NEW YORK AND NEW JERSEY HARBOR NAVIGATION PROJECT

SUPPLEMENTAL SAMPLING PROGRAM
2000-2001

FINAL REPORT

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TABLE OF CONTENTS

VOLUME I: SUPPLEMENTAL SAMPLING PROGRAM REPORT

LIST OF TABLES ii
LIST OF FIGURES ..... iii-iv

1.0 INTRODUCTION 1-1

1.1 BACKGROUND 1-1
1.2 PURPOSE 1-1
1.3 PROGRAM OBJECTIVES 1-2
1.4 REPORT FORMAT 1-2

2.0 MATERIALS AND METHODOLOGY 2-1

2.1 ICHTHYOPLANKTON SURVEY 2-1
2.1.1 Sampling Locations 2-2
2.1.2 Sampling Frequency 2-3

3.0 RESULTS AND DISCUSSION 3-1

3.1 ALL SPECIES 3-1
3.1.1 All Areas Combined 3-1
3.1.1 Navigation Channel Areas 3-2
3.1.2 Shoal/Shallow Areas 3-3
3.1.3 Slope Areas 3-4

3.2 WINTER FLOUNDER 3-4
3.2.1 Navigation Channel Areas 3-5
3.2.2 Shoal/Shallow Areas 3-5
3.2.3 Slope Areas 3-5
3.2.4 Upper New York Bay /Newark Bay and Arthur Kill 3-6
3.2.5 Statistical Analysis 3-7

REFERENCES R-1

APPENDICES

A-ICHTHYOPLANKTON SAMPLING DATA
B-WATER QUALITY DATA

LIST OF TABLES

2-1 New York and New Jersey Harbor Navigation Project Supplemental Sampling Program Epi-benthic Sled and Plankton Net Specifications 2-4

2-2 New York and New Jersey Harbor Navigation Project Supplemental Sampling Program Station Locations 2-5

3-1 New York and New Jersey Harbor Navigation Project Supplemental Sampling Program Common and Scientific Name of Fish Collected 3-9

3-2 Average Ichthyoplankton Density (No./1000m^3) by Lifestage - All Stations Combined, December 2000 - June 2001 3-10

3-3 Average Ichthyoplankton Density (No./ 1000m^3) by Lifestage - Navigation Channel Stations Combined, December 2000 - June 2001 3-11

3-4 Average Ichthyoplankton Density (No./ 1000m^3) by Lifestage - Shoal/Shallow Stations Combined, December 2000 - June 2001 3-12

3-5 Average Ichthyoplankton Density (No./ 1000m^3) by Lifestage - Slope Stations Combined, December 2000 - June 2001 3-13

LIST OF FIGURES

2-1 Ichthyoplankton Sampling Station Locations

3-1 Percent Composition of egg densities at all stations combined - December 2000 through June 2001

3-2 Percent Composition of yolk-larvae densities at all stations combined - December 2000 through June 2001

3-3 Percent Composition of post yolk-larvae densities at all stations combined - December 2000 through June 2001

3-4 Percent Composition of juvenile densities at all stations combined - December 2000 through June 2001

3-5 Percent Composition of egg densities at all navigation channel stations combined - December 2000 through June 2001

3-6 Percent Composition of yolk-larvae densities at all navigation channel stations combined - December 2000 through June 2001

3-7 Percent Composition of post yolk-larvae densities at all navigation channel stations combined - December 2000 through June 2001

3-8 Percent Composition of juvenile densities at all navigation channel stations combined - December 2000 through June 2001

3-9 Percent Composition of egg densities at all shoal stations combined - December 2000 through June 2001

3-10 Percent Composition of yolk-larvae densities at all shoal stations combined - December 2000 through June 2001

3-11 Percent Composition of post yolk-larvae densities at all shoal stations combined - December 2000 through June 2001

3-12 Percent Composition of juvenile densities at all shoal stations combined - December 2000 through June 2001

3-13 Percent Composition of egg densities at all slope stations combined - March 2000 through June 2001

3-14 Percent Composition of yolk-larvae densities at all slope stations combined - March 2000 through June 2001

3-15 Percent Composition of post yolk-larvae densities at all slope stations combined - March 2000 through June 2001

3-16 Monthly densities (No. / 1000 m^3) of winter flounder eggs at the Arthur Kill (AK) sampling stations

3-17 Monthly densities (No. / 1000 m^3) of winter flounder eggs at the Newark Bay (NB) sampling stations

3-18 Monthly densities (No. / 1000 m^3) of winter flounder eggs at the Port Jersey (PJ) sampling stations

3-19 Monthly densities (No. / 1000 m^3) of winter flounder eggs at the South Brooklyn (SB) sampling stations

3-20 Monthly densities (No. / 1000 m^3) of winter flounder yolk-sac larvae at the Arthur Kill (AK) sampling stations

3-21 Monthly densities (No. / 1000 m^3) of winter flounder yolk-sac larvae at the Newark Bay (NB) sampling stations

3-22 Monthly densities (No. / 1000 m^3) of winter flounder yolk-sac larvae at the Port Jersey (PJ) sampling stations

3-23 Monthly densities (No. / 1000 m^3) of winter flounder yolk-sac at the South Brooklyn (SB) sampling stations

3-24 Monthly densities (No. / 1000 m^3) of winter flounder post yolk-sac larvae at the Arthur Kill (AK) sampling stations

3-25 Monthly densities (No. / 1000 m^3) of winter flounder post yolk-sac larvae at the Newark Bay (NB) sampling stations

3-26 Monthly densities (No. / 1000 m^3) of winter flounder post yolk-sac larvae at the Port Jersey (PJ) sampling stations

3-27 Monthly densities (No. / 1000 m^3) of winter flounder post yolk-sac at the South Brooklyn (SB) sampling stations

3-28 Distribution of Winter Flounder Larvae in Navigation Channel Areas (Upper New York Bay Stations versus Newark Bay/Arthur Kill Stations)

3-29 Distribution of Winter Flounder Larvae in Shoal/Shallow Areas (Upper New York Bay Stations versus Newark Bay/Arthur Kill Stations)

3-30 Distribution of Winter Flounder Life Stages in the Upper New York Bay Stations versus Newark Bay/Arthur Kill Stations

3-31 Mean monthly bottom water temperature at the Upper New York Bay Stations versus Newark Bay/Arthur Kill Stations

3-32 Mean density of winter flounder (eggs, yolk-sac larvae, and post yolk-sac larvae) at locations with different sediment compositions.

Section 1

1.0 INTRODUCTION

1.1 BACKGROUND

The U.S. Army Corps of Engineers - New York District (USACE-NYD) was authorized by Congress in the 1996 Water Resources Development Act (WRDA) to conduct a comprehensive study on the navigation needs of the Port of New York and New Jersey. The study included the evaluation of deepening existing navigation channels, anchorages and berthing areas to depths of 50 ft or greater.

Potential environmental impacts associated with navigation channel improvements were evaluated in a Feasibility Report and a National Environmental Policy Act (NEPA) Environmental Impact Statement (EIS) prepared by the USACE-NYD (USACE-NYD 1999). Biological information on finfish, shellfish and macroinvertebrate distribution patterns, community structure, and seasonal use patterns was an integral part of identifying potential environmental impacts and evaluating project alternatives in the EIS.

A comprehensive review of literature concerning biological resources in the New York and New Jersey Harbor (NYNJH) indicated there were few comprehensive synoptic harborwide studies that could be used to evaluate the relative importance of aquatic habitats, including navigation channels, among the water bodies comprising the Harbor (USACE-NYD 1998). One study sponsored by the Port Authority of New York and New Jersey (PANYNJ) reported on the seasonal usage of Newark Bay, Kill Van Kull and Arthur Kill shoals and navigation channels from April 1995 to March 1996 (LMS 1996). The results of the study indicated similar species representation between the shallow water areas and deeper channel locations, with the species use pattern varying among seasons.

A year-long harborwide study was conducted as part of the NY-NJ Harbor Navigation Study (NYNJHNS) from October 1998 through September 1999, the predecessor to this study, to define utilization patterns of channel and shallow habitats primarily by demersal fish populations (USACE-NYD 1999). A total of 19 species and four lifestages were collected between February and June 1999. Species composition at shoal/interpier stations was similar to channel stations with the highest density occurring in April. In general, greater concentrations of eggs and larvae were collected at shallow water/interpier stations compared to the deeper channel stations. The limited literature concerning the biological resources in New York and New Jersey Harbor coupled with the species specific differences observed among studies have led to the need for additional data.

1.2 PURPOSE

The purpose of this seasonal study was to supplement data collected during the feasibility phase of the NYNJHNS harborwide baseline biological-sampling program. The supplemental sampling program scope-of-work (SOW) was coordinated with the National Marine Fisheries Service (NMFS), New Jersey Department of Environmental Protection (NJDEP) and the New York State Department of Environmental Conservation (NYSDEC). Specifically, data were collected on the seasonal distribution of egg and larval finfish species specific to selected project areas evaluated in the EIS (USACE 1999). The seven month-long sampling program was initiated in December 2000 and continued through June 2001. The program was designed to obtain additional information on the distribution patterns of the egg and larval stages of demersal species in the project area navigation channels and shoals, with an emphasis on early life stage winter flounder (*Pleuronectes americanus*). Winter flounder is recognized as a species of concern by the Northeast Multispecies Fishery Management Plan, and essential fish habitat for all life stages of the species has been designated in the harbor (NMFS 1999).

1.3 Program Objectives

Although, the previous studies outlined above have provided information on the seasonal occurrence and habitat use (i.e. shoal or navigation channel) of winter flounder in the Harbor the results have been inconsistent. As a result, the following study objectives were established with respect to winter flounder:

- to monitor the seasonal distribution patterns of eggs and larvae among Upper New York Bay and Arthur Kill/Newark Bay channels and shallow water locations.
- to determine if eggs and larval abundance patterns are different between Upper New York Bay and Arthur Kill/Newark Bay areas.
- to determine if eggs and larval abundance patterns are different between navigation channel and shallow water areas.

Through addressing the aforementioned objectives the USACE can implement improvements to the harbor and assure that the work is compatible with the seasonal and spatial occurrence of marine populations in the New York and New Jersey Harbor estuary.

1.4 Report Format

The supplemental biological monitoring program consisted of ichthyoplankton surveys of harborwide stations. Survey stations were located in navigation channels and shoal areas. Survey sampling methodologies, station locations and survey schedule information is provided in Section 2.0. Results of the ichthyoplankton survey are discussed in Section 3.0. Data tables for the ichthyoplankton surveys are provided in Appendices A and B.

Section 2

2.0 MATERIALS AND METHODOLOGY

The primary purpose of the supplemental sampling program was to obtain additional information on the distribution of early life stage benthic finfish, with an emphasis on winter flounder, in an area that included Anchorage, Newark Bay, Arthur Kill, Bay Ridge and Port Jersey Channels. Focused analyses addressed potential impacts to winter flounder spawning habitat, particularly in shoal and shallow water areas adjacent to the channels proposed for deepening and within interpier areas.

A summary of the supplemental sampling program methodology and materials is provided below. Additional details on sampling procedures, analysis and quality assurance/quality control (QA/QC) procedures are provided in the supplemental program's standard operating procedures (SOP) (Attachment C).

2.1 ICHTHYOPLANKTON SURVEY

A seasonal ichthyoplankton survey was conducted to obtain distribution and abundance information on demersal egg and larval stages of fish populations in the New York-New Jersey Harbor. The species of primary concern for the study was winter flounder. Ichthyoplankton surveys were conducted using an epibenthic sled-mounted 0.5-m mouth diameter plankton net with 0.5-mm mesh towed against the prevailing current at an adjusted speed over the bottom of 100 cm/sec. Tow duration was approximately ten minutes. Tow velocities and duration were adjusted to account for obstructions, limited transect distances and commercial traffic. A minimum 5:1 tow cable length to maximum station depth ratio was maintained to ensure sled contact with the bottom and to maintain the sampling efficiency of the sled. A General Oceanics Model 2030R digital flowmeter mounted in the mouth of the sled-mounted plankton net was used to calculate sample volume. All samples were collected during daylight hours. The epibenthic sled and 0.5-m plankton net specifications are shown in Table 2-1.

Ichthyoplankton samples were transferred to sample containers and preserved with 5% buffered formalin containing the vital stain rose bengal. Sample containers were returned to the laboratory for analysis. Samples were placed into a Pyrex tray on top of a light box and fish eggs, fish larvae, and crustacean larvae were removed from the detritus with featherweight forceps and eyedroppers. Organisms were counted, placed into labeled vials containing 5% Formalin, and stored for identification and enumeration analysis.

All fish larvae and eggs were identified to the lowest practical taxonomic level, assigned life stage (egg, yolk-sack larvae, post yolk-sac larvae, juvenile) based on morphometric characteristics, and enumerated. Samples containing large numbers of fish eggs or larvae were split prior to analysis using a Folsom plankton splitter. Actual egg and larval counts were adjusted for subsampling (i.e., splitting) and reported as egg or larval densities (no./1000 cubic meters [m^3]) based on sample volumes.

Strict quality control (QC) procedures were followed during sample sorting, enumeration, and identification. QC for sample sorting consisted of a Continuous Sampling Plan (CSP), by laboratory, to assure an Average Outgoing Quality Limit (AOQL) of ≥ 90%. The first 14 consecutive samples were reanalyzed in Mode 1 (i =14; 100%). When all 14 samples passed at the 90% level, laboratory personnel then moved into Mode 2 (f =1/20). At this level, one out of every 20 samples was randomly selected for reanalysis. This mode continued until the end of the program or until a failure (<90%) was experienced. If a sample failed in Mode 2, the laboratory personnel would begin Mode 1 over again.

QC for identification and enumeration consisted of a CSP by individual, to assure an AOQL of ≥ 90%. The first eight consecutive samples were reanalyzed in Mode 1 (i =8; 100%). When all eight samples passed at the 90% level, laboratory personnel would move into Mode 2 (f =1/7). At this level, one out of every seven samples was randomly selected for reanalysis. This mode continued until the end of the program or until a failure (<90%) was experienced. If a sample failed in Mode 2, the individual would begin Mode 1 over again.

2.1.1 Sampling Locations

Twenty-two (22) sampling locations were selected to distribute the sampling effort among several project areas and between navigation channels and shallow/shoals (Figure 2-1). A total of 12 stations were located in shallow water areas near the navigation channels and 10 stations were located in the navigation channels. Station locations and designations (channel or shallow/shoals) are presented in Table 2-2. Those stations that were also sampled as part of the harborwide baseline sampling program are indicated on the table. Two (2) additional stations were selected to determine if navigation channel side-slope areas were utilized different than channel or shallow/shoal areas.

Eleven stations were located in the Upper New York Bay area. Two stations were located at South Brooklyn interpier areas (SB-1 and SB-2) and one station was located over the Bay Ridge Flats (SB-3; Figure 2-1). Three stations were located in navigation channels, one in Bay Ridge Channel (SB-4) and two in Anchorage Channel (SB-5 and SB-6). Five (5) stations were located in the Port Jersey Area. Three were located in shoal/shallow areas (PJ-1, PJ-2, PJ-3) and two were located in Port Jersey Channel (PJ-4 and PJ-5). In addition, eleven stations were located in the Newark Bay and tributaries (Newark Bay/Arthur Kill). Two stations were located in shoal/shallow areas (AK-1 and AK-4) and two stations were located in the Kill Van Kull/Arthur Kill confluence area (AK-2 and AK-3). Two Arthur Kill stations were located on the north and south slopes of the navigation channel near Shooter's Island (AK-5 and AK-6). These two stations were added to the program in March 2001. Seven (7) stations were located in the Newark Bay area. Three were located in the navigation channel (NB-1, NB-5, and NB-6), and four were located in shoal/shallow areas (NB-2, NB-3, NB-4, and NB-7).

Sites were selected by water depth and located to ensure representative spatial coverage in the project area. Global Positioning System (GPS) coordinates as well as aides to navigation, soundings and landmarks were used to locate starting points at either end of

each station transect. Sampling direction depended on current and tidal patterns. Station locations and nominal depths are listed in Table 2-2.

2.1.2 Sampling Frequency

The ichthyoplankton sampling program was conducted over a 7-month period, beginning in December 2000 and continuing through June 2001. Sampling was conducted once in December and June, and twice each month from January through May. The seasonal period was selected to bracket the period that winter flounder eggs and larvae are present in the estuary with the stratified sampling schedule employed to better determine actual temporal distribution tends. Stations AK-5 and AK-6 were added to the program in March 2001 to obtain information on navigation channel side-slopes.

Table 2-1
New York and New Jersey Harbor Navigation Project
Supplemental Sampling Program
Epi-benthic Sled and Plankton Net Specifications

Part	Specification
Mouth diameter	0.5 m
Overall length	3.0 m
Mesh size	0.5 mm
Cod end diameter	10.1 cm
Code end mesh	0.5 mm (PVC cod end bucket)
Epibenthic sled	Constructed of PVC pipe

Note: Additional gear specifications provided in the standard operating procedures (SOP) (Supplement C).

Table 2-2
New York and New Jersey Harbor Navigation Project
Supplemental Sampling Program
Station Locations

Area	Station Name		Station Location	Average Depth	GPS Coordinates (deg., min., sec.)			
					Start		End	
					North	West	North	West
South Brooklyn/ Upper Bay	SB – 1	Shallow	Gowanus Bay Interpier South	27	40:39.45	74:00.86	40:39.56	74:01.05
	SB – 2 *	Shallow	Gowanus Bay Interpier	30	40:39.60	74:00.48	40:39.75	74:00.75
	SB – 3	Shallow	Bay Ridge Flats	22	40:39.36	74:02.26	40:38.91	74:02.36
	SB – 4 *	Channel	Bay Ridge Channel	42	40:39.28	74:01.52	40:38.98	74:01.79
	SB – 5	Channel	Anchorage Channel Middle	57	40:39.53	74:03.30	40:39.69	74:03.19
	SB – 6 *	Channel	Anchorage Channel South	49	40:38.76	74:03.11	40:38.48	74:02.98
Port Jersey	PJ – 1 *	Shallow	Jersey Flats	12	40:39.91	74:03.57	40:40.17	74:03.45
	PJ – 2	Shallow	Caven Point	10	40:40.62	74:03.44	40:41.02	74:03.35
	PJ – 3 *	Shallow	Constable Hook	13	40:39.75	74:04.75	40:39.53	74:04.19
	PJ – 4 *	Channel	Port Jersey Channel	39	40:39.91	74:04.11	40:40.07	74:04.51
	PJ – 5	Channel	Port Jersey Channel East	42	40:39.48	74:03.64	40:39.78	74:03.96
Arthur Kill	AK – 1	Shallow	Elizabeth Flats South	19	40:38.84	74:10.58	40:38.85	74:10.13
	AK – 2 *	Channel	North of Shooter Island Reach	39	40:38.80	74:10.75	40:38.77	74:10.26
	AK – 3 *	Channel	Elizabeth Reach	42	40:38.32	74:11.59	40:38.53	74:11.30
	AK – 4	Shallow	Prall's Island	20	40:36.83	74:11.91	40:36.24	74:11.82
	AK – 5 +	Slope	North Slope - Shooter's Island Reach	36	40:38.82	74:09.72	40:38.82	74:10.37
	AK – 6 +	Slope	South Slope - Shooter's Island Reach	36	40:38.79	74:09.92	40:38.77	74:10.40
Newark Bay	NB – 1	Channel	Newark Bay North Reach	40	40:41.62	74:07.40	40:41.35	74:07.54
	NB – 2	Shallow	Newark Bay Flats North	8	40:41.29	74:07.71	40:41.56	74:07.48
	NB – 3	Shallow	Newark Bay Flats Middle	10	40:41.06	74:07.61	40:41.40	74:07.44
	NB – 4	Shallow	Newark Bay Flats South	16	40:40.72	74:07.76	40:40.38	74:07.92
	NB – 5 *	Channel	Newark Bay Middle Reach	42	40:40.59	74:07.96	40:40.19	74:08.26
	NB – 6 *	Channel	Newark Bay South Reach	46	40:39.44	74:08.52	40:39.15	74:08.75
	NB – 7	Shallow	Elizabeth Flats North	13	40:39.62	74:09.29	40:39.51	74:08.99

* Stations sampled under the 1998-1999 baseline study
+ Special navigational channel side-slope station

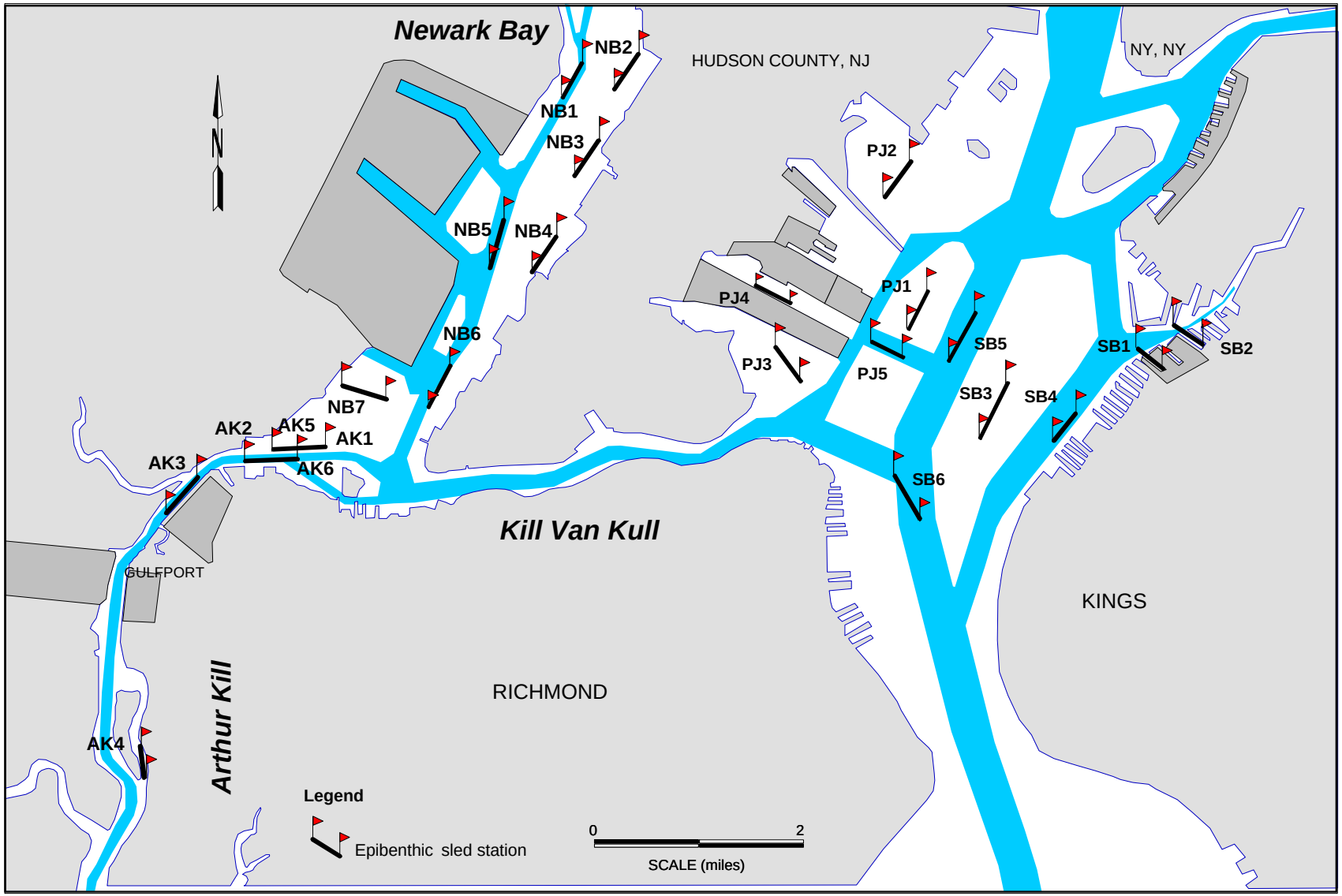

Figure 2-1
Supplemental Biological Monitoring Sampling Stations

Section 3

3.0 RESULTS AND DISCUSSION

Results of the supplemental sampling program are presented and discussed below. To address the primary objectives of the study, ichthyoplankton data were divided among three general aquatic habitat types, navigation channels, shoal/shallow water areas, and channel side-slope stations. Furthermore, data were analyzed by NY-NJ Harbor location (i.e. Upper New York Bay and Newark Bay/Arthur Kill). The data are provided in Appendices A and B. Summary tables and figures are provided at the end of Section 3.

3.1 All Species

3.1.1 All Areas Combined

Ichthyoplankton samples were collected from December 2000 through June 2001. A combined total of 271 epibenthic sled mounted plankton net samples were collected over the course of the study period. A total of 26 fish species representing 16 families (Table 3-1) were identified. Species representation varied according to lifestage and month. The number of species identified generally increased during the study period, with peak species representation occurring during the late spring months of May and June. Ichthyoplankton abundance (eggs and larvae) also increased over time, with maximum overall abundance for each life stages occurring in June.

Eggs were the dominant lifestage collected (72.2% of total ichthyoplankton) during the seven month sampling program (Table 3-2; Figure 3-1). Eggs of the windowpane flounder were the most abundant (39.6% of total eggs collected) followed by eggs of the tautog and cunner complex (26.3% of total eggs). (NOTE: No distinction was made between tautog and cunner eggs due to similarities in egg characteristics.) Other species represented by the egg lifestage were Atlantic menhaden, bay anchovy, hogchoker, weakfish, summer flounder and winter flounder. Following December, when no eggs were collected, egg densities generally increased, with peak density recorded in June.

Yolk-sac larvae accounting for 7.7% of the total ichthyoplankton density, which represented the smallest lifestage component in the ichthyoplankton samples. Yolk-sac larvae were present in collections from January through May (Table 3-2; Figure 3-2). Atlantic menhaden dominated (41.4%) the yolk-sac larvae total catch. Peak density and species representation was recorded during May.

Post yolk-sac larvae represented 19.0% of the total ichthyoplankton density and exhibited the highest species diversity among lifestages (Table 3-2; Figure 3-3). Larvae were collected during every month, with the highest densities recorded during May and June. Winter flounder, weakfish, grubby, and herrings (Clupeidae) constituted the highest post yolk-sac larval densities.

Juveniles composed the smallest percentage of the total catch (1.1%) (Table 3-2; Figure 3-4). Juveniles were collected in December, January, and April through June. Atlantic tomcod was the only species collected in multiple months (April through June).

3.1.2 Navigation Channel Areas

Twenty-two distinguishable taxa were represented in the navigation channel samples (Table 3-3). Eggs were the most abundant (79.7%) life-stage in the navigation channels followed by post yolk-sac larvae (15.8%), yolk-sac larvae (3.8%), and finally juveniles (0.6%).

Eggs of nine species were identified in the navigation channel samples. Species representation increased through the study period with only fourbeard rockling eggs collected in January and the eggs of seven taxa collected in May, the peak collection month. Eggs were collected in the navigation channel stations from January to June (Table 3-3; Figure 3-5). Fourbeard rockling eggs were collected from January to May, and represented the dominant species during January to March. Atlantic menhaden and American sandlance eggs were also common by April. Winter flounder eggs were collected February through April; however, densities were relatively low. Windowpane flounder eggs were collected in May and June only, but composed 39% of the total density of eggs collected. Windowpane, weakfish, hogchoker, and Labridae eggs were common April through June.

A small number of yolk-sac larvae were present in the study area navigation channels from February through May (Table 3-3; Figure 3-6), with a total average density of 209/1000m^3. Grubby and winter flounder were the only yolk-sac larvae collected in February and March. Yolk-sac larvae density was greatest in March and April, when winter flounder and grubby dominated sample densities. Atlantic silverside, windowpane flounder and striped bass yolk-sac larvae were collected in April and May. Winter flounder yolk-sac larvae represented 63% of the total navigation channel catch.

Post yolk-sac larvae were collected in navigation channels throughout the study period, and were the dominant lifestage from December through April (Table 3-3; Figure 3-7). Twenty taxa of post yolk-sac larvae were identified at the navigation channel stations. Few species were collected in December and January; however, species representation increased through the study and peaked in May. Summer flounder post yolk-sac larvae was the only species collected in January. Winter flounder were present from February through June and represented the dominant species from April through June. Grubby densities were relatively high from February through April.

At the navigation channel stations, five species, with very low densities (Table 3-3; Figure 3-8) represented the juvenile life stage. In four of the five months that juvenile fish were collected (December, January, and April through June) the catch was represented by only one species in each month. Juvenile densities peaked in April, resulting from a relatively large number of Atlantic tomcod. Bay anchovy, weakfish, winter flounder and windowpane flounder were also collected as juveniles.

Overall, ichthyoplankton density increased during the study period at the navigation channel stations. Peak densities in May and June can be attributed to high egg densities. Windowpane flounder eggs constituted 32.2% of the total ichthyoplankton catch at all navigation stations combined. Atlantic menhaden, summer flounder, weakfish and bay anchovy were the only species collected in navigation channel stations in December. Summer flounder, fourbeard rockling and weakfish were the only species collected in January.

3.1.3 Shoal/Shallow Water Areas

Species composition and abundance at shoal/shallow water stations was similar to navigation channel stations (Table 3-4). Eggs were again the dominant lifestage collected (69.7% of total ichthyoplankton), followed by post yolk-sac larvae (19.9%), yolk-sac larvae (9.8%), and juveniles (0.5%). The density of fish collected generally increased through the study period, with maximum densities recorded in May or June for each lifestage. Windowpane flounder was the dominant species collected, accounting for 30.6 percent of the total ichthyoplankton.

As noted at navigation channel stations, no eggs were collected during December sampling. Only pollock eggs were collected in January at the shoal/shallow water stations. Species representation was greatest in May and June when labrids, weakfish, and windowpane flounder eggs were dominant (Table 3-4; Figure 3-9). Winter flounder eggs were only present in March at shoal/shallow water stations. Windowpane flounder was the dominant (43.9% of total eggs) species collected as eggs.

Yolk-sac larvae first appeared in January (Table 3-4; Figure 3-10), a similar trend to navigation channel stations. Yolk-sac larvae species representation was low throughout the study period, with no more than two taxa identified in each month. Peak abundance occurred in May, primarily Atlantic menhaden, comprising 52.4% of the total yolk-sac larvae collected.

Post yolk-sac larvae species representation was high at all shoal/shallow water stations throughout the study period (December - June), peaking in June (Table 3-4, Figure 3-11). Winter flounder were present from February through June, with peak density in April. Grubby were abundant from February to April. Herring (Atlantic menhaden, Clupeidae and *Alosa* spp.) were also abundant by the end of sampling.

Juveniles were present only during December, May and June at shoal/shallow water stations (Table 3-4; Figure 3-12). Juvenile catch was represented by one species in each month. Juveniles consisted of only 0.5% of the total average density of ichthyoplankton at shoal/shallow water stations.

The ichthyoplankton collected in December and January accounted for only 2.1% of the total ichthyoplankton collected at shoal/shallow water stations. Average species density increased with time over the study period. Grubby and winter flounder (eggs and larvae)

were the dominant species identified in March and April collections. High overall densities in May and June can be attributed to egg densities, particularly that of windowpane flounder, labrids, and weakfish. May and June collections were the most diverse, while December and January species diversity was lowest.

3.1.4 Slope Areas

Navigation channel side-slope stations were not sampled during December through February (Table 3-5). Eggs (71.0% of total ichthyoplankton) were most numerous, followed by post yolk-sac larvae (23.4%) and yolk-sac larvae (5.6%). No juvenile ichthyoplankton were represented in side-slope samples (March to June). Species representation increased over the study period - similar to channel and shoal/shallow water stations - with peak species representation noted in May, followed by June.

Eggs were collected from April to June and windowpane flounder, Labrids, weakfish and bay anchovy dominated the collections (Table 3-5; Figure 3-13). No winter flounder eggs were collected during ichthyoplankton sampling at channel side-slope stations. Other species present included Atlantic menhaden, hogchoker, and fourbeard rockling.

Only two species of yolk-sac larvae - grubby and Atlantic silverside - were collected at the two channel side-slope stations, present from March through May (Figure 3-14). No yolk-sac larvae were collected in June. Grubby were present in March and April, and Atlantic silverside in May. Peak density occurred in March, followed by May.

Thirteen taxa of post yolk-sac larvae were identified at the channel side-slope stations (March to June) (Figure 3-15). Species diversity was highest for post yolk-sac larvae in May. Winter flounder were present in every month of sampling, and dominated collections in May. Grubby were especially abundant in March and April.

Peak ichthyoplankton densities at channel side-slope stations in May and June are the result of the collection of eggs. Especially abundant were eggs of windowpane flounder, labrids, bay anchovy and weakfish. No juveniles were collected during channel side-slope station sampling.

3.2 Winter Flounder

Early lifestage winter flounder were present in the study area from February through June; however, total density was highest in April and May (Table 3-2; Figures 3-16 through 3-27). Winter flounder eggs first appeared in collections in February and continued to be collected through April. Egg densities ranged from 5-66/1000 m^3, but typically were less than 15/1000 m^3. Egg density was highest in March, totaling 63/1000 m^3. Winter flounder eggs were collected only at sites in the vicinity of Port Jersey and South Brooklyn (i.e. Upper New York Bay).

Winter flounder yolk-sac larvae were collected at sites throughout the Harbor study area except at the Newark Bay stations. Yolk-sac larvae were collected from late-February through April. Yolk-sac larvae densities were relatively low (<20/1000 m^3) across sites in February, while higher total densities were collected from late-March (192/1000 m^3) to April (365/1000 m^3).

Winter flounder post yolk-sac larvae were collected at all sites and were present February through June. Several juvenile winter flounder were also collected, but only in June. Post yolk-sac densities ranged from 4 to 188/1000 m^3, but typically were less than 15/1000 m^3. Post yolk-sac larvae density peaked in April, averaging 130/1000 m^3.

Juvenile winter flounder were collected at one navigation channel site in Upper New York Bay during the supplemental sampling program. Because juveniles represent a small density (4.7/1000 m^3) of the total winter flounder ichthyoplankton collected, juveniles were not included in the following discussion.

3.2.1 Navigation Channel Areas

Winter flounder eggs and larvae were present in navigation channel station samples from February through June, with peak densities occurring in April and May (Table 3-3). Egg densities were low from February through March. The highest average density occurred in April (13/1000 m^3). Yolk-sac larvae were also collected from February through April. Average densities for this lifestage were somewhat higher, peaking in April at 43/1000 m^3. Post yolk-sac larvae were collected from February through June. Average densities for this lifestage were highest in April and May (229 and 88/1000 m^3, respectively). The average density of post yolk-sac larvae in June was 76/1000 m^3.

3.2.2 Shoal/Shallow Water Areas

Eggs were only present during March and April and only collected at one shoal/shallow water station (PJ-2) during the entire sampling program (Table 3-4). Average densities for March and April were 66/1000 m^3 and 6/1000 m^3, respectively. Yolk-sac larvae were present from February through April at seven stations. Densities of this lifestage increased during this period, with the peak average density occurring in April (37/1000 m^3). Post-yolk sac larvae were collected from February through June. The average density peaked in April (69/1000 m^3), before falling to 10/1000 m^3 in June.

3.2.3 Slope Areas

The navigation channel side-slope stations did not exhibit different winter flounder density patterns than the shoal/shallow water or navigation channel stations (Table 3-5). Channel side-slope stations were sampled from March through June in the Arthur Kill. Winter flounder eggs and yolk-sac larvae were not collected at the two channel side-slope stations (Figure 3-16 and Figure 3-20). Post yolk-sac larvae were collected at the two channel side-slope stations with the highest densities occurring in May.

3.2.4 Upper New York Bay and Newark Bay/Arthur Kill

Port Jersey, South Brooklyn and Anchorage Channel stations were grouped as Upper New York Bay stations (n=11) and Newark Bay and Arthur Kill stations were grouped as Newark Bay/Arthur Kill stations (n=11). The data were analyzed to determine if winter flounder densities differed between the Upper New York Bay and Newark Bay/Arthur Kill on a seasonal basis, by depth (i.e. channel vs. shoal/shallow water), or by lifestage.

Winter flounder densities in the navigation channels were distinctly different with 100% of the winter flounder eggs being collected in Upper New York Bay. In February, 100% of the larvae (i.e. yolk-sac and post yolk-sac) were collected in Upper New York Bay stations. By March larval winter flounder were also collected at Newark Bay/Arthur Kill stations, but average larval densities remained higher at Upper New York Bay stations through May (Figure 3-28). This trend changed in June when the majority of larvae collected (88%) in the navigation channels were from Newark Bay/Arthur Kill stations.

Similar to the results for navigation channel stations, 100% of the winter flounder eggs collected in shoal/shallow water areas were from Upper New York Bay. Larvae were first collected in February in Upper New York Bay, but were not collected in Newark Bay/Arthur Kill until March (Figure 3-29). In March and April, average larval densities were highest in Upper New York Bay, with approximately 71% and 62% of the larvae collected in those two months from Upper New York Bay stations. Winter flounder larval distribution shifted dramatically in May, with 69% of the larvae taken from Newark Bay/Arthur Kill shoal/shallow water areas. By June, larval distribution was almost equal throughout the Harbor areas sampled, with 52% of the larvae collected from Newark Bay/Arthur Kill and 48% collected from Upper New York Bay.

Stations located in the shoal/shallow water areas and navigation channels exhibited similar trends between Upper New York Bay and Newark Bay/Arthur Kill. Regardless of station depth (i.e. navigation channel vs. shoal/shallow water areas), winter flounder eggs were only collected at Upper New York Bay stations (Figure 3-30), suggesting that the bulk of winter flounder spawning occurred in that area during 2000-2001. The egg distribution pattern resulting from the 2000-2001 sampling program are different than the results from the 1998-1999 NY-NJ Harbor Navigation Study (USACE-NYD 1999) results where eggs were collected throughout the Harbor and not limited to Upper New York Bay.

The timing of winter flounder spawning is believed to be temperature dependent (Able and Fahay 1998). During this supplemental study, monthly bottom water temperature data were collected at each station at the time of sample collection (Figure 3-31). From December to March mean bottom water temperatures were between 3-6°C in both areas. Water temperatures gradually increased through the spring months reaching 16°C in June. The Newark Bay/Arthur Kill stations exhibited slightly warmer water temperatures than the Upper New York Bay stations from February-June; however, the difference was never greater than 2°C. In general, water temperatures were similar throughout the entire NYNJH during the supplemental study. Because winter flounder spawning was focused

in Upper New York Harbor during 2000-2001, water temperature alone was likely not the single factor influencing winter flounder spawning habitat utilization in NY-NJ Harbor.

The physical characteristics of the NY-NJ Harbor habitat could have influenced the spawning habitat utilization by winter flounder during 2000-2001. Winter flounder spawning habitat typically consists of shallow bays and coastal estuarine waters with sandy substrate in 2-40 m (6-20 ft) of water. Results from the NY-NJ Harbor Navigation Study suggest that suitable spawning habitat exists throughout the entire New York-New Jersey Harbor at many of the sites sampled in 2000-2001. However, winter flounder eggs were only collected in Upper New York Bay during the supplemental study. Thus it is likely that winter flounder spawning utilization is variable among years in the Hudson-Raritan Estuary.

Sediment composition was identified harborwide by the USACE in 1998 (USACE-NYD 1999). The dominant sediment type was a silt-clay mixture; however, sand-silt-clay, sand, and sand-silt sediments were also recorded. To determine if winter flounder densities (all lifestages combined) in the Harbor are related to sediment type, density data were pooled by site specific sediment types (Figure 3-32). Four sediment type categories were defined including three listed above and an unknown classification. Mean winter flounder abundance was greatest (203/1000 m^3) over sand substrate, but were greater than 100/1000 m^3 at all sites containing other substrate types. Although a difference in winter flounder abundance was observed across substrate types, it is impossible to conclude that the sand only substrate is preferred by winter flounder because sand existed at only one site.

The data suggest that a progressive expansion of post hatch winter flounder occurred from Upper New York Bay into the Newark Bay/Arthur Kill. Initially, winter flounder were collected as yolk-sac larvae at only three stations (AK-1, AK-2 and AK-3) in the Newark Bay/Arthur Kill Bay area. The winter flounder collected at these three sites constituted a small percentage (8%) of the total yolk-sac larvae caught in the Harbor study areas. As post yolk-sac larvae, winter flounder were collected at all stations and extended far into the Hudson-Raritan Estuary. The post yolk-sac larvae in the Newark Bay/Arthur Kill area constituted 36% of the overall catch. This gradual movement pattern of larval winter flounder into estuaries after hatching is not unique. While winter flounder larvae typically display fidelity to spawning areas; research has demonstrated that extensive dispersal from initial spawning areas does occur (Scarlett and Allen 1992; Chant et al. 2000).

3.2.5 Statistical Analysis

Statistical analysis was conducted to determine if the patterns observed in winter flounder habitat use in New York-New Jersey Harbor were statistically different across areas. The initial goal of the analysis was to determine if statistically significant differences could be identified using the egg and larval abundance data. This analysis was conducted specifically to determine if differences exist between the Upper New York Bay and Newark Bay/Arthur Kill regions; and if differences exist between the shoal/shallow water

areas and the navigation channels. Because there were no eggs collected in the Newark Bay/Arthur Kill region statistical analysis was not conducted for this lifestage. Furthermore, eggs were collected at only one shoal/shallow water site providing little data for testing statistical differences.

Statistical analysis was conducted on the daily average number of larvae/1000 m^3 by region and depth. A nonparametric test, the Wilcoxon signed-rank test, was used to test for differences among medians. This non-parametric analog of the paired t-test was used because the differences between paired means were decidedly non-normally distributed. The results of the Wilcoxon's test indicated that there was no significant ($P>0.05$) difference in winter flounder larval abundance between areas (Upper New York Bay versus Newark Bay/Arthur Kill) or between depths (channel versus shoal/shallow water). It should be noted, however, that due to the low statistical power of these tests, failure to find a significant difference could not be taken as evidence that such a difference does not occur. It should also be noted that stations AK-5 and AK-6 were not included in the statistical analysis because these stations were added in March, and were not comparable to the other stations (i.e. shoal or channel).

Table 3-1
New York and New Jersey Harbor Navigation Project
Supplemental Sampling Program
Common and Scientific Name of Fishes Collected

Family	Common Name	Scientific Name
Ammodytidae	American sandlance	*Ammodytes americanus*
Atherinidae	Atlantic silverside	*Menidia menidia*
Blenniidae	Blenny	*Hypsoblennius spp.*
Bothidae	Summer flounder	*Paralichthys dentatus*
	Windowpane	*Scophthalmus aquosus*
Clupeidae	Herring	
	River herring	*Alosa* spp.
	American shad	*Alosa sapidissima*
	Atlantic herring	*Clupea harengus harengus*
	Atlantic menhaden	*Brevoortia tyrannus*
Congridae	Conger Eel	*Conger oceanicus*
Cottidae	Grubby	*Myoxocephalus aenaeus*
Engraulidae	Bay anchovy	*Anchoa mitchilli*
Gadidae	Atlantic tomcod	*Microgadus tomcod*
	Fourbeard rockling	*Enchelyopus cimbrius*
	Pollock	*Pollachius virens*
Labridae	Cunner & Tautog	
Ophidiidae	Striped cusk-eel	*Ophidon marginatum*
Percichthyidae	Temperate Bass	Morone spp.
	Striped bass	*Morone saxatilis*
Pholidae	Rock gunnel	*Pholis gunnellus*
Pleuronectidae	Winter flounder	*Pleuronectes americanus*
Sciaenidae	Drum	
	Weakfish	*Cynoscion regalis*
Soleidae	Hogchoker	*Trinectes maculatus*
Syngnathidae	Northern pipefish	*Syngnathus fuscus*

Table 3-2
Average Ichthyoplankton Density (No./1000 m^3) by Lifestage - All Stations Combined, December 2000 - June 2001

Lifestage: Egg												
December		**January**		**February**		**March**		**April**		**May**		**June**	
		Fourbeard rockling	4	Fourbeard rockling	20	Fourbeard rockling	22	Atlantic menhaden	48	*Alosa* sp.	5	Atlantic menhaden	23
		Pollock	6	Winter flounder	9	Winter flounder	26	American sandlance	11	Atlantic menhaden	102	American shad	8
								Fourbeard rockling	21	Bay anchovy	64	Bay anchovy	89
								Winter flounder	13	Fourbeard rockling	9	Hogchoker	176
										Hogchoker	133	Labridae	470
										Labridae	502	Weakfish	87
										Weakfish	387	Windowpane	1,212
										Windowpane	251		

Lifestage: Yolk-sac Larvae												
December		**January**		**February**		**March**		**April**		**May**		**June**	
		American sandlance	12	Grubby	28	Grubby	48	Atlantic silverside	6	Atlantic menhaden	163		
		Grubby	5	Winter flounder	10	Winter flounder	24	Grubby	18	American silverside	28		
								Winter flounder	41	Striped bass	6		
										Windowpane	5		

Lifestage: Post-yolk sac Larvae												
December		**January**		**February**		**March**		**April**		**May**		**June**	
Atlantic menhaden	7	American menhaden	5	Atlantic herring	5	Atlantic herring	15	Atlantic herring	6	Atlantic herring	9	Alosa sp.	32
Bay anchovy	4	Summer flounder	5	American sandlance	12	American sandlance	6	American sandlance	14	Atlantic menhaden	7	Atlantic menhaden	17
Summer flounder	7			Atlantic tomcod	4	Atlantic tomcod	5	Atlantic tomcod	13	Atlantic silverside	20	Atlantic silverside	10
Weakfish	17			Grubby	23	Grubby	109	Blenniidae	6	Bay anchovy	25	Clupeidae	15
				Summer flounder	7	Rock gunnel	6	Grubby	77	Fourbeard rockling	8	Conger eel	7
				Winter flounder	8	Summer flounder	9	Striped cusk-eel	6	Grubby	17	*Morone* spp.	7
						Winter flounder	19	Summer flounder	11	Northern pipefish	6	Northern pipefish	10
								Winter flounder	130	Drum	8	Striped bass	8
										Weakfish	33	Weakfish	37
										Winter flounder	74	Winter flounder	46
										Windowpane	24	Windowpane	15

Lifestage: Juvenile												
December		**January**		**February**		**March**		**April**		**May**		**June**	
Bay anchovy	4	Weakfish	5					Atlantic tomcod	15	Atlantic tomcod	11	Atlantic tomcod	8
										Grubby	6	Winter flounder	5
												Windowpane	4

Table 3-3
Average Ichthyoplankton Density (No./1000 m^3) by Lifestage - Navigation Channel Stations Combined, December 2000 - June 2001

Lifestage: Egg

December	January	February	March	April	May	June
	Fourbeard rockling 4	Fourbeard rockling 26	Fourbeard rockling 25	Atlantic menhaden 65	Atlantic menhaden 138	Atlantic menhaden 5
		Winter flounder 9	Winter flounder 6	American sandlance 11	Bay anchovy 67	Bay anchovy 87
				Fourbeard rockling 16	Fourbeard rockling 8	Hogchoker 278
				Winter flounder 13	Hogchoker 201	Labridae 664
					Labridae 835	Weakfish 106
					Weakfish 612	Windowpane 1598
					Windowpane 439	

Lifestage: Yolk-sac Larvae

December	January	February	March	April	May	June
		Grubby 26	Grubby 57	Atlantic silverside 6	Atlantic silverside 6	
		Winter flounder 11	Winter flounder 30	Grubby 19	Striped bass 6	
				Winter flounder 43	Windowpane 5	

Lifestage: Post-yolk sac Larvae

December	January	February	March	April	May	June
Atlantic menhaden 5	Summer flounder 5	Atlantic herring 6	Atlantic herring 17	American sandlance 14	Atlantic herring 9	Conger eel 6
Summer flounder 7		American sandlance 9	American sandlance 5	Atlantic herring 6	Atlantic silverside 24	Clupeidae 4
Weakfish 16		American tomcod 4	American tomcod 5	Atlantic tomcod 12	Bay anchovy 25	*Morone* spp. 10
		Grubby 39	Grubby 122	Blenniidae 5	Fourbeard rockling 8	Striped bass 6
		Summer flounder 6	Rock gunnel 5	Grubby 109	Grubby 14	Winter flounder 76
		Winter flounder 4	Summer flounder 10	Striped cusk-eel 6	Sciaenidae 4	Windowpane 18
			Winter flounder 29	Summer flounder 11	Weakfish 33	
				Winter flounder 229	Winter flounder 88	
					Windowpane 24	

Lifestage: Juvenile

December	January	February	March	April	May	June
Bay anchovy 5	Weakfish 5			Atlantic tomcod 15	Atlantic tomcod 11	Winter flounder 5
						Windowpane 4

Table 3-4
Average Ichthyoplankton Density (No./1000 m^3) by Lifestage - Shoal/Shallow Stations Combined, December 2000 - June 2001

Lifestage: Egg												
December		**January**		**February**		**March**		**April**		**May**		**June**	
		Pollock	6	Fourbeard rockling	14	Fourbeard rockling	15	Atlantic menhaden	16	*Alosa* sp.	5	Atlantic menhaden	32
						Winter flounder	66	Fourbeard rockling	31	Atlantic menhaden	69	American shad	8
										Bay anchovy	49	Bay anchovy	92
										Fourbeard rockling	10	Hogchoker	29
										Hogchoker	36	Labridae	321
										Labridae	229	Weakfish	90
										Weakfish	201	Windowpane	933
										Windowpane	98		

Lifestage: Yolk-sac Larvae												
December		**January**		**February**		**March**		**April**		**May**		**June**	
		American sandlance	12	Grubby	29	Grubby	34	Grubby	14	Atlantic menhaden	163		
		Grubby	5	Winter flounder	9	Winter flounder	18	Winter flounder	37	Atlantic silverside	11		

Lifestage: Post-yolk sac Larvae												
December		**January**		**February**		**March**		**April**		**May**		**June**	
Atlantic menhaden	8	Atlantic menhaden	5	Atlantic herring	5	Atlantic herring	5	Atlantic tomcod	13	Atlantic menhaden	7	*Alosa* sp.	39
Bay anchovy	4			American sandlance	14	American sandlance	9	Blenniidae	8	Atlantic silverside	16	Atlantic menhaden	17
Summer flounder	8			American tomcod	4	Atlantic tomcod	5	Grubby	46	Bay anchovy	36	Atlantic silverside	10
Weakfish	18			Grubby	14	Grubby	93	Winter flounder	69	Grubby	10	Conger eel	9
				Summer flounder	8	Rock gunnel	7			Northern pipefish	7	Clupeidae	24
				Winter flounder	9	Winter flounder	14			Winter flounder	28	Northern pipefish	10
										Windowpane	24	Striped bass	11
												Weakfish	37
												Winter flounder	11
												Windowpane	10

Lifestage: Juvenile												
December		**January**		**February**		**March**		**April**		**May**		**June**	
Bay anchovy	4									Grubby	6	Atlantic tomcod	8

Table 3-5
Average Ichthyoplankton Density (No./1000 m^3) by Lifestage - Slope Stations Combined, March 2000 - June 2001

Lifestage: Egg												
December*		**January***		**February***		**March**		**April**		**May**		**June.**	
								Fourbeard rockling	15	Atlantic menhaden	62	Bay anchovy	75
										Bay anchovy	147	Hogchoker	4
										Fourbeard rockiling	6	Labridae	248
										Hogchoker	6	Weakfish	9
										Labridae	482	Windowpane	679
										Weakfish	246		
										Windowpane	145		
Lifestage: Yolk-sac Larvae													
December*		**January***		**February***		**March**		**April**		**May**		**June**	
						Grubby	76	Grubby	26	Atlantic silverside	67		
Lifestage: Post-yolk sac Larvae													
December*		**January***		**February***		**March**		**April**		**May**		**June**	
						American sandlance	8	Atlantic herring	7	Atlantic herring	9	Conger eel	5
						Grubby	133	Atlantic tomcod	22	Atlantic silverside	19	*Alosa* spp.	13
						Summer flounder	7	Grubby	92	Bay anchovy	6	*Morone* spp.	5
						Winter flounder	9	Winter flounder	60	Grubby	42	Striped bass	9
										Drum	9	Winter flounder	18
										Winter flounder	226		
Lifestage: Juvenile													
December*		**January***		**February***		**March**		**April**		**May**		**June**	

***** - Slope Station sampling began in March.

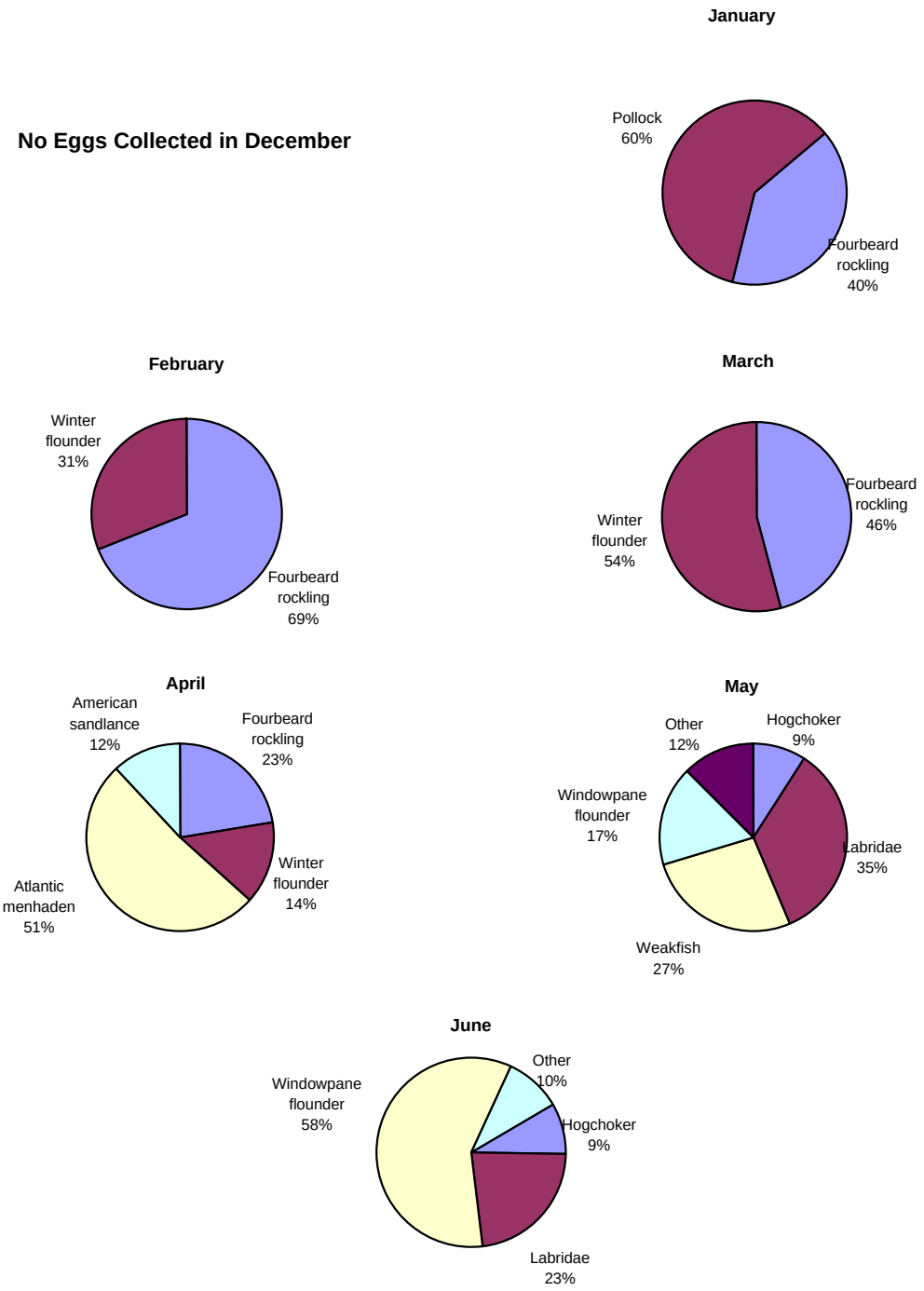

Figure 3-1. Percent Composition of Egg Densities at All Stations Combined - December 2000 through June 2001.

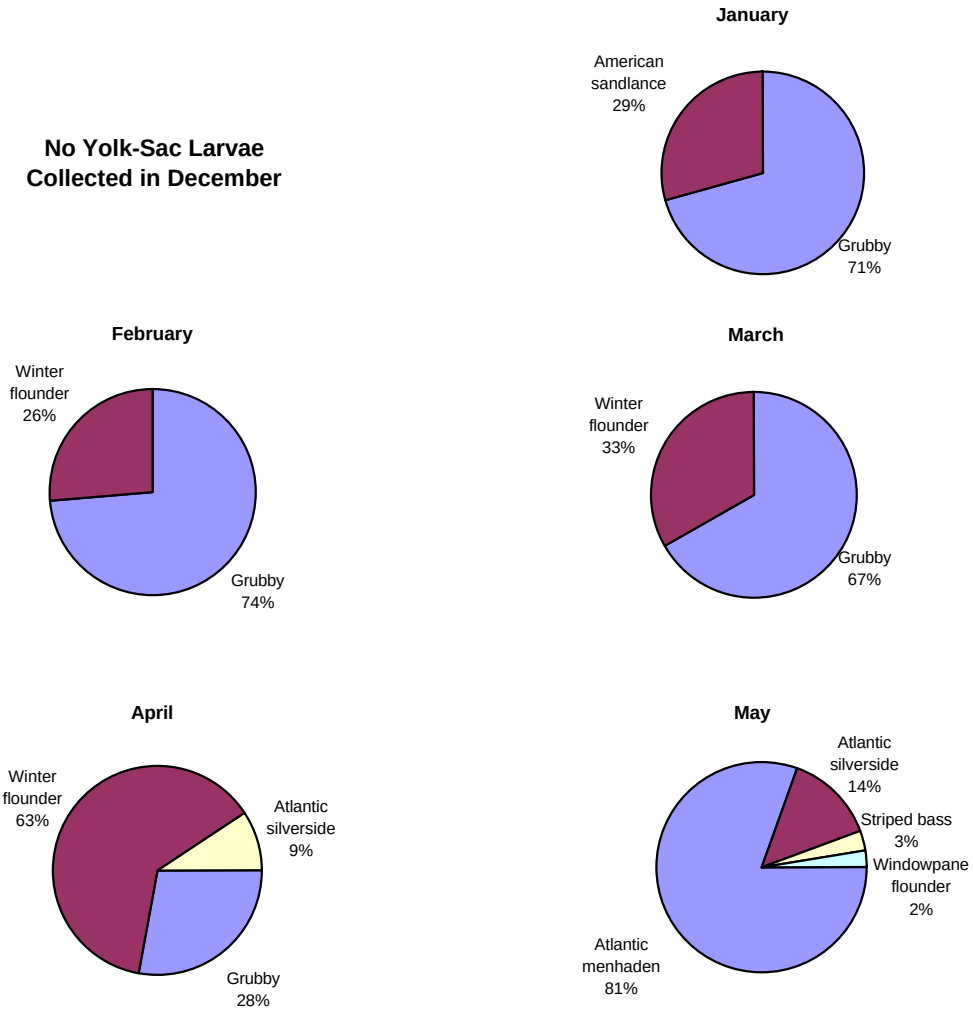

Figure 3-2. Percent Composition of Yolk-Sac Larvae Densities at All Staions Stations Combined - December 2000 through June 2001.

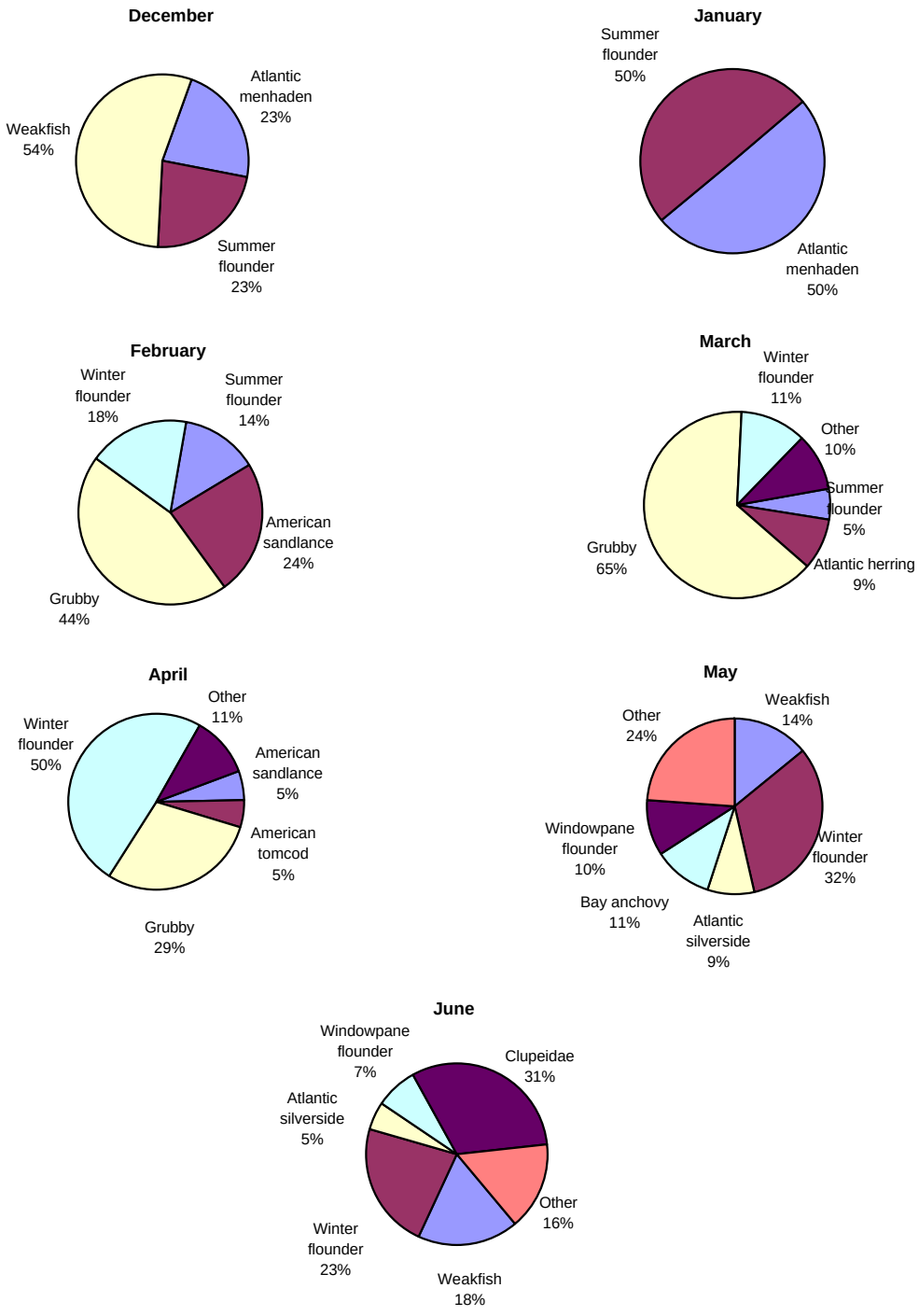

Figure 3-3. Percent Composition of Post Yolk-Sac Larvae Densities at All Stations Combined - December 2000 through June 2001.

Note: Clupeidae (June) consists of Alosa sp. (River herring), Atlantic menhaden, and unidentified Clupeids.

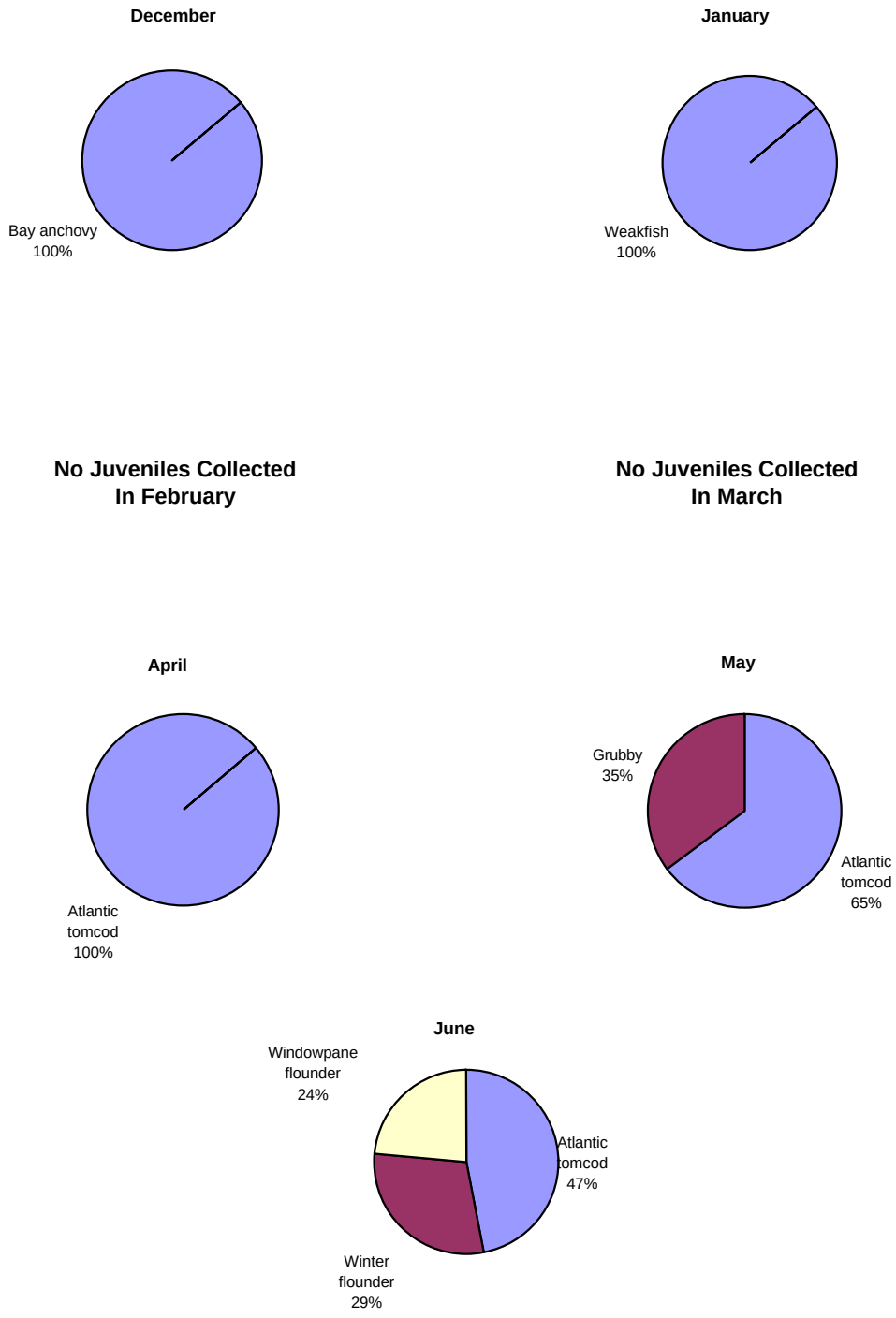

Figure 3-4. Percent Composition of Juvenile Densities at All Stations Combined - December 2000 through June 2001.

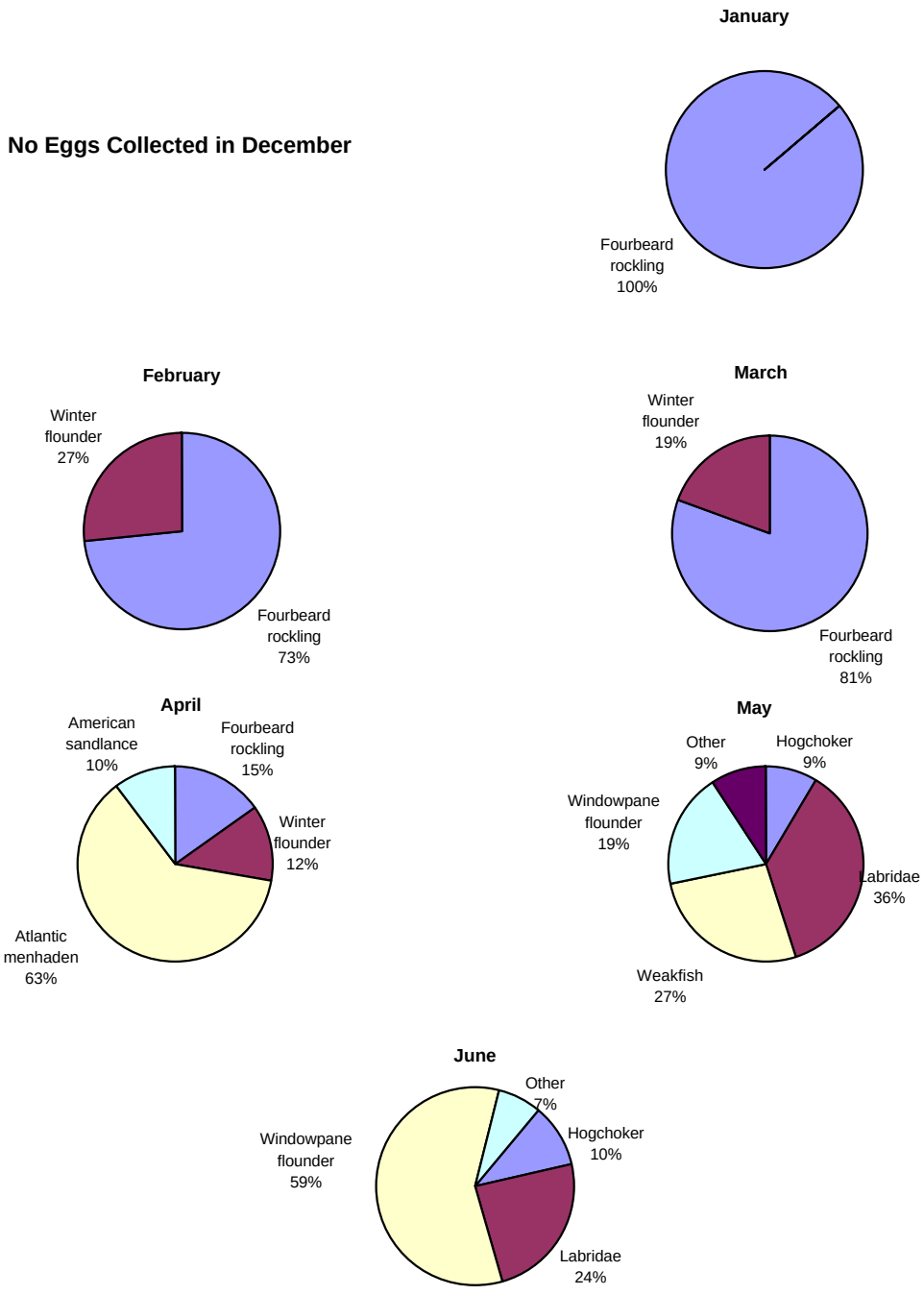

Figure 3-5. Percent Composition of Egg Densities at All Channel Stations Combined - December 2000 through June 2001.

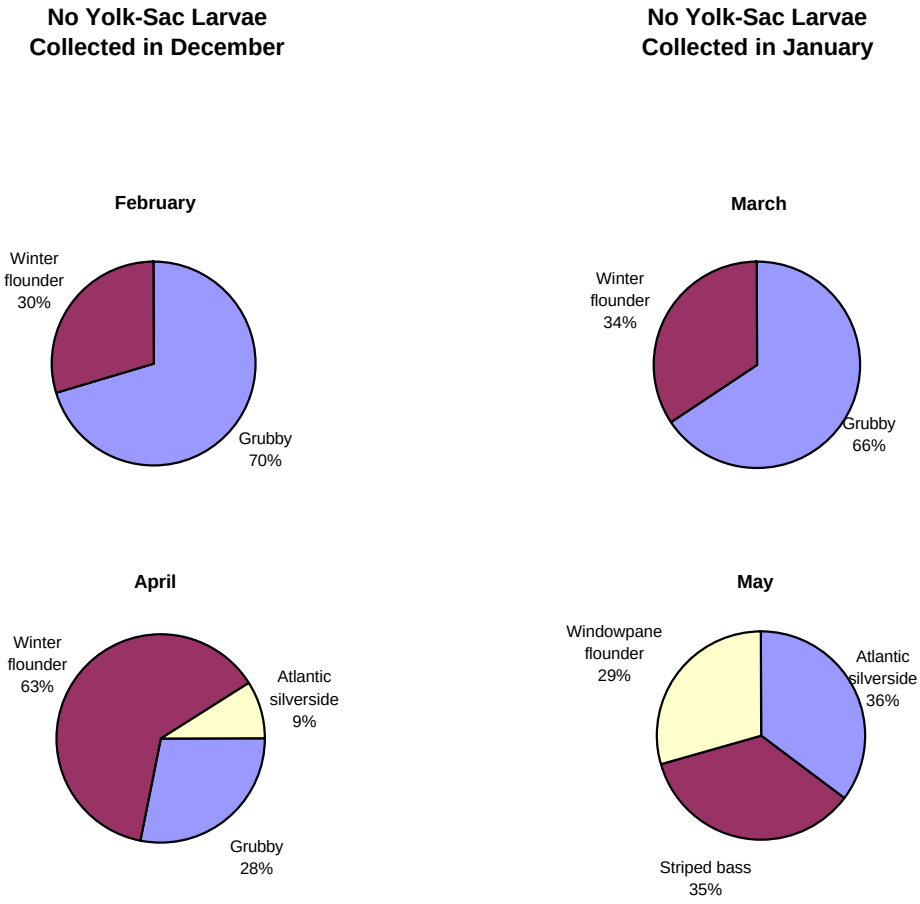

Figure 3-6. **Percent Composition of Yolk-Sac Larvae Densities at All Channel Stations Combined - December 2000 to June 2001.**

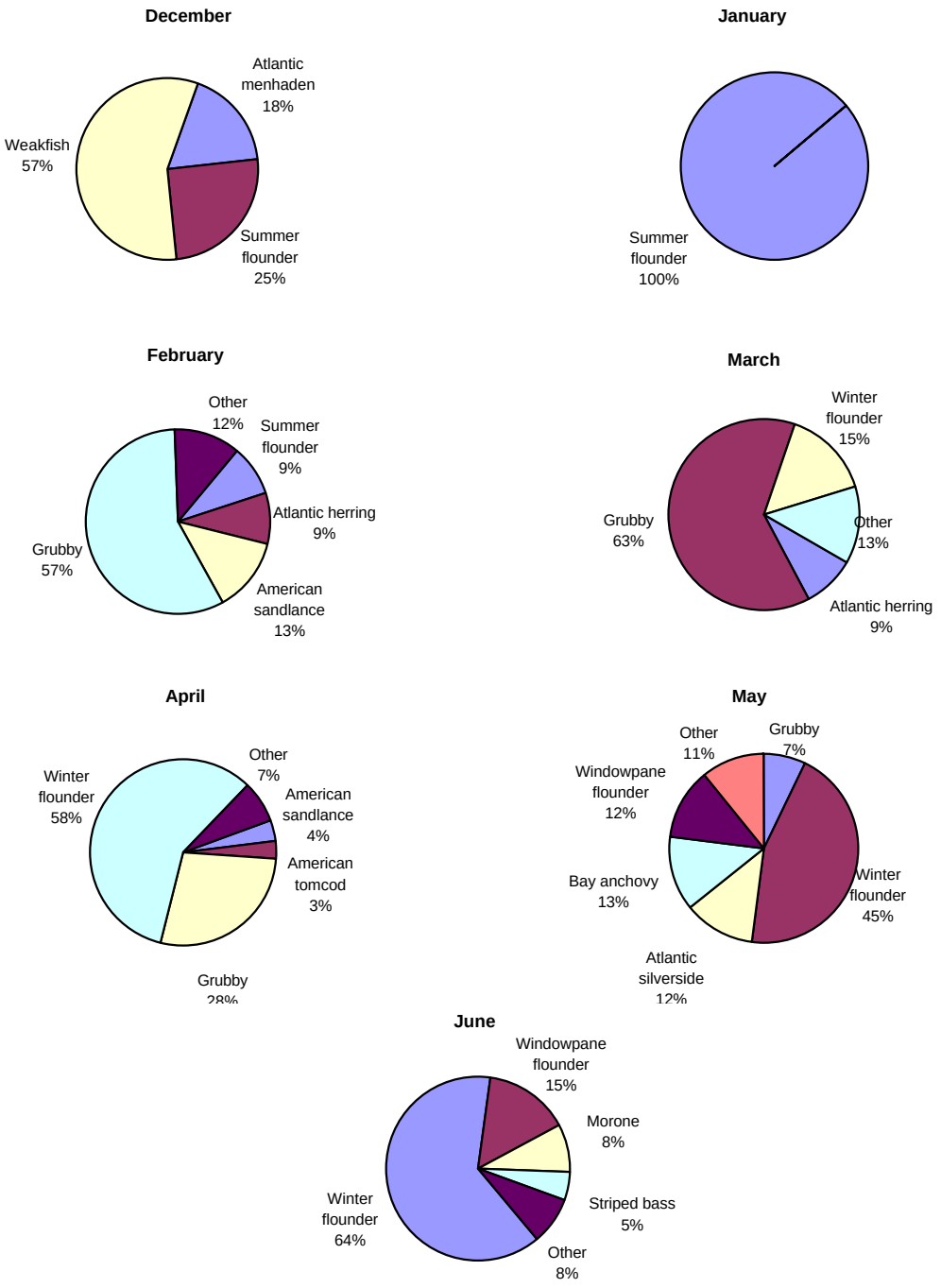

Figure 3-7. Percent Composition of Post Yolk-Sac Larvae Densities at All Channel Stations Combined - December 2000 to June 2001.

Figure 3-8. Percent Composition of Juvenile Densities at All Channel Stations Combined - December 2000 to June 2001.

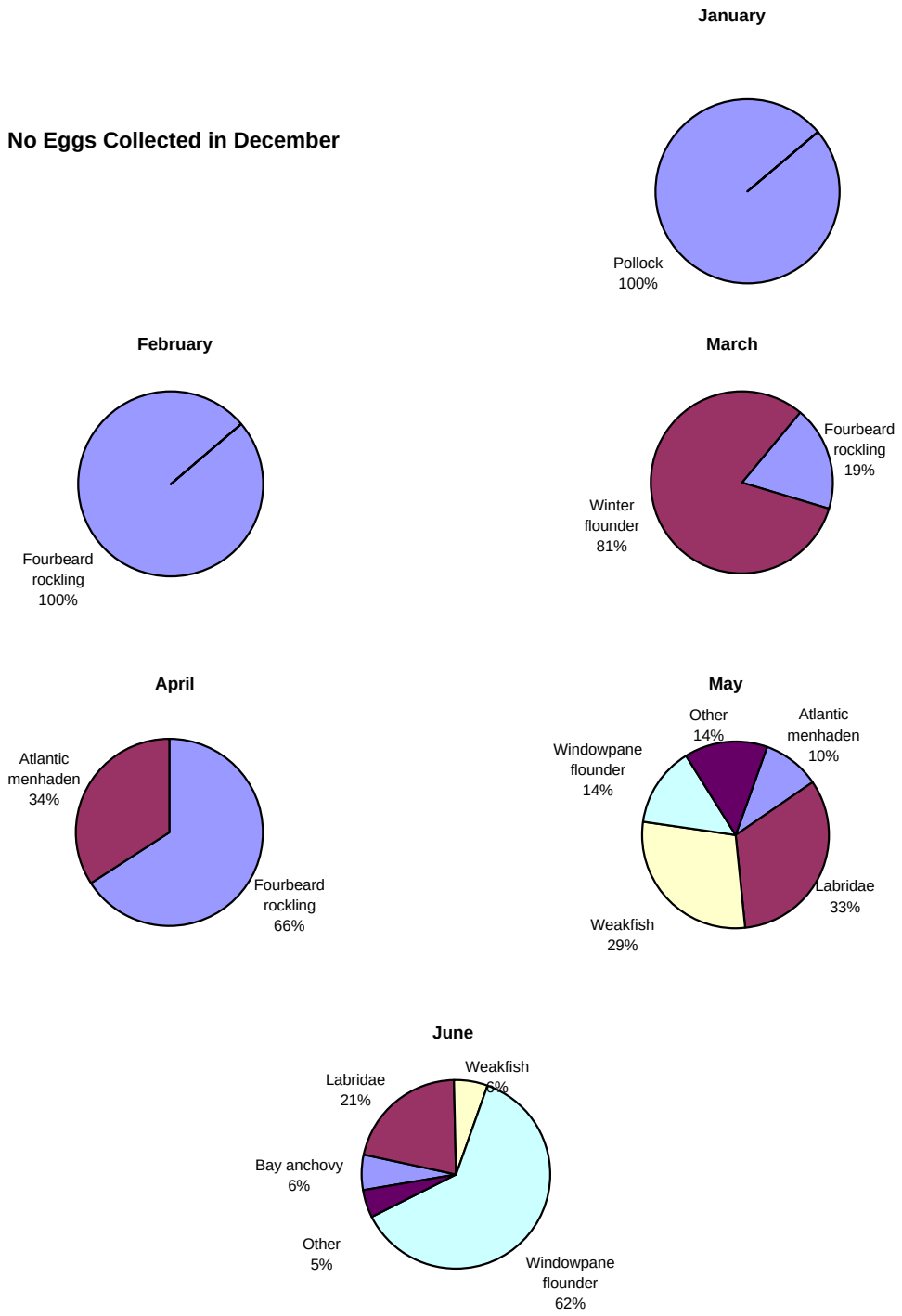

Figure 3-9. Percent Composition of Egg Densities at All Shoal Stations Combined - December 2000 through June 2001.

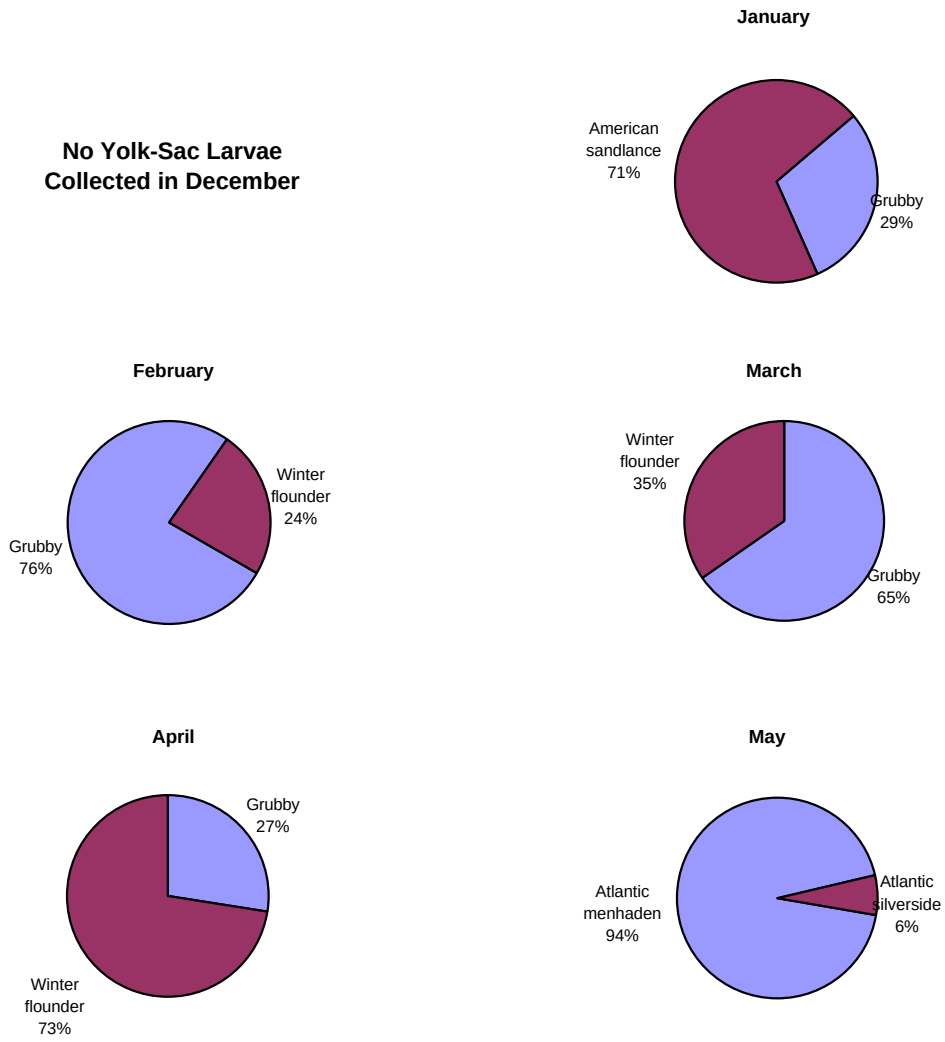

Figure 3-10. Percent Composition of Yolk-Sac Larvae Densities at All Shoal Stations Combined - December 2000 through June 2001.

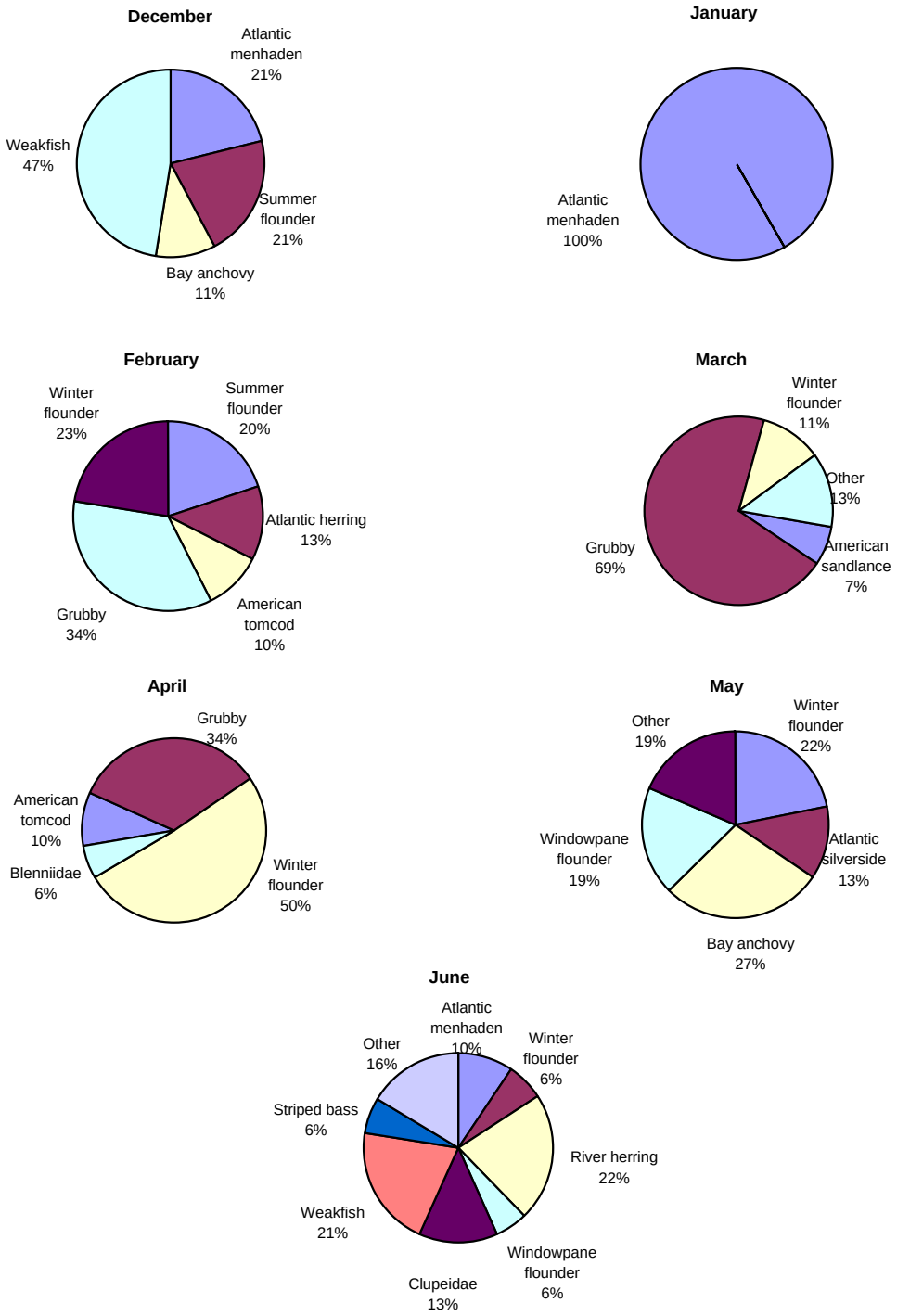

Figure 3-11. Percent Composition of Post Yolk-Sac Larvae Densities at All Shoal Stations Combined - December 2000 to June 2001.

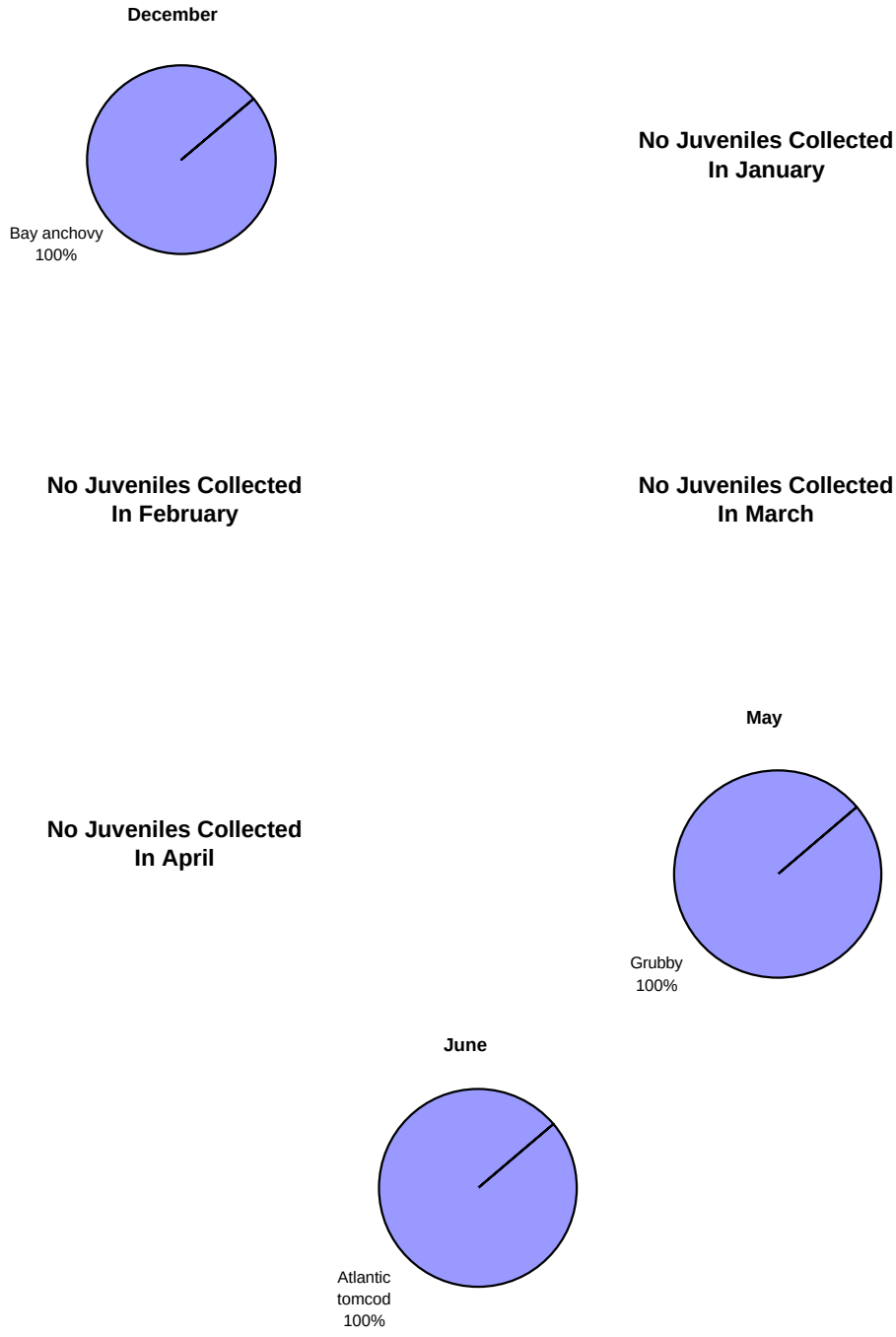

Figure 3-12. Percent Composition of Juvenile Densities at All Shoal Stations Combined - December 2000 to June 2001.

No Eggs Collected in December

No Eggs Collected in January

No Eggs Collected in February

No Eggs Collected in March

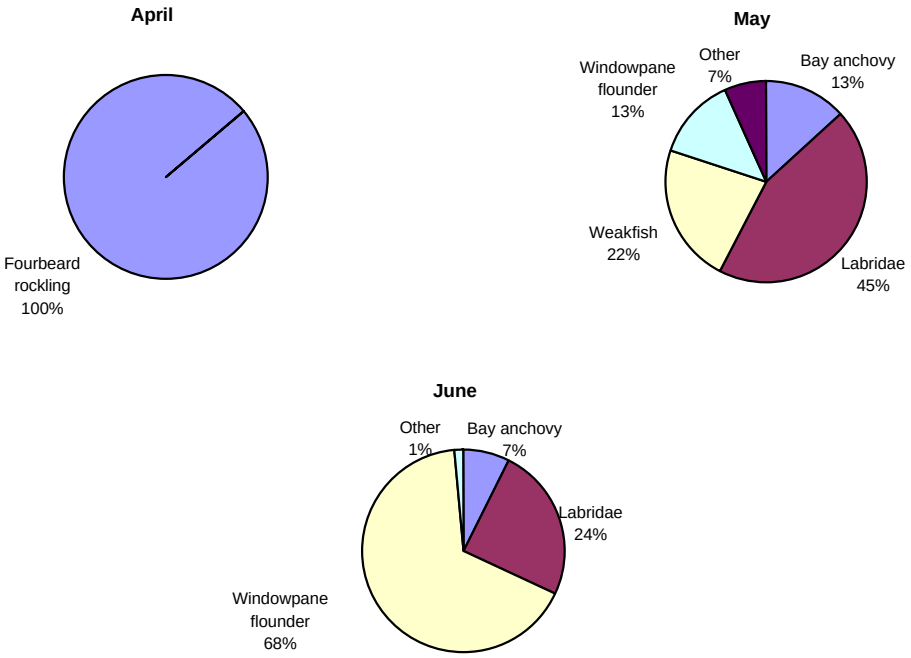

Figure 3-13. Percent Composition of Egg Densities at All Slope Stations Combined - March 2001 through June 2001.

Note: Slope station sampling began in March 2001.

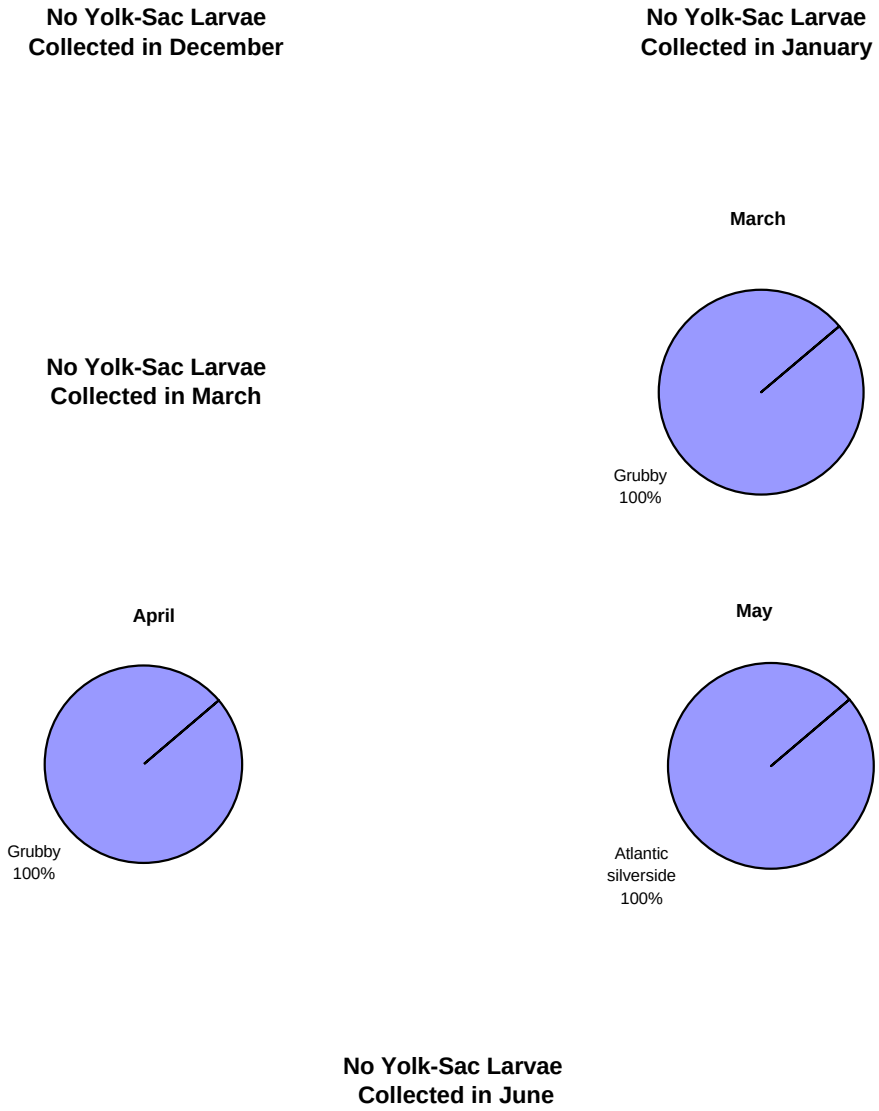

Figure 3-14. Percent Composition of Yolk-Sac Larvae Densities at All Slope Stations Combined - March 2001 to June 2001.

Note: Slope station sampling began in March 2001.

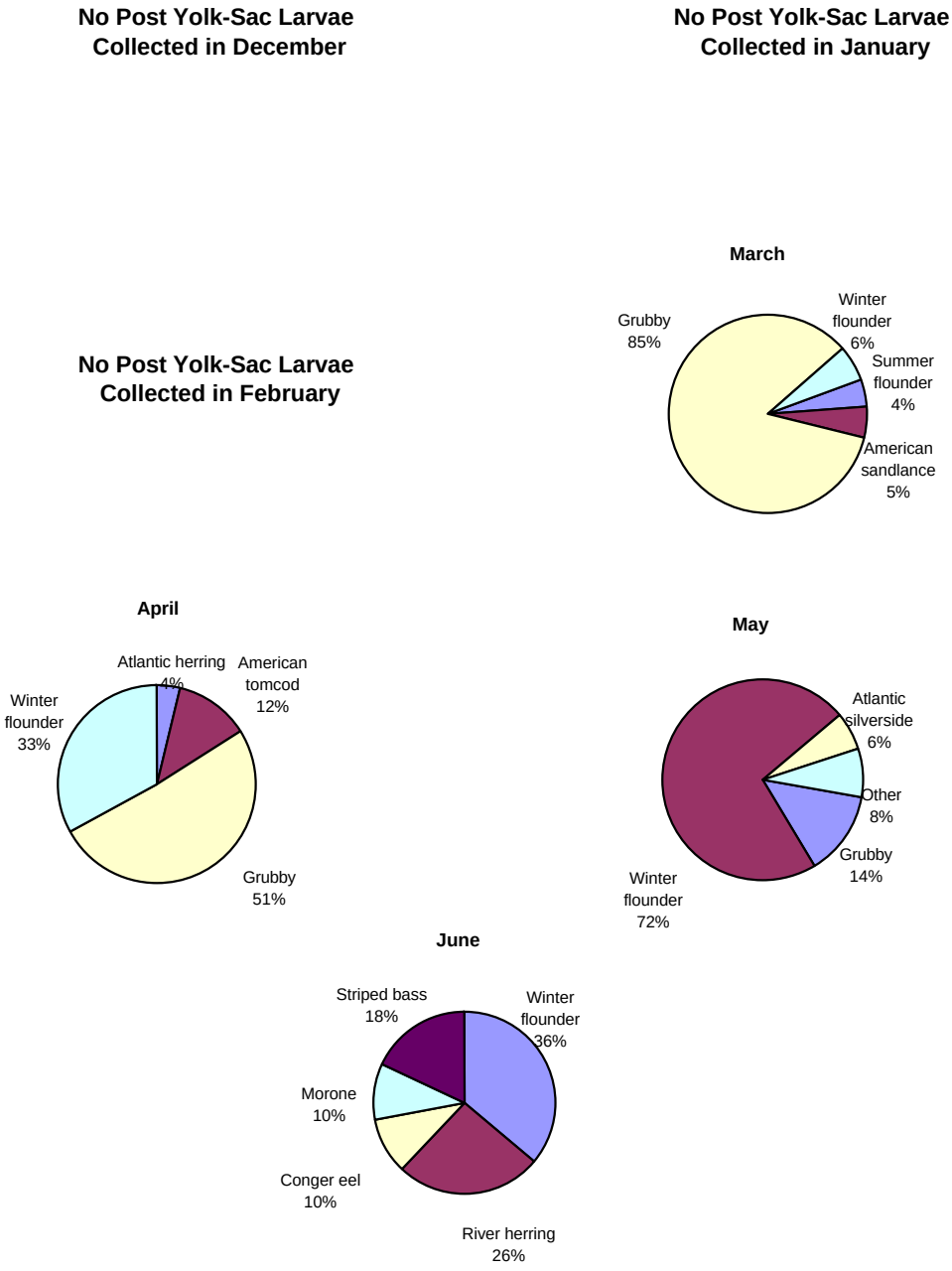

Figure 3-15. Percent Composition of Post Yolk-Sac Larvae Densities at All Slope Stations Combined - March 2001 to June 2001.

Note: Slope station sampling began in March 2001.

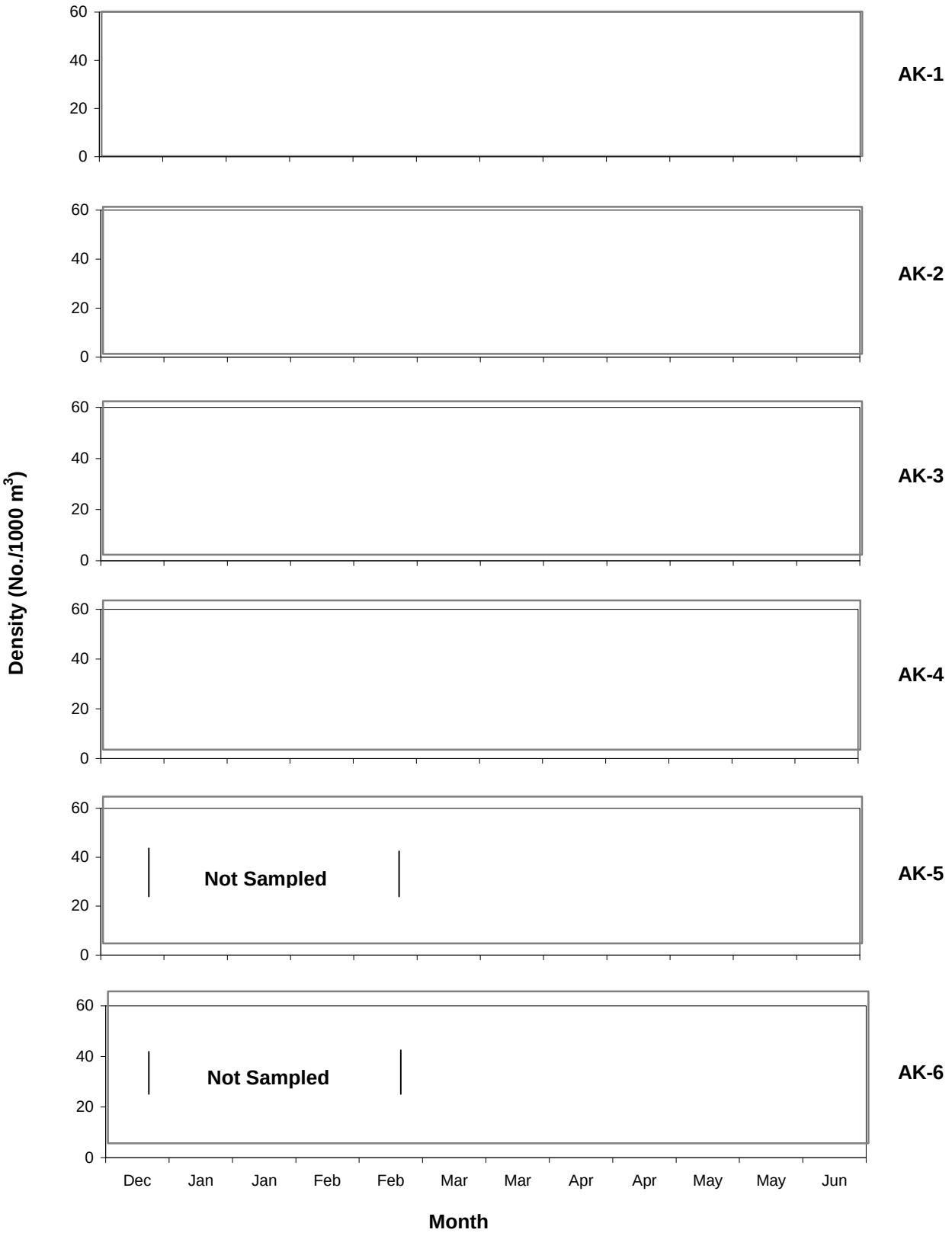

Figure 3-16. Monthly densities (No./1000 m^3) of winter flounder eggs collected at Arthur Kill (AK) sampling locations.

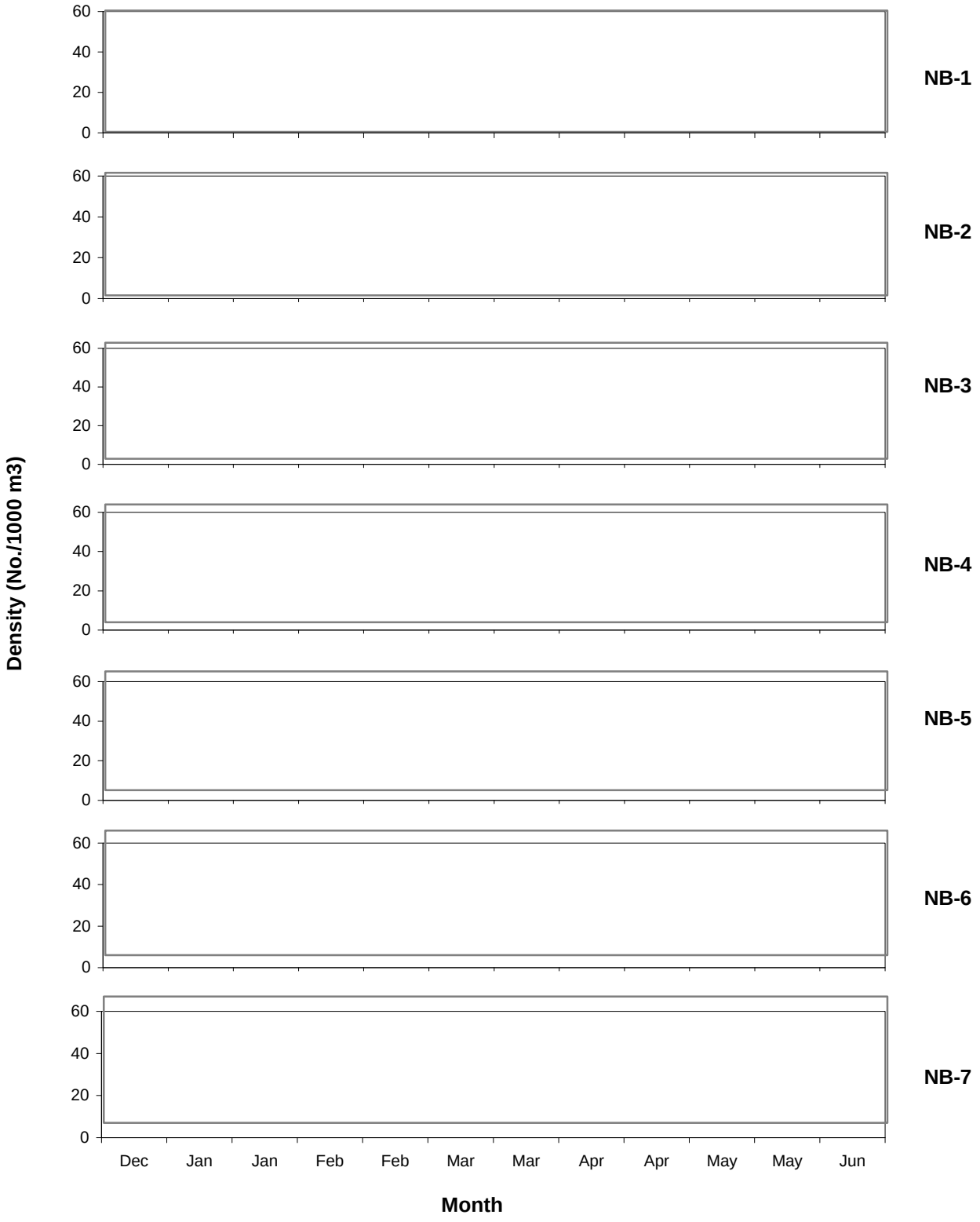

Figure 3-17. Monthly densities (No./1000 m^3) of winter flounder eggs collected at Newark Bay (NB) sampling locations.

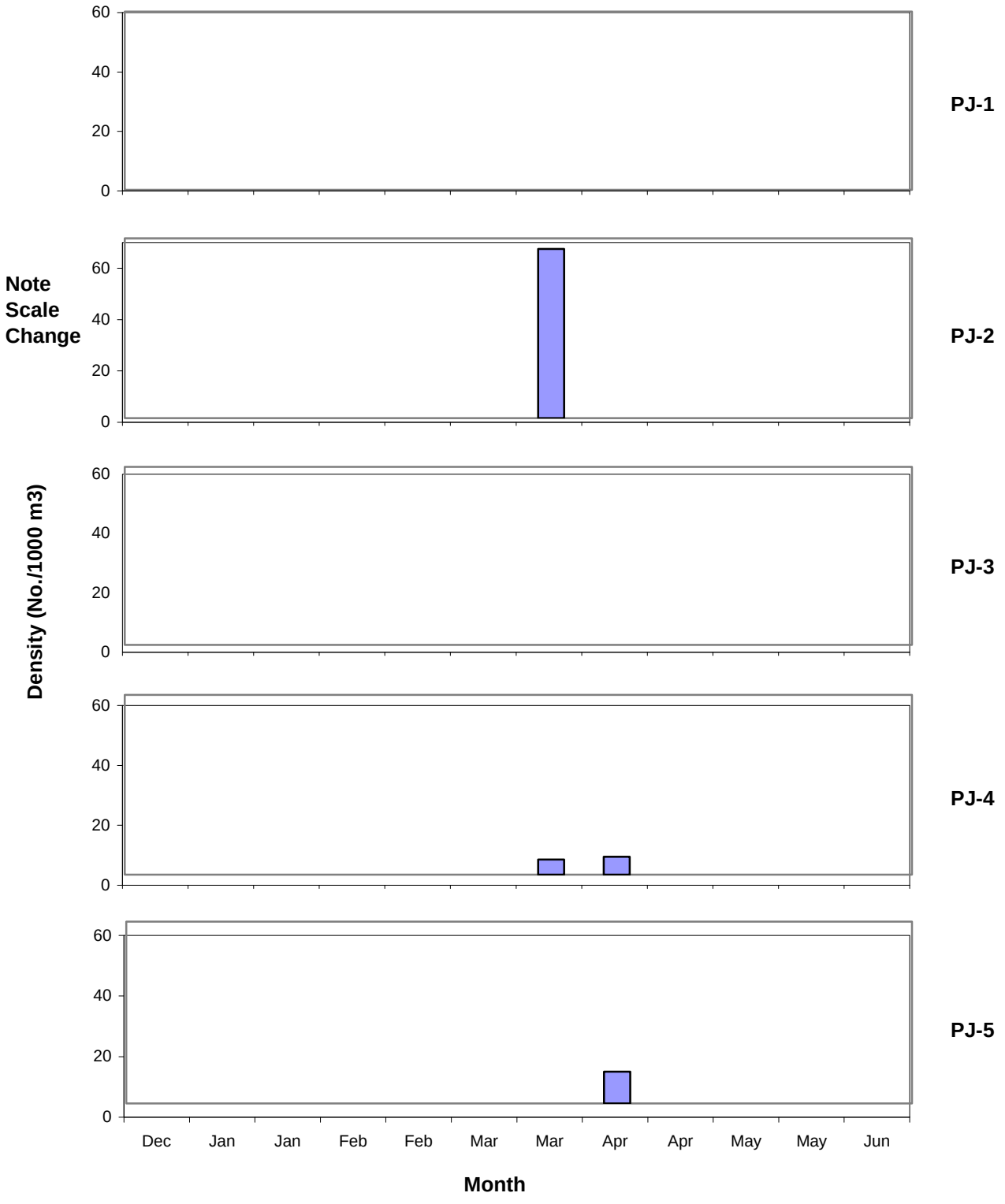

Figure 3-18. Monthly densities (No./1000 m^3) of winter flounder eggs collected at Port Jersey (PJ) sampling locations.

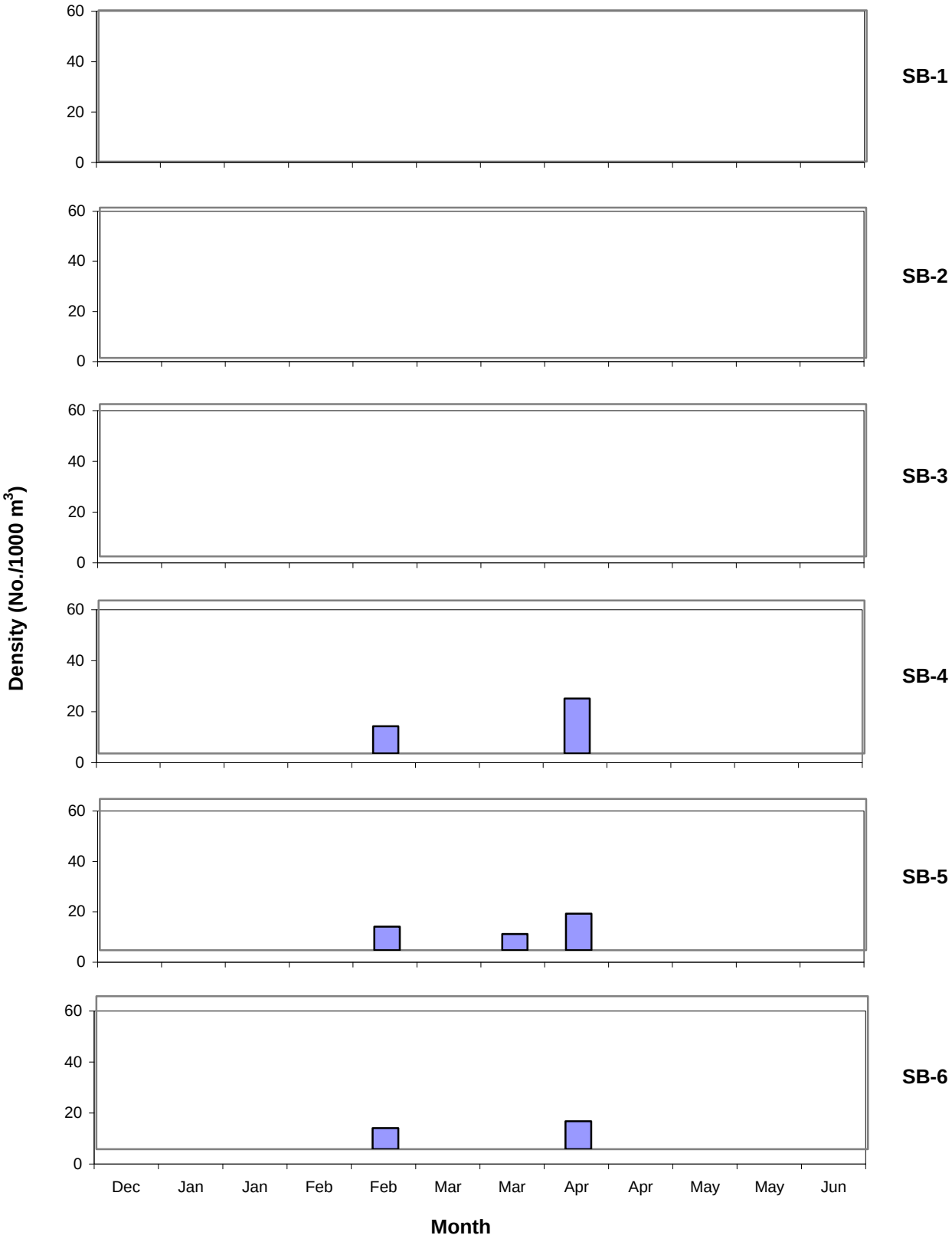

Figure 3-19. Monthly densities (No./1000 m^3) of winter flounder eggs collected at South Brooklyn (SB) sampling locations.

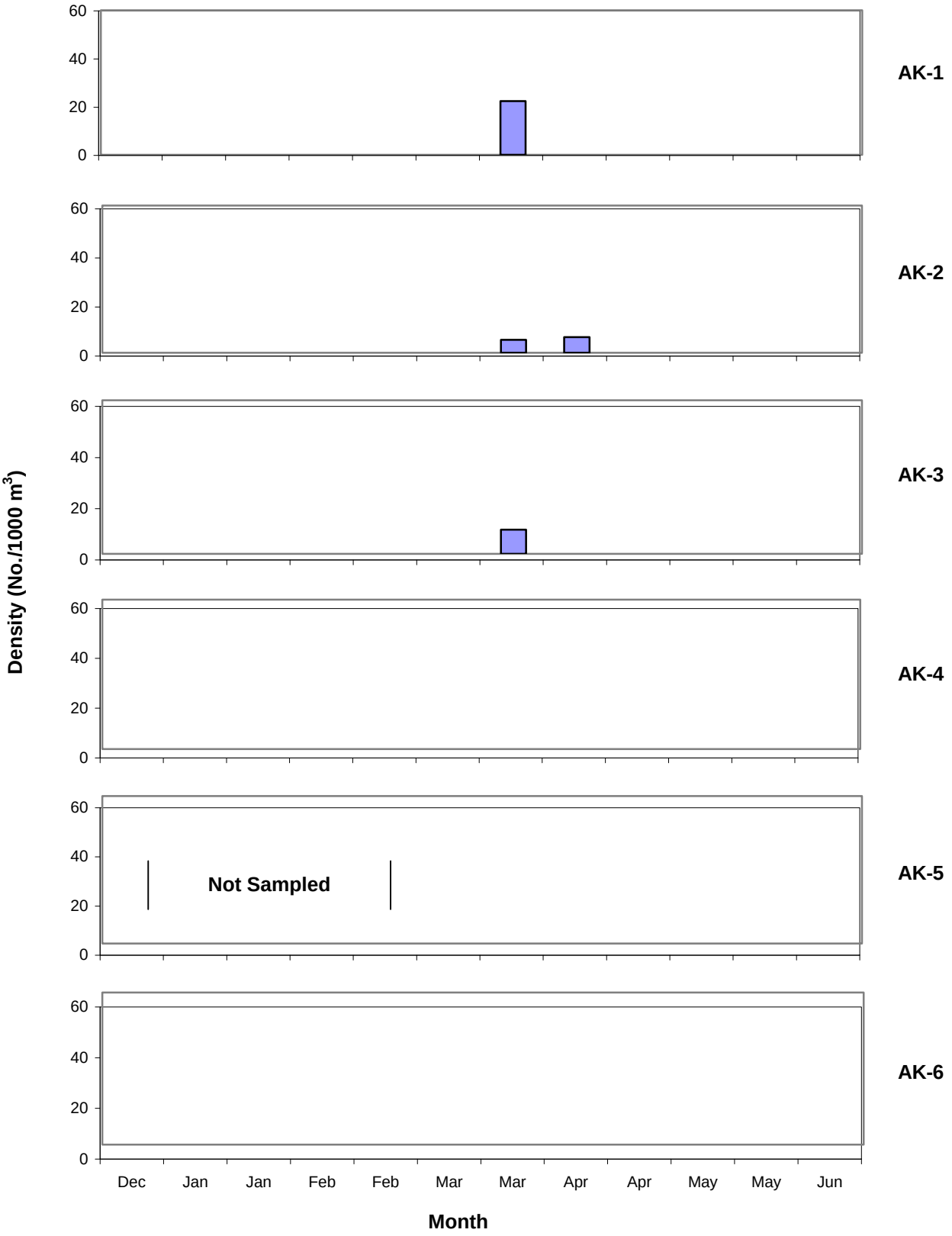

Figure 3-20. Monthly densities (No./1000 m^3) of winter flounder yolk-sac larvae collected at Arthur Kill (AK) sampling locations.

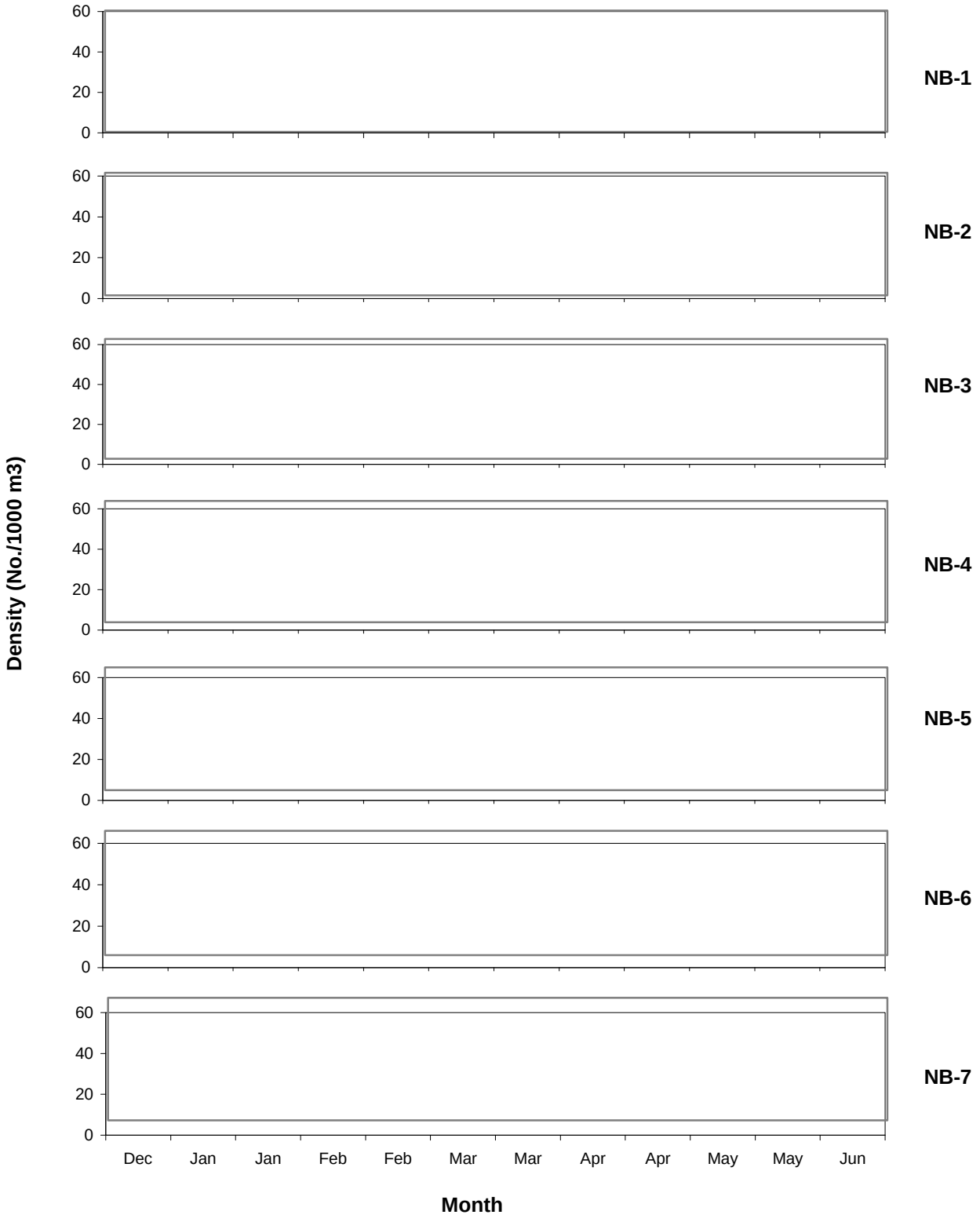

Figure 3-21. Monthly densities (No./1000 m^3) of winter flounder yolk-sac larvae collected at Newark Bay (NB) sampling locations.

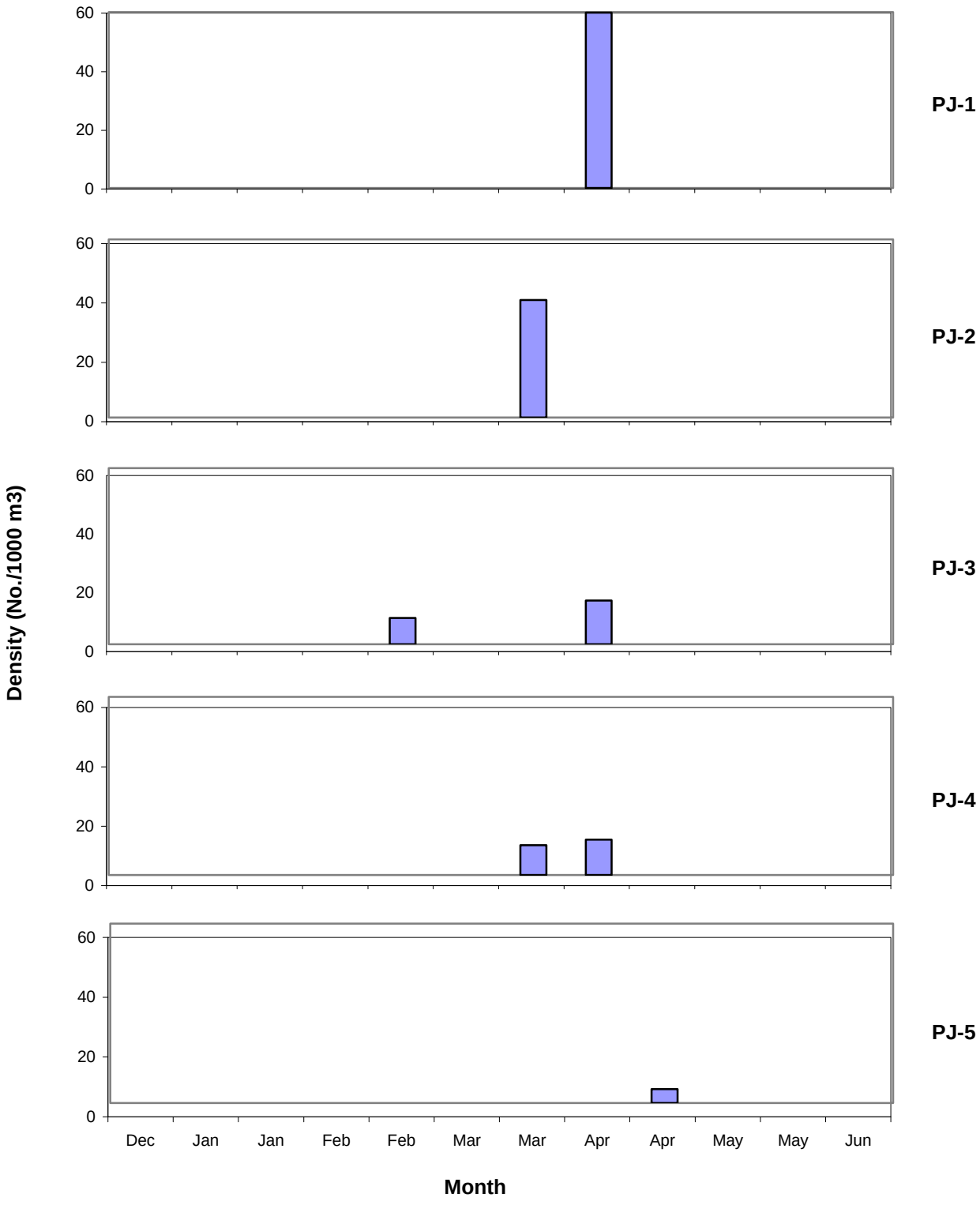

Figure 3-22. Monthly densities (No./1000 m^3) of winter flounder yolk-sac larvae collected at Port Jersey (PJ) sampling locations.

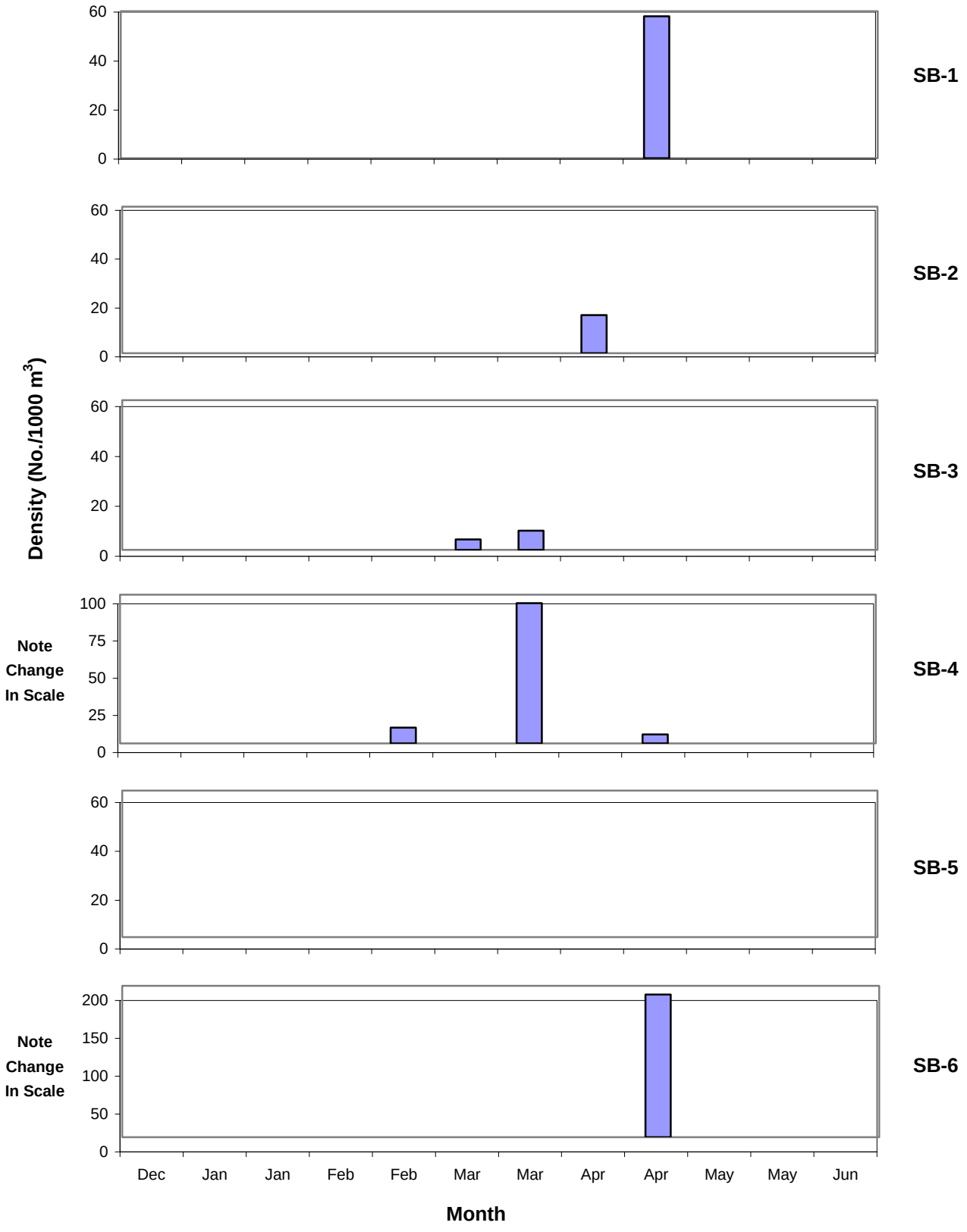

Figure 3-23. Monthly densities (No./1000 m^3) of winter flounder yolk-sac larvae collected at South Brooklyn (SB) sampling locations.

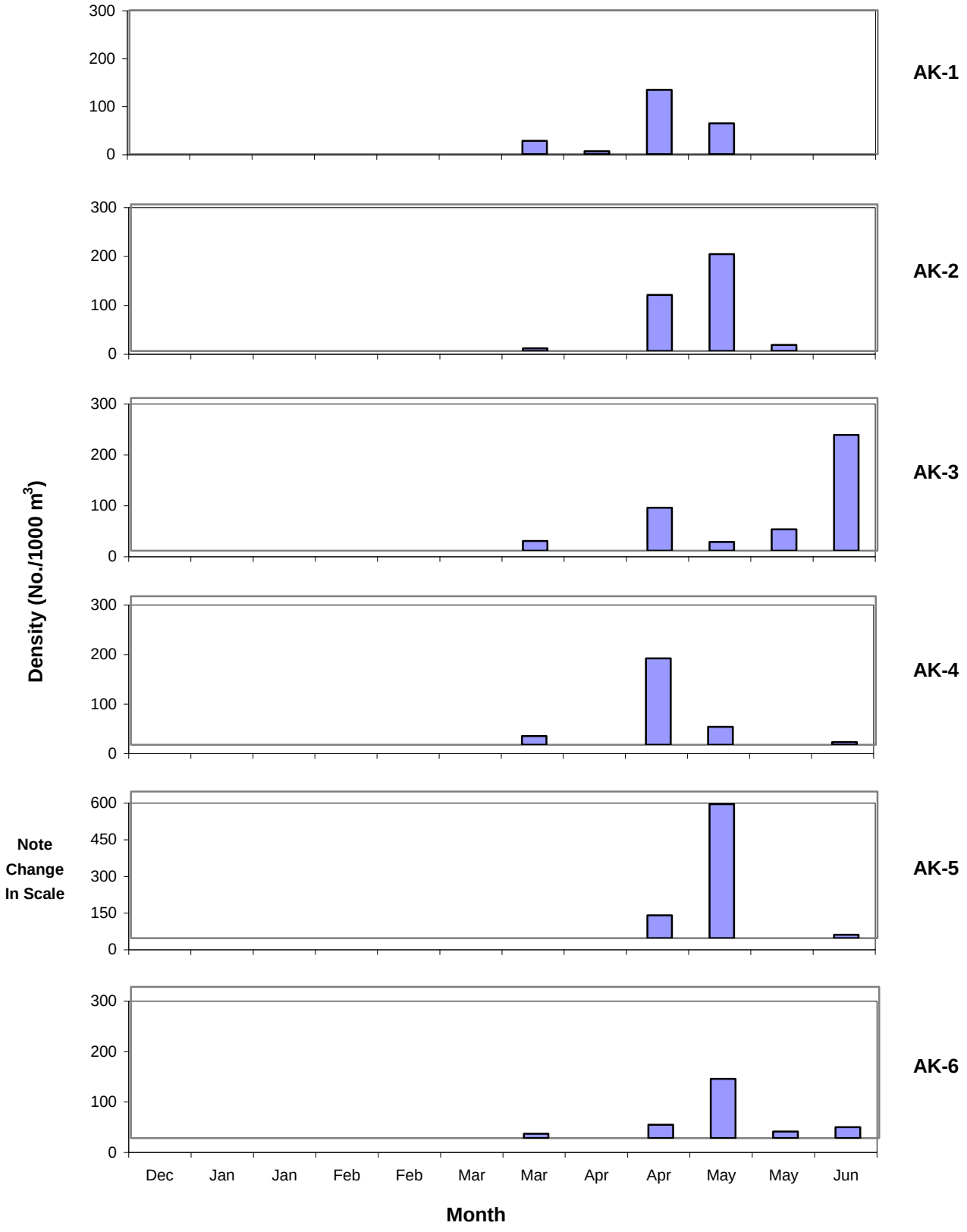

Figure 3-24. Monthly densities (No./1000 m^3) of winter flounder post yolk-sac larvae collected at Arthur Kill (AK) sampling locations.

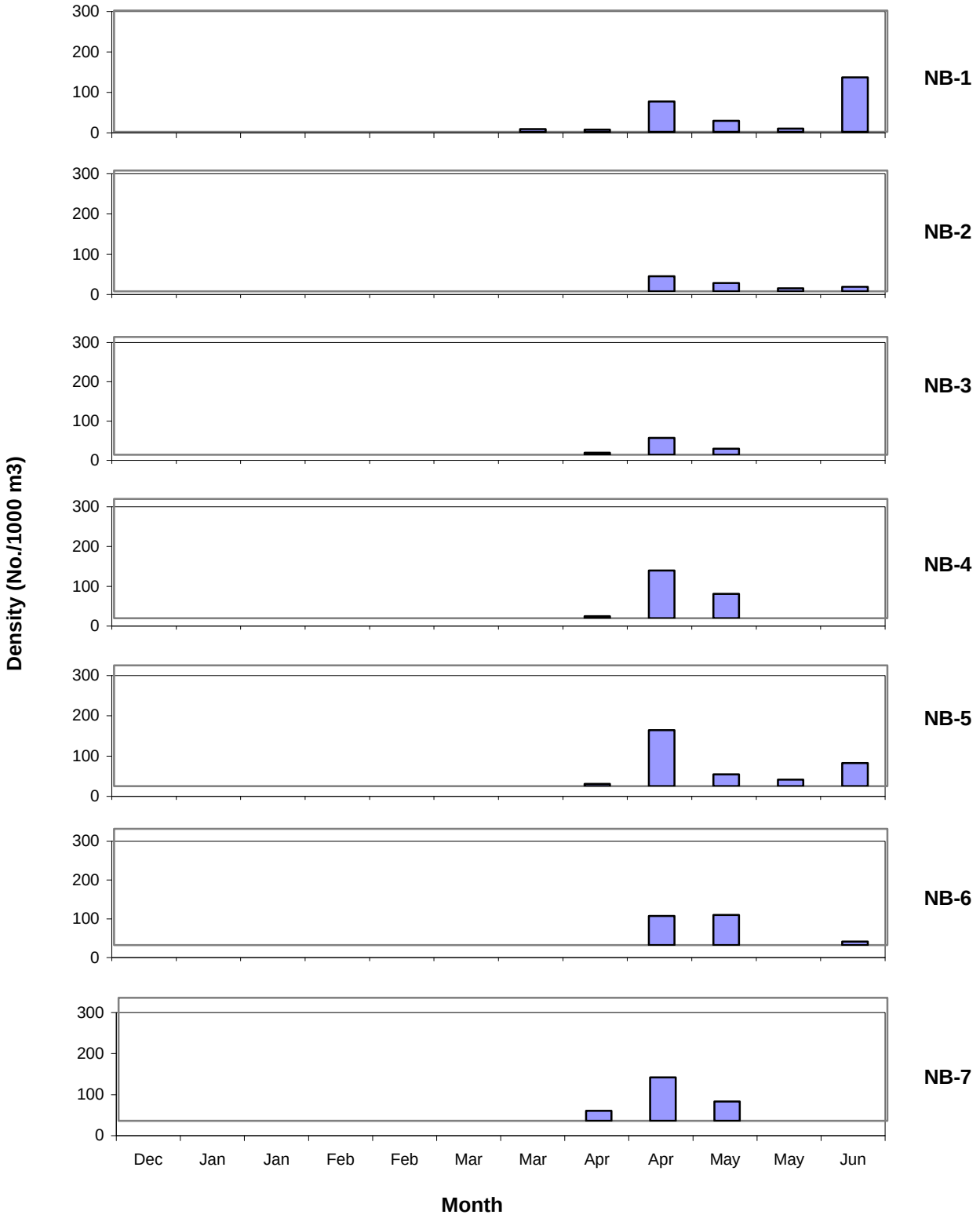

Figure 3-25. Monthly densities (No./1000 m^3) of winter flounder post yolk-sac larvae collected at Newark Bay (NB) sampling locations.

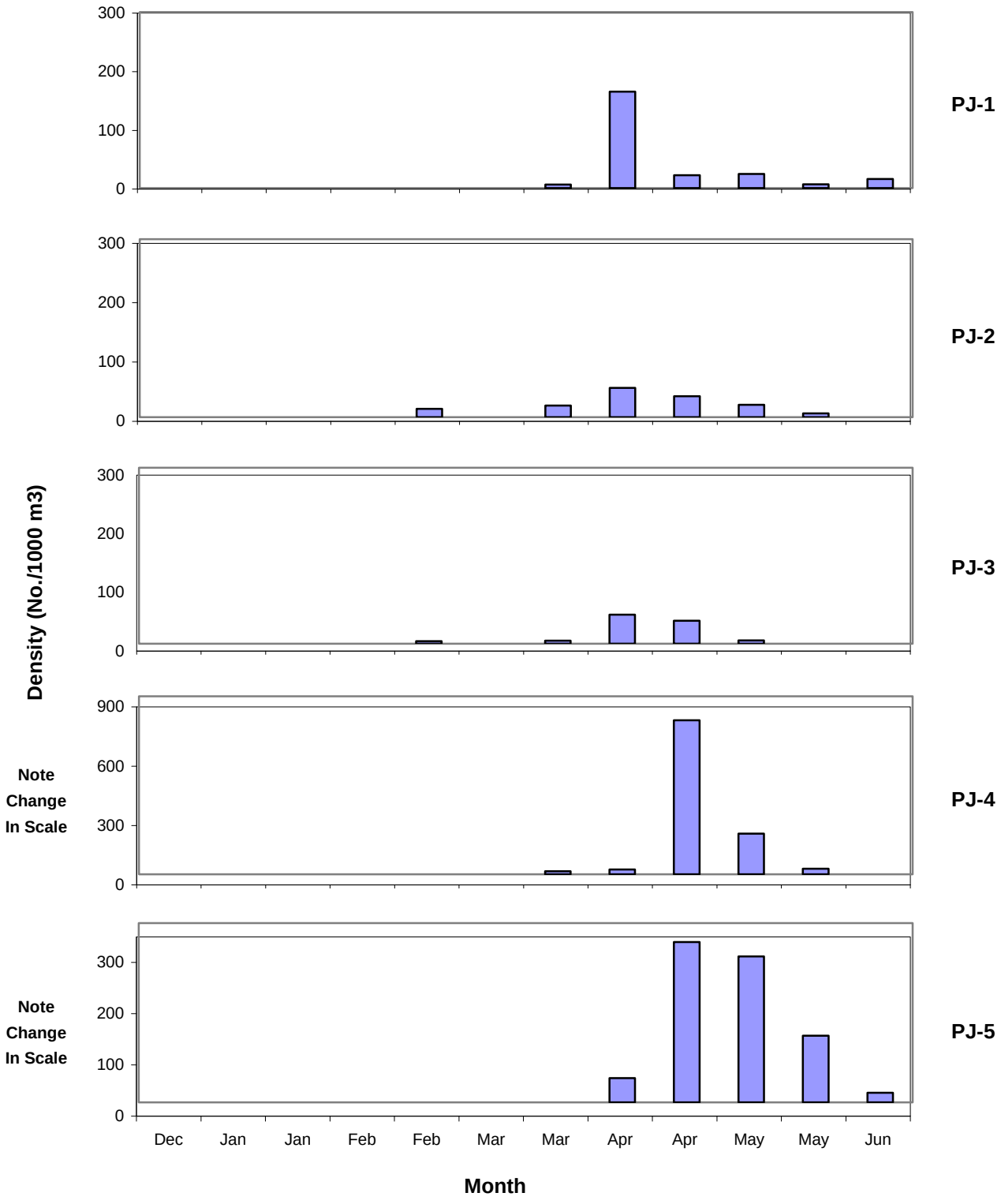

Figure 3-26. Monthly densities (No./1000 m^3) of winter flounder post yolk-sac larvae collected at Port Jersey (PJ) sampling locations.

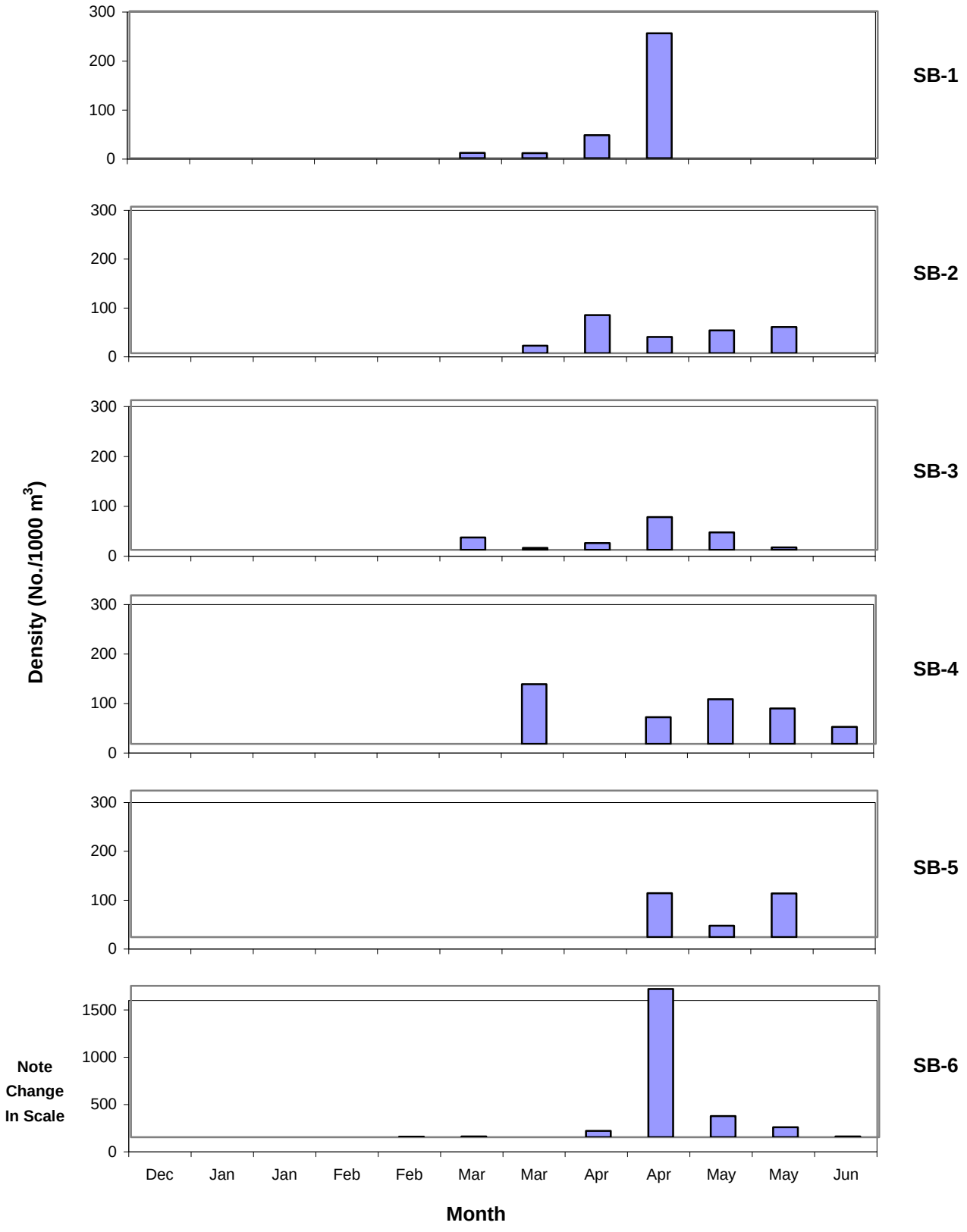

Figure 3-27. Monthly densities (No./1000 m^3) of winter flounder post yolk-sac larvae collected at South Brooklyn (SB) sampling locations.

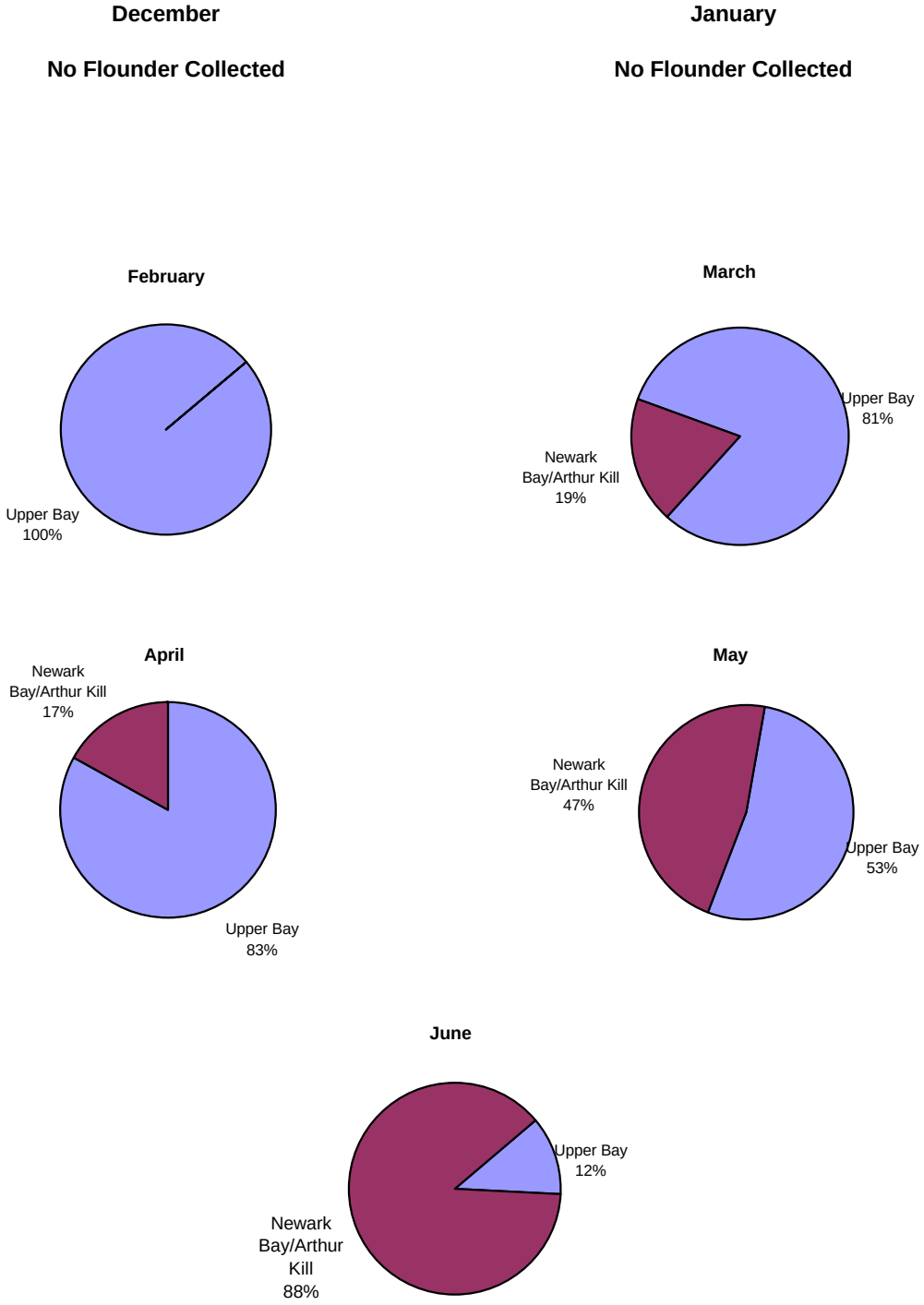

Figure 3-28. Distribution of Winter Flounder Larvae in Navigation Channel Areas (Upper New York Bay Stations versus Newark Bay/Arthur Kill Stations)

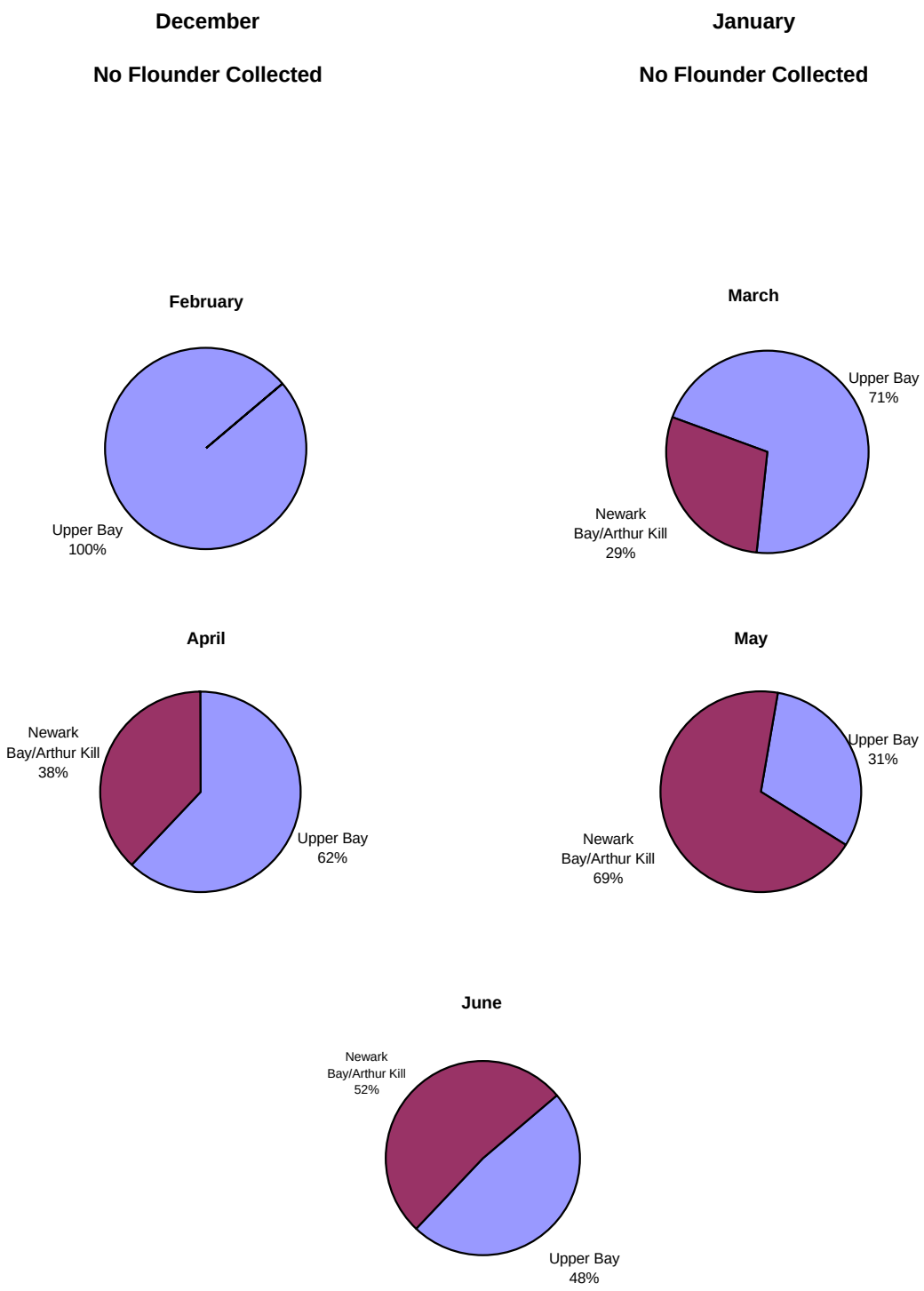

Figure 3-29. Distribution of Winter Flounder Larvae In Shoal/Shallow Areas (Upper New York Bay Stations versus Newark Bay/Arthur Kill Stations)

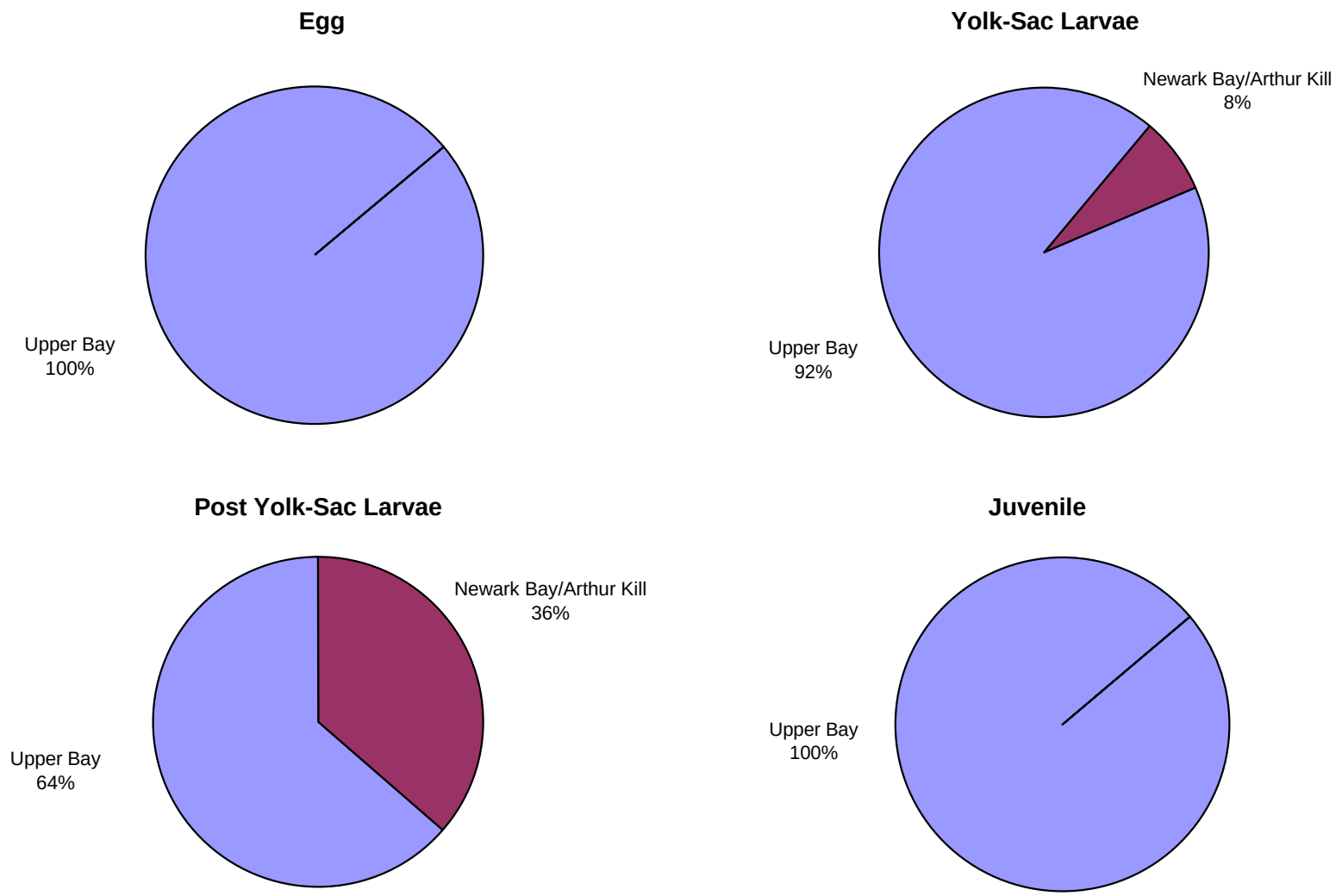

Figure 3-30. Distribution of Winter Flounder Lifestages in the Upper New York Bay Stations versus Newark Bay/Arthur Kill Stations.

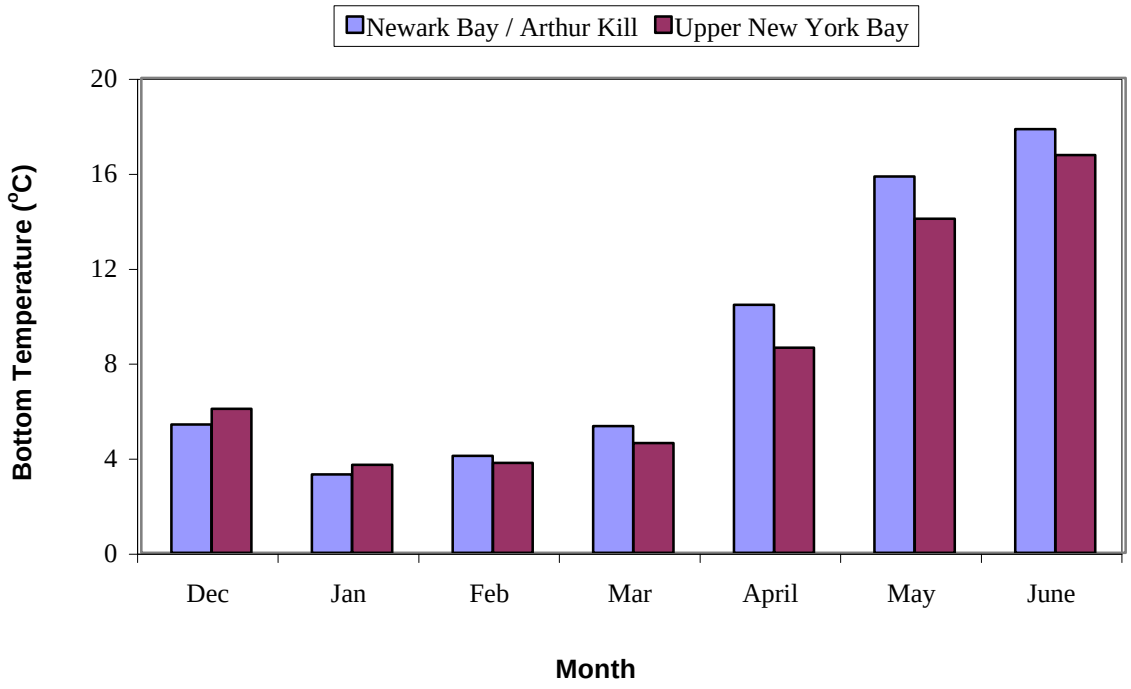

Figure 3-31. Mean monthly bottom water temperatures at the Upper New York Bay Stations versus Newark Bay/Arthur Kill Stations.

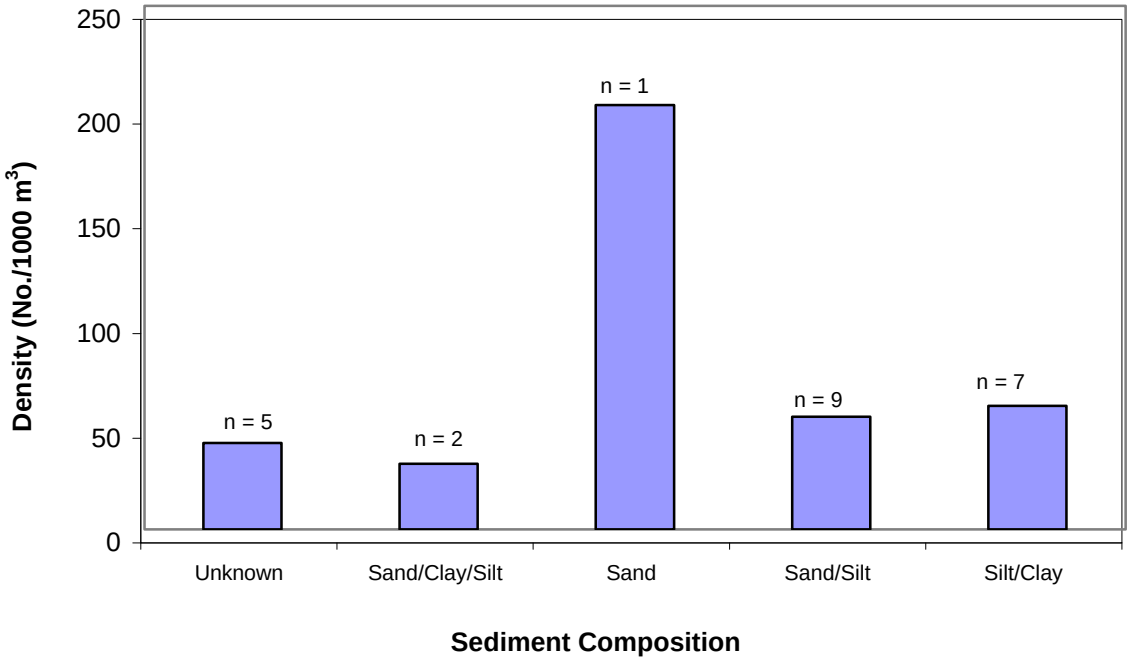

Figure 3-32. Mean density of winter flounder ichthyoplankton (eggs, yolk-sac, and post yolk-sac larvae) at locations with variable substrates.

APPENDIX A
ICHTHYOPLANKTON SAMPLING DATA
DECEMBER 2000 - JUNE 2001

Table A-1
Summary of December 2000 Sampling Data

Area	Station #	Sampling Date	Species	Life Stage	Number per 1000 m^3
Port Jersey	PJ-1	12/14/2000	Atlantic menhaden	PYS	5.47
	PJ-2		Atlantic menhaden	PYS	9.24
			Weakfish	PYS	6.16
	PJ-3		no catch		
	PJ-4		Summer flounder	PYS	6.21
	PJ-5	12/15/2000	Summer flounder	PYS	5.45
Arthur Kill	AK-1	12/15/2000	Bay anchovy	PYS	5.01
	AK-2		Summer flounder	PYS	5.20
			Weakfish	PYS	26.00
	AK-3		Atlantic menhaden	PYS	5.73
			Weakfish	PYS	5.73
	AK-4		Atlantic menhaden	PYS	9.34
			Weakfish	PYS	18.68
South Brooklyn/	SB-1	12/15/2000	no catch		
Upper Bay	SB-2		no catch		
	SB-3		Summer flounder	PYS	8.53
	SB-4		no catch		
	SB-5	12/14/2000	no catch		
	SB-6	12/15/2000	Bay anchovy	JUV	4.83
			Summer flounder	PYS	4.83
Newark Bay	NB-1	12/18/2000	Atlantic menhaden	PYS	4.10
	NB-2		Summer flounder	PYS	10.49
	NB-2		Weakfish	PYS	41.96
	NB-3		Summer flounder	PYS	3.71
	NB-3		Weakfish	PYS	3.71
	NB-4		Bay anchovy	JUV	3.69
	NB-5		Summer flounder	PYS	3.58
	NB-6	12/15/2000	Summer flounder	PYS	14.29
	NB-7	12/18/2000	Bay anchovy	PYS	2.55

Table A-2
Summary of January 2001 Sampling Data

Area	Station #	Sampling Date	Species	Life Stage	Number per 1000 m^3
Port Jersey	PJ-1	1/17/2001	No catch	-	-
	PJ-2		No catch	-	-
	PJ-3	1/19/2001	No catch	-	-
	PJ-4	1/17/2001	No catch	-	-
	PJ-5		No catch	-	-
Arthur Kill	AK-1	1/18/2001	No catch	-	-
	AK-2		No catch	-	-
	AK-3		No catch	-	-
	AK-4		No catch	-	-
Newark Bay	NB-1	1/19/2001	No catch	-	-
	NB-2		No catch	-	-
	NB-3		No catch	-	-
	NB-4	1/18/2001	No catch	-	-
	NB-5		Summer flounder	PYS	4.92
	NB-6		Weakfish	JUV	5.07
	NB-7		No catch	-	-
South Brooklyn/ Upper Bay	SB-1	1/19/2001	No catch	-	-
	SB-2		No catch	-	-
	SB-3	1/17/2001	No catch	-	-
	SB-4	1/19/2001	No catch	-	-
	SB-5	1/17/2001	Fourbeard rockling	EGG	3.76
	SB-6	1/19/2001	No catch	-	-
Port Jersey	PJ-1	1/26/01	No catch	-	-
	PJ-2		American Sandlance	EGG	11.95
	PJ-2		Polloc	EGG	5.97
	PJ-3		No catch	-	-
	PJ-4		No catch	-	-
	PJ-5		No catch	-	-
South Brooklyn/ Upper Bay	SB-1	1/26/01	No catch	-	-
	SB-2		No catch	-	-
	SB-3		Grubby	YS	5.32
	SB-3		Unidentified	EGG	10.65
	SB-4		American Sandlance	UID	3.91
	SB-5		Unidentified	EGG	14.29
	SB-6		Unidentified	EGG	3.89
Arthur Kill	AK-1	1/29/01	No catch	-	-
	AK-2		Four Beard Rockling	EGG	5.01
	AK-3		No catch	-	-
	AK-4		No catch	-	-
	AK-5		No catch	-	-
Newark Bay	NB-1	1/29/01	No catch	-	-
	NB-2		No catch	-	-
	NB-3		Atlantic Menhaden	PYS	4.63
	NB-4		No catch	-	-
	NB-5		Summer Flounder	PYS	4.65
	NB-6		No catch	-	-
	NB-7		No catch	-	-

Table A-3
Summary of February 2001 Sampling Data

Area	Station	Sampling Date	Species	Life Stage	Number per 1000 m^3
Port Jersey	PJ-1	2/14/2001	American sandlance	PYS	11.01
			Grubby	PYS	5.51
			Grubby	UID	5.51
			Grubby	YS	16.52
		2/27/2001	American sandlance	PYS	8.98
			Grubby	YS	13.47
			Grubby	PYS	4.49
	PJ-2	2/14/2001	Grubby	YS	4.87
			Grubby	PYS	4.87
		2/27/2001	American sandlance	PYS	9.45
			Grubby	PYS	61.40
			Grubby	YS	75.57
			Winter flounder	UID	9.45
			Winter flounder	PYS	14.17
	PJ-3	2/14/2001	NC	-	-
		2/27/2001	American sandlance	PYS	13.49
			Grubby	PYS	22.48
			Grubby	YS	17.98
			Winter flounder	YS	8.99
			Winter flounder	PYS	4.50
	PJ-4	2/14/2001	American sandlance	PYS	11.35
			Grubby	YS	5.68
		2/27/2001	Atlantic Herring	PYS	7.03
			Fourbeard rockling	EGG	35.13
			Grubby	PYS	49.18
			Grubby	YS	105.39
			Summer flounder	PYS	7.03
	PJ-5	2/14/2001	American sandlance	PYS	4.94
			Grubby	YS	9.89
		2/27/2001	American sandlance	UID	5.62
			American sandlance	PYS	5.62
			Grubby	PYS	16.86
			Grubby	YS	28.10
South Brooklyn/ Upper Bay	SB-1	2/14/2001	American sandlance	PYS	7.42
			Grubby	PYS	7.42
			Grubby	YS	14.84
		2/27/2001	Fourbeard rockling	EGG	20.96
			Grubby	YS	188.64
			Grubby	PYS	20.96
			Summer flounder	PYS	10.48
			UID	UID	10.48
	SB-2	2/14/2001	American sandlance	PYS	23.56
		2/27/2001	Fourbeard rockling	EGG	7.66
			Grubby	YS	61.26
			Grubby	PYS	7.66
	SB-3	2/14/2001	NC	-	-
		2/27/2001	American sandlance	PYS	7.61
			Grubby	YS	7.61
			Grubby	PYS	11.41
	SB-4	2/14/2001	American sandlance	PYS	10.14
		2/27/2001	Fourbeard rockling	EGG	16.01
			Grubby	YS	42.70
			Grubby	PYS	90.73
			Summer flounder	PYS	5.34
			Winter flounder	YS	10.67
			Winter flounder	UID	10.67
			Winter flounder	EGG	10.67

Table A-3 (cont'd)
Summary of February 2001 Sampling Data

Area	Station	Sampling Date	Species	Life Stage	Number per 1000 m^3
South Brooklyn/ Upper Bay (cont'd)	SB-5	2/14/2001	Grubby	YS	3.76
		2/27/2001	American sandlance	PYS	18.66
			Grubby	PYS	41.98
			Grubby	YS	9.33
			Winter flounder	EGG	9.33
	SB-6	2/14/2001	Grubby	YS	4.87
		2/27/2001	American sandlance	UID	4.14
			American sandlance	PYS	4.14
			Grubby	PYS	37.27
			Grubby	YS	45.55
			Winter flounder	EGG	8.28
			Winter flounder	PYS	4.14
Arthur Kill	AK-1	2/13/2001	Grubby	PYS	6.23
			Grubby	YS	12.46
		2/26/2001	Atlantic Herring	PYS	4.75
			American sandlance	PYS	9.50
			Grubby	YS	28.50
			Grubby	PYS	23.75
			Summer flounder	PYS	4.75
	AK-2	2/13/2001	Grubby	YS	6.11
		2/26/2001	Grubby	PYS	26.16
			Grubby	UID	4.36
			Grubby	YS	13.08
	AK-3	2/13/2001	Atlantic Herring	PYS	5.15
			Grubby	YS	5.15
		2/26/2001	Grubby	YS	86.29
			Summer flounder	PYS	6.16
	AK-4	2/13/2001	NC	-	-
		2/26/2001	Grubby	PYS	11.76
			Grubby	YS	11.76
Newark Bay	NB-1	2/13/2001	Grubby	YS	11.22
		2/26/2001	Grubby	YS	10.53
	NB-2	2/13/2001	NC	-	-
		2/26/2001	Atlantic Herring	PYS	4.78
			Grubby	PYS	19.13
			Grubby	YS	23.91
	NB-3	2/13/2001	NC	-	-
		2/26/2001	Atlantic tomcod	PYS	4.16
			Grubby	YS	8.33
			Grubby	PYS	12.49
	NB-4	2/13/2001	Grubby	YS	11.83
			Grubby	PYS	5.92
		2/26/2001	Grubby	YS	4.65
	NB-5	2/13/2001	Grubby	YS	18.18
		2/26/2001	Atlantic tomcod	PYS	3.67
			Grubby	YS	51.33
			Grubby	PYS	40.33
	NB-6	2/13/2001	Grubby	PYS	11.09
			Grubby	YS	16.64
		2/26/2001	Grubby	PYS	38.26
			Grubby	YS	27.33
			Summer flounder	PYS	5.47
	NB-7	2/13/2001	Grubby	YS	12.01
		2/26/2001	American sandlance	PYS	38.11
			Grubby	PYS	6.35
			Grubby	YS	12.70

Table A-4
Summary of March 2001 Sampling Data

Area	Station	Sampling Date	Species	Life Stage	Number per 1000 m^3
Port Jersey	PJ-1	3/15/2001	American sandlance	PYS	16.38
			Atlantic tomcod	PYS	5.46
			Fourbeard rockling	EGG	10.92
			Grubby	YS	38.23
			Grubby	PYS	81.92
		3/30/2001	Grubby	PYS	430.56
			Grubby	YS	60.64
			Rock gunnel	PYS	12.13
			Winter flounder	PYS	6.06
	PJ-2	3/15/2001	American sandlance	PYS	6.09
			Grubby	PYS	91.36
			Grubby	YS	48.73
		3/30/2001	Grubby	PYS	65.91
			Winter flounder	EGG	65.91
			Winter flounder	PYS	19.77
			Winter flounder	YS	39.54
			Winter flounder	UID	6.59
	PJ-3	3/15/2001	Atlantic herring	PYS	5.25
			Grubby	PYS	10.50
			Grubby	YS	26.25
		3/30/2001	Grubby	PYS	61.66
			Grubby	YS	10.28
			Grubby	UID	5.14
			Winter flounder	PYS	5.14
	PJ-4	3/15/2001	Fourbeard rockling	EGG	50.23
			Grubby	PYS	92.09
			Grubby	YS	50.23
		3/30/2001	Fourbeard rockling	EGG	75.38
			Grubby	PYS	70.35
			Winter flounder	EGG	5.03
			Winter flounder	UID	5.03
			Winter flounder	PYS	15.08
			Winter flounder	YS	10.05
	PJ-5	3/15/2001	Fourbeard rockling	EGG	11.90
			Grubby	PYS	55.53
			Grubby	YS	15.87
		3/30/2001	Atlantic herring	PYS	20.36
			Grubby	PYS	101.80

Table A-4 (cont'd)
Summary of March 2001 Sampling Data

Area	Station	Sampling Date	Species	Life Stage	Number per 1000 m^3
South Brooklyn/ Upper Bay	SB-1	3/15/2001	Fourbeard rockling	EGG	10.67
			Grubby	YS	85.34
			Grubby	PYS	192.02
			Winter flounder	PYS	10.67
		3/30/2001	Fourbeard rockling	EGG	20.58
			Grubby	YS	102.88
			Grubby	PYS	298.34
			Winter flounder	PYS	10.29
	SB-2	3/15/2001	American sandlance	PYS	7.49
			Grubby	PYS	37.44
			Grubby	YS	14.98
		3/30/2001	Fourbeard rockling	EGG	15.19
			UID	PYS	7.59
			Winter flounder	UID	7.59
			Winter flounder	PYS	15.19
	SB-3	3/15/2001	Grubby	PYS	8.35
			Rock gunnel	PYS	4.17
			Winter flounder	PYS	25.04
			Winter flounder	YS	4.17
		3/30/2001	Fourbeard rockling	EGG	19.09
			Grubby	PYS	30.55
			Winter flounder	UID	7.64
			Winter flounder	YS	7.64
			Winter flounder	PYS	3.82
	SB-4	3/15/2001	American sandlance	PYS	5.08
			Fourbeard rockling	EGG	81.27
			Grubby	PYS	634.95
			Grubby	YS	375.89
		3/30/2001	Fourbeard rockling	EGG	33.96
			Grubby	PYS	283.00
			Grubby	YS	30.19
			Winter flounder	YS	94.33
			Winter flounder	PYS	120.75
	SB-5	3/15/2001	American sandlance	PYS	3.46
			Fourbeard rockling	EGG	3.46
			Grubby	PYS	27.66
			Grubby	YS	20.75
		3/30/2001	Atlantic herring	PYS	38.46
			Fourbeard rockling	EGG	6.41
			Grubby	PYS	44.87
			Grubby	YS	32.05
			UID	PYS	6.41
			Winter flounder	EGG	6.41
	SB-6	3/15/2001	Fourbeard rockling	EGG	7.42
			Grubby	YS	7.42
			Grubby	PYS	18.54
			Winter flounder	PYS	7.42
		3/30/2001	Atlantic herring	PYS	3.02
			Grubby	PYS	3.02
			Grubby	YS	12.09

Table A-4 (cont'd)
Summary of March 2001 Sampling Data

Area	Station	Sampling Date	Species	Life Stage	Number per 1000 m^3
Newark Bay	NB-1	3/16/2001	American sandlance	PYS	4.97
			Grubby	PYS	109.45
			Grubby	YS	69.65
			Rock gunnel	PYS	4.97
			Summer flounder	PYS	4.97
		3/29/2001	Grubby	PYS	120.27
			Grubby	YS	21.22
			Summer flounder	PYS	14.15
			Winter flounder	PYS	7.07
	NB-2	3/16/2001	Grubby	YS	16.24
			Grubby	PYS	59.55
			Rock gunnel	PYS	5.41
		3/29/2001	Grubby	YS	6.13
			Grubby	PYS	30.63
	NB-3	3/16/2001	Grubby	PYS	61.89
			Grubby	YS	16.88
		3/29/2001	Grubby	YS	18.04
			Grubby	PYS	174.43
	NB-4	3/16/2001	Grubby	PYS	73.15
			Grubby	YS	5.23
		3/29/2001	Grubby	PYS	60.30
			Rock gunnel	PYS	5.03
	NB-5	3/16/2001	American sandlance	PYS	4.25
			Fourbeard rockling	EGG	4.25
			Grubby	YS	46.70
			Grubby	PYS	106.13
		3/29/2001	Grubby	PYS	53.18
			Grubby	YS	29.54
	NB-6	3/16/2001	Fourbeard rockling	EGG	13.26
			Grubby	YS	57.45
			Grubby	PYS	92.81
		3/29/2001	Atlantic herring	PYS	4.66
			American sandlance	PYS	4.66
			Grubby	YS	32.61
			Grubby	PYS	139.75
			Rock gunnel	PYS	4.66
	NB-7	3/16/2001	Grubby	PYS	43.73
			Grubby	YS	37.48
		3/29/2001	Grubby	YS	24.59
			Grubby	PYS	73.77

Table A-4
Summary of March 2001 Sampling Data

Area	Station	Sampling Date	Species	Life Stage	Number per 1000 m^3
Arthur Kill	AK-1	3/16/2001	American sandlance	PYS	9.26
			Grubby	PYS	32.41
			Grubby	YS	9.26
		3/29/2001	Fourbeard rockling	EGG	11.15
			Grubby	PYS	61.32
			Grubby	YS	72.46
			Winter flounder	PYS	27.87
			Winter flounder	YS	22.30
	AK-2	3/16/2001	American sandlance	PYS	4.78
			Fourbeard rockling	EGG	9.56
			Grubby	YS	76.51
			Grubby	PYS	105.20
		3/29/2001	Atlantic herring	PYS	21.23
			Fourbeard rockling	EGG	15.92
			Grubby	YS	21.23
			Grubby	PYS	53.08
			Winter flounder	PYS	5.31
			Winter flounder	YS	5.31
	AK-3	3/16/2001	Fourbeard rockling	EGG	10.60
			Grubby	YS	121.85
			Grubby	PYS	301.97
		3/29/2001	Atlantic herring	PYS	14.22
			American sandlance	PYS	4.74
			Atlantic tomcod	PYS	4.74
			Grubby	PYS	23.69
			Grubby	YS	9.48
			Winter flounder	YS	9.477
			Winter flounder	PYS	18.954
			Winter flounder	UID	4.739
	AK-4	3/16/2001	American sandlance	PYS	4.94
			Grubby	PYS	118.67
			Grubby	YS	44.50
		3/29/2001	Grubby	YS	13.20
			Grubby	PYS	43.99
			Winter flounder	PYS	17.60
Slope Station - North	AK-5	3/16/2001	American sandlance	PYS	7.90
			Grubby	YS	142.27
			Grubby	PYS	165.99
		3/29/2001	Grubby	YS	14.40
			Grubby	PYS	100.77
			Summer flounder	PYS	7.20
Slope Station South	AK-6	3/16/2001	Grubby	PYS	116.71
			Grubby	YS	62.25
		3/29/2001	Grubby	PYS	147.63
			Grubby	YS	86.84
			Winter flounder	PYS	8.68

Table A-5
Summary of April 2001 Sampling Data

Area	Station	Date	Species	Life Stage	Density number per 1000 m^3
Arthur Kill	AK-1	4/13/2001	Grubby	PYS	61.95
			Winter flounder	PYS	6.19
		4/26/2001	Atlantic menhaden	EGG	26.83
			Grubby	UID	13.41
			Grubby	PYS	80.48
			Winter flounder	PYS	134.14
	AK-2	4/13/2001	Atlantic tomcod	PYS	6.37
			Fourbeard rockling	EGG	12.74
			Grubby	YS	31.84
			Grubby	PYS	210.15
			Striped cusk eel	PYS	6.37
			Winter flounder	YS	6.37
		4/26/2001	Atlantic silverside	YS	6.05
			Fourbeard rockling	EGG	6.05
			Grubby	PYS	24.21
			Winter flounder	PYS	114.98
	AK-3	4/13/2001	Atlantic herring	PYS	6.65
			Atlantic tomcod	PYS	6.65
			Fourbeard rockling	EGG	6.65
			Grubby	PYS	106.46
			Striped cusk eel	PYS	6.65
		4/26/2001	Fourbeard rockling	EGG	7.67
			Grubby	PYS	53.72
			Winter flounder	PYS	84.42
	AK-4	4/13/2001	Atlantic tomcod	PYS	10.57
			Grubby	YS	10.57
			Grubby	PYS	73.98
		4/26/2001	Atlantic menhaden	EGG	13.10
			Grubby	PYS	13.10
			Winter flounder	PYS	174.61
North slope - Shooter's Island Reach	AK-5	4/13/2001	Fourbeard rockling	EGG	15.06
			Grubby	PYS	241.01
			Grubby	YS	37.66
			Winter flounder	UID	7.53
		4/26/2001	Grubby	PYS	20.67
			Winter flounder	PYS	93.01
South slope - Shooter's Island Reach	AK-6	4/13/2001	Atlantic herring	PYS	7.46
			Atlantic tomcod	PYS	22.37
			Grubby	YS	14.92
			Grubby	PYS	74.58
		4/26/2001	Grubby	PYS	31.88
			Winter flounder	PYS	26.57

Table A-5 (cont'd)
Summary of April 2001 Sampling Data

Area	Station	Date	Species	Life Stage	Density number per 1000 m^3
Newark Bay	NB-1	4/13/2001	Atlantic tomcod	PYS	35.00
			Grubby	PYS	110.83
			Grubby	YS	5.83
			Striped cusk eel	PYS	5.83
			Winter flounder	PYS	5.83
		4/26/2001	Atlantic menhaden	EGG	5.03
			Atlantic tomcod	PYS	5.03
			Atlantic tomcod	JUV	15.09
			Grubby	PYS	20.12
			Winter flounder	PYS	75.45
	NB-2	4/13/2001	No catch	-	-
		4/26/2001	Fourbeard rockling	EGG	5.34
			Grubby	PYS	37.37
			Winter flounder	PYS	37.37
	NB-3	4/13/2001	Grubby	PYS	5.22
			Winter flounder	PYS	5.22
		4/26/2001	Grubby	PYS	10.66
			Winter flounder	PYS	42.64
	NB-4	4/13/2001	Grubby	PYS	29.98
			Winter flounder	UID	5.00
			Winter flounder	PYS	5.00
		4/26/2001	Fourbeard rockling	EGG	10.02
			Grubby	PYS	20.04
			Winter flounder	PYS	120.27
	NB-5	4/13/2001	Grubby	PYS	5.67
			Winter flounder	PYS	5.67
		4/26/2001	Atlantic tomcod	PYS	11.11
			Fourbeard rockling	EGG	11.11
			Grubby	PYS	16.66
			Winter flounder	PYS	138.83
	NB-6	4/13/2001	Atlantic herring	PYS	4.53
			Grubby	PYS	126.82
			Grubby	YS	18.12
		4/26/2001	BLENNIIDAE	PYS	4.69
			Grubby	PYS	51.58
			Grubby	YS	9.38
			Winter flounder	PYS	75.03
	NB-7	4/13/2001	Grubby	PYS	18.56
			Winter flounder	UID	12.37
			Winter flounder	PYS	24.75
		4/26/2001	Atlantic menhaden	EGG	6.62
			Grubby	PYS	26.48
			Grubby	UID	6.62
			Winter flounder	PYS	105.91

Table A-5 (cont'd)
Summary of April 2001 Sampling Data

Area	Station	Date	Species	Life Stage	Density number per 1000 m^3
Port Jersey	PJ-1	4/13/2001	Grubby	YS	19.94
			Grubby	PYS	154.53
			UID	UID	24.92
			Winter flounder	YS	59.82
			Winter flounder	PYS	164.50
			Winter flounder	UID	44.86
		4/27/2001	Grubby	PYS	44.29
			Winter flounder	UID	5.54
			Winter flounder	PYS	22.15
	PJ-2	4/13/2001	Grubby	PYS	49.49
			Grubby	YS	5.50
			Winter flounder	UID	11.00
			Winter flounder	PYS	49.49
		4/27/2001	Grubby	PYS	8.85
			Winter flounder	PYS	35.40
	PJ-3	4/13/2001	Grubby	PYS	44.61
			Winter flounder	YS	14.87
			Winter flounder	PYS	49.57
		4/27/2001	Grubby	PYS	9.84
			Winter flounder	PYS	39.38
			Winter flounder	UID	4.92
	PJ-4	4/13/2001	Atlantic menhaden	EGG	5.95
			Fourbeard rockling	EGG	17.85
			Grubby	PYS	23.80
			Winter flounder	EGG	5.95
			Winter flounder	YS	11.90
			Winter flounder	PYS	23.80
		4/27/2001	Atlantic menhaden	EGG	55.29
			Fourbeard rockling	EGG	30.16
			Grubby	PYS	241.28
			Striped cusk eel	PYS	5.03
			Winter flounder	PYS	779.12
	PJ-5	4/13/2001	Atlantic menhaden	EGG	10.47
			Atlantic tomcod	PYS	10.47
			Fourbeard rockling	EGG	20.94
			Grubby	PYS	78.52
			Winter flounder	PYS	47.11
			Winter flounder	EGG	10.47
		4/27/2001	Atlantic menhaden	EGG	51.40
			Grubby	PYS	28.04
			UID #2	YS	4.67
			Winter flounder	YS	4.67
			Winter flounder	PYS	313.07

Table A-5 (cont'd)
Summary of April 2001 Sampling Data

Area	Station	Date	Species	Life Stage	Density number per 1000 m^3
South Brooklyn/ Upper Bay	SB-1	4/14/2001	Fourbeard rockling	EGG	11.74
			Grubby	YS	11.74
			Grubby	PYS	58.72
			Winter flounder	PYS	46.98
		4/27/2001	Atlantic menhaden	EGG	23.18
			Fourbeard rockling	EGG	57.94
			Grubby	PYS	46.35
			Winter flounder	PYS	254.94
			Winter flounder	YS	57.94
	SB-2	4/14/2001	Atlantic tomcod	PYS	15.62
			BLENNIIDAE	PYS	7.81
			Fourbeard rockling	EGG	93.70
			Grubby	PYS	171.79
			Grubby	YS	31.23
			Winter flounder	PYS	78.09
			Winter flounder	YS	15.62
		4/27/2001	Atlantic menhaden	EGG	8.35
			Grubby	PYS	33.39
			Winter flounder	UID	8.35
			Winter flounder	PYS	33.39
	SB-3	4/14/2001	Fourbeard rockling	EGG	6.88
			Grubby	YS	6.88
			Grubby	PYS	13.76
			Winter flounder	PYS	13.76
		4/27/2001	Winter flounder	PYS	65.46
			Winter flounder	UID	9.35
	SB-4	4/14/2001	Atlantic menhaden	EGG	129.08
			American sandlance	EGG	10.76
			Fourbeard rockling	EGG	43.03
			Grubby	PYS	32.27
			Summer flounder	PYS	10.76
			Winter flounder	EGG	21.51
		4/27/2001	Atlantic menhaden	EGG	143.30
			Atlantic tomcod	PYS	11.94
			Fourbeard rockling	EGG	11.94
			Grubby	YS	5.97
			Grubby	PYS	35.82
			Winter flounder	YS	5.97
			Winter flounder	PYS	53.74
	SB-5	4/14/2001	Fourbeard rockling	EGG	14.48
			Grubby	PYS	21.71
			Winter flounder	EGG	14.48
		4/27/2001	Atlantic menhaden	EGG	38.61
			Fourbeard rockling	EGG	12.87
			Grubby	PYS	57.91
			Winter flounder	PYS	90.08
	SB-6	4/14/2001	Atlantic menhaden	EGG	32.85
			American sandlance	PYS	10.95
			Grubby	PYS	711.72
			Grubby	YS	43.80
			Winter flounder	EGG	10.95
			Winter flounder	PYS	65.70
		4/27/2001	Atlantic menhaden	EGG	176.71
			American sandlance	PYS	17.67
			Atlantic tomcod	PYS	5.89
			Grubby	YS	17.67
			Grubby	PYS	223.83
			Striped cusk eel	PYS	5.89
			Winter flounder	YS	188.49
			Winter flounder	UID	41.23
			Winter flounder	PYS	1566.81

Table A-6
Summary of May 2001 Sampling Data

Area	Station	Sampling Date	Species	Life Stage	Number per 1000 m^3
Arthur Kill	AK-1	5/9/2001	Atlantic menhaden	EGG	42.67
			Atlantic silverside	PYS	26.67
			Atlantic silverside	YS	10.67
			Grubby	PYS	10.67
			Tautog	EGG	32.00
			Weakfish	EGG	26.67
			Winter flounder	PYS	64.00
		5/24/2001	Bay anchovy	EGG	70.91
			Northern pipefish	PYS	6.45
			Tautog	EGG	335.21
			Weakfish	EGG	32.23
			Windowpane	EGG	6.45
			Windowpane	PYS	12.89
	AK-2	5/9/2001	Atlantic menhaden	EGG	82.52
			Atlantic silverside	YS	5.50
			Atlantic silverside	PYS	5.50
			Tautog	EGG	88.02
			Weakfish	EGG	154.03
			Winter flounder	PYS	198.04
		5/24/2001	Atlantic menhaden	EGG	24.56
			Atlantic silverside	PYS	42.98
			Bay anchovy	EGG	36.84
			Hogchoker	EGG	6.14
			Tautog	EGG	571.03
			Weakfish	EGG	36.84
			Winter flounder	PYS	12.28
			Windowpane	EGG	190.34
	AK-3	5/9/2001	Tautog	EGG	80.40
			Winter flounder	PYS	17.23
		5/24/2001	Atlantic menhaden	EGG	178.04
			Bay anchovy	EGG	150.65
			Bay anchovy	PYS	41.94
			Fourbeard rockling	EGG	13.70
			Hogchoker	EGG	41.09
			Striped bass	YS	5.99
			Tautog	EGG	1753.01
			Weakfish	EGG	479.34
			Winter flounder	PYS	41.94
			Windowpane	PYS	5.99
			Windowpane	EGG	780.64
	AK-4	5/9/2001	Tautog	EGG	51.89
			Weakfish	EGG	10.38
			Winter flounder	PYS	36.32
		5/24/2001	Atlantic menhaden	EGG	16.24
			Atlantic silverside	PYS	5.41
			Bay anchovy	EGG	254.40
			Bay anchovy	PYS	64.95
			Tautog	EGG	102.84
			UID	PYS	64.95
			Weakfish	EGG	32.48
			Windowpane	PYS	5.41
			Windowpane	EGG	32.48

Table A-6 (Cont'd)
Summary of May Sampling Data

Area	Station	Sampling Date	Species	Life Stage	Number per 1000 m^3
Arthur Kill	AK-5	5/9/2001	Atlantic herring	PYS	11.20
			Atlantic menhaden	EGG	156.79
			Atlantic silverside	UID	11.20
			Atlantic silverside	YS	67.20
			Atlantic silverside	PYS	11.20
			Grubby	PYS	78.40
			Tautog	EGG	257.59
			Weakfish	EGG	705.56
			Winter flounder	PYS	548.77
		5/24/2001	Atlantic menhaden	EGG	16.53
			Atlantic silverside	PYS	38.58
			Bay anchovy	PYS	5.51
			Bay anchovy	EGG	88.17
			Hogchoker	EGG	5.51
			Unidentified drum	PYS	5.51
			Tautog	EGG	611.70
			Weakfish	EGG	60.62
			Windowpane	EGG	154.30
	AK-6	5/9/2001	Atlantic herring	PYS	5.88
			Fourbeard rockling	EGG	5.88
			Grubby	PYS	5.88
			Tautog	EGG	64.65
			Weakfish	EGG	129.31
			Winter flounder	PYS	117.55
		5/24/2001	Atlantic menhaden	EGG	12.90
			Atlantic silverside	PYS	6.45
			Bay anchovy	PYS	6.45
			Bay anchovy	EGG	206.46
			Unidentified drum	PYS	12.90
			Tautog	EGG	993.61
			Weakfish	EGG	90.33
			Winter flounder	PYS	12.90
			Windowpane	EGG	135.49

Table A-7
Summary of June 2001 Sampling Data

Area	Station	Date	Species	Life Stage	Density (no./1000m^3)
Arthur Kill	AK-1	6/4/2001	Unidentified alosid	PYS	74.57
			Atlantic menhaden	EGG	4.39
			Atlantic silverside	PYS	4.39
			Bay anchovy	EGG	140.38
			Unidentified labrid	EGG	35.09
			Northern pipefish	PYS	21.93
			Windowpane	EGG	52.64
			Windowpane	PYS	17.55
	AK-2	6/4/2001	Bay anchovy	EGG	33.96
			Unidentified clupeid	UID	9.70
			Unidentified labrid	EGG	218.33
			Morone spp.	PYS	9.70
			Weakfish	EGG	19.41
			Windowpane	EGG	713.20
	AK-3	6/4/2001	Bay anchovy	EGG	77.90
			Conger eel	LEPTO	11.99
			Hogchoker	EGG	23.97
			Unidentified labrid	EGG	497.39
			Weakfish	EGG	149.82
			Winter flounder	PYS	227.72
			Windowpane	EGG	1426.26
			Windowpane	PYS	5.99
	AK-4	6/4/2001	Unidentified alosid	PYS	31.34
			Atlantic menhaden	EGG	5.22
			Atlantic silverside	PYS	15.67
			Bay anchovy	EGG	94.03
			Unidentified clupeid	PYS	10.45
			Unidentified clupeid	UID	20.90
			Unidentified labrid	EGG	57.47
			Northern pipefish	PYS	10.45
			Weakfish	EGG	20.90
			Weakfish	PYS	36.57
			Winter flounder	PYS	5.22
	AK-5	6/4/2001	Bay anchovy	EGG	63.13
			Conger eel	LEPTO	4.51
			Unidentified labrid	EGG	211.95
			Morone spp.	PYS	4.51
			Unidentified	UID	4.51
			Weakfish	EGG	13.53
			Winter flounder	PYS	13.53
			Windowpane	EGG	798.20
	AK-6	6/4/2001	Unidentified alosid	PYS	12.90
			Bay anchovy	EGG	86.00
			Hogchoker	EGG	4.30
			Unidentified labrid	EGG	283.80
			Striped bass	PYS	8.60
			Weakfish	EGG	4.30
			Winter flounder	PYS	21.50
			Windowpane	EGG	559.00

Table A-7 (cont'd)
Summary of June 2001 Sampling Data

Area	Station	Date	Species	Life Stage	Density (no./1000m^3)
Newark Bay	NB-1	6/4/2001	Bay anchovy	EGG	115.81
			Conger eel	LEPTO	3.74
			Unidentified clupeid	PYS	3.74
			Unidentified labrid	EGG	108.34
			Weakfish	EGG	3.74
			Winter flounder	PYS	134.49
			Windowpane	JUV	3.74
			Windowpane	EGG	347.43
			Windowpane	PYS	7.47
	NB-2	6/4/2001	Northern pipefish	PYS	5.73
			Winter flounder	PYS	11.46
			Windowpane	EGG	5.73
	NB-3	6/4/2001	Unidentified alosid	PYS	10.72
			Bay anchovy	EGG	5.36
			Unidentified labrid	EGG	5.36
			Northern pipefish	PYS	5.36
	NB-4	6/4/2001	Bay anchovy	EGG	34.47
			Unidentified clupeid	PYS	4.92
			Unidentified labrid	EGG	24.62
			Northern pipefish	PYS	9.85
			Windowpane	EGG	39.40
	NB-5	6/4/2001	Bay anchovy	EGG	142.78
			Unidentified labrid	EGG	138.02
			Weakfish	EGG	9.52
			Winter flounder	PYS	57.11
			Windowpane	EGG	475.92
			Windowpane	PYS	38.07
	NB-6	6/4/2001	Atlantic menhaden	EGG	4.41
			Bay anchovy	EGG	88.12
			Unidentified clupeid	PYS	4.41
			Unidentified labrid	EGG	101.34
			Striped bass	PYS	4.41
			Winter flounder	PYS	8.81
			Windowpane	EGG	242.32
			Windowpane	PYS	4.41
	NB-7	6/4/2001	Bay anchovy	EGG	45.88
			Unidentified clupeid	UID	74.55
			Northern pipefish	PYS	11.47
			Windowpane	EGG	17.20

Table A-7 (cont'd)
Summary of June 2001 Sampling Data

Area	Station	Date	Species	Life Stage	Density (no./1000m^3)
Port Jersey	PJ-1	6/5/2001	Atlantic menhaden	PYS	5.11
			Atlantic menhaden	EGG	102.17
			Bay anchovy	EGG	326.93
			Unidentified clupeid	PYS	20.43
			Hogchoker	EGG	40.87
			Unidentified labrid	EGG	612.99
			Northern pipefish	PYS	5.11
			Striped bass	PYS	10.22
			Weakfish	EGG	81.73
			Winter flounder	PYS	15.32
			Windowpane	PYS	5.11
			Windowpane	EGG	3085.40
	PJ-2	6/5/2001	Atlantic menhaden	PYS	29.32
			Atlantic menhaden	EGG	17.59
			Bay anchovy	EGG	105.55
			Unidentified clupeid	PYS	58.64
			Unidentified labrid	EGG	281.46
			Striped bass	PYS	11.73
			Unidentified drum	UID	5.86
			Weakfish	EGG	29.32
			Windowpane	EGG	521.87
			Windowpane	PYS	5.86
	PJ-3	6/5/2001	Bay anchovy	EGG	157.92
			Unidentified clupeid	UID	59.22
			Unidentified labrid	EGG	34.54
			Windowpane	PYS	4.93
			Windowpane	EGG	64.15
	PJ-4	6/5/2001	Unidentified clupeid	PYS	5.24
			Hogchoker	EGG	181.75
			Unidentified labrid	EGG	699.02
			Weakfish	EGG	293.59
			Windowpane	PYS	5.24
			Windowpane	EGG	2572.41
	PJ-5	6/5/2001	Bay anchovy	EGG	131.90
			Hogchoker	EGG	37.69
			Unidentified labrid	EGG	810.24
			Striped bass	PYS	4.71
			Weakfish	EGG	188.43
			Winter flounder	JUV	4.71
			Winter flounder	PYS	18.84
			Windowpane	EGG	2977.16
			Windowpane	PYS	4.71

Table A-7 (cont'd)
Summary of June 2001 Sampling Data

Area	Station	Date	Species	Life Stage	Density (no./1000m^3)
South Brooklyn/ Upper Bay	SB-1	6/5/2001	Bay anchovy	EGG	22.76
			Hogchoker	EGG	22.76
			Unidentified labrid	EGG	887.53
			Weakfish	EGG	125.17
			Windowpane	EGG	1445.09
	SB-2	6/5/2001	Bay anchovy	EGG	74.51
			Conger eel	LEPTO	9.31
			Unidentified labrid	EGG	1192.17
			Weakfish	EGG	223.53
			Windowpane	PYS	18.63
			Windowpane	EGG	4004.94
	SB-3	6/5/2001	American shad	EGG	7.56
			Atlantic tomcod	JUV	7.56
			Bay anchovy	EGG	7.56
			Hogchoker	EGG	22.69
			Unidentified labrid	EGG	75.62
			Northern pipefish	PYS	7.56
			Weakfish	EGG	60.50
			Windowpane	EGG	90.75
	SB-4	6/5/2001	Conger eel	LEPTO	4.89
			Hogchoker	EGG	547.90
			Unidentified labrid	EGG	1956.78
			Winter flounder	PYS	34.24
			Windowpane	EGG	5479.00
			Windowpane	PYS	9.78
	SB-5	6/5/2001	Atlantic menhaden	EGG	5.35
			Bay anchovy	EGG	21.41
			Hogchoker	EGG	369.36
			Unidentified labrid	EGG	936.78
			Weakfish	EGG	80.30
			Windowpane	EGG	920.72
			Windowpane	PYS	32.12
	SB-6	6/5/2001	Hogchoker	EGG	504.88
			Hogchoker	EGG	1170.73
			Winter flounder	PYS	7.32
			Windowpane	PYS	51.22
			Windowpane	EGG	826.83

YS = yolk sac larvae
PYS = post yolk sac larvae
Lepto = leptocephalus larvae
Juv = juvenile
UID = unidentified

Table 1 (Cont'd). Summary of May Sampling Data

Area	Station	Sampling Date	Species	Life Stage	Number per 1000 m^3
Newark Bay	NB-1	5/9/2001	Tautog	EGG	6.77
			Weakfish	EGG	47.40
			Winter flounder	PYS	27.09
		5/24/2001	Bay anchovy	EGG	57.32
			Bay anchovy	PYS	8.19
			Tautog	EGG	835.19
			Weakfish	EGG	24.56
			Winter flounder	PYS	8.19
			Windowpane	EGG	286.59
	NB-2	5/9/2001	*Alosa* sp.	EGG	5.18
			Tautog	EGG	20.73
			Winter flounder	PYS	20.73
		5/24/2001	Bay anchovy	EGG	14.93
			Bay anchovy	PYS	7.46
			Northern pipefish	PYS	7.46
			Tautog	EGG	119.42
			Winter flounder	PYS	7.46
			Windowpane	PYS	7.46
			Windowpane	EGG	67.17
	NB-3	5/9/2001	Tautog	EGG	20.38
			Weakfish	EGG	15.29
			Winter flounder	PYS	15.29
		5/24/2001	Bay anchovy	EGG	6.91
			Tautog	EGG	331.87
			Weakfish	EGG	6.91
			Windowpane	PYS	6.91
			Windowpane	EGG	27.66
	NB-4	5/9/2001	Grubby	PYS	11.12
			Tautog	EGG	33.35
			Winter flounder	PYS	61.14
		5/24/2001	Bay anchovy	EGG	36.74
			Northern pipefish	PYS	6.12
			Tautog	EGG	330.67
			Weakfish	EGG	12.25
			Windowpane	EGG	73.48
	NB-5	5/9/2001	Atlantic herring	PYS	11.72
			Grubby	PYS	5.86
			Tautog	EGG	123.07
			Weakfish	EGG	46.88
			Winter flounder	PYS	29.30
		5/24/2001	Atlantic menhaden	EGG	26.52
			Atlantic tomcod	JUV	10.61
			Bay anchovy	EGG	84.88
			Hogchoker	EGG	10.61
			Tautog	EGG	1029.15
			Weakfish	EGG	37.13
			Winter flounder	PYS	15.91
			Windowpane	EGG	254.64
			Windowpane	PYS	5.30
	NB-6	5/9/2001	Grubby	PYS	10.35
			Tautog	EGG	15.53
			Weakfish	EGG	41.40
			Winter flounder	PYS	77.63
		5/24/2001	Bay anchovy	EGG	54.48
			Tautog	EGG	626.49
			Weakfish	EGG	61.29
			Windowpane	PYS	13.62
			Windowpane	EGG	143.00
	NB-7	5/9/2001	Grubby	PYS	5.88
			Tautog	EGG	29.41
			Winter flounder	PYS	47.06
		5/24/2001	Atlantic menhaden	EGG	6.60
			Atlantic menhaden	PYS	6.60
			Bay anchovy	EGG	46.21
			Tautog	EGG	283.85
			Weakfish	EGG	6.60
			Windowpane	EGG	46.21
			Windowpane	PYS	33.01

Table 1 (Cont'd). Summary of May Sampling Data

Area	Station	Sampling Date	Species	Life Stage	Number per 1000 m^3
Port Jersey	PJ-1	5/10/2001	Grubby	JUV	6.01
			Tautog	EGG	72.14
			Weakfish	EGG	234.45
			Winter flounder	PYS	24.05
			Windowpane	EGG	18.03
		5/25/2001	Bay anchovy	EGG	6.59
			Hogchoker	EGG	39.53
			Tautog	EGG	401.93
			Weakfish	EGG	191.08
			Winter flounder	PYS	6.59
			Windowpane	EGG	105.42
			Windowpane	PYS	32.94
	PJ-2	5/10/2001	Atlantic menhaden	EGG	265.80
			Atlantic menhaden	YS	162.63
			Tautog	EGG	118.91
			UID #2	EGG	545.58
			Weakfish	EGG	685.48
			Winter flounder	PYS	20.98
			Windowpane	EGG	62.95
		5/25/2001	Bay anchovy	EGG	6.42
			Hogchoker	EGG	12.83
			Tautog	EGG	288.73
			Weakfish	EGG	38.50
			Winter flounder	PYS	6.42
			Windowpane	EGG	76.99
			Windowpane	PYS	12.83
	PJ-3	5/10/2001	Atlantic menhaden	EGG	21.56
			Tautog	EGG	32.34
			Weakfish	EGG	269.52
			Winter flounder	PYS	5.39
			Windowpane	EGG	16.17
		5/25/2001	Bay anchovy	EGG	28.07
			Tautog	EGG	179.67
			Weakfish	EGG	56.15
			Windowpane	EGG	61.76
			Windowpane	PYS	5.61
	PJ-4	5/10/2001	Grubby	PYS	10.84
			Tautog	EGG	108.39
			Weakfish	EGG	1186.92
			Winter flounder	PYS	205.95
			Windowpane	EGG	135.49
		5/25/2001	Bay anchovy	EGG	58.80
			Hogchoker	EGG	44.10
			Tautog	EGG	970.25
			Weakfish	EGG	536.58
			Winter flounder	PYS	27.56
			Windowpane	EGG	345.47
			Windowpane	PYS	16.54
	PJ-5	5/10/2001	Atlantic menhaden	EGG	7.91
			Grubby	PYS	39.56
			Tautog	EGG	118.67
			Weakfish	EGG	909.79
			Winter flounder	PYS	284.81
			Windowpane	EGG	94.94
		5/25/2001	Fourbeard rockling	PYS	11.32
			Hogchoker	EGG	135.87
			Tautog	EGG	1018.99
			Weakfish	EGG	792.55
			Winter flounder	PYS	130.20
			Windowpane	EGG	622.72
			Windowpane	PYS	45.29

Table 1 (Cont'd). Summary of May Sampling Data

Area	Station	Sampling Date	Species	Life Stage	Number per 1000 m^3
South Brooklyn/ Upper Bay	SB-1	5/10/2001	Fourbeard rockling	EGG	11.32
			Grubby	PYS	11.32
			Tautog	EGG	33.97
			Weakfish	EGG	260.44
			Windowpane	EGG	101.91
			Windowpane	PYS	67.94
		5/25/2001	Hogchoker	EGG	12.30
			Tautog	EGG	516.41
			Weakfish	EGG	221.32
			Windowpane	EGG	196.73
	SB-2	5/10/2001	Atlantic menhaden	EGG	186.86
			Fourbeard rockling	EGG	9.34
			Tautog	EGG	121.46
			Weakfish	EGG	1065.10
			Winter flounder	PYS	46.71
		5/25/2001	Atlantic menhaden	EGG	8.93
			Bay anchovy	EGG	17.87
			Hogchoker	EGG	71.47
			Tautog	EGG	1277.51
			Weakfish	EGG	643.22
			Winter flounder	PYS	53.60
			Windowpane	EGG	607.49
	SB-3	5/10/2001	Atlantic menhaden	EGG	5.80
			Tautog	EGG	11.60
			Weakfish	EGG	156.60
			Winter flounder	PYS	34.80
			Windowpane	EGG	34.80
		5/25/2001	Bay anchovy	EGG	15.19
			Hogchoker	EGG	45.57
			Tautog	EGG	744.27
			Weakfish	EGG	60.76
			Winter flounder	PYS	5.06
			Windowpane	PYS	50.63
			Windowpane	EGG	131.64
	SB-4	5/10/2001	Atlantic herring	PYS	5.65
			Atlantic menhaden	EGG	440.83
			Fourbeard rockling	EGG	5.65
			Grubby	PYS	5.65
			Hogchoker	EGG	11.30
			Tautog	EGG	310.84
			Weakfish	PYS	11.30
			Weakfish	EGG	3323.15
			Winter flounder	PYS	90.43
			Windowpane	EGG	519.95
			Windowpane	YS	5.65
		5/25/2001	Atlantic menhaden	EGG	215.28
			Bay anchovy	EGG	71.76
			Hogchoker	EGG	897.01
			Unidentified drum	PYS	4.49
			Tautog	EGG	4341.54
			Weakfish	EGG	574.09
			Winter flounder	PYS	71.76
			Windowpane	PYS	35.88
			Windowpane	EGG	1327.58
	SB-5	5/10/2001	Atlantic menhaden	EGG	152.91
			Fourbeard rockling	EGG	5.88
			Tautog	EGG	135.26
			Weakfish	EGG	1187.96
			Winter flounder	PYS	23.52
			Windowpane	EGG	141.14
		5/25/2001	Atlantic menhaden	EGG	27.53
			Bay anchovy	EGG	27.53
			Hogchoker	EGG	220.22
			Tautog	EGG	1858.10
			Weakfish	EGG	688.19
			Winter flounder	PYS	89.46
			Windowpane	EGG	770.77
			Windowpane	PYS	13.76

Table 1 (Cont'd). Summary of May Sampling Data

Area	Station	Sampling Date	Species	Life Stage	Number per 1000 m^3
South Brooklyn/ Upper Bay	SB-6	5/10/2001	Atlantic menhaden	EGG	314.73
			Grubby	PYS	13.68
			Tautog	EGG	68.42
			Weakfish	PYS	54.74
			Weakfish	EGG	716.12
			Winter flounder	PYS	223.50
			Windowpane	EGG	109.47
			Windowpane	YS	4.56
		5/25/2001	Atlantic menhaden	EGG	42.17
			Bay anchovy	EGG	63.25
			Fourbeard rockling	PYS	5.27
			Hogchoker	EGG	442.76
			Tautog	EGG	2635.50
			Weakfish	EGG	780.11
			Winter flounder	PYS	105.42
			Windowpane	PYS	57.98
			Windowpane	EGG	864.44

APPENDIX B

WATER QUALITY DATA
DECEMBER 2000 - JUNE 2001

Table B-1
Water Quality Data - December 2000

Area	Station	Date	Water Temperature (°C)			Dissolved Oxygen (mg/l)			Turbidity (ntu)			Salinity (ppt)		
			Surface	Mid Water	Bottom	Surface	Mid Water	Bottom	Surface	Mid Water	Bottom	Surface	Mid Water	Bottom
Arthur Kill	AK-1	12/15/2000	5.70	5.70	5.70	9.60	9.50	9.50	4	2	7	20.50	20.60	20.60
	AK-2	12/15/2000	5.80	5.60	5.60	9.50	9.40	9.40	7	7	10	20.30	20.90	20.90
	AK-3	12/15/2000	5.60	5.70	5.80	9.50	9.30	9.40	9	8	9	20.00	20.00	19.93
	AK-4	12/15/2000	5.30	5.20	5.10	9.00	9.00	9.00	7	7	2	20.00	20.20	20.30
Newark Bay	NB-1	12/18/2000	5.30	5.00	5.10	10.30	10.10	10.00	15	17	20	15.20	16.10	17.70
	NB-2	12/18/2000	5.40	5.40	5.40	10.20	9.70	9.80	22	18	17	12.50	16.30	14.70
	NB-3	12/18/2000	5.00	4.90	5.20	10.40	10.50	10.00	17	25	41	15.10	15.50	18.70
	NB-4	12/18/2000	5.10	5.10	5.50	10.40	10.10	9.80	16	12	84	14.30	16.80	21.20
	NB-5	12/18/2000	5.20	5.20	5.50	10.20	10.30	9.90	14	12	11	15.40	17.70	21.20
	NB-6	12/15/2000	5.10	5.30	5.30	9.90	9.70	9.70	7	6	4	19.30	20.80	21.20
	NB-7	12/18/2000	5.20	5.20	5.20	10.30	10.20	10.10	12	14	12	16.30	18.50	18.70
Port Jersey	PJ-1	12/14/2000	6.20	6.20	6.20	9.10	9.20	9.10	22	16	28	24.90	24.20	24.40
	PJ-2	12/14/2000		6.20			9.40			10			22.80	
	PJ-3	12/14/2000	5.80		5.80	9.50		9.60	8		6	22.50		22.50
	PJ-4	12/14/2000	5.80	5.90	6.30	10.60	10.60	9.50	5	6	10	22.60	23.30	27.40
	PJ-5	12/15/2000	5.50	5.80	5.80	9.70	9.50	9.50	5	4	5	21.80	22.90	23.00
South Brooklyn/ Upper Bay	SB-1	12/15/2000	5.90	5.90	5.90	8.80	8.80	8.70	5	5	5	22.20	22.50	22.90
	SB-2	12/15/2000	5.20	5.80	6.10	8.90	8.60	8.50	3	4	2	22.00	23.60	24.60
	SB-3	12/15/2000	5.90	6.10	6.10	8.90	8.80	8.80	8	9	8	24.60	25.10	25.10
	SB-4	12/15/2000	5.70	5.70	6.10	9.20	9.00	8.80	8	7	10	21.00	21.50	25.00
	SB-5	12/14/2000	6.20	6.20	6.20	9.00	9.00	9.00	11	10	7	24.80	24.30	24.40
	SB-6	12/15/2000	6.00	6.10	6.20	8.80	8.80	8.70	3	3	1	25.60	26.60	26.90

Table B-2
Water Quality Data - January 2001

Area	Station	Date	Water Temperature (°C)			Dissolved Oxygen (mg/l)			Turbidity (ntu)			Salinity (ppt)		
			Surface	Mid Water	Bottom	Surface	Mid Water	Bottom	Surface	Mid Water	Bottom	Surface	Mid Water	Bottom
Arthur Kill	AK-1	1/18/2001	3.00	3.00	3.10	9.90	9.90	9.90	7	7	6	21.00	21.10	21.40
		1/29/2001	3.40	3.80	3.70	10.80	10.80	10.50	6	7	8	19.90	20.70	21.40
	AK-2	1/18/2001	3.10	3.10	3.20	9.90	9.90	10.00	7	9	8	21.30	21.40	21.50
		1/29/2001	3.60	3.60	3.30	10.70	11.70	11.00	7	7	9	20.80	20.70	23.40
	AK-3	1/18/2001	3.00	3.10	3.30	10.00	9.90	10.00	9	9	10	21.00	21.50	21.90
		1/29/2001	4.00	3.60	3.70	10.50	10.60	10.40	8	8	7	20.30	20.70	21.30
	AK-4	1/18/2001	3.70	3.70	3.70	9.60	10.10	10.00	11	8	9	21.60	21.40	21.40
		1/29/2001	3.60	3.50	3.40	10.70	10.80	10.80	7	7	6	20.90	20.20	20.30
Newark Bay	NB-1	1/19/2001	3.30	-	3.40	10.60	-	10.60	8	-	8	18.60	-	19.00
		1/29/2001	3.30	-	3.20	10.80	-	10.50	5	-	6	18.00	-	18.40
	NB-2	1/19/2001	3.60	-	3.50	10.50	-	10.40	7	-	8	18.50	-	19.00
		1/29/2001	3.10	-	3.10	10.90	-	10.80	7	-	7	17.30	-	18.20
	NB-3	1/19/2001	3.50	-	3.70	10.60	-	10.50	6	-	8	18.40	-	19.10
		1/29/2001	3.30	3.20	3.20	10.90	10.70	10.80	7	7	7	18.90	18.80	19.00
	NB-4	1/18/2001	3.00	3.10	3.20	10.10	10.10	10.00	6	6	7	20.90	20.80	21.30
		1/29/2001	3.30	-	3.20	11.10	-	11.00	6	-	6	18.60	-	19.00
	NB-5	1/18/2001	3.10	3.20	3.10	10.00	10.00	10.00	7	8	8	20.70	21.30	21.20
		1/29/2001	3.50	3.20	3.10	10.90	10.90	10.70	6	6	6	18.40	19.70	21.20
	NB-6	1/18/2001	3.20	3.20	3.30	10.20	10.30	10.20	6	6	6	21.90	21.90	22.40
		1/29/2001	3.60	3.10	3.10	11.00	10.60	10.60	5	6	9	19.40	20.70	21.50
	NB-7	1/18/2001	3.10	3.10	3.10	10.10	10.10	10.10	11	10	6	20.50	20.60	20.80
		1/29/2001	3.40	3.20	3.10	10.80	10.70	10.70	8	8	18	20.10	21.30	21.60
Port Jersey	PJ-1	1/17/2001	2.80	2.80	3.20	11.10	10.90	10.30	9	8	7	18.70	18.90	22.60
		1/26/2001	2.90	3.10	2.90	10.7	10.70	10.60	11	10	12	20.9	21.80	22.20
	PJ-2	1/17/2001	2.70	2.70	2.80	10.90	10.7	10.60	10	-	7	18.70	19.2	20.80
		1/26/2001	3.00	3.10	4.00	10.90	10.90	10.30	9	9	10	20.60	21.00	25.40
	PJ-3	1/19/2001	3.10	3.20	3.80	11.70	11.50	10.90	3	4	7	20.50	20.60	22.80
		1/26/2001	3.70	-	3.10	10.50	-	10.50	7	-	6	23.40	-	23.40
	PJ-4	1/17/2001	2.60	3.30	3.50	11.10	10.21	10.10	14	7	8	17.90	23.70	24.50
		1/26/2001	2.90	3.60	3.80	10.80	10.30	10.30	8	7	13	22.10	24.80	24.20
	PJ-5	1/17/2001	3.00	3.50	4.50	10.70	10.20	9.70	9	8	6	20.10	23.90	27.00
		1/26/2001	2.90	3.20	3.20	10.90	10.40	10.30	9	10	10	21.30	23.60	23.80
South Brooklyn/ Upper Bay	SB-1	1/19/2001	4.10	3.80	4.00	10.80	11.00	10.80	9	6	10	23.90	24.20	25.00
		1/26/2001	3.40	3.40	3.80	10.50	10.40	10.10	9	6	5	23.50	24.20	25.80
	SB-2	1/19/2001	3.80	3.80	3.90	10.80	10.70	10.80	5	4	6	23.70	24.40	24.80
		1/26/2001	3.50	3.20	3.80	10.60	10.30	10.10	5	6	5	22.90	24.30	26.10
	SB-3	1/17/2001	3.10	3.20	3.80	10.80	10.30	10.10	8	7	4	21.30	22.40	25.40
		1/26/2001	4.00	3.70	3.80	10.50	10.60	10.10	6	9	6	24.30	24.20	27.10
	SB-4	1/19/2001	4.00	3.90	4.40	10.80	10.80	10.40	7	6	15	23.90	24.80	27.80
		1/26/2001	3.60	3.70	3.60	10.50	10.30	10.20	8	10	7	24.10	24.30	25.30
	SB-5	1/17/2001	3.00	3.30	3.60	10.60	10.30	10.30	7	7	6	20.80	23.30	24.00
		1/26/2001	2.90	3.30	3.70	10.90	10.50	10.30	9	7	10	20.20	23.30	24.60
	SB-6	1/19/2001	3.50	3.90	4.40	11.50	10.90	10.60	5	5	5	20.60	24.60	27.20
		1/26/2001	3.50	3.20	3.90	10.90	10.60	10.10	7	7	5	22.40	23.80	26.90

Table B-3
Water Quality Data - February 2001

Area	Station	Date	Water Temperature (°C)			Dissolved Oxygen (mg/l)			Turbidity (ntu)			Salinity (ppt)		
			Surface	Mid Water	Bottom	Surface	Mid Water	Bottom	Surface	Mid Water	Bottom	Surface	Mid Water	Bottom
Arthur Kill	AK-1	2/13/2001	4.20	5.00	3.80	10.50	10.30	10.40	6	3	9	19.10	19.10	19.60
	AK-1	2/26/2001	4.40	4.30	4.30	10.70	10.80	10.90	11	12	77	20.10	20.10	20.20
	AK-2	2/13/2001	4.10	3.90	3.80	10.50	10.50	10.50	6	8	9	19.10	19.30	19.80
	AK-2	2/26/2001	4.40	4.20	4.20	10.60	10.40	10.40	11	8	12	20.00	20.10	20.00
	AK-3	2/13/2001	4.10	4.00	4.30	10.50	10.40	10.30	7	7	8	18.90	19.10	19.00
	AK-3	2/26/2001	4.80	4.30	4.30	10.50	10.50	10.40	10	11	15	18.90	19.60	20.60
	AK-4	2/13/2001	5.30	5.20	5.20	10.10	10.10	10.00	6	3	3	18.90	18.90	20.00
	AK-4	2/26/2001	4.90	4.90	4.90	10.80	10.80	10.70	9	13	11	19.00	19.00	19.00
Newark Bay	NB-1	2/13/2001	5.00	3.50	3.50	10.90	10.70	10.80	7	9	10	15.30	19.10	19.00
	NB-1	2/26/2001	4.60	4.00	4.00	11.20	10.80	10.10	13	12	14	14.30	17.50	18.50
	NB-2	2/13/2001	5.30		3.90	10.90		10.70	5		7	15.60		18.20
	NB-2	2/26/2001	4.40		4.20	11.20		10.90	12		17	15.00		16.60
	NB-3	2/13/2001	5.30		4.00	10.80		10.60	5		6	16.10		18.90
	NB-3	2/26/2001	4.40		4.40	11.10		11.00	11		23	16.40		16.80
	NB-4	2/13/2001	4.60		3.90	10.80		10.60	5		7	17.80		18.90
	NB-4	2/26/2001	4.50		4.50	11.10		11.00	10		17	16.50		16.60
	NB-5	2/13/2001	4.50	3.60	3.40	10.80	10.60	10.60	6	7	10	16.30	18.30	19.20
	NB-5	2/26/2001	4.60	3.90	3.80	11.10	10.60	10.50	11	12	15	14.60	19.20	20.00
	NB-6	2/13/2001	4.20	4.00	4.00	10.70	10.80	10.60	7	6	6	18.70	19.30	20.20
	NB-6	2/26/2001	4.50	3.90	3.80	11.30	10.70	10.50	10	15	16	16.50	19.70	20.80
	NB-7	2/13/2001	3.80	3.70	3.60	10.80	10.60	10.70	10	10	12	18.90	19.30	19.60
	NB-7	2/26/2001	4.20	4.20	4.10	10.70	10.70	10.60	11	12	19	19.30	19.00	19.50
Port Jersey	PJ-1	2/14/2001	3.20	3.40	3.40	11.40	11.20	11.00	17	14	19	16.20	19.70	19.70
	PJ-1	2/27/2001	4.10	4.00	3.90	12.10	12.00	11.50	10	9	17	18.20	18.70	22.30
	PJ-2	2/14/2001	3.30		3.60	11.10		10.50	18		26	18.00		20.40
	PJ-2	2/27/2001	4.00		3.80	12.10		12.30	11		18	18.70		20.20
	PJ-3	2/14/2001	3.80		3.60	11.20		10.70	11		11	18.40		21.20
	PJ-3	2/27/2001	4.20		3.80	11.30		11.30	10		14	19.50		20.40
	PJ-4	2/14/2001	3.90	3.50	3.40	11.10	10.80	10.80	17	11	10	17.10	21.00	21.50
	PJ-4	2/27/2001	4.00	3.80	4.00	11.40	11.10	10.80	9	10	9	19.00	22.00	23.10
	PJ-5	2/14/2001	3.60	3.60	3.70	11.20	10.50	10.70	16	12	10	17.00	22.40	22.60
	PJ-5	2/27/2001	4.30	3.80	4.00	12.00	11.70	11.20	11	9	15	19.30	21.10	24.20
South Brooklyn/ Upper Bay	SB-1	2/14/2001	3.90	3.80	3.70	10.40	10.40	10.30	5	10	8	23.00	23.30	24.60
	SB-1	2/27/2001	3.70	3.50	3.80	10.90	11.00	10.80	6	8	9	20.70	21.30	23.20
	SB-2	2/14/2001	4.00	3.80	3.60	10.50	10.60	10.50	7	8	8	22.50	22.90	23.30
	SB-2	2/27/2001	3.60	3.60	4.00	11.00	10.90	10.60	6	7	21	21.10	21.30	23.50
	SB-3	2/14/2001	3.90	3.70	3.60	10.80	10.50	10.60	11	8	9	20.70	24.40	23.00
	SB-3	2/27/2001	4.10	3.70	3.90	11.30	11.10	10.80	10	9	17	19.40	21.10	23.50
	SB-4	2/14/2001	3.90	3.80	3.80	10.60	10.50	10.30	10	8	7	22.60	23.90	26.30
	SB-4	2/27/2001	3.60	4.00	4.00	11.30	10.70	10.60	9	18	17	20.10	24.50	25.70
	SB-5	2/14/2001	3.60	3.50	3.80	11.20	10.80	10.50	19	16	12	16.90	21.00	22.90
	SB-5	2/27/2001	4.60	3.90	4.10	12.00	11.40	11.30	9	7	8	18.80	24.00	25.00
	SB-6	2/14/2001	3.90	3.70	3.70	10.90	10.60	10.50	12	7	6	20.20	23.50	25.00
	SB-6	2/27/2001	3.90	3.90	4.00	11.30	10.80	10.70	11	6	8	20.70	23.50	24.30

Table B-4
Water Quality Data - March 2001

Area	Station	Date	Water Temperature (ºC)			Dissolved Oxygen (mg/l)			Turbidity (ntu)			Salinity (ppt)		
			Surface	Mid Water	Bottom	Surface	Mid Water	Bottom	Surface	Mid Water	Bottom	Surface	Mid Water	Bot tom
Arthur Kill	AK-1	3/16/2001	6.20	5.10	4.80	10.50	10.30	10.40	8	10	8	16.40	18.30	18.80
		3/29/2001	6.00	5.90	5.60	10.10	10.00	9.90	8	11	17	14.20	14.30	15.20
	AK-2	3/16/2001	5.60	4.70	5.00	10.50	10.40	10.40	6	7	7	16.70	18.90	19.20
		3/29/2001	5.90	5.80	5.50	10.20	10.20	9.80	10	11	15	14.30	14.30	15.40
	AK-3	3/16/2001	6.30	4.80	5.00	10.60	10.40	10.30	6	6	6	15.90	17.20	18.00
		3/29/2001	6.10	5.90	5.80	10.10	10.00	10.10	9	13	10	13.90	14.30	14.40
	AK-4	3/16/2001	5.50	5.20	5.40	10.20	10.30	10.20	9	7	7	18.10	17.90	17.90
		3/29/2001	6.20	6.10	6.10	10.00	10.10	10.00	10	8	15	14.20	14.30	14.40
	AK-5	3/16/2001												
		3/29/2001	5.90	5.80	5.50	10.20	10.20	9.80	10	11	15	14.30	14.30	15.40
	AK-6	3/16/2001												
		3/29/2001	5.90	5.80	5.50	10.20	10.20	9.80	10	11	15	14.30	14.30	15.40
Newark Bay	NB-1	3/16/2001	6.30	4.90	4.70	10.60	10.50	10.20	6	7	9	15.00	17.30	18.30
		3/29/2001	5.60	5.40	5.40	11.40	10.50	10.30	9	15	13	7.40	11.40	12.60
	NB-2	3/16/2001	6.80		5.50	10.60		10.60	7		12	14.50		15.80
		3/29/2001	5.70		5.60	11.00		11.00	13		31	9.70		10.30
	NB-3	3/16/2001	6.50		5.10	10.70		10.50	6		6	14.40		17.00
		3/29/2001	5.70		5.40	11.00		10.30	7		10	9.50		13.80
	NB-4	3/16/2001	6.20	5.60	5.10	10.50	10.70	10.50	8	8	6	15.20	15.80	17.40
		3/29/2001	5.60		5.60	10.70		10.60	10		7	11.60		11.90
	NB-5	3/16/2001	6.50	4.90	5.00	10.70	10.40	10.30	9	7	8	14.30	17.60	18.10
		3/29/2001	5.60	5.50	5.30	10.90	10.70	10.30	9	15	13	10.50	11.80	14.30
	NB-6	3/16/2001	6.70	5.30	5.30	10.70	11.00	10.70	6	7	7	15.20	16.60	18.00
		3/29/2001	5.60	5.40	5.40	10.70	10.40	10.40	10	10	12	12.50	14.60	14.90
	NB-7	3/16/2001	6.00	5.30	5.10	10.80	10.70	10.50	7	7	8	14.60	15.00	16.00
		3/29/2001	5.50		5.40	10.70		10.50	10		31	12.50		13.40
Port Jersey	PJ-1	3/15/2001	4.80		4.20	11.20		10.70	10		9	17.00		19.90
		3/30/2001	4.90	4.90	4.90	10.90	10.80	10.80	15	13	13	16.10	16.40	17.00
	PJ-2	3/15/2001	4.60		4.20	11.00		10.90	10		30	16.60		18.60
		3/30/2001	4.90		4.80	11.00		11.00	18		29	15.10		15.10
	PJ-3	3/15/2001	4.60		4.40	11.00		11.00	7		8	17.30		18.90
		3/30/2001	4.90		4.90	10.90		10.70	10		25	15.50		16.00
	PJ-4	3/15/2001	4.60	4.20	4.30	11.10	10.70	10.60	9	9	16	16.20	21.00	22.20
		3/30/2001	4.90	4.90	4.90	11.10	11.00	10.30	14	12	7	15.20	15.30	20.60
	PJ-5	3/15/2001	4.40	4.30	4.40	11.00	10.60	10.50	9	6	5	18.80	22.40	24.60
		3/30/2001	4.90	4.90	4.90	11.10	10.90	10.40	15	14	10	15.10	15.60	20.40
South Brooklyn/ Upper Bay	SB-1	3/15/2001	4.50	4.30	4.30	10.60	10.60	10.50	6	8	7	21.40	21.50	22.50
		3/30/2001	5.10	4.90	4.90	10.40	10.30	10.30	7	7	8	20.00	20.30	20.30
	SB-2	3/15/2001	4.50	4.30	4.40	9.80	10.40	10.40	6	7	7	20.70	21.60	22.50
		3/30/2001	5.00	5.00	4.80	10.60	10.20	10.10	8	6	8	18.20	19.60	21.60
	SB-3	3/15/2001	4.60	4.30	4.30	10.80	10.70	10.70	6	6	5	19.30	20.60	21.70
		3/30/2001	5.10	5.10	5.10	10.40	10.40	10.40	8	9	8	19.30	19.10	19.20
	SB-4	3/15/2001	4.50	4.40	4.40	10.80	10.60	10.60	7	8	10	19.90	21.50	22.90
		3/30/2001	5.20	5.00	5.00	10.50	10.50	10.20	10	11	12	18.30	18.50	22.40
	SB-5	3/15/2001	4.40	4.30	4.40	10.80	10.70	10.50	8	6	4	20.40	23.00	24.00
		3/30/2001	5.00	5.00	4.90	10.70	10.60	10.30	12	10	11	17.30	18.00	21.40
	SB-6	3/15/2001	4.60	4.30	4.30	10.80	10.70	10.50	7	6	5	19.30	21.60	24.40
		3/30/2001	5.00	4.90	4.90	10.70	10.50	10.40	11	11	10	17.50	19.00	18.90

Table B-5
Water Quality Data - April 2001

Area	Station	Date	Temperature (°C)			Dissolved Oxygen (mg/L)			Turbidity (ntu)			Salinity (ppt)		
			Surface	Midwater	Bottom	Surface	Midwater	Bottom	Surface	Midwater	Bottom	Surface	Midwater	Bottom
Arthur Kill	AK-1	4/13/2001	9.30	8.80	8.80	9.80	9.90	9.90	11		14	9.80	10.20	10.40
		4/26/2001	11.60	11.60	11.70	7.60	7.70	7.60	9	9	9	16.50	16.50	16.50
	AK-2	4/13/2001	9.00	8.80	7.70	9.90	10.00	10.10	11	10	14	9.80	10.20	10.30
		4/26/2001	11.60	11.60	11.70	7.60	7.70	7.60	9	9	9	16.50	16.50	16.50
	AK-3	4/13/2001	9.40	9.20	9.10	9.70	9.80	9.70	16		19	9.70	9.50	9.80
		4/26/2001	11.70	11.90	11.60	7.00	7.20	7.20	7	10	7	16.70	16.70	16.60
	AK-4	4/13/2001	9.70	9.50	9.60	9.60	9.60	9.50	8	11	42	10.40	10.30	10.40
		4/26/2001	12.70	12.70	12.70	7.60	7.50	7.60	7	12	11	17.20	17.20	17.20
	AK-5	4/13/2001	9.30	8.80	8.30	9.80	10.00	10.20	13	14	15	9.80	10.40	11.20
		4/26/2001	11.50	11.70	11.80	7.60	7.60	7.60	7	8	8	16.50	16.50	16.50
	AK-6	4/13/2001	9.30	8.80	8.30	9.80	10.00	10.20	13	14	15	9.80	10.40	11.20
		4/26/2001	11.50	11.70	11.80	7.60	7.60	7.60	7	8	8	16.50	16.50	16.50
Newark Bay	NB-1	4/13/2001	10.20	10.10	8.70	9.80	9.80	9.70	10	11	18	8.50	8.60	10.70
		4/26/2001	12.80	11.80	11.40	8.00	7.90	7.80	12	16	32	14.50	15.50	16.10
	NB-2	4/13/2001	10.00	10.00	9.90	9.80	9.90	9.70	11	10	10	8.70	8.70	8.80
		4/26/2001	12.80		12.80	8.00		7.80	9		11	14.40		14.40
	NB-3	4/13/2001	10.10	10.10	10.10	9.70	9.70	9.70	11	11	12	8.60	8.60	8.60
		4/26/2001	12.90		12.50	8.10		8.10	6		10	14.50		15.10
	NB-4	4/13/2001	9.80	10.00	9.80	9.70	9.70	9.70	10	12	11	8.70	8.70	8.80
		4/26/2001	11.90		11.90	8.40		8.30	4		4	15.90		15.90
	NB-5	4/13/2001	10.20	9.40	8.90	9.80	9.90	9.80	11	15	19	8.50	9.50	10.70
		4/26/2001	12.70	12.30	12.30	8.10	7.80	7.80	7	12	16	14.60	14.90	15.20
	NB-6	4/13/2001	9.80	8.80	8.80	9.80	10.10	10.20	10	13	14	9.00	10.20	10.10
		4/26/2001	11.50	11.10	10.60	8.10	8.00	8.00	6	6	6	16.10	16.30	16.70
	NB-7	4/13/2001	9.80		9.90	9.80		9.80	11		11	8.70		9.10
		4/26/2001	11.40		11.00	8.10		7.70	6		6	16.00		16.30
Port Jersey	PJ-1	4/13/2001	8.20		7.50	10.80		10.70	20		23	7.50		9.70
		4/27/2001	11.70	11.00	10.00	9.70	11.60	12.20	18	15	13	12.40	13.40	17.00
	PJ-2	4/13/2001	7.80		7.40	11.10		11.10	25		28	6.50		6.50
		4/27/2001	12.00		10.70	11.20		12.00	14		31	12.70		14.40
	PJ-3	4/13/2001	8.70		8.80	10.70		10.60	16		18	8.00		8.50
		4/27/2001	10.80		10.50	9.90		11.70	15		13	14.00		15.00
	PJ-4	4/13/2001	9.30	8.40	7.30	10.70	10.60	9.90	16	18	14	8.20	9.20	23.20
		4/27/2001	11.60	9.90	9.30	11.50	12.50	11.70	16	18	14	12.80	17.40	22.60
	PJ-5	4/13/2001	8.40	7.80	7.40	10.70	10.70	10.50	20	21	18	7.50	8.90	11.20
		4/27/2001	10.80	9.70	8.90	13.50	12.30	13.20	16	12	8	14.30	19.50	24.90
South Brooklyn/ Upper Bay	SB-1	4/14/2001	8.90	8.00	7.40	10.40	10.40	9.50	14	14	15	8.70	9.50	19.50
		4/27/2001	10.50	10.30	10.00	12.80	10.80	11.90	9	8	8	16.70	17.60	18.20
	SB-2	4/14/2001	8.20	7.80	7.40	10.20	10.00	9.50	16	14	10	9.40	11.60	19.30
		4/27/2001	10.90	10.20	10.10	10.30	12.80	13.30	6	8	6	17.00	17.70	18.50
	SB-3	4/14/2001	7.60	7.60	7.30	10.70	10.30	10.60	27	21	20	6.40	7.80	8.90
		4/27/2001	10.70	10.20	10.20	11.60	11.00	12.40	11	12	11	15.30	15.60	15.90
	SB-4	4/14/2001	7.60	7.70	8.20	10.40	10.30	9.50	23		18	7.50	11.90	17.80
		4/27/2001	10.60	9.70	9.20	10.40	10.50	9.70	10	10	14	15.70	18.90	23.00
	SB-5	4/14/2001	7.50	7.30	7.10	13.40	11.20	11.10	25	22	20	4.40	12.20	10.40
		4/27/2001	11.10	9.70	9.10	8.80	9.00	9.00	20	16	16	12.60	18.60	24.40
	SB-6	4/14/2001	7.80	7.30	7.20	10.70	10.80	10.00	25	23	13	4.00	8.20	16.60
		4/27/2001	10.50	9.70	9.10	9.30	9.10	8.90	16	10	6	14.50	18.70	23.50

Table B-6
Water Quality Data - May 2001

Area	Station	Date	Temperature (°C)			Dissolved Oxygen (mg/L)			Turbidity (ntu)			Salinity (ppt)		
			Surface	Mid Water	Bottom	Surface	Mid Water	Bottom	Surface	Mid Water	Bottom	Surface	Mid Water	Bottom
Arthur Kill	AK-1	5/9/2001	15.70	14.90	15.00	7.20	7.20	7.20	8	10	29	18.90	18.90	19.00
		5/24/2001	16.60	16.40	16.90	4.80	4.80	4.70	9	10	11	19.70	19.70	19.80
	AK-2	5/9/2001	15.70	14.90	15.00	7.20	7.20	7.20	8	10	29	18.90	18.90	19.00
		5/24/2001	16.60	16.40	16.90	4.80	4.80	4.70	9	10	11	19.70	19.70	19.80
	AK-3	5/9/2001	15.20	15.30	15.20	5.70	5.70	5.71	13	10	10	19.00	18.90	18.90
		5/24/2001	17.30	16.40	16.70	4.40	4.40	4.60	9	10	10	19.30	19.60	19.50
	AK-4	5/9/2001	18.00		17.20	7.10	6.90	6.90	14	15	19	18.50	18.60	18.60
		5/24/2001	18.50	18.70	17.20	4.30	4.00	3.90	16	17	23	19.00	19.00	19.40
	AK-5	5/9/2001	15.80	15.10	13.50	7.00	6.90	7.60	10	12	52	18.70	18.90	20.50
		5/24/2001	17.00	16.40	16.50	5.00	4.80	4.90	10	11	11	19.20	19.50	19.60
	AK-6	5/9/2001	15.80	15.10	13.50	7.00	6.90	7.60	10	12	52	18.70	18.90	20.50
		5/24/2001	17.00	16.40	16.50	5.00	4.80	4.90	10	11	11	19.20	19.50	19.60
Newark Bay	NB-1	5/9/2001	16.10	15.20	15.20	7.50	7.60	7.50	11	16	16	16.90	17.80	18.00
		5/24/2001	17.90	16.90	16.70	4.10	4.10	4.30	16	14	14	15.80	17.30	17.90
	NB-2	5/9/2001	16.00		15.90	7.70		7.60	15		17	17.00		17.10
		5/24/2001	17.60		17.70	4.50		4.50	12		14	16.00		16.40
	NB-3	5/9/2001	16.10		15.90	7.80		7.90	8		16	17.40		17.50
		5/24/2001	17.50		17.20	4.80		4.50	12		11	16.80		17.40
	NB-4	5/9/2001	15.30	15.10	15.00	8.20	8.40	8.00	8	8	11	18.50	18.50	18.60
		5/24/2001	17.30		17.70	4.90		5.00	11		11	18.10		18.20
	NB-5	5/9/2001	16.30	14.40	14.20	8.00	7.70	7.60	6	13	12	18.10	19.10	19.70
		5/24/2001	17.30	17.10	17.20	4.70	5.90	5.30	12	10	11	16.90	17.80	17.20
	NB-6	5/9/2001	16.80	14.30	13.40	8.20	7.90	7.70	8	10	14	18.20	19.30	20.70
		5/24/2001	17.10	16.80	16.40	5.60	6.30	5.70	11	8	12	18.80	18.90	19.20
	NB-7	5/9/2001	15.00	14.20	14.50	7.90	7.80	7.70	13	23	21	18.90	19.30	19.10
		5/24/2001	16.70		16.80	8.30		8.10	13		16	19.30		19.20
Port Jersey	PJ-1	5/10/2001	16.00	14.80	13.20	7.80	7.80	7.60	3	14	6	17.80	18.30	22.40
		5/25/2001	15.00		15.00	6.90		6.80	15		17	21.10		21.20
	PJ-2	5/10/2001	14.60		14.50	7.50		7.60	17		22	19.20		18.90
		5/25/2001	15.10	15.00	15.00	6.80	6.80	6.70	20	24	34	20.50	20.50	20.50
	PJ-3	5/10/2001	14.10		14.00	7.60		7.50	3		3	20.60		21.20
		5/25/2001	15.50		15.30	6.60		6.70	18		25	20.50		20.90
	PJ-4	5/10/2001	16.00	13.60	12.60	7.80	6.40	7.30	2	10	11	19.10	20.70	24.80
		5/25/2001	15.20	15.20	14.90	6.90	6.90	6.50	9	10	11	21.10	21.10	21.80
	PJ-5	5/10/2001	15.80	13.10	13.10	8.10	7.80	7.80	3	4	9	17.70	23.00	25.10
		5/25/2001	15.10	15.10	15.00	6.90	6.70	6.60	11	11	11	21.30	21.70	22.20
South Brooklyn/ Upper Bay	SB-1	5/10/2001	14.50	13.30	13.00	7.80	8.00	7.80	8	7	63	21.00	21.40	23.30
		5/25/2001	14.90	14.90	14.90	6.40	6.30	6.30	9	13	12	21.60	21.80	21.80
	SB-2	5/10/2001	14.30	12.90	12.90	8.00	8.00	8.30	5	9	47	21.30	22.60	24.30
		5/25/2001	14.90	14.90	14.80	6.00	5.90	5.90	5	9	9	21.80	22.40	22.60
	SB-3	5/10/2001	14.90	13.70	13.20	7.80	7.80	7.90	2	4	7	20.30	20.80	22.70
		5/25/2001	15.00	15.00	15.00	6.50	6.50	6.40	10	12	13	21.50	21.50	21.50
	SB-4	5/10/2001	14.20	12.90	12.90	8.10	8.00	7.80	8	15	37	20.20	22.80	25.20
		5/25/2001	15.00	15.00	14.80	6.80	6.50	6.20	10	12	15	21.20	21.40	22.90
	SB-5	5/10/2001	15.20	13.00	12.90	8.10	7.90	7.80	2	2	8	18.80	24.30	25.00
		5/25/2001	15.00	14.80	14.80	6.80	6.50	6.50	9	10	10	22.10	23.60	24.00
	SB-6	5/10/2001	13.50	13.20	12.80	8.20	8.00	8.20	7	6	14	21.80	23.00	25.40
		5/25/2001	14.80	14.80	14.80	6.70	6.60	6.60	8	9	12	23.30	23.30	23.60

Table B-7
Water Quality Data - June 2001

Area	Station	Date	Temperature (°C)			Dissolved Oxygen (mg/L)			Turibdity (ntu)			Salinity (ppt)		
			Surface	Midwater	Bottom	Surface	Midwater	Bottom	Surface	Midwater	Bottom	Surface	Midwater	Bottom
Arthur Kill	AK-1	6/4/2001	17.80	17.60	17.90	6.20	6.30	6.30	9	12	12	18.20	16.30	16.10
	AK-2	6/4/2001	17.80	17.60	17.90	6.20	6.30	6.30	9	12	12	18.20	16.30	16.10
	AK-3	6/4/2001	18.00	17.50	17.60	6.10	6.00	6.20	6	10	10	17.30	17.50	17.60
	AK-4	6/4/2001	18.60	18.40	18.60	5.70	5.60	5.50	10	16	21	16.50	16.40	16.50
	AK-5	6/4/2001	17.80	17.60	17.40	6.40	6.30	6.20	13	14	12	16.30	16.40	16.40
	AK-6	6/4/2001	17.80	17.60	17.40	6.40	6.30	6.20	13	14	12	16.30	16.40	16.40
Newark Bay	NB-1	6/4/2001	18.80	17.60	17.80	6.10	4.70	5.60	18	19	16	10.20	14.60	14.70
	NB-2	6/4/2001	18.60		18.20	6.20		5.90	16		14	10.50		11.50
	NB-3	6/4/2001	18.50		18.00	5.80		5.70	16		16	11.00		13.30
	NB-4	6/4/2001	18.70		18.70	6.40		6.20	13		13	12.60		13.00
	NB-5	6/4/2001	18.50	17.20	17.20	6.20	5.70	5.70	12	13	15	11.40	16.30	17.40
	NB-6	6/4/2001	18.30	17.80	17.40	6.40	6.10	5.90	13	13	14	13.40	14.20	16.40
	NB-7	6/4/2001	18.30		17.90	6.50		6.40	11		16	14.60		16.10
Port Jersey	PJ-1	6/5/2001	17.50	17.30	16.50	6.70	6.60	6.20	15	14	19	14.70	15.10	19.30
	PJ-2	6/5/2001	18.40		18.10	6.70		6.30	16		17	16.30		16.60
	PJ-3	6/5/2001	18.40		18.60	6.50		6.50	10		15	17.90		17.90
	PJ-4	6/5/2001	18.00	16.80	16.30	6.70	6.30	6.30	7	11	10	17.50	19.30	20.50
	PJ-5	6/5/2001	18.10	17.10	16.70	6.60	6.20	6.20	11	16	15	16.30	18.00	18.90
South Brooklyn/	SB-1	6/5/2001	18.70	16.70	16.60	6.50	6.00	6.10	4	10	18	17.90	20.10	21.30
Upper Bay	SB-2	6/5/2001	18.50	17.00	16.30	6.60	5.90	6.00	10	8	11	18.10	19.60	21.10
	SB-3	6/5/2001	17.80	17.20	16.40	6.60	6.40	6.20	5	10	7	17.70	18.20	19.80
	SB-4	6/5/2001	17.80	17.10	16.80	6.50	6.10	6.30	10	11	10	17.80	19.50	19.40
	SB-5	6/5/2001	17.70	15.70	15.70	6.90	6.70	6.50	17	8	7	14.90	22.50	21.90
	SB-6	6/5/2001	17.80	16.70	16.30	6.60	6.60	6.70	10	10	5	15.90	19.70	20.70