608	0.0012	0.0024	0.0013	0.0026	0.0015	0.0030	0.0017	0.0033
6/2-6/9	0.600	0.0040	0.0080	0.0043	0.0086	0.0060	0.0119	0.0066	0.0132
6/10-6/16	0.600	0.0071	0.0141	0.0076	0.0152	0.0109	0.0217	0.0121	0.0241
6/17-6/23	0.600	0.0103	0.0206	0.0110	0.0220	0.0161	0.0319	0.0178	0.0354
6/24-6/30	0.600	0.0148	0.0294	0.0158	0.0314	0.0231	0.0459	0.0257	0.0509
7/1-7/7	0.605	0.0190	0.0377	0.0203	0.0402	0.0297	0.0587	0.0330	0.0651
7/8-7/14	0.672	0.0255	0.0504	0.0272	0.0538	0.0396	0.0779	0.0439	0.0863

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-72

Estimates* of Cumulative Proportion of Striped Bass Ichthyoplankton Cropped by Entrainment at Lovett (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.800	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/6-5/12	0.786	0.0001	0.0003	0.0002	0.0003	0.0002	0.0004	0.0002	0.0004
5/13-5/19	0.798	0.0019	0.0038	0.0021	0.0042	0.0024	0.0047	0.0026	0.0052
5/20-5/26	0.762	0.0043	0.0086	0.0047	0.0093	0.0054	0.0108	0.0060	0.0120
5/27-6/2	0.604	0.0053	0.0106	0.0058	0.0115	0.0070	0.0140	0.0781	0.0156
6/3-6/9	0.601	0.0068	0.0135	0.0073	0.0146	0.0094	0.0187	0.0104	0.0207
6/10-6/16	0.600	0.0096	0.0192	0.0103	0.0206	0.0139	0.0277	0.0154	0.0307
6/17-6/23	0.600	0.0122	0.0243	0.0131	0.0260	0.0180	0.0357	0.0200	0.0397
6/24-6/30	0.600	0.0145	0.0289	0.0156	0.0309	0.0217	0.0430	0.0241	0.0476
7/1-7/7	0.603	0.0167	0.0332	0.0180	0.0355	0.0252	0.0498	0.0279	0.0552
7/8-7/14	0.615	0.0186	0.0369	0.0199	0.0394	0.0280	0.0554	0.0311	0.0614

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-73

Estimates* of Cumulative Proportion of Striped Bass Ichthyoplankton Cropped by Entrainment at Indian Point (Unit 2) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.800	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/6-5/12	0.784	0.0005	0.0009	0.0005	0.0010	0.0006	0.0012	0.0006	0.0013
5/13-5/19	0.798	0.0030	0.0060	0.0033	0.0066	0.0037	0.0074	0.0041	0.0083
5/20-5/26	0.757	0.0113	0.0225	0.0122	0.0244	0.0143	0.0286	0.0159	0.0318
5/27-6/2	0.606	0.0154	0.0307	0.0167	0.0332	0.0209	0.0416	0.0233	0.0462
6/3-6/9	0.601	0.0209	0.0414	0.0224	0.0445	0.0295	0.0584	0.0328	0.0648
6/10-6/16	0.600	0.0291	0.0575	0.0312	0.0616	0.0426	0.0837	0.0472	0.0926
6/17-6/23	0.600	0.0358	0.0705	0.0383	0.0755	0.0531	0.1040	0.0589	0.1150
6/24-6/30	0.600	0.0431	0.0845	0.0460	0.0903	0.0646	-0.1256	0.0715	0.1387
7/1-7/7	0.603	0.0493	0.0965	0.0527	0.1030	0.0743	0.1438	0.8823	0.1586
7/8-7/14	0.619	0.0566	0.1103	0.0605	0.1177	0.0853	0.1641	0.0944	0.1808

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-74

Estimates* of Cumulative Proportion of Striped Bass Ichthyoplankton Cropped by Entrainment at Indian Point (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.800	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/6-5/12	0.784	0.0006	0.0012	0.0006	0.0013	0.0007	0.0015	0.0008	0.0016
5/13-5/19	0.798	0.0045	0.0089	0.0049	0.0097	0.0055	0.0110	0.0061	0.0122
5/20-5/26	0.757	0.0161	0.0321	0.0175	0.0348	0.0205	0.0408	0.0227	0.0453
5/27-6/2	0.606	0.0217	0.0431	0.0234	0.0466	0.0293	0.0581	0.0326	0.0644
6/3-6/9	0.601	0.0291	0.0575	0.0313	0.0618	0.0410	0.0807	0.0455	0.0894
6/10-6/16	0.600	0.0407	0.0802	0.0437	0.0859	0.0595	0.1161	0.0659	0.1284
6/17-6/23	0.600	0.0502	0.0982	0.0537	0.1050	0.0742	0.1439	0.0822	0.1588
6/24-6/30	0.600	0.0597	0.1164	0.0639	0.1243	0.0892	0.1715	0.0986	0.1889
7/1-7/7	0.603	0.0680	0.1319	0.0727	0.1407	0.1019	0.1947	0.1126	0.2141
7/8-7/14	0.619	0.0765	0.1479	0.0817	0.1576	0.1147	0.2176	0.1267	0.2390

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-75

Estimates* of Cumulative Proportion of Striped Bass Ichthyoplankton Cropped by Entrainment at Danskammer (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.800	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/6-5/12	0.	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/13-5/19	0.797	0.0002	0.0004	0.0002	0.0004	0.0003	0.0005	0.0003	0.0006
5/20-5/26	0.642	0.0007	0.0014	0.0007	0.0015	0.0010	0.0020	0.0011	0.0022
5/27-6/2	0.610	0.0038	0.0076	0.0040	0.0081	0.0058	0.0117	0.0065	0.0130
6/3-6/9	0.601	0.0061	0.0122	0.0065	0.0130	0.0095	0.0190	0.0106	0.0211
6/10-6/16	0.600	0.0073	0.0146	0.0078	0.0155	0.0115	0.0228	0.0127	0.0253
6/17-6/23	0.601	0.0093	0.0184	0.0099	0.0197	0.0146	0.0290	0.0162	0.0321
6/24-6/30	0.600	0.0106	0.0211	0.0113	0.0225	0.0167	0.0331	0.0185	0.0368
7/1-7/7	0.600	0.0117	0.0233	0.0125	0.0249	0.0185	0.0367	0.0205	0.0407
7/8-7/14	0.600	0.0127	0.0252	0.0135	0.0268	0.0200	0.0396	0.0222	0.0439

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-76

Estimates* of Cumulative Proportion of Striped Bass Ichthyoplankton Cropped by Entrainment at Multiplant by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.800	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/6-5/12	0.785	0.0008	0.0015	0.0008	0.0017	0.0010	0.0019	0.0011	0.0021
5/13-5/19	0.798	0.0078	0.0156	0.0085	0.0170	0.0096	0.0192	0.0107	0.0213
5/20-5/26	0.753	0.0222	0.0442	0.0241	0.0480	0.0282	0.0561	0.0314	0.0623
5/27-6/2	0.607	0.0318	0.0630	0.0344	0.0679	0.0434	0.0855	0.0481	0.0947
6/3-6/9	0.601	0.0455	0.0895	0.0489	0.0960	0.0649	0.1267	0.0719	0.1400
6/10-6/16	0.600	0.0638	0.1244	0.0684	0.1330	0.0937	0.1804	0.1036	0.1988
6/17-6/23	0.600	0.803	0.1553	0.0859	0.1656	0.1192	0.2266	0.1317	0.2490
6/24-6/30	0.600	0.0972	0.1862	0.1037	0.1982	0.1450	0.2719	0.1600	0.2978
7/1-7/7	0.603	0.1120	0.2129	0.1194	0.2263	0.1673	0.3099	0.1843	0.3385
7/8-7/14	0.620	0.1285	0.2422	0.1370	0.2571	0.1914	0.3498	0.2105	0.3810

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-77

Estimates* of Cumulative Proportion of Striped Bass Ichthyoplankton Cropped by Entrainment at Post-1972 Plants by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
49/29-5/5	0.800	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/6-5/12	0.784	0.0005	0.0010	0.0006	0.0011	0.0006	0.0013	0.0007	0.0014
5/13-5/19	0.798	0.0042	0.0085	0.0046	0.0092	0.0052	0.0104	0.0058	0.0116
5/20-5/26	0.757	0.0125	0.0249	0.0135	0.0270	0.0158	0.0315	0.0176	0.0350
5/27-6/2	0.606	0.0166	0.0331	0.0180	0.0358	0.0224	0.0445	0.0249	0.0494
6/3-6/9	0.601	0.0248	0.0491	0.0267	0.0528	0.0354	0.0698	0.0392	0.0773
6/10-6/16	0.600	0.0360	0.0710	0.0386	0.0760	0.0531	0.1040	0.0589	0.1150
6/17-6/23	0.600	0.0458	0.0899	0.0490	0.0961	0.0685	0.1332	0.0759	0.1470
6/24-6/30	0.600	0.0573	0.1118	0.0613	0.1193	0.0865	0.1666	0.0957	0.1836
7/1-7/7	0.604	0.0675	0.1310	0.0721	0.1396	0.1021	0.1952	0.1129	0.2147
7/8-7/14	0.622	0.0808	0.1558	0.0862	0.1658	0.1219	0.2307	0.1346	0.2532

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-78

Estimates* of Number of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Bowline (Unit 1) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.600	0	0	0	0	0	0	0	0
5/13-5/19	0.600	0	0	0	0	0	0	0	0
5/20-5/26	0.600	0	0	0	0	0	0	0	0
5/27-6/2	0.600	0	0	0	0	0	0	0	0
6/3-6/9	0.600	16,000	32,000	17,000	34,000	26,000	51,000	28,000	57,000
6/10-6/16	0.600	181,000	363,000	194,000	387,000	290,000	581,000	323,000	645,000
6/17-6/23	0.600	496,000	992,000	529,000	1,059,000	794,000	1,588,000	882,000	1,764,000
6/24-6/30	0.600	372,000	744,000	397,000	794,000	595,000	1,191,000	661,000	1,323,000
7/1-7/7	0.600	47,000	95,000	50,000	101,000	76,000	151,000	84,000	168,000
7/8-7/14	0.606	24,000	49,000	26,000	52,000	39,000	77,000	43,000	86,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-79

Estimates* of Number of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Bowline (Unit 2) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.600	1,000	1,000	1,000	1,000	1,000	2,000	1,000	2,000
5/13-5/19	0.600	13,000	25,000	13,000	27,000	20,000	40,000	22,000	45,000
5/20-5/26	0.600	0	0	0	0	0	0	0	0
5/27-6/2	0.600	0	0	0	0	0	0	0	0
6/3-6/9	0.600	78,000	156,000	83,000	167,000	125,000	250,000	139,000	278,000
6/10-6/16	0.600	406,000	813,000	433,000	867,000	650,000	1,300,000	722,000	1,444,000
6/17-6/23	0.600	497,000	994,000	530,000	1,060,000	795,000	1,590,000	883,000	1,767,000
6/24-6/30	0.600	447,000	895,000	477,000	954,000	716,000	1,431,000	795,000	1,591,000
7/1-7/7	0.600	54,000	108,000	57,000	115,000	86,000	172,000	96,000	192,000
7/8-7/14	0.606	26,000	52,000	28,000	56,000	41,000	83,000	46,000	92,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-80

Estimates* of Number of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Bowline (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.600	1,000	1,000	1,000	1,000	1,000	2,000	1,000	2,000
5/13-5/19	0.600	13,000	25,000	13,000	27,000	20,000	40,000	22,000	45,000
5/20-5/26	0.600	0	0	0	0	0	0	0	0
5/27-6/2	0.600	0	0	0	0	0	0	0	0
6/3-6/9	0.600	94,000	188,000	100,000	201,000	151,000	301,000	167,000	335,000
6/10-6/16	0.600	588,000	1,175,000	627,000	1,254,000	940,000	1,881,000	1,045,000	2,090,000
6/17-6/23	0.600	993,000	1,986,000	1,059,000	2,118,000	1,589,000	3,178,000	1,765,000	3,531,000
6/24-6/30	0.600	819,000	1,639,000	874,000	1,748,000	1,311,000	2,622,000	1,457,000	2,913,000
7/1-7/7	0.600	101,000	202,000	108,000	216,000	162,000	324,000	180,000	360,000
7/8-7/14	0.606	51,000	101,000	54,000	108,000	80,000	160,000	89,000	178,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-81

Estimates* of Number of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Lovett (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.600	2,000	3,000	2,000	4,000	3,000	5,000	3,000	6,000
5/13-5/19	0.600	15,000	29,000	16,000	31,000	23,000	47,000	26,000	52,000
5/20-5/26	0.600	63,000	127,000	68,000	135,000	101,000	203,000	113,000	225,000
5/27-6/2	0.600	33,000	66,000	35,000	71,000	53,000	106,000	59,000	118,000
6/3-6/9	0.600	39,000	77,000	41,000	83,000	62,000	124,000	69,000	138,000
6/10-6/16	0.600	387,000	775,000	413,000	826,000	620,000	1,239,000	688,000	1,377,000
6/17-6/23	0.600	804,000	1,609,000	858,000	1,716,000	1,287,000	2,574,000	1,430,000	2,860,000
6/24-6/30	0.600	518,000	1,036,000	553,000	1,106,000	829,000	1,658,000	921,000	1,843,000
7/1-7/7	0.600	65,000	131,000	70,000	140,000	105,000	209,000	116,000	233,000
7/8-7/14	0.603	19,000	37,000	20,000	40,000	30,000	60,000	33,000	66,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table D-82

Estimates of Number of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Indian Point (Unit 2) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.600	8,000	15,000	8,000	16,000	12,000	25,000	14,000	27,000
5/13-5/19	0.600	21,000	42,000	22,000	45,000	33,000	67,000	37,000	74,000
5/20-5/26	0.600	265,000	530,000	283,000	566,000	424,000	849,000	472,000	943,000
5/27-6/2	0.600	169,000	338,000	180,000	360,000	270,000	541,000	300,000	601,000
6/3-6/9	0.600	136,000	272,000	145,000	290,000	218,000	435,000	242,000	484,000
6/10-6/16	0.600	1,256,000	2,512,000	1,340,000	2,679,000	2,009,000	4,019,000	2,233,000	4,465,000
6/17-6/23	0.600	2,155,000	4,311,000	2,299,000	4,598,000	3,449,000	6,897,000	3,832,000	7,663,000
6/24-6/30	0.600	1,523,000	3,045,000	1,624,000	3,248,000	2,436,000	4,873,000	2,707,000	5,414,000
7/1-7/7	0.601	185,000	370,000	197,000	395,000	296,000	591,000	328,000	657,000
7/8-7/14	0.603	69,000	137,000	73,000	146,000	109,000	219,000	121,000	243,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-83

Estimates* of Number of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Indian Point (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.600	10,000	19,000	10,000	21,000	15,000	31,000	17,000	34,000
5/13-5/19	0.600	32,000	63,000	34,000	68,000	51,000	101,000	56,000	113,000
5/20-5/26	0.600	375,000	749,000	399,000	799,000	599,000	1,198,000	666,000	1,332,000
5/27-6/2	0.600	228,000	456,000	243,000	487,000	365,000	730,000	405,000	811,000
6/3-6/9	0.600	186,000	373,000	199,000	398,000	298,000	596,000	331,000	663,000
6/10-6/16	0.600	1,803,000	3,605,000	1,923,000	3,846,000	2,884,000	5,769,000	3,205,000	6,410,000
6/17-6/23	0.600	3,055,000	6,109,000	3,258,000	6,516,000	4,887,000	9,774,000	5,430,000	10,860,000
6/24-6/30	0.600	2,037,000	4,073,000	2,172,000	4,345,000	3,259,000	6,517,000	3,621,000	7,241,000
7/1-7/7	0.601	248,000	496,000	265,000	529,000	396,000	793,000	440,000	881,000
7/8-7/14	0.603	82,000	165,000	88,000	176,000	131,000	262,000	146,000	292,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-84

Estimates* of Number of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Danskammer (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.0	0	0	0	0	0	0	0	0
5/13-5/19	0.600	9,000	18,000	9,000	19,000	14,000	28,000	16,000	32,000
5/20-5/26	0.600	89,000	178,000	95,000	190,000	143,000	286,000	159,000	317,000
5/27-6/2	0.600	144,000	288,000	154,000	307,000	230,000	461,000	256,000	512,000
6/3-6/9	0.600	255,000	509,000	272,000	543,000	408,000	815,000	453,000	906,000
6/10-6/16	0.600	531,000	1,062,000	566,000	1,133,000	850,000	1,699,000	944,000	1,888,000
6/17-6/23	0.600	469,000	939,000	501,000	1,001,000	751,000	1,502,000	834,000	1,668,000
6/24-6/30	0.600	137,000	274,000	146,000	293,000	219,000	439,000	244,000	488,000
7/1-7/7	0.601	46,000	93,000	49,000	99,000	74,000	148,000	82,000	165,000
7/8-7/14	0.600	69,000	139,000	74,000	148,000	111,000	222,000	123,000	247,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-85

Estimates* of Number of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Multiplant by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.600	12,000	24,000	13,000	26,000	19,000	38,000	21,000	43,000
5/13-5/19	0.600	68,000	135,000	72,000	144,000	108,000	217,000	120,000	241,000
5/20-5/26	0.600	527,000	1,054,000	562,000	1,124,000	843,000	1,687,000	937,000	1,874,000
5/27-6/2	0.600	405,000	811,000	432,000	865,000	648,000	1,297,000	720,000	1,441,000
6/3-6/9	0.600	574,000	1,148,000	612,000	1,224,000	918,000	1,836,000	1,020,000	2,040,000
6/10-6/16	0.600	3,309,000	6,618,000	3,529,000	7,059,000	5,294,000	10,588,000	5,882,000	11,764,000
6/17-6/23	0.600	5,321,000	10,643,000	5,676,000	11,352,000	8,514,000	17,028,000	9,460,000	18,920,000
6/24-6/30	0.600	3,511,000	7,023,000	3,745,000	7,491,000	5,618,000	11,236,000	6,242,000	12,485,000
7/1-7/7	0.601	461,000	922,000	492,000	984,000	737,000	1,474,000	819,000	1,638,000
7/8-7/14	0.603	221,000	442,000	236,000	472,000	352,000	704,000	391,000	7,830,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-86

Estimates* of Number of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Post-1972 Plants by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.600	8,000	17,000	9,000	18,000	13,000	27,000	15,000	29,000
5/13-5/19	0.600	33,000	67,000	36,000	71,000	54,000	107,000	59,000	119,000
5/20-5/26	0.600	265,000	530,000	283,000	566,000	424,000	849,000	472,000	943,000
5/27-6/2	0.600	169,000	338,000	180,000	360,000	270,000	541,000	300,000	601,000
6/3-6/9	0.600	230,000	460,000	245,000	491,000	368,000	736,000	409,000	818,000
6/10-6/16	0.600	1,844,000	3,687,000	1,966,000	3,933,000	2,950,000	5,899,000	3,277,000	6,555,000
6/17-6/23	0.600	3,148,000	6,297,000	3,358,000	6,716,000	5,037,000	10,075,000	5,597,000	11,194,000
6/24-6/30	0.600	2,342,000	4,684,000	2,498,000	4,996,000	3,747,000	7,495,000	4,164,000	8,327,000
7/1-7/7	0.601	286,000	572,000	305,000	611,000	457,000	915,000	508,000	1,016,000
7/8-7/14	0.604	119,000	238,000	127,000	254,000	189,000	379,000	210,000	421,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-87

Estimates* of Cumulative Number of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Bowline (Unit 1) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.600	0	0	0	0	0	0	0	0
5/13-5/19	0.600	0	0	0	0	0	0	0	0
5/20-5/26	0.600	0	0	0	0	0	0	0	0
5/27-6/2	0.600	0	0	0	0	0	0	0	0
6/3-6/9	0.600	16,000	32,000	17,000	34,000	26,000	51,000	28,000	57,000
6/10-6/16	0.600	197,000	395,000	211,000	421,000	316,000	632,000	351,000	702,000
6/17-6/23	0.600	694,000	1,387,000	740,000	1,480,000	1,110,000	2,220,000	1,233,000	2,466,000
6/24-6/30	0.600	1,066,000	2,131,000	1,137,000	2,273,000	1,705,000	3,410,000	1,895,000	3,789,000
7/1-7/7	0.600	1,113,000	2,226,000	1,187,000	2,374,000	1,781,000	3,562,000	1,979,000	3,957,000
7/8-7/14	0.606	1,137,000	2,275,000	1,213,000	2,427,000	1,819,000	3,639,000	2,022,000	4,043,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-88

Estimates of Cumulative Number of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Bowline (Unit 2) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.600	1,000	1,000	1,000	1,000	1,000	2,000	1,000	2,000
5/13-5/19	0.600	13,000	26,000	14,000	28,000	21,000	42,000	23,000	47,000
5/20-5/26	0.600	13,000	26,000	14,000	28,000	21,000	42,000	23,000	47,000
5/27-6/2	0.600	13,000	26,000	14,000	28,000	21,000	42,000	23,000	47,000
6/3-6/9	0.600	91,000	183,000	97,000	195,000	146,000	292,000	162,000	325,000
6/10-6/16	0.600	498,000	995,000	531,000	1,061,000	796,000	1,592,000	885,000	1,769,000
6/17-6/23	0.600	994,000	1,989,000	1,061,000	2,121,000	1,591,000	3,182,000	1,768,000	3,536,000
6/24-6/30	0.600	1,442,000	2,883,000	1,538,000	3,076,000	2,307,000	4,614,000	2,563,000	5,126,000
7/1-7/7	0.600	1,496,000	2,991,000	1,595,000	3,191,000	2,393,000	4,786,000	2,659,000	5,318,000
7/8-7/14	0.606	1,522,000	3,044,000	1,623,000	3,246,000	2,434,000	4,869,000	2,705,000	5,410,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-89

Estimates* of Cumulative Number of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Bowline (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.600	1,000	1,000	1,000	1,000	1,000	2,000	1,000	2,000
5/13-5/19	0.600	13,000	26,000	14,000	28,000	21,000	42,000	23,000	47,000
5/20-5/26	0.600	13,000	26,000	14,000	28,000	21,000	42,000	23,000	47,000
5/27-6/2	0.600	13,000	26,000	14,000	28,000	21,000	42,000	23,000	47,000
6/3-6/9	0.600	107,000	215,000	114,000	229,000	172,000	343,000	191,000	381,000
6/10-6/16	0.600	695,000	1,390,000	741,000	1,483,000	1,112,000	2,224,000	1,236,000	2,471,000
6/17-6/23	0.600	1,688,000	3,376,000	1,801,000	3,601,000	2,701,000	5,402,000	3,001,000	6,002,000
6/24-6/30	0.600	2,507,000	5,015,000	2,675,000	5,349,000	4,012,000	8,024,000	4,458,000	8,915,000
7/1-7/7	0.600	2,609,000	5,217,000	2,782,000	5,565,000	4,174,000	8,347,000	4,637,000	9,275,000
7/8-7/14	0.606	2,659,000	5,318,000	2,836,000	5,673,000	4,254,000	8,508,000	4,727,000	9,453,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-90

Estimates* of Cumulative Number of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Lovett (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.600	2,000	3,000	2,000	4,000	3,000	5,000	3,000	6,000
5/13-5/19	0.600	16,000	33,000	17,000	35,000	26,000	52,000	29,000	58,000
5/20-5/26	0.600	80,000	159,000	85,000	170,000	127,000	255,000	141,000	283,000
5/27-6/2	0.600	113,000	226,000	120,000	241,000	180,000	361,000	201,000	401,000
6/3-6/9	0.600	152,000	303,000	162,000	323,000	242,000	485,000	269,000	539,000
6/10-6/16	0.600	539,000	1,078,000	575,000	1,149,000	862,000	1,724,000	958,000	1,916,000
6/17-6/23	0.600	1,343,000	2,687,000	1,433,000	2,866,000	2,149,000	4,299,000	2,388,000	4,776,000
6/24-6/30	0.600	1,861,000	3,723,000	1,986,000	3,971,000	2,978,000	5,957,000	3,309,000	6,619,000
7/1-7/7	0.600	1,927,000	3,854,000	2,055,000	4,111,000	3,083,000	6,166,000	3,426,000	6,851,000
7/8-7/14	0.603	1,946,000	3,891,000	2,075,000	4,151,000	3,113,000	6,226,000	3,459,000	6,918,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-91

Estimates* of Cumulative Number of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Indian Point (Unit 2) by 1-Wk Intervals For Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.600	8,000	15,000	8,000	16,000	12,000	25,000	14,000	27,000
5/13-5/19	0.600	29,000	57,000	30,000	61,000	46,000	91,000	51,000	101,000
5/20-5/26	0.600	294,000	588,000	313,000	627,000	470,000	940,000	522,000	1,045,000
5/27-6/2	0.600	463,000	925,000	494,000	987,000	740,000	1,481,000	823,000	1,645,000
6/3-6/9	0.600	599,000	1,198,000	639,000	1,277,000	958,000	1,916,000	1,064,000	2,129,000
6/10-6/16	0.600	1,855,000	3,709,000	1,978,000	3,957,000	2,967,000	5,935,000	3,297,000	6,594,000
6/17-6/23	0.600	4,010,000	8,020,000	4,277,000	8,555,000	6,416,000	12,832,000	7,129,000	14,258,000
6/24-6/30	0.600	5,533,000	11,065,000	5,901,000	11,803,000	8,852,000	17,704,000	9,836,000	19,672,000
7/1-7/7	0.601	5,718,000	11,435,000	6,099,000	12,198,000	9,148,000	18,295,000	10,164,000	20,328,000
7/8-7/14	0.603	5,786,000	11,572,000	6,172,000	12,344,000	9,257,000	18,514,000	10,286,000	20,571,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-92

Estimates* of Cumulative Number of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Indian Point (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.600	10,000	19,000	10,000	21,000	15,000	31,000	17,000	34,000
5/13-5/19	0.600	41,000	83,000	44,000	88,000	66,000	132,000	73,000	147,000
5/20-5/26	0.600	416,000	832,000	444,000	887,000	665,000	1,331,000	739,000	1,478,000
5/27-6/2	0.600	644,000	1,288,000	687,000	1,374,000	1,030,000	2,060,000	1,145,000	2,289,000
6/3-6/9	0.600	830,000	1,660,000	8,860,000	1,771,000	1,328,000	2,657,000	1,476,000	2,952,000
6/10-6/16	0.600	2,633,000	5,266,000	2,808,000	5,617,000	4,213,000	8,425,000	4,681,000	9,361,000
6/17-6/23	0.600	5,687,000	11,375,000	6,067,000	12,133,000	9,100,000	18,200,000	10,111,000	20,222,000
6/24-6/30	0.600	7,724,000	15,448,000	8,239,000	16,478,000	12,359,000	24,717,000	13,732,000	27,463,000
7/1-7/7	0.601	7,972,000	15,944,000	8,504,000	17,007,000	12,755,000	25,510,000	14,172,000	28,344,000
7/8-7/14	0.603	8,055,000	16,109,000	8,592,000	17,813,000	12,886,000	25,772,000	14,318,000	28,636,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-93

Estimates* of Cumulative Number of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Danskammer (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.0	0	0	0	0	0	0	0	0
5/13-5/19	0.600	9,000	18,000	9,000	19,000	14,000	28,000	16,000	32,000
5/20-5/26	0.600	98,000	196,000	105,000	209,000	157,000	314,000	174,000	349,000
5/27-6/2	0.600	242,000	484,000	258,000	517,000	387,000	775,000	430,000	861,000
6/3-6/9	0.600	497,000	994,000	530,000	1,060,000	795,000	1,590,000	883,000	1,767,000
6/10-6/16	0.600	1,028,000	2,056,000	1,096,000	2,193,000	1,645,000	3,289,000	1,827,000	3,655,000
6/17-6/23	0.600	1,497,000	2,994,000	1,597,000	3,194,000	2,396,000	4,791,000	2,662,000	5,323,000
6/24-6/30	0.600	1,634,000	3,269,000	1,743,000	3,487,000	2,615,000	5,230,000	2,905,000	5,811,000
7/1-7/7	0.601	1,681,000	3,361,000	1,793,000	3,585,000	2,689,000	5,378,000	2,988,000	5,976,000
7/8-7/14	0.600	1,750,000	3,500,000	1,867,000	3,733,000	2,800,000	5,600,000	3,111,000	6,222,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-94

Estimates* of Cumulative Number of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Multiplant by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.600	12,000	24,000	13,000	26,000	19,000	38,000	21,000	43,000
5/13-5/19	0.600	80,000	159,000	85,000	170,000	127,000	255,000	142,000	283,000
5/20-5/26	0.600	607,000	1,213,000	647,000	1,294,000	971,000	1,941,000	1,079,000	2,157,000
5/27-6/2	0.600	1,012,000	2,024,000	1,079,000	2,159,000	1,619,000	3,238,000	1,799,000	3,598,000
6/3-6/9	0.600	1,586,000	3,172,000	1,692,000	3,383,000	2,537,000	5,075,000	2,819,000	5,639,000
6/10-6/16	0.600	4,895,000	9,789,000	5,221,000	10,442,000	7,831,000	15,663,000	8,702,000	17,403,000
6/17-6/23	0.600	10,216,000	20,432,000	10,897,000	21,794,000	16,345,000	32,691,000	18,162,000	36,323,000
6/24-6/30	0.600	13,727,000	27,455,000	14,642,000	29,285,000	21,964,000	43,927,000	24,404,000	48,808,000
7/1-7/7	0.601	14,188,000	28,377,000	15,134,000	30,269,000	22,700,000	45,401,000	25,223,000	50,446,000
7/8-7/14	0.603	14,409,000	28,819,000	15,370,000	30,740,000	23,053,000	46,106,000	25,614,000	51,229,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-95

Estimates* of Cumulative Number of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Post-1972 Plants by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.600	1,000	17,000	9,000	18,000	13,000	27,000	15,000	29,000
5/13-5/19	0.600	42,000	83,000	45,000	89,000	67,000	134,000	74,000	148,000
5/20-5/26	0.600	307,000	614,000	327,000	655,000	491,000	982,000	546,000	1,091,000
5/27-6/2	0.600	476,000	952,000	508,000	1,015,000	761,000	1,523,000	846,000	1,692,000
6/3-6/9	0.600	706,000	1,412,000	753,000	1,506,000	1,130,000	2,259,000	1,255,000	2,510,000
6/10-6/16	0.600	2,550,000	5,099,000	2,720,000	5,439,000	4,079,000	8,159,000	4,533,000	9,065,000
6/17-6/23	0.600	5,698,000	11,396,000	6,078,000	12,156,000	9,117,000	18,233,000	10,130,000	20,259,000
6/24-6/30	0.600	8,040,000	16,080,000	8,576,000	17,152,000	12,864,000	25,728,000	14,293,000	28,587,000
7/1-7/7	0.601	8,326,000	16,652,000	8,881,000	17,763,000	13,321,000	26,643,000	14,802,000	29,603,000
7/8-7/14	0.604	8,445,000	16,891,000	9,008,000	18,017,000	13,151,000	27,022,000	15,012,000	30,024,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-96

Estimates* of Proportion of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Bowline (Unit 1) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.600	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/13-5/19	0.600	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/20-5/26	0.600	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/27-6/2	0.600	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/3-6/9	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	0.0001
6/10-6/16	0.600	0.0003	0.0006	0.0003	0.0006	0.0005	0.0009	0.0005	0.0011
6/17-6/23	0.600	0.0015	0.0030	0.0016	0.0032	0.0024	0.0048	0.0027	0.0054
6/24-6/30	0.600	0.0026	0.0051	0.0027	0.0055	0.0041	0.0082	0.0046	0.0092
7/1-7/7	0.600	0.0017	0.0034	0.0018	0.0037	0.0027	0.0055	0.0031	0.0061
7/8-7/14	0.606	0.0010	0.0020	0.0010	0.0021	0.0016	0.0031	0.0017	0.0035

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-97

Estimates* of Proportion of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Bowline (Unit 2) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/13-5/19	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/20-5/26	0.600	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/27-6/2	0.600	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/3-6/9	0.600	0.0002	0.0003	0.0002	0.0004	0.0003	0.0005	0.0003	0.0006
6/10-6/16	0.600	0.0007	0.0013	0.0007	0.0014	0.0011	0.0021	0.0012	0.0024
6/17-6/23	0.600	0.0015	0.0030	0.0016	0.0032	0.0024	0.0048	0.0027	0.0054
6/24-6/30	0.600	0.0031	0.0062	0.0033	0.0066	0.0050	0.0099	0.0055	0.0110
7/1-7/7	0.600	0.0020	0.0039	0.0021	0.0042	0.0031	0.0063	0.0035	0.0070
7/8-7/14	0.606	0.0011	0.0021	0.0011	0.0022	0.0017	0.0033	0.0019	0.0037

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-98

Estimates* of Proportion of White Perch Ichthyoplankton (Not Inlcuding Eggs) Cropped by Entrainment at Bowline (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/13-5/19	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/20-5/26	0.600	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/27-6/2	0.600	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/3-6/9	0.600	0.0002	0.0004	0.0002	0.0004	0.0003	0.0006	0.0004	0.0007
6/10-6/16	0.600	0.0010	0.0019	0.0010	0.0020	0.0015	0.0031	0.0017	0.0034
6/17-6/23	0.600	0.0030	0.0060	0.0032	0.0064	0.0048	0.0097	0.0054	0.0107
6/24-6/30	0.600	0.0057	0.0113	0.0060	0.0121	0.0091	0.0181	0.0101	0.0202
7/1-7/7	0.600	0.0037	0.0073	0.0039	0.0078	0.0059	0.0118	0.0065	0.0131
7/8-7/14	0.606	0.0020	0.0041	0.0022	0.0043	0.0032	0.0064	0.0036	0.0072

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-99

Estimates* of Proportion of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Lovett (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/13-5/19	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/20-5/26	0.600	<0.0001	0.0001	<0.0001	0.0001	<0.0001	0.0002	<0.0001	0.0002
5/27-6/2	0.600	<0.0001	0.0001	<0.0001	0.0001	0.0001	0.0002	0.0001	0.0002
6/3-6/9	0.600	<0.0001	0.0002	<0.0001	0.0002	0.0001	0.0003	0.0001	0.0003
6/10-6/16	0.600	0.0006	0.0013	0.0007	0.0013	0.0010	0.0020	0.0011	0.0022
6/17-6/23	0.600	0.0024	0.0049	0.0026	0.0052	0.0039	0.0078	0.0043	0.0087
6/24-6/30	0.600	0.0036	0.0072	0.0038	0.0077	0.0057	0.0115	0.0064	0.0128
7/1-7/7	0.600	0.0024	0.0048	0.0025	0.0051	0.0038	0.0076	0.0042	0.0084
7/8-7/14	0.603	0.0008	0.0015	0.0008	0.0016	0.0012	0.0024	0.0013	0.0027

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-100

Estimates* of Proportion of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Indian Point (Unit 2) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/13-5/19	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/20-5/26	0.600	0.0002	0.0005	0.0002	0.0005	0.0004	0.0007	0.0004	0.0008
5/27-6/2	0.600	0.0003	0.0007	0.0004	0.0007	0.0005	0.0011	0.0006	0.0012
6/3-6/9	0.600	0.0003	0.0006	0.0003	0.0006	0.0005	0.0009	0.0005	0.0010
6/10-6/16	0.600	0.0020	0.0041	0.0022	0.0044	0.0033	0.0065	0.0036	0.0073
6/17-6/23	0.600	0.0066	0.0131	0.0070	0.0140	0.0105	0.0210	0.0116	0.0233
6/24-6/30	0.600	0.0105	0.0211	0.0112	0.0225	0.0169	0.0337	0.0187	0.0375
7/1-7/7	0.601	0.0067	0.0134	0.0072	0.0143	0.0107	0.0215	0.0119	0.0238
7/8-7/14	0.603	0.0028	0.0055	0.0029	0.0059	0.0044	0.0088	0.0049	0.0098

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-101

Estimates* of Proportion of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Indian Point (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/13-5/19	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/20-5/26	0.600	0.0003	0.0006	0.0003	0.0007	0.0005	0.0010	0.0006	0.0012
5/27-6/2	0.600	0.0005	0.0009	0.0005	0.0010	0.0007	0.0015	0.0008	0.0016
6/3-6/9	0.600	0.0004	0.0008	0.0004	0.0008	0.0006	0.0013	0.0007	0.0014
6/10-6/16	0.600	0.0029	0.0059	0.0031	0.0063	0.0047	0.0094	0.0052	0.0104
6/17-6/23	0.600	0.0093	0.0186	0.0099	0.0198	0.0149	0.0297	0.0165	0.0330
6/24-6/30	0.600	0.0141	0.0282	0.0150	0.0301	0.0226	0.0451	0.0251	0.0501
7/1-7/7	0.601	0.0090	0.0180	0.0096	0.0192	0.0144	0.0288	0.0160	0.0320
7/8-7/14	0.603	0.0033	0.0066	0.0035	0.0071	0.0053	0.0105	0.0059	0.0117

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-102

Estimates* of Proportion of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Danskammer (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/13-5/19	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/20-5/26	0.600	<0.0001	0.0002	<0.0001	0.0002	0.0001	0.0002	0.0001	0.0003
5/27-6/2	0.600	0.0003	0.0006	0.0003	0.0006	0.0005	0.0009	0.0005	0.0010
6/3-6/9	0.600	0.0005	0.0011	0.0006	0.0011	0.0009	0.0017	0.0010	0.0019
6/10-6/16	0.600	0.0009	0.0017	0.0009	0.0018	0.0014	0.0028	0.0015	0.0031
6/17-6/23	0.600	0.0014	0.0029	0.0015	0.0030	0.0023	0.0046	000025	0.0051
6/24-6/30	0.600	0.0009	0.0019	0.0010	0.0020	0.0015	0.0030	0.0017	0.0034
7/1-7/7	0.601	0.0017	0.0034	0.0018	0.0036	0.0027	0.0054	0.0030	0.0060
7/8-7/14	0.600	0.0028	0.0056	0.0030	0.0059	0.0045	0.0089	0.0050	0.0099

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-103

Estimates* of Proportion of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Multiplant by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/13-5/19	0.600	<0.0001	0.0001	<0.0001	0.0001	<0.0001	0.0002	0.0001	0.0002
5/20-5/26	0.600	0.0005	0.0009	0.0005	0.0010	0.0007	0.0015	0.0008	0.0016
5/27-6/2	0.600	0.0008	0.0016	0.0009	0.0017	0.0013	0.0026	0.0014	0.0029
6/3-6/9	0.600	0.0012	0.0024	0.0013	0.0026	0.0019	0.0039	0.0022	0.0043
6/10-6/16	0.600	0.0054	0.0108	0.0058	0.0115	0.0086	0.0173	0.0096	0.0192
6/17-6/23	0.600	0.0162	0.0324	0.0173	0.0345	0.0259	0.0518	0.0288	0.0575
6/24-6/30	0.600	0.0243	0.0486	0.0259	0.0518	0.0389	0.0778	0.0432	0.0864
7/1-7/7	0.601	0.0167	0.0335	0.0179	0.0357	0.0268	0.0535	0.0297	0.0595
7/8-7/14	0.603	0.0089	0.0178	0.0095	0.0190	0.0141	0.0283	0.0157	0.0314

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-104

Estimates* of Proportion of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Post-1972 Plants by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/13-5/19	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/20-5/26	0.600	0.0002	0.0005	0.0002	0.0005	0.0004	0.0007	0.0004	0.0008
5/27-6/2	0.600	0.0003	0.0007	0.0004	0.0007	0.0005	0.0011	0.0006	0.0012
6/3-6/9	0.600	0.0005	0.0010	0.0005	0.0010	0.0008	0.0016	0.0009	0.0017
6/10-6/16	0.600	0.0030	0.0060	0.0032	0.0064	0.0048	0.0096	0.0053	0.0107
6/17-6/23	0.600	0.0096	0.0191	0.0102	0.0204	0.0153	0.0306	0.0170	0.0340
6/24-6/30	0.600	0.0162	0.0324	0.0173	0.0346	0.0259	0.0519	0.0288	0.0576
7/1-7/7	0.601	0.0104	0.0208	0.0111	0.0222	0.0166	0.0332	0.0184	0.0369
7/8-7/14	0.604	0.0048	0.0096	0.0051	0.0102	0.0076	0.0152	0.0085	0.0169

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-105

Estimates* of Cumulative Proportion of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Bowline (Unit 1) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.600	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/13-5/19	0.600	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/20-5/26	0.600	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/27-6/2	0.600	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/3-6/9	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
6/10-6/16	0.600	0.0003	0.0007	0.0004	0.0007	0.0005	0.0011	0.0006	0.0012
6/17-6/23	0.600	0.0018	0.0037	0.0020	0.0039	0.0029	0.0059	0.0033	0.0065
6/24-6/30	0.600	0.0044	0.0088	0.0047	0.0094	0.0070	0.0141	0.0078	0.0156
7/1-7/7	0.600	0.0061	0.0122	0.0065	0.0130	0.0098	0.0195	0.0109	0.0216
7/8-7/14	0.606	0.0071	0.0141	0.0076	0.0151	0.0113	0.0225	0.0126	0.0250

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-106

Estimates* of Cumulative Proportion of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Bowline (Unit 2) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/13-5/19	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/20-5/26	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/27-6/2	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
6/3-6/9	0.600	0.0002	0.0003	0.0002	0.0004	0.0003	0.0005	0.0003	0.0006
6/10-6/16	0.600	0.0008	0.0017	0.0009	0.0018	0.0013	0.0027	0.0015	0.0030
6/17-6/23	0.600	0.0023	0.0047	0.0025	0.0050	0.0038	0.0075	0.0042	0.0083
6/24-6/30	0.600	0.0054	0.0109	0.0058	0.0116	0.0087	0.0173	0.0097	0.0192
7/1-7/7	0.600	0.0074	0.0147	0.0079	0.0157	0.0118	0.0235	0.0131	0.0261
7/8-7/14	0.606	0.0084	0.0168	0.0090	0.0179	0.0134	0.0267	0.0149	0.0297

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-107

Estimates* of Cumulative Proportion of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Bowline (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/13-5/19	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/20-5/26	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/27-6/2	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
6/3-6/9	0.600	0.0002	0.0004	0.0002	0.0004	0.0003	0.0007	0.0004	0.0007
6/10-6/16	0.600	0.0012	0.0023	0.0012	0.0025	0.0019	0.0037	0.0021	0.0041
6/17-6/23	0.600	0.0042	0.0084	0.0045	0.0089	0.0067	0.0134	0.0074	0.0148
6/24-6/30	0.600	0.0098	0.0196	0.0105	0.0209	0.0157	0.0313	0.0174	0.0347
7/1-7/7	0.600	0.0135	0.0268	0.0144	0.0286	0.0215	0.0426	0.0239	0.0473
7/8-7/14	0.606	0.0155	0.0308	0.0165	0.0328	0.0246	0.0488	0.0273	0.0541

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-108

Estimates* of Cumulative Proportion of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Lovett (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/13-5/19	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/20-5/26	0.600	<0.0001	0.0001	<0.0001	0.0001	0.0001	0.0002	0.0001	0.0002
5/27-6/2	0.600	0.0001	0.0003	0.0001	0.0003	0.0002	0.0004	0.0002	0.0005
6/3-6/9	0.600	0.0002	0.0004	0.0002	0.0005	0.0003	0.0007	0.0004	0.0008
6/10-6/16	0.600	0.0008	0.0017	0.0009	0.0018	0.0014	0.0027	0.0015	0.0030
6/17-6/23	0.600	0.0033	0.0066	0.0035	0.0070	0.0053	0.0105	0.0058	0.0117
6/24-6/30	0.600	0.0069	0.0137	0.0073	0.0146	0.0110	0.0219	0.0122	0.0243
7/1-7/7	0.600	0.0092	0.0184	0.0098	0.0196	0.0147	0.0293	0.0164	0.0325
7/8-7/14	0.603	0.0100	0.0199	0.0106	0.0212	0.0159	0.0316	0.0177	0.0351

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-109

Estimates* of Cumulative Proportion of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Indian Point (Unit 2) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29/5-5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/13-5/19	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/20-5/26	0.600	0.0002	0.0005	0.0003	0.0005	0.0004	0.0008	0.0004	0.0009
5/27-6/2	0.600	0.0006	0.0012	0.0006	0.0013	0.0009	0.0019	0.0010	0.0021
6/3-6/9	0.600	0.0009	0.0017	0.0009	0.0019	0.0014	0.0028	0.0016	0.0031
6/10-6/16	0.600	0.0029	0.0058	0.0031	0.0062	0.0047	0.0093	0.0052	0.0104
6/17-6/23	0.600	0.0095	0.0189	0.0101	0.0201	0.0151	0.0301	0.0168	0.0334
6/24-6/30	0.600	0.0199	0.0395	0.0212	0.0421	0.0317	0.0628	0.0352	0.0696
7/1-7/7	0.601	0.0265	0.0524	0.0282	0.0559	0.0421	0.0829	0.0467	0.0918
7/8-7/14	0.603	0.0292	0.0577	0.0311	0.0614	0.0463	0.0910	0.0513	0.1007

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-110

Estimates* of Cumulative Proportion of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Indian Point (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/13-5/19	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/20-5/26	0.600	0.0004	0.0007	0.0004	0.0008	0.0006	0.0011	0.0006	0.0013
5/27-6/2	0.600	0.0008	0.0016	0.0009	0.0017	0.0013	0.0026	0.0014	0.0029
6/3-6/9	0.600	0.0012	0.0024	0.0013	0.0026	0.0019	0.0038	0.0021	0.0043
6/10-6/16	0.600	0.0041	0.0083	0.0044	0.0088	0.0066	0.0132	0.0073	0.0147
6/17-6/23	0.600	0.0134	0.0267	0.0143	0.0285	0.0214	0.0425	0.0237	0.0472
6/24-6/30	0.600	0.0273	0.0541	0.0291	0.0577	0.0434	0.0857	0.0482	0.0950
7/1-7/7	0.601	0.0360	0.0712	0.0384	0.0758	0.0572	0.1120	0.0634	0.1239
7/8-7/14	0.603	0.0392	0.0773	0.0418	0.0823	0.0622	0.1214	0.0689	0.1342

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-111

Estimates* of Cumulative Proportion of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Danskammer (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/13-5/19	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/20-5/26	0.600	<0.0001	0.0002	<0.0001	0.0002	0.0001	0.0003	0.0002	0.0003
5/27-6/2	0.600	0.0004	0.0007	0.0004	0.0008	0.0006	0.0012	0.0007	0.0013
6/3-6/9	0.600	0.0009	0.0018	0.0010	0.0019	0.0015	0.0029	0.0016	0.0032
6/10-6/16	0.600	0.0018	0.0035	0.0019	0.0038	0.0028	0.0057	0.0032	0.0063
6/17-6/23	0.600	0.0032	0.0064	0.0034	0.0068	0.0051	0.0102	0.0057	0.0113
6/24-6/30	0.600	0.0041	0.0083	0.0044	0.0088	0.0066	0.0132	0.0074	0.0147
7/1-7/7	0.601	0.0058	0.0116	0.0062	0.0124	0.0093	0.0185	0.0103	0.0206
7/8-7/14	0.600	0.0086	0.0171	0.0092	0.0183	0.0137	0.0273	0.0152	0.0303

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-112

Estimates* of Cumulative Proportion of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Multiplant by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/13-5/19	0.600	<0.0001	0.0001	<0.0001	0.0001	<0.0001	0.0002	0.0001	0.0002
5/20-5/26	0.600	0.0005	0.0010	0.0006	0.0011	0.0008	0.0017	0.0009	0.0018
5/27-6/2	0.600	0.0013	0.0027	0.0014	0.0028	0.0021	0.0043	0.0024	0.0047
6/3-6/9	0.600	0.0025	0.0051	0.0027	0.0054	0.0041	0.0081	0.0045	0.0090
6/10-6/16	0.600	0.0079	0.0158	0.0084	0.0168	0.0126	0.0252	0.0141	0.0280
6/17-6/23	0.600	0.0240	0.0476	0.0256	0.0508	0.0382	0.0757	0.0424	0.0839
6/24-6/30	0.600	0.0477	0.0939	0.0508	0.1000	0.0756	0.1476	0.0838	0.1631
7/1-7/7	0.601	0.0636	0.1243	0.0678	0.1321	0.1003	0.1932	0.1110	0.2128
7/8-7/14	0.603	0.0719	0.1398	0.0766	0.1486	0.1131	0.2160	0.1250	0.2376

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-113

Estimates* of Cumulative Proportion of White Perch Ichthyoplankton (Not Including Eggs) Cropped by Entrainment at Post-1972 Plants by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/13-5/19	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/20-5/26	0.600	0.0003	0.0005	0.0003	0.0006	0.0004	0.0008	0.0005	0.0009
5/27-6/2	0.600	0.0006	0.0012	0.0006	0.0013	0.0010	0.0019	0.0011	0.0021
6/3-6/9	0.600	0.0011	0.0022	0.0012	0.0023	0.0017	0.0035	0.0019	0.0038
6/10-6/16	0.600	0.0041	0.0082	0.0044	0.0087	0.0065	0.0130	0.0073	0.0145
6/17-6/23	0.600	0.0136	0.0271	0.0145	0.0289	0.0217	0.0433	0.0241	0.0480
6/24-6/30	0.600	0.0296	0.0587	0.0316	0.0625	0.0471	0.0929	0.0523	0.1029
7/1-7/7	0.601	0.0397	0.0782	0.0423	0.0833	0.0629	0.1230	0.0698	0.1360
7/8-7/14	0.604	0.0443	0.0871	0.0472	0.0927	0.0701	0.1364	0.0776	0.1506

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-114

Estimates* of Number of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Bowline (Unit 1) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.636	0	0	0	0	0	0	0	0
5/13-5/19	0.698	0	0	0	0	0	0	0	0
5/20-5/26	0.628	0	0	0	0	0	0	0	0
5/27-6/2	0.707	0	0	0	0	0	0	0	0
6/3-6/9	0.782	233,000	467,000	254,000	507,000	292,000	584,000	324,000	649,000
6/10-6/16	0.720	535,000	1,071,000	578,000	1,156,000	723,000	1,446,000	803,000	1,606,000
6/17-6/23	0.602	503,000	1,006,000	537,000	1,073,000	802,000	1,605,000	892,000	1,783,000
6/24-6/30	0.603	379,000	759,000	405,000	810,000	604,000	1,209,000	671,000	1,343,000
7/1-7/7	0.602	48,000	96,000	51,000	102,000	76,000	153,000	85,000	170,000
7/8-7/14	0.606	24,000	49,000	26,000	52,000	39,000	77,000	43,000	86,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-115

Estimates* of Number of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Bowline (Unit 2) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.636	1,000	2,000	1,000	2,000	1,000	2,000	1,000	3,000
5/13-5/19	0.698	28,000	57,000	31,000	61,000	39,000	79,000	44,000	87,000
5/20-5/26	0.628	0	0	0	0	0	0	0	0
5/27-6/2	0.707	0	0	0	0	0	0	0	0
6/3-6/9	0.782	1,142,000	2,284,000	1,241,000	2,482,000	1,428,000	2,857,000	1,587,000	3,174,000
6/10-6/16	0.720	1,199,000	2,398,000	1,295,000	2,589,000	1,618,000	3,237,000	1,798,000	3,596,000
6/17-6/23	0.602	504,000	1,007,000	537,000	1,075,000	803,000	1,607,000	893,000	1,785,000
6/24-6/30	0.603	456,000	912,000	487,000	974,000	727,000	1,453,000	807,000	1,615,000
7/7-7/7	0.602	54,000	109,000	58,000	116,000	87,000	174,000	97,000	193,000
7/8-7/14	0.606	26,000	52,000	28,000	56,000	41,000	83,000	46,000	92,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-116

Estimates* of Number of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Bowline (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.636	1,000	2,000	1,000	2,000	1,000	2,000	1,000	3,000
5/13-5/19	0.698	28,000	57,000	31,000	61,000	39,000	79,000	44,000	87,000
5/20-5/26	0.628	0	0	0	0	0	0	0	0
5/27-6/2	0.707	0	0	0	0	0	0	0	0
6/3-6/9	0.782	1,375,000	2,751,000	1,495,000	2,990,000	1,720,000	3,441,000	1,912,000	3,823,000
6/10-6/16	0.720	1,734,000	3,468,000	1,873,000	3,746,000	2,341,000	4,682,000	2,601,000	5,203,000
6/17-6/23	0.602	1,007,000	2,014,000	1,074,000	2,148,000	1,606,000	3,212,000	1,784,000	3,569,000
6/24-6/30	0.603	836,000	1,671,000	892,000	1,783,000	1,331,000	2,662,000	1,479,000	2,957,000
7/1-7/7	0.602	102,000	205,000	109,000	218,000	163,000	326,000	181,000	363,000
7/8-7/14	0.606	51,000	101,000	54,000	108,000	80,000	160,000	89,000	178,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-117

Estimates* of Number of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Lovett (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.600	2,000	3,000	2,000	4,000	3,000	5,000	3,000	6,000
5/13-5/19	0.701	34,000	68,000	37,000	73,000	47,000	94,000	52,000	104,000
5/20-5/26	0.616	70,000	141,000	75,000	151,000	110,000	220,000	122,000	244,000
5/27-6/2	0.688	67,000	135,000	73,000	145,000	95,000	190,000	105,000	211,000
6/3-6/9	0.774	380,000	761,000	413,000	826,000	480,000	961,000	534,000	1,067,000
6/10-6/16	0.666	637,000	1,274,000	684,000	1,368,000	925,000	1,849,000	1,027,000	2,055,000
6/17-6/23	0.601	809,000	1,619,000	864,000	1,727,000	1,293,000	2,586,000	1,437,000	2,874,000
6/24-6/30	0.604	532,000	1,063,000	567,000	1,134,000	845,000	1,690,000	939,000	1,878,000
7/1-7/7	0.602	66,000	132,000	71,000	141,000	106,000	211,000	117,000	235,000
7/8-7/14	0.603	19,000	37,000	20,000	40,000	30,000	60,000	33,000	66,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-118

Estimates* of Number of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Indian Point (Unit 2) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.600	8,000	15,000	8,000	16,000	12,000	25,000	14,000	27,000
5/13-5/19	0.728	69,000	138,000	75,000	150,000	93,000	185,000	103,000	206,000
5/20-5/26	0.614	291,000	582,000	311,000	622,000	456,000	912,000	507,000	1,013,000
5/27-6/2	0.697	375,000	751,000	404,000	809,000	522,000	1,045,000	580,000	1,161,000
6/3-6/9	0.782	1,891,000	3,782,000	2,055,000	4,110,000	2,365,000	4,731,000	2,628,000	5,256,000
6/10-6/16	0.681	2,384,000	4,769,000	2,565,000	5,130,000	3,390,000	6,779,000	3,766,000	7,533,000
6/17-6/23	0.601	2,169,000	4,338,000	2,314,000	4,627,000	3,465,000	6,929,000	3,850,000	7,699,000
6/24-6/30	0.604	1,562,000	3,123,000	1,667,000	3,333,000	2,483,000	4,966,000	2,759,000	5,518,000
7/1-7/7	0.602	187,000	374,000	199,000	399,000	298,000	596,000	331,000	662,000
7/8-7/14	0.603	69,000	137,000	73,000	146,000	109,000	219,000	121,000	243,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-119

Estimates* of Number of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Indian Point (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.600	10,000	19,000	10,000	21,000	15,000	31,000	17,000	34,000
5/13-5/19	0.728	105,000	210,000	114,000	227,000	140,000	281,000	156,000	312,000
5/20-5/26	0.614	411,000	822,000	439,000	878,000	644,000	1,288,000	715,000	1,431,000
5/27-6/2	0.697	507,000	1,014,000	546,000	1,092,000	705,000	1,410,000	783,000	1,567,000
6/3-6/9	0.782	2,590,000	5,179,000	2,815,000	5,630,000	3,240,000	6,479,000	3,599,000	7,199,000
6/10-6/16	0.681	3,423,000	6,845,000	3,682,000	7,363,000	4,866,000	9,731,000	5,406,000	10,813,000
6/17-6/23	0.601	3,074,000	6,147,000	3,279,000	6,558,000	4,910,000	9,820,000	5,456,000	10,911,000
6/24-6/30	0.604	2,089,000	4,178,000	2,229,000	4,458,000	3,321,000	6,643,000	3,691,000	7,381,000
7/1-7/7	0.602	250,000	501,000	267,000	534,000	400,000	799,000	444,000	888,000
7/8-7/14	0.603	82,000	165,000	88,000	176,000	131,000	262,000	146,000	292,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-120

Estimates* of Number of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Danskammer (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.800	<1,000	<1,000	<1,000	1,000	<1,000	1,000	<1,000	1,000
5/13-5/19	0.740	36,000	72,000	39,000	78,000	47,000	95,000	53,000	105,000
5/20-5/26	0.619	101,000	203,000	108,000	217,000	157,000	315,000	175,000	350,000
5/27-6/2	0.652	211,000	422,000	226,000	453,000	312,000	625,000	347,000	694,000
6/3-6/9	0.618	288,000	575,000	307,000	615,000	448,000	895,000	497,000	995,000
6/10-6/16	0.610	567,000	1,134,000	606,000	1,211,000	894,000	1,787,000	993,000	1,986,000
6/17-6/23	0.601	471,000	942,000	503,000	1,005,000	753,000	1,506,000	836,000	1,673,000
6/24-6/30	0.603	140,000	280,000	149,000	299,000	223,000	446,000	248,000	495,000
7/1-7/7	0.605	48,000	95,000	51,000	102,000	76,000	151,000	84,000	168,000
7/8-7/14	0.600	69,000	139,000	74,000	148,000	111,000	222,000	123,000	247,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-121

Estimates* of Number of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Multiplant by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.605	12,000	25,000	13,000	26,000	20,000	39,000	22,000	44,000
5/13-5/19	0.721	203,000	406,000	220,000	439,000	274,000	548,000	304,000	609,000
5/20-5/26	0.615	583,000	1,166,000	623,000	1,246,000	911,000	1,822,000	1,012,000	2,025,000
5/27-6/2	0.684	785,000	1,570,000	845,000	1,690,000	1,112,000	2,225,000	1,236,000	2,472,000
6/3-6/9	0.769	4,633,000	9,266,000	5,030,000	10,060,000	5,888,000	11,776,000	6,542,000	13,084,000
6/10-6/16	0.683	6,361,000	12,722,000	6,844,000	13,689,000	9,025,000	18,050,000	10,028,000	20,056,000
6/17-6/23	0.601	5,361,000	10,722,000	5,719,000	11,438,000	8,562,000	17,124,000	9,513,000	19,026,000
6/24-6/30	0.604	3,596,000	7,192,000	3,837,000	7,675,000	5,720,000	11,441,000	6,356,000	12,712,000
7/1-7/7	0.602	467,000	933,000	498,000	996,000	744,000	1,488,000	827,000	1,653,000
7/8-7/14	0.603	221,000	442,000	236,000	472,000	352,000	704,000	391,000	783,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-122

Estimates* of Number of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Post 1972 Plants by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.603	8,000	17,000	9,000	18,000	13,000	27,000	15,000	30,000
5/13-5/19	0.721	98,000	195,000	105,000	211,000	132,000	264,000	147,000	293,000
5/20-5/26	0.614	291,000	582,000	311,000	622,000	456,000	912,000	507,000	1,013,000
5/27-6/2	0.697	375,000	751,000	404,000	809,000	522,000	1,045,000	580,000	1,161,000
6/3-6/9	0.782	3,266,000	6,532,000	3,550,000	7,100,000	4,086,000	8,171,000	4,540,000	9,079,000
6/10-6/16	0.694	4,119,000	8,237,000	4,438,000	8,876,000	5,731,000	11,462,000	6,368,000	12,735,000
6/17-6/23	0.601	3,176,000	6,351,000	3,388,000	6,775,000	5,070,000	10,141,000	5,634,000	11,268,000
6/24-6/30	0.604	2,397,000	4,795,000	2,558,000	5,116,000	3,814,000	7,628,000	4,238,000	8,476,000
7/1-7/7	0.602	289,000	578,000	308,000	617,000	461,000	922,000	512,000	1,025,000
7/8-7/14	0.604	119,000	238,000	127,000	254,000	189,000	379,000	210,000	421,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-123

Estimates* of Cumulative Number of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Bowline (Unit 1) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.636	0	0	0	0	0	0	0	0
5/13-5/19	0.698	0	0	0	0	0	0	0	0
5/20-5/26	0.628	0	0	0	0	0	0	0	0
5/27-6/2	0.707	0	0	0	0	0	0	0	0
6/3-6/9	0.782	233,000	467,000	254,000	507,000	292,000	584,000	324,000	649,000
6/10-6/16	0.720	769,000	1,538,000	832,000	1,664,000	1,015,000	2,030,000	1,128,000	2,255,000
6/17-6/23	0.602	1,272,000	2,544,000	1,369,000	2,737,000	1,817,000	3,634,000	2,019,000	4,038,000
6/24-6/30	0.603	1,651,000	3,303,000	1,774,000	3,547,000	2,422,000	4,843,000	2,691,000	5,381,000
7/1-7/7	0.602	1,699,000	3,398,000	1,825,000	3,649,000	2,498,000	4,996,000	2,775,000	5,551,000
7/8-7/14	0.606	1,724,000	3,447,000	1,851,000	3,701,000	2,537,000	5,073,000	2,818,000	5,637,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-124

Estimates* of Cumulative Number of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Bowline Unit 2 by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.636	1,000	2,000	1,000	2,000	1,000	2,000	1,000	3,000
5/13-5/19	0.698	29,000	58,000	31,000	63,000	41,000	81,000	45,000	90,000
5/20-5/26	0.628	29,000	58,000	31,000	63,000	41,000	81,000	45,000	90,000
5/27-6/2	0.707	29,000	58,000	31,000	63,000	41,000	81,000	45,000	90,000
6/3-6/9	0.782	1,171,000	2,342,000	1,272,000	2,545,000	1,469,000	2,938,000	1,632,000	3,264,000
6/10-6/16	0.720	2,370,000	4,740,000	2,567,000	5,134,000	3,087,000	6,175,000	3,403,000	6,861,000
6/17-6/23	0.602	2,874,000	5,747,000	3,105,000	6,209,000	3,891,000	7,781,000	4,323,000	8,646,000
6/24-6/30	0.603	3,330,000	6,659,000	3,591,000	7,183,000	4,617,000	9,235,000	5,130,000	10,261,000
7/1-7/7	0.602	3,384,000	6,768,000	3,649,000	7,299,000	4,704,000	9,408,000	5,227,000	10,454,000
7/8-7/14	0.606	3,410,000	6,821,000	3,677,000	7,355,000	4,746,000	9,491,000	5,273,000	10,546,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-125

Estimates* of Cumulative Number of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Bowline (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.636	1,000	2,000	1,000	2,000	1,000	2,000	1,000	3,000
5/13-5/19	0.698	29,000	58,000	31,000	63,000	41,000	81,000	45,000	90,000
5/20-5/26	0.628	29,000	58,000	31,000	63,000	41,000	81,000	45,000	90,000
5/27-6/2	0.707	29,000	58,000	31,000	63,000	41,000	81,000	45,000	90,000
6/3-6/9	0.782	1,404,000	2,809,000	1,526,000	3,052,000	1,761,000	3,522,000	1,957,000	3,913,000
6/10-6/16	0.720	3,139,000	6,277,000	3,399,000	6,798,000	4,102,000	8,204,000	4,558,000	9,116,000
6/17-6/23	0.602	4,145,000	8,291,000	4,773,000	8,946,000	5,708,000	11,416,000	6,342,000	12,684,000
6/24-6/30	0.603	4,981,000	9,962,000	5,365,000	10,730,000	7,039,000	14,078,000	7,821,000	15,642,000
7/1-7/7	0.602	5,083,000	10,167,000	5,474,000	10,948,000	7,202,000	14,404,000	8,002,000	16,004,000
7/8-7/14	0.606	5,134,000	10,268,000	5,528,000	11,056,000	7,282,000	14,564,000	8,091,000	16,183,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-126

Estimates* of Cumulative Number of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Lovett (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.600	2,000	3,000	2,000	4,000	3,000	5,000	3,000	6,000
5/13-5/19	0.701	36,000	71,000	38,000	77,000	50,000	99,000	55,000	111,000
5/20-5/26	0.616	106,000	212,000	114,000	227,000	160,000	319,000	177,000	355,000
5/27-6/2	0.688	173,000	347,000	186,000	372,000	255,000	509,000	283,000	566,000
6/3-6/9	0.774	554,000	1,108,000	599,000	1,199,000	735,000	1,470,000	816,000	1,633,000
6/10-6/16	0.666	1,191,000	2,382,000	1,284,000	2,567,000	1,660,000	3,319,000	1,844,000	3,688,000
6/17-6/23	0.601	2,000,000	4,001,000	2,147,000	4,294,000	2,953,000	5,905,000	3,281,000	6,561,000
6/24-6/30	0.604	2,532,000	5,064,000	2,714,000	5,428,000	3,798,000	7,596,000	4,220,000	8,440,000
7/1-7/7	0.602	2,598,000	5,196,000	2,785,000	5,570,000	3,903,000	7,807,000	4,337,000	8,674,000
7/8-7/14	0.603	2,617,000	5,234,000	2,805,000	5,610,000	3,933,000	7,866,000	4,370,000	8,740,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-127

Estimates* of Cumulative Number of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Indian Point (Unit 2) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.600	8,000	15,000	8,000	16,000	12,000	25,000	14,000	27,000
5/13-5/19	0.728	77,000	154,000	83,000	166,000	105,000	210,000	116,000	233,000
5/20-5/26	0.614	368,000	736,000	394,000	788,000	561,000	1,121,000	623,000	1,246,000
5/27-6/2	0.697	744,000	1,487,000	799,000	1,597,000	1,083,000	2,166,000	1,203,000	2,407,000
6/3-6/9	0.782	2,634,000	5,269,000	2,854,000	5,707,000	3,448,000	6,897,000	3,831,000	7,663,000
6/10-6/16	0.681	5,019,000	10,038,000	5,419,000	10,837,000	6,838,000	13,676,000	7,598,000	15,196,000
6/17-6/23	0.601	7,188,000	14,375,000	7,732,000	15,464,000	10,303,000	20,605,000	11,447,000	22,895,000
6/24-6/30	0.604	8,749,000	17,499,000	9,399,000	18,797,000	12,786,000	25,572,000	14,207,000	28,413,000
7/1-7/7	0.602	8,936,000	17,872,000	9,598,000	19,196,000	13,048,000	26,168,000	14,538,000	29,075,000
7/8-7/14	0.603	9,005,000	18,009,000	9,671,000	19,342,000	13,193,000	26,386,000	14,659,000	29,318,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-128

Estimates* of Cumulative Number of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Indian Point (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.600	10,000	19,000	10,000	21,000	15,000	31,000	17,000	34,000
5/13-5/19	0.728	115,000	229,000	124,000	248,000	156,000	312,000	173,000	346,000
5/20-5/26	0.614	526,000	1,052,000	563,000	1,126,000	800,000	1,599,000	888,000	1,777,000
5/27-6/2	0.697	1,033,000	2,065,000	1,109,000	2,218,000	1,505,000	3,009,000	1,672,000	3,344,000
6/3-6/9	0.782	3,622,000	7,245,000	3,924,000	7,848,000	4,744,000	9,488,000	5,271,000	10,543,000
6/10-6/16	0.681	7,045,000	14,090,000	7,606,000	15,211,000	9,610,000	19,220,000	10,687,000	21,355,000
6/17-6/23	0.601	10,119,000	20,237,000	10,884,000	21,769,000	14,520,000	29,040,000	16,133,000	32,266,000
6/24-6/30	0.604	12,208,000	24,415,000	13,113,000	26,627,000	17,841,000	35,683,000	19,824,000	39,647,000
7/1-7/7	0.602	12,458,000	24,916,000	13,381,000	26,761,000	18,241,000	36,482,000	20,268,000	40,535,000
7/8-7/14	0.603	12,540,000	25,081,000	13,469,000	26,937,000	18,372,000	36,744,000	20,413,000	40,827,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-129

Estimates* of Cumulative Number of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Danskammer (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.800	<1,000	<1,000	<1,000	1,000	<1,000	1,000	<1,000	1,000
5/13-5/19	0.740	36,000	72,000	39,000	78,000	48,000	95,000	53,000	106,000
5/20-5/26	0.619	137,000	275,000	147,000	295,000	205,000	410,000	228,000	456,000
5/27-6/2	0.652	349,000	697,000	374,000	747,000	517,000	1,035,000	575,000	1,150,000
6/3-6/9	0.618	636,000	1,272,000	681,000	1,362,000	965,000	1,930,000	1,072,000	2,145,000
6/10-6/16	0.610	1,203,000	2,407,000	1,287,000	2,573,000	1,859,000	3,717,000	2,065,000	4,130,000
6/17-6/23	0.601	1,675,000	3,349,000	1,789,000	3,579,000	2,611,000	5,223,000	2,902,000	5,803,000
6/24-6/30	0.603	1,815,000	3,629,000	1,939,000	3,878,000	2,834,000	5,669,000	3,149,000	6,298,000
7/1-7/7	0.605	1,862,000	3,724,000	1,990,000	3,979,000	2,910,000	5,820,000	3,233,000	6,467,000
7/8-7/14	0.600	1,932,000	3,863,000	2,064,000	4,127,000	3,021,000	6,042,000	3,357,000	6,713,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-130

Estimates* of Cumulative Number of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Multiplant by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.605	12,000	25,000	13,000	26,000	20,000	39,000	22,000	44,000
5/13-5/19	0.721	216,000	431,000	233,000	465,000	294,000	587,000	326,000	652,000
5/20-5/26	0.615	799,000	1,597,000	855,000	1,711,000	1,205,000	2,410,000	1,339,000	2,677,000
5/27-6/2	0.684	1,584,000	3,168,000	1,700,000	3,400,000	2,317,000	4,634,000	2,575,000	5,149,000
6/3-6/9	0.769	6,217,000	12,434,000	6,730,000	13,461,000	8,205,000	16,410,000	9,117,000	18,234,000
6/10-6/16	0.683	12,578,000	25,156,000	13,575,000	27,150,000	17,230,000	34,460,000	19,145,000	38,289,000
6/17-6/23	0.601	17,939,000	35,878,000	19,294,000	38,588,000	25,792,000	51,584,000	28,658,000	57,315,000
6/24-6/30	0.604	21,535,000	43,070,000	23,131,000	46,263,000	31,512,000	63,025,000	35,014,000	70,027,000
7/1-7/7	0.602	22,002,000	44,003,000	23,629,000	47,258,000	32,256,000	64,512,000	35,840,000	71,680,000
7/8-7/14	0.603	22,223,000	44,446,000	23,865,000	47,730,000	32,608,000	65,217,000	36,232,000	72,463,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-131

Estimates* of Cumulative Number of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Post-1972 Plants by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values for 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0	0	0	0	0	0	0	0
5/6-5/12	0.603	8,000	17,000	9,000	18,000	13,000	27,000	15,000	30,000
5/13-5/19	0.721	106,000	212,000	114,000	229,000	145,000	291,000	161,000	323,000
5/20-5/26	0.614	397,000	794,000	425,000	851,000	601,000	1,203,000	668,000	1,336,000
5/27-6/2	0.697	773,000	1,545,000	830,000	1,660,000	1,124,000	2,247,000	1,248,000	2,497,000
6/3-6/9	0.782	4,039,000	8,078,000	4,380,000	8,760,000	5,209,000	10,419,000	5,788,000	11,576,000
6/10-6/16	0.694	8,157,000	16,315,000	8,818,000	17,635,000	10,940,000	21,880,000	12,156,000	24,311,000
6/17-6/23	0.601	11,333,000	22,666,000	12,205,000	24,411,000	16,011,000	32,021,000	17,790,000	35,579,000
6/24-6/30	0.604	13,730,000	27,461,000	14,764,000	29,527,000	19,825,000	39,649,000	22,027,000	44,055,000
7/1-7/7	0.602	14,020,000	28,039,000	15,072,000	30,144,000	20,286,000	40,572,000	22,540,000	45,079,000
7/8-7/14	0.604	14,139,000	28,277,000	15,199,000	30,399,000	20,475,000	40,950,000	22,750,000	45,500,000

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-132

Estimates* of Proportion of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Bowline (Unit 1) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.636	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/13-5/19	0.698	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/20-5/26	0.628	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/27-6/2	0.707	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/3-6/9	0.782	0.0005	0.0010	0.0005	0.0011	0.0006	0.0012	0.0007	0.0014
6/10-6/16	0.720	0.0009	0.0017	0.0009	0.0019	0.0012	0.0024	0.0013	0.0026
6/17-6/23	0.602	0.0015	0.0031	0.0016	0.0033	0.0024	0.0049	0.0027	0.0054
6/24-6/30	0.603	0.0026	0.0053	0.0028	0.0056	0.0042	0.0084	0.0046	0.0093
7/1-7/7	0.602	0.0017	0.0035	0.0019	0.0037	0.0028	0.0055	0.0031	0.0062
7/8-7/14	0.606	0.0010	0.0020	0.0010	0.0021	0.0016	0.0031	0.0017	0.0035

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-133

Estimates* of Proportion of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Bowline (Unit 2) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.636	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/13-5/19	0.698	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/20-5/26	0.628	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/27-6/2	0.707	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/3-6/9	0.782	0.0024	0.0048	0.0026	0.0052	0.0030	0.0060	0.0033	0.0067
6/10-6/16	0.720	0.0020	0.0039	0.0021	0.0042	0.0026	0.0053	0.0029	0.0059
6/17-6/23	0.602	0.0015	0.0031	0.0016	0.0033	0.0024	0.0049	0.0027	0.0054
6/24-6/30	0.603	0.0032	0.0063	0.0034	0.0067	0.0050	0.0101	0.0056	0.0112
7/1-7/7	0.602	0.0020	0.0040	0.0021	0.0042	0.0032	0.0063	0.0035	0.0070
7/8-7/14	0.606	0.0011	0.0021	0.0011	0.0022	0.0017	0.0033	0.0019	0.0037

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-134

Estimates* of Proportion of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Bowline (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.636	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/13-5/19	0.698	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/20-5/26	0.628	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/27-6/2	0.707	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/3-6/9	0.782	0.0029	0.0058	0.0032	0.0063	0.0036	0.0073	0.0040	0.0081
6/10-6/16	0.720	0.0028	0.0057	0.0031	0.0061	0.0038	0.0076	0.0042	0.0085
6/17-6/23	0.602	0.0031	0.0061	0.0033	0.0065	0.0049	0.0098	0.0054	0.0108
6/24-6/30	0.603	0.0058	0.0116	0.0062	0.0123	0.0092	0.0184	0.0102	0.0205
7/1-7/7	0.602	0.0037	0.0074	0.0040	0.0079	0.0059	0.0118	0.0066	0.0132
7/8-7/14	0.606	0.0020	0.0041	0.0022	0.0043	0.0032	0.0064	0.0036	0.0072

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-135

Estimates* of Proportion of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Lovett (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/13-5/19	0.701	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/20-5/26	0.616	<0.0001	0.0001	<0.0001	0.0001	<0.0001	0.0002	0.0001	0.0002
5/27-6/2	0.688	0.0001	0.0003	0.0001	0.0003	0.0002	0.0004	0.0002	0.0004
6/3-6/9	0.774	0.0008	0.0016	0.0009	0.0017	0.0010	0.0020	0.0011	0.0022
6/10-6/16	0.666	0.0010	0.0021	0.0011	0.0022	0.0015	0.0030	0.0017	0.0033
6/17-6/23	0.601	0.0025	0.0049	0.0026	0.0053	0.0039	0.0079	0.0044	0.0087
6/24-6/30	0.604	0.0037	0.0074	0.0039	0.0079	0.0058	0.0117	0.0065	0.0130
7/1-7/7	0.602	0.0024	0.0048	0.0026	0.0051	0.0038	0.0077	0.0043	0.0085
7/8-7/14	0.603	0.0008	0.0015	0.0008	0.0016	0.0012	0.0024	0.0013	0.0027

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-136

Estimates* of Proportion of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Indian Point (Unit 2) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/13-5/19	0.728	<0.0001	0.0001	<0.0001	0.0001	<0.0001	0.0002	<0.0001	0.0002
5/20-5/26	0.614	0.0003	0.0005	0.0003	0.0005	0.0004	0.0008	0.0004	0.0009
5/27-6/2	0.697	0.0008	0.0015	0.0008	0.0016	0.0010	0.0021	0.0012	0.0023
6/3-6/9	0.782	0.0040	0.0080	0.0043	0.0087	0.0050	0.0100	0.0055	0.0111
6/10-6/16	0.681	0.0039	0.0078	0.0042	0.0084	0.0055	0.0110	0.0061	0.0123
6/17-6/23	0.601	0.0066	0.0132	0.0070	0.0141	0.0105	0.0211	0.0117	0.0234
6/24-6/30	0.604	0.0108	0.0216	0.0115	0.0231	0.0172	0.0344	0.0191	0.0382
7/1-7/7	0.602	0.0068	0.0136	0.0072	0.0145	0.0108	0.0216	0.0120	0.0240
7/8-7/14	0.603	0.0028	0.0055	0.0029	0.0059	0.0044	0.0088	0.0049	0.0098

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-137

Estimates* of Proportion of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Indian Point (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/13-5/19	0.728	<0.0001	0.0002	0.0001	0.0002	0.0001	0.0003	0.0001	0.0003
5/20-5/26	0.614	0.0004	0.0007	0.0004	0.0008	0.0006	0.0011	0.0006	0.0012
5/27-6/2	0.697	0.0010	0.0020	0.0011	0.0022	0.0014	0.0028	0.0016	0.0031
6/3-6/9	0.782	0.0055	0.0109	0.0059	0.0119	0.0068	0.0137	0.0076	0.0152
6/10-6/16	0.681	0.0056	0.0112	0.0060	0.0120	0.0079	0.0159	0.0088	0.0176
6/17-6/23	0.601	0.0093	0.0187	0.0100	0.0199	0.0149	0.0299	0.0166	0.0332
6/24-6/30	0.604	0.0145	0.0289	0.0154	0.0309	0.0230	0.0460	0.0255	0.0511
7/1-7/7	0.602	0.0091	0.0182	0.0097	0.0194	0.0145	0.0290	0.0161	0.0322
7/8-7/14	0.603	0.0033	0.0066	0.0035	0.0071	0.0053	0.0105	0.0059	0.0117

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-138

Estimates* of Proportion of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Danskammer (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.800	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/13-5/19	0.740	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/20-5/26	0.619	<0.0001	0.0002	<0.0001	0.0002	0.0001	0.0003	0.0002	0.0003
5/27-6/2	0.652	0.0004	0.0008	0.0005	0.0009	0.0006	0.0013	0.0007	0.0014
6/3-6/9	0.618	0.0006	0.0012	0.0006	0.0013	0.0009	0.0019	0.0010	0.0021
6/10-6/16	0.610	0.0009	0.0018	0.0010	0.0020	0.0015	0.0029	0.0016	0.0032
6/17-6/23	0.601	0.0014	0.0029	0.0015	0.0031	0.0023	0.0046	0.0025	0.0051
6/24-6/30	0.603	0.0010	0.0019	0.0010	0.0021	0.0015	0.0031	0.0017	0.0034
7/1-7/7	0.605	0.0017	0.0035	0.0018	0.0036	0.0027	0.0055	0.0031	0.0061
7/8-7/14	0.600	0.0028	0.0056	0.0030	0.0059	0.0045	0.0089	0.0050	0.0099

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-139

Estimates* of Proportion of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Multiplant by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.605	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/13-5/19	0.721	0.0002	0.0004	0.0002	0.0004	0.0002	0.0005	0.0003	0.0006
5/20-5/26	0.615	0.0005	0.0010	0.0005	0.0011	0.0008	0.0016	0.0009	0.0018
5/27-6/2	0.684	0.0016	0.0032	0.0017	0.0034	0.0022	0.0045	0.0025	0.0050
6/3-6/9	0.769	0.0098	0.0195	0.0106	0.0212	0.0124	0.0248	0.0138	0.0276
6/10-6/16	0.683	0.0104	0.0207	0.0112	0.0223	0.0147	0.0294	0.0163	0.0327
6/17-6/23	0.601	0.0163	0.0326	0.0174	0.0348	0.0260	0.0521	0.0289	0.0578
6/24-6/30	0.604	0.0249	0.0498	0.0266	0.0531	0.0396	0.0792	0.0440	0.0880
7/1-7/7	0.602	0.0169	0.0339	0.0181	0.0361	0.0270	0.0540	0.0300	0.0600
7/8-7/14	0.603	0.0089	0.0178	0.0095	0.0190	0.0141	0.0283	0.0157	0.0314

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-140

Estimates* of Proportion of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Post-1972 Plants by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.603	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/13-5/19	0.721	<0.0001	0.0002	<0.0001	0.0002	0.0001	0.0002	0.0001	0.0003
5/20-5/26	0.614	0.0003	0.0005	0.0003	0.0005	0.0004	0.0008	0.0004	0.0009
5/27-6/2	0.697	0.0008	0.0015	0.0008	0.0016	0.0010	0.0021	0.0012	0.0023
6/3-6/9	0.782	0.0069	0.0138	0.0075	0.0150	0.0086	0.0172	0.0096	0.0191
6/10-6/16	0.694	0.0067	0.0134	0.0072	0.0145	0.0093	0.0187	0.0104	0.0207
6/17-6/23	0.601	0.0097	0.0193	0.0103	0.0206	0.0154	0.0308	0.0171	0.0343
6/24-6/30	0.604	0.0166	0.0332	0.0177	0.0354	0.0264	0.0528	0.0293	0.0587
7/1-7/7	0.602	0.0105	0.0210	0.0112	0.0224	0.0167	0.0335	0.0186	0.0372
7/8-7/14	0.604	0.0048	0.0096	0.0051	0.0102	0.0076	0.0152	0.0085	0.0169

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-141

Estimates* of Cumulative Proportion of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Bowline (Unit 1) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.636	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/13-5/19	0.698	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/20-5/26	0.628	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/27-6/2	0.707	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/3-6/9	0.782	0.0005	0.0010	0.0005	0.0011	0.0006	0.0012	0.0007	0.0014
6/10-6/16	0.720	0.0014	0.0027	0.0015	0.0030	0.0018	0.0036	0.0020	0.0040
6/17-6/23	0.602	0.0029	0.0058	0.0031	0.0062	0.0042	0.0084	0.0047	0.0094
6/24-6/30	0.603	0.0055	0.0110	0.0059	0.0118	0.0084	0.0167	0.0093	0.0186
7/1-7/7	0.602	0.0072	0.0144	0.0077	0.0154	0.0111	0.0222	0.0124	0.0246
7/8-7/14	0.606	0.0082	0.0164	0.0088	0.0175	0.0127	0.0252	0.0141	0.0280

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-142

Estimates* of Cumulative Proportion of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Bowline (Unit 2) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.636	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/13-5/19	0.698	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/20-5/26	0.628	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/27-6/2	0.707	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
6/3-6/9	0.782	0.0024	0.0049	0.0026	0.0053	0.0030	0.0061	0.0034	0.0068
6/10-6/16	0.720	0.0044	0.0088	0.0047	0.0095	0.0057	0.0113	0.0063	0.0126
6/17-6/23	0.602	0.0059	0.0118	0.0064	0.0127	0.0081	0.0162	0.0090	0.0179
6/24-6/30	0.603	0.0090	0.0180	0.0097	0.0194	0.0131	0.0261	0.0145	0.0289
7/1-7/7	0.602	0.0110	0.0219	0.0118	0.0235	0.0162	0.0322	0.0180	0.0357
7/8-7/14	0.606	0.0120	0.0240	0.0129	0.0257	0.0178	0.0354	0.0198	0.0393

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-143

Estimates* of Cumulative Proportion of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Bowline (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.636	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/13-5/19	0.698	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/20-5/26	0.628	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/27-6/2	0.707	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
6/3-6/9	0.782	0.0029	0.0058	0.0032	0.0064	0.0037	0.0073	0.0041	0.0081
6/10-6/16	0.720	0.0057	0.0115	0.0062	0.0124	0.0075	0.0149	0.0083	0.0165
6/17-6/23	0.602	0.0088	0.0175	0.0095	0.0189	0.0123	0.0245	0.0137	0.0272
6/24-6/30	0.603	0.0145	0.0289	0.0156	0.0310	0.0214	0.0425	0.0238	0.0471
7/1-7/7	0.602	0.0182	0.0361	0.0195	0.0387	0.0272	0.0538	0.0302	0.0597
7/8-7/14	0.606	0.0202	0.0400	0.0216	0.0428	0.0303	0.0599	0.0337	0.0664

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-144

Estimates* of Cumulative Proportion of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Lovett (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/13-5/19	0.701	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/20-5/26	0.616	<0.0001	0.0002	<0.0001	0.0002	0.0001	0.0003	0.0002	0.0003
5/27-6/2	0.688	0.0002	0.0005	0.0002	0.0005	0.0003	0.0007	0.0004	0.0007
6/3-6/9	0.774	0.0010	0.0021	0.0011	0.0022	0.0013	0.0027	0.0015	0.0030
6/10-6/16	0.666	0.0021	0.0041	0.0022	0.0045	0.0028	0.0057	0.0032	0.0063
6/17-6/23	0.601	0.0045	0.0090	0.0048	0.0097	0.0068	0.0135	0.0075	0.0150
6/24-6/30	0.604	0.0082	0.0163	0.0088	0.0175	0.0126	0.0250	0.0140	0.0278
7/1-7/7	0.602	0.0106	0.0210	0.0113	0.0225	0.0164	0.0325	0.0182	0.0361
7/8-7/14	0.603	0.0113	0.0225	0.0121	0.0241	0.0175	0.0348	0.0195	0.0386

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-145

Estimates* of Cumulative Proportion of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Indian Point (Unit 2) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/13-5/19	0.728	<0.0001	0.0001	<0.0001	0.0001	<0.0001	0.0002	<0.0001	0.0002
5/20-5/26	0.614	0.0003	0.0006	0.0003	0.0007	0.0005	0.0010	0.0005	0.0011
5/27-6/2	0.697	0.0011	0.0021	0.0011	0.0023	0.0015	0.0031	0.0017	0.0034
6/3-6/9	0.782	0.0050	0.0101	0.0055	0.0109	0.0065	0.0130	0.0072	0.0144
6/10-6/16	0.681	0.0089	0.0178	0.0096	0.0192	0.0120	0.0239	0.0133	0.0265
6/17-6/23	0.601	0.0154	0.0307	0.0166	0.0330	0.0224	0.0445	0.0249	0.0493
6/24-6/30	0.604	0.0261	0.0517	0.0279	0.0553	0.0392	0.0773	0.0435	0.0856
7/1-7/7	0.602	0.0327	0.0645	0.0350	0.0690	0.0496	0.0973	0.0550	0.1076
7/8-7/14	0.603	0.0354	0.0697	0.0378	0.0745	0.0538	0.1052	0.0596	0.1163

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-146

Estimates* of Cumulative Proportion of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Indian Point (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.600	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/13-5/19	0.728	<0.0001	0.0002	0.0001	0.0002	0.0001	0.0003	0.0001	0.0003
5/20-5/26	0.614	0.0005	0.0009	0.0005	0.0010	0.0007	0.0014	0.0008	0.0015
5/27-6/2	0.697	0.0015	0.0029	0.0016	0.0032	0.0021	0.0042	0.0023	0.0047
6/3-6/9	0.782	0.0069	0.0138	0.0075	0.0150	0.0089	0.0178	0.0100	0.0198
6/10-6/16	0.681	0.0125	0.0248	0.0135	0.0268	0.0168	0.0334	0.0186	0.0370
6/17-6/23	0.601	0.0217	0.0430	0.0233	0.0462	0.0314	0.0622	0.0349	0.0690
6/24-6/30	0.604	0.0358	0.0707	0.0384	0.0756	0.0537	0.1053	0.0595	0.1165
7/1-7/7	0.602	0.0446	0.0876	0.0477	0.0936	0.0674	0.1313	0.0747	0.1450
7/8-7/14	0.603	0.0478	0.0937	0.0510	0.1000	0.0723	0.1404	0.0801	0.1550

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-147

Estimates* of Cumulative Proportion of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Danskammer (All Units Combined) by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.800	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/13-5/19	0.740	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/20-5/26	0.619	0.0001	0.0002	0.0001	0.0003	0.0002	0.0004	0.0002	0.0004
5/27-6/2	0.652	0.0005	0.0011	0.0006	0.0012	0.0008	0.0016	0.0009	0.0018
6/3-6/9	0.618	0.0011	0.0023	0.0012	0.0025	0.0017	0.0035	0.0019	0.0039
6/10-6/16	0.610	0.0021	0.0041	0.0022	0.0044	0.0032	0.0064	0.0036	0.0071
6/17-6/23	0.601	0.0035	0.0070	0.0037	0.0075	0.0055	0.0109	0.0061	0.0122
6/24-6/30	0.603	0.0045	0.0089	0.0048	0.0095	0.0070	0.0140	0.0078	0.0155
7/1-7/7	0.605	0.0062	0.0123	0.0066	0.0132	0.0097	0.0194	0.0108	0.0215
7/8-7/14	0.600	0.0090	0.0179	0.0096	0.0190	0.0142	0.0282	0.0157	0.0312

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-148

Estimates* of Cumulative Proportion of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Multiplant by 1-Wk Intervals for Each Combination of Recirculation, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.605	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/13-5/19	0.721	0.0002	0.0004	0.0002	0.0004	0.0003	0.0005	0.0003	0.0006
5/20-5/26	0.615	0.0007	0.0014	0.0007	0.0015	0.0010	0.0021	0.0012	0.0023
5/27-6/2	0.684	0.0023	0.0045	0.0024	0.0049	0.0033	0.0065	0.0036	0.0073
6/3-6/9	0.769	0.0120	0.0240	0.0130	0.0260	0.0156	0.0312	0.0174	0.0346
6/10-6/16	0.683	0.0222	0.0442	0.0240	0.0477	0.0301	0.0597	0.0334	0.0662
6/17-6/23	0.601	0.0382	0.0754	0.0410	0.0808	0.0554	0.1086	0.0614	0.1202
6/24-6/30	0.604	0.0621	0.1214	0.0665	0.1296	0.0928	0.1792	0.1027	0.1976
7/1-7/7	0.602	0.0780	0.1511	0.0833	0.1611	0.1173	0.2335	0.1296	0.2457
7/8-7/14	0.603	0.0862	0.1662	0.0920	0.1770	0.1297	0.2455	0.1433	0.2695

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-149

Estimates* of Cumulative Proportion of White Perch Ichthyoplankton (Including Eggs) Cropped by Entrainment at Post-1972 Plants by 1-Wk Intervals for Each Combination of Recircualtion, W_I, and In-Plant Mortality Adjustment Values during 1974

In-Plant Mortality (q_p)		Eggs = 0.8, Larvae = 0.6, Juveniles = 0.7				All Life Stages = 1.0 (q_p = 1.0)			
Recirculation		0.1		0.0		0.1		0.0	
Date	$\bar{q}_p$ \ W	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
4/29-5/5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/6-5/12	0.603	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
5/13-5/19	0.721	<0.0001	0.0002	<0.0001	0.0002	0.0001	0.0002	0.0001	0.0003
5/20-5/26	0.614	0.0003	0.0007	0.0004	0.0007	0.0005	0.0010	0.0006	0.0011
5/27-6/2	0.697	0.0011	0.0022	0.0012	0.0024	0.0016	0.0031	0.0017	0.0035
6/3-6/9	0.782	0.0080	0.0159	0.0087	0.0173	0.0102	0.0203	0.0113	0.0225
6/10-6/16	0.694	0.0146	0.0291	0.0158	0.0315	0.0194	0.0386	0.0215	0.0428
6/17-6/23	0.601	0.0241	0.0479	0.0260	0.0514	0.0345	0.0682	0.0383	0.0756
6/24-6/30	0.604	0.0403	0.0795	0.0432	0.0850	0.0600	0.1174	0.0665	0.1298
7/1-7/7	0.602	0.0504	0.0988	0.0539	0.1055	0.0757	0.1470	0.0839	0.1622
7/8-7/14	0.604	0.0549	0.1074	0.0587	0.1147	0.0828	0.1599	0.0916	0.1764

*Estimates based on alternate values of in-plant mortality, recirculation, and withdrawal are given as a test of the sensitivity of these parameters.

Table E-150

Biweekly Standing-Crop Estimates of Striped Bass Ichthyoplankton (Both Day and Night Samples) for 1973

Time Interval	Striped Bass: Not Including Unidentified *Morone* spp. Number* ± Standard Error*	Striped Bass: Including Unidentified *Morone* spp. Number* ± Standard Error*
4/29-5/12	69,882,000 ± 24,282,000	69,882,000 ± 24,282,000
5/13-5/26	321,540,000 ± 87,990,000	325,594,000 ± 88,084,000
5/27-6/9	100,039,000 ± 38,030,000	101,553,000 ± 38,059,000
6/18-6/23	182,670,000 ± 48,701,000	183,778,000 ± 48,622,000
6/24-7/7	174,404,000 ± 66,513,000	182,763,000 ± 66,581,000
7/8-7/21**	24,587,000 ± 8,018,000	26,130,000 ± 8,109,000

*Numbers are rounded to nearest thousand

**Day sampling only

Table E-151

Standing Crop Weekly Estimates*of Striped Bass and White Perch Ichthyoplankton (Both Day and Night Samples) for 1974

Time Interval	Striped Bass Number	± Standard Error	White Perch Number	± Standard Error
4/29-5/5	1,170,000 ±	261,000	0 ±	0
5/6-5/12	58,052,000 ±	4,612,000	2,728,000 ±	375,000
5/13-5/19	177,608,000 ±	74,045,000	32,610,000 ±	7,733,000
5/20-5/26	192,980,000 ±	46,412,000	197,218,000 ±	56,659,000
5/27-6/2	225,331,000 ±	38,773,000	162,312,000 ±	19,242,000
6/3-6/9	154,778,000 ±	34,489,000	253,541,000 ±	69,301,000
6/10-6/16	326,291,000 ±	57,617,000	517,242,000 ±	75,903,000
6/17-6/23	333,533,000 ±	45,435,000	325,523,000 ±	35,812,000
6/24-6/30	114,175,000 ±	8,934,000	143,981,000 ±	14,378,169
7/1-7/7	21,890,000 ±	4,106,000	27,542,000 ±	3,652,000
7/8-7/14	12,837,000 ±	1,931,000	24,892,000 ±	3,112,000

*Numbers are rounded to nearest thousand

Table E-152

Standing Crop Estimates*of Striped Bass and White Perch Ichthyoplankton for 1973 and 1974 Adjusted for Eggs Not Yet Spawned

Time Interval	Striped Bass 1973	Striped Bass 1974	White Perch 1974
4/29-5/5	731,988,000	777,139,000	0
5/6-5/12		815,830,000	24,269,880,000
5/13-5/19	566,854,000	488,497,000	1,097,125,000
5/20-5/26		252,355,000	1,157,115,000
5/27-6/2	103,213,000	233,188,000	498,522,000
6/3-6/9		155,885,000	474,420,000
6/10-6/16	183,132,000	327,502,000	613,769,000
6/17-6/23		333,913,000	328,908,000
6/24-6/30	174,404,000	114,183,000	144,503,000
7/1-7/7		21,890,000	27,549,000
7/8-7/14	24,587,000**	12,837,000	24,892,000

*Numbers are rounded to nearest thousand
**Day Sampling Only.

Table E-153

Plant Region Densities (d) and Standard Error (S. E.) of Striped Bass Ichthyoplankton by 2-Wk Periods during 1973

	Bowline	Lovett	Indian Point	Danskammer
Time Interval	d ± S.E.	d ± S.E.	d ± S.E.	d ± S.E.
4/29-5/12	0.0026 ± 0.0013	0.0164 ± 0.0055	0.0295 ± 0.0107	0.0398 ± 0.0132
5/13-5/26	0.2957 ± 0.1614	0.3613 ± 0.1937	0.3484 ± 0.1778	0.1981 ± 0.0730
5/27-6/9	0.0121 ± 0.0052	0.0123 ± 0.0052	0.0146 ± 0.0051	0.1305 ± 0.0680
6/10-6/23	0.1007 ± 0.0353	0.1390 ± 0.0434	0.1495 ± 0.0434	0.1087 ± 0.0316
6/24-7/7	0.0394 ± 0.0153	0.0384 ± 0.0128	0.0444 ± 0.0127	0.1657 ± 0.1092
7/8-7/21	0.0043 ± 0.0017	0.0055 ± 0.0020	0.0055 ± 0.0019	0.0247 ± 0.0139

Table E-154

Plant Region Densities (d) and Standard Error (S. E.) of Striped Bass Ichthyoplankton (Including Unidentified *Morone*) during 1973

	Bowline	Lovett	Indian Point	Danskammer
Time Interval	d ± S.E.	d ± S.E.	d ± S.E.	d ± S.E.
4/29-5/12	0.0026 ± 0.0013	0.0026 ± 0.0013	0.0295 ± 0.0107	0.0399 ± 0.0132
5/13-5/26	0.2980 ± 0.1616	0.3614 ± 0.1937	0.3485 ± 0.1778	0.1981 ± 0.0730
5/27-6/9	0.0121 ± 0.0052	0.0127 ± 0.0053	0.0153 ± 0.0052	0.1312 ± 0.0680
6/10-6/23	0.1023 ± 0.0352	0.1410 ± 0.0433	0.1514 ± 0.0432	0.1091 ± 0.0316
6/24-7/7	0.0422 ± 0.0158	0.0410 ± 0.0136	0.0474 ± 0.0135	0.1700 ± 0.1090
7/8-7/21	0.0067 ± 0.0031	0.0082 ± 0.0037	0.0080 ± 0.0034	0.0251 ± 0.0139

Table E-155

Plant Region Densities (d) and Standard Error (S. E.) of Striped Bass Ichthyoplankton by 1-Wk Intervals during 1974

	Bowline	Lovett	Indian Point	Danskammer
Time Interval	d ± S.E.	d ± S.E.	d ± S.E.	d ± S.E.
4/29-5/5	0.0000 ± 0.0000	0.0004 ± 0.0001	0.0007 ± 0.0002	0.0002 ± 0.0001
5/6-5/12	0.0087 ± 0.0085	0.0370 ± 0.0170	0.0534 ± 0.0136	0.0000 ± 0.0000
5/13-5/19	0.1404 ± 0.1119	0.2769 ± 0.2210	0.2664 ± 0.1794	0.0323 ± 0.0200
5/20-5/26	0.2713 ± 0.1080	0.1917 ± 0.0700	0.2148 ± 0.0771	0.0439 ± 0.0155
5/27-6/2	0.0787 ± 0.0193	0.1041 ± 0.0117	0.1071 ± 0.0162	0.2696 ± 0.0665
6/3-6/9	0.1168 ± 0.0595	0.0898 ± 0.0279	0.0979 ± 0.0378	0.1616 ± 0.0595
6/10-6/16	0.2073 ± 0.0920	0.4021 ± 0.1834	0.3702 ± 0.1474	0.1993 ± 0.0472
6/17-6/23	0.1603 ± 0.0286	0.3303 ± 0.0578	0.2997 ± 0.0483	0.2862 ± 0.1015
6/24-6/30	0.0829 ± 0.0096	0.1115 ± 0.0130	0.1045 ± 0.0110	0.0681 ± 0.0086
7/1-7/7	0.0145 ± 0.0051	0.0184 ± 0.0090	0.0163 ± 0.0073	0.0093 ± 0.0019
7/8-7/14	0.0147 ± 0.0038	0.0094 ± 0.0018	0.0109 ± 0.0024	0.0044 ± 0.0013

Table E-156

Plant Region Densities (d) and Standard Error (S. E.) of Striped Bass Including Unidentified *Morone* Ichthyoplankton by 1-Wk Intervals during 1974

	Bowline	Lovett	Indian Point	Danskammer
Time Interval	d ± S.E.	d ± S.E.	d ± S.E.	d ± S.E.
4/29-5/5	0.0000 ± 0.0000	0.0004 ± 0.0001	0.0007 ± 0.0002	0.0002 ± 0.0001
5/6-5/12	0.0089 ± 0.0085	0.0370 ± 0.0170	0.0534 ± 0.0136	0.0000 ± 0.0000
5/13-5/19	0.1404 ± 0.1119	0.2769 ± 0.2206	0.2664 ± 0.1794	0.0324 ± 0.0199
5/20-5/26	0.2759 ± 0.1071	0.1945 ± 0.0695	0.2180 ± 0.0765	0.0527 ± 0.0181
5/27-6/2	0.0802 ± 0.0192	0.1084 ± 0.0115	0.1137 ± 0.0164	0.2829 ± 0.0675
6/3-6/9	0.1222 ± 0.0597	0.1042 ± 0.0287	0.1198 ± 0.0383	0.1660 ± 0.0600
6/10-6/16	0.2086 ± 0.0919	0.4063 ± 0.1833	0.3758 ± 0.1474	0.2077 ± 0.0481
6/17-6/23	0.1630 ± 0.0286	0.3365 ± 0.0577	0.3055 ± 0.0484	0.2894 ± 0.1022
6/24-6/30	0.0865 ± 0.0099	0.1153 ± 0.0131	0.1082 ± 0.0117	0.0693 ± 0.0088
7/1-7/7	0.0146 ± 0.0052	0.0186 ± 0.0092	0.0165 ± 0.0074	0.0099 ± 0.0020
7/8-7/14	0.0155 ± 0.0039	0.0101 ± 0.0019	0.0115 ± 0.0025	0.0045 ± 0.0013

Table E-157

Plant Region Densities (d) and Standard Error (S.E.) of White Perch Ichthyoplankton (Not Including Eggs) by 1-Wk Intervals during 1974

	Bowline	Lovett	Indian Point	Danskammer
Time Interval	d ± S.E.	d ± S.E.	d ± S.E.	d ± S.E.
4/29-5/5	0.0000 ± 0.0000	0.0000 ± 0.0000	0.0000 ± 0.0000	0.0000 ± 0.0000
5/6-5/12	0.0002 ± 0.0002	0.0007 ± 0.0000	0.0014 ± 0.0000	0.0000 ± 0.0000
5/13-5/19	0.0040 ± 0.0024	0.0061 ± 0.0046	0.0058 ± 0.0037	0.0037 ± 0.0009
5/20-5/26	0.0761 ± 0.0119	0.0253 ± 0.0051	0.0339 ± 0.0071	0.0339 ± 0.0137
5/27-6/2	0.0255 ± 0.0050	0.0144 ± 0.0024	0.0185 ± 0.0041	0.0548 ± 0.0147
6/3-6/9	0.0252 ± 0.0085	0.0152 ± 0.0062	0.0156 ± 0.0054	0.1141 ± 0.0214
6/10-6/16	0.0098 ± 0.0235	0.1667 ± 0.0399	0.1693 ± 0.0347	0.2663 ± 0.0876
6/17-6/23	0.1463 ± 0.0285	0.3066 ± 0.0578	0.2797 ± 0.0497	0.2046 ± 0.0391
6/24-6/30	0.1319 ± 0.0219	0.2153 ± 0.0393	0.1846 ± 0.0319	0.0608 ± 0.0075
7/1-7/7	0.0159 ± 0.0051	0.0248 ± 0.0094	0.0212 ± 0.0076	0.0172 ± 0.0031
7/8-7/14	0.0090 ± 0.0017	0.0074 ± 0.0013	0.0078 ± 0.0013	0.0250 ± 0.0064

Table E-158

Plant Region Densities (d) and Standard Error (S. E.) of White Perch Ichthyoplankton (Including Eggs) by 1-Wk Intervals during 1974

	Bowline	Lovett	Indian Point	Danskammer
Time Interval	d ± S.E.	d ± S.E.	d ± S.E.	d ± S.E.
4/29-5/5	0.0000 ± 0.0000	0.0000 ± 0.0000	0.0000 ± 0.0000	0.0000 ± 0.0000
5/6-5/12	0.0002 ± 0.0002	0.0007 ± 0.0000	0.0014 ± 0.0000	0.0001 ± 0.0001
5/13-5/19	0.0079 ± 0.0030	0.0122 ± 0.0053	0.0160 ± 0.0063	0.0124 ± 0.0043
5/20-5/26	0.0887 ± 0.0164	0.0275 ± 0.0057	0.0364 ± 0.0080	0.0373 ± 0.0138
5/27-6/2	0.0550 ± 0.0230	0.0257 ± 0.0093	0.0358 ± 0.0140	0.0743 ± 0.0178
6/3-6/9	0.2877 ± 0.1723	0.1177 ± 0.0691	0.1694 ± 0.1034	0.1253 ± 0.0219
6/10-6/16	0.2983 ± 0.1588	0.2487 ± 0.0744	0.2856 ± 0.1003	0.2800 ± 0.0882
6/17-6/23	0.1479 ± 0.0286	0.3070 ± 0.0580	0.2810 ± 0.0498	0.2051 ± 0.0341
6/24-6/30	0.1339 ± 0.0224	0.2195 ± 0.0404	0.1882 ± 0.0329	0.0618 ± 0.0076
7/1-7/7	0.0160 ± 0.0051	0.0250 ± 0.0095	0.0213 ± 0.0077	0.0176 ± 0.0033
7/8-7/14	0.0090 ± 0.0017	0.0074 ± 0.0013	0.0078 ± 0.0013	0.0250 ± 0.0064

Table E-159

Estimates of Plant Region Densities (d) and Standard Error (S. E.) for White Perch Including Unidentified *Morone* Ichthyoplankton (Not Including Eggs) by 1-Wk Intervals during 1974

	Bowline	Lovett	Indian Point	Danskammer
Time Interval	d ± S.E.	d ± S.E.	d ± S.E.	d ± S.E.
4/29-5/5	0.0000 ± 0.0000	0.0000 ± 0.0000	0.0000 ± 0.0000	0.0000 ± 0.0000
5/6-5/12	0.0004 ± 0.0004	0.0007 ± 0.0000	0.0014 ± 0.0000	0.0000 ± 0.0000
5/13-5/19	0.0040 ± 0.0024	0.0061 ± 0.0046	0.0058 ± 0.0037	0.0038 ± 0.0009
5/20-5/26	0.0807 ± 0.0125	0.0280 ± 0.0054	0.0370 ± 0.0075	0.0426 ± 0.0161
5/27-6/2	0.0270 ± 0.0051	0.0186 ± 0.0032	0.0252 ± 0.0054	0.0681 ± 0.0156
6/3-6/9	0.0305 ± 0.0086	0.0296 ± 0.0073	0.0375 ± 0.0088	0.1184 ± 0.0216
6/10-6/16	0.1212 ± 0.0236	0.1709 ± 0.0400	0.1750 ± 0.0346	0.2747 ± 0.0082
6/17-6/23	0.1491 ± 0.0291	0.3127 ± 0.0590	0.2855 ± 0.0507	0.2077 ± 0.0340
6/24-6/30	0.1356 ± 0.0222	0.2190 ± 0.0395	0.1883 ± 0.0321	0.0620 ± 0.0076
7/1-7/7	0.0160 ± 0.0051	0.0250 ± 0.0095	0.0214 ± 0.0076	0.0177 ± 0.0030
7/8-7/14	0.0098 ± 0.0018	0.0080 ± 0.0013	0.0085 ± 0.0013	0.0251 ± 0.0064

Table E-160

Estimates of Plant Region Densities (d) and Standard Error (S. E.) of White Perch Including Unidentified *Morone* Ichthyoplankton 1-Wk Intervals during 1974

	Bowline	Lovett	Indian Point	Danskammer
Time Interval	d ± S.E.	d ± S.E.	d ± S.E.	d ± S.E.
4/29-5/5	0.0000 ± 0.0000	0.0000 ± 0.0000	0.0000 ± 0.0000	0.0000 ± 0.0000
5/6-5/12	0.0004 ± 0.0004	0.0007 ± 0.0000	0.0014 ± 0.0000	0.0001 ± 0.0001
5/13-5/19	0.0079 ± 0.0030	0.0122 ± 0.0053	0.0160 ± 0.0063	0.0125 ± 0.0043
5/20-5/26	0.0933 ± 0.0169	0.0302 ± 0.0060	0.0396 ± 0.0084	0.0461 ± 0.0162
5/27-6/2	0.0565 ± 0.0230	0.0299 ± 0.0095	0.0425 ± 0.0145	0.0875 ± 0.0183
6/3-6/9	0.2930 ± 0.1721	0.1321 ± 0.0691	0.1913 ± 0.1034	0.1297 ± 0.0220
6/10-6/16	0.2997 ± 0.1588	0.2529 ± 0.0744	0.2912 ± 0.1002	0.2884 ± 0.0889
6/17-6/23	0.1506 ± 0.0292	0.3141 ± 0.0592	0.2868 ± 0.0508	0.2083 ± 0.0340
6/24-6/30	0.1375 ± 0.0227	0.2232 ± 0.0406	0.1919 ± 0.0330	0.0629 ± 0.0077
7/1-7/7	0.0162 ± 0.0052	0.0252 ± 0.0096	0.0215 ± 0.0077	0.0181 ± 0.0032
7/8-7/14	0.0098 ± 0.0018	0.0080 ± 0.0013	0.0085 ± 0.0013	0.0251 ± 0.0064

APPENDIX F

IMPINGEMENT DIRECT IMPACT

APPENDIX F

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APPENDIX F

IMPINGEMENT DIRECT IMPACT

A. IMPINGEMENT SAMPLING PROCEDURE

1. Bowline*

a. Sampling Frequency

The schedule of sampling was as follows: winter 1973, weekly; spring 1973-winter 1974, biweekly; and spring-summer 1974, weekly.

b. Methods

Impingement samples were collected from the three traveling screens at Unit 1 and from the three traveling screens at Unit 2 (when operational) from January 1973 through September 1974, as follows:

(1) Plant personnel washed traveling screens 24 hr before impingement sampling.

(2) Fish impinged during the 24 hr prior to sampling were collected, identified, and counted. The counts were recorded, along with selected plant operational data. These data were not used in the TI impingement estimates.

(3) Twelve 20-min screen washes (one every 2 hr) were generally utilized. The impinged fish and trash were collected in a steel frame basket of 0.6 cm (0.25-in.) square nylon mesh suspended in the screen-wash reservoir and the impinged fish identified, counted, and preserved in the field for further laboratory analysis. These fish counts were recorded, along with selected plant operational data.

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*Adapted from QLM (1974c) Progress Report for January-March 1974 Winter Environmental Programs. Report No. 5. Prepared for Orange and Rockland Utilities, Incorporated.

2. Lovett*

a. Sampling Frequency

The sampling schedule was as follows: winter 1973, weekly; spring 1973-winter 1974, biweekly; and spring-summer 1974, weekly.

b. Methods

Impingement samples were collected from traveling screens at the intake bays of Units 1 and 2, Unit 3, Unit 4 and Unit 5 from January 1973 through September 1974 as follows:

(1) Plant personnel washed the traveling screens 24 hr prior to impingement sampling.

(2) Fish impinged during the 24 hr prior to sampling were collected, identified, and counted. These counts were recorded, along with selected plant operational data. These data were not used for the TI impingement estimates.

(3) Twelve 15-min screen washes (one every 2 hr) were generally utilized. When a continuous wash schedule was used, the sample was collected on twelve 2-hr segments. The impinged fish and trash were collected in a steel frame basket constructed of 0.95-cm (0.375-in.) square stainless steel mesh hung under the screen-wash discharge of each intake and the impinged fish identified, counted, and preserved in the field for further laboratory analysis. These fish counts were recorded, along with selected plant operational data.

*Adapted from QLM (1974c) Progress Report for January-March 1974 Winter Environmental Programs. Report No. 5. Prepared for Orange and Rockland Utilities, Incorporated.

3. Indian Point*

a. Sampling Frequency

At Indian Point, sampling was performed on every plant operational day from January 1973 through September 1974.

b. Methods

Units 1 and 2 each have fixed screens, with traveling screens behind the fixed screens. Impingement collections were made at each unit as follows:

(1) Unit 1 fixed screens were raised and washed once daily between 0800 and 1200. Unit 2 fixed screens were raised and washed one to three times per 24-hr period. Washing frequency was dictated by impingement test design and head loss due to debris accumulation.

(2) From January 1, 1973, to May 7, 1973, Unit 1 traveling screens were washed three times per 24-hr period (0400, 1200, 2000). Beginning May 7, 1973, the frequency of traveling-screen washings was reduced to one per 24-hr period. Unit 2 traveling screens were washed immediately after fixed-screen washings. A 15-min wash time insured that each traveling screen made a complete circuit.

(3) Screens from each unit were washed separately and the wash-water sluice drained between each washing. Impinged fish and trash were collected by 0.95-cm (0.375-in.) square mesh screen attached to a wooden frame across the wash-water sluice.

(4) Impinged fish were collected, identified to species and age groups, and counted. Then, these fish counts were recorded, along with selected plant operational data.

*Adapted from Texas Instruments (1974a) Indian Point Impingement Study for the Period June 18, 1972, through December 31, 1973. Prepared for Consolidated Edison Company of New York, Inc.

4. Danskammer*

a. Sampling Frequency

The sampling schedule was as follows: from January 1973 through April 1974, biweekly; from May through September 1974, weekly.

b. Methods

Between January 1973 and September 1974, impingement samples were collected in the following manner from the six traveling screens at the intake for Units 1 and 2 and from the six traveling screens at the intake for Units 3 and 4:

(1) Twelve 15-min screen washes (one every 2 hr) were generally utilized from January 1973 through April 1974; during May through September 1974, four 15-min screen washes (one every 6 hr) and twelve 15-min screen washes (one every 2 hr) were generally utilized on alternate weeks.

(2) Impinged fish and trash were collected in a steel frame basket of 0.64-cm (0.25-in.) square nylon mesh suspended in the screen-wash discharge and the impinged fish identified, counted, and preserved in the field for further laboratory analysis. These fish were recorded, along with selected plant operational data.

B. ASSUMPTIONS OF THE RATIO ESTIMATOR

The following assumptions and limitations, inherent in the usual ratio estimates used to estimate impingement, must be noted as an indication of potential biases:

- The samples were assumed to have been randomly distributed with respect to impingement

*Personal communication with Tom Huggins, Central Hudson Gas and Electric Corporation.

- This ratio estimate is more accurate than the simple expansion

$$Y_j = \frac{\sum_i y_i}{n_j}$$

when the ratio

$$\frac{y_i}{z_i}$$

is less variable than y_i itself; this occurs when x_i is (approximately) proportional to z_i. The ratio estimate is biased, however, with the bias decreasing to 0 as the sample size increases; this bias may be in either direction, depending on the relationship between impingement and flow rate.

- The variance estimate is a large sample approximation in which large sample may be defined as one containing at least 30 observations and one that is large enough so that the coefficient of variation for both $\bar{y}$ and $\bar{z}$ is < 10%. The variance estimate is also biased — but again, the bias decreases to 0 with increasing sample sizes. In small samples, the variance estimate tends to be lower than the true variance.

C. COMPARISON OF IMPINGEMENT ESTIMATION TECHNIQUES

1. Introduction and Methods

Impingement was estimated using three other estimators in addition to the usual ratio method.

Estimates were made for each unit by 3-month intervals and then summed across time periods and units. The following describes the estimators used and methods of calculation.

a. Simple Expansion

This method is based on the mean number of fish impinged per sample day. The mean is multiplied by the number of days on which the plant was operating to estimate impingement. The formula is as follows:

$$Y_j = N_j \sum_{i=1}^{n_j} \frac{x_j}{n_j}$$

with a variance of

$$S_{Y_j}^2 = \frac{N_j(N_j - n_j)}{n_j(n_j - 1)} \left[\sum x_i^2 - \frac{\left(\sum x_i\right)^2}{n_j} \right]$$

where

Y_j = impingement estimate for j^{th} 3-month interval

$S_{Y_j}^2$ = variance of Y_j

x_i = number of fish impinged for i^{th} sample day

n_j = number of sample days in j^{th} 3-month interval

N_j = number of plant operational days in j^{th} 3-month interval

b. Individual Ratio Estimate

This estimate is based on the number of fish impinged per million gallons of water for each sample day. The mean number of fish impinged per million gallons is multiplied by the number of million gallons pumped during each 3-month period. The formula is as follows:

$$Y_j = Z_j \cdot R_j$$

where

Y_j = impingement estimate for j^{th} 3-month interval
Z_j = circulator flow (in million gallons) for j^{th} 3-month interval

$$R_j = \frac{1}{n_j} \sum_{i=1}^{n} \frac{x_i}{z_i}$$

where

x_i = number of fish impinged during i^{th} sample period
z_i = circulator flow (in million gallons) for i^{th} sample period
n_j = number of sample period during j^{th} 3-month interval

There is no variance estimate.

c. Individual Ratio Estimate with Bias Correction

This estimate is similar to the previous estimate but also includes a bias correction. The mean (with bias correction) number of fish impinged per million gallons is multiplied by the number of million gallons pumped during each 3-month period. The formula is as follows:

$$Y_j = Z_j R_j^*$$

with a variance estimate of

$$S_{Y_j}^2 = \frac{N_j(N_j - n_j)}{n_j(n_j - 1)} \left[\sum x_i^2 + R_j^{*2} \sum z_i - 2R_j^* \sum x_i z_i \right]$$

where

Y_j = impingement estimate for j^{th} 3-month interval

$S^2_{Y_j}$ = variance of Y_j

x_i = number of fish impinged for i^{th} sample period

z_i = circulator flow for i^{th} sample period

n_j = number of sample days during j^{th} 3-month interval

N_j = number of plant operational days during j^{th} 3-month interval

Z_j = circulator flow during j^{th} 3-month interval

$$R_j = \frac{1}{n_j} \sum_{i=1}^{n} \frac{x_i}{z_i}$$

$$R_j^* = R_j + \frac{\sum x_i - R_j \sum z_i}{2(n_j - 1)} (N_j - 1)$$

2. Results

Impingement estimates based on all four methods are presented in Table F-1 for each of the five species groups for the time periods January 1973-June 1973 and July 1973-June 1974. The difference between estimates by any of the four methods appears extremely small when compared with the size of the standard errors of each estimate. When the estimates by each of the four methods are ranked according to size for each species group and time period, the order of the four changes with species group and time period because of the inconsistent relationship between flow and impingement. As previously noted (Section VII), this relationship varies greatly with species, age group, and time of year.

Simple expansions probably represent the least reliable impingement estimate procedure. This is due to basing the estimate on the number of plant operational days irrespective of both the length of operation on any particular day and the circulator flow rate.

Table F-1

Comparison of Impingement Estimates Made Using Different Methods

Date	Species	Usual Ratio (N ± SE)	Simple Expansion (N ± SE)	Individual Ratio (N ± SE)	Individual Ratio with Bias Correction (N ± SE)
1/73-6/73	Striped bass	10,811 ± 1,328	9,472 ± 1,378	10,970 ± *	10,872 ± 1,345
	White perch	209,863 ± 14,061	192,581 ± 137,475	220,386 ± *	211,154 ± 14,377
	Atlantic tomcod	1,081,088 ± 285,687	919,199 ± 298,174	1,020,718 ± *	1,075,095 ± 286,530
	American shad	72 ± 33	66 ± 34	67 ± *	71 ± 33
	Other *Alosa* spp.	6,744 ± 1,237	6,527 ± 1,302	7,539 ± *	7,242 ± 1,274
7/73-6/74	Striped bass	56,659 ± 11,615	60,180 ± 11,744	56,012 ± *	56,905 ± 11,715
	White perch	609,927 ± 49,671	630,529 ± 48,873	614,093 ± *	609,263 ± 49,938
	Atlantic tomcod	347,123 ± 63,556	360,057 ± 67,820	331,916 ± *	351,679 ± 64,289
	American shad	6,920 ± 774	7,154 ± 821	6,741 ± *	6,962 ± 790
	Other *Alosa* spp.	264,152 ± 58,452	278,900 ± 57,931	242,476 ± *	252,846 ± 60,082

*No standard error calculated

The three other procedures are ratio estimates; taking into account a second variable, plant circulator flow rate. Intuitively, there appears to be some relationship between flow and impingement (e.g., no flow, no impingement). The accuracy of each of the ratio estimates depends on this relationship between flow and impingement. The usual ratio estimate was chosen for impact estimation due to the requirement of approximate proportionality between flow and impingement as previously noted (Section VII). While this has not consistently been shown to be the case, the results by this method appear to be neither consistently high nor low compared with the other estimates. It is apparent that, due to the extreme variability of the data, any of the three ratio estimators and even the rough simple expansion would provide reasonable impingement estimates.

D. MARK/RECAPTURE POPULATION ESTIMATION PROCEDURES AND ASSUMPTIONS

1. Petersen Estimate

The Petersen method is a single census procedure with a relatively short time period for the release of marks. The Petersen estimates were calculated as follows:

$$N = \frac{MC}{R}$$

where

N = population estimation

M = number marked and released

C = total number in sample in recovery time period

R = number of marks recaptured during recovery period

Approximate 95% confidence intervals of the inverse of $\frac{1}{N}$ were calculated as ± 1.96 multiplied by the square root of the estimated variance of the inverse of the Petersen estimate (N). This value was then added and subtracted from the inverse of N and the results inverted. The variance of the inverse of N was estimated by the following equation (Ricker, 1958):

$$S^2_{\left(\frac{1}{N}\right)} = \frac{R(C - R)}{M^2 \ C^3}$$

2. Schumacher-Eschmeyer Estimate

The Schumacher-Eschmeyer method is a multiple-census procedure utilizing a series of release and subsequent recovery periods. The Schumacher-Eschmeyer estimates (Ricker, 1958) were calculated as follows:

$$\frac{1}{N} = \frac{\Sigma M_t R_t}{\Sigma C_t M_t^2}$$

where

$\frac{1}{N}$ = inverse of population estimate

M_t = mean number of marked fish at large during t^{th} time interval

C_t = sample of unmarked and marked fish taken during t^{th} time interval

R_t = number of marked fish in sample C_t

The variance and standard error of $\frac{1}{N}$ were computed as follows:

$$\text{Variance } S^2_{\left(\frac{1}{N}\right)} = \frac{\Sigma(R_t^2/C_t) - (\Sigma R_t M_t)^2 / \Sigma (C_t M_t^2)}{X-1}$$

$$\text{Standard error } S_{\left(\frac{1}{N}\right)} = \frac{S}{\Sigma(C_t M^2_t)}$$

where

X = number of successive sampling periods

Approximate 95% confidence intervals of the inverse of N were calculated by multiplying the standard error by the appropriate value of t (from the t distribution for an α level of 0.05 with X - 1 degrees of freedom). This value was then added and subtracted from the inverse of N and the resulting values inverted.

3. Assumptions of the Petersen and Schumacher-Eschmeyer Population Estimates

Unbiased estimates of population size by mark/recapture procedures are dependent on the validity of the following assumptions:

- Marked and unmarked fish have the same natural mortality rates
- Marked and unmarked fish are equally vulnerable to fishing
- Marked fish do not lose their mark

- Marked fish become randomly mixed with unmarked fish in the population upon their release or the spatial distribution of fishing effort during the recovery period is proportional to the spatial distributions of fish abundance

- All recaptured fish are recognized and reported

- Recruitment to the catchable population is negligible during the recovery period

- Population size remains constant during the collection period

The assumption of equal mortality rates for marked and unmarked fish was partially tested by 14-day survival tests of marked fish (Table F-2). A low short-term handling mortality of marked fish was demonstrated and corrections applied to the number of marked fish in the river population to account for this mortality. There remains the possibility of a long-term mortality of fin-clipped or tagged fish due to infection, increased vulnerability to predation, or detrimental effects on behavior. The literature contains many conflicting accounts of the effects of marking on the growth and survival of fishes (Shetter, 1967; Carline and Brynildson, 1972; Nicola and Cordone, 1973; Coble, 1971, 1972). Generally, tagging has been shown to have little effect on survival, while fin-clipping may decrease survival in some cases. In our marking program, the magnitude of increase in the population estimates of juvenile and older white perch was the same, suggesting that tagged and fin-clipped fish survived equally well, all other factors remaining constant.

The assumption of equal vulnerability of marked and unmarked fish to recapture gear is not necessary for a comparison of fall and spring estimates; if marked fish were either more or less vulnerable to the fishing gear than unmarked fish, they would be equally so for both seasons.

Table F-2

Summary of Tag Survival Studies, Fall 1973

Species	Tag Type	Duration Days	August % Survival	August No.	September % Survival	September No.	October % Survival	October No.
		7	100	30	100	60	100	30
	Fin clip	14	93.3	30	98.3	60	100	30
		28	-	-	-	-	-	-
	Floy	7	33.3	30	81.0	42	100	60
White perch	fingerling	14	33.3	30	81.0	42	100	15
	tag	28	-	-	100	15	100	15
	Dennison	7	36.1	61	84.8	46	96.7	60
	anchor	14	32.8	61	84.8	46	95.0	60
	tag	28	-	-	100	15	100	15
Striped bass	Fin clip	7	97.5	60	100	30	-	-
		14	75	40	100	30	-	-
		28	-	-	-	-	-	-

The assumption that marked fish do not lose their mark has probably been met. Since the interval between release and recovery of marks occurred during the winter, there was little growth and therefore little regeneration of fins on fin-clipped fish. A careful examination of recaptured fin-clipped fish confirmed this conclusion. Loss of internal anchor tags is probably also minimal.

The assumption of random mixing of marked and unmarked individuals is discussed in Section VII, results of population estimation for impingement impact.

The assumption that all recaptured fish are recognized and reported has been assured by quality-control measures taken in the field to enforce the examination of fish for marks. The laboratory fin-clip verification program has further insured that reported recaptures are, in fact, of marked fish.

Since the release/recovery time interval did not overlap the spawning season, recruitment of the next year class to the entire river population of white perch did not occur and the assumption of no recruitment was met.

A further step in data reduction was necessary when a high incidence of pelvic fin-clip anomalies was discovered in the white perch population. In the early fall 1974 mark/recapture program, after the left pelvic, right pelvic, and double pelvic fin-clips were dropped from the marking scheme, young-of-the-year white perch continued to be recaptured with these fins missing. Preliminary estimates of the natural occurrence of missing pelvic fins in the population (Table F-3) indicated that these anomalies would have an important effect on the apparent recapture rate of fish bearing these fin-clip combinations; therefore, the fall 1973 young-of-the-year white perch estimate based on spring recaptures excluded these three fin-clip types from the calculation. The estimate based on fall recaptures was also recalculated excluding the pelvic fin-clips and impingement catch and recapture data and is included for comparison (Volume I; Table VII-9). Spring estimates of the fall populations of young-of-the-year and yearling and older white perch were used for calculating estimates of impingement direct impact.

Table F-3

Rate of Natural Occurrence of Pelvic Fin Loss in Young-of-the-Year White Perch Collected by Beach Seine and Box Trap in Hudson River, August 16 through October 1974

Fin Loss	No. Caught	% of Total Catch
Right pelvic	7	0.155
Left pelvic	4	0.089
Right and left pelvic	2	0.044
Total catch =	4510	

The number of marked striped bass and white perch released and recovered, by mark type, is presented in Table F-4. These data constitute the corrected values used in calculating the fall 1973 population estimates.

Table F-4

Spring (January-June 1974) Recoveries of Striped Bass and White Perch Marked and Released in Preceding Fall (August-December 1973)

	Total Length at Release (mm)	Mark Type	No. Marked*	No.†	% Recovery†
Striped bass	< 100	Fin clip	14336	9 (9)	0.06 (0.06)
White perch	< 100	Fin clip‡	9632	26 (132)	0.27 (1.37)
	100-149	Floy fingering tag	1257	2 (2)	0.16 (0.16)
	≥ 150	Dennison tag	5005	10 (12)	0.20 (0.24)

* Adjusted for 14-day handling mortality

† Numbers in parenthesis are totals that include impingement recoveries

‡ Excludes right pelvic; left pelvic and right- and left-pelvic fin clips

E. DERIVATION OF IMPINGEMENT DIRECT IMPACT ESTIMATION

Impingement direct impact of a power plant is defined as the percentage reduction of the total larval survival rate below what it would have been in the absence of impingement. The formula presented in Section VII for estimating direct impact due to impingement is derived as follows.

The total annual mortality rate q_t is also the expectation of death from all causes. It is given by

$$q_t = 1 - \frac{N_1}{N_o}$$

where N_o is number of fish present at the beginning of the interval during which impingement impact is to be estimated and N_1 is the number of fish remaining at the end of that interval. The expectation of death due to impingement, D_I, is given by

$$D_I = \frac{N_i}{N_o}$$

where N_i is the number of fish impinged during the interval of the study.

The expectation of death from sources of mortality besides impingement is

$$D_n = q_t - D_I$$

Since fish can die only once, the observed expectation of death from causes other than impingement is lower than it would be if no impingement occurred. In the absence of impingement, some of the impinged fish would die from other causes. The proportional mortality rate expected in the absence of impingement, q_n, is calculated from

$$q_n = 1 - e^{-m_n}$$

where e = 2.718.., and m_n is the instantaneous mortality rate due to causes other than impingement. According to Ricker (1958), m_n may be obtained from the relation

$$m_n = \frac{m_t D_n}{q_t}$$

where m_t is the total instantaneous mortality rate.

Assuming that the population declines exponentially during the study interval,

$$N_1 = N_o e^{-m_t T}$$

where T, the duration of the study interval, is considered to be unity, then,

$$\frac{N_1}{N_o} = e^{-m_t}$$

implies that

$$m_t = -\ln\left(\frac{N_1}{N_o}\right)$$

where ln (...) designates the natural logarithm of the parenthesized term.

Substituting in Ricker's formula,

$$m_n = \left[-\ln\left(\frac{N_1}{N_o}\right)\right]\left[\frac{D_n}{q_t}\right]$$

$$= \ln\left[\frac{N_1}{N_o}\right]^{-\left[\frac{D_n}{q_t}\right]}$$

$$= \ln\left[(1 - q_t)^{-\left(\frac{D_n}{q_t}\right)}\right]$$

Therefore, mortality in the absence of impingement would be

$$q_n = 1-e^{-m_n}$$

$$= 1-e^{-\ln\left[\left[1-q_t\right]^{\left(\frac{-D_n}{q_t}\right)}\right]}$$

$$= 1-(1-q_t)^{\left(\frac{D_n}{q_t}\right)},$$

Since $D_n = q_t - D_I$,

$$= 1-(1-q_t)^{\left(\frac{q_t - D_I}{q_t}\right)}$$

$$q_n = 1-(1-q_t)^{\left[1-\frac{D_I}{q_t}\right]}$$

The proportion of fish surviving at the end of the study interval is $(1-q_t)$, while the proportion which would survive if no impingement occurred is $(1-q_n)$. The ratio of these terms,

$$\frac{1-q_t}{1-q_n}$$

is the actual survival expressed as a proportion of that which would have occurred without impingement as a factor. Subtraction of this ratio from one, then, gives the proportional reduction of the population attributable to impingement. Finally, multiplication by 100 converts the proportion to a percentage estimate of impingement impact:

$$\%\ \text{direct impact} = \left[1-\frac{(1-q_t)}{(1-q_n)}\right] \times 100$$

F. IMPINGEMENT SAMPLING, PLANT OPERATION DATA, AND IMPINGEMENT ESTIMATES

The data utilized for making the impingement estimates are listed in Tables F-5 through F-24. The sample date, flow during sample period, and numbers of striped bass, white perch, Atlantic tomcod, American shad, and other *Alosa* spp. impinged are listed for each sample period. Except where noted by footnote, these data are consistent with the data received from all sources.

The sampling and plant operational data used to estimate impingement are presented for each plant by 3-month intervals in Tables F-25 through F-27. These data were obtained from the impingement sampling data sheets and plant operational logs and reflect actual operating conditions.

Impingement estimates for striped bass, white perch, Atlantic tomcod, American shad, and other *Alosa* spp. for each power plant by 3-month intervals are presented in Tables F-28 through F-38.

Table F-5

1973 Impingement Data, Lovett Plant Units 1 and 2

Date (1973)	Flow (gal. x 10^6)	Striped Bass	White Perch	Atlantic Tomcod	American Shad	Other *Alosa* spp.
1/16-17	72.6	0	0	5	0	0
1/22-23	45.0	0	0	5	0	0
1/29-30	36.3	0	2	7	0	0
2/5-6	36.3	1	4	3	0	0
2/12-13	36.3	0	0	0	0	0
2/26-27	35.8	0	2	0	0	0
3/5-6	36.3	0	3	0	0	0
3/20-21	72.6	0	0	0	0	0
4/2-3	35.5	0	0	0	0	0
4/16-17	20.4	0	0	0	0	0
5/30-31	72.6	0	0	0	0	0
6/12-13	71.1	0	0	0	0	0
6/26-27	78.6	0	0	0	0	0
7/11-12	72.6	0	0	0	0	0
7/25-26	69.6	0	2	0	0	0
8/8-9	72.6	0	1	0	0	0
8/28-29	72.6	1	3	0	0	0
9/13-14	36.7	0	0	0	0	0
9/25-26	72.6	1	0	0	0	0
10/23-24	36.3	0	0	0	0	0
11/6-7	72.6	0	0	0	0	2

Table F-6

1974 Impingement Data, Lovett Plant Units 1 and 2

Date (1974)	Flow (gal. x 10^6)	Striped Bass	White Perch	Atlantic Tomcod	American Shad	Other *Alosa* spp.
2/6-7	36.3	0	0	0	0	0
2/20-21	36.2	0	0	0	0	0
4/10-11	35.5	0	0	0	0	0
7/1-2	9.0	0	0	0	0	0
7/9-10	36.3	0	0	0	0	0
9/24-25	15.0	0	0	0	0	0

Table F-7

1973 Impingement Data, Lovett Plant Unit 3

Date (1973)	Flow (gal. x 10^6)	Striped Bass	White Perch	Atlantic Tomcod	American Shad	Other *Alosa* spp.
1/2-3*	59.2	1	22	2	0	0
1/9-10	55.0	0	0	0	0	0
1/16-17	60.5	0	2	6	0	0
1/22-23*	58.6	0	2	10	0	0
1/29-30*	59.2	0	2	50	0	0
2/12-13*	20.2	0	0	4	0	0
2/20†	15.0	0	4	0	0	0
2/26-27*	59.9	6	6	4	0	0
3/5-6*	60.5	4	20	2	0	0
3/20-21*	85.7	0	16	0	0	0
4/2-3*	59.2	0	4	0	0	0
4/16-17*	59.2	0	12	0	0	0
6/26-27*	32.8	0	0	4	0	0
7/11-12*	60.5	0	4	0	0	0
7/25-26*	58.0	0	2	2	0	4
8/8-9‡	60.0	2	2	0	0	18
8/28-29	60.5	0	2	2	0	0
9/13-14	61.1	1	2	0	0	6
9/25-26	20.2	0	0	0	0	0
10/9-10	60.5	0	0	1	0	0
10/23-24	60.5	0	0	0	0	5
11/6-7	60.5	0	0	0	0	8
11/20-21	60.5	1	2	0	0	29
12/4-5	60.5	0	16	0	0	25
12/18-19	60.5	3	23	0	0	2

* Calculations reflect one of two screens operating. Number of fish doubled to estimate for entire unit.

† First sample period not included because of decomposed fish.

‡ Flow total on data sheet incorrect. Flow estimated from plant logs.

Table F-8

1974 Impingement Data, Lovett Plant Unit 3

Date (1974)	Flow (gal. x 10^6)	Striped Bass	White Perch	Atlantic Tomcod	American Shad	Other *Alosa* spp.
1/2-3	60.5	0	1	0	0	0
2/20-21	60.3	0	0	0	0	0
8/13-14	55.4	1	1	1	0	0
9/24-25	10.1	0	0	0	0	0

Table F-9

1973 Impingement Data, Lovett Plant Unit 4

Date (1973)	Flow (gal. x 10^6)	Striped Bass	White Perch	Atlantic Tomcod	American Shad	Other *Alosa* spp.
1/2-3	147.6	2	68	151	0	0
1/9-10	135.4	1	19	122	0	0
1/16-17	150.4	1	34	277	0	0
1/22-23	150.4	3	105	1131	0	0
1/29-30	150.2	2	27	371	0	0
2/5-6	150.2	5	40	260	0	1
2/12-13	151.0	2	4	98	0	0
2/20	53.2	1	27	6	0	0
2/26-27	149.1	5	63	87	0	0
3/5-6	150.2	11	294	65	0	3
3/20-21	150.2	1	11	4	0	0
4/2-3	150.2	12	29	3	0	0
4/16-17	154.9	0	58	0	0	0
4/30-5/1	150.2	0	33	0	0	3
5/15-16	151.9	0	31	0	0	1
5/30-31	150.3	0	5	0	0	0
6/12-13	148.0	1	23	0	0	3
6/26-27	153.5	2	16	0	0	2
7/11-12	150.3	0	4	0	0	0
7/25-26	144.1	0	18	7	0	14
8/8-9	150.3	3	6	7	2	50
8/28-29	150.3	6	38	61	2	56
9/13-14	156.6	1	4	0	0	10
9/25-26	145.6	0	6	0	0	7
10/9-10	150.3	2	2	0	0	0
11/6-7	150.3	8	5	0	1	33
11/20-21	113.1	11	52	0	3	71
12/4-5	150.3	4	35	0	0	50

Table F-10

1974 Impingement Data, Lovett Plant Unit 4

Date (1974)	Flow (gal. x 10^6)	Striped Bass	White Perch	Atlantic Tomcod	American Shad	Other *Alosa* spp.
4/30-5/1	150.2	5	183	0	0	10
5/7-8	142.2	1	105	0	0	16
5/14-15	150.2	1	31	0	0	5
5/21-22	149.1	0	3	0	0	1
5/28-29	75.2	1	7	0	0	2
6/4-5	150.2	0	16	0	0	1
6/11-12	147.1	0	0	2	0	0
6/18-19	150.2	4	11	31	0	15
6/25-26	75.2	3	6	19	0	6
7/1-2	150.2	1	5	52	0	1
7/9-10	150.2	0	1	0	0	0
7/16-17	150.2	0	0	2	1	0
7/23-24	108.0	0	3	2	2	4
7/30-31	150.2	1	1	1	0	2
8/6-7	150.2	1	3	22	0	3
8/13-14	137.7	1	2	2	0	1
8/22-23	150.2	0	1	5	1	3
8/27-28	150.2	2	1	3	0	0
9/3-4	150.2	1	1	2	0	0
9/10-11	150.2	0	0	3	1	3
9/17-18	150.2	0	2	1	0	4
9/24-25	150.2	0	1	0	1	2

Table F-11

1973 Impingement Data, Lovett Plant Unit 5

Date (1973)	Flow (gal. x 10^6)	Striped Bass	White Perch	Atlantic Tomcod	American Shad	Other *Alosa* spp.
1/22-23	171.0	5	179	2167	0	0
1/29-30	172.8	3	35	1763	0	1
2/5-6	172.8	9	45	1072	0	0
2/12-13	172.8	2	8	705	0	0
2/20	61.2	2	48	107	0	1
2/26-27	172.8	7	61	222	0	0
3/5-6	172.8	21	282	209	3	0
3/20-21	170.4	8	108	45	0	0
4/2-3	172.8	47	34	26	0	0
4/16-17	174.6	2	554	7	0	1
4/30-5/1	172.8	12	142	4	0	9
5/15-16	172.8	0	108	2	0	8
5/30-31	172.8	1	23	0	0	5
6/12-13	85.5	0	51	2	0	1
6/26-27	176.4	9	65	1	0	4
7/11-12	144.0	0	8	0	0	3
7/25-26	165.6	6	19	8	0	85
8/8-9	172.8	8	19	12	1	65
8/28-29	172.8	43	221	88	1	68
9/13-14	180.0	9	25	0	0	8
10/9-10	172.8	4	1	0	0	1
10/23-24	86.4	1	2	0	1	1
11/20-21	172.8	30	330	0	3	374
12/4-5	172.8	17	135	0	5	80
12/18-19	86.4	32	552	0	0	1

Table F-12

1974 Impingement Data, Lovett Plant, Unit 5

Date (1974)	Flow (gal. x 10^6)	Striped Bass	White Perch	Atlantic Tomcod	American Shad	Other *Alosa* spp.
1/2-3	172.8	15	62	244	0	1
1/23-24	172.8	88	553	75	0	12
2/6-7	172.8	49	92	27	0	0
2/20-21	171.0	68	708	11	0	24
4/10-11	169.2	92	252	0	0	10
4/24-25	172.8	20	950	0	0	17
4/30-5/1	172.8	9	217	0	0	44
5/7-8	165.6	16	398	0	0	79
5/14-15	172.8	2	93	0	0	9
5/21-22	172.8	1	80	0	0	3
5/28-29	172.8	1	41	0	0	3
6/4-5	172.8	1	34	1	0	5
6/11-12	169.2	6	37	27	0	11
6/18-19	172.8	7	41	207	0	34
6/25-26	172.2	12	39	213	0	9
7/1-2	172.8	6	26	479	0	7
7/9-10	172.8	0	6	2	0	3
7/16-17	172.8	0	0	1	1	2
7/23-24	169.2	3	7	12	1	12
7/30-31	171.0	0	3	5	1	10
8/6-7	150.2	8	9	224	10	15
8/13-14	172.8	1	1	5	0	1
8/22-23	172.8	7	49	36	4	7
8/27-28	158.4	0	6	1	1	2
9/3-4	172.8	4	12	13	0	11
9/10-11	172.8	1	8	0	0	12
9/17-18	169.2	8	18	37	2	16
9/24-25	172.8	2	10			11

Table F-13

1973 Impingement Data, Bowline Plant Units 1 and 2

Date (1973)	Flow (gal. x 10^6)	Striped Bass	White Perch	Atlantic Tomcod	American Shad	Other *Alosa* spp.
1/3-4	553.0	78	647	438	0	0
1/8-9	504.2	10	200	565	0	2
1/15-16	474.0	22	359	88	0	1
1/23-24	450.3	102	1525	89	0	2
1/30-31	414.0	45	341	41	0	1
2/6-7	445.6	144	854	66	0	1
2/13-14	366.4	25	275	47	0	2
2/20-23	145.4	20	210	28	0	0
3/24-25	219.6	16	240	1	0	0
4/3-4*	189.5	9	30	0	0	5
4/10-11	464.5	61	309	10	0	0
4/17-18	404.5	62	493	2	0	0
4/26	142.2	32	479	6	0	0
5/1-2	404.2	26	373	0	0	2
5/16-17	245.8	11	580	10	0	4
5/31-6/1	410.5	1	76	22	1	4
6/14-15	505.4	0	10	4	0	2
6/27-28	468.1	0	60	9	0	6
7/12-13	455.0	2	5	16	0	0
7/19-20*	217.9	8	19	13	1	326
7/26-27**	416.9	8	37	1	9	333
8/9-10	622.1	12	46	15	1	31
8/29-30†	645.2	7	193	64	3	566
9/12-14	1013.8	4	10	0	0	6
9/17-18	553.0	2	24	1	0	24
9/26-27†	889.5	5	23	1	0	48
10/10-11	553.0	2	18	0	2	35
10/31-11/1	553.0	3	3	0	1	33
11/7-8†	829.5	20	28	0	9	1132
11/27-28	553.0	4	13	1	1	177
12/5-6	455.0	2	12	1	0	105
12/20-21	553.0	98	1547	0	2	233

* Data utilized from Unit 1 only

** Sample period with decomposed fish not included

† Two adjacent sample periods combined

Table F-14

1974 Impingement Data, Bowline Plant Units 1 and 2

Date (1974)	Flow (gal. x 10^6)	Striped Bass	White Perch	Atlantic Tomcod	American Shad	Other *Alosa* spp.
1/3-4	553.0	103	1277	2	34	749
1/30-31*†	454.8	95	466	6	0	7
2/13-14*	455.0	447	2101	10	0	2
3/13-14	455.0	242	1967	2	0	2
5/1-2*	455.0	105	166	0	0	22
5/8-9	455.0	26	110	1	0	36
5/15-16*	910.1	11	691	1	0	53
5/30-31*‡	455.0	0	8	1	0	0
6/5-6*	916.4	0	41	81	0	5
6/12-13*	910.1	1	30	116	0	36
6/19-20*	948.0	1	21	40	0	15
6/26-27*	872.2	6	105	576	0	25
7/2-3	725.6	1	45	31	0	6
7/10-11	891.1	5	4	712	0	7
7/17-18	910.1	3	1	26	2	1
7/24-25	872.2	15	10	42	19	47
8/1-2	929.0	0	11	6	6	21
8/7-8	872.2	10	13	18	6	51
8/22-23	966.0	9	15	12	1	47
8/28-29	1015.0	1	10	0	0	18
9/4-5	966.0	15	21	4	3	136
9/11-12	504.0	1	1	0	1	1
9/18-19	927.4	14	27	12	5	70
9/25-26	1121.3	1	5	4	0	8

*Includes Units 1 and 2

†1/15-17 data for Unit 2 not included due to inconsistencies with plant operational logs

‡5/22/74 data for Unit 1 not included due to inconsistencies with plant operational logs

Table F-15

1973 Impingement Data, Danskammer Plant Units 1 and 2

Date (1973)	Flow (gal. x 10^6)	Striped Bass	White Perch	Atlantic Tomcod	American Shad	Other *Alosa* spp.
1/4-5	58.0	0	2	164	0	0
1/10-11	59.2	0	8	1143	0	0
1/17-18	60.5	0	7	3648	0	0
1/24-25	58.8	0	3	2610	0	0
1/30-2/1	34.3	0	0	1324	0	0
2/7-8	60.0	0	0	1511	0	0
2/14-15	55.2	1	0	1025	0	0
2/21-22	36.7	0	0	399	0	0
2/27-28	55.4	0	0	441	0	0
3/6-7	57.4	0	4	809	0	0
3/21-22	29.0	0	12	576	0	0
4/3-4*	59.6	0	80	31	0	3
4/18-19	108.7	0	91	1	0	23
4/25	42.2	0	163	0	0	56
5/2-3	118.5	1	314	2	0	7
5/16-17	121.2	4	389	0	0	85
5/30-31	116.1	4	301	44	0	117
6/13-14	121.2	6	197	1	0	51
6/26-27	121.2	3	129	1	0	40
7/10-11	121.0	51	1047	2	0	91
7/24-25	241.9	20	395	6	0	93
8/7-8	121.0	8	54	2	10	979
8/21-22	131.0	26	218	0	3	520
9/5-6	121.0	11	127	0	4	363
9/18-19	121.0	44	283	1	8	2922
10/3-4	131.0	71	282	0	1	366
10/17-18	131.0	148	492	1	24	2690
10/31-11/1	108.4	779	1252	16	12	996
11/15-16	98.2	123	946	1	12	637
11/28-29	65.5	25	93	1	0	28
12/11-12	65.5	26	72	9	0	1
12/25-27	32.8	3	11	6	0	0

* Striped bass data not included because of inconsistencies in identification code numbers on data sheet

Table F-16

1974 Impingement Data, Danskammer Plant Units 1 and 2

Date (1974)	Flow (gal. x 10^6)	Striped Bass	White Perch	Atlantic Tomcod	American Shad	Other *Alosa* spp.
1/8-9	95.8	7	23	275	0	0
1/22-23	65.5	0	4	156	0	0
2/5-6	98.3	2	1	2910	0	0
2/19-20	65.5	0	1	253	0	0
3/5-6	60.5	0	3	183	0	0
3/25-26	60.5	0	4	6	0	2
4/2-3	90.7	2	11	8	0	1
4/15-16	42.8	0	96	1	0	2
4/30-5/1	90.7	17	1528	5	0	133
5/14-15	90.7	0	100	1	0	87
5/21-22*	93.6	1	223	0	0	18
5/28-29	90.7	11	302	0	0	54
6/4-5	93.6	13	678	3	0	126
6/11-12	121.0	9	214	0	0	40
6/18-19†	95.4	21	305	16	0	36
6/25-26	121.0	24	242	1	0	46
7/2-3	112.1	44	339	50	0	69
7/9-10	121.1	18	72	1	0	5
7/16-17	104.6	29	106	0	0	5
7/23-24	123.1	63	98	1	1	23
7/30-31	124.7	67	191	3	0	267
8/6-7	103.3	24	65	0	6	23
8/13-14	124.7	18	107	0	0	113
8/20-21	88.8	26	127	4	0	58
8/27-28	93.6	20	45	0	0	46
9/3-4	95.8	16	52	0	0	44
9/10-11-13	101.1	17	20	0	29	204
9/17-18	121.0	20	75	0	4	128
9/24-25	92.9	8	21	0	0	22

*Decomposed fish not included
†No flow listed; flow estimate from plant logs

Table F-17

1973 Impingement Data, Danskammer Plant Units 3 and 4

Date (1973)	Flow (gal. x 10^6)	Striped Bass	White Perch	Atlantic Tomcod	American Shad	Other *Alosa* spp.
1/4-5	186.8	0	8	3279	0	0
1/10-11	190.8	0	5	10322	0	2
1/17-18	194.9	0	4	7642	0	0
1/24-25	189.5	0	1	40882	0	0
1/31-2/1*	97.4	0	0	8111	0	0
2/7-8	132.1	0	0	1451	0	0
2/14-15	179.3	4	3	9040	0	0
2/21-22	127.9	0	4	1729	0	0
2/27-28	178.6	0	3	1334	0	0
3/6-7	187.4	0	2	579	0	0
3/21-22‡	89.6	0	10	51	0	0
4/3-4	191.3	0	17	8	0	0
4/18-19	169.3	0	13	1	0	0
4/25	65.1	0	1	0	0	3
5/2-3	162.0	0	65	1	0	2
5/16-17	254.1	1	79	1	0	5
5/30-31	243.8	0	148	25	0	28
6/13-14	321.6	9	44	2	0	2
6/26-27	321.5	19	200	3	0	35
7/10-11†	321.6	39	330	4	0	361
7/24-25	643.9	24	194	19	5	272
8/7-8	295.1	16	21	3	2	245
8/21-22	331.9	13	32	2	7	363
9/5-6	322.0	4	20	0	0	147
9/18-19	276.9	49	145	1	5	988
10/3-4	202.3	3	31	0	0	98
10/17-18	375.6	64	39	0	2	925
10/31-11/1	348.4	91	102	2	9	742
11/15-16	275.6	39	135	0	4	489
11/28-29	245.8	9	132	0	0	107
12/11-12	211.1	10	39	2	0	3
12/26-27	211.1	30	48	500	0	0

* Sample 6 excluded because of decomposed samnle

† Does not include *Morone* in either striped bass or white perch

‡ Overflow due to vegetation, no sampling after period 6. Total flow changed

Table F-18

1974 Impingement Data, Danskammer Plant Units 3 and 4

Date (1974)	Flow (gal. x 10^6)	Striped Bass	White Perch	Atlantic Tomcod	American Shad	Other *Alosa* spp.
1/8-9	228.0	5	19	3664	0	0
1/22-23	228.0	0	2	2393	0	0
2/5-6	211.1	0	1	439	0	0
2/19-20	211.1	0	0	245	0	0
3/5-6	183.6	0	2	74	0	0
3/25-26	194.8	0	1	1	0	0
4/2-3	194.8	0	11	1	0	0
4/15-16	194.8	2	225	0	0	5
4/30-5/1	194.8	3	286	0	0	17
5/14-15	194.8	0	30	0	0	12
5/21-22*	165.5	2	48	0	0	8
5/28-29†	254.4	6	157	0	0	50
6/4-5†	207.3	5	146	0	0	28
6/11-12	194.8	1	30	0	0	4
6/18-19*	211.5	6	106	5	0	17
6/25-26	194.9	7	60	5	0	27
7/2-3	280.8	11	53	3	0	9
7/9-10	257.0	13	17	0	0	0
7/16-17	272.2	12	28	2	5	3
7/23-24	334.1	44	28	0	0	3
7/30-31	344.5	26	48	0	26	152
8/6-7	334.1	11	21	3	9	41
8/13-14	280.8	19	135	4	18	114
8/20-21	334.1	34	243	8	25	268
8/27-28	341.0	14	30	1	46	293
9/3-4	343.4	9	29	2	5	58
9/10-11-13	341.0	19	40	0	7	142
9/17-18	208.1	3	57	0	0	50
9/24-25	264.8	5	9	0	13	105

*No flow listed; flow estimated from plant logs
†Decomposed fish not included

Table F-19

1974 Impingement Data, Roseton Units 1 and 2

Date (1974)	Vol. Flow (gal. x 10^6)	Striped Bass	White Perch	Atlantic Tomcod	American Shad	Other *Alosa* spp.
7/2-3	614.5	3	2	35	0	0
7/9-10	595.7	0	2	1	0	0
7/16-17	614.5	0	0	2	2	27
7/23-24	601.9	3	0	2	5	39
7/30-31	614.5	2	2	3	1	17
8/6-7	816.0	0	1	0	1	2
8/13-14	320.5	1	24	5	1	2
8/20-22-23	601.9	3	279	40	3	170
8/27-28	614.5	1	171	17	1	63
9/3-4	601.9	3	49	27	2	64
9/17-18	601.9	2	99	8	4	60
9/24-25	622.8	2	11	0	2	9

Table F-20

1973 Impingement Data, Indian Point Unit 1

Date	Striped Bass	White Perch	Tomcod	American Shad	Other *Alosa* spp.
1/ 1/73	0	6	2	0	0
2	0	2	1	0	0
3	0	2	3	0	0
4	0	6	0	0	0
5	0	1	8	0	0
6	0	1	2	0	0
7	0	0	0	0	0
8	0	0	1	0	0
9	0	0	0	0	0
10	0	0	0	0	0
11	0	0	1	0	0
12	0	0	0	0	0
5/ 8/73	3	600	0	1	0
9	0	147	0	0	0
10	0	262	0	0	0
11	1	246	0	0	0
12	0	119	0	0	0
13	2	224	0	0	0
14	0	57	0	0	0
15	0	138	0	0	0
16	0	44	0	0	0
17	0	43	0	0	0
18	0	62	1	0	0
19	0	20	0	0	0
20	0	28	0	0	0
21	3	97	0	0	0
22	0	35	2	0	0
23	0	4	0	0	0
24	0	8	1	0	0
25	0	7	0	0	0
26	0	11	0	0	0
27	0	21	2	0	1
28	0	7	0	0	0
29	0	20	4	0	0
30	0	12	4	0	2
31	0	16	30	0	5
6/ 1/73	0	22	5	0	3
2	0	34	1	0	1
3	6	20	1	0	3
4	2	29	0	0	0
5	0	18	3	0	2
10	0	23	0	0	0
17	0	5	0	0	0
7/ 8/73	0	0	0	0	0
29	0	0	0	0	0
8/ 5/73	0	1	0	0	0
12	0	0	0	0	0
19	0	2	0	0	0
9/ 2/73	0	0	0	0	0
16	0	0	0	0	0
11/11/73	0	0	0	0	3
18	3	21	0	0	60
24	5	372	1	1	32
12/ 2/73	2	44	0	0	38
9	5	96	0	0	19
16	18	280	1	0	14
23	1	59	0	0	19
30	5	121	384	0	0

Table F-21

1974 Impingement Data, Indian Point Unit 1

Date	Striped Bass	White Perch	Tomcod	American Shad	Other *Alosa* spp.
1/16/74	7	118	201	0	0
17	1	44	149	0	0
18	0	0	8	0	0
19	0	3	11	0	0
20	0	3	1	0	0
21	0	9	3	0	0
22	1	67	2	0	0
23	0	132	0	0	0
24	38	1208	3	0	0
25	17	516	11	0	0
26	5	947	0	0	0
27	2	913	0	0	0
28	1	114	2	0	0
29	0	442	0	0	0
30	2	206	1	0	0
31	0	86	1	0	0
2/ 1/74	3	313	1	0	0
2	2	197	1	0	0
3	0	2	1	0	0
4	0	47	1	0	0
5	0	11	1	0	0
6	0	5	0	0	0
7	1	16	0	0	0
8	4	210	0	0	0
9	3	337	0	0	0
10	7	97	2	0	0
11	3	139	0	0	0
12	5	175	1	0	0
13	11	793	1	0	0
14	0	0	0	0	0
15	1	508	1	0	0
17	4	583	2	0	0
18	2	316	2	0	0
19	0	239	0	0	0
20	1	145	0	0	0
21	2	110	0	0	0
22	4	529	0	0	0
23	11	621	1	0	2
24	5	214	0	0	0
25	5	183	0	0	0
26	0	235	0	0	0
27	0	322	2	0	0
28	2	338	0	0	0
3/ 1/74	2	386	0	0	0
2	0	90	1	0	0
3	0	108	0	0	0
4	0	91	0	0	0
5	0	108	0	0	0
6	1	66	0	0	0
7	0	85	4	0	0
8	1	49	1	0	0
9	0	27	2	0	0
10	0	9	0	0	0
11	0	20	1	0	0
12	0	7	0	0	0
13	1	25	0	0	0
14	0	19	0	0	0
15	0	19	0	0	0
16	0	48	0	0	0
17	0	24	0	0	0
18	0	8	0	0	0
19	71	2314	0	0	1
20	9	192	0	0	0
21	3	181	0	0	0
22	3	89	0	0	1
23	0	106	0	0	0
24	1	73	0	0	0
25	1	97	0	0	0
26	2	132	0	0	0
27	2	181	0	0	0
28	9	307	0	0	0
29	3	272	0	0	0
30	1	127	0	0	0
31	18	1222	0	0	0

Table F-21 (Contd)

Date	Striped Bass	White Perch	Tomcod	American Shad	Other *Alosa* spp.
4/ 1/74	32	849	0	0	0
2	89	1389	0	0	8
3	18	462	0	0	0
4	25	422	0	0	0
5	14	728	0	0	0
6	26	2961	0	0	0
7	23	491	0	0	1
8	30	646	0	0	0
9	16	426	0	0	0
10	2	239	0	0	1
11	8	138	0	0	404
12	2	73	0	0	0
13	2	44	0	0	0
14	0	81	0	0	0
15	0	136	0	0	0
16	1	91	0	0	0
17	4	177	0	0	0
18	6	154	1	0	0
19	8	165	0	0	0
20	3	76	0	0	0
21	1	71	0	0	0
22	5	60	0	0	0
23	6	95	0	0	2
24	5	50	0	0	3
25	2	77	0	0	0
26	3	36	0	0	3
27	3	52	0	0	0
28	4	190	0	0	4
29	8	301	0	0	2
30	3	219	0	0	2
5/ 1/74	6	276	0	0	7
2	8	493	0	0	7
3	3	227	0	0	4
4	4	141	0	0	5
23	2	148	78	0	10
24	5	90	5	0	51
25	0	58	11	0	25
26	1	61	163	0	19
27	1	79	83	0	35
28	0	51	96	0	18
29	2	75	32	0	19
30	0	53	0	0	6
31	1	33	1	0	4
6/ 1/74	4	26	0	0	3
2	1	35	8	0	13
3	1	50	188	0	25
4	2	114	1471	0	59
5	1	139	2056	0	37
6	2	127	110	0	40
7	2	34	15	0	7
8	0	41	22	0	7
9	0	21	7	0	8
10	4	29	161	0	12
11	1	52	259	0	10
12	0	45	299	0	15
13	0	53	763	0	24
14	0	0	0	0	0
15	1	17	239	0	16
16	2	14	81	0	7
17	2	28	261	0	20
18	3	1	411	0	16
19	0	44	261	0	24
20	1	20	913	0	23
21	2	18	1179	0	29
22	6	48	5607	0	71
23	8	31	8343	0	48
24	0	22	920	0	12
25	0	18	394	0	4
26	2	10	1087	0	20
27	0	22	1148	0	21
28	3	40	656	0	22
29	3	19	434	0	3
30	4	1532	478	0	5

Table F-21 (Contd)

Date (1974)	Striped Bass	White Perch	Atlantic Tomcod	American Shad	Other *Alosa* spp.
7/ 1/74	0	13	98	0	4
2	3	28	870	0	9
3	1	23	722	0	8
4	1	21	69	0	3
5	3	39	116	0	3
6	2	10	45	0	1
7	0	0	0	0	0
8	1	11	168	0	4
9	0	0	0	0	0
10	0	0	0	0	0
11	0	0	0	0	0
12	1	8	10	0	6
13	2	1	117	0	4
14	1	9	103	0	1
15	2	11	18	1	3
16	2	2	10	2	3
17	0	8	1	0	2
18	2	2	37	3	1
19	1	3	129	6	1
20	2	4	231	2	1
21	0	2	162	0	0
22	3	4	49	0	6
23	1	5	194	0	18
24	3	6	229	5	28
25	4	10	94	0	34
26	5	4	33	0	4
27	4	3	215	0	2
28	2	1	120	0	7
29	19	4	553	0	124
30	5	4	222	2	21
31	5	0	87	3	9
8/ 1/74	2	5	12	3	9
2	0	3	34	0	9
3	3	4	81	0	5
4	1	5	589	0	10
5	1	4	874	4	6
6	3	5	728	2	3
7	5	9	2727	8	32
8	6	4	1224	12	23
9	5	4	618	3	8
10	2	7	179	4	8
11	5	5	536	0	16
12	7	8	232	1	27
13	7	7	104	0	4
14	2	5	9	1	5
15	3	3	5	0	6
16	3	7	21	1	7
17	1	6	195	8	5
18	6	6	370	0	27
19	8	4	220	0	12
20	4	6	163	2	0
21	8	5	173	1	0
22	4	21	137	3	9
23	1	2	46	6	3
24	4	11	1638	1	15
25	0	4	52	0	4
26	1	4	95	0	7
27	5	7	118	6	11
28	1	2	21	1	0
29	4	4	27	1	3
30	1	3	8	1	7
31	1	1	5	0	1
9/ 1/74	1	3	27	1	1
2	0	0	28	0	1
3	2	3	81	3	1
4	2	1	127	0	13
5	3	3	82	3	6
6	8	12	183	8	13
7	1	21	72	8	21
8	5	5	238	4	18
9	7	34	815	16	32
10	5	12	595	0	21
11	8	28	636	12	47
12	8	20	170	10	11
13	4	10	135	2	9
14	2	2	216	3	25
15	2	17	279	5	15
16	10	20	585	5	17
17	12	21	236	4	24
18	8	27	175	4	27
19	4	8	30	1	4
20	1	11	55	3	7
21	3	11	38	2	7
22	0	32	104	0	3
23	3	51	45	1	17
24	6	61	103	7	12
25	1	21	21	0	7
26	0	7	13	0	5
27	2	2	1	1	1
28	0	0	0	0	0
29	0	1	0	1	2
30	0	2	0	0	2

Table F-22

1973 Impingement Data, Indian Point Unit 2

Date	Striped Bass	White Perch	Tomcod	American Shad	Other *Alosa* spp.
1/29/73	0	2	90	0	0
30	5	25	710	0	0
31	44	1163	171	0	0
2/ 8/73	0	7	4	0	0
9	2	6	11	0	0
13	0	107	18	0	0
14	10	1952	39	0	0
15	17	1252	14	0	0
16	13	1494	23	0	0
17	10	428	125	1	0
18	16	216	19	0	0
19	6	108	27	0	0
20	2	40	37	0	0
22	16	707	473	0	0
23	21	376	299	0	0
26	6	136	48	0	0
27	2	459	8	0	0
28	15	2393	8	0	0
3/ 1/73	30	1437	7	0	1
2	13	911	8	0	0
3	10	1683	9	0	0
4	16	1161	17	0	1
5	68	3932	10	0	2
6	20	1004	1	0	2
7	43	3566	46	0	1
8	130	5746	15	1	2
9	30	979	4	1	0
10	10	1604	2	0	0
11	12	1620	6	0	0
12	10	820	7	0	0
13	4	401	7	0	0
14	0	164	0	0	0
15	2	285	5	0	0
16	1	179	6	0	0
17	3	181	2	0	0
18	4	183	8	0	0
19	2	1075	28	0	0
20	0	60	15	0	0
21	0	153	23	0	0
22	2	123	8	0	0
23	2	147	12	0	0
24	1	177	20	0	0
25	4	402	32	0	0
26	2	47	14	0	0
27	2	440	39	0	0
28	41	923	15	0	0
29	9	196	7	0	0
30	23	1196	7	0	0
31	9	359	13	0	0
4/ 1/73	25	1053	20	0	0
2	65	1332	55	0	0
3	101	1081	48	0	0
4	34	933	12	0	0
5	11	600	7	0	0
6	0	32	7	0	0
7	8	232	9	0	0
8	0	209	4	0	0
9	1	259	2	0	0
10	0	179	1	0	0
11	6	492	4	0	0
12	8	574	0	0	0
13	3	712	4	0	0
14	3	302	3	0	0
15	0	160	0	0	0
16	0	120	0	0	0
17	0	274	0	0	0
20	0	106	0	0	0
21	0	72	0	0	0
22	0	43	0	0	0
25	5	1151	14	0	0
26	21	2920	15	0	0
27	125	10654	384	1	0
28	0	937	3	0	0
29	1	335	12	1	0
30	1	178	5	0	0

Table F-22 (Contd)

Date	Striped Bass	White Perch	Tomcod	American Shad	Other *Alosa* spp.
5/ 1/73	0	409	1	0	0
2	2	325	1	0	0
3	0	561	1	0	0
4	0	713	0	0	0
6	0	223	0	0	0
7	2	114	1	0	0
8	0	102	0	0	0
9	0	102	1	0	0
10	0	101	1	0	0
11	0	194	0	0	0
12	0	1	1	0	1
13	0	2	0	0	0
14	0	11	0	0	0
15	0	12	0	0	0
16	0	4	0	0	0
17	1	11	1	0	0
18	3	51	2	0	0
19	0	28	0	0	1
21	0	9	2	0	0
22	0	14	1	0	0
23	0	14	1	0	0
24	0	7	1	0	0
25	0	7	1	0	0
26	0	12	2	0	0
27	0	7	3	0	0
28	0	2	6	0	1
29	1	27	48	0	1
30	0	17	57	0	1
31	0	4	79	0	1
6/ 1/73	0	11	77	0	2
2	0	27	105	0	1
3	1	24	63	0	0
4	2	46	183	0	2
5	3	57	196	0	4
6	0	40	89	0	6
7	1	69	17	0	1
8	1	47	22	0	1
9	1	31	3	0	0
10	1	37	2	0	2
11	0	32	5	0	0
12	1	3	5	0	0
13	0	0	1	0	0
14	1	19	0	0	0
15	0	20	0	0	1
19	0	12	12	0	0
20	2	25	10	0	1
21	0	21	6	0	1
22	1	17	2	0	0
23	0	8	4	0	1
24	0	5	1	0	1
25	0	2	22	0	0
27	6	19	4939	0	4
28	3	26	1981	0	11
29	0	12	82	0	1
30	1	12	83	0	0
7/ 1/73	1	20	57	0	0
2	2	36	51	0	0
3	0	9	6	0	0
4	0	28	37	1	0
5	1	9	8	0	2
6	0	6	11	0	0
7	0	4	8	0	0
8	0	0	3	0	0
9	0	1	4	0	0
10	0	10	129	0	0
11	1	9	4	0	0
12	0	5	12	0	0
13	0	2	51	0	2
14	1	4	16	0	3
15	0	1	153	0	7
16	0	1	1291	0	13
17	0	6	561	0	14
18	0	10	1021	0	7
19	1	13	1166	0	28
20	0	4	599	0	35
21	0	14	387	0	53
22	2	11	103	0	42
23	2	23	908	0	1
24	1	18	211	0	0
25	0	9	67	5	0
26	2	16	5442	0	44
27	0	26	153	0	23
28	2	8	41	0	13
29	0	22	62	0	18
30	7	24	.20	0	4
31	5	32	34	0	61

Table F-22 (Contd)

Date	Striped Bass	White Perch	Tomcod	American Shad	Other *Alosa* spp.
8/ 1/73	17	31	34	0	0
2	27	144	82	0	1
3	22	89	23	0	4
4	11	118	18	0	8
5	35	510	47	0	4
6	2	9	40	0	68
7	0	7	78	0	35
8	10	62	39	0	7
9	11	68	37	0	0
10	5	33	19	0	10
11	2	10	13	0	0
12	10	122	194	0	0
13	4	33	40	0	1
14	12	49	98	0	2
15	1	43	85	0	55
16	3	43	84	0	34
17	13	146	84	0	97
18	9	186	71	0	56
19	1	98	70	0	41
20	5	139	185	0	59
21	4	82	164	0	70
22	1	42	83	0	10
23	2	26	438	0	1
24	0	18	68	0	8
25	0	19	48	0	2
26	4	41	419	0	1
27	1	14	161	0	5
28	1	16	151	0	5
29	5	31	74	0	5
30	4	22	284	0	1
31	1	26	150	0	3
9/ 1/73	1	38	98	0	6
2	5	29	75	0	5
3	2	21	84	0	4
4	0	14	92	0	0
5	1	12	41	1	7
6	0	3	15	0	2
7	2	2	6	0	1
8	0	3	7	0	1
9	0	2	4	0	0
10	0	0	6	0	1
11	0	1	0	0	1
12	1	0	0	0	0
20	0	12	0	0	0
21	0	3	1	0	3
22	1	3	0	0	1
23	1	5	0	0	7
24	2	5	0	0	4
25	1	6	0	0	14
26	0	0	0	0	3
27	1	14	0	0	2
28	2	36	0	0	7
29	1	7	0	0	4
30	0	3	0	0	1
10/ 1/73	0	5	0	0	4
2	0	0	0	0	0
3	0	2	0	0	5
4	0	1	0	0	5
5	0	0	0	0	1
6	0	0	0	0	0
7	0	4	0	0	2
8	1	1	0	0	0
9	0	0	0	0	0
10	0	0	0	0	1
11	0	1	0	0	1
12	0	1	0	0	5
13	0	0	0	0	7
14	0	1	0	0	10
15	0	1	0	0	15
16	2	2	1	0	17
17	0	0	0	0	0
18	2	1	0	0	2
19	1	0	0	0	3
20	0	1	0	0	1
23	0	0	0	0	0
24	0	0	0	0	5
25	0	2	0	0	5
26	1	2	0	0	8
27	2	0	0	0	7
28	2	6	0	0	9
29	0	5	0	0	18
30	2	3	0	0	2
31	1	4	0	0	1

Table F-22 (Contd)

Date	Striped Bass	White Perch	Tomcod	American Shad	Other *Alosa* spp.
11/ 1/73	0	0	0	0	2
3	3	2	0	0	10
5	2	7	0	0	2
6	1	2	0	1	12
7	10	9	0	0	15
8	7	3	0	0	6
9	2	5	0	0	9
10	7	1	0	0	20
11	8	9	0	2	15
12	7	57	0	0	48
13	25	246	3	1	257
18	8	18	0	0	14
19	3	4	0	0	16
20	4	13	0	0	17
21	2	18	0	0	19
23	0	3	0	0	4
24	3	12	0	0	16
25	4	16	0	0	15
26	8	72	0	0	18
27	0	11	0	0	3
28	0	51	0	0	11
29	3	41	0	0	7
30	6	41	0	0	7
12/ 1/73	4	42	0	0	12
2	5	34	0	0	11
3	2	51	0	0	8
4	1	39	0	0	14
5	2	28	0	0	12
6	4	15	0	0	5
7	3	35	0	0	9
8	2	42	0	0	10
9	5	114	0	0	9
10	0	80	0	0	4
11	22	315	3	1	45
12	8	177	0	0	31
13	10	127	1	0	17
14	7	167	0	0	10
15	8	162	0	0	12
16	7	84	0	0	6
20	6	83	1	0	1
21	1	86	0	0	0
22	2	36	2	0	0
29	1	45	1	0	0

Table F-23

1974 Impingement Data, Indian Point Unit 2

Date	Striped Bass	White Perch	Tomcod	American Shad	Other *Alosa* spp.
1/20/74	0	29	0	0	0
22	0	51	0	0	0
23	4	54	0	0	0
24	6	181	0	0	1
25	54	1508	8	0	0
26	181	7487	10	0	1
27	87	6438	0	0	0
28	31	3085	2	0	0
29	7	1222	4	0	0
30	2	56	1	0	0
31	17	2048	1	0	0
2/ 1/74	3	106	3	0	0
2	1	54	0	0	0
3	1	36	0	0	0
4	4	22	0	0	0
5	0	20	2	0	0
6	5	127	2	0	0
7	21	823	1	0	0
8	43	2288	0	0	0
9	40	2125	0	0	0
10	25	434	0	0	0
11	33	666	0	0	0
12	24	650	1	0	0
13	17	370	0	0	0
14	9	603	0	0	0
15	5	785	0	0	0
16	8	604	0	0	0
17	8	2115	0	0	0
18	31	1604	0	0	0
19	31	2359	0	0	0
20	9	1043	0	0	4
21	25	1656	0	0	7
22	71	4464	0	0	6
3/13/74	0	79	1	0	0
14	1	110	1	0	0
15	0	185	0	0	0
16	3	394	0	0	0
17	4	646	0	0	0
18	1	397	1	0	0
19	7	1698	0	0	1
20	6	380	0	0	0
21	18	1810	0	0	0
22	12	660	0	0	1
23	33	4919	0	0	0
24	44	4156	0	0	2
25	13	1813	0	0	1
26	53	9600	0	0	0
27	15	2247	0	0	1
28	10	2344	1	0	0
29	3	2335	0	0	0
30	6	2451	0	0	1
31	24	2763	0	0	0
4/ 1/74	6	606	0	0	0
2	60	3825	0	0	0
3	51	3196	0	0	4
4	69	5649	0	0	0
5	40	3303	0	0	0
6	45	5060	0	0	3
7	3	2217	0	0	0
8	13	4142	0	0	0
9	42	11631	1	0	1
10	9	1622	0	0	0
11	5	1007	0	0	0
12	0	2725	0	0	0
13	4	1928	0	0	0
14	2	772	0	0	1
15	0	997	0	0	0
16	0	943	0	0	0
17	0	2008	0	0	0
18	0	2703	0	0	0
19	0	1515	0	0	0
20	0	240	0	0	0
21	1	244	0	0	0
22	1	86	0	0	1
23	2	224	0	0	0
24	2	509	0	0	3
25	1	388	0	0	4
26	1	309	0	0	23
27	4	1499	0	0	46
28	7	2270	0	0	54
29	7	3796	0	0	80
30	23	5333	1	0	127

Table F-23 (Contd)

Date	Striped Bass	White Perch	Tomcod	American Shad	Other *Alosa* spp.
5/ 1/74	17	3202	0	0	54
2	132	13709	0	0	150
3	120	6349	0	0	70
4	1	114	0	0	2
5	14	998	0	0	13
6	22	2043	0	0	56
7	36	1640	1	0	205
8	168	4833	11	0	491
9	17	2502	4	0	72
10	31	6571	4	0	184
11	0	479	5	0	7
12	0	83	1	0	1
13	1	277	1	0	1
14	0	72	2	0	4
15	1	71	0	0	1
16	0	70	0	0	0
17	1	169	2	0	6
18	2	56	1	0	2
19	5	895	24	0	10
20	60	1855	109	0	15
21	40	1519	320	0	26
22	105	1466	1078	0	37
23	18	2025	434	0	25
24	27	1889	1370	0	84
25	21	1727	1998	0	155
26	17	1124	2763	0	69
27	19	1051	1118	0	76
28	10	762	1461	0	68
29	15	662	404	0	47
30	6	652	418	0	33
31	6	512	1295	0	18
6/ 1/74	16	1178	2110	0	54
2	44	1887	4782	0	82
3	44	1771	9293	0	114
4	23	316	1363	0	28
5	2	103	735	0	12
6	5	149	1238	0	24
7	7	192	1644	0	65
8	2	287	4687	0	52
9	6	242	2314	0	47
10	7	146	1045	0	51
11	6	115	3643	0	46
12	1	98	4658	0	58
13	2	54	1730	0	25
14	2	105	18235	0	56
15	0	6	402	0	3
16	0	7	72	1	2
17	5	53	4702	2	50
18	2	22	2064	0	39
19	12	117	5357	1	77
20	6	74	3492	0	29
21	2	17	2686	1	13
22	0	38	6917	0	40
23	0	49	3398	0	37
24	2	35	3048	0	18
25	3	49	6631	0	8
26	3	24	3096	0	11
27	4	56	2240	0	8
28	1	109	4893	0	11
29	0	55	2825	0	19
30	0	80	3652	0	11
7/ 1	1	56	548	0	6
2	1	130	1010	0	2
3	6	75	1412	0	6
4	4	30	7104	0	6
5	5	10	2189	0	1
6	7	11	1064	0	5
7	3	55	680	0	15
8	8	16	1646	0	8
9	15	25	1348	0	6
10	9	7	407	0	0
11	7	7	193	0	3
12	4	10	3297	0	4
13	4	7	14527	0	4
14	4	10	5588	0	0
15	2	15	1148	0	3
16	4	8	293	0	2
17	3	8	248	0	0
18	10	4	749	0	2
19	7	4	9624	0	5
20	8	22	5899	0	2
21	14	38	2661	0	2
22	9	25	442	0	4
23	28	28	263	0	0
24	19	50	2070	0	1

Table F-23 (Contd)

Date (1974)	Striped Bass	White Perch	Atlantic Tomcod	American Shad	Other *Alosa* spp.
7/25/74	15	56	929	0	1
26	40	13	2806	0	1
27	4	17	2152	0	0
28	7	10	2933	0	0
29	22	8	1028	0	0
30	42	8	851	0	1
31	1	0	5	0	0
8/ 1/74	15	10	788	13	7
2	21	9	2878	9	18
3	19	4	1305	0	5
4	24	13	11422	0	30
5	4	3	470	2	1
6	1	0	521	0	0
7	25	21	1996	21	21
8	44	53	6266	54	100
9	26	30	4038	22	16
10	4	7	461	5	8
11	11	19	555	16	15
12	52	71	3011	12	95
13	33	111	1840	0	5
14	22	43	535	9	17
15	8	30	354	2	9
16	56	61	864	19	24
17	13	27	3113	15	26
18	15	22	4594	10	42
19	14	19	2441	0	5
20	14	37	1636	0	15
21	28	94	2068	0	43
22	32	123	681	1	28
23	42	66	1440	11	25
24	20	53	241	7	52
25	7	69	535	8	15
26	9	91	874	1	29
27	9	75	620	9	43
28	3	16	113	3	4
29	1	19	297	2	4
30	11	13	53	4	10
31	5	15	277	1	15
9/ 1/74	5	16	312	4	9
2	21	41	963	17	31
3	6	40	916	12	22
4	27	68	1125	15	37
5	37	103	2308	28	72
6	17	80	661	18	29
7	11	55	652	2	10
8	4	32	767	2	5
9	3	31	487	2	0
10	2	43	345	2	8
11	19	200	1312	4	24
12	24	117	1971	1	31
13	11	78	1559	3	19
14	11	33	1762	2	22
15	47	150	2812	15	34
16	26	139	4492	15	39
17	23	115	1890	8	16
18	26	204	5294	15	46
19	19	90	2739	12	27
20	15	178	2211	11	34
21	18	198	2462	13	34
22	19	459	318	2	14
23	11	217	202	5	19
24	4	117	74	2	13
25	2	55	72	1	8
26	3	28	0	0	5
27	6	153	47	7	13
28	4	32	40	1	7
29	0	26	15	3	7
30	6	406	11	6	15

Table F-24

1974 Impingement Data, Indian Point Unit 3

Date (1974)	Striped Bass	White Perch	Atlantic Tomcod	American Shad	Other *Alosa* spp.
7/ 1/74	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0	0	0	0
6	0	0	0	0	0
7	0	0	0	0	0
8	0	0	0	0	0
9	0	0	0	0	0
10	0	0	0	0	0
11	0	0	0	0	0
12	0	0	0	0	0
13	0	0	0	0	0
14	0	0	0	0	0
15	0	0	0	0	0
16	0	0	0	0	0
17	0	0	0	0	0
18	1	1	7	0	0
19	1	2	1045	0	1
20	4	4	284	0	1
21	3	3	1123	0	1
22	2	3	261	0	1
23	2	1	146	0	9
24	0	0	0	0	0
25	0	0	0	0	0
26	0	0	0	0	0
27	0	0	0	0	0
28	0	0	0	0	0
29	0	0	0	0	0
30	0	0	0	0	0
31	0	0	0	0	0
8/ 1/74	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0	0	0	0
6	0	0	0	0	0
7	1	0	12	0	0
8	2	0	230	0	6
9	0	0	79	0	0
10	4	1	67	0	0
11	1	1	36	0	3
12	1	0	20	0	0
13	0	0	4	0	0
14	0	0	0	0	0
15	0	0	0	0	0
16	0	0	0	0	0
17	0	0	0	0	0
18	0	0	0	0	0
19	0	0	0	0	0
20	0	0	0	0	0
21	0	0	0	0	0
22	0	0	0	0	0
23	0	0	0	0	0
24	0	0	0	0	0
25	0	0	0	0	0
26	0	0	0	0	0
27	0	0	0	0	0
28	0	0	0	0	0
29	0	0	0	0	0
30	0	0	0	0	0
31	0	0	0	0	0
9/ 1/74	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	1	0	16	0	1
5	2	1	50	2	0
6	1	2	21	1	0
7	0	3	33	0	1
8	1	1	25	0	0
9	4	2	38	0	0
10	2	0	20	0	0
11	0	0	0	0	0
12	0	0	0	0	0
13	0	0	0	0	0
14	0	0	0	0	0
15	0	0	0	0	0
16	0	0	0	0	0
17	0	0	0	0	0
18	0	0	0	0	0
19	0	0	0	0	0
20	0	0	0	0	0
21	0	0	0	0	0
22	0	0	0	0	0
23	0	0	0	0	0
24	0	0	0	0	0
25	0	0	0	0	0
26	0	0	0	0	0
27	0	0	0	0	0
28	0	0	0	0	0
29	0	0	0	0	0
30	0	0	0	0	0

Table F-25

Sampling and Plant Operation Data for January-June 1973

Plant	Unit	Jan-Mar 1973 No. of Operating Days	Jan-Mar 1973 No. of Sample Days	Jan-Mar 1973 Volume Pumped x 10^6 g	Apr-Jun 1973 No. of Operating Days	Apr-Jun 1973 No. of Sample Days	Apr-Jun 1973 Volume Pumped x 10^6 g
Bowline	1 and 2	68	9	31,356.14**	90	9	41,084.40**
Lovett	1 and 2	78	8	4,311.26	63	5	3,460.97
	3	85	10	4,924.24	38	3	1,971.90
	4	89	11	13,216.94	89	7	13,212.77
	5	90	8	15,552.00	91	7	15,714.00
Indian Point	1*	12	12	5,298.12	31	31	12,238.85
	2*	49	49	18,026.21	81	81	27,231.12
Danskammer	1 and 2	90	11	5,132.90	91	8	10,092.60
	3 and 4	90	11	17,273.52	91	8	22,927.08

*Impingement is monitored every day at Indian Point; therefore, number of operating days = number of sample days.

**Includes data from Bowline Unit 1 only.

Table F-26

Sampling and Plant Operation Data for July 1973-June 1974

Plant	Unit	Jul-Sep 1973 No. of Operating Days	Jul-Sep 1973 No. of Sample Days	Jul-Sep 1973 Volume Pumped x 10^6 g	Oct-Dec 1973 No. of Operating Days	Oct-Dec 1973 No. of Sample Days	Oct-Dec 1973 Volume Pumped x 10^6 g	Jan-Mar 1974 No. of Operating Days	Jan-Mar 1974 No. of Sample Days	Jan-Mar 1974 Volume Pumped x 10^6 g	Apr-Jun 1974 No. of Operating Days	Apr-Jun 1974 No. of Sample Days	Apr-Jun 1974 Volume Pumped x 10^6 g
Bowline	1 and 2*	92	8	45,000.53‡	90	6	44,324.14*	85	4	38,394.02	52.5	8	45,008.54‡
Lovett	1 and 2	77	6	4,878.28	35	2	1,593.82	59	3	4,220.68†	†		
	3	90	6	5,443.20	89	6	5,356.26	37	2	2,176.65	0	0	0
	4	92	6	13,715.19	78	4	11,541.32	64	0	9,081.92	91	9	13,208.14
	5	85	5	14,414.40	83	5	13,728.60	81	4	13,265.60	91	11	15,398.09
Indian Point	1**	7	7	7,554.67	8	8	11,265.55	73	73	21,813.00	73	73	29,820.39
	2**	85	85	57,003.26	71	71	25,139.23	52	52	16,811.13	91	91	73,827.22
Danskammer	1 and 2	91	6	11,085.48	90	7	7,620.48	92	6	5,746.86	92	10	8,178.92
	3 and 4	92	6	30,172.86	92	7	20,979.20	90	6	18,038.12	91	10	16,865.30

*Bowline Unit 2 began operating April 1974.

**Impingement is monitored every day at Indian Point; therefore, number of operating days = number of sample days.

†Estimate for Lovett Units 1 and 2 for January-June 1974.

‡Includes data from Bowline Unit 1 only. Flow data for the following units and days are unavailable due to equipment failure; flow assumed at maximum rates:

Bowline Units 1 and 2	9/1-4/73
Maximum flow, 553,000,000 gpd	10/6-9/73
	11/8-21/73
	12/23-26/73

‡Bowline Units 1 and 3 operated a different number of days; therefore:

No. of operating days = avg of each unit operation

$$N = \frac{\text{No. of Unit-1 days and No. of Unit-2 days}}{2}$$

Table F-27

Sampling and Plant Operation Data for July-September 1974

Plant	Unit	No. of Operating Days	No. of Sample Days	Volume Pumped x 10^6 g
Bowline	1 and 2	92	12	86,455.72
Lovett	1 and 2	20	3	927.80
	3	26	2	1,132.24
	4	91	13	13,196.56
	5	92	13	15,503.40
Indian Point	1**	92	92	38,069.42
	2**	92	92	95,455.15
	3	*	*	*
Roseton	1 and 2	56	7	25,439.00
Danskammer	1 and 2	92	13	9,111.84
	3 and 4	92	13	27,439.70

*Not available.

**Impingement is monitored every day at Indian Point; therefore, number of operating days = number of sample days.

Table F-28

Striped Bass Impingement Estimates for January-June 1973

Plant	Unit	Jan-Mar 1973 No. Impinged ± SE	Apr-Jun 1973 No. Impinged ± SE	Total No. Impinged ± SE
Bowline	1 and 2	4,055 ± 906	2,565 ± 739	6,620 ± 1,169
Plant Total		4,055 ± 906	2,565 ± 739	6,620 ± 1,169
Lovett	1 and 2	12 ± 10	0 ± 0	12 ± 10
	3	101 ± 53	0 ± 0	101 ± 53
	4	292 ± 73	187 ± 143	479 ± 161
	5	700 ± 178	989 ± 546	1,689 ± 574
Plant Total		1,105 ± 200	1,176 ± 569	2,281 ± 599
Indian Point	1*	0	783	783
	2*	17	452	469
Plant Total		17	1,235	1,252
Danskammer	1 and 2	9 ± 8	225 ± 59	234 ± 60
	3 and 4	39 ± 30	385 ± 185	424 ± 187
Plant Total		48 ± 31	610 ± 194	658 ± 196
Multiplant Total		5,225 ± 928	5,586 ± 950	10,811 ± 1,328
Post 1972 Plant Total**		4,072 ± 906	3,017 ± 739	7,089 ± 1,169

*Impingement is monitored every day at Indian Point; therefore, number of operating days = number of sample days.

**Bowline Units 1 and 2 and Indian Point Unit 2.

Table F-29

White Perch Impingement Estimates for January-June 1973

Plant	Unit	Jan-Mar 1973 No. Impinged ± SE	Apr-Jun 1973 No. Impinged ± SE	Total No. Impinged ± SE
Bowline	1 and 2	40,822 ± 8,573	30,607 ± 7,941	71,429 ± 11,686
Plant Total		40,822 ± 8,573	30,607 ± 7,941	71,429 ± 11,686
Lovett	1 and 2	128 ± 51	0 ± 0	128 ± 51
	3	683 ± 194	209 ± 105	892 ± 221
	4	5,949 ± 2,030	2,433 ± 526	8,382 ± 2,097
	5	9,405 ± 2,739	13,614 ± 6,059	23,019 ± 6,649
Plant Total		16,165 ± 3,415	16,256 ± 6,083	32,421 ± 6,976
Indian Point	1*	18	45,905	45,923
	2*	2,379	28,703	31,082
Plant Total		2,397	74,608	77,005
Danskammer	1 and 2	325 ± 109	20,764 ± 3,088	21,089 ± 3,090
	3 and 4	394 ± 85	7,520 ± 1,715	7,914 ± 1,717
Plant Total		719 ± 138	28,289 ± 3,532	29,003 ± 3,535
Multiplant Total		60,103 ± 9,229	149,755 ± 10,608	209,858 ± 14,061
Post 1972 Plant Total**		43,201 ± 8,573	59,310 ± 7,941	102,511 ± 11,686

*Impingement is monitored every day at Indian Point; therefore, number of operating days = number of sample days.

**Bowline Units 1 and 2 and Indian Point Unit 2.

Table F-30

Atlantic Tomcod Impingement Estimates for January-June 1973

Plant	Unit	Jan-Mar 1973 No. Impinged ± SE	Apr-Jun 1973 No. Impinged ± SE	Total No. Impinged ± SE
Bowline	1 and 2	11,963 ± 3,707	813 ± 192	12,776 ± 3,712
Plant Total		11,963 ± 3,707	813 ± 192	12,776 ± 3,712
Lovett	1 and 2	232 ± 77	0 ± 0	232 ± 77
	3	720 ± 382	52 ± 57	772 ± 386
	4	22,110 ± 7,792	37 ± 37	22,147 ± 7,792
	5	77,232 ± 23,334	585 ± 296	77,817 ± 23,336
Plant Total		100,294 ± 24,604	674 ± 304	100,968 ± 24,606
Indian Point	1*	18	2,618	2,636
	2*	54	8,738	8,792
Plant Total		72	11,356	11,428
Danskammer	1 and 2	123,140 ± 24,932	998 ± 554	124,138 ± 24,938
	3 and 4	831,232 ± 283,507	544 ± 254	831,776 ± 283,507
Plant Total		954,372 ± 284,601	1,542 ± 609	995,914 ± 284,601
Multiplant Total		1,066,701 ± 285,687	14,385 ± 707	1,081,086 ± 285,687
Post 1972 Plant Total**		12,017 ± 3,707	9,551 ± 192	21,568 ± 3,712

*Impingement is monitored every day at Indian Point; therefore, number of operating days = number of sample days.

**Bowline Units 1 and 2 and Indian Point Unit 2.

Table F-31

American Shad Impingement Estimates for January-June 1973

Plant	Unit	Jan-Mar 1973 No. Impinged ± SE	Apr-Jun 1973 No. Impinged ± SE	Total No. Impinged ± SE
Bowline	1 and 2	0 ± 0	13 ± 9	13 ± 9
Plant Total		0 ± 0	13 ± 9	13 ± 9
Lovett	1 and 2	0 ± 0	0 ± 0	0 ± 0
	3	0 ± 0	0 ± 0	0 ± 0
	4	0 ± 0	0 ± 0	0 ± 0
	5	37 ± 32	0 ± 0	37 ± 32
Plant Total		37 ± 32	0 ± 0	37 ± 32
Indian Point	1*	0	6	6
	2*	3	13	16
Plant Total		3	19	22
Danskammer	1 and 2	0 ± 0	0 ± 0	0 ± 0
	3 and 4	0 ± 0	0 ± 0	0 ± 0
Plant Total		0 ± 0	0 ± 0	0 ± 0
Multiplant Total		40 ± 32	32 ± 9	72 ± 33
Post 1972 Plant Total**		3 ± 0	26 ± 9	29 ± 9

*Impingement is monitored every day at Indian Point; therefore, number of operating days = number of sample days.

**Bowline Units 1 and 2 and Indian Point Unit 2.

Table F-32

Other *Alosa* spp. Impingement Estimates for January-June 1973

Plant	Unit	Jan-Mar 1973 No. Impinged ± SE	Apr-Jun 1973 No. Impinged ± SE	Total No. Impinged ± SE
Bowline	1 and 2	79 ± 16	292 ± 71	371 ± 73
Plant Total		79 ± 16	292 ± 71	371 ± 73
Lovett	1 and 2	0 ± 0	0 ± 0	0 ± 0
	3	0 ± 0	0 ± 0	0 ± 0
	4	34 ± 23	112 ± 45	146 ± 51
	5	25 ± 15	390 ± 111	415 ± 113
Plant Total		59 ± 27	502 ± 120	561 ± 123
Indian Point	1*	0	8	8
	2*	15	38	53
Plant Total		15	46	61
Danskammer	1 and 2	0 ± 0	4,767 ± 1,168	4,767 ± 1,168
	3 and 4	20 ± 15	994 ± 381	1,014 ± 381
Plant Total		20 ± 15	5,761 ± 1,229	5,781 ± 1,229
Multiplant Total		173 ± 35	6,601 ± 1,236	6,774 ± 1,237
Post 1972 Plant Total**		94 ± 16	330 ± 71	424 ± 73

*Impingement is monitored every day at Indian Point; therefore, number of operating days = number of sample days.

**Bowline Units 1 and 2 and Indian Point Unit 2.

Table F-33

Striped Bass Impingement Estimates for July 1973-June 1974

Plant	Unit	Jul-Sep 1973 No. Impinged ± SE	Oct-Dec 1973 No. Impinged ± SE	Jan-Mar 1974 No. Impinged ± SE	Apr-Jun 1974 No. Impinged ± SE	Total No. Impinged ± SE
Bowline	1 and 2*	449 ± 146‡	1,635 ± 1,353‡	17,756 ± 7,328	1,140 ± 679‡	20,981 ± 7,484
Plant Total		449 ± 146	1,635 ± 1,353	17,756 ± 7,328	1,140 ± 679	20,981 ± 7,484
Lovett	1 and 2	25 ± 15	0 ± 0	0 ± 0†	†	25 ± 15
	3	51 ± 29	59 ± 42	0 ± 0	0 ± 0	110 ± 51
	4	153 ± 88	512 ± 179	No Data	167 ± 56	832 ± 207
	5	1,139 ± 612	1,668 ± 551	4,223 ± 1,230	1,364 ± 678	8,404 ± 1,628
Plant Total		1,368 ± 620	2,239 ± 581	4,233 ± 1,230	1,531 ± 680	9,371 ± 1,642
Indian Point	1**	0	39	278	440	757
	2**	272	228	1,065	1,517	3,082
Plant Total		272	267	1,343	1,957	3,839
Danskammer	1 and 2	2,070 ± 770	14,167 ± 8,616	116 ± 90	862 ± 217	17,215 ± 8,654
	3 and 4	1,996 ± 725	2,916 ± 875	72 ± 71	269 ± 67	5,253 ± 1,141
Plant Total		4,066 ± 1,058	17,083 ± 8,660	188 ± 115	1,131 ± 227	22,468 ± 8,729
Multiplant Total		6,155 ± 1,234	21,224 ± 8,784	23,521 ± 7,431	5,759 ± 988	56,659 ± 11,615
Post 1972 Plant Total††		721 ± 146	1,863 ± 1,353	18,821 ± 7,328	2,657 ± 679	24,063 ± 7,484

*Bowline Unit 2 began operating April 1974.

**Impingement is monitored every day at Indian Point; therefore, number of operating days = number of sample days.

†Estimate for Lovett Units 1 and 2 is for January-June 1974.

‡Flow data for the following units and days are unavailable due to equipment failure; flow assumed at maximum rates:

Bowline Units 1 and 2 — 9/1-4/73
Maximum flow, 553,000,000 gpd — 10/6-9/73
11/8-21/73
12/23-26/73

‡Bowline Units 1 and 3 operated a different number of days; therefore:

No of operating days = avg of each unit operation

$$N = \frac{\text{No. of Unit-1 days and No. of Unit-2 days}}{2}$$

††Bowline Units 1 and 2 and Indian Point Unit 2.

Table F-34

White Perch Impingement Estimates for July 1973-June 1974

Plant	Unit	Jul-Sep 1973 No. Impinged ± SE	Oct-Dec 1973 No. Impinged ± SE	Jan-Mar 1974 No. Impinged ± SE	Apr-Jun 1974 No. Impinged ± SE	Total No. Impinged ± SE
Bowline	1 and 2*	3,338 ± 1,977‡	20,549 ± 22,541‡	116,335 ± 32,656	8,908 ± 3,813‡	149,130 ± 39,901
Plant Total		3,338 ± 1,977	20,549 ± 22,541	116,335 ± 32,656	8,908 ± 3,813	149,130 ± 39,901
Lovett	1 and 2	74 ± 36	0 ± 0	0 ± 0†	†	74 ± 36
	3	204 ± 31	605 ± 354	18 ± 18	0 ± 0	827 ± 356
	4	1,162 ± 492	1,923 ± 1,012	No Data	4,019 ± 1,743	7,104 ± 2,075
	5	5,040 ± 3,311	20,259 ± 9,529	27,227 ± 12,926	17,817 ± 7,108	70,343 ± 17,871
Plant Total		6,480 ± 3,348	22,787 ± 9,589	27,245 ± 12,926	21,836 ± 7,319	38,348 ± 17,995
Indian Point	1**	3	993	17,983	11,932	30,911
	2**	2,877	2,512	84,123	137,558	227,070
Plant Total		2,880	3,505	102,106	149,490	257,981
Danskammer	1 and 2	27,481 ± 13,608	37,955 ± 13,808	464 ± 277	32,525 ± 12,181	98,425 ± 22,897
	3 and 4	10,216 ± 4,379	6,235 ± 1,348	359 ± 253	9,233 ± 2,437	26,043 ± 5,196
Plant Total		37,697 ± 14,295	44,190 ± 13,874	823 ± 375	41,758 ± 12,422	124,468 ± 23,479
Multiplant Total		50,395 ± 14,814	91,031 ± 28,136	246,509 ± 35,123	221,922 ± 14,914	609,927 ± 49,671
Post 1972 Plant Total††		6,215 ± 1,977	23,061 ± 22,541	200,458 ± 32,656	146,466 ± 3,813	376,200 ± 39,901

*Bowline Unit 2 began operating April 1974.

**Impingement is monitored every day at Indian Point; therefore, number of operating days = number of sample days.

†Estimate for Lovett Units 1 and 2 is for January-June 1974.

‡Flow data for the following units and days are unavailable due to equipment failure; flow assumed at maximum rates:

Bowline Units 1 and 2	9/1-4/73
Maximum flow, 553,000,000 gpd	10/6-9/73
	11/8-21/73
	12/23-26/73

‡Bowline Units 1 and 3 operated a different number of days; therefore:

No of operating days = avg of each unit operation

$$N = \frac{\text{No. of Unit-1 days and No. of Unit-2 days}}{2}$$

††Bowline Units 1 and 2 and Indian Point Unit 2.

Table F-35

Atlantic Tomcod Impingement Estimates for July 1973-June 1974

Plant	Unit	Jul-Sep 1973 No. Impinged ± SE	Oct-Dec 1973 No. Impinged ± SE	Jan-Mar 1974 No. Impinged ± SE	Apr-Jun 1974 No. Impinged ± SE	Total No. Impinged ± SE
Bowline	1 and 2*	1,038 ± 709‡	25 ± 20‡	400 ± 171	6,202 ± 3,198‡	7,665 ± 3,280
Plant Total		1,038 ± 709	25 ± 20	400 ± 171	6,202 ± 3,198	7,665 ± 3,280
Lovett	1 and 2	0 ± 0	0 ± 0	0 ± 0†	†	0 ± 0
	3	68 ± 35	15 ± 14	0 ± 0	0 ± 0	83 ± 38
	4	1,146 ± 871	0 ± 0	No Data	577 ± 335	1,723 ± 933
	5	1,864 ± 1,366	0 ± 0	6,869 ± 4,204	3,658 ± 2,160	12,391 ± 4,920
Plant Total		3,078 ± 1,620	15 ± 14	6,869 ± 4,204	4,235 ± 2,168	14,197 ± 5,008
Indian Point	1**	0	386	429	28,247	29,062
	2**	16,432	47	41	125,025	142,298
Plant Total		16,432	433	470	154,025	171,360
Danskammer	1 and 2	142 ± 61	410 ± 221	48,734 ± 36,260	308 ± 141	49,594 ± 36,261
	3 and 4	399 ± 193	5,974 ± 6,499	97,842 ± 51,443	92 ± 56	104,307 ± 51,842
Plant Total		541 ± 202	6,384 ± 6,503	146,576 ± 62,938	400 ± 152	153,901 ± 63,273
Multiplant Total		21,089 ± 1,780	6,857 ± 6,503	154,315 ± 63,078	164,862 ± 3,877	347,123 ± 63,556
Post 1972 Plant Total††		17,470 ± 709	72 ± 20	441 ± 171	131,980 ± 3,198	149,963 ± 3,280

*Bowline Unit 2 began operating April 1974.

**Impingement is monitored every day at Indian Point; therefore, number of operating days = number of sample days.

†Estimate for Lovett Units 1 and 2 is for January-June 1974.

‡Flow data for the following units and days are unavailable due to equipment failure; flow assumed at maximum rates:

Bowline Units 1 and 2 — 9/1-4/73
Maximum flow, 553,000,000 gpd — 10/6-9/73
11/8-21/73
12/23-26/73

‡Bowline Units 1 and 3 operated a different number of days; therefore:

No of operating days = avg of each unit operation

$$N = \frac{\text{No. of Unit-1 days and No. of Unit-2 days}}{2}$$

††Bowline Units 1 and 2 and Indian Point Unit 2.

Table F-36

American Shad Impingement Estimates for July 1973-June 1974

Plant	Unit	Jul-Sep 1973 No. Impinged ± SE	Oct-Dec 1973 No. Impinged ± SE	Jan-Mar 1974 No. Impinged ± SE	Apr-Jun 1974 No. Impinged ± SE	Total No. Impinged ± SE
Bowline	1 and 2*	131 ± 107‡	190 ± 97‡	681 ± 669	0 ± 0‡	1,002 ± 684
Plant Total		131 ± 107	190 ± 97	681 ± 669	0 ± 0	1,002 ± 684
Lovett	1 and 2	0 ± 0	0 ± 0	0 ± 0†	†	0 ± 0
	3	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0
	4	61 ± 37	82 ± 58	No Data	0 ± 0	143 ± 69
	5	35 ± 20	179 ± 68	0 ± 0	0 ± 0	214 ± 71
Plant Total		96 ± 42	261 ± 89	0 ± 0	0 ± 0	357 ± 99
Indian Point	1**	0	164	3	521	688
	2**	44	761	22	2,692	3,519
Plant Total		44	5	25	3,213	4,207
Danskammer	1 and 2	323 ± 182	591 ± 261	0 ± 0	0 ± 0	914 ± 318
	3 and 4	262 ± 103	178 ± 99	0 ± 0	0 ± 0	440 ± 143
Plant Total		585 ± 209	769 ± 279	0 ± 0	0 ± 0	1,354 ± 349
Multiplant Total		856 ± 239	2,145 ± 309	706 ± 669	3,213 ± 0	6,920 ± 774
Post-1972 Plant Total††		175 ± 107	951 ± 97	703 ± 669	2,692 ± 0	4,521 ± 684

*Bowline Unit 2 began operating April 1974.

**Impingement is monitored every day at Indian Point; therefore, number of operating days = number of sample days.

†Estimate for Lovett Units 1 and 2 is for January-June 1974.

‡Flow data for the following units and days are unavailable due to equipment failure; flow assumed at maximum rates:

Bowline Units 1 and 2	9/1-4/73
Maximum flow, 553,000,000 gpd	10/6-9/73
	11/8-21/73
	12/23-26/73

‡Bowline Units 1 and 3 operated a different number of days; therefore:

No of operating days = avg of each unit operation

$$N = \frac{\text{No. of Unit-1 days and No. of Unit-2 days}}{2}$$

††Bowline Units 1 and 2 and Indian Point Unit 2.

Table F-37

Other *Alosa* spp. Impingement Estimates for July 1973-June 1974

Plant	Unit	Jul-Sep 1973 No. Impinged ± SE	Oct-Dec 1973 No. Impinged ± SE	Jan-Mar 1974 No. Impinged ± SE	Apr-Jun 1974 No. Impinged ± SE	Total No. Impinged ± SE
Bowline	1 and 2*	12,471 ± 7,751‡	21,715 ± 12,934‡	15,215 ± 14,655	1,467‡ ± 303	50,868 ± 21,029
Plant Total		12,471 ± 7,751	21,715 ± 12,934	15,215 ± 14,655	1,467 ± 303	50,868 ± 21,029
Lovett	1 and 2	0 ± 0	29 ± 23	0 ± 0†	†	29 ± 23
	3	476 ± 237	1,018 ± 434	0 ± 0	0 ± 0	1,494 ± 494
	4	2,094 ± 865	3,151 ± 1,286	No Data	622 ± 174	5,867 ± 1,560
	5	3,952 ± 1,348	9,077 ± 5,330	712 ± 445	1,829 ± 607	15,570 ± 5,549
Plant Total		6,522 ± 1,619	13,246 ± 5,500	712 ± 445	2,451 ± 631	22,960 ± 5,785
Indian Point	1 and 2**	0	22	1	325	348
	3 and 4**	1,000	137	4	732	1,873
Plant Total		1,000	159	5	1,057	2,221
Danskammer	1 and 2	64,279 ± 43,781	56,885 ± 26,811	26 ± 30	4,766 ± 1,255	125,956 ± 51,353
	3 and 4	32,715 ± 13,600	28,021 ± 10,893	0 ± 0	1,411 ± 368	62,147 ± 17,429
Plant Total		96,994 ± 45,845	84,906 ± 28,939	26 ± 30	6,111 ± 1,308	188,103 ± 54,230
Multiplant Total		116,987 ± 46,523	120,055 ± 32,172	15,958 ± 14,662	11,152 ± 1,484	264,152 ± 58,452
Post 1972 Plant Total††		13,471 ± 7,751	21,852 ± 12,934	15,219 ± 14,655	2,199 ± 303	52,741 ± 21,029

*Bowline Unit 2 began operating April 1974.

**Impingement is monitored every day at Indian Point; therefore, number of operating days = number of sample days.

†Estimate for Lovett Units 1 and 2 is for January-June 1974.

‡Flow data for the following units and days are unavailable due to equipment failure; flow assumed at maximum rates:

Bowline Units 1 and 2 — 9/1-4/73
Maximum flow, 553,000,000 gpd — 10/6-9/73
11/8-21/73
12/23-26/73

‡Bowline Units 1 and 3 operated a different number of days; therefore:

No of operating days = avg of each unit operation

$$N = \frac{\text{No. of Unit-1 days and No. of Unit-2 days}}{2}$$

††Bowline Units 1 and 2 and Indian Point Unit 2.

Table F-38

Impingement Estimates for July-September 1974

Plant	Unit	Striped Bass No. Impinged ± SE	White Perch No. Impinged ± SE	Atlantic Tomcod No. Impinged ± SE	American Shad No. Impinged ± SE	Other *Alosa* Species No. Impinged ± SE
Bowline	1 and 2	606 ± 147	1,317 ± 322	7,005 ± 5,013	347 ± 134	3,337 ± 949
Plant Total		606 ± 147	1,317 ± 322	7,005 ± 5,013	347 ± 134	3,337 ± 949
Lovett	1 and 2	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0
	3	17 ± 4	17 ± 4	17 ± 4	0 ± 0	17 ± 4
	4	49 ± 15	146 ± 34	661 ± 339	42 ± 16	160 ± 37
	5	282 ± 76	1,092 ± 309	5,742 ± 3,298	141 ± 67	789 ± 126
Plant Total		348 ± 78	5,163 ± 309	6,420 ± 3,315	183 ± 69	966 ± 131
Indian Point	1	287	853	21,033	197	950
	2	1,328	5,441	169,235	557	2,041
	3	33	25	3,497	3	24
Plant Total		1,648	6,319	193,765	940	3,015
Roseton	1 and 2	91 ± 41	3,859 ± 2,073	590 ± 309	85 ± 7	2,276 ± 1,191
Plant Total		91 ± 41	3,859 ± 2,073	590 ± 309	85 ± 7	2,276 ± 1,191
Danskammer	1 and 2	2,396 ± 395	8,537 ± 1,931	382 ± 324	259 ± 190	6,587 ± 1,843
	3 and 4	1,534 ± 249	5,145 ± 1,511	160 ± 55	1,074 ± 308	8,687 ± 2,202
Plant Total		3,930 ± 467	13,682 ± 2,452	542 ± 329	1,333 ± 362	15,274 ± 2,871
Multiplant Total		6,623 ± 497	30,340 ± 3,242	208,322 ± 6,027	2,888 ± 392	24,868 ± 3,253
Post 1972 Plant Total**		2,058 ± 153	10,642 ± 2,098	180,327 ± 5,023	992 ± 134	7,678 ± 1,523

**Bowline Unit 1 and 2, Indian Point Unit 2 and 3, and Roseton Unit 1 and 2