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-26 Annual Performance Report
March 1, 2006 – February 28, 2007

Cover Photo
This year's cover features our Federal Aid Coordinator, Tony Petrillo, holding an oyster toadfish (*Opsanus tau*) collected during the fall 2006 Long Island Sound Trawl Survey.

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, 2006 - February 28, 2007

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 David G. Simpson
Job 6: Public Outreach	David R. Molnar

***Approved by*:** Eric M. Smith. Date: August 31, 2007
Director, Marine Fisheries Division

Edward C. Parker, Date: August 31, 2007
Chief, Bureau of Natural Resources

EXECUTIVE SUMMARY

Project: A Study of Marine Recreational Fisheries in Connecticut
Federal Aid Project: F54R-26 (Federal Aid in Sport Fish Restoration)
Annual Progress Report: March 1, 2006 – February 28, 2007
Total Project Expenditures (2006/07): $652,831 ($489,623 Federal, $163,208 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.

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 380,155 anglers made 1.5 million trips in 2006. This is the fifth highest estimated number of anglers since the survey began in 1981. Total estimated trips made in 2006 were above the 1.4 million trip average (1981-2006).

- Marine anglers caught an estimated 6.2 million fish, harvesting 1.5 million in 2006.

- 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 2006 was only 7,714 fish. The long-term average winter flounder harvest was 345,744 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 68 anglers participated in the survey and made 1,400 fishing trips in 2006. Volunteers including additional anglers involved in a fishing party made a total of 3,472 fishing trips. With multiple species taken per trip anglers reported 1,473 trips targeting bluefish, 2,304 trips for striped bass, 752 trips for summer flounder, 112 trips for winter flounder, 174 trips for scup and 324 trips for tautog.

- Volunteer anglers measured 2,253 individual bluefish measuring > 12 inches in length, 3,108 striped bass, 1,590 summer flounder, 108 winter flounder, 1,043 scup and 560 tautog. Over 60% of measured fish were released, providing 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 length frequency distributions of bluefish, scup, striped bass, summer flounder, weakfish, winter flounder, tautog and other ecologically important species that can be converted to ages using modal analysis, age-length keys or other techniques.

KEY FINDINGS:

- A total of 100,592 finfish, lobster and squid weighing 11,024 kg were collected in 2006.

- Forty-nine finfish species and thirty-eight invertebrate species (or taxa) were collected from 120 tows conducted in 2006. The total fish species count of 49 is the lowest observed in 23 years, the average (1984-2005) is 58 species per year. The Long Island Sound Trawl Survey has collected ninety-six finfish species since the survey began in 1984. No new finfish species were observed in 2006

- Atlantic sturgeon and long-finned squid were the only two species at record high abundances (geometric mean count per tow) in 2006. Hickory shad abundance remained near the record high level seen in 2005. Abundance of spiny dogfish was the highest since 1990.

- Adult scup abundance remains high relative to 1984-1998 levels but has dropped back down to the time series average level after a phenomenal peak in abundance in 2003. Similarly, summer flounder abundance has declined from the high levels recorded between 2001 and 2003 to more average levels as observed from 1996 to 2000.

- Adult bluefish abundance has dropped this past fall from the second highest levels in 2004, to those similar of the mid and late nineties. Young of year weakfish abundance dropped dramatically in 2006 after higher than normal catches from 1999 to 2005. Age 1+ weakfish abundance remains average. Striped bass abundance has been above average for the past 12 years.

- The spring survey index for tautog has remained low and below the time-series average for the past 14 years except for a short-lived increase in abundance recorded in 2002. The past eight years of winter flounder springtime abundance indices have been the lowest on record, with 2006 being a new record low for the time series.

- American lobster spring abundance dropped to a record low again in 2006. The spring index has been declining for seven years now (since 1999) and the past three years have been the lowest since 1988. Fall lobster abundance has also declined for seven years to a record low for the second year (similar to the spring index). Four of the past five years have been the lowest fall indices on record.

- Several other species were at or near record low abundance (by numbers) for both spring and fall surveys in 2006. Springtime indices of abundance have been at or near record lows for a couple years for black sea bass (2 years), cunner (3 years), fourspot flounder (2 years), red hake (4 years), and little skate (2 years). Windowpane flounder indices have been at or near record lows for the past seven years. Atlantic herring indices have been below average for the past nine years. Fall indices for butterfish have been hovered at or below average levels for the past seven years, while fall abundance has been below average for blueback herring for the past 9 years. Abundance of striped sea robin dropped significantly in 2006 to the second lowest value in the time series and the lowest since 1995.

CONCLUSIONS:

- The abundance of recreationally important species in Long Island Sound remains moderate to high including scup, striped bass, and summer flounder. 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 provides an additional recreational fishing opportunity, especially to 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.

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 2006 winter flounder young of the year index (0.9 fish/haul) was the lowest ranking out of 19 annual indices.

- The forage species abundance index was 59 in 2006, the sixth lowest of the time series, and well below the time series average of 93 forage fish/haul. (Atlantic silversides dominate this index).

CONCLUSIONS:

- A significant decline of the winter flounder young of year index for 2006 following fairly low indices since 2000 and the absence of a strong year class since 1996 is not expected to change the bleak 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 2006 on or about July 4 and persisted for 57 days ending about August 29, 2006 – an earlier onset and twelve day shorter duration than in 2005.

- Severe hypoxia (<1.0 mg/l dissolved oxygen) affected 45 km^2 during 2006. Such areas would be expected to be devoid of finfish, lobsters and crabs.

- Hypoxia (<=3.5 mg/l dissolved oxygen) extended over a maximum area of 896 km^2 during early August, a larger area than during the 2004 and 2005 seasons but the shortest duration since 2000.

- The Biomass Area-Day Depletion Index (BADD) index for 2006 was about average at 7,017 or about 3.6% of the total area-days in the LIS sampling area.

CONCLUSIONS:

- Although hypoxia developed early in the 2006 season following a late-July/early-August heat wave, a succession of storm events during the middle part of August provided sufficient turn-over of the waters in the Sound to lead to a dissipation of hypoxia by the end of August. The end result was a year of average conditions for Long Island Sound.

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:

- Outreach events directly reached 27,822 people through 19 events during this segment. The largest event was the "CMTA Boat Show" attended by 14,831 fishermen and hunters, followed by "Northeast Hunting and Fishing Show" at Mystic Seaport which had an attendance of 11,711.

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, 2006 to February 28, 2007.

	Federal	State	Total
Job 1. Marine Angler Survey	$141,746	$47,249	$188,995
Job 2. Marine Finfish Survey	$318,281	$106,094	$424,374
Job 3. A Study of Nearshore Habitat	$0	$0	$0
Job 4. Fishing Gear Selectivity	$0	$0	$0
Job 5. Cooperative Interagency Resource Monitoring	$10,792	$3,597	$14,389
Job 6. Public Outreach	$18,805	$6,268	$25,073
Total	$489,623	$163,208	$652,831

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JOB 1: MARINE ANGLER SURVEY

PART 1: MARINE RECREATIONAL FISHERY STATISTICS SURVEY

PART 2: VOLUNTEER ANGLER SURVEY

PART 1: MARINE RECREATIONAL FISHERY STATISTICS SURVEY

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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 380,155 marine anglers were estimated to have fished in Connecticut during 2006.

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

Marine anglers made 1,447,688 fishing trips in Connecticut during 2006.

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 2006, marine anglers creeled 500,889 bluefish (2,483,854 lbs.), 521,303 scup (734,117 lbs.), 7,714 winter flounder (9,140 lbs.), 106,779 summer flounder (339,548 lbs.), 171,590 tautog (682,619 lbs.), and 77,665 striped bass (1,309,306 lbs.).

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

Length frequency distributions (minimum, mean, and maximum) were not available at press time.

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 2006 and MRFSS angler effort and catch statistics from 1981- 2006.

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, 2006

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)	43	69	74	69	38	293 (16%)
Charter Boat (CH)	90	64	111	108	90	463 (25%)
Party/Charter Boat (PC)	45	47	54	53	45	244 (13%)
Private/Rental Boat (PR)	41	139	212	333	112	837 (46%)
Party/Head Boat Trips (HB) (based on 2 samplers/trip)	8	24	26	26	10	94 Trips
Total Number of Intercepts	219	319	451	563	285	1,837

In 2006, a National Sport Fishing Expenditure Survey was added to the MRFSS Intercept Survey. The goal of the survey was to collect expenditure data from marine recreational anglers in order to estimate the economic importance of recreational fishing. Anglers interviewed in the Intercept Survey were also given the option of participating in a follow up mail survey. For further information regarding the expenditure survey please visit the following website: http://www.st.nmfs.gov/st1/econ.

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 2006

During March-December 2006, a total of 1,378 interviews (intercepts) with marine anglers were conducted by Marine Fisheries Division staff for the MRFSS (Table 1.2). Overall intercept collection was lower than normal mainly due to the addition of the Expenditure Survey to the MRFSS and the time expended completing at sea headboat sampling. 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 and Party/Head Boat Trips Taken by Mode and Wave, 2006

	Wave 2	Wave 3	Wave 4	Wave 5	Wave 6	
Mode	Mar-Apr	May-Jun	Jul-Aug	Sep-Oct	Nov-Dec	**Total (%)**
Shore (SH)	62	71	77	26	5	241 (17%)
Charter Boat (CH)	0	12	45	11	0	68 (5%)
Party/Charter Boat (PC)	0	27	36	6	1	70 (5%)
Private/Rental Boat (PR)	102	171	332	95	109	809 (59%)
Party/Head Boat Trips (HB)	0 Trip (0 Ints.)	6 Trips (75 Ints.)	5 Trips (59 Ints.)	4 Trips (56 Ints.)	0 Trips (0 Ints.)	15 Trips (190 Ints. 14%)
Total Number of Intercepts	164	356	549	194	115	1,378

MRFSS 2006 Angler Participation and Fishing Trip Estimates and the MRFSS Time Series from 1981-2006

During 2006, an estimated 380,155 marine anglers made 1,445,688 trips (Tables 1.3-1.4). The annual estimated number of marine anglers averaged 338,750 participants from 1981-06. The annual total of marine recreational fishing effort averaged 1,445,727 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 1981-2006.

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 2006 by mode was 38.5% for shore mode, 3.1% party/charter boat mode and 58.4% for the private/rental mode. The percent distribution of fishing trips by mode for the time series was 36.3% for shore mode, 6.1% for party/charter mode and 57.7% in the private/rental mode.

MRFSS Catch Estimates 2006

Total catch was estimated at 6,155,793 fish and creeled catch at 1,510,618 fish for 2006. 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 and tautog were near or below a PSE of 20% for both total and creeled catch. Scup PSE for total catch was below 20% however the harvested estimate was slightly elevated at 28%. Total creeled catch in pounds for all species combined was estimated at 5.6 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 second most frequently caught species in Connecticut in 2006 with over 1,284,559 million fish for total catch. The creeled catch estimate was 500,889 fish. Bluefish catch estimates in numbers comprised about 21% of the total catch and 33% of the total creeled catch for all species (Figure 1.3). Bluefish estimated creeled catch in pounds accounted for 44% of the total creeled catch. The proportion of bluefish released was 61%.

The private rental boat mode comprised 52% and 50% for total catch and creeled catch estimates for 2006. The shore mode accounted for 37% and 26% for total catch and creeled catch estimates. In the time series, however, the shore mode annual mean was approximately 44% and 46% for total and creeled catch estimates. Bluefish was the only species where the shore mode harvest was a substantial proportion of the overall catch when compared to other

species. This occurrence was most likely due to young-of-year bluefish (referred to as "snappers") entering into estuarine waters during the summer months becoming readily available to shore based anglers. This fishery is very popular with shore based anglers since "snappers" can be readily accessible and easily caught by anglers of all abilities. Depending on year-class-strength, total bluefish estimates may be driven by the shore based fishery.

In numbers caught, bluefish have been the most commonly caught and harvested species in the MRFSS time series (27% and 33%, 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 has 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 26%. The time series ranged for released bluefish was 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 2006 with an estimated total catch of about 1.7 million fish (comprising 28% of the total catch for all species). The private/rental boat mode accounted for 82% of the total catch. The creeled catch was estimated at 77,665 fish, a 28% reduction over the previous year. Striped bass creeled catch in numbers comprised 5% for all species. Creeled catch in weight was estimated at 1.3 million pounds and comprised 23% of the total creeled catch for all species. Approximately 96% 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 1.8 million fish in 2005 (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%). This is most likely 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 slightly (4%) from 2005 but was the second highest estimate (1,002,693 fish) recorded in the time series. The estimated total catch comprised 16% of the total catch for all species (Figure 1.5). The private/rental boat mode accounted for 98% of the total catch. The 2006 creeled catch, however, dropped substantially from the previous year by 50%. The creeled catch estimate in numbers (106,779 fish) accounted for about 7% of the total creeled catch for all species. The creeled catch in weight was an estimated 339,548 lbs. and accounted for 6% of the total creeled catch in weight for all species. Approximately 90% of summer flounder caught were released. This increase in release rate was most likely due to an increase in the minimum size from 17.5 to 18 inches in 2006.

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 increased from an estimated 4,484 fish in 2005 to 31,452 fish in 2006. The total creeled catch estimate was 7,714 fish. Both total and creeled catch estimates comprised only 0.5% for all species (Figure 1.6). The private/rental mode comprised 67% of the estimated total catch. Since 1992, winter flounder annual estimates have fallen well below the time series mean of 421,503 fish for total catch and 345,722 for creeled catch. Winter flounder creeled catch in weight was estimated at 9,140 pounds, or about 0.2% of the total creeled catch in weight for all species. The proportion of winter flounder released increased from 16% in 2005 to 76% in 2006.

SCUP (Porgy)

Scup was the third most frequently caught species (slightly behind bluefish) in Connecticut for 2006 with 1,249,419 and 521,303 fish estimated for total and creeled catches. The private/rental boat mode accounted for 80% of the total catch. Scup estimates comprised 20% and 35% of the total and creeled catch estimates for all species (Figure 1.7). In weight, creeled catch was estimated at 734,117 pounds in 2006. The proportion of scup released was approximately 58%.

TAUTOG (Blackfish)

Tautog, locally referred to as blackfish by anglers, are one of the few year round resident species of Long Island Sound. Tautog total catch in 2006 was estimated at 311,174 fish and 171,590 fish for the creeled catch total (Figure 1.8). The creeled catch estimate in 2006 increased 2.3 times from the 2005 estimate. The total and creeled estimates comprised 5% and 11% of the total for all species. In weight, the creeled catch was estimated at 682,619 pounds. The proportion of tautog released was 45%.

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. However, length frequency data was not available at press time since the web site was currently under construction.

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, 1981-2006

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	304,068	12.1	65,380	16.0	369,448	10.3
2005	322,371	11.6	75,664	16.5	398,035	9.9
2006	336,090	9.0	44,064	16.7	380,155	8.2
Annual Mean	271,534		67,216		338,750	
% Distr.	80.2%		19.8%			

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, 1981-2006

	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	588,035	19.3	40,468	25.3	950,735	15.2	1,579,238	11.7
2005	504,698	20.4	19,461	20.9	1,044,288	134.0	1,568,447	11.1
2006	569,124	13.4	45,694	1.8	862,870	10.4	1,477,688	8.0
Annual Mean	524,309		87,763		833,655		1,445,727	
% Distr.	36.3%		6.1%		57.7%			

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, 1981-2006

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	151,795	30.9	136,968	14.1	1,234,005	14.5	1,522,768	12.3
2005	448,343	26.2	52,628	23.0	869,315	15.7	1,370,286	13.2
2006	472,656	25.1	142,745	12.3	669,158	14.5	1,284,559	12.0
Annual Mean	808,006		277,013		740,519		1,825,538	
% Distr.	44.3%		15.2%		40.6%			

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

Table 1.6: MRFSS Bluefish Harvested Catch (A+B1) Estimates in Numbers by Fishing Mode, 1981-2006

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
Annual Mean	612,877		266,275		467,786		1,346,938	
% Distr.	45.5%		19.8%		34.7%			

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

Table 1.7: MRFSS Bluefish Harvested Catch (A+B1) Estimates in Pounds by Fishing Mode, 1981-2006

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
Annual Mean	494,334		1,834,483		2,085,554		4,414,371	
% Distr.	11.2%		41.6%		47.2%			

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, 1981-2006

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
Annual Mean	116,897		15,889		460,037		592,823	
% Distr.	19.7%		2.7%		77.6%			

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

Table 1.9: MRFSS Striped Bass Harvested Catch (A+B1) Estimates in Numbers by Fishing Mode, 1981-2006

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
Annual Mean	3,025		5,363		29,672		38,060	
% Distr.	7.9%		14.1%		78.0%			

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

Table 1.10: MRFSS Striped Bass Harvested Catch (A+B1) Estimates in Pounds by Fishing Mode, 1981-2006

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
Annual Mean	23,218		57,968		424,815		506,001	
% Distr.	4.6%		11.5%		84.0%			

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, 1981-2006

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
Annual Mean	32,702		10,112		435,051		477,865	
% Distr.	6.8%		2.1%		91.0%			

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

Table 1.12: MRFSS Summer Flounder Harvested Catch (A+B1) Estimates in Numbers by Fishing Mode, 1981-2006

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
Annual Mean	13,389		8,872		177,620		199,972	
% Distr.	6.7%		4.4%		88.8%			

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

Table 1.13: MRFSS Summer Flounder Harvested Catch (A+B1) Estimates in Pounds by Fishing Mode, 1981-2006

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
Annual Mean	13,734		9,275		336,489		359,498	
% Distr.	3.8%		2.6%		93.6%			

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+B1) Estimates in Numbers by Fishing Mode, 1981-2006

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
Annual Mean	48,921		13,885		358,743		421,549	
% 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 Harvested Catch (A+B1) Estimates in Numbers by Fishing Mode, 1981-2006

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
Annual Mean	32,696		10,412		302,637		345,744	
% 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 Harvested Catch (A+B1) Estimates in Pounds by Fishing Mode, 1981-2006

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
Annual Mean	25,679		11,640		326,610		363,929	
% Distr.	7.1%		3.2%		89.7%			

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+B1) Estimates in Numbers by Fishing Mode, 1981-2006

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
Annual Mean	77,836		42,348		1,555,977		1,676,160	
% Distr.	4.6%		2.5%		92.8%			

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

Table 1.18: MRFSS Scup Harvested Catch (A+B1) Estimates in Numbers by Fishing Mode, 1981-2006

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
Annual Mean	42,274		35,973		1,061,161		1,139,407	
% Distr.	3.7%		3.2%		93.1%			

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

Table 1.19: MRFSS Scup Harvested Catch (A+B1) Estimates in Pounds by Fishing Mode, 1981-2006

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
Annual Mean	23,370		30,513		717,910		771,794	
% Distr.	3.0%		4.0%		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, 1981-2006

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
Annual Mean	22,452		6,217		242,361		271,030	
% Distr.	8.3%		2.3%		89.4%			

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

Table 1.21: MRFSS Tautog Harvested Catch (A+B1) Estimates in Numbers by Fishing Mode, 1981-2006

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
Annual Mean	13,511		4,725		138,031		156,267	
% Distr.	8.6%		3.0%		88.3%			

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

Table 1.22: MRFSS Tautog Harvested Catch (A+B1) Estimates in Pounds by Fishing Mode, 1981-2006

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
Annual Mean	34,076		14,806		437,742		486,623	
% Distr.	7.0%		3.0%		90.0%			

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 1935-2006

Striped Bass

Effective Date	Minimum Size	Daily Creel Limit	Fishing Season	Closed Season/Area	Other Restrictions
1935	16in. (fork length)	None.	Year round.	None.	Spearing prohibited.
1953	16in. (fork length)	None.	Year round.	None.	No sale; spearing prohibited.
Jan 1982	16in. (fork length)	4 fish between 16 and 24in. No limit >24in.	Year round.	None.	No sale; spearing prohibited.
Aug 1984	24in. (fork length)	None.	Apr 1-Dec 14	Dec 15-Mar 31 in all state waters.	No sale; spearing prohibited.
Aug 1985	26in. (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	33in. (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	34in. (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	36in. (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	38in. (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	36in. (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	34in. (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	28in. (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	28in. (total length)	2 fish/angler.	Year round.	None.	No sale; spearing and gaffing prohibited; fish must be landed intact.
May 10, 2000	24-30in. and $\geq$ 40in (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.

Striped Bass, Con't.

Effective Date	Minimum Size	Daily Creel Limit	Fishing Season	Closed Season/Area	Other Restrictions
Feb 27, 2001	24-32in. and ≥ 41in (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	28in. (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	14in. (total length)	None.	Year round.	None.	None.
Apr 22, 1994	14in. (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	14in. (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	15in. (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	15in. (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	15½in. (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	17in. (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-Current	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).

Winter Flounder

Effective Date	Minimum Size	Daily Creel Limit	Fishing Season	Closed Season/Area	Other Restrictions
Jan 1, 1982	8in. (total length)	None.	Year round.	None.	None.
Jan 1, 1985	10in. (total length)	None.	Year round.	None.	None.
Aug 19, 1986	10in. (total length)	None.	Year round except for Niantic River.	Niantic River closed Dec 1-Mar 31	None.
Apr 22, 1994	11in. (total length)	8 fish/angler	Apr 15-Feb 28.	Mar 1-Apr 14 in all state waters.	None.
Oct 1, 1995	12in. (total length)	8 fish/angler	Apr 15-Feb 28.	Mar 1-Apr 14 in all state waters.	None.
Jan 1, 1996	12in. (total length)	8 fish/angler	Year round.	None.	None.
Aug 1, 2005-Current	12in. (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	9in. (total length)	None.	Year round.	None.	None.
May 5, 1998	10in. (total length)	20 fish/angler	Year round.	None.	None.
May 17, 2001	11in. (total length)	25 fish/angler	May 10-Feb 28.	Mar 1-May 9 in all state waters.	None.
June 19, 2002	11½in. (total length)	25 fish/angler	Year round.	None.	None.
May 15, 2003	12in. (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.

Black Sea Bass, Con't.

Effective Date	Minimum Size	Daily Creel Limit	Fishing Season	Closed Season/Area	Other Restrictions
August 05, 2004	12in. (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	12in. (total length)	25 fish/angler	Jan 1-Nov 30.	Dec 1-Dec 31.	None.
April 30, 2006 - Current	12in. (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	7in. (total length)	None.	Year round.	None.	None.
Jan 1, 1985	8in. (total length)	None.	Year round.	None.	None.
May 10, 2000	8in. (total length)	50 fish/angler	Year round.	None.	None.
May 10, 2001	9in. (total length)	25 fish/angler	Jun 3-Oct 23.	Oct 24-Jun 2 in all state waters.	None.
June 19, 2002	10in. (total length)	50 fish/angler	Jul 13-Sep 25.	Sep 26-Jul 12 in all state waters.	None.
May 15, 2003	10in. (total length)	50 fish/angler	May 24-Oct 30.	Oct 31-May 23 in all state waters.	None.
May 24, 2004	10 1/2in. (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 1/2in. (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 1/2in. (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.

Tautog (Blackfish)

Effective Date	Minimum Size	Daily Creel Limit	Fishing Season	Closed Season/Area	Other Restrictions
Sep 19, 1987	12in. (total length)	None.	Year round.	None.	None.
May 19, 1995	14in. (total length)	None.	Year round.	None.	None.
Jul 29, 1996	14in. (total length)	4 fish/angler	Jun 15-Apr 30.	May 1-Jun 14 in all state waters.	None.

Tautog (Blackfish), Con't.

Effective Date	Minimum Size	Daily Creel Limit	Fishing Season	Closed Season/Area	Other Restrictions
May 15, 2003	14in. (total length)	4 fish/angler	Jan 1-Apr 30 and Jun 15-Nov 23.	May 1-Jun 14 and Nov 24-Dec 31 in all state waters.	None.
Feb 27, 2004-Current	14in. (total length)	4 fish/angler	Jan 1-Apr 30, Jun 15-Sep 7 and Sep 22 –Dec 13.	May 1-Jun 14, Sep 8 – Sep 21 and Dec 14-Dec 31 in all state waters.	None.

Weakfish

Effective Date	Minimum Size	Daily Creel Limit	Fishing Season	Closed Season/Area	Other Restrictions
Jan 1, 1995	16in. (total length)	None.	Year round.	None.	None.
Apr.1, 2003-Current	16in. (total length)	10 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	7in. (total length)	30fish/angler.	Year round.	See Other Restrictions.	Only for Long Island Sound and Tidal Rivers and Streams.

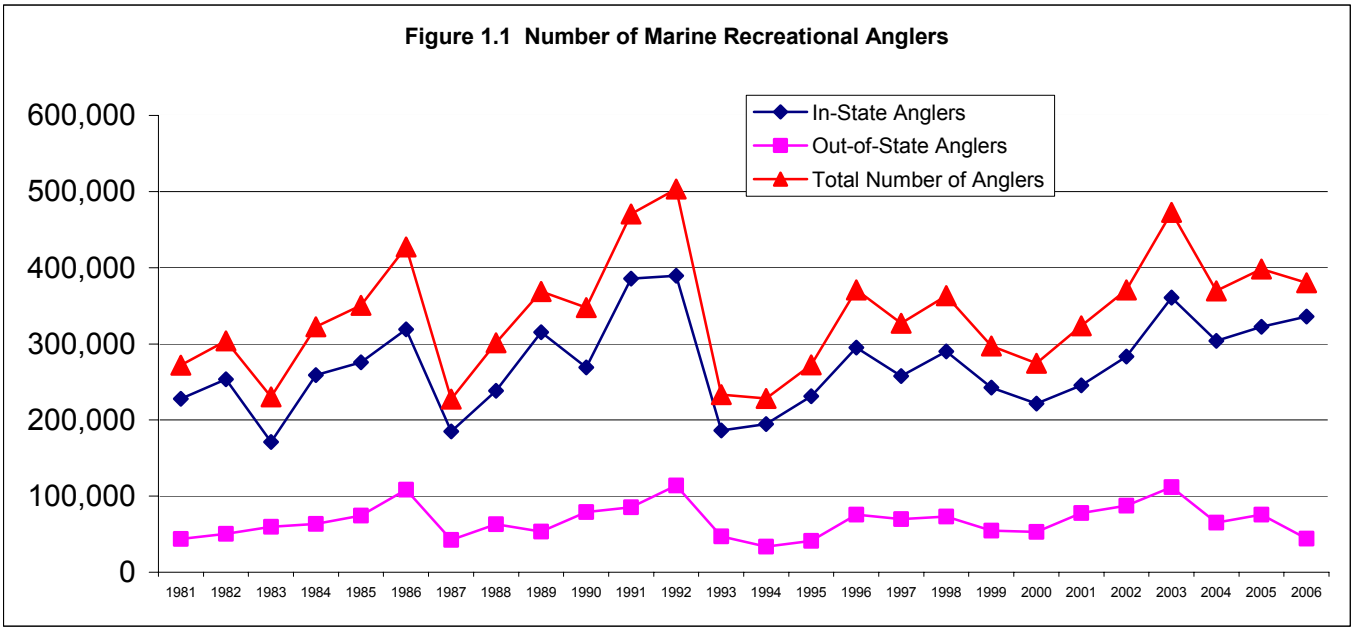
American Eel

Effective Date	Minimum Size	Daily Creel Limit	Fishing Season	Closed Season/Area	Other Restrictions
May 10, 2000-Current	6in. (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, 1981-2006



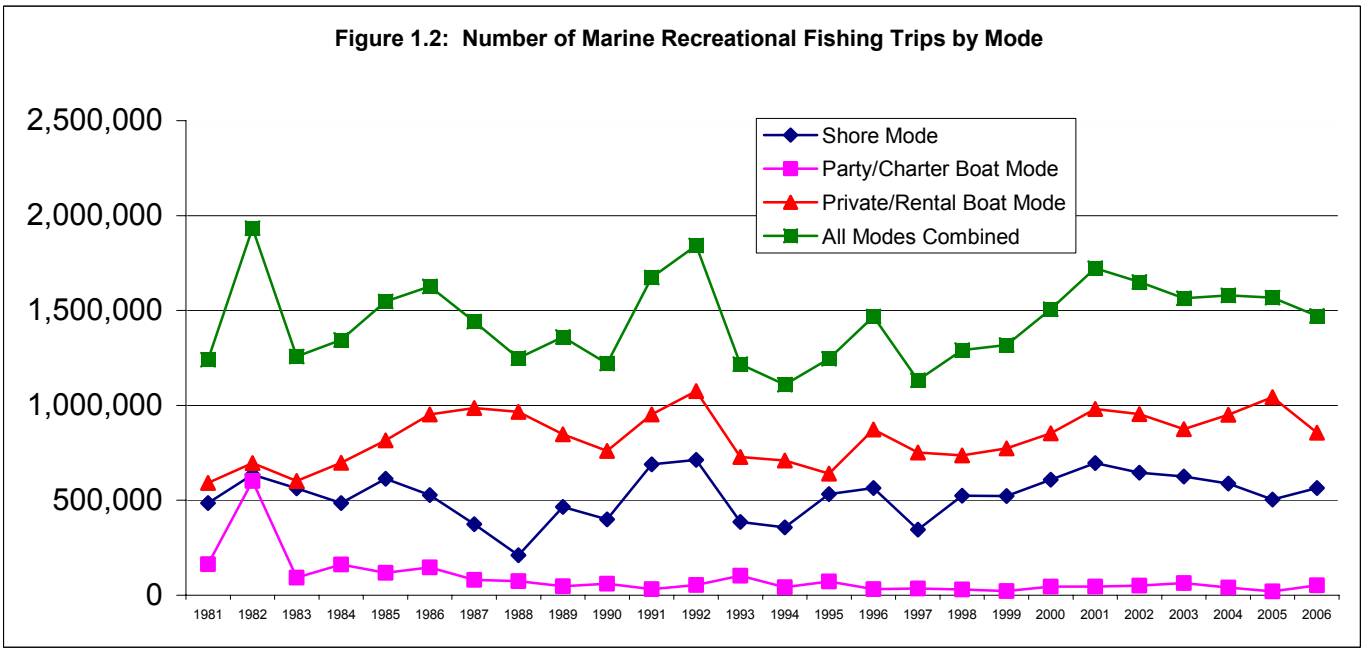
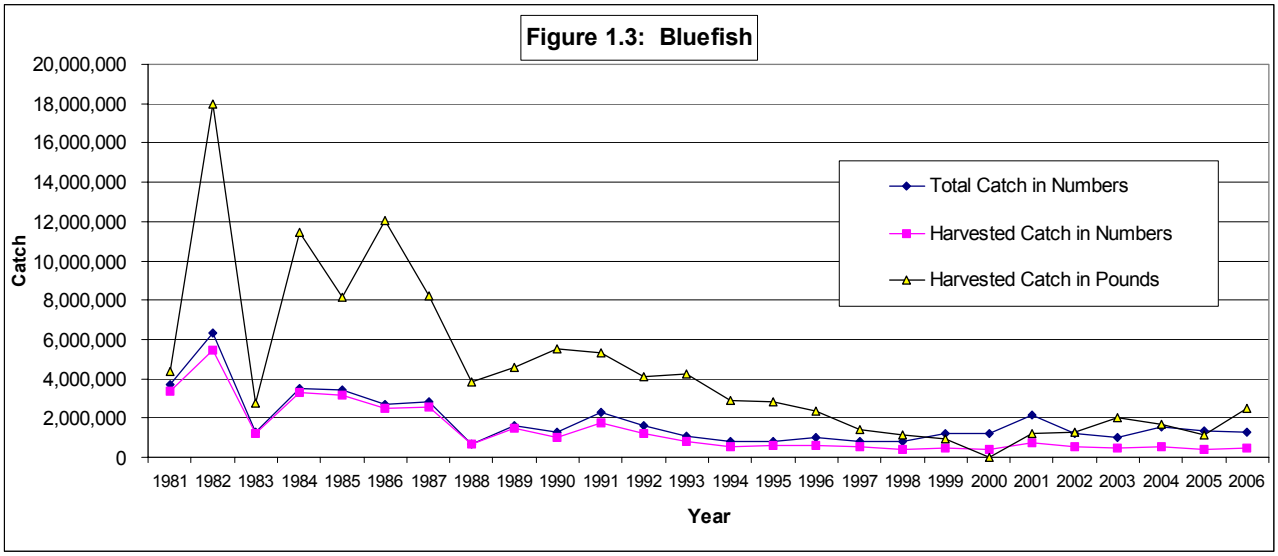
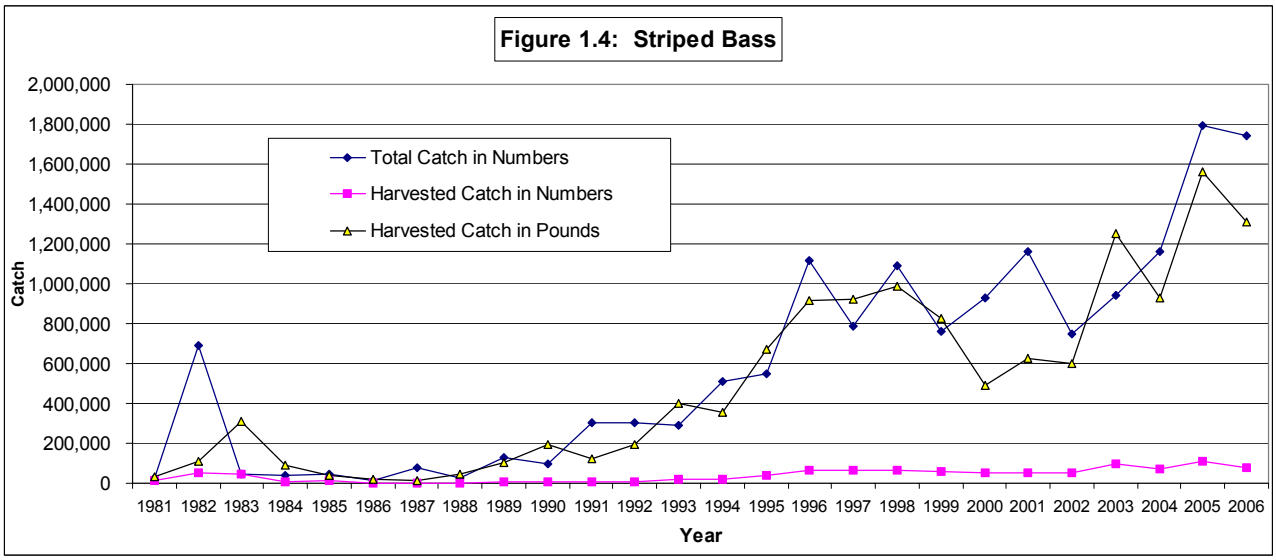


Figure 1.3-1.8: MRFSS Catch Estimates for Selected Species Caught by Marine Recreational Anglers, 1981-2006





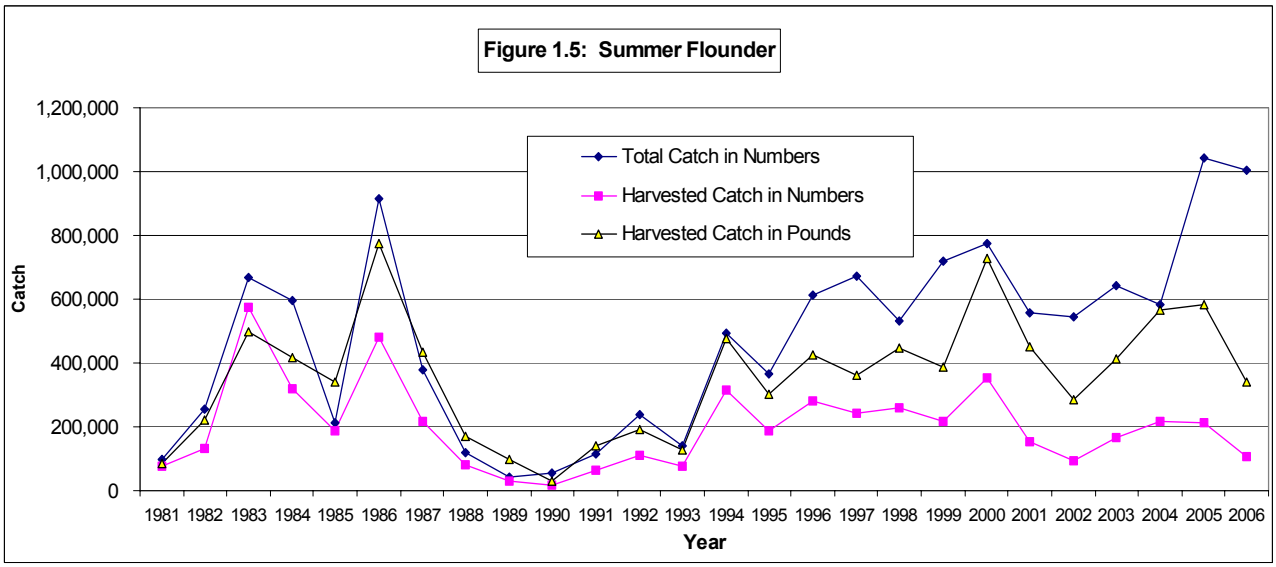
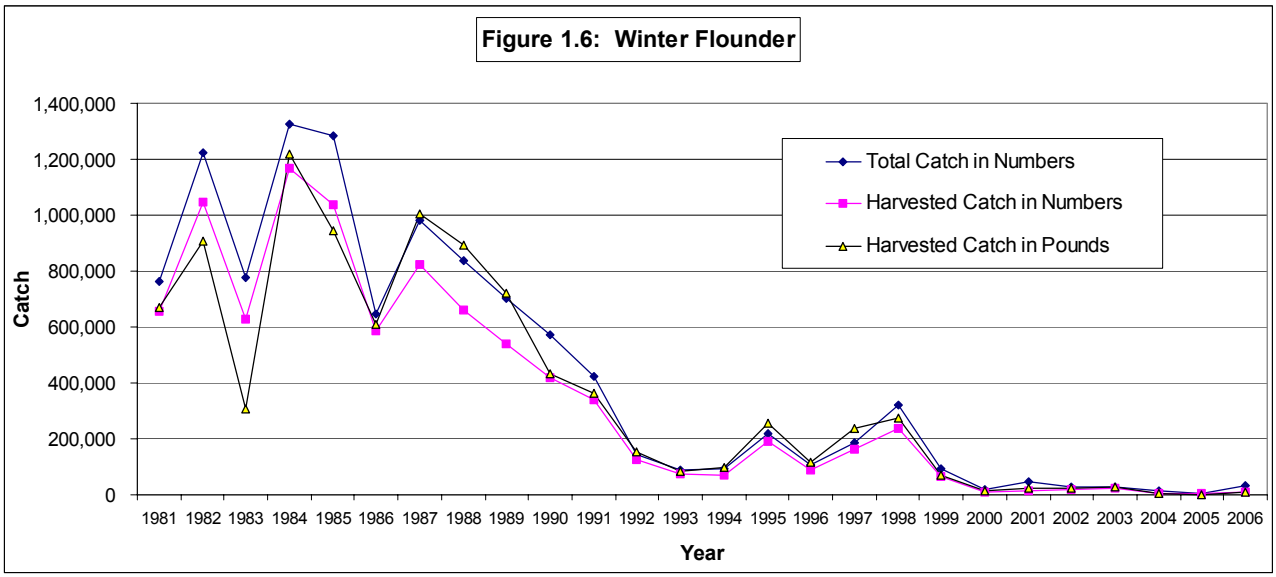
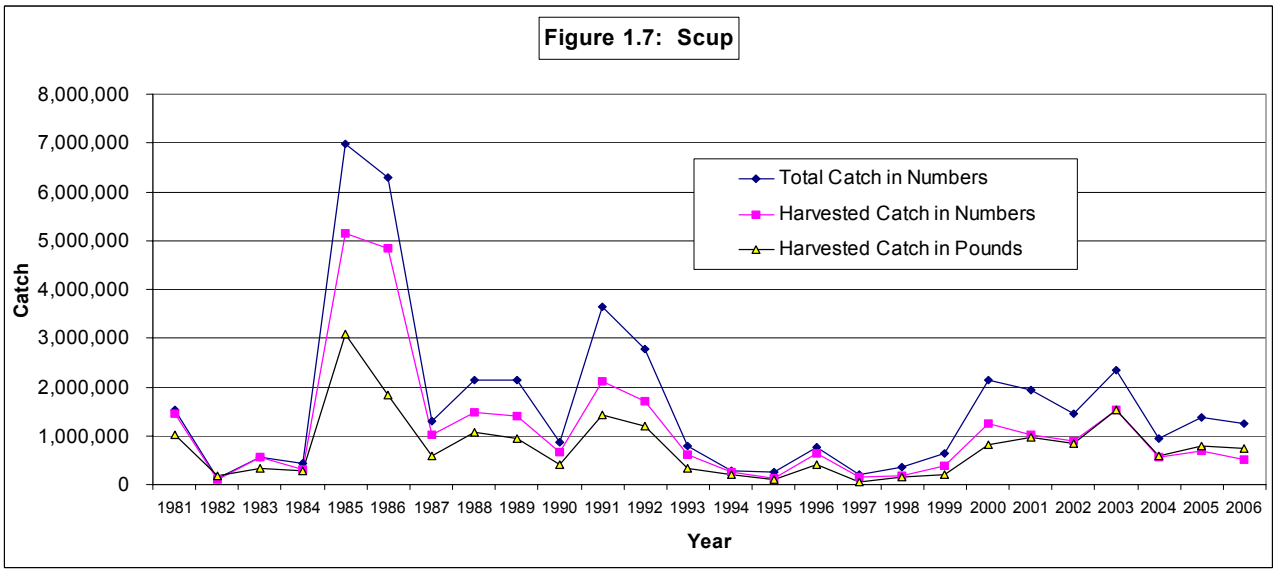
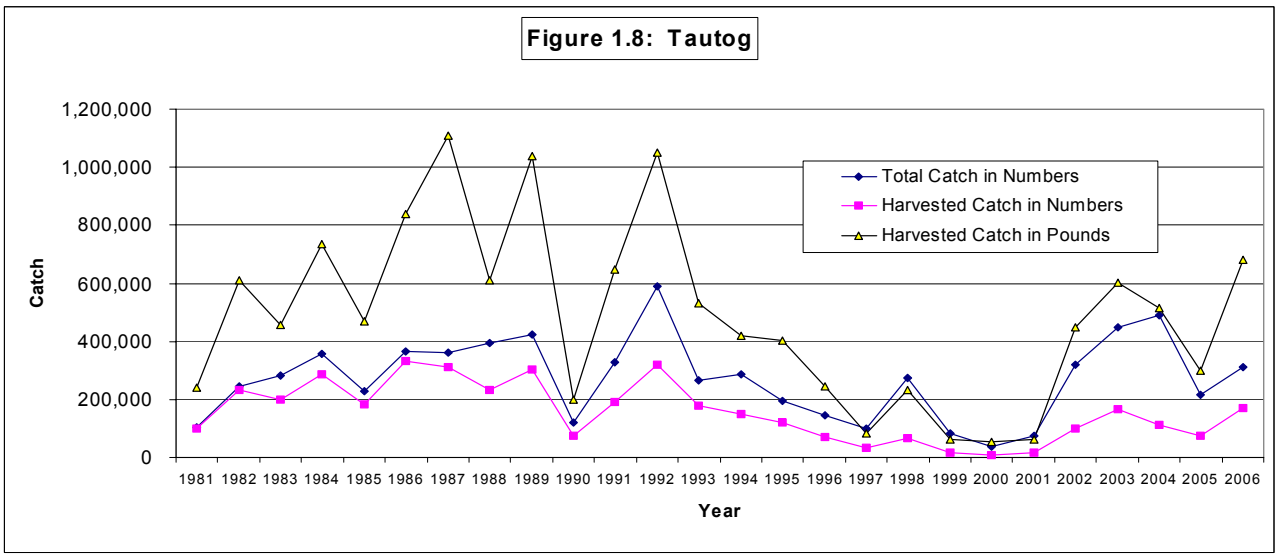


Figure 1.3-1.8: MRFSS Catch Estimates for Selected Species Caught by Marine Recreational Anglers, 1981-2006 (Con't.)







PART 2: VOLUNTEER ANGLER SURVEY

PART 2: VOLUNTEER ANGLER SURVEY

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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 2006.

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 (http://dep.state.ct.us/bunatr/fishing) 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 2006

In 2006, a total of 68 anglers participated in the survey which was down from the previous year's 84 anglers. Those 68 anglers took 1,400 fishing trips. Volunteers including additional anglers involved in a fishing party made a total of 3,472 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). The percent of successful trips, where at least one fish of any species was caught, was relatively high at 93% for boat anglers and 78% 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 1,473 targeted bluefish trips (boat and shore modes combined) and recorded a total of 2,648 adult bluefish caught (bluefish >12 inches). Of the total number of targeted trips, only 8% were unsuccessful. The overall catch including trips not targeting bluefish was 3,472 fish. Of the overall catch, anglers measured 2,253 adult bluefish (65%) and released about 69%. The 50^{th} percentile length measurement for bluefish was approximately 25 inches (total length). The targeted catch-per-unit-of-effort (CPUE) was 1.8 and 0.61 fish per angler trip for total and creeled catches.

Striped bass

Volunteers made 2,304 trips targeting striped bass and caught a total of 4,631 fish (overall catch including trips not targeting striped bass was 4,682 fish). About 10% or 236 trips targeting striped bass were unsuccessful. Of the overall catch, about 94% of the catch was released. VAS anglers measured 3,108 striped bass (66% of the overall catch). Legal size striped bass ($\geq$ 28 inches) comprised about 15% of the measured catch. The percent of legal size striped bass released was estimated at 63%. The 50^{th} percentile length measurement for striped

bass was about 18.5 inches. Striped bass ranged in length from as small as 6 inches to 50 inches. Targeted CPUE was 2.0 and 0.12 fish per angler trip for total and creeled catches.

Summer flounder

A total of 752 fishing trips were directed toward catching 2,491 summer flounder. Only 6% of the trips targeting summer flounder were unsuccessful. The overall catch was 2,559 fish. Volunteers measured 1,590 fish or about 62% of the overall catch. Approximately 80% 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 9% of summer flounder measuring 18 inches and greater. The 50th percentile length measurement for summer flounder was about 16.5 inches. Length measurements ranged from 5 to 29 inches. Summer flounder targeted CPUE was 3.3 and 0.7 fish per angler trip for total and creeled catches.

Winter flounder

Volunteers made 112 trips that targeted winter flounder. These targeted trips produced just 74 fish. The overall catch including non-targeted trips was 130 winter flounder. Of the total trips targeting winter flounder, 23% of the trips were unsuccessful. Of the overall catch, 108 winter flounder (83%) were measured. Anglers released about 25% of the overall catch and about 5% of the measured catch were sub-legal in size (<12 inches). Anglers released 7% 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 19 inches. Winter flounder targeted CPUE was 1.5 and 0.9 fish per angler trip for total and creeled catches.

Scup

Volunteers made 174 targeted trips for scup producing a total of 1,045 fish. Of the total trips targeting scup, only 6% of the trips were unsuccessful. The overall total catch was 1,513 fish. Volunteers measured about 69% (1,043 fish) of the overall total catch. Of the overall total catch, 68% were released. Sub-legal fish (<10.5 inches) comprised 52% of the measured catch. The proportion of legal sized fish ($\geq$10.5 inches) released by anglers was approximately 29%. The 50th percentile length measurement for scup was about 10 inches. Length measurements ranged from as little a 3 inches to 16 inches. Scup targeted CPUE was 6.0 and 2.1 fish per angler trip for total and creeled catches.

Tautog

VAS anglers made 324 trips that targeted tautog and caught a total of 730 fish. Of the total trips targeting tautog, 7% of the trips were unsuccessful. The overall total catch was 795 fish. Volunteers measured 560 tautog or about 70% of the overall total catch. About 30% of the measured catch was less than the legal size of 14 inches. Of the legal size measured catch, approximately 43% were released. The 50th percentile length measurement for tautog was about 15.5 inches. Length measurements ranged from 6 to 26 inches. Tautog targeted CPUE was 2.3 and 0.8 fish per angler trip for total and creeled catches.

Weakfish

There were only 15 targeted weakfish trips and a total of 10 fish were caught by VAS anglers. One fish was incidentally caught by non-targeted trips and none were released of the overall catch. Weakfish ranged in size from 14 to 35 inches in length. Due to inadequate length measurement data, length frequency distribution information was not presented in this report. Depressed catch rates by anglers indicates that weakfish remain in low abundance.

Black sea bass

VAS angler took 28 trips targeting black sea bass catching 45 fish. However, the overall catch was 368 black sea bass. Of the overall total catch, 94% were released. Volunteers measured 264 fish or 72% of the overall total catch. Of the measured catch, 88% of the catch was below the 12 inch legal length limit. The 50th percentile length measurement for black sea bass was about 7 inches and the percent of legal size fish released was 24%. Black sea bass targeted CPUE was 1.6 and 0.14 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@po.state.ct.us 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, 2006

Bluefish (12 in. >)		
# of Fish	# of Trips	% Distr.
0	266	55.1%
1	134	27.7%
2	36	7.5%
3	19	3.9%
4	9	1.9%
5	9	1.9%
6	4	0.8%
7	2	0.4%
8	2	0.4%
9	2	0.4%
Total	483	100%

Striped Bass		
# of Fish	# of Trips	% Distr.
0	503	86.6%
1	69	11.9%
2	9	1.5%
Total	581	100%

Summer Flounder		
# of Fish	# of Trips	% Distr.
0	135	48.9%
1	89	32.2%
2	25	9.1%
3	15	5.4%
4	4	1.4%
5	2	0.7%
6	6	2.2%
Total	276	100%

Winter Flounder		
# of Fish	# of Trips	% Distr.
0	4	17.4%
1	8	34.8%
2	2	8.7%
3	2	8.7%
4	1	4.3%
5	1	4.3%
6	1	4.3%
7	2	8.7%
10	2	8.7%
Total	23	100%

Scup		
# of Fish	# of Trips	% Distr.
0	72	46.8%
1	34	22.1%
2	14	9.1%
3	6	3.9%
4	6	3.9%
5	4	2.6%
6	3	1.9%
7	4	2.6%
8	5	3.2%
9	2	1.3%
10	1	0.6%
11	1	0.6%
25	2	1.3%
Total	154	100%

Tautog		
# of Fish	# of Trips	% Distr.
0	45	47.9%
1	20	21.3%
2	8	8.5%
3	12	12.8%
4	9	9.6%
Total	94	100%

Black Sea Bass		
# of Fish	# of Trips	% Distr.
0	71	91.0%
1	6	7.7%
2	1	1.3%
Total	78	100%

Table 1.2A (Con't.): Catch Trip Frequency Distribution of Released Fish for Selected Species, 2006

Bluefish (12 in. >)		
# of Fish	# of Trips	% Distr.
0	136	28.2%
1	139	28.8%
2	78	16.1%
3	34	7.0%
4	25	5.2%
5	20	4.1%
6	12	2.5%
7	5	1.0%
8	11	2.3%
9	4	0.8%
10	2	0.4%
11	3	0.6%
12	3	0.6%
13	3	0.6%
14	1	0.2%
15	2	0.4%
16	3	0.6%
17	1	0.2%
18	1	0.2%
Total	483	100%

Striped Bass		
# of Fish	# of Trips	% Distr.
0	78	13.4%
1	178	30.6%
2	90	15.5%
3	52	8.9%
4	29	5.0%
5	23	4.0%
6	19	3.3%
7	19	3.3%
8	16	2.7%
9	6	1.0%
10	8	1.4%
11	6	1.0%
12	7	1.2%
13	5	0.9%
14	3	0.5%
15	1	0.2%
16	1	0.2%
17	3	0.5%
18	6	1.0%
19	2	0.3%
22	2	0.3%
24	1	0.2%
25	1	0.2%
26	1	0.2%
27	1	0.2%
28	6	1.0%
31	4	0.7%
32	3	0.5%
34	1	0.2%
38	1	0.2%
40	2	0.3%
41	1	0.2%
45	1	0.2%
47	1	0.2%
53	1	0.2%
56	1	0.2%
60	1	0.2%
70	1	0.2%
Total	582	100%

Summer Flounder		
# of Fish	# of Trips	% Distr.
0	50	18.2%
1	83	30.2%
2	40	14.5%
3	25	9.1%
4	7	2.5%
5	12	4.4%
6	9	3.3%
7	6	2.2%
8	10	3.6%
9	6	2.2%
10	7	2.5%
11	4	1.5%
13	2	0.7%
14	5	1.8%
15	2	0.7%
16	3	1.1%
17	1	0.4%
18	1	0.4%
19	1	0.4%
24	1	0.4%
Total	275	100%

Winter Flounder		
# of Fish	# of Trips	% Distr.
0	10	43.5%
1	10	43.5%
2	1	4.3%
3	1	4.3%
5	1	4.3%
Total	23	100%

Table 1.2A: Catch Trip Frequency Distribution of Released Fish for Selected Species, 2006

Scup		
# of Fish	# of Trips	% Distr.
0	32	21.1%
1	35	23.0%
2	16	10.5%
3	20	13.2%
4	9	5.9%
5	7	4.6%
6	4	2.6%
7	3	2.0%
8	8	5.3%
10	6	3.9%
11	1	0.7%
12	3	2.0%
13	1	0.7%
14	2	1.3%
15	2	1.3%
20	2	1.3%
22	1	0.7%
Total	152	100%

Tautog		
# of Fish	# of Trips	% Distr.
0	18	19.1%
1	32	34.0%
2	18	19.1%
3	6	6.4%
4	5	5.3%
5	1	1.1%
6	1	1.1%
7	4	4.3%
9	1	1.1%
10	1	1.1%
11	3	3.2%
14	1	1.1%
19	1	1.1%
22	1	1.1%
29	1	1.1%
Total	94	100%

Black Sea Bass		
# of Fish	# of Trips	% Distr.
0	13	16.7%
1	27	34.6%
2	13	16.7%
3	10	12.8%
4	6	7.7%
5	2	2.6%
6	2	2.6%
8	2	2.6%
10	2	2.6%
15	1	1.3%
Total	78	100%

Figure 1.1A: Bluefish (12> inches) Length Frequency Distribution, 2006

Total Length (inches)	2006 Measurement Data Bluefish (12>inches)		
	Freq	%Freq	%Cum
13	37	1.6	1.6
14	19	0.8	2.4
15	22	1.0	3.4
16	21	0.9	4.4
17	30	1.3	5.7
18	58	2.6	8.3
19	58	2.6	10.8
20	100	4.4	15.3
21	106	4.7	20.0
22	230	10.2	30.2
23	140	6.2	36.4
24	183	8.1	44.5
25	165	7.3	51.8
26	175	7.8	59.6
27	118	5.2	64.8
28	164	7.3	72.1
29	162	7.2	79.3
30	162	7.2	86.5
31	104	4.6	91.1
32	94	4.2	95.3
33	47	2.1	97.4
34	25	1.1	98.5
35	11	0.5	99.0
36	12	0.5	99.5
37	5	0.2	99.7
38	3	0.1	99.9
39	2	0.1	100.0
40	0	0.0	100.0
Total	2,253	100	

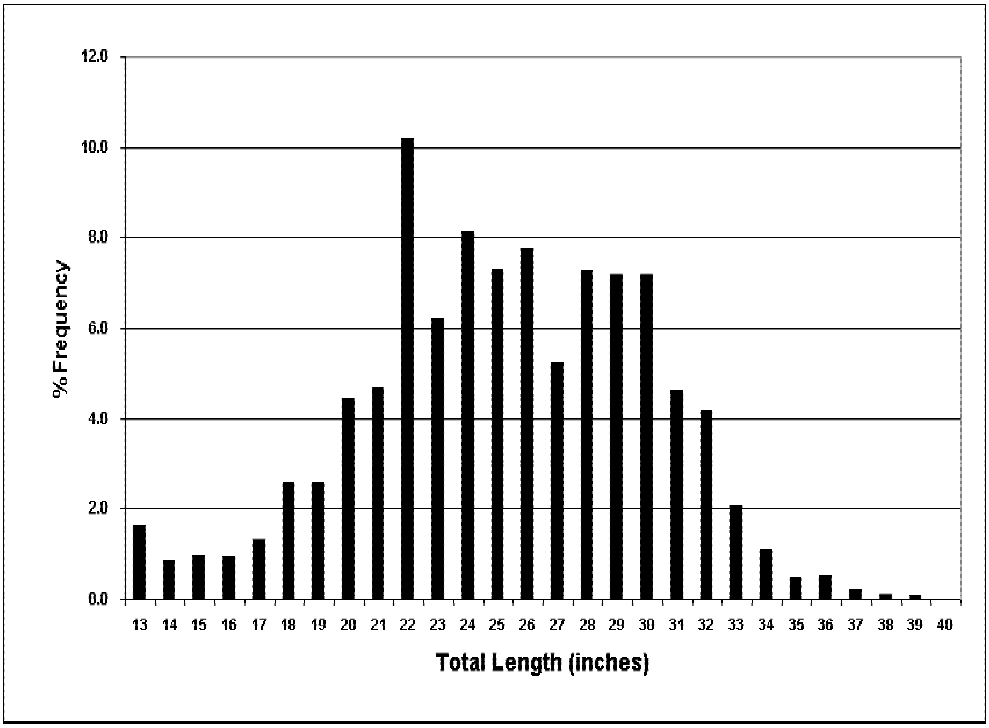


Figure 1.2A: Striped Bass Length Frequency Distribution, 2006

Total Length (inches)	2006 Measurement Data Striped Bass Freq	%Freq	%Cum
< or = 5	0	0.0	0.0
6	4	0.1	0.1
7	3	0.1	0.2
8	5	0.2	0.4
9	6	0.2	0.6
10	25	0.8	1.4
11	28	0.9	2.3
12	84	2.7	5.0
13	118	3.8	8.8
14	190	6.1	14.9
15	211	6.8	21.7
16	264	8.5	30.2
17	272	8.8	38.9
18	286	9.2	48.1
19	195	6.3	54.4
20	178	5.7	60.1
21	151	4.9	65.0
22	132	4.2	69.2
23	95	3.1	72.3
24	123	4.0	76.3
25	82	2.6	78.9
26	109	3.5	82.4
27	74	2.4	84.8
28	76	2.4	87.2
29	63	2.0	89.3
30	52	1.7	90.9
31	41	1.3	92.2
32	34	1.1	93.3
33	28	0.9	94.2
34	28	0.9	95.1
35	21	0.7	95.8
36	27	0.9	96.7
37	23	0.7	97.4
38	23	0.7	98.2
39	13	0.4	98.6
40	12	0.4	99.0
41	12	0.4	99.4
42	6	0.2	99.5
43	3	0.1	99.6
44	2	0.1	99.7
45	3	0.1	99.8
46	1	0.0	99.8
47	4	0.1	100.0
48	0	0.0	100.0
49	0	0.0	100.0
50	1	0.0	100.0
51	0	0.0	100.0
Total	3,108	100	100.0

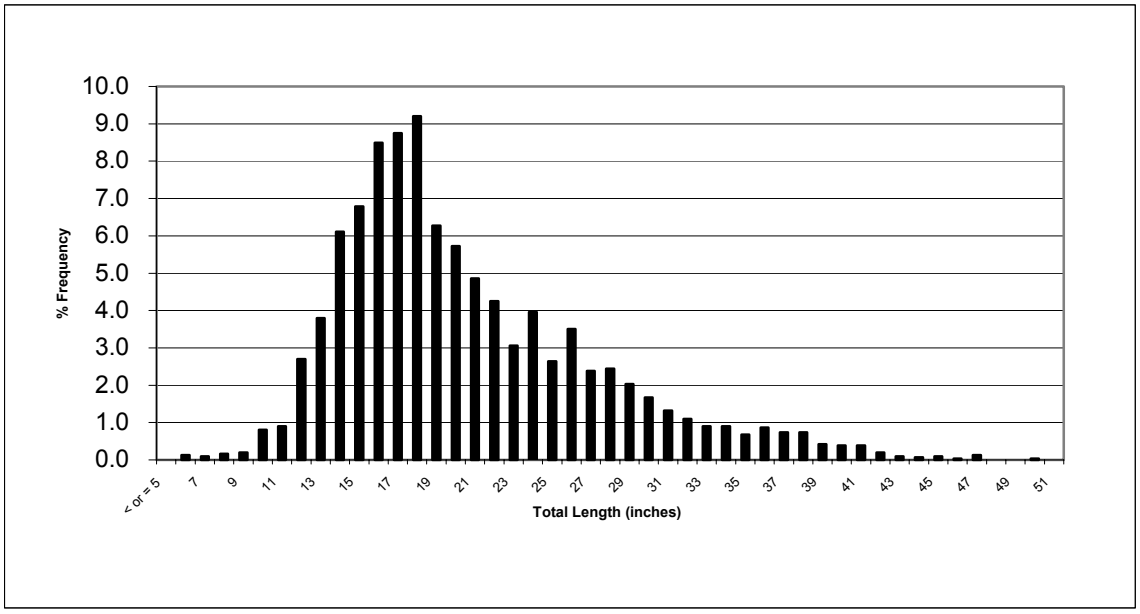


Figure 1.3A: Summer Flounder Length Frequency Distribution, 2006

Total Length (inches)	2006 Measurement Data Summer Flounder		
	Freq	%Freq	%Cum
< or = 8	1	0.1	0.1
9	1	0.1	0.2
10	4	0.3	0.4
11	2	0.1	0.5
12	24	1.5	2.0
13	54	3.4	5.4
14	116	7.3	12.7
15	210	13.2	25.9
16	267	16.8	42.7
17	271	17.0	59.8
18	216	13.6	73.4
19	140	8.8	82.2
20	92	5.8	88.0
21	55	3.5	91.4
22	50	3.1	94.6
23	37	2.3	96.9
24	19	1.2	98.1
25	14	0.9	99.0
26	8	0.5	99.5
27	7	0.4	99.9
28	1	0.1	100.0
29	1	0.1	100.0
30	0	0.0	100.0
Total	1,590	100	

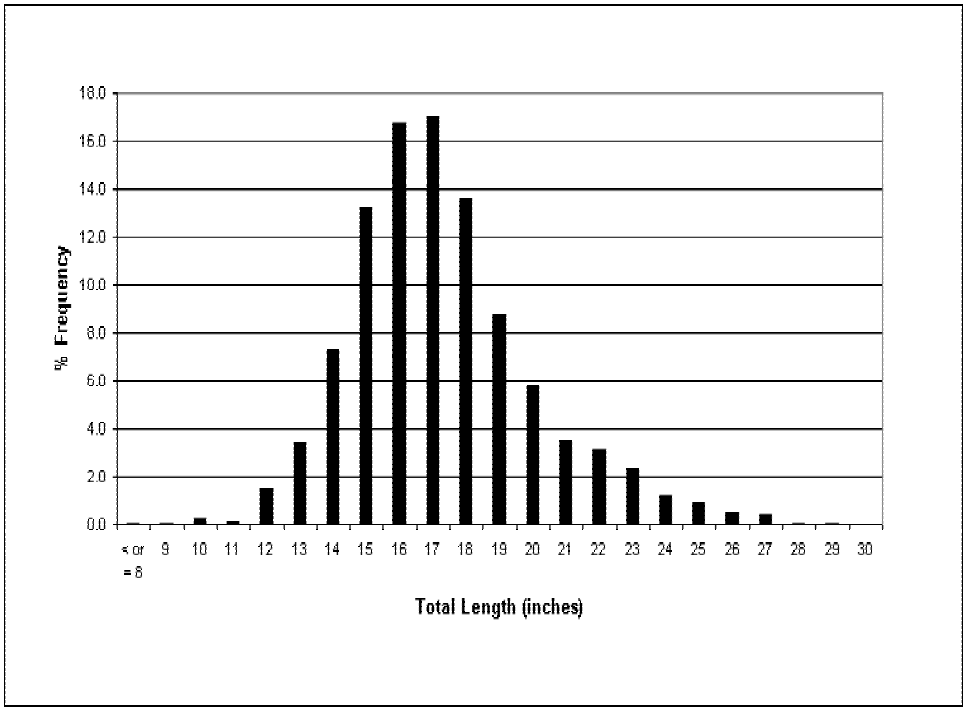


Figure 1.4A: Winter Flounder Length Frequency Distribution, 2006

Total Length (inches)	2006 Measurement Data Winter Flounder		
	Freq	%Freq	%Cum
< or = 8	0	0.0	0.0
9	0	0.0	0.0
10	1	0.9	0.9
11	4	3.7	4.6
12	8	7.4	12.0
13	39	36.1	48.1
14	18	16.7	64.8
15	17	15.7	80.6
16	9	8.3	88.9
17	8	7.4	96.3
18	3	2.8	99.1
19	1	0.9	100.0
20	0	0.0	100.0
Total	108	100	

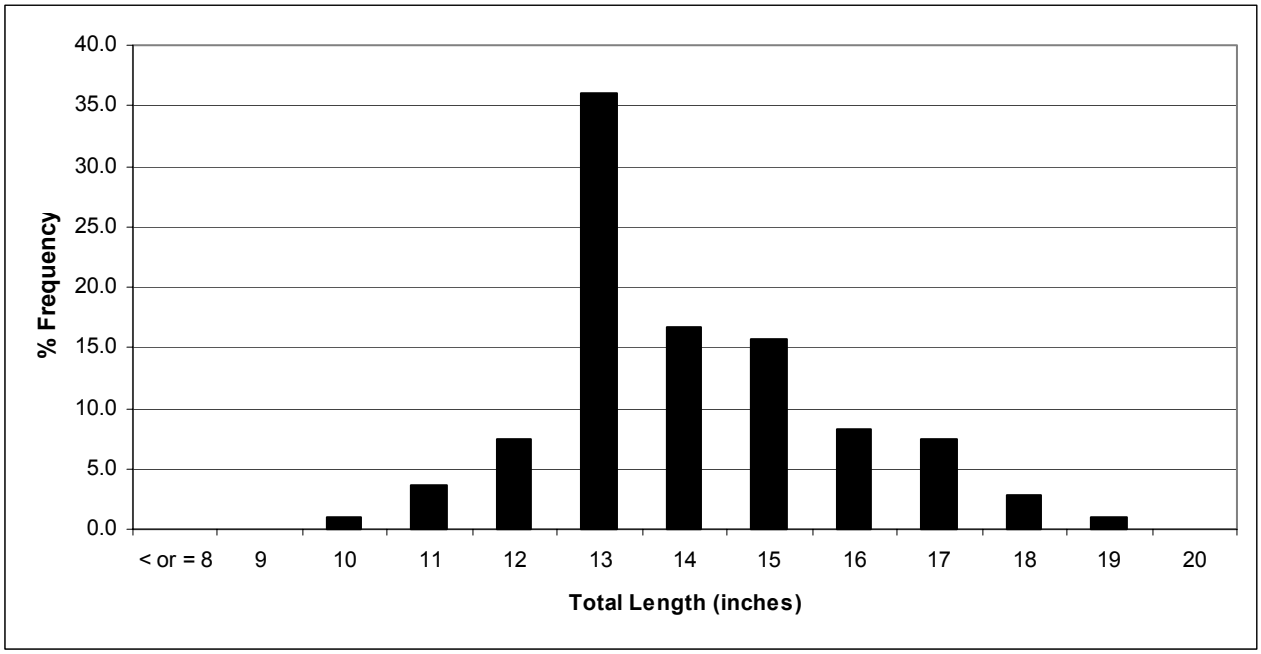


Figure 1.5A: Scup Length Frequency Distribution, 2006

Total Length (inches)	2005 Measurement Data Scup		
	Freq	%Freq	%Cum
< or = 4	20	1.9	1.9
5	17	1.6	3.5
6	41	3.9	7.5
7	28	2.7	10.1
8	90	8.6	18.8
9	145	13.9	32.7
10	199	19.1	51.8
11	189	18.1	69.9
12	82	7.9	77.7
13	72	6.9	84.6
14	93	8.9	93.6
15	50	4.8	98.4
16	17	1.6	100.0
17	0	0.0	100.0
Total	1,043	100	

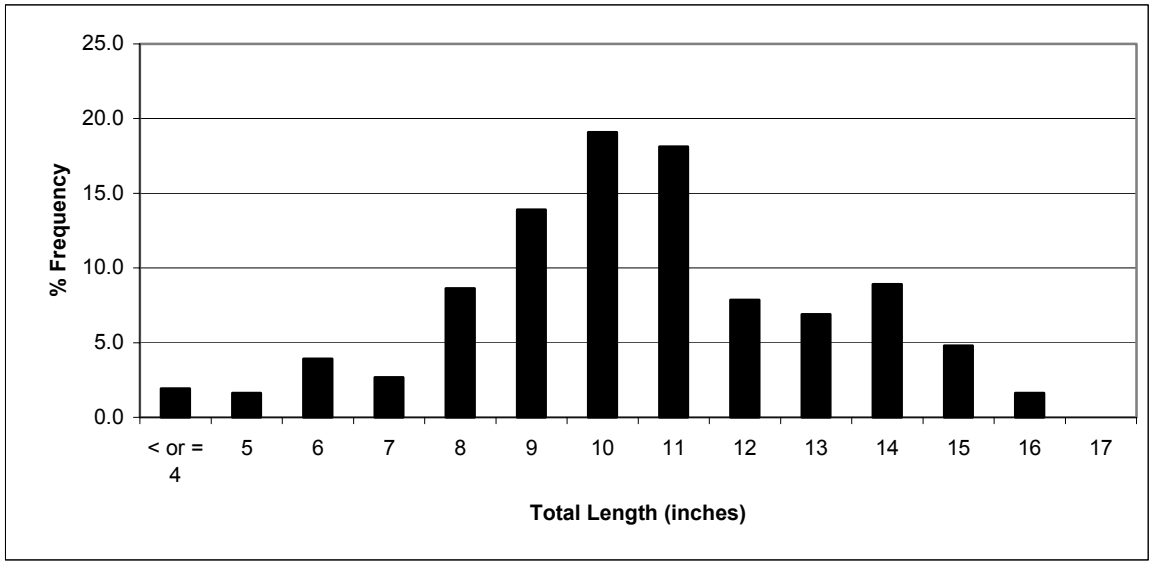


Figure 1.6A: Tautog Length Frequency Distribution, 2006

Total Length (inches)	2006 Measurement Data Tautog		
	Freq	%Freq	%Cum
< or = 7	6	1.1	1.1
8	8	1.4	2.5
9	8	1.4	4.0
10	11	2.0	5.9
11	13	2.3	8.2
12	73	13.0	21.3
13	47	8.4	29.7
14	42	7.5	37.2
15	51	9.1	46.3
16	52	9.3	55.6
17	51	9.1	64.7
18	54	9.6	74.3
19	62	11.1	85.4
20	27	4.8	90.2
21	20	3.6	93.8
22	12	2.1	95.9
23	12	2.1	98.1
24	8	1.4	99.5
25	2	0.4	99.9
26	1	0.2	100.0
27	0	0.0	100.0
Total	560	100	

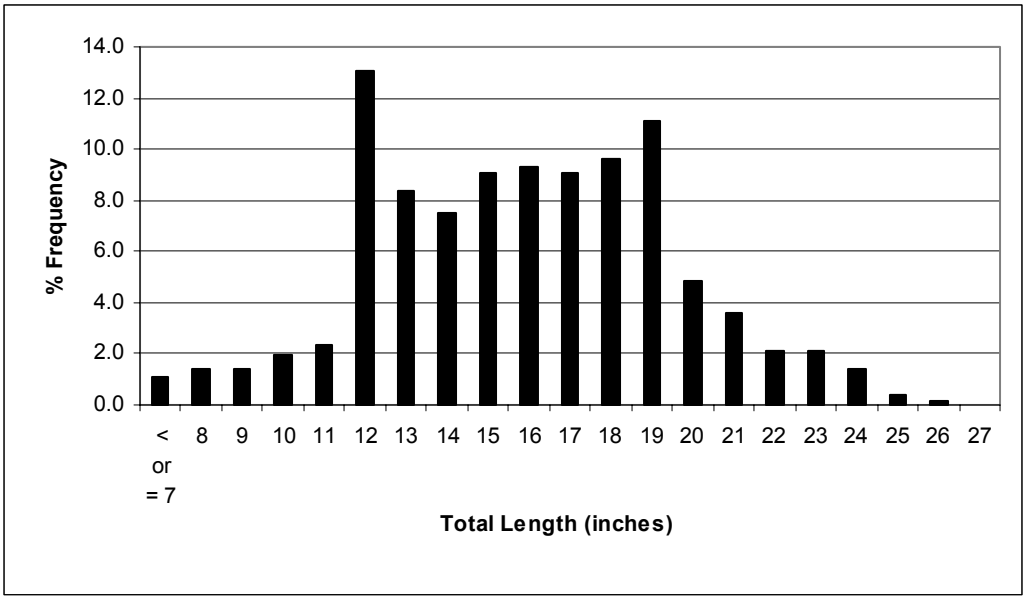
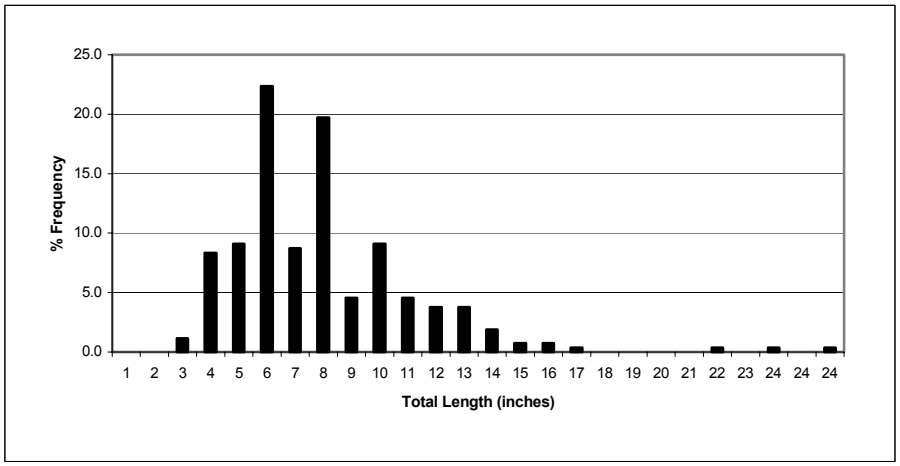


Figure 1.7A: Black Sea Bass Length Frequency Distribution, 2006

Total Length (inches)	2006 Measurement Data Black Sea Bass		
	Freq	%Freq	%Cum
1	0	0.0	0.0
2	0	0.0	0.0
3	3	1.1	1.1
4	22	8.3	9.5
5	24	9.1	18.6
6	59	22.3	40.9
7	23	8.7	49.6
8	52	19.7	69.3
9	12	4.5	73.9
10	24	9.1	83.0
11	12	4.5	87.5
12	10	3.8	91.3
13	10	3.8	95.1
14	5	1.9	97.0
15	2	0.8	97.7
16	2	0.8	98.5
17	1	0.4	98.9
18	0	0.0	98.9
19	0	0.0	98.9
20	0	0.0	98.9
21	0	0.0	98.9
22	1	0.4	99.2
23	0	0.0	99.2
24	1	0.4	99.6
24	0	0.0	99.6
24	1	0.4	100.0
Total	264	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

Length Measurement Information

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

JOB 2: MARINE FINFISH SURVEY

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

Part 2: **Estuarine Seine Survey**

PART 1: LONG ISLAND SOUND TRAWL SURVEY

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

CRUISE RESULTS FROM THE 2006 SPRING & FALL SURVEYS

STUDY PERIOD AND AREA

The Connecticut Division of Marine Fisheries completed twenty-three years of bottom trawl surveys in 2006. The Long Island Sound Trawl Survey encompasses an area from New London, Connecticut 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 2006 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 the 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 LISTS. 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. And finally, 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 species of herrings. 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. Additionally, rarely occurring species (totaling less than 30 fish/year each) are now measured. 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, will be discussed in a separate section of this report (see 'Narrows') following the 'Modifications' section.

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 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 (to the nearest 0.1 kg) in aggregate 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 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 60 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 (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 2.7, 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:

$$\text{Transformed variable} = \ln(\text{variable}+1).$$

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

$$\text{geometric mean} = \exp(\text{mean})-1.$$

The geometric mean count per tow was calculated from 1984 - 2006 for 38 finfish species, lobster, and long-finned squid (1986 - 2006). 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 2006, Table 2.29). 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 1979).

- **Scup**. An index-at-age matrix was developed for 1984-2006 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 8,136 scup aged between 1984 and 2006 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 2006 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. A total of 5,308 tautog were aged from 1984 to 2004, however only the 4,266 samples from April, May, June, September and October (standard LISTS months) were used to make year and season specific age-length keys (1 cm intervals). Tautog collected in 2005-2006 have been aged, however, a second reading is currently underway because of staff changes in readers, therefore, length frequencies was converted to an age frequency using a pooled age key for these two years. Since the length frequency of tautog collected in LISTS is sparse for fish greater than 60 cm in length and the age determinations are so varied, all fish 60 cm or greater were assigned a length of 60 cm. The final index-at-age was computed as the sum of the spring and fall indices-at-age. Finally, due to the paucity of tautog older than age 20 in LISTS catches, an age 20+ group is calculated by summing indices for ages 20 and up.

- **Weakfish**. Age 0 and age 1+ indices were calculated for both spring and fall surveys, 1984 - 2006. 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 2006, Table 2.42), 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 1984-2006 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 16,960 winter flounder aged between 1984 and 2006 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 2006 Spring and Fall Surveys

The spring survey normally starts during the second week of April each year. The 2006 spring survey was delayed due to several interruptions in rebuilding the main engine on the R/V John Dempsey. The research vessel was hauled in early January and unforeseen problems were encountered after the engine was dismantled and issues with parts availability were encountered. The April cruise was canceled due to these delays, however the May cruise commenced at the normal time on the 10th of the month. This cruise took 11 days to complete and finished on the 31stof May. The June cruise commenced on the 13th of June and finished on the 26th after nine sampling days. Without the April cruise in 2006, only 80 LISTS tows and 6 Narrows tows were completed during the spring survey (Table 2.4, and 2.53). A map for the May and June survey showing the sites selected and sites sampled is provided in Figure 2.2 and 2.3. These figures provide a short description if a site had to be relocated and the reasons why. Two samples were relocated in both the May and June surveys. Additional site information is provided in Table 2.5 (May) and Table 2.6 (June) including date of sample, time, tow duration, latitude/longitude, and surface and bottom temperature and salinity. Spring Narrows sampling information is additionally provided at the bottom of each of the respective figures and tables.

The R/V John Dempsey encountered further mechanical problems during the fall of 2006, which interrupted the sampling schedule again. Twenty tows were completed between September 6th and 11th. After completing the fourth tow of the day on September 11th the hydraulic power take off broke down. Again, parts availability and rebuilding the PTO delayed sampling until October 2nd when sampling was resumed. The remaining twenty tows were completed by the 12th, and finished up the 40 tows per cruise site selection that was started in September. Three Narrows tows were also completed on October 4th. The sites selected for October were never started because of a scheduled haul-out for sand blasting and painting of the hull and installation of a bow thruster. A map for the September-October sampling is provided in Figure 2.4 and sample information provided in Table 2.7.

This year we have provided a list of samples where duration of a tow was less than the

standard 30 minutes, including the reason why that particular tow was interrupted (Table 2.8). Six tows in May were less than the standard thirty minutes; five LISTS tows and one Narrows tow in June were also cut short in duration. There were six short tows in the fall and one of the three Narrows tows was also stopped short. Typical reasons for short tows less than the thirty minute standard is either lack of room at a particular location because of observed pots in a tow lane, or a drop in speed of the vessel because of gear interactions (lobster pots) or other debris in the net, or a complete stop because of a hang (a wreck or rock pile). Survey crew will often attempt to finish an interrupted tow by resetting beyond the obstruction or observed gear and completing the thirty minutes, however, oftentimes this isn't possible and sites will be moved to similar strata as close to the aborted tow as possible. Typically, a minimum of fifteen minute tow duration is required for the LISTS survey and a minimum of 10 minutes duration for the Narrows survey, with some exceptions. Two such exceptions occurred in 2006; one on May 19th (SP2006028 - 12 minutes) and another during the last tow of the year, October 14th (FA2006040 – 9 minutes).

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 2.9 illustrates many of the organizations that requested data in 2006 while Table 2.10 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

Forty-nine finfish species were observed in 2006 and no new species were caught (Table 2.11). From 1984 to 2006, ninety-six species were identified (Appendix 2.1), averaging 58 species per year with a range of 49 to 70 species (Fig 2.5). In addition, a total of thirty-eight types of invertebrates were collected in 2006 (Table 2.12). 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 (1984-2006) 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 92,042 finfish weighing 10,500.2 kg were sampled in 2006 (Table 2.13). In seventeen out of the last twenty-three years butterfish has been the highest-ranking finfish (numbers) in LISTS. In 2006, butterfish ranked first in numbers but second in weight, with 50,022 individuals weighing 1,631.4 kg. Scup (porgy) ranked second in number, with 28,829 individuals and first in weight for the year (4,636.1 kg). Bluefish ranked third by number (2,100 fish), but sixth by weight. During the previous seven years weakfish had been the third most

dominant species by number with good catches of juveniles during fall sampling, however, in 2006 only 241 individuals (ranked 17th) were recorded. Winter flounder (1,699 fish) ranked fourth numerically and bay anchovy (1,492) ranked fifth this year. Smooth dogfish ranked third in weight for the second year in a row with 1,176.6 kg followed by striped bass 418.7 kg. Together the top five species, accounted for 91.4 % of total numbers of finfish and 65.8% of total weight. The top two species (by weight), butterfish and scup, accounted for about 59.7% of the total biomass.

Scup topped the spring catches with 18,293 fish and accounted for almost half of the total catch and more than half (53.6%) of the spring biomass (Table 2.14). Scup catches this spring were the forth highest in the time series and the 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 11-12 cm, 18 cm, and 29-30 cm (Table 2.40). Butterfish were the second most abundant fish taken with 10,914 fish (579.1 kg) being observed in the May and June samples. Winter flounder, most likely undersampled in 2006 because of the lack of April sampling, nonetheless was ranked third with 1,591 fish (262.3 kg) being recorded. 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. The second highest biomass recorded in spring 2006 was from 256 smooth dogfish at 818.7 kg followed by butterfish.

The fall survey in 2006 differed from the previous five years in that few weakfish were seen in the catches. Weakfish typically rank second behind butterfish in recent years, but only 215 fish were seen in the fall survey in 2006 (Table 2.14). This dropped the weakfish rank to seventh. In twenty-one out of twenty-three years butterfish have ranked first. This past fall there were 39,108 butterfish (1,052.3 kg) recorded and 10,536 scup (806.9 kg). Scup ranked second in both number and biomass followed by bluefish in number with 2,062 fish (316.5 kg). Smooth dogfish again ranked high in biomass (3rd) with 357.9 kg from 76 individuals. Bay anchovy, moonfish, and windowpane flounder were the forth, fifth and sixth most abundant species during the fall period with 534, 361, and 232 fish respectively. The top three species by count; butterfish, scup and bluefish, made up 95.4% of the total catch in numbers and 64.8% of the biomass for this survey.

A total of 1,002.6 kg of invertebrates were taken in 2006 (Table 2.13). Long-finned squid (326 kg), horseshoe crab (205.8 kg) and American Lobster (197.9 kg) were the top three species in biomass. These three species accounted for 72.7% of the biomass. Seven hundred and forty eight (748) lobsters were recorded in the forty fall tows along with 7,802 long-finned squid and 109 horseshoe crabs. Boring sponge (51.3 kg) and spider crab (50.6 kg) were the forth and fifth most dominant invertebrate species by weight.

The total catch of invertebrates taken in the spring was 534.4 kg (Table 2.15). Long-finned squid had record spring abundance (11.55 squid/tow, Table 2.16) in 2006 with 1,763 squid caught. Long-finned squid ranked first by weight during the spring and accounted for 35.0% of the spring biomass followed by American lobster (28.6% or 152.9 kg). American lobster abundance was at a record low this past spring and only 562 were caught in the eighty tows conducted. Horseshoe crab (11.1% or 59.4 kg) and spider crab (8.4% or 44.9 kg) ranked third and forth, respectively, for this survey. Horseshoe crab biomass (146.4 kg) for the fall

survey topped the list with 31.3%, followed by long-finned squid (139.0 kg) with 29.7% of the total biomass. American lobster abundance for the second fall in a row was at a time series low, dropping another 30% this past fall. Boring sponge ranked forth with 40.4 kg. These top four species represent 79.2% of total invertebrate biomass in fall survey.

Length Frequencies

Length frequency tables are provided primarily to give the reader an understanding of the size range of these species taken in LISTS. Lengths are converted to age frequencies for analysis of principal species such as scup, bluefish, striped bass, summer flounder, tautog, winter flounder, and weakfish. Changes such as an expansion in the size (age) range for some important recreational species are apparent in recent years including more large scup (Table 2.40-2.41), summer flounder (Table 2.44-2.45), and striped bass (Table 2.42-2.43).

Length frequencies were prepared for 19 species:

alewife	spring and fall	1989 - 2006	Table 2.28;
American shad	spring and fall	1989 - 2006	Table 2.29;
Atlantic herring	spring and fall	1989 - 2006	Table 2.30;
Atlantic menhaden	fall	1996 - 2006	Table 2.31;
black sea bass	spring	1987 – 2006	Table 2.32;
blueback herring	spring and fall	1989 - 2006	Table 2.33;
bluefish	spring and fall	1984 - 2006	Table 2.34, Table 2.35;
butterfish	fall	1986 - 1990, 1992 - 2006	Table 2.36;
fourspot flounder	spring and fall	1989 - 1990, 1996 - 2006	Table 2.37;
hickory shad	spring and fall	1991 - 2006	Table 2.38;
long-finned squid	spring and fall	1986 - 1990, 1992 - 2006	Table 2.39;
scup	spring and fall	1984 - 2006	Table 2.40, Table 2.41;
striped bass	spring and fall	1984 - 2006	Table 2.42, Table 2.43;
summer flounder	spring and fall	1984 - 2006	Table 2.44, Table 2.45;
tautog	spring	1984 - 2006	Table 2.46;
weakfish	spring and fall	1984 - 2006	Table 2.47, Table 2.48;
windowpane flounder	spring	1989, 1990, 1994 - 2006	Table 2.49;
winter flounder	April-May and fall	1984 - 2006	Table 2.50, Table 2.51;
winter skate	spring	1995 - 2006	Table 2.52.

For the years where length data are available, length frequencies were prepared for the seasons or months for which the preferred indices of abundance and catch-at-age matrices are calculated; for some species length frequencies are provided for both seasons.

Seasonal Indices of Abundance

The geometric mean count per tow was calculated from 1984-2006 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 2.16 (spring) and 2.17 (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 2.18 and 2.19,

respectively). Age specific indices of abundance were calculated for specific important recreational species, including scup, striped bass, summer flounder, tautog, 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 2.6 through 2.11. These figures also include plots of each of the age specific indices and recruitment indices mentioned above. Figure 2.12 provides plots of abundance (biomass) indices for crabs (1992-2006), American lobster (1984-2006), and long-finned squid (1986-2006).

Atlantic Sturgeon (fall, numbers per tow) and squid (spring, numbers per tow) were the only two species that are at recorded high abundance in 2006. Hickory shad were again abundant in Long Island Sound this past fall, dropping slightly from record highs in 2005. Several species were at record low or near record low abundance for both the spring and fall surveys. This includes seven spring species (i.e. where the spring survey provides better estimates of overall abundance); cunner, winter flounder, American lobster (spring and fall are both good estimates), fourbeard rockling, longhorn sculpin, sea raven, and little skate. Two other species, fourspot flounder and windowpane flounder, currently are at the second lowest abundance in the time series following their respective minimums in 2005. Atlantic herring additionally is listed as the second lowest abundance and has been below average for the past nine years. Four species having the preferred index during the fall have logged their respective lows in 2006. These species include; northern kingfish, American lobster, Spanish mackerel and American shad. In addition, striped searobin and weakfish are at near record lows; both recorded the second lowest value in their respective time series during 2006.

The absence of April data should be considered while analyzing spring 2006 catch and abundance information for various species since total catch and abundance could be skewed in one direction or the other. For example, long-finned squid abundance this past spring was at a record high abundance of 11.55 squid per tow. Squid do not show in LISTS catches typically until May and June, as noted with only 30 squid being taken in April since 2000, thus, not including the 40 April samples in the calculation will produce a unusually high estimate for this species. Calculating squid abundance and assuming no April catch in the time series produces an index of 4.40 squid per tow or slightly below average spring abundance. The other extreme is observed with two other species such as longhorn sculpin and sea raven that have the highest percent occurrence in April (Gottschall et. el., 2000). These two species indices were at a time series low in 2006, probably because no sampling occurred while they were still present in the Sound. The history of survey sampling intensity by month is presented in Table 2.4.

Indices of Abundance: Important Recreational Species

Spring and fall abundance indices are presented in Tables 2.16-2.17. Indices of abundance at age were also calculated for seven important recreational species: bluefish (Table 2.20), scup (Table 2.21), striped bass (Table 2.22 age frequency, Table 2.23 index at age), summer flounder (Table 2.24), tautog (Table 2.25), weakfish (Table 2.26) and winter flounder (Table 2.27). 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 a portion of the spring survey (April-May). Two hundred and eighty–six (286) winter flounder collected and aged from LISTS 2006 were used for development of the age key and age matrix. Indices-at-age for tautog

are based on a combination of the spring and fall surveys and a pooled age key was used for the catch-at-age matrix (see methods). Both scup and weakfish indices-at-age are calculated and presented separately for each season. Five-hundred and seven scup were collected and aged in 2006 for use in age 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

The fall bluefish index dropped in 2005 to 18.89 fish/tow and again in 2006 to 15.66 fish/tow, after varying around the mean for the previous five years (Table 2.17, Figure 2.6). Average overall abundance for the time series is 24.80 fish/tow, and like weakfish, this index is composed of a high percentage of young-of year individuals that roughly make up about 70% of the bluefish catch. The 2006 young–of-year index of 12.43 fish/tow is also currently below the series average (17.13 fish/tow, Table 2.20). Higher abundances of age 0 fish were observed in 1997-1999, however, for the last seven years abundances have been at or slightly below average. A sixty-eight percent (68%) drop in age 0 abundance occurred from the time series high (39.19/tow) in 1999 to 2006 (Table 2.20, Figure 2.6). Catches of age 1+ fish this past season (2.14 fish/tow) dropped sharply from a 21-year record high abundance (in numbers) and the second highest biomass index of age 1+ fish 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 increased to just above average levels in 1985 (3.56 fish/tow) then decreased steadily by 54% to 1.92 fish/tow in 1989. For the next three years, a large increase nearing record abundance levels was observed in 1992 (8.44/tow). The following seven years marked a declining trend to less than 76% of average and the lowest abundance recorded in 1999.

Scup

Scup abundance indices have increased by nearly an order of magnitude since about 1998 (Table 2.17, Figure 2.9). However, since 1999 abundance has been highly variable and changing between roughly 143 to 343 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 297 fish/tow, almost than six times the pre-1998 average. High numbers of fish per tow result primarily from strong young-of year indices (1999-2002, 2004-2005), as high as 498 fish/tow in 1999 (Table 2.21). 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 6.

Another very strong young-of-year index was recorded in 2005; the second highest in the time series. This cohort followed through in 2006 to the second highest age 1 index in the time series (51.02 fish/tow). Age two abundance in 2006, similarly, had an above average index with 9.52 fish/tow, however, for all older scup, with the exception of age 7, indices have dropped in the last 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 is well 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.

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 in 2006 are currently at the second highest abundance observed at 40.57 fish/tow (Table 2.21, Figure 2.9). Additionally, this past year, ages 6 through 9 are at record high abundance for springtime sampling.

Striped bass

Similar to scup, striped bass abundance in recent years has been highly variable. Three of the highest abundances were recorded during the spring of 1999, 2002, and 2005 (Table 2.16, Figure 2.11). Abundance during the first six years of the survey was relatively small, 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 'jumpy' indices (indices that jump up or down 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. Currently, catch in numbers per tow dropped from the second highest in LISTS during 2005 (1.17 fish/tow) to ninth this past season (0.61 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 2006, the age structure was comprised predominately of three (25.8%), four (15.5%) and five year old fish (22.7) (Table 2.23). All indices-at-age for ages three through eleven in 2006 were above the respective averages for the time series. Contrary to the spring catch, LISTS fall sampling during 2006 produced a substantially higher index than a year earlier and is currently at second highest rank with 0.47 fish/tow (Table 2.17). Average fall abundance is 0.17 fish/tow for the series and 0.33 fish/tow in 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 (1.89 fish/tow) for nine out of the last twelve years. Fewer summer flounder were seen in 2006 this past year (1.35 fish/tow) as the index dropped below the long-term average for the first time in eight years (Table 2.17, Figure 2.7). 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 then increased in 2001 to 4.42 fish/tow. Summer flounder fall abundance peaked at 6.12 fish/tow in 2002 then 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 (and is currently below the series average), 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 and an index that exceeded the fall numbers. Spring abundance generally follows the same trend as the fall, with decreasing abundance in the last few years to a level that has dropped below the long-term average. Abundance during spring sampling is now reminiscent of the early nineties with the exception of older fish being seen in the catch in recent years.

Spring 2006 indices-at-age for age one through three dropped this year with each index being below the time series average (Table 2.24). Nonetheless, the one through three year old fish comprised 76% of the springtime catch in 2006. Age four fish during the spring are about average for the time series and age five and older fish are all above average. Fall indices-at-age showed an increase in young-of year fish this year with 0.98 fish/tow but dropped for ages 1 (0.22 fish/tow, ave 0.90 fish/tow) and age 2 (0.59 fish/tow, ave 0.66 fish/tow). Abundance for age one fish hasn't been this low since 1989 and, similarly, age two indices haven't been this low since 1995. LISTS is however still capturing some older fish as age 3 and older are all above the respective averages during the fall. This past fall, age one comprised 16.5%, of the catch while age two was 45%, and age three was 17.5% of the catch. The young-of-year summer flounder index (7.4% of the catch) 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 2.24). The length frequency distributions in Table 2.44 (spring) and Table 2.45 (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).

Tautog

Tautog abundance has remained low for thirteen out of the last fourteen years. Tautog underwent a long-term decline from 1984 (2.75/tow) to 1995 (0.15/tow) and, although there was a gradual increasing trend from 1999 to 2002 up to average levels (0.79/tow), the last four years have remained about 28% below average (Table 2.16, Figure 2.8). The 2006 abundance index is 0.64 fish per tow; up slightly from 2005. Although the fall is not considered the preferred index, the fall abundance this year (0.20/tow) was similar to the spring in that it was 17% below the time series average (Table 2.17). The 2006 indices-at-age for all but age one, and ages four through six were below their respective averages for the time series (Table 2.25). This differed from just two years earlier when none were above their respective calculated averages. Tautog indices-at-age do not track age classes well because of low Survey catch and the overlap of ages at length. Another factor obscuring the catch-at-age matrix is that the age at full recruitment to both the survey gear and the fishery varies between ages 5 and 9 for this species (Johnson and Gottschall, 1999).

Weakfish

One of the most significant changes in abundance seen during the 2006 fall survey was with weakfish. A ninety-four percent (94%) drop in abundance (1.50 fish/tow, Table 2.17) was recorded this fall, mostly from the age 0 weakfish being absent from LISTS catches (Table 2.26). Age 0 weakfish usually dominate the overall index and have been very abundant in the fall over the last seven years. Although weakfish young-of-year abundances had been high from 1999-2004 (Table 2.26, Figure 2.11), the abundance dropped by more than 50% in 2005 and again this

year to only 5.5% of the 1984-2005 mean (18.94/tow). A strong year class in 2000 drove the overall index to double, reaching a record 63.42 fish per tow. Although the next year class in 2001 caused the overall index to drop to 40.51 fish/tow, abundance for the following three years saw moderate increases up to the second most abundant year, reaching 59.07 fish/tow in 2004 (Tables 2.17 and 2.26, Figure 2.11). The Age 0 catches between 1999 and 2004 ranged from 30.93 fish/tow (1999) to 63.31 fish /tow (2000) and are 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). Similarly, springtime abundance of age 1+ weakfish had remained at roughly three times higher than the average (1997-1999) before declining to 0.04 fish/tow in 2003 (the lowest since 1994). This past spring, LISTS again recorded about average abundance at 0.14 fish/tow.

Winter Flounder

Winter flounder generally has had a decreasing trend in abundance since 1996. LISTS has seen lower than normal catches in thirteen of the last fifteen years. The overall winter flounder spring (April-June) index for 2006 (7.50/tow) is the lowest in twenty-three years of LISTS sampling and is currently only 11% of the long term mean of 66.67/tow (Table 2.16). Average catches for the first ten years of the survey were 94 winter flounder per standard tow. A customized winter flounder index (Table 2.27) that uses aged fish from April and May samples (used to develop indices of abundance at age) is at a historic low with only 5.59 fish/tow being recorded. This index fell for the fifth straight year in 2006. This season's index is the eighth year of low abundance (Table 2.27, Figure 2.7) 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). This was followed by increasing abundance for the next four years to the height of winter flounder abundance in 1990 (223.09/tow). This period of high winter flounder abundance was short lived as abundance 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.

Only the age-0 index, obtained from the Estuarine Seine Survey (Job 2, Part 2), shows a notable increase in abundance between 2003 and 2005. However, this also was short lived as the 2006 index of 0.74 fish per haul is now at a minimum for the nineteen-year time series. 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. This year that index dropped to only 11.5% of average fish per haul for this survey. The single notable increase from mature fish this year comes from age three fish (up 30% to 1.10 fish per tow) originating from the 2003 year class. This year class also produced an increase in age 2 fish in 2005 (59%) and age 1 fish in 2004 (156%). The LISTS age 4+ winter flounder index, however, continues to fall and is currently at 0.74 fish per tow. The age 4+ abundance currently is at the lowest level in the twenty-three years of the survey and for the past five years, the age 4+ indices have deteriorated to less than 10 fish per tow. 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.

NARROWS

Methods

The sample design in the Narrows relies upon stratified fixed sites. Initially sites were randomly selected by strata, however, this approach was modified in favor of fixed sites. Typically, this area is so heavily fished by lobstermen that there isn't sufficient area free of pot gear in which to tow the research trawl. In an attempt to reduce gear conflicts and avoid known bottom hangs while still representatively sampling this relatively small area (approximately 240 km^2), site selection evolved from ten stratified random sites during the spring of 2000 to six fixed sites starting in the fall of 2000. Six sites yield a sampling intensity of about one site per 40 km^2, which is a higher sampling intensity than LISTS (1:68 km^2). Five years of sampling in the Narrows showed comparable overall species richness and abundances in the Narrows as compared to LISTS (Gottschall and Pacileo 2005), therefore, since 2005 the number of sites to be sampled in the Narrows has been reduced to three sites per month with a resultant sampling intensity of 1:80 km^2.

Sampling gear and procedures for the Narrows survey are the same as described for LISTS with one exception, all finfish species collected in the Narrows samples are measured. Although data for these additional sites in the Narrows are collected and analyzed in the same manner as for the LISTS sites, the data are managed and analyzed separately to maintain consistency within the LISTS database.

To compare finfish abundance in the Narrows to other areas of the Sound with similar habitat characteristics, a micro-habitat analysis was initiated using statistical (SAS) and geographic (ESRI ArcView) software to analyze the substrate type underlying the actual path of the research vessel for all LISTS and Narrows tows where continuous position information was recorded. In 1984, when the Long Island Sound Trawl Survey (LISTS) strata designations were developed, the initial bottom type designation for each 1x2 n.mi. site box in the LISTS site grid was based on information from Reid et al. (1979). The same interpretation of the sediment data published in 1979 was used to assign bottom types for the Narrows site boxes in 1999. This micro-habitat analysis will rely on updated sediment information (Poppe et al. 2000) to determine bottom types along the actual towpath for each sample. Data files were converted into geographic information system (GIS) layers and new sediment types assigned following procedures described in Gottschall and Pacileo (2006).

Results and Discussion

Summary of Catches in Narrows

During 2006, 9 tows were conducted at three fixed sites in the far western section of Long Island Sound known as the Narrows (Table 2.53). The Narrows were sampled each month of the standard LISTS (May, June, and September), generally after the standard sample sites for each month's cruise had been completed. As explained previously, neither April nor October sampling was conducted this year (see Overview of LISTS 2006 Spring and Fall Surveys section in this report).

Twenty-seven (26) finfish and 16 invertebrate species were captured from the Narrows (Table 2.54). Butterfish was the most abundant finfish by number (12,977) and by weight (438.3

kg). Scup was the second most abundant by number (2,852) and by weight (359.5 kg). Combined, these two species accounted for 89% of the catch by number and 68.6% of the biomass. During the spring, 29 species were observed and a total of 2,817 fish (659.6 kg) were captured, whereas, during the fall, 21 finfish species were observed and a total of 20,443 finfish (538.0 kg) were captured (Table 2.55). Spring catches were dominated by Atlantic herring, winter flounder and butterfish (74.9% of the catch by number) and striped bass accounted for most of the biomass even though only 131 were caught. By comparison, scup dominated the fall catches by number (77.6%) and weight (42.6%).

The bulk of the invertebrate biomass recorded in the Narrows in 2006 was horseshoe crabs (20 crabs, 43.5% of the catch by weight). Although more American lobsters were caught (41), they only accounted for 11.5% of the invertebrate biomass. Since regular sampling began in the Narrows in 2000, horseshoe crab and American lobster have been the two most abundant invertebrate species (by weight), except in 2006. This past year, although horseshoe crab was still the most abundant invertebrate, lobster abundance only ranked fourth. Long-finned squid, typically one of the top two invertebrate species by number, was the most abundant invertebrate by number (304) again in 2006, even though it accounted for a small amount of the biomass (9.7%). When the catch is broken out by season, we can see that both lobster and horseshoe crab abundance in the spring fell below the biomass recorded for rock crab and hydroid *spp*. in 2006 (Table 2.56). Fall catches were dominated by horseshoe crab and long-finned squid, accounting for 94.4% of the biomass.

Species richness (measured as the mean number of species per tow) is one way to compare general ecosystem health for the Narrows with the rest of Long Island Sound if one equates diversity with a healthy ecosystem. The general trends described previously (Gottschall and Pacileo, 2007, and Gottschall and Pacileo, 2006) continued in 2006. Overall, the species richness values were fairly similar, both among years and between surveys (Table 2.57). When the lobster die-off occurred in the late 1990's, there was concern that whatever factors had reduced lobster abundance would disproportionately affect the Narrows. There is little indication of reduced finfish species richness in the Narrows versus the rest of the Sound. In fact, in six of the past seven spring surveys (86%), and four of seven fall surveys (57%), finfish species richness has been slightly greater in the Narrows than in LISTS samples. On the other hand, invertebrate species richness tends to be lower at Narrows sites than in the rest of the Sound, particularly in the fall (only once in seven years has the invertebrate diversity been higher in the Narrows in the fall). Finfish species richness is generally higher in the fall for both surveys. However, invertebrate species diversity, while usually higher in the fall for the LISTS survey, was lower in the fall Narrows survey for five of the seven years (71%). Lower species richness during the fall in the Narrows may be hypoxia related. Kaputa and Olsen (2000) documented dissolved oxygen concentrations decline from east to west in LIS, with the lowest levels occurring in the Narrows in the late summer.

For the majority of finfish species monitored with indices of abundance (geometric mean count/tow) in LISTS, springtime abundance trends for the time series (2000-2006) have been similar between the LISTS and Narrows surveys (Tables 2.16 and 2.58, respectively). For example, tautog indices show virtually the same pattern of increasing abundance (2000-2002), followed by a decline in 2003 and then some slight improvement to 2005. Black sea bass is another example of similar abundance patterns in the two surveys, with an increase 2000-2002, followed by a decline in 2003. Since 2003, however, abundance has continued to drop in LISTS

while remaining steady in Narrows. Other species show similar patterns in the indices but are more abundant in the Narrows than in LISTS; namely cunner, fourspot flounder and fourbeard rockling. The species that tend to have higher indices in LISTS are also those that tend to be caught in the eastern part of LIS during April-June LISTS sampling, such as northern searobin, little skate, spiny dogfish and sea raven. One species with a notable difference in abundance trends between the surveys is winter flounder. Although the LISTS index was higher than Narrows in 2000, since then winter flounder have declined continuously in LISTS (2001-2006) while indices have increased fourfold in the Narrows.

Indices of abundance for finfish in the fall tend to be higher in Narrows than in LISTS (Tables 2.58 and 2.17, respectively). This is true for bluefish, butterfish, spotted hake, menhaden, moonfish, striped searobin, scup and weakfish. For a couple species, fall indices of abundance are higher in LISTS but still show similar trends as the indices in Narrows. Examples would be smooth dogfish, summer flounder, blueback herring (except for 2005), hogchocker, and squid. One notable difference between fall indices in the Narrows versus indices in LISTS is the higher frequency of unusually large indices in some years, although this may be an artifact of the much smaller sample size in the Narrows (3-12 tows/yr) as compared to LISTS (40-80 tow/yr).

Seasonal biomass indices (geometric mean kg per tow) for a number of invertebrate species (Tables 2.18-2.19 and 2.60, for LISTS and Narrows data, respectively) show similar trends in abundance for many species. Of particular interest is whether epibenthic invertebrates (like lobsters and crabs) show similar trends between the surveys (Figure 2.13). Although individual annual index values vary a bit, the overall trends in American lobster biomass indices have shown a marked decline in both Spring Surveys (2000-2006) by a factor of 4.6; from 3.90 kg/tow to 0.84 kg/tow in LISTS (Table 2.18) and from 4.06 kg/tow to 0.88 kg/tow in Narrows (Table 2.60). Fall lobster indices have also followed the same declining trend of roughly the same magnitude in both surveys, except for two years (2003-2004) when the biomass per tow recorded in the Narrows showed a promising increase that was short-lived (Tables 2.19 and 2.60 for LISTS and Narrows data, respectively). Blue crab abundance (2000-2006) has been relatively low and stable in the spring in both LISTS (0.0-0.04kg/tow, 2000-2006) and Narrows surveys (0.0-0.03 kg/tow) except for one increase in Narrows 2002 to 0.08 kg/tow. In the fall, the Surveys again show similar trends, albeit decreasing from highs in 2000 to consistently low levels 2003-2006. Spring spider crab indices also show some similarities between the Surveys; increasing from 2000-2004, then dropping sharply for 2005 & 2006. Rock crab indices are quite similar for the spring 2000-2005 period but then show a divergence in 2006 with abundance increasing threefold to its highest level in the Narrows but remaining low in LISTS. Fall biomass indices for rock crabs also show similar patterns between the Surveys from 2000 to 2004 but then diverge with abundance in the Narrows increasing substantially while abundance in LISTS remains low.

Micro-Habitat Analysis

New sediment types have been determined for all tows with usable position data (2000-2006) in both LISTS and Narrows surveys (resultant sample sizes of 1,279 tows and 166 tows, respectively). To determine whether the new sediment types will help explain more of the

variability in catches between LISTS and Narrows, analysis of variance procedures (SAS PROC GLM) were performed. The Duncan Multiple Range Test option was used to test for differences in mean natural log catches by different sediment classifications. Preliminary results for three species, American lobster, winter flounder and scup (porgy), are presented here.

Since American lobster is an epibenthic invertebrate, one would expect survey catches to be different over different bottom types, and in fact the difference between catches is significantly different over different bottom types. The Reid et al. (1979) sediment classifications for each site box account for roughly 35% of the variability in the standard LISTS catches ($P<0.0001$, $R^2=0.3473$, df=2,1278) versus only 7% of the variability in the Narrows catches ($P=0.0008$, $R^2=0.0659$, df=1,165). By comparison, the Poppe et al (2000) sediment classifications at three points along each towpath account for 33-39% of the variability in the catches ($P<0.0001$-0.02, $R^2=0.3264$-0.3895, df=6,1250) but show a much weaker relationship to the lobster catches in the Narrows ($P<0.0001$-0.1045, $R^2=0.0277$-0.2430, df=2,163). For the Reid classifications, a Duncan multiple range test ($p=0.05$) showed there are significant differences in the LISTS catches over each of three bottom types (mud, transition or sand) with the highest catches occurring over mud bottom and the lowest catches occurring over sand bottom. For the Poppe classifications, a Duncan multiple range test ($p=0.05$) showed more overlap between the mean LISTS catches over different bottom types with the softest three sediment types producing significantly higher catches than the hardest four sediment types.

Mean catches over different bottom types were also compared for winter flounder, a vertebrate with close association with the bottom and, consequently, one would expect to see significant differences in the catches of winter flounder related to bottom type. However, the Reid sediment classifications account for roughly 10% of the variability in the standard LISTS catches ($P<0.0001$, $R^2=0.1035$, df=2,1278) and were not significantly related to variablity in the Narrows catches ($P=0.6351$, $R^2=0.0014$, df=1,165). By comparison, the Poppe sediment classifications account for only 7% of the variability in LISTS catches ($P<0.0001$, $R^2=0.0685$-0.0696, df=6,1250) and, similar to the Reid classifications, do not show a significant relationship to Narrows catches of winter flounder.

Similar statistical analyses for mean catches of scup (porgy) over different bottom types, using both Reid and Poppe classifications, were significant only for the Reid classifications in LISTS catches ($P<0.0001$, $R^2=0.0291$, df=2,1278). Tows over sand produced significantly less scup but there was no significant difference between tows over mud and transition bottom types. There were no significant relationships between the Poppe classifications and LISTS catches, nor between either classification method and Narrows catches of scup.

Relationships between catch and bottom sediment types are expected to be very species-specific and further analyses with additional specie are planned. Depth is also a large component of habitat utilization patterns and it is expected to have an impact on trawl survey catches. Future work will include assigning updated depth information to the same three points along each towpath that now have updated sediment types. Statistical procedures will be run against both updated depth and sediment type to determine to what extent these variables account for differences between LISTS and Narrows catches, or even if they account for more variability in the catches within a survey than the old sediment or depth classifications.

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TABLES 2.1 - 2.27
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 2006.

In addition to the species listed below, other rarely occurring species (totaling less than 30 fish/year each) were measured. During 2006, nineteen 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**
April	-	-	35	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
June	19	5	41	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	39	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
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	-
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**

Table 2.5. Station information for LISTS May 2006.

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. Average speed in May was not recorded due to malfunction with onboard laptop.

ample	Date	Site	Btm Type	Depth Int	Time	Duration	Ave Speed (knots)	Lat	Lon	S_Temp	S_Sal	B_Temp	B_Sal
SP2006001	5/10/2006	1428	T	1	8:18:00	30		41.2482	-72.5767	9.9	28.2	10.0	28.2
SP2006002	5/10/2006	1327	T	2	10:10:00	30		41.2263	-72.6505	10.0	28.1	10.0	21.8
SP2006003	5/10/2006	0925	T	4	11:57:00	30		41.1578	-72.7242	9.8	27.8	9.5	27.8
SP2006004	5/10/2006	0929	S	3	15:34:00	30		41.1580	-72.5845	10.1	28.1	9.8	28.3
SP2006005	5/10/2006	0629	S	4	17:11:00	30		41.1042	-72.5512	10.9	27.2	9.8	28.3
SP2006006	5/11/2006	0129	S	2	8:54:00	30		41.0287	-72.5652	10.9	26.9	10.3	27.3
SP2006007	5/11/2006	0128	T	2	10:18:00	30		41.0295	-72.5840	10.7	27.1	10.2	27.7
SP2006008	5/11/2006	5825	S	1	11:42:00	30		40.9800	-72.7348	11.7	26.6	9.4	27.2
SP2006009	5/11/2006	5824	S	1	12:46:00	30		40.9832	-72.7990	12.1	26.5	11.2	26.7
SP2006010	5/11/2006	0126	T	3	13:58:00	30		41.0232	-72.6895	10.5	27.3	9.6	27.6
SP2006011	5/15/2006	1840	T	1	9:23:00	30		41.2950	-72.0855	10.5	28.2	10.2	30.9
SP2006012	5/15/2006	1437	T	4	11:04:00	30		41.2460	-72.2185	10.6	28.1	10.1	30.3
SP2006013	5/15/2006	0830	S	4	12:53:00	30		41.1485	-72.4847	10.3	28.3	10.2	28.4
SP2006014	5/16/2006	1534	T	1	7:20:00	30		41.2527	-72.3755	10.5	27.1	10.4	28.3
SP2006015	5/16/2006	0528	S	3	9:27:00	30		41.0985	-72.5443	10.1	27.6	10.2	27.7
SP2006016	5/16/2006	0325	T	3	10:53:00	30		41.0652	-72.7055	10.6	26.8	8.9	27.5
SP2006017	5/16/2006	0924	T	3	12:32:00	30		41.1355	-72.7680	11.1	27.1	9.4	27.4
SP2006018	5/16/2006	1128	T	3	14:30:00	30		41.1842	-72.6403	10.9	21.8	10.3	27.8
SP2006019	5/17/2006	1026	T	4	9:22:00	30		41.1667	-72.7168	10.8	27.5	10.7	27.7
SP2006020	5/17/2006	0621	M	3	11:34:00	30		41.0977	-72.9043	11.4	27.0	10.0	27.5
SP2006021	5/17/2006	0921	M	2	12:46:00	30		41.1738	-72.8817	12.3	26.4	10.5	27.3
SP2006022	5/17/2006	0919	T	2	13:39:00	30		41.1623	-72.9380	12.4	26.1	10.6	27.2
SP2006023	5/18/2006	1118	M	1	8:01:00	30		41.1912	-73.0120	11.8	26.3	11.4	26.7
SP2006024	5/18/2006	1019	T	2	9:39:00	30		41.1628	-73.0377	11.8	25.7	11.3	26.9
SP2006025	5/18/2006	0820	M	3	11:14:00	30		41.1102	-72.9165	13.3	25.0	9.4	27.4
SP2006026	5/18/2006	1219	M	2	12:35:00	30		41.2112	-72.9623	12.7	26.4	11.4	26.9
SP2006027	5/18/2006	0717	M	2	13:53:00	30		41.1292	-73.0567	12.5	25.7	10.6	27.1
SP2006028	5/19/2006	0220	M	4	9:28:00	12		41.0480	-72.9118	13.7	24.9	9.0	27.4
SP2006029	5/19/2006	5918	M	3	11:09:00	30		40.9947	-72.9865	12.8	25.7	10.1	26.8
SP2006030	5/19/2006	5918	M	3	12:10:00	30		40.9850	-73.0627	13.6	25.3	10.8	26.6
SP2006031	5/24/2006	0015	T	4	9:20:00	19		40.9970	-73.1833	11.5	25.9	10.0	27.1
SP2006032	5/24/2006	0014	M	4	10:45:00	19		41.0103	-73.2103	12.2	26.1	10.0	27.1
SP2006033	5/24/2006	0114	M	4	12:58:00	25		41.0267	-73.1503	12.2	25.6	10.1	27.0
SP2006034	5/24/2006	0612	M	1	15:00:00	30		41.1010	-73.3157	11.7	26.5	11.4	26.5
SP2006035	5/25/2006	5709	S	2	15:25:00	30		40.9702	-73.4030	14.5	25.5	11.4	26.5
SP2006036	5/30/2006	0112	M	4	9:52:00	20		41.0240	-73.2452	17.1	25.8	10.9	26.9
SP2006037	5/30/2006	0110	T	3	11:47:00	30		41.0227	-73.3688	15.3	26.1	10.9	26.8
SP2006038	5/30/2006	5612	T	2	14:27:00	15		40.9497	-73.2298	16.0	26.0	12.1	26.3
SP2006039	5/31/2006	5912	M	3	9:57:00	30		40.9957	-73.2482	16.6	25.9	11.1	26.6
SP2006040	5/31/2006	0521	M	4	12:56:00	30		41.0882	-72.9172	16.2	26.8	11.7	27.3
LT2006001	5/25/2006	0007	M	3	9:59:00	30		41.0155	-73.4593	12.9	25.9	10.9	26.6
LT2006002	5/25/2006	5403	M	2	12:44:00	30		40.8990	-73.7030	14.0	24.8	11.3	26.4
LT2006003	5/25/2006	5505	T	2	13:59:00	30		40.9235	-73.5947	13.9	25.3	11.6	26.3

Table 2.6. Station information for LISTS June 2006.
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
SP2006041	6/13/2006	1738	T	2	7:50:00	30	2.7	41.2928	-72.1727	13.8	29.0	13.8	29.4
SP2006042	6/13/2006	1534	T	1	9:55:00	30	1.8	41.2590	-72.3665	14.0	26.1	14.0	27.2
SP2006043	6/13/2006	1332	S	1	12:09:00	30	3.0	41.2278	-72.4517	13.8	27.8	13.7	28.4
SP2006044	6/13/2006	0831	S	4	13:50:00	30	3.4	41.1332	-72.4968	15.1	27.5	13.4	28.5
SP2006045	6/13/2006	1235	T	4	15:24:00	30	4.1	41.2042	-72.3173	14.4	28.4	13.3	30.0
SP2006046	6/14/2006	0830	S	4	8:07:00	30	3.1	41.1475	-72.4832	16.0	26.5	13.9	28.0
SP2006047	6/14/2006	0531	T	3	9:30:00	30	4.0	41.0913	-72.4718	16.4	26.3	15.2	26.9
SP2006048	6/14/2006	0228	T	2	12:20:00	30	2.5	41.0347	-72.6352	16.9	26.2	15.1	26.8
SP2006049	6/14/2006	0429	T	3	13:32:00	30	2.9	41.0710	-72.5912	16.9	26.3	14.5	27.3
SP2006050	6/14/2006	0728	S	3	14:41:00	30	3.2	41.1172	-72.6143	14.6	27.5	14.3	27.6
SP2006051	6/15/2006	1428	T	1	8:10:00	30	3.2	41.2473	-72.5790	14.8	25.7	14.4	26.9
SP2006052	6/15/2006	1327	T	2	9:08:00	30	2.8	41.2263	-72.6537	14.9	27.0	14.8	27.1
SP2006053	6/15/2006	1127	T	3	10:26:00	30	3.7	41.1903	-72.6055	16.0	27.0	14.1	27.6
SP2006054	6/15/2006	1123	M	2	12:04:00	30	2.5	41.1807	-72.8470	15.7	26.8	13.9	26.9
SP2006055	6/15/2006	1025	T	3	13:15:00	18	2.3	41.1658	-72.7650	16.7	26.6	14.0	27.6
SP2006056	6/15/2006	0927	T	4	14:23:00	30	2.8	41.1557	-72.6727	16.4	26.7	14.2	27.4
SP2006057	6/16/2006	0627	S	3	8:45:00	30	2.7	41.1087	-72.6182	17.3	26.2	14.7	27.1
SP2006058	6/16/2006	0524	T	4	10:09:00	30	3.2	41.1010	-72.7423	17.4	26.4	13.9	27.6
SP2006059	6/16/2006	0423	M	4	11:33:00	30	2.8	41.0723	-72.8238	17.4	26.4	13.8	27.6
SP2006060	6/16/2006	0525	T	4	12:48:00	30	2.7	41.0875	-72.7587	17.9	26.5	14.0	27.5
SP2006061	6/16/2006	0527	T	3	14:00:00	30	2.7	41.0925	-72.6567	17.8	26.3	15.0	27.1
SP2006062	6/19/2006	0223	M	4	9:45:00	23	2.5	41.0407	-72.7957	17.9	26.0	13.8	27.3
SP2006063	6/19/2006	5823	S	1	11:00:00	30	2.8	40.9810	-72.7978	18.5	25.8	18.2	25.9
SP2006064	6/19/2006	0521	M	4	13:23:00	30	2.9	41.0872	-72.9187	18.2	26.0	14.2	27.1
SP2006065	6/19/2006	0522	M	4	14:37:00	30	3.5	41.1052	-72.8373	20.6	26.4	14.5	27.2
SP2006066	6/20/2006	1022	M	2	8:33:00	30	3.7	41.1735	-72.8812	16.6	26.8	14.6	27.0
SP2006067	6/20/2006	0823	M	3	10:34:00	20	3.3	41.1272	-72.8130	18.0	26.5	14.6	27.2
SP2006068	6/20/2006	0620	M	3	12:02:00	20	3.4	41.1107	-72.9512	18.8	26.5	14.4	27.1
SP2006069	6/20/2006	0617	T	2	13:29:00	30	3.4	41.1020	-73.0917	16.6	25.8	14.0	26.8
SP2006070	6/21/2006	0312	M	3	9:01:00	30	3.0	41.0645	-73.2417	19.1	25.7	14.4	26.7
SP2006071	6/21/2006	0211	T	2	10:01:00	30	2.8	41.0505	-73.3075	18.9	25.9	14.5	26.6
SP2006072	6/21/2006	5709	S	2	11:27:00	30	3.0	40.9667	-73.3340	19.1	25.7	14.3	26.6
SP2006073	6/21/2006	5911	M	3	13:19:00	30	3.2	40.9920	-73.3205	20.2	25.7	14.1	26.8
SP2006074	6/22/2006	5914	M	4	9:14:00	30	2.7	40.9940	-73.2028	20.2	25.9	14.1	27.0
SP2006075	6/22/2006	5513	S	2	11:04:00	30	3.3	40.9285	-73.2520	19.2	25.8	16.2	26.1
SP2006076	6/22/2006	5918	M	3	12:57:00	30	3.6	40.9853	-73.0363	20.1	25.8	14.5	27.0
SP2006077	6/26/2006	1320	M	1	8:43:00	30	2.8	41.2373	-72.9517	19.0	25.1	17.7	26.3
SP2006078	6/26/2006	1220	T	1	10:17:00	30	2.7	41.2117	-72.9548	18.8	26.1	16.2	26.7
SP2006079	6/26/2006	1118	M	1	11:39:00	30	3.5	41.1912	-73.0135	19.2	26.0	15.7	26.8
SP2006080	6/26/2006	0615	M	2	13:21:00	18	3.2	41.0950	-73.1973	19.1	25.4	15.0	26.5
LT2006004	6/27/2006	0007	M	3	9:54:00	15	3.2	41.0152	-73.4573	18.8	25.8	15.1	26.6
LT2006005	6/27/2006	5505	T	2	11:17:00	30	3.4	40.9315	-73.5430	18.4	25.5	17.0	25.9
LT2006006	6/27/2006	5403	M	2	13:11:00	30	3.2	40.8998	-73.7012	18.0	25.5	15.3	26.3

Table 2.7. Station information for LISTS September 2006.
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
FA2006001	9/6/2006	1437	T	4	8:57:00	30	1.7	41.2452	-72.2140	19.4	30.4	19.4	30.5
FA2006002	9/6/2006	1133	S	4	11:04:00	30	2.0	41.2000	-72.3475	19.6	29.4	19.6	30.2
FA2006003	9/6/2006	1333	S	1	12:20:00	30	1.3	41.2403	-72.3407	19.7	29.4	19.7	29.6
FA2006004	9/6/2006	1534	T	1	13:35:00	23	3.6	41.2590	-72.3553	19.9	28.3	19.9	28.5
FA2006005	9/6/2006	1533	S	1	15:25:00	30	3.4	41.2522	-72.3782	19.9	28.5	19.9	28.7
FA2006006	9/7/2006	0931	S	4	7:42:00	30	4.0	41.1617	-72.4382	20.1	29.1	20.1	29.2
FA2006007	9/7/2006	0429	T	3	9:18:00	30	4.1	41.0755	-72.5522	20.8	28.8	20.8	28.7
FA2006008	9/7/2006	0328	T	3	10:39:00	30	3.7	41.0590	-72.5903	21.4	28.4	21.0	28.7
FA2006009	9/7/2006	0327	T	3	11:54:00	30	3.5	41.0523	-72.6907	21.2	28.4	21.1	28.5
FA2006010	9/7/2006	0628	S	3	13:15:00	30	3.9	41.1053	-72.6163	21.0	28.7	20.9	28.8
FA2006011	9/7/2006	0729	S	3	14:13:00	30	4.0	41.1155	-72.5760	21.6	28.7	20.8	28.8
FA2006012	9/8/2006	1433	S	2	7:17:00	30	4.3	41.2450	-72.3572	19.9	28.2	19.9	28.6
FA2006013	9/8/2006	1028	T	4	9:00:00	30	4.0	41.1748	-72.5788	20.8	28.8	20.8	28.8
FA2006014	9/8/2006	0826	T	3	10:12:00	30	3.9	41.1422	-72.6432	21.1	28.6	21.0	28.7
FA2006015	9/8/2006	0925	T	4	11:13:00	30	3.0	41.1305	-72.7113	21.3	28.6	21.0	28.6
FA2006016	9/8/2006	1428	T	1	13:25:00	30	4.2	41.2375	-72.6282	20.3	28.9	20.3	28.9
FA2006017	9/11/2006	1427	T	1	8:27:00	30		41.2477	-72.6052	20.6	28.5	20.4	28.5
FA2006018	9/11/2006	1225	T	2	10:33:00	30	2.2	41.2073	-72.7173	20.5	28.7	20.4	28.6
FA2006019	9/11/2006	1124	T	2	11:34:00	30	4.1	41.1997	-72.7600	20.6	28.7	20.5	28.7
FA2006020	9/11/2006	1221	T	2	12:54:00	30	3.8	41.2193	-72.8723	20.8	28.3	20.8	28.3
FA2006021	10/2/2006	0525	T	4	9:30:00	30	2.5	41.0983	-72.7015	19.6	28.3	19.7	29.0
FA2006022	10/2/2006	5923	M	3	10:58:00	30	2.6	41.0012	-72.7415	19.7	27.9	19.8	28.4
FA2006023	10/2/2006	0223	M	4	12:41:00	30	3.1	41.0402	-72.8453	19.6	28.3	19.8	29.2
FA2006024	10/2/2006	0523	M	4	14:06:00	30	2.8	41.0907	-72.7942	19.8	28.3	19.8	29.3
FA2006025	10/3/2006	0219	M	4	9:00:00	15	3.0	41.0537	-72.9285	19.4	28.1	19.8	29.2
FA2006026	10/3/2006	0115	M	4	11:09:00	23	2.4	41.0290	-73.1175	19.6	27.9	19.8	28.8
FA2006027	10/3/2006	0314	M	3	13:09:00	30	2.8	41.0505	-73.2090	20.0	27.9	20.1	28.3
FA2006028	10/3/2006	0515	M	2	14:30:00	22	2.8	41.0948	-73.1297	20.1	27.6	20.1	28.1
FA2006029	10/5/2006	1118	M	1	7:59:00	30	3.5	41.1908	-73.0145	19.6	27.8	19.6	27.9
FA2006030	10/5/2006	1018	T	2	9:28:00	30	3.2	41.1752	-73.0103	19.6	28.2	19.5	28.2
FA2006031	10/5/2006	0612	M	1	12:25:00	30	3.0	41.1092	-73.2678	19.6	27.7	19.5	27.7
FA2006032	10/5/2006	0412	M	2	14:18:00	20	3.3	41.0655	-73.3093	19.9	27.8	19.8	27.8
FA2006033	10/5/2006	0313	M	3	15:13:00	30	3.0	41.0623	-73.2642	19.9	27.9	19.8	28.1
FA2006034	10/10/2006	5913	M	3	9:14:00	30	3.3	40.9927	-73.2097	19.0	27.9	19.0	28.0
FA2006035	10/10/2006	5709	S	2	10:52:00	30	3.0	40.9712	-73.4025	18.9	27.7	18.9	27.7
FA2006036	10/10/2006	0012	M	4	12:40:00	30	2.9	41.0080	-73.2840	19.4	27.9	19.0	28.2
FA2006037	10/12/2006	0615	M	2	8:31:00	30	3.0	41.1040	-73.1425	18.3	27.6	18.3	27.6
FA2006038	10/12/2006	0311	T	2	10:07:00	30	3.1	41.0567	-73.3055	18.6	27.7	18.6	27.8
FA2006039	10/12/2006	0110	T	3	12:14:00	30	2.8	41.0215	-73.3700	18.8	27.8	18.8	27.8
FA2006040	10/12/2006	0313	M	3	14:08:00	9	2.9	41.0477	-73.2707	18.8	27.9	18.8	28.0
LT2006007	10/4/2006	0007	M	3	9:51:00	14	3.5	41.0157	-73.4578	20.0	27.8	20.0	28.0
LT2006008	10/4/2006	5403	M	2	12:11:00	30	3.8	40.8988	-73.6998	20.0	26.9	19.7	27.2
LT2006009	10/4/2006	5505	T	2	13:07:00	30	3.9	40.9242	-73.5948	20.1	26.9	19.9	27.2

Table 2.8. Samples with non-standard tow durations and reason for incomplete tow, spring and fall 2006.
Standard LISTS tows begin with SP(spring) or FA (fall). Tows in the Narrows begin with LT.

Cruise	Sample	Date	Site	Btm Type	Depth Interval	Time	Duration	Reason	Comments
2006_1MAY	SP2006028	5/19/2006	0220	M	4	9:28:00	12	pots	speed dropped 12 minutes into tow; snagged pot gear on port door
	SP2006031	5/24/2006	0015	T	4	9:20:00	19	pots	speed dropped 19 minutes into tow; had 2 strings of gear on each wing; probably old or stored gear in area of ferry crossing (no buoys)
	SP2006032	5/24/2006	0014	M	4	10:45:00	19	pots	snagged a buoy 3 minutes into Part A; old gear with lots of marine growth; Part B was only 15.5 minutes because we ran out of room in our designated towpath
	SP2006033	5/24/2006	0114	M	4	12:58:00	25	pots	speed dropped 12 minutes into tow but no gear or lines on net; reset for another 13 minutes before speed dropped again; this time had one old pot on starboard wing (no buoys)
	SP2006036	5/30/2006	0112	M	4	9:52:00	20	pots	speed dropped sharply 20 minutes into tow; snagged bunch of active gear (looks like sets switched from E-W to N-S); retied as best we could
	SP2006038	5/30/2006	5612	T	2	14:27:00	15	hang	hung up hard 15 minutes into tow (wreck?)
2006_2JUN	SP2006055	6/15/2006	1025	T	3	13:15:00	18	pots	speed dropped 0.5 knots; 1 pot in net trailing string of gear
	SP2006062	6/19/2006	0223	M	4	9:45:00	23	pots	ran out of room in towpath; hauled back with buoys in front of us
	SP2006067	6/20/2006	0823	M	3	10:34:00	20	pots	tried N-S tow; ran out of room after 20 minutes
	SP2006068	6/20/2006	0620	M	3	12:02:00	20	pots	ran out of room after 20 minutes
	SP2006080	6/26/2006	0615	M	2	13:21:00	18	pots	speed dropped after 18 minutes; had pot gear on starboard door
	LT2006004	6/27/2006	0007	M	3	9:54:00	15	pots	speed dropped; pots in net
2006_3SEP	FA2006004	9/6/2006	1534	T	1	13:35:00	23	pots	ran out of room
	FA2006025	10/3/2006	0219	M	4	9:00:00	15		speed dropped
	FA2006026	10/3/2006	0115	M	4	11:09:00	23	pots	speed dropped
	FA2006028	10/3/2006	0515	M	2	14:30:00	22	pots	speed dropped after 7 minutes of part A; had 3 old pots in mouth & belly of net; reset but speed dropped again after 15 minutes of part B
	FA2006032	10/5/2006	0412	M	2	14:18:00	20		
	FA2006040	10/12/2006	0313	M	3	14:08:00	9	hang	hung up hard 9 minutes into tow (wreck?); substantial damage to float line on port side & port wing
	LT2006007	10/4/2006	0007	M	3	9:51:00	14	pots	pots ahead; snagged them as we hauled back; no room to reset

Table 2.9. Data requests by month, 2006.

MONTH	REQUEST	ORGANIZATION OR PURPOSE
January	tautog count & biomass indices and catch at length	Uconn
	winter flounder indices at age	Dominion Annual Report
	scup indices at age, biomass indices and length frequencies	ASMFC Technical Committee
	weakfish indices (0,1+)	ASMFC Technical Committee
	maps of bottom temperatures in LIS (from LISS)	for Fishery Advisory Council
	maps of horseshoe crab survey sites and bird info	for meeting with concerned citizens and Nature Cons
February	tow info for tows where windowpane flounder were measured	NEFMC
	All trawl tow records (SP,SU,FA,WI,LT)	NEFMC
	spiny dogfish indices, lengths and length frequencies by season	NMFS
	black sea bass indices and length frequencies	NMFS
	summer flounder indices, indices at age and length frequencies	NMFS
	Atlantic herring indices	ASMFC Compliance Report
	winter flounder catch at age and length frequencies	ASMFC Technical Committee
March	Summer Survey tow data	NEFMC
April	LISTS sampling grid and site info	NY DEC staff
	bluefish indices	ASMFC Compliance Report
	menhaden indices	ASMFC Compliance Report
May	tautog indices at age	ASMFC Technical Committee
	tautog indices	ASMFC Compliance Report
July	maps of beam trawl survey grid	for DEP project documentation
	tautog catch at age matrix	ASMFC Technical Committee
August	skates (all species) count and weight indices	NMFS
September	river herring count & weight indices and length freqs	Environmental Defense Org
	maps of proposed closed areas for horseshoe crab	for public hearing
October	skates (various species) counts and indices	NMFS
	winter flounder indices	ASMFC Compliance Report
November	count data 2000-2006 for eastern LIS	NMFS
	indices and counts from LISTS and Narrows for Status Report	DEP / EPA
	tautog indices	ASMFC Public Hearing
	cunner counts and indices	Queens College research on cormorant feeding habits
	maps of LIST catches of potential prey items for terns	for meeting with FWS
December	SFL indices at age using NMFS and LISTS data	NMFS / ASMFC

Table 2.10. Sample requests by month, 2006.

MONTH	REQUEST	ORGANIZATION OR PURPOSE
May	*Loligo paeleii* tentacles	NMFS Woods Hole - Loligo DNA Study
	misc critters for biology class	Illing Middle School
	squid for dissection class	Illing Middle School
	butterfish & whiting for dissection class	Putnam High School
	collected various species for fish isotope study re: cormorant food habits	Yale graduate student
	striped bass and bluefish	EPA-residual chemical tissue analyisis (e.g. PCBs)
June	collected various species for fish isotope study re: cormorant food habits	Yale graduate student
	striped bass and bluefish	EPA-residual chemical tissue analyisis (e.g. PCBs)
September	specimens of various species for teaching class on Biology of Fishes	Ecology and Evolutionary Biology, UCONN
	squid for dissection class	SCSU
	striped bass and bluefish	EPA-residual chemical tissue analyisis (e.g. PCBs)
	scup, bluefish, summer flouner and lobster	EPA/NCA-tissue contaminant analysis
October	specimens for teaching class on Biology of Fishes	Ecology and Evolutionary Biology, UCONN
	striped bass and bluefish	EPA-residual chemical tissue analyisis (e.g. PCBs)
	scup, bluefish, summer flouner and lobster	EPA/NCA-tissue contaminant analysis
	lobster for dissection class	SCSU
	squalus specimens requested: none provided b/c done sampling for yr	Ecology and Evolutionary Biology, UCONN

Table 2.11. List of finfish species observed in 2006.
Forty-nine species were observed in 2006. (No new species were observed in 2006). Since 1984, ninety-six 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	jack, yellow	Caranx bartholomaei
black sea bass	Centropristes striata	lizardfish, inshore	Synodus foetens
bluefish	Pomatomus saltatrix	menhaden, Atlantic	Brevoortia tyrannus
bonito, Atlantic	Sarda sarda	moonfish	Selene setapinnis
butterfish	Peprilus triacanthus	ocean pout	Macrozoarces americanus
cunner	Tautogolabrus adspersus	pipefish, northern	Syngnathus fuscus
dogfish, smooth	Mustelus canis	pollock	Pollachius virens
dogfish, spiny	Squalus acanthius	rockling, fourbeard	Enchelyopus cimbrius
filefish, planehead	Monacanthus hispidus	sand lance, American	Ammodtes americaus
flounder, fourspot	Paralichthys oblongus	scad, rough	Trachurus lathami
flounder, smallmouth	Etropus microstomus	scup	Stenotomus chrysops
flounder, summer	Paralichthys dentatus	searobin, northern	Prionotus carolinus
flounder, windowpane	Scophthalmus aquosus	searobin, striped	Prionotus evolans
flounder, winter	Pseudopleuronectes american	shad, American	Alosa sapidissima
flounder, yellowtail	Pleuronectes ferrugineus	shad, hickory	Alosa mediocris
glasseye snapper	Priacanthus cruentatus	skate, clearnose	Raja eglanteria
goosefish	Lophius americanus	skate, little	Leucoraja erinacea
gunnel, rock	Pholis gunnellus	skate, winter	Leucoraja ocellata
hake, red	Urophycis chuss	spot	Leiostomus xanthurus
hake, silver	Merluccius bilinearis	striped bass	Morone saxatilis
hake, spotted	Urophycis regia	sturgeon, Atlantic	Acipenser oxyrinchus
herring, Atlantic	Clupea harengus	tautog	Tautoga onitis
herring, alewife	Alosa pseudoharengus	toadfish, oyster	Opsanus tau
herring, blueback	Alosa aestivalis	weakfish	Cynoscion regalis
hogchoker	Trinectes maculatus		

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

Table 2.12. List of invertebrate species observed in 2006.
In 2006, thirty-eight 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
arks	Noetia-Anadara spp.	mussel, blue	Mytilus edulis
bryozoan, bushy	Phylum Bryozoa	northern moon snail	Lunatia heros
bryozoan, rubbery	Alcyonidium verrilli	sea grape	Molgula spp.
clam, hard clams	Artica-Mercinaria-Pitar sp.	sea urchin, purple	Arbacia punctulata
clam, surf	Spisula solidissima	shrimp, brown	Penaeus aztecus
coral, star	Astrangia poculata	shrimp, ghost	Gilvossius setimanus
crab, mud	Family Xanthidae	shrimp, mantis	Squilla empusa
crab, Japanese shore	Hemigrapsus sanguineus	shrimp, northern red	Pandalus montagui
crab, blue	Callinectes sapidus	shrimp, sand	Crangon septemspinosa
crab, flat claw hermit	Pagurus pollicaris	slipper shell, common	Crepidula fornicata
crab, horseshoe	Limulus polyphemus	sponge spp.	sponge spp.
crab, lady	Ovalipes ocellatus	sponge, boring	Cliona celate
crab, rock	Cancer irroratus	sponge, deadman's fingers	Haliclona spp.
crab, spider	Libinia emarginata	sponge, red bearded	Microciona prolifera
cyclocardia	Cyclocardia borealis	squid, long-finned	Loligo pealeii
hydroid spp.	Tubularia spp.	starfish spp.	Asteriid spp.
jelly, moon	Aurelia aurita	whelk, channeled	Busycotypus canaliculatus
jellyfish, lion's mane	Cyanea capillata	whelk, knobbed	Busycon carica
lobster, American	Homarus americanus	worms, fan	Myxicola infundibulum

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

Table 2.13. Total number and weight (kg) of finfish and invertebrates caught 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**	

Table 2.14. Total counts and weight (kg) of finfish taken in the spring and fall sampling periods, 2006.
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 = 80, Fall = 40.

	Spring			
species	**count**	**%**	**weight**	**%**
scup	18,293	48.4	3829.2	53.6
butterfish	10,914	28.9	579.1	8.1
winter flounder	1,591	4.2	262.3	3.7
silver hake	1,176	3.1	33.4	0.5
bay anchovy	958	2.5	5.5	0.1
windowpane flounder	845	2.2	105.3	1.5
northern searobin	608	1.6	71.7	1.0
red hake	597	1.6	34.6	0.5
alewife	567	1.5	49.2	0.7
fourspot flounder	413	1.1	85.3	1.2
little skate	395	1.0	212.1	3.0
smooth dogfish	256	0.7	818.7	11.5
spotted hake	241	0.6	12.6	0.2
striped searobin	193	0.5	74.0	1.0
tautog	170	0.4	283.7	4.0
summer flounder	110	0.3	93.0	1.3
striped bass	97	0.3	292.4	4.1
Atlantic herring	64	0.2	10.2	0.1
American shad	60	0.2	5.3	0.1
hickory shad	53	0.1	11.8	0.2
blueback herring	49	0.1	1.9	0
bluefish	38	0.1	42.1	0.6
weakfish	26	0.1	21.2	0.3
winter skate	23	0.1	60.0	0.8
hogchoker	15	0	2.3	0
fourbeard rockling	14	0	1.5	0
spiny dogfish	11	0	47.0	0.7
clearnose skate	9	0	10.8	0.2
Atlantic sturgeon	8	0	72.2	1.0
black sea bass	7	0	5.7	0.1
cunner	7	0	1.2	0
Atlantic menhaden	5	0	1.8	0
ocean pout	5	0	0.9	0
smallmouth flounder	5	0	0.4	0
northern pipefish	2	0	0.1	0
rock gunnel	2	0	0.1	0
goosefish	1	0	1.2	0
pollock	1	0	0.1	0
oyster toadfish	1	0	1.2	0
yellowtail flounder	1	0	0.4	0
Total	**37,831**		**7,141.5**	

	Fall			
species	**count**	**%**	**weight**	**%**
butterfish	39,108	72.1	1052.3	31.3
scup	10,536	19.4	806.9	24.0
bluefish	2,062	3.8	316.5	9.4
bay anchovy	534	1.0	2.8	0.1
moonfish	361	0.7	3.5	0.1
windowpane flounder	232	0.4	23.6	0.7
weakfish	215	0.4	31.0	0.9
little skate	198	0.4	98.5	2.9
striped searobin	173	0.3	39.5	1.2
winter flounder	108	0.2	8.9	0.3
summer flounder	93	0.2	87.5	2.6
silver hake	91	0.2	4.3	0.1
spotted hake	80	0.1	11.7	0.3
smooth dogfish	76	0.1	357.9	10.7
fourspot flounder	53	0.1	2.8	0.1
striped bass	47	0.1	126.3	3.8
red hake	28	0.1	2.8	0.1
clearnose skate	27	0	41.6	1.2
hickory shad	23	0	7.3	0.2
Atlantic menhaden	23	0	3.7	0.1
northern searobin	21	0	2.8	0.1
tautog	16	0	17.7	0.5
blueback herring	14	0	0.6	0
rough scad	14	0	0.5	0
spot	14	0	1.2	0
Atlantic sturgeon	13	0	296.5	8.8
black sea bass	12	0	3.6	0.1
American shad	8	0	0.8	0
hogchoker	7	0	0.9	0
alewife	6	0	0.3	0
glasseye snapper	4	0	0.1	0
inshore lizardfish	4	0	0.4	0
Atlantic herring	2	0	0.1	0
smallmouth flounder	2	0	0.2	0
yellow jack	2	0	0.1	0
Atlantic bonito	1	0	3.2	0.1
cunner	1	0	0.1	0
planehead filefish	1	0	0.1	0
northern pipefish	1	0	0.1	0
Total	**54,211**		**3,358.7**	

Table 2.15. Total catch of invertebrates taken in the spring and fall sampling periods, 2006.
Species are ranked by total weight (kg). Number of tows (sample sizes): Spring = 80, Fall = 40.

	Spring					Fall			
species	**count**	**%**	**weight**	**%**	**species**	**count**	**%**	**weight**	**%**
long-finned squid	1,763	62.5	187.0	35.0	horseshoe crab	85	1.3	146.4	31.3
American lobster	562	19.9	152.9	28.6	long-finned squid	6039	92.5	139.0	29.7
horseshoe crab	24	0.9	59.4	11.1	American lobster	186	2.8	45.0	9.6
spider crab	nc	nc	44.9	8.4	boring sponge	nc	nc	40.4	8.6
rock crab	nc	nc	21.4	4.0	lion's mane jellyfish	166	2.5	31.8	6.8
lion's mane jellyfish	392	13.9	13.6	2.5	rock crab	nc	nc	19.0	4.1
boring sponge	nc	nc	10.9	2.0	bushy bryozoan	nc	nc	16.9	3.6
blue mussel	nc	nc	6.7	1.3	spider crab	nc	nc	5.7	1.2
hydroid spp.	nc	nc	5.9	1.1	lady crab	nc	nc	3.6	0.8
channeled whelk	27	0.9	5.1	1.0	rubbery bryzoan	nc	nc	3.4	0.7
deadman's fingers sponge	nc	nc	4.0	0.7	deadman's fingers sponge	nc	nc	2.8	0.6
lady crab	nc	nc	3.9	0.7	channeled whelk	14	0.2	2.5	0.5
starfish spp.	nc	nc	3.7	0.7	flat claw hermit crab	nc	nc	2.4	0.5
flat claw hermit crab	nc	nc	3.3	0.6	mantis shrimp	25	0.4	1.6	0.3
common slipper shell	nc	nc	3.0	0.6	knobbed whelk	5	0.1	1.2	0.3
mantis shrimp	44	1.6	1.8	0.3	starfish spp.	nc	nc	1.1	0.2
mud crabs	nc	nc	1.4	0.3	blue mussel	nc	nc	0.9	0.2
blue crab	6	0.2	1.3	0.2	common slipper shell	nc	nc	0.9	0.2
bushy bryozoan	nc	nc	0.9	0.2	mud crabs	nc	nc	0.7	0.1
sand shrimp	nc	nc	0.6	0.1	mixed sponge species	nc	nc	0.6	0.1
rubbery bryzoan	nc	nc	0.6	0.1	blue crab	5	0.1	0.5	0.1
sea grape	nc	nc	0.4	0.1	moon jelly	2	0	0.5	0.1
star coral	nc	nc	0.3	0.1	arks	nc	nc	0.2	0
northern red shrimp	1	0	0.3	0.1	fan worm tubes	nc	nc	0.2	0
arks	nc	nc	0.2	0	purple sea urchin	1	0	0.2	0
hard clams	1	0	0.2	0	red bearded sponge	nc	nc	0.1	0
northern moon snail	nc	nc	0.2	0	brown shrimp	1	0	0.1	0
purple sea urchin	1	0	0.2	0	ghost shrimp	nc	nc	0.1	0
red bearded sponge	nc	nc	0.1	0	hard clams	nc	nc	0.1	0
northern cyclocardia	nc	nc	0.1	0	Japanese shore crab	nc	nc	0.1	0
surf clam	1	0	0.1	0	sea grape	nc	nc	0.1	0
Total	**2,822**		**534.4**		surf clam	nc	nc	0.1	0
					Total	**6,529**		**468.2**	

Note: nc= not counted

Table 2.16. Spring indices of abundance for selected species, 1984-2006.

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																							84-05
Species	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**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	1.02
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	0.14
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	
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	
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	0.24
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	
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	0.05
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	5.33
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	
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	38.76
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	17.41	7.50	66.67
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	4.55
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	3.77
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	
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	2.17
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	
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	
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	
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	6.43
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	
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	
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	
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	0.09
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	0.64
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	
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	0.13
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	
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	0.11
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	2.04
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	
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	
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	
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	10.60
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	0.17
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	
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	4.82
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	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	
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	0.79
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	

Table 2.17. Fall indices of abundance for selected species, 1984-2006.

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																							84-05
Species	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**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	
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	
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	24.80
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	173.98
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	
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	1.26
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	
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	
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
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	
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	
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	
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	
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	0.51
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	
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	0.22
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	0.22
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	0.03
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	7.23
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	0.03
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	0.70
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	0.70
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	
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	
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	0.10
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	
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	161.05
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	
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	
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	3.33
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	1.11
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	0.06
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	
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	
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	0.16
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	119.80
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	
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	0.04
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	
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	19.16

Table 2.18. Finfish and invertebrate biomass indices for the spring sampling period, 1992-2006.
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**
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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

Table 2.19. Finfish and invertebrate biomass indices for the fall sampling period, 1992-2006.
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**
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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

Table 2.20. Bluefish indices of abundance, 1984-2006.
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
84-05 mean	**17.13**	**2.35**	**3.56**	**5.68**

Table 2.21. Scup indices-at-age, 1984-2006.

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
84-05													
Mean	**25.721**	**15.093**	**0.000**	**10.628**	**6.201**	**6.807**	**1.391**	**0.532**	**0.135**	**0.019**	**0.005**	**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
84-05													
Mean	**161.053**	**11.378**	**123.863**	**25.812**	**6.071**	**2.908**	**1.752**	**0.491**	**0.131**	**0.019**	**0.004**	**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 2.22. Age frequency of striped bass taken in spring, 1984-2006.
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**
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	0	0	0	2	1	5	28	11	4	3	6	98	12	36	119	41	113	47	150	30	15	220	3
3	0	0	0	0	1	3	8	7	8	7	10	26	97	116	122	87	20	41	76	38	38	54	25
4	0	0	0	2	4	1	2	3	13	16	20	8	37	40	68	42	22	15	48	23	18	59	15
5	0	0	0	2	0	1	1	5	5	14	18	7	14	17	28	95	22	28	45	39	21	33	22
6	0	0	0	2	1	1	3	0	1	8	8	6	7	14	20	46	32	36	52	41	22	28	11
7	0	0	0	0	0	0	0	2	0	7	1	1	8	9	3	17	12	13	25	23	14	16	10
8	0	0	0	0	0	0	0	1	2	1	1	3	2	4	1	4	4	2	12	5	3	9	4
9	0	0	0	0	0	0	0	2	1	1	1	0	3	2	1	0	1	2	3	7	2	1	3
10	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	1	2	0	1	0	0	0	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
Total	**0**	**0**	**0**	**8**	**7**	**11**	**43**	**32**	**34**	**59**	**65**	**150**	**184**	**238**	**362**	**334**	**229**	**184**	**414**	**207**	**135**	**421**	**97**

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

Table 2.23. Striped bass indices-at-age, 1984-2006.
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
84-05 mean	0.49	0.00	0.14	0.12	0.07	0.06	0.05	0.02	0.01	0.00	0.00	0.00

Table 2.24. Summer flounder indices-at-age, 1984-2006.
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
84-05 Mean	**1.1072**	**0.0000**	**0.4638**	**0.3767**	**0.1611**	**0.0555**	**0.0268**	**0.0134**	**0.0067**	**0.0021**	**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
84-05 Mean	**1.8854**	**0.0886**	**0.9037**	**0.6606**	**0.1743**	**0.0376**	**0.0143**	**0.0044**	**0.0016**	**0.0005**	**0.0000**

Table 2.25. Tautog indices-at-age, 1984-2006.

Year and season specific age keys obtained from the LISTS spring and fall surveys were used to convert LISTS length frequencies to ages. Indices-at-age were then 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, and then summing the spring and fall indices-at-age. The age 1-20+ index is the sum of indices ages 1 – 20+. The age 20+ category includes 33 fish ranging from 20 to 30 years of age.

		Age									
Year	**1 - 20+**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1984	3.4693	0.0109	0.0816	0.1898	0.3030	0.4593	0.4959	0.2879	0.2843	0.3112	0.3527
1985	1.7966	0.0000	0.0174	0.0943	0.1912	0.1699	0.1252	0.1852	0.3001	0.2022	0.0902
1986	1.7199	0.0010	0.0277	0.0919	0.0486	0.1076	0.1874	0.2084	0.2296	0.3454	0.1073
1987	1.2128	0.0230	0.0815	0.0589	0.0605	0.0997	0.1334	0.1909	0.1372	0.0957	0.0520
1988	0.9007	0.0038	0.0313	0.0463	0.0724	0.0453	0.0404	0.0756	0.1007	0.1641	0.0790
1989	1.2589	0.0000	0.0425	0.0670	0.1382	0.0894	0.1154	0.1495	0.1600	0.1046	0.0817
1990	1.1613	0.0054	0.0896	0.1553	0.1120	0.1139	0.0496	0.0500	0.1244	0.0872	0.0619
1991	1.1465	0.0049	0.0216	0.0601	0.1194	0.1242	0.1487	0.0930	0.1254	0.1071	0.1067
1992	1.0253	0.0206	0.0484	0.0691	0.0422	0.0494	0.1229	0.1324	0.0849	0.0632	0.0636
1993	0.5694	0.0033	0.0209	0.0490	0.0324	0.0172	0.0605	0.0596	0.0423	0.0489	0.0522
1994	0.5838	0.0082	0.0373	0.0314	0.0691	0.0558	0.0551	0.0555	0.0799	0.0516	0.0312
1995	0.2530	0.0039	0.0086	0.0093	0.0299	0.0603	0.0265	0.0213	0.0347	0.0149	0.0219
1996	0.5630	0.0073	0.0518	0.0305	0.0086	0.0762	0.0452	0.0654	0.0711	0.0667	0.0608
1997	0.5079	0.0000	0.0390	0.0675	0.0568	0.0574	0.0639	0.0491	0.0556	0.0486	0.0101
1998	0.6442	0.0000	0.0425	0.0281	0.0701	0.0821	0.0876	0.0875	0.0848	0.0465	0.0575
1999	0.7614	0.0498	0.0792	0.0583	0.0666	0.1015	0.1379	0.0748	0.0843	0.0431	0.0203
2000	0.8003	0.0008	0.0469	0.0578	0.0829	0.0739	0.1403	0.1376	0.0897	0.0392	0.0467
2001	0.8946	0.0062	0.0302	0.0865	0.0830	0.1294	0.1197	0.1193	0.1058	0.0715	0.0453
2002	1.1666	0.0086	0.0262	0.0586	0.1016	0.1743	0.1972	0.1895	0.2091	0.0739	0.0419
2003	0.8978	0.0014	0.0145	0.0082	0.0597	0.1485	0.2358	0.1590	0.0926	0.0778	0.0185
2004	0.6938	0.0066	0.0216	0.0146	0.0363	0.0701	0.1914	0.1089	0.0490	0.0880	0.0419
2005	0.7597	0.0029	0.0469	0.0369	0.0622	0.0890	0.1255	0.1125	0.0931	0.0676	0.0420
2006	0.8405	0.0097	0.0195	0.0466	0.0753	0.1085	0.1308	0.1092	0.0978	0.0702	0.0497
84-05 Mean	**0.9199**	**0.0075**	**0.0393**	**0.0562**	**0.0735**	**0.0921**	**0.1147**	**0.1107**	**0.1121**	**0.0908**	**0.0539**

	Age									
Year	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20+**
1984	0.1265	0.2283	0.0923	0.0495	0.0452	0.0326	0.0471	0.0152	0.0008	0.0552
1985	0.1595	0.0982	0.0226	0.0994	0.0000	0.0249	0.0039	0.0124	0.0000	0.0000
1986	0.1483	0.0732	0.0421	0.0565	0.0160	0.0084	0.0114	0.0002	0.0023	0.0066
1987	0.0602	0.0533	0.0477	0.0311	0.0246	0.0267	0.0106	0.0005	0.0048	0.0205
1988	0.0469	0.0394	0.0295	0.0225	0.0492	0.0086	0.0063	0.0056	0.0052	0.0286
1989	0.0569	0.0932	0.0430	0.0404	0.0348	0.0172	0.0067	0.0048	0.0000	0.0136
1990	0.0979	0.0376	0.0568	0.0399	0.0221	0.0250	0.0088	0.0170	0.0035	0.0034
1991	0.0608	0.0256	0.0397	0.0361	0.0216	0.0006	0.0161	0.0118	0.0080	0.0151
1992	0.0599	0.0512	0.0440	0.0581	0.0236	0.0208	0.0167	0.0298	0.0167	0.0078
1993	0.0368	0.0351	0.0351	0.0129	0.0157	0.0152	0.0129	0.0097	0.0097	0.0000
1994	0.0234	0.0238	0.0071	0.0118	0.0118	0.0096	0.0024	0.0047	0.0070	0.0071
1995	0.0036	0.0036	0.0073	0.0000	0.0000	0.0000	0.0036	0.0000	0.0000	0.0036
1996	0.0231	0.0128	0.0102	0.0048	0.0100	0.0091	0.0086	0.0004	0.0001	0.0003
1997	0.0072	0.0119	0.0144	0.0048	0.0121	0.0071	0.0000	0.0024	0.0000	0.0000
1998	0.0192	0.0164	0.0055	0.0055	0.0000	0.0027	0.0055	0.0000	0.0000	0.0027
1999	0.0191	0.0090	0.0087	0.0029	0.0000	0.0000	0.0030	0.0029	0.0000	0.0000
2000	0.0213	0.0130	0.0123	0.0101	0.0084	0.0104	0.0023	0.0000	0.0027	0.0040
2001	0.0408	0.0161	0.0151	0.0002	0.0053	0.0106	0.0036	0.0001	0.0026	0.0033
2002	0.0257	0.0185	0.0107	0.0070	0.0147	0.0039	0.0000	0.0000	0.0000	0.0052
2003	0.0274	0.0088	0.0059	0.0184	0.0029	0.0124	0.0000	0.0029	0.0000	0.0031
2004	0.0200	0.0203	0.0106	0.0003	0.0054	0.0032	0.0026	0.0002	0.0001	0.0027
2005	0.0261	0.0171	0.0115	0.0072	0.0041	0.0068	0.0014	0.0011	0.0014	0.0044
2006	0.0385	0.0283	0.0202	0.0111	0.0092	0.0063	0.0040	0.0024	0.0018	0.0014
84-05 Mean	**0.0505**	**0.0412**	**0.0260**	**0.0236**	**0.0149**	**0.0116**	**0.0079**	**0.0055**	**0.0030**	**0.0085**

Table 2.26. Weakfish age 0 and age 1+ indices of abundance, 1984-2006.
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 (May-June)	
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
84-05 mean	**18.94**	**1.37**	**0.28**	**0.36**	**0.16**	**0.22**

Table 2.27. Winter flounder indices-at-age, 1984-2006.

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
84-05																
Mean	80.09	12.31	8.07	9.25	37.93	20.60	8.21	2.75	0.88	0.28	0.13	0.04	0.02	0.00	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
84-05																
Mean	13.79	5.24		0.33	3.78	4.44	3.00	1.39	0.52	0.20	0.08	0.03	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.

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TABLES 2.28 - 2.52
LENGTH FREQUENCIES (LISTS)

Table 2.28. Alewife length frequencies, spring and fall, 1 cm intervals (midpoint given), 1989–2006.
From 1989 - 1990, lengths were recorded from the first three tows of each day; since 1991, lengths have been recorded from every tow.

Spring

length	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
6	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
7	0	0	0	0	2	0	0	0	0	0	0	4	0	0	1	0	1	0
8	0	0	0	0	18	3	3	0	0	0	2	9	16	0	3	1	2	0
9	0	0	2	0	15	9	6	1	6	0	6	21	32	1	18	6	16	0
10	0	0	0	1	11	19	18	2	22	7	6	28	23	5	32	55	32	0
11	0	0	5	4	10	44	11	2	64	11	20	52	14	6	27	87	26	29
12	6	0	4	7	6	83	17	8	127	12	32	43	5	29	25	100	55	44
13	1	0	4	4	47	122	48	16	63	44	42	99	4	70	11	83	61	15
14	0	0	9	7	77	172	35	26	69	61	56	234	7	139	28	63	37	9
15	3	0	8	5	68	140	54	32	56	51	120	334	6	157	25	33	50	49
16	2	0	8	5	84	159	38	86	44	50	144	320	4	86	26	31	74	25
17	5	4	4	16	63	108	32	203	28	34	330	85	5	82	21	33	73	78
18	4	4	9	8	59	81	7	254	32	22	136	15	4	15	19	18	71	93
19	6	7	7	2	37	33	7	180	9	11	99	20	3	6	26	42	59	86
20	3	1	7	2	27	24	10	161	17	17	82	22	9	17	13	30	26	76
21	1	0	3	1	13	17	14	107	34	22	72	27	12	28	22	50	21	40
22	4	2	8	2	10	26	12	103	48	18	47	41	18	46	25	48	18	18
23	5	1	8	6	3	12	12	76	44	16	47	90	36	63	40	36	7	5
24	7	0	3	2	1	12	7	34	28	14	21	58	45	49	42	13	6	1
25	3	2	1	0	3	5	2	9	9	2	11	11	23	12	29	11	3	1
26	1	0	1	2	1	5	1	3	1	2	2	1	5	7	17	5	2	0
27	2	0	1	0	0	1	0	0	0	0	0	1	2	1	2	2	1	0
28	1	0	0	0	1	1	0	0	0	1	0	0	0	1	0	2	1	0
29	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Total	**56**	**21**	**93**	**74**	**556**	**1,076**	**334**	**1,304**	**701**	**395**	**1,275**	**1,515**	**274**	**820**	**452**	**749**	**642**	**569**

Fall

length	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
6	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	1	0
9	0	0	0	0	3	1	0	0	1	0	0	1	6	1	1	0	1	0
10	0	0	0	0	5	1	4	1	1	0	1	4	23	0	7	1	7	0
11	0	0	0	0	27	30	5	5	6	1	3	5	59	0	33	6	14	0
12	0	0	0	1	120	82	9	25	12	9	6	9	86	4	64	7	8	0
13	0	0	3	0	88	84	14	21	21	7	9	17	72	0	4	12	17	0
14	0	0	2	4	16	36	11	30	31	0	11	10	23	3	3	16	15	0
15	0	0	1	8	21	31	0	9	53	0	5	8	24	3	5	28	15	2
16	3	0	3	10	53	14	4	1	110	1	25	2	36	17	20	30	12	4
17	2	0	0	12	25	33	1	2	194	4	34	0	27	8	19	12	3	0
18	3	0	0	9	13	24	1	1	62	3	11	1	5	0	0	1	5	0
19	0	0	0	2	1	11	0	0	0	1	4	1	0	1	0	0	0	0
20	0	0	0	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0
21	0	0	0	0	3	1	1	0	0	1	2	0	0	0	0	0	0	0
22	0	1	0	0	2	1	0	0	0	0	1	0	0	0	0	0	0	0
23	0	0	0	0	0	1	0	0	0	0	3	0	0	0	0	0	0	0
24	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Total	**8**	**1**	**9**	**46**	**377**	**354**	**50**	**95**	**492**	**27**	**117**	**58**	**364**	**38**	**156**	**113**	**98**	**6**

Table 2.29. American shad length frequencies, spring and fall, 2 cm intervals, 1989-2006.
From 1989 - 1990, lengths were recorded from the first three tows of each day; since 1991, lengths have been recorded from every tow.

Spring

length	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
7	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0
9	0	0	0	0	8	2	17	0	6	9	5	5	2	13	6	1	6	0
11	0	0	1	3	7	2	16	5	24	27	20	46	1	101	12	8	11	0
13	4	0	10	8	4	4	11	9	59	85	31	29	2	87	11	14	10	0
15	49	1	82	17	6	22	22	191	177	108	65	21	2	41	0	45	25	38
17	29	8	49	23	10	72	68	154	319	97	52	32	4	49	3	6	4	14
19	5	5	4	33	6	374	40	47	62	32	20	13	0	17	0	2	0	5
21	1	3	10	25	6	158	6	9	2	1	35	1	0	4	4	2	6	0
23	0	3	31	20	5	18	2	16	5	8	50	4	0	7	7	4	7	0
25	0	2	10	7	1	6	0	15	1	7	14	2	3	4	0	0	3	0
27	0	1	1	0	0	2	0	5	0	1	1	1	0	0	0	0	2	0
29	0	0	0	0	0	1	0	0	0	0	0	0	0	5	0	0	0	0
31	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	1	0
33	0	0	0	0	0	0	0	1	3	0	3	3	0	1	0	0	1	0
35	0	1	1	1	0	1	0	0	0	0	0	0	0	1	0	1	0	0
37	0	0	0	2	0	1	0	0	4	0	1	0	0	1	0	0	1	1
39	1	0	0	3	2	2	1	0	2	0	4	0	0	2	0	0	0	1
41	1	0	1	5	2	3	2	0	3	0	3	0	0	0	0	0	0	1
43	0	0	1	4	2	1	0	0	1	1	6	0	0	2	0	0	0	0
45	1	0	1	7	2	3	2	0	0	0	1	0	0	0	0	0	0	0
47	0	0	0	2	0	1	2	0	1	0	1	0	0	0	0	0	1	0
49	0	0	0	2	0	1	0	0	0	0	1	0	0	0	0	0	0	0
51	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Total	**91**	**24**	**202**	**163**	**61**	**675**	**189**	**452**	**669**	**378**	**313**	**157**	**14**	**337**	**43**	**83**	**79**	**60**

Fall

length	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
7	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2	0	0
9	0	0	7	1	2	6	7	0	6	1	5	0	1	1	4	5	4	0
11	0	1	4	5	23	26	16	1	20	14	27	0	4	1	14	6	3	0
13	0	0	7	21	54	208	24	7	28	13	44	0	1	0	22	4	5	0
15	0	0	4	2	33	245	14	2	5	4	6	0	0	0	0	2	0	0
17	0	0	22	7	10	20	2	0	12	64	13	2	5	11	15	77	3	1
19	32	34	93	41	53	57	84	0	67	290	130	16	47	199	121	155	23	6
21	129	143	22	102	466	229	335	15	99	123	251	104	34	44	80	21	46	0
23	30	27	0	30	394	197	83	19	12	0	179	39	3	0	6	0	14	1
25	0	0	0	1	24	50	3	4	0	0	17	0	1	0	0	1	0	0
27	0	0	0	3	2	7	0	0	0	0	1	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
49	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
51	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**192**	**205**	**159**	**214**	**1,061**	**1,047**	**568**	**48**	**251**	**509**	**674**	**161**	**96**	**256**	**262**	**273**	**98**	**8**

Table 2.30. Atlantic herring length frequencies, spring and fall, 1 cm intervals, 1989-2006.
Lengths were recorded from the first three tows of each day.

Spring

length	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
3	0	0	0	5	0	0	0	0	0	2	0	0	0	0	0	0	0	0
4	0	0	0	0	4	0	0	0	0	18	504	61	0	0	1	2	0	0
5	0	2	0	11	3	1	0	0	1	149	1,547	104	0	0	8	30	76	3
6	1	3	3	16	1	0	1	3	0	92	237	1	3	0	9	10	140	2
7	0	1	4	15	2	0	2	15	69	84	18	7	11	1	0	8	118	1
8	0	0	7	0	1	0	0	5	165	28	5	1	6	1	0	9	73	11
9	0	0	3	0	1	0	1	1	27	11	4	0	8	0	0	3	8	10
10	0	0	0	0	3	1	0	0	0	2	0	0	1	0	0	0	0	0
11	0	0	0	0	3	1	0	1	2	0	0	0	0	0	0	0	0	0
12	0	0	0	0	38	2	0	0	0	0	0	0	0	0	0	0	0	0
13	0	8	0	0	215	8	0	0	5	0	0	0	0	0	0	1	3	0
14	0	1	0	0	203	11	0	1	29	0	0	0	1	0	0	9	7	0
15	2	0	8	0	122	9	6	0	59	5	0	0	2	0	0	49	14	0
16	3	1	38	0	174	17	7	3	12	8	0	3	0	0	0	65	20	0
17	2	31	33	0	100	42	8	2	4	5	0	6	2	0	0	140	63	0
18	2	4	29	2	28	32	12	0	10	2	0	0	1	0	3	275	98	0
19	0	16	19	29	21	39	12	6	21	0	1	0	11	2	1	117	57	0
20	0	161	67	15	41	43	78	10	40	5	1	6	65	3	2	67	67	0
21	0	333	72	24	35	29	283	26	14	4	2	11	85	17	0	12	19	0
22	0	424	70	111	96	14	399	15	19	11	10	38	77	32	0	16	11	3
23	0	201	160	61	387	111	245	20	7	4	15	36	14	87	4	0	15	4
24	0	195	297	311	436	224	290	22	18	1	19	47	33	71	17	0	25	3
25	0	315	337	751	645	485	416	46	117	2	9	99	31	18	36	3	21	5
26	1	447	360	503	921	560	1,028	85	202	31	10	70	46	30	63	3	78	3
27	0	347	514	382	807	947	723	93	236	33	35	80	24	27	65	14	106	9
28	0	338	513	391	825	604	706	64	234	44	37	104	34	19	72	9	87	6
29	2	247	319	492	550	387	337	37	82	21	25	69	29	52	52	1	40	3
30	0	156	383	142	287	204	231	29	31	1	11	24	8	3	27	3	19	1
31	2	127	139	77	129	29	14	4	15	2	0	0	4	0	8	1	0	0
32	0	50	22	1	33	6	14	1	2	1	1	0	0	0	0	0	0	0
33	0	11	13	2	0	2	1	0	0	0	0	0	1	0	0	0	0	0
34	0	8	1	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**15**	**3,427**	**3,411**	**3,341**	**6,119**	**3,808**	**4,814**	**489**	**1,421**	**566**	**2,491**	**767**	**497**	**363**	**368**	**847**	**1,165**	**64**

Fall

length	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
7	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	99	3	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	328	16	4	0	0	2	3	0	0	0	0	1	0	0	0
10	0	0	0	176	3	6	0	14	6	59	0	0	0	0	12	1	0	0
11	0	3	0	34	5	9	0	11	3	49	0	1	0	0	47	0	0	2
12	0	0	0	3	9	11	0	1	0	0	0	0	0	0	20	1	0	0
13	0	0	0	0	13	2	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	24	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	1	7	2	0	1	0	0	0	0	0	0	0	1	0	0
17	0	0	1	0	7	5	0	0	0	1	0	0	0	0	0	0	0	0
18	0	0	6	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
19	0	0	5	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0
21	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Total	**0**	**3**	**12**	**642**	**110**	**40**	**0**	**27**	**12**	**112**	**0**	**2**	**0**	**0**	**80**	**3**	**3**	**2**

Table 2.31. Atlantic menhaden length frequency, fall, 1996-2006.
Menhaden are scheduled to be measured from every tow. However, the following numbers of menhaden were not measured: 5 juveniles and 4 adults in 1996, and 7 adults in 1997.

	Fall										
length	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
4	0	0	0	0	0	0	0	1	0	0	0
5	0	0	0	0	0	0	0	2	0	0	0
6	0	0	0	0	0	0	0	17	1	0	0
7	1	0	0	20	12	0	2	32	26	0	1
8	0	1	18	51	73	0	6	22	178	11	0
9	0	11	53	152	128	0	8	9	135	22	0
10	1	5	120	471	125	1	9	1	143	19	0
11	0	6	49	337	51	25	14	1	47	13	2
12	0	11	44	25	35	30	10	1	18	9	8
13	0	0	20	2	15	16	14	4	1	1	1
14	0	2	0	0	6	7	20	2	0	3	2
15	0	0	0	0	2	4	24	0	0	1	0
16	0	0	0	0	2	0	8	0	0	2	1
17	0	0	0	0	3	0	12	0	0	0	0
18	0	0	0	0	0	0	17	0	0	0	0
19	0	0	0	0	0	0	16	0	0	0	0
20	0	0	0	1	0	0	2	0	0	0	0
21	0	0	0	1	0	0	1	0	0	1	0
22	0	0	0	0	0	0	1	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	1	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	1	0	0	0	0
27	2	0	0	0	0	0	1	0	0	1	0
28	3	1	0	3	0	0	2	0	3	4	0
29	23	17	0	6	1	0	18	5	10	21	2
30	30	25	0	28	3	0	29	8	44	54	2
31	11	17	1	42	7	1	39	8	65	43	2
32	2	6	1	27	12	0	27	3	51	21	1
33	0	1	0	19	4	2	25	2	10	5	0
34	0	0	0	1	4	0	9	1	7	2	1
35	0	0	0	0	1	0	5	0	1	1	0
Total	**73**	**103**	**306**	**1,187**	**484**	**86**	**320**	**119**	**740**	**234**	**23**

Table 2.32. Black sea bass length frequencies, spring, 1 cm intervals, 1987-2006.
From 1987 lengths have been recorded from every tow.

	Spring																			
length	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	8	0	0	0	0
9	0	0	0	0	2	0	0	0	0	0	0	0	1	2	0	9	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	5	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	5	0	0	0	0
12	0	0	0	0	2	0	0	0	0	0	0	0	0	2	0	5	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	9	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3	0	0	0	1
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
19	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0
20	1	0	1	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0
21	0	0	1	0	0	0	0	1	0	1	0	0	1	1	0	1	1	1	0	0
22	2	0	1	0	0	0	1	1	0	1	0	0	0	1	2	0	1	0	0	1
23	1	0	0	2	0	0	1	1	0	3	0	1	0	1	0	1	2	1	0	0
24	3	0	0	0	0	1	1	3	3	2	1	2	1	8	1	5	4	0	0	0
25	0	0	2	0	0	1	2	2	1	0	2	1	0	0	0	2	0	1	0	0
26	0	1	0	1	0	1	0	1	3	0	1	1	0	1	5	2	0	1	0	0
27	0	0	0	0	0	0	0	1	1	0	1	1	2	2	4	1	0	1	0	0
28	0	0	0	4	0	0	1	0	0	0	0	0	0	3	0	2	0	1	0	1
29	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	2	0	6	0	0
30	0	0	1	2	0	0	1	2	0	0	1	0	1	1	3	1	0	4	0	0
31	0	0	0	1	0	0	0	0	0	0	1	1	1	0	3	10	0	7	0	0
32	0	2	0	1	0	0	2	1	0	1	4	0	1	1	3	15	1	5	0	0
33	0	1	0	1	0	0	0	2	0	2	1	0	0	1	11	12	1	3	0	0
34	0	0	1	1	0	0	0	1	0	1	1	1	1	3	6	11	1	2	0	0
35	0	0	0	0	0	0	1	0	0	1	3	0	0	1	7	11	2	1	1	0
36	0	1	0	1	0	0	1	1	2	1	0	0	1	0	3	13	0	3	4	0
37	0	0	0	1	0	0	0	0	0	1	1	0	2	0	5	6	2	0	1	0
38	0	1	0	0	1	0	0	0	0	0	0	0	1	3	2	11	3	0	1	0
39	0	0	0	0	2	0	0	2	0	1	0	0	0	0	3	13	1	0	1	0
40	0	0	1	0	1	0	0	0	0	3	0	0	0	1	2	15	2	1	0	0
41	0	0	0	0	3	0	0	0	0	0	0	0	1	0	3	11	4	4	4	0
42	1	0	1	0	0	0	0	1	1	0	0	0	1	1	1	11	3	0	4	1
43	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	5	3	2	2	0
44	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	5	2	1	1	1
45	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	7	0	1	0	0
46	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	6	2	1	0	0
47	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	5	0	2	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0
49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	0	1
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
51	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
52	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**8**	**8**	**12**	**19**	**16**	**3**	**12**	**22**	**11**	**20**	**18**	**8**	**16**	**47**	**67**	**239**	**46**	**49**	**19**	**7**

Table 2.33. Blueback herring length frequencies, spring and fall, 1 cm intervals, 1989-2006.
From 1989 - 1990, lengths were recorded from the first three tows of each day; since 1991, lengths have been recorded from every tow.

Spring

length	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
6	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0
7	0	0	2	0	2	7	2	0	0	2	0	4	1	0	3	2	1	0
8	0	0	3	0	2	76	20	4	0	5	0	10	7	12	7	9	8	1
9	0	0	2	0	3	114	11	5	21	15	0	14	5	9	23	23	14	8
10	0	0	5	10	7	74	9	19	45	45	0	18	2	9	26	47	6	23
11	0	0	3	4	9	41	9	10	258	48	0	28	1	6	11	39	10	2
12	3	0	5	0	2	9	5	3	4	16	0	18	2	3	4	20	12	0
13	0	0	0	4	0	13	5	2	0	2	0	12	1	1	1	12	3	1
14	0	0	0	15	0	5	3	1	1	1	0	3	0	0	0	0	7	0
15	0	0	1	27	1	3	4	7	0	0	1	2	0	4	0	0	8	1
16	0	0	0	65	0	8	3	7	0	3	5	1	1	1	4	4	13	2
17	0	0	1	11	3	9	1	10	4	0	5	3	10	7	4	4	11	2
18	0	1	0	2	0	3	0	4	2	0	0	5	15	2	3	3	1	2
19	0	0	0	0	1	2	4	3	2	0	0	0	3	0	0	3	2	1
20	0	0	0	4	0	1	1	0	0	0	0	2	1	1	0	0	5	2
21	2	1	2	0	0	1	1	3	0	0	0	1	3	0	0	3	2	3
22	1	0	0	1	0	3	0	4	0	1	0	3	0	0	1	0	1	0
23	0	0	3	2	0	3	2	3	1	0	0	5	0	1	0	1	0	0
24	0	1	2	0	0	0	0	2	0	0	0	3	0	0	0	0	0	0
25	0	0	0	1	0	1	1	1	0	0	0	1	0	0	2	0	0	1
26	0	0	0	1	0	0	1	0	0	0	0	1	0	0	0	3	0	0
27	0	0	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0
Total	**6**	**3**	**29**	**147**	**30**	**373**	**83**	**90**	**338**	**140**	**11**	**136**	**52**	**56**	**89**	**173**	**104**	**49**

Fall

length	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
5	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	5	0	2	0	0	0	0	0	0	1	0	0
8	0	0	0	0	0	0	33	0	2	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	21	3	2	2	1	0	0	0	0	0	0	0
10	0	0	0	0	0	1	3	0	8	1	0	1	0	0	0	0	0	0
11	0	0	0	0	3	13	4	0	3	0	0	0	0	0	0	0	0	0
12	0	0	3	9	8	227	14	0	12	1	1	0	7	0	0	2	0	0
13	38	1	4	11	24	225	48	0	117	18	0	0	36	2	0	15	2	2
14	77	0	1	6	18	247	40	1	111	28	1	0	117	7	0	17	3	8
15	24	0	0	1	20	94	3	3	34	16	0	3	52	3	4	6	2	4
16	0	0	0	0	2	14	0	0	0	5	2	1	10	0	4	0	0	0
17	0	0	0	0	0	2	0	0	0	1	1	2	2	0	1	0	0	0
18	1	0	0	0	0	1	0	0	0	0	0	1	3	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0
21	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0
22	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0
25	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**140**	**2**	**9**	**27**	**76**	**827**	**172**	**7**	**292**	**72**	**8**	**8**	**227**	**12**	**9**	**42**	**8**	**14**

Table 2.34. Bluefish length frequencies, spring, 2 cm intervals (midpoint given), 1984-2006.
Lengths were recorded from every tow.

	Spring																						
length	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
25	0	0	0	0	0	0	3	0	0	0	0	0	0	1	0	2	1	0	0	0	1	0	1
27	0	0	0	0	0	0	1	2	1	0	0	0	0	2	2	0	6	0	1	0	2	0	2
29	0	0	2	1	0	0	1	2	0	0	0	1	1	1	0	1	6	0	1	0	1	0	5
31	0	0	0	0	0	0	0	11	0	0	0	0	0	1	0	0	1	0	0	1	0	2	2
33	0	0	1	0	0	0	0	16	0	0	0	0	0	2	1	1	0	0	1	0	0	0	3
35	0	0	0	1	0	0	0	16	0	0	0	0	1	0	0	1	0	1	0	0	0	0	1
37	0	0	0	0	0	0	0	10	0	0	0	0	0	1	0	0	0	0	0	1	0	0	1
39	0	0	0	0	0	0	0	3	0	0	0	0	0	2	0	0	0	1	0	0	0	1	1
41	0	0	2	0	0	0	2	10	0	0	0	1	0	0	0	4	0	4	6	5	0	7	0
43	0	0	2	1	1	0	0	26	1	0	0	0	1	3	2	3	1	9	13	7	1	2	0
45	0	0	1	0	0	0	1	17	4	0	0	1	2	0	3	2	0	5	6	3	0	1	2
47	0	0	0	0	0	0	0	3	3	0	0	0	0	0	0	1	2	2	3	0	1	0	6
49	0	0	3	2	3	0	0	4	5	3	0	0	0	0	1	6	1	2	3	1	1	1	3
51	0	0	2	1	5	2	1	7	12	2	0	0	4	10	3	6	1	1	9	4	6	1	3
53	0	0	4	3	6	1	0	6	7	1	2	0	2	6	2	6	2	2	6	3	3	2	6
55	0	0	4	1	11	0	1	4	0	1	1	0	3	2	1	3	1	1	6	1	1	2	0
57	0	0	3	2	8	0	0	2	1	2	0	1	0	1	3	2	0	1	0	1	0	1	2
59	0	1	0	0	6	1	1	0	0	1	1	0	0	1	0	3	1	0	0	4	1	2	1
61	0	0	3	0	2	2	0	0	2	1	4	0	0	3	0	2	0	0	0	1	0	0	0
63	0	0	1	0	1	0	0	1	1	1	4	0	0	0	3	2	1	0	0	2	0	1	0
65	0	0	1	1	0	3	0	1	2	0	0	1	0	0	0	2	0	0	1	0	0	0	0
67	0	0	0	0	0	3	1	1	0	0	0	0	1	0	1	1	0	0	0	2	0	1	0
69	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0
71	0	0	1	0	0	0	1	2	1	1	0	0	0	1	0	1	1	0	0	0	0	0	0
73	0	0	1	0	0	1	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
75	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
77	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
79	0	0	3	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0
81	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Total	**0**	**1**	**35**	**13**	**43**	**13**	**17**	**146**	**42**	**13**	**12**	**6**	**16**	**38**	**23**	**51**	**26**	**29**	**56**	**36**	**18**	**25**	**39**

Table 2. 35. Bluefish length frequencies, fall, 2 cm intervals (midpoint given), 1984-2006.
Lengths were recorded from every tow.

	Fall																						
length	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
7	1	2	0	0	0	0	0	2	33	0	1	0	0	3	13	4	0	1	1	0	0	0	2
9	2	11	0	5	3	0	3	51	325	5	82	1	0	148	429	293	2	40	9	8	18	77	11
11	38	18	20	95	116	78	75	315	474	82	1,450	162	7	2,946	1,774	1,205	64	302	153	103	1,072	729	315
13	1,308	148	65	430	603	743	107	540	392	603	5,722	825	65	4,163	3,566	654	210	259	399	110	1,168	950	413
15	2,559	1,789	514	982	334	1,500	508	443	497	432	3,786	216	602	870	1,267	637	410	458	342	44	428	390	241
17	1,797	2,067	932	546	779	2,342	1,183	1,086	1,060	698	1,862	641	3,323	1,005	287	863	370	1,247	106	661	274	619	401
19	426	554	386	118	780	2,436	1,222	1,164	838	2,445	1,041	1,897	1,845	769	211	435	1,200	670	149	1,487	556	1,527	286
21	246	96	169	19	532	903	507	627	263	1,174	803	934	487	332	199	913	2,246	391	617	1,011	677	1,188	108
23	68	21	86	9	193	198	150	398	28	214	469	202	32	154	216	1,096	840	161	723	104	550	429	64
25	19	24	15	5	18	18	62	212	1	66	265	14	7	25	370	1,032	337	76	355	2	339	178	28
27	2	5	0	0	1	5	9	32	0	10	62	3	0	3	167	476	9	18	50	0	53	32	14
29	0	2	0	0	0	0	0	1	0	0	1	0	0	0	7	53	0	5	1	0	10	0	2
31	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	1	0	0	1	0	2	0	0
33	0	0	0	2	0	0	6	0	0	0	0	2	0	0	1	0	0	0	3	0	14	0	4
35	0	0	0	4	1	0	17	0	3	0	0	22	0	1	1	0	0	0	13	1	79	0	4
37	4	8	1	16	2	1	41	1	21	0	10	92	0	2	2	1	2	15	27	6	188	0	27
39	25	66	35	56	6	10	145	19	118	4	30	192	2	52	28	7	31	52	67	20	428	0	50
41	64	133	118	84	23	72	245	130	169	19	116	125	18	110	46	15	129	90	152	15	212	15	25
43	32	63	101	41	31	101	156	229	77	42	125	37	22	52	28	11	73	31	86	13	33	43	11
45	6	14	20	21	32	34	25	137	35	79	32	10	23	20	30	1	16	15	10	6	15	57	2
47	13	11	63	9	25	19	25	69	72	74	7	19	61	6	29	7	9	15	8	14	27	38	1
49	21	55	52	11	19	21	17	88	179	81	9	20	74	27	33	9	14	25	14	19	47	35	6
51	25	58	43	14	16	19	36	73	210	50	13	21	38	16	23	7	32	26	13	18	59	57	4
53	31	44	21	14	18	32	16	21	162	26	42	25	17	10	9	10	40	12	18	7	22	22	12
55	20	25	9	25	8	21	5	5	90	11	56	6	10	5	9	4	16	5	12	6	31	8	7
57	13	9	4	30	1	12	1	3	54	33	32	3	10	8	2	10	3	4	12	8	48	14	7
59	4	5	15	11	12	7	3	6	29	69	11	1	8	10	6	12	6	8	9	4	40	15	5
61	6	20	5	9	8	4	5	6	10	108	20	4	8	10	5	3	11	10	3	5	17	12	6
63	2	13	11	5	15	4	9	6	11	54	20	5	2	5	10	3	6	3	6	3	21	27	2
65	0	12	11	6	12	2	13	1	12	30	39	7	1	2	7	3	11	2	5	1	22	14	3
67	0	11	11	3	14	4	12	1	3	16	49	5	3	4	5	3	7	5	6	1	9	11	1
69	1	7	8	10	17	10	12	9	4	2	35	4	2	1	2	6	3	5	7	1	12	10	0
71	1	1	13	4	7	19	15	5	11	1	17	5	3	1	1	7	8	1	7	2	6	1	0
73	1	2	3	8	7	7	16	5	15	11	7	4	1	5	1	0	2	2	4	1	6	3	0
75	2	1	5	3	9	5	13	8	17	8	5	4	7	3	4	5	1	1	1	1	1	4	0
77	0	3	1	1	3	4	10	6	6	4	8	3	8	6	1	1	0	0	3	0	3	1	0
79	0	2	2	1	1	3	1	2	4	6	2	1	0	1	0	1	1	2	1	0	0	0	0
81	0	1	0	0	0	1	2	0	1	0	4	1	2	0	0	1	1	0	0	0	1	0	0
83	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
Total	**6,737**	**5,301**	**2,739**	**2,598**	**3,646**	**8,635**	**4,673**	**5,701**	**5,224**	**6,457**	**16,234**	**5,514**	**6,688**	**10,776**	**8,789**	**7,789**	**6,110**	**3,957**	**3,393**	**3,682**	**6,488**	**6,506**	**2,062**

Table 2.36. Butterfish length frequencies, 1 cm intervals, fall, 1986-1990, 1992–2006.
Length frequencies of butterfish taken from the first three tows of each day.

	Fall																			
length	**1986**	**1987**	**1988**	**1989**	**1990**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	3	0	0	0	2	0	0	0	0	2	0	0
4	0	2	87	0	0	0	20	1	8	2	2	1	3	0	16	15	0	7	0	1
5	0	3	1,141	23	3	475	436	16	268	180	33	20	13	72	69	53	52	29	260	2
6	0	10	5,778	144	62	2,429	3,144	197	426	601	461	317	250	334	409	616	685	710	658	34
7	12	146	5,728	678	173	13,780	4,344	1,701	5,055	1,540	1,614	920	3,755	2,709	1,405	1,842	4,972	9,342	2,991	162
8	117	1,093	4,844	1,425	471	22,246	5,983	7,653	11,919	3,292	5,449	4,070	24,915	8,904	3,196	7,453	5,630	18,524	14,062	1,060
9	277	2,236	5,489	3,196	2,515	22,133	7,781	17,663	12,110	5,856	11,122	14,691	53,739	16,392	4,444	14,401	3,067	13,237	18,276	4,647
10	1,143	2,017	1,068	4,927	5,886	6,614	4,001	8,178	3,765	6,674	10,645	29,516	31,244	13,110	6,002	14,408	832	13,284	16,897	9,830
11	919	1,204	477	1,661	2,781	634	871	2,414	832	5,493	6,050	23,892	8,496	3,528	2,997	5,682	294	4,193	8,203	5,929
12	623	1,041	51	216	827	65	360	1,951	346	2,344	2,849	7,162	2,009	915	2,004	430	639	982	2,391	3,266
13	409	2,477	204	45	212	94	2,400	2,610	131	976	818	675	1,156	306	1,714	264	570	218	1,265	1,173
14	259	1,946	172	144	52	50	1,721	1,238	273	2,072	289	498	481	93	2,307	247	231	350	212	281
15	95	1,334	196	139	234	101	797	679	597	2,104	197	272	212	30	2,026	190	95	420	188	184
16	106	387	197	210	415	177	390	41	951	1,196	238	388	92	151	1,521	85	156	320	203	688
17	184	124	228	117	133	130	124	144	853	392	335	574	158	392	391	152	66	208	137	398
18	48	59	115	102	83	347	54	110	429	59	407	168	80	198	310	266	8	89	177	77
19	30	10	19	27	91	16	19	2	68	34	211	263	62	106	199	206	0	29	44	39
20	4	8	2	26	8	8	3	0	0	11	20	14	7	4	155	94	13	16	11	3
21	18	2	0	0	0	1	8	1	0	0	10	62	6	1	31	15	1	1	4	0
22	0	0	0	2	0	0	8	0	0	0	0	0	0	0	0	14	1	1	1	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	**4,244**	**14,108**	**25,796**	**13,082**	**13,946**	**69,300**	**32,464**	**44,599**	**38,034**	**32,826**	**40,750**	**83,503**	**126,680**	**47,245**	**29,196**	**46,433**	**17,312**	**61,962**	**65,980**	**27,775**

Table 2.37. Fourspot flounder length frequencies, spring and fall, 2 cm intervals (midpoint given), 1989, 1990, 1996-2006.
Lengths were recorded from the first three tows of each day.

Spring

length	1989	1990	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
13	2	0	0	0	0	1	0	1	0	0	0	0	1
15	5	2	0	0	5	5	0	0	3	0	3	0	0
17	21	8	1	3	8	12	1	2	17	2	13	0	0
19	19	19	8	16	14	61	22	5	89	8	8	0	6
21	17	42	31	60	13	28	26	4	99	6	4	1	18
23	11	341	198	161	16	32	239	42	33	8	4	14	24
25	56	528	279	353	105	72	422	181	84	124	26	71	29
27	103	225	208	456	209	97	256	300	199	228	82	75	33
29	120	139	193	392	233	81	201	245	191	187	129	64	44
31	89	60	117	192	137	66	139	153	175	163	178	68	61
33	51	27	54	76	60	60	81	45	89	88	113	52	36
35	8	33	15	22	16	25	39	11	26	47	35	31	13
37	2	12	6	3	4	7	12	8	7	12	5	11	4
39	0	4	3	0	2	1	1	2	3	6	2	3	1
41	0	0	0	0	0	0	0	0	0	0	0	2	1
43	0	0	0	0	0	0	0	0	0	0	0	1	0
45	0	0	0	0	0	0	0	0	0	0	0	1	0
Total	**504**	**1,440**	**1,113**	**1,734**	**822**	**548**	**1,439**	**999**	**1,015**	**879**	**602**	**394**	**271**

Fall

length	1989	1990	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
5	0	0	0	0	0	0	0	1	0	0	0	0	2
7	0	1	0	1	4	0	0	1	0	0	1	0	2
9	5	0	0	23	19	0	2	2	0	4	1	0	2
11	9	4	2	46	27	5	4	17	5	2	12	4	5
13	10	15	5	68	22	24	6	25	3	3	9	9	13
15	6	17	35	55	21	42	5	15	9	0	13	17	4
17	0	0	42	16	3	16	1	0	3	0	1	26	3
19	0	0	22	0	0	4	1	0	1	0	0	2	0
21	0	0	0	2	2	3	2	0	2	0	1	0	0
23	1	2	9	2	5	0	17	1	5	0	0	0	1
25	0	3	42	7	16	5	58	3	7	3	4	1	0
27	0	7	41	10	22	4	77	5	13	7	6	5	0
29	0	3	24	5	22	5	54	10	18	11	13	5	0
31	0	1	20	3	6	3	25	1	18	4	30	6	0
33	0	0	6	1	1	1	7	1	13	7	19	2	1
35	0	0	4	0	1	0	5	0	6	5	6	7	0
37	0	0	0	0	0	0	2	1	3	0	2	0	0
39	0	0	0	0	0	0	0	0	0	0	0	1	0
Total	**31**	**53**	**252**	**239**	**171**	**112**	**266**	**83**	**106**	**46**	**118**	**85**	**33**

Table 2.38. Hickory shad length frequencies, spring and fall, 1 cm intervals, 1991-2006.
Hickory shad were measured from every tow, with the exception of one fish in each of fall 1996, fall 1997, and fall 1998.

Spring

length	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
17	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	3
18	0	0	0	1	0	1	0	0	2	0	0	0	0	0	1	7
19	0	0	0	1	0	0	1	0	0	0	0	0	0	3	5	6
20	0	0	0	0	0	2	0	2	0	0	0	0	0	2	4	2
21	0	0	0	0	0	1	0	0	0	0	0	0	0	2	3	1
22	0	0	0	0	0	0	0	0	1	0	2	0	0	1	1	0
23	0	0	1	0	0	0	0	0	1	0	0	0	1	2	0	2
24	1	0	0	0	0	0	0	0	1	0	0	1	0	0	1	1
25	0	0	0	0	0	0	0	2	0	0	0	0	0	1	1	6
26	0	0	0	0	0	0	0	1	0	0	0	2	0	0	6	5
27	0	0	0	0	0	0	1	0	1	0	0	1	0	0	18	3
28	0	0	0	1	0	1	1	1	2	2	0	4	1	0	14	3
29	0	0	0	0	0	0	2	4	1	7	0	5	0	2	5	2
30	0	0	1	1	1	0	1	5	1	5	0	5	3	1	6	5
31	0	0	0	0	1	1	1	2	1	4	0	2	0	0	1	0
32	0	2	0	0	0	3	0	6	6	2	1	2	1	1	0	5
33	0	0	0	0	0	2	1	2	3	1	0	3	2	0	0	0
34	0	0	0	0	0	0	1	3	1	2	2	1	3	1	2	1
35	0	0	1	0	0	1	0	2	2	2	0	4	2	2	2	0
36	0	0	0	0	0	0	0	2	1	1	0	4	1	0	1	0
37	0	0	0	0	0	0	0	1	0	0	1	2	0	0	0	0
38	0	0	0	0	0	0	0	1	0	0	1	2	2	1	1	0
39	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
40	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
41	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Total	**1**	**2**	**3**	**4**	**2**	**12**	**9**	**34**	**24**	**26**	**10**	**40**	**16**	**20**	**75**	**53**

Fall

length	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
19	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
23	0	0	0	3	0	0	0	0	1	0	0	0	0	0	0	2
24	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1
25	0	0	0	6	0	1	1	0	2	0	0	0	0	0	2	1
26	0	1	2	8	0	3	1	0	5	0	0	0	0	4	3	0
27	0	0	0	3	0	2	0	0	5	2	0	1	0	3	0	1
28	0	1	0	1	0	3	0	0	2	0	0	1	0	1	1	1
29	0	0	0	2	0	0	0	0	0	2	0	0	0	1	2	3
30	0	1	0	1	1	0	1	0	0	0	0	0	0	0	8	7
31	0	0	1	0	1	0	2	1	2	0	0	0	1	0	15	1
32	0	1	0	0	1	2	2	1	7	3	1	0	2	0	12	1
33	0	2	1	2	0	1	3	2	2	2	3	1	2	1	5	0
34	0	2	0	0	1	4	2	0	3	4	0	1	1	0	5	1
35	0	0	2	0	0	0	0	0	0	2	0	0	0	2	1	1
36	0	1	0	0	0	0	0	0	0	0	0	1	0	1	2	1
37	0	1	1	0	0	0	1	0	2	1	0	0	0	1	2	0
38	0	0	0	0	0	0	0	1	0	0	0	0	0	2	0	1
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Total	**0**	**10**	**7**	**27**	**4**	**16**	**15**	**5**	**32**	**16**	**4**	**5**	**6**	**18**	**60**	**22**

Table 2.39. Long-finned squid length frequencies, spring and fall, 2 cm intervals (midpoint given), 1986-1990, 1992-2006.
Length frequencies of squid taken from the first three tows of each day.

Spring

length	1986	1987	1988	1989	1990	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
3	0	0	0	0	0	0	0	0	1	5	1	18	4	11	0	7	0	6	0	1
5	0	1	38	0	1	10	73	168	135	62	46	426	42	68	17	92	27	121	12	30
7	2	8	113	0	0	25	196	225	354	57	90	769	38	50	39	64	15	153	24	21
9	5	13	71	2	3	40	90	146	311	74	86	449	61	36	68	55	37	75	13	20
11	3	32	129	5	13	45	107	211	615	130	121	201	129	57	126	89	57	143	39	91
13	43	335	354	18	35	129	296	257	624	172	223	84	194	203	177	147	141	519	197	285
15	45	611	594	84	126	178	372	188	278	158	393	31	193	196	91	148	137	862	442	256
17	21	822	522	191	289	120	507	147	178	85	340	19	110	135	65	93	83	827	407	239
19	59	569	445	187	272	89	345	52	119	68	188	15	61	90	42	34	38	343	198	117
21	52	542	245	91	157	97	170	31	95	34	117	10	38	59	38	33	29	260	135	90
23	26	398	145	82	107	68	72	23	26	16	106	11	21	37	20	15	26	164	89	58
25	19	369	98	63	111	20	44	16	17	9	94	3	26	24	19	8	21	104	64	43
27	13	439	78	85	85	35	48	9	40	4	43	5	7	19	9	7	7	45	37	17
29	4	219	29	40	81	27	34	5	7	4	11	3	7	1	7	5	2	20	12	10
31	8	199	38	23	36	7	9	3	12	1	14	1	1	1	2	8	2	14	2	8
33	0	86	14	13	15	10	7	1	5	1	5	0	1	1	1	4	0	1	1	1
35	1	38	0	0	11	2	2	2	8	0	4	0	0	1	2	1	0	0	0	0
37	2	38	4	5	6	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0
39	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**303**	**4,720**	**2,917**	**894**	**1,348**	**903**	**2,372**	**1,484**	**2,825**	**880**	**1,882**	**2,045**	**933**	**990**	**723**	**811**	**622**	**3,657**	**1,672**	**1,287**

Fall

length	1986	1987	1988	1989	1990	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
3	0	157	59	113	74	316	914	89	181	82	130	135	133	55	36	90	90	171	101	181
5	0	1,212	1,039	1,211	1,108	4,413	5,838	1,809	1,682	1,968	1,582	2,530	1,577	1,598	893	956	3,111	2,450	2,302	836
7	16	1,835	1,886	1,124	1,305	10,225	8,690	3,954	4,150	4,620	2,446	6,150	4,172	4,046	1,919	2,260	5,752	5,464	4,889	1830
9	151	1,346	479	391	349	4,704	6,725	4,711	4,205	4,078	1,504	4,932	3,637	2,878	1,455	1,417	3,670	2,694	3,289	996
11	13	813	126	128	82	1,630	2,950	3,662	2,445	1,962	736	1,891	2,112	1,251	792	569	1,076	1,018	1,511	387
13	0	247	45	72	41	526	1,145	1,259	546	876	279	696	700	627	285	232	60	240	501	116
15	0	108	20	34	9	58	463	510	187	243	75	302	369	332	134	65	3	151	108	35
17	0	19	11	22	6	0	127	174	48	62	28	113	231	174	40	16	0	44	55	25
19	0	2	23	6	1	0	22	43	2	7	10	17	117	42	5	4	0	9	3	23
21	0	28	0	8	1	0	2	10	0	0	1	1	45	12	3	1	0	4	2	1
23	0	2	0	6	1	0	2	12	0	6	0	1	21	0	0	0	0	0	2	0
25	0	1	0	3	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0
Total	**180**	**5,770**	**3,688**	**3,118**	**2,977**	**21,872**	**26,879**	**16,233**	**13,446**	**13,904**	**6,791**	**16,768**	**13,115**	**11,016**	**5,562**	**5,610**	**13,762**	**12,245**	**12,763**	**4,430**

Table 2.40. Scup spring length frequencies, 1 cm intervals, 1984-2006.
Lengths were recorded from every tow.

	Spring																						
length	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
8	0	0	0	6	3	84	0	12	0	0	0	11	0	0	10	24	61	0	16	0	0	4	56
9	4	30	50	33	46	1,049	11	80	9	0	11	408	152	10	163	128	976	98	400	0	0	77	322
10	8	138	377	46	160	2,523	270	514	49	3	48	1,202	537	145	1,381	355	5,293	405	2,303	4	1	169	1,151
11	10	362	724	38	144	2,075	493	1,365	67	4	92	1,437	1,055	311	1,617	313	10,571	645	3,389	19	1	136	1,259
12	5	194	427	9	31	312	280	576	57	3	67	809	826	151	712	131	8,815	586	1,706	33	1	62	1,263
13	2	51	122	4	9	87	56	122	18	4	23	108	397	36	359	51	4,041	265	722	25	2	19	888
14	0	7	64	2	0	72	22	0	11	5	2	20	29	25	154	16	1,043	104	498	7	1	8	626
15	2	4	4	11	4	137	40	3	3	77	7	3	3	11	66	1	201	220	247	7	42	56	251
16	9	47	26	65	19	121	202	8	4	217	48	6	61	49	24	13	48	1,349	1,035	121	327	129	722
17	37	91	91	119	40	105	310	63	49	339	142	11	264	123	57	75	229	4,517	2,943	415	485	129	1,670
18	22	204	208	174	34	95	231	182	135	286	194	28	545	216	89	161	1,034	8,611	4,097	733	403	140	2,254
19	28	130	182	100	16	50	121	347	258	159	203	30	390	136	66	172	1,451	6,452	3,619	720	261	114	1,607
20	11	71	131	33	25	33	30	256	136	35	99	22	153	81	21	130	1,106	1,840	3,679	390	381	29	934
21	3	15	36	15	44	13	26	223	65	27	95	19	34	62	11	78	513	518	6,253	427	584	42	559
22	7	7	6	4	49	7	18	292	11	17	56	17	10	96	8	29	173	292	8,129	660	1,077	111	416
23	6	22	103	3	33	12	12	225	10	25	44	19	1	86	17	25	240	755	5,618	931	982	174	427
24	4	38	124	5	14	9	6	103	21	14	23	24	8	46	18	26	282	833	2,385	977	745	161	361
25	3	28	77	2	4	5	7	33	15	8	10	15	2	20	12	13	199	278	1,292	1,025	844	216	234
26	0	11	73	2	3	3	3	15	10	1	8	5	1	5	10	10	154	132	1,266	741	1,215	332	262
27	2	3	35	3	1	4	1	5	4	4	6	8	2	3	7	7	50	93	491	363	1,200	353	283
28	0	12	4	5	4	3	3	1	6	2	2	0	1	3	3	2	13	88	282	201	730	379	427
29	1	14	6	3	2	0	0	2	2	0	0	0	1	0	1	6	19	36	147	81	331	332	622
30	0	11	3	1	0	1	0	2	1	1	1	1	1	3	0	0	8	8	71	33	116	171	618
31	0	1	0	1	2	0	0	1	0	0	1	0	1	4	0	1	6	3	35	23	37	101	441
32	0	2	1	0	1	1	1	0	1	0	0	1	0	0	0	3	3	2	10	11	28	41	317
33	0	2	1	0	0	0	0	0	0	0	1	0	0	0	0	0	4	2	11	4	11	16	266
34	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	3	1	4	2	8	1	30
35	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	1	0	3	0	1	2	17
36	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	1	4
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2
38	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0
39	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	**166**	**1,497**	**2,877**	**684**	**689**	**6,801**	**2,143**	**4,430**	**942**	**1,232**	**1,183**	**4,204**	**4,474**	**1,624**	**4,806**	**1,771**	**36,537**	**28,134**	**50,654**	**7,955**	**9,817**	**3,506**	**18,292**

Table 2.41. Scup fall length frequencies, 1 cm intervals, 1984-2006.
Lengths were recorded from every tow.

	Fall																						
length	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
3	0	8	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	13	4
4	1	61	0	0	17	1	3	14	196	0	6	0	0	18	4	1	1	28	117	19	143	363	11
5	16	90	313	213	103	128	57	120	483	28	312	1	13	70	224	21	168	317	603	214	1,302	850	129
6	295	249	626	1,193	625	612	340	1,805	1,516	554	931	41	185	338	1,246	1,041	991	1,891	2,132	573	4,723	4,122	389
7	627	588	753	491	1,782	1,367	640	4,923	1,554	4,383	5,217	219	788	1,020	2,354	4,570	4,228	5,003	5,571	1,589	8,721	9,683	942
8	345	1,827	507	499	2,264	1,765	2,152	11,168	2,595	9,063	11,585	602	2,048	1,318	4,330	9,886	7,464	7,327	9,315	701	10,637	11,328	1,442
9	719	2,637	210	434	2,050	1,500	3,806	13,883	936	9,169	13,327	1,867	3,502	1,479	4,515	18,224	9,302	5,369	10,102	205	10,751	8,808	1,517
10	262	2,025	84	77	656	798	2,728	5,539	250	5,754	4,712	1,916	2,667	1,184	3,126	29,863	6,831	2,837	6,754	33	5,987	5,295	459
11	8	1,064	19	12	81	95	601	1,191	78	814	432	606	525	499	728	20,073	1,806	888	2,020	3	1,896	1,973	126
12	0	9	4	22	17	124	28	88	40	12	46	103	31	191	94	6,931	467	312	488	6	344	734	256
13	14	59	41	144	53	670	51	2	304	13	4	46	39	44	56	1,190	428	229	197	87	77	680	606
14	30	265	322	288	274	1,449	13	46	860	70	22	403	161	130	180	198	2,744	309	276	249	159	1,158	1,101
15	86	339	603	277	649	1,102	171	305	1,393	176	68	1,283	459	517	504	459	6,889	690	854	325	268	784	1,210
16	91	473	452	149	313	487	373	910	942	251	117	1,478	491	588	738	742	10,695	762	1,403	201	130	555	801
17	46	299	361	61	111	213	362	683	465	168	103	869	299	289	446	1,583	7,208	593	1,642	92	75	359	338
18	27	170	188	29	81	87	415	242	110	70	87	262	111	101	193	1,548	3,508	225	1,370	43	37	261	179
19	8	44	55	20	85	42	309	39	28	56	57	47	51	21	72	1,196	771	294	733	175	78	234	113
20	21	15	36	52	93	43	266	13	145	95	34	18	75	32	33	436	396	769	621	586	189	308	147
21	47	8	44	87	87	34	424	56	254	111	41	9	70	34	33	289	337	967	797	693	339	194	158
22	59	38	116	88	96	34	333	64	265	88	56	4	58	39	27	460	216	655	1,214	500	447	147	128
23	75	77	133	61	18	14	101	86	181	44	38	4	23	17	16	329	189	328	1,185	315	544	88	134
24	93	64	84	33	17	9	34	98	27	16	33	3	7	10	7	173	124	195	1,071	506	744	104	90
25	46	49	38	27	4	6	21	47	23	12	17	1	1	12	5	66	49	96	769	726	1,072	146	59
26	38	53	13	28	10	3	10	19	17	10	11	0	0	4	2	13	35	55	271	720	878	173	42
27	38	64	9	36	7	1	2	13	22	10	7	0	2	1	2	19	42	27	184	558	790	212	23
28	31	18	12	11	3	1	3	6	13	7	6	0	2	1	1	4	20	11	67	261	731	214	15
29	9	21	4	7	0	0	1	1	6	4	2	0	0	0	3	2	13	14	32	101	433	174	23
30	8	16	2	1	0	0	0	0	0	3	0	0	0	0	0	0	3	4	22	75	122	101	36
31	7	7	1	1	0	0	1	2	1	0	0	0	1	0	0	1	2	3	14	23	45	46	26
32	2	1	0	0	0	0	3	0	0	0	1	0	0	0	0	1	0	0	1	14	25	18	20
33	1	2	0	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	5	10	3	6
34	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	5	2
35	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	1	1	0	1
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	4	0	0
Total	**3,050**	**10,641**	**5,030**	**4,344**	**9,496**	**10,592**	**13,249**	**41,363**	**12,705**	**30,983**	**37,272**	**9,782**	**11,609**	**7,957**	**18,939**	**99,319**	**64,927**	**30,198**	**49,829**	**9,602**	**51,706**	**49,133**	**10,533**

Table 2.42. Striped bass spring length frequencies, 2 cm intervals (midpoint given), 1984–2006.
All striped bass taken in the Survey were measured, with the exception of one fish taken in 1984, one in 1988, and two in 1990.

	Spring																						
length	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
11	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	1	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	2	3	0	0	0	0	4	1	0	2	1	3	0	8	0	0	1	0
23	0	0	0	0	0	1	1	0	1	0	0	9	0	0	11	1	8	1	22	0	0	23	0
25	0	0	0	1	0	1	4	2	0	0	0	18	0	2	28	1	18	7	32	4	2	57	0
27	0	0	0	0	0	0	5	1	2	0	2	28	2	5	30	2	24	15	38	4	1	67	1
29	0	0	0	0	1	0	9	2	0	1	1	24	4	12	21	14	28	16	27	11	4	50	1
31	0	0	0	0	0	1	6	2	1	2	2	12	4	14	20	10	29	5	17	7	5	19	1
33	0	0	0	1	0	0	0	6	1	0	3	7	8	5	20	24	7	6	12	10	10	6	2
35	0	0	0	0	1	0	3	2	1	1	0	8	20	2	19	16	3	4	7	7	13	7	6
37	0	0	0	0	0	0	3	1	0	0	1	8	26	25	25	15	2	11	12	11	11	4	5
39	0	0	0	0	0	1	0	0	0	0	3	3	19	42	23	13	2	14	14	7	4	7	6
41	0	0	0	0	0	2	2	1	3	1	3	4	17	30	25	19	6	7	20	3	2	20	2
43	0	0	0	0	0	0	0	1	3	5	1	0	7	16	17	11	3	2	17	5	1	13	4
45	0	0	0	1	0	0	0	0	5	2	2	3	12	6	19	9	4	1	17	2	3	12	2
47	0	0	0	0	2	0	0	0	0	3	6	0	7	10	15	10	5	6	9	3	2	17	0
49	0	0	0	0	2	0	2	1	2	3	4	1	5	13	14	6	4	3	8	5	6	17	1
51	0	0	0	0	0	1	0	1	4	3	4	2	7	7	12	6	4	3	9	7	1	4	6
53	0	0	0	1	0	0	0	1	2	5	4	2	7	4	8	11	5	2	5	6	6	9	6
55	0	0	0	0	0	0	1	1	1	4	2	2	5	3	13	13	7	3	8	9	3	7	6
57	0	0	0	0	0	0	0	2	2	2	8	1	2	3	6	21	4	5	9	9	6	13	3
59	0	0	0	2	0	1	0	0	0	4	2	2	2	7	7	22	4	5	10	11	4	5	5
61	0	0	0	0	0	0	0	2	1	2	5	2	3	3	2	26	4	10	17	7	6	6	4
63	0	0	0	1	1	0	0	0	1	5	1	0	2	3	2	21	8	13	6	9	7	7	4
65	0	0	0	0	0	0	0	0	0	1	4	0	3	5	10	15	10	4	13	9	4	8	6
67	0	0	0	0	0	1	0	0	1	1	0	1	3	4	6	10	9	6	19	14	6	4	3
69	0	0	0	0	0	0	2	0	0	3	3	3	1	3	1	10	3	13	15	10	5	7	2
71	0	0	0	1	0	0	1	0	0	0	1	2	1	3	1	10	5	6	6	5	3	9	1
73	0	0	0	0	0	0	0	2	0	3	0	0	7	6	2	5	8	5	12	10	2	6	3
75	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	6	1	2	4	10	5	5	1
77	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	3	5	2	0	6	1	5
79	0	0	0	0	0	0	0	1	1	0	0	3	2	3	0	1	2	1	7	1	1	4	2
81	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	2	2	0	4	0	2	4	1
83	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	1	4	0	1	1
85	0	0	0	0	0	0	0	2	0	0	0	0	2	1	0	0	0	1	3	2	0	1	0
87	0	0	0	0	0	0	0	0	1	1	1	0	1	1	1	0	0	1	0	4	2	0	2
89	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	3
91	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	1	0	0	0	1
93	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1
97	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0
Total	**0**	**0**	**0**	**8**	**7**	**11**	**43**	**32**	**34**	**59**	**65**	**151**	**184**	**239**	**361**	**335**	**229**	**184**	**413**	**208**	**135**	**422**	**97**

Table 2.43. Striped bass fall length frequencies, 2 cm intervals (midpoint given), 1984–2006.
All striped bass taken in the Survey were measured on each tow.

	Fall																						
length	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	4	0	0
41	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2	0	7	0	2
43	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2	1	0	1	0	19	0	0
45	0	0	1	0	0	0	0	0	0	0	0	0	4	3	2	2	0	0	1	0	18	1	1
47	0	0	0	0	0	0	0	0	0	0	0	0	4	3	0	11	0	0	1	1	18	1	1
49	0	0	0	0	0	0	0	0	0	1	0	0	9	9	2	9	1	0	0	0	14	2	4
51	0	0	0	0	0	0	0	0	0	4	2	0	8	4	1	9	0	0	3	0	29	2	5
53	1	0	0	0	0	0	0	0	0	2	2	1	5	14	7	5	5	0	3	0	27	7	7
55	0	0	0	0	0	0	0	0	1	0	1	0	2	10	5	5	2	0	4	1	26	1	2
57	0	0	0	1	1	0	0	1	1	5	0	2	3	11	5	5	5	2	7	1	11	6	3
59	0	0	0	0	0	0	0	0	1	0	0	0	0	7	3	0	8	0	2	0	13	6	3
61	0	0	0	0	3	0	0	1	0	1	0	2	2	3	1	2	4	2	2	0	12	1	6
63	0	0	0	0	2	0	0	1	1	1	1	0	0	3	2	3	6	7	3	1	9	5	2
65	0	0	0	0	1	0	0	0	2	1	1	0	0	2	0	4	6	5	3	0	7	2	2
67	0	0	0	0	1	0	0	1	0	1	2	2	1	1	0	1	6	1	6	0	8	4	3
69	0	0	0	0	1	0	0	0	0	1	1	0	2	2	0	0	4	3	4	0	6	0	3
71	0	0	0	0	1	0	0	0	1	0	0	1	1	1	2	0	3	3	5	0	3	3	0
73	0	0	0	0	0	0	0	0	0	2	1	4	0	2	3	1	2	2	0	1	3	0	0
75	0	0	0	0	0	0	0	1	0	0	1	2	1	1	0	1	3	2	1	1	1	2	0
77	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1	4	0	4	0	1	0	0
79	0	0	0	0	0	0	0	0	0	2	1	0	0	1	1	0	1	1	2	1	1	0	1
81	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0
83	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
85	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	2	1	0
87	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0
89	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0
91	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
93	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1
97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
101	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Total	**1**	**0**	**1**	**1**	**10**	**0**	**0**	**6**	**8**	**22**	**16**	**15**	**48**	**80**	**37**	**62**	**64**	**28**	**56**	**8**	**243**	**47**	**47**

Table 2.44. Summer flounder length frequencies, spring, 2 cm intervals (midpoint given), 1984–2006.
All summer flounder taken in the Survey were measured, with the exception of one fish in 1990.

	Spring																						
length	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
13	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
19	0	0	0	36	0	0	1	0	0	0	0	1	1	0	0	0	2	0	0	2	1	0	0
21	0	0	11	39	0	0	0	0	0	0	3	2	2	1	0	0	2	1	1	3	0	0	0
23	0	0	10	31	1	0	1	3	2	0	9	1	2	2	0	0	0	6	1	13	1	2	1
25	1	0	22	33	2	0	2	6	1	9	20	1	2	10	1	2	6	5	2	27	3	3	0
27	8	0	43	25	20	0	7	12	6	22	32	3	11	10	2	14	7	26	13	79	8	14	0
29	7	0	39	6	18	0	15	17	14	15	10	9	45	22	5	32	21	60	50	135	25	10	2
31	9	1	17	3	18	0	19	23	12	12	19	12	44	27	4	42	23	53	89	104	14	19	5
33	0	7	13	5	12	1	12	9	8	7	22	2	14	25	7	22	28	16	57	54	18	15	21
35	2	8	4	2	13	3	1	5	6	7	16	2	12	11	11	22	22	10	41	49	13	12	17
37	1	3	4	5	8	2	1	6	2	6	20	1	10	20	28	26	34	20	57	75	34	8	14
39	3	3	3	4	5	1	2	5	2	7	7	0	12	16	38	18	36	12	61	71	51	9	10
41	1	3	7	1	8	2	1	6	5	4	6	3	5	10	35	14	33	19	51	77	49	13	5
43	0	1	3	0	2	2	0	0	2	4	6	7	6	6	22	16	22	24	28	58	48	10	5
45	0	0	1	1	3	0	0	8	4	0	4	0	5	4	15	11	29	16	21	33	18	5	4
47	0	0	3	3	3	1	1	4	2	1	3	0	1	6	9	10	18	14	20	43	28	12	3
49	1	0	1	1	1	2	0	2	1	0	2	1	3	2	12	17	7	10	14	32	26	6	3
51	0	0	5	0	1	0	0	1	1	0	1	0	1	3	15	9	8	12	19	19	13	8	7
53	0	0	1	0	1	0	2	1	0	1	1	2	3	5	5	9	5	8	10	21	16	6	4
55	0	2	1	0	1	1	0	0	1	2	1	0	3	2	6	8	8	8	14	10	13	5	2
57	0	0	0	0	0	1	1	0	0	0	2	0	0	1	5	4	5	8	12	9	3	2	1
59	0	0	0	0	1	1	0	0	0	2	0	0	2	3	3	8	8	2	6	12	8	4	1
61	0	2	0	0	0	0	0	0	0	1	2	1	1	0	1	3	4	4	6	5	5	3	0
63	0	0	0	0	0	0	0	0	0	1	0	0	0	1	2	0	2	1	7	10	9	0	4
65	0	1	0	0	0	0	0	1	1	0	1	0	0	0	1	1	2	4	2	8	2	1	0
67	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	2	3	5	4	0	1
69	0	0	0	1	0	1	0	0	0	0	0	0	1	1	1	1	0	0	0	4	2	0	0
71	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1	1	2	0	3	4	0
73	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	0	0
75	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0	0	0
77	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Total	**33**	**32**	**189**	**203**	**118**	**18**	**67**	**109**	**72**	**101**	**188**	**51**	**186**	**188**	**230**	**289**	**334**	**342**	**588**	**962**	**416**	**172**	**110**

Table 2.45. Summer flounder length frequencies, fall, 2 cm intervals (midpoint given), 1984–2006.
All summer flounder taken in the Survey were measured, with the exception of two fish in 1985.

	Fall																						
length	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
15	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3
17	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	2	0	0
19	0	3	3	0	0	0	0	0	0	2	0	0	1	0	0	0	1	0	0	0	0	0	2
21	0	7	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	2	0	0
23	0	4	3	0	0	0	0	0	1	2	0	1	3	0	0	0	0	1	7	0	3	2	0
25	0	6	0	0	0	0	0	2	0	4	0	0	2	0	0	1	1	0	5	0	5	0	0
27	0	6	3	1	0	0	1	1	0	1	0	0	0	0	0	3	11	1	17	0	5	2	0
29	0	2	2	7	0	0	0	1	0	1	1	0	1	0	0	1	2	1	19	0	10	1	0
31	0	3	6	9	3	0	0	1	1	0	1	0	4	3	0	4	2	14	13	0	5	5	0
33	10	0	10	30	10	0	3	3	3	8	8	8	12	17	1	16	3	28	14	3	6	33	5
35	22	4	33	35	20	0	10	11	14	29	7	13	33	37	11	18	8	104	70	15	3	55	2
37	21	17	44	28	41	0	14	21	19	31	10	6	33	44	10	39	23	109	106	29	6	37	6
39	20	10	35	21	37	0	11	28	15	29	25	6	38	72	17	50	33	81	158	28	18	32	9
41	16	11	26	16	36	1	18	30	12	37	10	16	49	54	21	52	31	61	119	16	21	57	10
43	11	24	26	5	21	1	18	13	13	16	4	9	23	27	34	43	31	28	61	22	25	30	16
45	3	16	9	3	18	1	15	13	9	6	5	2	15	10	32	22	13	16	77	21	32	25	13
47	2	11	6	6	8	3	3	5	6	11	7	2	13	11	36	8	8	15	35	18	29	15	4
49	3	12	1	2	3	3	3	3	8	3	7	1	8	7	15	4	18	23	24	10	26	15	8
51	3	1	4	1	1	2	0	8	4	6	0	3	8	4	9	7	11	20	14	8	9	7	1
53	1	1	2	2	1	4	1	7	4	3	1	0	3	5	7	12	7	8	5	5	7	8	4
55	1	2	1	2	1	0	2	4	2	1	0	2	0	3	4	3	5	9	1	2	4	3	2
57	2	0	1	2	1	0	1	0	1	2	1	1	1	2	2	2	2	5	10	2	4	1	2
59	0	0	1	0	1	0	1	0	0	1	3	0	0	2	1	6	3	4	7	4	3	1	0
61	0	0	0	1	0	0	1	0	0	1	0	0	0	1	2	1	2	0	1	2	0	1	0
63	1	1	0	0	1	0	0	1	1	0	0	0	0	0	2	0	2	1	2	2	1	0	1
65	0	0	0	0	0	1	0	1	0	0	0	0	0	0	2	0	1	1	1	1	0	1	1
67	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0
69	0	0	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	1	0	0	0	0	0
71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0
Total	**117**	**141**	**225**	**171**	**203**	**16**	**102**	**153**	**114**	**194**	**93**	**70**	**248**	**299**	**206**	**293**	**220**	**531**	**770**	**189**	**228**	**331**	**90**

Table 2.46. Tautog length frequencies, spring, 2 cm intervals (midpoint given), 1984-2006.
All tautog taken in the Survey were measured.

	Spring																						
length	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
9	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
11	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0
13	0	0	1	1	1	0	4	2	1	1	0	0	2	1	0	1	1	3	0	0	2	4	0
15	0	0	2	3	1	8	10	1	3	3	4	0	1	3	0	0	6	4	1	0	1	1	0
17	2	1	2	6	3	6	14	4	3	1	4	0	3	5	0	0	5	3	3	1	1	3	3
19	4	2	2	6	8	14	25	13	6	5	2	1	2	5	1	3	4	8	4	2	0	0	0
21	8	3	7	2	8	14	27	11	3	6	4	1	0	7	1	3	4	5	5	1	2	3	0
23	9	5	6	5	12	23	28	20	4	4	6	2	0	7	4	1	6	13	5	1	1	5	5
25	11	9	5	5	8	15	15	8	4	4	7	2	2	7	3	3	5	11	12	3	3	4	4
27	11	7	15	3	4	13	20	12	1	4	4	1	1	5	8	3	8	8	11	3	4	1	2
29	10	16	8	5	7	18	16	8	6	6	16	2	2	5	2	2	7	4	9	4	5	8	2
31	15	7	15	5	10	20	22	7	2	6	5	1	2	9	3	1	3	9	21	6	10	3	9
33	14	7	13	14	8	12	13	13	5	1	6	1	5	11	9	9	8	9	31	18	12	8	7
35	14	11	18	7	15	16	15	16	9	0	5	0	6	13	6	6	9	10	28	9	7	2	9
37	15	10	39	26	25	19	13	18	4	3	9	2	5	8	5	9	20	20	40	19	21	14	12
39	17	15	35	18	20	19	21	25	13	5	12	3	11	6	8	10	19	17	47	14	26	13	14
41	19	14	65	20	25	38	19	27	14	4	12	4	13	5	16	7	28	27	55	15	20	18	16
43	23	23	50	19	38	45	18	25	16	10	12	2	11	15	13	19	27	29	48	24	21	11	11
45	36	27	53	23	34	52	49	31	21	11	15	2	7	12	17	17	28	23	71	16	30	10	15
47	31	18	59	21	40	53	34	40	25	8	18	4	8	11	10	12	17	20	47	18	9	14	17
49	31	24	37	17	41	60	38	38	15	11	13	1	5	10	10	11	10	15	29	7	9	15	18
51	22	17	31	10	35	39	38	29	20	9	13	3	8	3	14	9	7	17	18	8	11	8	9
53	18	12	16	10	25	27	37	16	16	8	9	1	6	7	9	3	6	9	16	4	2	2	10
55	12	3	11	11	23	21	24	16	13	8	6	3	8	7	7	4	8	5	10	2	5	2	7
57	4	0	18	10	8	14	16	13	10	4	2	3	4	3	4	4	7	2	4	4	1	1	0
59	7	3	3	5	6	11	8	7	7	4	4	0	1	1	0	2	2	3	5	1	1	0	0
61	3	2	1	2	5	4	2	3	3	2	1	0	0	2	1	0	0	1	1	0	2	0	0
63	0	0	1	3	2	2	2	1	1	1	0	0	0	0	0	0	0	0	2	0	0	0	0
65	0	0	0	0	0	3	0	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0
67	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**336**	**236**	**513**	**257**	**412**	**566**	**528**	**407**	**227**	**129**	**189**	**40**	**113**	**168**	**151**	**139**	**245**	**277**	**523**	**181**	**208**	**150**	**170**

Table 2.47. Weakfish length frequencies, spring, 2 cm intervals (midpoint given), 1984-2006.
Weakfish were measured from every tow.

	Spring																						
length	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
5	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1
23	0	0	0	0	0	0	0	0	1	0	0	3	0	0	1	0	0	1	2	1	9	3	6
25	0	0	0	0	1	0	1	0	0	0	2	3	1	0	1	2	3	4	1	2	9	10	3
27	0	0	0	0	0	0	2	4	0	0	3	5	3	5	4	1	2	13	3	0	3	27	4
29	0	0	0	0	0	0	2	4	1	3	3	7	12	12	16	5	1	20	0	0	2	22	2
31	0	0	0	0	1	0	1	6	3	3	3	7	15	21	21	8	5	9	1	0	2	20	1
33	0	0	0	0	0	0	0	12	0	3	2	1	5	19	10	10	1	5	0	0	0	11	0
35	0	0	0	0	0	1	1	13	0	0	0	0	4	11	4	3	1	2	1	0	0	0	0
37	0	0	0	1	0	0	2	5	0	0	0	1	2	2	3	1	0	0	1	0	0	1	0
39	0	0	0	0	1	0	0	4	0	0	0	0	1	1	0	2	0	0	2	0	0	0	0
41	0	0	0	0	0	0	0	0	0	0	0	0	0	4	7	3	0	2	1	0	0	0	1
43	0	0	0	1	0	0	0	1	1	0	0	0	0	2	3	6	0	0	1	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	4	1	0	0	0	0	0	0
47	0	0	0	0	0	0	0	1	1	0	0	0	0	1	2	2	1	0	1	0	0	0	0
49	0	0	1	0	0	0	0	0	0	0	0	1	0	1	5	3	1	0	1	0	0	0	4
51	0	0	0	0	0	1	0	1	2	0	0	0	0	0	6	3	2	0	1	0	0	0	2
53	0	0	0	0	0	0	0	0	3	0	0	0	0	0	2	3	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0	0	4	0	0	0	0	1	1	3	1	0	2	0	0	0	0
57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	9	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	5	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	4	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	6	2	0	0	1	0	0	0
65	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	3	0	0	1	0
71	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0
73	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	2	1	4	0	0	0	0
75	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0
77	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
79	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
81	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
83	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**1**	**0**	**9**	**2**	**6**	**5**	**9**	**51**	**18**	**11**	**13**	**28**	**43**	**81**	**92**	**85**	**29**	**59**	**28**	**5**	**28**	**96**	**26**

Table 2.48. Weakfish length frequencies, fall, 2 cm intervals (midpoint given), 1984-2006.
Weakfish were measured from every tow, with the exceptions of 968 juveniles in 1988 and 863 juveniles in 1989 that were not measured.

	Fall																						
length	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
3	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	2	1	0	0	0	1	0	2	0	3	0	0	24	13	0	6	0	0	1
7	0	3	51	0	13	46	2	0	48	22	16	34	34	92	0	0	1,065	89	2	357	30	8	3
9	15	70	448	15	37	247	39	11	218	76	127	74	110	431	27	53	5,951	1,054	253	1,026	1,263	11	6
11	24	168	1,625	84	63	566	130	423	233	222	413	33	366	749	110	976	7,488	3,672	1,009	1,186	4,329	197	26
13	69	187	2,191	98	60	1,152	207	522	289	340	1,586	137	713	598	589	1,748	3,650	4,135	2,455	1,108	5,940	1,246	41
15	54	474	894	22	31	1,699	519	831	292	550	2,561	566	1,529	214	788	2,802	1,641	2,124	3,740	1,153	3,909	2,538	37
17	17	1,196	107	3	17	750	629	949	120	503	2,538	957	2,084	356	1,160	2,889	1,821	764	1,875	590	1,168	2,739	36
19	5	379	50	2	3	162	312	741	35	235	665	748	1,165	651	497	2,007	1,169	366	851	132	471	1,798	27
21	2	92	4	4	0	1	57	347	22	63	146	141	187	417	104	1,147	565	250	345	29	235	413	9
23	1	14	10	1	0	1	6	267	9	6	71	11	8	106	50	357	100	84	94	0	74	89	1
25	1	13	1	0	0	1	0	65	2	0	0	3	0	5	0	234	22	5	13	0	31	26	0
27	0	14	0	0	0	0	0	0	2	0	0	0	0	0	0	38	0	2	13	0	0	1	0
29	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	4	0	0	11	0	0	0	0
31	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	3
33	0	0	0	0	0	0	0	0	2	0	0	3	3	0	1	0	3	0	0	1	2	0	2
35	2	1	0	0	0	0	0	1	1	1	0	6	12	8	3	1	12	0	1	0	4	0	4
37	5	0	2	1	0	0	1	0	2	0	0	13	19	18	10	0	9	3	1	0	1	2	6
39	3	0	2	0	0	0	1	2	8	2	2	16	21	31	10	3	13	7	3	1	4	4	1
41	4	2	4	1	0	0	2	1	1	3	5	23	41	37	13	5	9	18	3	0	6	6	2
43	5	1	4	4	0	0	0	9	0	8	4	38	18	43	11	14	6	24	3	0	1	6	4
45	7	4	0	3	1	0	1	9	0	8	1	27	11	28	10	15	1	22	1	0	6	2	1
47	3	6	0	5	1	0	0	20	0	3	2	9	6	15	8	8	0	34	1	1	3	3	1
49	0	1	1	0	0	0	1	22	0	1	4	5	1	10	2	9	1	8	0	0	0	3	0
51	4	1	1	1	0	0	0	26	1	0	0	4	3	2	1	5	0	5	4	0	0	0	1
53	1	0	0	0	1	0	0	19	2	2	0	0	0	2	1	0	0	2	0	0	0	0	0
55	0	1	1	0	0	0	1	4	1	0	0	0	0	4	2	3	0	2	1	0	0	0	2
57	1	2	0	0	2	0	0	0	3	0	0	0	0	2	2	4	2	0	1	0	0	0	1
59	1	1	0	0	0	0	0	0	2	0	0	0	0	0	2	0	0	0	3	0	0	0	0
61	0	1	0	0	0	0	0	1	3	0	0	0	0	0	0	0	2	0	3	0	0	0	1
63	0	0	0	0	0	0	0	0	3	0	0	0	0	0	1	2	0	0	0	0	0	0	0
65	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	5	0	0	0	0	0	0
67	0	2	1	0	0	0	1	0	0	0	0	0	0	0	0	5	1	0	0	0	0	0	0
69	1	1	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
71	4	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
73	7	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75	10	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
77	5	5	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
79	2	2	4	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
83	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
85	1	0	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
87	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
89	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
91	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**259**	**2,650**	**5,415**	**246**	**234**	**4,628**	**1,911**	**4,270**	**1,299**	**2,047**	**8,141**	**2,850**	**6,332**	**3,823**	**3,404**	**12,331**	**23,561**	**12,683**	**10,686**	**5,592**	**17,478**	**9,092**	**216**

Table 2.49. Windowpane flounder length frequencies, spring, 1 cm intervals, 1989, 1990, 1994-2006.
Lengths were recorded from the first three tows of each day.

	Spring														
length	**1989**	**1990**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
4	0	0	1	0	0	0	0	0	0	0	0	2	0	0	0
5	4	0	0	0	0	0	0	1	0	0	0	0	1	0	0
6	0	0	0	0	0	2	0	2	5	1	1	10	2	0	0
7	0	0	0	0	1	4	2	4	17	2	7	22	3	0	0
8	0	2	4	1	3	5	4	3	27	7	6	23	6	0	0
9	0	40	16	3	2	9	5	2	11	10	21	20	11	0	0
10	25	66	67	12	34	15	7	8	17	13	12	11	19	7	2
11	69	96	169	86	79	37	19	20	5	29	8	3	24	12	1
12	89	74	305	148	162	76	60	40	3	23	10	7	25	16	7
13	337	53	362	259	288	136	131	37	10	29	5	9	58	25	12
14	430	66	232	189	381	309	200	45	11	26	8	13	100	22	34
15	414	124	152	180	487	362	211	96	24	43	15	13	101	23	42
16	305	180	126	89	310	606	177	123	27	55	12	15	72	37	36
17	174	212	209	70	331	754	130	165	23	73	9	15	65	22	48
18	78	178	372	99	339	588	165	160	32	94	24	23	56	4	45
19	65	132	357	139	548	440	260	194	26	78	19	26	45	16	20
20	174	144	289	143	604	366	362	386	75	89	15	31	60	13	24
21	216	116	217	85	567	429	461	357	136	95	22	45	32	22	24
22	299	143	139	82	401	438	311	301	166	232	45	50	42	29	27
23	319	108	163	57	409	368	229	217	138	290	110	92	39	42	28
24	270	103	147	54	280	323	227	217	125	245	141	123	66	36	41
25	177	87	183	54	236	231	188	206	121	208	133	111	109	47	31
26	189	103	184	70	235	191	178	136	106	126	114	76	100	52	52
27	138	79	138	56	187	222	162	161	91	88	69	88	86	49	37
28	148	38	70	44	117	145	138	97	56	83	62	68	71	29	38
29	78	26	68	24	97	98	67	53	47	59	41	37	48	24	24
30	99	35	42	27	66	75	58	42	37	39	42	35	51	20	14
31	50	20	25	12	31	23	34	39	12	25	19	22	32	13	8
32	8	15	13	4	25	12	13	26	16	21	17	9	16	5	2
33	16	3	2	9	5	8	6	3	8	15	7	2	10	1	3
34	0	5	5	0	4	1	1	1	2	5	4	4	9	3	0
35	0	4	5	1	3	0	3	4	5	10	2	4	5	0	0
36	0	4	2	2	1	1	0	0	1	2	0	5	0	2	0
37	0	0	0	1	0	0	3	1	1	2	2	1	1	0	0
38	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
39	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Total	**4,171**	**2,256**	**4,064**	**2,001**	**6,234**	**6,274**	**3,812**	**3,147**	**1,381**	**2,118**	**1,002**	**1,015**	**1,365**	**571**	**600**

Table 2.50. Winter flounder length frequencies, April-May, 1 cm intervals, 1984-2006.
Winter flounder were measured from every tow.

	April-May																						
length	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
5	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	7	4	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	36	4	2	3	0	0	1	0	2	0	0	1	3	0
8	0	0	5	8	3	1	10	3	1	72	26	28	4	2	5	7	2	5	0	1	5	5	0
9	1	7	6	52	16	17	38	29	7	208	41	97	21	15	41	18	3	20	4	2	22	32	0
10	3	9	35	49	29	70	139	54	18	433	137	307	61	75	128	50	23	55	5	11	36	73	5
11	26	28	188	114	135	312	375	121	75	698	442	618	246	260	283	135	84	161	34	28	129	164	6
12	35	127	455	239	359	628	1,117	228	136	921	835	877	461	528	492	252	145	256	88	57	174	278	55
13	149	284	617	483	869	954	2,563	342	170	713	1,006	772	582	497	554	252	169	239	148	50	188	337	48
14	196	219	733	820	1,378	1,260	3,243	729	180	528	1,149	854	788	517	488	225	185	223	132	54	132	209	39
15	255	308	808	1,060	1,882	1,424	3,847	1,127	254	526	1,487	792	956	484	481	204	177	162	148	50	81	163	19
16	177	467	771	1,033	1,819	1,579	3,627	1,169	323	485	1,680	766	992	553	574	214	210	159	174	66	53	128	16
17	182	473	763	1,028	1,953	1,651	3,544	1,568	373	501	1,540	698	1,099	599	713	290	254	245	160	76	41	122	40
18	153	574	730	1,006	1,507	1,724	3,145	1,648	398	580	1,467	692	1,149	666	658	313	248	251	206	86	65	108	52
19	117	794	780	855	1,596	1,532	3,054	1,690	397	542	1,217	632	1,032	574	622	283	327	313	317	142	72	117	41
20	169	607	665	666	1,136	1,462	2,434	1,676	344	624	896	515	1,012	529	685	296	311	362	364	174	59	148	65
21	108	591	600	592	1,045	1,358	1,904	1,493	277	626	742	469	821	429	592	320	314	308	353	127	79	125	54
22	104	486	534	552	963	1,407	1,481	1,332	302	549	556	367	795	444	524	218	289	306	353	87	53	69	45
23	63	479	521	442	897	1,160	1,416	1,099	212	426	359	346	676	402	486	290	266	233	337	84	48	71	28
24	81	346	427	377	748	971	1,092	1,113	278	418	310	311	701	401	544	260	218	205	395	79	47	51	22
25	74	318	341	374	520	1,015	1,018	939	202	349	296	318	692	377	529	344	228	244	311	97	46	49	28
26	90	187	375	333	541	982	846	858	242	383	219	231	719	461	527	304	223	249	285	129	61	36	13
27	62	232	240	281	420	736	639	788	181	320	216	318	568	496	505	360	251	259	259	150	84	36	23
28	43	129	244	230	366	648	586	598	181	197	173	260	549	416	518	418	252	311	187	170	92	25	29
29	29	86	189	220	253	502	525	511	160	221	122	244	460	401	466	389	285	326	248	200	103	32	17
30	42	70	178	154	266	339	305	397	133	178	103	180	540	365	448	362	279	299	215	206	96	35	20
31	24	71	124	151	120	247	307	241	96	200	117	130	367	313	323	321	300	286	201	166	112	33	27
32	20	85	77	113	169	163	171	157	98	142	91	76	375	260	277	249	227	228	171	167	95	38	28
33	7	69	86	61	111	73	218	108	60	139	72	63	267	193	195	228	262	172	155	138	122	45	20
34	7	45	56	85	69	47	113	107	38	159	65	42	190	166	140	191	220	189	109	116	94	48	20
35	12	19	42	47	54	68	70	65	35	112	52	30	119	136	136	159	195	189	107	115	88	31	20
36	4	11	39	53	33	65	44	30	26	79	49	33	84	89	79	103	150	143	94	73	91	34	18
37	4	8	15	20	25	20	24	25	26	36	25	12	50	68	32	90	120	133	60	53	93	27	15
38	0	15	17	19	15	18	48	7	4	10	21	16	28	37	37	35	80	77	59	79	46	25	4
39	0	4	18	11	22	3	18	13	0	17	15	14	12	18	13	18	54	70	24	44	56	25	6
40	0	0	18	8	9	8	12	9	3	3	16	7	13	10	5	20	16	35	32	38	34	11	3
41	0	0	1	2	6	7	3	1	0	5	6	3	1	6	3	14	20	26	11	17	18	7	5
42	0	1	3	0	8	3	8	5	0	2	6	3	6	2	2	4	7	10	9	7	9	9	1
43	0	0	2	3	3	0	1	1	0	2	1	0	2	1	0	3	11	3	4	13	1	3	0
44	0	1	4	0	2	1	1	1	1	0	0	1	3	0	1	3	4	1	1	3	7	2	0
45	0	1	0	1	1	0	8	1	0	0	0	0	0	0	0	1	2	0	3	4	2	2	1
46	0	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	2	0	0	0	3	2	0
47	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0
49	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0
51	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**2,237**	**7,152**	**10,707**	**11,543**	**19,350**	**22,455**	**37,996**	**20,283**	**5,231**	**11,449**	**15,565**	**11,124**	**16,445**	**10,790**	**12,106**	**7,246**	**6,413**	**6,755**	**5,763**	**3,160**	**2,640**	**2,758**	**833**

Table 2.51. Winter flounder length frequencies, fall, 1 cm intervals, 1984-2006.
Winter flounder were measured from every tow.

	Fall																						
length	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
5	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0	0
7	0	0	0	0	1	0	1	1	3	4	1	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	1	7	0	0	1	5	43	0	1	2	0	0	0	0	0	0	0	2	2	0
9	0	0	0	0	3	4	0	1	8	83	3	0	3	4	2	0	0	0	0	0	0	1	0
10	0	2	0	0	10	3	2	1	9	39	6	3	11	5	3	0	0	2	0	0	2	1	2
11	1	3	2	2	8	6	4	9	6	42	10	16	16	6	3	0	0	6	0	0	9	0	0
12	9	16	16	8	34	38	6	34	18	159	63	28	54	23	20	3	5	13	0	1	21	4	1
13	18	37	43	47	97	127	34	72	72	331	149	67	157	77	68	44	20	62	6	1	41	28	6
14	25	57	82	54	243	343	130	139	85	409	230	87	218	113	137	128	53	123	24	5	65	77	8
15	31	63	116	67	295	367	260	144	149	435	219	96	255	165	190	194	111	122	37	10	61	98	17
16	60	55	104	72	302	293	345	91	182	377	187	77	225	176	192	243	156	116	40	9	48	99	23
17	65	49	118	53	207	315	327	110	140	247	146	61	173	175	160	268	170	80	43	11	37	66	11
18	89	53	86	72	167	213	319	99	111	151	142	64	132	116	87	225	169	66	33	10	19	52	5
19	111	41	50	79	212	199	326	108	99	85	141	41	119	126	60	158	148	32	31	8	21	33	5
20	97	36	45	83	184	146	310	95	97	68	124	32	136	78	46	108	107	28	35	9	7	24	7
21	100	37	27	53	184	121	245	96	84	51	111	23	96	65	25	86	89	25	23	10	8	14	4
22	67	33	22	54	138	105	176	79	68	39	56	19	97	38	28	52	62	20	38	10	4	9	7
23	63	22	17	44	104	107	146	73	42	39	38	13	65	55	24	29	41	16	28	17	2	6	3
24	38	17	13	25	77	68	91	40	37	38	24	10	58	32	15	27	47	33	31	15	1	1	3
25	34	14	9	21	40	85	53	48	28	29	26	5	47	23	14	29	35	24	28	10	0	7	2
26	36	10	7	14	32	39	49	20	17	30	28	2	25	26	11	19	30	31	27	18	5	6	2
27	16	10	1	5	32	43	38	13	8	22	13	3	27	20	13	17	21	15	20	21	3	5	0
28	34	6	2	11	12	33	16	17	13	10	8	3	14	14	8	13	25	20	9	11	4	5	0
29	13	3	1	5	9	30	12	7	7	12	10	1	17	7	7	17	15	22	10	10	6	1	0
30	14	6	2	3	13	10	14	5	7	7	7	0	10	7	3	8	13	17	8	10	2	1	1
31	8	1	2	2	4	12	1	8	3	8	8	2	13	5	11	7	8	4	4	16	2	1	0
32	6	0	1	2	6	4	3	2	1	4	3	1	4	2	4	5	6	4	6	11	3	1	0
33	5	1	2	0	1	1	4	6	0	3	2	1	3	4	5	9	9	6	10	12	2	1	1
34	1	2	0	0	0	1	0	1	1	2	2	0	3	3	5	1	10	2	7	10	3	0	0
35	4	0	0	4	0	3	1	0	0	0	1	1	1	1	3	4	6	3	4	4	3	1	0
36	1	0	1	0	0	0	1	0	0	0	1	0	2	0	0	2	4	3	4	4	2	1	0
37	0	0	0	0	0	0	0	0	0	0	3	0	0	1	0	0	1	1	3	1	2	2	0
38	1	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	2	1	5	4	2	2	0
39	2	0	0	0	0	0	0	0	0	3	0	0	0	1	0	1	1	3	5	0	2	2	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	3	2	2	0
41	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	3	3	0	0	2	0
42	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0
44	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2	0
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Total	**949**	**575**	**769**	**781**	**2,422**	**2,717**	**2,914**	**1,321**	**1,300**	**2,771**	**1,765**	**657**	**1,984**	**1,370**	**1,146**	**1,699**	**1,364**	**907**	**527**	**262**	**392**	**557**	**108**

Table 2.52. Winter skate length frequencies, spring, 1995-2006.
Winter skate were scheduled to be measured from every tow. However, the following numbers of skate were not measured: 4 in 1995, 10 in 1996, and 2 in 1997.

	Spring											
length	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
27	0	0	0	0	0	1	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	1	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	1	0	0	3	0	0
39	0	0	0	0	0	0	0	1	2	2	0	0
41	0	0	0	0	0	0	0	1	1	2	0	0
43	0	0	0	0	0	3	0	1	2	4	1	0
45	0	0	0	0	1	3	0	0	0	6	0	0
47	0	0	0	0	0	2	0	0	0	4	3	0
49	0	0	0	0	0	2	0	0	1	2	1	1
51	0	1	0	1	0	0	0	1	1	0	1	0
53	0	0	0	0	1	3	1	0	1	0	0	1
55	0	0	2	3	1	1	0	0	1	1	1	4
57	1	2	4	3	2	0	0	0	6	0	0	1
59	5	4	1	5	3	2	0	1	1	2	0	1
61	1	5	2	1	0	0	3	1	1	1	3	1
63	2	2	2	4	1	0	0	1	2	3	2	2
65	4	2	4	7	0	0	0	0	0	0	1	1
67	1	1	2	2	1	1	0	1	1	1	3	3
69	2	0	1	4	2	0	0	1	4	1	0	1
71	1	3	2	3	1	2	2	1	2	2	0	1
73	0	3	0	0	0	1	2	4	0	2	1	4
75	4	4	1	5	3	1	2	1	3	1	0	1
77	0	2	3	6	7	2	1	1	1	1	0	0
79	1	2	1	4	1	1	2	3	1	1	1	0
81	0	4	0	3	2	1	1	2	3	3	0	1
83	0	3	0	2	0	0	1	0	1	1	0	0
85	0	2	1	1	0	3	1	2	1	0	0	0
87	0	0	0	0	0	0	1	1	1	0	0	0
89	0	0	0	1	0	0	0	0	0	0	0	0
91	0	0	0	0	0	0	0	1	0	0	0	0
93	0	0	1	0	0	0	0	1	0	1	0	0
Total	**22**	**40**	**27**	**55**	**26**	**29**	**18**	**26**	**37**	**45**	**18**	**23**

TABLES 2.53 - 2.60
NARROWS

Table 2.53. Number of additional samples (non-standard LISTS) taken by year and month, 1999-2006.
These additional samples were taken west of Norwalk in a section of the Sound referred to as 'The Narrows' to document species composition and abundance. Precipitated by the lobster mortality events noted in 1999, samples were initially collected ad hoc. In May and June 2000, 10 sites per month were selected. From September 2000 through 2004, six sites were selected for each month that LISTS was conducted. During 2005, sampling was reduced to three sites for each month of LISTS sampling.

	Year							
Cruise	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
April	-	2	6	6	6	6	3	-
May	-	10	6	6	6	6	3	3
June	-	10	6	6	6	6	3	3
July	-	-	-	-	-	-	-	-
August	-	-	-	-	-	-	-	-
September	-	6	6	6	5	5	3	3
October	4*	6	6	6	-	2	3	-
November	-	-	-	-	6	-	-	-
December	10**	-	-	-	-	-	-	-
Total	**14**	**34**	**30**	**30**	**29**	**25**	**15**	**9**

* nonstandard 10-minute tows/two sites off Greenwich, one site off Stamford, and one site off Bridgeport

** Standard 30-minute tows/central LIS sites - five tows off Bridgeport and five tows off New Haven

Table 2.54 Total number and weight (kg) of finfish and invertebrates caught in the Narrows in 2006.
Finfish species are in order of descending count. Invertebrate species are in order of descending weight (nc = not counted). Number of tows (sample size) = 9.

	Vertebrates			
species	**count**	**%**	**weight**	**%**
butterfish	12,977	73.0	438.3	37.7
scup	2,852	16.0	359.5	30.9
bluefish	743	4.2	70.4	6.0
winter flounder	599	3.4	52.7	4.5
silver hake	98	0.6	3.7	0.3
spotted hake	95	0.5	5.5	0.5
windowpane flounder	63	0.4	7.1	0.6
striped searobin	60	0.3	27.5	2.4
fourspot flounder	59	0.3	13.6	1.2
moonfish	54	0.3	0.9	0.1
weakfish	31	0.2	4.6	0.4
striped bass	24	0.1	67.1	5.8
bay anchovy	20	0.1	0.6	0.1
summer flounder	20	0.1	31.1	2.7
Atlantic menhaden	17	0.1	10.5	0.9
northern searobin	17	0.1	2.5	0.2
hickory shad	14	0.1	2.9	0.2
Atlantic herring	11	0.1	0.3	0.0
smooth dogfish	10	0.1	59.1	5.1
red hake	9	0.1	0.4	0.0
tautog	6	0.0	4.5	0.4
black sea bass	2	0.0	0.8	0.1
cunner	2	0.0	0.1	0.0
blueback herring	1	0.0	0.1	0.0
gizzard shad	1	0.0	0.1	0.0
fourbeard rockling	1	0.0	0.1	0.0
Totals	**17,786**		**1,164.0**	

	Invertebrates			
species	**count**	**%**	**weight**	**%**
horseshoe crab	20	5.0	45.9	43.5
rock crab	.	.	16.5	15.6
hydroid spp.	.	.	13.6	12.9
American lobster	41	10.4	12.1	11.5
long-finned squid	304	76.2	10.2	9.7
spider crab	.	.	2.5	2.4
channeled whelk	12	3.0	1.4	1.3
starfish spp.	.	.	0.9	0.9
mantis shrimp	14	3.5	0.8	0.8
mud crabs	.	.	0.4	0.4
blue crab	2	0.5	0.3	0.3
sand shrimp	.	.	0.2	0.2
hard clams	5	1.3	0.2	0.2
Japanese shore crab	.	.	0.2	0.2
tunicates, misc.		.	0.2	0.2
common slipper shell	.	.	0.1	0.1
Totals	**398**		**105.5**	

Table 2.55 Total counts and weight (kg) of finfish taken in spring and fall sampling periods in the Narrows, 2006.
Species are listed in order of total count. Number of tows (sample sizes): Spring = 6, Fall = 3.

	Spring				Fall				
species	**count**	**%**	**weight**	**%**	**species**	**count**	**%**	**weight**	**%**
Atlantic herring	918	32.6	154.2	23.4	scup	15,858	77.6	229.0	42.6
winter flounder	631	22.4	84.7	12.8	butterfish	2,362	11.6	30.5	5.7
butterfish	560	19.9	42.1	6.4	bluefish	603	2.9	88.8	16.5
bay anchovy	179	6.4	1.1	0.2	weakfish	486	2.4	21.5	4.0
striped bass	131	4.6	231.4	35.1	windowpane flounder	458	2.2	21.7	4.0
alewife	84	3.0	4.9	0.7	winter flounder	399	2.0	42.8	8.0
windowpane flounder	62	2.2	11.6	1.8	Atlantic menhaden	55	0.3	17.5	3.3
spotted hake	48	1.7	2.0	0.3	American shad	44	0.2	3.0	0.6
scup	27	0.9	15.7	2.4	striped searobin	41	0.2	6.6	1.2
American shad	25	0.9	1.3	0.2	hickory shad	37	0.2	9.6	1.8
smooth dogfish	24	0.9	47.6	7.2	striped bass	25	0.1	48.4	9.0
fourspot flounder	21	0.7	4.5	0.7	moonfish	23	0.1	0.7	0.1
striped searobin	21	0.7	12.8	1.9	alewife	15	0.1	0.8	0.1
hickory shad	15	0.5	3.3	0.5	summer flounder	11	0.1	11.8	2.2
tautog	11	0.4	15.3	2.3	blueback herring	6	0.0	0.2	0.0
red hake	10	0.4	1.5	0.2	tautog	6	0.0	2.5	0.5
fourbeard rockling	8	0.3	0.7	0.1	red hake	5	0.0	1.1	0.2
silver hake	8	0.3	0.5	0.1	spotted hake	3	0.0	0.9	0.2
blueback herring	6	0.2	0.2	0.0	yellow jack	3	0.0	0.3	0.1
ocean pout	5	0.2	2.0	0.3	bay anchovy	2	0.0	0.2	0.0
weakfish	5	0.2	1.2	0.2	Atlantic silverside	1	0.0	0.1	0.0
summer flounder	4	0.1	6.5	1.0	**Totals**	**20,443**		**538.0**	
little skate	3	0.1	1.0	0.2					
black sea bass	2	**0.1**	1.8	0.3					
clearnose skate	2	0.1	6.0	0.9					
Atlantic menhaden	2	0.1	1.5	0.2					
northern searobin	2	0.1	0.8	0.1					
pollock	2	0.1	0.2	0.0					
winter skate	1	0.0	3.2	0.5					
Totals	**2,817**		**659.6**						

Table 2.56 Total catch of invertebrates taken in the spring and fall sampling periods in the Narrows, 2006.
Species are ranked by total weight (kg). Number of tows (sample sizes): Spring = 6, Fall =3.

	Spring				Fall				
species	**count**	**%**	**weight**	**%**	**species**	**count**	**%**	**weight**	**%**
rock crab	.	.	16.3	31.2	horseshoe crab	17	5.2	40.3	75.6
hydroid spp.	.	.	13.6	26.1	long-finned squid	301	91.3	10.0	18.8
American lobster	35	50.7	10.2	19.5	American lobster	6	1.9	1.9	3.6
horseshoe crab	3	4.3	5.6	10.7	mantis shrimp	4	1.2	0.3	0.6
spider crab	.	.	2.2	4.2	spider crab	.	.	0.3	0.6
channeled whelk	12	17.4	1.4	2.7	rock crab	.	.	0.2	0.4
starfish spp.	.	.	0.7	1.3	starfish spp.	.	.	0.2	0.4
mantis shrimp	10	14.5	0.5	1.0	blue crab	1	0.3	0.1	0.2
mud crabs	.	.	0.4	0.8	**Totals**	**329**		**53.3**	
blue crab	1	1.4	0.2	0.4					
sand shrimp	.	.	0.2	0.4					
hard clams	5	7.2	0.2	0.4					
Japanese shore crab	.	.	0.2	0.4					
long-finned squid	3	4.3	0.2	0.4					
tunicates misc	.	.	0.2	0.4					
common slipper shell	.	.	0.1	0.2					
Totals	**69**		**52.2**						

Table 2.57 Species richness for the standard LISTS and Narrows Surveys, 2000-2006.
Species richness is measured as the mean number of species captured per tow. Sample sizes (number of tows) are noted in parentheses.

SPRING	LISTS							Narrows						
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
finfish	12.6 (120)	11.4 (120)	13.7 (120)	11.3 (120)	11.3 (119)	9.2 (120)	10.6 (80)	13.0 (22)	12.1 (18)	13.2 (18)	12.3 (18)	11.5 (18)	12.3 (9)	12.3 (6)
invertebrates	5.9 (120)	6.6 (120)	6.7 (120)	8.6 (120)	7.0 (119)	5.3 (120)	4.4 (80)	5.7 (22)	6.3 (18)	7.9 (18)	7.4 (18)	7.7 (18)	5.7 (9)	6.5 (6)

FALL	LISTS							Narrows						
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
finfish	13.7 (80)	13.3 (80)	14.3 (80)	14.4 (40)	13.4 (80)	13.6 (80)	10.6 (40)	14.8 (12)	14.9 (12)	15.6 (12)	14.0 (5)	12.7 (7)	12.7 (6)	11.7 (3)
invertebrates	7.2 (80)	7.1 (80)	7.1 (80)	6.2 (40)	6.2 (80)	5.7 (80)	5.7 (40)	7.2 (12)	6.2 (12)	5.9 (12)	6.0 (5)	5.4 (7)	6.0 (6)	4.7 (3)

Table 2.58. Indices of abundance for selected species in the Narrows, 2000-2006.

The geometric mean count per tow was calculated for 38 finfish and 2 invertebrates. April-June data were used for the Spring indices, September-October data for the Fall (in 2003, there was no October sampling). A time series mean indicates the seasonal index that provides the better estimate of relative abundance in LISTS (Simpson et al. 1991. For American lobster and long-finned squid, both spring and fall indices provide good estimates of abundance.

	Spring							00-05
Species	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**Mean**
alewife	0.72	1.01	0.93	2.21	1.32	3.38	0.00	1.60
black sea bass	0.07	0.31	0.49	0.24	0.15	0.17	0.20	0.24
bluefish	0.00	0.06	0.04	0.04	0.04	0.00	0.44	
butterfish	2.12	8.13	2.85	1.73	4.35	5.62	106.74	
cunner	0.53	0.63	0.70	0.36	0.22	0.00	0.20	0.41
dogfish, smooth	0.67	0.55	0.71	0.35	0.85	0.96	0.51	
dogfish, spiny	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
flounder, fourspot	8.87	5.67	8.64	3.19	3.08	1.13	6.32	5.10
flounder, summer	2.27	1.36	2.02	1.09	0.66	0.32	1.41	
flounder, windowpane	43.94	22.83	16.24	19.09	5.66	5.12	5.69	18.81
flounder, winter	19.27	54.28	35.31	42.24	57.04	64.86	71.92	45.50
hake, red	4.92	0.45	0.44	0.70	1.81	0.56	0.70	1.48
hake, silver	0.47	3.85	4.75	0.14	0.69	0.42	3.32	1.72
hake, spotted	36.46	11.84	15.76	8.44	1.70	1.60	6.82	
herring, Atlantic	0.46	4.99	2.81	4.00	2.52	20.73	0.85	5.92
herring, blueback	0.12	0.14	0.07	0.55	0.34	0.32	0.12	
hogchoker	0.00	0.05	0.00	0.00	0.04	0.00	0.00	
kingfish, northern	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
lobster, American	13.30	4.90	10.19	5.99	6.69	2.23	1.86	7.22
mackerel, Spanish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
menhaden, Atlantic	0.03	0.04	0.38	0.29	0.04	0.13	0.57	
moonfish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
ocean pout	0.00	0.00	0.18	0.21	0.23	0.32	0.00	0.16
rockling, fourbeard	1.20	0.99	1.15	0.42	0.83	0.54	0.12	0.86
scad, rough	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
sculpin, longhorn	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.01
scup	35.36	8.27	15.17	2.41	1.11	1.40	32.80	
sea raven	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
searobin, northern	1.68	0.79	0.48	0.18	0.04	0.11	0.62	0.55
searobin, striped	30.05	8.69	15.43	6.93	3.18	1.42	7.30	
shad, American	0.47	0.46	0.92	0.60	0.55	1.27	0.00	
shad, hickory	0.04	0.14	0.17	0.42	0.47	0.62	0.91	
skate, little	0.46	0.08	0.08	0.20	0.19	0.21	0.00	0.20
skate, winter	0.00	0.00	0.05	0.04	0.16	0.09	0.00	0.06
spot	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
squid, long-finned	0.40	0.51	0.76	0.22	1.28	1.27	0.35	0.74
striped bass	2.30	3.13	2.18	2.23	1.45	5.80	2.85	2.85
sturgeon, Atlantic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
tautog	0.59	0.87	1.14	0.48	0.34	0.51	0.41	0.66
weakfish	0.62	0.47	0.27	0.09	0.19	0.42	0.00	

	Fall							00-05
Species	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**Mean**
alewife	0.12	0.47	0.18	0.00	0.00	0.94	0.00	
black sea bass	0.13	0.00	0.67	0.00	0.00	0.00	0.00	
bluefish	21.60	209.12	47.20	62.01	49.46	32.97	223.95	70.39
butterfish	63.49	1,170.26	620.92	348.18	860.19	141.44	2,991.57	534.08
cunner	0.27	0.06	0.07	0.15	0.00	0.00	0.00	
dogfish, smooth	0.72	0.82	1.65	2.25	0.35	0.00	0.95	0.97
dogfish, spiny	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
flounder, fourspot	0.19	2.09	0.49	1.05	0.81	0.00	0.00	
flounder, summer	2.04	2.39	4.29	5.18	4.26	1.31	0.46	3.25
flounder, windowpane	4.93	6.50	7.26	5.85	6.27	28.19	0.84	
flounder, winter	8.49	10.82	7.93	2.68	19.43	40.56	3.81	
hake, red	0.15	0.20	0.00	0.00	0.00	0.36	0.00	
hake, silver	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
hake, spotted	5.39	1.06	1.78	3.48	0.00	0.26	2.82	2.00
herring, Atlantic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
herring, blueback	0.00	0.06	0.00	0.00	0.00	0.38	0.00	0.07
hogchoker	0.07	0.06	0.07	0.15	0.00	0.00	0.00	0.06
kingfish, northern	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.02
lobster, American	7.11	5.04	4.91	7.68	13.47	3.50	0.95	6.95
mackerel, Spanish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
menhaden, Atlantic	4.22	2.98	9.09	4.68	34.48	6.13	0.84	10.26
moonfish	5.52	2.93	10.35	2.44	1.90	1.21	16.31	4.06
ocean pout	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
rockling, fourbeard	0.40	0.17	0.00	0.00	0.00	0.00	0.00	
scad, rough	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.01
sculpin, longhorn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
scup	708.08	439.21	862.96	540.86	1,598.89	1,551.89	546.27	950.32
sea raven	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
searobin, northern	0.20	0.43	0.27	0.00	0.36	0.00	0.00	0.21
searobin, striped	37.69	24.63	24.22	21.76	18.59	5.89	1.00	
shad, American	0.47	0.90	3.34	0.15	3.77	4.54	0.00	2.20
shad, hickory	0.23	0.39	0.16	0.00	0.00	1.18	0.46	0.33
skate, little	0.19	0.00	0.00	0.00	0.00	0.00	0.00	
skate, winter	0.00	0.07	0.00	0.00	0.10	0.00	0.00	
spot	1.47	0.12	1.50	0.32	0.00	0.00	0.00	0.57
squid, long-finned	36.75	52.37	19.86	75.50	55.77	32.53	83.50	45.46
striped bass	0.59	1.06	1.07	1.70	0.53	2.48	0.84	
sturgeon, Atlantic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
tautog	0.61	0.17	0.57	0.15	0.10	0.59	0.44	
weakfish	876.42	151.45	142.64	496.38	90.66	21.87	2.96	296.57

Table 2.59. Biomass indices of abundance for selected finfish species in the Narrows, 2000-2006.
The geometric mean weight (kg) per tow was calculated for 38 finfish. April-June data were used for the Spring indices, September–October data for the Fall.

	Spring						
Species	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
alewife	0.15	0.07	0.14	0.37	0.14	0.44	0.00
black sea bass	0.02	0.23	0.35	0.19	0.14	0.15	0.10
bluefish	0.00	0.14	0.04	0.07	0.01	0.00	0.25
butterfish	0.35	1.91	0.58	0.39	1.07	1.45	10.75
cunner	0.11	0.10	0.12	0.06	0.04	0.00	0.02
dogfish, smooth	0.50	0.98	1.14	0.47	1.14	1.77	1.23
dogfish, spiny	0.00	0.00	0.00	0.00	0.00	0.00	0.00
flounder, fourspot	1.84	1.75	2.26	1.00	1.14	0.35	1.76
flounder, summer	2.87	1.39	1.63	0.73	0.68	0.45	1.87
flounder, windowpane	6.09	4.10	2.68	3.86	1.27	1.03	0.91
flounder, winter	2.36	5.90	6.15	9.23	7.40	8.60	8.31
hake, red	0.47	0.06	0.08	0.06	0.13	0.14	0.06
hake, silver	0.04	0.59	0.37	0.02	0.07	0.05	0.39
hake, spotted	2.04	0.98	1.02	0.64	0.26	0.17	0.40
herring, Atlantic	0.21	1.54	1.33	0.93	0.58	2.18	0.05
herring, blueback	0.02	0.01	0.01	0.04	0.03	0.02	0.02
hogchoker	0.00	0.01	0.00	0.00	0.01	0.00	0.00
kingfish, northern	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
menhaden, Atlantic	0.01	0.03	0.17	0.20	0.02	0.11	0.47
moonfish	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ocean pout	0.00	0.00	0.06	0.10	0.11	0.16	0.00
rockling, fourbeard	0.15	0.12	0.12	0.05	0.10	0.07	0.02
scad, rough	0.00	0.00	0.00	0.00	0.00	0.00	0.00
sculpin, longhorn	0.00	0.01	0.00	0.00	0.00	0.00	0.00
scup	3.01	1.81	4.25	1.17	0.60	0.83	3.71
sea raven	0.00	0.00	0.00	0.00	0.00	0.00	0.00
searobin, northern	0.42	0.26	0.12	0.04	0.01	0.07	0.23
searobin, striped	14.14	4.70	8.74	4.16	2.06	0.95	3.89
shad, American	0.14	0.20	0.11	0.11	0.08	0.13	0.00
shad, hickory	0.03	0.08	0.12	0.22	0.13	0.25	0.31
skate, little	0.31	0.06	0.06	0.11	0.14	0.09	0.00
skate, winter	0.00	0.00	0.08	0.03	0.11	0.17	0.00
spot	0.00	0.00	0.00	0.00	0.00	0.00	0.00
striped bass	5.07	4.55	4.78	4.51	2.72	11.42	9.11
sturgeon, Atlantic	0.00	0.00	0.00	0.00	0.00	0.00	0.00
tautog	0.57	0.57	0.85	0.42	0.38	0.55	0.23
weakfish	0.44	0.50	0.21	0.10	0.16	0.12	0.00

	Fall						
Species	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
alewife	0.02	0.05	0.03	0.00	0.00	0.11	0.00
black sea bass	0.03	0.00	0.10	0.00	0.00	0.00	0.00
bluefish	5.84	21.51	9.39	14.81	33.79	11.26	18.43
butterfish	2.66	49.88	16.64	6.06	15.98	3.34	76.89
cunner	0.06	0.01	0.01	0.02	0.00	0.00	0.00
dogfish, smooth	0.58	0.84	1.78	3.91	0.44	0.00	2.61
dogfish, spiny	0.00	0.00	0.00	0.00	0.00	0.00	0.00
flounder, fourspot	0.03	0.23	0.06	0.06	0.08	0.00	0.00
flounder, summer	1.82	2.21	2.99	4.62	4.93	1.31	0.64
flounder, windowpane	0.75	0.97	1.40	0.76	0.86	1.69	0.10
flounder, winter	1.21	1.22	1.66	0.60	1.63	3.84	0.41
hake, red	0.04	0.06	0.00	0.00	0.00	0.13	0.00
hake, silver	0.00	0.00	0.00	0.00	0.00	0.00	0.00
hake, spotted	1.54	0.32	0.51	0.57	0.00	0.11	0.70
herring, Atlantic	0.00	0.00	0.00	0.00	0.00	0.00	0.00
herring, blueback	0.00	0.01	0.00	0.00	0.00	0.03	0.00
hogchoker	0.01	0.01	0.01	0.02	0.00	0.00	0.00
kingfish, northern	0.00	0.00	0.00	0.00	0.01	0.00	0.00
mackerel, Spanish	0.00	0.00	0.00	0.00	0.00	0.00	0.00
menhaden, Atlantic	1.37	0.68	2.98	2.71	1.18	1.69	0.42
moonfish	0.14	0.08	0.28	0.08	0.11	0.11	0.30
ocean pout	0.00	0.00	0.00	0.00	0.00	0.00	0.00
rockling, fourbeard	0.05	0.02	0.00	0.00	0.00	0.00	0.00
scad, rough	0.00	0.01	0.00	0.00	0.00	0.00	0.00
sculpin, longhorn	0.00	0.00	0.00	0.00	0.00	0.00	0.00
scup	36.09	42.49	65.76	136.42	23.07	22.32	55.66
sea raven	0.00	0.00	0.00	0.00	0.00	0.00	0.00
searobin, northern	0.02	0.05	0.04	0.00	0.04	0.00	0.00
searobin, striped	9.02	12.49	13.81	10.46	4.67	0.85	0.78
shad, American	0.08	0.08	0.52	0.02	0.40	0.44	0.00
shad, hickory	0.12	0.19	0.11	0.00	0.00	0.61	0.12
skate, little	0.10	0.00	0.00	0.00	0.00	0.00	0.00
skate, winter	0.00	0.09	0.00	0.00	0.22	0.00	0.00
spot	0.24	0.02	0.34	0.04	0.00	0.00	0.00
striped bass	1.20	2.67	2.00	4.95	0.90	4.58	1.60
sturgeon, Atlantic	0.00	0.00	0.00	0.00	0.00	0.00	0.00
tautog	0.49	0.13	0.61	0.02	0.04	0.31	0.56
weakfish	19.41	3.85	5.11	9.59	1.91	1.97	1.22

Table 2.60. Biomass indices of abundance for selected invertebrate species in the Narrows, 2000-2006.
The geometric mean weight (kg) per tow was calculated 15 invertebrates. April-June data were used for the Spring indices, September–October data for the Fall.

Spring							
Species	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
crab, blue	0.01	0.03	0.08	0.01	0.00	0.00	**0.03**
crab, flat claw hermit	0.00	0.00	0.00	0.00	0.01	0.00	0.00
crab, horseshoe	1.52	3.41	5.58	4.56	6.45	1.40	0.56
crab, lady	0.01	0.02	0.01	0.00	0.01	0.00	0.00
crab, rock	0.39	0.48	0.70	0.58	0.52	0.55	1.88
crab, spider	0.13	0.42	0.68	1.60	1.90	0.07	0.31
jellyfish, lion's mane	0.01	0.01	0.12	0.23	0.24	0.11	0.00
lobster, American	4.06	2.10	4.02	2.51	2.74	1.10	0.88
mussel, blue	0.01	0.02	0.01	0.01	0.00	0.01	0.00
northern moon shell	0.00	0.01	0.01	0.01	0.00	0.00	0.00
oyster, common	0.00	0.00	0.01	0.00	0.00	0.00	0.00
shrimp, mantis	0.24	0.20	0.24	0.10	0.05	0.02	0.08
squid, long-finned	0.08	0.06	0.06	0.03	0.25	0.26	0.03
starfish spp.	1.02	1.22	1.11	1.00	0.16	0.07	0.09
whelks	0.00	0.00	0.00	0.02	0.04	0.01	0.18

Fall							
Species	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
crab, blue	0.55	0.19	0.16	0.04	0.00	0.06	0.03
crab, flat claw hermit	0.02	0.02	0.02	0.00	0.03	0.00	0.00
crab, horseshoe	4.95	9.39	9.05	15.89	11.32	46.66	11.95
crab, lady	0.04	0.01	0.00	0.04	0.01	0.03	0.00
crab, rock	0.18	0.13	0.24	0.06	0.09	0.43	0.06
crab, spider	0.13	0.69	0.13	0.04	0.03	0.06	0.10
jellyfish, lion's mane	0.00	0.00	0.00	0.00	0.00	0.00	0.00
lobster, American	2.57	2.40	1.76	2.90	4.74	1.61	0.43
mussel, blue	0.02	0.01	0.00	0.00	0.00	0.00	0.00
northern moon shell	0.00	0.01	0.00	0.00	0.00	0.00	0.00
oyster, common	0.00	0.00	0.00	0.00	0.00	0.00	0.00
shrimp, mantis	0.37	0.13	0.35	0.19	0.08	0.03	0.10
squid, long-finned	2.39	2.59	1.58	2.29	1.96	1.38	2.95
starfish spp.	1.56	0.74	0.90	0.11	0.08	0.05	0.06
whelks	0.00	0.00	0.02	0.00	0.00	0.03	0.00

FIGURES 2.1 - 2.13

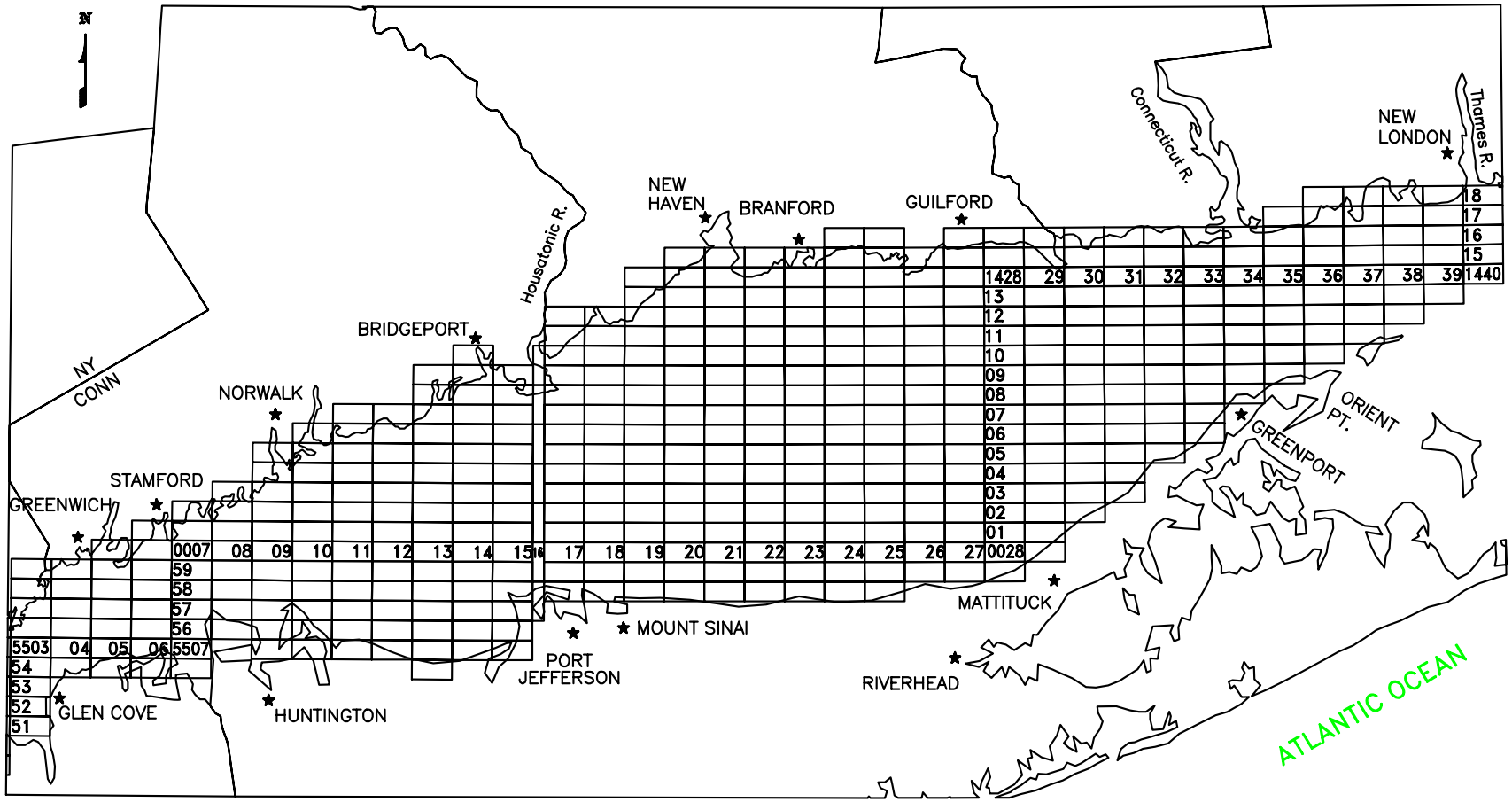
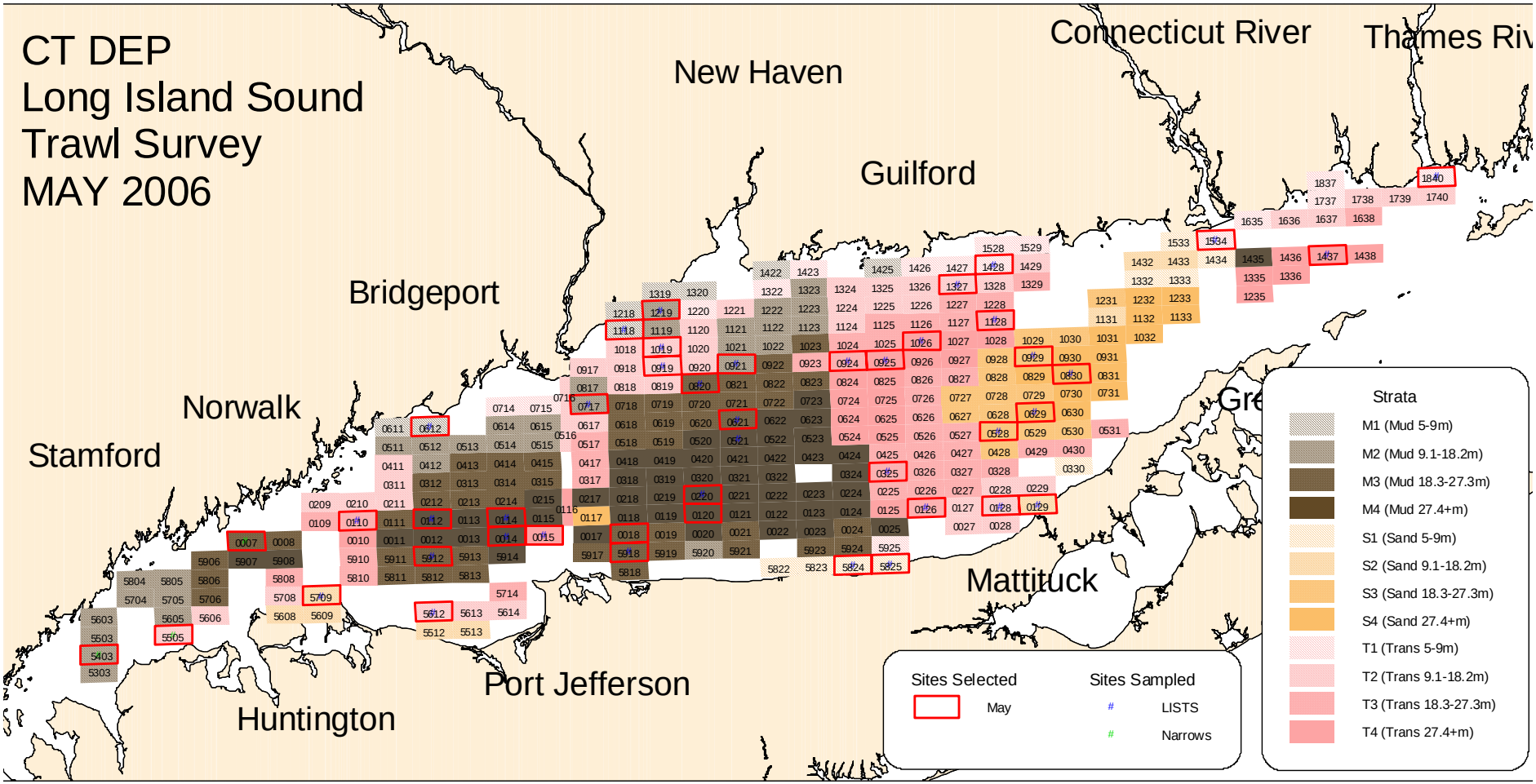


Figure 2.1. Trawl Survey site grid. *Each sampling site is 1x2 nmi (nautical miles). A four-digit number identifies the site: the first two digits are the row numbers (corresponding to minutes of latitude) and the last two digits are the column numbers (corresponding to two nautical miles in length on 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.)*

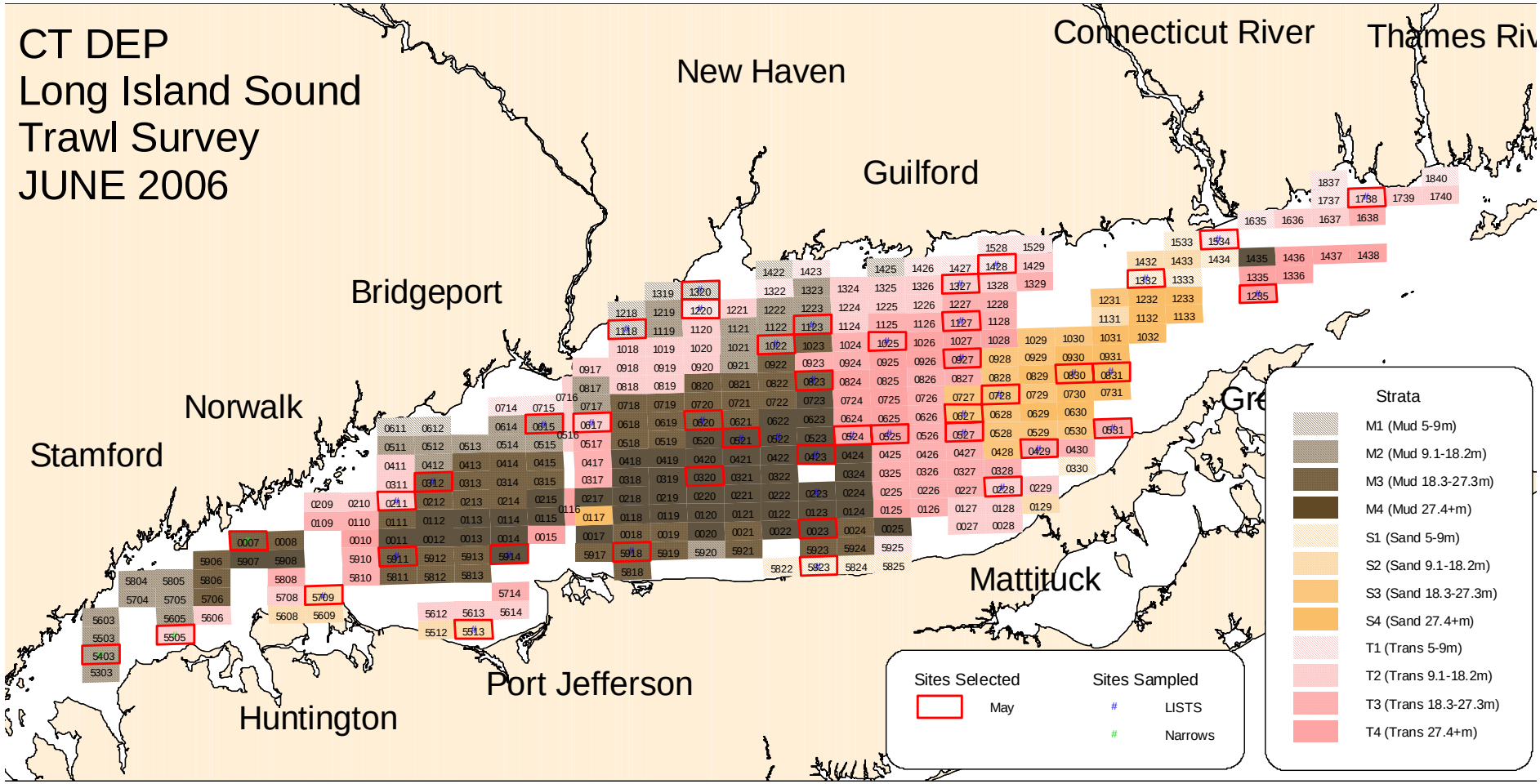
Figure 2.2. May 2006 sites selected and sampled. *The red outlined rectangles are the sites selected for the cruise and the blue dots are the sites sampled. Narrows sites sampled in western LIS are denoted as green dots. Samples that were collected from a different site than originally selected are noted in table below map.*



May 2006 samples that were collected from a different site than originally selected:

Sample	Site sampled	sampled strata	site selected	selected strata	# Attempts before moving	reason moved
SP2006030	5918	M3	0018	M3	0	POTS - fisherman called us to say he wouldn't move his gear
SP2006040	0521	M4	0120	M4	1	POTS - entangled with pot gear after 6.5 minutes

Figure 2.3. June 2006 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 2006 samples that were collected from a different site than originally selected:

Sample	Site sampled	sampled strata	site selected	selected strata	# Attempts before moving	reason moved
SP2006062	0223	M4	0023	M4	0	wrong coordinates in database and area is full of pot gear
SP2006065	0522	M4	0320	M4	1	POTS entangled on doors after 5 minutes (looks like pot sets are N-S)

Figure 2.4. September 2006 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.*

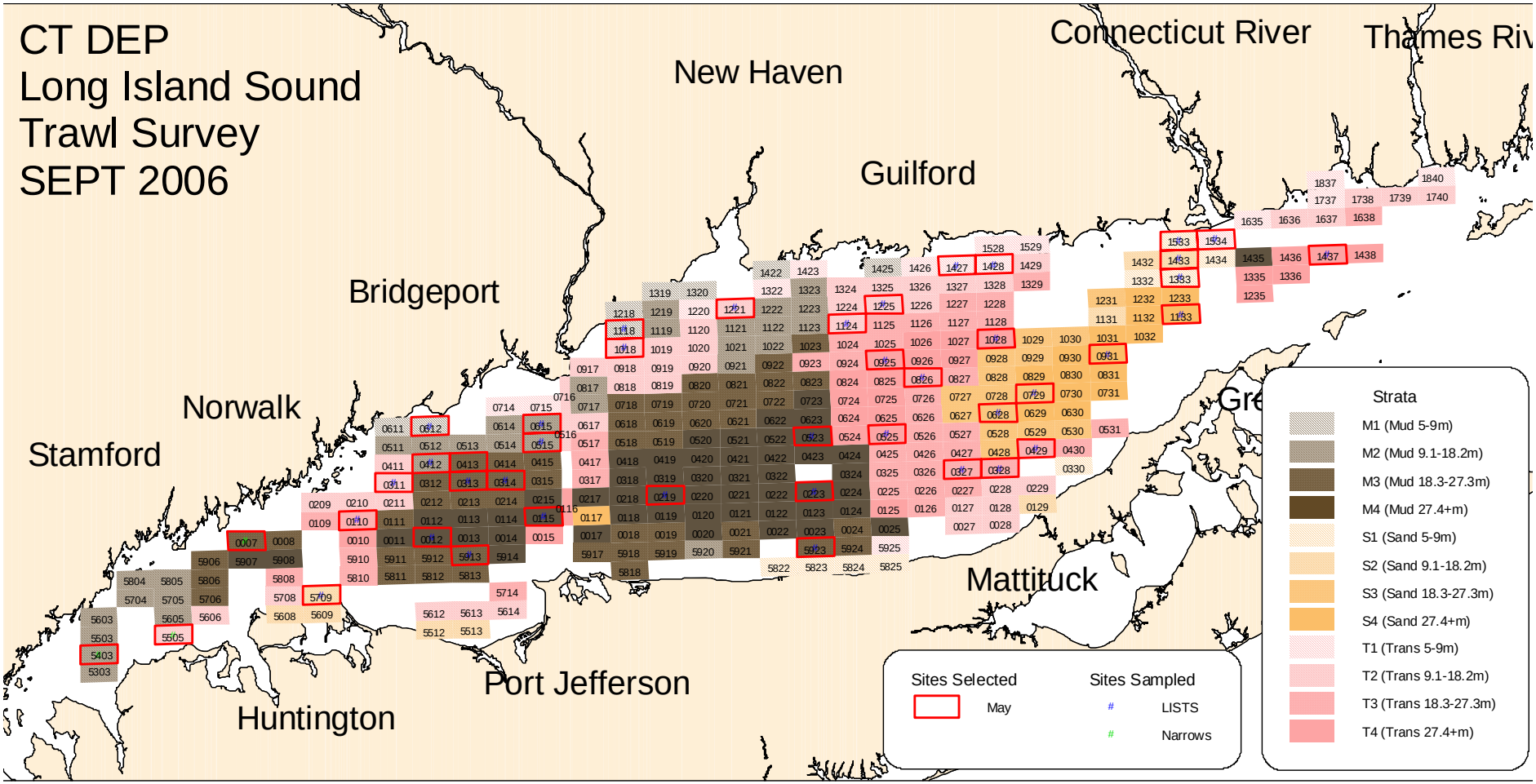


Figure 2.5. Number of finfish species observed annually, 1984-2006.

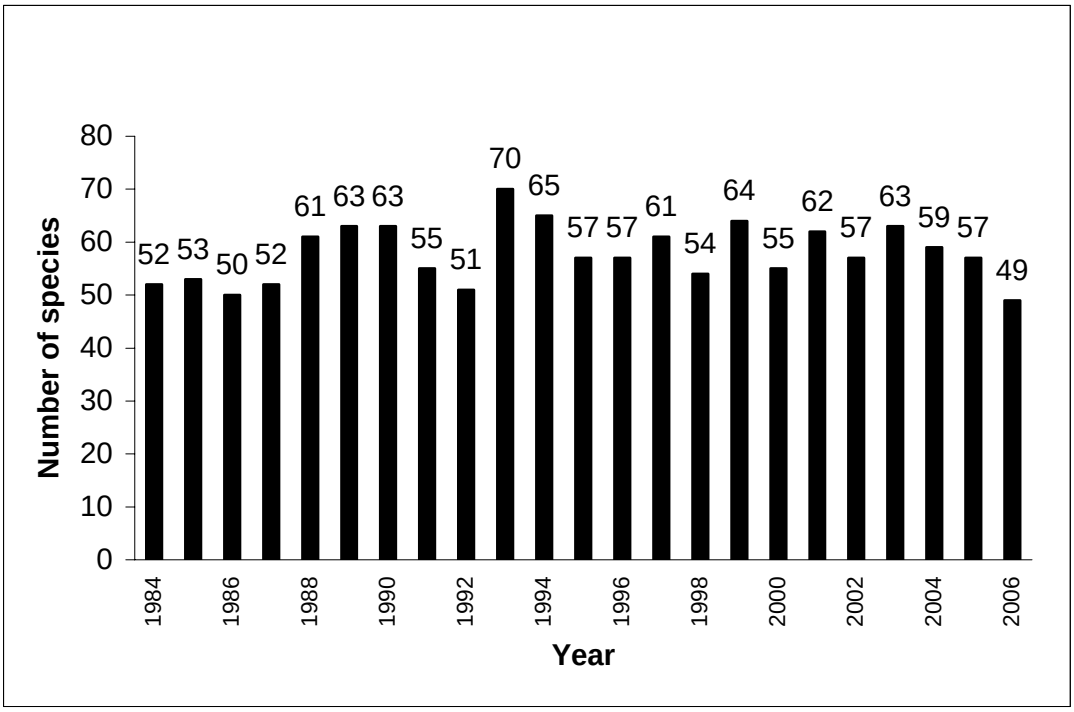
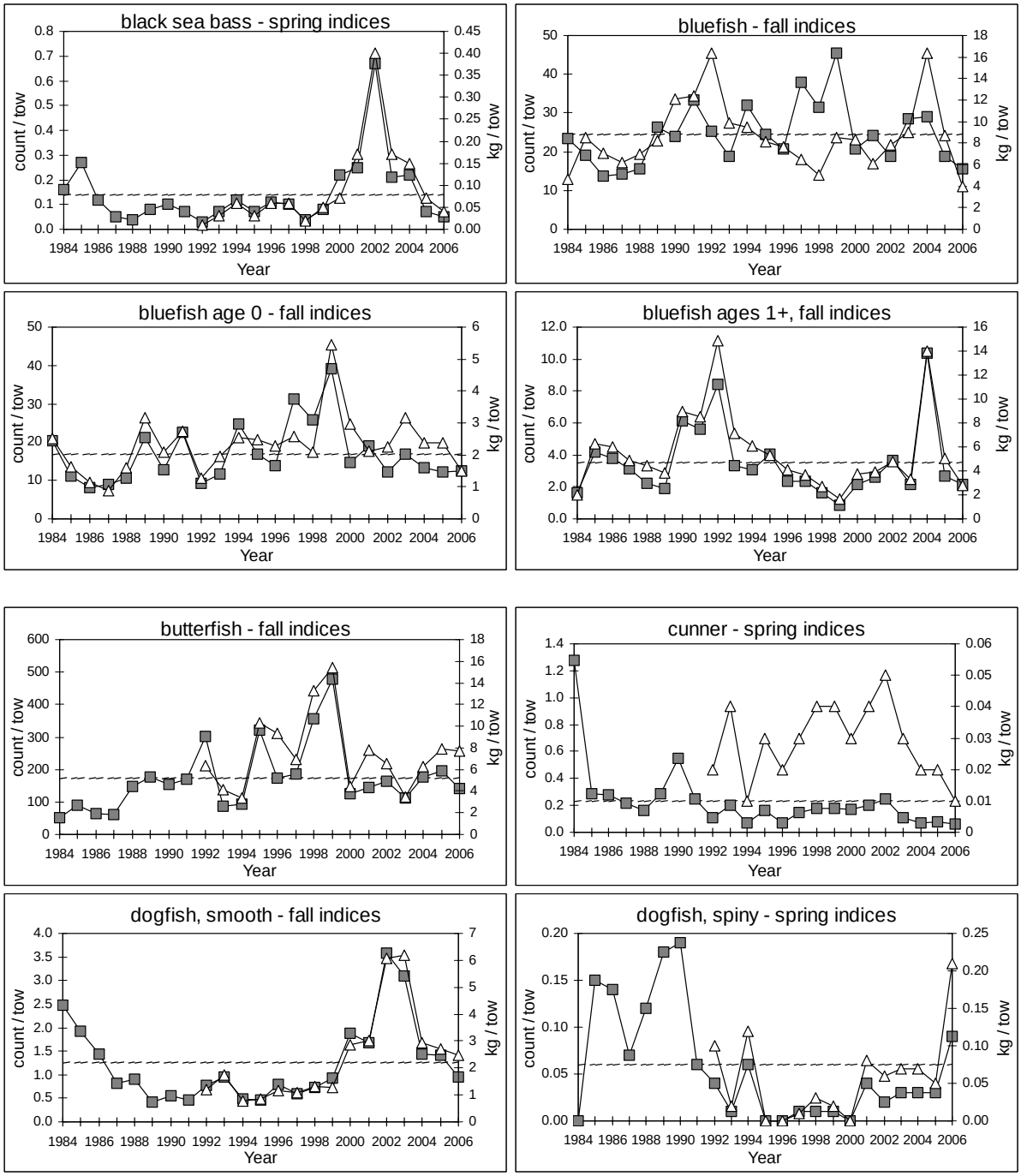
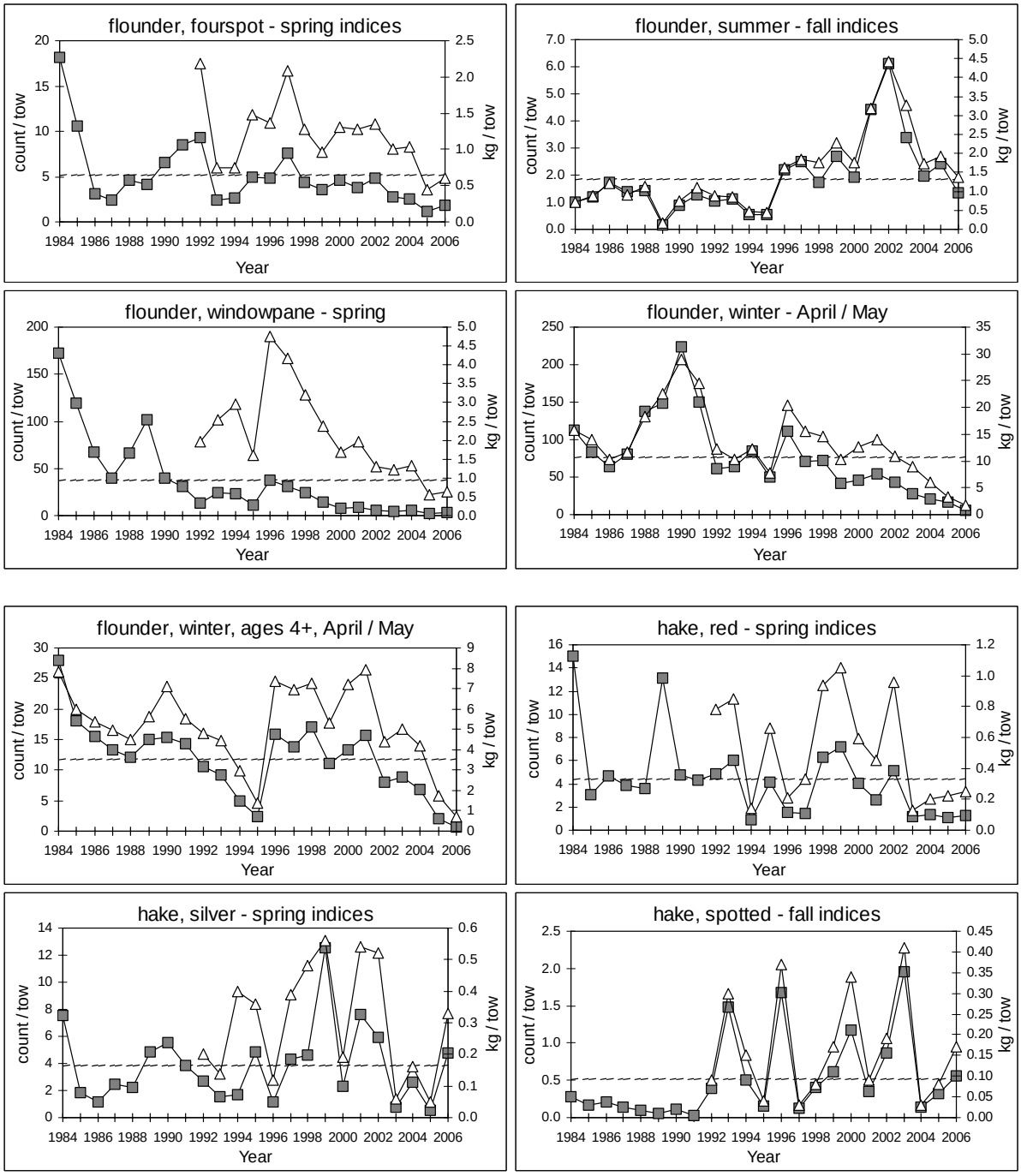


Figure 2.6. Plots of abundance indices for: black sea bass, bluefish (total, age 0, and ages 1+), butterfish, cunner, and dogfish (smooth and spiny).



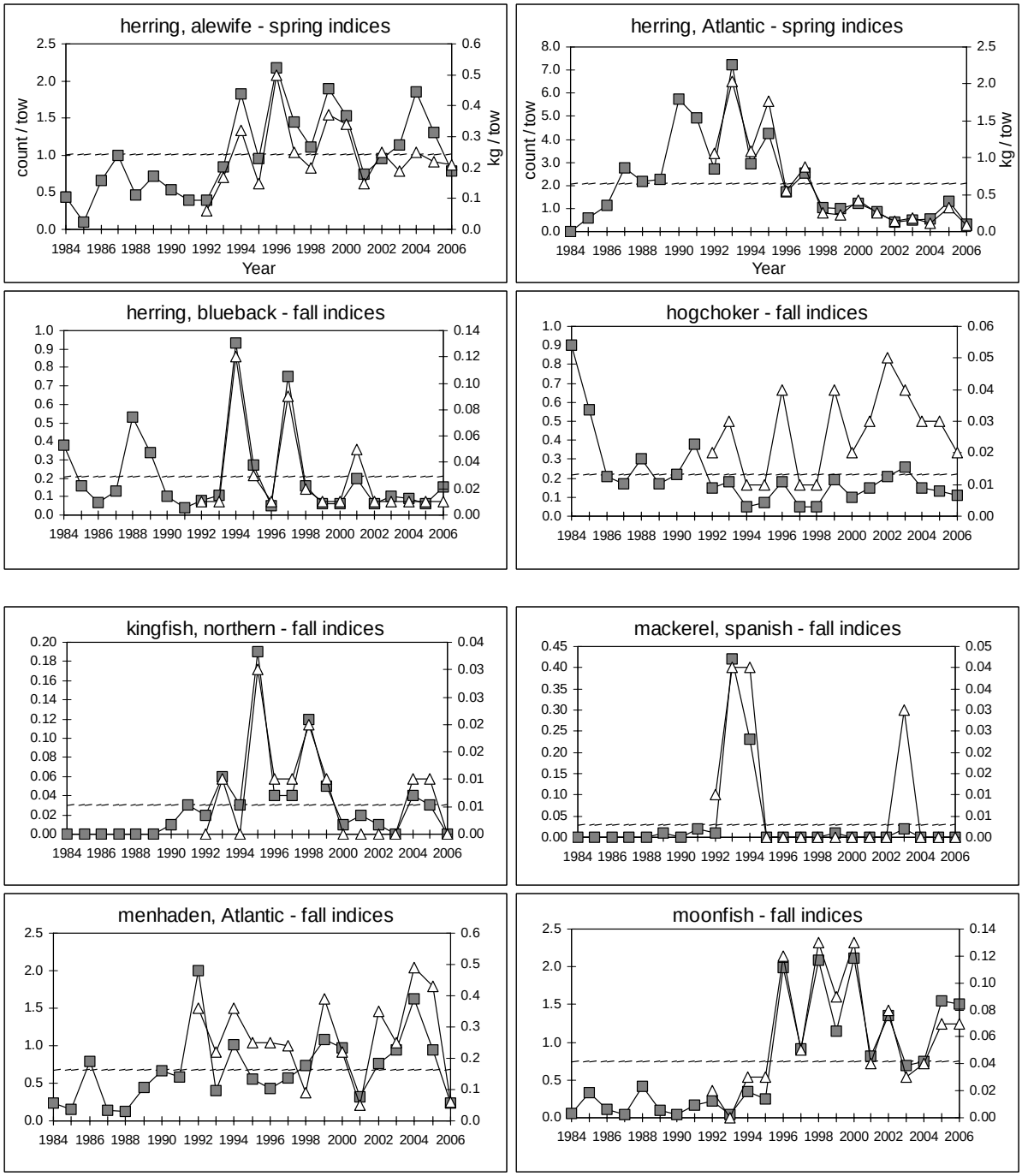
Legend: ■ = count / tow; △ = kg / tow; ---- = mean count / tow

Figure 2.7. Plots of abundance indices for: flounders (fourspot, summer, windowpane, winter, and winter ages 4+) and hakes (red, silver, and spotted).



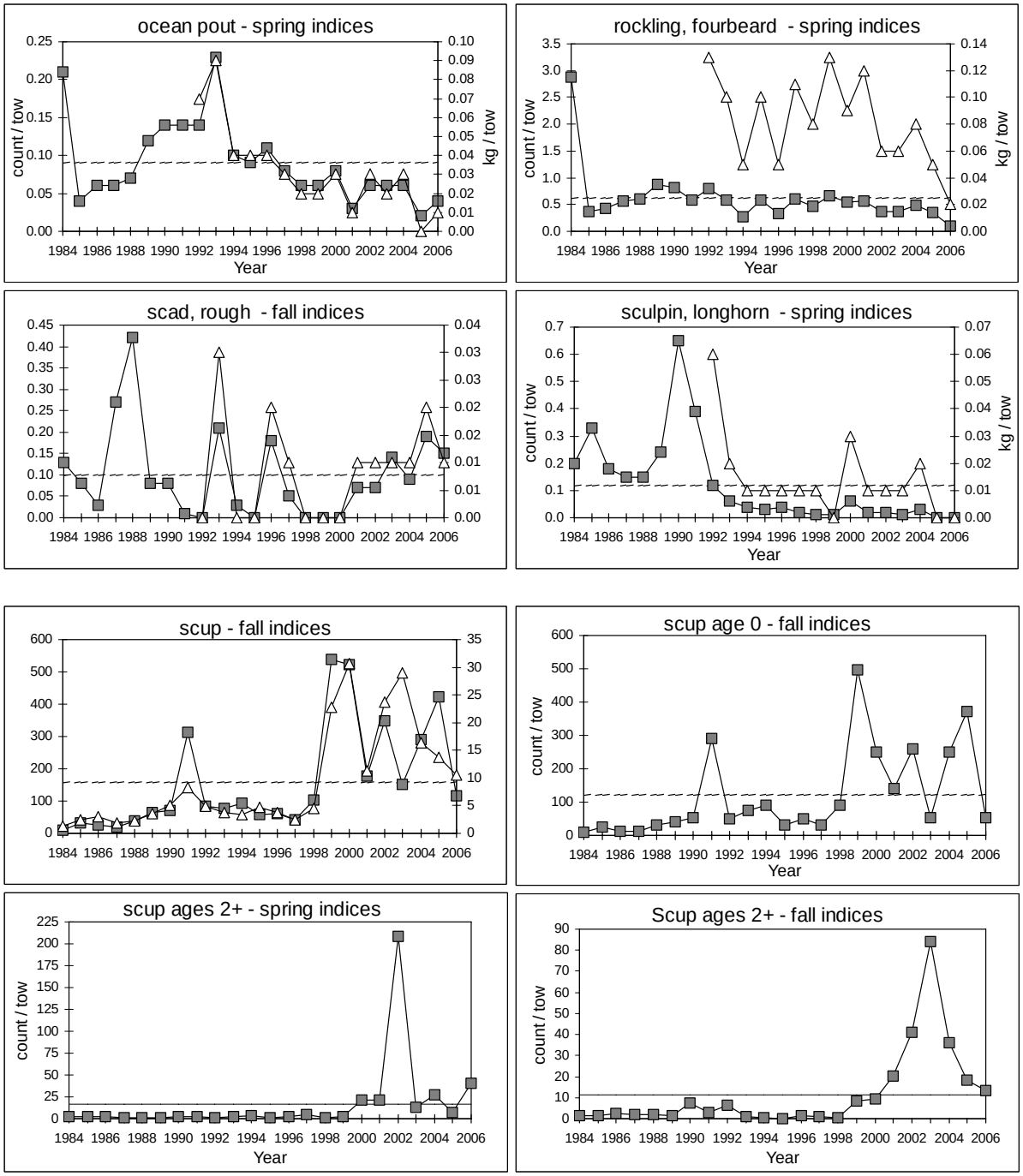
Legend: ■ = count / tow; △ = kg / tow; ---- = mean count / tow

Figure 2.8. Plots of abundance indices for: herrings (alewife, Atlantic, and blueback), hogchoker, Northern kingfish, Spanish mackerel, Atlantic menhaden, and moonfish.



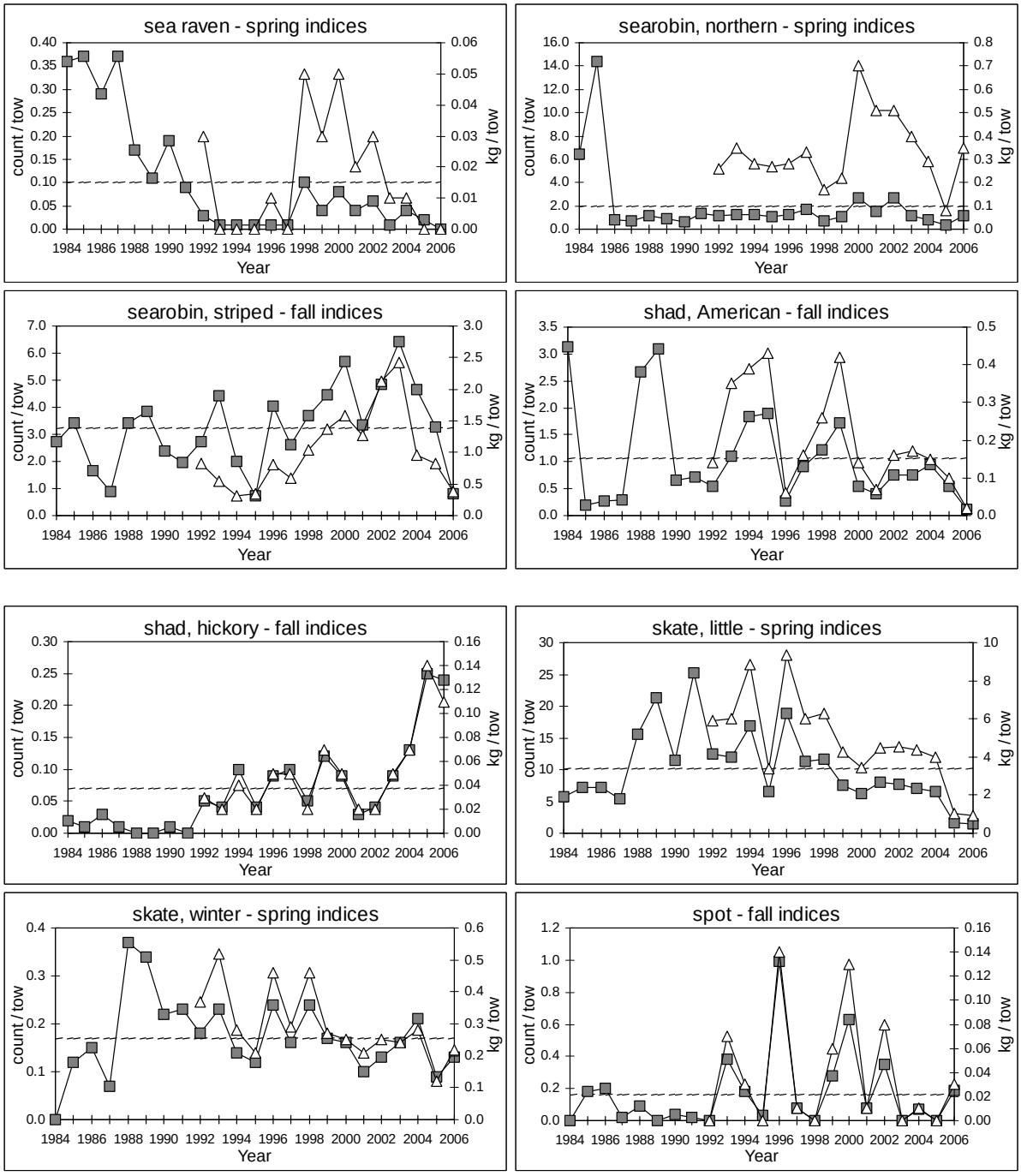
Legend: ■ = count / tow; △ = kg / tow; ---- = mean count / tow

Figure 2.9. 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 2.10. Plots of abundance indices for: sea raven, searobins (striped and northern), shad (American and hickory), skates (little and winter), and spot.



Legend: ■ = count / tow; △ = kg / tow; ---- = mean count / tow

Figure 2.11. Plots of abundance indices for: striped bass, Atlantic sturgeon, tautog, and weakfish (all ages, age 0, and ages 1+).

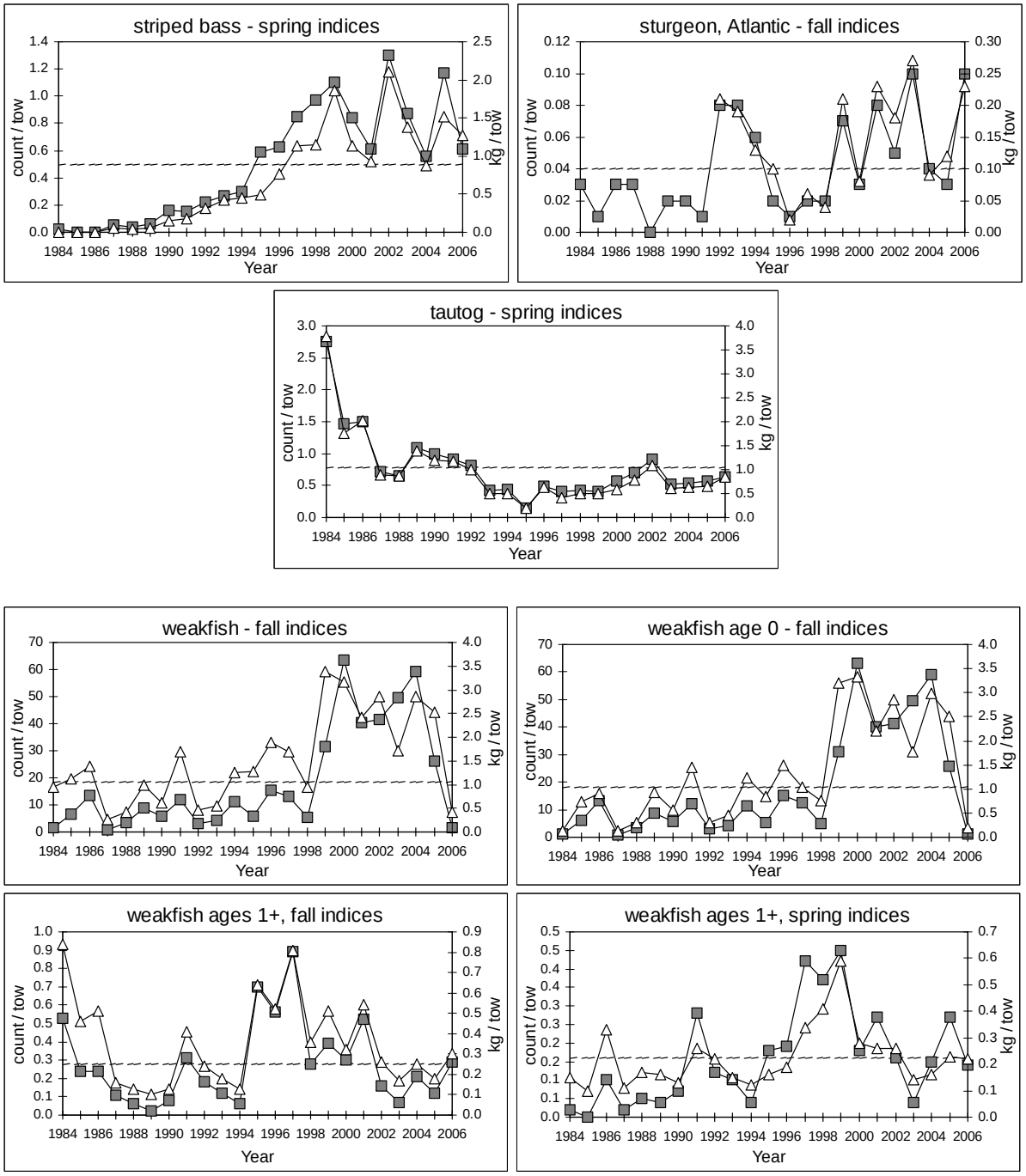
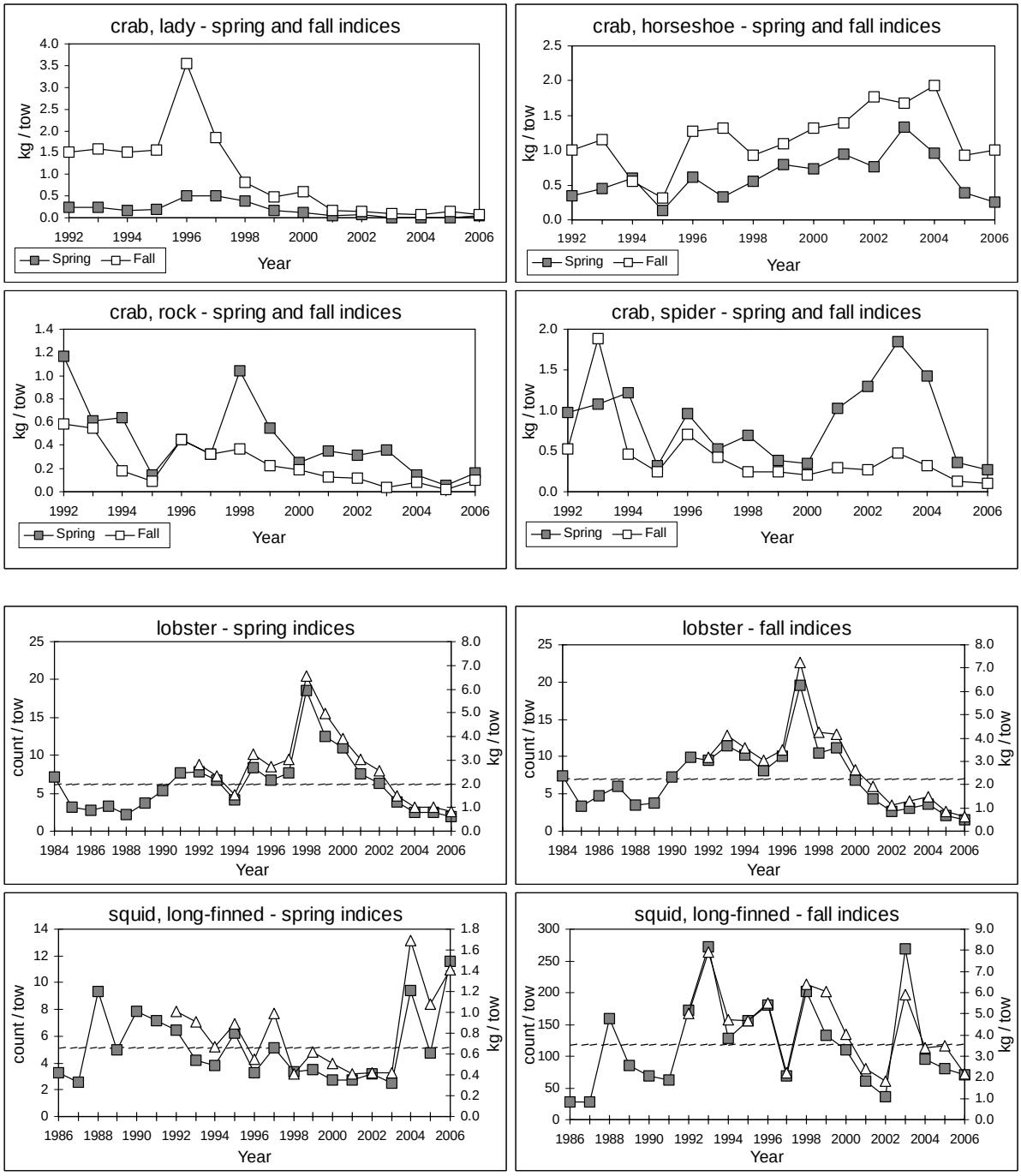


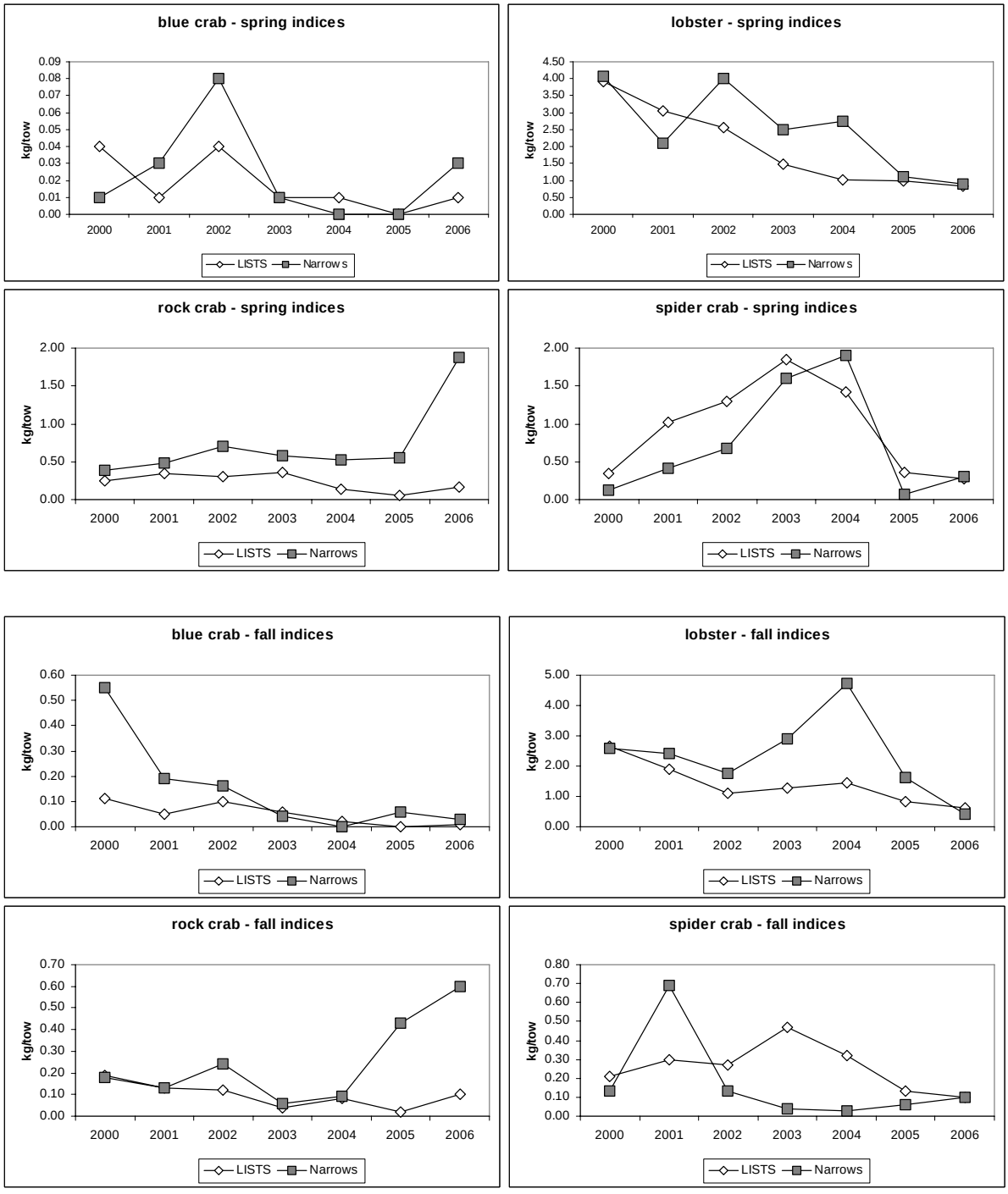
Figure 2.12. Plots of abundance and biomass indices for: crabs (lady, horseshoe, rock, and spider), American lobster, and long-finned squid.



Legend for bottom four graphs:

■ = count / tow; △ = kg / tow; ---- = mean count / tow

Figure 2.13. Plots of spring and fall biomass indices for LISTS vs. Narrows: blue crab, American lobster, rock crab, and spider crab.



APPENDICES

Appendix 2.1. List of finfish species identified by A *Study of Marine Recreational Fisheries in Connecticut* (F54R) programs. LISTS has collected ninety-six species from 1984-2006.
This appendix contains a list of 118 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	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*	ESS	S
butterfish	*Peprilus triacanthus*	ESS; IS; LISTS	BT; OT; S
cod, Atlantic	*Gadus morhua*	LISTS	OT
cornetfish, bluespotted	*Fistularia tabacaria*	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
haddock	*Melanogrammus aeglefinus*	LISTS	OT
hake, red	*Urophycis chuss*	IS; LISTS	BT; OT

Appendix 2.1 cont.

Common Name	Scientific Name	Sampling Program	Gear
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 sp.*	ESS; IS; LISTS	BT; OT; S
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

Appendix 2.1 cont.

Common Name	Scientific Name	Sampling Program	Gear
sennet, northern	*Sphyraena borealis*	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, 1984-2006.

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	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	5,178
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	**10,549**
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	**276**
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	0	0	**37,337**
bigeye	0	0	0	1	2	2	1	0	0	0	1	0	0	0	0	2	1	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	**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	**1,311**
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	**158,724**
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	**9**
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	**1,646,130**
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	**106**
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	**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	**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	**1,880**
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	**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	**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	**10,822**
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	**1,913**
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	**7**
eel, conger	0	0	0	0	0	0	0	0	1	3	0	2	1	0	0	2	0	2	0	3	1	0	0	**15**
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	**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	**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	**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	**55,286**
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	**913**
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	**10,808**
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	**237,079**
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	**405,876**
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	**13**
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**
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	**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	**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	**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	**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	**54**
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	**64**
haddock	0	0	0	0	0	0	0	0	0	0	0	2	0	1	7	1	0	0	0	26	7	2	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	**51,443**
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	**42,887**
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	**6,754**

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	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	5,178
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	**15,963**
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	**75,847**
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	**6,670**
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	**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	**2,178**
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	**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	**187**
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	**99**
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	**9**
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	**41**
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	**176,076**
lookdown	0	0	0	0	0	0	2	0	0	0	3	0	0	0	0	0	0	0	0	0	0	1	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	**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	**735**
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	**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	**10,087**
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	**7,288**
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	**530**
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	**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	**63**
pollock	5	0	3	8	6	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	**27**
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	**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	**133**
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	**5,041**
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	**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	**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	**413**
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	0	**2,610**
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	**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	**18**
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	**813**
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	**36**
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	**896**
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	**849,260**
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	**525**
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	**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	**20,290**
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	**36,177**
seasnail	0	0	0	0	1	0	8	0	0	0	0	0	0	0	0	0	0	4	0	0	4	2	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	**21**
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	**21,700**
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	**7**

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	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	5,178
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	**736**
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	**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	**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	**104**
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	**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	**450**
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	**110,528**
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	**1,168**
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	**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	**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	**445,636**
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	**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	**4,376**
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	**388**
tautog	734	773	796	624	629	791	693	501	265	164	224	61	136	190	194	217	287	319	565	225	232	179	186	**8,985**
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	**58**
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	**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	**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	**147,776**
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**	**197,000**	**100,591**	**4,636,113**

Appendix 2.3. Annual total weight (kg) of finfish, lobster and squid taken in LISTS, 1992-2006.
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	Total
(number of tows)	160	240	240	200	200	200	200	200	200	200	200	200	199	200	120	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	**65.7**
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	**7.6**
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	**12.3**
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	**0.4**
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	**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	**485.8**
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	**20,283.1**
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	**12.0**
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	1631.4	**28,839.4**
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	**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	**0.1**
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	**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	**71.3**
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	**0.2**
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	**0.1**
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	1176.6	**17,828.0**
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	**1,079.8**
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	**2.2**
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	**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	**0.2**
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	**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	**0.1**
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	**4,675.3**
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	**42.4**
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	**6,219.5**
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	**7,569.9**
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	**25,753.0**
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	**1.1**
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	**0.3**
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	**0.3**
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	**0.1**
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	**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	**2.2**
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	**2.0**
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	**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	**1,908.9**
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	**868.4**
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	**543.0**
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	**946.5**
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	**5,692.8**
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	**119.5**
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	**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	**92.3**
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	**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	**11.4**
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	**10.0**
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	**3.1**
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	**3.8**
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	**27,978.4**
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	**0.4**
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	**0.2**

Appendix 2.3 cont.

Common name	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Total
(number of tows)	160	240	240	200	200	200	200	200	200	200	200	200	199	200	120	2,959
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	**20.6**
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	**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	**1,145.1**
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	**88.9**
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	**79.7**
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	**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	**3.3**
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	**0.3**
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	**0.1**
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	**5.9**
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	**194.4**
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	**0.1**
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	**3.3**
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	**2.0**
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	**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	**0.9**
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	**13.1**
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	**1.7**
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	**32.1**
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	4636.1	**55,067.1**
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	**45.**
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	**0.1**
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	**1,777.5**
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	**7,096.9**
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	**0.7**
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	**1.7**
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	**894.9**
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	**0.7**
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	**213.9**
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	**0.3**
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	**2.8**
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	**0.4**
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	**815.8**
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	**27,352.7**
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	**1,842.0**
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	**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	**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	**10,809.3**
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	**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	**7,472.8**
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	**4,432.6**
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	**5,614.8**
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	**19.0**
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	**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	**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	**5,187.9**
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**	**281,596.8**

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	%	species	count	%	weight	%
butterfish	25,192	28.0	.	.	winter skate	32	0	.	.
windowpane flounder	18,848	20.9	.	.	spotted hake	30	0	.	.
winter flounder	15,341	17.0	.	.	black sea bass	28	0	.	.
scup	7,910	8.8	.	.	spot	25	0	.	.
weakfish	5,427	6.0	.	.	Atlantic mackerel	19	0	.	.
little skate	3,210	3.6	.	.	moonfish	14	0	.	.
bluefish	2,789	3.1	.	.	ocean pout	14	0	.	.
red hake	2,657	3.0	.	.	oyster toadfish	9	0	.	.
Atlantic herring	1,999	2.2	.	.	hickory shad	6	0	.	.
fourspot flounder	1,487	1.7	.	.	rough scad	5	0	.	.
striped searobin	886	1.0	.	.	Atlantic sturgeon	4	0	.	.
silver hake	723	0.8	.	.	clearnose skate	2	0	.	.
tautog	566	0.6	.	.	American eel	1	0	.	.
smooth dogfish	430	0.5	.	.	goosefish	1	0	.	.
summer flounder	414	0.5	.	.	grubby	1	0	.	.
northern searobin	396	0.4	.	.	northern pipefish	1	0	.	.
American shad	344	0.4	.	.	northern puffer	1	0	.	.
Atlantic menhaden	318	0.4	.	.	smallmouth flounder	1	0	.	.
blueback herring	256	0.3	.	.	striped bass	1	0	.	.
alewife	216	0.2	.	.	**Total**	**90,031**		-	
fourbeard rockling	123	0.1	.	.					
cunner	76	0.1	.	.					
sea raven	70	0.1	.	.	**Invertebrates**				
hogchoker	60	0.1	.	.	American lobster	2,553	28.1	.	.
longhorn sculpin	51	0.1	.	.	long-finned squid	6,537	71.9	.	.
spiny dogfish	47	0.1	.	.	**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	%
butterfish	45,983	36.7	.	.
winter flounder	25,695	20.5	.	.
windowpane flounder	19,497	15.6	.	.
scup	10,184	8.1	.	.
little skate	6,539	5.2	.	.
bluefish	3,688	2.9	.	.
fourspot flounder	2,478	2.0	.	.
red hake	1,933	1.5	.	.
weakfish	1,287	1.0	.	.
silver hake	1,210	1.0	.	.
striped searobin	1,194	1.0	.	.
Atlantic herring	1,193	1.0	.	.
American shad	1,187	0.9	.	.
northern searobin	474	0.4	.	.
tautog	455	0.4	.	.
smooth dogfish	385	0.3	.	.
summer flounder	320	0.3	.	.
fourbeard rockling	302	0.2	.	.
blueback herring	164	0.1	.	.
alewife	153	0.1	.	.
moonfish	137	0.1	.	.
rough scad	128	0.1	.	.
longhorn sculpin	103	0.1	.	.
winter skate	101	0.1	.	.
spotted hake	87	0.1	.	.
hogchoker	75	0.1	.	.
Atlantic menhaden	69	0.1	.	.
sea raven	50	0	.	.
cunner	48	0	.	.
spiny dogfish	39	0	.	.
smallmouth flounder	34	0	.	.
ocean pout	30	0	.	.
Atlantic mackerel	24	0	.	.
spot	18	0	.	.
black sea bass	17	0	.	.
striped bass	17	0	.	.
yellowtail flounder	6	0	.	.
grubby	5	0	.	.
rock gunnel	5	0	.	.
rainbow smelt	5	0	.	.
crevalle jack	4	0	.	.
bigeye scad	2	0	.	.
bigeye	2	0	.	.
planehead filefish	2	0	.	.
hickory shad	2	0	.	.
northern puffer	2	0	.	.
Atlantic sturgeon	2	0	.	.
Atlantic tomcod	2	0	.	.
Atlantic bonito	1	0	.	.
dwarf goatfish	1	0	.	.
goosefish	1	0	.	.
northern pipefish	1	0	.	.
short bigeye	1	0	.	.
striped cusk-eel	1	0	.	.
sea lamprey	1	0	.	.
Total	**125,344**		-	
Invertebrates				
American lobster	2,114	8.5	.	.
long-finned squid	22,769	91.5	.	.
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	%
butterfish	95,961	65.7	1,357.3	11.7
scup	13,646	9.3	837.7	7.2
winter flounder	9,548	6.5	1,344.8	11.5
bluefish	5,269	3.6	2,462.9	21.1
Atlantic herring	4,565	3.1	797.5	6.8
little skate	3,495	2.4	1,389.0	11.9
windowpane flounder	2,980	2.0	286.1	2.5
fourspot flounder	2,774	1.9	382.4	3.3
red hake	1,606	1.1	127.7	1.1
weakfish	1,317	0.9	94.8	0.8
Atlantic menhaden	1,115	0.8	60.6	0.5
striped searobin	857	0.6	305.1	2.6
silver hake	544	0.4	22.0	0.2
American shad	380	0.3	63.3	0.5
northern searobin	313	0.2	35.6	0.3
smooth dogfish	304	0.2	863.2	7.4
tautog	265	0.2	508.3	4.4
summer flounder	186	0.1	142.1	1.2
blueback herring	175	0.1	8.5	0.1
fourbeard rockling	150	0.1	12.8	0.1
alewife	122	0.1	9.2	0.1
spotted hake	68	0	10.3	0.1
moonfish	62	0	1.5	0
hogchoker	61	0	5.6	0
striped bass	42	0	89.4	0.8
longhorn sculpin	31	0	9.0	0.1
winter skate	31	0	105.3	0.9
cunner	30	0	3.7	0
Atlantic sturgeon	30	0	244.8	2.1
ocean pout	18	0	7.7	0.1
hickory shad	12	0	4.9	0
smallmouth flounder	12	0	0.6	0
goosefish	10	0	2.5	0
clearnose skate	8	0	10.3	0.1
Atlantic tomcod	8	0	1.3	0
mackerel scad	6	0	0.2	0
spiny dogfish	6	0	30.7	0.3
black sea bass	5	0	1.8	0
northern pipefish	5	0	0.4	0
Atlantic mackerel	4	0	1.0	0
sea raven	4	0	3.9	0
northern kingfish	2	0	0.2	0
round herring	2	0	0.2	0
yellow jack	2	0	0.2	0
Atlantic silverside	1	0	0.1	0
conger eel	1	0	0.1	0
northern puffer	1	0	0.1	0
Spanish mackerel	1	0	1.5	0
Total	**146,035**		**11,648.2**	
Invertebrates				
American lobster	8,160	19.9	1,537.9	28.6
blue mussel	nc	nc	1,157.1	21.5
long-finned squid	32,780	80.1	844.9	15.7
horseshoe crab	nc	nc	514.1	9.6
lady crab	nc	nc	375.4	7.0
rock crab	nc	nc	239.1	4.5
boring sponge	nc	nc	225.5	4.2
spider crab	nc	nc	186.0	3.5
starfish spp.	nc	nc	148.6	2.8
whelks	nc	nc	57.5	1.1
flat claw hermit crab	nc	nc	34.7	0.6
bluecrab	nc	nc	18.1	0.3
mantis shrimp	nc	nc	10.3	0.2
northern moon snail	nc	nc	8.6	0.2
common oyster	nc	nc	7.3	0.1
lion's mane jellyfish	nc	nc	2.4	0
surf clam	nc	nc	1.7	0
hard clams	nc	nc	1.2	0
bushy bryozoan	nc	nc	1.0	0
purple sea urchin	nc	nc	0.4	0
mud crabs	nc	nc	0.3	0
star coral	nc	nc	0.1	0
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	%
butterfish	33,538	28.7	776.8	6.3
scup	25,451	21.8	660.8	5.4
winter flounder	20,615	17.6	1,992.2	16.2
bluefish	7,703	6.6	1,159.8	9.4
windowpane flounder	6,062	5.2	574.5	4.7
little skate	5,604	4.8	2,565.3	20.9
Atlantic herring	3,836	3.3	768.6	6.3
weakfish	3,320	2.8	160.0	1.3
silver hake	1,703	1.5	112.9	0.9
fourspot flounder	1,494	1.3	195.6	1.6
American shad	1,289	1.1	133.2	1.1
alewife	1,211	1.0	75.0	0.6
blueback herring	1,052	0.9	26.6	0.2
striped searobin	927	0.8	183.6	1.5
northern searobin	800	0.7	63.7	0.5
red hake	490	0.4	54.0	0.4
smooth dogfish	310	0.3	816.3	6.6
Atlantic menhaden	276	0.2	61.4	0.5
summer flounder	242	0.2	141.6	1.2
tautog	207	0.2	346.5	2.8
spotted hake	148	0.1	25.7	0.2
moonfish	93	0.1	2.6	0
fourbeard rockling	92	0.1	8.4	0.1
striped bass	81	0.1	198.6	1.6
Atlantic sturgeon	60	0.1	848.6	6.9
spiny dogfish	55	0	186.2	1.5
ocean pout	42	0	9.1	0.1
hogchoker	36	0	3.8	0
black sea bass	33	0	10.9	0.1
winter skate	33	0	101.5	0.8
American sand lance	25	0	0.6	0
Spanish mackerel	25	0	1.7	0
cunner	18	0	1.3	0
smallmouth flounder	15	0	1.3	0
hickory shad	14	0	3.7	0
rough scad	13	0	0.2	0
Atlantic mackerel	11	0	0.9	0
spot	11	0	1.1	0
rainbow smelt	9	0	0.6	0
crevalle jack	8	0	0.5	0
goosefish	8	0	2.0	0
northern kingfish	7	0	0.5	0

species	count	%	weight	%
longhorn sculpin	7	0	1.6	0
grubby	5	0	0.3	0
mackerel scad	4	0	0.4	0
Atlantic silverside	3	0	0.3	0
bigeye scad	2	0	0.2	0
lookdown	2	0	0.2	0
northern puffer	2	0	0.2	0
Atlantic tomcod	2	0	0.3	0
bigeye	1	0	0.1	0
clearnose skate	1	0	1.8	0
inshore lizardfish	1	0	0.1	0
northern pipefish	1	0	0.1	0
rock gunnel	1	0	0.1	0
sea raven	1	0	0.2	0
white perch	1	0	0.3	0
yellow jack	1	0	0.1	0
Total	**117,002**		**12,284.5**	
Invertebrates				
American lobster	7,057	31.6	1,533.9	38.6
long-finned squid	15,299	68.4	594.8	15.0
horseshoe crab	nc	nc	386.7	9.7
blue mussel	nc	nc	377.5	9.5
lady crab	nc	nc	338.5	8.5
spider crab	nc	nc	335.0	8.4
rock crab	nc	nc	136.8	3.4
starfish spp.	nc	nc	124.6	3.1
flat claw hermit crab	nc	nc	51.4	1.3
northern moon snail	nc	nc	34.6	0.9
common oyster	nc	nc	18.4	0.5
whelks	nc	nc	14.1	0.4
mantis shrimp	nc	nc	9.8	0.2
lion's mane jellyfish	nc	nc	4.2	0.1
bluecrab	nc	nc	3.7	0.1
arks	nc	nc	3.0	0.1
boring sponge	nc	nc	1.9	0
hard clams	nc	nc	1.3	0
bushy bryozoan	nc	nc	0.6	0
mud crabs	nc	nc	0.3	0
surf clam	nc	nc	0.3	0
purple sea urchin	nc	nc	0.1	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

species	count	%	weight	%
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	%	species	count	%	weight	%
scup	101,464	44.4	6,679.0	34.9	northern kingfish	2	0	0.3	0
butterfish	60,490	26.5	1,458.3	7.6	round scad	2	0	0.2	0
weakfish	23,595	10.3	554.5	2.9	bigeye	1	0	0.1	0
winter flounder	8,867	3.9	1,921.4	10.0	Atlantic cod	1	0	0.1	0
bluefish	6,135	2.7	1,408.0	7.3	goosefish	1	0	0.2	0
little skate	3,340	1.5	1,604.7	8.4	inshore lizardfish	1	0	0.1	0
striped searobin	3,129	1.4	1,036.1	5.4	lined seahorse	1	0	0.1	0
fourspot flounder	2,590	1.1	398.6	2.1	white perch	1	0	0.2	0
windowpane flounder	2,488	1.1	368.8	1.9	yellowtail flounder	1	0	0.1	0
red hake	2,393	1.0	162.6	0.8	**Total**	**228,425**		**19,156.5**	
bay anchovy	2,303	1.0	12.2	0.1					
northern searobin	2,014	0.9	251.2	1.3	**Invertebrates**				
moonfish	1,817	0.8	15.0	0.1	American lobster	10,481	36.0	2,184.5	49.9
alewife	1,572	0.7	96.0	0.5	horseshoe crab	420	1.4	689.4	15.8
spotted hake	1,425	0.6	92.3	0.5	long-finned squid	16,585	57.0	582.3	13.3
Atlantic herring	770	0.3	124.1	0.6	lady crab	nc	nc	308.4	7.1
silver hake	679	0.3	28.8	0.2	spider crab	nc	nc	99.4	2.3
summer flounder	555	0.2	471.3	2.5	bushy bryozoan	nc	nc	95.2	2.2
Atlantic menhaden	492	0.2	31.8	0.2	rock crab	nc	nc	60.4	1.4
smooth dogfish	467	0.2	1,038.5	5.4	boring sponge	nc	nc	58.6	1.3
American shad	316	0.1	25.8	0.1	mantis shrimp	1,086	3.7	49.0	1.1
striped bass	293	0.1	602.6	3.1	blue mussel	nc	nc	36.8	0.8
tautog	287	0.1	463.5	2.4	lion's mane jellyfish	223	0.8	36.4	0.8
spot	204	0.1	17.8	0.1	channeled whelk	138	0.5	32.0	0.7
fourbeard rockling	185	0.1	14.7	0.1	knobbed whelk	76	0.3	29.9	0.7
blueback herring	143	0.1	6.8	0	starfish spp.	nc	nc	29.0	0.7
black sea bass	69	0	22.6	0.1	flat claw hermit crab	nc	nc	26.0	0.6
smallmouth flounder	61	0	2.7	0	bluecrab	104	0.4	19.3	0.4
cunner	50	0	5.3	0	northern moon snail	nc	nc	9.7	0.2
hickory shad	42	0	17.1	0.1	hydroid spp.	nc	nc	4.8	0.1
hogchoker	40	0	5.9	0	fan worm tubes	nc	nc	3.4	0.1
winter skate	31	0	66.5	0.3	hard clams	nc	nc	3.3	0.1
sea raven	19	0	9.2	0	arks	nc	nc	3.1	0.1
clearnose skate	18	0	37.9	0.2	mud crabs	nc	nc	2.8	0.1
ocean pout	18	0	4.9	0	sand shrimp	nc	nc	2.7	0.1
longhorn sculpin	14	0	5.0	0	common slipper shell	nc	nc	2.4	0.1
Atlantic sturgeon	7	0	79.0	0.4	purple sea urchin	nc	nc	2.3	0.1
oyster toadfish	6	0	2.5	0	common oyster	nc	nc	1.4	0
northern pipefish	4	0	0.2	0	sea grape	nc	nc	1.1	0
northern puffer	4	0	0.4	0	blood star	nc	nc	0.2	0
American sand lance	4	0	0.3	0	northern comb jelly	nc	nc	0.1	0
spiny dogfish	4	0	9.9	0.1	common razor clam	nc	nc	0.1	0
rock gunnel	3	0	0.2	0	northern cyclocardia	nc	nc	0.1	0
yellow jack	3	0	0.2	0	northern red shrimp	nc	nc	0.1	0
Atlantic silverside	2	0	0.1	0	surf clam	nc	nc	0.1	0
Atlantic mackerel	2	0	0.8	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
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 bryzoan	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 2.5. Total number and weight (kg) of finfish and invertebrates caught in the Narrows in 2000.
Finfish species are in order of descending count. Number of tows (sample size)=34.

Vertebrates				
species	**count**	**%**	**weight**	**%**
scup	13,196	36	766.8	26.1
weakfish	11,347	31	269.4	9.2
butterfish	4,151	11.3	90.9	3.1
striped searobin	1,921	5.2	688.3	23.4
spotted hake	1,707	4.7	94.6	3.2
windowpane flounder	1,451	4	198.1	6.7
winter flounder	688	1.9	79.7	2.7
bluefish	480	1.3	107.9	3.7
fourspot flounder	332	0.9	53.6	1.8
red hake	291	0.8	14.3	0.5
moonfish	160	0.4	1.8	0.1
striped bass	126	0.3	244.3	8.3
northern searobin	105	0.3	14.2	0.5
summer flounder	102	0.3	130.5	4.4
Atlantic menhaden	101	0.3	37.1	1.3
alewife	74	0.2	4.9	0.2
smooth dogfish	72	0.2	43	1.5
Atlantic herring	63	0.2	16.9	0.6
fourbeard rockling	51	0.1	4.1	0.1
tautog	44	0.1	48.4	1.6
American shad	41	0.1	6.9	0.2
spot	33	0.1	3.7	0.1
bay anchovy	32	0.1	0.5	0
cunner	32	0.1	3.8	0.1
little skate	19	0.1	11.2	0.4
silver hake	17	0	0.9	0
black sea bass	6	0	0.9	0
hickory shad	6	0	2.6	0.1
blueback herring	5	0	0.4	0
yellow jack	3	0	0.3	0
Atlantic tomcod	2	0	0.2	0
hogchoker	1	0	0.1	0
northern puffer	1	0	0.1	0
Total	**36,660**		**2,940.4**	

Invertebrates				
species	**count**	**%**	**weight**	**%**
American lobster	1,615	57.5	317.1	39.3
horseshoe crab	152	5.4	221.9	27.5
starfish spp.	0	.	145.7	18.1
long-finned squid	740	26.4	43	5.3
hydroid spp.	nc		34.8	4.3
rock crab	nc		13.9	1.7
mantis shrimp	256	9.1	11	1.4
bluecrab	43	1.5	7.7	1.0
spider crab	nc		4.9	0.6
mud crabs	nc		1.3	0.2
anemones	nc		1.1	0.1
hard clams	nc		0.9	0.1
lady crab	nc		0.7	0.1
sand shrimp	nc		0.6	0.1
blue mussel	nc		0.4	0
lion's mane jellyfish	3	0.1	0.3	0
flat claw hermit crab	nc		0.2	0
bushy bryozoan	nc		0.1	0
common slipper shell	nc		0.1	0
moon jelly	nc		0.1	0
purple sea urchin	nc		0.1	0
Total	**2,809**		**805.9**	

Note: nc= not counted

Appendix 2.5. cont. Total number and weight (kg) of finfish and invertebrates caught in the Narrows in 2001. Finfish species are in order of descending count. Number of tows (sample size)=30.

Vertebrates				
species	**count**	**%**	**weight**	**%**
butterfish	19,703	49.9	993.3	25.0
scup	7,551	19.1	983.8	24.7
bluefish	2,980	7.5	311.0	7.8
weakfish	2,744	6.9	82.5	2.1
winter flounder	1,476	3.7	163.2	4.1
Atlantic herring	1,099	2.8	286.8	7.2
striped searobin	959	2.4	436.6	11.0
spotted hake	800	2.0	39.5	1.0
windowpane flounder	704	1.8	118.8	3.0
fourspot flounder	357	0.9	60.0	1.5
silver hake	277	0.7	19.2	0.5
Atlantic menhaden	241	0.6	14.3	0.4
striped bass	104	0.3	231.6	5.8
summer flounder	83	0.2	100.6	2.5
alewife	70	0.2	2.1	0.1
moonfish	64	0.2	1.0	0
fourbeard rockling	53	0.1	2.8	0.1
northern searobin	50	0.1	8.1	0.2
American shad	43	0.1	8.8	0.2
smooth dogfish	35	0.1	69.6	1.7
tautog	32	0.1	24.6	0.6
cunner	22	0.1	2.2	0.1
red hake	19	0	2.0	0.1
hickory shad	11	0	4.9	0.1
black sea bass	10	0	6.9	0.2
blueback herring	6	0	0.3	0
bay anchovy	4	0	0.3	0
oyster toadfish	4	0	0.8	0
inshore lizardfish	3	0	0.4	0
Atlantic tomcod	3	0	0.3	0
hogchoker	2	0	0.2	0
little skate	2	0	1.4	0
northern puffer	2	0	0.2	0
spot	2	0	0.2	0
yellow jack	2	0	0.2	0
rough scad	1	0	0.1	0
longhorn sculpin	1	0	0.1	0
smallmouth flounder	1	0	0.1	0
winter skate	1	0	1.8	0
Total	**39,521**		**3,980.6**	

Invertebrates				
species	**count**	**%**	**weight**	**%**
horseshoe crab	176	8.9	299.3	43.9
American lobster	906	45.6	218.9	32.1
starfish spp.	nc		43.5	6.4
long-finned squid	766	38.6	33.6	4.9
spider crab	nc		24.1	3.5
bushy bryozoan	nc		15.1	2.2
rock crab	nc		13.8	2.0
anemones	nc		11.5	1.7
hydroid spp.	nc		9.3	1.4
mantis shrimp	120	6.0	5.7	0.8
bluecrab	15	0.8	3.6	0.5
mud crabs	nc		0.6	0.1
lady crab	nc		0.5	0.1
blue mussel	nc		0.4	0.1
sand shrimp	nc		0.3	0
common slipper shell	nc		0.2	0
hard clams	nc		0.2	0
flat claw hermit crab	nc		0.2	0
lion's mane jellyfish	2	0.1	0.2	0
northern moon snail	nc		0.2	0
green crab	nc		0.1	0
moon jelly	nc		0.1	0
Total	**1,985**		**681.4**	

Note: nc= not counted

Appendix 2.5. cont. Total number and weight (kg) of finfish and invertebrates caught in the Narrows in 2002. Finfish species are in order of descending count. Number of tows (sample size)=30.

Vertebrates				
species	**count**	**%**	**weight**	**%**
scup	12,983	38.5	1,438.6	37.4
butterfish	10,870	32.3	273.9	7.1
weakfish	2,474	7.3	80.2	2.1
striped searobin	1,333	4.0	618.6	16.1
winter flounder	1,237	3.7	203.0	5.3
bluefish	819	2.4	136.0	3.5
Atlantic herring	641	1.9	160.2	4.2
Atlantic menhaden	613	1.8	107.5	2.8
windowpane flounder	539	1.6	89.1	2.3
spotted hake	511	1.5	33.1	0.9
fourspot flounder	404	1.2	76.4	2.0
silver hake	197	0.6	8.4	0.2
moonfish	184	0.5	3.5	0.1
American shad	172	0.5	13.4	0.3
summer flounder	122	0.4	87.6	2.3
striped bass	97	0.3	287.8	7.5
alewife	89	0.3	3.7	0.1
bay anchovy	78	0.2	0.9	0
smooth dogfish	68	0.2	136.2	3.5
tautog	54	0.2	41.1	1.1
spot	38	0.1	5.3	0.1
black sea bass	37	0.1	19.6	0.5
fourbeard rockling	29	0.1	2.2	0.1
cunner	27	0.1	2.5	0.1
northern searobin	23	0.1	3.4	0.1
red hake	16	0	1.6	0
hickory shad	8	0	4.6	0.1
ocean pout	5	0	1.3	0
yellow jack	5	0	0.5	0
blueback herring	3	0	0.3	0
little skate	3	0	1.8	0
smallmouth flounder	3	0	0.3	0
winter skate	2	0	3.0	0.1
clearnose skate	1	0	4.0	0.1
crevalle jack	1	0	0.1	0
hogchoker	1	0	0.1	0
Total	**33,687**		**3,849.8**	

Invertebrates				
species	**count**	**%**	**weight**	**%**
horseshoe crab	203	9.3	357.4	48.6
American lobster	894	41.2	226.9	30.9
starfish spp.	288	13.3	50.7	6.9
long-finned squid	426	19.6	24.8	3.4
rock crab	nc		20.1	2.7
spider crab	nc		17.4	2.4
hydroid spp.	nc		10.4	1.4
mantis shrimp	290	13.4	10.4	1.4
bluecrab	17	0.8	3.9	0.5
bushy bryozoan	nc		3.3	0.4
lion's mane jellyfish	49	2.3	2.6	0.4
hard clams	nc		1.4	0.2
mud crabs	nc		1.1	0.1
anemones	nc		1.0	0.1
sand shrimp	nc		1.0	0.1
sea grape	nc		0.5	0.1
green crab	nc		0.3	0
blue mussel	nc		0.3	0
channeled whelk	3	0.1	0.2	0
common slipper shell	nc		0.2	0
flat claw hermit crab	nc		0.2	0
lady crab	nc		0.2	0
northern moon snail	nc		0.2	0
common oyster	nc		0.2	0
Total	**2,170**		**734.7**	

Note: nc= not counted

Appendix 2.5. cont. Total number and weight (kg) of finfish and invertebrates caught in the Narrows in 2003. Finfish species are in order of descending count. Number of tows (sample size)=23.

Vertebrates				
species	**count**	**%**	**weight**	**%**
scup	3,518	26.9	1,016.4	43.5
weakfish	2,970	22.7	61.4	2.6
butterfish	2,602	19.9	53.6	2.3
winter flounder	977	7.5	216.1	9.3
windowpane flounder	523	4.0	94.9	4.1
spotted hake	471	3.6	19.9	0.9
striped searobin	448	3.4	229.8	9.8
Atlantic herring	325	2.5	65.8	2.8
bluefish	313	2.4	78.4	3.4
alewife	167	1.3	10.4	0.4
fourspot flounder	164	1.3	32.4	1.4
striped bass	128	1.0	250.3	10.7
bay anchovy	91	0.7	0.8	0
summer flounder	74	0.6	52.9	2.3
Atlantic menhaden	67	0.5	32.0	1.4
American shad	40	0.3	2.7	0.1
blueback herring	32	0.2	0.9	0
smooth dogfish	29	0.2	75.2	3.2
red hake	24	0.2	1.2	0.1
tautog	18	0.1	16.3	0.7
moonfish	17	0.1	0.4	0
hickory shad	12	0.1	5.2	0.2
fourbeard rockling	12	0.1	0.9	0
cunner	10	0.1	1.3	0.1
ocean pout	7	0.1	2.2	0.1
black sea bass	6	0	4.5	0.2
little skate	5	0	2.6	0.1
northern searobin	4	0	0.7	0
oyster toadfish	4	0	1.8	0.1
silver hake	4	0	0.3	0
spot	2	0	0.2	0
clearnose skate	1	0	1.9	0.1
hogchoker	1	0	0.1	0
northern pipefish	1	0	0.1	0
Atlantic tomcod	1	0	0.1	0
white perch	1	0	0.1	0
winter skate	1	0	0.6	0
Total	**13,070**		**2,334.4**	

Invertebrates				
species	**count**	**%**	**weight**	**%**
horseshoe crab	201	11.0	322.0	52.5
American lobster	620	33.8	159.3	26.0
spider crab	.	.	43.5	7.1
starfish spp.	.	.	25.9	4.2
long-finned squid	837	45.6	19.2	3.1
rock crab	.	.	19.1	3.1
hydroid spp.	.	.	8.1	1.3
lion's mane jellyfish	105	5.7	6.0	1.0
mantis shrimp	64	3.5	3.0	0.5
sand shrimp	.	.	1.2	0.2
mud crabs	.	.	1.0	0.2
hard clams	.	.	0.5	0.1
anemones	.	.	0.4	0.1
bluecrab	2	0.1	0.4	0.1
channeled whelk	5	0.3	0.3	0
lady crab	.	.	0.2	0
blue mussel	.	.	0.2	0
arks	.	.	0.1	0
bushy bryozoan	.	.	0.1	0
common slipper shell	.	.	0.1	0
ghost shrimp	1	0.1	0.1	0
northern moon snail	.	.	0.1	0
Total	**1,835**		**610.8**	

Note: nc= not counted

Appendix 2.5. cont. Total number and weight (kg) of finfish and invertebrates caught in the Narrows in 2004. Finfish species are in order of descending count. Number of tows (sample size)=25.

Vertebrates				
species	**count**	**%**	**weight**	**%**
butterfish	14,627	44.2	295.6	17.6
scup	12,706	38.4	243.5	14.5
weakfish	1,924	5.8	31.8	1.9
winter flounder	1,404	4.2	179.9	10.7
bluefish	498	1.5	309.5	18.4
Atlantic menhaden	337	1.0	13.0	0.8
striped searobin	274	0.8	135.3	8.0
windowpane flounder	254	0.8	41.9	2.5
Atlantic herring	156	0.5	24.7	1.5
fourspot flounder	156	0.5	37.2	2.2
bay anchovy	132	0.4	1.6	0.1
spotted hake	116	0.4	6.4	0.4
American shad	88	0.3	5.4	0.3
red hake	66	0.2	2.4	0.1
summer flounder	60	0.2	75.0	4.5
smooth dogfish	60	0.2	111.1	6.6
striped bass	57	0.2	120.9	7.2
alewife	37	0.1	2.8	0.2
silver hake	37	0.1	1.4	0.1
fourbeard rockling	26	0.1	1.9	0.1
moonfish	25	0.1	0.8	0
blueback herring	16	0.0	0.6	0
hickory shad	16	0.0	3.8	0.2
tautog	14	0.0	16.5	1.0
ocean pout	8	0.0	2.9	0.2
cunner	6	0.0	0.8	0
little skate	6	0.0	3.7	0.2
winter skate	6	0.0	5.8	0.3
northern searobin	5	0.0	0.5	0
black sea bass	4	0.0	3.8	0.2
round scad	3	0.0	0.3	0
Atlantic tomcod	3	0.0	0.2	0
smallmouth flounder	2	0.0	0.2	0
American eel	1	0.0	1.1	0.1
hogchoker	1	0.0	0.2	0
northern kingfish	1	0.0	0.1	0
pollock	1	0.0	0.1	0
Total	**33,133**		**1,682.7**	

Invertebrates				
species	**count**	**%**	**weight**	**%**
horseshoe crab	239	13.2	413.8	59.0
American lobster	703	38.9	181.4	25.9
spider crab	nc		47.9	6.8
long-finned squid	678	37.5	23.3	3.3
rock crab	nc		11.7	1.7
lion's mane jellyfish	122	6.7	6.4	0.9
starfish spp.	nc		4.5	0.6
hydroid spp.	nc		4.3	0.6
mud crabs	nc		2.1	0.3
mantis shrimp	30	1.7	1.5	0.2
sand shrimp	nc		1.1	0.2
hard clams	nc		0.9	0.1
channeled whelk	11	0.6	0.7	0.1
common slipper shell	nc		0.4	0.1
flat claw hermit crab	nc		0.3	0
anemones	nc		0.3	0
lady crab	nc		0.2	0
star coral	nc		0.1	0
Japanese shore crab	25	1.4	0.1	0
ribbed mussel	nc		0.1	0
Total	**1,808**		**701.1**	

Appendix 2.5. cont. Total number and weight (kg) of finfish and invertebrates caught in the Narrows in 2005. Finfish species are in order of descending count. Number of tows (sample size)=15.

	Vertebrates			
species	**count**	**%**	**weight**	**%**
scup	15,884	68.3	244.7	20.4
butterfish	2,922	12.6	72.6	6.1
winter flounder	1,030	4.4	127.5	10.6
Atlantic herring	918	3.9	154.2	12.9
bluefish	603	2.6	88.8	7.4
windowpane flounder	521	2.2	33.3	2.8
weakfish	491	2.1	22.7	1.9
bay anchovy	181	0.8	1.3	0.1
striped bass	155	0.7	279.8	23.4
alewife	100	0.4	5.7	0.5
American shad	68	0.3	4.3	0.4
striped searobin	62	0.3	19.4	1.6
Atlantic menhaden	57	0.2	19.0	1.6
hickory shad	52	0.2	12.9	1.1
spotted hake	51	0.2	2.9	0.2
smooth dogfish	24	0.1	47.6	4.0
moonfish	23	0.1	0.7	0.1
fourspot flounder	21	0.1	4.5	0.4
tautog	17	0.1	17.8	1.5
red hake	15	0.1	2.6	0.2
summer flounder	15	0.1	18.3	1.5
blueback herring	12	0.1	0.4	0.0
fourbeard rockling	8	0.0	0.7	0.1
silver hake	8	0.0	0.5	0.0
ocean pout	5	0.0	2.0	0.2
little skate	3	0.0	1.0	0.1
yellow jack	3	0.0	0.3	0.0
black sea bass	2	0.0	1.8	0.2
clearnose skate	2	0.0	6.0	0.5
northern searobin	2	0.0	0.8	0.1
pollock	2	0.0	0.2	0.0
Atlantic silverside	1	0.0	0.1	0.0
winter skate	1	0.0	3.2	0.3
Totals	**23,259**		**1,197.6**	

	Invertebrates			
species	**count**	**%**	**weight**	**%**
horseshoe crab	173.0	21.8	330.3	80.5
American lobster	171.0	21.6	48.0	11.7
long-finned squid	418.0	52.7	14.2	3.5
rock crab	.	.	10.1	2.5
hydroid spp.	.	.	1.4	0.3
lion's mane jellyfish	23.0	2.9	1.1	0.3
spider crab	.	.	1.1	0.3
starfish spp.	.	.	1.0	0.2
bluecrab	1.0	0.1	0.4	0.1
mud crabs	.	.	0.4	0.1
mantis shrimp	3.0	0.4	0.4	0.1
bushy bryozoan	.	.	0.3	0.1
channeled whelk	3.0	0.4	0.3	0.1
sand shrimp	.	.	0.3	0.1
common slipper shell	.	.	0.3	0.1
hard clams	.	.	0.2	0.0
lady crab	.	.	0.2	0.0
Japanese shore crab	.	.	0.1	0.0
blue mussel	.	.	0.1	0.0
Totals	**792**		**410.2**	

Finfish not ranked

American sand lance, yoy

anchovy spp, yoy

Atlantic herring, yoy

Appendix 2.5 cont. Total number and weight (kg) of finfish and invertebrates caught in the Narrows in 2006. Finfish species are in order of descending count. Invertebrate species are in order of descending weight (nc = not counted). Number of tows (sample size) = 9.

	Vertebrates			
species	**count**	**%**	**weight**	**%**
butterfish	12,977	73.0	438.3	37.7
scup	2,852	16.0	359.5	30.9
bluefish	743	4.2	70.4	6.0
winter flounder	599	3.4	52.7	4.5
silver hake	98	0.6	3.7	0.3
spotted hake	95	0.5	5.5	0.5
windowpane flounder	63	0.4	7.1	0.6
striped searobin	60	0.3	27.5	2.4
fourspot flounder	59	0.3	13.6	1.2
moonfish	54	0.3	0.9	0.1
weakfish	31	0.2	4.6	0.4
striped bass	24	0.1	67.1	5.8
bay anchovy	20	0.1	0.6	0.1
summer flounder	20	0.1	31.1	2.7
Atlantic menhaden	17	0.1	10.5	0.9
northern searobin	17	0.1	2.5	0.2
hickory shad	14	0.1	2.9	0.2
Atlantic herring	11	0.1	0.3	0.0
smooth dogfish	10	0.1	59.1	5.1
red hake	9	0.1	0.4	0.0
tautog	6	0.0	4.5	0.4
black sea bass	2	0.0	0.8	0.1
cunner	2	0.0	0.1	0.0
blueback herring	1	0.0	0.1	0.0
gizzard shad	1	0.0	0.1	0.0
fourbeard rockling	1	0.0	0.1	0.0
Totals	**17,786**		**1,164.0**	

	Invertebrates			
species	**count**	**%**	**weight**	**%**
horseshoe crab	20	5.0	45.9	43.5
rock crab	.	.	16.5	15.6
hydroid spp.	.	.	13.6	12.9
American lobster	41	10.4	12.1	11.5
long-finned squid	304	76.2	10.2	9.7
spider crab	.	.	2.5	2.4
channeled whelk	12	3.0	1.4	1.3
starfish spp.	.	.	0.9	0.9
mantis shrimp	14	3.5	0.8	0.8
mud crabs	.	.	0.4	0.4
blue crab	2	0.5	0.3	0.3
sand shrimp	.	.	0.2	0.2
hard clams	5	1.3	0.2	0.2
Japanese shore crab	.	.	0.2	0.2
tunicates, misc.	.		0.2	0.2
common slipper shell	.	.	0.1	0.1
Totals	**398**		**105.5**	

Finfish not ranked

American sand lance, yoy
anchovy spp, yoy
Atlantic herring, yoy

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PART 2: ESTUARINE SEINE SURVEY

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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 2006 annual index of recruitment for young-of-year winter flounder (0.9 fish/haul) was the lowest ranking out of 19 annual indices, and just 12% of the series average of 7.7 flounder/haul.

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

Mean catch of all finfish (118 fish/haul) ranked ninth out of 19 annual indices but was below the series average of 136 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 2006 (59 forage fish/haul) was the sixth lowest of the time series, and well below the time series average of 93 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 30 meter (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 14cm 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 2006 at eight sites, yielding a total catch of 5,653 fish of 29 species and 7,991 invertebrates of 13 species. Mean catch of all finfish (118 fish/tow) was the ninth highest in the time series (Figure 2.2). This catch is slightly below the long-term mean of 136 fish /tow is attributed to average or below average catches of Atlantic silversides, striped killifish, mummichog and sheepshead minnow. 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 striped killifish (65%), mummichog (48%), YOY winter flounder (46%), northern puffer and pipefish (29%), grubby (27%), black sea bass (23%), tautog (17%) and cunner (13%). This rank order has changed from the previous years, with a notable decrease in winter flounder and tautog occurrence rate along with an increase in grubby, pipefish, black sea bass and northern puffer occurrence. Tautog abundance and occurrence rate increased significantly in 1998-99, returned to the series average in 2005, and was below the series average in 2006. Previous to 2005, tautog relative abundance had significantly increased to all-time abundance levels in 2002-04 (Figure 2.4). Summer flounder and inshore lizardfish abundance and occurrence were the highest in the 19 year time-series in 2006. Black sea bass abundance and occurrence were the second highest in the 19 year time-series in 2006. Snapper bluefish were above average in abundance in 2006. Grubby, cunner, northern kingfish, northern pipefish, northern puffer and winter flounder (age 1+ and older) abundance and occurrence was average for the 19 year time-series in 2006. All other species occurred in less than 15% of all samples, with occurrence rates similar to previous years. Two new species of finfish were captured in 2006, a northern sennet and a web burrfish.

Relative Abundance of Juvenile Winter Flounder and Tautog

The 2006 index of YOY winter flounder (0.9fish/haul) was the lowest ranking out of 19 annual indices (Table 2.2, Figure 2.3 and 2.7), and just 12% the series average of 7.7 flounder / haul. Overall, the time series indicates that relatively strong year classes were produced in 1988, 1992, 1994, and 1996 (Figure 2.3).

The 2006 index of YOY tautog (0.4 fish/haul) was the eighth lowest ranking out of 19 annual indices (Table 2.1, Figure 2.3 and 2.7), but below the series average of 0.65 tautog / haul. Overall, the time series indicates a significant increasing trend in abundance of young-of-year tautog from 1988 to 2006, even though the 2006 mean was below the longterm average. ($P \leq 0.01$, $t=2.8$, $df=18$), (Table 2.1, Figure 2.3).

Presence of Other Important Recreational Finfish

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 2006. YOY summer flounder have occurred in five years of the 19 year time series (1993, 1994, 1996, 1998 and 2006). The 2006 summer flounder abundance was the 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 19 years of the time series, reaching peak abundance in 1999. YOY scup is another recent addition to the seine survey, first occurring in 1999, with the highest relative abundance in the last six years of the time series, a reflection of strong recruitment in recent years (Table 2.4, Figure 2.8). Juvenile tautog have 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 2006 was the sixth lowest in the 19 year time series. Atlantic silversides were the most abundant, and the only species present at all sites in all samples (Table 2.1). There was a slight decrease in abundance in 2006. An increase in this species' abundance in 2002 through 2005 reversed a two-year decrease from 2000-2001. Mummichog abundance (2.5) was above the longterm average of 2.0 in 2006. Sheepshead minnow was similar to 2005, ranking ninth highest in the 19 year time series in both total catch and percent occurrence. Striped killifish abundance and occurrence decreased in 2006. Striped killifish abundance was the tenth highest in the 19 year time series and slightly below the series mean of 7.8 fish/haul.

Forage fish abundance has generally been increasing since 1997 (Figure 2.5) after a period of lower abundance (decreasing trend) since 1991. In 2006, forage fish abundance dipped below the series mean of 93 fish/haul, with a mean catch of 59 fish per haul. Forage fish abundance is driven numerically by the occurrence of adult Atlantic silverside (Figure 2.6) and more recently striped killifish, the second 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 1994 followed by the lowest time series abundance in 1995, appears to be increasing slightly with an above average catch in 2006. Sheepshead minnow the least abundant of the four forage fish species monitored has recently shown elevated abundance in 2002-2006.

Relative Abundance of Invertebrate Species

A total of 7,991 invertebrates of 13 species were captured in 2006 (Table 2.3), (Appendix 2.2). Seven crab species were present in the seine hauls, along with three shrimp species and two gastropods. Mud snail, Shore shrimp, sand shrimp, hermit crab, green crab and blue crab were the most abundant, and only hermit crabs were present at all sites (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, 1988-2006. *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, 1988-2006. *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
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)**
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)**
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)**
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)**
Fluke	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0 (0)	**0.20 (19)**
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)**
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)**
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)**
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)**
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)**
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)**
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)**
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)**
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)**
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)**
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)**
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)**
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)**
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)**
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)**
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)**
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)**
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)**

Table 2.2: Mean catch of young-of-year winter flounder at eight sites sampled by seine, 1988-2006.

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)**

*****record high for a site.

Table 2.3: Total catch of twelve invertebrate species at eight sites sampled by seine, 2006.
Seine sites are listed west to east.

Species	Greenwich	Bridgeport	Milford	New Haven	Clinton	Old Lyme	Waterford	Groton	**All Sites**
Blue Crab	0	1	0	0	28	51	4	0	**84**
Green Crab	11	1	23	5	31	758	153	42	**1,024**
Hermit Crab	60	265	29	34	133	4	55	123	**703**
Japan Crab	1	0	0	0	0	0	0	0	**1**
Lady Crab	0	13	0	35	3	5	4	6	**66**
Mud Crab	17	9	0	13	10	0	8	17	**74**
Mole Crab	0	0	0	0	0	0	0	0	**0**
Mud Snail	152	377	421	66	3,078	4	271	109	**4,478**
Rock Crab	0	0	0	0	0	0	0	0	**0**
Sand Shrimp	30	54	0	0	269	108	29	537	**1,027**
Spider Crab	2	6	0	2	0	0	2	0	**12**
Shore Shrimp	102	6	0	88	19	754	114	66	**1,149**

Table 2.4: Total Catch by species, 1988-2006.

SPECIES	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Alewife			1				1								28	1			
American Eel	1		1	1			1				2								
American Shad			1																
American Sand Lance			1																
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
Atlantic Tomcod			13			3											1	3	
Banded Gunnel											2	3					4	2	3
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
Blueback Herring			202	194	10		5	2			3	24	1		13	5			
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
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
Hogchoker			3	1															
Inshore Lizardfish	5		2			2	6			46	6	16	15	103	2		3		169
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
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
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
Northern Pipefish	64	19	216	142	120	82	117	52	241	38	191	141	96	189	87	25	72	92	82
Northern Puffer	4	14	59	37	4	37	15	40	25	5	5	13	63	14	79	101	75	93	34

Table 2.4 Cont.: Total Catch by species, 1988-2006.

SPECIES	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Northern Searobin			7										3	40	24	5	4	13	2
Northern Sennet																			1
Northern Stargazer		1																	
Oyster Toadfish	3	_	_	1	_	_	_	_	_	1	1			1		1	2	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				3			1			2		1				
Scup (Porgy)												1		58	172	131	50	154	6
Sheepshead Minnow	168	816	20	345	4	1	2	30	7	14	19	12	267	59	402	276	205	28	104
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
Striped Searobin	22		20	125	5	71	5	1	9	40							38	19	6
Summer Flounder						2	6		1		1								16
Tautog (Blackfish)	23	17	53	135	32	16	104	88	42	20	133	174	67	59	153	140	145	64	93
Three-Spine Stickleback			64											11					
Weakfish																15			
Web Burrffish																			1
White Perch																		3	
White Mullet			8		3										1				7
Windowpane Flounder	49		64	19	35	30	9	13	71	50	12	10	4		1	5	15	15	3
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
Winter Flounder (age 1)	7	5	16	9	6	14	13	12	21	8	9	4	7	2	3		9	11	7
Yellow Jack			1																

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

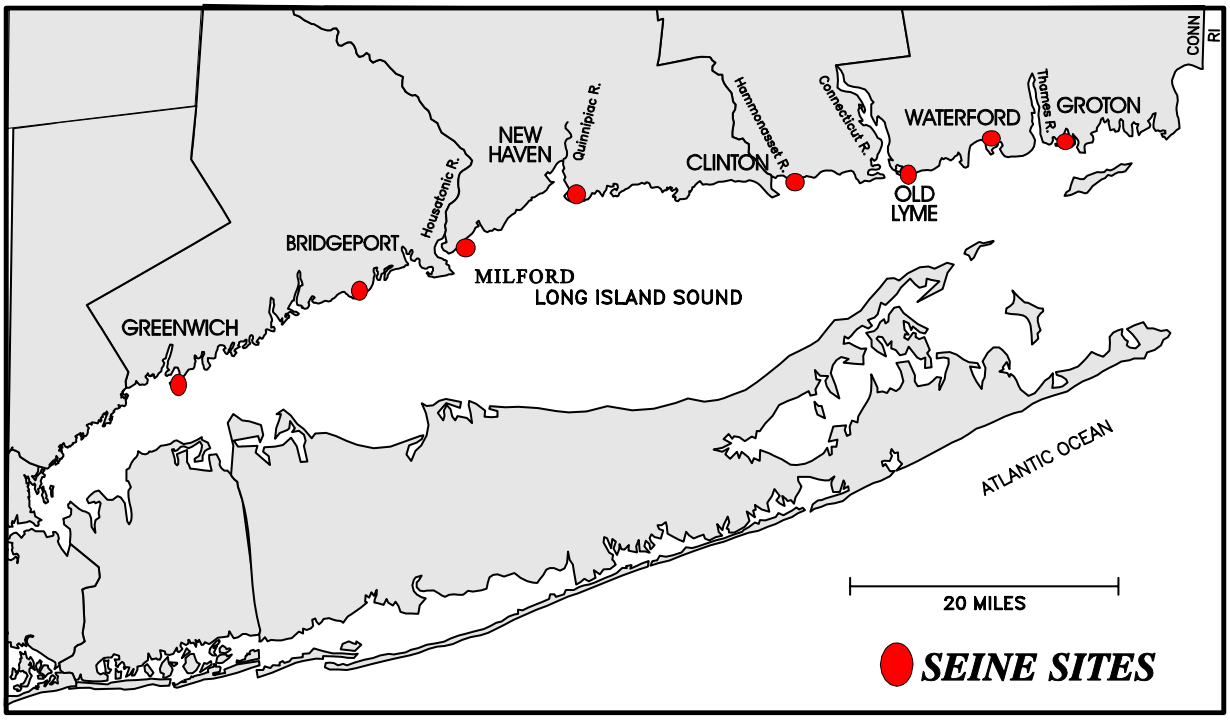

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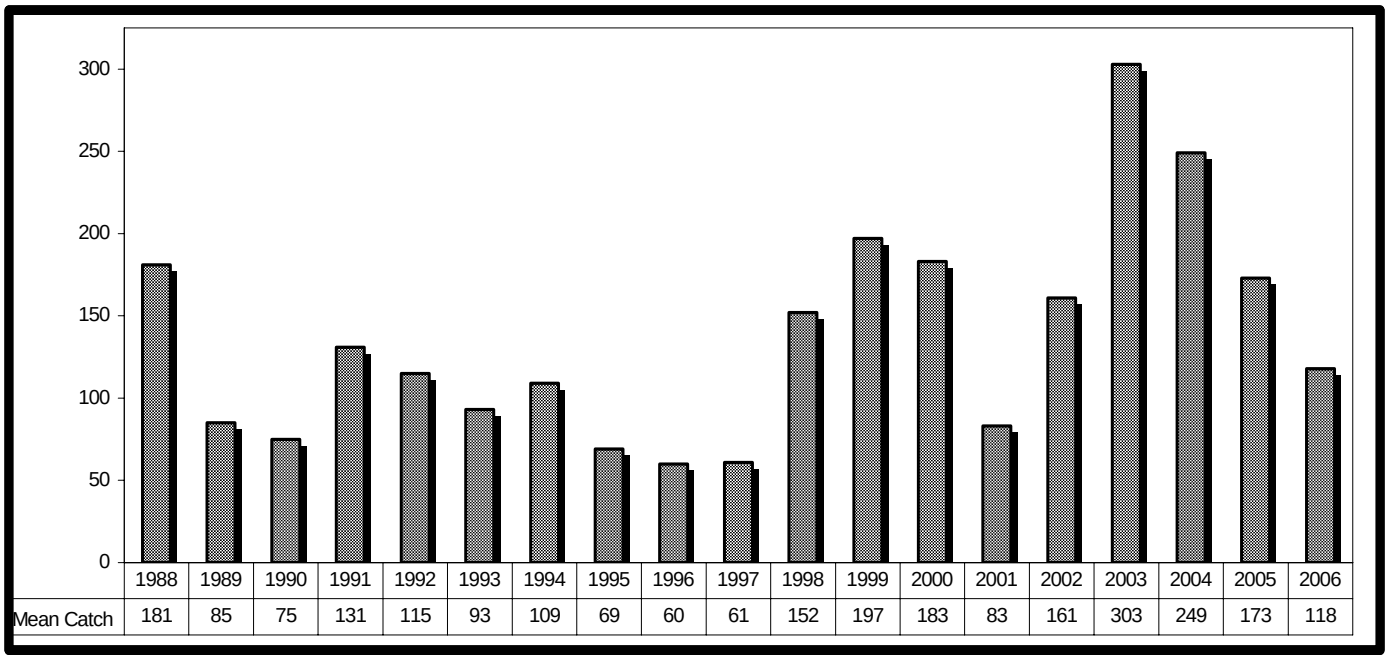
Figure 2.2: Mean catch (numbers) of all finfish taken in seine samples, 1988-2006.
Mean catch per haul includes samples at all sites. Note that sampling at the Milford site began in 1990.



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

Figure 2.3: Mean catch of young-of-year winter flounder, 1988-2006. *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.*

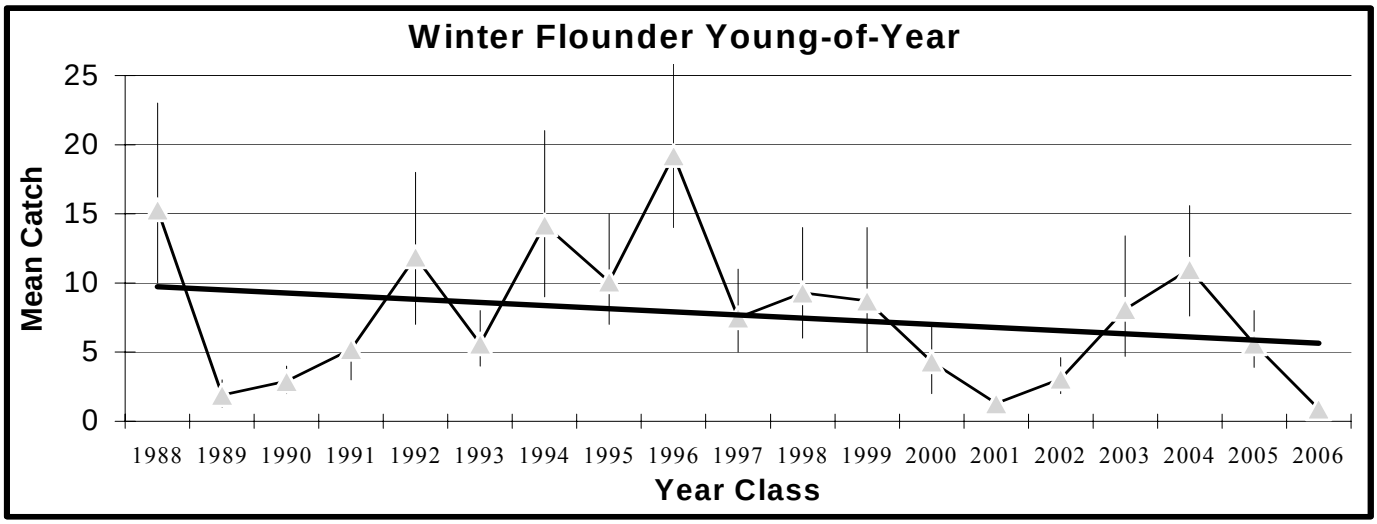


Figure 2.4: Mean catch of tautog young-of-year taken in seine samples, 1988-2006. *Geometric mean catch per haul (numbers) and occurrence (percent) includes samples at all sites. The time series mean of 0.65 tautog / haul is shown by the black line. Note that sampling at the Milford site began in 1990.*

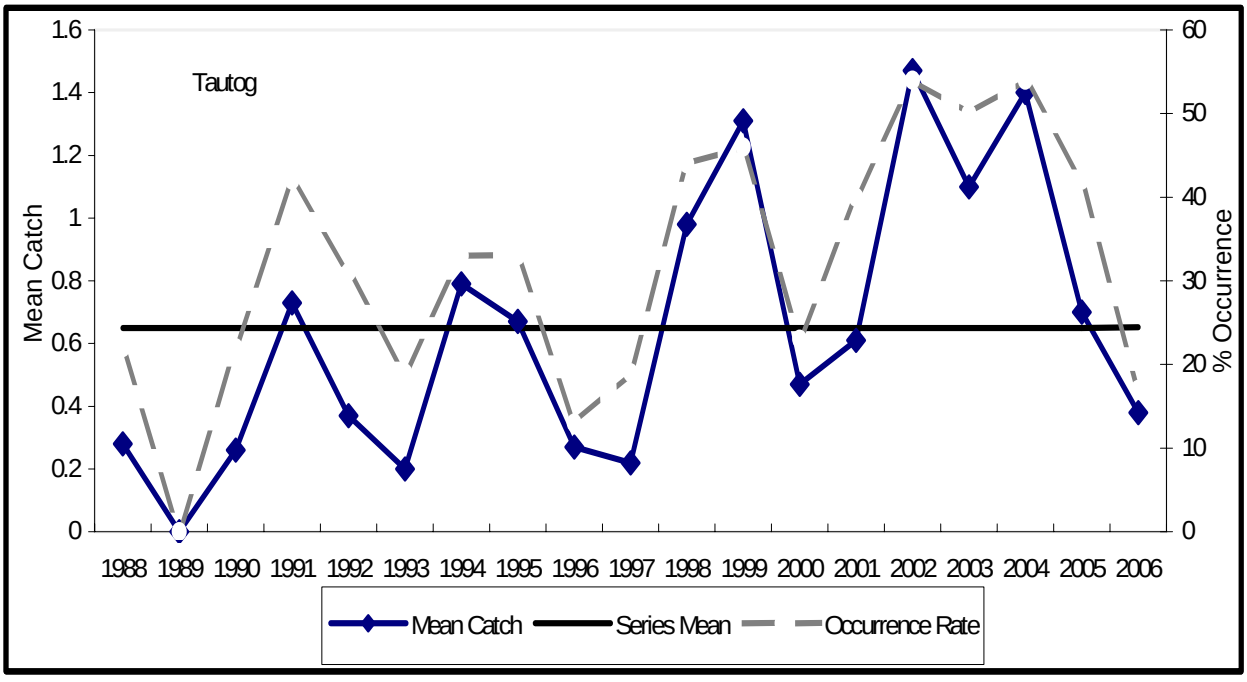


Figure 2.5: Mean catch of forage fish at eight sites sampled by seine, 1988-2006.
Forage species include Atlantic silversides, mummichog, sheepshead minnow, and striped killifish. The 95% confidence interval (CI) for each mean is also listed. See Appendix 2.1 for complete species names.

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**
MEAN	32.2	110.0	126.9	146.3	52.4	125.3	206.4	129.7	121.7	**59.4**
95% CI	20-50	83-145	85-190	108-197	32-86	97-162	152-281	108-155	101-147	**43-82**

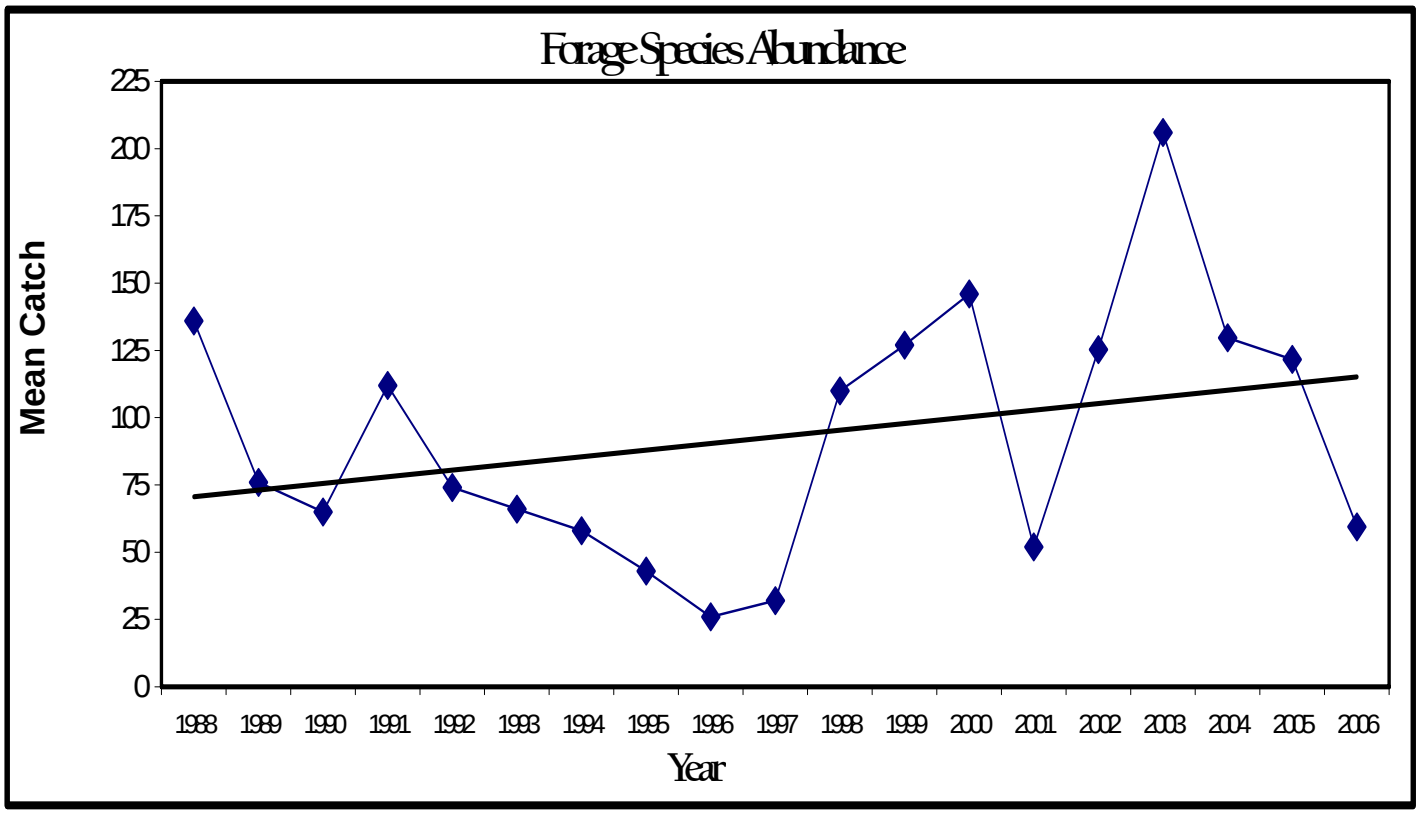


Figure 2.6: Total Catch of Four Species of Forage Fish, 1998-2006

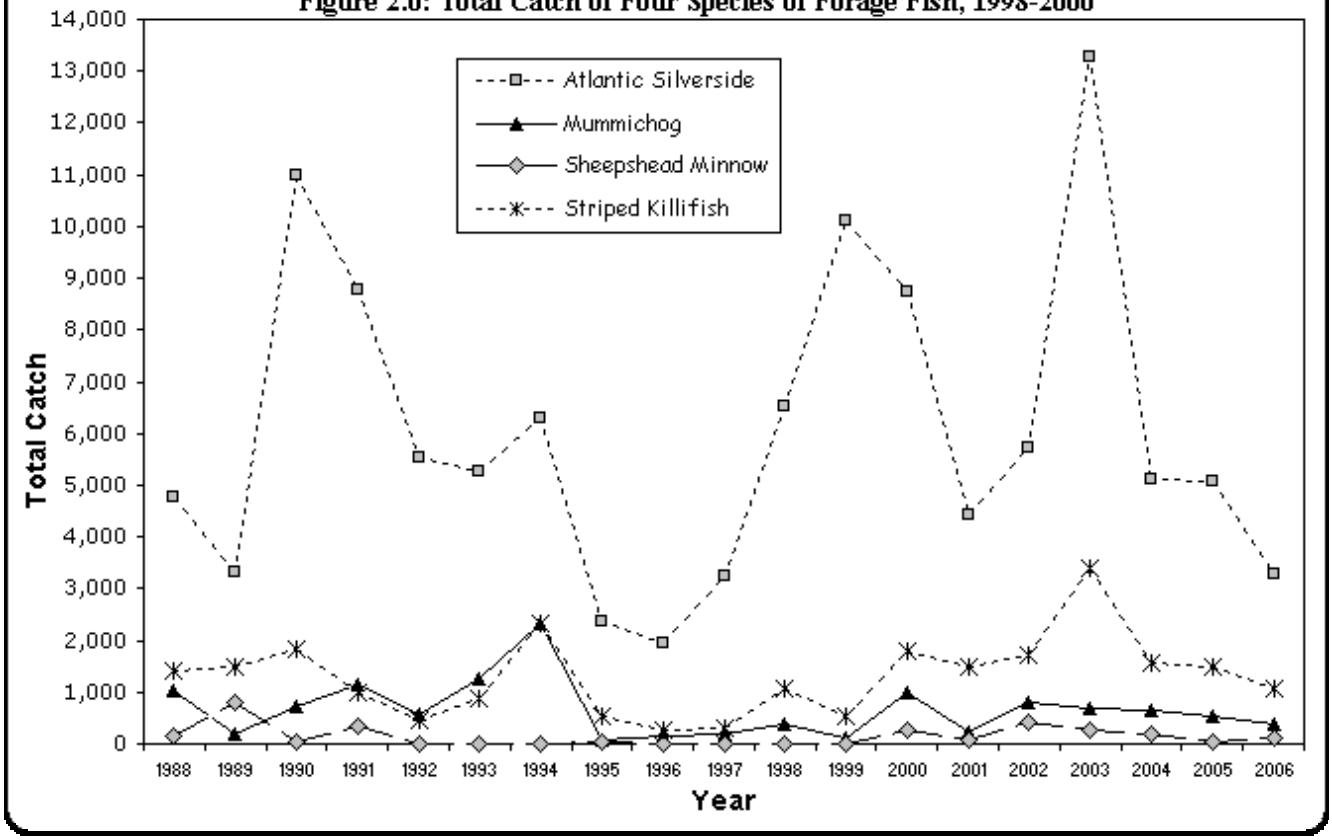


Figure 2.7: Total Catch of Four Recreational Important Finfish, 1988-2006

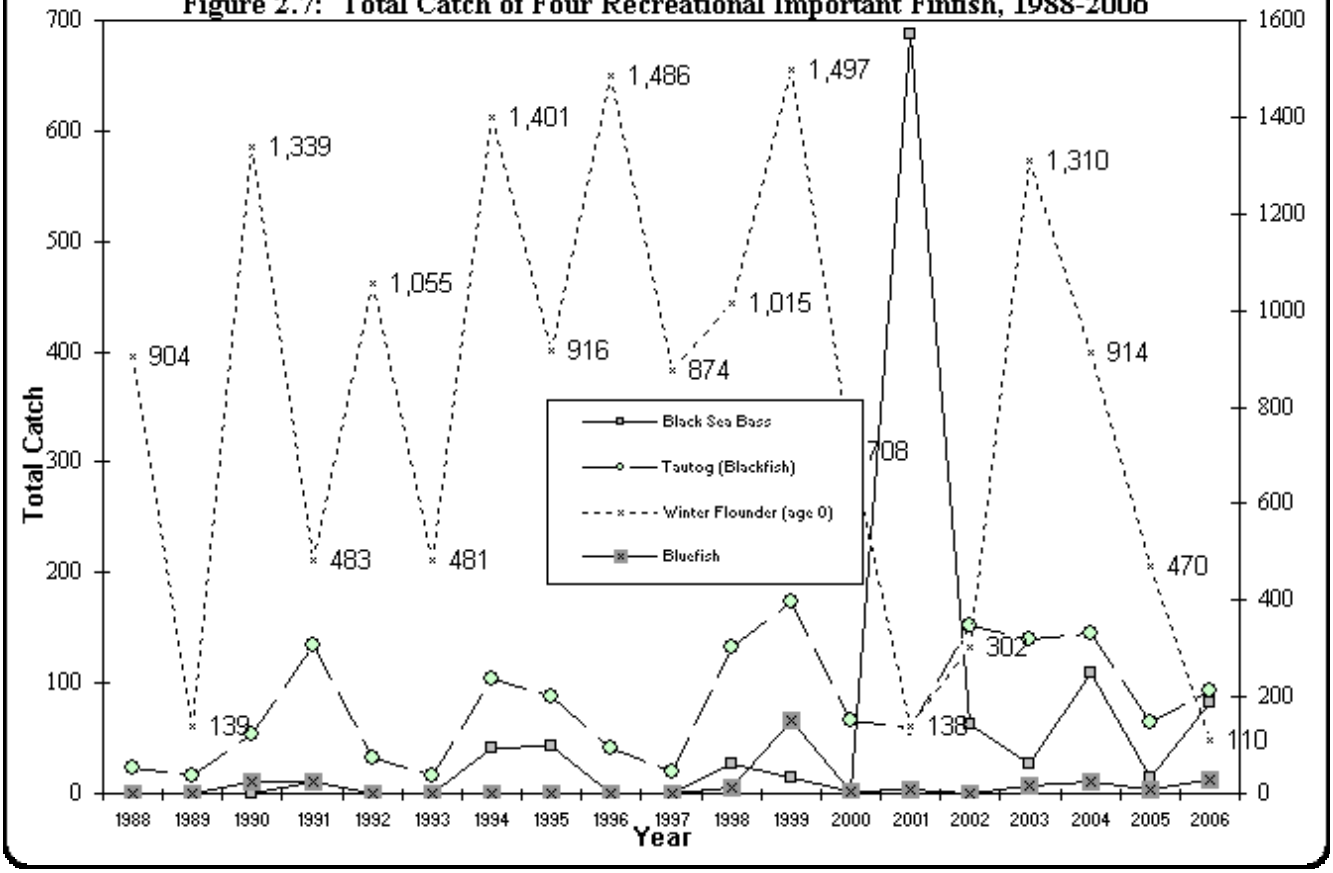


Figure 2.8: Total Catch of Four Recreational Important Finfish, 1988-2006

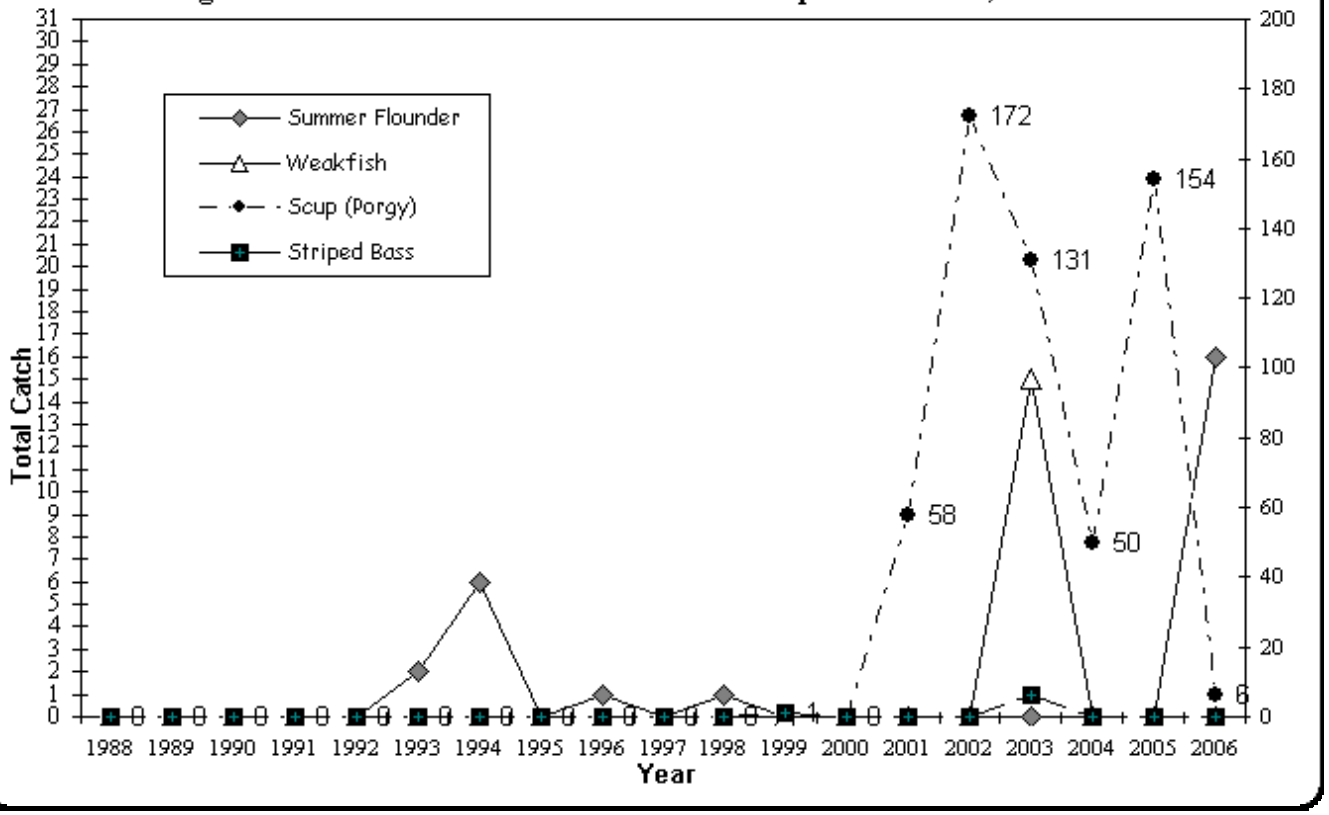
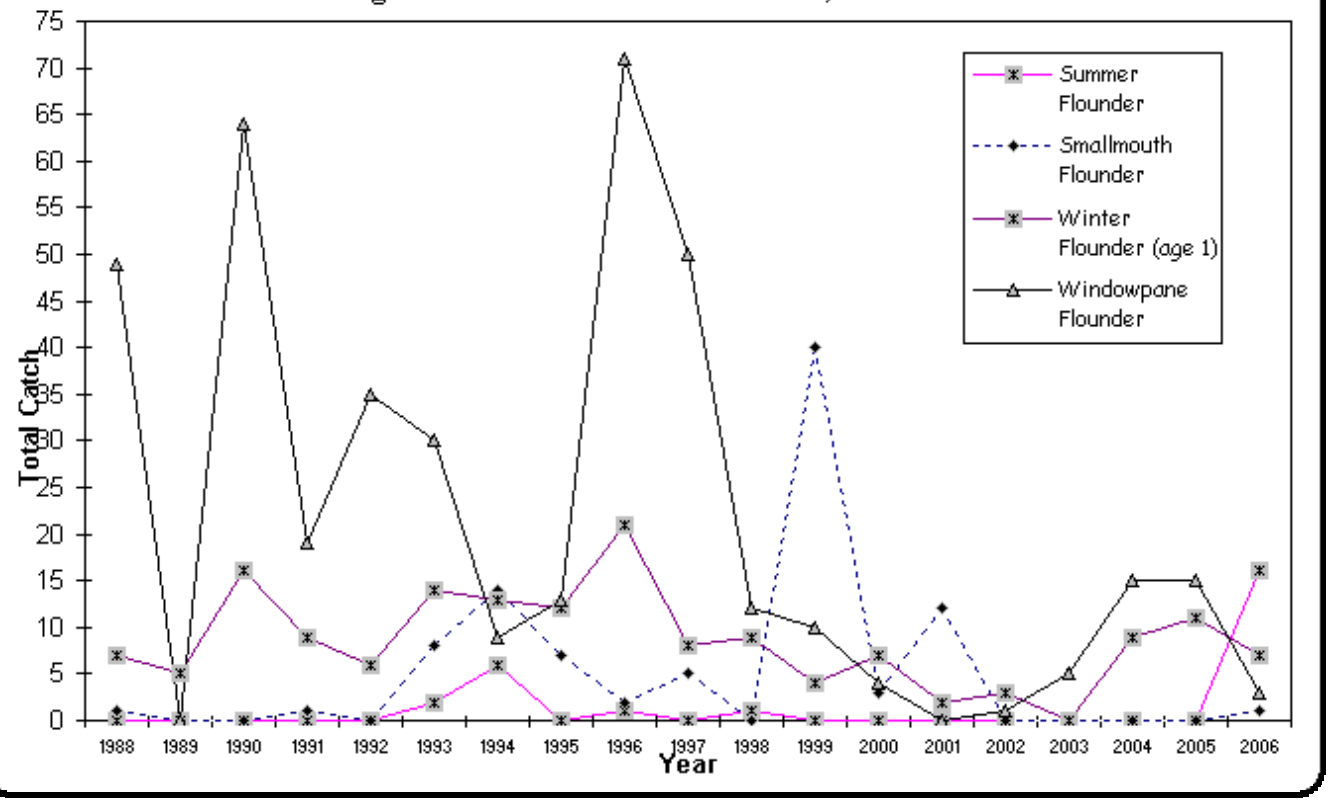


Figure 2.9: Total Catch of Flounders, 1998-2006



Appendix 2.1: Finfish species taken in the Estuarine Seine Survey, 1988-2006.

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***
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, 1988-2006.

COMMON NAME	SPECIES CODE	*SCIENTIFIC NAME*
Blue crab	**BCR**	*Callinectes sapidus*
Brown Shrimp	**BNS**	*Panaeus aztecus*
Green crab	**GCR**	*Carcinus maenas*
Hermit crab	**HCR**	*Pagurus spp.*
Horseshoe crab	**HSC**	*Limulus polyphemus*
Japanese crab	**JCR**	*Hemigrapsus sanguineus*
Lady crab	**LCR**	*Ovalipes ocellatus*
Mud crab	**MCR**	*Panopeus spp.*
Mole crab	**MLR**	*Emerita talpoida*
Mud snail	**MSN**	*Nassarius obsoletus*
Rock crab	**RCR**	*Cancer irroratus*
Sand shrimp	**SAS**	*Crangon septemspinosa*
Shore shrimp	**SHS**	*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:

Long Island Sound Ambient Water Quality Monitoring Program staff (see below)
at
CTDEP Bureau of Water Protection and Land Reuse
Planning and Standards Division
79 Elm Street
Hartford, CT 06106-5127

Christine B. Olsen
Phone: (860) 424-3727
E-mail: christine.olsen@po.state.ct.us
program oversight, reporting, data analysis, database management, scheduling and cooperative requests, QA/QC

Matthew J. Lyman
Phone: (860) 424-3158
E-mail: matthew.lyman@po.state.ct.us
database management, hypoxia area mapping, data analysis, data requests, field operations, webpage development

Katie O'Brien-Clayton
Phone: (860) 424-3292
E-mail: Katie.obrien-clayton@po.state.ct.us
field operations, data management, data requests, survey summaries, webpage development, QA/QC

Visit the Long Island Sound Water Quality Monitoring Program web page,
with Program information and data. Under construction at:
http://www.ct.gov/dep
Follow the links to Air / Land / Water – Water - Surface water -
Long Island Sound Water Quality Monitoring Program and Information

JOB 5: COOPERATIVE INTERAGENCY RESOURCE MONITORING

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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 <= 3.5mg/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 in 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 15.2 m 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 have been extended and will continue through the end of 2007.

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). Although a fixed station sampling program was adopted in 1994, the method of area calculation remained unchanged. Subsequently, staff from the Bureau of Water Management developed an ArcView based method. This approach is more appropriate for a fixed station design and has been adopted for this report. The historical time series using this new method will be developed and presented in future reports.

To calculate the area affected by hypoxia, the minimum dissolved oxygen and the location of each station sampled during each survey was entered into a Geographic Information System (ArcView) database and plotted. The Spatial Analyst extension in ArcView was 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 1 mg/l DO interval (0-0.99 mg/l, 1.0-1.99 mg/l, etc) was 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

During the summer of 2006, seven cruises were conducted, beginning in early June and ending by mid-September. A total of 234 site visits were completed in 2006, with 29 stations affected by hypoxia throughout the season. In 2006, hypoxic conditions were estimated to have begun on 4 July and ended on 29 August, approximately 57 days (Figure 5.1). The peak event occurred in early August. The maximum area with bottom water DO less than 3.5 mg/L was 896 km^2 (Table 5.1). In 2006 the area less than 3.5 mg/L was larger than during the 2004 and 2005 seasons; however, the duration was the shortest since 2000.

Habitat Impairment Associated with Hypoxia

During the summer of 2006 an area of 45 km^2 was exposed to severe hypoxia (<1.0 mg/l) (Table 5.1). Such conditions would be expected to completely exclude demersal finfish.

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 2.0-2.99 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 June 30 and September 7. The BADD index for 2006 was 7,017 or 3.6% of the total area-days in the LIS sampling area covered by the Long Island Sound Water Quality Monitoring Program.

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 2006. Plots of each year against the time series mean illustrate the inter-annual variability in both salinity (Figure 5.2) and temperature (Figure 5.3). In some cases, deviations from the 1991-2006 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 2006. Actual start and end dates are listed along with number of stations sampled for each survey.

			Stations	Area (km^2)					
Survey	Start Date	End Date	sampled	0.0 - 0.99	1.0 - 1.99	2.0 - 2.99	3.0 - 3.5	3.5 - 4.8	4.8+
HYJUN06	6/23/2006	6/23/2006	20	0	0	0	0	98	1064
WQJUL06	7/6/2006	7/10/2006	33	0	0	105	36	277	2311
HYJUL06	7/18/2006	7/19/2006	38	0	0	67	64	219	1787
WQAUG06	8/1/2006	8/7/2006	46	45	113	357	381	701	1132
HYAUG06	8/16/2006	8/21/2006	39	0	46	86	118	965	827
WQSEP06	8/29/2006	8/31/2006	41	0	0	17	100	494	2118

Table 5.2. Area-days exposure by survey and dissolved oxygen interval during 2006. Dates are interpolated values between surveys, yielding the days used in area-day calculation.

Survey	Dates	Days		0.0 - 0.99	1.0 - 1.99	2.0 - 2.99	3.0 - 3.5	3.5 - 4.8	4.8+
HYJUN05	6/23-6/29	7		0	0	0	0	683	7447
WQJUL05	6/30-7/15	16		0	0	1674	582	4430	36979
HYJUL05	7/16-7/25	10		0	0	667	637	2194	17866
WQAUG05	7/26-8/11	16		726	1803	5717	6094	11222	18106
HYAUG05	8/12-8/26	15		0	683	1293	1776	14469	12398
WQSEP05	8/27-8/31	5		0	0	87	500	2470	10588

Table 5.3. Biomass-Area-Day-Depletion (BADD) values by survey and dissolved oxygen interval during 2006. 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. Hypoxia area estimates were updated to include area below 3.5 as DO's above 3.5 mg/l are not limiting.

				(100%)	(82%)	(41%)	(4%)	(0%)	(0%)
Survey	Dates	Days		0.0 - 0.99	1.0 - 1.99	2.0 - 2.99	3.0 -3.5	3.5 - 4.8	4.8+
HYJUN05	6/23-6/29	7		0	0	0	0	0	0
WQJUL05	6/30-7/15	16		0	0	686	23	0	0
HYJUL05	7/16-7/25	10		0	0	273	25	0	0
WQAUG05	7/26-8/11	16		726	1479	2344	244	0	0
HYAUG05	8/12-8/26	15		0	560	530	71	0	0
WQSEP05	8/27-8/31	5		0	0	35	20	0	0
			Sum	726	2038	3869	384	0	0

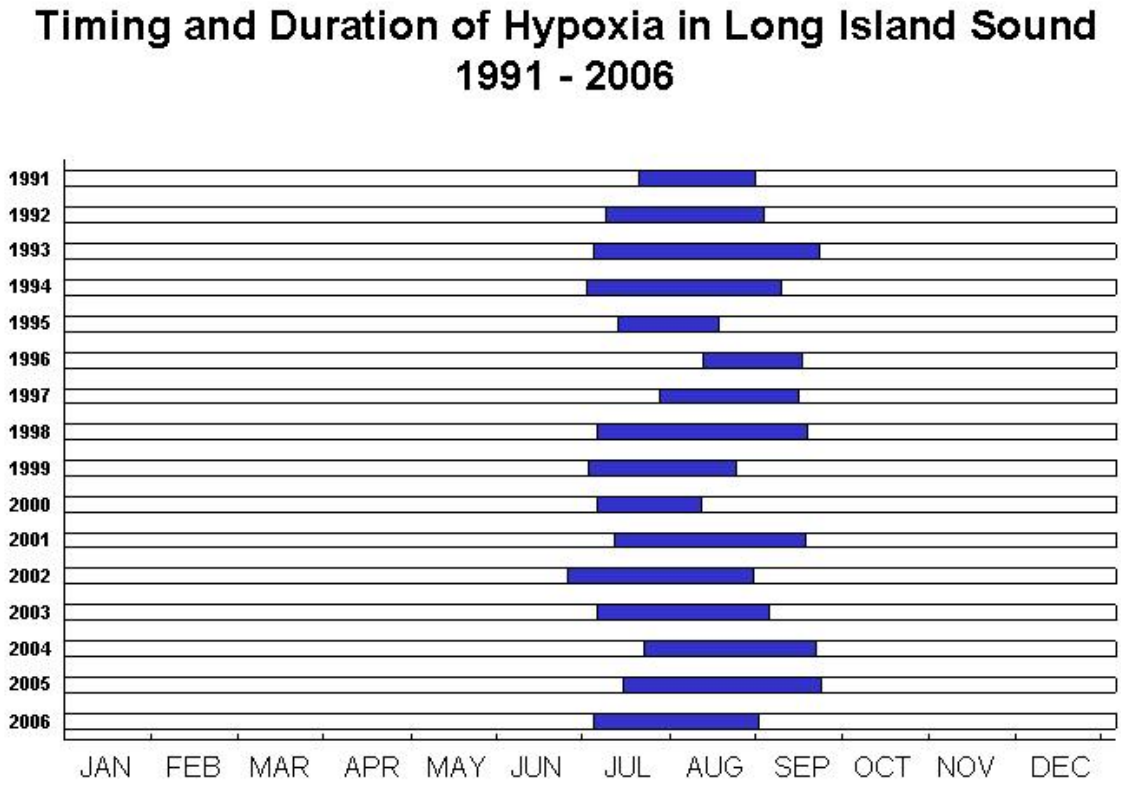

Figure 5.1. Timing and duration of hypoxia in Long Island Sound from 1991 through 2006. In 2006 hypoxia developed on about July 4 and persisted 57 days, ending on or about August 29, 2006.

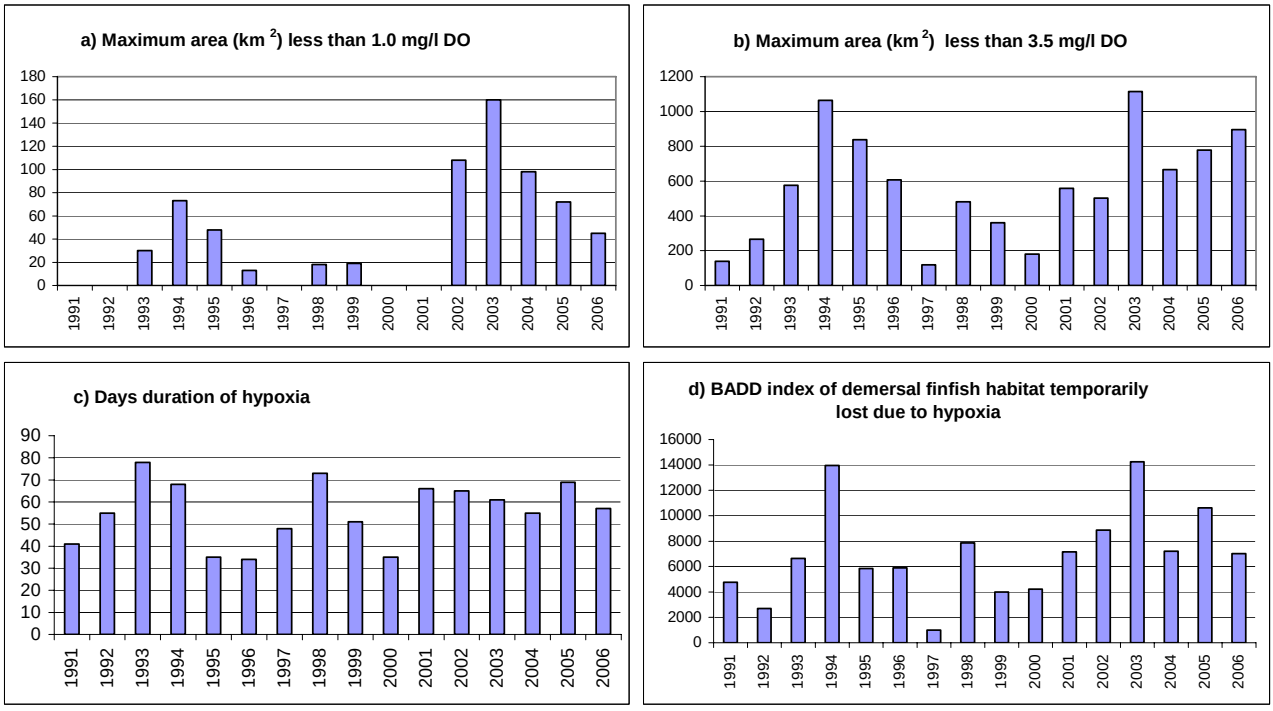

Figure 5.2. a) Maximum area (km^2) less than 1.0 mg/l DO, b) maximum area (km^2) less than 3.5 mg/l DO, c) duration (days) of hypoxia (DO<3.5 mg/l), d) biomass area-day depletion (BADD) index of temporary habitat loss to demersal finfish associated with hypoxia conditions each year.

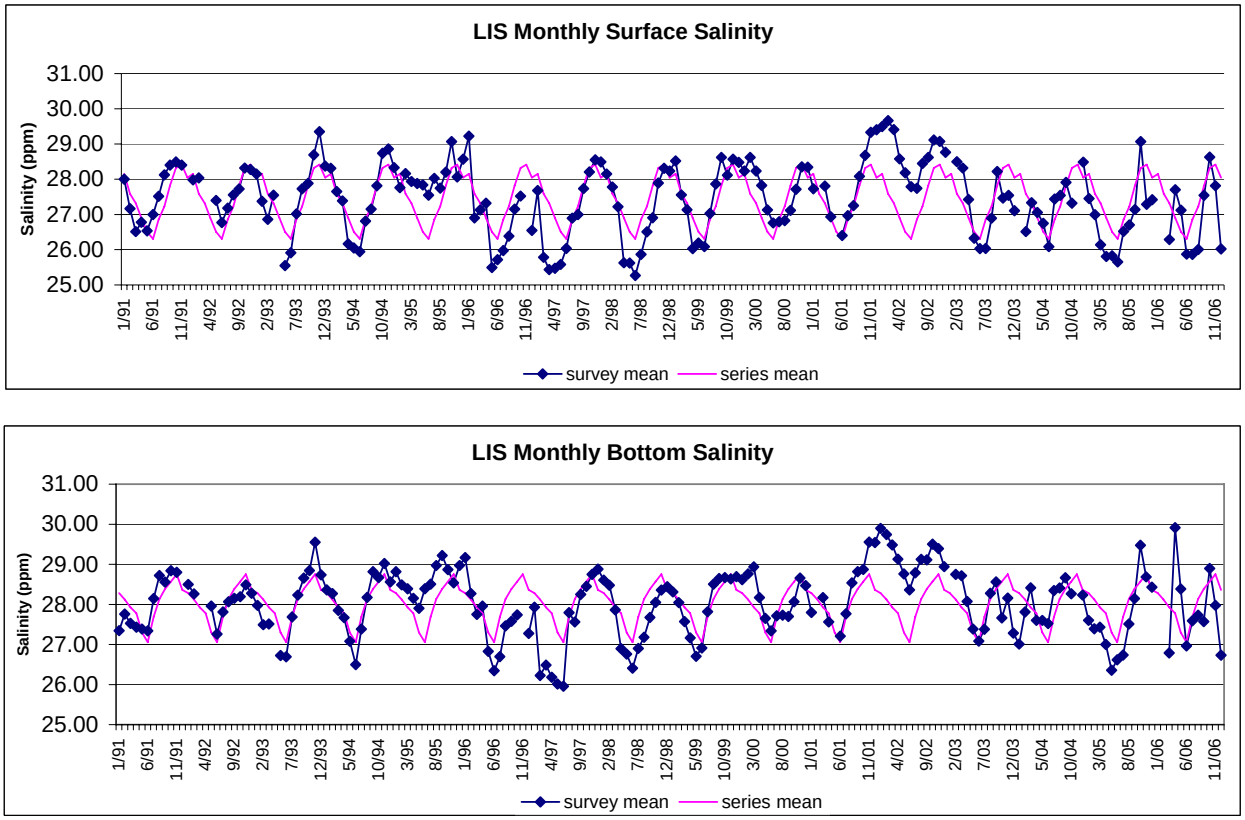

Figure 5.3. Surface and bottom salinity calculated from six axial water quality stations (B3, D3, F3, H6, I2 and M3) for the period between 1991 and 2006. Monthly (survey) means are plotted against the 1991-2006 time series mean.

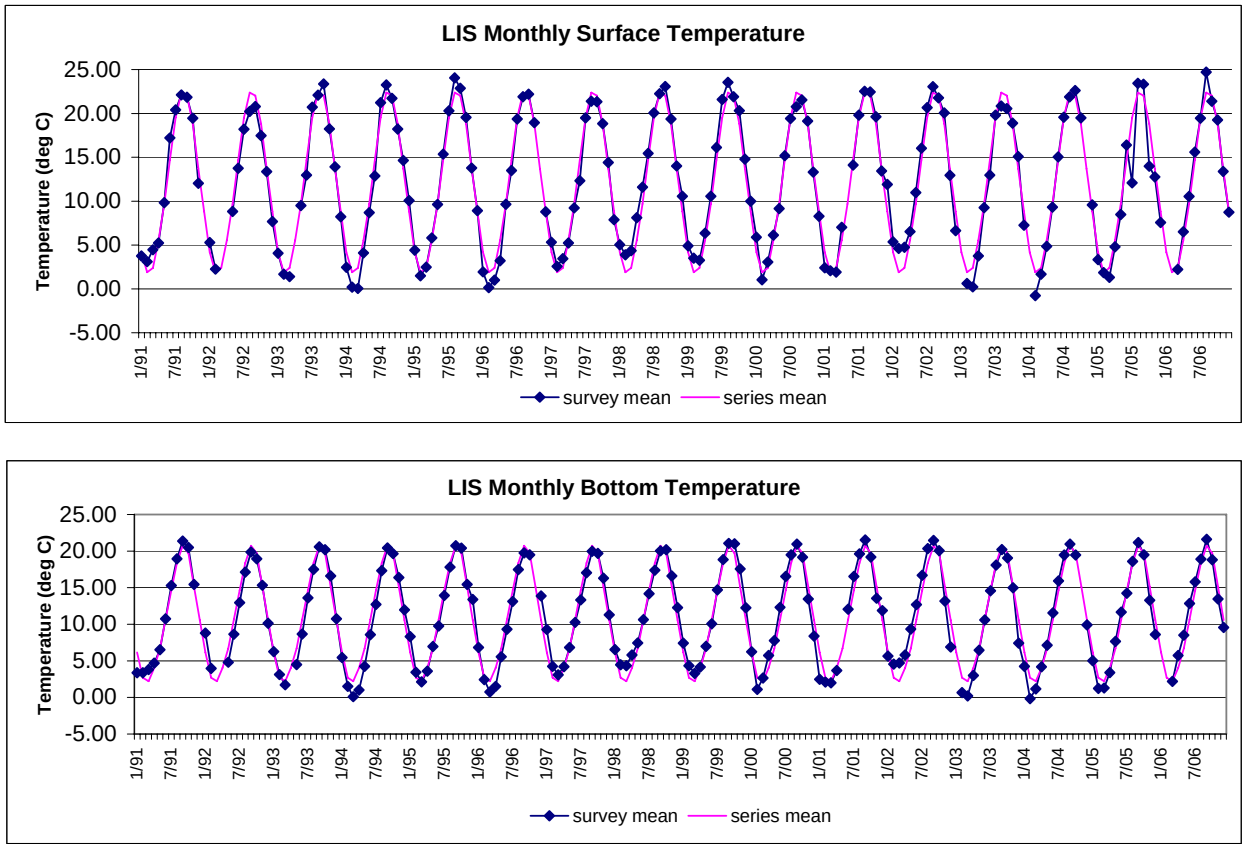

Figure 5.4. Surface and bottom temperature calculated from six axial water quality stations (B3, D3, F3, H6, I2 and M3) for the period between 1991 and 2006. Monthly (survey) means are plotted against the 1991-2006 time series mean.

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JOB 6: PUBLIC OUTREACH

JOB 6: PUBLIC OUTREACH

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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 27,822 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 where the importance of research and monitoring to good fisheries management was incorporated into the program (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 several speaking engagements with sportsmen clubs and other recreational clubs was 413 (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.

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 2006 to February 2007 (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 and members of the CT Outdoor Recreation Coalition (CORC). 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. One article written by Connecticut reporters describing Long Island Sound and Lobster health was published in the Connecticut Post in April of 2006. (see Appendix 6.1).

Marine Anglers and Marine Boaters

Project personnel organized and assisted in DEP, Marine and Inland Fisheries Division displays at two statewide fishing shows. The shows were sponsored by CMTA, Dodge Trucks, Channel 3 and Connecticut Outdoor Recreation Coalition and were held in January and February 2007 at the Connecticut Convention Center. These shows attracted 26,542 anglers, non-anglers, boaters, tackle retailers, legislators and general outdoor recreation enthusiasts. The theme for this show was "No Child Left Inside" and Trophy Fish Close to Home". F54R activities were highlighted at this shows in displays entitled "Trophy Fish Award Program" and "Marine Regulations, (A fisheries management explanation)". 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, 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, and Connecticut angler guides 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. Several 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 National Fishing Week. '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 hundreds 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 in a one-day environmental science festival "Marine Science Day" program held in May at the UCONN Avery Point Campus in Groton CT. Presentations titled "Marine Fisheries Management / Sportfish Restoration and Marine Resources" were provided to students. This event highlighted the importance of coastal resources and all facets of marine resource resource protection. Approximately 325 students attended the Marine Science Day at the University of Connecticut.

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 2006 – February 2007 (segment 25).

DATE:	PRESENTATION	ORGANIZATION	TITLE / TOPIC:	Target Audience	#'S
3/14/2006	Fishing Club Talk	Westport Outfitters	Marine Fisheries Mgmt./ Angler Surveys	anglers	32
3/29/2006	Fishing Club Talk	Central CT Stripers	Marine Fisheries Mgmt./ Angler Surveys	anglers	24
4/5/2006	Career Day / Mentoring	Glastonbury High School	Marine Fisheries Biologist	students	45
4/13/2006	Fishing Club Talk	Northeast Saltwater Fishing Club	Marine Fisheries Mgmt. / Angler Surveys	anglers	26
4/20/2006	Career Day / Mentoring	Future Problem Solvers	Managing Marine Fisheries	students	64
4/21/2006	Office Tour / Mentoring	The Williams School	Marine Fisheries Biology	students	33
4/26/2006	Workshop	SoundWaters	Horse Shoe Crab Survey	adults	30
5/3/2006	Career Day / Mentoring	Shepaug High School	Marine Fisheries Biologist	students	124
5/6-7/2006	Fishing Tourn. Presentation	Thames Striped Bass Tournament	Marine Fisheries Management	anglers	135
5/10/2006	Career Day / Mentoring	Enfield High School	Marine Fisheries Biologist	students	45
5/12/2006	Science Day	UCONN Avery Point	Marine Fisheries Biologist	students	325
5/17/2006	Career Day / Mentoring	Fermi High School	Marine Fisheries Biologist	students	45
5/30/2006	Marine Presentation	Old Saybrook Middle School	Marine Fisheries Biology	students	71
6/21/2006	Marine Presentation	CCSU Marine Biology	Marine Fisheries Biology	students	32
6/23/2006	Marine Presentation	FLW Striped Bass Tournament	Marine Fisheries Management	anglers	196
10/19/2006	Office Tour / Mentoring	Litchfield High School	Marine Fisheries Biology/Mgmt.	students	45
12/4/2006	Office Tour / Mentoring	Town Municipalities	Marine Fisheries	Town Gov't	8
1/25-28/2007	Outreach Display	CMTA Boating Show	No Child Left Inside	General Public	14,831
2/16-18/2007	Outreach Display	Northeast Fish and Hunting Expo	No Child Left Inside	General Public	11,711

APPENDIX 6.1

Warming Sound has lobsters in a pinch
By John Nickerson
Staff Writer

April 9, 2006

BRIDGEPORT -- Rising water temperatures could be to blame for the steep decline in lobsters and other cold-water species once found in abundance in Long Island Sound. According to researchers gathered yesterday in Bridgeport for the 16th annual Long Island Sound Summit, the Sound is experiencing a dramatic change in the types of wildlife that reside there. Trawling surveys over the past 20 years show the number of cold-water species such as winter flounder, American lobster, cunner and spiny dogfish are declining while warm-water species such as bluefish, menhaden, hickory shad, black sea bass and summer flounder are turning up far more regularly.

For example, Connecticut landings of the American lobster, which peaked at 3.7 million pounds in 1998, was down to about 710,000 pounds last year, according to the state Department of Environmental Protection. One significant reason for that decline is probably rising water temperatures, said Lawrence Swanson of Stony Brook University's Marine Sciences Research Center. Swanson said that from 1991 to 2002, water temperature at the bottom of the Sound increased by about 1 degree and put the Sound's lobster at the knife's edge of its survivable habitat.

Robert Whitlatch, a marine science professor at the University of Connecticut, said climate change not only affects traditional denizens of the Sound, it also opens the door to a host of invasive species. From the 1940s to 1970 -- a time of little temperature change -- few if any non-native species gained a foothold in local waters, Whitlatch said. But since the mid-1970s, when water temperatures began to climb, four types of soft-bodied tunicates -- commonly called sea squirts – have invaded the Sound.

The most recent sea squirt, Didemnum, which grows at unrivaled speeds into thick pancake batter-like globs, has covered much of the sea floor in the eastern part of the Sound. "It is marching down the Sound," Witlatch said. "A few degrees
difference in mean winter temperatures correlates with a large reversal in the relative dominances of resident and invader species."

Wesleyan University professor Johon Varekamp said water levels in the Sound are climbing three times faster than 1,500 years ago. After years of collecting core samples of mud from all over the Sound, Varekamp said he has determined that at about the year 500, the sea level was increasing by nearly a millimeter per year. In about 1850, the sea level grew by about 1.7 millimeters per year, and in the 1900s, it has increased to 3 millimeters per year. As an example of what sea levels have done, Varekamp compared pictures of Scotts Cove in Darien from 1965 to now, showing marsh areas that are
now covered with water. Varekamp said the reason for the change is global warming. Nitrogen in the Sound, which robs the water of oxygen and causes fish kills, has risen in seemingly exact correlation with the population and the amount of sewage dumped in the water, Varekamp said. "We are looking for the devil and we have found ourselves," he said.

DEP Commissioner Gina McCarthy said the Sound faces many challenges, not the least of which is sprawl, which is "eating up" the Sound's coast line. "We have to continue to love Long Island Sound, but we can't love it todeath," McCarthy said, Probably the greatest threat to the ecology of the Sound is climate change, she said. "There is more evidence that climate change is real than there is proof that cigarette smoking causes cancer," McCarthy said. "Something is happening, and frankly, we are the reason something is happening here."

Dennis Schain
Communications Director
Conn. Dept. of Environmental Protection
Phone: 860-424-3110
Cell: 860-462-3468
Fax: 860-424-4053
dennis.schain@po.state.ct.us

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