STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Gina McCarthy
Commissioner

Bureau of Natural Resources
Marine Fisheries Division

A STUDY OF MARINE RECREATIONAL FISHERIES IN CONNECTICUT

Federal Aid in Sport Fish Restoration
F-54-R-27 Annual Performance Report
March 1, 2007 – February 29, 2008

Special Acknowledgement

Boat Captain Peter Simpson, who "retired" on May 22, 2008, is featured on this year's cover to honor his significant contributions to the project over the past 23 years. Pete played an integral role in the acquisition of the *R/V John Dempsey*, contributing significantly to the layout, equipping, construction inspection and ultimately delivery of the vessel on August 2, 1990 from Pascagoula, MS. He navigated all the USCG inspection and documentation requirements, and ran and maintained the vessel professionally. Given the high profile nature of the vessel, we particularly appreciated the way Pete represented the Department while on the water working with local lobstermen in New York and Connecticut to conduct the LIS Trawl Survey and even the LIS Water Quality Monitoring Program. His knowledge of LIS and trawl survey work were invaluable and his cooperative spirit in working with the science crews on both surveys are what everyone will remember. Similarly, Pete was a welcoming face of the Department for the many visiting researchers and media personnel that have spent time on the Dempsey. In addition to vessel operations Pete help "shoreside" making the state purchasing process work for all Marine Fisheries staff will be sorely missed.

The cover photo includes some scenes from Pete's days on the Dempsey as well as a photo of Pete posing with an unlikely friend at a DEP outreach event not long ago.

Thanks to Kurt Gottschall for making maximal use of his insomnia over several nights to put together the photo collage for this year's cover to honor Pete's many contributions to DEP activities on LIS over the years.

State of Connecticut
Department of Environmental Protection
Bureau of Natural Resources
Marine Fisheries Division

Federal Aid in Sport Fish Restoration
F-54-R-26
Annual Performance Report

Project Title: ***A Study of Marine Recreational Fisheries in Connecticut***

Period Covered: March 1, 2007 - February 29, 2008

Job Title	***Prepared by*:**
Job 1: Marine Angler Survey	Roderick E. MacLeod
Job 2: Marine Finfish Survey	
Part 1: Long Island Sound Trawl Survey	Kurt F. Gottschall Deborah J. Pacileo
Part 2: Estuarine Seine Survey	David R. Molnar
Job 3: A Study of Nearshore Habitat	Inactive
Job 4: Studies in Conservation Engineering	Inactive
Job 5: Cooperative Interagency Resource Monitoring	Matthew J. Lyman
Job 6: Public Outreach	David R. Molnar

***Approved by*:** David G. Simpson. Date: July 9, 2008
Acting Director, Marine Fisheries Division

Edward C. Parker, Date: July 14, 2008
Chief, Bureau of Natural Resources

EXECUTIVE SUMMARY

Project: A Study of Marine Recreational Fisheries in Connecticut
Federal Aid Project: F54R-27 (Federal Aid in Sport Fish Restoration)
Annual Progress Report: March 1, 2007 – February 29, 2008
Total Project Expenditures (2007/08): $734,667 ($551,000 Federal, $183,667 State)

Purpose of the Project

The purpose of this project is to collect information needed for management of the marine recreational fishery. This information includes angler participation, effort, catch, and harvest; the relative abundance of finfish and specific population parameters for important selected species, water quality and habitat parameters, and assessment of fishery related issues such as hook and release mortality. The project also includes an outreach component to inform the public, and increase understanding and support for management programs and regulations.

The project is comprised of six jobs: 1) Marine Angler Survey, 2) Marine Finfish Survey, 3) Inshore Survey (Inactive), 4) Fishing Gear Studies (Inactive), 5) Cooperative Interagency Resource Monitoring, 6) Public Outreach. Job 3 has been inactive since March 1997. Job 4 has been inactive since 2000.

Information on marine angler activity is collected from intercept interviews conducted by DEP staff and through a telephone survey conducted by a National Marine Fisheries Service contractor as part of the coastwide Marine Recreational Fisheries Statistics Survey. The relative abundance of 40 species and more detailed population information on selected finfish are obtained from an annual Long Island Sound trawl survey. The relative abundance of young-of-year winter flounder and nearshore finfish species is obtained from fall seine sampling conducted at eight sites. Fishing gear and fishing practices are evaluated by conducting studies of hook and release mortality rates and through sampling catches of commercial fishing vessels taking species of recreational interest. Marine habitat is monitored and evaluated through cooperative interagency monthly sampling of water quality parameters (temperature, salinity, dissolved oxygen) at 20 to 25 fixed sites throughout the Sound. Public outreach is performed through speaking engagements at schools, with civic organizations and fishing clubs as well as through displays in the Marine Headquarters lobby and fishing shows. Project staff also keep the Fisheries Advisory Council informed on project activities and frequent media contacts provide broad newspaper coverage of project activities and findings.

This project is designed to address critical resource issues by monitoring trends in abundance of all common marine finfish, age and growth in selected sportfish and by estimating harvest rates and size composition for a variety of important recreational species. Jobs 1, 2, 3 and 4 are designed to provide the components of stock assessments described above based on the resources and the recreational and commercial fisheries occurring in Long Island Sound. Fishery catch and size composition (Jobs 1, 4) and fishery independent measures of abundance and size composition (Jobs 2, 3) are vital to understanding how regional fishery management plans are likely to affect the local fishery. Each of these Jobs also provide the basis for developing state specific strategies for compliance with fishery management plans where such latitude is permitted.

Job 5 provides trends in area, duration and intensity of hypoxia, the most significant water quality problem facing the Sound today. Job 6 provides for public outreach to communicate to anglers, the benefits of this project in particular and of the Federal Aid in Sport Fish Restoration program in general.

JOB 1: MARINE ANGLER SURVEY
PART 1: MARINE RECREATIONAL FISHERY STATISTICS SURVEY

OBJECTIVES (Summary)

- To estimate the number of marine anglers, fishing trips, fish caught, and number and weight of fish harvested.

KEY FINDINGS:

- An estimated 365,941 anglers made 1.7 million trips in 2007. Total estimated trips made in 2007 were above the 1.45 million trip average (1981-2006).

- Marine anglers caught an estimated 6.3 million fish, harvesting 1.7 million in 2007.

- Five species: bluefish, scup, striped bass, summer flounder and tautog accounted for over 90 of both total catch and harvest estimates.

- Winter flounder harvest has declined to fewer than 25,000 fish annually since 2000 and the estimated harvest for 2007 was only 4,164 fish. The long-term average winter flounder harvest was 333,093 fish with peak harvests of over 1 million fish in the early to mid-1980's.

CONCLUSIONS:

- Coastwide fishery management plans and strong recent year class production are resulting in increases in several fish populations and good catches of many of the primary recreational species.

- The once productive winter flounder resource no longer supports a substantial fishery in Connecticut. Landings (in number) that once ranked second or third behind bluefish and scup now account for less than 1% of fish harvested.

RECOMMENDATIONS

Continue to obtain catch and harvest information and angler participation rates through the Marine Recreational Fisheries Statistics Survey in order to monitor the status of the recreational marine fishery.

JOB 1: MARINE ANGLER SURVEY
PART 2: VOLUNTEER ANGLER SURVEY

OBJECTIVES (Summary)

To characterize the size and catch composition of both kept and released fish observed by volunteer anglers.

KEY FINDINGS:

- A total of 75 anglers participated in the survey and made 1,521 fishing trips in 2006. Volunteers including additional anglers involved in a fishing party made a total of 3,172 fishing trips. With multiple species taken per trip anglers reported 1,393 trips targeting bluefish, 2,157 trips for striped bass, 738 trips for summer flounder, 73 trips for winter flounder, 132 trips for scup and 176 trips for tautog.

- Volunteer anglers measured 2,060 individual bluefish measuring > 12 inches in length, 3,613 striped bass, 2,001 summer flounder, 94 winter flounder, 1,327 scup and 469 tautog. Collecting length measurements on released fish provides valuable data not available through MRFSS except for the party/headboat at sea sampling survey.

CONCLUSIONS:

- Volunteer anglers provide a tremendous amount of data on the size and catch composition of popular recreational species in Connecticut, supplying several stock assessments with scarce length information on released fish.

RECOMMENDATIONS:

- Maintain the Volunteer Angler Survey as an effective means of characterizing angler behavior and particularly in collecting length data on released fish that are not available from the MRFSS survey.

JOB 2 PART 1: LONG ISLAND SOUND TRAWL SURVEY (LISTS)
OBJECTIVES (Summary)

- Provide an annual index of numbers and biomass per standard tow for 40 common species and age specific indices of abundance for scup, tautog, winter flounder, and summer flounder, and recruitment indices for bluefish (age 0) and weakfish (age 0).
- Provide annual totals counts for all finfish species taken, total biomass for all finfish and invertebrate species taken, as well as, a species list for all species caught in LIS Trawl Survey sampling.

KEY FINDINGS:

- A total of 203,701 finfish, lobster and squid weighing 18,710 kg were collected in 2007.

- Sixty finfish species and forty-one invertebrate species (or taxa) were collected from 200 tows conducted in 2007. The total fish species count (60) is above the 23-year average of 58 species per year (1984-2006). The Long Island Sound Trawl Survey has collected ninety-seven finfish species since the survey began in 1984. One new finfish species, striped burrfish, was observed in 2007.

- Only one species, weakfish, was at record abundance by number (geometric mean count per tow) in 2007. This was principally due to a phenomenal year-class (record high index of 63.93 young-of-year fish per tow) – a complete reversal from near-record low abundance in 2006. Age 1+ weakfish abundance remains average.

- Although spiny dogfish were not at record abundance by number, they were at record levels of biomass (kg / tow) in 2007. Smooth dogfish abundance in 2007 was the second highest by weight and the third highest by number for the time-series.

- Adult scup abundance remains high relative to 1984-1998 levels; the 2007 index was the fourth highest in the time series. Summer flounder abundance has declined from the high levels recorded between 2001 and 2003 to average levels as observed from 1996 to 2000.

- Adult bluefish abundance has been at average levels for the past three years after decreasing from near-record high abundance in 2004. Striped bass abundance has been above average for the past 13 years.

- The spring survey index for tautog has remained low and below the time-series average for the past 15 years except for a short-lived increase in abundance recorded in 2002. The past nine years of winter flounder springtime abundance indices have been the lowest on record, with 2006 being the lowest index for the time series and 2007 being approx one-third of the time-series average.

- The spring index for American lobster has been declining for eight years now (since 1999) and has remained below the time-series average for the past five years. Fall lobster abundance has

also declined for eight years - to a record low for the third year in a row. Five of the past six years have been the lowest fall indices on record.

- Several species not typically exploited in recreational or commercial fisheries have undergone significant changes in abundance over the survey time series. Declining trends are evident for such species as tomcod, sea raven, longhorn sculpin, ocean pout and cunner all of which are cold temperate species. In contrast, several warm temperates have undergone significant increases in abundance that are similarly difficult to attribute to fishery management actions. These include moonfish, hickory shad, smallmouth flounder, spotted hake, northern sea robin, clearnose skate and inshore lizardfish.

CONCLUSIONS:

- The abundance of recreationally important species in Long Island Sound remains moderate to high including scup, striped bass, summer flounder and snapper bluefish. Recent high abundance of young-of-year scup also bodes well for future catches for this species. The increased abundance of hickory shad in recent years (2005 & 2006) has been providing additional recreational fishing opportunities, especially for nearshore anglers. However, some recreational species like winter flounder and tautog have gone through a protracted period of declining abundance and this is cause for concern. Additionally, several species not typically targeted by recreational fishermen are at record low levels and may indicate shifts in species assemblages within Long Island Sound associated with broad scale increasing temperature trends in the northwest Atlantic.

RECOMMENDATIONS:

- Continue monitoring through LIS Trawl Survey to provide information for stock assessment purposes and to evaluate the effectiveness of management measures.

JOB 2 PART 2: ESTUARINE SEINE SURVEY

OBJECTIVES (summary)

- To provide an annual index of recruitment for young-of-year winter flounder and all finfish and crab species taken.

KEY FINDINGS:

- The 2007 annual index of recruitment for young-of-year winter flounder (4.7 fish/haul) ranked 14th out of 20 annual indices.

- Mean catch of all finfish (236 fish/haul) ranked third out of 20 annual indices and was well above the series average of 142 fish/haul (Figure 2.2).

- The forage fish index for 2007 (149 forage fish/haul) was the second highest of the time series, and well above the time series average of 102 forage fish/haul.

CONCLUSIONS:

- A small increase in abundance of the winter flounder young of year index for 2007, followed by fairly low indices since 2000 and the absence of a strong year class since 1996 is not expected to change the disappointing short term outlook for the stock.

- The inshore forage fish abundance index primarily reflects the abundance of Atlantic silversides, followed by striped killifish and mummichog, the dominant forage species taken in the survey.

RECOMMENDATIONS:

- Continue to monitor young-of-year winter flounder and inshore forage species abundance through the September seine survey.

JOB 3 A STUDY OF NEARSHORE HABITAT – <u>INACTIVE THIS SEGMENT</u>

JOB 4 FISHING GEAR SELECTIVITY – <u>INACTIVE THIS SEGMENT</u>

JOB 5: COOPERATIVE INTERAGENCY RESOURCE MONITORING OBJECTIVES

- Provide monthly monitoring of water quality parameters important in the development of summer hypoxia in Long Island Sound including temperature, salinity, and dissolved oxygen.
- Provide indicators of hypoxia impacts on living resources.

KEY FINDINGS:

- Hypoxia first developed late in 2007 on or about July 12 and persisted for 72 days ending about September 21, 2007.

- Severe hypoxia (<1.0 mg/l dissolved oxygen) was not observed in 2007. Areas exposed to severe hypoxia would be expected to be devoid of finfish, lobsters and crabs.

- Hypoxia (<=3.5 mg/l dissolved oxygen) extended over a maximum area of 917 km^2 during late July - early August, a larger area than during the 2004-2006 seasons.

- The Biomass Area-Day Depletion Index (BADD) index for 2007 was about average at 5,198 or about 2.7% of the total area-days in the LIS sampling area. The BADD index is a gross measure of seasonal habitat loss associated with hypoxia.

CONCLUSIONS:

- Hypoxia developed fairly late in the 2007 season but persisted well into September (11th). However, with no severe hypoxia present the BADD index recorded the lowest level of seasonal habitat loss since 2001.

RECOMMENDATIONS:

- Continue conducting the water quality monitoring program to provide information needed to evaluate the effectiveness of measures to reduce nutrient loading to LIS and the impact of water quality improvements on marine life.

JOB 6: PUBLIC OUTREACH

OBJECTIVES

- Increase public awareness among anglers and the general public that information provided through this project contributes to state and federal efforts to enhance recreational fisheries conservation and that the majority of marine fisheries research and monitoring activities in Connecticut are funded through the Federal Aid in Sportfish Restoration Program.

KEY FINDINGS:

- A total of 21,697 outdoor and environmental writers, marine anglers and boaters, marina operators, fishing tackle retailers, Fisheries Advisory Council (FAC) members, and members of the general public attended outreach events. The largest event was the "CMTA Boat Show" attended by 11,308 fishermen and hunters, followed by "Northeast Hunting and Fishing Expo" at the Hartford Convention Center which had an attendance of 9,527.

CONCLUSIONS:

- Large numbers of anglers and members of the general public are provided information about Marine Fisheries programs through participation in outdoor fishing & hunting shows, Science and Career Days, public speaking engagements and displays at the Marine Fisheries Office.

RECOMMENDATIONS:

- Continue outreach efforts.

EXPENDITURES
Summary of expenditures for the period March 1, 2007 to February 29, 2008.

	Federal	State	Total
Job 1. Marine Angler Survey	$162,324	$54,108	$216,431
Job 2. Marine Finfish Survey	$354,946	$118,315	$473,262
Job 3. A Study of Nearshore Habitat	$0	$0	$0
Job 4. Fishing Gear Selectivity	$0	$0	$0
Job 5. Cooperative Interagency Resource Monitoring	$12,162	$4,054	$16,216
Job 6. Public Outreach	$21,569	$7,190	$28,758
Total	$551,000	$183,667	$734,667

TABLE OF CONTENTS

PAGE

JOB 1: MARINE ANGLER SURVEY

PART 1: MARINE RECREATIONAL FISHERY STATISTICS SURVEY

PART 2: VOLUNTEER ANGLER SURVEY

PART 1: MARINE RECREATIONAL FISHERY STATISTICS SURVEY

TABLE OF CONTENTS

PART 1: MARINE RECREATIONAL FISHERY STATISTICS SURVEY

LIST OF TABLES

PART 1: MARINE RECREATIONAL FISHERY STATISTICS SURVEY

LIST OF TABLES (Con't.)

PART 1: MARINE RECREATIONAL FISHERY STATISTICS SURVEY

LIST OF FIGURES

JOB 1: MARINE ANGLER SURVEY
PART 1: MARINE RECREATIONAL FISHERY STATISTICS SURVEY

GOAL

To provide long term monitoring of marine recreational fishing activity including angler participation and catch statistics in a manner that is comparable to other Atlantic coastal states.

OBJECTIVES

Provide estimates of:

1) Number of marine anglers in Connecticut each year.

A total of 365,941 marine anglers were estimated to have fished in Connecticut during 2007.

2) Total effort (trips) expended by anglers in Connecticut each year.

Marine anglers made 1,683,284 fishing trips in Connecticut during 2007.

3) Total catch (numbers of fish kept and released fish) and harvest (numbers and the weight of kept fish) of the most commonly sought species: bluefish, scup, winter flounder, summer flounder, tautog, and striped bass.

In 2007, marine anglers creeled 375,064 bluefish (2,273,529 lbs.), 689,975 scup (777,901 lbs.), 4,164 winter flounder (6,634 lbs.), 108,528 summer flounder (360,322 lbs.), 211,327 tautog (960,087 lbs.), and 109,856 striped bass (1,718,924 lbs.).

4) Length-frequency of harvested bluefish, scup, winter flounder, summer flounder, tautog, and striped bass.

Length frequency distributions (minimum, mean, and maximum) were estimated for bluefish, scup, winter flounder, summer flounder, tautog, and striped bass (Tables 1.9-1.14).

INTRODUCTION

The Connecticut Department of Environmental Protection (DEP), Bureau of Natural Resources, Marine Fisheries Division, has been collecting marine recreational fisheries information along the Connecticut coastline since 1979. However, in order to improve state-wide marine fisheries statistics and become more consistent with other states, Connecticut joined with the MRFSS program in July, 1987. Before Connecticut's involvement in the MRFSS, data collection was conducted by NMFS's contractor just as in other states where state agencies do not participate in the program. This report includes state angler intercept survey work in 2007 and MRFSS angler effort and catch statistics from 1981- 2007.

METHODS

The MRFSS is based on two complementary surveys: A random telephone survey of households, and an intercept survey of anglers at fishing sites (NMFS 1992). MRFSS utilized a contractor to conduct the telephone survey to calculate total angler participation and trip estimates. Connecticut performed the angler intercept survey (angler interviews) in order to collect angler catch and effort data, biological data, and socioeconomic and demographic information.

The MRFSS's primary objectives are (1) to provide a collection of accurate and representative data on the marine recreational fishery and (2) to produce accurate and precise regional (e.g. ME-CT) catch estimates which can be used by fishery managers to assess the impacts of recreational fishing on finfish stocks. In order to produce estimates with adequate precision at the state level (where proportional Standard Error (PSE) $\leq$20%, a modified version of Coefficient of Variation = S.E./Mean *100), the MRFSS initial intercept quota was tripled for Connecticut. Telephone and Intercept Surveys are collected in bimonthly time periods (termed Waves) and further broken down by mode in the Intercept Survey. In 2001, NMFS base allocations for the Northeast and Mid-Atlantic sub-regions were increased 1.5 times in order to increase effort and catch precision estimates for those areas. The increase was accomplished through a grant proposal submitted by the Atlantic Coastal Cooperative Statistics Program (ACCSP) Recreational Statistics Technical Committee and later approved by the ACCSP Coordinating Council. ACCSP is comprised of fifteen Atlantic coastal states and two federal agencies, which oversee and administer the collection of commercial and recreational fishery statistics. ACCSP provided funding for the additional intercept sampling as described in Table 1.1. However since state participation in 1987, Connecticut had already tripled NMFS Intercept Survey allocation and provided funding for those increases. ACCSP's involvement basically reduces Connecticut's expenditure toward processing of the additional intercepts. Wave 1 is not sampled in Connecticut or any states in the Mid Atlantic (NY-VA) and Northeast (ME-CT) sub-regions due to low fishing activity (NMFS 1992).

In addition, the sampling methodology of the party/charter boat mode was modified beginning in Wave 4 (July-August) 2003 in order to improve catch and trip estimates. The new changes in the survey (termed "the For-Hire Survey") called upon each state to provide and update a comprehensive list of current party/charter boat vessels and operators. This list provided a sampling frame where ten percent of for-hire vessel operators would be randomly selected to be contacted by telephone to report their fishing trip effort (angler trips) for a given two week period. Coupled with the telephone survey, pre-validation of vessels was performed where vessels were randomly selected and checked to determine if the vessel was out fishing or not. The same list would generate intercept assignments by wave. For-hire intercept assignments were split by vessel type (charter - 6 or less passengers) and party/head boats (more than 6) since sampling methods differ. Anglers fishing in the charter boat fishery were interviewed at dockside where party/charter boat anglers were interviewed on board while at sea. Dockside sampling of charter boat anglers was selected because of the six passenger limitation. At sea sampling was selected to increase the number of length and weight measurements on creeled fish in addition to length measurements on discarded fish. Intercept collection quotas for the

party/head boat mode were set by the number of trips (based on 2 samplers/trip). All other modes were allocated by the number of intercepts.

Table 1.1: MRFSS + ACCSP and State Angler Intercept and Party/Head Boat Trips Allocation by Mode and Wave, 2007

NMFS+ACCSP	Wave 2	Wave 3	Wave 4	Wave 5	Wave 6	
Mode	Mar-Apr	May-Jun	Jul-Aug	Sep-Oct	Nov-Dec	**Total (%)**
Shore (SH)	44	65	68	67	37	281 (20%)
Charter Boat (CH)	90	97	110	106	90	493 (36%)
Private/Rental Boat (PR)	42	120	213	165	61	601 (44%)
Party/Head Boat Trips (HB) (based on 2 samplers/trip)	8	24	36	30	0	98 Trips
Total Number of Intercepts	176	282	391	338	188	1,375

MRFSS Estimation Methods

MRFSS estimation methods used to compute catch and effort statistics were based on the following criteria: (1) improved guidelines for recording proxy data in lieu of missing data, (2) imputation for missing data, (3) telephone survey sample weighting, and (4) cleanup of historical intercept data (NMFS 1994). In cases where gaps or insufficient data occurs, proxy data (information obtained in the Telephone Survey from someone in a fishing household other than the angler) were used to fill voids in the database. In addition, catch and effort statistics for 1979-80 were omitted because of inadequate information (missing files that contained non-fishing household sample size information).

Angler participation and fishing trip estimates were derived primarily from the Telephone Survey and, in special situations, the Intercept Survey (NMFS 1992). In the Telephone Survey, households with telephones located in coastal counties or within 50 miles of the coastline were randomly selected and called to determine if a household fell into either of two categories: (1) households that comprised one or more marine recreational anglers and (2) non-fishing households. Households with anglers were further surveyed in order to collect fishing trip information used in estimating total fishing trips and angler participation. In situations where anglers did not possess a telephone (or live in a household), Intercept Survey data were used in order to account for that segment of the angling population that would otherwise be missed.

MRFSS Catch Type Categories

Catch estimates were broken down into three categories: Catch Type A, B1 and B2. Catch Type A consisted of catches that were kept by anglers and available for inspection by field interviewers. Catch Type B1 included angler catches that were used for bait, discarded dead, etc., and were not available for inspection, and Catch Type B2 was comprised of fish that were caught and released alive. In this report, total catch estimates consist of Catch Types A+B1+B2.

Creeled catch (fish removed from the population) include Catch Type A+B1 only. Catch Types A and B1 were the only catch groups estimated in both numbers and weights. Since Catch Type B1 are unobserved catches, Catch Type A mean weight estimates were used to expand Catch Type B1 estimates. Catch statistics in this document will be reported in numbers caught or as otherwise specified.

RESULTS AND DISCUSSION

Connecticut Intercept Survey 2007

During March-December 2007, a total of 1,983 interviews (intercepts) with marine anglers were conducted by Marine Fisheries Division staff for the MRFSS (Table 1.2). Intercept shortfalls occurred particularly in Waves 2 and 6 for NMFS + ACCSP quotas because of low fishing activity and poor weather conditions. Furthermore, most Connecticut-based party/charter businesses and marinas terminate their operations by November 1.

Table 1.2: Total Number of Angler Intercepts Collected by Mode and Party/Head Boat Trips Taken by Wave, 2007

	Wave 2	Wave 3	Wave 4	Wave 5	Wave 6	
Mode	Mar-Apr	May-Jun	Jul-Aug	Sep-Oct	Nov-Dec	**Total (%)**
Shore (SH)	52	84	207	92	16	451 (23%)
Charter Boat (CH)	0	77	111	78	14	280 (14%)
Private/Rental Boat (PR)	50	227	364	178	42	861 (43%)
Party/Head Boat Trips (HB)	0 Trip (0 Ints.)	5 Trips (111 Ints.)	6 Trips (149 Ints.)	6 Trips (131 Ints.)	0 Trips (0 Ints.)	17 Trips (391 Ints. 20%)
Total Number of Intercepts	102	499	831	439	72	1,983

MRFSS 2007 Angler Participation and Fishing Trip Estimates and the MRFSS Time Series from 1981-2007

During 2007, an estimated 365,941 marine anglers made 1,683,285 trips (Tables 1.3-1.4). The annual estimated number of marine anglers averaged 339,467 participants from 1981-07. The annual total of marine recreational fishing effort averaged 1,452,230 trips for the same period. Connecticut residents comprised about 80% of the total marine fishing population whereas nonresident anglers made up the remaining 20% from 1981-2007.

The three principal modes of marine recreational fishing include Shore Mode (anglers fishing from beach and bank or manmade structure), Private/Rental Mode (anglers fishing from a privately owned or rental boat), and Party/Charter Boat Mode where anglers pay a captain/vessel for hire to fish. The percentage breakdown of trips in 2007 by mode was 32.3% for shore mode, 3% party/charter boat mode and 64.7% for the private/rental mode. The percent distribution of

fishing trips by mode for the time series was 35.9% for shore mode, 6% for party/charter mode and 58.1% in the private/rental mode.

MRFSS Catch Estimates 2007

Total catch was estimated at 6,347,293 fish and creeled catch at 1,684,016 fish for 2007. Five popular species: bluefish, striped bass, scup, summer flounder, and tautog comprised over 90% of the estimated total catch and creeled catch (Tables 1.5-1.22). For that reason, these species will be the focus of discussion in this section. Precision estimates for bluefish, striped bass, summer flounder, scup and tautog were near or below a PSE of 20% for both total and creeled catch. Total creeled catch in pounds for all species combined was estimated at 6 million lbs.

Catch estimates vary annually for most species primarily due to changes in abundance and fishing regulations. For more insight to historical accounts of Connecticut's marine recreational fishery regulations please refer to Table 1.23.

BLUEFISH

Bluefish was the third most frequently caught species in Connecticut in 2007 with an estimated 1,222,423 million fish for total catch. The creeled catch estimate was 375,064 fish. Bluefish catch estimates in numbers comprised about 19% of the total catch and 21% of the total creeled catch for all species (Figure 1.3). Bluefish estimated creeled catch in pounds accounted for 36% of the total creeled catch. The proportion of bluefish released was 69%.

The private rental boat mode comprised 73% and 44% for total catch and creeled catch estimates. The shore mode accounted for 18% and 33% for total catch and creeled catch estimates. In the time series, however, the shore mode annual mean was approximately 44% and 45% for total and creeled catch estimates.

In numbers caught, bluefish have been the most commonly caught and harvested species in the MRFSS time series (27% and 34%, respectively). Bluefish total catch estimates range from a record low of 690,694 fish in 1988 to record high of about 6.3 million fish in 1982. The annual mean was about 1.8 million fish for total catch. Creeled catch estimates have ranged from 372,525 fish in 2000 to 3.3 million fish in 1981. The annual mean for creeled catch was 1.3 million fish. The annual mean rate anglers released fish alive was 27%. The time series for released bluefish ranged from about 4% to a record high of 72% (2005 estimate).

STRIPED BASS

Striped bass were the most frequently caught fish by marine recreational anglers in 2007 with an estimated total catch of about 1.9 million fish (comprising 30% of the total catch for all species). The private/rental boat mode accounted for 86% of the total catch. The creeled catch was estimated at 109,856 fish, an all time high for the time series. Striped bass creeled catch in numbers comprised 9% for all species. Creeled catch in weight was estimated at 1.7 million

pounds and comprised 29% of the total creeled catch for all species. Approximately 94% of the total number of striped bass caught were released alive.

Throughout the MRFSS time series, striped bass total catch estimates varied from as low as 27,783 fish in 1981 to a record high of 1.9 million fish in 2007 (Figure 1.4). Low abundance of striped bass in the 1980's due to over-fishing followed by successful stock restoration efforts in the 1990's to present have resulted in a substantial upward trend of total catch. With the exception of 1981, 1983, and 1985 the creeled catch estimate has remained consistently low with an annual mean retention rate of about 7% (range $\simeq$ 0.7% - 15%). The low retention rate can be attributed to catch restrictions implemented to curtail harvest in addition to recreational anglers increased awareness of conservation fishing practices (e.g. catch and release fishing).

SUMMER FLOUNDER (Fluke)

The summer flounder recreational total catch estimate decreased substantially (57%) from 2006 to 2007. The estimated total catch of 433,038 fish comprised 7% of the total catch for all species (Figure 1.5). The private/rental boat mode accounted for 97% of the total catch. Even though the total catch estimate dropped by more than half, the creeled catch estimate in numbers increased slightly (1%) from 2006 with an estimated 108,528 fish and accounted for about 6% of the total creeled catch for all species. The creeled catch in weight was an estimated 360,322 pounds and accounted for 3% of the total creeled catch in weight for all species. Approximately 75% of summer flounder caught were released.

In numbers caught, summer flounder comprised 7% and 5% of the total and creeled catch estimates in the MRFSS time series. The lowest estimated total catches occurred back to back in 1989 and 1990 with only 44,541 and 56,352 summer flounder, respectively. Creeled catch estimates have been highly variable (range = 17,707 in 1990 – 576,160 fish in 1983).

WINTER FLOUNDER

Winter flounder total catch decreased (43%) from an estimated 31, 756 fish in 2006 to 18,258 in 2007. The total creeled catch estimate was 4,164 fish. Total and creeled catch estimates comprised only 0.3% for all species (Figure 1.6). The private/rental mode comprised 79% of the estimated total catch. Since 1992, winter flounder annual estimates have fallen well below the time series mean of 406,612 fish for total catch and 333,093 for creeled catch. Winter flounder creeled catch in weight was estimated at 6,634 pounds, or about 0.1% of the total creeled catch in weight for all species. The proportion of winter flounder released was 77%.

SCUP (Porgy)

Scup was the second most frequently caught species in 2007 with 1,560,603 and 689,975 fish estimated for total and creeled catches. The private/rental boat mode accounted for 87% of the total catch. Scup estimates comprised 25% and 41% of the total and creeled catch estimates for all species (Figure 1.7). In weight, the creeled catch was estimated at 777,901 pounds. The proportion of scup released was approximately 56%.

TAUTOG (Blackfish)

Tautog, locally referred to as blackfish by Connecticut anglers, are one of the few year round resident species of Long Island Sound. Tautog total catch in 2007 was estimated at 656,690 fish (a two fold increase from 2006). The creeled catch total was estimated at 211,327 fish (Figure 1.8). The total and creeled estimates comprised 10% and 13% of the total for all species. In weight, the creeled catch was estimated at 960,087 pounds. The proportion of tautog released was 44%.

LENGTH FREQUENCY DISTRIBUTION FOR BLUEFISH, STRIPED BASS, SCUP, SUMMER FLOUNDER, WINTER FLOUNDER, AND TAUTOG

Length measurements were collected as described in the MRFSS Procedures Manual. Attempts were made to measure all marine finfish when available or in random sub-samples when large catches were encountered. Length frequency distributions for Type A (observed fish) as well as catch and trip statistics can be queried on the following NMFS web site: http://www.st.nmfs.gov/st1/recreational/queries/index.html.

Length frequency distributions varied annually for each species (as shown in Figures 1.9-1.14) in response to factors including year class strength and changes in recreational fishery regulations (minimum length requirements, daily creel limits, and closed fishing seasons). Since most marine species are regulated by a minimum length requirement, length frequency distributions were primarily comprised of legal size fish. One particular note, in the intercept survey fish are measured from the tip of the snout to the fork in the tail (fork length). Regulations for minimum length are measured from the tip of the snout to the end of the tail (total length) regardless if a species possess a forked tail or not.

MODIFICATIONS

None.

LITERATURE CITED

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NMFS. 1994. Marine recreational fishery statistics survey. Changes in estimation procedures. mimeo 2pp. Silver Spring, MD.

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Table 1.3: MRFSS Estimated Number of Marine Recreational Anglers in Connecticut, 1981-2007

Year	Coastal	PSE	Out-of-State	PSE	Total	PSE
1981	227,985	10.4	43,898	44.3	271,883	11.3
1982	253,428	20.8	50,371	38.8	303,799	18.5
1983	170,926	13.1	59,500	40.2	230,426	14.2
1984	258,895	11.1	63,546	45.6	322,442	12.6
1985	276,026	11.1	74,525	37.1	350,551	11.8
1986	319,002	9.4	108,338	35.7	427,341	11.4
1987	184,884	9.9	42,559	36.0	227,443	10.5
1988	238,315	10.5	63,118	37.1	301,434	11.4
1989	315,338	10.5	53,239	43.7	368,577	11.0
1990	268,920	9.5	78,851	39.0	347,771	11.5
1991	385,370	10.1	85,224	43.0	470,593	11.3
1992	389,394	10.7	113,995	36.1	503,388	11.6
1993	186,167	9.8	47,067	34.3	233,234	10.4
1994	194,668	11.2	33,439	47.0	228,107	11.8
1995	231,300	12.4	41,245	16.6	272,545	10.8
1996	295,009	10.9	75,864	15.5	370,873	9.2
1997	257,555	12.9	69,686	16.3	327,242	10.8
1998	290,105	13.6	72,993	15.9	363,098	11.4
1999	242,716	14.1	54,663	16.7	297,379	11.9
2000	221,523	10.6	53,054	13.9	274,577	9.0
2001	245,715	9.2	77,970	11.8	323,685	7.5
2002	283,399	8.5	87,313	11.5	370,712	7.1
2003	360,712	8.8	112,039	10.9	472,750	7.2
2004	296,870	12.2	62,539	16.0	359,409	10.5
2005	323,346	11.8	76,920	16.6	400,265	10.1
2006	336,090	9.0	44,064	16.7	380,155	8.2
2007	304,407	8.8	61,534	12.7	365,941	7.6
Annual Mean	272,521		66,946		339,467	
% Distr.	80.3%		19.7%			

Note: PSE – Proportional Standard Error, a modified version of Coefficient of Variation = S.E./Mean *100

Table 1.4: MRFSS Estimated Number of Marine Recreational Fishing Trips taken in Connecticut by Fishing Mode, 1981-2007

	Shore Mode		Party/Charter Boat Mode		Private/Rental Boat Mode		All Modes Total	
Year	Number of Trips	PSE	Number of Trips	PSE	Number of Trips	PSE	Number of Trips	PSE
1981	486,297	16.8	162,844	22.0	591,019	15.2	1,240,160	10.2
1982	635,851	18.2	601,997	97.0	695,394	19.9	1,933,242	31.6
1983	563,607	19.0	92,655	29.0	601,021	17.2	1,257,283	12.0
1984	485,545	18.4	161,559	32.2	698,261	10.6	1,345,365	9.4
1985	613,944	18.1	117,404	21.1	815,397	13.5	1,546,745	10.2
1986	527,344	14.9	146,664	18.8	952,962	11.0	1,626,970	8.2
1987	373,442	17.8	81,723	20.0	985,915	10.9	1,441,080	8.9
1988	210,495	19.2	73,890	14.7	965,271	12.5	1,249,656	10.3
1989	465,230	16.6	47,323	21.8	847,833	13.1	1,360,386	9.9
1990	398,986	16.4	61,329	22.2	759,820	12.5	1,220,135	9.5
1991	690,244	15.7	31,335	20.7	952,206	13.4	1,673,785	10.0
1992	712,467	18.1	53,723	26.3	1,075,540	13.2	1,841,730	10.4
1993	386,683	14.5	102,996	17.7	727,954	13.6	1,217,633	9.5
1994	356,758	16.2	42,482	26.2	709,549	15.0	1,108,789	11.0
1995	532,159	19.3	72,866	28.2	640,359	15.9	1,245,384	11.8
1996	564,088	16.7	31,550	25.5	873,181	13.3	1,468,819	10.2
1997	346,120	18.3	34,870	34.3	751,248	17.1	1,132,238	12.7
1998	524,236	20.4	30,373	30.7	736,926	18.1	1,291,535	13.3
1999	522,586	20.9	21,859	29.0	774,097	18.7	1,318,542	13.8
2000	608,507	16.0	45,783	24.8	853,510	13.1	1,507,800	9.8
2001	695,406	13.8	46,262	19.9	981,137	11.2	1,722,805	8.5
2002	645,218	13.9	51,148	16.0	953,313	9.6	1,649,679	7.8
2003	624,972	13.3	63,570	19.0	875,228	11.5	1,563,770	8.4
2004	573,814	19.7	38,905	25.8	923,800	15.3	1,536,519	11.8
2005	438,205	20.6	38,226	2.4	1,072,764	13.7	1,549,195	11.1
2006	569,124	13.4	45,694	1.8	862,870	10.4	1,477,688	8.0
2007	543,709	14.4	50,339	3.2	1,089,237	10.7	1,683,285	8.3
Annual Mean	522,038		87,014		843,178		1,452,230	
% Distr.	35.9%		6.0%		58.1%			

Note: PSE – Proportional Standard Error, a modified version of Coefficient of Variation = S.E./Mean *100

Table 1.5: MRFSS Bluefish Total Catch (A+B1+B2) Estimates in Numbers by Fishing Mode, 1981-2007

Year	Shore Mode	PSE	Party/ Charter Boat Mode	PSE	Private/ Rental Boat Mode	PSE	All Modes	PSE
1981	2,319,696	23.3	764,060	22.4	607,359	24.6	3,691,115	15.9
1982	3,755,301	22.0	1,200,341	29.4	1,381,279	28.9	6,336,921	15.5
1983	914,908	21.4	20,851	40.1	335,984	26.9	1,271,743	17.0
1984	1,369,212	24.8	1,141,702	26.7	1,018,051	18.6	3,528,965	14.0
1985	1,466,906	23.0	819,371	35.4	1,175,215	19.9	3,461,492	14.5
1986	633,549	35.5	637,048	22.1	1,398,449	19.4	2,669,046	14.2
1987	1,104,305	26.0	214,403	23.7	1,506,910	13.0	2,825,618	12.4
1988	171,066	32.0	46,815	28.1	472,813	17.3	690,694	14.4
1989	862,485	26.6	98,138	19.4	638,174	13.9	1,598,797	15.4
1990	466,486	26.9	91,993	16.7	703,933	13.0	1,262,412	12.4
1991	1,447,012	18.0	103,573	18.3	731,001	12.7	2,281,586	12.2
1992	550,671	26.0	251,330	23.3	797,890	10.6	1,599,891	11.0
1993	168,346	25.9	360,866	15.1	557,052	11.6	1,086,264	8.8
1994	109,389	27.4	208,726	22.5	475,503	13.7	793,618	10.8
1995	254,535	20.6	180,562	24.9	343,805	15.8	778,902	11.3
1996	390,308	20.3	118,972	30.1	481,677	14.6	990,957	11.3
1997	326,047	20.0	54,993	26.9	431,008	14.0	812,048	11.1
1998	469,754	23.4	65,123	30.1	256,577	13.1	791,454	14.7
1999	616,648	20.1	84,305	24.0	483,910	17.4	1,184,863	12.8
2000	705,962	18.2	72,958	19.3	474,044	18.4	1,252,964	12.4
2001	1,188,953	16.1	80,349	18.5	876,356	12.8	2,145,658	10.4
2002	521,488	15.6	90,600	14.9	619,571	14.2	1,231,659	9.8
2003	122,323	21.7	162,907	12.4	714,467	11.4	999,697	8.8
2004	146,097	31.2	138,140	13.7	1,196,261	14.2	1,480,498	12.3
2005	406,452	25.7	96,002	5.9	903,958	15.7	1,406,412	13.2
2006	475,774	25.1	112,749	5.7	674,062	14.5	1,262,585	12.2
2007	222,794	20.4	113,115	5.8	886,514	14.5	1,222,423	11.2
Annual Mean	784,684		271,481		745,993		1,802,159	
% Distr.	43.5%		15.1%		41.4%			

Note: PSE – Proportional Standard Error, a modified version of Coefficient of Variation = S.E./Mean *100

Table 1.6: MRFSS Bluefish Harvest (A+B1) Estimates in Numbers by Fishing Mode, 1981-2007

Year	Shore Mode	PSE	Party/ Charter Boat Mode	PSE	Private/ Rental Boat Mode	PSE	All Modes	PSE
1981	1,984,365	25.1	764,060	22.4	606,666	24.7	3,355,091	16.3
1982	3,259,111	24.5	1,200,341	29.4	991,619	35.4	5,451,071	17.2
1983	851,021	22.7	20,851	40.1	335,984	26.9	1,207,856	17.6
1984	1,163,856	28.0	1,141,702	26.7	966,359	19.2	3,271,917	14.8
1985	1,268,584	25.2	819,371	35.4	1,046,625	21.5	3,134,580	15.5
1986	605,837	37.0	627,196	22.4	1,281,506	20.9	2,514,539	15.0
1987	1,077,768	26.5	203,232	24.5	1,253,985	13.3	2,534,985	13.2
1988	164,926	33.1	45,359	28.8	453,415	18.0	663,700	14.9
1989	801,464	28.4	97,282	19.5	569,192	15.2	1,467,938	16.6
1990	398,312	30.7	91,683	16.8	544,242	15.7	1,034,237	14.5
1991	1,144,132	21.4	100,954	18.8	484,080	14.8	1,729,166	14.8
1992	447,823	30.8	223,714	25.7	513,294	12.9	1,184,831	13.8
1993	106,849	25.4	326,547	16.2	391,936	14.9	825,332	10.1
1994	51,743	39.6	181,443	25.2	278,858	17.0	512,044	13.5
1995	221,379	23.1	174,236	25.8	212,655	21.2	608,270	13.4
1996	251,910	24.7	108,441	32.2	263,720	18.9	624,071	13.9
1997	203,445	28.0	48,395	29.8	266,969	17.9	518,809	14.6
1998	206,383	31.7	55,624	34.3	124,493	17.8	386,500	18.5
1999	239,939	24.4	67,546	28.7	132,959	20.1	440,444	15.2
2000	248,924	25.6	57,867	23.0	82,925	23.7	389,716	17.5
2001	518,169	19.0	78,073	19.0	120,235	15.4	716,477	14.1
2002	291,610	21.0	88,285	15.2	189,446	18.9	569,341	12.7
2003	66,595	24.0	122,880	14.1	268,284	14.4	457,759	9.9
2004	81,602	40.8	116,446	16.0	340,383	16.7	538,431	12.7
2005	149,512	29.5	38,444	27.9	194,434	17.7	382,390	14.9
2006	129,536	39.3	123,180	12.7	248,173	17.6	500,889	13.8
2007	123,257	28.5	86,096	5.4	165,711	20.4	375,064	13.1
Annual Mean	594,743		259,602		456,598		1,310,943	
% Distr.	45.4%		19.8%		34.8%			

Note: PSE – Proportional Standard Error, a modified version of Coefficient of Variation = S.E./Mean *100

Table 1.7: MRFSS Bluefish Harvest (A+B1) Estimates in Pounds by Fishing Mode, 1981-2007

Year	Shore Mode	PSE	Party/ Charter Boat Mode	PSE	Private/ Rental Boat Mode	PSE	All Modes	PSE
1981	1,056,215	25.8	1,377,729	81.9	1,925,478	22.8	4,359,422	28.5
1982	705,049	23.6	16,148,664	29.6	1,125,054	32.6	17,978,767	26.7
1983	1,155,995	28.5	131,390	43.3	1,502,675	32.5	2,790,060	21.2
1984	1,014,839	59.0	6,569,084	29.4	3,881,205	20.5	11,465,126	18.9
1985	1,265,002	30.3	2,506,330	59.5	4,355,666	23.7	8,127,000	22.8
1986	1,052,097	57.1	5,025,800	25.1	5,990,654	23.2	12,068,554	16.3
1987	474,717	29.5	1,262,991	25.7	6,491,039	13.2	8,228,747	11.3
1988	99,696	36.2	406,277	39.2	3,329,519	17.4	3,835,493	15.7
1989	365,540	26.7	797,479	20.4	3,405,258	15.3	4,568,277	12.2
1990	1,263,287	51.6	909,717	17.5	3,340,674	16.6	5,513,678	15.8
1991	1,854,470	35.3	754,017	17.6	2,726,462	16.4	5,334,949	15.1
1992	326,572	35.1	1,369,052	24.3	2,425,946	13.5	4,121,570	11.7
1993	93,096	50.6	2,340,505	16.8	1,826,586	12.8	4,260,187	10.8
1994	44,711	40.2	1,464,970	25.7	1,417,851	17.1	2,927,535	15.3
1995	309,960	28.5	1,471,976	25.4	1,035,737	22.7	2,817,671	16.0
1996	82,013	29.8	1,135,647	34.9	1,150,356	19.8	2,368,014	19.4
1997	97,677	48.2	235,749	28.0	1,089,436	21.6	1,422,862	17.5
1998	224,931	64.0	306,748	37.0	593,492	20.5	1,125,171	19.6
1999	85,261	42.3	329,841	38.4	495,819	25.4	910,923	20.0
2000	79,941	46.7	343,510	22.4	297,727	23.9	721,178	15.4
2001	174,086	24.6	532,623	18.9	536,084	17.4	1,242,790	11.6
2002	189,492	33.6	541,135	15.5	527,160	21.9	1,257,786	12.4
2003	109,300	27.4	650,211	18.3	1,263,227	16.4	2,022,736	11.9
2004	37,846	45.0	231,190	20.5	1,390,355	18.6	1,659,389	15.9
2005	65,699	42.3	232,263	30.7	863,939	19.2	1,161,904	15.7
2006	625,198	49.7	621,651	15.9	1,237,005	20.1	2,483,854	16.5
2007	837,739	32.2	590,639	11.2	845,151	24.9	2,273,529	15.3
Annual Mean	507,053		1,788,414		2,039,613		4,335,080	
% Distr.	11.7%		41.3%		47.0%			

Note: PSE – Proportional Standard Error, a modified version of Coefficient of Variation = S.E./Mean *100

Table 1.8: MRFSS Striped Bass Total Catch (A+B1+B2) Estimates in Numbers by Fishing Mode, 1981-2007

Year	Shore Mode	PSE	Party/ Charter Boat Mode	PSE	Private/ Rental Boat Mode	PSE	All Modes	PSE
1981	21,727	49.6	2,401	73.2	3,655	59.7	27,783	40.1
1982	582,061	67.6	0	0.0	111,207	54.3	693,268	57.4
1983	13,131	72.2	0	0.0	29,695	57.1	42,826	45.3
1984	4,837	55.1	679	75.0	31,338	64.5	36,854	55.3
1985	9,737	43.8	9,768	58.9	22,792	50.3	42,297	32.0
1986	0	0.0	202	100.1	12,052	50.2	12,254	49.4
1987	3,929	59.2	0	0.0	75,028	28.8	78,957	27.5
1988	2,507	49.7	52	68.3	25,645	29.1	28,204	26.8
1989	27,077	31.9	1,374	37.9	102,696	20.9	131,147	17.7
1990	13,156	34.0	2,446	33.5	79,970	18.9	95,572	16.5
1991	25,214	31.0	7,023	33.1	274,146	46.2	306,383	41.5
1992	39,059	42.0	20,261	30.5	242,093	23.1	301,413	19.4
1993	41,060	26.2	42,547	23.5	206,965	18.5	290,571	14.1
1994	41,202	28.4	22,776	33.6	442,918	25.8	506,896	22.7
1995	248,342	57.3	38,967	38.3	258,076	26.5	545,384	29.1
1996	110,580	35.6	29,385	52.5	974,488	26.5	1,114,452	23.5
1997	124,645	30.4	24,446	27.5	638,256	20.7	787,346	17.5
1998	124,395	29.3	18,491	23.3	947,521	24.6	1,090,407	21.7
1999	181,831	54.6	15,086	26.1	562,912	21.7	759,829	20.7
2000	84,286	26.3	41,085	20.7	854,186	18.8	979,557	16.5
2001	267,085	27.2	9,840	21.0	884,948	17.3	1,161,872	14.6
2002	108,156	27.0	12,267	18.1	627,613	14.4	748,036	12.7
2003	184,486	31.7	32,396	11.9	722,138	17.9	939,020	15.1
2004	255,280	33.2	26,572	18.0	879,966	19.9	1,161,817	16.8
2005	248,691	42.4	23,258	25.1	1,519,261	16.2	1,791,209	15.0
2006	276,857	39.0	31,782	23.1	1,431,397	20.7	1,740,036	18.1
2007	229,548	35.9	37,820	7.2	1,674,387	18.5	1,941,755	16.5
Annual Mean	121,070		16,701		505,013		642,783	
% Distr.	18.8%		2.6%		78.6%			

Note: PSE – Proportional Standard Error, a modified version of Coefficient of Variation = S.E./Mean *100

Table 1.9: MRFSS Striped Bass Harvest (A+B1) Estimates in Numbers by Fishing Mode, 1981-2007

Year	Shore Mode	PSE	Party/ Charter Boat Mode	PSE	Private/ Rental Boat Mode	PSE	All Modes	PSE
1981	5,090	53.3	2,401	73.2	3,655	59.7	11,146	35.0
1982	25,002	80.8	0	0.0	25,079	48.2	50,081	47.0
1983	13,131	72.2	0	0.0	29,695	57.1	42,826	45.3
1984	2,246	77.1	0	0.0	3,432	70.7	5,678	52.5
1985	0	0.0	365	76.4	14,986	72.4	15,350	70.7
1986	0	0.0	0	0.0	1,760	48.2	1,760	48.2
1987	0	0.0	0	0.0	522	60.3	522	60.3
1988	0	0.0	52	68.3	2,620	50.8	2,672	49.8
1989	873	79.9	118	66.3	4,787	48.0	5,777	41.6
1990	0	0.0	149	100.0	5,933	34.7	6,082	33.9
1991	848	75.8	242	59.6	3,817	47.1	4,907	39.1
1992	0	0.0	2,393	34.2	6,760	40.2	9,154	31.0
1993	2,151	45.2	3,379	32.2	13,723	25.0	19,253	19.4
1994	2,026	100.0	1,323	41.9	13,580	31.4	16,929	28.1
1995	4,988	69.4	4,467	38.2	28,806	27.2	38,261	22.8
1996	0	0.0	3,577	43.6	59,263	19.7	62,840	18.8
1997	8,633	66.5	12,886	39.3	43,120	21.4	64,639	18.5
1998	1,619	77.4	8,637	34.4	53,958	24.0	64,215	20.8
1999	521	99.9	6,448	34.8	48,836	30.6	55,805	27.1
2000	643	100.0	17,789	27.9	34,759	19.8	53,191	16.0
2001	3,231	59.7	5,455	27.9	45,479	16.4	54,165	14.5
2002	2,159	71.9	8,808	22.1	40,093	21.1	51,060	17.3
2003	5,492	50.7	23,753	14.2	66,737	16.1	95,983	12.1
2004	0	0.0	15,927	22.8	56,441	20.7	72,368	16.9
2005	0	0.0	12,041	32.2	95,198	27.6	107,238	24.7
2006	0	0.0	9,240	19.9	68,425	19.5	77,665	17.4
2007	2,411	72.0	22,922	8.5	84,523	19.8	109,856	15.4
Annual Mean	3,002		6,014		31,703		40,719	
% Distr.	7.4%		14.8%		77.9%			

Note: PSE – Proportional Standard Error, a modified version of Coefficient of Variation = S.E./Mean *100

Table 1.10: MRFSS Striped Bass Harvest (A+B1) Estimates in Pounds by Fishing Mode, 1981-2007

Year	Shore Mode	PSE	Party/ Charter Boat Mode	PSE	Private/ Rental Boat Mode	PSE	All Modes	PSE
1981	20,518	56.1	5,293	73.8	8,986	56.5	34,795	37.9
1982	49,608	82.5	0	0.0	61,356	49.9	110,964	46.0
1983	71,852	89.5	0	0.0	238,946	57.1	310,798	48.5
1984	5,445	77.1	0	0.0	86,257	70.7	91,705	66.7
1985	0	0.0	3,858	0.0	37,286	73.3	41,144	66.4
1986	0	0.0	0	0.0	21,537	68.1	21,537	68.1
1987	0	0.0	0	0.0	13,307	78.3	13,307	78.3
1988	0	0.0	891	80.8	46,645	41.3	47,536	40.6
1989	2,308	0.0	3,931	70.6	94,449	48.8	100,688	45.8
1990	0	0.0	4,579	100.0	188,432	35.1	193,011	34.3
1991	30,108	88.6	5,049	61.4	90,153	49.9	125,309	41.8
1992	0	0.0	46,859	37.2	149,421	42.1	196,278	33.3
1993	46,178	46.0	81,647	32.7	272,242	24.6	400,067	18.8
1994	39,557	100.0	27,121	44.4	289,151	32.1	355,829	28.6
1995	73,676	69.4	65,816	45.3	532,155	29.3	671,647	24.8
1996	0	0.0	46,786	48.9	868,632	20.5	915,418	19.6
1997	106,881	69.9	196,267	44.2	617,317	21.6	920,465	19.1
1998	25,514	81.1	113,228	40.0	851,181	24.3	989,923	21.5
1999	11,268	100.0	94,114	41.0	718,647	31.0	824,031	27.5
2000	6,332	100.0	194,693	31.8	314,940	21.4	515,962	17.8
2001	29,722	60.5	65,644	29.3	532,678	20.2	628,044	17.6
2002	20,659	74.0	88,504	24.7	491,319	24.1	600,482	20.2
2003	64,052	50.6	161,053	17.2	1,026,433	16.6	1,251,538	14.0
2004	0	0.0	39,114	25.3	888,002	23.6	927,116	22.7
2005	0	0.0	130,724	39.8	1,428,407	27.7	1,559,133	25.6
2006	0	0.0	132,003	26.8	1,177,303	22.0	1,309,306	20.0
2007	30,384	73.3	255,185	16.2	1,433,358	22.5	1,718,927	18.9
Annual Mean	23,484		65,273		462,168		550,924	
% Distr.	4.3%		11.8%		83.9%			

Note: PSE – Proportional Standard Error, a modified version of Coefficient of Variation = S.E./Mean *100

Table 1.11: MRFSS Summer Flounder Total Catch (A+B1+B2) Estimates in Numbers by Fishing Mode, 1981-2007

Year	Shore Mode	PSE	Party/ Charter Boat Mode	PSE	Private/ Rental Boat Mode	PSE	All Modes	PSE
1981	40,753	38.6	0	0.0	55,088	47.8	95,841	32.0
1982	36,489	39.2	0	0.0	217,372	46.4	253,861	40.1
1983	219,240	34.8	199,774	45.3	250,900	53.0	669,914	26.6
1984	59,867	42.4	0	0.0	536,962	19.8	596,829	18.4
1985	10,488	41.9	2,351	100.0	202,016	26.2	214,855	24.7
1986	14,274	42.2	24,880	31.0	877,288	20.8	916,441	20.0
1987	13,438	29.6	2,104	42.7	361,687	13.9	377,229	13.4
1988	5,248	43.3	52	100.1	115,219	17.9	120,519	17.2
1989	0	0.0	0	0.0	44,541	26.5	44,541	26.5
1990	10,623	56.5	1,081	43.6	44,649	22.8	56,352	21.0
1991	8,945	46.7	0	0.0	106,626	18.0	115,571	17.0
1992	14,992	60.2	0	0.0	222,881	14.8	237,873	14.3
1993	11,489	32.5	0	0.0	130,716	16.5	142,205	15.4
1994	44,065	25.2	17	99.1	448,929	13.8	493,011	12.8
1995	36,873	37.0	2,784	58.8	324,937	14.3	364,594	13.3
1996	19,397	33.8	0	0.0	592,973	11.9	612,371	11.5
1997	41,075	55.4	5,974	48.6	627,151	16.7	674,200	15.9
1998	12,217	45.6	305	52.3	517,369	14.8	529,890	14.4
1999	18,040	35.0	5,896	35.1	693,804	16.2	717,740	15.7
2000	25,055	33.5	7,969	39.6	782,060	11.3	815,084	10.9
2001	19,028	40.8	1,597	47.4	537,779	11.9	558,404	11.6
2002	25,893	33.8	85	99.8	519,835	13.3	545,813	12.8
2003	94,702	30.4	3,402	27.1	542,479	11.7	640,583	10.9
2004	27,288	34.7	4,431	30.9	552,698	16.1	584,416	15.3
2005	19,812	42.7	85	0.0	1,023,761	16.8	1,043,658	16.5
2006	20,972	51.1	113	99.6	981,608	17.8	1,002,693	17.4
2007	8,850	46.4	4548	17.5	419,640	640.0	433,038	14.7
Annual Mean	31,819		9,905		434,480		476,205	
% Distr.	6.7%		2.1%		91.2%			

Note: PSE – Proportional Standard Error, a modified version of Coefficient of Variation = S.E./Mean *100

Table 1.12: MRFSS Summer Flounder Harvest (A+B1) Estimates in Numbers by Fishing Mode, 1981-2007

Year	Shore Mode	PSE	Party/ Charter Boat Mode	PSE	Private/ Rental Boat Mode	PSE	All Modes	PSE
1981	22,522	55.0	0	0.0	53,648	49.0	76,170	38.1
1982	26,200	41.0	0	0.0	107,531	69.2	133,730	56.3
1983	126,450	46.5	198,810	45.5	250,900	53.0	576,160	29.7
1984	56,354	44.8	0	0.0	263,451	20.3	319,804	18.5
1985	9,925	43.9	0	0.0	175,422	28.5	187,698	26.7
1986	9,655	61.0	13,552	38.4	459,409	31.0	482,616	29.6
1987	12,209	31.0	1,683	50.1	203,638	17.6	217,530	16.5
1988	1,693	59.5	52	100.1	78,789	22.8	80,534	22.4
1989	0	0.0	0	0.0	28,314	37.3	28,314	37.3
1990	2,180	51.3	331	64.5	15,196	35.3	17,707	31.0
1991	4,264	57.1	0	0.0	61,281	23.8	65,545	22.5
1992	11,424	72.5	0	0.0	97,994	18.4	109,418	18.1
1993	3,026	62.7	0	0.0	74,190	19.9	77,216	19.2
1994	18,624	37.5	17	99.1	297,367	17.0	316,007	16.1
1995	5,538	63.5	2,784	58.8	180,209	17.5	188,531	16.9
1996	4,725	52.8	0	0.0	277,329	14.8	282,054	14.5
1997	2,683	48.8	3,503	57.2	237,656	19.2	243,842	18.7
1998	1,619	100.0	305	52.3	259,477	20.3	261,401	20.1
1999	2,853	59.2	1,991	58.2	210,466	19.5	215,311	19.1
2000	2,971	72.2	3,288	45.3	365,352	17.6	371,611	17.4
2001	1,309	100.0	921	63.8	150,583	15.7	152,813	15.5
2002	1,291	100.0	85	99.8	91,990	18.2	93,366	18.0
2003	11,586	33.6	1,237	36.8	152,985	14.7	165,808	13.8
2004	3,402	74.8	2,079	42.0	212,391	19.6	217,872	19.2
2005	1,646	100.0	43	0.0	209,737	21.2	211,426	21.0
2006	3,970	100.0	0	0.0	102,809	20.7	106,779	20.3
2007	0	0.0	1,646	26.2	106,882	17.9	108,528	17.7
Annual Mean	12,893		8,605		175,000		196,585	
% Distr.	6.6%		4.4%		89.0%			

Note: PSE – Proportional Standard Error, a modified version of Coefficient of Variation = S.E./Mean *100

Table 1.13: MRFSS Summer Flounder Harvest (A+B1) Estimates in Pounds by Fishing Mode, 1981-2007

Year	Shore Mode	PSE	Party/ Charter Boat Mode	PSE	Private/ Rental Boat Mode	PSE	All Modes	PSE
1981	8,688	46.3	0	0.0	75,794	61.5	84,482	55.4
1982	14,806	40.8	0	0.0	207,671	69.7	222,477	65.1
1983	110,153	53.4	177,140	44.1	211,730	52.4	499,022	29.6
1984	27,736	38.9	0	0.0	391,310	21.8	419,046	20.5
1985	15,794	46.0	4,136	100.0	318,693	28.3	338,622	26.7
1986	11,102	68.0	19,711	49.5	743,817	30.1	774,630	29.0
1987	17,782	46.3	1,929	50.3	413,962	18.7	433,673	17.9
1988	3,124	61.2	128	100.0	166,441	23.2	169,692	22.8
1989	0	0.0	0	0.0	97,430	39.1	97,430	39.1
1990	4,211	65.9	542	66.0	26,164	34.0	30,917	30.1
1991	5,838	57.0	0	0.0	135,484	30.3	141,321	29.2
1992	20,232	77.7	0	0.0	171,381	18.5	191,611	18.5
1993	4,447	68.4	0	0.0	124,145	20.9	128,594	20.3
1994	21,691	38.7	20	103.8	453,283	17.2	474,994	16.5
1995	6,989	65.6	4,976	66.0	291,036	18.6	303,000	17.9
1996	5,675	52.2	0	0.0	419,807	14.9	425,481	14.7
1997	3,446	48.5	10,137	60.3	348,810	19.4	362,392	18.8
1998	4,879	100.0	509	56.1	442,979	19.9	448,367	19.7
1999	4,698	58.0	3,702	71.9	380,252	20.0	388,651	19.6
2000	5,833	78.9	7,008	53.7	765,364	18.4	778,206	18.1
2001	3,653	100.0	2,571	69.6	443,931	16.2	450,157	16.0
2002	3,060	100.0	267	100.1	279,713	19.7	283,042	19.5
2003	32,064	36.3	2,705	48.7	375,939	15.0	410,708	14.1
2004	7,163	74.9	5,564	54.7	554,741	18.8	567,466	18.4
2005	4,277	100.0	115	0.0	579,029	22.1	583,423	21.9
2006	9,744	100.0	0	0.0	329,804	21.3	339,548	20.9
2007	0	0.0	5,437	27.8	354,885	18.3	360,322	18.0
Annual Mean	13,225		9,133		337,170		359,529	
% Distr.	3.7%		2.5%		93.8%			

Note: PSE – Proportional Standard Error, a modified version of Coefficient of Variation = S.E./Mean *100

Table 1.14: MRFSS Winter Flounder Total Catch (A+B1+B2) Estimates in Numbers by Fishing Mode, 1981-2007

Year	Shore Mode	PSE	Party/ Charter Boat Mode	PSE	Private/ Rental Boat Mode	PSE	All Modes	PSE
1981	171,868	29.6	0	0.0	591,987	24.2	763,854	19.9
1982	181,431	29.3	7,411	90.3	1,033,813	60.4	1,222,655	51.2
1983	42,910	34.5	0	0.0	733,582	34.2	776,492	32.4
1984	110,824	24.1	40,733	63.8	1,173,963	18.9	1,325,520	16.9
1985	287,866	33.4	35,235	26.8	958,683	21.0	1,281,784	17.4
1986	84,733	36.6	87,148	27.9	475,003	18.9	646,885	15.1
1987	44,306	44.7	37,550	54.5	899,798	18.8	981,655	17.4
1988	21,392	28.0	102,810	27.5	713,811	16.8	838,014	14.7
1989	112,616	33.2	8,726	27.2	582,977	13.1	704,319	12.1
1990	66,619	52.5	32,002	32.9	473,626	28.2	572,247	24.2
1991	18,152	35.0	8,060	66.9	397,941	19.4	424,153	18.3
1992	6,904	48.3	41	85.5	137,900	19.7	144,845	18.9
1993	16,300	30.9	0	0.0	71,167	25.3	87,467	21.4
1994	19,861	38.1	84	101.3	73,779	29.4	93,724	24.5
1995	10,724	59.0	130	100.1	207,627	33.3	218,481	31.8
1996	20,523	40.8	0	0.0	85,563	29.2	106,086	24.8
1997	4,531	40.8	0	0.0	181,475	24.4	186,006	23.8
1998	3,532	54.4	0	0.0	316,849	26.5	320,381	26.2
1999	5,854	52.4	691	66.0	85,576	30.2	92,121	28.3
2000	0	0.0	294	70.7	21,358	27.1	21,653	26.8
2001	6,147	55.4	61	100.7	41,193	30.2	47,401	27.2
2002	1,291	100.0	0	0.0	24,372	30.9	25,663	29.8
2003	9,768	44.4	22	102.0	19,436	37.6	29,227	29.1
2004	10,884	84.5	0	0.0	2,809	70.7	13,693	68.7
2005	2,630	100.0	0	0.0	1,854	58.7	4,484	63.5
2006	10,280	76.5	0	0.0	21,172	34.2	31,452	34.0
2007	3,756	70.8	0	0.0	14,502	33.6	18,258	30.4
Annual Mean	47,248		13,370		345,993		406,612	
% Distr.	11.6%		3.3%		85.1%			

Note: PSE – Proportional Standard Error, a modified version of Coefficient of Variation = S.E./Mean *100

Table 1.15: MRFSS Winter Flounder Harvest (A+B1) Estimates in Numbers by Fishing Mode, 1981-2007

Year	Shore Mode	PSE	Party/ Charter Boat Mode	PSE	Private/ Rental Boat Mode	PSE	All Modes	PSE
1981	147,866	33.0	0	0.0	507,500	26.4	655,366	21.7
1982	132,399	37.5	7,411	90.3	905,065	68.6	1,044,875	59.6
1983	30,488	43.6	0	0.0	597,235	39.7	627,722	37.8
1984	73,352	25.2	38,762	67.0	1,056,598	20.5	1,168,713	18.7
1985	208,524	43.4	28,702	31.2	799,979	24.0	1,037,205	20.5
1986	75,226	40.5	75,611	31.6	434,021	20.4	584,858	16.5
1987	30,262	53.2	37,133	55.2	755,170	21.7	822,565	20.1
1988	10,973	34.4	47,785	31.1	601,084	19.4	659,841	17.8
1989	40,249	31.8	5,341	33.4	492,227	15.1	537,817	14.0
1990	16,611	42.9	20,956	42.7	380,364	34.3	417,930	31.3
1991	10,500	40.6	7,885	68.3	320,628	22.8	339,013	21.7
1992	4,894	54.4	41	85.5	118,447	22.1	123,382	21.3
1993	10,223	43.9	0	0.0	63,420	27.8	73,643	24.7
1994	10,253	35.5	84	101.3	58,006	35.0	68,343	30.2
1995	9,538	65.8	130	100.1	181,426	37.5	191,095	35.8
1996	17,042	47.6	0	0.0	73,088	33.5	90,130	28.6
1997	4,244	43.1	0	0.0	158,837	27.5	163,081	26.8
1998	1,807	72.1	0	0.0	233,376	34.1	235,182	33.8
1999	2,935	70.7	691	66.0	63,685	38.6	67,311	36.6
2000	0	0.0	147	100.1	10,064	41.7	10,211	41.1
2001	650	100.0	0	0.0	14,688	40.0	15,338	38.5
2002	0	0.0	0	0.0	16,476	35.4	16,476	35.4
2003	7,630	49.4	22	102.0	15,955	44.5	23,607	34.0
2004	1,790	75.3	0	0.0	2,339	82.4	4,129	57.0
2005	2,630	100.0	0	0.0	1,158	72.2	3,788	72.8
2006	0	0.0	0	0.0	7,714	54.9	7,714	34.0
2007	0	0.0	0	0.0	4,164	56.4	4,164	56.4
Annual Mean	31,485		10,026		291,582		333,093	
% Distr.	9.5%		3.0%		87.5%			

Note: PSE – Proportional Standard Error, a modified version of Coefficient of Variation = S.E./Mean *100

Table 1.16: MRFSS Winter Flounder Harvest (A+B1) Estimates in Pounds by Fishing Mode, 1981-2007

Year	Shore Mode	PSE	Party/ Charter Boat Mode	PSE	Private/ Rental Boat Mode	PSE	All Modes	PSE
1981	77,443	35.4	0	0.0	590,654	48.8	668,097	43.3
1982	118,499	45.2	10,024	97.5	777,018	73.4	905,542	63.3
1983	18,505	45.0	0	0.0	287,667	40.0	306,170	37.7
1984	53,913	27.8	34,932	67.0	1,131,513	19.6	1,220,359	18.3
1985	133,321	43.0	22,529	30.7	790,298	23.6	946,150	20.6
1986	54,213	41.6	89,053	35.7	466,240	20.7	609,506	17.0
1987	35,212	58.0	48,629	56.0	918,752	22.5	1,002,593	20.9
1988	12,412	35.7	60,503	32.0	819,079	19.9	891,997	18.4
1989	45,880	32.8	6,082	34.0	669,927	15.1	721,890	14.2
1990	16,748	44.5	20,587	44.7	397,355	36.8	434,690	33.8
1991	9,570	43.1	8,814	68.6	342,332	23.8	360,717	22.7
1992	5,456	56.8	62	84.9	145,903	23.0	151,419	22.2
1993	11,773	45.2	0	0.0	72,403	27.9	84,176	24.8
1994	15,454	37.3	119	100.8	83,889	35.6	99,463	30.6
1995	13,292	67.7	165	100.1	243,611	39.2	257,070	37.3
1996	24,489	49.9	0	0.0	92,472	33.5	116,961	28.4
1997	4,612	43.2	0	0.0	232,506	28.3	237,116	27.8
1998	2,690	72.5	0	0.0	272,777	34.0	275,467	33.7
1999	2,881	71.4	888	69.3	65,318	42.1	69,090	39.9
2000	0	0.0	234	100.2	13,719	41.7	13,953	41.1
2001	1,241	100.0	0	0.0	22,015	40.9	23,256	39.1
2002	0	0.0	0	0.0	25,154	35.3	25,154	35.3
2003	8,364	50.3	26	103.7	17,412	48.7	25,803	36.7
2004	1,684	76.1	0	0.0	3,587	100.0	5,271	72.3
2005	0	0.0	0	0.0	1,116	56.0	1,116	56.0
2006	0	0.0	0	0.0	9,140	55.4	9,140	55.4
2007	0	0.0	0	0.0	6,634	62.9	6,634	62.9
Annual Mean	24,728		11,209		314,759		350,696	
% Distr.	7.1%		3.2%		89.8%			

Note: PSE – Proportional Standard Error, a modified version of Coefficient of Variation = S.E./Mean *100

Table 1.17: MRFSS Scup Total Catch (A+B1+B2) Estimates in Numbers by Fishing Mode, 1981-2007

Year	Shore Mode	PSE	Party/ Charter Boat Mode	PSE	Private/ Rental Boat Mode	PSE	All Modes	PSE
1981	55,775	71.3	236,803	31.0	1,229,474	21.7	1,522,052	18.4
1982	3,421	74.1	2,216	100.0	133,706	49.1	139,343	47.2
1983	0	0.0	152,132	37.4	397,042	45.7	549,174	34.6
1984	3,292	100.0	0	0.0	417,967	26.1	421,259	26.0
1985	0	0.0	0	0.0	6,977,216	16.3	6,977,216	16.3
1986	534,911	86.8	56,030	45.3	5,710,424	19.1	6,301,365	18.8
1987	19,343	55.4	205,604	18.4	1,076,693	16.0	1,301,640	13.6
1988	5,813	83.3	97,538	30.1	2,035,811	13.5	2,139,162	12.9
1989	22,219	48.3	100,125	20.7	2,006,563	16.2	2,128,907	15.3
1990	21,837	59.5	157,229	17.4	676,378	32.4	855,444	25.9
1991	13,768	69.1	0	0.0	3,620,613	11.3	3,634,381	11.2
1992	41,686	41.1	0	0.0	2,739,130	12.7	2,780,816	12.5
1993	34,241	57.2	0	0.0	751,431	13.9	785,672	13.5
1994	3,952	46.0	52	100.6	278,405	23.8	282,410	23.4
1995	50,062	60.0	0	0.0	202,252	23.6	252,314	22.4
1996	8,995	86.9	5,136	76.9	751,146	22.6	765,277	22.3
1997	6,905	62.2	0	0.0	198,199	29.9	205,104	28.9
1998	15,192	51.1	0	0.0	341,766	23.9	356,957	23.0
1999	17,183	78.7	0	0.0	629,890	25.6	647,073	25.0
2000	141,317	35.6	0	0.0	2,101,254	14.6	2,242,571	13.9
2001	299,427	20.3	0	0.0	1,647,550	10.9	1,946,977	9.7
2002	128,400	30.7	0	0.0	1,322,939	15.5	1,451,339	14.4
2003	260,360	17.5	23,159	31.5	2,049,330	11.3	2,332,849	10.1
2004	39,759	62.3	17,562	33.6	879,059	17.2	936,379	16.3
2005	87,836	51.1	9,798	48.4	1,277,419	17.2	1,375,054	16.3
2006	208,033	60.0	37,653	26.5	1,003,733	18.2	1,249,419	17.7
2007	169,804	30.6	28,366	17.6	1,362,433	14.2	1,560,603	12.8
Annual Mean	81,242		41,830		1,548,808		1,671,880	
% Distr.	4.9%		2.5%		92.6%			

Note: PSE – Proportional Standard Error, a modified version of Coefficient of Variation = S.E./Mean *100

Table 1.18: MRFSS Scup Harvest (A+B1) Estimates in Numbers by Fishing Mode, 1981-2007

Year	Shore Mode	PSE	Party/ Charter Boat Mode	PSE	Private/ Rental Boat Mode	PSE	All Modes	PSE
1981	55,775	71.3	227,200	32.2	1,163,844	22.8	1,446,819	19.2
1982	0	0.0	0	0.0	112,094	57.4	112,094	57.4
1983	0	0.0	152,132	37.4	397,042	45.7	549,174	34.6
1984	3,292	100.0	0	0.0	307,576	30.9	310,869	30.6
1985	0	0.0	0	0.0	5,149,220	20.3	5,149,220	20.3
1986	530,292	87.6	52,996	47.8	4,264,248	23.8	4,847,537	23.0
1987	17,933	59.2	150,460	21.3	843,167	18.4	1,011,560	15.7
1988	0	0.0	86,942	33.4	1,395,701	17.5	1,482,643	16.6
1989	0	0.0	67,429	25.5	1,334,804	22.0	1,402,234	21.0
1990	17,231	72.9	120,355	21.2	518,902	41.8	656,489	33.3
1991	12,808	73.9	0	0.0	2,103,189	14.7	2,115,997	14.6
1992	35,176	46.3	0	0.0	1,667,894	16.6	1,703,070	16.3
1993	15,706	61.0	0	0.0	598,929	16.2	614,635	15.9
1994	2,165	59.8	52	100.6	246,829	26.0	249,047	25.8
1995	5,977	100.0	0	0.0	110,879	31.6	116,856	30.4
1996	7,710	100.0	3,669	100.0	627,844	25.8	639,222	25.3
1997	456	100.1	0	0.0	142,213	39.9	142,669	39.8
1998	5,398	98.8	0	0.0	184,414	38.2	189,812	37.2
1999	2,083	99.7	0	0.0	371,861	38.2	373,943	38.0
2000	42,846	87.7	0	0.0	1,274,843	18.0	1,317,689	17.7
2001	114,929	27.3	0	0.0	900,931	15.3	1,015,860	13.9
2002	36,904	49.5	0	0.0	844,792	21.3	881,696	20.5
2003	148,491	22.6	19,257	36.9	1,361,398	15.3	1,529,146	13.8
2004	31,345	77.8	15,779	36.6	507,224	24.8	554,348	23.2
2005	0	0.0	4,898	57.9	685,754	22.9	690,652	22.7
2006	12,596	88.3	34,117	28.8	474,590	30.7	521,303	28.1
2007	16,585	51.0	21,569	21.8	651,821	21.5	689,975	20.3
Annual Mean	41,322		35,439		1,046,000		1,122,761	
% Distr.	3.7%		3.2%		93.2%			

Note: PSE – Proportional Standard Error, a modified version of Coefficient of Variation = S.E./Mean *100

Table 1.19: MRFSS Scup Harvest Catch (A+B1) Estimates in Pounds by Fishing Mode, 1981-2007

Year	Shore Mode	PSE	Party/ Charter Boat Mode	PSE	Private/ Rental Boat Mode	PSE	All Modes	PSE
1981	30,867	87.9	368,834	36.9	622,376	24.8	1,022,077	20.3
1982	0	0.0	0	0.0	166,923	58.8	166,923	58.8
1983	0	0.0	70,605	37.6	256,318	48.6	326,925	38.9
1984	3,113	100.0	0	0.0	268,064	34.4	271,177	34.0
1985	0	0.0	0	0.0	3,081,383	20.1	3,081,383	20.1
1986	199,106	88.9	19,744	47.9	1,622,109	23.9	1,840,960	23.1
1987	11,378	61.4	108,555	22.1	455,887	18.8	575,817	15.5
1988	0	0.0	51,513	33.5	1,018,785	17.7	1,070,298	16.9
1989	0	0.0	49,264	34.1	898,569	22.6	947,835	21.5
1990	4,257	82.7	50,472	24.0	351,021	53.0	405,750	45.9
1991	7,533	67.3	0	0.0	1,408,144	14.8	1,415,677	14.7
1992	16,228	46.2	0	0.0	1,168,692	16.6	1,184,920	16.4
1993	7,019	60.4	0	0.0	331,437	16.5	338,457	16.2
1994	2,030	62.8	44	100.7	208,795	27.6	210,870	27.4
1995	4,347	100.0	0	0.0	96,478	35.9	100,825	34.7
1996	3,203	100.0	3,062	100.0	392,062	29.0	398,327	28.6
1997	123	99.8	0	0.0	46,244	36.7	46,367	36.6
1998	3,569	98.8	0	0.0	139,146	43.9	142,715	42.9
1999	1,263	99.7	0	0.0	198,052	40.2	199,316	40.0
2000	25,587	90.7	0	0.0	833,994	18.5	859,580	18.2
2001	86,689	27.4	0	0.0	873,970	15.7	960,659	14.5
2002	32,006	49.5	0	0.0	817,455	21.5	849,461	20.8
2003	118,186	22.8	15,470	43.0	1,394,734	15.6	1,528,390	14.3
2004	33,367	82.8	10,245	45.5	546,044	24.8	589,656	23.5
2005	0	0.0	5,620	65.3	792,536	23.0	798,156	22.8
2006	17,745	90.4	39,919	40.6	676,453	31.0	734,117	28.7
2007	26,325	51.2	28,245	35.6	723,331	22.8	777,901	21.3
Annual Mean	23,479		30,429		718,111		772,020	
% Distr.	3.0%		3.9%		93.0%			

Note: PSE – Proportional Standard Error, a modified version of Coefficient of Variation = S.E./Mean *100

Table 1.20: MRFSS Tautog Total Catch (A+B1+B2) Estimates in Numbers by Fishing Mode, 1981-2007

Year	Shore Mode	PSE	Party/ Charter Boat Mode	PSE	Private/ Rental Boat Mode	PSE	All Modes	PSE
1981	18,134	38.3	0	0.0	85,954	29.2	104,088	25.0
1982	10,899	87.1	0	0.0	232,240	41.9	243,139	40.2
1983	18,344	46.3	3,571	60.5	259,563	40.6	281,478	37.6
1984	64,456	24.1	7,464	51.4	285,431	19.7	357,352	16.3
1985	37,943	34.1	5,839	55.2	184,547	18.1	228,329	15.8
1986	98,001	51.0	16,587	34.9	252,835	28.7	367,422	24.1
1987	8,280	48.0	25,920	31.6	325,210	20.3	359,410	18.6
1988	23,240	29.3	21,642	23.8	349,091	15.1	393,973	13.5
1989	48,710	42.9	17,637	31.3	359,213	13.7	425,560	12.7
1990	15,047	28.0	17,879	35.2	87,751	19.3	120,676	15.4
1991	2,969	48.2	94	87.4	323,775	17.2	326,838	17.0
1992	11,560	40.5	0	0.0	576,043	14.4	587,603	14.2
1993	45,859	26.8	0	0.0	217,925	17.9	263,784	15.5
1994	43,717	23.7	6,644	52.5	235,317	21.0	285,678	17.7
1995	4,325	55.4	10,676	66.9	179,994	28.0	194,995	26.1
1996	16,866	33.7	10,719	42.7	119,068	21.5	146,653	18.2
1997	5,212	43.8	0	0.0	94,055	24.1	99,267	23.0
1998	6,896	54.5	136	100.0	267,637	40.8	274,669	39.8
1999	4,079	57.5	158	66.1	79,889	39.6	84,125	37.8
2000	8,998	72.0	0	0.0	30,505	45.0	39,503	38.4
2001	22,200	30.6	0	0.0	53,407	48.5	75,607	35.4
2002	5,689	49.3	0	0.0	313,192	29.2	318,881	28.7
2003	36,044	61.2	1,997	67.3	412,357	18.1	450,398	17.3
2004	1,701	70.7	1,426	53.6	485,674	29.5	488,801	29.3
2005	14,818	52.0	11,549	38.5	191,006	20.3	217,373	18.3
2006	9,772	56.6	1,705	11.6	299,698	16.3	311,175	15.8
2007	15,550	37.9	1,279	18.7	639,861	18.9	656,690	18.5
Annual Mean	22,197		6,034		257,083		285,314	
% Distr.	7.8%		2.1%		90.1%			

Note: PSE – Proportional Standard Error, a modified version of Coefficient of Variation = S.E./Mean *100

Table 1.21: MRFSS Tautog Harvest (A+B1) Estimates in Numbers by Fishing Mode, 1981-2007

Year	Shore Mode	PSE	Party/ Charter Boat Mode	PSE	Private/ Rental Boat Mode	PSE	All Modes	PSE
1981	15,740	41.5	0	0.0	84,568	29.6	100,308	25.8
1982	10,899	87.1	0	0.0	220,288	44.1	231,187	42.2
1983	13,900	55.7	3,571	60.5	183,206	48.8	200,676	44.7
1984	37,288	28.0	7,464	51.4	242,718	21.0	287,470	18.2
1985	32,878	37.8	5,535	58.0	143,904	20.4	182,318	17.6
1986	86,241	57.0	15,171	37.3	231,985	31.0	333,396	26.2
1987	5,580	62.5	23,004	34.7	283,845	22.3	312,430	20.4
1988	7,192	41.0	20,099	25.4	206,907	19.5	234,198	17.4
1989	46,442	44.8	8,723	37.5	248,617	17.6	303,782	16.0
1990	8,875	36.1	6,414	40.9	60,582	25.7	75,871	21.3
1991	1,697	68.4	81	100.2	189,360	22.6	191,137	22.4
1992	6,521	52.3	0	0.0	312,699	17.7	319,221	17.4
1993	24,533	44.0	0	0.0	155,523	20.8	180,055	18.9
1994	27,705	30.5	5,127	65.2	117,276	28.6	150,109	23.1
1995	2,779	65.8	10,676	66.9	106,805	35.9	120,259	32.5
1996	7,295	51.0	8,554	51.4	56,710	30.2	72,558	24.9
1997	1,894	71.6	0	0.0	30,306	44.6	32,200	42.2
1998	901	72.1	136	100.0	65,760	51.0	66,797	50.2
1999	0	0.0	88	100.4	15,612	60.9	15,701	60.5
2000	0	0.0	0	0.0	10,648	56.2	10,648	56.2
2001	2,956	60.5	0	0.0	13,623	63.9	16,579	53.6
2002	711	100.0	0	0.0	99,529	27.5	100,240	27.4
2003	6,774	55.0	1,309	99.1	159,792	20.1	167,875	19.2
2004	851	100.0	713	75.9	110,896	34.6	112,459	34.2
2005	1,646	100.0	4,481	44.3	67,758	26.6	73,886	24.7
2006	0	0.0	1,705	11.6	169,885	21.2	171,590	21.0
2007	4,306	74.5	986	19.8	206,035	24.9	211,327	24.3
Annual Mean	13,171		4,587		140,550		158,307	
% Distr.	8.3%		2.9%		88.8%			

Note: PSE – Proportional Standard Error, a modified version of Coefficient of Variation = S.E./Mean *100

Table 1.22: MRFSS Tautog Harvest Catch (A+B1) Estimates in Pounds by Fishing Mode, 1981-2007

Year	Shore Mode	PSE	Party/ Charter Boat Mode	PSE	Private/ Rental Boat Mode	PSE	All Modes	PSE
1981	32,857	45.1	0	0.0	209,481	29.3	242,336	26.1
1982	12,046	72.5	0	0.0	598,562	45.9	610,608	45.0
1983	30,276	56.7	6,817	62.3	421,491	62.0	458,581	57.1
1984	87,051	33.5	9,125	52.4	637,533	21.2	733,711	18.8
1985	78,217	41.3	16,449	59.0	376,521	23.9	471,185	20.4
1986	242,411	58.9	45,485	41.7	550,451	36.5	838,345	29.5
1987	21,354	68.2	80,832	37.4	1,004,420	24.0	1,106,606	22.0
1988	14,519	40.9	83,239	27.5	512,413	20.2	610,172	17.4
1989	89,588	46.8	20,029	35.6	928,602	19.4	1,038,217	17.9
1990	20,353	41.7	17,471	41.8	162,177	24.5	199,999	20.6
1991	5,112	68.7	342	99.9	643,181	23.8	648,633	23.7
1992	15,287	52.4	0	0.0	1,033,351	18.3	1,048,638	18.0
1993	65,188	44.3	0	0.0	465,836	21.9	531,024	20.0
1994	84,557	32.8	17,035	72.2	315,846	29.7	417,439	23.6
1995	7,806	68.6	32,950	70.6	361,859	35.5	402,617	32.4
1996	26,987	54.3	34,350	58.0	184,481	30.4	245,817	24.9
1997	3,201	71.8	0	0.0	81,096	42.0	84,297	40.5
1998	3,788	71.4	617	99.8	227,219	49.6	231,622	48.6
1999	0	0.0	423	99.9	60,719	63.1	61,142	62.7
2000	0	0.0	0	0.0	58,475	61.2	58,475	61.2
2001	11,920	65.7	0	0.0	51,237	65.2	63,157	54.4
2002	1,647	100.0	0	0.0	445,495	29.9	447,139	29.8
2003	21,113	50.9	1,766	99.0	580,983	20.1	603,862	19.4
2004	3,946	100.0	3,333	78.6	507,697	31.5	514,977	31.1
2005	6,746	100.0	7,121	67.6	287,114	26.6	300,981	25.5
2006	0	0.0	7,568	9.4	675,051	23.0	682,619	22.8
2007	18,038	77.5	4,336	33.5	937,713	29.7	960,087	29.0
Annual Mean	33,482		14,418		456,259		504,159	
% Distr.	6.6%		2.9%		90.5%			

Note: PSE – Proportional Standard Error, a modified version of Coefficient of Variation = S.E./Mean *100

Table 1.23: A History of Connecticut Marine Recreational Fisheries Regulations for Selected Species from 1935-2007

Striped Bass

Effective Date	Minimum Size	Daily Creel Limit	Fishing Season	Closed Season/Area	Other Restrictions
1935	16 in. (fork length)	None.	Year round.	None.	Spearing prohibited.
1953	16 in. (fork length)	None.	Year round.	None.	No sale; spearing prohibited.
Jan 1982	16 in. (fork length)	4 fish between 16 and 24in. No limit >24in.	Year round.	None.	No sale; spearing prohibited.
Aug 1984	24 in. (fork length)	None.	Apr 1-Dec 14	Dec 15-Mar 31 in all state waters.	No sale; spearing prohibited.
Aug 1985	26 in. (fork length)	None.	Apr 1-Dec 14	Dec 15-Mar 31 in all state waters.	No sale; spearing prohibited.
Jul 1, 1986- Striped bass fishery closed in all state waters (Moratorium)					
1987	33 in. (total length)	1 fish/angler.	Apr 1-Dec 14	Dec 15-Mar 31 in all state waters.	No sale; spearing and gaffing prohibited; fish must be landed intact.
Apr 1, 1989	34 in. (total length)	1 fish/angler.	Apr 1-Dec 14	Dec 15-Mar 31 in all state waters.	No sale; spearing and gaffing prohibited; fish must be landed intact.
Jul 1, 1989	36 in. (total length)	1 fish/angler.	Apr 1-Dec 14	Dec 15-Mar 31 in all state waters.	No sale; spearing and gaffing prohibited; fish must be landed intact.
Jan 1, 1990	38 in. (total length)	1 fish/angler.	Apr 1-Dec 14	Dec 15-Mar 31 in all state waters.	No sale; spearing and gaffing prohibited; fish must be landed intact.
Sep 1990	36 in. (total length)	1 fish/angler.	Apr 1-Dec 14	Dec 15-Mar 31 in all state waters.	No sale; spearing and gaffing prohibited; fish must be landed intact.
Apr 22, 1994	34 in. (total length)	1 fish/angler.	Apr 1-Dec 14	Dec 15-Mar 31 in all state waters.	No sale; spearing and gaffing prohibited; fish must be landed intact.
1995	28 in. (total length)	2 fish/angler.	Apr 1-Dec 14	Dec 15-Mar 31 in all state waters.	No sale; spearing and gaffing prohibited; fish must be landed intact.
Jul 29, 1996	28 in. (total length)	2 fish/angler.	Year round.	None.	No sale; spearing and gaffing prohibited; fish must be landed intact.
May 10, 2000	24-30 in. and $\geq$ 40 in. (total length) Party/Charter Only-29½ in. (total length)	1 fish/angler per length group. 2 fish/angler.	Year round.	None.	No sale; spearing and gaffing prohibited; fish must be landed intact.

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Striped Bass, Con't.

Feb 27, 2001	24-32in. and ≥ 41 in. (total length) Party/Charter Only - 28 in. (total length)	1 fish/angler per length group. 2 fish/angler.	Year round.	None.	No sale; spearing and gaffing prohibited; fish must be landed intact.
May 15, 2003 - Current	28 in. (total length)	2 fish/angler.	Year round.	None.	No sale; spearing and gaffing prohibited; fish must be landed intact.

Bluefish

Effective Date	Minimum Size	Daily Creel Limit	Fishing Season	Closed Season/Area	Other Restrictions
Jan 1, 1991	None	10 fish/angler for fish > 12in (total length).	Year round.	None.	None.
Apr 22, 1994 - Current	None	10 fish/angler	Year round.	None.	None.

Summer Flounder (Fluke)

Effective Date	Minimum Size	Daily Creel Limit	Fishing Season	Closed Season/Area	Other Restrictions
Jan 1, 1982	14 in. (total length)	None.	Year round.	None.	None.
Apr 22, 1994	14 in. (total length)	6 fish/angler	May 15-Sep 30.	Oct 1-May 14 in all state waters	On the water fillets must meet minimum length or be accompanied by legal sized rack (carcass).
Jul 29, 1996	14 in. (total length)	6 fish/angler	Year round.	None.	On the water fillets must meet minimum length or be accompanied by legal sized rack (carcass).
Apr 24, 1997	14½ in. (total length)	6 fish/angler	Year round.	None.	On the water fillets must meet minimum length or be accompanied by legal sized rack (carcass).
May 5, 1998	15 in. (total length)	6 fish/angler	Year round.	None.	On the water fillets must meet minimum length or be accompanied by legal sized rack (carcass).
Mar 17, 1999	15 in. (total length)	8 fish/angler	May 29-Sep 11.	Sep 12-May 28 in all state waters.	On the water fillets must meet minimum length or be accompanied by legal sized rack (carcass).
May 10, 2000	15½ in. (total length)	8 fish/angler	May 10-Oct 2.	Oct 3-May 9 in all state waters.	On the water fillets must meet minimum length or be accompanied by legal sized rack (carcass).

Summer Flounder (Fluke), Con't.

Effective Date	Minimum Size	Daily Creel Limit	Fishing Season	Closed Season/Area	Other Restrictions
May 17, 2001	17 in. (total length)	6 fish/angler	Year round.	None.	On the water fillets must meet minimum length or be accompanied by legal sized rack (carcass).
May 27, 2005	17 ½ in. (total length)	6 fish/angler	Apr 30-Dec 31.	Jan 1-Apr 29 in all state waters.	On the water fillets must meet minimum length or be accompanied by legal sized rack (carcass).
April 30, 2006	18 in. (total length)	6 fish/angler	Apr 30-Dec 31.	Jan 1-Apr 29 in all state waters.	On the water fillets must meet minimum length or be accompanied by legal sized rack (carcass).
April 2, 2007 - Current	18 in. (total length)	5 fish/angler	Apr 30-Sep 5.	Sep 6 - Apr 29 in all state waters.	On the water fillets must meet minimum length or be accompanied by legal sized rack (carcass).

Winter Flounder

Effective Date	Minimum Size	Daily Creel Limit	Fishing Season	Closed Season/Area	Other Restrictions
Jan 1, 1982	8 in. (total length)	None.	Year round.	None.	None.
Jan 1, 1985	10 in. (total length)	None.	Year round.	None.	None.
Aug 19, 1986	10 in. (total length)	None.	Year round except for Niantic River.	Niantic River closed Dec 1-Mar 31	None.
Apr 22, 1994	11 in. (total length)	8 fish/angler	Apr 15-Feb 28.	Mar 1-Apr 14 in all state waters.	None.
Oct 1, 1995	12 in. (total length)	8 fish/angler	Apr 15-Feb 28.	Mar 1-Apr 14 in all state waters.	None.
Jan 1, 1996	12 in. (total length)	8 fish/angler	Year round.	None.	None.
Aug 1, 2005 - Current	12 in. (total length)	10 fish/angler	Apr 1-May 30.	June 1-Mar 31.	None.

Black Sea Bass

Effective Date	Minimum Size	Daily Creel Limit	Fishing Season	Closed Season/Area	Other Restrictions
Apr 24, 1997	9 in. (total length)	None.	Year round.	None.	None.
May 5, 1998	10 in. (total length)	20 fish/angler	Year round.	None.	None.
May 17, 2001	11 in. (total length)	25 fish/angler	May 10-Feb 28.	Mar 1-May 9 in all state waters.	None.
June 19, 2002	11½ in. (total length)	25 fish/angler	Year round.	None.	None.

Black Sea Bass, Con't.

Effective Date	Minimum Size	Daily Creel Limit	Fishing Season	Closed Season/Area	Other Restrictions
May 15, 2003	12 in. (total length)	25 fish/angler	Jan 1-Sep 1 and Sep 16-Nov 30.	Sep 2-Sep 15 and Dec 1-Dec 31 in all state waters.	None.
August 05, 2004	12 in. (total length)	25 fish/angler	Jan 1-Sep 7 and Sep 22-Nov 30.	Sep 8-Sep 21 and Dec 1-Dec 31 in all state waters.	None.
May 27, 2005	12 in. (total length)	25 fish/angler	Jan 1-Nov 30.	Dec 1-Dec 31.	None.
April 30, 2006 - Current	12 in. (total length)	25 fish/angler	Year Round.	None.	None.

Scup (Porgy)

Effective Date	Minimum Size	Daily Creel Limit	Fishing Season	Closed Season/Area	Other Restrictions
Jan 1, 1982	7 in. (total length)	None.	Year round.	None.	None.
Jan 1, 1985	8 in. (total length)	None.	Year round.	None.	None.
May 10, 2000	8 in. (total length)	50 fish/angler	Year round.	None.	None.
May 10, 2001	9 in. (total length)	25 fish/angler	Jun 3-Oct 23.	Oct 24-Jun 2 in all state waters.	None.
June 19, 2002	10 in. (total length)	50 fish/angler	Jul 13-Sep 25.	Sep 26-Jul 12 in all state waters.	None.
May 15, 2003	10 in. (total length)	50 fish/angler	May 24-Oct 30.	Oct 31-May 23 in all state waters.	None.
May 24, 2004	10 ½ in. (total length)	20 fish/angler	Jul 23-Oct 12 and Nov 1-Dec 31.	Jan 1-Jul 22 and Oct 13-Oct 31 in all state waters.	None.
May 27, 2005	10 ½ in. (total length)	25 fish/angler Party/charter boats *only* – 60 fish/angler	Jul 1-Oct 31. Sep 1-Oct 31.	Nov 1-June 30 in all state waters.	None.
April 30, 2006 - Current	10 ½ in. (total length)	25 fish/angler Party/charter boats *only* – 60 fish/angler	Jun 1-Oct 31. Sep 1-Oct 31.	Nov 1-May 31 in all state waters.	None.

Weakfish

Effective Date	Minimum Size	Daily Creel Limit	Fishing Season	Closed Season/Area	Other Restrictions
Jan 1, 1995	16 in. (total length)	None.	Year round.	None.	None.
Apr.1, 2003	16 in. (total length)	10 fish/angler	Year round.	None.	None.
Oct.29, 2007 - Current	16 in. (total length)	6 fish/angler	Year round.	None.	None.

Hickory Shad

Effective Date	Minimum Size	Daily Creel Limit	Fishing Season	Closed Season/Area	Other Restrictions
Mar 17, 1999 - Current	None.	6 fish/angler, or in aggregate with American shad.	Year round.	None.	None.

White Perch

Effective Date	Minimum Size	Daily Creel Limit	Fishing Season	Closed Season/Area	Other Restrictions
Apr. 1, 2003 - Current	7 in. (total length)	30fish/angler.	Year round.	See Other Restrictions.	Only for Long Island Sound and Tidal Rivers and Streams.

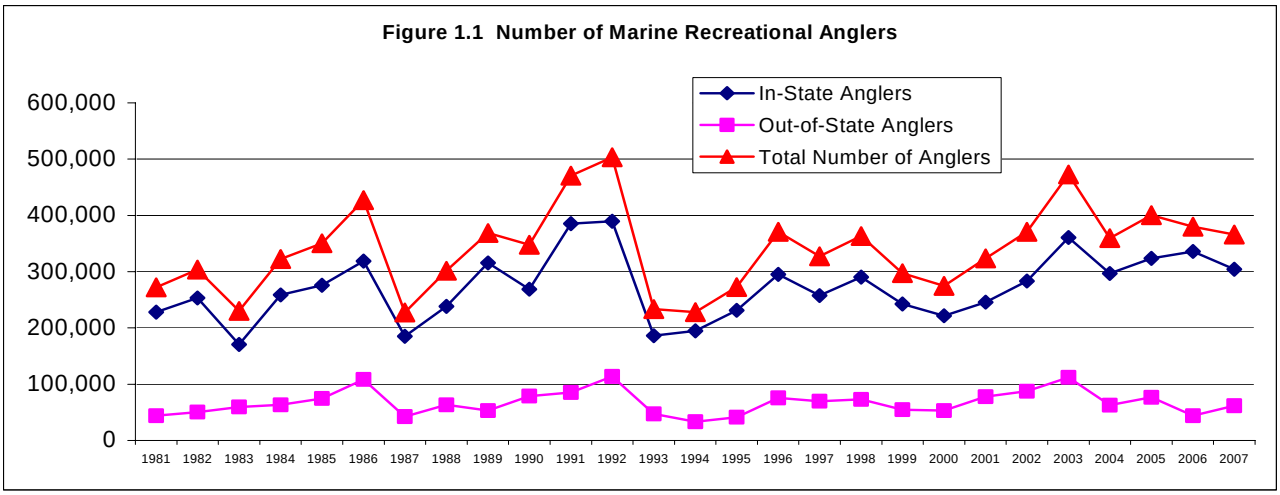
American Eel

Effective Date	Minimum Size	Daily Creel Limit	Fishing Season	Closed Season/Area	Other Restrictions
May 10, 2000 - Current	6 in. (total length)	50 fish/angler	Year round.	None.	None.

Gear Restrictions

1935 - Current	Striped bass may be taken by hook and line method only.
Apr 22, 1994 - Current	Spearing is allowed as a recreational activity only and must abide all recreational fishing regulations.

Figures 1.1-1.2: MRFSS Estimated Number of Marine Recreational Anglers and Fishing Trips in Connecticut, 1981-2007



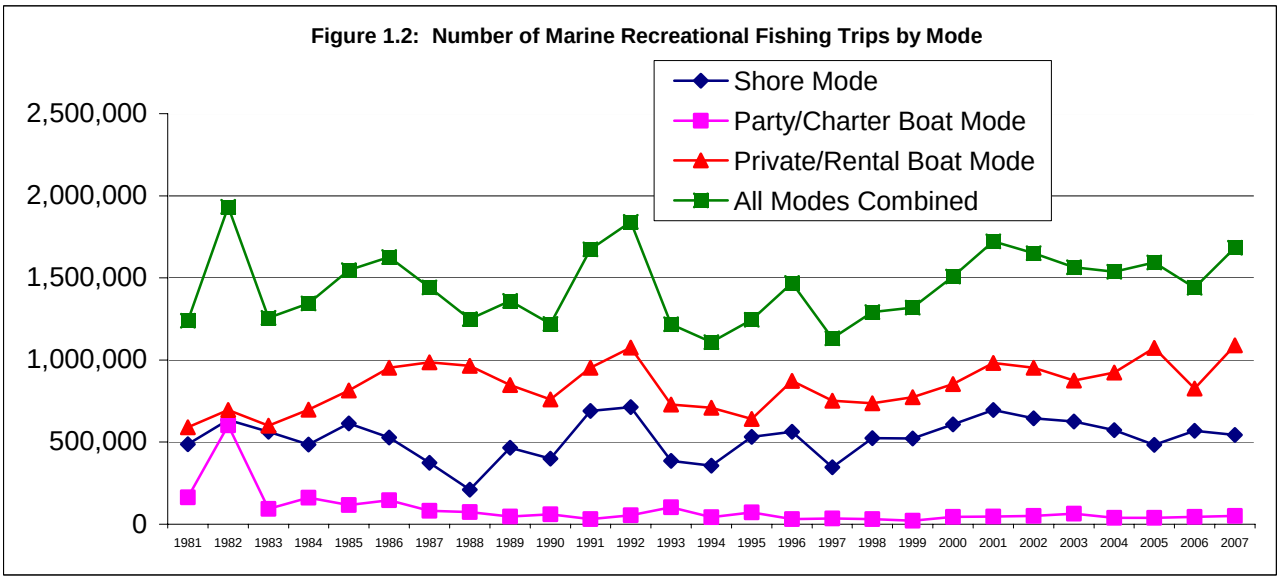
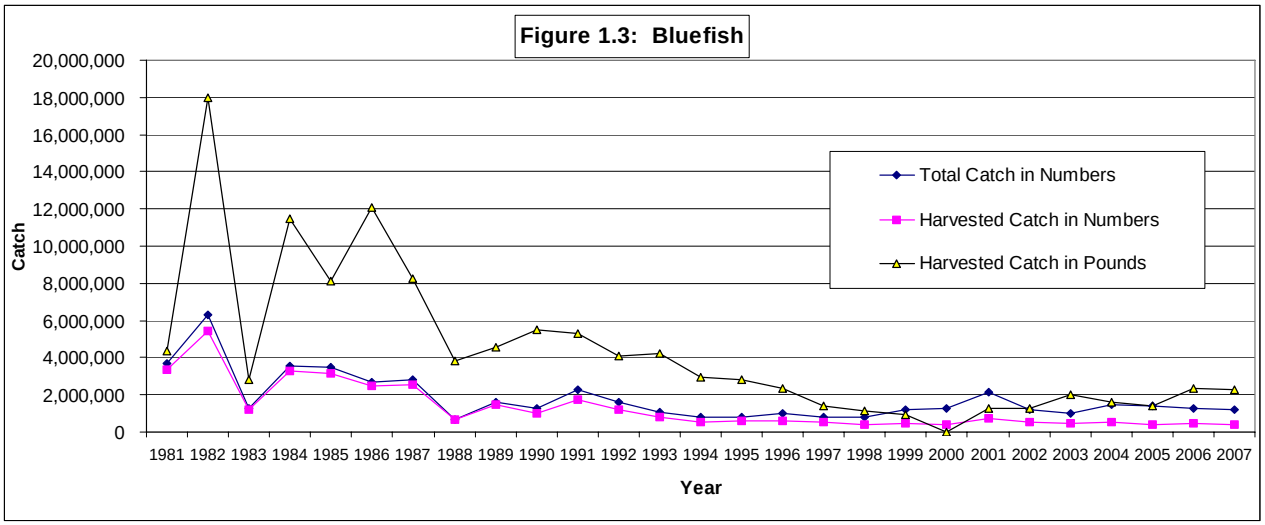
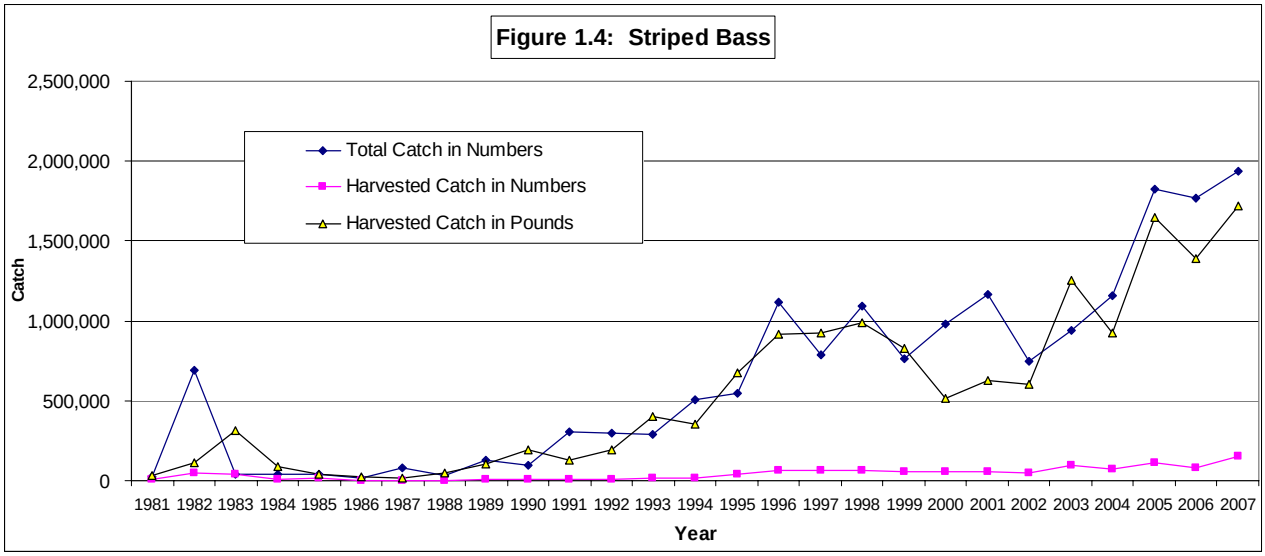


Figure 1.3-1.8: MRFSS Catch Estimates for Selected Species Caught by Marine Recreational Anglers, 1981-2007





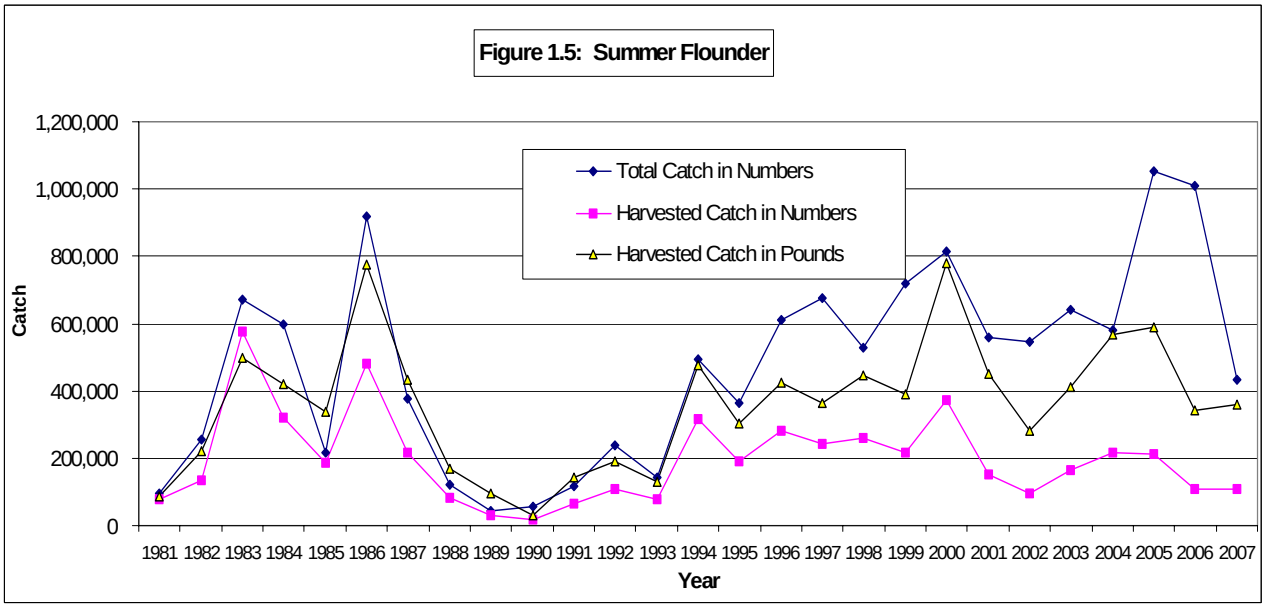
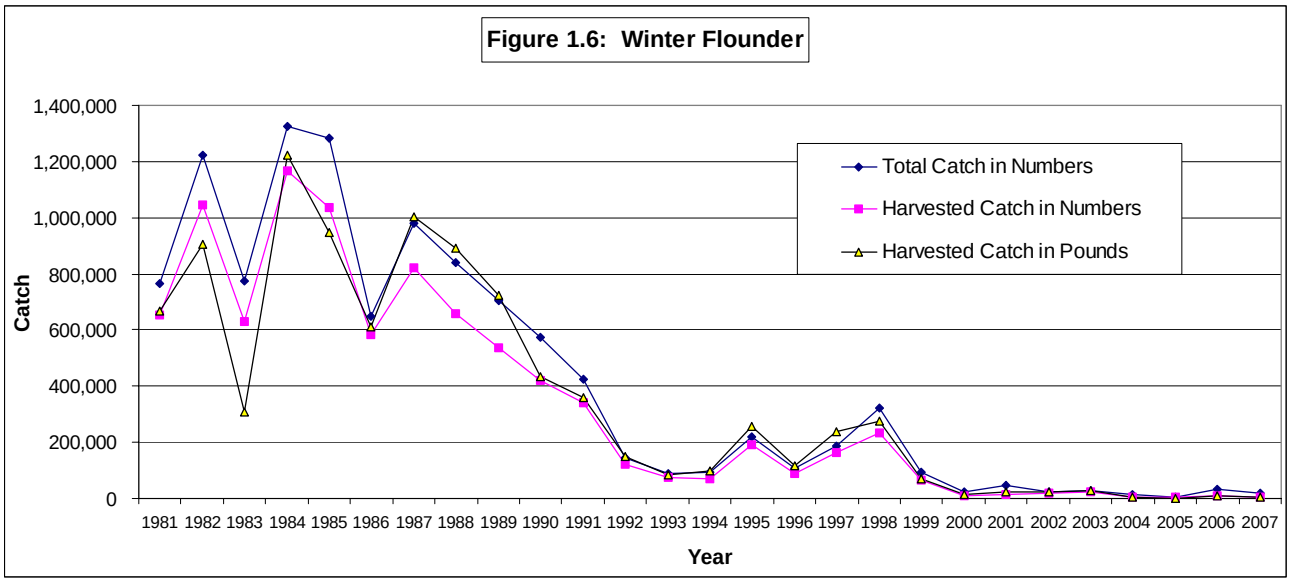
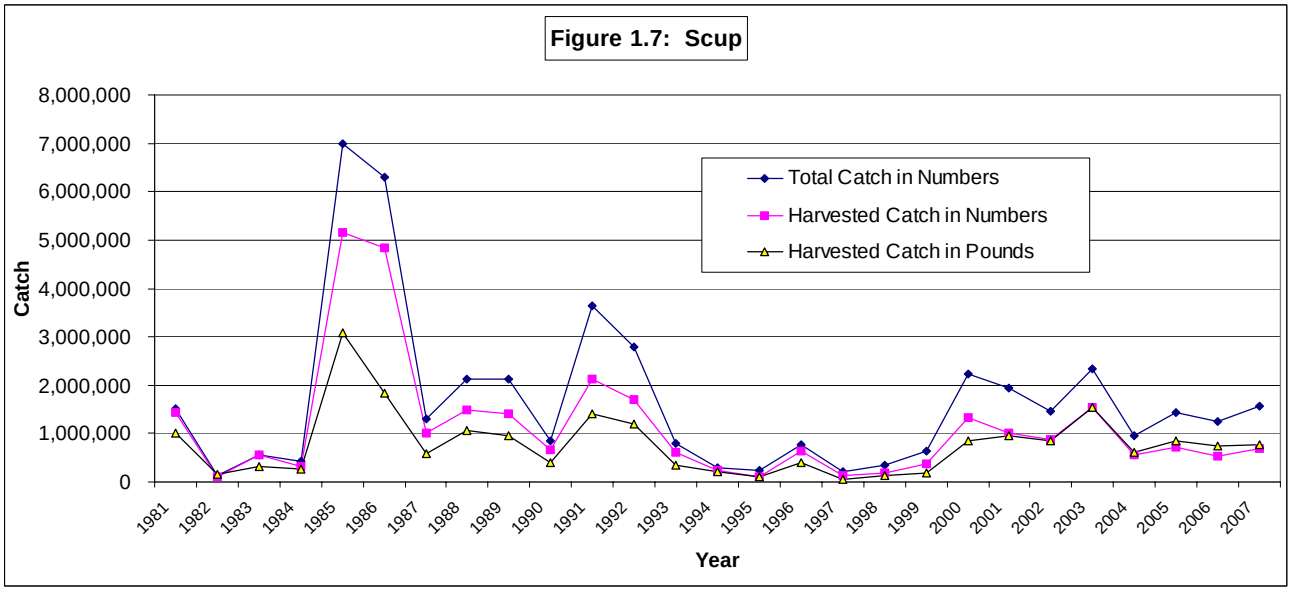


Figure 1.3-1.8: MRFSS Catch Estimates for Selected Species Caught by Marine Recreational Anglers, 1981-2007 (Con't.)





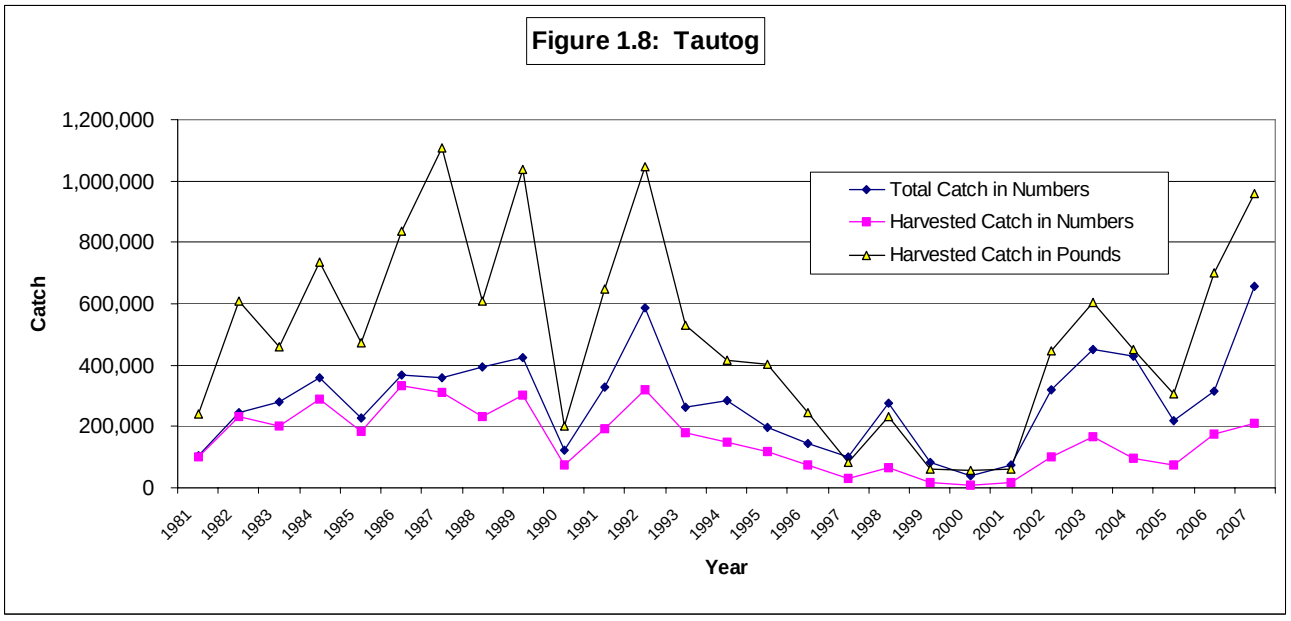
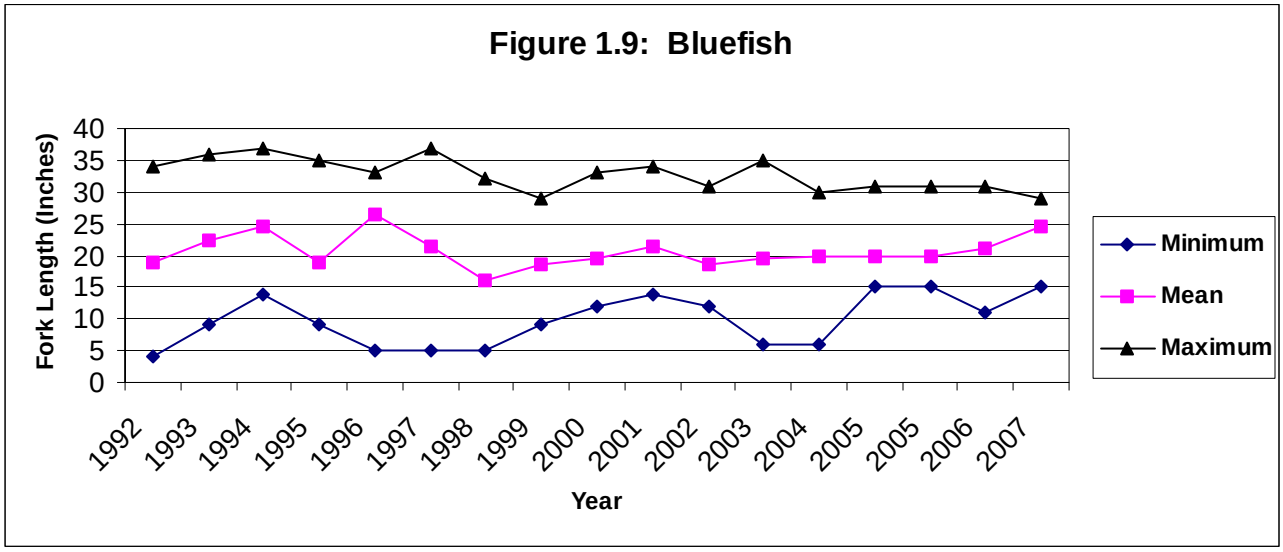
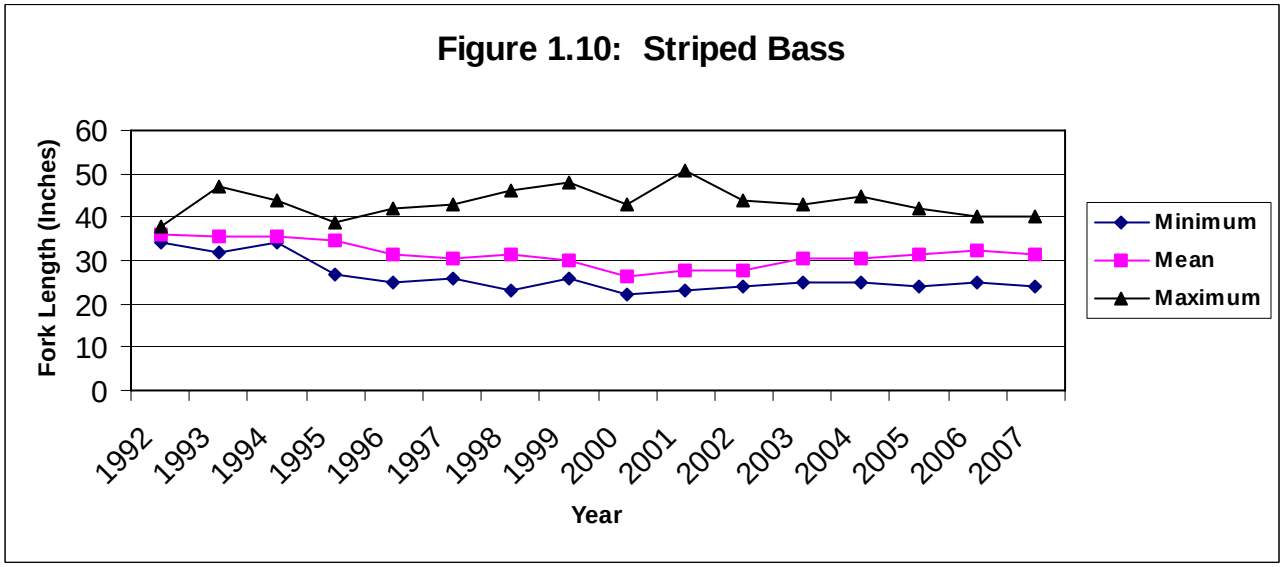


Figure 1.9-1.14: MRFSS Length Frequency Distribution (minimum, mean, maximum) for Selected Species Caught by Marine Recreational Anglers, 1981-2007





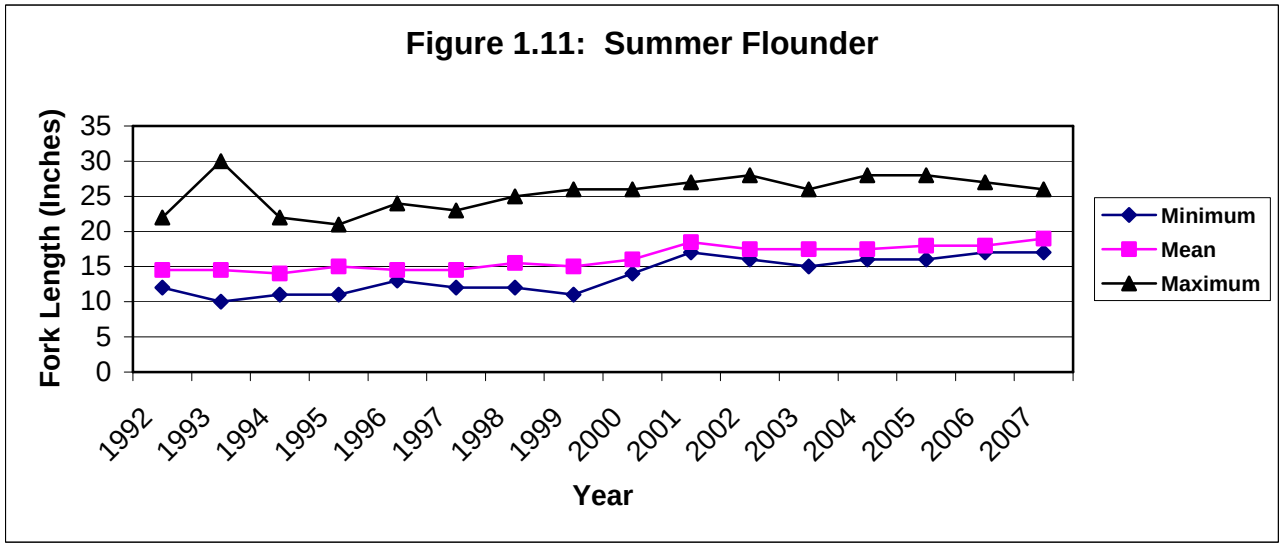
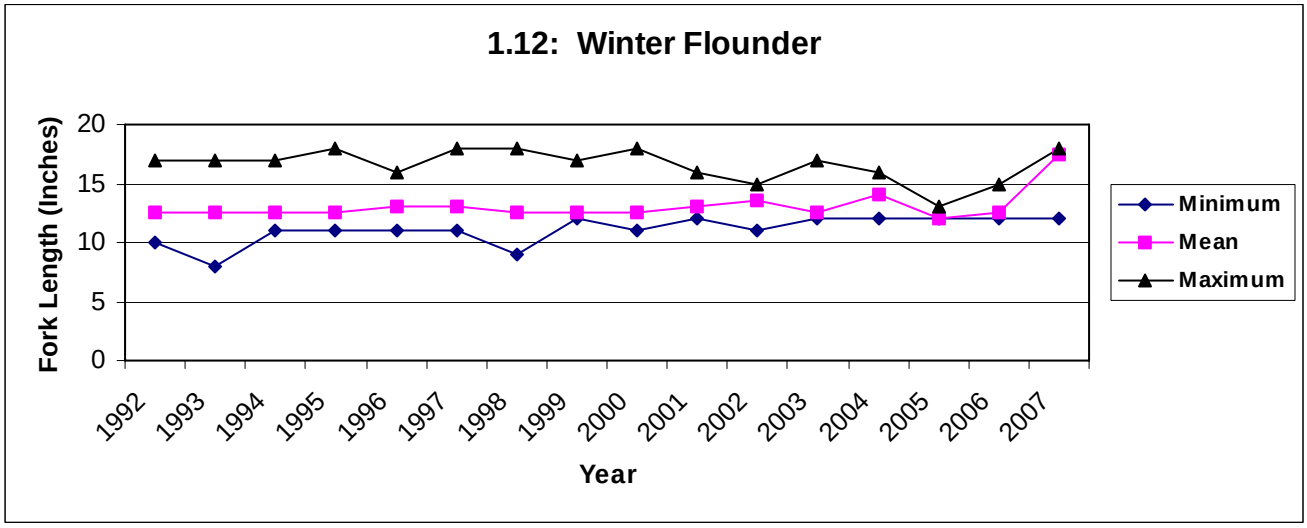
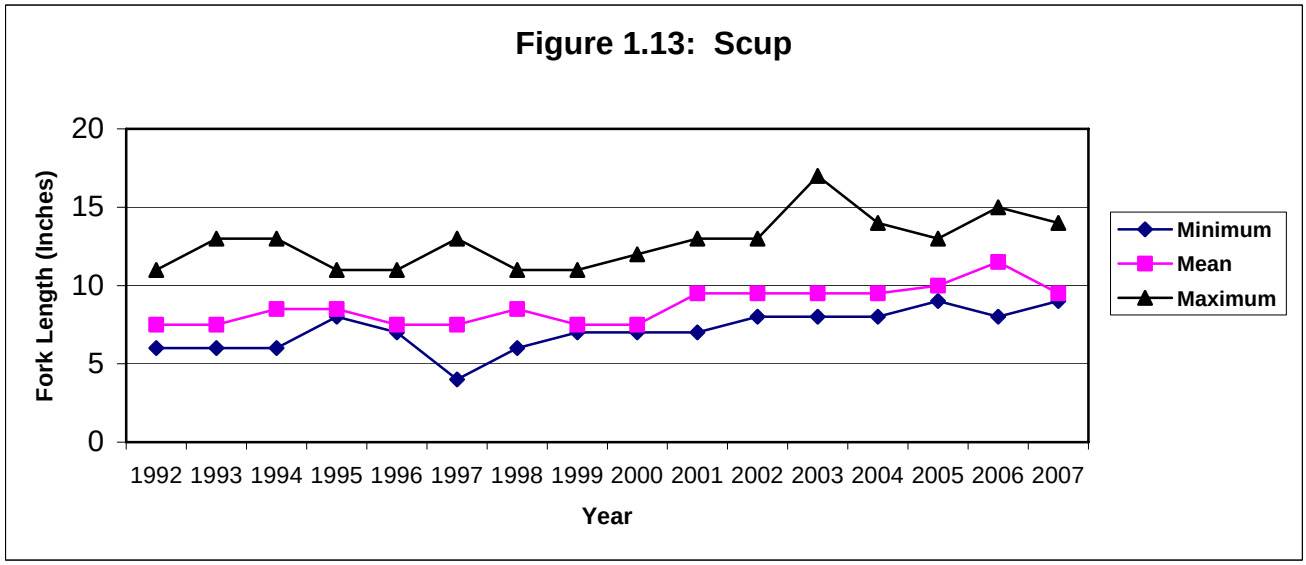
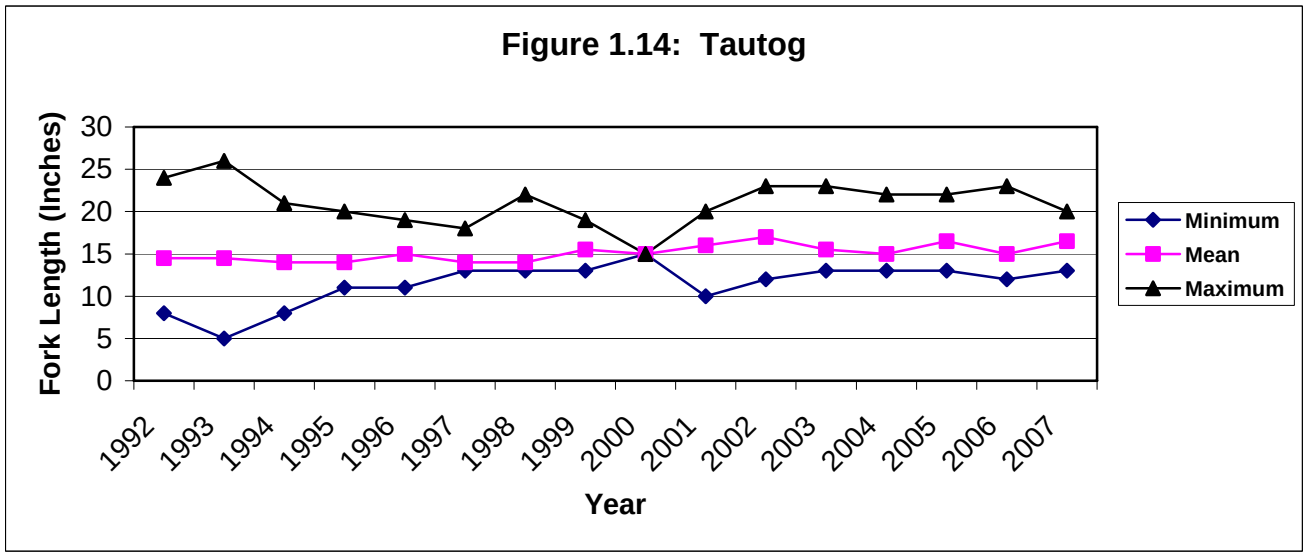


Figure 1.9-1.14: MRFSS Length Frequency Distribution (minimum, mean, maximum) for Selected Species Caught by Marine Recreational Anglers, 1981-2007 (Con't.)







PART 2: VOLUNTEER ANGLER SURVEY

PART 2: VOLUNTEER ANGLER SURVEY

TABLE OF CONTENTS

PART 2: VOLUNTEER ANGLER SURVEY

LIST OF TABLES

PART 2: VOLUNTEER ANGLER SURVEY

LIST OF FIGURES

JOB 1: MARINE ANGLER SURVEY
PART 2: VOLUNTEER ANGLER SURVEY

OBJECTIVES

Provide estimates of:

1) Size composition data on both kept and released bluefish, striped bass other common species.

Anglers participating in the Volunteer Angler Survey measured bluefish, striped bass and other species. Length frequencies of popular species: bluefish, striped bass, summer flounder, winter flounder, scup, tautog and weakfish are listed in Tables 1.1A - 1.7A.

2) Catch frequency (trips catching 0,1,2,...fish) data on both kept and discarded fish.

Catch frequency data and percent distribution on both kept and released are listed in Tables 1.1A-1.2A.

INTRODUCTION

The purpose of the Volunteer Angler Survey (VAS) is to supplement the National Marine Fisheries Service, Marine Recreational Fishery Statistics Survey by providing additional length measurement data particularly concerning fish that are released. In 1994, the VAS program was incorporated into the Marine Angler Survey (Job 1) in order to improve and expand the survey.

The survey's initial objective was to collect marine recreational fishing information concerning finfish species with special emphasis on striped bass. In 1994, the collection of bluefish length measurements was added to the survey to fully understand that fishery. In 1997, length measurement information on other marine finfish was added to the survey. This report primarily consists of data collected in 2007.

METHODS

The VAS is designed to collect trip and catch information from marine recreational (hook and line) anglers who volunteer to record their fishing activities by logbook. The logbook format consists of recording fishing effort, target species, fishing mode (boat vs. shore), area fished (subdivisions of Long Island Sound and adjacent waters), catch information concerning finfish kept (creeled) and released, and striped bass and bluefish length measurements (Appendix 1.1A). In 1997, the logbook was modified in order to collect length measurement data on other species as well. Instructions for volunteers were provided on the inside cover of the postage paid logbook. Each participating angler was assigned a personal numeric code for confidentiality purposes. After the logbook data were computer entered, logbooks were returned to each volunteer for their own personal record. For their participation, volunteers were sent a soft insulated lunch cooler in addition to updates of survey results. Furthermore, to improve communications with recreational anglers and to encourage more public input, volunteers were

notified of upcoming public hearings including proposed and final changes in recreational fishing regulations.

RESULTS AND DISCUSSION

Over the years the number of participants in the survey ranged from as low as 18 anglers participating in 1979 to a high of 115 anglers in 1997. Advertising the VAS program through the DEP's annually published Connecticut Angler's Guide including the State web site www.ct.gov/dep has helped increase volunteer participation. The guide is distributed to anglers purchasing freshwater licenses in addition to being circulated by bait and tackle shops and other entities.

VAS 2007

In 2007, a total of 75 anglers participated in the survey. Those 75 anglers took 1,521 fishing trips. Volunteers including additional anglers involved in a fishing party made a total of 3,172 fishing trips (note: targeted trips in the following paragraphs are not additive to the trip total since more than one species may be sought during an angler trip). Boat trips comprised 82% of the total trips taken. The percent of successful trips, where at least one fish of any species was caught, was 93% for boat anglers and 74% for shore anglers. Besides striped bass and bluefish, VAS anglers pursued and caught a wide range of inshore and offshore pelagic species and recorded length measurements on many species. This report contains statistics on species anglers targeted the most and that are under a current fishery management plan (bluefish, striped bass, summer flounder, scup, winter flounder, tautog, black sea bass, and weakfish). Please refer to tables 1.1A-1.2A for length frequency distribution tables and catch trip frequency distributions for kept and discarded (released) fish are listed in figures 1.1A-1.7A.

Bluefish

VAS participants made 1,393 targeted bluefish trips (boat and shore modes combined) and recorded a total of 2,260 adult bluefish caught (bluefish >12 inches). Of the total number of targeted trips, only 11% were unsuccessful. The overall catch including trips not targeting bluefish was 2,674 fish. Of the overall catch, anglers measured 2,060 adult bluefish (77%) and released about 75%. The 50^{th} percentile length measurement for bluefish was approximately 23.5 inches (total length). The targeted catch-per-unit-of-effort (CPUE) was 1.6 and 0.47 fish per angler trip for total and creeled catches.

Striped bass

Volunteers made 2,157 trips targeting striped bass and caught a total of 6,845 fish (overall catch including trips not targeting striped bass was 6,901 fish). About 14% or 291 trips targeting striped bass were unsuccessful. Of the overall catch, about 96% of the catch was released. VAS anglers measured 3,613 striped bass (52% of the overall catch). Legal size striped bass ($\geq$ 28 inches) comprised about 21% of the measured catch. The percent of legal size striped bass released was estimated at 73%. The 50^{th} percentile length measurement for striped

bass was about 21.5 inches. Striped bass ranged in length from as small as 6 inches to 48 inches. Targeted CPUE was 3.2 and 0.11 fish per angler trip for total and creeled catches.

Summer flounder

A total of 738 fishing trips were directed toward catching 2,728 summer flounder. Only 5% of the trips targeting summer flounder were unsuccessful. The overall catch was 2,794 fish. Volunteers measured 2,001 fish or about 72% of the overall catch. Approximately 69% of the overall catch was released. About 60% of the measured catch was comprised of fish less than the legal length limit of 18 inches. VAS anglers released 23% of summer flounder measuring 18 inches and greater. The 50th percentile length measurement for summer flounder was about 18 inches. Length measurements ranged from 8 to 29 inches. Summer flounder targeted CPUE was 3.7 and 1.2 fish per angler trip for total and creeled catches.

Winter flounder

Volunteers made 73 trips that targeted winter flounder. These targeted trips produced just 86 fish. The overall catch including non-targeted trips was 94 winter flounder. Of the total trips targeting winter flounder, 32% of the trips were unsuccessful. Of the overall catch, all 94 winter flounder were measured. Anglers released about 25% of the overall catch and about 7% of the measured catch were sub-legal in size (<12 inches). Anglers released 13% of legal sized fish ($\geq$12 inches). The 50th percentile length measurement for winter flounder was about 13 inches. Length measurements ranged from 10 to 21 inches. Winter flounder targeted CPUE was 1.2 and 0.9 fish per angler trip for total and creeled catches.

Scup

Volunteers made 132 targeted trips for scup producing a total of 1,199 fish. Of the total trips targeting scup, only 3% of the trips were unsuccessful. The overall total catch was 1,702 fish. Volunteers measured about 78% (1,327 fish) of the overall total catch. Of the overall total catch, 80% were released. Sub-legal fish (<10.5 inches) comprised 66% of the measured catch. The proportion of legal sized fish ($\geq$10.5 inches) released by anglers was approximately 40%. The 50th percentile length measurement for scup was about 9.5 inches. Length measurements ranged from as little as 4 inches to 18 inches. Scup targeted CPUE was 9.1 and 1.8 fish per angler trip for total and creeled catches.

Tautog

VAS anglers made 176 trips that targeted tautog and caught a total of 753 fish. Of the total trips targeting tautog, 6% of the trips were unsuccessful. The overall total catch was 787 fish. Volunteers measured 469 tautog or about 60% of the overall total catch. About 24% of the measured catch was less than the legal size of 14 inches. Of the legal size measured catch, approximately 42% were released. The 50th percentile length measurement for tautog was about 16.5 inches. Length measurements ranged from 6 to 24 inches. Tautog targeted CPUE was 4.3 and 1.4 fish per angler trip for total and creeled catches.

Weakfish

There were insufficient weakfish data for analysis. Although 30 trips targeted weakfish only two fish were recorded caught by VAS anglers.

Black sea bass

VAS angler took 26 trips targeting black sea bass catching 24 fish. However, the overall catch was 427 black sea bass. Of the overall total catch, 85% were released. Volunteers measured 355 fish or 83% of the overall total catch. Of the measured catch, 76% of the catch was below the 12 inch legal length limit. The 50th percentile length measurement for black sea bass was about 8 inches and the percent of legal size fish released was 30%. Black sea bass targeted CPUE was 0.9 and 0.12 fish per angler trip for total and creeled catches. The non-targeted catch rates suggests that the black sea bass fishery in Long Island Sound is an incidental fishery for most anglers.

CONCLUSIONS

VAS anglers provide valuable recreational fisheries data at a relatively low cost. In addition, collecting length data on released fish is often difficult or unattainable through conventional intercept surveys. The VAS program provides this information which is essential in assessing the recreational fishery. VAS data is also used in monitoring and assessing the recreational striped bass fishery in Connecticut as required through the Atlantic States Marine Fisheries Commission. Furthermore, VAS data is now being used in bluefish, summer flounder, winter flounder and weakfish stock assessments and will most likely be involved in other species as well. Any anglers interested in participating in the program can contact Rod MacLeod at 860-434-6043, or e-mail address: rod.macleod@ct.gov or writing to State of Connecticut, DEP, Marine Fisheries Office, P.O. Box 719, Old Lyme CT 06371.

MODIFICATIONS

None.

ACKNOWLEDGMENTS

I am very grateful to all anglers who have participated in the survey. Without their cooperation and assistance, the VAS program would not be possible.

Table 1.1A: Catch Trip Frequency Distribution of Creeled Fish for Selected Species, 2007

Creeled (Harvested)

Bluefish (12 in. >)		
# of Fish	# of Trips	% Distr.
0	92	31.5%
1	122	41.8%
2	29	9.9%
3	11	3.8%
4	11	3.8%
5	9	3.1%
6	5	1.7%
7	4	1.4%
8	1	0.3%
9	2	0.7%
10	6	2.1%
Total	292	100%

Striped Bass		
# of Fish	# of Trips	% Distr.
0	144	59.5%
1	77	31.8%
2	19	7.9%
3	0	0.0%
4	1	0.4%
15	1	0.4%
Total	242	99%

Summer Flounder		
# of Fish	# of Trips	% Distr.
0	30	13.8%
1	88	40.4%
2	41	18.8%
3	26	11.9%
4	15	6.9%
5	11	5.0%
6	3	1.4%
7	4	1.8%
Total	218	100%

Winter Flounder		
# of Fish	# of Trips	% Distr.
0	0	0.0%
1	8	44.4%
2	1	5.6%
3	4	22.2%
4	2	11.1%
5	0	0.0%
6	1	5.6%
10	2	11.1%
Total	18	100.0%

Scup		
# of Fish	# of Trips	% Distr.
0	18	19.1%
1	30	31.9%
2	14	14.9%
3	7	7.4%
4	8	8.5%
5	6	6.4%
6	5	5.3%
7	2	2.1%
8	2	2.1%
9	1	1.1%
12	1	1.1%
Total	94	100%

Tautog		
# of Fish	# of Trips	% Distr.
0	6	13.0%
1	13	28.3%
2	8	17.4%
3	6	13.0%
4	12	26.1%
7	1	2.2%
Total	46	100%

Black Sea Bass		
# of Fish	# of Trips	% Distr.
0	18	46.2%
1	18	46.2%
2	3	7.7%
3	1	2.6%
Total	39	100%

Table 1.2A: Catch Trip Frequency Distribution of Released Fish for Selected Species, 2007

Bluefish (12 in. >)		
# of Fish	# of Trips	% Distr.
0	42	9.5%
1	171	38.6%
2	84	19.0%
3	53	12.0%
4	17	3.8%
5	20	4.5%
6	20	4.5%
7	13	2.9%
8	4	0.9%
9	4	0.9%
10	5	1.1%
11	3	0.7%
12	2	0.5%
13	1	0.2%
14	0	0.0%
15	1	0.2%
16	1	0.2%
17	0	0.0%
18	1	0.2%
19	0	0.0%
20	1	0.2%
Total	443	100%

Striped Bass		
# of Fish	# of Trips	% Distr.
0	32	5.2%
1	216	35.1%
2	91	14.8%
3	48	7.8%
4	40	6.5%
5	33	5.4%
6	19	3.1%
7	15	2.4%
8	10	1.6%
9	8	1.3%
10	8	1.3%
11	8	1.3%
12	7	1.1%
13	4	0.6%
14	1	0.2%
15	8	1.3%
16	3	0.5%
18	3	0.5%
19	4	0.6%
20	6	1.0%
21	3	0.5%
22	7	1.1%
23	2	0.3%
25	4	0.6%
26	2	0.3%
27	4	0.6%
28	3	0.5%
30	2	0.3%
31	1	0.2%
32	2	0.3%
33	3	0.5%
35	1	0.2%
36	2	0.3%
37	2	0.3%
38	2	0.3%
39	1	0.2%
42	1	0.2%
44	2	0.3%
48	1	0.2%
52	1	0.2%
53	1	0.2%
55	1	0.2%
60	1	0.2%
63	1	0.2%
65	1	0.2%
83	1	0.2%
Total	616	100%

Summer Flounder		
# of Fish	# of Trips	% Distr.
0	16	5.6%
1	85	29.6%
2	63	22.0%
3	34	11.8%
4	28	9.8%
5	15	5.2%
6	9	3.1%
7	11	3.8%
8	2	0.7%
9	3	1.0%
10	4	1.4%
11	2	0.7%
13	3	1.0%
14	3	1.0%
15	3	1.0%
16	1	0.3%
17	3	1.0%
20	1	0.3%
23	1	0.3%
Total	287	100%

Winter Flounder		
# of Fish	# of Trips	% Distr.
0	2	14.3%
1	7	50.0%
2	3	21.4%
3	1	7.1%
4	1	7.1%
Total	14	100%

Table 1.2A: (Con't.): Catch Trip Frequency Distribution of Released Fish for Selected Species, 2007

Scup		
# of Fish	# of Trips	% Distr.
0	10	5.7%
1	63	36.2%
2	20	11.5%
3	14	8.0%
4	13	7.5%
5	13	7.5%
6	6	3.4%
7	5	2.9%
8	4	2.3%
9	2	1.1%
10	7	4.0%
12	1	0.6%
15	1	0.6%
16	1	0.6%
20	2	1.1%
22	1	0.6%
24	1	0.6%
26	1	94%
36	1	
38	1	
40	2	
46	2	
54	1	
55	1	
75	1	
Total	174	

Tautog		
# of Fish	# of Trips	% Distr.
0	3	4.7%
1	25	39.1%
2	8	12.5%
3	5	7.8%
4	10	15.6%
5	2	3.1%
6	5	7.8%
7	1	1.6%
9	1	1.6%
10	1	1.6%
13	1	1.6%
15	1	1.6%
16	1	1.6%
Total	64	100%

Black Sea Bass		
# of Fish	# of Trips	% Distr.
0	18	45.0%
1	18	45.0%
2	3	7.5%
3	1	2.5%
Total	40	100%

Figure 1.1A: Bluefish (12> inches) Length Frequency Distribution, 2007

Total Length (inches)	2007 Measurement Data Bluefish (12>inches)		
	Freq	%Freq	%Cum
13	16	0.8	0.8
14	58	2.8	3.6
15	31	1.5	5.2
16	87	4.3	9.4
17	66	3.2	12.7
18	97	4.8	17.4
19	58	2.8	20.3
20	125	6.1	26.4
21	113	5.5	31.9
22	127	6.2	38.2
23	117	5.7	43.9
24	185	9.1	53.0
25	148	7.3	60.2
26	150	7.4	67.6
27	149	7.3	74.9
28	134	6.6	81.5
29	91	4.5	85.9
30	105	5.1	91.1
31	52	2.6	93.6
32	63	3.1	96.7
33	35	1.7	98.4
34	17	0.8	99.3
35	5	0.2	99.5
36	8	0.4	99.9
37	2	0.1	100.0
38	0	0.0	100.0
39	0	0.0	100.0
40	0	0.0	100.0
Total	2,039	100	

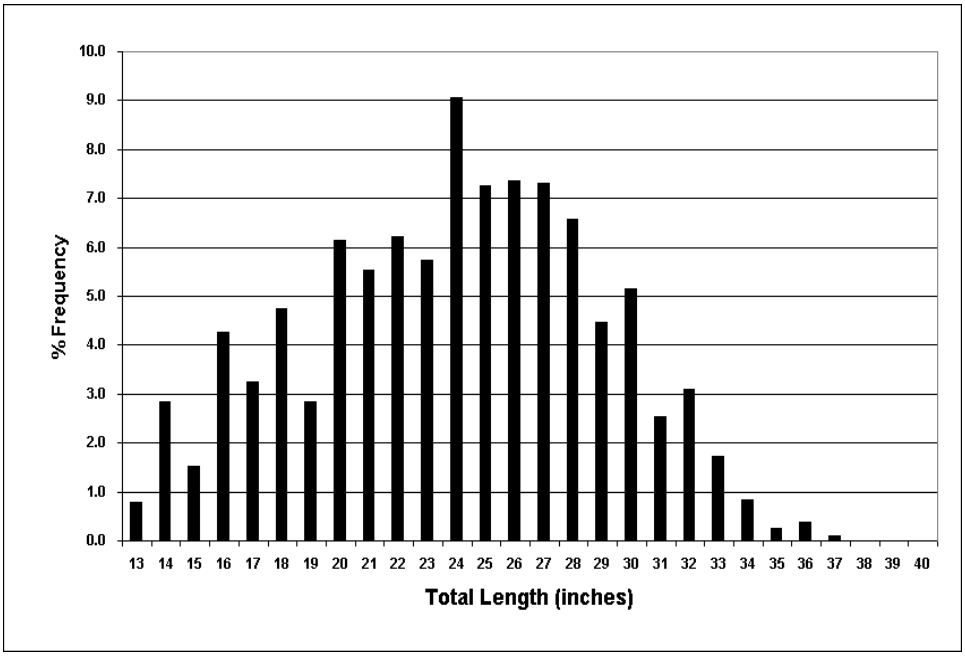


Figure 1.2A: Striped Bass Length Frequency Distribution, 2007

Total Length (inches)	2007 Measurement Data Striped Bass Freq	%Freq	%Cum	Total Length (inches)	Freq	%Freq	%Cum
< or = 5	0	0.0	0.0	29	93	2.6	85.3
6	1	0.0	0.0	30	94	2.6	87.9
7	1	0.0	0.1	31	59	1.6	89.5
8	3	0.1	0.1	32	96	2.7	92.2
9	8	0.2	0.4	33	57	1.6	93.7
10	19	0.5	0.9	34	57	1.6	95.3
11	17	0.5	1.4	35	38	1.1	96.4
12	53	1.5	2.8	36	27	0.7	97.1
13	52	1.4	4.3	37	13	0.4	97.5
14	96	2.7	6.9	38	22	0.6	98.1
15	93	2.6	9.5	39	16	0.4	98.5
16	177	4.9	14.4	40	14	0.4	98.9
17	199	5.5	19.9	41	14	0.4	99.3
18	247	6.8	26.7	42	11	0.3	99.6
19	208	5.8	32.5	43	5	0.1	99.8
20	260	7.2	39.7	44	4	0.1	99.9
21	215	6.0	45.6	45	2	0.1	99.9
22	279	7.7	53.4	46	0	0.0	99.9
23	196	5.4	58.8	47	2	0.1	100.0
24	196	5.4	64.2	48	1	0.0	100.0
25	196	5.4	69.6	49	0	0.0	100.0
26	175	4.8	74.5	50	0	0.0	100.0
27	159	4.4	78.9	51	0	0.0	100.0
28	138	3.8	82.7	Total	2,988	100	

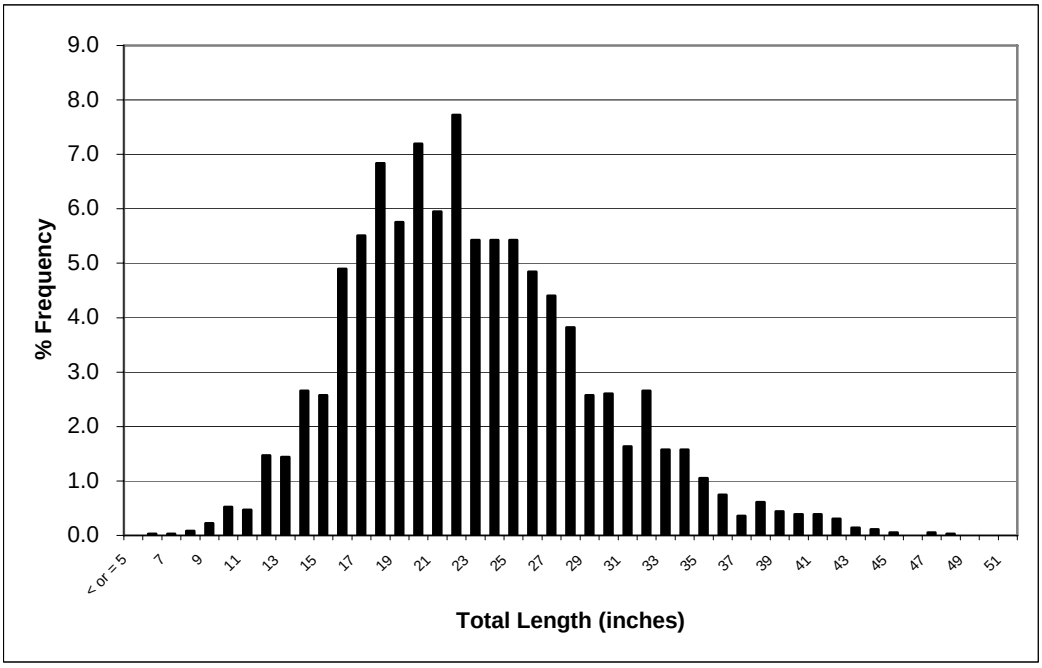


Figure 1.3A: Summer Flounder Length Frequency Distribution, 2007

Total Length (inches)	2007 Measurement Data Summer Flounder Freq	%Freq	%Cum
< or = 8	1	0.0	0.0
9	1	0.0	0.0
10	5	0.2	0.3
11	12	0.6	0.9
12	36	1.8	2.7
13	63	3.1	5.8
14	90	4.5	10.3
15	118	5.9	16.2
16	253	12.6	28.9
17	237	11.8	40.7
18	238	11.9	52.6
19	263	13.1	65.8
20	252	12.6	78.4
21	150	7.5	85.9
22	126	6.3	92.2
23	70	3.5	95.7
24	34	1.7	97.4
25	14	0.7	98.1
26	17	0.8	98.9
27	17	0.8	99.8
28	2	0.1	99.9
29	2	0.1	100.0
30	0	0.0	100.0
Total	2,001	100	

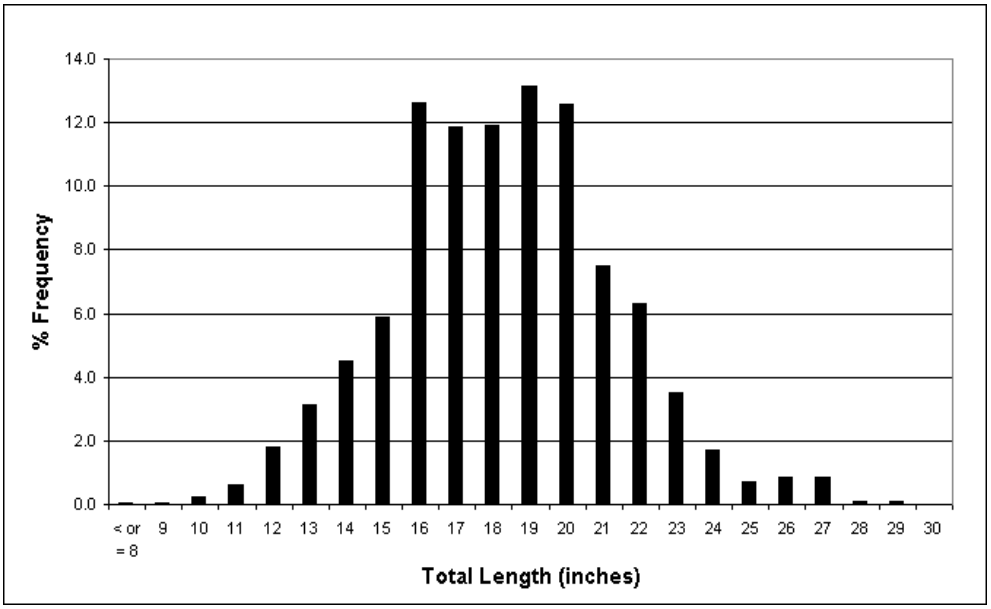


Figure 1.4A: Winter Flounder Length Frequency Distribution, 2007

Total Length (inches)	2007 Measurement Data Winter Flounder Freq	%Freq	%Cum
< or = 8	0	0.0	0.0
9	0	0.0	0.0
10	3	3.2	3.2
11	4	4.3	7.4
12	10	10.6	18.1
13	34	36.2	54.3
14	24	25.5	79.8
15	11	11.7	91.5
16	4	4.3	95.7
17	1	1.1	96.8
18	1	1.1	97.9
19	1	1.1	98.9
20	0	0.0	98.9
21	1	1.1	100.0
22	0	0.0	100.0
Total	94	100	

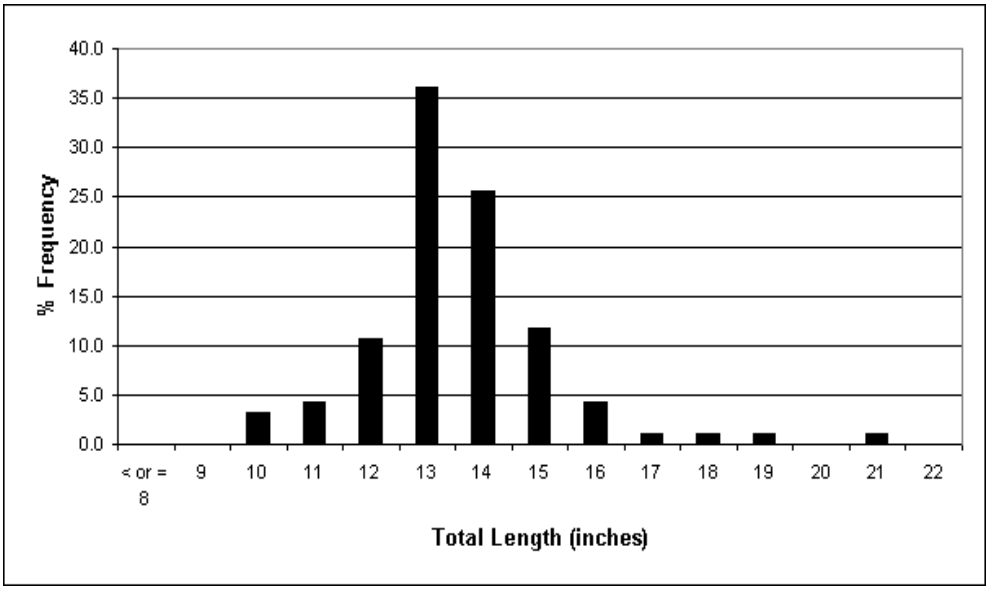


Figure 1.5A: Scup Length Frequency Distribution, 2007

Total Length (inches)	2007 Measurement Data Scup		
	Freq	%Freq	%Cum
< or = 4	8	0.6	0.6
5	17	1.3	1.9
6	19	1.4	3.3
7	75	5.7	9.0
8	141	10.6	19.6
9	263	19.8	39.4
10	357	26.9	66.3
11	208	15.7	82.0
12	88	6.6	88.6
13	43	3.2	91.9
14	40	3.0	94.9
15	37	2.8	97.7
16	24	1.8	99.5
17	2	0.2	99.6
18	5	0.4	100.0
Total	1,327	100	

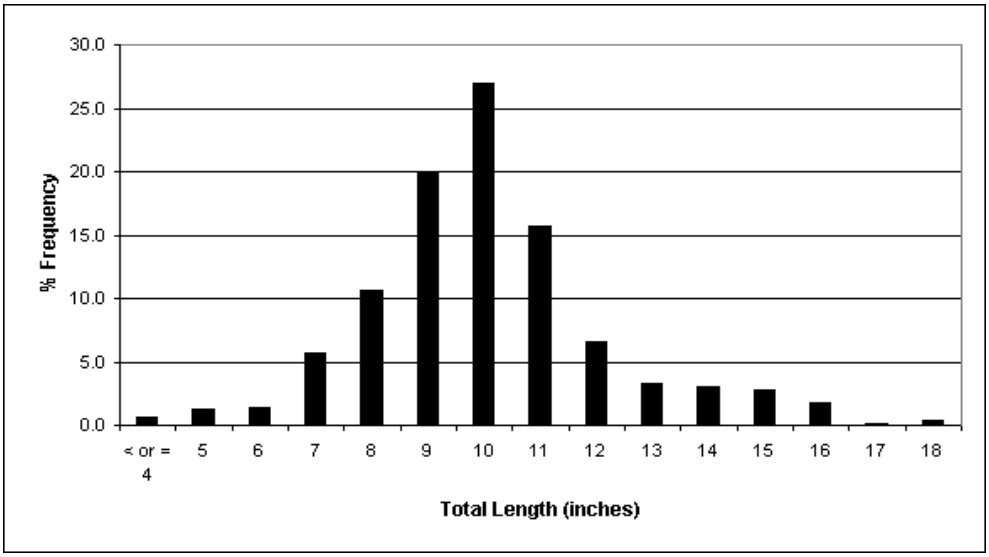


Figure 1.6A: Tautog Length Frequency Distribution, 2007

Total Length (inches)	2007 Measurement Data Tautog Freq	%Freq	%Cum
< or = 7	3	0.6	0.6
8	0	0.0	0.6
9	4	0.9	1.5
10	5	1.1	2.5
11	21	4.5	7.0
12	10	2.1	9.1
13	43	9.2	18.3
14	26	5.5	23.8
15	50	10.7	34.5
16	51	10.9	45.4
17	36	7.7	53.1
18	47	10.0	63.1
19	47	10.0	73.1
20	38	8.1	81.2
21	41	8.7	89.9
22	13	2.8	92.7
23	22	4.7	97.4
24	7	1.5	98.9
25	5	1.1	100.0
26	0	0.0	100.0
Total	469	100	

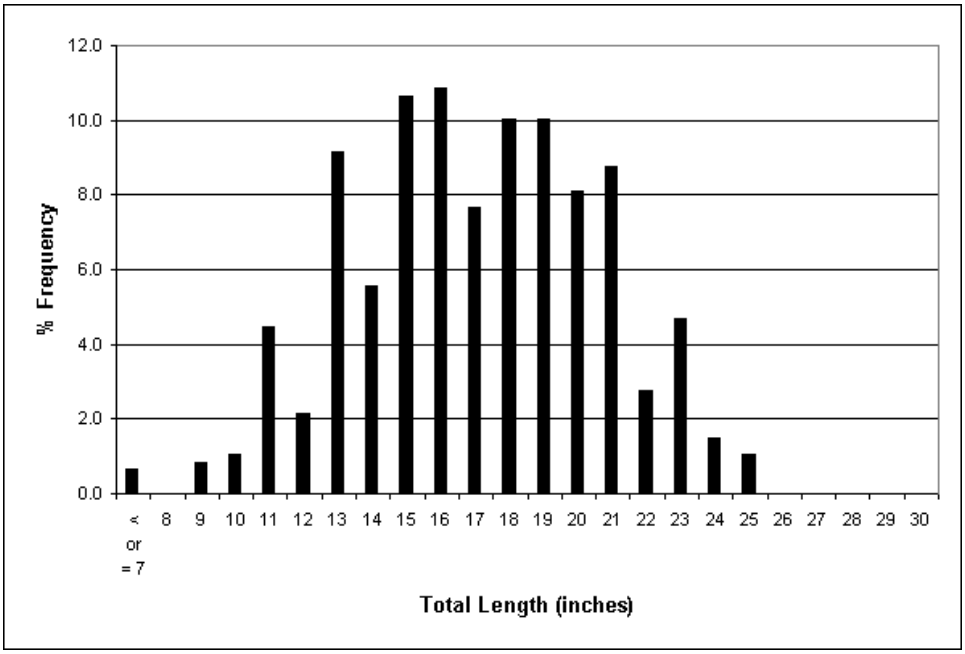
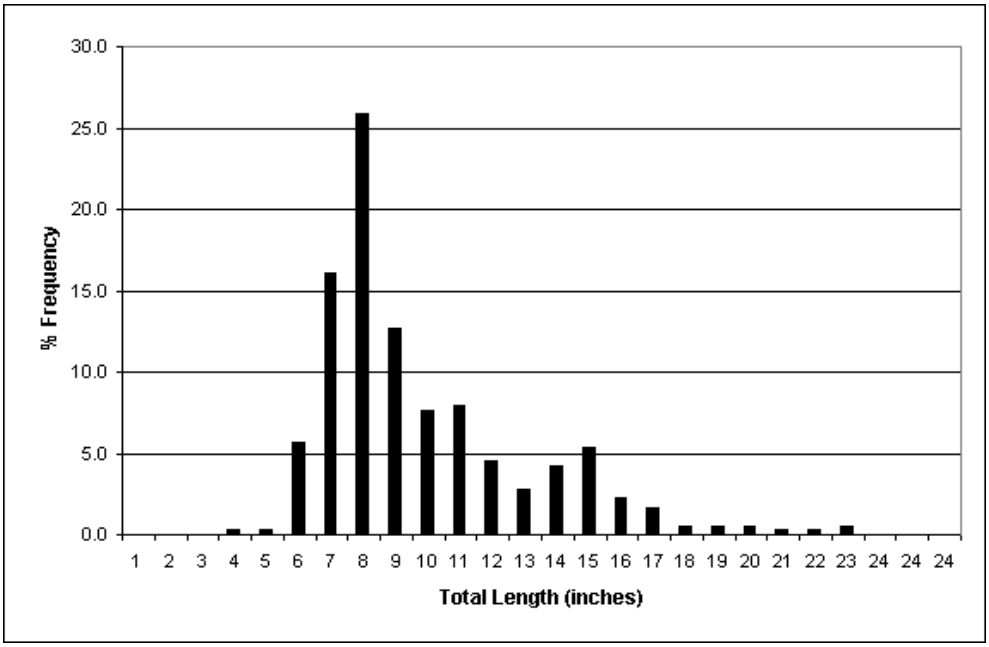


Figure 1.7A: Black Sea Bass Length Frequency Distribution, 2007

Total Length (inches)	2007 Measurement Data Black Sea Bass		
	Freq	%Freq	%Cum
1	0	0.0	0.0
2	0	0.0	0.0
3	0	0.0	0.0
4	1	0.3	0.3
5	1	0.3	0.6
6	20	5.6	6.2
7	57	16.1	22.3
8	92	25.9	48.2
9	45	12.7	60.8
10	27	7.6	68.5
11	28	7.9	76.3
12	16	4.5	80.8
13	10	2.8	83.7
14	15	4.2	87.9
15	19	5.4	93.2
16	8	2.3	95.5
17	6	1.7	97.2
18	2	0.6	97.7
19	2	0.6	98.3
20	2	0.6	98.9
21	1	0.3	99.2
22	1	0.3	99.4
23	2	0.6	100.0
24	0	0.0	100.0
Total	355	100	



APPENDIX 1.1A: Connecticut Volunteer Angler Logbook

Volunteer Angler Survey Logbook Instructions: Listed below are instructions for filling out the logbook. Upon logbook completion, tape the prepaid postage logbook shut and drop it off in the mail. All information is kept confidential. Once the information is entered in our computer system and error checked, the logbooks will be returned for your own records. If you any questions or comments regarding the survey, please contact **Rod MacLeod** at **(860) 434-6043** or at **E-Mail** address **rod.macleod@po.state.ct.us.**

(1) Please enter the month and day fishing trip took place.
(2) Fishing start time in military time (Example: 11am = 1100, 1pm = 1300 hrs, 2pm = 1400, etc.).
(3) Actual fishing time or lines wet to the nearest ½ hour. Do not include travel time.
(4) Number of anglers in fishing party.
(5) Areas fished most in descending order as described on the chart located on the inside cover of logbook. Also, if most of the fishing took place in a river please place a check mark in the box provided.
(6) Check mark your mode of fishing (boat or shore).
(7) Enter species code for 1st (primary) targeted species and 2nd (secondary) targeted species provided in the species code list below.
(8) Number of anglers that caught fish.
(9) Place a check mark if no fish were caught for the entire fishing party.

Catch Information: Catch information should include the total number of fish caught by the entire party. Enter the number of fish kept and released in the designated boxes. If you caught fish other than those in the pre-coded boxes, please refer to the species code list below and enter the code in the designated blank boxes. If you caught a fish not listed in the species code list, please write down the common name(s) in the blank box(es) provided.

Length Measurement Information: Please try to provide length measurement data on popular species caught including kept and released fish (exclude skates, cunners, etc). Fish must be measured to the ***nearest ½ inch*** from the tip of the snout to the end of the tail (total length). In case of large catches, try to measure your catch on a random basis. Measuring just large fish will not accurately reflect the actual size or age distribution of the population. When handling and measuring sub-legal sized fish, anglers should use their best judgement and experience to insure that those fish are returned to the water unharmed.

Species Code List:

01 Albacore	12 Cusk-eel	23 White Marlin	34 Smelt	45 Snapper Bluefish (≤12in.)
02 Alewife	13 Dogfish (all species)	24 Atlantic Menhaden	35 Spot	46 Yellowfin Tuna
03 Atlantic Salmon	14 Dolphin (Mahi-Mahi)	25 Pollock	36 Striped Bass	47 Bigeye Tuna
04 Blackfish (Tautog)	15 American Eel	26 Scup (Porgy)	37 Swordfish	48 Blue Marlin
05 Blowfish (Puffer)	16 Summer Flounder (Fluke)	27 Atlantic Sailfish	38 Oyster Toadfish	49 Blueback Herring
06 Bluefish (Adults > 12in.)	17 Goosefish (Monkfish)	28 Windowpane Flounder	39 Atlantic Tomcod	50 Hickory Shad
07 Atlantic Bonito	18 Haddock	29 Black Sea Bass	40 Bluefin Tuna	51 Little Tunny (False Albacore)
08 Brown Trout (Sea-Run)	19 Atlantic Herring	30 Searobins (all species)	41 Weakfish	52 Skipjack Tuna
09 Butterfish	20 Spanish Mackerel	31 American Shad	42 Whiting (Silver Hake)	53 Atlantic Wolffish
10 Atlantic Cod	21 Hakes (Red, Spotted)	32 Sharks(oceanic)	43 White Perch	54 Northern Kingfish
11 Cunner	22 Atlantic Mackerel	33 Skates	44 Winter Flounder	55 Atlantic Croaker

Daily Fishing Trip Log

(1) Month Day | **(2)** Military Time | **(3)** Hours Fished | **(4)** Number of Anglers in Party | **(5)** Areas Fished (See Map) *1st* *2nd* *3rd* | **X** Here if Fished in River

(6) _ Mode of Fishing: Boat ☐ Shore ☐

(7) Target Species (See Code List): 1st ☐☐ 2nd ☐☐

(8) Number of Anglers that Caught Fish

(9) _ Here if *No* Fish were Caught ☐

Catch Information

Species Name	Code		Number Kept	Number Released
Striped Bass	3	6		
Bluefish (Adults)	0	6		
Winter Flounder	4	4		
Blackfish	0	4		
Summer Flounder	1	6		
Scup (Porgy)	2	6		

Length Measurement Information

Code	Length Data	**X** if Released	Code	Length Data	**X** if Released
	•			•	
	•			•	
	•			•	
	•			•	
	•			•	
	•			•	
	•			•	
	•			•	
	•			•	
	•			•	

JOB 2: MARINE FINFISH SURVEY

Part 1: **Long Island Sound Trawl Survey**

Part 2: **Estuarine Seine Survey**

PART 1: LONG ISLAND SOUND TRAWL SURVEY

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

JOB 2 PART 1: LONG ISLAND SOUND TRAWL SURVEY (LISTS)

CRUISE RESULTS FROM THE 2007 SPRING & FALL SURVEYS

STUDY PERIOD AND AREA

The Connecticut DEP Marine Fisheries Division completed the twenty-forth year of the Long Island Sound Trawl Survey in 2007. The Long Island Sound Trawl Survey encompasses an area from New London to Greenwich, Connecticut and includes waters from 5 to 46 meters in depth in both Connecticut and New York state waters. Long Island Sound is surveyed in the spring during April through June and during the fall from September through October. This report includes results from the 2007 spring and fall sampling periods as well as providing time series information since the commencement of the survey in 1984.

GOAL

To collect, manage, synthesize and interpret fishery independent data on the living resources of Long Island Sound for fishery management and information needs of Connecticut biologists, fishery managers, lawmakers and the public.

OBJECTIVES

1) *Provide an annual index of counts and biomass per standard tow for 40 common species.*
2) *Provide age specific indices of abundance for scup, summer flounder, tautog and winter flounder.*
3) *Provide a recruitment index for bluefish (age 0) and weakfish (age 0).*
4) *Provide length frequency distributions of bluefish, scup, striped bass, summer flounder, tautog, weakfish, winter flounder, and other ecologically important species suitable for conversion to age using modal analysis, age-length keys or other techniques.*
5) *Provide annual total counts and biomass for all finfish species taken.*
6) *Provide annual total biomass for all invertebrate species taken.*
7) *Provide a species list for Long Island Sound based on LIS Trawl Survey sampling, noting the presence of additional species from other sampling conducted by the Marine Fisheries Division.*

INTRODUCTION

The Long Island Sound Trawl Survey (LISTS) was initiated in 1984 to provide fishery independent monitoring of important recreational species in Long Island Sound. A stratified-random design based on bottom type and depth interval was chosen and forty sites were sampled monthly from April through November to establish seasonal patterns of abundance and distribution. Seven species were initially of primary interest: bluefish, scup, striped bass, summer flounder, tautog, weakfish, and winter flounder. Length data for these species were collected from every tow; scup, tautog, and winter flounder were sampled for ageing. All fish species were identified and counted.

Since 1984, several changes have been incorporated into the Survey. In 1991, the sampling schedule was changed to a spring/fall format, although sampling is still conducted on a monthly basis (April - June, September, and October). Beginning in 1992, species were weighed in aggregate with an onboard scale to provide indices of biomass. Furthermore, more species have been sampled for lengths, such as windowpane and fourspot flounders, and important forage species such as butterfish, long-finned squid, and several herring species. By 2003, a total of 20 finfish species and two invertebrate species (lobster and long-finned squid) had been added to the original list of seven species measured. In addition, rarely occurring species (totaling less than 30 fish/year each) are now measured and age structures are collected for a sub-sample of weakfish and all summer flounder (>59 cm). All of these changes served to improve the quality and quantity of information made available to fishery managers for local and regional assessment of stock condition, and to provide a more complete annual inventory of LIS (Long Island Sound) fishery resources.

In the fall of 1999, an unusual die-off of lobsters occurred, particularly in the western portion of the Sound known as 'The Narrows' (Johnson and Shake 2000). This event lead to speculation that this area, which is adjacent to highly urbanized portions of Connecticut and New York, was experiencing a broad decline in living resources including finfish. Since the standard 40 sites per month did not cover this area, new sites were needed to evaluate finfish and invertebrate species composition and abundance west of a north-south line from Norwalk, CT to Eatons Neck, NY. Therefore, starting in 2000, additional sites in the western portion of the Sound were sampled during each month in addition to the LISTS sites. Sampling and data analysis for the Narrows, although not funded by this project or covered by the objectives, has in the past been discussed in LISTS annual reports (Gottschall and Pacileo 2007). Since a final report of Narrows sampling is required in 2008 under Fisheries Disaster Relief funding (Grant number: NA16FW1238), this report will not include that analysis.

METHODS

Sampling Design

LISTS is conducted from longitude 72^{o} 03' (New London, Connecticut) to longitude 73^{o} 39' (Greenwich, Connecticut). The sampling area includes Connecticut and New York waters from 5 to 46 m in depth and is conducted over mud, sand and transitional (mud/sand) sediment types. Sampling is divided into spring (April-June) and

fall (Sept-Oct) periods, with 40 sites sampled monthly for a total of 200 sites annually. The sampling gear employed is a 14 m otter trawl with a 51 mm codend (Table 2.1). To reduce the bias associated with day-night changes in catchability of some species, sampling is conducted during daylight hours (Sissenwine and Bowman 1978).

LISTS employs a stratified-random sampling design. The sampling area is divided into 1.85 x 3.7 km (1 x 2 nautical miles) sites (Figure 2.1), with each site assigned to one of 12 strata defined by depth interval (0 - 9.0 m, 9.1 - 18.2 m, 18.3 - 27.3 m or, 27.4+ m) and bottom type (mud, sand, or transitional as defined by Reid et al. 1979). For each monthly sampling cruise, sites are selected randomly from within each stratum. The number of sites sampled in each stratum was determined by dividing the total stratum area by 68 km^2 (20 square nautical miles), with a minimum of two sites sampled per stratum (Table 2.2). Discrete stratum areas smaller than a sample site are not sampled.

Sampling Procedures

Prior to towing at each site, temperature (^oC) and salinity (ppt) are measured at 1 m below the surface and 0.5 m above the bottom using a YSI model 30 S-C-T meter. Water is collected at depth with a five-liter niskin bottle, and temperature and salinity are measured within the bottle immediately upon collection.

The otter trawl is towed from the 15.2 m aluminum R/V John Dempsey for 30 minutes at approximately 3.5 knots, depending on the tide. At completion of the tow the catch is released onto a sorting table and sorted by species. Finfish, lobsters and squid are counted and weighed in aggregate (to the nearest 0.1 kg) by species with a precision marine-grade scale (30 kg, +/- 10 gm capacity). Catches weighing less than 0.1 kg are recorded as 0.1 kg. For the initial two years (1984 & 1985), lobsters were the only invertebrates recorded. Squid abundance has been recorded since 1986. Since 1992, additional invertebrate species have been weighed in aggregate, and some have been counted. The complete time series of species counted and weighed in the survey is documented in Appendix 2.4.

For selected finfish species, lengths are recorded to the centimeter as either total length or fork length (e.g. measurements from 100 mm to 109 mm are recorded as 10 cm) and entered in the database as 105 mm (Table 2.3). Lobsters are measured to 0.1 mm carapace length. Squid are measured to the centimeter mantle length and horseshoe crab measurements are taken using the prosomal width (cm).

The number of individuals measured from each tow varies by species, and also depends on the size of the catch and range of lengths (Table 2.3). If a species is subsampled, the length frequency of the catch is determined by multiplying the proportion of individuals in each centimeter interval by the total number of individuals caught. Some species are sorted and subsampled by length group so that all large individuals are measured and a subsample of small (often young-of-year) specimens are measured. All individuals not measured in a length group are counted. The length frequency of each group is estimated as described above, i.e. the proportion of individuals in each centimeter interval of the subsample is expanded to determine the total number of

individuals caught in the length group. The estimated length frequencies of each size group are then appended to complete the length frequency for that species. This procedure is often used with catches of bluefish, scup, and weakfish, which are usually dominated by young-of-year or discrete age/length classes.

Scup, summer flounder, tautog, weakfish and winter flounder are sampled for age determination (Table 2.3). Subsamples of scup, stratified by length group, are measured to the nearest mm (fork length) and scales from each individual are taken for ageing. Scup scales are removed posterior to the pectoral fin and ventral to the lateral line. The scales are pressed onto plastic laminate with an Ann Arbor roller press to obtain an impression of the scale, which is then viewed with a microfiche reader at 21x. Scales are also taken from all summer flounder greater than 59 cm. At least 15 scales are removed from the caudal peduncal area. These scales are pressed and aged to supplement the National Marine Fisheries Service age key used to age summer flounder collected by LISTS (see below). Most tautog taken in LISTS are aged due to the low numbers caught in recent years (under 250 fish). Tautog are iced and taken to the lab, where their total length (mm), sex, and total weight (gm) are recorded and their age is determined from opercular bones (Cooper 1967). Subsamples of winter flounder, stratified by length group and area (Table 2.3), are iced and taken to the lab where they are measured to the millimeter (total length), weighed (gm), sexed, their maturity stage determined (NMFS 1989), and they are aged with whole and sectioned otoliths (Simpson et al. 1988). Weakfish scales are obtained and processed as described above for scup, and otoliths are sectioned and read using procedures described in Simpson et al. 1988.

In reports prior to 2001, three species were not included in annual and seasonal totals: American sand lance, bay anchovy, and striped anchovy. These species, with the possible exception of striped anchovy, can be very abundant in Long Island Sound, but are not retained well in the otter trawl. Additionally, many of these fish are young-of-year and often drop out of the net as it is retrieved and wound on the net reel. For this reason they were not included in the list of species to be counted when LISTS was started in 1984. However, to document the occurrence of these species in LISTS catches, American sand lance was added in 1994, striped anchovy was added in 1996, and bay anchovy was added in 1998. Since 2001, adults of these three species are added to the annual and seasonal totals and the young-of-year are listed if present in the year's catch but are not quantified (Table 2.16, Appendix 2.4). Young-of-year for these three species are included in the database but are cataloged with a separate species identifier and quantities are considered estimates (Appendix 2.2).

Data Analysis

Indices of Abundance: Annual Mean Count and Weight per Tow

To evaluate the relative abundance of common species, an annual spring (April - June) and fall (September-October) geometric mean number per tow and weight per tow (biomass, kg) is calculated for the common finfish and invertebrate species. To calculate the geometric mean, the numbers and weight per tow are logged ($\log_e$) to normalize the highly skewed catch frequencies typical of trawl surveys:

Transformed variable = ln(variable+1).

Means are computed on the log scale and then retransformed to the geometric mean:

geometric mean = exp(mean)-1.

The geometric mean count per tow was calculated from 1984 - 2007 for 38 finfish species, lobster, and long-finned squid (1986 - 2007). The geometric mean weight per tow was calculated using weight data collected since 1992 for the same species, plus an additional 13 invertebrates.

For the seven finfish species that were measured on every tow--bluefish, scup, striped bass, summer flounder, tautog, weakfish, and winter flounder--biomass indices were calculated for the years 1984 - 1991 by using length/weight equations to convert length frequencies to weight per tow. Bluefish, scup, weakfish and winter flounder lengths were converted using equations from Wilk et al. 1978; striped bass conversions were accomplished using an equation from Young et al. 1994; and summer flounder and tautog conversions were accomplished using equations developed from LISTS data from 1984 -1987 and 1984 -1996 respectively.

Indices of Abundance: Indices-at-Age and Age Group

Annual age specific indices (indices-at-age matrices) were calculated for scup, striped bass, summer flounder, winter flounder and tautog. The age data used to calculate the indices came from three sources: striped bass ages were derived using the von Bertalanffy (1938) equation; summer flounder age-length keys were obtained from the National Marine Fisheries Service (NMFS) Northeast Fisheries Science Center spring and fall trawl surveys combined with LISTS ages (>59 cm); and scup, winter flounder and tautog age-length keys (in 1 cm intervals) were obtained directly from LISTS. Since fish growth can fluctuate annually as a function of population size or other environmental factors, a year and season specific age-length key was used wherever possible. Once lengths have been converted to age, the proportion at age is multiplied by the abundance index of the appropriate season to produce an index of abundance at age.

Recruitment (young-of-year) and age 1+ (all fish age one and older) indices were calculated for bluefish and weakfish. Observed modes in the length frequencies were used to separate the two groups.

The specific methods used to calculate indices-at-age for each species were as follows:

- **Bluefish**. Since bluefish are not aged, modes observed in the fall length frequencies were used to separate bluefish into age 0 and age 1+ groups, and a geometric mean catch per tow was calculated for each group. Comparison of the mean length-at-ages reported for young-of-year and age 1 bluefish in the New York Bight (Chiarella and Conover 1990) and Long Island Sound (Richards 1976) with LISTS length frequencies suggests that bluefish can easily be identified as either age 0 (snapper bluefish) or adults (age 1+). Richards (1976) and Chiarella and Conover (1990) determined that most bluefish less than 30 cm are age 0. A discontinuity in the LISTS fall length frequencies occurs most years between 26 cm and 39 cm

(Gottschall and Pacileo 2007, Table 2.35). Therefore 30 cm was determined to be a suitable length for partitioning age 0 and age one fish.

Although North Carolina state biologists have aged bluefish, their age keys were not used to age Long Island Sound bluefish because North Carolina mean lengths-at-age are not consistent with modes observed in Long Island Sound bluefish length frequencies. This difference suggests that growth may vary by region, or that early and late spawned bluefish may be differentially distributed along the coast (Kendall and Walford 1979).

- **Scup**. An index-at-age matrix was developed for 1984-2007 using spring (May-June only) and fall (September-October) LISTS data. April data was omitted since very few scup are taken at this time. A total of 8,819 scup aged between 1984 and 2007 were used to make year and season specific age-length keys (1 cm intervals). In the relatively few instances when the season/year specific key failed at a given 1 cm length interval, a three-year pooled key was used to determine the age. Three-year pooled keys were calculated using the years preceding and following the "run" year. For the terminal year, only two years were used for the pooled key. The final index-at-age was computed for both spring and fall indices-at-age. Since very few scup older than age 9 are taken, an age 10+ group is calculated by summing indices for ages 10 and up. To represent the full adult portion of the population an age 2+ index is calculated by summing the indices for ages 2 through 10+.

- **Striped bass**. To approximate the ages of striped bass taken in the survey, the average of the Chesapeake Bay and Hudson River striped bass von Bertalanffy parameters (L_{max} = 49.9 in, K = 0.13, t_o = 0.16, Vic Crecco, pers. comm.) were used in the rearranged von Bertalanffy equation:

$$t = (1/K) * (-\log_e ((L_{max} - L_t) / L_{max})) + t_o$$

Since this equation estimates age t as a fraction of a year, the estimates were rounded to the nearest year (e.g. age 3 = ages 2.5 to 3.4). A spring catch-at-age matrix was developed for 1984 through 2007 by apportioning the spring index by the percentage of fish at each age.

- **Summer flounder**. The year and season specific age-length keys (1 cm intervals) used to age LISTS catches were provided by NMFS from their spring and fall trawl surveys. These keys were supplemented with fish caught and aged by LISTS (60 cm and over). Since 2001, whenever the season/year specific key failed at a given 1 cm length interval a pooled year key using only adjacent years was used (Gottschall and Pacileo 2002). Since it is thought that growth rates for summer flounder have changed over time, a pooled key using only adjacent years would more accurately represent fish that could not be aged by the season/year specific key. Using this methodology, the catch-at-age matrix will remain unchanged for all but the terminal year, which will be updated as the following years' data becomes available.

- **Tautog**. An index-at-age matrix was developed for 1984-2006 using all survey months (Gottschall and Pacileo 2007). Ageing for 2006-2007 has not yet been completed thus results and a current index-at-age will not be presented in this report. Two-hundred forty three tautog were collected during the spring of 2007, and low catches in the fall resulted in only 25 fish being processed for that period. These collections will be aged during the summer of 2008.

- **Weakfish**. Age 0 and age 1+ indices were calculated for both spring and fall surveys, 1984 - 2007. Since few weakfish are taken in April, the spring geometric mean was calculated using only May and June. All weakfish taken in spring are assumed to be age 1+. Similar to bluefish, the fall age 0 and 1+ index was calculated by using length frequencies to separate the catch. Since a break in the fall length frequencies generally occurs between 24 and 32 cm each year (Gottschall and Pacileo 2007, Table 2.48), weakfish less than 30 cm are considered to be age 0 while those greater than or equal to 30 cm are ages 1+.

- **Winter flounder**. An index-at-age matrix was developed for 1984-2007 using April and May LISTS data. June data was not used since length frequency data suggest that many adult winter flounder have left the Sound by this time (an exception was made for 1984, the first year of LISTS, because very few samples were taken in the spring months). A total of 17,906 winter flounder aged between 1984 and 2007 were used to make year and region (east of Stratford Shoal, west of Stratford Shoal) specific age-length keys in 1 cm intervals. Similar to scup and summer flounder, three year pooled keys using only the adjacent years (two years for the terminal year runs) were used to assign ages if year specific keys were not available.

RESULTS AND DISCUSSION

Overview of LISTS 2007 Spring and Fall Surveys

The spring survey commenced on April 10th 2007 in eastern Long Island Sound aboard the R/V John Dempsey. The first site was conducted in deep water off the mouth of the Connecticut River. Sampling continued until the 40th tow was completed on May 2nd. Two Narrows tows were also conducted for this cruise on the 1st of May. A total of 10 sampling days were needed to complete the 42 April samples. May sampling again started in the east on May 11th and was completed on the 30th of the month after nine days of sampling. The June cruise commenced on the 11th of June and continued for the next nine days. Sampling was completed on the following Monday the 25th to finish up the 40 June tows and three Narrows samples. A total of 120 LISTS tows and 8 Narrows tows were completed during the spring survey (Table 2.4). Fall sampling (September and October) included all 80 of the scheduled LISTS tows, as well as two tows each month in the Narrows. Thirteen days were required each month to complete the sampling, an average of 3.23 tows per day.

Maps showing the sites selected versus the sites sampled during each month of sampling are provided in Figure 2.2 (April), Figure 2.3 (May), Figure 2.4 (June), Figure 2.5 (September) and Figure 2.6 (October). These figures provide a short description if a

site had to be relocated and the explanation why. During the spring cruise, five samples were relocated in April, five in May and two during the June survey. During the fall cruise, two sites were moved in each month. Additional site information is provided in Table 2.5 (April), Table 2.6 (May), Table 2.7 (June), Table 2.8 (September) and Table 2.9 (October) including date of sample, time, tow duration, latitude/longitude, and surface and bottom temperature and salinity. Information for the Narrows tows is provided at the bottom of each of the respective figures and tables.

Sometimes, a full 30-minute tow cannot be completed. Typical reasons for short tows include lack of room because of observed pot gear set in the immediate area, a drop in speed due to entanglement with some object on the bottom (frequently pot gear), or a complete stop in forward motion (submerged wreck or rock pile). Survey crew will often attempt to finish an interrupted tow by resetting beyond the obstruction or observed gear. If this is not possible, a site may have to be moved to another site nearby with the same stratum (bottom type and depth). Typically, a minimum of 15-20 minutes is required for the LIS Trawl Survey, while a minimum of 10 minutes is accepted for the Narrows sampling (with some exceptions) due to the difficulties associated with towing in this area of Long Island Sound (Gottschall and Pacileo 2007). Short tow information is summarized in Tables 2.10 (spring) and 2.11 (fall).

Cooperative Sample and Data Collection

Throughout the time series LISTS survey staff have been participating in cooperative efforts for sample collections, data requests, and special projects using survey personnel, equipment, and other resources. Most of these cooperative efforts are with state researchers or agencies, the National Marine Fisheries Service, Atlantic States Marine Fisheries Commission, New England and Mid-Atlantic Councils, and researchers or grad students associated with state or local universities. Table 2.12 illustrates many of the organizations that requested data in 2007 while Table 2.13 shows sample request received and fulfilled (each by month). In recent years many requests for samples have come from high schools, aquariums, or other educational organizations needing finfish and invertebrates for teaching purposes. Additionally, our own staff often have sample or data requests for media or other public outreach events (see job six of this report).

Number of Species Identified

Sixty finfish species were observed in 2007 including one new species, the striped burrfish (*Chilomycterus schoephi*) (Table 2.14). From 1984 to 2007, ninety-seven species were identified (Appendix 2.1), averaging 58 species per year with a range of 49 to 70 species (Fig 2.7). In addition, a total of forty-one types of invertebrates were collected in 2007 (Table 2.15). Most invertebrates are identified to species. However, in some difficult cases, invertebrates were identified to genus or higher taxon.

Total Catch

Appendix 2.4 presents a time series (1984-2007) of the finfish species collected each year and their respective rank by numbers. Annual total biomass of invertebrates are also included in this appendix, and are ranked by weight (kg).

A total of 177,841 finfish weighing 17,540.3 kg were sampled in 2007 (Table 2.16). In seventeen out of the last twenty-four years butterfish has been the highest-ranking finfish (numbers) in LISTS, however, in 2007 scup were more abundant and accounted for 42.6% of the catch by number (vs. butterfish 27.6%). Scup also ranked first by weight in 2007 with 30.4% of the total annual biomass from 75,681 fish taken in 200 tows. Butterfish were the second most abundant species caught in LISTS but ranked fourth in biomass behind smooth dogfish (580 fish or 12% of the annual total) and bluefish (10.3% of the annual total). Weakfish (17,386 fish), bluefish (9,378 fish) and winter flounder (4,550 fish) were the third, fourth and fifth most abundant species by number. These five species accounted for 87.8% of the total annual catch and 57.7% of the total biomass in 2007. These five species have also been the dominant species over the last ten years with the exception of little skate replacing bluefish for fifth most common in 2001 and 2002, and weakfish falling out of the top five in 2006, replaced by bay anchovy.

Scup once again topped the spring catches with 11,763 fish accounting for 32.2% of the total and more than a quarter (26.6%) of the spring biomass (Table 2.17). Scup catches this spring (11,763 fish) were the fifth highest in the time series and the second largest since, the record catch of 50,651 scup in 2002. Three prominent length groups for scup were seen this past spring with modes peaking at 10-12 cm, 16-18 cm, and 30-32 cm. Butterfish were the second most abundant fish taken with 4,492 fish (252.3 kg) being observed in the May and June samples, however this is less than half the butterfish caught in 2006. Winter flounder again ranked third with 4,336 fish (914.2 kg), taken this past spring. Winter flounder ranked first in number of fish taken during spring sampling for sixteen straight years until scup became more abundant in the catches in 2000. Flounder then fell to second rank each year until 2005 when it surpassed scup once again then dropped to the current third rank.

Catches in the fall survey have consistently been dominated by four species: scup, butterfish, weakfish, and bluefish. In 2007 these four species comprised 95.7% of the total catch of finfish and 68.5% of the total fall biomass. Scup surpassed butterfish for the first time since 2000 with a catch of 63,918 fish weighing 3,309.1 kg this year. Butterfish catches were less than the time series average (58,995) with 44,645 fish recorded this past fall. In twenty-one out of the last twenty-four years butterfish have ranked first. Weakfish and bluefish comprised 12.3% and 6.6 % of the fall catch with 17,355 fish and 9,339 fish respectively. Smooth dogfish again ranked high in biomass (3rd) with 1,548.4 kg from 373 individuals. Bay anchovy, moonfish, and windowpane flounder were the fifth, sixth, and seventh most abundant species during the fall period.

A total of 2,512.7 kg of invertebrates were taken in 2007 (Table 2.16). Long-finned squid (773.6 kg), horseshoe crab (596.4 kg) and American lobster (396.5 kg) were the top three species in biomass. These three species accounted for 70.3% of the biomass. One thousand six hundred and forty-eight (1,648) lobsters were recorded in the 200 survey tows in 2007 along with 24,212 long-finned squid and 333 horseshoe crabs. Spider crab (165.5 kg) and Lion's mane jellyfish (129.8 kg) were the fourth and fifth most dominant invertebrate species by weight.

The total biomass of invertebrate catch taken in the spring of 2007 was 1,123.9 kg (Table 2.18). American lobster had the highest biomass of 331.2 kg comprising 29.4% of the total spring weight followed by horseshoe crab with 273 kg (24.3%) and spider crab with 120.1 kg (10.7%). Spring lobster abundance increased from a record low abundance of 1.94 lobsters/tow in 2006 to 3.22 lobsters/tow in 2007. Springtime catches of long-finned squid made record catches in 2006 with 11.55 squid/tow, however, squid were far less abundant this spring and seemed to enter the Sound later in the year. Only 888 squid (2.14 squid/tow, Table 2.19) were cataloged in the spring of 2007 weighing 64.6 kg. Fall squid catches however, were more reminiscent of the early and mid-nineties with 179.39 squid/tow recorded in 2007. Squid (23,325) totaled 709.0 kg in the forty fall tows (Table 2.18). Long-finned squid accounted for 51% of the fall biomass followed by 23.3% for horseshoe crab (167 individuals or 323.4 kg) and 9.3% for lion's mane jellyfish (649 individuals or 129.3 kg). American lobster abundance dropped to a time-series low during the fall of 2007. Only 220 lobsters (65.3 kg) were documented in the fall survey and another 18% drop in abundance to 1.21 lobsters/tow was recorded this year.

Seasonal Indices of Abundance

The geometric mean count per tow was calculated from 1984-2007 for 38 finfish species plus lobster and long-finned squid (squid since 1986). All spring (April-June) and fall (September-October) data are used to compute the abundance indices presented in Tables 2.19 (spring) and 2.20 (fall), with the preferred seasonal index (for counts) denoted by an asterisk. Geometric mean biomass-per-tow indices have been calculated for 38 finfish and 15 invertebrate species (or species groups) since 1992, for both spring and fall (Table 2.21 and 2.22, respectively). Age specific indices of abundance were calculated for specific important recreational species, including scup, striped bass, summer flounder, and winter flounder (see below). For two other species, bluefish and weakfish recruitment indices were calculated using modal analysis of the length frequencies. For each of the thirty-eight finfish species, plots including catch per tow in numbers and biomass in kilograms are illustrated in Figures 2.8 through 2.13. These figures also include plots of each of the age specific indices and recruitment indices mentioned above. Figure 2.14 provides plots of abundance (biomass) indices for crabs (1992-2007), American lobster (1984-2007), and long-finned squid (1986-2007).

The only species with record high abundance in Long Island Sound during 2007 was weakfish (fall) with abundance at 63.96 fish per tow; comprised mostly of young-of-year weakfish. Five other species with notably higher abundance in 2007 are: black sea bass (spring index 0.26 fish/tow) which ranks third highest in the time series (also 3rd for fall); scup (fall index 475.29 fish/tow), like weakfish this index is comprised mostly of young of year and also ranks third in the time series; striped bass (spring 1.02 fish/tow) is currently fourth highest, however abundance has varied at high levels since 1999; and smooth dogfish (fall index of 2.27 fish/tow) and moonfish (1.66 fish/tow) both recorded the fourth highest abundance since 1984. Spiny dogfish has once again appeared in Long Island Sound Trawl Survey catches. Its abundance has been increasing since 2000 and is currently at the highest level seen in the last seventeen years. A few additional species have higher abundance during the non-preferred season (see Tables 2.19-2.20 for designation). Four of these species are: summer flounder in the spring survey (2.51

fish/tow); smooth dogfish, also in the spring survey (0.64 fish/tow); fall alewife abundance (0.95 fish/tow) and fall northern sea robin abundance (1.05 fish/tow). These four species were all in the top ten percent rank for their respective time series

Several species were at record low abundance or were in the lower tenth percentile for their respective time series in both the spring and fall surveys. This includes four spring species (i.e. where the spring survey provides better estimates of overall abundance): cunner (0.05 fish/tow) and long-finned squid abundance (2.14 squid/tow) were at record lows in 2007, silver hake (0.98 fish/tow) and little skate (2.82 fish/tow) were in the lower 10^{th} percentile. Winter flounder (20.58 fish/tow) and fourbeard rockling (0.35 fish/tow) were also low in the spring of 2007 but recorded just above the tenth percentile. American lobster spring abundance (spring and fall are both good estimates) increased 66% in 2007 (to 3.22 lobsters/tow) from the minimum 1.94 lobsters per tow recorded in 2006. However, LISTS fall sampling produced the worst American lobster abundance index in the twenty-four year time series (1.21 geometric mean count per tow).

Using the preferred spring index, a total of sixteen "spring species" had increasing abundance in 2007 while five species had decreasing abundance from the prior year (Table 2.19-2.20). During the fall, fourteen "fall species" had increasing abundance and six had decreasing abundance from the prior year. One species remained the same for this period.

Indices of Abundance: Important Recreational Species

Spring and fall abundance indices are presented in Tables 2.19-2.20. Indices of abundance at age were also calculated for seven important recreational species: bluefish (Table 2.23), scup (Table 2.24), striped bass (Table 2.25 age frequency, Table 2.26 index at age), summer flounder (Table 2.27), weakfish (Table 2.28) and winter flounder (Table 2.29). Bluefish and striped bass indices-at-age are based on the fall and spring surveys, respectively, whereas winter flounder indices-at-age are based on only the April and May cruises of the spring survey. In 2007, LISTS collected and aged 946 winter flounder for use in the development of age keys and the final catch-at-age matrix. Both scup and weakfish indices-at-age are calculated and presented separately for each season. Six hundred and eighty-three (683) scup were collected and aged in 2007 for use in the keys and calculations of the age matrix. Weakfish and bluefish use modal distributions for calculating their respective recruitment index although a small number of weakfish are taken each year for ageing purposes (see methods).

Bluefish

A generally increasing trend in overall bluefish abundance in Long Island Sound was documented in LISTS from 1986 through 1999. Abundance peaked in 1999, however, since 1991 abundance indices have been more variable with changes from 15% to 55% seen from one year to the next (Table 2.19, Figure 2.8). Since the peak in 1999, abundance dropped and varied around the mean of 24.4 fish/tow for the next five years. In 1995 and 1996 abundance was below average at 18.89 fish/tow and 15.66 fish/tow respectively. A substantial increase to 30.66 fish/tow was documented in 2007 with most

of that coming from an increase in snapper abundance (93%). Only a 14% increase in adults was recorded in 2007. Like weakfish, the overall bluefish index is dominated by young-of –year individuals that make up about 70% of the bluefish catch. The 2007 young-of-year index of 23.98 fish per tow is 42% above the mean. Higher abundance of age 0 fish were observed in 1997-1999, however, for the following seven years abundance was at or slightly below average. A sixty-eight percent (68%) drop in age 0 abundance occurred from the time series high in 1999 (39.19/tow) to 2006 (Table 2.23, Figure 2.8). Catches of age 1+ fish for the last three seasons have remained about the same averaging 2.4 fish/tow; sharply lower than the 21-year record high abundance (in numbers) and the second highest biomass index for age 1+ fish recorded in 2004 (10.38 fish/tow, 13.96 kg/tow). The age 1+ bluefish abundance (>29 cm) increased by a factor of twelve from 1999, when a time series low was recorded (0.86/tow), to the anomalous high in 2004. At the inception of the survey, adult abundance was low (1.6 fish/tow in 1984) then increased to just above average levels in 1985 (3.56 fish/tow). Abundance of adults then decreased steadily to 1.92 fish/tow in 1989. For the next three years, a large increase nearing record abundance levels was observed (8.44/tow in 1992). The following seven years (1993-1999) marked a declining trend in adult abundance to well below the series average and the lowest abundance recorded for the survey in 1999.

Scup

Scup abundance indices have increased by nearly an order of magnitude since about 1998 (Table 2.20, Figure 2.11). However, since 1999 abundance has been highly variable and changing between roughly 143 to 475 fish/tow from one year to the next. Excluding the exceptional but short-lived 1991 year class which produced an overall index of 311.6 fish/tow, fall abundance indices early in the survey time series (1984 through 1997) ranged between 10.7 (1984) and 92.5 fish/tow, averaging 52 fish/tow. Since 1998 the fall index has ranged from 103.3 (1998) to 537.7 (1999), averaging 315 fish/tow, and six times the pre-1998 average. High numbers of fish per tow result primarily from strong young-of-year indices (1999-2002, 2004-2005, 2007), as high as 498 fish/tow in 1999 (Table 2.24). However, unlike the strong 1991 year class signal (291 fish/tow at age 0) which produced only one subsequent double-digit index (26.5 at age 1 in Fall 1992), several recent strong year classes have persisted at double digit strength through age 3 (2000, 2001 year classes) or age 4 (1999 year class) and have produced record abundance indices at age through at least age 8.

Another very strong young-of-year index was recorded in 2005 and again this past fall. These two cohorts are the second and third highest respectively in the time series. The 2005 year class followed through in 2006 and 2007 with the second highest age 1 (51.02 fish/tow) and second highest age-2 index (29.3 fish/tow) in the time series. In 2007, most indices at age (with the exception of age 5) are well above the 1984-2006 mean. The time series strongest cohort (1999) once again produced a record age 8 index of 0.31 fish/tow this year. Only two year classes, 2003 and 2006, stand out as weak to moderate recruitment in the last several years. The 2006 young-of-year index is at 52.16 fish/tow and far below the 123.86 series mean. The 2003 year class also produced the lowest age 1 index in the last twelve years and the lowest age 2 index in the last six years. This past seasons high young-of-year index (319.9 fish/tow) is the third highest in the series and is expected to produce high indices at age as the year class gets older.

The new scale of elevated scup abundance has also been apparent in the spring survey. Spring indices of adult (age 2+) fish jumped from 2 to 21.7 fish/tow between 1999 and 2000, and have remained elevated since. During the spring 2002 survey, unusually high availability of scup resulted in an age 2+ index of 208.8 fish/tow, almost 14 times the series average. Age 3 fish from the 1999 year-class were particularly abundant at 123.2 fish/tow. Spring age 2+ indices during 2006 and 2007 are currently at the second and fourth highest abundance observed at 40.57 and 25.29 fish/tow respectively (Table 2.24, Figure 2.11).

Striped bass

Similar to scup, striped bass abundance in recent years has been highly variable. Four of the highest abundances were recorded during the spring of 1999, 2002, 2005, and 2007 (Table 2.19, Figure 2.13). Abundance during the first six years of the survey was relatively low, averaging only 0.03 fish/tow. Indications of a stock recovery first appeared in 1990 and during the next five years a moderate upward trend in abundance was observed, however in 1995 a 97% increase started the trend toward high abundance. Each year thereafter abundance increased in the Sound until 2000 and 2001 when LISTS started to observe decreases in abundance and erratic indices from one year to the next. Still, for the last 12 years abundance hasn't dipped below the series mean of 0.49 fish/tow. After the second spike in 2002, abundance again was followed by two years of decline. Recently, catch in numbers per tow dropped from the second highest in LISTS during 2005 (1.17 fish/tow) to ninth in 2006 (0.61 fish/tow), and fourth this past spring to 1.02 fish/tow. Overall abundance is still considered high and on average, over the last ten years, LISTS is capturing twelve times the number of stripers as it did in the first ten years of the survey. Since 1999, larger fish from 53 cm to 73 cm length have also been common during the spring and comprised 19% to 49% of the annual catch. Prior to the mid 1990's only 125 striped bass exceeding 52 cm in length were taken during the spring surveys. During 2007, the age structure was comprised predominately of two through age five fish (Table 2.25). Indices-at-age for ages two through age eight were at or above the respective averages for the time series. Additionally, LISTS fall sampling has also seen higher catches. Two of the highest fall annual indices were produced in 2004 (0.77 fish/tow) and 2006 (0.47 fish/tow). The current 0.38 fish/tow observed in the fall of 2007 is the fourth highest since the survey began. Average fall abundance is 0.18 fish/tow for the time series and 0.33 fish/tow over the last ten years.

Summer flounder

Summer flounder rebounded from record low abundances in the early and mid-nineties and have shown above average fall survey abundance (1.86 fish/tow) for ten out of the last thirteen years. Fewer summer flounder were seen in 2006 (1.35 fish/tow) as the index dropped below the long-term average for the first time in eight years, however a few more fish were observed in 2007 which bumped up the index to 1.89 fish/tow (Table 2.20, Figure 2.9). LISTS first observed a jump in abundance during the fall of 1996 to over 2 fish per tow. Abundance then hovered around this level for the next four years, increasing to 4.42 fish/tow in 2001. Summer flounder fall abundance peaked at 6.12 fish/tow in 2002 and dropped 45% in 2003 to 3.39 fish/tow and another 42% in 2004 to 1.95 fish/tow. Although the preferred fall index has declined sharply since 2002, abundance still remains about 32% above the average of the first twelve years of the

survey (1984-1995). Summer flounder have become more common in the spring survey since the mid-nineties when this increasing abundance trend began. Excellent springtime catches in 2003 resulted in record abundance (3.42 fish/tow) and an index that surpassed the fall numbers. Spring abundance generally follows the same trend as the fall, with decreasing abundance from 2002 through 2006. Summer flounder abundance in the spring of 2007 again surpassed the fall abundance with 2.51 fish/tow.

Spring 2007 indices-at-age for age one and ages three through nine were all higher than the previous year and well above their respective time series average (Table 2.27). Ages three and four as well as ages six through eight are all at the highest abundance recorded in LISTS. Ages one, five, and nine are documented as second highest in the series for the spring. The exception, age two fish (0.21 fish/tow), was 44% lower than average for that age group. The lack of age 2 fish in the population is consistent with low age one abundance in 2006 (0.04 fish/tow). Furthermore, fall age 1 abundance in 2006 also recorded low numbers (0.22 fish/tow) and is the second lowest in that series. Even though during the fall of 2007 abundance was considered average, some of the older ages had high abundance. Ages four, six and age eight were all at a series high while age three and five were at the second highest. Age one summer flounder made up 30% of the catch in 2007 while age2 (21%), age 3 (25%), and age 4 (11%) made up much of the rest. Young–of-year catches were about average this past fall with about 7% of the index (0.13 fish/tow), however, the young-of-year summer flounder index has been variable throughout the fall time series and may be unreliable. Some of the benefits of higher abundance seen since the mid to late-nineties is the presence of older and larger fish in the population. Eight and nine year old fish are now represented in the age matrix; prior to 1997, the oldest fish were age 7 (Table 2.27). The length frequency distributions in the spring and fall also illustrate this, with an increase in larger (> 50 cm) fish captured in the past ten years during the spring (average 52 fish compared to 5 fish pre-1996) and fall surveys (average 29 fish compared to 9 fish pre-1996), (Gottschall and Pacileo 2007, Table 2.44-2.45).

Weakfish

After a time-series low of 1.50 fish/tow in 2006, weakfish rebounded to a time-series high of 63.96 fish/tow in 2007 (Table 2.20, Figure 2.13). Age 0 weakfish usually dominate the overall index and have been very abundant in the fall over the last nine years, except in 2006 (Table 2.28). A strong year class in 2000 drove the overall index to double, reaching the second highest index of the time series (63.42/tow, Table 2.28). Similarly, the record-high overall index in 2007 was driven by a record-high index of age-0 fish (63.93/tow). The Age 0 catches between 1999 and 2004 ranged from 30.93 fish/tow (1999) to 63.31 fish /tow (2000) and were unprecedented in the time series. The average catch/tow of age 0 fish prior to 1999 was 7.12 fish/tow. Weakfish age 1+ abundance during the fall has generally fallen since the three years of peak abundance observed between 1995 and 1997. From 2002 through 2005, age 1+ abundance in the fall remained about 50% lower than average, however, in 2006 this index rose to about average levels (0.29 fish/tow) but then dropped to 20% of the time series mean in 2007 (0.06 fish/tow). Similarly, springtime abundance of age 1+ weakfish had remained at roughly three times higher than the average from 1997 to 1999 before declining to 0.04

fish/tow in 2003 (the lowest since 1994). This past spring, LISTS again recorded about average abundance at 0.11 fish/tow (Table 2.28, Figure 2.13).

Winter Flounder

Winter flounder generally has had a decreasing trend in abundance since 1996. LISTS has seen lower than average catches in fourteen of the last sixteen years. The overall winter flounder spring (April-June) index for 2007 (20.58 fish/tow) is the highest since 2003, however, abundance is still low and is approximately one third (32%) of the long term mean of 64.10 fish/tow (Table 2.19). Average catches for the first ten years of the survey were 94 winter flounder per standard tow. The customized winter flounder index (Table 2.29) that uses aged fish from April and May samples (used to develop indices of abundance at age) shows the same pattern as the overall index; the 2007 index (28.68 fish/tow) increased a little over the previous three years but is still well below the time series mean (76.85 fish/tow). This season's index is the ninth year of low abundance (Table 2.29, Figure 2.9) and illustrates why fisheries managers are concerned about the status of this species. During the beginning of the time series a slight drop in abundance was observed in 1985 and 1986 to just below average levels in 1986 (63.65/tow). For the next four years (1987-1990), abundance increased to 223.09 fish per tow: the height of winter flounder abundance for the survey. This period of high abundance was short lived as the index dropped 72% during the next two years to 61.39 fish per tow in 1992. From 1992 through 1995, abundance varied at or below average levels, however, 1996 showed a more than two-fold increase to 110.62 fish per tow. Since 2001 abundance generally has decline to the current low level.

The age-0 index, obtained from the Estuarine Seine Survey (Job 2, Part 2), shows a notable increase in abundance between 2003 and 2005 (Table 2.29). The 2006 index, however, was the lowest in the 20-year time-series (0.74 fish per haul). The age-0 index for 2007 (4.73 fish per seine haul) has increased considerably from the previous year, but it is still approximately 40% below the time-series average of 7.70 fish per seine haul. From its second lowest value in 2001, the age-0 index rose to average in 2003 (8.07 fish per haul), then increased 35% in 2004 to 10.96 fish per haul: the highest this index attained since 1996. For the past six years, the LISTS age 4+ winter flounder index has remained at less than 10 fish per tow (below the time-series average) and is currently at 4.16 fish per tow (Table 2.29). The 4+ index was at its height at the start of the survey in 1984 (27.91/tow) then declined through 1988 to stable and average abundance (around 13.10/tow) for the next three years. Dropping abundance followed, and during 1995 the lowest observed catch/tow (2.31) at the time was recorded. An unusual increase in abundance occurred in 1996 (15.92/tow) and for the next five years it fluctuated around average levels. The high age 4+ indices from 1996-2001 are probably a result of the strong 1992 and 1994-1996 year classes.

MODIFICATIONS

None.

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TABLES 2.1 - 2.29
LISTS

Table 2.1. Specifications for the Wilcox 14 m high-rise trawl net and associated gear.

Component	Description
Headrope	9.1 m long, 13 mm combination wire rope
Footrope	14.0 m long, 13 mm combination wire rope
Sweep	Combination type, 9.5 mm chain in belly, 7.9 mm chain in wing
Floats	7 floats, plastic, 203 mm diameter
Wings	102 mm mesh, #21 twisted nylon
Belly	102 mm mesh, #21 twisted nylon
Tail Piece	76 mm mesh, #21 twisted nylon
Codend	51 mm mesh, #54 braided nylon
Ground Wires	18.2 m long, 6x7 wire, 9.5 mm diameter
Bridle Wires:	top legs 27.4 m long, 6x7 wire, 6.4 mm diameter
Bottom Legs	27.4 m long, 6x7 wire, 11.1 mm, rubber disc type, 40 mm diameter
Doors	Steel "V" type, 1.2 m long x 0.8 m high, 91 kg
Tow Warp	6x7 wire, 9.5 mm diameter

Table 2.2. The number of sites scheduled for sampling each month within the 12 depth-bottom type strata.

	Depth Interval (m)				
Bottom type	**0 - 9.0**	**9.1 - 18.2**	**18.3 - 27.3**	**27.4+**	**Totals**
Mud	2	3	5	5	15
Sand	2	2	2	2	8
Transitional	3	5	5	4	17
Totals	**7**	**10**	**12**	**11**	**40**

Table 2.3. Length and age data collected in 2007.

In addition to the species listed below, other rarely occurring species (totaling less than 30 fish/year each) were measured. During 2007,twenty-nine other species were measured during LISTS sampling as either rarely occurring species or for other research related projects

Species measured	Measurement	# tows/day	# fish measured
Alewife	FL (cm)	All	min of 15 / tow
American lobster	CL (0.1 mm)	All	min of 50 / tow
American shad	FL (cm)	All	min of 15 / tow
Atlantic herring	FL (cm)	All	min of 15 YOY and min of 30 adults / tow
Atlantic menhaden	FL (cm)	All	min of 15 / tow
Atlantic sturgeon	FL (cm)	All	All
blueback herring	FL (cm)	All	min of 15 / tow
bluefish	FL (cm)	All	min of 30 YOY / tow, all adults
black sea bass	TL (cm)	All	All
butterfish	FL cm)	1st-3rd	min of 15 YOY and 15 adults / tow
cunner	TL (cm)	All	All
dogfish, smooth	FL (cm)	1st-3rd	All
dogfish, spiny	FL (cm)	All	All
fourspot flounder	TL (cm)	3rd on	min of 30/tow
hickory shad	FL (cm)	All	All
horseshoe crab	PW (cm)	All	All
northern searobin	FL (cm)	3rd on	min of 30/tow
moonfish	FL (cm)	Occasional	min of 10/tow
smallmouth flounder	TL (cm)	Occasional	min of 10/tow
striped bass	FL (cm)	All	All
striped searobin	FL (cm)	3rd on	min of 30/tow
scup	FL (cm)	All	min of 15 YOY and 30 / mode for age 1+
long-finned squid	ML (cm)	1st-3rd	min of 30 / tow
summer flounder	FL (cm)	All	All
tautog	TL (cm)	All	All
weakfish	FL (cm)	All	min of 15 YOY / tow, all adults
windowpane flounder	TL (cm)	1st-3rd	min of 50 / tow
winter flounder	TL (cm)	All	min of 100 / tow
winter skate	TL (cm)	All	All

Species aged	Structure	Subsample
scup	scales	Collected every month. For each month scales are taken from the following: 3 fish/cm <20 cm; 5/cm from 20-29 cm; and all fish > 30 cm.
summer flounder	scales	all fish > = 60 cm
tautog	opercular bones	Collected from a minimum of 200 fish/year.
weakfish	scales / otoliths	Collected each season. For each season, 1 scale and one otolith sample / cm up to 19 cm and all scales and otoliths >= 20 cm.
winter flounder	otoliths	Collected during April and May from two areas in the Sound: eastern-central and western. For each month and area, subsamples are taken as follows: in the eastern-central area 7 fish / cm < 30 cm, 14 / cm from 30-36 cm, all fish > 36 cm. In the western area 5 fish / cm < 30 cm, 10/cm from 30-36 cm, all fish > than 36 cm.

Notes: min = minimum; YOY = young-of-year; FL = fork length; TL = total length; CL = carapace length; ML = mantle length; PW = prosomal width.

Table 2.4. Number of Long Island Sound Trawl Survey (LISTS) samples taken by year and cruise

In 1984, thirty-five sites per monthly cruise from April through November were scheduled for sampling. Starting in 1985, forty sites per cruise were scheduled. In 1991, the Trawl Survey was modified to a spring (April - June) and fall (September - October) format--July, August and November sampling was suspended. In 1993 and 1994, an additional cruise of 40 sites was added to the fall period. The additional fall cruise was suspended in 1995. One hundred twenty tows were conducted in 2006 due to delays in rebuilding the main engine on the R/V John Dempsey (spring) and mechanical failure/overhaul of the hydraulic power take-off (fall).

	Year																							
Cruise	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
April	-	-	35	40	40	40	40	40	-	40	40	40	40	40	40	40	40	40	40	40	40	40	-	40
May	13	41	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
June	19	5	41	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	39	40	40	40
July	35	40	40	40	40	40	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August	34	40	40	40	40	40	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
September	35	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
Sept/Oct	-	-	-	-	-	-	-	-	-	40	40	-	-	-	-	-	-	-	-	-	-	-	-	-
October	35	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	-	40	40	-	40
November	29	40	40	40	40	40	40	-	-	-	-	-	-	-	-	-	-	-	-	40	-	-	-	-
Total	**200**	**246**	**316**	**320**	**320**	**320**	**297**	**200**	**160**	**240**	**240**	**200**	**200**	**200**	**200**	**200**	**200**	**200**	**200**	**200**	**199**	**200**	**120**	**200**

Table 2.5. Station information for LISTS April 2007.
Standard LISTS tows in the spring begin with SP. Tows in the Narrows begin with LT. Surface and bottom temperature and salinity are listed in the last four columns for each tow.

Sample	Date	Site	Btm Type	Depth Int	Time	Duration	Ave Speed (knots)	Lat	Lon	S_Temp	S_Sal	B_Temp	B_Sal
SP2007001	4/10/2007	1436	T	4	12:42:00	30	2.4	41.2335	-72.2850	4.9	26.2	4.8	30.8
SP2007002	4/19/2007	1737	T	1	7:52:00	30	3.0	41.2863	-72.1990	5.5	29.3	5.5	29.5
SP2007003	4/19/2007	1740	T	2	9:29:00	30	2.8	41.2920	-72.0767	5.5	29.7	5.4	30.4
SP2007004	4/19/2007	1335	T	4	11:14:00	30	4.3	41.2403	-72.2378	5.4	29.1	5.5	29.9
SP2007005	4/19/2007	0931	S	4	14:36:00	30	1.8	41.1622	-72.4382	5.7	27.9	5.2	28.4
SP2007006	4/19/2007	0830	S	4	15:50:00	19	3.8	41.1405	-72.5232	5.5	27.6	5.1	27.7
SP2007007	4/20/2007	0528	S	3	8:33:00	30	2.8	41.0987	-72.5427	4.9	27.8	5.0	27.8
SP2007008	4/20/2007	0526	T	3	9:46:00	30	3.8	41.1010	-72.6365	4.8	27.8	4.8	27.8
SP2007009	4/20/2007	0525	T	4	11:17:00	30	3.8	41.0937	-72.7102	5.4	27.6	4.6	27.7
SP2007010	4/20/2007	0326	T	3	12:35:00	30	2.6	41.0548	-72.7215	5.1	27.7	4.8	27.7
SP2007011	4/20/2007	0027	T	2	13:51:00	30	2.7	41.0090	-72.6455	6.3	27.6	5.2	27.6
SP2007012	4/20/2007	0229	T	2	14:50:00	30	3.4	41.0357	-72.6093	5.7	27.7	5.3	27.7
SP2007013	4/20/2007	0828	S	3	16:13:00	30	2.9	41.1377	-72.6093	6.3	27.1	5.0	27.9
SP2007014	4/23/2007	1429	T	2	8:23:00	30	2.7	41.2393	-72.5723	5.9	18.4	6.3	25.4
SP2007015	4/23/2007	1028	T	4	10:19:00	30	3.5	41.1748	-72.5802	5.6	27.7	5.4	27.7
SP2007016	4/23/2007	1427	T	1	11:43:00	30	4.1	41.2478	-72.6077	7.3	21.1	6.2	26.5
SP2007017	4/23/2007	1225	T	2	12:44:00	30	3.8	41.2088	-72.7158	8.3	25.0	6.3	26.9
SP2007018	4/23/2007	1125	T	3	13:50:00	30	3.0	41.1913	-72.7300	8.0	25.6	5.6	27.4
SP2007019	4/24/2007	0328	T	3	8:59:00	30	2.2	41.0603	-72.5843	6.7	26.6	6.4	27.3
SP2007020	4/24/2007	5824	S	1	10:36:00	30	3.4	40.9787	-72.7392	7.5	26.0	7.7	26.1
SP2007021	4/24/2007	5823	S	1	11:30:00	30	3.4	40.9815	-72.8200	8.2	26.1	8.1	26.1
SP2007022	4/24/2007	0223	M	4	12:47:00	23	2.9	41.0503	-72.7957	8.0	26.4	5.0	27.6
SP2007023	4/24/2007	0422	M	4	13:45:00	13	3.2	41.0810	-72.8453	8.1	27.5	4.9	27.7
SP2007024	4/25/2007	0218	M	4	9:35:00	15	2.7	41.0397	-72.9962	7.8	25.3	5.0	27.8
SP2007025	4/25/2007	0521	M	4	11:17:00	30	3.3	41.0870	-72.9197	7.8	27.2	5.4	27.8
SP2007026	4/25/2007	0522	M	4	12:20:00	30	3.2	41.1050	-72.8292	8.1	26.8	5.2	27.7
SP2007027	4/25/2007	0720	M	3	13:30:00	21	3.3	41.1248	-72.9297	8.7	26.2	5.7	27.7
SP2007028	4/25/2007	0720	M	3	14:16:00	30	2.8	41.1177	-72.9688	8.6	26.4	5.8	27.6
SP2007029	4/26/2007	0414	M	3	9:07:00	30	3.3	41.0835	-73.1368	8.6	25.8	5.0	27.0
SP2007030	4/26/2007	0213	M	3	10:30:00	30	3.5	41.0402	-73.2635	9.5	24.5	5.0	27.1
SP2007031	4/26/2007	5911	M	3	11:51:00	30	3.0	41.0002	-73.2767	9.6	25.0	5.0	27.2
SP2007032	4/26/2007	5513	S	2	13:18:00	30	3.4	40.9268	-73.2538	9.9	25.2	7.0	25.7
SP2007033	4/27/2007	0715	T	1	8:48:00	30	3.6	41.1275	-73.1313	9.8	25.4	9.9	25.4
SP2007034	4/27/2007	0511	M	2	10:08:00	30	3.3	41.0973	-73.2667	9.7	23.0	5.8	26.4
SP2007035	4/27/2007	0110	T	3	11:35:00	28	3.1	41.0235	-73.3653	8.5	25.3	5.4	26.7
SP2007036	5/1/2007	5709	S	2	9:59:00	30	3.3	40.9555	-73.4062	9.7	24.6	6.4	26.4
SP2007037	5/2/2007	1319	M	1	8:11:00	30	3.8	41.2310	-72.9708	10.2	23.3	8.1	26.1
SP2007038	5/2/2007	1320	M	1	9:21:00	30	2.9	41.2332	-72.9607	9.3	25.1	8.0	26.1
SP2007039	5/2/2007	1119	M	2	10:39:00	30	2.9	41.1893	-72.9948	8.9	25.6	6.9	26.9
SP2007040	5/2/2007	0921	M	2	11:50:00	30	3.2	41.1650	-72.9310	9.3	25.5	6.2	27.3
LT2007001	5/1/2007	5505	T	2	11:40:00	30	3.3	40.9328	-73.5405	10.5	23.7	6.6	26.1
LT2007002	5/1/2007	5403	M	2	13:14:00	30	3.6	40.8998	-73.6972	9.7	23.4	6.5	25.9

Table 2.6. Station information for LISTS May 2007.
Standard LISTS tows in the spring begin with SP. Tows in the Narrows begin with LT. Surface and bottom temperature and salinity are listed in the last four columns for each tow.

Sample	Date	Site	Btm Type	Depth Int	Time	Duration	Ave Speed (knots)	Lat	Lon	S_Temp	S_Sal	B_Temp	B_Sal
SP2007041	5/11/2007	1332	S	1	7:36:00	30	2.2	41.2350	-72.3885	9.2	27.2	8.6	28.7
SP2007042	5/11/2007	0730	S	4	9:22:00	30	2.1	41.1360	-72.4625	11.8	26.7	8.2	29.2
SP2007043	5/11/2007	0728	S	3	10:52:00	30	1.9	41.1255	-72.5662	14	25.9	8.8	28
SP2007044	5/11/2007	0526	T	3	12:05:00	30	2.9	41.1018	-72.6348	13.9	25.6	8.7	27.7
SP2007045	5/11/2007	0624	T	4	13:49:00	30	3.4	41.1208	-72.7468	14.6	25.6	7.4	27.3
SP2007046	5/14/2007	0931	S	4	8:41:00	30	3.6	41.1593	-72.4510	9.6	27.9	9.1	28.7
SP2007047	5/14/2007	0330	S	1	10:10:00	30	3.0	41.0595	-72.5000	12	26.4	10.7	27.1
SP2007048	5/14/2007	0228	T	2	11:20:00	30	2.5	41.0453	-72.5645	12.5	26.1	9.5	27.5
SP2007049	5/14/2007	0325	T	3	12:51:00	30	3.9	41.0638	-72.7203	13.9	25.6	8.4	27.4
SP2007050	5/14/2007	0327	T	3	14:05:00	30	3.7	41.0525	-72.6787	14.1	25.6	8.8	27.2
SP2007051	5/17/2007	0729	S	3	8:07:00	30	3.7	41.1263	-72.5250	12.7	26.1	10.3	28.2
SP2007052	5/17/2007	0525	T	4	9:25:00	30	4.0	41.0988	-72.6972	13.1	26	10.4	27.7
SP2007053	5/17/2007	0623	M	4	10:36:00	15	3.6	41.1098	-72.7997	13.3	26.2	10	27.7
SP2007054	5/17/2007	0522	M	4	11:31:00	30	3.4	41.1020	-72.8448	13.6	26.1	9.7	27.6
SP2007055	5/17/2007	0724	T	4	12:57:00	30	3.3	41.1127	-72.7897	13.5	26.2	9.9	27.7
SP2007056	5/17/2007	0824	T	4	14:13:00	17	3.4	41.1325	-72.7885	13.6	26.3	10	27.8
SP2007057	5/21/2007	1228	T	3	8:06:00	30	2.5	41.2133	-72.5522	11.1	27.6	10.8	28.1
SP2007058	5/21/2007	1225	T	2	9:50:00	30	3.5	41.2070	-72.7183	11.2	27.1	11	27.5
SP2007059	5/21/2007	0920	T	2	11:34:00	30	3.7	41.1648	-72.9253	12.1	26.2	8.4	26.8
SP2007060	5/21/2007	1220	T	1	13:09:00	30	2.8	41.2090	-72.9592	12.5	26	10.4	26.5
SP2007061	5/21/2007	0922	M	3	14:37:00	17	3.0	41.1642	-72.8468	12.8	26.8	9.7	27.3
SP2007062	5/22/2007	0715	T	1	9:12:00	30	3.0	41.1290	-73.1248	11.4	25.7	11.5	25.6
SP2007063	5/22/2007	0512	M	2	11:32:00	22	3.4	41.0997	-73.2555	12.5	25.9	10.2	26.3
SP2007064	5/22/2007	0312	M	3	12:36:00	30	3.0	41.0553	-73.2878	13	25.9	9	26.4
SP2007065	5/22/2007	0411	T	2	13:54:00	30	2.9	41.0660	-73.3303	12.7	25.8	9.6	26.3
SP2007066	5/23/2007	0719	M	3	8:16:00	14	3.3	41.1270	-72.9695	12.7	26.3	8.5	27
SP2007067	5/23/2007	0521	M	4	9:47:00	30	3.5	41.0878	-72.9195	13.1	26.3	9.4	27.3
SP2007068	5/23/2007	0123	M	4	11:25:00	30	.	41.0307	-72.7937	12.8	26.2	9.9	27.2
SP2007069	5/23/2007	0120	M	4	13:04:00	30	.	41.0298	-72.9108	13.6	26.2	8.7	27.3
SP2007070	5/23/2007	1118	M	1	14:58:00	30	3.1	41.1828	-73.0550	15	26.1	11.4	26.3
SP2007071	5/24/2007	0018	M	3	9:31:00	30	2.7	41.0107	-73.0052	12.1	26	8.9	27.2
SP2007072	5/24/2007	5918	M	3	10:37:00	30	2.8	40.9953	-72.9853	12.5	26	9.3	26.8
SP2007073	5/24/2007	5714	T	3	12:17:00	30	3.0	40.9648	-73.1758	12.6	25.9	9.7	26.3
SP2007074	5/24/2007	5513	S	2	13:29:00	30	3.4	40.9263	-73.2498	12.8	26	11.8	26
SP2007075	5/24/2007	0714	T	1	15:35:00	30	3.2	41.1208	-73.1885	14.6	25.7	10	26.3
SP2007076	5/29/2007	5709	S	2	9:46:00	30	3.0	40.9598	-73.4043	15.9	25.6	10.7	26.4
SP2007077	5/30/2007	0614	M	2	8:44:00	15	3.7	41.1180	-73.1628	12.1	25.7	10.3	26.4
SP2007078	5/30/2007	0412	M	2	10:11:00	15	3.3	41.0750	-73.2637	16.2	26	9.3	26.6
SP2007079	5/30/2007	0917	T	2	12:02:00	30	3.6	41.1523	-73.0832	16.2	26.1	9.8	26.8
SP2007080	5/30/2007	1320	M	1	13:23:00	30	2.9	41.2182	-72.9288	15.3	26.6	11.7	26.9
LT2007003	5/29/2007	5505	T	2	11:38:00	30	3.4	40.9320	-73.5383	16.4	25.3	10.1	26.3
LT2007004	5/29/2007	5403	M	2	13:05:00	30	3.7	40.8978	-73.7043	18.1	25	10.2	26.2
LT2007005	5/29/2007	0007	M	3	14:45:00	17	3.5	41.0080	-73.4995	14.5	26	9.5	26.5

Table 2.7. Station information for LISTS June 2007.
Standard LISTS tows in the spring begin with SP. Tows in the Narrows begin with LT. Surface and bottom temperature and salinity are listed in the last four columns for each tow.

Sample	Date	Site	Btm Type	Depth Int	Time	Duration	Ave Speed (knots)	Lat	Lon	S_Temp	S_Sal	B_Temp	B_Sal
SP2007081	6/11/2007	1437	T	4	7:50:00	30	2.9	41.2350	-72.2628	14.5	28.8	13.6	31
SP2007082	6/11/2007	1436	T	4	9:23:00	30	4.0	41.2373	-72.2803	14.7	28.7	13.7	30.8
SP2007083	6/11/2007	0831	S	4	12:01:00	30	2.1	41.1432	-72.4478	15.1	28.1	14.1	29.2
SP2007084	6/11/2007	0530	S	3	13:35:00	30	2.6	41.0947	-72.5083	16.6	26.9	14.5	28.6
SP2007085	6/11/2007	0429	T	3	15:20:00	30	2.8	41.0683	-72.5925	17.8	26.5	13.8	28.2
SP2007086	6/12/2007	0129	S	2	8:40:00	30	3.3	41.0292	-72.5655	17.2	26.7	15	27.8
SP2007087	6/12/2007	0125	T	4	10:00:00	30	2.9	41.0168	-72.7043	18.1	26.4	11.8	27.8
SP2007088	6/12/2007	5823	S	1	11:16:00	30	3.6	40.9798	-72.8270	16.8	26.4	16.7	26.4
SP2007089	6/12/2007	0424	M	4	12:40:00	30	3.6	41.0672	-72.8127	18	26.7	11.9	28.1
SP2007090	6/12/2007	0426	T	3	13:56:00	30	3.7	41.0700	-72.7010	18.6	26.9	12.9	27.8
SP2007091	6/12/2007	0629	S	4	15:15:00	30	3.0	41.1035	-72.5518	17.5	26.5	14.8	28.6
SP2007092	6/13/2007	1534	T	1	7:39:00	30	2.2	41.2577	-72.3577	15.5	29.3	15.2	29.9
SP2007093	6/13/2007	1533	S	1	8:53:00	30	3.0	41.2560	-72.3778	15.2	28.6	15.1	29.8
SP2007094	6/13/2007	0929	S	3	11:01:00	30	2.6	41.1625	-72.5368	14.5	29.1	14.5	29.1
SP2007095	6/13/2007	1228	T	3	12:16:00	30	2.5	41.2138	-72.5533	15	28.1	14.4	29.3
SP2007096	6/13/2007	1126	T	3	14:04:00	21	3.5	41.1920	-72.6947	17.9	27.2	15	28.3
SP2007097	6/14/2007	1529	T	1	8:28:00	30	3.8	41.2395	-72.5563	14.7	28.7	14.8	28.6
SP2007098	6/14/2007	1425	M	1	9:46:00	30	3.3	41.2393	-72.7255	16.2	28.1	16.2	28.1
SP2007099	6/14/2007	1124	T	2	10:53:00	30	3.5	41.1997	-72.7567	16.8	27.2	15.3	28.2
SP2007100	6/14/2007	1221	T	2	12:37:00	30	3.0	41.2205	-72.8685	16.9	27.4	16.4	27.9
SP2007101	6/14/2007	1319	M	1	14:00:00	30	3.3	41.2315	-72.9695	16.1	27.2	15.8	27.4
SP2007102	6/15/2007	1018	T	2	8:07:00	30	4.0	41.1745	-73.0222	16	27.2	16	27.3
SP2007103	6/15/2007	0919	T	2	9:46:00	30	3.3	41.1602	-72.9508	16.7	27.1	16.7	27.1
SP2007104	6/15/2007	0615	M	2	11:18:00	23	3.0	41.1063	-73.1425	15.4	26.8	15.5	26.7
SP2007105	6/15/2007	0715	T	1	13:18:00	30	3.7	41.1162	-73.1847	15.5	26.2	14.9	26.6
SP2007106	6/18/2007	0222	M	4	9:20:00	21	3.2	41.0418	-72.8393	18.2	26.8	12.1	28
SP2007107	6/18/2007	0121	M	4	11:01:00	30	2.9	41.0265	-72.8895	18.7	26.8	12.1	28.1
SP2007108	6/18/2007	0120	M	4	12:51:00	30	2.8	41.0212	-72.9603	18.8	26.9	12.2	28
SP2007109	6/18/2007	5918	M	3	14:13:00	30	3.0	40.9963	-72.9863	18.9	26.7	13.4	27.5
SP2007110	6/19/2007	0018	M	3	9:04:00	28	3.0	41.0105	-73.0112	18	26.4	12.4	28
SP2007111	6/19/2007	0015	T	4	10:20:00	25	3.2	41.0073	-73.1300	19	26.3	12.7	27.9
SP2007112	6/19/2007	5813	M	3	12:15:00	30	3.0	40.9687	-73.2667	19.5	26.4	13.5	26.7
SP2007113	6/19/2007	5612	T	2	13:42:00	15	3.2	40.9448	-73.2840	17.9	26.2	14.5	26.5
SP2007114	6/20/2007	5709	S	2	10:20:00	30	2.9	40.9673	-73.4068	18.6	25.8	15	26.5
SP2007115	6/21/2007	0315	M	3	8:53:00	30	2.9	41.0642	-73.1365	16.6	26.7	13.5	27.6
SP2007116	6/21/2007	0110	T	3	11:25:00	20	3.6	41.0247	-73.3665	17.7	26.4	13.1	27.5
SP2007117	6/21/2007	0511	M	2	12:26:00	30	3.2	41.0870	-73.3163	17.5	26.2	13.5	26.8
SP2007118	6/25/2007	0513	M	2	9:25:00	30	2.2	41.0980	-73.2083	17.1	26.5	13.8	27.4
SP2007119	6/25/2007	0313	M	3	10:47:00	30	2.7	41.0590	-73.2183	18.3	26.4	13.8	27.5
SP2007120	6/25/2007	0521	M	4	13:19:00	30	3.5	41.0872	-72.9250	18.5	26.8	14.5	27.8
LT2007006	6/20/2007	5505	T	2	12:38:00	30	3.7	40.9305	-73.5432	18.9	25.4	14.7	26.3
LT2007007	6/20/2007	5403	M	2	13:58:00	30	3.2	40.8978	-73.7048	18.2	25.4	14.3	26.3
LT2007008	6/20/2007	0007	M	3	15:41:00	11	3.1	41.0070	-73.5083	19	26.3	13.7	26.9

Table 2.8. Station information for LISTS September 2007.
Standard LISTS tows in the fall begin with FA. Tows in the Narrows begin with LT. Surface and bottom temperature and salinity are listed in the last four columns for each tow.

Sample	Date	Site	Btm Type	Depth Int	Time	Duration	Ave Speed (knots)	Lat	Lon	S_Temp	S_Sal	B_Temp	B_Sal
FA2007001	9/10/2007	1437	T	4	10:21:00	30		41.2305	-72.2733	21	30.5	20	31.4
FA2007002	9/10/2007	1737	T	1	11:43:00	30		41.2717	-72.1953	21	31.1	20.9	31.3
FA2007003	9/10/2007	1333	S	1	13:35:00	30		41.2422	-72.3300	20.8	30.7	20.9	30.7
FA2007004	9/11/2007	1433	S	2	7:55:00	27		41.2482	-72.3577	20.7	30.8	20.7	30.8
FA2007005	9/11/2007	1432	S	2	10:38:00	30		41.2352	-72.4057	20.6	30.8	20.7	30.7
FA2007006	9/11/2007	1029	S	3	12:16:00	30		41.1743	-72.5280	21.2	30.5	21	30.6
FA2007007	9/13/2007	0831	S	4	8:10:00	30		41.1422	-72.4473	21.4	29.9	21.4	30.1
FA2007008	9/13/2007	5824	S	1	10:30:00	30		40.9813	-72.7912	22	28.7	21.9	28.7
FA2007009	9/13/2007	0226	T	3	12:01:00	30		41.0413	-72.6853	22.5	28.9	22.2	28.9
FA2007010	9/13/2007	0228	T	2	13:59:00	30		41.0303	-72.6222	22.2	28.9	22.1	29.2
FA2007011	9/14/2007	0830	S	4	8:14:00	30		41.1488	-72.4800	21.8	29.3	21.2	30.2
FA2007012	9/14/2007	0530	S	3	9:26:00	30		41.0947	-72.5097	22	29.1	21.5	29.9
FA2007013	9/14/2007	0527	T	3	10:44:00	30		41.1002	-72.6152	22.1	29	21.9	29.6
FA2007014	9/14/2007	0325	T	3	12:21:00	30		41.0593	-72.7357	22.3	28.8	21.9	29.3
FA2007015	9/14/2007	0725	T	4	13:45:00	30		41.1228	-72.7335	22.3	28.9	21.9	29.6
FA2007016	9/17/2007	1228	T	3	8:23:00	30		41.2138	-72.5503	20.9	29.9	20.7	30.1
FA2007017	9/17/2007	1027	T	4	9:59:00	30		41.1727	-72.6885	21.2	29.1	21.3	29.7
FA2007018	9/17/2007	1427	T	1	12:51:00	30		41.2378	-72.6575	21.1	29.5	21.1	29.5
FA2007019	9/17/2007	1227	T	3	14:33:00	30		41.2030	-72.6472	21.1	29.9	20.9	29.9
FA2007020	9/18/2007	1026	T	4	8:51:00	30		41.1805	-72.6498	20.8	29.2	21.1	29.8
FA2007021	9/18/2007	0521	M	4	11:52:00	30		41.0953	-72.8702	21.2	29.1	21.3	29.4
FA2007022	9/18/2007	0720	M	3	14:01:00	18		41.1232	-72.9305	21.3	29.3	21	29.3
FA2007023	9/18/2007	0819	T	2	15:09:00	18		41.1608	-72.9488	21.6	29.3	21	29.3
FA2007024	9/19/2007	0522	M	4	10:08:00	30		41.0945	-72.8790	21	29.1	21.1	29.3
FA2007025	9/19/2007	0223	M	4	12:05:00	17		41.0507	-72.7952	21.1	29	21.7	29.7
FA2007026	9/19/2007	0122	M	4	13:37:00	30		41.0238	-72.8277	21.4	29	21.6	29.6
FA2007027	9/20/2007	5921	M	3	9:41:00	30		40.9983	-72.8615	20.9	28.9	21.3	29.3
FA2007028	9/24/2007	5919	M	3	9:05:00	30		40.9972	-72.9918	21.4	28.9	21.4	28.9
FA2007029	9/24/2007	5612	T	2	11:10:00	23		40.9505	-73.2300	21.3	28.5	21.2	28.5
FA2007030	9/24/2007	0113	M	4	12:44:00	30		41.0222	-73.2560	21.7	28.9	21.5	29.3
FA2007031	9/24/2007	0313	M	3	14:58:00	30		41.0482	-73.2665	22.4	28.8	21.3	28.9
FA2007032	9/25/2007	0617	T	2	8:39:00	26		41.1120	-73.0403	21	28.9	21.2	29.2
FA2007033	9/25/2007	0312	M	3	11:34:00	26		41.0653	-73.2340	21.4	28.8	21.3	29
FA2007034	9/25/2007	0614	M	2	13:07:00	30		41.1063	-73.2135	21.3	28.7	21.3	28.8
FA2007035	9/27/2007	0715	T	1	8:44:00	30		41.1278	-73.1288	21.5	28.4	21.7	28.6
FA2007036	9/27/2007	0511	M	2	10:37:00	30		41.0847	-73.3180	21.6	28.8	21.4	28.8
FA2007037	9/27/2007	0210	T	2	12:07:00	30		41.0390	-73.3725	21.6	28.9	21.5	28.9
FA2007038	9/27/2007	1319	M	1	14:47:00	30		41.2100	-72.9972	22.1	29	21.5	29
FA2007039	9/28/2007	1320	M	1	8:26:00	22		41.2272	-72.9730	21.6	28.9	21.5	28.9
FA2007040	9/28/2007	1021	M	2	9:38:00	30		41.1635	-72.9258	21.4	29	21.1	29.3
LT2007009	9/26/2007	5505	T	2	10:56:00	30		40.9343	-73.5427	21.7	28.2	21.4	28.5
LT2007010	9/26/2007	5403	M	2	13:00:00	30		40.8997	-73.7047	22.2	27.8	21.5	28.4

Table 2.9. Station information for LISTS October 2007.

Standard LISTS tows in the fall begin with FA. Tows in the Narrows begin with LT. Surface and bottom temperature and salinity are listed in the last four columns for each tow.

Sample	Date	Site	Btm Type	Depth Int	Time	Duration	Ave Speed (knots)	Lat	Lon	S_Temp	S_Sal	B_Temp	B_Sal
FA2007041	10/9/2007	1737	T	1	8:57:00	30		41.2883	-72.1993	19.7	31.5	19.6	31.5
FA2007042	10/9/2007	1740	T	2	10:26:00	30		41.2945	-72.0760	18.9	31.7	18.7	31.8
FA2007043	10/9/2007	1738	T	2	12:51:00	30		41.2883	-72.1552	19.4	31.5	19.1	31.6
FA2007044	10/9/2007	1436	T	4	14:26:00	30		41.2503	-72.2250	19.2	31.2	19	31.5
FA2007045	10/10/2007	1533	S	1	9:21:00	30		41.2567	-72.3830	18.8	30.1	18.9	31
FA2007046	10/11/2007	1432	S	2	7:31:00	26		41.2342	-72.4090	19.1	26.8	19.2	30.5
FA2007047	10/11/2007	0931	S	4	8:53:00	30		41.1502	-72.4948	19.8	30.5	19.8	30.5
FA2007048	10/11/2007	0831	S	4	10:07:00	30		41.1423	-72.4523	19.7	30.4	19.8	30.6
FA2007049	10/11/2007	0227	T	3	11:51:00	30		41.0453	-72.6067	20.5	29.6	20.3	29.9
FA2007050	10/11/2007	0226	T	3	13:30:00	30		41.0533	-72.6252	20.4	29.7	20.3	29.9
FA2007051	10/15/2007	0929	S	3	8:31:00	30		41.1647	-72.5278	19.1	29.9	19.1	30.3
FA2007052	10/15/2007	0327	T	3	10:07:00	30		41.0623	-72.6300	19.3	29.7	19.3	29.8
FA2007053	10/15/2007	0426	T	3	12:07:00	30		41.0793	-72.6418	19.3	29.7	19.3	29.8
FA2007054	10/15/2007	0625	T	4	13:50:00	30		41.0967	-72.7655	19.5	29.8	19.4	29.8
FA2007055	10/16/2007	0627	S	3	9:12:00	30		41.1105	-72.6123	18.9	29.8	19.1	29.9
FA2007056	10/16/2007	0925	T	4	10:46:00	30		41.1258	-72.7057	19	29.7	19	29.8
FA2007057	10/16/2007	1126	T	3	12:34:00	30		41.2028	-72.6405	18.4	29.7	18.6	30
FA2007058	10/16/2007	1225	T	2	14:17:00	30		41.2085	-72.7165	18.8	29.5	18.7	29.8
FA2007059	10/17/2007	0820	M	3	8:24:00	30		41.1453	-72.9213	19	29.2	19	29.2
FA2007060	10/17/2007	0322	M	4	10:02:00	30		41.0533	-72.8827	19.4	29.6	19.2	29.6
FA2007061	10/17/2007	5823	S	1	11:57:00	30		40.9802	-72.8292	19.2	29.3	19	29.3
FA2007062	10/17/2007	0021	M	3	13:23:00	30		41.0100	-72.8782	19.7	29.5	19.4	29.6
FA2007063	10/18/2007	0617	T	2	8:39:00	30		41.1117	-73.0417	19.5	29.3	19.5	29.4
FA2007064	10/18/2007	0015	T	4	10:47:00	30		41.0088	-73.1247	19.4	29.1	19.6	29.5
FA2007065	10/18/2007	5513	S	2	13:51:00	30		40.9258	-73.2503	19.4	28.7	19.2	28.8
FA2007066	10/18/2007	0014	M	4	15:43:00	22		41.0062	-73.2352	19.9	29.1	19.7	29.4
FA2007067	10/24/2007	1319	M	1	8:20:00	30		41.2317	-72.9665	18.9	29	18.9	29
FA2007068	10/24/2007	1322	T	1	10:09:00	30		41.2237	-72.8380	18.6	29.2	18.5	29.3
FA2007069	10/24/2007	0823	M	3	11:53:00	30		41.1393	-72.8527	19	29.6	18.5	30.2
FA2007070	10/24/2007	1221	T	2	13:35:00	30		41.2192	-72.8687	18.8	28.9	18.9	29.2
FA2007071	10/25/2007	0012	M	4	9:46:00	30		41.0097	-73.2730	19.1	29	19	29.6
FA2007072	10/29/2007	0212	M	3	8:38:00	30		41.0438	-73.2387	18	29.1	18.1	29.2
FA2007073	10/29/2007	0511	M	2	10:46:00	15		41.0865	-73.3163	16.9	28.9	16.9	28.9
FA2007074	10/29/2007	0714	T	1	12:36:00	30		41.1213	-73.1882	16.6	28.3	17.2	28.7
FA2007075	10/30/2007	0621	M	3	7:48:00	30		41.0975	-72.9063	17.7	29.5	17.7	29.5
FA2007076	10/30/2007	0521	M	4	9:38:00	21		41.0858	-72.9277	17.7	29.5	17.6	29.5
FA2007077	10/30/2007	0522	M	4	11:52:00	30		41.0917	-72.8865	17.5	29.4	17.5	29.6
FA2007078	10/30/2007	1118	M	1	13:36:00	30		41.1897	-73.0163	17	29.1	16.4	29.1
FA2007079	10/31/2007	1021	M	2	7:50:00	30		41.1730	-72.8803	16.9	29.2	17	29.2
FA2007080	10/31/2007	1022	M	2	9:37:00	30		41.1707	-72.9023	17.3	29.2	17.2	29.3
LT2007011	10/22/2007	5505	T	2	10:50:00	29		40.9320	-73.5462	19.1	28.2	19.5	28.9
LT2007012	10/22/2007	5403	M	2	12:15:00	30		40.9078	-73.6533	19.3	28.1	19.4	28.6

Table 2.10. Samples with non-standard tow durations and reason for incomplete tow, spring 2007.
Standard LISTS tows begin with SP(spring) or FA (fall). Tows in the Narrows begin with LT.

Sample	Date	Site	Btm Type	Depth Int	Time	Duration	Reason	Comments
SP2007006	4/19/2007	0830	S	4	15:50:09	19	hang	Hung up briefly; snagged pot gear; hole in starboard wing to be mended
SP2007022	4/24/2007	0223	M	4	12:46:52	23	pots	Speed dropped 0.5 knots; ghost string on stbd door - none in net. Also ran out of room; pot buoys ahead.
SP2007023	4/24/2007	0422	M	4	13:45:57	13	pots	Did tow in two parts: first part had to haul back b/c pots ahead; second part speed dropped. Caught a string on stbd door. Net caught on rudder; ripped belly & tail piece. Gear set blind.
SP2007024	4/25/2007	0218	M	4	9:35:10	15	pots	We received phone call from commercial fisherman asking us to change our tow coordinates to avoid his gear; got pots anyway.
SP2007027	4/25/2007	0720	M	3	13:30:40	21	pots	Ran out of room; pots ahead.
SP2007035	4/27/2007	0110	T	3	11:35:31	28	hang	Speed dropped but came off when hauled back.
SP2007053	5/17/2007	0623	M	4	10:36:04	15	hang	Pots visible; tried to avoid. Speed dropped 0.5 kts but no gear on doors or net when hauled back.
SP2007056	5/17/2007	0824	T	4	14:13:38	17	pots	Speed dropped; snagged string of pots. One broke off & ended up in net.
SP2007061	5/21/2007	0922	M	3	14:37:05	17	pots	Speed dropped; string of pots on stbd door.
SP2007063	5/22/2007	0512	M	2	11:32:59	22	pots	Three tries. Kept snagging gear (ghost gear?).
SP2007066	5/23/2007	0719	M	3	8:16:47	14	pots	Two tries; speed dropped - snagged lines of pots on doors.
SP2007077	5/30/2007	0614	M	2	8:43:48	15	pots	Two tries; speed dropped - snagged pot gear (some live & some ghost gear).
SP2007078	5/30/2007	0412	M	2	10:11:41	15	hang	Speed dropped.
LT2007005	5/29/2007	0007	M	3	14:45:47	17	pots	Pots all around; ran out of room.
SP2007096	6/13/2007	1126	T	3	14:04:01	21	hang	Hung up on mud/rock. Tore hole in extension.
SP2007104	6/15/2007	0615	M	2	11:18:52	23	pots	Speed dropped; pots on both doors & in net. Blind set.
SP2007106	6/18/2007	0222	M	4	9:20:42	21	pots	Speed dropped; ghost pots in net.
SP2007110	6/19/2007	0018	M	3	9:04:33	28	pots	Speed dropped - pot warp on door.
SP2007111	6/19/2007	0015	T	4	10:20:38	25	pots	Speed dropped; two old pots in net (singles) and old lines on both doors.
SP2007113	6/19/2007	5612	T	2	13:42:20	15	hang	
SP2007116	6/21/2007	0110	T	3	11:25:28	20	hang	
LT2007008	6/20/2007	0007	M	3	15:41:25	11	pots	Pots all around; ran out of room. Also had ghost gear in port wing.

Table 2.11. Samples with non-standard tow durations and reason for incomplete tow, fall 2007.
Standard LISTS tows begin with SP(spring) or FA (fall). Tows in the Narrows begin with LT.

Sample	Date	Site	Btm Type	Depth Int	Time	Duration	Reason	Comments
FA2007004	9/11/2007	1433	S	2	7:54:57	27	hang	Snagged near end of tow. Large tear in net; had to switch nets.
FA2007022	9/18/2007	0720	M	3	14:01:48	18	pots	Speed dropped; pot gear on port door (active gear). Very long up/down line?
FA2007023	9/18/2007	0819	T	2	15:09:04	18	pots	Speed dropped; line on both doors.
FA2007025	9/19/2007	0223	M	4	12:05:06	17		
FA2007029	9/24/2007	5612	T	2	11:10:09	23	hang	
FA2007032	9/25/2007	0617	T	2	8:39:15	26	pots	Speed dropped; 3 ghost pots in net (2 singles & old line to one pot).
FA2007033	9/25/2007	0312	M	3	11:34:29	26		
FA2007039	9/28/2007	1320	M	1	8:26:48	22		Speed dropped
FA2007046	10/11/2007	1432	S	2	7:31:38	26	hang	Speed dropped 0.4 kts; hauled back to find mid-size hole in stbd wing.
FA2007066	10/18/2007	0014	M	4	15:42:45	22	pots	Speed dropped 0.5 kts. Fouled pot line on port door; prob sunken below surface for awhile.
FA2007073	10/29/2007	0511	M	2	10:46:16	15	pots	Speed dropped; couple strings of old gear.
FA2007076	10/30/2007	0521	M	4	9:38:00	21	pots	Speed dropped; old gear in net & trailing. Buoy was submerged & had lots of mussels growing on it.
LT2007011	10/22/2007	5505	T	2	10:50:32	29	pots	Snagged a conch pot at end.

Table 2.12. Data requests by month, 2007.

MONTH	REQUEST	ORGANIZATION OR PURPOSE
January	tautog catch-at-age	ASMFC Technical Committee
	winter flounder indices-at-age	Dominion Annual Report
	windowpane indices, counts and weights	Massachusetts DEM
	maps of fishery resources in vicinity of proposed FSRU	DEIS review
February	invertebrate data	University of Connecticut
	horseshoe crab length frequency	ASMFC Technical Committee
	smooth dogfish length frequency	Massachusetts DEM
	request for GIS layers with WFL distribution and abundance in Bridgeport Harbor area - we don't have this info	Environmental Consultant
	count and weight indices	Council on Environmental Quality
March	count and weight indices	Environmental Consultant
	summer flounder age matrix using NMFS & LISTS data - also provided SFL indices, indices at age and VAS length frequency	NMFS
April	weakfish indices	ASMFC Technical Committee
	bluefish indices	ASMFC Compliance Report
	menhaden indices	ASMFC Compliance Report
	maps of towpaths in vicinity of oyster cages proposed in Branford	review of proposal
	maps of horseshoe crab closed areas	Notice sent to all license holders
May	count and weight of lobsters from each tow in LISTS and Narrows	University of Maryland
	bluefish age-o indices	ASMFC Technical Committee
	tautog indices	ASMFC Compliance Report
	maps of horseshoe crab closed areas	DEP Wildlife signs
June	butterfish length frequency	NMFS Woods Hole
	squid count & weight indices	NMFS Woods Hole - Loligo DNA study
	occurrence of Japanese shore crab	UCONN
July	squid egg catches, indices and tow info	NMFS
	spiny dogfish indices	ASMFC Technical Committee
	striped bass arithmetic and geometric indices	ASMFC Technical Committee
	summary of sites and data in western LIS	NPS - National Coastland and Barrier Network
August	trends in abundance (warm vs cold)	NRDC
September	document anything unusual at sites near Penfield Reef - nothing	responding to phone call from public
	winter flounder indices at age	NMFS
	LIS monthly bottom temps from Job 5 (water quality monitoring)	Washington Post
October	winter flounder indices	ASMFC Compliance Report
November	Sites database	University of Maryland
	lobster lengths 1987-2006	University of Maryland
December	whelk count and biomass indices	for part of a public presentation

Table 2.13. Sample requests by month, 2007.

MONTH	REQUEST	ORGANIZATION OR PURPOSE
May	*Loligo paeleii* (longfin squid) for dissection class	Illing Middle School
	lobsters for v-notch training	high schools assisting with v-notch program
	squid & various finfish specimens for dissection class	Putnam High School
	lobster for shell disease research	University of Connecticut
	critters for school demonstration	East Lyme
	striped bass, bluefish, weakfish, lobster and American eel	EPA-residual chemical tissue analysis (e.g. PCBs)
June	smooth dogfish and striped bass	Norwalk Aquarium
	lobsters for v-notch training	high schools assisting with v-notch program
	lobster for shell disease research	University of Connecticut
	striped bass, bluefish, weakfish and lobster	EPA-residual chemical tissue analysis (e.g. PCBs)
September	striped bass, bluefish, lobster and American eel	EPA-residual chemical tissue analysis (e.g. PCBs)
	small specimens of various spp (vert & invert) for fish bio class	Old Saybrook High School
	horshoe crabs and starfish for touch tank	Marine Education Network
	requested lobster for shell disease research (none sent - didn't catch sufficient sample numbers)	University of Connecticut
October	small specimens of various spp (vert & invert) for fish bio class	Old Saybrook High School
	striped bass, bluefish, weakfish and American eel	EPA-residual chemical tissue analysis (e.g. PCBs)
	Loligo paeleii (longfin squid) for dissection class	Southern Connecticut State University
	squalus specimens requested: none provided b/c done sampling for yr	Ecology and Evolutionary Biology, UCONN

Table 2.14. List of finfish species observed in 2007.
Sixty species were observed in 2007. (Bold type indicates new species). Since 1984, ninety-seven species of finfish have been identified in LISTS (see Appendix I for the full list of species).

Common Name	Scientific Name	Common Name	Scientific Name
anchovy, bay	*Anchoa mitchilli*	mackerel, Atlantic	*Scomber scombrus*
anchovy, striped	*Anchoa hepsetus*	menhaden, Atlantic	*Brevoortia tyrannus*
black sea bass	*Centropristes striata*	moonfish	*Selene setapinnis*
bluefish	*Pomatomus saltatrix*	ocean pout	*Macrozoarces americanus*
burrfish, striped	***Chilomycterus schoephi***	pipefish, northern	*Syngnathus fuscus*
butterfish	*Peprilus triacanthus*	pollock	*Pollachius virens*
cunner	*Tautogolabrus adspersus*	puffer, northern	*Sphoeroides maculatus*
dogfish, smooth	*Mustelus canis*	rockling, fourbeard	*Enchelyopus cimbrius*
dogfish, spiny	*Squalus acanthius*	sand lance, American	*Ammodytes americanus*
eel, American	*Anguilla rostrata*	scad, mackerel	*Decapterus macarellus*
flounder, fourspot	*Paralichthys oblongus*	scad, rough	*Trachurus lathami*
flounder, smallmouth	*Etropus microstomus*	scad, round	*Decapterus punctatus*
flounder, summer	*Paralichthys dentatus*	sculpin, longhorn	*Myoxocephalus octodecemspin*
flounder, windowpane	*Scophthalmus aquosus*	scup	*Stenotomus chrysops*
flounder, winter	*Pseudopleuronectes american*	sea raven	*Hemitripterus americanus*
flounder, yellowtail	*Pleuronectes ferrugineus*	searobin, northern	*Prionotus carolinus*
glasseye snapper	*Priacanthus cruentatus*	searobin, striped	*Prionotus evolans*
grubby	*Myoxocephalus aeneus*	sennet, northern	*Sphyraena borealis*
gunnel, rock	*Pholis gunnellus*	shad, American	*Alosa sapidissima*
hake, red	*Urophycis chuss*	shad, gizzard	*Dorosoma cepedianum*
hake, silver	*Merluccius bilinearis*	shad, hickory	*Alosa mediocris*
hake, spotted	*Urophycis regia*	silverside, Atlantic	*Menidia menidia*
herring, Atlantic	*Clupea harengus*	skate, clearnose	*Raja eglanteria*
herring, alewife	*Alosa pseudoharengus*	skate, little	*Leucoraja erinacea*
herring, blueback	*Alosa aestivalis*	skate, winter	*Leucoraja ocellata*
hogchoker	*Trinectes maculatus*	striped bass	*Morone saxatilis*
jack, yellow	*Caranx bartholomaei*	sturgeon, Atlantic	*Acipenser oxyrinchus*
kingfish, northern	*Menticirrhus saxatilis*	tautog	*Tautoga onitis*
lamprey, sea	*Petromyzon marinus*	toadfish, oyster	*Opsanus tau*
lizardfish, inshore	*Synodus foetens*	weakfish	*Cynoscion regalis*

Names taken from: Common and Scientific Names of Fishes from the United States, Canada and Mexico, American Fisheries Society, Sixth ed., 2004.

Table 2.15. List of invertebrate species observed in 2007.
In 2007, fourty-one invertebrate species were identified. In most cases, invertebrates are identified to species; however, species that are very similar are identified to genus, and in difficult cases, to a higher taxon.

Common Name	Scientific Name	Common Name	Scientific Name
anemones	*anemomes spp.*	mussel, blue	*Mytilus edulis*
arks	*Noetia-Anadara spp.*	northern moon snail	*Lunatia heros*
blood star	*Henricia spp.*	oyster, common	*Crassostrea virginica*
bryozoan, bushy	*Phylum Bryozoa*	sea grape	*Molgula spp.*
bryozoan, rubbery	*Alcyonidium verrilli*	sea urchin, green	*strongylocentrotus droebach*
clam, hard clams	*Artica-Mercinaria-Pitar sp.*	sea urchin, purple	*Arbacia punctulata*
clam, surf	*Spisula solidissima*	shrimp, coastal mud	*Upogebia affinis*
coral, star	*Astrangia poculata*	shrimp, mantis	*Squilla empusa*
crab, mud	*Family Xanthidae*	shrimp, northern red	*Pandalus montagui*
crab, Japanese shore	*Hemigrapsus sanguineus*	shrimp, sand	*Crangon septemspinosa*
crab, blue	*Callinectes sapidus*	slipper shell, common	*Crepidula fornicata*
crab, flat claw hermit	*Pagurus pollicaris*	sponge spp.	*sponge spp.*
crab, horseshoe	*Limulus polyphemus*	sponge, boring	*Cliona celate*
crab, jonah	*cancer borealis*	sponge, deadman's fingers	*Haliclona spp.*
crab, lady	*Ovalipes ocellatus*	sponge, red bearded	*Microciona prolifera*
crab, rock	*Cancer irroratus*	squid, long-finned	*Loligo pealeii*
crab, spider	*Libinia emarginata*	starfish spp.	*Asteriid spp.*
hydroid spp.	*Tubularia spp.*	tunicates, misc	*misc. class ascidiacea*
jelly, water	*Rhacostoma atlanticum*	whelk, channeled	*Busycotypus canaliculatus*
jellyfish, lion's mane	*Cyanea capillata*	whelk, knobbed	*Busycon carica*
lobster, American	*Homarus americanus*		

Names taken from: A Field Guide to the Atlantic Seashore, Peterson Field Guide Series, 1978 (Gosner, 1978).

Table 2.16. Total number and weight (kg) of finfish and invertebrates caught in 2007.

Finfish species are in order of descending count. Invertebrate species are in order of descending weight (nc = not counted). Young-of-year bay and striped anchovy are neither separated by species or quantified; young-of-year Atlantic herring are not quantified. Number of tows (sample size)=200.

species	count	%	weight	%
scup	75,681	42.6	5,333.5	30.4
butterfish	49,137	27.6	1,446.2	8.2
weakfish	17,386	9.8	584.8	3.3
bluefish	9,378	5.3	1,801.3	10.3
winter flounder	4,550	2.6	951.3	5.4
windowpane flounder	4,051	2.3	510.8	2.9
red hake	2,788	1.6	200.4	1.1
bay anchovy	2,440	1.4	14.5	0.1
Atlantic herring	1,932	1.1	234.2	1.3
alewife	1,537	0.9	101.3	0.6
little skate	1,277	0.7	697.0	4.0
fourspot flounder	1,094	0.6	224.9	1.3
moonfish	979	0.6	12.0	0.1
striped searobin	755	0.4	217.0	1.2
summer flounder	733	0.4	590.9	3.4
northern searobin	691	0.4	74.2	0.4
smooth dogfish	580	0.3	2,110.2	12.0
Atlantic menhaden	426	0.2	63.9	0.4
striped bass	422	0.2	888.0	5.1
spotted hake	340	0.2	23.9	0.1
silver hake	290	0.2	14.6	0.1
tautog	280	0.2	551.4	3.1
American shad	236	0.1	15.8	0.1
blueback herring	156	0.1	9.1	0.1
black sea bass	116	0.1	46.8	0.3
clearnose skate	97	0.1	193.3	1.1
fourbeard rockling	87	0	7.6	0
hogchoker	78	0	11.4	0.1
smallmouth flounder	48	0	2.6	0
winter skate	44	0	117.8	0.7
hickory shad	37	0	10.4	0.1
spiny dogfish	32	0	122.3	0.7
American sand lance	30	0	0.3	0
Atlantic sturgeon	18	0	336.4	1.9
cunner	16	0	3.0	0
rough scad	13	0	0.7	0
ocean pout	12	0	3.2	0
Atlantic mackerel	9	0	0.8	0
glasseye snapper	8	0	0.7	0
northern puffer	8	0	0.5	0
striped anchovy	6	0	0.1	0
sea raven	5	0	3.6	0
oyster toadfish	5	0	2.0	0
yellow jack	5	0	0.4	0
northern kingfish	4	0	0.4	0
round scad	3	0	0.3	0
longhorn sculpin	3	0	0.8	0
American eel	2	0	0.9	0
inshore lizardfish	2	0	0.2	0
mackerel scad	2	0	0.1	0
northern sennet	2	0	0.2	0
northern pipefish	2	0	0.2	0
Atlantic silverside	1	0	0.1	0
gizzard shad	1	0	0.1	0
grubby	1	0	0.1	0
pollock	1	0	0.1	0
rock gunnel	1	0	0.1	0
striped burrfish	1	0	0.5	0
sea lamprey	1	0	0.1	0
yellowtail flounder	1	0	1.0	0
Total	**177,841**		**17,540.3**	
Finfish not ranked				
anchovy spp, yoy				
Atlantic herring, yoy				
American sand lance (yoy)				
long-finned squid	24,212	88.2	773.6	30.8
horseshoe crab	333	1.2	596.4	23.7
American lobster	1,648	6.0	396.5	15.8
spider crab	nc	nc	165.5	6.6
lion's mane jellyfish	660	2.4	129.8	5.2
bushy bryozoan	nc	nc	107.4	4.3
mixed sponge species	nc	nc	84.5	3.4
rock crab	nc	nc	41.4	1.6
channeled whelk	196	0.7	33.4	1.3
flat claw hermit crab	nc	nc	27.5	1.1
blue mussel	nc	nc	20.4	0.8
starfish spp.	nc	nc	20.3	0.8
boring sponge	nc	nc	17.7	0.7
blue crab	68	0.2	13.0	0.5
mantis shrimp	264	1.0	12.1	0.5
deadman's fingers sponge	nc	nc	11.5	0.5
lady crab	nc	nc	11.5	0.5
knobbed whelk	23	0.1	11.1	0.4
common slipper shell	nc	nc	9.3	0.4
mud crabs	nc	nc	4.3	0.2
northern moon snail	nc	nc	4.3	0.2
sand shrimp	nc	nc	3.5	0.1
sea grape	nc	nc	3.5	0.1
arks	2	0	2.7	0.1
hydroid spp.	nc	nc	2.5	0.1
hard clams	1	0	2.2	0.1
rubbery bryzoan	nc	nc	1.4	0.1
common oyster	nc	nc	1.1	0
surf clam	10	0	1.0	0
anemones	16	0.1	0.6	0
purple sea urchin	2	0	0.6	0
red bearded sponge	nc	nc	0.5	0
star coral	nc	nc	0.4	0
water jelly	1	0	0.3	0
jonah crab	1	0	0.2	0
northern red shrimp	1	0	0.2	0
blood star	nc	nc	0.1	0
coastal mud shrimp	1	0	0.1	0
green sea urchin	1	0	0.1	0
Japanese shore crab	nc	nc	0.1	0
tunicates, misc	1	0	0.1	0
Total	**27,441**		**2,512.7**	

Note: nc= not counted

Table 2.17. Total counts and weight (kg) of finfish taken in the spring and fall sampling periods, 2007.
Species are listed in order of total count. Young-of-year bay anchovy, striped anchovy, and American sand lance are not included. Number of tows (sample sizes): Spring = 120, Fall = 80.

	Spring			
species	count	%	weight	%
scup	11,763	32.2	2,024.4	26.6
butterfish	4,492	12.3	252.3	3.3
winter flounder	4,336	11.9	914.2	12.0
windowpane flounder	3,481	9.5	466.6	6.1
red hake	2,685	7.3	188.0	2.5
Atlantic herring	1,930	5.3	234.0	3.1
bay anchovy	1,321	3.6	6.9	0.1
little skate	1,076	2.9	595.8	7.8
alewife	1,068	2.9	83.1	1.1
fourspot flounder	921	2.5	196.8	2.6
summer flounder	514	1.4	377.1	5.0
northern searobin	463	1.3	66.9	0.9
striped searobin	427	1.2	164.5	2.2
striped bass	288	0.8	476.1	6.3
silver hake	284	0.8	14.1	0.2
spotted hake	278	0.8	14.7	0.2
tautog	248	0.7	488.5	6.4
smooth dogfish	207	0.6	561.8	7.4
American shad	153	0.4	11.5	0.2
blueback herring	101	0.3	6.4	0.1
fourbeard rockling	84	0.2	7.3	0.1
black sea bass	60	0.2	29.1	0.4
hogchoker	50	0.1	7.6	0.1
bluefish	39	0.1	58.1	0.8
winter skate	37	0.1	95.0	1.2
Atlantic menhaden	33	0.1	13.7	0.2
spiny dogfish	32	0.1	122.3	1.6
weakfish	31	0.1	32.0	0.4
American sand lance	30	0.1	0.3	0
hickory shad	27	0.1	7.1	0.1
clearnose skate	22	0.1	35.1	0.5
cunner	15	0	2.8	0
smallmouth flounder	15	0	1.0	0
ocean pout	12	0	3.2	0
Atlantic sturgeon	5	0	41.8	0.5
sea raven	5	0	3.6	0
oyster toadfish	4	0	1.9	0
longhorn sculpin	3	0	0.8	0
northern pipefish	2	0	0.2	0
Atlantic silverside	1	0	0.1	0
grubby	1	0	0.1	0
pollock	1	0	0.1	0
rock gunnel	1	0	0.1	0
sea lamprey	1	0	0.1	0
yellowtail flounder	1	0	1.0	0
Total	**36,548**		**7,608.1**	

	Fall			
species	count	%	weight	%
scup	63,918	45.2	3,309.1	33.3
butterfish	44,645	31.6	1,193.9	12.0
weakfish	17,355	12.3	552.8	5.6
bluefish	9,339	6.6	1,743.2	17.6
bay anchovy	1,119	0.8	7.6	0.1
moonfish	979	0.7	12.0	0.1
windowpane flounder	570	0.4	44.2	0.4
alewife	469	0.3	18.2	0.2
Atlantic menhaden	393	0.3	50.2	0.5
smooth dogfish	373	0.3	1,548.4	15.6
striped searobin	328	0.2	52.5	0.5
northern searobin	229	0.2	7.3	0.1
summer flounder	219	0.2	213.8	2.2
winter flounder	215	0.2	37.1	0.4
little skate	201	0.1	101.2	1.0
fourspot flounder	173	0.1	28.1	0.3
striped bass	134	0.1	411.9	4.1
red hake	103	0.1	12.4	0.1
American shad	83	0.1	4.3	0
clearnose skate	75	0.1	158.2	1.6
spotted hake	62	0	9.2	0.1
blueback herring	55	0	2.7	0
black sea bass	55	0	17.7	0.2
smallmouth flounder	33	0	1.6	0
tautog	31	0	62.9	0.6
hogchoker	28	0	3.8	0
Atlantic sturgeon	13	0	294.6	3
rough scad	13	0	0.7	0
hickory shad	10	0	3.3	0
Atlantic mackerel	9	0	0.8	0
glasseye snapper	8	0	0.7	0
northern puffer	8	0	0.5	0
winter skate	7	0	22.8	0.2
striped anchovy	6	0	0.1	0
silver hake	6	0	0.5	0
yellow jack	5	0	0.4	0
northern kingfish	4	0	0.4	0
fourbeard rockling	3	0	0.3	0
round scad	3	0	0.3	0
Atlantic herring	2	0	0.2	0
American eel	2	0	0.9	0
inshore lizardfish	2	0	0.2	0
mackerel scad	2	0	0.1	0
northern sennet	2	0	0.2	0
cunner	1	0	0.2	0
gizzard shad	1	0	0.1	0
striped burrfish	1	0	0.5	0
oyster toadfish	1	0	0.1	0
Total	**141,293**		**9,932.2**	

Table 2.18. Total catch of invertebrates taken in the spring and fall sampling periods, 2007.
Species are ranked by total weight (kg). Number of tows (sample sizes): Spring = 120, Fall = 80.

	Spring			
species	**count**	**%**	**weight**	**%**
American lobster	1,428	50.5	331.2	29.4
horseshoe crab	166	5.9	273	24.3
spider crab	nc	nc	120.1	10.7
mixed sponge species	nc	nc	84.3	7.5
bushy bryozoan	nc	nc	76.2	6.8
long-finned squid	888	31.4	64.6	5.7
rock crab	nc	nc	37.2	3.3
channeled whelk	125	4.4	20.5	1.8
boring sponge	nc	nc	17.7	1.6
flat claw hermit crab	nc	nc	16.1	1.4
starfish spp.	nc	nc	15.6	1.4
deadman's fingers sponge	nc	nc	10.3	0.9
blue mussel	nc	nc	8.3	0.7
mantis shrimp	143	5.1	6.7	0.6
common slipper shell	nc	nc	5.7	0.5
blue crab	33	1.2	5.6	0.5
northern moon snail	nc	nc	4.1	0.4
sand shrimp	nc	nc	3.5	0.3
sea grape	nc	nc	3.5	0.3
lady crab	nc	nc	3.2	0.3
knobbed whelk	7	0.2	3.1	0.3
mud crabs	nc	nc	3	0.3
hydroid spp.	nc	nc	2.5	0.2
hard clams	nc	nc	1.5	0.1
rubbery bryzoan	nc	nc	1.3	0.1
arks	nc	nc	1.3	0.1
common oyster	nc	nc	0.6	0.1
anemones	16	0.6	0.6	0.1
surf clam	7	0.2	0.6	0.1
lion's mane jellyfish	11	0.4	0.5	0
red bearded sponge	nc	nc	0.4	0
star coral	nc	nc	0.3	0
purple sea urchin	1	0	0.3	0
northern red shrimp	1	0	0.2	0
blood star	nc	nc	0.1	0
green sea urchin	1	0	0.1	0
Japanese shore crab	nc	nc	0.1	0
Total	**2,827**		**1,123.9**	

Note: nc= not counted

	Fall			
species	**count**	**%**	**weight**	**%**
long-finned squid	23,325	94.8	709	51.0
horseshoe crab	167	0.7	323.4	23.3
lion's mane jellyfish	649	2.6	129.3	9.3
American lobster	220	0.9	65.3	4.7
spider crab	nc	nc	45.4	3.3
bushy bryozoan	nc	nc	31.2	2.2
channeled whelk	70	0.3	12.9	0.9
blue mussel	nc	nc	12.1	0.9
flat claw hermit crab	nc	nc	11.4	0.8
lady crab	nc	nc	8.3	0.6
knobbed whelk	16	0.1	8	0.6
blue crab	35	0.1	7.4	0.5
mantis shrimp	121	0.5	5.4	0.4
starfish spp.	nc	nc	4.7	0.3
rock crab	nc	nc	4.2	0.3
common slipper shell	nc	nc	3.6	0.3
arks	2	0	1.4	0.1
mud crabs	nc	nc	1.3	0.1
deadman's fingers sponge	nc	nc	1.2	0.1
hard clams	1	0	0.7	0.1
common oyster	nc	nc	0.5	0
surf clam	3	0	0.4	0
purple sea urchin	1	0	0.3	0
water jelly	1	0	0.3	0
jonah crab	1	0	0.2	0
northern moon snail	nc	nc	0.2	0
mixed sponge species	nc	nc	0.2	0
red bearded sponge	nc	nc	0.1	0
coastal mud shrimp	1	0	0.1	0
star coral	nc	nc	0.1	0
rubbery bryzoan	nc	nc	0.1	0
tunicates, misc	1	0	0.1	0
Total	**24,614**		**1,388.8**	

Table 2.19. Spring indices of abundance for selected species, 1984-2007.

The geometric mean count per tow was calculated for 38 finfish and 2 invertebrates using April-June data. An asterisk next to the species name and time series mean, indicates that the spring index is a better estimate than the fall index (Simpson et al. 1991). Two asterisks indicate that both the spring and the fall indices provide good estimates.

	Spring																								84-06
Species	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**Mean**
alewife *	0.43	0.10	0.66	1.00	0.47	0.72	0.54	0.39	0.39	0.84	1.83	0.96	2.18	1.44	1.11	1.89	1.53	0.75	0.95	1.14	1.86	1.30	0.78	1.62	1.01
black sea bass *	0.16	0.27	0.12	0.05	0.04	0.08	0.10	0.07	0.03	0.07	0.12	0.07	0.11	0.10	0.04	0.08	0.22	0.25	0.67	0.21	0.22	0.07	0.05	0.26	0.14
bluefish	0.00	0.02	0.19	0.07	0.11	0.07	0.09	0.52	0.31	0.05	0.07	0.03	0.07	0.18	0.12	0.24	0.08	0.07	0.30	0.16	0.11	0.11	0.22	0.16	
butterfish	8.92	0.62	2.38	0.25	0.46	0.80	1.60	2.17	2.60	0.48	1.71	1.06	3.22	6.16	6.51	1.90	3.35	2.94	7.09	3.17	2.10	2.27	18.67	3.48	
cunner *	1.28	0.29	0.28	0.22	0.16	0.29	0.55	0.25	0.11	0.20	0.07	0.16	0.07	0.15	0.18	0.18	0.17	0.20	0.25	0.11	0.07	0.08	0.06	0.05	0.23
dogfish, smooth	0.39	0.46	0.45	0.21	0.49	0.48	0.34	0.46	0.56	0.26	0.60	0.33	0.44	0.24	0.47	0.54	0.53	0.55	1.19	0.63	0.53	0.44	1.33	0.64	
dogfish, spiny *	0.00	0.15	0.14	0.07	0.12	0.18	0.19	0.06	0.04	0.01	0.06	0.00	0.00	0.01	0.01	0.01	0.00	0.04	0.02	0.03	0.03	0.03	0.09	0.12	0.06
flounder, fourspot *	18.18	10.55	3.15	2.38	4.62	4.14	6.53	8.46	9.33	2.37	2.59	5.00	4.82	7.54	4.34	3.53	4.57	3.83	4.82	2.78	2.56	1.14	1.86	3.37	5.18
flounder, summer	0.63	0.44	0.95	1.06	0.50	0.10	0.35	0.64	0.55	0.51	0.86	0.28	0.96	1.00	1.30	1.44	1.79	1.75	3.19	3.42	1.84	0.80	0.61	2.51	
flounder, windowpane *	172.27	119.82	67.82	40.33	66.02	101.71	39.74	30.87	13.17	24.71	23.54	10.69	37.47	30.43	24.27	14.19	8.11	9.04	5.44	4.90	5.96	2.29	2.98	15.65	37.21
flounder, winter *	111.96	66.81	61.50	67.92	100.96	135.23	170.12	118.95	54.31	53.34	74.35	48.11	93.05	57.41	59.36	32.80	33.67	46.40	25.49	21.22	16.45	17.47	7.50	20.58	64.10
hake, red *	15.04	3.02	4.67	3.84	3.64	13.12	4.75	4.35	4.83	6.00	0.89	4.12	1.49	1.41	6.28	7.21	4.01	2.64	5.11	1.18	1.37	1.06	1.30	3.85	4.41
hake, silver *	7.53	1.83	1.19	2.48	2.25	4.86	5.53	3.87	2.67	1.56	1.73	4.88	1.15	4.32	4.64	12.57	2.28	7.64	5.92	0.76	2.63	0.57	4.75	0.98	3.81
hake, spotted	0.00	0.00	0.02	0.01	0.22	0.01	0.02	0.22	0.08	0.07	0.02	0.21	0.31	0.25	0.26	1.11	2.68	1.52	2.05	1.18	0.65	0.37	1.47	1.04	
herring, Atlantic *	0.00	0.58	1.12	2.77	2.16	2.27	5.73	4.91	2.73	7.24	2.95	4.23	1.70	2.53	1.06	0.99	1.21	0.85	0.41	0.49	0.53	1.33	0.31	1.66	2.09
herring, blueback	5.42	0.30	0.34	0.14	0.03	0.05	0.08	0.11	0.20	0.08	0.55	0.29	0.28	0.25	0.15	0.02	0.37	0.19	0.15	0.27	0.46	0.33	0.13	0.29	
hogchoker	0.63	0.45	0.14	0.15	0.18	0.21	0.17	0.14	0.24	0.08	0.11	0.03	0.10	0.05	0.03	0.06	0.11	0.10	0.15	0.15	0.19	0.11	0.08	0.17	
kingfish, northern	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
lobster, American**	7.09	3.1	2.76	3.3	2.24	3.76	5.33	7.74	7.88	6.71	4.1	8.36	6.77	7.67	18.52	12.49	11.01	7.56	6.31	3.89	2.50	2.43	1.94	3.22	6.24
mackerel, Spanish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
menhaden, Atlantic	0.09	0.11	0.18	0.39	0.17	0.14	0.10	0.03	0.14	0.07	0.05	0.11	0.02	0.02	0.00	0.01	0.03	0.00	0.13	0.01	0.02	0.01	0.04	0.13	
moonfish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
ocean pout *	0.21	0.04	0.06	0.06	0.07	0.12	0.14	0.14	0.14	0.23	0.10	0.09	0.11	0.08	0.06	0.06	0.08	0.03	0.06	0.06	0.06	0.02	0.04	0.05	0.09
rockling, fourbeard*	2.87	0.37	0.43	0.56	0.61	0.88	0.82	0.58	0.80	0.59	0.27	0.58	0.33	0.60	0.47	0.66	0.55	0.57	0.37	0.36	0.48	0.35	0.09	0.35	0.62
scad, rough	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
sculpin, longhorn *	0.20	0.33	0.18	0.15	0.15	0.24	0.65	0.39	0.12	0.06	0.04	0.03	0.04	0.02	0.01	0.01	0.06	0.02	0.02	0.01	0.03	0.00	0.00	0.02	0.12
scup	2.80	5.65	3.40	1.17	1.11	2.77	2.25	3.09	1.75	1.32	1.88	5.24	3.25	3.23	4.25	2.22	28.46	7.20	50.42	4.84	8.12	3.48	59.05	10.00	
sea raven*	0.36	0.37	0.29	0.37	0.17	0.11	0.19	0.09	0.03	0.01	0.01	0.01	0.01	0.01	0.10	0.04	0.08	0.04	0.06	0.01	0.04	0.02	0.00	0.03	0.11
searobin, northern *	6.48	14.38	0.82	0.71	1.13	0.85	0.62	1.36	1.18	1.26	1.21	1.07	1.26	1.73	0.72	1.03	2.66	1.55	2.67	1.16	0.80	0.32	1.19	0.82	2.01
searobin, striped	1.30	1.78	1.33	0.60	0.57	0.66	0.71	1.55	1.52	0.46	0.93	1.28	0.82	0.71	1.48	1.82	3.69	2.36	3.83	1.85	1.40	0.31	0.89	0.95	
shad, American	0.10	1.36	0.57	0.92	0.44	0.90	0.34	0.54	0.75	0.29	0.68	0.49	0.48	1.08	0.86	0.80	0.38	0.08	0.61	0.20	0.34	0.28	0.25	0.44	
shad, hickory	0.52	0.00	0.01	0.00	0.01	0.00	0.00	0.01	0.02	0.01	0.02	0.01	0.07	0.05	0.09	0.12	0.09	0.04	0.15	0.09	0.10	0.25	0.27	0.12	
skate, little *	5.71	7.22	7.19	5.34	15.51	21.24	11.50	25.19	12.41	12.03	16.96	6.58	18.78	11.23	11.65	7.56	6.21	8.03	7.63	7.03	6.54	1.65	1.40	2.82	10.20
skate, winter*	0.00	0.12	0.15	0.07	0.37	0.34	0.22	0.23	0.18	0.23	0.14	0.12	0.24	0.16	0.24	0.17	0.16	0.10	0.13	0.16	0.21	0.09	0.13	0.15	0.17
spot	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
squid, long-finned**	nc	nc	3.24	2.56	9.37	4.98	7.87	7.18	6.44	4.23	3.82	6.21	3.24	5.14	3.33	3.49	2.70	2.73	3.22	2.50	9.43	4.76	11.55	2.14	5.14
striped bass *	0.02	0.00	0.00	0.05	0.04	0.06	0.16	0.15	0.22	0.27	0.30	0.59	0.63	0.85	0.97	1.10	0.84	0.61	1.30	0.87	0.56	1.17	0.61	1.02	0.49
sturgeon, Atlantic	0.06	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.03	0.02	0.03	0.01	0.01	0.01	0.05	0.04	0.02	0.01	0.05	0.00	0.00	0.02	0.05	0.02	
tautog *	2.75	1.47	1.50	0.71	0.65	1.09	1.00	0.92	0.82	0.42	0.44	0.15	0.49	0.40	0.42	0.40	0.57	0.70	0.91	0.52	0.54	0.57	0.64	0.48	0.79
weakfish	0.02	0.00	0.07	0.01	0.04	0.03	0.05	0.18	0.12	0.06	0.03	0.11	0.12	0.27	0.24	0.28	0.11	0.17	0.12	0.02	0.10	0.17	0.14	0.07	

Table 2.20. Fall indices of abundance for selected species, 1984-2007.

The geometric mean count per tow was calculated for 38 finfish and 2 invertebrates using September-October data. An asterisk next to the species name and a time series mean, indicates that the fall index provides a better estimate than the spring index (Simpson et al. 1991). Two asterisks indicate that both the spring and the fall indices provide good estimates.

	Fall																								84-06
Species	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**Mean**
alewife	0.42	0.01	0.05	0.04	0.19	0.16	0.11	0.07	0.19	0.40	0.66	0.16	0.24	1.23	0.11	0.42	0.25	0.55	0.22	0.58	0.26	0.43	0.05	0.95	
black sea bass	0.03	0.11	0.01	0.03	0.05	0.01	0.06	0.14	0.01	0.04	0.06	0.01	0.05	0.03	0.07	0.23	0.18	0.43	1.01	0.15	0.35	0.17	0.24	0.36	
bluefish *	23.41	19.01	13.66	14.32	15.49	26.25	23.88	33.43	25.22	18.92	32.06	24.46	20.80	37.90	31.41	45.31	20.57	24.24	18.75	28.53	29.13	18.89	15.66	30.66	24.40
butterfish *	51.93	89.72	63.41	60.09	146.67	174.87	154.65	170.59	301.72	87.73	93.05	320.06	173.74	186.62	355.49	477.91	125.97	142.89	165.07	112.86	175.37	197.24	140.23	154.53	172.52
cunner	0.09	0.05	0.05	0.06	0.05	0.06	0.05	0.08	0.09	0.05	0.05	0.03	0.01	0.05	0.08	0.06	0.07	0.04	0.03	0.06	0.04	0.05	0.02	0.01	
dogfish, smooth *	2.47	1.92	1.43	0.81	0.91	0.41	0.55	0.46	0.78	0.95	0.49	0.46	0.80	0.59	0.72	0.93	1.88	1.69	3.58	3.10	1.44	1.41	0.94	2.27	1.25
dogfish, spiny	0.04	0.00	0.00	0.03	0.01	0.00	0.12	0.00	0.02	0.05	0.10	0.00	0.01	0.04	0.07	0.03	0.04	0.16	0.05	0.00	0.18	0.22	0.00	0.00	
flounder, fourspot	1.18	1.03	0.50	0.37	1.73	0.80	1.47	0.74	1.44	1.55	1.33	0.44	2.05	3.29	1.63	1.19	1.15	1.17	1.09	0.96	1.14	1.11	0.65	0.73	
flounder, summer *	0.99	1.19	1.73	1.40	1.42	0.14	0.87	1.26	1.02	1.11	0.55	0.54	2.19	2.50	1.72	2.68	1.91	4.42	6.12	3.39	1.95	2.41	1.35	1.89	1.86
flounder, windowpane	22.11	11.56	7.32	6.85	12.10	8.68	7.19	4.71	6.79	9.48	3.89	2.43	28.13	13.36	4.64	2.53	2.81	1.81	1.86	3.39	2.27	6.14	1.54	3.65	
flounder, winter	7.31	2.75	3.86	5.42	10.07	11.03	15.42	6.10	6.41	9.32	6.13	3.77	12.29	7.75	6.69	8.66	7.08	3.07	1.74	1.25	2.19	2.15	0.94	0.82	
hake, red	0.74	0.33	1.00	0.37	0.75	1.14	0.44	0.33	0.39	1.81	0.59	0.20	1.62	0.89	0.53	0.29	1.20	0.41	0.15	0.73	0.76	0.45	0.33	0.54	
hake, silver	0.55	0.23	1.65	0.01	0.30	0.60	0.96	0.32	0.48	0.20	3.34	0.22	0.06	0.80	0.07	0.16	0.09	0.07	0.07	0.18	0.18	0.09	0.64	0.04	
hake, spotted *	0.28	0.17	0.21	0.14	0.10	0.05	0.11	0.03	0.39	1.48	0.50	0.16	1.68	0.12	0.41	0.61	1.18	0.35	0.86	1.95	0.14	0.32	0.56	0.39	0.51
herring, Atlantic	0.00	0.00	0.01	0.02	0.40	0.08	0.04	0.03	1.47	0.14	0.14	0.00	0.19	0.06	0.25	0.00	0.02	0.00	0.00	0.38	0.02	0.02	0.03	0.02	
herring, blueback *	0.38	0.16	0.07	0.13	0.53	0.34	0.10	0.04	0.08	0.11	0.93	0.27	0.05	0.75	0.16	0.06	0.06	0.20	0.06	0.10	0.09	0.06	0.15	0.24	0.21
hogchoker *	0.90	0.56	0.21	0.17	0.30	0.17	0.22	0.38	0.15	0.18	0.05	0.07	0.18	0.05	0.05	0.19	0.10	0.15	0.21	0.26	0.15	0.13	0.11	0.20	0.21
kingfish, northern *	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.02	0.06	0.03	0.19	0.04	0.04	0.12	0.05	0.01	0.02	0.01	0.00	0.04	0.03	0.00	0.04	0.03
lobster, American **	7.41	3.33	4.75	5.95	3.54	3.75	7.29	9.90	9.52	11.50	10.13	8.05	10.07	19.60	10.47	11.18	6.83	4.28	2.68	3.03	3.68	2.10	1.48	1.21	6.98
mackerel, Spanish *	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.01	0.42	0.23	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.03
menhaden, Atlantic *	0.23	0.15	0.79	0.14	0.13	0.45	0.66	0.59	2.00	0.40	1.02	0.56	0.43	0.57	0.73	1.08	0.97	0.32	0.76	0.95	1.63	0.94	0.23	0.80	0.68
moonfish *	0.05	0.33	0.11	0.04	0.41	0.10	0.04	0.17	0.22	0.04	0.34	0.25	1.99	0.91	2.08	1.15	2.11	0.82	1.36	0.69	0.74	1.55	1.51	1.66	0.74
ocean pout	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
rockling, fourbeard	0.08	0.01	0.04	0.05	0.21	0.15	0.07	0.04	0.06	0.03	0.06	0.01	0.11	0.07	0.03	0.04	0.12	0.03	0.01	0.04	0.04	0.01	0.00	0.02	
scad, rough *	0.13	0.08	0.03	0.27	0.42	0.08	0.08	0.01	0.00	0.21	0.03	0.00	0.18	0.05	0.00	0.00	0.00	0.07	0.07	0.14	0.09	0.19	0.15	0.08	0.10
sculpin, longhorn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
scup *	10.72	30.97	25.76	18.54	39.70	65.09	69.48	311.57	83.73	77.06	92.52	59.14	61.46	41.28	103.27	537.68	521.10	177.64	348.70	152.23	291.46	424.06	116.75	475.29	159.13
sea raven	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
searobin, northern	0.20	0.22	0.31	0.03	0.38	0.18	0.43	0.43	0.15	0.25	0.80	0.12	0.27	0.14	0.93	0.62	0.47	1.15	1.25	0.51	1.03	0.68	0.21	1.05	
searobin, striped *	2.75	3.44	1.64	0.90	3.44	3.83	2.39	1.97	2.75	4.44	2.00	0.74	4.03	2.62	3.68	4.48	5.68	3.34	4.85	6.44	4.67	3.26	0.81	2.25	3.22
shad, American *	3.13	0.19	0.27	0.29	2.66	3.10	0.65	0.72	0.54	1.11	1.84	1.90	0.27	0.91	1.22	1.73	0.55	0.41	0.76	0.75	0.95	0.54	0.12	0.38	1.07
shad, hickory *	0.02	0.01	0.03	0.01	0.00	0.00	0.01	0.00	0.05	0.04	0.10	0.04	0.09	0.10	0.05	0.12	0.09	0.03	0.04	0.09	0.13	0.25	0.24	0.08	0.07
skate, little	4.41	3.62	4.01	2.72	8.13	4.31	7.50	5.24	5.52	10.00	6.41	3.37	11.55	6.90	7.73	5.23	5.25	5.07	5.39	2.99	3.12	3.90	1.03	1.09	
skate, winter	0.00	0.01	0.00	0.00	0.03	0.03	0.05	0.02	0.07	0.09	0.12	0.07	0.17	0.08	0.05	0.06	0.01	0.13	0.13	0.00	0.07	0.10	0.00	0.06	
spot *	0.00	0.18	0.20	0.02	0.09	0.00	0.04	0.02	0.00	0.38	0.18	0.03	0.99	0.08	0.00	0.28	0.63	0.08	0.35	0.00	0.07	0.00	0.19	0.00	0.17
squid, long-finned **	nc	nc	27.40	28.60	159.16	85.60	69.12	62.97	172.95	272.11	127.96	155.28	180.99	68.57	202.29	132.50	109.87	60.18	35.48	269.32	94.47	81.12	70.58	179.39	117.45
striped bass	0.01	0.00	0.01	0.01	0.03	0.00	0.00	0.05	0.05	0.09	0.06	0.08	0.13	0.40	0.18	0.23	0.27	0.23	0.37	0.12	0.77	0.25	0.47	0.38	
sturgeon, Atlantic *	0.03	0.01	0.03	0.03	0.00	0.02	0.02	0.01	0.08	0.08	0.06	0.02	0.01	0.02	0.02	0.07	0.03	0.08	0.05	0.10	0.04	0.03	0.10	0.05	0.04
tautog	0.72	0.32	0.22	0.50	0.25	0.17	0.16	0.23	0.20	0.15	0.14	0.11	0.07	0.11	0.23	0.36	0.23	0.20	0.26	0.37	0.16	0.19	0.20	0.13	
weakfish *	1.55	6.35	13.57	0.73	3.54	8.69	5.71	12.11	3.22	4.18	11.21	5.64	15.49	12.93	5.28	31.36	63.42	40.51	41.45	49.46	59.07	26.00	1.50	63.96	18.39

Table 2.21. Finfish and invertebrate biomass indices for the spring sampling period, 1992-2007.
The geometric mean weight (kg) per tow was calculated for 38 finfish and 15 invertebrate species for the spring (April-June) sampling period.

	Spring															
	1992	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
alewife	0.06	0.17	0.32	0.15	0.50	0.25	0.20	0.37	0.34	0.15	0.25	0.19	0.25	0.22	0.21	0.32
black sea bass	0.01	0.03	0.06	0.03	0.06	0.06	0.02	0.05	0.07	0.17	0.40	0.17	0.15	0.07	0.04	0.16
bluefish	0.45	0.08	0.13	0.04	0.10	0.23	0.17	0.35	0.09	0.08	0.36	0.20	0.12	0.14	0.23	0.21
butterfish	0.43	0.10	0.31	0.19	0.73	1.27	1.06	0.52	0.69	0.79	1.48	0.64	0.41	0.55	2.30	0.66
cunner	0.02	0.04	0.01	0.03	0.02	0.03	0.04	0.04	0.03	0.04	0.05	0.03	0.02	0.02	0.01	0.02
dogfish, smooth	1.04	0.44	1.14	0.63	0.83	0.42	0.90	1.05	0.85	0.82	2.31	1.10	0.87	0.77	2.83	1.14
dogfish, spiny	0.10	0.02	0.12	0.00	0.00	0.01	0.03	0.02	0.00	0.08	0.06	0.07	0.07	0.05	0.21	0.23
flounder, fourspot	2.19	0.75	0.75	1.48	1.37	2.08	1.28	0.96	1.31	1.28	1.35	1.01	1.03	0.44	0.60	1.05
flounder, summer	0.35	0.27	0.48	0.16	0.53	0.60	1.15	1.09	1.35	1.21	2.38	2.45	1.69	0.67	0.61	1.72
flounder, windowpane	1.96	2.53	2.96	1.60	4.76	4.16	3.21	2.38	1.69	1.97	1.31	1.21	1.32	0.54	0.63	2.51
flounder, winter	8.72	7.54	9.44	6.51	14.61	10.63	9.65	6.67	7.46	9.77	6.31	6.64	3.87	2.94	1.65	4.99
hake, red	0.78	0.85	0.14	0.66	0.21	0.33	0.94	1.05	0.59	0.45	0.96	0.13	0.20	0.22	0.25	0.67
hake, silver	0.20	0.14	0.40	0.36	0.12	0.39	0.48	0.56	0.19	0.54	0.52	0.06	0.16	0.05	0.33	0.10
hake, spotted	0.01	0.01	0.00	0.02	0.03	0.09	0.03	0.13	0.27	0.17	0.20	0.13	0.18	0.05	0.14	0.11
herring, Atlantic	1.06	2.03	1.09	1.77	0.55	0.88	0.25	0.22	0.42	0.26	0.14	0.19	0.12	0.32	0.09	0.55
herring, blueback	0.05	0.02	0.06	0.03	0.04	0.04	0.02	0.00	0.04	0.02	0.01	0.02	0.04	0.04	0.02	0.04
hogchoker	0.04	0.02	0.02	0.01	0.02	0.01	0.01	0.01	0.03	0.04	0.04	0.04	0.04	0.03	0.02	0.05
kingfish, northern	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
mackerel, Spanish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
menhaden, Atlantic	0.07	0.03	0.03	0.04	0.01	0.01	0.00	0.00	0.02	0.00	0.03	0.01	0.01	0.00	0.02	0.07
moonfish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ocean pout	0.07	0.09	0.04	0.04	0.04	0.03	0.02	0.02	0.03	0.01	0.03	0.02	0.03	0.00	0.01	0.02
rockling, fourbeard	0.13	0.10	0.05	0.10	0.05	0.11	0.08	0.13	0.09	0.12	0.06	0.06	0.08	0.05	0.02	0.05
scad, rough	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
sculpin, longhorn	0.06	0.02	0.01	0.01	0.01	0.01	0.01	0.00	0.03	0.01	0.01	0.01	0.02	0.00	0.00	0.01
scup	0.48	0.49	0.58	0.65	0.73	0.75	0.75	0.56	4.56	2.85	13.16	2.28	3.93	1.65	10.41	3.32
sea raven	0.03	0.00	0.00	0.00	0.01	0.00	0.05	0.03	0.05	0.02	0.03	0.01	0.01	0.00	0.00	0.02
searobin, northern	0.26	0.35	0.28	0.27	0.28	0.33	0.17	0.22	0.70	0.51	0.51	0.40	0.29	0.08	0.35	0.26
searobin, striped	0.86	0.30	0.51	0.77	0.46	0.40	0.87	1.14	1.99	1.40	2.21	1.21	0.97	0.22	0.49	0.56
shad, American	0.29	0.09	0.21	0.10	0.11	0.23	0.13	0.20	0.05	0.01	0.11	0.03	0.04	0.05	0.05	0.07
shad, hickory	0.01	0.01	0.01	0.01	0.03	0.02	0.05	0.06	0.05	0.03	0.09	0.05	0.04	0.10	0.11	0.05
skate, little	5.89	5.99	8.87	3.38	9.35	6.00	6.27	4.25	3.43	4.47	4.56	4.35	4.01	1.05	0.91	1.82
skate, winter	0.37	0.52	0.28	0.21	0.46	0.29	0.46	0.27	0.25	0.21	0.25	0.24	0.28	0.12	0.22	0.23
spot	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
striped bass	0.31	0.43	0.45	0.49	0.77	1.13	1.15	1.86	1.13	0.93	2.10	1.38	0.87	1.52	1.27	1.37
sturgeon, Atlantic	0.05	0.05	0.08	0.03	0.02	0.04	0.13	0.08	0.05	0.03	0.16	0.00	0.00	0.05	0.15	0.06
tautog	1.00	0.51	0.51	0.19	0.63	0.42	0.49	0.51	0.59	0.78	1.09	0.61	0.62	0.65	0.84	0.61
weakfish	0.11	0.03	0.01	0.05	0.06	0.15	0.20	0.31	0.12	0.11	0.12	0.03	0.04	0.09	0.12	0.08
Invertebrates																
crab, blue	0.03	0.02	0.00	0.02	0.00	0.02	0.02	0.03	0.04	0.01	0.04	0.01	0.01	0.00	0.01	0.04
crab, flat claw hermit	0.15	0.08	0.18	0.02	0.09	0.04	0.10	0.10	0.07	0.12	0.14	0.32	0.17	0.05	0.04	0.11
crab, horseshoe	0.35	0.45	0.60	0.13	0.61	0.33	0.55	0.80	0.74	0.94	0.76	1.33	0.96	0.39	0.25	0.86
crab, lady	0.25	0.23	0.16	0.18	0.50	0.50	0.39	0.16	0.13	0.04	0.07	0.01	0.01	0.01	0.04	0.02
crab, rock	1.17	0.61	0.64	0.14	0.45	0.32	1.04	0.55	0.25	0.35	0.31	0.36	0.14	0.05	0.16	0.16
crab, spider	0.98	1.08	1.22	0.32	0.96	0.52	0.69	0.39	0.35	1.02	1.30	1.85	1.42	0.36	0.27	0.55
jellyfish, lion's mane	0.01	0.11	0.01	0.15	0.10	0.08	0.19	0.06	0.06	0.03	0.02	0.23	0.14	0.38	0.11	0.00
lobster, American	2.80	2.32	1.53	3.24	2.72	3.02	6.56	4.95	3.90	3.04	2.55	1.48	1.03	1.00	0.84	1.24
mussel, blue	0.31	0.01	0.07	0.03	0.03	0.01	0.05	0.03	0.04	0.01	0.17	0.08	0.11	0.09	0.04	0.04
northern moon shell	0.05	0.04	0.12	0.03	0.02	0.02	0.04	0.05	0.05	0.08	0.10	0.10	0.06	0.02	0.00	0.03
oyster, common	0.04	0.00	0.06	0.00	0.00	0.01	0.02	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
shrimp, mantis	0.06	0.13	0.05	0.05	0.04	0.03	0.03	0.07	0.18	0.08	0.04	0.03	0.03	0.01	0.02	0.05
squid, long-finned	1.01	0.91	0.67	0.89	0.55	0.99	0.41	0.62	0.51	0.41	0.42	0.42	1.69	1.08	1.41	0.33
starfish sp.	0.22	0.13	0.06	0.02	0.03	0.03	0.05	0.04	0.06	0.28	0.24	0.29	0.12	0.06	0.03	0.09
whelks	0.16	0.04	0.07	0.01	0.07	0.03	0.06	0.08	0.09	0.13	0.12	0.31	0.15	0.05	0.05	0.12

Table 2.22. Finfish and invertebrate biomass indices for the fall sampling period, 1992-2007.
The geometric mean weight (kg) per tow was calculated for 38 finfish and 15 invertebrate species for the fall (Sept-Oct) sampling period.

	Fall															
	1992	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
alewife	0.03	0.08	0.10	0.02	0.04	0.22	0.02	0.07	0.02	0.09	0.03	0.09	0.04	0.05	0.01	0.14
black sea bass	0.01	0.01	0.01	0.00	0.01	0.01	0.05	0.07	0.07	0.23	0.31	0.08	0.08	0.08	0.07	0.14
bluefish	16.39	9.91	9.45	8.09	7.62	6.53	5.06	8.51	8.34	6.11	7.87	8.99	16.39	8.75	3.92	9.74
butterfish	6.31	4.12	3.40	10.26	9.30	6.97	13.27	15.43	4.45	7.80	6.56	3.47	6.24	7.85	7.73	5.82
cunner	0.02	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.00	0.00
dogfish, smooth	1.20	1.75	0.76	0.85	1.16	1.09	1.32	1.27	2.85	3.02	6.09	6.18	2.95	2.70	2.46	6.11
dogfish, spiny	0.03	0.08	0.18	0.00	0.01	0.05	0.10	0.05	0.06	0.24	0.07	0.00	0.27	0.34	0.00	0.00
flounder, fourspot	0.14	0.16	0.14	0.08	0.48	0.24	0.19	0.14	0.35	0.17	0.25	0.30	0.29	0.19	0.06	0.19
flounder, summer	0.87	0.85	0.47	0.43	1.61	1.84	1.77	2.27	1.77	3.19	4.41	3.27	1.74	1.93	1.36	1.63
flounder, windowpane	0.51	0.73	0.42	0.32	2.11	1.30	0.61	0.38	0.45	0.30	0.38	0.43	0.26	0.57	0.29	0.42
flounder, winter	0.84	0.99	0.78	0.45	1.56	1.04	0.87	1.37	1.28	0.62	0.55	0.34	0.32	0.41	0.16	0.21
hake, red	0.11	0.34	0.19	0.04	0.48	0.18	0.10	0.06	0.32	0.07	0.02	0.19	0.14	0.10	0.06	0.12
hake, silver	0.04	0.02	0.28	0.02	0.01	0.06	0.01	0.03	0.01	0.01	0.01	0.02	0.02	0.01	0.08	0.01
hake, spotted	0.09	0.30	0.15	0.04	0.37	0.03	0.08	0.17	0.34	0.09	0.19	0.41	0.03	0.08	0.17	0.10
herring, Atlantic	0.07	0.01	0.01	0.00	0.02	0.01	0.02	0.00	0.00	0.00	0.00	0.03	0.00	0.01	0.00	0.00
herring, blueback	0.01	0.01	0.12	0.03	0.01	0.09	0.02	0.01	0.01	0.05	0.01	0.01	0.01	0.01	0.01	0.03
hogchoker	0.02	0.03	0.01	0.01	0.04	0.01	0.01	0.04	0.02	0.03	0.05	0.04	0.03	0.03	0.02	0.04
kingfish, northern	0.00	0.01	0.00	0.03	0.01	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00
mackerel, Spanish	0.01	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00
menhaden, Atlantic	0.36	0.22	0.36	0.25	0.25	0.24	0.09	0.39	0.22	0.05	0.35	0.25	0.49	0.43	0.06	0.29
moonfish	0.02	0.00	0.03	0.03	0.12	0.05	0.13	0.09	0.13	0.04	0.08	0.03	0.04	0.07	0.07	0.11
ocean pout	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
rockling, fourbeard	0.01	0.00	0.01	0.00	0.02	0.01	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.00
scad, rough	0.00	0.03	0.00	0.00	0.02	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.01	0.01
sculpin, longhorn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
scup	4.96	3.72	3.33	4.63	3.68	2.49	4.50	22.72	30.76	11.28	23.69	28.95	16.31	13.79	10.49	24.15
sea raven	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
searobin, northern	0.02	0.05	0.06	0.02	0.04	0.02	0.08	0.06	0.08	0.13	0.18	0.11	0.11	0.09	0.05	0.08
searobin, striped	0.82	0.54	0.32	0.34	0.81	0.60	1.04	1.37	1.59	1.27	2.12	2.43	0.96	0.82	0.38	0.37
shad, American	0.14	0.35	0.39	0.43	0.06	0.16	0.26	0.42	0.14	0.07	0.16	0.17	0.15	0.10	0.02	0.05
shad, hickory	0.03	0.02	0.04	0.02	0.05	0.05	0.02	0.07	0.05	0.02	0.02	0.05	0.07	0.14	0.11	0.03
skate, little	2.47	4.61	3.47	1.78	5.66	3.81	4.06	2.85	2.92	2.88	3.00	1.96	2.02	2.32	0.67	0.65
skate, winter	0.11	0.15	0.21	0.09	0.25	0.10	0.09	0.08	0.01	0.21	0.21	0.00	0.11	0.16	0.00	0.12
spot	0.00	0.07	0.03	0.00	0.14	0.01	0.00	0.06	0.13	0.01	0.08	0.00	0.01	0.00	0.03	0.00
striped bass	0.09	0.16	0.11	0.15	0.21	0.68	0.38	0.39	0.51	0.48	0.70	0.26	1.25	0.48	0.88	0.64
sturgeon, Atlantic	0.21	0.19	0.13	0.10	0.02	0.06	0.04	0.21	0.08	0.23	0.18	0.27	0.09	0.12	0.23	0.13
tautog	0.22	0.22	0.15	0.09	0.07	0.14	0.27	0.31	0.30	0.20	0.27	0.43	0.21	0.23	0.23	0.16
weakfish	0.47	0.56	1.26	1.27	1.88	1.70	0.94	3.39	3.17	2.41	2.86	1.72	2.85	2.52	0.42	3.51
Invertebrates																
crab, blue	0.15	0.17	0.05	0.04	0.04	0.11	0.10	0.17	0.11	0.05	0.10	0.06	0.02	0.00	0.01	0.07
crab, flat claw hermit	0.17	0.40	0.15	0.11	0.26	0.16	0.35	0.16	0.17	0.33	0.30	0.13	0.18	0.16	0.05	0.12
crab, horseshoe	1.01	1.16	0.55	0.32	1.27	1.32	0.93	1.09	1.31	1.39	1.76	1.67	1.93	0.93	1.00	1.40
crab, lady	1.52	1.58	1.52	1.56	3.54	1.84	0.82	0.48	0.60	0.17	0.14	0.10	0.08	0.14	0.07	0.07
crab, rock	0.58	0.55	0.18	0.09	0.45	0.32	0.37	0.22	0.19	0.13	0.12	0.04	0.08	0.02	0.10	0.04
crab, spider	0.53	1.89	0.46	0.25	0.71	0.42	0.25	0.24	0.21	0.30	0.27	0.47	0.32	0.13	0.10	0.15
jellyfish, lion's mane	0.02	0.01	0.03	0.17	0.18	0.50	0.17	0.03	0.22	0.17	0.10	0.01	0.13	0.12	0.46	0.45
lobster, American	3.17	4.11	3.58	3.03	3.48	7.22	4.24	4.16	2.65	1.91	1.10	1.28	1.46	0.84	0.61	0.51
mussel, blue	0.07	0.06	0.12	0.02	0.00	0.01	0.09	0.00	0.04	0.12	0.11	0.02	0.10	0.10	0.02	0.07
northern moon shell	0.03	0.02	0.03	0.01	0.01	0.00	0.02	0.01	0.00	0.04	0.10	0.00	0.00	0.01	0.00	0.00
oyster, common	0.01	0.02	0.00	0.00	0.00	0.01	0.00	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01
shrimp, mantis	0.05	0.08	0.02	0.02	0.13	0.06	0.02	0.09	0.18	0.05	0.06	0.02	0.04	0.03	0.04	0.06
squid, long-finned	5.00	7.92	4.71	4.68	5.53	2.20	6.40	6.06	4.05	2.39	1.81	5.88	3.38	3.47	2.15	6.51
starfish sp.	0.11	0.08	0.07	0.00	0.01	0.02	0.05	0.02	0.12	0.22	0.09	0.01	0.10	0.11	0.02	0.05
whelks	0.28	0.28	0.06	0.08	0.22	0.10	0.27	0.23	0.38	0.52	0.38	0.24	0.24	0.20	0.08	0.20

Table 2.23. Bluefish indices of abundance, 1984-2007.
Using September and October length data, the geometric mean catch per tow was calculated for two age groups of bluefish: age-0 and all fish age 1 and older. Age-0 was defined as bluefish less than 30 cm fork length.

	Fall			
Year	**age 0 count / tow**	**age 0 kg / tow**	**ages 1+ count / tow**	**ages 1+ kg / tow**
1984	20.34	2.51	1.61	2.03
1985	11.27	1.64	4.16	6.25
1986	8.05	1.13	3.77	5.96
1987	9.01	0.88	3.11	4.85
1988	10.73	1.59	2.20	4.43
1989	21.07	3.17	1.92	3.80
1990	12.82	2.09	6.14	8.92
1991	22.57	2.75	5.59	8.49
1992	9.23	1.27	8.44	14.88
1993	11.61	1.96	3.34	7.11
1994	24.85	2.54	3.07	6.09
1995	16.85	2.48	4.07	5.32
1996	13.85	2.27	2.34	4.09
1997	31.26	2.56	2.35	3.68
1998	25.89	2.08	1.65	2.70
1999	39.19	5.43	0.86	1.61
2000	14.67	2.97	2.18	3.75
2001	19.04	2.11	2.62	3.87
2002	12.35	2.25	3.63	4.81
2003	16.85	3.16	2.16	3.31
2004	13.30	2.39	10.38	13.96
2005	12.10	2.39	2.65	5.04
2006	12.43	1.49	2.14	2.74
2007	23.98	4.14	2.44	4.22
84-06 mean	**16.93**	**2.31**	**3.49**	**5.55**

Table 2.24. Scup indices-at-age, 1984-2007.

Spring (May and June) and fall (September and October) catch and age data were used to determine the geometric mean indices-at-age[1]. The spring and fall age keys were used to expand length frequencies to age frequencies and then the spring and fall overall indices were proportioned by the percentage of fish in each age. The 0-10+ index represents the overall index (sum of ages 0-10+), and the adult 2+ index is provided as the sum of ages 2-10+ index. All fish older than age 9 were included in the age 10+ index[2].

Spring (May-June)

Year	0-10+	2+	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10+
1984	2.797	2.308	0	0.489	1.311	0.577	0.307	0.074	0.004	0.002	0	0	0.034
1985	5.648	2.707	0	2.941	2.002	0.327	0.244	0.047	0.025	0.050	0	0.004	0.008
1986	7.230	2.785	0	4.444	1.651	0.988	0.137	0.003	0.003	0.003	0	0	0.003
1987	2.186	1.758	0	0.428	1.646	0.071	0.034	0.007	0	0	0	0	0
1988	2.061	0.893	0	1.168	0.309	0.502	0.054	0.026	0	0	0	0	0.003
1989	6.249	0.615	0	5.634	0.563	0.034	0.016	0	0.001	0.001	0	0	0
1990	4.867	2.345	0	2.521	2.098	0.206	0.037	0.005	0	0	0	0	0
1991	7.046	2.795	0	4.251	1.436	1.258	0.086	0.012	0.002	0	0	0	0
1992	1.749	1.360	0	0.389	1.212	0.093	0.052	0.002	0	0.002	0	0	0
1993	2.530	2.492	0	0.038	2.286	0.189	0.006	0.006	0.002	0.002	0	0	0
1994	3.892	3.093	0	0.799	2.038	0.931	0.100	0.015	0.003	0.007	0	0	0
1995	13.587	0.645	0	12.943	0.387	0.199	0.052	0.003	0.003	0	0	0	0
1996	7.766	2.562	0	5.204	2.477	0.074	0.004	0.006	0.002	0	0	0	0
1997	7.558	4.394	0	3.164	2.610	1.679	0.063	0.009	0.023	0.005	0.005	0	0
1998	10.826	0.761	0	10.065	0.578	0.115	0.063	0.005	0	0	0	0	0
1999	4.732	2.021	0	2.711	1.755	0.162	0.074	0.030	0	0	0	0	0
2000	146.224	21.711	0	124.513	17.184	4.237	0.195	0.064	0.030	0	0	0	0
2001	22.486	20.837	0	1.649	18.988	1.575	0.252	0.018	0.003	0.001	0	0	0
2002	257.914	208.764	0	49.150	66.611	123.248	17.437	1.294	0.099	0.035	0.040	0	0
2003	13.116	12.980	0	0.136	4.047	3.284	4.964	0.608	0.069	0.005	0.005	0	0
2004	26.915	26.902	0	0.014	3.965	8.956	4.904	8.207	0.764	0.079	0.018	0.009	0
2005	8.483	7.325	0	1.157	1.278	1.055	1.511	1.269	1.944	0.223	0.045	0	0
2006	59.052	40.570	0	18.4818	23.7191	5.6292	2.072	2.5571	3.1604	2.8971	0.5289	0.0065	0
2007	32.802	25.288	0	7.514	15.8649	5.8445	1.4891	0.5475	0.5357	0.541	0.3852	0.0726	0.0073
84-06 Mean	**27.170**	**16.201**	**0.000**	**10.969**	**6.963**	**6.756**	**1.420**	**0.620**	**0.267**	**0.144**	**0.028**	**0.001**	**0.002**

Fall (Sept-Oct)

Year	0-10+	2+	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10+
1984	10.721	1.692	7.986	1.043	0.783	0.519	0.280	0.092	0.018	0	0	0	0
1985	30.972	1.277	24.914	4.781	0.425	0.587	0.190	0.044	0.030	0.002	0	0	0
1986	25.761	2.519	12.863	10.379	2.277	0.219	0.013	0.005	0.005	0	0	0	0
1987	18.544	2.063	12.468	4.013	1.405	0.579	0.058	0.009	0.009	0.004	0	0	0
1988	39.699	2.092	31.687	5.920	1.818	0.242	0.032	0	0	0	0	0	0
1989	65.087	1.596	40.920	22.571	1.501	0.083	0.012	0	0	0	0	0	0
1990	69.477	7.396	54.350	7.731	6.946	0.398	0.034	0.005	0.008	0	0	0.005	0
1991	311.570	2.953	291.568	17.050	1.759	1.040	0.147	0.008	0	0	0	0	0
1992	83.731	6.244	50.971	26.516	5.540	0.398	0.287	0.013	0.007	0	0	0	0
1993	77.057	1.165	74.061	1.831	1.019	0.121	0.012	0.010	0	0	0.003	0	0
1994	92.523	0.657	90.778	1.088	0.457	0.185	0.012	0.003	0	0	0	0	0
1995	59.136	0.150	32.465	26.521	0.144	0.006	0	0	0	0	0	0	0
1996	61.459	1.400	51.497	8.562	1.365	0.029	0	0.005	0	0	0	0	0
1997	41.276	0.809	31.791	8.677	0.630	0.172	0.008	0	0	0	0	0	0
1998	103.272	0.628	90.404	12.240	0.537	0.069	0.022	0	0	0	0	0	0
1999	537.683	8.574	498.180	30.930	8.349	0.195	0.019	0.011	0	0	0	0	0
2000	521.103	9.265	250.391	261.446	8.323	0.794	0.140	0.008	0	0	0	0	0
2001	177.641	20.239	140.506	16.897	18.421	1.607	0.186	0.025	0	0	0	0	0
2002	348.703	41.179	259.902	47.623	23.321	16.812	0.665	0.325	0.048	0	0.007	0	0
2003	152.227	83.963	52.910	15.354	32.065	22.394	26.440	2.493	0.539	0.016	0.016	0	0
2004	291.458	36.277	251.052	4.129	8.338	15.082	5.978	6.245	0.534	0.072	0.008	0.021	0
2005	424.063	18.183	373.318	32.5615	8.1442	2.4374	4.0146	1.5049	1.6894	0.3322	0.0601	0	0
2006	116.755	13.575	52.1635	51.0162	9.5249	2.3407	0.257	0.3506	0.377	0.6807	0.044	0	0
2007	475.295	37.346	319.893	118.056	29.3351	5.9287	0.8955	0.2259	0.3019	0.313	0.3129	0.0332	0
84-06 Mean	**159.127**	**11.474**	**120.745**	**26.908**	**6.221**	**2.883**	**1.687**	**0.485**	**0.142**	**0.048**	**0.006**	**0.001**	**0.000**

(1) In 1984, 1985, 2003, 2004, and 2006 less than the number of scheduled tows were conducted in some months: in 1984, thirteen tows were conducted in May and nineteen in June; in 1985, five tows were conducted in June; in 2003, the 40 scheduled October tows were conducted in November and thus dropped; in 2004, thirty-nine tows were conducted in June; and in 2006, twenty tows were conducted in September and twenty tows were conducted in early October (see Table 2.4).

(2) A total of six fish were taken age 10+, all of which were taken between 1984 and 1988. The oldest fish aged was a 14-year-old taken in 1985.

Table 2.25. Age frequency of striped bass taken in spring, 1984-2007.
Ages were derived from trawl survey length data using the average of Hudson River and Chesapeake Bay von Bertalanffy parameters (Vic Crecco, pers. comm.).

	Year																							
Age	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
1	0	0	0	0	0	0	0	0	0	2	0	0	3	0	0	0	1	0	2	1	1	0	0	2
2	0	0	0	2	1	5	28	11	4	3	6	98	12	36	119	41	113	47	150	30	15	220	3	46
3	0	0	0	0	1	3	8	7	8	7	10	26	97	116	122	87	20	41	76	38	38	54	25	109
4	0	0	0	2	4	1	2	3	13	16	20	8	37	40	68	42	22	15	48	23	18	59	15	44
5	0	0	0	2	0	1	1	5	5	14	18	7	14	17	28	95	22	28	45	39	21	33	22	44
6	0	0	0	2	1	1	3	0	1	8	8	6	7	14	20	46	32	36	52	41	22	28	11	28
7	0	0	0	0	0	0	0	2	0	7	1	1	8	9	3	17	12	13	25	23	14	16	10	9
8	0	0	0	0	0	0	0	1	2	1	1	3	2	4	1	4	4	2	12	5	3	9	4	3
9	0	0	0	0	0	0	0	2	1	1	1	0	3	2	1	0	1	2	3	7	2	1	3	1
10	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	1	2	0	1	0	0	0	3	3
11	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	1	1	0
Total	**0**	**0**	**0**	**8**	**7**	**11**	**43**	**32**	**34**	**59**	**65**	**150**	**184**	**238**	**362**	**334**	**229**	**184**	**414**	**207**	**135**	**421**	**97**	**289**

Note: *number of fish taken but not measured = one in 1984, one in 1988, two in 1990.*

Table 2.26. Striped bass indices-at-age, 1984-2007.
Spring length data was converted to ages using the average of Hudson River and Chesapeake Bay von Bertalanffy parameters (Vic Crecco, pers comm). Indices-at-age were then determined by apportioning the spring indices (from Table 2.10) by the percentage of fish in each age.

		Spring										
Year	**Index**	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11**
1984	0.02	0	0	0	0	0	0	0	0	0	0	0
1985	0.00	0	0	0	0	0	0	0	0	0	0	0
1986	0.00	0	0	0	0	0	0	0	0	0	0	0
1987	0.05	0	0.0125	0	0.0125	0.0125	0.0125	0	0	0	0	0
1988	0.04	0	0.0057	0.0057	0.0229	0	0.0057	0	0	0	0	0
1989	0.06	0	0.0273	0.0164	0.0055	0.0055	0.0055	0	0	0	0	0
1990	0.16	0	0.1042	0.0298	0.0074	0.0037	0.0112	0	0	0	0.0037	0
1991	0.15	0	0.0516	0.0328	0.0141	0.0234	0	0.0094	0.0047	0.0094	0.0047	0
1992	0.22	0	0.0259	0.0518	0.0841	0.0324	0.0065	0	0.0129	0.0065	0	0
1993	0.27	0.0093	0.0140	0.0326	0.0745	0.0652	0.0372	0.0326	0.0047	0.0047	0	0
1994	0.30	0	0.0277	0.0462	0.0923	0.0831	0.0369	0.0046	0.0046	0.0046	0	0
1995	0.59	0	0.3855	0.1023	0.0315	0.0275	0.0236	0.0039	0.0118	0	0.0039	0
1996	0.63	0.0103	0.0411	0.3321	0.1267	0.0479	0.0240	0.0274	0.0068	0.0103	0	0.0034
1997	0.85	0	0.1286	0.4143	0.1429	0.0607	0.0500	0.0321	0.0143	0.0071	0	0
1998	0.97	0	0.3189	0.3269	0.1822	0.0750	0.0536	0.0080	0.0027	0.0027	0	0
1999	1.10	0	0.1346	0.2857	0.1379	0.3119	0.1510	0.0558	0.0131	0	0.0033	0.0033
2000	0.84	0.0037	0.4163	0.0737	0.0811	0.0811	0.1179	0.0442	0.0147	0.0037	0.0074	0
2001	0.61	0	0.1558	0.1359	0.0497	0.0928	0.1193	0.0431	0.0066	0.0066	0	0
2002	1.30	0.0063	0.4722	0.2392	0.1511	0.1416	0.1637	0.0787	0.0378	0.0094	0.0031	0
2003	0.87	0.0042	0.1267	0.1605	0.0971	0.1647	0.1732	0.0971	0.0211	0.0296	0	0
2004	0.56	0.0042	0.0627	0.1588	0.0752	0.0878	0.0919	0.0585	0.0125	0.0084	0	0.0042
2005	1.17	0	0.61	0.1497	0.1636	0.0915	0.0776	0.0444	0.025	0.0028	0	0.0028
2006	0.61	0	0.0189	0.1572	0.0943	0.1384	0.0692	0.0629	0.0252	0.0189	0.0189	0.0063
2007	1.02	0.0071	0.1629	0.386	0.1558	0.1558	0.0992	0.0319	0.0106	0.0035	0.0106	0
84-06 mean	0.52	0.00	0.14	0.12	0.07	0.07	0.05	0.03	0.01	0.01	0.00	0.00

Table 2.27. Summer flounder indices-at-age, 1984-2007.

Year and season specific age keys obtained from the NMFS spring and fall surveys were used to convert LISTS length frequencies to ages. Starting in 2000 LISTS ageing data (60 cm and over) were added to the age key to supplement the older age groups. Indices-at-age were determined for each season by apportioning the spring and fall overall indices (from Table 2.10 and Table 2.11) by the percentage of fish in each age. The age 0-7+ index is the sum of indices ages 0-9.

Spring

Year	0-7+	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9
1984	0.6291	0	0.3236	0.2610	0.0445	0	0	0	0	0	0
1985	0.4410	0	0.0166	0.3168	0.0489	0.0587	0	0	0	0	0
1986	0.9510	0	0.7700	0.0892	0.0742	0.0126	0.0050	0	0	0	0
1987	1.0572	0	0.9515	0.0793	0.0202	0.0036	0.0026	0	0	0	0
1988	0.4986	0	0.2317	0.2232	0.0352	0.0085	0	0	0	0	0
1989	0.1016	0	0.0111	0.0550	0.0191	0.0164	0	0	0	0	0
1990	0.3475	0	0.3053	0.0201	0.0156	0.0065	0	0	0	0	0
1991	0.6391	0	0.3892	0.2059	0.0205	0.0235	0	0	0	0	0
1992	0.5546	0	0.3182	0.1906	0.0229	0	0.0229	0	0	0	0
1993	0.5074	0	0.3216	0.1504	0.0101	0.0152	0.0101	0	0	0	0
1994	0.8601	0	0.4959	0.3136	0.0324	0	0	0	0.0182	0	0
1995	0.2796	0	0.2023	0.0608	0.0110	0	0	0	0.0055	0	0
1996	0.9609	0	0.6216	0.2370	0.0868	0	0.0052	0	0.0103	0	0
1997	0.9991	0	0.4481	0.4461	0.0740	0.0121	0.0134	0.0054	0	0	0
1998	1.3067	0	0.0734	0.5952	0.4693	0.1167	0.0324	0.0197	0	0	0
1999	1.4401	0	0.3263	0.5563	0.3521	0.1110	0.0696	0.0248	0	0	0
2000	1.7898	0	0.3805	0.7853	0.4240	0.0538	0.1316	0.0092	0	0.0054	0
2001	1.7468	0	0.8408	0.3395	0.3653	0.1073	0.0488	0.0333	0.0067	0.0051	0
2002	3.1851	0	1.0571	1.2637	0.4646	0.2233	0.0930	0.0362	0.0236	0.0145	0.0091
2003	3.4211	0	1.6080	1.0159	0.3949	0.2316	0.0851	0.0462	0.0327	0.0025	0.0042
2004	1.8381	0	0.2592	0.8180	0.4100	0.1878	0.0338	0.0817	0.0302	0.0145	0.0029
2005	0.8038	0	0.2523	0.2641	0.1495	0.0334	0.0364	0.0393	0.0196	0.0046	0.0046
2006	0.6129	0	0.0383	0.3597	0.0676	0.0654	0.0337	0.0263	0.0168	0.0051	0
2007	2.5073	0	1.1520	0.2102	0.5595	0.3163	0.1150	0.0888	0.0428	0.0152	0.0065
84-06 Mean	**1.0857**	**0.0000**	**0.4453**	**0.3759**	**0.1571**	**0.0560**	**0.0271**	**0.0140**	**0.0071**	**0.0022**	**0.0009**

Fall

Year	0-7+	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9
1984	0.9888	0	0.5648	0.3269	0.0713	0.0140	0.0042	0.0042	0.0034	0	0
1985	1.1931	0.2453	0.3605	0.4984	0.0804	0	0.0085	0	0	0	0
1986	1.7157	0.1738	1.1902	0.2681	0.0817	0.0019	0	0	0	0	0
1987	1.3963	0.0749	1.0573	0.2309	0.0305	0.0027	0	0	0	0	0
1988	1.4159	0.0150	0.8739	0.4782	0.0366	0.0122	0	0	0	0	0
1989	0.1363	0	0.0227	0.1051	0.0085	0	0	0	0	0	0
1990	0.8678	0.0321	0.6720	0.1214	0.0339	0.0042	0.0042	0	0	0	0
1991	1.2557	0.0363	0.8141	0.3457	0.0432	0.0082	0.0041	0.0041	0	0	0
1992	1.0178	0.0131	0.5685	0.3578	0.0561	0.0134	0.0089	0	0	0	0
1993	1.1113	0.0842	0.8371	0.1490	0.0362	0.0029	0	0.0019	0	0	0
1994	0.5517	0.1325	0.3008	0.0957	0.0138	0.0089	0	0	0	0	0
1995	0.5408	0.0424	0.3812	0.1043	0.0090	0.0039	0	0	0	0	0
1996	2.1914	0.0840	1.0394	1.0276	0.0375	0.0029	0	0	0	0	0
1997	2.4980	0.0693	0.8494	1.2261	0.3016	0.0321	0.0099	0.0084	0.0012	0	0
1998	1.7153	0	0.3251	1.0456	0.2867	0.0392	0.0187	0	0	0	0
1999	2.6787	0.0482	0.8000	1.4412	0.2963	0.0823	0.0084	0.0023	0	0	0
2000	1.9134	0.1151	0.5117	0.8244	0.2971	0.1122	0.0433	0.0067	0	0.0029	0
2001	4.4181	0.0208	2.6891	1.1372	0.4342	0.1095	0.0153	0.0078	0	0.0042	0
2002	6.1211	0.4415	3.0870	1.9304	0.4769	0.1216	0.0429	0.0168	0.0040	0	0
2003	3.3879	0	1.4584	1.3192	0.4069	0.0873	0.0908	0.0164	0.0089	0	0
2004	1.9537	0.2545	0.3848	0.7551	0.4398	0.0804	0.0241	0.0150	0	0	0
2005	2.4099	0.0671	1.0930	0.7441	0.3554	0.0866	0.0316	0.0123	0.0166	0.0032	0
2006	1.3148	0.0976	0.2170	0.5915	0.2299	0.0957	0.0435	0.0214	0.0182	0	0
2007	1.8880	0.1295	0.5669	0.3869	0.4676	0.2012	0.0778	0.0408	0.0087	0.0043	0
84-06 Mean	**1.8606**	**0.0890**	**0.8738**	**0.6576**	**0.1767**	**0.0401**	**0.0156**	**0.0051**	**0.0023**	**0.0004**	**0.0000**

Table 2.28. Weakfish age 0 and age 1+ indices of abundance, 1984-2007.
Using spring (May, June) and fall (September, October) length data, the geometric mean catch per tow was calculated for three groups of weakfish: fall age-0, spring - all fish age 1 and older (1+), and fall - all fish age 1 and older (1+). Weakfish less than 30 cm fork length in the fall were defined as age-0.

	Fall		Fall		Spring	
Year	age 0 count / tow	age 0 kg / tow	ages 1+ count / tow	age 1+ kg / tow	ages 1+ count / tow	ages 1+ kg / tow
1984	1.00	0.14	0.53	0.84	0.02	0.15
1985	6.19	0.74	0.24	0.46	0.00	0.10
1986	13.16	0.91	0.24	0.51	0.10	0.33
1987	0.63	0.13	0.11	0.16	0.02	0.11
1988	3.49	0.30	0.06	0.13	0.05	0.17
1989	8.69	0.94	0.02	0.10	0.04	0.16
1990	5.56	0.56	0.08	0.13	0.07	0.13
1991	11.95	1.44	0.31	0.41	0.28	0.26
1992	3.05	0.31	0.18	0.24	0.12	0.22
1993	4.08	0.46	0.12	0.18	0.10	0.15
1994	11.19	1.23	0.06	0.13	0.04	0.12
1995	5.22	0.84	0.70	0.64	0.18	0.16
1996	15.23	1.49	0.56	0.52	0.19	0.19
1997	12.38	1.03	0.89	0.81	0.42	0.34
1998	5.02	0.76	0.28	0.36	0.37	0.41
1999	30.93	3.21	0.39	0.51	0.45	0.59
2000	63.31	3.34	0.30	0.32	0.18	0.28
2001	40.09	2.20	0.52	0.54	0.27	0.26
2002	41.35	2.85	0.16	0.26	0.16	0.26
2003	49.41	1.77	0.07	0.17	0.04	0.14
2004	58.98	2.99	0.21	0.25	0.15	0.16
2005	25.86	2.50	0.12	0.18	0.27	0.23
2006	1.05	0.20	0.29	0.30	0.14	0.22
2007	63.93	3.86	0.06	0.14	0.11	0.22
84-06 mean	**18.17**	**1.32**	**0.28**	**0.35**	**0.16**	**0.22**

Table 2.29. Winter flounder indices-at-age, 1984-2007.

The Long Island Sound Trawl Survey April and May catch and age data was used to calculate the geometric mean indices-at-age. An April-May age key was used to convert lengths to ages, and an overall April-May index (the ages 1-13 index in the table) was apportioned by the percentage of fish at age. The 4+ index is the sum of indices ages 4-13 and represents the abundance of winter flounder that are recruited to the fishery. The age-0 indices were obtained from the Estuarine Seine Survey (Job 2 Part 2).

Catch-at-age: numbers **April-May**

Year	1 - 13	4+	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11	Age 12	Age 13
1984	111.96	27.91	-	8.21	44.01	31.83	20.96	4.23	1.23	0.67	0.74	0.04	0.01	0.03	0	0
1985	83.58	18.13	-	4.11	28.46	32.88	14.17	2.33	0.82	0.45	0.19	0.11	0.04	0.02	0	0
1986	63.65	15.43	-	6.69	26.00	15.53	12.26	2.05	0.50	0.24	0.24	0.10	0.01	0.03	0	0
1987	79.92	13.35	-	7.32	44.69	14.56	5.05	6.55	1.28	0.11	0.24	0.13	0	0	0	0
1988	137.59	12.13	15.46	14.49	71.87	39.10	8.59	1.83	1.46	0.16	0.04	0.02	0.02	0	0	0
1989	148.19	14.97	1.90	13.56	78.43	41.23	10.85	2.84	0.98	0.14	0.09	0.06	0.01	0	0	0
1990	223.09	15.29	2.85	11.31	131.52	64.97	8.97	4.09	1.96	0.19	0.05	0	0.02	0	0	0
1991	150.20	14.31	5.23	8.52	66.99	60.39	9.31	4.05	0.80	0.14	0	0	0	0.01	0	0
1992	61.39	10.49	11.90	6.80	31.32	12.78	8.97	1.10	0.36	0.05	0	0	0	0	0	0
1993	63.60	9.16	5.61	19.11	19.87	15.46	4.81	3.24	0.80	0.15	0.11	0.04	0.01	0	0	0
1994	84.44	4.87	14.23	9.57	64.14	5.86	3.01	1.14	0.49	0.17	0.05	0.01	0.01	0	0	0
1995	50.12	2.31	10.10	14.35	23.69	9.77	1.36	0.63	0.20	0.08	0.02	0.02	0.00	0	0	0
1996	110.62	15.92	19.22	11.46	59.07	24.17	14.41	0.97	0.28	0.14	0.06	0.04	0.01	0	0	0
1997	71.31	13.84	7.47	12.53	25.53	19.41	9.45	3.76	0.51	0.07	0.03	0.01	0.01	0.01	0	0
1998	72.91	17.06	9.24	11.22	32.40	12.23	12.67	3.15	0.99	0.14	0.02	0.07	0	0	0	0
1999	41.35	11.10	8.70	6.56	12.42	11.27	6.09	3.20	1.14	0.61	0.04	0.01	0.02	0	0	0
2000	45.41	13.26	4.33	7.11	16.66	8.40	7.70	3.42	1.53	0.31	0.26	0.01	0.01	0	0.01	0
2001	54.50	15.61	1.34	8.45	19.60	10.85	8.06	5.46	1.28	0.68	0.05	0.08	0	0	0	0
2002	43.71	7.99	3.06	6.27	19.90	9.56	4.43	1.95	1.02	0.35	0.11	0.03	0.10	0	0	0
2003	27.84	8.83	8.07	2.47	7.83	8.71	4.79	1.95	0.77	0.82	0.29	0.07	0.14	0	0	0
2004	20.46	6.81	10.96	6.32	3.88	3.45	3.88	1.92	0.64	0.21	0.11	0.03	0.01	0	0	0.01
2005	16.10	2.03	5.63	7.06	6.18	0.84	0.81	0.67	0.21	0.16	0.10	0.05	0.01	0.01	0	0
2006	5.59	0.74	0.93	1.14	2.60	1.10	0.19	0.14	0.17	0.09	0.01	0.09	0.03	0.02	0	0
2007	28.68	4.16	4.73	2.98	10.83	10.70	3.10	0.61	0.15	0.11	0.12	0.04	0.01	0.01	0	0
84-06																
Mean	76.85	11.80	7.70	8.90	36.39	19.75	7.86	2.64	0.85	0.27	0.12	0.04	0.02	0.01	0.00	0.00

Catch-at-age: biomass (kg) **April-May**

Year	1-13	4+	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11	Age 12	Age 13
1984	15.68	7.81	NA	0.31	3.06	4.50	5.18	1.51	0.49	0.30	0.28	0.03	0.01	0.01	0	0
1985	13.91	5.96	NA	0.15	2.54	5.26	3.97	0.97	0.46	0.33	0.11	0.08	0.03	0.02	0	0
1986	10.33	5.39	NA	0.24	2.16	2.55	3.68	0.88	0.32	0.21	0.16	0.09	0.01	0.03	0	0
1987	11.76	4.94	NA	0.30	4.03	2.50	1.39	2.59	0.64	0.08	0.14	0.09	0	0	0	0
1988	18.28	4.51	NA	0.54	6.06	7.17	2.64	0.93	0.74	0.12	0.03	0.02	0.03	0	0	0
1989	22.62	5.64	NA	0.43	7.99	8.56	3.62	1.32	0.47	0.10	0.07	0.05	0.01	0	0	0
1990	29.01	7.09	NA	0.33	10.37	11.21	3.79	2.19	0.89	0.14	0.04	0	0.04	0	0	0
1991	24.59	5.54	NA	0.32	6.82	11.92	3.53	1.47	0.43	0.10	0	0	0	0.01	0	0
1992	12.29	4.79	NA	0.27	3.82	3.41	3.81	0.71	0.25	0.02	0	0	0	0	0	0
1993	10.26	4.43	NA	0.54	1.93	3.36	1.96	1.73	0.51	0.11	0.08	0.04	0.01	0	0	0
1994	12.20	2.95	NA	0.34	7.13	1.79	1.51	0.77	0.43	0.16	0.06	0.01	0.01	0	0	0
1995	7.72	1.39	NA	0.51	2.70	3.12	0.71	0.39	0.18	0.08	0.02	0.01	0.01	0	0	0
1996	20.41	7.36	NA	0.41	6.11	6.53	6.32	0.61	0.22	0.12	0.06	0.03	0.01	0	0	0
1997	15.53	6.96	NA	0.48	2.61	5.48	4.26	2.23	0.36	0.07	0.03	0.01	0.01	0.01	0	0
1998	14.66	7.28	NA	0.36	3.59	3.43	4.88	1.64	0.60	0.09	0.02	0.05	0	0	0	0
1999	10.29	5.32	NA	0.23	1.41	3.33	2.60	1.59	0.69	0.39	0.02	0.00	0.03	0	0	0
2000	12.63	7.22	NA	0.32	2.31	2.78	3.68	2.05	0.96	0.29	0.21	0.01	0.01	0	0.01	0
2001	14.02	7.94	NA	0.27	2.33	3.48	3.39	3.05	0.87	0.51	0.05	0.07	0	0	0	0
2002	10.83	4.41	NA	0.31	3.05	3.06	2.13	1.12	0.70	0.28	0.09	0.02	0.07	0	0	0
2003	8.87	5.03	NA	0.09	0.96	2.79	2.35	1.21	0.50	0.59	0.23	0.06	0.08	0	0	0
2004	6.11	4.19	NA	0.19	0.53	1.20	2.13	1.24	0.50	0.18	0.10	0.02	0.01	0	0	0.01
2005	3.37	1.75	NA	0.28	0.96	0.38	0.57	0.61	0.22	0.17	0.09	0.06	0.02	0.01	0	0
2006	1.82	0.71	NA	0.06	0.48	0.58	0.16	0.13	0.17	0.08	0.02	0.09	0.05	0.02	0	0
2007	7.02	2.34	NA	0.12	1.18	3.38	1.55	0.37	0.14	0.10	0.11	0.03	0.01	0.01	0	
84-06																
Mean	13.36	5.16		0.32	3.61	4.28	2.97	1.34	0.50	0.20	0.08	0.04	0.02	0.00	0.00	0.00

Note: 1984:April = 0 tows, May = 13 tows, and 19 tows in June used to increase sample size; 1985: April = 0 tows, May = 41 tows; 1986-1991: April = 40 tows, May = 40 tows; 1992: April = 0 tows, May = 40; 1993-1995: April = 40 tows, May = 40 tows; 1996: April = 17 tows, May = 63 tows; 1997-2004: April = 40 tows and May = 40 tows; 2005: April = 35 tows, May = 45 tows; 2006: April = 0, and May = 40 tows; 2007: April = 35, and May = 45 tows..

FIGURES 2.1 - 2.14

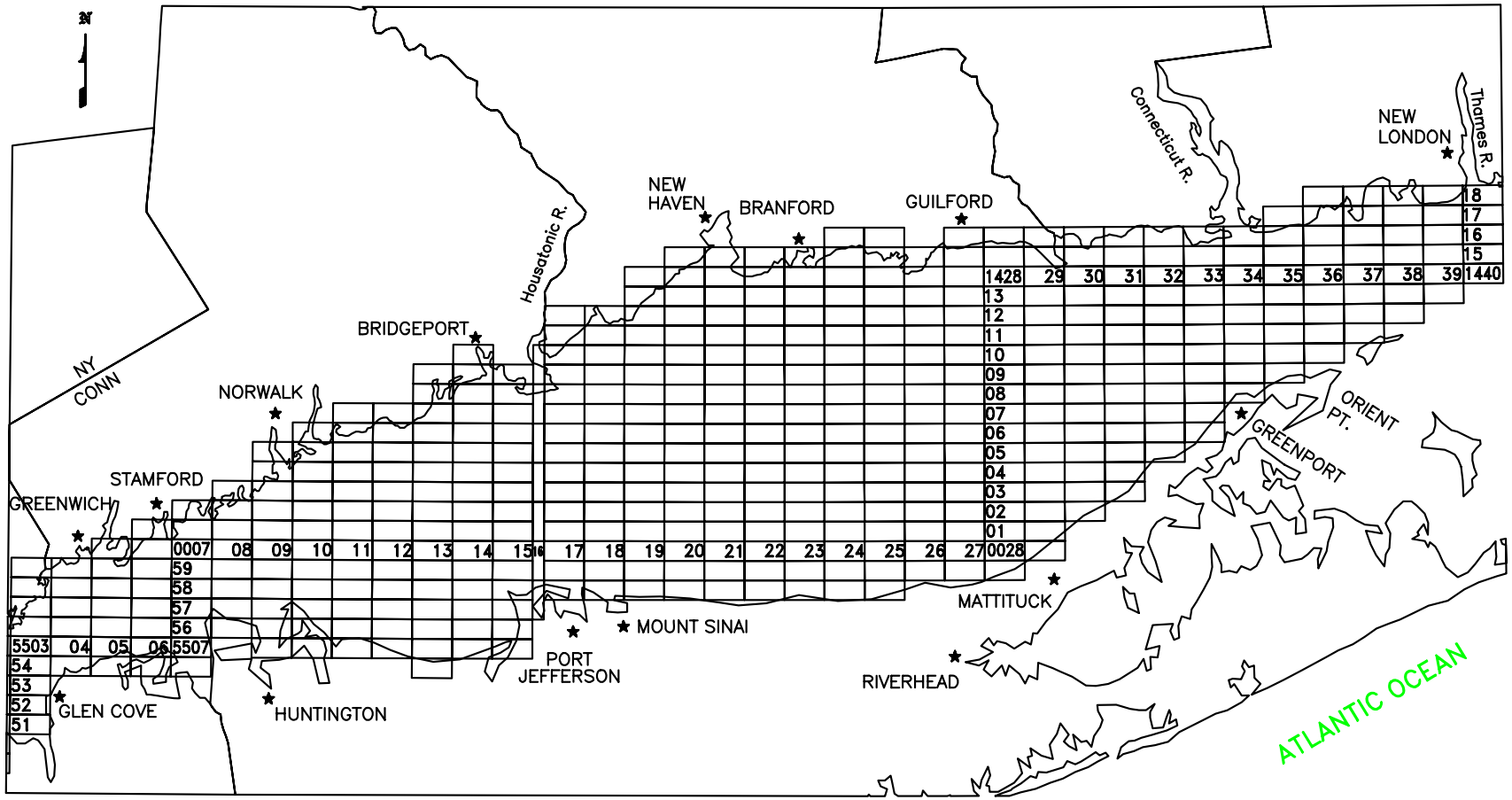
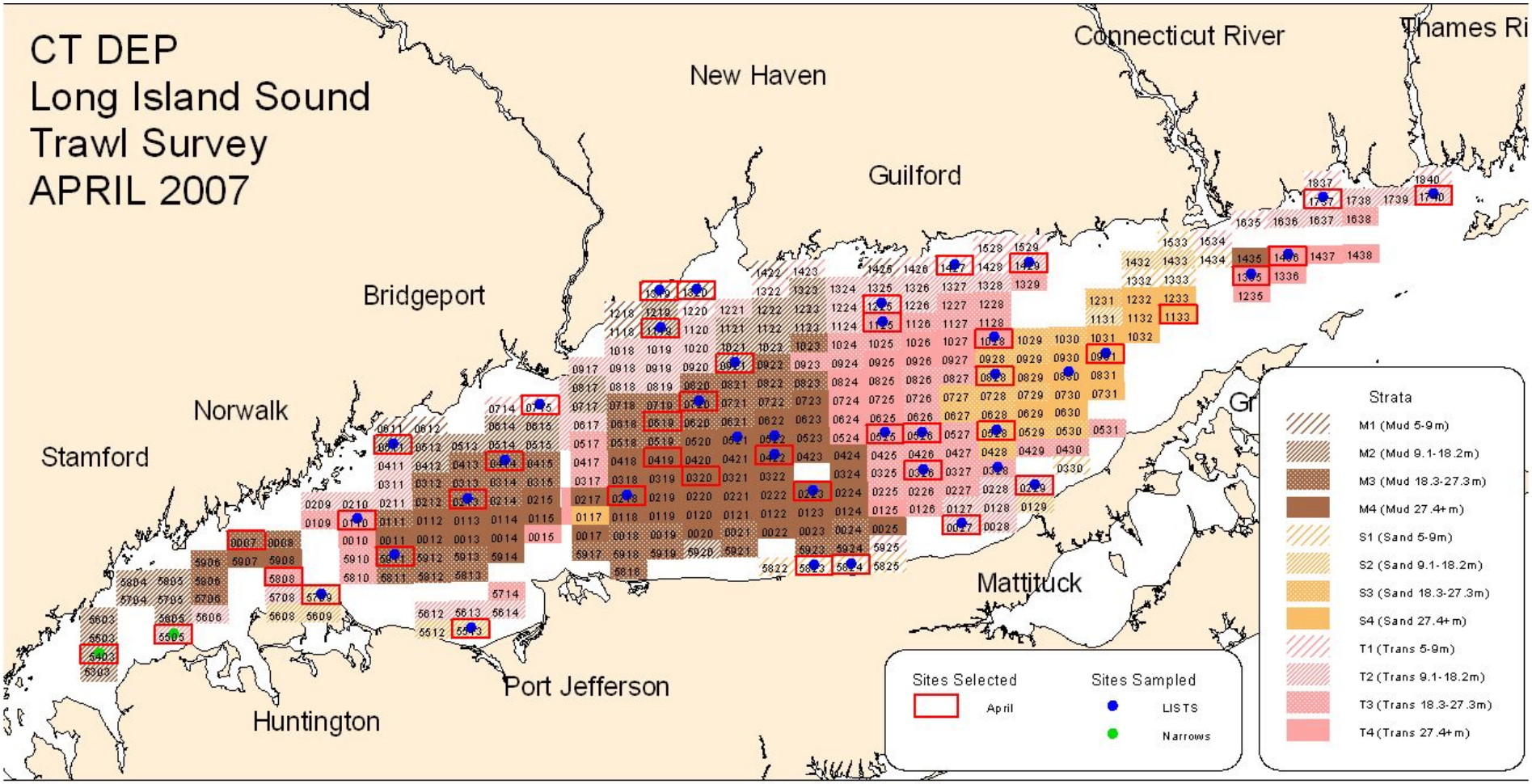


Figure 2.1. Trawl Survey site grid. *Each sampling site is 1x2 nmi (nautical miles). A four-digit number identifies the site: the first two digits are the row numbers (corresponding to minutes of latitude) and the last two digits are the column numbers (corresponding to two nautical miles in length on the longitudinal axis). Examples: site 1428 near Guilford and 0028 near Mattituck. (Note: The sites in column 16 are approximately 2x1 nmi. The grid was drawn on the Eastern and Western Long Island Sound 80,000:1 nautical charts, which overlap by the area in column 16.)*

Figure 2.2. April; 2007 sites selected and sampled. *The red outlined rectangles are the sites selected for the cruise and the blue dots are the sites sampled. Narrows sites sampled in western LIS are denoted as green dots. Samples that were collected from a different site than originally selected are noted in table below map.*

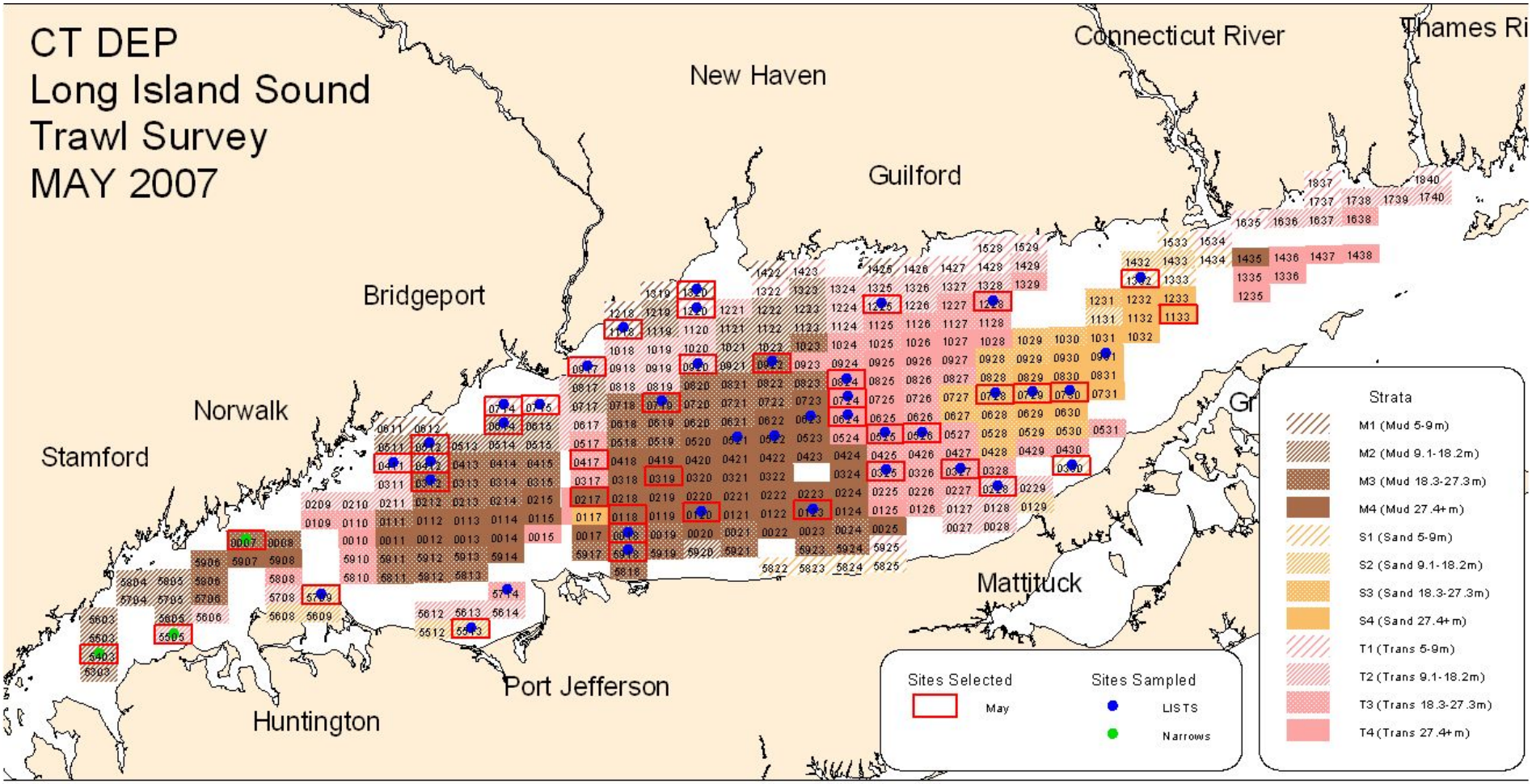


April 2007 samples that were collected from a different sites than originally selected:

Sample	Site sampled	sampled strata	site selected	selected strata	# Attempts before moving	reason moved
SP2007006	0830	S4	1133	S4	2	Tried couple times; dug into sand dunes & snapped ground cable on first try then dug in again on second try.
SP2007019	0328	T3	5808	T3	0	Unlikely to sampled selected site b/c pot gear interaction.
SP2007025	0521	M4	0320	M4	1	On first try, speed dropped. String of pots through port wing & on stbd door. Have to move to 0521 (TZ).
SP2007026	0522	M4	0419	M4	1	Set in but had to haul back immediately because saw a lot of gear ahead. Have to move to 0522 (TZ).
SP2007028	0720	M3	0619	M3	2	Speed dropped; had gear on both doors. Cut free & re-set. Speed dropped again. Gear set blind.

* Did not attempt site 00-07 because there was too much pot gear, there was also too much pot gear in alternate site (00-08).

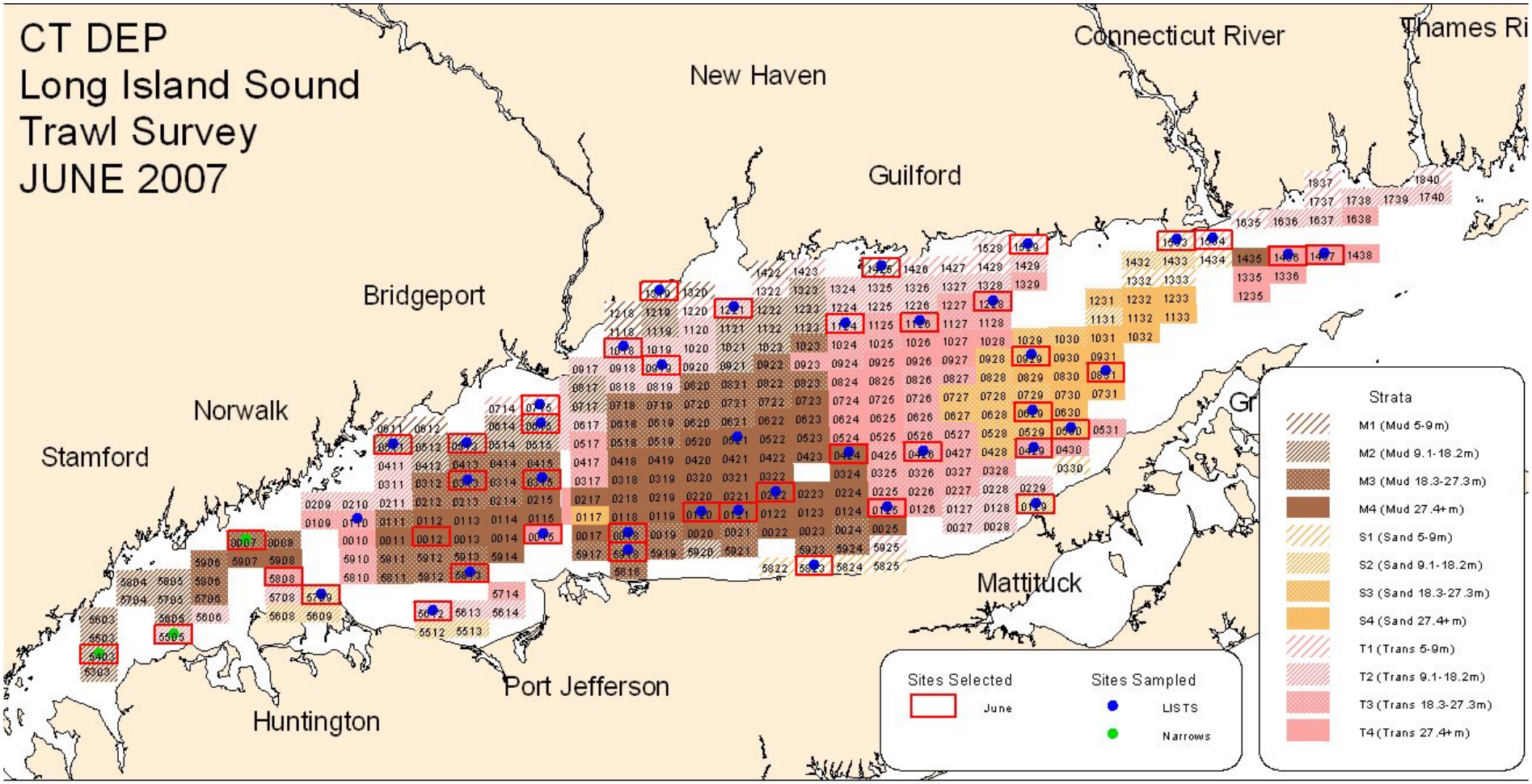
Figure 2.3. May 2007 sites selected and sampled. *The red outlined rectangles are the sites selected for the cruise and the blue dots are the sites sampled. Narrows sites sampled in western LIS are denoted as green dots. Samples that were collected from a different site than originally selected are noted in table below map.*



May 2007 samples that were collected from a different sites than originally selected:

Sample	Site sampled	sampled strata	site selected	selected strata	# Attempts before moving	reason moved
SP2007046	0931	S4	1133	S4	1	Net not fishing properly in sand dunes.
SP2007053	0623	M4	0319	M4	0	Phone call from commercial fisherman that several folks have pot gear in area.
SP2007054	0522	M4	0217	M4	0	Phone call from commercial fisherman that several folks have pot gear in area.
SP2007067	0521	M4	0118	M4	0	Phone call from commercial fisherman that several folks have pot gear in area.
SP2007073	5714	T3	0417	T3	0	pots

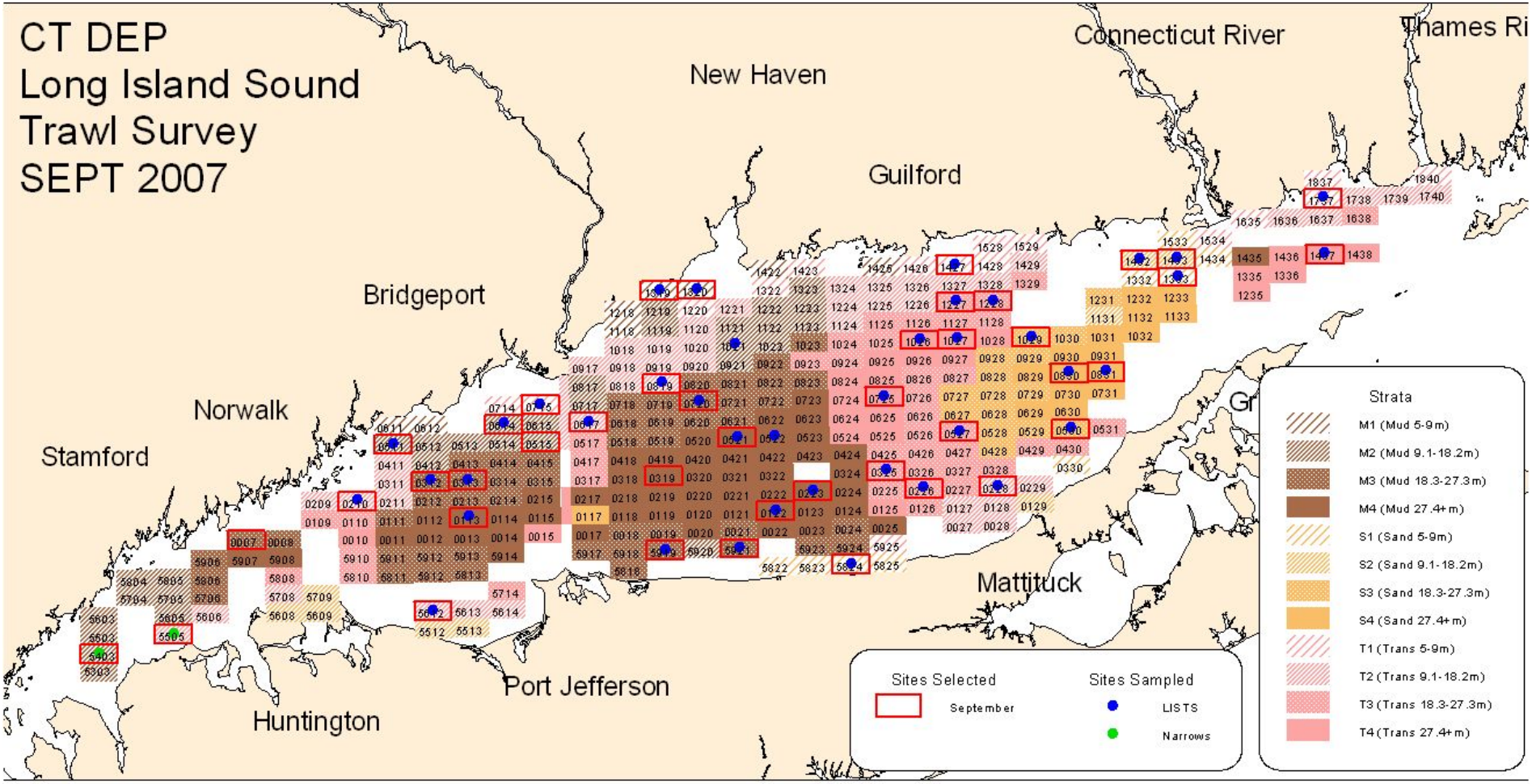
Figure 2.4. June 2007 sites selected and sampled. *The red outlined rectangles are the sites selected for the cruise and the blue dots are the sites sampled. Narrows sites sampled in western LIS are denoted as green dots. Samples that were collected from a different site than originally selected are noted in table below map.*



June 2007 samples that were collected from a different sites than originally selected:

Sample	Site sampled	sampled strata	site selected	selected strata	# Attempts before moving		reason moved
SP2007116	0110	T3	5808	T3	0	pots	
SP2007120	0521	M4	0012	M4	0	pots	

Figure 2.5. September 2007 sites selected and sampled. *The red outlined rectangles are the sites selected for the cruise and the blue dots are the sites sampled. Narrows sites sampled in western LIS are denoted as green dots. Samples that were collected from a different site than originally selected are noted in table below map.*

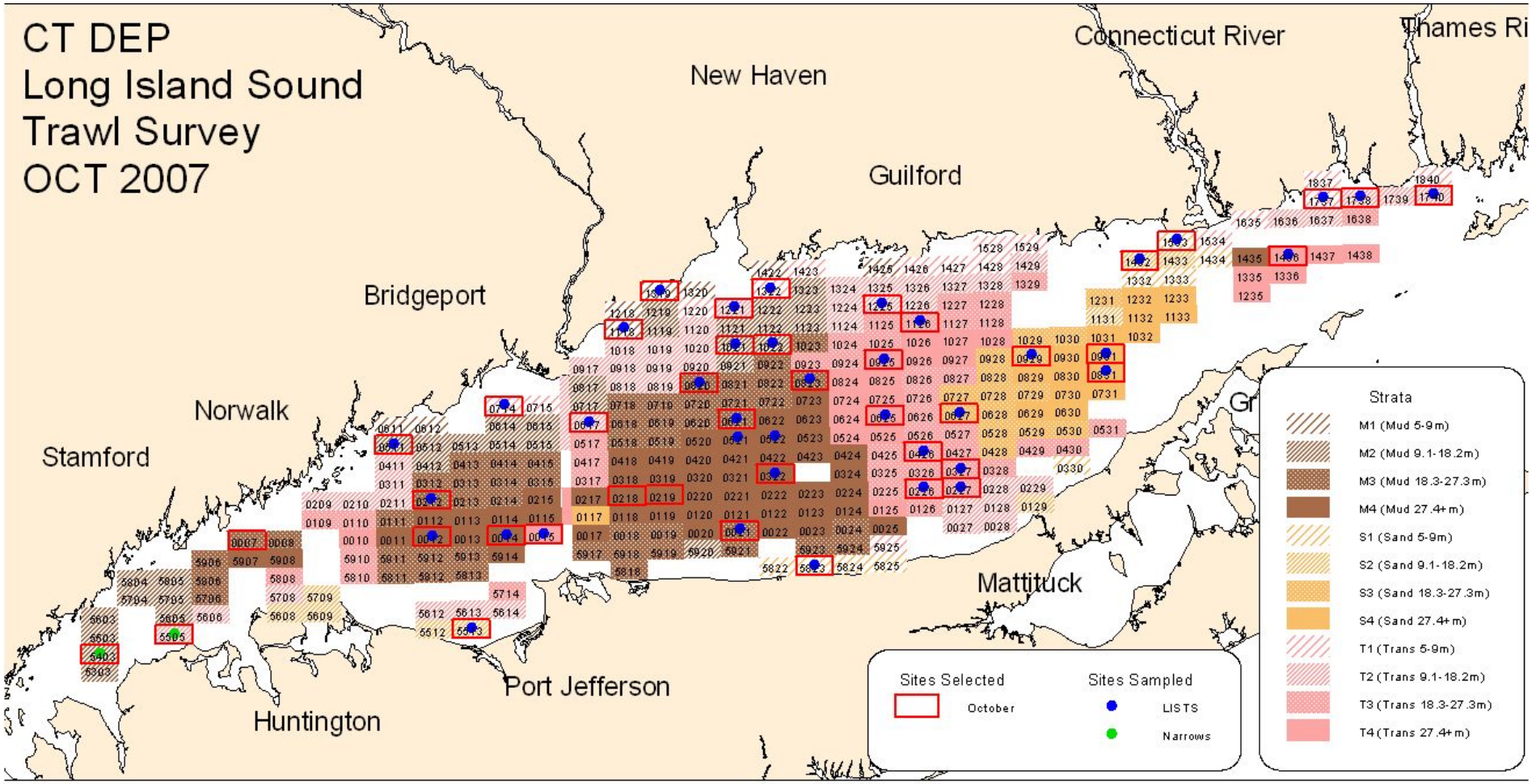


September 2007 samples that were collected from a different sites than originally selected:

Sample	Site sampled	sampled strata	site selected	selected strata	# Attempts before moving		reason moved
FA2007024	0522	M4	0319	M4	1	pots	
FA2007040	1021	M2	0515	M2			

* Did not attempt site 00-07 because there was too much pot gear, there was also too much pot gear in alternate site (00-08)

Figure 2.6. October 2007 sites selected and sampled. *The red outlined rectangles are the sites selected for the cruise and the blue dots are the sites sampled. Narrows sites sampled in western LIS are denoted as green dots. Samples that were collected from a different site than originally selected are noted in table below map.*



October 2007 samples that were collected from a different sites than originally selected:

Sample	Site sampled	sampled strata	site selected	selected strata	# Attempts before moving	reason moved
FA2007076	0521	M4	0218	M4	0	pots
FA2007077	0522	M4	0219	M4	0	pots

* Did not attempt site 00-07 because there was too much pot gear, there was also too much pot gear in alternate site (00-08).

Figure 2.7. Number of finfish species observed annually, 1984-2007.

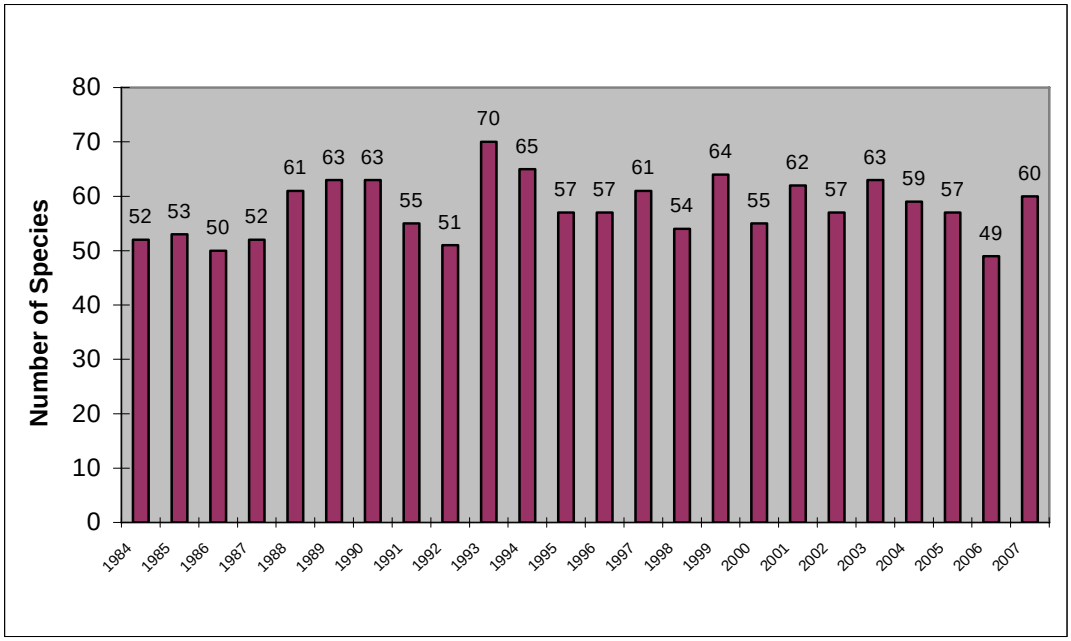
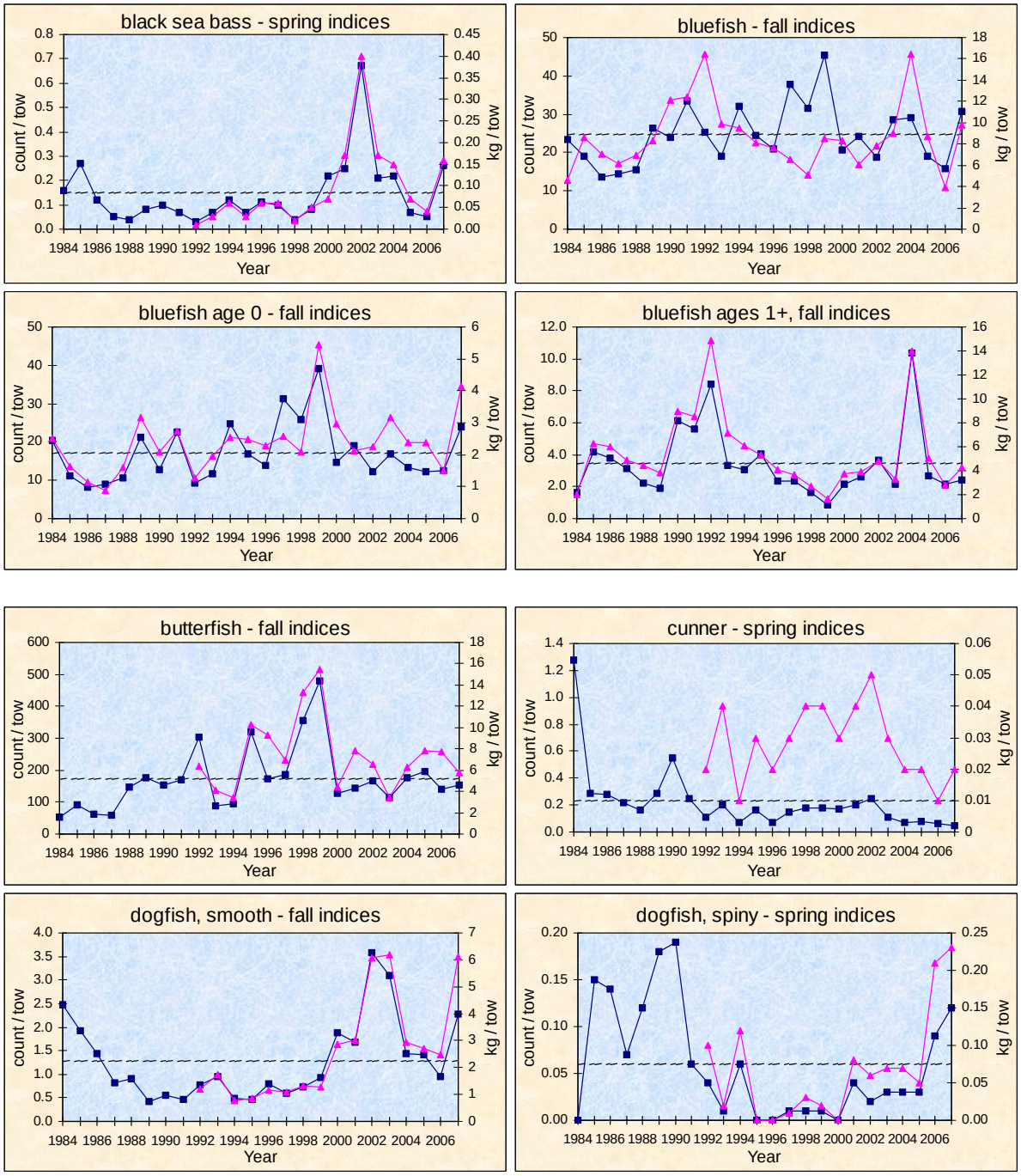


Figure 2.8. Plots of abundance indices for: black sea bass, bluefish (total, age 0, and ages 1+), butterfish, cunner, and dogfish (smooth and spiny).



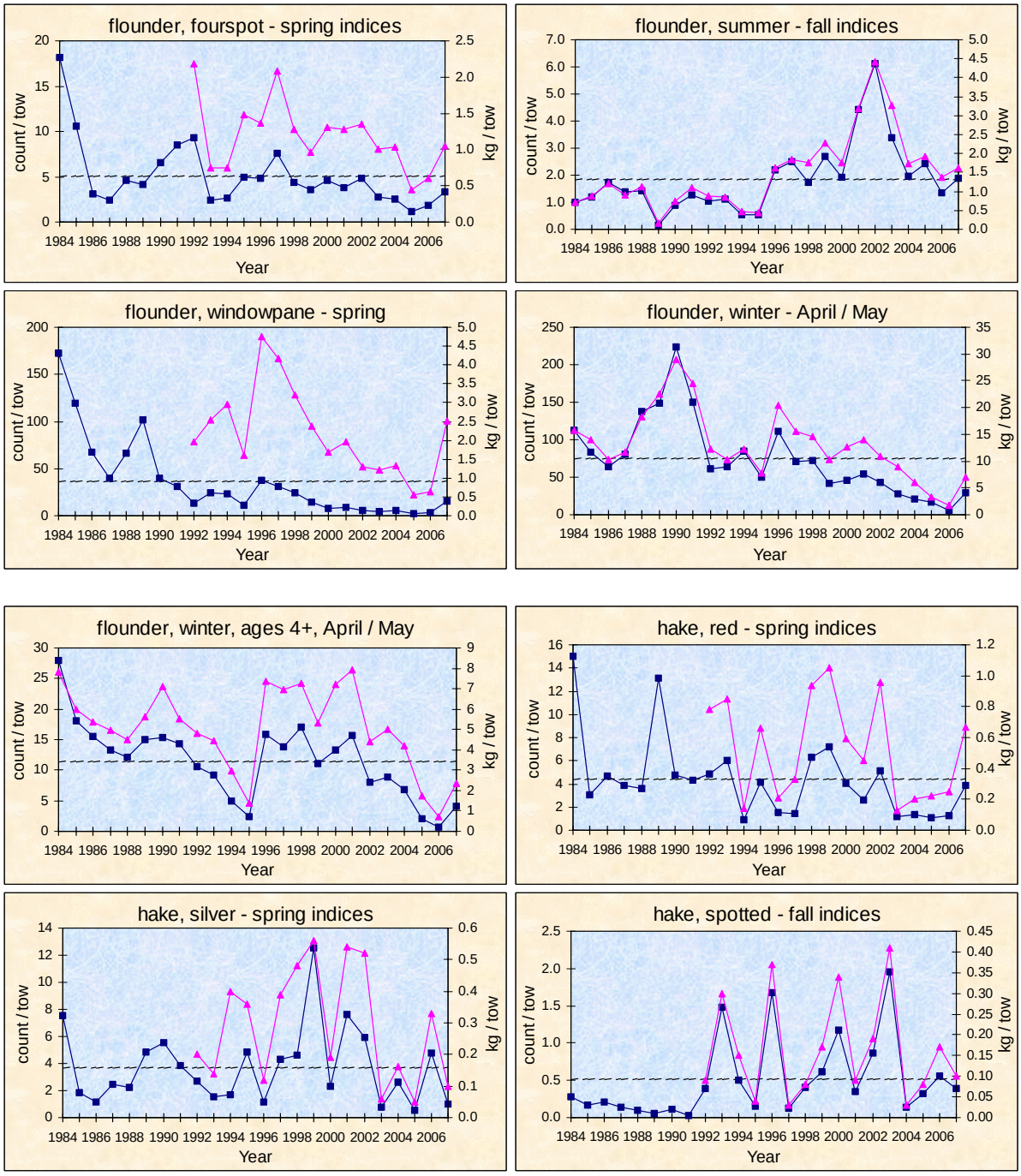
Legend:

■ = count / tow

▲ = kg / tow

---- = mean count / tow

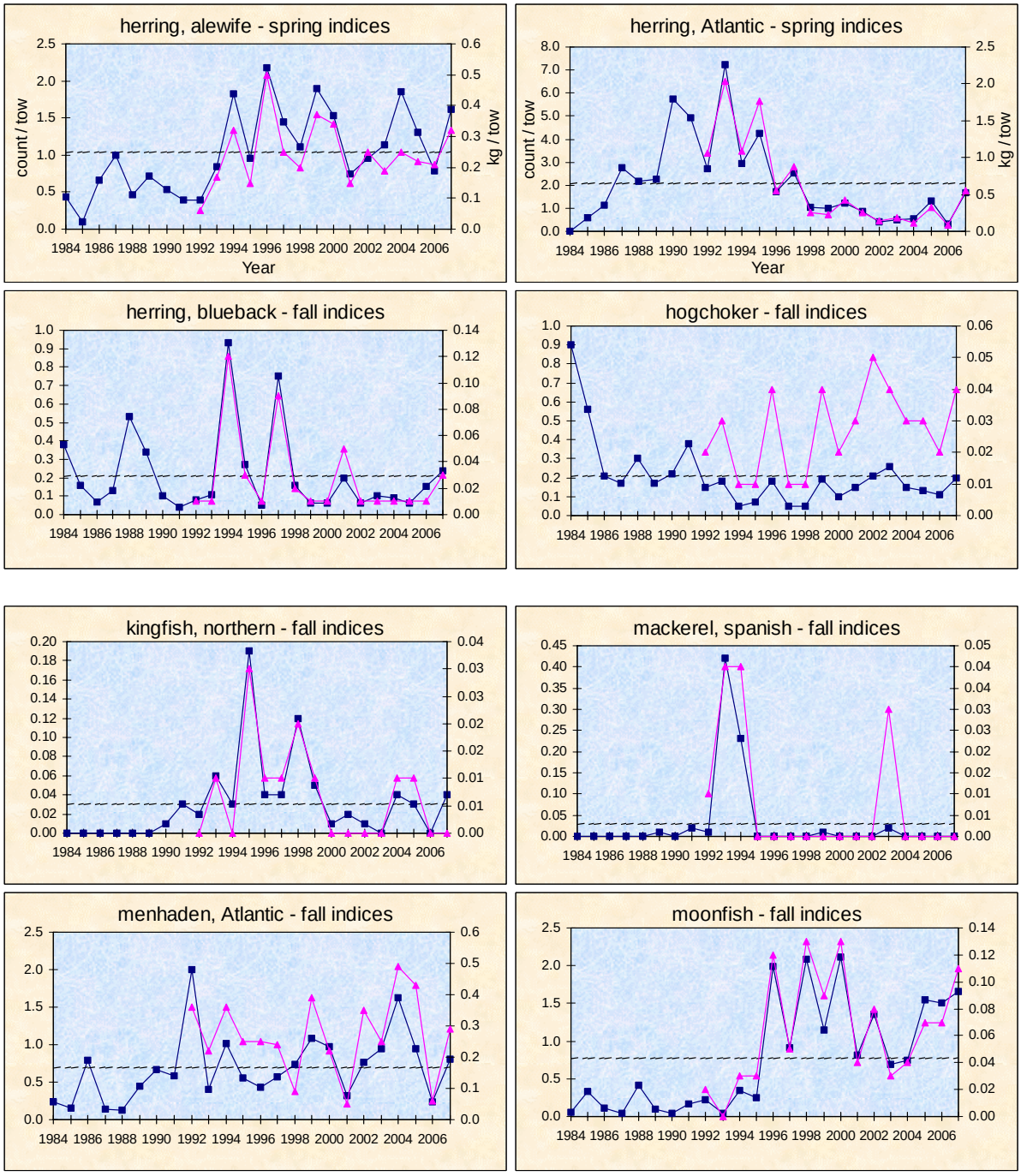
Figure 2.9. Plots of abundance indices for: flounders (fourspot, summer, windowpane, winter, and winter ages 4+) and hakes (red, silver, and spotted).



Legend:

■ = count / tow
▲ = kg / tow
---- = mean count / tow

Figure 2.10. Plots of abundance indices for: herrings (alewife, Atlantic, and blueback), hogchoker, Northern kingfish, Spanish mackerel, Atlantic menhaden, and moonfish.



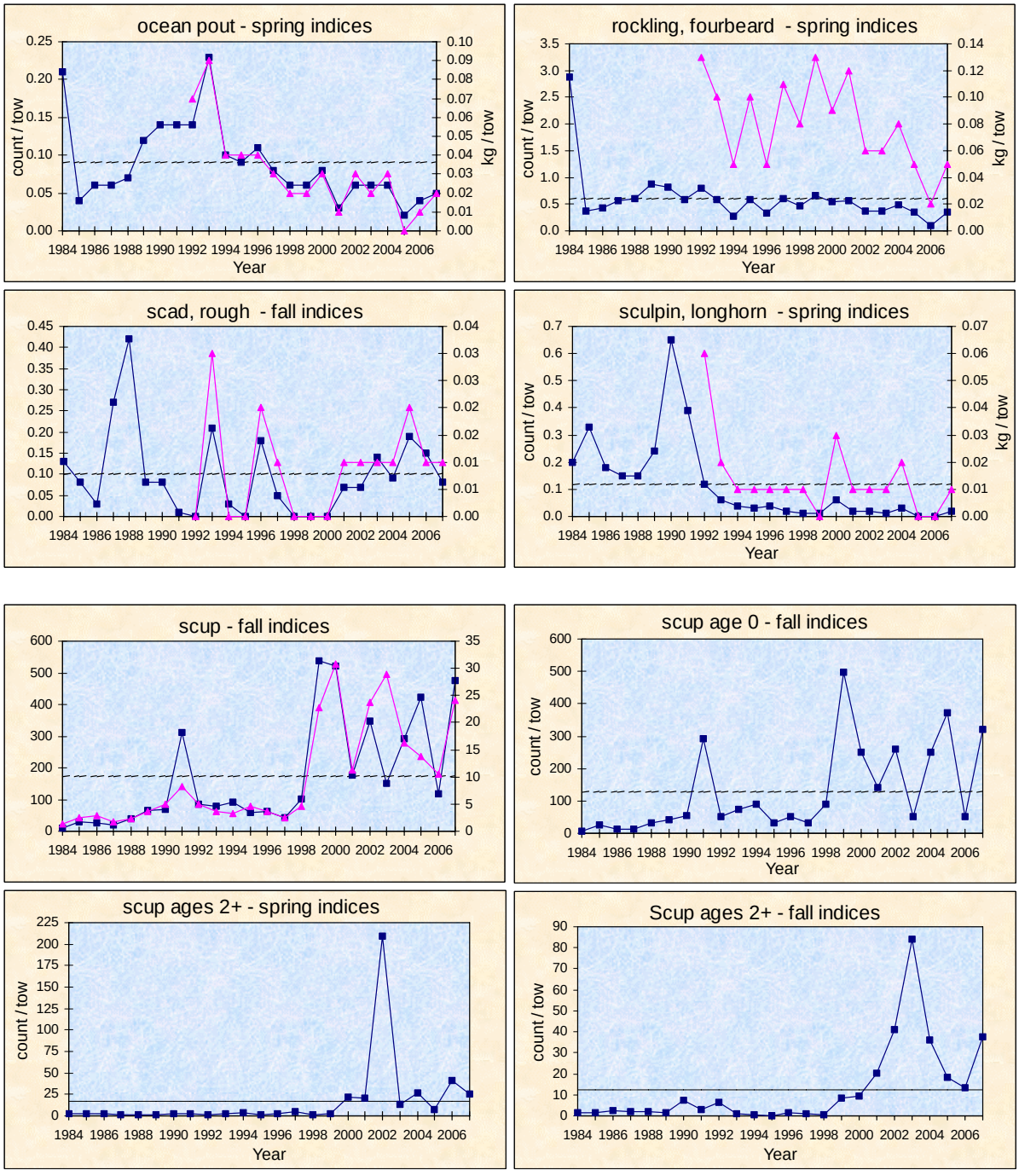
Legend:

■ = count / tow

▲ = kg / tow

---- = mean count / tow

Figure 2.11. Plots of abundance indices for: ocean pout, fourbeard rockling, rough scad, longhorn sculpin, and scup (all ages, age 0, and ages 2+).



Legend:

■ = count / tow
▲ = kg / tow
---- = mean count / tow

Figure 2.12. Plots of abundance indices for: sea raven, searobins (striped and northern), shad (American and hickory), skates (little and winter), and spot.

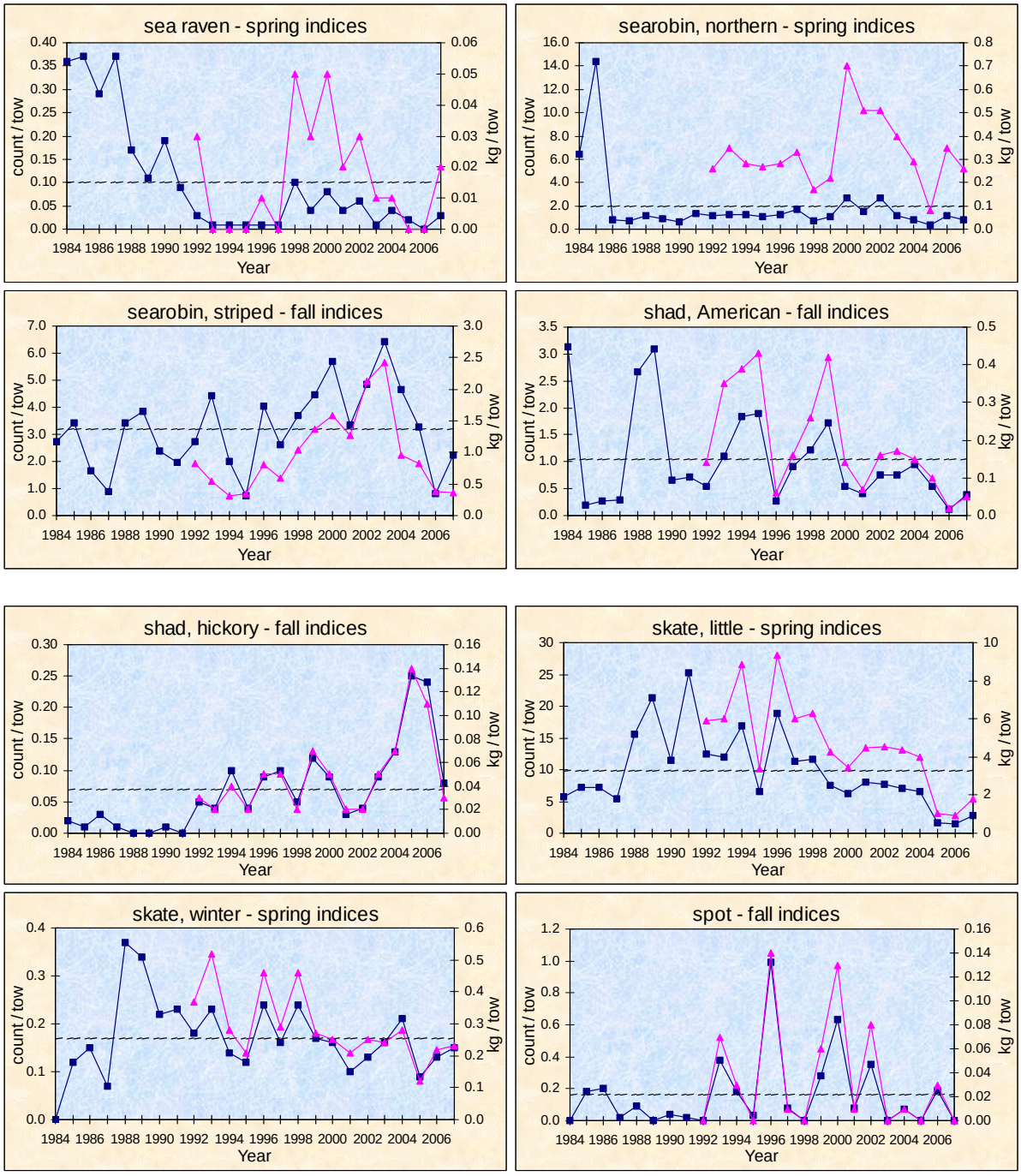
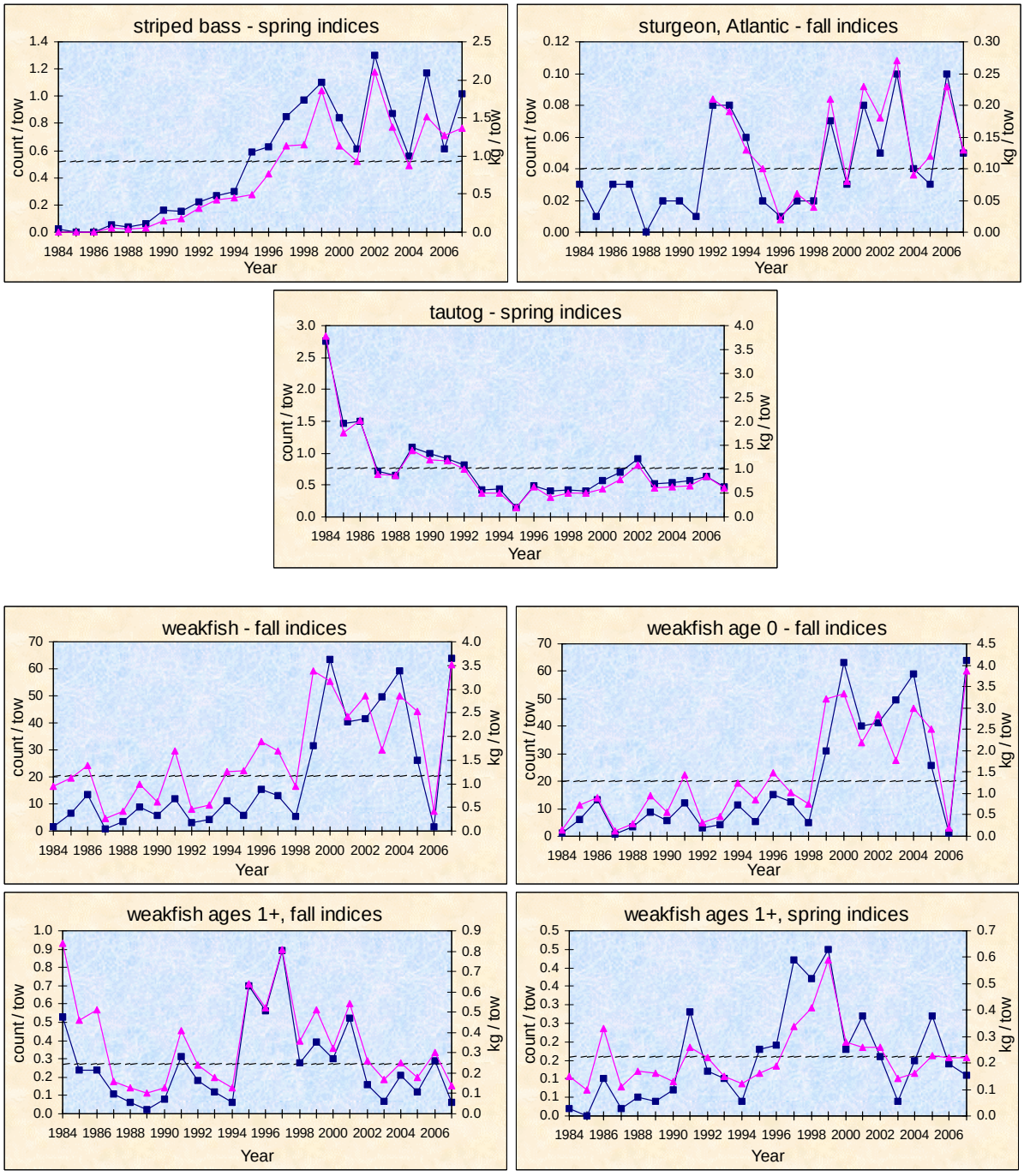


Figure 2.13. Plots of abundance indices for: striped bass, Atlantic sturgeon, tautog, and weakfish (all ages, age 0, and ages 1+).



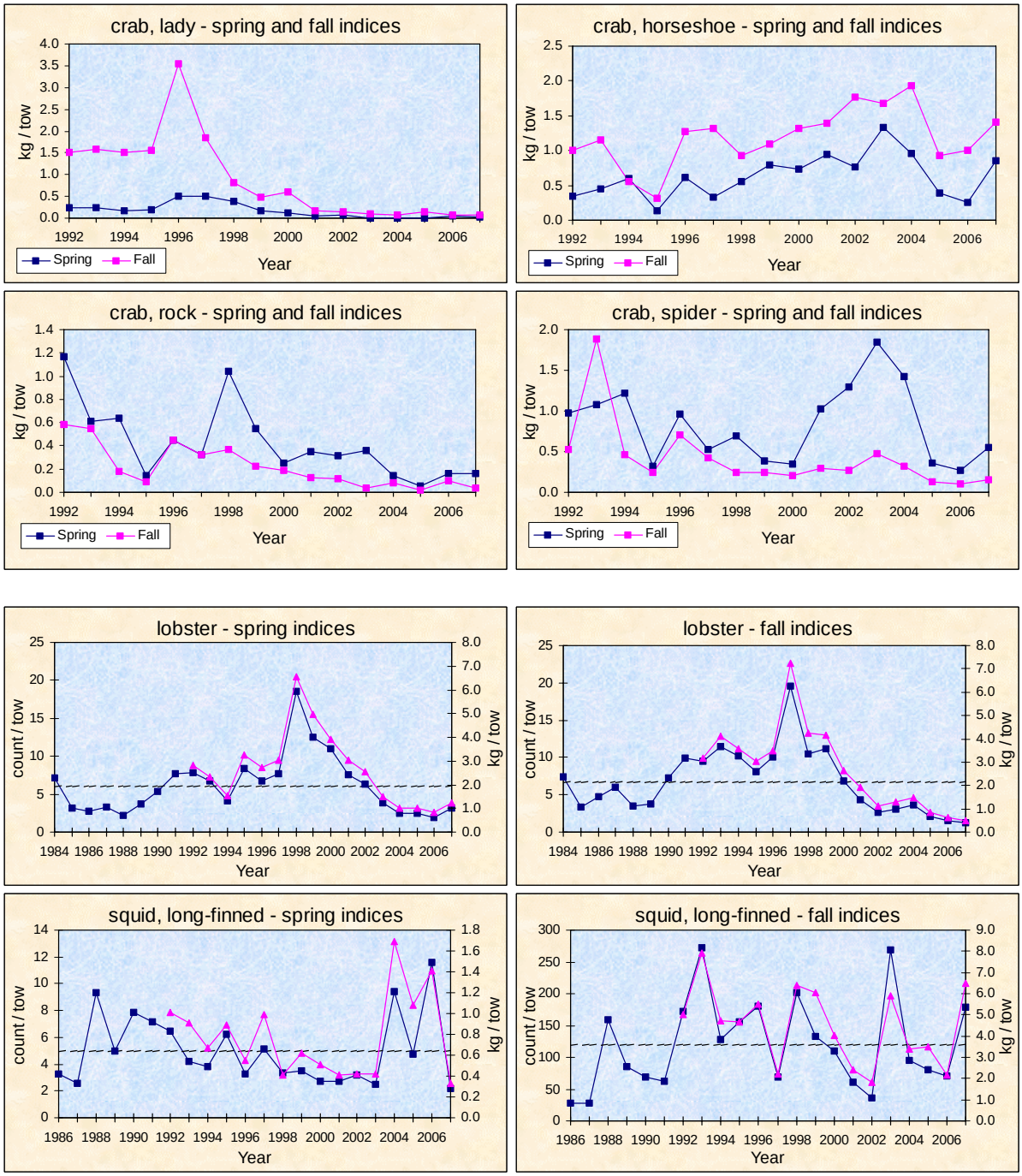
Legend:

■ = count / tow

▲ = kg / tow

---- = mean count / tow

Figure 2.14. Plots of abundance and biomass indices for: crabs (lady, rock, and spider), horseshoe crab, American lobster, and long-finned squid.



Legend for bottom four graphs:

■ = count / tow
▲ = kg / tow
---- = mean count / tow

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APPENDICES
LISTS

Appendix 2.1. List of finfish species identified by A *Study of Marine Recreational Fisheries in Connecticut* (F54R) programs. LISTS has collected ninety-seven species from 1984-2007.
This appendix contains a list of 120 species identified (Bold type indicates new species) from all sampling programs conducted since 1984. Species are listed alphabetically by common name (AFS 1991). Sampling program abbreviations are as follows: ESS = Estuarine Seine Survey; IS = Inshore Survey of Juvenile Winter Flounder; LISTS = Long Island Sound Trawl Survey; SNFH = A Study of Nearshore Finfish Habitat. Gear codes are as follows: BT = beam trawl; OT = otter trawl; PN = plankton net; S = seine.

Common Name	Scientific Name	Sampling Program	Gear
anchovy, bay	*Anchoa mitchilli*	ESS; IS; LISTS	BT; OT; S
anchovy, striped	*Anchoa hepsetus*	LISTS	OT
banded rudderfish	*Seriola zonata*	LISTS	OT
bass, calico	*Pomoxis sp.*	SNFH	PN
bass, striped	*Morone saxatilis*	LISTS; ESS	OT
bigeye	*Priacanthus arenatus*	LISTS	OT
bigeye, short	*Pristigenys alta*	LISTS	OT
black sea bass	*Centropristes striata*	ESS; IS; LISTS	BT; OT; S
bluefish	*Pomatomus saltatrix*	ESS; LISTS	OT; S
bonito, Atlantic	*Sarda sarda*	LISTS	OT
burrfish, striped	*Chilomycterus schoepfi*	LISTS; ESS	OT;S
burrfish, web	*Chilomycterus antillarum*	ESS	S
butterfish	*Peprilus triacanthus*	ESS; IS; LISTS	BT; OT; S
cod, Atlantic	*Gadus morhua*	LISTS	OT
cornetfish, bluespotted	*Fistularia tabacaria*	ESS; IS	BT
cornetfish, red	*Fistularia petimba*	IS; LISTS	BT; OT
croaker, Atlantic	*Micropogonias undulatus*	LISTS	OT
cunner	*Tautogolabrus adspersus*	ESS; IS; LISTS	BT; OT; S
cusk-eel, fawn	*Lepophidium profundorum*	LISTS	OT
cusk-eel, striped	*Ophidion marginatum*	LISTS	OT
dogfish, smooth	*Mustelus canis*	ESS; LISTS	OT; S
dogfish, spiny	*Squalus acanthius*	LISTS	OT
eel, American	*Anguilla rostrata*	ESS; IS; LISTS; SNFH	BT; OT; PN; S
eel, conger	*Conger oceanicus*	LISTS	OT
filefish, orange	*Aluterus schoepfi*	LISTS	OT
filefish, planehead	*Monacanthus hispidus*	LISTS	OT
flounder, American plaice	*Hippoglossoides platessoides*	LISTS	OT
flounder, fourspot	*Paralichthys oblongus*	IS; LISTS	BT; OT
flounder, smallmouth	*Etropus microstomus*	ESS; IS; LISTS	BT; OT; S
flounder, summer	*Paralichthys dentatus*	ESS; IS; LISTS	BT; OT; S
flounder, windowpane	*Scophthalmus aquosus*	ESS; IS; LISTS	BT; OT; S
flounder, winter	*Pleuronectes americanus*	ESS; IS; LISTS; SNFH	BT; OT; PN; S
flounder, yellowtail	*Pleuronectes ferrugineus*	IS; LISTS	BT; OT
glasseye snapper	*Priacanthus cruentatus*	LISTS	OT
goatfish, dwarf	*Upeneus parvus*	LISTS	OT
goatfish, red	*Mullus auratus*	LISTS	OT
goby, code	*Gobiosoma robustrum*	ESS	S
goby, naked	*Gobiosoma bosci*	ESS; IS,LISTS	BT; OT, S
goosefish	*Lophius americanus*	IS; LISTS	BT; OT
grubby	*Myoxocephalus aeneus*	ESS; IS; LISTS; SNFH	BT; OT; PN; S
gunnel, banded	*Pholis fasciata*	ESS; IS	BT; S
gunnel, rock	*Pholis gunnellus*	ESS; IS; LISTS; SNFH	BT; OT; PN; S
gurnard, flying	***Dactylopterus volitans***	**ESS**	S

Appendix 2.1 cont.

Common Name	Scientific Name	Sampling Program	Gear
haddock	*Melanogrammus aeglefinus*	LISTS	OT
hake, red	*Urophycis chuss*	IS; LISTS	BT; OT
hake, silver	*Merluccius bilinearis*	IS; LISTS	BT; OT
hake, spotted	*Urophycis regia*	ESS; IS; LISTS	BT; OT; S
herring, alewife	*Alosa pseudoharengus*	ESS; LISTS; SNFH	OT; PN; S
herring, Atlantic	*Clupea harengus*	LISTS; SNFH	OT; PN
herring, blueback	*Alosa aestivalis*	ESS; IS; LISTS; SNFH	BT; OT; PN; S
herring, round	*Etrumeus teres*	LISTS	OT
hogchoker	*Trinectes maculatus*	ESS; IS; LISTS	BT; OT; S
jack, crevalle	*Caranx hippos*	ESS; LISTS	OT; S
jack, yellow	*Caranx bartholomaei*	ESS; IS; LISTS	BT; OT; S
killifish, rainwater	*Lucania parva*	ESS	S
killifish, striped	*Fundulus majalis*	ESS; IS	BT; S
kingfish, northern	*Menticirrhus saxatilis*	ESS; IS; LISTS	BT; OT; S
lamprey, sea	*Petromyzon marinus*	LISTS	OT
lizardfish, inshore	*Synodus foetens*	ESS; LISTS	OT; S
lookdown	*Selene vomer*	LISTS	OT
lumpfish	*Cyclopterus lumpus*	IS; LISTS; SNFH	BT; OT; PN
mackerel, Atlantic	*Scomber scombrus*	LISTS	OT
mackerel, Spanish	*Scomberomorus maculatus*	LISTS	OT
menhaden, Atlantic	*Brevoortia tyrannus*	ESS; IS; LISTS; SNFH	BT; OT; PN; S
moonfish	*Selene setapinnis*	LISTS	OT
mullet, white	*Mugil curema*	ESS	S
mummichog	*Fundulus heteroclitus*	ESS	S
ocean pout	*Macrozoarces americanus*	LISTS	OT
oyster toadfish	*Opsanus tau*	ESS; IS; LISTS; SNFH	BT; OT; PN; S
perch, silver	*Bairdiella chrysura*	IS	BT
perch, white	*Morone americana*	ESS;IS; LISTS; SNFH	BT; OT; PN
perch, yellow	*Perca flavescens*	SNFH	PN
pipefish, northern	*Syngnathus fuscus*	ESS; IS; LISTS; SNFH	BT; OT; PN; S
pollock	*Pollachius virens*	LISTS	OT
pompano	*Trachinotus carolinus*	ESS	S
pompano, African	*Alectis ciliaris*	LISTS	OT
puffer, northern	*Sphoeroides maculatus*	ESS; IS; LISTS	BT; OT; S
pumpkinseed	*Lepomis gibbosus*	ESS	S
radiated shanny	*Ulvaria subbifurcata*	SNFH	PN
rockling, fourbeard	*Enchelyopus cimbrius*	IS; LISTS; SNFH	BT; OT; PN
salmon, Atlantic	*Salmo salar*	LISTS	OT
sand lance, American	*Ammodytes americanus*	ESS; LISTS; SNFH	OT; PN; S
sandbar (brown) shark	*Carcharhinus plumbeus*	LISTS	OT
scad, bigeye	*Selar crumenophthalmus*	LISTS	OT
scad, mackerel	*Decapterus macarellus*	LISTS	OT
scad, rough	*Trachurus lathami*	LISTS	OT
scad, round	*Decapterus punctatus*	LISTS	OT
sculpin, longhorn	*Myoxocephalus octodecemspinosus*	LISTS; SNFH	OT; PN
scup	*Stenotomus chrysops*	ESS; IS; LISTS	BT; OT; S
sea raven	*Hemitripterus americanus*	LISTS; SNFH	OT; PN
seahorse	*Hippocampus erectus*	ESS; IS; LISTS	BT; OT; S

Appendix 2.1 cont.

Common Name	Scientific Name	Sampling Program	Gear
searobin, northern	*Prionotus carolinus*	ESS; IS; LISTS; SNFH	BT; OT; PN; S
searobin, striped	*Prionotus evolans*	ESS; IS; LISTS	BT; OT; S
seasnail	*Liparis atlanticus*	LISTS; SNFH	OT; PN
sennet, northern	*Sphyraena borealis*	ESS; LISTS	OT
shad, American	*Alosa sapidissima*	ESS; IS; LISTS	BT; OT; S
shad, gizzard	*Dorosoma cepedianum*	LISTS	OT
shad, hickory	*Alosa mediocris*	LISTS	OT
sharksucker	*Echeneis naucrates*	LISTS	OT
sheepshead minnow	*Cyprinodon variegatus*	ESS	S
silverside, Atlantic	*Menidia menidia*	ESS; IS; LISTS; SNFH	BT; OT; PN; S
silverside, inland	*Menidia beryllina*	SNFH	PN
skate, barndoor	*Dipturus laevis*	LISTS	OT
skate, clearnose	*Raja eglanteria*	IS; LISTS	BT; OT
skate, little	*Leucoraja erinacea*	ESS; IS; LISTS	BT; OT; S
skate, winter	*Leucoraja ocellata*	LISTS	OT
smelt, rainbow	*Osmerus mordax*	ESS; IS; LISTS; SNFH	BT; OT; PN; S
snapper, grey	*Lutjanus griseus*	ESS	S
spot	*Leiostomus xanthurus*	IS; LISTS	BT; OT
stargazer, northern	*Astroscopus guttatus*	ESS	S
stickleback, black spot	*Gasterosteus wheatlandi*	ESS	S
stickleback, four-spine	*Apeltes quadracus*	ESS; IS	BT; S
stickleback, nine-spine	*Pungitius pungitius*	ESS	S
stickleback, three-spine	*Gasterosteus aculeatus*	ESS; IS	BT; S
stingray, roughtail	*Dasyatis centroura*	LISTS	OT
sturgeon, Atlantic	*Acipenser oxyrhynchus*	LISTS	OT
tautog	*Tautoga onitis*	ESS; IS; LISTS	BT; OT; S
tomcod, Atlantic	*Microgadus tomcod*	ESS; IS; LISTS; SNFH	BT; OT; PN; S
triggerfish, gray	*Balistes capriscus*	LISTS	OT
weakfish	*Cynoscion regalis*	IS; LISTS	BT; OT

Appendix 2.2. Annual total count of finfish, lobster and squid taken in the LISTS, 1984-2007.

Counts include all tows- number of tows conducted is shown in second row. Refer to Table 2.4 for details on number of tows conducted per month. Note: nc = not counted. Anchovy spp., (yoy) and sand lance, (yoy) are estimated.

Common name	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Total
(number of tows)	200	246	316	320	320	320	297	200	160	240	240	200	200	200	200	200	200	200	200	200	199	200	120	200	5,378
anchovy, bay	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	548	2,303	443	992	2,434	1,523	814	1,492	2,440	**12,990**
anchovy, striped	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	11	0	0	216	0	47	0	2	0	0	0	6	**282**
anchovy, spp (yoy-est)	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	2,667	15,700	935	1,515	3,410	13,110	3,254	2,179	1,267	**44,036**
bigeye	0	0	0	1	2	2	1	0	0	0	1	0	0	0	0	2	1	0	0	0	0	0	0	0	**10**
bigeye, short	1	2	0	0	1	2	0	0	0	1	1	0	3	2	0	0	0	1	5	0	0	0	0	0	**19**
black sea bass	34	53	44	24	22	21	39	39	5	20	34	12	27	22	18	50	69	134	394	64	124	42	19	116	**1,426**
bluefish	9,927	8,946	5,712	3,517	3,857	12,568	8,195	5,845	5,269	6,469	16,245	5,524	6,705	10,815	8,814	7,843	6,135	3,986	3,450	3,766	6,504	6,532	2,100	9,378	**168,102**
bonito, Atlantic	0	2	0	1	1	1	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	1	0	**9**
burrfish, striped	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	**1**
butterfish	37,137	67,944	44,624	42,519	60,746	94,928	80,778	40,537	95,961	67,087	54,378	64,930	49,360	70,985	136,926	191,100	60,490	45,264	66,550	36,133	94,735	92,996	50,022	49,137	**1,695,267**
cod, Atlantic	0	0	0	0	0	0	1	0	0	0	0	2	0	1	0	0	1	0	0	58	33	10	0	0	**106**
Gadus spp. (yoy/larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	36	0	0	**36**
cornetfish, red	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**2**
croaker, Atlantic	0	0	0	0	0	0	0	0	0	41	3	0	0	0	0	0	0	0	0	0	0	0	0	0	**44**
cunner	359	98	97	129	72	268	196	75	30	65	25	41	17	43	65	51	50	51	55	42	21	24	8	16	**1,896**
cusk-eel, fawn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	**4**
cusk-eel, striped	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	**2**
dogfish, smooth	846	919	850	526	564	374	284	193	304	420	361	168	275	167	310	305	467	598	1,019	570	503	467	332	580	**11,402**
dogfish, spiny	89	252	173	76	434	99	417	14	6	14	58	0	1	7	18	10	4	48	17	85	38	41	11	32	**1,946**
eel, American	2	0	1	0	0	2	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	2	**9**
eel, american (yoy/larvae)	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0	0	0	0	0	0	0	0	1	**1**
eel, conger	0	0	0	0	0	0	0	0	1	3	0	2	1	0	0	2	0	2	0	3	0	0	0	0	**14**
eel, conger (yoy/larvae)	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0	0	0	0	0	1	0	0	0	**1**
filefish, orange	0	1	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	**4**
filefish, planehead	4	20	1	0	25	13	23	1	0	10	1	0	3	0	0	3	0	1	0	1	0	0	1	0	**107**
flounder, American plaice	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	**1**
flounder, fourspot	2,691	2,759	2,126	2,112	4,653	2,924	4,698	3,553	2,774	1,447	1,674	2,584	2,815	4,122	1,908	1,393	2,590	2,167	1,859	1,877	1,406	688	466	1,094	**56,380**
flounder, smallmouth	2	0	2	15	39	13	4	20	12	30	17	19	41	58	97	96	61	98	139	49	50	44	7	48	**960**
flounder, summer	208	249	716	531	414	47	242	263	186	293	282	121	434	486	436	582	555	875	1,356	1,181	644	506	203	733	**11,541**
flounder, windowpane	26,200	18,936	22,514	15,588	26,919	31,082	14,738	8,482	2,980	8,526	6,678	3,815	14,116	10,324	6,483	4,643	2,488	3,065	1,991	2,177	2,275	1,982	1,077	4,051	**241,129**
flounder, winter	13,921	13,851	19,033	22,696	36,706	45,563	59,981	26,623	9,548	16,843	21,481	15,558	22,722	14,701	15,697	10,288	8,867	9,826	6,884	4,676	4,021	4,692	1,699	4,550	**410,426**
flounder, yellowtail	0	0	0	0	7	0	1	0	0	0	0	1	0	1	0	0	1	1	0	0	0	0	1	1	**14**
glasseye snapper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	1	4	8	**16**
goatfish, dwarf	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
goatfish, red	1	0	0	0	0	0	2	1	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	**7**
goby, naked	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	**1**
goosefish	1	8	1	1	1	15	3	8	10	4	8	4	1	2	3	2	1	1	3	0	1	2	1	0	**81**
grubby	0	1	1	1	5	9	6	0	0	0	5	1	2	11	5	2	0	0	1	2	0	2	0	1	**55**
gunnel, rock	0	6	0	6	5	10	9	0	0	0	1	0	3	0	0	0	3	1	1	6	2	9	2	1	**65**

Appendix 2.2 cont.

Common name	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Total
(number of tows)	200	246	316	320	320	320	297	200	160	240	240	200	200	200	200	200	200	200	200	200	199	200	120	200	5,378
haddock	0	0	0	0	0	0	0	0	0	0	0	2	0	1	7	1	0	0	0	26	7	2	0	0	**46**
hake, red	3,696	1,161	3,061	2,258	3,808	7,365	3,300	2,085	1,606	4,183	546	1,977	872	748	3,015	2,973	2,393	1,382	2,103	873	829	585	625	2,788	**54,231**
hake, silver	1,525	724	1,464	1,848	3,427	3,551	4,243	1,537	544	508	2,136	1,941	489	1,973	1,870	5,126	679	3,945	2,013	496	1,417	165	1,267	290	**43,177**
hake, spotted	78	69	96	55	255	12	42	73	68	497	184	72	384	77	142	381	1,425	606	798	656	230	234	321	340	**7,094**
herring, alewife	284	37	242	819	415	473	287	103	122	934	1,431	386	1,402	1,194	456	1,393	1,572	638	855	746	859	742	573	1,537	**17,500**
herring, Atlantic	112	510	2,536	2,549	2,721	2,560	25,029	4,003	4,565	6,271	3,850	9,135	972	3,455	893	2,511	770	497	365	459	851	1,168	66	1,932	**77,779**
herring, blueback	1,722	117	267	104	247	367	124	38	175	106	1,199	255	97	630	211	19	143	279	68	110	218	111	63	156	**6,826**
herring, round	22	15	0	1	0	0	0	0	2	6	2	0	0	0	31	0	0	5	0	0	0	0	0	0	**84**
hogchoker	293	282	140	87	113	118	259	104	61	73	37	17	45	15	12	39	40	85	100	92	83	61	22	78	**2,255**
jack, crevalle	0	1	0	1	4	0	0	0	0	6	8	1	0	3	0	8	0	0	1	2	2	2	0	0	**39**
jack, yellow	0	0	0	0	0	41	8	11	2	2	6	32	6	2	6	20	3	3	13	1	1	28	2	5	**192**
kingfish, northern	0	0	0	0	0	1	1	4	2	10	7	25	6	7	15	6	2	2	1	1	5	4	0	4	**103**
lamprey, sea	0	0	0	1	1	0	1	1	0	2	0	0	1	1	0	0	0	0	0	1	0	0	0	1	**10**
lizardfish, inshore	0	0	0	0	0	2	0	0	0	0	1	0	0	2	1	7	1	21	1	0	0	1	4	2	**43**
lobster, American	5,995	3,549	4,924	6,923	6,032	7,645	9,696	8,524	8,160	12,582	9,123	9,944	9,490	16,467	16,211	13,922	10,481	5,626	3,880	2,923	1,843	1,389	748	1,648	**177,725**
lookdown	0	0	0	0	0	0	2	0	0	0	3	0	0	0	0	0	0	0	0	0	0	1	0	0	**6**
lumpfish	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**2**
mackerel, Atlantic	68	17	20	29	45	376	46	2	4	17	11	1	5	8	13	21	2	0	5	8	0	37	0	9	**744**
mackerel, Spanish	0	0	0	0	0	11	0	2	1	233	106	0	0	0	0	1	0	0	0	1	0	0	0	0	**355**
menhaden, Atlantic	161	304	718	600	335	623	407	348	1,115	298	411	318	88	116	306	1,187	492	86	366	799	746	235	28	426	**10,513**
moonfish	7	226	23	7	142	60	10	24	62	6	149	33	921	287	1,188	645	1,817	225	424	133	182	356	361	979	**8,267**
ocean pout	26	3	14	14	30	58	39	42	18	66	42	30	26	15	13	17	18	6	13	14	18	3	5	12	**542**
perch, white	0	0	0	0	0	2	0	0	0	4	1	0	1	4	0	1	1	0	0	8	2	0	0	0	**24**
pipefish, northern	1	0	1	0	3	0	0	0	5	21	2	2	0	1	0	2	4	4	2	6	2	4	3	2	**65**
pollock	5	0	3	8	6	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	**28**
pompano, African	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	**1**
puffer, northern	1	2	6	0	3	2	2	5	1	28	4	1	3	1	28	14	4	8	6	3	5	5	0	8	**141**
rockling, fourbeard	376	89	184	312	563	686	393	163	150	242	93	169	109	199	133	233	185	251	106	113	173	106	14	87	**5,128**
rudderfish, banded	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
salmon, Atlantic	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
sand lance, American	nc	nc	nc	nc	nc	nc	nc	nc	nc	3	25	95	0	2	4	178	4	4	3	19	70	6	0	30	**443**
sand lance, (yoy-est)	nc	nc	nc	nc	nc	nc	nc	nc	nc	0	1,000	5	0	0	100	1,075	0	430	0	0	0	0	5,444	2	**8,056**
scad, bigeye	0	0	0	0	15	63	1	1	0	0	3	0	2	1	1	21	0	0	0	0	0	0	0	0	**108**
scad, mackerel	0	0	0	0	0	0	1	2	6	0	4	1	3	0	1	0	0	0	0	0	0	0	0	2	**20**
scad, rough	34	32	19	89	180	81	41	1	0	100	13	0	35	65	0	0	0	10	10	12	14	62	14	13	**825**
scad, round	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	1	2	0	0	4	11	12	0	3	**39**
sculpin, longhorn	14	82	51	32	107	107	263	139	31	11	7	5	7	4	2	2	14	5	3	5	5	0	0	3	**899**
scup	8,806	18,054	16,449	9,761	12,566	37,642	21,193	45,790	13,646	32,218	38,456	13,985	16,087	9,582	23,742	101,095	101,464	58,325	100,481	26,926	61,521	52,642	28,829	75,681	**924,941**
sea raven	57	59	70	88	52	34	44	19	4	1	1	2	2	3	30	9	19	7	11	3	7	3	0	5	**530**
seahorse, lined	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	**1**
searobin, northern	585	2,267	546	280	605	381	357	609	313	951	878	1,317	672	579	360	547	2,014	1,594	2,123	1,632	784	265	630	691	**20,981**
searobin, striped	1,434	2,295	2,035	1,482	2,086	2,211	2,353	865	857	1,491	1,298	682	1,008	819	1,321	1,690	3,129	2,061	2,394	2,235	1,308	757	366	755	**36,932**

Appendix 2.2 cont.

Common name	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Total
(number of tows)	200	246	316	320	320	320	297	200	160	240	240	200	200	200	200	200	200	200	200	200	199	200	120	200	5,378
seasnail	0	0	0	0	1	0	8	0	0	0	0	0	0	0	0	0	0	4	0	0	4	2	0	0	**19**
sennet, northern	1	0	0	0	0	1	0	0	0	2	0	0	0	0	0	6	0	1	2	0	0	8	0	2	**23**
shad, American	1,852	425	642	1,036	3,208	4,007	550	361	380	1,142	1,723	755	501	922	901	987	316	109	593	689	356	177	68	236	**21,936**
shad, gizzard	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	1	1	2	0	1	**8**
shad, hickory	71	4	7	6	4	40	2	1	12	10	31	6	29	25	40	56	42	14	45	41	39	136	75	37	**773**
shark, sandbar	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
sharksucker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	**1**
silverside, Atlantic	0	0	0	0	0	0	0	0	1	54	3	39	0	2	0	1	2	1	0	1	0	0	0	1	**105**
skate, barndoor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	**1**
skate, clearnose	0	0	3	2	1	1	3	2	8	8	1	4	1	4	20	22	18	65	59	68	22	102	36	97	**547**
skate, little	2,751	4,614	4,303	3,847	9,471	9,349	11,902	6,479	3,495	6,051	6,714	2,372	6,203	4,068	4,305	3,686	3,340	4,311	4,242	4,071	3,044	1,317	593	1,277	**111,805**
skate, winter	1	20	34	17	114	120	85	50	31	62	51	41	88	48	62	41	31	38	45	82	53	31	23	44	**1,212**
smelt, rainbow	0	0	0	0	5	4	2	2	0	9	9	4	0	0	0	0	0	0	1	1	0	0	0	0	**37**
spot	0	34	38	10	29	0	8	2	0	124	53	3	195	10	0	45	204	13	52	1	8	0	14	0	**842**
squid, long-finned	0	0	11,018	15,135	33,400	21,304	23,789	12,322	32,780	58,312	25,396	23,974	22,720	13,048	27,443	21,580	16,585	9,080	8,034	21,350	23,022	17,542	7,802	24,212	**469,848**
stingray, roughtail	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	1	0	0	0	**5**
striped bass	10	13	12	30	31	59	117	38	42	81	81	165	232	319	400	397	293	214	469	383	378	469	144	422	**4,798**
sturgeon, Atlantic	11	3	6	6	7	13	9	3	30	60	60	6	3	5	17	39	7	18	18	29	8	9	21	18	**406**
tautog	734	773	796	624	629	791	693	501	265	164	224	61	136	190	194	217	287	319	565	225	232	179	186	280	**9,264**
toadfish, oyster	3	4	9	0	0	3	4	1	0	2	0	1	0	0	3	2	6	2	8	9	1	0	1	5	**64**
tomcod, Atlantic	2	1	0	8	2	3	3	4	8	5	2	4	2	1	0	1	0	0	0	0	2	0	0	0	**48**
triggerfish, gray	0	1	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	**4**
weakfish	366	2,740	7,751	327	1,341	5,914	2,246	4,320	1,317	2,060	8,156	2,881	6,375	3,904	3,495	12,416	23,595	12,739	10,713	8,183	17,505	9,191	241	17,386	**165,162**
Total	**122,527**	**152,574**	**153,383**	**136,139**	**216,479**	**294,026**	**277,183**	**174,235**	**186,975**	**230,300**	**204,795**	**163,532**	**165,756**	**170,557**	**257,779**	**392,447**	**271,189**	**170,580**	**227,225**	**129,982**	**240,860**	**200,290**	**108,214**	**204,971**	**4,851,997**

Appendix 2.3. Annual total weight (kg) of finfish, lobster and squid taken in LISTS, 1992-2007.
Counts include all tows-see Table 2.4 for number of tows conducted. Note: nw = not weighed.

Common name	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Total
(number of tows)	160	240	240	200	200	200	200	200	200	200	200	200	199	200	120	200	2,959
anchovy, bay	nw	nw	nw	nw	nw	nw	nw	5.6	12.2	3.6	6.6	13.3	10.3	5.8	8.3	14.5	**80.2**
anchovy, striped	nw	nw	nw	nw	0.2	0.0	0.0	6.1	0.0	1.2	0.0	0.1	0.0	0.0	0.0	0.1	**7.7**
Anchovy, spp (yoy-est)	nw	nw	nw	nw	nw	nw	nw	0.5	4.5	0.8	1.5	2.0	3.0	0.0	0.0	0.8	**13.1**
bigeye	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.4**
bigeye, short	0.0	0.1	0.1	0.0	0.3	0.2	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	**1.0**
black sea bass	1.8	6.4	11.0	4.7	12.1	10.5	10.6	17.2	22.6	74.8	188.3	49.6	40.5	26.4	9.3	46.8	**532.6**
bluefish	2,462.9	2,226.1	2,341.7	1,156.1	1,118.2	977.6	899.0	1,218.0	1,408.0	751.2	1,099.7	791.6	2,140.6	1,333.8	358.6	1,801.3	**22,084.4**
bonito, Atlantic	0.0	6.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	0.0	0.0	0.0	3.2	0.0	**12.0**
burrfish, striped	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	**0.5**
butterfish	1,357.3	1,450.1	1,202.2	1,664.5	1,844.7	2,017.2	3,661.1	4,171.6	1,458.3	1,834.0	1,924.2	682.8	1,842.7	2,097.3	1,631.4	1,446.2	**30,285.6**
cod, Atlantic	0.0	0.0	0.0	0.1	0.0	0.3	0.0	0.0	0.1	0.0	0.0	2.8	4.7	0.9	0.0	0.0	**8.9**
cornetfish, red	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.1**
croaker, Atlantic	0.0	2.5	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**2.8**
cunner	3.7	6.2	2.1	4.4	2.6	4.1	8.1	5.9	5.3	5.9	7.2	6.7	3.7	4.1	1.3	3.0	**74.3**
cusk-eel, fawn	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	**0.2**
cusk-eel, striped	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.1**
dogfish, smooth	863.2	1,339.1	934.6	566.8	862.8	527.3	989.8	923.0	1,038.5	1,407.6	2,814.3	1,527.4	1,435.3	1,421.7	1,176.6	2,110.2	**19,938.2**
dogfish, spiny	30.7	58.4	199.6	0.0	2.1	13.7	44.5	51.1	9.9	128.6	48.0	239.5	104.7	102.0	47.0	122.3	**1,202.1**
eel, American	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.9	**3.1**
eel, conger	0.1	0.2	0.0	1.2	0.1	0.0	0.0	0.5	0.0	0.3	0.0	1.1	0.1	0.0	0.0	0.0	**3.6**
filefish, orange	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.2**
filefish, planehead	0.0	0.8	0.1	0.0	0.3	0.0	0.0	0.3	0.0	0.1	0.0	0.1	0.0	0.0	0.1	0.0	**1.8**
flounder, American plaice	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	**0.1**
flounder, fourspot	382.4	193.6	202.4	402.9	407.2	615.3	306.0	203.9	398.6	362.7	326.9	350.1	309.3	125.9	88.1	224.9	**4,900.2**
flounder, smallmouth	0.6	2.6	1.5	1.2	2.3	2.4	6.4	5.2	2.7	3.8	4.9	3.0	2.8	2.4	0.6	2.6	**45.0**
flounder, summer	142.1	193.1	173.0	79.6	266.4	326.0	431.3	459.8	471.3	628.1	989.3	845.7	627.2	406.1	180.5	590.9	**6,810.4**
flounder, windowpane	286.1	578.9	597.2	356.2	1,223.6	986.1	741.1	594.2	368.8	475.5	343.3	378.8	333.7	177.5	128.9	510.8	**8,080.7**
flounder, winter	1,344.8	1,898.0	2,060.9	1,614.7	3,335.0	2,439.4	2,450.3	2,011.7	1,921.4	1,993.6	1,584.1	1,421.9	839.9	566.1	271.2	951.3	**26,704.3**
flounder, yellowtail	0.0	0.0	0.0	0.1	0.0	0.3	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.4	1.0	**2.1**
glasseye snapper	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.7	**1.0**
goatfish, red	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	**0.3**
goby, naked	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	**0.1**
goosefish	2.5	0.5	2.0	3.3	0.1	1.6	3.2	0.3	0.2	0.4	0.6	0.0	0.1	0.7	1.2	0.0	**16.7**
grubby	0.0	0.0	0.3	0.1	0.2	0.7	0.3	0.2	0.0	0.0	0.1	0.1	0.0	0.2	0.0	0.1	**2.3**
gunnel, rock	0.0	0.0	0.1	0.0	0.2	0.0	0.0	0.0	0.2	0.1	0.1	0.4	0.2	0.6	0.1	0.1	**2.1**
haddock	0.0	0.0	0.0	0.2	0.0	0.1	0.5	0.1	0.0	0.0	0.0	1.3	0.6	0.2	0.0	0.0	**3.0**
hake, red	127.7	254.4	63.9	145.6	95.5	80.5	217.5	226.5	162.6	109.7	206.6	73.4	51.6	56.0	37.4	200.4	**2,109.3**
hake, silver	22.0	21.9	127.6	61.6	20.0	70.8	88.3	99.6	28.8	152.2	89.6	13.9	27.3	7.1	37.7	14.6	**883.0**
hake, spotted	10.3	55.9	32.4	6.5	42.6	19.0	12.2	38.8	92.3	34.9	48.2	70.4	37.8	17.4	24.3	23.9	**566.9**
herring, alewife	9.2	54.5	83.2	24.6	134.6	81.3	35.1	107.6	96.0	41.7	70.2	55.3	56.1	47.6	49.5	101.3	**1,047.8**
herring, Atlantic	797.5	1,120.0	769.3	1,631.7	189.8	515.1	74.6	45.4	124.1	72.6	63.9	89.1	58.3	131.1	10.3	234.2	**5,927.0**
herring, blueback	8.5	4.7	31.2	7.5	6.2	16.5	5.1	1.1	6.8	11.1	2.4	4.0	6.5	5.4	2.5	9.1	**128.6**
herring, round	0.2	0.3	0.2	0.0	0.0	0.0	0.6	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	**1.4**
hogchoker	5.6	7.3	3.9	1.7	5.4	1.8	1.9	5.0	5.9	10.5	13.3	8.6	9.5	8.7	3.2	11.4	**103.7**
jack, crevalle	0.0	0.5	0.5	0.1	0.0	0.6	0.0	0.7	0.0	0.0	0.1	0.2	0.2	0.2	0.0	0.0	**3.1**
jack, yellow	0.2	0.2	0.4	2.1	0.5	0.2	0.7	1.9	0.2	0.3	1.4	0.1	0.1	3.0	0.1	0.4	**11.8**
kingfish, northern	0.2	1.0	0.5	2.5	0.6	0.9	1.3	0.6	0.3	0.2	0.2	0.6	0.5	0.6	0.0	0.4	**10.4**
lamprey, sea	0.0	1.0	0.0	0.0	0.7	0.1	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.1	**3.2**
lizardfish, inshore	0.0	0.0	0.1	0.0	0.0	0.2	0.1	0.5	0.1	2.2	0.1	0.0	0.0	0.1	0.4	0.2	**4.0**
lobster, American	1,537.9	2,700.3	1,956.1	2,141.9	2,113.5	3,800.9	3,873.9	3,397.9	2,184.5	1,531.2	1,005.7	690.9	481.5	364.3	197.9	396.5	**28,374.9**
lookdown	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	**0.4**

Appendix 2.3 cont.

Common name	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Total
(number of tows)	160	240	240	200	200	200	200	200	200	200	200	200	199	200	120	200	2,959
lumpfish	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.2**
mackerel, Atlantic	1.0	1.3	0.9	0.1	0.5	1.7	1.1	3.1	0.8	0.0	2.5	1.9	0.0	5.7	0.0	0.8	**21.4**
mackerel, Spanish	1.5	5.3	6.4	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0	**15.5**
menhaden, Atlantic	60.6	103.9	87.8	41.9	40.5	38.5	9.2	90.9	31.8	4.7	96.3	344.9	110.7	77.9	5.5	63.9	**1,209.0**
moonfish	1.5	0.6	4.1	2.1	11.6	4.6	13.4	9.6	15.0	3.8	7.4	2.3	3.4	6.0	3.5	12.0	**100.9**
ocean pout	7.7	16.4	9.1	6.5	7.2	4.8	2.7	3.9	4.9	2.3	4.3	2.9	5.4	0.7	0.9	3.2	**82.9**
perch, white	0.0	0.3	0.3	0.0	0.1	0.9	0.0	0.4	0.2	0.0	0.0	1.4	0.5	0.0	0.0	0.0	**4.1**
pipefish, northern	0.4	0.6	0.2	0.1	0.0	0.1	0.0	0.1	0.2	0.3	0.2	0.4	0.2	0.3	0.2	0.2	**3.5**
pollock	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	**0.4**
pompano, African	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.1**
puffer, northern	0.1	0.9	0.4	0.1	0.3	0.1	0.5	1.1	0.4	0.7	0.3	0.3	0.4	0.3	0.0	0.5	**6.4**
rockling, fourbeard	12.8	15.7	8.5	14.7	8.6	17.3	11.6	28.8	14.7	21.5	9.7	9.2	13.0	6.8	1.5	7.6	**202.0**
salmon, Atlantic	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.1**
sand lance, American	nw	0.3	0.6	0.4	0.0	0.1	0.3	0.3	0.3	0.3	0.1	0.2	0.2	0.2	0.0	0.3	**3.6**
sand lance, (yoy - est)	nw	0.0	0.8	0.1	0.0	0.0	0.1	0.4	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.1	**2.1**
scad, bigeye	0.0	0.0	0.3	0.0	0.1	0.1	0.1	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**2.0**
scad, mackerel	0.2	0.0	0.4	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	**1.0**
scad, rough	0.0	4.4	0.2	0.0	1.5	2.0	0.0	0.0	0.0	0.7	0.7	0.5	0.7	1.9	0.5	0.7	**13.8**
scad, round	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.1	0.2	0.0	0.0	0.3	0.3	0.3	0.0	0.3	**2.0**
sculpin, longhorn	9.0	3.2	1.6	1.3	2.1	0.8	1.0	0.3	5.0	1.5	0.9	2.0	3.4	0.0	0.0	0.8	**32.9**
scup	837.7	867.9	878.1	770.5	739.4	530.5	740.5	3,641.3	6,679.0	5,828.4	13,814.0	5,221.9	6,801.1	3,080.7	4,636.1	5,333.5	**60,400.6**
sea raven	3.9	0.6	0.2	0.7	1.5	0.4	11.3	4.9	9.2	4.1	4.1	1.6	2.4	0.5	0.0	3.6	**49.0**
seahorse, lined	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.1**
searobin, northern	35.6	97.9	66.7	166.9	57.4	60.4	39.4	52.0	251.2	222.7	267.3	252.2	112.0	21.3	74.5	74.2	**1,851.7**
searobin, striped	305.1	260.0	208.6	277.5	278.7	230.5	509.7	497.0	1,036.1	861.0	1,065.0	805.1	465.4	183.7	113.5	217.0	**7,313.9**
seasnail	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.2	0.2	0.0	0.0	**0.7**
sennet, northern	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.1	0.2	0.0	0.0	0.7	0.0	0.2	**1.9**
shad, American	63.3	138.9	165.8	81.4	36.2	66.8	60.2	117.3	25.8	9.6	40.3	40.8	24.2	18.2	6.1	15.8	**910.7**
shad, gizzard	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.2	0.0	0.1	**0.8**
shad, hickory	4.9	4.4	7.6	2.5	10.2	9.1	15.9	19.4	17.1	6.7	19.6	20.1	14.2	43.1	19.1	10.4	**224.3**
sharksucker	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.3**
silverside, Atlantic	0.1	1.0	0.3	0.9	0.0	0.1	0.0	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.1	**2.9**
skate, barndoor	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	**0.4**
skate, clearnose	10.3	11.3	1.8	11.0	1.7	7.4	36.8	39.4	37.9	132.4	107.3	130.8	48.2	187.1	52.4	193.3	**1,009.1**
skate, little	1,389.0	2,534.8	3,091.5	1,055.3	2,801.8	1,945.8	2,085.5	1,829.6	1,604.7	2,022.6	2,121.9	2,187.3	1,689.8	682.5	310.6	697.0	**28,049.7**
skate, winter	105.3	220.9	139.2	89.2	212.7	109.7	180.7	89.8	66.5	112.2	133.5	162.1	100.3	59.9	60.0	117.8	**1,959.8**
smelt, rainbow	0.0	0.6	0.6	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	**1.7**
spot	0.0	10.6	4.3	0.3	14.1	1.1	0.0	5.7	17.8	1.3	7.2	0.1	0.9	0.0	1.2	0.0	**64.6**
squid, long-finned	844.9	1,629.1	965.4	796.4	720.4	515.2	767.0	826.4	582.3	346.2	279.9	573.2	953.4	683.5	326.0	773.6	**11,582.9**
stingray, roughtail	0.0	0.0	0.0	0.0	0.0	50.6	3.4	0.0	0.0	2.5	24.4	0.0	4.1	0.0	0.0	0.0	**85.0**
striped bass	89.4	210.3	198.6	185.3	373.5	509.9	484.2	815.4	602.6	472.5	855.2	770.3	811.8	675.1	418.7	888.0	**8,360.8**
sturgeon, Atlantic	244.8	633.6	848.6	145.5	19.9	37.8	189.7	498.6	79.0	270.6	275.3	550.2	117.6	152.7	368.7	336.4	**4,769.0**
tautog	508.3	320.0	373.9	95.1	225.9	271.8	347.1	326.6	463.5	491.2	921.1	346.0	353.7	269.2	301.4	551.4	**6,166.2**
toadfish, oyster	0.0	1.2	0.0	0.5	0.0	0.0	0.9	1.8	2.5	0.4	4.7	5.0	0.8	0.0	1.2	2.0	**21.0**
tomcod, Atlantic	1.3	0.8	0.3	0.8	0.3	0.1	0.0	0.7	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	**4.5**
triggerfish, gray	0.0	0.9	0.0	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**3.2**
weakfish	94.8	121.2	344.5	275.7	414.9	362.0	268.2	771.3	554.5	415.0	442.0	194.8	426.9	449.9	52.2	584.8	**5,772.7**
Total	**14,031.0**	**19,406.4**	**18,216.5**	**13,905.2**	**17,669.1**	**17,291.1**	**19,646.7**	**23,279.9**	**21,927.8**	**20,876.6**	**31,349.0**	**18,956.8**	**20,494.5**	**13,522.1**	**11,024.1**	**18,711.3**	**300,308.1**

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Appendix 2.4. Total number and weight (kg) of finfish and invertebrates caught in LISTS in 1984.
Finfish species are in order of descending count. Number of tows (sample size)=102.

species	count	%	weight	%	species	count	%	weight	%
butterfish	18,700	31.0	.	.	Atlantic mackerel	48	0.1	.	.
windowpane flounder	13,746	22.8	.	.	spotted hake	46	0.1	.	.
winter flounder	6,847	11.4	.	.	sea raven	32	0.1	.	.
bluefish	6,738	11.2	.	.	ocean pout	25	0	.	.
scup	3,225	5.4	.	.	rough scad	22	0	.	.
fourspot flounder	1,868	3.1	.	.	longhorn sculpin	12	0	.	.
little skate	1,491	2.5	.	.	black sea bass	11	0	.	.
red hake	1,323	2.2	.	.	moonfish	7	0	.	.
American shad	982	1.6	.	.	Atlantic sturgeon	6	0	.	.
blueback herring	925	1.5	.	.	round herring	5	0	.	.
striped searobin	697	1.2	.	.	spiny dogfish	4	0	.	.
silver hake	575	1.0	.	.	American eel	2	0	.	.
smooth dogfish	534	0.9	.	.	striped bass	2	0	.	.
tautog	472	0.8	.	.	oyster toadfish	2	0	.	.
northern searobin	448	0.7	.	.	goosefish	1	0	.	.
fourbeard rockling	303	0.5	.	.	northern sennet	1	0	.	.
weakfish	260	0.4	.	.	northern puffer	1	0	.	.
hogchoker	252	0.4	.	.	red goatfish	1	0	.	.
cunner	220	0.4	.	.	**Total**	**60,230**			
summer flounder	150	0.2	.	.					
alewife	108	0.2	.	.	**Invertebrates**				
hickory shad	71	0.1	.	.	American lobster	2865	100	.	.
Atlantic menhaden	67	0.1	.	.	**Total**	**2,865**		-	

Appendix 2.4. cont. Total number and weight (kg) of finfish and invertebrates caught in LISTS in 1985.
Finfish species are in order of descending count. Number of tows (sample size)=126.

species	count	%	weight	%	species	count	%	weight	%
butterfish	34,512	41.4	.	.	spot	26	0	.	.
scup	12,155	14.6	.	.	round herring	15	0	.	.
windowpane flounder	11,194	13.4	.	.	rough scad	14	0	.	.
winter flounder	7,980	9.6	.	.	Atlantic mackerel	13	0	.	.
bluefish	5,302	6.4	.	.	spiny dogfish	13	0	.	.
weakfish	2,650	3.2	.	.	winter skate	13	0	.	.
northern searobin	2,098	2.5	.	.	alewife	9	0	.	.
little skate	1,705	2.0	.	.	planehead filefish	7	0	.	.
fourspot flounder	1,289	1.5	.	.	rock gunnel	4	0	.	.
striped searobin	1,078	1.3	.	.	oyster toadfish	4	0	.	.
red hake	573	0.7	.	.	goosefish	3	0	.	.
Atlantic herring	504	0.6	.	.	ocean pout	3	0	.	.
smooth dogfish	405	0.5	.	.	Atlantic bonito	2	0	.	.
tautog	323	0.4	.	.	crevalle jack	1	0	.	.
American shad	280	0.3	.	.	grubby	1	0	.	.
silver hake	250	0.3	.	.	gray triggerfish	1	0	.	.
summer flounder	175	0.2	.	.	hickory shad	1	0	.	.
hogchoker	163	0.2	.	.	orange filefish	1	0	.	.
moonfish	142	0.2	.	.	northern puffer	1	0	.	.
blueback herring	100	0.1	.	.	Atlantic sturgeon	1	0	.	.
longhorn sculpin	80	0.1	.	.	Atlantic tomcod	1	0	.	.
cunner	51	0.1	.	.	**Total**	**83,395**		**-**	
sea raven	50	0.1	.	.					
fourbeard rockling	44	0.1	.	.					
Atlantic menhaden	38	0	.	.	**Invertebrates**				
black sea bass	35	0	.	.	American lobster	1589	100	.	.
spotted hake	27	0	.	.	**Total**	**1,589**		**-**	

Appendix 2.4. cont. Total number and weight (kg) of finfish and invertebrates caught in LISTS in 1986.
Finfish species are in order of descending count. Invertebrate species are in order of descending weight. Number of tows (sample size)=196.

species	count	%	weight	%
butterfish	25,192	28.0	.	.
windowpane flounder	18,848	20.9	.	.
winter flounder	15,341	17.0	.	.
scup	7,910	8.8	.	.
weakfish	5,427	6.0	.	.
little skate	3,210	3.6	.	.
bluefish	2,789	3.1	.	.
red hake	2,657	3.0	.	.
Atlantic herring	1,999	2.2	.	.
fourspot flounder	1,487	1.7	.	.
striped searobin	886	1.0	.	.
silver hake	723	0.8	.	.
tautog	566	0.6	.	.
smooth dogfish	430	0.5	.	.
summer flounder	414	0.5	.	.
northern searobin	396	0.4	.	.
American shad	344	0.4	.	.
Atlantic menhaden	318	0.4	.	.
blueback herring	256	0.3	.	.
alewife	216	0.2	.	.
fourbeard rockling	123	0.1	.	.
cunner	76	0.1	.	.
sea raven	70	0.1	.	.
hogchoker	60	0.1	.	.
longhorn sculpin	51	0.1	.	.
spiny dogfish	47	0.1	.	.
winter skate	32	0	.	.
spotted hake	30	0	.	.
black sea bass	28	0	.	.
spot	25	0	.	.
Atlantic mackerel	19	0	.	.
moonfish	14	0	.	.
ocean pout	14	0	.	.
oyster toadfish	9	0	.	.
hickory shad	6	0	.	.
rough scad	5	0	.	.
Atlantic sturgeon	4	0	.	.
clearnose skate	2	0	.	.
American eel	1	0	.	.
goosefish	1	0	.	.
grubby	1	0	.	.
northern pipefish	1	0	.	.
northern puffer	1	0	.	.
smallmouth flounder	1	0	.	.
striped bass	1	0	.	.
Total	**90,031**		**-**	
Invertebrates				
American lobster	2,553	28.1	.	.
long-finned squid	6,537	71.9	.	.
Total	**9,090**		**-**	

Appendix 2.4. cont. Total number and weight (kg) of finfish and invertebrates caught in LISTS in 1987.
Finfish species are in order of descending count. Invertebrate species are in order of descending weight. Number of tows (sample size)=200.

species	count	%	weight	%	species	count	%	weight	%
winter flounder	15,600	25.6	.	.	longhorn sculpin	32	0.1	.	.
butterfish	14,674	24.1	.	.	spotted hake	22	0	.	.
windowpane flounder	11,031	18.1	.	.	spiny dogfish	19	0	.	.
scup	5,029	8.3	.	.	ocean pout	14	0	.	.
bluefish	2,611	4.3	.	.	black sea bass	13	0	.	.
little skate	2,140	3.5	.	.	winter skate	13	0	.	.
red hake	1,729	2.8	.	.	striped bass	10	0	.	.
Atlantic herring	1,628	2.7	.	.	Atlantic tomcod	8	0	.	.
fourspot flounder	1,298	2.1	.	.	smallmouth flounder	7	0	.	.
silver hake	906	1.5	.	.	moonfish	6	0	.	.
alewife	754	1.2	.	.	rock gunnel	4	0	.	.
striped searobin	543	0.9	.	.	Atlantic sturgeon	4	0	.	.
summer flounder	374	0.6	.	.	spot	3	0	.	.
American shad	371	0.6	.	.	clearnose skate	2	0	.	.
tautog	363	0.6	.	.	hickory shad	2	0	.	.
Atlantic menhaden	329	0.5	.	.	Atlantic bonito	1	0	.	.
smooth dogfish	257	0.4	.	.	Atlantic mackerel	1	0	.	.
weakfish	248	0.4	.	.	round herring	1	0	.	.
fourbeard rockling	241	0.4	.	.	sea lamprey	1	0	.	.
northern searobin	220	0.4	.	.	**Total**	**60,862**		**-**	
sea raven	86	0.1	.	.					
blueback herring	79	0.1	.	.	**Invertebrates**				
cunner	79	0.1	.	.	American lobster	3,544	25.1	.	.
hogchoker	61	0.1	.	.	long-finned squid	10,552	74.9	.	.
rough scad	48	0.1	.	.	**Total**	**14,096**		**-**	

Appendix 2.4. cont. Total number and weight (kg) of finfish and invertebrates caught in LISTS in 1988.
Finfish species are in order of descending count. Invertebrate species are in order of descending weight. Number of tows (sample size)=200.

species	count	%	weight	%	species	count	%	weight	%
butterfish	45,983	36.7	.	.	ocean pout	30	0	.	.
winter flounder	25,695	20.5	.	.	Atlantic mackerel	24	0	.	.
windowpane flounder	19,497	15.6	.	.	spot	18	0	.	.
scup	10,184	8.1	.	.	black sea bass	17	0	.	.
little skate	6,539	5.2	.	.	striped bass	17	0	.	.
bluefish	3,688	2.9	.	.	yellowtail flounder	6	0	.	.
fourspot flounder	2,478	2.0	.	.	grubby	5	0	.	.
red hake	1,933	1.5	.	.	rock gunnel	5	0	.	.
weakfish	1,287	1.0	.	.	rainbow smelt	5	0	.	.
silver hake	1,210	1.0	.	.	crevalle jack	4	0	.	.
striped searobin	1,194	1.0	.	.	bigeye scad	2	0	.	.
Atlantic herring	1,193	1.0	.	.	bigeye	2	0	.	.
American shad	1,187	0.9	.	.	planehead filefish	2	0	.	.
northern searobin	474	0.4	.	.	hickory shad	2	0	.	.
tautog	455	0.4	.	.	northern puffer	2	0	.	.
smooth dogfish	385	0.3	.	.	Atlantic sturgeon	2	0	.	.
summer flounder	320	0.3	.	.	Atlantic tomcod	2	0	.	.
fourbeard rockling	302	0.2	.	.	Atlantic bonito	1	0	.	.
blueback herring	164	0.1	.	.	dwarf goatfish	1	0	.	.
alewife	153	0.1	.	.	goosefish	1	0	.	.
moonfish	137	0.1	.	.	northern pipefish	1	0	.	.
rough scad	128	0.1	.	.	short bigeye	1	0	.	.
longhorn sculpin	103	0.1	.	.	striped cusk-eel	1	0	.	.
winter skate	101	0.1	.	.	sea lamprey	1	0	.	.
spotted hake	87	0.1	.	.	**Total**	**125,344**		**-**	
hogchoker	75	0.1	.	.					
Atlantic menhaden	69	0.1	.	.					
sea raven	50	0	.	.	**Invertebrates**				
cunner	48	0	.	.	American lobster	2,114	8.5	.	.
spiny dogfish	39	0	.	.	long-finned squid	22,769	91.5	.	.
smallmouth flounder	34	0	.	.	**Total**	**24,883**		**-**	

Appendix 2.4. cont. Total number and weight (kg) of finfish and invertebrates caught in LISTS in 1989.
Finfish species are in order of descending count. Invertebrate species are in order of descending weight. Number of tows (sample size)=200.

species	count	%	weight	%	species	count	%	weight	%
butterfish	47,089	29.3	.	.	sea raven	34	0	.	.
winter flounder	32,361	20.2	.	.	black sea bass	15	0	.	.
windowpane flounder	25,109	15.6	.	.	rough scad	11	0	.	.
scup	17,391	10.8	.	.	striped bass	11	0	.	.
bluefish	8,649	5.4	.	.	yellow jack	11	0	.	.
little skate	7,079	4.4	.	.	goosefish	9	0	.	.
red hake	5,689	3.5	.	.	smallmouth flounder	9	0	.	.
weakfish	5,496	3.4	.	.	rock gunnel	8	0	.	.
American shad	1,977	1.2	.	.	grubby	7	0	.	.
fourspot flounder	1,877	1.2	.	.	spotted hake	7	0	.	.
striped searobin	1,763	1.1	.	.	rainbow smelt	4	0	.	.
silver hake	1,697	1.1	.	.	planehead filefish	3	0	.	.
Atlantic herring	1,154	0.7	.	.	Atlantic sturgeon	3	0	.	.
tautog	600	0.4	.	.	Atlantic tomcod	3	0	.	.
fourbeard rockling	397	0.2	.	.	bigeye	2	0	.	.
blueback herring	307	0.2	.	.	American eel	2	0	.	.
northern searobin	297	0.2	.	.	short bigeye	2	0	.	.
Atlantic mackerel	237	0.1	.	.	oyster toadfish	2	0	.	.
Atlantic menhaden	230	0.1	.	.	white perch	2	0	.	.
smooth dogfish	202	0.1	.	.	northern sennet	1	0	.	.
alewife	190	0.1	.	.	northern puffer	1	0	.	.
longhorn sculpin	107	0.1	.	.	banded rudderfish	1	0	.	.
cunner	106	0.1	.	.	Spanish mackerel	1	0	.	.
hogchoker	91	0.1	.	.	**Total**	**160,581**		**-**	
winter skate	91	0.1	.	.					
spiny dogfish	66	0	.	.					
ocean pout	58	0	.	.	**Invertebrates**				
bigeye scad	45	0	.	.	American lobster	3,447	19.9	.	.
moonfish	42	0	.	.	long-finned squid	13,883	80.1	.	.
summer flounder	35	0	.	.	**Total**	**17,330**		**-**	

Appendix 2.4. cont. Total number and weight (kg) of finfish and invertebrates caught in LISTS in 1990.
Finfish species are in order of descending count. Invertebrate species are in order of descending weight. Number of tows (sample size)=200.

species	count	%	weight	%
winter flounder	47,184	31.1	.	.
butterfish	45,373	29.9	.	.
scup	15,393	10.2	.	.
windowpane flounder	9,825	6.5	.	.
Atlantic herring	8,779	5.8	.	.
little skate	6,456	4.3	.	.
bluefish	4,688	3.1	.	.
fourspot flounder	3,270	2.2	.	.
silver hake	2,334	1.5	.	.
red hake	2,237	1.5	.	.
weakfish	1,921	1.3	.	.
striped searobin	866	0.6	.	.
tautog	554	0.4	.	.
American shad	406	0.3	.	.
fourbeard rockling	299	0.2	.	.
longhorn sculpin	243	0.2	.	.
northern searobin	232	0.2	.	.
Atlantic menhaden	219	0.1	.	.
smooth dogfish	209	0.1	.	.
summer flounder	170	0.1	.	.
cunner	168	0.1	.	.
alewife	160	0.1	.	.
spiny dogfish	150	0.1	.	.
hogchoker	84	0.1	.	.
winter skate	61	0	.	.
blueback herring	46	0	.	.
striped bass	45	0	.	.
sea raven	42	0	.	.
ocean pout	39	0	.	.
black sea bass	27	0	.	.
spotted hake	21	0	.	.
Atlantic mackerel	10	0	.	.
rough scad	10	0	.	.
seasnail	8	0	.	.
planehead filefish	7	0	.	.
moonfish	7	0	.	.
rock gunnel	7	0	.	.
yellow jack	7	0	.	.
grubby	4	0	.	.
spot	4	0	.	.
Atlantic sturgeon	4	0	.	.
oyster toadfish	4	0	.	.
goosefish	3	0	.	.
smallmouth flounder	3	0	.	.
Atlantic tomcod	3	0	.	.
clearnose skate	2	0	.	.
lookdown	2	0	.	.
red goatfish	2	0	.	.
rainbow smelt	2	0	.	.
bigeye scad	1	0	.	.
bigeye	1	0	.	.
hickory shad	1	0	.	.
mackerel scad	1	0	.	.
northern kingfish	1	0	.	.
northern puffer	1	0	.	.
red cornetfish	1	0	.	.
sandbar shark	1	0	.	.
sea lamprey	1	0	.	.
yellowtail flounder	1	0	.	.
Total	**151,600**		**-**	
Invertebrates				
American lobster	5,369	27.0	.	.
long-finned squid	14,538	73.0	.	.
Total	**19,907**		**-**	

Appendix 2.4. cont. Total number and weight (kg) of finfish and invertebrates caught in LISTS in 1991.
Finfish species are in order of descending count. Invertebrate species are in order of descending weight. Number of tows (sample size)=200.

species	count	%	weight	%	species	count	%	weight	%
scup	45,790	29.9	.	.	moonfish	24	0	.	.
butterfish	40,537	26.4	.	.	smallmouth flounder	20	0	.	.
winter flounder	26,623	17.4	.	.	sea raven	19	0	.	.
windowpane flounder	8,482	5.5	.	.	spiny dogfish	14	0	.	.
little skate	6,479	4.2	.	.	yellow jack	11	0	.	.
bluefish	5,845	3.8	.	.	goosefish	8	0	.	.
weakfish	4,320	2.8	.	.	northern puffer	5	0	.	.
Atlantic herring	4,003	2.6	.	.	northern kingfish	4	0	.	.
fourspot flounder	3,553	2.3	.	.	Atlantic tomcod	4	0	.	.
red hake	2,085	1.4	.	.	Atlantic sturgeon	3	0	.	.
silver hake	1,537	1.0	.	.	clearnose skate	2	0	.	.
striped searobin	865	0.6	.	.	Atlantic mackerel	2	0	.	.
northern searobin	609	0.4	.	.	mackerel scad	2	0	.	.
tautog	501	0.3	.	.	rainbow smelt	2	0	.	.
American shad	361	0.2	.	.	Spanish mackerel	2	0	.	.
Atlantic menhaden	348	0.2	.	.	spot	2	0	.	.
summer flounder	263	0.2	.	.	bigeye scad	1	0	.	.
smooth dogfish	193	0.1	.	.	planehead filefish	1	0	.	.
fourbeard rockling	163	0.1	.	.	hickory shad	1	0	.	.
longhorn sculpin	139	0.1	.	.	red goatfish	1	0	.	.
hogchoker	104	0.1	.	.	rough scad	1	0	.	.
alewife	103	0.1	.	.	sea lamprey	1	0	.	.
cunner	75	0	.	.	oyster toadfish	1	0	.	.
spotted hake	73	0	.	.	**Total**	**153,389**		-	
winter skate	50	0	.	.					
ocean pout	42	0	.	.	**Invertebrates**				
black sea bass	39	0	.	.	American lobster	8,524	40.9	.	.
blueback herring	38	0	.	.	long-finned squid	12,322	59.1	.	.
striped bass	38	0	.	.	**Total**	**20,846**		-	

Appendix 2.4. cont. Total number and weight (kg) of finfish and invertebrates caught in LISTS in 1992.
Finfish species are in order of descending count. Invertebrate species are in order of descending weight (nc = not counted). Number of tows (sample size)=160.

species	count	%	weight	%	species	count	%	weight	%
butterfish	95,961	65.7	1,357.3	11.7	black sea bass	5	0	1.8	0
scup	13,646	9.3	837.7	7.2	northern pipefish	5	0	0.4	0
winter flounder	9,548	6.5	1,344.8	11.5	Atlantic mackerel	4	0	1.0	0
bluefish	5,269	3.6	2,462.9	21.1	sea raven	4	0	3.9	0
Atlantic herring	4,565	3.1	797.5	6.8	northern kingfish	2	0	0.2	0
little skate	3,495	2.4	1,389.0	11.9	round herring	2	0	0.2	0
windowpane flounder	2,980	2.0	286.1	2.5	yellow jack	2	0	0.2	0
fourspot flounder	2,774	1.9	382.4	3.3	Atlantic silverside	1	0	0.1	0
red hake	1,606	1.1	127.7	1.1	conger eel	1	0	0.1	0
weakfish	1,317	0.9	94.8	0.8	northern puffer	1	0	0.1	0
Atlantic menhaden	1,115	0.8	60.6	0.5	Spanish mackerel	1	0	1.5	0
striped searobin	857	0.6	305.1	2.6	**Total**	**146,035**		**11,648.2**	
silver hake	544	0.4	22.0	0.2					
American shad	380	0.3	63.3	0.5	**Invertebrates**				
northern searobin	313	0.2	35.6	0.3	American lobster	8,160	19.9	1,537.9	28.6
smooth dogfish	304	0.2	863.2	7.4	blue mussel	nc	nc	1,157.1	21.5
tautog	265	0.2	508.3	4.4	long-finned squid	32,780	80.1	844.9	15.7
summer flounder	186	0.1	142.1	1.2	horseshoe crab	nc	nc	514.1	9.6
blueback herring	175	0.1	8.5	0.1	lady crab	nc	nc	375.4	7.0
fourbeard rockling	150	0.1	12.8	0.1	rock crab	nc	nc	239.1	4.5
alewife	122	0.1	9.2	0.1	boring sponge	nc	nc	225.5	4.2
spotted hake	68	0	10.3	0.1	spider crab	nc	nc	186.0	3.5
moonfish	62	0	1.5	0	starfish spp.	nc	nc	148.6	2.8
hogchoker	61	0	5.6	0	whelks	nc	nc	57.5	1.1
striped bass	42	0	89.4	0.8	flat claw hermit crab	nc	nc	34.7	0.6
longhorn sculpin	31	0	9.0	0.1	bluecrab	nc	nc	18.1	0.3
winter skate	31	0	105.3	0.9	mantis shrimp	nc	nc	10.3	0.2
cunner	30	0	3.7	0	northern moon snail	nc	nc	8.6	0.2
Atlantic sturgeon	30	0	244.8	2.1	common oyster	nc	nc	7.3	0.1
ocean pout	18	0	7.7	0.1	lion's mane jellyfish	nc	nc	2.4	0
hickory shad	12	0	4.9	0	surf clam	nc	nc	1.7	0
smallmouth flounder	12	0	0.6	0	hard clams	nc	nc	1.2	0
goosefish	10	0	2.5	0	bushy bryozoan	nc	nc	1.0	0
clearnose skate	8	0	10.3	0.1	purple sea urchin	nc	nc	0.4	0
Atlantic tomcod	8	0	1.3	0	mud crabs	nc	nc	0.3	0
mackerel scad	6	0	0.2	0	star coral	nc	nc	0.1	0
spiny dogfish	6	0	30.7	0.3	**Total**	**40,940**		**5,372**	

Appendix 2.4. cont. Total number and weight (kg) of finfish and invertebrates caught in LISTS in 1993.
Finfish species are in order of descending count. Invertebrate species are in order of descending weight (nc = not counted). Number of tows (sample size)=200.

species	count	%	weight	%
butterfish	35,361	33.0	847.8	7.1
scup	18,785	17.6	581.4	4.8
winter flounder	16,090	15.0	1,855.7	15.4
windowpane flounder	7,953	7.4	547.6	4.6
Atlantic herring	6,269	5.9	1,119.8	9.3
little skate	5,186	4.8	2,172.3	18.1
bluefish	4,402	4.1	1,343.2	11.2
red hake	3,963	3.7	232.0	1.9
fourspot flounder	1,262	1.2	182.3	1.5
weakfish	1,142	1.1	60.3	0.5
striped searobin	1,079	1.0	165.4	1.4
northern searobin	935	0.9	96.8	0.8
American shad	791	0.7	101.1	0.8
alewife	788	0.7	48.2	0.4
silver hake	500	0.5	21.1	0.2
spotted hake	331	0.3	36.7	0.3
smooth dogfish	283	0.3	857.6	7.1
Atlantic menhaden	271	0.3	94.1	0.8
fourbeard rockling	241	0.2	15.6	0.1
summer flounder	224	0.2	137.9	1.1
tautog	157	0.1	308.2	2.6
Spanish mackerel	136	0.1	2.2	0
blueback herring	96	0.1	4.3	0
rough scad	92	0.1	3.8	0
striped bass	78	0.1	198.7	1.7
ocean pout	66	0.1	16.4	0.1
cunner	64	0.1	6.1	0.1
Atlantic sturgeon	60	0.1	633.6	5.3
winter skate	59	0.1	213.2	1.8
spot	57	0.1	4.5	0
hogchoker	56	0.1	5.2	0
Atlantic silverside	54	0.1	1.0	0
northern puffer	23	0	0.4	0
smallmouth flounder	23	0	2.1	0
Atlantic croaker	20	0	1.1	0
black sea bass	16	0	5.0	0
spiny dogfish	14	0	58.4	0.5
Atlantic mackerel	11	0	0.9	0
longhorn sculpin	11	0	3.2	0
planehead filefish	9	0	0.7	0
hickory shad	9	0	4.1	0
northern pipefish	9	0	0.4	0
rainbow smelt	9	0	0.6	0
crevalle jack	5	0	0.4	0
northern kingfish	5	0	0.6	0
Atlantic tomcod	5	0	0.8	0
clearnose skate	4	0	7.7	0.1
white perch	4	0	0.3	0
conger eel	3	0	0.2	0
goosefish	3	0	0.3	0
American sand lance	3	0	0.3	0
Atlantic bonito	2	0	6.4	0.1
lumpfish	2	0	0.2	0
moonfish	2	0	0.2	0
sea lamprey	2	0	1.0	0
Atlantic salmon	1	0	0.1	0
American eel	1	0	1.6	0
northern sennet	1	0	0.1	0
orange filefish	1	0	0.1	0
round herring	1	0	0.1	0
red cornetfish	1	0	0.1	0
red goatfish	1	0	0.1	0
short bigeye	1	0	0.1	0
sea raven	1	0	0.6	0
yellow jack	1	0	0.1	0
Total	**107,035**		**12,012.4**	
Invertebrates				
American lobster	10,306	20.6	2,173.5	34.4
long-finned squid	39,723	79.4	1,176.5	18.6
blue mussel	nc	nc	945.1	15.0
horseshoe crab	nc	nc	673.8	10.7
spider crab	nc	nc	511.2	8.1
lady crab	nc	nc	428.0	6.8
rock crab	nc	nc	155.9	2.5
flat claw hermit crab	nc	nc	45.7	0.7
starfish spp.	nc	nc	37.4	0.6
boring sponge	nc	nc	36.6	0.6
whelks	nc	nc	34.0	0.5
mantis shrimp	nc	nc	31.6	0.5
lion's mane jellyfish	nc	nc	27.6	0.4
bluecrab	nc	nc	20.0	0.3
northern moon snail	nc	nc	8.9	0.1
common oyster	nc	nc	2.0	0
surf clam	nc	nc	1.0	0
hard clams	nc	nc	0.9	0
purple sea urchin	nc	nc	0.7	0
arks	nc	nc	0.7	0
mud crabs	nc	nc	0.4	0
star coral	nc	nc	0.3	0
blood star	nc	nc	0.2	0
common slipper shell	nc	nc	0.2	0
sand shrimp	nc	nc	0.1	0
sand dollar	nc	nc	0.1	0
northern red shrimp	nc	nc	0.1	0
polychaetes	nc	nc	0.1	0
Total	**50,029**		**6,313**	

Appendix 2.4. cont. Total number and weight (kg) of finfish and invertebrates caught in LISTS in 1994.
Finfish species are in order of descending count. Invertebrate species are in order of descending weight (nc = not counted). Number of tows (sample size)=200.

species	count	%	weight	%	species	count	%	weight	%
butterfish	33,538	28.7	776.8	6.3	longhorn sculpin	7	0	1.6	0
scup	25,451	21.8	660.8	5.4	grubby	5	0	0.3	0
winter flounder	20,615	17.6	1,992.2	16.2	mackerel scad	4	0	0.4	0
bluefish	7,703	6.6	1,159.8	9.4	Atlantic silverside	3	0	0.3	0
windowpane flounder	6,062	5.2	574.5	4.7	bigeye scad	2	0	0.2	0
little skate	5,604	4.8	2,565.3	20.9	lookdown	2	0	0.2	0
Atlantic herring	3,836	3.3	768.6	6.3	northern puffer	2	0	0.2	0
weakfish	3,320	2.8	160.0	1.3	Atlantic tomcod	2	0	0.3	0
silver hake	1,703	1.5	112.9	0.9	bigeye	1	0	0.1	0
fourspot flounder	1,494	1.3	195.6	1.6	clearnose skate	1	0	1.8	0
American shad	1,289	1.1	133.2	1.1	inshore lizardfish	1	0	0.1	0
alewife	1,211	1.0	75.0	0.6	northern pipefish	1	0	0.1	0
blueback herring	1,052	0.9	26.6	0.2	rock gunnel	1	0	0.1	0
striped searobin	927	0.8	183.6	1.5	sea raven	1	0	0.2	0
northern searobin	800	0.7	63.7	0.5	white perch	1	0	0.3	0
red hake	490	0.4	54.0	0.4	yellow jack	1	0	0.1	0
smooth dogfish	310	0.3	816.3	6.6	**Total**	**117,002**		**12,284.5**	
Atlantic menhaden	276	0.2	61.4	0.5					
summer flounder	242	0.2	141.6	1.2	**Invertebrates**				
tautog	207	0.2	346.5	2.8	American lobster	7,057	31.6	1,533.9	38.6
spotted hake	148	0.1	25.7	0.2	long-finned squid	15,299	68.4	594.8	15.0
moonfish	93	0.1	2.6	0	horseshoe crab	nc	nc	386.7	9.7
fourbeard rockling	92	0.1	8.4	0.1	blue mussel	nc	nc	377.5	9.5
striped bass	81	0.1	198.6	1.6	lady crab	nc	nc	338.5	8.5
Atlantic sturgeon	60	0.1	848.6	6.9	spider crab	nc	nc	335.0	8.4
spiny dogfish	55	0	186.2	1.5	rock crab	nc	nc	136.8	3.4
ocean pout	42	0	9.1	0.1	starfish spp.	nc	nc	124.6	3.1
hogchoker	36	0	3.8	0	flat claw hermit crab	nc	nc	51.4	1.3
black sea bass	33	0	10.9	0.1	northern moon snail	nc	nc	34.6	0.9
winter skate	33	0	101.5	0.8	common oyster	nc	nc	18.4	0.5
American sand lance	25	0	0.6	0	whelks	nc	nc	14.1	0.4
Spanish mackerel	25	0	1.7	0	mantis shrimp	nc	nc	9.8	0.2
cunner	18	0	1.3	0	lion's mane jellyfish	nc	nc	4.2	0.1
smallmouth flounder	15	0	1.3	0	bluecrab	nc	nc	3.7	0.1
hickory shad	14	0	3.7	0	arks	nc	nc	3.0	0.1
rough scad	13	0	0.2	0	boring sponge	nc	nc	1.9	0
Atlantic mackerel	11	0	0.9	0	hard clams	nc	nc	1.3	0
spot	11	0	1.1	0	bushy bryozoan	nc	nc	0.6	0
rainbow smelt	9	0	0.6	0	mud crabs	nc	nc	0.3	0
crevalle jack	8	0	0.5	0	surf clam	nc	nc	0.3	0
goosefish	8	0	2.0	0	purple sea urchin	nc	nc	0.1	0
northern kingfish	7	0	0.5	0	**Total**	**22,356**		**3,972**	

Appendix 2.4. cont. Total number and weight (kg) of finfish and invertebrates caught in LISTS in 1995.
Finfish species are in order of descending count. Invertebrate species are in order of descending weight (nc = not counted). Number of tows (sample size)=200.

species	count	%	weight	%
butterfish	64,930	50.1	1,664.5	15.2
winter flounder	15,558	12.0	1,614.7	14.7
scup	13,985	10.8	770.5	7.0
Atlantic herring	9,135	7.0	1,631.7	14.9
bluefish	5,524	4.3	1,156.1	10.5
windowpane flounder	3,815	2.9	356.2	3.2
weakfish	2,881	2.2	275.7	2.5
fourspot flounder	2,584	2.0	402.9	3.7
little skate	2,372	1.8	1,055.3	9.6
red hake	1,977	1.5	145.6	1.3
silver hake	1,941	1.5	61.6	0.6
northern searobin	1,317	1.0	166.9	1.5
American shad	755	0.6	81.4	0.7
striped searobin	682	0.5	277.5	2.5
alewife	386	0.3	24.6	0.2
Atlantic menhaden	318	0.2	41.9	0.4
blueback herring	255	0.2	7.5	0.1
fourbeard rockling	169	0.1	14.7	0.1
smooth dogfish	168	0.1	566.8	5.2
striped bass	165	0.1	185.3	1.7
summer flounder	121	0.1	79.6	0.7
American sand lance	95	0.1	0.4	0
spotted hake	72	0.1	6.5	0.1
tautog	61	0	95.1	0.9
cunner	41	0	4.4	0
winter skate	41	0	89.2	0.8
Atlantic silverside	39	0	0.9	0
moonfish	33	0	2.1	0
yellow jack	32	0	2.1	0
ocean pout	30	0	6.5	0.1
northern kingfish	25	0	2.5	0
smallmouth flounder	19	0	1.2	0
hogchoker	17	0	1.7	0
black sea bass	12	0	4.7	0
hickory shad	6	0	2.5	0
Atlantic sturgeon	6	0	145.5	1.3
longhorn sculpin	5	0	1.3	0
clearnose skate	4	0	11.0	0.1
goosefish	4	0	3.3	0
rainbow smelt	4	0	0.3	0
Atlantic tomcod	4	0	0.8	0

species	count	%	weight	%
spot	3	0	0.3	0
Atlantic cod	2	0	0.1	0
conger eel	2	0	1.2	0
haddock	2	0	0.2	0
northern pipefish	2	0	0.1	0
sea raven	2	0	0.7	0
African pompano	1	0	0.1	0
crevalle jack	1	0	0.1	0
grubby	1	0	0.1	0
Atlantic mackerel	1	0	0.1	0
mackerel scad	1	0	0.1	0
northern puffer	1	0	0.1	0
oyster toadfish	1	0	0.5	0
yellowtail flounder	1	0	0.1	0
Total	**129,609**		**10,966.8**	
Invertebrates				
American lobster	9,944	29.3	2,141.9	55.1
long-finned squid	23,974	70.7	796.4	20.5
lady crab	nc	nc	535.0	13.8
horseshoe crab	nc	nc	116.8	3
spider crab	nc	nc	95.4	2.5
lion's mane jellyfish	nc	nc	78.3	2
rock crab	nc	nc	47.0	1.2
blue mussel	nc	nc	14.0	0.4
flat claw hermit crab	nc	nc	12.8	0.3
boring sponge	nc	nc	11.2	0.3
whelks	nc	nc	10.8	0.3
mantis shrimp	nc	nc	8.1	0.2
bluecrab	nc	nc	6.0	0.2
northern moon snail	nc	nc	5.8	0.1
starfish spp.	nc	nc	4.7	0.1
arks	nc	nc	1.4	0
hard clams	nc	nc	0.7	0
purple sea urchin	nc	nc	0.7	0
sand shrimp	nc	nc	0.4	0
ghost shrimp	nc	nc	0.3	0
mud crabs	nc	nc	0.2	0
common razor clam	nc	nc	0.1	0
shore shrimp	nc	nc	0.1	0
Total	**33,918**		**3,888**	

Appendix 2.4. cont. Total number and weight (kg) of finfish and invertebrates caught in LISTS in 1996.
Finfish species are in order of descending count. Invertebrate species are in order of descending weight (nc = not counted). Number of tows (sample size)=200.

species	count	%	weight	%
butterfish	49,360	37.0	1,844.7	12.4
winter flounder	22,722	17.0	3,335.0	22.5
scup	16,087	12.0	739.4	5.0
windowpane flounder	14,116	10.6	1,223.6	8.2
bluefish	6,705	5.0	1,118.2	7.5
weakfish	6,375	4.8	414.9	2.8
little skate	6,203	4.6	2,801.8	18.9
fourspot flounder	2,815	2.1	407.2	2.7
alewife	1,402	1.0	134.6	0.9
striped searobin	1,008	0.8	278.7	1.9
Atlantic herring	972	0.7	189.8	1.3
moonfish	921	0.7	11.6	0.1
red hake	872	0.7	95.5	0.6
northern searobin	672	0.5	57.4	0.4
American shad	501	0.4	36.2	0.2
silver hake	489	0.4	20.0	0.1
summer flounder	434	0.3	266.4	1.8
spotted hake	384	0.3	42.6	0.3
smooth dogfish	275	0.2	862.8	5.8
striped bass	232	0.2	373.5	2.5
spot	195	0.1	14.1	0.1
tautog	136	0.1	225.9	1.5
fourbeard rockling	109	0.1	8.6	0.1
blueback herring	97	0.1	6.2	0
Atlantic menhaden	88	0.1	40.5	0.3
winter skate	88	0.1	212.7	1.4
hogchoker	45	0	5.4	0
smallmouth flounder	41	0	2.3	0
rough scad	35	0	1.5	0
hickory shad	29	0	10.2	0.1
black sea bass	27	0	12.1	0.1
ocean pout	26	0	7.2	0
cunner	17	0	2.6	0
striped anchovy	11	0	0.2	0
longhorn sculpin	7	0	2.1	0
northern kingfish	6	0	0.6	0
yellow jack	6	0	0.5	0
Atlantic mackerel	5	0	0.5	0
planehead filefish	3	0	0.3	0
mackerel scad	3	0	0.1	0
northern puffer	3	0	0.3	0
rock gunnel	3	0	0.2	0
short bigeye	3	0	0.3	0
Atlantic sturgeon	3	0	19.9	0.1
bigeye scad	2	0	0.1	0
grubby	2	0	0.2	0
sea raven	2	0	1.5	0
Atlantic tomcod	2	0	0.3	0
clearnose skate	1	0	1.7	0
conger eel	1	0	0.1	0
gizzard shad	1	0	0.1	0
goosefish	1	0	0.1	0
sea lamprey	1	0	0.7	0
spiny dogfish	1	0	2.1	0
white perch	1	0	0.1	0
Total	**133,546**		**14,835.2**	
Invertebrates				
American lobster	9,490	29.5	2,113.5	39.1
lady crab	nc	nc	1,160.4	21.5
long-finned squid	22,720	70.5	720.4	13.3
horseshoe crab	nc	nc	717.0	13.3
spider crab	nc	nc	293.9	5.4
rock crab	nc	nc	162.7	3.0
lion's mane jellyfish	nc	nc	42.7	0.8
blue mussel	nc	nc	42.5	0.8
flat claw hermit crab	nc	nc	39.4	0.7
whelks	nc	nc	33.0	0.6
mantis shrimp	nc	nc	20.9	0.4
boring sponge	nc	nc	19.2	0.4
bushy bryozoan	nc	nc	15.2	0.3
starfish spp.	nc	nc	6.2	0.1
arks	nc	nc	4.3	0.1
northern moon snail	nc	nc	4.3	0.1
bluecrab	nc	nc	4.0	0.1
hard clams	nc	nc	3.2	0.1
surf clam	nc	nc	1.4	0
mud crabs	nc	nc	0.3	0
purple sea urchin	nc	nc	0.1	0
Total	**32,210**		**5,405**	

Appendix 2.4. cont. Total number and weight (kg) of finfish and invertebrates caught in LISTS in 1997.
Finfish species are in order of descending count. Invertebrate species are in order of descending weight (nc = not counted). Number of tows (sample size)=200.

species	count	%	weight	%
butterfish	70,985	50.3	2,017.2	15.5
winter flounder	14,701	10.4	2,439.4	18.8
bluefish	10,815	7.7	977.6	7.5
windowpane flounder	10,324	7.3	986.1	7.6
scup	9,582	6.8	530.5	4.1
fourspot flounder	4,122	2.9	615.3	4.7
little skate	4,068	2.9	1,945.8	15.0
weakfish	3,904	2.8	362.0	2.8
Atlantic herring	3,455	2.4	515.1	4.0
silver hake	1,973	1.4	70.8	0.5
alewife	1,194	0.8	81.3	0.6
American shad	922	0.7	66.8	0.5
striped searobin	819	0.6	230.5	1.8
red hake	748	0.5	80.5	0.6
blueback herring	630	0.4	16.5	0.1
northern searobin	579	0.4	60.4	0.5
summer flounder	486	0.3	326.0	2.5
striped bass	319	0.2	509.9	3.9
moonfish	287	0.2	4.6	0
fourbeard rockling	199	0.1	17.3	0.1
tautog	190	0.1	271.8	2.1
smooth dogfish	167	0.1	527.3	4.1
Atlantic menhaden	116	0.1	38.5	0.3
spotted hake	77	0.1	19.0	0.1
rough scad	65	0	2.0	0
smallmouth flounder	58	0	2.4	0
winter skate	48	0	109.7	0.8
cunner	43	0	4.1	0
hickory shad	25	0	9.1	0.1
black sea bass	22	0	10.5	0.1
hogchoker	15	0	1.8	0
ocean pout	15	0	4.8	0
grubby	11	0	0.7	0
spot	10	0	1.1	0
Atlantic mackerel	8	0	1.7	0
northern kingfish	7	0	0.9	0
spiny dogfish	7	0	13.7	0.1
Atlantic sturgeon	5	0	37.8	0.3
clearnose skate	4	0	7.4	0.1
longhorn sculpin	4	0	0.8	0
white perch	4	0	0.9	0
crevalle jack	3	0	0.6	0
sea raven	3	0	0.4	0
Atlantic silverside	2	0	0.1	0
goosefish	2	0	1.6	0
inshore lizardfish	2	0	0.2	0
round scad	2	0	0.2	0
American sand lance	2	0	0.1	0
short bigeye	2	0	0.2	0
yellow jack	2	0	0.2	0
bigeye scad	1	0	0.1	0
Atlantic cod	1	0	0.3	0
haddock	1	0	0.1	0
northern pipefish	1	0	0.1	0
northern puffer	1	0	0.1	0
roughtail stingray	1	0	50.6	0.4
sea lamprey	1	0	0.1	0
Atlantic tomcod	1	0	0.1	0
yellowtail flounder	1	0	0.3	0
Total	**141,040**		**12,974.6**	

Invertebrates				
American lobster	16,467	55.3	3,800.9	64.6
lady crab	nc	nc	592.5	10.1
long-finned squid	13,048	43.8	515.2	8.8
horseshoe crab	204	0.7	472.4	8.0
spider crab	nc	nc	188.3	3.2
rock crab	nc	nc	94.1	1.6
lion's mane jellyfish	nc	nc	88.0	1.5
bushy bryozoan	nc	nc	28.0	0.5
flat claw hermit crab	nc	nc	21.7	0.4
boring sponge	nc	nc	16.5	0.3
whelks	22	0.1	14.8	0.3
bluecrab	33	0.1	13.6	0.2
mantis shrimp	nc	nc	9.3	0.2
starfish spp.	nc	nc	7.3	0.1
hard clams	nc	nc	3.8	0.1
blue mussel	nc	nc	3.5	0.1
northern moon snail	nc	nc	3.3	0.1
northern comb jelly	nc	nc	2.0	0
arks	nc	nc	1.8	0
common oyster	nc	nc	1.8	0
surf clam	nc	nc	0.9	0
common slipper shell	nc	nc	0.7	0
mud crabs	nc	nc	0.6	0
sand shrimp	nc	nc	0.2	0
common razor clam	nc	nc	0.2	0
blood star	nc	nc	0.1	0
star coral	nc	nc	0.1	0
northern red shrimp	nc	nc	0.1	0
shore shrimp	nc	nc	0.1	0
purple sea urchin	nc	nc	0.1	0
Total	**29,774**		**5,882**	

Appendix 2.4. cont. Total number and weight (kg) of finfish and invertebrates caught in LISTS in 1998.
Finfish species are in order of descending count. Invertebrate species are in order of descending weight (nc = not counted). Number of tows (sample size)=200.

species	count	%	weight	%
butterfish	136,926	64.0	3,661.1	24.4
scup	23,742	11.1	740.5	4.9
winter flounder	15,697	7.3	2,450.3	16.3
bluefish	8,814	4.1	899.0	6.0
windowpane flounder	6,483	3.0	741.1	4.9
little skate	4,305	2.0	2,085.5	13.9
weakfish	3,495	1.6	268.2	1.8
red hake	3,015	1.4	217.5	1.4
fourspot flounder	1,908	0.9	306.0	2.0
silver hake	1,870	0.9	88.3	0.6
striped searobin	1,321	0.6	509.7	3.4
moonfish	1,188	0.6	13.4	0.1
American shad	901	0.4	60.2	0.4
Atlantic herring	893	0.4	74.6	0.5
alewife	456	0.2	35.1	0.2
summer flounder	436	0.2	431.3	2.9
striped bass	400	0.2	484.2	3.2
northern searobin	360	0.2	39.4	0.3
smooth dogfish	310	0.1	989.8	6.6
Atlantic menhaden	306	0.1	9.2	0.1
blueback herring	211	0.1	5.1	0
tautog	194	0.1	347.1	2.3
spotted hake	142	0.1	12.2	0.1
fourbeard rockling	133	0.1	11.6	0.1
smallmouth flounder	97	0	6.4	0
cunner	65	0	8.1	0.1
winter skate	62	0	180.7	1.2
hickory shad	40	0	15.9	0.1
round herring	31	0	0.6	0
sea raven	30	0	11.3	0.1
northern puffer	28	0	0.5	0
clearnose skate	20	0	36.8	0.2
black sea bass	18	0	10.6	0.1
spiny dogfish	18	0	44.5	0.3
Atlantic sturgeon	17	0	189.7	1.3
northern kingfish	15	0	1.3	0
Atlantic mackerel	13	0	1.1	0
ocean pout	13	0	2.7	0
hogchoker	12	0	1.9	0
haddock	7	0	0.5	0
yellow jack	6	0	0.7	0
grubby	5	0	0.3	0
round scad	4	0	0.3	0
American sand lance	4	0	0.3	0
goosefish	3	0	3.2	0
oyster toadfish	3	0	0.9	0
gray triggerfish	2	0	2.3	0
longhorn sculpin	2	0	1.0	0
bigeye scad	1	0	0.1	0
inshore lizardfish	1	0	0.1	0
mackerel scad	1	0	0.1	0
roughtail stingray	1	0	3.4	0
Total	**214,025**		**15,005.7**	
Invertebrates				
American lobster	16,211	36.7	3,873.9	60.2
long-finned squid	27,443	62.1	767.0	11.9
horseshoe crab	303	0.7	489.4	7.6
blue mussel	nc	nc	309.0	4.8
lady crab	nc	nc	291.2	4.5
rock crab	nc	nc	241.4	3.8
spider crab	nc	nc	157.2	2.4
lion's mane jellyfish	nc	nc	63.1	1.0
flat claw hermit crab	nc	nc	56.0	0.9
bushy bryozoan	nc	nc	55.6	0.9
boring sponge	nc	nc	24.9	0.4
knobbed whelk	51	0.1	22.5	0.3
starfish spp.	nc	nc	18.2	0.3
bluecrab	49	0.1	12.8	0.2
channeled whelk	40	0.1	10.1	0.2
whelks	52	0.1	9.8	0.2
northern moon snail	nc	nc	8.6	0.1
mantis shrimp	nc	nc	5.6	0.1
common oyster	nc	nc	5.4	0.1
hard clams	nc	nc	3.7	0.1
arks	nc	nc	2.0	0
red bearded sponge	nc	nc	1.4	0
surf clam	nc	nc	1.1	0
sea grape	nc	nc	0.8	0
mud crabs	nc	nc	0.7	0
boreal squid	18	0	0.7	0
purple sea urchin	nc	nc	0.6	0
common slipper shell	nc	nc	0.5	0
star coral	nc	nc	0.4	0
moon jelly	nc	nc	0.2	0
ghost shrimp	nc	nc	0.1	0
Total	**44,167**		**6,434**	

Appendix 2.4. cont. Total number and weight (kg) of finfish and invertebrates caught in LISTS in 1999.
Finfish species are in order of descending count. Invertebrate species are in order of descending weight (nc = not counted). Number of tows (sample size)=200.

species	count	%	weight	%
butterfish	191,100	54.1	4,171.6	21.9
scup	101,095	28.6	3,641.3	19.1
weakfish	12,416	3.5	771.3	4.0
winter flounder	10,288	2.9	2,011.7	10.6
bluefish	7,843	2.2	1,218.0	6.4
silver hake	5,126	1.5	99.6	0.5
windowpane flounder	4,643	1.3	594.2	3.1
little skate	3,686	1.0	1,829.6	9.6
red hake	2,973	0.8	226.5	1.2
Atlantic herring	2,511	0.7	45.4	0.2
striped searobin	1,690	0.5	497.0	2.6
alewife	1,393	0.4	107.6	0.6
fourspot flounder	1,393	0.4	203.9	1.1
Atlantic menhaden	1,187	0.3	90.9	0.5
American shad	987	0.3	117.3	0.6
moonfish	645	0.2	9.6	0.1
summer flounder	582	0.2	459.8	2.4
bay anchovy	548	0.2	5.6	0
northern searobin	547	0.2	52.0	0.3
striped bass	397	0.1	815.4	4.3
spotted hake	381	0.1	38.8	0.2
smooth dogfish	305	0.1	923.0	4.8
fourbeard rockling	233	0.1	28.8	0.2
tautog	217	0.1	326.6	1.7
striped anchovy	216	0.1	6.1	0
American sand lance	178	0.1	0.3	0
smallmouth flounder	96	0	5.2	0
hickory shad	56	0	19.4	0.1
cunner	51	0	5.9	0
black sea bass	50	0	17.2	0.1
spot	45	0	5.7	0
winter skate	41	0	89.8	0.5
hogchoker	39	0	5.0	0
Atlantic sturgeon	39	0	498.6	2.6
clearnose skate	22	0	39.4	0.2
bigeye scad	21	0	1.4	0
Atlantic mackerel	21	0	3.1	0
yellow jack	20	0	1.9	0
blueback herring	19	0	1.1	0
ocean pout	17	0	3.9	0
northern puffer	14	0	1.1	0
spiny dogfish	10	0	51.1	0.3
sea raven	9	0	4.9	0
crevalle jack	8	0	0.7	0
inshore lizardfish	7	0	0.5	0
northern kingfish	6	0	0.6	0
northern sennet	6	0	0.5	0
planehead filefish	3	0	0.3	0
bigeye	2	0	0.2	0
conger eel	2	0	0.5	0
goosefish	2	0	0.3	0
grubby	2	0	0.2	0
northern pipefish	2	0	0.1	0
longhorn sculpin	2	0	0.3	0
oyster toadfish	2	0	1.8	0
Atlantic silverside	1	0	0.1	0
gizzard shad	1	0	0.1	0
haddock	1	0	0.1	0
round scad	1	0	0.1	0
striped cusk-eel	1	0	0.1	0
sharksucker	1	0	0.3	0
Spanish mackerel	1	0	0.2	0
Atlantic tomcod	1	0	0.7	0
white perch	1	0	0.4	0
Total	**353,203**		**19,054.7**	

Invertebrates				
American lobster	13,922	38.1	3,397.9	61.6
long-finned squid	21,580	59.0	826.4	15.0
horseshoe crab	384	1.1	634.1	11.5
lady crab	nc	nc	159.7	2.9
rock crab	nc	nc	118.6	2.2
spider crab	nc	nc	95.4	1.7
bushy bryozoan	nc	nc	78.0	1.4
flat claw hermit crab	nc	nc	32.5	0.6
knobbed whelk	61	0.2	24.8	0.4
bluecrab	89	0.2	21.3	0.4
channeled whelk	81	0.2	21.1	0.4
mantis shrimp	376	1.0	19.3	0.4
boring sponge	nc	nc	19.3	0.4
lion's mane jellyfish	61	0.2	16.7	0.3
blue mussel	nc	nc	14.1	0.3
northern moon snail	nc	nc	9.1	0.2
starfish spp.	nc	nc	8.8	0.2
common oyster	nc	nc	4.7	0.1
arks	nc	nc	2.8	0.1
common slipper shell	nc	nc	1.8	0
mud crabs	nc	nc	1.7	0
hard clams	nc	nc	1.5	0
sand shrimp	nc	nc	1.0	0
purple sea urchin	nc	nc	1.0	0
northern red shrimp	nc	nc	0.9	0
surf clam	nc	nc	0.4	0
sea grape	nc	nc	0.2	0
star coral	nc	nc	0.1	0
common razor clam	nc	nc	0.1	0
moon jelly	nc	nc	0.1	0
nemerteans	nc	nc	0.1	0
Total	**36,554**		**5,514**	

Appendix 2.4. cont. Total number and weight (kg) of finfish and invertebrates caught in LISTS in 2000.
Finfish species are in order of descending count. Invertebrate species are in order of descending weight (nc = not counted). Number of tows (sample size)=200.

species	count	%	weight	%
scup	101,464	44.4	6,679.0	34.9
butterfish	60,490	26.5	1,458.3	7.6
weakfish	23,595	10.3	554.5	2.9
winter flounder	8,867	3.9	1,921.4	10.0
bluefish	6,135	2.7	1,408.0	7.3
little skate	3,340	1.5	1,604.7	8.4
striped searobin	3,129	1.4	1,036.1	5.4
fourspot flounder	2,590	1.1	398.6	2.1
windowpane flounder	2,488	1.1	368.8	1.9
red hake	2,393	1.0	162.6	0.8
bay anchovy	2,303	1.0	12.2	0.1
northern searobin	2,014	0.9	251.2	1.3
moonfish	1,817	0.8	15.0	0.1
alewife	1,572	0.7	96.0	0.5
spotted hake	1,425	0.6	92.3	0.5
Atlantic herring	770	0.3	124.1	0.6
silver hake	679	0.3	28.8	0.2
summer flounder	555	0.2	471.3	2.5
Atlantic menhaden	492	0.2	31.8	0.2
smooth dogfish	467	0.2	1,038.5	5.4
American shad	316	0.1	25.8	0.1
striped bass	293	0.1	602.6	3.1
tautog	287	0.1	463.5	2.4
spot	204	0.1	17.8	0.1
fourbeard rockling	185	0.1	14.7	0.1
blueback herring	143	0.1	6.8	0
black sea bass	69	0	22.6	0.1
smallmouth flounder	61	0	2.7	0
cunner	50	0	5.3	0
hickory shad	42	0	17.1	0.1
hogchoker	40	0	5.9	0
winter skate	31	0	66.5	0.3
sea raven	19	0	9.2	0
clearnose skate	18	0	37.9	0.2
ocean pout	18	0	4.9	0
longhorn sculpin	14	0	5.0	0
Atlantic sturgeon	7	0	79.0	0.4
oyster toadfish	6	0	2.5	0
northern pipefish	4	0	0.2	0
northern puffer	4	0	0.4	0
American sand lance	4	0	0.3	0
spiny dogfish	4	0	9.9	0.1
rock gunnel	3	0	0.2	0
yellow jack	3	0	0.2	0
Atlantic silverside	2	0	0.1	0
Atlantic mackerel	2	0	0.8	0

species	count	%	weight	%
northern kingfish	2	0	0.3	0
round scad	2	0	0.2	0
bigeye	1	0	0.1	0
Atlantic cod	1	0	0.1	0
goosefish	1	0	0.2	0
inshore lizardfish	1	0	0.1	0
lined seahorse	1	0	0.1	0
white perch	1	0	0.2	0
yellowtail flounder	1	0	0.1	0
Total	**228,425**		**19,156.5**	
Invertebrates				
American lobster	10,481	36.0	2,184.5	49.9
horseshoe crab	420	1.4	689.4	15.8
long-finned squid	16,585	57.0	582.3	13.3
lady crab	nc	nc	308.4	7.1
spider crab	nc	nc	99.4	2.3
bushy bryozoan	nc	nc	95.2	2.2
rock crab	nc	nc	60.4	1.4
boring sponge	nc	nc	58.6	1.3
mantis shrimp	1,086	3.7	49.0	1.1
blue mussel	nc	nc	36.8	0.8
lion's mane jellyfish	223	0.8	36.4	0.8
channeled whelk	138	0.5	32.0	0.7
knobbed whelk	76	0.3	29.9	0.7
starfish spp.	nc	nc	29.0	0.7
flat claw hermit crab	nc	nc	26.0	0.6
bluecrab	104	0.4	19.3	0.4
northern moon snail	nc	nc	9.7	0.2
hydroid spp.	nc	nc	4.8	0.1
fan worm tubes	nc	nc	3.4	0.1
hard clams	nc	nc	3.3	0.1
arks	nc	nc	3.1	0.1
mud crabs	nc	nc	2.8	0.1
sand shrimp	nc	nc	2.7	0.1
common slipper shell	nc	nc	2.4	0.1
purple sea urchin	nc	nc	2.3	0.1
common oyster	nc	nc	1.4	0
sea grape	nc	nc	1.1	0
blood star	nc	nc	0.2	0
northern comb jelly	nc	nc	0.1	0
common razor clam	nc	nc	0.1	0
northern cyclocardia	nc	nc	0.1	0
northern red shrimp	nc	nc	0.1	0
surf clam	nc	nc	0.1	0
Total	**29,113**		**4,374**	

Appendix 2.4. cont. Total number and weight (kg) of finfish and invertebrates caught in LISTS in 2001.
Finfish species are in order of descending count. Invertebrate species are in order of descending weight (nc = not counted). Young-of-year bay anchovy, striped anchovy, and American sand lance are not quantified. Number of tows (sample size)=200.

species	count	%	weight	%
scup	58,325	37.7	5,828.4	30.7
butterfish	45,264	29.3	1,834.0	9.7
weakfish	12,739	8.2	415.0	2.2
winter flounder	9,826	6.4	1,993.6	10.5
little skate	4,311	2.8	2,022.6	10.6
bluefish	3,986	2.6	751.2	4.0
silver hake	3,945	2.6	152.2	0.8
windowpane flounder	3,065	2.0	475.5	2.5
fourspot flounder	2,167	1.4	362.7	1.9
striped searobin	2,061	1.3	861.0	4.5
northern searobin	1,594	1.0	222.7	1.2
red hake	1,382	0.9	109.7	0.6
summer flounder	875	0.6	628.1	3.3
alewife	638	0.4	41.7	0.2
spotted hake	606	0.4	34.9	0.2
smooth dogfish	598	0.4	1,407.6	7.4
Atlantic herring	497	0.3	72.6	0.4
bay anchovy	443	0.3	3.6	0
tautog	319	0.2	491.2	2.6
blueback herring	279	0.2	11.1	0.1
fourbeard rockling	251	0.2	21.5	0.1
moonfish	225	0.1	3.8	0
striped bass	214	0.1	472.5	2.5
black sea bass	134	0.1	74.8	0.4
American shad	109	0.1	9.6	0.1
smallmouth flounder	98	0.1	3.8	0
Atlantic menhaden	86	0.1	4.7	0
hogchoker	85	0.1	10.5	0.1
clearnose skate	65	0	132.4	0.7
cunner	51	0	5.9	0
spiny dogfish	48	0	128.6	0.7
striped anchovy	47	0	1.2	0
winter skate	38	0	112.2	0.6
inshore lizardfish	21	0	2.2	0
Atlantic sturgeon	18	0	270.6	1.4
hickory shad	14	0	6.7	0
spot	13	0	1.3	0
rough scad	10	0	0.7	0
northern puffer	8	0	0.7	0
sea raven	7	0	4.1	0
ocean pout	6	0	2.3	0
round herring	5	0	0.1	0
longhorn sculpin	5	0	1.5	0
fawn cusk-eel	4	0	0.2	0
northern pipefish	4	0	0.3	0
American sand lance	4	0	0.3	0
seasnail	4	0	0.3	0
yellow jack	3	0	0.3	0
conger eel	2	0	0.3	0
northern kingfish	2	0	0.2	0
oyster toadfish	2	0	0.4	0
Atlantic silverside	1	0	0.1	0
American eel	1	0	0.6	0
planehead filefish	1	0	0.1	0
goosefish	1	0	0.4	0
naked goby	1	0	0.1	0
northern sennet	1	0	0.1	0
rock gunnel	1	0	0.1	0
red goatfish	1	0	0.1	0
roughtail stingray	1	0	2.5	0
short bigeye	1	0	0.1	0
yellowtail flounder	1	0	0.2	0
Total	**154,514**		**18,997.8**	
Finfish not ranked				
American sand lance, yoy				
anchovy spp, yoy				
Atlantic herring, yoy				
Invertebrates				
American lobster	5,626	35.1	1,531.2	39.2
horseshoe crab	503	3.1	870.7	22.3
long-finned squid	9,080	56.6	346.2	8.9
spider crab	nc	nc	302.5	7.7
bushy bryozoan	nc	nc	162.9	4.2
starfish spp.	nc	nc	154.7	4.0
rock crab	nc	nc	86.3	2.2
blue mussel	nc	nc	84.7	2.2
lady crab	nc	nc	79.0	2.0
flat claw hermit crab	nc	nc	57.6	1.5
knobbed whelk	118	0.7	53.3	1.4
channeled whelk	190	1.2	48.0	1.2
boring sponge	nc	nc	30.0	0.8
lion's mane jellyfish	182	1.1	25.9	0.7
northern moon snail	nc	nc	17.5	0.4
mantis shrimp	304	1.9	16.5	0.4
bluecrab	38	0.2	6.2	0.2
sea grape	nc	nc	6.1	0.2
common slipper shell	nc	nc	5.3	0.1
hydroid spp.	nc	nc	5.0	0.1
arks	nc	nc	4.0	0.1
mud crabs	nc	nc	3.6	0.1
hard clams	nc	nc	3.0	0.1
sand shrimp	nc	nc	2.8	0.1
common oyster	1	0	1.2	0
fan worm tubes	nc	nc	1.0	0
purple sea urchin	nc	nc	0.8	0
moon jelly	nc	nc	0.4	0
ghost shrimp	nc	nc	0.3	0
bobtail squid	1	0	0.1	0
common razor clam	nc	nc	0.1	0
northern red shrimp	nc	nc	0.1	0
surf clam	nc	nc	0.1	0
Total	**16,043**		**3,907**	

Appendix 2.4. cont. Total number and weight (kg) of finfish and invertebrates caught in LISTS in 2002.
Finfish species are in order of descending count. Invertebrate species are in order of descending weight (nc = not counted). Young-of-year bay and striped anchovy are neither separated by species or quantified; young-of-year Atlantic herring are not quantified. Number of tows (sample size)=200.

species	count	%	weight	%
scup	100,481	47.0	13,814.1	46.0
butterfish	66,550	31.1	1,924.2	6.4
weakfish	10,713	5.0	442.0	1.5
winter flounder	6,884	3.2	1,584.1	5.3
little skate	4,242	2.0	2,121.9	7.1
bluefish	3,450	1.6	1,099.7	3.7
striped searobin	2,394	1.1	1,065.0	3.5
northern searobin	2,123	1.0	267.3	0.9
red hake	2,103	1.0	206.6	0.7
silver hake	2,013	0.9	89.6	0.3
windowpane flounder	1,991	0.9	343.3	1.1
fourspot flounder	1,859	0.9	326.9	1.1
summer flounder	1,356	0.6	989.3	3.3
smooth dogfish	1,019	0.5	2,814.3	9.4
bay anchovy	992	0.5	6.6	0
alewife	855	0.4	70.2	0.2
spotted hake	798	0.4	48.2	0.2
American shad	593	0.3	40.3	0.1
tautog	565	0.3	921.1	3.1
striped bass	469	0.2	855.2	2.8
moonfish	424	0.2	7.4	0
black sea bass	394	0.2	188.3	0.6
Atlantic menhaden	366	0.2	96.3	0.3
Atlantic herring	365	0.2	63.9	0.2
smallmouth flounder	139	0.1	4.9	0
fourbeard rockling	106	0	9.7	0
hogchoker	100	0	13.3	0
blueback herring	68	0	2.4	0
clearnose skate	59	0	107.3	0.4
cunner	55	0	7.2	0
spot	52	0	7.2	0
hickory shad	45	0	19.6	0.1
winter skate	45	0	133.5	0.4
Atlantic sturgeon	18	0	275.3	0.9
spiny dogfish	17	0	48.0	0.2
ocean pout	13	0	4.3	0
yellow jack	13	0	1.4	0
sea raven	11	0	4.1	0
rough scad	10	0	0.7	0
oyster toadfish	8	0	4.7	0
northern puffer	6	0	0.3	0
Atlantic mackerel	5	0	2.5	0
short bigeye	5	0	0.2	0
goosefish	3	0	0.6	0
American sand lance	3	0	0.1	0
longhorn sculpin	3	0	0.9	0
northern sennet	2	0	0.2	0
northern pipefish	2	0	0.2	0
Atlantic bonito	1	0	2.4	0
crevalle jack	1	0	0.1	0
gizzard shad	1	0	0.1	0
grubby	1	0	0.1	0
inshore lizardfish	1	0	0.1	0
northern kingfish	1	0	0.2	0
rock gunnel	1	0	0.1	0
rainbow smelt	1	0	0.1	0
roughtail stingray	1	0	24.4	0.1
Total	**213,796**		**30,062.0**	
Finfish not ranked				
anchovy spp, yoy				
Atlantic herring, yoy				
Invertebrates				
blue mussel	nc	nc	2,497.8	43.9
American lobster	3,880	29.7	1,005.7	17.7
horseshoe crab	517	4.0	862.9	15.2
spider crab	nc	nc	348.4	6.1
long-finned squid	8,034	61.5	279.9	4.9
lady crab	nc	nc	117.0	2.1
starfish spp.	nc	nc	91.8	1.6
bushy bryozoan	nc	nc	85.0	1.5
boring sponge	nc	nc	83.9	1.5
rock crab	nc	nc	74.6	1.3
flat claw hermit crab	36	0.3	55.8	1.0
channeled whelk	174	1.3	43.6	0.8
northern moon snail	nc	nc	40.3	0.7
knobbed whelk	40	0.3	19.1	0.3
bluecrab	84	0.6	16.1	0.3
lion's mane jellyfish	71	0.5	12.3	0.2
mantis shrimp	226	1.7	11.2	0.2
arks	nc	nc	7.8	0.1
common slipper shell	nc	nc	7.3	0.1
hydroid spp.	nc	nc	7.3	0.1
sea grape	nc	nc	5.3	0.1
hard clams	3	0	5.2	0.1
mud crabs	nc	nc	4.7	0.1
purple sea urchin	nc	nc	2.3	0
sand shrimp	nc	nc	1.6	0
rubbery bryzoan	nc	nc	1.0	0
surf clam	nc	nc	1.0	0
deadman's fingers sponge	nc	nc	0.5	0
blood star	nc	nc	0.4	0
common oyster	nc	nc	0.4	0
mixed sponge species	nc	nc	0.4	0
northern red shrimp	nc	nc	0.3	0
anemones	nc	nc	0.1	0
bobtail squid	1	0	0.1	0
ghost shrimp	nc	nc	0.1	0
ribbed mussel	nc	nc	0.1	0
sea cucumber	1	0	0.1	0
Total	**13,067**		**5,691**	

Appendix 2.4. cont. Total number and weight (kg) of finfish and invertebrates caught in LISTS in 2003.
Finfish species are in order of descending count. Invertebrate species are in order of descending weight (nc = not counted). Young-of-year bay and striped anchovy are neither separated by species or quantified; young-of-year Atlantic herring are not quantified. Number of tows (sample size)=160.

species	count	%	weight	%
butterfish	25,483	34.4	524.6	3.7
scup	17,552	23.7	4,389.3	30.6
weakfish	5,596	7.6	131.9	0.9
winter flounder	4,245	5.7	1,276.5	8.9
bluefish	3,717	5.0	655.0	4.6
little skate	2,867	3.9	1,554.1	10.8
bay anchovy	2,254	3.0	12.5	0.1
windowpane flounder	1,858	2.5	333.9	2.3
fourspot flounder	1,658	2.2	327.7	2.3
striped searobin	1,529	2.1	687.0	4.8
northern searobin	1,468	2.0	240.7	1.7
summer flounder	1,151	1.6	825.0	5.8
red hake	681	0.9	31.1	0.2
alewife	608	0.8	49.4	0.3
smooth dogfish	552	0.7	1,508.8	10.5
spotted hake	527	0.7	41.6	0.3
Atlantic herring	448	0.6	87.8	0.6
American shad	305	0.4	23.5	0.2
silver hake	217	0.3	8.3	0.1
striped bass	215	0.3	542.1	3.8
tautog	210	0.3	325.4	2.3
Atlantic menhaden	121	0.2	16.1	0.1
fourbeard rockling	111	0.1	9.0	0.1
blueback herring	98	0.1	3.4	0
moonfish	97	0.1	1.3	0
hogchoker	89	0.1	8.3	0.1
black sea bass	57	0.1	45.7	0.3
Atlantic cod	57	0.1	2.7	0
clearnose skate	55	0.1	105.9	0.7
smallmouth flounder	38	0.1	2.4	0
winter skate	38	0.1	90.6	0.6
cunner	36	0	5.9	0
haddock	26	0	1.3	0
Atlantic sturgeon	23	0	391.9	2.7
hickory shad	22	0	10.3	0.1
American sand lance	19	0	0.2	0
ocean pout	14	0	2.9	0
rough scad	12	0	0.5	0
oyster toadfish	9	0	5.0	0
spiny dogfish	7	0	34.8	0.2
rock gunnel	6	0	0.4	0
round scad	4	0	0.3	0
glasseye snapper	3	0	0.1	0
conger eel	3	0	1.1	0
Atlantic mackerel	3	0	0.3	0
crevalle jack	2	0	0.2	0
northern pipefish	2	0	0.2	0
northern puffer	2	0	0.2	0
longhorn sculpin	2	0	0.9	0
sea raven	2	0	1.3	0
striped anchovy	2	0	0.1	0
Atlantic silverside	1	0	0.1	0

Species	count	%	weight	%
barndoor skate	1	0	0.4	0
Planehead filefish	1	0	0.1	0
rainbow smelt	1	0	0.1	0
sea lamprey	1	0	1.3	0
Spanish mackerel	1	0	2.1	0
Total	**74,107**		**14,323.6**	
Finfish not ranked				
anchovy spp, yoy				
Atlantic herring, yoy				
Invertebrates				
Horseshoe crab	399	1.7	670.5	23.2
spider crab	nc	nc	640.6	22.2
American lobster	1,958	8.3	479.7	16.6
long-finned squid	19,231	81.9	421.3	14.6
boring sponge	nc	nc	107.5	3.7
rock crab	nc	nc	80.9	2.8
starfish spp.	nc	nc	73.7	2.6
flat claw hermit crab	nc	nc	61.3	2.1
channeled whelk	334	1.4	58.8	2.0
bushy bryozoan	nc	nc	54.3	1.9
lion's mane jellyfish	1,307	5.6	40.6	1.4
knobbed whelk	96	0.4	35.1	1.2
sea grape	nc	nc	31.1	1.1
northern moon snail	nc	nc	20.9	0.7
blue mussel	nc	nc	19.7	0.7
common slipper shell	nc	nc	16.8	0.6
lady crab	nc	nc	12.0	0.4
hydroid spp.	nc	nc	9.6	0.3
ribbed mussel	nc	nc	8.8	0.3
sand shrimp	nc	nc	6.8	0.2
arks	nc	nc	6.5	0.2
mud crabs	nc	nc	6.5	0.2
rubbery bryzoan	nc	nc	6.0	0.2
mantis shrimp	110	0.5	4.9	0.2
bluecrab	24	0.1	4.3	0.1
hard clams	nc	nc	3.9	0.1
star coral	nc	nc	1.9	0.1
coastal mud shrimp	4	0	0.7	0
purple sea urchin	nc	nc	0.6	0
blood star	nc	nc	0.4	0
northern red shrimp	2	0	0.4	0
Japanese shore crab	4	0	0.3	0
anemones	nc	nc	0.1	0
sand dollar	1	0	0.1	0
common razor clam	1	0	0.1	0
moon jelly	nc	nc	0.1	0
northern cyclocardia	nc	nc	0.1	0
mixed sponge species	nc	nc	0.1	0
Total	**23,471**		**2,887**	

Appendix 2.4. cont. Total number and weight (kg) of finfish and invertebrates caught in LISTS in 2004.
Finfish species are in order of descending count. Invertebrate species are in order of descending weight (nc = not counted). Young-of-year bay and striped anchovy are neither separated by species or quantified; young-of-year Atlantic herring are not quantified. Number of tows (sample size)=199.

species	count	%	weight	%
butterfish	94,735	46.7	1,842.7	9.7
scup	61,521	30.3	6,801.1	35.7
weakfish	17,505	8.6	426.9	2.2
bluefish	6,504	3.2	2,140.6	11.2
winter flounder	4,021	2.0	839.9	4.4
little skate	3,044	1.5	1,689.8	8.9
windowpane flounder	2,275	1.1	333.7	1.8
bay anchovy	1,523	0.8	10.3	0.1
silver hake	1,417	0.7	27.3	0.1
fourspot flounder	1,406	0.7	309.3	1.6
striped searobin	1,308	0.6	465.4	2.4
alewife	859	0.4	56.1	0.3
Atlantic herring	851	0.4	58.3	0.3
red hake	829	0.4	51.6	0.3
northern searobin	784	0.4	112.0	0.6
Atlantic menhaden	746	0.4	110.7	0.6
summer flounder	644	0.3	627.2	3.3
smooth dogfish	503	0.2	1,435.3	7.5
striped bass	378	0.2	811.8	4.3
American shad	356	0.2	24.2	0.1
tautog	232	0.1	353.7	1.9
spotted hake	230	0.1	37.8	0.2
blueback herring	218	0.1	6.5	0
moonfish	182	0.1	3.4	0
fourbeard rockling	173	0.1	13.0	0.1
black sea bass	124	0.1	40.5	0.2
hogchoker	83	0	9.5	0
American sand lance	70	0	0.2	0
winter skate	53	0	100.3	0.5
smallmouth flounder	50	0	2.8	0
hickory shad	39	0	14.2	0.1
spiny dogfish	38	0	104.7	0.5
Atlantic cod	33	0	4.7	0
clearnose skate	22	0	48.2	0.3
cunner	21	0	3.7	0
ocean pout	18	0	5.4	0
rough scad	14	0	0.7	0
round scad	11	0	0.3	0
spot	8	0	0.9	0
Atlantic sturgeon	8	0	117.6	0.6
haddock	7	0	0.6	0
sea raven	7	0	2.4	0
northern kingfish	5	0	0.5	0
northern puffer	5	0	0.4	0
longhorn sculpin	5	0	3.4	0
seasnail	4	0	0.2	0
crevalle jack	2	0	0.2	0
northern pipefish	2	0	0.2	0
rock gunnel	2	0	0.2	0
Atlantic tomcod	2	0	0.2	0
white perch	2	0	0.5	0
American plaice	1	0	0.1	0
conger eel	1	0	0.1	0
gizzard shad	1	0	0.1	0
goosefish	1	0	0.1	0
pollock	1	0	0.1	0
roughtail stingray	1	0	4.1	0
oyster toadfish	1	0	0.8	0
yellow jack	1	0	0.1	0
Total	**202,887**		**19,056.6**	
Finfish not ranked				
anchovy spp, yoy				
Atlantic herring, yoy				
Invertebrates				
long-finned squid	23,022	86.5	953.4	28.8
horseshoe crab	534	2.0	873.4	26.4
American lobster	1,843	6.9	481.5	14.5
spider crab	nc	nc	355.5	10.7
blue mussel	nc	nc	250.2	7.6
bushy bryozoan	nc	nc	50.9	1.5
flat claw hermit crab	nc	nc	42.4	1.3
channeled whelk	199	0.7	42.3	1.3
starfish spp.	nc	nc	41.7	1.3
boring sponge	nc	nc	41.7	1.3
rock crab	1	0.0	35.2	1.1
lion's mane jellyfish	803	3.0	34.0	1.0
common slipper shell	nc	nc	22.9	0.7
sea grape	nc	nc	16.4	0.5
lady crab	nc	nc	14.5	0.4
northern moon snail	nc	nc	11.5	0.3
knobbed whelk	21	0.1	7.7	0.2
mantis shrimp	159	0.6	7.0	0.2
arks	nc	nc	7.0	0.2
mud crabs	nc	nc	5.4	0.2
sand shrimp	nc	nc	4.7	0.1
bluecrab	13	0	2.8	0.1
hard clams	nc	nc	2.3	0.1
surf clam	5	0	1.0	0
purple sea urchin	nc	nc	0.8	0
mixed sponge species	nc	nc	0.6	0
hydroid spp.	nc	nc	0.6	0
deadman's fingers sponge	nc	nc	0.5	0
rubbery bryzoan	nc	nc	0.4	0
star coral	nc	nc	0.3	0
northern red shrimp	nc	nc	0.3	0
northern cyclocardia	nc	nc	0.2	0
blood star	nc	nc	0.1	0
coastal mud shrimp	1	0	0.1	0
sea cucumber	2	0	0.1	0
Total	**26,603**		**3,309.4**	

Appendix 2.4. cont. Total number and weight (kg) of finfish and invertebrates caught in LISTS in 2005.
Finfish species are in order of descending count. Invertebrate species are in order of descending weight (nc = not counted). Young-of-year bay and striped anchovy are neither separated by species or quantified; young-of-year Atlantic herring are not quantified. Number of tows (sample size)=200.

species	count	%	weight	%
butterfish	92,996	52.2	2,097.3	16.8
scup	52,642	29.6	3,080.7	24.7
weakfish	9,191	5.2	449.9	3.6
bluefish	6,532	3.7	1,333.8	10.7
winter flounder	4,692	2.6	566.1	4.5
windowpane flounder	1,982	1.1	177.5	1.4
little skate	1,317	0.7	682.5	5.5
Atlantic herring	1,168	0.7	131.1	1.1
bay anchovy	814	0.5	5.8	0
striped searobin	757	0.4	183.7	1.5
alewife	742	0.4	47.6	0.4
fourspot flounder	688	0.4	125.9	1
red hake	585	0.3	56.0	0.4
summer flounder	506	0.3	406.1	3.3
striped bass	469	0.3	675.1	5.4
smooth dogfish	467	0.3	1,421.7	11.4
moonfish	356	0.2	6.0	0
northern searobin	265	0.1	21.3	0.2
Atlantic menhaden	235	0.1	77.9	0.6
spotted hake	234	0.1	17.4	0.1
tautog	179	0.1	269.2	2.2
American shad	177	0.1	18.2	0.1
silver hake	165	0.1	7.1	0.1
hickory shad	136	0.1	43.1	0.3
blueback herring	111	0.1	5.4	0
fourbeard rockling	106	0.1	6.8	0.1
clearnose skate	102	0.1	187.1	1.5
rough scad	62	0	1.9	0
hogchoker	61	0	8.7	0.1
smallmouth flounder	44	0	2.4	0
black sea bass	42	0	26.4	0.2
spiny dogfish	41	0	102.0	0.8
Atlantic mackerel	37	0	5.7	0
winter skate	31	0	59.9	0.5
yellow jack	28	0	3.0	0
cunner	24	0	4.1	0
round scad	12	0	0.3	0
Atlantic cod	10	0	0.9	0
rock gunnel	9	0	0.6	0
Atlantic sturgeon	9	0	152.7	1.2
northern sennet	8	0	0.7	0
American sand lance	6	0	0.2	0
northern puffer	5	0	0.3	0
northern kingfish	4	0	0.6	0
northern pipefish	4	0	0.3	0
ocean pout	3	0	0.7	0
sea raven	3	0	0.5	0
crevalle jack	2	0	0.2	0
gizzard shad	2	0	0.2	0
goosefish	2	0	0.7	0
grubby	2	0	0.2	0

species	count	%	weight	%
haddock	2	0	0.2	0
seasnail	2	0	0.2	0
glasseye snapper	1	0	0.1	0
inshore lizardfish	1	0	0.1	0
lookdown	1	0	0.1	0
pollock	1	0	0.1	0
Total	**178,073**		**12,474.3**	
Finfish not ranked				
anchovy spp, yoy				
Atlantic herring, yoy				
Invertebrates				
blue mussel	nc	nc	971.0	32.6
long-finned squid	17,542	83.2	683.5	22.9
American lobster	1,389	6.6	364.3	12.2
horseshoe crab	161	0.8	304.2	10.2
starfish spp.	nc	nc	198.4	6.7
lion's mane jellyfish	1,806	8.6	97.3	3.3
spider crab	nc	nc	92.0	3.1
bushy bryozoan	nc	nc	64.6	2.2
lady crab	nc	nc	48.8	1.6
boring sponge	nc	nc	26.1	0.9
flat claw hermit crab	nc	nc	23.1	0.8
channeled whelk	101	0.5	23.0	0.8
common slipper shell	nc	nc	12.2	0.4
rubbery bryozoan	nc	nc	11.0	0.4
knobbed whelk	23	0.1	9.7	0.3
rock crab	nc	nc	9.3	0.3
ribbed mussel	nc	nc	7.6	0.3
hard clams	nc	nc	7.2	0.2
northern moon snail	nc	nc	4.7	0.2
sea grape	nc	nc	4.5	0.2
mantis shrimp	64	0.3	3.8	0.1
arks	nc	nc	3.5	0.1
hydroid spp.	nc	nc	3.4	0.1
mud crabs	nc	nc	2.5	0.1
sand shrimp	nc	nc	2.1	0.1
deadman's fingers sponge	nc	nc	1.1	0
purple sea urchin	nc	nc	0.7	0
bluecrab	3	0	0.6	0
mixed sponge species	nc	nc	0.4	0
surf clam	nc	nc	0.4	0
star coral	nc	nc	0.3	0
sand dollar	1	0	0.2	0
northern red shrimp	nc	nc	0.2	0
boreal squid	1	0	0.1	0
Japanese shore crab	5	0	0.1	0
northern cyclocardia	nc	nc	0.1	0
common oyster	nc	nc	0.1	0
Total	**21,096**		**2,982.1**	

Appendix 2.4. cont. Total number and weight (kg) of finfish and invertebrates caught in LISTS in 2006.
Finfish species are in order of descending count. Invertebrate species are in order of descending weight (nc = not counted). Young-of-year bay and striped anchovy are neither separated by species or quantified; young-of-year Atlantic herring are not quantified. Number of tows (sample size)=120.

species	count	%	weight	%	species	count	%	weight	%
butterfish	50,022	54.3	1,631.4	15.5					
scup	28,829	31.3	4,636.1	44.2					
bluefish	2,100	2.3	358.6	3.4	**Finfish not ranked**				
winter flounder	1,699	1.8	271.2	2.6	anchovy spp, yoy				
bay anchovy	1,492	1.6	8.3	0.1	Atlantic herring, yoy				
silver hake	1,267	1.4	37.7	0.4	American sand lance (yoy)				
windowpane flounder	1,077	1.2	128.9	1.2					
northern searobin	630	0.7	74.5	0.7					
red hake	625	0.7	37.4	0.4					
little skate	593	0.6	310.6	3	**Invertebrates**				
alewife	573	0.6	49.5	0.5	long-finned squid	7,802	83.4	326	32.5
fourspot flounder	466	0.5	88.1	0.8	horseshoe crab	109	1.2	205.8	20.5
striped searobin	366	0.4	113.5	1.1	American lobster	748	8	197.9	19.7
moonfish	361	0.4	3.5	0	boring sponge	nc	nc	51.3	5.1
smooth dogfish	332	0.4	1,176.6	11.2	spider crab	nc	nc	50.6	5
spotted hake	321	0.3	24.3	0.2	lion's mane jellyfish	558	6	45.4	4.5
weakfish	241	0.3	52.2	0.5	rock crab	nc	nc	40.4	4
summer flounder	203	0.2	180.5	1.7	bushy bryozoan	nc	nc	17.8	1.8
tautog	186	0.2	301.4	2.9	blue mussel	nc	nc	7.6	0.8
striped bass	144	0.2	418.7	4	channeled whelk	41	0.4	7.6	0.8
hickory shad	75	0.1	19.1	0.2	lady crab	nc	nc	7.5	0.7
American shad	68	0.1	6.1	0.1	deadman's fingers sponge	nc	nc	6.8	0.7
Atlantic herring	66	0.1	10.3	0.1	hydroid spp.	nc	nc	5.9	0.6
blueback herring	63	0.1	2.5	0	flat claw hermit crab	nc	nc	5.7	0.6
clearnose skate	36	0	52.4	0.5	starfish spp.	nc	nc	4.8	0.5
Atlantic menhaden	28	0	5.5	0.1	rubbery bryzoan	nc	nc	4	0.4
winter skate	23	0	60	0.6	common slipper shell	nc	nc	3.9	0.4
hogchoker	22	0	3.2	0	mantis shrimp	70	0.7	3.4	0.3
Atlantic sturgeon	21	0	368.7	3.5	mud crabs	nc	nc	2.1	0.2
black sea bass	19	0	9.3	0.1	blue crab	11	0.1	1.8	0.2
fourbeard rockling	14	0	1.5	0	knobbed whelk	5	0.1	1.2	0.1
rough scad	14	0	0.5	0	sand shrimp	nc	nc	0.6	0.1
spot	14	0	1.2	0	mixed sponge species	nc	nc	0.6	0.1
spiny dogfish	11	0	47	0.4	moon jelly	2	0	0.5	0
cunner	8	0	1.3	0	sea grape	nc	nc	0.5	0
smallmouth flounder	7	0	0.6	0	arks	nc	nc	0.4	0
ocean pout	5	0	0.9	0	purple sea urchin	2	0	0.4	0
glasseye snapper	4	0	0.1	0	star coral	nc	nc	0.3	0
inshore lizardfish	4	0	0.4	0	hard clams	1	0	0.3	0
northern pipefish	3	0	0.2	0	northern red shrimp	1	0	0.3	0
rock gunnel	2	0	0.1	0	red bearded sponge	nc	nc	0.2	0
yellow jack	2	0	0.1	0	fan worm tubes	nc	nc	0.2	0
Atlantic bonito	1	0	3.2	0	northern moon snail	nc	nc	0.2	0
planehead filefish	1	0	0.1	0	surf clam	1	0	0.2	0
goosefish	1	0	1.2	0	brown shrimp	1	0	0.1	0
pollock	1	0	0.1	0	ghost shrimp	nc	nc	0.1	0
oyster toadfish	1	0	1.2	0	Japanese shore crab	nc	nc	0.1	0
yellowtail flounder	1	0	0.4	0	northern cyclocardia	nc	nc	0.1	0
Total	**92,042**		**10,500.2**		**Total**	**9,352**		**1,002.6**	

Appendix 2.4. cont. Total number and weight (kg) of finfish and invertebrates caught in 2007.
Finfish species are in order of descending count. Invertebrate species are in order of descending weight (nc = not counted). Young-of-year bay and striped anchovy are neither separated by species or quantified; young-of-year Atlantic herring are not quantified. Number of tows (sample size)=200.

species	count	%	weight	%
scup	75,681	42.6	5,333.5	30.4
butterfish	49,137	27.6	1,446.2	8.2
weakfish	17,386	9.8	584.8	3.3
bluefish	9,378	5.3	1,801.3	10.3
winter flounder	4,550	2.6	951.3	5.4
windowpane flounder	4,051	2.3	510.8	2.9
red hake	2,788	1.6	200.4	1.1
bay anchovy	2,440	1.4	14.5	0.1
Atlantic herring	1,932	1.1	234.2	1.3
alewife	1,537	0.9	101.3	0.6
little skate	1,277	0.7	697.0	4.0
fourspot flounder	1,094	0.6	224.9	1.3
moonfish	979	0.6	12.0	0.1
striped searobin	755	0.4	217.0	1.2
summer flounder	733	0.4	590.9	3.4
northern searobin	691	0.4	74.2	0.4
smooth dogfish	580	0.3	2,110.2	12.0
Atlantic menhaden	426	0.2	63.9	0.4
striped bass	422	0.2	888.0	5.1
spotted hake	340	0.2	23.9	0.1
silver hake	290	0.2	14.6	0.1
tautog	280	0.2	551.4	3.1
American shad	236	0.1	15.8	0.1
blueback herring	156	0.1	9.1	0.1
black sea bass	116	0.1	46.8	0.3
clearnose skate	97	0.1	193.3	1.1
fourbeard rockling	87	0	7.6	0
hogchoker	78	0	11.4	0.1
smallmouth flounder	48	0	2.6	0
winter skate	44	0	117.8	0.7
hickory shad	37	0	10.4	0.1
spiny dogfish	32	0	122.3	0.7
American sand lance	30	0	0.3	0
Atlantic sturgeon	18	0	336.4	1.9
cunner	16	0	3.0	0
rough scad	13	0	0.7	0
ocean pout	12	0	3.2	0
Atlantic mackerel	9	0	0.8	0
glasseye snapper	8	0	0.7	0
northern puffer	8	0	0.5	0
striped anchovy	6	0	0.1	0
sea raven	5	0	3.6	0
oyster toadfish	5	0	2.0	0
yellow jack	5	0	0.4	0
northern kingfish	4	0	0.4	0
round scad	3	0	0.3	0
longhorn sculpin	3	0	0.8	0
American eel	2	0	0.9	0
inshore lizardfish	2	0	0.2	0
mackerel scad	2	0	0.1	0
northern sennet	2	0	0.2	0
northern pipefish	2	0	0.2	0
Atlantic silverside	1	0	0.1	0
gizzard shad	1	0	0.1	0
Total	**177,841**		**17,540.3**	

species	count	%	weight	%
grubby	1	0	0.1	0
pollock	1	0	0.1	0
rock gunnel	1	0	0.1	0
striped burrfish	1	0	0.5	0
sea lamprey	1	0	0.1	0
yellowtail flounder	1	0	1.0	0
Finfish not ranked				
anchovy spp, yoy				
Atlantic herring, yoy				
American sand lance (yoy)				
long-finned squid	24,212	88.2	773.6	30.8
horseshoe crab	333	1.2	596.4	23.7
American lobster	1,648	6.0	396.5	15.8
spider crab	nc	nc	165.5	6.6
lion's mane jellyfish	660	2.4	129.8	5.2
bushy bryozoan	nc	nc	107.4	4.3
mixed sponge species	nc	nc	84.5	3.4
rock crab	nc	nc	41.4	1.6
channeled whelk	196	0.7	33.4	1.3
flat claw hermit crab	nc	nc	27.5	1.1
blue mussel	nc	nc	20.4	0.8
starfish spp.	nc	nc	20.3	0.8
boring sponge	nc	nc	17.7	0.7
blue crab	68	0.2	13.0	0.5
mantis shrimp	264	1.0	12.1	0.5
deadman's fingers sponge	nc	nc	11.5	0.5
lady crab	nc	nc	11.5	0.5
knobbed whelk	23	0.1	11.1	0.4
common slipper shell	nc	nc	9.3	0.4
mud crabs	nc	nc	4.3	0.2
northern moon snail	nc	nc	4.3	0.2
sand shrimp	nc	nc	3.5	0.1
sea grape	nc	nc	3.5	0.1
arks	2	0	2.7	0.1
hydroid spp.	nc	nc	2.5	0.1
hard clams	1	0	2.2	0.1
rubbery bryzoan	nc	nc	1.4	0.1
common oyster	nc	nc	1.1	0
surf clam	10	0	1.0	0
anemones	16	0.1	0.6	0
purple sea urchin	2	0	0.6	0
red bearded sponge	nc	nc	0.5	0
star coral	nc	nc	0.4	0
water jelly	1	0	0.3	0
jonah crab	1	0	0.2	0
northern red shrimp	1	0	0.2	0
blood star	nc	nc	0.1	0
coastal mud shrimp	1	0	0.1	0
green sea urchin	1	0	0.1	0
Japanese shore crab	nc	nc	0.1	0
tunicates, misc	1	0	0.1	0
Total	**27,441**		**2,512.7**	

Note: nc= not counted

PART 2: ESTUARINE SEINE SURVEY

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

JOB 2 PART 2: ESTUARINE SEINE SURVEY

OBJECTIVES

1) *Provide an annual index of recruitment for winter flounder (Age0, 1+), all finfsh species taken, and all crab species.*

The 2007 annual index of recruitment for young-of-year winter flounder (4.7 fish/haul) ranked 14th out of 20 annual indices.

2) *Provide an annual total count for all finfish taken.*

Mean catch of all finfish (236 fish/haul) ranked third out of 20 annual indices and was well above the series average of 142 fish/haul (Figure 2.2). Geometric means were calculated for 22 species commonly captured since the survey began in 1988 (Table 2.1).

3) *Provide an index for shallow subtidal forage species abundance.*

An index of forage abundance was generated using the catch of four of the most common forage species caught: Atlantic silversides, striped killifish, mummichog, and sheepshead minnow. The index for 2007 (149 forage fish/haul) was the second highest of the time series, and well above the time series average of 102 forage fish/haul.

METHODS

Eight sites (Figure 2.1) are sampled with an eight-meter (25 ft.) bag seine with 6.4mm (0.25 in.) bar mesh during September 2006. Area swept was standardized to 4.6 m (15 ft.), width by means of a taut spreader rope and a 30m (98 ft.), measured distance, parallel to, or at a 45º angle to the shoreline, against the current or tide if present. At each site, six seine hauls were taken within two hours before and after low slack tide during daylight hours. Sites in Groton, Waterford, Old Lyme, Clinton, New Haven, Bridgeport and Greenwich have been sampled since 1988. The Milford site was added in 1990.

Finfish and crabs taken in each sample are identified to species or lowest practical taxon (full listing given in Appendix 2.1, 2.2) and counted. One exception is inland silversides, which are not separated from Atlantic silversides because they are rare and difficult to identify. Qualitative counts were used for menhaden when abundant (A= 1000) to minimize discard mortality. Winter flounder are measured to total length (mm), and classified as young-of-year (YOY) if less than 12 cm and age 1+ if 12cm or larger. The age of flounder near this size was verified in 1990-1992 by examination of the sagittal otolith. Physical data recorded at each seine location included water temperature and salinity at one-meter depth. The geometric, or retransformed natural log mean catch per standard haul is calculated for catches at each site and collectively for the 22 most abundant species, with separate indices for young-of-year and winter flounder age 1 and older. Confidence intervals (95%) for each geometric mean are retransformations of the corresponding log intervals. Frequency of occurrence is given as a percentage of all samples taken each year.

RESULTS

A total of 48 seine hauls were taken in 2007 at eight sites, yielding a total catch of 11,336 fish of 25 species and 5,360 invertebrates of 11 species. Mean catch of all finfish (236 fish/tow) was the third highest in the time series (Figure 2.2). This catch is well above the long-term mean of 142 fish/tow is attributed to above average catches of Atlantic silversides, striped killifish, mummichog, sheepshead minnow, northern puffer, scup and tautog. Geometric means were calculated for 22 species commonly captured since the survey began in 1988 (Table 2.1). The most frequently caught species was Atlantic silversides, which occurred in 100 percent of all samples, followed by YOY winter flounder (92%), striped killifish (88%), mummichog (65%), tautog (54%), northern puffer (44%), pipefish (42%), sheepshead minnow (40%), scup (29%), cunner (25%) and black sea bass (23%). This rank order has changed from the previous years, with a notable increase in winter flounder and tautog occurrence rate along with an increase in striped killifish, northern puffer, pipefish and sheepshead minnow occurrence. Fourteen of the 22 species monitored increased in abundance in 2007, while seven fish species decreased and two were unchanged. Tautog abundance and occurrence rate increased significantly in 1998-99, returned to the series average in 2005, and was well above the series average (record year) in 2007. Previous to 2005, tautog relative abundance had significantly increased to all-time abundance levels in 2002-04 (Figure 2.4). Three forage fish species were the highest in the 20-year time-series. Tautog, scup and northern puffer occurrence and abundance were also the highest in 2007. Cunner abundance and occurrence was the third highest in the 20 year time-series in 2007. No snapper bluefish, four-spine stickleback, smallmouth founder, striped bass and weakfish young-of-year were observed in the survey in 2007. Grubby, summer flounder, age 1 winter flounder and windowpane flounder decrease in abundance in 2007 from the previous year. Grubby, northern kingfish, northern pipefish, windowpane flounder and winter flounder (age 1+ and older) abundance and occurrence was average for the 20-year time-series in 2007. All other species occurred in less than 10% of all samples, with occurrence rates similar to previous years. One new species of finfish, flying gurnard (*Dactylopterus volitans*) was captured in 2007, at the Waterford site. Other notable catches, were 2 northern seahorses captured at the Waterford site and seven white mullet at Old Lyme.

Relative Abundance of Juvenile Winter Flounder and Tautog

The 2007 index of YOY winter flounder (4.7fish/haul) ranked fourteenth out of 20 annual indices (Table 2.2, Figure 2.3 and 2.7). Overall, the time series indicates that relatively strong year classes were produced in 1988, 1992, 1994, and 1996 (Figure 2.3).

The 2007 index of YOY tautog (2.4 fish/haul) was the highest ranking out of 20 annual indices (Table 2.1, Figure 2.3 and 2.7), well above the series average of 0.74 tautog / haul. Overall, the time series indicates a significant increasing trend in abundance of young-of-year tautog from 1988 to 2007, with good year classes produced in 1998-99, 2002-04 and 2007, even though the 2006 mean was below the long-term average. ($P \leq 0.01$, $t=2.8$, $df=19$),

(Table 2.1, Figure 2.4).

Presence of Other Important Recreational Finfish

YOY scup is another recent addition to the seine survey, first occurring in 1999, with the highest relative abundance in the last seven years of the time series, a reflection of strong recruitment and survival in recent years (Table 2.4, Figure 2.8). Juvenile striped bass first occurred in the survey in 1999 with one individual captured. In 2003 six more YOY stripers were taken (Table 2.4, Figure 2.8). However, no striped bass were captured in 2007. YOY summer flounder have occurred in six years of the 20-year time series (1993, 1994, 1996, 1998, 2006 and 2007). The 2007 summer flounder abundance was the third highest of the time series. YOY black sea bass first appeared in 1991 and every year since 1997, reaching their highest abundance in 2001, (Figure 2.7). Snapper bluefish have occurred in 14 out of 20 years of the time series, reaching peak abundance in 1999. Juvenile tautog has occurred every year in the seine survey except 1989.

Relative Abundance of Forage Species

Seine survey catches are dominated by forage species, defined here as short-lived, highly fecund species that spend the majority of their life cycle inshore where they are common food for piscivorous fish. An index of forage abundance was generated using the catch of four of the most common forage species caught: Atlantic silversides, striped killifish, mummichog, and sheepshead minnow (Figure 2.5, Figure 2.6). The index for 2007 was the second highest in the 20 year time series. Three of the four forage fish species (Striped killifish, sheepshead minnow and mummichog) occurred in record abundance in 2007. Atlantic silversides were the most abundant, and the only species present at all sites in all samples (Table 2.1). There was a substantial increase in silverside abundance in 2007. An increase in this species' abundance in 2002 through 2005 reversed a two-year decrease from 2000-2001 and a decrease in 2006. Striped killifish, sheepshead minnow and mummichog occurred in record abundance in 2007. Mummichog abundance (7.3) was well above the long-term average of 2.3 in 2007. Sheepshead minnow had a record abundance (3.35) in 2007, ranking highest in the 20 year time series in both total catch and percent occurrence. Striped killifish abundance and occurrence increase to record levels in 2007 (21.2 fish/tow, 88% occurrence). Collectively, killifish abundance has not been this high since 2002-2005.

Forage fish abundance has generally been increasing since 1997 (Figure 2.5) after a period of lower abundance (decreasing trend) since 1991. In 2007, forage fish abundance significantly rose above the series mean of 101.8 fish/haul, with a mean catch of 149.5 fish per haul. Forage fish abundance is driven numerically by the occurrence of adult Atlantic silverside (Figure 2.6) and more recently striped killifish, mummichog and sheepshead minnow, the second and third most abundant forage species. Striped killifish are more suited to marine habitats, than other 'Fundulus' species captured in the estuarine seine survey. Both Atlantic silverside and striped killifish were captured in slightly below average numbers in 2006, suggesting relatively poor year class production 2 –3 years ago, since the survey captures

adults more effectively. Mummichog, the third most abundant forage fish (Table 2.3) in the survey, peaked in abundance in 2007. The lowest time series abundance occurred in 1997, mummichog appear to be increasing with an above average catches since 1999. Sheepshead minnow the least abundant of the four forage fish species monitored has recently shown elevated abundance in 2002-2007, with a record year in 2007 (3.35 fish/tow).

Relative Abundance of Invertebrate Species

A total of 5,360 invertebrates of 11 species were captured in 2007 (Table 2.3), (Appendix 2.2). Seven crab species were present in the seine hauls, along with two shrimp species, one gastropod and one cephalopod (shortfin squid). Mud snail, shore shrimp, sand shrimp, lady crab, hermit crab, green crab and blue crab were the most abundant, and only mud snails, shore shrimp, sand shrimp, lady and green crab had greater than 50% occurrence in 2007 (Table 2.3).

MODIFICATIONS

None.

LITERATURE CITED

Northeast Utilities Service Company (NUSCo), 2002. Monitoring the marine environment of Long Island Sound at Millstone Nuclear Power Station, Waterford, CT. Winter flounder studies, Table 6, page 34.

Table 2.1: Mean catch of species commonly taken in seine samples, 1988-2007. *Geometric mean catch per haul is given with percent occurrence in parentheses. See Appendix 3.1 for complete species names.*

Species	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Atlantic Silverside	60.7 (95)	32.6 (95)	45.0 (81)	88.5 (100)	53.2 (100)	42.7 (94)	37.7 (100)	27.0 (96)	17.7 (94)	23.1 (92)	81.6 (100)
Black Sea Bass	0.0 (0)	0.0 (0)	0.0 (0)	0.1 (4)	0.0 (0)	0.0 (0)	0.2 (15)	0.1 (4)	0.0 (0)	0.0 (0)	0.1 (6)
Bluefish (Snapper)	0.0 (0)	0.0 (0)	0.02 (2)	0.1 (10)	0.02 (2)	0.0 (0)	0.01 (2)	0.1 (4)	0.0 (0)	0.01 (2)	0.1 (15)
Cunner	0.2 (17)	0.2 (14)	0.03 (4)	0.1 (11)	0.2 (15)	0.0 (0)	0.4 (23)	0.2 (15)	0.4 (13)	0.01 (2)	0.03 (23)
Fluke	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.03 (4)	0.08 (10)	0.0 (0)	0.02 (2)	0.0 (0)	0.1 (2)
Four-Spine Stickleback	0.3 (17)	0.4 (19)	0.0 (0)	0.7 (22)	0.1 (5)	0.1 (4)	0.01 (2)	0.0 (0)	0.04 (4)	0.0 (0)	0.1 (8)
Grubby	0.8 (33)	0.0 (0)	0.03 (4)	0.1 (11)	0.5 (31)	0.1 (8)	0.4 (33)	0.3 (25)	0.2 (19)	0.3 (29)	0.2 (17)
Menhaden	0.05 (5)	0.0 (0)	0.03 (4)	0.05 (4)	0.54 (19)	0.04 (6)	0.10 (10)	0.03 (4)	0.0 (0)	0.08 (6)	0.4 (6)
Mummichog	2.8 (47)	1.7 (50)	1.1 (35)	1.9 (40)	1.6 (38)	3. 7 (50)	3.5 (42)	0.7 (35)	1.2 (44)	0.5 (15)	2.0 (42)
Northern Kingfish	0.0 (0)	0.0 (0)	0.0 (0)	0.04 (6)	0.1 (8)	0.2 (10)	0.03 (4)	0.1 (15)	0.04 (4)	0.1 (13)	0.02 (10)
Northern Pipefish	0.7 (39)	0.3 (29)	0.5 (41)	1.1 (57)	0.9 (35)	0.9 (50)	1.1 (58)	0.5 (33)	1.0 (44)	0.4 (33)	1.8 (71)
Northern Puffer	0.1 (8)	0.2 (19)	0.1 (10)	0.4 (25)	0.1 (8)	0.4 (23)	0.2 (17)	0.5 (40)	0.2 (15)	0.1 (6)	0.1 (10)
Scup	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)
Sheepshead Minnow	0.7 (27)	1.0 (33)	0.1 (9)	0.6 (21)	0.04 (4)	0.01 (2)	0.02 (2)	0.1 (4)	0.0 (0)	0.1 (4)	0.1 (4)
Striped Killifish	9.6 (72)	11.0 (76)	6.0 (65)	4.2 (73)	3.1 (58)	5.1 (63)	5.3 (63)	4.0 (69)	2.0 (54)	1.5 (40)	7.2 (75)
Smallmouth Flounder	0.02 (3)	0.0 (0)	0.0 (0)	0.02 (2)	0.0 (0)	0.1 (13)	0.1 (10)	0.1 (6)	0.03 (4)	0.1 (4)	0.0 (0)
Striped Bass	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)
Striped Searobin	0.2 (11)	0.0 (0)	0.1 (13)	0.2 (10)	0.1 (8)	0.9 (46)	0.1 (10)	0.01 (2)	0.1 (10)	0.4 (35)	1.9 (60)
Tautog	0.3 (22)	0.0 (0)	0.3 (22)	0.7 (42)	0.4 (31)	0.2 (19)	0.8 (33)	0.7 (33)	0.3 (13)	0.2 (19)	1.0 (44)
Weakfish	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)
Winter Flounder (young-of-year)	**15.5** (97)	**1.9** (74)	**2.9** (74)	**5.2** (92)	**11.9** (98)	**5.6** (88)	**14.2** (98)	**10.1** (94)	**19.2** (100)	**7.5** (94)	**9.3** (92)
Winter Flounder (age 1 + older)	0.1 (14)	0.1 (10)	0.0 (0)	0.1 (15)	0.1 (8)	0.2 (21)	0.2 (17)	0.2 (19)	0.2 (10)	0.1 (15)	0.1 (10)
Windowpane Flounder	0.6 (31)	0.0 (0)	0.2 (13)	0.2 (13)	0.2 (23)	0.3 (23)	0.3 (17)	0.1 (17)	0.7 (35)	0.4 (23)	0.1 (13)

Table 2.1 cont.: Mean catch of species commonly taken in seine samples, 1988-2007. *Geometric mean catch per haul is given with percent occurrence in parentheses. See Appendix 3.1 for complete species names.*

Species	1999	2000	2001	2002	2003	2004	2005	2006	2007
Atlantic Silverside	102.5 (94)	99.7 (100)	36.1 (92)	80.1 (100)	113.6 (96)	85.1 (100)	81.3 (100)	37.7 (100)	**74.9 (100)**
Black Sea Bass	0.1 (8)	0.02 (2)	0.98 (25)	0.39 (17)	0.18 (13)	0.44 (25)	0.14 (8)	0.5 (23)	**0.6 (23)**
Bluefish (Snapper)	0.9 (46)	0.04 (4)	0.1 (13)	0.02 (2)	0.15 (10)	0.20 (15)	0.06 (4)	0.17 (8)	**0 (0)**
Cunner	0.5 (23)	0.3 (19)	0.16 (15)	0.33 (13)	0.18 (17)	0.48 (29)	0.30 (21)	0.14 (13)	**0.47 (25)**
Fluke	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0 (0)	0.20 (19)	**0.08 (6)**
Four-Spine Stickleback	0.04 (4)	0.01 (2)	0.05 (4)	0.0 (0)	0.0 (0)	0.5 (2)	0 (0)	0.02 (2)	**0 (0)**
Grubby	0.5 (27)	0.1 (10)	0.24 (17)	0.31 (21)	0.53 (29)	1.26 (50)	0.84 (46)	0.35 (27)	**0.27 (15)**
Menhaden	0.4 (15)	0.4 (10)	0.01 (2)	1.0 (27)	8.1 (58)	0.42 (8)	0.21 (6)	0.40 (13)	**0.59 (17)**
Mummichog	0.8 (29)	3.2 (44)	1.4 (42)	3.4 (54)	2.9 (44)	2.8 (35)	1.5 (27)	2.5 (48)	**7.3 (65)**
Northern Kingfish	0.1 (8)	0.05 (4)	0.17 (13)	0.05 (4)	0.21 (15)	0.32 (17)	0.11 (10)	0.01 (8)	**0.02 (2)**
Northern Pipefish	1.0 (48)	1.0 (54)	1.4 (48)	0.46 (19)	0.30 (25)	0.74 (48)	0.53 (25)	0.62 (29)	**0.82 (42)**
Northern Puffer	0.2 (19)	0.6 (35)	0.17 (17)	0.70 (35)	0.70 (31)	0.67 (40)	0.54 (31)	0.37 (29)	**1.24 (44)**
Scup	0.0 (0)	0.0 (0)	0.46 (23)	0.99 (35)	0.56 (25)	0.24 (13)	0.88 (29)	0.06 (4)	**0.99 (29)**
Sheepshead Minnow	0.1 (6)	0.4 (17)	0.24 (10)	0.58 (15)	0.66 (19)	0.51 (15)	0.23 (15)	0.23 (6)	**3.35 (40)**
Striped Killifish	4.5 (67)	8.6 (63)	7.5 (71)	14.5 (85)	14.9 (81)	12.9 (73)	19.4 (96)	7.1 (65)	**21.2 (88)**
Smallmouth Flounder	0.3 (21)	0.4 (6)	0.13 (13)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.01 (2)	**0 (0)**
Striped Bass	0.02 (2)	0.0 (0)	0.0 (0)	0.0 (0)	0.06 (6)	0.0 (0)	0.0 (0)	0.0 (0)	**0.0 (0)**
Striped Searobin	0.6 (38)	0.1 (10)	0.38 (29)	0.35 (25)	0.66 (40)	0.49 (38)	0.18 (13)	0.09 (13)	**0.32 (27)**
Tautog	1.3 (46)	0.5 (23)	0.61 (40)	1.5 (54)	1.1 (50)	1.4 (54)	0.7 (42)	0.38 (17)	**2.42 (54)**
Weakfish	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.15 (13)	0.0 (0)	0.0 (0)	0.0 (0)	**0.0 (0)**
Winter Flounder (young-of-year)	**8.7** (88)	**4.3** (77)	**1.3** (58)	**3.1** (79)	**8.1 (85)**	**11.0 (98)**	**5.6 (94)**	**0.92 (46)**	**4.73 (92)**
Winter Flounder (age 1 + older)	0.1 (6)	0.1 (15)	0.03 (4)	0.03 (2)	0.0 (0)	0.13 (17)	0.17 (21)	0.10 (15)	**0.08 (8)**
Windowpane Flounder	0.1 (13)	0.05 (6)	0.0 (0)	0.01 (2)	0.7 (10)	0.2 (21)	0.17 (15)	0.04 (6)	**0.03 (4)**

Table 2.2: Mean catch of young-of-year winter flounder at eight sites sampled by seine, 1988-2007.

The 95% confidence interval, rounded to the nearest whole number, for each geometric mean per haul is given in parentheses. Sites are listed west to east, left to right.

Year	Greenwich	Bridgeport	Milford	New Haven	Clinton	Old Lyme	Waterford	Groton	**All Sites**
1988	9.7 (3-29)	*19.0 (1-23)	not sampled	38.7 (23-65)	2.7 (1-7)	58.4 (27-126)	29.6 (19-46)	11.4 (8-16)	15.5 (10-23)
1989	0.6 (0-2)	1.7 (1-10)	not sampled	4.7 (2-11)	1.1 (1-2)	1.6 (0-5)	3.5 (2-7)	1.5 (0-4)	1.9 (1-3)
1990	0.5 (0-1)	4.0 (0-5)	1.6 (0-4)	5.7 (2-14)	0.2 (0-1)	16.8 (10-21)	2.6 (0-4)	2.2 (0-8)	2.9 (2-4)
1991	2.0 (1-2)	1.8 (0-5)	2.7 (1-6)	6.4 (3-13)	4.1 (2-7)	15.3 (7-31)	18.2 (8-39)	5.6 (3-9)	5.2 (3-6)
1992	6.2 (4-19)	3.3 (1-8)	4.3 (1-16)	40.2 (17-94)	5.5 (3-10)	48.0 (32-134)	32.5 (18-59)	6.3 (4-10)	11.9 (7-18)
1993	4.3 (1-21)	1.2 (0-3)	3.6 (2-5)	11.5 (6-20)	1.4 (0-4)	13.3 (4-38)	16.7 (13-22)	8.6 (5-15)	5.6 (4-8)
1994	4.3 (1-20)	4.5 (2-7)	4.6 (1-12)	35.3 (21-59)	8.1 (2-31)	61.7 (37-103)	21.0 (8-52)	38.4 (9-144)	14.2 (9-21)
1995	7.2 (4-13)	1.9 (0-5)	1.8 (0-7)	19.0 (14-26)	3.2 (1-9)	34.2 (17-70)	36.6 (23-58)	30.3 (23-40)	10.1 (7-15)
1996	*12.6 (6-24)	7.7 (4-14)	*6.6 (5-9)	*49.3 (31-79)	11.8 (7-18)	91.3 (64-130)	30.5 (14-63)	15.7 (9-26)	*19.2 (14-26)
1997	3.4 (1-12)	2.9 (0-14)	1.6 (0-4)	3.8 (2-9)	6.6 (1-14)	52.0 (33-80)	11.3 (9-15)	23.7 (4-134)	7.5 (5-11)
1998	9.0 (5-17)	1.2 (0-3)	0.9 (0-2)	22.4 (14-35)	4.0 (3-5)	57.2 (38-86)	21.9 (12-40)	17.6 (4-67)	9.3 (6-14)
1999	8.0 (4-15)	1.0 (0-4)	3.5 (1-10)	0.9 (0-2)	2.6 (1-7)	*137.1 (75-249)	36.1 (24-55)	25.7 (12-55)	8.7 (5-14)
2000	6.7 (2-17)	2.1 (0-6)	0.8 (0-3)	1.7 (1-4)	0.5 (0-1)	48.3 (29-81)	*41.6 (31-55)	0.8 (0-3)	4.3 (2-7)
2001	1.2 (.1-3.4)	0.2 (.2-.9)	0.6 (.1-1.3)	0.0 (0)	1.1 (.1-3.1)	0.9 (.8-2.4)	9.1 (4.9-16.2)	4.1 (.7-14.5)	1.3 (.8-2.1)
2002	5.1 (1.6-13.3)	0.9 (0-2.7)	0.3 (0-0.8)	1.1 (.2-2.5)	2.66 (0.7-7)	15.6 (8.7-27.3)	9.0 (5.9-13.5)	3.1 (0-17.3)	3.1 (2-4.6)
2003	5.9 (1.2-20.4)	1.9 (0.4-4.8)	0.9 (0-4.1)	1.7 (0.2-4.9)	4.6 (2.1-9.0)	51.1 (19.7-130.1)	32.3 (15.2-67.6)	*45.8 (8.0-243.3)	8.1 (4.7-13.4)
2004	11.3 (6.4-19.4)	1.0 (0.3-2.1)	3.4 (0.9-8.5)	33.1 (12.3-86)	*18.4 (9.2-35.7)	11.1 (4.2-27.4)	13.0 (5.7-28.5)	33.8 (20.2-56.1)	11.0 (7.6-15.6)
2005	7.7 (2.7-19.6)	1.9 (1.4-2.7)	5.1 (1-18.3)	1.6 (0.4-4.1)	11.1 (5-23.6)	4.1 (0.3-18.8)	7.3 (2-21.9)	16.7 (6.5-40.7)	5.6 (3.9-8.0)
2006	0.1 (0-0.5)	0.1 (0-0.5)	0 (0-0)	0 (0-0)	1.4 (0.4-3.1)	3.3 (2.1-5.0)	1.3 (0.1-3.8)	5.5 (0.8-23)	0.9 (0.5-1.5)
2007	**4.4 (1.2-12.3)**	**0.8 (0-2.5)**	**0.8 (0.3-1.4)**	**6.4 (2.4-15)**	**5.6 (3.2-9.5)**	**7.9 (3.7-13.1)**	**7.1 (0.1-3.8)**	**17.9 (8.8-35.4)**	**4.7 (3.3-6.6)**

*****record high for a site.

Table 2.3: Total catch of twelve invertebrate species at eight sites sampled by seine, 2007.
Seine sites are listed west to east.

Species	Greenwich	Bridgeport	Milford	New Haven	Clinton	Old Lyme	Waterford	Groton	All Sites
Blue Crab	4	0	0	1	12	12	2	0	**31**
Green Crab	11	0	23	1	4	23	24	63	**147**
Hermit Crab	6	0	29	31	28	4	19	38	**153**
Japan Crab	0	0	1	0	0	0	0	0	**1**
Lady Crab	28	3	0	134	6	18	0	0	**195**
Mud Crab	0	0	0	10	0	0	16	0	**30**
Mole Crab	0	0	0	0	0	0	0	0	**0**
Mud Snail	124	93	421	301	2,373	18	156	160	**3,569**
Rock Crab	0	0	0	0	0	0	0	0	**0**
Sand Shrimp	80	0	0	9	76	143	10	149	**525**
Spider Crab	2	0	0	0	0	0	2	0	**1**
Shore Shrimp	201	0	0	98	15	68	223	76	**707**
Shortfin Squid	0	0	0	1	0	0	0	0	**1**

Table 2.4: Total Catch by Species, 1988-2007.

SPECIES	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Alewife			1				1								28	1				
American Eel	1	3	1	1			1				5									
American Shad			1																	
American Sand Lance			1				10													
Atlantic Silverside	4,750	3,319	10,977	8,765	5,545	5,263	6,311	2,352	1,942	3,249	6,532	10,120	8,738	4,417	5,730	13,278	5,122	5,089	3,267	5,087
Atlantic Tomcod			13			3											1	3		
Banded Gunnel											2	3					4	2	3	1
Bay Anchovy	18	67	24								27			1			1	12		
Black-Spot Stickleback			11																	
Black Sea Bass				10			41	43			27	14	2	687	63	27	110	15	82	109
Blueback Herring			202	194	10		5	2			3	24	1		13	5				9
Bluefish (snapper)			26	23	2		1			1	11	152	3	8	2	17	23	8		
Bluespotted Coronetfish												1								
Crevalle Jack	5		1																	
Cunner	15	13	14	7	19		42	24	63	1	24	142	26	15	110	15	54	35	18	58
Flying Gurnard																				1
4-Spine Stickleback	33	76	83	225	11	21	1		3		6	3	1	7			9		2	
Gray Snapper			1																	
Grubby	111		54	10	61	7	38	19	21	28	17	55	15	73	33	95	143	76	31	32
Hogchoker			3	1																
Inshore Lizardfish	5		2			2	6			46	6	16	15	103	2		3		169	18
Little Skate										1					1					
Menhaden	3		4	5	1,074	3	9	2		11	2,003	377	1,236	1	1,284	5,098	1,117	75	117	144
Mummichog	1,031	198	710	1,150	573	1,256	2,343	78	151	190	396	115	1,008	246	811	702	637	543	398	1,203
Naked Goby			1	5				1			1	1		4	2	2	2		13	
Nine-Spine Stickleback			132																	
Northern Kingfish			2	5	4	23	2	9	3	10	7	6	5	17	5	21	38	11	1	1
Northern Pipefish	64	19	216	142	120	82	117	52	241	38	191	141	96	189	87	25	72	92	82	75
Northern Puffer	4	14	59	37	4	37	15	40	25	5	5	13	63	14	79	101	75	93	34	241

Table 2.4 Cont.: Total Catch by Species, 1988-2007.

SPECIES	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Northern Searobin			7										3	40	24	5	4	13	2	10
Northern Sennet																			1	
Northern Stargazer		5																		
Oyster Toadfish	3	_	_	1	_	_	_	_	_	1	1			1		1	2	1	1	1
Pumpkinseed				2													3			
Rainbow Smelt						5	2										34			
Rainwater Killifish			4							4			2		6	35	53	19	3	
Rock Gunnel			1		1	1				3							1			
Seahorse (Northern)			1				4			1			2		1					2
Scup (Porgy)												1		58	172	131	50	154	6	170
Sheepshead Minnow	168	816	20	345	4	1	2	30	7	14	19	12	267	59	402	276	205	28	104	1,439
Smallmouth Flounder	1			1		8	14	7	2	5		40	3	12					1	
Smooth Dogfish			1																	
Spotted Hake			1																	
Striped Bass												1				6				
Striped Burrfish												1								
Striped Killifish	1,416	1,504	1,824	1,009	465	863	2,323	520	269	289	1,066	539	1,797	1,494	1,698	3,410	1,548	1,470	1,063	1,994
Striped Searobin	22		20	125	5	71	5	1	9	40							38	19	6	32
Summer Flounder						2	6		1		1								16	8
Tautog (Blackfish)	23	17	53	135	32	16	104	88	42	20	133	174	67	59	153	140	145	64	93	321
Three-Spine Stickleback			64											11						
Weakfish																15				
Web Burrffish																			1	
White Perch																		3		
White Mullet			8		3										1				7	7
Windowpane Flounder	49		64	19	35	30	9	13	71	50	12	10	4		1	5	15	15	3	2
Winter Flounder (age 0)	904	139	276	483	1,055	481	1,401	916	1,486	874	1,015	1,497	708	138	302	1,310	914	470	110	365
Winter Flounder (age 1)	7	5	16	9	6	14	13	12	21	8	9	4	7	2	3		9	11	7	6
Yellow Jack			1																	

Figure 2.1: *Sampling locations of the seine survey along the coast of Connecticut.*

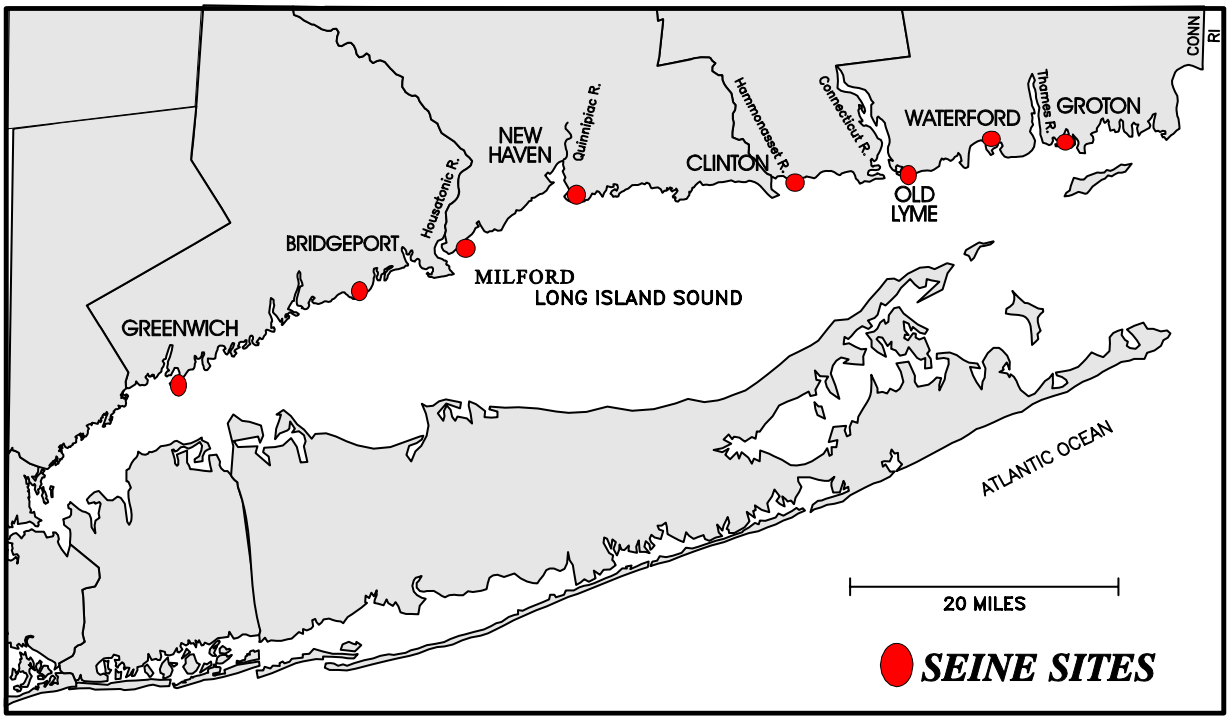

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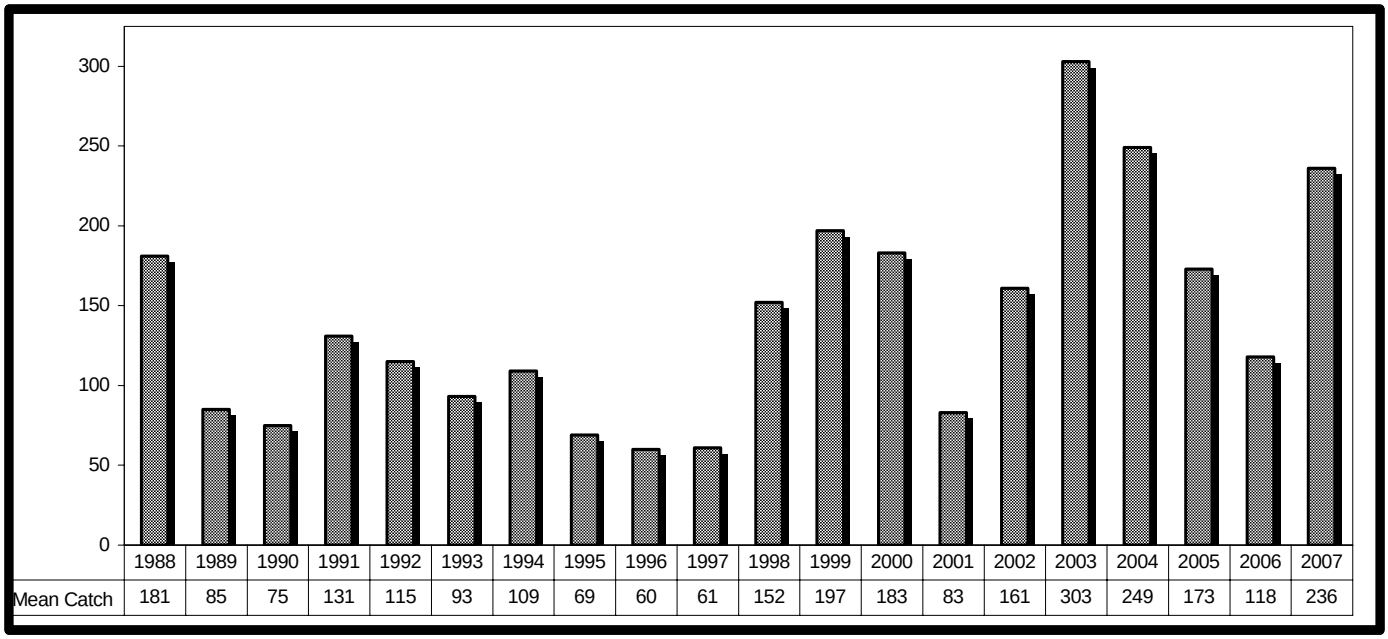
Figure 2.2: Mean catch (numbers) of all finfish taken in seine samples, 1988-2007.
Mean catch per haul includes samples at all sites. Note that sampling at the Milford site began in 1990.



	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Mean Catch	181	85	75	131	115	93	109	69	60	61	152	197	183	83	161	303	249	173	118	236

Figure 2.3: Mean catch of young-of-year winter flounder, 1988-2007. *The 95% confidence interval for each index is show as a vertical bar, along with a trendline. Note that all sites are included with sampling at the Milford site beginning in 1990.*

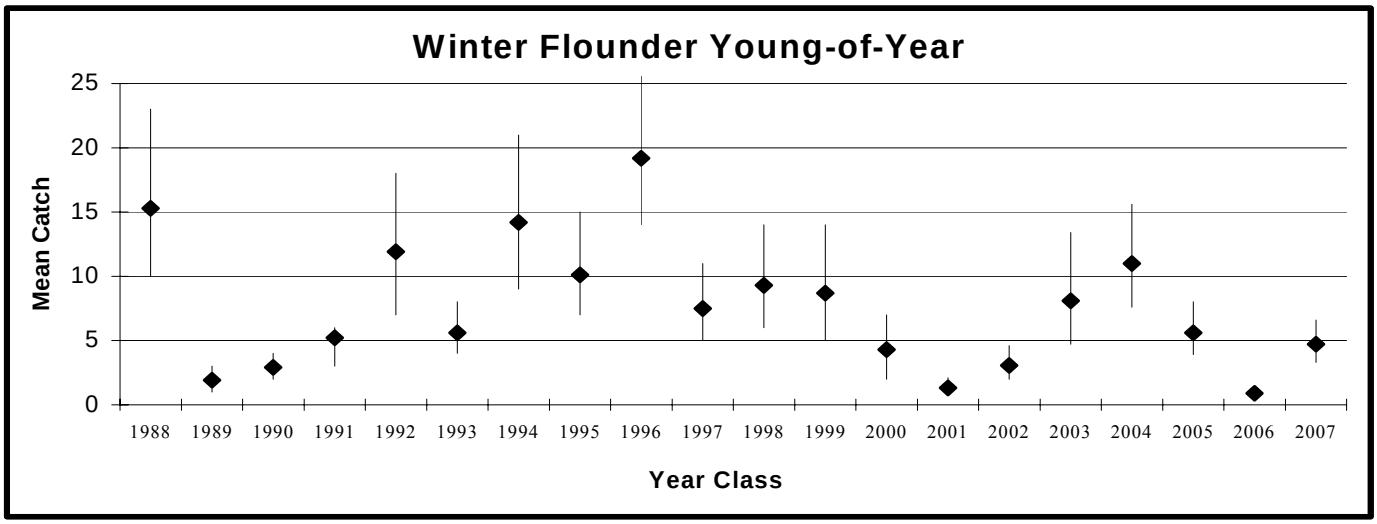


Figure 2.4: Mean catch of tautog young-of-year taken in seine samples, 1988-2007. *Geometric mean catch per haul (numbers) and occurrence (percent) includes samples at all sites. The time series mean of 0.65 tautog / haul is shown by the black line. Note that sampling at the Milford site began in 1990.*

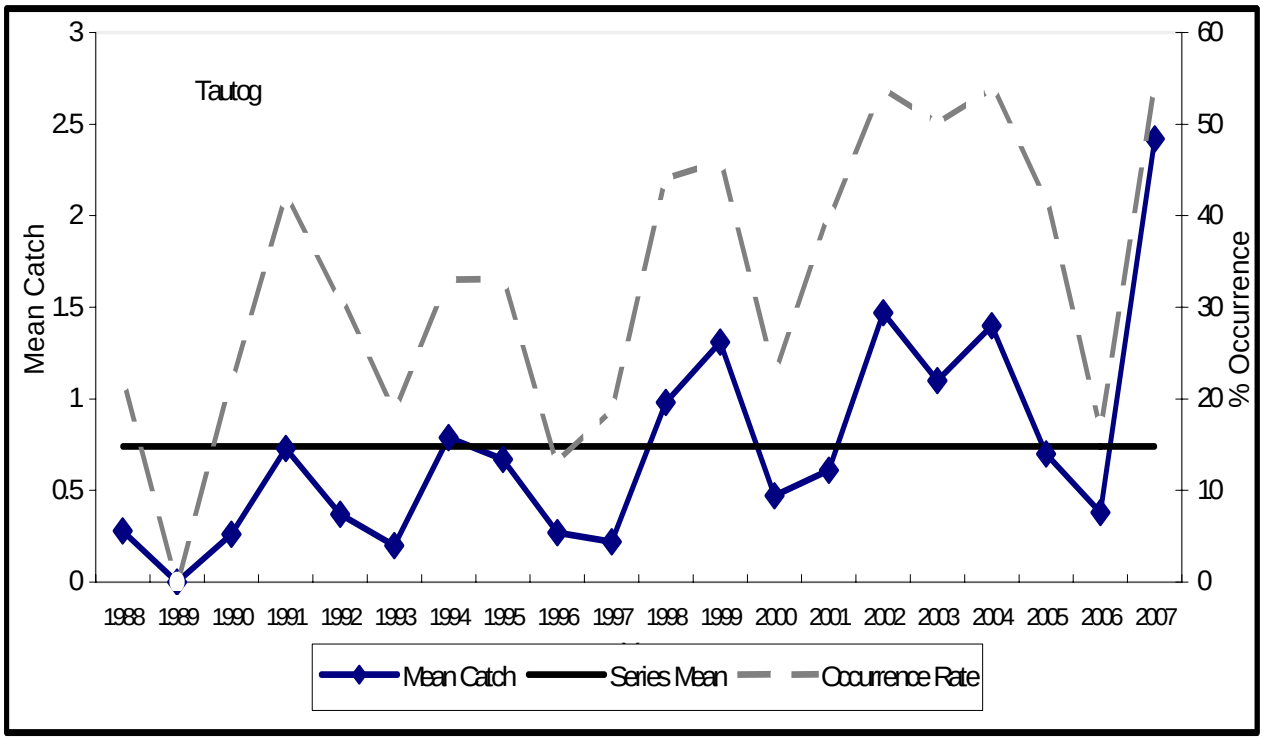


Figure 2.5: Mean catch of forage fish at eight sites sampled by seine, 1988-2007.
Forage species include Atlantic silversides, mummichog, sheepshead minnow, and striped killifish. The 95% confidence interval (CI) for each mean is also listed. See Appendix 2.1 for complete species names.

MEAN CATCH PER STANDARD HAUL

YEAR	1988	1989	1990	1991	1992	1993	1994	1995	1996
MEAN	136.3	76.1	65.0	111.7	74.2	65.6	58.0	42.5	25.9
95% CI	97-189	52-107	45-94	81-149	52-104	41-103	34-99	32-57	18-36

YEAR	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	**2007**
MEAN	32.2	110.0	126.9	146.3	52.4	125.3	206.4	129.7	121.7	59.4	**149.5**
95% CI	20-50	83-145	85-190	108-197	32-86	97-162	152-281	108-155	101-147	43-82	**119-187**

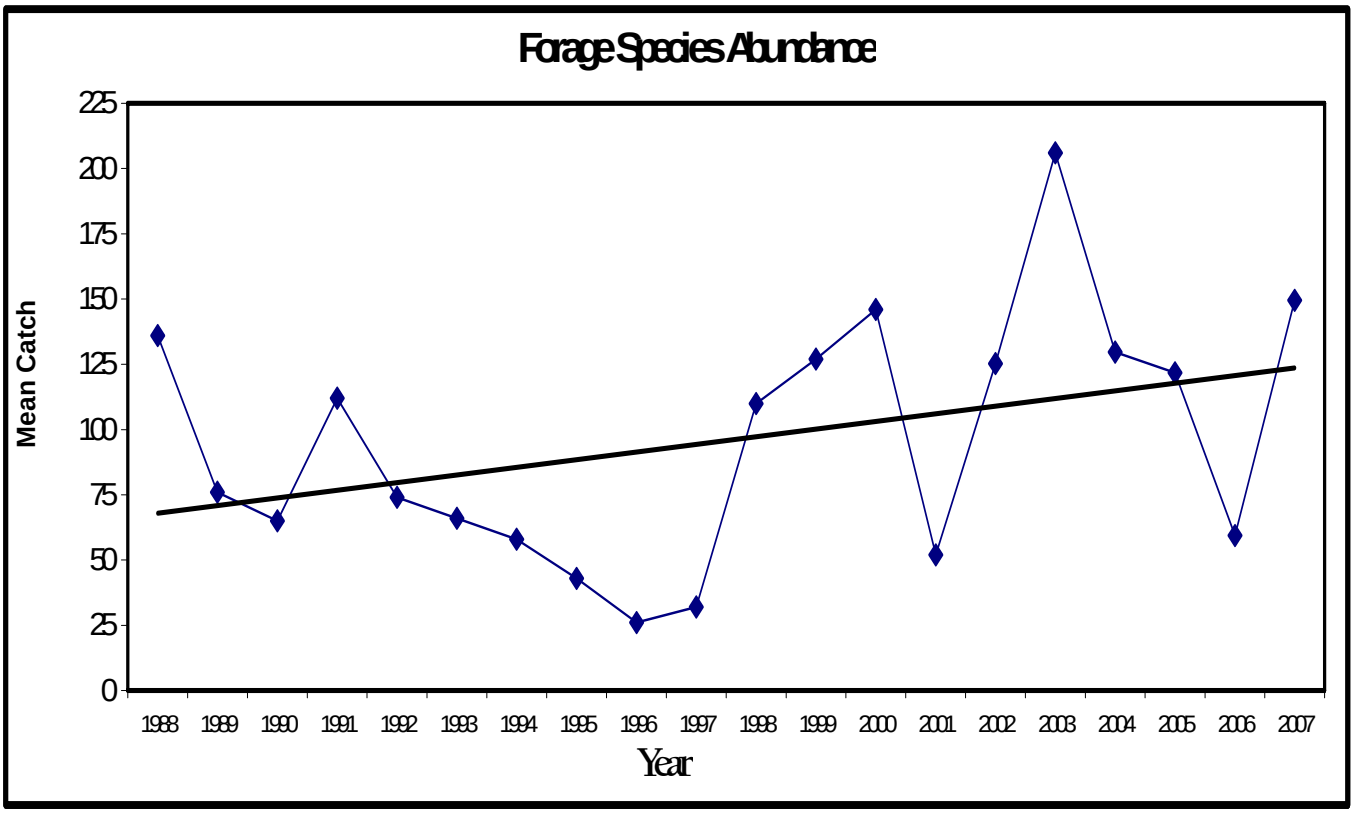


Figure 2.6: Total Catch of Four Species of Forage Fish, 1998-2007

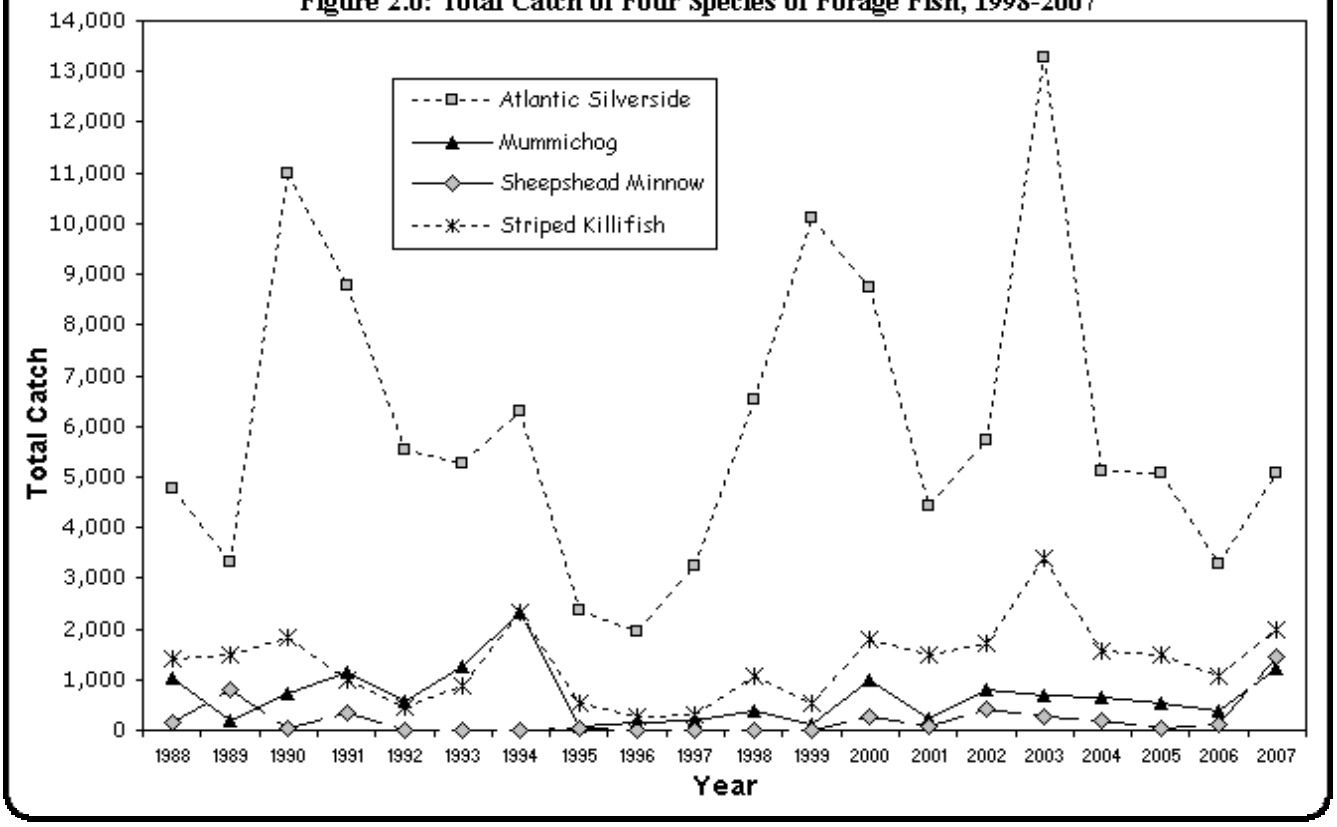


Figure 2.7: Total Catch of Four Recreational Important Finfish, 1988-2007

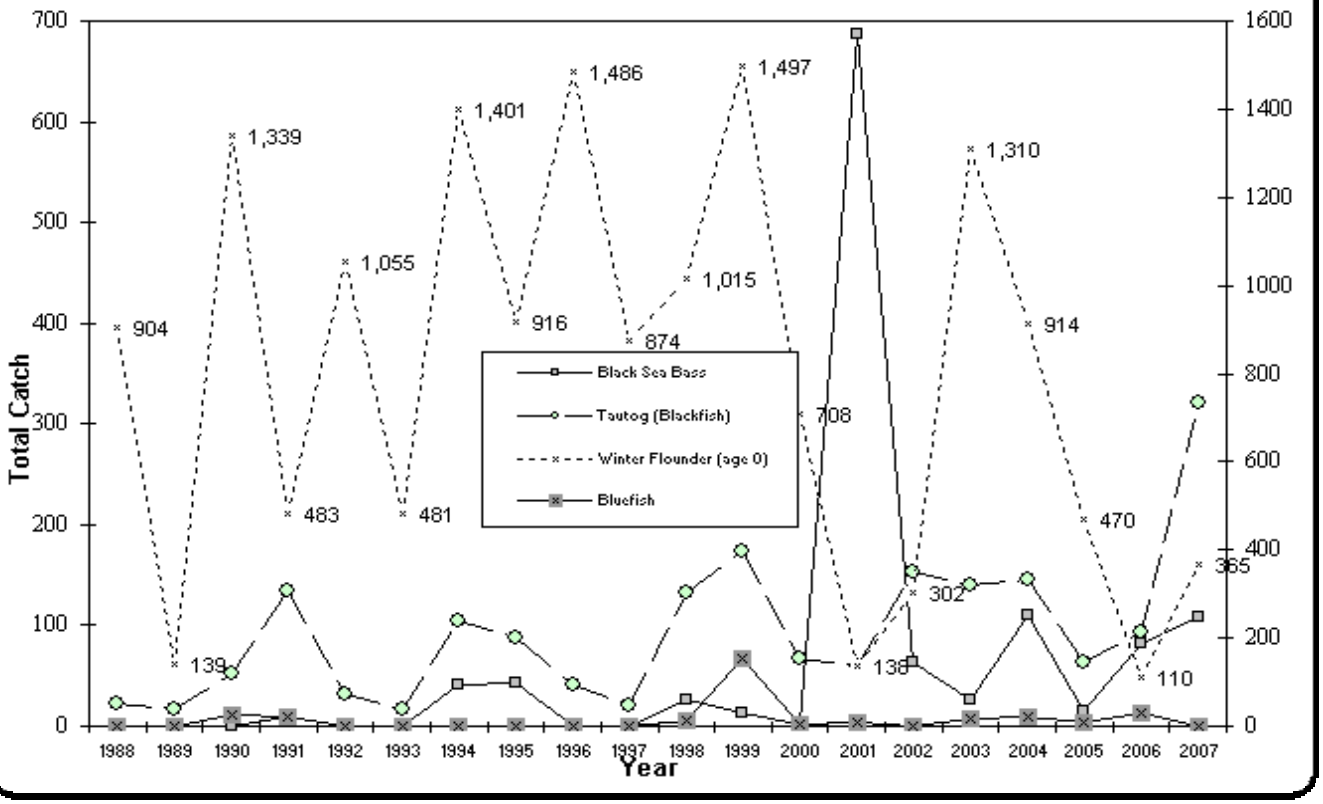


Figure 2.8: Total Catch of Four Recreational Important Finfish, 1988-2007

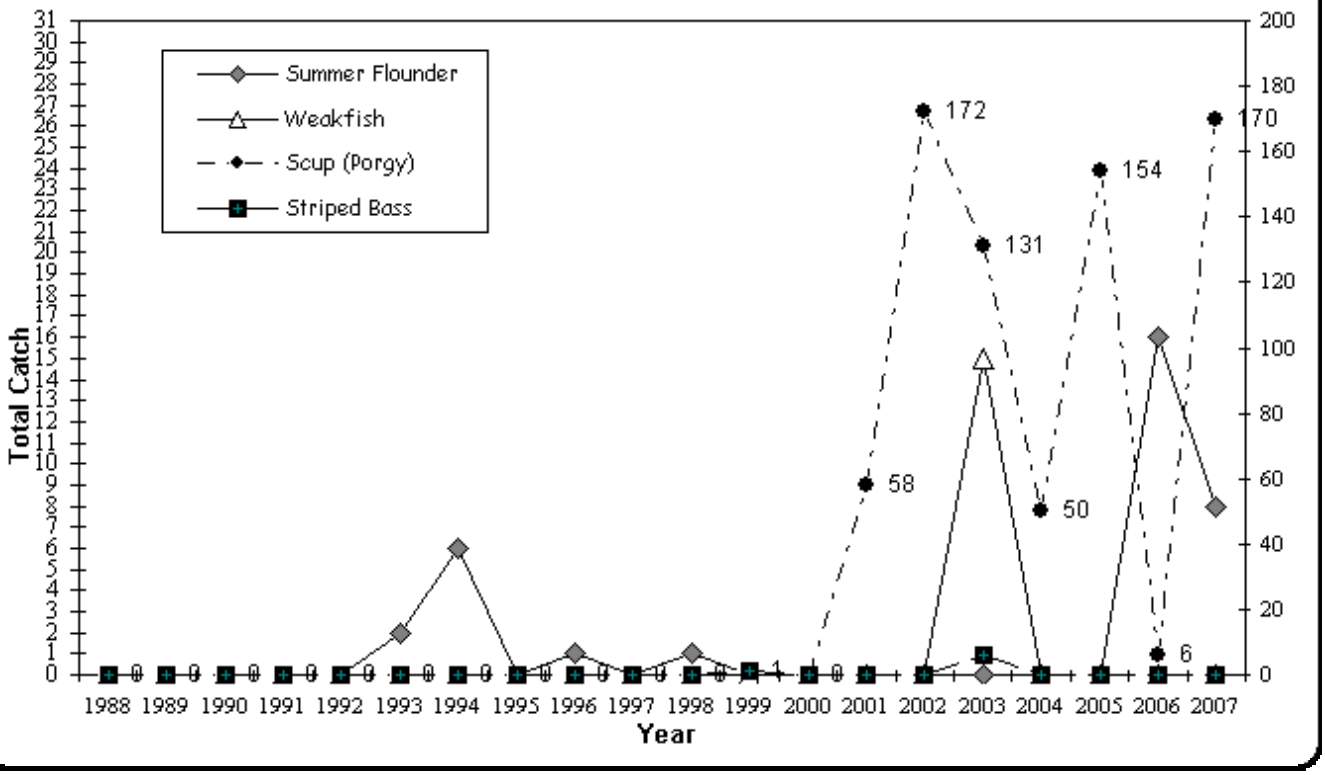
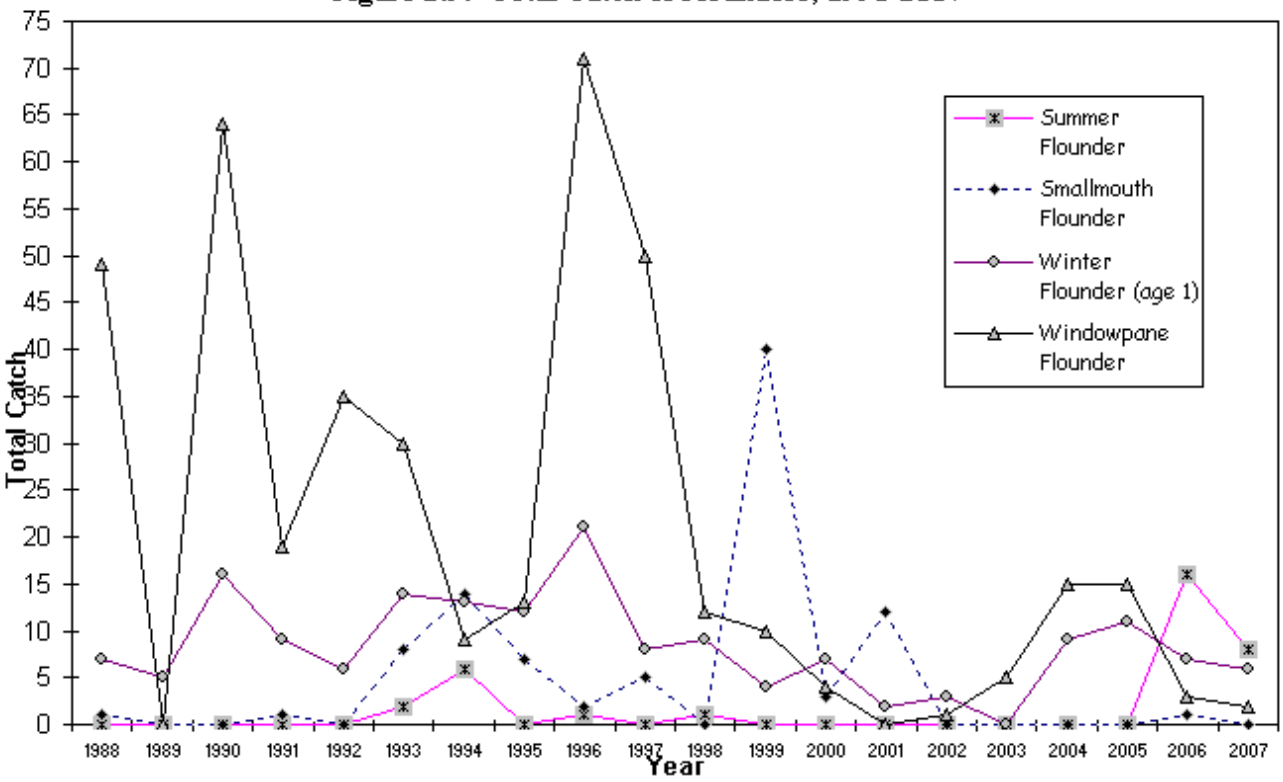


Figure 2.9: Total Catch of Flounders, 1998-2007



Appendix 2.1: Finfish species taken in the Estuarine Seine Survey, 1988-2007.

COMMON NAME	SPECIES CODE	SCIENTIFIC NAME
Alewife	**ALW**	*Alosa pseudoharengus*
American eel	**EEL**	*Anguilla rostrata*
American shad	**ASD**	*Alosa sapidissima*
American sand lance	**ASL**	*Ammodytes americanus*
Atlantic silversides	**ASS**	*Menidia menidia*
Atlantic tomcod	**TOM**	*Microgadus tomcod*
Banded gunnel	**BGN**	*Pholis fasciata*
Bay anchovy	**ACH**	*Anchoa mitchilli*
Black-spot stickleback	**BSS**	*Gasterosteus wheatlandi*
Black sea bass	**BSB**	*Centropristis striata*
Blueback herring	**BBH**	*Alosa aestivalis*
Bluefish	**BLF**	*Pomatomus saltatrix*
Blue spotted coronetfish	**BSC**	*Fistularia tabacaria*
Crevalle jack	**CRJ**	*Caranx hippos*
Cunner	**CUN**	*Tautogolabrus adspersus*
Flying Gurnard	**FGD**	*Dactylopterus volitans*
Four-spine stickleback	**FSS**	*Apeltes quadracus*
Gray snapper	**GRA**	*Lutjanus griseus*
Grubby	**GRB**	*Myoxocephalus aeneus*
Hogchoker	**HOG**	*Trinectes maculatus*
Inshore lizardfish	**LIZ**	*Synodens foetens*
Little skate	**LSK**	*Raja erinacea*
Menhaden	**MEN**	*Brevoortia tyrannus*
Mummichog	**MUM**	*Fundulus heteroclitus*
Naked goby	**NKG**	*Gobiosoma bosci*
Nine-spine stickleback	**NSS**	*Pungitius pungitius*
Northern kingfish	**NKF**	*Menticirrhus saxatilis*
Northern pipefish	**PIP**	*Syngnathus fuscus*
Northern puffer	**PUF**	*Sphaeroides maculatus*
Northern searobin	**NSR**	*Prionotus carolinus*
Northern stargazer	**STR**	*Astroscopus guttatus*
Pumpkinseed	**PUM**	*Lepomis gibbosus*
Rainbow smelt	**RSM**	*Osmerus mordax*
Rainwater killifish	**RWK**	*Lucania parva*
Rock gunnel	**RGN**	*Pholis gunnellus*
Northern seahorse	**SEH**	*Hippocampus erectus*
Northern sennet	**NOS**	*Sphyraena borealis*
Scup	**PGY**	*Stenotomus chrysops*
Sheepshead minnow	**SHM**	*Cyprinodon variegatus*
Smallmouth flounder	**SMF**	*Etropus microstomus*
Smooth dogfish	**SMD**	*Mustelus canis*
Spotted hake	**SPH**	*Urophycis regius*
Striped bass	**STB**	*Morone saxatilis*
Striped burrfish	**SBF**	*Chilomycterus schoepfi*
Striped killifish	**SKF**	*Fundulus majalis*
Striped searobin	**SSR**	*Prionotus evolans*
Summer flounder	**SFL**	*Paralichthys dentatus*
Tautog	**BKF**	*Tautoga onitis*
Three-spine stickleback	**TSS**	*Gasterosteus aculeatus*
Toadfish	**TDF**	*Ospsanus tau*
Weakfish	**WKF**	*Cynoscion regalis*
Web Burrfish	**WBF**	*Chilomycterus antillarum*
White mullet	**WML**	*Mugil curema*
Windowpane flounder	**WPF**	*Scopthalmus aquosus*
Winter flounder (YOY)	**WFO**	*Pseudopleuronectes americanus*
Winter flounder (AGE 1+)	**WFL**	*Pseudopleuronectes americanus*
Yellow jack	**YJK**	*Caranx bartholomaei*

Appendix 2.2: Invertebrate species taken in the Estuarine Seine Survey, 1988-2007.

COMMON NAME	SPECIES CODE	*SCIENTIFIC NAME*
Blue crab	**BCR**	*Callinectes sapidus*
Brown Shrimp	**BNS**	*Panaeus aztecus*
Green crab	**GCR**	*Carcinus maenas*
Hermit crab	**HER**	*Pagurus spp.*
Horseshoe crab	**HSC**	*Limulus polyphemus*
Shortfin Squid	**ILL**	*Illex illecebrosus*
Japanese crab	**JCR**	*Hemigrapsus sanguineus*
Lady crab	**LCR**	*Ovalipes ocellatus*
Mud crab	**BMC**	*Panopeus spp.*
Mole crab	**MLR**	*Emerita talpoida*
Mud snail	**MSN**	*Nassarius obsoletus*
Rock crab	**RCR**	*Cancer irroratus*
Sand shrimp	**CRG**	*Crangon septemspinosa*
Shore shrimp	**PAL**	*Palaemonetes spp.*

JOB 5: COOPERATIVE INTERAGENCY RESOURCE MONITORING

LONG ISLAND SOUND AMBIENT WATER QUALITY MONITORING PROGRAM

Inquiries regarding the DEP's ongoing water quality monitoring efforts in Long Island Sound should be directed to:

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hypoxia area mapping, field operations, survey summaries

Visit the Long Island Sound Water Quality Monitoring Program web page,
with Program information and data at:
http://www.ct.gov/dep/cwp/view.asp?a=2719&q=325534&depNav_GID=1654

JOB 5: COOPERATIVE INTERAGENCY RESOURCE MONITORING

TABLE OF CONTENTS

JOB 5: COOPERATIVE INTERAGENCY RESOURCE MONITORING

LIST OF TABLES

LIST OF FIGURES

JOB 5: COOPERATIVE INTERAGENCY RESOURCE MONITORING

GOAL

To provide long-term monitoring of physical, chemical and biological indicators of environmental conditions in order to evaluate the effects of non-fishing activities on the health and abundance of valued recreational species.

OBJECTIVES

1) Provide monthly monitoring of water quality parameters important in the development of summer hypoxia in Long Island Sound including temperature, salinity, and dissolved oxygen, at eighteen fixed axial and lateral stations throughout Long Island Sound.

2) Provide estimates of the area and duration of summer hypoxia (low oxygen) in Long Island Sound based on sampling at an additional 30 fixed sites semi-monthly between June and September.

INTRODUCTION

Long Island Sound, Living Resources and Hypoxia

Long Island Sound (the Sound) is a semi-enclosed estuary that encompasses 3,370 km^2 (337,000 ha) including embayments (Wolfe et al., 1991) and receives runoff from a 41,400 km^2 drainage basin that includes Long Island, New York and much of New England to the Canadian border. More than 7 million people live within the state of Connecticut and New York counties bordering the Sound (LISS 1990). The Sound has typically acted as the receiving body of domestic, agricultural and industrial waste generated within the region.

Excessive nutrient inputs (most notably nitrogen) from atmospheric deposition, runoff and sewage discharges as well as natural sources results in a high rate of primary (phytoplankton) production within the Sound. Summer warming of surface water results in a temperature and density stratification within the water column, known as the pycnocline. As phytoplankton blooms die off and decompose, oxygen in bottom waters is used up, often resulting in hypoxia (low dissolved oxygen, DO <= 3.5 mg/l) and in some cases, anoxia (DO <0.2 mg/l). These periodic hypoxic events generally develop by early July and may persist until late September.

Simpson *et al*, (1995) identified low oxygen tolerance thresholds for 16 individual species of finfish and lobster, and six aggregate species indices. For the most sensitive species (scup, striped sea robin) dissolved oxygen becomes limiting at over 4.0 mg/l, whereas more highly tolerant species (Atlantic herring and butterfish) did not decline in abundance until oxygen levels were below 2.0 mg/l. Both demersal species biomass and demersal species richness begin to decline when dissolved oxygen levels fall below about 3.5 mg/l. No finfish or macroinvertebrates were observed when dissolved oxygen fell below 1.0 mg/l.

An index of habitat impairment (Biomass Area-Day Depletion, BADD) was developed based on the percent reduction in demersal finfish biomass associated with each 1 mg/l interval below 3.5

mg/l. In addition to BADD, inter-annual trends in the severity of hypoxia are monitored using duration (weeks where DO<3.5 mg/l) and maximum areal extent of waters with severe hypoxia (DO<1.0 mg/l). Together, these three indices are used to relate dissolved oxygen trends to conditions for living resources in the Sound.

Water Quality Monitoring Program

In January 1991, Connecticut DEP initiated a water quality and hydrographic survey to provide continuity to a time series begun in 1988 under the National Estuaries Program's, Long Island Sound Study. This survey continues in an expanded form with EPA (and Federal Aid to Sportfish Restoration) support as the Department's "Long Island Sound Ambient Water Quality Monitoring Program."

In the first three years of this study (1991-1993), sampling was conducted cooperatively between Marine Fisheries and Water Management staff to evaluate dissolved oxygen (DO) conditions and coincident fish abundance. With the completion of fishery resource sampling in 1993, emphasis shifted to intensive water quality monitoring under the Bureau of Water Management. In 1994, forty-eight permanent stations were established to monitor summer hypoxia; eighteen of these stations are sampled on a monthly basis year-round. Marine Fisheries staff continue to provide research vessel support and rely on this program to evaluate the effects of hypoxia on living resources through the three indices identified above. In addition, monthly patterns in temperature and salinity have proven useful in understanding both seasonal and inter-annual trends and in making inferences concerning fishery resources.

METHODS

Sampling Design

In 1994, 48 fixed stations were established to monitor hypoxia. Beginning in December 1994, eighteen of these stations were also sampled as part of the monthly water quality monitoring program, an expansion from the previous seven axial station coverage. In 1998 a 49th station (J4) was added in the eastern Sound. Monthly stations were distributed to provide axial coverage over the length of the Sound, including a reference station outside the Sound, southeast of Fishers Island. Transverse stations were located off New Haven, Bridgeport and Norwalk. Summer hypoxia monitoring stations are concentrated in the hypoxia prone western half of the Sound, although Connecticut shoreline coverage extends east of the Connecticut River. The eighteen monthly stations are sampled year round, generally during the first week of the month. Beginning in the end of June, hypoxia monitoring commences and twice monthly hypoxia sampling continues through September. During the summer of 2002 Connecticut DEP modified the summer hypoxia sampling by decreasing the number of stations sampled from 49 down to between 20 and 25. These changes were made to make better use of the resources available and to better reflect the understanding from eleven years of monitoring. The mid month Hypoxia surveys will be limited to the narrows, western and central basins with a focus on stations that historically have been affected by hypoxic conditions. The number of stations sampled on these surveys will be adjusted according to the severity of the hypoxic event. During years of unusually severe hypoxia additional stations will be monitored to ensure an accurate assessment of the area affected by low dissolved oxygen.

Sampling Procedures

Water sampling is conducted from the 50 ft Research Vessel John Dempsey. Conductivity-temperature-depth (CTD) water column profiles are taken with a Sea-Bird model SBE-19 SeaCat Profiler, equipped with dissolved oxygen (YSI model 5739), photosynthetically-active radiation (PAR) (Licor spherical underwater model 193SA) and Fluorometer (WET labs WETstar Miniature Fluorometer) sensors. Data are recorded at a rate of twice per second and the instrument is lowered through the water column at a rate of 0.2 m per second. Dissolved oxygen is also measured by Winkler titration as a quality assurance procedure. Nutrients, and chlorophyll a are also measured. See Kaputa and Olsen (2000) for a complete description of the Long Island Sound Water Quality Monitoring Program. Beginning in 2002 CTDEP expanded its monthly monitoring by adding phytopigment analysis (HPLC method) in April of 2002 and Zooplankton analysis in August of 2002. MesoZooplankton samples are collected using a 200-micron mesh, 0.5 meter double ring plankton net and MicroZooplankton samples are collected from a multiple depth composite of whole water samples. These changes will be continued through the fall of 2008.

Area and Duration Estimates

In the initial years of this project (1991-1993) the area affected by hypoxia was estimated using a stratified-random sampling approach where stations were selected at random within five east-west zones, further subdivided by depth at the 18 m contours (Gottschall and Simpson, 1999). In 1994 a fixed station sampling program was adopted. To calculate the area of hypoxia from this fixed station design the monitoring staff developed a GIS based method using ArcView, this approach is more appropriate for the programs design.

To calculate the area affected by hypoxia, the minimum dissolved oxygen and the location of each station sampled during each survey is entered into a Geographic Information System (currently ArcMap 9.1) database and plotted. The Spatial Analyst extension is used to interpolate DO values between stations using the inverse distance weighted (IDW) method, producing a cell grid of minimum DO values for the Sound. The area within each interval (0-0.99, 1.0-1.99, 2.0-2.99, 3.0-3.5, 3.51-4.8) is estimated by multiplying the number of cells within each DO interval by the area within each cell (approximately 0.1 square km). Area estimates include LIS waters shoreward to the 4.0 m contour, except at the eastern (The Race, Fishers Island, Thames River) and western (Throgs Neck Bridge) boundaries, encompassing a total of 2,723 square km.

The duration of each annual hypoxia event in LIS was estimated using the time series of bottom water dissolved oxygen concentrations at each station. Start and end dates were approximated for each station graphically by determining the intersection of the time series line with the 3.5 mg/l grid line. The earliest start date and latest end date – regardless of station – provided the preliminary start and end date estimates for the year. Data available from the Long Island Sound Trawl Survey (Job 2), other programs and agencies, as well as daily wind and precipitation records were then considered. Such supplementary data improved the date estimates by filling in gaps between sampling events and accounting for substantial wind or storm events that would likely have provided the energy necessary to mix the water column.

Indices of Habitat Impairment Associated with Hypoxia

An index of habitat impairment (Biomass Area-Day Depletion, BADD) was developed based on the percent reduction in demersal finfish biomass associated with each 1 mg/l interval below 3.5 mg/l. Based on Simpson *et al* (1996), demersal finfish biomass is reduced 100% (total avoidance) in waters with DO<1.0 mg/l. From 1.0-1.9 mg/l biomass is reduced 82%, while a 41% reduction occurs at 2.0-2.9 mg/l, and a 04% reduction occurs at 3.0-3.5 mg/l dissolved oxygen. These rates are applied to the area-days within each DO interval calculated during each survey and summed over the hypoxia season defined here as July 1 – September 10 (72 d). The index is then expressed as a percentage of the available area-days (sample area 2,723 km^2 x 72 d, or 196,056 area-days). In addition to BADD, inter-annual trends in the severity of hypoxia are monitored using duration (weeks where DO<3.5 mg/l) and maximum areal extent of waters with severe hypoxia (DO<1.0 mg/l).

RESULTS AND DISCUSSION

Hypoxic Area and Duration

The hypoxic area and duration during the summer of 2007 in Long Island Sound was merely average, due in large part to a late onset of hypoxia. Hypoxia was estimated to begin on or about July 12, 2007 and ended on or about September 21, 2007 for a total of 72 days (Figures 5.1, 5.2). There were no areas affected by dissolved oxygen levels below 1 mg/L (Figure 5.2). Overall the hypoxic event was average for both area and duration. Our July 30-August 1 (WQAUG07) survey had the maximum area (917 sq. kilometers) affected by hypoxia (Table 5.1, Figure 5.2).

Habitat Impairment Associated with Hypoxia

Area-days by DO interval were calculated for each survey (Table 5.2) to produce the biomass-area-day-depletion (BADD) index used to quantify habitat impairment (Table 5.3). The greatest impairment was associated with the 2-2.99 mg/l DO interval due to the wider area of exposure estimated for this interval throughout the summer.

The BADD index was calculated for the 72-day period between July 12 and September 21. The BADD index for 2007 was 5,198 or 2.7% of the total area-days in the LIS sampling area covered by the Ambient Water Quality Monitoring Program (Figure 5.2).

Monthly Salinity and Temperature Trends

Monthly mean surface and bottom water temperature and salinity were calculated from six axial water quality stations (B3, D3, F3, H6, I2 and M3) for the period between 1991 and 2007. Plots of each year against the time series mean illustrate the inter-annual variability in both salinity (Figure 5.3) and temperature (Figure 5.4). In some cases, deviations from the 1991-2004 mean can be associated with fish population events. For example, strong winter flounder recruitment indices observed in 1994 and 1996 (Job 2) are consistent with colder than average late winter water temperatures that are believed to enhance survival of flounder larvae.

Missing stations can affect monthly means. Therefore the plotted values should be regarded as a qualitative summary of salinity and temperature trends.

MODIFICATIONS

None.

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Table 5.1. Area (km^2) by survey and 1.0 mg/l dissolved oxygen interval during 2007. Actual start and end dates are listed along with number of stations sampled for each survey.

				Area (km^2)					
Survey	Start Date	End Date	Stations sampled	0.0 - 0.99	1.0 - 1.99	2.0 - 2.99	3.0 - 3.5	3.5-4.8	4.8 +
HYJUN07	6/21/2007	6/21/2007	21	0	0	0	0	0	2,723
WQJUL07	7/9/2007	7/11/2007	38	0	0	0	0	537.1	2191.3
HYJUL07	7/19/2007	7/24/2007	38	0	0	129.9	152.4	541.6	1751.9
WQAUG07	7/30/2007	8/1/2007	41	0	79.1	339.8	498.3	563.2	1250
HYAUG07	8/13/2007	8/15/2007	42	0	18.7	236.6	531.8	641.4	1144.7
WQSEP07	8/28/2007	8/30/2007	42	0	0	41.6	26.3	818.1	1843.1

Table 5.2. Area-days exposure by survey and dissolved oxygen interval during 2007. Dates are interpolated values between surveys, yielding the days used in area-day calculation.

Cruise	Dates	Days		0.0 - 0.99	1.0 - 1.99	2.0 - 2.99	3.0 - 3.5	3.5 - 4.8	4.8+
HYJUN07	6/21-6/30	10		0	0	0	0	0	27230
WQJUL07	6/30-7/15	15		0	0	0	0	8057	32870
HYJUL07	7/15-7/28	13		0	0	1689	1981	7041	22775
WQAUG07	7/28-8/7	10		0	791	3398	4983	5632	12500
HYAUG07	8/7-8/21	15		0	281	3549	7977	9621	17171
WQSEP07	8/21-8/30	10		0	0	416	263	8181	18431

Table 5.3. Biomass-Area-Day-Depletion (BADD) values by survey and dissolved oxygen interval during 2007. BADD values are calculated as area-days x percent impairment (shown in parentheses) associated with each dissolved oxygen interval. Impairment based on demersal finfish biomass response. One-half of area-days calculated in the 3-3.99 mg/l interval were used as DO's above 3.5 mg/l are not limiting.

				100%	82%	41%	4%	0%	0%
Cruise	Dates	Days		0.0 - 0.99	1.0 - 1.99	2.0 - 2.99	3.0 -3.5	3.5 - 4.8	4.8+
HYJUN07	6/21-6/30	10		0	0	0	0	0	0
WQJUL07	6/30-7/15	15		0	0	0	0	0	0
HYJUL07	7/15-7/28	13		0	0	692	79	0	0
WQAUG07	7/28-8/7	10		0	649	1393	199	0	0
HYAUG07	8/7-8/21	15		0	230	1455	319	0	0
WQSEP07	8/21-8/30	10		0	0	171	11	0	0
			Sum	0	879	3711	608	0	0

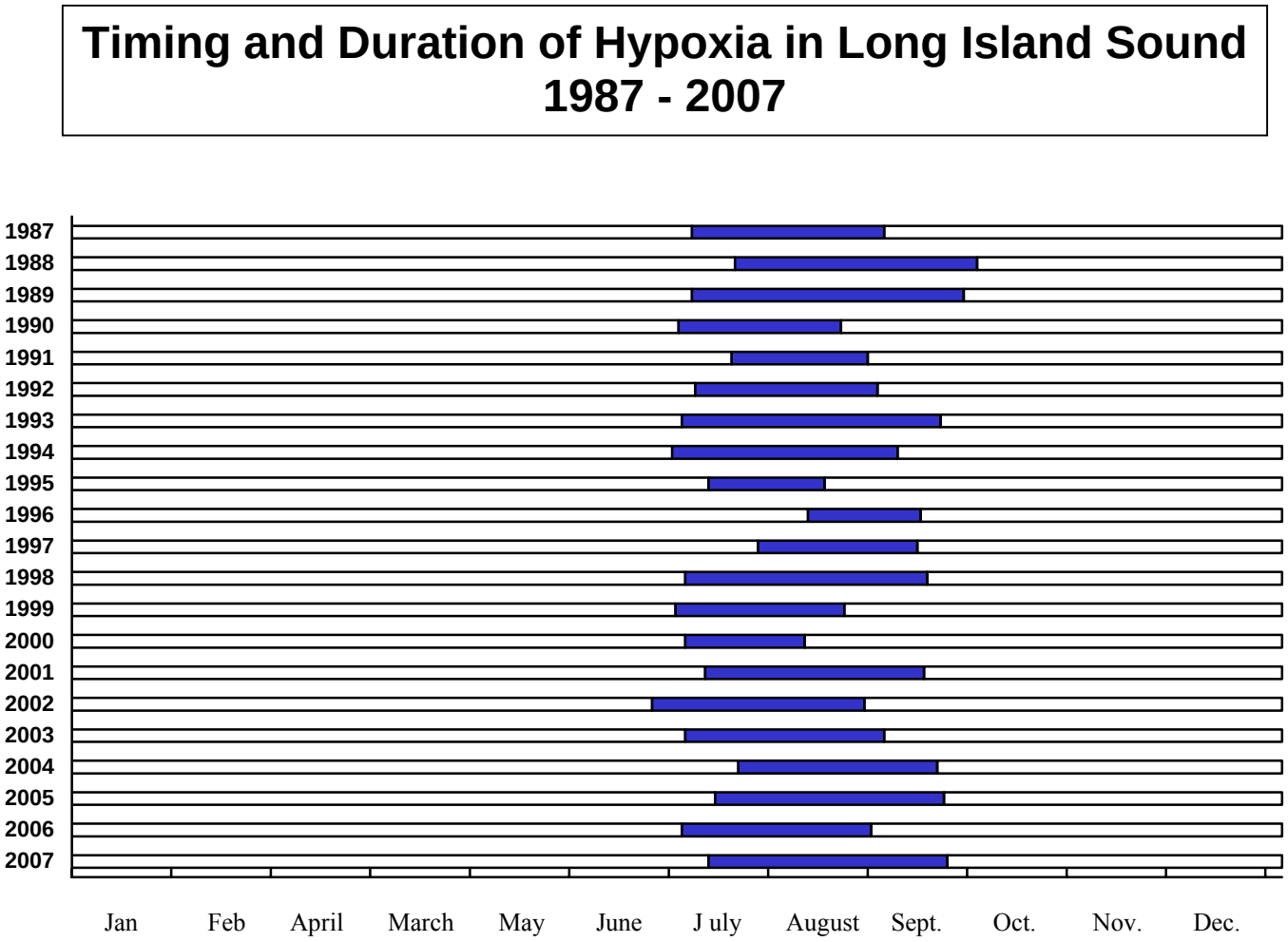

Figure 5.1. Timing and duration of hypoxia in Long Island Sound from 1987 through 2007. In 2007 hypoxia developed on about July 12 and persisted 72 days, ending on or about September 21, 2007.

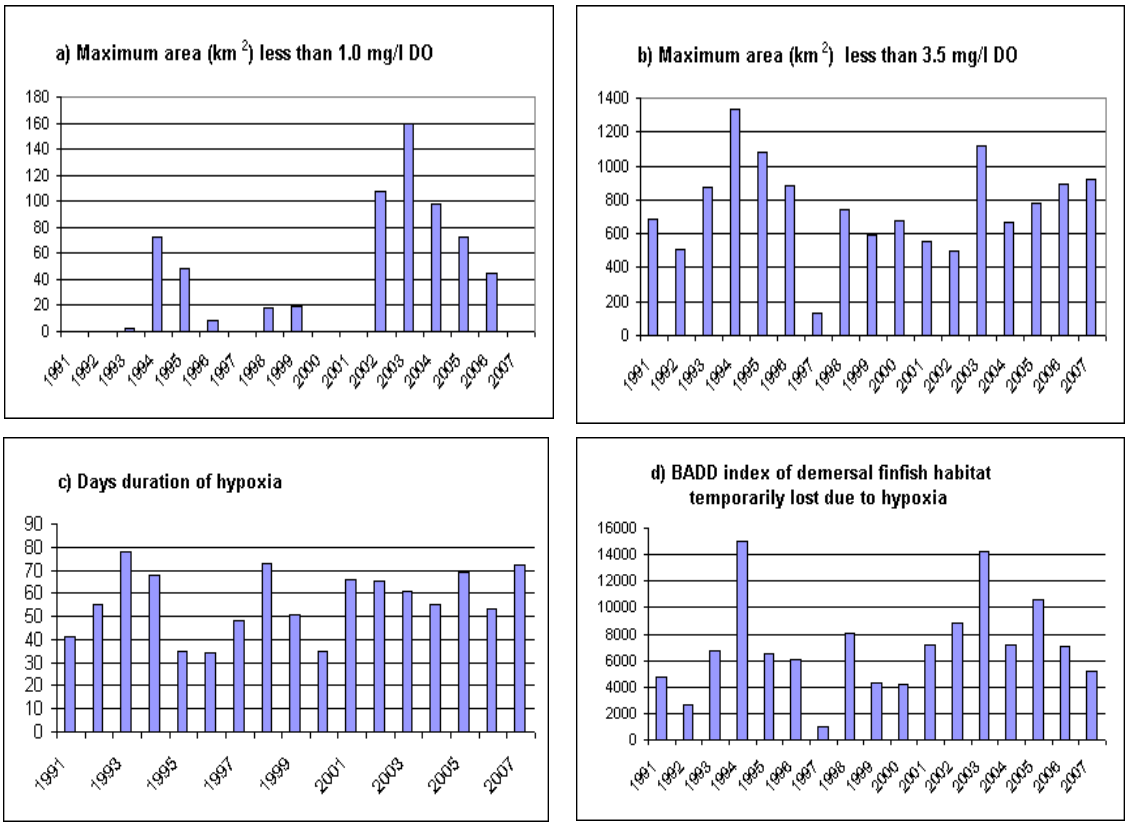

Figure 5.2. a) Maximum area (km^2) less than 1.0 mg/l DO, b) maximum area (km^2) less than 3.5 mg/l DO, c) duration (days) of hypoxia (DO<3.5 mg/l), d) biomass area-day depletion (BADD) index of temporary habitat loss to demersal finfish associated with hypoxia conditions each year.

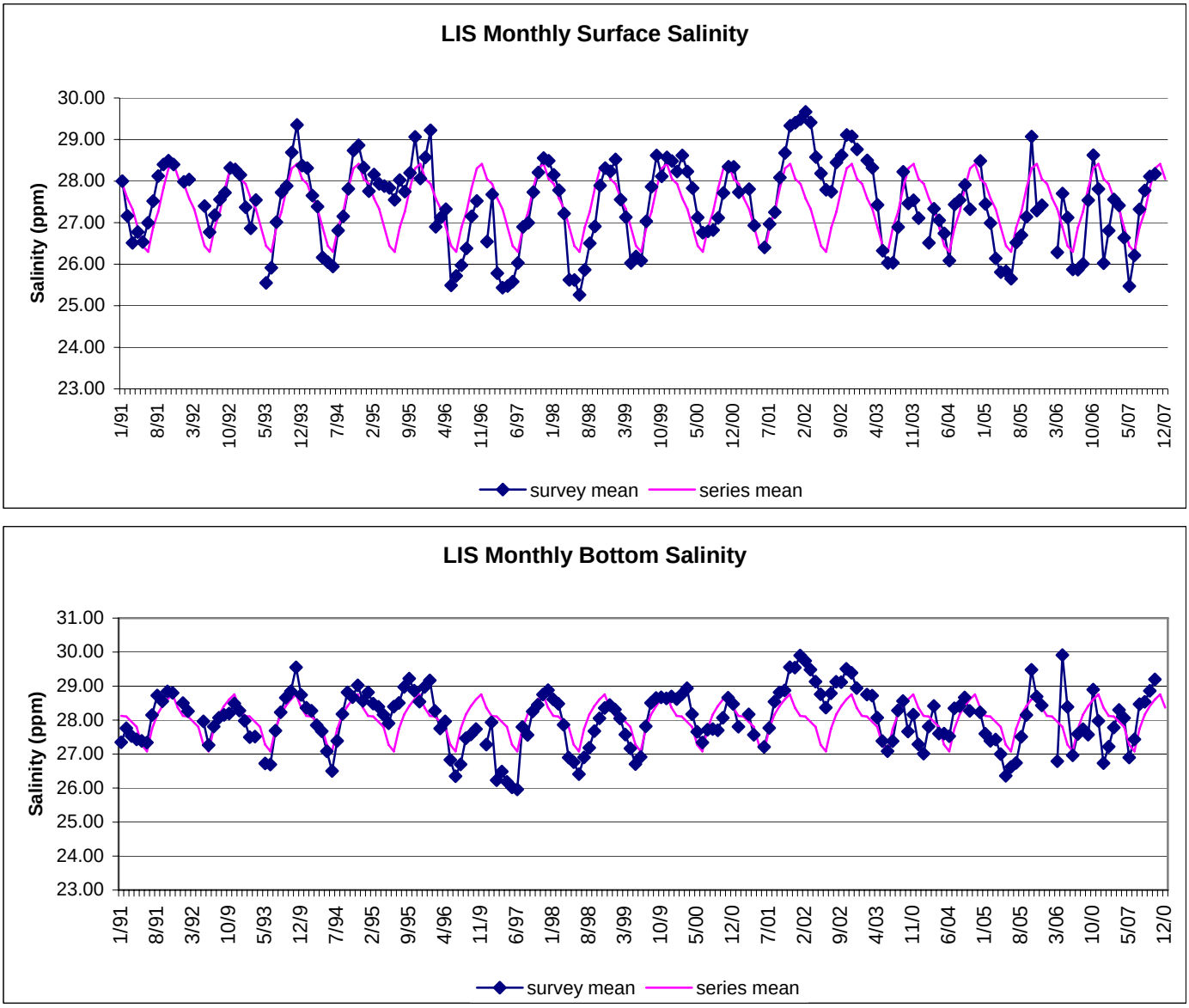

Figure 5.3. Surface and bottom salinity calculated from six axial water quality stations (B3, D3, F3, H6, I2 and M3) for the period between 1991 and 2007. Monthly (survey) means are plotted against the 1991-2007 time series mean.

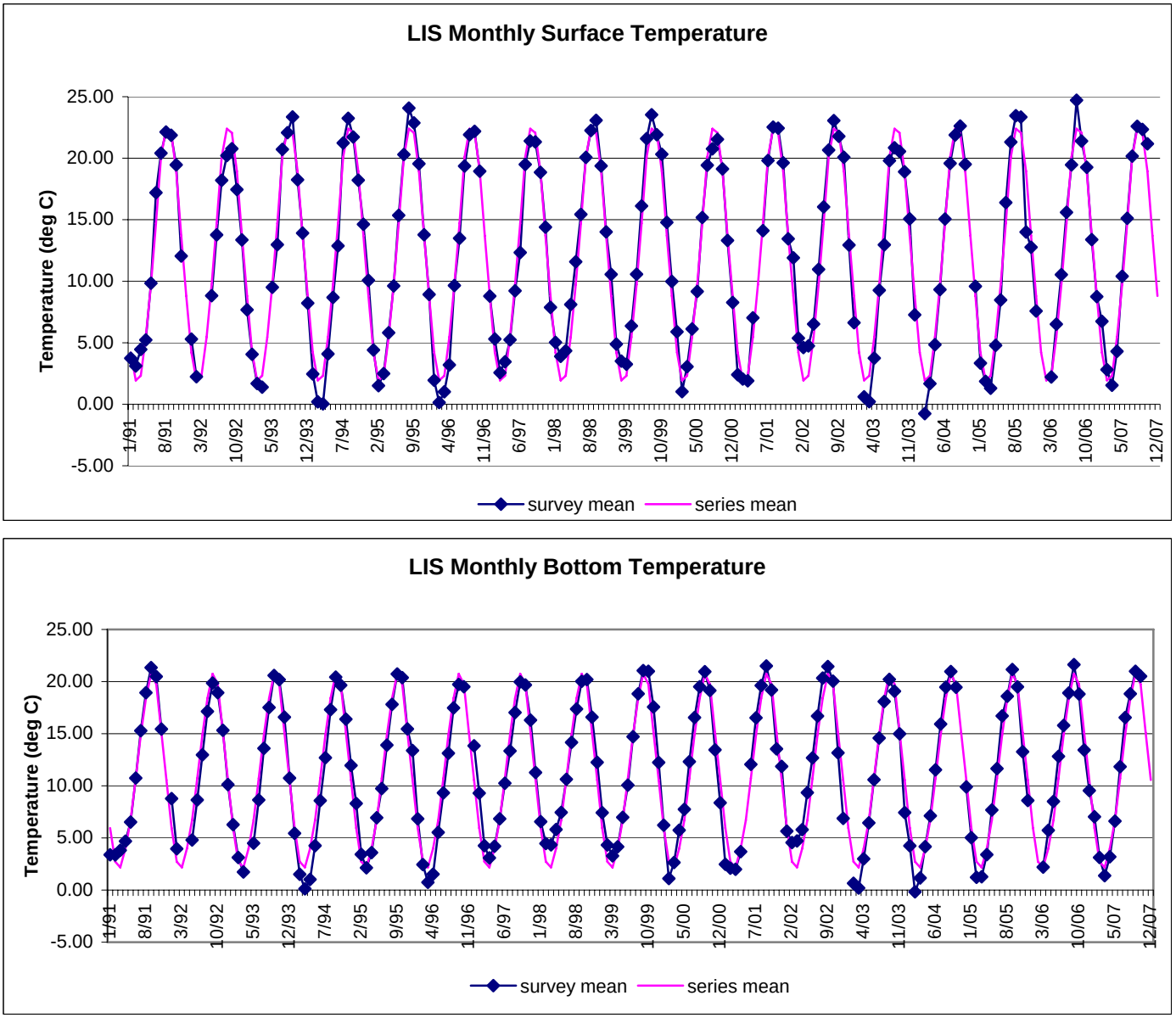

Figure 5.4. Surface and bottom temperature calculated from six axial water quality stations (B3, D3, F3, H6, I2 and M3) for the period between 1991 and 2007. Monthly (survey) means are plotted against the 1991-2007 time series mean.

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JOB 6: PUBLIC OUTREACH

JOB 6: PUBLIC OUTREACH

TABLE OF CONTENTS

LIST OF TABLES

JOB 6: PUBLIC OUTREACH

GOAL

To increase awareness among anglers and the general public of the information products provided by this project and how this information contributes to state and federal efforts to enhance, restore and protect marine habitat and recreational fish populations.

OBJECTIVES

1) Increase public awareness that research & monitoring are essential to good fisheries management and the majority of marine fisheries research & monitoring activities in Connecticut are funded through excise tax on fishing tackle and motorboat fuels

SUMMARY

1. A total of 21,697 outdoor and environmental writers, marine anglers and boaters, marina operators, fishing tackle retailers, Fisheries Advisory Council (FAC) members, and members of the general public attended outreach events. The importance of research and monitoring to good fisheries management was incorporated into the programs (Table 6.2).

2. These same audiences also learned that good water quality and proper pollution prevention (non-fishing impacts) are essential to good fisheries habitat management.

3. Total attendance at 16 speaking engagements with sportsmen clubs and other recreational environmental clubs was 862 (Table 6.2). The audience was encouraged to become actively involved in the fishery management process by attending public hearings and FAC meetings. Notices of public hearings were sent to hundreds of tackle shops and various media outlets including the DEP website (www.ct.gov/dep/fishing).

4. The message that the majority of marine finfish research and monitoring are funded through excise taxes on fishing and motorboat fuels was emphasized at major department outreach events (Table 6.2).

INTRODUCTION

Public outreach was formally incorporated into this project in 1997 (segment 17). An outreach plan was developed by project staff working closely with US Fish and Wildlife Service personnel. Six target audiences were identified in priority order (Table 6.1) in the outreach plan. This report summarizes F54R outreach activities conducted from March 2007 to February 2008 (segment 26).

Table 6.1:
Priority Audiences for Outreach Activities

1. Outdoor/environmental writers
2. Marine anglers
3. Marine boaters and marina operators
4. Fishing tackle retailers
5. Fisheries Advisory Council (to CT DEP)
6. General public

RESULTS AND DISCUSSION

Outdoor and Environmental Writers

DEP press releases, project summaries and full annual reports were mailed out to several outdoor writers, members of the CT Outdoor Recreation Coalition (CORC) and Fisheries Advisory Council (FAC). Project staff were also interviewed concerning F54R activities in person, at public and regulatory hearings, and over the telephone by writers and reporters for the news media.

Marine Anglers and Marine Boaters

Project personnel organized and assisted in DEP, Marine and Inland Fisheries Division displays at two statewide fishing/hunting and boating shows. The shows were sponsored by CMTA, Dodge Trucks, Channel 3, Channel 30 and Connecticut Outdoor Recreation Coalition and were held in January and February 2008 at the Connecticut Convention Center. These shows attracted 20,835 anglers, non-anglers, boaters, tackle retailers, legislators and general outdoor recreation enthusiasts. The theme for this show was "No Child Left Inside", Trophy Fish Close to Home" and "Marine Fisheries Angler Surveys". F54R activities were highlighted at these shows in displays entitled "Trophy Fish Award Program" and "Marine Angler Surveys, (a marine fisheries cooperative management program)". Audiences learned the importance of research and monitoring which are funded through excise taxes on fishing tackle and motorboat fuels. Colorful posters and pictures, brief project specific text and taxidermy reproductions helped draw attention to marine species monitored under F54R programs and solicit questions and discussion of those programs.

Several outreach displays were developed by project staff and mounted in the lobby and hallways at the Marine Fisheries Headquarters in Ferry Point State Park. These displays highlighted unique characteristics of Long Island Sound, public access, species identification, the trophy fish award program, marine angler surveys and gave a brief description of current F54R programs designed to protect the Sound's resources. These fisheries displays can easily be viewed by anglers, boaters and their families at this popular fishing and picnic area.

Fishing Tackle Retailers

Fishing tackle retailers provide an important avenue for communication between the department and anglers. A complete list of fishing tackle retailers is maintained and updated yearly. Timely DEP press releases, species fact sheets, Connecticut angler guides and Marine Fisheries Brochure are mailed to tackle retailers to keep them informed. Correspondence between the marine fisheries office staff and retailers are ongoing.

Fisheries Advisory Council

The Fisheries Advisory Council, which represents a cross section of Connecticut residents with interests in fisheries issues, met quarterly to discuss statewide fisheries issues. After each meeting most Council members report Council discussions back to the fishing and environmental groups they represent. Council members also discussed monitoring and funding issues at meetings with state legislators. Many Council members visited Marine Fisheries displays at the Northeast Fishing and Hunting Expo, CMTA Boating and Fishing Show and other activities the Fisheries Division held during 2007. 'A Study of Marine Recreational Fisheries in Connecticut' was mailed to Fishery Advisory Council members to keep them informed.

General Public

Marine Headquarters is open daily Mon-Fri. attracting thousands to the public outreach displays at the office. Display topics included all F54R projects. Activities funded under other Federal Aid in Sport Fish Restoration projects were also highlighted; including Connecticut Pumpout Stations and Waste Reception Facilities (V-4), Motorboat Access Renovation and Development (F60D), Motorboat Access Area Operation and Maintenance (F70D), and Habitat Conservation and Enhancement (F61T).

Sport Fish Restoration projects were also highlighted at public schools and universities through out the year. Presentations titled "Marine Fisheries Management / Sportfish Restoration and Marine Resource Management" were provided to students. These outreach events highlighted the importance of coastal resources and all facets of marine resource protection. Approximately 684 students attended Marine Fisheries Division presentations.

Finally, project staff lead numerous workshops and speaking engagements throughout the state, as well as informational tours and talks at the Marine Fisheries Office (Table 6.2). These talks and tours reached all target audiences, especially the business community, teachers and students. Audiences learned how to become active participants in the management process, through public hearings and FAC Meetings.

MODIFICATIONS

None.

Table 6.2: Summary of talks, tours, career days and workshops given by project staff highlighting F54R activities, March 2007 – February 2008 (segment 27).

DATE:	PRESENTATION TYPE:	ORGANIZATION	TITLE / TOPIC:	Target Audience	TOTAL
3/10/2007	Fishing Club Talk	Westport Outfitters	Marine Fisheries Mgmt./ Angler Surveys	anglers	43
4/25/2007	Career Day / Mentoring	Fermi High School	Marine Fisheries Biologist	students	5
5/15/2007	Talk	East Lyme Middle School	Diversity in Estuaries	students	29
5/15/2007	Talk	Avalonia Land Trust	Horseshoe Crab Spawning Survey	adults	50
6/27/2007	Marine Presentation	CCSU Marine Biology	Marine Fisheries Biology	students	35
7/27/2007	Office Tour / Mentoring	New Haven/BPT Sound School Groton Maratime Academy	Marine Fisheries Management/Career	students	90
10/3/2007	Talk	Southern CT State Univ.	Lobster Management	students	16
10/21/2007	Talk	CARE Instructors Training	Marine Fisheries Programs	educators	51
10/25/2007	Office Tour / Mentoring	Deep River Elementary School	Marine Fisheries	students	41
10/26/2007	Office Tour / Mentoring	Deep River Elementary School	Marine Fisheries	students	59
11/8/2007	Talk	GHS Environmental Club	Envirothon Training	students	36
12/3/2007	Talk	Yale Coastal Ecology	LIS Ecology	students	18
1/25/2008	Workshop	New Haven Aqauculture School	Keeping the Sound Healthy	students	60
1/24-27/2008	Outreach Display	CMTA Boating Show	No Child Left Inside	general public	11,308
2/6/2008	Career Day / Mentoring	Glastonbury Smith Middle School	Marine Fisheries Careers	students	141
2/8/2008	Workshop	New Haven Aqauculture School	Keeping the Sound Healthy	students	60
2/15-17/2008	Outreach Display	Northeast Fish and Hunting Expo	No Child Left Inside	general public	9,527
2/20/2008	Career Day / Mentoring	Glastonbury High School	Marine Fisheries Careers	students	128

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