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New York District

NEW YORK AND NEW JERSEY HARBOR DEEPENING PROJECT

2012 Migratory Finfish Report

FINAL REPORT

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NEW YORK/NEW JERSEY HARBOR DEEPENING PROJECT

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MIGRATORY FINFISH REPORT

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November 2013

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TABLE OF CONTENTS

APPENDICES

LIST OF TABLES

LIST OF FIGURES

LIST OF FIGURES

1.0 INTRODUCTION

1.1 BACKGROUND

The 2012 Migratory Finfish Survey (MFS) 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. The purpose of the study is to investigate the timing and location of seasonal movements of migratory fish in the New York/New Jersey Harbor (NY/NJ Harbor). The general life histories of these species are well known, but aspects of their use of the Harbor during migrations, such as seasonal timing and migratory pathways, have not previously been well studied. This program will provide data on target migratory species that can be evaluated in relation to dredging operations.

By traversing the NY/NJ Harbor and the Hudson-Raritan Estuary, migratory finfish species gain access to upstream freshwater spawning/nursery habitat, the largest being the Hudson River and its tributaries. Other important spawning rivers include the Bronx River (via the East River) in New York, and the Hackensack and Passaic Rivers, the Raritan River, and Shrewsbury/Navesink Rivers in New Jersey, particularly for river herring and in some cases American shad (NJDEP 2005). Almost a dozen species utilize the NY/NJ Harbor during some part of their annual migration (Waldman 2006). These species include the Atlantic sturgeon (*Acipenser oxyrinchus*), shortnose sturgeon (*Acipenser brevirostrum*), striped bass (*Morone saxatilis*), hickory shad (*Alosa mediocris*), rainbow smelt (*Osmerus mordax*), American eel (*Anguilla rostrata*), Atlantic tomcod (*Microgadus tomcod*), alewife (*Alosa pseudoharengus*), blueback herring (*Alosa aestivalis*), and American shad (*Alosa sapidissima*).

Finfish migrations in the NY/NJ Harbor are dominated by anadromous (marine species that spawn in freshwater) species that occur bi-annually in the Harbor during spring and fall. To characterize these migratory movements through the Harbor, five target species were selected. Four species, as identified by National Marine Fisheries Service (NMFS) and state agencies as migratory species of particular concern, were selected for the MFS program: American shad,

blueback herring, alewife, and striped bass. Atlantic menhaden (*Brevoortia tyrannus*), while not an anadromous species, is migratory and was added as a fifth target species due to its important role as a forage species (ASMFC 2012). All the target species have commercial and recreational value, and striped bass is a large predator in the Harbor that represents a higher tropic level than the other target species.

Recent evidence suggests that blueback herring and alewife (collectively referred to as river herring) stocks have declined in abundance since the 1970's and there are currently restrictions in place to prevent excessive commercial harvest (ASMFC 2012). According to the most recent river herring stock assessment, populations have experienced a 93% decrease in commercial landings compared to the 1970's. From 1999-2010 numbers of spawning fish declined in 10 out of 17 rivers studied. Although some independent studies had recently showed increasing trends, overall, biological data suggest that river herring are experiencing a decline in mean length, mean length-at-age, and percent repeat spawners (ASMFC 2012). These are all characteristics of declining populations undergoing increasing mortality (ASMFC 2012). Both species are under review as candidates for federal listing. In 2013, NMFS is anticipated to announce a proposal to list critical habitat for river herring species.

Migratory fish potentially are vulnerable to habitat disturbance along migration corridors because their migratory behavior concentrates them in relatively small areas over short periods of time. For example, adult spawning stocks of American shad, blueback herring, alewife and striped bass that use the Hudson River pass through the Harbor to access upstream spawning areas and the annual juvenile production will pass through the Harbor as they emigrate to the marine environment. Timing and duration of passage within the Harbor are influenced by the given species' biology, environmental cues including temperature and river discharge, as well as the specific migratory pathway (e.g., spawning run travelled). Spawning runs to the Hudson River and its tributaries as well as the Hackensack and Passaic Rivers and the East River are of particular importance because access to these waterbodies requires passage through navigation channels and other areas within the Harbor complex.

In NY/NJ Harbor, seasonal dredging restrictions for finfish have been instituted primarily to protect essential fish habitat, specifically winter flounder spawning and nursery habitat (USACE

2010, Wilber et al. 2013). However, regional concerns have become increasingly focused on migratory finfish stocks. Developing an understanding of where migratory pathways occur and the timing of peak seasonal use (temporal and spatial patterns) can improve effective management of dredging activities within the NY/NJ Harbor while protecting these resources. For example, knowledge of species-specific depth preferences during migration, rate of passage, and whether their abundances are concentrated in shoals or channels will influence their potential exposure to dredging activities.

The 2012 MFS supplements an initial study performed during 2006 and a follow-up study in 2011. The 2006 MFS included spring and fall sampling using mid-water and bottom trawls within the NY/NJ Harbor. The 2011 MFS consisted of spring, summer and fall sampling using only mid-water trawls within the Harbor. Previous data indicated that, with the exception of striped bass, the target species were collected in greater abundances using the mid-water trawl gear type and exhibited distinct seasonal patterns in abundance. Preliminary findings from the 2006 MFS therefore formed a basis for the sampling protocol used in the 2011 and 2012 MFS programs, in terms of timing and spatial coverage of stations.

1.2 STUDY OBJECTIVES

The objectives of the 2012 MFS Program were to:

1. Identify the major migratory pathways of the four target migratory species within NY/NJ Harbor, as well as for Atlantic menhaden. Spatial distribution factors include depth and harbor area for both adults and juveniles.
2. Characterize temporal migratory patterns of target species within NY/NJ Harbor. Seasonal movements include both the upstream and downstream migrations of spawning adults and older juveniles and the downstream movement of YOY juveniles. Sampling also collected juveniles and sub-adults (yearlings and older) that move into the Harbor during spring.

This report focuses on the findings of the 2012 MFS Program and references the results of the 2006 and 2011 MFS Programs.

1.3 TARGET SPECIES LIFE HISTORY

The following sub-sections briefly summarize key life history characteristics and timing of migratory movements for each target species.

1.3.1 Alewife

The alewife, an anadromous species, inhabits waters from the Gulf of Saint Lawrence to South Carolina, occurring primarily between the Gulf of Maine and the Chesapeake Bay. Adult alewives enter the NY/NJ Harbor between late-February and mid-March moving upstream to spawn in freshwater tributaries in relatively shallow water with slow currents (Schmidt et al. 1988, Everly and Boreman 1999). Alewives typically spawn three to four weeks before blueback herring (Loesch 1987 in ASMFC 2009), when water temperatures rise to approximately 10°C. In 2010, alewives entered tributary spawning streams of the Hudson River during early April when water temperatures were just above 10.6 °C (Kahnle and Hattala 2010). Post-spawning adults quickly return downstream (Collette and Klein-MacPhee 2002 in ASMFC 2009). There are 16 Hudson River tributaries with documented alewife spawning runs, including Canterbury Brook, Moodna Creek, Fishkill Creek, Quassaick Creek, and Hathaways Glen Brook in the lower Hudson River and Coxsackie Creek, Moordener Kill, and Poesten Kill in the upper Hudson River (Schmidt and Lake 1999).

Alewife larvae and juveniles remain in their freshwater nurseries until late May or June before moving downstream as YOY into the lower estuary where they remain until November prior to movement into the ocean (Stone et al. 1994, Everly and Boreman 1999). It is generally accepted that juveniles join the adult population at sea within the first year of their lives and follow a north-south seasonal migration along the Atlantic coast, similar to that of American shad (Neves 1981).

Generally, female alewives are larger and heavier, and grow slightly faster than males of the same age (ASMFC 2012). Size and age at sexual maturity vary depending on the latitudinal location of their natal rivers. River herrings in the Hudson River watershed with a minimum total length of 170 millimeters (mm) are characterized as spawning adults (ASMFC 2012). The River Herring Stock Assessment reported that Hudson River alewives and blueback herring of both

sexes have experienced significant decreases in mean length over time and currently range from 240-280 mm total length (ASMFC 2012). Mean total length of river herring from the Hudson River sampled during 2004-2010 were on average about 25-45 mm smaller than those species and sexes sampled prior to 1986 (ASMFC 2012). Age at maturity is often calculated based on the spawning marks left on the fish's scale, which are scar-like rings extending around the scale (like an annuli) that are formed during the spawning migration into fresh water where little or no food is eaten by adult fish (ASMFC 2012). In the Hudson River, alewives that previously spawned ranged in age from 4 to 10 years during 1999-2001, while females ranged in age from 5 to 10 years (ASMFC 2012).

1.3.2 American shad

American shad is an anadromous species occurring along the Atlantic coast from the St. Lawrence River in Canada to the St. Johns River in Florida, with high concentrations in waters from Connecticut to North Carolina (Gusey 1981). Adult American shad spend most of their life at sea as a schooling fish with immature and adult fish traveling together. American shad adults are primarily found in the Hudson-Raritan estuary during their spawning runs, beginning as early as March and lasting as late as June. Post-spawning movements keep the adults in the estuary until September before they migrate back to marine waters (Talbot 1954, Able and Fahay 2010, ASMFC 2012). Stone et al. (1994) suggested that American shad could be found in the Harbor year-round.

Spawning occurs in tidal freshwater areas of the Hudson River estuary between dusk and midnight at water temperatures between 12 and 21°C (Waldman 2006). Eggs are demersal and non-adhesive. Both yolk-sac and post-yolk-sac larvae are planktonic and are passively transported to lower reaches of the estuary where metamorphosis to the juvenile stage occurs. Juveniles remain in the lower estuary until the late fall or early winter before migrating to the sea (Everly and Boreman 1999). In the estuary, juvenile American shad are present in peak abundances from June to December (Stone et al. 1994). The YOY shad emigration occurs as a gradual seaward movement over several months, and is strongly dependent on age and size (Limburg 1996). They typically reach a length of approximately 75-100 mm (3-4 inches) by the end of summer when they are leaving the Hudson River (Limburg 1996). When they reach

sexual maturity at 4 to 6 years old, they return to their natal rivers to spawn. Mean total length of American shad spawning stock in the Hudson River ranged from 450-520 mm for males and 520-590 mm for females during a long-term Hudson River survey conducted from 1980 to 2008 (Hattala and Kahnle 2009).

1.3.3 Atlantic menhaden

Atlantic menhaden, locally referred to as "bunker", is a seasonally abundant clupeid that occurs in large schools in coastal bays and estuaries. Atlantic menhaden migrate seasonally along the Atlantic coast from Maine to central Florida, moving north through the Mid-Atlantic Bight during spring and south during fall to overwinter in waters south of Cape Hatteras, North Carolina (Able and Fahay 2010). Adults are present in coastal ocean waters of NY/NJ primarily in March and enter estuaries in April where they are generally abundant from May through November. Adults are rare or absent from the estuary during December to March (Stone et al. 1994, Able and Fahay 2010). Adults can undergo frequent movements in and out of bays and inlets depending on tides, season, and weather, which may be regulated by local availability of food (Monroe 2000 and references therein).

Atlantic menhaden primarily spawn in continental shelf waters along the U.S. Atlantic coast, although some spawning activity is reported to occur in the lower reaches of estuaries and coastal bays (Dovel 1971). Multiple spawning events occur annually, during the spring and again in the fall to early winter (McHugh et al. 1959).

Atlantic menhaden produce pelagic eggs. After hatching, some larvae move into estuaries from October through June. Large schools of juvenile Atlantic menhaden use tributaries and estuaries as nurseries during the summer before migrating offshore in the fall to deeper or warmer waters (Monroe 2000). Atlantic menhanden juveniles collected from the Narragansett Bay ranged from 25-38 mm total length, while sexually mature males ranged in size from 180-280 mm total length by age 1 and sexually mature females ranged in size from 195 to over 300 mm total length by age 2 and 3 (Gray 1984).

1.3.4 Blueback herring

Blueback herring inhabit coastal and estuarine waters from Nova Scotia to Florida, with concentrations in the Middle and South Atlantic Bight. In general, blueback herring have a more southern distribution than alewife (Mullen et al. 1986). Similar to alewife, blueback herring are present in coastal ocean waters prior to entering estuaries on their annual spawning runs during the spring (Schmidt et al. 1988). Prior to the spawning run, adult blueback herring stage in estuaries at the mouth of natal rivers in March and early April when water temperatures are approximately 4-9°C (Loesch and Lund 1977, Able and Fahay 2010).

Adult blueback herring enter the Hudson-Raritan Estuary in early March, prior to their migration to spawning areas from May to July (Stone et al. 1994). Adult blueback herring swim at mid-water depths and have been documented to feed during their freshwater migration (Monroe 2000). The blueback herring spawning period usually begins about a month later than that of alewife (Loesch 1987) and they prefer deep freshwater habitats with swift currents over hard gravel or sand substrates (Loesch and Lund 1977, Everly and Boreman 1999). After spawning, blueback herring move into the lower estuary and coastal ocean waters, although a few adults may remain in the estuary through winter (Stone et al. 1994).

Juvenile blueback herring begin migrating downstream to the estuary at the end of summer, approximately a month after American shad and alewife (Marcy 1976, Monroe 2000 and references therein). By the end of November juveniles have typically returned to the ocean, though some evidence of juvenile overwintering in estuaries has been reported in New Jersey and the lower Connecticut River (Monroe 2000 and references therein). Aside from a few juveniles overwintering within estuaries during their first year, researchers assume that most juveniles join the adult population at sea within the first year of their lives, and follow a north-south seasonal migration along the Atlantic coast, where changes in temperature likely drive oceanic migration (Neves 1981).

Blueback herring are typically smaller than alewife, but follow the same general pattern of sex-specific growth where females are larger and heavier and grow slightly faster than males of the same age (ASMFC 2012). As stated above, the River Herring Stock Assessment reported

significant decreases in mean length over time for the Hudson River, with adult river herring currently ranging from 240-280 mm total length (ASMFC 2012). In the Hudson River, alewives that previously spawned ranged in age from 3 to 9 years for available data (1989-1990, 1999-2001), while females that had previously spawned ranged in age from 3 to 10 years (ASMFC 2012).

1.3.5 Striped bass

Striped bass is one of the most important sport and commercial fish species in the eastern United States. Along the Atlantic coast, three systems – the Hudson River, Chesapeake Bay, and Albemarle – Pamlico Sound serve as the primary spawning grounds for this anadromous species. The Hudson-Raritan Estuary is recognized as an important spawning and nursery habitat for striped bass, contributing up to 10% of the entire western Atlantic coastal stock (McLaren et al. 1981; Waldman 1990). Due to extensive polychlorinated biphenyls (PCB) contamination in the upper areas of the river resulting in high concentrations in fish tissue, commercial fishing for striped bass in the Hudson River has been closed since 1976.

Hudson River striped bass exhibit considerable variation in migration patterns. Many remain in estuarine waters throughout the year, while others migrate along the coast, mixing with other Atlantic coast populations (Secor et al. 2001). In coastal situations, the larger juveniles and adult striped bass migrate seasonally between southern New Jersey and Maine, moving southerly during the fall and northerly during the late winter and early spring (Waldman et al. 1990), before moving up the Hudson River to spawn.

Adult striped bass are present in coastal ocean waters of New York and New Jersey in March before entering estuaries (Able and Fahay 2010). Striped bass are demersal and may be present all year in the Hudson-Raritan Estuary with adults primarily occurring from early March through early September (spawning in fresh waters from late April to June followed by post-spawning movements). Striped bass move upstream and spawn above the salt front (Secor and Houde 1995) during April and May in the Hudson River (Waldman et al. 1990).

Spawning occurs in early spring at or near the surface in fresh or slightly brackish waters usually concentrated between river mile 33 to 55 (miles measured upstream from the Battery), from

early May through June (Boreman and Klauda 1988). Eggs and larvae remain in the Hudson River, upstream of the NY/NJ Harbor, until the end of the larval post yolk-sac stage toward the end of the summer, when juveniles migrate from upstream areas to higher salinity waters closer to the Harbor (EA 1998).

YOY striped bass may remain in the NY/NJ Harbor and Hudson River areas through their first year (Able and Fahay 2010), with high catches usually occurring during summer and fall. In the Hudson-Raritan Estuary, juvenile striped bass are common all year with higher abundance from late April to November (Stone et al. 1994). Juvenile striped bass are abundant in inter-pier areas of NY/NJ Harbor, but they can also be found in high concentrations in open water. They prefer deep to moderately deep basins over shoals (Cantelmo and Wahtola 1992).

1.4 OVERVIEW OF 2006 MIGRATORY FINFISH SURVEY

As described above, the 2006 MFS was initiated to gather information on the timing and spatial distribution of important migratory fish moving through NY/NJ Harbor that could potentially be exposed to dredging operations during navigation channel deepening and maintenance (USACE-NYD 2011). During the 2006 MFS, 16 bottom trawl and 26 mid-water trawl locations were sampled. Of the 26 mid-water trawl stations, 18 were located in navigation channels and 8 were in non-channel areas. Of the 16 bottom trawl stations, 12 were located in navigation channels and 4 were in non-channel areas.

A total of 55,290 finfish (58 species) were collected. Twenty-seven (27) species were collected during the mid-water trawl surveys and 53 species were collected during the bottom trawl surveys. The five target species were collected by both survey methods. Spatial and temporal patterns observed for the five target species are summarized in Table 1-1 (adapted from Table 4-5 of USACE-NYD 2011) and in the following paragraphs.

Mid-water and bottom trawl collections indicated that juvenile alewives occurred in the NY/NJ Harbor primarily during early spring (peak catches in April) and were generally absent from the area during the summer and early fall. During the late fall (November), catches were comprised of young-of-year (YOY) juveniles entering the Harbor from freshwater nursery areas as well as juveniles returning to the estuary from coastal waters. Alewives were collected in both bottom (n

= 11) and mid-water (n = 35) trawls and were not collected in the majority of samples. Alewives were collected at sample depths ranging from 9 to 28 feet for mid-water trawls, with 82% (n=896 fish) collected from 20-28 feet. Few alewives were collected from bottom trawls (n=39 fish), at sample depths ranging from 39 to 60 feet.

Mid-water and bottom trawl collections indicated that American shad were present in NY/NJ Harbor during late fall (primarily November). American shad were absent from mid-water trawls during June through October, and were absent from bottom trawls during June through September (note: one June sample event and no July sample events). No patterns were observed between station types and among study areas in mid-water trawls.

Mid-water and bottom trawl collections indicated that Atlantic menhaden were present in NY/NJ Harbor during late summer (August) to late fall (November). Atlantic menhaden caught in mid-water trawls tended to be more abundant at Arthur Kill/Kill Van Kull and Newark Bay stations during August, October, and November. They were less common in the Lower Bay, followed by the Upper Bay.

Mid-water and bottom trawl collections indicated that blueback herring were present in NY/NJ Harbor during early spring (primarily April) and were generally absent from the area during June through October. They were present in lower numbers during the late fall (November), with a combination of YOY and returning juveniles occurring in the catches. There were no significant differences in catch per unit effort (CPUE) among study areas, as analyzed by gear (mid-water or bottom trawl).

Bottom and mid-water trawl collections indicated that striped bass were present in NY/NJ Harbor during the late fall (November) and almost exclusively were using near bottom habitat. Striped bass CPUE was highest in Newark Bay, followed by the Arthur Kill/Kill Van Kull. Few were collected in the Lower Bay and none were collected in the Upper Bay.

1.5 OVERVIEW OF 2011 MIGRATORY FINFISH SURVEY

To build upon results of the 2006 survey, the 2011 MFS survey was designed to collect additional data on temporal and spatial distributions of the migratory target species such that

their potential exposure to deepening and maintenance dredging operations could be better assessed. One week of exploratory mid-water trawls was conducted during the first week of April followed by full surveys at all selected stations during the remaining weeks of April, May, and the first week of June 2011. An additional two summer surveys were completed during the weeks of 11 July and 15 August. The fall migratory sampling began the week of 12 September and continued to the first week of December 2011. Twenty (20) fixed mid-water trawls at station locations consistent with the 2006 surveys (Figure 2-1, Table 2-1) were sampled. Fewer stations were sampled in 2011 so that each station could be sampled more frequently.

A total of 69,705 finfish (40 species) were collected. All five target species were collected by the mid-water trawl. Blueback herring, alewife, and American shad ranked second, third, and fifth most abundant, respectively, in the total catch for the 2011 MFS program. The single most abundant species collected was bay anchovy (*Anchoa mitchilli*) and gizzard shad (*Dorosoma cepedianum*) ranked fourth. During April through December, months with the highest abundance coincided with months of highest species richness, which were May (n=10,083 finfish; 24 species), September (n=10,012 finfish; 19 species), and October (n=31,271 finfish; 24 species).

Results of the 2011 MFS Program are consistent with the findings of the 2006 MFS survey. Previous studies have reported that migratory finfish use the NY/NJ Harbor during spring and fall migration periods (Stone et al. 1994, Waldman 2006, Able and Fahay 2010). The migratory target species, particularly American shad and river herring, displayed seasonal occurrence in the Harbor. Juveniles were found in the inner Harbor areas (not Lower Bay) in the spring and all Harbor areas during fall.

Mid-water trawl collections indicated that alewives were present in NY/NJ Harbor during the spring (primarily April and May) and fall (October and November) and were generally absent from the area during the summer months. YOY juveniles entered the Harbor from freshwater nursery areas and juveniles return from coastal waters largely via channels in 2011.

As observed in 2006, American shad were present in the Harbor during fall (October-November) and generally were absent throughout the rest of the sampling period. Highest CPUEs occurred in the non-channel locations of the Upper Bay during the 2011 sampling.

During 2011, Atlantic menhaden were not collected in great numbers throughout the survey. Highest abundances were observed during the fall months (October-December), but no CPUE exceeded 1.8 fish/10 min tow. There were also no discernible patterns between station types among study areas.

Blueback herring were collected in high abundances during fall months especially in the Upper Bay (September through December), but also were present throughout the Harbor during spring months. Summer months yielded very few catches. In Upper and Lower Bay, collections were primarily made at non-channel stations.

Like Atlantic menhaden, striped bass were collected in relatively low numbers throughout the 2011 sampling effort, primarily in the Arthur Kill/Newark Bay portion of the harbor. CPUE peaked at 2.0 fish/10 min tow in May in the Arthur Kill/Kill Van Kull region. This species was completely absent from the Lower Bay. All collections were made in channel stations.

1.6 REPORT ORGANIZATION

For the purposes of this report, the finfish collected were classified into one of three groups: target migratory species, Essential Fish Habitat (EFH) managed species, and other finfish species that were collected during the sampling program. The intent of this organization was to highlight species that were identified as important by resource agencies and to consider their relative abundances in the NY/NJ Harbor's finfish community. Data analyses and treatment in the discussion focus upon the target migratory finfish species.

Section 2 describes the study design, sampling areas and stations, and provides a summary of the equipment and data analysis methods used. Section 3 presents the results of the mid-water trawl sampling program. Section 4 discusses finfish use of the NY/NJ Harbor in terms of seasonal distribution/movements and habitat use throughout the Harbor. Migratory finfish survey results are qualitatively discussed within the context of USACE-NYD's ongoing efforts to better understand potential impacts associated with exposure to total suspended solids and underwater noise on fish behavior and migration within NY/NJ Harbor. Section 5 provides a concise summary of the overall results of the MFS Program.

2.0 METHODS

2.1 STUDY AREAS AND SAMPLING LOCATIONS

During the 2006 MFS, stations were sampled with both mid-water and bottom trawls to determine the effectiveness at capturing the migratory target species. A recommendation from that program was to sample target migratory finfish species using the mid-water trawl because of the high target species CPUE using this gear, with the exception of striped bass. As identified in the 2006 MFS, striped bass primarily were collected by bottom trawl (USACE 2007), therefore catch rates using a mid-water trawl most likely underestimate abundance.[1]

During the 2012 MFS, twenty (20) fixed mid-water trawl stations consistent with locations sampled in 2006 (Figure 2-1, Table 2-1) were sampled. Fewer stations were sampled in 2011 and 2012 so that each station could be sampled more frequently (i.e., weekly during the peak spring and fall migration periods). Of these stations, seventeen (17) were located in channel areas and three (3) were in non-channel areas. This distribution of sampling effort reflects logistical limitations on sampling shallow water areas using a mid-water trawl, and a focus on sampling in the navigation channels where dredging occurs.

The NY/NJ Harbor was divided into four study areas representing distinct subsections of the harbor complex in order to detect differential usage by migratory species: the Arthur Kill/Kill Van Kull, Newark Bay, Upper New York Bay, and Lower New York Bay. These are interconnected areas of varying hydrodynamics and physical properties (such as substrate). Sampling stations were distributed within each study area as described in the following sub-sections.

[1] Striped bass are included as a target species as they are an important species within NY/NJ Harbor even though mid-water trawls may under-estimate their abundance.

2.1.1 Arthur Kill and Kill Van Kull (AK/KVK)

The AK/KVK study area is confluent with the Upper Bay via the Kill Van Kull (a narrow, tidal strait) and with the Raritan Bay via the Arthur Kill (another narrow, tidal strait). This study area has a dynamic hydrology due to the variation in tidal velocity, amount of freshwater flow, and complex bathymetry connecting bays (i.e., Upper, Newark, and Raritan bays). Little shallow water habitat exists in this study area. Six (6) channel stations were sampled in this area using the mid-water trawl; four (4) (MAK-1 to 4) were in the Arthur Kill and two (MKK-1 and 2) were in the Kill Van Kull. These were the same stations sampled during 2006 and 2011. Due to the limited extent of shallow water habitat within this study area, deep water channel stations were selected due to water depth and safety issues related to towing a mid-water trawl in a high vessel traffic area.

2.1.2 Newark Bay (NB)

The Hackensack and Passaic River basins form the watershed of Newark Bay. The Newark Bay study area consists of broader expanses of open water than the Arthur Kill/Kill Van Kull. Newark Bay contains extensive deep water navigation channels, and its shorelines and shallow water habitats have been greatly modified by bulkheads, riprap, and historic fill. Four (4) stations were sampled in Newark Bay using the mid-water trawl; all four (MNB-1, 2, 5, and 6) were in navigation channels. Stations were established at the mouths of the Passaic and Hackensack Rivers. Two (2) non-channel stations (MNB-3 & 4) sampled in 2006 were not sampled in 2011 and 2012 due to the decreased number of stations included in these programs.

2.1.3 Upper Bay (UB)

The Upper Bay study area is centrally located within the NY/NJ Harbor, connecting the three other study areas to the Hudson River. The Upper Bay begins at the mouth of the Hudson River and empties into the Lower Bay. It is connected to the Newark Bay and Arthur Kill via the Kill Van Kull to the west, and exchanges water with the East River and Long Island Sound. Similar to Newark Bay, this study area contains extensive deep, open water channels and relatively few remaining areas of shallow water habitat due to historic shoreline modifications and development of port facilities. Six (6) stations were sampled in the Upper Bay using the mid-water trawl; five

(MUB-1 through 3, 8 and 9) were in channels and one (MUB-11) was a non-channel station. Two (2) non-channel stations (MNB-6 and 7) and three channel stations (MNB-4, 5, and 10) sampled in 2006 were not sampled in 2011 and 2012 due to the decreased number of stations included in these programs.

2.1.4 Lower Bay (LB)

The Lower Bay study area contains expanses of both deep and shallow open water. Water quality is influenced by the Atlantic Ocean more so than the other three study areas. Four (4) stations were sampled in the Lower Bay using the mid-water trawl; two (2) (MLB-3 and 5) were channel areas and two (2) (MLB-4 and 6) were non-channel areas. Two non-channel stations (MLB-1 and 2) sampled in 2006 were not sampled in 2011 and 2012. One channel station (MLB-5) and one non-channel station (MLB-6) were added for the 2011 and 2012 surveys to sample nearshore areas where the Lower Bay constricts through the Narrows and into the Upper Bay.

2.2 WATER QUALITY

Dissolved oxygen, temperature, conductivity, and salinity were measured after each trawl using a calibrated YSI Pro2030 multi-parameter handheld meter with other available meters (YSI Model 85 Handheld Oxygen, Conductivity, Salinity and Temperature System) as back-up meters. Temperature was measured to the nearest +/- 0.3 °C; dissolved oxygen (+/- 0.3 mg/L); conductivity (+/- 1 µS [micro Siemens]/cm); and salinity (+/- 0.1 ppt [parts per thousand]) and recorded on the Field Data Sheet (Table 2-2). Water quality parameters recorded with mid-water trawls were taken at the sample depth. This sample depth varied based on station depth and location.

Water quality data collected during the 2012 MFS Program were supplemented by data derived from National Oceanic and Atmospheric Administration (NOAA) water quality buoys. While

NOAA data are collected at the surface (http://www.ndbc.noaa.gov/measdes.shtml), these data were demonstrated to be characteristic of mid-water temperatures[2] and provide a sound dataset to supplement the MFS Program. Hourly air and water temperature data from three NOAA buoys in NY/NJ Harbor were downloaded for the 2012 calendar year: Bergen Point West Reach (GNN4) in the Kill Van Kull, Sandy Hook (SDHN4) in the Lower Bay, and the Battery (BATN6) in Upper Bay (Figure 3-2). Data were averaged daily.

MFS Program water quality data for 2012 are provided in Appendix A.

2.3 FINFISH SAMPLING

The U.S. Army Corps of Engineers' M/V (motor vessel) *Hudson* was the primary sampling vessel used for the mid-water trawl surveys. Surveys were scheduled during daylight hours (between one hour after sunrise and one hour before sunset). Mid-water trawls were conducted using an 18-foot (5.5 m) mid-water balloon trawl (Table 2-3), rigged for mid-water trawling. For transects less than 38 feet deep, a minimum cable length of 200 feet of tow cable was deployed to ensure the mid-water trawl extended beyond the *Hudson*'s wheel wash. The float cable length required to fish at mid depths down to 20 feet was determined using a chart of sample depth, float cable lengths, and tow speeds. For transects greater than 38 feet deep, the tow cable length was determined from a chart of wire angle (target angle of approximately 80°) and sample depth to provide the amount of wire from the trawl doors to the water surface and ensuring the mid-water trawl was being towed below the *Hudson*'s wheel wash. For mid-water trawls based on wire angle and length to determine sample depth, the wire angle was measured using a mechanical inclinometer at the beginning of each tow.

[2] During 2012, NOAA buoys at Bergen, New Jersey and the Battery, New York were 0.1-0.5 ºC higher than mid-water temperatures taken at trawl locations from the same date and time, a minor variation which can be attributed to the spatial difference between the buoy and the mid-water trawl location.

Mid-water trawls were towed into the prevailing current at a speed of approximately 6.6 ft/sec (200 cm/sec). Tow velocities were monitored using a General Oceanics electronic flowmeter and deck readout to ensure consistency of tow speed throughout the sampling program. Tidal current differences between the surface and mid-water, as indicated by wire angles deviating from approximately 80°, required slight adjustments in the *Hudson*'s speed through the surface water to maintain a target angle of approximately 80° (range between 78 and 82°).

Mid-water sampling was conducted weekly at twenty (20) stations. The spring migratory sampling began during the last week of March, and continued weekly through April, bi-weekly in May, and once during first week of June 2012. Two summer surveys the weeks of 9 July and 13 August followed. The fall migratory sampling began the week of 10 September and continued weekly to the first week of December 2012, with the exception of the week of 29 October, when sampling was cancelled in the aftermath of Hurricane Sandy (Table 3-1). Surveys were conducted on consecutive days, weather conditions permitting, until all stations were sampled.

Mid-water trawl sampling stations were located using Global Positioning System (GPS) coordinates as well as aids to navigation, soundings, bottom type, and landmarks in the river channel and shoal areas. GPS coordinates were recorded to the nearest one hundredth of a minute (i.e., 40° 35.56') at the start and end of each trawl transect. All pertinent sample information was recorded on a Field Data Sheet.

Following each trawl, fish collected were identified, enumerated, their total lengths were measured to the nearest millimeter, and the fish were returned to the water. The total lengths of up to 100 specimens of each target species (i.e., Atlantic menhaden, American shad, blueback herring, alewife and striped bass) were recorded. For all non-target species, total lengths of up to 25 specimens of each species were recorded for randomly selected individuals. After analysis, all live organisms were released at the collection site. As needed, one specimen of each new species collected was retained for confirmation of the field identification and quality control purposes.

Survey data and observations were recorded on Field Data Sheets. Finfish collection data are provided in Appendix B.

2.4 DATA ANALYSIS

2.4.1 Catch per Unit Effort

CPUE, defined as the number of fish collected per 10 minutes of trawling, was determined for each 2012 mid-water trawl sample and was standardized to 10 minutes using the following formula:

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

Where:

N equals the number of fish collected during the trawl and

T equals the actual tow time expressed in minutes.

Average weekly CPUE was calculated by grouping sample events based on a 7-day weekly period, and averaging CPUEs within that period. Monthly averages were calculated by averaging samples collected within a calendar month, independent of the weekly grouping.

Spring and fall migratory seasons were grouped based on target species abundance in the Harbor. Spring is represented by the months March through June (corresponds to week of year 13 through 23), summer as July and August (week of year 28-33), and fall as September through December (week of year 37-49).

GIS figures were developed to show total CPUE (i.e., sum of sample catches) for each target species for spring and fall 2012.

2.4.2 Statistical Methods

Statistical methods were applied to the 2012 survey data to assess differences in target species catch rates observed across the survey areas. Consistent with the 2011 survey data, however, catch rates in 2012 for species other than alewife and blueback (*Alosa* spp.) were too low to support statistical analysis. As such, the catch rates for juvenile and adult *Alosa* spp. were evaluated during the spring and fall, respectively. The null hypothesis (H_o) being tested maintains that there will be no difference in catch rate across the study areas by season; for

example, median CPUEs of alewife during spring are equal for all study areas. The results of this evaluation will be used to identify those study areas that support higher numbers of fishes during either spring or fall.

ANOVA assumption testing indicated that a non-parametric test would be required given that normality and/or equal variance assumptions were typically not met even for transformed data (i.e., log (CPUE+1)). Accordingly, the non-parametric Kruskal-Wallis one-way ANOVA was used to test for differences in catch rates across survey areas with a Dunn's multiple comparison test (MCT) used to determine differences among locations. Each test is described in greater detail below.

2.4.2.1 Statistical Analysis

The Kruskal-Wallis test is a particularly powerful nonparametric substitution for the one-way ANOVA that may be employed when the assumption of normality is not met by the data (Hintze 2007). The Kruskal-Wallis one-way ANOVA test was run in NCSS 2007 for the spring and fall samples of alewife and blueback herring. Because the test is based on ranks of data rather than absolute values, the transformed (log (CPUE+1) and untransformed data produce the same ANOVA results. The Kruskal-Wallis one-way ANOVA was used to test for differences among survey areas for the blueback and alewife spring and fall samples (see raw data in Appendix C).

Where a significant result was obtained from the Kruskal-Wallis one-way ANOVA, Dunn's MCT was used to determine which survey areas had significantly different median CPUEs. The Dunn's MCT (with Bonferroni adjustment) was used to detect the differences among the median CPUEs of the study areas. Under this test median CPUEs are significantly different if Dunn's z-value is greater than 2.6383. The results of the Dunn's multiple comparison test are reported by indicating the study area mean ranks sorted in ascending order. The study area mean ranks are the study areas sum of ranks used in the Kruskal-Wallis and Dunn's tests divided by the study area counts. The study area mean ranks roughly represent the study area median CPUEs.

2.4.2.2 Cumulative Frequency Distribution

Cumulative frequency distributions (CFDs) derived from empirical catch data, i.e., empirical distribution functions, can be used to compare standardized responses among variables (Hintze 2007). Empirical distribution functions were run using the Nondetect Analysis in NCSS (Hintze 2007). Cumulative frequency distribution graphs were developed using empirical distribution functions to investigate temporal catch patterns and predict the probability of when (by week of year) a given percentage of fish could be expected to occur within a study area. This probability can be used to examine differences among the target species in the timing of the adult spawning migration and downstream juvenile migration. The null hypothesis of the distribution functions is that the timing of all target species are equal. The alternative hypothesis is that the timing for at least two of the target species are different. The logrank chi-square test with the Bonferroni adjusted probability level was used to test the hypothesis. CFDs were developed for all target species for spring (weeks of 26 March through 4 June) and for fall (weeks of 10 September through 3 December). The raw data used for these analyses are presented in Appendices C-4 and C-5.

3.0 RESULTS

Water quality and migratory finfish data and results are provided for all four NY/NJ Harbor study areas (Arthur Kill/Kill Van Kull, Newark Bay, Upper Bay, and Lower Bay). The migratory finfish data were also sorted and analyzed by station type (non-channel and channel) and season. Species composition and patterns in relative abundance are described in the following sections.

3.1 WATER QUALITY

During the 2012 study period, average weekly mid-water temperatures ranged from 8.4 (26 November, Newark Bay) to 25.6 °C (13 August, Newark Bay) (Figure 3-1a). Overall for each week, average temperatures were consistent among the Harbor areas. Arthur Kill/Kill Van Kull experienced greater variability in mid-water temperatures throughout the study period as compared to the other regions (Figure 3-1b). Sample weeks with the greatest temperature range occurred during the week of 9 July for Upper Bay, 13 August for Arthur Kill/Kill Van Kull and

Lower Bay, and of note during the week of 4 November for Newark Bay (following a temperature drop during the aftermath of Hurricane Sandy; Figure 3-1b).

Average weekly salinity at mid-water ranged from 18.0 (30 April, Newark Bay) to 29.0 ppt (15 October, Lower Bay) during the 2012 study period (Figure 3-1a). This salinity range is less than that which was seen in 2011, likely due to the lack of intense rain events during the 2012 sampling period. Mean salinity ranges differed between areas. The lowest mean salinities were in Newark Bay followed by the Arthur Kill/Kill Van Kull, then the Upper Bay; mean salinities were approximately 3 ppt higher within the Lower Bay than the Upper Bay.

Dissolved oxygen concentrations fluctuated with temperature and are somewhat linked to salinity (Figure 3-1a). The solubility of oxygen in water solution decreases with rising temperatures and increasing salinities. As expected, dissolved oxygen concentrations were generally highest during weeks in April, May and December, and were lowest during weeks in August and September among the four areas. During the 2012 study period, average weekly mid-water dissolved oxygen concentration ranged from 5.0 (10 September, Newark Bay and Arthur Kill/Kill Van Kull) to 9.7 mg/L (7 May, Upper Bay).

Water and air temperature data from the NOAA research buoys were graphically depicted for 2012 to supplement the water quality data collected during the MFS program (Figure 3-2). During 2012, average daily water temperatures began to rise during early March. Average daily water temperatures did not fall much below 4ºC (when blueback herring begin to stage in estuaries [Loesch and Lund 1977, Able and Fahay 2010]) for the three water quality buoys even during the traditionally coldest months of January and February. On October 29, 2012 Hurricane Sandy made landfall in the New York Area causing the Sandy Hook Buoy to stop functioning after this date. The buoy at The Battery temporarily stopped functioning as a result of the storm as well.

3.2 FINFISH DESCRIPTIVE FINDINGS

A total of 440 mid-water trawls were conducted during the 2012 MFS, comprised of 374 samples from channel stations and 66 samples from non-channel stations (Table 3-1). A total of 119,951 finfish (34 species) were collected (Table 3-2, Table 3-3). The five target species were collected

by the mid-water trawl, with blueback herring, alewife, Atlantic menhaden and American shad ranked second, fifth, sixth and tenth most abundant, respectively, in the total catch for the 2012 MFS program. The most abundant species collected were bay anchovy Atlantic herring (*Clupea harengus*) and striped anchovy (*Anchoa hepsetus*), which were ranked first, third and fourth by number collected, respectively. During June through December, months with the highest abundance were also the months with the highest species richness, which were August (n=29,344 finfish; 12 species), September (n=14,118 finfish; 11 species), October (n=31,236 finfish; 14 species) and November (n=29,082 finfish; 12 species; Table 3-3).

Target species represented 27% of the total finfish catch (n=32,048; Table 3-3). Several EFH species were also collected during the 2012 MFS program, of which the most common were Atlantic herring (n=3,220), butterfish (*Peprilus triacanthus*) (n=89), and bluefish (*Pomatomus saltatrix*) (n=20).

CPUE of non-target species was greater for each study area, except Upper Bay, than for target species and EFH species combined due to high catch rates of bay anchovy (Table 3-4). Average CPUE of bay anchovy ranged from 102 fish/10 min tow in Upper Bay to 299 fish/10 min tow in Lower Bay (Table 3-4). Excluding bay anchovy, CPUE by region for the non-target species was low and characterized by a substantial number of zero catches, which resulted in high standard errors (Table 3-4). Overall, CPUE of non-target EFH species peaked at a total of 20 fish/10 min tow in the Arthur Kill/Kill Van Kull and averaged 8.47 across all Harbor areas. Total CPUE of non-target other species (non-EFH) was highest in the Lower Bay (316 fish/10 min tow), followed by Arthur Kill/Kill Van Kull (245 fish/10 min tow) (Table 3-4).

The following sub-sections describe the relative abundance and distribution of the five target species: alewife, American shad, Atlantic menhaden, blueback herring, and striped bass. In addition to these species, five (5) Atlantic tomcod (*Microgadus tomcod*) were collected from a channel station in the Upper Bay (MUB-9) on 26 April 2012 (Table 3-3). Although not a target species, historically they are an important anadromous species in the Harbor.

3.2.1 Alewife

3.2.1.1 Seasonal and Temperature-related Patterns

Alewives were collected in the Harbor during the weeks of 26 March through 7 May during the spring, and from the week of 24 September through the week of 3 December in the fall (Figure 3-3). Spring CPUEs did not exceed 3.5 fish/10 min tow. No alewives were collected during July and August. Alewives were common in Upper and Lower Bays during the weeks of 11 November to 3 December. The highest average weekly CPUE of alewives was collected at Upper Bay non-channel stations during the week of 11 November (63.0 fish/10 min tow).

In Newark Bay during April, alewife CPUE decreased from 3.5 to 0 fish/10min, corresponding to an increase in water temperature from approximately 10°C to 13°C. Alewife CPUE increased in the fall after the week of 4 November 2012, which occurred just after a decrease in average mid-water temperature below 15^{o}C across all Harbor areas (Figure 3-3). In Upper and Lower Bay, water temperatures decreased from approximately 16°C to 13°C in these two weeks. During this period, average weekly CPUE of alewives increased in the channel and non-channel stations of the Upper and Lower Bays. In Newark Bay and Arthur Kill/Kill Van Kull, alewives were collected in low densities after the week of 4 November 2012.

3.2.1.2 Channel – Non-channel Station Patterns

The two highest CPUEs of alewives were collected from non-channel stations in the Upper and Lower Bays the week of 11 November. Although alewives were more consistently collected at channel stations than non-channel station, the two peak CPUEs at channel stations (35.0 fish/10 min tow the week of 11 November in Upper Bay, and 19.5 fish/10 min tow the week of 19 November in Lower Bay) were lower than peak weekly CPUE at non-channel stations (Figure 3-3).

3.2.1.3 Harbor Study Area Patterns

Average CPUE during the sampling period was highest in the Upper Bay (2.4 fish/10 min tow) and lowest in the Arthur Kill/Kull Van Kull (0.2 fish/10 min tow) (Table 3-4). In the spring, Newark Bay collections comprised over 70% of the total alewife catch. During the spring,

alewives were predominantly collected at Newark Bay channel stations near the Hackensack and Passaic Rivers (Figure 3-4a). Few alewives were collected at Arthur Kill stations, with a single non-zero catch occurring the week of 9 April (0.2 fish/10 min tow). The results of the Kruskal-Wallis one-way ANOVA detected differences in median CPUE among study areas for the spring samples ($p = 0.024$) (the complete results are presented in Appendix C-2). The only statistically significant comparison was the spring Newark Bay and Newark Bay CPUEs for alewives ($Z=2.755$). The results of the Dunn's MCT are summarized below by indicating the study area mean ranks, with a line connecting those study areas that were not significantly different:

LB=86.00	AK/KVK=87.62	UB=90.86	NB=98.78

During the fall, Upper Bay comprised 67% of the total catch of alewives (Table 3-3), with CPUEs at all but one station ranging between 11 and 100 fish/10 min tow (Figure 3-4b). The channel station located just east of Shooter's Island (MKK-2) yielded equally high CPUE during the fall (Figure 3-4b). Contrary to spring sampling, alewives were relatively abundant in the Lower Bay, as well as in the Upper Bay and Kill Van Kull during the fall. Very few alewives appeared to utilize Newark Bay, and none were collected at Arthur Kill stations (Figure 3-4b). The results of the Kruskal-Wallis one-way ANOVA test did not detect differences in median CPUE among study areas for the alewife fall samples ($p = 0.14$) (the complete results are presented in Appendix C-2). The mean ranks for the study areas were as follows (the line connecting all locations indicates no significant difference in mean rank):

AK/KVK=104.81	NB=107.08	LB=112.47	UB=117.16

3.2.1.4 Length Frequency Distributions

Figure 3-5 depicts the length frequency distributions for alewives by season and Harbor area. In the spring (March-June), relatively few alewives were collected as compared to the fall. Spring collections from Newark Bay averaged 109 mm total length, and ranged from 77-129 mm (n=32). Arthur Kill/Kill Van Kull and the Upper Bay collections were composed of only one (1,

at 88 mm) and three (3, at 90, 130, and 260 mm) alewives, respectively. No alewives were collected in the Lower Bay during the spring sampling.

During summer months (one July and one August survey), no alewives were collected in the Harbor.

The length frequency distributions of alewives caught during the fall (September-December) were similar across all four Harbor areas. Ninety-six percent (96%) of alewives sampled were from the 70-120 mm length groups. Alewives from the Upper Bay were collected across a larger distribution of lengths, skewed to the right and ranged from 75 mm to 200 mm.

Of all alewives caught in both spring and fall 2012, 97% (n=476) were in length intervals representative of juveniles or immature fish (< 170 mm), and 16 fish were representative of adults (≥ 170 mm; per Hattala et al. in ASMFC 2012). During the spring, one (1) fish greater than 170 mm was collected from the Upper Bay (MUB-2), in late March. During the fall, 15 alewives over 170 mm were collected in the Upper Bay (MUB-11, MUB-1) on 14 November.

3.2.2 American shad

3.2.2.1 Seasonal and Temperature-Related Patterns

American shad were collected in the Harbor from the weeks of 4 April through 7 May during the spring and from the week of 10 September to the week of 3 December in the fall. Low CPUEs occurred during summer sampling in August in the Arthur Kill/Kill Van Kull (Figure 3-6). Average weekly CPUE of American shad peaked at Lower Bay non-channel stations in the week of 10 September (8.0 fish/10 min tow) and at Upper Bay non-channels stations in the week of 11 November 2012 (6.0 fish/10 min tow). During November, American shad were collected during three consecutive weeks in the Upper Bay, and these catches occurred after mid-water temperatures in the Upper Bay began to drop below approximately 15 °C (Figure 3-6).

3.2.2.2 Channel – Non-channel Station Patterns

Average weekly American shad CPUEs were low across all channel stations in the Harbor, peaking at 1.3 fish/10 min tow during the week of 2 April 2012 in Newark Bay (Figure 3-6). In

comparison, the peak CPUE in Lower Bay and Upper Bay occurred at non-channel stations, with 8.0 fish/10 min tow the week of 10 September in the Lower Bay and 6.0 fish/10 min tow the week of 11 November 2012 in the Upper Bay (Figure 3-6).

3.2.2.3 Harbor Study Area Patterns

Average CPUE for American shad across the entire sampling period was low across all areas, with Lower Bay having the highest overall CPUE (0.2 fish/10 min tow) (Table 3-4). In the spring (March-June), total American shad collections were low in the Arthur Kill/Kill Van Kull and Newark Bay (CPUE ranging from 0.2 to 1.3 fish/10min) and no American shad were collected during the spring at stations across the Upper and Lower Bays (Figure 3-7a). During the fall months (September-December), American shad were collected in all sampling regions, again in low numbers (8 fish/10 min tow or less; Figure 3-7b). Across the Harbor, American shad were slightly more abundant in fall (CPUE peaking at 8 fish/10 min tow in the Lower Bay) collections compared to spring (CPUE peaking at 1.3 fish/10 min tow in Newark Bay). Due to low catch rates, ANOVA and MCT analyses were not run for American shad.

3.2.2.4 Length Frequency Distributions

In the spring, America shad total lengths ranged from a minimum of 116 mm (Newark Bay) to a maximum of 163 mm (Kill Van Kull; Figure 3-8). The mean total lengths from the Arthur Kill/Kill Van Kull and Newark Bay were 143 and 129 mm, respectively. No American shad were collected in Upper or Lower Bay during the spring months.

Two American shad (94 and 100 mm TL) were caught during the summer sampling period, both collected from the Arthur Kill (MAK-1, MAK-2) in August.

In the fall, the length frequency distribution was similar among Harbor areas, with 92% of American shad in the 90 to 149 mm lengths (Figure 3-8). Smaller American shad were collected from the Arthur Kill/Kill Van Kull during the fall than during the spring sampling, averaging 114 mm. American shad from Lower Bay were collected across a larger distribution of length than the other Harbor areas, with mean total length of 137 mm, 80% (n=15) occurring in the 130 to 170 mm length groups.

The largest American shad collected was 163 mm TL (Figure 3-8; MLB-5). None of the American shad collected were sexually mature adults, which at a minimum would be expected to measure 450 mm or more in total length (Hattala and Kahnle 2009).

3.2.3 Atlantic menhaden

3.2.3.1 Seasonal and Temperature-Related Patterns

Atlantic menhaden were collected in all seasons and regions throughout the Harbor (Table 3-3). Based on the weekly CPUE data, the majority of Atlantic menhaden collections occurred in April and May during the spring and October and November during the fall (Figure 3-9). During the spring, Atlantic menhaden collections peaked in Newark Bay during the week of 9 April with an average CPUE of 15.0 fish/10 min tow. CPUEs of Atlantic menhaden remained below 0.8 fish/10 min tow during the summer. During the fall, Atlantic menhaden peaked at 12.5 fish/10min in the Arthur Kill/Kill Van Kull during the week of 11 November. Generally, Atlantic menhaden were collected when Harbor water temperatures were below 20 ^{o}C.

3.2.3.2 Channel – Non-channel Station Patterns

Collections at non-channel stations in the Upper and Lower Bays totaled 3 and 6 fish/10 min tow, respectively. Non-channel station collections peaked in Upper Bay during the week of 23 April with an average CPUE of 2.0 fish/10 min tow. Other collections of Atlantic menhaden at non-channel stations were 1.0 fish/10 min tow or less (Figure 3-9).

3.2.3.3 Harbor Study Area Patterns

Overall, average CPUEs for Atlantic menhaden across the entire sampling program were highest in the Arthur Kill/Kill Van Kull and Newark Bay regions (0.7 and 1.5 fish/10 min tow CPUE, respectively). For Upper and Lower Bay regions, average CPUE during 2012 was less than 0.3 fish/10 min tow (Table 3-4). Atlantic menhaden were collected at 14 of the 20 stations sampled during the spring (Figure 3-10a). All stations in Newark Bay and Arthur Kill/Kill Van Kull yielded collections, with one exception (MAK-2). The highest total CPUE was recorded at the mouth of the Passaic River (CPUE = 63 fish/10min; MNB-6). In Upper and Lower Bay, 6 of 11 stations yielded collections with the highest being at station MUB-9. The fall sampling yielded

similar results with collections occurring in all areas of the Harbor at 16 of the 20 stations sampled (Figure 3-10b). The highest collections occurred in Newark Bay (CPUE = 48 fish/10 min tow; MNB-5) and the Arthur Kill/Kill Van Kull (CPUE = 72 fish/10 min tow; MKK-2). Due to low catch rates, ANOVA and MCT analyses were not run for Atlantic menhaden.

3.2.3.4 Length Frequency Distributions

During the spring, Atlantic menhaden total lengths averaged 131 mm in the Arthur Kill/Kill Van Kull, 114 mm in Newark Bay, and 249 mm in Upper Bay. Lower Bay collections during the spring were limited to one Atlantic menhaden at 28 mm TL (Figure 3-11). Three separate length groups were observed during the spring in the Harbor: YOY fish represented by lengths of 20 to 49 mm TL comprised 14% of total menhaden collected during spring, year-1 fish represented by lengths of 90 to 149 mm TL comprised 64% of the spring total, and spawning adults represented by length of 290 to 379 mm TL comprised 21% of all menhaden collected in the spring.

Six menhaden were caught during the summer (two sample events during July-August) in all sampling regions throughout the Harbor with lengths ranging from 44 to 336 mm (Newark Bay).

Similar to the spring, fall collections of Atlantic menhaden fell into three length groups. The first two groups spanned the 60 to 159 mm and 160 to 239 mm length intervals. The third length interval consisted of larger fish between the 320 and 369 mm length intervals, again similar to the largest spring length interval (Figure 3-11). No fish were collected during the fall at lengths intervals of 240 mm through 319 mm.

3.2.4 Blueback herring

3.2.4.1 Seasonal and Temperature-related Patterns

Blueback herring were the most abundant target species caught in the 2012 Migratory Finfish Survey, with a total of 31,234 individuals collected (Table 3-3). Blueback herring were collected in the Harbor from the weeks of 26 March through 7 May and from the week of 8 October through the week of 3 December (Figure 3-12). Some blueback herring were collected during late May, July and August, but with average weekly CPUE at or less than 3.3 fish/10 min tow.

Average weekly mid-water trawl collections of blueback herring peaked at Upper Bay stations during the week of 26 November (average CPUE = 7,330.0 fish/10 min tow; Figure 3-12). Blueback herring were collected in the spring during late March and early April, in all Harbor areas except Lower Bay. The peak average weekly CPUE occurred in Newark Bay (67.8 fish/10 min tow) during the week of 2 April. Blueback herring continued to be collected at low rates into May in both the Upper Bay and Lower Bay (Figure 3-12).

During the summer, blueback herring were only collected the week of 13 August in the Arthur Kill/Kill Van Kull and Newark Bay, with average weekly CPUEs of 2.0 and 2.5 fish/10 min tow, respectively.

CPUEs were greater during the fall across the Harbor, and blueback herring were collected in every Harbor area from 4 November through 3 December, when the 2012 MFS survey ended. Average weekly CPUEs exceeded 500 fish/10 min tow during two weeks in the Upper Bay, and during three weeks in the Lower Bay. The top two weekly CPUEs were collected during the weeks of 26 November in the Upper Bay (934 fish/10 min tow at channel stations; 7,330 fish/10 min tow at non-channel stations), and during the week of 19 November in the Lower Bay (2,252.0 fish/10 min tow at non-channel stations). Average weekly CPUEs in the Newark Bay and Arthur Kill/Kill Van Kull areas during this period were similar in magnitude to each other, ranging from approximately 50 to 200 fish/10min.

The weeks with relatively abundant catches of blueback herring in the spring occurred when average mid-water temperatures were also approximately 12° C or less. The large catches of blueback herring during November in the Upper and Lower Bays were preceded by a drop, and then stabilization, in average mid-water temperatures in those areas. Temperatures dropped from approximately 16 °C to approximately 12 °C over the course of the month of October 2012, and then remained near 10-12 °C through the first week of December.

3.2.4.2 Channel – Non-channel Station Patterns

In the Upper and Lower Bays, where both channel and non-channel station types were sampled, blueback herring were collected primarily from non-channel stations with relatively high CPUE during the fall, peaking at a CPUE of 7,330 fish/10 min tow during the week of 26 November.

Blueback herring were collected in low numbers at channel and non-channel stations during late spring and summer months from the week of 26 March through October in all regions (Figure 3-12).

3.2.4.3 Harbor Study Area Patterns

During the spring, blueback herring were most abundant in the northern portions of the Upper Bay, as well as Newark Bay and the Arthur Kill. They did not utilize the southern portions of the Lower Bay to as great an extent (Figure 3-13a). During the fall, blueback herring were relatively abundant throughout the study area (Figure 3-13b). Average CPUE was highest in the Upper and Lower Bays (114.6 and 93.3 fish/10 min tow, respectively) and lowest in Newark Bay (27.7 fish/10 min tow) (Table 3-4).

Total CPUE during spring indicates that blueback herring use all areas of the Harbor during these months, with collections at 14 of the 20 stations sampled (Figure 3-13a). Relative to the other target species, blueback herring were collected in higher abundance. The Kruskal-Wallis one-way ANOVA test for differences in median CPUE among study areas for the blueback herring spring samples was marginally significant ($p = 0.053$) (results are presented in Appendix C-3). The Dunn's MCT (with Bonferroni adjustment) detected a significant difference between Newark Bay and Lower Bay. Under this test median CPUEs are significantly different if Dunn's z-value is greater than 2.6383, and the z-value for the comparison between Newark Bay and Lower Bay was 2.7067 during spring. The mean ranks for the study areas were as follows, with a line connecting those study areas that were not significantly different:

LB=77.85 AK/KVK=89.69 UB=92.88 NB=100.81

During the fall, Upper Bay and Lower Bay yielded high CPUEs of blueback herring (75% of the total blueback herring catch) relative to Arthur Kill/Kill Van Kull and Newark Bay (Figure 3-12). CPUE was relatively high (>1,000 total fish/10 min tow for the majority of stations) at both channel and non-channel stations in these areas (Figure 3-13b). However, the Kruskal-Wallis one-way ANOVA test did not detect any statistically significant difference in median CPUE

among study areas for the blueback herring fall samples (probability level = 0.15) (see Appendix C-3). The mean ranks for the study areas were as follows (the line connecting all locations indicates no significant difference in mean rank):

LB=103.59	UB=105.84	AK/KVK=108.33	NB=127.65

3.2.4.4 Length Frequency Distributions

In the spring, almost all of the blueback herring caught (99%; n=808) regardless of Harbor area occurred in the 60 and 170 mm size range (Figure 3-14). Nine blueback herring were 170 mm total length or greater, which represent spawning adults (Hattala et al. in ASMFC 2012), while the lengths of the remaining fish measured indicate that they are likely juveniles. The mean size of blueback herring collected in the spring was 96 mm total length for the Arthur Kill/KVK, 92 mm for Newark Bay, 102 mm for the Upper Bay, and 112 for the Lower Bay.

During the summer months (July-August), blueback herring collected from Newark Bay (n=10) and the Arthur Kill/Kill Van Kull (n=12) averaged 81 mm and 46 mm total length, respectively (Figure 3-14).

In the fall, the length frequency distribution consisted of juvenile or immature fish (n=4,656), with approximately 65% of the catch from Arthur Kill/Kill Van Kull, Newark Bay, and Upper Bay ranging from 70-79 mm total length. Similarly, approximately 65% of blueback herring from Lower Bay ranged from 70-89 mm total length. One adult blueback with total length 178 mm was collected in the Arthur Kill/Kill Van Kull (MAK-1). There was less overall variation is size and fish were somewhat smaller for all areas in the fall compared to the spring, with the size of all blueback herring ranging between 56 mm and 178 mm total length and mean total lengths were similar among Harbor areas in the fall.

3.2.5 Striped bass

3.2.5.1 Seasonal Patterns

Three (3) striped bass were collected during the 2012 MFS Program, two during the spring and the remaining caught in the fall (Table 3-3). Based on the weekly CPUE data, striped bass were

present in the Harbor the week of 9 April and 7 May during the spring (Figure 3-15). The remaining individual was collected during the week of 3 December (Figure 3-15).

Average weekly CPUE during the three weeks that striped bass were collected ranged from 0.2 to 0.3 (Figure 3-15).

3.2.5.2 Channel – Non-channel Station Patterns

Minimal catch occurred at channel stations, with no striped bass collections occurring at non-channel stations during the 2012 Program (Figure 3-15).

3.2.5.3 Harbor Study Area Patterns

No striped bass were collected in the Lower Bay during 2012. The other Harbor areas yielded one individual each. During spring, one striped bass was collected in the Arthur Kill/Kill Van Kull (MKK-2) and Newark Bay (MNB-5, mouth of the Hackensack River), and in the fall in Upper Bay (MUB-9) (Figures 3-16a, 3-16b). No striped bass were collected at 17 of the 20 stations sampled during 2012.

Due to low catch rates attributable to their demersal nature, the Kruskal-Wallis one-way ANOVA test to detect differences among study areas was not run for striped bass.

3.2.5.4 Length Frequency Distributions

The two striped bass were caught in the spring at Arthur Kill/Kill Van Kull and Newark Bay stations were 120 mm and 136 mm, respectively (Figure 3-17). One striped bass caught from the Upper Bay during the fall measured 391 mm TL. Because of the extremely small catch during the 2012 MFS Program, no discernible patterns could be identified.

3.3 TIMING OF MIGRATION

Cumulative frequency distribution (CFD) graphs were developed to investigate spring and fall temporal patterns for the target species. CFDs were plotted for target species for spring (weeks of 26 March through 4 June) and fall (weeks of 10 September through 3 December) (Figure 3-18).

Due to low catch rates, striped bass was not included in the CFD analysis. The results of the CFDs are presented in Appendix C-6 and C-7.

The logrank test indicates that there were significant differences in 2012 among target species occurrence during the spring ($p < 0.0001$). The CFD for blueback herring was significantly different from all other species. The CFD for alewives was significantly different from Atlantic menhaden. No other combinations of species were found to have significantly different CFDs from each other (Table 3-5). Atlantic menhaden occurred latest in the spring, while the three remaining species (i.e., alewife, blueback herring, and American shad) generally overlap in occurrence and were found earlier in the season.

The CFD is presented in Figure 3-18. The CFD indicates that by the week of 26 March approximately 6% of the alewives and 35% of the blueback herring would have passed through the study area. By the week of 30 April, approximately 97% of alewives and blueback herring would have passed through the study area (Figure 3-18). Because the CPUE for American shad and Atlantic menhaden was low, they are being discussed separately. American shad were caught from the week of 2 April through the week of 23 April. The CFD indicates that by 2 April 31% would have passed through the study area and by 16 April 88% would have passed through the study area. Atlantic menhaden were caught from the week of 26 March to 4 June. The results of the CFD indicate that 47% would have passed through the study area by the week of 2 April, and by 21 May, 98% would have passed through the study area.

The logrank test indicates there were also significant differences in 2012 among target species with occurrence during the fall ($p = 0.0001$). Significant differences in CFDs were identified for Atlantic menhaden and blueback herring relative to each other and all other species with the exception of blueback herring (Table 3-6). The CFD for alewives also differed from that of striped bass. The remaining CFDs were not significantly different. Blueback herring occurred late in the season while Atlantic menhaden occur more abruptly in the mid season which is expected to have resulted in these CFDs being different from the rest of the group.

As shown in Figure 3-18, approximately 42% of Atlantic menhaden had passed through the study area by the week of 4 November, and approximately 95% by the next week, beginning 11

November. However, only approximately 18% of blueback herring had passed through the area by this week. By the week of 26 November, approximately 98% of alewives had passed through the study area, as had 84% of the American shad, 99% of the Atlantic menhaden, and 86% of the blueback herring (Figure 3-18).

4.0 DISCUSSION

The Migratory Finfish Sampling Program provides region-specific life history information for key migratory species that occur in the NY/NJ Harbor. The program's five target species (alewife, American shad, Atlantic menhaden, blueback herring, and striped bass) may use the Harbor in a variety of ways: as a pre-spawning staging area, as a corridor to access spawning habitat in the Hudson River or other tributaries, and as foraging grounds and overwintering habitat for juveniles. As indicated earlier, information gained from this study can be used to assess potential interactions between dredging operations and migratory species as they move through the Harbor.

This study was conducted in concert with USACE-NYD's ongoing efforts to monitor the extent and duration of suspended sediment plumes generated during dredging operations, and following USACE Engineering Research and Development Center's (ERDC) underwater acoustic surveys of backhoe and cutterhead dredge operations and ambient noise conditions in the NY/NJ Harbor (Reine et al. 2012, Reine et al. 2013). These studies are designed to fill knowledge gaps and provide a better understanding of potential impacts of dredging operations on fish migration within NY/NJ Harbor.

4.1 SPATIAL AND TEMPORAL PATTERNS

Spatial and temporal distribution patterns observed for the five target species are summarized in Table 1-1, and a summary of other migratory finfish surveys completed in the Hudson Raritan Estuary is provided in Table 4-1. In the Estuary, most fisheries surveys targeting migratory species have been conducted within the Hudson River and its tributaries, and relatively few within the NY/NJ Harbor, or the Arthur Kill, Kill Van Kull and tributaries along New Jersey's coast (Table 4-1).

Alewife and blueback herring co-occur throughout much of their range; however, their individual life histories often result in different spatial and temporal distribution patterns (Monroe 2000). Blueback herring were the most abundant of the five target species investigated during the 2012 MFS. In spring 2012, blueback herring were relatively common within the Newark Bay, Upper Bay, and in the Arthur Kill; however they were collected in low abundance from Lower Bay stations. Blueback herring were significantly more abundant in the Newark Bay in comparison to the Lower Bay, a result that was mostly driven by relatively high catches the week of 2 April. During 2006 and 2011 MFS surveys, it was noted that blueback herring abundance was especially high in spring up to three weeks prior to peak alewife abundance, most notably in the Upper Bay (USACE-NYD 2012). These observed abundance patterns during the previous survey years indicate "staging" in the estuary, prior to initiation of migration upriver to spawn. Loesch and Lund (1977) described blueback herring collections in the lower Connecticut River several weeks prior to initiation of spawning. This spring staging pattern was not clearly observed during the 2012 MFS, possibly due to unseasonably warm winter temperatures. Warmer water temperatures during winter months are hypothesized to deter fish from pre-migration staging because it is energetically costly for the fish to linger in the estuary (NMFS 2012). During fall, blueback herring were abundant throughout the Harbor and continued to be abundant throughout November, though there were no significant differences among harbor regions.

In spring 2012, while blueback herring were common, alewives were relatively rare throughout the Harbor. Alewives were consistently collected in Newark Bay during April at low densities, but were uncommon or absent at the Arthur Kill/Kill Van Kull, Upper and Lower Bay stations during spring. The onset of alewife spawning runs typically precedes blueback herring runs by three to four weeks and is cued by water temperatures ranging from 5 to 10^{o}C (Monroe et al. 2000). Water temperatures in the NY/NJ Harbor remained above 5^{o}C throughout most of January and February and increased to 10^{o}C by late March. Given the indicators (low spring catch rates of alewives, unseasonably warm water temperatures, and catches of blueback herring during March), it is likely that alewife had mostly moved out of the NY/NJ Harbor to upstream waters by the start of the 2012 MFS. There were no significant differences in alewife abundances among harbor regions during the fall.

Most alewife and blueback herring collected during spring 2012 MFS collections were juveniles and sub-adults. Greater numbers of both alewife and blueback herring were collected in fall, with most being juveniles and sub-adults. Loesch (1987) reported that blueback herring and alewife from the Connecticut River reached spawning size at approximately 260-300 mm. In contrast, spawning in Hudson River alewife and blueback herring populations has been reported among much smaller individuals (approximately 170 mm or greater; Hattala et al. 2012), and recent observed trends have shown a decrease in mean length and mean length-at-age. During the spring 2012 MFS survey, eight blueback herring greater than 170 mm (i.e., "spawning adults") collected, often with many 90-120 mm juveniles. During the fall, one spawning-sized blueback herring and 12 spawning-sized alewives were collected in samples with many other 90-100 mm juveniles or immature alewives (i.e., the modal size group). These patterns are similar to Stone et al. (1994), which indicated that alewife and juvenile blueback herring may be present all year in the Hudson-Raritan Estuary, with abundances dependent upon the life stage and season.

Many factors cue juvenile river herring out-migration, including increased flow, decreasing water temperatures, lunar phases, and decreased food availability in tributaries (Monroe 2000, Yako et al. 2002). Juvenile blueback herring tend to remain in their natal spawning rivers a month longer than alewives and migrate downstream within a narrow timeframe as compared to alewives, which emigrate throughout summer in successive cohorts (Monroe 2000). In the Connecticut River, juvenile blueback herring out-migration has been documented to end in late October and early November when water temperatures reach 10ºC (O'Leary and Kynard 1986). In the Chesapeake Bay and Connecticut River, alewife and blueback herring were documented in inshore waters at the mouth of their natal river for one to two years (Walton 1983, Marcy 1969). During the 2012 MFS, the greatest abundance of blueback herring was observed in Upper and Lower Bays during the week of 26 November, following a decline in water temperatures Harbor-wide. Blueback herring and alewife were also collected in December, despite water temperatures of approximately 10ºC. The late-season collections in NY/NJ Harbor during 2012 may be a combination of the relatively stable water temperatures during this time period (9-10ºC at the Battery) and an indication that at least some juvenile blueback herring remain in the Harbor during winter, rather than out-migrating to the ocean.

Atlantic menhaden were more abundant during the 2012 MFS program than in previous program years. During both spring and fall, Atlantic menhaden were collected most often within the Arthur Kill/Kill Van Kull and Newark Bay channel stations, and to a lesser extent throughout the Upper and Lower Bays and in Newark Bay. Three distinct age classes (YOY, Year-1 and spawning adults) were identified based on length frequency analysis and published size/age class intervals (Reintjes 1982, Rogers and Van Den Avyle 1989). YOY fish (10-40 mm TL) represented 14% of total menhaden collected during spring. Year-1 fish (80-140 mm TL) represented 64% of the spring total. Spawning adults, 5-7 years of age (290 – 370 mm TL), represented 21% of all menhaden collected in the spring). A similar size-class distribution was observed during the fall migration, with length intervals reflecting growth of the fish since the spring.

American shad were relatively uncommon during spring collections, occurring in low densities in the Arthur Kill/Kill Van Kull and in Newark Bay. No shad were collected at Upper and Lower Bay stations in spring 2012. During fall surveys, shad were slightly more abundant and more widely distributed among sampling stations harborwide, although no spawning sized American shad were collected. Juvenile shad collected during fall 2012 exhibited similar spatial and temporal patterns as blueback herring juveniles (i.e., favoring Upper and Lower Bays, peak fall abundance during November). Co-occurrence of shad and river herring has been documented in other northeastern estuaries (Monroe 2000).

It is difficult to infer spatial and seasonal distribution patterns of striped bass from the MFS Program data, as they were rare in mid-water trawl collections. The 2012 surveys were no exception, with only three individuals collected; one each in the Arthur Kill and Newark Bay in spring, and a single individual collected in the Upper Bay during fall. However, striped bass have been documented as abundant during the USACE-NYD's annual Aquatic Biological Survey (ABS) Program, in which bottom trawls were used to collect fish throughout the Harbor (including many stations in common with the MFS program) from December/January through May/June during 1998 through 2010. Striped bass were collected throughout the year during the multi-year ABS surveys, with highest CPUE generally occurring during summer and fall in the Upper Bay, Newark Bay and Arthur Kill. This comparison among the two surveys suggests that

the location within the water column targeted by the two gear types (mid-water vs. bottom trawl) is a critical determinant of effectiveness in collecting striped bass.

While considered a highly motile, pelagic species, striped bass are strongly attracted to submerged structures, especially as juveniles (Cantelmo and Wahtola 1992, Able and Duffy-Anderson 2006). Both juveniles and adults are known to be adaptable, opportunistic predators, often feeding on benthic or demersal prey such as blue crabs or other crustaceans (Booth and Gary 1993, Steimle et al. 2000). Adult and juvenile striped bass were collected in mid-water trawl samples during the 1982-1983 NJDEP Fishery Resources Inventory, at Weehawken and Jersey City, New Jersey, primarily during winter, fall and early spring sampling events (NJDEP 1984). However, striped bass were considerably more abundant, and widely distributed (seasonally and spatially) among bottom trawl and trap net samples during the NJDEP survey. During December 1995, and again in December 1997, a survey of fish overwintering patterns in the lower Hudson River was conducted by Hartman and Nagy (2006). These investigators used gill nets and mid-water trawls to verify a fisheries hydroacoustics sampling program for the lower Hudson River. Striped bass was among the most common species collected in mid-water trawl samples (up to 25% of total catch per sample) at stations ranging from the Battery north to Haverstraw Bay.

On October 29, 2012, Hurricane Sandy made landfall near Atlantic City, NJ. The storm produced a 13.8 ft. tidal surge in Upper New York Bay, causing widespread flooding and significant damage to coastal infrastructure (Grubel et al. 2012). The effect of the storm on marine resource species has not yet been fully determined. The Hudson River Foundation (HRF), in collaboration with Queens College – City University of New York (CUNY), developed a survey instrument which was used to gather and summarize preliminary observations and monitoring data, including preliminary monitoring results from the 2012 MFS on the immediate effects of Hurricane Sandy in a report to the National Fish and Wildlife Foundation (Grubel et al. 2012). The general conclusion of the HRF/CUNY study was that no short-term detrimental effects on marine/estuarine biota in the NY/NJ Harbor region were evident; however, it will be some time before it can be conclusively determined that the storm did not result in more insidious, long-term effects from increased sediment transport, re-suspension, or contaminant mobilization.

Large numbers of blueback herring were collected in the week following the storm in the Arthur Kill, Newark Bay, and Kill Van Kull as well as in the Upper and Lower Bays. Although not as numerous as blueback herring, alewife were collected in the Kill Van Kull and the Upper and Lower Bays, American shad were collected in the Upper and Lower Bays, and Atlantic menhaden were collected in Newark Bay. These data may indicate an increased rate of fish out-migration, but at this time it is not possible to say whether this was related to the storm or simply a normal autumnal migration.

4.2 DREDGING AND MIGRATORY FINFISH

Migratory finfish populations are vulnerable to anthropogenic disturbances, such as dredging (ASMFC 2009). Primary and secondary impacts from dredging include channelization of spawning and nursery habitat, dredged material placement that interferes with migration or isolates spawning habitat, release of contaminants, and high TSS levels, which may inhibit feeding and respiration, especially among larval and juvenile fish (ASMFC 2009). State and Federal resource agencies (e.g., NYSDEC, NJDEP, NMFS) have used seasonal dredging windows to protect fish during the critical migration periods, (Reine et al. 1998, Evans et al. 2011). These restrictions are based on concerns that various anadromous species, including striped bass, American shad, river herring, and sturgeon may be prevented from migrating or may avoid entry to natal spawning streams due to TSS plumes (Reine et al. 1998). Underwater noise produced during dredging operations has been hypothesized to disrupt fish migration by blocking or delaying movement through navigable waterways, interrupting or impairing communication and disrupting foraging behavior. However, field studies have not conclusively demonstrated TSS or sound-associated interference of fish migration by navigation dredging operations (Reine et al. 1998).

4.2.1 Total Suspended Solids

The potential for dredging impacts on migratory species depends on site-specific conditions and interactions among the dredge plant, *in situ* sediment characteristics, local hydrodynamics, and distributions of organisms in space and time. These factors interact to determine the duration of suspended sediment exposure (Wilber and Clarke 2001). Larval and juvenile fish, in particular, are especially sensitive to dredging-induced turbidity, as their gills may become clogged or

abraded by floating particulates. Feeding ability of some larval and juvenile fishes is decreased under higher TSS conditions due to a reduction in available light (Snyder 1976, Auld and Schubel 1978). Fish are typically exposed to localized plumes for short durations, unless they follow the plume, are confined to an area with restricted circulation, or if dredging occurs near the estuarine salt front where fish may meander between fresh and salt water to facilitate osmoregulation (Wilber and Clarke 2001).

As part of USACE-NYD's ongoing Harborwide Water Quality/Total Suspended Solids (WQ/TSS) Monitoring Program, a number of WQ/TSS surveys were conducted in the greater New York Harbor (Table 4-3). These surveys were designed to monitor the extent of plumes of re-suspended sediment generated by ship traffic and harbor deepening dredging operations. The size, extent, and duration of the sediment plume were highly dependent upon site-specific sediment type and current characteristics. In general, the TSS surveys demonstrate that areas with finer sediment grain size, and/or stronger currents are likely to generate sediment plumes that will be transported further downstream in comparison to locations with relatively coarse sediments and quiescent flow. However, regardless of sediment type and current regime, the lateral size of sediment plumes from dredging was limited and remained confined to the channel basins. Suspended sediment plumes are dynamic and each TSS survey represents a composite snapshot over time with many factors contributing to the observed variation. In the near future, the USACE-NYD will develop a TSS Summary Report to collectively assess more than a dozen TSS studies that have been completed in the NY/NJ Harbor. The resulting TSS Summary Report will provide a comprehensive comparison and assessment of observed plume structure and dynamics across the Harbor.

4.2.2 Underwater Sound

Similar to TSS, the effect of underwater sound on fish is a function of magnitude and duration of exposure, and can affect fish behavior by disturbing feeding, predator avoidance, and social interactions, or have more lasting physical effects (Popper 2003, Popper and Hasting 2009). Within the NY/NJ Harbor, the majority of dredging associated with the HDP is conducted using mechanical bucket dredges. However, cutterhead dredges are also used for fracturing hard substrates and hopper dredgers have been used to dredge the Ambrose Channel. Sounds

generated during dredging activities encompass several categories and can range in duration from seconds to minutes. These include physical removal which produces scraping/grinding sounds; hydraulic pump noise; sounds emanating from the barge's hull (particularly during early stages of filling), and sounds associated with the periodic movement of the dredge using cables, spuds, and tugboats (Reine et al. 2013). The magnitude and extent of the various underwater sounds produced are influenced by factors such as substrate type, channel morphology, site-specific hydrodynamic conditions, equipment maintenance status, and skill of the dredge operator.

During 2011, the USACE ERDC conducted a field assessment at the confluence of the Kill Van Kull and Upper Bay to characterize underwater sounds associated with dredging in rock and gravel substrate (Reine et al. 2013). The findings of this study indicated that ambient noise in the Upper Bay approached or exceeded NMFS sound thresholds for a continuous noise source. Existing NMFS Marine Mammal Protection Act guidance identifies sound pressure level (SPL) thresholds for behavioral disturbance/harassment from an impulsive noise source (e.g., seismic survey), and different thresholds for behavioral disturbance/harassment from a continuous noise source (e.g., dredging) (referenced in Reine et al. 2013). These SPLs are often used as thresholds for injury and disturbance for others species as well. Non-continuous, repetitive sounds occurred during dredging, but lasted for only a few seconds per event. Dredge engine/generator noise was the only continuous sound that exceeded the 120 dB threshold for continuous noise. The study concluded that fish behavioral responses would be expected to occur primarily in narrow deep channels (e.g., Arthur Kill/Kill Van Kull) where it would be difficult for fish to avoid noise.

5.0 SUMMARY

The results of the 2012 MFS Program are consistent with the findings of the 2006 and 2011 MFS surveys, as well as previous studies that demonstrate that migratory finfish use NY/NJ Harbor during spring and fall migration periods. The target species, particularly alewife and blueback herring, are characterized by distinct patterns of seasonal occurrence in the Harbor. Juveniles were present in the inner Harbor area (i.e., not Lower Bay) in the spring, and are distributed throughout the Harbor during fall. An especially large out-migration of juvenile blueback herring

(along with lesser numbers of other clupeids) was documented in fall 2012; this may have been influenced by the occurrence of Hurricane Sandy, which produced a large storm surge in the Harbor on October 29, 2012. However, at this time, it is not possible to conclusively determine the magnitude of the storm's impact on seasonal herring movement patterns. Striped bass, notably juveniles, are known to aggregate in the upper Harbor during winter, but are likely under-represented by single fishing gear (mid-water trawl) used in the present survey.

The findings of the 2012 MFS Program and recent USACE-NYD TSS surveys indicate that most target migratory finfish species would have limited exposure to suspended sediment plumes resulting from dredging operations. The possible exception is striped bass, which generally exhibit a greater preference for demersal habitats and submerged structures in comparison to the clupeid species surveyed, and would have a greater likelihood of occurring within the vicinity of sediment plumes. However, considering the limited extent and short duration of sediment plumes, and the high degree of motility and known spatial and temporal distribution patterns of the target migratory species, detrimental impacts to all life stages, including juvenile and adult striped bass, are expected to be minimal.

In addition, adverse effects on migratory fish associated with dredging-related underwater sounds are expected to be minimal, as a result of limited exposure time during migration and the relatively high ambient noise levels present throughout the NY/NJ Harbor area. In NY/NJ Harbor, seasonal dredging restrictions for finfish have been instituted primarily to protect essential fish habitat, specifically winter flounder spawning and nursery habitat. However, regional concerns have increased with regard to impacts on migratory fish stocks. Continuation of the District's monitoring program and developing a better understanding of migratory pathways and peak seasonal use (temporal and spatial patterns) in conjunction with USACE-NYD TSS studies and underwater sound studies can improve the ability to effectively manage dredging activities within the NY/NJ Harbor while protecting regional fisheries resources.

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Table 1-1. Observed seasonal patterns of target species collected during the 2006 and 2011 Migratory Finfish Sampling Programs.

Species	Season/Month of Concern	NY/NJ Harbor Areas of Concern	Habitat Usage (channel/non-channel)	Comments and additional seasonal information (based on other studies)
Alewife	April, May and September through November	Upper Bay and Arthur Kill/Kill Van Kull, and Newark Bay (not Lower Bay)	Pattern for use of channel over non-channel habitat	Yearlings during spring; YOY and a few yearlings during fall. (May be present all year; common January - April, July – September, & December.[a])
American Shad	October, November (Uncommon)	Upper Bay and Arthur Kill/Kill Van Kull	Use channel and deeper non-channel habitats - no pattern indicated	Yearlings during spring; YOY and a few yearlings/older juveniles during fall. (May be present all year; higher numbers collected during January - March & November-December.[a])
Atlantic Menhaden	Late summer (August) to late fall (November)	Upper Bay and Arthur Kill/Kill Van Kull, and Newark Bay (not Lower Bay)	Abundance indicated use of channel habitat	Yearlings and older juveniles/adults during spring; YOY during summer and fall with a few yearlings/older juveniles during fall. (May be present all year; higher numbers collected in January, August, & December.[a])
Blueback Herring	April, May, August, and September through November	Upper Bay and Lower Bay	Common in non-channel habitats (MUB-11 significantly higher CPUE during fall); also present in channel habitats.	Yearlings during spring; YOY and some yearlings during fall. (May be present all year; common during January - May & November-December.[a])
Striped Bass	October and November (uncommon in mid-water)	Primarily Newark Bay, Arthur Kill/Kill Van Kull	Pattern for use of channel habitat.	Older juveniles during late summer and yearlings during fall. (Present all year; common during January – April, July - August, & November-December.[a]) (Highest densities during summer.[°])

Seasonal distribution/occurrence varies yearly within the NY/NJ Harbor area. Two studies summarized available information:

[a] = Woodhead 1991; ° = USACE-NYD 2004b

Table 2-1. Description of mid-water stations sampled during the 2006, 2011, and 2012 Migratory Finfish Sampling Program

Harbor Area	Station Name	Station Type	Station Location	MLLW Depth (ft)	Valid Samples Collected		
					2006	2011	2012
Arthur Kill/ Kill Van Kull	MAK-1	Channel	In channel off Elizabeth port	40	12	22	22
	MAK-2	Channel	In channel at mouth of Piles Creek	33	12	21	22
	MAK-3	Channel	In channel at mouth of Rahway River	35	12	21	22
	MAK-4	Channel	In channel, just S of Fresh Kills/Cedar Point	35	12	21	22
	MKK-1	Channel	In channel off Constable Hook	49	12	22	22
	MKK-2	Channel	In channel off tip of Bayonne	47	12	21	22
Newark Bay	MNB-1	Channel	Mouth of S. Elizabeth Channel	41	12	22	22
	MNB-2	Channel	Just S of Elizabeth Channel	43	12	21	22
	MNB-3	Non-Channel	On flats east of Elizabeth & Port Newark channels	9	12	---	---
	MNB-4	Non-Channel	On flats just S of NJ Turnpike Ext. bridge	7	12	---	---
	MNB-5	Channel	In channel; mouth of Hackensack River	30	12	21	22
	MNB-6	Channel	In channel; mouth of Passaic River	30	12	21	22
Upper Bay	MUB-1	Channel	Middle of The Narrows, just N of Verrazano	62	12	21	22
	MUB-2	Channel	In Anchorage Channel, just S of 24 buoy	47	12	22	22
	MUB-3	Channel	Bay Ridge Channel, just SE of marker 7	37	12	22	22
	MUB-4	Channel	In Anchorage Channel, just W Bay Ridge Flats	38	12	---	---
	MUB-5	Channel	E of Jersey Flats; N of channel to Military Ocean Terminal	52	12	---	---
	MUB-6	Non-Channel	Jersey Flats	10	12	---	---
	MUB-7	Non-Channel	Shallows off Caven Point	6	12	---	---
	MUB-8	Channel	Edge of Anchorage Channel; SE of Liberty Island	54	12	22	22

Table 2-1 (continued). Description of mid-water and stations sampled during the 2006, 2011, and 2012 Migratory Finfish Sampling Program

Harbor Area	Station Name	Station Type	Station Location	MLLW Depth (ft)	Valid Samples Collected		
					2006	2011	2012
Upper Bay	MUB-9	Channel	Edge of Anchorage Channel; just E of Ellis Is.	51	12	21	22
	MUB10	Channel	Edge of Anchorage Channel; E of Liberty Island	51	12	**---**	---
	MUB11	Non-Channel	Bay Ridge Flats	12	--	21	22
Lower Bay	MLB-1	Non-Channel	Gravesend Bay	25	12	---	---
	MLB-2	Non-Channel	N of West Bank/Hoffman Island	27	12	---	---
	MLB-3	Channel	Outside Ambrose Channel; E of Swinburne Island	31	12	21	22
	MLB-4	Non-Channel	On flats SW of West Bank	15	12	21	22
	MLB-5	Channel	Ambrose Channel S of marker 22	42	--	21	22
	MLB-6	Non-Channel	SE of Coney Island	24	--	21	22

Notes:
-- : Not sampled
Source: National Oceanic & Atmospheric Administration navigation charts 12333, 12327, NOAA Soundings (2006), and NOAA Soundings (undated)

Table 2-2. Water quality parameters and meter specifications for water quality measurements taken during the 2006, 20011, and 2012 Migratory Finfish Sampling Program.

Water Quality Parameter	**Parameter Units and Accuracy**
Temperature	+/- 0.3°C
Dissolved oxygen	+/- 0.3 mg/L
Conductivity	+/- 1 µS/cm
Salinity	+/- 0.1 ppt

Table 2-3. Specifications of the 18-ft mid-water trawl used to collect finfish during the 2006, 2011, and 2012 Migratory Finfish Sampling Program.

Part	**Specification**
Trawl type	Four seam balloon trawl designed for fishing the water column from surface to near bottom
Headrope	18 ft. (5.49 m)
Footrope	18 ft (5.49 m)
Wing height/siderope	6.0 ft. (1.83 m)
Total length	21.3 ft (6.5m)
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 0.75-in (79.2 x 39.6 x 3.1 cm)
Tow line/cable length	Determined using the target sample depth and expected wire angle to get tow cable length from the chart in Table 4 of the SOP. If floats are used the tow cable length is set at 200 feet.
Spreader Bars	5-ft, 0.75-inch galvanized pipe attached to head and foot rope on each net wing to maintain vertical net opening.
Door Floats	16 - 18-inch round air filled or foam floats, attached to door with cable of varying length depending on fishing depth.
Float line length	As per table specifications in the SOP.

Table 3-1. Number of valid mid-water trawl samples collected per sample week and season during the 2012 Migratory Sampling Program.

Season Grouping	Sample Week	Number of Valid Samples Collected
Spring	March 26, 2012	20
	April 2, 2012	20
	April 9, 2012	20
	April 16, 2012	20
	April 23, 2012	20
	April 30, 2012	20
	May 7, 2012	20
	May 21, 2012	20
	June 4, 2012	20
Summer	July 9, 2012	20
	August 13, 2012	20
Fall	September 10, 2012	20
	September 24, 2012	20
	October 1, 2012	20
	October 8, 2012	20
	October 15, 2012	20
	October 22, 2012	20
	November 4, 2012	20
	November 11, 2012	20
	November 19, 2012	20
	November 26, 2012	20
	December 3, 2012	20

Note: Dates listed indicate the Monday of each Sample Week.

Table 3-2. Checklist of finfish species (common and scientific names) collected in mid-water trawl samples during the 2006, 2011 and 2012 Migratory Finfish Sampling Program (X = Present in Catch; Ranked 1-10 with 1 being the most common species)

Group	Common Name	Scientific Name	2006	2011	2012
Target Species	Alewife	*Alosa pseudoharengus*	4	3	5
	American shad	*Alosa sapidissima*	8	5	10
	Atlantic menhaden	*Brevoortia tyrannus*	3	X	6
	Blueback herring	*Alosa aestivalis*	2	2	2
	Striped bass	*Morone saxatilis*	X	X	X
Essential Fish Habitat Species	Atlantic herring	*Clupea harengus harengus*	5	9	3
	Black sea bass	*Centropristis striata*		X	
	Bluefish	*Pomatomus saltatrix*	10	8	X
	Butterfish	*Peprilus triacanthus*	6	7	8
	Pollock	*Pollachius virens*		X	
	Red hake	*Urophycis chuss*		X	
	Scup	*Stenotomus chrysops*		X	
	Silver hake	*Merluccius bilinearis*		6	X
	Spanish mackerel	*Scomberomorus maculatus*	X		
	Windowpane	*Scophthalmus aquosus*		X	
	Winter flounder	*Pseudopleuronectes americanus*	X		X
Other Species	American eel	*Anguilla rostrata*		X	
	American sandlance	*Ammodytes americanus*	X		X
	Atlantic croaker	*Micropogonias undulatus*		X	X
	Atlantic cutlassfish	*Trichiurus lepturus*	X		
	Atlantic moonfish	*Selene setapinnis*	X	X	X
	Atlantic silverside	*Menidia menidia*	X	X	X
	Atlantic thread herring	*Opisthonema oglinum*		X	7
	Atlantic tomcod	*Microgadus tomcod*		X	X
	Banded killifish	*Fundulus diaphanus*		X	
	Bay anchovy	*Anchoa mitchilli*	1	1	1
	Blue crab	*Callinectes sapidus*	7	10	X
	Blue runner	*Caranx crysos*			X
	Boxfishes	*Ostraciidae*	X		
	Conger eel	*Conger oceanicus*	6	X	X
	Feather blenny	*Hypsoblennius hentz*	5		X
	Fourbeard rockling	*Enchelyopus cimbrius*	X		
	Gizzard shad	*Dorosoma cepedianum*	3	4	
	Grubby	*Myoxocephalus aenaeus*	X		
	Hickory shad	*Alosa mediocris*	X		

Table 3-2 (continued). Checklist of finfish species (common and scientific names) collected in mid-water trawl samples during the 2006, 2011 and 2012 Migratory Finfish Sampling Program (X = Present in Catch; Ranked 1-10 with 1 being the most common species)

Group	Common Name	Scientific Name	2006	2011	2012
Other Species	Inland silverside	*Menidia beryllina*			X
	Lined seahorse	*Hippocampus erectus*	X	X	X
	Lookdown	*Selene vomer*	X		
	Naked goby	*Gobiosoma bosci*		X	
	Northern pipefish	*Syngnathus fuscus*	X	X	X
	Northern puffer	*Sphoeroides maculatus*			X
	Northern searobin	*Prionotus carolinus*		X	
	Northern stargazer	*Astroscopus guttatus*	X		X
	Oyster toadfish	*Opsanus tau*		X	
	Pinfish	*Lagodon rhomboides*		X	
	River herrings	*Alosa spp.*		X	
	Silver perch	*Bairdiella chrysoura*		X	
	Skilletfish	*Gobiesox strumosus*			X
	Smallmouth flounder	*Etropus microstomus*		X	
	Spotted hake	*Urophycis regia*	X	X	X
	Striped anchovy	*Anchoa hepsetus*	9	8	4
	Striped cusk-eel	*Ophidion marginatum*		X	
	Striped searobin	*Prionotus evolans*	X	X	X
	Threespine stickleback	*Gasterosteus aculeatus*			X
	Weakfish	*Cynoscion regalis*		X	X
	White mullet	*Mugil curema*			9
	White perch	*Morone americana*		X	X
		TOTAL NUMBER OF SPECIES	30	40	34

Table 3-3. Total number of finfish collected by species each month in mid-water trawl samples during the 2012 Migratory Finfish Sampling Program.

Group	Common Name	March	April	May	June	July	August	September	October	November	December	Total
Target Species	Alewife	2	33	1				1	1	446	8	490
	American shad		16				2		1	30	6	55
	Atlantic menhaden	2	77	23	2		6	3	54	99	2	266
	Blueback herring	342	574	54	1		22	3	369	25,797	4,414	31,234
	Striped bass		1	1							1	3
	Sub-total	*346*	*701*	*79*	*3*	*0*	*30*	*7*	*425*	*26,372*	*4,431*	*32,048*
Essential Fish Habitat Species	Atlantic herring	633	3,192	26	1					1		3,220
	Bluefish			4	1		9	1	5			20
	Butterfish		4	19	7	26	22	2	9			89
	Silver hake									2		2
	Winter flounder								1			1
	Sub-total	*633*	*3,196*	*49*	*9*	*26*	*31*	*3*	*15*	*3*	*0*	*3,332*
Other Species	American sandlance		1									1
	Atlantic croaker										1	1
	Atlantic moonfish								2	1	0	3
	Atlantic silverside								6	4	5	15
	Atlantic thread herring							93	5			98

Table 3-3 (continued.) Total number of finfish collected by species each month in mid-water trawl samples during the 2012 Migratory Finfish Sampling Program.

Group	Common Name	March	April	May	June	July	August	September	October	November	December	Total
Other Species	Atlantic tomcod		5									5
	Bay anchovy	4	528	1,615	1,575	3,558	29,118	12,651	30,752	2,698	286	82,781
	Blue crab			3		6	10	6	13	1		39
	Blue runner							2				2
	Conger eel				1							1
	Feather blenny					1						1
	Inland silverside						18					18
	Lined seahorse	2	5	3			1					9
	Northern pipefish		1			2				2		5
	Northern puffer					3						3
	Northern stargazer					1	2	2	5			10
	Skilletfish					2						2
	Spotted hake		6		2					1		9
	Striped anchovy						126	1,354	13			1,493
	Striped searobin				1							1
	Threespine stickleback			1								1
	Weakfish						8					8
	White mullet				59							59

Table 3-3 (continued.) Total number of finfish collected by species each month in mid-water trawl samples during the 2012 Migratory Finfish Sampling Program.

Group	Common Name	March	April	May	June	July	August	September	October	November	December	Total
Other Species	White perch		2	4								6
	Sub-total	*6*	*548*	*1,626*	*1,638*	*3,573*	*29,283*	*14,108*	*30,796*	*2,707*	*292*	*84,571*
Total Number		**985**	**4,445**	**1,754**	**1,650**	**3,599**	**29,344**	**14,118**	**31,236**	**29,082**	**4,723**	**119,951**
Number of Species		**6**	**14**	**12**	**10**	**8**	**12**	**11**	**14**	**12**	**9**	**34**

Table 3-4. Average mid-water trawl CPUE (± 1 standard error) by species for all channel and non-channel stations in the Arthur Kill/Kill Van Kull (AK/KVK), Newark Bay (NB), Upper Bay (UB) and Lower Bay (LB) during the 2012 Finfish Monitoring Sampling Program. (Shaded cells represent station types that were not sampled)

Common Name	Station Type	Region								Average CPUE
		AK/KVK		Newark Bay		Upper Bay		Lower Bay		
		Mean	SE	Mean	SE	Mean	SE	Mean	SE	
Target Species										
	Channel	0.18	0.16	0.44	0.20	2.25	0.90	0.91	0.86	0.94
	Non-Channel					2.86	2.86	1.80	1.62	2.33
Alewife	Combined	0.18	0.16	0.44	0.20	2.35	0.88	1.35	0.91	1.08
	Channel	0.14	0.06	0.10	0.04	0.05	0.03	0.23	0.13	0.13
	Non-Channel					0.32	0.27	0.11	0.11	0.22
American shad	Combined	0.14	0.06	0.10	0.04	0.10	0.05	0.17	0.08	0.13
	Channel	0.73	0.54	1.51	0.79	0.28	0.14	0.02	0.02	0.64
	Non-Channel					0.14	0.10	0.14	0.06	0.14
Atlantic menhaden	Combined	0.73	0.54	1.51	0.79	0.26	0.11	0.08	0.03	0.64
	Channel	43.99	13.18	27.70	7.71	65.31	25.05	14.23	9.86	37.81
	Non-Channel					360.77	332.47	172.36	105.87	266.57
Blueback herring	Combined	43.99	13.18	27.70	7.71	114.55	59.00	93.30	53.53	69.89
	Channel	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.01
	Non-Channel									
Striped bass	Combined	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.01
Sum of Target Species Combined CPUE		**45.05**		**29.77**		**117.27**		**94.90**		**71.75**

Table 3-4 (continued). Average mid-water trawl CPUE (± 1 standard error) by species for all navigation channel and non-channel stations in the Arthur Kill/Kill Van Kull (AK/KVK), Newark Bay (NB), Upper Bay (UB) and Lower Bay (LB) during the 2012 Finfish Monitoring Sampling Program. (Shaded cells represent station types that were not sampled)

Common Name	Station Type	Region								Average CPUE
		AK/KVK		Newark Bay		Upper Bay		Lower Bay		
		Mean	SE	Mean	SE	Mean	SE	Mean	SE	
Essential Fish Habitat Species										
	Channel	19.71	14.09	10.52	5.91	2.90	2.10	0.05	0.03	8.30
	Non-Channel					0.05	0.05	0.07	0.05	0.06
Atlantic herring	Combined	19.71	14.09	10.52	5.91	2.42	1.75	0.06	0.03	8.18
	Channel	0.02	0.01	0.05	0.03	0.04	0.02	0.00	0.00	0.03
	Non-Channel					0.00	0.00	0.23	0.18	0.23
Bluefish	Combined	0.02	0.01	0.05	0.03	0.03	0.02	0.11	0.09	0.05
	Channel	0.12	0.04	0.10	0.04	0.10	0.04	0.43	0.36	0.19
	Non-Channel					0.32	0.27	0.61	0.27	0.47
Butterfish	Combined	0.12	0.04	0.10	0.04	0.14	0.06	0.52	0.23	0.22
	Channel	0.00	0.00	0.00	0.00	0.02	0.02	0.00	0.00	0.02
	Non-Channel					0.00	0.00	0.00	0.00	0.00
Silver hake	Combined	0.00	0.00	0.00	0.00	0.02	0.02	0.00	0.00	0.02
	Channel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Non-Channel					0.05	0.05	0.00	0.00	0.05
Winter flounder	Combined	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01
Sum of EFH Species Combined CPUE		**19.85**		**10.67**		**2.61**		**0.69**		**8.47**

Table 3-4 (continued). Average mid-water trawl CPUE (± 1 standard error) by species for all navigation channel and non-channel stations in the Arthur Kill/Kill Van Kull (AK/KVK), Newark Bay (NB), Upper Bay (UB) and Lower Bay (LB) during the 2012 Finfish Monitoring Sampling Program. (Shaded cells represent station types that were not sampled)

Common Name	Station Type	Region								Average CPUE
		AK/KVK		Newark Bay		Upper Bay		Lower Bay		
		Mean	SE	Mean	SE	Mean	SE	Mean	SE	
Other Species										
	Channel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Non-Channel					0.05	0.05	0.00	0.00	0.05
American sandlance	Combined	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01
	Channel	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	Non-Channel					0.00	0.00	0.00	0.00	0.00
Atlantic croaker	Combined	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	Channel	0.00	0.00	0.01	0.01	0.02	0.01	0.00	0.00	0.01
	Non-Channel					0.00	0.00	0.00	0.00	0.00
Atlantic moonfish	Combined	0.00	0.00	0.01	0.01	0.02	0.01	0.00	0.00	0.01
	Channel	0.02	0.02	0.14	0.08	0.00	0.00	0.00	0.00	0.08
	Non-Channel					0.00	0.00	0.00	0.00	0.00
Atlantic silverside	Combined	0.02	0.02	0.14	0.08	0.00	0.00	0.00	0.00	0.08
	Channel	0.04	0.04	0.01	0.01	0.01	0.01	0.00	0.00	0.02
	Non-Channel					0.00	0.00	2.07	1.98	2.07
Atlantic thread herring	Combined	0.04	0.04	0.01	0.01	0.01	0.01	1.03	0.99	0.27
	Channel	0.00	0.00	0.00	0.00	0.05	0.05	0.00	0.00	0.05
	Non-Channel					0.00	0.00	0.00	0.00	0.00
Atlantic tomcod	Combined	0.00	0.00	0.00	0.00	0.04	0.04	0.00	0.00	0.04
	Channel	243.73	62.26	125.17	35.66	73.29	23.39	5.77	3.04	111.99
	Non-Channel					242.59	121.85	592.48	320.46	417.53
Bay anchovy	Combined	243.73	62.26	125.17	35.66	101.51	28.40	299.13	162.39	192.38

Table 3-4 (continued). Average mid-water trawl CPUE (± 1 standard error) by species for all navigation channel and non-channel stations in the Arthur Kill/Kill Van Kull (AK/KVK), Newark Bay (NB), Upper Bay (UB) and Lower Bay (LB) during the 2012 Finfish Monitoring Sampling Program. (Shaded cells represent station types that were not sampled)

Common Name	Station Type	Region								Average CPUE
		AK/KVK		Newark Bay		Upper Bay		Lower Bay		
		Mean	SE	Mean	SE	Mean	SE	Mean	SE	
	Channel	0.11	0.03	0.22	0.07	0.04	0.02	0.00	0.00	0.12
	Non-Channel					0.09	0.06	0.00	0.00	0.09
Blue crab	Combined	0.11	0.03	0.22	0.07	0.05	0.02	0.00	0.00	0.12
	Channel	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02
	Non-Channel					0.00	0.00	0.00	0.00	0.00
Blue runner	Combined	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02
	Channel	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01
	Non-Channel					0.00	0.00	0.00	0.00	0.00
Conger eel	Combined	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01
	Channel	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	Non-Channel					0.00	0.00	0.00	0.00	0.00
Feather blenny	Combined	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	Channel	0.00	0.00	0.00	0.00	0.16	0.16	0.00	0.00	0.16
	Non-Channel					0.00	0.00	0.00	0.00	0.00
Lined seahorse	Combined	0.00	0.00	0.00	0.00	0.14	0.14	0.00	0.00	0.14
	Channel	0.03	0.01	0.02	0.02	0.02	0.01	0.07	0.04	0.03
	Non-Channel					0.00	0.00	0.00	0.00	0.00
Northern pipefish	Combined	0.03	0.01	0.02	0.02	0.02	0.01	0.03	0.02	0.03
	Channel	0.02	0.02	0.02	0.02	0.00	0.00	0.00	0.00	0.02
	Non-Channel					0.00	0.00	0.00	0.00	0.00
Northern puffer	Combined	0.02	0.02	0.02	0.02	0.00	0.00	0.00	0.00	0.02

Table 3-4 (continued). Average mid-water trawl CPUE (± 1 standard error) by species for all navigation channel and non-channel stations in the Arthur Kill/Kill Van Kull (AK/KVK), Newark Bay (NB), Upper Bay (UB) and Lower Bay (LB) during the 2012 Finfish Monitoring Sampling Program. (Shaded cells represent station types that were not sampled)

Common Name	Station Type	Region								Average CPUE
		AK/KVK		Newark Bay		Upper Bay		Lower Bay		
		Mean	SE	Mean	SE	Mean	SE	Mean	SE	
	Channel	0.02	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.01
	Non-Channel					0.00	0.00	0.00	0.00	0.00
Northern stargazer	Combined	0.02	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.01
	Channel	0.02	0.02	0.00	0.00	0.05	0.03	0.00	0.00	0.03
	Non-Channel					0.05	0.05	0.02	0.02	0.03
Skilletfish	Combined	0.02	0.02	0.00	0.00	0.05	0.02	0.01	0.01	0.03
	Channel	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02
	Non-Channel					0.00	0.00	0.00	0.00	0.00
Spotted hake	Combined	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02
	Channel	0.00	0.00	0.03	0.03	0.05	0.05	0.00	0.00	0.04
	Non-Channel					0.00	0.00	0.00	0.00	0.00
Striped anchovy	Combined	0.00	0.00	0.03	0.03	0.05	0.04	0.00	0.00	0.04
	Channel	0.73	0.28	0.22	0.11	0.08	0.04	0.07	0.07	0.27
	Non-Channel					0.14	0.10	30.98	30.26	15.56
Striped searobin	Combined	0.73	0.28	0.22	0.11	0.09	0.04	15.52	15.14	4.14
	Channel	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.01
	Non-Channel					0.00	0.00	0.00	0.00	0.00
Threespine stickleback	Combined	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.01
	Channel	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.01
	Non-Channel					0.00	0.00	0.00	0.00	0.00
Tidewater silverside	Combined	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.01

Table 3-4 (continued). Average mid-water trawl CPUE (± 1 standard error) by species for all navigation channel and non-channel stations in the Arthur Kill/Kill Van Kull (AK/KVK), Newark Bay (NB), Upper Bay (UB) and Lower Bay (LB) during the 2012 Finfish Monitoring Sampling Program. (Shaded cells represent station types that were not sampled)

Common Name	Station Type	Region								Average CPUE
		AK/KVK		Newark Bay		Upper Bay		Lower Bay		
		Mean	SE	Mean	SE	Mean	SE	Mean	SE	
	Channel	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.05
	Non-Channel					0.00	0.00	0.02	0.02	0.02
Weakfish	Combined	0.05	0.05	0.00	0.00	0.00	0.00	0.01	0.01	0.03
	Channel	0.00	0.00	0.00	0.00	0.54	0.54	0.00	0.00	0.54
	Non-Channel					0.00	0.00	0.00	0.00	0.00
White mullet	Combined	0.00	0.00	0.00	0.00	0.45	0.45	0.00	0.00	0.45
	Channel	0.01	0.01	0.06	0.03	0.00	0.00	0.00	0.00	0.03
	Non-Channel					0.00	0.00	0.00	0.00	0.00
White perch	Combined	0.01	0.01	0.06	0.03	0.00	0.00	0.00	0.00	0.03
Sum of Other Species		**244.81**		**125.92**		**102.42**		**315.74**		**197.90**
Sum of All Species		***309.70***		***166.36***		***222.30***		***411.33***		***278.13***

Table 3-5. Summary of significant differences among target species Cumulative Frequency Distributions during spring for the 2012 Migratory Finfish Sampling Program.

	Alewife	**American Shad**	**Atlantic Menhaden**	**Blueback Herring**	**Striped Bass**
Alewife	--	NS	Significantly Different	Significantly Different	NS
American Shad		--	NS	Significantly Different	NS
Atlantic Menhaden			--	Significantly Different	NS
Blueback Herring				--	Significantly Different
Striped Bass					--

NS = Not significant

Table 3-6. Summary of significant differences among target species Cumulative Frequency Distributions during fall for the 2012 Migratory Finfish Survey.

	Alewife	**American Shad**	**Atlantic Menhaden**	**Blueback Herring**	**Striped Bass**
Alewife	--	NS	Significantly Different	Significantly Different	Significantly Different
American Shad		--	Significantly Different	Significantly Different	NS
Atlantic Menhaden			--	Significantly Different	Significantly Different
Blueback Herring				--	NS
Striped Bass					--

NS = Not significant

Table 4-1. Relevant studies with migratory finfish collections conducted in the Hudson-Raritan Estuary.

Survey	Author	Year	Gear	Target Species	Sampling Period	Summary
Westway Fish Sampling	Lawler, Metusky, and Skelly Engineers	1980	Bottom trawling, mid-water trawling	All	1979-1980	Sampling in the vicinity of the proposed Westway site took place from 1979-1980 along the west side of Manhattan. Bottom and mid-water trawls targeted all species that occurred between the piers. YOY striped bass were collected during this sampling and were shown to be using the interpier areas.
A Study of Marine Recreational Fisheries in Connecticut: Long Island Sound Trawl Survey	CTDEEP	1984-2011	14-m Otter Trawl	All	Spring and Fall	Connecticut DEP Marine Fisheries Division has conducted the Long Island Sound Trawl Survey for 28 years. This study enumerates and identifies all species collected. Biomass, age specific, and length frequency indices are calculated for all species including the five migratory finfish species that are the focus of this study.
Inventory of the fishery resources of the Hudson River from Bayonne to Piermont	New Jersey Department of Environmental Protection	1984	Bottom trawling, mid-water trawling, trap nets, gill nets	All	Fall 1982 - Fall 1983	The fisheries of the lower Hudson River (Bayonne to Piermont) were sampled once per season beginning in the fall of 1982 and continuing through the fall of 1983. Sampling gear included bottom and midwater trawls, trap nets, and gill nets. Sampling took place at representative locations. The most commonly occurring and abundant fish species collected were alewife, American eel, American shad, Atlantic tomcod, bay anchovy, blueback herring, hogchoker, striped bass, white perch and winter flounder.
Riverwalk Existing Hydrological, Water Quality, and Biological Conditions Report	Lawler, Metusky, and Skelly Engineers	1985	Bottom trawling	All	October 1983 - April 1984	Bottom trawling was conducted bi-weekly in inter-pier areas along the east side of Manhattan from October 1983 through April 1984. Striped bass were among the most abundant species collected during this study.
Hunter's Point Aquatic Sampling Program	Lawler, Metusky, and Skelly Engineers	1986	Bottom trawl, ichthyoplankton trawl, trap nets, gill nets, beach seine	All	March 1985-February 1986	Bottom trawl and ichthyoplankton samples were collected at 8 locations along the East River. At 4 of these locations, trap nets, gill nets, and beach seines were deployed as well. Sampling yielded 45 different species, with striped bass, American shad, alewife, and blueback herring being among the most abundant species.

Table 4-1 (continued). Relevant studies with migratory finfish collections conducted in the Hudson-Raritan Estuary.

Survey	Author	Year	Gear	Target Species	Sampling Period	Summary
Jamaica Bay Fisheries Survey	National Parks Service	1991	Otter trawl, gill net and beach seine	All	1988-1989	A total of 81 species were collected using otter trawls, gill nets, and beach seines at locations around Jamaica Bay from 1988-1989. Species collected during otter trawls were made up primarily of winter flounder, but also included blueback herring, alewife, American shad, Atlantic menhaden, and striped bass.
Newark Bay Sampling Program	Lawler, Metusky, and Skelly Engineers	1996	Bottom trawl	All	April 1995 - March 1996	Bottom trawl sampling was conducted at six Newark Bay locations at monthly intervals between April 1995 and March 1996 with the purpose of characterizing the species composition and relative abundances of the fish community in shoal areas of the Bay. Twenty-seven species of fish were collected yielded large catches of bay anchovy, striped bass and winter flounder.
New York New Jersey Harbor Deepening Project: Aquatic Biological Survey	USACE-NYD	1998-2010	30ft otter trawl	Focus is winter flounder, migratory fish species recorded as well	December-June	Bottom trawl surveys targeted winter flounder. All species that were caught were identified and enumerated. Alewife, bluebacks, and striped bass were most abundant from January-April. Atlantic menhaden and American Shad were not collected in high abundance during this time period.
River Herring Spawning Stock Survey	NYSDEC	1999-2001	gill nets, cast nets, scap and dip nets, and jigging	Alewife, blueback herring	Spring-Fall	Recent concerns of fishers indicate that changes "appear" to be occurring in the herring stocks. To document current status, NYS Department of Environmental Conservation biologists developed this program with funding through the Hudson River Estuary Program.
Gill Net & Otter Trawl Sampling Norton Basin, Little Bay, Grass Hassock Channel, and The Raunt	Barry Vitor & Associates submitted to PANYNJ	2002	Gill net and Otter Trawl	All species	August	Gill net and otter trawl sampling took place in August of 2002 in various regions of Jamaica Bay. Results indicated that Atlantic Menhaden were caught in the highest abundance during gill net sampling at most stations. During otter trawl sampling, very few numbers of migratory fish were caught

Table 4-1 (continued). Relevant studies with migratory finfish collections conducted in the Hudson-Raritan Estuary.

Survey	Author	Year	Gear	Target Species	Sampling Period	Summary
Marine Biological Studies of the Marine Transfer Stations Operated by the NYCDOS	NYCDOS	2003	trawling, gill nets	All	January 2003-January 2004	Trawling and gill net sampling took place from January 2003 through January of 2004 at eight Marine Transfer Stations around the New York Harbor Estuary. All species were targeted. Of the five migratory species that are the focus of the Migratory Finfish Survey, striped bass was most abundant with over 400 fish collected. The other four species were not collected in great abundance. Conclusions from the study indicated that the general fisheries population, both adult and larval, were healthy from both a species abundance and numerical point of view.
A study of the Striped Bass in the Marine District of New York State	NYSDEC	2005	Beach Seine	Primarily striped bass, all other species that were collected were recorded as well	May-Oct	Beach seining at various bays and inlets along western long island yielded collection numbers for all migratory fish species except American shad. Results indicate that peak abundance for striped bass YOY is occurring from June through October. Alewife and blueback were sparsely caught during this sampling period, while Atlantic Menhaden YOY were caught in huge numbers from June through October 2005
Nearshore fish communities of the mid-Hudson River Estuary, 1984-2005	NYSDEC	2005	Beach Seine	Focus is striped bass, other migratory fish species recorded as well	July-November	Beach seine sampling took place in the Tappan Zee Haverstraw Bay Area of the Hudson at 25 sites that were sampled every two weeks from July through November, 2005. Striped bass YOY peak abundance was July-September with low older fish abundance during this time. Blueback herring were most abundant during October and November. Alewife peaked early during sampling during July, with very few caught after August. Menhaden peaked during August then again in October. American shad abundance was relatively low throughout sampling peaking in late July.

Table 4-1 (continued). Relevant studies with migratory finfish collections conducted in the Hudson-Raritan Estuary.

Survey	Author	Year	Gear	Target Species	Sampling Period	Summary
Winter Distribution and Abundance of Hudson River Fishes Using Hydroacoustics	K.J. Hartman and B.W. Nagy	2006	Mid-water trawls, gill nets	All	December 1995, December 1997	Hartman and Nagy reported on sampling that was conducted in December 1995 and 1997 in the Hudson River from the Battery to Poughkeepsie. A total of 13 species was collected in midwater trawls in 1995 including striped bass, white perch, bay anchovy, alewife, blueback herring, and Atlantic croaker. The fish that mostly made up the Lower Hudson collections (Yonkers and the Battery) were striped bass and white perch.
Tappan Zee Bridge FEIS: Appendix F, Attachment 1 - Aquatic Sampling Program	AECOM	2011	Gill nets	All species	April 2007-May 2008	Sampling was conducted every other month from April 2007-May 2008. Alewives mostly occurred May 2008 sampling. American shad and blueback herring were caught in low numbers in April and May. Striped bass were present throughout the entirety of the sampling with peak abundance occurring in April. Older year classes of striped bass were caught in April and May while sub-adults and YOY fish were caught later in the year. Atlantic menhaden were caught in high numbers throughout the warmer months when the salinity was at its peak in August.
Evaluation of Fish Species Assemblages at the Proposed 91st Street Converted MTS and South Bronx and Bush Terminal Mitigation Sites	NYCDOS	2012	Mid-water trawls, bottom trawls, trap nets, ichthyoplankton sled tows	All	December 2011-January 2012	A total of 243 finfish from 13 species and 17 blue crabs (Callinectes sapidus) were collected during the December 2011 and January 2012 sampling program conducted at the East 91st Street MTS site. Blueback herring were the most abundant species collected during this survey. Striped bass, alewife, American shad, and Atlantic menhaden were also collected during this survey.

Table 4-1 (continued). Relevant studies with migratory finfish collections conducted in the Hudson-Raritan Estuary.

Survey	Author	Year	Gear	Target Species	Sampling Period	Summary
River Herring Benchmark Stock Assessment	Atlantic State Marine Fisheries Commission	2012	seining, trawling, gill nets	alewife, blueback herring	2001-2011	Of the 52 in-river stocks of alewife and blueback herring for which data were available, 22 were depleted, 1 stock was increasing, and the status of 28 stocks could not be determined because the time-series of available data was too short. In most recent years, 2 were increasing, 4 were decreasing, and 9 were stable with 38 rivers not having enough data to assess recent trends. The coastwide meta-complex of river herring stocks on the US Atlantic coast is depleted to near historic lows. A depleted status indicates that there was evidence for declines in abundance due to a number of factors, but the relative importance of these factors in reducing river herring stocks could not be determined.

Seasonal distribution/occurrence varies yearly within the NY/NJ Harbor area. Two studies summarized available information:

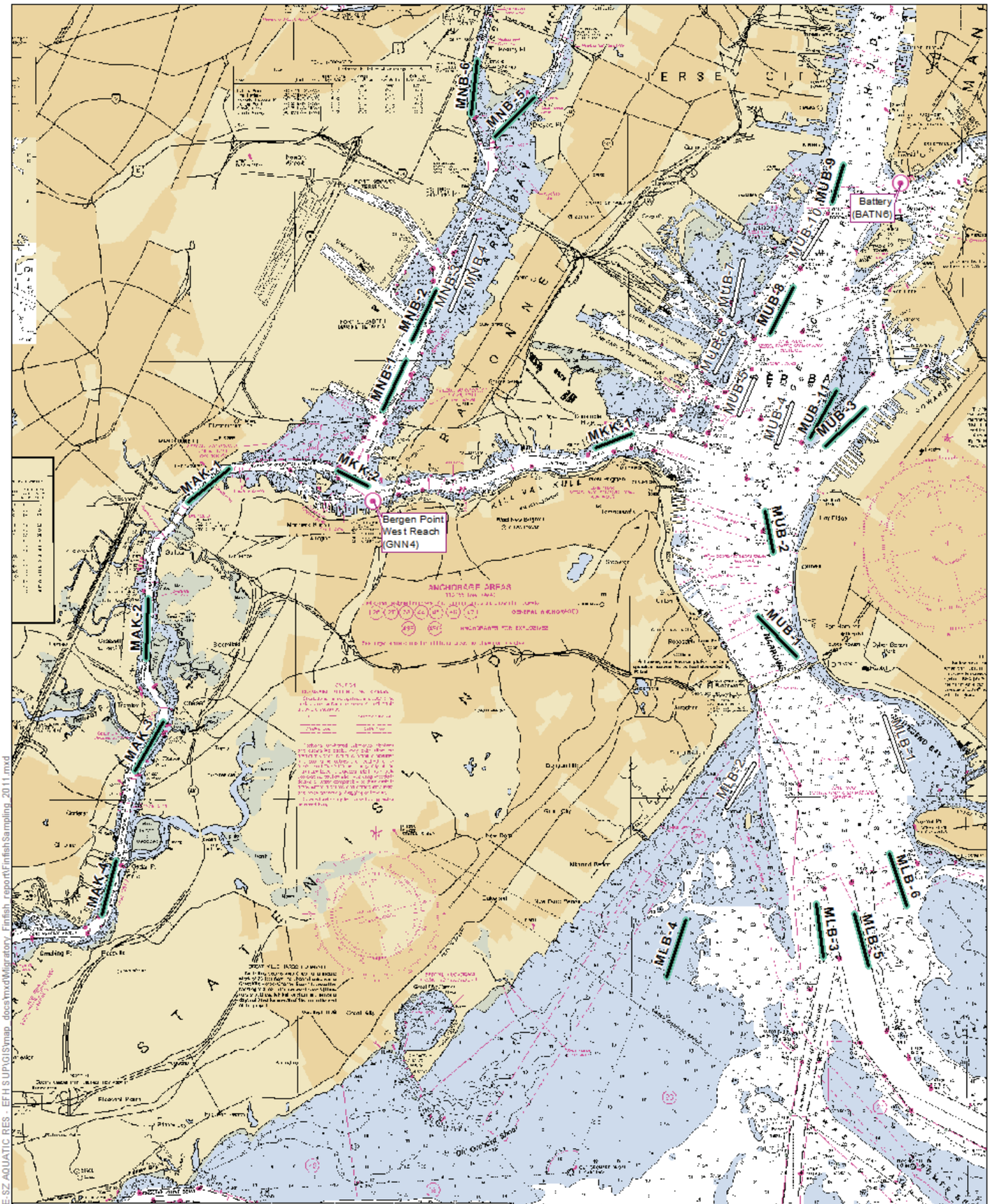
[a] = Woodhead 1991; ° = USACE-NYD 2004b

Table 4-2. Summary of harborwide Water Quality/Total Suspended Solids (WQ/TSS) monitoring surveys conducted by USACE-New York District, 2001-2012.

Survey	Type of Survey(s) (Type of Data Collected)	Area(s) Surveyed	Dates
Pilot Study	Ambient, Far Field Dredge, Ship Wake, Storm Event(TSS/Turbidity)	Newark Bay, Arthur Kill, Upper NY Bay	March 2001-February 2002
Arthur Kill 2/3	Far Field Dredge (Mobile ADCP, OBS Arrays, TSS/Turbidity)	Arthur Kill N. of Shooters Island	June 2006
Newark Bay Ship Wake	Ship Wake (Mobile ADCP)	Newark Bay (Port Elizabeth)	July 2006
Near Field Pilot Study	Near Field Dredge (Bucket Mounted OBS, Platform Mounted OBS and ADCP	Newark Bay	January 2008
S-NB-1 #1	Far Field Dredge (Mobile ADCP, TSS/Turbidity)	Newark Bay	February 2008
S-NB-1 #2	Far Field Dredge (Mobile ADCP, OBS Arrays, TSS/Turbidity)	Newark Bay	November 2008
South Elizabeth Hydrodynamic	Hydrodynamic (Mobile ADCP)	Newark Bay (South Elizabeth Channel)	November 2008
Port Jersey Habitat Enhancement Project	TSS/Turbidity	Upper New York Bay (Port Jersey)	December 2008
S-E-1 A	Far Field Dredge (Mobile ADCP, OBS Arrays, TSS/Turbidity)	Newark Bay (Port Elizabeth Channel)	March 2009
S-E-1 B	Far Field Dredge (Mobile ADCP, OBS Arrays, TSS/Turbidity Water Samples	Newark Bay (Port Elizabeth Channel)	April 2009
S-KVK-1	Far Field Cutterhead Dredge (Mobile ADCP, OBS Arrays, TSS/Turbidity Water Samples	Kill Van Kull	June 2009
S-AN-2	Far Field Dredge (Mobile ADCP, TSS/Turbidity)	Upper New York Bay (Anchorage Channel)	January 2011

Table 4-2 (continued). Summary of harborwide Water Quality/Total Suspended Solids (WQ/TSS) monitoring surveys conducted by USACE-New York District, 2001-2012.

Survey	Type of Survey(s) (Type of Data Collected)	Area(s) Surveyed	Dates
S-KVK-2	Far Field Cutterhead Dredge (Mobile ADCP, OBS Arrays, TSS/Turbidity Water Samples	Kill Van Kull	March 2011
S-NB-2 #1 & #2	Far Field Dredge (Mobile ADCP, OBS Arrays, TSS/Turbidity Water Samples	Newark Bay (South Elizabeth Channel)	July & October 2011
S-AK-2	Far Field Dredge (Mobile ADCP, TSS/Turbidity Water Samples)	Arthur Kill	March 2012



2012 MIGRATORY FINFISH TRANSECTS

TRANSECT	LOCATION	EBB START		FLOOD START	
		LAT	LONG	LAT	LONG
MAK-1	Arthur Kill -- Elizabethport Reach	40° 38.40'	74° 11.61'	40° 38.77'	74° 10.99'
MAK-2	Arthu Kill -- Prall's Island Reach	40° 36.62'	74° 12.24'	40° 37.30'	74° 12.21'
MAK-3	Arthur Kill -- Tremley Point Reach	40° 35.33'	74° 12.41'	40° 35.89'	74° 11.99'
MAK-4	Arthur Kill -- Fresh Kill Reach	40° 33.68'	74° 12.91'	40° 34.30'	74° 12.70'
MKK-1	Kill Van Kull -- Constable Hook Reach	40° 39.00'	74° 05.51'	40° 39.15'	74° 04.97'
MKK-2	Kill Van Kull -- North of Shooters I. Reach	40° 38.57'	74° 08.92'	40° 38.75'	74° 09.36'
MLB-3	Lower Bay - West of Ambrose Ch.	40° 33.17'	74° 02.13'	40° 33.78'	74° 02.23'
MLB-4	Lower Bay -- West Bank	40° 32.95'	74° 04.48'	40° 33.60'	74° 04.18'
MLB-5	**Lower Bay -- Ambrose Channel**	**40° 33.07'**	**74° 01.46'**	**40° 33.67'**	**74° 01.67'**
MLB-6	**Lower Bay -- North of East Bank**	**40° 33.75'**	**74° 00.89'**	**40° 34.34'**	**74° 01.14'**
MNB-1	Newark Bay -- South Reach	40° 39.44'	74° 08.69'	40° 40.00'	74° 08.34'
MNB-2	Newark Bay -- Middle Reach	40° 40.23'	74° 08.25'	40° 40.80'	74° 07.88'
MNB-5	Newark Bay -- Droyers Point Reach	40° 42.55'	74° 06.98'	40° 42.99'	74° 06.40'
MNB-6	Newark Bay -- Kearney Point Reach	40° 42.80'	74° 07.35'	40° 43.42'	74° 07.25'
MUB-1	Upper Bay -- Narrows	40° 36.60'	74° 02.52'	40° 37.06'	74° 03.09'
MUB-2	Upper Bay -- Anchorage Channel/Bay Ridge	40° 37.80'	74° 02.86'	40° 38.27'	74° 02.97'
MUB-3	Upper Bay -- Bay Ridge Channel	40° 39.01'	74° 02.06'	40° 39.43'	74° 01.46'
MUB-8	Upper Bay -- Anchorage Channel	40° 40.29'	74° 02.88'	40° 40.81'	74° 02.53'
MUB-9	Upper Bay -- Anchorage Channel/Hudson R.	40° 41.78'	74° 01.94'	40° 42.21'	74° 01.78'
MUB-11	**Upper Bay -- Bay Ridge Flats**	**40° 39.09'**	**74° 02.29'**	**40° 39.64'**	**74° 01.89'**

Transects in bold were added for the 2011 survey.

Figure 2-1
2006 , 2011 and 2012 Migratory Finfish Sampling Program mid-water trawl locations.

2012 Transect | Transect Not Sampled in 2012 | NOAA National Data Buoy

0 2,000 4,000 Meters

N

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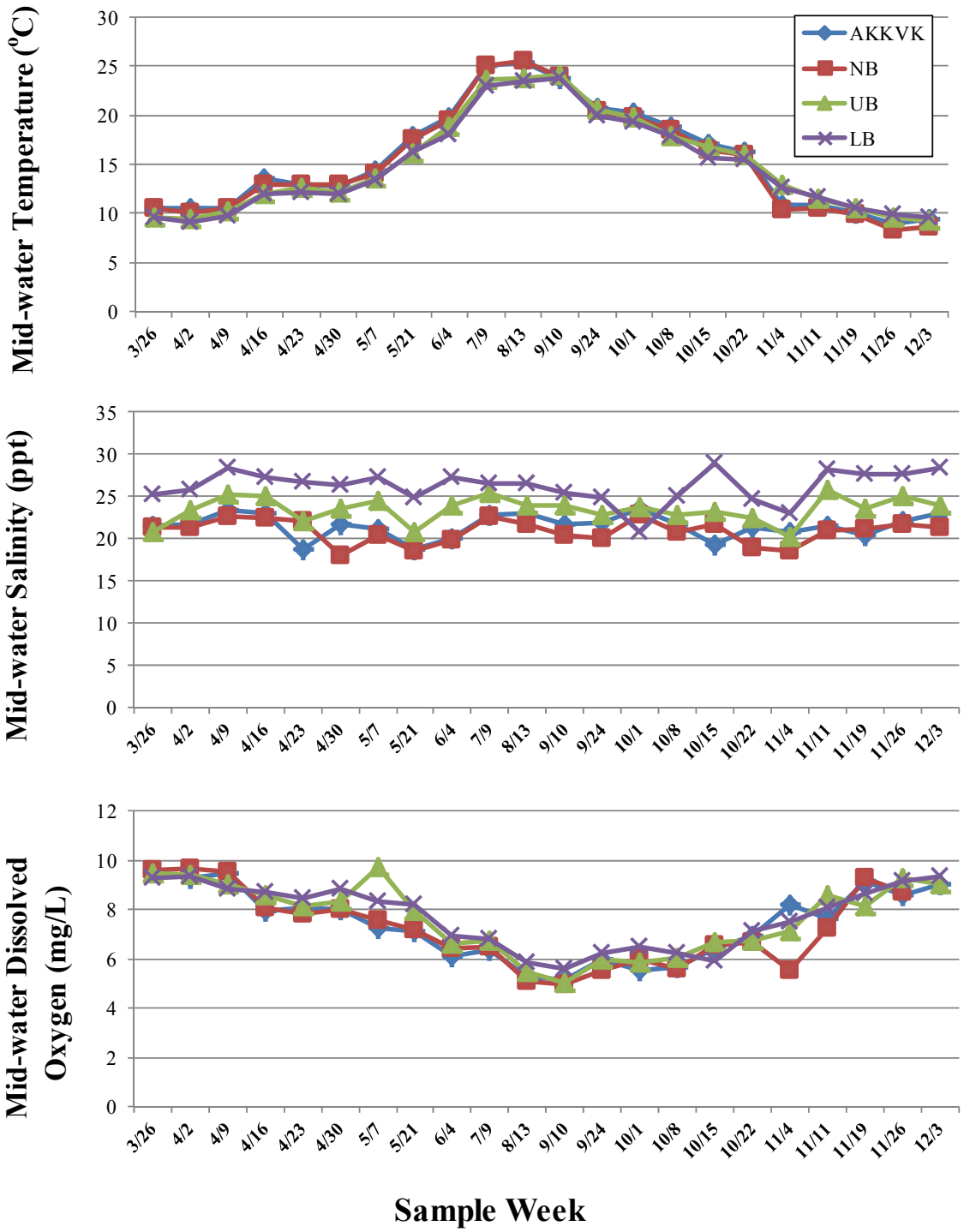


Figure 3-1a Average weekly water quality data by region during the 2012 Migratory Finfish Sampling Program.
Notes: Sample week is indicated by Monday of week.

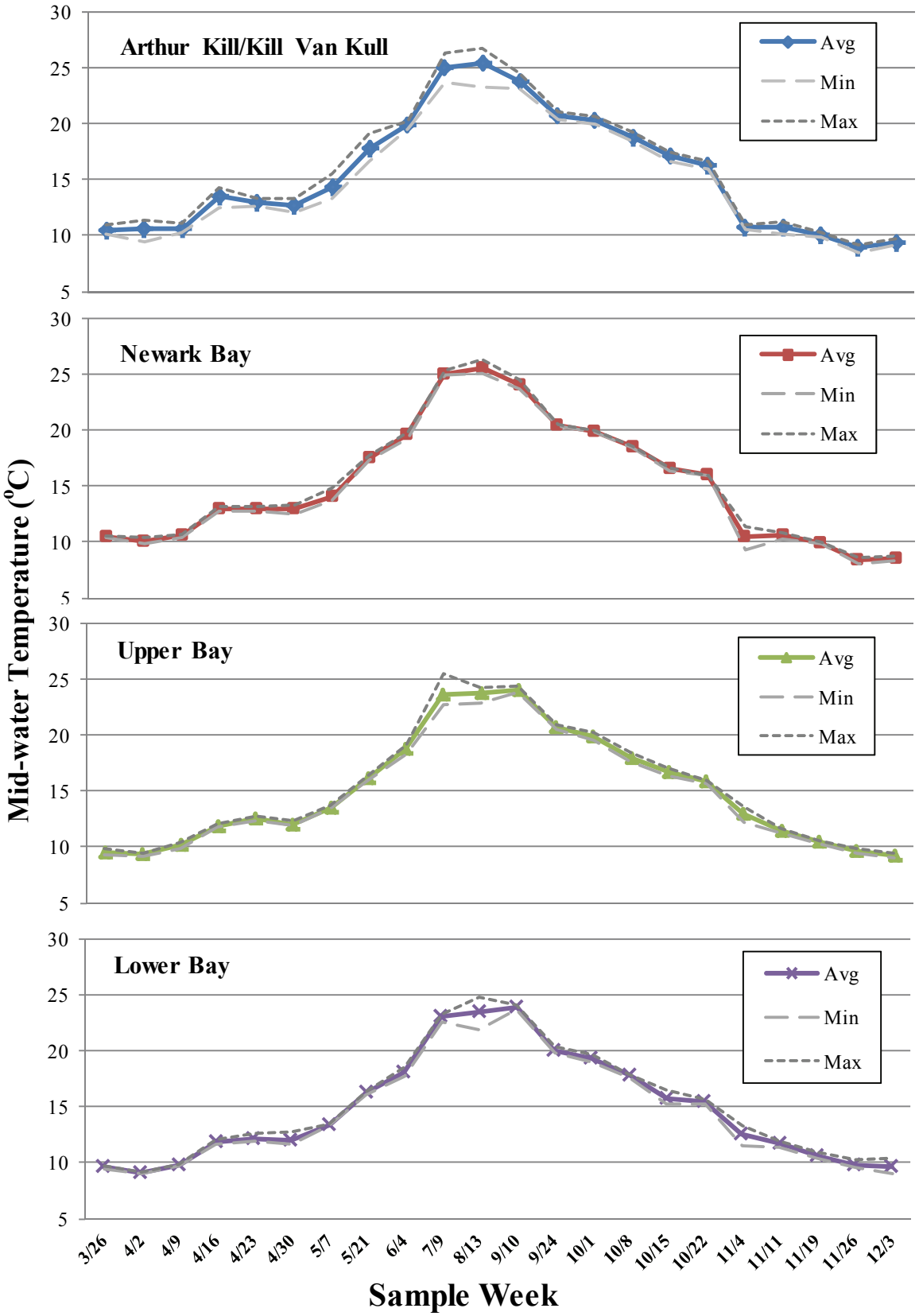


Figure 3-1b Mid-water temperatures (average, maximum, minimum) by week for each region during the 2012 Migratory Finfish Sampling Program.

Notes: Sample week is indicated by Monday of week.

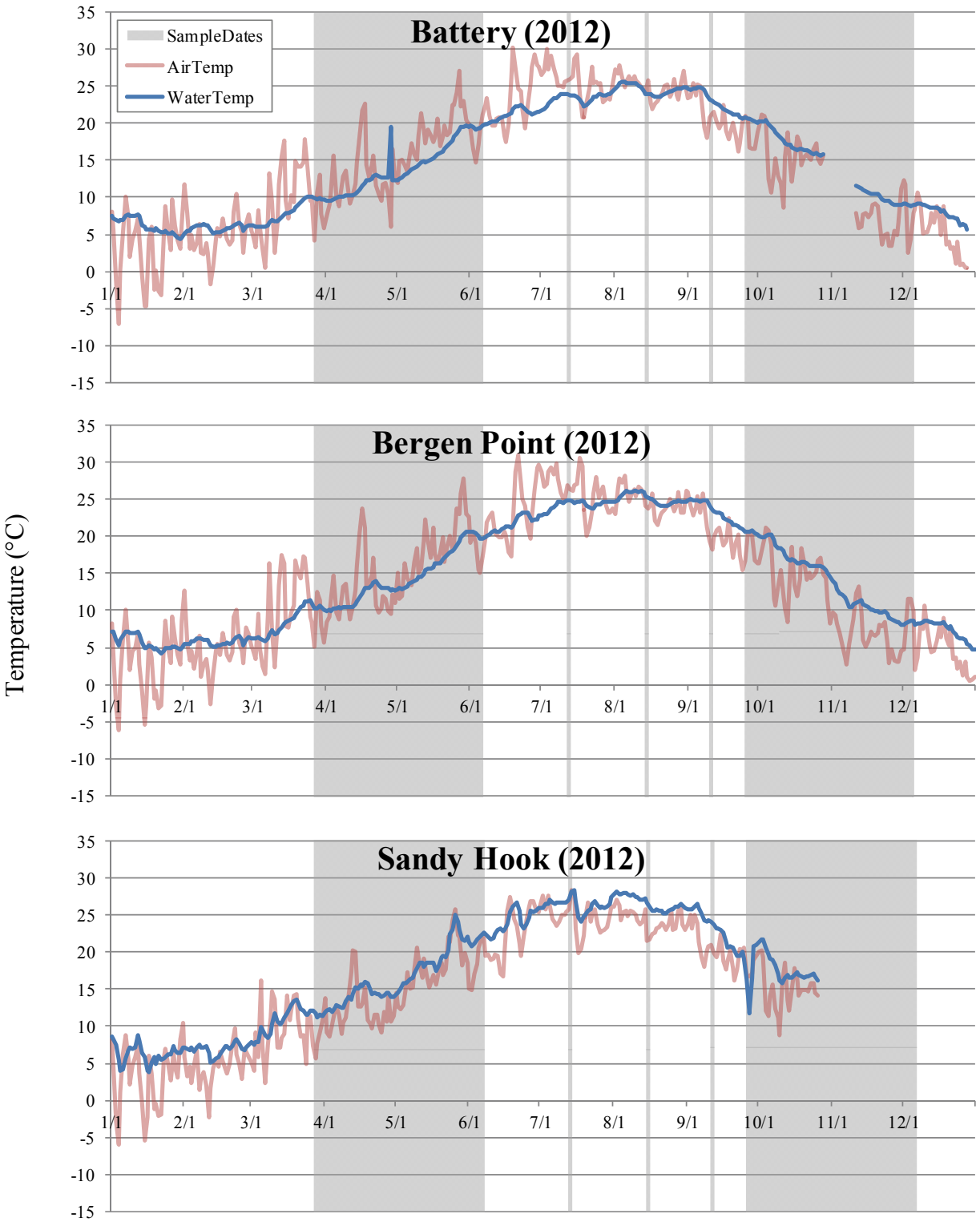


Figure 3-2. Average daily water and air temperatures during 2012 from NOAA water quality buoys at three locations in NY/NJ Harbor. (Note: Solid shaded sample dates represent weekly sampling, Sandy Hook and The Battery buoys malfunctioned as a result of Hurricane Sandy on October 29)

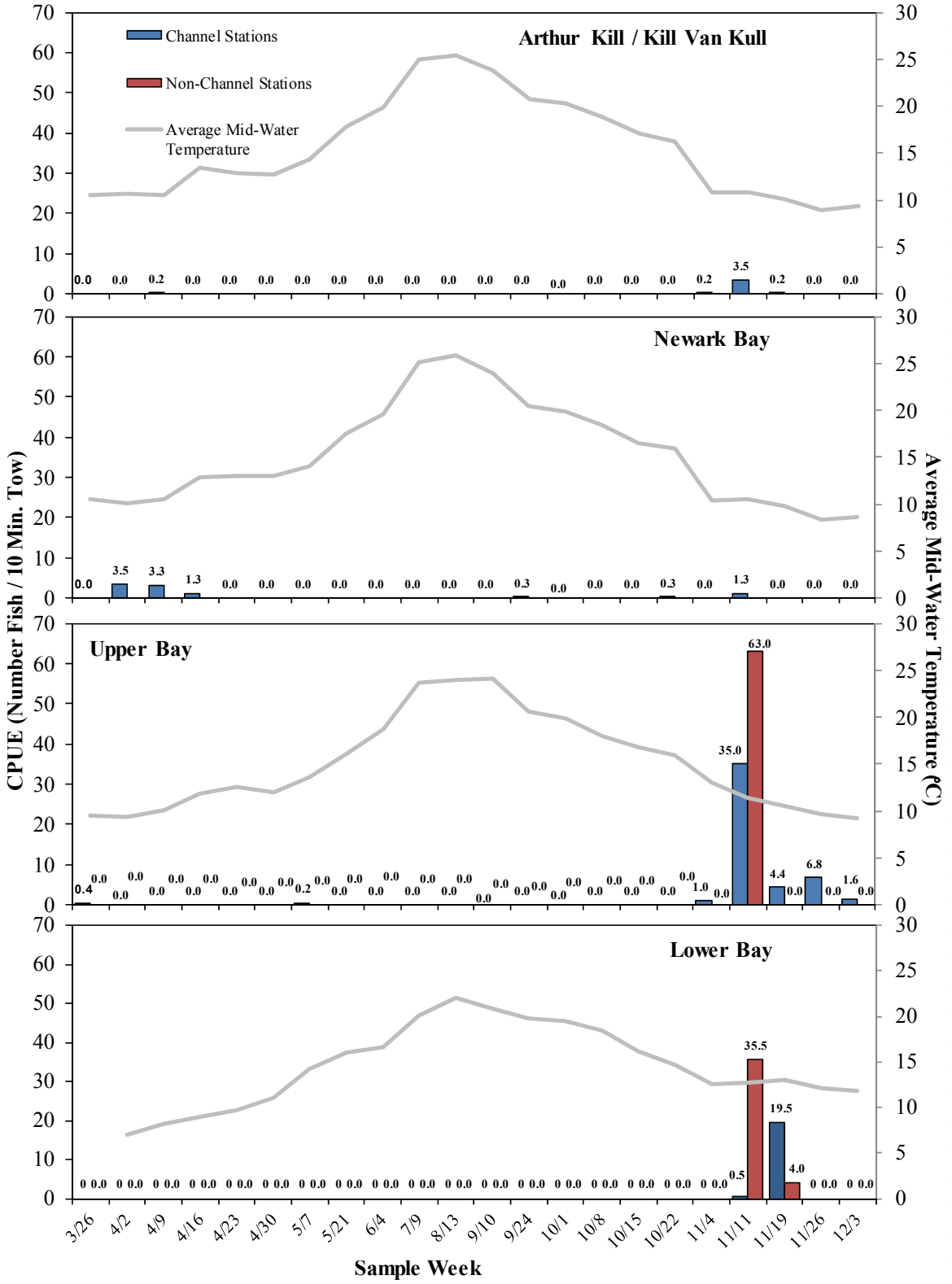


Figure 3-3 Average weekly alewife mid-water trawl CPUE at channel and non-channel stations, and average weekly mid-water temperature in the Arthur Kill/Kill Van Kull, Newark Bay, Upper Bay, and Lower Bay during the 2012 Migratory Finfish Sampling Program.

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

Non-channel stations were not sampled in Arthur Kill/Kill Van Kull Sampling Areas

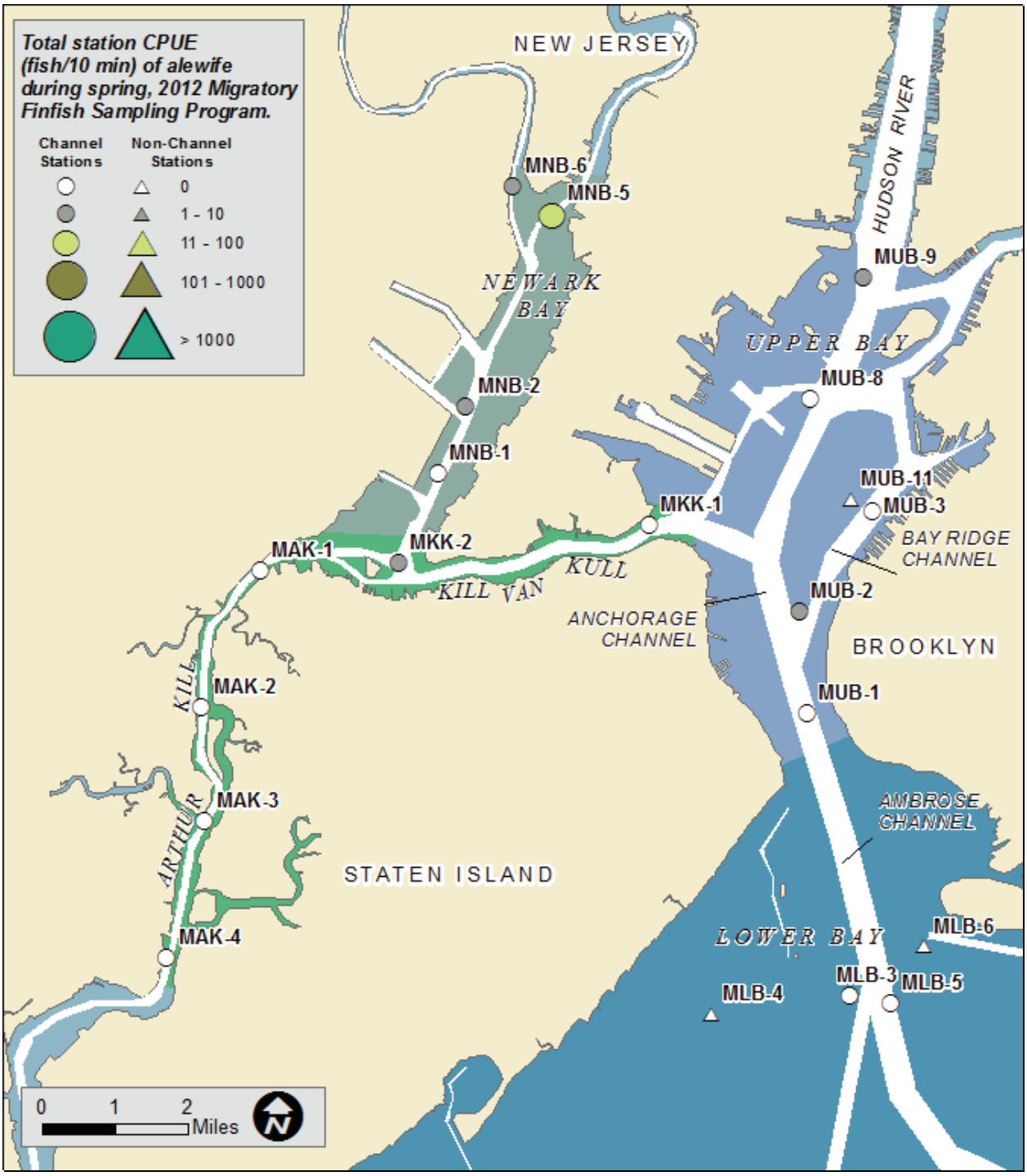


Figure 3-4a. Total station CPUE (fish/10 min) of alewife during spring, 2012 Migratory Finfish Sampling Program

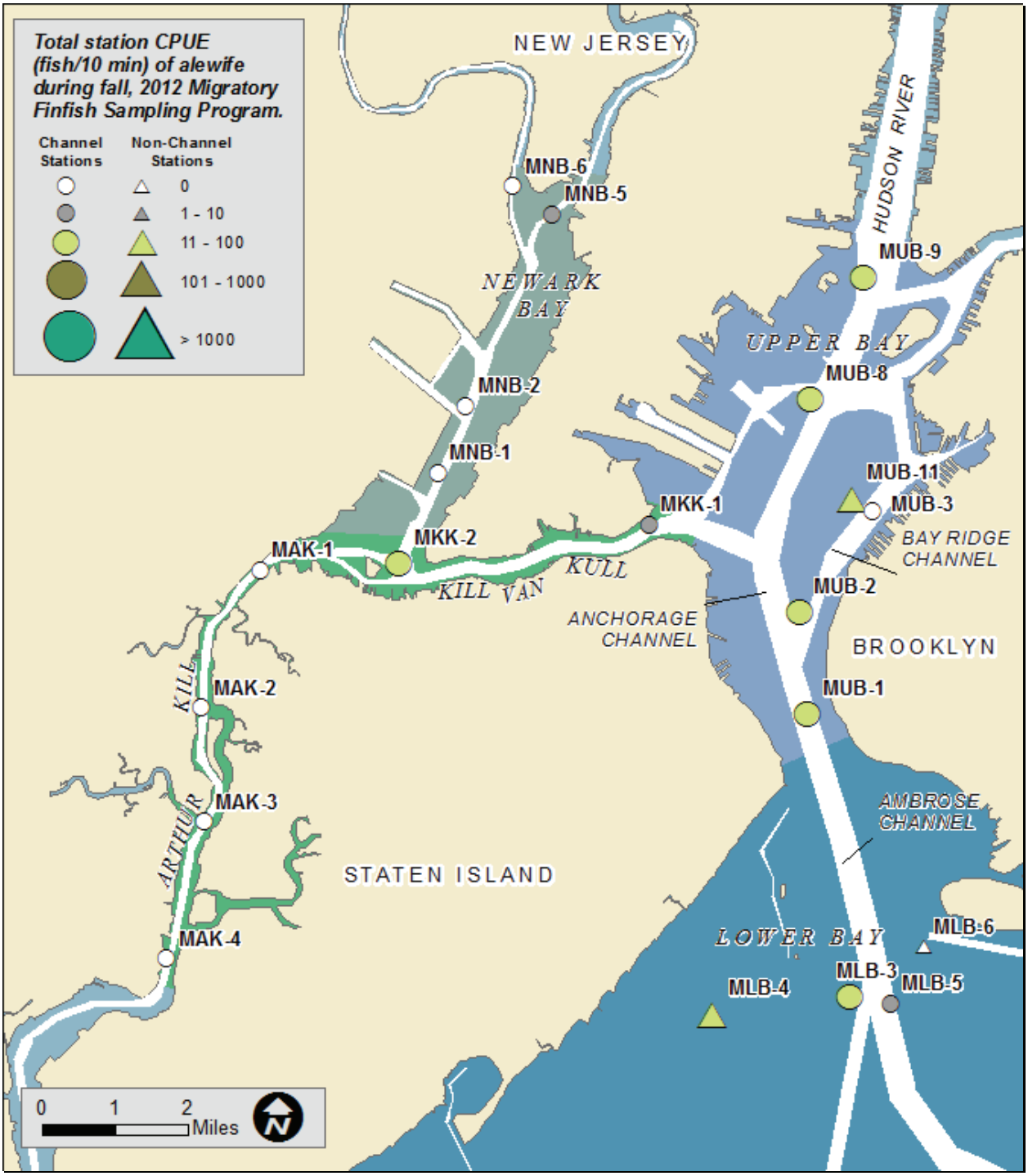


Figure 3-4b. Total station CPUE (fish/10 min) of alewife during fall, 2012 Migratory Finfish Sampling Program

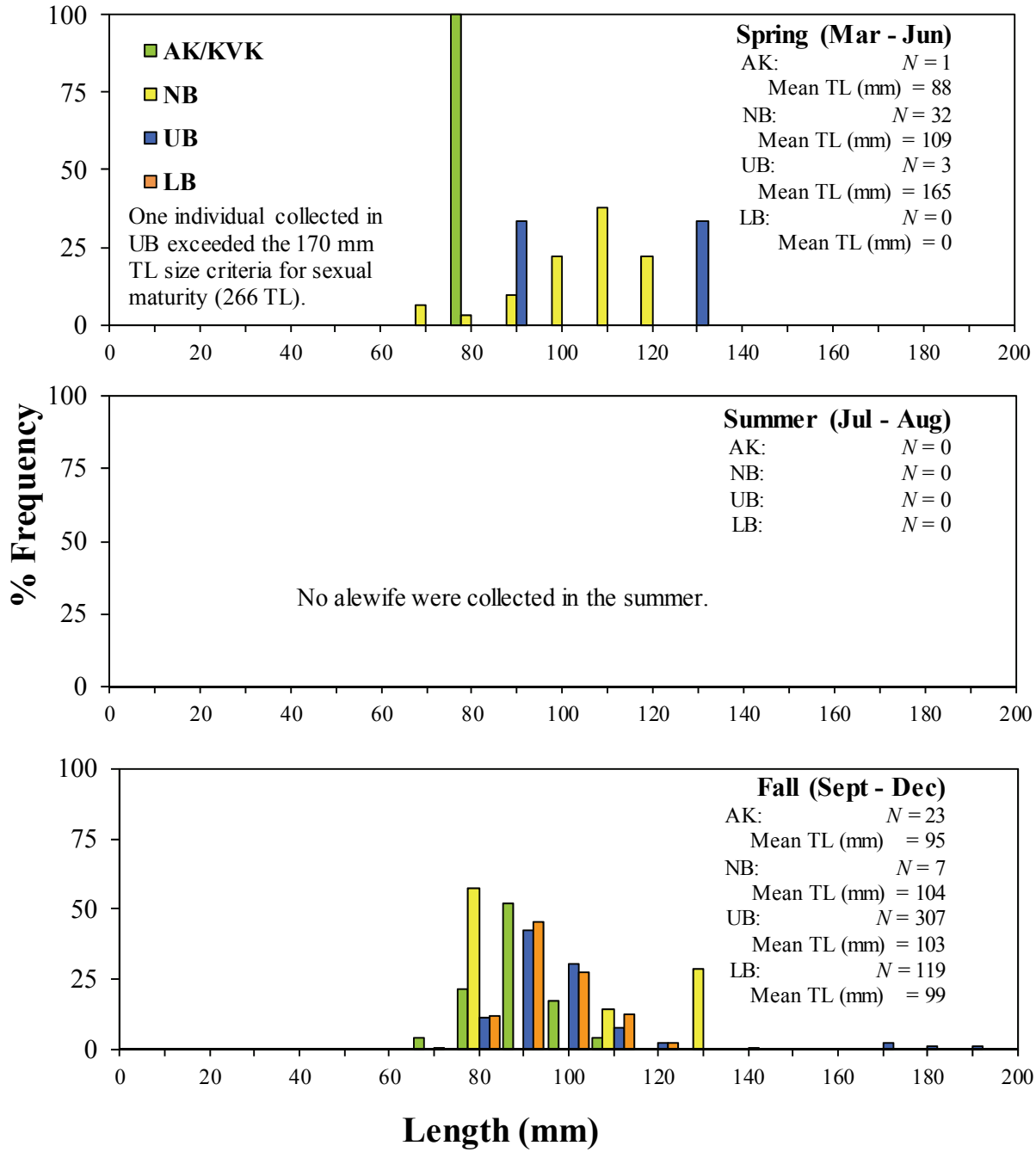


Figure 3-5 Length frequency distribution (10 mm intervals) by season and all study areas for alewife collected during the 2012 Migratory Finfish Sampling Program.

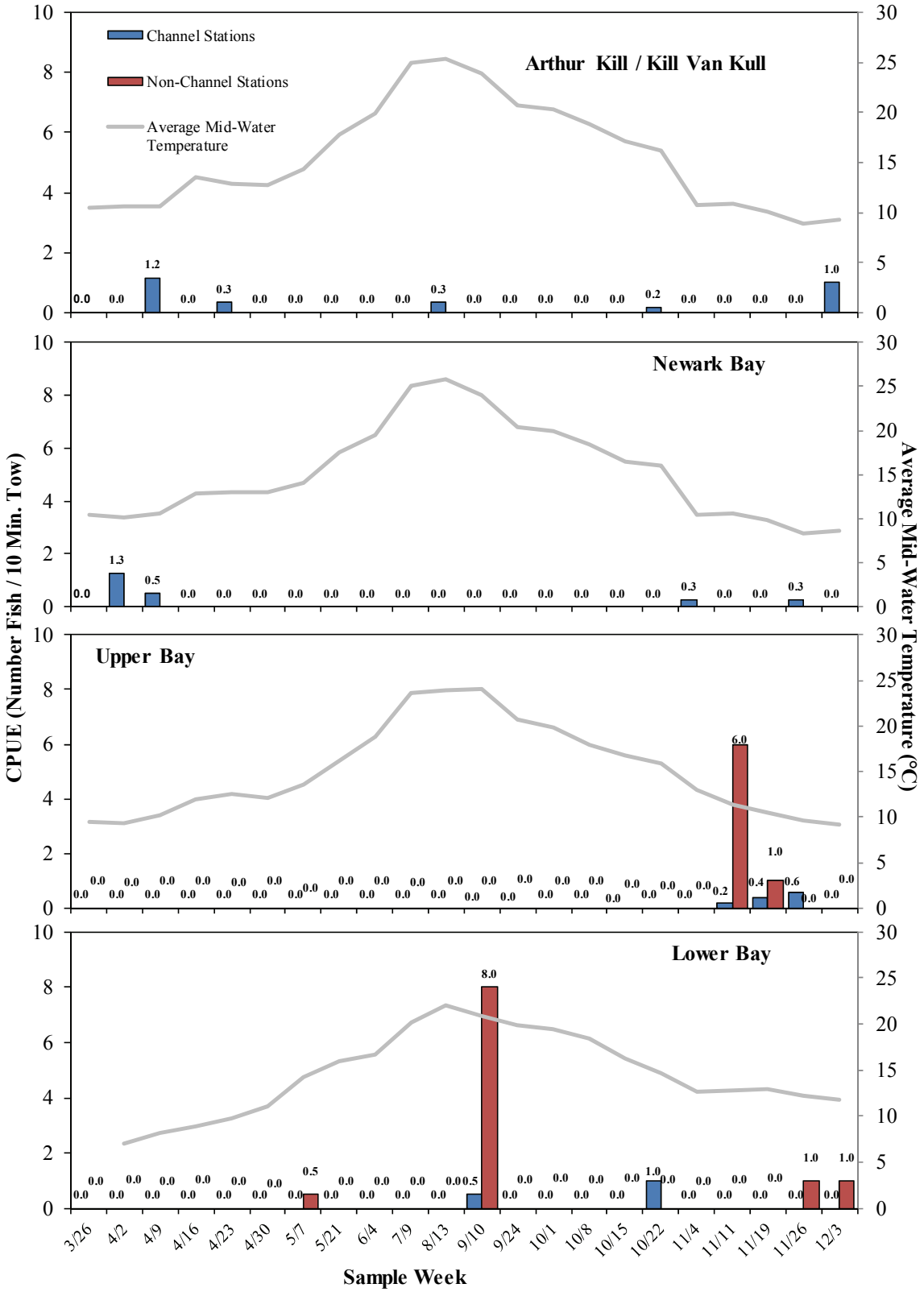


Figure 3-6 Average weekly American shad mid-water trawl CPUE at channel and non-channel stations, and average weekly mid-water temperature in the Arthur Kill/Kill Van Kull, Newark Bay, Upper Bay, and Lower Bay during the 2012 Migratory Finfish Sampling Program.

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

Non-channel stations were not sampled in Arthur Kill/Kill Van Kull Sampling Areas

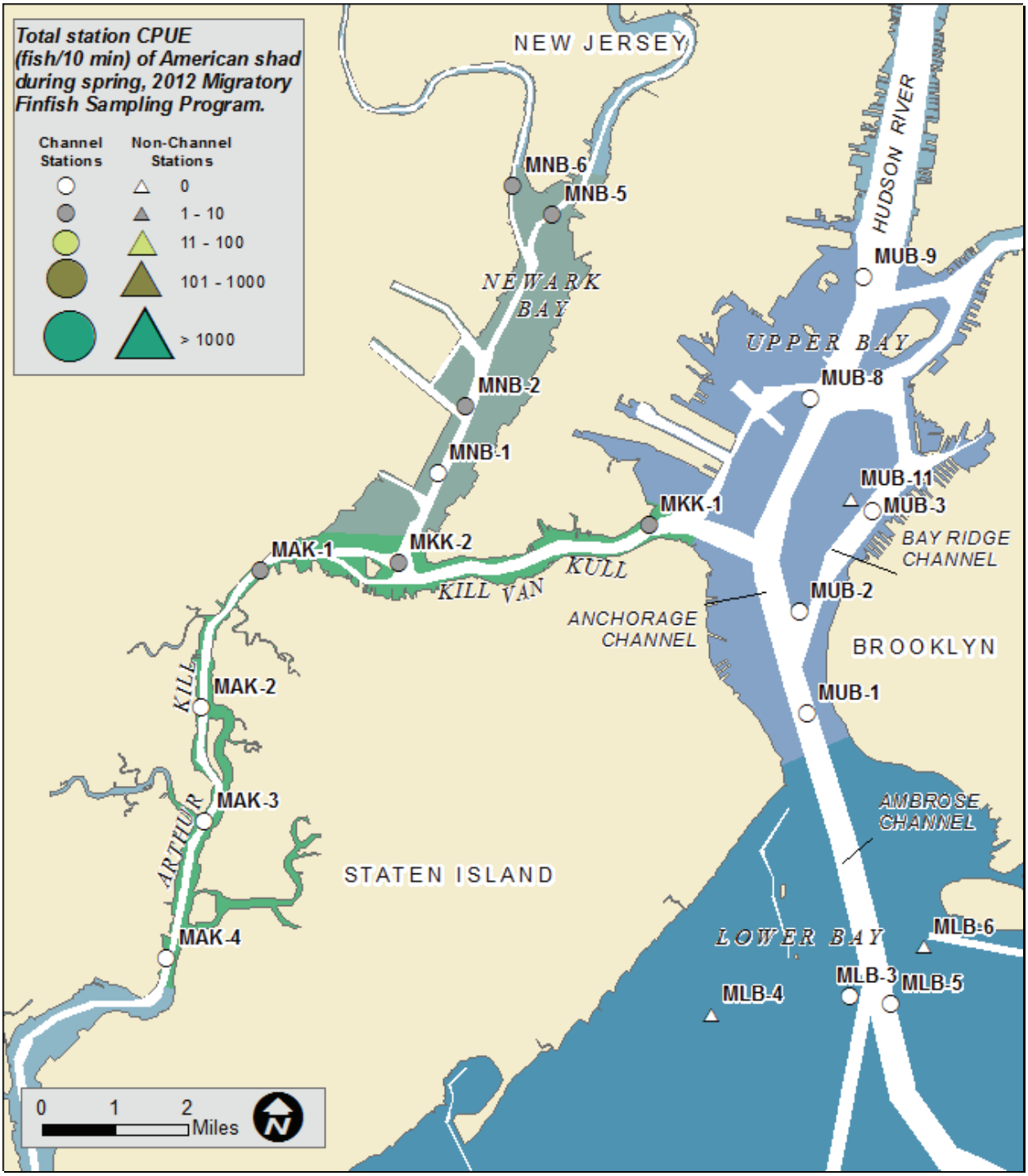


Figure 3-7a. Total station CPUE (fish/10 min) of American shad during spring, 2012 Migratory Finfish Sampling Program

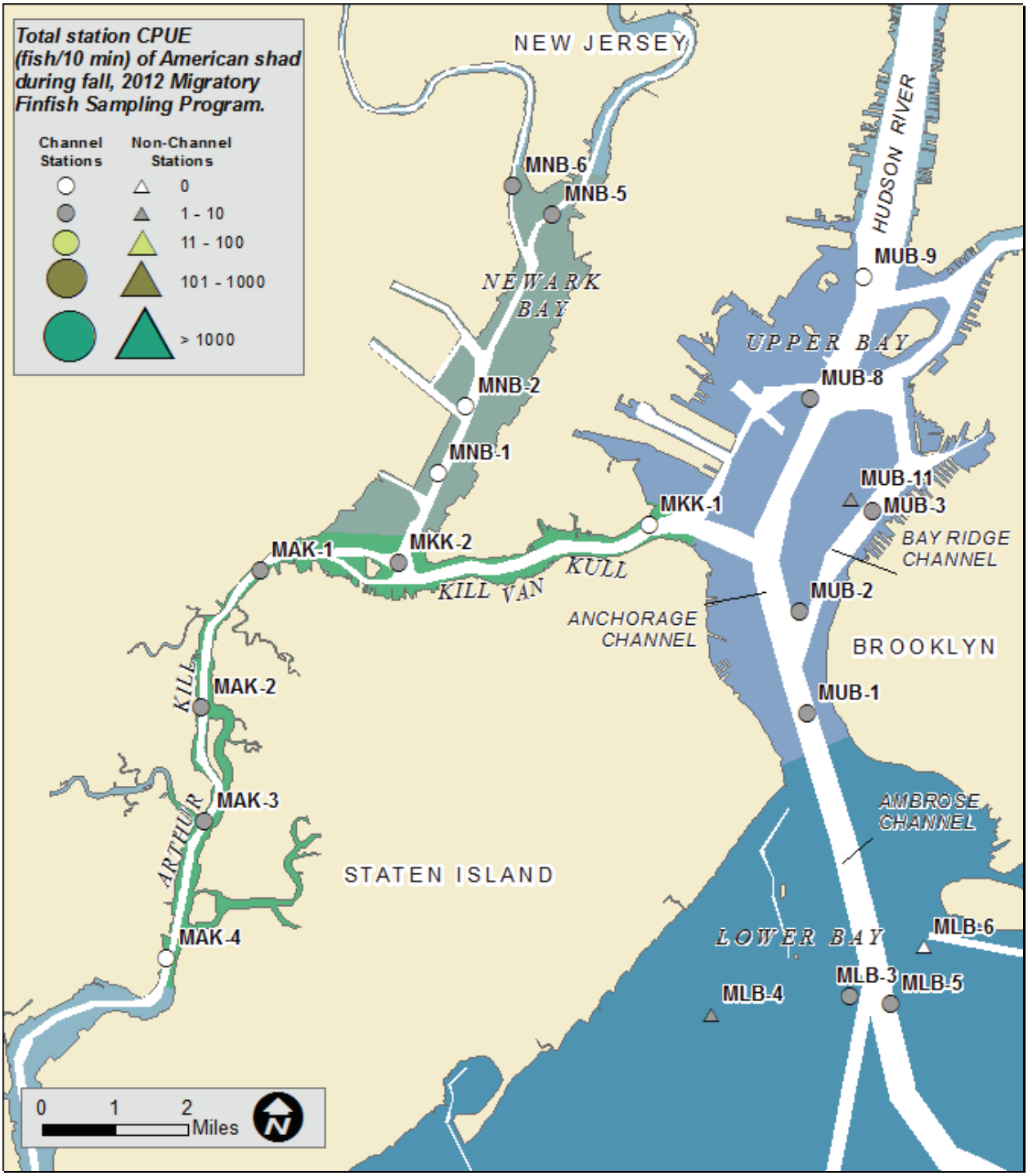


Figure 3-7b. Total station CPUE (fish/10 min) of American shad during fall, 2012 Migratory Finfish Sampling Program

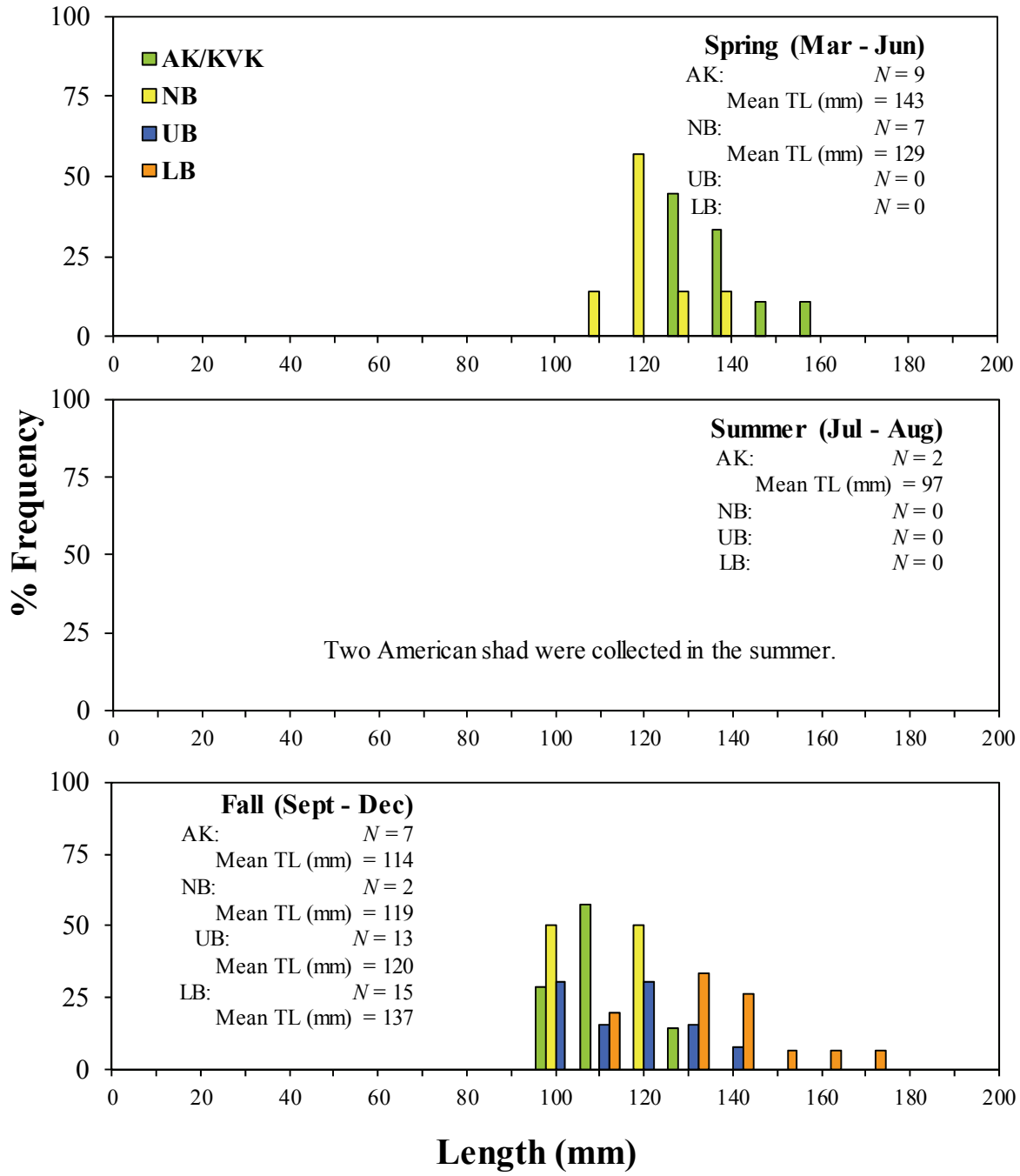


Figure 3-8 Length frequency distribution (10 mm intervals) by season and all study areas for American shad collected during the 2012 Migratory Finfish Sampling Program.

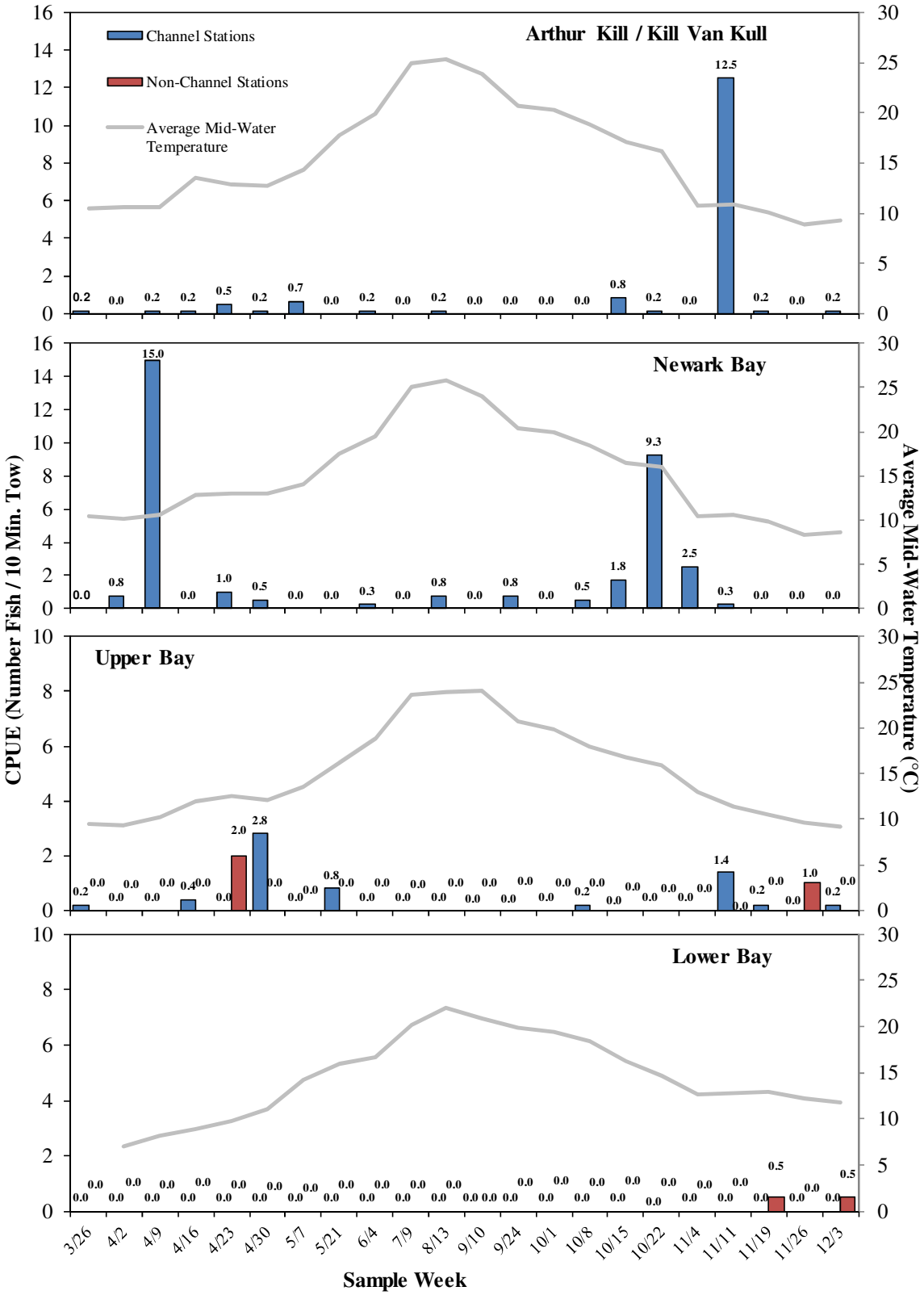


Figure 3-6 Average weekly Atlantic menhaden mid-water trawl CPUE at channel and non-channel stations, and average weekly mid-water temperature in the Arthur Kill/Kill Van Kull, Newark Bay, Upper Bay, and Lower Bay during the 2012 Migratory Finfish Sampling Program.

Note: Dates listed indicate the Monday of each sampling week. Scale difers for Upper and Lower Bays. Non-channel stations were not sampled in Arthur Kill/Kill Van Kull Sampling Areas

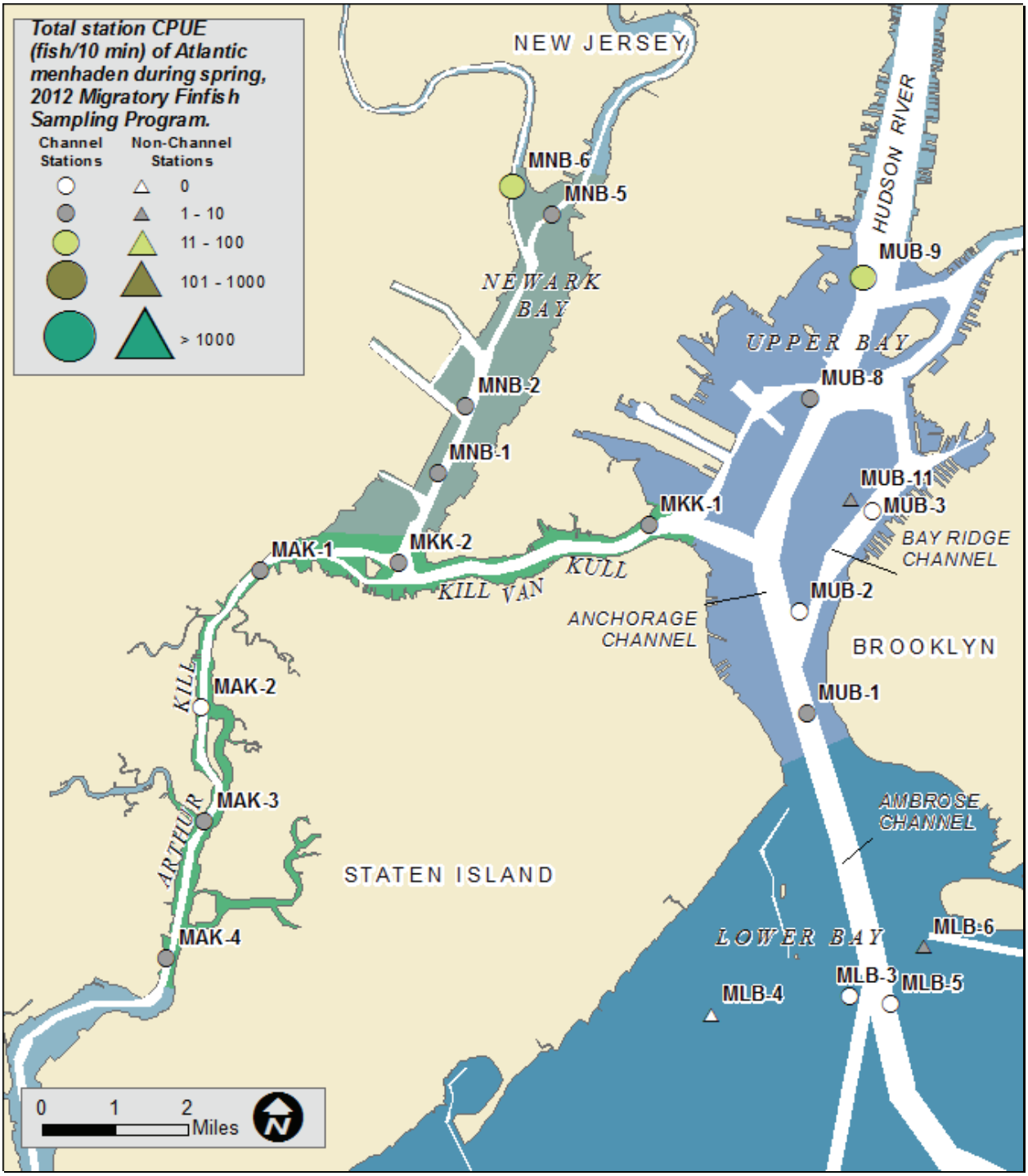


Figure 3-10a. Total station CPUE (fish/10 min) of Atlantic menhaden during spring, 2012 Migratory Finfish Sampling Program

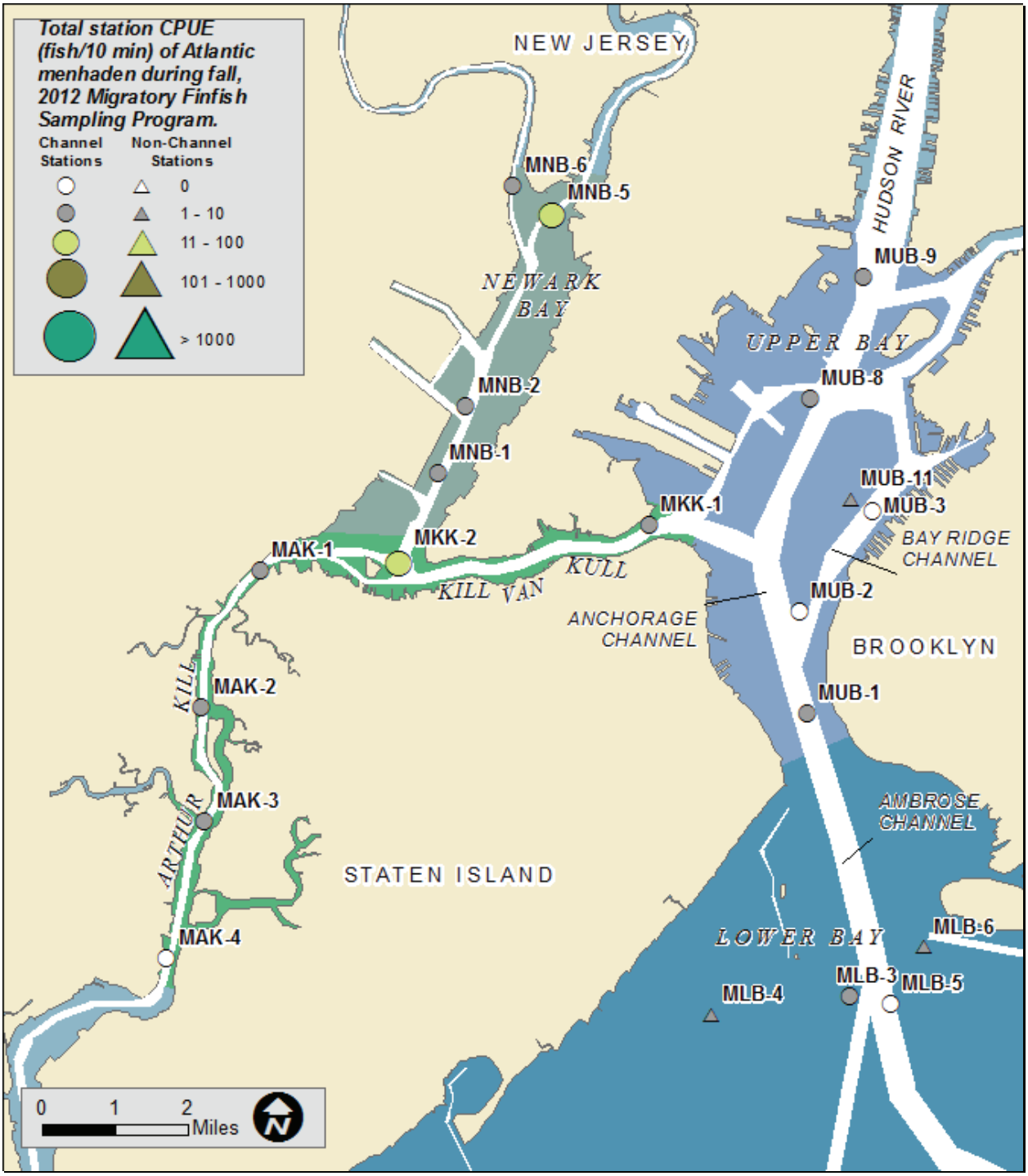


Figure 3-10b. Total station CPUE (fish/10 min) of Atlantic menhaden during fall, 2012 Migratory Finfish Sampling Program

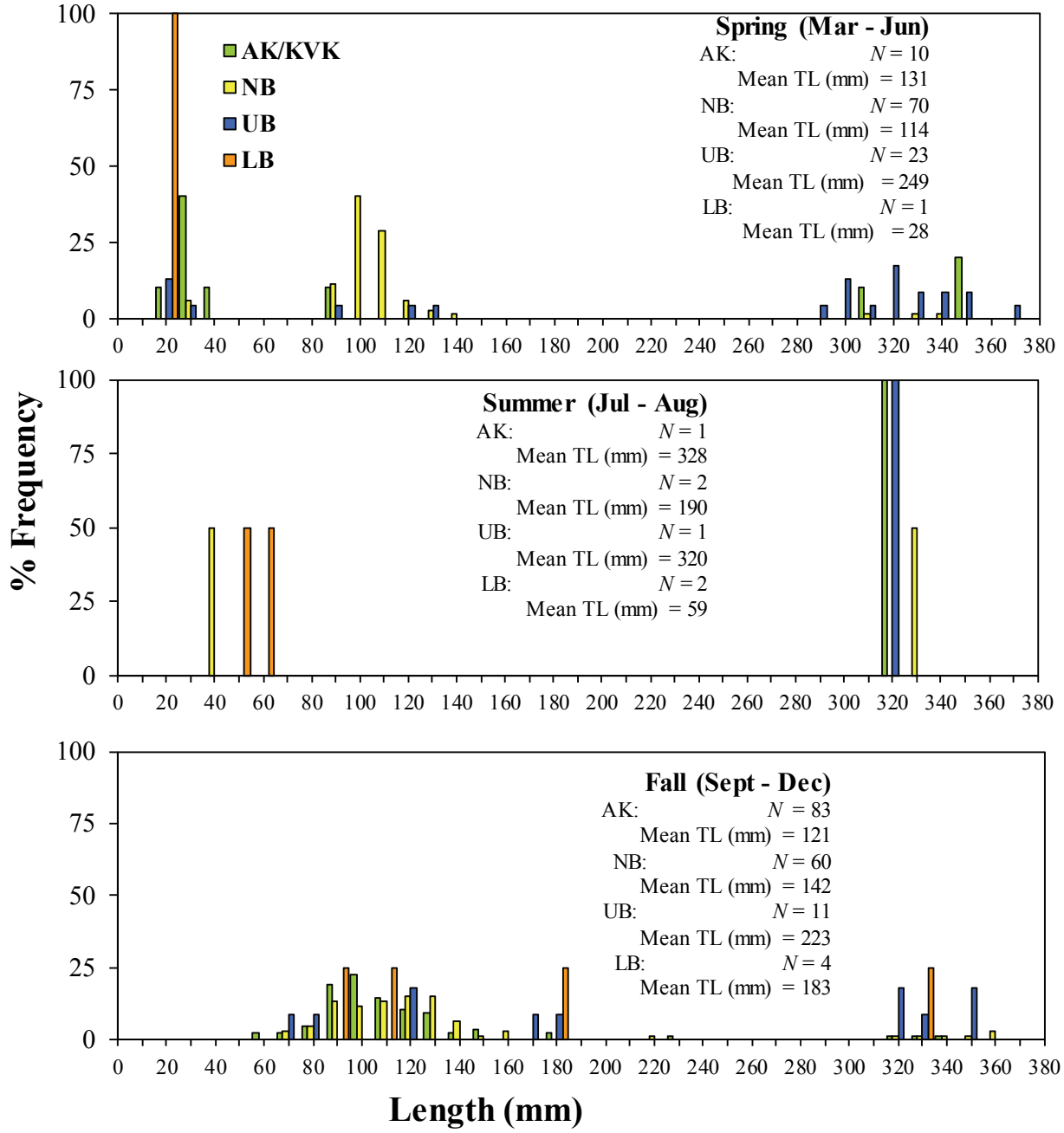


Figure 3-11 Length frequency distribution (10 mm intervals) by season and all study areas for Atlantic menhaden collected during the 2012 Migratory Finfish Sampling Program.

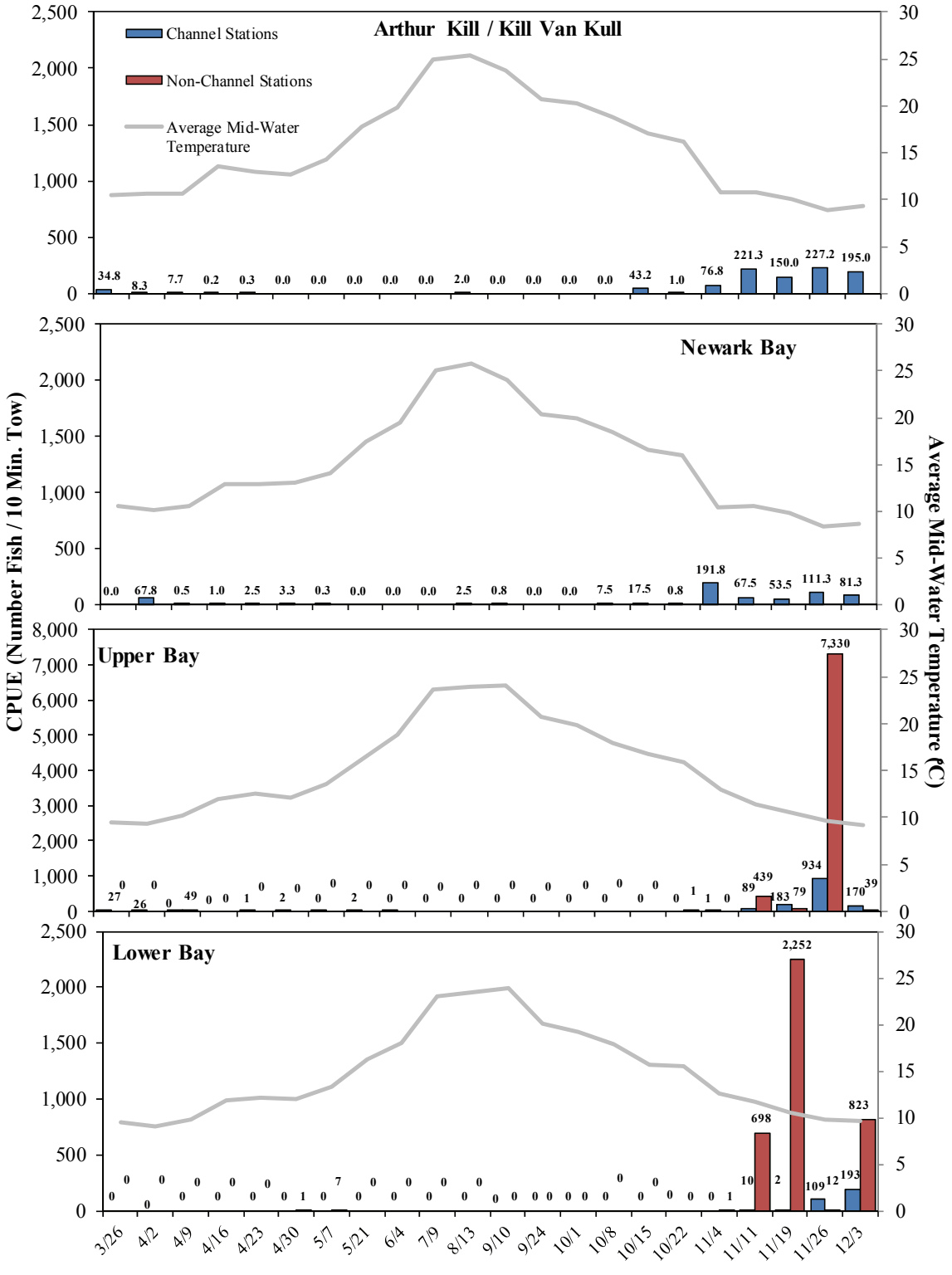


Figure 3-12 Average weekly blueback herring mid-water trawl CPUE at channel and non-channel stations, and average weekly mid-water temperature in the Arthur Kill/Kill Van Kull, Newark Bay, Upper Bay, and Lower Bay during the 2012 Migratory Finfish Sampling Program.

Note: Dates listed indicate the Monday of each sampling week.
Non-channel stations were not sampled in Arthur Kill/Kill Van Kull Sampling Areas.
CPUE y-axis scale differs for UB figure.

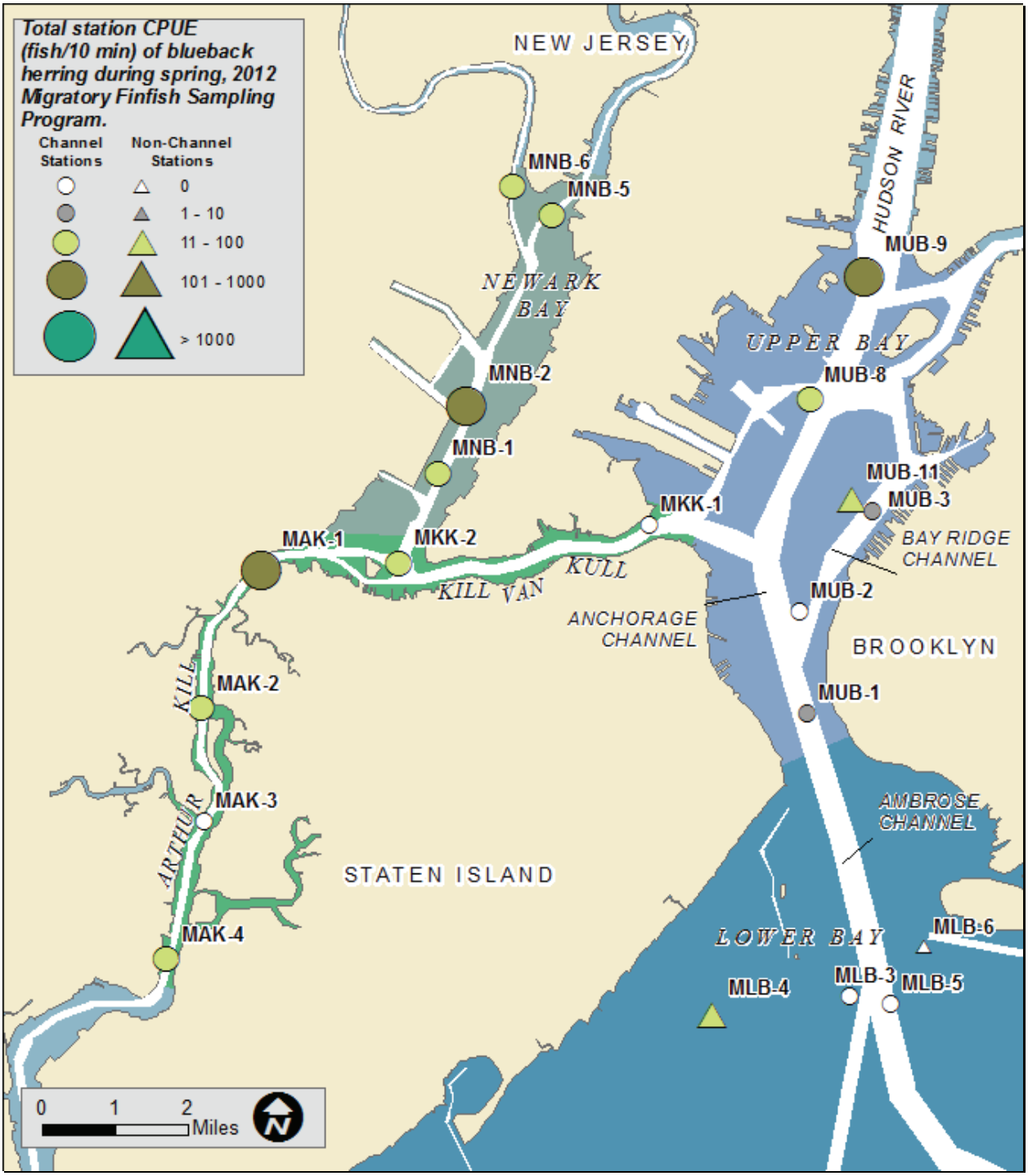


Figure 3-13a. Total station CPUE (fish/10 min) of blueback herring during spring, 2012 Migratory Finfish Sampling Program

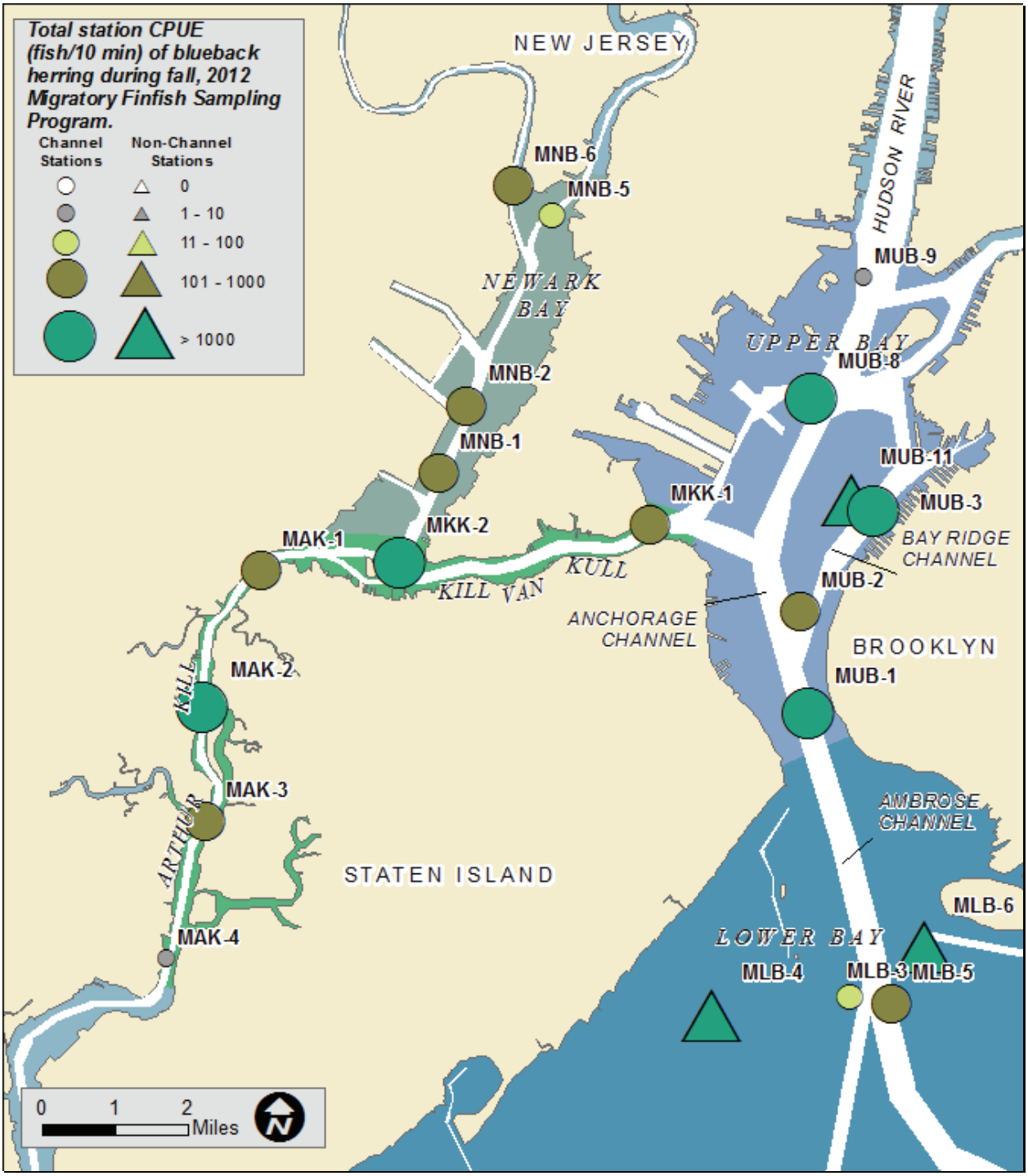


Figure 3-13b. Total station CPUE (fish/10 min) of blueback herring during fall, 2012 Migratory Finfish Sampling Program

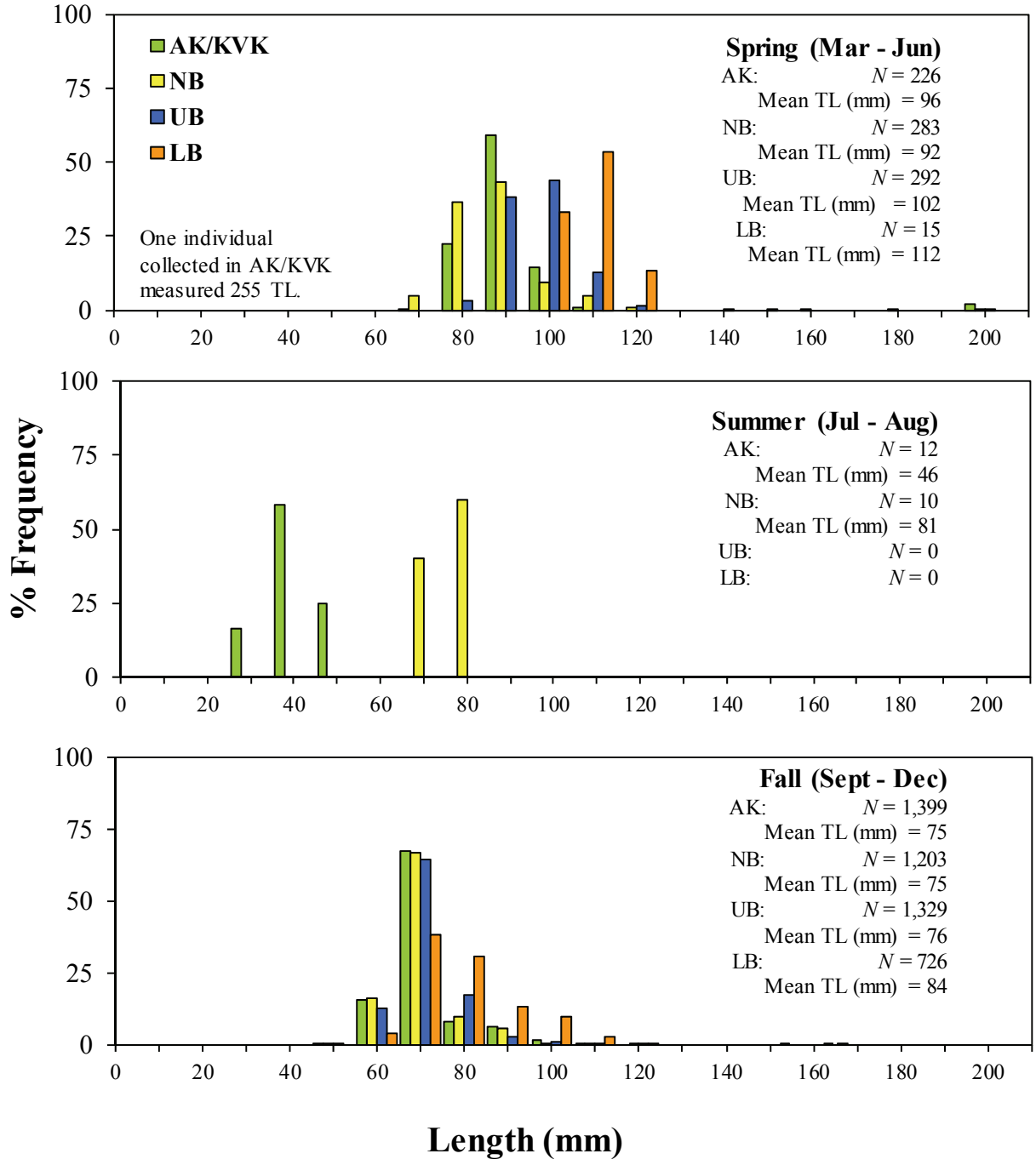


Figure 3-14 Length frequency distribution (10 mm intervals) by season and all study areas for blueback herring collected during the 2012 Migratory Finfish Sampling Program.

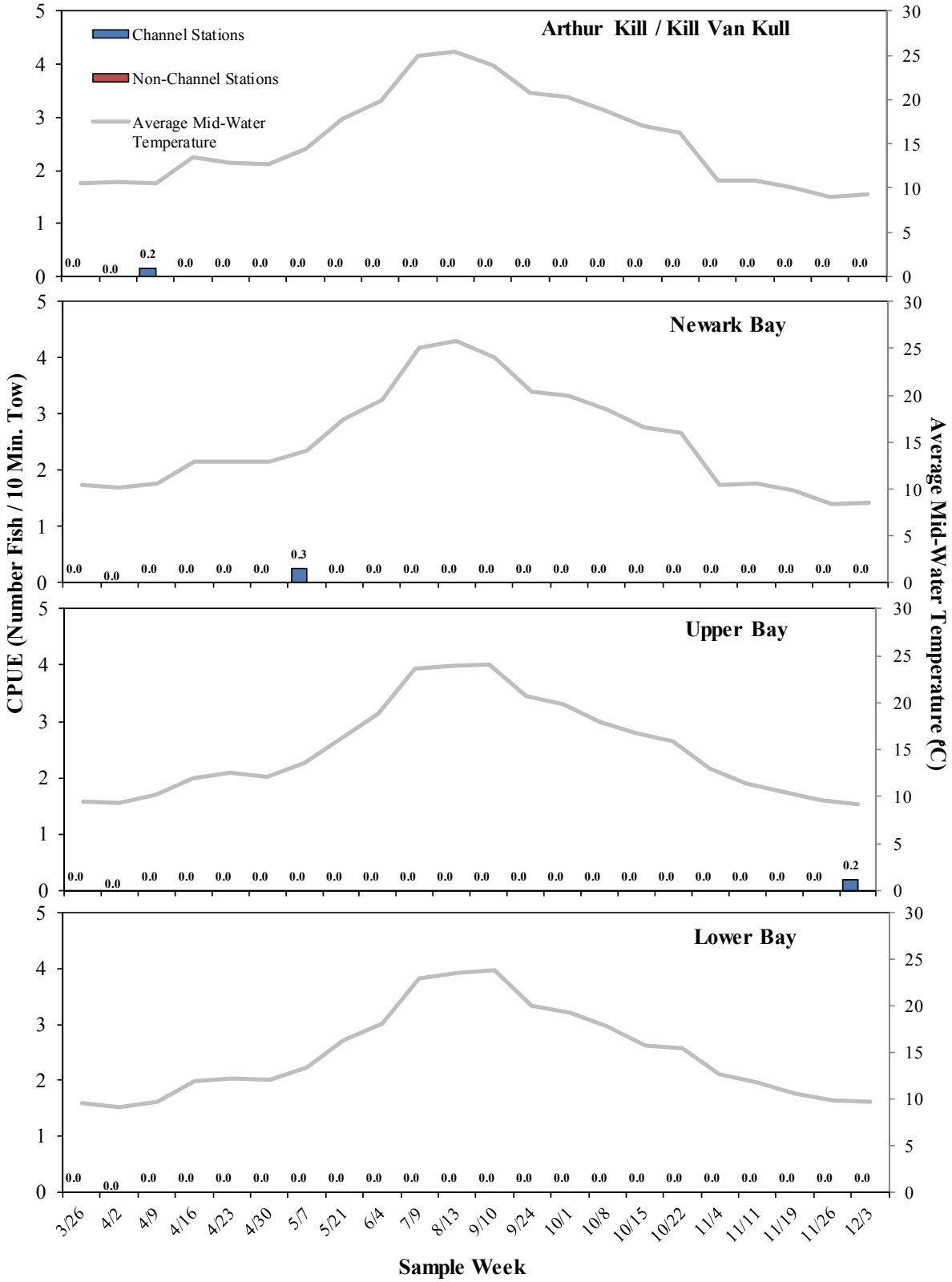


Figure 3-15 Average weekly striped bass mid-water trawl CPUE at channel and non-channel stations, and average weekly mid-water temperature in the Arthur Kill/Kill Van Kull, Newark Bay, Upper Bay, and Lower Bay during the 2012 Migratory Finfish Sampling Program.

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

Non-channel stations were not sampled in Arthur Kill/Kill Van Kull Sampling Areas

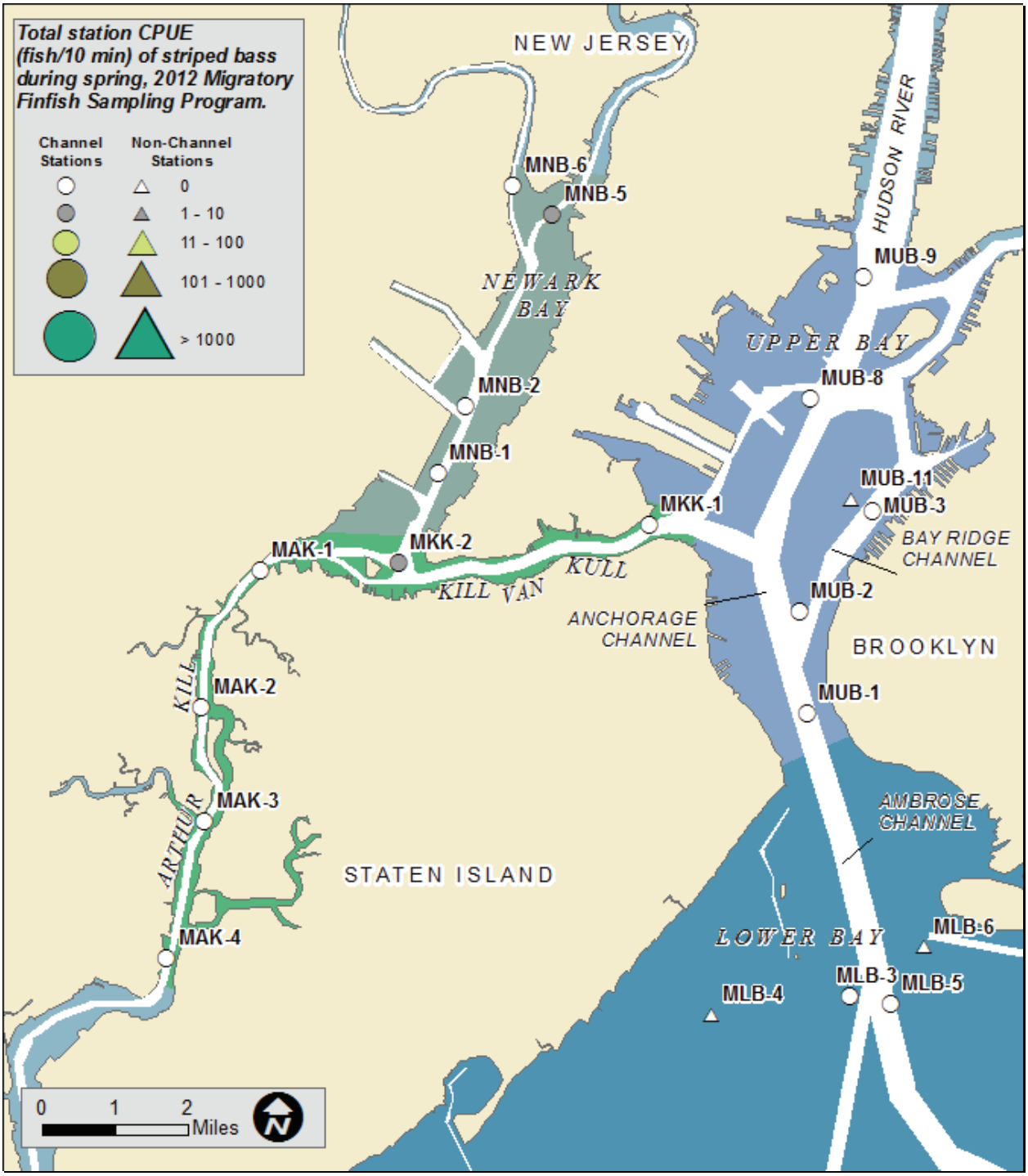


Figure 3-16a. Total station CPUE (fish/10 min) of striped bass during spring, 2012 Migratory Finfish Sampling Program

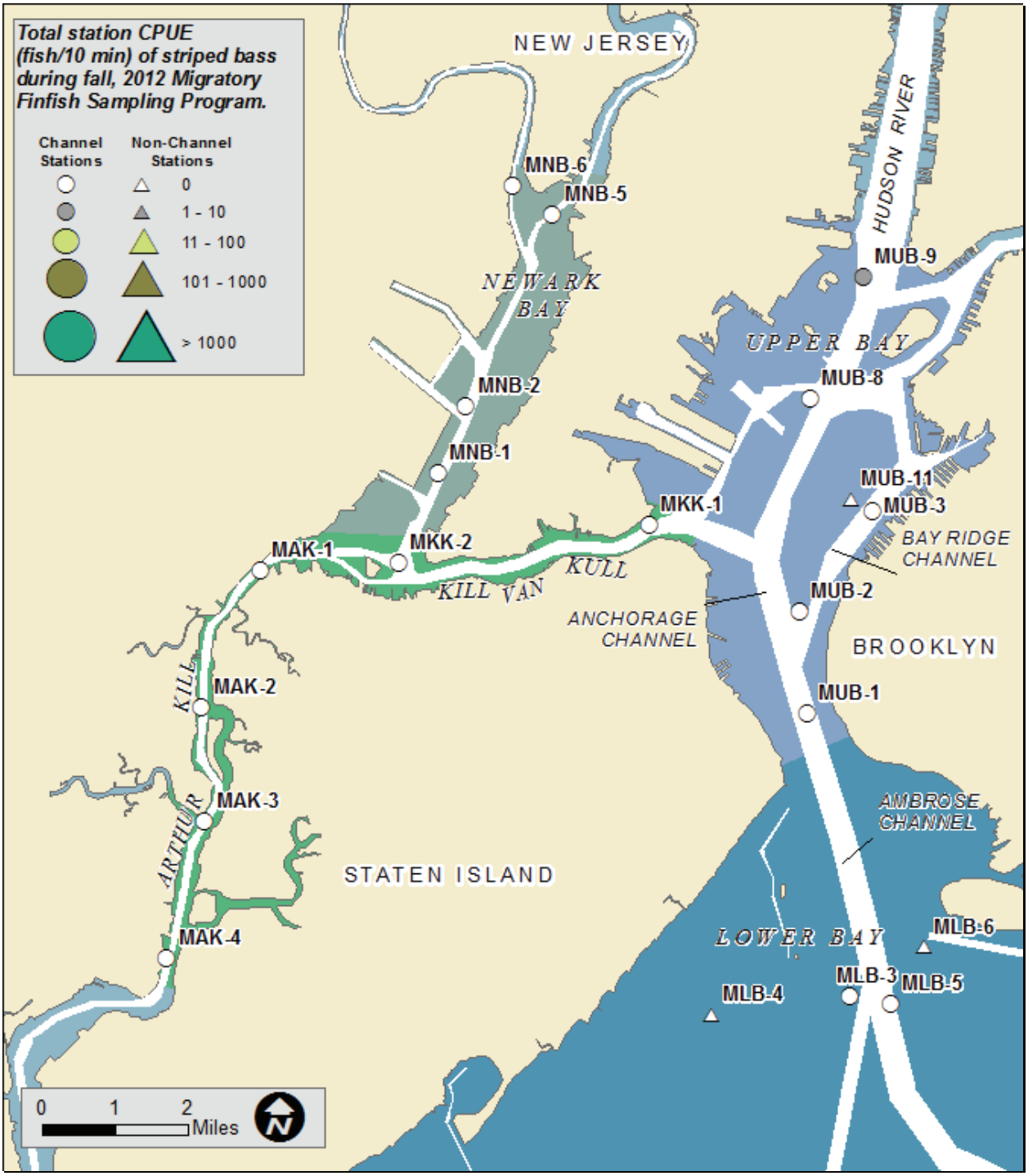


Figure 3-16b. Total station CPUE (fish/10 min) of striped bass during fall, 2012 Migratory Finfish Sampling Program

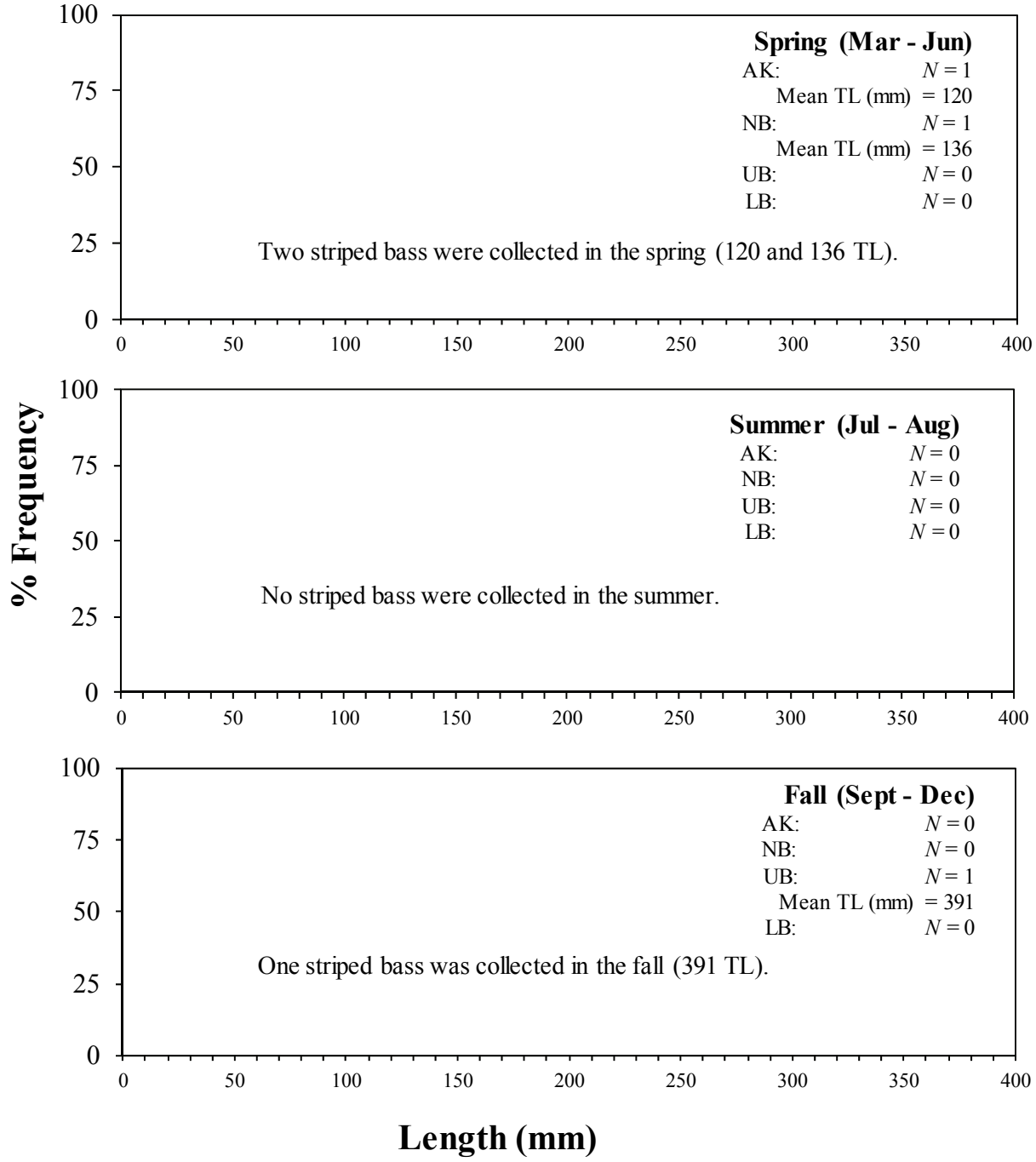
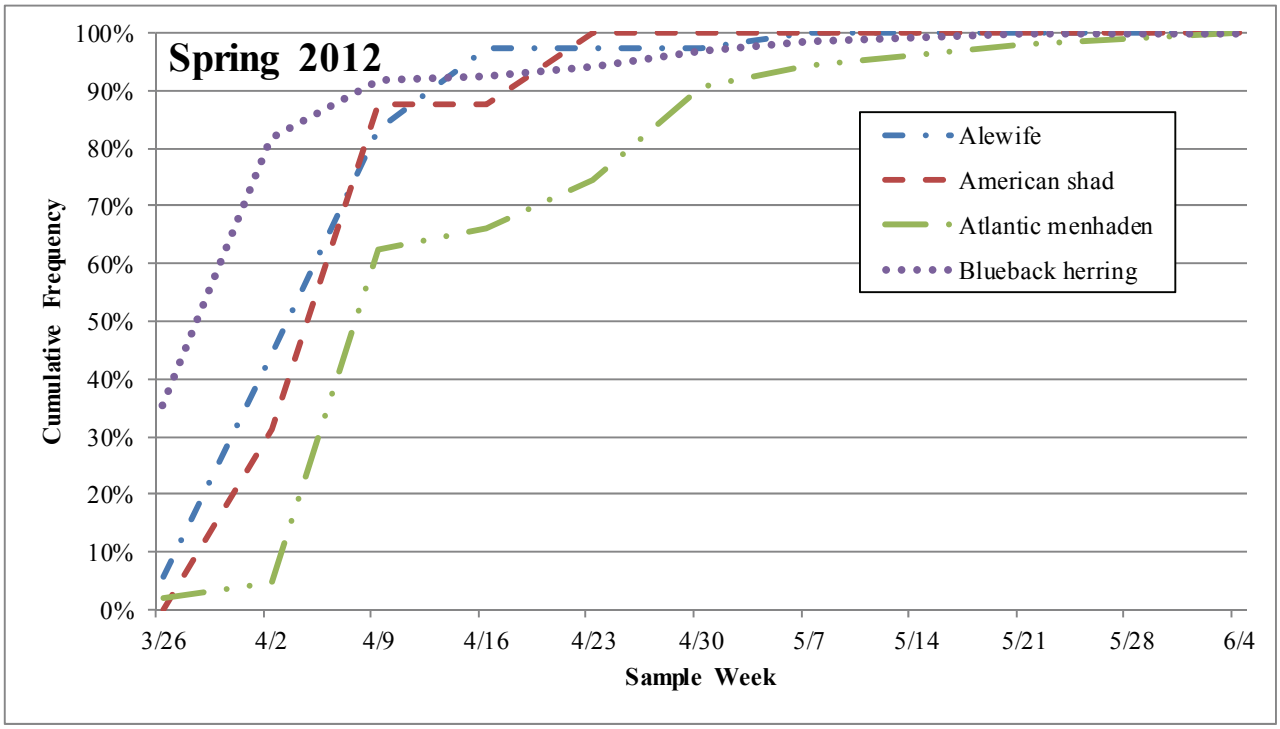


Figure 3-17 Length frequency distribution (10 mm intervals) by season and all study areas for striped bass collected during the 2012 Migratory Finfish Sampling Program.



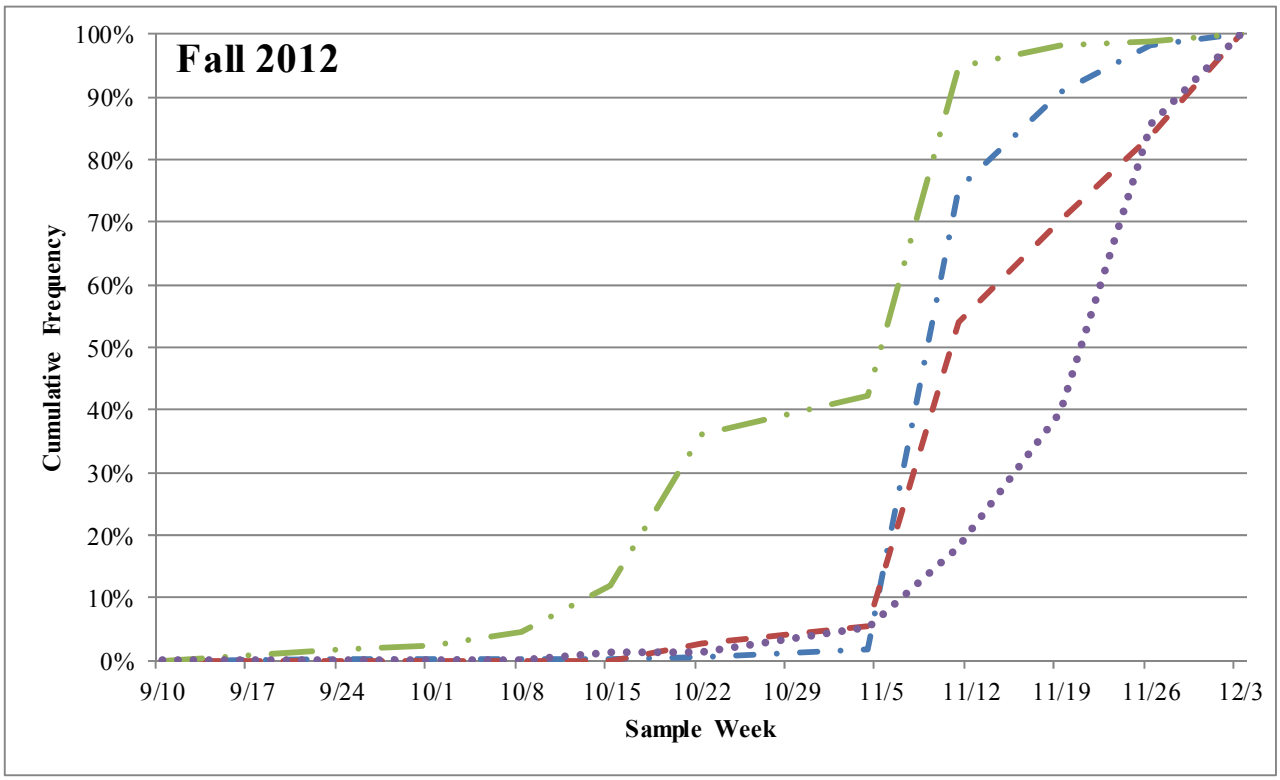


Figure 3-18 **Cumulative Occurrence of Target Species for Spring and Fall Sampling, 2012 Migratory Finfish Survey**

Note: Sampling Week is indicated by Monday of week. Striped bass were not included due to low catch.

Appendix A

Water Quality Data by Date and Station Collected During the 2012 Migratory Finfish Survey

Date	Station	Temp (°C)	DO (mg/L)	SpCond @ 25°C (µS/cm)	Salinity (ppt)	Depth (ft)
3/27/2012	MLB-3	9.6	9.3	39650	25.2	20
3/27/2012	MLB-4	9.4	9.4	35510	22.3	11
3/27/2012	MLB-5	9.7	9	44396	28.3	30
3/27/2012	MLB-6	9.6	9.3	39126	25.2	16
3/27/2012	MUB-1	9.4	9.1	35523	22.3	32
3/27/2012	MUB-11	9.3	9.4	30051	18.6	8
3/27/2012	MUB-2	9.4	9.1	31450	19.4	27
3/27/2012	MUB-3	9.4	9.5	30604	18.8	19
3/29/2012	MAK-1	10.4	9.6	34281	21.5	25
3/29/2012	MAK-2	10.6	9.5	34334	21.5	22
3/29/2012	MAK-3	10.8	9.2	33603	21	22
3/29/2012	MAK-4	11	9.4	32654	20.4	22
3/29/2012	MKK-1	10.1	9.8	35905	22.5	28
3/29/2012	MKK-2	10.3	9.7	35314	22.1	30
3/29/2012	MNB-1	10.6	9.8	33879	21.2	29
3/29/2012	MNB-2	10.4	9.7	34507	21.6	29
3/29/2012	MNB-5	10.5	9.2	33852	21.1	17
3/29/2012	MNB-6	10.5	9.7	33500	21	10
3/29/2012	MUB-8	9.8	9.9	36165	22.7	29
3/29/2012	MUB-9	9.8	9.8	35720	22.3	29
4/3/2012	MKK-1	9.5	9.2	38871	22.5	28
4/3/2012	MLB-3	9.1	9.4	39580	25	16
4/3/2012	MLB-4	9.2	9.4	39359	25	9
4/3/2012	MLB-5	9	9.2	43916	28.1	26
4/3/2012	MLB-6	9.2	9.4	39716	25	15
4/3/2012	MUB-1	9.3	9.4	37412	23.6	33
4/3/2012	MUB-11	9.5	9.3	36390	22.9	9
4/3/2012	MUB-2	9.5	9.5	35935	22.6	23
4/3/2012	MUB-3	9.5	9.2	36378	22.9	19
4/3/2012	MUB-8	9.2	9.5	38180	24.4	30
4/3/2012	MUB-9	9.2	9.4	37383	23.4	31
4/4/2012	MAK-1	10.6	9.4	34513	21.6	20
4/4/2012	MAK-2	10.7	9.3	34360	21.5	20
4/4/2012	MAK-3	11.4	9.1	33829	21.2	21
4/4/2012	MAK-4	11.4	9.2	33829	21.2	20
4/4/2012	MKK-2	10.1	9.6	34784	21.8	27
4/4/2012	MNB-1	9.9	9.9	35307	22.2	29
4/4/2012	MNB-2	10	9.8	34871	21.9	29
4/4/2012	MNB-5	10.2	9.5	33190	20.7	19
4/4/2012	MNB-6	10.4	9.4	32350	20.1	10
4/10/2012	MAK-1	10.3	9.6	36640	23.1	25

Date	Station	Temp (°C)	DO (mg/L)	SpCond @ 25°C (µS/cm)	Salinity (ppt)	Depth (ft)
4/10/2012	MAK-2	10.6	9.4	36803	23.2	22
4/10/2012	MAK-3	10.9	9.4	36675	23.1	22
4/10/2012	MAK-4	11.1	9.3	35913	22.6	22
4/10/2012	MKK-1	10.3	9.6	38646	24.5	30
4/10/2012	MKK-2	10.3	9.7	37905	24.1	30
4/10/2012	MNB-1	10.5	9.6	37188	23.5	30
4/10/2012	MNB-2	10.4	9.6	37021	23.4	29
4/10/2012	MNB-5	10.7	9.5	34865	21.9	20
4/10/2012	MNB-6	10.7	9.52	35004	22	10
4/11/2012	MLB-3	9.7	8.3	44507	28.6	20
4/11/2012	MLB-4	9.8	9.2	43085	27.6	10
4/11/2012	MLB-5	9.7	8.8	44910	28.9	30
4/11/2012	MLB-6	9.8	9	43900	28.1	15
4/11/2012	MUB-1	9.9	8.9	43557	27.9	33
4/11/2012	MUB-11	10.4	9.3	37531	23.8	9
4/11/2012	MUB-2	10.1	9	40049	25.5	28
4/11/2012	MUB-3	10.2	9	38586	24.4	20
4/11/2012	MUB-8	10.2	9	39851	25.3	31
4/11/2012	MUB-9	10.2	8.8	38357	24.3	31
4/17/2012	MKK-1	12.5	8.6	37750	23.9	27
4/17/2012	MLB-3	11.9	8.6	41730	26.7	16
4/17/2012	MLB-4	12.1	8.6	41690	26.7	9
4/17/2012	MLB-5	11.7	8.8	43760	28.2	28
4/17/2012	MLB-6	11.9	8.7	42040	27.1	15
4/17/2012	MUB-1	11.9	8.5	40740	26	34
4/17/2012	MUB-11	11.9	8.6	38610	24.5	10
4/17/2012	MUB-2	11.9	8.6	38980	24.8	25
4/17/2012	MUB-3	11.9	8.6	39270	24.9	20
4/17/2012	MUB-8	12	8.6	39120	24.6	30
4/17/2012	MUB-9	11.8	8.6	39100	24.9	30
4/18/2012	MAK-1	13.5	8.3	35850	22.7	22
4/18/2012	MAK-2	13.7	7.6	35820	22.7	20
4/18/2012	MAK-3	14.3	7.5	35620	22.4	20
4/18/2012	MAK-4	14.3	7.3	36070	22.9	19
4/18/2012	MKK-2	12.8	8.3	36050	22.8	30
4/18/2012	MNB-1	12.7	8.3	36850	23.3	30
4/18/2012	MNB-2	12.8	8.2	36680	23.1	30
4/18/2012	MNB-5	13	8	34800	21.9	15
4/18/2012	MNB-6	13.2	7.9	34360	21.7	10
4/25/2012	MAK-1	12.9	8.2	34377	21.6	25
4/25/2012	MAK-2	13	8.1	35389	22.3	22

Date	Station	Temp (°C)	DO (mg/L)	SpCond @ 25°C (µS/cm)	Salinity (ppt)	Depth (ft)
4/25/2012	MAK-3	13.2	7.9	35251	22.2	22
4/25/2012	MAK-4	13.3	7.9	34959	22	22
4/25/2012	MKK-1	12.6	8.3	34039	2.4	30
4/25/2012	MKK-2	12.6	8.2	35455	22.3	30
4/25/2012	MNB-1	12.7	8.3	35921	22.7	30
4/25/2012	MNB-2	12.8	8.1	36212	22.9	30
4/25/2012	MNB-5	13.1	7	34681	21.8	16
4/25/2012	MNB-6	13.2	7.9	35170	20.7	10
4/26/2012	MLB-3	12.2	8.5	41788	26.8	20
4/26/2012	MLB-4	12.6	8.7	37725	24	10
4/26/2012	MLB-5	11.9	8.2	43842	28.3	27
4/26/2012	MLB-6	12	8.4	43478	28	15
4/26/2012	MUB-1	12.3	8.1	40336	25.7	31
4/26/2012	MUB-11	12.7	8.1	32791	20.6	10
4/26/2012	MUB-2	12.5	8	36835	23.3	26
4/26/2012	MUB-3	12.5	8.1	35060	22.1	20
4/26/2012	MUB-8	12.8	8.3	33079	20.7	25
4/26/2012	MUB-9	12.8	8.2	32580	20.4	30
5/1/2012	MAK-1	12.7	8.3	33877	21.2	23
5/1/2012	MAK-2	12.7	8	34080	21.4	20
5/1/2012	MAK-3	13	7.7	33797	21.2	20
5/1/2012	MAK-4	13.3	7.8	32884	20.6	20
5/1/2012	MKK-1	12.1	8.1	37679	23.9	28
5/1/2012	MKK-2	12.5	8.3	34905	22	28
5/1/2012	MNB-1	12.5	8.1	34492	21.7	28
5/1/2012	MNB-2	12.8	7.9	32903	20.6	26
5/1/2012	MNB-5	13.3	7.9	27512	16.9	16
5/1/2012	MNB-6	13.3	8	20848	12.6	10
5/2/2012	MLB-3	12.1	8.6	40360	25.7	16
5/2/2012	MLB-4	12.7	9.8	37894	24	9
5/2/2012	MLB-5	11.7	8.4	43976	28.2	30
5/2/2012	MLB-6	11.6	8.5	42603	27.4	12
5/2/2012	MUB-1	12.3	8.3	35901	22.6	35
5/2/2012	MUB-11	12.1	8.3	37658	23.9	8
5/2/2012	MUB-2	11.9	8.7	38287	24.3	25
5/2/2012	MUB-3	12	8.2	37840	24	20
5/2/2012	MUB-8	12.1	8.1	37256	23.6	27
5/2/2012	MUB-9	12	8.2	36505	23.1	29
5/8/2012	MAK-1	14.1	7.4	33332	20.4	24
5/8/2012	MAK-2	14.4	7.2	32978	20.7	23
5/8/2012	MAK-3	15.3	6.5	32071	20.1	23

Date	Station	Temp (°C)	DO (mg/L)	SpCond @ 25°C (µS/cm)	Salinity (ppt)	Depth (ft)
5/8/2012	MAK-4	15.5	6.6	32261	20.2	23
5/8/2012	MKK-1	13.3	7.9	35682	22.5	30
5/8/2012	MKK-2	13.4	7.9	35465	22.4	30
5/8/2012	MNB-1	13.7	7.7	34507	21.7	30
5/8/2012	MNB-2	13.7	7.7	34467	21.6	30
5/8/2012	MNB-5	14.1	7.4	32289	20.2	14
5/8/2012	MNB-6	14.8	7.4	29149	18	10
5/9/2012	MLB-3	13.3	8.3	41692	26.8	19
5/9/2012	MLB-4	13.5	8.4	41117	26.3	10
5/9/2012	MLB-5	13.4	8.3	42880	27.6	27
5/9/2012	MLB-6	13.3	8.2	44146	28.5	17
5/9/2012	MUB-1	13.5	8.1	41016	26.3	30
5/9/2012	MUB-11	13.7	8.1	36748	23.3	10
5/9/2012	MUB-2	13.5	18.1	38838	24.7	27
5/9/2012	MUB-3	13.5	8	38635	24.6	20
5/9/2012	MUB-8	13.5	8.1	39805	25.4	29
5/9/2012	MUB-9	13.6	7.9	35995	22.7	29
5/22/2012	MKK-1	16.7	7.9	32195	20.2	28
5/22/2012	MLB-3	16.3	8.2	39393	25	17
5/22/2012	MLB-4	16.1	8.3	35475	22.4	10
5/22/2012	MLB-5	16.4	8.1	44122	28.3	30
5/22/2012	MLB-6	16.2	8.1	37159	23.6	13
5/22/2012	MUB-1	16.3	7.5	40355	25.9	31
5/22/2012	MUB-11	16.1	8	31581	19.8	10
5/22/2012	MUB-2	16.2	8.4	33747	21	28
5/22/2012	MUB-3	16	7.8	33368	20.9	20
5/22/2012	MUB-8	16	8	33117	20.6	29
5/22/2012	MUB-9	16.3	8	26927	16.5	30
5/23/2012	MAK-1	17.9	7.3	29951	18.6	24
5/23/2012	MAK-2	17.8	7.1	29844	18.5	22
5/23/2012	MAK-3	18.5	6.4	28570	17.6	22
5/23/2012	MAK-4	19.1	6.4	28548	17.7	22
5/23/2012	MKK-2	17	7.6	32162	20.1	30
5/23/2012	MNB-1	17.3	7.4	31143	19.4	29
5/23/2012	MNB-2	17.4	7.3	30582	19	29
5/23/2012	MNB-5	17.6	7.1	29312	18.1	17
5/23/2012	MNB-6	17.7	6.9	28957	17.9	10
6/5/2012	MKK-1	19.5	6.4	33279	20.9	28
6/5/2012	MLB-3	18.5	6.8	41084	26.3	17
6/5/2012	MLB-4	18.4	7.1	39906	25.5	9
6/5/2012	MLB-5	17.8	7	43982	28.4	27

Date	Station	Temp (°C)	DO (mg/L)	SpCond @ 25°C (µS/cm)	Salinity (ppt)	Depth (ft)
6/5/2012	MLB-6	17.7	6.8	44614	28.9	14
6/5/2012	MUB-1	18.3	6.9	41777	26.8	31
6/5/2012	MUB-11	18.9	6.8	36006	22.9	10
6/5/2012	MUB-2	18.6	6.7	39906	25.5	29
6/5/2012	MUB-3	18.9	6.6	36167	23	21
6/5/2012	MUB-8	18.9	6.4	35690	22.6	29
6/5/2012	MUB-9	19.1	6.4	36409	23.1	29
6/6/2012	MAK-1	19.6	6.4	32097	20.1	25
6/6/2012	MAK-2	19.7	6.3	31918	19.9	23
6/6/2012	MAK-3	20.3	5.4	31063	19.4	23
6/6/2012	MAK-4	20.3	5.6	31755	19.8	23
6/6/2012	MKK-2	19.9	6.6	31920	20	27
6/6/2012	MNB-1	19.4	6.5	33285	20.9	30
6/6/2012	MNB-2	19.3	6.4	33601	21.1	30
6/6/2012	MNB-5	19.7	6.4	30602	19.1	17
6/6/2012	MNB-6	19.8	6.3	29843	18.5	12
7/12/2012	MAK-1	24.8	6.7	36470	23	23
7/12/2012	MAK-2	25	6.4	36372	23	20
7/12/2012	MAK-3	25.7	6.2	36008	22.7	20
7/12/2012	MAK-4	26.4	6	35858	22.6	20
7/12/2012	MKK-1	23.7	6.4	37208	23.6	28
7/12/2012	MKK-2	24.4	6.6	37075	21.4	28
7/12/2012	MNB-1	25	7.3	36697	23.2	28
7/12/2012	MNB-2	24.9	6.5	32977	22.9	28
7/12/2012	MNB-5	25.1	6	35794	22.3	17
7/12/2012	MNB-6	25.3	6.1	35067	22	10
7/13/2012	MLB-3	22.9	6.6	40565	25.9	29
7/13/2012	MLB-4	23.3	7.2	41174	26.4	8
7/13/2012	MLB-5	22.5	6.6	43001	27.7	27
7/13/2012	MLB-6	23.2	6.9	40829	26.2	13
7/13/2012	MUB-1	25.5	7	39379	25.2	34
7/13/2012	MUB-11	23.5	6.7	37053	24.4	9
7/13/2012	MUB-2	23.5	7.3	40303	25.7	25
7/13/2012	MUB-3	23.4	6.7	39032	24.9	20
7/13/2012	MUB-8	23	6.5	40160	25.7	28
7/13/2012	MUB-9	22.8	6.1	40513	25.9	28
8/14/2012	MLB-3	23.6	5.4	40884	26.2	16
8/14/2012	MLB-4	24.8	7.3	40065	25.7	9
8/14/2012	MLB-5	21.9	5.3	43916	28.4	29
8/14/2012	MLB-6	23.7	5.5	40528	26	13
8/14/2012	MUB-1	23.7	5.8	40536	22	35

Date	Station	Temp (°C)	DO (mg/L)	SpCond @ 25°C (µS/cm)	Salinity (ppt)	Depth (ft)
8/14/2012	MUB-11	24.3	5.5	38195	24.2	9
8/14/2012	MUB-2	24	5.6	39827	25.4	24
8/14/2012	MUB-3	24	5.3	33087	21.5	19
8/14/2012	MUB-8	23.6	5.5	40099	25.6	27
8/14/2012	MUB-9	22.9	4.9	39280	24.9	31
8/15/2012	MAK-1	25.6	5.6	30992	21.7	22
8/15/2012	MAK-2	25.7	5.5	36068	22.7	18
8/15/2012	MAK-3	26	5.3	36142	22.8	20
8/15/2012	MAK-4	26.7	5.1	36192	22.8	19
8/15/2012	MKK-1	23.3	4.8	39970	25.5	30
8/15/2012	MKK-2	25.1	5.5	36356	22.9	29
8/15/2012	MNB-1	25.2	5.3	36330	22.9	29
8/15/2012	MNB-2	25.1	5.3	36505	23.1	28
8/15/2012	MNB-5	25.8	5	34309	21.7	17
8/15/2012	MNB-6	26.4	4.8	30567	18.9	10
9/10/2012	MLB-3	23.8	5.2	38578	24.5	17
9/10/2012	MLB-4	24.1	6.8	41110	26.3	10
9/10/2012	MLB-5	23.7	5.1	40437	25.8	30
9/10/2012	MLB-6	23.8	5.3	38832	24.7	13
9/10/2012	MUB-1	23.8	5.5	38804	24.3	32
9/10/2012	MUB-11	24.1	5.2	34399	21.6	9
9/10/2012	MUB-2	24	5.2	38072	24.2	23
9/10/2012	MUB-3	24	5	38896	24.8	19
9/10/2012	MUB-8	24.3	4.5	39066	24.7	26
9/10/2012	MUB-9	24.4	4.8	36090	23.4	30
9/11/2012	MAK-1	23.6	5.3	35901	22.7	24
9/11/2012	MAK-2	24	5.2	36201	22.8	20
9/11/2012	MAK-3	24.4	5.1	35913	22.7	20
9/11/2012	MAK-4	24.5	4.9	21019	15.6	19
9/11/2012	MKK-1	23.3	4.8	37625	23.9	29
9/11/2012	MKK-2	23.2	5.6	35456	22.3	29
9/11/2012	MNB-1	23.8	5.2	35573	22.6	27
9/11/2012	MNB-2	23.9	5	35586	22.4	27
9/11/2012	MNB-5	24.6	4.5	32756	20.5	17
9/11/2012	MNB-6	23.7	5.1	26112	15.9	8
9/25/2012	MKK-1	20.5	6.2	28990	24	28
9/25/2012	MLB-3	20.1	6.3	22727	26.1	16
9/25/2012	MLB-4	19.8	6.3	41000	26.3	8
9/25/2012	MLB-5	19.9	6	41209	26.9	28
9/25/2012	MLB-6	20.3	6.2	27917	20.3	12
9/25/2012	MUB-1	20.6	5.9	26600	24.7	32

Date	Station	Temp (°C)	DO (mg/L)	SpCond @ 25°C (µS/cm)	Salinity (ppt)	Depth (ft)
9/25/2012	MUB-11	20.9	6.2	34266	22.7	9
9/25/2012	MUB-2	20.7	6	36618	23.8	23
9/25/2012	MUB-3	20.7	6.1	31657	17.4	19
9/25/2012	MUB-8	20.5	6.1	32135	23.9	28
9/25/2012	MUB-9	20.6	5.7	37451	23.8	27
9/26/2012	MAK-1	20.5	5.5	31690	21.9	23
9/26/2012	MAK-2	20.9	5.8	31556	21.9	19
9/26/2012	MAK-3	20.9	5.9	31549	20.9	20
9/26/2012	MAK-4	21.1	5.8	31335	20.9	22
9/26/2012	MKK-2	20.4	6.6	31714	21.9	29
9/26/2012	MNB-1	20.5	5.7	31410	21.7	28
9/26/2012	MNB-2	20.4	5.6	30644	21	27
9/26/2012	MNB-5	20.4	5.6	28724	19.6	16
9/26/2012	MNB-6	20.4	5.1	23472	17.4	10
10/2/2012	MKK-1	20	5.7	35106	21.4	28
10/2/2012	MLB-3	19.2	6.2	28812	20.6	15
10/2/2012	MLB-4	19.6	6.6	30167	21.1	10
10/2/2012	MLB-5	19	6.2	27877	19.8	29
10/2/2012	MLB-6	19.3	6.8	33196	21.9	14
10/2/2012	MUB-1	19.5	6	39996	28.8	36
10/2/2012	MUB-11	19.9	6	35181	20.3	9
10/2/2012	MUB-2	19.6	6.4	30746	21.1	28
10/2/2012	MUB-3	19.8	5.8	36507	26.1	20
10/2/2012	MUB-8	19.9	5.7	30488	22.3	28
10/2/2012	MUB-9	20.3	5.2	33648	23.2	27
10/3/2012	MAK-1	20.2	6.2	31098	25.1	25
10/3/2012	MAK-2	20.7	5.3	33374	23.6	22
10/3/2012	MAK-3	20.7	5.2	33907	23.5	22
10/3/2012	MAK-4	20.5	5.1	34471	23.1	22
10/3/2012	MKK-2	19.9	5.8	35072	24.8	29
10/3/2012	MNB-1	19.9	5.9	34037	24.2	29
10/3/2012	MNB-2	19.9	6	34314	22.4	29
10/3/2012	MNB-5	19.8	6.1	34303	23.1	17
10/3/2012	MNB-6	19.9	5.8	32391	21.6	10
10/10/2012	MAK-1	18.6	5.8	34431	22	23
10/10/2012	MAK-2	19.3	5.6	31082	22.6	21
10/10/2012	MAK-3	19.1	5.3	32091	22.1	21
10/10/2012	MAK-4	18.9	5.1	31899	20.8	20
10/10/2012	MKK-1	18.5	5.8	36146	22.9	28
10/10/2012	MKK-2	18.4	6.2	29339	20.1	28
10/10/2012	MNB-1	18.4	6.2	30649	21.1	28

Date	Station	Temp (°C)	DO (mg/L)	SpCond @ 25°C (µS/cm)	Salinity (ppt)	Depth (ft)
10/10/2012	MNB-2	18.5	5.9	32440	21.1	27
10/10/2012	MNB-5	18.4	5.1	31823	19.9	16
10/10/2012	MNB-6	18.6	5.1	31866	20.6	10
10/11/2012	MLB-3	17.9	6.2	35154	27.2	17
10/11/2012	MLB-4	17.6	6.6	37454	23.8	8
10/11/2012	MLB-5	17.9	5.7	42507	27.2	28
10/11/2012	MLB-6	17.9	6.3	35225	22.2	13
10/11/2012	MUB-1	18	5.9	37552	23.8	35
10/11/2012	MUB-11	17.6	6.8	32231	20.2	8
10/11/2012	MUB-2	18	5.8	38577	24.5	25
10/11/2012	MUB-3	17.6	6.7	33479	21	20
10/11/2012	MUB-8	18.1	5.8	37586	23.9	30
10/11/2012	MUB-9	18.4	5.2	37307	23.7	28
10/15/2012	MKK-1	16.7	6.6	39876	25.5	31
10/15/2012	MLB-3	15.2	5.5	45974	29.8	19
10/15/2012	MLB-4	16.5	6.8	41274	26.5	10
10/15/2012	MLB-5	15.3	5.6	45959	29.8	30
10/15/2012	MLB-6	15.8	5.8	45685	29.7	13
10/15/2012	MUB-1	16.3	6.4	42614	27.5	34
10/15/2012	MUB-11	17	6.5	38231	24.4	10
10/15/2012	MUB-2	17	7.5	18625	11.1	24
10/15/2012	MUB-3	16.8	6.6	39347	25.1	18
10/15/2012	MUB-8	16.6	6.5	40830	26.2	30
10/15/2012	MUB-9	16.8	6.6	39079	25	30
10/16/2012	MAK-1	17.3	6.3	35378	22.3	26
10/16/2012	MAK-2	17.5	6.1	35069	22.1	23
10/16/2012	MAK-3	17.2	6.1	34946	22.1	24
10/16/2012	MAK-4	17	6.6	18227	10.8	22
10/16/2012	MKK-2	16.8	6.8	25752	13.4	30
10/16/2012	MNB-1	16.7	6.6	35647	22.5	28
10/16/2012	MNB-2	16.6	6.7	35338	22.3	27
10/16/2012	MNB-5	16.5	6.6	34950	22	17
10/16/2012	MNB-6	16.3	6.3	32278	20	12
10/23/2012	MLB-3	15.4	6.6	40086	25.6	17
10/23/2012	MLB-4	15.7	8.1	32727	23.7	10
10/23/2012	MLB-5	15.2	6.6	41591	27.2	29
10/23/2012	MLB-6	15.7	7.2	33467	22.1	13
10/23/2012	MUB-1	16	7.2	34098	22.1	33
10/23/2012	MUB-11	16	6.6	35093	22.5	10
10/23/2012	MUB-2	15.9	6.6	35998	22.8	24
10/23/2012	MUB-3	16	6.6	35209	22.2	19

Date	Station	Temp (°C)	DO (mg/L)	SpCond @ 25°C (µS/cm)	Salinity (ppt)	Depth (ft)
10/23/2012	MUB-8	16	6.6	34913	20.4	27
10/23/2012	MUB-9	15.7	7	35086	24.3	29
10/24/2012	MAK-1	16	7	33227	20.7	23
10/24/2012	MAK-2	16.3	6.9	33226	20.9	21
10/24/2012	MAK-3	16.7	6.8	33579	21.1	20
10/24/2012	MAK-4	16.5	6.6	34424	21.7	20
10/24/2012	MKK-1	15.9	6.6	31727	21.9	29
10/24/2012	MKK-2	16	7.5	31313	21.2	28
10/24/2012	MNB-1	16	6.9	32627	20.7	28
10/24/2012	MNB-2	16	6.8	32022	20	27
10/24/2012	MNB-5	15.9	6.5	28506	17.6	17
10/24/2012	MNB-6	16	6.6	28109	17.4	10
11/6/2012	MLB-3	12.8	7.7	34314	20.6	18
11/6/2012	MLB-4	11.5	8.2	36444	23.1	10
11/6/2012	MLB-5	13.3	7.1	35156	21.1	30
11/6/2012	MLB-6	12.8	6.9	42329	27.2	17
11/6/2012	MUB-1	12.8	7.2	40135	25.1	35
11/6/2012	MUB-11	13	7.4	31244	19.7	10
11/6/2012	MUB-2	12.2	7.5	36544	21.1	27
11/6/2012	MUB-3	13.1	6.9	34352	22.2	20
11/6/2012	MUB-8	13.6	6.8	34727	22.2	26
11/6/2012	MUB-9	13.3	7	30788	11.1	31
11/9/2012	MAK-1	10.8	8.2	33511	20.8	23
11/9/2012	MAK-2	10.7	8.1	32854	21	21
11/9/2012	MAK-3	10.9	8.1	33665	20.9	21
11/9/2012	MAK-4	10.6	8.4	33811	21.2	20
11/9/2012	MKK-1	10.8	7.6	33071	20.6	28
11/9/2012	MKK-2	11	8.6	33044	20.1	28
11/9/2012	MNB-1	10.9	6.8	30010	20.4	54
11/9/2012	MNB-2	11.4	6.6	30755	18.9	27
11/9/2012	MNB-5	9.3	4.1	27355	17.1	16
11/9/2012	MNB-6	10.2	4.7	28486	17.5	10
11/14/2012	MKK-1	11.1	7.4	34702	21.8	27
11/14/2012	MLB-3	11.7	8.2	43418	27.9	17
11/14/2012	MLB-4	11.7	7.9	43198	27.8	8
11/14/2012	MLB-5	11.9	8	45800	29.6	28
11/14/2012	MLB-6	11.4	8.2	42606	27.3	15
11/14/2012	MUB-1	11.4	8.1	40850	26	32
11/14/2012	MUB-11	11.3	9.1	39885	25.3	10
11/14/2012	MUB-2	11.5	8	40720	26	25
11/14/2012	MUB-3	11.4	8.1	40126	25.6	20

Date	Station	Temp (°C)	DO (mg/L)	SpCond @ 25°C (µS/cm)	Salinity (ppt)	Depth (ft)
11/14/2012	MUB-8	11.6	8.6	41811	26.8	30
11/14/2012	MUB-9	11.4	9.5	39839	24.8	30
11/15/2012	MAK-1	11	7.5	33911	21.2	26
11/15/2012	MAK-2	11.3	7.3	32956	20.6	24
11/15/2012	MAK-3	10.5	8	33772	21.2	24
11/15/2012	MAK-4	10.1	8.2	34858	21.9	23
11/15/2012	MKK-2	10.9	7.5	35044	22	30
11/15/2012	MNB-1	10.7	7.6	34572	21.7	28
11/15/2012	MNB-2	10.8	7.5	35184	22.1	28
11/15/2012	MNB-5	10.5	7.4	33740	21.1	17
11/15/2012	MNB-6	10.2	6.6	30930	19.2	10
11/19/2012	MLB-3	10.4	8	39828	23.3	19
11/19/2012	MLB-4	10.9	8.6	45310	29.2	11
11/19/2012	MLB-5	10.6	9.5	45106	29	30
11/19/2012	MLB-6	10.5	8.4	44560	28.7	17
11/19/2012	MUB-1	10.6	8.5	40872	26	35
11/19/2012	MUB-11	10.5	8.2	34499	24.4	8
11/19/2012	MUB-2	10.3	7.2	36688	23.1	29
11/19/2012	MUB-3	10.5	8.2	37891	24	20
11/19/2012	MUB-8	10.6	8.6	36010	22.2	25
11/19/2012	MUB-9	10.5	8.2	33797	21.7	31
11/20/2012	MAK-1	9.8	9.5	33878	21.7	25
11/20/2012	MAK-2	10.2	9	34099	21.3	21
11/20/2012	MAK-3	10.3	8.7	32937	20.8	21
11/20/2012	MAK-4	10.1	9.2	30112	19.1	20
11/20/2012	MKK-1	10.1	9.5	34122	20.7	30
11/20/2012	MKK-2	10.2	9.1	30082	18.9	29
11/20/2012	MNB-1	10	9.3	34880	21.8	29
11/20/2012	MNB-2	9.9	9	34850	21.8	28
11/20/2012	MNB-5	9.8	9.6	34257	20.6	17
11/20/2012	MNB-6	9.8	9.2	31432	20.1	10
11/27/2012	MKK-1	9	9.6	36088	22.6	28
11/27/2012	MLB-3	9.7	8.9	42127	27	16
11/27/2012	MLB-4	9.8	9.8	41999	26.8	7
11/27/2012	MLB-5	10.2	9.5	43919	29.1	28
11/27/2012	MLB-6	9.6	8.5	40086	27.4	15
11/27/2012	MUB-1	9.8	9.2	37522	26.8	37
11/27/2012	MUB-11	9.4	8.9	3400	23.6	9
11/27/2012	MUB-2	9.4	9.9	37499	23.6	24
11/27/2012	MUB-3	9.6	9.5	38461	24.7	20
11/27/2012	MUB-8	9.9	9.1	42770	27.3	29

Date	Station	Temp (°C)	DO (mg/L)	SpCond @ 25°C (µS/cm)	Salinity (ppt)	Depth (ft)
11/27/2012	MUB-9	9.8	9	37411	23.6	30
11/28/2012	MAK-1	8.7	8.6	35170	22	23
11/28/2012	MAK-2	9.1	8.1	34590	21.8	21
11/28/2012	MAK-3	9.1	8.3	34930	21.9	21
11/28/2012	MAK-4	9.1	8.3	35820	22.5	22
11/28/2012	MKK-2	8.5	8.6	35160	21.9	30
11/28/2012	MNB-1	8.6	9.1	35650	22.3	30
11/28/2012	MNB-2	8.6	8.6	34730	21.7	29
11/28/2012	MNB-5	8	8.7	34110	21.2	18
11/28/2012	MNB-6	8.3	8.5	34630	21.6	10
12/4/2012	MKK-1	9.4	8.7	40280	25.6	30
12/4/2012	MLB-3	9.6	9.4	43950	28	17
12/4/2012	MLB-4	9	9.9	40270	25.6	10
12/4/2012	MLB-5	10.4	8.9	47170	30.5	30
12/4/2012	MLB-6	9.6	9.2	45020	29	17
12/4/2012	MUB-1	9.3	9	41510	26.5	35
12/4/2012	MUB-11	9	9	35880	22.2	9
12/4/2012	MUB-2	9.2	9.1	39300	24.5	28
12/4/2012	MUB-3	9.2	9.2	37380	23.8	20
12/4/2012	MUB-8	9.4	9	36610	23	27
12/4/2012	MUB-9	9.1	8.9	34570	23.4	32
12/5/2012	MAK-1	9.3	9	35740	22.5	24
12/5/2012	MAK-2	9.4	9	35430	22.2	22
12/5/2012	MAK-3	9.7	8.7	34940	21.8	22
12/5/2012	MAK-4	9.2	9.4	35580	22.3	22
12/5/2012	MKK-2	9.1	9.2	37300	23.5	30
12/5/2012	MNB-1	8.8	9.1	35720	22.6	28
12/5/2012	MNB-2	8.7	9.2	35510	22.2	27
12/5/2012	MNB-5	8.6	8.9	32390	20.1	17
12/5/2012	MNB-6	8.3	9.1	32890	20.4	9

Appendix B

Mid-water Trawl Catch per Unit Effort by Date and Station Collected During the 2012 Migratory Finfish Survey

Date	Station	Common Name	Number Caught	CPUE (#/10 min. tow)
3/27/2012	MUB-2	Alewife	1	1
3/29/2012	MAK-1	Atlantic herring	244	244
3/29/2012	MAK-1	Atlantic menhaden	1	1
3/29/2012	MAK-1	Blueback herring	182	182
3/29/2012	MAK-2	Atlantic herring	16	16
3/29/2012	MAK-2	Bay anchovy	1	1
3/29/2012	MAK-2	Blueback herring	26	26
3/29/2012	MAK-3	Atlantic herring	6	6
3/29/2012	MAK-4	Atlantic herring	31	31
3/29/2012	MKK-1	Atlantic herring	1	1
3/29/2012	MKK-1	Lined seahorse	1	1
3/29/2012	MKK-2	Blueback herring	1	1
3/29/2012	MKK-2	Lined seahorse	1	1
3/29/2012	MNB-1	Atlantic herring	33	33
3/29/2012	MNB-2	Atlantic herring	5	5
3/29/2012	MNB-5	Atlantic herring	1	1
3/29/2012	MNB-6	Atlantic herring	2	2
3/29/2012	MUB-8	Atlantic herring	74	74
3/29/2012	MUB-8	Blueback herring	9	9
3/29/2012	MUB-9	Alewife	1	1
3/29/2012	MUB-9	Atlantic herring	220	220
3/29/2012	MUB-9	Atlantic menhaden	1	1
3/29/2012	MUB-9	Bay anchovy	3	3
3/29/2012	MUB-9	Blueback herring	124	124
4/3/2012	MKK-1	Bay anchovy	7	7
4/3/2012	MUB-11	American sandlance	1	1
4/3/2012	MUB-8	Atlantic herring	1	1
4/3/2012	MUB-9	Blueback herring	131	131
4/3/2012	MUB-9	Lined seahorse	1	1
4/4/2012	MAK-1	Atlantic herring	50	50
4/4/2012	MAK-3	Atlantic herring	5	5
4/4/2012	MAK-4	Atlantic herring	2	2
4/4/2012	MAK-4	Bay anchovy	1	1
4/4/2012	MAK-4	Blueback herring	46	46
4/4/2012	MKK-2	Atlantic herring	40	40
4/4/2012	MKK-2	Blueback herring	4	4
4/4/2012	MNB-1	Atlantic herring	22	22
4/4/2012	MNB-1	Bay anchovy	1	1
4/4/2012	MNB-1	Blueback herring	49	49
4/4/2012	MNB-2	American shad	1	1

Date	Station	Common Name	Number Caught	CPUE (#/10 min. tow)
4/4/2012	MNB-2	Atlantic herring	201	201
4/4/2012	MNB-2	Atlantic menhaden	3	3
4/4/2012	MNB-2	Blueback herring	118	118
4/4/2012	MNB-5	Alewife	14	14
4/4/2012	MNB-5	American shad	3	3
4/4/2012	MNB-5	Atlantic herring	6	6
4/4/2012	MNB-5	Bay anchovy	3	3
4/4/2012	MNB-5	Blueback herring	69	69
4/4/2012	MNB-6	American shad	1	1
4/4/2012	MNB-6	Atlantic herring	8	8
4/4/2012	MNB-6	Bay anchovy	1	1
4/4/2012	MNB-6	Blueback herring	35	35
4/10/2012	MAK-1	Atlantic herring	94	94
4/10/2012	MAK-1	Blueback herring	1	1
4/10/2012	MAK-2	Blueback herring	41	41
4/10/2012	MAK-4	Atlantic herring	146	146
4/10/2012	MAK-4	Bay anchovy	1	1
4/10/2012	MKK-1	American shad	1	1
4/10/2012	MKK-1	Atlantic herring	23	23
4/10/2012	MKK-2	Alewife	1	1
4/10/2012	MKK-2	American shad	6	6
4/10/2012	MKK-2	Atlantic herring	1839	1839
4/10/2012	MKK-2	Atlantic menhaden	1	1
4/10/2012	MKK-2	Bay anchovy	158	158
4/10/2012	MKK-2	Blueback herring	4	4
4/10/2012	MKK-2	Striped bass	1	1
4/10/2012	MNB-1	Atlantic herring	6	6
4/10/2012	MNB-1	Bay anchovy	2	2
4/10/2012	MNB-1	Lined seahorse	1	1
4/10/2012	MNB-2	Alewife	4	4
4/10/2012	MNB-2	American shad	1	1
4/10/2012	MNB-2	Atlantic herring	71	71
4/10/2012	MNB-2	Bay anchovy	1	1
4/10/2012	MNB-2	Blueback herring	2	2
4/10/2012	MNB-2	Northern pipefish	1	1
4/10/2012	MNB-5	Alewife	6	6
4/10/2012	MNB-5	Atlantic herring	475	475
4/10/2012	MNB-5	Bay anchovy	10	10
4/10/2012	MNB-6	Alewife	3	3
4/10/2012	MNB-6	American shad	1	1
4/10/2012	MNB-6	Atlantic herring	59	59

Date	Station	Common Name	Number Caught	CPUE (#/10 min. tow)
4/10/2012	MNB-6	Atlantic menhaden	60	60
4/10/2012	MNB-6	Bay anchovy	3	3
4/10/2012	MNB-6	White perch	2	2
4/11/2012	MLB-5	Lined seahorse	1	1
4/11/2012	MUB-11	Atlantic herring	1	1
4/11/2012	MUB-11	Bay anchovy	4	4
4/11/2012	MUB-11	Blueback herring	49	49
4/11/2012	MUB-2	Atlantic herring	1	1
4/11/2012	MUB-3	Atlantic herring	1	1
4/11/2012	MUB-3	Bay anchovy	2	2
4/11/2012	MUB-8	Blueback herring	1	1
4/11/2012	MUB-9	Atlantic herring	4	4
4/17/2012	MLB-3	Butterfish	1	1
4/17/2012	MLB-6	Atlantic menhaden	1	1
4/17/2012	MUB-1	Atlantic menhaden	1	1
4/17/2012	MUB-8	Atlantic menhaden	1	1
4/18/2012	MAK-1	Atlantic menhaden	1	1
4/18/2012	MKK-2	Blueback herring	1	1
4/18/2012	MNB-1	Lined seahorse	1	1
4/18/2012	MNB-2	Alewife	5	5
4/18/2012	MNB-2	Atlantic herring	1	1
4/18/2012	MNB-5	Atlantic herring	26	26
4/18/2012	MNB-5	Bay anchovy	1	1
4/18/2012	MNB-5	Blueback herring	1	1
4/18/2012	MNB-6	Atlantic herring	5	5
4/18/2012	MNB-6	Blueback herring	3	3
4/25/2012	MAK-1	American shad	2	2
4/25/2012	MAK-1	Atlantic herring	1	1
4/25/2012	MAK-4	Atlantic menhaden	2	2
4/25/2012	MKK-1	Atlantic herring	34	34
4/25/2012	MKK-1	Atlantic menhaden	1	1
4/25/2012	MKK-1	Bay anchovy	20	20
4/25/2012	MKK-2	Atlantic herring	60	60
4/25/2012	MKK-2	Bay anchovy	66	66
4/25/2012	MKK-2	Blueback herring	2	2
4/25/2012	MKK-2	Lined seahorse	1	1
4/25/2012	MNB-1	Atlantic menhaden	3	3
4/25/2012	MNB-1	Spotted hake	1	1
4/25/2012	MNB-2	Blueback herring	9	9
4/25/2012	MNB-5	Blueback herring	1	1
4/25/2012	MNB-6	Atlantic menhaden	1	1

Date	Station	Common Name	Number Caught	CPUE (#/10 min. tow)
4/25/2012	MNB-6	Bay anchovy	1	1
4/26/2012	MUB-11	Atlantic menhaden	2	2
4/26/2012	MUB-3	Blueback herring	1	1
4/26/2012	MUB-3	Butterfish	1	1
4/26/2012	MUB-8	Atlantic herring	1	1
4/26/2012	MUB-8	Bay anchovy	30	30
4/26/2012	MUB-8	Butterfish	2	2
4/26/2012	MUB-9	Atlantic herring	9	9
4/26/2012	MUB-9	Atlantic tomcod	5	5
4/26/2012	MUB-9	Bay anchovy	216	216
4/26/2012	MUB-9	Blueback herring	6	6
4/26/2012	MUB-9	Spotted hake	5	5
5/1/2012	MAK-1	Bay anchovy	1	1
5/1/2012	MAK-3	Atlantic menhaden	1	1
5/1/2012	MKK-2	Butterfish	1	1
5/1/2012	MNB-2	Atlantic herring	2	2
5/1/2012	MNB-2	White perch	1	1
5/1/2012	MNB-5	Atlantic menhaden	1	1
5/1/2012	MNB-5	Bay anchovy	1	1
5/1/2012	MNB-5	Bluefish	1	1
5/1/2012	MNB-5	White perch	1	1
5/1/2012	MNB-6	Atlantic herring	2	2
5/1/2012	MNB-6	Atlantic menhaden	1	1
5/1/2012	MNB-6	Bay anchovy	3	3
5/1/2012	MNB-6	Blue crab	1	1
5/1/2012	MNB-6	Blueback herring	13	13
5/1/2012	MNB-6	White perch	1	1
5/2/2012	MLB-3	Butterfish	1	1
5/2/2012	MLB-4	Atlantic herring	2	2
5/2/2012	MLB-4	Bay anchovy	107	107
5/2/2012	MLB-4	Blueback herring	1	1
5/2/2012	MLB-4	Butterfish	7	7
5/2/2012	MLB-6	Bay anchovy	14	14
5/2/2012	MLB-6	Butterfish	1	1
5/2/2012	MUB-1	Blueback herring	1	1
5/2/2012	MUB-8	Atlantic menhaden	1	1
5/2/2012	MUB-8	Bay anchovy	9	9
5/2/2012	MUB-8	Blueback herring	11	11
5/2/2012	MUB-9	Atlantic herring	1	1
5/2/2012	MUB-9	Atlantic menhaden	13	13
5/2/2012	MUB-9	Bay anchovy	2	2

Date	Station	Common Name	Number Caught	CPUE (#/10 min. tow)
5/2/2012	MUB-9	Butterfish	1	1
5/8/2012	MAK-2	White perch	1	1
5/8/2012	MAK-3	Atlantic menhaden	1	1
5/8/2012	MAK-3	Bay anchovy	3	3
5/8/2012	MAK-4	Atlantic menhaden	2	2
5/8/2012	MKK-1	Atlantic herring	7	7
5/8/2012	MKK-1	Bay anchovy	642	642
5/8/2012	MKK-1	Lined seahorse	1	1
5/8/2012	MKK-2	Atlantic herring	1	1
5/8/2012	MKK-2	Atlantic menhaden	1	1
5/8/2012	MKK-2	Bay anchovy	57	57
5/8/2012	MKK-2	Butterfish	1	1
5/8/2012	MNB-1	Atlantic herring	1	1
5/8/2012	MNB-1	Bay anchovy	15	15
5/8/2012	MNB-2	Bay anchovy	2	2
5/8/2012	MNB-5	Bay anchovy	2	2
5/8/2012	MNB-5	Blueback herring	1	1
5/8/2012	MNB-5	Striped bass	1	1
5/8/2012	MNB-6	Bay anchovy	2	2
5/9/2012	MLB-3	Atlantic herring	1	1
5/9/2012	MLB-3	Bay anchovy	60	60
5/9/2012	MLB-4	Atlantic herring	1	1
5/9/2012	MLB-4	Bay anchovy	32	32
5/9/2012	MLB-4	Blueback herring	14	14
5/9/2012	MLB-6	Butterfish	3	3
5/9/2012	MUB-1	Blueback herring	1	1
5/9/2012	MUB-1	Lined seahorse	1	1
5/9/2012	MUB-11	Bay anchovy	1	1
5/9/2012	MUB-3	Atlantic herring	1	1
5/9/2012	MUB-3	Bay anchovy	7	7
5/9/2012	MUB-9	Alewife	1	1
5/9/2012	MUB-9	Atlantic herring	6	6
5/9/2012	MUB-9	Bay anchovy	75	75
5/22/2012	MLB-3	Butterfish	1	1
5/22/2012	MLB-3	Lined seahorse	1	1
5/22/2012	MLB-6	Butterfish	2	2
5/22/2012	MUB-2	Bluefish	1	1
5/22/2012	MUB-3	Bay anchovy	1	1
5/22/2012	MUB-8	Blueback herring	12	12
5/22/2012	MUB-9	Atlantic menhaden	4	4
5/22/2012	MUB-9	Bay anchovy	83	83

Date	Station	Common Name	Number Caught	CPUE (#/10 min. tow)
5/22/2012	MUB-9	Bluefish	2	2
5/23/2012	MAK-1	Bay anchovy	320	320
5/23/2012	MAK-3	Bay anchovy	1	1
5/23/2012	MAK-4	Atlantic herring	1	1
5/23/2012	MKK-2	Blue crab	1	1
5/23/2012	MNB-1	Butterfish	1	1
5/23/2012	MNB-2	Threespine stickleback	1	1
5/23/2012	MNB-5	Bay anchovy	45	45
5/23/2012	MNB-6	Bay anchovy	130	130
5/23/2012	MNB-6	Blue crab	1	1
6/5/2012	MKK-1	Bay anchovy	13	13
6/5/2012	MKK-1	Butterfish	2	2
6/5/2012	MLB-4	Bay anchovy	849	849
6/5/2012	MLB-4	Butterfish	2	2
6/5/2012	MUB-1	White mullet	59	59
6/5/2012	MUB-2	Conger eel	1	1
6/5/2012	MUB-8	Bay anchovy	12	12
6/5/2012	MUB-8	Blueback herring	1	1
6/6/2012	MAK-2	Atlantic herring	1	1
6/6/2012	MAK-2	Bay anchovy	1	1
6/6/2012	MAK-4	Atlantic menhaden	1	1
6/6/2012	MAK-4	Bay anchovy	489	489
6/6/2012	MAK-4	Butterfish	2	2
6/6/2012	MKK-2	Bay anchovy	25	25
6/6/2012	MNB-1	Bay anchovy	15	15
6/6/2012	MNB-2	Bluefish	1	1
6/6/2012	MNB-2	Butterfish	1	1
6/6/2012	MNB-6	Atlantic menhaden	1	1
6/6/2012	MNB-6	Bay anchovy	171	171
6/6/2012	MNB-6	Spotted hake	2	2
6/6/2012	MNB-6	Striped searobin	1	1
7/12/2012	MAK-1	Bay anchovy	1	1
7/12/2012	MAK-1	Blue crab	1	1
7/12/2012	MAK-2	Butterfish	3	3
7/12/2012	MAK-2	Northern puffer	1	1
7/12/2012	MAK-3	Butterfish	2	2
7/12/2012	MAK-3	Northern puffer	1	1
7/12/2012	MAK-3	Skilletfish	2	2
7/12/2012	MAK-4	Blue crab	1	1
7/12/2012	MAK-4	Butterfish	1	1
7/12/2012	MKK-2	Feather blenny	1	1

Date	Station	Common Name	Number Caught	CPUE (#/10 min. tow)
7/12/2012	MKK-2	Northern pipefish	1	1
7/12/2012	MNB-1	Butterfish	1	1
7/12/2012	MNB-1	Northern pipefish	1	1
7/12/2012	MNB-5	Blue crab	2	2
7/12/2012	MNB-5	Butterfish	1	1
7/12/2012	MNB-6	Bay anchovy	298	298
7/12/2012	MNB-6	Blue crab	2	2
7/13/2012	MLB-3	Bay anchovy	4	4
7/13/2012	MLB-4	Bay anchovy	3255	3255
7/13/2012	MLB-4	Butterfish	9	9
7/13/2012	MUB-11	Butterfish	6	6
7/13/2012	MUB-2	Northern puffer	1	1
7/13/2012	MUB-8	Butterfish	3	3
7/13/2012	MUB-8	Northern stargazer	1	1
8/14/2012	MLB-3	Lined seahorse	1	1
8/14/2012	MLB-4	Atlantic menhaden	2	2
8/14/2012	MLB-4	Bay anchovy	13348	13348
8/14/2012	MLB-4	Bluefish	8	8
8/14/2012	MLB-4	Butterfish	3	3
8/14/2012	MLB-4	Striped anchovy	30	30
8/14/2012	MLB-4	Weakfish	1	1
8/14/2012	MLB-5	Bay anchovy	10	10
8/14/2012	MLB-5	Butterfish	16	16
8/14/2012	MLB-5	Striped anchovy	3	3
8/14/2012	MUB-11	Bay anchovy	2	2
8/14/2012	MUB-11	Northern stargazer	1	1
8/14/2012	MUB-2	Northern stargazer	1	1
8/14/2012	MUB-8	Bay anchovy	2	2
8/14/2012	MUB-8	Inland silverside	18	18
8/14/2012	MUB-9	Bay anchovy	322	322
8/14/2012	MUB-9	Bluefish	1	1
8/14/2012	MUB-9	Striped anchovy	2	2
8/15/2012	MAK-1	American shad	1	1
8/15/2012	MAK-1	Bay anchovy	706	706
8/15/2012	MAK-1	Blue crab	2	2
8/15/2012	MAK-1	Striped anchovy	18	18
8/15/2012	MAK-2	American shad	1	1
8/15/2012	MAK-2	Atlantic menhaden	1	1
8/15/2012	MAK-2	Bay anchovy	4209	4209
8/15/2012	MAK-2	Blueback herring	3	3
8/15/2012	MAK-2	Striped anchovy	12	12

Date	Station	Common Name	Number Caught	CPUE (#/10 min. tow)
8/15/2012	MAK-2	Weakfish	7	7
8/15/2012	MAK-3	Bay anchovy	1417	1417
8/15/2012	MAK-3	Blueback herring	5	5
8/15/2012	MAK-3	Striped anchovy	18	18
8/15/2012	MAK-4	Bay anchovy	1898	1898
8/15/2012	MAK-4	Blue crab	1	1
8/15/2012	MAK-4	Blueback herring	2	2
8/15/2012	MAK-4	Butterfish	3	3
8/15/2012	MAK-4	Striped anchovy	21	21
8/15/2012	MKK-1	Bay anchovy	5733	5733
8/15/2012	MKK-1	Blue crab	1	1
8/15/2012	MKK-1	Blueback herring	2	2
8/15/2012	MKK-1	Striped anchovy	3	3
8/15/2012	MKK-2	Bay anchovy	501	501
8/15/2012	MKK-2	Blue crab	1	1
8/15/2012	MKK-2	Striped anchovy	1	1
8/15/2012	MNB-1	Bay anchovy	331	331
8/15/2012	MNB-1	Striped anchovy	6	6
8/15/2012	MNB-2	Atlantic menhaden	1	1
8/15/2012	MNB-2	Bay anchovy	61	61
8/15/2012	MNB-2	Striped anchovy	4	4
8/15/2012	MNB-5	Bay anchovy	157	157
8/15/2012	MNB-5	Blue crab	2	2
8/15/2012	MNB-5	Blueback herring	5	5
8/15/2012	MNB-5	Striped anchovy	6	6
8/15/2012	MNB-6	Atlantic menhaden	2	2
8/15/2012	MNB-6	Bay anchovy	421	421
8/15/2012	MNB-6	Blue crab	3	3
8/15/2012	MNB-6	Blueback herring	5	5
8/15/2012	MNB-6	Striped anchovy	2	2
9/10/2012	MLB-4	Atlantic thread herring	87	87
9/10/2012	MLB-4	Bay anchovy	3765	3765
9/10/2012	MLB-4	Bluefish	1	1
9/10/2012	MLB-4	Striped anchovy	1332	1332
9/10/2012	MUB-8	Butterfish	1	1
9/10/2012	MUB-9	Striped anchovy	1	1
9/11/2012	MAK-1	Bay anchovy	196	196
9/11/2012	MKK-2	Atlantic thread herring	5	5
9/11/2012	MKK-2	Bay anchovy	1742	1742
9/11/2012	MNB-1	Bay anchovy	35	35
9/11/2012	MNB-2	Atlantic thread herring	1	1

Date	Station	Common Name	Number Caught	CPUE (#/10 min. tow)
9/11/2012	MNB-5	Bay anchovy	66	66
9/11/2012	MNB-5	Blueback herring	1	1
9/11/2012	MNB-6	Blueback herring	2	2
9/25/2012	MKK-1	Striped anchovy	3	3
9/25/2012	MLB-4	Northern stargazer	1	1
9/25/2012	MUB-11	Bay anchovy	193	193
9/25/2012	MUB-3	Northern stargazer	1	1
9/25/2012	MUB-9	Bay anchovy	138	138
9/26/2012	MAK-1	Bay anchovy	492	615
9/26/2012	MAK-2	Bay anchovy	676	676
9/26/2012	MAK-3	Bay anchovy	1658	1658
9/26/2012	MAK-4	Bay anchovy	729	729
9/26/2012	MAK-4	Blue crab	1	1
9/26/2012	MAK-4	Blue runner	2	2
9/26/2012	MAK-4	Striped anchovy	3	3
9/26/2012	MKK-2	Bay anchovy	713	713
9/26/2012	MKK-2	Striped anchovy	14	14
9/26/2012	MNB-1	Bay anchovy	259	259
9/26/2012	MNB-1	Striped anchovy	1	1
9/26/2012	MNB-2	Bay anchovy	91	91
9/26/2012	MNB-2	Blue crab	1	1
9/26/2012	MNB-5	Alewife	1	1
9/26/2012	MNB-5	Bay anchovy	790	790
9/26/2012	MNB-5	Blue crab	4	4
9/26/2012	MNB-5	Butterfish	1	1
9/26/2012	MNB-6	Atlantic menhaden	3	3
9/26/2012	MNB-6	Bay anchovy	1108	1108
10/2/2012	MKK-1	Bay anchovy	20	20
10/2/2012	MKK-1	Northern stargazer	2	2
10/2/2012	MLB-4	Atlantic menhaden	1	1
10/2/2012	MLB-4	Atlantic thread herring	4	4
10/2/2012	MLB-4	Bay anchovy	1275	1275
10/2/2012	MLB-4	Striped anchovy	1	1
10/2/2012	MUB-1	Northern stargazer	2	2
10/2/2012	MUB-11	Bay anchovy	736	736
10/2/2012	MUB-3	Bay anchovy	683	683
10/2/2012	MUB-3	Blue crab	1	1
10/2/2012	MUB-8	Bay anchovy	4	4
10/2/2012	MUB-8	Northern stargazer	1	1
10/2/2012	MUB-9	Bay anchovy	601	601
10/2/2012	MUB-9	Blue crab	1	1

Date	Station	Common Name	Number Caught	CPUE (#/10 min. tow)
10/2/2012	MUB-9	Striped anchovy	4	4
10/3/2012	MAK-1	Bay anchovy	410	410
10/3/2012	MAK-1	Blue crab	2	2
10/3/2012	MAK-3	Bay anchovy	502	502
10/3/2012	MAK-3	Blue crab	1	1
10/3/2012	MAK-3	Bluefish	1	1
10/3/2012	MAK-3	Striped anchovy	2	2
10/3/2012	MAK-4	Bay anchovy	1261	1261
10/3/2012	MKK-2	Bay anchovy	2279	2279
10/3/2012	MKK-2	Striped anchovy	1	1
10/3/2012	MNB-1	Bay anchovy	419	419
10/10/2012	MAK-1	Bay anchovy	487	487
10/10/2012	MAK-2	Bay anchovy	355	355
10/10/2012	MAK-3	Bay anchovy	56	56
10/10/2012	MKK-1	Bay anchovy	351	351
10/10/2012	MKK-1	Blue crab	2	2
10/10/2012	MNB-2	Atlantic silverside	4	4
10/10/2012	MNB-2	Bay anchovy	233	233
10/10/2012	MNB-2	Blueback herring	2	2
10/10/2012	MNB-5	Atlantic menhaden	2	2
10/10/2012	MNB-5	Bay anchovy	1003	1003
10/10/2012	MNB-5	Blueback herring	28	28
10/10/2012	MNB-6	Bay anchovy	949	949
10/11/2012	MLB-3	Bay anchovy	2	2
10/11/2012	MLB-4	Bay anchovy	1997	1997
10/11/2012	MLB-4	Bluefish	1	1
10/11/2012	MUB-11	Bay anchovy	675	675
10/11/2012	MUB-11	Striped anchovy	1	1
10/11/2012	MUB-2	Bay anchovy	340	340
10/11/2012	MUB-8	Atlantic menhaden	1	1
10/11/2012	MUB-8	Bay anchovy	56	56
10/11/2012	MUB-8	Striped anchovy	2	2
10/11/2012	MUB-9	Bay anchovy	886	886
10/15/2012	MKK-1	Bay anchovy	507	507
10/15/2012	MKK-1	Butterfish	1	1
10/15/2012	MLB-3	Bay anchovy	2	2
10/15/2012	MLB-4	Bay anchovy	357	357
10/15/2012	MUB-1	Bay anchovy	67	67
10/15/2012	MUB-1	Butterfish	1	1
10/15/2012	MUB-11	Bay anchovy	1294	1294
10/15/2012	MUB-11	Blue crab	1	1

Date	Station	Common Name	Number Caught	CPUE (#/10 min. tow)
10/15/2012	MUB-11	Butterfish	1	1
10/15/2012	MUB-11	Striped anchovy	2	2
10/15/2012	MUB-11	Winter flounder	1	1
10/15/2012	MUB-2	Atlantic thread herring	1	1
10/15/2012	MUB-2	Bay anchovy	1050	1050
10/15/2012	MUB-3	Bay anchovy	1893	1893
10/15/2012	MUB-8	Bay anchovy	4	4
10/15/2012	MUB-9	Atlantic moonfish	1	1
10/15/2012	MUB-9	Bay anchovy	632	632
10/15/2012	MUB-9	Blue crab	2	2
10/15/2012	MUB-9	Butterfish	2	2
10/16/2012	MAK-1	Bay anchovy	16	16
10/16/2012	MAK-2	Atlantic menhaden	1	1
10/16/2012	MAK-2	Bay anchovy	433	433
10/16/2012	MAK-2	Blueback herring	254	254
10/16/2012	MAK-3	Atlantic menhaden	4	4
10/16/2012	MAK-3	Bay anchovy	543	543
10/16/2012	MAK-3	Blueback herring	5	5
10/16/2012	MAK-3	Bluefish	1	1
10/16/2012	MAK-4	Atlantic silverside	2	2
10/16/2012	MAK-4	Bay anchovy	372	372
10/16/2012	MKK-2	Bay anchovy	826	826
10/16/2012	MNB-1	Bay anchovy	22	22
10/16/2012	MNB-2	Bay anchovy	527	527
10/16/2012	MNB-2	Blue crab	1	1
10/16/2012	MNB-2	Butterfish	3	3
10/16/2012	MNB-5	Atlantic menhaden	2	2
10/16/2012	MNB-5	Bay anchovy	21	21
10/16/2012	MNB-5	Blueback herring	29	29
10/16/2012	MNB-5	Butterfish	1	1
10/16/2012	MNB-6	Atlantic menhaden	5	5
10/16/2012	MNB-6	Bay anchovy	2439	2439
10/16/2012	MNB-6	Blue crab	1	1
10/16/2012	MNB-6	Blueback herring	41	41
10/23/2012	MLB-4	Bay anchovy	109	109
10/23/2012	MUB-11	Bay anchovy	2332	2332
10/23/2012	MUB-11	Blue crab	1	1
10/23/2012	MUB-11	Blueback herring	1	1
10/23/2012	MUB-2	Bay anchovy	1	1
10/23/2012	MUB-3	Bay anchovy	3	3
10/23/2012	MUB-8	Bay anchovy	284	284

Date	Station	Common Name	Number Caught	CPUE (#/10 min. tow)
10/24/2012	MAK-1	Bay anchovy	301	301
10/24/2012	MAK-1	Blueback herring	3	3
10/24/2012	MAK-2	Bay anchovy	60	60
10/24/2012	MAK-3	Atlantic menhaden	1	1
10/24/2012	MAK-3	Bay anchovy	25	25
10/24/2012	MAK-3	Blueback herring	1	1
10/24/2012	MAK-4	Blueback herring	2	2
10/24/2012	MKK-2	American shad	1	1
10/24/2012	MKK-2	Bay anchovy	278	278
10/24/2012	MNB-1	Atlantic menhaden	2	2
10/24/2012	MNB-1	Bay anchovy	408	408
10/24/2012	MNB-1	Blueback herring	1	1
10/24/2012	MNB-1	Bluefish	2	2
10/24/2012	MNB-2	Bay anchovy	190	190
10/24/2012	MNB-5	Alewife	1	1
10/24/2012	MNB-5	Atlantic menhaden	35	35
10/24/2012	MNB-5	Atlantic moonfish	1	1
10/24/2012	MNB-5	Bay anchovy	171	171
10/24/2012	MNB-5	Blueback herring	1	1
10/24/2012	MNB-6	Bay anchovy	5	5
10/24/2012	MNB-6	Blueback herring	1	1
11/6/2012	MLB-4	Bay anchovy	485	485
11/6/2012	MLB-4	Blueback herring	2	2
11/6/2012	MLB-6	Bay anchovy	5	6
11/6/2012	MUB-1	Bay anchovy	1	1
11/6/2012	MUB-2	Blueback herring	1	1
11/6/2012	MUB-3	Blueback herring	3	3
11/6/2012	MUB-9	Alewife	5	5
11/6/2012	MUB-9	Atlantic moonfish	1	1
11/6/2012	MUB-9	Bay anchovy	97	97
11/9/2012	MAK-1	Bay anchovy	1	1
11/9/2012	MAK-1	Blueback herring	1	1
11/9/2012	MAK-2	Bay anchovy	1	1
11/9/2012	MAK-2	Blueback herring	21	21
11/9/2012	MAK-3	Bay anchovy	1	1
11/9/2012	MAK-4	Bay anchovy	1	1
11/9/2012	MKK-1	Alewife	1	1
11/9/2012	MKK-1	Bay anchovy	1	1
11/9/2012	MKK-1	Blueback herring	48	48
11/9/2012	MKK-2	Atlantic silverside	1	1
11/9/2012	MKK-2	Bay anchovy	3	3

Date	Station	Common Name	Number Caught	CPUE (#/10 min. tow)
11/9/2012	MKK-2	Blueback herring	391	391
11/9/2012	MNB-1	Bay anchovy	23	23
11/9/2012	MNB-1	Blueback herring	38	38
11/9/2012	MNB-2	Atlantic menhaden	1	1
11/9/2012	MNB-2	Bay anchovy	74	74
11/9/2012	MNB-2	Blueback herring	278	278
11/9/2012	MNB-5	American shad	1	1
11/9/2012	MNB-5	Atlantic menhaden	9	9
11/9/2012	MNB-5	Bay anchovy	10	10
11/9/2012	MNB-6	Bay anchovy	4	4
11/9/2012	MNB-6	Blueback herring	451	451
11/14/2012	MKK-1	Atlantic menhaden	1	1
11/14/2012	MKK-1	Bay anchovy	72	72
11/14/2012	MKK-1	Blueback herring	6	6
11/14/2012	MLB-3	Alewife	1	1
11/14/2012	MLB-3	American shad	5	5
11/14/2012	MLB-3	Bay anchovy	92	92
11/14/2012	MLB-3	Blueback herring	13	13
11/14/2012	MLB-4	Alewife	71	71
11/14/2012	MLB-4	American shad	5	5
11/14/2012	MLB-4	Bay anchovy	251	251
11/14/2012	MLB-4	Blueback herring	1325	1325
11/14/2012	MLB-5	American shad	1	1
11/14/2012	MLB-5	Blueback herring	7	7
11/14/2012	MLB-6	Bay anchovy	4	4
11/14/2012	MLB-6	Blueback herring	70	70
11/14/2012	MUB-1	Alewife	21	21
11/14/2012	MUB-1	Blueback herring	218	218
11/14/2012	MUB-1	Silver hake	2	2
11/14/2012	MUB-11	Alewife	63	63
11/14/2012	MUB-11	American shad	6	6
11/14/2012	MUB-11	Bay anchovy	86	86
11/14/2012	MUB-11	Blueback herring	439	439
11/14/2012	MUB-2	Alewife	66	66
11/14/2012	MUB-2	American shad	1	1
11/14/2012	MUB-2	Bay anchovy	36	36
11/14/2012	MUB-2	Blueback herring	6	6
11/14/2012	MUB-3	Bay anchovy	5	5
11/14/2012	MUB-3	Blueback herring	206	206
11/14/2012	MUB-8	Alewife	40	40
11/14/2012	MUB-8	Atlantic menhaden	1	1

Date	Station	Common Name	Number Caught	CPUE (#/10 min. tow)
11/14/2012	MUB-8	Bay anchovy	88	88
11/14/2012	MUB-8	Blueback herring	6	6
11/14/2012	MUB-9	Alewife	48	48
11/14/2012	MUB-9	Atlantic menhaden	6	6
11/14/2012	MUB-9	Bay anchovy	156	156
11/14/2012	MUB-9	Blueback herring	8	8
11/15/2012	MAK-1	Bay anchovy	3	3
11/15/2012	MAK-1	Blueback herring	140	140
11/15/2012	MAK-2	Atlantic menhaden	2	2
11/15/2012	MAK-2	Bay anchovy	12	12
11/15/2012	MAK-2	Blueback herring	1175	1175
11/15/2012	MAK-3	Atlantic menhaden	1	1
11/15/2012	MAK-3	Bay anchovy	12	12
11/15/2012	MAK-4	Bay anchovy	4	4
11/15/2012	MKK-2	Alewife	21	21
11/15/2012	MKK-2	Atlantic menhaden	71	71
11/15/2012	MKK-2	Bay anchovy	83	83
11/15/2012	MKK-2	Blueback herring	7	7
11/15/2012	MNB-1	Bay anchovy	352	352
11/15/2012	MNB-1	Blue crab	1	1
11/15/2012	MNB-1	Blueback herring	97	97
11/15/2012	MNB-2	Blueback herring	115	115
11/15/2012	MNB-5	Alewife	5	5
11/15/2012	MNB-5	Bay anchovy	42	42
11/15/2012	MNB-6	Atlantic menhaden	1	1
11/15/2012	MNB-6	Bay anchovy	10	10
11/15/2012	MNB-6	Blueback herring	58	58
11/19/2012	MLB-3	Alewife	38	38
11/19/2012	MLB-3	American shad	1	1
11/19/2012	MLB-3	Atlantic menhaden	1	1
11/19/2012	MLB-3	Bay anchovy	82	82
11/19/2012	MLB-3	Blueback herring	4	4
11/19/2012	MLB-4	Alewife	8	8
11/19/2012	MLB-4	Atlantic menhaden	1	1
11/19/2012	MLB-4	Bay anchovy	120	120
11/19/2012	MLB-4	Blueback herring	263	263
11/19/2012	MLB-5	Alewife	1	1
11/19/2012	MLB-5	American shad	2	2
11/19/2012	MLB-5	Bay anchovy	2	2
11/19/2012	MLB-6	Atlantic menhaden	1	1
11/19/2012	MLB-6	Blueback herring	4240	4240

Date	Station	Common Name	Number Caught	CPUE (#/10 min. tow)
11/19/2012	MUB-1	Blueback herring	1	1
11/19/2012	MUB-11	American shad	1	1
11/19/2012	MUB-11	Bay anchovy	8	8
11/19/2012	MUB-11	Blueback herring	79	79
11/19/2012	MUB-2	Blueback herring	302	302
11/19/2012	MUB-3	American shad	1	1
11/19/2012	MUB-3	Bay anchovy	4	4
11/19/2012	MUB-3	Blueback herring	559	559
11/19/2012	MUB-8	Alewife	12	12
11/19/2012	MUB-8	American shad	1	1
11/19/2012	MUB-8	Atlantic menhaden	1	1
11/19/2012	MUB-8	Bay anchovy	129	129
11/19/2012	MUB-8	Blueback herring	54	54
11/19/2012	MUB-9	Alewife	10	10
11/19/2012	MUB-9	Bay anchovy	44	44
11/19/2012	MUB-9	Spotted hake	1	1
11/20/2012	MAK-1	Bay anchovy	1	1
11/20/2012	MAK-1	Blueback herring	5	5
11/20/2012	MAK-2	Bay anchovy	7	7
11/20/2012	MAK-3	Bay anchovy	23	23
11/20/2012	MAK-3	Blueback herring	342	342
11/20/2012	MAK-4	Bay anchovy	6	6
11/20/2012	MAK-4	Northern pipefish	2	2
11/20/2012	MKK-1	Alewife	1	1
11/20/2012	MKK-1	Bay anchovy	4	4
11/20/2012	MKK-1	Blueback herring	178	178
11/20/2012	MKK-2	Atlantic menhaden	1	1
11/20/2012	MKK-2	Bay anchovy	57	57
11/20/2012	MKK-2	Blueback herring	375	375
11/20/2012	MNB-1	Bay anchovy	8	8
11/20/2012	MNB-1	Blueback herring	68	68
11/20/2012	MNB-2	Bay anchovy	3	3
11/20/2012	MNB-2	Blueback herring	67	67
11/20/2012	MNB-5	Atlantic silverside	3	3
11/20/2012	MNB-5	Bay anchovy	8	8
11/20/2012	MNB-5	Blueback herring	3	3
11/20/2012	MNB-6	Bay anchovy	4	4
11/20/2012	MNB-6	Blueback herring	76	76
11/27/2012	MKK-1	Bay anchovy	12	12
11/27/2012	MLB-3	American shad	1	1
11/27/2012	MLB-3	Atlantic herring	1	1

Date	Station	Common Name	Number Caught	CPUE (#/10 min. tow)
11/27/2012	MLB-3	Blueback herring	6	6
11/27/2012	MLB-4	Bay anchovy	92	92
11/27/2012	MLB-4	Blueback herring	16	16
11/27/2012	MLB-5	Blueback herring	211	211
11/27/2012	MLB-6	Bay anchovy	2	2
11/27/2012	MLB-6	Blueback herring	8	8
11/27/2012	MUB-1	Alewife	34	34
11/27/2012	MUB-1	American shad	2	2
11/27/2012	MUB-1	Bay anchovy	4	4
11/27/2012	MUB-1	Blueback herring	1639	1639
11/27/2012	MUB-11	Atlantic menhaden	1	1
11/27/2012	MUB-11	Blueback herring	7330	7330
11/27/2012	MUB-2	Bay anchovy	3	3
11/27/2012	MUB-2	Blueback herring	183	183
11/27/2012	MUB-3	Bay anchovy	4	4
11/27/2012	MUB-3	Blueback herring	1497	1497
11/27/2012	MUB-8	American shad	1	1
11/27/2012	MUB-8	Blueback herring	1353	1353
11/27/2012	MUB-9	Bay anchovy	1	1
11/28/2012	MAK-1	Bay anchovy	18	18
11/28/2012	MAK-1	Blueback herring	734	734
11/28/2012	MAK-2	Bay anchovy	1	1
11/28/2012	MAK-2	Blueback herring	36	36
11/28/2012	MAK-3	Bay anchovy	7	7
11/28/2012	MAK-3	Blueback herring	593	593
11/28/2012	MAK-4	Bay anchovy	1	1
11/28/2012	MKK-2	Bay anchovy	1	1
11/28/2012	MNB-1	Bay anchovy	16	16
11/28/2012	MNB-1	Blueback herring	307	307
11/28/2012	MNB-2	Bay anchovy	9	9
11/28/2012	MNB-2	Blueback herring	136	136
11/28/2012	MNB-5	Blueback herring	2	2
11/28/2012	MNB-6	American shad	1	1
11/28/2012	MNB-6	Bay anchovy	2	2
12/4/2012	MKK-1	Bay anchovy	43	43
12/4/2012	MKK-1	Blueback herring	431	431
12/4/2012	MLB-4	Blueback herring	1645	1645
12/4/2012	MLB-5	Blueback herring	385	385
12/4/2012	MLB-6	Bay anchovy	1	1
12/4/2012	MUB-1	Atlantic menhaden	1	1
12/4/2012	MUB-1	Bay anchovy	1	1

Date	Station	Common Name	Number Caught	CPUE (#/10 min. tow)
12/4/2012	MUB-11	Bay anchovy	6	6
12/4/2012	MUB-11	Blueback herring	39	39
12/4/2012	MUB-2	Bay anchovy	3	3
12/4/2012	MUB-2	Blueback herring	31	31
12/4/2012	MUB-8	Bay anchovy	1	1
12/4/2012	MUB-8	Blueback herring	819	819
12/4/2012	MUB-9	Alewife	8	8
12/4/2012	MUB-9	Bay anchovy	79	79
12/4/2012	MUB-9	Striped bass	1	1
12/5/2012	MAK-1	American shad	1	1
12/5/2012	MAK-1	Atlantic menhaden	1	1
12/5/2012	MAK-1	Bay anchovy	87	87
12/5/2012	MAK-1	Blueback herring	64	64
12/5/2012	MAK-2	American shad	2	2
12/5/2012	MAK-2	Atlantic croaker	1	1
12/5/2012	MAK-2	Bay anchovy	9	9
12/5/2012	MAK-2	Blueback herring	317	317
12/5/2012	MAK-3	American shad	3	3
12/5/2012	MAK-3	Bay anchovy	15	15
12/5/2012	MKK-2	Bay anchovy	4	4
12/5/2012	MKK-2	Blueback herring	358	358
12/5/2012	MNB-1	Bay anchovy	1	1
12/5/2012	MNB-1	Blueback herring	22	22
12/5/2012	MNB-2	Bay anchovy	12	12
12/5/2012	MNB-2	Blueback herring	237	237
12/5/2012	MNB-5	Bay anchovy	1	1
12/5/2012	MNB-5	Blueback herring	4	4
12/5/2012	MNB-6	Atlantic silverside	5	5
12/5/2012	MNB-6	Bay anchovy	23	23
12/5/2012	MNB-6	Blueback herring	62	62

Appendix C

Output from Statistical Analyses for the 2012 Migratory Finfish Sampling Program

Appendix C-1
Analysis of Variance Detail

A two-way repeated measure Analysis of Variance (ANOVA) was attempted to test the differences in catch rates for five target species by location and week of year. A two-way repeated measure ANOVA is a powerful test to measure interactions between and within subjects. However, the assumptions are restrictive. These include:

1) continuous response variables;
2) residuals are normally distributed with mean equal to zero and constant variance;
3) subjects are independent;
4) within-subject co-variances are equal for all between-subject groups;
5) within subject covariances are circular (Hintze 2007).

The one-way ANOVA is used to detect differences between two or more group means. The assumptions for the one-way ANOVA include:

1) data are continuous;
2) each group is normally distributed about the mean;
3) variances of the populations are equal;
4) groups are independent;
5) each group is a simple random sample from the population (Hintze 2007).

Data were not sufficient to conduct the two way repeated measures or the one-way ANOVA for American shad, Atlantic menhaden, and striped bass. These species were collected so infrequently that there are insufficient data points to draw meaningful conclusions regarding time and location of occurrence.

While catches of alewife and blueback herring were sufficient to run comparative statistics, data did not meet the assumptions of normality, equal variance, or both for the raw and log (CPUE+1) transformed data. Data were split into spring and fall samples and within each dataset. The data used for the alewife and blueback herring spring and fall samples are presented in Table C.1-1. The assumptions were tested using the NCSS 2007 one-way ANOVA analysis. The results of assumption testing for the raw and transformed data for spring and fall samples of alewife are

presented in Tables C.1-2, C.1-3, C.1-4, and C.1-5. These results indicate that the data are not normally distributed, do not have equal variances, or both. As such neither a repeated measures two-way ANOVA or a one-way ANOVA could be completed. The results for the assumption testing for raw data for the spring and fall samples of blueback herring are presented in Appendices C.1-5 and C.1-6. The results indicate the data are not normally distributed, but do have equal variances.

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
13	3/27/12	Spring	MLB-4	LB	Alewife	0	0	Alewife Spring
13	3/27/12	Spring	MLB-4	LB	American shad	0	0	American shad Spring
13	3/27/12	Spring	MLB-4	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
13	3/27/12	Spring	MLB-4	LB	Blueback herring	0	0	Blueback herring Spring
13	3/27/12	Spring	MLB-4	LB	Striped bass	0	0	Striped bass Spring
13	3/27/12	Spring	MLB-3	LB	Alewife	0	0	Alewife Spring
13	3/27/12	Spring	MLB-3	LB	American shad	0	0	American shad Spring
13	3/27/12	Spring	MLB-3	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
13	3/27/12	Spring	MLB-3	LB	Blueback herring	0	0	Blueback herring Spring
13	3/27/12	Spring	MLB-3	LB	Striped bass	0	0	Striped bass Spring
13	3/27/12	Spring	MLB-5	LB	Alewife	0	0	Alewife Spring
13	3/27/12	Spring	MLB-5	LB	American shad	0	0	American shad Spring
13	3/27/12	Spring	MLB-5	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
13	3/27/12	Spring	MLB-5	LB	Blueback herring	0	0	Blueback herring Spring
13	3/27/12	Spring	MLB-5	LB	Striped bass	0	0	Striped bass Spring
13	3/27/12	Spring	MLB-6	LB	Alewife	0	0	Alewife Spring
13	3/27/12	Spring	MLB-6	LB	American shad	0	0	American shad Spring
13	3/27/12	Spring	MLB-6	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
13	3/27/12	Spring	MLB-6	LB	Blueback herring	0	0	Blueback herring Spring
13	3/27/12	Spring	MLB-6	LB	Striped bass	0	0	Striped bass Spring
13	3/27/12	Spring	MUB-3	UB	Alewife	0	0	Alewife Spring
13	3/27/12	Spring	MUB-3	UB	American shad	0	0	American shad Spring
13	3/27/12	Spring	MUB-3	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
13	3/27/12	Spring	MUB-3	UB	Blueback herring	0	0	Blueback herring Spring
13	3/27/12	Spring	MUB-3	UB	Striped bass	0	0	Striped bass Spring
13	3/27/12	Spring	MUB-11	UB	Alewife	0	0	Alewife Spring
13	3/27/12	Spring	MUB-11	UB	American shad	0	0	American shad Spring
13	3/27/12	Spring	MUB-11	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
13	3/27/12	Spring	MUB-11	UB	Blueback herring	0	0	Blueback herring Spring
13	3/27/12	Spring	MUB-	UB	Striped bass	0	0	Striped bass Spring

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
			11					
13	3/27/12	Spring	MUB-2	UB	Alewife	1	0.301029996	Alewife Spring
13	3/27/12	Spring	MUB-2	UB	American shad	0	0	American shad Spring
13	3/27/12	Spring	MUB-2	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
13	3/27/12	Spring	MUB-2	UB	Blueback herring	0	0	Blueback herring Spring
13	3/27/12	Spring	MUB-2	UB	Striped bass	0	0	Striped bass Spring
13	3/27/12	Spring	MUB-1	UB	Alewife	0	0	Alewife Spring
13	3/27/12	Spring	MUB-1	UB	American shad	0	0	American shad Spring
13	3/27/12	Spring	MUB-1	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
13	3/27/12	Spring	MUB-1	UB	Blueback herring	0	0	Blueback herring Spring
13	3/27/12	Spring	MUB-1	UB	Striped bass	0	0	Striped bass Spring
13	3/29/12	Spring	MKK-1	AKKVK	Alewife	0	0	Alewife Spring
13	3/29/12	Spring	MKK-1	AKKVK	American shad	0	0	American shad Spring
13	3/29/12	Spring	MKK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
13	3/29/12	Spring	MKK-1	AKKVK	Blueback herring	0	0	Blueback herring Spring
13	3/29/12	Spring	MKK-1	AKKVK	Striped bass	0	0	Striped bass Spring
13	3/29/12	Spring	MAK-1	AKKVK	Alewife	0	0	Alewife Spring
13	3/29/12	Spring	MAK-1	AKKVK	American shad	0	0	American shad Spring
13	3/29/12	Spring	MAK-1	AKKVK	Atlantic menhaden	1	0.301029996	Atlantic menhaden Spring
13	3/29/12	Spring	MAK-1	AKKVK	Blueback herring	182	2.26245109	Blueback herring Spring
13	3/29/12	Spring	MAK-1	AKKVK	Striped bass	0	0	Striped bass Spring
13	3/29/12	Spring	MAK-2	AKKVK	Alewife	0	0	Alewife Spring
13	3/29/12	Spring	MAK-2	AKKVK	American shad	0	0	American shad Spring
13	3/29/12	Spring	MAK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
13	3/29/12	Spring	MAK-2	AKKVK	Blueback herring	26	1.431363764	Blueback herring Spring
13	3/29/12	Spring	MAK-2	AKKVK	Striped bass	0	0	Striped bass Spring
13	3/29/12	Spring	MAK-3	AKKVK	Alewife	0	0	Alewife Spring
13	3/29/12	Spring	MAK-3	AKKVK	American shad	0	0	American shad Spring

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
13	3/29/12	Spring	MAK-3	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
13	3/29/12	Spring	MAK-3	AKKVK	Blueback herring	0	0	Blueback herring Spring
13	3/29/12	Spring	MAK-3	AKKVK	Striped bass	0	0	Striped bass Spring
13	3/29/12	Spring	MAK-4	AKKVK	Alewife	0	0	Alewife Spring
13	3/29/12	Spring	MAK-4	AKKVK	American shad	0	0	American shad Spring
13	3/29/12	Spring	MAK-4	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
13	3/29/12	Spring	MAK-4	AKKVK	Blueback herring	0	0	Blueback herring Spring
13	3/29/12	Spring	MAK-4	AKKVK	Striped bass	0	0	Striped bass Spring
13	3/29/12	Spring	MKK-2	AKKVK	Alewife	0	0	Alewife Spring
13	3/29/12	Spring	MKK-2	AKKVK	American shad	0	0	American shad Spring
13	3/29/12	Spring	MKK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
13	3/29/12	Spring	MKK-2	AKKVK	Blueback herring	1	0.301029996	Blueback herring Spring
13	3/29/12	Spring	MKK-2	AKKVK	Striped bass	0	0	Striped bass Spring
13	3/29/12	Spring	MNB-1	NB	Alewife	0	0	Alewife Spring
13	3/29/12	Spring	MNB-1	NB	American shad	0	0	American shad Spring
13	3/29/12	Spring	MNB-1	NB	Atlantic menhaden	0	0	Atlantic menhaden Spring
13	3/29/12	Spring	MNB-1	NB	Blueback herring	0	0	Blueback herring Spring
13	3/29/12	Spring	MNB-1	NB	Striped bass	0	0	Striped bass Spring
13	3/29/12	Spring	MNB-2	NB	Alewife	0	0	Alewife Spring
13	3/29/12	Spring	MNB-2	NB	American shad	0	0	American shad Spring
13	3/29/12	Spring	MNB-2	NB	Atlantic menhaden	0	0	Atlantic menhaden Spring
13	3/29/12	Spring	MNB-2	NB	Blueback herring	0	0	Blueback herring Spring
13	3/29/12	Spring	MNB-2	NB	Striped bass	0	0	Striped bass Spring
13	3/29/12	Spring	MNB-5	NB	Alewife	0	0	Alewife Spring
13	3/29/12	Spring	MNB-5	NB	American shad	0	0	American shad Spring
13	3/29/12	Spring	MNB-5	NB	Atlantic menhaden	0	0	Atlantic menhaden Spring
13	3/29/12	Spring	MNB-5	NB	Blueback herring	0	0	Blueback herring Spring
13	3/29/12	Spring	MNB-5	NB	Striped bass	0	0	Striped bass Spring

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
13	3/29/12	Spring	MNB-6	NB	Alewife	0	0	Alewife Spring
13	3/29/12	Spring	MNB-6	NB	American shad	0	0	American shad Spring
13	3/29/12	Spring	MNB-6	NB	Atlantic menhaden	0	0	Atlantic menhaden Spring
13	3/29/12	Spring	MNB-6	NB	Blueback herring	0	0	Blueback herring Spring
13	3/29/12	Spring	MNB-6	NB	Striped bass	0	0	Striped bass Spring
13	3/29/12	Spring	MUB-8	UB	Alewife	0	0	Alewife Spring
13	3/29/12	Spring	MUB-8	UB	American shad	0	0	American shad Spring
13	3/29/12	Spring	MUB-8	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
13	3/29/12	Spring	MUB-8	UB	Blueback herring	9	1	Blueback herring Spring
13	3/29/12	Spring	MUB-8	UB	Striped bass	0	0	Striped bass Spring
13	3/29/12	Spring	MUB-9	UB	Alewife	1	0.301029996	Alewife Spring
13	3/29/12	Spring	MUB-9	UB	American shad	0	0	American shad Spring
13	3/29/12	Spring	MUB-9	UB	Atlantic menhaden	1	0.301029996	Atlantic menhaden Spring
13	3/29/12	Spring	MUB-9	UB	Blueback herring	124	2.096910013	Blueback herring Spring
13	3/29/12	Spring	MUB-9	UB	Striped bass	0	0	Striped bass Spring
14	4/3/12	Spring	MKK-1	AKKVK	Alewife	0	0	Alewife Spring
14	4/3/12	Spring	MKK-1	AKKVK	American shad	0	0	American shad Spring
14	4/3/12	Spring	MKK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
14	4/3/12	Spring	MKK-1	AKKVK	Blueback herring	0	0	Blueback herring Spring
14	4/3/12	Spring	MKK-1	AKKVK	Striped bass	0	0	Striped bass Spring
14	4/3/12	Spring	MLB-4	LB	American shad	0	0	American shad Spring
14	4/3/12	Spring	MLB-4	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
14	4/3/12	Spring	MLB-4	LB	Blueback herring	0	0	Blueback herring Spring
14	4/3/12	Spring	MLB-4	LB	Striped bass	0	0	Striped bass Spring
14	4/3/12	Spring	MLB-4	LB	Alewife	0	0	Alewife Spring
14	4/3/12	Spring	MLB-3	LB	American shad	0	0	American shad Spring
14	4/3/12	Spring	MLB-3	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
14	4/3/12	Spring	MLB-3	LB	Blueback herring	0	0	Blueback herring Spring
14	4/3/12	Spring	MLB-3	LB	Striped bass	0	0	Striped bass Spring

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
14	4/3/12	Spring	MLB-3	LB	Alewife	0	0	Alewife Spring
14	4/3/12	Spring	MLB-5	LB	American shad	0	0	American shad Spring
14	4/3/12	Spring	MLB-5	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
14	4/3/12	Spring	MLB-5	LB	Blueback herring	0	0	Blueback herring Spring
14	4/3/12	Spring	MLB-5	LB	Striped bass	0	0	Striped bass Spring
14	4/3/12	Spring	MLB-5	LB	Alewife	0	0	Alewife Spring
14	4/3/12	Spring	MLB-6	LB	American shad	0	0	American shad Spring
14	4/3/12	Spring	MLB-6	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
14	4/3/12	Spring	MLB-6	LB	Blueback herring	0	0	Blueback herring Spring
14	4/3/12	Spring	MLB-6	LB	Striped bass	0	0	Striped bass Spring
14	4/3/12	Spring	MLB-6	LB	Alewife	0	0	Alewife Spring
14	4/3/12	Spring	MUB-8	UB	American shad	0	0	American shad Spring
14	4/3/12	Spring	MUB-8	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
14	4/3/12	Spring	MUB-8	UB	Blueback herring	0	0	Blueback herring Spring
14	4/3/12	Spring	MUB-8	UB	Striped bass	0	0	Striped bass Spring
14	4/3/12	Spring	MUB-8	UB	Alewife	0	0	Alewife Spring
14	4/3/12	Spring	MUB-9	UB	American shad	0	0	American shad Spring
14	4/3/12	Spring	MUB-9	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
14	4/3/12	Spring	MUB-9	UB	Blueback herring	131	2.120573931	Blueback herring Spring
14	4/3/12	Spring	MUB-9	UB	Striped bass	0	0	Striped bass Spring
14	4/3/12	Spring	MUB-9	UB	Alewife	0	0	Alewife Spring
14	4/3/12	Spring	MUB-1	UB	American shad	0	0	American shad Spring
14	4/3/12	Spring	MUB-1	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
14	4/3/12	Spring	MUB-1	UB	Blueback herring	0	0	Blueback herring Spring
14	4/3/12	Spring	MUB-1	UB	Striped bass	0	0	Striped bass Spring
14	4/3/12	Spring	MUB-1	UB	Alewife	0	0	Alewife Spring
14	4/3/12	Spring	MUB-2	UB	American shad	0	0	American shad Spring
14	4/3/12	Spring	MUB-2	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
14	4/3/12	Spring	MUB-2	UB	Blueback herring	0	0	Blueback herring Spring

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
14	4/3/12	Spring	MUB-2	UB	Striped bass	0	0	Striped bass Spring
14	4/3/12	Spring	MUB-2	UB	Alewife	0	0	Alewife Spring
14	4/3/12	Spring	MUB-3	UB	American shad	0	0	American shad Spring
14	4/3/12	Spring	MUB-3	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
14	4/3/12	Spring	MUB-3	UB	Blueback herring	0	0	Blueback herring Spring
14	4/3/12	Spring	MUB-3	UB	Striped bass	0	0	Striped bass Spring
14	4/3/12	Spring	MUB-3	UB	Alewife	0	0	Alewife Spring
14	4/3/12	Spring	MUB-11	UB	American shad	0	0	American shad Spring
14	4/3/12	Spring	MUB-11	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
14	4/3/12	Spring	MUB-11	UB	Blueback herring	0	0	Blueback herring Spring
14	4/3/12	Spring	MUB-11	UB	Striped bass	0	0	Striped bass Spring
14	4/3/12	Spring	MUB-11	UB	Alewife	0	0	Alewife Spring
14	4/4/12	Spring	MAK-4	AKKVK	Alewife	0	0	Alewife Spring
14	4/4/12	Spring	MAK-4	AKKVK	American shad	0	0	American shad Spring
14	4/4/12	Spring	MAK-4	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
14	4/4/12	Spring	MAK-4	AKKVK	Blueback herring	46	1.672097858	Blueback herring Spring
14	4/4/12	Spring	MAK-4	AKKVK	Striped bass	0	0	Striped bass Spring
14	4/4/12	Spring	MAK-3	AKKVK	Alewife	0	0	Alewife Spring
14	4/4/12	Spring	MAK-3	AKKVK	American shad	0	0	American shad Spring
14	4/4/12	Spring	MAK-3	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
14	4/4/12	Spring	MAK-3	AKKVK	Blueback herring	0	0	Blueback herring Spring
14	4/4/12	Spring	MAK-3	AKKVK	Striped bass	0	0	Striped bass Spring
14	4/4/12	Spring	MAK-2	AKKVK	Alewife	0	0	Alewife Spring
14	4/4/12	Spring	MAK-2	AKKVK	American shad	0	0	American shad Spring
14	4/4/12	Spring	MAK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
14	4/4/12	Spring	MAK-2	AKKVK	Blueback herring	0	0	Blueback herring Spring
14	4/4/12	Spring	MAK-2	AKKVK	Striped bass	0	0	Striped bass Spring
14	4/4/12	Spring	MAK-1	AKKVK	Alewife	0	0	Alewife Spring

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
14	4/4/12	Spring	MAK-1	AKKVK	American shad	0	0	American shad Spring
14	4/4/12	Spring	MAK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
14	4/4/12	Spring	MAK-1	AKKVK	Blueback herring	0	0	Blueback herring Spring
14	4/4/12	Spring	MAK-1	AKKVK	Striped bass	0	0	Striped bass Spring
14	4/4/12	Spring	MKK-2	AKKVK	Alewife	0	0	Alewife Spring
14	4/4/12	Spring	MKK-2	AKKVK	American shad	0	0	American shad Spring
14	4/4/12	Spring	MKK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
14	4/4/12	Spring	MKK-2	AKKVK	Blueback herring	4	0.698970004	Blueback herring Spring
14	4/4/12	Spring	MKK-2	AKKVK	Striped bass	0	0	Striped bass Spring
14	4/4/12	Spring	MNB-1	NB	American shad	0	0	American shad Spring
14	4/4/12	Spring	MNB-1	NB	Atlantic menhaden	0	0	Atlantic menhaden Spring
14	4/4/12	Spring	MNB-1	NB	Blueback herring	49	1.698970004	Blueback herring Spring
14	4/4/12	Spring	MNB-1	NB	Striped bass	0	0	Striped bass Spring
14	4/4/12	Spring	MNB-1	NB	Alewife	0	0	Alewife Spring
14	4/4/12	Spring	MNB-2	NB	American shad	1	0.301029996	American shad Spring
14	4/4/12	Spring	MNB-2	NB	Atlantic menhaden	3	0.602059991	Atlantic menhaden Spring
14	4/4/12	Spring	MNB-2	NB	Blueback herring	118	2.075546961	Blueback herring Spring
14	4/4/12	Spring	MNB-2	NB	Striped bass	0	0	Striped bass Spring
14	4/4/12	Spring	MNB-2	NB	Alewife	0	0	Alewife Spring
14	4/4/12	Spring	MNB-5	NB	American shad	3	0.602059991	American shad Spring
14	4/4/12	Spring	MNB-5	NB	Atlantic menhaden	0	0	Atlantic menhaden Spring
14	4/4/12	Spring	MNB-5	NB	Blueback herring	69	1.84509804	Blueback herring Spring
14	4/4/12	Spring	MNB-5	NB	Striped bass	0	0	Striped bass Spring
14	4/4/12	Spring	MNB-5	NB	Alewife	14	1.176091259	Alewife Spring
14	4/4/12	Spring	MNB-6	NB	American shad	1	0.301029996	American shad Spring
14	4/4/12	Spring	MNB-6	NB	Atlantic menhaden	0	0	Atlantic menhaden Spring
14	4/4/12	Spring	MNB-6	NB	Blueback herring	35	1.556302501	Blueback herring Spring
14	4/4/12	Spring	MNB-6	NB	Striped bass	0	0	Striped bass Spring

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
14	4/4/12	Spring	MNB-6	NB	Alewife	0	0	Alewife Spring
15	4/10/12	Spring	MKK-2	AKKVK	Alewife	1	0.301029996	Alewife Spring
15	4/10/12	Spring	MKK-2	AKKVK	American shad	6	0.84509804	American shad Spring
15	4/10/12	Spring	MKK-2	AKKVK	Atlantic menhaden	1	0.301029996	Atlantic menhaden Spring
15	4/10/12	Spring	MKK-2	AKKVK	Blueback herring	4	0.698970004	Blueback herring Spring
15	4/10/12	Spring	MKK-2	AKKVK	Striped bass	1	0.301029996	Striped bass Spring
15	4/10/12	Spring	MAK-1	AKKVK	Alewife	0	0	Alewife Spring
15	4/10/12	Spring	MAK-1	AKKVK	American shad	0	0	American shad Spring
15	4/10/12	Spring	MAK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
15	4/10/12	Spring	MAK-1	AKKVK	Blueback herring	1	0.301029996	Blueback herring Spring
15	4/10/12	Spring	MAK-1	AKKVK	Striped bass	0	0	Striped bass Spring
15	4/10/12	Spring	MAK-2	AKKVK	Alewife	0	0	Alewife Spring
15	4/10/12	Spring	MAK-2	AKKVK	American shad	0	0	American shad Spring
15	4/10/12	Spring	MAK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
15	4/10/12	Spring	MAK-2	AKKVK	Blueback herring	41	1.62324929	Blueback herring Spring
15	4/10/12	Spring	MAK-2	AKKVK	Striped bass	0	0	Striped bass Spring
15	4/10/12	Spring	MAK-3	AKKVK	Alewife	0	0	Alewife Spring
15	4/10/12	Spring	MAK-3	AKKVK	American shad	0	0	American shad Spring
15	4/10/12	Spring	MAK-3	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
15	4/10/12	Spring	MAK-3	AKKVK	Blueback herring	0	0	Blueback herring Spring
15	4/10/12	Spring	MAK-3	AKKVK	Striped bass	0	0	Striped bass Spring
15	4/10/12	Spring	MAK-4	AKKVK	Alewife	0	0	Alewife Spring
15	4/10/12	Spring	MAK-4	AKKVK	American shad	0	0	American shad Spring
15	4/10/12	Spring	MAK-4	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
15	4/10/12	Spring	MAK-4	AKKVK	Blueback herring	0	0	Blueback herring Spring
15	4/10/12	Spring	MAK-4	AKKVK	Striped bass	0	0	Striped bass Spring
15	4/10/12	Spring	MKK-1	AKKVK	Alewife	0	0	Alewife Spring
15	4/10/12	Spring	MKK-1	AKKVK	American shad	1	0.301029996	American shad Spring

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
15	4/10/12	Spring	MKK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
15	4/10/12	Spring	MKK-1	AKKVK	Blueback herring	0	0	Blueback herring Spring
15	4/10/12	Spring	MKK-1	AKKVK	Striped bass	0	0	Striped bass Spring
15	4/10/12	Spring	MNB-2	NB	American shad	1	0.301029996	American shad Spring
15	4/10/12	Spring	MNB-2	NB	Atlantic menhaden	0	0	Atlantic menhaden Spring
15	4/10/12	Spring	MNB-2	NB	Blueback herring	2	0.477121255	Blueback herring Spring
15	4/10/12	Spring	MNB-2	NB	Striped bass	0	0	Striped bass Spring
15	4/10/12	Spring	MNB-2	NB	Alewife	4	0.698970004	Alewife Spring
15	4/10/12	Spring	MNB-5	NB	American shad	0	0	American shad Spring
15	4/10/12	Spring	MNB-5	NB	Atlantic menhaden	0	0	Atlantic menhaden Spring
15	4/10/12	Spring	MNB-5	NB	Blueback herring	0	0	Blueback herring Spring
15	4/10/12	Spring	MNB-5	NB	Striped bass	0	0	Striped bass Spring
15	4/10/12	Spring	MNB-5	NB	Alewife	6	0.84509804	Alewife Spring
15	4/10/12	Spring	MNB-6	NB	American shad	1	0.301029996	American shad Spring
15	4/10/12	Spring	MNB-6	NB	Atlantic menhaden	60	1.785329835	Atlantic menhaden Spring
15	4/10/12	Spring	MNB-6	NB	Blueback herring	0	0	Blueback herring Spring
15	4/10/12	Spring	MNB-6	NB	Striped bass	0	0	Striped bass Spring
15	4/10/12	Spring	MNB-6	NB	Alewife	3	0.602059991	Alewife Spring
15	4/10/12	Spring	MNB-1	NB	American shad	0	0	American shad Spring
15	4/10/12	Spring	MNB-1	NB	Atlantic menhaden	0	0	Atlantic menhaden Spring
15	4/10/12	Spring	MNB-1	NB	Blueback herring	0	0	Blueback herring Spring
15	4/10/12	Spring	MNB-1	NB	Striped bass	0	0	Striped bass Spring
15	4/10/12	Spring	MNB-1	NB	Alewife	0	0	Alewife Spring
15	4/11/12	Spring	MLB-6	LB	Alewife	0	0	Alewife Spring
15	4/11/12	Spring	MLB-6	LB	American shad	0	0	American shad Spring
15	4/11/12	Spring	MLB-6	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
15	4/11/12	Spring	MLB-6	LB	Blueback herring	0	0	Blueback herring Spring
15	4/11/12	Spring	MLB-6	LB	Striped bass	0	0	Striped bass Spring
15	4/11/12	Spring	MLB-5	LB	Alewife	0	0	Alewife Spring

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
15	4/11/12	Spring	MLB-5	LB	American shad	0	0	American shad Spring
15	4/11/12	Spring	MLB-5	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
15	4/11/12	Spring	MLB-5	LB	Blueback herring	0	0	Blueback herring Spring
15	4/11/12	Spring	MLB-5	LB	Striped bass	0	0	Striped bass Spring
15	4/11/12	Spring	MLB-3	LB	Alewife	0	0	Alewife Spring
15	4/11/12	Spring	MLB-3	LB	American shad	0	0	American shad Spring
15	4/11/12	Spring	MLB-3	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
15	4/11/12	Spring	MLB-3	LB	Blueback herring	0	0	Blueback herring Spring
15	4/11/12	Spring	MLB-3	LB	Striped bass	0	0	Striped bass Spring
15	4/11/12	Spring	MLB-4	LB	Alewife	0	0	Alewife Spring
15	4/11/12	Spring	MLB-4	LB	American shad	0	0	American shad Spring
15	4/11/12	Spring	MLB-4	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
15	4/11/12	Spring	MLB-4	LB	Blueback herring	0	0	Blueback herring Spring
15	4/11/12	Spring	MLB-4	LB	Striped bass	0	0	Striped bass Spring
15	4/11/12	Spring	MUB-11	UB	American shad	0	0	American shad Spring
15	4/11/12	Spring	MUB-11	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
15	4/11/12	Spring	MUB-11	UB	Blueback herring	49	1.698970004	Blueback herring Spring
15	4/11/12	Spring	MUB-11	UB	Striped bass	0	0	Striped bass Spring
15	4/11/12	Spring	MUB-11	UB	Alewife	0	0	Alewife Spring
15	4/11/12	Spring	MUB-3	UB	American shad	0	0	American shad Spring
15	4/11/12	Spring	MUB-3	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
15	4/11/12	Spring	MUB-3	UB	Blueback herring	0	0	Blueback herring Spring
15	4/11/12	Spring	MUB-3	UB	Striped bass	0	0	Striped bass Spring
15	4/11/12	Spring	MUB-3	UB	Alewife	0	0	Alewife Spring
15	4/11/12	Spring	MUB-2	UB	American shad	0	0	American shad Spring
15	4/11/12	Spring	MUB-2	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
15	4/11/12	Spring	MUB-2	UB	Blueback herring	0	0	Blueback herring Spring
15	4/11/12	Spring	MUB-2	UB	Striped bass	0	0	Striped bass Spring
15	4/11/12	Spring	MUB-2	UB	Alewife	0	0	Alewife Spring

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
15	4/11/12	Spring	MUB-1	UB	American shad	0	0	American shad Spring
15	4/11/12	Spring	MUB-1	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
15	4/11/12	Spring	MUB-1	UB	Blueback herring	0	0	Blueback herring Spring
15	4/11/12	Spring	MUB-1	UB	Striped bass	0	0	Striped bass Spring
15	4/11/12	Spring	MUB-1	UB	Alewife	0	0	Alewife Spring
15	4/11/12	Spring	MUB-9	UB	American shad	0	0	American shad Spring
15	4/11/12	Spring	MUB-9	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
15	4/11/12	Spring	MUB-9	UB	Blueback herring	0	0	Blueback herring Spring
15	4/11/12	Spring	MUB-9	UB	Striped bass	0	0	Striped bass Spring
15	4/11/12	Spring	MUB-9	UB	Alewife	0	0	Alewife Spring
15	4/11/12	Spring	MUB-8	UB	American shad	0	0	American shad Spring
15	4/11/12	Spring	MUB-8	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
15	4/11/12	Spring	MUB-8	UB	Blueback herring	1	0.301029996	Blueback herring Spring
15	4/11/12	Spring	MUB-8	UB	Striped bass	0	0	Striped bass Spring
15	4/11/12	Spring	MUB-8	UB	Alewife	0	0	Alewife Spring
16	4/17/12	Spring	MKK-1	AKKVK	Alewife	0	0	Alewife Spring
16	4/17/12	Spring	MKK-1	AKKVK	American shad	0	0	American shad Spring
16	4/17/12	Spring	MKK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
16	4/17/12	Spring	MKK-1	AKKVK	Blueback herring	0	0	Blueback herring Spring
16	4/17/12	Spring	MKK-1	AKKVK	Striped bass	0	0	Striped bass Spring
16	4/17/12	Spring	MLB-6	LB	Alewife	0	0	Alewife Spring
16	4/17/12	Spring	MLB-6	LB	American shad	0	0	American shad Spring
16	4/17/12	Spring	MLB-6	LB	Atlantic menhaden	1	0.301029996	Atlantic menhaden Spring
16	4/17/12	Spring	MLB-6	LB	Blueback herring	0	0	Blueback herring Spring
16	4/17/12	Spring	MLB-6	LB	Striped bass	0	0	Striped bass Spring
16	4/17/12	Spring	MLB-5	LB	Alewife	0	0	Alewife Spring
16	4/17/12	Spring	MLB-5	LB	American shad	0	0	American shad Spring
16	4/17/12	Spring	MLB-5	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
16	4/17/12	Spring	MLB-5	LB	Blueback herring	0	0	Blueback herring Spring

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
16	4/17/12	Spring	MLB-5	LB	Striped bass	0	0	Striped bass Spring
16	4/17/12	Spring	MLB-3	LB	Alewife	0	0	Alewife Spring
16	4/17/12	Spring	MLB-3	LB	American shad	0	0	American shad Spring
16	4/17/12	Spring	MLB-3	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
16	4/17/12	Spring	MLB-3	LB	Blueback herring	0	0	Blueback herring Spring
16	4/17/12	Spring	MLB-3	LB	Striped bass	0	0	Striped bass Spring
16	4/17/12	Spring	MLB-4	LB	Alewife	0	0	Alewife Spring
16	4/17/12	Spring	MLB-4	LB	American shad	0	0	American shad Spring
16	4/17/12	Spring	MLB-4	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
16	4/17/12	Spring	MLB-4	LB	Blueback herring	0	0	Blueback herring Spring
16	4/17/12	Spring	MLB-4	LB	Striped bass	0	0	Striped bass Spring
16	4/17/12	Spring	MUB-8	UB	American shad	0	0	American shad Spring
16	4/17/12	Spring	MUB-8	UB	Atlantic menhaden	1	0.301029996	Atlantic menhaden Spring
16	4/17/12	Spring	MUB-8	UB	Blueback herring	0	0	Blueback herring Spring
16	4/17/12	Spring	MUB-8	UB	Striped bass	0	0	Striped bass Spring
16	4/17/12	Spring	MUB-8	UB	Alewife	0	0	Alewife Spring
16	4/17/12	Spring	MUB-9	UB	American shad	0	0	American shad Spring
16	4/17/12	Spring	MUB-9	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
16	4/17/12	Spring	MUB-9	UB	Blueback herring	0	0	Blueback herring Spring
16	4/17/12	Spring	MUB-9	UB	Striped bass	0	0	Striped bass Spring
16	4/17/12	Spring	MUB-9	UB	Alewife	0	0	Alewife Spring
16	4/17/12	Spring	MUB-11	UB	American shad	0	0	American shad Spring
16	4/17/12	Spring	MUB-11	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
16	4/17/12	Spring	MUB-11	UB	Blueback herring	0	0	Blueback herring Spring
16	4/17/12	Spring	MUB-11	UB	Striped bass	0	0	Striped bass Spring
16	4/17/12	Spring	MUB-11	UB	Alewife	0	0	Alewife Spring
16	4/17/12	Spring	MUB-3	UB	American shad	0	0	American shad Spring
16	4/17/12	Spring	MUB-3	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
16	4/17/12	Spring	MUB-3	UB	Blueback herring	0	0	Blueback herring Spring

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
16	4/17/12	Spring	MUB-3	UB	Striped bass	0	0	Striped bass Spring
16	4/17/12	Spring	MUB-3	UB	Alewife	0	0	Alewife Spring
16	4/17/12	Spring	MUB-2	UB	American shad	0	0	American shad Spring
16	4/17/12	Spring	MUB-2	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
16	4/17/12	Spring	MUB-2	UB	Blueback herring	0	0	Blueback herring Spring
16	4/17/12	Spring	MUB-2	UB	Striped bass	0	0	Striped bass Spring
16	4/17/12	Spring	MUB-2	UB	Alewife	0	0	Alewife Spring
16	4/17/12	Spring	MUB-1	UB	American shad	0	0	American shad Spring
16	4/17/12	Spring	MUB-1	UB	Atlantic menhaden	1	0.301029996	Atlantic menhaden Spring
16	4/17/12	Spring	MUB-1	UB	Blueback herring	0	0	Blueback herring Spring
16	4/17/12	Spring	MUB-1	UB	Striped bass	0	0	Striped bass Spring
16	4/17/12	Spring	MUB-1	UB	Alewife	0	0	Alewife Spring
16	4/18/12	Spring	MKK-2	AKKVK	Alewife	0	0	Alewife Spring
16	4/18/12	Spring	MKK-2	AKKVK	American shad	0	0	American shad Spring
16	4/18/12	Spring	MKK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
16	4/18/12	Spring	MKK-2	AKKVK	Blueback herring	1	0.301029996	Blueback herring Spring
16	4/18/12	Spring	MKK-2	AKKVK	Striped bass	0	0	Striped bass Spring
16	4/18/12	Spring	MAK-4	AKKVK	Alewife	0	0	Alewife Spring
16	4/18/12	Spring	MAK-4	AKKVK	American shad	0	0	American shad Spring
16	4/18/12	Spring	MAK-4	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
16	4/18/12	Spring	MAK-4	AKKVK	Blueback herring	0	0	Blueback herring Spring
16	4/18/12	Spring	MAK-4	AKKVK	Striped bass	0	0	Striped bass Spring
16	4/18/12	Spring	MAK-3	AKKVK	Alewife	0	0	Alewife Spring
16	4/18/12	Spring	MAK-3	AKKVK	American shad	0	0	American shad Spring
16	4/18/12	Spring	MAK-3	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
16	4/18/12	Spring	MAK-3	AKKVK	Blueback herring	0	0	Blueback herring Spring
16	4/18/12	Spring	MAK-3	AKKVK	Striped bass	0	0	Striped bass Spring
16	4/18/12	Spring	MAK-2	AKKVK	Alewife	0	0	Alewife Spring

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
16	4/18/12	Spring	MAK-2	AKKVK	American shad	0	0	American shad Spring
16	4/18/12	Spring	MAK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
16	4/18/12	Spring	MAK-2	AKKVK	Blueback herring	0	0	Blueback herring Spring
16	4/18/12	Spring	MAK-2	AKKVK	Striped bass	0	0	Striped bass Spring
16	4/18/12	Spring	MAK-1	AKKVK	Alewife	0	0	Alewife Spring
16	4/18/12	Spring	MAK-1	AKKVK	American shad	0	0	American shad Spring
16	4/18/12	Spring	MAK-1	AKKVK	Atlantic menhaden	1	0.301029996	Atlantic menhaden Spring
16	4/18/12	Spring	MAK-1	AKKVK	Blueback herring	0	0	Blueback herring Spring
16	4/18/12	Spring	MAK-1	AKKVK	Striped bass	0	0	Striped bass Spring
16	4/18/12	Spring	MNB-1	NB	Alewife	0	0	Alewife Spring
16	4/18/12	Spring	MNB-1	NB	American shad	0	0	American shad Spring
16	4/18/12	Spring	MNB-1	NB	Atlantic menhaden	0	0	Atlantic menhaden Spring
16	4/18/12	Spring	MNB-1	NB	Blueback herring	0	0	Blueback herring Spring
16	4/18/12	Spring	MNB-1	NB	Striped bass	0	0	Striped bass Spring
16	4/18/12	Spring	MNB-2	NB	Alewife	5	0.77815125	Alewife Spring
16	4/18/12	Spring	MNB-2	NB	American shad	0	0	American shad Spring
16	4/18/12	Spring	MNB-2	NB	Atlantic menhaden	0	0	Atlantic menhaden Spring
16	4/18/12	Spring	MNB-2	NB	Blueback herring	0	0	Blueback herring Spring
16	4/18/12	Spring	MNB-2	NB	Striped bass	0	0	Striped bass Spring
16	4/18/12	Spring	MNB-5	NB	Alewife	0	0	Alewife Spring
16	4/18/12	Spring	MNB-5	NB	American shad	0	0	American shad Spring
16	4/18/12	Spring	MNB-5	NB	Atlantic menhaden	0	0	Atlantic menhaden Spring
16	4/18/12	Spring	MNB-5	NB	Blueback herring	1	0.301029996	Blueback herring Spring
16	4/18/12	Spring	MNB-5	NB	Striped bass	0	0	Striped bass Spring
16	4/18/12	Spring	MNB-6	NB	Alewife	0	0	Alewife Spring
16	4/18/12	Spring	MNB-6	NB	American shad	0	0	American shad Spring
16	4/18/12	Spring	MNB-6	NB	Atlantic menhaden	0	0	Atlantic menhaden Spring
16	4/18/12	Spring	MNB-6	NB	Blueback herring	3	0.602059991	Blueback herring Spring

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
16	4/18/12	Spring	MNB-6	NB	Striped bass	0	0	Striped bass Spring
17	4/25/12	Spring	MKK-1	AKKVK	Alewife	0	0	Alewife Spring
17	4/25/12	Spring	MKK-1	AKKVK	American shad	0	0	American shad Spring
17	4/25/12	Spring	MKK-1	AKKVK	Atlantic menhaden	1	0.301029996	Atlantic menhaden Spring
17	4/25/12	Spring	MKK-1	AKKVK	Blueback herring	0	0	Blueback herring Spring
17	4/25/12	Spring	MKK-1	AKKVK	Striped bass	0	0	Striped bass Spring
17	4/25/12	Spring	MKK-2	AKKVK	Alewife	0	0	Alewife Spring
17	4/25/12	Spring	MKK-2	AKKVK	American shad	0	0	American shad Spring
17	4/25/12	Spring	MKK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
17	4/25/12	Spring	MKK-2	AKKVK	Blueback herring	2	0.477121255	Blueback herring Spring
17	4/25/12	Spring	MKK-2	AKKVK	Striped bass	0	0	Striped bass Spring
17	4/25/12	Spring	MAK-1	AKKVK	Alewife	0	0	Alewife Spring
17	4/25/12	Spring	MAK-1	AKKVK	American shad	2	0.477121255	American shad Spring
17	4/25/12	Spring	MAK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
17	4/25/12	Spring	MAK-1	AKKVK	Blueback herring	0	0	Blueback herring Spring
17	4/25/12	Spring	MAK-1	AKKVK	Striped bass	0	0	Striped bass Spring
17	4/25/12	Spring	MAK-2	AKKVK	Alewife	0	0	Alewife Spring
17	4/25/12	Spring	MAK-2	AKKVK	American shad	0	0	American shad Spring
17	4/25/12	Spring	MAK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
17	4/25/12	Spring	MAK-2	AKKVK	Blueback herring	0	0	Blueback herring Spring
17	4/25/12	Spring	MAK-2	AKKVK	Striped bass	0	0	Striped bass Spring
17	4/25/12	Spring	MAK-3	AKKVK	Alewife	0	0	Alewife Spring
17	4/25/12	Spring	MAK-3	AKKVK	American shad	0	0	American shad Spring
17	4/25/12	Spring	MAK-3	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
17	4/25/12	Spring	MAK-3	AKKVK	Blueback herring	0	0	Blueback herring Spring
17	4/25/12	Spring	MAK-3	AKKVK	Striped bass	0	0	Striped bass Spring
17	4/25/12	Spring	MAK-4	AKKVK	Alewife	0	0	Alewife Spring
17	4/25/12	Spring	MAK-4	AKKVK	American shad	0	0	American shad Spring

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
17	4/25/12	Spring	MAK-4	AKKVK	Atlantic menhaden	2	0.477121255	Atlantic menhaden Spring
17	4/25/12	Spring	MAK-4	AKKVK	Blueback herring	0	0	Blueback herring Spring
17	4/25/12	Spring	MAK-4	AKKVK	Striped bass	0	0	Striped bass Spring
17	4/25/12	Spring	MNB-1	NB	Alewife	0	0	Alewife Spring
17	4/25/12	Spring	MNB-1	NB	American shad	0	0	American shad Spring
17	4/25/12	Spring	MNB-1	NB	Atlantic menhaden	3	0.602059991	Atlantic menhaden Spring
17	4/25/12	Spring	MNB-1	NB	Blueback herring	0	0	Blueback herring Spring
17	4/25/12	Spring	MNB-1	NB	Striped bass	0	0	Striped bass Spring
17	4/25/12	Spring	MNB-2	NB	Alewife	0	0	Alewife Spring
17	4/25/12	Spring	MNB-2	NB	American shad	0	0	American shad Spring
17	4/25/12	Spring	MNB-2	NB	Atlantic menhaden	0	0	Atlantic menhaden Spring
17	4/25/12	Spring	MNB-2	NB	Blueback herring	9	1	Blueback herring Spring
17	4/25/12	Spring	MNB-2	NB	Striped bass	0	0	Striped bass Spring
17	4/25/12	Spring	MNB-5	NB	Alewife	0	0	Alewife Spring
17	4/25/12	Spring	MNB-5	NB	American shad	0	0	American shad Spring
17	4/25/12	Spring	MNB-5	NB	Atlantic menhaden	0	0	Atlantic menhaden Spring
17	4/25/12	Spring	MNB-5	NB	Blueback herring	1	0.301029996	Blueback herring Spring
17	4/25/12	Spring	MNB-5	NB	Striped bass	0	0	Striped bass Spring
17	4/25/12	Spring	MNB-6	NB	Alewife	0	0	Alewife Spring
17	4/25/12	Spring	MNB-6	NB	American shad	0	0	American shad Spring
17	4/25/12	Spring	MNB-6	NB	Atlantic menhaden	1	0.301029996	Atlantic menhaden Spring
17	4/25/12	Spring	MNB-6	NB	Blueback herring	0	0	Blueback herring Spring
17	4/25/12	Spring	MNB-6	NB	Striped bass	0	0	Striped bass Spring
17	4/26/12	Spring	MLB-6	LB	Alewife	0	0	Alewife Spring
17	4/26/12	Spring	MLB-6	LB	American shad	0	0	American shad Spring
17	4/26/12	Spring	MLB-6	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
17	4/26/12	Spring	MLB-6	LB	Blueback herring	0	0	Blueback herring Spring
17	4/26/12	Spring	MLB-6	LB	Striped bass	0	0	Striped bass Spring
17	4/26/12	Spring	MLB-5	LB	Alewife	0	0	Alewife Spring

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
17	4/26/12	Spring	MLB-5	LB	American shad	0	0	American shad Spring
17	4/26/12	Spring	MLB-5	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
17	4/26/12	Spring	MLB-5	LB	Blueback herring	0	0	Blueback herring Spring
17	4/26/12	Spring	MLB-5	LB	Striped bass	0	0	Striped bass Spring
17	4/26/12	Spring	MLB-3	LB	Alewife	0	0	Alewife Spring
17	4/26/12	Spring	MLB-3	LB	American shad	0	0	American shad Spring
17	4/26/12	Spring	MLB-3	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
17	4/26/12	Spring	MLB-3	LB	Blueback herring	0	0	Blueback herring Spring
17	4/26/12	Spring	MLB-3	LB	Striped bass	0	0	Striped bass Spring
17	4/26/12	Spring	MLB-4	LB	Alewife	0	0	Alewife Spring
17	4/26/12	Spring	MLB-4	LB	American shad	0	0	American shad Spring
17	4/26/12	Spring	MLB-4	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
17	4/26/12	Spring	MLB-4	LB	Blueback herring	0	0	Blueback herring Spring
17	4/26/12	Spring	MLB-4	LB	Striped bass	0	0	Striped bass Spring
17	4/26/12	Spring	MUB-8	UB	American shad	0	0	American shad Spring
17	4/26/12	Spring	MUB-8	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
17	4/26/12	Spring	MUB-8	UB	Blueback herring	0	0	Blueback herring Spring
17	4/26/12	Spring	MUB-8	UB	Striped bass	0	0	Striped bass Spring
17	4/26/12	Spring	MUB-8	UB	Alewife	0	0	Alewife Spring
17	4/26/12	Spring	MUB-9	UB	American shad	0	0	American shad Spring
17	4/26/12	Spring	MUB-9	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
17	4/26/12	Spring	MUB-9	UB	Blueback herring	6	0.84509804	Blueback herring Spring
17	4/26/12	Spring	MUB-9	UB	Striped bass	0	0	Striped bass Spring
17	4/26/12	Spring	MUB-9	UB	Alewife	0	0	Alewife Spring
17	4/26/12	Spring	MUB-11	UB	American shad	0	0	American shad Spring
17	4/26/12	Spring	MUB-11	UB	Atlantic menhaden	2	0.477121255	Atlantic menhaden Spring
17	4/26/12	Spring	MUB-11	UB	Blueback herring	0	0	Blueback herring Spring
17	4/26/12	Spring	MUB-11	UB	Striped bass	0	0	Striped bass Spring
17	4/26/12	Spring	MUB-11	UB	Alewife	0	0	Alewife Spring

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
17	4/26/12	Spring	MUB-3	UB	American shad	0	0	American shad Spring
17	4/26/12	Spring	MUB-3	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
17	4/26/12	Spring	MUB-3	UB	Blueback herring	1	0.301029996	Blueback herring Spring
17	4/26/12	Spring	MUB-3	UB	Striped bass	0	0	Striped bass Spring
17	4/26/12	Spring	MUB-3	UB	Alewife	0	0	Alewife Spring
17	4/26/12	Spring	MUB-2	UB	American shad	0	0	American shad Spring
17	4/26/12	Spring	MUB-2	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
17	4/26/12	Spring	MUB-2	UB	Blueback herring	0	0	Blueback herring Spring
17	4/26/12	Spring	MUB-2	UB	Striped bass	0	0	Striped bass Spring
17	4/26/12	Spring	MUB-2	UB	Alewife	0	0	Alewife Spring
17	4/26/12	Spring	MUB-1	UB	American shad	0	0	American shad Spring
17	4/26/12	Spring	MUB-1	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
17	4/26/12	Spring	MUB-1	UB	Blueback herring	0	0	Blueback herring Spring
17	4/26/12	Spring	MUB-1	UB	Striped bass	0	0	Striped bass Spring
17	4/26/12	Spring	MUB-1	UB	Alewife	0	0	Alewife Spring
18	5/1/12	Spring	MKK-1	AKKVK	Alewife	0	0	Alewife Spring
18	5/1/12	Spring	MKK-1	AKKVK	American shad	0	0	American shad Spring
18	5/1/12	Spring	MKK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
18	5/1/12	Spring	MKK-1	AKKVK	Blueback herring	0	0	Blueback herring Spring
18	5/1/12	Spring	MKK-1	AKKVK	Striped bass	0	0	Striped bass Spring
18	5/1/12	Spring	MAK-4	AKKVK	Alewife	0	0	Alewife Spring
18	5/1/12	Spring	MAK-4	AKKVK	American shad	0	0	American shad Spring
18	5/1/12	Spring	MAK-4	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
18	5/1/12	Spring	MAK-4	AKKVK	Blueback herring	0	0	Blueback herring Spring
18	5/1/12	Spring	MAK-4	AKKVK	Striped bass	0	0	Striped bass Spring
18	5/1/12	Spring	MAK-3	AKKVK	Alewife	0	0	Alewife Spring
18	5/1/12	Spring	MAK-3	AKKVK	American shad	0	0	American shad Spring
18	5/1/12	Spring	MAK-3	AKKVK	Atlantic menhaden	1	0.301029996	Atlantic menhaden Spring

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
18	5/1/12	Spring	MAK-3	AKKVK	Blueback herring	0	0	Blueback herring Spring
18	5/1/12	Spring	MAK-3	AKKVK	Striped bass	0	0	Striped bass Spring
18	5/1/12	Spring	MAK-2	AKKVK	Alewife	0	0	Alewife Spring
18	5/1/12	Spring	MAK-2	AKKVK	American shad	0	0	American shad Spring
18	5/1/12	Spring	MAK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
18	5/1/12	Spring	MAK-2	AKKVK	Blueback herring	0	0	Blueback herring Spring
18	5/1/12	Spring	MAK-2	AKKVK	Striped bass	0	0	Striped bass Spring
18	5/1/12	Spring	MAK-1	AKKVK	Alewife	0	0	Alewife Spring
18	5/1/12	Spring	MAK-1	AKKVK	American shad	0	0	American shad Spring
18	5/1/12	Spring	MAK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
18	5/1/12	Spring	MAK-1	AKKVK	Blueback herring	0	0	Blueback herring Spring
18	5/1/12	Spring	MAK-1	AKKVK	Striped bass	0	0	Striped bass Spring
18	5/1/12	Spring	MKK-2	AKKVK	Alewife	0	0	Alewife Spring
18	5/1/12	Spring	MKK-2	AKKVK	American shad	0	0	American shad Spring
18	5/1/12	Spring	MKK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
18	5/1/12	Spring	MKK-2	AKKVK	Blueback herring	0	0	Blueback herring Spring
18	5/1/12	Spring	MKK-2	AKKVK	Striped bass	0	0	Striped bass Spring
18	5/1/12	Spring	MNB-1	NB	Alewife	0	0	Alewife Spring
18	5/1/12	Spring	MNB-1	NB	American shad	0	0	American shad Spring
18	5/1/12	Spring	MNB-1	NB	Atlantic menhaden	0	0	Atlantic menhaden Spring
18	5/1/12	Spring	MNB-1	NB	Blueback herring	0	0	Blueback herring Spring
18	5/1/12	Spring	MNB-1	NB	Striped bass	0	0	Striped bass Spring
18	5/1/12	Spring	MNB-2	NB	Alewife	0	0	Alewife Spring
18	5/1/12	Spring	MNB-2	NB	American shad	0	0	American shad Spring
18	5/1/12	Spring	MNB-2	NB	Atlantic menhaden	0	0	Atlantic menhaden Spring
18	5/1/12	Spring	MNB-2	NB	Blueback herring	0	0	Blueback herring Spring
18	5/1/12	Spring	MNB-2	NB	Striped bass	0	0	Striped bass Spring
18	5/1/12	Spring	MNB-6	NB	Alewife	0	0	Alewife Spring

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
18	5/1/12	Spring	MNB-6	NB	American shad	0	0	American shad Spring
18	5/1/12	Spring	MNB-6	NB	Atlantic menhaden	1	0.301029996	Atlantic menhaden Spring
18	5/1/12	Spring	MNB-6	NB	Blueback herring	13	1.146128036	Blueback herring Spring
18	5/1/12	Spring	MNB-6	NB	Striped bass	0	0	Striped bass Spring
18	5/1/12	Spring	MNB-5	NB	Alewife	0	0	Alewife Spring
18	5/1/12	Spring	MNB-5	NB	American shad	0	0	American shad Spring
18	5/1/12	Spring	MNB-5	NB	Atlantic menhaden	1	0.301029996	Atlantic menhaden Spring
18	5/1/12	Spring	MNB-5	NB	Blueback herring	0	0	Blueback herring Spring
18	5/1/12	Spring	MNB-5	NB	Striped bass	0	0	Striped bass Spring
18	5/2/12	Spring	MLB-4	LB	Alewife	0	0	Alewife Spring
18	5/2/12	Spring	MLB-4	LB	American shad	0	0	American shad Spring
18	5/2/12	Spring	MLB-4	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
18	5/2/12	Spring	MLB-4	LB	Blueback herring	1	0.301029996	Blueback herring Spring
18	5/2/12	Spring	MLB-4	LB	Striped bass	0	0	Striped bass Spring
18	5/2/12	Spring	MLB-3	LB	Alewife	0	0	Alewife Spring
18	5/2/12	Spring	MLB-3	LB	American shad	0	0	American shad Spring
18	5/2/12	Spring	MLB-3	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
18	5/2/12	Spring	MLB-3	LB	Blueback herring	0	0	Blueback herring Spring
18	5/2/12	Spring	MLB-3	LB	Striped bass	0	0	Striped bass Spring
18	5/2/12	Spring	MLB-5	LB	Alewife	0	0	Alewife Spring
18	5/2/12	Spring	MLB-5	LB	American shad	0	0	American shad Spring
18	5/2/12	Spring	MLB-5	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
18	5/2/12	Spring	MLB-5	LB	Blueback herring	0	0	Blueback herring Spring
18	5/2/12	Spring	MLB-5	LB	Striped bass	0	0	Striped bass Spring
18	5/2/12	Spring	MLB-6	LB	Alewife	0	0	Alewife Spring
18	5/2/12	Spring	MLB-6	LB	American shad	0	0	American shad Spring
18	5/2/12	Spring	MLB-6	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
18	5/2/12	Spring	MLB-6	LB	Blueback herring	0	0	Blueback herring Spring
18	5/2/12	Spring	MLB-6	LB	Striped bass	0	0	Striped bass Spring
18	5/2/12	Spring	MUB-1	UB	Alewife	0	0	Alewife Spring

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
18	5/2/12	Spring	MUB-1	UB	American shad	0	0	American shad Spring
18	5/2/12	Spring	MUB-1	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
18	5/2/12	Spring	MUB-1	UB	Blueback herring	1	0.301029996	Blueback herring Spring
18	5/2/12	Spring	MUB-1	UB	Striped bass	0	0	Striped bass Spring
18	5/2/12	Spring	MUB-2	UB	Alewife	0	0	Alewife Spring
18	5/2/12	Spring	MUB-2	UB	American shad	0	0	American shad Spring
18	5/2/12	Spring	MUB-2	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
18	5/2/12	Spring	MUB-2	UB	Blueback herring	0	0	Blueback herring Spring
18	5/2/12	Spring	MUB-2	UB	Striped bass	0	0	Striped bass Spring
18	5/2/12	Spring	MUB-3	UB	Alewife	0	0	Alewife Spring
18	5/2/12	Spring	MUB-3	UB	American shad	0	0	American shad Spring
18	5/2/12	Spring	MUB-3	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
18	5/2/12	Spring	MUB-3	UB	Blueback herring	0	0	Blueback herring Spring
18	5/2/12	Spring	MUB-3	UB	Striped bass	0	0	Striped bass Spring
18	5/2/12	Spring	MUB-11	UB	Alewife	0	0	Alewife Spring
18	5/2/12	Spring	MUB-11	UB	American shad	0	0	American shad Spring
18	5/2/12	Spring	MUB-11	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
18	5/2/12	Spring	MUB-11	UB	Blueback herring	0	0	Blueback herring Spring
18	5/2/12	Spring	MUB-11	UB	Striped bass	0	0	Striped bass Spring
18	5/2/12	Spring	MUB-8	UB	Alewife	0	0	Alewife Spring
18	5/2/12	Spring	MUB-8	UB	American shad	0	0	American shad Spring
18	5/2/12	Spring	MUB-8	UB	Atlantic menhaden	1	0.301029996	Atlantic menhaden Spring
18	5/2/12	Spring	MUB-8	UB	Blueback herring	11	1.079181246	Blueback herring Spring
18	5/2/12	Spring	MUB-8	UB	Striped bass	0	0	Striped bass Spring
18	5/2/12	Spring	MUB-9	UB	Alewife	0	0	Alewife Spring
18	5/2/12	Spring	MUB-9	UB	American shad	0	0	American shad Spring
18	5/2/12	Spring	MUB-9	UB	Atlantic menhaden	13	1.146128036	Atlantic menhaden Spring
18	5/2/12	Spring	MUB-9	UB	Blueback herring	0	0	Blueback herring Spring

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
18	5/2/12	Spring	MUB-9	UB	Striped bass	0	0	Striped bass Spring
19	5/8/12	Spring	MKK-1	AKKVK	Alewife	0	0	Alewife Spring
19	5/8/12	Spring	MKK-1	AKKVK	American shad	0	0	American shad Spring
19	5/8/12	Spring	MKK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
19	5/8/12	Spring	MKK-1	AKKVK	Blueback herring	0	0	Blueback herring Spring
19	5/8/12	Spring	MKK-1	AKKVK	Striped bass	0	0	Striped bass Spring
19	5/8/12	Spring	MKK-2	AKKVK	Alewife	0	0	Alewife Spring
19	5/8/12	Spring	MKK-2	AKKVK	American shad	0	0	American shad Spring
19	5/8/12	Spring	MKK-2	AKKVK	Atlantic menhaden	1	0.301029996	Atlantic menhaden Spring
19	5/8/12	Spring	MKK-2	AKKVK	Blueback herring	0	0	Blueback herring Spring
19	5/8/12	Spring	MKK-2	AKKVK	Striped bass	0	0	Striped bass Spring
19	5/8/12	Spring	MAK-1	AKKVK	Alewife	0	0	Alewife Spring
19	5/8/12	Spring	MAK-1	AKKVK	American shad	0	0	American shad Spring
19	5/8/12	Spring	MAK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
19	5/8/12	Spring	MAK-1	AKKVK	Blueback herring	0	0	Blueback herring Spring
19	5/8/12	Spring	MAK-1	AKKVK	Striped bass	0	0	Striped bass Spring
19	5/8/12	Spring	MAK-2	AKKVK	Alewife	0	0	Alewife Spring
19	5/8/12	Spring	MAK-2	AKKVK	American shad	0	0	American shad Spring
19	5/8/12	Spring	MAK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
19	5/8/12	Spring	MAK-2	AKKVK	Blueback herring	0	0	Blueback herring Spring
19	5/8/12	Spring	MAK-2	AKKVK	Striped bass	0	0	Striped bass Spring
19	5/8/12	Spring	MAK-3	AKKVK	Alewife	0	0	Alewife Spring
19	5/8/12	Spring	MAK-3	AKKVK	American shad	0	0	American shad Spring
19	5/8/12	Spring	MAK-3	AKKVK	Atlantic menhaden	1	0.301029996	Atlantic menhaden Spring
19	5/8/12	Spring	MAK-3	AKKVK	Blueback herring	0	0	Blueback herring Spring
19	5/8/12	Spring	MAK-3	AKKVK	Striped bass	0	0	Striped bass Spring
19	5/8/12	Spring	MAK-4	AKKVK	Alewife	0	0	Alewife Spring
19	5/8/12	Spring	MAK-4	AKKVK	American shad	0	0	American shad Spring

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
19	5/8/12	Spring	MAK-4	AKKVK	Atlantic menhaden	2	0.477121255	Atlantic menhaden Spring
19	5/8/12	Spring	MAK-4	AKKVK	Blueback herring	0	0	Blueback herring Spring
19	5/8/12	Spring	MAK-4	AKKVK	Striped bass	0	0	Striped bass Spring
19	5/8/12	Spring	MNB-1	NB	Alewife	0	0	Alewife Spring
19	5/8/12	Spring	MNB-1	NB	American shad	0	0	American shad Spring
19	5/8/12	Spring	MNB-1	NB	Atlantic menhaden	0	0	Atlantic menhaden Spring
19	5/8/12	Spring	MNB-1	NB	Blueback herring	0	0	Blueback herring Spring
19	5/8/12	Spring	MNB-1	NB	Striped bass	0	0	Striped bass Spring
19	5/8/12	Spring	MNB-2	NB	Alewife	0	0	Alewife Spring
19	5/8/12	Spring	MNB-2	NB	American shad	0	0	American shad Spring
19	5/8/12	Spring	MNB-2	NB	Atlantic menhaden	0	0	Atlantic menhaden Spring
19	5/8/12	Spring	MNB-2	NB	Blueback herring	0	0	Blueback herring Spring
19	5/8/12	Spring	MNB-2	NB	Striped bass	0	0	Striped bass Spring
19	5/8/12	Spring	MNB-5	NB	Alewife	0	0	Alewife Spring
19	5/8/12	Spring	MNB-5	NB	American shad	0	0	American shad Spring
19	5/8/12	Spring	MNB-5	NB	Atlantic menhaden	0	0	Atlantic menhaden Spring
19	5/8/12	Spring	MNB-5	NB	Blueback herring	1	0.301029996	Blueback herring Spring
19	5/8/12	Spring	MNB-5	NB	Striped bass	1	0.301029996	Striped bass Spring
19	5/8/12	Spring	MNB-6	NB	Alewife	0	0	Alewife Spring
19	5/8/12	Spring	MNB-6	NB	American shad	0	0	American shad Spring
19	5/8/12	Spring	MNB-6	NB	Atlantic menhaden	0	0	Atlantic menhaden Spring
19	5/8/12	Spring	MNB-6	NB	Blueback herring	0	0	Blueback herring Spring
19	5/8/12	Spring	MNB-6	NB	Striped bass	0	0	Striped bass Spring
19	5/9/12	Spring	MLB-4	LB	Alewife	0	0	Alewife Spring
19	5/9/12	Spring	MLB-4	LB	American shad	0	0	American shad Spring
19	5/9/12	Spring	MLB-4	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
19	5/9/12	Spring	MLB-4	LB	Blueback herring	14	1.176091259	Blueback herring Spring
19	5/9/12	Spring	MLB-4	LB	Striped bass	0	0	Striped bass Spring
19	5/9/12	Spring	MLB-3	LB	Alewife	0	0	Alewife Spring

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
19	5/9/12	Spring	MLB-3	LB	American shad	0	0	American shad Spring
19	5/9/12	Spring	MLB-3	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
19	5/9/12	Spring	MLB-3	LB	Blueback herring	0	0	Blueback herring Spring
19	5/9/12	Spring	MLB-3	LB	Striped bass	0	0	Striped bass Spring
19	5/9/12	Spring	MLB-5	LB	Alewife	0	0	Alewife Spring
19	5/9/12	Spring	MLB-5	LB	American shad	0	0	American shad Spring
19	5/9/12	Spring	MLB-5	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
19	5/9/12	Spring	MLB-5	LB	Blueback herring	0	0	Blueback herring Spring
19	5/9/12	Spring	MLB-5	LB	Striped bass	0	0	Striped bass Spring
19	5/9/12	Spring	MLB-6	LB	Alewife	0	0	Alewife Spring
19	5/9/12	Spring	MLB-6	LB	American shad	0	0	American shad Spring
19	5/9/12	Spring	MLB-6	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
19	5/9/12	Spring	MLB-6	LB	Blueback herring	0	0	Blueback herring Spring
19	5/9/12	Spring	MLB-6	LB	Striped bass	0	0	Striped bass Spring
19	5/9/12	Spring	MUB-2	UB	Alewife	0	0	Alewife Spring
19	5/9/12	Spring	MUB-2	UB	American shad	0	0	American shad Spring
19	5/9/12	Spring	MUB-2	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
19	5/9/12	Spring	MUB-2	UB	Blueback herring	0	0	Blueback herring Spring
19	5/9/12	Spring	MUB-2	UB	Striped bass	0	0	Striped bass Spring
19	5/9/12	Spring	MUB-1	UB	Alewife	0	0	Alewife Spring
19	5/9/12	Spring	MUB-1	UB	American shad	0	0	American shad Spring
19	5/9/12	Spring	MUB-1	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
19	5/9/12	Spring	MUB-1	UB	Blueback herring	1	0.301029996	Blueback herring Spring
19	5/9/12	Spring	MUB-1	UB	Striped bass	0	0	Striped bass Spring
19	5/9/12	Spring	MUB-3	UB	Alewife	0	0	Alewife Spring
19	5/9/12	Spring	MUB-3	UB	American shad	0	0	American shad Spring
19	5/9/12	Spring	MUB-3	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
19	5/9/12	Spring	MUB-3	UB	Blueback herring	0	0	Blueback herring Spring
19	5/9/12	Spring	MUB-3	UB	Striped bass	0	0	Striped bass Spring

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
19	5/9/12	Spring	MUB-11	UB	Alewife	0	0	Alewife Spring
19	5/9/12	Spring	MUB-11	UB	American shad	0	0	American shad Spring
19	5/9/12	Spring	MUB-11	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
19	5/9/12	Spring	MUB-11	UB	Blueback herring	0	0	Blueback herring Spring
19	5/9/12	Spring	MUB-11	UB	Striped bass	0	0	Striped bass Spring
19	5/9/12	Spring	MUB-9	UB	Alewife	1	0.301029996	Alewife Spring
19	5/9/12	Spring	MUB-9	UB	American shad	0	0	American shad Spring
19	5/9/12	Spring	MUB-9	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
19	5/9/12	Spring	MUB-9	UB	Blueback herring	0	0	Blueback herring Spring
19	5/9/12	Spring	MUB-9	UB	Striped bass	0	0	Striped bass Spring
19	5/9/12	Spring	MUB-8	UB	Alewife	0	0	Alewife Spring
19	5/9/12	Spring	MUB-8	UB	American shad	0	0	American shad Spring
19	5/9/12	Spring	MUB-8	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
19	5/9/12	Spring	MUB-8	UB	Blueback herring	0	0	Blueback herring Spring
19	5/9/12	Spring	MUB-8	UB	Striped bass	0	0	Striped bass Spring
21	5/22/12	Spring	MKK-1	AKKVK	Alewife	0	0	Alewife Spring
21	5/22/12	Spring	MKK-1	AKKVK	American shad	0	0	American shad Spring
21	5/22/12	Spring	MKK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
21	5/22/12	Spring	MKK-1	AKKVK	Blueback herring	0	0	Blueback herring Spring
21	5/22/12	Spring	MKK-1	AKKVK	Striped bass	0	0	Striped bass Spring
21	5/22/12	Spring	MLB-4	LB	Alewife	0	0	Alewife Spring
21	5/22/12	Spring	MLB-4	LB	American shad	0	0	American shad Spring
21	5/22/12	Spring	MLB-4	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
21	5/22/12	Spring	MLB-4	LB	Blueback herring	0	0	Blueback herring Spring
21	5/22/12	Spring	MLB-4	LB	Striped bass	0	0	Striped bass Spring
21	5/22/12	Spring	MLB-3	LB	Alewife	0	0	Alewife Spring
21	5/22/12	Spring	MLB-3	LB	American shad	0	0	American shad Spring
21	5/22/12	Spring	MLB-3	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
21	5/22/12	Spring	MLB-3	LB	Blueback herring	0	0	Blueback herring Spring

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
21	5/22/12	Spring	MLB-3	LB	Striped bass	0	0	Striped bass Spring
21	5/22/12	Spring	MLB-5	LB	Alewife	0	0	Alewife Spring
21	5/22/12	Spring	MLB-5	LB	American shad	0	0	American shad Spring
21	5/22/12	Spring	MLB-5	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
21	5/22/12	Spring	MLB-5	LB	Blueback herring	0	0	Blueback herring Spring
21	5/22/12	Spring	MLB-5	LB	Striped bass	0	0	Striped bass Spring
21	5/22/12	Spring	MLB-6	LB	Alewife	0	0	Alewife Spring
21	5/22/12	Spring	MLB-6	LB	American shad	0	0	American shad Spring
21	5/22/12	Spring	MLB-6	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
21	5/22/12	Spring	MLB-6	LB	Blueback herring	0	0	Blueback herring Spring
21	5/22/12	Spring	MLB-6	LB	Striped bass	0	0	Striped bass Spring
21	5/22/12	Spring	MUB-9	UB	Alewife	0	0	Alewife Spring
21	5/22/12	Spring	MUB-9	UB	American shad	0	0	American shad Spring
21	5/22/12	Spring	MUB-9	UB	Atlantic menhaden	4	0.698970004	Atlantic menhaden Spring
21	5/22/12	Spring	MUB-9	UB	Blueback herring	0	0	Blueback herring Spring
21	5/22/12	Spring	MUB-9	UB	Striped bass	0	0	Striped bass Spring
21	5/22/12	Spring	MUB-8	UB	Alewife	0	0	Alewife Spring
21	5/22/12	Spring	MUB-8	UB	American shad	0	0	American shad Spring
21	5/22/12	Spring	MUB-8	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
21	5/22/12	Spring	MUB-8	UB	Blueback herring	12	1.113943352	Blueback herring Spring
21	5/22/12	Spring	MUB-8	UB	Striped bass	0	0	Striped bass Spring
21	5/22/12	Spring	MUB-11	UB	Alewife	0	0	Alewife Spring
21	5/22/12	Spring	MUB-11	UB	American shad	0	0	American shad Spring
21	5/22/12	Spring	MUB-11	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
21	5/22/12	Spring	MUB-11	UB	Blueback herring	0	0	Blueback herring Spring
21	5/22/12	Spring	MUB-11	UB	Striped bass	0	0	Striped bass Spring
21	5/22/12	Spring	MUB-3	UB	Alewife	0	0	Alewife Spring
21	5/22/12	Spring	MUB-3	UB	American shad	0	0	American shad Spring
21	5/22/12	Spring	MUB-3	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
21	5/22/12	Spring	MUB-3	UB	Blueback herring	0	0	Blueback herring Spring
21	5/22/12	Spring	MUB-3	UB	Striped bass	0	0	Striped bass Spring
21	5/22/12	Spring	MUB-2	UB	Alewife	0	0	Alewife Spring
21	5/22/12	Spring	MUB-2	UB	American shad	0	0	American shad Spring
21	5/22/12	Spring	MUB-2	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
21	5/22/12	Spring	MUB-2	UB	Blueback herring	0	0	Blueback herring Spring
21	5/22/12	Spring	MUB-2	UB	Striped bass	0	0	Striped bass Spring
21	5/22/12	Spring	MUB-1	UB	Alewife	0	0	Alewife Spring
21	5/22/12	Spring	MUB-1	UB	American shad	0	0	American shad Spring
21	5/22/12	Spring	MUB-1	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
21	5/22/12	Spring	MUB-1	UB	Blueback herring	0	0	Blueback herring Spring
21	5/22/12	Spring	MUB-1	UB	Striped bass	0	0	Striped bass Spring
21	5/23/12	Spring	MAK-1	AKKVK	Alewife	0	0	Alewife Spring
21	5/23/12	Spring	MAK-1	AKKVK	American shad	0	0	American shad Spring
21	5/23/12	Spring	MAK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
21	5/23/12	Spring	MAK-1	AKKVK	Blueback herring	0	0	Blueback herring Spring
21	5/23/12	Spring	MAK-1	AKKVK	Striped bass	0	0	Striped bass Spring
21	5/23/12	Spring	MAK-2	AKKVK	Alewife	0	0	Alewife Spring
21	5/23/12	Spring	MAK-2	AKKVK	American shad	0	0	American shad Spring
21	5/23/12	Spring	MAK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
21	5/23/12	Spring	MAK-2	AKKVK	Blueback herring	0	0	Blueback herring Spring
21	5/23/12	Spring	MAK-2	AKKVK	Striped bass	0	0	Striped bass Spring
21	5/23/12	Spring	MAK-3	AKKVK	Alewife	0	0	Alewife Spring
21	5/23/12	Spring	MAK-3	AKKVK	American shad	0	0	American shad Spring
21	5/23/12	Spring	MAK-3	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
21	5/23/12	Spring	MAK-3	AKKVK	Blueback herring	0	0	Blueback herring Spring
21	5/23/12	Spring	MAK-3	AKKVK	Striped bass	0	0	Striped bass Spring
21	5/23/12	Spring	MAK-4	AKKVK	Alewife	0	0	Alewife Spring

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
21	5/23/12	Spring	MAK-4	AKKVK	American shad	0	0	American shad Spring
21	5/23/12	Spring	MAK-4	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
21	5/23/12	Spring	MAK-4	AKKVK	Blueback herring	0	0	Blueback herring Spring
21	5/23/12	Spring	MAK-4	AKKVK	Striped bass	0	0	Striped bass Spring
21	5/23/12	Spring	MKK-2	AKKVK	Alewife	0	0	Alewife Spring
21	5/23/12	Spring	MKK-2	AKKVK	American shad	0	0	American shad Spring
21	5/23/12	Spring	MKK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
21	5/23/12	Spring	MKK-2	AKKVK	Blueback herring	0	0	Blueback herring Spring
21	5/23/12	Spring	MKK-2	AKKVK	Striped bass	0	0	Striped bass Spring
21	5/23/12	Spring	MNB-1	NB	Alewife	0	0	Alewife Spring
21	5/23/12	Spring	MNB-1	NB	American shad	0	0	American shad Spring
21	5/23/12	Spring	MNB-1	NB	Atlantic menhaden	0	0	Atlantic menhaden Spring
21	5/23/12	Spring	MNB-1	NB	Blueback herring	0	0	Blueback herring Spring
21	5/23/12	Spring	MNB-1	NB	Striped bass	0	0	Striped bass Spring
21	5/23/12	Spring	MNB-2	NB	Alewife	0	0	Alewife Spring
21	5/23/12	Spring	MNB-2	NB	American shad	0	0	American shad Spring
21	5/23/12	Spring	MNB-2	NB	Atlantic menhaden	0	0	Atlantic menhaden Spring
21	5/23/12	Spring	MNB-2	NB	Blueback herring	0	0	Blueback herring Spring
21	5/23/12	Spring	MNB-2	NB	Striped bass	0	0	Striped bass Spring
21	5/23/12	Spring	MNB-5	NB	Alewife	0	0	Alewife Spring
21	5/23/12	Spring	MNB-5	NB	American shad	0	0	American shad Spring
21	5/23/12	Spring	MNB-5	NB	Atlantic menhaden	0	0	Atlantic menhaden Spring
21	5/23/12	Spring	MNB-5	NB	Blueback herring	0	0	Blueback herring Spring
21	5/23/12	Spring	MNB-5	NB	Striped bass	0	0	Striped bass Spring
21	5/23/12	Spring	MNB-6	NB	Alewife	0	0	Alewife Spring
21	5/23/12	Spring	MNB-6	NB	American shad	0	0	American shad Spring
21	5/23/12	Spring	MNB-6	NB	Atlantic menhaden	0	0	Atlantic menhaden Spring
21	5/23/12	Spring	MNB-6	NB	Blueback herring	0	0	Blueback herring Spring

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
21	5/23/12	Spring	MNB-6	NB	Striped bass	0	0	Striped bass Spring
23	6/5/12	Spring	MKK-1	AKKVK	Alewife	0	0	Alewife Spring
23	6/5/12	Spring	MKK-1	AKKVK	American shad	0	0	American shad Spring
23	6/5/12	Spring	MKK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
23	6/5/12	Spring	MKK-1	AKKVK	Blueback herring	0	0	Blueback herring Spring
23	6/5/12	Spring	MKK-1	AKKVK	Striped bass	0	0	Striped bass Spring
23	6/5/12	Spring	MLB-6	LB	Alewife	0	0	Alewife Spring
23	6/5/12	Spring	MLB-6	LB	American shad	0	0	American shad Spring
23	6/5/12	Spring	MLB-6	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
23	6/5/12	Spring	MLB-6	LB	Blueback herring	0	0	Blueback herring Spring
23	6/5/12	Spring	MLB-6	LB	Striped bass	0	0	Striped bass Spring
23	6/5/12	Spring	MLB-3	LB	Alewife	0	0	Alewife Spring
23	6/5/12	Spring	MLB-3	LB	American shad	0	0	American shad Spring
23	6/5/12	Spring	MLB-3	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
23	6/5/12	Spring	MLB-3	LB	Blueback herring	0	0	Blueback herring Spring
23	6/5/12	Spring	MLB-3	LB	Striped bass	0	0	Striped bass Spring
23	6/5/12	Spring	MLB-5	LB	Alewife	0	0	Alewife Spring
23	6/5/12	Spring	MLB-5	LB	American shad	0	0	American shad Spring
23	6/5/12	Spring	MLB-5	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
23	6/5/12	Spring	MLB-5	LB	Blueback herring	0	0	Blueback herring Spring
23	6/5/12	Spring	MLB-5	LB	Striped bass	0	0	Striped bass Spring
23	6/5/12	Spring	MLB-4	LB	Alewife	0	0	Alewife Spring
23	6/5/12	Spring	MLB-4	LB	American shad	0	0	American shad Spring
23	6/5/12	Spring	MLB-4	LB	Atlantic menhaden	0	0	Atlantic menhaden Spring
23	6/5/12	Spring	MLB-4	LB	Blueback herring	0	0	Blueback herring Spring
23	6/5/12	Spring	MLB-4	LB	Striped bass	0	0	Striped bass Spring
23	6/5/12	Spring	MUB-9	UB	Alewife	0	0	Alewife Spring
23	6/5/12	Spring	MUB-9	UB	American shad	0	0	American shad Spring
23	6/5/12	Spring	MUB-9	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
23	6/5/12	Spring	MUB-9	UB	Blueback herring	0	0	Blueback herring Spring

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
23	6/5/12	Spring	MUB-9	UB	Striped bass	0	0	Striped bass Spring
23	6/5/12	Spring	MUB-8	UB	Alewife	0	0	Alewife Spring
23	6/5/12	Spring	MUB-8	UB	American shad	0	0	American shad Spring
23	6/5/12	Spring	MUB-8	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
23	6/5/12	Spring	MUB-8	UB	Blueback herring	1	0.301029996	Blueback herring Spring
23	6/5/12	Spring	MUB-8	UB	Striped bass	0	0	Striped bass Spring
23	6/5/12	Spring	MUB-11	UB	Alewife	0	0	Alewife Spring
23	6/5/12	Spring	MUB-11	UB	American shad	0	0	American shad Spring
23	6/5/12	Spring	MUB-11	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
23	6/5/12	Spring	MUB-11	UB	Blueback herring	0	0	Blueback herring Spring
23	6/5/12	Spring	MUB-11	UB	Striped bass	0	0	Striped bass Spring
23	6/5/12	Spring	MUB-3	UB	Alewife	0	0	Alewife Spring
23	6/5/12	Spring	MUB-3	UB	American shad	0	0	American shad Spring
23	6/5/12	Spring	MUB-3	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
23	6/5/12	Spring	MUB-3	UB	Blueback herring	0	0	Blueback herring Spring
23	6/5/12	Spring	MUB-3	UB	Striped bass	0	0	Striped bass Spring
23	6/5/12	Spring	MUB-2	UB	Alewife	0	0	Alewife Spring
23	6/5/12	Spring	MUB-2	UB	American shad	0	0	American shad Spring
23	6/5/12	Spring	MUB-2	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
23	6/5/12	Spring	MUB-2	UB	Blueback herring	0	0	Blueback herring Spring
23	6/5/12	Spring	MUB-2	UB	Striped bass	0	0	Striped bass Spring
23	6/5/12	Spring	MUB-1	UB	Alewife	0	0	Alewife Spring
23	6/5/12	Spring	MUB-1	UB	American shad	0	0	American shad Spring
23	6/5/12	Spring	MUB-1	UB	Atlantic menhaden	0	0	Atlantic menhaden Spring
23	6/5/12	Spring	MUB-1	UB	Blueback herring	0	0	Blueback herring Spring
23	6/5/12	Spring	MUB-1	UB	Striped bass	0	0	Striped bass Spring
23	6/6/12	Spring	MAK-1	AKKVK	Alewife	0	0	Alewife Spring
23	6/6/12	Spring	MAK-1	AKKVK	American shad	0	0	American shad Spring

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
23	6/6/12	Spring	MAK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
23	6/6/12	Spring	MAK-1	AKKVK	Blueback herring	0	0	Blueback herring Spring
23	6/6/12	Spring	MAK-1	AKKVK	Striped bass	0	0	Striped bass Spring
23	6/6/12	Spring	MAK-2	AKKVK	Alewife	0	0	Alewife Spring
23	6/6/12	Spring	MAK-2	AKKVK	American shad	0	0	American shad Spring
23	6/6/12	Spring	MAK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
23	6/6/12	Spring	MAK-2	AKKVK	Blueback herring	0	0	Blueback herring Spring
23	6/6/12	Spring	MAK-2	AKKVK	Striped bass	0	0	Striped bass Spring
23	6/6/12	Spring	MAK-3	AKKVK	Alewife	0	0	Alewife Spring
23	6/6/12	Spring	MAK-3	AKKVK	American shad	0	0	American shad Spring
23	6/6/12	Spring	MAK-3	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
23	6/6/12	Spring	MAK-3	AKKVK	Blueback herring	0	0	Blueback herring Spring
23	6/6/12	Spring	MAK-3	AKKVK	Striped bass	0	0	Striped bass Spring
23	6/6/12	Spring	MAK-4	AKKVK	Alewife	0	0	Alewife Spring
23	6/6/12	Spring	MAK-4	AKKVK	American shad	0	0	American shad Spring
23	6/6/12	Spring	MAK-4	AKKVK	Atlantic menhaden	1	0.301029996	Atlantic menhaden Spring
23	6/6/12	Spring	MAK-4	AKKVK	Blueback herring	0	0	Blueback herring Spring
23	6/6/12	Spring	MAK-4	AKKVK	Striped bass	0	0	Striped bass Spring
23	6/6/12	Spring	MKK-2	AKKVK	Alewife	0	0	Alewife Spring
23	6/6/12	Spring	MKK-2	AKKVK	American shad	0	0	American shad Spring
23	6/6/12	Spring	MKK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Spring
23	6/6/12	Spring	MKK-2	AKKVK	Blueback herring	0	0	Blueback herring Spring
23	6/6/12	Spring	MKK-2	AKKVK	Striped bass	0	0	Striped bass Spring
23	6/6/12	Spring	MNB-1	NB	Alewife	0	0	Alewife Spring
23	6/6/12	Spring	MNB-1	NB	American shad	0	0	American shad Spring
23	6/6/12	Spring	MNB-1	NB	Atlantic menhaden	0	0	Atlantic menhaden Spring
23	6/6/12	Spring	MNB-1	NB	Blueback herring	0	0	Blueback herring Spring
23	6/6/12	Spring	MNB-1	NB	Striped bass	0	0	Striped bass Spring

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
23	6/6/12	Spring	MNB-2	NB	Alewife	0	0	Alewife Spring
23	6/6/12	Spring	MNB-2	NB	American shad	0	0	American shad Spring
23	6/6/12	Spring	MNB-2	NB	Atlantic menhaden	0	0	Atlantic menhaden Spring
23	6/6/12	Spring	MNB-2	NB	Blueback herring	0	0	Blueback herring Spring
23	6/6/12	Spring	MNB-2	NB	Striped bass	0	0	Striped bass Spring
23	6/6/12	Spring	MNB-5	NB	Alewife	0	0	Alewife Spring
23	6/6/12	Spring	MNB-5	NB	American shad	0	0	American shad Spring
23	6/6/12	Spring	MNB-5	NB	Atlantic menhaden	0	0	Atlantic menhaden Spring
23	6/6/12	Spring	MNB-5	NB	Blueback herring	0	0	Blueback herring Spring
23	6/6/12	Spring	MNB-5	NB	Striped bass	0	0	Striped bass Spring
23	6/6/12	Spring	MNB-6	NB	Alewife	0	0	Alewife Spring
23	6/6/12	Spring	MNB-6	NB	American shad	0	0	American shad Spring
23	6/6/12	Spring	MNB-6	NB	Atlantic menhaden	1	0.301029996	Atlantic menhaden Spring
23	6/6/12	Spring	MNB-6	NB	Blueback herring	0	0	Blueback herring Spring
23	6/6/12	Spring	MNB-6	NB	Striped bass	0	0	Striped bass Spring
28	7/12/12	Summer	MKK-1	AKKVK	Alewife	0	0	Alewife Summer
28	7/12/12	Summer	MKK-1	AKKVK	American shad	0	0	American shad Summer
28	7/12/12	Summer	MKK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Summer
28	7/12/12	Summer	MKK-1	AKKVK	Blueback herring	0	0	Blueback herring Summer
28	7/12/12	Summer	MKK-1	AKKVK	Striped bass	0	0	Striped bass Summer
28	7/12/12	Summer	MAK-4	AKKVK	Alewife	0	0	Alewife Summer
28	7/12/12	Summer	MAK-4	AKKVK	American shad	0	0	American shad Summer
28	7/12/12	Summer	MAK-4	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Summer
28	7/12/12	Summer	MAK-4	AKKVK	Blueback herring	0	0	Blueback herring Summer
28	7/12/12	Summer	MAK-4	AKKVK	Striped bass	0	0	Striped bass Summer
28	7/12/12	Summer	MAK-3	AKKVK	Alewife	0	0	Alewife Summer
28	7/12/12	Summer	MAK-3	AKKVK	American shad	0	0	American shad Summer
28	7/12/12	Summer	MAK-3	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Summer

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
28	7/12/12	Summer	MAK-3	AKKVK	Blueback herring	0	0	Blueback herring Summer
28	7/12/12	Summer	MAK-3	AKKVK	Striped bass	0	0	Striped bass Summer
28	7/12/12	Summer	MAK-2	AKKVK	Alewife	0	0	Alewife Summer
28	7/12/12	Summer	MAK-2	AKKVK	American shad	0	0	American shad Summer
28	7/12/12	Summer	MAK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Summer
28	7/12/12	Summer	MAK-2	AKKVK	Blueback herring	0	0	Blueback herring Summer
28	7/12/12	Summer	MAK-2	AKKVK	Striped bass	0	0	Striped bass Summer
28	7/12/12	Summer	MAK-1	AKKVK	Alewife	0	0	Alewife Summer
28	7/12/12	Summer	MAK-1	AKKVK	American shad	0	0	American shad Summer
28	7/12/12	Summer	MAK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Summer
28	7/12/12	Summer	MAK-1	AKKVK	Blueback herring	0	0	Blueback herring Summer
28	7/12/12	Summer	MAK-1	AKKVK	Striped bass	0	0	Striped bass Summer
28	7/12/12	Summer	MKK-2	AKKVK	Alewife	0	0	Alewife Summer
28	7/12/12	Summer	MKK-2	AKKVK	American shad	0	0	American shad Summer
28	7/12/12	Summer	MKK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Summer
28	7/12/12	Summer	MKK-2	AKKVK	Blueback herring	0	0	Blueback herring Summer
28	7/12/12	Summer	MKK-2	AKKVK	Striped bass	0	0	Striped bass Summer
28	7/12/12	Summer	MNB-5	NB	Alewife	0	0	Alewife Summer
28	7/12/12	Summer	MNB-5	NB	American shad	0	0	American shad Summer
28	7/12/12	Summer	MNB-5	NB	Atlantic menhaden	0	0	Atlantic menhaden Summer
28	7/12/12	Summer	MNB-5	NB	Blueback herring	0	0	Blueback herring Summer
28	7/12/12	Summer	MNB-5	NB	Striped bass	0	0	Striped bass Summer
28	7/12/12	Summer	MNB-6	NB	Alewife	0	0	Alewife Summer
28	7/12/12	Summer	MNB-6	NB	American shad	0	0	American shad Summer
28	7/12/12	Summer	MNB-6	NB	Atlantic menhaden	0	0	Atlantic menhaden Summer
28	7/12/12	Summer	MNB-6	NB	Blueback herring	0	0	Blueback herring Summer
28	7/12/12	Summer	MNB-6	NB	Striped bass	0	0	Striped bass Summer
28	7/12/12	Summer	MNB-2	NB	Alewife	0	0	Alewife Summer

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
28	7/12/12	Summer	MNB-2	NB	American shad	0	0	American shad Summer
28	7/12/12	Summer	MNB-2	NB	Atlantic menhaden	0	0	Atlantic menhaden Summer
28	7/12/12	Summer	MNB-2	NB	Blueback herring	0	0	Blueback herring Summer
28	7/12/12	Summer	MNB-2	NB	Striped bass	0	0	Striped bass Summer
28	7/12/12	Summer	MNB-1	NB	Alewife	0	0	Alewife Summer
28	7/12/12	Summer	MNB-1	NB	American shad	0	0	American shad Summer
28	7/12/12	Summer	MNB-1	NB	Atlantic menhaden	0	0	Atlantic menhaden Summer
28	7/12/12	Summer	MNB-1	NB	Blueback herring	0	0	Blueback herring Summer
28	7/12/12	Summer	MNB-1	NB	Striped bass	0	0	Striped bass Summer
28	7/13/12	Summer	MLB-4	LB	Alewife	0	0	Alewife Summer
28	7/13/12	Summer	MLB-4	LB	American shad	0	0	American shad Summer
28	7/13/12	Summer	MLB-4	LB	Atlantic menhaden	0	0	Atlantic menhaden Summer
28	7/13/12	Summer	MLB-4	LB	Blueback herring	0	0	Blueback herring Summer
28	7/13/12	Summer	MLB-4	LB	Striped bass	0	0	Striped bass Summer
28	7/13/12	Summer	MLB-3	LB	Alewife	0	0	Alewife Summer
28	7/13/12	Summer	MLB-3	LB	American shad	0	0	American shad Summer
28	7/13/12	Summer	MLB-3	LB	Atlantic menhaden	0	0	Atlantic menhaden Summer
28	7/13/12	Summer	MLB-3	LB	Blueback herring	0	0	Blueback herring Summer
28	7/13/12	Summer	MLB-3	LB	Striped bass	0	0	Striped bass Summer
28	7/13/12	Summer	MLB-5	LB	Alewife	0	0	Alewife Summer
28	7/13/12	Summer	MLB-5	LB	American shad	0	0	American shad Summer
28	7/13/12	Summer	MLB-5	LB	Atlantic menhaden	0	0	Atlantic menhaden Summer
28	7/13/12	Summer	MLB-5	LB	Blueback herring	0	0	Blueback herring Summer
28	7/13/12	Summer	MLB-5	LB	Striped bass	0	0	Striped bass Summer
28	7/13/12	Summer	MLB-6	LB	Alewife	0	0	Alewife Summer
28	7/13/12	Summer	MLB-6	LB	American shad	0	0	American shad Summer
28	7/13/12	Summer	MLB-6	LB	Atlantic menhaden	0	0	Atlantic menhaden Summer
28	7/13/12	Summer	MLB-6	LB	Blueback herring	0	0	Blueback herring Summer
28	7/13/12	Summer	MLB-6	LB	Striped bass	0	0	Striped bass Summer
28	7/13/12	Summer	MUB-8	UB	Alewife	0	0	Alewife Summer

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
28	7/13/12	Summer	MUB-8	UB	American shad	0	0	American shad Summer
28	7/13/12	Summer	MUB-8	UB	Atlantic menhaden	0	0	Atlantic menhaden Summer
28	7/13/12	Summer	MUB-8	UB	Blueback herring	0	0	Blueback herring Summer
28	7/13/12	Summer	MUB-8	UB	Striped bass	0	0	Striped bass Summer
28	7/13/12	Summer	MUB-9	UB	Alewife	0	0	Alewife Summer
28	7/13/12	Summer	MUB-9	UB	American shad	0	0	American shad Summer
28	7/13/12	Summer	MUB-9	UB	Atlantic menhaden	0	0	Atlantic menhaden Summer
28	7/13/12	Summer	MUB-9	UB	Blueback herring	0	0	Blueback herring Summer
28	7/13/12	Summer	MUB-9	UB	Striped bass	0	0	Striped bass Summer
28	7/13/12	Summer	MUB-11	UB	Alewife	0	0	Alewife Summer
28	7/13/12	Summer	MUB-11	UB	American shad	0	0	American shad Summer
28	7/13/12	Summer	MUB-11	UB	Atlantic menhaden	0	0	Atlantic menhaden Summer
28	7/13/12	Summer	MUB-11	UB	Blueback herring	0	0	Blueback herring Summer
28	7/13/12	Summer	MUB-11	UB	Striped bass	0	0	Striped bass Summer
28	7/13/12	Summer	MUB-3	UB	Alewife	0	0	Alewife Summer
28	7/13/12	Summer	MUB-3	UB	American shad	0	0	American shad Summer
28	7/13/12	Summer	MUB-3	UB	Atlantic menhaden	0	0	Atlantic menhaden Summer
28	7/13/12	Summer	MUB-3	UB	Blueback herring	0	0	Blueback herring Summer
28	7/13/12	Summer	MUB-3	UB	Striped bass	0	0	Striped bass Summer
28	7/13/12	Summer	MUB-2	UB	Alewife	0	0	Alewife Summer
28	7/13/12	Summer	MUB-2	UB	American shad	0	0	American shad Summer
28	7/13/12	Summer	MUB-2	UB	Atlantic menhaden	0	0	Atlantic menhaden Summer
28	7/13/12	Summer	MUB-2	UB	Blueback herring	0	0	Blueback herring Summer
28	7/13/12	Summer	MUB-2	UB	Striped bass	0	0	Striped bass Summer
28	7/13/12	Summer	MUB-1	UB	Alewife	0	0	Alewife Summer
28	7/13/12	Summer	MUB-1	UB	American shad	0	0	American shad Summer
28	7/13/12	Summer	MUB-1	UB	Atlantic menhaden	0	0	Atlantic menhaden Summer
28	7/13/12	Summer	MUB-1	UB	Blueback herring	0	0	Blueback herring Summer

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
28	7/13/12	Summer	MUB-1	UB	Striped bass	0	0	Striped bass Summer
33	8/14/12	Summer	MLB-6	LB	Alewife	0	0	Alewife Summer
33	8/14/12	Summer	MLB-6	LB	American shad	0	0	American shad Summer
33	8/14/12	Summer	MLB-6	LB	Atlantic menhaden	0	0	Atlantic menhaden Summer
33	8/14/12	Summer	MLB-6	LB	Blueback herring	0	0	Blueback herring Summer
33	8/14/12	Summer	MLB-6	LB	Striped bass	0	0	Striped bass Summer
33	8/14/12	Summer	MLB-5	LB	Alewife	0	0	Alewife Summer
33	8/14/12	Summer	MLB-5	LB	American shad	0	0	American shad Summer
33	8/14/12	Summer	MLB-5	LB	Atlantic menhaden	0	0	Atlantic menhaden Summer
33	8/14/12	Summer	MLB-5	LB	Blueback herring	0	0	Blueback herring Summer
33	8/14/12	Summer	MLB-5	LB	Striped bass	0	0	Striped bass Summer
33	8/14/12	Summer	MLB-3	LB	Alewife	0	0	Alewife Summer
33	8/14/12	Summer	MLB-3	LB	American shad	0	0	American shad Summer
33	8/14/12	Summer	MLB-3	LB	Atlantic menhaden	0	0	Atlantic menhaden Summer
33	8/14/12	Summer	MLB-3	LB	Blueback herring	0	0	Blueback herring Summer
33	8/14/12	Summer	MLB-3	LB	Striped bass	0	0	Striped bass Summer
33	8/14/12	Summer	MLB-4	LB	Alewife	0	0	Alewife Summer
33	8/14/12	Summer	MLB-4	LB	American shad	0	0	American shad Summer
33	8/14/12	Summer	MLB-4	LB	Atlantic menhaden	2	0.477121255	Atlantic menhaden Summer
33	8/14/12	Summer	MLB-4	LB	Blueback herring	0	0	Blueback herring Summer
33	8/14/12	Summer	MLB-4	LB	Striped bass	0	0	Striped bass Summer
33	8/14/12	Summer	MUB-9	UB	Alewife	0	0	Alewife Summer
33	8/14/12	Summer	MUB-9	UB	American shad	0	0	American shad Summer
33	8/14/12	Summer	MUB-9	UB	Atlantic menhaden	0	0	Atlantic menhaden Summer
33	8/14/12	Summer	MUB-9	UB	Blueback herring	0	0	Blueback herring Summer
33	8/14/12	Summer	MUB-9	UB	Striped bass	0	0	Striped bass Summer
33	8/14/12	Summer	MUB-8	UB	Alewife	0	0	Alewife Summer
33	8/14/12	Summer	MUB-8	UB	American shad	0	0	American shad Summer
33	8/14/12	Summer	MUB-8	UB	Atlantic menhaden	0	0	Atlantic menhaden Summer
33	8/14/12	Summer	MUB-8	UB	Blueback herring	0	0	Blueback herring Summer

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
33	8/14/12	Summer	MUB-8	UB	Striped bass	0	0	Striped bass Summer
33	8/14/12	Summer	MUB-11	UB	Alewife	0	0	Alewife Summer
33	8/14/12	Summer	MUB-11	UB	American shad	0	0	American shad Summer
33	8/14/12	Summer	MUB-11	UB	Atlantic menhaden	0	0	Atlantic menhaden Summer
33	8/14/12	Summer	MUB-11	UB	Blueback herring	0	0	Blueback herring Summer
33	8/14/12	Summer	MUB-11	UB	Striped bass	0	0	Striped bass Summer
33	8/14/12	Summer	MUB-3	UB	Alewife	0	0	Alewife Summer
33	8/14/12	Summer	MUB-3	UB	American shad	0	0	American shad Summer
33	8/14/12	Summer	MUB-3	UB	Atlantic menhaden	0	0	Atlantic menhaden Summer
33	8/14/12	Summer	MUB-3	UB	Blueback herring	0	0	Blueback herring Summer
33	8/14/12	Summer	MUB-3	UB	Striped bass	0	0	Striped bass Summer
33	8/14/12	Summer	MUB-2	UB	Alewife	0	0	Alewife Summer
33	8/14/12	Summer	MUB-2	UB	American shad	0	0	American shad Summer
33	8/14/12	Summer	MUB-2	UB	Atlantic menhaden	0	0	Atlantic menhaden Summer
33	8/14/12	Summer	MUB-2	UB	Blueback herring	0	0	Blueback herring Summer
33	8/14/12	Summer	MUB-2	UB	Striped bass	0	0	Striped bass Summer
33	8/14/12	Summer	MUB-1	UB	Alewife	0	0	Alewife Summer
33	8/14/12	Summer	MUB-1	UB	American shad	0	0	American shad Summer
33	8/14/12	Summer	MUB-1	UB	Atlantic menhaden	0	0	Atlantic menhaden Summer
33	8/14/12	Summer	MUB-1	UB	Blueback herring	0	0	Blueback herring Summer
33	8/14/12	Summer	MUB-1	UB	Striped bass	0	0	Striped bass Summer
33	8/15/12	Summer	MKK-1	AKKVK	Alewife	0	0	Alewife Summer
33	8/15/12	Summer	MKK-1	AKKVK	American shad	0	0	American shad Summer
33	8/15/12	Summer	MKK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Summer
33	8/15/12	Summer	MKK-1	AKKVK	Blueback herring	2	0.477121255	Blueback herring Summer
33	8/15/12	Summer	MKK-1	AKKVK	Striped bass	0	0	Striped bass Summer
33	8/15/12	Summer	MKK-2	AKKVK	Alewife	0	0	Alewife Summer
33	8/15/12	Summer	MKK-2	AKKVK	American shad	0	0	American shad Summer

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
33	8/15/12	Summer	MKK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Summer
33	8/15/12	Summer	MKK-2	AKKVK	Blueback herring	0	0	Blueback herring Summer
33	8/15/12	Summer	MKK-2	AKKVK	Striped bass	0	0	Striped bass Summer
33	8/15/12	Summer	MAK-4	AKKVK	Alewife	0	0	Alewife Summer
33	8/15/12	Summer	MAK-4	AKKVK	American shad	0	0	American shad Summer
33	8/15/12	Summer	MAK-4	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Summer
33	8/15/12	Summer	MAK-4	AKKVK	Blueback herring	2	0.477121255	Blueback herring Summer
33	8/15/12	Summer	MAK-4	AKKVK	Striped bass	0	0	Striped bass Summer
33	8/15/12	Summer	MAK-3	AKKVK	Alewife	0	0	Alewife Summer
33	8/15/12	Summer	MAK-3	AKKVK	American shad	0	0	American shad Summer
33	8/15/12	Summer	MAK-3	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Summer
33	8/15/12	Summer	MAK-3	AKKVK	Blueback herring	5	0.77815125	Blueback herring Summer
33	8/15/12	Summer	MAK-3	AKKVK	Striped bass	0	0	Striped bass Summer
33	8/15/12	Summer	MAK-2	AKKVK	Alewife	0	0	Alewife Summer
33	8/15/12	Summer	MAK-2	AKKVK	American shad	1	0.301029996	American shad Summer
33	8/15/12	Summer	MAK-2	AKKVK	Atlantic menhaden	1	0.301029996	Atlantic menhaden Summer
33	8/15/12	Summer	MAK-2	AKKVK	Blueback herring	3	0.602059991	Blueback herring Summer
33	8/15/12	Summer	MAK-2	AKKVK	Striped bass	0	0	Striped bass Summer
33	8/15/12	Summer	MAK-1	AKKVK	Alewife	0	0	Alewife Summer
33	8/15/12	Summer	MAK-1	AKKVK	American shad	1	0.301029996	American shad Summer
33	8/15/12	Summer	MAK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Summer
33	8/15/12	Summer	MAK-1	AKKVK	Blueback herring	0	0	Blueback herring Summer
33	8/15/12	Summer	MAK-1	AKKVK	Striped bass	0	0	Striped bass Summer
33	8/15/12	Summer	MNB-1	NB	Alewife	0	0	Alewife Summer
33	8/15/12	Summer	MNB-1	NB	American shad	0	0	American shad Summer
33	8/15/12	Summer	MNB-1	NB	Atlantic menhaden	0	0	Atlantic menhaden Summer
33	8/15/12	Summer	MNB-1	NB	Blueback herring	0	0	Blueback herring Summer
33	8/15/12	Summer	MNB-1	NB	Striped bass	0	0	Striped bass Summer

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
33	8/15/12	Summer	MNB-2	NB	Alewife	0	0	Alewife Summer
33	8/15/12	Summer	MNB-2	NB	American shad	0	0	American shad Summer
33	8/15/12	Summer	MNB-2	NB	Atlantic menhaden	1	0.301029996	Atlantic menhaden Summer
33	8/15/12	Summer	MNB-2	NB	Blueback herring	0	0	Blueback herring Summer
33	8/15/12	Summer	MNB-2	NB	Striped bass	0	0	Striped bass Summer
33	8/15/12	Summer	MNB-5	NB	Alewife	0	0	Alewife Summer
33	8/15/12	Summer	MNB-5	NB	American shad	0	0	American shad Summer
33	8/15/12	Summer	MNB-5	NB	Atlantic menhaden	0	0	Atlantic menhaden Summer
33	8/15/12	Summer	MNB-5	NB	Blueback herring	5	0.77815125	Blueback herring Summer
33	8/15/12	Summer	MNB-5	NB	Striped bass	0	0	Striped bass Summer
33	8/15/12	Summer	MNB-6	NB	Alewife	0	0	Alewife Summer
33	8/15/12	Summer	MNB-6	NB	American shad	0	0	American shad Summer
33	8/15/12	Summer	MNB-6	NB	Atlantic menhaden	2	0.477121255	Atlantic menhaden Summer
33	8/15/12	Summer	MNB-6	NB	Blueback herring	5	0.77815125	Blueback herring Summer
33	8/15/12	Summer	MNB-6	NB	Striped bass	0	0	Striped bass Summer
37	9/10/12	Fall	MLB-6	LB	Alewife	0	0	Alewife Fall
37	9/10/12	Fall	MLB-6	LB	American shad	0	0	American shad Fall
37	9/10/12	Fall	MLB-6	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
37	9/10/12	Fall	MLB-6	LB	Blueback herring	0	0	Blueback herring Fall
37	9/10/12	Fall	MLB-6	LB	Striped bass	0	0	Striped bass Fall
37	9/10/12	Fall	MLB-5	LB	Alewife	0	0	Alewife Fall
37	9/10/12	Fall	MLB-5	LB	American shad	0	0	American shad Fall
37	9/10/12	Fall	MLB-5	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
37	9/10/12	Fall	MLB-5	LB	Blueback herring	0	0	Blueback herring Fall
37	9/10/12	Fall	MLB-5	LB	Striped bass	0	0	Striped bass Fall
37	9/10/12	Fall	MLB-3	LB	Alewife	0	0	Alewife Fall
37	9/10/12	Fall	MLB-3	LB	American shad	0	0	American shad Fall
37	9/10/12	Fall	MLB-3	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
37	9/10/12	Fall	MLB-3	LB	Blueback herring	0	0	Blueback herring Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
37	9/10/12	Fall	MLB-3	LB	Striped bass	0	0	Striped bass Fall
37	9/10/12	Fall	MLB-4	LB	Alewife	0	0	Alewife Fall
37	9/10/12	Fall	MLB-4	LB	American shad	0	0	American shad Fall
37	9/10/12	Fall	MLB-4	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
37	9/10/12	Fall	MLB-4	LB	Blueback herring	0	0	Blueback herring Fall
37	9/10/12	Fall	MLB-4	LB	Striped bass	0	0	Striped bass Fall
37	9/10/12	Fall	MUB-8	UB	Alewife	0	0	Alewife Fall
37	9/10/12	Fall	MUB-8	UB	American shad	0	0	American shad Fall
37	9/10/12	Fall	MUB-8	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
37	9/10/12	Fall	MUB-8	UB	Blueback herring	0	0	Blueback herring Fall
37	9/10/12	Fall	MUB-8	UB	Striped bass	0	0	Striped bass Fall
37	9/10/12	Fall	MUB-9	UB	Alewife	0	0	Alewife Fall
37	9/10/12	Fall	MUB-9	UB	American shad	0	0	American shad Fall
37	9/10/12	Fall	MUB-9	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
37	9/10/12	Fall	MUB-9	UB	Blueback herring	0	0	Blueback herring Fall
37	9/10/12	Fall	MUB-9	UB	Striped bass	0	0	Striped bass Fall
37	9/10/12	Fall	MUB-11	UB	Alewife	0	0	Alewife Fall
37	9/10/12	Fall	MUB-11	UB	American shad	0	0	American shad Fall
37	9/10/12	Fall	MUB-11	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
37	9/10/12	Fall	MUB-11	UB	Blueback herring	0	0	Blueback herring Fall
37	9/10/12	Fall	MUB-11	UB	Striped bass	0	0	Striped bass Fall
37	9/10/12	Fall	MUB-3	UB	Alewife	0	0	Alewife Fall
37	9/10/12	Fall	MUB-3	UB	American shad	0	0	American shad Fall
37	9/10/12	Fall	MUB-3	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
37	9/10/12	Fall	MUB-3	UB	Blueback herring	0	0	Blueback herring Fall
37	9/10/12	Fall	MUB-3	UB	Striped bass	0	0	Striped bass Fall
37	9/10/12	Fall	MUB-2	UB	Alewife	0	0	Alewife Fall
37	9/10/12	Fall	MUB-2	UB	American shad	0	0	American shad Fall
37	9/10/12	Fall	MUB-2	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
37	9/10/12	Fall	MUB-2	UB	Blueback herring	0	0	Blueback herring Fall
37	9/10/12	Fall	MUB-2	UB	Striped bass	0	0	Striped bass Fall
37	9/10/12	Fall	MUB-1	UB	Alewife	0	0	Alewife Fall
37	9/10/12	Fall	MUB-1	UB	American shad	0	0	American shad Fall
37	9/10/12	Fall	MUB-1	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
37	9/10/12	Fall	MUB-1	UB	Blueback herring	0	0	Blueback herring Fall
37	9/10/12	Fall	MUB-1	UB	Striped bass	0	0	Striped bass Fall
37	9/11/12	Fall	MKK-1	AKKVK	Alewife	0	0	Alewife Fall
37	9/11/12	Fall	MKK-1	AKKVK	American shad	0	0	American shad Fall
37	9/11/12	Fall	MKK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
37	9/11/12	Fall	MKK-1	AKKVK	Blueback herring	0	0	Blueback herring Fall
37	9/11/12	Fall	MKK-1	AKKVK	Striped bass	0	0	Striped bass Fall
37	9/11/12	Fall	MKK-2	AKKVK	Alewife	0	0	Alewife Fall
37	9/11/12	Fall	MKK-2	AKKVK	American shad	0	0	American shad Fall
37	9/11/12	Fall	MKK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
37	9/11/12	Fall	MKK-2	AKKVK	Blueback herring	0	0	Blueback herring Fall
37	9/11/12	Fall	MKK-2	AKKVK	Striped bass	0	0	Striped bass Fall
37	9/11/12	Fall	MAK-4	AKKVK	Alewife	0	0	Alewife Fall
37	9/11/12	Fall	MAK-4	AKKVK	American shad	0	0	American shad Fall
37	9/11/12	Fall	MAK-4	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
37	9/11/12	Fall	MAK-4	AKKVK	Blueback herring	0	0	Blueback herring Fall
37	9/11/12	Fall	MAK-4	AKKVK	Striped bass	0	0	Striped bass Fall
37	9/11/12	Fall	MAK-3	AKKVK	Alewife	0	0	Alewife Fall
37	9/11/12	Fall	MAK-3	AKKVK	American shad	0	0	American shad Fall
37	9/11/12	Fall	MAK-3	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
37	9/11/12	Fall	MAK-3	AKKVK	Blueback herring	0	0	Blueback herring Fall
37	9/11/12	Fall	MAK-3	AKKVK	Striped bass	0	0	Striped bass Fall
37	9/11/12	Fall	MAK-2	AKKVK	Alewife	0	0	Alewife Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
37	9/11/12	Fall	MAK-2	AKKVK	American shad	0	0	American shad Fall
37	9/11/12	Fall	MAK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
37	9/11/12	Fall	MAK-2	AKKVK	Blueback herring	0	0	Blueback herring Fall
37	9/11/12	Fall	MAK-2	AKKVK	Striped bass	0	0	Striped bass Fall
37	9/11/12	Fall	MAK-1	AKKVK	Alewife	0	0	Alewife Fall
37	9/11/12	Fall	MAK-1	AKKVK	American shad	0	0	American shad Fall
37	9/11/12	Fall	MAK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
37	9/11/12	Fall	MAK-1	AKKVK	Blueback herring	0	0	Blueback herring Fall
37	9/11/12	Fall	MAK-1	AKKVK	Striped bass	0	0	Striped bass Fall
37	9/11/12	Fall	MNB-1	NB	Alewife	0	0	Alewife Fall
37	9/11/12	Fall	MNB-1	NB	American shad	0	0	American shad Fall
37	9/11/12	Fall	MNB-1	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
37	9/11/12	Fall	MNB-1	NB	Blueback herring	0	0	Blueback herring Fall
37	9/11/12	Fall	MNB-1	NB	Striped bass	0	0	Striped bass Fall
37	9/11/12	Fall	MNB-2	NB	Alewife	0	0	Alewife Fall
37	9/11/12	Fall	MNB-2	NB	American shad	0	0	American shad Fall
37	9/11/12	Fall	MNB-2	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
37	9/11/12	Fall	MNB-2	NB	Blueback herring	0	0	Blueback herring Fall
37	9/11/12	Fall	MNB-2	NB	Striped bass	0	0	Striped bass Fall
37	9/11/12	Fall	MNB-6	NB	Alewife	0	0	Alewife Fall
37	9/11/12	Fall	MNB-6	NB	American shad	0	0	American shad Fall
37	9/11/12	Fall	MNB-6	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
37	9/11/12	Fall	MNB-6	NB	Blueback herring	2	0.477121255	Blueback herring Fall
37	9/11/12	Fall	MNB-6	NB	Striped bass	0	0	Striped bass Fall
37	9/11/12	Fall	MNB-5	NB	Alewife	0	0	Alewife Fall
37	9/11/12	Fall	MNB-5	NB	American shad	0	0	American shad Fall
37	9/11/12	Fall	MNB-5	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
37	9/11/12	Fall	MNB-5	NB	Blueback herring	1	0.301029996	Blueback herring Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
37	9/11/12	Fall	MNB-5	NB	Striped bass	0	0	Striped bass Fall
39	9/25/12	Fall	MKK-1	AKKVK	Alewife	0	0	Alewife Fall
39	9/25/12	Fall	MKK-1	AKKVK	American shad	0	0	American shad Fall
39	9/25/12	Fall	MKK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
39	9/25/12	Fall	MKK-1	AKKVK	Blueback herring	0	0	Blueback herring Fall
39	9/25/12	Fall	MKK-1	AKKVK	Striped bass	0	0	Striped bass Fall
39	9/25/12	Fall	MLB-4	LB	Alewife	0	0	Alewife Fall
39	9/25/12	Fall	MLB-4	LB	American shad	0	0	American shad Fall
39	9/25/12	Fall	MLB-4	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
39	9/25/12	Fall	MLB-4	LB	Blueback herring	0	0	Blueback herring Fall
39	9/25/12	Fall	MLB-4	LB	Striped bass	0	0	Striped bass Fall
39	9/25/12	Fall	MLB-3	LB	Alewife	0	0	Alewife Fall
39	9/25/12	Fall	MLB-3	LB	American shad	0	0	American shad Fall
39	9/25/12	Fall	MLB-3	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
39	9/25/12	Fall	MLB-3	LB	Blueback herring	0	0	Blueback herring Fall
39	9/25/12	Fall	MLB-3	LB	Striped bass	0	0	Striped bass Fall
39	9/25/12	Fall	MLB-5	LB	Alewife	0	0	Alewife Fall
39	9/25/12	Fall	MLB-5	LB	American shad	0	0	American shad Fall
39	9/25/12	Fall	MLB-5	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
39	9/25/12	Fall	MLB-5	LB	Blueback herring	0	0	Blueback herring Fall
39	9/25/12	Fall	MLB-5	LB	Striped bass	0	0	Striped bass Fall
39	9/25/12	Fall	MLB-6	LB	Alewife	0	0	Alewife Fall
39	9/25/12	Fall	MLB-6	LB	American shad	0	0	American shad Fall
39	9/25/12	Fall	MLB-6	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
39	9/25/12	Fall	MLB-6	LB	Blueback herring	0	0	Blueback herring Fall
39	9/25/12	Fall	MLB-6	LB	Striped bass	0	0	Striped bass Fall
39	9/25/12	Fall	MUB-8	UB	Alewife	0	0	Alewife Fall
39	9/25/12	Fall	MUB-8	UB	American shad	0	0	American shad Fall
39	9/25/12	Fall	MUB-8	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
39	9/25/12	Fall	MUB-8	UB	Blueback herring	0	0	Blueback herring Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
39	9/25/12	Fall	MUB-8	UB	Striped bass	0	0	Striped bass Fall
39	9/25/12	Fall	MUB-9	UB	Alewife	0	0	Alewife Fall
39	9/25/12	Fall	MUB-9	UB	American shad	0	0	American shad Fall
39	9/25/12	Fall	MUB-9	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
39	9/25/12	Fall	MUB-9	UB	Blueback herring	0	0	Blueback herring Fall
39	9/25/12	Fall	MUB-9	UB	Striped bass	0	0	Striped bass Fall
39	9/25/12	Fall	MUB-1	UB	Alewife	0	0	Alewife Fall
39	9/25/12	Fall	MUB-1	UB	American shad	0	0	American shad Fall
39	9/25/12	Fall	MUB-1	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
39	9/25/12	Fall	MUB-1	UB	Blueback herring	0	0	Blueback herring Fall
39	9/25/12	Fall	MUB-1	UB	Striped bass	0	0	Striped bass Fall
39	9/25/12	Fall	MUB-2	UB	Alewife	0	0	Alewife Fall
39	9/25/12	Fall	MUB-2	UB	American shad	0	0	American shad Fall
39	9/25/12	Fall	MUB-2	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
39	9/25/12	Fall	MUB-2	UB	Blueback herring	0	0	Blueback herring Fall
39	9/25/12	Fall	MUB-2	UB	Striped bass	0	0	Striped bass Fall
39	9/25/12	Fall	MUB-3	UB	Alewife	0	0	Alewife Fall
39	9/25/12	Fall	MUB-3	UB	American shad	0	0	American shad Fall
39	9/25/12	Fall	MUB-3	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
39	9/25/12	Fall	MUB-3	UB	Blueback herring	0	0	Blueback herring Fall
39	9/25/12	Fall	MUB-3	UB	Striped bass	0	0	Striped bass Fall
39	9/25/12	Fall	MUB-11	UB	Alewife	0	0	Alewife Fall
39	9/25/12	Fall	MUB-11	UB	American shad	0	0	American shad Fall
39	9/25/12	Fall	MUB-11	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
39	9/25/12	Fall	MUB-11	UB	Blueback herring	0	0	Blueback herring Fall
39	9/25/12	Fall	MUB-11	UB	Striped bass	0	0	Striped bass Fall
39	9/26/12	Fall	MKK-2	AKKVK	Alewife	0	0	Alewife Fall
39	9/26/12	Fall	MKK-2	AKKVK	American shad	0	0	American shad Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
39	9/26/12	Fall	MKK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
39	9/26/12	Fall	MKK-2	AKKVK	Blueback herring	0	0	Blueback herring Fall
39	9/26/12	Fall	MKK-2	AKKVK	Striped bass	0	0	Striped bass Fall
39	9/26/12	Fall	MAK-1	AKKVK	Alewife	0	0	Alewife Fall
39	9/26/12	Fall	MAK-1	AKKVK	American shad	0	0	American shad Fall
39	9/26/12	Fall	MAK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
39	9/26/12	Fall	MAK-1	AKKVK	Blueback herring	0	0	Blueback herring Fall
39	9/26/12	Fall	MAK-1	AKKVK	Striped bass	0	0	Striped bass Fall
39	9/26/12	Fall	MAK-4	AKKVK	Alewife	0	0	Alewife Fall
39	9/26/12	Fall	MAK-4	AKKVK	American shad	0	0	American shad Fall
39	9/26/12	Fall	MAK-4	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
39	9/26/12	Fall	MAK-4	AKKVK	Blueback herring	0	0	Blueback herring Fall
39	9/26/12	Fall	MAK-4	AKKVK	Striped bass	0	0	Striped bass Fall
39	9/26/12	Fall	MAK-3	AKKVK	Alewife	0	0	Alewife Fall
39	9/26/12	Fall	MAK-3	AKKVK	American shad	0	0	American shad Fall
39	9/26/12	Fall	MAK-3	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
39	9/26/12	Fall	MAK-3	AKKVK	Blueback herring	0	0	Blueback herring Fall
39	9/26/12	Fall	MAK-3	AKKVK	Striped bass	0	0	Striped bass Fall
39	9/26/12	Fall	MAK-2	AKKVK	Alewife	0	0	Alewife Fall
39	9/26/12	Fall	MAK-2	AKKVK	American shad	0	0	American shad Fall
39	9/26/12	Fall	MAK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
39	9/26/12	Fall	MAK-2	AKKVK	Blueback herring	0	0	Blueback herring Fall
39	9/26/12	Fall	MAK-2	AKKVK	Striped bass	0	0	Striped bass Fall
39	9/26/12	Fall	MNB-1	NB	Alewife	0	0	Alewife Fall
39	9/26/12	Fall	MNB-1	NB	American shad	0	0	American shad Fall
39	9/26/12	Fall	MNB-1	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
39	9/26/12	Fall	MNB-1	NB	Blueback herring	0	0	Blueback herring Fall
39	9/26/12	Fall	MNB-1	NB	Striped bass	0	0	Striped bass Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
39	9/26/12	Fall	MNB-2	NB	Alewife	0	0	Alewife Fall
39	9/26/12	Fall	MNB-2	NB	American shad	0	0	American shad Fall
39	9/26/12	Fall	MNB-2	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
39	9/26/12	Fall	MNB-2	NB	Blueback herring	0	0	Blueback herring Fall
39	9/26/12	Fall	MNB-2	NB	Striped bass	0	0	Striped bass Fall
39	9/26/12	Fall	MNB-5	NB	Alewife	1	0.301029996	Alewife Fall
39	9/26/12	Fall	MNB-5	NB	American shad	0	0	American shad Fall
39	9/26/12	Fall	MNB-5	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
39	9/26/12	Fall	MNB-5	NB	Blueback herring	0	0	Blueback herring Fall
39	9/26/12	Fall	MNB-5	NB	Striped bass	0	0	Striped bass Fall
39	9/26/12	Fall	MNB-6	NB	Alewife	0	0	Alewife Fall
39	9/26/12	Fall	MNB-6	NB	American shad	0	0	American shad Fall
39	9/26/12	Fall	MNB-6	NB	Atlantic menhaden	3	0.602059991	Atlantic menhaden Fall
39	9/26/12	Fall	MNB-6	NB	Blueback herring	0	0	Blueback herring Fall
39	9/26/12	Fall	MNB-6	NB	Striped bass	0	0	Striped bass Fall
40	10/2/12	Fall	MKK-1	AKKVK	Alewife	0	0	Alewife Fall
40	10/2/12	Fall	MKK-1	AKKVK	American shad	0	0	American shad Fall
40	10/2/12	Fall	MKK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
40	10/2/12	Fall	MKK-1	AKKVK	Blueback herring	0	0	Blueback herring Fall
40	10/2/12	Fall	MKK-1	AKKVK	Striped bass	0	0	Striped bass Fall
40	10/2/12	Fall	MLB-4	LB	Alewife	0	0	Alewife Fall
40	10/2/12	Fall	MLB-4	LB	American shad	0	0	American shad Fall
40	10/2/12	Fall	MLB-4	LB	Atlantic menhaden	1	0.301029996	Atlantic menhaden Fall
40	10/2/12	Fall	MLB-4	LB	Blueback herring	0	0	Blueback herring Fall
40	10/2/12	Fall	MLB-4	LB	Striped bass	0	0	Striped bass Fall
40	10/2/12	Fall	MLB-3	LB	Alewife	0	0	Alewife Fall
40	10/2/12	Fall	MLB-3	LB	American shad	0	0	American shad Fall
40	10/2/12	Fall	MLB-3	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
40	10/2/12	Fall	MLB-3	LB	Blueback herring	0	0	Blueback herring Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
40	10/2/12	Fall	MLB-3	LB	Striped bass	0	0	Striped bass Fall
40	10/2/12	Fall	MLB-5	LB	Alewife	0	0	Alewife Fall
40	10/2/12	Fall	MLB-5	LB	American shad	0	0	American shad Fall
40	10/2/12	Fall	MLB-5	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
40	10/2/12	Fall	MLB-5	LB	Blueback herring	0	0	Blueback herring Fall
40	10/2/12	Fall	MLB-5	LB	Striped bass	0	0	Striped bass Fall
40	10/2/12	Fall	MLB-6	LB	Alewife	0	0	Alewife Fall
40	10/2/12	Fall	MLB-6	LB	American shad	0	0	American shad Fall
40	10/2/12	Fall	MLB-6	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
40	10/2/12	Fall	MLB-6	LB	Blueback herring	0	0	Blueback herring Fall
40	10/2/12	Fall	MLB-6	LB	Striped bass	0	0	Striped bass Fall
40	10/2/12	Fall	MUB-9	UB	Alewife	0	0	Alewife Fall
40	10/2/12	Fall	MUB-9	UB	American shad	0	0	American shad Fall
40	10/2/12	Fall	MUB-9	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
40	10/2/12	Fall	MUB-9	UB	Blueback herring	0	0	Blueback herring Fall
40	10/2/12	Fall	MUB-9	UB	Striped bass	0	0	Striped bass Fall
40	10/2/12	Fall	MUB-8	UB	Alewife	0	0	Alewife Fall
40	10/2/12	Fall	MUB-8	UB	American shad	0	0	American shad Fall
40	10/2/12	Fall	MUB-8	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
40	10/2/12	Fall	MUB-8	UB	Blueback herring	0	0	Blueback herring Fall
40	10/2/12	Fall	MUB-8	UB	Striped bass	0	0	Striped bass Fall
40	10/2/12	Fall	MUB-11	UB	Alewife	0	0	Alewife Fall
40	10/2/12	Fall	MUB-11	UB	American shad	0	0	American shad Fall
40	10/2/12	Fall	MUB-11	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
40	10/2/12	Fall	MUB-11	UB	Blueback herring	0	0	Blueback herring Fall
40	10/2/12	Fall	MUB-11	UB	Striped bass	0	0	Striped bass Fall
40	10/2/12	Fall	MUB-3	UB	Alewife	0	0	Alewife Fall
40	10/2/12	Fall	MUB-3	UB	American shad	0	0	American shad Fall
40	10/2/12	Fall	MUB-3	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
40	10/2/12	Fall	MUB-3	UB	Blueback herring	0	0	Blueback herring Fall
40	10/2/12	Fall	MUB-3	UB	Striped bass	0	0	Striped bass Fall
40	10/2/12	Fall	MUB-2	UB	Alewife	0	0	Alewife Fall
40	10/2/12	Fall	MUB-2	UB	American shad	0	0	American shad Fall
40	10/2/12	Fall	MUB-2	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
40	10/2/12	Fall	MUB-2	UB	Blueback herring	0	0	Blueback herring Fall
40	10/2/12	Fall	MUB-2	UB	Striped bass	0	0	Striped bass Fall
40	10/2/12	Fall	MUB-1	UB	Alewife	0	0	Alewife Fall
40	10/2/12	Fall	MUB-1	UB	American shad	0	0	American shad Fall
40	10/2/12	Fall	MUB-1	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
40	10/2/12	Fall	MUB-1	UB	Blueback herring	0	0	Blueback herring Fall
40	10/2/12	Fall	MUB-1	UB	Striped bass	0	0	Striped bass Fall
40	10/3/12	Fall	MKK-2	AKKVK	Alewife	0	0	Alewife Fall
40	10/3/12	Fall	MKK-2	AKKVK	American shad	0	0	American shad Fall
40	10/3/12	Fall	MKK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
40	10/3/12	Fall	MKK-2	AKKVK	Blueback herring	0	0	Blueback herring Fall
40	10/3/12	Fall	MKK-2	AKKVK	Striped bass	0	0	Striped bass Fall
40	10/3/12	Fall	MAK-1	AKKVK	Alewife	0	0	Alewife Fall
40	10/3/12	Fall	MAK-1	AKKVK	American shad	0	0	American shad Fall
40	10/3/12	Fall	MAK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
40	10/3/12	Fall	MAK-1	AKKVK	Blueback herring	0	0	Blueback herring Fall
40	10/3/12	Fall	MAK-1	AKKVK	Striped bass	0	0	Striped bass Fall
40	10/3/12	Fall	MAK-2	AKKVK	Alewife	0	0	Alewife Fall
40	10/3/12	Fall	MAK-2	AKKVK	American shad	0	0	American shad Fall
40	10/3/12	Fall	MAK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
40	10/3/12	Fall	MAK-2	AKKVK	Blueback herring	0	0	Blueback herring Fall
40	10/3/12	Fall	MAK-2	AKKVK	Striped bass	0	0	Striped bass Fall
40	10/3/12	Fall	MAK-3	AKKVK	Alewife	0	0	Alewife Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
40	10/3/12	Fall	MAK-3	AKKVK	American shad	0	0	American shad Fall
40	10/3/12	Fall	MAK-3	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
40	10/3/12	Fall	MAK-3	AKKVK	Blueback herring	0	0	Blueback herring Fall
40	10/3/12	Fall	MAK-3	AKKVK	Striped bass	0	0	Striped bass Fall
40	10/3/12	Fall	MAK-4	AKKVK	Alewife	0	0	Alewife Fall
40	10/3/12	Fall	MAK-4	AKKVK	American shad	0	0	American shad Fall
40	10/3/12	Fall	MAK-4	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
40	10/3/12	Fall	MAK-4	AKKVK	Blueback herring	0	0	Blueback herring Fall
40	10/3/12	Fall	MAK-4	AKKVK	Striped bass	0	0	Striped bass Fall
40	10/3/12	Fall	MNB-1	NB	Alewife	0	0	Alewife Fall
40	10/3/12	Fall	MNB-1	NB	American shad	0	0	American shad Fall
40	10/3/12	Fall	MNB-1	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
40	10/3/12	Fall	MNB-1	NB	Blueback herring	0	0	Blueback herring Fall
40	10/3/12	Fall	MNB-1	NB	Striped bass	0	0	Striped bass Fall
40	10/3/12	Fall	MNB-2	NB	Alewife	0	0	Alewife Fall
40	10/3/12	Fall	MNB-2	NB	American shad	0	0	American shad Fall
40	10/3/12	Fall	MNB-2	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
40	10/3/12	Fall	MNB-2	NB	Blueback herring	0	0	Blueback herring Fall
40	10/3/12	Fall	MNB-2	NB	Striped bass	0	0	Striped bass Fall
40	10/3/12	Fall	MNB-5	NB	Alewife	0	0	Alewife Fall
40	10/3/12	Fall	MNB-5	NB	American shad	0	0	American shad Fall
40	10/3/12	Fall	MNB-5	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
40	10/3/12	Fall	MNB-5	NB	Blueback herring	0	0	Blueback herring Fall
40	10/3/12	Fall	MNB-5	NB	Striped bass	0	0	Striped bass Fall
40	10/3/12	Fall	MNB-6	NB	Alewife	0	0	Alewife Fall
40	10/3/12	Fall	MNB-6	NB	American shad	0	0	American shad Fall
40	10/3/12	Fall	MNB-6	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
40	10/3/12	Fall	MNB-6	NB	Blueback herring	0	0	Blueback herring Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
40	10/3/12	Fall	MNB-6	NB	Striped bass	0	0	Striped bass Fall
41	10/10/12	Fall	MKK-1	AKKVK	Alewife	0	0	Alewife Fall
41	10/10/12	Fall	MKK-1	AKKVK	American shad	0	0	American shad Fall
41	10/10/12	Fall	MKK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
41	10/10/12	Fall	MKK-1	AKKVK	Blueback herring	0	0	Blueback herring Fall
41	10/10/12	Fall	MKK-1	AKKVK	Striped bass	0	0	Striped bass Fall
41	10/10/12	Fall	MKK-2	AKKVK	Alewife	0	0	Alewife Fall
41	10/10/12	Fall	MKK-2	AKKVK	American shad	0	0	American shad Fall
41	10/10/12	Fall	MKK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
41	10/10/12	Fall	MKK-2	AKKVK	Blueback herring	0	0	Blueback herring Fall
41	10/10/12	Fall	MKK-2	AKKVK	Striped bass	0	0	Striped bass Fall
41	10/10/12	Fall	MAK-1	AKKVK	Alewife	0	0	Alewife Fall
41	10/10/12	Fall	MAK-1	AKKVK	American shad	0	0	American shad Fall
41	10/10/12	Fall	MAK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
41	10/10/12	Fall	MAK-1	AKKVK	Blueback herring	0	0	Blueback herring Fall
41	10/10/12	Fall	MAK-1	AKKVK	Striped bass	0	0	Striped bass Fall
41	10/10/12	Fall	MAK-4	AKKVK	Alewife	0	0	Alewife Fall
41	10/10/12	Fall	MAK-4	AKKVK	American shad	0	0	American shad Fall
41	10/10/12	Fall	MAK-4	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
41	10/10/12	Fall	MAK-4	AKKVK	Blueback herring	0	0	Blueback herring Fall
41	10/10/12	Fall	MAK-4	AKKVK	Striped bass	0	0	Striped bass Fall
41	10/10/12	Fall	MAK-3	AKKVK	Alewife	0	0	Alewife Fall
41	10/10/12	Fall	MAK-3	AKKVK	American shad	0	0	American shad Fall
41	10/10/12	Fall	MAK-3	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
41	10/10/12	Fall	MAK-3	AKKVK	Blueback herring	0	0	Blueback herring Fall
41	10/10/12	Fall	MAK-3	AKKVK	Striped bass	0	0	Striped bass Fall
41	10/10/12	Fall	MAK-2	AKKVK	Alewife	0	0	Alewife Fall
41	10/10/12	Fall	MAK-2	AKKVK	American shad	0	0	American shad Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
41	10/10/12	Fall	MAK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
41	10/10/12	Fall	MAK-2	AKKVK	Blueback herring	0	0	Blueback herring Fall
41	10/10/12	Fall	MAK-2	AKKVK	Striped bass	0	0	Striped bass Fall
41	10/10/12	Fall	MNB-1	NB	Alewife	0	0	Alewife Fall
41	10/10/12	Fall	MNB-1	NB	American shad	0	0	American shad Fall
41	10/10/12	Fall	MNB-1	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
41	10/10/12	Fall	MNB-1	NB	Blueback herring	0	0	Blueback herring Fall
41	10/10/12	Fall	MNB-1	NB	Striped bass	0	0	Striped bass Fall
41	10/10/12	Fall	MNB-2	NB	Alewife	0	0	Alewife Fall
41	10/10/12	Fall	MNB-2	NB	American shad	0	0	American shad Fall
41	10/10/12	Fall	MNB-2	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
41	10/10/12	Fall	MNB-2	NB	Blueback herring	2	0.477121255	Blueback herring Fall
41	10/10/12	Fall	MNB-2	NB	Striped bass	0	0	Striped bass Fall
41	10/10/12	Fall	MNB-5	NB	Alewife	0	0	Alewife Fall
41	10/10/12	Fall	MNB-5	NB	American shad	0	0	American shad Fall
41	10/10/12	Fall	MNB-5	NB	Atlantic menhaden	2	0.477121255	Atlantic menhaden Fall
41	10/10/12	Fall	MNB-5	NB	Blueback herring	28	1.462397998	Blueback herring Fall
41	10/10/12	Fall	MNB-5	NB	Striped bass	0	0	Striped bass Fall
41	10/10/12	Fall	MNB-6	NB	Alewife	0	0	Alewife Fall
41	10/10/12	Fall	MNB-6	NB	American shad	0	0	American shad Fall
41	10/10/12	Fall	MNB-6	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
41	10/10/12	Fall	MNB-6	NB	Blueback herring	0	0	Blueback herring Fall
41	10/10/12	Fall	MNB-6	NB	Striped bass	0	0	Striped bass Fall
41	10/11/12	Fall	MLB-6	LB	Alewife	0	0	Alewife Fall
41	10/11/12	Fall	MLB-6	LB	American shad	0	0	American shad Fall
41	10/11/12	Fall	MLB-6	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
41	10/11/12	Fall	MLB-6	LB	Blueback herring	0	0	Blueback herring Fall
41	10/11/12	Fall	MLB-6	LB	Striped bass	0	0	Striped bass Fall
41	10/11/12	Fall	MLB-5	LB	Alewife	0	0	Alewife Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
41	10/11/12	Fall	MLB-5	LB	American shad	0	0	American shad Fall
41	10/11/12	Fall	MLB-5	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
41	10/11/12	Fall	MLB-5	LB	Blueback herring	0	0	Blueback herring Fall
41	10/11/12	Fall	MLB-5	LB	Striped bass	0	0	Striped bass Fall
41	10/11/12	Fall	MLB-4	LB	Alewife	0	0	Alewife Fall
41	10/11/12	Fall	MLB-4	LB	American shad	0	0	American shad Fall
41	10/11/12	Fall	MLB-4	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
41	10/11/12	Fall	MLB-4	LB	Blueback herring	0	0	Blueback herring Fall
41	10/11/12	Fall	MLB-4	LB	Striped bass	0	0	Striped bass Fall
41	10/11/12	Fall	MLB-3	LB	Alewife	0	0	Alewife Fall
41	10/11/12	Fall	MLB-3	LB	American shad	0	0	American shad Fall
41	10/11/12	Fall	MLB-3	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
41	10/11/12	Fall	MLB-3	LB	Blueback herring	0	0	Blueback herring Fall
41	10/11/12	Fall	MLB-3	LB	Striped bass	0	0	Striped bass Fall
41	10/11/12	Fall	MUB-8	UB	Alewife	0	0	Alewife Fall
41	10/11/12	Fall	MUB-8	UB	American shad	0	0	American shad Fall
41	10/11/12	Fall	MUB-8	UB	Atlantic menhaden	1	0.301029996	Atlantic menhaden Fall
41	10/11/12	Fall	MUB-8	UB	Blueback herring	0	0	Blueback herring Fall
41	10/11/12	Fall	MUB-8	UB	Striped bass	0	0	Striped bass Fall
41	10/11/12	Fall	MUB-9	UB	Alewife	0	0	Alewife Fall
41	10/11/12	Fall	MUB-9	UB	American shad	0	0	American shad Fall
41	10/11/12	Fall	MUB-9	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
41	10/11/12	Fall	MUB-9	UB	Blueback herring	0	0	Blueback herring Fall
41	10/11/12	Fall	MUB-9	UB	Striped bass	0	0	Striped bass Fall
41	10/11/12	Fall	MUB-11	UB	Alewife	0	0	Alewife Fall
41	10/11/12	Fall	MUB-11	UB	American shad	0	0	American shad Fall
41	10/11/12	Fall	MUB-11	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
41	10/11/12	Fall	MUB-11	UB	Blueback herring	0	0	Blueback herring Fall
41	10/11/12	Fall	MUB-11	UB	Striped bass	0	0	Striped bass Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
41	10/11/12	Fall	MUB-3	UB	Alewife	0	0	Alewife Fall
41	10/11/12	Fall	MUB-3	UB	American shad	0	0	American shad Fall
41	10/11/12	Fall	MUB-3	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
41	10/11/12	Fall	MUB-3	UB	Blueback herring	0	0	Blueback herring Fall
41	10/11/12	Fall	MUB-3	UB	Striped bass	0	0	Striped bass Fall
41	10/11/12	Fall	MUB-2	UB	Alewife	0	0	Alewife Fall
41	10/11/12	Fall	MUB-2	UB	American shad	0	0	American shad Fall
41	10/11/12	Fall	MUB-2	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
41	10/11/12	Fall	MUB-2	UB	Blueback herring	0	0	Blueback herring Fall
41	10/11/12	Fall	MUB-2	UB	Striped bass	0	0	Striped bass Fall
41	10/11/12	Fall	MUB-1	UB	Alewife	0	0	Alewife Fall
41	10/11/12	Fall	MUB-1	UB	American shad	0	0	American shad Fall
41	10/11/12	Fall	MUB-1	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
41	10/11/12	Fall	MUB-1	UB	Blueback herring	0	0	Blueback herring Fall
41	10/11/12	Fall	MUB-1	UB	Striped bass	0	0	Striped bass Fall
42	10/15/12	Fall	MKK-1	AKKVK	Alewife	0	0	Alewife Fall
42	10/15/12	Fall	MKK-1	AKKVK	American shad	0	0	American shad Fall
42	10/15/12	Fall	MKK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
42	10/15/12	Fall	MKK-1	AKKVK	Blueback herring	0	0	Blueback herring Fall
42	10/15/12	Fall	MKK-1	AKKVK	Striped bass	0	0	Striped bass Fall
42	10/15/12	Fall	MLB-4	LB	Alewife	0	0	Alewife Fall
42	10/15/12	Fall	MLB-4	LB	American shad	0	0	American shad Fall
42	10/15/12	Fall	MLB-4	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
42	10/15/12	Fall	MLB-4	LB	Blueback herring	0	0	Blueback herring Fall
42	10/15/12	Fall	MLB-4	LB	Striped bass	0	0	Striped bass Fall
42	10/15/12	Fall	MLB-3	LB	Alewife	0	0	Alewife Fall
42	10/15/12	Fall	MLB-3	LB	American shad	0	0	American shad Fall
42	10/15/12	Fall	MLB-3	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
42	10/15/12	Fall	MLB-3	LB	Blueback herring	0	0	Blueback herring Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
42	10/15/12	Fall	MLB-3	LB	Striped bass	0	0	Striped bass Fall
42	10/15/12	Fall	MLB-5	LB	Alewife	0	0	Alewife Fall
42	10/15/12	Fall	MLB-5	LB	American shad	0	0	American shad Fall
42	10/15/12	Fall	MLB-5	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
42	10/15/12	Fall	MLB-5	LB	Blueback herring	0	0	Blueback herring Fall
42	10/15/12	Fall	MLB-5	LB	Striped bass	0	0	Striped bass Fall
42	10/15/12	Fall	MLB-6	LB	Alewife	0	0	Alewife Fall
42	10/15/12	Fall	MLB-6	LB	American shad	0	0	American shad Fall
42	10/15/12	Fall	MLB-6	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
42	10/15/12	Fall	MLB-6	LB	Blueback herring	0	0	Blueback herring Fall
42	10/15/12	Fall	MLB-6	LB	Striped bass	0	0	Striped bass Fall
42	10/15/12	Fall	MUB-9	UB	Alewife	0	0	Alewife Fall
42	10/15/12	Fall	MUB-9	UB	American shad	0	0	American shad Fall
42	10/15/12	Fall	MUB-9	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
42	10/15/12	Fall	MUB-9	UB	Blueback herring	0	0	Blueback herring Fall
42	10/15/12	Fall	MUB-9	UB	Striped bass	0	0	Striped bass Fall
42	10/15/12	Fall	MUB-8	UB	Alewife	0	0	Alewife Fall
42	10/15/12	Fall	MUB-8	UB	American shad	0	0	American shad Fall
42	10/15/12	Fall	MUB-8	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
42	10/15/12	Fall	MUB-8	UB	Blueback herring	0	0	Blueback herring Fall
42	10/15/12	Fall	MUB-8	UB	Striped bass	0	0	Striped bass Fall
42	10/15/12	Fall	MUB-1	UB	Alewife	0	0	Alewife Fall
42	10/15/12	Fall	MUB-1	UB	American shad	0	0	American shad Fall
42	10/15/12	Fall	MUB-1	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
42	10/15/12	Fall	MUB-1	UB	Blueback herring	0	0	Blueback herring Fall
42	10/15/12	Fall	MUB-1	UB	Striped bass	0	0	Striped bass Fall
42	10/15/12	Fall	MUB-2	UB	Alewife	0	0	Alewife Fall
42	10/15/12	Fall	MUB-2	UB	American shad	0	0	American shad Fall
42	10/15/12	Fall	MUB-2	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
42	10/15/12	Fall	MUB-2	UB	Blueback herring	0	0	Blueback herring Fall
42	10/15/12	Fall	MUB-2	UB	Striped bass	0	0	Striped bass Fall
42	10/15/12	Fall	MUB-3	UB	Alewife	0	0	Alewife Fall
42	10/15/12	Fall	MUB-3	UB	American shad	0	0	American shad Fall
42	10/15/12	Fall	MUB-3	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
42	10/15/12	Fall	MUB-3	UB	Blueback herring	0	0	Blueback herring Fall
42	10/15/12	Fall	MUB-3	UB	Striped bass	0	0	Striped bass Fall
42	10/15/12	Fall	MUB-11	UB	Alewife	0	0	Alewife Fall
42	10/15/12	Fall	MUB-11	UB	American shad	0	0	American shad Fall
42	10/15/12	Fall	MUB-11	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
42	10/15/12	Fall	MUB-11	UB	Blueback herring	0	0	Blueback herring Fall
42	10/15/12	Fall	MUB-11	UB	Striped bass	0	0	Striped bass Fall
42	10/16/12	Fall	MAK-2	AKKVK	Alewife	0	0	Alewife Fall
42	10/16/12	Fall	MAK-2	AKKVK	American shad	0	0	American shad Fall
42	10/16/12	Fall	MAK-2	AKKVK	Atlantic menhaden	1	0.301029996	Atlantic menhaden Fall
42	10/16/12	Fall	MAK-2	AKKVK	Blueback herring	254	2.40654018	Blueback herring Fall
42	10/16/12	Fall	MAK-2	AKKVK	Striped bass	0	0	Striped bass Fall
42	10/16/12	Fall	MAK-3	AKKVK	Alewife	0	0	Alewife Fall
42	10/16/12	Fall	MAK-3	AKKVK	American shad	0	0	American shad Fall
42	10/16/12	Fall	MAK-3	AKKVK	Atlantic menhaden	4	0.698970004	Atlantic menhaden Fall
42	10/16/12	Fall	MAK-3	AKKVK	Blueback herring	5	0.77815125	Blueback herring Fall
42	10/16/12	Fall	MAK-3	AKKVK	Striped bass	0	0	Striped bass Fall
42	10/16/12	Fall	MAK-4	AKKVK	Alewife	0	0	Alewife Fall
42	10/16/12	Fall	MAK-4	AKKVK	American shad	0	0	American shad Fall
42	10/16/12	Fall	MAK-4	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
42	10/16/12	Fall	MAK-4	AKKVK	Blueback herring	0	0	Blueback herring Fall
42	10/16/12	Fall	MAK-4	AKKVK	Striped bass	0	0	Striped bass Fall
42	10/16/12	Fall	MAK-1	AKKVK	Alewife	0	0	Alewife Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
42	10/16/12	Fall	MAK-1	AKKVK	American shad	0	0	American shad Fall
42	10/16/12	Fall	MAK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
42	10/16/12	Fall	MAK-1	AKKVK	Blueback herring	0	0	Blueback herring Fall
42	10/16/12	Fall	MAK-1	AKKVK	Striped bass	0	0	Striped bass Fall
42	10/16/12	Fall	MKK-2	AKKVK	Alewife	0	0	Alewife Fall
42	10/16/12	Fall	MKK-2	AKKVK	American shad	0	0	American shad Fall
42	10/16/12	Fall	MKK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
42	10/16/12	Fall	MKK-2	AKKVK	Blueback herring	0	0	Blueback herring Fall
42	10/16/12	Fall	MKK-2	AKKVK	Striped bass	0	0	Striped bass Fall
42	10/16/12	Fall	MNB-5	NB	Alewife	0	0	Alewife Fall
42	10/16/12	Fall	MNB-5	NB	American shad	0	0	American shad Fall
42	10/16/12	Fall	MNB-5	NB	Atlantic menhaden	2	0.477121255	Atlantic menhaden Fall
42	10/16/12	Fall	MNB-5	NB	Blueback herring	29	1.477121255	Blueback herring Fall
42	10/16/12	Fall	MNB-5	NB	Striped bass	0	0	Striped bass Fall
42	10/16/12	Fall	MNB-6	NB	Alewife	0	0	Alewife Fall
42	10/16/12	Fall	MNB-6	NB	American shad	0	0	American shad Fall
42	10/16/12	Fall	MNB-6	NB	Atlantic menhaden	5	0.77815125	Atlantic menhaden Fall
42	10/16/12	Fall	MNB-6	NB	Blueback herring	41	1.62324929	Blueback herring Fall
42	10/16/12	Fall	MNB-6	NB	Striped bass	0	0	Striped bass Fall
42	10/16/12	Fall	MNB-2	NB	Alewife	0	0	Alewife Fall
42	10/16/12	Fall	MNB-2	NB	American shad	0	0	American shad Fall
42	10/16/12	Fall	MNB-2	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
42	10/16/12	Fall	MNB-2	NB	Blueback herring	0	0	Blueback herring Fall
42	10/16/12	Fall	MNB-2	NB	Striped bass	0	0	Striped bass Fall
42	10/16/12	Fall	MNB-1	NB	Alewife	0	0	Alewife Fall
42	10/16/12	Fall	MNB-1	NB	American shad	0	0	American shad Fall
42	10/16/12	Fall	MNB-1	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
42	10/16/12	Fall	MNB-1	NB	Blueback herring	0	0	Blueback herring Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
42	10/16/12	Fall	MNB-1	NB	Striped bass	0	0	Striped bass Fall
43	10/23/12	Fall	MLB-6	LB	Alewife	0	0	Alewife Fall
43	10/23/12	Fall	MLB-6	LB	American shad	0	0	American shad Fall
43	10/23/12	Fall	MLB-6	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
43	10/23/12	Fall	MLB-6	LB	Blueback herring	0	0	Blueback herring Fall
43	10/23/12	Fall	MLB-6	LB	Striped bass	0	0	Striped bass Fall
43	10/23/12	Fall	MLB-5	LB	Alewife	0	0	Alewife Fall
43	10/23/12	Fall	MLB-5	LB	American shad	0	0	American shad Fall
43	10/23/12	Fall	MLB-5	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
43	10/23/12	Fall	MLB-5	LB	Blueback herring	0	0	Blueback herring Fall
43	10/23/12	Fall	MLB-5	LB	Striped bass	0	0	Striped bass Fall
43	10/23/12	Fall	MLB-3	LB	Alewife	0	0	Alewife Fall
43	10/23/12	Fall	MLB-3	LB	American shad	0	0	American shad Fall
43	10/23/12	Fall	MLB-3	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
43	10/23/12	Fall	MLB-3	LB	Blueback herring	0	0	Blueback herring Fall
43	10/23/12	Fall	MLB-3	LB	Striped bass	0	0	Striped bass Fall
43	10/23/12	Fall	MLB-4	LB	Alewife	0	0	Alewife Fall
43	10/23/12	Fall	MLB-4	LB	American shad	0	0	American shad Fall
43	10/23/12	Fall	MLB-4	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
43	10/23/12	Fall	MLB-4	LB	Blueback herring	0	0	Blueback herring Fall
43	10/23/12	Fall	MLB-4	LB	Striped bass	0	0	Striped bass Fall
43	10/23/12	Fall	MUB-8	UB	Alewife	0	0	Alewife Fall
43	10/23/12	Fall	MUB-8	UB	American shad	0	0	American shad Fall
43	10/23/12	Fall	MUB-8	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
43	10/23/12	Fall	MUB-8	UB	Blueback herring	0	0	Blueback herring Fall
43	10/23/12	Fall	MUB-8	UB	Striped bass	0	0	Striped bass Fall
43	10/23/12	Fall	MUB-9	UB	Alewife	0	0	Alewife Fall
43	10/23/12	Fall	MUB-9	UB	American shad	0	0	American shad Fall
43	10/23/12	Fall	MUB-9	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
43	10/23/12	Fall	MUB-9	UB	Blueback herring	0	0	Blueback herring Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
43	10/23/12	Fall	MUB-9	UB	Striped bass	0	0	Striped bass Fall
43	10/23/12	Fall	MUB-11	UB	Alewife	0	0	Alewife Fall
43	10/23/12	Fall	MUB-11	UB	American shad	0	0	American shad Fall
43	10/23/12	Fall	MUB-11	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
43	10/23/12	Fall	MUB-11	UB	Blueback herring	1	0.301029996	Blueback herring Fall
43	10/23/12	Fall	MUB-11	UB	Striped bass	0	0	Striped bass Fall
43	10/23/12	Fall	MUB-3	UB	Alewife	0	0	Alewife Fall
43	10/23/12	Fall	MUB-3	UB	American shad	0	0	American shad Fall
43	10/23/12	Fall	MUB-3	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
43	10/23/12	Fall	MUB-3	UB	Blueback herring	0	0	Blueback herring Fall
43	10/23/12	Fall	MUB-3	UB	Striped bass	0	0	Striped bass Fall
43	10/23/12	Fall	MUB-2	UB	Alewife	0	0	Alewife Fall
43	10/23/12	Fall	MUB-2	UB	American shad	0	0	American shad Fall
43	10/23/12	Fall	MUB-2	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
43	10/23/12	Fall	MUB-2	UB	Blueback herring	0	0	Blueback herring Fall
43	10/23/12	Fall	MUB-2	UB	Striped bass	0	0	Striped bass Fall
43	10/23/12	Fall	MUB-1	UB	Alewife	0	0	Alewife Fall
43	10/23/12	Fall	MUB-1	UB	American shad	0	0	American shad Fall
43	10/23/12	Fall	MUB-1	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
43	10/23/12	Fall	MUB-1	UB	Blueback herring	0	0	Blueback herring Fall
43	10/23/12	Fall	MUB-1	UB	Striped bass	0	0	Striped bass Fall
43	10/24/12	Fall	MKK-2	AKKVK	Alewife	0	0	Alewife Fall
43	10/24/12	Fall	MKK-2	AKKVK	American shad	1	0.301029996	American shad Fall
43	10/24/12	Fall	MKK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
43	10/24/12	Fall	MKK-2	AKKVK	Blueback herring	0	0	Blueback herring Fall
43	10/24/12	Fall	MKK-2	AKKVK	Striped bass	0	0	Striped bass Fall
43	10/24/12	Fall	MAK-4	AKKVK	Alewife	0	0	Alewife Fall
43	10/24/12	Fall	MAK-4	AKKVK	American shad	0	0	American shad Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
43	10/24/12	Fall	MAK-4	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
43	10/24/12	Fall	MAK-4	AKKVK	Blueback herring	2	0.477121255	Blueback herring Fall
43	10/24/12	Fall	MAK-4	AKKVK	Striped bass	0	0	Striped bass Fall
43	10/24/12	Fall	MAK-3	AKKVK	Alewife	0	0	Alewife Fall
43	10/24/12	Fall	MAK-3	AKKVK	American shad	0	0	American shad Fall
43	10/24/12	Fall	MAK-3	AKKVK	Atlantic menhaden	1	0.301029996	Atlantic menhaden Fall
43	10/24/12	Fall	MAK-3	AKKVK	Blueback herring	1	0.301029996	Blueback herring Fall
43	10/24/12	Fall	MAK-3	AKKVK	Striped bass	0	0	Striped bass Fall
43	10/24/12	Fall	MAK-2	AKKVK	Alewife	0	0	Alewife Fall
43	10/24/12	Fall	MAK-2	AKKVK	American shad	0	0	American shad Fall
43	10/24/12	Fall	MAK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
43	10/24/12	Fall	MAK-2	AKKVK	Blueback herring	0	0	Blueback herring Fall
43	10/24/12	Fall	MAK-2	AKKVK	Striped bass	0	0	Striped bass Fall
43	10/24/12	Fall	MAK-1	AKKVK	Alewife	0	0	Alewife Fall
43	10/24/12	Fall	MAK-1	AKKVK	American shad	0	0	American shad Fall
43	10/24/12	Fall	MAK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
43	10/24/12	Fall	MAK-1	AKKVK	Blueback herring	3	0.602059991	Blueback herring Fall
43	10/24/12	Fall	MAK-1	AKKVK	Striped bass	0	0	Striped bass Fall
43	10/24/12	Fall	MKK-1	AKKVK	Alewife	0	0	Alewife Fall
43	10/24/12	Fall	MKK-1	AKKVK	American shad	0	0	American shad Fall
43	10/24/12	Fall	MKK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
43	10/24/12	Fall	MKK-1	AKKVK	Blueback herring	0	0	Blueback herring Fall
43	10/24/12	Fall	MKK-1	AKKVK	Striped bass	0	0	Striped bass Fall
43	10/24/12	Fall	MNB-1	NB	Alewife	0	0	Alewife Fall
43	10/24/12	Fall	MNB-1	NB	American shad	0	0	American shad Fall
43	10/24/12	Fall	MNB-1	NB	Atlantic menhaden	2	0.477121255	Atlantic menhaden Fall
43	10/24/12	Fall	MNB-1	NB	Blueback herring	1	0.301029996	Blueback herring Fall
43	10/24/12	Fall	MNB-1	NB	Striped bass	0	0	Striped bass Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
43	10/24/12	Fall	MNB-2	NB	Alewife	0	0	Alewife Fall
43	10/24/12	Fall	MNB-2	NB	American shad	0	0	American shad Fall
43	10/24/12	Fall	MNB-2	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
43	10/24/12	Fall	MNB-2	NB	Blueback herring	0	0	Blueback herring Fall
43	10/24/12	Fall	MNB-2	NB	Striped bass	0	0	Striped bass Fall
43	10/24/12	Fall	MNB-5	NB	Alewife	1	0.301029996	Alewife Fall
43	10/24/12	Fall	MNB-5	NB	American shad	0	0	American shad Fall
43	10/24/12	Fall	MNB-5	NB	Atlantic menhaden	35	1.556302501	Atlantic menhaden Fall
43	10/24/12	Fall	MNB-5	NB	Blueback herring	1	0.301029996	Blueback herring Fall
43	10/24/12	Fall	MNB-5	NB	Striped bass	0	0	Striped bass Fall
43	10/24/12	Fall	MNB-6	NB	Alewife	0	0	Alewife Fall
43	10/24/12	Fall	MNB-6	NB	American shad	0	0	American shad Fall
43	10/24/12	Fall	MNB-6	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
43	10/24/12	Fall	MNB-6	NB	Blueback herring	1	0.301029996	Blueback herring Fall
43	10/24/12	Fall	MNB-6	NB	Striped bass	0	0	Striped bass Fall
45	11/6/12	Fall	MLB-6	LB	Alewife	0	0	Alewife Fall
45	11/6/12	Fall	MLB-6	LB	American shad	0	0	American shad Fall
45	11/6/12	Fall	MLB-6	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
45	11/6/12	Fall	MLB-6	LB	Blueback herring	0	0	Blueback herring Fall
45	11/6/12	Fall	MLB-6	LB	Striped bass	0	0	Striped bass Fall
45	11/6/12	Fall	MLB-5	LB	Alewife	0	0	Alewife Fall
45	11/6/12	Fall	MLB-5	LB	American shad	0	0	American shad Fall
45	11/6/12	Fall	MLB-5	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
45	11/6/12	Fall	MLB-5	LB	Blueback herring	0	0	Blueback herring Fall
45	11/6/12	Fall	MLB-5	LB	Striped bass	0	0	Striped bass Fall
45	11/6/12	Fall	MLB-3	LB	Alewife	0	0	Alewife Fall
45	11/6/12	Fall	MLB-3	LB	American shad	0	0	American shad Fall
45	11/6/12	Fall	MLB-3	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
45	11/6/12	Fall	MLB-3	LB	Blueback herring	0	0	Blueback herring Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
45	11/6/12	Fall	MLB-3	LB	Striped bass	0	0	Striped bass Fall
45	11/6/12	Fall	MLB-4	LB	Alewife	0	0	Alewife Fall
45	11/6/12	Fall	MLB-4	LB	American shad	0	0	American shad Fall
45	11/6/12	Fall	MLB-4	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
45	11/6/12	Fall	MLB-4	LB	Blueback herring	2	0.477121255	Blueback herring Fall
45	11/6/12	Fall	MLB-4	LB	Striped bass	0	0	Striped bass Fall
45	11/6/12	Fall	MUB-8	UB	Alewife	0	0	Alewife Fall
45	11/6/12	Fall	MUB-8	UB	American shad	0	0	American shad Fall
45	11/6/12	Fall	MUB-8	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
45	11/6/12	Fall	MUB-8	UB	Blueback herring	0	0	Blueback herring Fall
45	11/6/12	Fall	MUB-8	UB	Striped bass	0	0	Striped bass Fall
45	11/6/12	Fall	MUB-9	UB	Alewife	5	0.77815125	Alewife Fall
45	11/6/12	Fall	MUB-9	UB	American shad	0	0	American shad Fall
45	11/6/12	Fall	MUB-9	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
45	11/6/12	Fall	MUB-9	UB	Blueback herring	0	0	Blueback herring Fall
45	11/6/12	Fall	MUB-9	UB	Striped bass	0	0	Striped bass Fall
45	11/6/12	Fall	MUB-11	UB	Alewife	0	0	Alewife Fall
45	11/6/12	Fall	MUB-11	UB	American shad	0	0	American shad Fall
45	11/6/12	Fall	MUB-11	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
45	11/6/12	Fall	MUB-11	UB	Blueback herring	0	0	Blueback herring Fall
45	11/6/12	Fall	MUB-11	UB	Striped bass	0	0	Striped bass Fall
45	11/6/12	Fall	MUB-3	UB	Alewife	0	0	Alewife Fall
45	11/6/12	Fall	MUB-3	UB	American shad	0	0	American shad Fall
45	11/6/12	Fall	MUB-3	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
45	11/6/12	Fall	MUB-3	UB	Blueback herring	3	0.602059991	Blueback herring Fall
45	11/6/12	Fall	MUB-3	UB	Striped bass	0	0	Striped bass Fall
45	11/6/12	Fall	MUB-2	UB	Alewife	0	0	Alewife Fall
45	11/6/12	Fall	MUB-2	UB	American shad	0	0	American shad Fall
45	11/6/12	Fall	MUB-2	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
45	11/6/12	Fall	MUB-2	UB	Blueback herring	1	0.301029996	Blueback herring Fall
45	11/6/12	Fall	MUB-2	UB	Striped bass	0	0	Striped bass Fall
45	11/6/12	Fall	MUB-1	UB	Alewife	0	0	Alewife Fall
45	11/6/12	Fall	MUB-1	UB	American shad	0	0	American shad Fall
45	11/6/12	Fall	MUB-1	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
45	11/6/12	Fall	MUB-1	UB	Blueback herring	0	0	Blueback herring Fall
45	11/6/12	Fall	MUB-1	UB	Striped bass	0	0	Striped bass Fall
45	11/9/12	Fall	MKK-2	AKKVK	Alewife	0	0	Alewife Fall
45	11/9/12	Fall	MKK-2	AKKVK	American shad	0	0	American shad Fall
45	11/9/12	Fall	MKK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
45	11/9/12	Fall	MKK-2	AKKVK	Blueback herring	391	2.593286067	Blueback herring Fall
45	11/9/12	Fall	MKK-2	AKKVK	Striped bass	0	0	Striped bass Fall
45	11/9/12	Fall	MKK-1	AKKVK	Alewife	1	0.301029996	Alewife Fall
45	11/9/12	Fall	MKK-1	AKKVK	American shad	0	0	American shad Fall
45	11/9/12	Fall	MKK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
45	11/9/12	Fall	MKK-1	AKKVK	Blueback herring	48	1.69019608	Blueback herring Fall
45	11/9/12	Fall	MKK-1	AKKVK	Striped bass	0	0	Striped bass Fall
45	11/9/12	Fall	MAK-1	AKKVK	Alewife	0	0	Alewife Fall
45	11/9/12	Fall	MAK-1	AKKVK	American shad	0	0	American shad Fall
45	11/9/12	Fall	MAK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
45	11/9/12	Fall	MAK-1	AKKVK	Blueback herring	1	0.301029996	Blueback herring Fall
45	11/9/12	Fall	MAK-1	AKKVK	Striped bass	0	0	Striped bass Fall
45	11/9/12	Fall	MAK-4	AKKVK	Alewife	0	0	Alewife Fall
45	11/9/12	Fall	MAK-4	AKKVK	American shad	0	0	American shad Fall
45	11/9/12	Fall	MAK-4	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
45	11/9/12	Fall	MAK-4	AKKVK	Blueback herring	0	0	Blueback herring Fall
45	11/9/12	Fall	MAK-4	AKKVK	Striped bass	0	0	Striped bass Fall
45	11/9/12	Fall	MAK-3	AKKVK	Alewife	0	0	Alewife Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
45	11/9/12	Fall	MAK-3	AKKVK	American shad	0	0	American shad Fall
45	11/9/12	Fall	MAK-3	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
45	11/9/12	Fall	MAK-3	AKKVK	Blueback herring	0	0	Blueback herring Fall
45	11/9/12	Fall	MAK-3	AKKVK	Striped bass	0	0	Striped bass Fall
45	11/9/12	Fall	MAK-2	AKKVK	Alewife	0	0	Alewife Fall
45	11/9/12	Fall	MAK-2	AKKVK	American shad	0	0	American shad Fall
45	11/9/12	Fall	MAK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
45	11/9/12	Fall	MAK-2	AKKVK	Blueback herring	21	1.342422681	Blueback herring Fall
45	11/9/12	Fall	MAK-2	AKKVK	Striped bass	0	0	Striped bass Fall
45	11/9/12	Fall	MNB-1	NB	Alewife	0	0	Alewife Fall
45	11/9/12	Fall	MNB-1	NB	American shad	0	0	American shad Fall
45	11/9/12	Fall	MNB-1	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
45	11/9/12	Fall	MNB-1	NB	Blueback herring	38	1.591064607	Blueback herring Fall
45	11/9/12	Fall	MNB-1	NB	Striped bass	0	0	Striped bass Fall
45	11/9/12	Fall	MNB-2	NB	Alewife	0	0	Alewife Fall
45	11/9/12	Fall	MNB-2	NB	American shad	0	0	American shad Fall
45	11/9/12	Fall	MNB-2	NB	Atlantic menhaden	1	0.301029996	Atlantic menhaden Fall
45	11/9/12	Fall	MNB-2	NB	Blueback herring	278	2.445604203	Blueback herring Fall
45	11/9/12	Fall	MNB-2	NB	Striped bass	0	0	Striped bass Fall
45	11/9/12	Fall	MNB-5	NB	Alewife	0	0	Alewife Fall
45	11/9/12	Fall	MNB-5	NB	American shad	1	0.301029996	American shad Fall
45	11/9/12	Fall	MNB-5	NB	Atlantic menhaden	9	1	Atlantic menhaden Fall
45	11/9/12	Fall	MNB-5	NB	Blueback herring	0	0	Blueback herring Fall
45	11/9/12	Fall	MNB-5	NB	Striped bass	0	0	Striped bass Fall
45	11/9/12	Fall	MNB-6	NB	Alewife	0	0	Alewife Fall
45	11/9/12	Fall	MNB-6	NB	American shad	0	0	American shad Fall
45	11/9/12	Fall	MNB-6	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
45	11/9/12	Fall	MNB-6	NB	Blueback herring	451	2.655138435	Blueback herring Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
45	11/9/12	Fall	MNB-6	NB	Striped bass	0	0	Striped bass Fall
46	11/14/12	Fall	MKK-1	AKKVK	Alewife	0	0	Alewife Fall
46	11/14/12	Fall	MKK-1	AKKVK	American shad	0	0	American shad Fall
46	11/14/12	Fall	MKK-1	AKKVK	Atlantic menhaden	1	0.301029996	Atlantic menhaden Fall
46	11/14/12	Fall	MKK-1	AKKVK	Blueback herring	6	0.84509804	Blueback herring Fall
46	11/14/12	Fall	MKK-1	AKKVK	Striped bass	0	0	Striped bass Fall
46	11/14/12	Fall	MLB-6	LB	Alewife	0	0	Alewife Fall
46	11/14/12	Fall	MLB-6	LB	American shad	0	0	American shad Fall
46	11/14/12	Fall	MLB-6	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
46	11/14/12	Fall	MLB-6	LB	Blueback herring	70	1.851258349	Blueback herring Fall
46	11/14/12	Fall	MLB-6	LB	Striped bass	0	0	Striped bass Fall
46	11/14/12	Fall	MLB-5	LB	Alewife	0	0	Alewife Fall
46	11/14/12	Fall	MLB-5	LB	American shad	1	0.301029996	American shad Fall
46	11/14/12	Fall	MLB-5	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
46	11/14/12	Fall	MLB-5	LB	Blueback herring	7	0.903089987	Blueback herring Fall
46	11/14/12	Fall	MLB-5	LB	Striped bass	0	0	Striped bass Fall
46	11/14/12	Fall	MLB-3	LB	Alewife	1	0.301029996	Alewife Fall
46	11/14/12	Fall	MLB-3	LB	American shad	5	0.77815125	American shad Fall
46	11/14/12	Fall	MLB-3	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
46	11/14/12	Fall	MLB-3	LB	Blueback herring	13	1.146128036	Blueback herring Fall
46	11/14/12	Fall	MLB-3	LB	Striped bass	0	0	Striped bass Fall
46	11/14/12	Fall	MLB-4	LB	Alewife	71	1.857332496	Alewife Fall
46	11/14/12	Fall	MLB-4	LB	American shad	5	0.77815125	American shad Fall
46	11/14/12	Fall	MLB-4	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
46	11/14/12	Fall	MLB-4	LB	Blueback herring	1325	3.122543524	Blueback herring Fall
46	11/14/12	Fall	MLB-4	LB	Striped bass	0	0	Striped bass Fall
46	11/14/12	Fall	MUB-9	UB	Alewife	48	1.69019608	Alewife Fall
46	11/14/12	Fall	MUB-9	UB	American shad	0	0	American shad Fall
46	11/14/12	Fall	MUB-9	UB	Atlantic menhaden	6	0.84509804	Atlantic menhaden Fall
46	11/14/12	Fall	MUB-9	UB	Blueback herring	8	0.954242509	Blueback herring Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
46	11/14/12	Fall	MUB-9	UB	Striped bass	0	0	Striped bass Fall
46	11/14/12	Fall	MUB-8	UB	Alewife	40	1.612783857	Alewife Fall
46	11/14/12	Fall	MUB-8	UB	American shad	0	0	American shad Fall
46	11/14/12	Fall	MUB-8	UB	Atlantic menhaden	1	0.301029996	Atlantic menhaden Fall
46	11/14/12	Fall	MUB-8	UB	Blueback herring	6	0.84509804	Blueback herring Fall
46	11/14/12	Fall	MUB-8	UB	Striped bass	0	0	Striped bass Fall
46	11/14/12	Fall	MUB-11	UB	Alewife	63	1.806179974	Alewife Fall
46	11/14/12	Fall	MUB-11	UB	American shad	6	0.84509804	American shad Fall
46	11/14/12	Fall	MUB-11	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
46	11/14/12	Fall	MUB-11	UB	Blueback herring	439	2.643452676	Blueback herring Fall
46	11/14/12	Fall	MUB-11	UB	Striped bass	0	0	Striped bass Fall
46	11/14/12	Fall	MUB-3	UB	Alewife	0	0	Alewife Fall
46	11/14/12	Fall	MUB-3	UB	American shad	0	0	American shad Fall
46	11/14/12	Fall	MUB-3	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
46	11/14/12	Fall	MUB-3	UB	Blueback herring	206	2.315970345	Blueback herring Fall
46	11/14/12	Fall	MUB-3	UB	Striped bass	0	0	Striped bass Fall
46	11/14/12	Fall	MUB-1	UB	Alewife	21	1.342422681	Alewife Fall
46	11/14/12	Fall	MUB-1	UB	American shad	0	0	American shad Fall
46	11/14/12	Fall	MUB-1	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
46	11/14/12	Fall	MUB-1	UB	Blueback herring	218	2.340444115	Blueback herring Fall
46	11/14/12	Fall	MUB-1	UB	Striped bass	0	0	Striped bass Fall
46	11/14/12	Fall	MUB-2	UB	Alewife	66	1.826074803	Alewife Fall
46	11/14/12	Fall	MUB-2	UB	American shad	1	0.301029996	American shad Fall
46	11/14/12	Fall	MUB-2	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
46	11/14/12	Fall	MUB-2	UB	Blueback herring	6	0.84509804	Blueback herring Fall
46	11/14/12	Fall	MUB-2	UB	Striped bass	0	0	Striped bass Fall
46	11/15/12	Fall	MAK-1	AKKVK	Alewife	0	0	Alewife Fall
46	11/15/12	Fall	MAK-1	AKKVK	American shad	0	0	American shad Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
46	11/15/12	Fall	MAK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
46	11/15/12	Fall	MAK-1	AKKVK	Blueback herring	140	2.149219113	Blueback herring Fall
46	11/15/12	Fall	MAK-1	AKKVK	Striped bass	0	0	Striped bass Fall
46	11/15/12	Fall	MAK-2	AKKVK	Alewife	0	0	Alewife Fall
46	11/15/12	Fall	MAK-2	AKKVK	American shad	0	0	American shad Fall
46	11/15/12	Fall	MAK-2	AKKVK	Atlantic menhaden	2	0.477121255	Atlantic menhaden Fall
46	11/15/12	Fall	MAK-2	AKKVK	Blueback herring	1175	3.070407322	Blueback herring Fall
46	11/15/12	Fall	MAK-2	AKKVK	Striped bass	0	0	Striped bass Fall
46	11/15/12	Fall	MAK-3	AKKVK	Alewife	0	0	Alewife Fall
46	11/15/12	Fall	MAK-3	AKKVK	American shad	0	0	American shad Fall
46	11/15/12	Fall	MAK-3	AKKVK	Atlantic menhaden	1	0.301029996	Atlantic menhaden Fall
46	11/15/12	Fall	MAK-3	AKKVK	Blueback herring	0	0	Blueback herring Fall
46	11/15/12	Fall	MAK-3	AKKVK	Striped bass	0	0	Striped bass Fall
46	11/15/12	Fall	MAK-4	AKKVK	Alewife	0	0	Alewife Fall
46	11/15/12	Fall	MAK-4	AKKVK	American shad	0	0	American shad Fall
46	11/15/12	Fall	MAK-4	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
46	11/15/12	Fall	MAK-4	AKKVK	Blueback herring	0	0	Blueback herring Fall
46	11/15/12	Fall	MAK-4	AKKVK	Striped bass	0	0	Striped bass Fall
46	11/15/12	Fall	MKK-2	AKKVK	Alewife	21	1.342422681	Alewife Fall
46	11/15/12	Fall	MKK-2	AKKVK	American shad	0	0	American shad Fall
46	11/15/12	Fall	MKK-2	AKKVK	Atlantic menhaden	71	1.857332496	Atlantic menhaden Fall
46	11/15/12	Fall	MKK-2	AKKVK	Blueback herring	7	0.903089987	Blueback herring Fall
46	11/15/12	Fall	MKK-2	AKKVK	Striped bass	0	0	Striped bass Fall
46	11/15/12	Fall	MNB-2	NB	Alewife	0	0	Alewife Fall
46	11/15/12	Fall	MNB-2	NB	American shad	0	0	American shad Fall
46	11/15/12	Fall	MNB-2	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
46	11/15/12	Fall	MNB-2	NB	Blueback herring	115	2.064457989	Blueback herring Fall
46	11/15/12	Fall	MNB-2	NB	Striped bass	0	0	Striped bass Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
46	11/15/12	Fall	MNB-5	NB	Alewife	5	0.77815125	Alewife Fall
46	11/15/12	Fall	MNB-5	NB	American shad	0	0	American shad Fall
46	11/15/12	Fall	MNB-5	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
46	11/15/12	Fall	MNB-5	NB	Blueback herring	0	0	Blueback herring Fall
46	11/15/12	Fall	MNB-5	NB	Striped bass	0	0	Striped bass Fall
46	11/15/12	Fall	MNB-6	NB	Alewife	0	0	Alewife Fall
46	11/15/12	Fall	MNB-6	NB	American shad	0	0	American shad Fall
46	11/15/12	Fall	MNB-6	NB	Atlantic menhaden	1	0.301029996	Atlantic menhaden Fall
46	11/15/12	Fall	MNB-6	NB	Blueback herring	58	1.770852012	Blueback herring Fall
46	11/15/12	Fall	MNB-6	NB	Striped bass	0	0	Striped bass Fall
46	11/15/12	Fall	MNB-1	NB	Alewife	0	0	Alewife Fall
46	11/15/12	Fall	MNB-1	NB	American shad	0	0	American shad Fall
46	11/15/12	Fall	MNB-1	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
46	11/15/12	Fall	MNB-1	NB	Blueback herring	97	1.991226076	Blueback herring Fall
46	11/15/12	Fall	MNB-1	NB	Striped bass	0	0	Striped bass Fall
47	11/19/12	Fall	MLB-6	LB	Alewife	0	0	Alewife Fall
47	11/19/12	Fall	MLB-6	LB	American shad	0	0	American shad Fall
47	11/19/12	Fall	MLB-6	LB	Atlantic menhaden	1	0.301029996	Atlantic menhaden Fall
47	11/19/12	Fall	MLB-6	LB	Blueback herring	4240	3.627468272	Blueback herring Fall
47	11/19/12	Fall	MLB-6	LB	Striped bass	0	0	Striped bass Fall
47	11/19/12	Fall	MLB-5	LB	Alewife	1	0.301029996	Alewife Fall
47	11/19/12	Fall	MLB-5	LB	American shad	2	0.477121255	American shad Fall
47	11/19/12	Fall	MLB-5	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
47	11/19/12	Fall	MLB-5	LB	Blueback herring	0	0	Blueback herring Fall
47	11/19/12	Fall	MLB-5	LB	Striped bass	0	0	Striped bass Fall
47	11/19/12	Fall	MLB-3	LB	Alewife	38	1.591064607	Alewife Fall
47	11/19/12	Fall	MLB-3	LB	American shad	1	0.301029996	American shad Fall
47	11/19/12	Fall	MLB-3	LB	Atlantic menhaden	1	0.301029996	Atlantic menhaden Fall
47	11/19/12	Fall	MLB-3	LB	Blueback herring	4	0.698970004	Blueback herring Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
47	11/19/12	Fall	MLB-3	LB	Striped bass	0	0	Striped bass Fall
47	11/19/12	Fall	MLB-4	LB	Alewife	8	0.954242509	Alewife Fall
47	11/19/12	Fall	MLB-4	LB	American shad	0	0	American shad Fall
47	11/19/12	Fall	MLB-4	LB	Atlantic menhaden	1	0.301029996	Atlantic menhaden Fall
47	11/19/12	Fall	MLB-4	LB	Blueback herring	263	2.421603927	Blueback herring Fall
47	11/19/12	Fall	MLB-4	LB	Striped bass	0	0	Striped bass Fall
47	11/19/12	Fall	MUB-8	UB	Alewife	12	1.113943352	Alewife Fall
47	11/19/12	Fall	MUB-8	UB	American shad	1	0.301029996	American shad Fall
47	11/19/12	Fall	MUB-8	UB	Atlantic menhaden	1	0.301029996	Atlantic menhaden Fall
47	11/19/12	Fall	MUB-8	UB	Blueback herring	54	1.740362689	Blueback herring Fall
47	11/19/12	Fall	MUB-8	UB	Striped bass	0	0	Striped bass Fall
47	11/19/12	Fall	MUB-9	UB	Alewife	10	1.041392685	Alewife Fall
47	11/19/12	Fall	MUB-9	UB	American shad	0	0	American shad Fall
47	11/19/12	Fall	MUB-9	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
47	11/19/12	Fall	MUB-9	UB	Blueback herring	0	0	Blueback herring Fall
47	11/19/12	Fall	MUB-9	UB	Striped bass	0	0	Striped bass Fall
47	11/19/12	Fall	MUB-11	UB	Alewife	0	0	Alewife Fall
47	11/19/12	Fall	MUB-11	UB	American shad	1	0.301029996	American shad Fall
47	11/19/12	Fall	MUB-11	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
47	11/19/12	Fall	MUB-11	UB	Blueback herring	79	1.903089987	Blueback herring Fall
47	11/19/12	Fall	MUB-11	UB	Striped bass	0	0	Striped bass Fall
47	11/19/12	Fall	MUB-3	UB	Alewife	0	0	Alewife Fall
47	11/19/12	Fall	MUB-3	UB	American shad	1	0.301029996	American shad Fall
47	11/19/12	Fall	MUB-3	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
47	11/19/12	Fall	MUB-3	UB	Blueback herring	559	2.748188027	Blueback herring Fall
47	11/19/12	Fall	MUB-3	UB	Striped bass	0	0	Striped bass Fall
47	11/19/12	Fall	MUB-2	UB	Alewife	0	0	Alewife Fall
47	11/19/12	Fall	MUB-2	UB	American shad	0	0	American shad Fall
47	11/19/12	Fall	MUB-2	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
47	11/19/12	Fall	MUB-2	UB	Blueback herring	302	2.481442629	Blueback herring Fall
47	11/19/12	Fall	MUB-2	UB	Striped bass	0	0	Striped bass Fall
47	11/19/12	Fall	MUB-1	UB	Alewife	0	0	Alewife Fall
47	11/19/12	Fall	MUB-1	UB	American shad	0	0	American shad Fall
47	11/19/12	Fall	MUB-1	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
47	11/19/12	Fall	MUB-1	UB	Blueback herring	1	0.301029996	Blueback herring Fall
47	11/19/12	Fall	MUB-1	UB	Striped bass	0	0	Striped bass Fall
47	11/20/12	Fall	MKK-2	AKKVK	Alewife	0	0	Alewife Fall
47	11/20/12	Fall	MKK-2	AKKVK	American shad	0	0	American shad Fall
47	11/20/12	Fall	MKK-2	AKKVK	Atlantic menhaden	1	0.301029996	Atlantic menhaden Fall
47	11/20/12	Fall	MKK-2	AKKVK	Blueback herring	375	2.575187845	Blueback herring Fall
47	11/20/12	Fall	MKK-2	AKKVK	Striped bass	0	0	Striped bass Fall
47	11/20/12	Fall	MAK-4	AKKVK	Alewife	0	0	Alewife Fall
47	11/20/12	Fall	MAK-4	AKKVK	American shad	0	0	American shad Fall
47	11/20/12	Fall	MAK-4	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
47	11/20/12	Fall	MAK-4	AKKVK	Blueback herring	0	0	Blueback herring Fall
47	11/20/12	Fall	MAK-4	AKKVK	Striped bass	0	0	Striped bass Fall
47	11/20/12	Fall	MAK-3	AKKVK	Alewife	0	0	Alewife Fall
47	11/20/12	Fall	MAK-3	AKKVK	American shad	0	0	American shad Fall
47	11/20/12	Fall	MAK-3	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
47	11/20/12	Fall	MAK-3	AKKVK	Blueback herring	342	2.53529412	Blueback herring Fall
47	11/20/12	Fall	MAK-3	AKKVK	Striped bass	0	0	Striped bass Fall
47	11/20/12	Fall	MAK-2	AKKVK	Alewife	0	0	Alewife Fall
47	11/20/12	Fall	MAK-2	AKKVK	American shad	0	0	American shad Fall
47	11/20/12	Fall	MAK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
47	11/20/12	Fall	MAK-2	AKKVK	Blueback herring	0	0	Blueback herring Fall
47	11/20/12	Fall	MAK-2	AKKVK	Striped bass	0	0	Striped bass Fall
47	11/20/12	Fall	MAK-1	AKKVK	Alewife	0	0	Alewife Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
47	11/20/12	Fall	MAK-1	AKKVK	American shad	0	0	American shad Fall
47	11/20/12	Fall	MAK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
47	11/20/12	Fall	MAK-1	AKKVK	Blueback herring	5	0.77815125	Blueback herring Fall
47	11/20/12	Fall	MAK-1	AKKVK	Striped bass	0	0	Striped bass Fall
47	11/20/12	Fall	MKK-1	AKKVK	Alewife	1	0.301029996	Alewife Fall
47	11/20/12	Fall	MKK-1	AKKVK	American shad	0	0	American shad Fall
47	11/20/12	Fall	MKK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
47	11/20/12	Fall	MKK-1	AKKVK	Blueback herring	178	2.252853031	Blueback herring Fall
47	11/20/12	Fall	MKK-1	AKKVK	Striped bass	0	0	Striped bass Fall
47	11/20/12	Fall	MNB-5	NB	Alewife	0	0	Alewife Fall
47	11/20/12	Fall	MNB-5	NB	American shad	0	0	American shad Fall
47	11/20/12	Fall	MNB-5	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
47	11/20/12	Fall	MNB-5	NB	Blueback herring	3	0.602059991	Blueback herring Fall
47	11/20/12	Fall	MNB-5	NB	Striped bass	0	0	Striped bass Fall
47	11/20/12	Fall	MNB-6	NB	Alewife	0	0	Alewife Fall
47	11/20/12	Fall	MNB-6	NB	American shad	0	0	American shad Fall
47	11/20/12	Fall	MNB-6	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
47	11/20/12	Fall	MNB-6	NB	Blueback herring	76	1.886490725	Blueback herring Fall
47	11/20/12	Fall	MNB-6	NB	Striped bass	0	0	Striped bass Fall
47	11/20/12	Fall	MNB-2	NB	Alewife	0	0	Alewife Fall
47	11/20/12	Fall	MNB-2	NB	American shad	0	0	American shad Fall
47	11/20/12	Fall	MNB-2	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
47	11/20/12	Fall	MNB-2	NB	Blueback herring	67	1.832508913	Blueback herring Fall
47	11/20/12	Fall	MNB-2	NB	Striped bass	0	0	Striped bass Fall
47	11/20/12	Fall	MNB-1	NB	Alewife	0	0	Alewife Fall
47	11/20/12	Fall	MNB-1	NB	American shad	0	0	American shad Fall
47	11/20/12	Fall	MNB-1	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
47	11/20/12	Fall	MNB-1	NB	Blueback herring	68	1.838849091	Blueback herring Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
47	11/20/12	Fall	MNB-1	NB	Striped bass	0	0	Striped bass Fall
48	11/27/12	Fall	MKK-1	AKKVK	Alewife	0	0	Alewife Fall
48	11/27/12	Fall	MKK-1	AKKVK	American shad	0	0	American shad Fall
48	11/27/12	Fall	MKK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
48	11/27/12	Fall	MKK-1	AKKVK	Blueback herring	0	0	Blueback herring Fall
48	11/27/12	Fall	MKK-1	AKKVK	Striped bass	0	0	Striped bass Fall
48	11/27/12	Fall	MLB-6	LB	Alewife	0	0	Alewife Fall
48	11/27/12	Fall	MLB-6	LB	American shad	0	0	American shad Fall
48	11/27/12	Fall	MLB-6	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
48	11/27/12	Fall	MLB-6	LB	Blueback herring	8	0.954242509	Blueback herring Fall
48	11/27/12	Fall	MLB-6	LB	Striped bass	0	0	Striped bass Fall
48	11/27/12	Fall	MLB-3	LB	Alewife	0	0	Alewife Fall
48	11/27/12	Fall	MLB-3	LB	American shad	1	0.301029996	American shad Fall
48	11/27/12	Fall	MLB-3	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
48	11/27/12	Fall	MLB-3	LB	Blueback herring	6	0.84509804	Blueback herring Fall
48	11/27/12	Fall	MLB-3	LB	Striped bass	0	0	Striped bass Fall
48	11/27/12	Fall	MLB-5	LB	Alewife	0	0	Alewife Fall
48	11/27/12	Fall	MLB-5	LB	American shad	0	0	American shad Fall
48	11/27/12	Fall	MLB-5	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
48	11/27/12	Fall	MLB-5	LB	Blueback herring	211	2.326335861	Blueback herring Fall
48	11/27/12	Fall	MLB-5	LB	Striped bass	0	0	Striped bass Fall
48	11/27/12	Fall	MLB-4	LB	Alewife	0	0	Alewife Fall
48	11/27/12	Fall	MLB-4	LB	American shad	0	0	American shad Fall
48	11/27/12	Fall	MLB-4	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
48	11/27/12	Fall	MLB-4	LB	Blueback herring	16	1.230448921	Blueback herring Fall
48	11/27/12	Fall	MLB-4	LB	Striped bass	0	0	Striped bass Fall
48	11/27/12	Fall	MUB-9	UB	Alewife	0	0	Alewife Fall
48	11/27/12	Fall	MUB-9	UB	American shad	0	0	American shad Fall
48	11/27/12	Fall	MUB-9	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
48	11/27/12	Fall	MUB-9	UB	Blueback herring	0	0	Blueback herring Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
48	11/27/12	Fall	MUB-9	UB	Striped bass	0	0	Striped bass Fall
48	11/27/12	Fall	MUB-8	UB	Alewife	0	0	Alewife Fall
48	11/27/12	Fall	MUB-8	UB	American shad	1	0.301029996	American shad Fall
48	11/27/12	Fall	MUB-8	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
48	11/27/12	Fall	MUB-8	UB	Blueback herring	1353	3.131618664	Blueback herring Fall
48	11/27/12	Fall	MUB-8	UB	Striped bass	0	0	Striped bass Fall
48	11/27/12	Fall	MUB-11	UB	Alewife	0	0	Alewife Fall
48	11/27/12	Fall	MUB-11	UB	American shad	0	0	American shad Fall
48	11/27/12	Fall	MUB-11	UB	Atlantic menhaden	1	0.301029996	Atlantic menhaden Fall
48	11/27/12	Fall	MUB-11	UB	Blueback herring	7330	3.86516322	Blueback herring Fall
48	11/27/12	Fall	MUB-11	UB	Striped bass	0	0	Striped bass Fall
48	11/27/12	Fall	MUB-3	UB	Alewife	0	0	Alewife Fall
48	11/27/12	Fall	MUB-3	UB	American shad	0	0	American shad Fall
48	11/27/12	Fall	MUB-3	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
48	11/27/12	Fall	MUB-3	UB	Blueback herring	1497	3.175511813	Blueback herring Fall
48	11/27/12	Fall	MUB-3	UB	Striped bass	0	0	Striped bass Fall
48	11/27/12	Fall	MUB-2	UB	Alewife	0	0	Alewife Fall
48	11/27/12	Fall	MUB-2	UB	American shad	0	0	American shad Fall
48	11/27/12	Fall	MUB-2	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
48	11/27/12	Fall	MUB-2	UB	Blueback herring	183	2.264817823	Blueback herring Fall
48	11/27/12	Fall	MUB-2	UB	Striped bass	0	0	Striped bass Fall
48	11/27/12	Fall	MUB-1	UB	Alewife	34	1.544068044	Alewife Fall
48	11/27/12	Fall	MUB-1	UB	American shad	2	0.477121255	American shad Fall
48	11/27/12	Fall	MUB-1	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
48	11/27/12	Fall	MUB-1	UB	Blueback herring	1639	3.214843848	Blueback herring Fall
48	11/27/12	Fall	MUB-1	UB	Striped bass	0	0	Striped bass Fall
48	11/28/12	Fall	MKK-2	AKKVK	Alewife	0	0	Alewife Fall
48	11/28/12	Fall	MKK-2	AKKVK	American shad	0	0	American shad Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
48	11/28/12	Fall	MKK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
48	11/28/12	Fall	MKK-2	AKKVK	Blueback herring	0	0	Blueback herring Fall
48	11/28/12	Fall	MKK-2	AKKVK	Striped bass	0	0	Striped bass Fall
48	11/28/12	Fall	MAK-4	AKKVK	Alewife	0	0	Alewife Fall
48	11/28/12	Fall	MAK-4	AKKVK	American shad	0	0	American shad Fall
48	11/28/12	Fall	MAK-4	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
48	11/28/12	Fall	MAK-4	AKKVK	Blueback herring	0	0	Blueback herring Fall
48	11/28/12	Fall	MAK-4	AKKVK	Striped bass	0	0	Striped bass Fall
48	11/28/12	Fall	MAK-3	AKKVK	Alewife	0	0	Alewife Fall
48	11/28/12	Fall	MAK-3	AKKVK	American shad	0	0	American shad Fall
48	11/28/12	Fall	MAK-3	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
48	11/28/12	Fall	MAK-3	AKKVK	Blueback herring	593	2.773786445	Blueback herring Fall
48	11/28/12	Fall	MAK-3	AKKVK	Striped bass	0	0	Striped bass Fall
48	11/28/12	Fall	MAK-2	AKKVK	Alewife	0	0	Alewife Fall
48	11/28/12	Fall	MAK-2	AKKVK	American shad	0	0	American shad Fall
48	11/28/12	Fall	MAK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
48	11/28/12	Fall	MAK-2	AKKVK	Blueback herring	36	1.568201724	Blueback herring Fall
48	11/28/12	Fall	MAK-2	AKKVK	Striped bass	0	0	Striped bass Fall
48	11/28/12	Fall	MAK-1	AKKVK	Alewife	0	0	Alewife Fall
48	11/28/12	Fall	MAK-1	AKKVK	American shad	0	0	American shad Fall
48	11/28/12	Fall	MAK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
48	11/28/12	Fall	MAK-1	AKKVK	Blueback herring	734	2.866287339	Blueback herring Fall
48	11/28/12	Fall	MAK-1	AKKVK	Striped bass	0	0	Striped bass Fall
48	11/28/12	Fall	MNB-1	NB	Alewife	0	0	Alewife Fall
48	11/28/12	Fall	MNB-1	NB	American shad	0	0	American shad Fall
48	11/28/12	Fall	MNB-1	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
48	11/28/12	Fall	MNB-1	NB	Blueback herring	307	2.488550717	Blueback herring Fall
48	11/28/12	Fall	MNB-1	NB	Striped bass	0	0	Striped bass Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
48	11/28/12	Fall	MNB-2	NB	Alewife	0	0	Alewife Fall
48	11/28/12	Fall	MNB-2	NB	American shad	0	0	American shad Fall
48	11/28/12	Fall	MNB-2	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
48	11/28/12	Fall	MNB-2	NB	Blueback herring	136	2.136720567	Blueback herring Fall
48	11/28/12	Fall	MNB-2	NB	Striped bass	0	0	Striped bass Fall
48	11/28/12	Fall	MNB-6	NB	Alewife	0	0	Alewife Fall
48	11/28/12	Fall	MNB-6	NB	American shad	1	0.301029996	American shad Fall
48	11/28/12	Fall	MNB-6	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
48	11/28/12	Fall	MNB-6	NB	Blueback herring	0	0	Blueback herring Fall
48	11/28/12	Fall	MNB-6	NB	Striped bass	0	0	Striped bass Fall
48	11/28/12	Fall	MNB-5	NB	Alewife	0	0	Alewife Fall
48	11/28/12	Fall	MNB-5	NB	American shad	0	0	American shad Fall
48	11/28/12	Fall	MNB-5	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
48	11/28/12	Fall	MNB-5	NB	Blueback herring	2	0.477121255	Blueback herring Fall
48	11/28/12	Fall	MNB-5	NB	Striped bass	0	0	Striped bass Fall
49	12/4/12	Fall	MKK-1	AKKVK	Alewife	0	0	Alewife Fall
49	12/4/12	Fall	MKK-1	AKKVK	American shad	0	0	American shad Fall
49	12/4/12	Fall	MKK-1	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
49	12/4/12	Fall	MKK-1	AKKVK	Blueback herring	431	2.635483747	Blueback herring Fall
49	12/4/12	Fall	MKK-1	AKKVK	Striped bass	0	0	Striped bass Fall
49	12/4/12	Fall	MLB-6	LB	Alewife	0	0	Alewife Fall
49	12/4/12	Fall	MLB-6	LB	American shad	0	0	American shad Fall
49	12/4/12	Fall	MLB-6	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
49	12/4/12	Fall	MLB-6	LB	Blueback herring	0	0	Blueback herring Fall
49	12/4/12	Fall	MLB-6	LB	Striped bass	0	0	Striped bass Fall
49	12/4/12	Fall	MLB-5	LB	Alewife	0	0	Alewife Fall
49	12/4/12	Fall	MLB-5	LB	American shad	0	0	American shad Fall
49	12/4/12	Fall	MLB-5	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
49	12/4/12	Fall	MLB-5	LB	Blueback herring	385	2.586587305	Blueback herring Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
49	12/4/12	Fall	MLB-5	LB	Striped bass	0	0	Striped bass Fall
49	12/4/12	Fall	MLB-3	LB	Alewife	0	0	Alewife Fall
49	12/4/12	Fall	MLB-3	LB	American shad	0	0	American shad Fall
49	12/4/12	Fall	MLB-3	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
49	12/4/12	Fall	MLB-3	LB	Blueback herring	0	0	Blueback herring Fall
49	12/4/12	Fall	MLB-3	LB	Striped bass	0	0	Striped bass Fall
49	12/4/12	Fall	MLB-4	LB	Alewife	0	0	Alewife Fall
49	12/4/12	Fall	MLB-4	LB	American shad	0	0	American shad Fall
49	12/4/12	Fall	MLB-4	LB	Atlantic menhaden	0	0	Atlantic menhaden Fall
49	12/4/12	Fall	MLB-4	LB	Blueback herring	1645	3.216429831	Blueback herring Fall
49	12/4/12	Fall	MLB-4	LB	Striped bass	0	0	Striped bass Fall
49	12/4/12	Fall	MUB-8	UB	Alewife	0	0	Alewife Fall
49	12/4/12	Fall	MUB-8	UB	American shad	0	0	American shad Fall
49	12/4/12	Fall	MUB-8	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
49	12/4/12	Fall	MUB-8	UB	Blueback herring	819	2.913813852	Blueback herring Fall
49	12/4/12	Fall	MUB-8	UB	Striped bass	0	0	Striped bass Fall
49	12/4/12	Fall	MUB-9	UB	Alewife	8	0.954242509	Alewife Fall
49	12/4/12	Fall	MUB-9	UB	American shad	0	0	American shad Fall
49	12/4/12	Fall	MUB-9	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
49	12/4/12	Fall	MUB-9	UB	Blueback herring	0	0	Blueback herring Fall
49	12/4/12	Fall	MUB-9	UB	Striped bass	1	0.301029996	Striped bass Fall
49	12/4/12	Fall	MUB-11	UB	Alewife	0	0	Alewife Fall
49	12/4/12	Fall	MUB-11	UB	American shad	0	0	American shad Fall
49	12/4/12	Fall	MUB-11	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
49	12/4/12	Fall	MUB-11	UB	Blueback herring	39	1.602059991	Blueback herring Fall
49	12/4/12	Fall	MUB-11	UB	Striped bass	0	0	Striped bass Fall
49	12/4/12	Fall	MUB-3	UB	Alewife	0	0	Alewife Fall
49	12/4/12	Fall	MUB-3	UB	American shad	0	0	American shad Fall
49	12/4/12	Fall	MUB-3	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
49	12/4/12	Fall	MUB-3	UB	Blueback herring	0	0	Blueback herring Fall
49	12/4/12	Fall	MUB-3	UB	Striped bass	0	0	Striped bass Fall
49	12/4/12	Fall	MUB-2	UB	Alewife	0	0	Alewife Fall
49	12/4/12	Fall	MUB-2	UB	American shad	0	0	American shad Fall
49	12/4/12	Fall	MUB-2	UB	Atlantic menhaden	0	0	Atlantic menhaden Fall
49	12/4/12	Fall	MUB-2	UB	Blueback herring	31	1.505149978	Blueback herring Fall
49	12/4/12	Fall	MUB-2	UB	Striped bass	0	0	Striped bass Fall
49	12/4/12	Fall	MUB-1	UB	Alewife	0	0	Alewife Fall
49	12/4/12	Fall	MUB-1	UB	American shad	0	0	American shad Fall
49	12/4/12	Fall	MUB-1	UB	Atlantic menhaden	1	0.301029996	Atlantic menhaden Fall
49	12/4/12	Fall	MUB-1	UB	Blueback herring	0	0	Blueback herring Fall
49	12/4/12	Fall	MUB-1	UB	Striped bass	0	0	Striped bass Fall
49	12/5/12	Fall	MKK-2	AKKVK	Alewife	0	0	Alewife Fall
49	12/5/12	Fall	MKK-2	AKKVK	American shad	0	0	American shad Fall
49	12/5/12	Fall	MKK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
49	12/5/12	Fall	MKK-2	AKKVK	Blueback herring	358	2.555094449	Blueback herring Fall
49	12/5/12	Fall	MKK-2	AKKVK	Striped bass	0	0	Striped bass Fall
49	12/5/12	Fall	MAK-1	AKKVK	Alewife	0	0	Alewife Fall
49	12/5/12	Fall	MAK-1	AKKVK	American shad	1	0.301029996	American shad Fall
49	12/5/12	Fall	MAK-1	AKKVK	Atlantic menhaden	1	0.301029996	Atlantic menhaden Fall
49	12/5/12	Fall	MAK-1	AKKVK	Blueback herring	64	1.812913357	Blueback herring Fall
49	12/5/12	Fall	MAK-1	AKKVK	Striped bass	0	0	Striped bass Fall
49	12/5/12	Fall	MAK-2	AKKVK	Alewife	0	0	Alewife Fall
49	12/5/12	Fall	MAK-2	AKKVK	American shad	2	0.477121255	American shad Fall
49	12/5/12	Fall	MAK-2	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
49	12/5/12	Fall	MAK-2	AKKVK	Blueback herring	317	2.50242712	Blueback herring Fall
49	12/5/12	Fall	MAK-2	AKKVK	Striped bass	0	0	Striped bass Fall
49	12/5/12	Fall	MAK-3	AKKVK	Alewife	0	0	Alewife Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	Date	Season	Station	Area Grouping	Common Name	CPUE - 10 min	Log(CPUE+ 1)	Species/Season
49	12/5/12	Fall	MAK-3	AKKVK	American shad	3	0.602059991	American shad Fall
49	12/5/12	Fall	MAK-3	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
49	12/5/12	Fall	MAK-3	AKKVK	Blueback herring	0	0	Blueback herring Fall
49	12/5/12	Fall	MAK-3	AKKVK	Striped bass	0	0	Striped bass Fall
49	12/5/12	Fall	MAK-4	AKKVK	Alewife	0	0	Alewife Fall
49	12/5/12	Fall	MAK-4	AKKVK	American shad	0	0	American shad Fall
49	12/5/12	Fall	MAK-4	AKKVK	Atlantic menhaden	0	0	Atlantic menhaden Fall
49	12/5/12	Fall	MAK-4	AKKVK	Blueback herring	0	0	Blueback herring Fall
49	12/5/12	Fall	MAK-4	AKKVK	Striped bass	0	0	Striped bass Fall
49	12/5/12	Fall	MNB-5	NB	Alewife	0	0	Alewife Fall
49	12/5/12	Fall	MNB-5	NB	American shad	0	0	American shad Fall
49	12/5/12	Fall	MNB-5	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
49	12/5/12	Fall	MNB-5	NB	Blueback herring	4	0.698970004	Blueback herring Fall
49	12/5/12	Fall	MNB-5	NB	Striped bass	0	0	Striped bass Fall
49	12/5/12	Fall	MNB-6	NB	Alewife	0	0	Alewife Fall
49	12/5/12	Fall	MNB-6	NB	American shad	0	0	American shad Fall
49	12/5/12	Fall	MNB-6	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
49	12/5/12	Fall	MNB-6	NB	Blueback herring	62	1.799340549	Blueback herring Fall
49	12/5/12	Fall	MNB-6	NB	Striped bass	0	0	Striped bass Fall
49	12/5/12	Fall	MNB-2	NB	Alewife	0	0	Alewife Fall
49	12/5/12	Fall	MNB-2	NB	American shad	0	0	American shad Fall
49	12/5/12	Fall	MNB-2	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
49	12/5/12	Fall	MNB-2	NB	Blueback herring	237	2.376576957	Blueback herring Fall
49	12/5/12	Fall	MNB-2	NB	Striped bass	0	0	Striped bass Fall
49	12/5/12	Fall	MNB-1	NB	Alewife	0	0	Alewife Fall
49	12/5/12	Fall	MNB-1	NB	American shad	0	0	American shad Fall
49	12/5/12	Fall	MNB-1	NB	Atlantic menhaden	0	0	Atlantic menhaden Fall
49	12/5/12	Fall	MNB-1	NB	Blueback herring	22	1.361727836	Blueback herring Fall

Table C.1-1. Raw Data Used for the ANOVA								
WOY	**Date**	**Season**	**Station**	**Area Grouping**	**Common Name**	**CPUE - 10 min**	**Log(CPUE+ 1)**	**Species/Season**
49	12/5/12	Fall	MNB-1	NB	Striped bass	0	0	Striped bass Fall

Acronyms:
AKKVK – Arthur Kill/Kill Van Kull Study Area
CPUE – Catch per unit effort
LB – Lower Bay
MAK – Mid-water Trawl in AK
MKK – Mid-water Trawl in KVK
MLB – Mid-water Trawl in LB
MNB – Mid-water Trawl in NB
MUB – Mid-water Trawl in UB
NB – Newark Bay
UB – Upper Bay
WOY – week of year

Table C.1-2. Assumption Testing for Spring Alewife Samples, Log(CPUE+1) Transformed Data

Page/Date/Time	1 4/2/2013 12:08:51 AM
Database	C:\Documents and Settings\jb ... ts\2012 MFR NCSS Database.S0
Filter	Species_Season = "Alewife Spring"
Response	Log_CPUE_1_

Tests of Assumptions Section

Assumption	Test Value	Prob Level	Decision (0.05)
Skewness Normality of Residuals	11.8329	0.000000	Reject
Kurtosis Normality of Residuals	8.3386	0.000000	Reject
Omnibus Normality of Residuals	209.5493	0.000000	Reject
Modified-Levene Equal-Variance Test	5.5971	0.001090	Reject

Box Plot Section

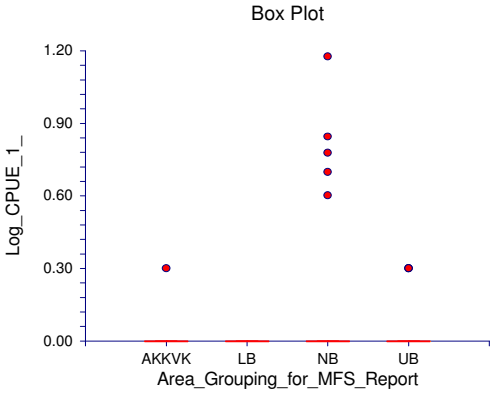


Table C.1-3. Assumption Testing for Fall Alewife Samples, Log(CPUE+1) Transformed Data

Analysis of Variance Report

Page/Date/Time	1 4/2/2013 12:10:09 AM
Database	C:\Documents and Settings\jb ... ts\2012 MFR NCSS Database.S0
Filter	Species_Season = "Alewife Fall"
Response	Log_CPUE_1_

Tests of Assumptions Section

Assumption	Test Value	Prob Level	Decision (0.05)
Skewness Normality of Residuals	11.2351	0.000000	Reject
Kurtosis Normality of Residuals	7.4430	0.000000	Reject
Omnibus Normality of Residuals	181.6256	0.000000	Reject
Modified-Levene Equal-Variance Test	3.5710	0.014897	Reject

Box Plot Section

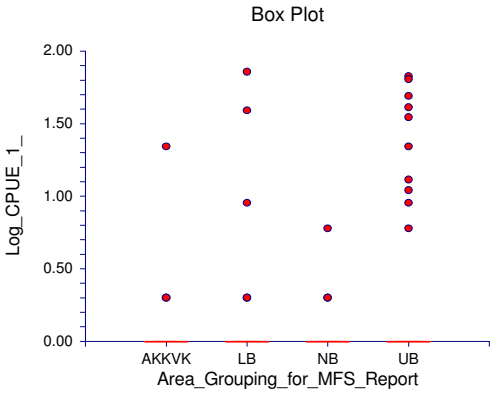


Table C.1-4. Assumption Testing for Spring Blueback Herring Samples, Log(CPUE+1) Transformed Data

Analysis of Variance Report

Page/Date/Time	1 4/2/2013 12:11:28 AM
Database	C:\Documents and Settings\jb ... ts\2012 MFR NCSS Database.S0
Filter	Species_Season = "Blueback herring Spring"
Response	Log_CPUE_1_

Tests of Assumptions Section

Assumption	Test Value	Prob Level	Decision (0.05)
Skewness Normality of Residuals	9.1200	0.000000	Reject
Kurtosis Normality of Residuals	5.8331	0.000000	Reject
Omnibus Normality of Residuals	117.1991	0.000000	Reject
Modified-Levene Equal-Variance Test	2.0145	0.113628	Accept

Box Plot Section

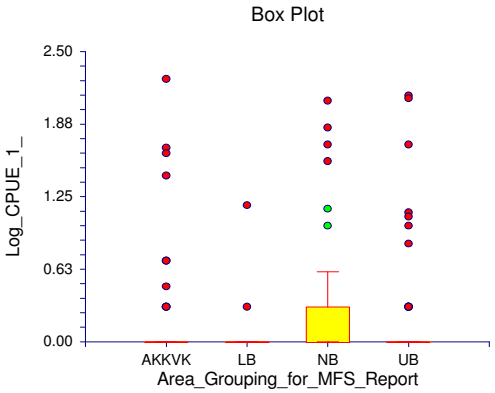


Table C.1-5. Assumption Testing for Fall Blueback Herring Samples, Log(CPUE+1) Transformed Data

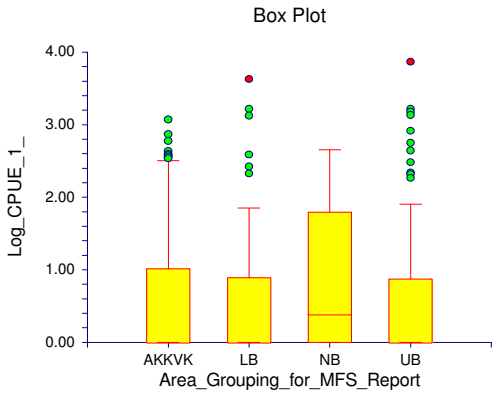
Analysis of Variance Report

Page/Date/Time	1 4/2/2013 12:12:15 AM
Database	C:\Documents and Settings\jb ... ts\2012 MFR NCSS Database.S0
Filter	Species_Season = "Blueback herring Fall"
Response	Log_CPUE_1_

Tests of Assumptions Section

Assumption	Test Value	Prob Level	Decision (0.05)
Skewness Normality of Residuals	6.5495	0.000000	Reject
Kurtosis Normality of Residuals	1.3905	0.164378	Accept
Omnibus Normality of Residuals	44.8296	0.000000	Reject
Modified-Levene Equal-Variance Test	0.3396	0.796732	Accept

Box Plot Section



Appendix C-2
Results of the Kruskal-Wallis One-Way ANOVA for the Spring and Fall Alewife Samples

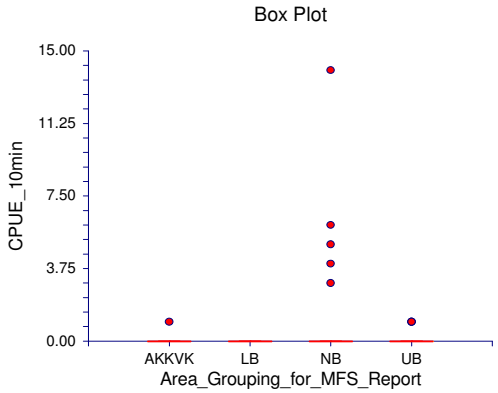
Alewife Spring Analysis of Variance Report

Page/Date/Time	1 4/2/2013 12:01:06 AM
Database	C:\Documents and Settings\jb ... ts\2012 MFR NCSS Database.S0
Filter	Species_Season = "Alewife Spring"
Response	CPUE_10min

Tests of Assumptions Section

Assumption	Test Value	Prob Level	Decision (0.05)
Skewness Normality of Residuals	14.4164	0.000000	Reject
Kurtosis Normality of Residuals	9.7795	0.000000	Reject
Omnibus Normality of Residuals	303.4729	0.000000	Reject
Modified-Levene Equal-Variance Test	4.8848	0.002752	Reject

Box Plot Section



Analysis of Variance Table

Source Term	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (Alpha=0.05)
A: Area_Grouping_for_MFS_Report	3	0.903518	21.42963	7.14321	4.88	
	0.002752*					
S(A)	176	257.3704	1.462332			
Total (Adjusted)	179	278.8				
Total	180					

* Term significant at alpha = 0.05

Analysis of Variance Report

Page/Date/Time	2 4/2/2013 12:01:06 AM
Database	C:\Documents and Settings\jb ... ts\2012 MFR NCSS Database.S0
Filter	Species_Season = "Alewife Spring"
Response	CPUE_10min

Kruskal-Wallis One-Way ANOVA on Ranks

Hypotheses

H0: All medians are equal.
Ha: At least two medians are different.

Test Results

Method	DF	Chi-Square (H)	Prob Level	Decision(0.05)
Not Corrected for Ties	3	1.344605	0.718569	Accept H0
Corrected for Ties	3	9.428044	0.024109	Reject H0

Number Sets of Ties	2
Multiplicity Factor	5000100

Group Detail

Group	Count	Sum of Ranks	Mean Rank	Z-Value	Median
AKKVK	54	4731.50	87.62	-0.4854	0
LB	36	3096.00	86.00	-0.5793	0
NB	36	3556.00	98.78	1.0657	0
UB	54	4906.50	90.86	0.0609	0

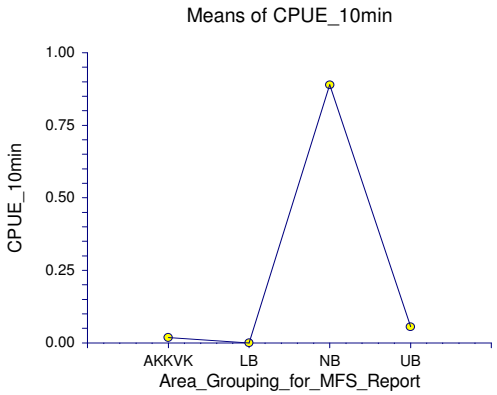
Means and Effects Section

Term	Count	Mean	Standard Error	Effect
All	180	0.2		0.2407407
A: Area_Grouping_for_MFS_Report				
AKKVK	54	1.851852E-02	0.1645607	-0.2222222
LB	36	0	0.2015448	-0.2407407
NB	36	0.8888889	0.2015448	0.6481481
UB	54	5.555556E-02	0.1645607	-0.1851852

Analysis of Variance Report

Page/Date/Time	3 4/2/2013 12:01:06 AM
Database	C:\Documents and Settings\jb ... ts\2012 MFR NCSS Database.S0
Filter	Species_Season = "Alewife Spring"
Response	CPUE_10min

Plots of Means Section



Kruskal-Wallis Multiple-Comparison Z-Value Test (Dunn's Test)

CPUE_10min	AKKVK	LB	NB	UB
AKKVK	0.0000	0.3827	2.6352	0.8558
LB	0.3827	0.0000	2.7550	1.1481
NB	2.6352	2.7550	0.0000	1.8698
UB	0.8558	1.1481	1.8698	0.0000

Regular Test: Medians significantly different if z-value > 1.9600
Bonferroni Test: Medians significantly different if z-value > 2.6383

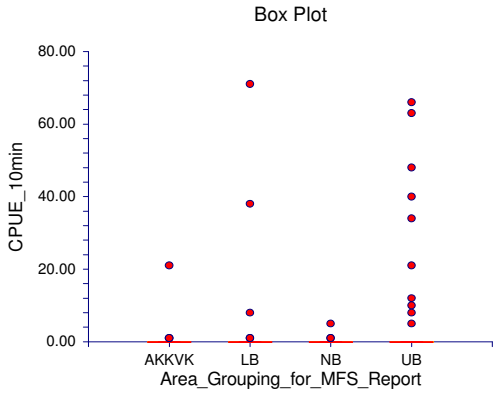
Alewife Fall Analysis of Variance Report

Page/Date/Time	1 4/2/2013 12:10:27 AM
Database	C:\Documents and Settings\jb ... ts\2012 MFR NCSS Database.S0
Filter	Species_Season = "Alewife Fall"
Response	CPUE_10min

Tests of Assumptions Section

Assumption	Test Value	Prob Level	Decision (0.05)
Skewness Normality of Residuals	13.4164	0.000000	Reject
Kurtosis Normality of Residuals	9.0977	0.000000	Reject
Omnibus Normality of Residuals	262.7674	0.000000	Reject
Modified-Levene Equal-Variance Test	3.0171	0.030829	Reject

Box Plot Section



Analysis of Variance Table

Source Term	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (Alpha=0.05)
A: Area_Grouping_for_MFS_Report	3	0.030829*	0.705278	813.8212	271.2737	3.02
S(A)	216	19421.02	89.91211			
Total (Adjusted)	219	20234.84				
Total	220					

* Term significant at alpha = 0.05

Analysis of Variance Report

Page/Date/Time	2 4/2/2013 12:10:27 AM
Database	C:\Documents and Settings\jb ... ts\2012 MFR NCSS Database.S0
Filter	Species_Season = "Alewife Fall"
Response	CPUE_10min

Kruskal-Wallis One-Way ANOVA on Ranks

Hypotheses

H0: All medians are equal.
Ha: At least two medians are different.

Test Results

Method	DF	Chi-Square (H)	Prob Level	Decision(0.05)
Not Corrected for Ties	3	1.418643	0.701171	Accept H0
Corrected for Ties	3	5.458824	0.141122	Accept H0

Number Sets of Ties	5
Multiplicity Factor	7880628

Group Detail

Group	Count	Sum of Ranks	Mean Rank	Z-Value	Median
AKKVK	66	6917.50	104.81	-0.8679	0
LB	44	4948.50	112.47	0.2290	0
NB	44	4711.50	107.08	-0.3985	0
UB	66	7732.50	117.16	1.0158	0

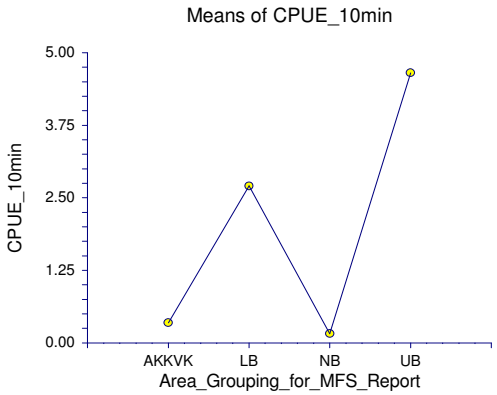
Means and Effects Section

Term	Count	Mean	Standard Error	Effect
All	220	2.072727		1.965909
A: Area_Grouping_for_MFS_Report				
AKKVK	66	0.3484848	1.167178	-1.617424
LB	44	2.704545	1.429495	0.7386364
NB	44	0.1590909	1.429495	-1.806818
UB	66	4.651515	1.167178	2.685606

Analysis of Variance Report

Page/Date/Time	3 4/2/2013 12:10:27 AM
Database	C:\Documents and Settings\jb ... ts\2012 MFR NCSS Database.S0
Filter	Species_Season = "Alewife Fall"
Response	CPUE_10min

Plots of Means Section



Kruskal-Wallis Multiple-Comparison Z-Value Test (Dunn's Test)

CPUE_10min	AKKVK	LB	NB	UB
AKKVK	0.0000	1.2122	0.3593	2.1861
LB	1.2122	0.0000	0.7786	0.7431
NB	0.3593	0.7786	0.0000	1.5960
UB	2.1861	0.7431	1.5960	0.0000

Regular Test: Medians significantly different if z-value > 1.9600
Bonferroni Test: Medians significantly different if z-value > 2.6383

Appendix C-3
Results of the Kruskal-Wallis One-Way ANOVA for the Spring and Fall Blueback Herring Samples

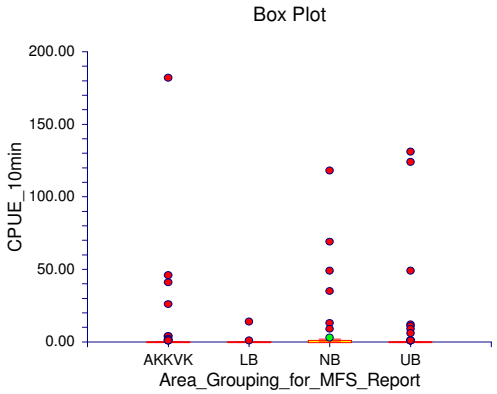
Blueback Herring Spring Analysis of Variance Report

Page/Date/Time	1 4/2/2013 12:11:10 AM
Database	C:\Documents and Settings\jb ... ts\2012 MFR NCSS Database.S0
Filter	Species_Season = "Blueback herring Spring"
Response	CPUE_10min

Tests of Assumptions Section

Assumption	Test Value	Prob Level	Decision (0.05)
Skewness Normality of Residuals	12.5089	0.000000	Reject
Kurtosis Normality of Residuals	8.6160	0.000000	Reject
Omnibus Normality of Residuals	230.7079	0.000000	Reject
Modified-Levene Equal-Variance Test	0.8360	0.475766	Accept

Box Plot Section



Analysis of Variance Table

Source Term	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (Alpha=0.05)
A: Area_Grouping_for_MFS_Report	3	0.475766	0.229137	1271.476	423.8253	0.84
S(A)	176	89225.52	506.9632			
Total (Adjusted)	179	90496.99				
Total	180					

* Term significant at alpha = 0.05

Analysis of Variance Report

Page/Date/Time	2 4/2/2013 12:11:10 AM
Database	C:\Documents and Settings\jb ... ts\2012 MFR NCSS Database.S0
Filter	Species_Season = "Blueback herring Spring"
Response	CPUE_10min

Kruskal-Wallis One-Way ANOVA on Ranks

Hypotheses

H0: All medians are equal.
Ha: At least two medians are different.

Test Results

Method	DF	Chi-Square (H)	Prob Level	Decision(0.05)
Not Corrected for Ties	3	3.656846	0.300982	Accept H0
Corrected for Ties	3	7.666834	0.053423	Accept H0

Number Sets of Ties	6
Multiplicity Factor	3050220

Group Detail

Group	Count	Sum of Ranks	Mean Rank	Z-Value	Median
AKKVK	54	4843.00	89.69	-0.1373	0
LB	36	2802.50	77.85	-1.6289	0
NB	36	3629.00	100.81	1.3268	0
UB	54	5015.50	92.88	0.4011	0

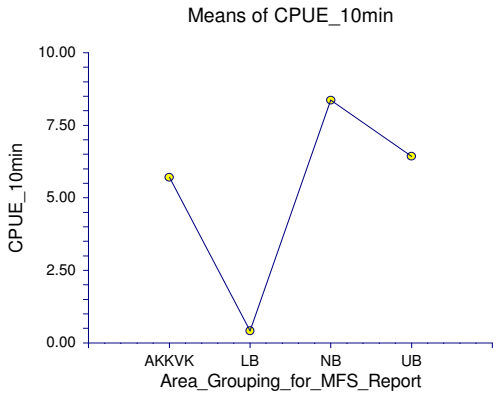
Means and Effects Section

Term	Count	Mean	Standard Error	Effect
All	180	5.394444		5.226852
A: Area_Grouping_for_MFS_Report				
AKKVK	54	5.703704	3.064018	0.4768519
LB	36	0.4166667	3.75264	-4.810185
NB	36	8.361111	3.75264	3.134259
UB	54	6.425926	3.064018	1.199074

Analysis of Variance Report

Page/Date/Time	3 4/2/2013 12:11:10 AM
Database	C:\Documents and Settings\jb ... ts\2012 MFR NCSS Database.S0
Filter	Species_Season = "Blueback herring Spring"
Response	CPUE_10min

Plots of Means Section



Kruskal-Wallis Multiple-Comparison Z-Value Test (Dunn's Test)

CPUE_10min	AKKVK	LB	NB	UB
AKKVK	0.0000	1.5289	1.4362	0.4613
LB	1.5289	0.0000	2.7067	1.9414
NB	1.4362	2.7067	0.0000	1.0236
UB	0.4613	1.9414	1.0236	0.0000

Regular Test: Medians significantly different if z-value > 1.9600
Bonferroni Test: Medians significantly different if z-value > 2.6383

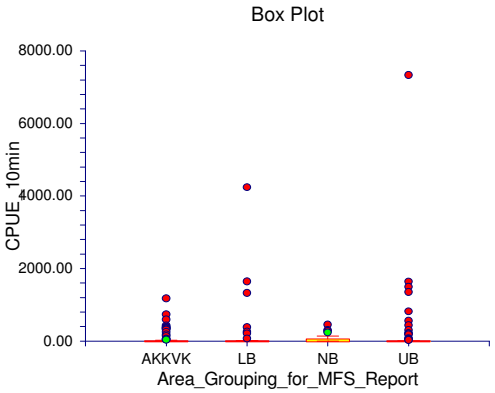
Blueback Herring Fall Analysis of Variance Report

Page/Date/Time	1 4/2/2013 12:12:35 AM
Database	C:\Documents and Settings\jb ... ts\2012 MFR NCSS Database.S0
Filter	Species_Season = "Blueback herring Fall"
Response	CPUE_10min

Tests of Assumptions Section

Assumption	Test Value	Prob Level	Decision (0.05)
Skewness Normality of Residuals	16.0791	0.000000	Reject
Kurtosis Normality of Residuals	10.6149	0.000000	Reject
Omnibus Normality of Residuals	371.2134	0.000000	Reject
Modified-Levene Equal-Variance Test	0.9920	0.397432	Accept

Box Plot Section



Analysis of Variance Table

Source Term	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (Alpha=0.05)
A: Area_Grouping_for_MFS_Report	3	0.398047	0.267852	1140993	380330.8	0.99
S(A)	216	8.292306E+07	383903.1			
Total (Adjusted)	219	8.406406E+07				
Total	220					

* Term significant at alpha = 0.05

Analysis of Variance Report

Page/Date/Time	2 4/2/2013 12:12:35 AM
Database	C:\Documents and Settings\jb ... ts\2012 MFR NCSS Database.S0
Filter	Species_Season = "Blueback herring Fall"
Response	CPUE_10min

Kruskal-Wallis One-Way ANOVA on Ranks

Hypotheses

H0: All medians are equal.
Ha: At least two medians are different.

Test Results

Method	DF	Chi-Square (H)	Prob Level	Decision(0.05)
Not Corrected for Ties	3	4.14171	0.246563	Accept H0
Corrected for Ties	3	5.351384	0.147803	Accept H0

Number Sets of Ties	9
Multiplicity Factor	2406918

Group Detail

Group	Count	Sum of Ranks	Mean Rank	Z-Value	Median
AKKVK	66	7150.00	108.33	-0.3305	0
LB	44	4558.00	103.59	-0.8050	0
NB	44	5616.50	127.65	1.9979	1.5
UB	66	6985.50	105.84	-0.7107	0

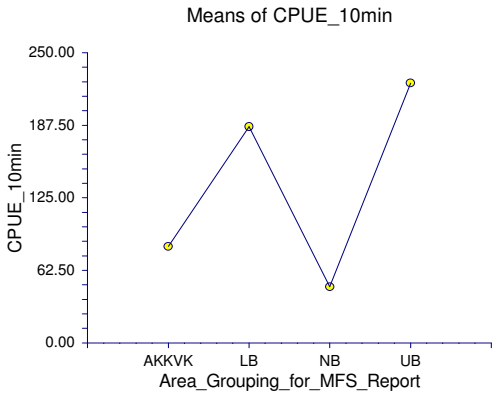
Means and Effects Section

Term	Count	Mean	Standard Error	Effect
All	220	139.0136		135.3939
A: Area_Grouping_for_MFS_Report				
AKKVK	66	83.13636	76.26738	-52.25758
LB	44	186.25	93.40808	50.85606
NB	44	48.34091	93.40808	-87.05303
UB	66	223.8485	76.26738	88.45454

Analysis of Variance Report

Page/Date/Time	3 4/2/2013 12:12:35 AM
Database	C:\Documents and Settings\jb ... ts\2012 MFR NCSS Database.S0
Filter	Species_Season = "Blueback herring Fall"
Response	CPUE_10min

Plots of Means Section



Kruskal-Wallis Multiple-Comparison Z-Value Test (Dunn's Test)

CPUE_10min	AKKVK	LB	NB	UB
AKKVK	0.0000	0.4351	1.7722	0.2557
LB	0.4351	0.0000	2.0150	0.2064
NB	1.7722	2.0150	0.0000	2.0009
UB	0.2557	0.2064	2.0009	0.0000

Regular Test: Medians significantly different if z-value > 1.9600
Bonferroni Test: Medians significantly different if z-value > 2.6383

Appendix C-4
Data Used for the NonDetect Analysis to Derive the Cumulative Frequency Distribution for Spring Samples

Table C-4.1. Data Used for the NonDetect Analysis for Spring Samples

Year	Season	WOY	Area Grouping	Species Code	Common Name	SumOfCPUE_10min
2012	Spring	13	AKKVK	2	Alewife	0
2012	Spring	13	AKKVK	6	American shad	0
2012	Spring	13	AKKVK	14	Atlantic menhaden	1
2012	Spring	13	AKKVK	27	Blueback herring	209
2012	Spring	13	AKKVK	156	Striped bass	0
2012	Spring	13	LB	2	Alewife	0
2012	Spring	13	LB	6	American shad	0
2012	Spring	13	LB	14	Atlantic menhaden	0
2012	Spring	13	LB	27	Blueback herring	0
2012	Spring	13	LB	156	Striped bass	0
2012	Spring	13	NB	2	Alewife	0
2012	Spring	13	NB	6	American shad	0
2012	Spring	13	NB	14	Atlantic menhaden	0
2012	Spring	13	NB	27	Blueback herring	0
2012	Spring	13	NB	156	Striped bass	0
2012	Spring	13	UB	2	Alewife	2
2012	Spring	13	UB	6	American shad	0
2012	Spring	13	UB	14	Atlantic menhaden	1
2012	Spring	13	UB	27	Blueback herring	133
2012	Spring	13	UB	156	Striped bass	0
2012	Spring	14	AKKVK	2	Alewife	0
2012	Spring	14	AKKVK	6	American shad	0
2012	Spring	14	AKKVK	14	Atlantic menhaden	0
2012	Spring	14	AKKVK	27	Blueback herring	50
2012	Spring	14	AKKVK	156	Striped bass	0
2012	Spring	14	LB	2	Alewife	0
2012	Spring	14	LB	6	American shad	0
2012	Spring	14	LB	14	Atlantic menhaden	0
2012	Spring	14	LB	27	Blueback herring	0
2012	Spring	14	LB	156	Striped bass	0
2012	Spring	14	NB	2	Alewife	14
2012	Spring	14	NB	6	American shad	5
2012	Spring	14	NB	14	Atlantic menhaden	3
2012	Spring	14	NB	27	Blueback herring	271
2012	Spring	14	NB	156	Striped bass	0
2012	Spring	14	UB	2	Alewife	0
2012	Spring	14	UB	6	American shad	0
2012	Spring	14	UB	14	Atlantic menhaden	0
2012	Spring	14	UB	27	Blueback herring	131
2012	Spring	14	UB	156	Striped bass	0
2012	Spring	15	AKKVK	2	Alewife	1
2012	Spring	15	AKKVK	6	American shad	7
2012	Spring	15	AKKVK	14	Atlantic menhaden	1
2012	Spring	15	AKKVK	27	Blueback herring	46
2012	Spring	15	AKKVK	156	Striped bass	1
2012	Spring	15	LB	2	Alewife	0
2012	Spring	15	LB	6	American shad	0
2012	Spring	15	LB	14	Atlantic menhaden	0

Table C-4.1. Data Used for the NonDetect Analysis for Spring Samples

Year	Season	WOY	Area Grouping	Species Code	Common Name	SumOfCPUE_10min
2012	Spring	15	LB	27	Blueback herring	0
2012	Spring	15	LB	156	Striped bass	0
2012	Spring	15	NB	2	Alewife	13
2012	Spring	15	NB	6	American shad	2
2012	Spring	15	NB	14	Atlantic menhaden	60
2012	Spring	15	NB	27	Blueback herring	2
2012	Spring	15	NB	156	Striped bass	0
2012	Spring	15	UB	2	Alewife	0
2012	Spring	15	UB	6	American shad	0
2012	Spring	15	UB	14	Atlantic menhaden	0
2012	Spring	15	UB	27	Blueback herring	50
2012	Spring	15	UB	156	Striped bass	0
2012	Spring	16	AKKVK	2	Alewife	0
2012	Spring	16	AKKVK	6	American shad	0
2012	Spring	16	AKKVK	14	Atlantic menhaden	1
2012	Spring	16	AKKVK	27	Blueback herring	1
2012	Spring	16	AKKVK	156	Striped bass	0
2012	Spring	16	LB	2	Alewife	0
2012	Spring	16	LB	6	American shad	0
2012	Spring	16	LB	14	Atlantic menhaden	1
2012	Spring	16	LB	27	Blueback herring	0
2012	Spring	16	LB	156	Striped bass	0
2012	Spring	16	NB	2	Alewife	5
2012	Spring	16	NB	6	American shad	0
2012	Spring	16	NB	14	Atlantic menhaden	0
2012	Spring	16	NB	27	Blueback herring	4
2012	Spring	16	NB	156	Striped bass	0
2012	Spring	16	UB	2	Alewife	0
2012	Spring	16	UB	6	American shad	0
2012	Spring	16	UB	14	Atlantic menhaden	2
2012	Spring	16	UB	27	Blueback herring	0
2012	Spring	16	UB	156	Striped bass	0
2012	Spring	17	AKKVK	2	Alewife	0
2012	Spring	17	AKKVK	6	American shad	2
2012	Spring	17	AKKVK	14	Atlantic menhaden	3
2012	Spring	17	AKKVK	27	Blueback herring	2
2012	Spring	17	AKKVK	156	Striped bass	0
2012	Spring	17	LB	2	Alewife	0
2012	Spring	17	LB	6	American shad	0
2012	Spring	17	LB	14	Atlantic menhaden	0
2012	Spring	17	LB	27	Blueback herring	0
2012	Spring	17	LB	156	Striped bass	0
2012	Spring	17	NB	2	Alewife	0
2012	Spring	17	NB	6	American shad	0
2012	Spring	17	NB	14	Atlantic menhaden	4
2012	Spring	17	NB	27	Blueback herring	10
2012	Spring	17	NB	156	Striped bass	0
2012	Spring	17	UB	2	Alewife	0
2012	Spring	17	UB	6	American shad	0

Table C-4.1. Data Used for the NonDetect Analysis for Spring Samples

Year	Season	WOY	Area Grouping	Species Code	Common Name	SumOfCPUE_10min
2012	Spring	17	UB	14	Atlantic menhaden	2
2012	Spring	17	UB	27	Blueback herring	7
2012	Spring	17	UB	156	Striped bass	0
2012	Spring	18	AKKVK	2	Alewife	0
2012	Spring	18	AKKVK	6	American shad	0
2012	Spring	18	AKKVK	14	Atlantic menhaden	1
2012	Spring	18	AKKVK	27	Blueback herring	0
2012	Spring	18	AKKVK	156	Striped bass	0
2012	Spring	18	LB	2	Alewife	0
2012	Spring	18	LB	6	American shad	0
2012	Spring	18	LB	14	Atlantic menhaden	0
2012	Spring	18	LB	27	Blueback herring	1
2012	Spring	18	LB	156	Striped bass	0
2012	Spring	18	NB	2	Alewife	0
2012	Spring	18	NB	6	American shad	0
2012	Spring	18	NB	14	Atlantic menhaden	2
2012	Spring	18	NB	27	Blueback herring	13
2012	Spring	18	NB	156	Striped bass	0
2012	Spring	18	UB	2	Alewife	0
2012	Spring	18	UB	6	American shad	0
2012	Spring	18	UB	14	Atlantic menhaden	14
2012	Spring	18	UB	27	Blueback herring	12
2012	Spring	18	UB	156	Striped bass	0
2012	Spring	19	AKKVK	2	Alewife	0
2012	Spring	19	AKKVK	6	American shad	0
2012	Spring	19	AKKVK	14	Atlantic menhaden	4
2012	Spring	19	AKKVK	27	Blueback herring	0
2012	Spring	19	AKKVK	156	Striped bass	0
2012	Spring	19	LB	2	Alewife	0
2012	Spring	19	LB	6	American shad	0
2012	Spring	19	LB	14	Atlantic menhaden	0
2012	Spring	19	LB	27	Blueback herring	14
2012	Spring	19	LB	156	Striped bass	0
2012	Spring	19	NB	2	Alewife	0
2012	Spring	19	NB	6	American shad	0
2012	Spring	19	NB	14	Atlantic menhaden	0
2012	Spring	19	NB	27	Blueback herring	1
2012	Spring	19	NB	156	Striped bass	1
2012	Spring	19	UB	2	Alewife	1
2012	Spring	19	UB	6	American shad	0
2012	Spring	19	UB	14	Atlantic menhaden	0
2012	Spring	19	UB	27	Blueback herring	1
2012	Spring	19	UB	156	Striped bass	0
2012	Spring	21	AKKVK	2	Alewife	0
2012	Spring	21	AKKVK	6	American shad	0
2012	Spring	21	AKKVK	14	Atlantic menhaden	0
2012	Spring	21	AKKVK	27	Blueback herring	0
2012	Spring	21	AKKVK	156	Striped bass	0
2012	Spring	21	LB	2	Alewife	0

Table C-4.1. Data Used for the NonDetect Analysis for Spring Samples

Year	Season	WOY	Area Grouping	Species Code	Common Name	SumOfCPUE_10min
2012	Spring	21	LB	6	American shad	0
2012	Spring	21	LB	14	Atlantic menhaden	0
2012	Spring	21	LB	27	Blueback herring	0
2012	Spring	21	LB	156	Striped bass	0
2012	Spring	21	NB	2	Alewife	0
2012	Spring	21	NB	6	American shad	0
2012	Spring	21	NB	14	Atlantic menhaden	0
2012	Spring	21	NB	27	Blueback herring	0
2012	Spring	21	NB	156	Striped bass	0
2012	Spring	21	UB	2	Alewife	0
2012	Spring	21	UB	6	American shad	0
2012	Spring	21	UB	14	Atlantic menhaden	4
2012	Spring	21	UB	27	Blueback herring	12
2012	Spring	21	UB	156	Striped bass	0
2012	Spring	23	AKKVK	2	Alewife	0
2012	Spring	23	AKKVK	6	American shad	0
2012	Spring	23	AKKVK	14	Atlantic menhaden	1
2012	Spring	23	AKKVK	27	Blueback herring	0
2012	Spring	23	AKKVK	156	Striped bass	0
2012	Spring	23	LB	2	Alewife	0
2012	Spring	23	LB	6	American shad	0
2012	Spring	23	LB	14	Atlantic menhaden	0
2012	Spring	23	LB	27	Blueback herring	0
2012	Spring	23	LB	156	Striped bass	0
2012	Spring	23	NB	2	Alewife	0
2012	Spring	23	NB	6	American shad	0
2012	Spring	23	NB	14	Atlantic menhaden	1
2012	Spring	23	NB	27	Blueback herring	0
2012	Spring	23	NB	156	Striped bass	0
2012	Spring	23	UB	2	Alewife	0
2012	Spring	23	UB	6	American shad	0
2012	Spring	23	UB	14	Atlantic menhaden	0
2012	Spring	23	UB	27	Blueback herring	1
2012	Spring	23	UB	156	Striped bass	0

Appendix C-5
Data Used for the NonDetect Analysis to Derive the Cumulative Frequency Distribution for Fall Samples

Table C-4.1. Data Used for the NonDetect Analysis for Fall Samples

Year	Season	WOY	Area Grouping	Species Code	Common Name	SumOfCPUE_10min
2012	Fall	37	AKKVK	2	Alewife	0
2012	Fall	37	AKKVK	6	American shad	0
2012	Fall	37	AKKVK	14	Atlantic menhaden	0
2012	Fall	37	AKKVK	27	Blueback herring	0
2012	Fall	37	AKKVK	156	Striped bass	0
2012	Fall	37	LB	2	Alewife	0
2012	Fall	37	LB	6	American shad	0
2012	Fall	37	LB	14	Atlantic menhaden	0
2012	Fall	37	LB	27	Blueback herring	0
2012	Fall	37	LB	156	Striped bass	0
2012	Fall	37	NB	2	Alewife	0
2012	Fall	37	NB	6	American shad	0
2012	Fall	37	NB	14	Atlantic menhaden	0
2012	Fall	37	NB	27	Blueback herring	3
2012	Fall	37	NB	156	Striped bass	0
2012	Fall	37	UB	2	Alewife	0
2012	Fall	37	UB	6	American shad	0
2012	Fall	37	UB	14	Atlantic menhaden	0
2012	Fall	37	UB	27	Blueback herring	0
2012	Fall	37	UB	156	Striped bass	0
2012	Fall	39	AKKVK	2	Alewife	0
2012	Fall	39	AKKVK	6	American shad	0
2012	Fall	39	AKKVK	14	Atlantic menhaden	0
2012	Fall	39	AKKVK	27	Blueback herring	0
2012	Fall	39	AKKVK	156	Striped bass	0
2012	Fall	39	LB	2	Alewife	0
2012	Fall	39	LB	6	American shad	0
2012	Fall	39	LB	14	Atlantic menhaden	0
2012	Fall	39	LB	27	Blueback herring	0
2012	Fall	39	LB	156	Striped bass	0
2012	Fall	39	NB	2	Alewife	1
2012	Fall	39	NB	6	American shad	0
2012	Fall	39	NB	14	Atlantic menhaden	3
2012	Fall	39	NB	27	Blueback herring	0
2012	Fall	39	NB	156	Striped bass	0
2012	Fall	39	UB	2	Alewife	0
2012	Fall	39	UB	6	American shad	0
2012	Fall	39	UB	14	Atlantic menhaden	0
2012	Fall	39	UB	27	Blueback herring	0
2012	Fall	39	UB	156	Striped bass	0
2012	Fall	40	AKKVK	2	Alewife	0
2012	Fall	40	AKKVK	6	American shad	0
2012	Fall	40	AKKVK	14	Atlantic menhaden	0
2012	Fall	40	AKKVK	27	Blueback herring	0
2012	Fall	40	AKKVK	156	Striped bass	0
2012	Fall	40	LB	2	Alewife	0
2012	Fall	40	LB	6	American shad	0
2012	Fall	40	LB	14	Atlantic menhaden	1

Table C-4.1. Data Used for the NonDetect Analysis for Fall Samples

Year	Season	WOY	Area Grouping	Species Code	Common Name	SumOfCPUE_10min
2012	Fall	40	LB	27	Blueback herring	0
2012	Fall	40	LB	156	Striped bass	0
2012	Fall	40	NB	2	Alewife	0
2012	Fall	40	NB	6	American shad	0
2012	Fall	40	NB	14	Atlantic menhaden	0
2012	Fall	40	NB	27	Blueback herring	0
2012	Fall	40	NB	156	Striped bass	0
2012	Fall	40	UB	2	Alewife	0
2012	Fall	40	UB	6	American shad	0
2012	Fall	40	UB	14	Atlantic menhaden	0
2012	Fall	40	UB	27	Blueback herring	0
2012	Fall	40	UB	156	Striped bass	0
2012	Fall	41	AKKVK	2	Alewife	0
2012	Fall	41	AKKVK	6	American shad	0
2012	Fall	41	AKKVK	14	Atlantic menhaden	0
2012	Fall	41	AKKVK	27	Blueback herring	0
2012	Fall	41	AKKVK	156	Striped bass	0
2012	Fall	41	LB	2	Alewife	0
2012	Fall	41	LB	6	American shad	0
2012	Fall	41	LB	14	Atlantic menhaden	0
2012	Fall	41	LB	27	Blueback herring	0
2012	Fall	41	LB	156	Striped bass	0
2012	Fall	41	NB	2	Alewife	0
2012	Fall	41	NB	6	American shad	0
2012	Fall	41	NB	14	Atlantic menhaden	2
2012	Fall	41	NB	27	Blueback herring	30
2012	Fall	41	NB	156	Striped bass	0
2012	Fall	41	UB	2	Alewife	0
2012	Fall	41	UB	6	American shad	0
2012	Fall	41	UB	14	Atlantic menhaden	1
2012	Fall	41	UB	27	Blueback herring	0
2012	Fall	41	UB	156	Striped bass	0
2012	Fall	42	AKKVK	2	Alewife	0
2012	Fall	42	AKKVK	6	American shad	0
2012	Fall	42	AKKVK	14	Atlantic menhaden	5
2012	Fall	42	AKKVK	27	Blueback herring	259
2012	Fall	42	AKKVK	156	Striped bass	0
2012	Fall	42	LB	2	Alewife	0
2012	Fall	42	LB	6	American shad	0
2012	Fall	42	LB	14	Atlantic menhaden	0
2012	Fall	42	LB	27	Blueback herring	0
2012	Fall	42	LB	156	Striped bass	0
2012	Fall	42	NB	2	Alewife	0
2012	Fall	42	NB	6	American shad	0
2012	Fall	42	NB	14	Atlantic menhaden	7
2012	Fall	42	NB	27	Blueback herring	70
2012	Fall	42	NB	156	Striped bass	0
2012	Fall	42	UB	2	Alewife	0
2012	Fall	42	UB	6	American shad	0

Table C-4.1. Data Used for the NonDetect Analysis for Fall Samples

Year	Season	WOY	Area Grouping	Species Code	Common Name	SumOfCPUE_10min
2012	Fall	42	UB	14	Atlantic menhaden	0
2012	Fall	42	UB	27	Blueback herring	0
2012	Fall	42	UB	156	Striped bass	0
2012	Fall	43	AKKVK	2	Alewife	0
2012	Fall	43	AKKVK	6	American shad	1
2012	Fall	43	AKKVK	14	Atlantic menhaden	1
2012	Fall	43	AKKVK	27	Blueback herring	6
2012	Fall	43	AKKVK	156	Striped bass	0
2012	Fall	43	LB	2	Alewife	0
2012	Fall	43	LB	6	American shad	0
2012	Fall	43	LB	14	Atlantic menhaden	0
2012	Fall	43	LB	27	Blueback herring	0
2012	Fall	43	LB	156	Striped bass	0
2012	Fall	43	NB	2	Alewife	1
2012	Fall	43	NB	6	American shad	0
2012	Fall	43	NB	14	Atlantic menhaden	37
2012	Fall	43	NB	27	Blueback herring	3
2012	Fall	43	NB	156	Striped bass	0
2012	Fall	43	UB	2	Alewife	0
2012	Fall	43	UB	6	American shad	0
2012	Fall	43	UB	14	Atlantic menhaden	0
2012	Fall	43	UB	27	Blueback herring	1
2012	Fall	43	UB	156	Striped bass	0
2012	Fall	45	AKKVK	2	Alewife	1
2012	Fall	45	AKKVK	6	American shad	0
2012	Fall	45	AKKVK	14	Atlantic menhaden	0
2012	Fall	45	AKKVK	27	Blueback herring	461
2012	Fall	45	AKKVK	156	Striped bass	0
2012	Fall	45	LB	2	Alewife	0
2012	Fall	45	LB	6	American shad	0
2012	Fall	45	LB	14	Atlantic menhaden	0
2012	Fall	45	LB	27	Blueback herring	2
2012	Fall	45	LB	156	Striped bass	0
2012	Fall	45	NB	2	Alewife	0
2012	Fall	45	NB	6	American shad	1
2012	Fall	45	NB	14	Atlantic menhaden	10
2012	Fall	45	NB	27	Blueback herring	767
2012	Fall	45	NB	156	Striped bass	0
2012	Fall	45	UB	2	Alewife	5
2012	Fall	45	UB	6	American shad	0
2012	Fall	45	UB	14	Atlantic menhaden	0
2012	Fall	45	UB	27	Blueback herring	4
2012	Fall	45	UB	156	Striped bass	0
2012	Fall	46	AKKVK	2	Alewife	21
2012	Fall	46	AKKVK	6	American shad	0
2012	Fall	46	AKKVK	14	Atlantic menhaden	75
2012	Fall	46	AKKVK	27	Blueback herring	1328
2012	Fall	46	AKKVK	156	Striped bass	0
2012	Fall	46	LB	2	Alewife	72

Table C-4.1. Data Used for the NonDetect Analysis for Fall Samples

Year	Season	WOY	Area Grouping	Species Code	Common Name	SumOfCPUE_10min
2012	Fall	46	LB	6	American shad	11
2012	Fall	46	LB	14	Atlantic menhaden	0
2012	Fall	46	LB	27	Blueback herring	1415
2012	Fall	46	LB	156	Striped bass	0
2012	Fall	46	NB	2	Alewife	5
2012	Fall	46	NB	6	American shad	0
2012	Fall	46	NB	14	Atlantic menhaden	1
2012	Fall	46	NB	27	Blueback herring	270
2012	Fall	46	NB	156	Striped bass	0
2012	Fall	46	UB	2	Alewife	238
2012	Fall	46	UB	6	American shad	7
2012	Fall	46	UB	14	Atlantic menhaden	7
2012	Fall	46	UB	27	Blueback herring	883
2012	Fall	46	UB	156	Striped bass	0
2012	Fall	47	AKKVK	2	Alewife	1
2012	Fall	47	AKKVK	6	American shad	0
2012	Fall	47	AKKVK	14	Atlantic menhaden	1
2012	Fall	47	AKKVK	27	Blueback herring	900
2012	Fall	47	AKKVK	156	Striped bass	0
2012	Fall	47	LB	2	Alewife	47
2012	Fall	47	LB	6	American shad	3
2012	Fall	47	LB	14	Atlantic menhaden	3
2012	Fall	47	LB	27	Blueback herring	4507
2012	Fall	47	LB	156	Striped bass	0
2012	Fall	47	NB	2	Alewife	0
2012	Fall	47	NB	6	American shad	0
2012	Fall	47	NB	14	Atlantic menhaden	0
2012	Fall	47	NB	27	Blueback herring	214
2012	Fall	47	NB	156	Striped bass	0
2012	Fall	47	UB	2	Alewife	22
2012	Fall	47	UB	6	American shad	3
2012	Fall	47	UB	14	Atlantic menhaden	1
2012	Fall	47	UB	27	Blueback herring	995
2012	Fall	47	UB	156	Striped bass	0
2012	Fall	48	AKKVK	2	Alewife	0
2012	Fall	48	AKKVK	6	American shad	0
2012	Fall	48	AKKVK	14	Atlantic menhaden	0
2012	Fall	48	AKKVK	27	Blueback herring	1363
2012	Fall	48	AKKVK	156	Striped bass	0
2012	Fall	48	LB	2	Alewife	0
2012	Fall	48	LB	6	American shad	1
2012	Fall	48	LB	14	Atlantic menhaden	0
2012	Fall	48	LB	27	Blueback herring	241
2012	Fall	48	LB	156	Striped bass	0
2012	Fall	48	NB	2	Alewife	0
2012	Fall	48	NB	6	American shad	1
2012	Fall	48	NB	14	Atlantic menhaden	0
2012	Fall	48	NB	27	Blueback herring	445
2012	Fall	48	NB	156	Striped bass	0

Table C-4.1. Data Used for the NonDetect Analysis for Fall Samples

Year	Season	WOY	Area Grouping	Species Code	Common Name	SumOfCPUE_10min
2012	Fall	48	UB	2	Alewife	34
2012	Fall	48	UB	6	American shad	3
2012	Fall	48	UB	14	Atlantic menhaden	1
2012	Fall	48	UB	27	Blueback herring	12002
2012	Fall	48	UB	156	Striped bass	0
2012	Fall	49	AKKVK	2	Alewife	0
2012	Fall	49	AKKVK	6	American shad	6
2012	Fall	49	AKKVK	14	Atlantic menhaden	1
2012	Fall	49	AKKVK	27	Blueback herring	1170
2012	Fall	49	AKKVK	156	Striped bass	0
2012	Fall	49	LB	2	Alewife	0
2012	Fall	49	LB	6	American shad	0
2012	Fall	49	LB	14	Atlantic menhaden	0
2012	Fall	49	LB	27	Blueback herring	2030
2012	Fall	49	LB	156	Striped bass	0
2012	Fall	49	NB	2	Alewife	0
2012	Fall	49	NB	6	American shad	0
2012	Fall	49	NB	14	Atlantic menhaden	0
2012	Fall	49	NB	27	Blueback herring	325
2012	Fall	49	NB	156	Striped bass	0
2012	Fall	49	UB	2	Alewife	8
2012	Fall	49	UB	6	American shad	0
2012	Fall	49	UB	14	Atlantic menhaden	1
2012	Fall	49	UB	27	Blueback herring	889
2012	Fall	49	UB	156	Striped bass	1

Appendix C-6
Results of the Nondetect Analysis in NCSS 2007 to Derive the Cumulative Frequency Distribution for Spring Samples of Target Species

Nondetects Analysis Report

Page/Date/Time 1 4/9/2013 2:35:15 PM
Database C:\Documents and Settings\jb ... \2012 MFR CFD Database_V2.S0
Filter Season = "Spring"
Response Variable = WOY
Nondetects Variable = Censor_1. Group Variable = CName
Confidence Limits Method = Linear (Greenwood).

Data Summary Section

Group	Type	Rows	Count	Minimum	Maximum	
Alewife	Detected	6	36	13	19	
Alewife	Not Detected	0	0			
Alewife	Total	6	36	13	19	
American shad	Detected	4	16	14	17	
American shad	Not Detected	0	0			
American shad	Total	4	16	14	17	
Atlantic menhaden	Detected		18	106	13	23
Atlantic menhaden	Not Detected		0	0		
Atlantic menhaden	Total		18	106	13	23
Blueback herring	Detected	21	971	13	23	
Blueback herring	Not Detected	0	0			
Blueback herring	Total	21	971	13	23	
Striped bass	Detected	2	2	15	19	
Striped bass	Not Detected	0	0			
Striped bass	Total	2	2	15	19	

Data Summary Section: Response Quartiles

	Quartile	Estimate	Lower 95.0% C.L.	Upper 95.0% C.L.
Alewife	First (Q1)	14.000	14.000	14.000
Alewife	Median (Q2)	15.000	14.000	15.000
Alewife	Third (Q3)	15.000	15.000	16.000
American shad	First (Q1)	14.000	19.000	15.000
American shad	Median (Q2)	15.000	19.000	15.000
American shad	Third (Q3)	15.000	15.000	17.000
Atlantic menhaden	First (Q1)	15.000	15.000	15.000
Atlantic menhaden	Median (Q2)	15.000	15.000	15.000
Atlantic menhaden	Third (Q3)	18.000	16.000	18.000

Nondetects Analysis Report

Page/Date/Time 2 4/9/2013 2:35:15 PM
Database C:\Documents and Settings\jb ... \2012 MFR CFD Database_V2.S0
Filter Season = "Spring"
Response Variable = WOY
Nondetects Variable = Censor_1. Group Variable = CName
Confidence Limits Method = Linear (Greenwood).

Data Summary Section: Response Quartiles

	Quartile	Estimate	Lower 95.0% C.L.	Upper 95.0% C.L.
Blueback herring	First (Q1)	13.000	19.000	13.000
Blueback herring	Median (Q2)	14.000	14.000	14.000
Blueback herring	Third (Q3)	14.000	14.000	14.000
Striped bass	First (Q1)	15.000	15.000	19.000
Striped bass	Median (Q2)	19.000	15.000	19.000
Striped bass	Third (Q3)	19.000	15.000	19.000

Logrank Tests Section
Hypotheses
H0: Distribution Functions are Equal Among Groups
HA: At Least One Group Distribution Functions Differs

Test Name	Chi-Square	DF	Prob Level	Reject H0 (Alpha = 0.05)
Logrank	363.053	4	0.0000	Yes
Gehan-Wilcoxon	359.784	4	0.0000	Yes
Tarone-Ware	362.195	4	0.0000	Yes
Peto-Peto	342.279	4	0.0000	Yes
Mod. Peto-Peto	342.266	4	0.0000	Yes

Multiple Pairwise Tests Section
Hypotheses
H0: Distribution Functions are Equal
HA: Distribution Functions Differ

Group Pair Tested: Alewife vs. American shad
Bonferroni

Test Name	Chi-Square	DF	Prob Level	Reject H0 (Alpha =0.05)	Adjusted Prob Level	Reject H0 (Alpha =0.05)
Logrank	0.740	1	0.3897	No	1.0000	No
Gehan-Wilcoxon	0.526	1	0.4682	No	1.0000	No
Tarone-Ware	0.618	1	0.4317	No	1.0000	No
Peto-Peto	0.152	1	0.6964	No	1.0000	No
Mod. Peto-Peto	0.151	1	0.6973	No	1.0000	No

Group Pair Tested: Alewife vs. Atlantic menhaden
Bonferroni

Test Name	Chi-Square	DF	Prob Level	Reject H0 (Alpha =0.05)	Adjusted Prob Level	Reject H0 (Alpha =0.05)

Logrank	18.915	1	0.0000	Yes	0.0001	Yes
Gehan-Wilcoxon	20.439	1	0.0000	Yes	0.0001	Yes
Tarone-Ware	20.501	1	0.0000	Yes	0.0001	Yes
Peto-Peto	10.061	1	0.0015	Yes	0.0151	Yes
Mod. Peto-Peto	10.065	1	0.0015	Yes	0.0151	Yes

Group Pair Tested: Alewife vs. Blueback herring
Bonferroni

Test Name	Chi-Square	DF	Prob Level	Reject H0 (Alpha =0.05)	Adjusted Prob Level	Reject H0 (Alpha =0.05)
Logrank	33.096	1	0.0000	Yes	0.0000	Yes
Gehan-Wilcoxon	32.638	1	0.0000	Yes	0.0000	Yes
Tarone-Ware	32.947	1	0.0000	Yes	0.0000	Yes
Peto-Peto	31.182	1	0.0000	Yes	0.0000	Yes
Mod. Peto-Peto	31.180	1	0.0000	Yes	0.0000	Yes

Group Pair Tested: Alewife vs. Striped bass
Bonferroni

Test Name	Chi-Square	DF	Prob Level	Reject H0 (Alpha =0.05)	Adjusted Prob Level	Reject H0 (Alpha =0.05)
Logrank	3.469	1	0.0625	No	0.6252	No
Gehan-Wilcoxon	3.784	1	0.0517	No	0.5174	No
Tarone-Ware	3.628	1	0.0568	No	0.5680	No
Peto-Peto	4.279	1	0.0386	Yes	0.3858	No
Mod. Peto-Peto	4.285	1	0.0385	Yes	0.3846	No

Group Pair Tested: American shad vs. Atlantic menhaden
Bonferroni

Test Name	Chi-Square	DF	Prob Level	Reject H0 (Alpha =0.05)	Adjusted Prob Level	Reject H0 (Alpha =0.05)
Logrank	6.533	1	0.0106	Yes	0.1059	No
Gehan-Wilcoxon	8.338	1	0.0039	Yes	0.0388	Yes
Tarone-Ware	8.156	1	0.0043	Yes	0.0429	Yes
Peto-Peto	4.736	1	0.0295	Yes	0.2954	No
Mod. Peto-Peto	4.741	1	0.0294	Yes	0.2945	No

Group Pair Tested: American shad vs. Blueback herring
Bonferroni

Test Name	Chi-Square	DF	Prob Level	Reject H0 (Alpha =0.05)	Adjusted Prob Level	Reject H0 (Alpha =0.05)
Logrank	26.018	1	0.0000	Yes	0.0000	Yes
Gehan-Wilcoxon	25.446	1	0.0000	Yes	0.0000	Yes
Tarone-Ware	25.785	1	0.0000	Yes	0.0000	Yes
Peto-Peto	23.338	1	0.0000	Yes	0.0000	Yes
Mod. Peto-Peto	23.336	1	0.0000	Yes	0.0000	Yes

Group Pair Tested: American shad vs. Striped bass
Bonferroni

Test Name	Chi-Square	DF	Prob Level	Reject H0 (Alpha =0.05)	Adjusted Prob Level	Reject H0 (Alpha =0.05)
Logrank	2.872	1	0.0901	No	0.9012	No

Gehan-Wilcoxon	3.223	1	0.0726	No	0.7260	No
Tarone-Ware	3.047	1	0.0809	No	0.8089	No
Peto-Peto	3.902	1	0.0482	Yes	0.4823	No
Mod. Peto-Peto	3.914	1	0.0479	Yes	0.4788	No

Group Pair Tested: Atlantic menhaden vs. Blueback herring
Bonferroni

Test Name	Chi-Square	DF	Prob Level	Reject H0 (Alpha =0.05)	Adjusted Prob Level	Reject H0 (Alpha =0.05)
Logrank	331.580	1	0.0000	Yes	0.0000	Yes
Gehan-Wilcoxon	328.655	1	0.0000	Yes	0.0000	Yes
Tarone-Ware	330.698	1	0.0000	Yes	0.0000	Yes
Peto-Peto	319.095	1	0.0000	Yes	0.0000	Yes
Mod. Peto-Peto	319.084	1	0.0000	Yes	0.0000	Yes

Group Pair Tested: Atlantic menhaden vs. Striped bass
Bonferroni

Test Name	Chi-Square	DF	Prob Level	Reject H0 (Alpha =0.05)	Adjusted Prob Level	Reject H0 (Alpha =0.05)
Logrank	0.477	1	0.4898	No	1.0000	No
Gehan-Wilcoxon	0.635	1	0.4256	No	1.0000	No
Tarone-Ware	0.558	1	0.4552	No	1.0000	No
Peto-Peto	0.688	1	0.4068	No	1.0000	No
Mod. Peto-Peto	0.690	1	0.4062	No	1.0000	No

Group Pair Tested: Blueback herring vs. Striped bass
Bonferroni

Test Name	Chi-Square	DF	Prob Level	Reject H0 (Alpha =0.05)	Adjusted Prob Level	Reject H0 (Alpha =0.05)
Logrank	14.804	1	0.0001	Yes	0.0012	Yes
Gehan-Wilcoxon	14.935	1	0.0001	Yes	0.0011	Yes
Tarone-Ware	14.873	1	0.0001	Yes	0.0011	Yes
Peto-Peto	14.772	1	0.0001	Yes	0.0012	Yes
Mod. Peto-Peto	14.772	1	0.0001	Yes	0.0012	Yes

Notes:
The most commonly used test is the Logrank test.

Nondetects Analysis Report

Page/Date/Time 3 4/9/2013 2:35:15 PM
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Confidence Limits Method = Linear (Greenwood).

Logrank Test Detail Section

Group	Z-Value	Standard Error	Standardized Z-Value
Alewife	15.094	3.481	4.336
American shad	8.687	2.251	3.859
Atlantic menhaden	78.319	4.472	17.511
Blueback herring	-103.762	5.934	-17.487
Striped bass	1.662	0.548	3.033

Probability Level was 0.0000

Gehan-Wilcoxon Test Detail Section

Group	Z-Value	Standard Error	Standardized Z-Value
Alewife	14124.000	3399.554	4.155
American shad	8269.000	2233.395	3.702
Atlantic menhaden	80778.000	4621.706	17.478
Blueback herring	-104934.000	5981.855	-17.542
Striped bass	1763.000	574.338	3.070

Probability Level was 0.0000

Tarone-Ware Test Detail Section

Group	Z-Value	Standard Error	Standardized Z-Value
Alewife	461.374	108.447	4.254
American shad	267.840	70.720	3.787
Atlantic menhaden	2514.699	143.603	17.511
Blueback herring	-3298.032	187.986	-17.544
Striped bass	54.119	17.733	3.052

Probability Level was 0.0000

Peto-Peto Test Detail Section

Group	Z-Value	Standard Error	Standardized Z-Value
Alewife	9.148	2.462	3.715
American shad	5.382	1.659	3.244
Atlantic menhaden	62.670	3.649	17.174
Blueback herring	-78.610	4.560	-17.239
Striped bass	1.411	0.461	3.061

Probability Level was 0.0000

Nondetects Analysis Report

Page/Date/Time 4 4/9/2013 2:35:15 PM
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Confidence Limits Method = Linear (Greenwood).

Mod. Peto-Peto Test Detail Section

Group	Z-Value	Standard Error	Standardized Z-Value
Alewife	9.138	2.460	3.715
American shad	5.376	1.657	3.244
Atlantic menhaden	62.609	3.646	17.174
Blueback herring	-78.533	4.556	-17.238
Striped bass	1.410	0.460	3.061

Probability Level was 0.0000

Specific Response Detail: Estimated Cumulative Proportion

CName	Response (R)	Cumulative Proportion P(R)	Standard Error of P(R)	Lower 95.0% C.L. for P(R)	Upper 95.0% C.L. for P(R)	Cum. Count
Alewife	3.000					0
American shad	3.000					0
Atlantic menhaden	3.000					0
Blueback herring	3.000					0
Striped bass	3.000					0
Alewife	6.000					0
American shad	6.000					0
Atlantic menhaden	6.000					0
Blueback herring	6.000					0
Striped bass	6.000					0
Alewife	9.000					0
American shad	9.000					0
Atlantic menhaden	9.000					0
Blueback herring	9.000					0
Striped bass	9.000					0
Alewife	12.000					0
American shad	12.000					0
Atlantic menhaden	12.000					0
Blueback herring	12.000					0
Striped bass	12.000					0

Nondetects Analysis Report

Page/Date/Time 5 4/9/2013 2:35:15 PM
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Response Variable = WOY
Nondetects Variable = Censor_1. Group Variable = CName
Confidence Limits Method = Linear (Greenwood).

Specific Response Detail: Estimated Cumulative Proportion

CName	Response (R)	Cumulative Proportion P(R)	Standard Error of P(R)	Lower 95.0% C.L. for P(R)	Upper 95.0% C.L. for P(R)	Cum. Count
Alewife	15.000	0.4444	0.0828	0.2821	0.6068	30
American shad	15.000	0.3125	0.1159	0.0854	0.5396	14
Atlantic menhaden	15.000	0.0472	0.0206	0.0068	0.0875	66
Blueback herring	15.000	0.8177	0.0124	0.7934	0.8420	892
Striped bass	15.000					1
Alewife	18.000	0.9722	0.0274	0.9185	1.0000	35
American shad	18.000	1.0000	0.0000	1.0000	1.0000	16
Atlantic menhaden	18.000	0.7453	0.0423	0.6623	0.8282	96
Blueback herring	18.000	0.9434	0.0074	0.9288	0.9579	942
Striped bass	18.000	0.5000	0.3536	0.0000	1.0000	1
Alewife	21.000	1.0000	0.0000	1.0000	1.0000	36
American shad	21.000	1.0000	0.0000	1.0000	1.0000	16
Atlantic menhaden	21.000	0.9434	0.0224	0.8994	0.9874	104
Blueback herring	21.000	0.9866	0.0037	0.9794	0.9938	970
Striped bass	21.000	1.0000	0.0000	1.0000	1.0000	2
Alewife	24.000	1.0000	0.0000	1.0000	1.0000	36
American shad	24.000	1.0000	0.0000	1.0000	1.0000	16
Atlantic menhaden	24.000	1.0000	0.0000	1.0000	1.0000	106
Blueback herring	24.000	1.0000	0.0000	1.0000	1.0000	971
Striped bass	24.000	1.0000	0.0000	1.0000	1.0000	2
Alewife	27.000	1.0000	0.0000	1.0000	1.0000	36
American shad	27.000	1.0000	0.0000	1.0000	1.0000	16
Atlantic menhaden	27.000	1.0000	0.0000	1.0000	1.0000	106
Blueback herring	27.000	1.0000	0.0000	1.0000	1.0000	971
Striped bass	27.000	1.0000	0.0000	1.0000	1.0000	2
Alewife	30.000	1.0000	0.0000	1.0000	1.0000	36
American shad	30.000	1.0000	0.0000	1.0000	1.0000	16
Atlantic menhaden	30.000	1.0000	0.0000	1.0000	1.0000	106
Blueback herring	30.000	1.0000	0.0000	1.0000	1.0000	971
Striped bass	30.000	1.0000	0.0000	1.0000	1.0000	2

Nondetects Analysis Report

Page/Date/Time 6 4/9/2013 2:35:15 PM
Database C:\Documents and Settings\jb ... \2012 MFR CFD Database_V2.S0
Filter Season = "Spring"
Response Variable = WOY
Nondetects Variable = Censor_1. Group Variable = CName
Confidence Limits Method = Linear (Greenwood).

Quantiles of Responses

CName	Proportion of Response	Estimated Quantile	Lower 95.0% C.L. Quantile	Upper 95.0% C.L. Quantile
Alewife	0.0500	13.000	17.000	14.000
American shad	0.0500	14.000	19.000	14.000
Atlantic menhaden	0.0500	15.000	14.000	15.000
Blueback herring	0.0500	13.000	19.000	13.000
Striped bass	0.0500	15.000	15.000	19.000
Alewife	0.1000	14.000	17.000	14.000
American shad	0.1000	14.000	19.000	15.000
Atlantic menhaden	0.1000	15.000	15.000	15.000
Blueback herring	0.1000	13.000	19.000	13.000
Striped bass	0.1000	15.000	15.000	19.000
Alewife	0.1500	14.000	14.000	14.000
American shad	0.1500	14.000	19.000	15.000
Atlantic menhaden	0.1500	15.000	15.000	15.000
Blueback herring	0.1500	13.000	19.000	13.000
Striped bass	0.1500	15.000	15.000	19.000
Alewife	0.2000	14.000	14.000	14.000
American shad	0.2000	14.000	19.000	15.000
Atlantic menhaden	0.2000	15.000	15.000	15.000
Blueback herring	0.2000	13.000	19.000	13.000
Striped bass	0.2000	15.000	15.000	19.000
Alewife	0.2500	14.000	14.000	14.000
American shad	0.2500	14.000	19.000	15.000
Atlantic menhaden	0.2500	15.000	15.000	15.000
Blueback herring	0.2500	13.000	19.000	13.000
Striped bass	0.2500	15.000	15.000	19.000
Alewife	0.3000	14.000	14.000	15.000
American shad	0.3000	14.000	19.000	15.000
Atlantic menhaden	0.3000	15.000	15.000	15.000
Blueback herring	0.3000	13.000	19.000	13.000
Striped bass	0.3000	15.000	15.000	19.000

Nondetects Analysis Report

Page/Date/Time 7 4/9/2013 2:35:15 PM
Database C:\Documents and Settings\jb ... \2012 MFR CFD Database_V2.S0
Filter Season = "Spring"
Response Variable = WOY
Nondetects Variable = Censor_1. Group Variable = CName
Confidence Limits Method = Linear (Greenwood).

Quantiles of Responses

CName	Proportion of Response	Estimated Quantile	Lower 95.0% C.L. Quantile	Upper 95.0% C.L. Quantile
Alewife	0.3500	14.000	14.000	15.000
American shad	0.3500	15.000	19.000	15.000
Atlantic menhaden	0.3500	15.000	15.000	15.000
Blueback herring	0.3500	13.000	19.000	14.000
Striped bass	0.3500	15.000	15.000	19.000
Alewife	0.4000	14.000	14.000	15.000
American shad	0.4000	15.000	19.000	15.000
Atlantic menhaden	0.4000	15.000	15.000	15.000
Blueback herring	0.4000	14.000	14.000	14.000
Striped bass	0.4000	15.000	15.000	19.000
Alewife	0.4500	15.000	14.000	15.000
American shad	0.4500	15.000	19.000	15.000
Atlantic menhaden	0.4500	15.000	15.000	15.000
Blueback herring	0.4500	14.000	14.000	14.000
Striped bass	0.4500	15.000	15.000	19.000
Alewife	0.5000	15.000	14.000	15.000
American shad	0.5000	15.000	19.000	15.000
Atlantic menhaden	0.5000	15.000	15.000	15.000
Blueback herring	0.5000	14.000	14.000	14.000
Striped bass	0.5000	19.000	15.000	19.000
Alewife	0.5500	15.000	14.000	15.000
American shad	0.5500	15.000	15.000	15.000
Atlantic menhaden	0.5500	15.000	15.000	16.000
Blueback herring	0.5500	14.000	14.000	14.000
Striped bass	0.5500	19.000	15.000	19.000
Alewife	0.6000	15.000	14.000	15.000
American shad	0.6000	15.000	15.000	15.000
Atlantic menhaden	0.6000	15.000	15.000	17.000
Blueback herring	0.6000	14.000	14.000	14.000
Striped bass	0.6000	19.000	15.000	19.000

Nondetects Analysis Report

Page/Date/Time 8 4/9/2013 2:35:15 PM
Database C:\Documents and Settings\jb ... \2012 MFR CFD Database_V2.S0
Filter Season = "Spring"
Response Variable = WOY
Nondetects Variable = Censor_1. Group Variable = CName
Confidence Limits Method = Linear (Greenwood).

Quantiles of Responses

CName	Proportion of Response	Estimated Quantile	Lower 95.0% C.L. Quantile	Upper 95.0% C.L. Quantile
Alewife	0.6500	15.000	15.000	15.000
American shad	0.6500	15.000	15.000	15.000
Atlantic menhaden	0.6500	16.000	15.000	17.000
Blueback herring	0.6500	14.000	14.000	14.000
Striped bass	0.6500	19.000	15.000	19.000
Alewife	0.7000	15.000	15.000	15.000
American shad	0.7000	15.000	15.000	15.000
Atlantic menhaden	0.7000	17.000	15.000	18.000
Blueback herring	0.7000	14.000	14.000	14.000
Striped bass	0.7000	19.000	15.000	19.000
Alewife	0.7500	15.000	15.000	16.000
American shad	0.7500	15.000	15.000	17.000
Atlantic menhaden	0.7500	18.000	16.000	18.000
Blueback herring	0.7500	14.000	14.000	14.000
Striped bass	0.7500	19.000	15.000	19.000
Alewife	0.8000	15.000	15.000	16.000
American shad	0.8000	15.000	15.000	17.000
Atlantic menhaden	0.8000	18.000	17.000	18.000
Blueback herring	0.8000	14.000	14.000	15.000
Striped bass	0.8000	19.000	15.000	19.000
Alewife	0.8500	16.000	15.000	16.000
American shad	0.8500	15.000	15.000	17.000
Atlantic menhaden	0.8500	18.000	18.000	18.000
Blueback herring	0.8500	15.000	15.000	15.000
Striped bass	0.8500	19.000	15.000	19.000
Alewife	0.9000	16.000	15.000	16.000
American shad	0.9000	17.000	15.000	17.000
Atlantic menhaden	0.9000	18.000	18.000	21.000
Blueback herring	0.9000	15.000	15.000	15.000
Striped bass	0.9000	19.000	15.000	19.000

Nondetects Analysis Report

Page/Date/Time 9 4/9/2013 2:35:15 PM
Database C:\Documents and Settings\jb ... \2012 MFR CFD Database_V2.S0
Filter Season = "Spring"
Response Variable = WOY
Nondetects Variable = Censor_1. Group Variable = CName
Confidence Limits Method = Linear (Greenwood).

Quantiles of Responses

CName	Proportion of Response	Estimated Quantile	Lower 95.0% C.L. Quantile	Upper 95.0% C.L. Quantile
Alewife	0.9500	16.000	15.000	19.000
American shad	0.9500	17.000	15.000	17.000
Atlantic menhaden	0.9500	21.000	18.000	21.000
Blueback herring	0.9500	18.000	17.000	18.000
Striped bass	0.9500	19.000	15.000	19.000

Response Detail for CName = Alewife

Response (R)	Cumulative Proportion P(R)	Standard Error of P(R)	Lower 95.0% C.L. for P(R)	Upper 95.0% C.L. for P(R)	Cum. Count	Count
13.000	0.0000				2	2
14.000	0.0556	0.0382	0.0000	0.1304	16	14
15.000	0.4444	0.0828	0.2821	0.6068	30	14
16.000	0.8333	0.0621	0.7116	0.9551	35	5
19.000	0.9722	0.0274	0.9185	1.0000	36	1

Response Detail for CName = American shad

Response (R)	Cumulative Proportion P(R)	Standard Error of P(R)	Lower 95.0% C.L. for P(R)	Upper 95.0% C.L. for P(R)	Cum. Count	Count
14.000	0.0000				5	5
15.000	0.3125	0.1159	0.0854	0.5396	14	9
17.000	0.8750	0.0827	0.7130	1.0000	16	2

Nondetects Analysis Report

Page/Date/Time 10 4/9/2013 2:35:15 PM
Database C:\Documents and Settings\jb ... \2012 MFR CFD Database_V2.S0
Filter Season = "Spring"
Response Variable = WOY
Nondetects Variable = Censor_1. Group Variable = CName
Confidence Limits Method = Linear (Greenwood).

Response Detail for CName = Atlantic menhaden

Response (R)	Cumulative Proportion P(R)	Standard Error of P(R)	Lower 95.0% C.L. for P(R)	Upper 95.0% C.L. for P(R)	Cum. Count	Count
13.000	0.0000				2	2
14.000	0.0189	0.0132	0.0000	0.0448	5	3
15.000	0.0472	0.0206	0.0068	0.0875	66	61
16.000	0.6226	0.0471	0.5304	0.7149	70	4
17.000	0.6604	0.0460	0.5702	0.7505	79	9
18.000	0.7453	0.0423	0.6623	0.8282	96	17
19.000	0.9057	0.0284	0.8500	0.9613	100	4
21.000	0.9434	0.0224	0.8994	0.9874	104	4
23.000	0.9811	0.0132	0.9552	1.0000	106	2

Response Detail for CName = Blueback herring

Response (R)	Cumulative Proportion P(R)	Standard Error of P(R)	Lower 95.0% C.L. for P(R)	Upper 95.0% C.L. for P(R)	Cum. Count	Count
13.000	0.0000				342	342
14.000	0.3522	0.0153	0.3222	0.3823	794	452
15.000	0.8177	0.0124	0.7934	0.8420	892	98
16.000	0.9186	0.0088	0.9014	0.9358	897	5
17.000	0.9238	0.0085	0.9071	0.9405	916	19
18.000	0.9434	0.0074	0.9288	0.9579	942	26
19.000	0.9701	0.0055	0.9594	0.9808	958	16
21.000	0.9866	0.0037	0.9794	0.9938	970	12
23.000	0.9990	0.0010	0.9970	1.0000	971	1

Response Detail for CName = Striped bass

Response (R)	Cumulative Proportion P(R)	Standard Error of P(R)	Lower 95.0% C.L. for P(R)	Upper 95.0% C.L. for P(R)	Cum. Count	Count
15.000	0.0000				1	1
19.000	0.5000	0.3536	0.0000	1.0000	2	1

Nondetects Analysis Report

Page/Date/Time 11 4/9/2013 2:35:15 PM
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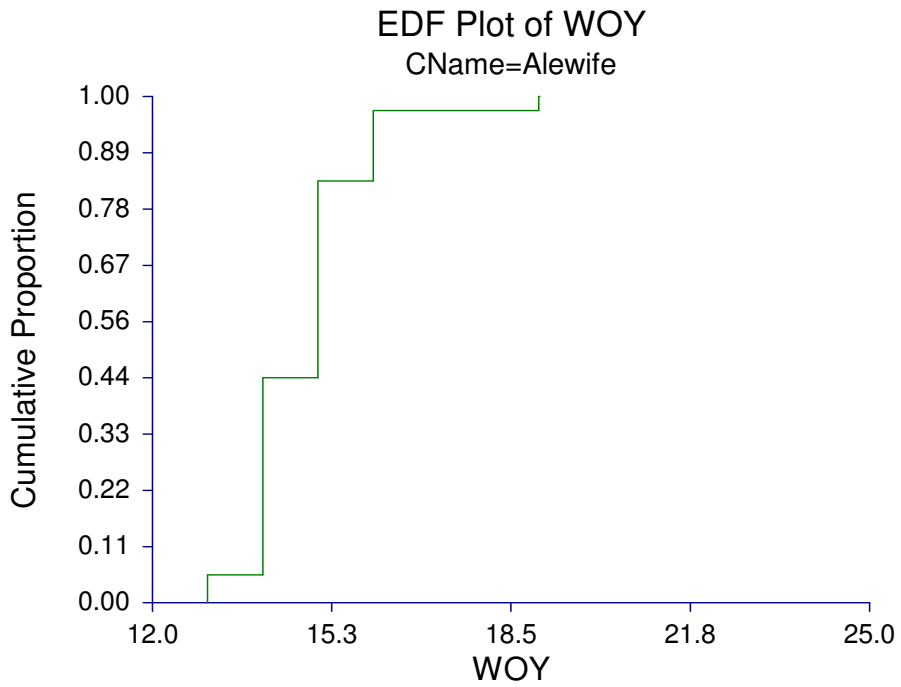
Response Variable = WOY
Nondetects Variable = Censor_1. Group Variable = CName
Confidence Limits Method = Linear (Greenwood).

Plots Section



Nondetects Analysis Report

Page/Date/Time 12 4/9/2013 2:35:15 PM
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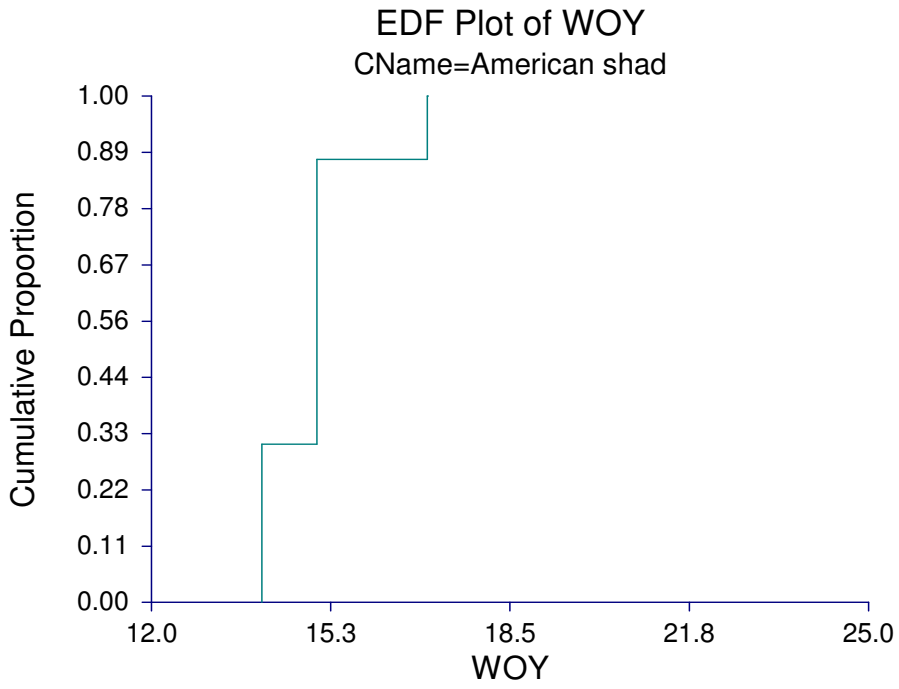
Confidence Limits Method = Linear (Greenwood).



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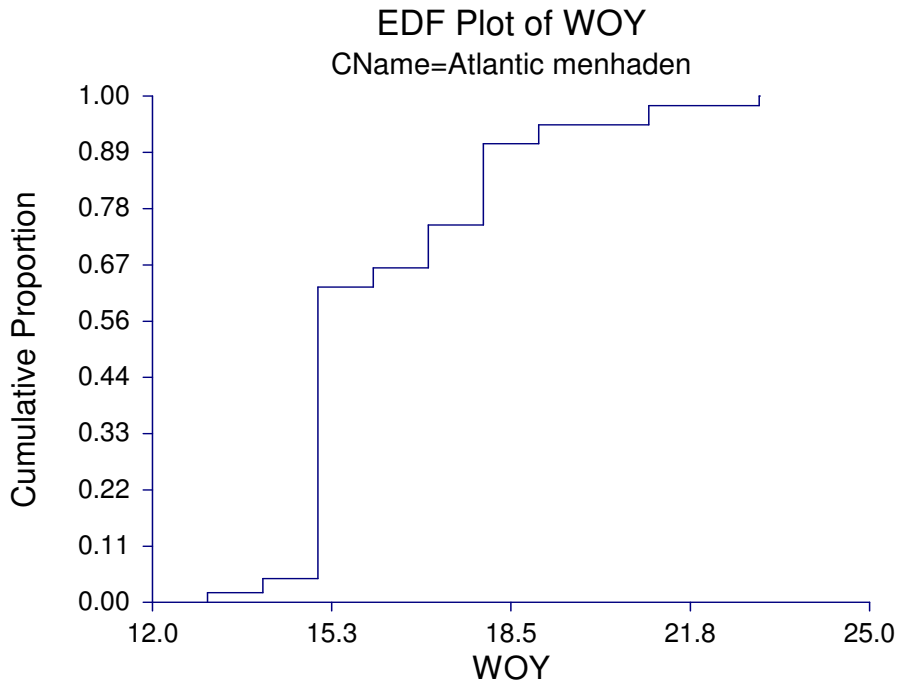
Confidence Limits Method = Linear (Greenwood).



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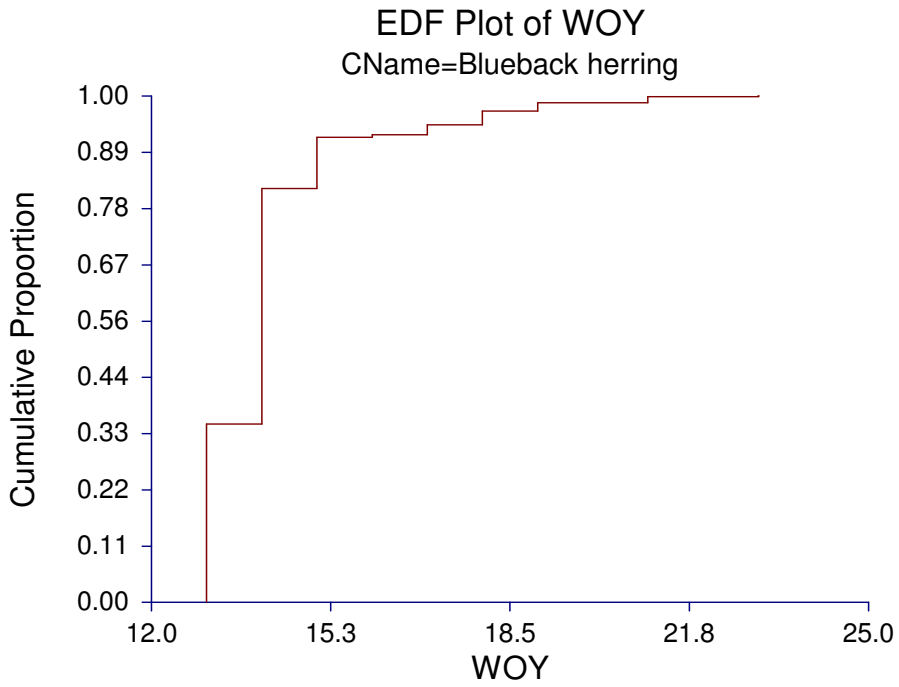
Nondetects Variable = Censor_1. Group Variable = CName
Confidence Limits Method = Linear (Greenwood).



Nondetects Analysis Report

Page/Date/Time 15 4/9/2013 2:35:15 PM
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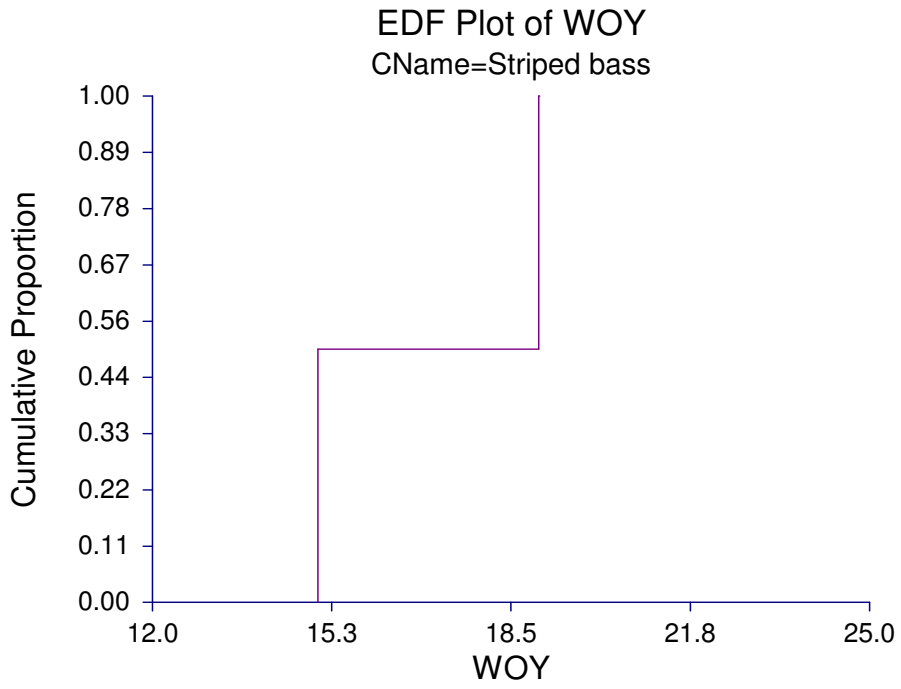
Response Variable = WOY
Nondetects Variable = Censor_1. Group Variable = CName
Confidence Limits Method = Linear (Greenwood).



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Response Variable = WOY
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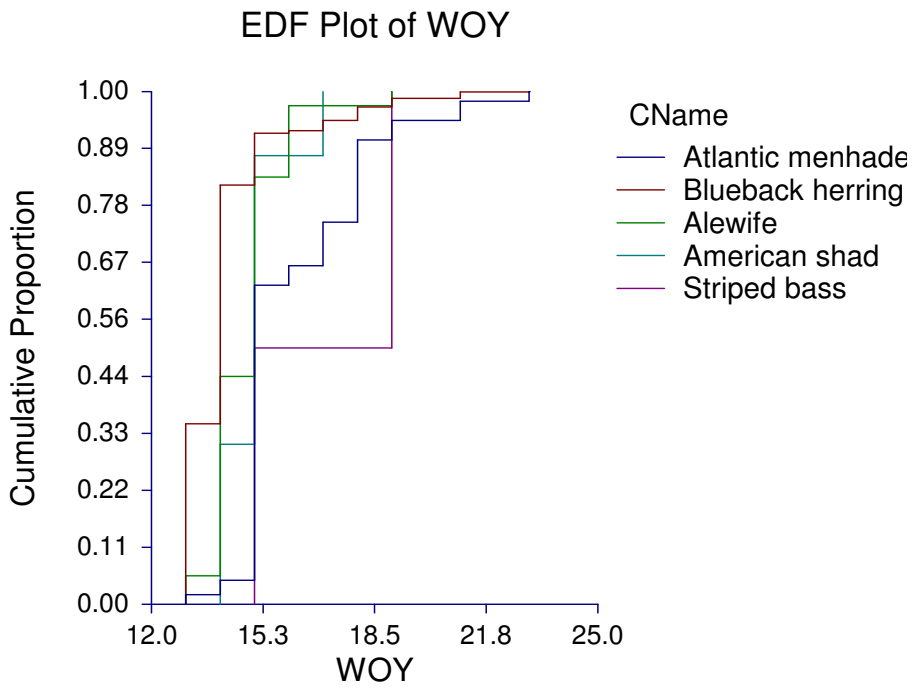
Confidence Limits Method = Linear (Greenwood).



Appendix C-7
Results of the Nondetect Analysis in NCSS 2007 to Derive the Cumulative Frequency Distribution for Fall Samples of Target Species

Nondetects Analysis Report

Page/Date/Time 1 4/9/2013 2:30:05 PM
Database C:\Documents and Settings\jb ... \2012 MFR CFD Database_V2.S0
Filter Season = "Fall"
Response Variable = WOY
Nondetects Variable = Censor_1. Group Variable = CName
Confidence Limits Method = Linear (Greenwood).

Data Summary Section

Group	Type	Rows	Count	Minimum	Maximum	
Alewife	Detected	13	456	39	49	
Alewife	Not Detected	0	0			
Alewife	Total	13	456	39	49	
American shad	Detected	10	37	43	49	
American shad	Not Detected	0	0			
American shad	Total	10	37	43	49	
Atlantic menhaden	Detected		18	158	39	49
Atlantic menhaden	Not Detected		0	0		
Atlantic menhaden	Total		18	158	39	49
Blueback herring	Detected	27	30583	37	49	
Blueback herring	Not Detected	0	0			
Blueback herring	Total	27	30583	37	49	
Striped bass	Detected	1	1	49	49	
Striped bass	Not Detected	0	0			
Striped bass	Total	1	1	49	49	

Data Summary Section: Response Quartiles

	Quartile	Estimate	Lower 95.0% C.L.	Upper 95.0% C.L.
Alewife	First (Q1)	46.000	46.000	46.000
Alewife	Median (Q2)	46.000	46.000	46.000
Alewife	Third (Q3)	46.000	46.000	47.000
American shad	First (Q1)	46.000	46.000	46.000
American shad	Median (Q2)	46.000	46.000	47.000
American shad	Third (Q3)	48.000	47.000	49.000
Atlantic menhaden	First (Q1)	43.000	43.000	43.000
Atlantic menhaden	Median (Q2)	46.000	45.000	46.000
Atlantic menhaden	Third (Q3)	46.000	46.000	46.000

Nondetects Analysis Report

Page/Date/Time 2 4/9/2013 2:30:05 PM
Database C:\Documents and Settings\jb ... \2012 MFR CFD Database_V2.S0
Filter Season = "Fall"
Response Variable = WOY
Nondetects Variable = Censor_1. Group Variable = CName
Confidence Limits Method = Linear (Greenwood).

Data Summary Section: Response Quartiles

	Quartile	Estimate	Lower 95.0% C.L.	Upper 95.0% C.L.
Blueback herring	First (Q1)	47.000	47.000	47.000
Blueback herring	Median (Q2)	48.000	48.000	48.000
Blueback herring	Third (Q3)	48.000	48.000	48.000
Striped bass	First (Q1)	49.000	49.000	49.000
Striped bass	Median (Q2)	49.000	49.000	49.000
Striped bass	Third (Q3)	49.000	49.000	49.000

Logrank Tests Section
Hypotheses
H0: Distribution Functions are Equal Among Groups
HA: At Least One Group Distribution Functions Differs

Test Name	Chi-Square	DF	Prob Level	Reject H0 (Alpha = 0.05)
Logrank	657.085	4	0.0000	Yes
Gehan-Wilcoxon	805.090	4	0.0000	Yes
Tarone-Ware	823.526	4	0.0000	Yes
Peto-Peto	602.813	4	0.0000	Yes
Mod. Peto-Peto	602.810	4	0.0000	Yes

Multiple Pairwise Tests Section
Hypotheses
H0: Distribution Functions are Equal
HA: Distribution Functions Differ

Group Pair Tested: Alewife vs. American shad
Bonferroni

Test Name	Chi-Square	DF	Prob Level	Reject H0 (Alpha =0.05)	Adjusted Prob Level	Reject H0 (Alpha =0.05)
Logrank	7.122	1	0.0076	Yes	0.0762	No
Gehan-Wilcoxon	9.586	1	0.0020	Yes	0.0196	Yes
Tarone-Ware	8.653	1	0.0033	Yes	0.0327	Yes
Peto-Peto	14.459	1	0.0001	Yes	0.0014	Yes
Mod. Peto-Peto	14.461	1	0.0001	Yes	0.0014	Yes

Group Pair Tested: Alewife vs. Atlantic menhaden
Bonferroni

Test Name	Chi-Square	DF	Prob Level	Reject H0 (Alpha =0.05)	Adjusted Prob Level	Reject H0 (Alpha =0.05)

Logrank	136.844	1	0.0000	Yes	0.0000	Yes
Gehan-Wilcoxon	124.257	1	0.0000	Yes	0.0000	Yes
Tarone-Ware	132.808	1	0.0000	Yes	0.0000	Yes
Peto-Peto	43.619	1	0.0000	Yes	0.0000	Yes
Mod. Peto-Peto	43.602	1	0.0000	Yes	0.0000	Yes

Group Pair Tested: Alewife vs. Blueback herring
Bonferroni

Test Name	Chi-Square	DF	Prob Level	Reject H0 (Alpha =0.05)	Adjusted Prob Level	Reject H0 (Alpha =0.05)
Logrank	317.647	1	0.0000	Yes	0.0000	Yes
Gehan-Wilcoxon	492.944	1	0.0000	Yes	0.0000	Yes
Tarone-Ware	456.192	1	0.0000	Yes	0.0000	Yes
Peto-Peto	386.341	1	0.0000	Yes	0.0000	Yes
Mod. Peto-Peto	386.339	1	0.0000	Yes	0.0000	Yes

Group Pair Tested: Alewife vs. Striped bass
Bonferroni

Test Name	Chi-Square	DF	Prob Level	Reject H0 (Alpha =0.05)	Adjusted Prob Level	Reject H0 (Alpha =0.05)
Logrank	49.778	1	0.0000	Yes	0.0000	Yes
Gehan-Wilcoxon	49.778	1	0.0000	Yes	0.0000	Yes
Tarone-Ware	49.778	1	0.0000	Yes	0.0000	Yes
Peto-Peto	49.778	1	0.0000	Yes	0.0000	Yes
Mod. Peto-Peto	49.778	1	0.0000	Yes	0.0000	Yes

Group Pair Tested: American shad vs. Atlantic menhaden
Bonferroni

Test Name	Chi-Square	DF	Prob Level	Reject H0 (Alpha =0.05)	Adjusted Prob Level	Reject H0 (Alpha =0.05)
Logrank	49.944	1	0.0000	Yes	0.0000	Yes
Gehan-Wilcoxon	51.699	1	0.0000	Yes	0.0000	Yes
Tarone-Ware	51.078	1	0.0000	Yes	0.0000	Yes
Peto-Peto	61.354	1	0.0000	Yes	0.0000	Yes
Mod. Peto-Peto	61.344	1	0.0000	Yes	0.0000	Yes

Group Pair Tested: American shad vs. Blueback herring
Bonferroni

Test Name	Chi-Square	DF	Prob Level	Reject H0 (Alpha =0.05)	Adjusted Prob Level	Reject H0 (Alpha =0.05)
Logrank	9.560	1	0.0020	Yes	0.0199	Yes
Gehan-Wilcoxon	12.401	1	0.0004	Yes	0.0043	Yes
Tarone-Ware	12.865	1	0.0003	Yes	0.0033	Yes
Peto-Peto	5.925	1	0.0149	Yes	0.1493	No
Mod. Peto-Peto	5.925	1	0.0149	Yes	0.1493	No

Group Pair Tested: American shad vs. Striped bass
Bonferroni

Test Name	Chi-Square	DF	Prob Level	Reject H0 (Alpha =0.05)	Adjusted Prob Level	Reject H0 (Alpha =0.05)
Logrank	4.429	1	0.0353	Yes	0.3534	No

Gehan-Wilcoxon	4.429	1	0.0353	Yes	0.3534	No
Tarone-Ware	4.429	1	0.0353	Yes	0.3534	No
Peto-Peto	4.429	1	0.0353	Yes	0.3534	No
Mod. Peto-Peto	4.429	1	0.0353	Yes	0.3534	No

Group Pair Tested: Atlantic menhaden vs. Blueback herring
Bonferroni

Test Name	Chi-Square	DF	Prob Level	Reject H0 (Alpha =0.05)	Adjusted Prob Level	Reject H0 (Alpha =0.05)
Logrank	324.358	1	0.0000	Yes	0.0000	Yes
Gehan-Wilcoxon	301.428	1	0.0000	Yes	0.0000	Yes
Tarone-Ware	356.689	1	0.0000	Yes	0.0000	Yes
Peto-Peto	203.249	1	0.0000	Yes	0.0000	Yes
Mod. Peto-Peto	203.248	1	0.0000	Yes	0.0000	Yes

Group Pair Tested: Atlantic menhaden vs. Striped bass
Bonferroni

Test Name	Chi-Square	DF	Prob Level	Reject H0 (Alpha =0.05)	Adjusted Prob Level	Reject H0 (Alpha =0.05)
Logrank	52.000	1	0.0000	Yes	0.0000	Yes
Gehan-Wilcoxon	52.000	1	0.0000	Yes	0.0000	Yes
Tarone-Ware	52.000	1	0.0000	Yes	0.0000	Yes
Peto-Peto	52.000	1	0.0000	Yes	0.0000	Yes
Mod. Peto-Peto	52.000	1	0.0000	Yes	0.0000	Yes

Group Pair Tested: Blueback herring vs. Striped bass
Bonferroni

Test Name	Chi-Square	DF	Prob Level	Reject H0 (Alpha =0.05)	Adjusted Prob Level	Reject H0 (Alpha =0.05)
Logrank	5.927	1	0.0149	Yes	0.1491	No
Gehan-Wilcoxon	5.927	1	0.0149	Yes	0.1491	No
Tarone-Ware	5.927	1	0.0149	Yes	0.1491	No
Peto-Peto	5.927	1	0.0149	Yes	0.1491	No
Mod. Peto-Peto	5.927	1	0.0149	Yes	0.1491	No

Notes:
The most commonly used test is the Logrank test.

Nondetects Analysis Report

Page/Date/Time 3 4/9/2013 2:30:05 PM
Database C:\Documents and Settings\jb ... \2012 MFR CFD Database_V2.S0
Filter Season = "Fall"
Response Variable = WOY
Nondetects Variable = Censor_1. Group Variable = CName
Confidence Limits Method = Linear (Greenwood).

Logrank Test Detail Section

Group	Z-Value	Standard Error	Standardized Z-Value
Alewife	-318.629	18.223	-17.485
American shad	-14.249	4.816	-2.959
Atlantic menhaden	-217.321	12.092	-17.972
Blueback herring	549.341	22.166	24.783
Striped bass	0.858	0.349	2.460

Probability Level was 0.0000

Gehan-Wilcoxon Test Detail Section

Group	Z-Value	Standard Error	Standardized Z-Value
Alewife	-8523862.000	388320.750	-21.951
American shad	-355991.000	105491.257	-3.375
Atlantic menhaden	-3989523.000	231791.034	-17.212
Blueback herring	12842572.000	461743.501	27.813
Striped bass	26804.000	10898.097	2.460

Probability Level was 0.0000

Tarone-Ware Test Detail Section

Group	Z-Value	Standard Error	Standardized Z-Value
Alewife	-52867.903	2513.587	-21.033
American shad	-2307.276	674.215	-3.422
Atlantic menhaden	-28544.439	1523.313	-18.738
Blueback herring	83567.955	2994.176	27.910
Striped bass	151.663	61.664	2.460

Probability Level was 0.0000

Peto-Peto Test Detail Section

Group	Z-Value	Standard Error	Standardized Z-Value
Alewife	-154.430	7.898	-19.553
American shad	-5.238	2.201	-2.380
Atlantic menhaden	-66.781	4.691	-14.236
Blueback herring	225.713	9.400	24.011
Striped bass	0.736	0.299	2.460

Probability Level was 0.0000

Nondetects Analysis Report

Page/Date/Time 4 4/9/2013 2:30:05 PM
Database C:\Documents and Settings\jb ... \2012 MFR CFD Database_V2.S0
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Confidence Limits Method = Linear (Greenwood).

Mod. Peto-Peto Test Detail Section

Group	Z-Value	Standard Error	Standardized Z-Value
Alewife	-154.424	7.898	-19.553
American shad	-5.238	2.201	-2.380
Atlantic menhaden	-66.778	4.691	-14.236
Blueback herring	225.704	9.400	24.011
Striped bass	0.736	0.299	2.460

Probability Level was 0.0000

Specific Response Detail: Estimated Cumulative Proportion

CName	Response (R)	Cumulative Proportion P(R)	Standard Error of P(R)	Lower 95.0% C.L. for P(R)	Upper 95.0% C.L. for P(R)	Cum. Count
Alewife	5.000					0
American shad	5.000					0
Atlantic menhaden	5.000					0
Blueback herring	5.000					0
Striped bass	5.000					0
Alewife	10.000					0
American shad	10.000					0
Atlantic menhaden	10.000					0
Blueback herring	10.000					0
Striped bass	10.000					0
Alewife	15.000					0
American shad	15.000					0
Atlantic menhaden	15.000					0
Blueback herring	15.000					0
Striped bass	15.000					0
Alewife	20.000					0
American shad	20.000					0
Atlantic menhaden	20.000					0
Blueback herring	20.000					0
Striped bass	20.000					0

Nondetects Analysis Report

Page/Date/Time 5 4/9/2013 2:30:05 PM
Database C:\Documents and Settings\jb ... \2012 MFR CFD Database_V2.S0
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Nondetects Variable = Censor_1. Group Variable = CName
Confidence Limits Method = Linear (Greenwood).

Specific Response Detail: Estimated Cumulative Proportion

CName	Response (R)	Cumulative Proportion P(R)	Standard Error of P(R)	Lower 95.0% C.L. for P(R)	Upper 95.0% C.L. for P(R)	Cum. Count
Alewife	25.000					0
American shad	25.000					0
Atlantic menhaden	25.000					0
Blueback herring	25.000					0
Striped bass	25.000					0
Alewife	30.000					0
American shad	30.000					0
Atlantic menhaden	30.000					0
Blueback herring	30.000					0
Striped bass	30.000					0
Alewife	35.000					0
American shad	35.000					0
Atlantic menhaden	35.000					0
Blueback herring	35.000					0
Striped bass	35.000					0
Alewife	40.000	0.0022	0.0022	0.0000	0.0065	1
American shad	40.000					0
Atlantic menhaden	40.000	0.0190	0.0109	0.0000	0.0403	4
Blueback herring	40.000	0.0001	0.0001	0.0000	0.0002	3
Striped bass	40.000					0
Alewife	45.000	0.0044	0.0031	0.0000	0.0105	8
American shad	45.000	0.0270	0.0267	0.0000	0.0793	2
Atlantic menhaden	45.000	0.3608	0.0382	0.2859	0.4356	67
Blueback herring	45.000	0.0122	0.0006	0.0109	0.0134	1606
Striped bass	45.000					0
Alewife	50.000	1.0000	0.0000	1.0000	1.0000	456
American shad	50.000	1.0000	0.0000	1.0000	1.0000	37
Atlantic menhaden	50.000	1.0000	0.0000	1.0000	1.0000	158
Blueback herring	50.000	1.0000	0.0000	1.0000	1.0000	30583
Striped bass	50.000					1

Nondetects Analysis Report

Page/Date/Time 6 4/9/2013 2:30:05 PM
Database C:\Documents and Settings\jb ... \2012 MFR CFD Database_V2.S0
Filter Season = "Fall"
Response Variable = WOY
Nondetects Variable = Censor_1. Group Variable = CName
Confidence Limits Method = Linear (Greenwood).

Quantiles of Responses

CName	Proportion of Response	Estimated Quantile	Lower 95.0% C.L. Quantile	Upper 95.0% C.L. Quantile
Alewife	0.0500	46.000	46.000	46.000
American shad	0.0500	45.000	49.000	46.000
Atlantic menhaden	0.0500	42.000	41.000	42.000
Blueback herring	0.0500	45.000	45.000	45.000
Striped bass	0.0500	49.000	49.000	49.000
Alewife	0.1000	46.000	46.000	46.000
American shad	0.1000	46.000	45.000	46.000
Atlantic menhaden	0.1000	42.000	42.000	43.000
Blueback herring	0.1000	46.000	46.000	46.000
Striped bass	0.1000	49.000	49.000	49.000
Alewife	0.1500	46.000	46.000	46.000
American shad	0.1500	46.000	46.000	46.000
Atlantic menhaden	0.1500	43.000	42.000	43.000
Blueback herring	0.1500	46.000	46.000	46.000
Striped bass	0.1500	49.000	49.000	49.000
Alewife	0.2000	46.000	46.000	46.000
American shad	0.2000	46.000	46.000	46.000
Atlantic menhaden	0.2000	43.000	43.000	43.000
Blueback herring	0.2000	47.000	47.000	47.000
Striped bass	0.2000	49.000	49.000	49.000
Alewife	0.2500	46.000	46.000	46.000
American shad	0.2500	46.000	46.000	46.000
Atlantic menhaden	0.2500	43.000	43.000	43.000
Blueback herring	0.2500	47.000	47.000	47.000
Striped bass	0.2500	49.000	49.000	49.000
Alewife	0.3000	46.000	46.000	46.000
American shad	0.3000	46.000	46.000	46.000
Atlantic menhaden	0.3000	43.000	43.000	45.000
Blueback herring	0.3000	47.000	47.000	47.000
Striped bass	0.3000	49.000	49.000	49.000

Nondetects Analysis Report

Page/Date/Time 7 4/9/2013 2:30:05 PM
Database C:\Documents and Settings\jb ... \2012 MFR CFD Database_V2.S0
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Response Variable = WOY
Nondetects Variable = Censor_1. Group Variable = CName
Confidence Limits Method = Linear (Greenwood).

Quantiles of Responses

CName	Proportion of Response	Estimated Quantile	Lower 95.0% C.L. Quantile	Upper 95.0% C.L. Quantile
Alewife	0.3500	46.000	46.000	46.000
American shad	0.3500	46.000	46.000	46.000
Atlantic menhaden	0.3500	43.000	43.000	46.000
Blueback herring	0.3500	47.000	47.000	47.000
Striped bass	0.3500	49.000	49.000	49.000
Alewife	0.4000	46.000	46.000	46.000
American shad	0.4000	46.000	46.000	47.000
Atlantic menhaden	0.4000	45.000	43.000	46.000
Blueback herring	0.4000	48.000	47.000	48.000
Striped bass	0.4000	49.000	49.000	49.000
Alewife	0.4500	46.000	46.000	46.000
American shad	0.4500	46.000	46.000	47.000
Atlantic menhaden	0.4500	46.000	45.000	46.000
Blueback herring	0.4500	48.000	48.000	48.000
Striped bass	0.4500	49.000	49.000	49.000
Alewife	0.5000	46.000	46.000	46.000
American shad	0.5000	46.000	46.000	47.000
Atlantic menhaden	0.5000	46.000	45.000	46.000
Blueback herring	0.5000	48.000	48.000	48.000
Striped bass	0.5000	49.000	49.000	49.000
Alewife	0.5500	46.000	46.000	46.000
American shad	0.5500	47.000	46.000	47.000
Atlantic menhaden	0.5500	46.000	46.000	46.000
Blueback herring	0.5500	48.000	48.000	48.000
Striped bass	0.5500	49.000	49.000	49.000
Alewife	0.6000	46.000	46.000	46.000
American shad	0.6000	47.000	46.000	48.000
Atlantic menhaden	0.6000	46.000	46.000	46.000
Blueback herring	0.6000	48.000	48.000	48.000
Striped bass	0.6000	49.000	49.000	49.000

Nondetects Analysis Report

Page/Date/Time 8 4/9/2013 2:30:05 PM
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Nondetects Variable = Censor_1. Group Variable = CName
Confidence Limits Method = Linear (Greenwood).

Quantiles of Responses

CName	Proportion of Response	Estimated Quantile	Lower 95.0% C.L. Quantile	Upper 95.0% C.L. Quantile
Alewife	0.6500	46.000	46.000	46.000
American shad	0.6500	47.000	46.000	48.000
Atlantic menhaden	0.6500	46.000	46.000	46.000
Blueback herring	0.6500	48.000	48.000	48.000
Striped bass	0.6500	49.000	49.000	49.000
Alewife	0.7000	46.000	46.000	46.000
American shad	0.7000	47.000	46.000	48.000
Atlantic menhaden	0.7000	46.000	46.000	46.000
Blueback herring	0.7000	48.000	48.000	48.000
Striped bass	0.7000	49.000	49.000	49.000
Alewife	0.7500	46.000	46.000	47.000
American shad	0.7500	48.000	47.000	49.000
Atlantic menhaden	0.7500	46.000	46.000	46.000
Blueback herring	0.7500	48.000	48.000	48.000
Striped bass	0.7500	49.000	49.000	49.000
Alewife	0.8000	47.000	47.000	47.000
American shad	0.8000	48.000	47.000	49.000
Atlantic menhaden	0.8000	46.000	46.000	46.000
Blueback herring	0.8000	48.000	48.000	48.000
Striped bass	0.8000	49.000	49.000	49.000
Alewife	0.8500	47.000	47.000	47.000
American shad	0.8500	49.000	48.000	49.000
Atlantic menhaden	0.8500	46.000	46.000	46.000
Blueback herring	0.8500	48.000	48.000	48.000
Striped bass	0.8500	49.000	49.000	49.000
Alewife	0.9000	47.000	47.000	48.000
American shad	0.9000	49.000	48.000	49.000
Atlantic menhaden	0.9000	46.000	46.000	46.000
Blueback herring	0.9000	49.000		49.000
Striped bass	0.9000	49.000	49.000	49.000

Nondetects Analysis Report

Page/Date/Time 9 4/9/2013 2:30:05 PM
Database C:\Documents and Settings\jb ... \2012 MFR CFD Database_V2.S0
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Nondetects Variable = Censor_1. Group Variable = CName
Confidence Limits Method = Linear (Greenwood).

Quantiles of Responses

CName	Proportion of Response	Estimated Quantile	Lower 95.0% C.L. Quantile	Upper 95.0% C.L. Quantile
Alewife	0.9500	48.000	48.000	48.000
American shad	0.9500	49.000	48.000	49.000
Atlantic menhaden	0.9500	47.000	46.000	47.000
Blueback herring	0.9500	49.000		49.000
Striped bass	0.9500	49.000	49.000	49.000

Response Detail for CName = Alewife

Response (R)	Cumulative Proportion P(R)	Standard Error of P(R)	Lower 95.0% C.L. for P(R)	Upper 95.0% C.L. for P(R)	Cum. Count	Count
39.000	0.0000				1	1
43.000	0.0022	0.0022	0.0000	0.0065	2	1
45.000	0.0044	0.0031	0.0000	0.0105	8	6
46.000	0.0175	0.0061	0.0055	0.0296	344	336
47.000	0.7544	0.0202	0.7149	0.7939	414	70
48.000	0.9079	0.0135	0.8814	0.9344	448	34
49.000	0.9825	0.0061	0.9704	0.9945	456	8

Response Detail for CName = American shad

Response (R)	Cumulative Proportion P(R)	Standard Error of P(R)	Lower 95.0% C.L. for P(R)	Upper 95.0% C.L. for P(R)	Cum. Count	Count
43.000	0.0000				1	1
45.000	0.0270	0.0267	0.0000	0.0793	2	1
46.000	0.0541	0.0372	0.0000	0.1269	20	18
47.000	0.5405	0.0819	0.3800	0.7011	26	6
48.000	0.7027	0.0751	0.5554	0.8500	31	5
49.000	0.8378	0.0606	0.7191	0.9566	37	6

Nondetects Analysis Report

Page/Date/Time 10 4/9/2013 2:30:05 PM
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Filter Season = "Fall"
Response Variable = WOY
Nondetects Variable = Censor_1. Group Variable = CName
Confidence Limits Method = Linear (Greenwood).

Response Detail for CName = Atlantic menhaden

Response (R)	Cumulative Proportion P(R)	Standard Error of P(R)	Lower 95.0% C.L. for P(R)	Upper 95.0% C.L. for P(R)	Cum. Count	Count
39.000	0.0000				3	3
40.000	0.0190	0.0109	0.0000	0.0403	4	1
41.000	0.0253	0.0125	0.0008	0.0498	7	3
42.000	0.0443	0.0164	0.0122	0.0764	19	12
43.000	0.1203	0.0259	0.0695	0.1710	57	38
45.000	0.3608	0.0382	0.2859	0.4356	67	10
46.000	0.4241	0.0393	0.3470	0.5011	150	83
47.000	0.9494	0.0174	0.9152	0.9836	155	5
48.000	0.9810	0.0109	0.9597	1.0000	156	1
49.000	0.9873	0.0089	0.9699	1.0000	158	2

Response Detail for CName = Blueback herring

Response (R)	Cumulative Proportion P(R)	Standard Error of P(R)	Lower 95.0% C.L. for P(R)	Upper 95.0% C.L. for P(R)	Cum. Count	Count
37.000	0.0000				3	3
41.000	0.0001	0.0001	0.0000	0.0002	33	30
42.000	0.0011	0.0002	0.0007	0.0014	362	329
43.000	0.0118	0.0006	0.0106	0.0130	372	10
45.000	0.0122	0.0006	0.0109	0.0134	1606	1234
46.000	0.0525	0.0013	0.0500	0.0550	5502	3896
47.000	0.1799	0.0022	0.1756	0.1842	12118	6616
48.000	0.3962	0.0028	0.3908	0.4017	26169	14051
49.000	0.8557	0.0020	0.8517	0.8596	30583	4414

Response Detail for CName = Striped bass

Response (R)	Cumulative Proportion P(R)	Standard Error of P(R)	Lower 95.0% C.L. for P(R)	Upper 95.0% C.L. for P(R)	Cum. Count	Count
49.000	0.0000				1	1

Nondetects Analysis Report

Page/Date/Time 11 4/9/2013 2:30:05 PM
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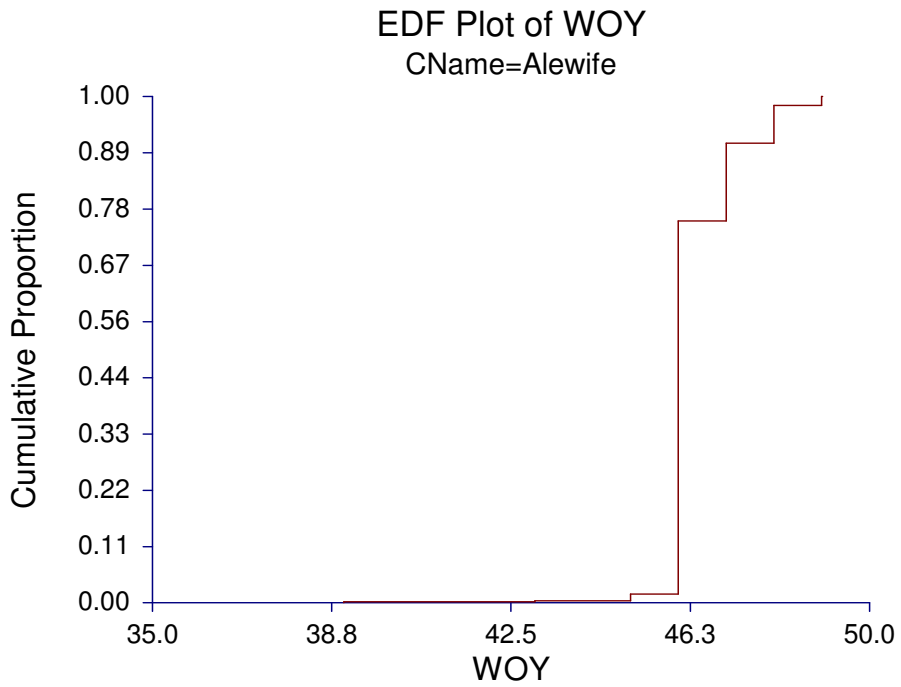
Confidence Limits Method = Linear (Greenwood).

Plots Section



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Page/Date/Time 12 4/9/2013 2:30:05 PM
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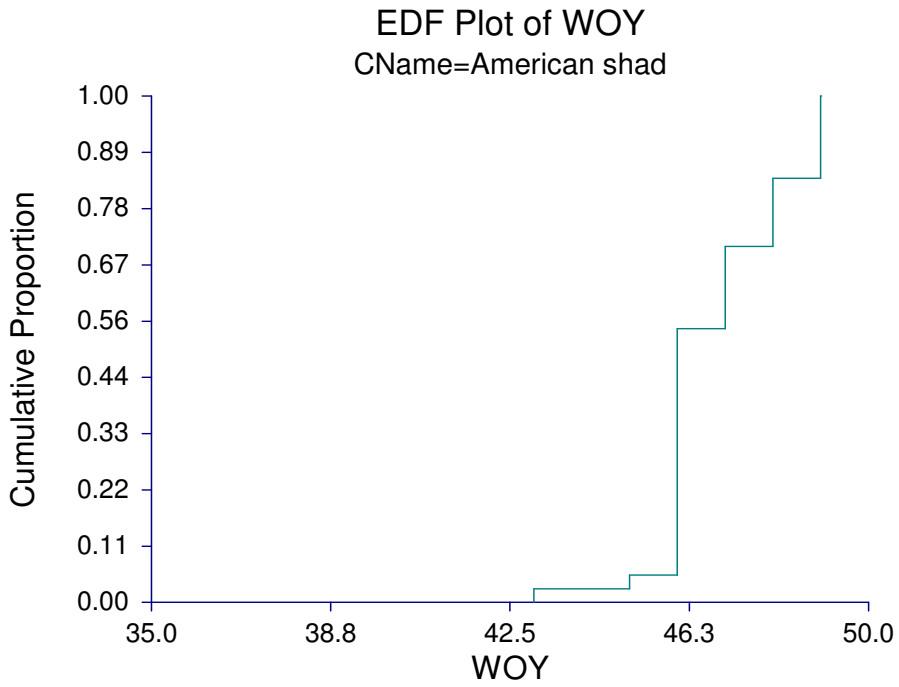
Confidence Limits Method = Linear (Greenwood).



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Page/Date/Time 13 4/9/2013 2:30:05 PM
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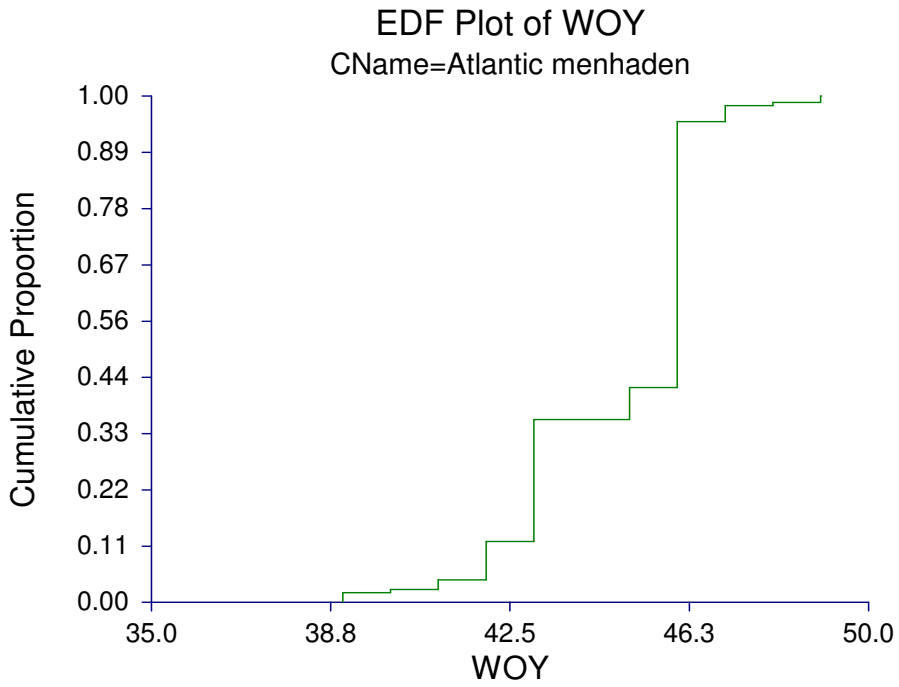

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Page/Date/Time 14 4/9/2013 2:30:05 PM
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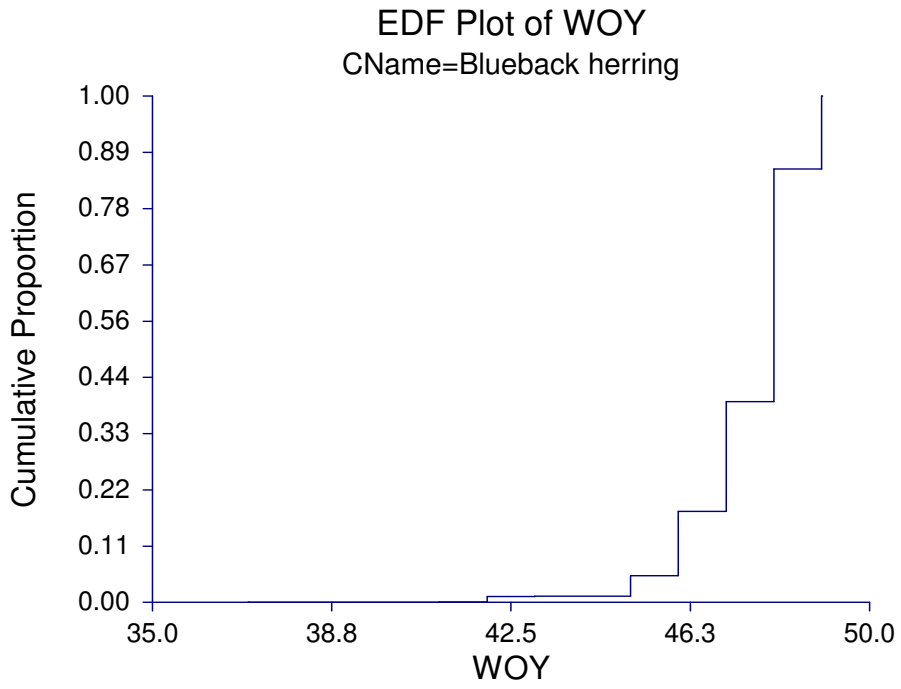

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Page/Date/Time 15 4/9/2013 2:30:05 PM
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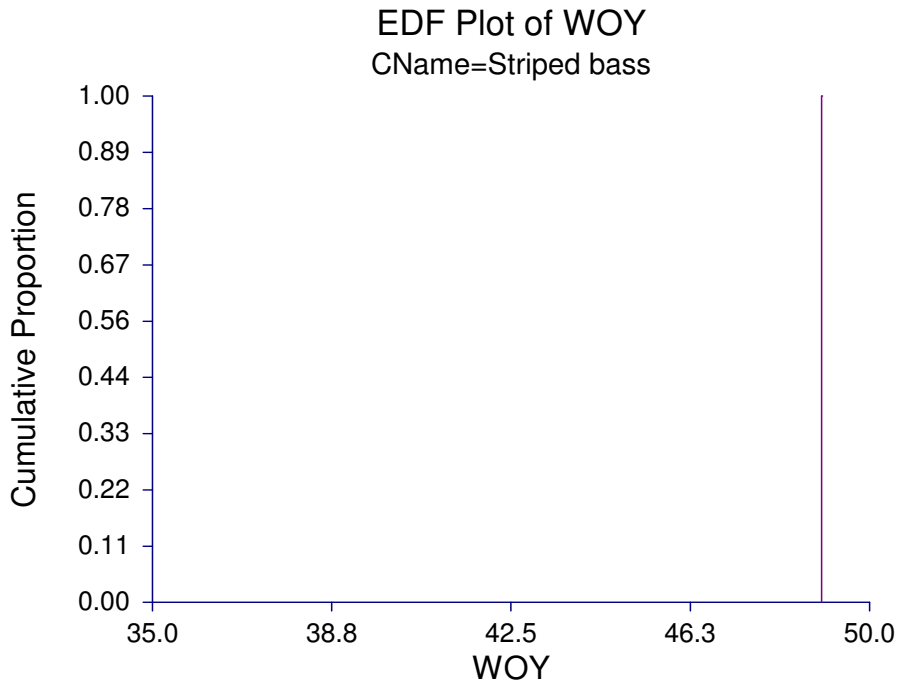
Confidence Limits Method = Linear (Greenwood).



Nondetects Analysis Report

Page/Date/Time 16 4/9/2013 2:30:05 PM
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Confidence Limits Method = Linear (Greenwood).