SEABROOK ENVIRONMENTAL STUDIES 1979

FINFISH ECOLOGY INVESTIGATIONS IN HAMPTON-SEABROOK ESTUARY AND ADJOINING COASTAL WATERS

TECHNICAL REPORT XI-2

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1.0 INTRODUCTION

Hampton-Seabrook estuary and the adjacent nearshore region provides habitat for several dozen commercially, recreationally and ecologically important species of finfish. The estuary, with its extensive salt marsh and associated drainage system, serves as a nursery both for fish which spawn locally and for others that spawn in the Gulf of Maine. The open coastal waters in the immediate vicinity are also a feeding ground for the juveniles and adults of several pelagic and bottom-feeding finfish species.

A comprehensive, long-term study of finfish resources in Hampton-Seabrook estuary and vicinity began with a survey of juvenile and adult finfish in the estuary in 1969 (NAI 1971). The first ichthyoplankton survey associated with Seabrook Environmental Studies was completed in 1971 (NAI 1972). Since then, similar monitoring studies have been conducted (NAI 1974, 1975, 1976, 1977, 1979, 1980) to provide baseline data for assessing impact of Seabrook Station's once-through cooling water system. This report extends the historical data base to include 1979 data on the abundance and distribution of finfish eggs, larvae, juveniles and adults collected at various sampling sites within the estuary and in adjacent nearshore open coastal waters. The report is the fourth in a series presenting results of a preoperational monitoring program initiated in July 1975. Comparisons are made in the report between the most recent, 1979, observations and spatial and temporal trends of the previous 3-1/2 years, 1975 through 1978.

2.0 METHODS

2.1 OTTER TRAWLS

The inshore groundfish community was sampled monthly by trawling at night along Transects 1, 2 and 3 (Figure 2.1-1; Table 2.1-1) with a 9.2 m shrimp trawl (3.8 cm nylon mesh body; 1.3 cm mesh cod end liner). Four replicates were taken at each transect. The net was towed at approximately 2 kn (engine operating at 900 rpm) for 10 minutes, with successive tows taken in opposite directions. Transects 1 and 3 were located in deeper water than Transect 2 (Table 2.1-2).

2.2 GILL NETS

Gill nets were set for three consecutive 24-hr periods per month at three stations (Figure 2.1-1). Two net arrays, each consisting of a surface and bottom net, were set at each station, one parallel to and one perpendicular to the isobath (Figure 2.1-1). Additionally, two gill nets were set per station at mid-depth in March, June and October (Table 2.1-1). The nets were positioned on permanent buoys and tended daily by SCUBA divers. Stations A and B are situated over soft substrate, while C is located over rocky substrate (Table 2.1-2).

2.3 BEACH SEINING

Seine samples were taken biweekly from April to November at Stations S1, S2 and S3 (Figure 2.1-1; Table 2.1-1). Duplicate hauls were taken at each station with a 30.7 x 2.7 m bag seine. The nylon bag was 2.5 m square with 1.2 cm stretch mesh. Prior to July 1977, seine samples were collected monthly, with four replicates per station.

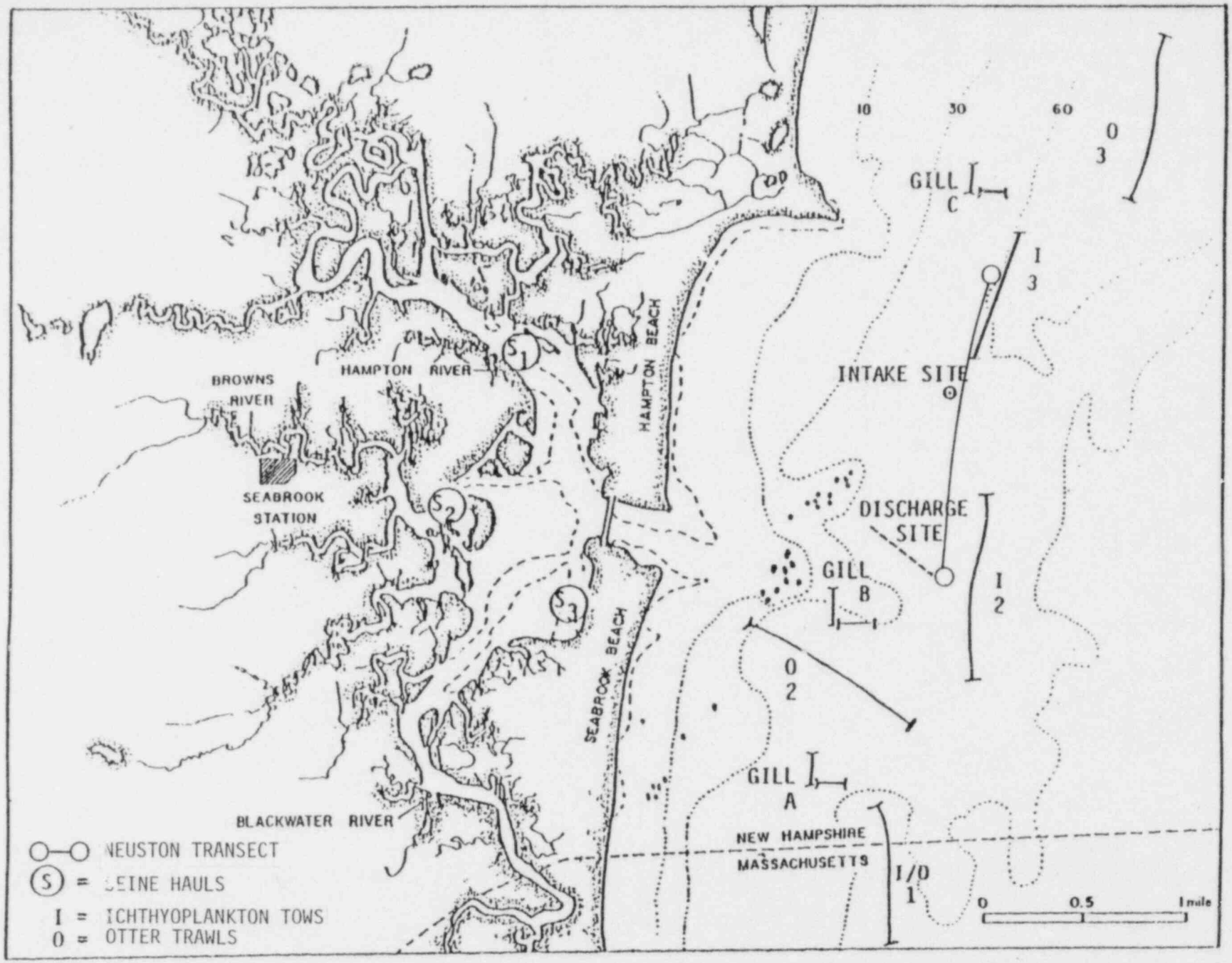


Figure 2.1-1. Finfish sampling stations, 1979. Seabrook Finfish Studies, 1979.

TABLE 2.1-1. FINFISH SAMPLING METHODS, JULY 1975 THROUGH DECEMBER 1979. SEABROOK FINFISH STUDIES, 1979.

PROGRAM	GEAR CHARACTERISTICS	SAMPLE DESIGN	SAMPLING SCHEDULE
Otter Trawl	9.2 m trawl 3.8 cm mesh body 1.3 cm liner	3 stations, offshore 4 replicates per sta. 10-minute tow	Monthly, night; year round
Gill Net	30.7 by 3.7 m nets mesh sizes: 2.5, 5.0, 10.0 and 12.5 cm	3 stations, offshore 4 nets per sta. (2 near surface, 2 near bottom)[a]	Monthly, daytime; year round[a] 3 consecutive 24 hr. sets
Beach Seining	20.7 by 0.9 bag seine Outer wings: 2.5 mesh Bag: 1.2 cm mesh	3 stations, estuary	Daytime; April through November
through June 1977		4 replicates per sta.	Monthly
after June 1977		2 replicates per sta.	Biweekly
Ichthyoplankton	1 m diameter 505 µm mesh plankton net with depressor	3 stations, offshore 4 replicates per sta.	July 1975-June 1977 monthly: all stations analyzed
		Same[b]	July 1977-Dec 1978 monthly: Jan,Sep, Oct,Nov. Biweekly: Feb, Aug, Dec.
		Same[b]	Jan-Dec 1979 biweekly

[a] two additional mid-water nets used per station in March, June and October 1979.

[b] Sta 3 (intake) - all dates analyzed

Sta 1,2 (south, discharge) - only monthly samples analyzed; others considered contingency samples

TABLE 2.1-2. DESCRIPTION OF FINFISH SAMPLING STATIONS. SEABROOK FINFISH STUDIES, 1979.

OTTER TRAWLS			
TRANSECT	TOW DEPTH	BOTTOM TYPE	REMARKS
1	20-28 meters	sand	150-200 m from rock outcroppings
2	15-17 meters	sand, drift algae w/shell debris	Scoured by tidal currents; large quantities of drift algae. 100 m from Inner Sunk Rocks
3	22-30 meters	sandy; littered with shell debris	Located off Great Boars Head; just seaward of a cobble area (Rocks 15-50 cm diameter).

GILL NETS			
STATION	BOTTOM NET DEPTH	BOTTOM TYPE	REMARKS
A	20 m	sand	Seaward from rocky outcropping off Seabrook.
B	17 m	sand	Seaward of Inner Sunk Rocks.
C	17 m	rock/cobble	Offshore from Great Boars Head

BEACH SEINES			
STATION	DEPTH	BOTTOM TYPE	REMARKS
S1	.5-2 m	sand	Scoured by tidal currents; approximately 300 m upriver from Hampton Beach Marina.
S2	.5-1 m	sand	Scoured by tidal currents; approximately 200 m from the mouth of the Brown's River.
S3	.5-3 m	sand	Scoured by tidal currents; located in Seabrook Harbor, approximately 300 m from Hampton Harbor bridge.

2.4 ALEWIFE (*ALOSA PSEUDOHARENGUS*) SURVEY

From late April to early June, the New Hampshire Fish and Game Department maintained an alewife spawning run survey site on the Taylor River approximately two miles upstream from seine station S1 on the Hampton River. The survey's principal purpose was to determine when the upstream run had peaked and then to transfer some of the spawning fish to the Winnacunnet River. In 1979, five one-minute counts of passing alewifes were made on each of six days; while, a single one-minute count was recorded on each of six additional days.

2.5 ICHTHYOPLANKTON

Ichthyoplankton monitoring samples were collected twice monthly from January through December 1979 with these exceptions, caused by weather conditions: only one sampling was made in February, the second March sample period was delayed until April 3, and the second December sample period was delayed until January 2, 1980. Four oblique tows were taken at night along Transects 1 (south), 2 (discharge) and 3 (intake) (Figure 2.1-1) using a 1-m diameter 0.505 mm mesh net. The net with depressor was set off the stern; speed was varied during the 10-minute tow, allowing the net to sink to approximately 2 m off the bottom and to rise obliquely to the surface at least twice during the tow. The standard 10-minute tow was reduced to 5 minutes during periods of high plankton density to minimize net clogging. Volume filtered was estimated with a calibrated General Oceanics digital flowmeter mounted in the net mouth. Volume filtered ranged from 91 to 859 m^3 and averaged 538 m^3. Upon retrieval, the net was washed down from mouth to cod end and the contents were preserved in 5% formalin buffered with borax. From January through July, one replicate at each station was fixed in a solution of 10% formalin, 48% ethanol, 2% glacial acetic acid and 40% deionized water to preserve ctenophores for macrozooplankton analysis.

Diel studies were conducted to examine the short-term, small-scale distribution of winter flounder (*Pseudopleuronectes americanus*) larvae on 29-30 May, and cunner (*Tautogolabrus adspersus*) eggs and larvae on 2-3 August. During each diel study, two tows were made at each of three depths at the intake and discharge at noon, sunset, midnight and sunrise. Due to weather or equipment problems, some diel samples could not be collected. During the May study, bottom samples at the discharge at sunrise were not collected. During the August study, the following sunset samples were not collected: all depths at the intake and one near-bottom replicate at the discharge. Surface and mid-depth samples were collected with a 1-m diameter 0.505 mm mesh net towed at 2 kn. Near-bottom samples were obtained with a 1-m diameter 0.505 mm mesh net mounted on an epibenthic sled; the bottom of the net mouth was approximately 18 cm above the sled runners. Tow duration was 10 minutes. Volume filtered was estimated with a calibrated General Oceanics digital flowmeter mounted in the net mouth. Volume filtered ranged from 279 to 828 ($\bar{x}$ = 495) m^3 in May and 248 to 707 ($\bar{x}$ = 423) m^3 in August.

Single neuston tows for lobster larvae (*Homarus americanus*) were made throughout the summer of 1979 along a north-south transect centered on the intake (Figure 2.1-1) using a rectangular (1 m x 2 m x 8 m) 1-mm mesh net fitted with a calibrated General Oceanics digital flowmeter (see Seabrook Plankton Studies, 1979 (NAI, 1981a)). Weekly samples collected from July 3 through September 27 were also analyzed for fish larvae. Tows were made from the side of the boat in water clear of the boat's wake; the bottom of the net mouth was 0.7 m below surface. Tow speeds of approximately 2 kn were maintained; tow duration was 30 minutes. Volume filtered ranged from 993 to 1956 m^3 and averaged 1,461 m^3. Upon retrieval, the net was washed down from mouth to cod end and the contents were emptied into five-gallon buckets, thoroughly rinsing all debris before discarding.

2.6 SAMPLE ANALYSIS/DATA COMPILATION

2.6.1 Juveniles and Adults

Catch data from each of the three types of fishing gear used in this study were converted to catch per unit effort. For the otter trawls, one unit was equated to ten-minutes of trawling; for the gill nets, a three-day set constituted one unit; while, for beach seines, one unit equalled two 100-foot hauls. Each transect or station was considered separately, as were the surface, mid-depth and bottom sets for the gill nets.

Sanders (1960) Biological Index was used to composite degree of omnipresence and numerical dominance for common species in beach seine catches. The ten most abundant species in each sampling event were ranked in order of abundance, with a score of 10 assigned to the most abundant and a 1 assigned to the tenth most abundant. Scores were summed over the year to produce the Biological Index Value (BIV). Since there were eight months in which biweekly seines were hauled (dates within each month were combined for comparability with previous years) the maximum possible score was 80.

2.6.2 Ichthyoplankton

Ichthyoplankton monitoring samples were subsampled with a Folsom Plankton Splitter and sorted for fish eggs and larvae. All stations were analyzed from one collection per month. On the remaining dates (January 23, April 3, April 29, May 22, June 20, July 19, August 16, September 19, October 23, November 30 and January 2, 1980), only the intake was analyzed. Successive aliquots were analyzed until approximately 200 eggs and 100 larvae were sorted; a maximum of one-half of the sample was sorted for a given life stage if there were less than 75 eggs or 25 larvae in one-half of the sample. Larvae were usually identified to species, and up to 30 individuals of each species were measured (standard length in mm). Larvae from samples preserved with ctenophore

fixative were not measured. Some eggs were difficult to identify to species and were grouped with eggs of similar appearance [e.g. cunner (*Tautogolabrus adspersus*) and tautog (*Tautoga onitis*) with yellowtail flounder (*Limanda ferruginea*)]. Abundances of fish eggs and larvae were expressed as no./1000 m^3.

Each entire sample from the May diel study was sorted for fish larvae; winter flounder larvae were identified, counted and measured (standard length in mm). August diel samples were sorted entirely for fish larvae and subsampled with a Folsom Plankton Splitter for fish eggs; cunner larvae were identified, counted and up to 50 individuals measured; cunner/tautog/yellowtail flounder (Labrid/*Limanda*) eggs were also counted. Abundances were expressed as number per 1000 m^3.

Each neuston sample was sorted for fish larvae which were then preserved in 5% formalin buffered with borax. All larvae from each sample were analyzed, except for two samples which contained over 1000 individuals; these samples were subsampled with a Folsom Plankton Splitter to provide a workable aliquot which contained at least 200 individuals. Larvae were identified to species where possible and up to 30 individuals of each species were measured (standard length in mm). Abundances of fish larvae were expressed as number per 1000 m^3.

3.0 RESULTS

In all, 54 taxonomic groups were represented among all types of sampling gear in 1979 (Table 3.0-1). The overwhelming majority (90%) of these taxa were collected as juvenile or adult fish; American eel, ocean perch and radiated shanny were collected only as larvae, while cusk, and possibly tautog, were collected as larvae and eggs, but not as adult or juvenile fish. At least nine species, and probably five more whose eggs are indistinguishable from those of other species, were collected at all life stages. The gill netting of one chub mackerel added a new species to the Seabrook Finfish study records, in 1979.

For ease of reader comprehension, common names accepted by the American Fisheries Society (Bailey, 1970) are used throughout the text. The scientific (Latin) equivalents are given in Table 3.0-1.

3.1 OTTER TRAWLS

Trawl catches produced a total of 10,893 finfish representing 37 species, in 1979. Yellowtail flounder represented approximately one-third of the catch; while, the next five most abundant species on the list (Table 3.1-1) collectively comprised approximately one-half of the total catch. Overall, trawls collected about twice as many fish at either Transect 1 or 3 as at Transect 2 (Table 3.1-2). At Transect 2 the trawl typically encountered drifting macroalgae in appreciably greater abundance than at the other two transects (for data on volumes of algae removed from tows, see Appendix Table 7-2). Reduced effectiveness due to fouling by algae may partly account for the especially low catches at Transect 2 in August and September (Table 3.1-2). Low catches recorded for all transects in late March may reflect seasonal movements of finfish away from the (inshore) study area. The largest catches occurred in December at Transects 1 and 3 while the greatest catch at Station 2 occurred in May.

TABLE 3.0-1. LIST OF FISH SPECIES ENCOUNTERED IN THE MARINE AND ESTUARINE WATERS IN THE VICINITY OF THE HAMPTON-SEABROOK ESTUARY FROM JANUARY THROUGH DECEMBER 1979. SEABROOK FINFISH STUDIES, 1979.

SCIENTIFIC NAME	COMMON NAME[a]	LIFE STAGE		
		JUVENILE AND/OR ADULT	LARVAE	EGGS
Alosa aestivalis	Blueback herring	X		
Alosa pseudoharengus	Alewife	X		
Alosa sapidissima	American shad	X		
Alosa spp.	River herring		X	
Ammodytes americanus	American sand lance	X	X	
Anarhichas lupus	Wolffish	X		
Anguilla rostrata	American eel		X	
Aspidophoroides monopterygius	Alligatorfish	X	X	
Brevoortia tyrannus	Atlantic menhaden	X		
Brosme brosme	Cusk		X	X
Centropristis striata	Sea bass	X		
Clupea harengus	Atlantic herring	X	X	
Cyclopterus lumpus	Lumpfish	X	X	
Enchelyopus cimbrius	Fourbeard rockling	X	X	X
Fundulus spp.	Mummichog/killifish	X		
Gadus/Melanogrammus	Cod and/or haddock			X
Gadus morhua	Cod	X	X	
Gasterosteus aculeatus	Threespine stickleback	X	X	
Glyptocephalus cynoglossus	Witch flounder	X	X	X
Hemitripterus americanus	Sea raven	X		
Hippoglossus hippoglossus	Halibut	X		
Hippoglossoides platessiodes	American plaice	X	X	X
Labridae/Limanda	Cunner/tautog/yellowtail flounder			X
Limanda ferruginea	Yellowtail flounder	X	X	
Liopsetta putnami	Smooth flounder	X		
Liparis spp.	Striped and/or common seasnail		X	X
Liparis atlanticus	Seasnail	X		

Continued

TABLE 3.0-1. (Continued)

SCIENTIFIC NAME	COMMON NAME	LIFE STAGE		
		JUVENILE AND/OR ADULT	LARVAE	EGGS
Lophius americanus	Goosefish	X	X	
Lumpenus lumpretaeformis	Snakeblenny	X	X	
Macrozoarces americanus	Ocean pout	X	X	
Melanogrammus aeglefinus	Haddock	X	X	
Menidia menidia	Atlantic silversides	X		
Merluccius bilinearis	Silver hake	X	X	X
Myoxocephalus aenaeus	Grubby sculpin	X	X	
Myoxocephalus octodecemspinosus	Longhorn sculpin	X	X	
Myoxocephalus scorpius	Shorthorn sculpin	X	X	
Osmerus mordax	Rainbow smelt	X	X	
Paralichthys oblongus	Fourspot flounder	X	X	
Peprilus triacanthus	Butterfish	X	X	X
Pholis gunnellus	Rock gunnel	X	X	
Pollachius virens	Pollock	X	X	X
Pomatomus saltatrix	Bluefish	X		
Prionotus carolinus	Common searobin	X		
Pseudopleuronectes americanus	Winter flounder	X	X	
Pungitius pungitius	Ninespine stickleback	X		
Raja spp.	Skates	X		
Salmo gairdneri	Rainbow trout	X		
Salmo trutta	Brown trout	X		
Scomber scombrus	Atlantic mackerel	X	X	X
Scomber japonicus	Chub mackerel	X		
Scophthalmus aquosus	Windowpane	X	X	X
Sebastes marinus	Ocean perch		X	
Squalus acanthias	Spiny dogfish	X		
Stenotomus chrysops	Scup	X		
Syngnathus fuscus	Northern pipefish	X	X	

Continued

TABLE 3.0-1. (Continued)

SCIENTIFIC NAME	COMMON NAME	LIFE STAGE		
		JUVENILE AND/OR ADULT	LARVAE	EGGS
Tautoga onitis	Tautog		X	
Tautogolabrus adspersus	Cunner	X	X	
Ulvaria subbifurcata	Radiated shanny		X	
Urophycis spp.	Hake	X	X	X

[a]According to Bailey *et al.* (1970)

TABLE 3.1-1. SPECIES RANK FOR FISHES COLLECTED IN OTTER TRAWLS. SEABROOK FINFISH STUDIES, 1979.

SPECIES	TOTAL NUMBER	%
Limanda ferruginea	3663	33.6
Gadus morhua	1487	13.7
Myoxocephalus octodecemspinosus	1386	12.7
Urophysis spp.	936	8.6
Pseudopleuronectes americanus	805	7.4
Osmerus mordax	740	6.8
Pollachius virens	452	4.1
Melanogrammus aeglefinus	360	3.3
Merluccius bilinearis	287	2.6
Macrozoarces americanus	234	2.1
Raja spp.	189	1.7
Scophthalmus aquosus	100	0.9
Myoxocephalus aenaeus	81	0.7
Hemitripterus americanus	51	0.5
Paralichthys oblongus	24	0.2
Menidia menidia	16	0.1
Liparis atlanticus	14	0.1
Cyclopterus lumpus	10	0.1
Hippoglossoides platessoides	10	0.1
Alosa sapidissima	8	0.1
Tautogolabrus adspersus	6	0.1
Ammodytes americanus	5	<.1
Pholis gunnelus	5	<.1
Lophius americanus	4	<.1
Alosa pseudoharengus	3	<.1
Aspidophoroides monopterygius	2	<.1
Clupea harengus	2	<.1
Enchelyopus cimbrus	2	<.1
Myoxocephalus scorpius	2	<.1
Peprilus triacanthus	2	<.1
Anarhichas lupus	1	<.1
Centropristus striata	1	<.1
Glyptocephalus cynoglossus	1	<.1
Hippoglossus hippoglossus	1	<.1
Lumpenus lumpretaeformis	1	<.1
Stentomus chrysops	1	<.1
Syngnatus fuscus	1	<.1

TABLE 3.1-2. NUMBER OF SPECIES AND INDIVIDUALS COLLECTED PER SAMPLING PERIOD AT EACH OTTER TRAWL TRANSECT. SEABROOK FINFISH STUDIES, 1979.

	TRANS 1		TRANS 2		TRANS 3	
	No. Spp.	No. Ind.	No. Spp.	No. Ind.	No. Spp.	No. Ind.
4 Feb	13	285	7	122	8	185
7 Mar	11	187	8	344	10	241
28 Mar	8	48	11	73	10	75
24 Apr	14	244	11	253	8	147
31 May	13	430	10	604	11	496
28 Jun	11	529	10	71	13	515
30 Jul	12	303	10	139	9	504
27 Aug	15	339	6	28	15	520
23 Sep	15	347	10	39	15	541
15 Nov	11	346	14	160	9	314
5 Dec	14	568	13	219	12	283
26 Dec	19	736	14	99	12	569
Annual Total	35	4362	26	2141	29	4390

3.2 GILL NETS

Gill net catches in 1979 totalled 3,960 finfish representing 23 species. Atlantic herring comprised 78.5% of the total catch; while, the next most abundant species, Atlantic menhaden and silver hake collectively made up approximately 9% of the catch (Table 3.2-1). Numerical importance of menhaden in the 1979 catch appears due to mid-depth gill net catch results on 2 October (Appendix Table 7-3) Fifty-five percent (104 individuals) of the entire year's menhaden catch was recovered in that circumstance.

With the exception of a few dates, gill nets at each of the three stations produced similar catch results throughout 1979 (Table 3.2-2). Netting at Station B on 6 November yielded over 1400 Atlantic herring (Appendix Table 7-3), more than 90% of which came from the surface net (a bottom net, but not a mid-water net, had also been set). Station variances in September and December were also due to this species. Low total yields were recorded for the 6 March and 12 June catches, primarily due to a coincident scarcity of herring, rainbow smelt and silver hake (Appendix Table 7-3).

3.3 BEACH SEINES

Seining produced 34,752 finfish representing 22 species. Atlantic silversides comprised 60% of the total catch; while, the next most abundant species, alewife (juveniles) made up an additional 18% of the catch. Other species collected in relatively large quantity were: juvenile pollock and smelt (Table 3.3-1).

Seine hauls in the Hampton River (Station S1) produced less than half the total catch recorded at either Station S2 or S3; number of species was also lowest at Station S1 (Table 3.3-2). Notably, no Atlantic herring or American sand lance were collected from the Hampton River in 1979. Station S2 in the Brown's River would have had total

TABLE 3.2-1. SPECIES RANK FOR FISHES COLLECTED IN GILL NETS. SEABROOK FINFISH STUDIES, 1979.

SPECIES	TOTAL NUMBER	%
Clupea harengus	3108	78.5
Brevoortia tyrannus	189	4.8
Merluccius bilinearis	159	4.0
Peprilus tricanthus	90	2.3
Pollachius virens	81	2.0
Alosa aestivalis	64	1.6
Scomber scombrus	57	1.4
Osmerus mordax	49	1.2
Urophysis spp.	38	1.0
Gadus morhua	36	0.9
Myoxocephalus octodecemspinosus	19	0.5
Tautogolabrus adspersus	19	0.5
Alosa pseudoharengus	15	0.4
Hemitripterus americanus	10	0.2
Pseudopleuronectes americanus	10	0.2
Pomotomus saltatrix	5	0.1
Alosa sapidissima	3	0.1
Raja spp.	2	0.1
Cyclopterus lumpus	1	<.1
Limanda ferruginea	1	<.1
Prionotus carolinus	1	<.1
Scomber japonicus	1	<.1
Squalus acanthias	1	<.1

TABLE 3.2-2. NUMBER OF SPECIES AND INDIVIDUALS COLLECTED PER SAMPLING PERIOD AT EACH GILL NET STATION. SEABROOK FINFISH STUDIES, 1979.

	STATION A		STATION B		STATION C	
	No. Spp.	No. Ind.	No. Spp.	No. Ind.	No. Spp.	No. Ind.
10 Jan	1	3	3	13	2	29
6 Mar[a]	0	0	1	1	1	1
12 Apr	1	158	10	103	3	69
8 May	3	35	9	41	7	83
12 Jun[a]	2	2	2	2	2	3
10 Jul	7	60	7	69	12	161
7 Aug	6	45	7	56	12	39
5 Sep	7	12	10	113	12	70
2 Oct[a]	4	77	2	127	3	90
6 Nov	8	190	8	1466	4	88
4 Dec	6	223	5	5	3	9
Annual Total	18	892	19	2195	20	873

[a]includes mid-depth net catches:

	STATION A		STATION B		STATION C	
	No. Spp.	No. Ind.	No. Spp.	No. Ind.	No. Spp.	No. INd.
6 Mar	0	0	1	1	1	1
12 Jun	2	2	2	2	2	3
2 Oct		77	2	127	3	90

TABLE 3.3-1. SPECIES RANK FOR FISH COLLECTED IN BEACH SEINES SEABROOK FINFISH STUDIES, 1979.

SPECIES	TOTAL NUMBER	%
Menidia menidia	20928	60.2
Alosa pseudoharengus	6272	18.0
Pollachius virens	2718	7.8
Osmerus mordax	1604	4.6
Fundulus heteroclitus	908	2.6
Pseudopleuronectes americanus	563	1.6
Alosa aestivalis	396	1.1
Gasterosteus aculeatus	354	1.0
Peprilus triacanthus	335	1.0
Clupea harengus	319	0.9
Ammodytes americanus	157	0.4
Liopsetta putnami	108	0.3
Gadus morhua	33	0.1
Pungitius pungitius	29	0.1
Salmo trutta	10	<.1
Myoxocephalus aenaeus	6	<.1
Salmo gairdneri	3	<.1
Alosa sapidissima	2	<.1
Hemitripterus americanus	2	<.1
Scomber scombrus	2	<.1
Syngnathus fuscus	2	<.1
Scophthalmus aquosus	1	<.1

TABLE 3.3-2. NUMBER OF FINFISH SPECIES AND INDIVIDUALS COLLECTED AT THREE BEACH SEINE STATIONS. SEABROOK FINFISH STUDIES, 1979.

	STATION S1		STATION S2		STATION S3	
	NO. SPP.	NO. IND.	NO. SPP.	NO. IND.	NO. SPP.	NO. IND.
Apr	5	29	5	8	6	10
May	7	417	8	181	8	2559
Jun	6	28	9	6489	8	241
Jul	8	45	11	201	6	166
Aug	5	160	7	1193	9	2016
Sep	5	898	7	1074	11	3826
Oct	6	3024	4	1366	13	5246
Nov	5	1910	9	2714	7	951
TOTAL	12	6511	17	13226	21	15015

catch yields similar to Station S1 except for a large catch of over 6,000 alewife juveniles on 4 June (Appendix Table 7-4). In general, Station S3 tended to stand apart from the two other seining stations regarding the quality and quantity of the catch. Located nearest to the Harbor entrance, Station S3 also tended to exhibit slightly higher salinity values than either Station S1 or S2 and slightly lower temperatures during the summer months (Table 3.3-3).

3.4 ALEWIFE SURVEY

In 1979, New Hampshire Fish and Game Department investigators began counting alewives ascending the Taylor River fish ladder on 25 April (Table 3.4-1). Subsequent tallies established that the spawning run had begun to slow by mid-May at which time river water temperatures registered 66°F. The last observation, of one migrant, was reported on 7 June suggesting a run duration of approximately 44 days. The Fish and Game Department's assessment was that upwards of 400,000 alewifes may have ascended the Taylor River to spawn during the spring of 1979 (Bob Fawcett, Personal Communication).

3.5 ICHTHYOPLANKTON

3.5.1 Temporal and Spatial Trends, 1979

Thirteen taxa of finfish eggs and thirty-six fish larvae taxa were identified from New Hampshire coastal waters during 1979 (Tables 3.5-1 and 3.5-2). Three egg types (cunner/tautog/yellowtail flounder, mackerel and hake species) accounted for 95% of all eggs collected. Cunner, American sand lance and sea snails together comprised 75% of all larvae collected; eleven additional taxa, each representing at least 1% of the larval assemblage, accounted for 22% of the larvae collected (Table 3.5-2). Overall, fish eggs were more than twice as abundant at the intake and discharge transects, whereas fish larvae were most abundant at the south transect. Of the three dominant egg types, both cunner/

TABLE 3.3-3. SALINITIES AND TEMPERATURE RECORDED DURING BEACH SEINE HAULS. SEABROOK FINFISH STUDIES 1979.

DATE	STA	SAL	TEMP °C	DATE	STA	SAL	TEMP °C
4/4	S1	18.9	4.3	7/31	S1	29.9	22.8
	S2	23.4	5.1		S2	28.9	24.0
	S3	28.6	4.3		S3	31.6	19.1
4/18	S1	28.9	4.6	8/24	S1	28.7	18.1
	S2	30.2	4.4		S2	28.6	17.8
	S3	32.9	3.9		S3	30.3	17.3
5/2	S1	26.6	9.8	9/7	S1	29.7	16.3
	S2	28.3	9.9		S2	NR	NR
	S3	31.4	8.0		S3	32.0	13.8
5/16	S1	29.6	10.9	9/21	S1	NR	NR
	S2	29.0	11.5		S2	NR	NR
	S3	32.1	9.2		S3	NR	NR
6/4	S1	33.4	16.4	10/3	S1	23.4	14.9
	S2	28.5	17.5		S2	24.9	15.3
	S3	32.0	12.5		S3	29.6	14.4
6/19	S1	29.9	18.8	10/17	S1	27.2	8.7
	S2	29.1	18.2		S2	29.5	9.3
	S3	30.9	15.1		S3	33.5	9.8
7/5	S1	29.8	17.0	11/8	S1	31.3	8.7
	S2	30.2	16.8		S2	27.8	8.4
	S3	31.2	14.7		S3	30.7	8.7
7/19	S1	31.0	20.0	11/27	S1	27.6	NR
	S2	30.4	21.5		S2	23.1	NR
	S3	31.6	18.5		S3	31.3	NR

NR = not recorded

TABLE 3.4-1. RESULTS OF NH FISH AND GAME DEPT. ALEWIFE SPAWNING RUN SURVEY ON THE TAYLOR RIVER, SPRING 1979. SEABROOK FINFISH STUDIES, 1979.

DATE	TIME	TEMP(°F)	COUNTS (fish per minute)				
25 Apr	11 am		26	19	18	16	23
26 Apr	2 pm		9	12	8	6	5
27 Apr	12 noon	58	44	54	45	55	35
30 Apr	9 am	58					
1 May	4 pm		49				
2 May	4:05 pm		13	5	4	5	7
4 May			8	2	2	1	10
8 May	10:30 am		5	3	1	4	1
10 May	11 am		120				
15 May		66	3				
28 May			3				
7 Jun			1				

TABLE 3.5-1. RANKED MEAN SPECIES DENSITY (no./1000 m^3) BY STATION[a] OF FISH EGGS. SEABROOK FINFISH STUDIES, 1979.

SPECIES	MEAN DENSITY			ALL TRANSECTS	
	INTAKE (3)	DISCHARGE (2)	SOUTH (1)	MEAN DENSITY	% COMPOSITION
Labrid/*Limanda*	6,943	10,766	2,997	6,902	48.6
Scomber scombrus	9,601	3,680	849	4,710	33.2
Urophycis spp.	586	2,918	2,193	1,897	13.3
Merluccius bilinearis	103	184	290	191	1.3
Hippoglossoides platessoides	130	239	155	175	1.2
Enchelyopus cimbrius	93	122	91	102	0.7
Scophthalmus aquosus	83	124	94	101	0.7
Glyptocephalus cynoglossus	6	72	48	42	0.3
Gadus/Melanogrammus	30	36	58	41	0.3
Pollachius virens	22	26	33	27	0.2
Unidentified	1	<1	10	4	<0.1
Brosme brosme	0	0	2	1	<0.1
Peprilus triacanthus	<1	0	<1	<1	<0.1
Liparis spp.	0	<1	0	<1	<0.1
TOTAL	17,598	18,167	6,820	14,193	

[a]Means based on dates when all stations were analyzed.

TABLE 3.5-2. RANKED MEAN SPECIES DENSITY (no./1000 m^3) BY STATION[a] FOR FISH LARVAE. SEABROOK FINFISH STUDIES, 1979.

SPECIES	MEAN DENSITY			ALL TRANSECTS	
	INTAKE (3)	DISCHARGE (2)	SOUTH (1)	MEAN DENSITY	% COMPOSITION
Tautogolabrus adspersus	80	61	717	283	38.5
Ammodytes americanus	226	157	254	212	28.9
Liparis spp.	94	53	11	53	7.2
Ulvaria subbifurcata	21	36	41	33	4.4
Enchelyopus cimbrius	18	28	22	23	3.1
Pseudopleuronectes americanus	17	17	25	20	2.7
Pollachius virens	31	12	12	19	2.5
Scomber scombrus	2	17	24	14	1.9
Phycis gunnellus	21	5	7	11	1.5
Merluccius bilinearis	11	3	17	10	1.4
Limanda ferruginea	4	10	13	9	1.2
Scophthalmus aquosus	8	7	10	8	1.1
Hippoglossoides platessoides	6	3	16	8	1.1
Clupea harengus	4	6	14	8	1.1
Glyptocephalus cynoglossus	5	2	11	6	0.8
Unidentified	1	5	8	5	0.6
Myoxocephalus aenaeus	8	2	2	4	0.5
Urophycis spp.	2	1	7	3	0.5
Gadus morhua	2	1	<1	1	0.2
Tautoga onitis	<1	1	2	1	0.1
Anguilla rostrata	1	1	<1	1	0.1
Myoxocephalus octodecemspinosus	1	1	<1	1	0.1
Cyclopterus lumpus	1	1	<1	1	0.1
Sebastes marinus	<1	1	<1	1	0.1
Peprilus triacanthus	<1	<1	1	1	0.1
Aspidophoroides monopterygius	<1	<1	<1	<1	<0.1
Myoxocephalus scorpius	<1	<1	<1	<1	<0.1
Osmerus mordax	<1	<1	<1	<1	<0.1
Syngnathus fuscus	<1	<1	<1	<1	<0.1
Alosa sp.	0	<1	1	<1	<0.1
Brosme brosme	0	<1	<1	<1	<0.1
Lophius americanus	<1	<1	<1	<1	<0.1
Paralichthys oblongus	<1	0	0	<1	<0.1
Melanogrammus aeglefinus	<1	0	0	<1	<0.1
Gasterosteus aculeatus	0[b]	0	<1	<1	<0.1
Macrozoarces americanus	0	0	<1	<1	<0.1
Lumpenus lumpretaeformis	0[b]	0	0	0	0[b]
TOTAL	566	432	1,217	738	

[a]Means based on dates when all stations were analyzed.

[b]Present on a date when only the intake was analyzed.

tautog/yellowtail flounder and mackerel were more abundant at the intake and discharge; hake species were more abundant at the discharge and south transects than at the intake. Station differences in larval distribution were clearly influenced by the distribution of cunner, which were an order of magnitude higher at the south transect than at either the intake or discharge.

Overall egg species richness (12-13 species; Table 3.5-3) and larval species richness (32-34 species; Table 3.5-4) were similar at all stations. Egg species richness was generally highest from mid April through early October and in December, and larval species richness was highest from late April through mid September.

Mean abundance of fish eggs increased from $\leq 10^2/1000m^3$ in January and February to the annual maximum ($1.2 \times 10^5/1000m^3$) in early June and decreased to less than $10^2/1000m^3$ in late October (Table 3.5-5). Mean abundance of fish larvae increased from $\leq 10^2/1000m^3$) in early January to the first peak ($2.5 \times 10^3/1000m^3$) in late March. A second peak ($3.5 \times 10^3/1000m^3$) occurred in August and then abundances dropped to $<10'/1000m^3$ in early October (Table 3.5-6). Dominant species for both life stages varied seasonally and are summarized in Table 3.5-7.

Abundances of 14 ichthyoplankton taxa were examined for spatial distributional trends, with emphasis on their periods of peak occurrence (Appendix Tables 7-11 and 7-12). Taxa selected included indicator species, numerical dominants and species of commercial and recreational value (NAI, 1980). Both American plaice and cunner/tautog/yellowtail flounder eggs were more abundant at the discharge transect than at either the intake or south transects in late March/April and June/July, respectively; abundances were usually 1.5 to 3 times greater at the discharge except for cunner/tautog/ yellowtail flounder eggs on July 11, which were an order of magnitude higher at the discharge than at the south transect. Mackerel eggs were most abundant at the intake in May and June; they were most abundant at the south transect in July and August. Silver hake eggs were 1.5 to 6 times more abundant at the south

TABLE 3.5-3. SPECIES RICHNESS OF FISH EGGS.
SEABROOK FINFISH STUDIES, 1979.

	INTAKE	DISCHARGE	SOUTH	ALL
JAN 09 79	3	2	3	3
JAN 23 79	2	-1	-1	2
FEB 28 79	3	3	3	5
MAR 22 79	4	4	3	6
APR 03 79	5	-1	-1	5
APR 16 79	7	6	5	9
APR 29 79	5	-1	-1	5
MAY 10 79	6	8	8	8
MAY 22 79	4	-1	-1	4
JUN 07 79	5	6	9	9
JUN 20 79	9	-1	-1	9
JUL 11 79	7	7	9	9
JUL 19 79	7	-1	-1	7
AUG 01 79	9	6	8	9
AUG 16 79	6	-1	-1	6
SEP 11 79	9	7	9	10
SEP 19 79	8	-1	-1	8
OCT 02 79	6	8	5	8
OCT 23 79	5	-1	-1	5
NOV 19 79	2	4	3	4
NOV 30 79	3	-1	-1	3
DEC 18 79	4	4	5	7
JAN 02 80	3	-1	-1	3
ALL	12	12	13	14

-1 = not analyzed. Alternate biweekly samples taken at the "discharge" and "south" tow stations were intended as contingency samples: the basic sampling design called for surveying spatial trends (station differences) on a monthly basis only, while temporal trends were investigated primarily at the intake, using biweekly tows.

TABLE 3.5-4. SPECIES RICHNESS OF FISH LARVAE.
SEABROOK FINFISH STUDIES, 1979.

	INTAKE	DISCHARGE	SOUTH	ALL
JAN 09 79	4	3	3	4
JAN 23 79	5	-1	-1	5
FEB 28 79	8	9	9	12
MAR 22 79	9	10	8	11
APR 03 79	10	-1	-1	10
APR 16 79	7	9	7	10
APR 29 79	15	-1	-1	15
MAY 10 79	16	16	12	18
MAY 22 79	15	-1	-1	15
JUN 07 79	12	16	14	18
JUN 20 79	12	-1	-1	12
JUL 11 79	16	17	14	19
JUL 19 79	12	-1	-1	12
AUG 01 79	13	14	11	17
AUG 16 79	10	-1	-1	10
SEP 11 79	16	11	12	18
SEP 19 79	13	-1	-1	13
OCT 02 79	5	3	4	6
OCT 23 79	4	-1	-1	4
NOV 19 79	4	5	5	6
NOV 30 79	6	-1	-1	6
DEC 18 79	4	4	4	5
JAN 02 80	4	-1	-1	4
ALL	34	32	34	37

-1 = not analyzed. See explanation, Table 3.5-3.

TABLE 3.5-5. MEAN ABUNDANCE (No./1000 m^3), WITH STANDARD DEVIATION AND N, OF TOTAL FISH EGGS AT EACH STATION. SEABROOK FINFISH STUDIES, 1979.

	INTAKE			DISCHARGE			SOUTH			ALL		
	MEAN	S.D.	N	MEAN	S.D.	N	MEAN	S.D.	N	MEAN	S.D.	N
JAN 09 79	16.89	1.82	4	5.44	4.17	4	25.92	18.87	4	16.08	13.39	12
JAN 23 79	4.97	1.27	4	-1.00	-1.00	0	-1.00	-1.00	0	4.97	1.27	4
FEB 28 79	17.16	4.26	4	63.50	4.92	4	175.81	53.78	4	85.49	75.11	12
MAR 22 79	308.75	27.28	4	468.28	142.18	4	301.91	11.68	4	359.65	110.45	12
APR 03 79	1127.15	202.10	4	-1.00	-1.00	0	-1.00	-1.00	0	1127.15	202.10	4
APR 16 79	1428.40	529.11	4	2588.40	1117.50	4	1644.72	501.41	4	1887.17	873.05	12
APR 29 79	703.85	98.40	4	-1.00	-1.00	0	-1.00	-1.00	0	703.85	98.40	4
MAY 10 79	2330.71	1432.48	4	1509.92	451.29	4	679.83	87.45	4	1506.82	1054.89	12
MAY 22 79	37812.83	1401.65	4	-1.00	-1.00	0	-1.00	-1.00	0	37812.83	1401.65	4
JUN 07 79	177260.01	37016.81	4	140820.73	40890.58	4	40557.76	4185.45	4	119546.17	66926.05	12
JUN 20 79	49415.11	12711.55	4	-1.00	-1.00	0	-1.00	-1.00	0	49415.11	12711.55	4
JUL 11 79	16531.85	5322.19	4	57679.77	32121.37	4	9304.13	4903.71	3	29687.17	28686.44	11
JUL 19 79	41349.85	14849.18	4	-1.00	-1.00	0	-1.00	-1.00	0	41349.85	14849.18	4
AUG 01 79	11072.33	1974.38	4	12267.01	6260.77	4	27499.37	7062.72	4	16946.24	9293.20	12
AUG 16 79	5287.97	1892.59	4	-1.00	-1.00	0	-1.00	-1.00	0	5287.97	1892.59	4
SEP 11 79	1499.06	686.37	4	1867.60	487.51	4	901.79	245.88	4	1422.82	618.51	12
SEP 19 79	602.40	482.50	4	-1.00	-1.00	0	-1.00	-1.00	0	602.40	482.50	4
OCT 02 79	205.69	143.63	4	161.75	36.74	4	198.16	59.79	4	188.53	85.85	12
OCT 23 79	24.71	20.34	4	-1.00	-1.00	0	-1.00	-1.00	0	24.71	20.34	4
NOV 19 79	163.74	6.99	4	224.99	36.56	4	181.67	19.67	4	190.13	34.71	12
NOV 30 79	541.45	81.45	4	-1.00	-1.00	0	-1.00	-1.00	0	541.45	81.45	4
DEC 18 79	353.08	35.72	4	333.00	27.85	4	541.06	161.05	4	409.05	131.20	12
JAN 02 80	126.50	17.90	4	-1.00	-1.00	0	-1.00	-1.00	0	126.50	17.90	4
ALL	15138.45	38380.87	92	18165.86	42695.72	48	6320.09	13172.72	47	13824.83	35247.21	187

-1 = not analyzed. See explanation, Table 3.5-3.

TABLE 3.5-6. MEAN ABUNDANCE (No./1000 m^3), WITH STANDARD DEVIATION AND N, OF TOTAL FISH LARVAE AT EACH STATION. SEABROOK FINFISH STUDIES, 1979.

	INTAKE			DISCHARGE			SOUTH			ALL		
	MEAN	S.D.	N	MEAN	S.D.	N	MEAN	S.D.	N	MEAN	S.D.	N
JAN 09 79	118.95	17.38	4	45.66	32.50	4	38.98	35.41	4	67.86	46.30	12
JAN 23 79	1562.39	876.61	4	-1.00	-1.00	0	-1.00	-1.00	0	1562.39	876.61	4
FEB 28 79	101.41	18.10	4	262.06	57.14	4	180.25	77.42	4	181.24	85.48	12
MAR 22 79	2907.90	863.95	4	1659.82	583.94	4	2993.84	519.10	4	2520.55	880.63	12
APR 03 79	389.47	193.50	4	-1.00	-1.00	0	-1.00	-1.00	0	389.47	193.50	4
APR 16 79	203.34	133.36	4	34.57	23.66	4	70.14	32.97	4	102.68	105.15	12
APR 29 79	232.68	88.62	4	-1.00	-1.00	0	-1.00	-1.00	0	232.68	88.62	4
MAY 10 79	1205.67	706.03	4	823.61	909.65	4	132.64	44.27	4	720.64	759.79	12
MAY 22 79	381.17	138.23	4	-1.00	-1.00	0	-1.00	-1.00	0	381.17	138.23	4
JUN 07 79	361.84	184.33	4	840.80	240.59	4	1265.43	344.50	4	822.69	453.93	12
JUN 20 79	1165.97	262.22	4	-1.00	-1.00	0	-1.00	-1.00	0	1165.97	262.22	4
JUL 11 79	80.32	33.82	4	446.74	80.84	4	666.91	416.84	3	373.54	315.29	11
JUL 19 79	5859.10	4865.49	4	-1.00	-1.00	0	-1.00	-1.00	0	5859.10	4865.49	4
AUG 01 79	1155.83	273.76	4	669.81	422.20	4	8664.62	3460.32	4	3496.75	4236.15	12
AUG 16 79	2161.09	953.05	4	-1.00	-1.00	0	-1.00	-1.00	0	2161.09	953.05	4
SEP 11 79	299.29	47.74	4	187.64	33.67	4	299.31	93.77	4	262.08	79.70	12
SEP 19 79	35.18	4.89	4	-1.00	-1.00	0	-1.00	-1.00	0	35.18	4.89	4
OCT 02 79	3.73	4.39	4	4.51	4.43	4	5.49	2.13	4	4.57	3.52	12
OCT 23 79	75.94	26.32	4	-1.00	-1.00	0	-1.00	-1.00	0	75.94	26.32	4
NOV 19 79	24.10	13.45	4	51.88	22.81	4	44.39	16.46	4	40.12	20.38	12
NOV 30 79	158.16	48.29	4	-1.00	-1.00	0	-1.00	-1.00	0	158.16	48.29	4
DEC 18 79	333.43	137.63	4	157.55	39.93	4	106.80	12.97	4	199.26	126.23	12
JAN 02 80	12.68	6.67	4	-1.00	-1.00	0	-1.00	-1.00	0	12.68	6.67	4
ALL	819.68	1618.28	92	432.05	564.75	48	1217.21	2605.98	47	819.60	1766.38	187

-1 = not analyzed. See explanation, Table 3.5-3.

TABLE 3.5-7. SUMMARY OF SEASONAL FISH EGG AND LARVAE DISTRIBUTION AND DOMINANT SPECIES. SEABROOK FINFISH STUDIES, 1979.

MONTH	FISH EGGS[a] MAX. ABUNDANCE (#/1000m^3)	DOMINANT SPECIES	FISH LARVAE[b] MAX ABUNDANCE (#/1000m^3)	DOMINANT SPECIES
JAN	1.6×10^1	Cod/haddock	1.6×10^3	American sand lance
FEB	8.5×10^1	American plaice	1.8×10^2	American sand lance
MAR	3.6×10^2	American plaice	2.5×10^3	American sand lance
APR	1.9×10^3	American plaice	3.9×10^2	Seasnails Pollock
MAY	3.8×10^4	Mackerel Cunner/tautog/ yellowtail	7.2×10^2	Seasnails Winter flounder
JUN	1.2×10^5	Mackerel Cunner/tautog/ yellowtail	1.2×10^3	Radiated shanny Winter flounder
JUL	4.1×10^4	Hakes Cunner/tautog/ yellowtail	5.9×10^3	Mackerel, cunner four bear rock-ling
AUG	1.7×10^4	Hakes Cunner/tautog/ yellowtail	3.5×10^3	Cunner
SEP	1.4×10^3	Hakes, silver hake fourbeard rockling	2.6×10^2	Cunner fourbeard rockling
OCT	1.3×10^2	Hakes, silver hake fourbeard rockling	7.5×10^1	Fourbeard rock-ling, silver hake
NOV	5.4×10^2	Cod/haddock Pollock	1.6×10^2	Atlantic herr-ing, Pollock
DEC	4.1×10^2	Cod/haddock Pollock	2.0×10^2	Pollock

[a]Appendix Tables 7-5, 7-6 and 7-7

[b]Appendix Tables 7-8, 7-9 and 7-10

transect during July and August. Abundances of hake species in July were approximately an order of magnitude higher at the discharge, whereas in August these eggs were approximately an order of magnitude higher at the south transect. Pollock eggs were most abundant at the south transect (1.2 to 3 times) in November and December. Cod/ haddock eggs exhibited no clear spatial trends. Menhaden eggs did not appear in 1979 collections.

Seven of the fourteen larval taxa examined (American plaice, mackerel, yellowtail flounder, cunner, silver hake, hake species and Atlantic herring) were generally most abundant at the south transect. Cod larvae were generally most abundant at the intake and least abundant at the south transect. Winter flounder larvae were most abundant at the intake and least abundant at the south transect in May, whereas in June this pattern was reversed. Abundances of pollock larvae exhibited no clear trend. During their peak in March, American sand lance abundances were slightly (1.1 to 1.8 times) higher at the south transect. Rainbow smelt and haddock larvae occurred too rarely to evaluate, and menhaden larvae were not collected in 1979.

3.5.2 Diel Studies

During the diel study on 29-30 May, winter flounder larvae were more abundant in mid water than in either surface or near-bottom waters during all photoperiods except sunrise (intake only), when the larvae were more abundant near bottom (Figure 3.5-1). Surface abundances ranged from 0 to 13/1000m^3 ($\bar{x}$ = 5), whereas mid-depth abundances ranged from 7 to 150/1000m^3 ($\bar{x}$ = 64) (Appendix Table 7-13). Near-bottom abundances averaged 45/1000m^3, principally due to high numbers found at the intake at sunrise.

On 2-3 August, cunner/tautog/yellowtail flounder eggs were most abundant at the surface during all photoperiods at both stations (the intake was not sampled during sunset) (Figure 3.5-2). Overall, these eggs were twice as abundant at the intake (Appendix Table 7-13). Differences between the two stations were most noticeable at midnight,

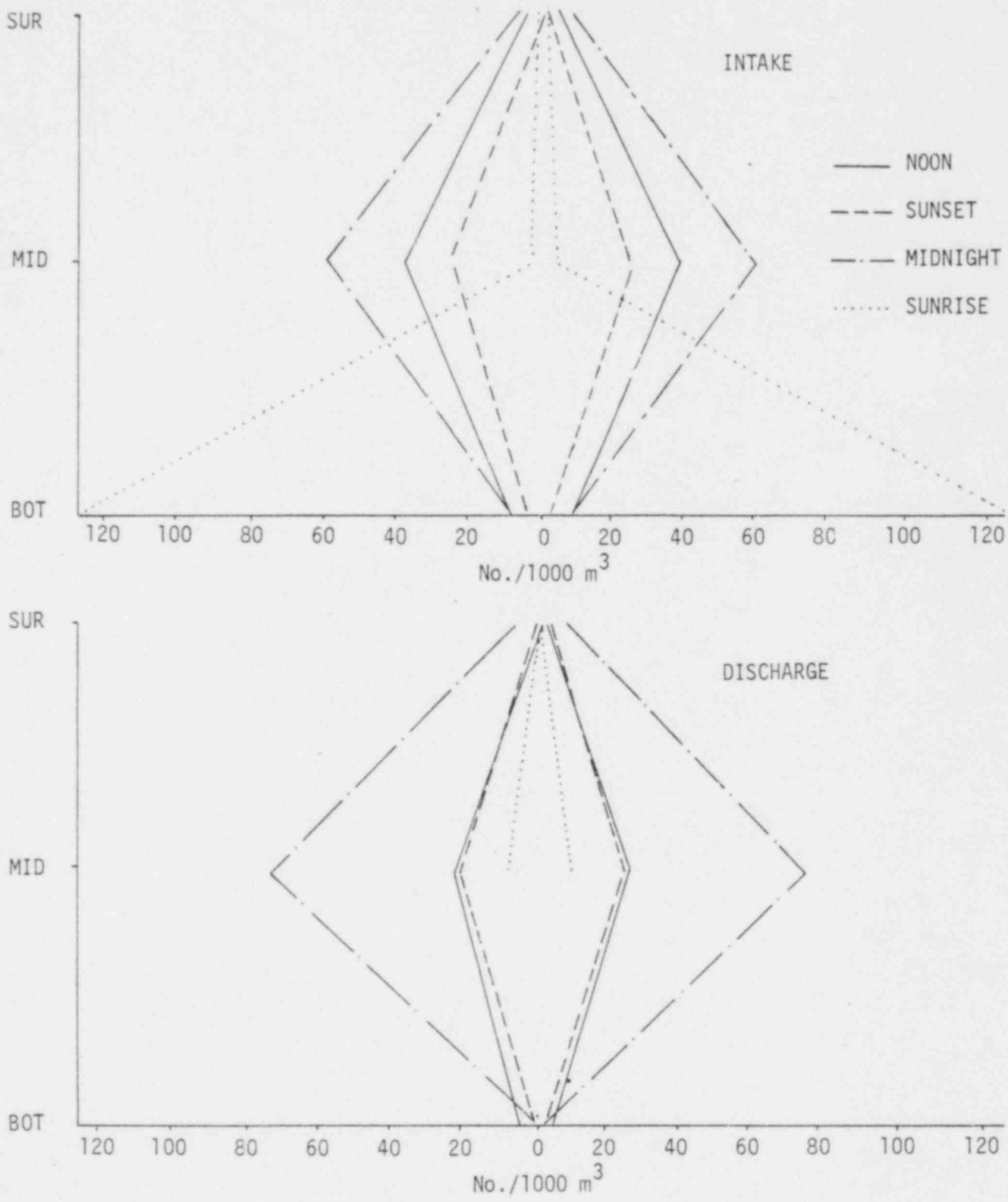


Figure 3.5-1. Kite diagram of winter flounder larvae abundance during the diel study on 29-30 May. Seabrook Finfish Studies, 1979.

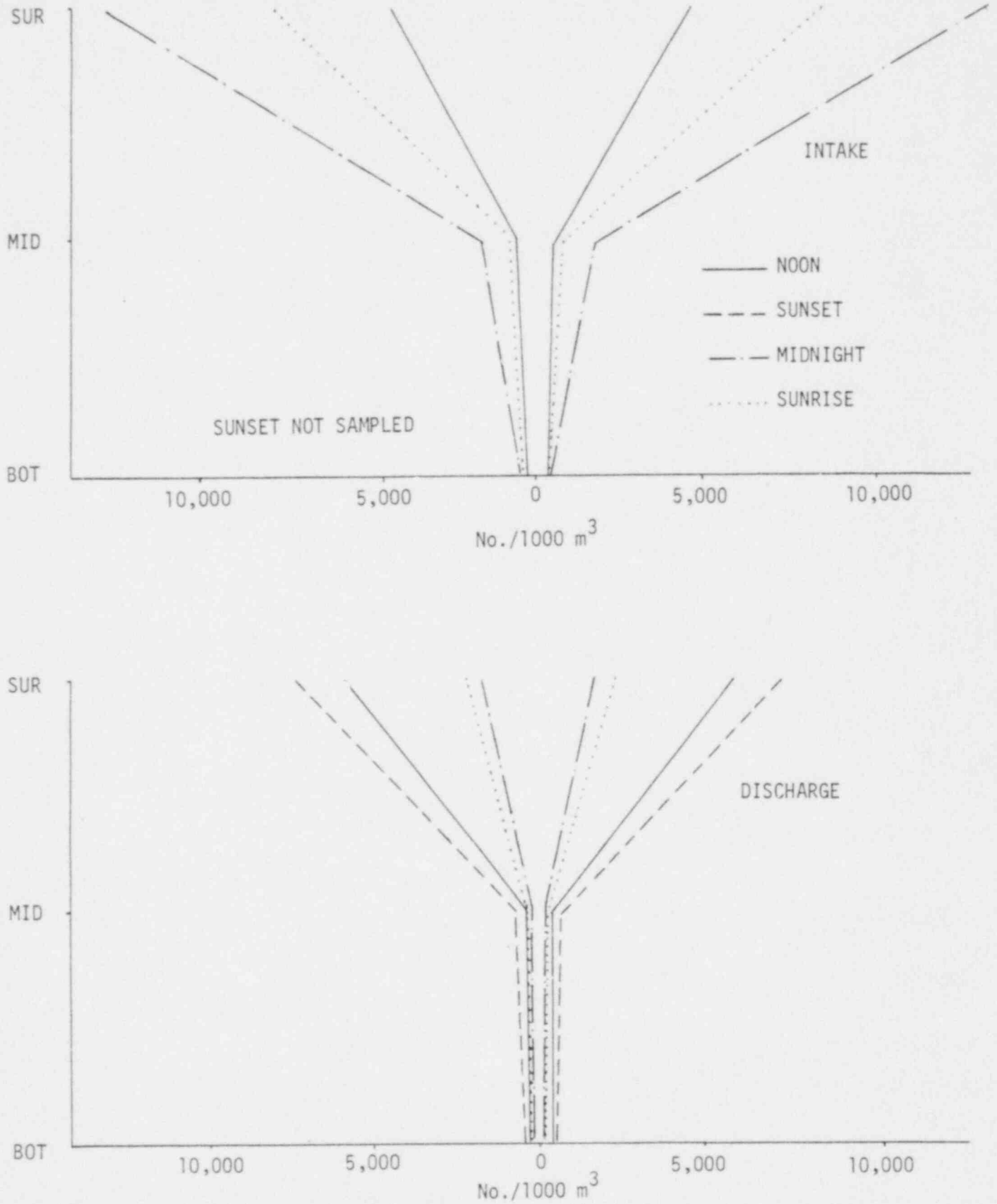


Figure 3.5-2. Kite diagram of cunner/tautog/yellowtail flounder egg abundance during the diel study on 2-3 August. Seabrook Finfish Studies, 1979.

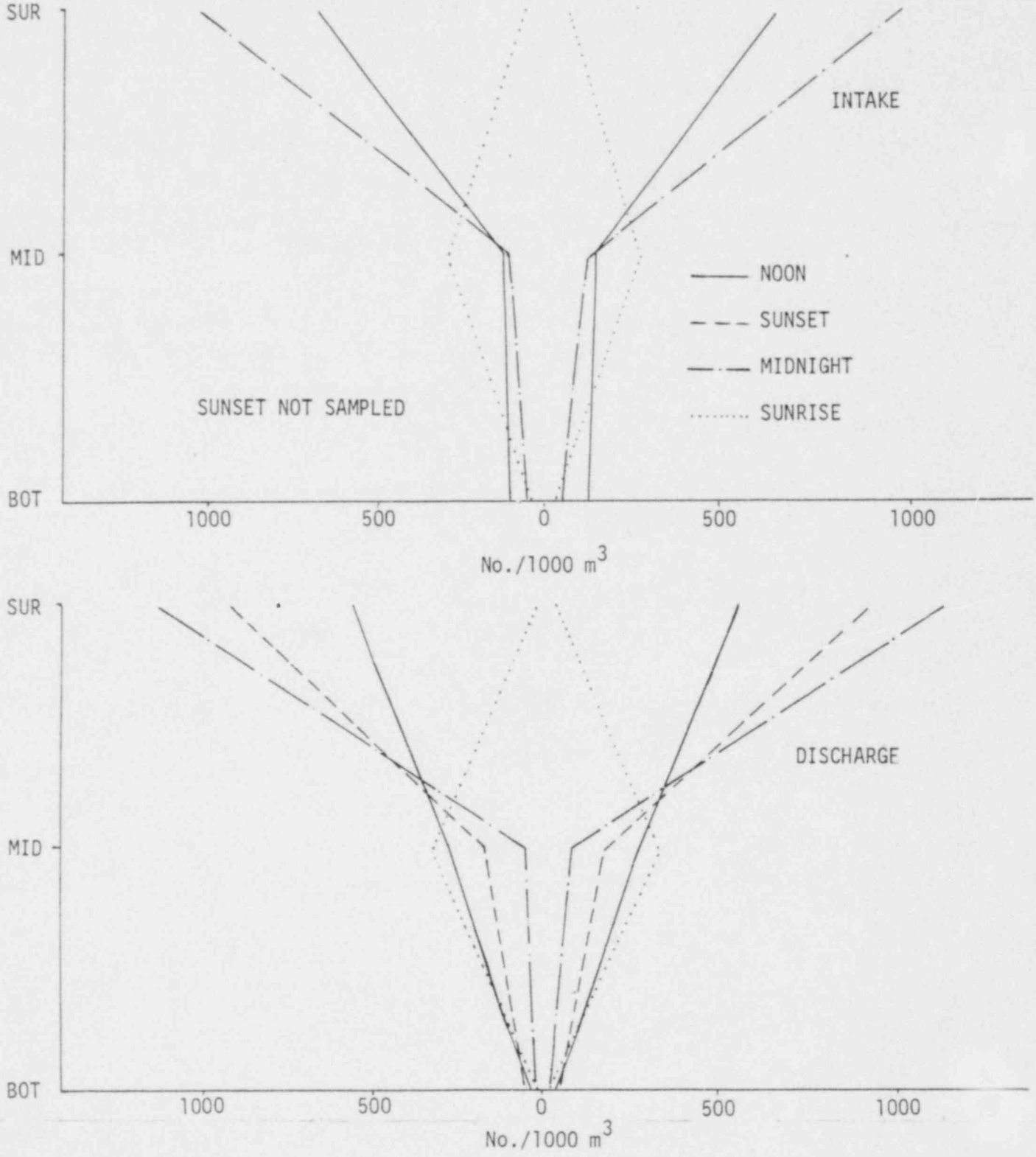


Figure 3.5-3. Kite diagram of cunner larvae abundance during the diel study on 2-3 August. Seabrook Finfish Studies, 1979.

when mid-water and surface abundances were 7 and 8 times greater, respectively, at the intake. Surface abundances ranged from 3.2×10^3 to $2.6 \times 10^4/1000m^3$ ($\bar{x} = 1.2 \times 10^4$), mid-water abundances ranged from 4.9×10^2 to $3.5 \times 10^3/ 1000\ m^3$ ($\bar{x} = 1.3 \times 10^3$) and near-bottom abundances ranged from 3.6×10^2 to $9.8 \times 10^2/1000\ m^3$ ($\bar{x} = 6.5 \times 10^2$).

During the August diel study, cunner larvae were most abundant at the surface during all photoperiods except sunrise, when they were most abundant at mid water (Figure 3.5-3). Largest depth differences occurred at midnight at both stations when abundances of cunner larvae were approximately two orders of magnitude higher at the surface than at near bottom (Appendix Table 7-13). Surface abundances ranged from 4.9×10^1 to 2.3×10^3 ($\bar{x} = 1.2 \times 10^3$), mid-water abundances ranged from 1.3×10^2 to 6.7×10^2 ($\bar{x} = 3.9 \times 10^2$) and near-bottom abundances ranged from 2.7×10^1 to $2.3 \times 10^2/1000m^3$ ($\bar{x} = 9.5 \times 10^1$).

3.5.3 Ichthyoplankton From Neuston Tows

Twelve fish larvae taxa were identified in neuston collections from July through September (Table 3.5-8). Total larval abundances ranged from 4.0×10^1 to $1.3 \times 10^3/1000m^3$, with peaks on July 17, August 14 and September 11. Fourbeard rockling and radiated shanny dominated the July collections; winter flounder and mackerel were each relatively abundant on one date in July. Cunner dominated most of the August and September collections. Hakes were found from early August through mid September and fourbeard rockling reappeared as a dominant or codominant beginning in mid September.

TABLE 3.5-8. ABUNDANCE (No./1000 m^3) AND OVERALL PERCENT COMPOSITION OF FISH LARVAE IN NEUSTON COLLECTIONS FROM JULY THROUGH SEPTEMBER. SEABROOK FINFISH STUDIES, 1979.

Abundance (no./1000m^3)

Species	Overall % Comp	Overall $\bar{x}$	Jul 03	Jul 10	Jul 17	Jul 27
Enchelyopus cimbrius	35.2	113	29	15	666	31
Tautogolabrus adspersus	31.0	99	0	0	9	5
Urophycis spp.	15.4	49	0	0	0	0
Ulvaria subbifurcata	12.7	41	316	94	107	0
Pseudopleuronectes americanus	2.6	8	107	0	0	0
Scomber scombrus	1.9	6	0	0	77	0
Cyclopterus lumpus	0.5	2	2	0	15	1
Syngnathus fuscus	0.3	1	0	1	0	3
Gasterosteus aculeatus	0.2	< 1	0	0	6	0
Unidentified	0.2	< 1	0	2	0	0
Liparis spp.	0.1	< 1	3	0	0	0
Scophthalmus aquosus	< 0.1	< 1	0	0	-	0
Peprilus triacanthus	< 0.1	< 1	0	0	0	0
Total		320	457	112	880	40

Species	Jul 31	Aug 07	Aug 14	Aug 21	Aug 28	Sep 04	Sep 11
Enchelyopus cimbrius	65	23	2	32	1	0	370
Tautogolabrus adspersus	33	75	489	46	9	84	524
Urophycis spp.	0	5	10	30	101	74	421
Ulvaria subbifurcata	0	2	1	0	0	0	0
Pseudopleuronectes americanus	0	0	0	0	0	0	0
Scomber scombrus	1	0	0	0	0	0	0
Cyclopterus lumpus	0	1	0	0	0	1	0
Syngnathus fuscus	4	2	0	1	1	0	0
Gasterosteus aculeatus	< 1	0	0	0	0	0	0
Unidentified	0	2	1	0	2	0	0
Liparis spp.	0	0	0	0	0	0	0
Scophthalmus aquosus	0	0	0	0	0	1	0
Peprilus triacanthus	0	0	0	0	0	1	0
Total	103	110	503	108	114	161	1315

Species	Sep 20	Sep 27
Enchelyopus cimbrius	169	63
Tautogolabrus adspersus	14	0
Urophycis spp.	0	0
Ulvaria subbifurcata	0	6
Pseudopleuronectes americanus	0	0
Scomber scombrus	0	0
Cyclopterus lumpus	0	0
Syngnathus fuscus	0	2
Gasterosteus aculeatus	0	0
Unidentified	0	0
Liparis spp.	0	0
Scophthalmus aquosus	0	0
Peprilus triacanthus	0	0
Total	183	71

4.0 DISCUSSION

4.1 JUVENILE AND ADULT FISH

4.1.1 Near-Bottom Fish

Species associated with bottom waters, and collected in abundance off Hampton Beach, include: yellowtail flounder, rainbow smelt, hake, silver hake, Atlantic cod, and winter flounder (Table 4.1-1). Over the past four years, catches of yellowtail, hake and silver hake have been consistently greater at Transects 1 and 3 than at Transect 2; while winter flounder has been consistently more abundant at Transect 2 than at the other transects. This pattern of catchability conforms rather well to known patterns of inshore/offshore distribution of these species. The rainbow smelt is reportedly an inshore distributed species (Bigelow and Schroeder 1953), however, they were not caught in greater numbers at Transect 2 compared with the other transects.

From 1976 through 1978, hake catches had been reasonably stable, from 11 to 20 fish per unit effort at Transects 1 and 3, and 5 or 6 fish per unit effort at Transect 2. In 1979, however, catch per effort declined somewhat, with the most substantial drop occurring at Transect 2 (Table 4.1-1). Most of the hake caught in gill nets and otter trawls off Hampton Beach (Figure 4.1-1) were juveniles; the adults are known to prefer water deeper than 40 meters (Musick 1974). The 1979 catch decline may reflect relatively poor 1977 or 1978 year-class reproduction success since hake mature in approximately three years (Clayton *et al.*, 1978).

Hake have generally appeared from March through December, with catches peaking in summer or early autumn (Figure 4.1-1). Hake move offshore in late winter and early spring to avoid water temperatures below 5°C (Musick, 1974); the presence of three hake in Transect 2 trawl catches in February and early March, 1979, imply that winter conditions were relatively mild at that time.

TABLE 4.1-1. CATCH PER UNIT OF OTTER TRAWL EFFORT FOR SIX FINFISH SPECIES COLLECTED FROM 1976 THROUGH 1979. SEABROOK FINFISH STUDIES 1979.

TAXON	YEAR	TRANSECTS[a] 1 C/E	1 % TOTAL[b]	2 C/E	2 % TOTAL[b]	3 C/E	3 % TOTAL[b]
Limanda ferruginea							
	1979	40.5	44.6	7.4	15.1	29.0	31.7
	1978	23.1	34.7	2.3	6.5	14.9	20.2
	1977	28.5	40.2	3.0	12.7	12.8	22.8
	1976	37.3	80.6	5.7	18.4	22.2	33.8
Osmerus mordax							
	1979	6.6	7.3	4.7	9.7	4.5	4.9
	1978	5.2	7.9	8.8	24.3	3.5	4.7
	1977	1.4	2.0	2.1	8.8	1.8	3.3
	1976	6.6	14.2	11.8	38.3	7.0	10.6
Urophycis spp. (*Urophycis chuss* and *U. tenuis*)	1979	9.9	10.9	1.5	3.2	8.8	8.9
	1978	14.7	22.2	6.3	17.3	12.9	17.6
	1977	21.3	30.2	4.6	19.5	17.0	30.5
	1976	17.1	37.0	4.6	14.9	11.3	17.2
Merluccius bilinearis							
	1979	2.3	2.5	0.5	1.0	3.3	3.6
	1978	4.3	6.5	0.3	0.8	1.9	2.5
	1977	2.2	3.1	0.6	2.7	1.7	3.3
	1976	6.2	13.4	0.7	2.3	4.6	17.0
Gadus morhua							
	1979	7.7	8.5	11.6	23.9	12.6	13.8
	1978	5.9	8.9	1.9	5.2	17.3	23.5
	1977	1.7	2.3	0.5	1.9	1.9	3.4
	1976	2.7	5.9	0.4	1.2	4.2	6.3
Pseudopleuronectes americanus							
	1979	2.8	3.1	12.5	25.7	2.4	2.7
	1978	2.9	4.4	9.7	26.6	3.6	4.9
	1977	3.5	4.9	6.4	26.7	1.9	3.4
	1976	1.6	3.4	5.1	16.6	1.6	2.4

[a] Some tows in 1976 and 1977 only five minutes, but all data converted to catch/10 min.

[b] % total by transect

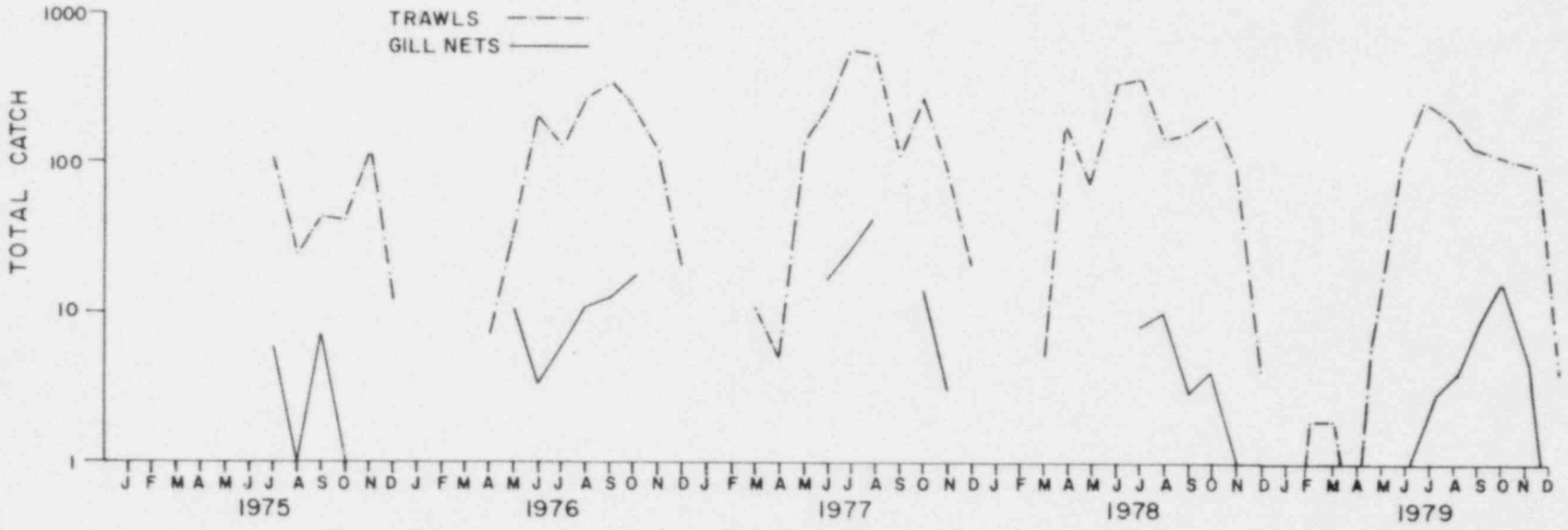


Figure 4.1-1. Total monthly catch of hake, *Urophycis* spp., in otter trawls and gill nets from 1975 through 1979. Seabrook Finfish Studies, 1979.

The silver hake is primarily a summer and fall visitor, with juveniles and adults comprising the catch, presumably to take advantage of macrozooplankton and young finfish resources in New Hampshire's territorial waters. The Gulf of Maine at large is a principal nursery for this species (TRIGOM-PARC 1974). Gill nets have tended to capture larger specimens than otter trawls, providing an explanation for the stronger late summer decline in catch shown by the gill net data (Figure 4.1-2); some adults prefer to move offshore into deeper water in summer (Clayton *et al.*, 1978). All silver hakes, from yearlings to adults, move offshore in winter, as do the true hakes.

Yellowtail flounder are among the most prominant members of the resident groundfish assemblage in New Hampshire coastal waters. Catch per unit effort, which had recently been declining from year to year, took an upward turn in 1979 (Table 4.1-1). Most of the specimens caught in the trawls have been immature, an observation which is consistent with the known preference of the adult for slightly deeper waters (depths greater than 40 m, Clayton *et al.*, 1978). In the past five years yellowtail catches have tended to peak in early winter and again in spring (Figure 4.1-3) suggesting some seasonal movement, possibly emigration of individuals as they become sexually mature, and recruitment of juvenile stocks from metamorphosing larvae.

The Atlantic cod inhabiting the territorial waters of New Hampshire, and those of neighboring Massachusetts north of Cape Ann and Maine south of Cape Porpoise, are presumed to be one of three somewhat distinct breeding groups in the Gulf of Maine (Wise 1963). In Figure 4.1-4, gill net data perhaps better represent the true seasonal presence of larger cod in the Hampton Beach vicinity than do trawl results, although adult cod characteristically avoid capture by either catch method. Since 1977, cod catches, consisting mostly of juvenile fish, have been generally increasing, with the most notable rise occurring at Transect 2 (Table 4.1-1).

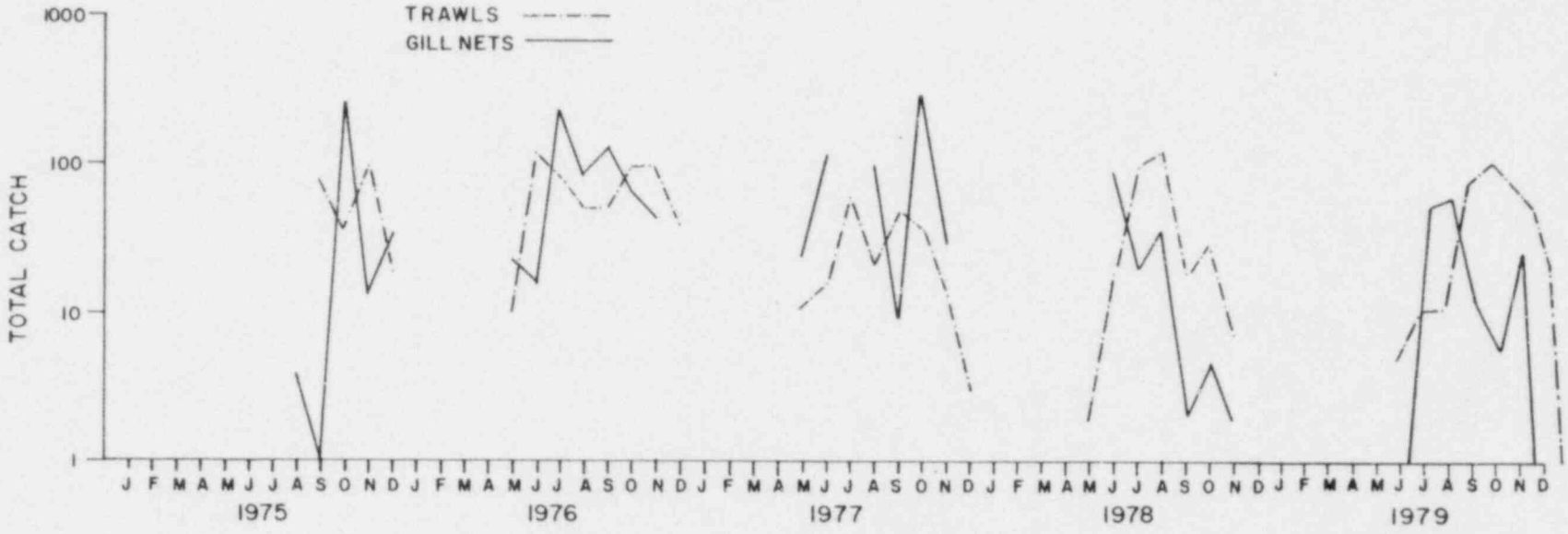


Figure 4.1-2. Total monthly catch of silver hake, *Merluccius bilinearis*, in otter trawls and gill nets from 1975 through 1979. Seabrook Finfish Studies, 1979.

Figure 4.1-3. Total monthly catch of yellowtail flounder, *Limanda ferruginea*, in otter trawls from 1975 through 1979. Seabrook Finfish Studies, 1979.

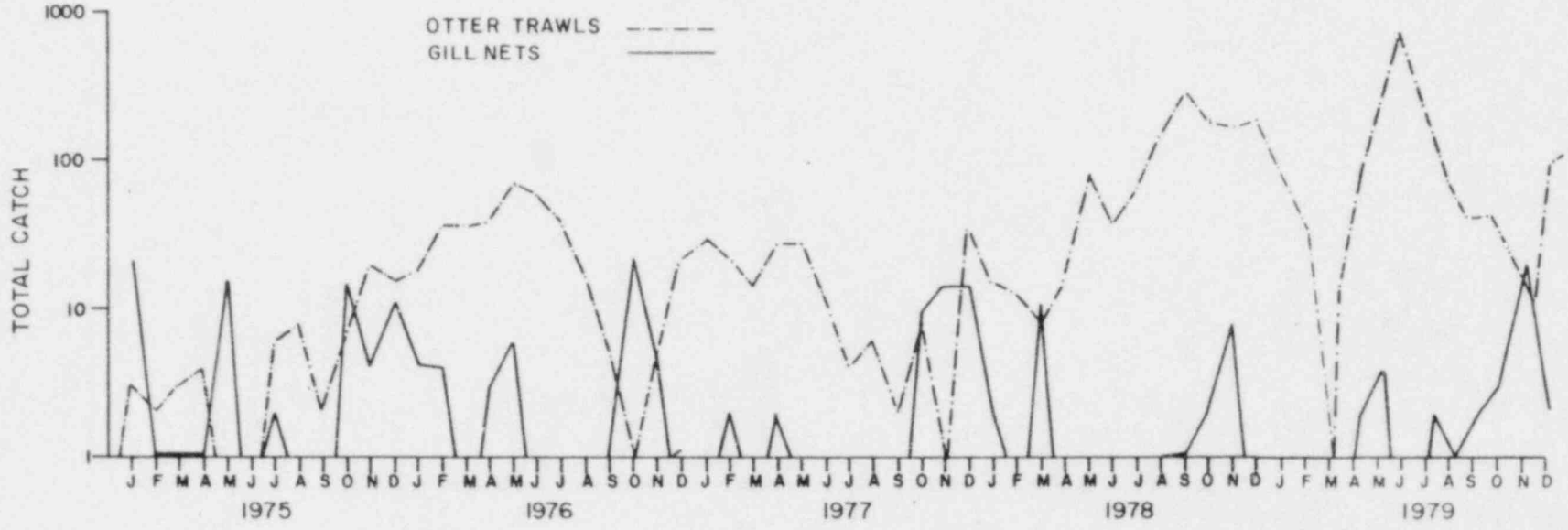


Figure 4.1-4. Total monthly catch of Atlantic cod, *Gadus morhua*, in otter trawls and gill nets from 1975 through 1979. Seabrook Finfish Studies, 1979.

The winter flounder is a widely distributed ground fish and a primary recreational fish in Hampton Harbor. Adults are usually found in the open waters of the inner continental shelf and offshore banks (Perlmutter 1947; Poole 1966), and frequently move into shoal areas to feed and spawn (Kennedy and Steele 1971; Wells, Steele and Tyler 1973; Frame 1974). In the Hampton - Seabrook study area, a few adults are caught in otter trawls in the fall and winter but most are captured from late spring through summer. Over the past four years, catch per effort of adults and juveniles combined has been consistently higher at Transect 2 nearshore than at Transects 1 and 3 slightly further offshore. Catch per effort has also been steadily increasing at Transect 2 during the past four years (Table 4.1-1), although their percent of the total catch has remained stable over the last three years.

Winter flounder captured by beach seine in Hampton Harbor (Table 4.1-2) are predominantly juvenile fish (total length: 0.9 to 18.5 cm); such immature flounder are reported to be far more likely than the adults to frequent the shallow subtidal zone and, unlike the adults, will move in and out of the intertidal zone with the changing tide (Perlmutter 1947, Poole 1966). Historically, the beach seine Biological Index Value computed for this species has been second only to the Atlantic silversides, but in 1979 winter flounder ranked number one within the estuary (Table 4.1-3). Juvenile flounder occur year round in otter trawl catches but tend to be scarcest in December or January, creating, in conjunction with low adult catches, an early winter depression in trawl catch abundance (Figure 4.1-5).

The rainbow smelt is an anadromous fish which apparently inhabits nearshore open coastal bottom waters during the warmer months, and reenters bays and estuaries during fall in preparation for an early spring spawning run (Clayton *et al.*, 1978). From 1976 through 1978 otter trawl catch per effort tended to be higher at Transect 2 than at Transects 1 and 3 which are slightly farther offshore; however, this distinction was not evident from 1979 catch results (Table 4.1-1). Since 1976, otter trawl and gill net smelt catches have peaked in winter and early spring; smelt have been virtually unobtainable by such capture

TABLE 4.1-2. CATCH PER UNIT OF SEINING EFFORT (TWO HAULS) FOR FIVE FINFISH SPECIES COLLECTED FROM 1976 THROUGH 1979. SEABROOK FINFISH STUDIES 1979.

	STATIONS					
	S1		S2		S3	
	C/E	% TOTAL[a]	C/E	% TOTAL[a]	C/E	% TOTAL[a]
Menidia menidia						
1979	352.3	86.6	366.2	44.3	589.5	62.8
1978	125.6	63.6	228.9	67.5	416.5	87.3
1977	93.2	28.7	162.5	42.8	398.0	80.7
1976	332.6	74.7	185.6	44.4	1049.9	82.8
Ammodytes americanus						
1979	0.0	0.0	1.6	0.2	8.2	0.9
1978	0.0	0.0	87.3	17.4	1.3	0.2
1977	88.4	27.2	13.8	3.6	0.0	0.0
1976	0.1	<0.1	0.0	0.0	53.1	4.2
Fundulus spp.						
1979	6.3	1.6	50.3	6.1	0.2	<0.1
1978	47.4	9.9	8.0	1.6	0.1	<0.1
1977	97.6	30.0	175.3	46.2	0.2	<0.1
1976	104.7	23.5	215.3	51.5	0.0	0.0
Pseudopleuronectes americanus						
1979	3.7	0.9	10.9	1.3	20.6	2.2
1978	20.0	1.0	4.8	0.9	13.3	2.8
1977	7.4	2.3	3.8	1.0	11.9	2.4
1976	2.5	0.5	4.3	0.1	5.7	0.4
Osmerus mordax						
1979	0.1	<0.1	0.1	<0.1	100.1	10.7
1978	0.0	<0.0	0.2	<0.1	0.4	0.1
1977	0.1	0.1	0.1	0.1	56.2	11.4
1976	1.9	0.4	3.9	1.0	82.5	6.5

[a]Percent of total catch per station per year.

TABLE 4.1-3. SUMMARY OF BIOLOGICAL INDEX VALUES FOR DOMINANT FISH SPECIES COLLECTED IN BEACH SEINES FROM 1976 THROUGH 1979. SEABROOK FINFISH STUDIES, 1979.

	BIOLOGICAL INDEX VALUES*			
	1976	1977	1978	1979
Menidia menidia	68	67	70	52
Pseudopleuronectes americanus	61	64	64	57
Fundulus	53	39	38	40
Gasterosteus aculeatus	28	37	54	39
Pungitius pungitius	29	25	31	19
Ammodytes americanus	14	30	39	21
Osmerus mordax	28	37	15	39
Alosa aestivalis	13	34	13	32
Liopsetta putnami	0	26	46	33
Urophycis	18	26	22	0
Alosa pseudoharengus	20	14	11	30
Clupea harengus	3	8	25	21

*Maximum value is 80

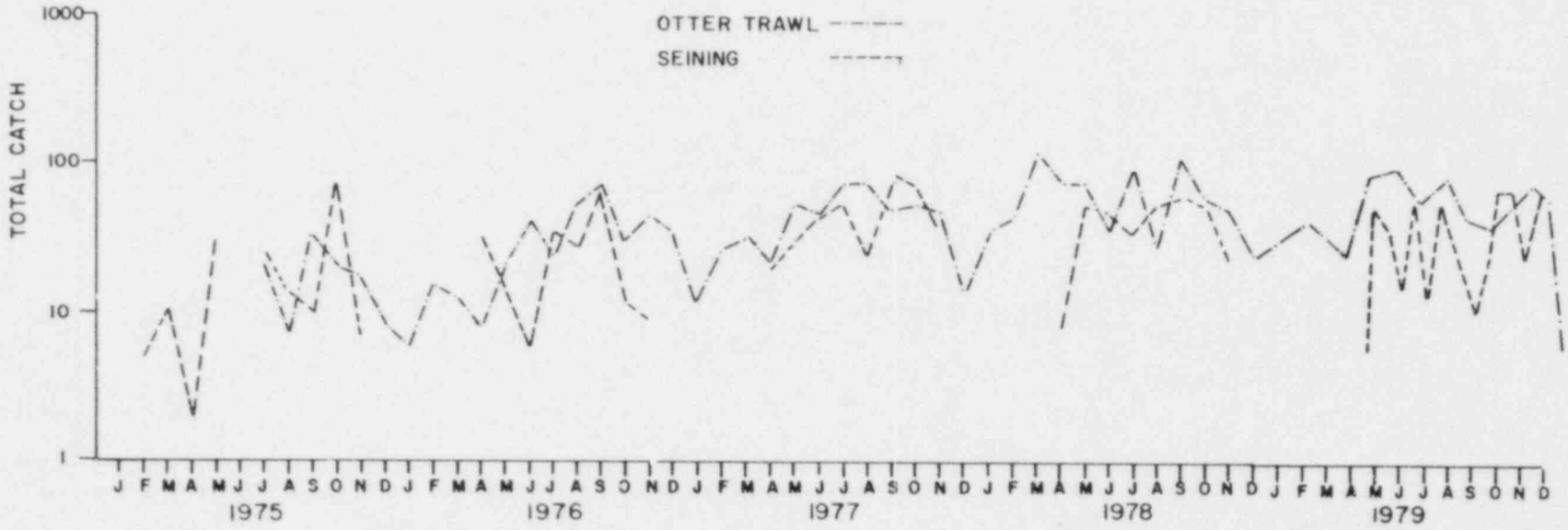


Figure 4.1-5. Total monthly catch of winter flounder, *Pseudopleuronectes americanus*, in otter trawls and beach seines from 1975 through 1979. Seabrook Finfish Studies, 1979.

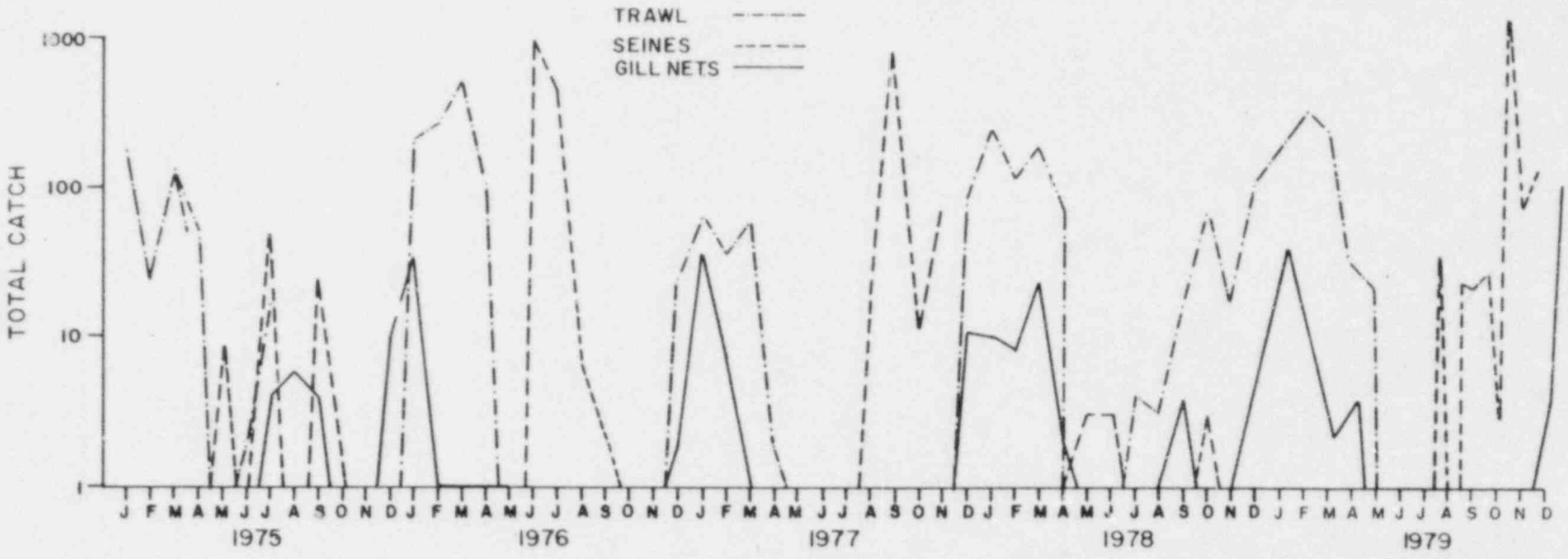


Figure 4.1-6. Total monthly catch of rainbow smelt, *Osmerus mordax*, in otter trawls, gill nets and beach seines from 1975 through 1979. Seabrook Finfish Studies, 1979.

methods during the warmer months (Figure 4.1-6). Bigelow and Schroeder (1953) report that even in summer smelt are rarely encountered more than a mile or so from shore, or in water more than 6-meters deep. The absence of this species from summer catches implies that the smelt must move to some nearshore setting other than off Hampton Beach or move further offshore, contrary to reports from Bigelow and Schroeder (1953).

Young-of-the-year smelt have been abundant from summer through fall in Seabrook Harbor seine hauls (Station S3) in each of the past four years, except 1978 (Table 4.1-2), which may have been a relatively unsuccessful reproductive year locally. These young fish begin to mingle with adult populations by fall (McKenzie 1964, Clayton 1976).

4.1.2 Pelagic Fish

Pelagic species numerically important in gill net catches include the herring group (especially *Clupea harengus* and *Alosa* spp.) and the Atlantic mackerel. Catch data show little evidence of a consistent temporal trend, although 1979 appeared to be a relatively poor year for catching these species (Table 4.1-4). Herring and mackerel tend to be more abundant in surface gill nets than in either mid-water or bottom set nets. In general, the mid-water net catch yield in 1979 resembled the bottom net catch more than the surface net results.

The Atlantic herring frequenting the New Hampshire coast are believed to be representatives of one of several Gulf of Maine subpopulations, each of which have distinctive migratory and reproductive patterns (Clayton *et al.*, 1978). Adults appear sporadically in the catch, typically in late fall (their spawning period) and again in early spring. Juveniles occur from October through June, but in the past few years have been absent from the catch in midsummer (Figure 4.1-7), presumably having moved offshore to avoid water temperatures above 13°C (Stickney 1969). Nineteen seventy nine marks the first year since 1975, that no subadults were captured during the coldest months (Figure 4.1-7).

TABLE 4.1-4. CATCH PER UNIT OF GILL NET EFFORT (C/E = 3-DAY SET) FOR FIVE FINFISH SPECIES COLLECTED FROM 1976 THROUGH 1979 SEABROOK FINFISH STUDIES, 1979.

		STATIONS					
		A		B		C	
		C/E	% TOTAL[a]	C/E	% TOTAL[a]	C/E	% TOTAL[a]
Clupea harengus							
1979	S	14.1	83.2	46.5	92.0	8.3	55.3
	M[b]	7.4	84.8	9.1	63.1	4.4	42.5
	B	5.9	76.4	8.9	74.3	4.8	55.4
1978	S	90.7	82.7	27.7	62.5	75.7	62.1
	B	60.9	91.4	67.1	71.0	72.4	77.3
1977[c]	S	68.0	64.8	53.7	68.7	56.6	46.8
	B	16.1	36.2	18.5	39.1	17.6	27.3
1976	S	15.1	43.9	18.3	46.7	48.9	67.4
	B	35.2	63.5	20.4	52.7	21.1	44.0
Scomber scombrus							
1979	S	0.5	2.7	0.6	1.2	0.6	4.1
	M[b]	0.0	0.0	0.0	0.0	0.0	0.0
	B	0.1	0.8	0.0	0.0	0.0	0.0
1978	S	1.6	1.4	2.9	6.6	1.2	1.0
	B	1.1	1.6	1.7	1.8	1.5	1.6
1977[c]	S	11.7	11.2	7.1	9.1	7.2	7.1
	B	1.1	2.4	0.9	1.8	0.9	3.3
1976	S	7.3	21.3	10.7	27.3	12.9	17.8
	B	0.6	1.1	1.5	4.1	1.2	2.4
Alosa aestivalis							
1979	S	0.5	2.9	0.3	0.6	1.1	7.1
	M[b]	0.0	0.0	0.0	0.0	0.2	2.1
	B	0.0	0.0	<0.1	0.3	0.0	0.0
1978	S	5.9	5.4	5.3	12.0	35.4	29.4
		1.6	2.3	18.1	19.2	9.4	10.5
1977[c]	S	7.0	6.6	9.4	12.1	32.5	26.9
	B	1.0	2.2	1.5	3.3	1.8	2.7
1976	S	8.5	19.4	1.7	4.3	2.9	4.0
	B	2.5	4.6	1.0	2.6	0.2	1.0

Continued

TABLE 4.1-4. (Continued)

		STATIONS					
		A		B		C	
		C/E	% TOTAL	C/E	% TOTAL	C/E	% TOTAL
Alosa pseudoharengus							
1979	S	0.2	1.3	0.1	0.2	0.2	1.0
	M	0.0	0.0	0.0	0.0	0.0	0.0
	B	0.0	0.0	0.0	0.0	0.0	0.0
1978	S	1.7	1.6	1.9	4.3	5.2	4.3
	B	0.2	0.2	0.1	<0.1	0.7	0.8
1977[c]	S	1.5	1.4	2.4	3.0	1.6	1.3
	B	0.3	0.8	1.0	2.0	0.8	1.2
1976	S	0.5	1.4	1.5	3.8	0.2	0.2
	B	0.5	0.9	0.5	1.3	0.5	1.0
Merluccius bilinearis							
1979	S	1.2	7.0	1.1	2.1	1.1	7.3
	M	0.1	1.3	0.0	0.0	0.1	1.1
	B	0.5	5.5	0.7	5.8	0.3	3.5
1978	S	6.8	6.2	3.0	6.7	0.9	0.7
	B	0.4	0.6	0.5	0.5	0.9	1.0
1977[c]	S	11.6	11.0	8.8	11.3	13.9	11.5
	B	17.6	39.5	19.8	41.7	25.8	40.0
1976	S	3.5	10.2	6.5	16.7	7.0	9.6
	B	7.3	13.4	9.6	24.7	14.5	30.1

[a] Percent of total catch by station and net depth

[b] Mid-depth nets sampled only during March, June and October

[c] Only one 24 hour set in March; weathered out

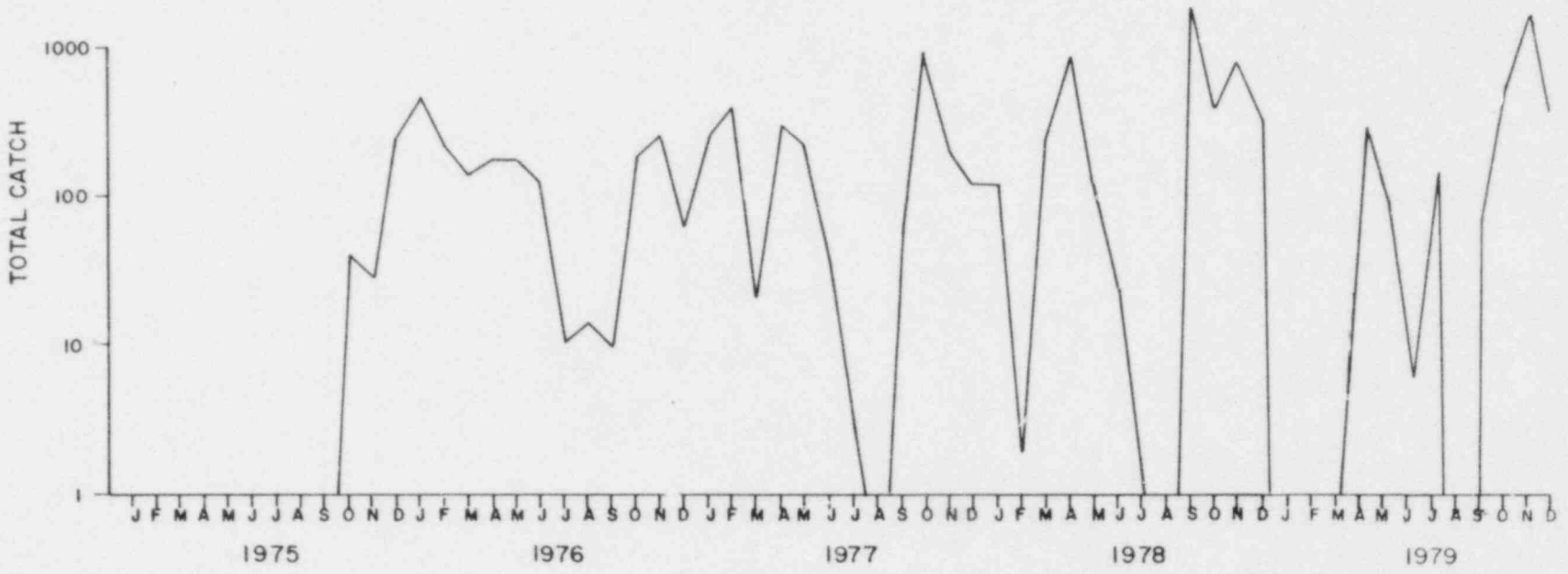


Figure 4.1-7. Total monthly catch of Atlantic herring, *Clupea harengus*, in gill nets from 1975 through 1979. Seabrook Finfish Studies, 1979.

The Atlantic mackerel is a wide ranging, open water species which visits inshore waters during the warmer months to take advantage of local food resources. The population most closely associated with New England waters usually leaves the inshore area by late September but may be temporarily replaced by a contingent moving south from spawning grounds in the Gulf of St. Lawrence (Clayton *et al.*, 1978); a tendency toward bimodality in the catch data (Figure 4.1-8) is consistent with such a sequence of events. Mackerel catch per effort has been declining sharply since 1977 (Table 4.1-2) perhaps due to: 1) increasingly transient occupancy of New Hampshire territorial waters in response to competition from other pelagic predators or 2) a temporary downturn in the cycle of reproductive success. A boom and bust reproductive cycle is especially characteristic of t species (Clayton *et al* 1978). Despite the mackerel's elusiveness over the last few years, the proportion of adults in the gill net catch has been among the highest for any recreationally important species.

The alewife and blueback herring are closely related anadromous fish, collectively termed "river herring" by fishermen, many of whom have difficulty distinguishing between these two species. The blueback ranges farther south, and does not have to ascend streams all the way to fresh water in order to successfully spawn; hence, the bluebacks reproductive success is less disrupted by dams at the head-of-tide without adequate fishways than is the alewife. The alewife survey conducted by the New Hampshire Fish and Game Department was more extensive in 1979 than in 1978, and showed a larger number of fish passing the Taylor River weir, from late April to early June. Adults of both species of river herring return to the ocean after spawning.

Blueback and alewife young-of-the-year are both frequently caught in seine hauls inside Hampton-Seabrook estuary from May to November (Figure 4.1-9). In 1979, a particularly large school of young-of-the-year alewives was intercepted at the mouth of the Brown's River in June. Since 1976, juvenile river herring have been scarce or absent from all seine catches in mid summer. Most river herring captured off Hampton Beach in gill nets are subadults (total length less than 25 cm).

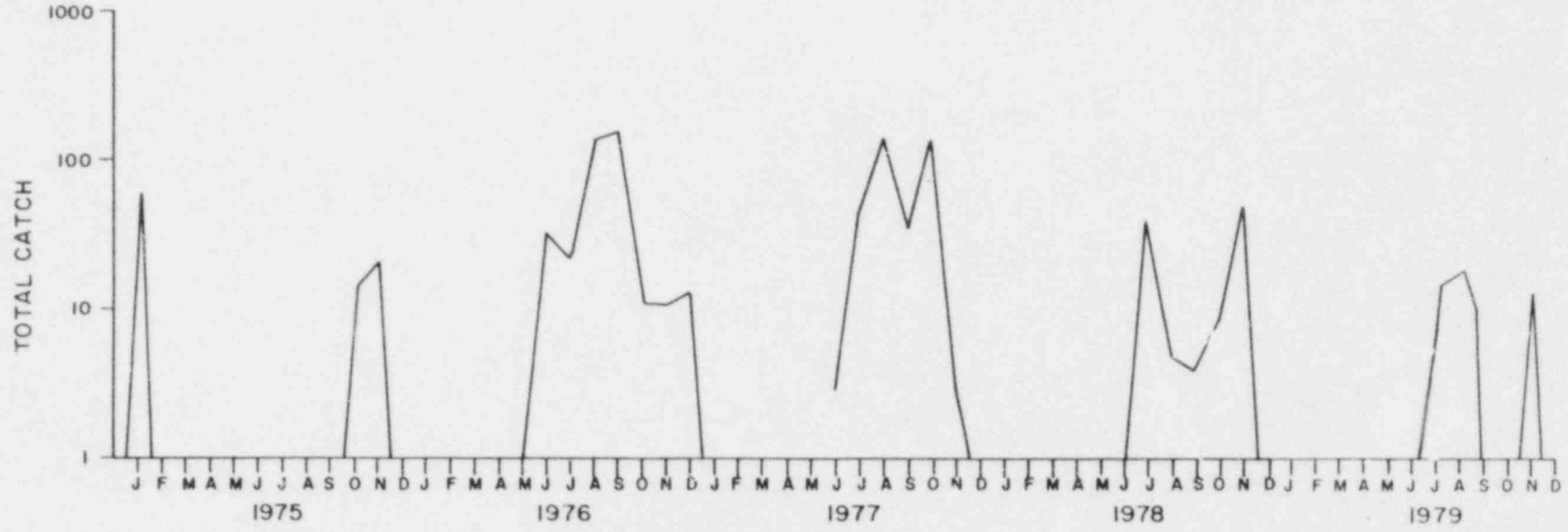


Figure 4.1-8. Total monthly catch of Atlantic mackerel, *Scomber scombrus*, in gill nets from 1975 through 1979. Seabrook Finfish Studies, 1979.

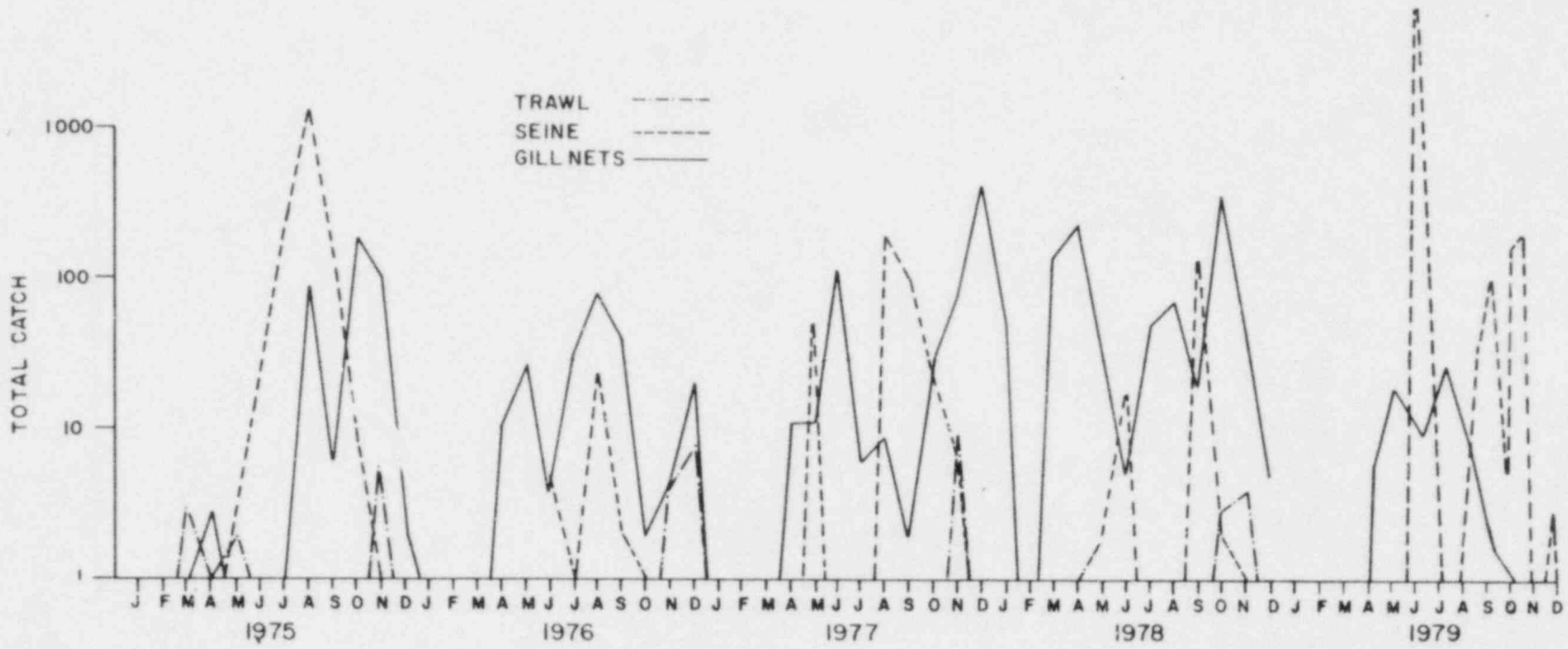


Figure 4.1-9. Total monthly catch of river herring, *Alosa pseudoharengus* and *A. aestivalis*, in otter trawls, gill nets and beach seines from 1975 through 1979. Seabrook Finfish Studies, 1979.

Overall, gill net catch abundance, which had been increasing through 1978, took a downward turn in 1979 (Table 4.1-2, Figure 4.1-9).

Over the years, numerous SCUBA diver observations have indicated that juvenile pollock (total length less than 55 cm) are common in the vicinity of Hampton Beach from April through November. Divers have occasionally observed pollock, 20 to 40 cm in total length, avoiding entrapment in gill nets while seizing smaller fish so entrapped. Mature pollock have not been captured by any of the fishing methods used in this study, possibly in part because they range farther offshore (Bigelow and Schroeder 1953). The area between Cape Ann and the Isles of Shoals has been reported to be a regional breeding ground for Pollock (Steele, 1963). Seine haul results in May (Appendix Table 7-4) are probably more indicative of true abundance of young pollock than gill net and otter trawl catches (Figure 4.1-10). Individuals caught by seine in Hampton-Seabrook estuary tend to be young-of-the-year (6-9 cm total length) while individuals of a much wider age range, (7 to 42 cm total length) are captured by trawls and gill nets employed offshore.

The Atlantic menhaden is a pelagic fish, related to the herring, which moves northward into the Gulf of Maine with the seasonal warming of the water. Except in 1977, gill net catches of this species off Hampton Beach have been intermittent during the warmer months, with the first captures of the season usually occurring in May (Figure 4.1-11). In most years, the largest catches have been in October.

4.1.3 Estuarine Species

Potentially abundant resident finfish, with life styles closely tied to Hampton-Seabrook estuary include the Atlantic silversides, killifish and the American sand lance. All three species are small-bodied "bait" or forage fish which serve as prey for many piscivorous marine animals.

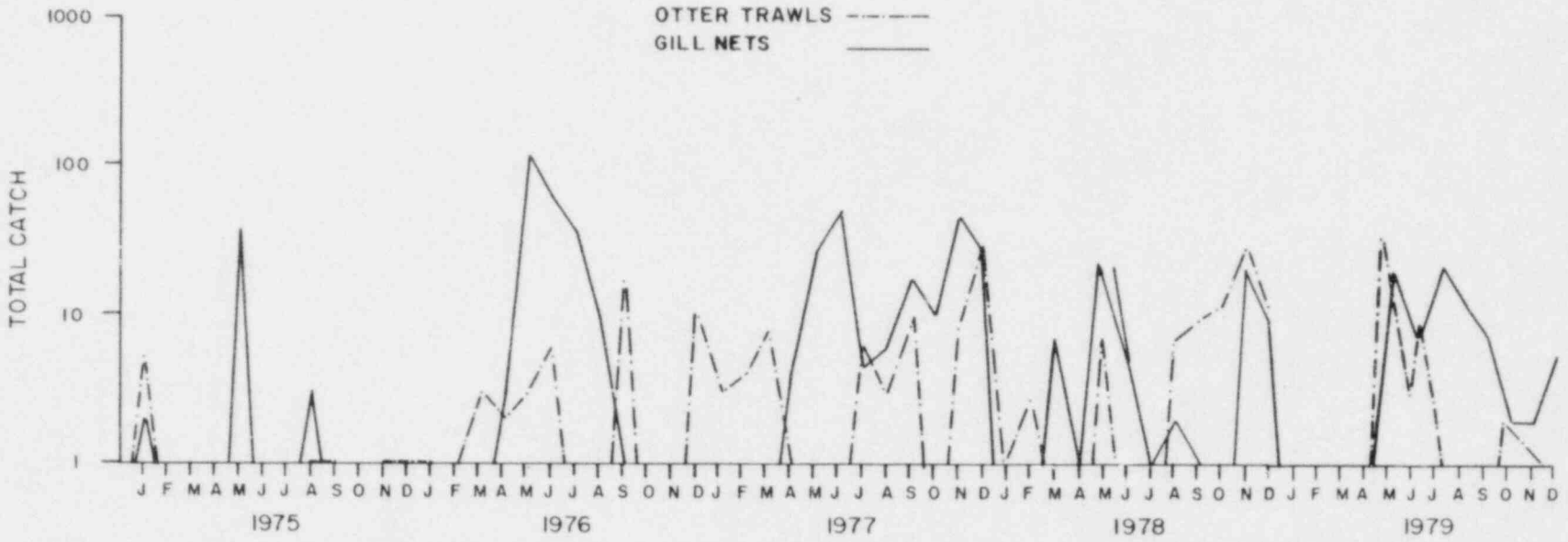


Figure 4.1-10. Total monthly catch of pollock, *Pollachius virens*, in otter trawls and gill nets from 1975 through 1979. Seabrook Finfish Studies, 1979.

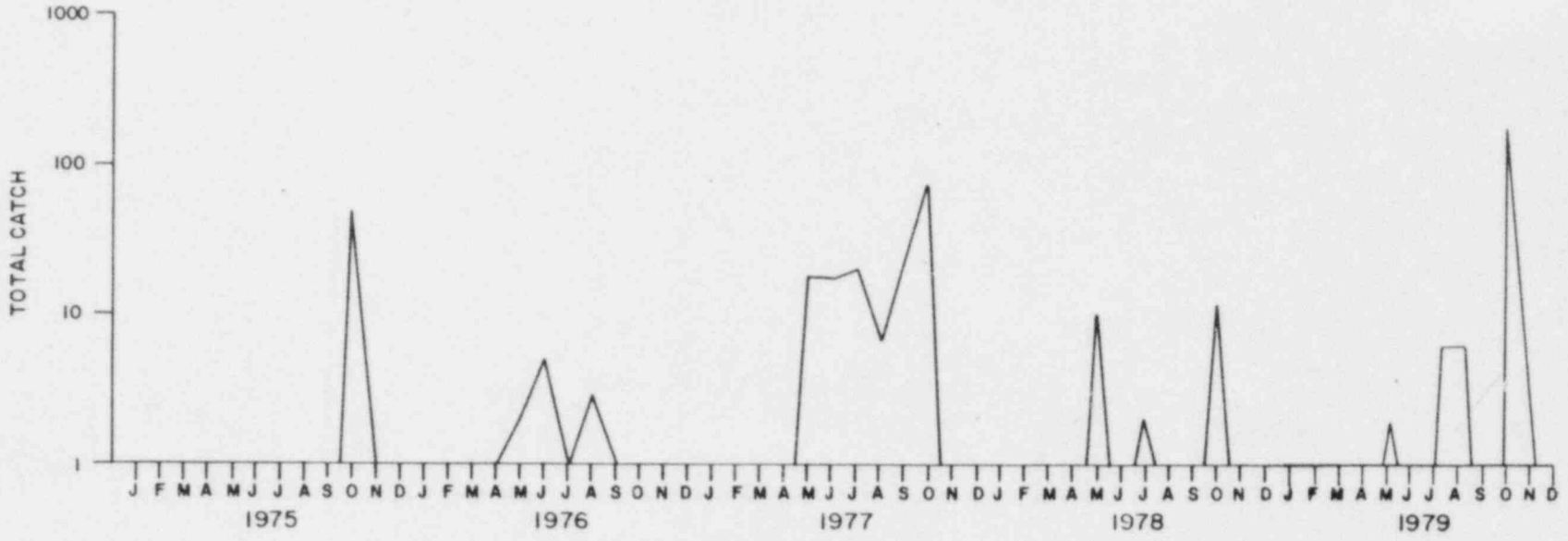


Figure 4.1-11. Total monthly catch of Atlantic menhaden, *Brevoortia tyrannus*, in gill nets from 1975 through 1979. Seabrook Finfish Studies, 1979.

Atlantic silversides are consistently caught in great numbers in Hampton-Seabrook estuary by seining. Annual average catch per effort has ranged from a low of 93 fish per unit effort at Station S1 in 1977 to a high of 1049 fish at Station S3 in 1976 (Table 4.1-2). Nineteen seventy nine was an intermediate year with less than the usual difference in catch per effort between seine stations. High catch returns have consistently been recorded in the estuary between July and November (Figure 4.1-12). A few silversides have been captured at other times of the year, but most of the resident population probably spends the winter outside Hampton Harbor and then moves quickly to the upstream reaches of tributaries, such as the Taylor and Hampton Falls Rivers, for the early summer spawning period (cf Jerome *et al.*, 1965, 1968; Clayton *et al.*, 1978). The few adult silversides which have been captured in the otter trawls in winter tend to substantiate such a pattern of movement (Figure 4.1-12).

In contrast to silversides, catches of American sand lance are erratic (Table 4.1-2, Figure 4.1-13). Sand lance characteristically have an uneven distribution on estuary sand banks; within a few meters populations can fluctuate from no fish at all to thousands per square meter. These fish can easily avoid quantitative capture by rapidly burrowing tail-first into the sand; when momentarily held in a net their slender serpentine form makes escape through the 1.2 cm seine mesh relatively easy. Results reported here, therefore, should be regarded as only qualitative. Sand lance usually appear in seine catches beginning in May or June. Adults are presumed to move offshore during late autumn and winter (Bigelow and Schroeder, 1953; Leim and Scott 1966) and have been captured in otter trawls in winter and early spring (Figure 4.1-13).

Killifish are year-round residents of Hampton-Seabrook estuary. They are active in the vicinity of the seining stations from May until November, with peak abundance usually occurring in summer (Figure 4.1-14). Catch per effort was high in 1976 and 1977 but has undergone a relative decline in succeeding years (Table 4.1-3). Over the past few years, Stations S1 and S2 have consistently accounted for

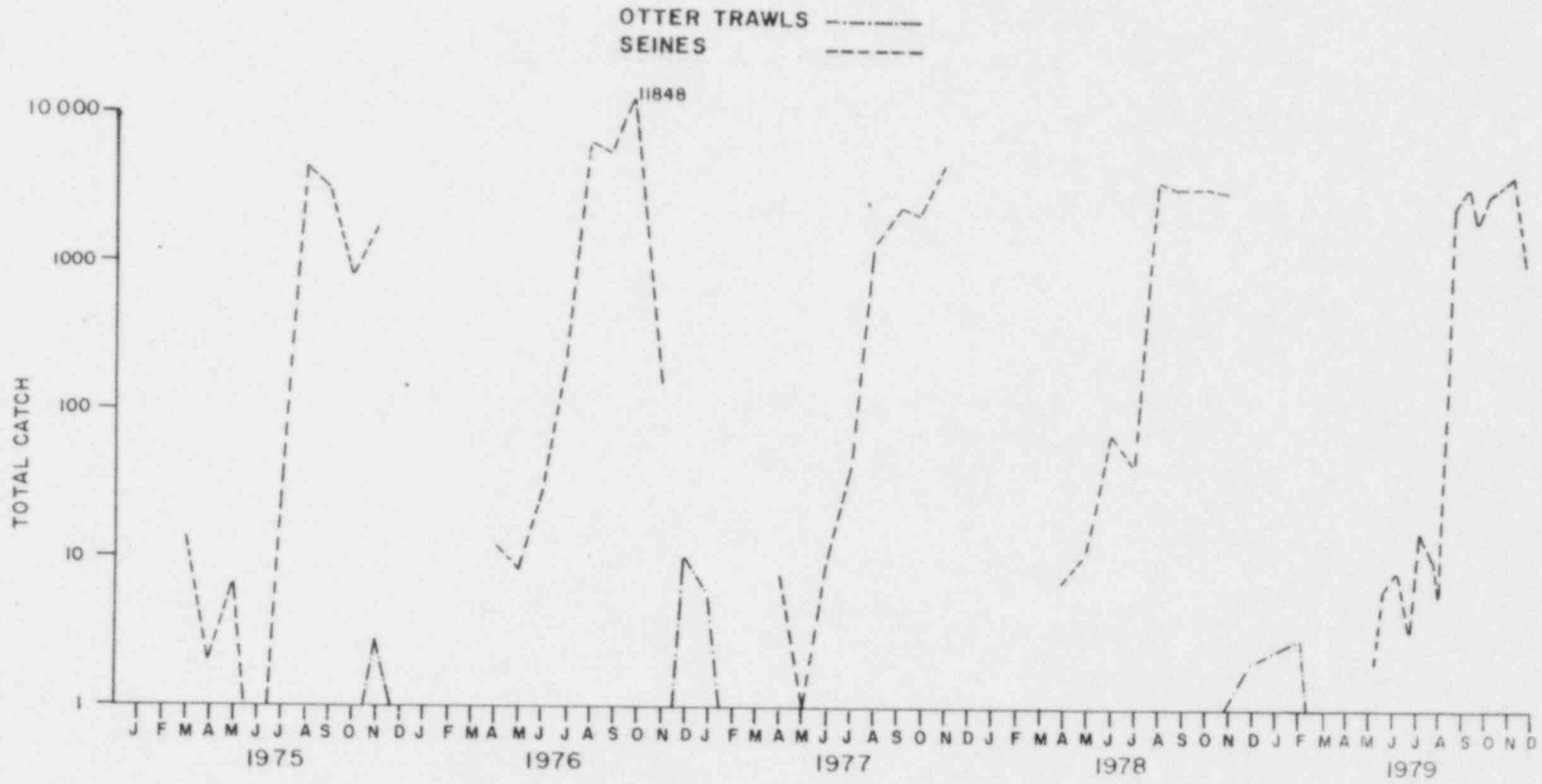


Figure 4.1-12. Total monthly catch of Atlantic silversides, *Menidia menidia*, in otter trawls and beach seines from 1975 through 1979. Seabrook Finfish Studies, 1979.

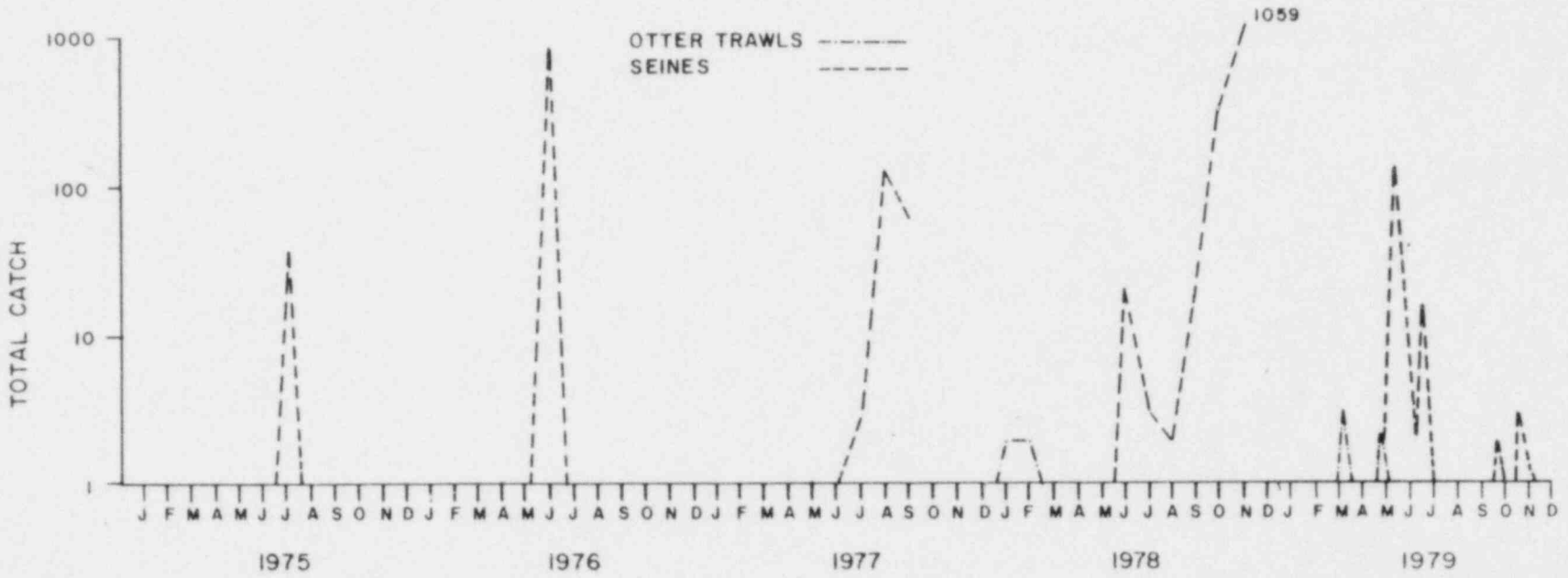


Figure 4.1-13. Total monthly catch of American sand lance, *Ammodytes americanus*, in otter trawls and beach seines from 1975 through 1979. Seabrook Finfish Studies, 1979.

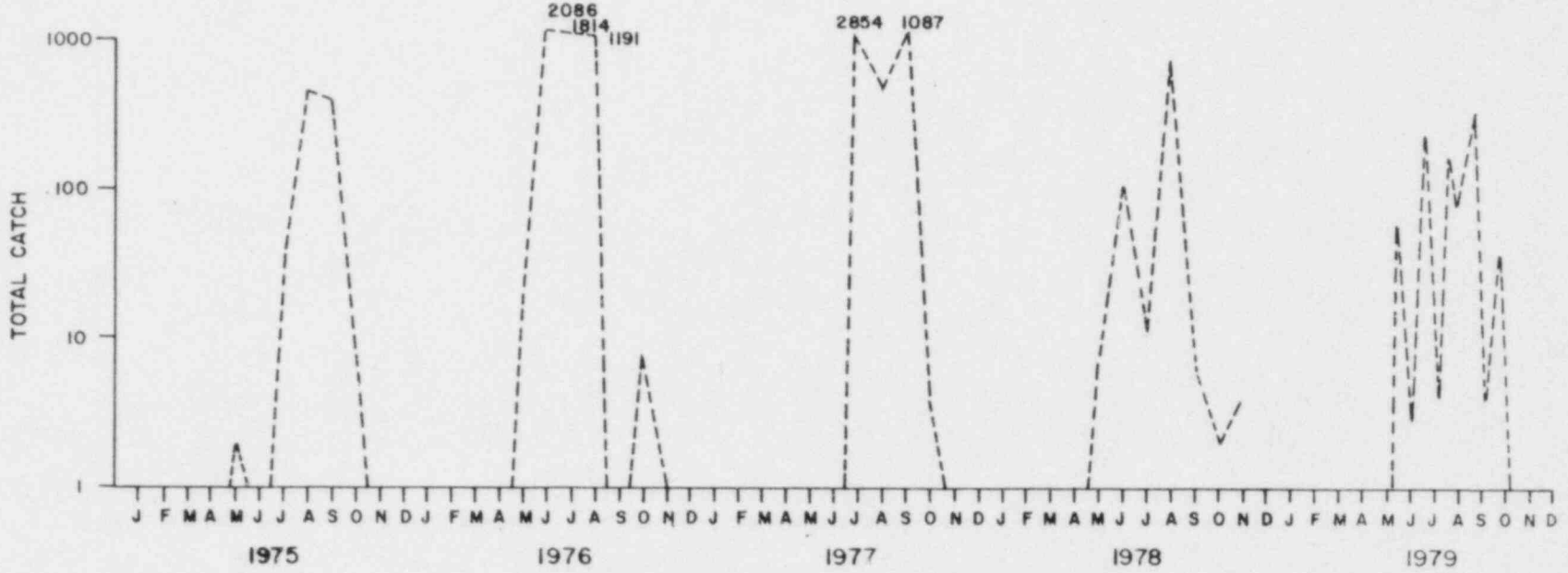


Figure 4.1-14. Total monthly catch of killifish, *Fundulus* spp., in beach seines from 1975 through 1979. Seabrook Finfish Studies, 1979.

nearly all of the total catch; this is almost certainly a reflection of the comparative proximity of Stations S1 and S2 to the branching system of salt marsh drainage which constitutes the preferred habitat of this species.

4.1.4 Other Representative Species

In accordance with Section 316(a) of the Federal Clean Water Act, seven finfish species were selected as "indicators" of potential Seabrook Station ecological impact:

Alewife	*Alosa pseudoharengus*
Atlantic mackerel	*Scomber scombrus*
Atlantic menhaden	*Brevoortia tyrannus*
Coho salmon	*Oncorhynchus kisutch*
Pollock	*Pollachius virens*
Rainbow smelt	*Osmerus mordax*
Winter flounder	*Pseudopleuronectes americanus*

Five of the seven species have already been discussed in Sections 4.1-1 and 4.1.2.

The coho salmon is the only indicator species not indigenous to the Gulf of Maine. Coho are native to the eastern North Pacific and were introduced into nearby Great Bay Estuary through the efforts of the New Hampshire Fish and Game Department to establish a recreational salmon fishery. The program had some success but was limited in scope. In the past five years, six coho salmon have been captured during the Seabrook Finfish Studies. One 6 lb female was captured in a gill net in June 1978; the other five fish were juveniles averaging 22 cm total length, caught by beach seine in Hampton-Seabrook Estuary, four in 1976, one in 1978.

The cunner is a temperate water "pan fish" which congregates around rock formations and other natural and man-made aquatic obstructions making quantitative sampling of their populations difficult, and virtually impossible using the types of fishing gear employed in this study. Instead, the approach taken has been to investigate condition, age and growth characteristics of captured specimens to establish a baseline for future comparison, once Seabrook Station becomes operational. A previous report (NAI, 1980) presented evidence that cunner collected from New Hampshire waters was shorter at a given age than cunner from Massachusetts (Serchuk and Cole 1974) or Connecticut (Dew 1976). Age at mortality for New Hampshire cunner appeared to fall midway between ages at maturity determined for Gulf of St. Lawrence (Johansen 1925) and Connecticut (Dew 1976) populations. Differences in growth rates and ages at maturity were ascribed to latitude, that is, geographic differences in the length of time water remains between 10 and 23°C (the species' temperature preferendum, Fiske *et al.*, 1968).

4.2 ICHTHYOPLANKTON

From mid 1976 through 1979, the ichthyoplankton assemblage in Hampton-Seabrook coastal waters has been dominated by gadids, cunner/yellowtail flounder, American sand lance, American plaice and seasnails (NAI, 1979; 1980) most of which are substrate oriented. Representation of errant pelagic species in the ichthyoplankton has been minimal, with the exception of mackerel eggs in 1978 and 1979 and Atlantic herring larvae prior to 1978. Estuarine-dependent species such as Atlantic tomcod and rainbow smelt were rare. Species richness of both fish eggs and larvae has been relatively stable from year to year (NAI, 1979; 1980).

Seasonal species composition of the dominant taxa has generally remained consistent. The annual fish egg abundance peak, occurring during June and/or July, was comprised principally of cunner/tautog/yellowtail flounder (Figure 4.2-1). During late fall and winter, which

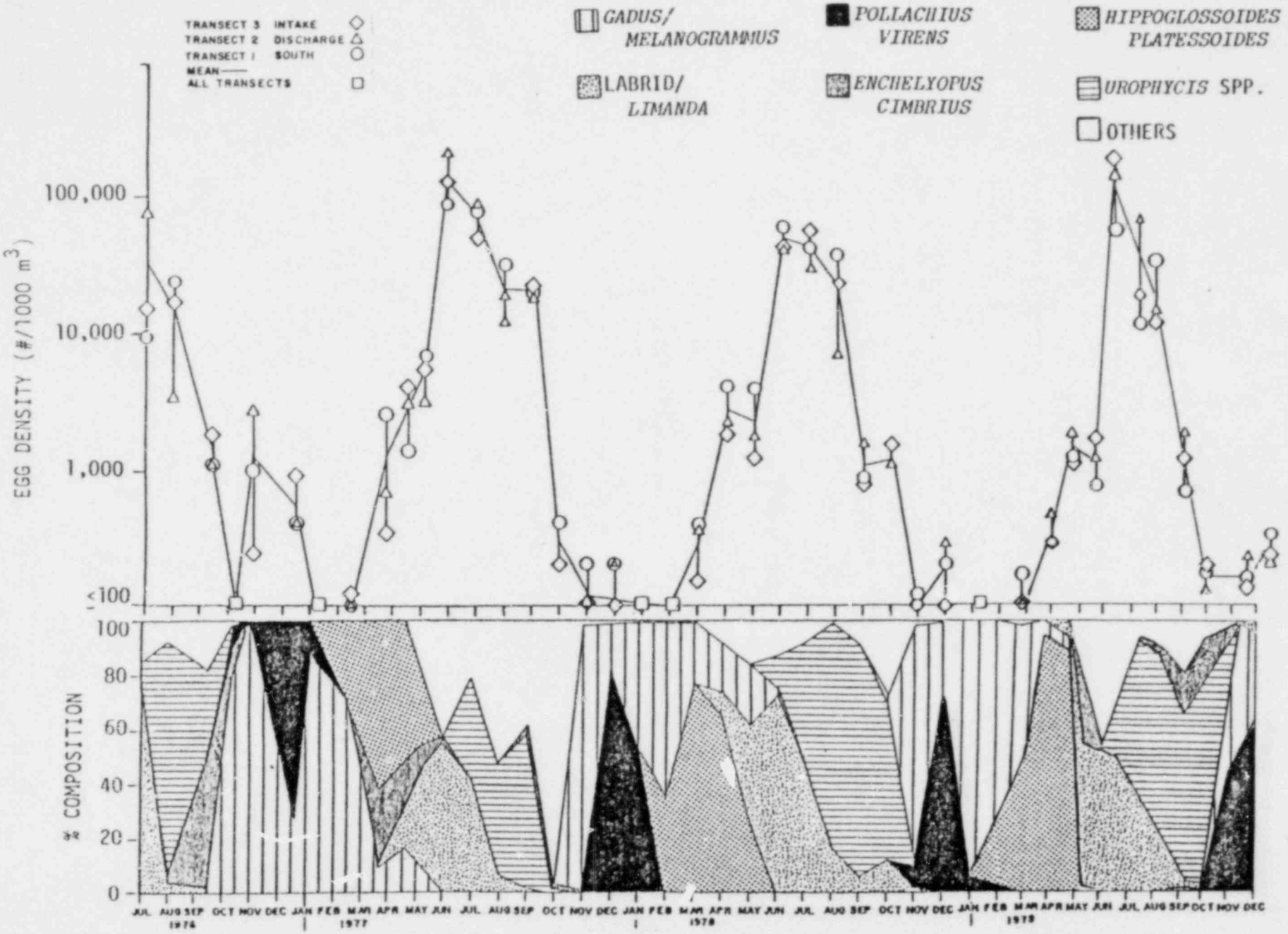


Figure 4.2-1. Abundance (No./1000 m^3) and percent composition of fish eggs in New Hampshire coastal waters from July 1976 through December 1979. Seabrook Finfish Studies, 1979.

was usually the period of minimal densities, cod/haddock and pollock were the dominant eggs. American plaice eggs dominated the late winter/spring assemblage; hakes and rockling dominated principally in summer and early fall. Larval abundance peaks were not as seasonally defined as annual egg abundance peaks (Figure 4.2-2). American sand lance larvae dominated the winter/spring assemblage, cunner and fourbeard rockling were dominant in summer and fall, and pollock were dominant in winter. Atlantic herring were also a dominant fall species. Seasnails dominated in fall 1976, in winter and spring 1978 and principally in spring 1979.

During 1979, total fish larvae were more abundant at the south transect than at the intake and discharge, whereas total fish eggs were least abundant at the south transect. These transect differences were due principally to the distribution of the dominant taxa: cunner larvae abundances were an order of magnitude higher at the south transect and two of the three dominant eggs (cunner/tautog/yellowtail flounder and mackerel) were least abundant at the south transect. This trend was different from that observed in 1978, when total fish eggs and larvae were least abundant at the discharge (NAI, 1980). In 1978, cunner and American sand lance, the two most abundant larvae, were least abundant at the discharge; cunner/tautog/yellowtail flounder and hake eggs (ranked first and second, respectively) were also least abundant at the discharge whereas mackerel (ranked third) were least abundant at the south transect.

Based on 1978 data, changes in spatial distribution between years were suggested for cunner/tautog/yellowtail flounder, mackerel, hakes, and American plaice eggs and American sand lance, yellowtail flounder, silver hake and mackerel larvae (NAI, 1980). Spatial trends observed in 1979 were similar to those observed in 1977 for cunner/tautog/yellowtail flounder, mackerel and hake eggs (Figure 4.2-3). Cunner/tautog/yellowtail flounder eggs were most abundant at the discharge, except in 1978; annual transect abundances have been similar, except for lower densities at the intake and south transects in 1976. Mackerel eggs have generally increased each year at all transects,

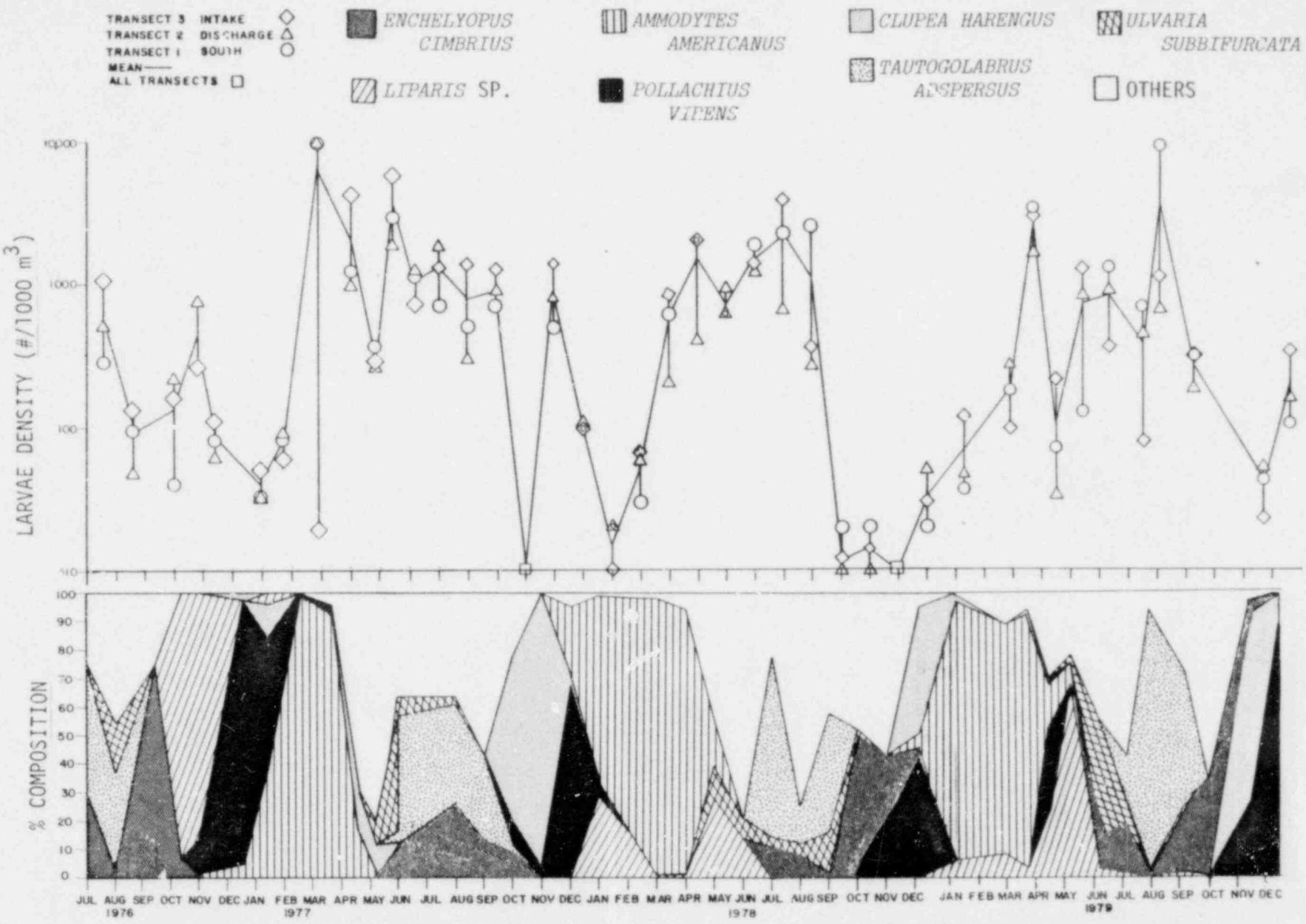
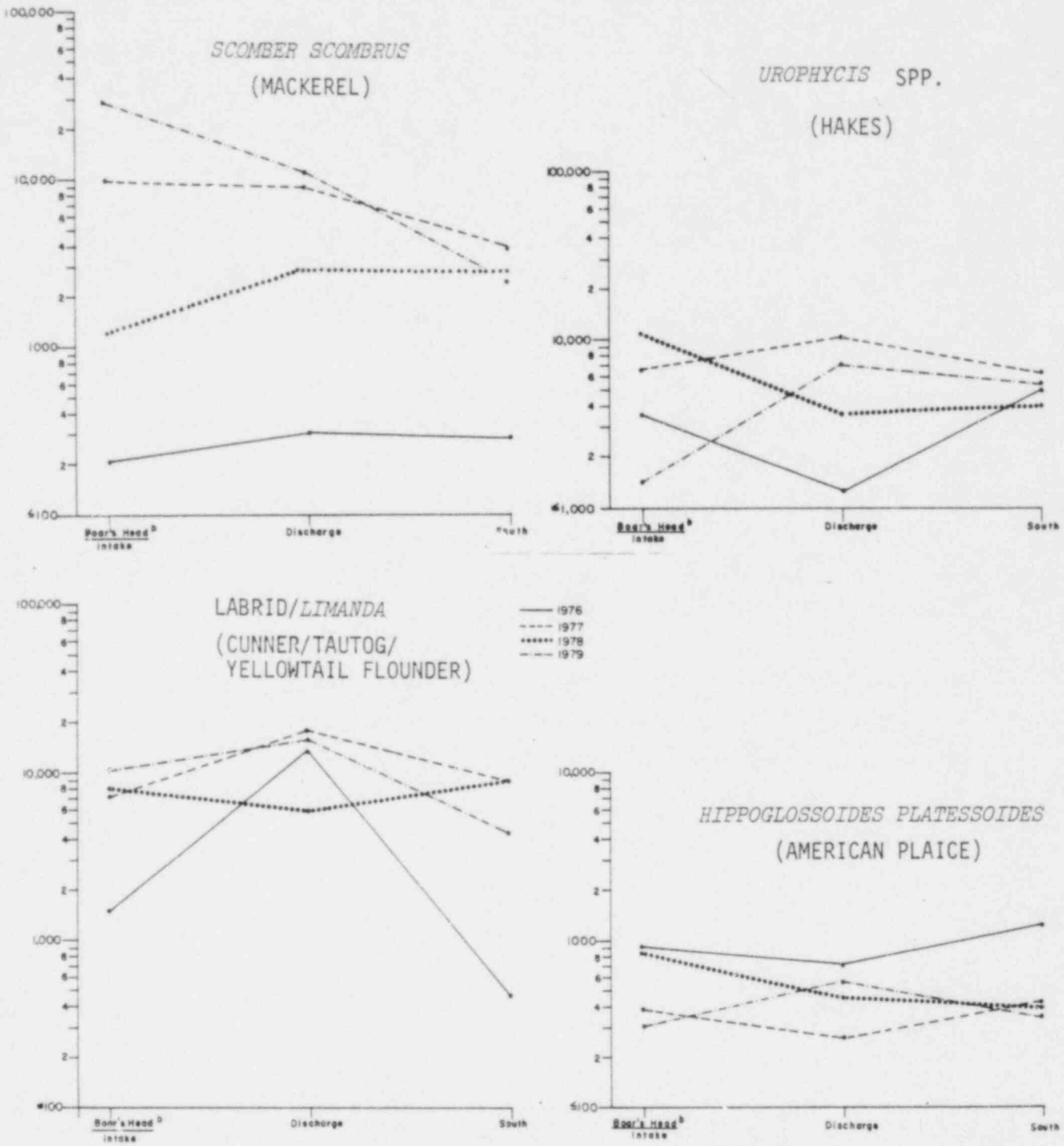


Figure 4.2-2. Abundance and percent composition of fish larvae in ichthyoplankton collections from the Hampton-Seabrook region, July 1976 through December 1978. Seabrook Finfish Studies, 1979.



[a]Based on the number of consecutive sample periods that a species was present at one or more stations in each year.

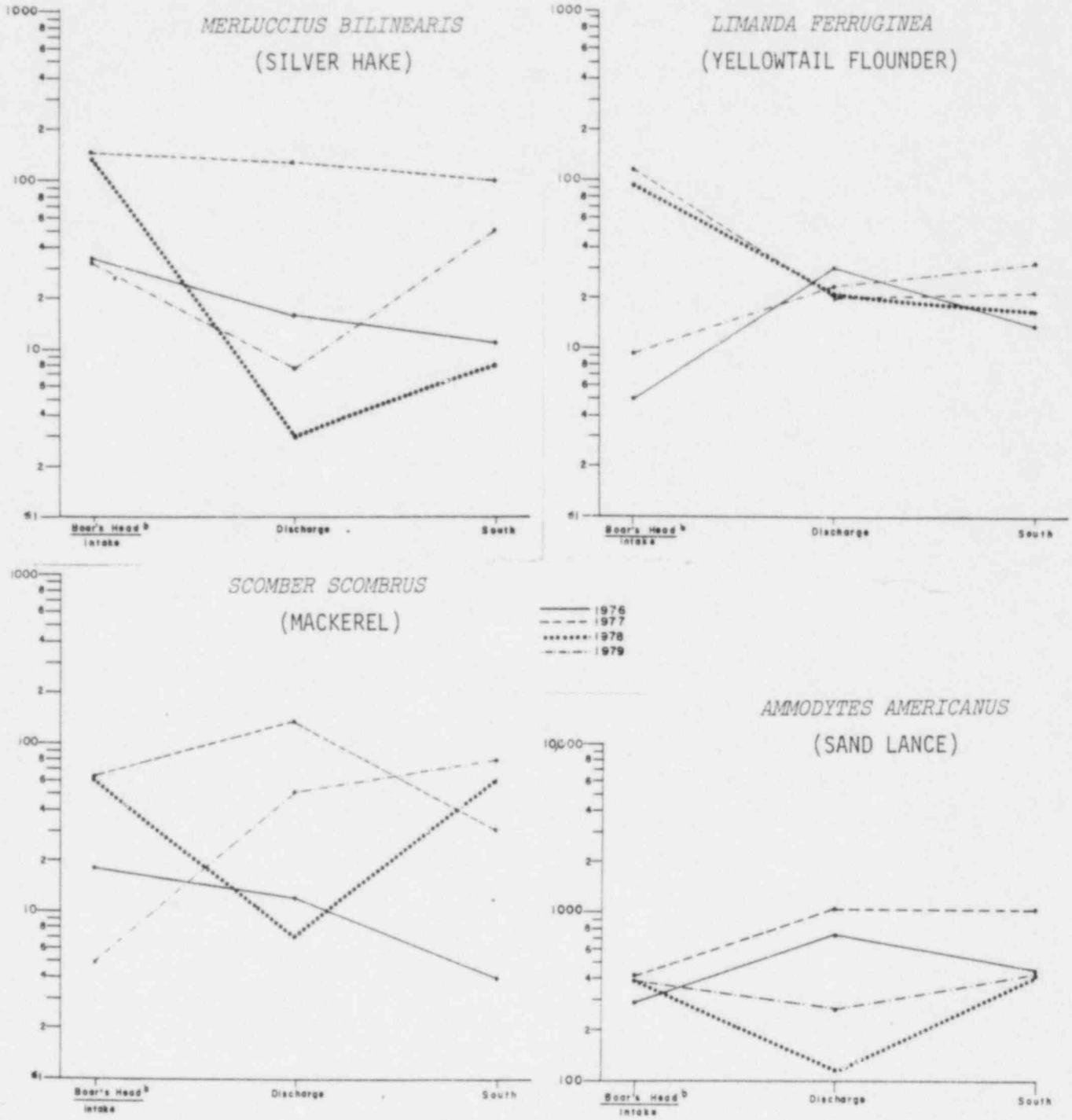
[b]Boar's Head sampled through June 15, 1977; intake sampled from July 6, 1977 to present.

Figure 4.2-3. Mean abundance[a] (no./1000m^3) of selected species of fish eggs by station[b], 1976-1979. Seabrook Finfish Studies, 1979.

except for the south transect in 1979. Hakes were most abundant at the discharge in 1977 and 1979 and lowest there in 1976 and 1978; 1979 intake levels were lowest of all four years. American plaice eggs were the most evenly distributed of this group of four taxa.

American sand lance larval abundance trends in 1979 were similar to those observed in 1978, with lower numbers at the discharge compared with 1976 and 1977 levels (Figure 4.2-4). Yellowtail flounder larvae were similar between years at the discharge and south transects; 1979 intake levels were about twice as high as 1976 Boar's Head levels and approximately an order of magnitude lower than 1977 (Boar's Head) and 1978 (intake) levels. Silver hake larval abundances in 1979 were most similar to those of 1976 at the intake, were intermediate between 1978 (low) and 1976 (moderate) levels at the discharge and approached 1977 (high) levels at the south transect. Mackerel larvae at the intake were least abundant in 1979 whereas at the south transect they were most abundant in 1979; discharge abundances approached 1977 high levels.

Ichthyoneuston and diel studies were conducted for the first time during 1979. Seasonal trends observed in the 1979 data will be compared to those observed in 1980 in a future report.



[a] Based on the number of consecutive sample periods that a species was present at one or more stations in each year.

[b] Boar's Head sampled through June 15, 1977; intake sampled from July 6, 1977 to present.

Figure 4.2-4. Mean abundance[a] (no./1000m^3) of selected species of fish larvae by station[b], 1976-1979. Seabrook Finfish Studies, 1979.

5.0 SUMMARY

Yellowtail flounder dominated the otter trawl catch with 3,663 fish comprising one-third of the total catch of all species (an increase from 23% the previous year). Rankings of the most abundant species, including hakes, cod, smelt, winter flounder and sculpin have changed little over the years. Catches, especially of cod and hakes, appear to conform to spatial and temporal distribution patterns reported in the scientific literature. Within the study area, catches of cod and winter flounder have gradually increased since at least 1977. Trawls at Transect 2 yielded approximately half the total catch of either Transects 1 or 3, partly because large quantities of drifting macroalgae were encountered at Transect 2, especially in August and September. Similar quantities of algae have been encountered in previous surveys and have apparently similarly affected total catch. Both winter flounder and rainbow smelt have previously been caught in greater numbers at Transect 2 than at Transects 1 and 3; in 1979, however, this catch distribution held only for winter flounder.

Atlantic herring comprised the bulk of the gill net catch (78.5%) in 1979, a slightly greater proportion than in 1978. Gill net catch data generally showed little evidence of a consistent temporal trend, although 1979 was a relatively poor year for catching clupeids (members of the herring family) and mackerel. With notable exceptions on a few dates, gill net catches were generally similar at each of the three sampling stations in 1979 as in the past. Total catch was low at all stations in March and June and at Stations B and C in December (nets at Station A still yielded Atlantic herring). Mid-depth net sampling, initiated in 1979, produced most of the menhaden catch on 2 October, elevating menhaden to the status of second most abundant species in gill net catches. Herring and mackerel tended to be more abundant in surface nets than either mid-water or bottom nets. In general, mid-water nets tended to produce catches more closely resembling bottom-net than surface-net results.

Silversides, representing 60% of the total seine catch in 1979, have consistently been caught in Hampton-Seabrook Estuary in large numbers. Alewife were the second most abundant seined species, with a particularly large catch in the Hampton River of over 6,000 individuals on 4 June. Winter flounder, which historically has ranked second behind silversides in "biological importance" (compounding numerical dominance and seasonal occurrence), ranked number one in biological importance in 1979. From spring through summer, American sand lance have qualitatively occurred in seine catches over the past 3-1/2 years.

Bench seines have consistently produced high total catches between July and November, with 1979 appearing intermediate and with less between-station differences in abundance than in previous years. Over the past 3-1/2 years, Stations S1 and S2 have consistently accounted for nearly all of the total killifish catch, probably reflecting the comparative proximity of these two stations to the salt marshes. Regarding catch quality and quantity, Station S3 has traditionally tended to stand apart, generally exhibiting somewhat high salinity and lower water temperatures during summer than Stations S1 and S2.

As determined by a New Hampshire Fish and Game Department survey, the alewife spawning run began in 1979 in late April and continued until early June, although slowing considerably after mid May. At the peak of the run on 10 May, up to 120 fish per minute passed the Taylor River weir.

Ichthyofauna surveys in 1979, indicated that three egg types, cunner/tautog/yellowtail, mackerel and hake species, accounted for 95% of all fish eggs collected. Cunner, American sand lance, and seasnails comprised 75% of all fish larvae collected in 1979. Except for sand lance, which occurred in late winter (January through March), these taxa predominated during the warmer months (May to September). Similar findings have been reported for surveys in 1976 through 1978. Seasonal patterns emerging from ichthyofauna surveys during the past 3-1/2 years have shown maximum egg abundances (ca 10^3-10^4 per $1000m^3$) occurring early summer; while, the period of maximum larval abundance (ca 10^2-10^3

per $1000m^3$) typically extends from spring throughout the summer. During the winter minimum (late fall/early winter) the gadids cod/haddock and pollock are the only taxa present in appreciable numbers (ca 200 per $1000m^3$).

Fish larvae were most abundant at the south transect during 1979; whereas fish eggs were least abundant at that location. On the other hand, in 1978, both fish eggs and larvae were least abundant at the discharge site. Year-to-year comparisons of spatial distribution for dominant egg and larvae types showed some consistencies and some inconsistencies, largely reflecting data variability. Some shifts which may warrant continuing observation, however, include: 1) cunner/tautog/yellowtail eggs most abundant at the discharge, in 1976, 1977 and 1979, 2) American sand lance larvae least abundant at the discharge, in 1978 and 1979, 3) a decline in hake eggs and in yellowtail, mackerel, and silver hake larvae at the intake in 1979, and 4) a general increase in abundance of mackerel eggs, particularly in contrast to 1976 levels.

In diel studies conducted in May, winter flounder larvae were generally most abundant at mid-depths, except at sunrise when most were near bottom. In August, cunner larvae and cunner (tautog/yellowtail eggs were most abundant at the surface, except at sunrise when cunner larvae were most abundant at mid-depth. Dominant ichthyofauna in summer/ early fall neuston tows consisted of: fourbeard rockling (July and September), cunner and hakes (August and September) and radiated shanny, winter flounder and mackerel (July).

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APPENDICES

APPENDIX TABLE 7-1. MONTHLY CATCH (REPLICATES SUMMED) OF FISH COLLECTED BY OTTER TRAWLS OFF HAMPTON-SEABROOK ESTUARY. SEABROOK FINFISH STUDIES, 1979.

		FEB 04	MAR 07	MAR 28	APR 24	MAY 31	JUN 28	JUL 30	AUG 27	SEP 23	NOV 15	DEC 05	DEC 26	ALL
TRAN 1	ALOSA PSEUDOHARENGUS	0	0	0	0	0	0	0	1	0	0	1	1	3
	ALOSA SAPIDISSIMA	0	0	0	0	0	0	0	0	0	0	4	3	7
	AMMODYTES AMERICANUS	0	0	0	2	0	0	0	0	0	0	0	0	2
	ANARRHICHAS LUPUS	0	0	0	0	1	0	0	0	0	0	0	0	1
	ASPIDOPHOROIDES MONOPTERYGIUS	0	0	0	0	0	0	0	0	0	0	0	1	1
	CENTROPRISTIS STRIATA	0	0	0	0	1	0	0	0	0	0	0	0	1
	CYCLOPTERUS LUMPUS	0	0	0	0	0	0	0	0	0	0	0	3	3
	ENCHELYOPUS CIMBRIUS	0	0	0	0	0	0	1	0	0	0	0	0	1
	GADUS MORHUA	3	0	8	100	71	55	10	9	4	2	47	61	370
	GLYPTOCEPHALUS CYNOGLOSSUS	0	0	0	0	0	0	1	0	0	0	0	0	1
	HEMITRIPTERUS AMERICANUS	0	1	0	4	0	0	0	3	4	1	2	0	15
	HIPPOGLOSSOIDES PLATESSOIDES	0	0	0	0	0	6	0	0	0	0	0	0	6
	HIPPOGLOSSUS HIPPOGLOSSUS	0	0	0	0	0	0	0	1	0	0	0	0	1
	LIMANDA FERRUGINEA	74	101	25	87	250	157	133	155	164	206	158	436	1946
	LIPARIS ATLANTICUS	3	2	0	1	0	0	0	0	0	0	0	0	6
	LOPHIUS AMERICANUS	0	0	0	0	1	0	0	1	1	0	0	0	3
	MACROZOARCES AMERICANUS	2	2	2	2	6	6	7	7	3	4	4	2	47
	MELANOGRAMMUS AEGLEFINUS	0	0	0	0	0	1	0	4	2	11	5	18	41
	MENIDIA MENIDIA	3	0	0	0	0	0	0	0	0	0	0	1	4
	MERLUCCIUS BILINEARIS	0	0	0	0	3	1	2	14	45	21	21	1	108
	MYOXOCEPHALUS AENAEUS	3	3	0	0	0	0	0	0	0	0	0	2	8
	MYOXOCEPHALUS OCTODECEMSPINOSUS	3	2	4	14	36	78	33	58	57	48	96	52	481
	MYOXOCEPHALUS SCORPIUS	0	1	0	0	0	0	0	0	0	0	0	0	1
	OSMERUS MORDAX	184	62	0	0	0	0	0	0	0	0	0	73	319
	PARALICHTHYS OBLONGUS	0	0	0	1	0	16	0	2	1	0	0	0	20
	PEPRILUS TRIACANTHUS	0	0	0	0	0	0	0	0	1	0	0	0	1
	PHOLIS GUNNELLUS	1	0	0	0	0	0	0	0	0	0	0	1	2
	POLLACHIUS VIRENS	0	0	0	1	0	0	1	0	1	0	200	71	277
	PSEUDOPLEURONECTES AMERICANUS	6	11	5	22	12	21	7	17	12	11	12	1	137
	RAJA BINOCULATA	0	1	1	2	0	0	1	0	0	0	0	0	5
	RAJA ERINACEA	0	0	0	0	0	0	1	0	0	0	0	0	1
	RAJA SP.	1	1	1	1	4	0	0	1	8	5	8	5	35
	SCOPHTHALMUS AQUOSUS	1	0	2	4	3	0	0	1	2	12	6	1	32
	TAUTOGOLABRUS ADSPERSUS	0	0	0	0	0	1	0	0	0	0	0	0	1
	UROPHYCIS SP.	1	0	0	3	39	187	106	65	42	25	4	3	475

APPENDIX TABLE 7-1. (Continued)

		FEB 04	MAR 07	MAR 28	APR 24	MAY 31	JUN 28	JUL 30	AUG 27	SEP 23	NOV 15	DEC 05	DEC 26	ALL
TRAN 2	ALOSA PSEUDOHARENGUS	0	0	0	0	0	0	0	0	0	0	0	0	0
	ALOSA SAPIDISSIMA	0	0	0	0	0	0	0	0	0	0	1	0	1
	AMMODYTES AMERICANUS	0	3	0	0	0	0	0	0	0	0	0	0	3
	CLUPEA HARENGUS H	0	0	0	0	0	0	0	0	0	0	0	1	1
	CYCLOPTERUS LUMPUS	0	0	1	0	0	0	0	0	4	0	1	1	7
	GADUS MORHUA	0	0	0	33	429	2	9	0	2	10	19	7	511
	HEMITRIPTERUS AMERICANUS	0	0	3	2	1	1	6	0	4	6	3	0	26
	LIMANDA FERRUGINEA	10	90	9	45	43	2	21	1	4	26	30	34	324
	LIPARIS ATLANTICUS	2	0	0	0	0	0	0	0	0	3	0	2	7
	MACROZOARCES AMERICANUS	0	0	1	23	22	3	0	0	0	9	7	0	65
	MELANOGRAMMUS AEGLEFINUS	0	0	0	0	0	0	0	0	0	2	0	4	6
	MENIDIA MENIDIA	0	0	0	0	0	0	0	0	0	0	0	1	1
	MERLUCCIUS BILINEARIS	0	0	0	0	2	8	6	0	1	2	0	0	20
	MYOXOCEPHALUS AENAEUS	7	9	1	0	0	0	0	13	0	0	0	1	31
	MYOXOCEPHALUS OCTODECEMSPINOSUS	0	1	4	25	17	4	3	2	8	17	5	3	90
	MYOXOCEPHALUS SCORPIUS	0	0	1	0	0	0	0	0	0	0	0	0	1
	OSMERUS MORDAX	60	68	27	23	0	0	0	0	0	0	2	27	207
	PHOLIS GUNNELLUS	0	0	0	0	0	0	0	0	0	1	0	1	2
	POLLACHIUS VIRENS	0	0	0	32	9	6	2	0	1	1	105	5	152
	PSEUDOPLEURONECTES AMERICANUS	28	166	21	54	74	28	53	10	8	54	34	5	551
	RAJA BINOCULATA	0	0	0	0	0	0	0	0	0	0	1	0	1
	RAJA SP.	0	0	3	2	2	0	1	0	0	0	1	0	9
	SCOPHTHALMUS AQUOSUS	4	5	2	10	6	1	0	0	0	14	1	7	50
	STENOTOMUS CHRYSOPS	0	0	0	0	0	0	0	0	0	1	0	0	1
	SYNGNATHUS FUSCUS	0	0	0	0	0	0	0	1	0	0	0	0	1
	TAUTOGOLABRUS ADSPERSUS	0	0	0	0	0	0	4	0	1	0	0	0	5
	UROPHYCIS SP.	1	2	0	4	8	15	19	1	4	14	0	0	68

APPENDIX TABLE 7-1. (Continued)

		FEB 04	MAR 07	MAR 28	APR 24	MAY 31	JUN 28	JUL 30	AUG 27	SEP 23	NOV 15	DEC 05	DEC 26	ALL
TRAN 3	ALOSA PSEUDOHARENGUS	0	0	0	0	0	0	0	0	0	0	0	0	0
	ASPIDOPHOROIDES MONOPTERYGIUS	0	0	1	0	0	0	0	0	0	0	0	0	1
	CLUPEA HARENGUS H	0	0	0	0	0	1	0	0	0	0	0	0	1
	ENCHELYOPUS CIMBRIUS	0	0	0	0	0	1	0	0	0	0	0	0	1
	GADUS MORHUA	31	1	4	11	209	155	57	31	37	0	32	38	606
	HEMITRIPTERUS AMERICANUS	0	0	0	0	1	0	0	1	4	0	3	1	10
	HIPPOGLOSSOIDES PLATESSOIDES	0	1	1	0	1	1	0	0	0	0	0	0	4
	LIMANDA FERRUGINEA	41	101	27	51	106	148	154	125	127	67	27	419	1393
	LIPARIS ATLANTICUS	0	0	1	0	0	0	0	0	0	0	0	0	1
	LOPHIUS AMERICANUS	0	0	0	0	0	0	0	1	0	0	0	0	1
	LUMPENUS LUMPRETAEFORMIS	0	1	0	0	0	0	0	0	0	0	0	0	1
	MACROZOARCES AMERICANUS	1	5	16	5	36	16	14	11	12	4	0	2	122
	MELANOGRAMMUS AEGLEFINUS	0	0	0	0	0	0	2	63	82	56	110	0	313
	MENIDIA MENIDIA	0	0	0	0	0	0	0	0	0	0	0	11	11
	MERLUCCIUS BILINEARIS	0	0	0	0	0	1	3	65	55	34	1	0	159
	MYOXOCEPHALUS AENAEUS	0	1	0	0	0	0	0	1	4	0	0	36	42
	MYOXOCEPHALUS OCTODECEMSPINOSUS	1	4	7	61	69	105	181	113	101	62	71	34	815
	OSMERUS MORDAX	90	110	6	0	0	0	0	0	0	0	2	6	214
	PARALICHTHYS OBLONGUS	0	0	0	0	0	1	0	1	2	0	0	0	4
	PEPRILUS TRIACANTHUS	0	0	0	0	0	0	0	1	0	0	0	0	1
	PHOLIS GUNNELLUS	0	0	0	0	0	0	0	0	0	0	0	1	1
	POLLACHIUS VIRENS	0	0	0	1	0	3	0	0	0	0	13	6	23
	PSEUDOPLEURONECTES AMERICANUS	10	13	1	10	8	6	10	18	19	14	8	0	117
	RAJA BINOCULATA	0	0	0	0	0	0	0	0	1	0	0	0	1
	RAJA ERINACEA	0	0	0	2	0	0	0	0	0	0	0	0	2
	RAJA RADIATA	0	0	0	0	0	0	0	0	2	0	0	0	2
	RAJA SP.	10	4	11	6	8	11	7	22	25	14	8	7	133
	SCOPHTHALMUS AQUOSUS	1	0	0	0	3	0	0	1	2	2	1	8	18
	UROPHYCIS CHUSS	0	0	0	0	18	0	0	0	0	0	0	0	18
	UROPHYCIS SP.	0	0	0	0	37	66	76	60	68	61	7	0	375

APPENDIX TABLE 7.2. VOLUME (LITERS) OF ALGAE COLLECTED IN OTTER TRAWL TOWS DURING 1979. SEABROOK FINFISH STUDIES, 1979.

DATE	TRANSECT 1 REPLICATES				TRANSECT 2 REPLICATES				TRANSECT 3 REPLICATES			
	A	B	C	D	A	B	C	D	A	B	C	D
4 February	5	8	12	4	12	11	28	11	0	0	0	0
7 March	12	12	12	16	49	32	24	16	12	12	0	0
28 March	73	16	65	4	16	16	32	24	8	0	0	12
24 April	0	0	4	0	24	16	24	16	0	0	0	0
31 May	0	0	0	0	24	130	57	24	0	0	0	0
28 June	0	0	0	0	73	36	36	81	0	0	0	0
30 July	0	0	0	0	300	16	32	49	0	0	0	0
27 August	0	0	0	0	570	680	>200	>200	0	0	0	0
24 September	0	0	0	0	340	280	>200	>200	0	0	0	0
15 November	0	0	0	0	65	81	73	57	0	0	0	0
5 December	0	0	0	0	8	20	16	8	24	0	0	0
26 December	4	0	0	0	4	5	24	4	0	0	0	0

APPENDIX TABLE 7-3. FISH SPECIES COLLECTED IN GILL NETS (SUM OF 3 DAYS) OFF HAMPTON-SEABROOK. SEABROOK FINFISH STUDIES, 1979.

TRAN			JAN 10	MAR 06	APR 12	MAY 08	JUN 12	JUL 10	AUG 07	SEP 05	OCT 02	NOV 06	DEC 04	ALL
A	ALOSA AESTIVALIS	S	0	0	0	4	3	2	6	0	0	0	1	16
		ALL	0	0	0	4	3	2	6	0	0	0	1	16
	ALOSA PSEUDOHARENGUS	S	0	0	0	3	0	2	0	1	0	0	1	7
		ALL	0	0	0	3	0	2	0	1	0	0	1	7
	ALOSA SAPIDISSIMA	S	0	0	0	0	0	0	2	0	0	0	0	2
		ALL	0	0	0	0	0	0	2	0	0	0	0	2
	ALOSA SP.	S	0	0	0	0	0	0	0	0	0	0	0	0
	BREVOORTIA TYRANNUS	S	0	0	0	0	0	2	5	0	1	1	0	9
		M	1	0	1	1	0	1	1	1	8	1	1	8
		ALL	0	0	0	0	0	2	6	0	9	1	0	17
	CLUPEA HARENGUS H	S	0	0	21	27	21	25	0	1	28	159	202	465
		B	0	0	137	1	0	7	0	2	26	8	12	194
		M	1	0	1	1	1	1	1	1	66	1	1	67
		ALL	0	0	158	28	3	32	0	3	120	168	214	726
	CYCLOPTERUS LUMPUS	S	0	0	0	0	0	0	0	0	0	0	0	0
	GADUS MORHUA	S	0	0	0	0	0	0	0	0	0	0	0	0
		B	0	0	0	0	0	1	0	0	3	2	2	8
		ALL	0	0	0	0	0	1	0	0	3	2	2	8
	HEMITRIPTERUS AMERICANUS	S	0	0	0	0	0	0	0	0	0	0	0	0
		B	0	0	0	0	0	0	0	0	0	0	1	1
		ALL	0	0	0	0	0	0	0	0	0	0	1	1
	LIMANDA FERRUGINEA	S	0	0	0	0	0	0	0	0	0	0	0	0
		B	0	0	0	0	0	0	0	1	0	0	0	1
		ALL	0	0	0	0	0	0	0	1	0	0	0	1
	MERLUCCIUS BILINEARIS	S	0	0	0	0	0	18	17	2	0	2	0	39
		B	0	0	0	0	0	1	3	1	3	6	0	14
		M	1	0	1	1	0	1	1	1	1	1	1	1
		ALL	0	0	0	0	0	19	20	3	4	8	0	54
	MYOXOCEPHALUS OCTODECEMSPINOSUS	S	0	0	0	0	0	0	0	0	0	0	0	0
		B	0	0	0	0	0	0	0	0	2	1	0	3
		ALL	0	0	0	0	0	0	0	0	2	1	0	3
	OSMERUS MORDAX	S	1	0	0	0	0	3	0	0	0	0	0	1
		B	2	0	0	0	0	0	0	0	0	0	0	2
		ALL	3	0	0	0	0	0	0	0	0	0	0	3
	PEPRILUS TRIACANTHUS	S	0	0	0	0	0	0	3	0	0	2	0	5
		M	1	0	1	1	0	1	1	1	2	1	1	2
		ALL	0	0	0	0	0	0	3	0	2	2	0	7
	POLLACHIUS VIRENS	S	0	0	0	0	0	0	0	0	0	0	0	0
		B	0	0	0	0	3	0	0	0	1	0	4	8
		ALL	0	0	0	0	3	0	0	0	1	0	4	8
	P\ MATOMUS SALTATRIX	S	0	0	0	0	0	0	0	0	0	0	0	0
	PRIONOTUS CAROLINUS	S	0	0	0	0	0	0	0	0	0	0	0	0
		M	1	0	1	1	1	1	1	1	0	1	1	1
		ALL	0	0	0	0	1	0	0	0	0	0	0	1
	PSEUDOPLEURONECTES AMERICANUS	S	0	0	0	0	0	0	0	0	0	0	0	0
		B	0	0	0	0	0	0	0	1	0	0	0	1
		ALL	0	0	0	0	0	0	0	1	0	0	0	1
	RAJA BINOCULATA	S	0	0	0	0	0	0	0	0	0	0	0	0
	RAJA SP.	S	0	0	0	0	0	0	0	0	0	0	0	0
	SCOMBER JAPONICUS	S	0	0	0	0	0	0	0	0	0	0	0	0
	SCOMBER SCOMBRUS	S	0	0	0	0	0	2	0	0	0	4	0	15
		B	0	0	0	0	0	0	0	0	0	2	0	2
		ALL	0	0	0	0	0	2	0	0	0	6	0	17
	SQUALUS ACANTHIAS	S	0	0	0	0	0	0	0	0	0	0	0	0
	TAUTOGOLABRUS ADSPERSUS	S	0	0	0	0	0	0	0	0	0	0	0	0
		B	0	0	0	0	0	0	0	2	0	0	0	2
		ALL	0	0	0	0	0	0	0	2	0	0	0	2
	UROPHYCIS SP.	S	0	0	0	0	0	0	0	0	0	0	0	0
		B	0	0	0	0	1	0	0	1	14	2	0	18
		ALL	0	0	0	0	1	0	0	1	14	2	0	18

APPENDIX TABLE 7-3. (Continued).

			JAN 10	MAR 06	APR 12	MAY 08	JUN 12	JUL 10	AUG 07	SEP 05	OCT 02	NOV 06	DEC 04	ALL
TRAN B	ALOSA AESTIVALIS	S	0	0	1	2	1	2	3	0	0	1	0	10
		B	0	0	0	0	0	0	0	0	0	0	1	1
		ALL	0	0	1	2	1	2	3	0	0	1	1	11
	ALOSA PSEUDOHARENGUS	S	0	0	0	2	1	0	0	0	0	0	0	3
		ALL	0	0	0	2	1	0	0	0	0	0	0	3
	ALOSA SAPIDISSIMA	S	0	0	0	0	0	0	0	0	0	0	0	0
	ALOSA SP.	S	0	0	0	0	0	0	0	0	0	0	0	0
	BREVOORTIA TYRANNUS	S	0	0	0	1	0	0	1	0	1	0	0	3
		B	0	0	0	0	0	0	0	0	1	0	0	1
		M	1	0	1	1	0	1	1	1	46	1	1	46
		ALL	0	0	0	1	0	0	1	0	48	0	0	50
	CLUPEA HARENGUS H	S	0	0	56	18	2	33	0	8	92	1321	4	1534
		B	0	0	36	8	0	6	0	51	82	102	0	285
		M	1	0	1	1	1	1	1	1	81	1	1	82
		ALL	0	0	92	26	3	39	0	59	265	1423	4	1911
	CYCLOPTERUS LUMPUS	S	0	0	1	0	0	0	0	0	0	0	0	1
		ALL	0	0	1	0	0	0	0	0	0	0	0	1
	GADUS MORHUA	S	0	0	0	0	0	0	0	0	0	15	0	15
		B	0	0	2	3	0	0	0	0	0	3	0	8
		ALL	0	0	2	3	0	0	0	0	0	18	0	23
	MENTICIRRUS AMERICANUS	S	0	0	0	0	0	0	0	0	0	0	0	0
		B	1	0	1	1	0	0	0	0	0	0	0	3
		ALL	1	0	1	1	0	0	0	0	0	0	0	3
	LIMANDA FERRUGINEA	S	0	0	0	0	0	0	0	0	0	0	0	0
	MERLUCCIUS BILINEARIS	S	0	0	0	0	0	11	20	1	0	3	0	35
		B	0	0	0	0	0	2	2	7	0	12	0	23
		ALL	0	0	0	0	0	13	22	8	0	15	0	58
	MYOXOCEPHALUS OCTODECEMSPINOSUS	S	0	0	0	0	0	0	0	0	0	0	0	0
		B	1	0	2	1	0	2	0	2	0	1	0	9
		ALL	1	0	2	1	0	2	0	2	0	1	0	9
	OSMERUS MORDAX	S	8	0	1	0	0	0	0	0	0	0	0	8
		B	3	0	0	0	0	0	0	0	0	0	1	4
		M	1	1	1	1	0	1	1	1	0	1	1	1
		ALL	11	1	1	0	0	0	0	0	0	0	1	14
	PEPRILUS TRIACANTHUS	S	0	0	0	0	0	0	12	23	0	0	0	35
		B	0	0	0	0	0	0	0	3	0	0	0	3
		ALL	0	0	0	0	0	0	12	26	0	0	0	38
	POLLACHIUS VIRENS	S	0	0	0	1	0	0	0	0	0	0	0	1
		B	0	0	1	3	1	8	9	2	0	0	2	26
		M	1	0	1	1	1	1	1	1	0	1	1	1
		ALL	0	0	1	4	2	8	9	2	0	0	2	28
	POMATOMUS SALTATRIX	S	0	0	0	0	0	0	0	1	0	0	0	1
		B	0	0	0	0	0	0	0	0	1	0	0	1
		ALL	0	0	0	0	0	0	0	1	1	0	0	2
	PRIONOTUS CAROLINUS	S	0	0	0	0	0	0	0	0	0	0	0	0
	PSEUDOPLEURONECTES AMERICANUS	S	0	0	0	0	0	0	0	0	0	0	0	0
		B	0	1	1	1	0	0	0	1	0	0	1	5
		ALL	0	1	1	1	0	0	0	1	0	0	1	5
	RAJA BINOCULATA	S	0	0	0	0	0	0	0	0	0	0	0	0
		B	0	0	1	0	0	0	0	0	0	0	0	1
		ALL	0	0	1	0	0	0	0	0	0	0	0	1
	RAJA SP.	S	0	0	0	0	0	0	0	0	0	0	0	0
	SCOMBER JAPONICUS	S	0	0	0	0	0	0	0	0	0	1	0	1
		ALL	0	0	0	0	0	0	0	0	0	1	0	1
	SCOMBER SCOMBRUS	S	0	0	0	0	0	4	7	5	0	4	0	20
		ALL	0	0	0	0	0	4	7	5	0	4	0	20
	SQUALUS ACANTHIAS	S	0	0	0	0	0	0	0	0	0	0	0	0
	TAUTOGOLABRUS ADSPERSUS	S	0	0	0	0	0	0	0	0	0	0	0	0
		B	0	0	0	0	0	1	0	1	0	0	0	2
		ALL	0	0	0	0	0	1	0	1	0	0	0	2
	UROPHYCIS SP.	S	0	0	0	0	0	0	0	0	0	0	0	0
		B	0	0	0	0	0	0	2	8	2	3	0	15
		ALL	0	0	0	0	0	0	2	8	2	3	0	15

APPENDIX TABLE 7-3. (Continued).

			JAN 10	MAR 06	APR 12	MAY 08	JUN 12	JUL 10	AUG 07	SEP 05	OCT 02	NOV 06	DEC 04	ALL
TRAN C	ALOSA AESTIVALIS	S	0	0	5	4	2	21	0	1	1	0	1	35
		M	1	0	1	1	2	1	1	1	0	1	1	2
		ALL	0	0	5	4	4	21	0	1	1	0	1	37
	ALOSA PSEUDOHARENGUS	S	0	0	0	4	0	0	0	1	0	0	0	5
		ALL	0	0	0	4	0	0	0	1	0	0	0	5
	ALOSA SAPIDISSIMA	S	0	0	0	0	0	0	0	1	0	0	0	1
		ALL	0	0	0	0	0	0	0	1	0	0	0	1
	ALOSA SP.	S	0	0	0	0	1	0	0	0	0	0	0	1
		ALL	0	0	0	0	1	0	0	0	0	0	0	1
	BREVOORTIA TYRANNUS	S	0	0	0	1	0	3	0	0	34	0	0	38
		B	0	0	0	0	0	1	0	0	33	0	0	34
		M	1	0	1	1	0	1	1	1	50	1	1	50
		ALL	0	0	0	1	0	4	0	0	117	0	0	122
	CLUPEA HARENGUS H	S	0	0	38	54	0	13	0	7	81	78	2	273
		B	0	0	23	2	0	60	0	1	66	1	5	158
		M	1	1	1	1	0	1	1	1	39	1	1	46
		ALL	0	1	61	56	0	73	0	8	186	78	7	471
	CYCLOPTERUS LUMPUS	S	0	0	0	0	0	0	0	0	0	0	0	0
	GADUS MORHUA	S	0	0	0	0	0	0	0	1	0	0	0	1
		B	0	0	0	1	0	1	1	1	0	0	0	4
		ALL	0	0	0	1	0	1	1	2	0	0	0	5
	HEMITRIPTERUS AMERICANUS	S	0	0	0	0	0	0	0	0	0	0	0	0
		B	0	0	0	0	0	3	1	2	0	0	0	6
		ALL	0	0	0	0	0	3	1	2	0	0	0	6
	LIMANDA FERRUGINEA	S	0	0	0	0	0	0	0	0	0	0	0	0
	MERLUCCIUS BILINEARIS	S	0	0	0	0	1	16	16	1	0	2	0	36
		B	0	0	0	0	0	4	2	1	1	2	0	10
		M	1	0	1	1	0	1	1	1	1	1	1	1
		ALL	0	0	0	0	1	20	18	2	2	4	0	47
	MYOXOCEPHALUS OCTODECEMSPINOSUS	S	0	0	0	0	0	0	0	0	0	0	1	1
		B	1	0	0	1	2	0	1	0	0	0	0	5
		M	1	0	1	1	1	1	1	1	0	1	1	1
		ALL	1	0	0	1	3	0	1	0	0	0	1	7
	OSMERUS MORDAX	S	18	1	2	0	0	0	0	0	0	0	0	21
		B	10	0	1	0	0	0	0	0	0	0	0	11
		ALL	28	1	3	0	0	0	0	0	0	0	0	32
	PEPRILUS TRIACANTHUS	S	0	0	0	0	1	0	0	32	3	0	0	36
		B	0	0	0	0	0	0	1	8	0	0	0	9
		ALL	0	0	0	0	1	0	1	40	3	0	0	45
	POLLACHIUS VIRENS	S	0	0	0	12	2	6	1	2	0	0	0	23
		B	0	0	0	4	0	8	3	4	1	2	0	22
		ALL	0	0	0	16	2	14	4	6	1	2	0	45
	POMATOMUS SALTATRIX	S	0	0	0	0	0	2	0	1	0	0	0	3
		ALL	0	0	0	0	0	2	0	1	0	0	0	3
	PRIONOTUS CAROLINUS	S	0	0	0	0	0	0	0	0	0	0	0	0
	PSEUDOPLEURONECTES AMERICANUS	S	0	0	0	0	0	0	0	0	0	0	0	0
		B	0	0	0	0	0	2	2	0	0	0	0	4
		ALL	0	0	0	0	0	2	2	0	0	0	0	4
	RAJA OCULATA	S	0	0	0	0	0	0	0	0	0	0	0	0
	RAJA SP.	S	0	0	0	0	0	0	0	0	0	0	0	0
		B	0	0	0	0	0	0	1	0	0	0	0	1
		ALL	0	0	0	0	0	0	1	0	0	0	0	1
	SCOMBER JAPONICUS	S	0	0	0	0	0	0	0	0	0	0	0	0
	SCOMBER SCOMBRUS	S	0	0	0	0	1	9	2	5	0	3	0	20
		ALL	0	0	0	0	1	9	2	5	0	3	0	20
	SQUALUS ACANTHIAS	S	0	0	0	0	0	0	0	0	0	0	0	0
		B	0	0	0	0	0	0	1	0	0	0	0	1
		ALL	0	0	0	0	0	0	1	0	0	0	0	1
	TAUTOGOLABRUS ADSPERSUS	S	0	0	0	0	0	0	0	3	0	3	0	0
		B	0	0	0	0	0	9	5	1	0	0	0	15
		ALL	0	0	0	0	0	9	5	1	0	0	0	15
	UROPHYCIS SP.	S	0	0	0	0	0	0	0	0	0	0	0	0
		B	0	0	0	0	0	3	2	0	0	0	0	5
		ALL	0	0	0	0	0	3	2	0	0	0	0	5

APPENDIX TABLE 7-4. MONTHLY CATCH (REPLICATES SUMMED) OF FISH COLLECTED IN BEACH SEINES IN HAMPTON-SEABROOK ESTUARY. SEABROOK FINFISH STUDIES, 1979.

		APR 04	APR 18	MAY 02	MAY 16	JUN 04	JUN 19	JUL 05	JUL 19	JUL 31	AUG 24	SEP 07	SEP 21	OCT 03	OCT 17	NOV 08	NOV 27	ALL
STA 1	AMMODYTES AMERICANUS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MENIDIA MENIDIA	0	0	1	3	0	0	10	8	3	96	407	369	2006	836	1819	78	5636
	ALOSA AESTIVALIS	0	0	0	0	0	0	0	0	0	0	81	0	57	7	0	0	145
	ALOSA PSEUDOHARENGUS	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	102
	MYOXOCEPHALUS AENAEUS	0	0	0	0	0	0	1	0	0	0	0	0		0	0	0	1
	FUNDULUS HETEROCLITUS	0	0	0	0	0	4	1	9	19	32	3	33	0	0	0	0	101
	POLLACHIUS VIRENS	0	3	233	51	5	0	0	0	0	0	0		0	0	0	0	292
	GASTEROSTEUS ACULEATUS	17	5	31	74	7	5	0	1	0	0	0	0	0	0	0	0	140
	PUNGITIUS PUNGITIUS	0	0	4	1	0	6	0	1	3	0	0	0	3	0	0	2	20
	OSMERUS MORDAX	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2
	LIOPSETTA PUTNAMI	0	2	3	1	0	0	2	1	2	0	0	0	0	0	0	1	12
	PSEUDOPLEURONECTES AMERICANUS	1	1	15	0	0	0	10	1	3	2	4	0	12	1	0	9	59
	SALMO GAIRDNERI	0	0	0	0	0	0	0	0	9	0	0	1	0	0	0	0	1

APPENDIX TABLE 7-4. (Continued)

		APR 04	APR 18	MAY 02	MAY 16	JUN 04	JUN 19	JUL 05	JUL 19	JUL 31	AUG 24	SEP 07	SEP 21	OCT 03	OCT 17	NOV 08	NOV 27	ALL
STA 2	AMMODYTES AMERICANUS	0	0	0	2	2	16	0	0	0	0	0	2	0	3	1	0	26
	MENIDIA MENIDIA	0	0	1	3	7	3	6	3	3	827	4	1046	716	587	1998	655	5859
	ALOSA AESTIVALIS	0	0	0	0	0	0	2	0	0	2	0	5	1	3	0	1	14
	ALOSA PSEUDOHARENGUS	0	0	0	0	6028	118	1	0	1	0	0	0	0	0	0	1	6149
	CLUPEA HARENGUS H	0	0	0	0	0	0	5	0	0	0	0	1	0	0	0	0	6
	HEMITRIPTERUS AMERICANUS	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	MYOXOCEPHALUS AENAEUS	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1	3
	FUNDULUS HETEROCLITUS	0	0	0	59	3	231	3	161	57	288	0	2	0	0	0	0	804
	POLLACHIUS VIRENS	0	1	60	6	1	2	0	0	0	0	0	0	0	0	0	2	72
	GASTEROSTEUS ACULEATUS	3	2	3	17	46	10	2	2	0	0	0	0	0	0	0	0	85
	PUNGITIUS PUNGITIUS	0	0	0	0	0	0	0	3	0	0	0	1	0	0	0	0	4
	OSMERUS MORDAX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
	LIOPSETTA PUTNAMI	0	1	1	2	1	5	2	1	9	0	0	1	0	0	0	1	24
	PSEUDOPLEURONECTES AMERICANUS	0	1	12	14	1	13	1	7	2	3	1	11	37	18	4	49	174
	SALMO GAIRDNERI	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2
	SCOMBER SCOMBRUS	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	SYNGNATHUS FUSCUS	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1

APPENDIX TABLE 7-4. (Continued)

		APR 04	APR 18	MAY 02	MAY 16	JUN 04	JUN 19	JUL 05	JUL 19	JUL 31	AUG 24	SEP 07	SEP 21	OCT 03	OCT 17	NOV 08	NOV 27	ALL
STA 3	AMMODYTES AMERICANUS	0	0	0	131	0	0	0	0	0	0	0	0	0	0	0	0	131
	MENIDIA MENIDIA	0	0	1	1	2	0	0	0	0	1898	3091	593	578	2562	430	277	9433
	SCOPHTHALMUS AQUOSUS	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
	ALOSA AESTIVALIS	0	0	0	0	0	0	0	0	0	33	22	1	1	178	0	2	237
	ALOSA PSEUDOHARENGUS	1	0	0	0	0	0	0	0	0	0	3	0	0	17	0	0	21
	ALOSA SAPIDISSIMA	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
	CLUPEA HARENGUS H	0	0	0	113	0	0	0	0	0	0	8	0	0	191	0	0	313
	HEMITRIPTERUS AMERICANUS	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
	MYOXOCEPHALUS AENAEUS	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	2
	FUNDULUS HETEROCLITUS	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0	3
	GADUS MORHUA	0	0	1	32	0	0	0	0	0	0	0	0	0	0	0	0	33
	POLLACHIUS VIRENS	1	0	610	1603	4	77	0	0	0	4	27	6	2	20	0	0	2354
	GASTEROSTEUS ACULEATUS	0	3	5	9	25	68	10	4	0	0	0	3	0	1	0	1	128
	PUNGITIUS PUNGITIUS	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2	1	5
	OSMERUS MORDAX	0	0	0	0	0	0	0	37	0	22	20	27	3	1281	80	131	1601
	LIOPSETTA PUTNAMI	1	0	2	2	2	0	1	62	0	1	0	0	0	0	1	0	72
	PSEUDOPLEURONECTES AMERICANUS	0	4	25	24	14	47	2	48	36	11	6	15	21	51	20	6	330
	SALMO TRUTTA	0	0	0	0	0	0	0	0	3	6	0	1	0	0	0	0	10
	SCOMBER SCOMBRUS	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
	PEPRILUS TRIACANTHUS	0	0	0	0	0	0	0	0	0	0	0	0	0	335	0	0	335
	SYNGNATHUS FUSCUS	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1

APPENDIX 7-5. MEAN ABUNDANCE (No./1000 m^3) OF FISH EGGS ON DATES WHEN ALL STATIONS WERE ANALYZED. SEABROOK FINFISH STUDIES, 1979.

	JAN 09 79	FEB 28 79	MAR 22 79	APR 16 79	MAY 10 79	JUN 07 79	JUL 11 79	AUG 01 79	SEP 11 79
SCOPHTHALMUS AQUOSUS	.00	.00	.00	.00	6.99	761.80	89.79	265.85	77.32
LIPARIS SP.	.00	.00	.00	.33	.00	.00	.00	.00	.00
BROSME BROSME	.00	.00	.00	.00	.00	9.59	.00	.00	.00
ENCHELYOPUS CIMBRIUS	.00	.00	.18	10.80	114.17	491.07	205.59	185.85	194.17
MERLUCCIUS BILINEARIS	.00	.00	.00	.00	.00	19.12	966.91	1141.94	225.33
POLLACHIUS VIRENS	.94	.14	.18	.00	.00	.00	.00	.00	.00
UROPHYCIS SP.	.00	.12	.00	.66	.00	380.82	13422.22	8909.98	868.00
GLYPTOCEPHALUS CYNOGLOSSUS	.00	.00	.00	5.38	1.61	300.26	187.51	5.68	14.69
HIPPOGLOSSOIDES PLATESSOIDES	1.15	43.68	336.60	1654.86	20.13	.00	16.80	.00	.52
SCOMBER SCOMBRUS	.00	.00	.00	.33	507.40	55561.24	303.65	101.35	.00
PEPRILUS TRIACANTHUS	.00	.00	.00	.00	.00	.00	.00	.00	.80
EGGS (UNIDENTIFIED)	.00	.42	1.29	1.56	1.08	29.50	.00	9.52	.63
LABRID/LIMANDA	.00	.00	.18	128.07	847.21	61992.77	14422.96	6319.96	34.15
GADUS/MELANOGRAMMUS	14.00	41.13	21.23	85.18	8.23	.00	71.74	6.12	7.20

	OCT 02 79	NOV 19 79	DEC 18 79	ALL
SCOPHTHALMUS AQUOSUS	3.47	.00	.00	100.51
LIPARIS SP.	.00	.00	.00	.03
BROSME BROSME	.00	.00	.00	.80
ENCHELYOPUS CIMBRIUS	30.60	.00	.12	101.99
MERLUCCIUS BILINEARIS	7.58	.00	.00	191.35
POLLACHIUS VIRENS	.00	75.50	243.32	26.86
UROPHYCIS SP.	142.09	.00	.00	1896.95
GLYPTOCEPHALUS CYNOGLOSSUS	.44	.00	.00	41.95
HIPPOGLOSSOIDES PLATESSOIDES	.00	1.35	7.28	174.63
SCOMBER SCOMBRUS	.00	.12	.00	4736.86
PEPRILUS TRIACANTHUS	.00	.00	.27	.09
EGGS (UNIDENTIFIED)	.30	.00	.13	2.73
LABRID/LIMANDA	3.76	.00	28.40	6929.42
GADUS/MELANOGRAMMUS	.30	113.16	129.52	41.27

APPENDIX 7-6. PERCENT COMPOSITION OF FISH EGGS OF DATES WHEN ALL STATIONS WERE ANALYZED. SEABROOK FINFISH STUDIES, 1979.

	JAN 09 79	FEB 28 79	MAR 22 79	APR 16 79	MAY 10 79	JUN 07 79	JUL 11 79	AUG 01 79	SEP 11 79
SCOPHTHALMUS AQUOSUS	.0000	.0000	.0000	.0000	.4639	.6372	.3025	1.5688	5.4340
LIPARIS SP.	.0000	.0000	.0000	.0177	.0000	.0000	.0000	.0000	.0000
BROSME BROSME	.0000	.0000	.0000	.0000	.0000	.0080	.0000	.0000	.0000
ENCHELYOPUS CIMBRIUS	.0000	.0000	.0502	.5721	7.5766	.4108	.6925	1.0967	13.6472
MERLUCCIUS BILINEARIS	.0000	.0000	.0000	.0000	.0000	.0160	3.2570	6.7386	15.8371
POLLACHIUS VIRENS	5.8217	.1582	.0489	.0000	.0000	.0000	.0000	.0000	.0000
UROPHYCIS SP.	.0000	.1433	.0000	.0348	.0000	.3186	45.2122	52.5779	61.0057
GLYPTOCEPHALUS CYNOGLOSSUS	.0000	.0000	.0000	.2849	.1068	.2512	.6316	.0335	1.0323
HIPPOGLOSSOIDES PLATESSOIDES	7.1362	51.0904	93.5916	87.6901	1.3358	.0000	.0566	.0000	.0368
SCOMBER SCOMBRUS	.0000	.0000	.0000	.0177	33.6737	46.4768	1.0228	.5981	.0000
PEPRILUS TRIACANTHUS	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0564
EGGS (UNIDENTIFIED)	.0000	.4956	.3581	.0829	.0715	.0247	.0000	.0562	.0445
LABRID/LIMANDA	.0000	.0000	.0489	6.7861	56.2253	51.8568	48.5832	37.2942	2.4002
GADUS/MELANOGRAMMUS	87.0421	48.1124	5.9024	4.5137	.5465	.0000	.2417	.0361	.5059

	OCT 02 79	NOV 19 79	DEC 18 79	ALL
SCOPHTHALMUS AQUOSUS	1.8389	.0000	.0000	.7055
LIPARIS SP.	.0000	.0000	.0000	.0002
BROSME BROSME	.0000	.0000	.0000	.00
ENCHELYOPUS CIMBRIUS	16.2323	.0000	.0289	.7159
MERLUCCIUS BILINEARIS	4.0187	.0000	.0000	1.3432
POLLACHIUS VIRENS	.0000	39.7105	59.4850	.1885
UROPHYCIS SP.	75.3644	.0000	.0000	13.3152
GLYPTOCEPHALUS CYNOGLOSSUS	.2338	.0000	.0000	.2945
HIPPOGLOSSOIDES PLATESSOIDES	.0000	.7111	1.7805	1.2258
SCOMBER SCOMBRUS	.0000	.0625	.0000	33.2499
PEPRILUS TRIACANTHUS	.0000	.0000	.0661	.0006
EGGS (UNIDENTIFIED)	.1581	.0000	.0315	.0262
LABRID/LIMANDA	1.9957	.0000	6.9430	48.6393
GADUS/MELANOGRAMMUS	.1581	59.5159	31.6649	.2897

APPENDIX 7-7. MEAN ABUNDANCE (No./1000 m^3) OF FISH EGGS BY SPECIES AT THE INTAKE. SEABROOK FINFISH STUDIES, 1979.

	JAN 09 79	JAN 23 79	FEB 28 79	MAR 22 79	APR 03 79	APR 16 79	APR 29 79	MAY 10 79
SCOPHTHALMUS AQUOSUS	.00	.00	.00	.00	.00	.00	.00	7.19
LIPARIS SP.	.00	.00	.00	.00	.00	.00	.00	.00
BROSME BROSME	.00	.00	.00	.00	.00	.00	.00	.00
ENCHELYOPUS CIMBRIUS	.00	.00	.00	.54	.00	11.91	33.27	179.04
MERLUCCIUS BILINEARIS	.00	.00	.00	.00	.00	.00	.00	.00
POLLACHIUS VIRENS	1.50	.51	.00	.00	.00	.00	.00	.00
UROPHYCIS SP.	.00	.00	.00	.00	.00	1.97	.00	.00
GLYPTOCEPHALUS CYNOGLOSSUS	.00	.00	.00	.00	5.02	16.13	.00	.00
HIPPOGLOSSOIDES PLATESSOIDES	2.07	.00	12.58	294.04	1085.06	1209.78	113.83	32.03
SCOMBER SCOMBRUS	.00	.00	.00	.00	.00	.00	.56	970.73
PEPRILUS TRIACANTHUS	.00	.00	.00	.00	.00	.00	.00	.00
EGGS (UNIDENTIFIED)	.00	.00	1.27	2.34	5.62	1.32	.00	.00
LABRID/LIMANDA	.00	.00	.00	.00	9.77	124.31	538.80	1126.62
GADUS/MELANOGRAMMUS	13.32	4.47	3.31	11.83	21.68	62.99	16.38	15.10

	MAY 22 79	JUN 07 79	JUN 20 79	JUL 11 79	JUL 18 79	AUG 01 79	AUG 16 79	SEP 11 79
SCOPHTHALMUS AQUOSUS	286.53	775.81	316.91	15.12	378.00	148.73	910.23	53.34
LIPARIS SP.	.00	.00	.00	.00	.00	.00	.00	.00
BROSME BROSME	.00	.00	.00	.00	.00	.00	.00	.00
ENCHELYOPUS CIMBRIUS	378.75	477.98	383.64	52.17	425.88	187.44	127.54	185.73
MERLUCCIUS BILINEARIS	.00	.00	40.15	336.64	586.57	737.29	252.55	152.92
POLLACHIUS VIRENS	.00	.00	.00	.00	.00	.00	.00	.00
UROPHYCIS SP.	.00	591.43	6413.35	243.50	8641.74	2770.90	2032.99	1063.39
GLYPTOCEPHALUS CYNOGLOSSUS	.00	.00	291.49	31.19	25.08	17.04	.00	8.49
HIPPOGLOSSOIDES PLATESSOIDES	.00	.00	.00	.00	.00	.00	.00	.79
SCOMBER SCOMBRUS	36486.07	114091.41	5847.84	90.45	400.80	56.94	.00	.00
PEPRILUS TRIACANTHUS	.00	.00	.00	.00	.00	.00	.00	.00
EGGS (UNIDENTIFIED)	.00	.00	54.89	.00	.00	5.74	6.13	1.80
LABRID/LIMANDA	661.17	61323.29	25811.10	13571.78	30891.78	7142.51	1958.52	26.37
GADUS/MELANOGRAMMUS	.00	.00	245.75	.00	.00	5.74	.00	6.13

	SEP 19 79	OCT 02 79	OCT 23 79	NOV 19 79	NOV 30 79	DEC 18 79	JAN 02 80	ALL
SCOPHTHALMUS AQUOSUS	33.99	1.61	.00	.00	.00	.00	.00	127.30
LIPARIS SP.	.00	.00	.00	.00	.00	.00	.00	.00
BROSME BROSME	.00	.00	.00	.00	.00	.00	.00	.00
ENCHELYOPUS CIMBRIUS	62.39	24.83	5.59	.00	.00	.00	.00	110.72
MERLUCCIUS BILINEARIS	10.94	5.37	.91	.00	.00	.00	.00	92.32
POLLACHIUS VIRENS	.00	.00	1.71	38.04	532.52	224.18	9.08	35.11
UROPHYCIS SP.	469.95	172.25	.00	.00	.00	.00	.00	1069.24
GLYPTOCEPHALUS CYNOGLOSSUS	1.46	.40	.00	.00	.00	.00	.00	17.23
HIPPOGLOSSOIDES PLATESSOIDES	2.17	.00	.00	.00	.34	10.35	34.88	121.65
SCOMBER SCOMBRUS	.00	.00	.00	.00	.00	.00	.00	6867.16
PEPRILUS TRIACANTHUS	.00	.00	.00	.00	.00	.81	.00	.04
EGGS (UNIDENTIFIED)	.00	.00	.00	.00	.00	.00	.00	3.44
LABRID/LIMANDA	15.48	1.24	1.76	.00	.00	.00	.00	6661.11
GADUS/MELANOGRAMMUS	6.02	.00	14.82	125.70	8.59	117.73	82.54	33.14

APPENDIX 7-8. MEAN ABUNDANCE (No./1000 m^3) OF FISH LARVAE ON DATES WHEN ALL STATIONS WERE ANALYZED. SEABROOK FINFISH STUDIES, 1979.

	JAN 09 79	FEB 28 79	MAR 22 79	APR 16 79	MAY 10 79	JUN 07 79	JUL 11 79	AUG 01 79	SEP 11 79	OCT 02 79	NOV 09 79	DEC 18 79	ALL
ASPIDOPHOROIDES MONOPTERYGIUS	.00	.00	3.40	.00	1.20	.00	.00	.00	.00	.00	.00	.00	.39
AMMODYTES AMERICANUS	61.77	147.15	2246.02	14.49	55.08	1.37	.38	.00	.00	.00	.00	1.36	212.11
ANGUILLA ROSTRATA	.00	.00	4.40	4.18	.94	.00	.00	.00	.00	.00	.00	.00	.80
PARALICHTHYS OBLONGUS	.00	.00	.00	.00	.00	.00	.00	.00	.32	.00	.00	.00	.03
SCOPHTHALMUS AQUOSUS	.00	.00	.00	.00	.00	.00	11.63	53.33	34.74	.84	.00	.00	8.36
ALOSA SP.	.00	.00	.00	.00	.00	3.01	.00	.00	.00	.00	.00	.00	.25
CLUPEA HARENGUS H	1.53	.65	45.10	.00	1.55	.00	.00	.98	4.92	.00	25.71	16.69	8.15
MYOXOCEPHALUS AENAEUS	.00	1.07	18.33	10.29	15.33	.60	.00	.00	.00	.00	.00	.00	3.83
MYOXOCEPHALUS OCTODECEMSPINOSUS	.00	1.21	7.71	.00	.00	.00	.00	.00	.00	.00	.00	.00	.75
MYOXOCEPHALUS SCORPIUS	.00	.95	1.66	1.24	.00	.30	.00	.00	.00	.00	.00	.00	.32
CYCLOPTERUS LUMPUS	.00	.00	.00	.00	.00	5.61	1.78	.00	.42	.00	.00	.00	.64
LIPARIS SP.	4.38	14.34	81.96	24.64	479.85	24.24	2.89	.26	.00	.00	.00	.00	53.06
BROSME BROSME	.00	.00	.00	.00	.00	1.22	1.05	.00	.00	.00	.00	.00	.18
ENCHELYOPUS CIMBRIUS	.00	.00	.00	1.18	.59	88.23	57.85	64.00	58.17	1.56	1.56	.27	22.54
GADUS MORHUA	.18	.13	.00	.00	.59	3.05	4.53	.80	.53	.00	1.57	2.21	1.11
MELANOGRAMMUS AEGLEFINUS	.00	.00	.00	.00	.00	.29	.00	.00	.00	.00	.00	.00	.02
MERLUCCIUS BILINEARIS	.00	.00	.00	.00	.00	.00	11.41	98.68	7.51	1.48	.00	.00	9.99
POLLACHIUS VIRENS	.00	.55	.91	29.41	.48	.00	.00	.00	.00	.00	10.72	178.73	18.53
UROPHYCIS SP.	.00	.00	.00	.00	.00	.00	.65	23.07	15.74	.13	.12	.00	3.33
GASTEROSTEUS ACULEATUS	.00	.25	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.02
TAUTOGA ONITIS	.00	.00	.00	.00	.00	.00	.00	3.49	9.02	.00	.00	.00	1.05
TAUTOGOLABRUS ADSPERSUS	.00	.00	.00	.00	.15	2.51	58.45	3195.07	120.58	.00	.00	.00	282.96
LOPHIUS AMERICANUS	.00	.00	.00	.00	.00	.30	.00	.00	.25	.24	.00	.00	.07
OSMERUS MORDAX	.00	.00	.00	.00	3.74	.00	.00	.00	.00	.00	.00	.00	.31
PHOLIS GUNNELLUS	.00	14.69	110.80	.68	4.63	.00	.00	.00	.00	.00	.00	.00	10.98
GLYPTOCEPHALUS CYNOGLOSSUS	.00	.00	.00	.00	.00	5.38	46.28	17.17	3.58	.00	.00	.00	5.84
HIPPOGLOSSOIDES PLATESSOIDES	.00	.00	.17	16.24	25.89	47.58	8.40	.00	.00	.00	.44	.00	8.23
LIMANDA FERRUGINEA	.00	.00	.00	.00	2.06	58.52	39.74	7.21	.62	.00	.00	.00	8.80
PSEUDOPLEURONECTES AMERICANUS	.00	.00	.00	.00	104.84	123.55	4.39	2.22	.00	.00	.00	.00	18.70
SCOMBER SCOMBRUS	.00	.00	.00	.00	2.41	89.21	73.11	10.70	.00	.00	.00	.00	14.21
SEBASTES MARINUS	.00	.00	.00	.00	.00	.00	6.49	.00	.26	.00	.00	.00	.52
LUMPENUS LUMPRETAEFORMIS	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ULVARIA SUBBIFURCATA	.00	.00	.00	.53	14.76	333.51	34.36	6.71	2.09	.00	.00	.00	32.63
PEPRILUS TRIACANTHUS	.00	.00	.00	.00	.00	.00	.00	4.77	1.71	.00	.00	.00	.54
SYNGNATHUS FUSCUS	.00	.00	.00	.00	.00	.00	.65	2.30	.53	.33	.00	.00	.32
MACROZOARCES AMERICANUS	.00	.13	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01
LARVAE (UNIDENTIFIED-MUTILATED)	.00	.14	.00	.00	6.43	33.51	8.51	5.99	1.08	.00	.00	.00	4.61

APPENDIX 7-9. PERCENT COMPOSITION OF FISH LARVAE ON DATES WHEN ALL STATIONS WERE ANALYZED. SEABROOK FINFISH STUDIES, 1979.

	JAN 09 79	FEB 08 79	MAR 02 79	APR 12 79	MAY 09 79	JUN 07 79	JUL 11 79	AUG 01 79	SEP 12 79	OCT 02 79	NOV 09 79	DEC 11 79	ALL
ASPIDOPHOROIDES MONOPTERYGIUS	.00	.00	.13	.00	.17	.00	.00	.00	.00	.00	.00	.00	.05
AMMODYTES AMERICANUS	91.02	81.19	89.11	14.11	7.64	.17	.10	.00	.00	.00	.00	.68	28.85
ANGUILLA ROSTRATA	.00	.00	.17	4.07	.13	.00	.00	.00	.00	.00	.00	.00	.11
PARALICHTHYS OBLONGUS	.00	.00	.00	.00	.00	.00	.00	.00	.12	.00	.00	.00	.00
SCOPHTHALMUS AQUOSUS	.00	.00	.00	.00	.00	.00	3.11	1.53	13.26	18.38	.00	.00	1.14
ALOSA SP.	.00	.00	.00	.00	.00	.37	.00	.00	.00	.00	.00	.00	.03
CLUPEA HARENGUS H	2.26	.36	1.78	.00	.22	.00	.00	.03	1.88	.00	64.08	8.38	1.11
MYOXOCEPHALUS AENAEUS	.00	.59	.73	10.03	2.13	.07	.00	.00	.00	.00	.00	.00	.52
MYOXOCEPHALUS OCTODECEMSPINOSUS	.00	.67	.31	.00	.00	.00	.00	.00	.00	.00	.00	.00	.10
MYOXOCEPHALUS SCORPIUS	.00	.53	.07	1.20	.00	.00	.00	.00	.00	.00	.00	.00	.04
CYCLOPTERUS LUMPUS	.00	.00	.00	.00	.00	.68	.48	.00	.16	.00	.00	.00	.09
LIPARIS SP.	6.45	7.91	3.25	24.00	66.59	2.95	.77	.01	.00	.00	.00	.00	7.22
BROSME BROSME	.00	.00	.00	.00	.00	.15	.28	.00	.00	.00	.00	.00	.02
ENCHELYOPUS CIMBRIUS	.00	.00	.00	1.15	.08	10.72	15.49	1.83	22.19	34.04	3.88	.14	3.07
GADUS MORHUA	.27	.07	.00	.00	.08	.37	1.21	.02	.20	.00	3.92	1.41	.15
MELANOGRAMMUS AEGLEFINUS	.00	.00	.00	.00	.00	.04	.00	.00	.00	.00	.00	.00	.00
MERLUCCIUS BILINEARIS	.00	.00	.00	.00	.00	.00	3.32	2.82	2.86	32.38	.00	.00	1.36
POLLACHIUS VIRENS	.00	.30	.04	28.64	.07	.00	.00	.00	.00	.00	26.72	89.70	2.52
UROPHYCIS SP.	.00	.00	.00	.00	.00	.00	.18	.66	6.01	2.92	.30	.00	.45
GASTEROSTEUS ACULEATUS	.00	.14	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
TAUTOGA ONITIS	.00	.00	.00	.00	.00	.00	.00	.13	3.44	.00	.00	.00	.14
TAUTOGOLABRUS ADSPERSUS	.00	.00	.00	.00	.02	.31	15.65	81.37	46.01	.00	.00	.00	38.49
LOPHIUS AMERICANUS	.00	.00	.00	.00	.00	.04	.00	.00	.10	5.16	.00	.00	.01
OSMERUS MORDAX	.00	.00	.00	.00	.52	.30	.00	.00	.00	.00	.00	.00	.04
PHOLIS GUNNELLUS	.00	8.10	4.40	.67	.64	.00	.00	.00	.00	.00	.00	.00	1.49
GLYPTOCEPHALUS CYNOGLOSSUS	.00	.00	.00	.00	.00	.78	12.39	.49	1.37	.30	.00	.00	.79
HIPPOGLOSSOIDES PLATESSOIDES	.00	.00	.01	15.61	3.59	5.78	2.25	.00	.00	.00	1.10	.00	1.12
LIMANDA FERRUGINEA	.00	.00	.00	.00	.28	7.11	10.64	.21	.24	.00	.00	.00	1.20
PSEUDOPLEURONECTES AMERICANUS	.00	.00	.00	.00	14.56	15.02	1.17	.06	.00	.00	.00	.00	2.68
SCOMBER SCOMBRUS	.00	.00	.00	.00	.33	10.84	19.57	.31	.00	.00	.00	.00	1.93
SEBASTES MARINUS	.00	.00	.00	.00	.00	.00	1.74	.00	.10	.00	.00	.00	.07
LUMPENUS LUMPRETAEFORMIS	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ULVARIA SUBBIFURCATA	.00	.00	.00	.33	2.05	40.54	9.20	.19	.80	.00	.00	.00	4.44
PEPRILUS TRIACANTHUS	.00	.00	.00	.00	.00	.00	.00	.14	.65	.00	.00	.00	.07
SYNGNATHUS FUSCUS	.00	.00	.00	.00	.00	.00	.17	.07	.20	2.12	.00	.00	.04
MACROZOARCES AMERICANUS	.00	.07	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
LARVAE (UNIDENTIFIED-MUTILATED)	.00	.08	.00	.00	.89	4.07	2.28	.17	.41	.00	.00	.00	.63

APPENDIX 7-10. MEAN ABUNDANCE (No./1000 m^3) OF FISH LARVAE BY SPECIES AT THE INTAKE. SEABROOK FINFISH STUDIES, 1979.

	JAN 09 79	JAN 23 79	FEB 28 79	MAR 22 79	APR 03 79	APR 16 79	APR 29 79	MAY 10 79	MAY 22 79
ASPIDOPHOROIDES MONOPTERYGIUS	.00	.00	.00	4.91	.00	.00	.52	.95	.49
AMMODYTES AMERICANUS	104.53	1537.95	61.55	2428.77	346.58	30.93	53.13	81.67	8.88
ANGUILLA ROSTRATA	.00	.00	.00	8.92	6.41	4.03	4.64	1.32	.00
PARALICHTHYS OBLONGUS	.00	.00	.00	.00	.00	.00	.00	.00	.00
SCOPHTHALMUS AQUOSUS	.00	.00	.00	.00	.00	.00	.00	.00	.00
ALOSA SP.	.00	.00	.00	.00	.00	.00	.00	.00	.00
CLUPEA HARENGUS H	2.59	.00	.42	8.52	1.04	.00	.00	2.84	.00
MYOXOCEPHALUS AENAEUS	.00	.00	1.27	39.63	13.97	26.10	7.07	27.14	2.74
MYOXOCEPHALUS OCTODECEMSPINOSUS	.00	2.00	1.63	13.10	.00	.00	1.04	.00	.00
MYOXOCEPHALUS SCORPIUS	.00	.00	.42	3.93	.00	.[illegible]	1.06	.00	.00
CYCLOPTERUS LUMPUS	.00	.00	.00	.00	.00	.00	.00	.00	.97
LIPARIS SP.	11.28	12.61	16.76	177.71	9.08	60.76	144.14	850.07	94.68
BROSME BROSME	.00	.00	.00	.00	.00	.00	.00	.00	.00
ENCHELYDPUS CIMBRIUS	.00	.00	.00	.00	.00	.0[illegible]	.00	1.76	14.16
GADUS MORHUA	.54	.00	.00	.00	.00	.00	1.04	1.76	.00
MELANOGRAMMUS AEGLEFINUS	.00	.00	.00	.00	.00	.00	.00	.00	.00
MERLUCCIUS BILINEARIS	.00	.00	.00	.00	.00	.00	.00	.00	.00
POLLACHIUS VIRENS	.00	5.77	.83	.00	.49	48.17	1.96	.00	1.39
UROPHYCIS SP.	.00	.00	.00	.00	.00	.00	.00	.00	.00
GASTEROSTEUS ACULEATUS	.00	.00	.00	.00	.00	.00	.00	.00	.00
TAUTOGA ONITIS	.00	.00	.00	.00	.00	.00	.00	.00	.00
TAUTOGOLABRUS ADSPERSUS	.00	.00	.00	.00	.00	.00	.00	.00	.97
LOPHIUS AMERICANUS	.00	.00	.00	.00	.00	.00	.00	.00	.00
OSMERUS MORDAX	.00	.00	.00	.00	.00	.00	.00	2.44	4.22
PHOLIS GUNNELLUS	.00	.00	18.51	222.40	5.97	2.05	1.06	5.59	.00
GLYPTOCEPHALUS CYNOGLOSSUS	.00	.00	.00	.00	.00	.00	.00	.00	.00
HIPPOGLOSSOIDES PLATESSOIDES	.00	.00	.00	.00	3.37	31.29	5.96	23.11	13.96
LIMANDA FERRUGINEA	.00	.00	.00	.00	.00	.00	1.04	4.14	26.04
PSEUDOPLEURONECTES AMERICANUS	.00	.00	.00	.00	.00	.00	.52	169.90	51.59
SCOMBER SCOMBRUS	.00	.00	.00	.00	.00	.00	.00	1.90	67.70
SEBASTES MARINUS	.00	.00	.00	.00	.00	.00	.00	.00	.00
LUMPENUS LUMPRETAEFORMIS	.00	.00	.00	.00	.49	.00	.00	.00	.00
ULVARIA SUBBIFURCATA	.00	.00	.00	.00	.00	.00	8.97	26.41	91.44
PEPRILUS TRIACANTHUS	.00	.00	.00	.00	.00	.00	.00	.00	.00
SYNGNATHUS FUSCUS	.00	.00	.00	.00	.00	.00	.00	.00	.00
MACROZOARCES AMERICANUS	.00	.00	.00	.00	.00	.00	.00	.00	.00
LARVAE (UNIDENTIFIED-EUTILATED)	.00	4.06	.00	.00	2.07	.00	.52	4.67	1.04

Continued

APPENDIX 7-10. (Continued)

	JUN 07 79	JUN 20 79	JUL 11 79	JUL 19 79	AUG 01 79	AUG 16 79	SEP 11 79	SEP 19 79	OCT 02 79
ASPIDOPHOROIDES MONOPTERYGIUS	.00	.00	.00	.00	.00	.00	.00	.00	.00
[illegible]ODYTES AMERICANUS	1.28	.00	1.06	.00	.00	.00	.00	.00	.00
ANGUILLA ROSTRATA	.00	.00	.00	.00	.00	.00	.00	.00	.00
PARALICHTHYS OBLONGUS	.00	.00	.00	.00	.00	.00	.85	.00	.00
SCOPHTHALMUS AQUOSUS	.00	.00	2.92	43.02	56.86	27.80	39.47	8.08	.71
ALOSA SP.	.00	.00	.00	.00	.00	.00	.00	.00	.00
CLUPEA HARENGUS H	.00	.00	.00	.39	.00	.00	5.75	1.45	.00
MYOXOCEPHALUS AENAEUS	.00	.00	.00	.00	.00	.00	.00	.00	.00
MYOXOCEPHALUS OCTODECEMSPINOSUS	.00	.00	.00	.00	.00	.00	.00	.00	.00
MYOXOCEPHALUS SCORPIUS	.00	.00	.00	.00	.00	.00	.00	.00	.00
CYCLOPTERUS LUMPUS	11.30	2.51	3.87	1.98	.00	.00	.47	.00	.00
LIPARIS SP.	13.12	24.70	.49	.00	.00	.00	.00	.00	.00
BROSME BROSME	.00	.00	.00	.00	.00	.00	.00	.00	.00
ENCHELYOPUS CIMBRIUS	42.00	70.13	18.88	72.59	67.04	198.84	8[illegible].69	12.46	1.11
GADUS MORHUA	3.52	4.37	8.75	.00	1.62	.00	1.59	.00	.00
MELANOGRAMMUS AEGLEFINUS	.88	3.43	.00	.00	.00	5.49	.00	.00	.00
MERLUCCIUS BILINEARIS	.00	.00	.46	66.02	120.44	244.88	6.90	1.52	.80
POLLACHIUS VIRENS	.00	.00	.00	.00	.00	.00	.00	.73	.00
UROPHYCIS SP.	.00	.00	.00	9.25	13.50	419.81	8.73	.00	.40
GASTEROSTEUS ACULEATUS	.00	.00	.00	.54	.00	.00	.00	.00	.00
TAUTOGA ONITIS	.00	.00	.00	.00	.00	.00	5.10	.00	.00
TAUTOGOLABRUS ADSPERSUS	.00	.00	4.39	5474.26	823.07	1218.98	133.52	5.12	.00
LOPHIUS AMERICANUS	.00	.00	.00	16.68	.00	.00	.00	.00	.71
OSMERUS MORDAX	.00	.00	.00	.00	.00	.00	.00	.00	.00
PHOLIS GUNNELLUS	.00	.00	.00	.00	.00	.00	.00	.00	.00
GLYPTOCEPHALUS CYNOGLOSSUS	.00	3.74	3.49	.00	47.82	9.92	3.12	.76	.00
HIPPOGLOSSOIDES PLATESSOIDES	5.23	13.40	7.73	.00	.00	.00	.00	2.14	.00
LIMANDA FERRUGINEA	20.78	398.07	12.24	.00	9.01	5.49	.00	.36	.00
PSEUDOPLEURONECTES AMERICANUS	32.31	261.81	2.05	.00	1.62	.00	.00	.36	.00
SCOMBER SCOMBRUS	11.34	1.23	3.84	106.40	4.32	1.89	.00	.00	.00
SEBASTES MARINUS	.00	.00	.53	.00	.00	.00	.79	.00	.00
LUMPENUS LUMPRETAEFORMIS	.00	.00	.00	.00	.00	.00	.00	.00	.00
ULVARIA SUBBIFURCATA	215.88	377.63	8.17	.00	.00	.00	3.84	.73	.00
PEPRILUS TRIACANTHUS	.00	.00	.00	.00	1.43	.00	4.45	.00	.00
SYNGNATHUS FUSCUS	.00	.00	.00	2.52	3.23	.00	1.59	.73	.00
MACROZOARCES AMERICANUS	.00	.00	.00	.00	.00	.00	.00	.00	.00
LARVAE (UNIDENTIFIED-MUTILATED)	4.19	4.87	.46	64.86	5.88	27.98	1.33	.73	.00

Continued

APPENDIX 7-10. (Continued)

	OCT 23 79	NOV 16 79	NOV 30 79	DEC 18 79	JAN 02 80
ASPIDOPHOROIDES MONOPTERYGIUS	.00	.00	.00	.00	.00
AMMODYTES AMERICANUS	.00	.00	.41	.00	1.03
ANGUILLA ROSTRATA	.00	.00	.00	.00	.00
PARALICHTHYS OBLONGUS	.00	.00	.00	.00	.00
SCOPHTHALMUS AQUOSUS	.85	.00	.68	.00	.00
ALOSA SP.	.00	.00	.00	.00	.00
CLUPEA HARENGUS H	71.26	17.39	1.37	12.20	1.03
MYOXOCEPHALUS AENAEUS	.00	.00	.00	.00	.00
MYOXOCEPHALUS OCTODECEMSPINOSUS	.00	.00	.00	.00	.00
MYOXOCEPHALUS SCORPIUS	.00	.00	.00	.00	.00
CYCLOPTERUS LUMPUS	.00	.00	.00	.00	.00
LIPARIS SP.	.00	.00	.00	.00	3.43
BROSME BROSME	.00	.00	.00	.00	.00
ENCHELYOPUS CIMBRIUS	2.92	1.04	.34	.81	.00
GADUS MORHUA	.00	.00	1.09	2.90	.00
MELANOGRAMMUS AEGLEFINUS	.00	.00	.00	.00	.00
MERLUCCIUS BILINEARIS	.00	.00	.00	.00	.00
POLLACHIUS VIRENS	.91	4.99	154.27	317.53	7.18
UROPHYCIS SP.	.00	.00	.00	.00	.00
GASTEROSTEUS ACULEATUS	.00	.00	.00	.00	.00
TAUTOGA ONITIS	.00	.00	.00	.00	.00
TAUTOGOLABRUS ADSPERSUS	.00	.00	.00	.00	.00
LOPHIUS AMERICANUS	.00	.00	.00	.00	.00
OSMERUS MORDAX	.00	.00	.00	.00	.00
PHOLIS GUNNELLUS	.00	.00	.00	.00	.00
GLYPTOCEPHALUS CYNOGLOSSUS	.00	.00	.00	.00	.00
HIPPOGLOSSOIDES PLATESSOIDES	.00	.68	.00	.00	.00
LIMANDA FERRUGINEA	.00	.00	.00	.00	.00
PSEUDOPLEURONECTES AMERICANUS	.00	.00	.00	.00	.00
SCOMBER SCOMBRUS	.00	.00	.00	.00	.00
SEBASTES MARINUS	.00	.00	.00	.00	.00
LUMPENUS LUMPRETAEFORMIS	.00	.00	.00	.00	.00
ULVARIA SUBBIFURCATA	.00	.00	.00	.00	.00
PEPRILUS TRIACANTHUS	.00	.00	.00	.00	.00
SYNGNATHUS FUSCUS	.00	.00	.00	.00	.00
MACROZOARCES AMERICANUS	.00	.00	.00	.00	.00
LARVAE (UNIDENTIFIED-MUTILATED)	.00	.00	.00	.00	.00

APPENDIX 7-11. MEAN ABUNDANCE (No./1000 m^3) BY STATION AND DATE OF SELECTED SPECIES OF FISH EGGS. SEABROOK FINFISH STUDIES, 1979.

		INTAKE	DISCHARGE	SOUTH	ALL
LABRID/LINANDA	JAN 09 79	.00	.00	.00	.00
(CUNNER/TAUTOG/YELLOWTAIL	JAN 23 79	.00	-1.00	-1.00	.00
FLOUNDER)	FEB 28 79	.00	.00	.00	.00
	MAR 22 79	.00	.53	.00	.18
	APR 03 79	9.77	-1.00	-1.00	9.77
	APR 16 79	124.31	121.67	138.22	128.07
	APR 29 79	539.80	-1.00	-1.00	539.80
	MAY 10 79	1126.62	831.91	583.11	847.21
	MAY 22 79	661.17	-1.00	-1.00	661.17
	JUN 07 79	61323.29	94629.98	30025.05	61992.77
	JUN 20 79	35811.10	-1.00	-1.00	35811.10
	JUL 11 79	13571.78	24451.48	2186.52	14422.96
	JUL 19 79	30891.78	-1.00	-1.00	30891.78
	AUG 01 79	7142.51	9114.40	2702.96	6318.96
	AUG 16 79	1958.52	-1.00	-1.00	1958.52
	SEP 11 79	26.37	42.74	33.34	34.15
	SEP 19 79	15.48	-1.00	-1.00	15.48
	OCT 02 79	1.24	3.73	6.32	3.76
	OCT 23 79	1.76	-1.00	-1.00	1.76
	NOV 19 79	.00	.00	.00	.00
	NOV 30 79	.00	-1.00	-1.00	.00
	DEC 18 79	.00	.00	85.20	28.40
	JAN 02 80	.00	-1.00	-1.00	.00
	ALL	6661.11	10766.37	2996.94	6793.93

		INTAKE	DISCHARGE	SOUTH	ALL
POLLACHIUS VIRENS	JAN 09 79	1.50	.42	.89	.94
(POLLOCK)	JAN 23 79	.51	-1.00	-1.00	.51
	FEB 28 79	.00	.41	.00	.14
	MAR 22 79	.00	.53	.00	.18
	APR 03 79	.00	-1.00	-1.00	.00
	APR 16 79	.00	.00	.00	.00
	APR 29 79	.00	-1.00	-1.00	.00
	MAY 10 79	.00	.00	.00	.00
	MAY 22 79	.00	-1.00	-1.00	.00
	JUN 07 79	.00	.00	.00	.00
	JUN 20 79	.00	-1.00	-1.00	.00
	JUL 11 79	.00	.00	.00	.00
	JUL 19 79	.00	-1.00	-1.00	.00
	AUG 01 79	.00	.00	.00	.00
	AUG 16 79	.00	-1.00	-1.00	.00
	SEP 11 79	.00	.00	.00	.00
	SEP 19 79	.00	-1.00	-1.00	.00
	OCT 02 79	.00	.00	.00	.00
	OCT 23 79	1.71	-1.00	-1.00	1.71
	NOV 19 79	38.04	73.31	115.17	75.50
	NOV 30 79	532.52	-1.00	-1.00	532.52
	DEC 18 79	224.18	232.46	273.32	243.32
	JAN 02 80	9.08	-1.00	-1.00	9.08
	ALL	35.11	25.59	33.14	32.17

Continued

APPENDIX 7-11. (Continued)

		INTAKE	DISCHARGE	SOUTH	ALL
SCOMBER SCOMBRUS	JAN 09 79	.00	.00	.00	.00
(MACKEREL)	JAN 23 79	.00	-1.00	-1.00	.00
	FEB 28 79	.00	.00	.00	.00
	MAR 22 79	.00	.00	.00	.00
	APR 03 79	.00	-1.00	-1.00	.00
	APR 16 79	.00	1.00	.00	.33
	APR 29 79	.56	-1.00	-1.00	.56
	MAY 10 79	870.73	535.56	15.92	507.40
	MAY 22 79	36486.07	-1.00	-1.00	36486.07
	JUN 07 79	114091.41	43417.18	9175.12	55561.24
	JUN 20 79	5847.84	-1.00	-1.00	5847.84
	JUL 11 79	90.45	191.93	736.87	303.65
	JUL 19 79	400.80	-1.00	-1.00	400.80
	AUG 01 79	56.94	11.63	235.48	101.35
	AUG 16 79	.00	-1.00	-1.00	.00
	SEP 11 79	.00	.00	.00	.00
	SEP 19 79	.00	-1.00	-1.00	.00
	OCT 02 79	.00	.00	.00	.00
	OCT 23 79	.00	-1.00	-1.00	.00
	NOV 19 79	.00	.36	.00	.13
	NOV 30 79	.00	-1.00	-1.00	.00
	DEC 18 79	.00	.00	.00	.00
	JAN 02 80	.00	-1.00	-1.00	.00
	ALL	6867.16	3679.80	849.29	4536.51

		INTAKE	DISCHARGE	SOUTH	ALL
GADUS/MELANOGRAMMUS	JAN 09 79	13.32	5.02	23.66	14.00
(COD/HADDOCK)	JAN 23 79	4.47	-1.00	-1.00	4.47
	FEB 28 79	3.31	19.09	101.00	41.13
	MAR 22 79	11.83	19.85	32.01	21.23
	APR 03 79	21.68	-1.00	-1.00	21.68
	APR 16 79	62.89	108.50	84.06	85.18
	APR 29 79	16.39	-1.00	-1.00	16.39
	MAY 10 79	15.10	7.42	2.18	8.23
	MAY 22 79	.00	-1.00	-1.00	.00
	JUN 07 79	.00	.00	.00	.00
	JUN 20 79	245.75	-1.00	-1.00	245.75
	JUL 11 79	.00	15.44	242.46	71.74
	JUL 19 79	.00	-1.00	-1.00	.00
	AUG 01 79	5.74	.00	12.62	6.12
	AUG 16 79	.00	-1.00	-1.00	.00
	SEP 11 79	6.13	8.99	6.47	7.20
	SEP 19 79	6.02	-1.00	-1.00	6.02
	OCT 02 79	.00	.89	.00	.30
	OCT 23 79	14.82	-1.00	-1.00	14.82
	NOV 19 79	125.70	149.32	64.45	113.16
	NOV 30 79	8.59	-1.00	-1.00	8.59
	DEC 18 79	117.73	85.23	175.62	129.52
	JAN 02 80	82.54	-1.00	-1.00	82.54
	ALL	33.14	35.81	58.20	40.12

		INTAKE	DISCHARGE	SOUTH	ALL
HIPPOGLOSSOIDES PLATESSOIDES	JAN 09 79	2.07	.00	1.38	1.15
(AMERICAN PLAICE)	JAN 23 79	.00	-1.00	-1.00	.00
	FEB 28 79	12.58	44.01	74.45	43.68
	MAR 22 79	294.04	447.37	268.38	336.60
	APR 03 79	1085.06	-1.00	-1.00	1085.06
	APR 16 79	1209.78	2349.67	1405.15	1654.86
	APR 29 79	113.83	-1.00	-1.00	113.83
	MAY 10 79	32.03	17.28	11.07	20.13
	MAY 22 79	.00	-1.00	-1.00	.00
	JUN 07 79	.00	.00	.00	.00
	JUN 20 79	.00	-1.00	-1.00	.00
	JUL 11 79	.00	.00	61.61	16.80
	JUL 19 79	.00	-1.00	-1.00	.00
	AUG 01 79	.00	.00	.00	.00
	AUG 16 79	.00	-1.00	-1.00	.00
	SEP 11 79	.78	.00	.78	.52
	SEP 19 79	2.17	-1.00	-1.00	2.17
	OCT 02 79	.00	.00	.00	.00
	OCT 23 79	.00	-1.00	-1.00	.00
	NOV 19 79	.00	2.00	2.05	1.35
	NOV 30 79	.34	-1.00	-1.00	.34
	DEC 18 79	10.35	4.96	6.54	7.28
	JAN 02 80	34.88	-1.00	-1.00	34.88
	ALL	121.65	238.77	154.55	159.98

Continued

APPENDIX 7-11. (Continued)

		INTAKE	DISCHARGE	SOUTH	ALL
UROPHYCIS SP.	JAN 09 79	.00	.00	.00	.00
(HAKE)	JAN 23 79	.00	-1.00	-1.00	.00
	FEB 28 79	.00	.00	.37	.12
	MAR 22 79	.00	.00	.00	.00
	APR 03 79	.00	-1.00	-1.00	.00
	APR 16 79	1.87	.00	.00	.66
	APR 29 79	.00	-1.00	-1.00	.00
	MAY 10 79	.00	.00	.00	.00
	MAY 22 79	.00	-1.00	-1.00	.00
	JUN 07 79	581.43	114.70	436.33	380.82
	JUN 20 79	6413.35	-1.00	-1.00	6413.35
	JUL 11 79	2434.50	31952.15	3365.83	13422.22
	JUL 19 79	8641.74	-1.00	-1.00	8641.74
	AUG 01 79	2770.80	1585.47	22363.57	8909.98
	AUG 16 79	2032.99	-1.00	-1.00	2032.99
	SEP 11 79	1063.38	1239.93	300.67	868.00
	SEP 19 79	469.85	-1.00	-1.00	469.95
	OCT 02 79	172.25	108.79	145.22	142.09
	OCT 23 79	.00	-1.00	-1.00	.00
	NOV 19 79	.00	.00	.00	.00
	NOV 30 79	.00	-1.00	-1.00	.00
	DEC 18 79	.00	.00	.00	.00
	JAN 02 80	.00	-1.00	-1.00	.00
	ALL	1069.24	2917.58	2193.24	1826.18

		INTAKE	DISCHARGE	SOUTH	ALL
MERLUCCIUS BILINEARIS	JAN 09 79	.00	.00	.00	.00
(SILVER HAKE)	JAN 23 79	.00	-1.00	-1.00	.00
	FEB 28 79	.00	.00	.00	.00
	MAR 22 79	.00	.00	.00	.00
	APR 03 79	.00	-1.00	-1.00	.00
	APR 16 79	.00	.00	.00	.00
	APR 29 79	.00	-1.00	-1.00	.00
	MAY 10 79	.00	.00	.00	.00
	MAY 22 79	.00	-1.00	-1.00	.00
	JUN 07 79	.00	.00	57.35	19.12
	JUN 20 79	40.15	-1.00	-1.00	40.15
	JUL 11 79	336.64	749.16	2097.62	966.91
	JUL 19 79	586.57	-1.00	-1.00	586.57
	AUG 01 79	737.29	1114.11	1574.42	1141.94
	AUG 16 79	252.55	-1.00	-1.00	252.55
	SEP 11 79	152.92	333.50	189.58	225.33
	SEP 19 79	10.94	-1.00	-1.00	10.94
	OCT 02 79	5.37	9.85	7.51	7.58
	OCT 23 79	.91	-1.00	-1.00	.91
	NOV 19 79	.00	.00	.00	.00
	NOV 30 79	.00	-1.00	-1.00	.00
	DEC 18 79	.00	.00	.00	.00
	JAN 02 80	.00	-1.00	-1.00	.00
	ALL	92.32	183.88	289.54	165.39

-1 = not analyzed

APPENDIX 7-12. MEAN ABUNDANCE (No./1000 m^3) BY STATION AND DATE OF SELECTED SPECIES OF FISH LARVAE. SEABROOK FINFISH STUDIES, 1979.

		INTAKE	DISCHARGE	SOUTH	ALL
OSMERUS MORDAX	JAN 09 79	.000	.000	.000	.000
(RAINBOW SMELT)	JAN 23 79	.000	¯1.000	¯1.000	.000
	FEB 28 79	.000	.000	.000	.000
	MAR 22 79	.000	.000	.000	.000
	APR 03 79	.000	¯1.000	¯1.000	.000
	APR 16 79	.000	.000	.000	.000
	APR 29 79	.000	¯1.000	¯1.000	.000
	MAY 10 79	2.435	3.409	5.382	3.742
	MAY 22 79	4.219	¯1.000	¯1.000	4.219
	JUN 07 79	.000	.000	.000	.000
	JUN 20 79	.000	¯1.000	¯1.000	.000
	JUL 11 79	.000	.000	.000	.000
	JUL 19 79	.000	¯1.000	¯1.000	.000
	AUG 01 79	.000	.000	.000	.000
	AUG 16 79	.000	¯1.000	¯1.000	.000
	SEP 11 79	.000	.000	.000	.000
	SEP 19 79	.000	¯1.000	¯1.000	.000
	OCT 02 79	.000	.000	.000	.000
	OCT 23 79	.000	¯1.000	¯1.000	.000
	NOV 19 79	.000	.000	.000	.000
	NOV 30 79	.000	¯1.000	¯1.000	.000
	DEC 18 79	.000	.000	.000	.000
	JAN 02 80	.000	¯1.000	¯1.000	.000
	ALL	.289	.284	.458	.330

		INTAKE	DISCHARGE	SOUTH	ALL
POLLACHIUS VIRENS	JAN 09 79	.000	.000	.000	.000
(POLLOCK)	JAN 23 79	5.774	¯1.000	¯1.000	5.774
	FEB 28 79	.827	.812	.000	.546
	MAR 22 79	.000	2.716	.000	.905
	APR 03 79	.488	¯1.000	¯1.000	.488
	APR 16 79	48.167	2.016	38.051	29.411
	APR 29 79	1.957	¯1.000	¯1.000	1.957
	MAY 10 79	.000	1.025	.408	.477
	MAY 22 79	1.390	¯1.000	¯1.000	1.390
	JUN 07 79	.000	.000	.000	.000
	JUN 20 79	.000	¯1.000	¯1.000	.000
	JUL 11 79	.000	.000	.000	.000
	JUL 19 79	.000	¯1.000	¯1.000	.000
	AUG 01 79	.000	.000	.000	.000
	AUG 16 79	.000	¯1.000	¯1.000	.000
	SEP 11 79	.000	.000	.000	.000
	SEP 19 79	.729	¯1.000	¯1.000	.729
	OCT 02 79	.000	.000	.000	.000
	OCT 23 79	.909	¯1.000	¯1.000	.909
	NOV 19 79	4.990	20.970	6.200	10.720
	NOV 30 79	154.270	¯1.000	¯1.000	154.270
	DEC 18 79	317.526	122.070	96.588	178.728
	JAN 02 80	7.177	¯1.000	¯1.000	7.177
	ALL	23.661	12.467	12.021	17.862

Continued

APPENDIX 7-12. (Continued)

		INTAKE	DISCHARGE	SOUTH	ALL
PSEUDOPLEURONECTES AMERICANUS	JAN 09 79	.000	.000	.000	.000
(WINTER FLOUNDER)	JAN 23 79	.000	-1.000	-1.000	.000
	FEB 28 79	.000	.000	.000	.000
	MAR 22 79	.000	.000	.000	.000
	APR 03 79	.000	-1.000	-1.000	.000
	APR 16 79	.000	.000	.000	.000
	APR 29 79	.520	-1.000	-1.000	.520
	MAY 10 79	169.898	135.476	8.459	104.944
	MAY 22 79	51.593	-1.000	-1.000	51.593
	JUN 07 79	32.315	58.766	279.584	123.555
	JUN 20 79	261.806	-1.000	-1.000	261.806
	JUL 11 79	2.050	9.449	.758	4.388
	JUL 19 79	.000	-1.000	-1.000	.000
	AUG 01 79	1.615	5.057	.000	2.224
	AUG 16 79	.000	-1.000	-1.000	.000
	SEP 11 79	.000	.000	.000	.000
	SEP 19 79	.364	-1.000	-1.000	.364
	OCT 02 79	.000	.000	.000	.000
	OCT 23 79	.000	-1.000	-1.000	.000
	NOV 19 79	.000	.000	.000	.000
	NOV 30 79	.000	-1.000	-1.000	.000
	DEC 18 79	.000	.000	.000	.000
	JAN 02 80	.000	-1.000	-1.000	.000
	ALL	22.615	17.396	24.648	21.787

		INTAKE	DISCHARGE	SOUTH	ALL
SCOMBER SCOMBRUS	JAN 09 79	.000	.000	.000	.000
(MACKEREL)	JAN 23 79	.000	-1.000	-1.000	.000
	FEB 28 79	.000	.000	.000	.000
	MAR 22 79	.000	.000	.000	.000
	APR 03 79	.000	-1.000	-1.000	.000
	APR 16 79	.000	.000	.000	.000
	APR 29 79	.000	-1.000	-1.000	.000
	MAY 10 79	1.898	5.322	.000	2.407
	MAY 22 79	67.699	-1.000	-1.000	67.699
	JUN 07 79	11.337	111.803	144.499	89.212
	JUN 20 79	1.229	-1.000	-1.000	1.229
	JUL 11 79	3.83	83.919	151.064	73.110
	JUL 19 79	106.396	-1.000	-1.000	106.396
	AUG 01 79	4.325	.000	27.765	10.697
	AUG 16 79	1.894	-1.000	-1.000	1.894
	SEP 11 79	.000	.000	.000	.000
	SEP 19 79	.000	-1.000	-1.000	.000
	OCT 02 79	.000	.000	.000	.000
	OCT 23 79	.000	-1.000	-1.000	.000
	NOV 19 79	.000	.000	.000	.000
	NOV 30 79	.000	-1.000	-1.000	.000
	DEC 18 79	.000	.000	.000	.000
	JAN 02 80	.000	-1.000	-1.000	.000
	ALL	8.635	16.753	24.303	14.657

		INTAKE	DISCHARGE	SOUTH	ALL
TAUTOGOLABRUS ADSPERSUS	JAN 09 79	.000	.000	.000	.000
(CUNNER)	JAN 23 79	.000	-1.000	-1.000	.000
	FEB 28 79	.000	.000	.000	.000
	MAR 22 79	.000	.000	.000	.000
	APR 03 79	.000	-1.000	-1.000	.000
	APR 16 79	.000	.000	.000	.000
	APR 29 79	.000	-1.000	-1.000	.000
	MAY 10 79	.000	.460	.000	.153
	MAY 22 79	.971	-1.000	-1.000	.971
	JUN 07 79	.000	1.934	5.602	2.512
	JUN 20 79	.000	-1.000	-1.000	.000
	JUL 11 79	4.386	77.597	104.992	58.446
	JUL 19 79	5474.262	-1.000	-1.000	5474.262
	AUG 01 79	823.070	556.789	8205.327	3195.065
	AUG 16 79	1218.975	-1.000	-1.000	1218.975
	SEP 11 79	133.519	93.837	134.383	120.580
	SEP 19 79	5.120	-1.000	-1.000	5.120
	OCT 02 79	.000	.000	.000	.000
	OCT 23 79	.000	-1.000	-1.000	.000
	NOV 19 79	.000	.000	.000	.000
	NOV 30 79	.000	-1.000	-1.000	.000
	DEC 18 79	.000	.000	.000	.000
	JAN 02 80	.000	-1.000	-1.000	.000
	ALL	333.057	60.886	716.94.	359.679

Continued

APPENDIX 7-12. (Continued)

		INTAKE	DISCHARGE	SOUTH	ALL
AMMODYTES AMERICANUS	JAN 09 79	104.529	42.894	37.886	61.770
(SAND LANCE)	JAN 23 79	1537.953	-1.000	-1.000	1537.953
	FEB 28 79	61.548	228.283	151.617	147.149
	MAR 22 79	2428.772	1536.173	2773.122	2246.022
	APR 03 79	346.575	-1.000	-1.000	346.575
	APR 16 79	30.931	5.036	7.488	14.485
	APR 29 79	53.132	-1.000	-1.000	53.132
	MAY 10 79	81.667	65.250	18.332	55.083
	MAY 22 79	8.880	-1.000	-1.000	8.880
	JUN 07 79	1.278	2.830	.000	1.369
	JUN 20 79	.000	-1.000	-1.000	.000
	JUL 11 79	1.057	.000	.000	.384
	JUL 19 79	.000	-1.000	-1.000	.000
	AUG 01 79	.000	.000	.000	.000
	AUG 16 79	.000	-1.000	-1.000	.000
	SEP 11 79	.000	.000	.000	.000
	SEP 19 79	.000	-1.000	-1.000	.000
	OCT 02 79	.000	.000	.000	.000
	OCT 23 79	.000	-1.000	-1.000	.000
	NOV 19 79	.000	.000	.000	.000
	NOV 30 79	.408	-1.000	-1.000	.408
	DEC 18 79	.000	2.944	1.128	1.357
	JAN 02 80	1.033	-1.000	-1.000	1.033
	ALL	202.511	158.951	254.432	203.866

		INTAKE	DISCHARGE	SOUTH	ALL
GADUS MORHUA	JAN 09 79	.543	.000	.000	.181
(COD)	JAN 23 79	.000	-1.000	-1.000	.000
	FEB 28 79	.000	.395	.000	.132
	MAR 22 79	.000	.000	.000	.000
	APR 03 79	.000	-1.000	-1.000	.000
	APR 16 79	.000	.000	.000	.000
	APR 29 79	1.040	-1.000	-1.000	1.040
	MAY 10 79	1.764	.000	.000	.588
	MAY 22 79	.000	-1.000	-1.000	.000
	JUN 07 79	3.523	3.839	1.792	3.051
	JUN 20 79	4.368	-1.000	-1.000	4.368
	JUL 11 79	8.746	3.716	.000	4.532
	JUL 19 79	.000	-1.000	-1.000	.000
	AUG 01 79	1.615	.775	.000	.797
	AUG 16 79	.000	-1.000	-1.000	.000
	SEP 11 79	1.587	.000	.000	.529
	SEP 19 79	.000	-1.000	-1.000	.000
	OCT 02 79	.000	.000	.000	.000
	OCT 23 79	.000	-1.000	-1.000	.000
	NOV 19 79	.000	2.710	2.010	1.573
	NOV 30 79	1.086	-1.000	-1.000	1.086
	DEC 18 79	2.898	1.874	1.856	2.209
	JAN 02 80	.000	-1.000	-1.000	.000
	ALL	1.181	1.109	.482	.987

		INTAKE	DISCHARGE	SOUTH	ALL
HIPPOGLOSSOIDES PLATESSOIDES	JAN 09 79	.000	.000	.000	.000
(AMERICAN PLAICE)	JAN 23 79	.000	-1.000	-1.000	.000
	FEB 28 79	.000	.000	.000	.000
	MAR 22 79	.000	.000	.500	.167
	APR 03 79	3.374	-1.000	-1.000	3.374
	APR 16 79	31.292	9.342	8.077	16.237
	APR 29 79	5.961	-1.000	-1.000	5.961
	MAY 10 79	23.106	12.617	41.955	25.893
	MAY 22 79	13.956	-1.000	-1.000	13.956
	JUN 07 79	5.226	8.633	128.882	47.580
	JUN 20 79	13.395	-1.000	-1.000	13.395
	JUL 11 79	7.734	5.232	13.506	8.398
	JUL 19 79	.000	-1.000	-1.000	.000
	AUG 01 79	.000	.000	.000	.000
	AUG 16 79	.000	-1.000	-1.000	.000
	SEP 11 79	.000	.000	.000	.000
	SEP 19 79	2.143	-1.000	-1.000	2.143
	OCT 02 79	.000	.000	.000	.000
	OCT 23 79	.000	-1.000	-1.000	.000
	NOV 19 79	.678	.000	.642	.440
	NOV 30 79	.000	-1.000	-1.000	.000
	DEC 18 79	.000	.000	.000	.000
	JAN 02 80	.000	-1.000	-1.000	.000
	ALL	4.646	2.985	16.186	7.120

Continued

APPENDIX 7-12. (Continued)

		INTAKE	DISCHARGE	SOUTH	ALL
LIMANDA FERRUGINEA	JAN 09 79	.000	.000	.000	.000
(YELLOWTAIL FLOUNDER)	JAN 23 79	.000	-1.000	-1.000	.000
	FEB 28 79	.000	.000	.000	.000
	MAR 22 79	.000	.000	.000	.000
	APR 03 79	.000	-1.000	-1.000	.000
	APR 16 79	.000	.000	.000	.000
	APR 29 79	1.040	-1.000	-1.000	1.040
	MAY 10 79	4.136	2.049	.000	2.062
	MAY 22 79	26.044	-1.000	-1.000	26.044
	JUN 07 79	20.782	71.627	83.152	58.520
	JUN 20 79	388.068	-1.000	-1.000	388.068
	JUL 11 79	12.237	44.202	70.448	39.736
	JUL 19 79	.000	-1.000	-1.000	.000
	AUG 01 79	9.011	.000	12.618	7.210
	AUG 16 79	5.495	-1.000	-1.000	5.495
	SEP 11 79	.000	1.866	.000	.622
	SEP 19 79	.364	-1.000	-1.000	.364
	OCT 02 79	.000	.000	.000	.000
	OCT 23 79	.000	-1.000	-1.000	.000
	NOV 19 79	.000	.000	.000	.000
	NOV 30 79	.000	-1.000	-1.000	.000
	DEC 18 79	.000	.000	.000	.000
	JAN 02 80	.000	-1.000	-1.000	.000
	ALL	20.747	9.979	12.647	15.847

		INTAKE	DISCHARGE	SOUTH	ALL
MELANOGRAMMUS AEGLEFINUS	JAN 09 79	.000	.000	.000	.000
	JAN 23 79	.000	-1.000	-1.000	.000
(HADDOCK)	FEB 28 79	.000	.000	.000	.000
	MAR 22 79	.000	.000	.000	.000
	APR 03 79	.000	-1.000	-1.000	.000
	APR 16 79	.000	.000	.000	.000
	APR 29 79	.000	-1.000	-1.000	.000
	MAY 10 79	.000	.000	.000	.000
	MAY 22 79	.000	-1.000	-1.000	.000
	JUN 07 79	.885	.000	.000	.295
	JUN 20 79	3.431	-1.000	-1.000	3.431
	JUL 11 79	.000	.000	.000	.000
	JUL 19 79	.000	-1.000	-1.000	.000
	AUG 01 79	.000	.000	.000	.000
	AUG 16 79	5.495	-1.000	-1.000	5.495
	SEP 11 79	.000	.000	.000	.000
	SEP 19 79	.000	-1.000	-1.000	.000
	OCT 02 79	.000	.000	.000	.000
	OCT 23 79	.000	-1.000	-1.000	.000
	NOV 19 79	.000	.000	.000	.000
	NOV 30 79	.000	-1.000	-1.000	.000
	DEC 18 79	.000	.000	.000	.000
	JAN 02 80	.000	-1.000	-1.000	.000
	ALL	.427	.000	.000	.210

		INTAKE	DISCHARGE	SOUTH	ALL
UROPHYCIS SP.	JAN 09 79	.000	.000	.000	.000
(HAKE)	JAN 23 79	.000	-1.000	-1.000	.000
	FEB 28 79	.000	.000	.000	.000
	MAR 22 79	.000	.000	.000	.000
	APR 03 79	.000	-1.000	-1.000	.000
	APR 16 79	.000	.000	.000	.000
	APR 29 79	.000	-1.000	-1.000	.000
	MAY 10 79	.000	.000	.000	.000
	MAY 22 79	.000	-1.000	-1.000	.000
	JUN 07 79	.000	.000	.000	.000
	JUN 20 79	.000	-1.000	-1.000	.000
	JUL 11 79	.000	.000	2.398	.654
	JUL 19 79	9.254	-1.000	-1.000	9.254
	AUG 01 79	13.486	5.075	50.635	23.068
	AUG 16 79	419.810	-1.000	-1.000	419.810
	SEP 11 79	8.733	4.622	33.867	15.741
	SEP 19 79	.000	-1.000	-1.000	.000
	OCT 02 79	.401	.000	.000	.134
	OCT 23 79	.000	-1.000	-1.000	.000
	NOV 19 79	.000	.357	.000	.119
	NOV 30 79	.000	-1.000	-1.000	.000
	DEC 18 79	.000	.000	.000	.000
	JAN 02 80	.000	-1.000	-1.000	.000
	ALL	19.639	.838	7.345	11.723

Continued

APPENDIX 7-12. (Continued)

		INTAKE	DISCHARGE	SOUTH	ALL
CLUPEA HARENGUS H	JAN 09 79	2.592	1.460	.548	1.533
(ATLANTIC HERRING)	JAN 23 79	.000	-1.000	-1.000	.000
	FEB 28 79	.423	.000	1.525	.648
	MAR 22 79	8.516	11.611	115.168	45.099
	APR 03 79	1.037	-1.000	-1.000	1.037
	APR 16 79	.000	.000	.000	.000
	APR 29 79	.000	-1.000	-1.000	.000
	MAY 10 79	2.843	.460	1.354	1.552
	MAY 22 79	.000	-1.000	-1.000	.000
	JUN 07 79	.000	.000	.000	.000
	JUN 20 79	.000	-1.000	-1.000	.000
	JUL 11 79	.000	.000	.000	.000
	JUL 19 79	.988	-1.000	-1.000	.988
	AUG 01 79	.000	2.928	.000	.976
	AUG 16 79	.000	-1.000	-1.000	.000
	SEP 11 79	5.750	1.807	7.206	4.921
	SEP 19 79	1.449	-1.000	-1.000	1.449
	OCT 02 79	.000	.000	.000	.000
	OCT 23 79	71.255	-1.000	-1.000	71.255
	NOV 19 79	17.394	25.575	34.172	25.714
	NOV 30 79	1.367	-1.000	-1.000	1.367
	DEC 18 79	12.196	30.660	7.225	16.693
	JAN 02 80	1.033	-1.000	-1.000	1.033
	ALL	5.515	6.208	14.230	7.883

		INTAKE	DISCHARGE	SOUTH	ALL
MERLUCCIUS BILINEARIS	JAN 09 79	.000	.000	.000	.000
(SILVER HAKE)	JAN 23 79	.000	-1.000	-1.000	.000
	FEB 28 79	.000	.000	.000	.000
	MAR 22 79	.000	.000	.000	.000
	APR 03 79	.000	-1.000	-1.000	.000
	APR 16 79	.000	.000	.000	.000
	APR 29 79	.000	-1.000	-1.000	.000
	MAY 10 79	.000	.000	.000	.000
	MAY 22 79	.000	-1.000	-1.000	.000
	JUN 07 79	.000	.000	.000	.000
	JUN 20 79	.000	-1.000	-1.000	.000
	JUL 11 79	.465	14.119	26.049	12.407
	JUL 19 79	66.016	-1.000	-1.000	66.016
	AUG 01 79	120.437	6.553	169.050	98.680
	AUG 16 79	244.880	-1.000	-1.000	244.880
	SEP 11 79	6.804	8.825	6.795	7.508
	SEP 19 79	1.520	-1.000	-1.000	1.520
	OCT 02 79	.803	.962	2.679	1.481
	OCT 23 79	.000	-1.000	-1.000	.000
	NOV 19 79	.000	.000	.000	.000
	NOV 30 79	.000	-1.000	-1.000	.000
	DEC 18 79	.000	.000	.000	.000
	JAN 02 80	.000	-1.000	-1.000	.000
	ALL	19.175	2.538	16.856	14.322

-1 = not analyzed

APPENDIX 7-13. ABUNDANCES (No./1000 m^3), WITH STANDARD DEVIATION AND N, OF WINTER FLOUNDER LARVAE (29-30 May) AND CUNNER/TAUTOG/YELLOWTAIL FLOUNDER EGGS AND CUNNER LARVAE (2-3 August) DURING DIEL STUDIES. SEABROOK FINFISH STUDIES, 1979.

A. WINTER FLOUNDER LARVAE

		NOON-MEAN	NOON-S.D.	NOON-N	SUNSET-MEAN	SUNSET-S.D.	SUNSET-N	MIDNIGHT-MEAN	MIDNIGHT-S.D.	MIDNIGHT-N	SUNRISE-MEAN	SUNRISE-S.D.	SUNRISE-N	ALL-MEAN	ALL-S.D.	ALL-N
SEABROOK INTAKE STRUCTURE	SUR	7	2.6	2	0	.0	2	13	11.4	2	2	.1	2	5	7.0	8
	MID	77	22.0	2	48	17.9	2	120	6.8	2	7	.2	2	63	45.4	8
	BOT	18	14.0	2	8	6.1	2	18	10.5	2	256	134.7	2	75	123.1	8
	ALL	34	35.7	6	19	23.0	6	50	54.7	6	88	143.2	6	48	78.9	24
SEABROOK DIFFUSER	SUR	0	.0	2	1	1.5	2	13	10.3	2	0	.0	2	4	7.2	8
	MID	46	5.7	2	44	12.2	2	150	24.8	2	18	13.3	2	64	55.3	8
	BOT	8	4.1	2	3	1.8	2	1	1.5	2	‾1	‾1.0	‾1	4	3.9	6
	ALL	18	22.1	6	16	22.2	6	55	74.7	6	9	12.7	4	26	43.9	22
ALL	SUR	3	4.1	4	1	1.1	4	13	8.0	4	1	1.2	4	5	6.9	16
	MID	61	22.3	4	46	12.9	4	135	22.6	4	12	9.8	4	64	48.9	16
	BOT	13	10.3	4	5	4.5	4	9	11.4	4	256	134.7	2	45	97.4	14
	ALL	26	29.5	12	17	22.6	12	52	62.5	12	57	114.6	10	37	64.8	46

B. CUNNER/TAUTOG/YELLOWTAIL FLOUNDER EGGS

		NOON-MEAN	NOON-S.D.	NOON-N	SUNSET-MEAN	SUNSET-S.D.	SUNSET-N	MIDNIGHT-MEAN	MIDNIGHT-S.D.	MIDNIGHT-N	SUNRISE-MEAN	SUNRISE-S.D.	SUNRISE-N	ALL-MEAN	ALL-S.D.	ALL-N
SEABROOK INTAKE STRUCTURE	SUR	8761	2221	2	‾1	‾1	‾1	26341	4640	2	16636	3548	2	17246	8357	6
	MID	1010	181	2	‾1	‾1	‾1	3543	3402	2	1105	425	2	1886	2002	6
	BOT	566	12	2	‾1	‾1	‾1	744	595	2	976	121	2	762	328	6
	ALL	3446	4241	6	‾1	‾1	‾1	10209	12821	6	6238	8211	6	6631	8035	18
SEABROOK DIFFUSER	SUR	11521	6186	2	14340	4062	2	3164	279	2	4257	1072	2	8320	5796	8
	MID	637	159	2	1430	359	2	494	11	2	845	552	2	851	459	8
	BOT	695	207	2	866	0	1	433	23	2	355	15	2	548	219	7
	ALL	4284	6252	6	6481	7461	5	1364	1400	6	1819	1876	6	3357	4952	23
ALL	SUR	10141	4116	4	14340	4062	2	14752	13647	4	10446	7461	4	12146	8122	14
	MID	823	256	4	1430	359	2	2018	2637	4	975	429	4	1295	1392	14
	BOT	631	141	4	866	0	1	589	388	4	666	365	4	647	285	13
	ALL	3865	5112	12	6481	7461	5	5787	9847	12	4028	6144	12	4795	7133	41

C. CUNNER LARVAE

		NOON-MEAN	NOON-S.D.	NOON-N	SUNSET-MEAN	SUNSET-S.D.	SUNSET-N	MIDNIGHT-MEAN	MIDNIGHT-S.D.	MIDNIGHT-N	SUNRISE-MEAN	SUNRISE-S.D.	SUNRISE-N	ALL-MEAN	ALL-S.D.	ALL-N
SEABROOK INTAKE STRUCTURE	SUR	1301	196.72	2	‾1	‾1.00	‾1	1383	855.75	2	167	192.96	2	1149	932.10	6
	MID	272	73.79	2	‾1	‾1.00	‾1	226	161.81	2	524	561.10	2	341	299.73	6
	BOT	226	37.13	2	‾1	‾1.00	‾1	103	76.67	2	53	19.14	2	139	77.94	6
	ALL	600	551.98	6	‾1	‾1.00	‾1	770	634.70	6	260	336.89	6	543	596.73	18
SEABROOK DIFFUSER	SUR	1107	132.30	2	1853	163.56	2	2266	62.63	2	49	6.66	2	1320	804.31	8
	MID	538	420.04	2	363	11.46	2	133	94.41	2	665	625.40	2	430	359.52	8
	BOT	77	20.88	2	123	.00	1	33	13.75	2	27	7.23	2	57	38.48	7
	ALL	581	501.26	6	913	744.54	5	811	129.14	6	247	428.08	6	626	809.15	23
ALL	SUR	1204	176.86	4	1853	163.58	2	2123	577.11	4	108	130.76	4	1247	940.72	14
	MID	415	296.56	4	363	11.46	2	180	120.72	4	594	491.80	4	392	325.06	14
	BOT	152	86.35	4	123	.00	1	68	60.59	4	38	37.75	4	95	71.49	13
	ALL	596	502.79	12	913	744.54	5	790	632.77	12	253	367.33	12	589	753.75	41

‾1 = not analyzed