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New York District

NEW YORK AND NEW JERSEY HARBOR DEEPENING PROJECT

Aquatic Biological Survey Report




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NEW YORK AND NEW JERSEY HARBOR DEEPENING PROJECT

AQUATIC BIOLOGICAL SURVEY REPORT

2010

FINAL Report

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1.0 INTRODUCTION

1.1 BACKGROUND

The 2010 Aquatic Biological Survey (ABS) was conducted as part of the New York and New Jersey Harbor Deepening Project (HDP). The HDP is a United States Army Corps of Engineers – New York District (USACE-NYD) and Port Authority of New York and New Jersey (PANYNJ) sponsored project to deepen navigation channels to 50 feet to accommodate larger commercial vessels. A primary goal of the ABS is to collect data on finfish, shellfish, macroinvertebrates, and water quality, with a focus on fish community structure, distribution and seasonal patterns of habitat use in New York/New Jersey Harbor (Harbor).

The 2010 ABS supplements data provided in previous reports: 1998-1999 New York and New Jersey Harbor Navigation Study ("1999 Survey"), 2000-2001 Supplemental Sampling Program ("2001 Survey"), 2001-2002 Aquatic Biological Sampling Program ("2002 Survey"), the 2002-2003 Biological Sampling Program ("2003 Survey"), the 2004 Aquatic Biological Survey Report, the 2005 Aquatic Biological Survey Report, 2006 Aquatic Biological Survey Report, 2007 Aquatic Biological Survey Report, 2008 Aquatic Biological Survey Report and the 2009 Aquatic Biological Survey Report.

The finfish assemblage (species occurrence and relative abundance) within the Harbor is a dynamic community consisting of many resident and migratory fish species typical of coastal estuaries and inshore waterways along the Middle Atlantic Bight. The Harbor estuary provides spawning habitats, migratory pathways, nursery and foraging areas for fish, blue crab and American lobster. The multi-year ABS sampling program is essential to evaluating the use of channel and non-channel areas within the Harbor from year to year. Program sampling conducted from 1999-2010 is used to describe annual variability in seasonal movement patterns, usage and relative abundance, and to expand the temporal coverage of the program database particularly with respect to winter flounder. The ABS program has provided a valuable long-term data set to evaluate spatial and temporal

patterns exhibited by early life stages and spawning adult winter flounder. Since 2002, when program sampling began in the Lower Bay, the study objectives, survey areas, and sampling gear have remained relatively consistent among sampling years to allow for inter-annual comparisons.

The focus of the 2010 ABS, conducted from December 2009 through June 2010, was to collect spatial and temporal distribution data in the Harbor for adults, juveniles, and early life stage eggs and larvae of winter flounder as well as other finfish including Essential Fish Habitat (EFH) designated species. These data were used to document finfish distribution, habitat use (spawning and nursery habitat utilization), and trends in relative abundance. USACE-NYD has further investigated patterns in winter flounder abundance and habitat use based on the 2002 to 2010 data. The first summary report entitled "Application of winter flounder early life history data to seasonal dredging constraints and Essential Fish Habitat designations" summarized the relationships between the occurrence of winter flounder eggs and larvae as well as EFH utilization in the Harbor (USACE-NYD 2010b). A second summary report is currently under development and focuses on adult and sub-adult winter flounder occurrence and characterization of spawning habitat in the Harbor. These summary reports provide findings and conclusions regarding inter-annual patterns of winter flounder in the Harbor. The results of the 2010 ABS program are provided and discussed in this report.

1.2 STUDY OBJECTIVES

During the 2010 ABS program, data were collected on adult and early life stages of finfish in the Harbor with an emphasis on winter flounder. Sampling was conducted from December to June when winter flounder spawning and early life stages typically occur in the Harbor. The specific objectives were to determine the utilization and timing of selected Harbor areas and relative abundance of adult and early life stage winter flounder and other EFH designated species using these areas.

To meet the program objectives, two sampling methodologies were employed. A bottom trawl was used to sample adult and juvenile finfish, and a plankton net mounted on an epibenthic sled was used to sample demersal eggs and larvae.

1.3 REPORT ORGANIZATION

All finfish species are classified into one of three groups: Essential Fish Habitat (EFH) designated species, important non-EFH species (including American lobster and blue crab as well as finfish identified by the resource agencies as forage, commercial and/or recreationally important species of special concern), and other finfish. Eleven (11) species were categorized as important non-EFH species: Alewife, American eel, American lobster, American shad, Atlantic menhaden, Atlantic sturgeon (none collected in 2010), blue crab, blueback herring, rainbow smelt (none collected in 2010), shortnose sturgeon (one was collected in 2010) and striped bass. This organization has been used since the 2006 report to broaden the study's focus from primarily winter flounder to other important species in the Harbor's finfish community that have become an increasing focus of interest for local and regional resource managers. Table 1-1 presents a summary of the EFH designated species by life stage occurring in the Harbor as determined by the National Marine Fisheries Service.

2.0 METHODS

2.1 SAMPLING LOCATIONS

Throughout the ABS program, a standard set of sampling locations has been used, but some adjustments have been made from year to year, as described below. Most of the sampling locations were surveyed each year with a few additions or deletions in some years. In 2010, 29 stations were sampled using both the bottom trawl and the epibenthic sled. This included seven of the eight stations added to the Lower Bay in 2008, one new station added in the channel of Newark Bay in 2009, and one new station added to the Upper Bay in 2009. Three new stations were added to the Lower Bay in 2010 to include two non-channel deep stations (≥ 25 feet) and one non-channel shallow station (< 15 feet). The additional Kill Van Kull ichthyoplankton stations, which were added in March 2008, were not surveyed in 2009 or 2010 because of ongoing dredging in the immediate area. Table 2-1 provides a description of all the ABS stations sampled since 2002 when program sampling began in the Lower Bay. Stations surveyed during 2010 are highlighted in bold.

Of the 29 stations surveyed during 2010 using both the bottom trawl and the epibenthic sled, 17 were located in non-channel areas (includes deep non-channel stations), and 12 were located within channels (≥ 40 feet). As in previous years, to better document the spatial dynamics of the various finfish populations, the Harbor was divided into three geographic regions: Arthur Kill/Newark Bay, Upper New York Bay, and Lower New York Bay (Figure 2-1). Sampling stations were distributed as follows among the three regions:

- **Arthur Kill and Newark Bay**

  During the 2010 ABS program, six stations were sampled in this region including two channel stations in the Arthur Kill (AK-2 and AK-3), two non-channel stations in Newark Bay (NB-4 and NB-7), and two channel stations also in Newark Bay (NB-6 and NB-8). Non-channel Newark Bay station (NB-3) and

Newark Bay channel station (NB-5) were not sampled in 2010 because of ongoing dredging operations in the area. Channel station NB-8 was added in 2009 to provide a similar channel area to that found in NB-5. The non-channel AK-1 station has not been sampled since 2004 because the shallow water contour has been removed by dredging. The non-channel stations, AK-4 and AK-7, have not been sampled since 2005 and 2006, respectively, because of underwater obstructions that have made those areas unsafe to trawl.

- **Upper New York Bay ("Upper Bay")**

  During the 2010 ABS program, seven stations were sampled in this region including five stations in South Brooklyn (SB) and two in Port Jersey (PJ). The two Kill Van Kull channel stations (KVK-1 and KVK- 2), which were sampled using an epibenthic sled during part of the 2008 ABS program, were not sampled in 2010 because of ongoing dredging in the area. Of the five stations surveyed in South Brooklyn, four were located in channels including Bay Ridge Channel (SB-4), Anchorage Channel (SB-5 and SB-6) and one new station (SB-7) added in 2010. Due to hang downs primarily on scrap metal, the bottom trawl could not be used at SB-7 during the last two surveys (23 April 2010 and 6 May 2010). One non-channel station was located in the Bay Ridge Flats (SB-3). Both of the stations surveyed in Port Jersey were located in non-channel areas containing the Port Jersey Flats (PJ-1) and the Caven Point Flats (PJ-2). The two non-channel stations located within the inter-pier area of Gowanus Bay (SB-1 and SB-2) have not been sampled since 2007 due to site restrictions that made it difficult to consistently sample these locations (e.g., short tow times and frequent hang downs of the sampling gear from bottom debris). These stations have been dropped from the program. PJ-5 (Port Jersey Channel east) was not sampled from 2008 through 2010 and the channel station (PJ-4) was not sampled since 2008 because of ongoing dredge operations in the area.

- **Lower New York Bay ("Lower Bay")**

During the 2010 ABS program, 16 stations were sampled in the Lower Bay (LB) including seven of the eight new station locations added in 2008 to provide better spatial coverage of the non-channel areas of the Lower Bay (LB-7 through LB-10, LB-12 and LB-13) and the Ambrose Channel North (LB-14). LB-11 was dropped from the ABS Program due to safety reasons in April 2008. Of the six stations historically sampled in the Lower Bay, three are located in channels including Ambrose Channel (LB-2), Chapel Hill South Channel (LB-4) and Raritan Bay East Reach (LB-6), and three are located in non-channel areas including East Bank (LB-1), Swash Channel Range (LB-3) and Old Orchard Shoals (LB-5). Starting in 2008, non-channel stations in the Lower Bay were further classified into groupings based on water depth. In 2010, three more non-channel stations were added in the Lower Bay to include deeper areas (LBD-15 and LBD-17) and one corresponding non-channel shallow station on the south end of East Bank (LB-16). The non-channel station depth categories are as follows: non-channel deep stations (≥ 25 feet: LB-7, LB-10, LBD-15, and LBD-17), non-channel intermediate (15-24 feet: LB-9, LB-12), and non-channel shallow stations (< 15 feet: LB-1, LB-3, LB-5, LB-8, LB-11, LB-13, LB-16).

2.2 BOTTOM TRAWL

Bottom trawl sampling for adult and juvenile finfish was scheduled to bracket the period when adult winter flounder are historically present in the Harbor to spawn. For the 2010 ABS, bottom trawl surveys were conducted once in December 2009 and May 2010, and twice each month from January to April 2010 at the 29 bottom trawl stations described above. A total of 286 bottom trawls were collected during the 2010 ABS program: 116 at channel stations and 170 at non-channel stations (Table 2-2).

Bottom trawls were conducted using a 30-ft (9.1-m) otter trawl with the same specifications as used during previous years of ABS sampling (Table 2-3). Bottom trawls were conducted during daylight[1] hours from one hour after sunrise to one hour before

[1] Bottom trawls were conducted during the night from the 1999 through 2004 sampling programs. In 2005, sampling was changed to daylight hours due to safety considerations.

sunset against the prevailing current at a bottom speed of approximately 5.0 ft/sec (150 cm/sec). Boat speed was measured using a General Oceanics (GO) Model 2031 electronic flow meter coupled to a GO Model 2135 deck readout. GPS coordinates were recorded at the beginning and end of each tow. Target tow duration was ten minutes, although tow times were occasionally adjusted as needed to account for obstructions, limited transect distance, commercial traffic, and other safety considerations in the field. A minimum ratio of 5:1 tow cable length to maximum station water depth was maintained to ensure that the trawl was in contact with the bottom throughout each tow.

Upon retrieval of the net, all of the contents were placed in a collection tub filled with ambient water and the net was inspected. If it was determined that the net was damaged while actively trawling and that some of the sample could have been lost or that the net did not fish properly, then the trawl was deemed invalid and repeated. If the trawl sample was determined to be valid then all fish were identified and enumerated on the research vessel immediately following collection. For all winter flounder collected, the total length (TL) was recorded to the nearest millimeter (mm). For all other species, a random subsample of up to 25 specimens of each species was selected for length determination.

When possible, winter flounder gender was determined in the field by exerting gentle pressure to extrude either eggs or milt. If gender could not be determined in the field by this method, up to a total of five winter flounder (≥ 250mm TL) per trawl were preserved on ice and returned to the laboratory for further analysis. The total number of adult winter flounder returned to the lab for gender determination was limited to 30 for the entire program in 2010. Spawning condition (ripe, partially spent, and spent) (Schmidt and St. Pierre 1997; Wyanski and Brown 2010) was also recorded in the laboratory to provide additional information on spawning period. Since winter flounder typically exhibit adult gonad development at 250 mm TL and reach sexual maturity between 280 mm and 300 mm TL (Witherell 1993), a 250-mm TL requirement was established to limit the number of immature fish kept for analysis.

Except for winter flounder preserved for laboratory analysis, all fish collected were released into the water after on-board examination.

2.3 EPIBENTHIC SLED

Epibenthic sled tow sampling for ichthyoplankton was scheduled to bracket the period when winter flounder eggs and larvae are historically present in the Harbor. For the 2010 ABS, ichthyoplankton surveys were conducted twice each month (approximately every other week) from January to June at the 29 stations described above. A total of 342 epibenthic sled tows were collected in 2010: 138 at channel stations and 204 at non-channel stations (Table 2-2).

Ichthyoplankton samples were collected using 0.5-m² plankton net with 0.5-mm mesh mounted on an aluminum epibenthic sled (Table 2-4). The plankton net was fitted with a GO Model 2030R flow meter to measure sample volume. All samples were collected during daylight hours from one hour after sunrise to one hour before sunset. Tows were conducted against the prevailing current at a speed of approximately 3.0 to 3.6 ft/sec (90 to 110 cm/sec) through the water. Boat speed was measured using a GO Model 2031 electronic flow meter coupled to a GO Model 2135 deck readout. GPS coordinates were recorded at the beginning and end of each tow to ensure proper station maintenance. Target tow duration was ten minutes, although tow times were occasionally adjusted as needed to account for obstructions, limited transect distance, commercial traffic, and other safety considerations in the field. A minimum ratio of 3:1 tow cable length to maximum station water depth was maintained to ensure that the sled was in contact with the bottom throughout each tow.

Upon retrieval of the epibenthic sled, the flow meter reading was checked to ensure that enough water volume had been sampled and that the net had not been ripped or filled with mud/debris. If it was determined to be a valid sample, then the net was washed down from the outside concentrating the sample in the cod-end bucket. Each ichthyoplankton sample was then transferred to an appropriately sized container(s) and the remaining

volume filled with 10% buffered Formalin containing the vital stain Rose Bengal. Samples were then returned to the laboratory for sorting and identification.

2.3.1 Laboratory Methodology for Ichthyoplankton Sort and Identification

All specimens were identified to the lowest taxonomic level practicable, assigned a life stage based on morphometric characteristics (i.e., egg, yolk-sac larvae, post yolk-sac larvae, or juvenile) and except for winter flounder, only viable eggs[2] were enumerated. For some larvae, it was not possible to discern between yolk-sac and post yolk-sac life stages because the specimens were damaged. These were classified as unidentified larval stage. Quality control procedures consisted of a continuous sampling plan to assure an Average Outgoing Quality Limit (AOQL) of less than 0.10 ($\geq$ 90% accuracy) during sample sorting, enumeration, life stage designation, and identification.

To further identify and describe the embryonic development of viable winter flounder eggs collected during the ichthyoplankton survey, the following sequential staging methodology was developed based upon the winter flounder egg development described by Martin and Drewry (1978). This methodology was employed by Schultz *et al*. (2007) and is consistent with other authors who have described similar staging systems for other species (Gorodilov 1996; Gadomski and Caddell 1996). In particular, Allen *et al.* (2005) describes a staging system for the developmental progression of lake trout, *Salvelinus namaycush*, which closely follows this study's five-stage methodology for winter flounder growth from fertilization to hatching as further described below. Staging of the eggs enables one to distinguish between eggs that were recently deposited from those that are more developed and may have moved from the site of their deposition (Schultz *et al.* 2007).

[2] Viable eggs were fertilized eggs showing various stages of development at the time of preservation. Non-viable eggs include those that were unfertilized as well as those fertilized but obviously dead: an egg that has become opaque or murky in nature or has the presence of fungus and/or other types of deterioration.

After sorting and species identification, all of the viable winter flounder eggs were further identified (beginning in 2008) into one of the following five stages using observed embryonic characteristics (see also Appendix D):

Egg Stages:

Stage 1 or Early Cleavage Stage: 1-64 cells, age equals < 24 hours.

Stage 2 or Blastula Stage: Final product of cleavage, formation of blastocoel, age equals approximately 24-48 hours.

Stage 3 or Gastrula Stage: Between formation of blastocoel and formation of embryonic axis, age equals approximately 2-3 days.

Stage 4 or Early Embryo Stage: Formation of embryonic axis, age equals approximately 4-15 days.

Stage 5 or Late Embryo Stage: After formation of embryonic axis near hatching, age equals approximately > 15 days.

In 2008, 2009 and 2010, all non-viable winter flounder eggs were counted during the staging process but only viable eggs were applied to the density calculations (see Section 2.5.2) to allow for direct comparisons between previous years of sampling in which non-viable eggs were not counted. Consistent with previous years, non-viable eggs for other species were not counted.

In addition, all winter flounder yolk-sac and post yolk-sac larvae were further classified (beginning in 2007) into the following developmental stages (see also Appendix D):

Larval Stages:

Stage 1: Yolk-sac present or eyes not pigmented.

Stage 2: Eyes pigmented, no loop or coil formed in the gut, no flexion of the notochord, and no yolk-sac present or minimal traces of yolk may remain.

Stage 3: Loop or coil formed in gut and/or flexion of the notochord has begun, but left eye has not migrated past the midline.

Stage 4: Left eye has migrated past the midline, but juvenile characteristics not

present.

Up to 25 winter flounder of each larval stage were then randomly selected and measured from each sample. Total lengths of larvae were measured to the nearest 0.1 mm using microscopic imaging and measuring software further described below (see also Appendix D). Juveniles that did not fit in the microscope view for image capturing measurement were measured to the nearest 1.0 mm using a calibrated measuring board. Larvae that exhibited prior damage/decomposition and/or sampling damage that could result in inaccurate lengths were not measured.

The measurement of winter flounder yolk-sac and post yolk-sac larvae was accomplished using a Motic DM143 Digital Microscope, a Canon Powershot S31S Digital Camera, and University of Texas Health Science Center at San Antonio (UTHSCSA) ImageTool software. The procedure involved first capturing a microscopic digital image of the larvae using Canon's CameraWindow software and saving it to a computer database. A 2-mm scale was included in each image for calibration purposes. The images were then accessed, the calibration was set in mm, and the larvae measured using the UTHSCSA image analysis software.

2.4 WATER QUALITY MEASUREMENTS

Dissolved oxygen (DO), temperature, conductivity, and salinity were measured during each survey at each station location using a calibrated YSI Model 85 Handheld Oxygen, Conductivity, Salinity and Temperature System meter with a known degree of accuracy (Table 2-5). Measurements were recorded from the bottom strata of the water column at approximately one foot (0.3 m) above the substrate. Field instruments were calibrated each day both prior to and after sampling. At least once per sampling day, the accuracy of the YSI Model 85 instrument was verified using an ASTM certified thermometer, a laboratory conductivity/salinity meter, and at least three water samples collected in the field and analyzed for DO using the Winkler titration method.

2.5 DATA ANALYSIS

All finfish were identified to the lowest practical taxonomic level in both trawl and ichthyoplankton sampling. Species were grouped into one of three categories: EFH designated species, important non-EFH species, and other species. Data analysis for this report focused on the current program year (i.e. 2010).

2.5.1 Bottom Trawl

Catch per unit effort (CPUE), defined as the number of fish collected per 10 minutes of trawling, was determined for each bottom trawl sample and was standardized to 10 minutes using the following formula:

$$CPUE = \left(\frac{N}{T}\right) \times 10$$

Where:

N equals the number of fish collected during the trawl and

T equals the actual tow time expressed in minutes.

2.5.2 Epibenthic Sled

Ichthyoplankton densities expressed as total number per 1,000 cubic meters (m^3) were computed for each epibenthic sled tow based on the volume of water sampled and using the following formula:

$$Density = \left(\frac{N}{[A \times D]}\right) \times 1{,}000$$

Where:

N equals the total number of organisms collected,

A equals the area of the net mouth (m^2) and

D equals the distance traveled (m) calculated as the total flow meter count multiplied by the flow meter constant (0.026873).

3.0 RESULTS

Adult finfish and ichthyoplankton results are described for both channel and non-channel stations in three Harbor regions (Arthur Kill/Newark Bay, Upper Bay, and Lower Bay). Species composition, relative abundance, density (per unit volume for ichthyoplankton samples), and catch per unit effort (CPUE) for bottom trawl samples are described in the sections below. Detailed station data for adult and juvenile finfish, ichthyoplankton, and water quality are provided in Appendices A through C, respectively.

3.1 ALL SPECIES

3.1.1 Bottom Trawl

A total of 28,537 finfish (49 species) and two shellfish species American lobster (n=12) and blue crab (n=341) were collected in the 286 samples completed during the 2010 bottom trawl survey (Tables 3-1 and 3-2). White perch (n=9,862 collected, 34.1% of the total catch) was the dominant species collected, followed by American sandlance (n=4,283, 14.8%), spotted hake (n=2,987, 10.3%), and red hake (n=2,361, 8.2%). These were followed by Atlantic silverside (n=2,108, 7.3%), striped bass (n=1,995, 6.9%), winter flounder (n=910, 3.1%), alewife (n=894, 3.1%), bay anchovy (n=820, 2.8%), silver hake (n=506, 1.8%), blue crab (n=341, 1.2%), and Atlantic herring (n=333, 1.2%). The remaining 39 species were each represented by 266 fish or less. Of these species, 34 were represented by 100 or fewer fish (Table 3-2).

Approximately 71.1% (n=20,552 collected) of the total bottom trawl catch consisted of those fish grouped as other species. EFH and important non-EFH species represented about 15.8% (n=4,578) and 13% (n=3,760) of the total bottom trawl catch, respectively. Four EFH species: red hake (n=2,361 collected, 8.2% of the total catch), winter flounder (n=910, 3.1%), silver hake (n=506, 1.8%), and Atlantic herring (n=333, 1.2%), and three important non-EFH species: striped bass (n=1,995, 6.9%), alewife (n=894, 3.1%), and blue crab (n=341, 1.2%) each contributed over one percent of the total catch in the

Harbor (Table 3-2). The remaining EFH and important non-EFH species each represented less than 0.9% of the total catch.

When defined by station type, a total of 19,224 finfish from 48 species, five American lobster and 254 blue crabs were collected from the 116 samples obtained at 12 channel stations during 2010, and a total of 9,313 finfish from 39 species, 87 blue crabs and seven American lobster were collected from the 170 samples obtained at 17 non-channel stations (Table 3-2). White perch (n=9,826 collected, 50.4% of the total channel catch), was the dominant species collected, followed by spotted hake (n=2,724, 14.0%), red hake (n=2,213, 11.6%) and striped bass (n=1,919, 9.8%). The remaining species made up less than 15% of the total channel catch. American sandlance (n=4,281 collected, 45.5% of the total non-channel catch), Atlantic silverside (n=1,545, 16.4%), bay anchovy (n=791, 8.4%), and alewife (n=762, 8.1%) were the four most abundant species collected at non-channel stations. The other 35 species made up the remaining 21.6% of the non-channel catch. Finfish, American lobster and blue crab abundances at all channel stations totaled 19,483 compared to a total of 9,407 at all non-channel stations. By region, channel stations/non-channel station catches totaled 14,399/179 in the Arthur Kill/Newark Bay, 1,924/8,216 in the Lower Bay, and 3,160/1,012 in the Upper Bay (Table 3-2).

During the 2010 ABS, stations were sampled every two weeks. Occasionally, due to inclement weather, more than one week was needed to sample all stations. To display weekly patterns in catch rates, average weekly bottom trawl CPUE for all fish combined was calculated as a 7-day weekly average for channel and non-channel stations. Average CPUE rates varied temporally and spatially from December through April in the Arthur Kill/Newark Bay and Upper Bay regions (Figure 3-1). Forty-eight species of fish were collected from channels and 39 species of fish were collected from non-channel areas (Table 3-3). American Lobster and blue crab were collected from both station types. CPUE rates at non-channel stations were higher in most of December through March in the Lower Bay and during December and May in the Upper Bay. These seasonal variations in CPUE at channel and non-channel stations were largely a reflection of the species most commonly collected. White perch (average peak monthly CPUEs of 307 in

January and 175 in December), spotted hake (98 in April), and striped bass (117 in December) influenced seasonal abundances at channel stations (Table 3-3). By contrast, the highest monthly average bottom trawl CPUEs found at non-channel stations were much lower and consisted of American sandlance (average peak monthly CPUEs of 131 in December), Atlantic silverside (31 in January), alewife (16 in March) and bay anchovy (28 in May).

Red hake followed by winter flounder, silver hake, and Atlantic herring were the most common EFH species collected from channel stations while winter flounder followed by silver hake, Atlantic herring, red hake and butterfish were the most common EFH species collected in non-channel locations (Table 3-3). Silver hake, Atlantic herring, windowpane, and little skate were about equally common at both station types. Other EFH species were uncommon in bottom trawl collections. Black sea bass, clearnose skate, pollock, scup, spiny dogfish, and winter skate had low monthly mean CPUE rates, while the mean CPUEs for little skate, butterfish, summer flounder, and windowpane were slightly higher. Striped bass followed by blue crab, Atlantic menhaden, and alewife were the most common important non-EFH species collected in channel stations and alewife was the most common at non-channel stations. Blueback herring, Atlantic menhaden, and American shad were about equally common at both station types. High monthly average bottom trawl CPUEs for EFH and important non-EFH species occurred at channel stations and included striped bass in December (average peak monthly CPUE of 116.6) and January (20.5), red hake (34.9, 26.5, 25.4, and 16.8 in April, December, January, and March, respectively), silver hake in December (18.8), blue crab in May (15.6), and Atlantic menhaden in December (13.2). The monthly average bottom trawl CPUEs at non-channel stations were low with the highest CPUE for alewife in March (16), silver hake in December (12.1) and Atlantic herring in May (9). The highest CPUE for winter flounder (10.4) occurred at channel stations during March. Of note, one Atlantic sturgeon (an important non-EFH species that is a state listed threatened species) was collected at a channel station in the Lower Bay in December (Tables 3-2 and 3-3). This specimen was measured and released alive at the collection site. A biologist from USACE-NYD reported this Atlantic sturgeon collection (date, time, station location &

total length of fish) and release to the National Oceanic and Atmospheric Administration (NOAA) Sandy Hook Field office.

As a group, the 28 other species collected in the bottom trawls consisted of a diverse assemblage of finfish species with a range of abundances (rare to abundant) distributed spatially and temporally. The most common of these species were white perch, American sandlance, spotted hake, Atlantic silverside, and bay anchovy (Table 3-2). White perch were collected primarily in channels of the Arthur Kill/Newark Bay region from December to March with a peak monthly average CPUE of 307 in January. American sandlance were collected at non-channel stations primarily in the Lower Bay with a peak monthly average CPUE of 131 in December and then again in February and March at 26 and 24, respectively (Table 3-3). Atlantic silverside were collected at both channel and non-channel stations primarily in the Lower Bay during January and February with a peak monthly average CPUE of 31 at non-channel stations in January. Spotted hake were more common in channel stations of the Arthur Kill/Newark Bay and Upper Bay during April and May with monthly average CPUEs of 98 and 43, respectively. Bay anchovy were collected primarily in May in non-channel stations at an average monthly CPUE of 28; only a few collected from channel areas (Table 3-3).

3.1.1.1 Arthur Kill/Newark Bay

A total of 14,304 fish (34 species) and 274 blue crabs were collected from 58 bottom trawl samples (38 from channel stations and 20 from non-channel stations) in the Arthur Kill/Newark Bay during 2010 (Table 3-2). White perch (n=9,833 collected, 67.5% of the total Arthur Kill/Newark Bay catch) was the dominant species collected in the region, and was followed by striped bass (n=1,880, 12.9%), spotted hake (n=1,199, 8.2%), red hake (n=733, 5%), winter flounder (n=358, 2.5%), and blue crab (n=274, 1.9%).

EFH and important non-EFH species comprised 23.0% (n=3,357) of the total bottom trawl collections in the Arthur Kill/Newark Bay during 2010 (Figure 3-2). Striped bass was the dominant species collected (n=1,880; 56.0% of total Arthur Kill/Newark Bay

catch). They were dominant in December and January and co-dominant in February and March with winter flounder and red hake (each species comprised around a third of the catch. Red hake dominated the collections in April with blue crab making up about 25% of the catch and winter flounder about 10%. Blue crab dominated the collections in May with red hake making up about 20% of the catch. Few winter flounder were collected in December and May. Red hake average monthly CPUEs were high at channel stations from December to May, while winter flounder CPUEs were high from December to March at channel stations. Blue crab CPUEs at channel stations peaked in May and were high in April (Tables 3-4a&b). Blue crab and Atlantic herring were common at non-channel stations in May (Table 3-2).

In grouping by channel or non-channel stations, 32 fish species plus blue crab were collected from the four channel stations and 16 fish species plus blue crab were collected from the two non-channel stations in the Arthur Kill/Newark Bay (Tables 3-4a and 3-4b). Of the most common species collected in the Arthur Kill/Newark Bay, white perch, striped bass, spotted hake, red hake, winter flounder, and blue crab were collected primarily from channel stations. Blue crab and Atlantic silverside were the most common species collected from non-channel stations. Collections peaked at channel stations in January following high CPUEs in December (CPUEs of 1,345 and 967, respectively) and were lowest in May while non-channel station CPUEs were very low from December through May (Figure 3-1). Trends in CPUE within the Arthur Kill/Newark Bay were primarily influenced by large collections of white perch and striped bass in channel stations during the winter months (January to March), spotted hake and blue crab (April and May), fairly consistent collections of red hake and winter flounder through the sampling period. At non-channel locations, trends in CPUE within the Arthur Kill/Newark Bay were primarily influenced by collections of Atlantic silverside in December plus blue crab and Atlantic herring during May (Tables 3-4a and 3-4b).

3.1.1.2 Upper Bay

A total of 4,116 fish (36 species), three American lobster and 53 blue crabs were collected from 68 bottom trawls samples (38 from channel stations and 30 from non-

channel stations) in the Upper Bay during 2010 (Table 3-2). Spotted hake (n=1,226 collected, 29.4% of the total Upper Bay catch) and red hake (n=1,212, 29%) were the dominant species collected; followed by bay anchovy (n=531, 12.7%), winter flounder (n=249, 6%), Atlantic herring (n=194, 4.7%), striped bass (n=88, 2.1%), alewife (n=76, 1.8%), windowpane (n=71, 1.7%), blue crab (n=53, 1.3%), and silver hake (n=48, 1.2%).

EFH and important non-EFH species comprised 51.1% (n=2,131) of the total bottom trawl collections in the Upper Bay during 2010 (Figure 3-2). Red hake, striped bass, winter flounder, silver hake, alewife, and blue crab were the most commonly collected of this group in December. Red hake dominated the collections from January to April while winter flounder were common during each of these months.

In grouping by channel or non-channel stations, 35 fish species plus American lobster and blue crab were sampled from channel stations and 27 fish species plus blue crab were collected from non-channel stations in the Upper Bay (Tables 3-4a and 3-4b). Of the dominant species collected in the Upper Bay, spotted hake, red hake, windowpane, and silver hake were sampled primarily from channel stations. Bay anchovy, striped bass, and Atlantic herring were collected primarily from non-channel stations. Winter flounder, alewife, and blue crab were captured from both areas. Collections peaked at channel stations in April following high CPUEs at non-channel stations in May (CPUEs of 394 and 186, respectively), and were lowest at channel stations in December and mid February through early March. Non-channel station CPUEs were low from January through April (Figure 3-1). Trends in CPUE within the Upper Bay were influenced by higher CPUEs of red hake in channel stations primarily from January to April and spotted hake in April and May. Bay anchovy were abundant in non-channel stations during December and May (Tables 3-4a and 3-4b).

3.1.1.3 Lower Bay

A total of 10,117 fish (41 species), nine American lobster and 14 blue crabs were collected from 160 bottom trawl samples (40 from channel stations and 120 from non-

channel stations) in the Lower Bay during 2010 (Table 3-2). American sandlance (n=4,261 collected, 42.0% of the total Lower Bay catch) was the dominant species collected; followed by Atlantic silverside (n=2,015, 19.9%), alewife (n=811, 8.0%), spotted hake (n=562, 5.5%), silver hake (n=443, 4.4%), red hake (n=416, 4.1%), winter flounder (n=303, 3.0%), bay anchovy (n=285, 2.8%), Atlantic menhaden (n=240, 2.4%), Atlantic herring (n=132, 1.3%) and butterfish (n=116, 1.1%).

EFH and important non-EFH species comprised 28.1% (n=2,850) of the total bottom trawl collections in the Lower Bay during 2010 (Figure 3-2). Silver hake were dominant with red hake and Atlantic menhaden as co-dominant species in December. Atlantic herring dominated in January while silver hake, winter flounder, and red hake were common. In February, winter flounder were dominant followed by Atlantic herring and blueback herring. Alewife were dominant in March and in April followed by winter flounder and red hake. Butterfish were dominant in May while winter flounder and red hake were common.

In grouping by channel or non-channel stations, 32 species of fish plus American lobster and blue crab were sampled from channel stations, and 35 species of fish plus American lobster and blue crab were collected from non-channel stations in the Lower Bay (Tables 3-4a and 3-4b). Of the dominant species collected in the Lower Bay, red hake and Atlantic menhaden were sampled primarily from channel stations. American sandlance, Atlantic silverside, bay anchovy were captured primarily from non-channel areas. Spotted hake, silver hake, and winter flounder were collected from both areas. Trends in CPUE within the Lower Bay were influenced primarily by large collections of several common species. At channel stations, there were large collections of Atlantic silverside in January (29) and February (36), high catches of silver hake (49), red hake (50) and Atlantic menhaden (40) in December, and spotted hake in April (23) and May (13). At non-channel stations, large collections of American sandlance in December (monthly average CPUEs of 184) were followed by high catches in February (37) and March (34) and of Atlantic silverside in January (43) followed by February (15), alewife during March (23),

silver hake during December (17), and bay anchovy during December (14) (Tables 3-4a and 3-4b).

3.1.2 Epibenthic Sled

Finfish eggs, larvae, and juveniles were collected from channel and non-channel stations in all three regions of the Harbor during ABS epibenthic sled sampling in 2010. A total of 176,407 early life stage eggs and larvae, and juveniles were collected in the 342 samples completed in 2010 (Table 3-5). A majority of the ichthyoplankton collected were eggs (n=162,948; 92.4%); 6.3% were post yolk-sac larvae (n=11,055), and 1.1% were yolk-sac larvae (n=1,877). Most of the specimens were collected in the Lower Bay (n=98,495; 55.8%; 192 samples) followed by the Arthur Kill/Newark Bay (n=40,118; 22.7%; 67 samples) and Upper Bay (n=37,795; 21.4%; 83 samples).

During the 2010 survey, a total of 28 taxa were identified in the ichthyoplankton samples with the Lower Bay having the highest taxa richness (28 taxa) compared to 22 taxa in the Upper Bay and 17 in the Arthur Kill/Newark Bay (Table 3-5). Six EFH designated species (Atlantic herring, Atlantic mackerel, silver hake, summer flounder, windowpane, and winter flounder) and one important non-EFH species (Atlantic menhaden) were collected in 2010 ichthyoplankton samples (Table 3-5). The Lower Bay also had the highest number of EFH and important non-EFH species (seven), compared to six in the Upper Bay and five in the Arthur Kill/Newark Bay.

Of these EFH and important non-EFH species, five (Atlantic herring, summer flounder, windowpane, winter flounder, and Atlantic menhaden) were collected from all three regions (Table 3-5). Egg, yolk-sac larvae, and post yolk-sac larvae life stages of windowpane, winter flounder, and Atlantic menhaden were collected from all three regions, except no windowpane or Atlantic menhaden yolk-sac larvae were collected in the Arthur Kill/Newark Bay. Atlantic herring and summer flounder post yolk-sac larvae were collected from all three regions. Atlantic mackerel eggs were collected only in the Lower Bay and silver hake eggs were collected in the Upper Bay and Lower Bay. One

juvenile Atlantic herring was collected in the Upper Bay and four juvenile flounder were collected (three in the Upper Bay and one in the Arthur Kill/Newark Bay).

3.1.2.1 Eggs

A total of 162,948 viable eggs from 11 taxa of finfish were collected in the Harbor during ABS ichthyoplankton sampling in 2010 (Table 3-5). The majority of eggs collected were bay anchovy (n=131,736 collected, 80.8% of the total egg catch), followed by wrasses (Labridae) (n=19,428, 11.9%), windowpane (n=7,641, 4.7%), Atlantic menhaden (n=1,981, 1.2%), and searobins (*Prionotus* sp.) (n=1,569, 1%) with the remaining six taxa each representing less than one percent of the total catch.

Average weekly egg densities were generally higher in the Arthur Kill/Newark Bay compared to both the Upper Bay and Lower Bay (Figure 3-3). In all regions, peak egg densities were found at channel stations during the week of 31 May (the peak density of 30,834 eggs/1,000m³ occurred in Arthur Kill/Newark Bay) and at non-channel stations during the weeks of 31 May and 14 June (the peak density of 16,968 eggs/1,000m³ occurred in Arthur Kill/Newark Bay on 14 June). Peak densities in the Upper Bay and Lower Bay occurred the week of 31 May. In the Arthur Kill/Newark Bay and the Upper Bay, egg densities were similar in scale and generally higher in the channels with peak average weekly densities occurring in channels during the week of 31 May (peak density of 30,834 eggs/1,000m³ in the Arthur Kill/Newark Bay followed by peak density of 26,934 eggs/1,000m³ in the Upper Bay). In both the Lower Bay and Upper Bay, peak densities occurred in both channel and non-channel areas the week of 31 May. In the Arthur Kill/Newark Bay, the peak channel densities occurred the week of 31 May while the peak non-channel densities occurred two weeks later during the week of 14 June 2010 (Figure 3-3). The peak egg densities found the week of 31 May were followed by high densities the week of 14 June. The high weekly densities were generally the result of large collections of bay anchovy in both channel and non-channel areas. Maximum monthly average catches of 21,552 and 12,865 anchovy eggs/1,000m³ occurred in Arthur Kill/Newark Bay channel and non-channel stations, respectively (Table 3-6a). Bay

anchovy monthly densities were also high in the Upper Bay and Lower Bay during June. In addition, there were relatively large collections of wrasse eggs in both channel and non-channel areas of all three Harbor regions with the mean monthly density peaked at 2,535 eggs/1,000 m³ at Upper Bay channel stations during June. Atlantic menhaden collections were high in all regions during June, and windowpane collections in the Upper Bay and Lower Bay were high in May and June. Few eggs were collected during the winter months while winter flounder eggs were collected primarily from the Upper Bay and Lower Bay in March.

EFH and important non-EFH species comprised 6.2% (n=10,105) (Figure 3-4) of the total egg collection (n=162,948) (Table 3-5) during the 2010 ichthyoplankton sampling program. The collection of EFH and important non-EFH species eggs was dominated in January, February and March by winter flounder, except for the Upper Bay in January or the Arthur Kill/Newark Bay in January and February when no winter flounder eggs were collected, and in April, May and June by windowpane. No windowpane eggs collected in the Arthur Kill/Newark Bay in April or June and a few winter flounder eggs were present in the Lower Bay during April. Atlantic menhaden dominated the June collection of EFH and important non-EFH species eggs in the Arthur Kill/Newark Bay and were present in Upper Bay and Lower Bay collections during May and June.

Of the EFH and important non-EFH species, the mean monthly collection of winter flounder eggs peaked at 115 eggs/1,000m^3 at non-channel stations of the Upper Bay in March (Table 3-6a). Winter flounder eggs were collected from January to April in the Lower Bay, during February and March in the Upper Bay and only in March in Arthur Kill/Newark Bay. Windowpane eggs were collected from April through June at both channel and non-channel stations in the Upper Bay and Lower Bay with peak mean monthly egg densities occurring in the Lower Bay in June at non-channel stations (779 eggs/1,000m^3) and in the Upper Bay channel stations (691 eggs/1,000m^3). Monthly mean egg densities for windowpane were slightly higher in non-channel stations in the Lower Bay compared to channel stations in the Upper Bay with the two highest monthly mean densities of 779 and 691 eggs/1,000m^3 occurring in June, respectively. Windowpane eggs

were collected in low densities in the Arthur Kill/Newark Bay and only during May (Table 3-6a). Atlantic menhaden eggs were collected primarily in June with a peak mean monthly density of 550 eggs/1,000m^3 occurring at channel stations in the Arthur Kill/Newark Bay and a peak mean monthly density of 397 eggs/1,000m^3 occurring at non-channel stations in the Upper Bay. During June, silver hake eggs were collected in the Upper Bay channel stations (45 eggs/1,000 m^3) and Lower Bay channel and non-channel stations (25 and 12 eggs/1,000 m^3, respectively).

3.1.2.2 Yolk-sac Larvae

A total of 1,877 yolk-sac larvae from 10 taxa of finfish were collected in the Harbor during ABS ichthyoplankton sampling in 2010 (Table 3-5). The majority of yolk-sac larvae collected were American sandlance (n=1,169 collected, 62.3% of the catch) followed by winter flounder (n=534 collected, 28.5%), grubby (n=92, 4.9%), bay anchovy (24, 1.3%), and Atlantic menhaden (n=24, 1.3%) with the remaining taxa each representing less than two percent of the total collection (Table 3-5).

Average weekly densities of yolk-sac larvae were generally higher in the Lower Bay followed by the Upper Bay compared to generally lower catches in the Arthur Kill/Newark Bay (Figure 3-5). Peak yolk-sac larval densities occurred in the Lower Bay during the week of 4 January at non-channel stations. This was due to large collections of American sandlance yolk-sac larvae (Table 3-6b). American sandlance yolk-sac larvae were also collected in high densities in the Upper Bay at both station types the week of 4 January. However, Upper Bay densities were low the week of 18 January, while sandlance continued to be collected in high numbers at both station types in the Lower Bay. Winter flounder contributed to high densities in early April at all harbor regions.

EFH and important non-EFH species comprised 30.4% (n=570 of 1,877) of the total yolk-sac larvae collection during the 2010 ichthyoplankton sampling program (Figure 3-6). Collections were small consisting of less than six yolk-sac larvae from any region in January, February, and May. The collection of EFH and important non-EFH species

yolk-sac larvae were dominated by winter flounder from January through April in all three regions excluding the Upper Bay in January when no winter flounder yolk-sac larvae were collected. Windowpane dominated in the Upper Bay and Lower Bay collections in May and Atlantic menhaden dominated the Upper Bay and Lower Bay collections in June (Figure 3-6). No EFH and important non-EFH species yolk-sac larvae were collected from the Arthur Kill/Newark Bay in May or June, and the Upper Bay in January.

Of the EFH and important non-EFH species, winter flounder occurred at a peak mean monthly density of 67 yolk-sac larvae/1,000 m^3 at Lower Bay non-channel stations during April (Table 3-6b). Windowpane yolk-sac larvae were collected in non-channel areas of the Lower Bay during May and June and in channels of the Upper Bay during June. Densities were less than or equal to one yolk-sac larvae/1,000 m^3. Windowpane yolk-sac larvae were collected in channels of both the Upper Bay and Lower Bay during May and June. Densities were less than or equal to two yolk-sac larvae/1,000 m^3. None were collected from the Arthur Kill/Newark Bay. Atlantic menhaden yolk-sac larvae were collected from both station types in the Upper Bay and Lower Bay during June; densities were less than or equal to four yolk-sac larvae/1,000 m^3.

3.1.2.3 Post Yolk-sac Larvae

A total of 11,055 post yolk-sac larvae from 22 taxa of finfish were collected in the Harbor during ABS ichthyoplankton sampling in 2010 (Table 3-5). The majority of post yolk-sac larvae collected were winter flounder (n=4,277 collected, 38.7% of the catch), followed by grubby (n=2,707, 24.5%), American sandlance (n=2,136, 19.3%), bay anchovy (n=941, 8.5%), and gobies (n=244, 2.2%). The remaining 18 taxa represented less than 7.0 percent of the total collection.

Peak average weekly densities of post yolk-sac larvae occurred at non-channel stations in the Lower Bay during the week of 5 April (1,133 post yolk-sac larvae/1,000m^3) and at channel stations (565 post yolk-sac larvae/1,000m^3) during the week of 22 March (Figure

3-7). The peak post yolk-sac larvae collections in late March and early April were generally the result of high catches of winter flounder in both channel and non-channel areas in the Lower Bay and Upper Bay (Table 3-6c). Maximum monthly average catches of 529 post yolk-sac winter flounder larvae/1,000m³ were collected in Lower Bay non-channel stations and 281 post yolk-sac winter flounder larvae/1,000m³ were collected at Upper Bay channel stations during April (Table 3-6c). In the Arthur Kill/Newark Bay, peak densities in June were the result of large collections of gobies and bay anchovy at non-channel stations with an average monthly collection of 210 and 178 post yolk-sac larvae/1,000 m³, respectively.

EFH and important non-EFH species comprised 41.3% (n=4,570) of the total post yolk-sac larvae (n=11,055) collection during the 2010 ichthyoplankton sampling program (Figure 3-8). EFH and important non-EFH species collected at this life stage included Atlantic herring, summer flounder, windowpane, winter flounder and Atlantic menhaden. The collection of EFH and important non-EFH species post yolk-sac larvae was dominated from February through May by winter flounder in all three regions (Figure 3-8). Collections in Arthur Kill/Newark Bay were dominated by summer flounder in January and Atlantic menhaden in June. In June, windowpane dominated Lower Bay collections and winter flounder dominated Upper Bay collections.

Of the EFH and important non-EFH species, windowpane post yolk-sac larvae were collected from May into June with peak mean monthly post yolk-sac larval densities occurring in May in the Upper Bay at channel stations (12 post yolk-sac larvae/1,000m^3) and at channel stations during June (seven post yolk-sac larvae/1,000m³)(Table 3-6c). Monthly mean post yolk-sac larval densities for windowpane were generally lower in the Lower Bay and Arthur Kill/Newark Bay than in the Upper Bay with the highest densities for those two regions occurring in Lower Bay channel and non-channel stations during June (nine and six post yolk-sac larvae/1,000m^3, respectively). Atlantic menhaden post yolk-sac larvae were collected as early as January and as late as June with peak occurrence in June at non-channel stations of the Lower Bay (16 post yolk-sac larvae/1,000m^3) (Table 3-6c).

3.1.2.4 Juveniles

A total of 126 juveniles from seven taxa of finfish were collected in the Harbor during ABS ichthyoplankton sampling in 2010 (Table 3-5). The majority of juveniles collected were Atlantic croaker (n=98 collected, 77.8% of the catch), followed by Atlantic tomcod (n=12, 9.5%), bay anchovy (n=9, 7.1%), and summer flounder (n=4, 3.2%). One northern pipefish, one Atlantic herring, and one striped cuskeel were also collected (each representing less than 1% of the collection).

Peak average weekly densities for juveniles occurred during the week of 4 January at non-channel stations in the Upper Bay (103 juveniles/1,000m^3) and were the result of large catches of Atlantic croaker (Figure 3-9 and Table 3-6d). Upper Bay channel stations had high collections of Atlantic croaker. The Arthur Kill/Newark Bay region also had large catches of Atlantic croaker at both channel and non-channel stations in January.

EFH and important non-EFH species comprised 4.0% (n=5 of 126) of the total juvenile collection during the 2010 ichthyoplankton sampling program (Figure 3-10, Table 3-5). Of the EFH and important non-EFH species, only Atlantic herring and summer flounder juveniles were collected. All Atlantic herring juveniles were collected in channel areas of the Upper Bay during May. Summer flounder were collected from channel areas of the Arthur Kill/Newark Bay in May and from channel and non-channel areas of the Upper Bay during January (Table 3-6d).

3.2 WINTER FLOUNDER

3.2.1 Bottom Trawl

A total of 910 adult and juvenile winter flounder were collected during the bottom trawl sampling of the 2010 ABS (Table 3-2). The majority were collected in the Arthur Kill/Newark Bay (358 collected, 39.3% of the winter flounder catch) and the Lower Bay (303, 33.3%); followed by the Upper Bay (249, 27.4%). Winter flounder were collected

at both channel and non-channel stations. With the majority (n=641; 70.4%) collected from channel stations (Table 3-2). They were collected during each month (December to May) from all three regions of the ABS sampling program with the highest monthly average catches (all regions combined) occurring at channel stations from December through April (Table 3-3).

3.2.1.1 Winter Flounder Catch Per Unit Effort (CPUE)

Average weekly bottom trawl collections of adult and juvenile winter flounder peaked (CPUE = 31.7) during the first week of 1 March in the Arthur Kill/Newark Bay. High CPUE (23.3) occurred the week of 18 January in the same region (Figure 3-11). Winter flounder were also common in channel station collections of the Arthur Kill/Newark Bay from December through April, channel and non-channel stations of the Upper Bay from December through April with a peak of 14.3 during the week of 19 April, and in the Lower Bay at channel stations in March and April with a peak of 10.3 during the week of 19 April. Few winter flounder were collected from non-channel stations of the Arthur Kill/Newark Bay from December through May and the Lower Bay in December, February, and the first half of March.

When compiled monthly by region (Tables 3-4a and 3-4b), mean CPUEs for winter flounder were highest at channel stations in the Arthur Kill/Newark Bay during March (monthly average CPUE = 23.4) and were also high in the Arthur Kill/Newark Bay from December through February (CPUEs of 12.2, 14.4, and 14.1, respectively). The highest CPUEs in the other regions were 8.3 and 6.8 in the Upper Bay and Lower Bay, respectively, during April. Monthly average CPUEs for winter flounder at non-channel stations were generally less than 4.0 with a maximum CPUE of 4.5 occurring in the Upper Bay during January (Table 3-4b). Winter flounder CPUEs below 1.0 occurred at non-channel stations in the Arthur Kill/Newark Bay during December and February through May, and in the Lower Bay during December and February (Table 3-4b).

During the 2009 ABS, eight new bottom trawl sampling locations were added in the Lower Bay and three additional stations were added as part of the 2010 ABS program, including two deep non-channel areas to better define the spatial distribution of winter flounder across a range of water depths. The Lower Bay and Upper Bay stations were grouped by station depth to present patterns in average weekly winter flounder CPUE during 2010 by the four depth categories (Figure 3-12): channel (typically > 40 feet), non-channel deep (≥ 25 feet), non-channel intermediate (15-24 feet), and non-channel shallow (typically < 15 feet). In the Lower Bay, adult and juvenile winter flounder were collected primarily from the deep non-channel stations in January and April (peak average weekly CPUE of 11.75 the week of 19 April), at channels during mid March through April (peak average weekly CPUE of 12.0 the week of 19 April). Deep non-channel CPUEs were slightly lower than channel CPUEs during February through mid-March (Figure 3-12). Few winter flounder were collected at non-channel intermediate stations as evidenced by the majority of zero and near-zero catches. Similarly, non-channel shallow stations had low CPUEs of adult and juvenile winter flounders (peak average weekly CPUE of 4.8 the week of 4 January). Of note, CPUEs in the non-channel stations of the Upper Bay were higher than those observed in the Lower Bay at combined deep and shallow non-channel stations (Table 3-4b).

3.2.1.2 Winter Flounder Size Distribution

During the 2010 bottom trawl survey a total of 910 winter flounder were measured, ranging from 56 to 471 mm TL (Figure 3-13). The majority of the winter flounder collected (88.8%) were juveniles (TL ≤ 250 mm). Most of these measured between 80 and 140 mm TL. Just over 14.5% of the winter flounder collected in non-channel areas measured greater than 250 mm TL (considered sexually mature) compared to 10.4% in channel stations (Figure 3-13). The mean total length of winter flounder collected at channel and non-channel stations was 160 mm TL (standard deviation ± 65 mm) and 155 mm TL (± 78 mm), respectively. The modal length class was 100-109 mm TL at channel stations and 140-149 mm TL at non-channel stations (Figure 3-13).

Spatial patterns in size distribution indicate that 10.6% of the winter flounder collected in the Arthur Kill/Newark Bay were ≥ 200 mm TL compared to 27.4% in the Lower Bay and 27.7% for the Upper Bay (Figures 3-14a through 3-14c). These larger sub-adult (200-249 mm TL) and adult-sized (≥ 250 mm TL) winter flounder were especially common in the Lower Bay and Upper Bay during April after the primary spawning period (Figure 3-14b). The most commonly measured winter flounder in the Arthur Kill/Newark Bay were in the 80 to 180 mm TL range. The most commonly measured winter flounder in Lower Bay were in the 80 to 140 mm TL range from January through March, the 100 to 180 mm and 220 to 310 mm TL ranges in April, 120 to 180 in May, and no discernable length range was evident in December. The most commonly measured winter flounder in Upper Bay were within the 60 to 180 mm TL range from January through March, the 100 to 220 mm and 260 to 330 mm TL ranges in April, and no discernible length ranges were evident in either May or December. Bottom trawl sampling ended in early May and there was no evidence that young of the year winter flounder had attained a length range of approximately 40 to 60 mm TL which, based on the bottom trawl mesh size, is the approximate length that juvenile winter flounder begin to be recruited into the trawl collections (Figures 3-14a through 3-14c).

3.2.1.3 Winter Flounder Gender Ratio

During the 2010 bottom trawl survey, a total of 43 adult winter flounder ≥ 250 mm TL and one that measured 222 mm TL had their gender determined in either the field or in the laboratory (Table 3-7)[3]. Of the 44 fish that were analyzed for gender, over half (54.5%) were collected in the Lower Bay and 62.5% of those were females compared to 80% females in both the Upper Bay and Arthur Kill/Newark Bay (Table 3-7). Females averaged 303 mm TL and weighed 325 g compared to males which averaged 294 mm TL and weighed 302 g. The average TL for females and males was highest in the Lower Bay (316 and 302 mm TL, respectively) and lowest in the Arthur Kill/Newark Bay (274 and 222 mm TL, respectively; Table 3-7). The longest female measured 415 mm TL, weighed

[3] Note that spawning condition (i.e. ripe versus spent) could not always be determined in the field, and weight was only measured on those specimens returned to the lab.

594.1 g, and was collected at LBD-15 (a new non-channel deep station) in April and was spent. The largest male measured 388 mm TL, was partially spent, and was collected at LB-16 (a new non-channel shallow station) in April. The three new stations added to the Lower Bay in 2010 (LBD-15, LB-16, and LBD-17) accounted for eight of the 43 adult winter flounder greater than or equal to 250 mm TL, and the female to male gender ratio was 1:1 for these stations compared to 4:1 for the other 26 stations sampled in 2010.

Thirty-six winter flounder greater than or equal to 250 mm TL were collected before and during spawning (mid-December through March, Table 3-7). Of those, 27 fish were found to be ripe or partially spent, including two females with developing ovaries that did not appear to spawn this season. Seven completely spent females were collected in March. Of the 59 winter flounder greater than or equal to 250 mm that were collected after the peak spawning period was over in April, eight had their gender determined and four of those were females with developing ovaries, which indicated they did not spawn this season. Most of the ripe, partially spent and spent winter flounder were collected in the Lower Bay and Upper Bay, while proportionately more of the females with developing ovaries were collected in the Arthur Kill/Newark Bay region (n=3 out of 5).

3.2.1.4 Winter Flounder Bottom Trawl Inter-Annual Variation

Past ABS annual reports compared the current program year with data from previous ABS program years. The inter-annual results are not included in the 2010 report because the USACE-NYD is developing a summary report that evaluates spatial and temporal patterns of adult and sub-adult winter flounder collected during 2002-2010 ABS bottom trawl sampling. This summary report is expected to be completed by late 2011, and should be referred to for comprehensive inter-annual evaluations of ABS bottom trawl data.

3.2.2 Epibenthic Sled

Winter flounder eggs, yolk-sac and post-yolk sac larvae were collected throughout the Harbor at both channel and non-channel stations during the 2010 ABS ichthyoplankton survey (Table 3-5). A total of 5,365 winter flounder ichthyoplankton were collected consisting of 327 viable eggs, 534 yolk-sac larvae, 4,277 post yolk-sac larvae, and 227 unidentified larval stage (Table 3-5).

3.2.2.1 Winter Flounder Eggs

A total of 327 viable winter flounder eggs were collected during 2010 ichthyoplankton sampling in the Harbor. Winter flounder eggs were collected predominantly in March at non-channel stations of the Upper Bay (monthly average density = 114.6 eggs/1,000 m³) and in non-channel areas of the Lower Bay (27.9 eggs/1,000 m³). Lower monthly average egg densities were collected at channel stations in the Upper Bay (2.4 eggs/1,000 m³ during February) and in the Lower Bay during January, February and April (2.2, 6.2, 0.6 eggs/1,000 m³, respectively). At non-channel stations, lower monthly average densities were collected in the Lower Bay during January, February and April (4.0, 12.4, 2.5 eggs/1,000 m³, respectively), in the Upper Bay during February (6.2 eggs/1,000 m³), and in the Arthur Kill/Newark Bay during March (7.0 eggs/1,000 m³).

Viable winter flounder eggs were first collected during the week of 18 January at both channel and non-channel stations of the Lower Bay. Egg stages 1 through 4 were present in non-channel stations while channel stations included only Stage 2 and 4 eggs (Figures 3-15a and 3-15b). The first collections of winter flounder eggs in the Upper Bay occurred at channel stations during the week of 1 February and at non-channel stations the week of 15 February. However, total densities were low. Egg densities in the Lower Bay peaked the week of 22 February at channel stations (13 eggs/1,000 m³) with densities similar to non-channel station densities during the weeks of 18 January, 1 February and 22 February. The peak at non-channel stations occurred the week of 15 March at about 80 eggs/1,000 m³. Egg densities in the Upper Bay peaked the week of 1 March at non-channel stations (225 eggs/1,000 m³). The Upper Bay channel stations collections had

low densities, which consisted of Stage 4 eggs only found in February. No Stage 1, 2, 3, or 5 eggs were collected at Upper Bay channel stations (Figure 3-15a) while Stage 1, 2, 3, and 4 eggs were collected at Lower Bay channel stations. All five eggs stages were represented in Lower Bay non-channel collections and egg Stage 1, 2, 3, and 4 were represented in Lower Bay channel collections and Upper Bay non-channel collections. Stage 1 and 2 eggs were found in the Arthur Kill/Newark Bay the week of 1 March and only Stage 4 eggs were found in the Upper Bay in February. No viable winter flounder eggs were collected after the week of 19 April. No viable eggs were collected in the channels of Arthur Kill/Newark Bay in 2010 (Table 3-6a).

A total of 140 non-viable winter flounder eggs were collected during 2010, and these were predominantly collected from non-channel stations in Upper and Lower Bays (Figure 3-15c). Non-viable eggs were collected in the Lower Bay from January to mid-March at non-channel stations, while non-viable eggs were collected on two sample weeks, 22 February and 15 March, in low densities at Lower Bay channel stations (n = 6 eggs). The peak non-viable egg density occurred during the week of 15 March in the Lower Bay at non-channel stations (40 eggs/1,000m^3), which was also the peak collection for viable eggs in Lower Bay (all five stages and all non-viable eggs were collected from LB-16). In the Upper Bay, non-viable eggs were collected only at non-channel stations, and occurred from February through mid-May (Figure 3-15c). The peak weekly density of non-viable eggs occurred on 1 March (59 eggs/1,000m^3). Similar to the Lower Bay, this peak in Upper Bay density corresponded to the same peak density for weekly viable winter flounder eggs (all five stages and all non-viable eggs were collected from PJ-2). No non-viable eggs were collected in the Arthur Kill/Newark Bay in 2010 (Table 3-6a, Figure 3-15c).

3.2.2.2 Winter Flounder Larvae

A total of 534 winter flounder yolk-sac larvae were collected during the 2010 ichthyoplankton sampling in the Harbor. The majority of which were collected in the Lower Bay (76.4%), followed by the Upper Bay (15.7%) and the Arthur Kill/Newark

Bay (7.9%) (Table 3-5). Winter flounder yolk-sac larvae were collected from January through April with peak occurrences in April at both channel and non-channel areas of the Lower Bay (average monthly density of 34.4 and 67.3 larvae/1,000 m³, respectively) and the Upper Bay (19.6 and 44.0 larvae/1,000 m³, respectively) (Table 3-6b). Yolk-sac larvae densities were less than 10 larvae/1,000 m³ at both types of stations in the Upper and Lower Bays during January, February and March. Peak average monthly density in the Arthur Kill/Newark Bay occurred in March at non-channel stations (10.1 larvae/1,000 m³) and in April at channel stations (13.4 larvae/1,000 m³) (Table 3-6b).

Winter flounder yolk-sac larvae (Larval Stage 1) were first collected in very low densities during the week of 18 January in non-channel areas of the Lower Bay and Arthur Kill/Newark Bay (Figure 3-16a and 3-16b). Peak collections of yolk-sac larvae occurred during the week of 5 April at channel and non-channel stations of the Lower Bay. No winter flounder yolk-sac larvae were collected at either station type after the sampling week of 19 April (Figure 3-16a and 3-16b).

A total of 4,277 winter flounder post yolk-sac larvae were collected during 2010 ichthyoplankton sampling in the Harbor. The majority of which were collected in the Lower Bay (79.7%), followed by the Upper Bay (14.9%) and the Arthur Kill/Newark Bay (5.4%) (Table 3-5). Winter flounder post yolk-sac larvae were collected primarily from March through May with peak densities occurring in April (Table 3-6c). The highest densities were recorded in April in the Lower Bay at non-channel stations (528.7 larvae/1,000 m³) and during April at Upper Bay and Lower Bay channel stations (281 and 201 larvae/1,000 m³, respectively). Relatively high densities were also recorded at Lower Bay channel stations in March and May (126 and 127 larvae/1,000 m³, respectively) and in April at Upper Bay and Arthur Kill/Newark Bay non-channel stations (126 and 88 larvae/1,000 m³, respectively).

Winter flounder post yolk-sac larvae (Larval Stage 2 through 4) were first collected in low density during the week of 1 February in channel and non-channel areas of the Arthur Kill/Newark Bay (Figures 3-16a and 3-16b). Peak collections occurred in late

March and early April. The majority of the post yolk-sac larvae collected in the Lower Bay and Upper Bay were Stage 3 larvae in both channel and non-channel areas. No winter flounder post yolk-sac larvae were collected after the sampling week of 31 May 2010 (Figures 3-16a and 3-16b).

Figure 3-17 presents the length frequency distribution of all the winter flounder larvae measured in 2010. In the Lower Bay, the most frequently collected length class was 3-4 mm TL (n=418) and most of those (83.7%) were collected in non-channel areas. The most frequently collected larvae lengths in both the Upper Bay (n=129) and Arthur Kill/Newark Bay (n=108) were also in the 3-4 mm TL range, and most of those (54.3 and 67.6%, respectively) were collected at non-channel stations (Figure 3-17).

3.2.2.3 Winter Flounder Ichthyoplankton Inter-Annual Variation (Eggs & Larvae)

In 2010, USACE-NYD prepared a comprehensive review of winter flounder early life stage data (2002-2010) collected as part of the ABS Program, entitled *Application of Winter Flounder Early Life History data to Seasonal Dredging Constraints and Essential Fish Habitat Designations* (USACE-NYD 2010b). The primary findings from this review relate to spatial and temporal patterns of early life stage winter flounder within the Harbor, as briefly summarized below.

The spatial data show that winter flounder eggs are distributed throughout the Lower and Upper Bay areas of the Harbor, with significantly lower egg densities in the Arthur Kill/Newark Bay area. Averaged over the nine year period, eggs collected in the Arthur Kill/Newark Bay area accounted for less than 5% (based on density) of the total egg collection within the project area. Winter flounder larval densities are highest in the Lower Bay and lowest in the Arthur Kill/Newark Bay area where yolk-sac and post-yolk-sac larval collections averaged 10% and 14%, respectively, of the overall larval collections from 2002 to 2010.

Among the non-channel stations sampled for the ABS Program, egg collections were highest at the shallowest stations. There was a significant negative correlation between non-channel station depth (Lower and Upper Bay stations) and the station's average percent contribution to overall egg collections ($r^2 = 0.68$, $p = 0.005$). Stations with the highest catches of eggs were at approximately three meters (10 feet) depth, whereas non-channel stations with low egg abundances were at depths of eight and nine meters (26 and 30 feet), respectively. In addition, nearly all (98%) newly spawned eggs (stages 1 and 2, less than 48 hours old) were collected at non-channel stations. Also, samples that contained multiple egg stages (presumably from multiple spawning events, which is indicative of spawning sites or sinks) were collected almost exclusively at non-channel stations.

Temporally, the ABS data indicate winter flounder eggs occur in the Harbor from early February to early April, with 90% of the annual egg collections obtained after 18 February in eight of nine years. In addition, 90% of yolk-sac larvae were collected during April and 90% of post-yolk sac larvae were collected by 16 May of each year. Study results indicate that the two years in which the 90% collection of post-yolk sac larvae occurred later in May (2003 and 2005) were years with the most extreme low water temperatures in March of less than 2^{o}C. This finding is consistent with previous studies that have demonstrated extreme cold temperatures delay egg and larval development (Laurence 1975, Williams 1975, Sogard *et al.* 2001).

3.3 WATER QUALITY DATA

Mean monthly bottom water temperature from January through June ranged from approximately 2.3 to 19.6° C during the 2010 ABS sampling program (Figure 3-18). The bottom water temperature was slightly lower in the Arthur Kill/Newark Bay from December through February and slightly higher from March through June than in the other regions of the Harbor. The mean temperatures in the Lower Bay were slightly higher than the other regions from December through February and consistently lower than the other two regions from April through June. The Upper Bay was generally intermediate in monthly mean temperature, except during March when Upper Bay

temperatures were similar to the Lower Bay. During January and February, mean bottom water temperatures throughout the Harbor ranged between 2.3 and 4.4° C and peaked to a high of approximately 20° C in Arthur Kill/Newark Bay during June (Figure 3-18).

Mean monthly bottom water salinity recorded in parts per thousand (ppt) during the 2010 ABS program ranged from approximately 17 to 28 ppt (Figure 3-18). Salinities were consistently lowest in the Arthur Kill/Newark Bay and highest in the Lower Bay throughout the season. In all three regions, salinities gradually decreased monthly from January through April and then gradually increased during May and June. The highest salinities were in the Lower Bay (28 ppt) recorded in January and the lowest salinities were in the Arthur Kill/Newark Bay (17 ppt) during March and April (Figure 3-18).

Trends in bottom water dissolved oxygen levels were similar across the three Harbor regions gradually decreasing from January through April, and then rapidly decreased from April through June 2010 as water temperatures increased (Figure 3-18). Mean monthly dissolved oxygen in all three regions remained between approximately 9 and 12 mg/L from January through April, and then decreased from a range of approximately 9 to 10 mg/L for the three regions during April to a low of 6 mg/L in the Arthur Kill/Newark Bay and a low of about 7.5 in the Lower Bay and Upper Bay during June (Figure 3-18).

All water quality sampling data are presented in Appendix C.

4.0 DISCUSSION

The Aquatic Biological Survey provides a valuable source of finfish abundance and distribution data for the New York and New Jersey Harbor. While the systematic sampling program and the consistent sampling locations allow for comparisons between years, the adaptive nature of the program has also allowed the program to evolve into providing pertinent data for evaluation by local and regional resource managers. Prior to 2007, for example, winter flounder larvae were identified into two stages (yolk-sac and post yolk-sac). In 2007 and subsequent years, winter flounder larvae were identified to one of four developmental stages, which provides an indication of the proximity of the sample location to spawning areas. In 2008, eight new sampling locations were added in the Lower Bay to better define the spatial distribution of winter flounder across a range of water depths. Also in 2008, a new winter flounder egg staging protocol was developed to better distinguish between eggs that were recently deposited from those that are in later stages of development to better determine the location of spawning areas of the Harbor. In 2010, four new sampling locations were added, three of which were added in Lower Bay to quantify winter flounder abundance in deep areas compared to navigation channels.

Water quality and habitat characteristics throughout the Harbor affect the spatial and temporal distribution of finfish. The three Harbor regions defined in this study exhibit different water quality, currents, depth distributions and sediment conditions. Water temperatures are similar in the three regions during the winter months and the warmest water temperatures occur in the Arthur Kill/Newark Bay region during the spring and into early summer (April to July). The Arthur Kill/Newark Bay region also has some of the coolest bottom temperatures in January and the most variable and lowest salinities overall. While the Lower Bay has the highest and least variable salinities, bottom temperatures in this region tend to be less variable. The Arthur Kill/Newark Bay and, to a lesser extent, the Upper Bay salinities and temperatures are influenced by freshwater

runoff from the Raritan, Passaic, Hackensack and Hudson Rivers. Dissolved oxygen concentrations are similar throughout the regions over the sampling period.

The bottom substrate in the Arthur Kill/Newark Bay region is dominated by fine grain sediments (silt and clay) while the Lower Bay is comprised primarily of sand and coarse-grained sands. The Upper Bay consists of a mixture of finer clay and silt, and sand sediments. The Arthur Kill/Newark Bay and Upper Bay regions are comprised of a larger percentage of maintained deep channels and berthing areas compared to the Lower Bay, which is dominated by shallows/shoals with a smaller percentage of maintained channel areas.

4.1 ALL SPECIES

The finfish composition of anadromous, semi-anadromous and shallow water residents collected during the 2010 Aquatic Biological Survey is typical of estuaries within the Middle Atlantic Bight (Able and Fahay 2010). The Harbor is dominated by migratory and seasonally transient fish species. Many species spawn in the Harbor seasonally while others spawn offshore on the continental shelf or upstream in the Harbor tributaries. This seasonality and preference for different spawning habitat influences the occurrence and density of species collected during the sampling program. Species that spawn in the Harbor, such as bay anchovy, were generally present in high densities during their seasonal spawning period (April through July) while other species, such as adult American shad, migrate through the Harbor to primary spawning habitats in the Hudson River.

Species abundance and richness has varied annually throughout the sampling program, though this variation is likely within the natural variation of populations within a dynamic ecosystem. For example, the highest total abundance of all species combined in bottom trawl catches over the sampling program occurred in 2010 with 28,537 finfish from 49 species, 341 blue crabs and 12 American lobsters collected (n=286 samples). This was followed in abundance in 2008 with 24,531 finfish from 42 species and 84 blue crabs collected (n=203 samples) and in 2006 with 23,874 fish from 41 species and 218

blue crabs collected (n=213 samples). The lowest species abundance occurred during 2005 (n=208 samples) and 2007 (n=212 samples) with 4,860 finfish from 40 species and 7,032 finfish from 47 species, respectively.

Figure 4-1 shows the percentage of species caught in each region at channel versus non-channel areas for the bottom trawl collections from 2002 through 2010. Bay anchovy have been the dominant species collected at non-channel stations in all three regions, especially in the Upper and Lower Bays (59% and 43% of the total catch, respectively) with alewife (33%), spotted hake (31%) and white perch (60%) dominating the channel collections at the Lower Bay, Upper Bay and Arthur Kill/Newark Bay, respectively through 2010 (Figure 4-1). A total of 54,028 fish and blue crabs have been collected in the Arthur Kill/Newark Bay region (approximately 73% collected at channel stations). White perch, striped bass, and spotted hake have usually dominated the channel collections and bay anchovy, Atlantic herring, white perch, and striped bass have usually dominated the non-channel collections. A total of 44,594 fish and blue crabs have been collected in the Upper Bay region (approximately 39% collected at channel stations). Spotted hake, red hake, winter flounder, striped bass, alewife, and blueback herring have usually dominated the channel collections while bay anchovy, Atlantic herring, and blueback herring have usually dominated the non-channel collections. A total of 43,414 fish and blue crabs have been collected in the Lower Bay region (approximately 50% collected at channel stations). Alewife, spotted hake, blueback herring and bay anchovy have usually dominated the channel collections and bay anchovy, American sandlance, Atlantic silverside, and alewife have usually dominated the non-channel collections.

From 2006 through 2009, bay anchovy, white perch, and alewife have generally been the most abundant species collected in bottom trawls. In 2010, white perch was the most common species collected (34.1% of the total catch) while alewife ranked 8th (3.1%) and bay anchovy ranked 9th (2.8%). White perch were almost exclusively collected from Arthur Kill/Newark Bay channel stations in 2010 from December through March, which was typical of past programs. American sandlance were collected in high abundance during 2010 (ranked 2nd; 15% of the total catch) compared to past sampling years, but as

in those past years this species was primarily collected at non-channel stations in the Lower Bay. Spotted hake (ranked 3rd in 2010; 10% of the total catch) were also collected in higher abundances than recent years. This species was mostly collected from channel stations in Arthur Kill/Newark Bay and Upper Bay.

Early life stage (ichthyoplankton collections of egg, larvae and juvenile life stages) densities have also tended to vary spatially and temporally, though overall they are less variable among years than adult catches are. In 2010, 163,057 eggs, 13,331 larvae and 126 juveniles (total catch=176,514; 342 samples), which was the fifth highest abundance in the program with the most samples collected, behind 2004 (n=346,761; 327 samples), 2008 (n=274,189; 314 samples), 2009 (n=186,864; 289 samples), and 2005 (n=180,925; 326 samples). Although adult bay anchovy were less common in 2010 than previous program years, bay anchovy eggs and larvae comprised 75% of the total ichthyoplankton collection. They were collected predominantly in June at channel and non-channel stations in all three Harbor regions. Early life stages of wrasses (eggs only), windowpane, and winter flounder were common in 2010 as they usually were in prior years.

4.1.1 Essential Fish Habitat Species

Over the years of the ABS Program, only a few EFH species (notably Atlantic herring and red hake, and to a lesser extent winter flounder) have at times been collected in substantial numbers. Bottom trawl catches of several EFH species (red hake, windowpane, winter flounder, and little skate) have generally occurred in channel and deep water areas and to a lesser extent in shallow water (non-channel) habitats. Atlantic herring, butterfish, scup, and summer flounder are generally collected at shallow (non-channel) habitats. Some of these trends were not as evident in 2010 as no bluefish and few scup were collected and summer flounder were collected primarily from channels. The number of Atlantic herring collected was lower than usual while winter flounder and red hake numbers were higher. Both species used non-channel areas but CPUEs were much higher at channel stations. Slightly higher CPUEs were found in 2010 for Atlantic herring and little skate at non-channel stations, and for windowpane and summer flounder

at channel stations. Winter flounder and windowpane eggs and larvae consistently comprised a large part of the 2010 ABS ichthyoplankton collections.

The following sections discuss the results of a few of the more commonly collected EFH species in NY/NJ Harbor. Trends in the collection of winter flounder are discussed in more detail in Section 4.2.

4.1.1.1 Atlantic herring (Clupea harengus)

Noted for its characteristic north-south migrations, Atlantic herring is a pelagic, schooling species that ranges from Labrador to Cape Hatteras (Able and Fahay 2010). Within the Harbor estuary, EFH is designated for Atlantic herring larvae, juveniles and adults (Table 1-1). Spawning typically occurs offshore and the eggs, which are demersal and adhesive, are not commonly collected (Stevenson and Scott 2005). Atlantic herring eggs have not been collected during the ABS ichthyoplankton sampling. Since 2006 post yolk-sac larvae have been collected primarily in channel stations of the Upper Bay and Arthur Kill/Newark Bay between February and April. In 2010, Atlantic herring post-yolk sac larvae (n=37) were found during March and April in low densities at both channel and non-channel stations in Lower Bay and Upper Bay (Table 3-6c).

During ABS bottom trawl sampling for adults and juveniles from 2002 through 2010, Atlantic herring was the second most commonly collected species at non-channel stations in both the Upper Bay and Arthur Kill/Newark Bay accounting for 13% and 29% of the total non-channel catch in each of those regions, respectively (Figure 4-1). However in 2010, Atlantic herring collections were low though adults were more prevalent at non-channel stations in Upper Bay and Arthur Kill/Newark Bay.

4.1.1.2 Red hake (Urophycis chuss)

Within the Harbor estuary, EFH is designated for the larval, juvenile and adult stages of red hake (Table 1-1). Red hake make seasonal migrations in response to changing water

temperatures, inhabiting shallow water habitat in the spring before moving to deeper water in the summer (Able and Fahay 2010). Spawning occurs offshore from the late spring through the summer, and both eggs and larvae are pelagic (Steimle *et al*. 1999). No red hake eggs or larvae have been collected during the ABS ichthyoplankton program sampling in the Harbor.

During ABS bottom trawl sampling from 2002 through 2010, red hake has comprised 12% of the total channel catch in the Upper Bay region (Figure 4-1). During 2010 sampling, red hake (n=2,361) were the most abundant of any program year and were especially abundant in channel stations in Arthur Kill/Newark Bay and Upper Bay regions. These peak densities in 2010 followed two years of much lower numbers. Prior to 2010, the highest abundance of red hake occurred in 2006 and 2007 (USACE-NYD 2007 and USACE-NYD 2008). Red hake tend to be collected during January through April with CPUEs dropping off dramatically by May. This is a pattern commonly observed in ABS program sampling that was also evident in 2010.

4.1.1.3 Silver hake (Merluccius bilinearis)

Silver hake (whiting) have designated EFH for all life stages in the area just southeast of NY/NJ Harbor in the Middle Atlantic Bight. There is no designated EFH within the Harbor estuary. Silver hake distribution ranges on the continental shelf of the Northwest Atlantic Ocean from the Gulf of St. Lawrence and the Grand Banks, Newfoundland south to Cape Fear, North Carolina. They are highly abundant from Nova Scotia to New Jersey. Spawning begins in January along the shelf and slope of the Middle Atlantic Bight peaking from May to June (Lock and Packer 2004).

During ichthyoplankton sampling in 2010, 152 silver hake eggs were collected. Sixty-four were from the Upper Bay (channel stations), 88 from the Lower Bay (channel and non-channel stations) and none from the Arthur Kill/Newark Bay area. Before 2010, silver hake eggs had only been collected once in Upper Bay (non-channel station) during the 2006 ABS program. No larvae have been collected in the Harbor during the ABS program.

Silver hake has not commonly comprised a large portion of the bottom trawl catch in past years of the ABS program (Figure 4-1). Typically, between 19 and 65 fish have been collected during prior sampling years compared to 506 fish collected during bottom trawl sampling in 2010. Peak densities occurred primarily at channel and non-channel stations in the Lower Bay in 2010, which was consistent with previous years of collection. Silver hake have been most abundant in January and February, but peaked during December in 2010.

4.1.1.4 Windowpane (Scophthalmus aquosus)

Windowpane is a left-eye flounder that commonly inhabits near shore estuaries and the continental shelf from Georges Bank to the Chesapeake (Chang *et al.* 1999). Spawning typically occurs in the New York Bight from February through May and then again in the fall (Able and Fahay 2010). Within the Harbor estuary, EFH is designated for all life stages of windowpane flounder (Table 1-1).

During ABS ichthyoplankton sampling in 2010, windowpane was the most commonly collected EFH species, due primarily to high concentrations of eggs in the Lower Bay and Upper Bay. These regionally high egg densities from April through June are common in each ABS program year. Larval windowpane were collected in lower than normal densities during May and June 2010 (100-250 larvae/1,000m^3), which is inconsistent with previous years where peak monthly collections of windowpane ichthyoplankton typically exceeded 1,000 larvae/1,000m^3.

As was generally the case in previous years, adult and juvenile windowpane were collected in relatively low abundances during the bottom trawl sampling season. Adult and juvenile windowpane exhibit a slight trend towards higher CPUEs at channel locations, although this was less apparent in 2008 (USACE-NYD 2009), 2009 (USACE-NYD 2010a) and 2010. In 2010, windowpane were collected at higher CPUEs at Upper Bay channel stations followed by Lower Bay non-channel stations.

4.1.1.5 Other EFH Species

Of the remaining species with EFH designations, black sea bass, butterfish, clearnose skate, little skate, pollock, scup, spiny dogfish, summer flounder, and winter skate were collected in relatively low abundances within the Harbor estuary during 2010 ABS sampling. Most EFH species are uncommon in ABS bottom trawl collections including Atlantic cod (n=0 in 2010; last collected in 2009), Atlantic mackerel (n=0 in 2010; last collected in 1999), black sea bass (n=3 in 2010; last collected in 2009), clearnose skate (n=2 in 2010; last collected in 2009), pollock (n=4 in 2010; last collected in 2009), scup (n=1 in 2010; last collected in 2008), spiny dogfish (n=17 in 2010; last collected in 2007), winter skate (n=16 in 2010; last collected in 2009), and yellowtail flounder (n=0 in 2010; last collected in 2004). Many of these EFH species are also uncommon in ichthyoplankton collections: Atlantic cod (n=0 in 2010; last collected in 2009 and 2003), Atlantic mackerel (n=4 in 2010; last collected in 2008); black sea bass and butterfish (n=0 in 2010; last collected in 2008), pollock (n=0 in 2010; last collected in 2001), and yellowtail flounder (collected once in 2002).

One scup was collected in 2010 bottom trawls and none were collected in 2009 despite having been collected during sampling in 2007 (n=121) and 2008 (n=111). Previous collections of scup were focused in the Lower and Upper Bays within non-channel stations in June during 2007 (USACE-NYD 2008) and within channel stations in May during 2008 (USACE-NYD 2009). The scup collected in 2010 was from a non-channel station in the Lower Bay in April. Scup have never been collected during ichthyoplankton sampling.

Butterfish (primarily juveniles) are seasonal inhabitants of the Harbor, primarily collected during summer months in Lower Bay, and have at times been common in bottom trawl collections. In 2010, 116 were collected (a few during December and most during May at Lower Bay non-channel stations (CPUE of 9.4). In recent years, nine adults and sub-adults were collected in bottom trawls during both 2009 and 2008, and 47 in 2007, which

is evidence of their interannual variability in the Harbor. Butterfish post yolk-sac larvae and juveniles are collected in low abundances during ichthyoplankton sampling in most years, but were not collected in 2009 or 2010.

Two clearnose skate, 16 winter skate, and 91 little skate were collected in bottom trawls during 2010 with little skate being the most common as it was in previous years. Little skate were collected primarily from Lower Bay non-channel stations and from Upper Bay channel stations throughout the sampling season. During previous program years, little skate were consistently collected from Lower and Upper bays though there is no clear pattern between channel and non-channel station abundances. Similarly, winter skate and clearnose skate were also collected from Lower and Upper Bays during the 2010.

A total of 65 summer flounder were collected in 2010 bottom trawls primarily at channel stations in the Upper Bay followed by the Arthur Kill/Newark Bay with fewer collected from both station types in the Lower Bay. They were collected every month but were more common in April and May, which was similar to peak occurrences in May and June during previous years. Because spawning typically occurs on the continental shelf from September through January (Able and Fahay 2010), summer flounder adults are usually uncommon to ABS collections in the winter and spring. Post yolk-sac larvae and juvenile summer flounder are collected in low abundances from January through April in 2010 and in most years (Table 3-5, USACE-NYD 2007, USACE-NYD 2008, and USACE-NYD 2009), which is indicative of their pelagic early life history as they move towards coastal areas.

4.1.2 Important Non-EFH Species

Based upon their relative importance to both local and regional managers, eleven species have been grouped in this report for the ABS program as important non-EFH species: alewife, American eel, American lobster, American shad, Atlantic menhaden, Atlantic sturgeon, blue crab, blueback herring, rainbow smelt, shortnose sturgeon and striped bass. Of these eleven species, only alewife, Atlantic menhaden, blueback herring and striped

bass have historically comprised a large part of the ABS bottom trawl collections and only Atlantic menhaden ichthyoplankton comprised a large part of the ABS collections.

4.1.2.1 River herring (Alewife and Blueback Herring)

More commonly referred to as river herring, alewife and blueback herring are often combined in management assessments because of their similar morphology, ecological role and environmental requirements (Bozeman and Van Den Avyle 1989). Both species enter the Harbor estuary during annual spawning runs in the spring although spawning typically occurs upstream in less brackish and freshwater portions of the estuary (Able and Fahay 2010). For this report, they are categorized as important non-EFH species because of the current fishery, which includes both commercial and recreational harvesting for bait, and because a general trend in decreasing abundance within the Hudson River Estuary (Schmidt *et al.* 2003, NYSDEC 2011). Additionally, in May 2009, the Atlantic States Marine Fisheries Commission adopted Amendment 2 to the Interstate Fishery Management Plan for Shad and River Herring, which requires closing unsustainable river herring fisheries by 2012. New York State is in the process of determining the current river herring stock status in the Hudson River (NYSDEC 2011).Water pollution, entrainment and impingement losses, and more recently increased predation from striped bass have also contributed to their decreased numbers (Hattala *et al.* 2009).

Alewife and blueback herring are regularly among the top 10 species most commonly collected, though collections were higher in years prior to 2010. In bottom trawl collection from 2002 to 2010, alewife has been the most commonly collected species at channel stations in the Lower Bay comprising 33% of the total catch in those areas (5% at non-channel stations), while blueback herring has been common to the Lower Bay (13% at channel stations) and Upper Bay (5% at non-channel stations, 6% at channel stations) regardless of station type (Figure 4-1). In the Upper Bay, alewife comprised 9% of the channel catch, which was tied with striped bass and winter flounder for the third most commonly collected species. Typically both alewife and blueback herring are collected throughout the ABS sampling season, with peak collections during January and February

(USACE-NYD 2007, USACE-NYD 2008, USACE-NYD 2009, USACE-NYD 2010a). In 2010, alewife were collected primarily in March and April at non-channel stations in the Lower Bay, and to a lesser extent at non-channel stations in the Upper Bay during December, and at channel stations of the Upper Bay and Lower Bay in April and December. Peak catch rates of blueback herring were typically collected from December through February in most years. This pattern held in 2010, though blueback herring CPUEs were lower than recent years.

4.1.2.2 Atlantic menhaden (Brevoortia tyrannus)

Similar to river herring, Atlantic menhaden represent an important prey species for many other species of fish and have historically constituted one of the largest commercial fisheries by weight in the United States (Rogers and Van Den Avyle 1989). Seasonal migrations during the spring and fall reportedly coincide with changes in water temperature with most spawning occurring over the inner continental shelf across most months (Able and Fahay 2010). During ABS sampling, Atlantic menhaden has been only moderately abundant in bottom trawl collections in recent years (330 collected in 2008; 15 collected in 2009; 266 collected in 2010) although their eggs and, to a lesser extent, their larvae have comprised a common component of ichthyoplankton samples throughout the ABS program. In 2010, 266 Atlantic menhaden were collected in bottom trawls primarily at channel stations of the Lower Bay during December and some were collected at non-channel stations in the Lower Bay during December and the Arthur Kill/Newark Bay during April.

In 2010, Atlantic menhaden eggs (n=1,981) were collected exclusively in May and June at both channel and non-channel stations in all three regions of the Harbor. Peak densities occurred at channel stations in the Arthur Kill/Newark Bay and to a lesser extent in the Upper Bay followed by the lowest densities in the Lower Bay. Yolk-sac larvae (n=7) were collected exclusively in June at channel and non-channel stations in the Upper Bay and Lower Bay while post yolk-sac larvae (n=47) were collected from all regions and station types. Egg and larval comparisons among years are difficult because the dominant

region, station type, and magnitude vary each year. Regardless of year or life stage, Atlantic menhaden densities have been consistently highest from May through July (when sampling continued into July).

4.1.2.3 Striped bass (Morone saxatilis)

Striped bass is a recreationally important game fish that was harvested commercially in the Hudson River until the 1970s. Being an anadromous species, striped bass typically move into the estuary in April through mid-June to spawn in fresh water near the salt front (Smith 1985). Although it is a migratory species that ranges along the Atlantic Coast, recent studies using otolith analysis have suggested that a year-round resident population may inhabit New York Harbor (Levinton and Waldman 2006).

Historically, striped bass have comprised an important component of the Arthur Kill/Newark Bay and Upper Bay bottom trawl collections, accounting for 15% and 8% of the channel and non-channel catches, respectively, in the Arthur Kill/Newark Bay as well as 9% of the channel catch in the Upper Bay (Figure 4-1). Striped bass was a dominant or very common species in collections during the early program years when bottom trawl surveys were conducted at night. Since changing to daytime trawling in 2005, however, striped bass catches have generally been lower.

During 2010 bottom trawl sampling, 1,995 striped bass were collected (sixth most abundant species), 94% of which were collected at channel stations in the Arthur Kill/Newark Bay during December with continued catches from January through March. These results are relatively consistent with the more recent years of the ABS program, where more striped bass are collected from channel stations: 95% (n=522 total) in 2007 (USACE-NYD 2008), 85% (n=1,420 total) were collected in 2008 (USACE-NYD 2009), and 87% (n=684 total) in 2009 (USACE-NYD 2010a). Since the start of the ABS program in 2002, just a few striped bass yolk-sac and post yolk-sac larvae have been collected during ichthyoplankton sampling and none have been collected since 2007 (USACE-NYD 2008).

4.1.2.4 Other Important Non-EFH Species

Sturgeon species are uncommon to the ABS collections. Shortnose sturgeon is a federally listed endangered species known to inhabit estuaries and large coastal rivers along the Atlantic Coast, but is uncommon or no longer present in many of the river systems in its middle and southern range (Bain *et al.* 1998). No shortnose sturgeon were collected in 2010 and only one shortnose sturgeon was collected during bottom trawl sampling in 2009 and that was at a non-channel station in the Upper Bay in May (USACE-NYD 2010a). One Atlantic sturgeon was collected at a Lower Bay channel station in December during 2010 and one was collected from an Upper Bay non-channel station during 2005. The Atlantic sturgeon is an estuary-dependant, anadromous species that uses the Hudson River as spawning and nursery habitat (Levinton and Waldman 2006). The New York Bight subpopulation is considered one of the healthiest in the nation; however it has recently been under consideration for listing as federally endangered. In October 2010 after completing a status review, NOAA announced that federal listing of the Atlantic Sturgeon under the Federal Endangered Species Act is warranted (Federal Register 2010). Federal listing is pending the public comment period and public hearings. All of the sturgeon collected during the ABS program were promptly measured and released alive, and reported, following the sturgeon handling protocols developed by the National Marine Fisheries Service (NOAA 2000)

American shad is an important commercial fishery harvested for both its flesh and roe. Adult shad spend most of their lives in the Atlantic Ocean before migrating into the estuary in the spring to spawn when water temperatures reach between 12 and 21°C (Levinton and Waldman 2006). Spawning typically occurs in freshwater and in shallow water habitats north of Croton in the Hudson River (Smith 1985). From 2007 to 2009, the bottom trawl collections of American shad have remained remarkably consistent with between 47 and 65 fish collected each year and most of the collections have tended to be focused in channel areas of the Upper and Lower Bays throughout the sampling season (USACE-NYD 2008, USACE-NYD 2009, USACE-NYD 2010a, Tables 3-2 and 3-3). In 2010, 107 American shad were captured with collections primarily occurring at non-

channel stations in the Lower Bay. Just a few American shad eggs, yolk-sac and post yolk-sac larvae have been collected during the ABS ichthyoplankton sampling program including most recently in 2008 when 16 eggs were identified in non-channel stations of the Lower Bay in May (USACE-NYD 2009).

During initial program sampling, blue crabs were recorded as bycatch in bottom trawls but beginning in 2006 they were enumerated and measured because of their importance as a commercial fishery. In 2010, 341 blue crabs were collected primarily from the Arthur Kill/Newark Bay channel stations, which were more blue crabs than collected during previous years. In 2007, 305 blue crabs were collected (USACE-NYD 2008), and in 2006, 218 blue crabs were collected (USACE-NYD 2007). Regardless of year, blue crab collections have occurred at channel and non-channel stations in all three regions though collections have been consistently higher in the Arthur Kill/Newark Bay and Upper Bay with a preference for channel stations.

Of the remaining important non-EFH species (American eel, American lobster, and rainbow smelt), only a few have been collected from 2002 to 2009, including two rainbow smelt collected during 2009 bottom trawl sampling (USACE-NYD 2010a). In 2010, 12 American lobsters were collected (nine from the Lower Bay and three from the Upper Bay) compared to one in 2007, none in 2008 and one in 2009. In 2010, six American eel were collected (all from channel stations in the Arthur Kill/Newark Bay) compared to two in 2007, none in 2008 and one in 2009.

4.2 WINTER FLOUNDER

As a valuable commercial and recreational species, winter flounder has remained a species of importance to local and regional resource managers. Winter flounder are traditionally managed as three separate stocks: The Gulf of Maine, Southern New England/Mid-Atlantic, and Georges Bank, which was once considered a separate species (Able and Fahay 2010). Recent assessments of the Southern New England/Mid-Atlantic stock have noted declines in commercial landings and recreational catches since the mid-1980s (ASMFC 1998 and Vonderweidt *et al*. 2006). Other studies in the

region, such as the Niantic River Estuary winter flounder surveys, have also shown steady declines in winter flounder abundances since the 1970s (MEL 2008). Northeast Fisheries Science Center (NEFSC) indices of groundfish have shown a consistent decline since hitting a near historic peak of 11,176 metric tons in commercial landings in 1981 (NEFSC 2008).

Except for the Georges Bank population, which may spawn at depths up to 45 meters, adult winter flounder have been documented to migrate inshore in the fall and early winter throughout most of its range (Able and Fahay 2010), typically spawning in very shallow water less than five meters (NMFS 1999 and Brown *et al*. 2000). A recent study on the New York Bight intercontinental shelf suggests that not all winter flounder move to estuaries to spawn and some spawning may occur in nearshore areas on the inner continental shelf (Wuenschel *et al.* 2009). DeCelles and Cadrin (2010) documented a similar pattern of coastal spawning in the southern Gulf of Maine in Plymouth Bay.

Spawning individuals that move to estuarine waters are believed to spawn in shallow waters where conditions favor limited movements of their eggs, which are demersal and adhesive, due to tidal currents. Schultz *et al.* (2007) found early stage eggs concentrated in low current areas. These areas in combination with the adhesive nature of the eggs would tend to maintain eggs where they were spawned. The yolk-sac larvae would then begin development in low current areas which would be beneficial for a life stage with limited mobility (Schultz *et al.* 2007).

The USACE-NYD Aquatic Biological Survey offers a comprehensive data source on the population structure and yearly habitat use of winter flounder in the New York/New Jersey Harbor. ABS program results have been used to not only document winter flounder spawning over broad regional areas of the Harbor, but have also been used to highlight the inter-annual variability in the relative abundance and distribution of winter flounder early life stages for use by local and regional administrators in better defining both seasonal dredging restrictions and winter flounder EFH (USACE-NYD 2010b).

Within the ABS study area, winter flounder have been shown to spawn in shallow, non-channel habitats primarily in the Upper and Lower Bays (USACE-NYD 2010b). Several ABS program findings support this conclusion including: (1) egg densities/abundance were higher at shallower non-channel stations; (2) nearly all (98%) of the newly deposited eggs (Stage 1 and 2 eggs less than two days old) were collected at non-channel stations; and (3) samples from 2008-2010 that contained multiple egg stages were collected primarily in single sampling periods from non-channel stations indicating multiple spawning events were occurring in these areas.

Based on these life history strategies, the occurrence of eggs and the subsequent collections of early stage yolk-sac larvae can be used in the ABS program to identify potential spawning and nursery areas in the Harbor. Additional program elements developed in recent years (i.e., larval life staging, egg staging, further categorization of station depths) have expanded and refined the assessment of timing and occurrence of early life stages. Findings from this robust dataset combined with important studies on winter flounder spawning, development, and habitat use provide a powerful tool for protecting winter flounder resources in the NY/NJ Harbor.

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Table 1-1. Summary of federally designated EFH species in NY/NJ Harbor.

SPECIES	EGGS	LARVAE	NEONATE/ EARLY JUVENILES	JUVENILES	ADULTS	SPAWNING ADULTS
Atlantic herring (*Clupea harengus*)		**M,S**		**M,S**	**M,S**	
Atlantic mackerel (*Scomber scombrus*)	**M,S**	**M,S**		**M,S**	**M,S**	
Black sea bass (*Centropristus striata*)	**M,S**	**M,S**		**M,S**	**M,S**	
Bluefish (*Pomatomus saltatrix*)				**M,S**	**M,S**	
Butterfish (*Peprilus triacanthus*)	**M,S**	**M,S**		**M,S**	**M,S**	
Red hake *(Urophycis chuss*)		**M,S**		**M,S**	**M,S**	
Scup (*Stenotomus chrysops*)	**M,S**	**M,S**		**M,S**	**M,S**	
Summer flounder (*Paralicthys dentatus*)		**M,S**		**M,S**	**M,S**	
Windowpane (*Scopthalmus aquosus*)	**S**	**M,S**		**M,S**	**M,S**	**M,S**
Winter flounder (*Pseudopleuronectes americanus*)	**M,S**	**M,S**		**M,S**	**M,S**	**M,S**
Clearnose skate (*Raja eglanteria*)				**X**	**X**	
Little skate (*Leucoraja erinacea*)				**X**	**X**	
Winter skate (*Leucoraja ocellata*)				**X**	**X**	
Cobia (*Rachycentron canadum*)	**X**	**X**		**X**	**X**	
King mackerel (*Scomberomorus cavalla*)	**X**	**X**		**X**	**X**	
Spanish mackerel (*Scomberomorus maculatus*)	**X**	**X**		**X**	**X**	
Dusky shark (*Carcharhinus obscurus*)			**X**	**X**		
Sand tiger shark (*Odontaspis taurus*)			**X**		**X**	
Sandbar shark (*Carcharinus plumbeus*)			**X**		**X**	

Source: National Marine Fisheries Service (2007): Guide to Essential Fish Habitat Designation in the Northeastern United States – the Hudson River/Raritan/Sandy Hook Bays, New York/ New Jersey Harbor Estuary.

Legend: S = Includes the seawater salinity zone (salinity ≥ 25.0‰)

M = Includes mixing water / brackish salinity zone (0.5‰ < salinity < 25.0‰)

F = Includes tidal freshwater salinity zone (0.0‰ < salinity < 0.5‰)

X = Designated EFH but no salinity zone specified

Table 2-1. Description of stations sampled during the 2010 Aquatic Biological Survey and the number of valid samples collected during the 2010 sampling program.

Area	Station Name	Type	Station Location	Depth (ft)	Valid Samples Collected	
					Trawl	Ichthyo.
South Brooklyn (5 Transects in 2010)	SB–1	Non-channel	Gowanus Bay Interpier South	27	NS	NS
	SB–2	Non-channel	Gowanus Bay Interpier	30	NS	NS
	SB–3	**Non-channel**	**Bay Ridge Flats**	**18**	**10**	**12**
	SB–4	**Channel**	**Bay Ridge Channel**	**40**	**10**	**12**
	SB–5	**Channel**	**Anchorage Channel Middle**	**47**	**10**	**12**
	SB–6	**Channel**	**Anchorage Channel South**	**48**	**10**	**12**
	SB-7	**Channel**	**Anchorage Channel Middle**	**54**	**8**	**11**
Port Jersey (2 Transects in 2010)	**PJ–1**	**Non-channel**	**Jersey Flats**	**19**	**10**	**12**
	PJ–2	**Non-channel**	**Caven Point**	**10**	**10**	**12**
	PJ–3	Non-channel	Constable Hook	10	NS	NS
	PJ–4	Channel	Port Jersey Channel	51	NS	NS
	PJ–5	Channel	Port Jersey Channel East	42	NS	NS
Newark Bay (4 Transects in 2010)	NB–3	Non-channel	Newark Bay Flats Middle	10	NS	NS
	NB–4	**Non-channel**	**Newark Bay Flats South**	**12**	**10**	**12**
	NB–5	Channel	Newark Bay Middle Reach	42	NS	NS
	NB–6	**Channel**	**Newark Bay South Reach**	**46**	**8**	**7**
	NB–7	**Non-channel**	**Elizabeth Flats North**	**11**	**10**	**12**
	NB–8	**Channel**	**Newark Bay North Reach Channel**	**43**	**10**	**12**
Lower Bay (16 Transects in 2010)	**LB–1**	**Non-channel**	**East Bank**	**17**	**10**	**12**
	LB–2	**Channel**	**North End Ambrose Channel**	**54**	**10**	**12**
	LB–3	**Non-channel**	**Swash Channel Range**	**20**	**10**	**12**
	LB–4	**Channel**	**Chapel Hill South Channel**	**37**	**10**	**12**
	LB–5	**Non-channel**	**Old Orchard Shoals**	**21**	**10**	**12**
	LB–6	**Channel**	**Raritan Bay East Reach**	**46**	**10**	**12**
	LB-7	**Non-channel**	**South of West Bank**	**31**	**10**	**12**
	LB-8	**Non-channel**	**West Bank Flat**	**20**	**10**	**12**
	LB-9	**Non-channel**	**West of Channel**	**30**	**10**	**12**
	LB-10	**Non-channel**	**Anchorage west of Gravesend Bay**	**30**	**10**	**12**
	LB-11	Non-channel	Gravesend Bay Flats	22	NS	NS
	LB-12	**Non-channel**	**West of Chapel Hill South Channel**	**25**	**10**	**12**
	LB-13	**Non-channel**	**East of Chapel Hill South Channel**	**19**	**10**	**12**
	LB-14	**Channel**	**Just north of Ambrose Channel**	**52**	**10**	**12**
	LBD-15	**Non-Channel/Deep Water**	**Deep area west of East Bank**	**47**	**10**	**12**
	LB-16	**Non-Channel**	**South End of East Bank**	**18**	**10**	**12**
	LBD-17	**Non-Channel/Deep Water**	**Deep area west of Romer Shoal**	**48**	**10**	**12**

Area	Station Name	Type	Station Location	Depth (ft)	Valid Samples Collected	
					Trawl	Ichthyo.
Arthur Kill (2 Transects in 2010)	AK-1	Non-channel	Elizabeth Flats South	19	NS	NS
	AK-2	**Channel**	**North of Shooter's Island Reach**	**52**	**10**	**12**
	AK-3	**Channel**	**Elizabeth Reach**	**50**	**10**	**12**
	AK-4	Non-channel	Prall's Island	20	NS	NS
	AK-7	Non-channel	Island of Meadows	15	NS	NS
Kill Van Kull (0 Transects in 2010)	KVK-1	Channel	Entrance to KVK Channel (Sand)	52	NS	NS
	KVK-2	Channel	Entrance to KVK Channel (Silt)	55	NS	NS

Stations in BOLD represent those sampled during 2010 Sampling Program.
NS = Not Sampled

Table 2-2. Sampling of bottom trawls (B) and ichthyoplankton tows (I) conducted by station and week during the 2010 Aquatic Biological Survey.

Region	Station	12/14	12/21	1/4	1/11	1/18	2/1	2/15	2/22	3/1	3/8	3/15	3/22	4/5	4/19	5/3	5/17	5/31*	6/14
Arthur Kill / Newark Bay	AK-2		B	B,I		B,I	B,I	B,I		B,I			B,I	B,I	B,I	B,I	I	I	I
	AK-3		B	B,I		B,I	B,I	B,I		B,I			B,I	B,I	B,I	B,I	I	I	I
	NB-4		B	B,I		B,I	B,I	B,I		B,I			B,I	B,I	B,I	B,I	I	I	I
	NB-6		B	B,I			B,I	B,I		B,I			B,I	B,I	B,I				
	NB-7		B	B,I		B,I	B,I	B,I		B,I			B,I	B,I	B,I	B,I	I	I	I
	NB-8		B	B,I		B,I	B,I	B,I		B,I			B,I	B,I	B,I	B,I	I	I	I
Upper Bay	PJ-1	B		B,I		B,I	B,I	B,I		B,I		B,I		B,I	B,I	B,I	I	I	I
	PJ-2	B		B,I		B,I	B,I	B,I		B,I		B,I		B,I	B,I	B,I	I	I	I
	SB-3	B		B,I		B,I	B,I	B,I		B,I		B,I		B,I	B,I	B,I	I	I	I
	SB-4	B		B,I		B,I	B,I	B,I		B,I		B,I		B,I	B,I	B,I	I	I	I
	SB-5	B		B,I		B,I	B,I	B,I		B,I		B,I		B,I	B,I	B,I	I	I	I
	SB-6	B		B,I		B,I	B,I	B,I		B,I		B,I		B,I	B,I	B,I	I	I	I
	SB-7	B		B,I		B,I	B,I	B,I		B,I		B,I		B,I			I	I	I
Lower Bay	LB-1	B			B,I	B,I	B,I		B,I		B,I		B,I	B,I	B,I	B,I	I	I	I
	LB-2	B			B,I	B,I	B,I		B,I		B,I		B,I	B,I	B,I	B,I	I	I	I
	LB-3	B		B,I		B,I	B,I	B,I		B,I		B,I		B,I	B,I	B,I	I	I	I
	LB-4	B			B,I	B,I	B,I		B,I	B,I		B,I		B,I	B,I	B,I	I	I	I
	LB-5	B			B,I	B,I	B,I		B,I	B,I		B,I		B,I	B,I	B,I	I	I	I
	LB-6	B			B,I	B,I	B,I		B,I	B,I		B,I		B,I	B,I	B,I	I	I	I
	LB-7	B		B,I		B,I	B,I	B,I		B,I		B,I		B,I	B,I	B,I	I	I	I
	LB-8	B		B,I		B,I	B,I	B,I		B,I		B,I		B,I	B,I	B,I	I	I	I
	LB-9	B		B,I		B,I	B,I	B,I		B,I			B,I	B,I	B,I	B,I	I	I	I
	LB-10	B		B,I		B,I	B,I	B,I			B,I		B,I	B,I	B,I	B,I	I	I	I
	LB-12	B			B,I	B,I	B,I		B,I	B,I		B,I		B,I	B,I	B,I	I	I	I
	LB-13	B			B,I	B,I	B,I		B,I	B,I		B,I		B,I	B,I	B,I	I	I	I
	LB-14	B		B,I		B,I	B,I		B,I		B,I		B,I	B,I	B,I	B,I	I	I	I
	LB-16	B			B,I	B,I	B,I		B,I	B,I		B,I		B,I	B,I	B,I	I	I	I
	LBD-15	B			B,I	B,I	B,I		B,I		B,I		B,I	B,I	B,I	B,I	I	I	I
	LBD-17	B			B,I	B,I	B,I		B,I	B,I		B,I		B,I	B,I	B,I	I	I	I

* Actual sampling occurred June 1-3, 2010.

Table 2-3. Specifications of the bottom trawl used during the Aquatic Biological Survey.

Part	Specification
Headrope	25.9 ft. (7.9 m)
Footrope	27.9 ft (8.5 m)
Wing height	3.6 ft. (1.1 m)
Total length	35.1 ft (10.7 m)
Wing mesh (square)	1.0-in. (2.54 cm)
Body mesh (square)	1.0-in. (2.54 cm)
Cod end mesh (square)	0.75-in. (1.9 cm)
Cod end liner mesh (square)	0.25-in. (0.6 cm)
Trawl doors	32.0 x 17.0 x 1.0-in (81.3 x 43.2 x 2.5 cm)
Tow line length	5 times maximum station water depth

Table 2-4. Specifications of the epibenthic sled and plankton net used during the Aquatic Biological Survey.

Part	Specification
Mouth height x width	0.5 x 0.5 m
Overall length	3.0 m
Mesh size	0.5 mm
Cod-end diameter	10.1 cm
Cod-end mesh	0.5 mm (PVC cod-end bucket)
Distance from sled base	Bottom of net is 17.8 cm above the bottom of the sled runners
Epibenthic sled	Constructed of welded aluminum.

Table 2-5. Water quality parameters measured during the Aquatic Biological Survey.

Water Quality Parameter	Units and Accuracy	Sample Depths
Temperature	+/- 0.2˚C	Bottom
Dissolved oxygen	+/- 0.5 mg/L	Bottom
Conductivity	+/- 100 µS/cm	Bottom
Salinity	+/- 0.1 ppt	Bottom

Table 3-1. Taxa identified in bottom trawl and epibenthic sled (ichthyoplankton) samples collected during the 2010 Aquatic Biological Survey with ranking based on total number collected.

Group	Common Name	Scientific Name	Trawl	Sled
Essential Fish Habitat Species	Atlantic herring	*Clupea harengus*	x	x
	Atlantic mackerel	*Scomber scombrus*		x
	Black sea bass	*Centropristis striata*	x	
	Butterfish	*Peprilus triacanthus*	x	
	Clearnose skate	*Raja eglanteria*	x	
	Little skate	*Raja erinacea*	x	
	Pollock	*Pollachius virens*	x	
	Red hake	*Urophycis chuss*	4	
	Scup	*Stenotomus chrysops*	x	
	Silver hake	*Merluccius bilinearis*	10	x
	Spiny dogfish	*Squalus acanthias*	x	
	Summer flounder	*Paralichthys dentatus*	x	x
	Windowpane	*Scopthalmus aquosus*	x	3
	Winter flounder	*Pseudopleuronectes americanus*	7	4
	Winter skate	*Raja ocellata*	x	
Important Non-EFH Species	Alewife	*Alosa pseudoharengus*	8	
	American eel	*Anguilla rostrata*	x	
	American lobster	*Homarus americanus*	x	
	American shad	*Alosa sapidissima*	x	
	Atlantic menhaden	*Brevoortia tyrannus*	x	7
	Atlantic sturgeon	*Acipenser oxyrinchus oxyrinchus*	x	
	Blue crab	*Callinectes sapidus*	x	
	Blueback herring	*Alosa aestivalis*	x	
	Striped bass	*Morone saxatilis*	6	
Other Species	American sandlance	*Ammodytes americanus*	2	5
	Atlantic croaker	*Micropogonias undulates*	x	10
	Atlantic silverside	*Menidia menidia*	5	x
	Atlantic tomcod	*Microgadus tomcod*	x	x
	Bay anchovy	*Anchoa mitchilli*	9	1
	Black drum	*Pogonias cromis*	x	
	Clupeid unidentified			x
	Cods and Haddocks	*Gadidae*		x
	Conger eel	*Conger oceanicus*	x	
	Crevalle jack	*Caranx hippos*	x	
	Cunner	*Tautogolabrus adspersus*	x	x
	Feather blenny	*Hypsoblennius hentzi*		x

Table 3-1. Taxa identified in bottom trawl and epibenthic sled (ichthyoplankton) samples collected during the 2010 Aquatic Biological Survey with ranking based on total number collected.

Group	Common Name	Scientific Name	Trawl	Sled
Other Species	Fourbeard rockling	*Enchelyopus cimbrius*		x
	Fourspine stickleback	*Apeltes quadracus*	x	
	Fourspot flounder	*Hippoglossina oblonga*	x	x
	Gizzard shad	*Dorosoma cepedianum*	x	
	Gobies	*Gobiidae*		9
	Goosefish	*Lophius americanus*		x
	Grubby	*Myoxocephalus aenaeus*	x	6
	Hogchocker	*Trinectes maculatus*	x	
	Naked goby	*Gobiosoma bosci*	x	
	Northern pipefish	*Syngnathus fuscus*	x	x
	Northern puffer	*Sphoeroides maculatus*		x
	Northern searobin	*Prionotus carolinus*	x	
	Oyster toadfish	*Opsanus tau*	x	
	Rock gunnel	*Pholis gunnellus*	x	x
	Searobin species	*Prionotus sp.*		8
	Silver perch	*Diapterus rhombeus*	x	
	Smallmouth flounder	*Etropus microstomus*	x	
	Spotted hake	*Urophycis regia*	3	
	Striped cuskeel	*Ophidion marginatum*	x	x
	Striped mullet	*Mugil cephalus*	x	
	Striped searobin	*Prionotus evolans*	x	
	Tautog	*Tautoga onitis*	x	x
	Unidentified			x
	Weakfish	*Cynoscion regalis*	x	x
	White perch	*Morone americana*	1	
	Wrasses	*Labridae*		2
		Total Taxa	51	30

Notes:
*1-10 = Rank of ten most abundant species based on total collected. X = Species was collected.
**Family level classifications were not included in the total taxa count if species from within that family were collected and identified to a lower taxonomic level (e.g., Gobidae were not counted in trawls total taxa due to the collection of *Gobiosoma bosci* and *Gobiosoma ginsburgi*).

Table 3-2. Total number collected by species at channel and non-channel stations during bottom trawl sampling for the 2010 Aquatic Biological Survey (includes finfish and macrocrustaceans).

Species	Station Type	Region			Total
		AKNB	LB	UB	
Essential Fish Habitat Species					
Atlantic herring	Channel	1	57	47	105
	Non-Channel	6	75	147	228
	Combined	7	132	194	333
Black sea bass	Channel	1	0	1	2
	Non-Channel	0	0	1	1
	Combined	1	0	2	3
Butterfish	Channel	0	1	0	1
	Non-Channel	0	115	0	115
	Combined	0	116	0	116
Clearnose skate	Channel	0	0	1	1
	Non-Channel	0	1	0	1
	Combined	0	1	1	2
Little skate	Channel	0	8	26	34
	Non-Channel	0	50	7	57
	Combined	0	58	33	91
Pollock	Channel	0	1	0	1
	Non-Channel	0	3	0	3
	Combined	0	4	0	4
Red hake	Channel	733	277	1,203	2,213
	Non-Channel	0	139	9	148
	Combined	733	416	1,212	2,361
Scup	Channel	0	0	0	0
	Non-Channel	0	1	0	1
	Combined	0	1	0	1
Silver hake	Channel	13	200	47	260
	Non-Channel	2	243	1	246
	Combined	15	443	48	506
Spiny dogfish	Channel	0	5	1	6
	Non-Channel	0	11	0	11
	Combined	0	16	1	17
Summer flounder	Channel	22	6	28	56
	Non-Channel	1	7	1	9
	Combined	23	13	29	65

Table 3-2. Total number collected by species at channel and non-channel stations during bottom trawl sampling for the 2010 Aquatic Biological Survey (includes finfish and macrocrustaceans).

Species	Station Type	Region			Total
		AKNB	LB	UB	
Windowpane	Channel	12	14	66	92
	Non-Channel	1	55	5	61
	Combined	13	69	71	153
Winter flounder	Channel	349	125	167	641
	Non-Channel	9	178	82	269
	Combined	358	303	249	910
Winter skate	Channel	0	0	7	7
	Non-Channel	0	9	0	9
	Combined	0	9	7	16
Sub-Total Channel		***1,131***	***694***	***1,594***	***3,419***
Sub-Total Non-Channel		***19***	***887***	***253***	***1,159***
Sub-Total Essential Fish Habitat Species		***1,150***	***1,581***	***1,847***	***4,578***
Important Non-EFH Species					
Alewife	Channel	7	64	61	132
	Non-Channel	0	747	15	762
	Combined	7	811	76	894
American eel	Channel	6	0	0	6
	Non-Channel	0	0	0	0
	Combined	6	0	0	6
American lobster	Channel	0	2	3	5
	Non-Channel	0	7	0	7
	Combined	0	9	3	12
American shad	Channel	1	14	13	28
	Non-Channel	10	59	10	79
	Combined	11	73	23	107
Atlantic menhaden	Channel	0	172	10	182
	Non-Channel	15	68	1	84
	Combined	15	240	11	266
Atlantic sturgeon	Channel	0	1	0	1
	Non-Channel	0	0	0	0
	Combined	0	1	0	1
Blue crab	Channel	224	6	24	254
	Non-Channel	50	8	29	87
	Combined	274	14	53	341

Table 3-2. Total number collected by species at channel and non-channel stations during bottom trawl sampling for the 2010 Aquatic Biological Survey (includes finfish and macrocrustaceans).

Species	Station Type	Region			Total
		AKNB	LB	UB	
Blueback herring	Channel	1	35	21	57
	Non-Channel	13	59	9	81
	Combined	14	94	30	138
Striped bass	Channel	1,875	6	38	1,919
	Non-Channel	5	21	50	76
	Combined	1,880	27	88	1,995
Sub-Total Channel		***2,114***	***300***	***170***	***2,584***
Sub-Total Non-Channel		***93***	***969***	***114***	***1,176***
Sub-Total Important Non-EFH Species		***2,207***	***1,269***	***284***	***3,760***
Other Species					
American sandlance	Channel	0	1	1	2
	Non-Channel	2	4,260	19	4,281
	Combined	2	4,261	20	4,283
Atlantic croaker	Channel	2	0	1	3
	Non-Channel	1	0	1	2
	Combined	3	0	2	5
Atlantic silverside	Channel	4	539	20	563
	Non-Channel	45	1,476	24	1,545
	Combined	49	2,015	44	2,108
Atlantic tomcod	Channel	5	0	12	17
	Non-Channel	0	1	2	3
	Combined	5	1	14	20
Bay anchovy	Channel	1	14	14	29
	Non-Channel	3	271	517	791
	Combined	4	285	531	820
Black drum	Channel	1	0	0	1
	Non-Channel	0	0	0	0
	Combined	1	0	0	1
Conger eel	Channel	0	0	1	1
	Non-Channel	0	3	0	3
	Combined	0	3	1	4
Crevalle jack	Channel	1	0	0	1
	Non-Channel	0	0	0	0
	Combined	1	0	0	1

Table 3-2. Total number collected by species at channel and non-channel stations during bottom trawl sampling for the 2010 Aquatic Biological Survey (includes finfish and macrocrustaceans).

Species	Station Type	Region			Total
		AKNB	LB	UB	
Cunner	Channel	0	3	5	8
	Non-Channel	0	0	6	6
	Combined	0	3	11	14
Fourspine stickleback	Channel	1	0	0	1
	Non-Channel	0	0	0	0
	Combined	1	0	0	1
Fourspot flounder	Channel	0	4	0	4
	Non-Channel	0	2	0	2
	Combined	0	6	0	6
Gizzard shad	Channel	59	3	2	64
	Non-Channel	0	0	0	0
	Combined	59	3	2	64
Grubby	Channel	32	11	13	56
	Non-Channel	0	12	29	41
	Combined	32	23	42	97
Hogchocker	Channel	1	0	0	1
	Non-Channel	0	0	0	0
	Combined	1	0	0	1
Naked goby	Channel	0	3	1	4
	Non-Channel	0	0	0	0
	Combined	0	3	1	4
Northern pipefish	Channel	9	6	10	25
	Non-Channel	0	8	4	12
	Combined	9	14	14	37
Northern searobin	Channel	0	1	1	2
	Non-Channel	0	2	1	3
	Combined	0	3	2	5
Oyster toadfish	Channel	1	0	0	1
	Non-Channel	0	0	0	0
	Combined	1	0	0	1
Rock gunnel	Channel	1	2	0	3
	Non-Channel	0	3	2	5
	Combined	1	5	2	8
Silver perch	Channel	5	7	37	49
	Non-Channel	0	8	0	8
	Combined	5	15	37	57

Table 3-2. Total number collected by species at channel and non-channel stations during bottom trawl sampling for the 2010 Aquatic Biological Survey (includes finfish and macrocrustaceans).

Species	Station Type	Region			Total
		AKNB	LB	UB	
Smallmouth flounder	Channel	1	11	37	49
	Non-Channel	0	40	7	47
	Combined	1	51	44	96
Spotted hake	Channel	1,198	309	1,217	2,724
	Non-Channel	1	253	9	263
	Combined	1,199	562	1,226	2,987
Striped cuskeel	Channel	2	0	0	2
	Non-Channel	0	1	0	1
	Combined	2	1	0	3
Striped mullet	Channel	9	4	2	15
	Non-Channel	0	2	0	2
	Combined	9	6	2	17
Striped searobin	Channel	0	1	7	8
	Non-Channel	0	0	0	0
	Combined	0	1	7	8
Tautog	Channel	3	5	8	16
	Non-Channel	0	16	3	19
	Combined	3	21	11	35
Weakfish	Channel	0	5	0	5
	Non-Channel	0	2	0	2
	Combined	0	7	0	7
White perch	Channel	9,818	1	7	9,826
	Non-Channel	15	0	21	36
	Combined	9,833	1	28	9,862
Sub-Total Channel Total		***11,154***	***930***	***1,396***	***13,480***
Sub-Total Non-Channel Total		***67***	***6,360***	***645***	***7,072***
Sub-Total Other Species		***11,221***	***7,290***	***2,041***	***20,552***
Total Number All - Channel		**14,399**	**1,924**	**3,160**	**19,483**
Total Species All - Channel		**33**	**37**	**37**	**50**
Total Number All - Non-Channel		**179**	**8,216**	**1,012**	**9,407**
Total Species All - Non-Channel		**16**	**37**	**28**	**41**
Total Number All - Combined		**14,578**	**10,140**	**4,172**	**28,890**
Total Species All - Combined		**35**	**43**	**38**	**51**

Table 3-3. Monthly average bottom trawl CPUE by species for all channel and non-channel stations during the 2010 Aquatic Biological Survey.

Species	Station Type	Dec	Jan	Feb	Mar	Apr	May	Average
Essential Fish Habitat Species								
Atlantic herring	Channel		3.00	1.33	0.08	0.04	0.10	0.91
	Non-channel		1.59	0.29	0.18	0.21	8.94	1.35
Black sea bass	Channel	0.17						0.02
	Non-channel	0.06						0.01
Butterfish	Channel	0.08						0.01
	Non-channel	0.12					6.65	0.68
Clearnose skate	Channel				0.04			0.01
	Non-channel	0.06						0.01
Little skate	Channel	0.42	0.39	0.21	0.17	0.43	0.10	0.29
	Non-channel	0.35	0.18	0.09	0.38	0.68	0.41	0.34
Pollock	Channel					0.04		0.01
	Non-channel						0.18	0.02
Red hake	Channel	26.50	25.45	10.94	16.84	34.88	11.10	21.41
	Non-channel	3.59	0.24	0.09	1.65	0.50	0.29	0.88
Scup	Channel							
	Non-channel					0.03		0.01
Silver hake	Channel	18.83	1.25	0.38				2.27
	Non-channel	12.06	1.25					1.46
Spiny dogfish	Channel	0.42	0.04					0.05
	Non-channel	0.65						0.06
Summer flounder	Channel	0.25	0.43	0.08	0.32	1.23	1.10	0.53
	Non-channel		0.03	0.03	0.03	0.12	0.13	0.05
Windowpane	Channel	0.42	0.35	0.42	1.92	0.84	0.90	0.84
	Non-channel	0.12	0.21	0.03	0.76	0.74	0.06	0.37
Winter flounder	Channel	6.15	5.96	6.56	10.41	7.10	2.60	6.96
	Non-channel	1.07	1.82	0.44	1.29	3.15	2.12	1.66
Winter skate	Channel	0.08	0.17			0.04	0.10	0.06
	Non-channel	0.18	0.09		0.03	0.06		0.05
Important Non-EFH Species								
Alewife	Channel	1.58	0.52	0.38	0.63	3.28	0.30	1.15
	Non-channel	1.41	0.56	0.03	15.97	5.12	0.12	4.49
American eel	Channel	0.08			0.05	0.13	0.10	0.05
	Non-channel							
American lobster	Channel		0.09	0.08		0.04		0.04
	Non-channel		0.03	0.03	0.03	0.12		0.04

Table 3-3. Monthly average bottom trawl CPUE by species for all channel and non-channel stations during the 2010 Aquatic Biological Survey.

Species	Station Type	Dec	Jan	Feb	Mar	Apr	May	Average
American shad	Channel	0.50	0.22	0.21	0.42	0.09		0.24
	Non-channel	1.00			0.97	0.88		0.47
Atlantic menhaden	Channel	13.17	0.35	0.29	0.04	0.30	0.10	1.57
	Non-channel	3.29	0.38			0.44		0.49
Atlantic sturgeon	Channel	0.08						0.01
	Non-channel							
Blue crab	Channel	1.17	0.78	0.04	0.82	6.85	15.63	3.16
	Non-channel	0.91	0.13	0.15	0.50	0.49	2.19	0.56
Blueback herring	Channel		0.96	0.50	0.96	0.04		0.50
	Non-channel	2.35	0.06	0.29	0.21	0.62	0.06	0.48
Striped bass	Channel	116.57	20.51	5.48	8.05	0.58	0.10	19.05
	Non-channel	1.88	0.35	0.06	0.09	0.82		0.45
Other Species								
American sandlance	Channel			0.08				0.02
	Non-channel	131.25	9.26	26.24	24.09	0.71		25.18
Atlantic croaker	Channel	0.17	0.04					0.03
	Non-channel	0.06	0.03					0.01
Atlantic silverside	Channel	0.25	10.43	12.96	0.54			4.89
	Non-channel	5.49	30.95	10.96	0.91	0.03		9.12
Atlantic tomcod	Channel	0.08		0.13	0.08	0.09	1.00	0.16
	Non-channel						0.18	0.02
Bay anchovy	Channel	1.50	0.22	0.13			0.30	0.25
	Non-channel	17.49	0.62	0.04		1.00	28.14	4.89
Black drum	Channel	0.08						0.01
	Non-channel							
Conger eel	Channel		0.04					0.01
	Non-channel		0.06		0.03			0.02
Crevalle jack	Channel	0.08						0.01
	Non-channel							
Cunner	Channel	0.08	0.09	0.21				0.07
	Non-channel		0.03	0.06	0.06	0.03		0.04
Fourspine stickleback	Channel					0.04		0.01
	Non-channel							
Fourspot flounder	Channel	0.33						0.03
	Non-channel	0.12						0.01
Gizzard shad	Channel	4.61	0.86					0.65
	Non-channel							

Table 3-3. Monthly average bottom trawl CPUE by species for all channel and non-channel stations during the 2010 Aquatic Biological Survey.

Species	Station Type	Dec	Jan	Feb	Mar	Apr	May	Average
Grubby	Channel	0.08	0.22	1.81	0.88	0.38	0.37	0.71
	Non-channel	0.18	0.38	0.26	0.26	0.29		0.26
Hogchocker	Channel						0.17	0.01
	Non-channel							
Naked goby	Channel	0.08	0.09		0.04			0.03
	Non-channel							
Northern pipefish	Channel	0.25	0.09	0.17	0.46	0.42		0.25
	Non-channel	0.12			0.24	0.09		0.08
Northern searobin	Channel	0.08				0.04		0.02
	Non-channel	0.06					0.16	0.02
Oyster toadfish	Channel						0.20	0.02
	Non-channel							
Rock gunnel	Channel		0.04		0.04	0.04		0.03
	Non-channel		0.06	0.03	0.06			0.03
Silver perch	Channel	0.75	1.91					0.46
	Non-channel	0.35	0.06					0.05
Smallmouth flounder	Channel	0.25	0.30	0.13	1.50	0.04		0.43
	Non-channel	0.53	0.50		0.44	0.18		0.28
Spotted hake	Channel	7.70	1.81	0.25	5.25	97.70	43.47	25.41
	Non-channel	2.94	0.29	0.06	1.29	4.47	0.29	1.55
Striped cuskeel	Channel				0.08	0.04		0.03
	Non-channel				0.03			0.01
Striped mullet	Channel	0.50	0.43					0.14
	Non-channel	0.06	0.03					0.01
Striped searobin	Channel	0.17					0.60	0.07
	Non-channel							
Tautog	Channel	0.25	0.17	0.21	0.08	0.10		0.14
	Non-channel		0.06		0.03	0.44	0.06	0.11
Weakfish	Channel	0.42						0.04
	Non-channel	0.06	0.03					0.01
White perch	Channel	174.73	306.74	113.35	81.35	3.08	0.27	119.81
	Non-channel	0.57	0.06	0.32	0.06	0.43		0.23

* Averages were calculated on per sample basis

Table 3-4 a. Monthly average bottom trawl CPUE by species for all channel stations in the Arthur Kill/Newark Bay (AKNB), Upper Bay (UB), and Lower Bay (LB) during the 2010 Aquatic Biological Survey.

Species	Region	Dec	Jan	Feb	Mar	Apr	May	Average
Essential Fish Habitat Species								
	AKNB						0.33	0.03
Atlantic herring	UB		2.88	3.00				1.24
	LB		5.75	1.00	0.25	0.13		1.43
	AKNB	0.25						0.03
Black sea bass	UB	0.25						0.03
	LB							
	AKNB							
Butterfish	UB							
	LB	0.25						0.03
	AKNB							
Clearnose skate	UB				0.13			0.03
	LB							
	AKNB							
Little skate	UB		0.75	0.63	0.50	1.43	0.33	0.68
	LB	1.25	0.38					0.20
	AKNB							
Pollock	UB							
	LB					0.13		0.03
	AKNB	20.00	34.19	15.56	27.39	34.70	20.33	26.35
Red hake	UB	9.75	40.00	17.00	22.50	71.52	9.67	31.70
	LB	49.75	3.25	0.25	0.63	3.00	5.25	6.93
	AKNB							
Scup	UB							
	LB							
	AKNB	1.75	0.81	0.50				0.44
Silver hake	UB	6.00	2.25	0.63				1.24
	LB	48.75	0.63					5.00
	AKNB							
Spiny dogfish	UB	0.25						0.03
	LB	1.00	0.13					0.13
	AKNB		0.43		0.46	1.79	2.33	0.74
Summer flounder	UB		0.75	0.13	0.50	1.86	1.33	0.74
	LB	0.75	0.13	0.13		0.13		0.15
	AKNB	0.50	0.29		1.00	0.55	0.33	0.46
Windowpane	UB	0.25	0.75	0.75	4.13	1.71	2.67	1.74
	LB	0.50		0.50	0.63	0.38		0.35

Table 3-4 a. Monthly average bottom trawl CPUE by species for all channel stations in the Arthur Kill/Newark Bay (AKNB), Upper Bay (UB), and Lower Bay (LB) during the 2010 Aquatic Biological Survey.

Species	Region	Dec	Jan	Feb	Mar	Apr	May	Average
	AKNB	12.21	14.43	14.06	23.36	6.44	4.67	13.55
Winter flounder	UB	4.00	3.63	2.50	5.13	8.25	1.33	4.42
	LB	2.25	0.88	3.13	2.75	6.75	2.00	3.13
	AKNB							
Winter skate	UB	0.25	0.50			0.14	0.33	0.18
	LB							
Important Non-EFH Species								
	AKNB			0.25	0.13	0.68		0.22
Alewife	UB	2.25	0.88	0.38	1.50	3.86	1.00	1.61
	LB	2.50	0.63	0.50	0.25	5.38		1.60
	AKNB	0.25			0.16	0.38	0.33	0.16
American eel	UB							
	LB							
	AKNB							
American lobster	UB			0.25		0.14		0.08
	LB		0.25					0.05
	AKNB	0.25						0.03
American shad	UB		0.13	0.50	1.00			0.34
	LB	1.25	0.50	0.13	0.25	0.25		0.35
	AKNB							
Atlantic menhaden	UB		0.25	0.13		1.00		0.26
	LB	39.50	0.75	0.75	0.13		0.25	4.30
	AKNB							
Atlantic sturgeon	UB							
	LB	0.25						0.03
	AKNB	1.50	0.71		2.08	19.07	52.11	8.86
Blue crab	UB	1.75	1.50	0.13	0.13	0.43		0.63
	LB	0.25	0.13		0.25	0.25		0.15
	AKNB			0.25				0.05
Blueback herring	UB		0.38	0.63	1.50	0.14		0.55
	LB		2.38	0.63	1.38			0.88
	AKNB	348.71	64.24	15.44	23.52	1.18		56.99
Striped bass	UB	0.50	2.75	1.00	0.63	0.14		1.00
	LB	0.50				0.38	0.25	0.15

Table 3-4 a. Monthly average bottom trawl CPUE by species for all channel stations in the Arthur Kill/Newark Bay (AKNB), Upper Bay (UB), and Lower Bay (LB) during the 2010 Aquatic Biological Survey.

Species	Region	Dec	Jan	Feb	Mar	Apr	May	Average
Other Species								
	AKNB							
American sandlance	UB			0.13				0.03
	LB			0.13				0.03
	AKNB	0.50						0.05
Atlantic croaker	UB		0.13					0.03
	LB							
	AKNB			1.00				0.21
Atlantic silverside	UB		0.88	1.63				0.53
	LB	0.75	29.13	36.25	1.63			13.48
	AKNB	0.25		0.25		0.25	0.33	0.16
Atlantic tomcod	UB			0.13	0.25		3.00	0.32
	LB							
	AKNB	0.25						0.03
Bay anchovy	UB	1.75	0.50	0.38				0.37
	LB	2.50	0.13				0.75	0.35
	AKNB	0.25						0.03
Black drum	UB							
	LB							
	AKNB							
Conger eel	UB		0.13					0.03
	LB							
	AKNB	0.25						0.03
Crevalle jack	UB							
	LB							
	AKNB							
Cunner	UB			0.63				0.13
	LB	0.25	0.25					0.08
	AKNB					0.13		0.03
Fourspine stickleback	UB							
	LB							
	AKNB							
Fourspot flounder	UB							
	LB	1.00						0.10

Table 3-4 a. Monthly average bottom trawl CPUE by species for all channel stations in the Arthur Kill/Newark Bay (AKNB), Upper Bay (UB), and Lower Bay (LB) during the 2010 Aquatic Biological Survey.

Species	Region	Dec	Jan	Feb	Mar	Apr	May	Average
	AKNB	13.82	2.10					1.84
Gizzard shad	UB		0.25					0.05
	LB		0.38					0.08
	AKNB		0.29	4.94	0.88	0.84	1.22	1.55
Grubby	UB		0.13	0.38	0.88	0.29		0.34
	LB	0.25	0.25	0.13	0.88			0.28
	AKNB						0.56	0.04
Hogchocker	UB							
	LB							
	AKNB							
Naked goby	UB				0.13			0.03
	LB	0.25	0.25					0.08
	AKNB		0.14		0.88	0.67		0.35
Northern pipefish	UB		0.13	0.50	0.13	0.60		0.27
	LB	0.75			0.38			0.15
	AKNB							
Northern searobin	UB					0.14		0.03
	LB	0.25						0.03
	AKNB						0.67	0.05
Oyster toadfish	UB							
	LB							
	AKNB					0.13		0.03
Rock gunnel	UB							
	LB		0.13		0.13			0.05
	AKNB		1.29					0.24
Silver perch	UB	0.50	4.38					0.97
	LB	1.75						0.18
	AKNB			0.25				0.05
Smallmouth flounder	UB		0.13	0.13	4.38			0.97
	LB	0.75	0.75		0.13	0.13		0.28
	AKNB	5.36	2.67		6.25	148.52	44.22	37.13
Spotted hake	UB	7.75	2.88	0.50	6.00	124.57	83.33	32.32
	LB	10.00		0.25	3.50	23.38	13.00	7.73
	AKNB				0.25	0.13		0.08
Striped cuskeel	UB							
	LB							

Table 3-4 a. Monthly average bottom trawl CPUE by species for all channel stations in the Arthur Kill/Newark Bay (AKNB), Upper Bay (UB), and Lower Bay (LB) during the 2010 Aquatic Biological Survey.

Species	Region	Dec	Jan	Feb	Mar	Apr	May	Average
	AKNB	1.50	0.57					0.26
Striped mullet	UB		0.25					0.05
	LB		0.50					0.10
	AKNB							
Striped searobin	UB	0.50					1.67	0.18
	LB						0.25	0.03
	AKNB	0.50			0.13			0.08
Tautog	UB		0.13	0.63		0.32		0.22
	LB	0.25	0.38		0.13			0.13
	AKNB							
Weakfish	UB							
	LB	1.25						0.13
	AKNB	523.68	1007.43	339.94	244.06	8.58	0.89	365.53
White perch	UB	0.25	0.38	0.13		0.30		0.19
	LB	0.25						0.03

* Averages were calculated on per sample basis

Table 3-4 b. Monthly average bottom trawl CPUE by species for all non-channel stations in the Arthur Kill/Newark Bay (AKNB), Lower Bay (LB), and Upper Bay (UB) during the 2010 Aquatic Biological Survey.

Species	Region	Dec	Jan	Feb	Mar	Apr	May	Average
Essential Fish Habitat Species								
	AKNB						3.13	0.31
Atlantic herring	UB				0.17	0.17	48.56	4.92
	LB		2.25	0.42	0.21	0.25		0.63
	AKNB							
Black sea bass	UB	0.33						0.03
	LB							
	AKNB							
Butterfish	UB							
	LB	0.17					9.42	0.96
	AKNB							
Clearnose skate	UB							
	LB	0.08						0.01
	AKNB							
Little skate	UB					1.33		0.27
	LB	0.50	0.26	0.13	0.54	0.63	0.58	0.42
	AKNB							
Pollock	UB							
	LB						0.25	0.03
	AKNB							
Red hake	UB	0.67	0.33	0.17	0.33	0.67		0.37
	LB	4.92	0.25	0.08	2.25	0.54	0.42	1.16
	AKNB							
Scup	UB							
	LB					0.04		0.01
	AKNB		0.63					0.13
Silver hake	UB	0.33						0.03
	LB	17.00	1.67					2.03
	AKNB							
Spiny dogfish	UB							
	LB	0.92						0.09
	AKNB						0.63	0.06
Summer flounder	UB			0.17				0.03
	LB		0.04		0.04	0.17	0.08	0.06
	AKNB					0.31		0.06
Windowpane	UB		0.17		0.33	0.50		0.20
	LB	0.17	0.25	0.04	1.00	0.88	0.08	0.46

Table 3-4 b. Monthly average bottom trawl CPUE by species for all non-channel stations in the Arthur Kill/Newark Bay (AKNB), Lower Bay (LB), and Upper Bay (UB) during the 2010 Aquatic Biological Survey.

Species	Region	Dec	Jan	Feb	Mar	Apr	May	Average
	AKNB	0.63	1.25		0.71	0.56		0.57
Winter flounder	UB	3.67	4.50	1.33	2.50	3.67	3.33	3.10
	LB	0.50	1.25	0.29	1.08	3.46	2.17	1.48
	AKNB							
Winter skate	UB							
	LB	0.25	0.13		0.04	0.08		0.08
Important Non-EFH Species								
	AKNB							
Alewife	UB	4.00				0.33	0.67	0.53
	LB	1.00	0.79	0.04	22.63	7.17		6.23
	AKNB							
American eel	UB							
	LB							
	AKNB							
American lobster	UB							
	LB		0.04	0.04	0.04	0.17		0.06
	AKNB					2.50		0.50
American shad	UB	0.33			0.33	1.33		0.37
	LB	1.33			1.29	0.50		0.49
	AKNB					3.75		0.75
Atlantic menhaden	UB	0.33						0.03
	LB	4.58	0.54					0.57
	AKNB							
Atlantic sturgeon	UB							
	LB							
	AKNB	1.75	0.63		1.75	2.38	17.75	2.90
Blue crab	UB	3.00	0.33	0.67	1.33	0.83	0.56	0.99
	LB	0.25		0.04	0.08	0.08		0.07
	AKNB					3.25		0.65
Blueback herring	UB	1.67			0.17	0.33	0.33	0.30
	LB	2.92	0.08	0.42	0.25	0.25		0.49
	AKNB				0.25	1.25		0.30
Striped bass	UB	9.67	2.00	0.33	0.33	0.83		1.67
	LB	0.25				0.75		0.18

Table 3-4 b. Monthly average bottom trawl CPUE by species for all non-channel stations in the Arthur Kill/Newark Bay (AKNB), Lower Bay (LB), and Upper Bay (UB) during the 2010 Aquatic Biological Survey.

Species	Region	Dec	Jan	Feb	Mar	Apr	May	Average
Other Species								
American sandlance	AKNB	0.63	0.25					0.11
	UB	6.33						0.63
	LB	184.25	13.08	37.17	34.13	1.00		35.50
Atlantic croaker	AKNB	0.50						0.05
	UB		0.17					0.03
	LB							
Atlantic silverside	AKNB	13.63	3.31	1.67	0.71			2.50
	UB	0.67	0.17	2.00	1.50			0.80
	LB	5.33	43.25	14.75	0.79	0.04		12.30
Atlantic tomcod	AKNB							
	UB						0.67	0.07
	LB						0.08	0.01
Bay anchovy	AKNB	0.63		0.31			0.50	0.18
	UB	43.33	1.17			4.17	131.78	18.58
	LB	13.83	0.58			0.38	6.83	2.26
Black drum	AKNB							
	UB							
	LB							
Conger eel	AKNB							
	UB							
	LB		0.08		0.04			0.03
Crevalle jack	AKNB							
	UB							
	LB							
Cunner	AKNB							
	UB		0.17	0.33	0.33	0.17		0.20
	LB							
Fourspine stickleback	AKNB							
	UB							
	LB							
Fourspot flounder	AKNB							
	UB							
	LB	0.17						0.02

Table 3-4 b. Monthly average bottom trawl CPUE by species for all non-channel stations in the Arthur Kill/Newark Bay (AKNB), Lower Bay (LB), and Upper Bay (UB) during the 2010 Aquatic Biological Survey.

Species	Region	Dec	Jan	Feb	Mar	Apr	May	Average
Gizzard shad	AKNB							
	UB							
	LB							
Grubby	AKNB							
	UB	1.00	1.83	0.83	0.50	1.67		1.07
	LB		0.08	0.17	0.25			0.10
Hogchocker	AKNB							
	UB							
	LB							
Naked goby	AKNB							
	UB							
	LB							
Northern pipefish	AKNB							
	UB				0.33	0.50		0.17
	LB	0.17			0.25			0.07
Northern searobin	AKNB							
	UB						0.56	0.06
	LB	0.08					0.08	0.02
Oyster toadfish	AKNB							
	UB							
	LB							
Rock gunnel	AKNB							
	UB		0.17	0.17				0.07
	LB		0.04		0.08			0.03
Silver perch	AKNB							
	UB							
	LB	0.50	0.08					0.07
Smallmouth flounder	AKNB							
	UB	1.00	0.33		0.33			0.23
	LB	0.50	0.63		0.54	0.25		0.33
Spotted hake	AKNB	0.50						0.05
	UB	0.67				1.17		0.30
	LB	3.92	0.42	0.08	1.83	6.04	0.42	2.11
Striped cuskeel	AKNB							
	UB							
	LB				0.04			0.01

Table 3-4 b. Monthly average bottom trawl CPUE by species for all non-channel stations in the Arthur Kill/Newark Bay (AKNB), Lower Bay (LB), and Upper Bay (UB) during the 2010 Aquatic Biological Survey.

Species	Region	Dec	Jan	Feb	Mar	Apr	May	Average
Striped mullet	AKNB							
	UB							
	LB	0.08	0.04					0.02
Striped searobin	AKNB							
	UB							
	LB							
Tautog	AKNB							
	UB		0.17		0.17		0.33	0.10
	LB		0.04			0.63		0.13
Weakfish	AKNB							
	UB							
	LB	0.08	0.04					0.02
White perch	AKNB	1.88		2.75		0.88		0.91
	UB	2.00	0.33		0.33	1.83		0.70
	LB							

* Averages were calculated on per sample basis

Table 3-5. Total number of viable eggs, yolk-sac, post yolk-sac, juveniles and unidentified larval stage collected by region at all stations during ichthyoplankton sampling for the 2010 Aquatic Biological Survey.

Common Name	Life Stage	Region			Grand Total
		AKNB	UB	LB	
Essential Fish Habitat Species					
Atlantic herring	Egg	0	0	0	0
	Yolk-sac	0	0	0	0
	Post yolk-sac	1	16	20	37
	Juvenile	0	1	0	1
	Unidentified larvae	0	0	0	0
	Total	1	17	20	38
Atlantic mackerel	Egg	0	0	4	4
	Yolk-sac	0	0	0	0
	Post yolk-sac	0	0	0	0
	Juvenile	0	0	0	0
	Unidentified larvae	0	0	0	0
	Total	0	0	4	4
Silver hake	Egg	0	64	88	152
	Yolk-sac	0	0	0	0
	Post yolk-sac	0	0	0	0
	Juvenile	0	0	0	0
	Unidentified larvae	0	0	0	0
	Total	0	64	88	152
Summer flounder	Egg	0	0	0	0
	Yolk-sac	0	0	0	0
	Post yolk-sac	11	4	24	39
	Juvenile	1	3	0	4
	Unidentified larvae	0	0	0	0
	Total	12	7	24	43
Windowpane	Egg	15	1634	5992	7641
	Yolk-sac	0	3	9	12
	Post yolk-sac	3	45	52	100
	Juvenile	0	0	0	0
	Unidentified larvae	0	0	0	0
	Total	18	1,682	6,053	7,753
Winter flounder	Egg	5	128	194	327
	Yolk-sac	42	84	408	534
	Post yolk-sac	231	638	3408	4277
	Juvenile	0	0	0	0
	Unidentified larvae	38	27	162	227
	Total	316	877	4,172	5,365
Sub Total Essential Fish Habitat Species Total		347	2,647	10,362	13,356

Table 3-5. Total number of viable eggs, yolk-sac, post yolk-sac, juveniles and unidentified larval stage collected by region at all stations during ichthyoplankton sampling for the 2010 Aquatic Biological Survey.

Common Name	Life Stage	Region			Grand Total
		AKNB	UB	LB	
Important Non-EFH Species					
Atlantic menhaden	Egg	696	733	552	1981
	Yolk-sac	0	7	17	24
	Post yolk-sac	13	21	82	116
	Juvenile	0	0	0	0
	Unidentified larvae	0	5	38	43
	Total	709	766	689	2,164
Sub Total Important Non-EFH Species		709	766	689	2,164
Other Species					
American sandlance	Egg	0	0	0	0
	Yolk-sac	25	253	891	1169
	Post yolk-sac	83	479	1574	2136
	Juvenile	0	0	0	0
	Unidentified larvae	2	10	22	34
	Total	110	742	2,487	3,339
Atlantic croaker	Egg	0	0	0	0
	Yolk-sac	0	0	0	0
	Post yolk-sac	35	66	2	103
	Juvenile	24	73	1	98
	Unidentified larvae	0	0	0	0
	Total	59	139	3	201
Atlantic silverside	Egg	0	0	0	0
	Yolk-sac	3	0	0	3
	Post yolk-sac	13	2	13	28
	Juvenile	0	0	0	0
	Unidentified larvae	0	0	0	0
	Total	16	2	13	31
Atlantic tomcod	Egg	0	0	0	0
	Yolk-sac	0	0	0	0
	Post yolk-sac	8	3	3	14
	Juvenile	4	8	0	12
	Unidentified larvae	0	0	0	0
	Total	12	11	3	26

Table 3-5. Total number of viable eggs, yolk-sac, post yolk-sac, juveniles and unidentified larval stage collected by region at all stations during ichthyoplankton sampling for the 2010 Aquatic Biological Survey.

Common Name	Life Stage	Region			Grand Total
		AKNB	UB	LB	
Bay anchovy	Egg	34660	27448	69628	131736
	Yolk-sac	0	4	20	24
	Post yolk-sac	155	60	726	941
	Juvenile	4	5	0	9
	Unidentified larvae	0	0	10	10
	Total	34,819	27,517	70,384	132,720
Clupeid unidentified	Egg	0	0	0	0
	Yolk-sac	0	0	0	0
	Post yolk-sac	0	4	2	6
	Juvenile	0	0	0	0
	Unidentified larvae	50	0	3	53
	Total	50	4	5	59
Cods and Haddocks	Egg	0	34	74	108
	Yolk-sac	0	0	0	0
	Post yolk-sac	0	0	0	0
	Juvenile	0	0	0	0
	Unidentified larvae	0	0	0	0
	Total	0	34	74	108
Cunner	Egg	0	0	0	0
	Yolk-sac	0	0	0	0
	Post yolk-sac	0	0	1	1
	Juvenile	0	0	0	0
	Unidentified larvae	0	0	0	0
	Total	0	0	1	1
Feather blenny	Egg	0	0	0	0
	Yolk-sac	0	0	0	0
	Post yolk-sac	0	0	3	3
	Juvenile	0	0	0	0
	Unidentified larvae	0	0	0	0
	Total	0	0	3	3

Table 3-5. Total number of viable eggs, yolk-sac, post yolk-sac, juveniles and unidentified larval stage collected by region at all stations during ichthyoplankton sampling for the 2010 Aquatic Biological Survey.

Common Name	Life Stage	Region			Grand Total
		AKNB	UB	LB	
Fourspot flounder	Egg	0	0	0	0
	Yolk-sac	0	0	1	1
	Post yolk-sac	0	0	1	1
	Juvenile	0	0	0	0
	Unidentified larvae	0	0	0	0
	Total	0	0	2	2
Gobies	Egg	0	0	0	0
	Yolk-sac	0	0	0	0
	Post yolk-sac	212	15	17	244
	Juvenile	0	0	0	0
	Unidentified larvae	0	0	0	0
	Total	212	15	17	244
Goosefish	Egg	0	0	0	0
	Yolk-sac	0	0	3	3
	Post yolk-sac	0	0	3	3
	Juvenile	0	0	0	0
	Unidentified larvae	0	0	0	0
	Total	0	0	6	6
Grubby	Egg	0	2	0	2
	Yolk-sac	11	42	39	92
	Post yolk-sac	239	501	1967	2707
	Juvenile	0	0	0	0
	Unidentified larvae	0	0	0	0
	Total	250	545	2,006	2,801
Northern pipefish	Egg	0	0	0	0
	Yolk-sac	0	0	0	0
	Post yolk-sac	38	24	66	128
	Juvenile	0	0	1	1
	Unidentified larvae	0	0	0	0
	Total	38	24	67	129

Table 3-5. Total number of viable eggs, yolk-sac, post yolk-sac, juveniles and unidentified larval stage collected by region at all stations during ichthyoplankton sampling for the 2010 Aquatic Biological Survey.

Common Name	Life Stage	Region			Grand Total
		AKNB	UB	LB	
Northern puffer	Egg	0	0	0	0
	Yolk-sac	0	0	0	0
	Post yolk-sac	0	0	1	1
	Juvenile	0	0	0	0
	Unidentified larvae	0	0	0	0
	Total	0	0	1	1
Rock gunnel	Egg	0	0	0	0
	Yolk-sac	2	4	8	14
	Post yolk-sac	15	37	108	160
	Juvenile	0	0	0	0
	Unidentified larvae	0	0	0	0
	Total	17	41	116	174
Searobin species	Egg	0	288	1281	1569
	Yolk-sac	0	0	0	0
	Post yolk-sac	0	0	1	1
	Juvenile	0	0	0	0
	Unidentified larvae	0	0	0	0
	Total	0	288	1,282	1,570
Striped cuskeel	Egg	0	0	0	0
	Yolk-sac	0	0	0	0
	Post yolk-sac	0	0	0	0
	Juvenile	0	0	1	1
	Unidentified larvae	0	0	0	0
	Total	0	0	1	1
Tautog	Egg	0	0	0	0
	Yolk-sac	0	0	1	1
	Post yolk-sac	0	1	5	6
	Juvenile	0	0	0	0
	Unidentified larvae	0	0	4	4
	Total	0	1	10	11

Table 3-5. Total number of viable eggs, yolk-sac, post yolk-sac, juveniles and unidentified larval stage collected by region at all stations during ichthyoplankton sampling for the 2010 Aquatic Biological Survey.

Common Name	Life Stage	Region			Grand Total
		AKNB	UB	LB	
Unidentified	Egg	0	0	0	0
	Yolk-sac	0	0	0	0
	Post yolk-sac	0	0	0	0
	Juvenile	0	0	0	0
	Unidentified larvae	0	3	27	30
	Total	0	3	27	30
Weakfish	Egg	0	0	0	0
	Yolk-sac	0	0	0	0
	Post yolk-sac	0	1	1	2
	Juvenile	0	0	0	0
	Unidentified larvae	0	0	0	0
	Total	0	1	1	2
Wrasses	Egg	3478	5015	10934	19428
	Yolk-sac	0	0	0	0
	Post yolk-sac	0	0	0	0
	Juvenile	0	0	0	0
	Unidentified larvae	0	0	0	0
	Total	3,478	5,015	10,934	19,428
Sub Total Other Species		39,771	35,148	88,133	160,887
Egg Total		38,855	35,346	88,748	162,948
Yolk-sac Total		83	397	1,397	1,877
Post Yolk-sac Total		1,057	1,917	8,081	11,055
Juvenile Total		33	90	3	126
Unidentified Larval Stage Total		90	45	266	401
Grand Total		**40,118**	**37,795**	**98,495**	**176,407**

Table 3-6 a. Monthly average egg density (number/1,000m^3) by species for channel stations and non-channel stations in Arthur Kill/Newark Bay (AKNB), Upper Bay (UB), and Lower Bay (LB) during ichthyoplankton sampling for the 2010 Aquatic Biological Survey.

Channel Stations								
Species	**Region**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**Average**
Essential Fish Habitat Species								
Atlantic mackerel	AKNB							
	UB							
	LB							
Silver hake	AKNB							
	UB						45.33	7.55
	LB						25.29	4.21
Windowpane	AKNB					12.50		2.08
	UB				27.48	241.82	690.81	160.02
	LB				19.49	332.94	399.19	125.27
Winter flounder	AKNB							
	UB		2.37					0.40
	LB	2.24	6.25		0.64			1.52
Important Non-EFH Species								
Atlantic menhaden	AKNB						549.53	91.59
	UB					17.46	187.51	34.16
	LB					41.69	61.45	17.19
Other Species								
Bay anchovy	AKNB					1.51	21552.25	3592.29
	UB					3.40	13646.49	2274.98
	LB					232.64	14566.78	2466.57
Cods and Haddocks	AKNB							
	UB			2.34	10.28			2.10
	LB	0.55	0.92		5.55			1.17
Fourbeard rockling	AKNB			2.68	5.39	1.10		1.53
	UB				43.80			7.30
	LB				0.47	0.80		0.21
Grubby	AKNB							
	UB							
	LB							
Searobin species	AKNB							
	UB						184.54	30.76
	LB					62.84	169.92	38.79
Wrasses	AKNB					47.99	2307.65	392.61
	UB					72.13	2535.05	434.53
	LB					123.90	1458.95	263.81

Table 3-6 a. Monthly average egg density (number/1,000m^3) by species for channel stations and non-channel stations in Arthur Kill/Newark Bay (AKNB), Upper Bay (UB), and Lower Bay (LB) during ichthyoplankton sampling for the 2010 Aquatic Biological Survey.

Non-Channel Stations

Species	Region	Jan	Feb	Mar	Apr	May	June	Average
Essential Fish Habitat Species								
Atlantic mackerel	AKNB							
	UB							
	LB						0.93	0.15
Silver hake	AKNB							
	UB							
	LB						11.75	1.96
Windowpane	AKNB					1.24		0.21
	UB				13.08	207.50	156.46	62.84
	LB				19.26	372.17	779.32	195.13
Winter flounder	AKNB			7.01				1.17
	UB		6.25	114.63				20.15
	LB	4.05	12.35	27.92	2.53			7.81
Important Non-EFH Species								
Atlantic menhaden	AKNB						22.20	3.70
	UB					10.66	397.30	67.99
	LB					16.51	78.15	15.78
Other Species								
Bay anchovy	AKNB					1.73	12,864.97	2,144.45
	UB					9.80	7,921.33	1,321.86
	LB					42.24	11,020.58	1,843.80
Cods and Haddocks	AKNB							
	UB			10.06	5.26			2.55
	LB			0.69	14.46			2.52
Fourbeard rockling	AKNB				1.65			0.28
	UB				10.43			1.74
	LB				1.97			0.33
Grubby	AKNB							
	UB			1.69				0.28
	LB							
Searobin species	AKNB							
	UB						22.94	3.82
	LB					15.79	199.49	35.88
Wrasses	AKNB					48.54	900.29	158.14
	UB					70.65	1,105.11	195.96
	LB					97.39	1,819.08	319.41

Table 3-6 b. Monthly average yolk-sac larval density (number/1,000m^3) by species for channel stations and non-channel stations in Arthur Kill/Newark Bay (AKNB), Upper Bay (UB), and Lower Bay (LB) during ichthyoplankton sampling for the 2010 Aquatic Biological Survey.

Channel Stations								
Species	**Region**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**Average**
Essential Fish Habitat Species								
Windowpane	AKNB							
	UB					0.82	0.81	0.28
	LB					2.05	0.68	0.46
Winter flounder	AKNB			2.81	13.36			3.01
	UB		0.45	3.94	19.60			3.67
	LB			5.45	34.38			6.64
Important Non-EFH Species								
Atlantic menhaden	AKNB							
	UB						4.05	0.69
	LB						1.78	0.30
Other Species								
American sandlance	AKNB	1.52	5.10	2.28				1.62
	UB	92.49	8.58	2.08				17.56
	LB	72.88	14.55	1.38				14.80
Atlantic silverside	AKNB					1.62	0.76	0.33
	UB							
	LB							
Bay anchovy	AKNB							
	UB						0.71	0.12
	LB						4.90	0.82
Fourspot flounder	AKNB							
	UB							
	LB							
Goosefish	AKNB							
	UB							
	LB						1.19	0.20
Grubby	AKNB		1.20	3.11	1.12			1.01
	UB		0.45	2.62	8.67			1.81
	LB			0.48	2.05			0.42
Rock gunnel	AKNB		1.20					0.22
	UB		1.75					0.30
	LB		1.09					0.18
Tautog	AKNB							
	UB							
	LB							

Table 3-6 b. Monthly average yolk-sac larval density (number/1,000m^3) by species for channel stations and non-channel stations in Arthur Kill/Newark Bay (AKNB), Upper Bay (UB), and Lower Bay (LB) during ichthyoplankton sampling for the 2010 Aquatic Biological Survey.

Non-Channel Stations								
Species	**Region**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**Average**
Essential Fish Habitat Species								
Windowpane	AKNB							
	UB						0.86	0.14
	LB					0.30	1.00	0.22
Winter flounder	AKNB	1.51	2.70	10.10	8.34			3.77
	UB		2.92	1.72	43.98			8.10
	LB	0.22	2.18	6.35	67.32			12.68
Important Non-EFH Species								
Atlantic menhaden	AKNB							
	UB						1.73	0.29
	LB						3.52	0.59
Other Species								
American sandlance	AKNB	11.84	5.70					2.92
	UB	94.44	3.68	1.72				16.64
	LB	159.93	15.12	3.26				29.72
Atlantic silverside	AKNB							
	UB							
	LB							
Bay anchovy	AKNB							
	UB						2.59	0.43
	LB						2.87	0.48
Fourspot flounder	AKNB							
	UB							
	LB						0.23	0.04
Goosefish	AKNB							
	UB							
	LB						0.18	0.03
Grubby	AKNB			3.36				0.56
	UB		0.83	0.84	19.96			3.61
	LB			4.26	4.34			1.43
Rock gunnel	AKNB							
	UB		1.04					0.17
	LB	0.27	1.02					0.21
Tautog	AKNB							
	UB							
	LB						0.20	0.03

Table 3-6 c. Monthly average post-yolk sac larval density (number/1,000m^3) by species for channel stations and non-channel stations in Arthur Kill/Newark Bay (AKNB), Upper Bay (UB), and Lower Bay (LB) during ichthyoplankton sampling for the 2010 Aquatic Biological Survey.

Channel Stations								
Species	**Region**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**Average**
Essential Fish Habitat Species								
Atlantic herring	AKNB					0.93		0.13
	UB			3.49	1.65			0.84
	LB			1.16				0.19
Summer flounder	AKNB	1.74	0.62	3.71	1.34			1.34
	UB	0.75		0.55				0.22
	LB		0.78	3.44				0.70
Windowpane	AKNB						0.93	0.13
	UB					11.98	9.16	3.60
	LB					0.68	9.39	1.68
Winter flounder	AKNB		0.53		36.87	48.71	2.45	14.09
	UB		0.45	7.37	281.07	45.08	2.70	51.33
	LB			126.45	200.98	127.35	0.68	75.91
Important Non-EFH Species								
Atlantic menhaden	AKNB			1.53			6.61	1.26
	UB	0.75	1.62	3.64			1.40	0.24
	LB			1.45				4.30
Other Species								
American sandlance	AKNB	11.77	6.25	6.57				4.30
	UB	127.74	17.24	34.48				30.55
	LB	158.67	12.20	3.73				29.10
Atlantic croaker	AKNB	26.41						4.30
	UB	10.76						1.83
	LB							
Atlantic silverside	AKNB						7.62	1.06
	UB						1.42	0.24
	LB						6.16	1.03
Atlantic tomcod	AKNB			4.42	0.59			0.93
	UB				1.10			0.16
	LB							
Bay anchovy	AKNB						25.34	3.54
	UB						21.46	3.65
	LB						144.10	24.02
Clupeid unidentified	AKNB							
	UB							
	LB						0.54	0.09

Table 3-6 c. Monthly average post-yolk sac larval density (number/1,000m^3) by species for channel stations and non-channel stations in Arthur Kill/Newark Bay (AKNB), Upper Bay (UB), and Lower Bay (LB) during ichthyoplankton sampling for the 2010 Aquatic Biological Survey.

Channel Stations								
Species	**Region**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**Average**
Cunner	AKNB							
	UB							
	LB							
Feather blenny	AKNB							
	UB							
	LB							
Fourspot flounder	AKNB							
	UB							
	LB							
Gobies	AKNB						49.86	6.96
	UB						4.21	0.72
	LB						1.34	0.22
Goosefish	AKNB							
	UB							
	LB							
Grubby	AKNB		2.48	50.34	72.74	1.86		23.62
	UB		1.18	66.18	129.44	0.64		30.85
	LB		3.68	61.44	167.27	1.60		39.00
Northern pipefish	AKNB						7.43	1.04
	UB						6.10	1.04
	LB						7.57	1.26
Northern puffer	AKNB							
	UB							
	LB							
Rock gunnel	AKNB		5.92	2.11	0.56			1.60
	UB		7.16	2.66	1.10			1.84
	LB		8.18	6.01	5.09			3.21
Searobin species	AKNB							
	UB							
	LB							
Tautog	AKNB							
	UB							
	LB						0.68	0.11

Table 3-6 c. Monthly average post-yolk sac larval density (number/1,000m^3) by species for channel stations and non-channel stations in Arthur Kill/Newark Bay (AKNB), Upper Bay (UB), and Lower Bay (LB) during ichthyoplankton sampling for the 2010 Aquatic Biological Survey.

Channel Stations								
Species	**Region**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**Average**
Weakfish	AKNB							
	UB						0.59	0.10
	LB							

Table 3-6 c. Monthly average post-yolk sac larval density (number/1,000m^3) by species for channel stations and non-channel stations in Arthur Kill/Newark Bay (AKNB), Upper Bay (UB), and Lower Bay (LB) during ichthyoplankton sampling for the 2010 Aquatic Biological Survey.

Non-Channel Stations

Species	Region	Jan	Feb	Mar	Apr	May	June	Average
Essential Fish Habitat Species								
Atlantic herring	AKNB							
	UB			2.82	3.63			1.07
	LB			2.39	1.30		0.71	0.73
Summer flounder	AKNB	1.42						0.24
	UB			1.95				0.32
	LB			3.51	0.88			0.73
Windowpane	AKNB					1.24	1.70	0.49
	UB					1.75	7.38	1.52
	LB					2.26	6.31	1.43
Winter flounder	AKNB		5.70	67.32	88.07	3.17		27.38
	UB		3.00	8.45	126.32	28.51		27.71
	LB		1.87	63.40	528.69	60.73	0.25	109.16
Important Non-EFH Species								
Atlantic menhaden	AKNB				1.26		3.09	0.72
	UB	0.92		0.82			6.14	1.31
	LB	0.28	0.22	1.02			15.61	2.85
Other Species								
American sandlance	AKNB	50.15	12.94	5.61				11.45
	UB	112.66	11.07	26.58				25.05
	LB	247.39	21.40	27.60	2.10			49.75
Atlantic croaker	AKNB	8.62						1.44
	UB	46.49						7.75
	LB	0.51						0.08
Atlantic silverside	AKNB						5.55	0.92
	UB							
	LB					0.56	0.48	0.17
Atlantic tomcod	AKNB			1.26				0.21
	UB			0.88				0.15
	LB		0.36	0.20	0.24			0.13
Bay anchovy	AKNB						178.19	29.70
	UB	0.93					27.97	4.82
	LB						116.62	19.44
Clupeid unidentified	AKNB							
	UB						3.95	0.66
	LB							

Table 3-6 c. Monthly average post-yolk sac larval density (number/1,000m^3) by species for channel stations and non-channel stations in Arthur Kill/Newark Bay (AKNB), Upper Bay (UB), and Lower Bay (LB) during ichthyoplankton sampling for the 2010 Aquatic Biological Survey.

Non-Channel Stations

Species	Region	Jan	Feb	Mar	Apr	May	June	Average
Cunner	AKNB							
	UB							
	LB						0.20	0.03
Feather blenny	AKNB							
	UB							
	LB					0.58		0.10
Fourspot flounder	AKNB							
	UB							
	LB						0.20	0.03
Gobies	AKNB						209.97	34.99
	UB						9.12	1.52
	LB		0.29				2.72	0.50
Goosefish	AKNB							
	UB							
	LB						0.57	0.10
Grubby	AKNB			34.22	22.81			9.50
	UB			106.41	44.22			25.11
	LB		3.28	153.76	245.23	2.46		67.45
Northern pipefish	AKNB						38.89	6.48
	UB						14.48	2.41
	LB					0.28	10.34	1.77
Northern puffer	AKNB							
	UB							
	LB						0.20	0.03
Rock gunnel	AKNB		4.35					0.73
	UB		10.18	5.05				2.54
	LB		7.61	10.25	0.54			3.07
Searobin species	AKNB							
	UB							
	LB						0.17	0.03
Tautog	AKNB							
	UB						0.86	0.14
	LB						0.79	0.13

Table 3-6 c. Monthly average post-yolk sac larval density (number/1,000m^3) by species for channel stations and non-channel stations in Arthur Kill/Newark Bay (AKNB), Upper Bay (UB), and Lower Bay (LB) during ichthyoplankton sampling for the 2010 Aquatic Biological Survey.

Non-Channel Stations

Species	Region	Jan	Feb	Mar	Apr	May	June	Average
Weakfish	AKNB							
	UB							
	LB						0.20	0.03

Table 3-6 d. Monthly average juvenile density (number/1,000m^3) by species for channel stations and non-channel stations in Arthur Kill/Newark Bay (AKNB), Upper Bay (UB), and Lower Bay (LB) during ichthyoplankton sampling for the 2010 Aquatic Biological Survey.

Channel Stations								
Species	**Region**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**Average**
Essential Fish Habitat Species								
Atlantic herring	AKNB							
	UB					0.65		0.11
	LB							
Summer flounder	AKNB					0.93		0.15
	UB	0.64						0.11
	LB							
Other Species								
Atlantic croaker	AKNB	17.49						2.91
	UB	13.62						2.27
	LB							
Atlantic tomcod	AKNB					4.11		0.68
	UB				4.24	3.10		1.22
	LB							
Bay anchovy	AKNB	3.06						0.51
	UB	2.00						0.33
	LB							
Northern pipefish	AKNB							
	UB							
	LB			0.48				0.08
Striped cuskeel	AKNB							
	UB							
	LB			0.94				0.16

Table 3-6 d. Monthly average juvenile density (number/1,000m^3) by species for channel stations and non-channel stations in Arthur Kill/Newark Bay (AKNB), Upper Bay (UB), and Lower Bay (LB) during ichthyoplankton sampling for the 2010 Aquatic Biological Survey.

Non-Channel Stations								
Species	**Region**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**Average**
Essential Fish Habitat Species								
Atlantic herring	AKNB							
	UB							
	LB							
Summer flounder	AKNB							
	UB	1.83						0.31
	LB							
Other Species								
Atlantic croaker	AKNB	7.10						1.18
	UB	47.94						7.99
	LB	0.20						0.03
Atlantic tomcod	AKNB							
	UB							
	LB							
Bay anchovy	AKNB	1.42						0.24
	UB	1.83						0.31
	LB							
Northern pipefish	AKNB							
	UB							
	LB							
Striped cuskeel	AKNB							
	UB							
	LB							

Table 3-7. Winter flounder gender determination analysis for the 2010 Aquatic Biological Survey.

#	Sample Date	Region	Station	Station Type	TL (mm)	Weight (g)	Sex	Comments
1	12/21/2009	AKNB	AK-3	Channel	255	220.1	F	DEVELOPING
2	3/25/2010	AKNB	AK-2	Channel	311	297.7	F	PARTIALLY SPENT
3	4/7/2010	AKNB	NB-8	Channel	264	198.7	F	DEVELOPING
4	4/7/2010	AKNB	NB-8	Channel	264	254.7	F	DEVELOPING
5	2/18/2010	AKNB	AK-2	Channel	222		M	RIPE
6	12/18/2009	UB	SB-4	Channel	326	430.9	F	RIPE
7	12/18/2009	UB	SB-4	Channel	294	337.6	F	RIPE
8	12/18/2009	UB	SB-4	Channel	280	282.5	F	RIPE
9	1/21/2010	UB	SB-5	Channel	304	344.1	F	RIPE
10	1/21/2010	UB	SB-7	Channel	289	319.7	F	PARTIALLY SPENT
11	1/21/2010	UB	SB-7	Channel	324	438.5	F	RIPE
12	3/16/2010	UB	SB-4	Channel	332	346.1	F	SPENT
13	3/16/2010	UB	SB-4	Channel	339	470.5	F	RIPE
14	3/16/2010	UB	SB-5	Channel	253	186.3	F	SPENT
15	3/16/2010	UB	SB-7	Channel	270	207.4	F	DEVELOPING
16	4/8/2010	UB	SB-4	Channel	278	237.3	F	SPENT
17	4/8/2010	UB	SB-4	Channel	276	202.1	F	SPENT
18	12/18/2009	UB	SB-4	Channel	313		M	PARTIALLY SPENT
19	12/18/2009	UB	SB-6	Channel	287	303.3	M	RIPE
20	3/17/2010	UB	PJ-1	Non-channel Shallow	280	241.7	M	RIPE
21	12/14/2009	LB	LB-1	Non-channel Shallow	377	878.3	F	RIPE
22	12/14/2009	LB	LB-10	Non-channel Deep	333	386	F	RIPE
23	12/14/2009	LB	LB-14	Channel	293	305	F	PARTIALLY SPENT
24	12/14/2009	LB	LB-2	Channel	268	245.3	F	PARTIALLY SPENT
25	2/2/2010	LB	LB-6	Channel	326		F	PARTIALLY SPENT
26	2/2/2010	LB	LBD-17	Non-channel Naturally Deep	311		F	PARTIALLY SPENT
27	3/2/2010	LB	LB-6	Channel	340		F	PARTIALLY SPENT
28	3/2/2010	LB	LB-6	Channel	340		F	PARTIALLY SPENT

Table 3-7. Winter flounder gender determination analysis for the 2010 Aquatic Biological Survey.

#	Sample Date	Region	Station	Station Type	TL (mm)	Weight (g)	Sex	Comments
29	3/2/2010	LB	LB-6	Channel	275	213.7	F	SPENT
30	3/17/2010	LB	LB-6	Channel	354	520	F	SPENT
31	3/22/2010	LB	LB-2	Channel	293	225	F	SPENT
32	3/22/2010	LB	LBD-15	Non-channel Naturally Deep	415	594.1	F	SPENT
33	3/22/2010	LB	LBD-15	Non-channel Naturally Deep	296	256.8	F	SPENT
34	4/5/2010	LB	LBD-15	Non-channel Naturally Deep	258	153.8	F	DEVELOPING
35	4/9/2010	LB	LB-3	Non-channel Shallow	268	214.2	F	DEVELOPING
36	12/14/2009	LB	LB-2	Channel	289		M	RIPE
37	12/14/2009	LB	LB-2	Channel	267		M	RIPE
38	1/11/2010	LB	LBD-17	Non-channel Naturally Deep	308	361.1	M	RIPE
39	2/22/2010	LB	LB-6	Channel	275		M	RIPE
40	3/17/2010	LB	LB-3	Non-channel Shallow	329		M	RIPE
41	3/17/2010	LB	LB-3	Non-channel Shallow	253		M	RIPE
42	3/18/2010	LB	LBD-17	Non-channel Naturally Deep	306		M	RIPE
43	4/6/2010	LB	LB-16	Non-channel Shallow	307		M	RIPE
44	4/6/2010	LB	LB-16	Non-channel Shallow	388		M	PARTIALLY SPENT

Averages		**TL**	**Weight**	**Total Collected**
Arthur Kill / Newark Bay	Female	274	243	4
	Male	222	--	1
Upper Bay Average	Female	297	317	15
	Male	293	273	9
Lower Bay Average	Female	316	363	12
	Male	302	361	3
Overall Average	**Female**	**303**	**325**	**31**
	Male	**294**	**302**	**13**

UNITED STATES - EAST COAST
NEW YORK - NEW JERSEY

NEW YORK HARBOR

Mercator Projection
Scale 1:40,000 at Lat. 40°32'
North American Datum of 1983
(World Geodetic System 1984)
SOUNDINGS IN FEET
AT MEAN LOWER LOW WATER

NEWARK
JERSEY CITY
HOBOKEN
MANHATTAN
BROOKLYN
STATEN ISLAND
NEWARK BAY
KILL VAN KULL
ARTHUR KILL
UPPER BAY
LOWER BAY
THE NARROWS
GRAVESEND BAY
CONEY ISLAND
ROCKAWAY INLET
ANCHORAGE AREAS
AMBROSE CHANNEL
FLINTS KNOLL
ROMER SHOAL

NB-3 NB-4 NB-6 NB-7 NB-8
AK-2 AK-3
KVK-1 KVK-2
PJ-1 PJ-2
SB-3 SB-4 SB-5 SB-6 SB-7
LB-1 LB-2 LB-3 LB-4 LB-5 LB-6 LB-7 LB-8 LB-9 LB-10 LB-12 LB-13 LB-14 LB-16
LBD-15 LBD-17

Area	Station Name	Type	Station Location	Depth (ft)	GPS Coordinates (deg., decimal min.) Flood Start North	Flood Start West	Ebb Start North	Ebb Start West
Newark Bay (4 Transects in 2010)	**NB–3**	Non-channel	Newark Bay Flats North	10	40 41.36	74 07.61	40 40.99	74 07.55
	NB–4	Non-channel	Newark Bay Flats South	12	40 40.66	74 07.63	40 40.29	74 07.87
	NB–5	Channel	Newark Bay Middle Reach	42	40 40.77	74 07.88	40 40.38	74 08.09
	NB–6	Channel	Newark Bay South Reach	46	40 40.13	74 08.28	40 39.76	74 08.52
	NB–7†	Non-channel	Elizabeth Flats North	11	40 39.62	74 09.33	40 39.41	74 09.05
	NB–8	Channel	Newark Bay North Reach	43	40 41.29	74 07.64	40 40.89	74 07.83
Arthur Kill (2 Transects in 2010)	AK-1	Non-channel	Elizabeth Flats South	19	40 38.84	74 10.58	40 38.85	74 10.13
	AK-2	Channel	North of Shooter's Island Reach	52	40 38.80	74 10.39	40 38.78	74 09.82
	AK-3	Channel	Elizabeth Reach	50	40 38.65	74 11.28	40 38.40	74 11.63
	AK-4	Non-channel	Prall's Island	20	40 36.83	74 11.91	40 36.24	74 11.82
	AK-7	Non-channel	Island of Meadows	15	40 34.59	74 12.49	40 34.70	74 12.47
Kill Van Kull	KVK-1	Channel	Entrance to KVK Channel (Sand)	52	40 38.95	74 04.34	40 38.86	74 04.05
	KVK-2	Channel	Entrance to KVK Channel (Silt)	55	40 38.96	74 03.91	40 38.80	74 03.61
Port Jersey (2 Transects in 2010)	**PJ–1**	Non-channel	Jersey Flats	19	40 40.16	74 03.38	40 39.85	74 03.63
	PJ–2	Non-channel	Caven Point	10	40 41.07	74 03.28	40 40.66	74 03.41
	PJ–3†	Non-channel	Constable Hook	10	40 39.74	74 04.79	40 39.53	74 04.33
	PJ–4	Channel	Port Jersey Channel	51	40 40.15	74 04.56	40 39.90	74 04.06
	PJ–5	Channel	Port Jersey Channel East	42	40 39.76	74 03.98	40 39.54	74 03.53
South Brooklyn (5 Transects in 2010)	SB–1	Non-channel	Gowanus Bay Interpier South	27	40 39.45	74 00.86	40 39.56	74 01.05
	SB–2	Non-channel	Gowanus Bay Interpier	30	40 39.60	74 00.48	40 39.75	74 00.75
	SB–3	Non-channel	Bay Ridge Flats	18	40 39.36	74 02.09	40 39.09	74 02.29
	SB–4	Channel	Bay Ridge Channel	40	40 39.38	74 01.51	40 39.12	74 01.95
	SB–5	Channel	Anchorage Channel North	47	40 40.92	74 02.53	40 40.49	74 02.79
	SB–6	Channel	Anchorage Channel South	48	40 38.01	74 02.92	40 37.70	74 02.83
	SB-7	Channel	Anchorage Channel Middle	54	40 40.33	74 02.39	40 39.90	74 02.64

Area	Station Name	Type	Station Location	Depth (ft)	GPS Coordinates (deg., decimal min.) Flood Start North	Flood Start West	Ebb Start North	Ebb Start West
Lower Bay (16 Transects in 2010)	**LB–1**	Non-channel	East Bank	17	40 33.63	74 00.29	40 33.29	74 00.10
	LB–2	Channel	North End Ambrose Channel	54	40 33.42	74 01.58	40 33.07	74 01.46
	LB–3	Non-channel	Swash Channel Range	20	40 33.21	74 04.46	40 32.79	74 04.72
	LB–4	Channel	Chapel Hill South Channel	37	40 30.64	74 02.56	40 30.18	74 02.63
	LB–5	Non-channel	Old Orchard Shoals	21	40 30.92	74 05.44	40 30.72	74 04.94
	LB–6	Channel	Raritan Bay East Reach	46	40 29.39	74 06.52	40 29.53	74 07.09
	LB-7	Non-channel	South of West Bank	31	40 33.65	74 03.27	40 33.19	74 03.37
	LB-8	Non-channel	West Bank Flat	20	40 34.66	74 03.55	40 34.24	74 03.43
	LB-9	Non-channel	East of West Bank	30	40 34.01	74 02.37	40 34.43	74 02.47
	LB-10	Non-channel	Anchorage west of Gravesend Bay	30	40 35.76	74 01.15	40 35.36	74 00.91
	LB-11	Non-channel	Gravesend Bay Flats	22	40 35.30	74 00.61	40 35.68	74 00.76
	LB-12	Non-channel	West of Chapel Hill South Channel	25	40 30.28	74 02.91	40 29.84	74 02.96
	LB-13	Non-channel	East of Chapel Hill South Channel	19	40 30.38	74 02.17	40 29.94	74 02.09
	LB-14	Channel	Just north of Ambrose Channel	52	40 34.43	74 01.75	40 34.13	74 01.74
	LBD-15	Non-Channel/Deep	Deep area west of East Bank	47	40 32.77	74 00.86	40 33.19	74 00.98
	LB-16	Non-Channel	South End of East Bank	18	40 31.20	73 58.02	40 31.49	73 58.40
	LBD-17	Non-Channel/Deep	Deep area southeast of Romer Shoal	48	40 28.93	73 54.83	40 29.08	73 55.31

Stations in BOLD represent those sampled during 2010
† Indicates station in which transect always begins at the Flood Start coordinates

Figure 2-1: USACE Aquatic Biological Survey
2010 Station Locations

0 2,500 5,000 Meters

N

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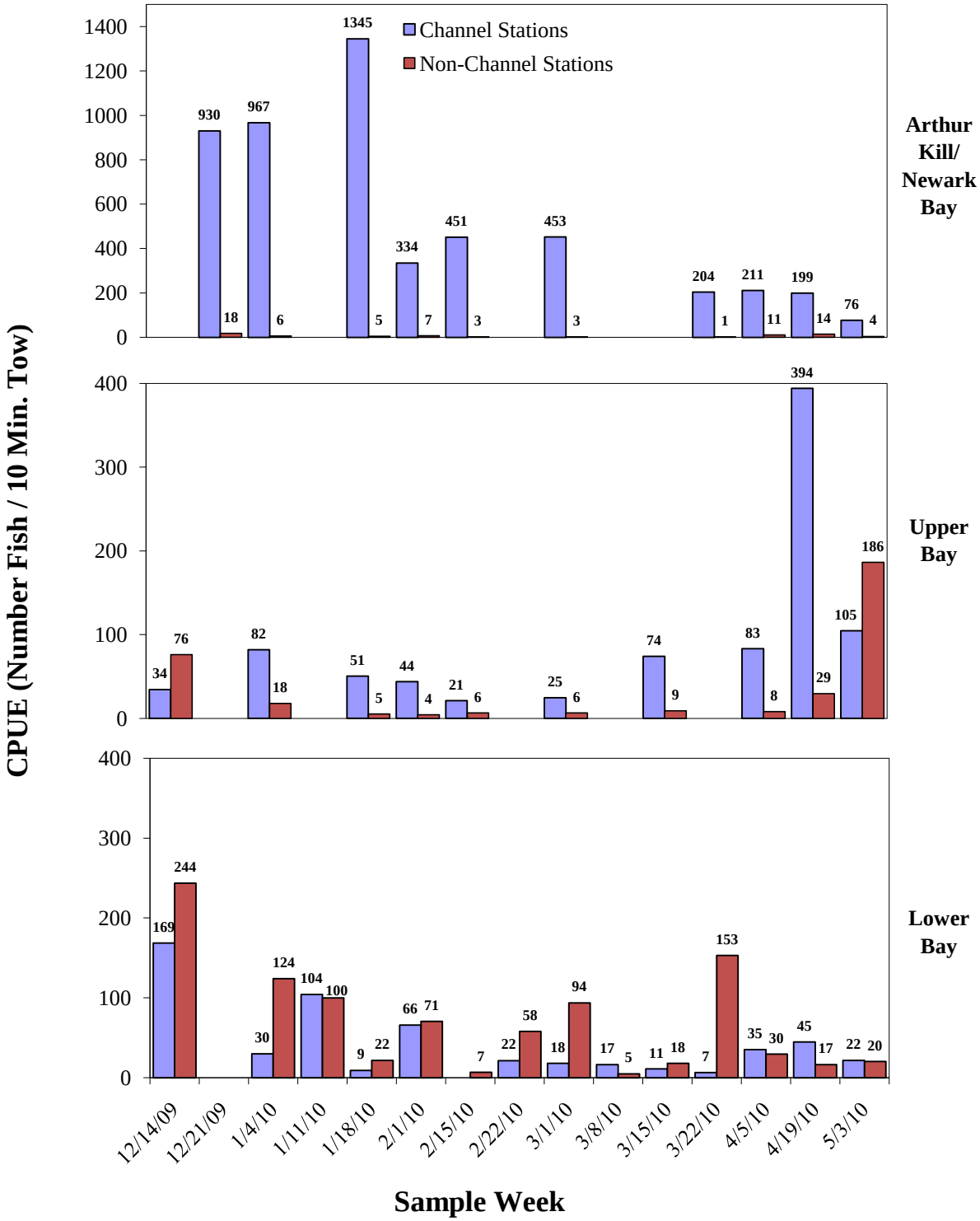

Figure 3-1 **Average weekly bottom trawl CPUE for all fish combined at channel and non-channel stations in the Arthur Kill/Newark Bay, Upper Bay, and Lower Bay, 2010 Aquatic Biological Survey.**

Note(s): Dates listed indicate Monday of each sample week.
CPUE does not include blue crab or American lobster
Scale changed for Arthur Kill/Newark Bay.

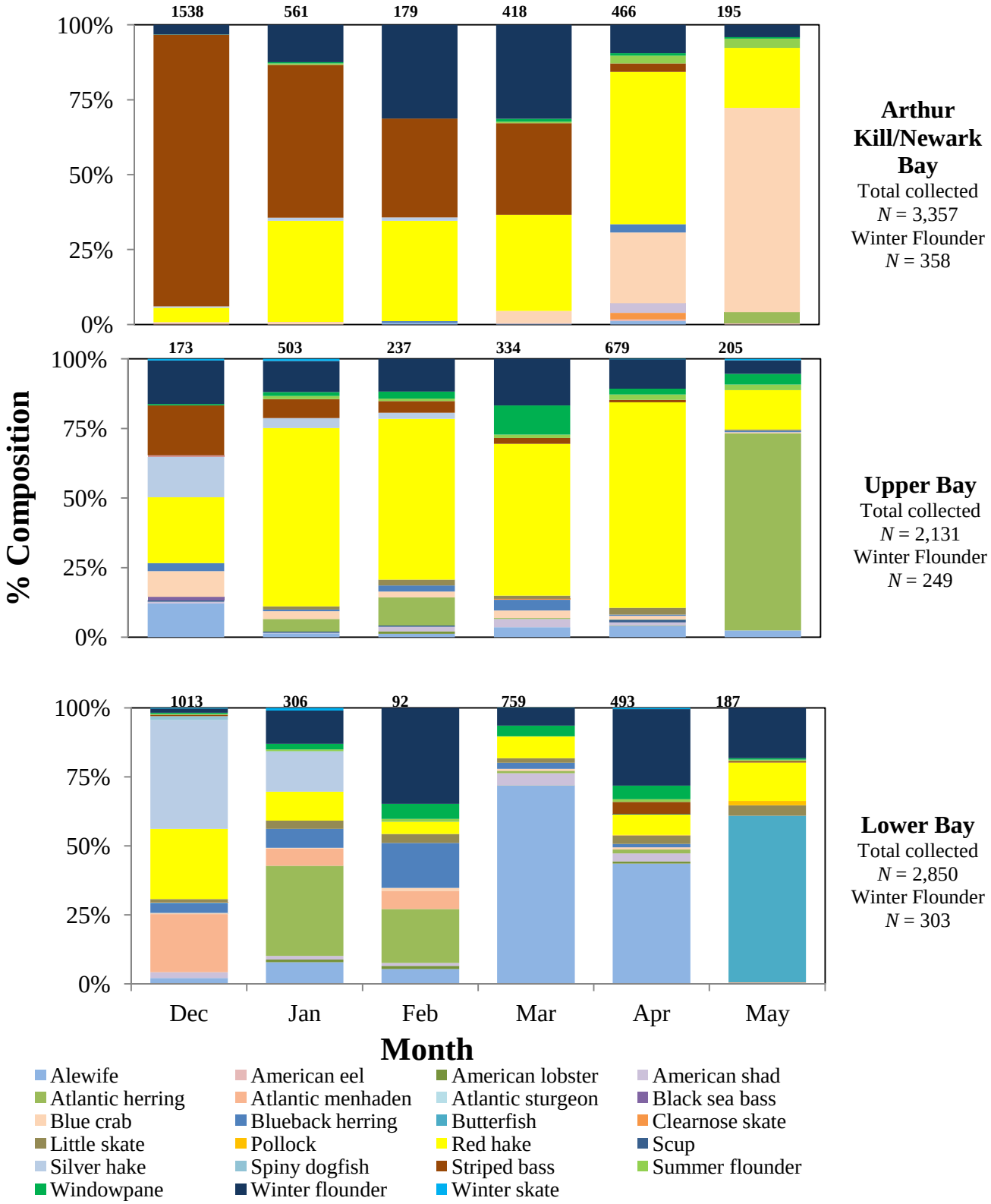

Figure 3-2 **EFH and Important Non-EFH species composition of bottom trawl catches from Arthur Kill/Newark Bay, Upper Bay,and Lower Bay stations during the 2010 Aquatic Biological Survey.**

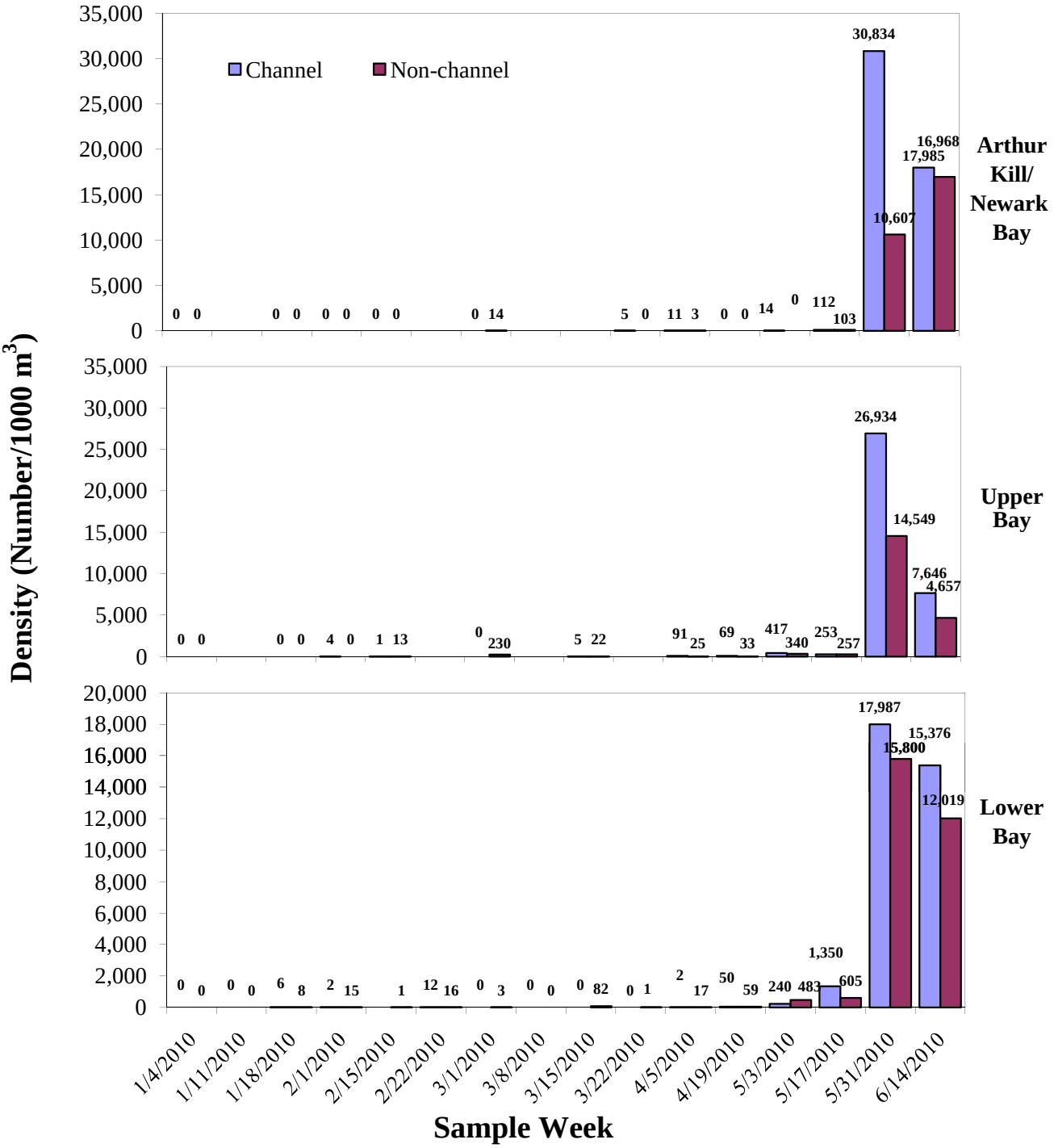

Figure 3-3 **Average weekly viable egg density of all species combined at channel and non-channel stations in the Arthur Kill/Newark Bay, Upper Bay, and Lower Bay, 2010 Aquatic Biological Survey.**

Note: Scale change for Lower Bay.
Weeks begin on Monday. Those weeks that are blank were not sampled.

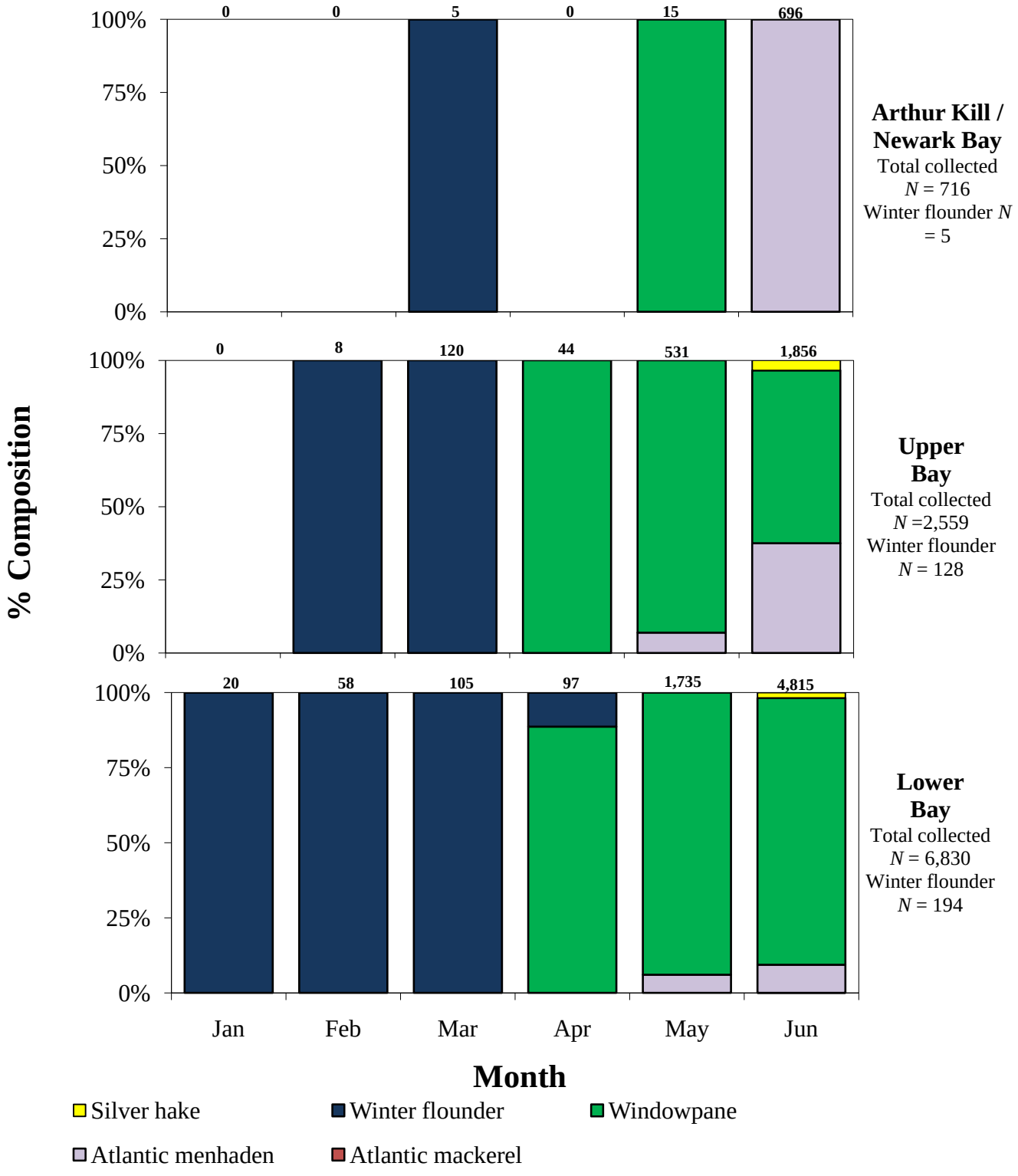

Figure 3-4 **EFH and important Non-EFH species compostion of viable eggs collected at all stations during the 2010 Aquatic Biological Survey.**

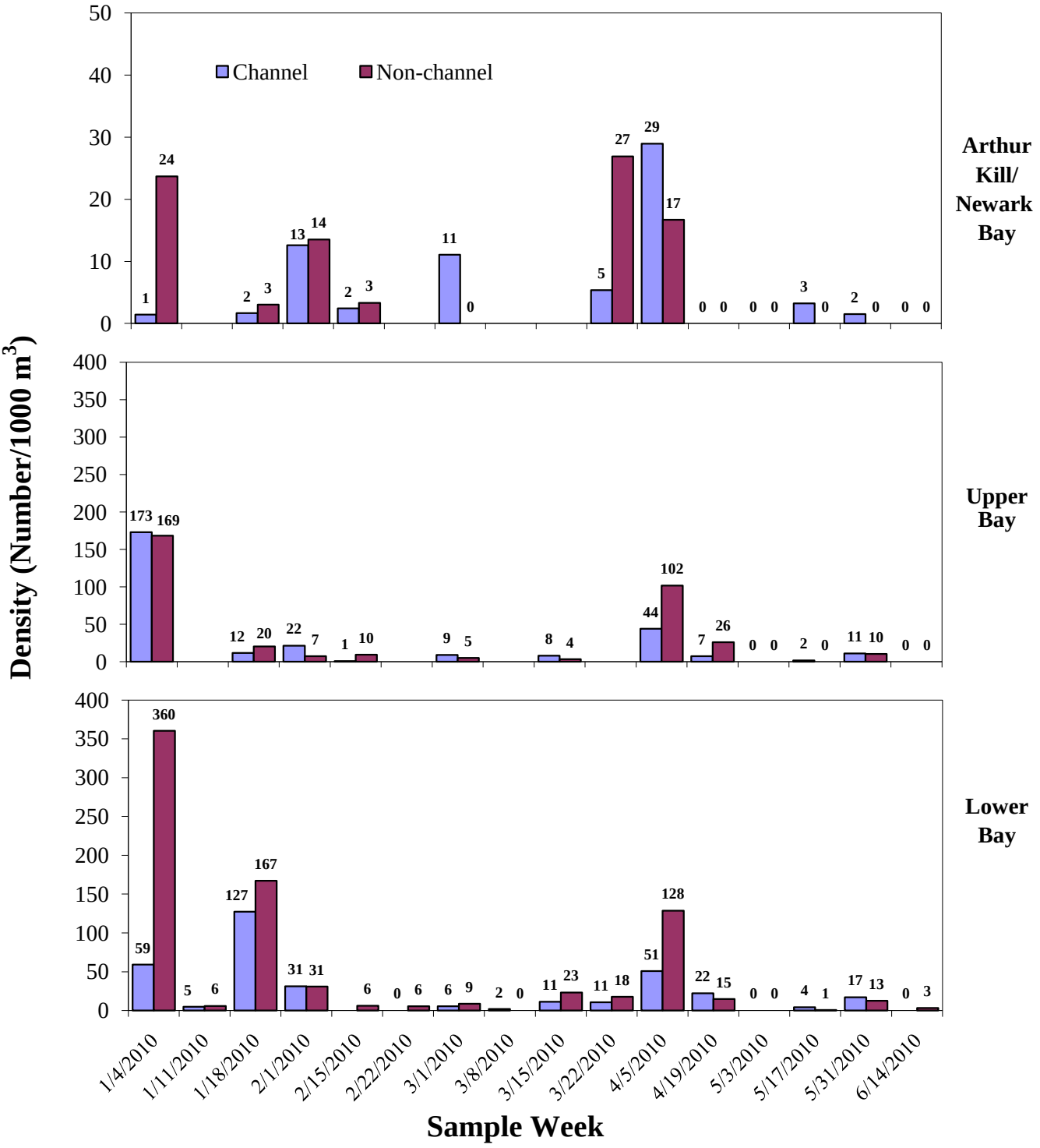

Figure 3-5 **Average weekly yolk-sac larvae density of all species combined at channel and non-channel stations in the Arthur Kill/Newark Bay, Upper Bay, and Lower Bay, 2010 Aquatic Biological Survey.**

Note: Scale change for Arthur Kill/Newark Bay.
Weeks begin on Monday. Those weeks that are blank were not sampled.

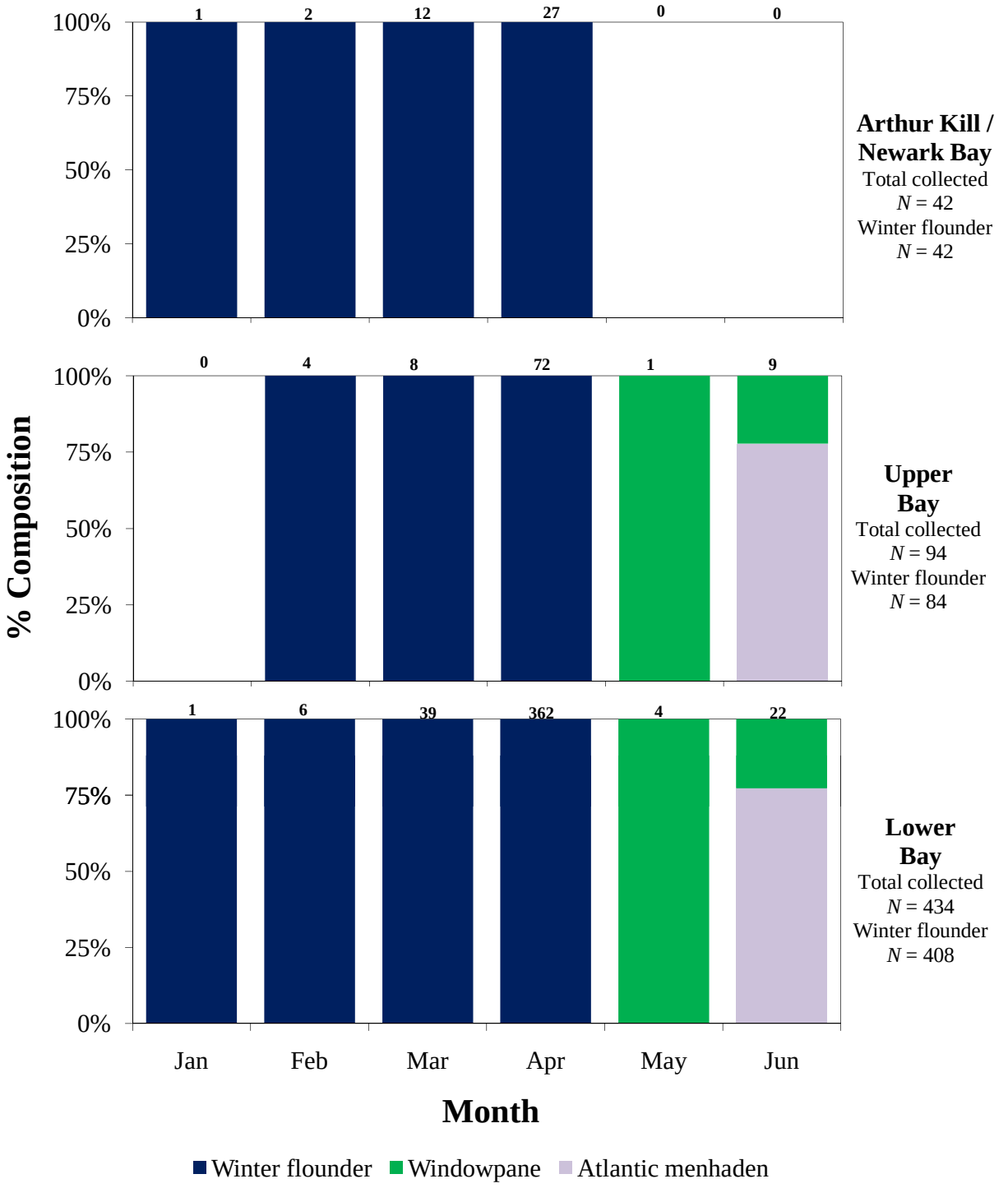

Figure 3-6 **EFH and important Non-EFH species compostion of yolk-sac larvae collected at all stations during the 2010 Aquatic Biological Survey.**

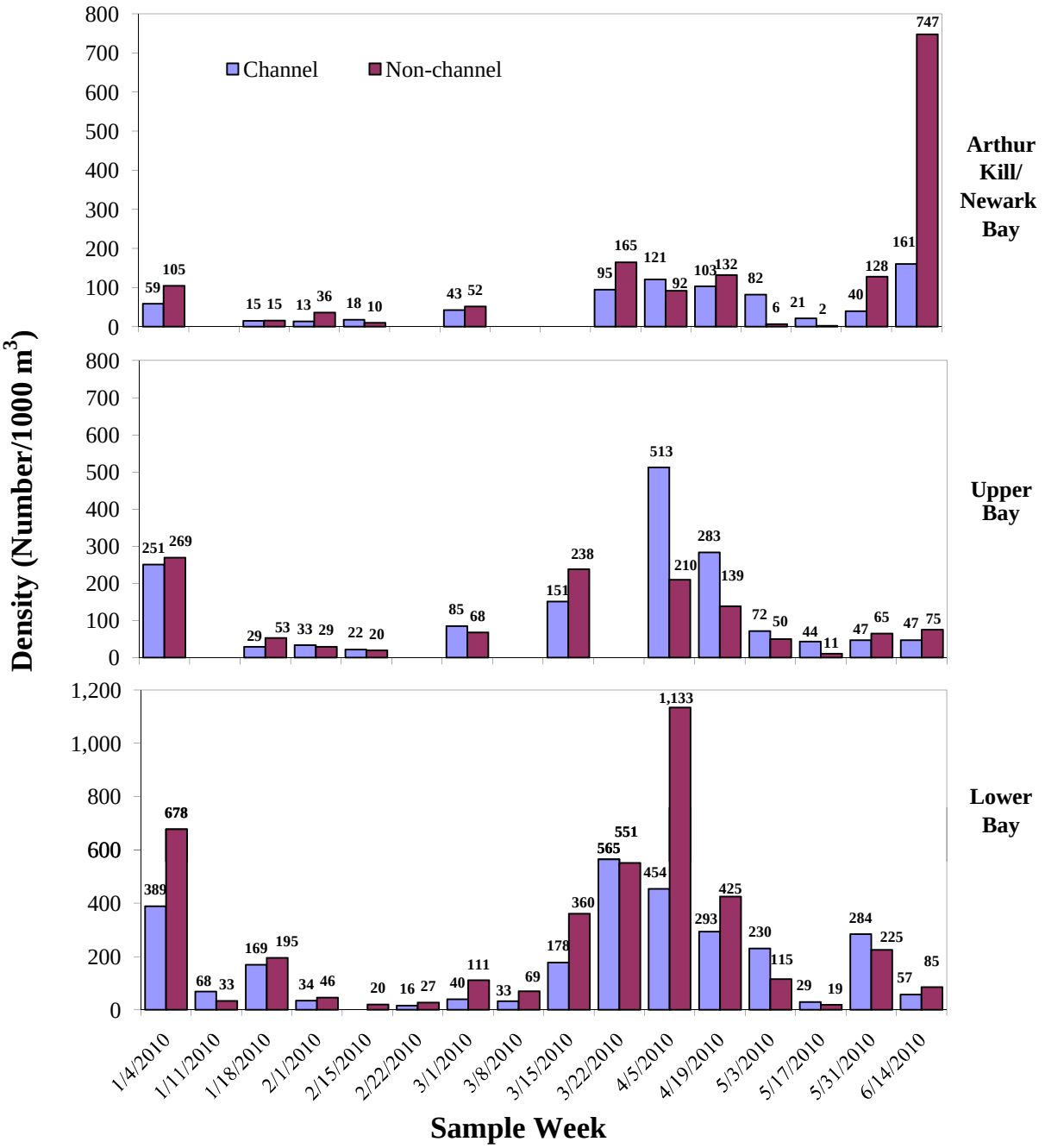

Figure 3-7 **Average weekly post-yolk sac larvae density of all species combined at channel and non-channel stations in the Arthur Kill/Newark Bay, Upper Bay, and Lower Bay, 2010 Aquatic Biological Survey.**

Note: Scale change for Lower Bay.
Weeks begin on Monday. Those weeks that are blank were not sampled.

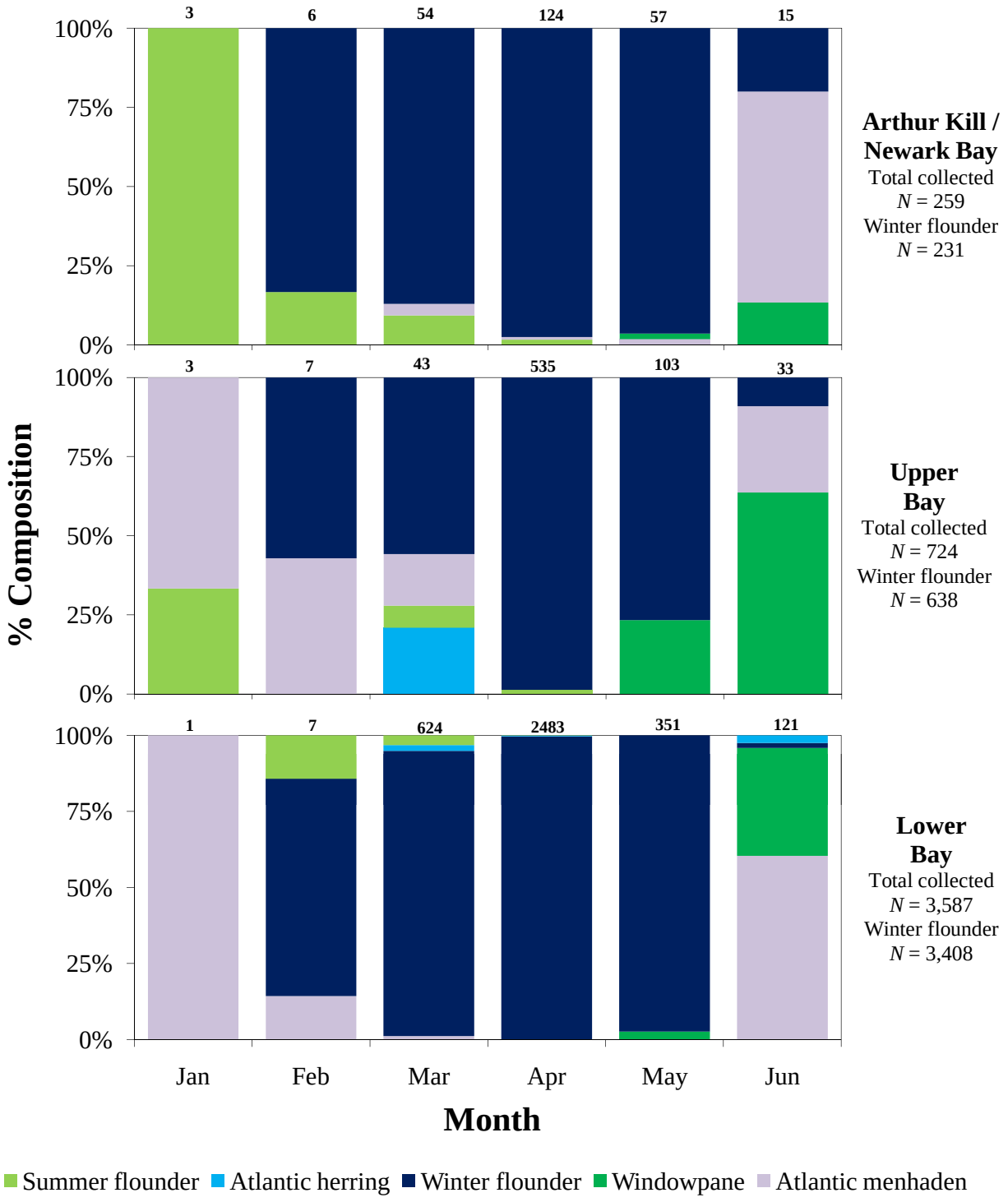

Figure 3-8 **EFH and important Non-EFH species compostion of post yolk-sac larvae collected at all stations during the 2010 Aquatic Biological Survey.**

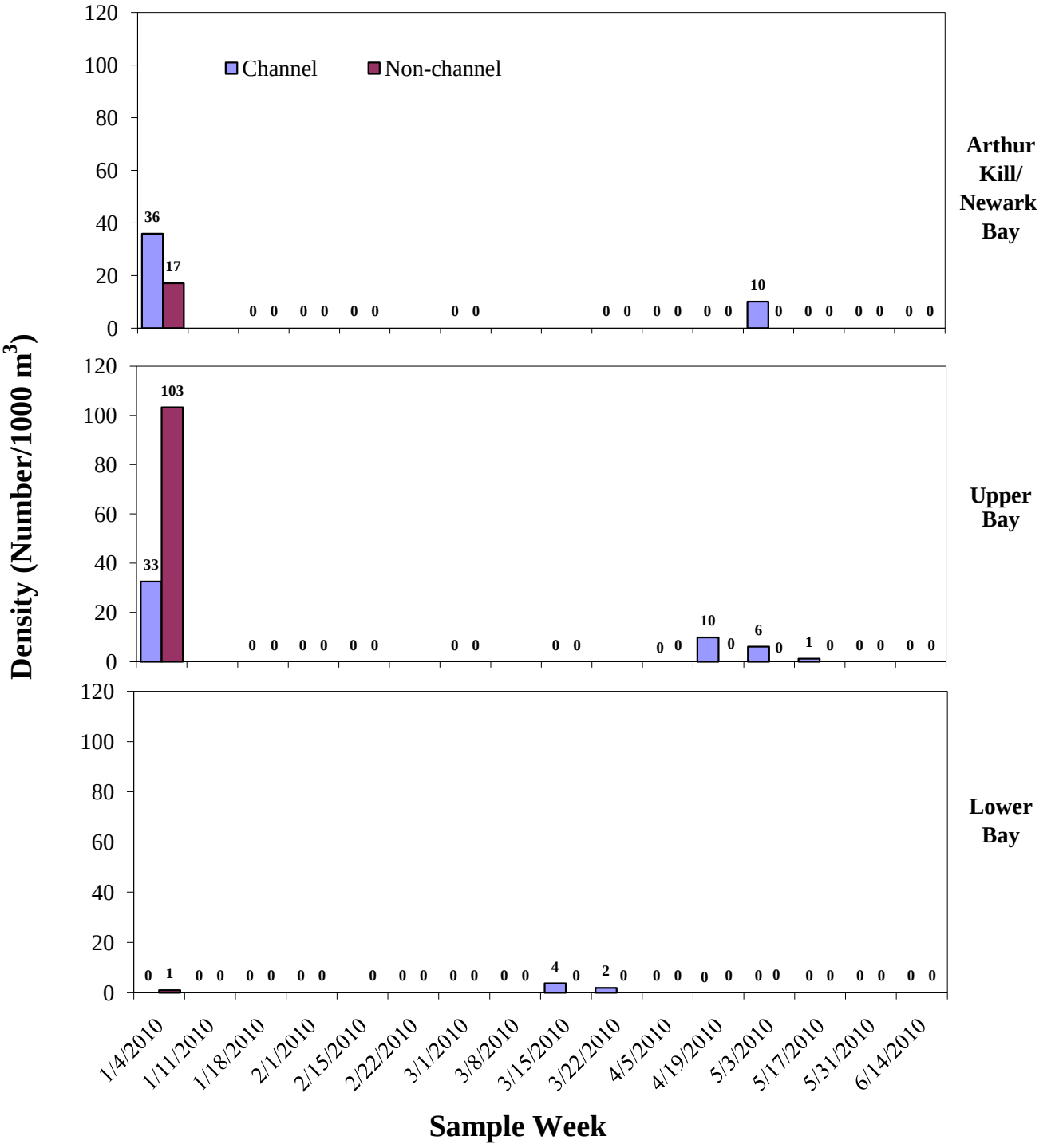

Figure 3-9 **Average weekly juvenile density of all species combined at channel and non-channel stations in the Arthur Kill/Newark Bay, Upper Bay, and Lower Bay, 2010 Aquatic Biological Survey.**

Note: Weeks begin on Monday. Those weeks that are blank were not sampled.

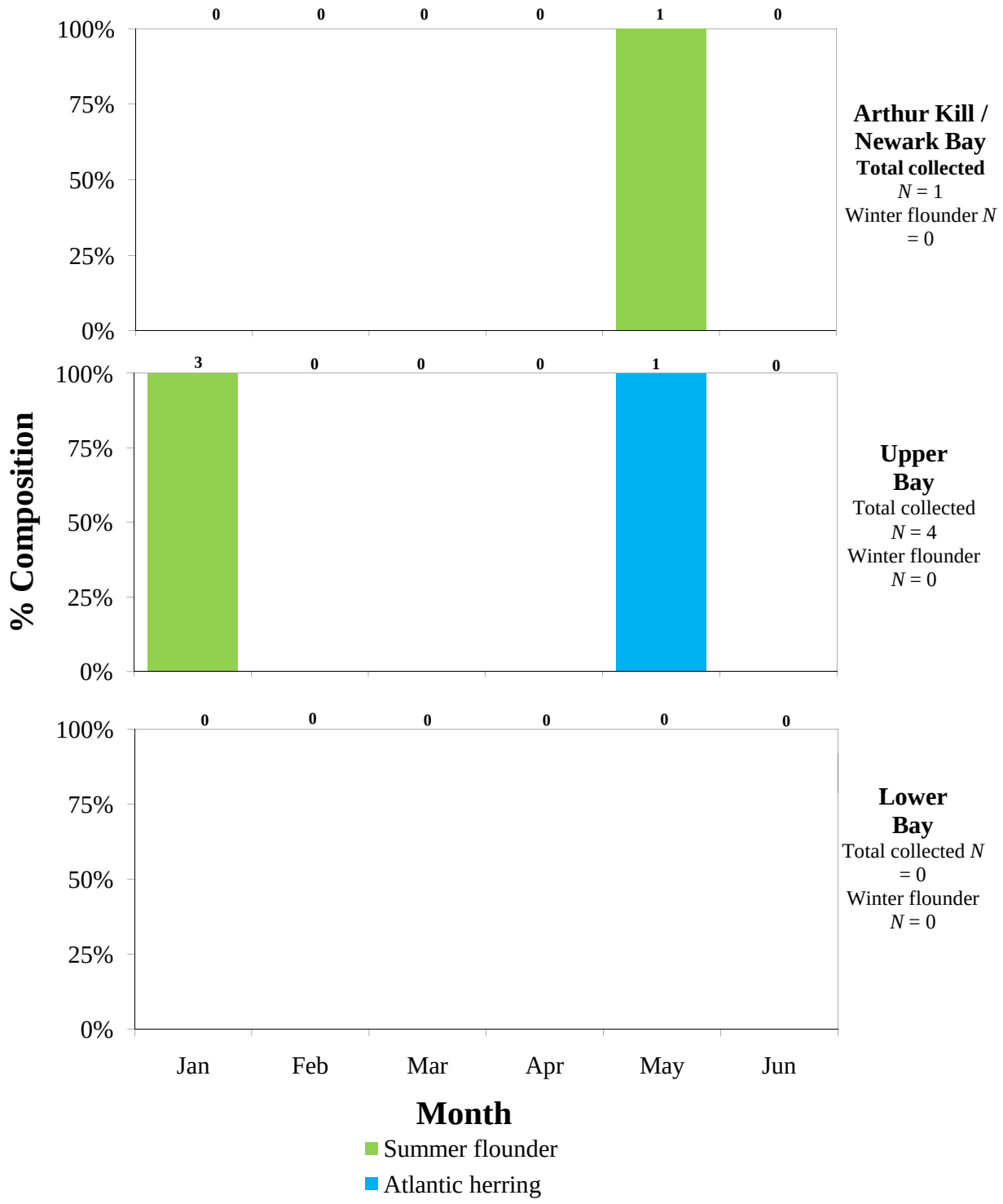

Figure 3-10 **EFH and important Non-EFH species compostion of juveniles collected at all stations during the 2010 Aquatic Biological Survey.**

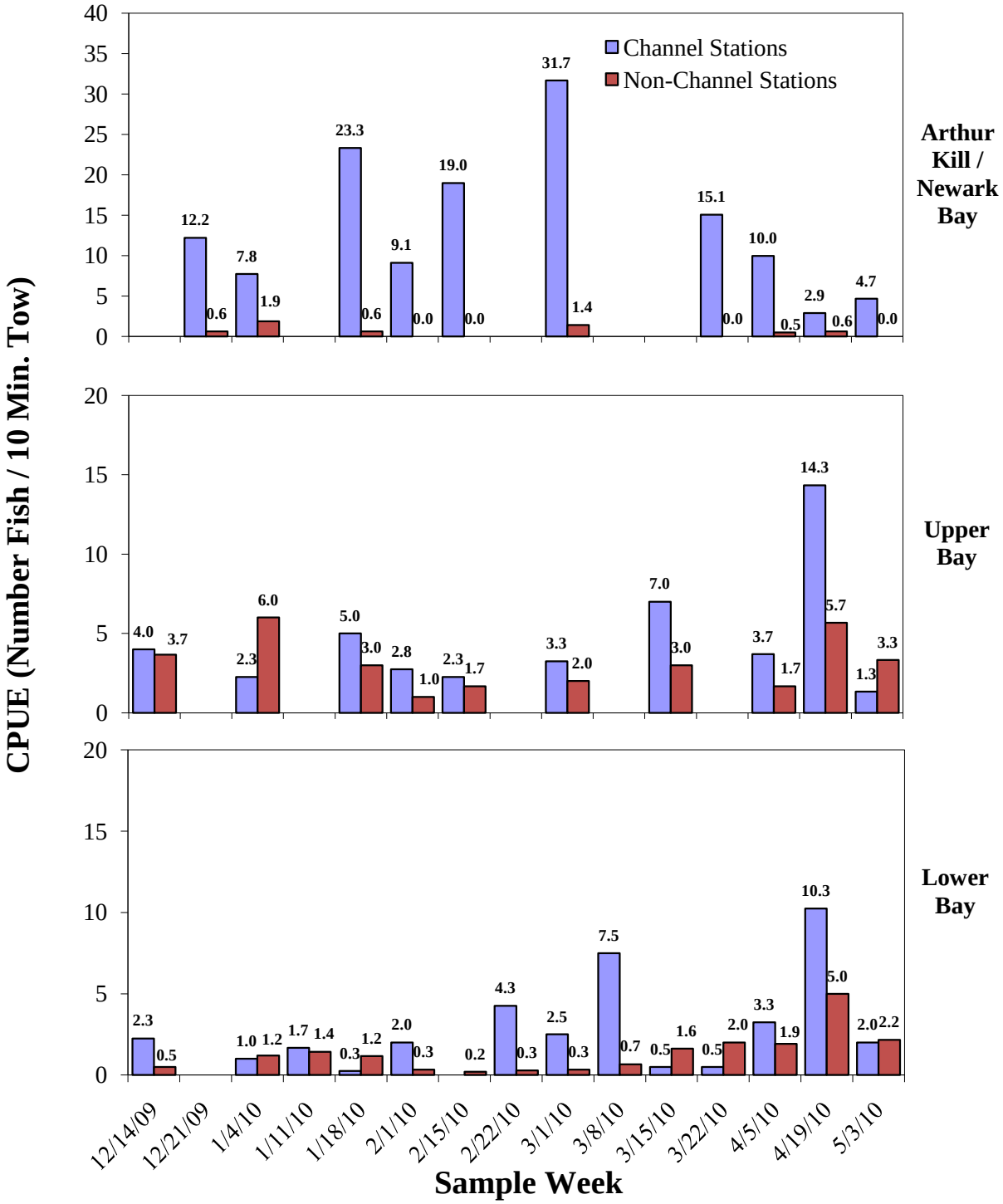

Figure 3-11 **Average weekly winter flounder bottom trawl CPUE at channel and non-channel stations in the Arthur Kill/Newark Bay, Upper Bay, and Lower Bay during the 2010 Aquatic Biological Survey.**

Note: Dates listed indicate the Monday of each sampling week.
Scale changed for Arthur Kill/Newark Bay.

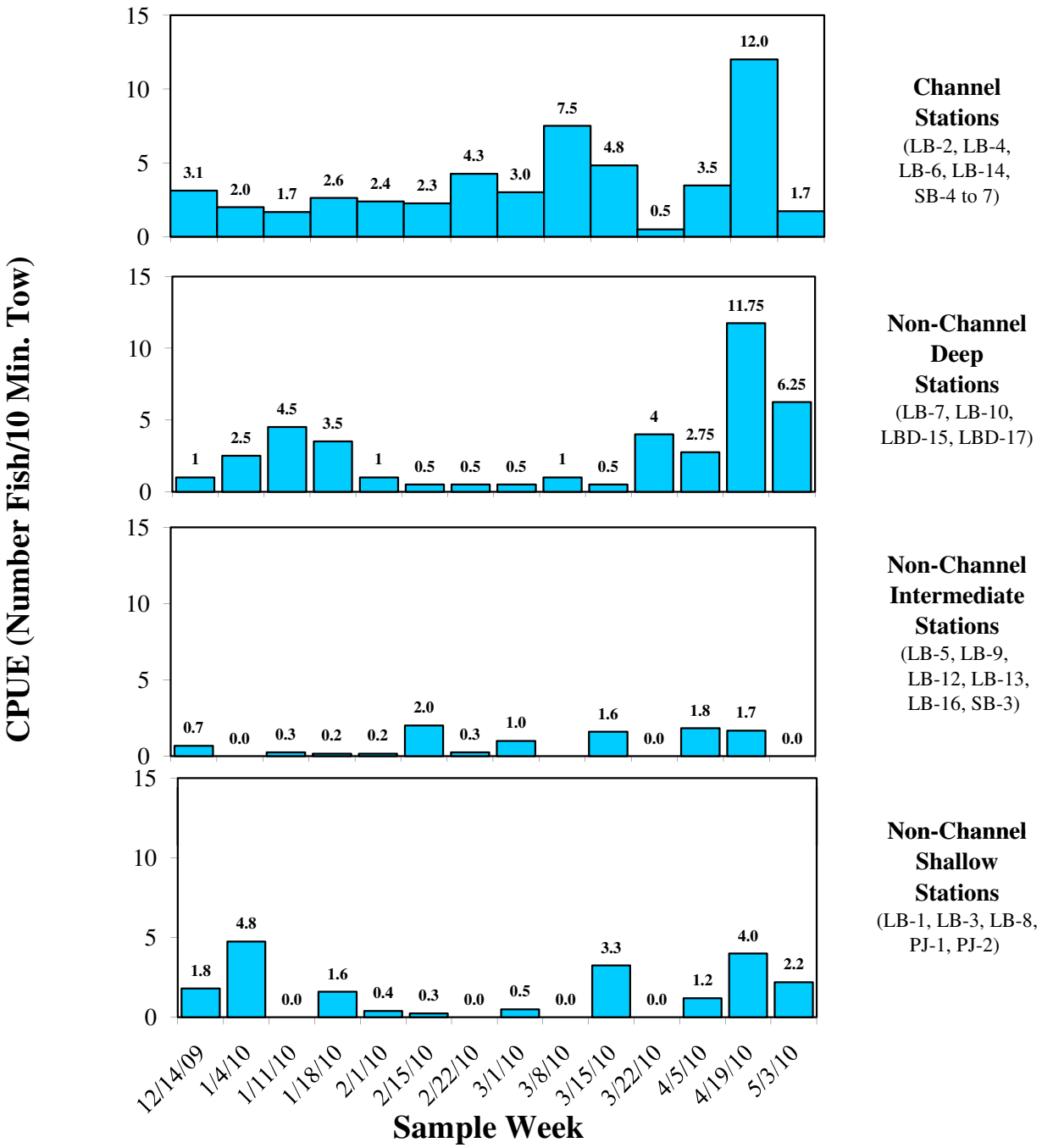

Figure 3-12 **Average weekly bottom trawl CPUE of winter flounder in the Upper Bay and Lower Bay by station depth during the 2010 Aquatic Biological Survey. Station depth categories are channel (typically ≥ 40 ft), non-channel deep (≥ 25 ft), non-channel intermediate (15-24 ft), and non-channel shallow (≤ 15 ft).**

Note: Weeks begin on Monday. Those weeks that are blank were not sampled.

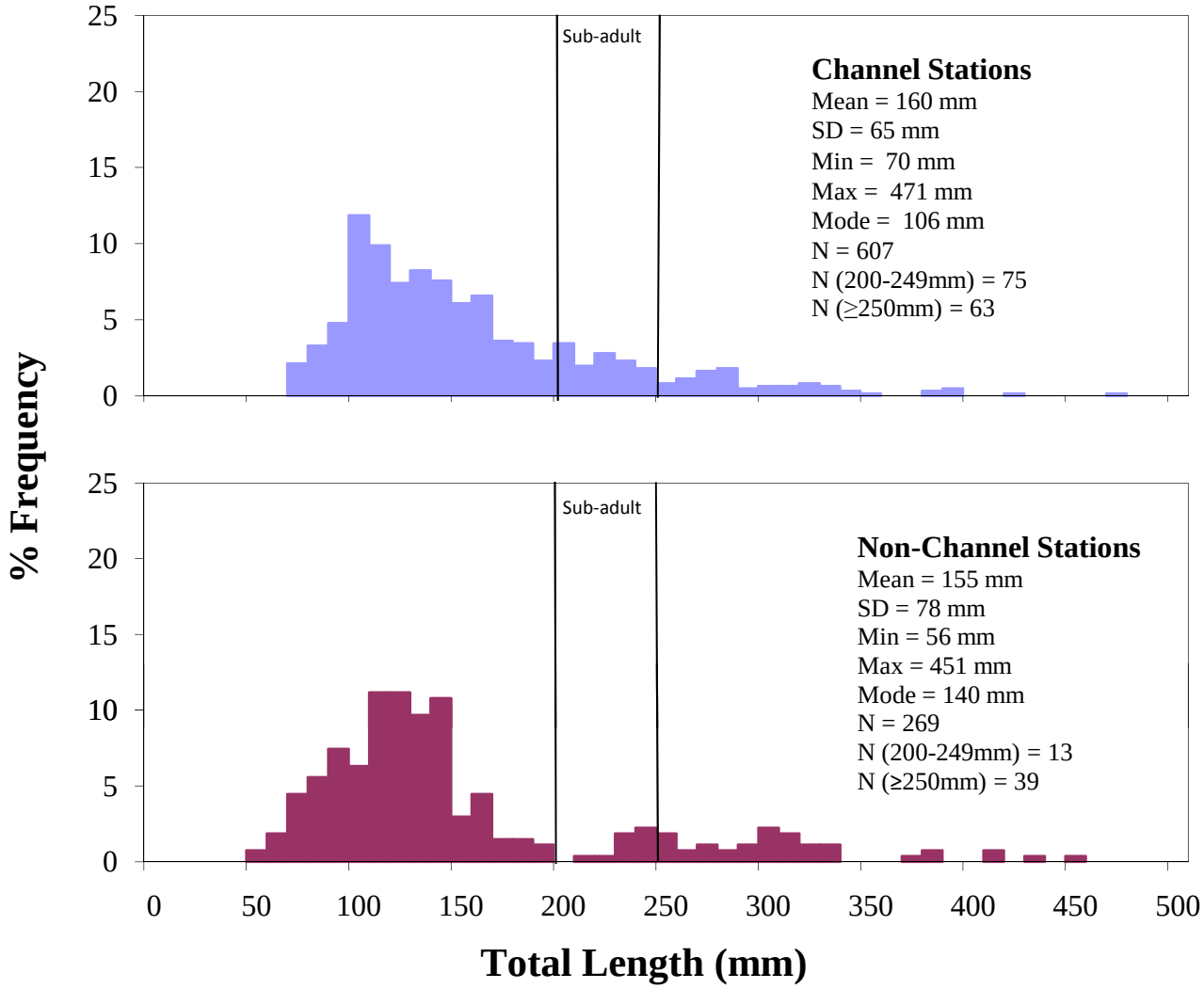

Figure 3-13 **Length frequency distribution (10-mm intervals) of all winter flounder measured during bottom trawl sampling for the 2010 Aquatic Biological Survey.**

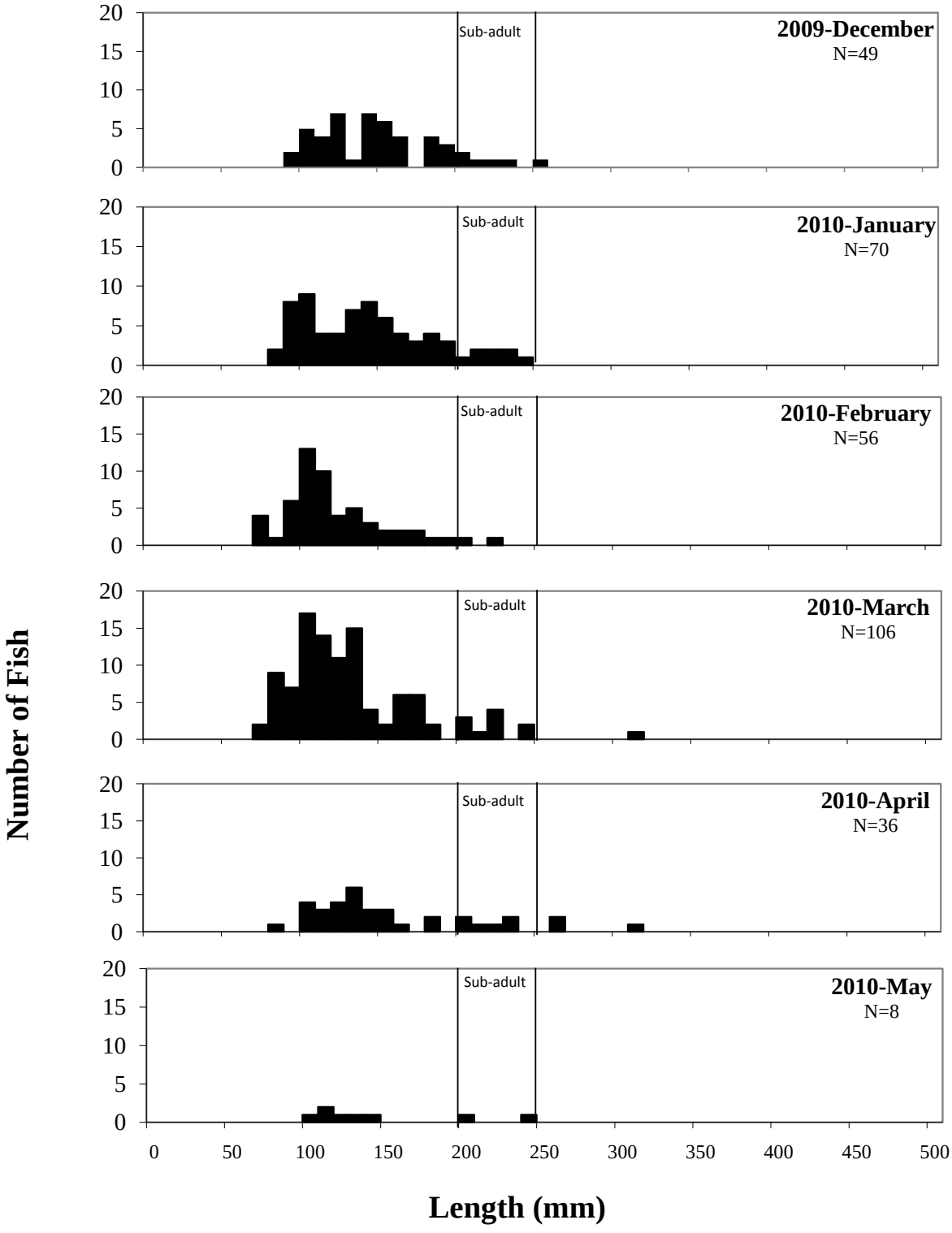

Figure 3-14a **Length frequency distribution of winter flounder collected during bottom trawl sampling at Arthur Kill/Newark Bay stations, 2010 Aquatic Biological Survey.**

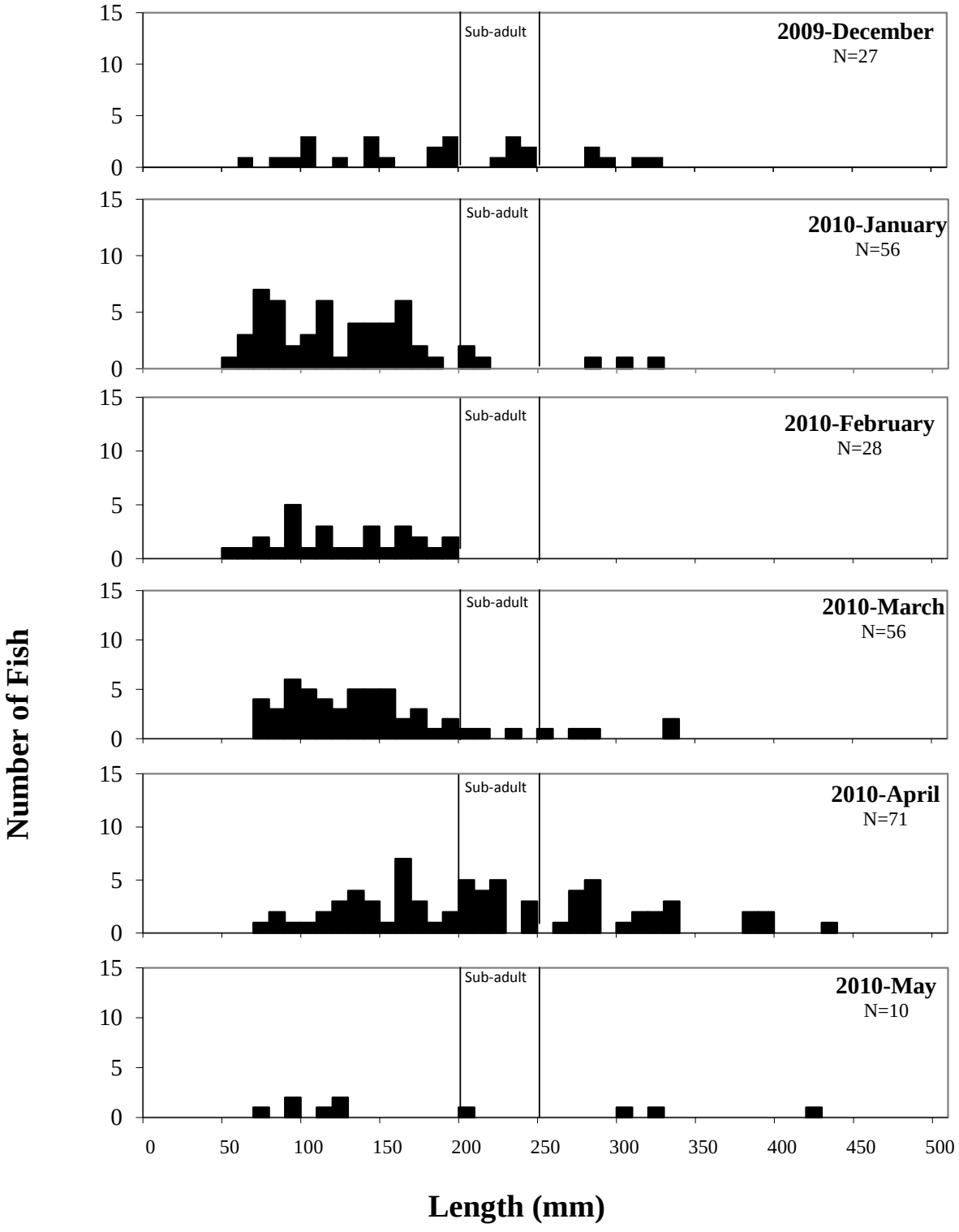

Figure 3-14b **Length frequency distribution of winter flounder collected during bottom trawl sampling at Upper Bay stations, 2010 Aquatic Biological Survey.**

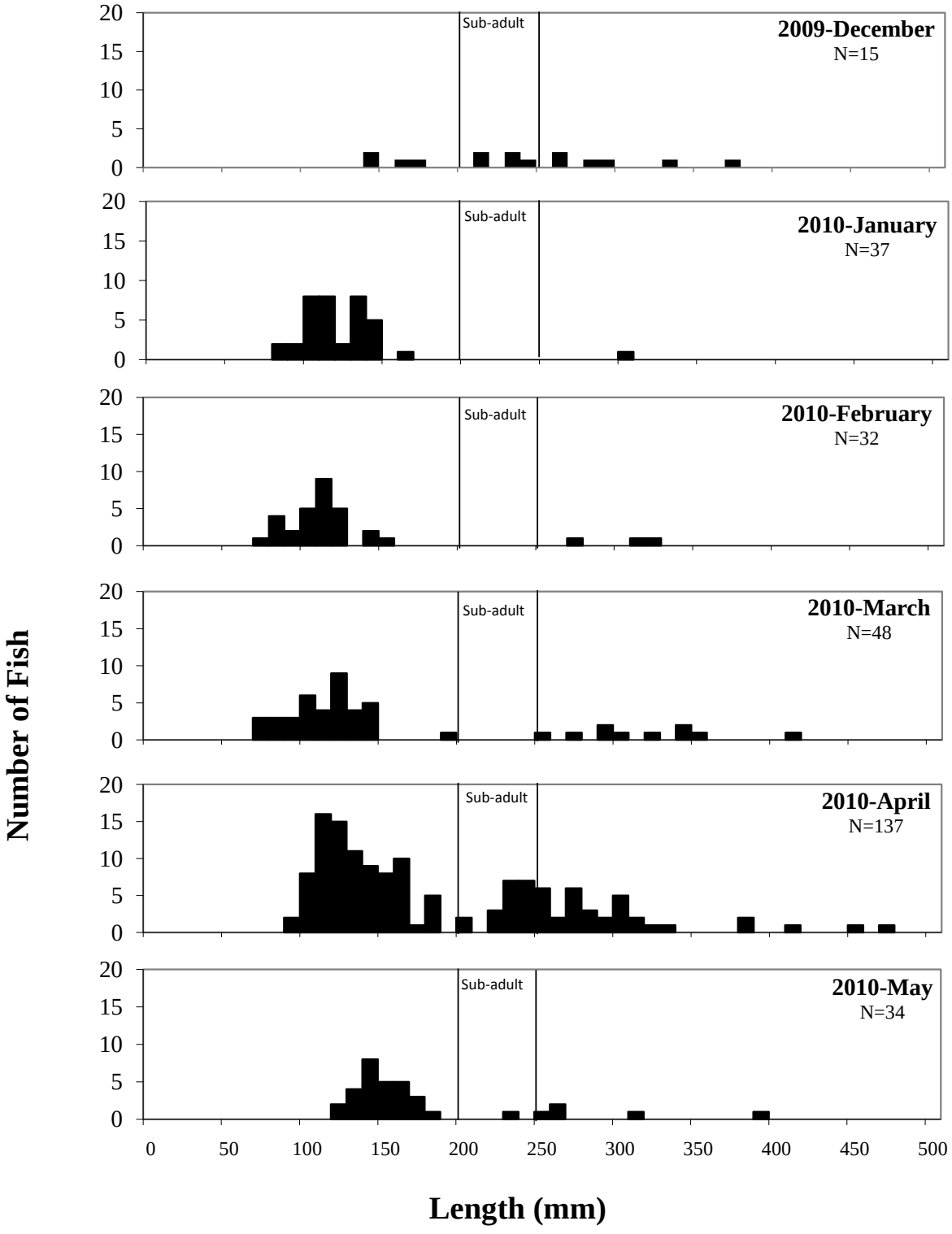

Figure 3-14c **Length frequency distribution of winter flounder collected during bottom trawl sampling at Lower Bay stations, 2010 Aquatic Biological Survey.**

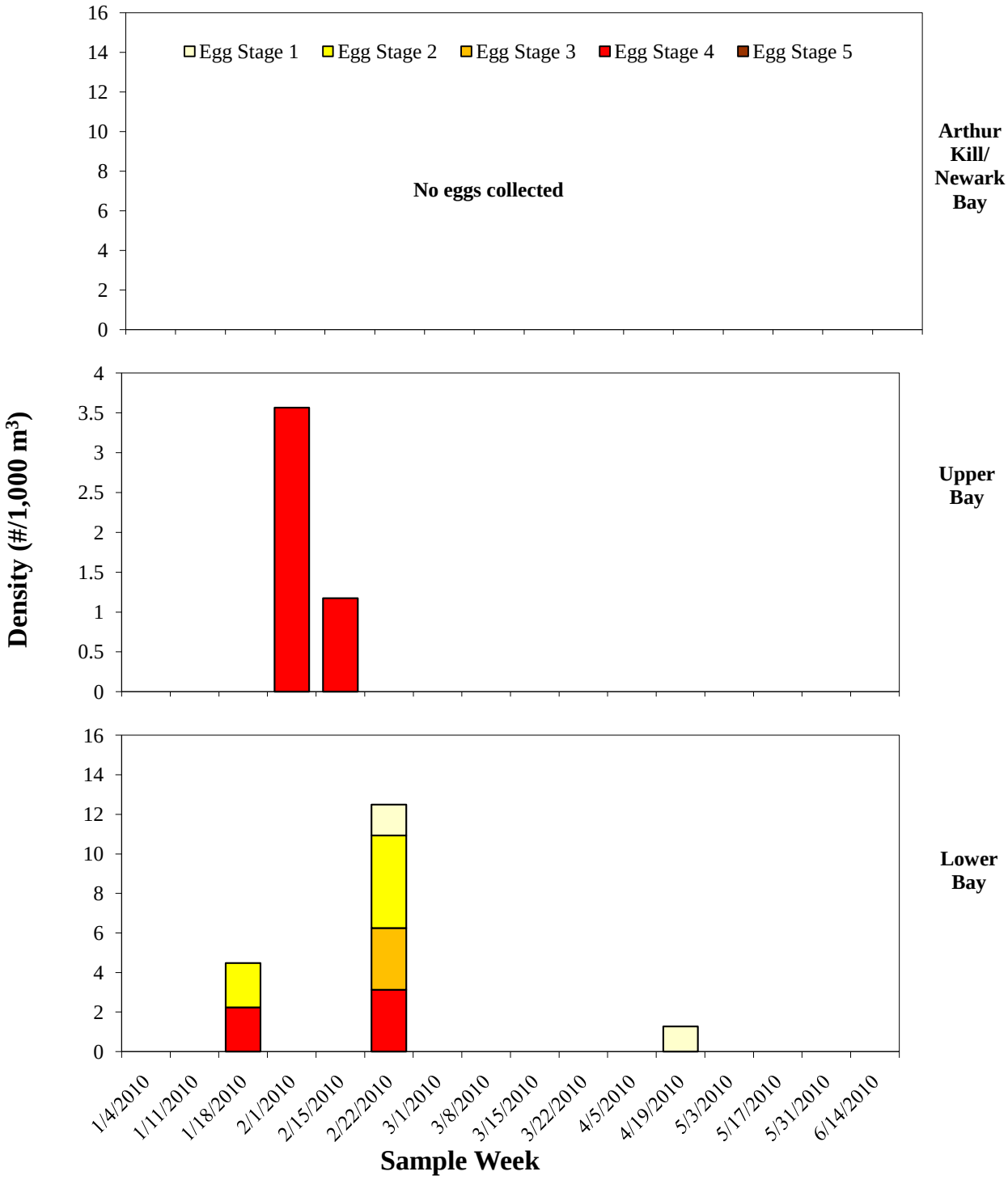

Figure 3-15a **Average weekly winter flounder egg density at channel stations in the Arthur Kill/Newark Bay, Upper Bay, and Lower Bay, during the 2010 Aquatic Biological Survey**

Note: Scale changed for Upper Bay.

Dates listed indicate the Monday of each sample week.

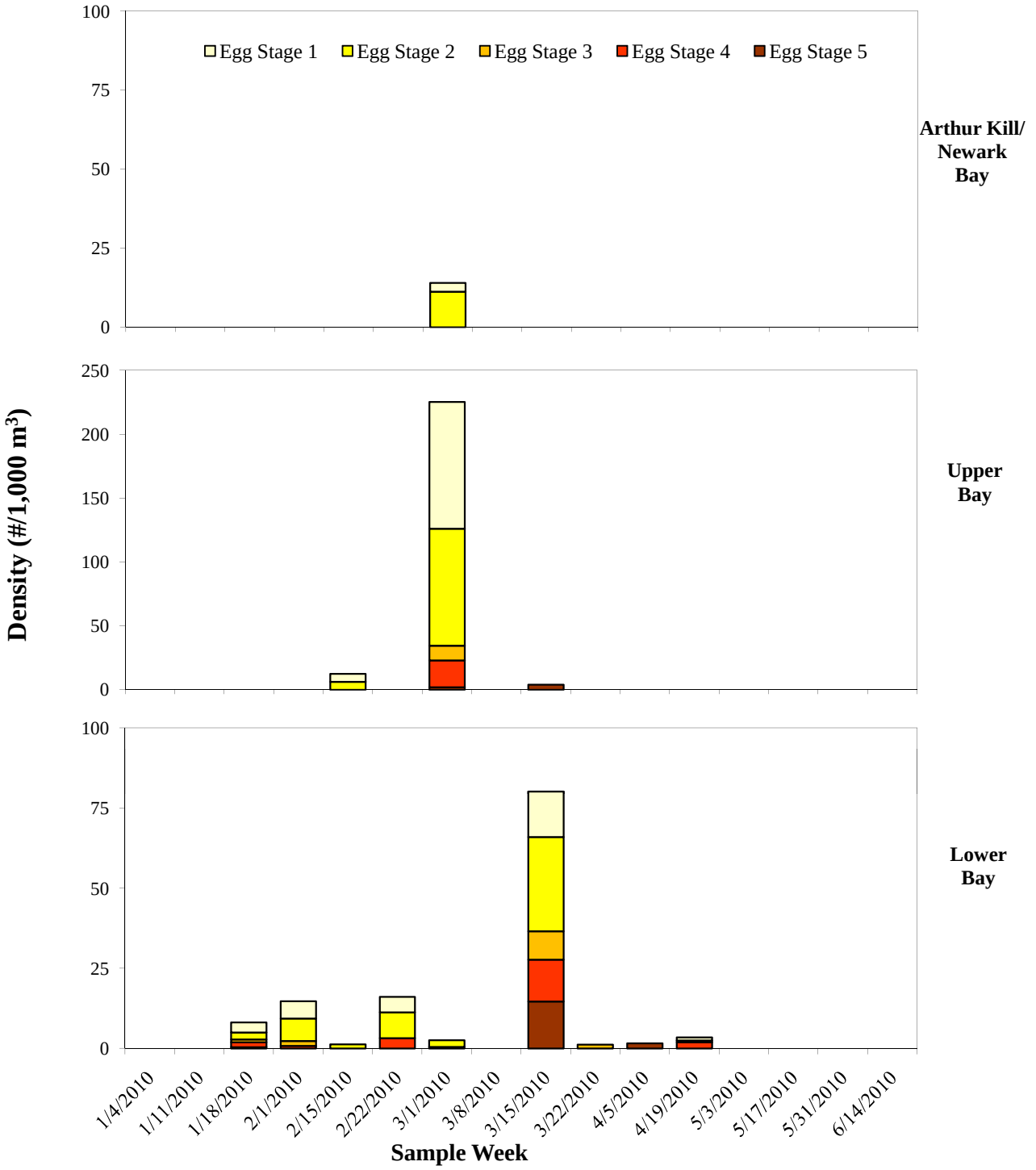

Figure 3-15b **Average weekly winter flounder egg density at non-channel stations in the Arthur Kill/Newark Bay, Upper Bay, and Lower Bay, during the 2010 Aquatic Biological Survey**

Note: Dates listed indicate the Monday of each sample week.
Scale change for Upper Bay.

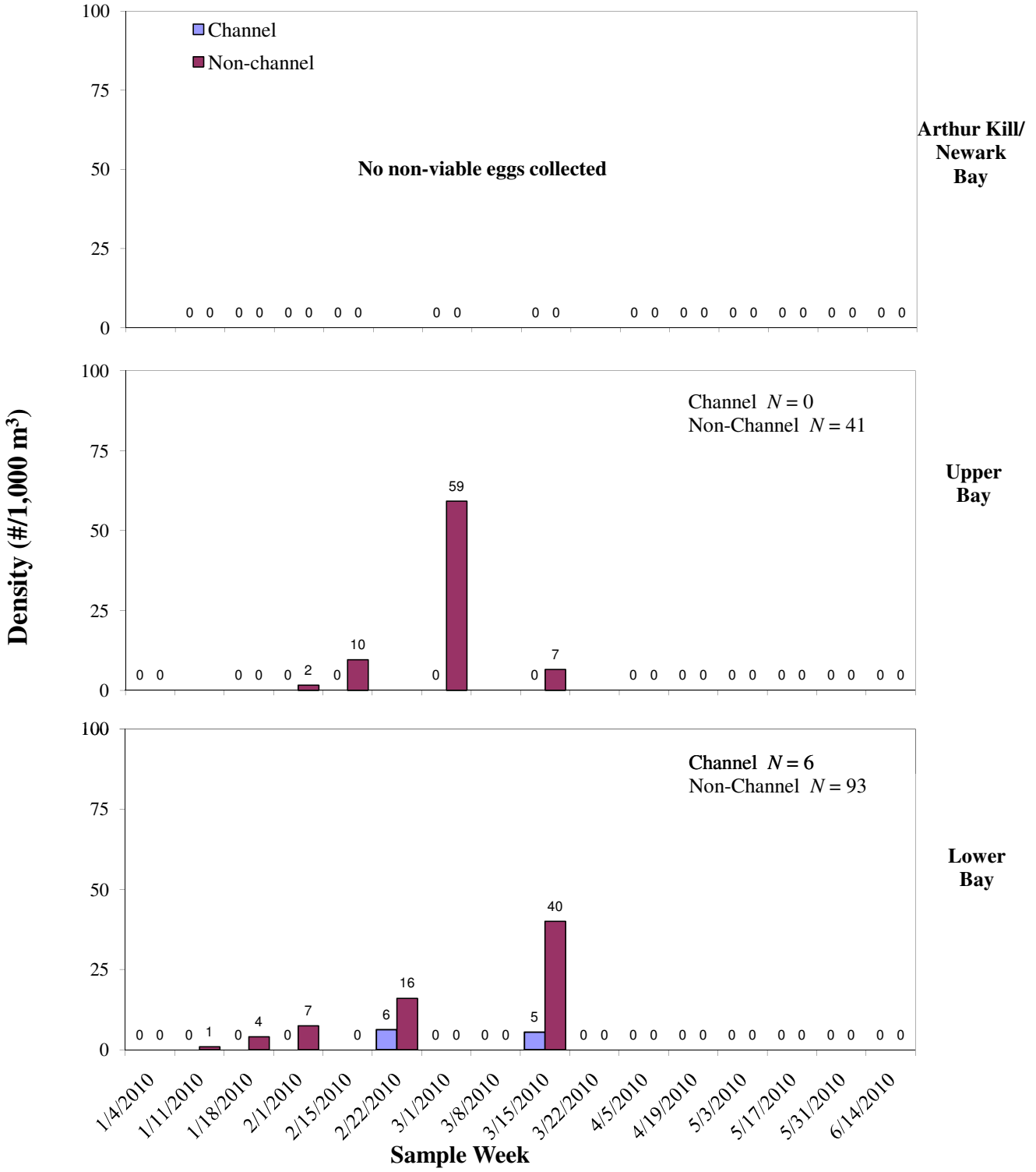

Figure 3-15c **Average weekly winter flounder non-viable egg density at channel and non-channel stations in the Arthur Kill/Newark Bay, Upper Bay, and Lower Bay, during the 2010 Aquatic Biological Survey**

Note: Dates listed indicate the Monday of each sample week.

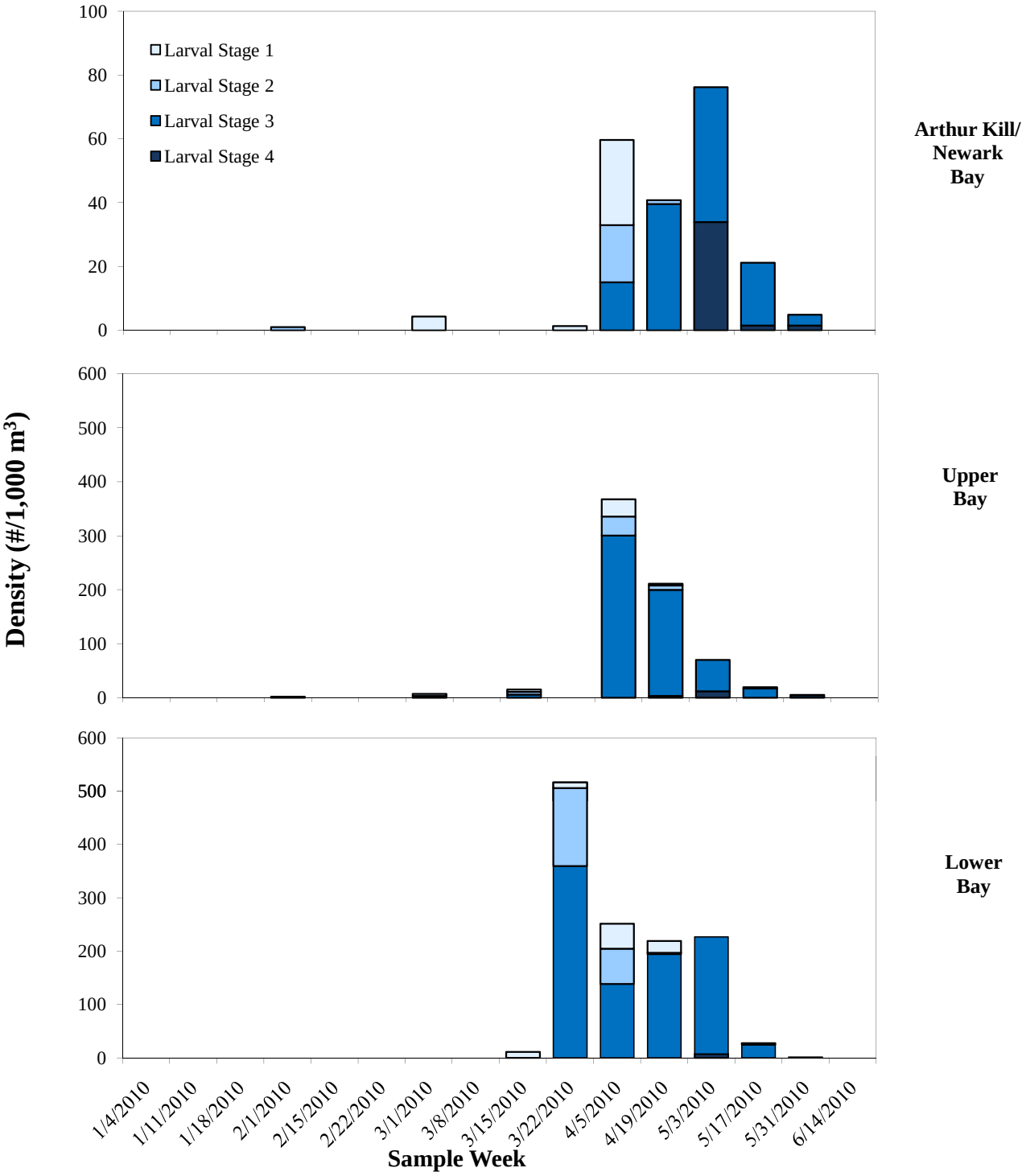

Figure 3-16a **Average weekly winter flounder larval density at channel stations in the Arthur Kill/Newark Bay, Upper Bay, and Lower Bay, during the 2010 Aquatic Biological Survey**

Note: Dates listed indicate the Monday of each sample week.
Scale changed for Arthur Kill/Newark Bay.

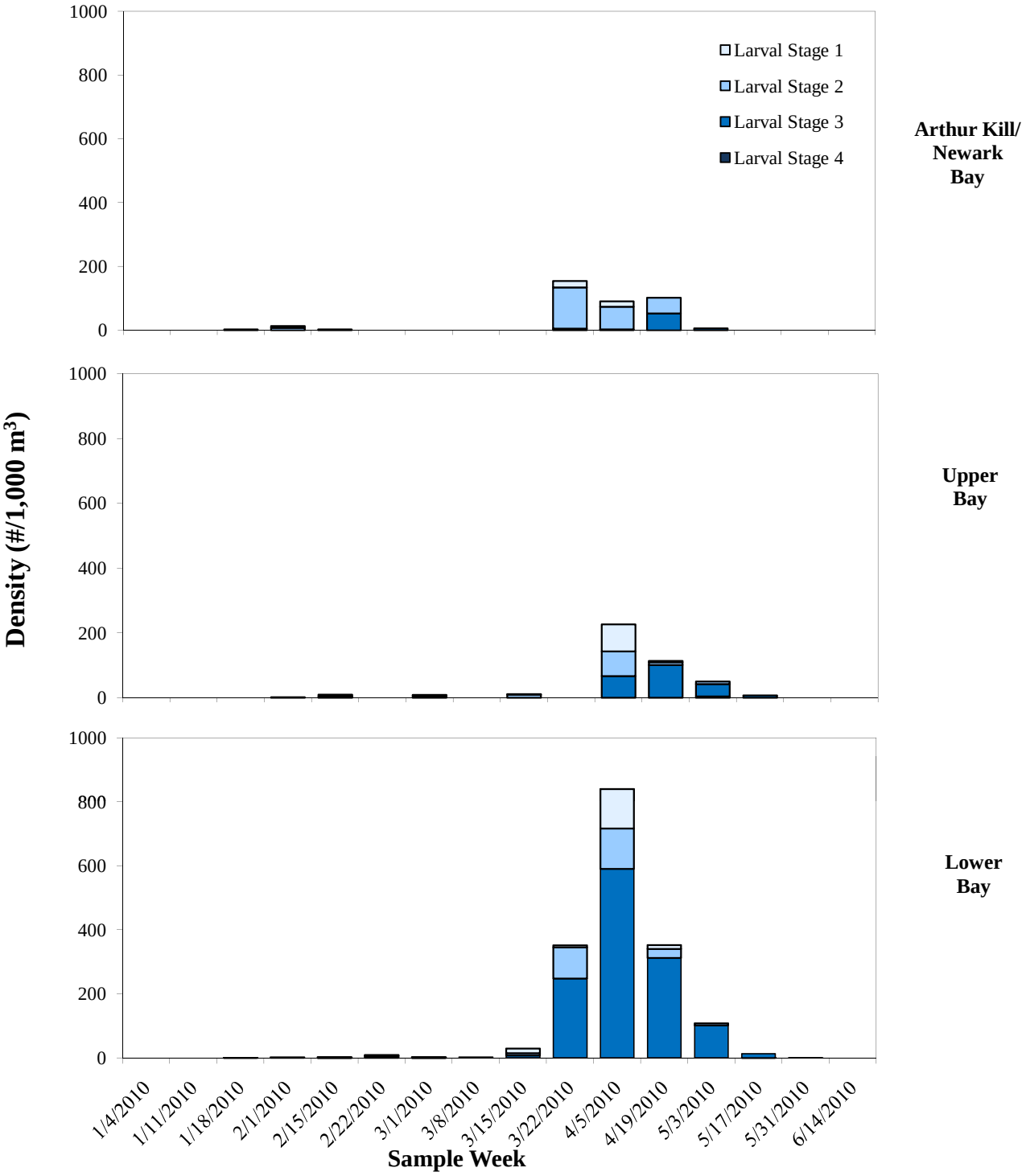

Figure 3-16b **Average weekly winter flounder larval density at non-channel stations in the Arthur Kill/Newark Bay, Upper Bay, and Lower Bay, during the 2010 Aquatic Biological Survey**

Note: Dates listed indicate the Monday of each sample week.

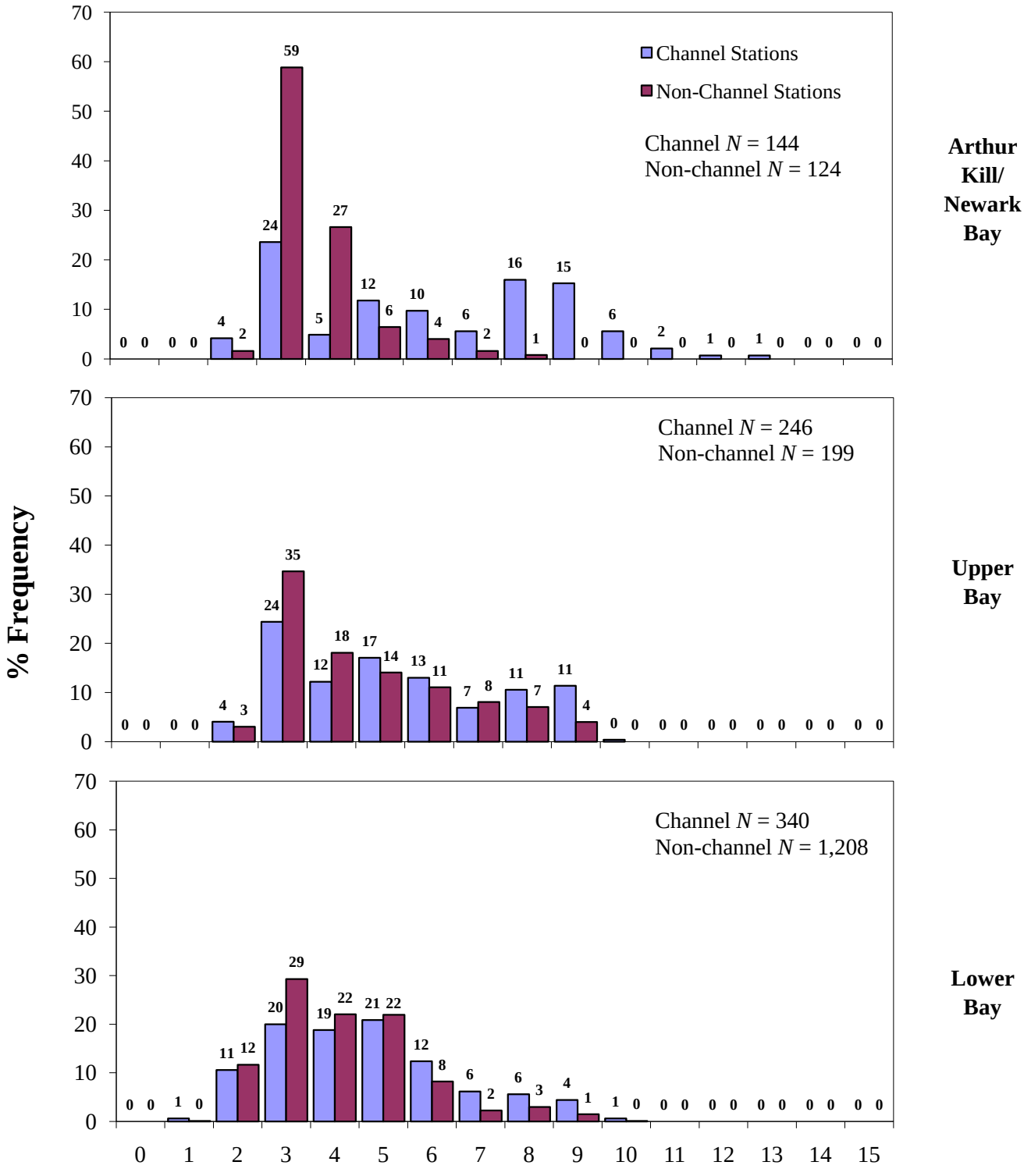

Figure 3-17 **Length frequency distribution of winter flounder larvae collected during ichthyoplankton sampling at Arthur Kill/Newark Bay, Upper Bay, and Lower Bay stations, 2010 Aquatic Biological Survey.**

Note: Scale change in Arthur Kill/Newark Bay

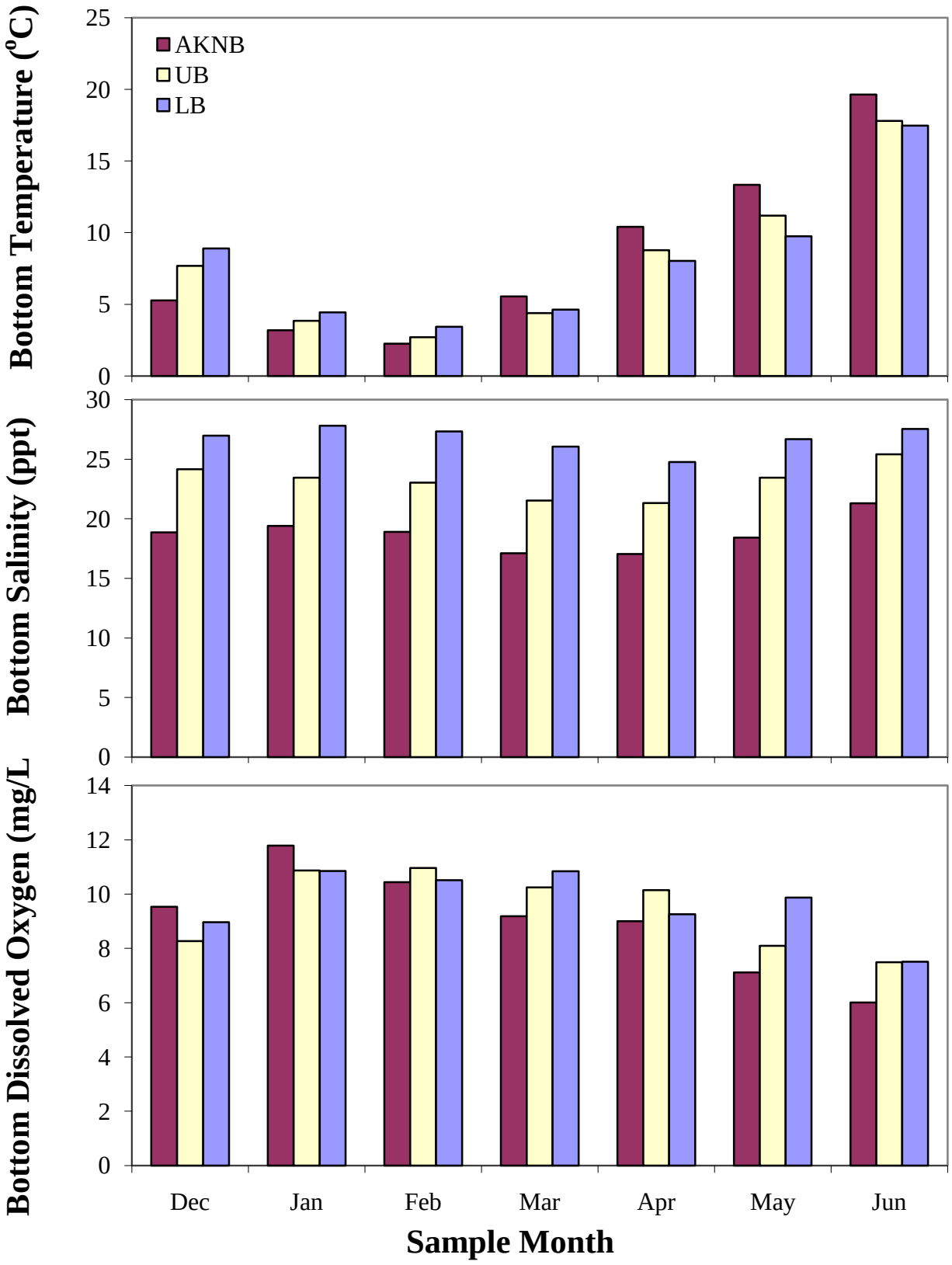

Figure 3-18 **Average monthly water quality data by region during the 2010 Aquatic Biological Survey.**

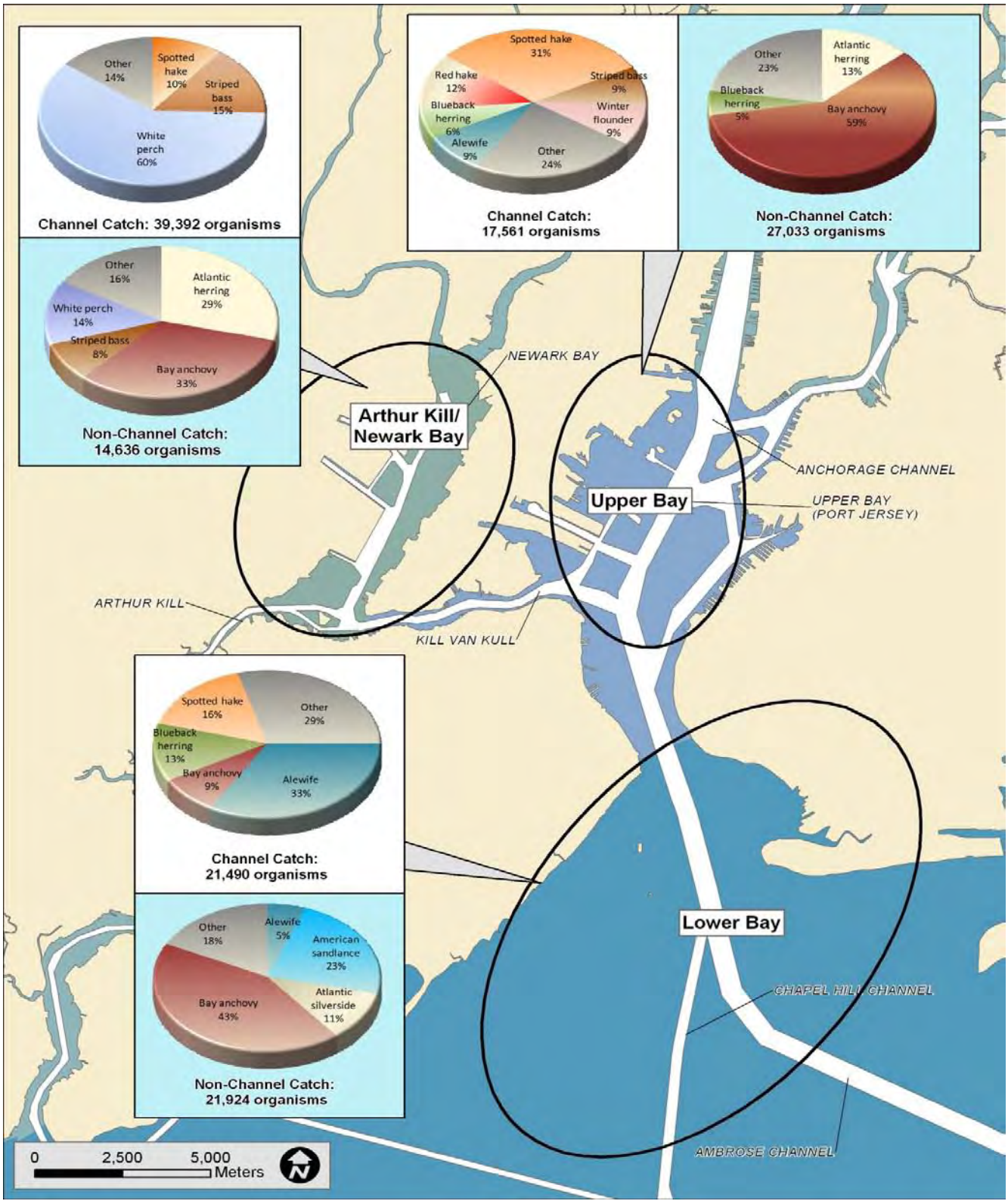

Figure 4-1 Total bottom trawl collection by region and station type (2002-2010)

Appendix A

Bottom Trawl CPUE (number per 10 minute trawl) by date and station sampled during the 2010 Aquatic Biological Survey

Appendix A. Bottom Trawl CPUE (number per 10 minute trawl) by date and station sampled during the 2010 Aquatic Biological Survey

Date	Station	Common Name	CPUE
12/14/2009	LB-1	American sandlance	288
12/14/2009	LB-1	Atlantic menhaden	1
12/14/2009	LB-1	Atlantic silverside	7
12/14/2009	LB-1	Bay anchovy	1
12/14/2009	LB-1	Silver hake	1
12/14/2009	LB-1	Spiny dogfish	1
12/14/2009	LB-1	Spotted hake	3
12/14/2009	LB-1	Winter flounder	1
12/14/2009	LBD-15	Alewife	2
12/14/2009	LBD-15	Bay anchovy	4
12/14/2009	LBD-15	Butterfish	2
12/14/2009	LBD-15	Fourspot flounder	1
12/14/2009	LBD-15	Little skate	1
12/14/2009	LBD-15	Red hake	31
12/14/2009	LBD-15	Silver hake	37
12/14/2009	LBD-15	Silver perch	4
12/14/2009	LBD-15	Smallmouth flounder	1
12/14/2009	LBD-15	Spiny dogfish	8
12/14/2009	LBD-15	Spotted hake	8
12/14/2009	LBD-15	Striped mullet	1
12/14/2009	LBD-15	Weakfish	1
12/14/2009	LBD-15	Winter flounder	2
12/14/2009	LB-16	Alewife	5
12/14/2009	LB-16	American sandlance	31
12/14/2009	LB-16	American shad	3
12/14/2009	LB-16	Atlantic menhaden	15
12/14/2009	LB-16	Atlantic silverside	3
12/14/2009	LB-16	Bay anchovy	3
12/14/2009	LB-16	Blueback herring	2
12/14/2009	LB-16	Spotted hake	2
12/14/2009	LB-16	Striped bass	1
12/14/2009	LB-16	Winter skate	1
12/14/2009	LBD-17	Fourspot flounder	1
12/14/2009	LBD-17	Little skate	1
12/14/2009	LBD-17	Red hake	10
12/14/2009	LBD-17	Silver hake	139
12/14/2009	LBD-17	Smallmouth flounder	1
12/14/2009	LBD-17	Spiny dogfish	2
12/14/2009	LBD-17	Spotted hake	20
12/14/2009	LBD-17	Windowpane	2
12/14/2009	LBD-17	Clearnose skate	1
12/14/2009	LBD-17	Winter skate	2
12/14/2009	LB-2	Alewife	7
12/14/2009	LB-2	American shad	3

Appendix A. Bottom Trawl CPUE (number per 10 minute trawl) by date and station sampled during the 2010 Aquatic Biological Survey

Date	Station	Common Name	CPUE
12/14/2009	LB-2	Atlantic silverside	1
12/14/2009	LB-2	Butterfish	1
12/14/2009	LB-2	Fourspot flounder	1
12/14/2009	LB-2	Little skate	2
12/14/2009	LB-2	Red hake	71
12/14/2009	LB-2	Silver hake	111
12/14/2009	LB-2	Silver perch	2
12/14/2009	LB-2	Spiny dogfish	2
12/14/2009	LB-2	Spotted hake	12
12/14/2009	LB-2	Summer flounder	1
12/14/2009	LB-2	Weakfish	4
12/14/2009	LB-2	Windowpane	1
12/14/2009	LB-2	Winter flounder	4
12/14/2009	LB-14	Atlantic silverside	1
12/14/2009	LB-14	Cunner	1
12/14/2009	LB-14	Fourspot flounder	3
12/14/2009	LB-14	Grubby	1
12/14/2009	LB-14	Little skate	3
12/14/2009	LB-14	Northern pipefish	2
12/14/2009	LB-14	Northern searobin	1
12/14/2009	LB-14	Red hake	77
12/14/2009	LB-14	Silver hake	28
12/14/2009	LB-14	Silver perch	4
12/14/2009	LB-14	Smallmouth flounder	3
12/14/2009	LB-14	Spotted hake	11
12/14/2009	LB-14	Summer flounder	2
12/14/2009	LB-14	Windowpane	1
12/14/2009	LB-14	Winter flounder	3
12/14/2009	LB-10	Atlantic silverside	4
12/14/2009	LB-10	Blueback herring	1
12/14/2009	LB-10	Little skate	2
12/14/2009	LB-10	Northern searobin	1
12/14/2009	LB-10	Red hake	1
12/14/2009	LB-10	Silver hake	2
12/14/2009	LB-10	Smallmouth flounder	1
12/14/2009	LB-10	Spotted hake	3
12/14/2009	LB-10	Winter flounder	2
12/14/2009	LB-10	Blue crab	2
12/15/2009	LB-9	Alewife	1
12/15/2009	LB-9	American sandlance	51
12/15/2009	LB-9	American shad	9
12/15/2009	LB-9	Atlantic menhaden	2
12/15/2009	LB-9	Bay anchovy	20
12/15/2009	LB-9	Red hake	1

Appendix A. Bottom Trawl CPUE (number per 10 minute trawl) by date and station sampled during the 2010 Aquatic Biological Survey

Date	Station	Common Name	CPUE
12/15/2009	LB-13	American sandlance	1,326
12/15/2009	LB-13	Atlantic menhaden	3
12/15/2009	LB-13	Bay anchovy	4
12/15/2009	LB-13	Little skate	1
12/15/2009	LB-13	Silver hake	1
12/15/2009	LB-4	Alewife	1
12/15/2009	LB-4	Atlantic menhaden	155
12/15/2009	LB-4	Atlantic sturgeon	1
12/15/2009	LB-4	Bay anchovy	10
12/15/2009	LB-4	Red hake	40
12/15/2009	LB-4	Silver hake	18
12/15/2009	LB-4	Silver perch	1
12/15/2009	LB-4	Spiny dogfish	2
12/15/2009	LB-4	Spotted hake	3
12/15/2009	LB-4	Striped bass	2
12/15/2009	LB-4	Tautog	1
12/15/2009	LB-4	Weakfish	1
12/15/2009	LB-12	Alewife	1
12/15/2009	LB-12	American sandlance	1
12/15/2009	LB-12	American shad	2
12/15/2009	LB-12	Atlantic menhaden	9
12/15/2009	LB-12	Atlantic silverside	1
12/15/2009	LB-12	Bay anchovy	48
12/15/2009	LB-12	Blueback herring	2
12/15/2009	LB-12	Little skate	1
12/15/2009	LB-12	Northern pipefish	2
12/15/2009	LB-12	Red hake	16
12/15/2009	LB-12	Silver hake	10
12/15/2009	LB-12	Silver perch	2
12/15/2009	LB-12	Spotted hake	7
12/15/2009	LB-12	Striped bass	2
12/15/2009	LB-12	Winter flounder	1
12/15/2009	LB-5	Atlantic menhaden	18
12/15/2009	LB-5	Atlantic silverside	1
12/15/2009	LB-5	Bay anchovy	75
12/15/2009	LB-5	Blueback herring	3
12/15/2009	LB-5	Spotted hake	1
12/15/2009	LB-6	Alewife	2
12/15/2009	LB-6	American shad	2
12/15/2009	LB-6	Atlantic menhaden	3
12/15/2009	LB-6	Atlantic silverside	1
12/15/2009	LB-6	Naked goby	1
12/15/2009	LB-6	Northern pipefish	1
12/15/2009	LB-6	Red hake	11

Appendix A. Bottom Trawl CPUE (number per 10 minute trawl) by date and station sampled during the 2010 Aquatic Biological Survey

Date	Station	Common Name	CPUE
12/15/2009	LB-6	Silver hake	38
12/15/2009	LB-6	Spotted hake	14
12/15/2009	LB-6	White perch	1
12/15/2009	LB-6	Winter flounder	2
12/15/2009	LB-6	Blue crab	1
12/15/2009	LB-3	American sandlance	104
12/15/2009	LB-3	Atlantic silverside	26
12/15/2009	LB-3	Bay anchovy	3
12/15/2009	LB-7	Alewife	3
12/15/2009	LB-7	American sandlance	1
12/15/2009	LB-7	American shad	2
12/15/2009	LB-7	Atlantic menhaden	7
12/15/2009	LB-7	Atlantic silverside	5
12/15/2009	LB-7	Bay anchovy	6
12/15/2009	LB-7	Blueback herring	27
12/15/2009	LB-7	Silver hake	14
12/15/2009	LB-7	Smallmouth flounder	3
12/15/2009	LB-7	Spotted hake	2
12/15/2009	LB-7	Blue crab	1
12/15/2009	LB-8	American sandlance	409
12/15/2009	LB-8	Atlantic silverside	17
12/15/2009	LB-8	Bay anchovy	2
12/15/2009	LB-8	Spotted hake	1
12/18/2009	PJ-2	Alewife	10
12/18/2009	PJ-2	American shad	1
12/18/2009	PJ-2	Atlantic menhaden	1
12/18/2009	PJ-2	Atlantic silverside	2
12/18/2009	PJ-2	Bay anchovy	124
12/18/2009	PJ-2	Blueback herring	5
12/18/2009	PJ-2	Silver hake	1
12/18/2009	PJ-2	Smallmouth flounder	1
12/18/2009	PJ-2	Spotted hake	1
12/18/2009	PJ-2	Striped bass	3
12/18/2009	PJ-2	Winter flounder	2
12/18/2009	PJ-2	Blue crab	6
12/18/2009	PJ-1	Alewife	2
12/18/2009	PJ-1	Bay anchovy	6
12/18/2009	PJ-1	Black sea bass	1
12/18/2009	PJ-1	Grubby	2
12/18/2009	PJ-1	Spotted hake	1
12/18/2009	PJ-1	Striped bass	26
12/18/2009	PJ-1	White perch	6
12/18/2009	PJ-1	Winter flounder	6
12/18/2009	PJ-1	Blue crab	3

Appendix A. Bottom Trawl CPUE (number per 10 minute trawl) by date and station sampled during the 2010 Aquatic Biological Survey

Date	Station	Common Name	CPUE
2/2/2010	LB-12	American sandlance	1
2/2/2010	LB-12	Atlantic silverside	87
2/2/2010	LB-12	Blueback herring	1
2/2/2010	LB-4	Alewife	2
2/2/2010	LB-4	American sandlance	1
2/2/2010	LB-4	Atlantic menhaden	1
2/2/2010	LB-4	Atlantic silverside	116
2/2/2010	LB-4	Winter flounder	1
2/2/2010	LB-13	American sandlance	25
2/2/2010	LB-13	Atlantic silverside	5
2/2/2010	LBD-17	American sandlance	476
2/2/2010	LBD-17	Atlantic silverside	3
2/2/2010	LBD-17	Little skate	2
2/2/2010	LBD-17	Red hake	1
2/2/2010	LBD-17	Spotted hake	2
2/2/2010	LBD-17	Winter flounder	1
2/2/2010	LB-16	Atlantic herring	4
2/2/2010	LB-16	Atlantic silverside	1
2/4/2010	SB-7	Cunner	5
2/4/2010	SB-7	Grubby	1
2/4/2010	SB-7	Little skate	3
2/4/2010	SB-7	Northern pipefish	1
2/4/2010	SB-7	Red hake	14
2/4/2010	SB-7	Striped bass	1
2/4/2010	SB-7	Tautog	4
2/4/2010	SB-7	Winter flounder	5
2/4/2010	SB-5	American sandlance	1
2/4/2010	SB-5	Atlantic herring	1
2/4/2010	SB-5	Atlantic silverside	2
2/4/2010	SB-5	Atlantic tomcod	1
2/4/2010	SB-5	Red hake	31
2/4/2010	SB-5	Striped bass	1
2/4/2010	SB-5	Summer flounder	1
2/4/2010	SB-5	White perch	1
2/4/2010	SB-5	Winter flounder	5
2/4/2010	PJ-1	Atlantic silverside	1
2/4/2010	PJ-1	Grubby	1
2/4/2010	PJ-1	Summer flounder	1
2/4/2010	PJ-1	Winter flounder	2
2/4/2010	PJ-2	Atlantic silverside	4
12/18/2009	SB-5	Bay anchovy	3
12/18/2009	SB-5	Red hake	1
12/18/2009	SB-5	Striped searobin	1
12/18/2009	SB-7	Alewife	1

Appendix A. Bottom Trawl CPUE (number per 10 minute trawl) by date and station sampled during the 2010 Aquatic Biological Survey

Date	Station	Common Name	CPUE
12/18/2009	SB-7	Bay anchovy	2
12/18/2009	SB-7	Red hake	7
12/18/2009	SB-7	Silver hake	3
12/18/2009	SB-7	Spotted hake	1
12/18/2009	SB-7	Striped searobin	1
12/18/2009	SB-7	White perch	1
12/18/2009	SB-7	Winter flounder	5
12/18/2009	SB-7	Blue crab	6
12/18/2009	SB-6	Alewife	1
12/18/2009	SB-6	Red hake	5
12/18/2009	SB-6	Silver hake	5
12/18/2009	SB-6	Silver perch	1
12/18/2009	SB-6	Spiny dogfish	1
12/18/2009	SB-6	Spotted hake	12
12/18/2009	SB-6	Windowpane	1
12/18/2009	SB-6	Winter flounder	1
12/18/2009	SB-4	Alewife	7
12/18/2009	SB-4	Bay anchovy	2
12/18/2009	SB-4	Black sea bass	1
12/18/2009	SB-4	Red hake	26
12/18/2009	SB-4	Silver hake	16
12/18/2009	SB-4	Silver perch	1
12/18/2009	SB-4	Spotted hake	18
12/18/2009	SB-4	Striped bass	2
12/18/2009	SB-4	Winter flounder	10
12/18/2009	SB-4	Winter skate	1
12/18/2009	SB-4	Blue crab	1
12/18/2009	SB-3	American sandlance	19
12/18/2009	SB-3	Grubby	1
12/18/2009	SB-3	Red hake	2
12/18/2009	SB-3	Smallmouth flounder	2
12/18/2009	SB-3	Winter flounder	3
12/21/2009	NB-6	Gizzard shad	24
12/21/2009	NB-6	Red hake	20
12/21/2009	NB-6	Spotted hake	1
12/21/2009	NB-6	Striped bass	3
12/21/2009	NB-6	White perch	96
12/21/2009	NB-6	Winter flounder	3
12/21/2009	NB-8	Atlantic croaker	1
12/21/2009	NB-8	Atlantic tomcod	1
12/21/2009	NB-8	Bay anchovy	1
12/21/2009	NB-8	Gizzard shad	8
12/21/2009	NB-8	Red hake	30
12/21/2009	NB-8	Silver hake	2

Appendix A. Bottom Trawl CPUE (number per 10 minute trawl) by date and station sampled during the 2010 Aquatic Biological Survey

Date	Station	Common Name	CPUE
12/21/2009	NB-8	Spotted hake	11
12/21/2009	NB-8	Striped bass	10
12/21/2009	NB-8	Striped mullet	1
12/21/2009	NB-8	Tautog	1
12/21/2009	NB-8	White perch	1,405
12/21/2009	NB-8	Winter flounder	11
12/21/2009	NB-8	Blue crab	3
12/21/2009	NB-8	Black drum	1
12/21/2009	NB-4	Atlantic croaker	1
12/21/2009	NB-4	Atlantic silverside	16
12/21/2009	NB-4	Spotted hake	1
12/21/2009	NB-4	Blue crab	1
12/21/2009	NB-7	American sandlance	1
12/21/2009	NB-7	Atlantic silverside	11
12/21/2009	NB-7	Bay anchovy	1
12/21/2009	NB-7	White perch	4
12/21/2009	NB-7	Winter flounder	1
12/21/2009	NB-7	Blue crab	3
12/21/2009	AK-3	Black sea bass	1
12/21/2009	AK-3	Gizzard shad	1
12/21/2009	AK-3	Red hake	25
12/21/2009	AK-3	Spotted hake	6
12/21/2009	AK-3	Striped bass	1,242
12/21/2009	AK-3	Striped mullet	1
12/21/2009	AK-3	Tautog	1
12/21/2009	AK-3	White perch	61
12/21/2009	AK-3	Windowpane	2
12/21/2009	AK-3	Winter flounder	24
12/21/2009	AK-3	Blue crab	2
12/21/2009	AK-2	American eel	1
12/21/2009	AK-2	American shad	1
12/21/2009	AK-2	Atlantic croaker	1
12/21/2009	AK-2	Crevalle jack	1
12/21/2009	AK-2	Gizzard shad	22
12/21/2009	AK-2	Red hake	5
12/21/2009	AK-2	Silver hake	5
12/21/2009	AK-2	Spotted hake	3
12/21/2009	AK-2	Striped bass	140
12/21/2009	AK-2	Striped mullet	4
12/21/2009	AK-2	White perch	533
12/21/2009	AK-2	Winter flounder	11
12/21/2009	AK-2	Blue crab	1
1/4/2010	PJ-1	Bay anchovy	2
1/4/2010	PJ-1	Grubby	10

Appendix A. Bottom Trawl CPUE (number per 10 minute trawl) by date and station sampled during the 2010 Aquatic Biological Survey

Date	Station	Common Name	CPUE
1/4/2010	PJ-1	Smallmouth flounder	1
1/4/2010	PJ-1	Striped bass	11
1/4/2010	PJ-1	White perch	2
1/4/2010	PJ-1	Windowpane	1
1/4/2010	PJ-1	Winter flounder	15
1/4/2010	PJ-2	Bay anchovy	5
1/4/2010	PJ-2	Smallmouth flounder	1
1/4/2010	PJ-2	Striped bass	1
1/4/2010	PJ-2	Winter flounder	3
1/4/2010	PJ-2	Blue crab	1
1/4/2010	SB-5	Red hake	65
1/4/2010	SB-5	Silver hake	4
1/4/2010	SB-5	Silver perch	5
1/4/2010	SB-5	Spotted hake	2
1/4/2010	SB-5	Striped bass	3
1/4/2010	SB-5	Striped mullet	2
1/4/2010	SB-5	White perch	1
1/4/2010	SB-5	Winter flounder	3
1/4/2010	SB-5	Winter skate	1
1/4/2010	SB-7	Atlantic silverside	3
1/4/2010	SB-7	Bay anchovy	2
1/4/2010	SB-7	Blueback herring	1
1/4/2010	SB-7	Red hake	68
1/4/2010	SB-7	Silver hake	6
1/4/2010	SB-7	Silver perch	30
1/4/2010	SB-7	Spotted hake	17
1/4/2010	SB-7	Summer flounder	1
1/4/2010	SB-7	Tautog	1
1/4/2010	SB-7	White perch	1
1/4/2010	SB-7	Winter flounder	5
1/4/2010	SB-7	Winter skate	3
1/4/2010	SB-7	Blue crab	1
1/4/2010	SB-6	Atlantic herring	1
1/4/2010	SB-6	Atlantic silverside	1
1/4/2010	SB-6	Red hake	55
1/4/2010	SB-6	Silver hake	4
1/4/2010	SB-6	Smallmouth flounder	1
1/4/2010	SB-6	Spotted hake	3
1/4/2010	SB-6	Windowpane	6
1/4/2010	SB-4	Bay anchovy	1
1/4/2010	SB-4	Conger eel	1
1/4/2010	SB-4	Red hake	17
1/4/2010	SB-4	Silver hake	1
1/4/2010	SB-4	Striped bass	10

Appendix A. Bottom Trawl CPUE (number per 10 minute trawl) by date and station sampled during the 2010 Aquatic Biological Survey

Date	Station	Common Name	CPUE
1/4/2010	SB-4	Summer flounder	1
1/4/2010	SB-4	Winter flounder	1
1/4/2010	SB-3	Cunner	1
1/5/2010	LB-8	Atlantic herring	7
1/5/2010	LB-8	Atlantic silverside	12
1/5/2010	LB-8	Red hake	2
1/5/2010	LB-7	American sandlance	1
1/5/2010	LB-7	Atlantic herring	1
1/5/2010	LB-7	Atlantic menhaden	4
1/5/2010	LB-7	Atlantic silverside	151
1/5/2010	LB-7	Bay anchovy	12
1/5/2010	LB-7	Blueback herring	1
1/5/2010	LB-7	Silver hake	18
1/5/2010	LB-7	Silver perch	1
1/5/2010	LB-7	Smallmouth flounder	4
1/5/2010	LB-7	Spotted hake	4
1/5/2010	LB-7	Striped mullet	1
1/5/2010	LB-7	Winter flounder	2
1/5/2010	LB-3	Alewife	1
1/5/2010	LB-3	Atlantic menhaden	1
1/5/2010	LB-3	Atlantic silverside	194
1/5/2010	LB-3	Bay anchovy	1
1/5/2010	LB-3	Little skate	1
1/5/2010	LB-3	Silver hake	5
1/5/2010	LB-3	Tautog	1
1/5/2010	LB-3	Winter flounder	1
1/5/2010	LB-3	American lobster	1
1/5/2010	LB-9	Atlantic silverside	6
1/5/2010	LB-9	Silver perch	1
1/5/2010	LB-14	Alewife	2
1/5/2010	LB-14	Atlantic herring	1
1/5/2010	LB-14	Atlantic menhaden	1
1/5/2010	LB-14	Atlantic silverside	2
1/5/2010	LB-14	Red hake	20
1/5/2010	LB-14	Smallmouth flounder	1
1/5/2010	LB-14	Striped mullet	1
1/5/2010	LB-14	Summer flounder	1
1/5/2010	LB-14	Winter flounder	1
1/5/2010	LB-10	American sandlance	12
1/5/2010	LB-10	Atlantic silverside	163
1/5/2010	LB-10	Red hake	2
1/5/2010	LB-10	Silver hake	2
1/5/2010	LB-10	Smallmouth flounder	2
1/5/2010	LB-10	Windowpane	3

Appendix A. Bottom Trawl CPUE (number per 10 minute trawl) by date and station sampled during the 2010 Aquatic Biological Survey

Date	Station	Common Name	CPUE
1/5/2010	LB-10	Winter flounder	3
1/6/2010	AK-2	Gizzard shad	3
1/6/2010	AK-2	Grubby	1
1/6/2010	AK-2	Red hake	92
1/6/2010	AK-2	Silver hake	2
1/6/2010	AK-2	Silver perch	1
1/6/2010	AK-2	Spotted hake	4
1/6/2010	AK-2	Striped bass	62
1/6/2010	AK-2	Striped mullet	1
1/6/2010	AK-2	Summer flounder	1
1/6/2010	AK-2	White perch	507
1/6/2010	AK-2	Winter flounder	11
1/6/2010	AK-2	Blue crab	1
1/6/2010	AK-3	Gizzard shad	1
1/6/2010	AK-3	Grubby	1
1/6/2010	AK-3	Northern pipefish	1
1/6/2010	AK-3	Red hake	32
1/6/2010	AK-3	Spotted hake	1
1/6/2010	AK-3	Striped bass	31
1/6/2010	AK-3	Striped mullet	1
1/6/2010	AK-3	Summer flounder	1
1/6/2010	AK-3	White perch	784
1/6/2010	AK-3	Windowpane	2
1/6/2010	AK-3	Winter flounder	18
1/6/2010	NB-8	Gizzard shad	3
1/6/2010	NB-8	Red hake	13
1/6/2010	NB-8	Spotted hake	2
1/6/2010	NB-8	Striped bass	25
1/6/2010	NB-8	Summer flounder	1
1/6/2010	NB-8	White perch	1,676
1/6/2010	NB-8	Winter flounder	2
1/6/2010	NB-4	American sandlance	1
1/6/2010	NB-4	Atlantic silverside	5
1/6/2010	NB-7	Silver hake	3
1/6/2010	NB-7	Winter flounder	4
1/6/2010	NB-6	Gizzard shad	4
1/6/2010	NB-6	Red hake	66
1/6/2010	NB-6	Silver hake	2
1/6/2010	NB-6	Silver perch	8
1/6/2010	NB-6	Spotted hake	8
1/6/2010	NB-6	Striped bass	18
1/6/2010	NB-6	White perch	482
1/6/2010	NB-6	Blue crab	4
1/11/2010	LB-16	American sandlance	247

Appendix A. Bottom Trawl CPUE (number per 10 minute trawl) by date and station sampled during the 2010 Aquatic Biological Survey

Date	Station	Common Name	CPUE
1/11/2010	LB-16	Atlantic silverside	1
1/11/2010	LB-16	Little skate	1
1/11/2010	LB-16	Silver hake	1
1/11/2010	LBD-17	American sandlance	5
1/11/2010	LBD-17	Atlantic menhaden	1
1/11/2010	LBD-17	Atlantic silverside	3
1/11/2010	LBD-17	Silver hake	1
1/11/2010	LBD-17	Smallmouth flounder	1
1/11/2010	LBD-17	Spotted hake	2
1/11/2010	LBD-17	Summer flounder	1
1/11/2010	LBD-17	Winter flounder	1
1/11/2010	LBD-17	Winter skate	3
1/11/2010	LB-13	Atlantic silverside	45
1/11/2010	LB-4	Atlantic silverside	27
1/11/2010	LB-4	Cunner	2
1/11/2010	LB-4	Grubby	1
1/11/2010	LB-4	Naked goby	2
1/11/2010	LB-4	Rock gunnel	1
1/11/2010	LB-4	Tautog	3
1/11/2010	LB-4	Winter flounder	1
1/11/2010	LB-12	American sandlance	30
1/11/2010	LB-12	Atlantic silverside	81
1/11/2010	LB-12	Grubby	1
1/11/2010	LB-12	Smallmouth flounder	1
1/11/2010	LB-12	Windowpane	2
1/11/2010	LB-12	Winter flounder	1
1/11/2010	LB-6	Atlantic herring	18
1/11/2010	LB-6	Atlantic silverside	184
1/11/2010	LB-6	Gizzard shad	3
1/11/2010	LB-6	Little skate	2
1/11/2010	LB-6	Red hake	1
1/11/2010	LB-6	Striped mullet	3
1/11/2010	LB-6	Winter flounder	1
1/11/2010	LB-6	American lobster	1
1/11/2010	LB-5	American sandlance	1
1/11/2010	LB-5	Atlantic silverside	11
1/11/2010	LB-5	Grubby	1
1/12/2010	LB-2	Alewife	1
1/12/2010	LB-2	American shad	1
1/12/2010	LB-2	Atlantic herring	17
1/12/2010	LB-2	Atlantic menhaden	3
1/12/2010	LB-2	Atlantic silverside	12
1/12/2010	LB-2	Bay anchovy	1
1/12/2010	LB-2	Blueback herring	15

Appendix A. Bottom Trawl CPUE (number per 10 minute trawl) by date and station sampled during the 2010 Aquatic Biological Survey

Date	Station	Common Name	CPUE
1/12/2010	LB-2	Red hake	1
1/12/2010	LB-2	Silver hake	5
1/12/2010	LB-2	Smallmouth flounder	4
1/12/2010	LB-2	Spiny dogfish	1
1/12/2010	LB-2	Winter flounder	3
1/12/2010	LBD-15	Alewife	17
1/12/2010	LBD-15	Atlantic menhaden	7
1/12/2010	LBD-15	Atlantic silverside	207
1/12/2010	LBD-15	Bay anchovy	1
1/12/2010	LBD-15	Silver hake	4
1/12/2010	LBD-15	Smallmouth flounder	1
1/12/2010	LBD-15	Spotted hake	1
1/12/2010	LBD-15	Weakfish	1
1/12/2010	LBD-15	Winter flounder	8
1/12/2010	LB-1	Atlantic silverside	11
1/19/2010	LB-1	American sandlance	14
1/19/2010	LB-1	Atlantic silverside	57
1/19/2010	LBD-15	Alewife	1
1/19/2010	LBD-15	Atlantic herring	44
1/19/2010	LBD-15	Atlantic silverside	6
1/19/2010	LBD-15	Blueback herring	1
1/19/2010	LBD-15	Conger eel	2
1/19/2010	LBD-15	Little skate	2
1/19/2010	LBD-15	Red hake	2
1/19/2010	LBD-15	Rock gunnel	1
1/19/2010	LBD-15	Silver hake	4
1/19/2010	LBD-15	Smallmouth flounder	6
1/19/2010	LBD-15	Spotted hake	2
1/19/2010	LBD-15	Winter flounder	14
1/19/2010	LBD-17	Little skate	1
1/19/2010	LBD-17	Silver hake	5
1/19/2010	LB-13	American sandlance	1
1/19/2010	LB-4	American shad	3
1/19/2010	LB-4	Atlantic herring	3
1/19/2010	LB-4	Atlantic menhaden	1
1/19/2010	LB-4	Atlantic silverside	1
1/19/2010	LB-4	Blueback herring	2
1/19/2010	LB-4	Grubby	1
1/19/2010	LB-4	Little skate	1
1/19/2010	LB-4	Red hake	4
1/19/2010	LB-4	American lobster	1
1/19/2010	LB-12	Little skate	1
1/20/2010	LB-9	Atlantic herring	2
1/20/2010	LB-2	Alewife	2

Appendix A. Bottom Trawl CPUE (number per 10 minute trawl) by date and station sampled during the 2010 Aquatic Biological Survey

Date	Station	Common Name	CPUE
1/20/2010	LB-6	Atlantic menhaden	1
1/20/2010	LB-6	Atlantic silverside	5
1/20/2010	LB-6	Blueback herring	2
1/20/2010	LB-6	Winter flounder	1
1/20/2010	LB-6	Blue crab	1
1/20/2010	LB-3	Atlantic silverside	6
1/20/2010	LB-7	Atlantic silverside	4
1/20/2010	LB-7	Spotted hake	1
1/21/2010	SB-5	Atlantic croaker	1
1/21/2010	SB-5	Atlantic menhaden	1
1/21/2010	SB-5	Bay anchovy	1
1/21/2010	SB-5	Gizzard shad	2
1/21/2010	SB-5	Little skate	3
1/21/2010	SB-5	Red hake	57
1/21/2010	SB-5	Silver hake	1
1/21/2010	SB-5	Spotted hake	1
1/21/2010	SB-5	Striped bass	6
1/21/2010	SB-5	Summer flounder	1
1/21/2010	SB-5	Winter flounder	2
1/21/2010	SB-7	Alewife	2
1/21/2010	SB-7	Grubby	1
1/21/2010	SB-7	Little skate	2
1/21/2010	SB-7	Northern pipefish	1
1/21/2010	SB-7	Red hake	50
1/21/2010	SB-7	Summer flounder	3
1/21/2010	SB-7	White perch	1
1/21/2010	SB-7	Winter flounder	18
1/21/2010	SB-7	Blue crab	10
1/21/2010	SB-6	American shad	1
1/21/2010	SB-6	Atlantic herring	2
1/21/2010	SB-6	Red hake	3
1/21/2010	SB-6	Blue crab	1
1/21/2010	LB-14	Atlantic herring	7
1/21/2010	LB-14	Atlantic silverside	2
1/21/2010	LB-14	Smallmouth flounder	1
1/21/2010	LB-10	American sandlance	3
1/21/2010	LB-10	Atlantic silverside	80
1/21/2010	LB-10	Windowpane	1
1/21/2010	SB-4	Alewife	5
1/21/2010	SB-4	Atlantic herring	20
1/21/2010	SB-4	Atlantic menhaden	1
1/21/2010	SB-4	Atlantic silverside	3
1/21/2010	SB-4	Blueback herring	2
1/21/2010	SB-4	Little skate	1

Appendix A. Bottom Trawl CPUE (number per 10 minute trawl) by date and station sampled during the 2010 Aquatic Biological Survey

Date	Station	Common Name	CPUE
1/21/2010	SB-4	Red hake	5
1/21/2010	SB-4	Silver hake	2
1/21/2010	SB-4	Striped bass	3
2/3/2010	NB-8	Grubby	2
2/3/2010	NB-8	Red hake	10
2/3/2010	NB-8	Striped bass	2
2/3/2010	NB-8	White perch	484
2/3/2010	NB-8	Winter flounder	4
2/3/2010	NB-6	Alewife	2
2/3/2010	NB-6	Atlantic tomcod	2
2/3/2010	NB-6	Red hake	24
2/3/2010	NB-6	Silver hake	2
2/3/2010	NB-6	Striped bass	6
2/3/2010	NB-6	White perch	244
2/3/2010	NB-4	White perch	1
2/3/2010	NB-7	Atlantic silverside	1
2/3/2010	NB-7	Bay anchovy	1
2/3/2010	NB-7	White perch	10
2/3/2010	AK-3	Red hake	40
2/3/2010	AK-3	Silver hake	2
2/3/2010	AK-3	Smallmouth flounder	2
2/3/2010	AK-3	Striped bass	14
2/3/2010	AK-3	White perch	340
2/3/2010	AK-3	Winter flounder	30
2/3/2010	AK-2	Grubby	8
2/3/2010	AK-2	Red hake	23
2/3/2010	AK-2	Striped bass	28
2/3/2010	AK-2	White perch	68
2/3/2010	AK-2	Winter flounder	3
2/5/2010	LB-10	Atlantic silverside	10
2/5/2010	LB-10	Grubby	2
2/5/2010	LB-1	Atlantic silverside	12
2/5/2010	LBD-15	Alewife	1
2/5/2010	LBD-15	Atlantic herring	4
2/5/2010	LBD-15	Atlantic silverside	122
2/5/2010	LBD-15	Blueback herring	9
2/5/2010	LBD-15	Little skate	1
2/5/2010	LBD-15	Winter flounder	2
2/5/2010	LB-2	Atlantic herring	2
2/5/2010	LB-2	Atlantic menhaden	3
2/5/2010	LB-2	Atlantic silverside	7
2/5/2010	LB-2	Blueback herring	4
2/5/2010	LB-2	Grubby	1
2/5/2010	LB-2	Red hake	2

Appendix A. Bottom Trawl CPUE (number per 10 minute trawl) by date and station sampled during the 2010 Aquatic Biological Survey

Date	Station	Common Name	CPUE
2/5/2010	LB-2	Spotted hake	1
2/5/2010	LB-2	Windowpane	1
2/5/2010	LB-2	Winter flounder	2
2/5/2010	LB-14	Winter flounder	2
2/17/2010	PJ-2	Atlantic silverside	5
2/17/2010	PJ-2	Cunner	1
2/17/2010	PJ-2	Striped bass	1
2/17/2010	PJ-2	Blue crab	1
2/17/2010	LB-8	Atlantic silverside	4
2/17/2010	LB-7	Atlantic silverside	25
2/17/2010	LB-7	Winter flounder	1
2/17/2010	LB-3	Atlantic silverside	1
1/21/2010	SB-3	Atlantic silverside	1
1/21/2010	SB-3	Rock gunnel	1
1/21/2010	SB-3	Tautog	1
1/21/2010	SB-3	Winter flounder	1
1/22/2010	AK-3	Red hake	22
1/22/2010	AK-3	Striped bass	156
1/22/2010	AK-3	White perch	1,610
1/22/2010	AK-3	Winter flounder	46
1/22/2010	AK-2	Gizzard shad	2
1/22/2010	AK-2	Red hake	6
1/22/2010	AK-2	Spotted hake	2
1/22/2010	AK-2	Striped bass	136
1/22/2010	AK-2	Striped mullet	2
1/22/2010	AK-2	White perch	628
1/22/2010	AK-2	Winter flounder	24
1/22/2010	NB-8	Gizzard shad	2
1/22/2010	NB-8	Red hake	8
1/22/2010	NB-8	Silver hake	2
1/22/2010	NB-8	Spotted hake	2
1/22/2010	NB-8	Striped bass	22
1/22/2010	NB-8	White perch	1,365
1/22/2010	NB-4	Atlantic silverside	2
1/22/2010	NB-7	Atlantic silverside	6
1/22/2010	NB-7	Winter flounder	1
1/22/2010	NB-7	Blue crab	3
1/22/2010	PJ-1	Grubby	1
1/22/2010	PJ-1	Red hake	2
1/22/2010	PJ-1	Winter flounder	7
1/22/2010	PJ-1	Blue crab	1
1/22/2010	PJ-2	Atlantic croaker	1
1/22/2010	PJ-2	Winter flounder	1
2/1/2010	SB-4	Atlantic herring	1

Appendix A. Bottom Trawl CPUE (number per 10 minute trawl) by date and station sampled during the 2010 Aquatic Biological Survey

Date	Station	Common Name	CPUE
2/1/2010	SB-4	Atlantic menhaden	1
2/1/2010	SB-4	Bay anchovy	3
2/1/2010	SB-4	Grubby	1
2/1/2010	SB-4	Little skate	1
2/1/2010	SB-4	Red hake	40
2/1/2010	SB-4	Silver hake	2
2/1/2010	SB-4	Spotted hake	2
2/1/2010	SB-4	Striped bass	5
2/1/2010	SB-4	Windowpane	1
2/1/2010	SB-4	Blue crab	1
2/1/2010	SB-3	Grubby	1
2/1/2010	SB-3	Red hake	1
2/1/2010	SB-3	Striped bass	1
2/1/2010	SB-3	Winter flounder	1
2/1/2010	SB-6	Atlantic silverside	1
2/1/2010	SB-6	Grubby	1
2/1/2010	SB-6	Little skate	1
2/1/2010	SB-6	Red hake	30
2/1/2010	SB-6	Silver hake	3
2/1/2010	SB-6	Windowpane	3
2/1/2010	SB-6	Winter flounder	1
2/1/2010	SB-6	American lobster	2
2/1/2010	LB-8	American sandlance	23
2/1/2010	LB-8	Atlantic silverside	8
2/1/2010	LB-7	Atlantic silverside	27
2/1/2010	LB-7	Winter flounder	1
2/1/2010	LB-3	Atlantic silverside	11
2/1/2010	LB-9	Atlantic herring	2
2/1/2010	LB-9	Grubby	1
2/2/2010	LB-5	Atlantic silverside	1
2/2/2010	LB-6	Atlantic herring	6
2/2/2010	LB-6	Atlantic menhaden	2
2/2/2010	LB-6	Atlantic silverside	104
2/2/2010	LB-6	Summer flounder	1
2/2/2010	LB-6	Windowpane	2
2/2/2010	LB-6	Winter flounder	3
2/17/2010	LB-10	Atlantic silverside	3
2/18/2010	NB-7	Atlantic silverside	1
2/19/2010	PJ-1	Atlantic silverside	1
2/19/2010	PJ-1	Cunner	1
2/19/2010	PJ-1	Grubby	2
2/19/2010	PJ-1	Winter flounder	1
2/19/2010	PJ-1	Blue crab	2
2/22/2010	LBD-17	American sandlance	367

Appendix A. Bottom Trawl CPUE (number per 10 minute trawl) by date and station sampled during the 2010 Aquatic Biological Survey

Date	Station	Common Name	CPUE
2/22/2010	LBD-17	American lobster	1
2/22/2010	LB-13	Atlantic silverside	3
2/22/2010	LB-13	Windowpane	1
2/22/2010	LB-4	Atlantic silverside	24
2/22/2010	LB-4	Winter flounder	1
2/22/2010	LB-12	Atlantic silverside	5
2/22/2010	LB-6	Alewife	2
2/22/2010	LB-6	Atlantic silverside	38
2/22/2010	LB-6	Blueback herring	1
2/22/2010	LB-6	Winter flounder	5
2/22/2010	LB-5	Atlantic silverside	13
2/22/2010	LB-5	Winter flounder	1
2/23/2010	LB-1	Atlantic silverside	7
2/23/2010	LBD-15	Atlantic silverside	6
2/23/2010	LBD-15	Grubby	1
2/23/2010	LBD-15	Red hake	1
2/23/2010	LBD-15	Winter flounder	1
2/23/2010	LBD-15	Blue crab	1
2/23/2010	LB-2	American shad	1
2/23/2010	LB-2	Spotted hake	1
2/23/2010	LB-2	Windowpane	1
2/23/2010	LB-2	Winter flounder	2
2/23/2010	LB-14	Atlantic silverside	1
2/23/2010	LB-14	Winter flounder	9
3/1/2010	NB-7	Atlantic silverside	3
3/1/2010	NB-7	Winter flounder	3
3/1/2010	NB-4	Blue crab	4
3/1/2010	NB-8	Red hake	2
3/1/2010	NB-8	Striped bass	8
3/1/2010	NB-8	White perch	98
3/1/2010	NB-8	Blue crab	2
3/1/2010	NB-6	Red hake	28
3/1/2010	NB-6	Striped bass	46
3/1/2010	NB-6	White perch	124
3/1/2010	AK-2	Alewife	1
3/1/2010	AK-2	Red hake	1
3/1/2010	AK-2	Striped bass	47
3/1/2010	AK-2	Tautog	1
3/1/2010	AK-2	White perch	221
3/1/2010	AK-2	Winter flounder	15
3/1/2010	AK-3	Grubby	5
3/1/2010	AK-3	Red hake	13
3/1/2010	AK-3	Striped bass	42
3/1/2010	AK-3	Summer flounder	2

Appendix A. Bottom Trawl CPUE (number per 10 minute trawl) by date and station sampled during the 2010 Aquatic Biological Survey

Date	Station	Common Name	CPUE
3/1/2010	AK-3	White perch	1,045
3/1/2010	AK-3	Winter flounder	112
3/1/2010	AK-3	Blue crab	2
3/2/2010	LB-16	American sandlance	811
3/2/2010	LBD-17	American sandlance	3
3/2/2010	LBD-17	Blueback herring	2
3/2/2010	LB-13	Windowpane	1
2/18/2010	NB-4	Atlantic silverside	4
2/18/2010	NB-8	Grubby	2
2/18/2010	NB-8	Red hake	6
2/18/2010	NB-8	Striped bass	10
2/18/2010	NB-8	White perch	806
2/18/2010	NB-6	Atlantic silverside	2
2/18/2010	NB-6	Red hake	2
2/18/2010	NB-6	Striped bass	34
2/18/2010	NB-6	White perch	70
2/18/2010	NB-6	Winter flounder	2
2/18/2010	AK-3	Atlantic silverside	2
2/18/2010	AK-3	Grubby	6
2/18/2010	AK-3	Red hake	10
2/18/2010	AK-3	Striped bass	6
2/18/2010	AK-3	White perch	520
2/18/2010	AK-3	Winter flounder	36
2/18/2010	AK-2	Atlantic silverside	4
2/18/2010	AK-2	Blueback herring	2
2/18/2010	AK-2	Grubby	22
2/18/2010	AK-2	Red hake	10
2/18/2010	AK-2	Striped bass	24
2/18/2010	AK-2	White perch	188
2/18/2010	AK-2	Winter flounder	38
2/19/2010	SB-3	Atlantic silverside	1
2/19/2010	SB-3	Grubby	1
2/19/2010	SB-3	Rock gunnel	1
2/19/2010	SB-3	Winter flounder	4
2/19/2010	SB-3	Blue crab	1
2/19/2010	SB-4	American shad	1
2/19/2010	SB-4	Atlantic herring	10
2/19/2010	SB-4	Atlantic silverside	3
2/19/2010	SB-4	Blueback herring	5
2/19/2010	SB-4	Red hake	2
2/19/2010	SB-4	Spotted hake	2
2/19/2010	SB-4	Striped bass	1
2/19/2010	SB-4	Winter flounder	1
2/19/2010	SB-6	Atlantic silverside	5

Appendix A. Bottom Trawl CPUE (number per 10 minute trawl) by date and station sampled during the 2010 Aquatic Biological Survey

Date	Station	Common Name	CPUE
2/19/2010	SB-6	Red hake	4
2/19/2010	SB-6	Windowpane	1
2/19/2010	SB-7	Atlantic herring	6
2/19/2010	SB-7	Atlantic silverside	1
2/19/2010	SB-7	Northern pipefish	1
2/19/2010	SB-7	Red hake	11
2/19/2010	SB-7	Windowpane	1
2/19/2010	SB-7	Winter flounder	3
2/19/2010	SB-5	Alewife	3
2/19/2010	SB-5	American shad	3
2/19/2010	SB-5	Atlantic herring	6
2/19/2010	SB-5	Atlantic silverside	1
2/19/2010	SB-5	Northern pipefish	2
2/19/2010	SB-5	Red hake	4
2/19/2010	SB-5	Smallmouth flounder	1
2/19/2010	SB-5	Tautog	1
2/19/2010	SB-5	Winter flounder	5
3/2/2010	LB-4	Atlantic silverside	1
3/2/2010	LB-4	Blueback herring	3
3/2/2010	LB-4	Red hake	1
3/2/2010	LB-12	American sandlance	1
3/2/2010	LB-12	American shad	1
3/2/2010	LB-12	Northern pipefish	1
3/2/2010	LB-12	Windowpane	1
3/2/2010	LB-6	Alewife	1
3/2/2010	LB-6	American shad	2
3/2/2010	LB-6	Atlantic herring	2
3/2/2010	LB-6	Atlantic menhaden	1
3/2/2010	LB-6	Atlantic silverside	12
3/2/2010	LB-6	Blueback herring	1
3/2/2010	LB-6	Grubby	1
3/2/2010	LB-6	Rock gunnel	1
3/2/2010	LB-6	Spotted hake	5
3/2/2010	LB-6	Winter flounder	5
3/2/2010	LB-6	Blue crab	1
3/2/2010	LB-5	American sandlance	1
3/2/2010	LB-5	Winter flounder	1
3/4/2010	PJ-2	Atlantic silverside	3
3/4/2010	PJ-2	Blueback herring	1
3/4/2010	PJ-2	Blue crab	4
3/4/2010	SB-5	Alewife	2
3/4/2010	SB-5	Atlantic tomcod	1
3/4/2010	SB-5	Blueback herring	1
3/4/2010	SB-5	Grubby	3

Appendix A. Bottom Trawl CPUE (number per 10 minute trawl) by date and station sampled during the 2010 Aquatic Biological Survey

Date	Station	Common Name	CPUE
3/4/2010	SB-5	Red hake	20
3/4/2010	SB-5	Smallmouth flounder	1
3/4/2010	SB-5	Windowpane	2
3/4/2010	SB-5	Winter flounder	6
3/4/2010	SB-7	Alewife	1
3/4/2010	SB-7	American shad	1
3/4/2010	SB-7	Blueback herring	3
3/4/2010	SB-7	Red hake	7
3/4/2010	SB-7	Summer flounder	1
3/4/2010	SB-7	Winter flounder	2
3/4/2010	SB-4	Alewife	2
3/4/2010	SB-4	American shad	2
3/4/2010	SB-4	Blueback herring	1
3/4/2010	SB-4	Red hake	13
3/4/2010	SB-4	Summer flounder	1
3/4/2010	SB-4	Windowpane	1
3/4/2010	SB-4	Winter flounder	5
3/4/2010	SB-3	Northern pipefish	1
3/4/2010	SB-3	Windowpane	1
3/4/2010	SB-3	Winter flounder	5
3/4/2010	SB-3	Blue crab	1
3/4/2010	PJ-1	Atlantic silverside	5
3/4/2010	PJ-1	Cunner	1
3/4/2010	PJ-1	Northern pipefish	1
3/4/2010	PJ-1	Winter flounder	1
3/4/2010	PJ-1	Blue crab	1
3/5/2010	LB-8	American sandlance	1
3/5/2010	LB-8	Atlantic herring	1
3/5/2010	LB-8	Smallmouth flounder	1
3/5/2010	LB-7	Atlantic herring	1
3/5/2010	LB-7	Atlantic silverside	4
3/5/2010	LB-7	Blueback herring	4
3/5/2010	LB-7	Windowpane	1
3/5/2010	LB-7	Winter flounder	1
3/5/2010	LB-7	Blue crab	1
3/5/2010	LB-3	Atlantic silverside	1
3/5/2010	LB-3	Red hake	2
3/5/2010	LB-3	Windowpane	1
3/5/2010	LB-3	Winter flounder	1
3/5/2010	LB-9	Grubby	1
3/5/2010	LB-9	Rock gunnel	1
3/5/2010	SB-6	Grubby	1
3/5/2010	SB-6	Red hake	12
3/5/2010	SB-6	Smallmouth flounder	4

Appendix A. Bottom Trawl CPUE (number per 10 minute trawl) by date and station sampled during the 2010 Aquatic Biological Survey

Date	Station	Common Name	CPUE
3/5/2010	SB-6	Windowpane	5
3/8/2010	LB-10	American sandlance	1
3/8/2010	LB-10	Atlantic silverside	10
3/8/2010	LB-10	Northern pipefish	1
3/8/2010	LB-14	Alewife	1
3/8/2010	LB-14	Blueback herring	7
3/8/2010	LB-14	Grubby	6
3/8/2010	LB-14	Red hake	3
3/8/2010	LB-14	Windowpane	1
3/8/2010	LB-14	Winter flounder	15
3/8/2010	LB-1	Atlantic silverside	1
3/8/2010	LBD-15	Winter flounder	2
3/16/2010	PJ-2	American shad	2
3/16/2010	PJ-2	Atlantic herring	1
3/16/2010	PJ-2	Atlantic silverside	1
3/16/2010	PJ-2	Striped bass	1
3/16/2010	PJ-2	White perch	1
3/16/2010	PJ-2	Winter flounder	1
3/16/2010	SB-5	Alewife	3
3/16/2010	SB-5	Atlantic tomcod	1
3/16/2010	SB-5	Blueback herring	4
3/16/2010	SB-5	Red hake	38
3/16/2010	SB-5	Smallmouth flounder	2
3/16/2010	SB-5	Spotted hake	10
3/16/2010	SB-5	Striped bass	2
3/16/2010	SB-5	Summer flounder	1
3/16/2010	SB-5	Windowpane	3
3/16/2010	SB-5	Winter flounder	3
3/16/2010	SB-7	Alewife	2
3/16/2010	SB-7	Blueback herring	3
3/16/2010	SB-7	Northern pipefish	1
3/16/2010	SB-7	Red hake	7
3/16/2010	SB-7	Spotted hake	6
3/16/2010	SB-7	Striped bass	1
3/16/2010	SB-7	Winter flounder	12
3/16/2010	SB-6	Alewife	2
3/16/2010	SB-6	American shad	4
3/16/2010	SB-6	Grubby	2
3/16/2010	SB-6	Little skate	3
3/16/2010	SB-6	Naked goby	1
3/16/2010	SB-6	Red hake	71
3/16/2010	SB-6	Smallmouth flounder	28
3/16/2010	SB-6	Spotted hake	22
3/16/2010	SB-6	Summer flounder	1

Appendix A. Bottom Trawl CPUE (number per 10 minute trawl) by date and station sampled during the 2010 Aquatic Biological Survey

Date	Station	Common Name	CPUE
3/16/2010	SB-6	Windowpane	22
3/16/2010	SB-6	Winter flounder	2
3/16/2010	SB-6	Clearnose skate	1
3/16/2010	SB-4	American shad	1
3/16/2010	SB-4	Grubby	1
3/16/2010	SB-4	Little skate	1
3/16/2010	SB-4	Red hake	12
3/16/2010	SB-4	Spotted hake	10
3/16/2010	SB-4	Striped bass	2
3/16/2010	SB-4	Winter flounder	11
3/16/2010	SB-4	Blue crab	1
3/16/2010	SB-3	Cunner	1
3/16/2010	SB-3	Grubby	2
3/16/2010	SB-3	Red hake	2
3/16/2010	SB-3	Smallmouth flounder	2
3/16/2010	SB-3	White perch	1
3/16/2010	SB-3	Windowpane	1
3/16/2010	SB-3	Winter flounder	3
3/17/2010	LB-8	Grubby	1
3/17/2010	LB-8	Smallmouth flounder	1
3/17/2010	LB-3	Atlantic herring	1
3/17/2010	LB-3	Grubby	2
3/17/2010	LB-3	Little skate	1
3/17/2010	LB-3	Northern pipefish	1
3/17/2010	LB-3	Red hake	4
3/17/2010	LB-3	Smallmouth flounder	4
3/17/2010	LB-3	Spotted hake	6
3/17/2010	LB-3	Striped cuskeel	1
3/17/2010	LB-3	Windowpane	2
3/17/2010	LB-3	Winter flounder	7
3/17/2010	LB-3	American lobster	1
3/17/2010	LB-5	Grubby	1
3/17/2010	LB-5	Little skate	1
3/17/2010	LB-5	Northern pipefish	1
3/17/2010	LB-5	Red hake	3
3/17/2010	LB-5	Smallmouth flounder	2
3/17/2010	LB-5	Spotted hake	1
3/17/2010	LB-5	Windowpane	8
3/17/2010	LB-5	Winter flounder	5
3/17/2010	LB-6	Smallmouth flounder	1
3/17/2010	LB-6	Spotted hake	10
3/17/2010	LB-6	Windowpane	4
3/17/2010	LB-6	Winter flounder	1
3/17/2010	LB-6	Blue crab	1

Appendix A. Bottom Trawl CPUE (number per 10 minute trawl) by date and station sampled during the 2010 Aquatic Biological Survey

Date	Station	Common Name	CPUE
3/17/2010	PJ-1	Grubby	1
3/17/2010	PJ-1	Striped bass	1
3/17/2010	PJ-1	Tautog	1
3/17/2010	PJ-1	Winter flounder	5
3/17/2010	PJ-1	Blue crab	2
3/18/2010	LB-12	Alewife	1
3/18/2010	LB-12	Little skate	3
3/18/2010	LB-12	Red hake	4
3/18/2010	LB-12	Smallmouth flounder	2
3/18/2010	LB-12	Spotted hake	6
3/18/2010	LB-12	Windowpane	3
3/18/2010	LB-4	Northern pipefish	1
3/18/2010	LB-4	Spotted hake	4
3/18/2010	LB-4	Tautog	1
3/18/2010	LB-13	Windowpane	1
3/18/2010	LBD-17	Conger eel	1
3/18/2010	LBD-17	Little skate	7
3/18/2010	LBD-17	Northern pipefish	1
3/18/2010	LBD-17	Red hake	40
3/18/2010	LBD-17	Smallmouth flounder	1
3/18/2010	LBD-17	Spotted hake	12
3/18/2010	LBD-17	Windowpane	3
3/18/2010	LBD-17	Winter flounder	1
3/18/2010	LBD-17	Winter skate	1
3/18/2010	LB-16	American sandlance	1
3/18/2010	LB-16	Northern pipefish	1
3/18/2010	LB-16	Windowpane	2
3/22/2010	LB-10	Alewife	1
3/22/2010	LB-10	Atlantic herring	1
3/22/2010	LB-10	Atlantic silverside	3
3/22/2010	LB-10	Little skate	1
3/22/2010	LB-10	Spotted hake	10
3/22/2010	LB-10	Summer flounder	1
3/22/2010	LB-10	Blue crab	1
3/22/2010	LB-1	Smallmouth flounder	2
3/22/2010	LB-1	Spotted hake	1
3/22/2010	LB-1	Windowpane	1
3/22/2010	LBD-15	Alewife	541
3/22/2010	LBD-15	American shad	30
3/22/2010	LBD-15	Atlantic herring	1
3/22/2010	LBD-15	Red hake	1
3/22/2010	LBD-15	Spotted hake	8
3/22/2010	LBD-15	Winter flounder	8
3/22/2010	LB-2	Northern pipefish	2

Appendix A. Bottom Trawl CPUE (number per 10 minute trawl) by date and station sampled during the 2010 Aquatic Biological Survey

Date	Station	Common Name	CPUE
3/22/2010	LB-2	Spotted hake	2
3/22/2010	LB-2	Winter flounder	1
3/22/2010	LB-9	Grubby	1
3/22/2010	LB-9	Rock gunnel	1
3/22/2010	LB-14	Red hake	1
3/22/2010	LB-14	Spotted hake	7
3/25/2010	NB-4	Striped bass	1
3/25/2010	NB-4	Blue crab	3
3/25/2010	NB-8	Grubby	2
3/25/2010	NB-8	Northern pipefish	4
3/25/2010	NB-8	Red hake	18
3/25/2010	NB-8	Spotted hake	32
3/25/2010	NB-8	Striped bass	30
3/25/2010	NB-8	Summer flounder	2
3/25/2010	NB-8	White perch	458
3/25/2010	NB-8	Winter flounder	8
3/25/2010	NB-8	Blue crab	6
3/25/2010	AK-2	Northern pipefish	1
3/25/2010	AK-2	Red hake	10
3/25/2010	AK-2	Spotted hake	14
3/25/2010	AK-2	Striped bass	9
3/25/2010	AK-2	White perch	4
3/25/2010	AK-2	Winter flounder	6
3/25/2010	AK-2	Blue crab	3
4/5/2010	LB-10	Alewife	10
4/5/2010	LB-10	American shad	3
4/5/2010	LB-10	Little skate	2
4/5/2010	LB-10	Red hake	3
4/5/2010	LB-10	Spotted hake	3
4/5/2010	LB-10	Striped bass	17
4/5/2010	LB-10	Winter flounder	6
4/5/2010	LB-1	Atlantic herring	2
4/5/2010	LB-1	Blueback herring	2
4/5/2010	LB-1	Little skate	1
4/5/2010	LB-1	Winter flounder	1
4/5/2010	LBD-15	Alewife	135
4/5/2010	LBD-15	American shad	3
4/5/2010	LBD-15	Atlantic herring	2
4/5/2010	LBD-15	Little skate	3
4/5/2010	LBD-15	Red hake	8
4/5/2010	LBD-15	Spotted hake	3
4/5/2010	LBD-15	Winter flounder	5
4/5/2010	LBD-15	American lobster	2
4/5/2010	LB-14	Alewife	2

Appendix A. Bottom Trawl CPUE (number per 10 minute trawl) by date and station sampled during the 2010 Aquatic Biological Survey

Date	Station	Common Name	CPUE
4/5/2010	LB-14	Red hake	1
4/5/2010	LB-14	Spotted hake	5
4/5/2010	LB-9	Striped bass	1
4/5/2010	LB-9	Winter flounder	1
4/5/2010	PJ-2	American shad	3
4/5/2010	PJ-2	Blueback herring	1
4/5/2010	PJ-2	White perch	6
4/5/2010	PJ-2	Winter flounder	1
4/6/2010	LB-16	Winter flounder	2
4/6/2010	LBD-17	Atlantic silverside	1
4/6/2010	LBD-17	Bay anchovy	1
4/6/2010	LBD-17	Spotted hake	1
4/6/2010	LB-13	Winter skate	1
4/6/2010	LB-4	Alewife	33
4/6/2010	LB-4	Atlantic herring	1
4/6/2010	LB-4	Red hake	1
4/6/2010	LB-4	Spotted hake	8
4/6/2010	LB-4	Striped bass	3
4/6/2010	LB-4	Summer flounder	1
4/6/2010	LB-4	Windowpane	1
4/6/2010	LB-12	Alewife	6
4/6/2010	LB-12	Atlantic herring	1
4/6/2010	LB-12	Blueback herring	1
4/6/2010	LB-12	Little skate	3
4/6/2010	LB-12	Spotted hake	11
4/6/2010	LB-12	Windowpane	3
4/6/2010	LB-12	Winter flounder	3
4/6/2010	LB-7	Spotted hake	5
4/6/2010	LB-7	American lobster	1
4/7/2010	AK-3	Alewife	1
4/7/2010	AK-3	Grubby	6
4/7/2010	AK-3	Red hake	59
4/7/2010	AK-3	Spotted hake	117
4/7/2010	AK-3	Striped bass	1
4/7/2010	AK-3	Summer flounder	4
4/7/2010	AK-3	White perch	30
4/7/2010	AK-3	Windowpane	1
4/7/2010	AK-3	Winter flounder	23
4/7/2010	AK-3	Blue crab	3
4/7/2010	AK-2	Red hake	17
4/7/2010	AK-2	Spotted hake	205
4/7/2010	AK-2	Striped bass	1
4/7/2010	AK-2	Summer flounder	1
4/7/2010	AK-2	White perch	9

Appendix A. Bottom Trawl CPUE (number per 10 minute trawl) by date and station sampled during the 2010 Aquatic Biological Survey

Date	Station	Common Name	CPUE
4/7/2010	AK-2	Winter flounder	13
4/7/2010	NB-6	Red hake	40
4/7/2010	NB-6	Spotted hake	94
4/7/2010	NB-6	Summer flounder	2
4/7/2010	NB-6	Blue crab	2
4/7/2010	NB-8	Alewife	4
4/7/2010	NB-8	American eel	1
4/7/2010	NB-8	Atlantic tomcod	1
4/7/2010	NB-8	Fourspine stickleback	1
4/7/2010	NB-8	Red hake	58
4/7/2010	NB-8	Spotted hake	118
4/7/2010	NB-8	Striped bass	7
4/7/2010	NB-8	Summer flounder	2
4/7/2010	NB-8	White perch	22
4/7/2010	NB-8	Windowpane	1
4/7/2010	NB-8	Winter flounder	4
4/7/2010	NB-8	Blue crab	3
3/25/2010	NB-6	Northern pipefish	2
3/25/2010	NB-6	Red hake	88
3/25/2010	NB-6	Spotted hake	4
3/25/2010	NB-6	Striped bass	4
3/25/2010	NB-6	Striped cuskeel	2
3/25/2010	NB-6	Windowpane	8
3/25/2010	NB-6	Blue crab	4
3/25/2010	AK-3	American eel	1
3/25/2010	AK-3	Red hake	59
3/25/2010	AK-3	Striped bass	3
3/25/2010	AK-3	White perch	3
3/25/2010	AK-3	Winter flounder	46
4/7/2010	NB-4	American shad	1
4/7/2010	NB-4	Atlantic menhaden	15
4/7/2010	NB-4	White perch	1
4/7/2010	NB-4	Winter flounder	1
4/7/2010	NB-4	Blue crab	3
4/7/2010	NB-7	Striped bass	3
4/7/2010	NB-7	White perch	1
4/7/2010	NB-7	Blue crab	1
4/8/2010	SB-6	Grubby	1
4/8/2010	SB-6	Red hake	7
4/8/2010	SB-6	Spotted hake	45
4/8/2010	SB-6	Windowpane	5
4/8/2010	SB-6	Winter flounder	2
4/8/2010	SB-6	American lobster	1
4/8/2010	SB-4	Alewife	2

Appendix A. Bottom Trawl CPUE (number per 10 minute trawl) by date and station sampled during the 2010 Aquatic Biological Survey

Date	Station	Common Name	CPUE
4/8/2010	SB-4	Red hake	1
4/8/2010	SB-4	Spotted hake	107
4/8/2010	SB-4	Striped bass	1
4/8/2010	SB-4	Windowpane	1
4/8/2010	SB-4	Winter flounder	4
4/8/2010	SB-3	Grubby	1
4/8/2010	SB-3	Winter flounder	2
4/8/2010	SB-3	Blue crab	2
4/8/2010	PJ-1	Cunner	1
4/8/2010	PJ-1	Grubby	2
4/8/2010	PJ-1	Northern pipefish	1
4/8/2010	PJ-1	Spotted hake	1
4/8/2010	PJ-1	Striped bass	2
4/8/2010	PJ-1	White perch	1
4/8/2010	PJ-1	Winter flounder	2
4/8/2010	PJ-1	Blue crab	1
4/8/2010	SB-7	Northern pipefish	2
4/8/2010	SB-7	Red hake	17
4/8/2010	SB-7	Spotted hake	110
4/8/2010	SB-7	Tautog	2
4/8/2010	SB-7	White perch	1
4/8/2010	SB-7	Winter flounder	8
4/8/2010	SB-5	Little skate	2
4/8/2010	SB-5	Northern pipefish	1
4/8/2010	SB-5	Red hake	6
4/8/2010	SB-5	Spotted hake	5
4/8/2010	SB-5	White perch	1
4/8/2010	SB-5	Winter flounder	1
4/9/2010	LB-8	Alewife	1
4/9/2010	LB-8	Spotted hake	1
4/9/2010	LB-3	Blueback herring	2
4/9/2010	LB-3	Spotted hake	11
4/9/2010	LB-3	Windowpane	3
4/9/2010	LB-3	Winter flounder	2
4/9/2010	LB-5	Little skate	3
4/9/2010	LB-5	Spotted hake	73
4/9/2010	LB-5	Summer flounder	1
4/9/2010	LB-5	Windowpane	5
4/9/2010	LB-5	Winter flounder	3
4/9/2010	LB-6	Alewife	8
4/9/2010	LB-6	American shad	2
4/9/2010	LB-6	Red hake	4
4/9/2010	LB-6	Spotted hake	44
4/9/2010	LB-6	Winter flounder	13

Appendix A. Bottom Trawl CPUE (number per 10 minute trawl) by date and station sampled during the 2010 Aquatic Biological Survey

Date	Station	Common Name	CPUE
4/9/2010	LB-2	Pollock	1
4/9/2010	LB-2	Spotted hake	13
4/19/2010	LB-8	American sandlance	3
4/19/2010	LB-8	Spotted hake	2
4/19/2010	LB-8	Windowpane	1
4/19/2010	LB-8	Winter flounder	2
4/19/2010	LB-7	Alewife	2
4/19/2010	LB-7	American shad	2
4/19/2010	LB-7	Bay anchovy	2
4/19/2010	LB-7	Blueback herring	1
4/19/2010	LB-7	Red hake	1
4/19/2010	LB-7	Spotted hake	10
4/19/2010	LB-7	Winter flounder	1
4/19/2010	LB-3	Little skate	1
4/19/2010	LB-3	Smallmouth flounder	1
4/19/2010	LB-3	Spotted hake	1
4/19/2010	LB-3	Winter flounder	2
4/19/2010	LB-3	American lobster	1
4/19/2010	LB-9	Little skate	1
4/19/2010	LB-9	Scup	1
4/19/2010	LB-9	Tautog	15
4/19/2010	LB-14	Red hake	5
4/19/2010	LB-14	Spotted hake	1
4/19/2010	LB-14	Windowpane	1
4/19/2010	LB-14	Winter flounder	19
4/19/2010	PJ-2	American shad	3
4/19/2010	PJ-2	Atlantic herring	1
4/19/2010	PJ-2	Blueback herring	1
4/19/2010	PJ-2	Spotted hake	3
4/19/2010	PJ-2	Striped bass	2
4/19/2010	PJ-2	White perch	4
4/19/2010	PJ-2	Blue crab	1
4/20/2010	LB-16	American sandlance	21
4/20/2010	LB-16	Bay anchovy	1
4/20/2010	LB-16	Smallmouth flounder	1
4/20/2010	LB-16	Blue crab	2
4/20/2010	LBD-17	Smallmouth flounder	1
4/20/2010	LB-1	Windowpane	4
4/20/2010	LB-1	Winter flounder	2
4/20/2010	LBD-15	Alewife	17
4/20/2010	LBD-15	American shad	3
4/20/2010	LBD-15	Spotted hake	8
4/20/2010	LBD-15	Summer flounder	1
4/20/2010	LBD-15	Winter flounder	21

Appendix A. Bottom Trawl CPUE (number per 10 minute trawl) by date and station sampled during the 2010 Aquatic Biological Survey

Date	Station	Common Name	CPUE
4/20/2010	LB-2	Winter flounder	6
4/20/2010	LB-10	Alewife	1
4/20/2010	LB-10	American shad	1
4/20/2010	LB-10	Atlantic herring	1
4/20/2010	LB-10	Bay anchovy	5
4/20/2010	LB-10	Smallmouth flounder	2
4/20/2010	LB-10	Spotted hake	9
4/20/2010	LB-10	Summer flounder	1
4/20/2010	LB-10	Windowpane	2
4/20/2010	LB-10	Winter flounder	25
4/21/2010	AK-3	Northern pipefish	3
4/21/2010	AK-3	Red hake	5
4/21/2010	AK-3	Spotted hake	135
4/21/2010	AK-3	White perch	7
4/21/2010	AK-3	Winter flounder	7
4/21/2010	AK-3	Blue crab	17
4/21/2010	AK-2	Atlantic tomcod	1
4/21/2010	AK-2	Red hake	1
4/21/2010	AK-2	Spotted hake	27
4/21/2010	AK-2	Summer flounder	3
4/21/2010	AK-2	White perch	1
4/21/2010	AK-2	Winter flounder	5
4/21/2010	AK-2	Blue crab	9
4/21/2010	NB-6	Red hake	2
4/21/2010	NB-6	Spotted hake	8
4/21/2010	NB-6	Windowpane	2
4/21/2010	NB-6	Blue crab	86
4/21/2010	NB-8	American eel	2
4/21/2010	NB-8	Grubby	1
4/21/2010	NB-8	Northern pipefish	2
4/21/2010	NB-8	Red hake	96
4/21/2010	NB-8	Rock gunnel	1
4/21/2010	NB-8	Spotted hake	484
4/21/2010	NB-8	Striped cuskeel	1
4/21/2010	NB-8	Summer flounder	2
4/21/2010	NB-8	Blue crab	33
4/21/2010	NB-4	American shad	9
4/21/2010	NB-4	Blueback herring	13
4/21/2010	NB-4	Blue crab	4
4/21/2010	NB-7	Striped bass	3
4/21/2010	NB-7	White perch	1
4/21/2010	NB-7	Windowpane	1
4/21/2010	NB-7	Winter flounder	1
4/21/2010	NB-7	Blue crab	1

Appendix A. Bottom Trawl CPUE (number per 10 minute trawl) by date and station sampled during the 2010 Aquatic Biological Survey

Date	Station	Common Name	CPUE
4/22/2010	LB-5	Spotted hake	5
4/22/2010	LB-5	Windowpane	3
4/22/2010	LB-5	Winter flounder	1
4/22/2010	LB-5	Winter skate	1
4/22/2010	LB-6	Red hake	13
4/22/2010	LB-6	Smallmouth flounder	1
4/22/2010	LB-6	Spotted hake	115
4/22/2010	LB-6	Windowpane	1
4/22/2010	LB-6	Winter flounder	16
4/22/2010	LB-6	Blue crab	2
4/22/2010	LB-12	Little skate	1
4/22/2010	LB-12	Red hake	1
4/22/2010	LB-12	Spotted hake	1
4/22/2010	LB-12	Summer flounder	1
4/22/2010	LB-12	Winter flounder	6
4/22/2010	LB-4	Spotted hake	1
4/22/2010	LB-13	Smallmouth flounder	1
4/22/2010	LB-13	Spotted hake	1
4/23/2010	SB-6	Alewife	25
4/23/2010	SB-6	Atlantic menhaden	7
4/23/2010	SB-6	Blueback herring	1
4/23/2010	SB-6	Little skate	1
4/23/2010	SB-6	Northern pipefish	1
4/23/2010	SB-6	Red hake	5
4/23/2010	SB-6	Spotted hake	35
4/23/2010	SB-6	Summer flounder	4
4/23/2010	SB-6	Windowpane	4
4/23/2010	SB-6	Winter flounder	2
4/23/2010	SB-4	Little skate	1
4/23/2010	SB-4	Red hake	40
4/23/2010	SB-4	Spotted hake	115
4/23/2010	SB-4	Summer flounder	3
4/23/2010	SB-4	Winter flounder	17
4/23/2010	SB-4	Winter skate	1
4/23/2010	SB-4	Blue crab	1
4/23/2010	SB-3	Bay anchovy	15
4/23/2010	SB-3	Grubby	1
4/23/2010	SB-3	Little skate	6
4/23/2010	SB-3	Spotted hake	3
4/23/2010	SB-3	Striped bass	1
4/23/2010	SB-3	Windowpane	1
4/23/2010	SB-3	Winter flounder	3
4/23/2010	SB-3	Blue crab	1
4/23/2010	SB-5	Grubby	1

Appendix A. Bottom Trawl CPUE (number per 10 minute trawl) by date and station sampled during the 2010 Aquatic Biological Survey

Date	Station	Common Name	CPUE
4/23/2010	SB-5	Little skate	6
4/23/2010	SB-5	Northern searobin	1
4/23/2010	SB-5	Red hake	425
4/23/2010	SB-5	Spotted hake	455
4/23/2010	SB-5	Summer flounder	6
4/23/2010	SB-5	Windowpane	2
4/23/2010	SB-5	Winter flounder	24
4/23/2010	SB-5	Blue crab	2
4/23/2010	PJ-1	Alewife	2
4/23/2010	PJ-1	American shad	2
4/23/2010	PJ-1	Bay anchovy	10
4/23/2010	PJ-1	Grubby	6
4/23/2010	PJ-1	Little skate	2
4/23/2010	PJ-1	Northern pipefish	2
4/23/2010	PJ-1	Red hake	4
4/23/2010	PJ-1	Windowpane	2
4/23/2010	PJ-1	Winter flounder	14
5/3/2010	AK-3	Grubby	2
5/3/2010	AK-3	Hogchocker	2
5/3/2010	AK-3	Red hake	15
5/3/2010	AK-3	Spotted hake	62
5/3/2010	AK-3	Summer flounder	5
5/3/2010	AK-3	White perch	2
5/3/2010	AK-3	Winter flounder	10
5/3/2010	AK-3	Blue crab	13
5/3/2010	AK-2	Grubby	2
5/3/2010	AK-2	Oyster toadfish	2
5/3/2010	AK-2	Red hake	32
5/3/2010	AK-2	Spotted hake	48
5/3/2010	AK-2	Winter flounder	4
5/3/2010	AK-2	Blue crab	94
5/3/2010	NB-4	Atlantic herring	5
5/3/2010	NB-4	Bay anchovy	1
5/3/2010	NB-4	Blue crab	3
5/3/2010	NB-8	American eel	1
5/3/2010	NB-8	Atlantic herring	1
5/3/2010	NB-8	Atlantic tomcod	1
5/3/2010	NB-8	Red hake	14
5/3/2010	NB-8	Spotted hake	23
5/3/2010	NB-8	Summer flounder	2
5/3/2010	NB-8	White perch	1
5/3/2010	NB-8	Windowpane	1
5/3/2010	NB-8	Blue crab	49
5/3/2010	NB-7	Atlantic herring	1

Appendix A. Bottom Trawl CPUE (number per 10 minute trawl) by date and station sampled during the 2010 Aquatic Biological Survey

Date	Station	Common Name	CPUE
5/3/2010	NB-7	Summer flounder	1
5/3/2010	NB-7	Blue crab	33
5/4/2010	LB-8	Bay anchovy	1
5/4/2010	LB-8	Pollock	2
5/4/2010	LB-8	Winter flounder	1
5/4/2010	LB-7	Bay anchovy	41
5/4/2010	LB-7	Little skate	1
5/4/2010	LB-7	Northern searobin	1
5/4/2010	LB-7	Pollock	1
5/4/2010	LB-7	Red hake	1
5/4/2010	LB-7	Spotted hake	3
5/4/2010	LB-3	Little skate	1
5/4/2010	LB-5	Bay anchovy	3
5/4/2010	LB-5	Butterfish	7
5/4/2010	LB-6	Atlantic menhaden	1
5/4/2010	LB-6	Red hake	12
5/4/2010	LB-6	Spotted hake	8
5/4/2010	LB-6	Striped bass	1
5/4/2010	LB-6	Winter flounder	2
5/4/2010	LB-9	Butterfish	1
5/4/2010	LB-9	Little skate	1
5/5/2010	LB-16	Atlantic tomcod	1
5/5/2010	LB-16	Bay anchovy	8
5/5/2010	LB-16	Butterfish	98
5/5/2010	LBD-17	Little skate	1
5/5/2010	LB-13	Bay anchovy	3
5/5/2010	LB-13	Summer flounder	1
5/5/2010	LB-4	Bay anchovy	3
5/5/2010	LB-4	Red hake	5
5/5/2010	LB-4	Spotted hake	42
5/5/2010	LB-4	Striped searobin	1
5/5/2010	LB-4	Winter flounder	1
5/5/2010	LB-12	Bay anchovy	26
5/5/2010	LB-12	Butterfish	7
5/5/2010	PJ-2	Alewife	2
5/5/2010	PJ-2	Atlantic herring	144
5/5/2010	PJ-2	Atlantic tomcod	1
5/5/2010	PJ-2	Bay anchovy	111
5/5/2010	PJ-2	Blueback herring	1
5/6/2010	SB-3	Atlantic tomcod	1
5/6/2010	SB-3	Bay anchovy	196
5/6/2010	SB-3	Tautog	1
5/6/2010	SB-4	Alewife	3
5/6/2010	SB-4	Red hake	1

Appendix A. Bottom Trawl CPUE (number per 10 minute trawl) by date and station sampled during the 2010 Aquatic Biological Survey

Date	Station	Common Name	CPUE
5/6/2010	SB-4	Spotted hake	4
5/6/2010	SB-4	Striped searobin	3
5/6/2010	SB-4	Windowpane	1
5/6/2010	SB-4	Winter flounder	1
5/6/2010	SB-6	Little skate	1
5/6/2010	SB-6	Red hake	6
5/6/2010	SB-6	Spotted hake	24
5/6/2010	SB-6	Summer flounder	1
5/6/2010	SB-6	Windowpane	6
5/6/2010	SB-5	Atlantic tomcod	9
5/6/2010	SB-5	Red hake	22
5/6/2010	SB-5	Spotted hake	222
5/6/2010	SB-5	Striped searobin	2
5/6/2010	SB-5	Summer flounder	3
5/6/2010	SB-5	Windowpane	1
5/6/2010	SB-5	Winter flounder	3
5/6/2010	SB-5	Winter skate	1
5/6/2010	PJ-1	Atlantic herring	2
5/6/2010	PJ-1	Bay anchovy	88
5/6/2010	PJ-1	Northern searobin	2
5/6/2010	PJ-1	Winter flounder	10
5/6/2010	PJ-1	Blue crab	2
5/7/2010	LB-14	Red hake	3
5/7/2010	LB-14	Spotted hake	1
5/7/2010	LB-14	Winter flounder	5
5/7/2010	LB-2	Red hake	1
5/7/2010	LB-2	Spotted hake	1
5/7/2010	LBD-15	Little skate	1
5/7/2010	LBD-15	Red hake	4
5/7/2010	LBD-15	Windowpane	1
5/7/2010	LBD-15	Winter flounder	25
5/7/2010	LB-10	Little skate	2
5/7/2010	LB-10	Spotted hake	2

Appendix B

Ichthyoplankton (epibenthic sled) life stage densities by date and station collected during the 2010 Aquatic Biological Survey.

Appendix B. Ichthyoplankton (epibenthic sled) life stage densities (Number per 1,000 m^3) by date and station collected during the 20 Aquatic Biological Survey. ES1 to ES5 are winter flounder egg stages 1-5, WFNVE are winter flounder non-viable eggs, ST1 to ST4 are winter flounder larval life stages 1-4, YS is yolk-sac larvae, PYS is post yolk-sac larvae, JUV is juveniles, and UID is unidentified larval lifestage.

Sample Date	Station	Common Name	Life Stage	Density
1/4/2010	PJ-1	American sandlance	YS	60.55
1/4/2010	PJ-2	American sandlance	YS	16.74
1/4/2010	SB-5	American sandlance	YS	83.24
1/4/2010	SB-7	American sandlance	YS	142.45
1/4/2010	SB-6	American sandlance	YS	340.95
1/4/2010	SB-4	American sandlance	YS	125.92
1/4/2010	SB-3	American sandlance	YS	428.29
1/4/2010	PJ-1	American sandlance	PYS	77.07
1/4/2010	PJ-2	American sandlance	PYS	5.58
1/4/2010	SB-5	American sandlance	PYS	376.26
1/4/2010	SB-7	American sandlance	PYS	30.52
1/4/2010	SB-6	American sandlance	PYS	251.23
1/4/2010	SB-4	American sandlance	PYS	246.37
1/4/2010	SB-3	American sandlance	PYS	434.99
1/4/2010	PJ-2	Atlantic croaker	PYS	278.96
1/4/2010	SB-5	Atlantic croaker	PYS	3.33
1/4/2010	SB-7	Atlantic croaker	PYS	25.44
1/4/2010	SB-6	Atlantic croaker	PYS	29.91
1/4/2010	SB-4	Atlantic croaker	PYS	27.37
1/4/2010	PJ-1	Atlantic croaker	JUV	181.66
1/4/2010	PJ-2	Atlantic croaker	JUV	106.00
1/4/2010	SB-5	Atlantic croaker	JUV	6.66
1/4/2010	SB-7	Atlantic croaker	JUV	35.61
1/4/2010	SB-6	Atlantic croaker	JUV	11.96
1/4/2010	SB-4	Atlantic croaker	JUV	54.75
1/4/2010	PJ-1	Atlantic menhaden	PYS	5.50
1/4/2010	SB-6	Atlantic menhaden	PYS	5.98
1/4/2010	PJ-2	Bay anchovy	PYS	5.58
1/4/2010	PJ-1	Bay anchovy	JUV	11.01
1/4/2010	SB-7	Bay anchovy	JUV	5.09
1/4/2010	SB-4	Bay anchovy	JUV	10.95
1/4/2010	SB-6	Summer flounder	PYS	5.98
1/4/2010	PJ-1	Summer flounder	JUV	11.01
1/4/2010	SB-7	Summer flounder	JUV	5.09
1/5/2010	LB-8	American sandlance	YS	202.47
1/5/2010	LB-7	American sandlance	YS	178.82
1/5/2010	LB-3	American sandlance	YS	96.88
1/5/2010	LB-9	American sandlance	YS	367.07
1/5/2010	LB-14	American sandlance	YS	59.12
1/5/2010	LB-10	American sandlance	YS	956.14
1/5/2010	LB-8	American sandlance	PYS	165.66

Appendix B. Ichthyoplankton (epibenthic sled) life stage densities (Number per 1,000 m^3) by date and station collected during the 20 Aquatic Biological Survey. ES1 to ES5 are winter flounder egg stages 1-5, WFNVE are winter flounder non-viable eggs, ST1 to ST4 are winter flounder larval life stages 1-4, YS is yolk-sac larvae, PYS is post yolk-sac larvae, JUV is juveniles, and UID is unidentified larval lifestage.

Sample Date	Station	Common Name	Life Stage	Density
1/5/2010	LB-7	American sandlance	PYS	473.64
1/5/2010	LB-3	American sandlance	PYS	217.98
1/5/2010	LB-9	American sandlance	PYS	771.94
1/5/2010	LB-14	American sandlance	PYS	388.51
1/5/2010	LB-10	American sandlance	PYS	1,746.55
1/5/2010	LB-8	Atlantic croaker	PYS	6.14
1/5/2010	LB-3	Atlantic croaker	PYS	6.05
1/5/2010	LB-7	Atlantic croaker	JUV	4.83
1/6/2010	NB-8	American sandlance	YS	5.66
1/6/2010	NB-4	American sandlance	YS	30.29
1/6/2010	NB-7	American sandlance	YS	17.05
1/6/2010	NB-8	American sandlance	PYS	33.95
1/6/2010	NB-4	American sandlance	PYS	78.76
1/6/2010	NB-7	American sandlance	PYS	90.94
1/6/2010	NB-6	American sandlance	PYS	7.77
1/6/2010	AK-2	Atlantic croaker	PYS	30.86
1/6/2010	AK-3	Atlantic croaker	PYS	77.66
1/6/2010	NB-8	Atlantic croaker	PYS	45.27
1/6/2010	NB-4	Atlantic croaker	PYS	6.06
1/6/2010	NB-7	Atlantic croaker	PYS	28.42
1/6/2010	NB-6	Atlantic croaker	PYS	31.09
1/6/2010	AK-3	Atlantic croaker	JUV	41.82
1/6/2010	NB-8	Atlantic croaker	JUV	33.95
1/6/2010	NB-7	Atlantic croaker	JUV	28.42
1/6/2010	NB-6	Atlantic croaker	JUV	46.64
1/6/2010	AK-2	Bay anchovy	JUV	15.43
1/6/2010	AK-3	Bay anchovy	JUV	5.97
1/6/2010	NB-7	Bay anchovy	JUV	5.68
1/6/2010	AK-2	Summer flounder	PYS	7.71
1/6/2010	NB-7	Summer flounder	PYS	5.68
1/11/2010	LBD-17	American sandlance	YS	9.23
1/11/2010	LB-13	American sandlance	YS	5.20
1/11/2010	LB-12	American sandlance	YS	4.90
1/11/2010	LB-16	American sandlance	PYS	6.39
1/11/2010	LBD-17	American sandlance	PYS	55.37
1/11/2010	LB-13	American sandlance	PYS	25.98
1/11/2010	LB-4	American sandlance	PYS	23.61
1/11/2010	LB-12	American sandlance	PYS	78.47
1/11/2010	LB-6	American sandlance	PYS	145.19
1/11/2010	LB-5	American sandlance	PYS	28.00
1/11/2010	LB-16	Winter flounder	WFNVE	6.39

Appendix B. Ichthyoplankton (epibenthic sled) life stage densities (Number per 1,000 m^3) by date and station collected during the 20 Aquatic Biological Survey. ES1 to ES5 are winter flounder egg stages 1-5, WFNVE are winter flounder non-viable eggs, ST1 to ST4 are winter flounder larval life stages 1-4, YS is yolk-sac larvae, PYS is post yolk-sac larvae, JUV is juveniles, and UID is unidentified larval lifestage.

Sample Date	Station	Common Name	Life Stage	Density
1/12/2010	LB-2	American sandlance	YS	14.42
1/12/2010	LBD-15	American sandlance	YS	7.66
1/12/2010	LB-1	American sandlance	YS	14.51
1/12/2010	LB-2	American sandlance	PYS	36.05
1/12/2010	LBD-15	American sandlance	PYS	22.98
1/12/2010	LB-1	American sandlance	PYS	14.51
1/19/2010	LB-1	American sandlance	YS	313.97
1/19/2010	LBD-15	American sandlance	YS	544.02
1/19/2010	LB-16	American sandlance	YS	704.65
1/19/2010	LBD-17	American sandlance	YS	205.78
1/19/2010	LB-13	American sandlance	YS	26.95
1/19/2010	LB-4	American sandlance	YS	268.99
1/19/2010	LB-12	American sandlance	YS	102.89
1/19/2010	LB-1	American sandlance	PYS	446.17
1/19/2010	LBD-15	American sandlance	PYS	350.47
1/19/2010	LB-16	American sandlance	PYS	283.96
1/19/2010	LBD-17	American sandlance	PYS	281.59
1/19/2010	LB-13	American sandlance	PYS	168.41
1/19/2010	LB-4	American sandlance	PYS	224.16
1/19/2010	LB-12	American sandlance	PYS	90.03
1/19/2010	LB-12	Rock gunnel	YS	6.43
1/19/2010	LBD-15	Winter flounder	ST1	5.23
1/19/2010	LB-16	Winter flounder	ES1	36.81
1/19/2010	LB-16	Winter flounder	ES2	26.29
1/19/2010	LB-4	Winter flounder	ES2	8.97
1/19/2010	LB-16	Winter flounder	ES3	10.52
1/19/2010	LB-16	Winter flounder	ES4	5.26
1/19/2010	LB-13	Winter flounder	ES4	6.74
1/19/2010	LB-4	Winter flounder	ES4	8.97
1/19/2010	LB-12	Winter flounder	ES4	6.43
1/19/2010	LB-16	Winter flounder	ES5	5.26
1/19/2010	LB-16	Winter flounder	WFNVE	42.07
1/19/2010	LB-12	Winter flounder	WFNVE	6.43
1/20/2010	LB-6	American sandlance	YS	45.04
1/20/2010	LB-7	American sandlance	YS	6.79
1/20/2010	LB-8	American sandlance	YS	38.51
1/20/2010	LB-9	American sandlance	YS	8.22
1/20/2010	LB-2	American sandlance	YS	119.24
1/20/2010	LB-6	American sandlance	PYS	112.60
1/20/2010	LB-5	American sandlance	PYS	27.16
1/20/2010	LB-7	American sandlance	PYS	47.55

Appendix B. Ichthyoplankton (epibenthic sled) life stage densities (Number per 1,000 m^3) by date and station collected during the 20 Aquatic Biological Survey. ES1 to ES5 are winter flounder egg stages 1-5, WFNVE are winter flounder non-viable eggs, ST1 to ST4 are winter flounder larval life stages 1-4, YS is yolk-sac larvae, PYS is post yolk-sac larvae, JUV is juveniles, and UID is unidentified larval lifestage.

Sample Date	Station	Common Name	Life Stage	Density
1/20/2010	LB-8	American sandlance	PYS	391.51
1/20/2010	LB-9	American sandlance	PYS	78.09
1/20/2010	LB-2	American sandlance	PYS	194.31
1/20/2010	LB-6	American sandlance	UID	18.02
1/20/2010	LB-7	American sandlance	UID	13.59
1/20/2010	LB-8	American sandlance	UID	44.93
1/20/2010	LB-7	Atlantic menhaden	PYS	6.79
1/20/2010	LB-2	Cods and Haddocks	Egg	4.42
1/21/2010	SB-5	American sandlance	YS	13.68
1/21/2010	SB-7	American sandlance	YS	10.95
1/21/2010	SB-6	American sandlance	YS	7.69
1/21/2010	LB-14	American sandlance	YS	76.26
1/21/2010	LB-10	American sandlance	YS	43.69
1/21/2010	SB-4	American sandlance	YS	15.01
1/21/2010	SB-3	American sandlance	YS	10.10
1/21/2010	SB-5	American sandlance	PYS	13.68
1/21/2010	SB-6	American sandlance	PYS	53.84
1/21/2010	LB-14	American sandlance	PYS	144.90
1/21/2010	LB-10	American sandlance	PYS	165.05
1/21/2010	SB-4	American sandlance	PYS	50.02
1/21/2010	SB-3	American sandlance	PYS	85.88
1/21/2010	SB-6	American sandlance	UID	7.69
1/21/2010	SB-4	American sandlance	UID	10.00
1/22/2010	AK-2	American sandlance	YS	4.99
1/22/2010	PJ-1	American sandlance	YS	24.13
1/22/2010	PJ-2	American sandlance	YS	26.84
1/22/2010	AK-3	American sandlance	PYS	12.22
1/22/2010	AK-2	American sandlance	PYS	14.96
1/22/2010	NB-8	American sandlance	PYS	13.45
1/22/2010	NB-4	American sandlance	PYS	24.88
1/22/2010	NB-7	American sandlance	PYS	6.02
1/22/2010	PJ-1	American sandlance	PYS	32.17
1/22/2010	PJ-2	American sandlance	PYS	40.26
1/22/2010	NB-8	Summer flounder	PYS	4.48
1/22/2010	NB-7	Winter flounder	ST1	6.02
2/1/2010	SB-4	American sandlance	YS	5.36
2/1/2010	SB-3	American sandlance	YS	22.10
2/1/2010	SB-6	American sandlance	YS	56.10
2/1/2010	LB-8	American sandlance	YS	9.96
2/1/2010	LB-7	American sandlance	YS	10.31
2/1/2010	LB-3	American sandlance	YS	10.91

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Sample Date	Station	Common Name	Life Stage	Density
2/1/2010	LB-9	American sandlance	YS	33.54
2/1/2010	SB-4	American sandlance	PYS	21.46
2/1/2010	SB-3	American sandlance	PYS	49.71
2/1/2010	SB-6	American sandlance	PYS	77.67
2/1/2010	LB-8	American sandlance	PYS	44.84
2/1/2010	LB-7	American sandlance	PYS	10.31
2/1/2010	LB-3	American sandlance	PYS	21.81
2/1/2010	LB-9	American sandlance	PYS	27.95
2/1/2010	SB-6	American sandlance	UID	4.32
2/1/2010	SB-6	Atlantic menhaden	PYS	12.95
2/1/2010	SB-4	Rock gunnel	YS	5.36
2/1/2010	SB-6	Rock gunnel	YS	8.63
2/1/2010	LB-7	Rock gunnel	YS	5.15
2/1/2010	LB-7	Rock gunnel	PYS	5.15
2/1/2010	LB-3	Rock gunnel	PYS	5.45
2/1/2010	LB-9	Rock gunnel	PYS	16.77
2/1/2010	LB-3	Winter flounder	ST1	10.91
2/1/2010	LB-9	Winter flounder	ST1	5.59
2/1/2010	SB-3	Winter flounder	ST2	5.52
2/2/2010	LB-5	American sandlance	YS	21.08
2/2/2010	LB-6	American sandlance	YS	36.98
2/2/2010	LB-12	American sandlance	YS	35.96
2/2/2010	LB-4	American sandlance	YS	17.69
2/2/2010	LB-13	American sandlance	YS	18.27
2/2/2010	LBD-17	American sandlance	YS	38.29
2/2/2010	LB-16	American sandlance	YS	123.59
2/2/2010	LB-5	American sandlance	PYS	63.23
2/2/2010	LB-6	American sandlance	PYS	14.79
2/2/2010	LB-12	American sandlance	PYS	29.97
2/2/2010	LB-4	American sandlance	PYS	23.58
2/2/2010	LB-13	American sandlance	PYS	22.84
2/2/2010	LBD-17	American sandlance	PYS	30.64
2/2/2010	LB-16	American sandlance	PYS	182.91
2/2/2010	LB-5	American sandlance	UID	14.05
2/2/2010	LB-13	American sandlance	UID	4.57
2/2/2010	LB-16	American sandlance	UID	9.89
2/2/2010	LB-6	Cods and Haddocks	Egg	7.40
2/2/2010	LB-13	Rock gunnel	YS	4.57
2/2/2010	LB-16	Rock gunnel	YS	9.89
2/2/2010	LB-5	Rock gunnel	PYS	7.03
2/2/2010	LB-12	Rock gunnel	PYS	17.98

Appendix B. Ichthyoplankton (epibenthic sled) life stage densities (Number per 1,000 m^3) by date and station collected during the 20 Aquatic Biological Survey. ES1 to ES5 are winter flounder egg stages 1-5, WFNVE are winter flounder non-viable eggs, ST1 to ST4 are winter flounder larval life stages 1-4, YS is yolk-sac larvae, PYS is post yolk-sac larvae, JUV is juveniles, and UID is unidentified larval lifestage.

Sample Date	Station	Common Name	Life Stage	Density
2/2/2010	LB-13	Rock gunnel	PYS	4.57
2/2/2010	LB-16	Rock gunnel	PYS	39.55
2/2/2010	LB-5	Winter flounder	UID	7.03
2/2/2010	LB-5	Winter flounder	ST1	7.03
2/2/2010	LB-12	Winter flounder	ES1	59.94
2/2/2010	LB-16	Winter flounder	ES1	4.94
2/2/2010	LB-12	Winter flounder	ES2	41.96
2/2/2010	LBD-17	Winter flounder	ES2	22.98
2/2/2010	LB-16	Winter flounder	ES2	19.77
2/2/2010	LB-12	Winter flounder	ES3	17.98
2/2/2010	LB-16	Winter flounder	ES4	9.89
2/2/2010	LB-12	Winter flounder	WFNVE	41.96
2/2/2010	LB-13	Winter flounder	WFNVE	4.57
2/2/2010	LBD-17	Winter flounder	WFNVE	22.98
2/2/2010	LB-16	Winter flounder	WFNVE	19.77
2/3/2010	NB-8	American sandlance	YS	4.23
2/3/2010	NB-6	American sandlance	YS	9.84
2/3/2010	NB-4	American sandlance	YS	16.21
2/3/2010	AK-3	American sandlance	YS	26.74
2/3/2010	NB-8	American sandlance	PYS	8.45
2/3/2010	NB-6	American sandlance	PYS	14.77
2/3/2010	NB-4	American sandlance	PYS	27.02
2/3/2010	NB-7	American sandlance	PYS	18.14
2/3/2010	AK-3	American sandlance	PYS	21.40
2/3/2010	NB-8	American sandlance	UID	4.23
2/3/2010	NB-6	American sandlance	UID	4.92
2/3/2010	NB-8	Rock gunnel	YS	4.23
2/3/2010	AK-3	Rock gunnel	YS	5.35
2/3/2010	NB-4	Rock gunnel	PYS	10.81
2/3/2010	NB-6	Summer flounder	PYS	4.92
2/3/2010	NB-4	Winter flounder	ST1	10.81
2/3/2010	NB-8	Winter flounder	ST2	4.23
2/3/2010	NB-4	Winter flounder	ST2	16.21
2/4/2010	SB-5	American sandlance	YS	3.64
2/4/2010	SB-5	American sandlance	PYS	18.18
2/4/2010	PJ-1	American sandlance	PYS	5.00
2/4/2010	PJ-2	American sandlance	PYS	11.73
2/4/2010	SB-5	American sandlance	UID	10.91
2/4/2010	SB-5	Grubby	YS	3.64
2/4/2010	PJ-1	Rock gunnel	PYS	15.00
2/4/2010	SB-5	Winter flounder	ST1	3.64

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Sample Date	Station	Common Name	Life Stage	Density
2/4/2010	SB-5	Winter flounder	ST2	3.64
2/4/2010	SB-7	Winter flounder	ES4	14.27
2/4/2010	PJ-1	Winter flounder	WFNVE	5.00
2/5/2010	LB-10	American sandlance	YS	14.74
2/5/2010	LBD-15	American sandlance	YS	4.88
2/5/2010	LB-2	American sandlance	YS	39.34
2/5/2010	LB-14	American sandlance	YS	22.42
2/5/2010	LB-1	American sandlance	PYS	16.26
2/5/2010	LB-2	American sandlance	PYS	21.86
2/5/2010	LB-14	American sandlance	PYS	37.37
2/5/2010	LB-1	Grubby	PYS	5.42
2/5/2010	LB-2	Grubby	PYS	4.37
2/5/2010	LBD-15	Rock gunnel	YS	4.88
2/5/2010	LB-2	Rock gunnel	YS	8.74
2/5/2010	LB-2	Rock gunnel	PYS	4.37
2/5/2010	LB-14	Rock gunnel	PYS	29.89
2/17/2010	LB-7	American sandlance	YS	5.30
2/17/2010	LB-3	American sandlance	YS	13.29
2/17/2010	LB-10	American sandlance	YS	6.36
2/17/2010	LB-8	American sandlance	PYS	6.30
2/17/2010	LB-7	American sandlance	PYS	5.30
2/17/2010	LB-3	American sandlance	PYS	6.64
2/17/2010	LB-9	American sandlance	UID	6.59
2/17/2010	LB-7	Atlantic menhaden	PYS	5.30
2/17/2010	LB-8	Grubby	PYS	6.30
2/17/2010	LB-3	Grubby	PYS	6.64
2/17/2010	PJ-2	Rock gunnel	YS	6.25
2/17/2010	PJ-2	Rock gunnel	PYS	25.01
2/17/2010	LB-8	Rock gunnel	PYS	6.30
2/17/2010	LB-7	Rock gunnel	PYS	10.59
2/17/2010	LB-3	Rock gunnel	PYS	26.57
2/17/2010	LB-9	Rock gunnel	PYS	13.18
2/17/2010	LB-8	Winter flounder	UID	6.30
2/17/2010	PJ-2	Winter flounder	ST1	12.50
2/17/2010	LB-8	Winter flounder	ST1	6.30
2/17/2010	PJ-2	Winter flounder	ST2	12.50
2/17/2010	LB-7	Winter flounder	ST2	5.30
2/17/2010	PJ-2	Winter flounder	ES1	18.76
2/17/2010	PJ-2	Winter flounder	ES2	18.76
2/17/2010	LB-8	Winter flounder	ES2	6.30
2/17/2010	PJ-2	Winter flounder	WFNVE	18.76

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Sample Date	Station	Common Name	Life Stage	Density
2/18/2010	NB-7	American sandlance	YS	6.60
2/18/2010	NB-7	American sandlance	PYS	6.60
2/18/2010	AK-2	American sandlance	PYS	5.35
2/18/2010	NB-8	Grubby	YS	9.63
2/18/2010	NB-8	Grubby	PYS	14.45
2/18/2010	AK-2	Grubby	PYS	5.35
2/18/2010	NB-7	Rock gunnel	PYS	6.60
2/18/2010	NB-8	Rock gunnel	PYS	9.63
2/18/2010	NB-6	Rock gunnel	PYS	6.95
2/18/2010	AK-3	Rock gunnel	PYS	20.09
2/18/2010	AK-2	Rock gunnel	PYS	10.70
2/18/2010	NB-4	Winter flounder	UID	6.09
2/18/2010	NB-7	Winter flounder	ST2	6.60
2/19/2010	SB-7	American sandlance	YS	3.56
2/19/2010	SB-4	American sandlance	PYS	4.69
2/19/2010	SB-6	American sandlance	PYS	4.75
2/19/2010	SB-7	American sandlance	PYS	7.12
2/19/2010	SB-5	American sandlance	PYS	4.01
2/19/2010	SB-3	Grubby	YS	5.01
2/19/2010	SB-4	Grubby	PYS	4.69
2/19/2010	SB-6	Grubby	PYS	4.75
2/19/2010	SB-3	Rock gunnel	PYS	10.02
2/19/2010	SB-4	Rock gunnel	PYS	23.47
2/19/2010	SB-7	Rock gunnel	PYS	17.81
2/19/2010	SB-5	Rock gunnel	PYS	16.02
2/19/2010	PJ-1	Rock gunnel	PYS	11.03
2/19/2010	SB-3	Winter flounder	ST1	5.01
2/19/2010	SB-4	Winter flounder	ES4	4.69
2/19/2010	SB-3	Winter flounder	WFNVE	10.02
2/22/2010	LB-16	American sandlance	YS	11.14
2/22/2010	LBD-17	American sandlance	YS	5.38
2/22/2010	LB-16	American sandlance	PYS	11.14
2/22/2010	LBD-17	American sandlance	PYS	10.77
2/22/2010	LB-12	American sandlance	PYS	17.16
2/22/2010	LBD-17	American sandlance	UID	5.38
2/22/2010	LB-12	Atlantic tomcod	PYS	8.58
2/22/2010	LB-13	Gobies	PYS	6.94
2/22/2010	LB-12	Grubby	PYS	25.74
2/22/2010	LBD-17	Rock gunnel	PYS	5.38
2/22/2010	LB-13	Rock gunnel	PYS	6.94
2/22/2010	LB-12	Rock gunnel	PYS	17.16

Appendix B. Ichthyoplankton (epibenthic sled) life stage densities (Number per 1,000 m^3) by date and station collected during the 20 Aquatic Biological Survey. ES1 to ES5 are winter flounder egg stages 1-5, WFNVE are winter flounder non-viable eggs, ST1 to ST4 are winter flounder larval life stages 1-4, YS is yolk-sac larvae, PYS is post yolk-sac larvae, JUV is juveniles, and UID is unidentified larval lifestage.

Sample Date	Station	Common Name	Life Stage	Density
2/22/2010	LB-5	Winter flounder	ST1	22.54
2/22/2010	LB-16	Winter flounder	ST2	5.57
2/22/2010	LB-5	Winter flounder	ST2	22.54
2/22/2010	LBD-17	Winter flounder	ES1	21.54
2/22/2010	LB-16	Winter flounder	ES2	16.71
2/22/2010	LB-13	Winter flounder	ES2	13.89
2/22/2010	LB-12	Winter flounder	ES2	8.58
2/22/2010	LB-16	Winter flounder	WFNVE	11.14
2/22/2010	LBD-17	Winter flounder	WFNVE	32.31
2/23/2010	LBD-15	American sandlance	PYS	5.47
2/23/2010	LB-1	Grubby	PYS	23.69
2/23/2010	LBD-15	Grubby	PYS	10.94
2/23/2010	LB-14	Grubby	PYS	25.04
2/23/2010	LB-2	Rock gunnel	PYS	12.43
2/23/2010	LB-14	Rock gunnel	PYS	18.78
2/23/2010	LB-2	Summer flounder	PYS	6.22
2/23/2010	LB-1	Winter flounder	ST2	5.92
2/23/2010	LBD-15	Winter flounder	ST2	5.47
2/23/2010	LB-1	Winter flounder	ES1	11.85
2/23/2010	LB-14	Winter flounder	ES1	6.26
2/23/2010	LB-1	Winter flounder	ES2	11.85
2/23/2010	LBD-15	Winter flounder	ES2	5.47
2/23/2010	LB-2	Winter flounder	ES2	6.22
2/23/2010	LB-14	Winter flounder	ES2	12.52
2/23/2010	LB-2	Winter flounder	ES3	6.22
2/23/2010	LB-14	Winter flounder	ES3	6.26
2/23/2010	LB-1	Winter flounder	ES4	11.85
2/23/2010	LBD-15	Winter flounder	ES4	10.94
2/23/2010	LB-14	Winter flounder	ES4	12.52
2/23/2010	LB-1	Winter flounder	WFNVE	41.46
2/23/2010	LBD-15	Winter flounder	WFNVE	27.34
2/23/2010	LB-2	Winter flounder	WFNVE	12.43
2/23/2010	LB-14	Winter flounder	WFNVE	12.52
3/1/2010	NB-8	American sandlance	YS	7.47
3/1/2010	NB-6	American sandlance	YS	6.43
3/1/2010	AK-2	American sandlance	YS	4.38
3/1/2010	NB-7	American sandlance	PYS	22.42
3/1/2010	NB-8	American sandlance	PYS	14.94
3/1/2010	AK-2	American sandlance	PYS	8.75
3/1/2010	AK-3	American sandlance	PYS	12.13
3/1/2010	NB-6	Atlantic menhaden	PYS	6.43

Appendix B. Ichthyoplankton (epibenthic sled) life stage densities (Number per 1,000 m^3) by date and station collected during the 20 Aquatic Biological Survey. ES1 to ES5 are winter flounder egg stages 1-5, WFNVE are winter flounder non-viable eggs, ST1 to ST4 are winter flounder larval life stages 1-4, YS is yolk-sac larvae, PYS is post yolk-sac larvae, JUV is juveniles, and UID is unidentified larval lifestage.

Sample Date	Station	Common Name	Life Stage	Density
3/1/2010	NB-6	Atlantic tomcod	PYS	12.86
3/1/2010	AK-2	Grubby	YS	8.75
3/1/2010	NB-7	Grubby	PYS	56.06
3/1/2010	NB-4	Grubby	PYS	25.35
3/1/2010	NB-8	Grubby	PYS	7.47
3/1/2010	NB-6	Grubby	PYS	12.86
3/1/2010	AK-2	Grubby	PYS	35.01
3/1/2010	AK-3	Grubby	PYS	36.39
3/1/2010	NB-6	Rock gunnel	PYS	12.86
3/1/2010	AK-3	Rock gunnel	PYS	4.04
3/1/2010	NB-8	Summer flounder	PYS	7.47
3/1/2010	AK-2	Winter flounder	ST1	13.13
3/1/2010	AK-3	Winter flounder	ST1	4.04
3/1/2010	NB-7	Winter flounder	ES1	5.61
3/1/2010	NB-7	Winter flounder	ES2	22.42
3/2/2010	LB-16	American sandlance	YS	4.62
3/2/2010	LBD-17	American sandlance	YS	27.05
3/2/2010	LB-13	American sandlance	YS	12.90
3/2/2010	LB-4	American sandlance	YS	11.02
3/2/2010	LB-12	American sandlance	YS	4.85
3/2/2010	LB-16	American sandlance	PYS	4.62
3/2/2010	LBD-17	American sandlance	PYS	228.03
3/2/2010	LB-13	American sandlance	PYS	47.31
3/2/2010	LB-12	American sandlance	PYS	19.41
3/2/2010	LB-16	American sandlance	UID	4.62
3/2/2010	LB-4	American sandlance	UID	5.51
3/2/2010	LBD-17	Atlantic menhaden	PYS	3.86
3/2/2010	LB-6	Atlantic menhaden	PYS	6.14
3/2/2010	LBD-17	Grubby	PYS	3.86
3/2/2010	LB-13	Grubby	PYS	86.03
3/2/2010	LB-4	Grubby	PYS	22.04
3/2/2010	LB-12	Grubby	PYS	14.56
3/2/2010	LB-5	Grubby	PYS	96.05
3/2/2010	LB-16	Rock gunnel	PYS	18.49
3/2/2010	LBD-17	Rock gunnel	PYS	15.46
3/2/2010	LB-13	Rock gunnel	PYS	17.21
3/2/2010	LB-4	Rock gunnel	PYS	11.02
3/2/2010	LB-12	Rock gunnel	PYS	4.85
3/2/2010	LB-6	Rock gunnel	PYS	18.41
3/2/2010	LB-5	Rock gunnel	PYS	4.18
3/2/2010	LB-13	Summer flounder	PYS	4.30

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Sample Date	Station	Common Name	Life Stage	Density
3/2/2010	LB-4	Summer flounder	PYS	22.04
3/2/2010	LB-5	Summer flounder	PYS	8.35
3/2/2010	LB-13	Winter flounder	ST1	8.60
3/2/2010	LB-13	Winter flounder	ST2	4.30
3/2/2010	LBD-17	Winter flounder	ST3	3.86
3/2/2010	LB-12	Winter flounder	ES2	14.56
3/4/2010	SB-7	American sandlance	YS	3.72
3/4/2010	SB-3	American sandlance	YS	5.03
3/4/2010	SB-5	American sandlance	PYS	10.98
3/4/2010	SB-7	American sandlance	PYS	14.88
3/4/2010	SB-4	American sandlance	PYS	20.09
3/4/2010	SB-3	American sandlance	PYS	15.08
3/4/2010	PJ-1	American sandlance	PYS	15.17
3/4/2010	SB-7	American sandlance	UID	3.72
3/4/2010	PJ-1	American sandlance	UID	5.06
3/4/2010	SB-5	Atlantic herring	PYS	3.66
3/4/2010	SB-7	Atlantic herring	PYS	3.72
3/4/2010	SB-4	Atlantic herring	PYS	5.02
3/4/2010	SB-5	Atlantic menhaden	PYS	10.98
3/4/2010	PJ-1	Cods and Haddocks	Egg	5.06
3/4/2010	PJ-1	Grubby	Egg	10.11
3/4/2010	SB-5	Grubby	YS	10.98
3/4/2010	SB-3	Grubby	YS	5.03
3/4/2010	PJ-2	Grubby	PYS	17.19
3/4/2010	SB-5	Grubby	PYS	113.49
3/4/2010	SB-7	Grubby	PYS	29.76
3/4/2010	SB-4	Grubby	PYS	20.09
3/4/2010	SB-3	Grubby	PYS	60.31
3/4/2010	PJ-1	Grubby	PYS	55.62
3/4/2010	SB-3	Rock gunnel	PYS	15.08
3/4/2010	PJ-1	Rock gunnel	PYS	5.06
3/4/2010	SB-3	Winter flounder	UID	10.05
3/4/2010	SB-4	Winter flounder	ST1	15.07
3/4/2010	PJ-1	Winter flounder	ST1	5.06
3/4/2010	PJ-2	Winter flounder	ST2	5.73
3/4/2010	SB-5	Winter flounder	ST2	3.66
3/4/2010	SB-4	Winter flounder	ST2	10.05
3/4/2010	SB-3	Winter flounder	ST2	10.05
3/4/2010	SB-3	Winter flounder	ST3	5.03
3/4/2010	PJ-2	Winter flounder	ES1	297.93
3/4/2010	PJ-2	Winter flounder	ES2	275.02

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Sample Date	Station	Common Name	Life Stage	Density
3/4/2010	PJ-2	Winter flounder	ES3	34.38
3/4/2010	PJ-2	Winter flounder	ES4	63.02
3/4/2010	PJ-2	Winter flounder	ES5	5.73
3/4/2010	PJ-2	Winter flounder	WFNVE	177.61
3/5/2010	LB-8	American sandlance	YS	4.77
3/5/2010	LB-7	American sandlance	YS	5.23
3/5/2010	LB-3	American sandlance	YS	5.54
3/5/2010	SB-6	American sandlance	YS	7.31
3/5/2010	LB-8	American sandlance	PYS	14.30
3/5/2010	LB-7	American sandlance	PYS	5.23
3/5/2010	LB-9	American sandlance	PYS	71.97
3/5/2010	SB-6	American sandlance	PYS	40.23
3/5/2010	LB-3	Atlantic menhaden	PYS	5.54
3/5/2010	LB-8	Cods and Haddocks	Egg	4.77
3/5/2010	LB-8	Grubby	PYS	66.72
3/5/2010	LB-7	Grubby	PYS	125.56
3/5/2010	LB-3	Grubby	PYS	27.71
3/5/2010	LB-9	Grubby	PYS	46.57
3/5/2010	SB-6	Grubby	PYS	51.20
3/5/2010	LB-7	Rock gunnel	PYS	5.23
3/5/2010	LB-3	Rock gunnel	PYS	5.54
3/5/2010	LB-9	Rock gunnel	PYS	16.94
3/5/2010	SB-6	Rock gunnel	PYS	3.66
3/5/2010	LB-3	Summer flounder	PYS	16.63
3/5/2010	LB-9	Winter flounder	ST1	4.23
3/5/2010	LB-9	Winter flounder	ST2	4.23
3/5/2010	LB-8	Winter flounder	ES2	4.77
3/5/2010	LB-9	Winter flounder	ES4	4.23
3/8/2010	LB-10	American sandlance	PYS	15.17
3/8/2010	LB-1	American sandlance	PYS	7.01
3/8/2010	LB-2	American sandlance	PYS	11.47
3/8/2010	LBD-15	American sandlance	PYS	4.26
3/8/2010	LB-2	Grubby	YS	3.82
3/8/2010	LB-10	Grubby	PYS	15.17
3/8/2010	LB-1	Grubby	PYS	49.06
3/8/2010	LB-2	Grubby	PYS	45.90
3/8/2010	LBD-15	Grubby	PYS	46.91
3/8/2010	LB-1	Rock gunnel	PYS	35.04
3/8/2010	LB-2	Rock gunnel	PYS	7.65
3/8/2010	LBD-15	Rock gunnel	PYS	21.32
3/8/2010	LB-1	Summer flounder	PYS	7.01

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Sample Date	Station	Common Name	Life Stage	Density
3/8/2010	LB-1	Winter flounder	UID	7.01
3/8/2010	LB-1	Winter flounder	ST3	7.01
3/16/2010	SB-6	American sandlance	YS	5.59
3/16/2010	SB-3	American sandlance	YS	5.27
3/16/2010	SB-6	American sandlance	PYS	61.49
3/16/2010	SB-4	American sandlance	PYS	43.82
3/16/2010	SB-3	American sandlance	PYS	94.77
3/16/2010	PJ-2	American sandlance	PYS	34.46
3/16/2010	SB-5	American sandlance	PYS	72.27
3/16/2010	SB-7	American sandlance	PYS	12.07
3/16/2010	SB-3	Atlantic herring	PYS	5.27
3/16/2010	PJ-2	Atlantic herring	PYS	4.92
3/16/2010	SB-5	Atlantic herring	PYS	3.44
3/16/2010	SB-7	Atlantic herring	PYS	12.07
3/16/2010	PJ-2	Atlantic menhaden	PYS	4.92
3/16/2010	SB-7	Atlantic menhaden	PYS	18.10
3/16/2010	SB-3	Atlantic tomcod	PYS	5.27
3/16/2010	SB-6	Cods and Haddocks	Egg	5.59
3/16/2010	SB-4	Cods and Haddocks	Egg	13.15
3/16/2010	SB-3	Cods and Haddocks	Egg	36.86
3/16/2010	PJ-2	Cods and Haddocks	Egg	4.92
3/16/2010	SB-6	Grubby	YS	5.59
3/16/2010	SB-4	Grubby	YS	4.38
3/16/2010	SB-6	Grubby	PYS	50.31
3/16/2010	SB-4	Grubby	PYS	162.13
3/16/2010	SB-3	Grubby	PYS	300.11
3/16/2010	PJ-2	Grubby	PYS	83.69
3/16/2010	SB-5	Grubby	PYS	48.18
3/16/2010	SB-7	Grubby	PYS	54.31
3/16/2010	SB-6	Rock gunnel	PYS	5.59
3/16/2010	SB-3	Rock gunnel	PYS	5.27
3/16/2010	PJ-2	Rock gunnel	PYS	4.92
3/16/2010	SB-7	Rock gunnel	PYS	12.07
3/16/2010	SB-4	Summer flounder	PYS	4.38
3/16/2010	PJ-2	Summer flounder	PYS	4.92
3/16/2010	SB-7	Winter flounder	UID	12.07
3/16/2010	SB-4	Winter flounder	ST1	4.38
3/16/2010	SB-3	Winter flounder	ST1	5.27
3/16/2010	SB-7	Winter flounder	ST1	12.07
3/16/2010	SB-6	Winter flounder	ST2	11.18
3/16/2010	SB-3	Winter flounder	ST2	5.27

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Sample Date	Station	Common Name	Life Stage	Density
3/16/2010	PJ-2	Winter flounder	ST2	24.61
3/16/2010	SB-5	Winter flounder	ST2	10.32
3/16/2010	SB-6	Winter flounder	ST3	5.59
3/16/2010	SB-4	Winter flounder	ST3	4.38
3/16/2010	SB-5	Winter flounder	ST3	13.77
3/16/2010	PJ-2	Winter flounder	ES5	4.92
3/16/2010	PJ-2	Winter flounder	WFNVE	19.69
3/17/2010	LB-8	American sandlance	PYS	38.99
3/17/2010	LB-7	American sandlance	PYS	5.07
3/17/2010	LB-3	American sandlance	PYS	25.79
3/17/2010	LB-5	American sandlance	PYS	36.31
3/17/2010	LB-6	American sandlance	PYS	7.49
3/17/2010	LB-7	Atlantic herring	PYS	5.07
3/17/2010	LB-5	Atlantic herring	PYS	12.10
3/17/2010	PJ-1	Atlantic herring	PYS	6.75
3/17/2010	LB-7	Atlantic menhaden	PYS	10.14
3/17/2010	LB-7	Cods and Haddocks	Egg	5.07
3/17/2010	PJ-1	Cods and Haddocks	Egg	13.51
3/17/2010	LB-8	Grubby	YS	11.14
3/17/2010	LB-7	Grubby	YS	10.14
3/17/2010	LB-3	Grubby	YS	6.45
3/17/2010	LB-5	Grubby	YS	12.10
3/17/2010	LB-8	Grubby	PYS	44.56
3/17/2010	LB-7	Grubby	PYS	207.78
3/17/2010	LB-3	Grubby	PYS	380.47
3/17/2010	LB-5	Grubby	PYS	696.03
3/17/2010	PJ-1	Grubby	PYS	121.56
3/17/2010	LB-8	Rock gunnel	PYS	11.14
3/17/2010	LB-3	Rock gunnel	PYS	58.04
3/17/2010	LB-6	Rock gunnel	PYS	7.49
3/17/2010	LB-6	Striped cuskeel	JUV	7.49
3/17/2010	LB-3	Summer flounder	PYS	12.90
3/17/2010	LB-5	Summer flounder	PYS	12.10
3/17/2010	PJ-1	Summer flounder	PYS	6.75
3/17/2010	LB-6	Winter flounder	UID	7.49
3/17/2010	LB-8	Winter flounder	ST1	27.85
3/17/2010	LB-7	Winter flounder	ST1	55.74
3/17/2010	LB-3	Winter flounder	ST1	6.45
3/17/2010	LB-5	Winter flounder	ST1	18.16
3/17/2010	LB-6	Winter flounder	ST1	22.47
3/17/2010	LB-8	Winter flounder	ST2	16.71

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Sample Date	Station	Common Name	Life Stage	Density
3/17/2010	LB-7	Winter flounder	ST2	5.07
3/17/2010	LB-3	Winter flounder	ST2	6.45
3/17/2010	LB-8	Winter flounder	ST3	5.57
3/17/2010	LB-5	Winter flounder	ES2	24.21
3/17/2010	LB-5	Winter flounder	ES4	6.05
3/17/2010	LB-5	Winter flounder	ES5	6.05
3/17/2010	PJ-1	Winter flounder	ES5	6.75
3/18/2010	LB-16	American sandlance	YS	13.34
3/18/2010	LB-12	American sandlance	PYS	28.77
3/18/2010	LB-13	American sandlance	PYS	21.58
3/18/2010	LBD-17	American sandlance	PYS	28.88
3/18/2010	LB-16	American sandlance	PYS	26.68
3/18/2010	LB-12	Atlantic herring	PYS	34.52
3/18/2010	LB-4	Atlantic herring	PYS	5.48
3/18/2010	LBD-17	Atlantic herring	PYS	5.78
3/18/2010	LB-4	Atlantic menhaden	PYS	5.48
3/18/2010	LB-16	Cods and Haddocks	Egg	6.67
3/18/2010	LB-12	Grubby	YS	5.75
3/18/2010	LB-13	Grubby	YS	10.79
3/18/2010	LB-12	Grubby	PYS	730.73
3/18/2010	LB-4	Grubby	PYS	323.57
3/18/2010	LB-13	Grubby	PYS	156.45
3/18/2010	LBD-17	Grubby	PYS	103.97
3/18/2010	LB-16	Grubby	PYS	26.68
3/18/2010	LBD-17	Rock gunnel	PYS	5.78
3/18/2010	LB-16	Rock gunnel	PYS	13.34
3/18/2010	LB-12	Summer flounder	PYS	23.02
3/18/2010	LB-4	Summer flounder	PYS	5.48
3/18/2010	LB-16	Winter flounder	ST1	6.67
3/18/2010	LB-16	Winter flounder	ST2	33.35
3/18/2010	LB-16	Winter flounder	ST3	53.35
3/18/2010	LB-16	Winter flounder	ES1	113.37
3/18/2010	LB-13	Winter flounder	ES2	37.76
3/18/2010	LB-16	Winter flounder	ES2	173.40
3/18/2010	LB-13	Winter flounder	ES3	10.79
3/18/2010	LB-16	Winter flounder	ES3	60.02
3/18/2010	LB-13	Winter flounder	ES4	5.39
3/18/2010	LB-16	Winter flounder	ES4	93.37
3/18/2010	LB-13	Winter flounder	ES5	5.39
3/18/2010	LBD-17	Winter flounder	ES5	5.78
3/18/2010	LB-16	Winter flounder	ES5	100.04

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Sample Date	Station	Common Name	Life Stage	Density
3/18/2010	LB-4	Winter flounder	WFNVE	10.97
3/18/2010	LB-16	Winter flounder	WFNVE	320.12
3/22/2010	LB-1	American sandlance	PYS	19.30
3/22/2010	LB-2	American sandlance	PYS	7.06
3/22/2010	LB-9	American sandlance	PYS	13.60
3/22/2010	LB-14	American sandlance	PYS	3.83
3/22/2010	LB-14	Atlantic herring	PYS	3.83
3/22/2010	LB-1	Atlantic menhaden	PYS	4.83
3/22/2010	LB-1	Atlantic tomcod	PYS	4.83
3/22/2010	LB-10	Grubby	YS	31.41
3/22/2010	LB-1	Grubby	YS	14.48
3/22/2010	LB-10	Grubby	PYS	232.42
3/22/2010	LB-1	Grubby	PYS	270.21
3/22/2010	LBD-15	Grubby	PYS	235.48
3/22/2010	LB-2	Grubby	PYS	84.68
3/22/2010	LB-9	Grubby	PYS	27.20
3/22/2010	LB-14	Grubby	PYS	15.33
3/22/2010	LB-14	Northern pipefish	JUV	3.83
3/22/2010	LB-1	Rock gunnel	PYS	9.65
3/22/2010	LBD-15	Rock gunnel	PYS	3.74
3/22/2010	LB-2	Rock gunnel	PYS	3.53
3/22/2010	LB-1	Winter flounder	UID	24.13
3/22/2010	LB-9	Winter flounder	UID	131.49
3/22/2010	LB-14	Winter flounder	UID	68.97
3/22/2010	LB-1	Winter flounder	ST1	9.65
3/22/2010	LBD-15	Winter flounder	ST1	14.95
3/22/2010	LB-2	Winter flounder	ST1	21.17
3/22/2010	LB-10	Winter flounder	ST2	12.56
3/22/2010	LB-1	Winter flounder	ST2	221.96
3/22/2010	LBD-15	Winter flounder	ST2	52.33
3/22/2010	LB-2	Winter flounder	ST2	31.76
3/22/2010	LB-9	Winter flounder	ST2	104.28
3/22/2010	LB-14	Winter flounder	ST2	260.55
3/22/2010	LB-1	Winter flounder	ST3	641.75
3/22/2010	LBD-15	Winter flounder	ST3	22.43
3/22/2010	LB-2	Winter flounder	ST3	56.45
3/22/2010	LB-9	Winter flounder	ST3	326.46
3/22/2010	LB-14	Winter flounder	ST3	662.87
3/22/2010	LB-1	Winter flounder	ES3	4.83
3/25/2010	NB-8	American sandlance	PYS	5.30
3/25/2010	NB-6	American sandlance	PYS	6.11

Appendix B. Ichthyoplankton (epibenthic sled) life stage densities (Number per 1,000 m^3) by date and station collected during the 20 Aquatic Biological Survey. ES1 to ES5 are winter flounder egg stages 1-5, WFNVE are winter flounder non-viable eggs, ST1 to ST4 are winter flounder larval life stages 1-4, YS is yolk-sac larvae, PYS is post yolk-sac larvae, JUV is juveniles, and UID is unidentified larval lifestage.

Sample Date	Station	Common Name	Life Stage	Density
3/25/2010	AK-2	American sandlance	PYS	5.36
3/25/2010	AK-3	Atlantic menhaden	PYS	5.79
3/25/2010	NB-4	Atlantic tomcod	PYS	5.06
3/25/2010	NB-8	Atlantic tomcod	PYS	10.60
3/25/2010	NB-6	Atlantic tomcod	PYS	6.11
3/25/2010	AK-3	Atlantic tomcod	PYS	5.79
3/25/2010	AK-2	Fourbeard rockling	Egg	21.45
3/25/2010	NB-7	Grubby	YS	13.44
3/25/2010	AK-2	Grubby	YS	16.09
3/25/2010	NB-7	Grubby	PYS	40.31
3/25/2010	NB-4	Grubby	PYS	15.18
3/25/2010	NB-8	Grubby	PYS	42.41
3/25/2010	NB-6	Grubby	PYS	12.23
3/25/2010	AK-3	Grubby	PYS	57.90
3/25/2010	AK-2	Grubby	PYS	198.44
3/25/2010	NB-8	Summer flounder	PYS	5.30
3/25/2010	AK-3	Summer flounder	PYS	11.58
3/25/2010	AK-2	Summer flounder	PYS	5.36
3/25/2010	NB-7	Winter flounder	UID	26.87
3/25/2010	NB-4	Winter flounder	UID	85.99
3/25/2010	NB-7	Winter flounder	ST1	20.15
3/25/2010	NB-4	Winter flounder	ST1	20.23
3/25/2010	NB-8	Winter flounder	ST1	5.30
3/25/2010	NB-7	Winter flounder	ST2	127.64
3/25/2010	NB-4	Winter flounder	ST2	131.52
3/25/2010	NB-4	Winter flounder	ST3	10.12
4/5/2010	LB-10	American sandlance	PYS	6.09
4/5/2010	LB-9	Atlantic herring	PYS	5.79
4/5/2010	LB-9	Atlantic tomcod	PYS	5.79
4/5/2010	LB-10	Fourbeard rockling	Egg	6.09
4/5/2010	LB-14	Fourbeard rockling	Egg	3.73
4/5/2010	LB-9	Fourbeard rockling	Egg	5.79
4/5/2010	LB-14	Cods and Haddocks	Egg	3.73
4/5/2010	LB-10	Grubby	YS	36.51
4/5/2010	PJ-2	Grubby	YS	31.41
4/5/2010	LB-10	Grubby	PYS	60.86
4/5/2010	LB-1	Grubby	PYS	32.94
4/5/2010	LBD-15	Grubby	PYS	80.28
4/5/2010	LB-14	Grubby	PYS	11.20
4/5/2010	LB-9	Grubby	PYS	57.87
4/5/2010	PJ-2	Grubby	PYS	62.83

Appendix B. Ichthyoplankton (epibenthic sled) life stage densities (Number per 1,000 m^3) by date and station collected during the 20 Aquatic Biological Survey. ES1 to ES5 are winter flounder egg stages 1-5, WFNVE are winter flounder non-viable eggs, ST1 to ST4 are winter flounder larval life stages 1-4, YS is yolk-sac larvae, PYS is post yolk-sac larvae, JUV is juveniles, and UID is unidentified larval lifestage.

Sample Date	Station	Common Name	Life Stage	Density
4/5/2010	LB-10	Winter flounder	UID	54.77
4/5/2010	LB-1	Winter flounder	UID	164.70
4/5/2010	LBD-15	Winter flounder	UID	4.01
4/5/2010	LB-14	Winter flounder	UID	63.46
4/5/2010	PJ-2	Winter flounder	UID	56.54
4/5/2010	LB-10	Winter flounder	ST1	182.57
4/5/2010	LB-1	Winter flounder	ST1	779.56
4/5/2010	LBD-15	Winter flounder	ST1	128.46
4/5/2010	LB-14	Winter flounder	ST1	186.64
4/5/2010	LB-9	Winter flounder	ST1	28.94
4/5/2010	PJ-2	Winter flounder	ST1	251.30
4/5/2010	LB-10	Winter flounder	ST2	60.86
4/5/2010	LB-1	Winter flounder	ST2	647.81
4/5/2010	LBD-15	Winter flounder	ST2	60.21
4/5/2010	LB-14	Winter flounder	ST2	265.02
4/5/2010	LB-9	Winter flounder	ST2	75.23
4/5/2010	PJ-2	Winter flounder	ST2	194.76
4/5/2010	LB-10	Winter flounder	ST3	42.60
4/5/2010	LB-1	Winter flounder	ST3	1,712.85
4/5/2010	LBD-15	Winter flounder	ST3	188.67
4/5/2010	LB-14	Winter flounder	ST3	429.27
4/5/2010	LB-9	Winter flounder	ST3	219.92
4/5/2010	PJ-2	Winter flounder	ST3	37.70
4/5/2010	LB-10	Winter flounder	ES5	6.09
4/6/2010	LB-16	American sandlance	PYS	7.28
4/6/2010	LB-13	American sandlance	PYS	6.45
4/6/2010	LB-12	American sandlance	PYS	12.96
4/6/2010	LB-12	Atlantic herring	PYS	12.96
4/6/2010	LB-16	Cods and Haddocks	Egg	7.28
4/6/2010	LB-13	Cods and Haddocks	Egg	6.45
4/6/2010	LB-7	Cods and Haddocks	Egg	5.87
4/6/2010	LBD-17	Grubby	YS	6.28
4/6/2010	LB-4	Grubby	YS	9.02
4/6/2010	LBD-17	Grubby	PYS	113.07
4/6/2010	LB-13	Grubby	PYS	25.79
4/6/2010	LB-4	Grubby	PYS	811.70
4/6/2010	LB-12	Grubby	PYS	453.48
4/6/2010	LB-7	Grubby	PYS	11.74
4/6/2010	LB-12	Rock gunnel	PYS	12.96
4/6/2010	LB-16	Winter flounder	UID	80.10
4/6/2010	LB-13	Winter flounder	UID	45.14

Appendix B. Ichthyoplankton (epibenthic sled) life stage densities (Number per 1,000 m^3) by date and station collected during the 20 Aquatic Biological Survey. ES1 to ES5 are winter flounder egg stages 1-5, WFNVE are winter flounder non-viable eggs, ST1 to ST4 are winter flounder larval life stages 1-4, YS is yolk-sac larvae, PYS is post yolk-sac larvae, JUV is juveniles, and UID is unidentified larval lifestage.

Sample Date	Station	Common Name	Life Stage	Density
4/6/2010	LB-12	Winter flounder	UID	103.65
4/6/2010	LB-7	Winter flounder	UID	29.36
4/6/2010	LB-16	Winter flounder	ST1	7.28
4/6/2010	LB-13	Winter flounder	ST1	12.90
4/6/2010	LB-12	Winter flounder	ST1	25.91
4/6/2010	LB-7	Winter flounder	ST1	199.66
4/6/2010	LB-16	Winter flounder	ST2	50.97
4/6/2010	LB-13	Winter flounder	ST2	154.77
4/6/2010	LB-12	Winter flounder	ST2	207.31
4/6/2010	LB-7	Winter flounder	ST2	70.47
4/6/2010	LB-16	Winter flounder	ST3	582.51
4/6/2010	LBD-17	Winter flounder	ST3	6.28
4/6/2010	LB-13	Winter flounder	ST3	199.91
4/6/2010	LB-4	Winter flounder	ST3	18.04
4/6/2010	LB-12	Winter flounder	ST3	2,215.58
4/6/2010	LB-7	Winter flounder	ST3	299.49
4/6/2010	LB-12	Winter flounder	ES5	12.96
4/7/2010	NB-4	Atlantic menhaden	PYS	5.04
4/7/2010	NB-7	Fourbeard rockling	Egg	6.61
4/7/2010	AK-3	Fourbeard rockling	Egg	37.49
4/7/2010	NB-6	Fourbeard rockling	Egg	5.60
4/7/2010	AK-2	Grubby	YS	8.98
4/7/2010	NB-7	Grubby	PYS	26.46
4/7/2010	AK-3	Grubby	PYS	85.69
4/7/2010	AK-2	Grubby	PYS	80.84
4/7/2010	NB-6	Grubby	PYS	140.02
4/7/2010	NB-8	Grubby	PYS	30.89
4/7/2010	NB-4	Grubby	PYS	5.04
4/7/2010	AK-2	Rock gunnel	PYS	4.49
4/7/2010	AK-3	Summer flounder	PYS	10.71
4/7/2010	AK-2	Winter flounder	UID	49.40
4/7/2010	NB-6	Winter flounder	UID	5.60
4/7/2010	NB-8	Winter flounder	UID	8.83
4/7/2010	NB-4	Winter flounder	UID	10.07
4/7/2010	NB-7	Winter flounder	ST1	13.23
4/7/2010	AK-3	Winter flounder	ST1	32.13
4/7/2010	AK-2	Winter flounder	ST1	13.47
4/7/2010	NB-6	Winter flounder	ST1	39.21
4/7/2010	NB-8	Winter flounder	ST1	22.07
4/7/2010	NB-4	Winter flounder	ST1	20.15
4/7/2010	NB-7	Winter flounder	ST2	85.99

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Sample Date	Station	Common Name	Life Stage	Density
4/7/2010	AK-2	Winter flounder	ST2	53.89
4/7/2010	NB-8	Winter flounder	ST2	17.65
4/7/2010	NB-4	Winter flounder	ST2	55.41
4/7/2010	NB-7	Winter flounder	ST3	6.61
4/7/2010	AK-3	Winter flounder	ST3	5.36
4/7/2010	AK-2	Winter flounder	ST3	40.42
4/7/2010	NB-6	Winter flounder	ST3	5.60
4/7/2010	NB-8	Winter flounder	ST3	8.83
4/8/2010	PJ-1	Atlantic herring	PYS	21.75
4/8/2010	SB-5	Atlantic herring	PYS	11.55
4/8/2010	SB-5	Atlantic tomcod	PYS	7.70
4/8/2010	SB-4	Fourbeard rockling	Egg	4.46
4/8/2010	SB-3	Fourbeard rockling	Egg	56.57
4/8/2010	SB-7	Fourbeard rockling	Egg	46.32
4/8/2010	SB-5	Fourbeard rockling	Egg	242.62
4/8/2010	SB-6	Cods and Haddocks	Egg	23.31
4/8/2010	SB-4	Cods and Haddocks	Egg	8.92
4/8/2010	SB-3	Cods and Haddocks	Egg	16.97
4/8/2010	SB-7	Cods and Haddocks	Egg	39.71
4/8/2010	SB-4	Grubby	YS	17.84
4/8/2010	SB-3	Grubby	YS	11.31
4/8/2010	PJ-1	Grubby	YS	10.88
4/8/2010	SB-5	Grubby	YS	30.81
4/8/2010	SB-6	Grubby	PYS	18.65
4/8/2010	SB-4	Grubby	PYS	102.55
4/8/2010	SB-3	Grubby	PYS	33.94
4/8/2010	PJ-1	Grubby	PYS	81.57
4/8/2010	SB-7	Grubby	PYS	39.71
4/8/2010	SB-5	Grubby	PYS	519.90
4/8/2010	SB-5	Rock gunnel	PYS	7.70
4/8/2010	SB-6	Winter flounder	UID	9.33
4/8/2010	PJ-1	Winter flounder	UID	32.63
4/8/2010	SB-5	Winter flounder	UID	11.55
4/8/2010	SB-6	Winter flounder	ST1	69.94
4/8/2010	SB-4	Winter flounder	ST1	53.51
4/8/2010	SB-5	Winter flounder	ST1	3.85
4/8/2010	SB-6	Winter flounder	ST2	97.92
4/8/2010	SB-4	Winter flounder	ST2	35.67
4/8/2010	SB-3	Winter flounder	ST2	16.97
4/8/2010	PJ-1	Winter flounder	ST2	16.31
4/8/2010	SB-5	Winter flounder	ST2	7.70

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Sample Date	Station	Common Name	Life Stage	Density
4/8/2010	SB-6	Winter flounder	ST3	890.58
4/8/2010	SB-4	Winter flounder	ST3	249.69
4/8/2010	SB-3	Winter flounder	ST3	135.77
4/8/2010	PJ-1	Winter flounder	ST3	27.19
4/8/2010	SB-5	Winter flounder	ST3	61.62
4/9/2010	LB-3	American sandlance	PYS	12.35
4/9/2010	LB-3	Atlantic herring	PYS	12.35
4/9/2010	LB-8	Fourbeard rockling	Egg	10.68
4/9/2010	LB-8	Cods and Haddocks	Egg	21.36
4/9/2010	LB-3	Cods and Haddocks	Egg	43.24
4/9/2010	LB-5	Cods and Haddocks	Egg	78.01
4/9/2010	LB-8	Grubby	YS	10.68
4/9/2010	LB-3	Grubby	YS	12.35
4/9/2010	LB-2	Grubby	YS	7.37
4/9/2010	LB-8	Grubby	PYS	58.75
4/9/2010	LB-3	Grubby	PYS	2,680.91
4/9/2010	LB-5	Grubby	PYS	1,308.84
4/9/2010	LB-6	Grubby	PYS	53.89
4/9/2010	LB-2	Grubby	PYS	103.23
4/9/2010	LB-2	Rock gunnel	PYS	14.75
4/9/2010	LB-3	Summer flounder	PYS	12.35
4/9/2010	LB-5	Summer flounder	PYS	8.67
4/9/2010	LB-8	Winter flounder	UID	32.04
4/9/2010	LB-5	Winter flounder	UID	8.67
4/9/2010	LB-6	Winter flounder	UID	7.70
4/9/2010	LB-8	Winter flounder	ST1	42.73
4/9/2010	LB-3	Winter flounder	ST1	24.71
4/9/2010	LB-5	Winter flounder	ST1	43.34
4/9/2010	LB-8	Winter flounder	ST2	74.77
4/9/2010	LB-3	Winter flounder	ST2	37.06
4/9/2010	LB-5	Winter flounder	ST2	69.34
4/9/2010	LB-8	Winter flounder	ST3	432.60
4/9/2010	LB-3	Winter flounder	ST3	420.05
4/9/2010	LB-5	Winter flounder	ST3	771.44
4/9/2010	LB-6	Winter flounder	ST3	92.38
4/9/2010	LB-2	Winter flounder	ST3	14.75
4/19/2010	LB-7	Fourbeard rockling	Egg	5.79
4/19/2010	LB-3	Fourbeard rockling	Egg	5.93
4/19/2010	LB-8	Cods and Haddocks	Egg	27.89
4/19/2010	LB-7	Cods and Haddocks	Egg	17.38
4/19/2010	LB-3	Cods and Haddocks	Egg	47.45

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Sample Date	Station	Common Name	Life Stage	Density
4/19/2010	LB-9	Cods and Haddocks	Egg	9.42
4/19/2010	LB-14	Cods and Haddocks	Egg	11.20
4/19/2010	PJ-2	Cods and Haddocks	Egg	14.59
4/19/2010	LB-9	Grubby	YS	9.42
4/19/2010	LB-8	Grubby	PYS	94.84
4/19/2010	LB-7	Grubby	PYS	196.96
4/19/2010	LB-3	Grubby	PYS	41.52
4/19/2010	LB-9	Grubby	PYS	221.36
4/19/2010	LB-14	Grubby	PYS	3.73
4/19/2010	PJ-2	Grubby	PYS	68.11
4/19/2010	LB-14	Winter flounder	UID	3.73
4/19/2010	PJ-2	Winter flounder	UID	4.86
4/19/2010	LB-8	Winter flounder	ST1	16.74
4/19/2010	LB-3	Winter flounder	ST1	17.79
4/19/2010	LB-8	Winter flounder	ST2	106.00
4/19/2010	LB-7	Winter flounder	ST2	23.17
4/19/2010	LB-3	Winter flounder	ST2	112.70
4/19/2010	LB-8	Winter flounder	ST3	284.53
4/19/2010	LB-7	Winter flounder	ST3	318.61
4/19/2010	LB-3	Winter flounder	ST3	1,026.15
4/19/2010	LB-9	Winter flounder	ST3	127.16
4/19/2010	LB-14	Winter flounder	ST3	26.12
4/19/2010	PJ-2	Winter flounder	ST3	116.75
4/20/2010	LB-16	American sandlance	PYS	5.28
4/20/2010	LB-10	Fourbeard rockling	Egg	7.68
4/20/2010	LB-16	Fourbeard rockling	Egg	5.28
4/20/2010	LB-2	Cods and Haddocks	Egg	29.46
4/20/2010	LB-10	Cods and Haddocks	Egg	30.73
4/20/2010	LB-16	Cods and Haddocks	Egg	5.28
4/20/2010	LB-1	Cods and Haddocks	Egg	14.50
4/20/2010	LBD-15	Cods and Haddocks	Egg	32.14
4/20/2010	LB-10	Grubby	YS	11.52
4/20/2010	LB-1	Grubby	YS	5.44
4/20/2010	LBD-15	Grubby	YS	5.36
4/20/2010	LB-2	Grubby	PYS	68.74
4/20/2010	LB-10	Grubby	PYS	57.62
4/20/2010	LB-16	Grubby	PYS	79.25
4/20/2010	LBD-17	Grubby	PYS	33.82
4/20/2010	LB-1	Grubby	PYS	21.75
4/20/2010	LBD-15	Grubby	PYS	139.25
4/20/2010	LB-2	Winter flounder	ST1	88.37

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Sample Date	Station	Common Name	Life Stage	Density
4/20/2010	LB-10	Winter flounder	ST1	23.05
4/20/2010	LBD-17	Winter flounder	ST1	16.91
4/20/2010	LB-1	Winter flounder	ST1	32.62
4/20/2010	LB-2	Winter flounder	ST2	9.82
4/20/2010	LB-10	Winter flounder	ST2	34.57
4/20/2010	LB-16	Winter flounder	ST2	21.13
4/20/2010	LBD-17	Winter flounder	ST2	4.23
4/20/2010	LB-1	Winter flounder	ST2	16.31
4/20/2010	LB-2	Winter flounder	ST3	108.01
4/20/2010	LB-10	Winter flounder	ST3	293.84
4/20/2010	LB-16	Winter flounder	ST3	31.70
4/20/2010	LBD-17	Winter flounder	ST3	38.04
4/20/2010	LB-1	Winter flounder	ST3	59.81
4/20/2010	LBD-15	Winter flounder	ST3	32.14
4/20/2010	LB-16	Winter flounder	ES4	5.28
4/21/2010	AK-3	Atlantic tomcod	PYS	4.75
4/21/2010	AK-3	Grubby	PYS	142.37
4/21/2010	AK-2	Grubby	PYS	42.12
4/21/2010	NB-6	Grubby	PYS	55.43
4/21/2010	NB-8	Grubby	PYS	4.55
4/21/2010	NB-4	Grubby	PYS	46.69
4/21/2010	NB-7	Grubby	PYS	13.04
4/21/2010	AK-3	Winter flounder	ST2	4.75
4/21/2010	NB-4	Winter flounder	ST2	46.69
4/21/2010	NB-7	Winter flounder	ST2	52.18
4/21/2010	AK-3	Winter flounder	ST3	80.68
4/21/2010	AK-2	Winter flounder	ST3	37.44
4/21/2010	NB-6	Winter flounder	ST3	40.31
4/21/2010	NB-4	Winter flounder	ST3	46.69
4/21/2010	NB-7	Winter flounder	ST3	58.70
4/22/2010	LB-12	Grubby	YS	6.49
4/22/2010	LB-5	Grubby	PYS	13.66
4/22/2010	LB-6	Grubby	PYS	31.29
4/22/2010	LB-12	Grubby	PYS	58.40
4/22/2010	LB-4	Grubby	PYS	254.41
4/22/2010	LB-13	Grubby	PYS	42.54
4/22/2010	LB-6	Rock gunnel	PYS	20.86
4/22/2010	LB-4	Rock gunnel	PYS	5.09
4/22/2010	LB-5	Windowpane	Egg	355.20
4/22/2010	LB-6	Windowpane	Egg	135.60
4/22/2010	LB-12	Windowpane	Egg	58.40

Appendix B. Ichthyoplankton (epibenthic sled) life stage densities (Number per 1,000 m^3) by date and station collected during the 20 Aquatic Biological Survey. ES1 to ES5 are winter flounder egg stages 1-5, WFNVE are winter flounder non-viable eggs, ST1 to ST4 are winter flounder larval life stages 1-4, YS is yolk-sac larvae, PYS is post yolk-sac larvae, JUV is juveniles, and UID is unidentified larval lifestage.

Sample Date	Station	Common Name	Life Stage	Density
4/22/2010	LB-4	Windowpane	Egg	20.35
4/22/2010	LB-13	Windowpane	Egg	48.62
4/22/2010	LB-12	Winter flounder	ST1	32.45
4/22/2010	LB-5	Winter flounder	ST2	6.83
4/22/2010	LB-12	Winter flounder	ST2	6.49
4/22/2010	LB-13	Winter flounder	ST2	6.08
4/22/2010	LB-5	Winter flounder	ST3	464.50
4/22/2010	LB-6	Winter flounder	ST3	135.60
4/22/2010	LB-12	Winter flounder	ST3	259.57
4/22/2010	LB-4	Winter flounder	ST3	508.83
4/22/2010	LB-13	Winter flounder	ST3	814.33
4/22/2010	LB-4	Winter flounder	ES1	5.09
4/22/2010	LB-13	Winter flounder	ES1	12.15
4/22/2010	LB-13	Winter flounder	ES3	6.08
4/22/2010	LB-13	Winter flounder	ES4	18.23
4/23/2010	SB-4	Atlantic tomcod	JUV	29.66
4/23/2010	SB-4	Fourbeard rockling	Egg	13.18
4/23/2010	SB-3	Fourbeard rockling	Egg	6.02
4/23/2010	SB-6	Grubby	YS	12.04
4/23/2010	SB-3	Grubby	YS	66.17
4/23/2010	SB-5	Grubby	PYS	17.21
4/23/2010	PJ-1	Grubby	PYS	18.90
4/23/2010	SB-6	Grubby	PYS	168.55
4/23/2010	SB-4	Grubby	PYS	39.54
4/23/2010	SB-5	Windowpane	Egg	60.24
4/23/2010	PJ-1	Windowpane	Egg	6.30
4/23/2010	SB-6	Windowpane	Egg	66.21
4/23/2010	SB-4	Windowpane	Egg	65.91
4/23/2010	SB-3	Windowpane	Egg	72.18
4/23/2010	PJ-1	Winter flounder	UID	12.60
4/23/2010	PJ-1	Winter flounder	ST1	12.60
4/23/2010	SB-4	Winter flounder	ST1	9.89
4/23/2010	PJ-1	Winter flounder	ST2	25.20
4/23/2010	SB-4	Winter flounder	ST2	24.71
4/23/2010	SB-5	Winter flounder	ST3	51.63
4/23/2010	PJ-1	Winter flounder	ST3	151.19
4/23/2010	SB-6	Winter flounder	ST3	487.58
4/23/2010	SB-4	Winter flounder	ST3	49.43
4/23/2010	SB-3	Winter flounder	ST3	36.09
4/23/2010	SB-6	Winter flounder	ST4	6.02
4/23/2010	SB-4	Winter flounder	ST4	4.94

Appendix B. Ichthyoplankton (epibenthic sled) life stage densities (Number per 1,000 m^3) by date and station collected during the 20 Aquatic Biological Survey. ES1 to ES5 are winter flounder egg stages 1-5, WFNVE are winter flounder non-viable eggs, ST1 to ST4 are winter flounder larval life stages 1-4, YS is yolk-sac larvae, PYS is post yolk-sac larvae, JUV is juveniles, and UID is unidentified larval lifestage.

Sample Date	Station	Common Name	Life Stage	Density
5/3/2010	AK-3	Atlantic herring	PYS	5.57
5/3/2010	AK-2	Atlantic tomcod	JUV	13.17
5/3/2010	NB-8	Atlantic tomcod	JUV	11.46
5/3/2010	AK-2	Fourbeard rockling	Egg	6.58
5/3/2010	AK-3	Grubby	PYS	11.13
5/3/2010	AK-3	Summer flounder	JUV	5.57
5/3/2010	AK-2	Windowpane	Egg	13.17
5/3/2010	NB-8	Windowpane	Egg	22.93
5/3/2010	AK-3	Winter flounder	ST3	61.23
5/3/2010	AK-2	Winter flounder	ST3	19.75
5/3/2010	NB-8	Winter flounder	ST3	45.86
5/3/2010	NB-7	Winter flounder	ST3	12.68
5/3/2010	AK-3	Winter flounder	ST4	72.37
5/3/2010	AK-2	Winter flounder	ST4	6.58
5/3/2010	NB-8	Winter flounder	ST4	22.93
5/4/2010	LB-3	Atlantic menhaden	Egg	23.09
5/4/2010	LB-6	Atlantic menhaden	Egg	46.06
5/4/2010	LB-7	Grubby	PYS	7.89
5/4/2010	LB-9	Grubby	PYS	9.46
5/4/2010	LB-8	Windowpane	Egg	978.23
5/4/2010	LB-7	Windowpane	Egg	189.45
5/4/2010	LB-3	Windowpane	Egg	1,338.93
5/4/2010	LB-5	Windowpane	Egg	704.49
5/4/2010	LB-6	Windowpane	Egg	299.39
5/4/2010	LB-9	Windowpane	Egg	340.57
5/4/2010	LB-9	Winter flounder	UID	4.73
5/4/2010	LB-9	Winter flounder	ST2	14.19
5/4/2010	LB-8	Winter flounder	ST3	37.05
5/4/2010	LB-7	Winter flounder	ST3	149.98
5/4/2010	LB-3	Winter flounder	ST3	216.42
5/4/2010	LB-5	Winter flounder	ST3	154.99
5/4/2010	LB-6	Winter flounder	ST3	460.61
5/4/2010	LB-9	Winter flounder	ST3	33.11
5/4/2010	LB-6	Winter flounder	ST4	28.79
5/4/2010	LB-5	Wrasses	Egg	28.18
5/4/2010	LB-9	Wrasses	Egg	9.46
5/5/2010	LB-16	Atlantic menhaden	Egg	14.83
5/5/2010	LBD-17	Atlantic menhaden	Egg	9.33
5/5/2010	LB-13	Atlantic menhaden	Egg	107.69
5/5/2010	LB-12	Atlantic menhaden	Egg	67.81
5/5/2010	LBD-17	Feather blenny	PYS	14.00

Appendix B. Ichthyoplankton (epibenthic sled) life stage densities (Number per 1,000 m^3) by date and station collected during the 20 Aquatic Biological Survey. ES1 to ES5 are winter flounder egg stages 1-5, WFNVE are winter flounder non-viable eggs, ST1 to ST4 are winter flounder larval life stages 1-4, YS is yolk-sac larvae, PYS is post yolk-sac larvae, JUV is juveniles, and UID is unidentified larval lifestage.

Sample Date	Station	Common Name	Life Stage	Density
5/5/2010	LB-4	Fourbeard rockling	Egg	6.41
5/5/2010	LBD-17	Grubby	PYS	4.67
5/5/2010	LB-4	Grubby	PYS	12.82
5/5/2010	LB-16	Windowpane	Egg	177.91
5/5/2010	LBD-17	Windowpane	Egg	79.34
5/5/2010	LB-13	Windowpane	Egg	628.17
5/5/2010	LB-4	Windowpane	Egg	391.12
5/5/2010	LB-12	Windowpane	Egg	361.68
5/5/2010	LB-16	Windowpane	PYS	7.41
5/5/2010	LB-12	Windowpane	PYS	5.65
5/5/2010	LB-16	Winter flounder	ST2	14.83
5/5/2010	LBD-17	Winter flounder	ST2	14.00
5/5/2010	LB-13	Winter flounder	ST2	17.95
5/5/2010	LB-12	Winter flounder	ST2	5.65
5/5/2010	PJ-2	Winter flounder	ST2	22.33
5/5/2010	LB-16	Winter flounder	ST3	74.13
5/5/2010	LBD-17	Winter flounder	ST3	135.34
5/5/2010	LB-13	Winter flounder	ST3	233.32
5/5/2010	LB-4	Winter flounder	ST3	307.77
5/5/2010	LB-12	Winter flounder	ST3	79.12
5/5/2010	PJ-2	Winter flounder	ST3	11.16
5/5/2010	LB-16	Wrasses	Egg	22.24
5/5/2010	LBD-17	Wrasses	Egg	9.33
5/5/2010	LB-13	Wrasses	Egg	35.90
5/5/2010	LB-4	Wrasses	Egg	6.41
5/5/2010	LB-12	Wrasses	Egg	11.30
5/5/2010	PJ-2	Wrasses	Egg	5.58
5/6/2010	SB-4	Atlantic menhaden	Egg	122.75
5/6/2010	SB-6	Atlantic menhaden	Egg	8.84
5/6/2010	PJ-1	Atlantic menhaden	Egg	63.96
5/6/2010	SB-5	Atlantic tomcod	JUV	24.76
5/6/2010	SB-4	Grubby	PYS	5.11
5/6/2010	SB-3	Windowpane	Egg	511.20
5/6/2010	SB-4	Windowpane	Egg	531.93
5/6/2010	SB-6	Windowpane	Egg	291.61
5/6/2010	SB-7	Windowpane	Egg	176.25
5/6/2010	SB-5	Windowpane	Egg	445.72
5/6/2010	PJ-1	Windowpane	Egg	364.58
5/6/2010	SB-3	Winter flounder	ST3	65.26
5/6/2010	SB-4	Winter flounder	ST3	56.26
5/6/2010	SB-6	Winter flounder	ST3	44.18

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Sample Date	Station	Common Name	Life Stage	Density
5/6/2010	SB-7	Winter flounder	ST3	120.59
5/6/2010	SB-5	Winter flounder	ST3	12.38
5/6/2010	PJ-1	Winter flounder	ST3	38.38
5/6/2010	SB-6	Winter flounder	ST4	26.51
5/6/2010	SB-7	Winter flounder	ST4	9.28
5/6/2010	SB-5	Winter flounder	ST4	12.38
5/6/2010	PJ-1	Winter flounder	ST4	12.79
5/6/2010	SB-3	Wrasses	Egg	10.88
5/6/2010	SB-4	Wrasses	Egg	40.92
5/6/2010	SB-6	Wrasses	Egg	26.51
5/6/2010	SB-7	Wrasses	Egg	9.28
5/6/2010	SB-5	Wrasses	Egg	12.38
5/6/2010	PJ-1	Wrasses	Egg	63.96
5/7/2010	LB-14	Atlantic menhaden	Egg	20.62
5/7/2010	LB-1	Atlantic menhaden	Egg	8.16
5/7/2010	LB-10	Atlantic menhaden	Egg	62.33
5/7/2010	LBD-15	Grubby	PYS	30.18
5/7/2010	LB-14	Windowpane	Egg	123.73
5/7/2010	LB-2	Windowpane	Egg	58.16
5/7/2010	LBD-15	Windowpane	Egg	60.35
5/7/2010	LB-1	Windowpane	Egg	187.69
5/7/2010	LB-10	Windowpane	Egg	280.48
5/7/2010	LB-10	Windowpane	PYS	5.19
5/7/2010	LB-1	Winter flounder	ST2	6.12
5/7/2010	LB-14	Winter flounder	ST3	61.86
5/7/2010	LB-2	Winter flounder	ST3	49.85
5/7/2010	LBD-15	Winter flounder	ST3	30.18
5/7/2010	LB-1	Winter flounder	ST3	42.84
5/7/2010	LB-10	Winter flounder	ST3	36.36
5/7/2010	LB-2	Wrasses	Egg	8.31
5/7/2010	LBD-15	Wrasses	Egg	15.09
5/7/2010	LB-1	Wrasses	Egg	32.64
5/7/2010	LB-10	Wrasses	Egg	10.39
5/17/2010	LB-10	Atlantic menhaden	Egg	10.60
5/17/2010	LB-1	Atlantic menhaden	Egg	38.83
5/17/2010	LBD-17	Atlantic menhaden	Egg	6.88
5/17/2010	LB-4	Atlantic menhaden	Egg	46.90
5/17/2010	LB-12	Atlantic menhaden	Egg	27.00
5/17/2010	LB-2	Atlantic menhaden	Egg	11.17
5/17/2010	LB-9	Atlantic menhaden	Egg	5.91
5/17/2010	LB-12	Atlantic silverside	PYS	13.50

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Sample Date	Station	Common Name	Life Stage	Density
5/17/2010	LB-1	Bay anchovy	Egg	38.83
5/17/2010	LBD-17	Bay anchovy	Egg	6.88
5/17/2010	LB-13	Bay anchovy	Egg	505.92
5/17/2010	LB-4	Bay anchovy	Egg	140.69
5/17/2010	LB-12	Bay anchovy	Egg	67.50
5/17/2010	LB-2	Bay anchovy	Egg	312.87
5/17/2010	LB-9	Bay anchovy	Egg	17.72
5/17/2010	LB-14	Bay anchovy	Egg	120.31
5/17/2010	LB-12	Northern pipefish	PYS	6.75
5/17/2010	LB-4	Searobin species	Egg	15.63
5/17/2010	LB-12	Searobin species	Egg	20.25
5/17/2010	LB-10	Windowpane	Egg	127.26
5/17/2010	LB-1	Windowpane	Egg	563.06
5/17/2010	LBD-15	Windowpane	Egg	139.19
5/17/2010	LB-16	Windowpane	Egg	80.52
5/17/2010	LBD-17	Windowpane	Egg	34.41
5/17/2010	LB-13	Windowpane	Egg	284.58
5/17/2010	LB-4	Windowpane	Egg	156.33
5/17/2010	LB-12	Windowpane	Egg	114.75
5/17/2010	LB-2	Windowpane	Egg	139.67
5/17/2010	LB-9	Windowpane	Egg	100.41
5/17/2010	LB-14	Windowpane	Egg	207.81
5/17/2010	LB-14	Windowpane	YS	16.41
5/17/2010	LB-13	Windowpane	PYS	7.90
5/17/2010	LB-12	Windowpane	PYS	13.50
5/17/2010	LB-14	Windowpane	PYS	5.47
5/17/2010	LB-14	Winter flounder	ST2	10.94
5/17/2010	LB-10	Winter flounder	ST3	15.91
5/17/2010	LB-16	Winter flounder	ST3	5.03
5/17/2010	LB-4	Winter flounder	ST3	70.35
5/17/2010	LB-12	Winter flounder	ST3	13.50
5/17/2010	LB-2	Winter flounder	ST3	11.17
5/17/2010	LB-9	Winter flounder	ST3	5.91
5/17/2010	LB-14	Winter flounder	ST3	10.94
5/17/2010	LB-10	Wrasses	Egg	42.42
5/17/2010	LB-1	Wrasses	Egg	252.40
5/17/2010	LBD-15	Wrasses	Egg	214.14
5/17/2010	LB-16	Wrasses	Egg	171.10
5/17/2010	LB-13	Wrasses	Egg	126.48
5/17/2010	LB-4	Wrasses	Egg	343.92
5/17/2010	LB-12	Wrasses	Egg	114.75

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Sample Date	Station	Common Name	Life Stage	Density
5/17/2010	LB-2	Wrasses	Egg	83.80
5/17/2010	LB-9	Wrasses	Egg	59.06
5/17/2010	LB-14	Wrasses	Egg	131.25
5/18/2010	SB-5	Atlantic herring	JUV	5.24
5/18/2010	AK-3	Atlantic silverside	YS	9.70
5/18/2010	SB-5	Bay anchovy	Egg	13.97
5/18/2010	NB-8	Bay anchovy	Egg	9.03
5/18/2010	NB-7	Bay anchovy	Egg	6.93
5/18/2010	PJ-1	Bay anchovy	Egg	20.94
5/18/2010	SB-5	Windowpane	Egg	55.86
5/18/2010	SB-7	Windowpane	Egg	86.23
5/18/2010	AK-2	Windowpane	Egg	5.30
5/18/2010	AK-3	Windowpane	Egg	29.09
5/18/2010	NB-8	Windowpane	Egg	4.52
5/18/2010	NB-4	Windowpane	Egg	4.96
5/18/2010	PJ-1	Windowpane	Egg	209.41
5/18/2010	PJ-2	Windowpane	Egg	78.66
5/18/2010	SB-5	Windowpane	PYS	5.24
5/18/2010	SB-7	Windowpane	PYS	7.19
5/18/2010	NB-4	Windowpane	PYS	4.96
5/18/2010	PJ-1	Windowpane	PYS	10.47
5/18/2010	SB-5	Winter flounder	ST3	26.19
5/18/2010	SB-7	Winter flounder	ST3	14.37
5/18/2010	AK-2	Winter flounder	ST3	21.20
5/18/2010	AK-3	Winter flounder	ST3	24.24
5/18/2010	NB-8	Winter flounder	ST3	13.55
5/18/2010	PJ-1	Winter flounder	ST3	10.47
5/18/2010	PJ-2	Winter flounder	ST3	5.24
5/18/2010	NB-8	Winter flounder	ST4	4.52
5/18/2010	SB-5	Wrasses	Egg	41.90
5/18/2010	SB-7	Wrasses	Egg	71.86
5/18/2010	AK-2	Wrasses	Egg	68.90
5/18/2010	AK-3	Wrasses	Egg	164.86
5/18/2010	NB-8	Wrasses	Egg	54.21
5/18/2010	NB-4	Wrasses	Egg	104.08
5/18/2010	NB-7	Wrasses	Egg	90.08
5/18/2010	PJ-1	Wrasses	Egg	209.41
5/18/2010	PJ-2	Wrasses	Egg	36.71
5/19/2010	LB-8	Atlantic menhaden	Egg	13.74
5/19/2010	LB-6	Atlantic menhaden	Egg	208.75
5/19/2010	SB-6	Atlantic menhaden	Egg	8.09

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Sample Date	Station	Common Name	Life Stage	Density
5/19/2010	LB-8	Bay anchovy	Egg	13.74
5/19/2010	LB-3	Bay anchovy	Egg	11.78
5/19/2010	LB-5	Bay anchovy	Egg	351.50
5/19/2010	LB-6	Bay anchovy	Egg	1,287.27
5/19/2010	SB-4	Bay anchovy	Egg	13.19
5/19/2010	SB-3	Bay anchovy	Egg	37.86
5/19/2010	LB-8	Grubby	PYS	6.87
5/19/2010	LB-7	Searobin species	Egg	7.21
5/19/2010	LB-5	Searobin species	Egg	351.50
5/19/2010	LB-6	Searobin species	Egg	487.08
5/19/2010	LB-8	Windowpane	Egg	219.88
5/19/2010	LB-7	Windowpane	Egg	64.86
5/19/2010	LB-3	Windowpane	Egg	235.59
5/19/2010	LB-5	Windowpane	Egg	1,640.31
5/19/2010	LB-6	Windowpane	Egg	1,287.27
5/19/2010	SB-6	Windowpane	Egg	56.63
5/19/2010	SB-4	Windowpane	Egg	290.29
5/19/2010	SB-3	Windowpane	Egg	81.13
5/19/2010	LB-7	Windowpane	YS	7.21
5/19/2010	SB-4	Windowpane	YS	6.60
5/19/2010	LB-5	Windowpane	PYS	14.65
5/19/2010	SB-6	Windowpane	PYS	76.86
5/19/2010	SB-4	Windowpane	PYS	6.60
5/19/2010	SB-6	Winter flounder	ST2	4.05
5/19/2010	SB-4	Winter flounder	ST2	6.60
5/19/2010	LB-8	Winter flounder	ST3	6.87
5/19/2010	LB-7	Winter flounder	ST3	64.86
5/19/2010	LB-3	Winter flounder	ST3	5.89
5/19/2010	LB-5	Winter flounder	ST3	29.29
5/19/2010	LB-6	Winter flounder	ST3	6.52
5/19/2010	SB-6	Winter flounder	ST3	8.09
5/19/2010	SB-4	Winter flounder	ST3	19.79
5/19/2010	SB-3	Winter flounder	ST3	5.41
5/19/2010	LB-5	Winter flounder	ST4	14.65
5/19/2010	LB-8	Wrasses	Egg	68.71
5/19/2010	LB-7	Wrasses	Egg	93.68
5/19/2010	LB-3	Wrasses	Egg	141.36
5/19/2010	LB-5	Wrasses	Egg	878.74
5/19/2010	LB-6	Wrasses	Egg	417.49
5/19/2010	SB-6	Wrasses	Egg	97.08
5/19/2010	SB-4	Wrasses	Egg	277.09

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Sample Date	Station	Common Name	Life Stage	Density
5/19/2010	SB-3	Wrasses	Egg	97.36
6/1/2010	AK-3	Atlantic menhaden	Egg	1,141.71
6/1/2010	NB-8	Atlantic menhaden	Egg	1,201.57
6/1/2010	NB-4	Atlantic menhaden	Egg	88.79
6/1/2010	PJ-1	Atlantic menhaden	Egg	715.50
6/1/2010	PJ-2	Atlantic menhaden	Egg	538.76
6/1/2010	SB-5	Atlantic menhaden	Egg	443.55
6/1/2010	AK-3	Atlantic menhaden	PYS	30.58
6/1/2010	NB-8	Atlantic menhaden	PYS	9.10
6/1/2010	NB-4	Atlantic menhaden	PYS	5.55
6/1/2010	PJ-1	Atlantic menhaden	UID	27.95
6/1/2010	NB-8	Atlantic silverside	YS	4.55
6/1/2010	AK-3	Atlantic silverside	PYS	40.78
6/1/2010	NB-4	Atlantic silverside	PYS	22.20
6/1/2010	SB-7	Bay anchovy	Egg	5,501.36
6/1/2010	AK-2	Bay anchovy	Egg	16,604.21
6/1/2010	AK-3	Bay anchovy	Egg	13,374.37
6/1/2010	NB-8	Bay anchovy	Egg	51,667.30
6/1/2010	NB-4	Bay anchovy	Egg	9,411.25
6/1/2010	NB-7	Bay anchovy	Egg	11,021.30
6/1/2010	PJ-1	Bay anchovy	Egg	7,423.28
6/1/2010	PJ-2	Bay anchovy	Egg	5,746.79
6/1/2010	SB-5	Bay anchovy	Egg	9,092.72
6/1/2010	NB-7	Bay anchovy	PYS	221.98
6/1/2010	PJ-1	Bay anchovy	PYS	5.59
6/1/2010	PJ-2	Bay anchovy	PYS	67.35
6/1/2010	NB-8	Gobies	PYS	4.55
6/1/2010	AK-2	Northern pipefish	PYS	5.58
6/1/2010	NB-8	Northern pipefish	PYS	9.10
6/1/2010	NB-4	Northern pipefish	PYS	5.55
6/1/2010	PJ-2	Northern pipefish	PYS	11.22
6/1/2010	SB-7	Windowpane	Egg	468.20
6/1/2010	PJ-1	Windowpane	Egg	268.31
6/1/2010	SB-5	Windowpane	Egg	332.66
6/1/2010	SB-7	Windowpane	PYS	14.63
6/1/2010	AK-2	Windowpane	PYS	5.58
6/1/2010	PJ-1	Windowpane	PYS	11.18
6/1/2010	PJ-2	Windowpane	PYS	5.61
6/1/2010	SB-5	Windowpane	PYS	6.93
6/1/2010	SB-7	Winter flounder	ST3	14.63
6/1/2010	AK-2	Winter flounder	ST3	5.58

Appendix B. Ichthyoplankton (epibenthic sled) life stage densities (Number per 1,000 m^3) by date and station collected during the 20 Aquatic Biological Survey. ES1 to ES5 are winter flounder egg stages 1-5, WFNVE are winter flounder non-viable eggs, ST1 to ST4 are winter flounder larval life stages 1-4, YS is yolk-sac larvae, PYS is post yolk-sac larvae, JUV is juveniles, and UID is unidentified larval lifestage.

Sample Date	Station	Common Name	Life Stage	Density
6/1/2010	NB-8	Winter flounder	ST3	4.55
6/1/2010	NB-8	Winter flounder	ST4	4.55
6/1/2010	SB-5	Winter flounder	ST4	6.93
6/1/2010	SB-7	Wrasses	Egg	468.20
6/1/2010	AK-2	Wrasses	Egg	1,963.94
6/1/2010	AK-3	Wrasses	Egg	1,141.71
6/1/2010	NB-8	Wrasses	Egg	5,407.04
6/1/2010	NB-4	Wrasses	Egg	355.14
6/1/2010	NB-7	Wrasses	Egg	338.08
6/1/2010	PJ-1	Wrasses	Egg	626.06
6/1/2010	PJ-2	Wrasses	Egg	628.55
6/1/2010	SB-5	Wrasses	Egg	1,108.87
6/2/2010	LB-10	Atlantic menhaden	Egg	505.85
6/2/2010	LB-1	Atlantic menhaden	Egg	102.92
6/2/2010	LB-16	Atlantic menhaden	Egg	141.49
6/2/2010	LBD-17	Atlantic menhaden	Egg	162.15
6/2/2010	LB-13	Atlantic menhaden	Egg	181.09
6/2/2010	LB-14	Atlantic menhaden	Egg	457.03
6/2/2010	LB-10	Atlantic menhaden	YS	40.65
6/2/2010	LB-1	Atlantic menhaden	YS	9.65
6/2/2010	LBD-15	Atlantic menhaden	YS	4.71
6/2/2010	LB-12	Atlantic menhaden	YS	6.10
6/2/2010	LB-2	Atlantic menhaden	YS	4.75
6/2/2010	LB-14	Atlantic menhaden	YS	9.52
6/2/2010	LB-10	Atlantic menhaden	PYS	13.55
6/2/2010	LBD-15	Atlantic menhaden	PYS	4.71
6/2/2010	LBD-15	Atlantic menhaden	UID	4.71
6/2/2010	LBD-17	Atlantic menhaden	UID	129.72
6/2/2010	LB-4	Atlantic menhaden	UID	21.90
6/2/2010	LB-10	Atlantic silverside	PYS	6.77
6/2/2010	LB-4	Atlantic silverside	PYS	49.28
6/2/2010	LB-10	Bay anchovy	Egg	5,636.56
6/2/2010	LB-1	Bay anchovy	Egg	6,793.03
6/2/2010	LBD-15	Bay anchovy	Egg	6,775.71
6/2/2010	LB-16	Bay anchovy	Egg	12,168.46
6/2/2010	LBD-17	Bay anchovy	Egg	2,010.70
6/2/2010	LB-13	Bay anchovy	Egg	10,231.31
6/2/2010	LB-4	Bay anchovy	Egg	3,854.54
6/2/2010	LB-12	Bay anchovy	Egg	3,662.22
6/2/2010	LB-2	Bay anchovy	Egg	6,466.14
6/2/2010	LB-14	Bay anchovy	Egg	17,062.47

Appendix B. Ichthyoplankton (epibenthic sled) life stage densities (Number per 1,000 m^3) by date and station collected during the 20 Aquatic Biological Survey. ES1 to ES5 are winter flounder egg stages 1-5, WFNVE are winter flounder non-viable eggs, ST1 to ST4 are winter flounder larval life stages 1-4, YS is yolk-sac larvae, PYS is post yolk-sac larvae, JUV is juveniles, and UID is unidentified larval lifestage.

Sample Date	Station	Common Name	Life Stage	Density
6/2/2010	LB-2	Bay anchovy	YS	9.51
6/2/2010	LB-14	Bay anchovy	YS	14.28
6/2/2010	LB-10	Bay anchovy	PYS	88.07
6/2/2010	LB-16	Bay anchovy	PYS	4.42
6/2/2010	LBD-17	Bay anchovy	PYS	28.38
6/2/2010	LB-13	Bay anchovy	PYS	5.66
6/2/2010	LB-4	Bay anchovy	PYS	5.48
6/2/2010	LB-2	Bay anchovy	PYS	4.75
6/2/2010	LB-14	Bay anchovy	PYS	4.76
6/2/2010	LB-1	Northern pipefish	PYS	19.30
6/2/2010	LBD-15	Northern pipefish	PYS	4.71
6/2/2010	LB-16	Northern pipefish	PYS	4.42
6/2/2010	LB-12	Northern pipefish	PYS	12.21
6/2/2010	LB-14	Northern pipefish	PYS	4.76
6/2/2010	LB-10	Searobin species	Egg	361.32
6/2/2010	LB-1	Searobin species	Egg	823.40
6/2/2010	LBD-15	Searobin species	Egg	75.29
6/2/2010	LB-16	Searobin species	Egg	70.75
6/2/2010	LBD-17	Searobin species	Egg	97.29
6/2/2010	LB-13	Searobin species	Egg	90.54
6/2/2010	LB-4	Searobin species	Egg	175.21
6/2/2010	LB-12	Searobin species	Egg	195.32
6/2/2010	LB-2	Searobin species	Egg	190.18
6/2/2010	LB-14	Searobin species	Egg	152.34
6/2/2010	LBD-17	Searobin species	PYS	4.05
6/2/2010	LB-2	Silver hake	Egg	38.04
6/2/2010	LBD-15	Tautog	PYS	4.71
6/2/2010	LB-4	Tautog	PYS	5.48
6/2/2010	LB-10	Windowpane	Egg	1,662.06
6/2/2010	LB-1	Windowpane	Egg	823.40
6/2/2010	LBD-15	Windowpane	Egg	752.86
6/2/2010	LB-16	Windowpane	Egg	848.96
6/2/2010	LBD-17	Windowpane	Egg	908.06
6/2/2010	LB-13	Windowpane	Egg	181.09
6/2/2010	LB-4	Windowpane	Egg	525.62
6/2/2010	LB-12	Windowpane	Egg	439.47
6/2/2010	LB-2	Windowpane	Egg	532.51
6/2/2010	LB-14	Windowpane	Egg	228.52
6/2/2010	LB-10	Windowpane	YS	6.77
6/2/2010	LB-4	Windowpane	YS	5.48
6/2/2010	LBD-15	Windowpane	PYS	18.82

Appendix B. Ichthyoplankton (epibenthic sled) life stage densities (Number per 1,000 m^3) by date and station collected during the 20 Aquatic Biological Survey. ES1 to ES5 are winter flounder egg stages 1-5, WFNVE are winter flounder non-viable eggs, ST1 to ST4 are winter flounder larval life stages 1-4, YS is yolk-sac larvae, PYS is post yolk-sac larvae, JUV is juveniles, and UID is unidentified larval lifestage.

Sample Date	Station	Common Name	Life Stage	Density
6/2/2010	LB-16	Windowpane	PYS	22.11
6/2/2010	LBD-17	Windowpane	PYS	8.11
6/2/2010	LB-13	Windowpane	PYS	5.66
6/2/2010	LB-4	Windowpane	PYS	16.43
6/2/2010	LB-12	Windowpane	PYS	18.31
6/2/2010	LB-2	Windowpane	PYS	47.55
6/2/2010	LB-14	Windowpane	PYS	4.76
6/2/2010	LB-4	Winter flounder	ST3	5.48
6/2/2010	LB-12	Winter flounder	ST3	6.10
6/2/2010	LB-10	Unidentified	UID	60.97
6/2/2010	LBD-17	Unidentified	UID	60.81
6/2/2010	LB-16	Goosefish	YS	4.42
6/2/2010	LB-14	Goosefish	YS	9.52
6/2/2010	LBD-17	Goosefish	PYS	8.11
6/2/2010	LB-13	Goosefish	PYS	5.66
6/2/2010	LB-10	Wrasses	Egg	1,662.06
6/2/2010	LB-1	Wrasses	Egg	617.55
6/2/2010	LBD-15	Wrasses	Egg	978.71
6/2/2010	LB-16	Wrasses	Egg	1,273.44
6/2/2010	LBD-17	Wrasses	Egg	97.29
6/2/2010	LB-13	Wrasses	Egg	905.43
6/2/2010	LB-4	Wrasses	Egg	1,489.25
6/2/2010	LB-12	Wrasses	Egg	1,611.38
6/2/2010	LB-2	Wrasses	Egg	266.25
6/2/2010	LB-14	Wrasses	Egg	761.72
6/3/2010	LB-3	Atlantic herring	PYS	17.02
6/3/2010	LB-3	Atlantic menhaden	Egg	22.69
6/3/2010	SB-3	Atlantic menhaden	Egg	995.23
6/3/2010	SB-4	Atlantic menhaden	Egg	725.25
6/3/2010	SB-6	Atlantic menhaden	YS	32.42
6/3/2010	SB-3	Atlantic menhaden	YS	10.37
6/3/2010	SB-6	Atlantic menhaden	PYS	6.48
6/3/2010	LB-8	Atlantic menhaden	PYS	22.66
6/3/2010	LB-7	Atlantic menhaden	PYS	40.65
6/3/2010	LB-3	Atlantic menhaden	PYS	130.49
6/3/2010	LB-5	Atlantic menhaden	PYS	11.95
6/3/2010	SB-3	Atlantic menhaden	PYS	25.92
6/3/2010	LB-8	Atlantic menhaden	UID	5.66
6/3/2010	SB-4	Atlantic silverside	PYS	11.33
6/3/2010	SB-6	Bay anchovy	Egg	15,974.34
6/3/2010	LB-8	Bay anchovy	Egg	13,232.26

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Sample Date	Station	Common Name	Life Stage	Density
6/3/2010	LB-7	Bay anchovy	Egg	20,346.45
6/3/2010	LB-3	Bay anchovy	Egg	5,945.64
6/3/2010	LB-5	Bay anchovy	Egg	63,860.04
6/3/2010	LB-6	Bay anchovy	Egg	38,434.96
6/3/2010	LB-9	Bay anchovy	Egg	17,629.60
6/3/2010	SB-3	Bay anchovy	Egg	26,456.59
6/3/2010	SB-4	Bay anchovy	Egg	64,909.68
6/3/2010	LB-7	Bay anchovy	YS	17.42
6/3/2010	LB-3	Bay anchovy	YS	22.69
6/3/2010	LB-5	Bay anchovy	YS	23.90
6/3/2010	LB-6	Bay anchovy	YS	15.40
6/3/2010	LB-9	Bay anchovy	YS	4.94
6/3/2010	SB-3	Bay anchovy	YS	15.55
6/3/2010	SB-4	Bay anchovy	YS	5.67
6/3/2010	SB-6	Bay anchovy	PYS	97.25
6/3/2010	LB-8	Bay anchovy	PYS	118.95
6/3/2010	LB-7	Bay anchovy	PYS	522.60
6/3/2010	LB-3	Bay anchovy	PYS	822.63
6/3/2010	LB-5	Bay anchovy	PYS	639.32
6/3/2010	LB-6	Bay anchovy	PYS	985.51
6/3/2010	LB-9	Bay anchovy	PYS	54.35
6/3/2010	SB-3	Bay anchovy	PYS	46.65
6/3/2010	SB-4	Bay anchovy	PYS	5.67
6/3/2010	LB-3	Bay anchovy	UID	11.35
6/3/2010	LB-5	Bay anchovy	UID	29.87
6/3/2010	LB-6	Bay anchovy	UID	15.40
6/3/2010	LB-8	Northern pipefish	PYS	5.66
6/3/2010	LB-7	Northern pipefish	PYS	5.81
6/3/2010	LB-3	Northern pipefish	PYS	5.67
6/3/2010	LB-5	Northern pipefish	PYS	5.97
6/3/2010	SB-6	Searobin species	Egg	414.92
6/3/2010	LB-3	Searobin species	Egg	68.08
6/3/2010	LB-5	Searobin species	Egg	191.20
6/3/2010	LB-6	Searobin species	Egg	328.50
6/3/2010	LB-3	Silver hake	Egg	90.77
6/3/2010	LB-5	Silver hake	Egg	191.20
6/3/2010	LB-6	Silver hake	Egg	164.25
6/3/2010	SB-4	Silver hake	Egg	362.62
6/3/2010	SB-3	Tautog	PYS	5.18
6/3/2010	LB-9	Tautog	UID	4.94
6/3/2010	SB-6	Windowpane	Egg	2,489.51

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Sample Date	Station	Common Name	Life Stage	Density
6/3/2010	LB-8	Windowpane	Egg	181.26
6/3/2010	LB-7	Windowpane	Egg	92.91
6/3/2010	LB-3	Windowpane	Egg	45.39
6/3/2010	LB-5	Windowpane	Egg	382.40
6/3/2010	LB-6	Windowpane	Egg	328.50
6/3/2010	LB-9	Windowpane	Egg	474.34
6/3/2010	SB-3	Windowpane	Egg	82.94
6/3/2010	SB-6	Windowpane	YS	6.48
6/3/2010	LB-3	Windowpane	YS	11.35
6/3/2010	SB-3	Windowpane	YS	5.18
6/3/2010	SB-6	Windowpane	PYS	6.48
6/3/2010	LB-5	Windowpane	PYS	5.97
6/3/2010	SB-3	Windowpane	PYS	15.55
6/3/2010	SB-4	Windowpane	PYS	17.00
6/3/2010	SB-6	Unidentified	UID	19.45
6/3/2010	LB-3	Unidentified	UID	5.67
6/3/2010	LB-5	Unidentified	UID	5.97
6/3/2010	LB-6	Unidentified	UID	5.13
6/3/2010	SB-6	Wrasses	Egg	2,904.43
6/3/2010	LB-8	Wrasses	Egg	1,087.58
6/3/2010	LB-7	Wrasses	Egg	371.62
6/3/2010	LB-3	Wrasses	Egg	476.56
6/3/2010	LB-5	Wrasses	Egg	955.99
6/3/2010	LB-6	Wrasses	Egg	492.76
6/3/2010	LB-9	Wrasses	Egg	1,106.79
6/3/2010	SB-3	Wrasses	Egg	165.87
6/3/2010	SB-4	Wrasses	Egg	2,538.37
6/14/2010	AK-3	Atlantic menhaden	Egg	953.89
6/14/2010	PJ-1	Atlantic menhaden	Egg	87.33
6/14/2010	SB-5	Atlantic menhaden	Egg	130.60
6/14/2010	SB-7	Atlantic menhaden	Egg	79.04
6/14/2010	SB-3	Atlantic menhaden	Egg	46.97
6/14/2010	SB-4	Atlantic menhaden	Egg	46.29
6/14/2010	NB-7	Atlantic menhaden	PYS	6.81
6/14/2010	PJ-1	Atlantic menhaden	PYS	10.92
6/14/2010	AK-3	Atlantic silverside	PYS	4.97
6/14/2010	AK-2	Bay anchovy	Egg	18,381.47
6/14/2010	AK-3	Bay anchovy	Egg	11,287.68
6/14/2010	NB-8	Bay anchovy	Egg	17,998.44
6/14/2010	NB-4	Bay anchovy	Egg	14,257.58
6/14/2010	NB-7	Bay anchovy	Egg	16,769.78

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Sample Date	Station	Common Name	Life Stage	Density
6/14/2010	PJ-1	Bay anchovy	Egg	2,401.68
6/14/2010	PJ-2	Bay anchovy	Egg	3,479.77
6/14/2010	SB-5	Bay anchovy	Egg	3,395.59
6/14/2010	SB-7	Bay anchovy	Egg	3,240.78
6/14/2010	SB-3	Bay anchovy	Egg	2,019.88
6/14/2010	SB-4	Bay anchovy	Egg	2,684.98
6/14/2010	AK-3	Bay anchovy	PYS	79.49
6/14/2010	NB-8	Bay anchovy	PYS	72.57
6/14/2010	NB-4	Bay anchovy	PYS	381.90
6/14/2010	NB-7	Bay anchovy	PYS	108.89
6/14/2010	PJ-2	Bay anchovy	PYS	12.98
6/14/2010	SB-3	Bay anchovy	PYS	35.23
6/14/2010	SB-4	Bay anchovy	PYS	40.51
6/14/2010	PJ-1	Clupeid unidentified	PYS	5.46
6/14/2010	PJ-2	Clupeid unidentified	PYS	6.49
6/14/2010	SB-3	Clupeid unidentified	PYS	11.74
6/14/2010	NB-4	Clupeid unidentified	UID	196.25
6/14/2010	NB-7	Clupeid unidentified	UID	88.48
6/14/2010	AK-3	Gobies	PYS	154.01
6/14/2010	NB-8	Gobies	PYS	140.61
6/14/2010	NB-4	Gobies	PYS	615.28
6/14/2010	NB-7	Gobies	PYS	224.60
6/14/2010	PJ-1	Gobies	PYS	16.38
6/14/2010	PJ-2	Gobies	PYS	32.46
6/14/2010	SB-3	Gobies	PYS	5.87
6/14/2010	SB-4	Gobies	PYS	28.93
6/14/2010	AK-2	Northern pipefish	PYS	6.38
6/14/2010	AK-3	Northern pipefish	PYS	9.94
6/14/2010	NB-8	Northern pipefish	PYS	13.61
6/14/2010	NB-4	Northern pipefish	PYS	143.21
6/14/2010	NB-7	Northern pipefish	PYS	6.81
6/14/2010	PJ-1	Northern pipefish	PYS	5.46
6/14/2010	PJ-2	Northern pipefish	PYS	58.43
6/14/2010	SB-5	Northern pipefish	PYS	10.88
6/14/2010	SB-7	Northern pipefish	PYS	4.94
6/14/2010	SB-3	Northern pipefish	PYS	11.74
6/14/2010	PJ-1	Searobin species	Egg	43.67
6/14/2010	SB-5	Searobin species	Egg	174.13
6/14/2010	SB-7	Searobin species	Egg	395.22
6/14/2010	SB-3	Searobin species	Egg	93.95
6/14/2010	SB-4	Searobin species	Egg	416.64

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Sample Date	Station	Common Name	Life Stage	Density
6/14/2010	PJ-1	Windowpane	Egg	305.67
6/14/2010	SB-5	Windowpane	Egg	609.47
6/14/2010	SB-7	Windowpane	Egg	711.39
6/14/2010	SB-3	Windowpane	Egg	281.84
6/14/2010	SB-4	Windowpane	Egg	462.93
6/14/2010	NB-7	Windowpane	PYS	6.81
6/14/2010	PJ-1	Windowpane	PYS	5.46
6/14/2010	PJ-2	Windowpane	PYS	6.49
6/14/2010	AK-2	Wrasses	Egg	2,450.86
6/14/2010	AK-3	Wrasses	Egg	1,430.83
6/14/2010	NB-8	Wrasses	Egg	1,451.49
6/14/2010	NB-4	Wrasses	Egg	2,036.80
6/14/2010	NB-7	Wrasses	Egg	871.16
6/14/2010	PJ-1	Wrasses	Egg	1,266.34
6/14/2010	PJ-2	Wrasses	Egg	1,454.23
6/14/2010	SB-5	Wrasses	Egg	2,873.19
6/14/2010	SB-7	Wrasses	Egg	3,794.08
6/14/2010	SB-3	Wrasses	Egg	2,489.62
6/14/2010	SB-4	Wrasses	Egg	2,823.86
6/15/2010	LBD-17	Atlantic mackerel	Egg	22.31
6/15/2010	LB-10	Atlantic menhaden	Egg	155.81
6/15/2010	LB-1	Atlantic menhaden	Egg	175.25
6/15/2010	LBD-15	Atlantic menhaden	Egg	41.58
6/15/2010	LBD-17	Atlantic menhaden	Egg	89.23
6/15/2010	LB-13	Atlantic menhaden	Egg	250.91
6/15/2010	SB-6	Atlantic menhaden	Egg	75.39
6/15/2010	LBD-17	Atlantic menhaden	YS	16.73
6/15/2010	LB-9	Atlantic menhaden	YS	6.53
6/15/2010	LB-10	Atlantic menhaden	PYS	9.74
6/15/2010	LBD-15	Atlantic menhaden	PYS	31.18
6/15/2010	LB-16	Atlantic menhaden	PYS	56.99
6/15/2010	LBD-17	Atlantic menhaden	PYS	16.73
6/15/2010	LB-9	Atlantic menhaden	PYS	13.07
6/15/2010	SB-6	Atlantic menhaden	PYS	4.71
6/15/2010	LB-16	Atlantic silverside	PYS	4.75
6/15/2010	LB-10	Bay anchovy	Egg	3,388.92
6/15/2010	LB-1	Bay anchovy	Egg	2,278.26
6/15/2010	LBD-15	Bay anchovy	Egg	3,450.95
6/15/2010	LB-16	Bay anchovy	Egg	2,355.39
6/15/2010	LBD-17	Bay anchovy	Egg	2,476.04
6/15/2010	LB-13	Bay anchovy	Egg	26,345.47

Appendix B. Ichthyoplankton (epibenthic sled) life stage densities (Number per 1,000 m^3) by date and station collected during the 20 Aquatic Biological Survey. ES1 to ES5 are winter flounder egg stages 1-5, WFNVE are winter flounder non-viable eggs, ST1 to ST4 are winter flounder larval life stages 1-4, YS is yolk-sac larvae, PYS is post yolk-sac larvae, JUV is juveniles, and UID is unidentified larval lifestage.

Sample Date	Station	Common Name	Life Stage	Density
6/15/2010	LB-4	Bay anchovy	Egg	33,774.47
6/15/2010	LB-12	Bay anchovy	Egg	35,831.90
6/15/2010	LB-9	Bay anchovy	Egg	5,436.68
6/15/2010	SB-6	Bay anchovy	Egg	4,372.49
6/15/2010	LB-10	Bay anchovy	PYS	63.30
6/15/2010	LB-1	Bay anchovy	PYS	5.48
6/15/2010	LBD-15	Bay anchovy	PYS	15.59
6/15/2010	LB-16	Bay anchovy	PYS	94.98
6/15/2010	LBD-17	Bay anchovy	PYS	16.73
6/15/2010	LB-13	Bay anchovy	PYS	11.74
6/15/2010	LB-4	Bay anchovy	PYS	31.98
6/15/2010	LB-12	Bay anchovy	PYS	53.66
6/15/2010	LB-9	Bay anchovy	PYS	65.34
6/15/2010	SB-6	Bay anchovy	PYS	28.27
6/15/2010	LB-10	Clupeid unidentified	UID	4.87
6/15/2010	LB-16	Clupeid unidentified	UID	9.50
6/15/2010	LB-16	Cunner	PYS	4.75
6/15/2010	LBD-17	Fourspot flounder	YS	5.58
6/15/2010	LB-16	Fourspot flounder	PYS	4.75
6/15/2010	LB-10	Gobies	PYS	4.87
6/15/2010	LB-1	Gobies	PYS	38.34
6/15/2010	LB-4	Gobies	PYS	6.40
6/15/2010	LB-9	Gobies	PYS	6.53
6/15/2010	SB-6	Gobies	PYS	4.71
6/15/2010	LB-10	Northern pipefish	PYS	19.48
6/15/2010	LBD-15	Northern pipefish	PYS	5.20
6/15/2010	LB-16	Northern pipefish	PYS	19.00
6/15/2010	LB-13	Northern pipefish	PYS	5.87
6/15/2010	LB-4	Northern pipefish	PYS	31.98
6/15/2010	LB-9	Northern pipefish	PYS	6.53
6/15/2010	SB-6	Northern pipefish	PYS	32.98
6/15/2010	LB-10	Searobin species	Egg	116.86
6/15/2010	LB-1	Searobin species	Egg	525.75
6/15/2010	LBD-15	Searobin species	Egg	124.73
6/15/2010	LB-16	Searobin species	Egg	227.94
6/15/2010	LBD-17	Searobin species	Egg	111.53
6/15/2010	LB-13	Searobin species	Egg	501.82
6/15/2010	LB-4	Searobin species	Egg	409.39
6/15/2010	LB-12	Searobin species	Egg	286.66
6/15/2010	LB-9	Searobin species	Egg	522.76
6/15/2010	SB-6	Searobin species	Egg	75.39

Appendix B. Ichthyoplankton (epibenthic sled) life stage densities (Number per 1,000 m^3) by date and station collected during the 20 Aquatic Biological Survey. ES1 to ES5 are winter flounder egg stages 1-5, WFNVE are winter flounder non-viable eggs, ST1 to ST4 are winter flounder larval life stages 1-4, YS is yolk-sac larvae, PYS is post yolk-sac larvae, JUV is juveniles, and UID is unidentified larval lifestage.

Sample Date	Station	Common Name	Life Stage	Density
6/15/2010	LB-10	Tautog	PYS	4.87
6/15/2010	LB-16	Tautog	PYS	9.50
6/15/2010	LB-10	Tautog	UID	9.74
6/15/2010	LB-16	Weakfish	PYS	4.75
6/15/2010	SB-6	Weakfish	PYS	4.71
6/15/2010	LB-10	Windowpane	Egg	584.30
6/15/2010	LB-1	Windowpane	Egg	1,314.38
6/15/2010	LBD-15	Windowpane	Egg	706.82
6/15/2010	LB-16	Windowpane	Egg	2,735.29
6/15/2010	LBD-17	Windowpane	Egg	1,561.46
6/15/2010	LB-13	Windowpane	Egg	1,254.55
6/15/2010	LB-4	Windowpane	Egg	1,023.47
6/15/2010	LB-12	Windowpane	Egg	1,146.62
6/15/2010	LB-9	Windowpane	Egg	731.86
6/15/2010	SB-6	Windowpane	Egg	452.33
6/15/2010	LBD-17	Windowpane	PYS	5.58
6/15/2010	LB-13	Windowpane	PYS	17.61
6/15/2010	LB-4	Windowpane	PYS	6.40
6/15/2010	LB-12	Windowpane	PYS	6.71
6/15/2010	LB-9	Windowpane	PYS	26.14
6/15/2010	SB-6	Windowpane	PYS	28.27
6/15/2010	LB-10	Wrasses	Egg	1,402.31
6/15/2010	LB-1	Wrasses	Egg	3,242.15
6/15/2010	LBD-15	Wrasses	Egg	1,829.42
6/15/2010	LB-16	Wrasses	Egg	1,747.55
6/15/2010	LBD-17	Wrasses	Egg	401.52
6/15/2010	LB-13	Wrasses	Egg	3,261.82
6/15/2010	LB-4	Wrasses	Egg	6,550.20
6/15/2010	LB-12	Wrasses	Egg	7,453.03
6/15/2010	LB-9	Wrasses	Egg	3,868.40
6/15/2010	SB-6	Wrasses	Egg	3,769.39
6/16/2010	LB-2	Atlantic menhaden	Egg	34.59
6/16/2010	LB-7	Atlantic menhaden	Egg	46.65
6/16/2010	LB-3	Atlantic menhaden	PYS	6.42
6/16/2010	LB-7	Atlantic menhaden	PYS	11.66
6/16/2010	LB-8	Atlantic menhaden	PYS	4.85
6/16/2010	LB-2	Bay anchovy	Egg	2,179.14
6/16/2010	LB-5	Bay anchovy	Egg	6,362.92
6/16/2010	LB-6	Bay anchovy	Egg	14,762.55
6/16/2010	LB-3	Bay anchovy	Egg	1,309.58
6/16/2010	LB-7	Bay anchovy	Egg	2,892.36

Appendix B. Ichthyoplankton (epibenthic sled) life stage densities (Number per 1,000 m^3) by date and station collected during the 20 Aquatic Biological Survey. ES1 to ES5 are winter flounder egg stages 1-5, WFNVE are winter flounder non-viable eggs, ST1 to ST4 are winter flounder larval life stages 1-4, YS is yolk-sac larvae, PYS is post yolk-sac larvae, JUV is juveniles, and UID is unidentified larval lifestage.

Sample Date	Station	Common Name	Life Stage	Density
6/16/2010	LB-8	Bay anchovy	Egg	4,073.47
6/16/2010	LB-2	Bay anchovy	PYS	38.91
6/16/2010	LB-5	Bay anchovy	PYS	29.24
6/16/2010	LB-6	Bay anchovy	PYS	81.41
6/16/2010	LB-3	Bay anchovy	PYS	44.94
6/16/2010	LB-7	Bay anchovy	PYS	40.82
6/16/2010	LB-8	Bay anchovy	PYS	72.74
6/16/2010	LB-2	Clupeid unidentified	PYS	4.32
6/16/2010	LB-2	Gobies	PYS	4.32
6/16/2010	LB-5	Gobies	PYS	5.85
6/16/2010	LB-8	Gobies	PYS	9.70
6/16/2010	LB-2	Northern pipefish	PYS	12.97
6/16/2010	LB-5	Northern pipefish	PYS	5.85
6/16/2010	LB-6	Northern pipefish	PYS	10.85
6/16/2010	LB-3	Northern pipefish	PYS	44.94
6/16/2010	LB-7	Northern pipefish	PYS	29.16
6/16/2010	LB-8	Northern pipefish	PYS	48.49
6/16/2010	LB-8	Northern puffer	PYS	4.85
6/16/2010	LB-2	Searobin species	Egg	103.77
6/16/2010	LB-5	Searobin species	Egg	93.57
6/16/2010	LB-7	Searobin species	Egg	186.60
6/16/2010	LB-8	Searobin species	Egg	116.38
6/16/2010	LB-8	Tautog	YS	4.85
6/16/2010	LB-2	Windowpane	Egg	207.54
6/16/2010	LB-5	Windowpane	Egg	280.72
6/16/2010	LB-6	Windowpane	Egg	347.35
6/16/2010	LB-3	Windowpane	Egg	282.46
6/16/2010	LB-7	Windowpane	Egg	886.37
6/16/2010	LB-8	Windowpane	Egg	426.74
6/16/2010	LB-7	Windowpane	YS	5.83
6/16/2010	LB-7	Windowpane	PYS	11.66
6/16/2010	LB-8	Windowpane	PYS	4.85
6/16/2010	LB-2	Wrasses	Egg	1,764.06
6/16/2010	LB-5	Wrasses	Egg	2,432.88
6/16/2010	LB-6	Wrasses	Egg	347.35
6/16/2010	LB-3	Wrasses	Egg	1,848.82
6/16/2010	LB-7	Wrasses	Egg	2,659.10
6/16/2010	LB-8	Wrasses	Egg	2,366.49

Appendix C

Water quality data by date and station collected during the 2010 Aquatic Biological Survey

Appendix C. Water quality data by date and station collected during the 2010 Aquatic Biological Survey.

Date	Station	Temp (°C)	DO (mg/L)	Cond (uS/cm)	Salinity (ppt)	Depth (ft)
12/21/2009	AK-2	5.10	9.10	30500	19.70	46
12/21/2009	AK-3	5.90	8.90	32760	20.20	51
12/14/2009	LB-1	9.40	9.00	43870	28.30	18
12/14/2009	LB-2	10.00	7.80	44590	29.60	50
12/15/2009	LB-3	8.80	9.40	41040	26.00	15
12/15/2009	LB-4	8.00	9.90	42380	27.00	38
12/15/2009	LB-5	7.90	9.30	38460	24.20	20
12/15/2009	LB-6	8.30	9.30	42740	27.20	43
12/21/2009	NB-4	4.20	10.10	25950	15.60	11
12/21/2009	NB-6	6.10	10.50	34260	21.20	57
12/21/2009	NB-7	4.80	9.60	28700	17.20	10
12/18/2009	PJ-1	7.50	8.80	37520	24.10	20
12/18/2009	PJ-2	6.80	9.60	29370	17.90	12
12/18/2009	SB-3	6.80	8.30	35750	21.90	20
12/18/2009	SB-4	8.40	7.50	41070	26.30	41
12/18/2009	SB-5	7.70	8.50	38200	23.90	47
12/18/2009	SB-6	7.90	7.40	43380	27.70	53
12/15/2009	LB-7	9.80	8.70	44630	28.70	28
12/15/2009	LB-8	8.40	9.40	35680	22.50	9
12/15/2009	LB-9	10.30	9.30	44720	28.70	31
12/14/2009	LB-10	8.40	9.00	39670	25.00	30
12/15/2009	LB-12	8.40	9.40	41230	26.60	25
12/15/2009	LB-13	8.20	9.70	42300	26.90	20
12/14/2009	LB-14	8.30	8.70	40000	25.30	50
12/21/2009	NB-8	5.50	9.00	32080	19.20	49
12/14/2009	LBD-15	10.50	8.00	46790	30.30	47
12/14/2009	LB-16	8.40	8.60	41600	26.50	18
12/14/2009	LBD-17	9.40	8.00	44850	28.70	48
12/18/2009	SB-7	8.70	7.80	42660	27.30	54
1/4/2010	PJ-1	3.40	10.70	34130	20.80	23
1/4/2010	PJ-2	3.40	10.60	32710	20.30	12
1/4/2010	SB-3	3.60	9.80	36870	22.90	19
1/4/2010	SB-4	3.90	11.09	40130	25.00	41
1/4/2010	SB-5	4.10	10.90	38430	24.00	52
1/4/2010	SB-6	3.70	10.60	42790	26.80	54
1/4/2010	SB-7	3.90	10.58	39540	24.60	54
1/5/2010	LB-10	3.60	11.04	41810	26.20	33
1/5/2010	LB-14	4.00	11.02	43480	27.40	60
1/5/2010	LB-3	3.60	11.00	40780	25.40	22
1/5/2010	LB-7	4.60	10.50	43730	27.50	31
1/5/2010	LB-8	4.50	10.90	41920	26.30	17
1/5/2010	LB-9	5.00	10.46	44710	28.30	31
1/6/2010	AK-2	3.00	12.88	32650	19.90	48
1/6/2010	AK-3	2.60	11.13	31340	19.00	50
1/6/2010	NB-4	2.20	11.71	27410	16.30	12
1/6/2010	NB-6	3.00	10.38	33640	20.70	53
1/6/2010	NB-7	2.50	10.90	30160	18.40	11

Appendix C. Water quality data by date and station collected during the 2010 Aquatic Biological Survey.

Date	Station	Temp (°C)	DO (mg/L)	Cond (uS/cm)	Salinity (ppt)	Depth (ft)
1/6/2010	NB-8	2.70	10.89	31210	18.80	42
1/11/2010	LB-12	3.40	10.20	42800	26.50	25
1/11/2010	LB-13	2.60	10.80	40500	25.10	18
1/11/2010	LB-16	5.00	10.20	46010	29.00	19
1/11/2010	LB-4	3.80	10.00	43300	27.20	37
1/11/2010	LB-5	3.50	10.60	41550	25.40	21
1/11/2010	LB-6	3.10	11.30	42700	26.90	47
1/11/2010	LBD-17	5.60	10.40	47700	30.80	49
1/12/2010	LB-1	3.80	11.00	42180	26.40	17
1/12/2010	LB-2	6.00	11.30	47320	30.30	53
1/12/2010	LBD-15	5.80	11.10	47700	30.40	50
1/19/2010	LB-1	5.10	11.00	47200	30.10	21
1/19/2010	LB-12	4.40	11.40	44270	28.00	25
1/19/2010	LB-13	4.70	11.20	44710	28.00	21
1/19/2010	LB-16	4.90	11.00	48100	30.80	25
1/19/2010	LB-4	4.60	11.30	45530	28.90	40
1/19/2010	LBD-15	4.90	11.00	48470	30.90	50
1/19/2010	LBD-17	5.40	10.60	50000	32.20	53
1/20/2010	LB-2	5.10	11.30	46470	29.60	55
1/20/2010	LB-3	4.20	10.80	41100	25.70	18
1/20/2010	LB-5	4.10	10.90	40820	25.50	23
1/20/2010	LB-6	4.30	11.50	42900	27.00	48
1/20/2010	LB-7	4.60	10.60	44190	28.10	32
1/20/2010	LB-8	4.30	11.10	40700	25.50	12
1/20/2010	LB-9	4.70	11.90	41490	25.80	29
1/21/2010	LB-10	4.30	9.90	42100	26.40	30
1/21/2010	LB-14	4.70	9.90	45400	28.70	47
1/21/2010	SB-3	3.80	10.30	36550	22.60	19
1/21/2010	SB-4	4.60	9.60	42550	26.90	42
1/21/2010	SB-5	4.40	11.80	39900	24.80	55
1/21/2010	SB-6	3.80	10.20	43300	25.30	52
1/21/2010	SB-7	4.00	11.00	38200	24.60	49
1/22/2010	AK-2	4.00	12.10	35050	21.60	47
1/22/2010	AK-3	3.90	12.70	33200	20.30	49
1/22/2010	NB-4	3.70	12.50	30350	18.70	12
1/22/2010	NB-7	3.70	12.30	31500	19.10	11
1/22/2010	NB-8	3.80	12.20	35500	20.60	50
1/22/2010	PJ-1	3.90	12.30	34800	21.70	17
1/22/2010	PJ-2	3.50	12.70	31800	17.90	12
2/1/2010	LB-3	3.50	8.20	43320	27.20	16
2/1/2010	LB-7	3.70	8.40	43990	28.30	27
2/1/2010	LB-8	3.40	8.70	43360	27.20	15
2/1/2010	LB-9	3.10	8.40	40080	24.90	27
2/1/2010	SB-3	2.70	9.00	37650	23.20	20
2/1/2010	SB-4	3.10	10.10	37590	23.20	40
2/1/2010	SB-6	2.80	8.80	40640	25.20	57
2/2/2010	LB-12	3.10	10.60	43330	27.10	30

Appendix C. Water quality data by date and station collected during the 2010 Aquatic Biological Survey.

Date	Station	Temp (°C)	DO (mg/L)	Cond (uS/cm)	Salinity (ppt)	Depth (ft)
2/2/2010	LB-13	3.00	10.60	43250	27.10	21
2/2/2010	LB-16	3.50	10.38	44190	27.80	
2/2/2010	LB-4	3.10	10.80	43450	27.30	41
2/2/2010	LB-5	2.90	11.70	39250	24.40	23
2/2/2010	LB-6	2.50	11.00	40110	24.90	49
2/2/2010	LBD-17	4.80	10.00	48540	30.80	50
2/3/2010	AK-2	2.30	9.40	30340	18.30	52
2/3/2010	AK-3	2.50	9.50	27420	16.40	52
2/3/2010	NB-4	2.20	9.50	28060	16.70	13
2/3/2010	NB-6	2.30	9.70	29390	18.20	58
2/3/2010	NB-7	2.00	9.60	26430	15.80	11
2/3/2010	NB-8	2.50	10.30	28720	17.30	43
2/4/2010	PJ-1	2.40	11.20	35750	21.80	19
2/4/2010	PJ-2	2.20	11.30	32000	19.50	11
2/4/2010	SB-5	2.90	11.40	33130	20.10	44
2/4/2010	SB-7	2.20	12.20	32910	19.40	48
2/5/2010	LB-1	3.40	10.60	43690	27.40	18
2/5/2010	LB-10	3.10	11.50	39250	24.30	30
2/5/2010	LB-14	3.70	10.40	44750	28.10	55
2/5/2010	LB-2	4.30	10.30	46780	29.70	55
2/5/2010	LBD-15	4.20	10.20	46640	29.40	41
2/17/2010	LB-10	2.60	10.10	41400	25.90	28
2/17/2010	LB-3	2.10	10.70	40950	25.40	20
2/17/2010	LB-7	2.90	9.70	44440	27.80	30
2/17/2010	LB-8	2.70	10.10	39990	24.80	17
2/17/2010	LB-9	2.80	9.90	43200	27.00	28
2/17/2010	PJ-2	2.20	12.40	34140	20.80	12
2/18/2010	AK-2	2.30	11.10	36240	22.20	47
2/18/2010	AK-3	2.30	10.80	34150	20.80	50
2/18/2010	NB-4	2.10	11.10	30750	18.50	11
2/18/2010	NB-6	2.30	11.20	36680	22.50	55
2/18/2010	NB-7	2.10	12.10	31250	18.90	12
2/18/2010	NB-8	2.10	11.00	34600	21.10	43
2/19/2010	PJ-1	2.90	10.60	37570	24.60	18
2/19/2010	SB-3	2.60	12.50	35880	22.20	17
2/19/2010	SB-4	2.80	11.00	40990	25.60	41
2/19/2010	SB-5	3.20	10.80	42460	26.60	51
2/19/2010	SB-6	2.80	11.20	38280	23.60	53
2/19/2010	SB-7	3.10	10.90	42760	26.70	52
2/22/2010	LB-12	3.30	12.00	42710	26.60	28
2/22/2010	LB-13	3.30	12.30	40660	25.30	21
2/22/2010	LB-16	3.90	13.20	43520	27.40	22
2/22/2010	LB-4	3.80	10.80	46440	29.40	39
2/22/2010	LB-5	3.20	12.20	41630	25.70	22
2/22/2010	LB-6	3.70	11.30	45830	29.00	48
2/22/2010	LBD-17	4.40	10.20	49390	31.50	46
2/23/2010	LB-1	4.10	11.40	43820	28.10	18

Appendix C. Water quality data by date and station collected during the 2010 Aquatic Biological Survey.

Date	Station	Temp (°C)	DO (mg/L)	Cond (uS/cm)	Salinity (ppt)	Depth (ft)
2/23/2010	LB-14	3.90	10.30	49590	27.40	54
2/23/2010	LB-2	3.80	10.30	45630	28.20	54
2/23/2010	LBD-15	4.10	10.10	45930	29.00	49
3/1/2010	AK-2	3.30	10.30	30780	18.60	49
3/1/2010	AK-3	3.40	9.60	31040	18.90	46
3/1/2010	NB-4	3.50	9.90	27790	16.60	12
3/1/2010	NB-6	3.30	10.30	31840	19.40	53
3/1/2010	NB-7	3.60	11.70	28740	17.30	12
3/1/2010	NB-8	3.50	9.70	31380	19.10	40
3/2/2010	LB-12	3.40	11.40	41440	25.70	25
3/2/2010	LB-13	3.70	11.90	41580	26.00	20
3/2/2010	LB-16	3.40	12.20	46880	29.70	24
3/2/2010	LB-4	3.70	11.60	42330	26.80	37
3/2/2010	LB-5	4.00	12.90	38450	23.60	19
3/2/2010	LB-6	3.60	12.40	41080	25.70	42
3/2/2010	LBD-17	2.80	11.10	48770	30.80	46
3/4/2010	PJ-1	3.50	9.10	38230	23.80	23
3/4/2010	PJ-2	3.70	9.80	32570	20.40	12
3/4/2010	SB-3	3.40	9.20	38090	23.70	21
3/4/2010	SB-4	3.40	9.30	40190	25.10	40
3/4/2010	SB-5	3.50	9.60	37760	23.00	43
3/4/2010	SB-7	3.30	9.20	40970	25.50	54
3/5/2010	LB-3	3.60	11.50	38150	23.70	21
3/5/2010	LB-7	3.50	11.40	43310	26.60	30
3/5/2010	LB-8	3.80	12.50	39700	24.90	17
3/5/2010	LB-9	3.40	11.20	42440	26.60	30
3/5/2010	SB-6	3.40	11.60	37550	23.30	56
3/8/2010	LB-1	4.00	9.80	44740	28.40	17
3/8/2010	LB-10	4.00	11.30	43930	27.90	30
3/8/2010	LB-14	3.60	10.00	44590	27.70	52
3/8/2010	LB-2	3.60	10.30	46720	29.10	53
3/8/2010	LBD-15	3.50	10.10	47730	30.10	45
3/16/2010	PJ-2	5.40	11.10	25870	15.50	13
3/16/2010	SB-3	5.50	10.30	28700	17.70	19
3/16/2010	SB-4	5.20	10.50	32710	19.90	40
3/16/2010	SB-5	5.20	11.50	25600	18.40	53
3/16/2010	SB-6	5.20	11.00	41090	25.80	51
3/16/2010	SB-7	5.20	10.90	39690	24.30	54
3/17/2010	LB-3	5.50	9.90	32640	19.20	19
3/17/2010	LB-5	5.50	9.80	32220	19.70	22
3/17/2010	LB-6	5.10	9.30	43100	27.20	46
3/17/2010	LB-7	5.20	9.80	42350	26.40	32
3/17/2010	LB-8	7.10	11.50	30300	18.40	17
3/17/2010	PJ-1	5.40	10.30	25100	15.10	17
3/18/2010	LB-12	5.70	11.40	35690	22.00	30
3/18/2010	LB-13	5.70	10.70	36960	22.90	24
3/18/2010	LB-16	5.50	11.00	44280	28.20	20

Appendix C. Water quality data by date and station collected during the 2010 Aquatic Biological Survey.

Date	Station	Temp (°C)	DO (mg/L)	Cond (uS/cm)	Salinity (ppt)	Depth (ft)
3/18/2010	LB-4	5.30	10.30	42760	27.10	40
3/18/2010	LBD-17	4.80	10.90	47290	30.10	53
3/22/2010	LB-1	6.40	10.00	39890	25.20	19
3/22/2010	LB-10	6.30	11.60	39920	25.20	30
3/22/2010	LB-14	6.00	10.20	43580	26.20	55
3/22/2010	LB-2	5.20	9.80	46060	29.40	54
3/22/2010	LB-9	6.10	9.30	38080	24.00	30
3/22/2010	LBD-15	5.20	9.90	45860	29.20	48
3/25/2010	AK-2	6.70	7.78	34320	21.10	45
3/25/2010	AK-3	7.00	8.25	31730	19.60	
3/25/2010	NB-4	9.90	7.88	12560	7.20	9
3/25/2010	NB-6	6.70	7.84	32460	20.10	52
3/25/2010	NB-7	9.00	9.23	15330	8.40	9
3/25/2010	NB-8	6.70	7.77	30340	19.00	44
4/5/2010	LB-1	7.60	9.56	38580	24.40	17
4/5/2010	LB-10	7.70	10.30	39860	22.80	30
4/5/2010	LB-14	6.80	10.40	39720	24.80	48
4/5/2010	LB-9	7.10	9.20	37600	23.50	29
4/5/2010	LBD-15	6.20	10.22	45070	29.00	44
4/5/2010	PJ-2	8.70	10.00	13500	8.90	12
4/6/2010	LB-12	8.00	7.80	30730	19.00	28
4/6/2010	LB-13	8.40	7.80	27750	16.90	20
4/6/2010	LB-16	7.50	7.90	37900	23.90	20
4/6/2010	LB-4	8.10	7.90	30050	18.50	38
4/6/2010	LB-7	7.00	7.60	39420	25.30	33
4/6/2010	LBD-17	5.50	8.10	46770	29.80	52
4/7/2010	AK-2	7.80	9.24	3348	20.40	48
4/7/2010	AK-3	7.80	9.35	33700	21.10	48
4/7/2010	NB-4	14.40	8.56	9480	5.30	9
4/7/2010	NB-6	7.60	9.38	35820	22.30	53
4/7/2010	NB-7	13.60	9.23	12450	7.10	8
4/7/2010	NB-8	8.60	8.93	30280	18.70	40
4/8/2010	PJ-1	9.30	10.83	25730	15.60	13
4/8/2010	SB-3	8.30	10.18	32920	20.50	13
4/8/2010	SB-4	7.30	10.33	40860	26.10	39
4/8/2010	SB-5	7.50	10.90	39540	24.50	44
4/8/2010	SB-6	6.80	11.08	42760	27.30	48
4/8/2010	SB-7	7.40	10.95	38890	25.00	48
4/9/2010	LB-2	7.50	10.21	39290	25.60	52
4/9/2010	LB-3	8.10	9.13	40430	25.40	17
4/9/2010	LB-5	7.50	8.32	38490	24.70	20
4/9/2010	LB-6	6.60	9.75	43100	27.00	44
4/9/2010	LB-8	9.40	9.18	33220	20.80	12
4/19/2010	LB-14	8.50	10.80	41450	26.50	55
4/19/2010	LB-3	9.00	10.10	37850	23.80	21
4/19/2010	LB-7	8.40	9.90	40830	26.00	28
4/19/2010	LB-8	8.90	10.20	38030	24.00	16

Appendix C. Water quality data by date and station collected during the 2010 Aquatic Biological Survey.

Date	Station	Temp (°C)	DO (mg/L)	Cond (uS/cm)	Salinity (ppt)	Depth (ft)
4/19/2010	LB-9	8.80	9.40	38100	24.10	30
4/19/2010	PJ-2	9.80	9.80	30860	18.90	10
4/20/2010	LB-1	9.20	8.62	40920	26.30	18
4/20/2010	LB-10	9.50	8.60	38230	24.30	30
4/20/2010	LB-16	8.60	9.26	41540	26.50	21
4/20/2010	LB-2	7.30	9.55	44110	28.30	54
4/20/2010	LBD-15	7.20	8.81	44650	28.40	44
4/20/2010	LBD-17	5.50	10.70	47160	30.00	55
4/21/2010	AK-2	10.20	8.90	31410	19.40	45
4/21/2010	AK-3	10.40	9.30	30700	19.10	46
4/21/2010	NB-4	11.20	8.30	27760	16.60	11
4/21/2010	NB-6	10.30	8.90	30850	19.10	51
4/21/2010	NB-7	12.30	9.20	27820	17.10	10
4/21/2010	NB-8	10.60	8.70	29750	18.40	47
4/22/2010	LB-12	9.20	9.00	40030	25.20	28
4/22/2010	LB-13	9.90	10.30	37420	23.50	23
4/22/2010	LB-4	9.40	9.10	38800	24.70	39
4/22/2010	LB-5	9.80	9.30	36070	22.70	19
4/22/2010	LB-6	8.60	9.30	41560	26.50	44
4/23/2010	PJ-1	10.80	8.80	27710	16.90	12
4/23/2010	SB-3	10.00	8.20	34150	21.40	17
4/23/2010	SB-4	9.60	9.80	37200	23.50	38
4/23/2010	SB-5	9.50	9.50	37300	23.20	54
4/23/2010	SB-6	9.10	11.50	40100	25.50	47
5/3/2010	AK-2	12.40	9.00	30580	19.00	50
5/3/2010	AK-3	13.20	8.60	29080	18.00	47
5/3/2010	NB-4	15.00	8.20	22510	13.60	11
5/3/2010	NB-7	15.30	8.40	23300	14.40	9
5/3/2010	NB-8	12.70	8.40	29620	18.40	48
5/4/2010	LB-3	11.10	9.10	37000	23.70	18
5/4/2010	LB-5	10.90	9.30	38220	24.20	21
5/4/2010	LB-6	9.80	10.70	42290	27.10	46
5/4/2010	LB-7	9.60	9.90	42040	26.60	29
5/4/2010	LB-8	12.00	9.90	36480	23.10	11
5/4/2010	LB-9	10.00	9.80	40790	25.50	31
5/5/2010	LB-12	11.10	9.10	37880	23.90	30
5/5/2010	LB-13	11.70	9.30	36300	22.90	20
5/5/2010	LB-16	10.30	10.30	40900	26.10	18
5/5/2010	LB-4	9.90	9.20	41800	26.70	39
5/5/2010	LBD-17	5.80	13.90	47470	30.20	51
5/5/2010	PJ-2	13.20	7.90	27600	16.90	12
5/6/2010	PJ-1	12.90	8.40	29660	18.60	13
5/6/2010	SB-3	11.20	8.50	37600	23.90	18
5/6/2010	SB-4	10.20	7.80	40740	25.90	38
5/6/2010	SB-5	10.90	9.30	37500	23.70	54
5/6/2010	SB-6	9.80	10.10	42140	26.90	46
5/6/2010	SB-7	9.50	10.20	42310	27.00	47

Appendix C. Water quality data by date and station collected during the 2010 Aquatic Biological Survey.

Date	Station	Temp (°C)	DO (mg/L)	Cond (uS/cm)	Salinity (ppt)	Depth (ft)
5/7/2010	LB-1	9.70	9.80	42640	27.00	16
5/7/2010	LB-10	9.00	9.00	42000	23.70	27
5/7/2010	LB-14	7.90	10.40	45530	29.00	54
5/7/2010	LB-2	7.50	10.20	45700	29.90	51
5/7/2010	LBD-15	8.60	9.30	44030	28.20	49
5/17/2010	LB-1	10.80	9.10	43930	28.10	19
5/17/2010	LB-10	11.00	8.37	39130	24.80	28
5/17/2010	LB-12	10.20	8.40	41500	26.50	30
5/17/2010	LB-13	11.40	10.10	40500	25.60	23
5/17/2010	LB-14	9.20	10.90	43830	28.10	51
5/17/2010	LB-16	9.90	9.70	44820	28.80	22
5/17/2010	LB-2	8.10	12.10	45400	29.20	53
5/17/2010	LB-4	9.60	8.60	42590	27.20	40
5/17/2010	LB-9	9.50	9.40	43460	27.90	28
5/17/2010	LBD-15	9.40	10.70	44050	28.30	46
5/17/2010	LBD-17	5.50	12.10	38150	30.80	46
5/18/2010	AK-2	12.90	6.20	32670	20.40	48
5/18/2010	AK-3	13.20	5.90	32390	20.20	50
5/18/2010	NB-4	12.90	5.60	32140	20.10	10
5/18/2010	NB-7	13.00	5.50	31670	19.80	10
5/18/2010	NB-8	12.80	5.30	32660	20.40	43
5/18/2010	PJ-1	11.20	6.00	38730	24.70	20
5/18/2010	PJ-2	11.90	5.60	34010	21.40	13
5/18/2010	SB-5	11.80	6.70	35030	22.00	46
5/18/2010	SB-7	11.00	8.20	38880	24.50	48
5/19/2010	LB-3	10.30	9.20	40830	26.10	19
5/19/2010	LB-5	11.20	9.50	39450	25.10	21
5/19/2010	LB-6	11.10	8.80	40420	25.50	46
5/19/2010	LB-7	9.20	9.90	44530	28.30	30
5/19/2010	LB-8	10.50	9.70	40580	25.80	11
5/19/2010	SB-3	11.40	7.70	37170	23.50	19
5/19/2010	SB-4	11.20	8.00	38170	24.30	42
5/19/2010	SB-6	10.40	8.90	41000	25.00	49
6/1/2010	AK-2	18.80	5.90	33870	21.50	49
6/1/2010	AK-3	19.70	5.40	32960	21.10	49
6/1/2010	NB-4	19.90	5.70	31520	20.10	11
6/1/2010	NB-7	19.60	5.70	32400	20.40	9
6/1/2010	NB-8	19.60	5.60	33660	20.50	42
6/1/2010	PJ-1	17.90	6.20	39180	25.10	19
6/1/2010	PJ-2	18.00	6.30	37150	23.60	11
6/1/2010	SB-5	17.60	6.80	37910	24.10	47
6/1/2010	SB-7	17.60	6.40	39810	25.10	47
6/2/2010	LB-1	17.70	7.90	43100	27.40	19
6/2/2010	LB-10	17.40	7.60	42380	27.30	30
6/2/2010	LB-12	17.70	6.60	41770	26.30	30
6/2/2010	LB-13	18.30	7.90	40690	26.30	22
6/2/2010	LB-14	16.60	7.90	44540	28.80	52

Appendix C. Water quality data by date and station collected during the 2010 Aquatic Biological Survey.

Date	Station	Temp (°C)	DO (mg/L)	Cond (uS/cm)	Salinity (ppt)	Depth (ft)
6/2/2010	LB-16	18.30	8.20	43710	28.30	18
6/2/2010	LB-2	15.50	8.80	45510	29.50	53
6/2/2010	LB-4	17.30	7.10	42540	27.50	39
6/2/2010	LBD-15	16.50	8.40	44390	28.90	44
6/2/2010	LBD-17	13.60	9.00	46590	27.80	42
6/3/2010	LB-3	18.40	7.20	41340	26.60	19
6/3/2010	LB-5	18.50	9.80	40650	26.10	21
6/3/2010	LB-6	17.10	8.50	43460	28.10	46
6/3/2010	LB-7	17.10	7.90	44050	28.50	28
6/3/2010	LB-8	18.50	7.90	40880	26.20	15
6/3/2010	LB-9	18.20	8.90	41570	26.70	30
6/3/2010	SB-3	18.30	7.40	39100	25.00	17
6/3/2010	SB-4	18.40	7.20	39720	25.40	37
6/3/2010	SB-6	17.60	8.30	41960	26.90	46
6/14/2010	AK-2	19.50	7.30	35040	22.10	47
6/14/2010	AK-3	20.00	7.10	34770	21.90	50
6/14/2010	NB-4	19.80	5.80	34600	21.80	11
6/14/2010	NB-7	19.90	5.60	34310	21.60	11
6/14/2010	NB-8	19.50	6.00	35100	22.10	42
6/14/2010	PJ-1	17.70	6.50	40190	25.80	19
6/14/2010	PJ-2	18.00	6.10	38060	24.20	12
6/14/2010	SB-3	17.70	6.80	40130	25.70	19
6/14/2010	SB-4	17.70	6.70	39740	25.40	38
6/14/2010	SB-5	17.50	10.10	40710	26.10	48
6/14/2010	SB-7	17.50	10.30	41070	26.40	55
6/15/2010	LB-1	18.20	7.70	44900	29.00	19
6/15/2010	LB-10	17.40	6.70	39770	25.50	29
6/15/2010	LB-12	17.70	6.90	41550	26.60	29
6/15/2010	LB-13	18.20	6.60	41400	26.60	24
6/15/2010	LB-16	17.60	8.80	45800	29.70	25
6/15/2010	LB-4	17.90	7.00	41420	26.60	40
6/15/2010	LB-9	17.20	7.50	43800	28.40	28
6/15/2010	LBD-15	17.40	7.70	44180	28.00	44
6/15/2010	LBD-17	13.20	10.70	46960	30.50	57
6/15/2010	SB-6	17.60	9.70	42020	27.00	50
6/16/2010	LB-14	18.10	6.50	42870	27.60	46
6/16/2010	LB-2	18.20	7.30	42970	27.70	53
6/16/2010	LB-3	18.10	5.50	41650	26.80	20
6/16/2010	LB-5	18.40	5.40	40600	26.00	22
6/16/2010	LB-6	18.30	5.10	41070	26.40	46
6/16/2010	LB-7	18.10	5.50	43180	27.90	30
6/16/2010	LB-8	18.10	5.70	42740	27.60	17

Appendix D

Laboratory microscope setup and winter flounder egg and larval staging photographs and illustrations

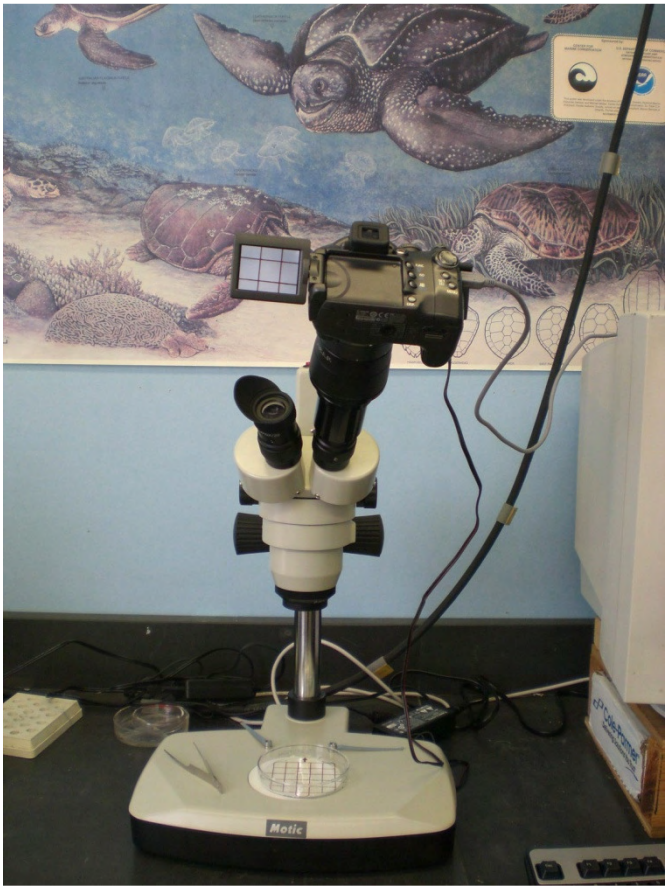

Figure D-1. Laboratory analysis set up showing the Motic DM143 Digital Microscope with Canon Powershot S31S Digital Camera.

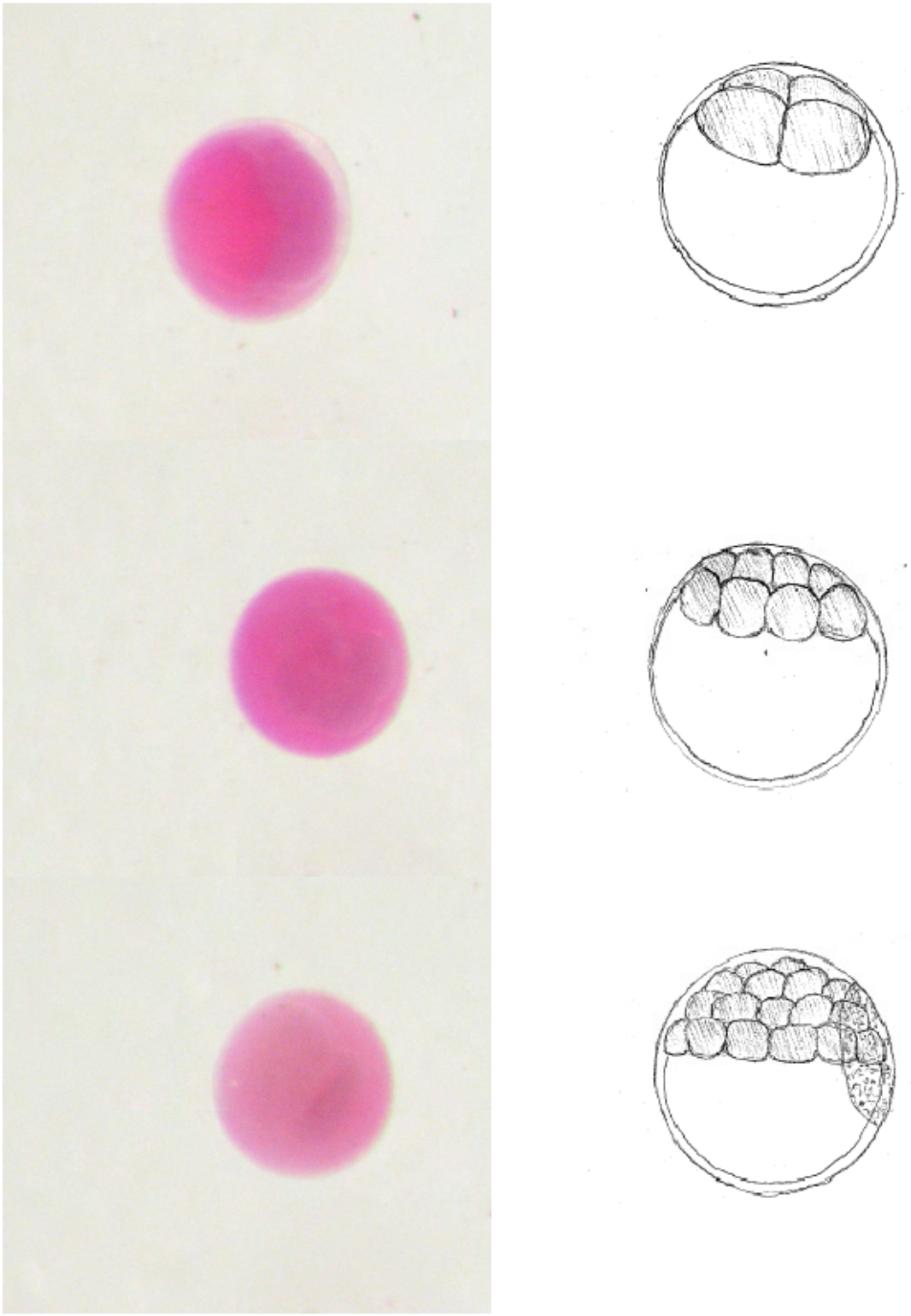

Figure D-2. Winter Flounder - Egg Stage 1 or Early Cleavage Stage.

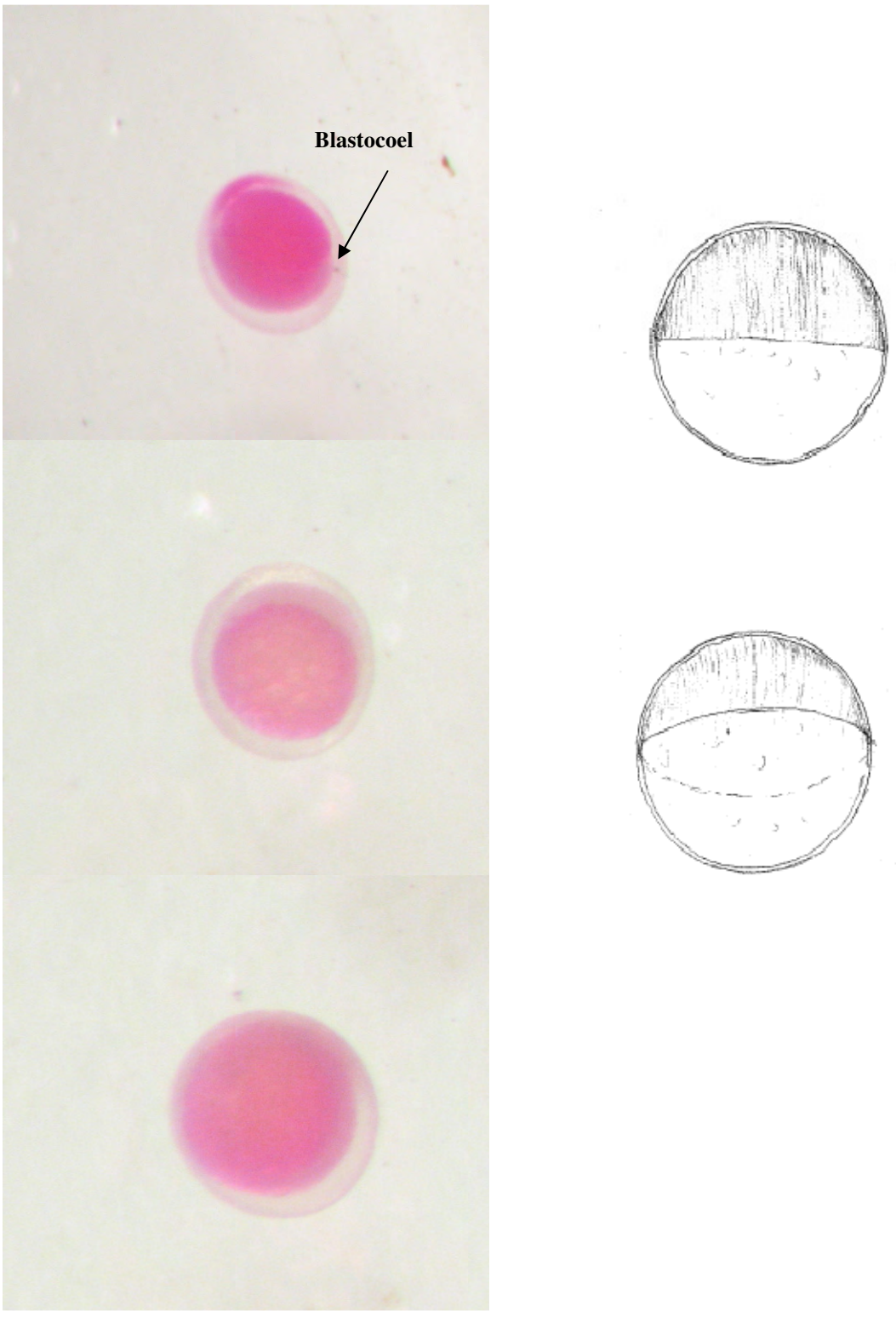

Figure D-3. Winter Flounder - Egg Stage 2 or Blastula Stage.

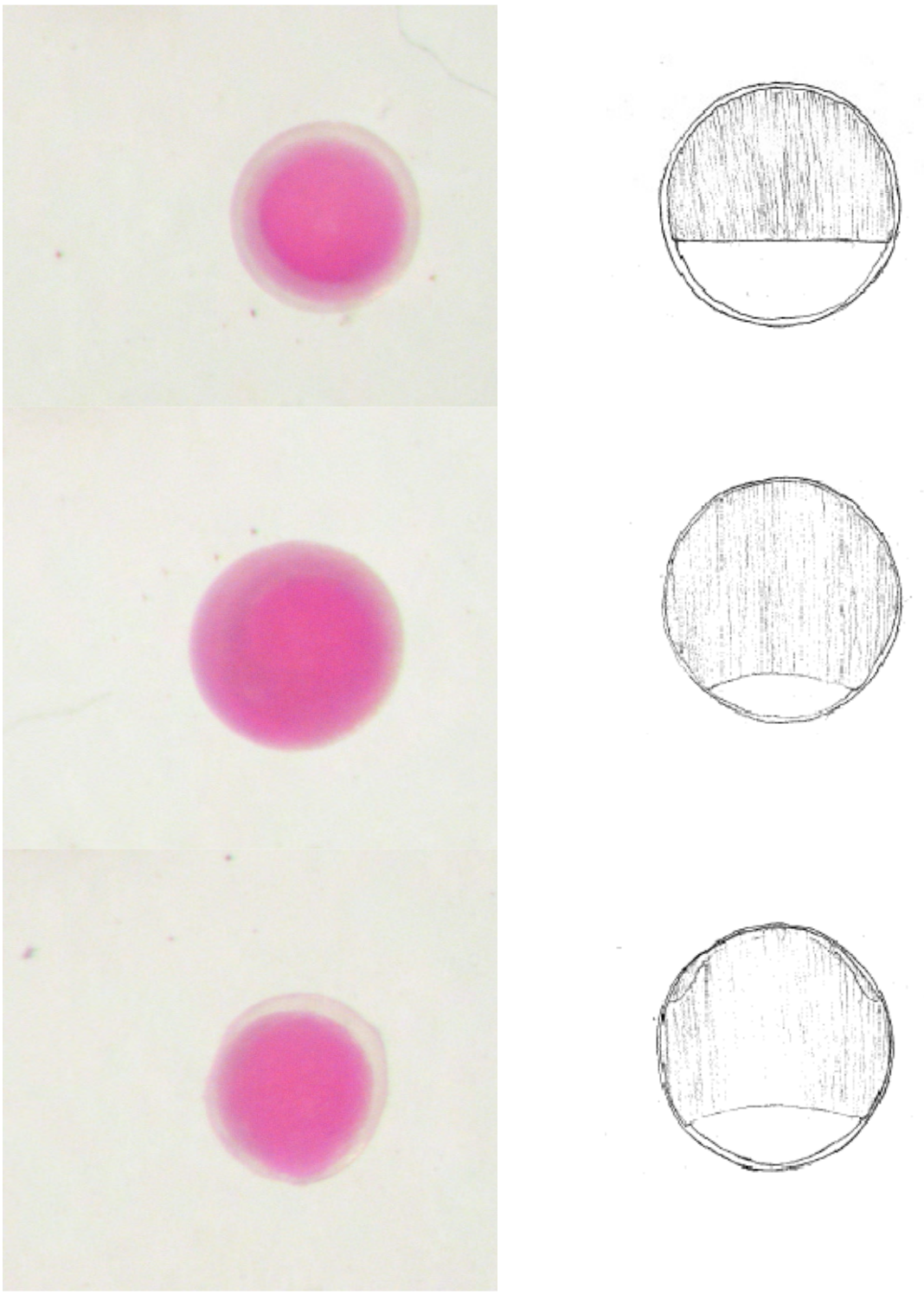

Figure D-4. Winter Flounder – Egg Stage 3 or Gastrula Stage.

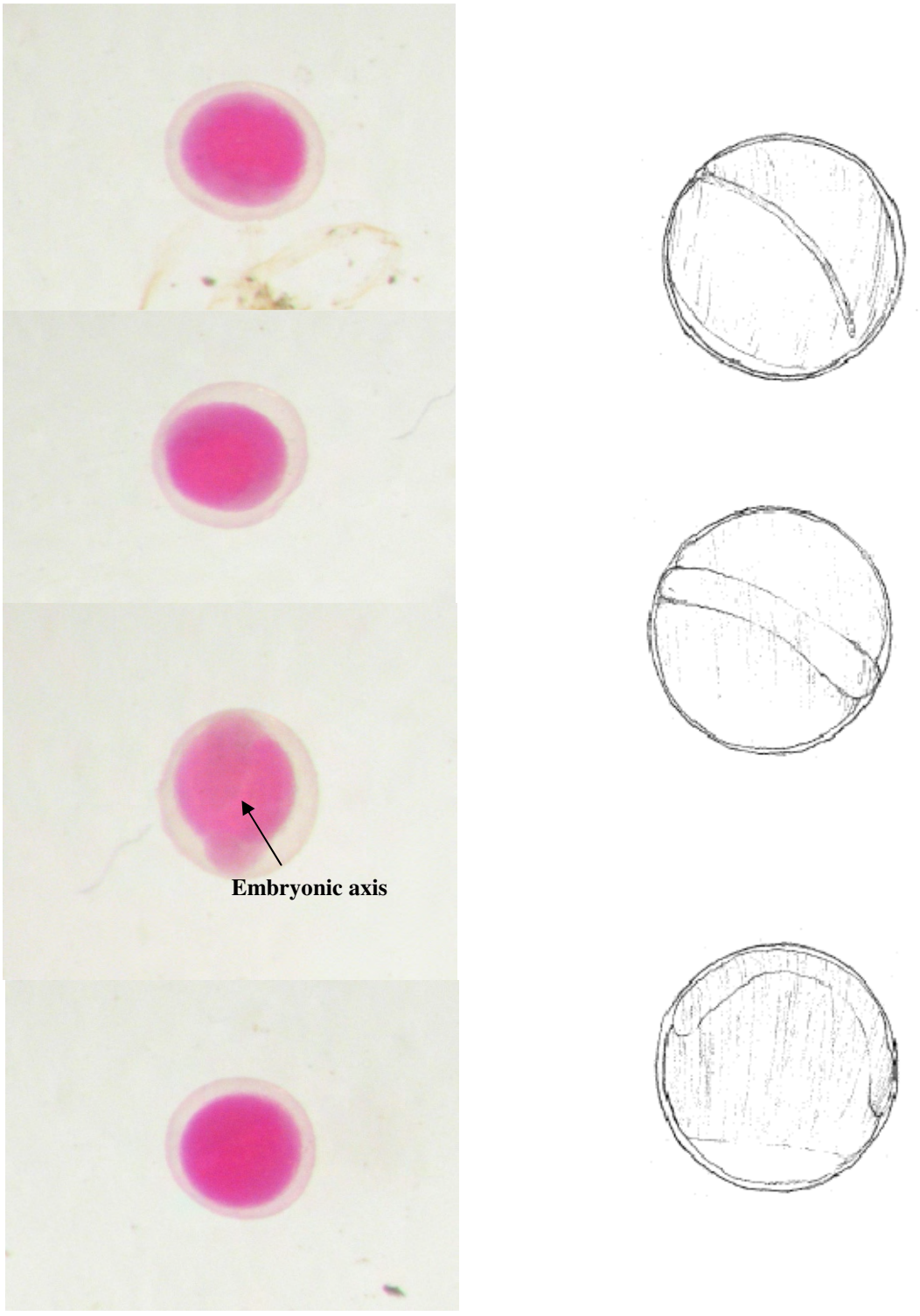

Figure D-5. Winter Flounder – Egg Stage 4 or Early Embryo Stage.

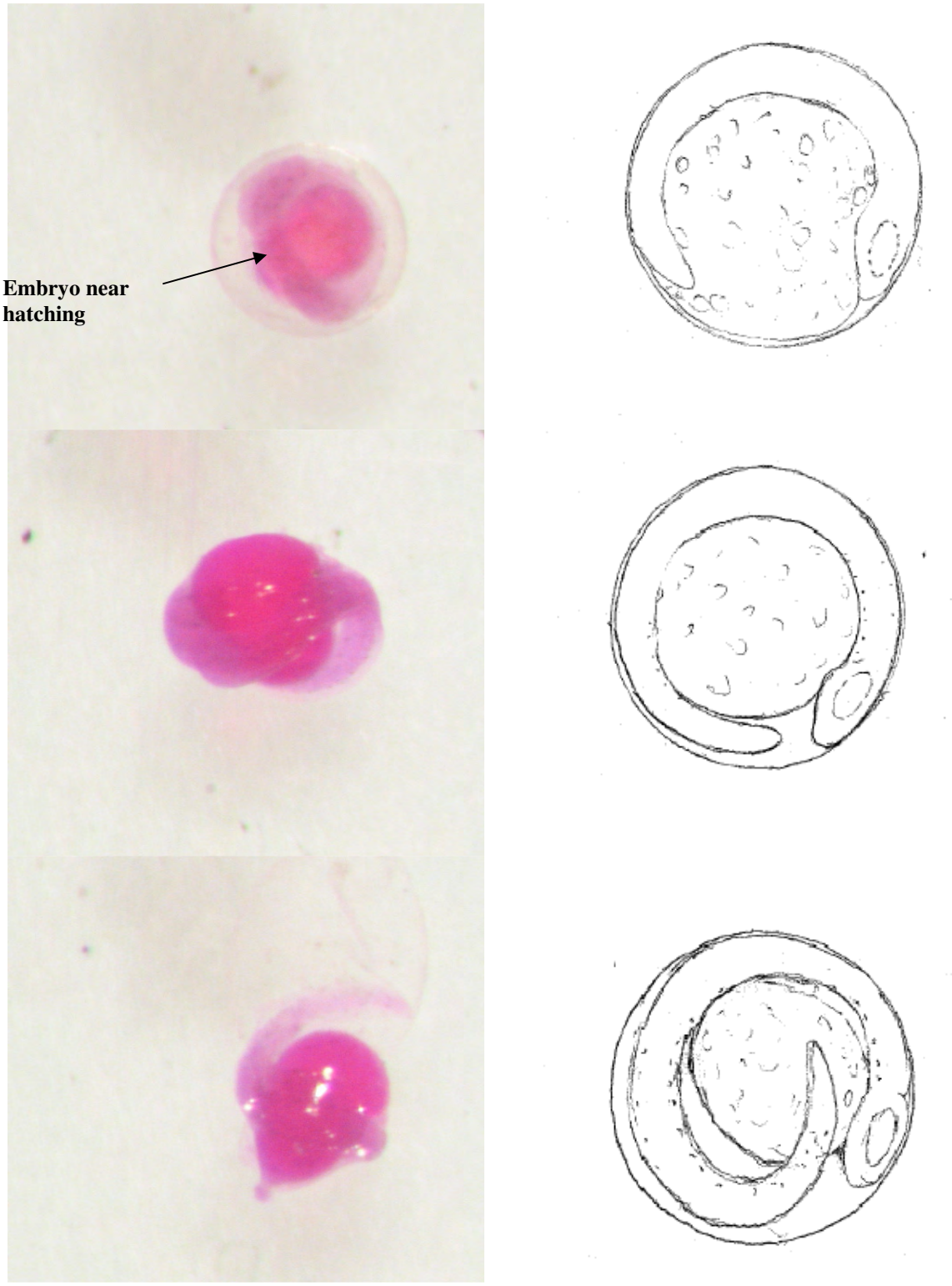

Figure D-6. Winter Flounder - Egg Stage 5 or Late Embryo Stage.

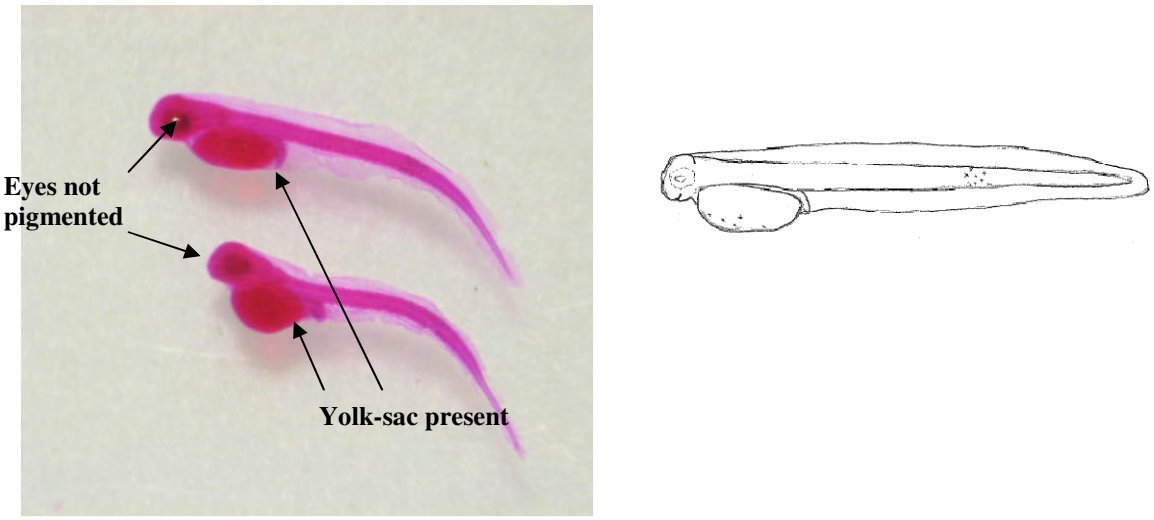

Figure D-7. Winter Flounder - Larval Stage 1.

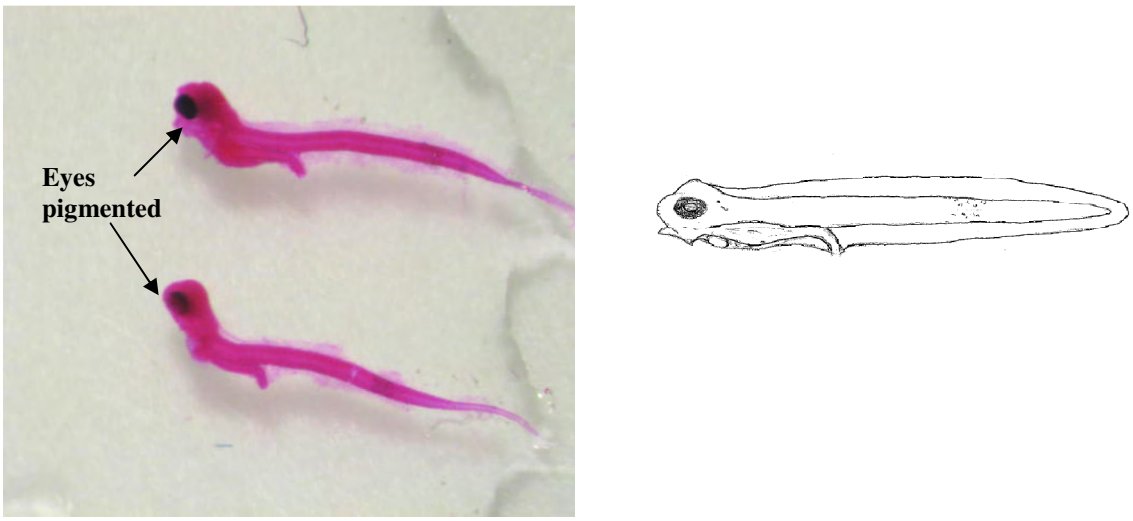

Figure D-8. Winter Flounder - Larval Stage 2.

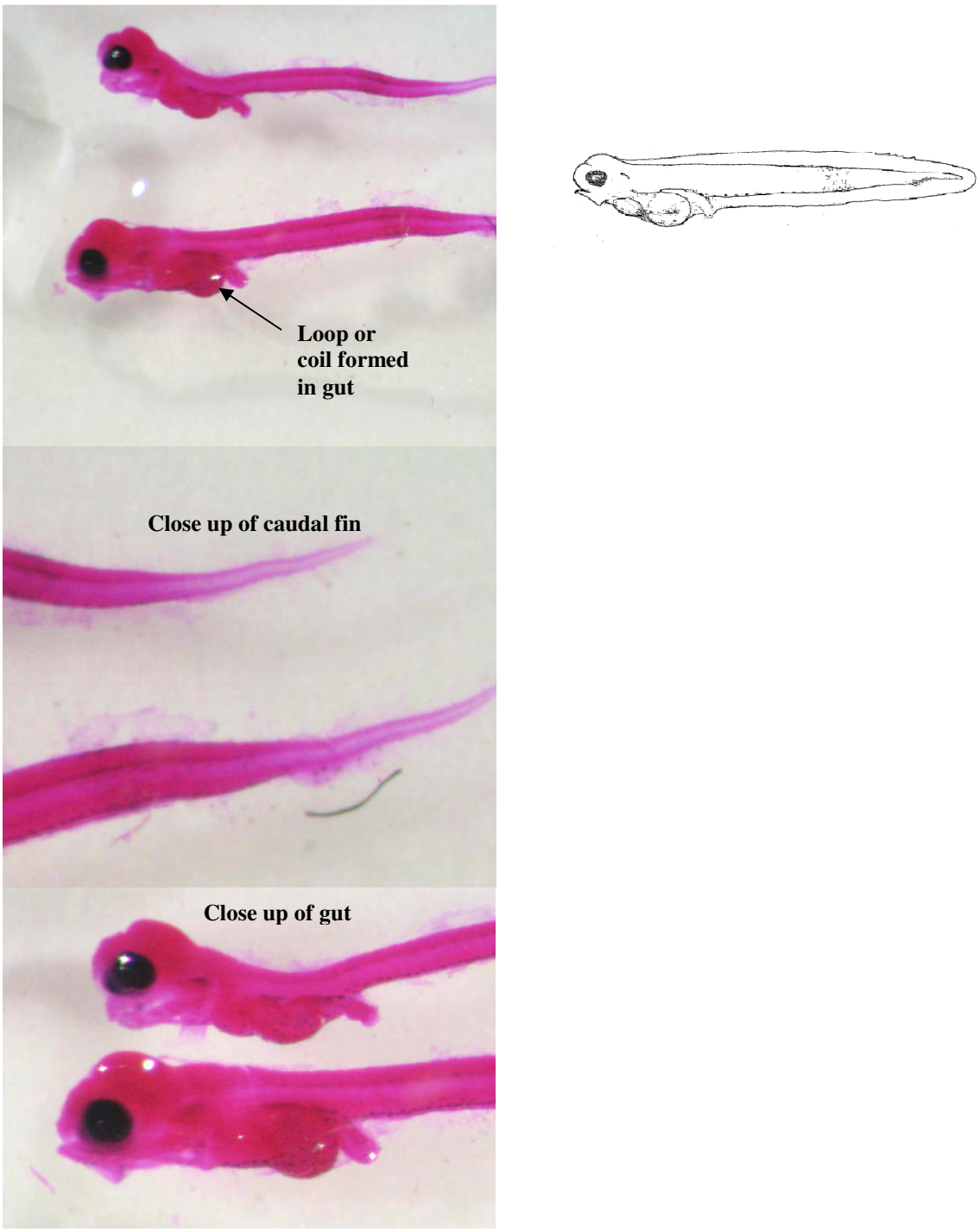

Figure D-9. Winter Flounder – Larval Stage 3.

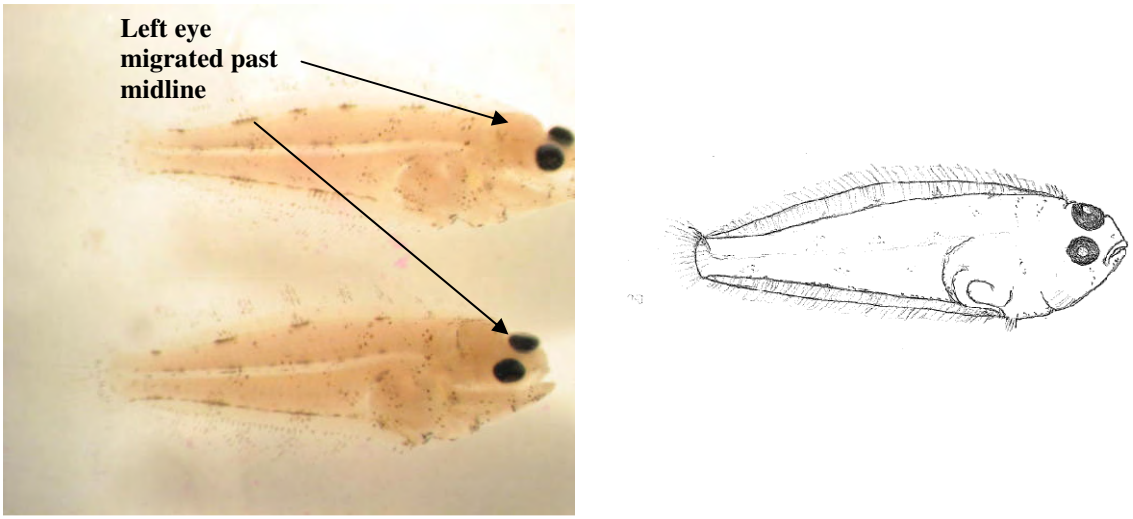

Figure D-10. Winter Flounder - Larval Stage 4.

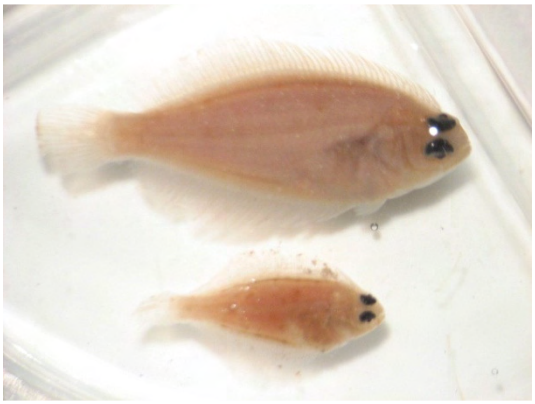

Figure D-11. Winter Flounder – Juvenile.