STATE OF CONNECTICUT
DEPARTMENT OF ENERGY AND ENVIRONMENTAL PROTECTION

Robert Klee
Commissioner

Bureau of Natural Resources
Marine Fisheries Division
www.ct.gov/deep/fishing

A STUDY OF MARINE RECREATIONAL FISHERIES IN CONNECTICUT

Federal Aid in Sport Fish Restoration
F14AF00296 (F-54-R-34)
Annual Performance Report
March 1, 2014 – February 28, 2015

Cover photo: ***Fisheries Biologist (retired) Roderick MacLeod with a trophy striped bass he caught in Long Island Sound.***

Roderick (Rod) MacLeod retired on April 30, 2015, after more than 34 years of service with the Marine Fisheries Division. During that time Rod helped initiate the marine angler survey program including the Volunteer Angler Program – one of the first of its kind on the east coast. Rod headed up the marine angler survey for nearly 30 years including managing the transition from Connecticut's independent creel surveys to participation in the Marine Recreational Fishery Statistics Survey in 1987. Rod also contributed significantly to the design and implementation of our return to independent creel surveys in 2013 intended to complement the federal MRIP survey.

In addition to oversight of state marine angler surveys, Rod served as Connecticut's representative on ASMFC Interstate Tagging and Artificial Reef Committees and on the ACCSP Operations and Recreational Technical Committees.

Rod's day-to-day duties also included heading up fish kill investigations and looking out for anglers' interests in the agency's review of structures and dredging permits, including providing critical advice on the development of fishing access sites whenever such opportunities arose. Rod also played a central role in our outreach efforts targeting the angling community, including producing the weekly fishing reports and helping hundreds of callers over the years looking for a good place to get out fishing or crabbing. His detailed knowledge of fishing and fishing access along the entire coast, gleaned from years of creel survey work and his owned extensive fishing experience, has been invaluable to this office and the fishing public.

Rod will be missed not only for the contributions he has made to this agency over more than a third of a century, but also as a longtime friend and colleague. We wish Rod and his family the best as he enters this new and exciting phase in his life in retirement. Try to leave a few fish on the shoal for us weekend warriors, Rod!

State of Connecticut
Department of Energy and Environmental Protection
79 Elm Street
Hartford, CT 06106-5127
www.ct.gov/deep

Federal Aid in Sport Fish Restoration
F14AF00296 (F-54-R-34)
Annual Performance Report

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

Period Covered: March 1, 2014 - February 28, 2015

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Date: May 1, 2015

MARINE ANGLER SURVEY

Job 1: Marine Recreational Fishery Statistics Survey

MARINE RECREATIONAL FISHERY STATISTICS SURVEY

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JOB 1: MARINE ANGLER SURVEY

GOAL

To collect marine recreational angler fishing information in the boat mode through a voluntary catch card survey program.

OBJECTIVES

Provide estimates of:

1) Length-frequency distribution of harvested black sea bass, bluefish, scup, winter flounder, summer flounder, tautog, striped bass, and weakfish.
2) Length-frequency distribution of discarded black sea bass, bluefish, scup, winter flounder, summer flounder, tautog, striped bass, and weakfish.
3) Targeted catch/effort of black sea bass, bluefish, scup, winter flounder, summer flounder, tautog and striped bass.
4) Percent of targeted trips by species.

INTRODUCTION

The Connecticut Department of Energy and Environmental Protection (DEEP), 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 National Marine Fisheries Service (NMFS) Marine Recreational Fishery Statistics Survey (MRFSS) 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. The MRFSS has undergone a series of procedural changes over recent years as an outcome of the National Research Council (NRC) independent review and findings in regards to the MRFSS and potential bias. As a result, a new survey was developed and initiated under the Marine Recreational Information Program or MRIP. A critical procedural change in the sampling design of MRIP was the implementation of twenty-four hour per day sampling in the Access Point Angler Intercept Survey (APAIS). Prior to 2013, APAIS sampling took place during daytime peak angling activity times under MRFSS procedures. In addition, MRIP night sampling requires two persons per assignment as a safety precaution. Under these new MRIP guidelines, this meant DEEP would have to possibly double or triple its current resources in order to participate. As a subcontractor to NMFS primary contractor, DEEP could not absorb those additional costs. Consequently, the primary contractor assumed full angler survey responsibility beginning in 2013. DEEP continues to manage the site registry for the MRIP survey. The Marine Angler Survey focus then shifted to collection of length frequency of both harvested and released fish to supplement the MRIP survey. Collection of length frequency data that included released fish was viewed as particularly important to support stock assessments as well as to better understand the recreational fishing experience in our state, both from shore and private boat.

METHODS

The CT Marine Angler Survey consists of collecting marine recreational fishing (finfish) information through a new voluntary catch card program. Anglers were recruited at selected private boat mode fishing sites by DEEP staff to voluntarily report their fishing trip information and collect length measurements on fish caught, including both caught and released fish (discards). Collecting length measurement information on discarded fish is difficult to obtain through traditional access point intercept surveys such as NOAA/NMFS Marine Recreational Information Program (MRIP). In addition, this program is designed to better characterize the private boat mode which lands a substantial proportion of fish caught in Connecticut (Table 1.1). The voluntary catch card was implemented in order to better understand the size composition on discarded fish as well as collecting other valuable recreational angler boat fishing trip data.

Table 1.1

NOAA Fisheries - Marine Recreational Information Program
Marine Angler Catch (Numbers of Fish) Estimates by Mode for Connecticut 2012

Mode	Total Catch	% Dist.	Kept/Harvest	% Dist.
Shore	768,237	12.1%	336,358	17.4%
Party Boat	84,526	1.3%	51,790	2.7%
Charter Boat	76,270	1.2%	55,563	2.9%
Private Boat	5,396,375	85.3%	1,490,616	77.1%
Total	6,325,408		1,934,327	

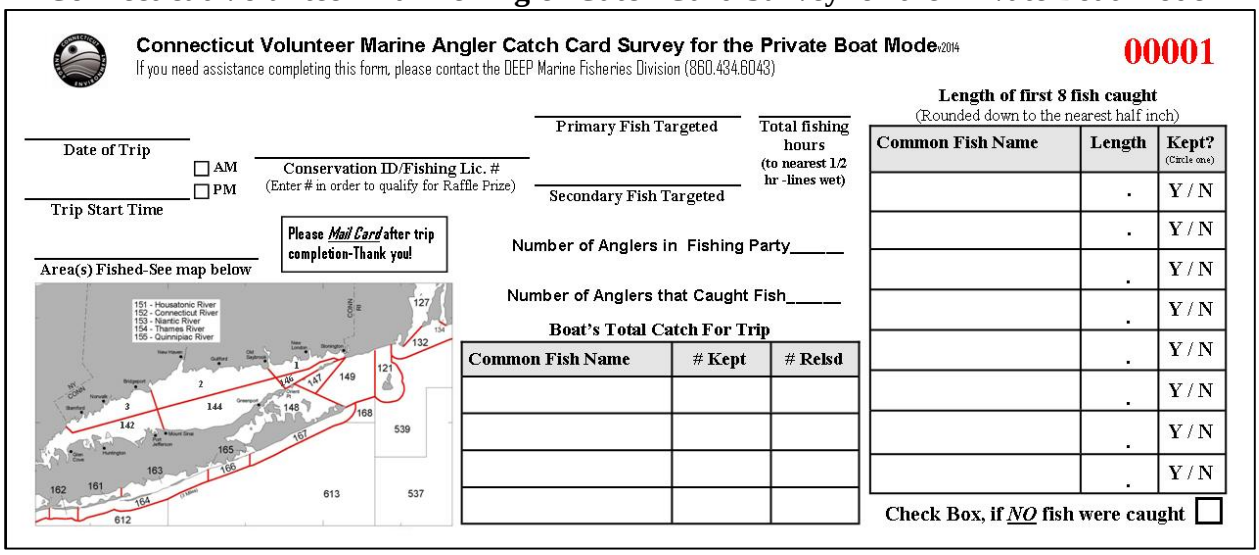
The catch card was designed to collect fishing trip effort and catch, including fish length information from boat anglers. Boat anglers were approached by DEEP staff and queried for eligibility and voluntary participation purposes. Post marked daily catch cards were distributed to anglers departing from selected private boat sites with high activity in order to maximize catch card distribution. Each participating boat angler or anglers fishing together in a group were provided a waterproof daily catch card, pencil, and measuring tape in addition to verbal instructions. Anglers were encouraged to drop off post marked catch cards in the mail upon trip completion or at designated drop-off-boxes installed at key fishing sites. This information will provide important angler trip and species catch data needed to effectively monitor and assess this component of the recreational fishery.

Boat anglers were asked to fill out the following (Figure 1.1):

- Date of Trip (mm/dd)/Trip Start Time (check box AM/PM)
- Conservation ID/Fishing License Number
- Primary Fish Targeted
- Secondary Fish Targeted
- Total Hours Fishing (lines wet)
- Areas Fished (see map)

- Number of Anglers that Caught Fish
- Number of Anglers in Fishing Party
- Boat's Total Catch for Trip
    - Total Number of Fish Caught and Disposition (Kept/Released)
- If No Fish Caught -Check Box
- Length of First 8 Fish Caught
    - Common Fish Name, Length, Disposition (Kept/Released)

Figure 1.1:
Connecticut Volunteer Marine Angler Catch Card Survey for the Private Boat Mode



Connecticut Volunteer Marine Angler Catch Card Survey for the Private Boat Mode v2014

If you need assistance completing this form, please contact the DEEP Marine Fisheries Division (860.434.6043)

00001

Date of Trip

☐ AM
☐ PM

Trip Start Time

Conservation ID/Fishing Lic. #
(Enter # in order to qualify for Raffle Prize)

Primary Fish Targeted

Secondary Fish Targeted

Total fishing hours
(to nearest 1/2 hr -lines wet)

Please *Mail Card* after trip completion-Thank you!

Area(s) Fished-See map below

151 - Housatonic River
152 - Connecticut River
153 - Niantic River
154 - Thames River
155 - Quinnipac River

Number of Anglers in Fishing Party_____

Number of Anglers that Caught Fish_____

Boat's Total Catch For Trip

Common Fish Name	# Kept	# Relsd

Length of first 8 fish caught
(Rounded down to the nearest half inch)

Common Fish Name	Length	Kept? (Circle one)
	.	Y / N
	.	Y / N
	.	Y / N
	.	Y / N
	.	Y / N
	.	Y / N
	.	Y / N
	.	Y / N

Check Box, if *NO* fish were caught ☐

Boat anglers were asked to enter catch information including common name(s) and number of fish kept and released in the spaces provided on the catch card. A check off box was provided if no fish were caught. Additionally, anglers entered common name(s) of the first eight fish captured regardless of species and size. Each fish was measured to the nearest ½ inch (rounded down) and recorded disposition by circling either Y (yes) or N (no) in the Kept column. The number of cards issued was categorized by a unique card identification number, date, site, and vessel registration of fishing boat was also recorded. All catch cards given out to anglers was accounted for through the card ID number. As an incentive to maximize participation, anglers entering their Conservation ID/Fishing License Number would be eligible for wining a raffle prize at year's end. All data were electronically entered and stored in ACCESS.

RESULTS AND DISCUSSION

DEEP staff completed 228 daily assignments and distributed 1,118 catch cards to boat based anglers at four state boat launch facilities. The launch areas were selected because of their

high usage ratings based on information compiled by NMFS' MRIP master site register database. These launch areas were located primarily in the eastern part of the state (Appendix 1.1).

A total of 309 cards were returned (27.6%) with 645 anglers reporting their fishing trip activities. Of the 645 anglers, 539 or about 84% of the anglers caught at least one fish. A total of 1,330 (27.7%) fish were kept and 3,471 (72.3%) fish were released (Table 1.2).

Anglers measured a total of 1,624 fish during the survey. Black sea bass, scup, striped bass, and summer flounder accounted for about 75% of the measured catch (Table 1.3).

MODIFICATIONS

None.

Table 1.2:

Angler Catch Percent Distribution by Species and Disposition

Species	Kept	%	Released	%	Total
Alewife	0	0.0%	1	100.0%	1
Black Sea Bass	280	26.8%	765	73.2%	1,045
Bluefish	81	24.5%	249	75.5%	330
Catfish	1	50.0%	1	50.0%	2
Cunnner	0	0.0%	1	100.0%	1
Dogfishes	0	0.0%	63	100.0%	63
Eels	0	0.0%	1	100.0%	1
False Albacore	4	16.0%	21	84.0%	25
Hickory Shad	2	1.2%	164	98.8%	166
Ladyfish	0	0.0%	6	100.0%	6
Menhaden	24	72.7%	9	27.3%	33
Northern Kingfish	0	0.0%	8	100.0%	8
Scup	528	47.6%	581	52.4%	1,109
Searobins	13	9.5%	124	90.5%	137
Skates	1	1.0%	102	99.0%	103
Smooth Dogfish	0	0.0%	4	100.0%	4
Squid	4	100.0%	0	0.0%	4
Striped Bass	44	15.9%	232	84.1%	276
Striped Searobin	0	0.0%	5	100.0%	5
Summer Flounder	234	28.0%	603	72.0%	837
Tautog	100	16.3%	512	83.7%	612
Triggerfishes	0	0.0%	1	100.0%	1
Jacks	0	0.0%	1	100.0%	1
Winter Flounder	14	45.2%	17	54.8%	31
Total	**1,330**	**27.7%**	**3,471**	**72.3%**	**4,801**

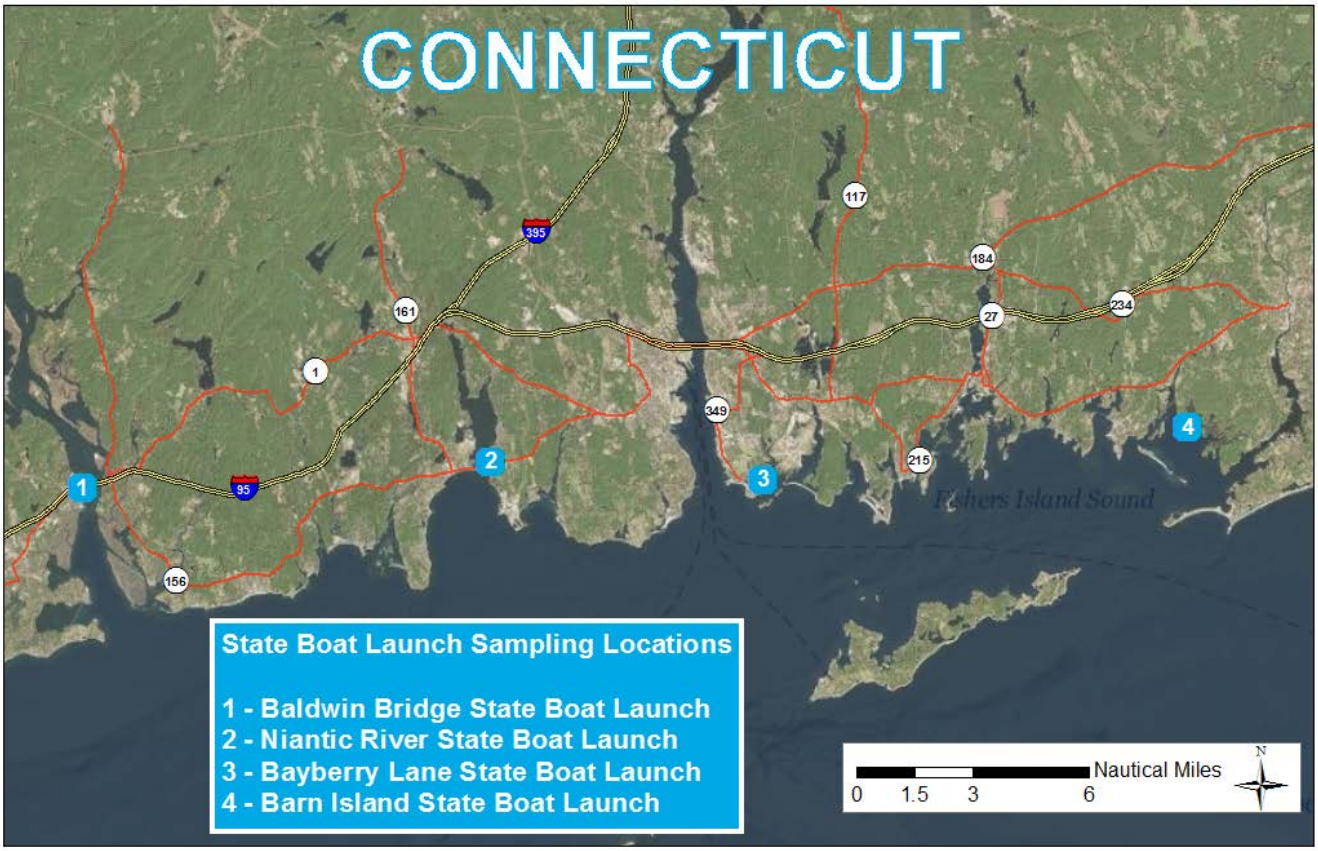
Table 1.3:

Total Number of Fish Measured by Volunteer Anglers

Species	Total Number of Fish Measured	% Distr.
Alewife	1	0.1%
Black Sea Bass	303	18.7%
Bluefish	123	7.6%
Catfish	2	0.1%
Cunner	1	0.1%
Dogfishes	21	1.3%
Eels	1	0.1%
False Albacore	19	1.2%
Hickory Shad	1	0.1%
Ladyfish	5	0.3%
Menhaden	8	0.5%
Northern Kingfish	1	0.1%
Scup	291	17.9%
Searobins	52	3.2%
Skates	19	1.2%
Striped Bass	175	10.8%
Summer Flounder	443	27.3%
Tautog	135	8.3%
Winter Flounder	23	1.4%
TOTAL	**1,624**	

Appendix 1.1:

Recreational Boat Angler Sampling Locations



MARINE ANGLER SURVEY

Job 2: Volunteer Angler Survey

VOLUNTEER ANGLER SURVEY

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JOB 2: VOLUNTEER ANGLER SURVEY

OBJECTIVES

Provide estimates of:
1) Size composition data on both kept and released bluefish, striped bass and other common species.
2) Catch frequency (trips catching 0,1, 2,.. fish) data on both kept and discarded fish.

INTRODUCTION

The purpose of the Volunteer Angler Survey (VAS) is to supplement the National Marine Fisheries Service, Marine Recreational Fishery Statistics Survey/Marine Recreational Information Program 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 2014.

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 and shore), area fished (subdivisions of Long Island Sound and adjacent waters), catch information concerning finfish kept (harvested) and released, and striped bass and bluefish length measurements. In 1997, the logbook was modified in order to collect length measurement data on other species. 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. 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.

New in 2013, the VAS program was incorporated into the Atlantic Coastal Cooperative Statistics Program (ACCSP) Standard Atlantic Fisheries Information System (SAFIS) eLogbook application. Under the ACCSP eLogbook application, the VAS database was upgraded from the previous outdated database system it was using. The VAS logbook format was slightly modified

so that the information collected would be compatible with ACCSP minimum data element standards (Appendix 2.1).

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 DEEP's annually published Connecticut Angler's Guide including the state web site www.ct.gov/deep/fishing has helped increase volunteer participation. The guide is distributed to anglers purchasing Connecticut fishing licenses in addition to being circulated by bait and tackle shops and other entities.

Initially in 2012 with the VAS database being housed and updated under ACCSP SAFIS, one of the primary purposes was that anglers would be able to enter their own fishing information and compile their own statistics using eLogbook. However, a data entry problem occurred concerning the 'fishing area' field. Because of the unique geographic location of Connecticut's shoreline including Long Island Sound, marine anglers can fish over multiple areas crossing interstate and federal boundaries during a single trip. Unfortunately, eLogbook software disabled data entering of certain 'fishing area' fields outside of Connecticut's marine waters. Nevertheless, the problem was resolved, but the concept of electronic reporting by volunteer anglers was postponed until 2014. As in previous years, paper logbooks were distributed to survey volunteers and Marine Fisheries staff performed VAS data entry.

VAS 2014

The Connecticut Volunteer Angler Survey (VAS) program has been in existence since 1979. In 2014, a total of 32 anglers participated in the program and made 661 trips averaging about 20 trips per year. The number of angler trips including all members in the fishing party was 1,435 (Table 2.1). The private boat mode comprised the most trips with 62% of all angler trips. Of that total, 1,176 angler trips or about 82% of the trips caught a total of 8,709 fish. VAS anglers caught a variety of species from near shore species to open ocean pelagic species (e.g. tuna). The top seven species important to Connecticut and currently under a fisheries management plan comprised about 80% of the total catch (Table 2.2). With the exception of winter flounder, the release rate for most species was over 70%.

VAS participants measured over 90% (7,860 fish) of the total catch (Table 2.3). In some cases, anglers measured every fish they caught (striped bass, summer flounder, tautog, and winter flounder). As previously mentioned, collecting length measurements especially on released/discarded fish is very difficult to obtain through conventional access point angler intercept surveys.

New for 2014 was SAFIS, where angler's computer entered their own data through eLogbook on the ACCSP website www.accsp.org. A total of 12 anglers participated in the

eLogbook application. Most of the anglers that entered their own data expressed favorable comments toward the program.

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 access point angler intercept surveys. The VAS program provides this information which is essential in assessing the recreational fishery in Connecticut as required by the Atlantic States Marine Fisheries Commission. Any anglers interested in participating in the program can contact David Molnar at 860-434-6043, or e-mail address: david.molnar@ct.gov or writing to State of Connecticut, DEEP, Marine Fisheries Office, P.O. Box 719, Old Lyme CT 06371.

MODIFICATIONS

None.

ACKNOWLEDGEMENTS

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

Table 2.1 Distribution of Angler Trips by Mode

Mode	Trips[1]	%
Charter	6	0.4%
Headboat	42	2.9%
Private Boat	889	62.0%
Shore	420	29.3%
Enhanced Shore	78	5.4%
Total	**1,435**	

Trips[1]-Total number of trips in fishing party

Table 2.2 Angler Total Catch Distribution (in numbers) by Species and Disposition

	#Harvested	% Harvested	#Released	% Released	Total
Black sea bass	326	22.5%	1,125	77.5%	**1,451**
Bluefish	171	23.6%	553	76.4%	**724**
Scup	621	30.0%	1,447	70.0%	**2,068**
Striped bass	92	8.3%	1,012	91.7%	**1,104**
Summer flounder	208	20.8%	791	79.2%	**999**
Tautog	116	21.7%	419	78.3%	**535**
Winter flounder	29	74.4%	10	25.6%	**39**
Total	**1,563**	**22.6%**	**5,357**	**77.4%**	**6,920**

Table 2.3 Measured Catch Distribution (in numbers) by Species and Disposition

	#Harvested	% Harvested	#Released	% Released	Total
Black sea bass	316	22.6%	1,082	77.4%	**1,398**
Bluefish	158	22.7%	537	77.3%	**695**
Scup	536	27.5%	1,410	72.5%	**1,946**
Striped bass	92	8.3%	1,012	91.7%	**1,104**
Summer flounder	208	21.0%	781	79.0%	**989**
Tautog	116	21.7%	419	78.3%	**535**
Winter flounder	29	74.4%	10	25.6%	**39**
Total	**1,455**	**21.7%**	**5,251**	**78.3%**	**6,706**

APPENDIX 2.1: Connecticut Volunteer Angler Logbook

TAPE

CONNECTICUT
VOLUNTEER ANGLER SURVEY

Rev. 2/2013 – 12 Trip

Angler Code

CONNECTICUT DEEP MARINE FISHERIES DIVISION VOLUNTEER ANGLER SURVEY

This space for office use only.

Logged ____________

Entered ____________

Checked ____________

TAPE

Send Me ☐ *More Logbooks*

Connecticut Department of
Energy & Environmental Protection
Bureau of Natural Resources
Marine Fisheries Division

TAPE

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CT DEEP MARINE FISHERIES DIVISION
PO BOX 719
OLD LYME CT 06371-9973

VOLUNTEER ANGLER SURVEY 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 into the database, and error checked, the logbooks will be returned for your own records. If you are interested in online reporting please contact us.

The information provided by this report will help us in making fishery management decisions. Please help us by completing this report as accurately as possible.

If you have any questions or comments regarding the survey, please contact Rod MacLeod (rod.macleod@ct.gov) or Greg Wojcik (gregory.wojcik @ct.gov) at 860.434.6043.

Trip Header Record

The top of each page is for recording **each trip's header information**. In this section, make a new entry for each trip made. If you fill a logbook page before the trip is over, continue onto the next page. Use as many pages and books as necessary to record your fishing activity. If you have a multi-day trip, make only one entry for that trip.

Date Enter the date that your fishing trip occurred on.

Start Time Enter the time on a 24 hour clock (military time) that you started your fishing trip.

Mode Indicate the fishing mode by putting a check mark in the appropriate box. The Shore (Enhanced Site) option refers to the designated shore fishing sites along the Connecticut coast that allow for the harvest of smaller select species. See the anglers guide for more information.

Trip Effort Record

Enter the approprate fishing effort information for the fishing area.

Fishing Area Enter the code for the area in which you made your catch. Refer to the Fishing Area Chart on page iii for the appropriate area code. If you fish in the race along the border between area 6 and 147, please use area code 6.

Total Anglers Enter the total number of anglers that are in the fishing party.

Lucky Anglers Enter the number of anglers that caught fish in the fishing party.

Hours Fished Enter the actual fishing time or 'lines wet' to the nearest half hour. Do not include travel time.

Targeted Species Enter the 1st (Primary) targeted species and 2nd (secondary) targeted species.

VOLUNTEER ANGLER SUVEY INSTRUCTIONS (CONTINUED)

Trip Catch Record

Under each trip effort record are the associated catch records. Enter a catch row for each species, disposition (Kept/Released) and length. If you caught more fish then rows provide, continue onto the next effort or page as necessary. If you do not catch or harvest any fish, complete the trip header and effort information (Date to Targeted Species 2).

Species Enter the species code from the Species Code List below. If the species is not listed, write in the species name.

K / R Indicate if the fish were kept or released by writhing K (Kept) or R (Released). If you kept and released the same species indicate this by adding an additional row. If you kept and released the same species, complete two rows.

Length (in) Enter the length in inches of the fish. **ROUND DOWN TO THE NEAREST HALF INCH**. In previous years, the Volunteer Angler Survey requested rounding to the nearest half inch but rounding down helps produce more accurate data.

Quantity Enter the number of fish of that specific species, disposition (K/R), and length. If any of these fields change, create a new row. If additional rows are needed, continue onto the next page.

Species Code List

Groundfish

COD - Cod
HADD - Haddock
POLL - Pollock

Flounders

FLUK - Summer flounder / fluke
FLBB - Winter flounder / blackback

Other Finfish

BLU - Bluefish
BSB - Black sea bass
CUN - Cunner
EEL - Eel, American
MEN - Menhaden / bunker
WPRC - Perch, white
SCUP - Scup / porgy
SROB - Sea robins
HSHD - Hickory shad
STB - Striped bass

Other Finfish continued

TAUG - Tautog / blackfish
TRIG - Triggerfish
WEAK - Weakfish / squeteague / gray sea trout

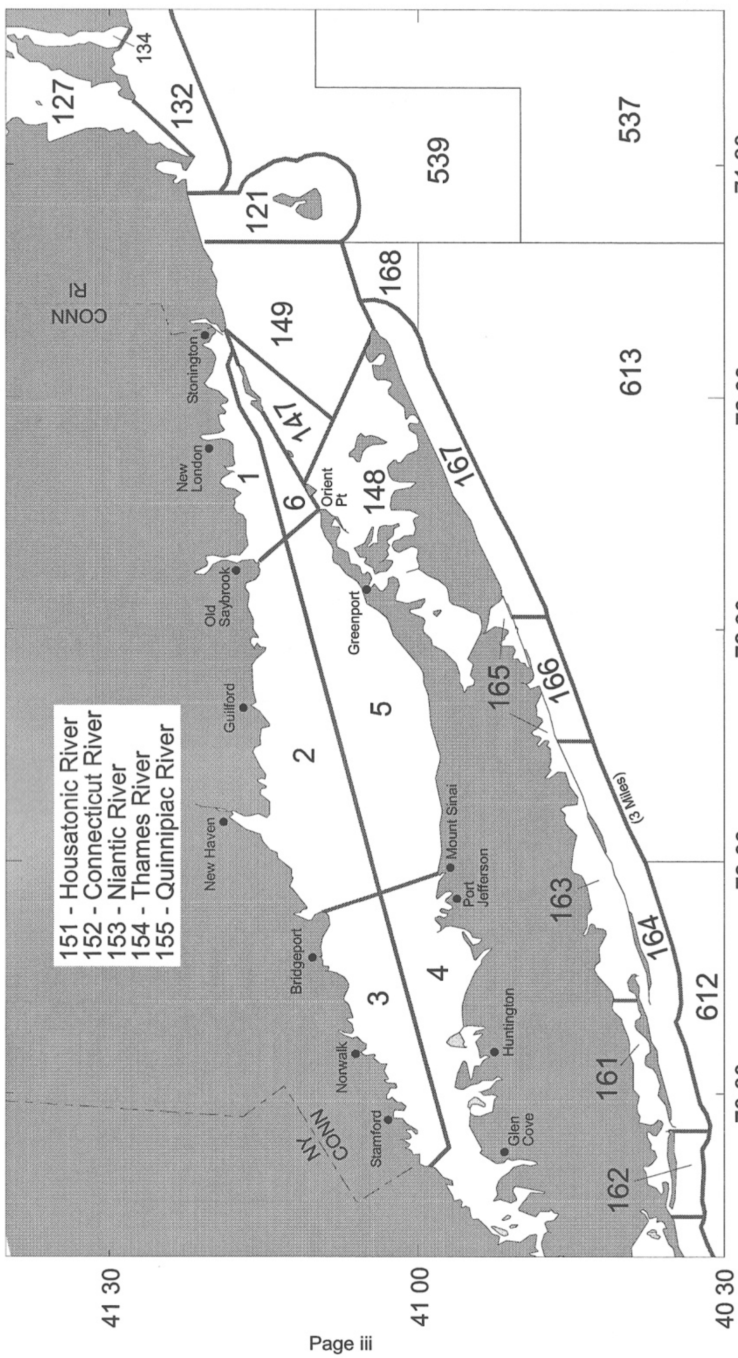
Tuna / Large Pelagics

ALB - Albacore tuna
BET - Big eye tuna
BFT - Bluefin tuna
BON - Bonito
LTNY - Little tunny
SKJ - Skipjack
YFT - Yellowfin tuna
DOL - Dolphin fish / mahi-mahi
WAH - Wahoo

Sharks and Skates

DGSP - Dogfish, spiny
DGSM - Dogfish, smooth
SKAT - Skate
SHBL - Shark, blue

If you caught a species that does not appear in this list, write in the species name or contact the Marine Fisheries Division for the proper species code.



Long Island Sound and Vicinity Fishing Area Chart

Date: __ / __ / ____ **Start Time:** __ : __

Mode: Private Boat ☐ Charter Boat ☐ Party Boat ☐ Shore ☐ Shore (Enhanced Site) ☐

Area	Total Anglers	Lucky Anglers	Hours Fished	Targeted Species 1	Targeted Species 2

Species	K/R	Length (in)	Quantity
		.	
		.	
		.	
		.	
		.	
		.	
		.	
		.	
		.	
		.	
		.	
		.	
		.	
		.	

Comments/Observations: ______________________

JOB 3: ENHANCED OPPORTUNITY SHORE FISHING PROGRAM

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JOB 3: ENHANCED OPPORTUNITY SHORE FISHING PROGRAM

GOAL

To maintain and improve the fishing experience, opportunity and quality of access to public trust marine fisheries resources in Connecticut especially in urban areas, while maintaining marine fish conservation objectives.

OBJECTIVES

1. *Preserve the quality of shore fishing opportunity for species whose management is heavily minimum size dependent, while also meeting fishery management plan conservation objectives.*
2. *Collect data from the designated enhanced shore fishing sites necessary to gauge the biological and social impact of enhanced opportunity and whether fishery management plan harvest targets are still being met.*
3. *Create an "adopt-a-shore-site" relationship with tackle shops that are located near specific sites to help maintain and manage locations.*
4. *Establish contacts with local officials of town owned sites especially within urban areas to increase awareness and appreciation of quality shore based recreational fishing opportunity in their community.*
5. *Increase public awareness of the sites to encourage activity by increasing communication with tackle shops and anglers.*

INTRODUCTION

The Connecticut Department of Energy and Environmental Protection (DEEP), Bureau of Natural Resources, Marine Fisheries Division, has collected marine recreational fisheries information since 1979. Starting in 1987, Connecticut joined with the National Marine Fisheries Service (NMFS) Marine Recreational Fishery Statistic Survey (MRFSS) which in 2007 evolved into the Marine Recreational Information Program (MRIP). In 2013 a critical procedural change in the sampling design was implemented requiring 24 hour per day sampling for the Access Point Angler Intercept Survey (APAIS). Prior to 2013, APAIS sampling took place during daytime peak angling activity times only. In addition, MRIP night sampling required two persons per assignment as a safety precaution. Under these new MRIP guidelines, DEEP would have to double or triple its current seasonal staff to participate which would have been prohibitively costly in our capacity as a subcontractor to NMFS primary private contractor. Due to these concerns DEEP ended MRIP participation in 2013 and a NMFS contractor took over responsibility for conducting the MRIP APAIS in Connecticut. At the same time, DEEP identified a need to enhance fishing opportunity for shore based anglers. Starting in 2011 DEEP designated shore based fishing sites that allowed for less restrictive fishing regulations (see Appendix 8.1). Additionally, the Atlantic States Marine Fisheries Commission (ASMFC) Summer Flounder, Scup and Black Sea Bass Board requested that DEEP increase monitoring of the enhanced shore fishing sites to provide additional catch information since the number of shore mode intercepts completed by MRIP was significantly

lower at shore sites compared to other modes. This project was designed to meet that monitoring need.

METHODS

The DEEP developed a voluntary daily angler catch card program designed to collect fishing trip and catch information, including length measurements of harvested and released (discarded) fish, from recreational anglers at enhanced shore fishing sites. Collecting length measurement data, especially on discarded fish, is extremely difficult to obtain through traditional access point angler intercept surveys (i.e. MRIP). In past years, such length data has been successfully collected utilizing volunteer anglers to report their fishing trip information through a logbook survey (i.e. Connecticut Volunteer Angler Survey program (VAS, Job 2). The VAS program was used as a template for the more extensive catch card program (see Appendix 3.2).

There were five assignment zones containing a total of 39 sites from Stonington to Norwalk that were sampled (Figure 3.1). For each assignment, the zone, time of day (am or pm), starting site and direction of travel was randomly selected using the SAS 'ranuni' function. Upon arriving at a site, the creel agent would record:

- Date and time of creel agent arrival
- Weekend or weekday
- Site name
- Initial count of angler(s)
- Arrival and departure time of additional anglers
- Date and time of creel agent departure

Each angler was asked to participate in an angler survey to provide fishing effort and catch information. If they agreed, the creel agent would perform a partial trip interview. The following questions were asked:

- What time did you start fishing?
- Have you been interviewed by this program already this year?
- What species are you fishing for?
- How Many times do you go saltwater fishing per year?
- Of those, what percent are from shore?
- Are there any comments you would like to make about shore fishing in CT (Pro's or Con's).
- Have you caught any fish yet on this trip? If yes, how many fish of each species did you catch?

All fish caught while the creel agent is on site, are measured and recorded. To capture the remaining catch and effort information, each participating angler was provided a waterproof daily catch card, pencil, measuring tape, and verbal instructions were given by DEEP staff. Anglers were asked to fill out the following (data fields):

- Conservation identification number (fishing license number)
- Primary target species
- Secondary target species

- Total hours spent fishing
- Date (mm/dd/yy)/start time (check box AM/PM)
- Total number of fish kept and released by species
- Length measurements for the first seven fish caught.

Anglers were encouraged to mail in the post marked catch card, or deposit it into designated drop-off-boxes installed at fishing sites, upon trip completion. Questions concerning the survey could be answered by contacting the DEEP Marine Headquarters office.

RESULTS AND DISCUSSION

Survey volunteers provided important data characterizing individual angler trips, species specific catch rates and length measurements for both kept and discarded fish Catch cards distributed to shore anglers were categorized by identification number, date, and enhanced shore fishing site code. From May-November 2014 there were a total of 292 assignments totaling 2,092 cards distributed to anglers at enhanced shore fishing sites and 800 (34.5%) were returned. A total of 1,542 fish were reported caught (Table 3.1). Half of the fish (50%) were released due to regulatory discard or undesirable catch. The total harvest reported was 330 fish comprised of 11 species.

Length Information

Each individual angler reported common name(s) of the first seven fish captured regardless of species and size. Each fish was measured to the nearest ½ inch (rounded down) and disposition recorded. A total of 661 fish measurements were received, comprised of 11 species (Table 3.2). Bluefish, scup, striped bass and summer flounder were the most frequently harvested by anglers, comprising 90% of the total measured catch (Figure 3.1).

Enhanced shore fishing

Anglers fishing from designated enhanced opportunity shore fishing sites in 2014 were allowed to harvest scup at 9 inches minimum length (vs. 10.5 inches in other private fishing modes and 11 inches for party/charter modes) and summer flounder at 16 inches (vs 18 inches for other modes). The smaller minimum sizes were adopted out of concern that shore anglers were taking a disproportional share of conservation burden associated with the increased minimum sizes adopted in response to the harvest limits established under the joint ASMFC/MAFMC fishery management plans for these species. Shore fishing is a popular component of marine waters fishing in Connecticut with an MRIP estimated 437,339 such trips being made in 2014. Despite making up more than 30% of all 1.39 million marine fishing trips in Connecticut last year, scup and summer flounder harvest by shore fishermen (8,854 scup, 5,380 summer flounder) represented just 1.5% and 4.5%, of the state's harvest of these species, respectively.

Although sample sizes remain small, enhanced opportunity shore fishing site sampling in 2014 suggests the reduced minimum length requirements at these sites improved success rates for shore scup anglers by 21% and shore summer flounder fishermen by 29%

MODIFICATIONS

No modifications are expected, however objectives 4 and 5 will be further emphasized in 2015.

Table 3.1: Assignments by month and zone

MONTH	ZONE1	ZONE2	ZONE3	ZONE4	ZONE5	TOTAL
MAY	6	7	5	6	5	**29**
JUNE	9	9	10	7	8	**43**
JULY	11	10	8	9	9	**47**
AUGUST	11	10	10	9	9	**49**
SEPTEMBER	10	9	10	8	9	**46**
OCTOBER	13	8	9	9	9	**48**
NOVEMBER	6	7	6	6	5	**30**
TOTAL	**66**	**60**	**58**	**54**	**54**	**292**

Table 3.2: Sites visited by month and zone in 2014

MONTH	ZONE1	ZONE2	ZONE3	ZONE4	ZONE5	TOTAL
MAY	34	46	29	53	29	**191**
JUNE	63	79	56	61	48	**317**
JULY	76	89	46	82	54	**347**
AUG	76	90	54	81	54	**355**
SEPT	70	81	60	72	54	**337**
OCT	90	68	53	77	54	**342**
NOV	42	59	36	48	28	**213**
TOTAL	**451**	**512**	**334**	**474**	**321**	**2,092**

Table 3.3: Number of fishing parties intercepted (Intercepts) and total number of anglers interviewed in 2014

MONTH	INTERCEPTS	ANGLERS INTERVIEWED
MAY	144	206
JUN	322	553
JUL	420	686
AUG	481	758
SEPT	312	512
OCT	219	340
NOV	32	51
TOTAL	**1930**	**3106**

Table 3.4: Catch disposition from Enhanced Shore Fishing Sites in 2014

SPECIES	RELEASED	KEPT	TOTAL
ATLANTIC MACKEREL		1	1
ATLANTIC MENHADEN	13	65	78
BLACK SEA BASS	2	1	3
BLUEFISH	245	466	711
CUNNER	1		1
DOGFISH UNC	3		3
HICKORY SHAD	27	15	42
SCUP	109	268	377
SEA ROBINS UNC	136	7	143
SKATES UNC	3		3
STRIPED BASS	55	14	69
SUMMER FLOUNDER	70	13	83
TAUTOG	17	8	25
WHITE PERCH	1	2	3
COMBINED TOTAL	**682**	**680**	**1,542**

Table 3.5: Length measurement distribution from Enhanced Shore Fishing Sites

SPECIES	MEASURED BY ANGLER	MEASURED BY AGENT	TOTAL LENGTHS
ATLANTIC MENHADEN	6	6	12
BLACK SEA BASS	2		2
BLUEFISH	127	130	257
CUNNER	1		1
HICKORY SHAD	5	8	13
SCUP	94	139	233
SEA ROBINS UNC	9	4	13
STRIPED BASS	40	15	55
SUMMER FLOUNDER	37	12	49
TAUTOG	13	8	21
WHITE PERCH	2	1	3
COMBINED TOTAL	**338**	**323**	**661**

Table 3.6: MRIP 2014 effort and harvest statistics for Connecticut by mode.

Estimate Status	Year	Fishing Mode	Angler Trips	PSE
FINAL	2014	SHORE	437,339	20.8
FINAL	2014	PARTY BOAT	19,155	3.4
FINAL	2014	CHARTER BOAT	71,390	6.1
FINAL	2014	PRIVATE/RENTAL BOAT	865,347	13.6
TOTAL			1,393,231	

Estimate Status	Year	Common Name	Fishing Mode	Total Harvest (A+B1)	PSE
FINAL	2014	SCUP	SHORE	8,854	83.1
FINAL	2014	SCUP	PARTY BOAT	49,960	23.3
FINAL	2014	SCUP	CHARTER BOAT	8,794	73.9
FINAL	2014	SCUP	PRIVATE/RENTAL BOAT	497,218	20.2
TOTAL				564,826	

Estimate Status	Year	Common Name	Fishing Mode	Total Harvest (A+B1)	PSE
FINAL	2014	SUMMER FLOUNDER	SHORE	5,380	79.4
FINAL	2014	SUMMER FLOUNDER	PARTY BOAT	421	70.6
FINAL	2014	SUMMER FLOUNDER	CHARTER BOAT	0	.
FINAL	2014	SUMMER FLOUNDER	PRIVATE/RENTAL BOAT	113,701	21.8
TOTAL				119,502	

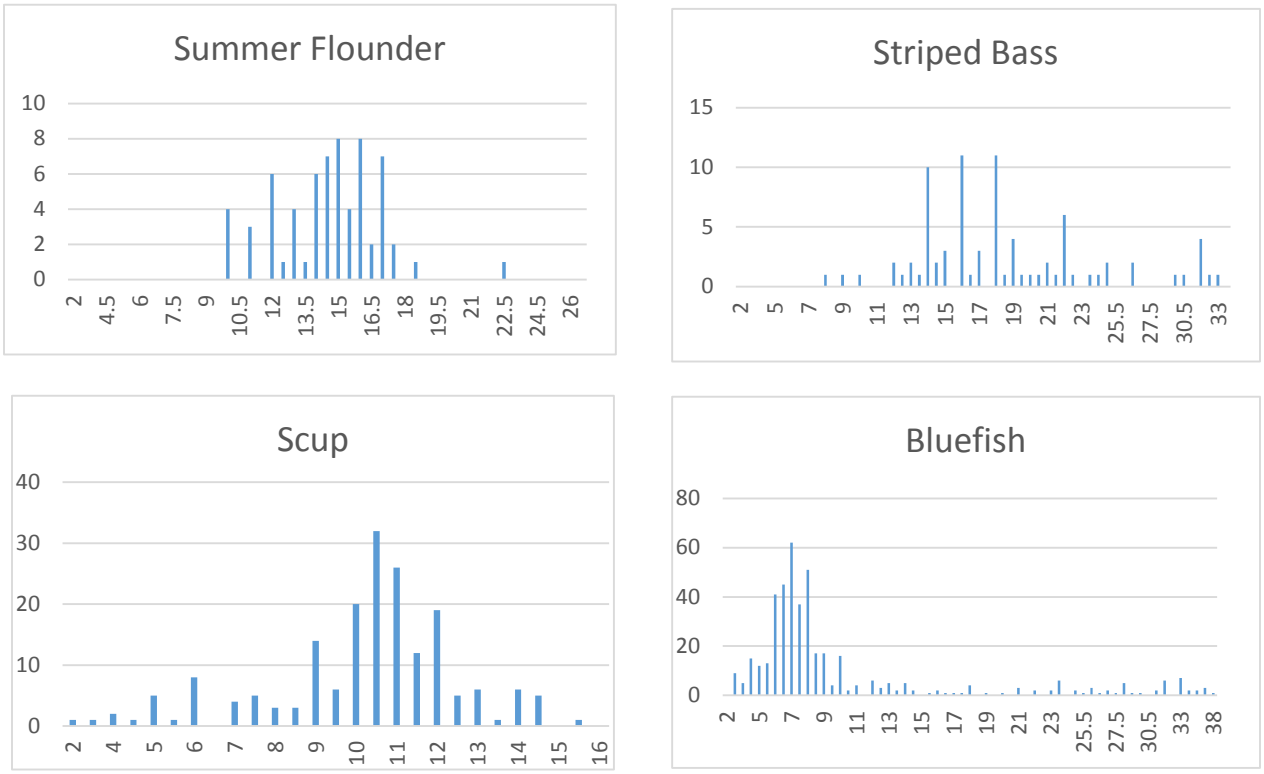

Figure 3.1: Length frequencies of popular marine fish measured at Enhanced Opportunity Shore Fishing Sites. Total length is rounded down to the nearest half inch.

Appendix 3.1

Appendix 3.2

00001

Site Number

Date Distributed

Time Distributed

Fishing Mode

Vessel Registration Number

CT Fishing Quality Evaluation (Individual Fisherman Card)

If you need assistance completing this form, please contact the DEEP Marine Fisheries Division (860.434.6043)

00001

(One card per angler/trip) Please place this card in the mail after completing the trip.

Trip Date:

Conservation ID (Found on your Fishing License)

Primary Targeted Species

Secondary Targeted Species

☐ I did not catch any fish today

Angler's Total Catch For The Trip
(Use Tally Marks in # Kept and # Rlsd Column's)

Species	# Kept	# Rlsd
Porgy (example)	++++ ||	++++

Length of first seven fish caught
(Rounded down to the nearest half inch)

Species	Length	Kept?
Fluke (example)	16.5	Y/N
	.	Y/N
	.	Y/N
	.	Y/N
	.	Y/N
	.	Y/N
	.	Y/N
	.	Y/N

JOB 4: TACKLE SHOP COOP SURVEY

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GOAL

Create working relationships with coastal tackle shops and supplement recreational fishery catch statistics to be used in the analysis of recreational management measures.

OBJECTIVES

1) Provide length composition estimates for marine recreational finfish catches, both kept and released, from participating tackle shop customers.
2) Provide creel data (number of fish harvested per angler trip) from participating tackle shop customers.
3) Create a shore site sponsorship with tackle shops that are located near specific sites to help maintain and manage locations.
4) Increase public awareness of these sites to encourage activity by increasing communication with tackle shops and anglers.
5) Establish contacts with local officials of town owned sites especially within urban areas to increase awareness and appreciation of quality shore based recreational fishing opportunity in their community.

INTRODUCTION

The focus of the Tackle Shop Coop Survey is to build cooperation with tackle shop personnel along the Connecticut coastline to help increase awareness of shore fishing sites. This job was also intended to provide supplemental catch, effort and size composition for several marine species by distributing angler catch report forms to anglers through tackle shops.

METHODS

Tackle shops that are in close proximity to shore sites were asked to participate by sponsoring a shore fishing site. The Department provided these tackle shops with publicity materials such as sponsored shop signs at their chosen fishing site and on the Department's website. The tackle shop personnel were then asked to increase awareness of the sites with customers and keep the Department informed of maintenance needs and fishing activity at the sites.

In addition, Reporting Cards (see Job 3) were distributed to all tackle shops along the Connecticut coastline to be handed out to anglers patronizing these shops. Recreational fishery dependent catch, harvest and length composition data will be collected from fishermen using the procedures outlined in Job 3.

RESULTS

Tackle shops contacted were interested in fishing access issues and generally supported efforts to improve fishery data to support management. However, active involvement in these efforts was not sustainable because of their need to focus on servicing customers and running their businesses. Display space is also at a premium making shops reluctant to display shore access site materials or catch cards. Time required to explain the purpose of the catch cards and how they should be completed was also lacking as employees understandably needed to focus on helping customers who are generally trying to get what they need and be on their way to begin a day of fishing.

Efforts to increase communication with shops has paid off however, in terms of the input we have received on our enhanced shore fishing access program. One tackle shop in New London now advocates for shore anglers at a major local state owned fishing access site when marine fishing regulations are being discussed at annual public hearings held to guide our state's response to Atlantic States Marine Fisheries Commission mandates on harvest limits.

Two other shops have come forward with suggestions for adding enhanced shore fishing access sites in their areas. In response, the agency has designated a site in Old Saybrook and another in the center of New Haven. The same New Haven tackle shop owner has also successfully advocated for maintaining the enhanced shore fishing site designation at another New Haven location damaged by storms. His customers let him know this site was still accessible and productive. He, in turn, let us know how valued this site remained for his customers which lead the agency to restore the enhanced shore fishing site designation to this access point. Good working relationships maintained through greater communication efforts with our local tackle shops have improved our ability to serve our shore based angling community.

Since there is a high percentage of Enhanced Shore Fishing Sites that are town and city owned along the shoreline, keeping in contact with town officials has helped in the success of promoting the use angling at the sites. In many cases, town officials have taken the responsibility of posting and maintaining signs identifying sites as well as signs that provide fishing regulations to the anglers using the sites.

MODIFICATIONS

Given lessons learned during the first year of this project, objectives 1, 2 and 3 under job 4 are being eliminated.

Fishery catch and harvest information is being more effectively collected under jobs 1 ,2 and 3 and it is clear that tackle shops are unable to invest the time required to sponsor shore fishing sites in their areas, although they have proven to be strong advocates for such sites which is equally valuable.

Consistent with this narrower focus on strong communications and relationships with local tackle shops, particularly as partners in promoting shore fishing access, objectives 4 and 5 will be added to Job 3 in 2015, and Job 4 as a separate program will be discontinued.

JOB 5: MARINE FINFISH SURVEY

Long Island Sound Trawl Survey

LONG ISLAND SOUND TRAWL SURVEY

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JOB 5: LONG ISLAND SOUND TRAWL SURVEY (LISTS)

CRUISE RESULTS FROM THE 2014 SPRING AND FALL SURVEYS

STUDY PERIOD AND AREA

The Connecticut DEEP Marine Fisheries Division completed the thirty-first year of the Long Island Sound Trawl Survey in 2014. The Long Island Sound Trawl Survey encompasses an area from New London to Greenwich, Connecticut and includes waters from 5 to 46 meters in depth in both Connecticut and New York state waters. Typically, Long Island Sound is surveyed in the spring, from April through June, and during the fall, from September through October. This report includes results from the 2014 spring and fall sampling periods and provides time series information since the commencement of the survey in 1984.

GOAL

To provide long term monitoring of abundance, biomass and size composition of marine fishery resources along with environmental parameters, in order to evaluate the effects of fishing and environmental conditions on the distribution and abundance of living resources in Long Island Sound.

OBJECTIVES

Provide:

1) Annual indices of counts and biomass per standard tow for 40 common species and age-specific indices of abundance for winter flounder, tautog, scup, summer flounder, bluefish (Age 0, 1+) and weakfish (Age 0, 1+).
2) Length-frequency distributions of bluefish, scup, summer flounder, winter flounder, tautog, striped bass, weakfish, black sea bass, and other ecologically important species.
3) Annual total counts and biomass for all finfish species taken and annual total biomass for all common macro-invertebrate species taken.
4) 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.
5) Fishery independent survey data to cooperative state researchers or agencies, such as the National Marine Fisheries Service, Atlantic States Marine Fisheries Commission, New England and Mid-Atlantic Councils, and researchers associated with state or local universities

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 finfish 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 aging. Lobster were also enumerated and measured from every tow. All fish species were identified and counted.

Since 1984, several changes have been incorporated into the Survey. In 1991, the sampling schedule was changed to a spring/fall format, although sampling is still conducted on a monthly basis (April - June, September, and October). Beginning in 1992, species were weighed in aggregate with an onboard scale to provide indices of biomass. Furthermore, more species have been sampled for lengths, such as windowpane and fourspot flounders, and important forage species such as butterfish, long-finned squid, and several herring species. By 2003, the list of species measured expanded to 20 finfish species and two invertebrate species (lobster and long-finned squid), plus rarely occurring species. In 2014, lengths were collected from all finfish species on each tow. In addition, age structures were collected from bluefish, menhaden, tautog, scup, winter flounder, weakfish and large summer flounder (>59 cm). All of these changes serve 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.

METHODS

Sampling Design

LISTS is conducted from longitude 72^{o} 03' (New London, Connecticut) to longitude 73^{o} 39' (Greenwich, Connecticut). The sampling area includes Connecticut and New York waters from 5 to 46 m in depth and is conducted over mud, sand and transitional (mud/sand) sediment types. Sampling is divided into spring (April-June) and fall (Sept-Oct) periods, with 40 sites sampled monthly for a total of 200 sites annually. The sampling gear employed is a 14 m otter trawl with a 51 mm codend (Table 5.1). To reduce the bias associated with day-night changes in catchability of some species, sampling is conducted during daylight hours only (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 5.1), 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 5.2). Discrete stratum areas smaller than a sample site are not sampled.

Sampling Procedures

Prior to each tow, temperature (^{o}C) 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 retrieval.

The survey's 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 placed onto a sorting table and sorted by species. Finfish, lobsters and squid are counted and weighed in aggregate (to the nearest 0.1 kg) by species with a precision marine-grade scale (30 kg, +/- 10 gm capacity). Catches weighing less than 0.1 kg are recorded as 0.1 kg. During the initial two years of the survey (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 5.4.

For 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 5.3). Lobsters are measured to 0.1 mm carapace length. Squid are measured using the mantle length (cm), horseshoe crab measurements are taken using prosomal width (cm) and whelk (knobbed and channeled) shell widths are measured in millimeters.

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 5.3). If a species is subsampled, the length frequency of the catch is determined by multiplying the proportion of measured individuals in each centimeter interval by the total number of individuals caught. Some species are sorted and subsampled by length group so that, for example, all large individuals are measured and a subsample of small (often young-of-year) specimens is measured. All individuals not measured in a length group are counted. The length frequency of each group is estimated as described above, i.e. the proportion of individuals in each centimeter interval of the subsample is expanded to determine the total number of individuals caught in the length group. The estimated length frequencies of each size group are then appended to complete the length frequency for that species. This procedure is often used with catches of bluefish, scup, and weakfish, which are usually dominated by young-of-year or discrete age/length classes.

Bluefish, menhaden, scup, summer flounder, tautog, weakfish (ageing was discontinued in 2013) and winter flounder are sampled for age determination (Table 5.3). The target number of age samples (otolith) for bluefish were 50 from the spring period (defined by ASMFC Bluefish Technical Committee as Jan-July) and 50 from the fall period (August-December). Subsamples of scup, stratified by length group, are measured to the nearest mm (fork length) and scales from each individual are taken for ageing. Scup scales are removed posterior to the pectoral fin and ventral to the lateral line. The scales are pressed onto plastic laminate with an Ann Arbor roller press to obtain an impression of the scale, which is then viewed with a microfiche reader at 21x. Scales are also taken from all summer flounder greater than 59 cm. At least 15 scales are removed from the caudal peduncle area. These scales are pressed and aged to supplement the National Marine Fisheries Service age key and are also included in the formulation of LISTS summer flounder catch-at-age matrix (see below).

Menhaden scales are collected from roughly 50 fish each year as required by Amendment 2 of the ASMFC Atlantic menhaden management plan. Amendment 2 introduced a requirement for biological sampling of the commercial bait harvest to support improved stock assessments. However since Connecticut has such a small menhaden commercial fishery, sampling it would be difficult. The same size/age component of the menhaden population taken in the commercial fishery is available to LISTS so collections are taken as part of each survey cruise. Menhaden fork length (mm), and sex are recorded and scales are taken about mid-body (lateral line) and below the insertion of the dorsal fin. 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). At the request of the ASMFC Tautog Technical Committee, LISTS began collecting tautog otoliths in addition to opercles in 2012. Results from a recent ASMFC Tautog Ageing Workshop (May 2012) indicated there was no clear benefit to switching from opercles to otoliths for CT, so tautog otoliths will be collected (minimum of 50 per/ASMFC) and archived for potential use in the future. Subsamples of winter flounder, stratified by length group and area (as listed in bottom of Table 5.3), are iced and taken to the lab where they are measured to the millimeter (total length), weighed (gm) and sexed. Their maturity stage is determined (NMFS 1989), and they are aged with whole and/or sectioned otoliths (Simpson et al. 1988). Weakfish scales were obtained and processed as described above for scup, and, prior to 2013, otoliths were sectioned and read using procedures described in Simpson et al. 1988. However, since the compliance criteria for a number of other species managed through ASMFC Fishery Management Plans have increased to include ageing over the years, coincidence with stagnant (or declining) levels of funding and staff, age structures for weakfish will no longer be collected because it is not required.

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 have been included in the annual and seasonal totals and the young-of-year are listed if present in the year's catch but are not quantified (Table 5.15, Appendix 5.4). 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 5.2).

In 2014, the only endangered species encountered by LIS Trawl Survey was Atlantic sturgeon, a species that was listed as Endangered by NOAA in 2012. Sampling procedures have been modified in recent years to minimize the likelihood of injury to Atlantic sturgeon. When sampling in a season and area where the chance of catching a sturgeon is high (based on historic LISTS catch) and water depth is greater than 27m, gear retrieval speed is reduced to decrease the stress induced by rapid changes in pressure. When a sturgeon is detected in the net, it is removed as quickly and carefully as possible. Subsequent handling and processing follow protocols described in A Protocol for Use of Shortnose, Atlantic, Gulf, and Green Sturgeons (Kahn and Mohead. 2010. U.S. Dep. Commerce, NOAA Tech Memo, NMFS-OPR-45, 62p.,

http://www.nmfs.noaa.gov/pr/pdfs/species/kahn_mohead_2010.pdf) and adhere to the Reasonable and Prudent Measures, as well as, the Terms and Conditions spelled out in the ESA Section 7 Biological Opinion's Incidental Take Statement issued by NOAA for CT in June 2012 (http://www.greateratlantic.fisheries.noaa.gov/protected/section7/bo/actbiops/usfws_state_fisheries_surveys_2013.pdf). Future LISTS interactions with sturgeon will follow requirements of the subsequent biological opinion issued by NOAA for the 11 Northeast States and District of Columbia. All interactions with endangered species are detailed in Appendix 5.5.

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 - 2014 for 38 finfish species, lobster, and long-finned squid (1986 - 2014). 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; 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); 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**. Otoliths were taken from 190 bluefish, 22 from the spring period and 168 from the fall period. Of the 22 samples taken in the spring, only 6 were obtained from LISTS; the bulk of the samples came from recreational anglers. All of the fall samples were obtained from LISTS (168 fish). No samples were obtained through donations from a fishing tournaments in 2014. In 2012 a coast wide biological sampling program was initiated through ASMFC addendum 1 of the bluefish management plan. Since there is only three years of data from the northeast, there are still limited results available at this time. Therefore, the method of using modes observed in the fall length frequencies to separate bluefish into age 0 and age 1+ groups, and calculate a geometric mean catch per tow for each group (Table 5.22) was continued through 2014. 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 (Table 5.42). Therefore 30 cm was determined to be a suitable length for partitioning age 0 and age one fish. With the addition the biological sampling programs along the coast, a regional northeast key is being finalized through ASMFC and from 2013 forward, a LISTS key will be utilized for calculating a full index-at-age for Long Island Sound.

  Prior to 2012, there was limited bluefish ageing in the northeast. Although North Carolina state biologists have aged bluefish for some time, their age keys were not used to age Long Island Sound bluefish because North Carolina mean lengths-at-age are not consistent with modes observed in Long Island Sound bluefish length frequencies. This difference suggests that growth may vary by region, or that early and late spawned bluefish may be differentially distributed along the coast (Kendall and Walford 1979).

- **Scup**. An index-at-age matrix was developed for 1984-2014 using spring (May-June only) and fall (September-October) LISTS data (Table 5.23). April data was omitted since very few scup are taken at this time. A total of 12,910 scup aged between 1984 and 2014 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 (less than 4% in any given year), 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 spring survey (Table 5.24), 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 2014 by apportioning the spring index by the percentage of fish at each age (Table 5.25).

- **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 (typically 60 cm and over). In 2014 LISTS had sample requests for summer flounder and scale samples from these fish (< 60cm) were collected . In 2014, 19 summer flounder, were aged; 14 from the spring and 5 (all > 60cm) from the fall. 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 (Table 5.26) 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 1984-2014 using all survey months (Gottschall and Pacileo 2007) (Table 5.27). During 2014, 167 tautog were captured and opercles were collected from all; 131 collected in the spring and 36 were collected in the fall. Ageing for 2006-2012 has been completed. Ageing for 2013-2014 samples has not yet been completed. A 2012 age key was used for the 2013-2014 un-aged fish and a pooled key was used where the 2012 key failed. Therefore, the 2013-2014 indices-at age are preliminary; the 2013-2014 tautog samples will be aged during the summer of 2015 and an updated index-at-age matrix will be constructed.

- **Weakfish**. Age 0 and age 1+ indices were calculated for both spring (1984 – 2013) and fall surveys (1984 – 2009, 2013) (Table 5.28). 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+ indices were 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 (Table 5.57), weakfish less than 30 cm are considered to be age 0 while those greater than or equal to 30 cm are ages 1+. Ageing for weakfish was discontinued in 2013.

- **Winter flounder**. An index-at-age matrix was developed for 1984-2014 using April and May LISTS data (Table 5.29). June data were 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 23,272 winter flounder aged between 1984 and 2014 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.

Each flounder aged as described above was also assessed for maturity stage (following Burnett 1989) by sex. CT DEEP staging of winter flounder was verified in a cooperative study with NMFS in 2009-2010 (Gottschall and Pacileo 2011). The percentage of male and female fish in each centimeter length group that was sexually mature (ripe, resting, or spent) was calculated in order to determine the length group at which 50% was mature each year.

Species Richness by Group

The Long Island Sound Trawl Survey monitors species richness using groups of species classified as either cold temperate or warm temperate. For the purposes of tracking species richness, American sand lance, bay anchovy, and striped anchovy were omitted (see *Sampling Procedures* section). All other finfish species captured in LISTS were divided into groups based on their temperature preferences and seasonal spawning habits as documented in the literature (Collette and Klein-MacPhee 2002, Murdy et al. 1997). Species in the cold temperate group prefer water temperatures below 15^0C (60^0F), tend to spawn at the lower end of their temperature tolerance range, and are more abundance north of Long Island Sound than south of New York. Species in the warm temperate group prefer warmer temperatures (11-22^0C or 50-77^0F), tend to spawn in the upper range of their temperature tolerance, and are more abundant south of the Sound than north of Cape Cod (Appendix 5.6). Species that are not tolerant of cold temperatures, are abundant only south of Chesapeake Bay but stray into northern waters mostly as juveniles, and spawn only in the mid-Atlantic Bight and south were placed into a separate group (subtropical) and were not included in the analysis because they are typically only present in the fall LISTS.

Open Water Forage Abundance

A Long Island Sound open water forage index of abundance was compiled to measure the available food base which supports resident and migratory species within the Sound. This index is formulated as a biomass index that is assembled from 11 of the forage species that are most common in LISTS catches along with three other species that are considered forage at an early life stage (young-of-year, YOY). The species used to generate the index are; Atlantic herring, long-finned squid, butterfish, alewife, blueback herring, American shad, hickory shad, menhaden, whiting, spotted hake, and red hake along with young-of-year stage of scup, bluefish, and weakfish. The geometric mean biomass is calculated using the aggregate of these 14 species on a per tow basis and calculated using the same methodology as described above for individual species biomass indices.

RESULTS AND DISCUSSION

Overview of LISTS 2014 Spring and Fall Surveys

Each month of the survey, sampling aboard the R/V John Dempsey generally began in the east end of Long Island Sound and progressed westward. The April survey commenced on April 9, 2014, and continued until May 2 for a total of six (6) days underway and 40 tows completed. May sampling started on May 12 and continued till May 22 with eight (8) sampling days underway and 40 sites completed. June sampling began on June 9 and ended on June 24, taking ten (10) days underway to complete the 40 sites. The Fall Survey commenced on September 9 and needed 8 days underway to complete 40 tows. The October survey fell short by 1 tow (39 completed instead of 40 tows) because of weather and took 11 sampling days. The October cruise continued until November fourth. A total of 199 LISTS tows were completed in 43 days underway during the spring and fall 2014 surveys (Table 5.4); not including transit days or weather days.

Maps showing the sites selected versus the sites sampled during each month of sampling are provided in Figure 5.2 (April), Figure 5.3 (May), Figure 5.4 (June), Figure 5.5 (September) and Figure 5.6 (October). Within each figure the red bordered sites are the sites selected for the month and the solid blue dots indicate the actual sites sampled. If a site had to be relocated during sampling, an explanation of why it was moved is provided under the figure. Additional site/station information is provided in Table 5.5 (April), Table 5.6 (May), Table 5.7 (June), Table 5.8 (September) and Table 5.9 (October). These tables provide date of saple, time, tow duration, latitude/longitude, surface and bottom temperature and salinity, average tow speed, distance towed and approximate area swept for each tow.

Sometimes, a full 30-minute tow cannot be completed. Typical reasons for short tows include lack of room because of observed pot gear set in the immediate area, a drop in speed due to entanglement with some object on the bottom (frequently derelict pot gear), or a complete stop in forward motion (submerged wreck or rock pile). Survey crew will often attempt to finish an interrupted tow by clearing the net (if needed) and resetting beyond the obstruction or observed gear. If this is not possible, a site may have to be moved to another site nearby with the same stratum (bottom type and depth). If the site was moved, the data from the initial site will not be used. Typically, a minimum of 15-20 minutes is required for a LISTS tow to be recorded. However, there are occasions when a tow with less than 15 minutes will be accepted, usually because there is no alternate site in the designated strata in the vicinity. Short tow information for each month in the 2014 survey is summarized in Table 5.10.

Cooperative Sample and Data Collection

Throughout the time series, LISTS 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 graduate students associated with state or local universities. Table 5.11 illustrates many of the organizations that requested data in 2014, while Table 5.12 shows sample request received and fulfilled. 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 11 of this report).

Number of Species Identified

Sixty finfish species were observed in the 2014 Long Island Sound Trawl Survey (Table 5.13). This includes one new species for the survey; blue spotted cornet fish (*Fistularia tabacaria*). From 1984 to 2014, LIS Trawl Survey has identified one hundred six (106) finfish species (Appendix 5.1), averaging 58 species per year with a range of 43 to 70 species (Figure 5.7). In addition, a total of 42 types of invertebrates were collected in 2014 (Table 5.14). Most invertebrates are identified to species. However, in some cases, invertebrates were identified to genus or a higher level taxon.

Total Catch

Appendix 5.4 presents a time series (1984-2014) of the finfish species collected each year and their respective rank by numbers. Annual total biomass of invertebrates is also included in this appendix (1992-2014), ranked by weight (kg). A total of 153,100 finfish weighing 16,174 kg were sampled in 2014 (Table 5.15). A total of 33,919 finfish weighing 8,816 kg were sampled in spring of 2014 (Table 5.16). A total of 119,182 finfish weighing 7,358 kg were sampled in fall of 2014 (Table 5.16). A total of 1,529 kg of invertebrates were taken in 2014 (Table 5.15). The total biomass of invertebrate catch taken in the spring of 2014 was 866 kg (Table 5.17). A total of 663 kg of invertebrates were taken in fall of 2014 (Table 5.17).

Length Frequencies

Length frequency tables are provided primarily to give the reader an understanding of the size range of various 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 5.52-5.53), striped bass (Table 5.54-5.55), and summer flounder (Table 5.56-5.57).

Length frequencies were prepared for 22 species:

alewife	spring and fall	1989 - 2014	Table 5.30;
American shad	spring and fall	1989 - 2043	Table 5.31;
American lobster	spring and fall (M&F)	1984 - 2014	Table 5.32-Table 5.35;
Atlantic herring	spring and fall	1989 - 2014	Table 5.36;
Atlantic menhaden	spring and fall	1996 – 2014	Table 5.37;
black sea bass	spring and fall	1987 – 2014	Table 5.38, Table5.39
blueback herring	spring and fall	1989 - 2014	Table 5.40;
bluefish	spring and fall	1984 - 2014	Table 5.41, Table 5.42;
butterfish	spring and fall	1986 - 1990, 1992 - 2014	Table 5.43;
clearnose skate	spring and fall	1993 - 2014	Table 5.44, Table 5.45;
fourspot flounder	spring and fall	1989 - 1990, 1996 - 2014	Table 5.46;
hickory shad	spring and fall	1991 - 2014	Table 5.47;

horseshoe crab	spring and fall (M&F)	1998 - 2014	Table 5.48, Table 5.49;
long-finned squid	spring and fall	1986 - 1990, 1992 - 2014	Table 5.50, Table 5.51;
scup	spring and fall	1984 - 2014	Table 5.52, Table 5.53;
striped bass	spring and fall	1984 - 2014	Table 5.54, Table 5.55;
summer flounder	spring and fall	1984 - 2014	Table 5.56, Table 5.57;
tautog	spring	1984 - 2014	Table 5.58;
weakfish	spring and fall	1984 - 2014	Table 5.59, Table 5.60;
windowpane flounder	spring and fall	1989, 1990, 1994 - 2014	Table 5.61, Table 5.62;
winter flounder	April-May and fall	1984 - 2014	Table 5.63, Table 5.64;
winter skate	spring and fall	1995 - 2014	Table 5.65.

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 1984-2014 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 5.18 (spring) and 5.19 (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 5.20 and 5.21, respectively). Age specific indices of abundance were calculated for selected important recreational species, including scup, striped bass, summer flounder, and winter flounder (see below). For two other species, bluefish and weakfish recruitment indices were calculated using modal analysis of the length frequencies. For each of the thirty-eight finfish species, plots including catch per tow in numbers and biomass in kilograms are illustrated in Figures 2.8 through 5.13. These figures also include plots of each of the age specific indices and recruitment indices mentioned above. Figure 5.14 provides plots of abundance (biomass) indices for crabs (lady, rock, spider; 1992-2014), American lobster (1984-2014), horseshoe crab (1992-2014), and long-finned squid (1986-2014).

Indices of Abundance: Important Recreational Species

Spring and fall abundance indices are presented in Tables 5.18-5.19. Indices of abundance at age were also calculated for seven important recreational species: bluefish (Table 5.22), scup (Table 5.23), striped bass (Table 5.24 age frequency, Table 5.25 indices at age), summer flounder (Table 5.26), tautog (Table 5.27), weakfish (Table 5.28) and winter flounder (Table 5.29). Bluefish and striped bass indices-at-age are based on the fall and spring surveys, respectively, whereas winter flounder indices-at-age are based on only the April and May cruises of the spring survey. In 2014, LISTS collected otoliths from 602 winter flounder, 601 of which were used in the development of age keys and the final catch-at-age matrix. Both scup and weakfish indices-at-age are calculated and presented separately for each season. Scales from 702 scup were collected and aged in 2014, 689 of which were used in the keys and calculations of the age matrix. Weakfish and bluefish use modal distributions for calculating their respective recruitment index although a small number of weakfish are taken each year for ageing purposes (see methods).

Winter Flounder Average Size at Maturity

Average size at maturity for winter flounder captured in April and May cruises has increased since maturation data recording began in 1990. The number mature by cm-interval and sex was calculated for the subset of fish examined in the laboratory each year, and a five-year average computed to maximize sample size. The resulting maturation curves (Figure 5.18) skew right for both sexes from 1990-94 to 2010-2013. The 50%-midpoint for females has increased from 24-26cm in the 1990s to 27cm after 2000. The 50%-midpoint for males has increased from 16-19cm in the 1990s to 20-22cm after 2000. These results indicate not only a larger average size at maturation but also a greater synchronization of the maturation process over a smaller size range.

Species Richness by Group

The number of cold temperate and warm temperate species captured in each tow was averaged by seasonal cruise (April-June and September-October) for each year from 1984-2014 as an indicator of annual biological diversity or species richness. Trends in these indicators were tested for statistical significance by regression analysis. Results (Figure 5.19) show that the average number of warm temperate species captured/tow in spring and fall cruises has increased ($F=26.8$ and 76.0 respectively, $p<0.001$); while the average number of cold temperate species has decreased, especially in spring ($F=36.8$, $p<0.001$) but also in fall cruises ($F=11.7$, $p=0.002$).

MODIFICATIONS

No modifications.

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TABLES 5.1 - 5.29
LISTS

Table 5.1. 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 5.2. 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 5.3. Length and age data collected in 2014.

In addition to the species listed below, other rarely occurring species (totaling less than 30 fish/year each) were measured. During 2014, thirty-one 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)	All	min of 15 YOY and 15 adults / tow
cunner	TL (cm)	All	All
dogfish, smooth	FL (cm)	All	All
dogfish, spiny	FL (cm)	All	All
fourspot flounder	TL (cm)	All	min of 30/tow
hake, red	TL (cm)	All	min of 30/tow
hake, silver (whiting)	TL (cm)	All	min of 30/tow
hake, spotted	TL (cm)	All	min of 30/tow
hickory shad	FL (cm)	All	All
horseshoe crab	PW (cm)	All	All
northern searobin	FL (cm)	All	min of 30/tow
moonfish	FL (cm)	All	min of 10/tow
smallmouth flounder	TL (cm)	All	min of 10/tow
striped bass	FL (cm)	All	All
striped searobin	FL (cm)	All	min of 30/tow
scup	FL (cm)	All	min of 15 YOY and 30 / mode for age 1+
long-finned squid	ML (cm)	All	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
whelk , channeled	PW (mm)	All	All
whelk , knobbed	PW (mm)	All	All
windowpane flounder	TL (cm)	All	min of 50 / tow
winter flounder	TL (cm)	All	min of 100 / tow
winter skate	TL (cm)	All	All

Species aged	Structure	Subsample
bluefish	scales / otoliths	Collected each season. For each season, minimum of 50 scale and otolith samples collected from full length distribution. Spring collection may use other means of sampling to obtain the required minimum.
Menhaden	scales	Collected each season. For each season, minimum of 50 scale samples collected from full length distribution.
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	Ageing/collections discontinued in October 2014
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 5.4. 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). Delays in overhauling the transmission in the fall of 2008 resulted in missing September sampling. The June cruise and all of fall sampling in 2010 were canceled for an engine replacement in the R/V John Dempsey. Due to delays in engine replacement, begun in 2010 but not completed until late April 2011, April sampling in 2011 was abbreviated.

	Year																														
Cruise	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**Total**
April	-	-	35	40	40	40	40	45*	-	40	40	40	40	40	40	40	40	40	40	40	40	40	-	40	40	40	40	12	40	40	40	
May	13	41	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	38	40	40	40	40	
June	19	5	41	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	39	40	40	40	40	40	-	40	40	40	40	
July	35	40	40	40	40	40	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
August	34	40	40	40	40	40	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
September	35	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	41**	40	40	40	40	40	40	40	-	40	-	40	40	40	40	
Sept/Oct	-	-	-	-	-	-	-	-	-	40	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
October	35	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	-	40	40	-	40	40	40	-	40	40	40	39	
November	29	40	40	40	40	40	40	-	-	-	-	-	-	-	-	-	-	-	-	40	-	-	-	-	-	-	-	-	-	-	-	
Total	**200**	**246**	**316**	**320**	**320**	**320**	**297**	**205**	**160**	**240**	**240**	**200**	**200**	**200**	**200**	**200**	**201**	**200**	**200**	**200**	**199**	**200**	**120**	**200**	**160**	**200**	**78**	**172**	**200**	**200**	**199**	**6,593**

Table 5.5. Station information for LISTS April 2014.

Standard LISTS tows in the spring begin with SP and fall begins with FA. Latitude (N) and Longitude (W) are displayed in decimal degrees. Surface and bottom temperature and salinity are labeled as S_ and B_, respectively. Area swept is estimated by assuming the effective sweep is 2/3rds of the footrope length.

Sample Number	Date	Site Number	Bottom Type	Depth Interval	Time Start	Duration (min)	Latitude	Longitude	S_Temp (sfc, C)	S_Salinity (sfc, ppt)	B_Temp (btm, C)	B_Salinity (btm, ppt)	Ave Speed (knots)	Distance (nm)	Area Swept (sq.nm)
SP2014001	4/9/2014	1433	S	2	10:05	30	41.2465	-72.3514	4.1	26.3	4.3	27.4	1.4	0.6854	0.0035
SP2014002	4/9/2014	1737	T	1	12:06	30	41.2892	-72.1974	5.3	27.6	4.4	29.8	3.1	1.5507	0.0078
SP2014003	4/11/2014	1432	S	2	7:18	30	41.2336	-72.3997	4.4	21.8	4.3	27.8	3.6	1.7784	0.0090
SP2014004	4/11/2014	1336	T	4	9:24	30	41.2237	-72.2355	4.6	27.3	4.2	30.8	2.6	1.3099	0.0066
SP2014005	4/11/2014	831	S	4	11:58	30	41.1433	-72.4478	4.4	28.0	3.9	29.3	2.2	1.1114	0.0056
SP2014006	4/11/2014	929	S	3	13:09	30	41.1648	-72.5309	4.3	27.8	4.0	28.4	2.3	1.1378	0.0058
SP2014007	4/11/2014	1029	S	3	14:11	30	41.1648	-72.5875	4.6	27.9	3.9	28.1	2.9	1.4291	0.0072
SP2014008	4/21/2014	931	S	4	7:50	30	41.1593	-72.4492	5.8	27.4	5.6	27.9	1.9	0.9279	0.0047
SP2014009	4/21/2014	128	T	2	9:43	30	41.0303	-72.5820	6.3	27.5	6.1	27.4	2.9	1.4675	0.0074
SP2014010	4/21/2014	227	T	3	11:00	30	41.0458	-72.6033	6.4	27.5	5.7	27.6	3.2	1.6163	0.0082
SP2014011	4/21/2014	325	T	3	12:21	30	41.0570	-72.7542	6.6	27.6	4.6	27.8	2.7	1.3316	0.0067
SP2014012	4/21/2014	526	T	3	13:28	30	41.0901	-72.6899	6.7	27.7	5.5	27.6	2.4	1.2152	0.0061
SP2014013	4/21/2014	725	T	4	14:54	30	41.1200	-72.7455	6.3	27.6	5.5	27.6	2.6	1.2809	0.0065
SP2014014	4/21/2014	926	T	4	15:56	30	41.1503	-72.6949	6.8	25.4	5.8	27.5	2.6	1.2911	0.0065
SP2014015	4/22/2014	1328	T	2	8:20	30	41.2380	-72.5781	6.3	20.4	6.2	26.3	2.5	1.2717	0.0064
SP2014016	4/22/2014	1428	T	1	9:16	30	41.2472	-72.5800	6.6	23.8	6.2	26.0	2.8	1.4230	0.0072
SP2014017	4/22/2014	924	T	3	10:59	30	41.1720	-72.7795	6.7	26.6	5.9	27.1	3.1	1.5670	0.0079
SP2014018	4/22/2014	523	M	4	12:10	30	41.0908	-72.7973	7.5	27.6	5.4	27.7	3.2	1.6138	0.0082
SP2014019	4/22/2014	221	M	4	13:23	30	41.0425	-72.8856	7.6	27.5	4.7	27.8	3.1	1.5472	0.0078
SP2014020	4/28/2014	313	M	3	8:41	30	41.0633	-73.1986	7.1	26.3	6.6	27.1	3.4	1.6800	0.0085
SP2014021	4/28/2014	5911	M	3	10:49	30	40.9876	-73.3303	7.6	26.9	7.0	26.9	3.0	1.4951	0.0076
SP2014022	4/28/2014	212	M	3	11:54	30	41.0315	-73.2950	8.7	26.3	6.4	27.2	3.2	1.6102	0.0081
SP2014023	4/28/2014	511	M	2	13:08	17	41.0923	-73.3076	7.9	26.6	7.0	26.8	3.1	0.8877	0.0045
SP2014024	4/28/2014	512	M	2	14:00	20	41.0900	-73.3038	8.3	26.6	6.9	26.8	3.5	1.1527	0.0058
SP2014025	4/28/2014	417	T	3	15:48	30	41.0745	-73.0751	7.0	27.2	7.5	28.2	3.3	1.6498	0.0083
SP2014026	4/28/2014	519	M	3	16:41	21	41.0876	-73.0143	7.7	27.2	6.4	27.4	3.1	1.0850	0.0055
SP2014027	4/28/2014	717	M	2	18:10	30	41.1190	-73.0978	8.9	24.2	7.3	26.5	2.6	1.3077	0.0066
SP2014028	4/28/2014	918	T	2	19:07	30	41.1556	-73.0601	8.1	26.8	7.8	27.1	2.8	1.4054	0.0071
SP2014029	5/2/2014	1118	M	1	6:38	30	41.1816	-73.0493	8.3	26.0	7.6	26.9	3.4	1.7122	0.0087
SP2014030	5/2/2014	1019	T	2	7:38	16	41.1652	-73.0198	7.9	26.5	7.2	27.1	3.1	0.8309	0.0042
SP2014031	5/2/2014	1320	M	1	8:52	30	41.2023	-72.9907	9.0	25.1	7.5	26.9	3.2	1.5753	0.0080
SP2014032	5/2/2014	1221	T	2	9:56	23	41.2085	-72.9211	8.2	25.9	7.8	26.6	2.8	1.0607	0.0054
SP2014033	5/2/2014	922	M	3	11:06	30	41.1663	-72.8511	7.5	27.2	7.1	27.1	3.0	1.4798	0.0075
SP2014034	5/2/2014	521	M	4	12:33	30	41.0883	-72.9145	8.1	27.2	7.3	26.4	2.7	1.3267	0.0067
SP2014035	5/2/2014	622	M	4	13:20	30	41.0937	-72.8865	8.4	27.3	7.2	27.3	2.8	1.4011	0.0071
SP2014036	5/2/2014	623	M	4	14:16	30	41.1005	-72.8486	8.1	27.3	7.0	27.3	3.1	1.5524	0.0078
SP2014037	5/2/2014	724	T	4	15:08	30	41.1115	-72.7933	8.3	27.3	7.1	27.3	3.2	1.6115	0.0081
SP2014038	5/2/2014	1427	T	1	16:41	30	41.2358	-72.6572	7.8	25.8	7.2	26.7	3.9	1.9450	0.0098
SP2014039	5/2/2014	1332	S	1	18:01	30	41.2267	-72.4588	7.5	26.1	7.0	27.4	3.8	1.9085	0.0096
SP2014040	5/2/2014	1333	S	1	18:49	21	41.2317	-72.3876	7.6	25.8	7.4	26.9	2.0	0.6895	0.0035

Table 5.6. Station information for LISTS May 2014.

Standard LISTS tows in the spring begin with SP and fall begins with FA. Latitude (N) and Longitude (W) are displayed in decimal degrees. Surface and bottom temperature and salinity are labeled as S_ and B_, respectively. Area swept is estimated by assuming the effective sweep is 2/3rds of the footrope length.

Sample Number	Date	Site Number	Bottom Type	Depth Interval	Time Start	Duration (min)	Latitude	Longitude	S_Temp (sfc, C)	S_Salinity (sfc, ppt)	B_Temp (btm, C)	B_Salinity (btm, ppt)	Ave Speed (knots)	Distance (nm)	Area Swept (sq.nm)
SP2014041	5/12/2014	1336	T	4	7:30	30	41.2116	-72.2923	10.0	26.3	7.7	30.3	1.8	0.9110	0.0046
SP2014042	5/12/2014	1028	T	4	9:46	30	41.1765	-72.5742	8.5	28.0	8.4	28.2	3.2	1.6135	0.0082
SP2014043	5/12/2014	825	T	4	11:25	30	41.1493	-72.7036	10.3	26.3	8.0	27.7	2.8	1.3788	0.0070
SP2014044	5/12/2014	827	T	3	12:42	30	41.1317	-72.6664	11.6	26.2	8.2	27.6	3.6	1.7964	0.0091
SP2014045	5/13/2014	1534	T	1	7:10	18	41.2567	-72.3640	9.6	25.7	9.2	27.1	1.6	0.4938	0.0025
SP2014046	5/13/2014	128	T	2	9:47	30	41.0303	-72.5826	11.8	26.6	9.5	27.3	3.5	1.7352	0.0088
SP2014047	5/13/2014	5824	S	1	11:27	30	40.9810	-72.7325	12.4	26.4	8.4	27.0	3.0	1.5075	0.0076
SP2014048	5/13/2014	124	M	4	12:51	30	41.0192	-72.8021	12.1	26.3	7.5	27.3	3.0	1.5065	0.0076
SP2014049	5/13/2014	125	T	4	13:50	30	41.0108	-72.7428	12.1	26.3	7.7	27.2	3.1	1.5559	0.0079
SP2014050	5/14/2014	1434	S	1	7:08	30	41.2308	-72.4005	10.5	18.3	9.3	27.0	1.7	0.8282	0.0042
SP2014051	5/14/2014	929	S	3	8:43	30	41.1638	-72.5291	10.4	27.3	9.3	27.9	3.6	1.7834	0.0090
SP2014052	5/14/2014	428	S	3	10:03	30	41.0822	-72.5785	10.0	27.4	9.4	27.7	3.7	1.8284	0.0092
SP2014053	5/14/2014	327	T	3	11:17	30	41.0510	-72.6855	12.3	26.4	8.6	27.3	2.8	1.3943	0.0070
SP2014054	5/14/2014	629	S	4	12:44	30	41.1027	-72.5544	11.0	27.2	9.3	27.9	2.9	1.4609	0.0074
SP2014055	5/14/2014	931	S	4	13:58	30	41.1493	-72.4987	10.0	27.8	9.1	28.3	3.2	1.6174	0.0082
SP2014056	5/15/2014	1127	T	3	8:56	30	41.1945	-72.5922	10.7	27.1	9.1	27.7	3.8	1.9022	0.0096
SP2014057	5/15/2014	924	T	3	9:54	30	41.1708	-72.7811	11.7	26.8	10.3	26.6	2.7	1.3274	0.0067
SP2014058	5/15/2014	722	M	3	11:11	30	41.1310	-72.8453	12.7	26.0	8.4	27.2	3.3	1.6520	0.0083
SP2014059	5/15/2014	821	M	3	12:22	30	41.1063	-72.9141	12.7	26.0	8.2	27.1	3.2	1.5863	0.0080
SP2014060	5/15/2014	1022	M	2	13:38	30	41.1808	-72.8455	12.6	26.7	9.8	26.8	3.3	1.6709	0.0084
SP2014061	5/15/2014	1020	T	2	15:12	30	41.1825	-72.9109	13.0	25.9	9.8	26.7	2.6	1.2892	0.0065
SP2014062	5/19/2014	514	M	2	8:24	30	41.0981	-73.1593	12.0	24.6	9.3	26.5	2.9	1.4688	0.0074
SP2014063	5/19/2014	511	M	2	9:32	30	41.1012	-73.2620	12.5	25.5	9.5	26.4	3.2	1.6219	0.0082
SP2014064	5/19/2014	210	T	2	10:40	30	41.0461	-73.3156	12.7	25.4	11.4	25.9	3.2	1.5777	0.0080
SP2014065	5/19/2014	5709	S	2	12:08	18	40.9488	-73.4070	13.1	25.7	12.9	25.8	2.7	0.8108	0.0041
SP2014066	5/19/2014	5513	S	2	14:52	30	40.9236	-73.2488	13.6	25.8	13.2	25.9	3.1	1.5641	0.0079
SP2014067	5/19/2014	5713	T	2	15:53	30	40.9551	-73.2549	13.6	25.8	10.7	26.3	3.2	1.5968	0.0081
SP2014068	5/20/2014	517	T	3	8:10	30	41.1048	-73.0273	12.6	25.9	8.4	26.8	2.6	1.3132	0.0066
SP2014069	5/20/2014	112	M	4	9:58	30	41.0265	-73.2382	13.2	25.0	8.5	26.7	3.1	1.5374	0.0078
SP2014070	5/20/2014	114	M	4	11:11	30	41.0092	-73.2231	13.2	24.8	8.5	26.8	2.7	1.3546	0.0068
SP2014071	5/20/2014	5918	M	3	12:51	30	40.9848	-73.0361	13.1	26.2	10.3	26.5	2.6	1.3189	0.0067
SP2014072	5/20/2014	5921	M	3	14:05	30	40.9880	-72.9135	12.9	26.3	12.2	26.4	2.6	1.2800	0.0065
SP2014073	5/21/2014	1118	M	1	7:41	30	41.1915	-73.0179	11.6	26.3	10.9	26.4	2.8	1.4229	0.0072
SP2014074	5/21/2014	719	M	3	10:01	30	41.1252	-72.9684	13.1	26.0	8.7	26.7	2.9	1.4694	0.0074
SP2014075	5/21/2014	119	M	4	11:31	30	41.0200	-73.0071	13.8	26.1	8.4	27.0	2.7	1.3282	0.0067
SP2014076	5/21/2014	121	M	4	13:20	30	41.0138	-72.9335	14.0	26.3	8.6	26.9	2.5	1.2750	0.0064
SP2014077	5/22/2014	1225	T	2	8:49	30	41.1961	-72.7768	12.7	27.0	11.2	27.1	3.8	1.8910	0.0096
SP2014078	5/22/2014	1425	M	1	10:18	7	41.2375	-72.7283	11.9	27.0	11.8	27.0	2.7	0.3135	0.0016
SP2014079	5/22/2014	1427	T	1	12:20	30	41.2368	-72.6615	11.9	27.0	11.8	27.0	3.2	1.6075	0.0081
SP2014080	5/22/2014	1428	T	1	13:33	30	41.2355	-72.6403	12.0	26.8	11.6	26.9	2.6	1.2907	0.0065

Table 5.7. Station information for LISTS June 2014.

Standard LISTS tows in the spring begin with SP and fall begins with FA. Latitude (N) and Longitude (W) are displayed in decimal degrees. Surface and bottom temperature and salinity are labeled as S_ and B_, respectively. Area swept is estimated by assuming the effective sweep is 2/3rds of the footrope length.

Sample Number	Date	Site Number	Bottom Type	Depth Interval	Time Start	Duration (min)	Latitude	Longitude	S_Temp (sfc, C)	S_Salinity (sfc, ppt)	B_Temp (btm, C)	B_Salinity (btm, ppt)	Ave Speed (knots)	Distance (nm)	Area Swept (sq.nm)
SP2014081	6/9/2014	1738	T	2	7:58	30	41.2860	-72.1976	15.2	29.1	14.7	29.6	3.2	1.5993	0.0081
SP2014082	6/9/2014	1235	T	4	9:48	30	41.2126	-72.2692	15.8	26.9	13.3	30.5	2.2	1.1180	0.0057
SP2014083	6/9/2014	330	S	1	12:21	30	41.0618	-72.4973	16.9	26.4	15.8	26.7	2.4	1.1868	0.0060
SP2014084	6/9/2014	5825	S	1	14:24	30	40.9848	-72.7281	17.3	25.7	17.0	25.8	3.3	1.6747	0.0085
SP2014085	6/10/2014	831	S	4	7:46	30	41.1440	-72.4481	15.9	27.1	13.4	28.8	3.5	1.7717	0.0090
SP2014086	6/10/2014	426	T	3	9:39	30	41.0677	-72.6955	17.8	25.9	13.1	27.6	3.2	1.5853	0.0080
SP2014087	6/10/2014	529	S	3	10:55	30	41.0905	-72.5854	17.6	26.2	13.6	28.4	3.3	1.6424	0.0083
SP2014088	6/10/2014	430	T	3	12:11	30	41.0793	-72.5393	17.0	26.4	13.6	28.3	3.8	1.8760	0.0095
SP2014089	6/11/2014	1432	S	2	7:11	30	41.2328	-72.3953	14.3	28.3	14.4	28.3	3.6	1.8028	0.0091
SP2014090	6/11/2014	931	S	4	8:34	30	41.1610	-72.4445	15.8	27.0	13.8	28.8	3.9	1.9598	0.0099
SP2014091	6/11/2014	729	S	3	10:21	21	41.1147	-72.5811	16.5	26.5	14.2	28.3	2.4	0.8573	0.0043
SP2014092	6/11/2014	229	T	2	12:06	30	41.0363	-72.6064	15.7	26.4	13.5	27.7	3.1	1.5425	0.0078
SP2014093	6/16/2014	1228	T	3	8:02	30	41.2125	-72.5608	15.3	27.6	15.2	27.8	2.8	1.4032	0.0071
SP2014094	6/16/2014	725	T	4	11:19	30	41.1278	-72.6992	16.6	27.1	13.0	27.1	.	.	.
SP2014095	6/16/2014	623	M	4	12:37	30	41.1107	-72.8003	15.1	27.0	13.5	27.5	3.6	1.8107	0.0091
SP2014096	6/16/2014	422	M	4	14:08	30	41.0760	-72.8477	15.2	27.0	13.9	27.5	3.2	1.5869	0.0080
SP2014097	6/17/2014	714	T	1	8:24	30	41.1303	-73.1396	18.2	25.1	17.6	25.5	3.0	1.4751	0.0075
SP2014098	6/17/2014	210	T	2	11:40	30	41.0395	-73.3650	17.9	25.7	13.6	26.1	2.5	1.2475	0.0063
SP2014099	6/17/2014	512	M	2	12:50	30	41.0988	-73.2570	18.7	25.7	15.3	26.0	2.9	1.4280	0.0072
SP2014100	6/17/2014	511	M	2	14:18	20	41.1010	-73.2673	20.3	25.6	15.0	26.0	3.5	1.1522	0.0058
SP2014101	6/18/2014	617	T	2	8:00	30	41.1126	-73.0411	17.0	26.0	12.5	26.5	2.3	1.1749	0.0059
SP2014102	6/18/2014	312	M	3	9:50	30	41.0637	-73.2346	19.2	25.8	13.6	26.2	2.9	1.4416	0.0073
SP2014103	6/18/2014	11	M	4	11:59	30	41.0077	-73.3401	17.8	25.6	12.7	26.3	2.7	1.3375	0.0068
SP2014104	6/18/2014	5513	S	2	13:24	30	40.9268	-73.2478	18.9	25.6	17.8	25.6	2.1	1.0519	0.0053
SP2014105	6/18/2014	5912	M	3	14:49	30	40.9875	-73.2957	18.8	25.6	14.4	26.0	2.8	1.4052	0.0071
SP2014106	6/19/2014	1320	M	1	7:38	30	41.2067	-72.9930	17.0	26.2	14.6	26.4	3.5	1.7342	0.0088
SP2014107	6/19/2014	519	M	3	9:21	30	41.0970	-72.9711	17.6	26.2	12.7	26.8	2.9	1.4378	0.0073
SP2014108	6/19/2014	21	M	3	10:59	30	41.0105	-72.8778	18.1	25.8	13.4	27.3	3.2	1.5928	0.0080
SP2014109	6/19/2014	5922	M	3	12:30	30	40.9918	-72.8373	18.0	25.8	13.9	26.7	3.4	1.6844	0.0085
SP2014110	6/19/2014	118	M	4	13:56	30	41.0305	-73.0023	17.9	25.9	13.7	27.4	3.2	1.5948	0.0081
SP2014111	6/20/2014	321	M	4	8:33	30	41.0530	-72.9257	18.3	26.2	14.4	27.4	3.6	1.7844	0.0090
SP2014112	6/20/2014	924	T	3	10:02	30	41.1353	-72.7675	18.1	26.3	15.3	27.5	3.1	1.5424	0.0078
SP2014113	6/20/2014	1026	T	4	11:43	30	41.1757	-72.6481	17.7	26.5	15.5	27.6	2.7	1.3272	0.0067
SP2014114	6/23/2014	1022	M	2	8:25	30	41.1705	-72.8828	18.7	26.4	14.7	27.1	3.2	1.5870	0.0080
SP2014115	6/23/2014	925	T	4	9:49	30	41.1637	-72.7236	19.3	26.6	16.2	27.8	3.1	1.5672	0.0079
SP2014116	6/23/2014	1125	T	3	12:06	30	41.1591	-72.7081	19.9	26.5	16.1	27.8	3.1	1.5346	0.0078
SP2014117	6/23/2014	1325	T	2	13:25	30	41.2278	-72.7246	18.2	27.2	17.3	27.2	2.8	1.3867	0.0070
SP2014118	6/24/2014	1322	T	1	8:19	30	41.2213	-72.8828	18.8	26.8	17.2	27.0	2.9	1.4662	0.0074
SP2014119	6/24/2014	1425	M	1	10:39	20	41.2372	-72.7314	18.1	27.2	18.1	27.4	3.4	1.1412	0.0058
SP2014120	6/24/2014	1427	T	1	11:51	30	41.2363	-72.6602	18.2	27.5	17.7	27.7	3.9	1.9445	0.0098

Table 5.8. Station information for LISTS September 2014.

Standard LISTS tows in the spring begin with SP and fall begins with FA. Latitude (N) and Longitude (W) are displayed in decimal degrees. Surface and bottom temperature and salinity are labeled as S_ and B_, respectively. Area swept is estimated by assuming the effective sweep is 2/3rds of the footrope length.

Sample Number	Date	Site Number	Bottom Type	Depth Interval	Time Start	Duration (min)	Latitude	Longitude	S_Temp (sfc, C)	S_Salinity (sfc, ppt)	B_Temp (btm, C)	B_Salinity (btm, ppt)	Ave Speed (knots)	Distance (nm)	Area Swept (sq.nm)
FA2014001	9/9/2014	1738	T	2	8:43	30	41.2828	-72.2036	21.2	30.4	21.0	30.4	2.4	1.2122	0.0061
FA2014002	9/9/2014	1840	T	1	11:21	30	41.3298	-72.0856	20.8	29.8	20.2	30.5	3.1	1.5656	0.0079
FA2014003	9/11/2014	830	S	4	7:55	30	41.1480	-72.4853	22.1	28.6	21.8	28.9	3.2	1.6082	0.0081
FA2014004	9/11/2014	328	T	3	9:27	30	41.0616	-72.5876	22.3	28.5	22.2	28.6	3.8	1.9190	0.0097
FA2014005	9/11/2014	123	M	4	10:59	30	41.0375	-72.7970	22.7	27.7	21.7	28.4	3.3	1.6614	0.0084
FA2014006	9/11/2014	5823	S	1	12:23	30	40.9810	-72.8245	22.1	28.1	22.0	28.1	3.3	1.6389	0.0083
FA2014007	9/11/2014	226	T	3	13:48	30	41.0373	-72.6905	22.6	28.3	22.3	28.5	3.3	1.6290	0.0082
FA2014008	9/11/2014	128	T	2	15:01	30	41.0201	-72.6385	22.5	28.3	22.3	28.5	3.8	1.8838	0.0095
FA2014009	9/12/2014	1336	T	4	7:22	30	41.2253	-72.2426	21.0	29.6	20.7	30.0	2.3	1.1568	0.0058
FA2014010	9/12/2014	629	S	4	9:36	30	41.1135	-72.5006	22.0	28.7	22.0	28.7	3.3	1.6496	0.0083
FA2014011	9/12/2014	325	T	3	11:09	30	41.0641	-72.7070	22.3	28.1	22.0	28.4	3.7	1.8269	0.0092
FA2014012	9/12/2014	525	T	4	12:24	30	41.0840	-72.7667	22.6	28.0	22.1	28.3	2.4	1.2036	0.0061
FA2014013	9/12/2014	828	S	3	13:56	30	41.1373	-72.6146	22.2	28.9	22.0	28.9	2.7	1.3411	0.0068
FA2014014	9/12/2014	1029	S	3	15:06	30	41.1638	-72.5888	22.3	28.8	21.7	29.1	3.2	1.5949	0.0081
FA2014015	9/15/2014	1228	T	3	8:11	30	41.2137	-72.5510	21.1	28.6	20.7	28.9	2.3	1.1747	0.0059
FA2014016	9/15/2014	623	M	4	12:13	30	41.1111	-72.7953	21.9	27.9	21.5	28.1	3.5	1.7453	0.0088
FA2014017	9/15/2014	523	M	4	13:35	30	41.0805	-72.8508	22.0	27.8	21.7	28.2	2.5	1.2390	0.0063
FA2014018	9/15/2014	824	T	4	15:04	30	41.1275	-72.8065	22.3	28.2	21.8	28.4	2.6	1.2811	0.0065
FA2014019	9/16/2014	1332	S	1	7:22	30	41.2311	-72.3991	20.3	29.1	20.3	29.3	1.8	0.9218	0.0047
FA2014020	9/16/2014	926	T	4	9:27	30	41.1645	-72.6320	21.4	28.4	21.5	28.6	2.4	1.2161	0.0061
FA2014021	9/16/2014	1024	T	3	10:42	30	41.1837	-72.7308	21.5	28.1	21.5	28.1	2.7	1.3576	0.0069
FA2014022	9/16/2014	1123	M	2	11:52	30	41.1915	-72.7881	21.4	27.9	21.4	27.9	3.1	1.5250	0.0077
FA2014023	9/16/2014	920	T	2	13:25	30	41.1642	-72.9235	21.0	27.6	20.9	27.6	3.4	1.6838	0.0085
FA2014024	9/16/2014	919	T	2	14:43	30	41.1507	-72.9905	21.4	27.6	21.2	27.6	2.8	1.3858	0.0070
FA2014025	9/17/2014	615	M	2	8:20	30	41.0905	-73.1498	21.2	27.5	21.2	27.6	2.9	1.4633	0.0074
FA2014026	9/17/2014	611	M	1	9:45	30	41.1108	-73.2733	20.9	27.2	20.9	27.2	3.2	1.5805	0.0080
FA2014027	9/17/2014	5709	S	2	11:40	30	40.9468	-73.4084	21.6	27.1	21.4	27.1	3.1	1.5585	0.0079
FA2014028	9/17/2014	5912	M	3	13:17	30	40.9853	-73.3021	21.8	27.4	21.8	27.6	3.0	1.5182	0.0077
FA2014029	9/17/2014	5513	S	2	14:48	30	40.9248	-73.2523	22.0	27.1	20.9	27.0	3.1	1.5731	0.0079
FA2014030	9/17/2014	5914	M	4	16:06	27	40.9930	-73.2029	22.3	27.4	21.9	27.8	2.7	1.2285	0.0062
FA2014031	9/18/2014	1020	T	2	8:35	30	41.1815	-72.9251	20.6	27.6	20.6	27.7	3.1	1.5347	0.0078
FA2014032	9/18/2014	620	M	3	9:51	30	41.1158	-72.9310	21.4	28.0	21.6	28.2	2.8	1.4152	0.0072
FA2014033	9/18/2014	5917	M	3	11:43	30	40.9923	-73.0558	21.6	27.8	21.6	28.2	3.3	1.6447	0.0083
FA2014034	9/18/2014	118	M	4	13:19	20	41.0230	-73.0510	22.0	27.9	21.6	28.3	2.9	0.9541	0.0048
FA2014035	9/18/2014	518	M	3	14:44	30	41.0903	-73.0566	22.5	27.8	21.5	28.6	3.0	1.4934	0.0075
FA2014036	9/18/2014	719	M	3	15:57	30	41.1153	-73.0173	21.5	27.7	21.5	28.1	2.9	1.4431	0.0073
FA2014037	9/23/2014	1119	M	2	7:43	30	41.1883	-73.0049	20.4	27.6	20.3	27.6	2.9	1.4466	0.0073
FA2014038	9/23/2014	1320	M	1	9:15	30	41.2075	-72.9825	20.3	27.5	20.1	27.5	3.2	1.5818	0.0080
FA2014039	9/23/2014	1322	T	1	10:37	30	41.2228	-72.8733	20.0	27.6	20.1	27.6	3.1	1.5253	0.0077
FA2014040	9/23/2014	1428	T	1	12:28	30	41.2375	-72.6310	20.5	28.6	20.3	28.8	4.0	1.9970	0.0101

Table 5.9. Station information for LISTS October 2014.

Standard LISTS tows in the spring begin with SP and fall begins with FA. Latitude (N) and Longitude (W) are displayed in decimal degrees. Surface and bottom temperature and salinity are labeled as S_ and B_, respectively. Area swept is estimated by assuming the effective sweep is 2/3rds of the footrope length

Sample Number	Date	Site Number	Bottom Type	Depth Interval	Time Start	Duration (min)	Latitude	Longitude	S_Temp (sfc, C)	S_Salinity (sfc, ppt)	B_Temp (btm, C)	B_Salinity (btm, ppt)	Ave Speed (knots)	Distance (nm)	Area Swept (sq.nm)
FA2014041	10/14/2014	1332	S	1	7:37	30	41.2320	-72.3956	17.9	29.0	18.1	29.7	2.2	1.0957	0.0055
FA2014042	10/14/2014	1027	T	4	9:44	30	41.1808	-72.6466	18.3	28.4	18.2	28.8	2.7	1.3613	0.0069
FA2014043	10/14/2014	624	T	4	11:12	30	41.1187	-72.7563	18.6	28.4	18.4	28.8	3.2	1.5909	0.0080
FA2014044	10/14/2014	5921	M	3	12:56	30	41.0000	-72.8583	18.6	28.2	18.6	28.2	2.8	1.3879	0.0070
FA2014045	10/15/2014	1118	M	1	7:48	30	41.1898	-73.0222	17.6	27.6	17.6	27.6	2.9	1.4472	0.0073
FA2014046	10/15/2014	15	T	4	9:48	30	41.0083	-73.1256	18.8	27.9	18.8	28.5	2.6	1.2945	0.0065
FA2014047	10/15/2014	5613	T	2	11:57	30	40.9493	-73.1891	18.2	27.5	19.0	28.0	3.0	1.4966	0.0076
FA2014048	10/15/2014	5513	S	2	13:47	30	40.9280	-73.2540	18.5	27.4	18.0	27.5	3.1	1.5696	0.0079
FA2014049	10/16/2014	5920	M	2	9:19	30	40.9851	-72.9490	19.0	28.0	19.0	28.0	3.4	1.7108	0.0086
FA2014050	10/16/2014	5923	M	3	10:42	30	40.9870	-72.8038	18.8	27.6	18.7	28.3	3.2	1.6217	0.0082
FA2014051	10/16/2014	5925	T	1	12:29	30	41.0020	-72.7085	18.8	28.1	18.8	28.2	3.3	1.6267	0.0082
FA2014052	10/17/2014	714	T	1	8:17	30	41.1313	-73.1349	18.4	27.2	18.5	27.6	2.6	1.2754	0.0064
FA2014053	10/17/2014	612	M	1	9:39	30	41.1100	-73.2678	18.6	27.5	18.8	27.8	2.7	1.3608	0.0069
FA2014054	10/17/2014	511	M	2	10:53	30	41.1017	-73.2643	18.6	27.6	18.5	27.8	2.8	1.3767	0.0070
FA2014055	10/17/2014	412	M	2	12:21	23	41.0660	-73.3085	18.7	27.8	18.7	27.9	3.0	1.1341	0.0057
FA2014056	10/20/2014	211	T	2	9:09	30	41.0498	-73.3044	18.1	27.8	18.3	28.1	2.8	1.3760	0.0070
FA2014057	10/20/2014	5911	M	3	11:18	30	41.0010	-73.2738	18.1	27.6	18.4	28.0	2.7	1.3368	0.0068
FA2014058	10/20/2014	17	M	4	13:37	30	41.0067	-73.0760	18.1	27.8	18.3	28.5	2.8	1.4113	0.0071
FA2014059	10/21/2014	118	M	4	8:40	30	41.0210	-73.0478	18.1	28.0	18.4	28.6	2.6	1.2822	0.0065
FA2014060	10/21/2014	222	M	4	10:36	30	41.0322	-72.8888	17.7	28.2	18.1	28.8	2.9	1.4692	0.0074
FA2014061	10/21/2014	5919	M	3	13:53	30	40.9900	-73.0358	18.0	27.9	18.1	28.1	3.4	1.6762	0.0085
FA2014062	10/28/2014	1432	S	2	7:26	30	41.2338	-72.3904	16.2	28.5	16.5	29.2	2.5	1.2679	0.0064
FA2014063	10/28/2014	1126	T	3	9:33	30	41.1995	-72.6628	16.0	28.7	16.1	28.8	3.3	1.6286	0.0082
FA2014064	10/28/2014	419	M	4	11:51	30	41.0758	-72.9691	16.8	28.1	16.7	28.2	3.4	1.7195	0.0087
FA2014065	10/28/2014	1029	S	3	15:04	30	41.1587	-72.5986	16.7	29.0	16.8	29.1	3.0	1.5082	0.0076
FA2014066	10/29/2014	1737	T	1	7:42	30	41.2903	-72.1965	16.6	30.5	16.6	30.6	3.2	1.6059	0.0081
FA2014067	10/29/2014	1533	S	1	9:46	30	41.2563	-72.3738	16.3	27.7	16.6	29.0	2.6	1.3042	0.0066
FA2014068	10/29/2014	630	S	4	12:06	30	41.1071	-72.4960	16.6	28.6	16.5	28.9	3.0	1.4764	0.0075
FA2014069	10/29/2014	526	T	3	14:29	30	41.1002	-72.6331	16.9	28.4	16.7	28.9	3.4	1.6863	0.0085
FA2014070	10/30/2014	1235	T	4	7:27	30	41.2140	-72.2636	16.4	29.9	16.5	30.9	1.8	0.8953	0.0045
FA2014071	10/30/2014	430	T	3	9:54	30	41.0862	-72.4915	16.0	28.4	16.4	28.9	2.8	1.3869	0.0070
FA2014072	10/30/2014	325	T	3	11:40	30	41.0652	-72.7001	16.3	28.8	16.3	29.0	3.3	1.6604	0.0084
FA2014073	10/30/2014	623	M	4	13:19	24	41.0977	-72.8477	16.4	28.3	16.7	28.7	2.5	0.9834	0.0050
FA2014074	10/31/2014	1124	T	2	9:07	30	41.2011	-72.7343	15.7	28.8	15.7	28.8	2.8	1.3912	0.0070
FA2014075	10/31/2014	821	M	3	10:55	30	41.1088	-72.9043	16.3	28.3	16.3	28.3	3.1	1.5325	0.0077
FA2014076	10/31/2014	1224	T	2	12:54	30	41.1958	-72.8143	16.0	28.0	16.1	28.3	2.9	1.4546	0.0074
FA2014077	11/4/2014	228	T	2	8:36	30	41.0427	-72.5558	14.3	28.6	14.3	28.6	2.5	1.2545	0.0063
FA2014078	11/4/2014	527	T	3	10:23	30	41.0918	-72.6603	15.0	28.5	14.9	28.5	3.7	1.8696	0.0094
FA2014079	11/4/2014	828	S	3	12:26	28	41.1393	-72.6155	15.0	28.6	14.9	28.7	3.0	1.4177	0.0072

Table 5.10. Samples with non-standard tow durations and reasons for incomplete tows, spring and fall 2014.
Standard LISTS tows begin with SP (spring) or FA (fall).

Sample	Date	Site	Bottom Type	Depth Interval	Time	Duration	Reason	Comments
APRIL								
SP2014023	4/28/2014	0511	M	2	13:08	17	speed drop	speed dropped but net seemed to pop off hang during haul-back; one old pot in net
SP2014024	4/28/2014	0512	M	2	14:00	20	pots	snagged string of pots with submerged buoy weighted down by mussels
SP2014026	4/28/2014	0519	M	3	16:41	21	pots	snagged string of old gear (2011 trap tag)
SP2014030	5/2/2014	1019	T	2	7:38	16	hang	hang damaged the net; had to change nets
SP2014032	5/2/2014	1221	T	2	9:56	23	hang	came off during haul-back; no damage to net
SP2014040	5/2/2014	1333	S	1	18:49	21	speed drop	speed dropped but no gear or debris in net
MAY								
SP2014045	5/13/2014	1534	T	1	7:10	18	speed drop	net loaded up with debris and algae
SP2014065	5/19/2014	5709	S	2	12:08	18	pots	buoy on port door, active and ghost gear; tree limbs in net; damage to net
SP2014078	5/22/2014	1425	M	1	10:18	7	hangs	2 attempts; kept hanging up on bottom; snagged large section of rigid pipe; significant damage to net; had to change nets
JUNE								
SP2014091	6/11/2014	0729	S	3	10:21	21	pots	2 attempts; 1st part speed dropped but no gear or debris in net; 2nd attempt buoy tangled with door, no pots onboard
SP2014100	6/17/2014	0511	M	2	14:18	20	pots	ghost pots in net (trap tags from 2004)
SP2014119	6/24/2014	1425	M	1	10:39	20	hangs	2 attempts; hung on bottom; damage to net; changed net
SEPT								
FA2014030	9/17/2014	5914	M	4	16:06	27	speed drop	speed drop but no gear or debris on net
FA2014034	9/18/2014	0118	M	4	13:19	20	speed drop	speed drop but no gear or debris on net
OCT								
FA2014055	10/17/2018	0412	M	2	12:21	23	speed drop	speed drop but no gear or debris on net
FA2014073	10/30/2014	0623	M	4	13:19	24	pots	snagged active gear set N-S (2014 trap tags); re-tied pots
FA2014079	11/4/2014	0828	S	3	12:26	28	rough bottom	felt rough bottom just before boost, so hauled back
FA2014080	11/4/2014	1133	S	4	15:00	0	hnag / dunes	3 attempts; on third attempt substantial damage to net & ran out of daylight

Table 5.11. Data requests by month, 2014.

MONTH	REQUEST	ORGANIZATION OR PURPOSE
January		
	LISTS sturgeon catch data, 1984-2013	ASMFC
	LISTS squid indices & biological info	university
	LISTS BADD index for LISS	EPA
	LISTS sampling locations for dump site EIS (GIS)	EPA
February		
	LISTS BSB length frequencies	CT DEEP / ASMFC
	LISTS methodology	LeHigh University
	LISTS winter flounder age matrix & ESS indices, 1984-2013	CT DEEP
	LISTS winter flounder age matrix, 1984-2013	Dominion
	LISTS winter flounder age matrix	NMFS
	LISTS towpaths (GIS)	CT DOA Aquaculture
	LISTS tow points (GIS)	EPA
March		
	menhaden catch & indices from LISTS & seine surveys	Dominion
	LISTS summer flounder counts & lengths	NY DEC
	LISTS species indicators for LISS	EPA
	summary of CT DEEP trawl surveys in LIS	NMFS
	CT DEEP trawl survey data for SFL, WFL	NMFS
	LISTS BSB indices at length	ASMFC
	menhaden indices for LISTS, CT & Th riverine surveys	ASMFC
	LISTS site grid (GIS)	ASMFC
April		
	LISTS tautog age matrix, 1984-2012	ASMFC
	LISTS time-series warm/cold, lobster indices & species richness	CT CEQ
	LISTS count & biomass indices, 1984-2013	Normandeau Assoc.
	LISTS scup & fluke indices & age keys, 1984-2013	NMFS
	LISTS site grid (GIS)	ASMFC
May		
	LISTS catch data for BLF,BSB,PGY,RED,SFL,SQI,WFL,WHI,WPF	NOAA
	LISTS indices and SMD data, 1984-2013	NOAA
	LISTS site grid (GIS)	Uconn / CT DEEP
June		
July		
	LISTS lobster catch & length data, 2014	CT DEEP / media
August		
	LISTS lobster catch data, 1984-2013	Univ of Maine
September		
	LISTS BSB indices at length	ASMFC
	LISTS species distributions for 13 Priority GCN species (GIS)	CT DEEP
October		
November		
	LISTS abundance indices	CT news media
	black sea bass	CT DEEP / ASMFC
December		
	LISTS lobster catch & length data, 2014	CT DEEP / ASMFC
	LISTS tows, counts, lengths (1984-2013) flat files	NMFS NEFSC

Table 5.12. Sample requests by month, 2014.

MONTH	REQUEST	ORGANIZATION OR PURPOSE
April		
	squid & various finfish specimens for dissection class	Putnam High School
	various species for decomposition studies	UNH
	various species for microscopic tissue structure studies for spp ID	UNH
	dogfish for parasite studies	Uconn
	channeled and knobbed whelk (conch)	NY DEC
May		
	squid & various finfish specimens for dissection class	Putnam High School
	tautog tissue samples for DNA study	VIMS
	dogfish for parasite studies	Uconn
	channeled and knobbed whelk (conch)	NY DEC
	various species for decomposition studies	UNH
	various species for microscopic tissue structure studies for spp ID	UNH
	various critters for environmental outreach program	M.E.N.
June		
	channeled and knobbed whelk (conch)	NY DEC
	hermit crabs	UConn
July		
August		
September		
	channeled and knobbed whelk (conch)	NY DEC
	various species for fish biology lab	Uconn
October		
	channeled and knobbed whelk (conch)	NY DEC
	squid	CT DEEP - CARE
November		
	various fish species	CT DEEP - Encon Police

Table 5.13. List of finfish species observed in 2014.

Sixty finfish species were observed in 2014. (Bold type indicates new species). Since 1984, one hundred-six species of finfish have been identified in LISTS (see Appendix 5.1 for the full list of species).

Common Name	Scientific Name	Common Name	Scientific Name
anchovy, bay	Anchoa mitchilli	lookdown	Selene vomer
black sea bass	Centropristis striata	mackerel, Atlantic	Scomber scombrus
blue runner	Caranx crysos	menhaden, Atlantic	Brevoortia tyrannus
bluefish	Pomatomus saltatrix	moonfish	Selene setapinnis
butterfish	Peprilus triacanthus	perch, silver	Bairdiella chrysoura
cod, Atlantic	Gadus morhua	perch, white	Morone americana
corntefish, blue spotted	**Fistularia tabacaria**	pipefish, northern	Syngnathus fuscus
croaker, Atlantic	Micropogonias undulatus	puffer, northern	Sphoeroides maculatus
cunner	Tautogolabrus adspersus	rockling, fourbeard	Enchelyopus cimbrius
cusk-eel, striped	Ophidion marginatum	rudderfish, banded	Seriola zonata
dogfish, smooth	Mustelus canis	sand lance, American	Ammodytes americanus
dogfish, spiny	Squalus acanthias	scad, mackerel	Decapterus macarellus
drum, black	**Pogonias cromis**	scad, rough	Trachurus lathami
filefish, planehead	Monacanthus hispidus	scad, round	Decapterus punctatus
flounder, fourspot	Paralichthys oblongus	scup	Stenotomus chrysops
flounder, smallmouth	Etropus microstomus	sea raven	Hemitripterus americanus
flounder, summer	Paralichthys dentatus	searobin, northern	Prionotus carolinus
flounder, windowpane	Scophthalmus aquosus	searobin, striped	Prionotus evolans
flounder, winter	Pseudopleuronectes american	shad, American	Alosa sapidissima
goatfish, red	Mullus auratus	shad, hickory	Alosa mediocris
hake, red	Urophycis chuss	silverside, Atlantic	Menidia menidia
hake, silver	Merluccius bilinearis	skate, clearnose	Raja eglanteria
hake, spotted	Urophycis regia	skate, little	Leucoraja erinacea
herring, Atlantic	Clupea harengus	skate, winter	Leucoraja ocellata
herring, alewife	Alosa pseudoharengus	spot	Leiostomus xanthurus
herring, blueback	Alosa aestivalis	striped bass	Morone saxatilis
hogchoker	Trinectes maculatus	sturgeon, Atlantic	Acipenser oxyrinchus
jack, crevalle	Caranx hippos	tautog	Tautoga onitis
kingfish, northern	Menticirrhus saxatilis	toadfish, oyster	*Opsanus tau*
lizardfish, inshore	Synodus foetens	weakfish	*Cynoscion regalis*

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

Table 5.14. List of invertebrates observed in 2014.
In 2014, forty-two 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
Tubularia hydroids	Tubularia, spp.	mussel, blue	Mytilus edulis
anemones	anemomes spp.	mussel, ribbed	Geukensia demissa
arks	Noetia-Anadara spp.	northern moon snail	Lunatia heros
bryozoan, bushy	Phylum Bryozoa	oyster, common	Crassostrea virginica
bryozoan, rubbery	Alcyonidium verrilli	sea grape	Molgula spp.
clam, common razer	Ensis directus	sea urchin, purple	Arbacia punctulata
clam, hard clams	Artica-Mercinaria-Pitar sp.	shrimp, brown	Penaeus aztecus
clam, surf	Spisula solidissima	shrimp, coastal mud	Upogebia affinis
coral, star	Astrangia poculata	shrimp, ghost	Gilvossius setimanus
crab, mud	Family Xanthidae	shrimp, mantis	Squilla empusa
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
hydroid spp.	hydroid spp.	squid, longfin inshore	Loligo pealeii
jelly, comb	Phylum Ctenophora	starfish spp.	Asteriid spp.
jelly, water	Rhacostoma atlanticum	tunicates, misc	misc. class ascidiacea
jellyfish, lion's mane	Cyanea capillata	whelk, channeled	Busycotypus canaliculatus
lobster, American	Homarus americanus	whelk, knobbed	Busycon carica

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

Table 5.15. Total number and weight (kg) of finfish and invertebrates caught in 2014.

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 and American sand lance are not quantified. Number of tows (sample size)=199.

species	count	%	weight	%
butterfish	69,372	45.3	1,707.6	10.6
scup	45,705	29.9	5,161.4	31.9
weakfish	10,477	6.8	334.8	2.1
bluefish	4,457	2.9	522.7	3.2
northern searobin	2,584	1.7	225.9	1.4
striped searobin	2,544	1.7	1,020.8	6.3
moonfish	2,200	1.4	23.2	0.1
windowpane flounder	2,191	1.4	365.6	2.3
Atlantic herring	1,838	1.2	91.2	0.6
bay anchovy	1,424	0.9	9.4	0.1
winter flounder	1,372	0.9	459.7	2.8
black sea bass	1,295	0.8	543.3	3.4
smooth dogfish	1,197	0.8	2,799.2	17.3
summer flounder	859	0.6	567.4	3.5
fourspot flounder	820	0.5	145.0	0.9
little skate	770	0.5	428.2	2.6
Atlantic menhaden	723	0.5	267.8	1.7
alewife	555	0.4	43.2	0.3
spotted hake	505	0.3	59.5	0.4
red hake	398	0.3	33.5	0.2
silver hake	323	0.2	10.6	0.1
striped bass	255	0.2	407.5	2.5
hogchoker	246	0.2	27.8	0.2
tautog	194	0.1	192.5	1.2
American shad	162	0.1	12.3	0.1
smallmouth flounder	152	0.1	6.0	0.0
clearnose skate	104	0.1	207.7	1.3
winter skate	82	0.1	133.8	0.8
blueback herring	58	0.0	4.2	0.0
northern kingfish	51	0.0	3.2	0.0
hickory shad	30	0.0	10.5	0.1
inshore lizardfish	30	0.0	2.8	0.0
spot	20	0.0	1.8	0.0
spiny dogfish	15	0.0	62.2	0.4
Atlantic sturgeon	13	0.0	272.4	1.7
American sand lance	12	0.0	0.2	0.0
blue runner	10	0.0	0.9	0.0
northern puffer	10	0.0	1.3	0.0
striped cusk-eel	6	0.0	0.6	0.0
Atlantic cod	5	0.0	0.3	0.0
rough scad	5	0.0	0.5	0.0
planehead filefish	4	0.0	0.4	0.0
fourbeard rockling	4	0.0	0.4	0.0
crevalle jack	2	0.0	0.2	0.0
Atlantic croaker	2	0.0	0.2	0.0
cunner	2	0.0	0.2	0.0
Atlantic mackerel	2	0.0	0.2	0.0
silver perch	2	0.0	0.2	0.0
oyster toadfish	2	0.0	0.6	0.0
Atlantic silverside	1	0.0	0.1	0.0
black drum	1	0.0	0.1	0.0
blue spotted cornetfish	1	0.0	0.1	0.0
lookdown	1	0.0	0.1	0.0
mackerel scad	1	0.0	0.1	0.0
northern pipefish	1	0.0	0.1	0.0
round scad	1	0.0	0.1	0.0
red goatfish	1	0.0	0.1	0.0
banded rudderfish	1	0.0	0.4	0.0
sea raven	1	0.0	1.5	0.0
white perch	1	0.0	0.2	0.0
Total	**153,100**		**16,173.8**	

species	count	%	weight	%
Finfish not ranked				
anchovy spp, (yoy)				
Atlantic herring, (yoy)				
American sand lance (yoy)				
gadid spp, (yoy)				
Invertebrates				
longfin inshore squid	13,436	86.3	582.3	37.9
horseshoe crab	261	1.7	497.3	32.4
spider crab	nc		145.6	9.5
blue mussel	nc		52.2	3.4
lion's mane jellyfish	1,262	8.1	48.2	3.1
American lobster	178	1.1	31.5	2.1
bushy bryozoan	nc		24.8	1.6
mixed sponge species	nc		20.6	1.3
common slipper shell	nc		18.8	1.2
mantis shrimp	332	2.1	14.4	0.9
flat claw hermit crab	nc		14.0	0.9
knobbed whelk	34	0.2	12.3	0.8
lady crab	nc		9.3	0.6
sea grape	nc		7.3	0.5
channeled whelk	29	0.2	5.9	0.4
hydroid spp.	nc		5.3	0.3
rock crab	nc		4.8	0.3
northern moon snail	nc		4.6	0.3
Tubularia, spp.	nc		4.6	0.3
boring sponge	nc		4.3	0.3
sand shrimp	nc		4.1	0.3
blue crab	18	0.1	3.0	0.2
arks	nc		2.7	0.2
mud crabs	nc		2.6	0.2
starfish spp.	2	0.0	1.6	0.1
ribbed mussel	nc		1.6	0.1
comb jelly spp	nc		1.4	0.1
star coral	nc		0.7	0.0
purple sea urchin	4	0.0	0.6	0.0
surf clam	4	0.0	0.5	0.0
coastal mud shrimp	1	0.0	0.3	0.0
rubbery bryzoan	nc		0.3	0.0
tunicates, misc	nc		0.3	0.0
anemones	5	0.0	0.2	0.0
brown shrimp	2	0.0	0.2	0.0
common razor clam	1	0.0	0.2	0.0
hard clams	nc		0.2	0.0
common oyster	nc		0.2	0.0
red bearded sponge	nc		0.1	0.0
deadman's fingers sponge	nc		0.1	0.0
ghost shrimp	1	0.0	0.1	0.0
water jelly	1	0.0	0.1	0.0
Total	**15,571**		**1,529.2**	

Note: nc= not counted

Table 5.16. Total counts and weight (kg) of finfish taken in the spring and fall sampling periods, 2014.
Species are listed in order of descending count.. Young-of-year bay anchovy, striped anchovy, Atlantic herring and American sand lance are not included. Number of tows (sample sizes): Spring = 120 and Fall=79.

	Spring			
species	**count**	**%**	**weight**	**%**
scup	15,531	45.8	3,647.2	41.4
butterfish	3,352	9.9	216.4	2.5
Atlantic herring	1,835	5.4	90.9	1.0
northern searobin	1,756	5.2	201.8	2.3
windowpane flounder	1,746	5.1	309.3	3.5
striped searobin	1,690	5.0	698.2	7.9
winter flounder	1,244	3.7	431.9	4.9
black sea bass	1,058	3.1	412.2	4.7
bay anchovy	892	2.6	5.3	0.1
summer flounder	675	2.0	412.2	4.7
fourspot flounder	659	1.9	136.4	1.5
little skate	522	1.5	292.8	3.3
alewife	450	1.3	39.2	0.4
smooth dogfish	397	1.2	978.4	11.1
spotted hake	318	0.9	25.2	0.3
silver hake	309	0.9	9.4	0.1
red hake	275	0.8	18.5	0.2
Atlantic menhaden	269	0.8	109.7	1.2
striped bass	206	0.6	298.4	3.4
hogchoker	165	0.5	18.8	0.2
tautog	158	0.5	167.4	1.9
American shad	121	0.4	9.8	0.1
winter skate	68	0.2	110.1	1.2
blueback herring	48	0.1	3.7	0.0
clearnose skate	42	0.1	71.3	0.8
smallmouth flounder	32	0.1	2.0	0.0
hickory shad	24	0.1	8.0	0.1
weakfish	23	0.1	18.3	0.2
spiny dogfish	15	0.0	62.2	0.7
American sand lance	12	0.0	0.2	0.0
bluefish	6	0.0	7.4	0.1
striped cusk-eel	6	0.0	0.6	0.0
Atlantic cod	5	0.0	0.3	0.0
fourbeard rockling	4	0.0	0.4	0.0
silver perch	2	0.0	0.2	0.0
Atlantic silverside	1	0.0	0.1	0.0
northern puffer	1	0.0	0.1	0.0
sea raven	1	0.0	1.5	0.0
white perch	1	0.0	0.2	0.0
Total	**33,919**		**8,816.0**	

	Fall			
species	**count**	**%**	**weight**	**%**
butterfish	66,020	55.4	1,491.2	20.3
scup	30,174	25.3	1,514.2	20.6
weakfish	10,454	8.8	316.5	4.3
bluefish	4,451	3.7	515.3	7.0
moonfish	2,200	1.8	23.2	0.3
striped searobin	854	0.7	322.6	4.4
northern searobin	828	0.7	24.1	0.3
smooth dogfish	800	0.7	1,820.8	24.7
bay anchovy	532	0.4	4.1	0.1
Atlantic menhaden	454	0.4	158.1	2.1
windowpane flounder	445	0.4	56.3	0.8
little skate	248	0.2	135.4	1.8
black sea bass	238	0.2	131.1	1.8
spotted hake	187	0.2	34.3	0.5
summer flounder	184	0.2	155.2	2.1
fourspot flounder	161	0.1	8.6	0.1
winter flounder	128	0.1	27.8	0.4
red hake	123	0.1	15.0	0.2
smallmouth flounder	121	0.1	4.0	0.1
alewife	105	0.1	4.0	0.1
hogchoker	81	0.1	9.0	0.1
clearnose skate	62	0.1	136.4	1.9
northern kingfish	51	0.0	3.2	0.0
striped bass	49	0.0	109.1	1.5
American shad	40	0.0	2.5	0.0
tautog	36	0.0	25.1	0.3
inshore lizardfish	30	0.0	2.8	0.0
spot	20	0.0	1.8	0.0
silver hake	14	0.0	1.2	0.0
winter skate	14	0.0	23.7	0.3
Atlantic sturgeon	13	0.0	272.4	3.7
blueback herring	10	0.0	0.5	0.0
blue runner	10	0.0	0.9	0.0
northern puffer	9	0.0	1.2	0.0
hickory shad	6	0.0	2.5	0.0
rough scad	5	0.0	0.5	0.0
planehead filefish	4	0.0	0.4	0.0
Atlantic herring	3	0.0	0.3	0.0
crevalle jack	2	0.0	0.2	0.0
Atlantic croaker	2	0.0	0.2	0.0
cunner	2	0.0	0.2	0.0
Atlantic mackerel	2	0.0	0.2	0.0
oyster toadfish	2	0.0	0.6	0.0
black drum	1	0.0	0.1	0.0
blue spotted cornetfish	1	0.0	0.1	0.0
lookdown	1	0.0	0.1	0.0
mackerel scad	1	0.0	0.1	0.0
northern pipefish	1	0.0	0.1	0.0
round scad	1	0.0	0.1	0.0
red goatfish	1	0.0	0.1	0.0
banded rudderfish	1	0.0	0.4	0.0
Total	**119,182**		**7,357.8**	

Table 5.17. Total catch of invertebrates taken in the spring and fall sampling periods, 2014.
Species are ranked by total weight (kg). Number of tows (sample sizes): Spring = 120 and Fall=79.

	Spring				Fall				
species	**count**	**%**	**weight**	**%**	**species**	**count**	**%**	**weight**	**%**
horseshoe crab	175	5.2	329.4	37.8	longfin inshore squid	11,813	96.5	408.8	61.5
longfin inshore squid	1,623	48.7	173.5	19.9	horseshoe crab	86	0.7	167.9	25.3
spider crab	nc		136.1	15.6	blue mussel	nc		10.1	1.5
blue mussel	nc		42.1	4.8	mantis shrimp	239	2.0	10.1	1.5
lion's mane jellyfish	1,228	36.8	41.9	4.8	spider crab	nc		9.5	1.4
American lobster	167	5.0	27.8	3.2	knobbed whelk	22	0.2	8.7	1.3
bushy bryozoan	nc		23.5	2.7	common slipper shell	nc		8.7	1.3
mixed sponge species	nc		20.5	2.4	lady crab	nc		7.6	1.1
common slipper shell	nc		10.1	1.2	lion's mane jellyfish	34	0.3	6.3	0.9
flat claw hermit crab	nc		9.4	1.1	flat claw hermit crab	nc		4.6	0.7
sea grape	nc		7.2	0.8	boring sponge	nc		4.3	0.6
northern moon snail	nc		4.6	0.5	American lobster	11	0.1	3.7	0.6
channeled whelk	22	0.7	4.5	0.5	blue crab	15	0.1	2.7	0.4
Tubularia, spp.	nc		4.5	0.5	hydroid spp.	nc		2.2	0.3
mantis shrimp	93	2.8	4.3	0.5	channeled whelk	7	0.1	1.4	0.2
sand shrimp	nc		4.0	0.5	bushy bryozoan	nc		1.3	0.2
rock crab	nc		4.0	0.5	arks	nc		1.2	0.2
knobbed whelk	12	0.4	3.6	0.4	rock crab	nc		0.8	0.1
hydroid spp.	nc		3.1	0.4	mud crabs	nc		0.7	0.1
mud crabs	nc		1.9	0.2	starfish spp.	nc		0.5	0.1
lady crab	nc		1.7	0.2	surf clam	3	0.0	0.3	0.0
ribbed mussel	nc		1.6	0.2	brown shrimp	2	0.0	0.2	0.0
arks	nc		1.5	0.2	star coral	nc		0.2	0.0
comb jelly spp	nc		1.3	0.1	common razor clam	1	0.0	0.2	0.0
starfish spp.	2	0.0	1.1	0.1	common oyster	nc		0.2	0.0
star coral	nc		0.5	0.1	coastal mud shrimp	1	0.0	0.1	0.0
purple sea urchin	3	0.1	0.5	0.1	comb jelly spp	nc		0.1	0.0
blue crab	3	0.1	0.3	0.0	sand shrimp	nc		0.1	0.0
tunicates, misc	nc		0.3	0.0	deadman's fingers sponge	nc		0.1	0.0
anemones	5	0.2	0.2	0.0	rubbery bryzoan	nc		0.1	0.0
coastal mud shrimp	nc		0.2	0.0	sea grape	nc		0.1	0.0
hard clams	nc		0.2	0.0	mixed sponge species	nc		0.1	0.0
rubbery bryzoan	nc		0.2	0.0	Tubularia, spp.	nc		0.1	0.0
surf clam	1	0.0	0.2	0.0	purple sea urchin	1	0.0	0.1	0.0
red bearded sponge	nc		0.1	0.0	water jelly	1	0.0	0.1	0.0
ghost shrimp	1	0.0	0.1	0.0	**Total**	**12,236**		**663.2**	
Total	**3,335**		**866.0**						

Note: nc= not counted

Table 5.18. Spring indices of abundance for selected species, 1984-2014.

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																														
Species	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**84-13 Mean**
alewife *	0.43	0.10	0.66	1.00	0.47	0.72	0.54	0.39	0.39	0.84	1.83	0.96	2.18	1.44	1.11	1.89	1.53	0.75	0.95	1.14	1.86	1.30	0.78	1.62	1.32	1.04	1.29	0.94	0.77	1.06	0.88	1.04
black sea bass *	0.16	0.27	0.12	0.05	0.04	0.08	0.10	0.07	0.03	0.07	0.12	0.07	0.11	0.10	0.04	0.08	0.22	0.25	0.67	0.21	0.22	0.07	0.05	0.26	0.22	0.32	0.28	0.27	0.83	0.97	2.73	0.21
bluefish	0.00	0.02	0.19	0.07	0.11	0.07	0.09	0.52	0.31	0.05	0.07	0.03	0.07	0.18	0.12	0.24	0.08	0.07	0.30	0.16	0.11	0.11	0.22	0.16	0.08	0.24	0.01	0.17	0.07	0.11	0.03	
butterfish	8.92	0.62	2.38	0.25	0.46	0.80	1.60	2.17	2.60	0.48	1.71	1.06	3.22	6.16	6.51	1.90	3.35	2.94	7.09	3.17	2.10	2.27	18.67	3.48	4.64	9.44	1.99	15.64	13.44	3.38	2.87	
cunner *	1.28	0.29	0.28	0.22	0.16	0.29	0.55	0.25	0.11	0.20	0.07	0.16	0.07	0.15	0.18	0.18	0.17	0.20	0.25	0.11	0.07	0.08	0.06	0.05	0.10	0.05	0.08	0.08	0.06	0.06	0.00	0.20
dogfish, smooth	0.39	0.46	0.45	0.21	0.49	0.48	0.34	0.46	0.56	0.26	0.60	0.33	0.44	0.24	0.47	0.54	0.53	0.55	1.19	0.63	0.53	0.44	1.33	0.64	0.87	1.05	0.09	1.51	0.82	0.80	0.78	
dogfish, spiny *	0.00	0.15	0.14	0.07	0.12	0.18	0.19	0.06	0.04	0.01	0.06	0.00	0.00	0.01	0.01	0.01	0.00	0.04	0.02	0.03	0.03	0.03	0.09	0.12	0.07	0.43	0.03	0.19	0.06	0.08	0.06	0.08
flounder, fourspot *	18.18	10.55	3.15	2.38	4.62	4.14	6.53	8.46	9.33	2.37	2.59	5.00	4.82	7.54	4.34	3.53	4.57	3.83	4.82	2.78	2.56	1.14	1.86	3.37	2.94	1.71	1.52	4.09	5.45	2.26	1.90	4.68
flounder, summer	0.63	0.44	0.95	1.06	0.50	0.10	0.35	0.64	0.55	0.51	0.86	0.28	0.96	1.00	1.30	1.44	1.79	1.75	3.19	3.42	1.84	0.80	0.61	2.51	1.61	1.93	2.69	3.85	3.06	3.24	3.00	
flounder, windowpane *	172.27	119.82	67.82	40.33	66.02	101.71	39.74	30.87	13.17	24.71	23.54	10.69	37.47	30.43	24.27	14.19	8.11	9.04	5.44	4.90	5.96	2.29	2.98	15.65	10.11	7.08	11.40	9.39	9.85	5.96	5.02	30.84
flounder, winter *	111.96	66.81	61.50	67.92	100.96	135.23	170.12	118.95	54.31	53.34	74.35	48.11	93.05	57.41	59.36	32.80	33.67	46.40	25.49	21.22	16.45	17.47	7.50	20.58	22.34	18.98	20.88	16.68	12.02	6.35	4.10	53.07
hake, red *	15.04	3.02	4.67	3.84	3.64	13.12	4.75	4.35	4.83	6.00	0.89	4.12	1.49	1.41	6.28	7.21	4.01	2.64	5.11	1.18	1.37	1.06	1.30	3.85	3.37	1.48	3.27	0.60	3.35	1.35	0.70	3.95
hake, silver *	7.53	1.83	1.19	2.48	2.25	4.86	5.53	3.87	2.67	1.56	1.73	4.88	1.15	4.32	4.64	12.57	2.28	7.64	5.92	0.76	2.63	0.57	4.75	0.98	19.08	2.30	5.24	2.10	19.45	1.47	1.08	4.61
hake, spotted	0.00	0.00	0.02	0.01	0.22	0.01	0.02	0.22	0.08	0.07	0.02	0.21	0.31	0.25	0.26	1.11	2.68	1.52	2.05	1.18	0.65	0.37	1.47	1.04	3.15	0.65	1.89	1.84	1.60	2.15	1.03	
herring, Atlantic *	0.00	0.58	1.12	2.77	2.16	2.27	5.73	4.91	2.73	7.24	2.95	4.23	1.70	2.53	1.06	0.99	1.21	0.85	0.41	0.49	0.53	1.33	0.31	1.66	0.77	1.82	2.56	1.57	0.73	2.64	1.44	2.00
herring, blueback	5.42	0.30	0.34	0.14	0.03	0.05	0.08	0.11	0.20	0.08	0.55	0.29	0.28	0.25	0.15	0.02	0.37	0.19	0.15	0.27	0.46	0.33	0.13	0.29	0.21	0.43	0.37	0.14	0.13	0.26	0.15	
hogchoker	0.63	0.45	0.14	0.15	0.18	0.21	0.17	0.14	0.24	0.08	0.11	0.03	0.10	0.05	0.03	0.06	0.11	0.10	0.15	0.15	0.19	0.11	0.08	0.17	0.13	0.11	0.15	0.24	0.29	0.32	0.40	
kingfish, northern	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.01	0.00	
lobster, American**	7.09	3.10	2.76	3.30	2.24	3.76	5.33	7.74	7.88	6.72	4.10	8.36	6.77	7.67	18.52	12.49	11.01	7.56	6.31	3.89	2.50	2.43	1.94	3.22	2.72	1.40	1.30	0.79	0.97	0.44	0.45	5.14
menhaden, Atlantic	0.09	0.11	0.18	0.39	0.17	0.14	0.10	0.03	0.14	0.07	0.05	0.11	0.02	0.02	0.00	0.01	0.03	0.00	0.13	0.01	0.02	0.01	0.04	0.13	0.05	0.07	0.05	0.11	0.63	0.37	0.62	
moonfish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
ocean pout *	0.21	0.04	0.06	0.06	0.07	0.12	0.14	0.14	0.14	0.23	0.10	0.09	0.11	0.08	0.06	0.06	0.08	0.03	0.06	0.06	0.06	0.02	0.04	0.05	0.04	0.08	0.04	0.10	0.05	0.00	0.00	0.08
rockling, fourbeard*	2.87	0.37	0.43	0.56	0.61	0.88	0.82	0.58	0.80	0.59	0.27	0.58	0.33	0.60	0.47	0.66	0.55	0.57	0.37	0.36	0.48	0.35	0.09	0.35	0.26	0.18	0.17	0.19	0.16	0.02	0.02	0.52
scad, rough	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.01	0.00	0.00	0.00	
sculpin, longhorn *	0.20	0.33	0.18	0.15	0.15	0.24	0.65	0.39	0.12	0.06	0.04	0.03	0.04	0.02	0.01	0.01	0.06	0.02	0.02	0.01	0.03	0.00	0.00	0.02	0.01	0.01	0.01	0.04	0.01	0.01	0.00	0.10
scup	2.80	5.65	3.40	1.17	1.11	2.77	2.25	3.09	1.75	1.32	1.88	5.24	3.25	3.23	4.25	2.22	28.46	7.20	50.42	4.84	8.12	3.48	59.05	10.00	19.87	21.92	6.88	22.34	50.24	14.23	14.96	11.75
sea raven*	0.36	0.37	0.29	0.37	0.17	0.11	0.19	0.09	0.03	0.01	0.01	0.01	0.01	0.01	0.10	0.04	0.08	0.04	0.06	0.01	0.04	0.02	0.00	0.03	0.00	0.02	0.05	0.02	0.02	0.00	0.01	0.09
searobin, northern *	6.48	14.38	0.82	0.71	1.13	0.85	0.62	1.36	1.18	1.26	1.21	1.07	1.26	1.73	0.72	1.03	2.66	1.55	2.67	1.16	0.80	0.32	1.19	0.82	1.32	1.73	1.52	1.16	5.05	1.90	1.68	1.99
searobin, striped	1.30	1.78	1.33	0.60	0.57	0.66	0.71	1.55	1.52	0.46	0.93	1.28	0.82	0.71	1.48	1.82	3.69	2.36	3.83	1.85	1.40	0.31	0.89	0.95	1.07	2.14	0.77	2.96	5.01	2.80	2.50	
shad, American	0.10	1.36	0.57	0.92	0.44	0.90	0.34	0.54	0.75	0.29	0.68	0.49	0.48	1.08	0.86	0.80	0.38	0.08	0.61	0.20	0.34	0.28	0.25	0.44	0.57	0.57	0.53	0.49	0.46	0.43	0.41	
shad, hickory	0.52	0.00	0.01	0.00	0.01	0.00	0.00	0.01	0.02	0.01	0.02	0.01	0.07	0.05	0.09	0.12	0.09	0.04	0.15	0.09	0.10	0.25	0.27	0.12	0.02	0.03	0.02	0.01	0.07	0.03	0.11	
skate, clearnose	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.03	0.02	0.03	0.10	0.04	0.03	0.01	0.07	0.09	0.06	0.08	0.01	0.08	0.39	0.12	0.15	
skate, little *	5.71	7.22	7.19	5.34	15.51	21.24	11.50	25.19	12.41	12.03	16.96	6.58	18.78	11.23	11.65	7.56	6.21	8.03	7.63	7.03	6.54	1.65	1.40	2.82	1.56	1.03	1.02	1.15	2.15	1.11	1.08	8.18
skate, winter*	0.00	0.12	0.15	0.07	0.37	0.34	0.22	0.23	0.18	0.23	0.14	0.12	0.24	0.16	0.24	0.17	0.16	0.10	0.13	0.16	0.21	0.09	0.13	0.15	0.12	0.15	0.10	0.14	0.32	0.28	0.26	0.17
spot	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.89	0.00	
squid, long-finned**	nc	nc	3.24	2.56	9.37	4.98	7.87	7.18	6.44	4.23	3.82	6.21	3.24	5.14	3.33	3.49	2.70	2.73	3.22	2.50	9.43	4.76	11.55	2.14	3.45	6.57	3.20	4.10	3.34	1.47	4.09	4.72
striped bass *	0.02	0.00	0.00	0.05	0.04	0.06	0.16	0.15	0.22	0.27	0.30	0.59	0.63	0.85	0.97	1.10	0.84	0.61	1.30	0.87	0.56	1.17	0.61	1.02	0.57	0.60	0.40	0.48	0.43	0.67	0.41	0.52
sturgeon, Atlantic	0.06	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.03	0.02	0.03	0.01	0.01	0.01	0.05	0.04	0.02	0.01	0.05	0.00	0.00	0.02	0.05	0.02	0.01	0.01	0.01	0.02	0.02	0.02	0.00	
tautog *	2.75	1.47	1.50	0.71	0.65	1.09	1.00	0.92	0.82	0.42	0.44	0.15	0.49	0.40	0.42	0.40	0.57	0.70	0.91	0.52	0.54	0.57	0.64	0.48	0.50	0.40	0.25	0.38	0.44	0.43	0.51	0.70
weakfish	0.02	0.00	0.07	0.01	0.04	0.03	0.05	0.18	0.12	0.06	0.03	0.11	0.12	0.27	0.24	0.28	0.11	0.17	0.12	0.02	0.10	0.17	0.14	0.07	0.03	0.05	0.01	0.08	0.50	0.32	0.11	

Table 5.19. Fall indices of abundance for selected species, 1984-2014.

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. There was no fall sampling in 2010.

																Fall															84-13
Species	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**Mean**
alewife	0.42	0.01	0.05	0.04	0.19	0.16	0.11	0.07	0.19	0.40	0.66	0.16	0.24	1.23	0.11	0.42	0.25	0.55	0.22	0.58	0.26	0.43	0.05	0.95	0.42	0.18	-	0.43	0.07	0.40	0.18	
black sea bass	0.03	0.11	0.01	0.03	0.05	0.01	0.06	0.14	0.01	0.04	0.06	0.01	0.05	0.03	0.07	0.23	0.18	0.43	1.01	0.15	0.35	0.17	0.24	0.36	0.93	0.26	-	0.29	1.49	0.99	1.35	
bluefish *	23.41	19.01	13.66	14.32	15.49	26.25	23.88	33.43	25.22	18.92	32.06	24.46	20.80	37.90	31.41	45.31	20.57	24.24	18.75	28.53	29.13	18.89	15.66	30.66	14.28	18.11	-	11.10	15.06	9.71	18.61	22.77
butterfish *	51.93	89.72	63.41	60.09	146.67	174.87	154.65	170.59	301.72	87.73	93.05	320.06	173.74	186.62	355.49	477.91	125.97	142.89	165.07	112.86	175.37	197.24	140.23	154.53	181.71	409.75	-	39.62	132.47	60.24	132.54	170.56
cunner	0.09	0.05	0.05	0.06	0.05	0.06	0.05	0.08	0.09	0.05	0.05	0.03	0.01	0.05	0.08	0.06	0.07	0.04	0.03	0.06	0.04	0.05	0.02	0.01	0.05	0.05	-	0.01	0.03	0.01	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	2.27	0.63	1.13	-	1.43	2.41	4.13	5.78	1.40
dogfish, spiny	0.04	0.00	0.00	0.03	0.01	0.00	0.12	0.00	0.02	0.05	0.10	0.00	0.01	0.04	0.07	0.03	0.04	0.16	0.05	0.00	0.18	0.22	0.00	0.00	0.11	0.08	-	0.01	0.01	0.00	0.00	
flounder, fourspot	1.18	1.03	0.50	0.37	1.73	0.80	1.47	0.74	1.44	1.55	1.33	0.44	2.05	3.29	1.63	1.19	1.15	1.17	1.09	0.96	1.14	1.11	0.65	0.73	1.30	1.82	-	1.35	0.81	0.42	0.86	
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	3.09	3.12	-	2.56	3.74	3.07	1.71	2.08
flounder, windowpane	22.11	11.56	7.32	6.85	12.10	8.68	7.19	4.71	6.79	9.48	3.89	2.43	28.13	13.36	4.64	2.53	2.81	1.81	1.86	3.39	2.27	6.14	1.54	3.65	7.95	5.59	-	5.32	3.38	3.13	2.42	
flounder, winter	7.31	2.75	3.86	5.42	10.07	11.03	15.42	6.10	6.41	9.32	6.13	3.77	12.29	7.75	6.69	8.66	7.08	3.07	1.74	1.25	2.19	2.15	0.94	0.82	2.26	1.55	-	1.27	1.37	0.33	0.44	
hake, red	0.74	0.33	1.00	0.37	0.75	1.14	0.44	0.33	0.39	1.81	0.59	0.20	1.62	0.89	0.53	0.29	1.20	0.41	0.15	0.73	0.76	0.45	0.33	0.54	0.41	0.90	-	0.60	0.21	0.39	0.66	
hake, silver	0.55	0.23	1.65	0.01	0.30	0.60	0.96	0.32	0.48	0.20	3.34	0.22	0.06	0.80	0.07	0.16	0.09	0.07	0.07	0.18	0.18	0.09	0.64	0.04	0.28	0.18	-	0.41	0.40	0.12	0.11	
hake, spotted *	0.28	0.17	0.21	0.14	0.10	0.05	0.11	0.03	0.39	1.48	0.50	0.16	1.68	0.12	0.41	0.61	1.18	0.35	0.86	1.95	0.14	0.32	0.56	0.39	0.69	1.11	-	2.62	1.15	1.93	1.49	0.68
herring, Atlantic	0.00	0.00	0.01	0.02	0.40	0.08	0.04	0.03	1.47	0.14	0.14	0.00	0.19	0.06	0.25	0.00	0.02	0.00	0.00	0.38	0.02	0.02	0.03	0.02	0.02	0.06	-	0.04	0.00	0.03	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	0.24	0.05	0.09	-	0.08	0.01	0.00	0.04	0.18
hogchoker *	0.90	0.56	0.21	0.17	0.30	0.17	0.22	0.38	0.15	0.18	0.05	0.07	0.18	0.05	0.05	0.19	0.10	0.15	0.21	0.26	0.15	0.13	0.11	0.20	0.12	0.09	-	0.59	0.94	0.65	0.67	0.26
kingfish, northern *	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.02	0.06	0.03	0.19	0.04	0.04	0.12	0.05	0.01	0.02	0.01	0.00	0.04	0.03	0.00	0.04	0.05	0.05	-	0.21	0.24	0.09	0.23	0.05
lobster, American **	7.41	3.33	4.75	5.95	3.54	3.75	7.29	9.90	9.52	11.50	10.13	8.05	10.07	19.60	10.47	11.18	6.83	4.28	2.68	3.03	3.68	2.10	1.48	1.21	2.07	1.82	-	0.38	0.29	0.16	0.09	5.74
menhaden, Atlantic *	0.23	0.15	0.79	0.14	0.13	0.45	0.66	0.59	2.00	0.40	1.02	0.56	0.43	0.57	0.73	1.08	0.97	0.32	0.76	0.95	1.63	0.94	0.23	0.80	0.47	0.28	-	0.74	0.94	0.39	0.61	0.67
moonfish *	0.05	0.33	0.11	0.04	0.41	0.10	0.04	0.17	0.22	0.04	0.34	0.25	1.99	0.91	2.08	1.15	2.11	0.82	1.36	0.69	0.74	1.55	1.51	1.66	5.08	10.03	-	1.50	0.79	2.62	3.92	1.33
ocean pout	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00	
rockling, fourbeard	0.08	0.01	0.04	0.05	0.21	0.15	0.07	0.04	0.06	0.03	0.06	0.01	0.11	0.07	0.03	0.04	0.12	0.03	0.01	0.04	0.04	0.01	0.00	0.02	0.06	0.04	-	0.03	0.01	0.00	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	0.08	0.00	0.38	-	0.32	0.12	0.14	0.04	0.11
sculpin, longhorn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00	
scup *	10.72	30.97	25.76	18.54	39.70	65.09	69.48	311.57	83.73	77.06	92.52	59.14	61.46	41.28	103.27	537.68	521.10	177.64	348.70	152.23	291.46	424.06	116.75	475.29	303.26	139.38	-	198.23	223.52	40.68	182.58	173.80
sea raven	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00	
searobin, northern	0.20	0.22	0.31	0.03	0.38	0.18	0.43	0.43	0.15	0.25	0.80	0.12	0.27	0.14	0.93	0.62	0.47	1.15	1.25	0.51	1.03	0.68	0.21	1.05	1.11	0.88	-	1.19	2.07	1.56	2.70	
searobin, striped *	2.75	3.44	1.64	0.90	3.44	3.83	2.39	1.97	2.75	4.44	2.00	0.74	4.03	2.62	3.68	4.48	5.68	3.34	4.85	6.44	4.67	3.26	0.81	2.25	3.66	3.54	-	4.10	7.06	5.29	5.83	3.45
shad, American *	3.13	0.19	0.27	0.29	2.66	3.10	0.65	0.72	0.54	1.11	1.84	1.90	0.27	0.91	1.22	1.73	0.55	0.41	0.76	0.75	0.95	0.54	0.12	0.38	0.41	0.46	-	0.42	0.44	0.31	0.20	0.93
shad, hickory *	0.02	0.01	0.03	0.01	0.00	0.00	0.01	0.00	0.05	0.04	0.10	0.04	0.09	0.10	0.05	0.12	0.09	0.03	0.04	0.09	0.13	0.25	0.24	0.08	0.03	0.06	-	0.05	0.19	0.16	0.04	0.07
skate, clearnose *	0.00	0.00	0.02	0.02	0.00	0.00	0.02	0.02	0.05	0.04	0.01	0.02	0.01	0.03	0.12	0.10	0.10	0.34	0.18	0.33	0.10	0.48	0.23	0.44	0.38	0.24	-	0.27	0.73	0.68	0.34	0.17
skate, little	4.41	3.62	4.01	2.72	8.13	4.31	7.50	5.24	5.52	10.00	6.41	3.37	11.55	6.90	7.73	5.23	5.25	5.07	5.39	2.99	3.12	3.90	1.03	1.09	1.28	0.99	-	0.84	1.14	0.63	0.82	
skate, winter	0.00	0.01	0.00	0.00	0.03	0.03	0.05	0.02	0.07	0.09	0.12	0.07	0.17	0.08	0.05	0.06	0.01	0.13	0.13	0.00	0.07	0.10	0.00	0.06	0.21	0.10	-	0.05	0.17	0.12	0.09	
spot *	0.00	0.18	0.20	0.02	0.09	0.00	0.04	0.02	0.00	0.38	0.18	0.03	0.99	0.08	0.00	0.28	0.63	0.08	0.35	0.00	0.07	0.00	0.19	0.00	2.67	0.01	-	0.04	1.60	1.70	0.16	0.34
squid, long-finned **	nc	nc	27.40	28.60	159.16	85.60	69.12	62.97	172.95	272.11	127.96	155.28	180.99	68.57	202.29	132.50	109.87	60.18	35.48	269.32	94.47	81.12	70.58	179.39	114.99	187.15	-	85.68	62.53	32.59	112.67	115.88
striped bass	0.01	0.00	0.01	0.01	0.03	0.00	0.00	0.05	0.05	0.09	0.06	0.08	0.13	0.40	0.18	0.23	0.27	0.23	0.37	0.12	0.77	0.25	0.47	0.38	0.44	0.30	-	0.24	0.17	0.26	0.17	
sturgeon, Atlantic *	0.03	0.01	0.03	0.03	0.00	0.02	0.02	0.01	0.08	0.08	0.06	0.02	0.01	0.02	0.02	0.07	0.03	0.08	0.05	0.10	0.04	0.03	0.10	0.05	0.06	0.10	-	0.02	0.02	0.01	0.05	0.04
tautog	0.72	0.32	0.22	0.50	0.25	0.17	0.16	0.23	0.20	0.15	0.14	0.11	0.07	0.11	0.23	0.36	0.23	0.20	0.26	0.37	0.16	0.19	0.20	0.13	0.23	0.08	-	0.07	0.14	0.15	0.18	
weakfish *	1.55	6.35	13.57	0.73	3.54	8.69	5.71	12.11	3.22	4.18	11.21	5.64	15.49	12.93	5.28	31.36	63.42	40.51	41.45	49.46	59.07	26.00	1.50	63.96	9.11	6.65	-	12.27	22.27	7.50	41.56	18.78

Table 5.20. Finfish and invertebrate biomass indices for the spring sampling period, 1992-2014.
The geometric mean weight (kg) per tow was calculated for 38 finfish and 15 invertebrate species for the spring (April-June) sampling period.

	Spring																						
	1992	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
alewife	0.06	0.17	0.32	0.15	0.50	0.25	0.20	0.37	0.34	0.15	0.25	0.19	0.25	0.22	0.21	0.31	0.22	0.24	0.16	0.17	0.17	0.20	0.18
black sea bass	0.01	0.03	0.06	0.03	0.06	0.06	0.02	0.05	0.07	0.17	0.40	0.17	0.15	0.07	0.04	0.14	0.10	0.21	0.18	0.18	0.34	0.43	1.37
bluefish	0.45	0.08	0.13	0.04	0.10	0.23	0.17	0.35	0.09	0.08	0.36	0.20	0.12	0.14	0.23	0.21	0.11	0.30	0.03	0.24	0.11	0.18	0.03
butterfish	0.43	0.10	0.31	0.19	0.73	1.27	1.06	0.52	0.69	0.79	1.48	0.64	0.41	0.55	2.30	0.66	1.06	1.37	0.49	2.69	1.87	0.66	0.61
cunner	0.02	0.04	0.01	0.03	0.02	0.03	0.04	0.04	0.03	0.04	0.05	0.03	0.02	0.02	0.01	0.02	0.02	0.01	0.02	0.02	0.01	0.01	0.00
dogfish, smooth	1.04	0.44	1.14	0.63	0.83	0.42	0.90	1.05	0.85	0.82	2.31	1.10	0.87	0.77	2.83	1.14	1.88	2.07	0.18	2.90	1.68	1.32	1.27
dogfish, spiny	0.10	0.02	0.12	0.00	0.00	0.01	0.03	0.02	0.00	0.08	0.06	0.07	0.07	0.05	0.21	0.25	0.15	0.84	0.07	0.37	0.11	0.16	0.12
flounder, fourspot	2.19	0.75	0.75	1.48	1.37	2.08	1.28	0.96	1.31	1.28	1.35	1.01	1.03	0.44	0.60	1.05	0.93	0.64	0.62	1.23	1.60	0.75	0.65
flounder, summer	0.35	0.27	0.48	0.16	0.53	0.60	1.15	1.09	1.35	1.21	2.38	2.45	1.69	0.67	0.61	1.72	1.44	1.40	1.28	2.73	2.22	2.16	2.09
flounder, windowpane	1.96	2.53	2.96	1.60	4.76	4.16	3.21	2.38	1.69	1.97	1.31	1.21	1.32	0.54	0.63	2.51	2.04	1.29	2.20	1.86	1.74	1.32	1.26
flounder, winter	8.72	7.54	9.44	6.51	14.61	10.63	9.65	6.67	7.46	9.77	6.31	6.64	3.87	2.94	1.65	4.99	3.84	2.94	4.26	3.60	2.72	2.26	1.46
hake, red	0.78	0.85	0.14	0.66	0.21	0.33	0.94	1.05	0.59	0.45	0.96	0.13	0.20	0.22	0.25	0.67	0.61	0.23	0.47	0.09	0.65	0.24	0.11
hake, silver	0.20	0.14	0.40	0.36	0.12	0.39	0.48	0.56	0.19	0.54	0.52	0.06	0.16	0.05	0.33	0.10	1.02	0.27	0.33	0.26	0.87	0.15	0.07
hake, spotted	0.01	0.01	0.00	0.02	0.03	0.09	0.03	0.13	0.27	0.17	0.20	0.13	0.18	0.05	0.14	0.11	0.31	0.07	0.14	0.21	0.22	0.20	0.15
herring, Atlantic	1.06	2.03	1.09	1.77	0.55	0.88	0.25	0.22	0.42	0.26	0.14	0.19	0.12	0.32	0.09	0.55	0.19	0.37	0.65	0.30	0.17	0.60	0.32
herring, blueback	0.05	0.02	0.06	0.03	0.04	0.04	0.02	0.00	0.04	0.02	0.01	0.02	0.04	0.04	0.02	0.04	0.02	0.06	0.04	0.02	0.01	0.03	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	0.05	0.03	0.02	0.04	0.06	0.07	0.09	0.10
kingfish, northern	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00
menhaden, Atlantic	0.07	0.03	0.03	0.04	0.01	0.01	0.00	0.00	0.02	0.00	0.03	0.01	0.01	0.00	0.02	0.07	0.03	0.04	0.03	0.07	0.29	0.22	0.37
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	0.07	0.09	0.04	0.04	0.04	0.03	0.02	0.02	0.03	0.01	0.03	0.02	0.03	0.00	0.01	0.02	0.01	0.03	0.01	0.03	0.01	0.00	0.00
rockling, fourbeard	0.13	0.10	0.05	0.10	0.05	0.11	0.08	0.13	0.09	0.12	0.06	0.06	0.08	0.05	0.02	0.05	0.05	0.03	0.03	0.03	0.03	0.00	0.00
scad, rough	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
sculpin, longhorn	0.06	0.02	0.01	0.01	0.01	0.01	0.01	0.00	0.03	0.01	0.01	0.01	0.02	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	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	3.35	5.88	6.40	3.14	9.55	9.99	6.47	5.61
sea raven	0.03	0.00	0.00	0.00	0.01	0.00	0.05	0.03	0.05	0.02	0.03	0.01	0.01	0.00	0.00	0.02	0.00	0.01	0.02	0.01	0.01	0.00	0.01
searobin, northern	0.26	0.35	0.28	0.27	0.28	0.33	0.17	0.22	0.70	0.51	0.51	0.40	0.29	0.08	0.35	0.26	0.23	0.44	0.52	0.30	0.81	0.34	0.39
searobin, striped	0.86	0.30	0.51	0.77	0.46	0.40	0.87	1.14	1.99	1.40	2.21	1.21	0.97	0.22	0.49	0.56	0.65	1.34	0.47	1.81	2.25	1.54	1.53
shad, American	0.29	0.09	0.21	0.10	0.11	0.23	0.13	0.20	0.05	0.01	0.11	0.03	0.04	0.05	0.05	0.07	0.08	0.07	0.07	0.07	0.10	0.06	0.07
shad, hickory	0.01	0.01	0.01	0.01	0.03	0.02	0.05	0.06	0.05	0.03	0.09	0.05	0.04	0.10	0.11	0.05	0.00	0.01	0.00	0.00	0.02	0.01	0.05
skate, clearnose	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.03	0.04	0.06	0.13	0.07	0.04	0.02	0.08	0.12	0.08	0.11	0.02	0.11	0.54	0.17	0.21
skate, little	5.89	5.99	8.87	3.38	9.35	6.00	6.27	4.25	3.43	4.47	4.56	4.35	4.01	1.05	0.91	1.82	0.97	0.71	0.66	0.79	1.34	0.74	0.71
skate, winter	0.37	0.52	0.28	0.21	0.46	0.29	0.46	0.27	0.25	0.21	0.25	0.24	0.28	0.12	0.22	0.23	0.19	0.23	0.15	0.25	0.46	0.25	0.33
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	0.20	0.00
striped bass	0.31	0.43	0.45	0.49	0.77	1.13	1.15	1.86	1.13	0.93	2.10	1.38	0.87	1.52	1.27	1.37	0.86	0.93	0.66	0.96	0.58	0.98	0.54
sturgeon, Atlantic	0.05	0.05	0.08	0.03	0.02	0.04	0.13	0.08	0.05	0.03	0.16	0.00	0.00	0.05	0.15	0.06	0.02	0.02	0.02	0.08	0.10	0.06	0.00
tautog	1.00	0.51	0.51	0.19	0.63	0.42	0.49	0.51	0.59	0.78	1.09	0.61	0.62	0.65	0.84	0.61	0.60	0.51	0.30	0.44	0.38	0.40	0.51
weakfish	0.11	0.03	0.01	0.05	0.06	0.15	0.20	0.31	0.12	0.11	0.12	0.03	0.04	0.09	0.12	0.08	0.02	0.04	0.01	0.04	0.39	0.22	0.08
Invertebrates																							
crab, blue	0.03	0.02	0.00	0.02	0.00	0.02	0.02	0.03	0.04	0.01	0.04	0.01	0.01	0.00	0.01	0.04	0.02	0.00	0.02	0.03	0.04	0.03	0.00
crab, flat claw hermit	0.15	0.08	0.18	0.02	0.09	0.04	0.10	0.10	0.07	0.12	0.14	0.32	0.17	0.05	0.04	0.11	0.09	0.12	0.08	0.09	0.05	0.07	0.07
crab, horseshoe	0.35	0.45	0.60	0.13	0.61	0.33	0.55	0.80	0.74	0.94	0.76	1.33	0.96	0.39	0.25	0.86	0.62	0.65	0.52	0.81	0.55	0.70	0.45
crab, lady	0.25	0.23	0.16	0.18	0.50	0.50	0.39	0.16	0.13	0.04	0.07	0.01	0.01	0.01	0.04	0.02	0.02	0.01	0.06	0.11	0.06	0.01	0.01
crab, rock	1.17	0.61	0.64	0.14	0.45	0.32	1.04	0.55	0.25	0.35	0.31	0.36	0.14	0.05	0.16	0.16	0.20	0.18	0.13	0.25	0.16	0.06	0.03
crab, spider	0.98	1.08	1.22	0.32	0.96	0.52	0.69	0.39	0.35	1.02	1.30	1.85	1.42	0.36	0.27	0.55	0.57	0.46	0.70	0.78	0.74	0.62	0.55
jellyfish, lion's mane	0.01	0.11	0.01	0.15	0.10	0.08	0.19	0.06	0.06	0.03	0.02	0.23	0.14	0.38	0.11	0.00	0.10	0.03	0.08	0.08	0.01	0.16	0.14
lobster, American	2.80	2.32	1.53	3.24	2.72	3.02	6.56	4.95	3.90	3.04	2.55	1.48	1.03	1.00	0.84	1.24	1.18	0.62	0.55	0.30	0.33	0.17	0.15
mussel, blue	0.31	0.01	0.07	0.03	0.03	0.01	0.05	0.03	0.04	0.01	0.17	0.08	0.11	0.09	0.04	0.04	0.02	0.00	0.02	0.02	0.04	0.06	0.08
northern moon shell	0.05	0.04	0.12	0.03	0.02	0.02	0.04	0.05	0.05	0.08	0.10	0.10	0.06	0.02	0.00	0.03	0.03	0.04	0.04	0.04	0.01	0.02	0.03
oyster, common	0.04	0.00	0.06	0.00	0.00	0.01	0.02	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.03	0.01	0.00	0.02	0.00
shrimp, mantis	0.06	0.13	0.05	0.05	0.04	0.03	0.03	0.07	0.18	0.08	0.04	0.03	0.03	0.01	0.02	0.05	0.04	0.04	0.01	0.07	0.05	0.05	0.03
squid, long-finned	1.01	0.91	0.67	0.89	0.55	0.99	0.41	0.62	0.51	0.41	0.42	0.42	1.69	1.08	1.41	0.33	0.40	0.92	0.77	0.61	0.43	0.20	0.76
starfish sp.	0.22	0.13	0.06	0.02	0.03	0.03	0.05	0.04	0.06	0.28	0.24	0.29	0.12	0.06	0.03	0.09	0.13	0.11	0.12	0.09	0.02	0.01	0.01
whelks	0.16	0.04	0.07	0.01	0.07	0.03	0.06	0.08	0.09	0.13	0.12	0.31	0.15	0.05	0.05	0.12	0.11	0.08	0.05	0.13	0.06	0.10	0.05

Table 5.21. Finfish and invertebrate biomass indices for the fall sampling period, 1992-2014.

The geometric mean weight (kg) per tow was calculated for 38 finfish and 15 invertebrate species for the fall (Sept-Oct) sampling period. There was no fall sampling in 2010.

	Fall																							
	1992	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
alewife	0.03	0.08	0.10	0.02	0.04	0.22	0.02	0.07	0.02	0.09	0.03	0.09	0.04	0.05	0.01	0.14	0.04	0.02	-	0.06	0.01	0.03	0.03
black sea bass	0.01	0.01	0.01	0.00	0.01	0.01	0.05	0.07	0.07	0.23	0.31	0.08	0.08	0.08	0.07	0.14	0.23	0.07	-	0.15	0.33	0.46	0.82
bluefish	16.39	9.91	9.45	8.09	7.62	6.53	5.06	8.51	8.34	6.11	7.87	8.99	16.39	8.75	3.92	9.74	9.19	6.40	-	3.84	3.72	2.73	3.91
butterfish	6.31	4.12	3.40	10.26	9.30	6.97	13.27	15.43	4.45	7.80	6.56	3.47	6.24	7.85	7.73	5.82	8.97	14.39	-	2.81	6.14	3.62	5.97
cunner	0.02	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.00	0.00	0.00	0.01	-	0.00	0.01	0.00	0.00
dogfish, smooth	1.20	1.75	0.76	0.85	1.16	1.09	1.32	1.27	2.85	3.02	6.09	6.18	2.95	2.70	2.46	6.23	1.25	2.80	-	3.66	4.69	7.93	11.05
dogfish, spiny	0.03	0.08	0.18	0.00	0.01	0.05	0.10	0.05	0.06	0.24	0.07	0.00	0.27	0.34	0.00	0.00	0.18	0.18	-	0.01	0.01	0.00	0.00
flounder, fourspot	0.14	0.16	0.14	0.08	0.48	0.24	0.19	0.14	0.35	0.17	0.25	0.30	0.29	0.19	0.06	0.19	0.16	0.21	-	0.11	0.14	0.05	0.10
flounder, summer	0.87	0.85	0.47	0.43	1.61	1.84	1.77	2.27	1.77	3.19	4.41	3.27	1.74	1.93	1.36	1.65	1.97	2.41	-	1.82	2.74	2.18	1.41
flounder, windowpane	0.51	0.73	0.42	0.32	2.11	1.30	0.61	0.38	0.45	0.30	0.38	0.43	0.26	0.57	0.29	0.42	0.98	0.64	-	0.68	0.61	0.57	0.47
flounder, winter	0.84	0.99	0.78	0.45	1.56	1.04	0.87	1.37	1.28	0.62	0.55	0.34	0.32	0.41	0.16	0.22	0.49	0.26	-	0.28	0.40	0.11	0.17
hake, red	0.11	0.34	0.19	0.04	0.48	0.18	0.10	0.06	0.32	0.07	0.02	0.19	0.14	0.10	0.06	0.12	0.09	0.13	-	0.14	0.04	0.08	0.14
hake, silver	0.04	0.02	0.28	0.02	0.01	0.06	0.01	0.03	0.01	0.01	0.01	0.02	0.02	0.01	0.08	0.01	0.03	0.02	-	0.04	0.05	0.02	0.01
hake, spotted	0.09	0.30	0.15	0.04	0.37	0.03	0.08	0.17	0.34	0.09	0.19	0.41	0.03	0.08	0.17	0.10	0.16	0.23	-	0.53	0.27	0.38	0.36
herring, Atlantic	0.07	0.01	0.01	0.00	0.02	0.01	0.02	0.00	0.00	0.00	0.00	0.03	0.00	0.01	0.00	0.00	0.00	0.01	-	0.00	0.00	0.00	0.00
herring, blueback	0.01	0.01	0.12	0.03	0.01	0.09	0.02	0.01	0.01	0.05	0.01	0.01	0.01	0.01	0.01	0.03	0.00	0.01	-	0.01	0.00	0.00	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	0.04	0.02	0.02	-	0.11	0.17	0.11	0.10
kingfish, northern	0.00	0.01	0.00	0.03	0.01	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00	-	0.04	0.04	0.02	0.03
menhaden, Atlantic	0.36	0.22	0.36	0.25	0.25	0.24	0.09	0.39	0.22	0.05	0.35	0.25	0.49	0.43	0.06	0.29	0.12	0.10	-	0.39	0.47	0.18	0.31
moonfish	0.02	0.00	0.03	0.03	0.12	0.05	0.13	0.09	0.13	0.04	0.08	0.03	0.04	0.07	0.07	0.11	0.27	0.21	-	0.07	0.04	0.11	0.20
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
rockling, fourbeard	0.01	0.00	0.01	0.00	0.02	0.01	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.01	-	0.00	0.00	0.00	0.00
scad, rough	0.00	0.03	0.00	0.00	0.02	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.00	0.03	-	0.05	0.01	0.01	0.01
sculpin, longhorn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00
scup	4.96	3.72	3.33	4.63	3.68	2.49	4.50	22.72	30.76	11.28	23.69	28.95	16.31	13.79	10.49	24.42	16.53	13.73	-	20.28	13.54	6.47	10.71
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
searobin, northern	0.02	0.05	0.06	0.02	0.04	0.02	0.08	0.06	0.08	0.13	0.18	0.11	0.11	0.09	0.05	0.08	0.09	0.08	-	0.11	0.22	0.23	0.24
searobin, striped	0.82	0.54	0.32	0.34	0.81	0.60	1.04	1.37	1.59	1.27	2.12	2.43	0.96	0.82	0.38	0.37	0.94	0.61	-	1.12	2.81	2.66	2.26
shad, American	0.14	0.35	0.39	0.43	0.06	0.16	0.26	0.42	0.14	0.07	0.16	0.17	0.15	0.10	0.02	0.05	0.08	0.11	-	0.09	0.08	0.06	0.03
shad, hickory	0.03	0.02	0.04	0.02	0.05	0.05	0.02	0.07	0.05	0.02	0.02	0.05	0.07	0.14	0.11	0.03	0.01	0.02	-	0.01	0.09	0.08	0.02
skate, clearnose	0.06	0.05	0.01	0.04	0.01	0.05	0.17	0.15	0.15	0.53	0.30	0.46	0.17	0.71	0.30	0.69	0.64	0.40	-	0.41	1.01	0.93	0.54
skate, little	2.47	4.61	3.47	1.78	5.66	3.81	4.06	2.85	2.92	2.88	3.00	1.96	2.02	2.32	0.67	0.65	0.82	0.64	-	0.58	0.66	0.44	0.58
skate, winter	0.11	0.15	0.21	0.09	0.25	0.10	0.09	0.08	0.01	0.21	0.21	0.00	0.11	0.16	0.00	0.12	0.31	0.18	-	0.07	0.20	0.15	0.12
spot	0.00	0.07	0.03	0.00	0.14	0.01	0.00	0.06	0.13	0.01	0.08	0.00	0.01	0.00	0.03	0.00	0.34	0.00	-	0.01	0.41	0.47	0.02
striped bass	0.09	0.16	0.11	0.15	0.21	0.68	0.38	0.39	0.51	0.48	0.70	0.26	1.25	0.48	0.88	0.64	0.79	0.61	-	0.43	0.26	0.44	0.26
sturgeon, Atlantic	0.21	0.19	0.13	0.10	0.02	0.06	0.04	0.21	0.08	0.23	0.18	0.27	0.09	0.12	0.23	0.13	0.21	0.29	-	0.10	0.10	0.03	0.11
tautog	0.22	0.22	0.15	0.09	0.07	0.14	0.27	0.31	0.30	0.20	0.27	0.43	0.21	0.23	0.23	0.16	0.20	0.07	-	0.05	0.08	0.11	0.12
weakfish	0.47	0.56	1.26	1.27	1.88	1.70	0.94	3.39	3.17	2.41	2.86	1.72	2.85	2.52	0.42	3.51	1.17	0.66	-	1.37	1.88	0.99	2.13
Invertebrates																							
crab, blue	0.15	0.17	0.05	0.04	0.04	0.11	0.10	0.17	0.11	0.05	0.10	0.06	0.02	0.00	0.01	0.07	0.02	0.04	-	0.09	0.07	0.05	0.02
crab, flat claw hermit	0.17	0.40	0.15	0.11	0.26	0.16	0.35	0.16	0.17	0.33	0.30	0.13	0.18	0.16	0.05	0.12	0.24	0.16	-	0.12	0.13	0.12	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	1.40	1.92	1.21	-	1.25	0.65	1.21	0.87
crab, lady	1.52	1.58	1.52	1.56	3.54	1.84	0.82	0.48	0.60	0.17	0.14	0.10	0.08	0.14	0.07	0.07	0.25	0.18	-	0.30	0.20	0.07	0.06
crab, rock	0.58	0.55	0.18	0.09	0.45	0.32	0.37	0.22	0.19	0.13	0.12	0.04	0.08	0.02	0.10	0.04	0.28	0.09	-	0.09	0.05	0.03	0.01
crab, spider	0.53	1.89	0.46	0.25	0.71	0.42	0.25	0.24	0.21	0.30	0.27	0.47	0.32	0.13	0.10	0.15	0.25	0.29	-	0.21	0.18	0.21	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	0.45	0.02	0.58	-	0.01	0.03	0.59	0.07
lobster, American	3.17	4.11	3.58	3.03	3.48	7.22	4.24	4.16	2.65	1.91	1.10	1.28	1.46	0.84	0.61	0.51	0.80	0.77	-	0.12	0.10	0.06	0.04
mussel, blue	0.07	0.06	0.12	0.02	0.00	0.01	0.09	0.00	0.04	0.12	0.11	0.02	0.10	0.10	0.02	0.07	0.04	0.03	-	0.03	0.02	0.16	0.06
northern moon shell	0.03	0.02	0.03	0.01	0.01	0.00	0.02	0.01	0.00	0.04	0.10	0.00	0.00	0.01	0.00	0.00	0.03	0.01	-	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	0.01	0.02	0.01	-	0.00	0.01	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	0.06	0.08	0.06	-	0.22	0.20	0.14	0.11
squid, long-finned	5.00	7.92	4.71	4.68	5.53	2.20	6.40	6.06	4.05	2.39	1.81	5.88	3.38	3.47	2.15	6.51	4.29	4.25	-	2.52	2.28	1.25	4.01
starfish sp.	0.11	0.08	0.07	0.00	0.01	0.02	0.05	0.02	0.12	0.22	0.09	0.01	0.10	0.11	0.02	0.05	0.09	0.06	-	0.03	0.00	0.01	0.01
whelks	0.28	0.28	0.06	0.08	0.22	0.10	0.27	0.23	0.38	0.52	0.38	0.24	0.24	0.20	0.08	0.20	0.30	0.20	-	0.21	0.15	0.17	0.09

Table 5.22. Bluefish indices of abundance, 1984-2014.
Using September and October length data, the geometric mean catch per tow was calculated for two age groups of bluefish: age-0 and all fish age 1 and older. Age-0 was defined as bluefish less than 30 cm fork length.

	Fall			
Year	age 0 count / tow	age 0 kg / tow	ages 1+ count / tow	ages 1+ kg / tow
1984	20.34	2.51	1.61	2.03
1985	11.27	1.64	4.16	6.25
1986	8.05	1.13	3.77	5.96
1987	9.01	0.88	3.11	4.85
1988	10.73	1.59	2.20	4.43
1989	21.07	3.17	1.92	3.80
1990	12.82	2.09	6.14	8.92
1991	22.57	2.75	5.59	8.49
1992	9.23	1.27	8.44	14.88
1993	11.61	1.96	3.34	7.11
1994	24.85	2.54	3.07	6.09
1995	16.85	2.48	4.07	5.32
1996	13.85	2.27	2.34	4.09
1997	31.26	2.56	2.35	3.68
1998	25.89	2.08	1.65	2.70
1999	39.19	5.43	0.86	1.61
2000	14.67	2.97	2.18	3.75
2001	19.04	2.11	2.62	3.87
2002	12.35	2.25	3.63	4.81
2003	16.85	3.16	2.16	3.31
2004	13.30	2.39	10.38	13.96
2005	12.10	2.39	2.65	5.04
2006	12.43	1.49	2.14	2.74
2007	23.98	4.14	2.44	4.22
2008	6.14	0.82	4.52	8.18
2009	11.65	1.16	3.18	5.09
2010	-	-	-	-
2011	8.21	1.34	1.40	2.36
2012	13.11	1.86	0.97	1.67
2013	7.86	0.87	0.96	1.82
2014	16.53	2.22	0.88	1.47
84-13 mean	**15.87**	**2.18**	**3.24**	**5.21**

Table 5.23. Scup indices-at-age, 1984-2014.

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. 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	0.000	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	18.482	23.719	5.629	2.072	2.557	3.160	2.897	0.529	0.007	0
2007	32.802	25.288	0	7.514	15.865	5.845	1.489	0.548	0.536	0.541	0.385	0.073	0.007
2008	92.100	75.143	0	16.957	40.620	27.815	4.936	0.911	0.158	0.303	0.236	0.148	0.016
2009	104.454	72.840	0	31.614	28.228	28.413	12.491	2.498	0.613	0.215	0.134	0.250	0.000
2010	68.138	67.717	0	0.421	24.265	21.998	14.002	6.019	1.187	0.118	0.058	0.041	0.029
2011	36.112	33.985	0	2.127	3.285	11.378	9.812	4.116	3.391	1.421	0.248	0.071	0.263
2012	114.410	65.371	0	49.039	25.925	11.982	9.231	9.567	4.671	2.755	0.871	0.144	0.226
2013	57.922	53.309	0	4.613	29.415	8.721	3.150	4.982	4.451	1.545	0.758	0.169	0.117
2014	60.483	45.822	0	14.661	10.635	23.833	5.069	1.504	2.323	1.486	0.608	0.319	0.045
84-13 Mean	**37.695**	**25.543**	**0.000**	**12.153**	**10.925**	**9.051**	**2.926**	**1.430**	**0.705**	**0.340**	**0.111**	**0.030**	**0.023**

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	32.562	8.144	2.437	4.015	1.505	1.689	0.332	0.060	0	0
2006	116.755	13.575	52.164	51.016	9.525	2.341	0.257	0.351	0.377	0.681	0.044	0	0
2007	475.295	37.346	319.893	118.056	29.335	5.929	0.896	0.226	0.302	0.313	0.313	0.033	0
2008	303.256	24.478	243.679	35.099	11.921	7.044	3.556	1.055	0.502	0.137	0.124	0.140	0
2009	139.380	31.506	67.486	40.388	20.786	6.934	2.615	0.735	0.214	0.131	0.068	0.022	0
2010	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	198.226	40.786	119.032	38.409	8.157	14.894	9.669	3.922	3.225	0.586	0.167	0.025	0.140
2012	223.522	15.983	153.235	54.305	9.963	2.846	2.063	0.567	0.137	0.323	0.076	0.007	0
2013	40.683	16.235	17.744	6.704	9.187	4.069	0.807	1.058	0.746	0.237	0.090	0.031	0.011
2014	182.583	14.003	144.702	23.878	4.325	6.505	1.188	0.426	0.808	0.476	0.193	0.051	0.032
84-13 Mean	**173.803**	**14.835**	**127.525**	**31.443**	**8.015**	**3.725**	**2.014**	**0.646**	**0.289**	**0.098**	**0.034**	**0.010**	**0.005**

(1) In 1984, 1985, 2003, 2004, 2006, 2008, 2010, 2011, and 2014 less than the number of scheduled tows were conducted in some months (Table 5.4).

(2) Fish in the age 10+ group include: 6 fish taken 1984-1988, 8 fish taken 2002-2010, 81 taken in 2011, 28 taken in 2012, 26 taken in 2013, and 15 taken in 2014. The oldest scup aged were four 14-year-old fish taken in 1985 and 2013 and 2014 (2).

Table 5.24. Age frequency of striped bass taken in spring, 1984-2014.
Ages were derived from trawl survey length data using the average of Hudson River and Chesapeake Bay von Bertalanffy parameters.

	Year																													
Age	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
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	11	5	0	1	11	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	46	20	84	3	2	46	49	4
3	0	0	0	0	1	3	8	7	8	7	10	26	97	116	122	87	20	41	76	38	38	54	25	109	15	54	7	2	13	33	94
4	0	0	0	2	4	1	2	3	13	16	20	8	37	40	68	42	22	15	48	23	18	59	15	44	48	130	17	29	13	21	73
5	0	0	0	2	0	1	1	5	5	14	18	7	14	17	28	95	22	28	45	39	21	33	22	44	41	64	24	50	19	12	20
6	0	0	0	2	1	1	3	0	1	8	8	6	7	14	20	46	32	36	52	41	22	28	11	28	11	34	11	44	12	16	6
7	0	0	0	0	0	0	0	2	0	7	1	1	8	9	3	17	12	13	25	23	14	16	10	9	7	10	6	29	5	10	1
8	0	0	0	0	0	0	0	1	2	1	1	3	2	4	1	4	4	2	12	5	3	9	4	3	3	1	2	7	3	15	5
9	0	0	0	0	0	0	0	2	1	1	1	0	3	2	1	0	1	2	3	7	2	1	3	1	1	0	0	1	2	1	1
10	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	1	2	0	1	0	0	0	3	3	2	0	0	0	0	2	1
11	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	1	1	0	0	0	0	0	1	1	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Total	**0**	**0**	**0**	**8**	**7**	**11**	**43**	**32**	**34**	**59**	**65**	**150**	**184**	**238**	**362**	**334**	**229**	**184**	**414**	**207**	**135**	**421**	**97**	**289**	**159**	**382**	**70**	**166**	**125**	**160**	**205**

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

Table 5.25. Striped bass indices-at-age, 1984-2014.
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 5.18) 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**	**Age 12**
1984	0.02	0	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	0
1986	0.00	0	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	0
1988	0.04	0	0.0057	0.0057	0.0229	0	0.0057	0	0	0	0	0	0
1989	0.06	0	0.0273	0.0164	0.0055	0.0055	0.0055	0	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	0
1991	0.15	0	0.0516	0.0328	0.0141	0.0234	0	0.0094	0.0047	0.0094	0.0047	0	0
1992	0.22	0	0.0259	0.0518	0.0841	0.0324	0.0065	0	0.0129	0.0065	0	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	0
1994	0.30	0	0.0277	0.0462	0.0923	0.0831	0.0369	0.0046	0.0046	0.0046	0	0	0
1995	0.59	0	0.3855	0.1023	0.0315	0.0275	0.0236	0.0039	0.0118	0	0.0039	0	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	0
1997	0.85	0	0.1286	0.4143	0.1429	0.0607	0.0500	0.0321	0.0143	0.0071	0	0	0
1998	0.97	0	0.3189	0.3269	0.1822	0.0750	0.0536	0.0080	0.0027	0.0027	0	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	0
2000	0.84	0.0037	0.4163	0.0737	0.0811	0.0811	0.1179	0.0442	0.0147	0.0037	0.0074	0	0
2001	0.61	0	0.1558	0.1359	0.0497	0.0928	0.1193	0.0431	0.0066	0.0066	0	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	0
2003	0.87	0.0042	0.1267	0.1605	0.0971	0.1647	0.1732	0.0971	0.0211	0.0296	0	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	0
2005	1.17	0	0.6100	0.1497	0.1636	0.0915	0.0776	0.0444	0.0250	0.0028	0	0.0028	0
2006	0.61	0	0.0189	0.1572	0.0943	0.1384	0.0692	0.0629	0.0252	0.0189	0.0189	0.0063	0
2007	1.02	0.0071	0.1629	0.3860	0.1558	0.1558	0.0992	0.0319	0.0106	0.0035	0.0106	0	0
2008	0.57	0.0394	0.0717	0.0538	0.1721	0.1470	0.0394	0.0251	0.0108	0.0036	0.0072	0	0
2009	0.60	0.0078	0.1316	0.0846	0.2037	0.1003	0.0533	0.0157	0.0016	0	0	0	0
2010	0.40	0	0.0169	0.0394	0.0958	0.1352	0.0620	0.0338	0.0113	0	0	0	0
2011	0.48	0.0029	0.0058	0.0058	0.0839	0.1446	0.1272	0.0839	0.0202	0.0029	0	0	0.0029
2012	0.43	0.0381	0.1595	0.0451	0.0451	0.0659	0.0416	0.0173	0.0104	0.0069	0	0.0035	0
2013	0.67	0	0.2052	0.1382	0.0879	0.0503	0.0670	0.0419	0.0628	0.0042	0.0084	0.0042	0
2014	0.41	0	0.0080	0.1880	0.1460	0.0400	0.0120	0.0020	0.0100	0.0020	0.0020	0	0
84-13 mean		**0.0044**	**0.1298**	**0.1168**	**0.0830**	**0.0782**	**0.0573**	**0.0284**	**0.0115**	**0.0049**	**0.0024**	**0.0009**	**0.0001**

Table 5.26. Summer flounder indices-at-age, 1984-2014.

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 5.18 and Table 5.19) by the percentage of fish in each age.

Spring

Year	0-11	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
1984	0.6291	0	0.3236	0.2610	0.0445	0	0	0	0	0	0	0	0	0
1985	0.4410	0	0.0166	0.3168	0.0489	0.0587	0	0	0	0	0	0	0	0
1986	0.9510	0	0.7700	0.0892	0.0742	0.0126	0.0050	0	0	0	0	0	0	0
1987	1.0572	0	0.9515	0.0793	0.0202	0.0036	0.0026	0	0	0	0	0	0	0
1988	0.4986	0	0.2317	0.2232	0.0352	0.0085	0	0	0	0	0	0	0	0
1989	0.1016	0	0.0111	0.0550	0.0191	0.0164	0	0	0	0	0	0	0	0
1990	0.3475	0	0.3053	0.0201	0.0156	0.0065	0	0	0	0	0	0	0	0
1991	0.6391	0	0.3892	0.2059	0.0205	0.0235	0	0	0	0	0	0	0	0
1992	0.5546	0	0.3182	0.1906	0.0229	0	0.0229	0	0	0	0	0	0	0
1993	0.5074	0	0.3216	0.1504	0.0101	0.0152	0.0101	0	0	0	0	0	0	0
1994	0.8601	0	0.4959	0.3136	0.0324	0	0	0	0.0182	0	0	0	0	0
1995	0.2796	0	0.2023	0.0608	0.0110	0	0	0	0.0055	0	0	0	0	0
1996	0.9609	0	0.6216	0.2370	0.0868	0	0.0052	0	0.0103	0	0	0	0	0
1997	0.9991	0	0.4481	0.4461	0.0740	0.0121	0.0134	0.0054	0	0	0	0	0	0
1998	1.3067	0	0.0734	0.5952	0.4693	0.1167	0.0324	0.0197	0	0	0	0	0	0
1999	1.4401	0	0.3263	0.5563	0.3521	0.1110	0.0696	0.0248	0	0	0	0	0	0
2000	1.7898	0	0.3805	0.7853	0.4240	0.0538	0.1316	0.0092	0	0.0054	0	0	0	0
2001	1.7468	0	0.8408	0.3395	0.3653	0.1073	0.0488	0.0333	0.0067	0.0051	0	0	0	0
2002	3.1851	0	1.0571	1.2637	0.4646	0.2233	0.0930	0.0362	0.0236	0.0145	0.0091	0	0	0
2003	3.4211	0	1.6080	1.0159	0.3949	0.2316	0.0851	0.0462	0.0327	0.0025	0.0042	0	0	0
2004	1.8381	0	0.2592	0.8180	0.4100	0.1878	0.0338	0.0817	0.0302	0.0145	0.0029	0	0	0
2005	0.8038	0	0.2523	0.2641	0.1495	0.0334	0.0364	0.0393	0.0196	0.0046	0.0046	0	0	0
2006	0.6129	0	0.0383	0.3597	0.0676	0.0654	0.0337	0.0263	0.0168	0.0051	0	0	0	0
2007	2.5073	0	1.1569	0.2053	0.5595	0.3163	0.1150	0.0888	0.0428	0.0152	0.0065	0.0010	0	0
2008	1.6145	0	0.6008	0.2912	0.2374	0.2633	0.1165	0.0622	0.0236	0.0033	0.0054	0.0054	0.0054	0
2009	1.9295	0	0.7772	0.3770	0.2905	0.1804	0.1949	0.0700	0.0258	0.0101	0.0036	0	0	0
2010	2.6878	0	1.8671	0.2805	0.2113	0.1439	0.0944	0.0416	0.0244	0.0142	0.0052	0.0052	0	0
2011	3.8479	0	1.0024	1.0839	0.8014	0.3820	0.3159	0.1098	0.0628	0.0580	0.0171	0.0146	0	0
2012	3.0620	0	0.4684	0.6283	0.9746	0.6346	0.2044	0.0754	0.0333	0.0224	0.0050	0.0113	0.0043	0
2013	3.2359	0	0.8843	0.6681	0.6637	0.6734	0.2047	0.0818	0.0201	0.0184	0.0041	0.0044	0.0129	0
2014	2.9996	0	0.9709	0.7062	0.4847	0.4325	0.2977	0.0465	0.0369	0.0126	0.0072	0.0022	0.0022	0.0022
84-13 Mean	**1.4619**	**0.0000**	**0.5667**	**0.4060**	**0.2450**	**0.1294**	**0.0623**	**0.0284**	**0.0132**	**0.0064**	**0.0023**	**0.0014**	**0.0008**	**0.0000**

Fall

Year	0-11	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
1984	0.9888	0	0.5648	0.3269	0.0713	0.0140	0.0042	0.0042	0.0034	0	0	0	0	0
1985	1.1931	0.2453	0.3605	0.4984	0.0804	0	0.0085	0	0	0	0	0	0	0
1986	1.7157	0.1738	1.1902	0.2681	0.0817	0.0019	0	0	0	0	0	0	0	0
1987	1.3963	0.0749	1.0573	0.2309	0.0305	0.0027	0	0	0	0	0	0	0	0
1988	1.4159	0.0150	0.8739	0.4782	0.0366	0.0122	0	0	0	0	0	0	0	0
1989	0.1363	0	0.0227	0.1051	0.0085	0	0	0	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	0	0	0
1991	1.2557	0.0363	0.8141	0.3457	0.0432	0.0082	0.0041	0.0041	0	0	0	0	0	0
1992	1.0178	0.0131	0.5685	0.3578	0.0561	0.0134	0.0089	0	0	0	0	0	0	0
1993	1.1113	0.0842	0.8371	0.1490	0.0362	0.0029	0	0.0019	0	0	0	0	0	0
1994	0.5517	0.1325	0.3008	0.0957	0.0138	0.0089	0	0	0	0	0	0	0	0
1995	0.5408	0.0424	0.3812	0.1043	0.0090	0.0039	0	0	0	0	0	0	0	0
1996	2.1914	0.0840	1.0394	1.0276	0.0375	0.0029	0	0	0	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	0	0	0
1998	1.7153	0	0.3251	1.0456	0.2867	0.0392	0.0187	0	0	0	0	0	0	0
1999	2.6787	0.0482	0.8000	1.4412	0.2963	0.0823	0.0084	0.0023	0	0	0	0	0	0
2000	1.9134	0.1151	0.5117	0.8244	0.2971	0.1122	0.0433	0.0067	0	0.0029	0	0	0	0
2001	4.4181	0.0208	2.6891	1.1372	0.4342	0.1095	0.0153	0.0078	0	0.0042	0	0	0	0
2002	6.1211	0.4415	3.0870	1.9304	0.4769	0.1216	0.0429	0.0168	0.0040	0	0	0	0	0
2003	3.3879	0	1.4584	1.3192	0.4069	0.0873	0.0908	0.0164	0.0089	0	0	0	0	0
2004	1.9537	0.2545	0.3848	0.7551	0.4398	0.0804	0.0241	0.0150	0	0	0	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	0	0	0
2006	1.3148	0.0976	0.2170	0.5915	0.2299	0.0957	0.0435	0.0214	0.0182	0	0	0	0	0
2007	1.8880	0.1295	0.5669	0.3869	0.4676	0.2012	0.0778	0.0408	0.0087	0.0043	0	0	0.0043	0
2008	3.0853	0.7816	0.4848	0.9581	0.4458	0.3256	0.0804	0.0090	0	0	0	0	0	0
2009	3.1169	0.4054	0.6606	0.8883	0.6241	0.3182	0.1330	0.0437	0.0244	0.0070	0.0122	0.0000	0.0000	0
2010	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2011	2.5578	0.1173	0.6933	0.9333	0.5641	0.1232	0.0543	0.0275	0.0130	0.0130	0.0061	0.0052	0.0075	0
2012	3.7358	0.1633	0.4592	0.8283	1.4239	0.5848	0.1836	0.0631	0.0296	0	0	0	0	0
2013	3.0664	0.2181	0.5709	0.6080	0.8049	0.6328	0.1789	0.0291	0.0139	0.0016	0	0.0082	0	0
2014	1.7086	0.1231	0.4034	0.3945	0.3620	0.2825	0.0823	0.0294	0.0205	0.0078	0	0.0031	0	0
84-13 Mean	**2.0774**	**0.1332**	**0.8115**	**0.6802**	**0.2894**	**0.1072**	**0.0368**	**0.0114**	**0.0049**	**0.0012**	**0.0006**	**0.0005**	**0.0004**	**0.0000**

note: 1984-1999 indices-at-age were run using a GT 60cm group in the age key.

Table 5.27. Tautog indices-at-age, 1984-2014.

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 5.18 and Table 5.19) 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 36 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	0.4590	0.4955	0.2892	0.2851	0.3105	0.3532
1985	1.7968	0	0.0191	0.0936	0.1922	0.1667	0.1279	0.1836	0.3005	0.2021	0.0902
1986	1.7200	0.0015	0.0273	0.0933	0.0495	0.1037	0.2019	0.2409	0.2452	0.2864	0.1017
1987	1.2129	0.0242	0.0799	0.0592	0.0602	0.1003	0.1341	0.1908	0.1349	0.0957	0.0523
1988	0.9006	0.0031	0.0327	0.0466	0.0721	0.0447	0.0401	0.0755	0.1008	0.1641	0.0790
1989	1.2590	0	0.0426	0.0683	0.1370	0.0893	0.1154	0.1495	0.1600	0.1046	0.0817
1990	1.1615	0.0113	0.0840	0.1546	0.1122	0.1142	0.0493	0.0500	0.1247	0.0875	0.0622
1991	1.1468	0.0057	0.0235	0.0582	0.1189	0.1241	0.1487	0.0931	0.1253	0.1071	0.1067
1992	1.0254	0.0197	0.0490	0.0709	0.0412	0.0491	0.1229	0.1323	0.0849	0.0632	0.0636
1993	0.5694	0.0034	0.0211	0.0505	0.0313	0.0166	0.0605	0.0595	0.0423	0.0489	0.0522
1994	0.5839	0.0093	0.0362	0.0322	0.0684	0.0558	0.0551	0.0555	0.0799	0.0516	0.0312
1995	0.2529	0.0034	0.0091	0.0092	0.0297	0.0602	0.0269	0.0212	0.0346	0.0150	0.0219
1996	0.5627	0.0073	0.0518	0.0305	0.0086	0.0762	0.0452	0.0654	0.0712	0.0667	0.0608
1997	0.5079	0	0.0390	0.0675	0.0568	0.0574	0.0639	0.0491	0.0556	0.0486	0.0101
1998	0.6442	0	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	0.8004	0.0012	0.0466	0.0578	0.0829	0.0740	0.1402	0.1376	0.0897	0.0392	0.0467
2001	0.8946	0.0062	0.0304	0.0863	0.0830	0.1294	0.1197	0.1193	0.1058	0.0715	0.0454
2002	1.1666	0.0101	0.0247	0.0585	0.1012	0.1748	0.1972	0.1895	0.2091	0.0739	0.0419
2003	0.8978	0.0033	0.0124	0.0083	0.0598	0.1485	0.2385	0.1596	0.0893	0.0778	0.0185
2004	0.6934	0.0075	0.0205	0.0150	0.0361	0.0710	0.1930	0.1096	0.0494	0.0812	0.0440
2005	0.7596	0.0100	0.0367	0.0618	0.0261	0.0922	0.1437	0.1576	0.1064	0.0303	0.0268
2006	0.8405	0	0.0334	0.0345	0.1039	0.1274	0.1140	0.1196	0.1521	0.0620	0.0479
2007	0.6136	0.0038	0.0126	0.0167	0.0460	0.0478	0.0608	0.0919	0.0936	0.0966	0.0532
2008	0.7269	0.0066	0.0279	0.0428	0.0620	0.0848	0.1164	0.0708	0.0649	0.0831	0.0640
2009	0.4822	0.0150	0.0355	0.0074	0.0026	0.0394	0.0681	0.1013	0.0658	0.0319	0.0324
2010	0.2472	0	0.0053	0.0455	0.0093	0.0053	0.0315	0.0503	0.0294	0.0096	0.0093
2011	0.4456	0.0180	0.0401	0.0532	0.0303	0.0301	0.0612	0.0630	0.0415	0.0267	0.0167
2012	0.5809	0.027	0.1148	0.0919	0.0808	0.0635	0.0389	0.0384	0.0499	0.0489	0.0115
2013*	0.5779	0.0083	0.0575	0.0726	0.0668	0.0714	0.1041	0.0893	0.0441	0.023	0.0105
2014*	0.6960	0.0134	0.0911	0.0757	0.0804	0.0991	0.1237	0.0887	0.0475	0.0325	0.011
84-13 Mean	**0.8218**	**0.0088**	**0.0392**	**0.0543**	**0.0657**	**0.0828**	**0.1050**	**0.1044**	**0.1007**	**0.0754**	**0.0469**

	Age									
Year	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20+**
1984	0.1261	0.2281	0.0933	0.0507	0.0449	0.0322	0.0469	0.0156	0.0006	0.0531
1985	0.1595	0.0982	0.0226	0.0994	0	0.0249	0.0039	0.0124	0	0
1986	0.1423	0.0863	0.0374	0.0522	0.0232	0.0071	0.0114	0.0003	0.0023	0.0061
1987	0.0607	0.0543	0.0479	0.0313	0.0246	0.0265	0.0105	0.0004	0.0048	0.0203
1988	0.0469	0.0395	0.0295	0.0225	0.0493	0.0086	0.0063	0.0055	0.0052	0.0286
1989	0.0569	0.0932	0.0430	0.0404	0.0348	0.0172	0.0067	0.0048	0	0.0136
1990	0.0979	0.0375	0.0567	0.0397	0.0221	0.0250	0.0088	0.0170	0.0035	0.0033
1991	0.0610	0.0258	0.0399	0.0361	0.0217	0.0005	0.0160	0.0117	0.0080	0.0148
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
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	0	0	0.0036	0	0	0.0036
1996	0.0230	0.0127	0.0103	0.0048	0.0099	0.0090	0.0086	0.0004	0.0001	0.0002
1997	0.0072	0.0119	0.0144	0.0048	0.0121	0.0071	0	0.0024	0	0
1998	0.0192	0.0164	0.0055	0.0055	0	0.0027	0.0055	0	0	0.0027
1999	0.0191	0.0090	0.0087	0.0029	0	0	0.0030	0.0029	0	0
2000	0.0213	0.0130	0.0123	0.0101	0.0084	0.0104	0.0023	0	0.0027	0.0040
2001	0.0407	0.0161	0.0152	0.0004	0.0053	0.0105	0.0036	0.0001	0.0026	0.0031
2002	0.0257	0.0185	0.0107	0.0070	0.0147	0.0039	0	0	0	0.0052
2003	0.0274	0.0088	0.0059	0.0184	0.0029	0.0124	0	0.0029	0	0.0031
2004	0.0204	0.0221	0.0119	0.0003	0.0028	0.0031	0.0026	0.0002	0	0.0027
2005	0.0347	0.0257	0.0039	0.0037	0	0	0	0	0	0
2006	0.0183	0.0200	0.0037	0	0.0037	0	0	0	0	0
2007	0.0294	0.0156	0.0194	0.0108	0.0019	0.0116	0	0.0019	0	0
2008	0.0322	0.0225	0.0228	0.0163	0.0098	0	0	0	0	0
2009	0.0343	0.0064	0.0091	0.0217	0.0070	0.0032	0.0011	0	0	0
2010	0.0192	0.0139	0.0048	0.0046	0.0046	0	0	0	0.0046	0
2011	0.0167	0.0161	0.0080	0.0080	0.0040	0.0000	0.0040	0.0080	0.0000	0.0000
2012	0	0.0077	0.0038	0	0.0038	0	0	0	0	0
2013*	0.0091	0.0056	0.004	0.0005	0.0111	.	.		0	0
2014*	0.0078	0.0152	0.002	0.0019	0.0027	.		0.0033	0	0
84-13 Mean	**0.0424**	**0.0346**	**0.0213**	**0.0192**	**0.0125**	**0.0090**	**0.0061**	**0.0045**	**0.0023**	**0.0060**

* 2013 and 2014 - ageing not complete so used a 2010-2012 pooled age key

Table 5.28. Weakfish age 0 and age 1+ indices of abundance, 1984-2014.
Using spring (May, June) and fall (September, October) length data, the geometric mean catch per tow was calculated for three groups of weakfish: fall age-0, spring - all fish age 1 and older (1+), and fall - all fish age 1 and older (1+). Weakfish less than 30 cm fork length in the fall were defined as age-0.

	Fall		Fall		Spring	
Year	age 0 count / tow	age 0 kg / tow	ages 1+ count / tow	age 1+ kg / tow	ages 1+ count / tow	ages 1+ kg / tow
1984	1.00	0.14	0.53	0.84	0.02	0.15
1985	6.19	0.74	0.24	0.46	0.00	0.10
1986	13.16	0.91	0.24	0.51	0.10	0.33
1987	0.63	0.13	0.11	0.16	0.02	0.11
1988	3.49	0.30	0.06	0.13	0.05	0.17
1989	8.69	0.94	0.02	0.10	0.04	0.16
1990	5.56	0.56	0.08	0.13	0.07	0.13
1991	11.95	1.44	0.31	0.41	0.28	0.26
1992	3.05	0.31	0.18	0.24	0.12	0.22
1993	4.08	0.46	0.12	0.18	0.10	0.15
1994	11.19	1.23	0.06	0.13	0.04	0.12
1995	5.22	0.84	0.70	0.64	0.18	0.16
1996	15.23	1.49	0.56	0.52	0.19	0.19
1997	12.38	1.03	0.89	0.81	0.42	0.34
1998	5.02	0.76	0.28	0.36	0.37	0.41
1999	30.93	3.21	0.39	0.51	0.45	0.59
2000	63.31	3.34	0.30	0.32	0.18	0.28
2001	40.09	2.20	0.52	0.54	0.27	0.26
2002	41.35	2.85	0.16	0.26	0.16	0.26
2003	49.41	1.77	0.07	0.17	0.04	0.14
2004	58.98	2.99	0.21	0.25	0.15	0.16
2005	25.86	2.50	0.12	0.18	0.27	0.23
2006	1.05	0.20	0.29	0.30	0.14	0.22
2007	63.93	3.86	0.06	0.14	0.11	0.22
2008	9.03	1.17	0.08	0.14	0.05	0.12
2009	6.48	0.57	0.30	0.22	0.08	0.16
2010	-	-	-	-	0.02	0.12
2011	11.64	0.87	0.68	0.55	0.10	0.15
2012	21.96	1.47	0.73	0.69	0.62	0.56
2013	7.01	0.59	0.52	0.52	0.52	0.44
2014	41.53	2.27	0.08	0.12	0.17	0.23
84-13 mean	**18.55**	**1.34**	**0.30**	**0.36**	**0.17**	**0.23**

Table 5.29. Winter flounder indices-at-age, 1984-2014.

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 8).

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	15.40	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	1.66	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	2.80	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	5.68	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	9.16	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	13.25	4.33	7.11	16.66	8.40	7.70	3.42	1.53	0.31	0.26	0.01	0.01	0	0.01	0
2001	54.50	15.61	1.34	8.45	19.60	10.85	8.06	5.46	1.28	0.68	0.05	0.08	0	0	0	0
2002	43.71	7.99	3.06	6.27	19.90	9.56	4.43	1.95	1.02	0.35	0.11	0.03	0.10	0	0	0
2003	27.84	8.83	8.07	2.47	7.83	8.71	4.79	1.95	0.77	0.82	0.29	0.07	0.14	0	0	0
2004	20.46	6.81	10.96	6.32	3.88	3.45	3.88	1.92	0.64	0.21	0.11	0.03	0.01	0	0	0.01
2005	16.10	2.03	5.63	7.06	6.18	0.84	0.81	0.67	0.21	0.16	0.10	0.05	0.01	0.01	0	0
2006	5.59	0.74	0.93	1.14	2.60	1.10	0.19	0.14	0.17	0.09	0.01	0.09	0.03	0.02	0	0
2007	28.68	4.16	4.73	2.98	10.83	10.70	3.10	0.61	0.15	0.11	0.12	0.04	0.01	0.01	0.01	0
2008	24.11	4.97	1.97	11.46	3.49	4.18	4.12	0.65	0.12	0.04	0.03	0.01	0	0	0.01	0
2009	22.65	2.86	0.77	7.56	11.21	1.02	1.31	1.21	0.22	0.06	0.04	0	0.01	0	0.01	0
2010	20.88	1.84	0.96	6.64	8.45	3.94	0.71	0.57	0.44	0.11	0.01	0	0	0	0	0
2011	27.95	5.55	1.12	6.54	9.34	6.53	3.66	1.15	0.30	0.39	0.04	0	0	0	0	0
2012	15.80	2.83	0.29	4.84	5.61	2.51	1.97	0.62	0.09	0.06	0.05	0	0	0	0	0
2013	10.08	4.03	0.27	0.61	3.50	1.94	1.96	1.33	0.48	0.10	0.08	0.05	0	0	0	0
2014	5.92	2.36	0.47	0.85	0.64	2.08	1.36	0.62	0.26	0.06	0.03	0.01	0	0	0	0
84-13 Mean	63.92	9.92	6.00	8.18	29.65	16.17	6.59	2.23	0.71	0.23	0.11	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
2007	7.02	2.34	NA	0.12	1.18	3.38	1.55	0.37	0.14	0.10	0.11	0.03	0.01	0.01	0.01	0
2008	5.08	3.00	NA	0.39	0.39	1.30	2.31	0.47	0.11	0.05	0.04	0.01	0	0	0.01	0
2009	3.96	1.89	NA	0.28	1.48	0.32	0.68	0.88	0.20	0.05	0.04	0	0.01	0	0.02	0
2010	4.26	1.38	NA	0.24	1.16	1.49	0.40	0.45	0.42	0.10	0.01	0	0	0	0	0
2011	6.72	3.19	NA	0.23	1.34	1.96	1.81	0.78	0.22	0.35	0.04	0	0	0	0	0
2012	3.88	1.85	NA	0.20	0.93	0.90	1.13	0.47	0.09	0.06	0.06	0	0	0	0	0
2013	3.42	2.45	NA	0.02	0.37	0.57	0.98	0.86	0.39	0.07	0.08	0.06	0	0	0	0
2014	2.35	1.51	NA	0.03	0.09	0.73	0.74	0.44	0.21	0.06	0.03	0.01	0	0	0	0
84-13 Mean	11.38	4.49	NA	0.29	2.99	3.61	2.57	1.17	0.44	0.18	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, 1993-1995, 1997-2004, 2009, and 2012-2014: April = 40 tows, May = 40 tows; 1992 and 2006: April = 0 tows, May = 40; 1996: April = 17 tows, May = 63 tows; 2005: April = 35 tows, May = 45 tows; 2007: April = 35 tows, May = 45 tows; 2008: April = 36, and May = 44 tows; 2010: May = 38 tows, 2011: April = 12 tows.

TABLES 5.30 - 5.65
LENGTH FREQUENCIES
LISTS

Table 5.30. Alewife length frequencies, spring and fall, 1 cm intervals, 1989–2014.

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	2007	2008	2009	2010	2011	2012	2013	2014
6	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
7	0	0	0	0	2	0	0	0	0	0	0	4	0	0	1	0	1	0	0	4	0	2	1	0	0	0
8	0	0	0	0	18	3	3	0	0	0	2	9	16	0	3	1	2	0	0	4	1	10	0	1	3	2
9	0	0	2	0	15	9	6	1	6	0	6	21	32	1	18	6	16	0	0	4	6	10	0	3	7	5
10	0	0	0	1	11	19	18	2	22	7	6	28	23	5	32	55	32	0	8	5	11	23	5	6	16	7
11	0	0	5	4	10	44	11	2	64	11	20	52	14	6	27	87	26	29	13	32	10	9	22	8	11	16
12	6	0	4	7	6	83	17	8	127	12	32	43	5	29	25	100	55	44	34	131	17	6	54	27	19	15
13	1	0	4	4	47	122	48	16	63	44	42	99	4	70	11	83	61	15	38	193	24	12	48	98	18	24
14	0	0	9	7	77	172	35	26	69	61	56	234	7	139	28	63	37	9	37	178	51	6	50	187	14	33
15	3	0	8	5	68	140	54	32	56	51	120	334	6	157	25	33	50	49	85	86	101	8	59	123	12	48
16	2	0	8	5	84	159	38	86	44	50	144	320	4	86	26	31	74	25	128	46	106	7	37	56	5	53
17	5	4	4	16	63	108	32	203	28	34	330	85	5	82	21	33	73	78	161	47	142	5	7	27	10	16
18	4	4	9	8	59	81	7	254	32	22	136	15	4	15	19	18	71	93	182	25	196	2	11	17	21	30
19	6	7	7	2	37	33	7	180	9	11	99	20	3	6	26	42	59	86	122	49	215	7	11	24	22	24
20	3	1	7	2	27	24	10	161	17	17	82	22	9	17	13	30	26	76	105	38	137	7	9	19	10	50
21	1	0	3	1	13	17	14	107	34	22	72	27	12	28	22	50	21	40	71	21	53	18	9	18	28	58
22	4	2	8	2	10	26	12	103	48	18	47	41	18	46	25	48	18	18	41	14	29	22	10	24	34	25
23	5	1	8	6	3	12	12	76	44	16	47	90	36	63	40	36	7	5	28	16	13	12	16	27	39	8
24	7	0	3	2	1	12	7	34	28	14	21	58	45	49	42	13	6	1	10	7	14	4	7	18	15	18
25	3	2	1	0	3	5	2	9	9	2	11	11	23	12	29	11	3	1	3	0	11	2	4	11	4	12
26	1	0	1	2	1	5	1	3	1	2	2	1	5	7	17	5	2	0	2	0	1	0	2	3	3	4
27	2	0	1	0	0	1	0	0	0	0	0	1	2	1	2	2	1	0	0	0	0	0	0	1	0	1
28	1	0	0	0	1	1	0	0	0	1	0	0	0	1	0	2	1	0	0	1	0	0	2	0	0	0
29	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
30	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
31	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
32	1	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
Total	**56**	**21**	**93**	**74**	**556**	**1,076**	**334**	**1,304**	**701**	**395**	**1,275**	**1,515**	**274**	**820**	**452**	**749**	**642**	**569**	**1,068**	**901**	**1,138**	**172**	**364**	**698**	**291**	**449**

Fall

length	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
6	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
7	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
8	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	1	0	0	1	0	-	0	0	0	0
9	0	0	0	0	3	1	0	0	1	0	0	1	6	1	1	0	1	0	3	2	0	-	1	0	0	1
10	0	0	0	0	5	1	4	1	1	0	1	4	23	0	7	1	7	0	8	2	1	-	1	0	0	2
11	0	0	0	0	27	30	5	5	6	1	3	5	59	0	33	6	14	0	22	1	2	-	9	0	8	0
12	0	0	0	1	120	82	9	25	12	9	6	9	86	4	64	7	8	0	44	0	2	-	22	2	14	7
13	0	0	3	0	88	84	14	21	21	7	9	17	72	0	4	12	17	0	87	5	10	-	14	3	16	27
14	0	0	2	4	16	36	11	30	31	0	11	10	23	3	3	16	15	0	134	14	10	-	22	0	34	48
15	0	0	1	8	21	31	0	9	53	0	5	8	24	3	5	28	15	2	118	4	8	-	28	2	6	12
16	3	0	3	10	53	14	4	1	110	1	25	2	36	17	20	30	12	4	31	0	1	-	14	1	2	4
17	2	0	0	12	25	33	1	2	194	4	34	0	27	8	19	12	3	0	8	3	1	-	19	2	2	0
18	3	0	0	9	13	24	1	1	62	3	11	1	5	0	0	1	5	0	6	0	1	-	17	0	0	2
19	0	0	0	2	1	11	0	0	0	1	4	1	0	1	0	0	0	0	7	1	0	-	1	0	1	0
20	0	0	0	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	-	0	0	0	0
21	0	0	0	0	3	1	1	0	0	1	2	0	0	0	0	0	0	0	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	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	0	0	0	-	0	0	0	1
24	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
25	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
26	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
27	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
Total	**8**	**1**	**9**	**46**	**377**	**354**	**50**	**95**	**492**	**27**	**117**	**58**	**364**	**38**	**156**	**113**	**98**	**6**	**468**	**33**	**37**	**0**	**148**	**10**	**83**	**104**

Table 5.31. American shad length frequencies, spring and fall, 2.0 cm intervals (midpoint given), 1989-2014.

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	2007	2008	2009	2010	2011	2012	2013	2014
7	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
9	0	0	0	0	8	2	17	0	6	9	5	5	2	13	6	1	6	0	0	0	1	0	0	0	11	7
11	0	0	1	3	7	2	16	5	24	27	20	46	1	101	12	8	11	0	5	26	12	12	5	3	48	41
13	4	0	10	8	4	4	11	9	59	85	31	29	2	87	11	14	10	0	20	78	36	21	28	34	38	32
15	49	1	82	17	6	22	22	191	177	108	65	21	2	41	0	45	25	38	54	180	66	77	100	106	20	9
17	29	8	49	23	10	72	68	154	319	97	52	32	4	49	3	6	4	14	44	51	40	47	25	45	11	3
19	5	5	4	33	6	374	40	47	62	32	20	13	0	17	0	2	0	5	8	11	15	5	3	5	2	1
21	1	3	10	25	6	158	6	9	2	1	35	1	0	4	4	2	6	0	3	3	3	2	1	0	1	1
23	0	3	31	20	5	18	2	16	5	8	50	4	0	7	7	4	7	0	4	3	4	0	0	10	8	16
25	0	2	10	7	1	6	0	15	1	7	14	2	3	4	0	0	3	0	7	0	0	1	0	22	1	2
27	0	1	1	0	0	2	0	5	0	1	1	1	0	0	0	0	2	0	4	0	0	0	0	4	0	2
29	0	0	0	0	0	1	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	1	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	1	3	0	3	3	0	1	0	0	1	0	2	0	0	0	0	0	0	0
35	0	1	1	1	0	1	0	0	0	0	0	0	0	1	0	1	0	0	0	1	1	0	0	0	0	1
37	0	0	0	2	0	1	0	0	4	0	1	0	0	1	0	0	1	1	0	0	0	0	0	0	0	1
39	1	0	0	3	2	2	1	0	2	0	4	0	0	2	0	0	0	1	1	0	0	0	0	0	0	1
41	1	0	1	5	2	3	2	0	3	0	3	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
43	0	0	1	4	2	1	0	0	1	1	6	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0
45	1	0	1	7	2	3	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
47	0	0	0	2	0	1	2	0	1	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	2	1
49	0	0	0	2	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
51	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
Total	**91**	**24**	**202**	**163**	**61**	**675**	**189**	**452**	**669**	**378**	**313**	**157**	**14**	**337**	**43**	**83**	**79**	**60**	**152**	**353**	**178**	**165**	**162**	**231**	**142**	**120**

Fall

length	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
7	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2	0	0	0	0	0	-	0	0	0	1
9	0	0	7	1	2	6	7	0	6	1	5	0	1	1	4	5	4	0	2	4	0	-	4	4	0	9
11	0	1	4	5	23	26	16	1	20	14	27	0	4	1	14	6	3	0	19	4	27	-	4	4	0	2
13	0	0	7	21	54	208	24	7	28	13	44	0	1	0	22	4	5	0	26	3	22	-	2	2	1	2
15	0	0	4	2	33	245	14	2	5	4	6	0	0	0	0	2	0	0	13	0	36	-	2	0	2	5
17	0	0	22	7	10	20	2	0	12	64	13	2	5	11	15	77	3	1	2	0	3	-	6	2	8	0
19	32	34	93	41	53	57	84	0	67	290	130	16	47	199	121	155	23	6	5	6	42	-	35	5	31	9
21	129	143	22	102	466	229	335	15	99	123	251	104	34	44	80	21	46	0	8	28	88	-	42	52	32	9
23	30	27	0	30	394	197	83	19	12	0	179	39	3	0	6	0	14	1	8	7	25	-	14	21	5	1
25	0	0	0	1	24	50	3	4	0	0	17	0	1	0	0	1	0	0	0	0	0	-	0	0	0	2
27	0	0	0	3	2	7	0	0	0	0	1	0	0	0	0	0	0	0	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	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	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	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	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	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	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	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	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	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	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	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	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**	**83**	**52**	**243**	**-**	**109**	**90**	**79**	**40**

Table 5.32. American lobster length frequencies-spring, female, 1 mm intervals, 1984–2014.

Lobsters were measured from each tow.

Female	Spring																														
	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Length	(32)	(46)	(116)	(120)	(120)	(120)	(120)	(120)	(80)	(120)	(120)	(120)	(120)	(120)	(120)	(120)	(120)	(120)	(120)	(120)	(119)	(120)	(80)	(120)	(120)	(120)	(78)	(92)	(120)	(120)	(119)
16	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
17	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	2	0	2	0	4	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	1	0	0	3	1	0	2	4	0	0	0	1	0	0	0	0	0	1	0	0	0	0
23	0	0	0	0	0	0	0	0	0	4	0	1	3	1	1	2	6	0	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	2	1	8	0	2	0	1	0	0	0	0	2	0	0	1	0	0	0	0
25	1	0	0	0	0	0	1	0	0	1	0	1	1	0	3	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
26	0	0	0	0	0	0	0	3	5	0	0	0	6	9	3	9	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	1	0	0	1	0	5	7	12	4	6	9	0	0	1	0	0	0	0	0	0	0	0	0	0	0
28	0	2	0	0	1	0	0	3	0	1	1	0	5	8	6	10	11	1	0	0	0	0	0	1	0	0	0	0	0	1	0
29	0	0	1	2	0	0	0	4	0	2	0	0	13	14	7	8	13	3	2	1	1	0	0	0	0	0	0	2	1	0	0
30	0	0	0	1	1	0	11	6	0	5	3	0	13	12	95	2	19	2	0	1	0	0	0	1	0	0	0	1	5	0	0
31	0	0	0	0	1	1	6	3	6	1	1	4	8	22	19	16	20	1	4	1	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	1	0	0	13	7	2	20	0	2	15	13	18	21	23	2	2	1	1	0	0	0	0	0	1	0	0	1	1
33	0	1	0	2	2	6	8	0	5	1	6	21	14	13	35	18	8	3	0	2	1	1	0	5	1	0	0	2	0	0	0
34	0	3	0	1	0	0	5	8	15	4	0	18	7	22	64	8	37	4	8	2	3	0	0	4	0	0	1	0	0	4	0
35	4	4	3	2	0	0	9	1	4	6	4	22	15	22	59	22	48	3	5	2	1	2	0	4	0	1	0	0	1	0	1
36	5	3	2	11	0	0	9	8	6	14	0	8	14	21	41	26	48	3	5	2	0	0	0	0	0	0	0	0	4	3	2
37	0	4	1	2	0	0	10	9	6	7	11	27	21	42	58	29	36	2	3	4	0	2	0	3	3	0	0	1	4	0	0
38	2	0	0	7	2	4	6	11	13	17	1	49	10	31	72	42	35	7	10	2	3	0	1	5	0	0	1	1	2	0	0
39	1	3	0	3	5	1	0	8	12	9	4	22	16	39	73	34	53	7	3	2	3	2	0	10	3	1	2	4	1	1	3
40	1	4	2	10	4	4	7	6	17	28	8	41	18	30	98	23	68	8	10	6	5	2	3	11	1	0	3	1	1	0	3
41	2	3	1	18	2	3	22	9	10	23	8	18	18	17	71	36	58	11	8	4	2	2	2	13	1	3	2	0	1	1	1
42	1	6	3	8	1	3	17	22	9	41	11	46	18	33	143	54	65	11	18	5	6	0	0	5	2	0	1	1	1	2	2
43	1	1	1	22	0	11	19	16	11	13	11	53	27	44	59	50	84	9	6	8	6	4	1	7	1	2	1	0	3	0	1
44	1	1	2	16	6	2	13	12	14	25	9	61	22	32	43	38	117	19	15	15	4	5	4	9	3	3	0	1	4	0	0
45	0	2	1	9	1	12	11	12	5	24	8	38	22	36	135	35	138	9	14	3	3	2	2	9	0	0	1	0	1	1	2
46	4	3	1	12	3	8	4	18	26	30	2	34	22	42	88	64	102	15	22	4	0	1	4	3	3	1	1	2	3	1	1
47	2	1	4	31	2	14	4	21	8	40	8	59	35	53	70	77	91	18	20	25	7	2	5	11	3	1	0	1	5	0	4
48	2	2	2	15	6	20	22	17	28	35	12	54	31	56	104	59	72	11	17	9	7	6	2	7	3	5	3	2	1	1	5
49	4	4	4	10	4	7	13	28	19	67	15	37	32	55	198	90	89	8	15	15	5	1	3	7	2	2	0	5	6	3	3
50	6	1	6	7	4	7	16	18	5	40	21	51	43	67	139	63	104	13	21	13	6	2	0	10	6	1	0	3	2	1	3
51	4	5	6	8	3	15	33	24	22	59	16	58	48	88	133	95	109	31	17	13	5	2	4	16	6	3	1	0	3	0	5
52	9	8	3	15	3	14	29	45	32	35	33	58	57	73	165	89	125	40	25	11	6	4	3	13	3	3	1	0	4	3	4
53	10	4	4	20	5	19	14	38	31	54	24	53	47	82	167	89	83	32	26	9	6	6	5	14	3	3	0	0	2	0	2
54	2	4	6	15	2	22	38	35	18	38	29	44	45	87	140	84	152	30	41	15	6	7	2	9	3	3	1	1	3	0	1
55	9	2	8	14	3	9	26	19	26	47	17	59	64	82	191	91	132	34	38	21	8	9	11	20	6	7	2	2	4	0	4
56	6	9	11	12	14	15	31	47	16	60	17	64	56	98	152	99	85	44	24	14	10	14	2	20	7	0	3	0	4	0	4
57	10	3	6	10	11	23	24	57	61	79	24	46	60	95	159	156	102	44	28	11	7	10	7	17	12	6	1	2	0	3	3
58	1	8	7	15	6	25	38	35	27	53	17	56	62	111	144	118	118	38	35	11	12	12	7	15	9	5	5	1	3	2	2
59	10	18	7	14	7	29	13	51	28	52	37	70	66	97	144	147	105	45	32	12	12	11	9	15	4	3	5	0	12	2	2
60	6	12	11	19	9	25	34	45	43	57	30	91	76	97	114	102	97	60	48	15	16	10	3	24	6	4	1	3	2	1	2
61	5	14	11	8	12	15	33	49	31	56	44	62	62	92	181	160	79	46	40	21	6	20	13	28	7	3	2	2	3	1	0
62	12	9	5	11	4	12	57	33	34	75	46	61	67	94	118	116	75	59	46	13	11	14	9	22	10	7	2	2	4	0	0
63	4	9	10	27	9	27	56	41	25	60	44	60	70	96	133	136	66	43	41	28	14	13	6	23	11	5	4	1	5	0	3
64	10	16	9	16	8	13	38	33	41	75	24	64	91	86	176	148	110	75	46	23	11	16	8	25	10	6	1	1	0	1	2
65	9	7	9	29	15	25	46	45	26	68	28	72	78	110	169	160	84	63	48	10	16	19	12	16	13	10	0	0	0	0	0
66	11	15	18	25	10	21	43	59	48	86	26	84	87	116	147	121	99	55	39	15	19	9	3	21	23	8	1	0	4	0	2
67	6	20	22	21	14	31	33	51	41	52	28	67	62	98	148	171	90	72	42	16	23	23	9	17	8	4	4	1	7	0	3
68	21	10	12	43	11	14	41	65	37	45	29	76	73	94	142	158	107	49	48	19	20	13	14	21	15	7	4	2	1	1	2
69	10	8	18	33	16	16	36	78	56	58	30	71	57	107	148	188	76	79	52	28	16	13	1	13	19	10	2	2	1	0	1
70	15	5	14	30	13	29	51	59	37	67	27	79	74	119	157	177	86	67	57	25	21	12	6	23	20	6	6	0	1	0	0
71	10	11	12	21	12	13	29	48	49	67	44	92	88	125	117	166	91	74	45	24	15	18	10	23	14	6	3	4	2	2	2
72	11	6	20	18	8	24	40	50	48	61	30	77	91	107	157	177	98	75	80	20	13	22	10	30	15	8	0	1	2	4	2
73	13	9	18	13	14	20	47	39	54	54	37	97	69	107	171	164	99	59	61	30	17	17	8	23	18	8	6	1	3	1	3
74	10	6	17	20	8	24	24	43	52	45	39	60	74	130	153	215	104	66	70	25	11	12	9	17	13	6	5	0	2	0	2
75	15	12	17	28	7	20	67	87	56	54	25	83	68	103	181	196	124	80	47	27	16	19	9	17	14	7	5	0	0	4	0
76	14	9	20	14	8	25	67	71	41	38	24	78	69	114	229	185	102	59	45	15	9	16	11	13	25	5	9	0	4	0	1
77	9	5	15	19	15	32	41	77	69	44	20	102	65	95	160	195	109	52	39	23	16	13	17	16	11	6	3	2	1	0	1
78	24	9	15	14	13	49	60	57	63	64	22	90	61	110	177	176	93	48	55	18	7	9	15	16	16	10	4	4	1	1	2
79	23	6	24	21	10	55	42	64	35	52	30	77	92	117	179	203	98	51	52	11	10	9	13	14	12	14	3	2	3	2	0
80	22	1	18	10	11	35	34	45	31	71	41	71	79	92	180	200	91	63	41	16	15	9	11	15	8	7	9	3	4	1	0
81	10	2	7	15	13	19	69	56	49	48	34	72	86	148	170	140	85	62	33	11	15	9	9	12	16	2	8	2	0	1	1
82	9	0	3	9	5	15	28	41	36	35	21	71	57	110	108	106	47	40	21	14	8	6	5	14	10	4	5	0	1	0	0
83	9	5	5	8	3	7	25	22	16	7	7	15	31	28	65	59	41	25	17	4	4	7	3	9	14	9	2	1	1	0	0
84	3	1	7	9	4	11	15	12	7	8	4	11	19	20	7	33	14	18	18	4	4	5	3	5	7	7	2	0	3	3	0
85	5	2	5	7	6	3	11	5	7	8	8	17	20	28	22	9	15	9	7	1	5	1	0	5	6	2	1	2	0	1	0
86	9	3	6	3	6	8	14	14	3	3	2	11	23	24	23	10	12	8	11	2	0	3	0	2	7	1	4	0	0	0	1
87	10	0	3	4	8	13	17	9	7	13	15	16	11	13	12	9	8	7	4	4	1	3	3	0	1	2	1	0	2	0	0
88	2	3	8	3	9	9	6	11	3	11	2	7	13	18	17	5	1	9	1	0	1	0	0	2	5	3	2	0	0	0	0
89	3	6	5	8	5	8	12	10	12	5	2	16	12	16	13	11	8	9	5	1	1	1	0	3	0	1	0	0	0	0	0
90	15	2	4	3	8	4	5	8	11	3	3	9	15	10	11	10	7	10	4	1	4	2	0	1	4	0	0	0	0	0	0
91	5	1	1	6	2	5	11	8	1	3	0	5	7	11	6	3	2	4	0	0	0	2	1	0	0	0	2	0	1	0	0
92	4	2	0	2	3	2	7	1	0	3	3	3	5	7	7	2	1	2	7	0	1	0	0	0	1	3	0	0	0	0	0
93	0	1	2	1	2	1	2	1	0	0	1	0	6	3	0	2	5	0	1	0	0	0	1	0	1	0	3	0	0	0	1
94	0	2	1	1	3	1	1	2	0	1	5	1	1	1	4	1	0	1	0	1	0	0	0	1	2	0	0	0	0	0	0
95	0	0	1	2	2	3	8	4	0	0	0	0	0	0	6	0	0	1	1	0	0	0	0	1	0	1	0	0	0	0	0
96	0	1	0	0	0	2	0	1	0	1	2	0	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
97	1	1	1	0	3	0	0	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
98	2	2	0	1	0	1	1	0	1	0	0	0	1	3	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
99	3	0	2	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	1	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
101	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
102	2	0	0	0	1	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
103	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
104	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
106	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
109	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
110	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	451	335	469	838	405	914	1,621	1,946	1,560	2,336	1,131	3,052	2,837	4,220	6,921	5,731	4,595	2,011	1,646	709	483	458	296	737	449	238	144	69	139	56	90
legal size			81.0			81.8									82.6								83.3		84.1				85.7		

Table 5.33. American lobster length frequencies–fall, female, 1 mm intervals, 1984–2014.

Lobsters were measured from each tow.

Female	Fall																														
	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Length	(70)	(80)	(80)	(80)	(80)	(80)	(80)	(80)	(80)	(120)	(120)	(80)	(80)	(80)	(80)	(80)	(80)	(80)	(80)	(40)	(80)	(80)	(40)	(80)	(40)	(80)	(0)	(80)	(80)	(80)	(80)
16	0	0	0	0	0	0	0	5	0	0	0	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	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
22	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	-	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	-	0	0	0	0
24	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
25	0	0	0	0	0	1	0	0	0	0	0	1	2	0	0	0	0	1	0	0	1	0	0	0	0	0	-	0	0	0	0
26	0	0	0	0	0	0	0	0	0	1	4	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
27	0	0	0	0	0	1	0	0	0	3	0	0	0	1	0	1	0	0	0	0	0	1	0	0	0	0	-	0	0	0	0
28	0	0	0	0	0	0	1	0	4	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
29	0	0	0	0	0	1	1	0	0	3	3	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	-	0	2	0	0
30	0	0	0	0	1	0	4	0	2	5	3	0	5	7	2	0	0	0	0	0	0	0	0	0	0	1	-	0	0	0	0
31	0	0	1	0	0	0	3	0	7	11	8	1	5	4	0	0	1	1	0	0	1	0	0	0	0	0	-	0	0	0	0
32	1	0	0	0	0	0	3	1	15	4	13	1	4	5	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
33	0	0	0	2	1	1	3	12	9	2	2	0	0	1	1	5	0	0	0	0	0	0	0	0	1	0	-	1	0	0	0
34	1	0	0	0	2	1	0	6	16	3	17	2	6	8	1	8	0	0	0	0	1	0	0	0	0	0	-	1	0	0	0
35	0	0	6	1	0	2	3	0	23	5	16	3	8	6	0	2	1	0	0	0	1	0	0	0	0	0	-	1	0	0	0
36	4	0	1	1	1	3	1	1	31	7	26	0	8	14	0	5	0	0	0	0	0	0	0	0	1	0	-	0	0	3	0
37	4	0	2	0	3	2	10	22	19	2	19	5	5	7	1	8	1	0	1	0	1	1	0	0	0	0	-	0	0	0	0
38	3	2	2	3	3	2	8	1	24	9	23	1	18	17	2	13	1	2	0	0	0	1	0	0	0	0	-	0	0	1	0
39	6	0	10	1	1	0	9	15	32	6	22	0	7	22	2	4	1	2	1	0	0	0	2	0	0	1	-	0	0	0	0
40	0	0	3	1	12	14	14	20	35	16	24	12	23	15	3	8	1	1	0	0	0	0	0	0	0	0	-	0	0	0	0
41	3	0	0	5	2	6	19	21	32	22	52	8	39	15	7	13	2	0	0	1	2	1	0	0	0	0	-	1	0	0	0
42	7	0	5	0	4	2	3	36	52	21	43	7	24	49	9	17	2	3	0	0	2	0	1	0	0	0	-	0	0	0	0
43	5	0	2	4	4	2	16	23	30	39	52	16	20	25	5	15	3	0	1	1	1	4	0	0	0	0	-	0	1	0	0
44	29	7	1	8	1	6	11	32	32	29	63	14	46	47	9	17	5	0	2	1	2	1	0	0	0	2	-	1	1	1	0
45	18	0	7	3	2	0	12	25	50	17	57	22	38	32	7	27	4	2	2	1	0	1	1	0	0	1	-	0	1	0	0
46	10	0	1	11	6	6	26	34	42	43	63	20	33	50	12	18	9	3	2	1	5	2	2	1	0	0	-	1	0	0	0
47	21	7	3	12	2	12	18	52	47	44	41	27	32	42	5	16	2	1	0	1	2	0	0	0	0	1	-	1	0	0	0
48	10	5	4	14	8	18	19	35	58	52	69	28	33	58	14	15	7	2	6	0	2	2	1	0	1	0	-	0	0	0	0
49	29	6	7	14	15	11	15	27	77	58	47	47	19	71	11	27	10	2	4	2	4	1	1	0	0	1	-	0	0	1	0
50	27	9	6	21	12	4	31	41	52	38	69	54	28	61	13	31	10	6	2	2	2	4	3	2	3	0	-	0	0	0	0
51	35	8	2	12	3	11	10	44	73	72	94	45	41	49	15	30	13	6	3	1	2	2	0	0	1	0	-	0	1	0	0
52	26	11	3	15	3	11	21	40	66	54	59	51	42	120	18	34	13	3	6	3	5	2	1	0	0	0	-	1	0	0	0
53	33	8	3	22	10	7	22	55	82	94	55	43	43	106	29	18	16	9	3	1	6	10	2	3	1	3	-	0	0	1	0
54	16	8	18	11	12	14	20	41	61	83	76	38	58	82	17	45	28	8	1	3	2	2	3	1	2	3	-	1	1	0	0
55	23	10	27	21	2	6	22	59	58	59	54	39	45	102	48	32	18	9	1	3	7	8	1	1	3	1	-	3	2	0	0
56	45	10	11	36	10	24	22	29	82	87	74	45	41	90	23	32	33	12	1	3	6	0	3	2	1	6	-	3	2	0	0
57	16	15	16	18	7	7	15	52	71	71	78	50	44	121	24	39	22	13	5	2	13	5	2	1	10	6	-	2	0	0	0
58	23	16	11	19	13	17	36	55	63	119	79	69	47	114	29	31	23	14	6	5	5	8	1	2	2	5	-	1	0	1	0
59	21	11	13	26	13	23	30	79	66	110	84	48	46	110	35	36	28	18	5	6	10	4	4	0	2	5	-	0	2	1	0
60	30	18	20	18	7	17	16	74	53	115	70	53	51	140	29	35	34	8	6	9	7	6	1	4	5	2	-	1	2	0	0
61	10	4	17	24	12	14	37	46	52	91	79	51	56	119	34	37	27	9	5	2	12	7	2	1	2	6	-	1	1	0	0
62	27	16	23	21	14	32	41	64	53	107	117	44	53	133	39	44	32	19	3	5	10	3	5	1	2	8	-	1	1	1	0
63	31	14	13	22	8	20	22	53	66	130	93	58	41	126	51	45	29	19	6	6	16	12	4	4	4	5	-	0	1	0	0
64	25	10	15	29	23	31	26	71	38	100	86	79	38	139	34	44	29	21	9	12	19	5	4	4	4	7	-	0	0	0	0
65	17	9	39	24	15	28	26	77	44	93	89	49	43	146	49	42	37	18	9	6	15	9	1	2	3	9	-	0	0	0	0
66	24	26	25	23	15	16	42	70	56	90	87	82	53	126	51	43	26	19	5	5	10	7	1	4	1	6	-	0	0	1	0
67	17	24	33	11	19	16	29	38	43	78	106	51	38	117	26	53	31	17	8	11	14	6	2	3	3	8	-	0	1	0	0
68	15	8	27	18	22	30	36	41	42	94	77	48	55	124	54	44	37	19	7	6	4	8	1	6	4	4	-	0	0	0	2
69	13	18	15	27	26	32	21	34	61	104	85	38	50	136	54	47	30	22	4	8	16	12	5	1	4	3	-	1	0	0	0
70	63	18	42	27	34	23	20	36	51	122	63	60	55	128	47	35	34	23	17	4	13	5	0	4	3	3	-	0	0	0	0
71	26	21	28	34	33	40	30	50	50	94	87	62	87	127	50	40	20	20	3	6	14	2	0	2	3	6	-	2	0	0	0
72	27	16	27	32	13	12	39	58	31	81	85	38	49	150	41	53	32	25	11	12	10	3	2	3	6	4	-	0	0	0	0
73	21	29	42	24	18	15	58	46	33	74	69	60	40	106	41	47	36	24	9	6	10	5	2	6	4	5	-	1	0	1	0
74	31	17	23	29	14	21	36	30	39	85	73	44	38	111	37	49	39	19	12	7	16	9	3	2	3	1	-	1	0	1	0
75	39	14	25	24	14	12	21	31	25	66	84	31	58	122	67	50	29	28	7	7	16	5	3	7	3	1	-	1	0	1	0
76	31	14	22	36	14	13	35	27	35	112	50	38	57	113	47	43	26	21	10	8	15	5	3	4	2	3	-	0	0	0	0
77	17	16	10	26	13	14	17	37	40	74	72	36	23	64	41	31	22	18	2	1	18	5	3	4	0	1	-	0	0	0	1
78	27	17	24	27	27	21	22	24	19	57	53	19	34	96	43	38	20	33	6	15	5	8	2	2	0	2	-	0	0	0	0
79	26	19	16	37	31	13	29	33	26	72	42	28	28	91	34	28	32	21	2	9	12	6	3	5	3	5	-	0	0	0	1
80	33	11	15	20	23	12	6	14	23	65	26	25	44	91	25	32	26	19	14	2	16	4	2	5	1	4	-	0	1	0	0
81	13	7	13	14	5	10	12	18	24	36	38	36	41	61	25	28	20	20	2	4	3	4	0	0	2	5	-	3	0	0	0
82	9	2	19	6	6	2	10	14	10	39	26	25	21	52	23	23	14	7	2	5	3	8	3	2	0	5	-	0	0	1	0
83	10	5	8	12	6	12	8	3	11	17	11	12	31	20	10	6	13	7	4	1	2	9	1	5	0	4	-	0	0	0	0
84	5	6	2	7	1	1	4	10	8	17	22	10	7	17	5	4	7	6	0	0	2	1	0	0	1	3	-	0	0	1	0
85	9	1	8	6	9	3	6	17	7	8	20	5	5	13	5	2	5	3	1	0	2	1	0	1	2	1	-	0	0	0	0
86	11	2	9	10	0	1	10	12	4	10	14	1	6	12	5	2	6	1	0	0	2	1	0	0	0	1	-	0	0	0	0
87	11	6	9	8	23	4	18	12	5	16	20	1	8	11	3	5	5	3	0	1	1	2	1	0	1	1	-	1	0	0	0
88	9	3	9	9	3	1	3	9	9	13	8	1	20	10	7	5	2	1	0	0	0	1	0	0	0	0	-	0	0	2	0
89	3	4	6	2	7	3	5	1	8	8	12	5	13	14	1	3	3	3	0	0	0	4	0	0	1	0	-	0	0	0	0
90	8	1	3	6	0	1	6	1	5	1	15	9	5	10	1	2	1	2	1	0	0	1	0	0	0	1	-	0	0	0	0
91	3	1	2	5	0	1	1	0	3	0	5	0	9	3	2	1	1	0	0	0	0	0	0	0	0	1	-	0	0	0	0
92	8	0	0	2	1	1	4	1	7	1	6	1	3	1	3	0	0	0	0	0	0	0	0	0	0	2	-	0	0	0	0
93	2	2	0	3	2	0	0	1	2	1	8	0	1	4	2	1	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
94	0	2	0	1	0	0	0	2	1	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1	-	0	0	0	0
95	1	0	0	1	6	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
96	3	0	0	1	1	0	1	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
97	15	1	0	1	1	0	1	0	1	0	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
98	2	1	0	1	1	0	1	0	0	0	0	0	0	1	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	1	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
100	0	1	0	1	1	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
101	0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
102	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
103	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
104	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
105	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
107	1	0	3	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
111	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
113	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
117	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
Total	**1,089**	**523**	**759**	**907**	**622**	**688**	**1,133**	**1,917**	**2,301**	**3,264**	**3,198**	**1,795**	**1,979**	**4,196**	**1,329**	**1,511**	**957**	**596**	**223**	**195**	**365**	**225**	**84**	**94**	**96**	**150**	**-**	**31**	**20**	**18**	**4**
legal size:			81.0			81.8																83.3			84.1				85.7		

Table 5.34. American lobster length frequencies–spring, male, 1 mm intervals, 1984–2014.

Lobsters were measured from each tow.

Male	Spring																														
	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Length	(32)	(46)	(116)	(120)	(120)	(120)	(120)	(120)	(80)	(120)	(120)	(120)	(120)	(120)	(120)	(120)	(120)	(120)	(120)	(120)	(119)	(120)	(80)	(120)	(120)	(120)	(78)	(92)	(120)	(120)	(119)
16	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	3	0	0	0	0	1	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	2	0	2	0	1	0	6	0	1	3	0	0	3	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	1	1	0	4	6	4	0	0	0	0	0	0	1	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	4	0	0	4	3	2	2	2	1	0	0	2	0	0	0	0	0	0	2	1	0	0
27	0	0	0	0	0	9	0	0	1	9	2	0	2	1	2	1	1	2	0	1	0	0	0	0	1	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	1	3	1	0	2	1	5	2	12	2	2	0	0	0	0	1	1	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	9	0	0	2	3	5	0	9	3	1	0	0	0	0	0	0	0	0	3	0	0	1
30	0	0	0	1	0	1	5	0	5	1	0	3	10	5	2	4	15	3	1	2	1	0	0	0	0	0	0	0	0	2	0
31	0	1	0	1	1	0	0	8	4	3	2	0	8	13	14	7	18	3	4	0	0	1	1	1	0	0	0	0	1	0	1
32	0	0	0	0	3	6	0	6	6	8	1	8	9	12	11	16	17	2	2	5	0	0	0	2	0	0	1	1	3	2	0
33	0	2	1	2	0	0	1	9	0	6	4	15	6	9	4	15	16	3	9	3	0	1	0	1	1	0	0	1	0	0	0
34	0	0	3	2	0	1	1	5	1	6	0	27	19	16	52	12	25	2	4	1	0	0	0	5	0	0	1	0	0	0	1
35	2	0	2	0	0	0	4	5	9	5	1	20	12	22	26	23	33	2	5	2	4	0	1	2	1	0	0	1	2	0	1
36	2	4	0	1	1	7	14	4	5	7	3	17	13	24	34	19	26	6	1	3	1	2	0	6	0	0	1	3	3	0	1
37	1	1	2	5	0	3	2	23	9	12	4	15	20	32	58	35	32	5	3	2	4	2	0	7	1	0	0	1		0	0
38	0	1	1	5	2	7	14	9	1	26	3	18	18	21	93	12	28	3	8	4	2	1	2	7	0	0	2	1	4	0	3
39	0	0	0	10	0	6	12	5	7	15	4	31	15	20	33	20	35	11	9	4	3	2	3	8	0	1	0	0	1	0	0
40	0	2	0	7	2	8	3	5	12	17	7	25	21	41	32	20	52	8	10	2	0	1	2	4	2	0	1	3	3	2	1
41	0	2	2	9	1	0	11	8	7	4	10	28	19	41	75	46	55	3	13	7	3	0	1	6	3	0	2	2	2	0	0
42	4	2	0	3	1	9	13	10	13	42	7	39	18	46	125	36	63	14	9	10	3	5	0	16	3	2	0	3	4	1	2
43	1	2	1	16	0	9	14	9	12	23	5	52	26	24	70	51	32	5	9	10	5	2	2	8	1	1	1	0	2	1	1
44	3	0	1	15	1	3	10	11	6	42	9	17	21	50	170	44	110	10	15	9	1	0	4	12	2	1	3	3	2	0	3
45	1	5	4	22	3	7	7	20	13	45	6	39	28	46	76	50	65	17	16	20	5	3	2	9	3	1	2	2	4	3	1
46	0	2	2	24	2	24	7	12	25	37	9	32	22	66	155	71	74	19	18	18	4	3	2	11	0	4	1	3	2	0	6
47	0	1	2	31	7	3	2	17	47	32	9	54	32	66	146	87	65	17	9	4	4	4	1	16	0	2	2	1	0	0	1
48	6	6	5	9	1	8	20	17	7	23	6	45	32	78	93	60	57	22	29	6	3	6	5	8	4	2	2	0	2	1	5
49	9	3	4	24	4	22	20	45	21	40	19	46	18	82	120	87	69	16	18	8	15	3	4	16	3	3	1	0	3	0	1
50	7	3	1	19	4	23	10	21	25	30	21	29	35	61	66	83	110	34	22	16	7	6	4	9	4	2	0	2	2	0	3
51	3	4	4	12	2	20	26	42	16	75	16	62	45	57	158	90	65	24	31	19	8	8	9	10	3	5	0	0	1	0	2
52	9	5	2	12	2	15	23	21	25	37	31	49	52	75	81	80	100	27	27	14	10	6	2	12	3	2	2	0	7	0	3
53	5	9	7	17	4	10	12	33	16	41	26	60	50	56	138	69	66	25	20	11	5	7	5	19	6	4	1	0	2	1	1
54	10	3	16	14	7	14	30	45	36	43	29	74	49	74	210	79	110	33	38	26	15	6	5	21	5	4	1	4	4	2	0
55	5	3	6	18	7	23	16	42	27	50	27	46	51	82	101	101	114	38	23	18	2	9	6	12	5	3	2	1	3	4	4
56	3	12	11	17	10	6	34	38	37	44	14	70	54	83	130	82	95	37	29	19	13	11	9	7	7	6	6	2	4	0	3
57	1	7	10	26	11	17	36	30	12	51	27	54	60	68	145	93	95	43	35	22	7	6	5	21	4	3	3	3	1	1	2
58	12	7	5	10	4	19	44	71	31	47	35	41	83	96	111	111	99	43	46	11	12	8	5	13	8	1	2	1	2	2	0
59	3	13	7	12	14	25	29	57	27	88	34	71	56	67	63	144	89	43	43	13	6	11	10	24	9	7	4	2	3	0	1
60	1	9	14	29	8	23	49	50	37	42	34	94	84	156	121	105	105	56	35	24	8	9	6	16	9	6	1	0	4	2	3
61	9	14	16	12	10	22	39	56	46	62	34	77	59	102	176	123	83	51	36	28	14	10	14	11	11	6	3	3	5	2	3
62	11	10	13	15	6	30	44	78	36	65	54	57	58	127	152	117	84	69	44	20	11	12	7	12	16	12	2	0	5	0	2
63	18	15	16	28	8	24	52	65	54	44	36	59	60	101	167	132	73	54	44	24	16	13	13	19	19	5	6	2	5	3	4
64	8	16	12	26	8	21	45	72	43	63	27	73	90	95	153	133	98	69	46	26	10	14	8	22	16	4	8	3	5	1	0
65	13	8	11	20	15	20	47	55	36	73	33	77	73	97	165	111	96	75	50	30	21	17	8	16	16	8	2	1	5	1	1
66	5	10	11	26	16	32	49	71	31	71	23	39	73	107	223	129	64	56	39	23	31	15	6	22	23	2	6	2	0	1	0
67	1	5	11	26	11	32	29	57	44	39	21	69	60	118	182	149	66	77	53	24	16	14	6	33	19	1	3	1	10	1	0
68	5	10	13	12	7	21	33	80	48	26	34	67	64	100	147	116	81	82	32	36	22	23	11	20	19	10	5	0	0	1	2
69	8	9	10	19	24	25	39	71	46	43	32	57	79	101	156	140	77	73	51	25	11	20	8	16	11	4	3	4	3	2	3
70	8	11	14	23	7	34	38	50	51	27	24	60	77	99	158	152	85	73	44	27	21	16	9	15	21	11	5	2	5	1	2
71	9	5	13	22	13	29	55	66	23	48	42	85	58	91	112	152	62	71	56	20	29	20	7	4	18	5	11	3	1	0	0
72	6	17	13	14	17	33	40	93	42	37	41	59	85	111	145	105	72	62	42	23	13	11	8	25	15	7	4	3	5	2	0
73	14	5	10	21	11	28	37	94	42	34	27	93	64	82	122	109	61	63	46	15	22	16	6	13	14	3	6	1	2	3	1
74	6	9	27	21	11	45	40	74	36	32	33	67	71	92	146	123	74	85	40	35	15	10	2	15	8	9	5	3	4	2	1
75	6	3	13	15	10	35	29	63	40	48	21	84	62	73	81	120	52	72	39	21	16	14	6	19	11	5	2	3	3	0	2
76	12	3	20	16	18	18	33	79	23	32	23	47	48	67	143	122	49	69	50	25	9	11	4	13	8	3	4	2	5	0	0
77	9	7	10	14	7	22	30	69	31	24	12	50	54	66	115	97	57	63	35	24	18	17	2	8	14	10	6	2	6	0	1
78	18	3	18	9	11	33	46	37	29	38	20	55	35	46	113	90	37	56	55	14	9	8	4	9	13	8	0	2	3	0	0
79	7	9	15	21	15	22	31	77	19	41	30	36	43	64	129	83	43	57	31	14	13	9	7	13	7	12	6	4	0	4	0
80	5	6	9	22	5	23	34	49	22	19	32	52	37	57	77	63	47	67	39	19	8	10	6	15	9	4	7	0	1	1	0
81	8	0	9	11	1	34	21	53	34	31	19	43	27	70	118	67	44	45	41	11	6	8	5	11	9	10	3	1	1	2	0
82	2	3	2	10	4	9	18	39	25	13	13	51	27	62	97	83	23	36	31	10	7	2	1	16	8	2	2	0	1	2	1
83	9	0	5	9	7	18	12	33	24	6	7	15	15	47	33	41	37	25	21	4	8	4	7	2	8	6	0	3	0	1	1
84	5	1	8	12	2	5	10	33	9	7	3	26	8	34	28	29	24	23	21	8	7	3	3	8	10	2	2	2	2	2	0
85	3	2	6	8	4	6	9	28	6	3	0	14	4	49	18	20	26	23	18	2	8	3	5	5	1	2	1	1	0	0	0
86	1	3	5	1	6	26	8	28	7	4	2	15	13	12	19	17	30	23	15	1	8	1	1	7	6	1	2	1	0	2	0
87	3	0	1	13	8	9	4	31	0	0	6	3	6	30	37	23	11	15	8	3	3	1	2	1	7	4	0	2	0	1	0
88	0	0	5	4	1	14	2	21	2	0	4	14	4	32	15	27	12	10	13	2	2	1	1	1	4	1	1	0	0	3	0
89	5	0	2	2	3	2	6	21	5	0	2	11	3	33	28	23	13	10	8	2	1	3	2	0	4	4	2	0	0	0	0
90	0	0	0	1	5	6	5	24	2	1	0	7	7	30	25	24	16	11	9	3	0	0	1	3	3	4	0	1	0	0	1
91	4	0	1	7	4	7	5	26	6	1	0	7	2	25	11	20	11	14	8	3	1	4	0	0	3	2	1	1	0	0	1
92	2	0	2	4	2	3	1	24	1	3	0	8	11	23	15	9	8	10	10	1	0	1	1	0	1	0	0	1	1	1	0
93	0	0	3	6	1	10	0	5	0	1	0	8	2	6	27	4	13	9	4	0	1	1	0	5	0	0	0	0	1	0	0
94	0	2	1	3	0	1	0	9	1	0	0	9	2	7	16	17	11	9	4	3	2	0	1	0	3	0	0	1	0	0	0
95	1	0	0	5	0	0	0	1	0	1	2	7	1	4	5	8	7	0	1	2	1	0	0	1	1	0	0	1	0	0	0
96	0	0	1	1	0	0	2	8	1	1	0	6	0	1	8	4	5	2	3	0	1	0	0	0	0	0	0	0	0	0	0
97	3	3	1	2	1	9	2	2	4	0	0	3	0	6	3	4	1	2	0	1	0	0	0	0	2	1	0	0	0	0	0
98	0	0	0	3	0	0	1	1	0	0	1	0	0	2	0	0	1	0	2	1	0	1	1	0	0	0	0	0	0	0	0
99	2	0	0	1	0	1	0	2	0	0	0	1	1	1	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0
100	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
101	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
103	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
104	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
107	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**317**	**295**	**436**	**854**	**375**	**1,031**	**1,362**	**2,429**	**1,371**	**1,906**	**1,064**	**2,690**	**2,389**	**3,875**	**6,112**	**4,554**	**3,624**	**2,198**	**1,633**	**843**	**541**	**439**	**266**	**690**	**451**	**231**	**149**	**99**	**154**	**64**	**77**
legal size			81.0			81.8									82.6								83.3		84.1				85.7		

Table 5.35. American lobster length frequencies–fall, male, 1 mm intervals, 1984–2014.

Lobsters were measured from each tow.

Male	Fall																														
	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Length	(70)	(80)	(80)	(80)	(80)	(80)	(80)	(80)	(80)	(120)	(120)	(80)	(80)	(80)	(80)	(80)	(80)	(80)	(80)	(40)	(80)	(80)	(40)	(80)	(40)	(80)	(0)	(80)	(80)	(80)	(80)
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	-	0	0	0	0
25	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
26	0	0	2	0	0	0	0	0	1	0	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
27	0	0	0	0	0	2	0	0	1	9	0	0	0	1	0	0	1	0	0	0	0	1	0	0	0	0	-	0	0	0	0
28	1	2	0	0	0	0	3	0	0	3	4	0	1	1	0	1	0	0	0	0	0	1	0	0	0	0	-	1	0	0	0
29	0	0	0	0	0	1	3	0	0	6	0	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
30	0	0	0	0	0	0	3	0	3	0	4	0	3	2	0	0	0	0	0	0	0	1	0	0	0	0	-	0	0	0	0
31	0	0	2	0	1	0	2	0	4	2	3	0	6	2	2	0	0	0	0	0	0	1	0	1	0	0	-	0	0	0	0
32	4	0	0	4	0	0	0	5	13	2	3	0	4	5	2	2	0	0	0	0	1	0	0	0	0	0	-	0	0	0	0
33	1	0	0	2	0	1	0	3	4	0	9	1	11	3	1	5	3	0	0	0	0	0	0	0	0	0	-	0	0	0	0
34	1	0	0	2	1	0	2	1	13	4	11	0	4	1	1	1	1	0	0	0	0	0	0	1	1	0	-	0	0	0	0
35	3	0	0	1	0	0	3	7	13	15	12	1	8	3	0	4	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
36	3	0	0	1	0	1	5	8	25	8	21	1	7	14	2	1	0	0	0	1	1	0	0	0	0	0	-	0	0	0	0
37	3	0	6	0	1	1	7	4	38	4	21	1	11	7	0	2	0	0	0	0	0	1	0	0	0	0	-	0	0	0	0
38	2	2	2	3	2	0	0	6	40	6	34	1	17	14	3	5	0	0	0	0	1	4	3	0	0	0	-	0	0	0	0
39	0	0	2	1	2	1	5	8	34	5	25	4	16	28	7	17	3	0	1	0	0	1	0	0	1	0	-	0	0	0	0
40	3	0	6	2	1	5	10	8	35	21	35	6	15	14	5	7	1	0	2	0	0	0	0	0	1	0	-	0	1	0	0
41	6	1	1	3	4	1	12	13	43	14	54	5	11	24	1	6	1	0	1	0	0	1	2	0	1	0	-	0	0	0	0
42	4	6	2	0	11	3	12	13	43	34	55	5	29	25	9	8	5	0	1	1	2	1	0	0	1	0	-	1	1	0	0
43	1	0	3	3	2	1	7	7	49	17	56	12	23	41	5	21	2	2	0	0	0	1	1	1	1	0	-	0	0	0	0
44	4	1	1	5	11	1	6	13	35	13	63	26	16	40	5	19	3	2	1	1	3	0	0	0	0	2	-	2	0	0	0
45	7	3	3	3	8	10	11	42	44	34	43	20	44	53	9	18	5	3	2	1	2	2	2	0	0	1	-	1	0	0	0
46	2	2	1	7	4	14	10	31	44	19	58	33	18	35	7	16	5	2	3	0	0	2	0	0	2	1	-	2	0	0	0
47	13	4	3	10	10	5	16	14	66	60	26	26	33	41	13	20	7	2	2	1	2	3	0	1	1	0	-	0	0	0	0
48	15	3	5	7	14	4	16	10	67	49	72	19	49	72	8	20	9	9	1	0	3	2	0	0	0	0	-	0	2	0	0
49	4	2	10	8	2	12	18	45	48	100	56	33	30	48	10	37	9	1	0	1	6	3	2	0	1	2	-	0	0	0	0
50	13	5	8	21	9	11	16	37	63	56	55	53	28	56	15	44	9	3	2	0	5	4	3	1	0	0	-	1	2	0	0
51	51	6	5	17	10	11	24	46	74	30	88	27	22	88	21	37	18	6	3	3	3	0	1	0	0	1	-	0	1	0	0
52	15	5	11	17	3	16	31	43	65	78	82	56	30	80	36	42	9	4	2	0	3	4	1	1	1	3	-	0	0	0	1
53	13	9	3	30	5	15	22	57	55	83	83	61	37	103	29	29	15	8	3	1	7	1	0	1	0	1	-	1	0	0	0
54	24	12	19	26	21	17	25	76	47	59	97	59	30	116	23	43	21	7	2	3	8	5	2	1	3	3	-	1	1	0	0
55	23	4	17	23	13	26	25	47	83	84	70	80	32	96	26	46	38	9	2	2	12	3	3	1	0	7	-	1	1	0	0
56	18	12	25	18	13	13	13	37	65	104	90	52	43	89	39	39	21	10	3	4	10	3	3	0	2	6	-	0	0	0	0
57	9	0	10	30	26	18	36	43	64	101	79	92	27	111	44	42	27	10	5	4	8	8	1	7	2	4	-	0	0	0	0
58	29	15	24	23	13	30	34	51	68	68	107	58	48	80	42	57	21	10	8	5	6	7	3	1	1	5	-	1	0	0	0
59	47	8	26	31	16	14	23	43	86	109	78	76	40	143	33	54	29	24	10	8	10	13	6	5	1	6	-	0	2	0	0
60	16	6	11	26	7	26	39	56	77	103	109	69	30	134	56	61	37	9	9	7	13	7	2	2	0	1	-	0	0	0	0
61	23	5	10	25	30	12	24	57	68	138	120	78	59	128	53	64	44	15	8	5	17	8	5	4	1	3	-	0	0	0	0
62	50	17	26	23	10	13	36	37	57	125	92	80	42	145	57	49	28	19	10	7	10	6	3	1	4	7	-	0	2	0	0
63	14	18	37	20	15	19	28	63	68	144	107	74	41	149	60	63	39	29	15	7	4	9	5	4	1	10	-	2	0	0	0
64	28	17	22	24	35	19	25	86	74	87	106	73	77	138	57	68	42	35	9	8	19	12	2	2	2	8	-	0	3	0	0
65	36	10	39	31	20	16	39	87	49	107	83	75	73	161	75	48	37	34	17	10	14	14	3	4	6	11	-	1	1	0	0
66	22	13	21	41	31	27	22	60	59	81	87	93	40	130	63	61	41	24	12	7	21	6	4	2	6	11	-	3	1	1	1
67	14	16	39	28	21	24	30	78	82	108	119	63	46	136	51	38	43	38	13	7	17	12	2	7	7	14	-	1	3	0	1
68	16	18	30	31	17	19	42	71	69	107	79	55	34	113	67	61	57	33	21	7	15	12	5	5	4	16	-	0	4	1	0
69	46	13	22	32	31	30	24	51	81	131	101	75	28	121	52	54	41	21	20	11	23	10	2	5	5	8	-	0	2	0	0
70	32	11	28	31	14	24	26	63	56	117	112	79	36	122	60	78	42	22	12	8	30	7	1	4	3	6	-	3	0	0	1
71	8	14	25	23	21	25	24	58	63	115	83	52	63	126	69	75	48	47	21	13	20	6	6	0	4	12	-	1	0	0	0
72	23	20	31	36	29	19	33	89	61	86	76	65	66	86	77	64	47	52	13	9	19	10	6	9	2	8	-	0	1	2	0
73	40	18	42	29	13	42	40	53	44	85	83	51	44	98	54	70	47	32	6	5	20	9	0	3	4	9	-	1	0	0	0
74	36	18	22	25	22	19	39	28	69	130	108	56	42	99	64	65	37	39	21	14	10	4	1	8	6	12	-	1	0	0	0
75	9	8	23	18	16	28	33	38	53	101	97	58	35	99	62	63	39	33	14	6	23	12	0	3	1	11	-	1	1	0	0
76	21	15	24	25	12	36	20	37	33	75	66	37	32	88	55	66	33	28	14	5	16	4	5	7	0	6	-	1	1	0	1
77	13	6	23	19	33	18	32	28	53	79	52	55	37	94	55	60	31	33	17	3	7	9	5	6	2	7	-	0	0	0	0
78	28	12	9	32	13	29	24	36	46	70	55	59	33	76	46	54	28	38	11	5	8	3	1	5	4	2	-	2	1	0	1
79	5	13	11	33	8	19	19	56	48	61	66	43	47	81	52	59	35	35	17	6	9	4	2	5	4	6	-	2	2	0	0
80	15	18	13	20	22	15	38	40	49	102	53	39	29	78	44	51	34	26	7	5	5	7	3	4	0	3	-	0	0	0	0
81	23	11	18	10	8	17	16	45	39	47	66	46	32	83	37	52	25	18	14	2	12	5	0	4	0	2	-	0	0	1	0
82	7	7	20	10	6	6	21	19	21	46	26	41	15	57	34	29	23	21	10	3	8	5	3	5	4	5	-	0	0	0	0
83	6	6	12	5	6	11	14	23	29	26	25	23	10	23	20	20	12	4	3	1	3	2	1	0	4	2	-	0	0	0	0
84	4	2	13	5	8	10	6	10	23	12	15	31	8	19	6	15	7	6	1	2	3	2	0	4	1	1	-	0	0	0	0
85	7	2	15	8	10	3	14	15	39	11	13	17	5	12	4	10	8	3	1	1	3	2	0	0	0	3	-	0	0	0	0
86	7	5	11	5	5	3	8	2	10	10	30	26	14	20	7	10	3	3	0	0	2	0	0	0	2	0	-	0	1	0	0
87	5	0	15	5	7	6	17	2	16	8	13	15	4	16	6	17	3	1	0	0	0	3	0	1	0	1	-	0	0	0	1
88	3	1	12	7	2	0	26	2	16	9	25	13	8	14	6	7	7	3	0	0	3	0	0	0	0		-	0	0	0	0
89	7	5	9	5	9	7	7	4	19	9	20	17	10	15	8	12	5	0	0	0	0	0	0	0	0	2	-	0	0	0	0
90	18	3	13	3	5	7	8	8	10	3	22	10	5	14	3	4	6	0	1	0	4	0	0	0	0	0	-	0	0	1	0
91	4	2	14	5	2	11	5	7	12	17	15	6	3	15	4	7	3	0	0	0	1	0	0	1	0	2	-	0	0	0	0
92	7	0	8	4	14	1	3	2	10	3	19	6	3	10	4	5	1	0	0	0	0	0	0	0	0	2	-	0	0	0	0
93	1	0	0	1	6	0	6	5	7	3	12	12	0	8	3	3	1	0	0	0	1	0	0	0	2	0	-	0	0	0	0
94	1	1	2	1	0	1	4	2	3	2	12	2	1	6	0	2	1	0	0	0	1	0	0	0	0	0	-	0	0	0	0
95	0	1	5	1	0	0	0	1	3	2	9	1	0	4	5	1	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
96	0	0	3	1	0	14	0	0	1	4	1	2	0	4	4	1	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
97	13	0	4	3	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	-	0	0	0	0
98	1	1	0	0	0	0	0	0	0	1	0	0	0	0	2	0	1	0	0	0	1	0	0	0	0	0	-	0	0	0	0
99	0	1	4	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
100	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
101	0	0	1	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
102	0	1	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
103	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
104	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
105	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
106	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	-	0	0	0	0
107	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
Total	**930**	**436**	**888**	**945**	**712**	**814**	**1,198**	**2,043**	**2,853**	**3,563**	**3,673**	**2,406**	**1,750**	**4,165**	**1,783**	**2,107**	**1,202**	**814**	**375**	**200**	**454**	**266**	**101**	**126**	**100**	**235**	-	**31**	**34**	**6**	**8**
legal size:			81.0			81.8								82.6								83.3		84.1				85.7			

Table 5.36. Atlantic herring length frequencies, spring and fall, 1 cm intervals, 1989-2014.
Atlantic herring 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	2007	2008	2009	2010	2011	2012	2013	2014
3	0	0	0	5	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
4	0	0	0	0	4	0	0	0	0	18	504	61	0	0	1	2	0	0	0	1	213	2	12	0	29	3
5	0	2	0	11	3	1	0	0	1	149	1,547	104	0	0	8	30	76	3	20	36	3,416	28	35	15	429	29
6	1	3	3	16	1	0	1	3	0	92	237	1	3	0	9	10	140	2	2	13	449	12	59	2	227	0
7	0	1	4	15	2	0	2	15	69	84	18	7	11	1	0	8	118	1	0	12	44	1	103	2	38	2
8	0	0	7	0	1	0	0	5	165	28	5	1	6	1	0	9	73	11	0	23	48	1	132	0	10	1
9	0	0	3	0	1	0	1	1	27	11	4	0	8	0	0	3	8	10	0	16	59	0	43	1	1	2
10	0	0	0	0	3	1	0	0	0	2	0	0	1	0	0	0	0	0	0	2	6	0	3	1	0	5
11	0	0	0	0	3	1	0	1	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	46
12	0	0	0	0	38	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	492
13	0	8	0	0	215	8	0	0	5	0	0	0	0	0	0	1	3	0	0	0	0	5	1	1	0	483
14	0	1	0	0	203	11	0	1	29	0	0	0	1	0	0	9	7	0	0	0	1	29	26	6	23	200
15	2	0	8	0	122	9	6	0	59	5	0	0	2	0	0	49	14	0	9	1	9	39	55	16	112	48
16	3	1	38	0	174	17	7	3	12	8	0	3	0	0	0	65	20	0	14	0	91	49	19	12	121	6
17	2	31	33	0	100	42	8	2	4	5	0	6	2	0	0	140	63	0	27	2	149	25	3	3	119	18
18	2	4	29	2	28	32	12	0	10	2	0	0	1	0	3	275	98	0	166	6	28	31	7	0	49	95
19	0	16	19	29	21	39	12	6	21	0	1	0	11	2	1	117	57	0	467	1	203	86	14	20	32	85
20	0	161	67	15	41	43	78	10	40	5	1	6	65	3	2	67	67	0	228	7	521	222	14	107	50	52
21	0	333	72	24	35	29	283	26	14	4	2	11	85	17	0	12	19	0	99	11	279	106	8	196	148	16
22	0	424	70	111	96	14	399	15	19	11	10	38	77	32	0	16	11	3	105	9	162	71	24	91	847	4
23	0	201	160	61	387	111	245	20	7	4	15	36	14	87	4	0	15	4	106	13	144	97	59	23	824	60
24	0	195	297	311	436	224	290	22	18	1	19	47	33	71	17	0	25	3	150	27	71	105	173	21	268	71
25	0	315	337	751	645	485	416	46	117	2	9	99	31	18	36	3	21	5	122	38	87	108	214	16	104	30
26	1	447	360	503	921	560	1,028	85	202	31	10	70	46	30	63	3	78	3	125	39	108	110	210	18	96	50
27	0	347	514	382	807	947	723	93	236	33	35	80	24	27	65	14	106	9	122	38	69	95	147	11	30	30
28	0	338	513	391	825	604	706	64	234	44	37	104	34	19	72	9	87	6	116	36	85	62	65	4	5	4
29	2	247	319	492	550	387	337	37	82	21	25	69	29	52	52	1	40	3	47	15	44	26	48	4	1	0
30	0	156	383	142	287	204	231	29	31	1	11	24	8	3	27	3	19	1	6	6	27	7	2	0	0	0
31	2	127	139	77	129	29	14	4	15	2	0	0	4	0	8	1	0	0	0	2	6	0	2	0	0	0
32	0	50	22	1	33	6	14	1	2	1	1	0	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	0
34	0	8	1	0	8	0	0	0	0	0	0	0	0	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**	**1,931**	**355**	**6,319**	**1,317**	**1,479**	**570**	**3,563**	**1,834**

Fall

length	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
7	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
8	0	0	0	99	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	-	0	0	0	0
9	0	0	0	328	16	4	0	0	2	3	0	0	0	0	1	0	0	0	0	0	4	-	1	0	1	0
10	0	0	0	176	3	6	0	14	6	59	0	0	0	0	12	1	0	0	0	0	2	-	0	0	1	0
11	0	3	0	34	5	9	0	11	3	49	0	1	0	0	47	0	0	2	0	0	1	-	0	0	1	0
12	0	0	0	3	9	11	0	1	0	0	0	0	0	0	20	1	0	0	1	0	0	-	0	0	0	0
13	0	0	0	0	13	2	0	0	0	0	0	0	0	0	0	0	0	0	1	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	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	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	0	0	0	-	0	0	0	1
17	0	0	1	0	7	5	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	-	1	0	0	2
18	0	0	6	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	-	1	0	0	0
19	0	0	5	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	-	0	0	0	0
20	0	0	0	0	2	0	0	0	1	0	0	0	0	0	0	0	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	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	0	0	0	-	1	0	0	0
23	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1	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	1	0	0	1	0	-	0	0	0	0
25	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
Total	**0**	**3**	**12**	**642**	**110**	**40**	**0**	**27**	**12**	**112**	**0**	**2**	**0**	**0**	**80**	**3**	**3**	**2**	**2**	**1**	**9**	-	**4**	**0**	**3**	**3**

Table 5.37. Atlantic menhaden length frequency, spring and fall, 1 cm intervals, 1996-2014.
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.

Spring

length	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
7	0	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	0	0	0	0	0	0	0
9	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	7	0	0
11	0	0	0	1	0	0	13	0	0	0	0	0	0	0	0	0	3	0	0
12	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	15	0	0
13	0	0	0	0	0	0	6	0	0	0	2	0	0	0	0	0	8	0	0
14	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	5	0	0
15	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	8	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
20	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0
22	0	0	0	0	0	0	0	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	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
25	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	1	0	0
26	0	0	0	0	0	0	1	0	0	0	0	4	0	0	0	0	2	3	6
27	0	0	0	0	0	0	1	0	0	0	0	6	2	3	1	4	14	25	46
28	0	1	0	0	1	0	1	0	0	0	0	5	4	9	5	10	33	32	81
29	0	1	0	0	1	0	0	1	3	0	1	5	2	2	1	18	53	59	79
30	0	1	0	0	0	0	1	1	0	0	0	4	1	5	0	10	28	27	34
31	0	3	0	0	0	0	0	0	1	0	2	4	1	0	0	1	12	13	19
32	0	0	0	0	1	0	3	0	0	0	0	0	0	0	0	0	1	0	1
33	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Total	**0**	**6**	**0**	**1**	**9**	**0**	**47**	**2**	**5**	**1**	**5**	**33**	**10**	**19**	**7**	**43**	**195**	**162**	**266**

Fall

length	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
4	0	0	0	0	0	0	0	1	0	0	0	0	0	0	-	0	0	0	0
5	0	0	0	0	0	0	0	2	0	0	0	1	0	0	-	0	0	0	0
6	0	0	0	0	0	0	0	17	1	0	0	24	0	0	-	0	1	1	0
7	1	0	0	20	12	0	2	32	26	0	1	39	2	0	-	0	0	0	0
8	0	1	18	51	73	0	6	22	178	11	0	32	2	2	-	0	0	0	0
9	0	11	53	152	128	0	8	9	135	22	0	12	6	0	-	0	0	0	0
10	1	5	120	471	125	1	9	1	143	19	0	34	3	3	-	0	1	0	2
11	0	6	49	337	51	25	14	1	47	13	2	51	2	4	-	0	0	0	1
12	0	11	44	25	35	30	10	1	18	9	8	24	1	5	-	6	0	4	5
13	0	0	20	2	15	16	14	4	1	1	1	49	0	4	-	7	1	5	0
14	0	2	0	0	6	7	20	2	0	3	2	7	0	3	-	9	0	4	0
15	0	0	0	0	2	4	24	0	0	1	0	1	1	5	-	6	1	1	0
16	0	0	0	0	2	0	8	0	0	2	1	1	4	4	-	3	0	1	0
17	0	0	0	0	3	0	12	0	0	0	0	0	3	0	-	0	1	0	0
18	0	0	0	0	0	0	17	0	0	0	0	0	0	1	-	0	2	0	0
19	0	0	0	0	0	0	16	0	0	0	0	0	0	1	-	0	2	0	0
20	0	0	0	1	0	0	2	0	0	0	0	0	0	0	-	0	2	0	0
21	0	0	0	1	0	0	1	0	0	1	0	0	0	0	-	0	1	0	0
22	0	0	0	0	0	0	1	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	0	0	1	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	1	7
26	0	0	0	0	0	0	1	0	0	0	0	3	0	0	-	0	7	2	2
27	2	0	0	0	0	0	1	0	0	1	0	21	9	4	-	4	27	6	68
28	3	1	0	3	0	0	2	0	3	4	0	35	2	7	-	18	68	13	164
29	23	17	0	6	1	0	18	5	10	21	2	31	1	1	-	48	66	12	132
30	30	25	0	28	3	0	29	8	44	54	2	18	0	5	-	30	35	14	63
31	11	17	1	42	7	1	39	8	65	43	2	7	0	2	-	4	11	5	2
32	2	6	1	27	12	0	27	3	51	21	1	2	0	0	-	2	0	1	9
33	0	1	0	19	4	2	25	2	10	5	0	0	0	0	-	0	0	0	0
34	0	0	0	1	4	0	9	1	7	2	1	0	0	0	-	0	0	0	0
35	0	0	0	0	1	0	5	0	1	1	0	0	0	0	-	0	0	0	0
Total	**73**	**103**	**306**	**1,187**	**484**	**86**	**320**	**119**	**740**	**234**	**23**	**392**	**36**	**51**	-	**137**	**226**		**455**

Table 5.38. Black sea bass length frequencies, spring, 1 cm intervals, 1987-2014.
Since 1987, black sea bass have been measured from every tow.

	Spring																												
length	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
5	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
6	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	2	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	1	0	1
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	8	0	0	0	0	1	1	2	0	0	3	0	2
9	0	0	0	0	0	2	0	0	0	0	0	0	0	1	2	0	9	0	0	0	0	1	1	1	0	0	9	2	2
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	5	0	0	0	0	7	7	2	0	0	8	2	9
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	5	0	0	0	0	1	2	1	0	0	11	0	10
12	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2	0	5	0	0	0	0	1	2	2	0	1	14	0	2
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	9	0	0	0	0	2	1	1	0	1	12	1	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3	0	0	0	1	0	0	0	0	0	2	0	0
15	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	1	2	0
16	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	3	0
17	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	4	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	1	0	1	1	0	0	6	1
19	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	14	1
20	0	1	0	1	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	24	9
21	0	0	0	1	0	0	0	0	1	0	1	0	0	1	1	0	1	1	1	0	0	1	1	0	0	0	1	33	9
22	0	2	0	1	0	0	0	1	1	0	1	0	0	0	1	2	0	1	0	0	1	4	2	2	1	2	2	34	6
23	0	1	0	0	2	0	0	1	1	0	3	0	1	0	1	0	1	2	1	0	0	4	3	3	1	2	4	22	10
24	0	3	0	0	0	0	1	1	3	3	2	1	2	1	8	1	5	4	0	0	0	0	0	3	1	2	1	12	19
25	2	0	0	2	0	0	1	2	2	1	0	2	1	0	0	0	2	0	1	0	0	4	1	2	0	2	1	11	39
26	0	0	1	0	1	0	1	0	1	3	0	1	1	0	1	5	2	0	1	0	0	1	2	1	1	0	3	3	67
27	0	0	0	0	0	0	0	0	1	1	0	1	1	2	2	4	1	0	1	0	0	1	0	0	2	0	6	2	93
28	1	0	0	0	4	0	0	1	0	0	0	0	0	0	3	0	2	0	1	0	1	1	0	2	0	0	3	2	125
29	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	2	0	6	0	0	1	1	2	4	0	3	0	152
30	0	0	0	1	2	0	0	1	2	0	0	1	0	1	1	3	1	0	4	0	0	0	0	2	4	1	2	0	139
31	0	0	0	0	1	0	0	0	0	0	0	1	1	1	0	3	10	0	7	0	0	0	3	2	2	2	3	1	96
32	0	0	2	0	1	0	0	2	1	0	1	4	0	1	1	3	15	1	5	0	0	4	5	2	3	3	6	6	91
33	0	0	1	0	1	0	0	0	2	0	2	1	0	0	1	11	12	1	3	0	0	1	2	2	0	1	7	5	43
34	2	0	0	1	1	0	0	0	1	0	1	1	1	1	3	6	11	1	2	0	0	3	3	4	6	1	10	9	49
35	0	0	0	0	0	0	0	1	0	0	1	3	0	0	1	7	11	2	1	1	0	5	0	4	1	3	6	4	19
36	1	0	1	0	1	0	0	1	1	2	1	0	0	1	0	3	13	0	3	4	0	5	0	7	0	2	7	8	14
37	0	0	0	0	1	0	0	0	0	0	1	1	0	2	0	5	6	2	0	1	0	1	1	3	2	5	3	10	11
38	1	0	1	0	0	1	0	0	0	0	0	0	0	1	3	2	11	3	0	1	0	1	0	4	2	4	8	4	9
39	1	0	0	0	0	2	0	0	2	0	1	0	0	0	0	3	13	1	0	1	0	0	1	7	0	5	12	6	3
40	0	0	0	1	0	1	0	0	0	0	3	0	0	0	1	2	15	2	1	0	0	2	0	4	0	3	4	9	6
41	0	0	0	0	0	3	0	0	0	0	0	0	0	1	0	3	11	4	4	4	0	1	1	5	2	2	11	8	8
42	0	1	0	1	0	0	0	0	1	1	0	0	0	1	1	1	11	3	0	4	1	0	0	7	1	2	1	2	3
43	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	5	3	2	2	0	1	1	3	0	2	6	1	0
44	2	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	5	2	1	1	1	0	0	0	0	1	2	3	1
45	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	7	0	1	0	0	1	1	0	1	0	3	2	1
46	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	6	2	1	0	0	0	1	0	0	1	2	2	2
47	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	5	0	2	0	0	1	0	2	0	0	2	1	3
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	1	0	1
49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	0	1	0	0	0	0	0	1	3	0
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0
51	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	1	1
52	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
53	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
54	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	1
55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
56	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	0	0
57	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**12**	**8**	**8**	**12**	**19**	**16**	**3**	**12**	**22**	**11**	**20**	**18**	**8**	**16**	**47**	**67**	**239**	**46**	**49**	**19**	**7**	**58**	**43**	**84**	**36**	**48**	**186**	**263**	**1058**

Table 5.39. Black sea bass length frequencies, fall, 1 cm intervals, 1987-2014.
Since 1987, black sea bass have been measured from every tow.

	Fall																												
length	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	2	0	0	1	-	0	1	3	3
5	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	2	0	3	1	0	0	0	1	-	4	0	2	0
6	0	0	0	0	1	0	0	3	0	0	0	0	0	0	0	3	1	0	7	0	0	1	1	0	-	4	1	3	5
7	0	0	0	0	0	4	0	3	1	0	1	0	0	3	0	6	4	0	23	2	0	3	2	0	-	2	1	3	2
8	0	2	0	1	0	4	0	1	2	0	1	0	0	0	1	5	8	0	15	2	0	4	0	2	-	1	2	1	2
9	0	0	0	0	1	3	0	0	4	0	0	0	1	0	0	3	6	0	10	2	0	1	2	0	-	1	2	0	4
10	0	0	0	0	0	2	0	0	1	0	0	0	0	0	0	1	3	0	5	2	0	2	0	0	-	0	2	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	5	0	2	2	0	1	0	0	-	0	5	0	0
12	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	-	0	3	0	0
13	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	4	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	2	0	-	0	14	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1	0	-	0	21	0	0
16	0	0	0	0	0	2	0	0	0	0	0	0	0	2	1	0	1	0	0	0	0	1	5	0	-	0	37	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	0	7	0	0	0	1	4	8	2	-	0	20	3	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	16	1	0	0	1	1	14	6	-	0	20	3	0
19	0	0	0	0	0	0	0	0	0	0	0	2	0	3	1	0	23	0	0	0	2	2	10	4	-	0	23	1	0
20	0	0	0	0	0	3	0	0	0	0	2	0	1	6	3	0	19	0	0	0	1	4	10	6	-	0	14	1	0
21	0	0	0	0	0	1	0	0	0	1	0	1	0	4	1	0	17	0	0	1	3	4	9	4	-	0	9	1	2
22	0	0	0	0	0	1	0	0	1	0	0	0	0	1	1	0	5	0	0	0	0	1	4	3	-	0	3	8	1
23	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	4	0	1	0	0	2	0	0	-	0	6	11	2
24	0	0	2	0	0	0	0	0	0	0	1	0	0	3	0	0	2	0	0	0	0	0	0	0	-	0	0	12	1
25	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2	-	0	0	14	1
26	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	-	1	0	18	2
27	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	1	0	2	-	1	1	15	3
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	4	2	0	-	1	2	13	10
29	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	3	0	1	1	2	0	1	0	0	-	2	1	8	13
30	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	5	0	0	0	0	1	0	-	5	1	8	10
31	0	0	0	0	1	0	2	0	0	0	0	0	0	0	1	0	1	1	0	0	0	2	1	0	-	4	1	4	21
32	0	0	2	0	0	0	0	0	0	0	0	1	0	2	3	2	0	0	0	0	0	2	0	0	-	1	0	4	14
33	0	0	0	0	2	0	0	0	0	0	0	0	0	0	3	2	0	0	0	2	0	0	0	0	-	1	1	4	23
34	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	2	2	0	0	1	0	1	1	0	-	1	1	0	21
35	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	3	2	1	1	0	0	0	1	1	-	2	1	1	27
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	2	0	0	-	0	1	2	20
37	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	9	2	0	0	0	0	1	1	0	-	3	1	3	12
38	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	7	3	0	0	1	0	1	0	1	-	1	1	6	11
39	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	2	0	1	-	2	2	1	7
40	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	3	2	0	1	0	0	0	1	0	-	1	3	7	8
41	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	3	0	0	1	0	2	0	0	-	3	2	2	4
42	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	2	0	0	0	0	-	3	4	3	2
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	3	0	0	0	0	1	0	0	-	0	3	5	3
44	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	3	1	0	0	0	0	0	0	0	-	1	3	2	0
45	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	3	1
46	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	1	0
47	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	-	0	1	0	1
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	-	0	2	2	0
49	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	0
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	1	0	0	0	-	0	0	1	2
51	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
52	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	1	1
53	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
54	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	1	1	0
Total	**0**	**3**	**9**	**1**	**8**	**22**	**2**	**8**	**12**	**1**	**6**	**4**	**10**	**33**	**22**	**66**	**155**	**11**	**75**	**23**	**12**	**53**	**77**	**38**	**0**	**45**	**224**	**185**	**239**

Table 5.40. Blueback herring length frequencies, spring and fall, 1 cm intervals, 1989-2014.

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	2007	2008	2009	2010	2011	2012	2013	2014
6	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
7	0	0	2	0	2	7	2	0	0	2	0	4	1	0	3	2	1	0	0	1	0	4	0	0	5	1
8	0	0	3	0	2	76	20	4	0	5	0	10	7	12	7	9	8	1	0	8	0	1	0	0	9	8
9	0	0	2	0	3	114	11	5	21	15	0	14	5	9	23	23	14	8	1	11	7	4	3	3	9	3
10	0	0	5	10	7	74	9	19	45	45	0	18	2	9	26	47	6	23	9	14	19	19	5	18	5	1
11	0	0	3	4	9	41	9	10	258	48	0	28	1	6	11	39	10	2	3	12	25	38	9	12	8	2
12	3	0	5	0	2	9	5	3	4	16	0	18	2	3	4	20	12	0	5	2	27	8	3	5	1	2
13	0	0	0	4	0	13	5	2	0	2	0	12	1	1	1	12	3	1	3	4	17	10	6	1	1	0
14	0	0	0	15	0	5	3	1	1	1	0	3	0	0	0	0	7	0	1	1	5	4	2	0	0	0
15	0	0	1	27	1	3	4	7	0	0	1	2	0	4	0	0	8	1	2	2	9	1	0	0	0	0
16	0	0	0	65	0	8	3	7	0	3	5	1	1	1	4	4	13	2	23	1	30	4	2	2	7	0
17	0	0	1	11	3	9	1	10	4	0	5	3	10	7	4	4	11	2	37	7	64	2	12	2	5	6
18	0	1	0	2	0	3	0	4	2	0	0	5	15	2	3	3	1	2	7	3	49	1	3	2	3	11
19	0	0	0	0	1	2	4	3	2	0	0	0	3	0	0	3	2	1	3	2	17	2	1	0	1	4
20	0	0	0	4	0	1	1	0	0	0	0	2	1	1	0	0	5	2	0	1	2	0	1	0	1	3
21	2	1	2	0	0	1	1	3	0	0	0	1	3	0	0	3	2	3	2	0	1	1	0	0	7	2
22	1	0	0	1	0	3	0	4	0	1	0	3	0	0	1	0	1	0	1	1	0	1	0	0	5	2
23	0	0	3	2	0	3	2	3	1	0	0	5	0	1	0	1	0	0	1	1	0	1	0	0	0	0
24	0	1	2	0	0	0	0	2	0	0	0	3	0	0	0	0	0	0	2	0	0	1	0	0	1	0
25	0	0	0	1	0	1	1	1	0	0	0	1	0	0	2	0	0	1	1	0	0	0	0	0	0	0
26	0	0	0	1	0	0	1	0	0	0	0	1	0	0	0	3	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	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**	**101**	**71**	**272**	**102**	**47**	**45**	**68**	**47**

Fall

length	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
5	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
6	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
7	0	0	0	0	0	0	5	0	2	0	0	0	0	0	0	1	0	0	0	0	0	-	0	0	0	0
8	0	0	0	0	0	0	33	0	2	0	0	0	0	0	0	0	0	0	1	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	1	0	2	-	0	0	0	0
10	0	0	0	0	0	1	3	0	8	1	0	1	0	0	0	0	0	0	0	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	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	0	0	0	-	0	0	0	1
13	38	1	4	11	24	225	48	0	117	18	0	0	36	2	0	15	2	2	0	0	0	-	0	1	0	1
14	77	0	1	6	18	247	40	1	111	28	1	0	117	7	0	17	3	8	1	1	3	-	4	0	0	2
15	24	0	0	1	20	94	3	3	34	16	0	3	52	3	4	6	2	4	14	2	5	-	9	0	0	3
16	0	0	0	0	2	14	0	0	0	5	2	1	10	0	4	0	0	0	31	0	2	-	9	0	0	1
17	0	0	0	0	0	2	0	0	0	1	1	2	2	0	1	0	0	0	7	0	1	-	3	0	0	2
18	1	0	0	0	0	1	0	0	0	0	0	1	3	0	0	0	0	0	0	0	5	-	0	0	0	0
19	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
20	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	-	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	-	0	0	0	0
22	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
23	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
24	0	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	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	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**	**55**	**3**	**18**	**0**	**25**	**1**	**0**	**10**

Table 5.41. Bluefish length frequencies, spring, 1 cm intervals, 1984-2014.
Bluefish 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**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0
25	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	3	0	1	0	0	0	0	1
26	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	4	0	1	0	0	0	1	8	1	3	0	0	0	0	1
27	0	0	0	0	0	0	1	1	1	0	0	0	0	2	2	0	2	0	0	0	2	0	1	2	0	2	0	1	0	0	0
28	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	4	0	0	7	0	0	0	0	0
29	0	0	2	0	0	0	1	2	0	0	0	1	1	1	0	1	4	0	1	0	0	0	1	0	0	3	0	0	0	0	0
30	0	0	0	0	0	0	0	7	0	0	0	0	0	1	0	0	1	0	0	1	0	1	2	1	0	0	0	0	1	0	0
31	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	0	1	0
32	0	0	1	0	0	0	0	11	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1
33	0	0	0	0	0	0	0	6	0	0	0	0	0	2	0	1	0	0	1	0	0	0	2	1	0	2	0	0	2	0	0
34	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0
35	0	0	0	1	0	0	0	9	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	1	0	0	0	1	2	0	1
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	1	0	0
37	0	0	0	0	0	0	0	10	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
38	0	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	0	1	0	1	1	0	0
39	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0
40	0	0	1	0	0	0	1	5	0	0	0	0	0	0	0	0	0	1	1	1	0	2	0	0	0	0	0	0	0	0	0
41	0	0	1	0	0	0	1	6	0	0	0	1	0	0	0	4	0	3	5	4	0	5	0	0	0	0	0	0	0	0	0
42	0	0	1	1	1	0	0	14	1	0	0	0	0	2	2	2	0	3	5	4	1	1	0	1	3	0	0	1	1	1	0
43	0	0	1	0	0	0	0	12	0	0	0	0	1	1	0	1	1	6	8	3	0	1	0	0	4	0	0	3	1	2	0
44	0	0	1	0	0	0	0	10	3	0	0	0	1	0	2	2	0	1	3	1	0	1	1	2	7	0	0	0	0	0	0
45	0	0	0	0	0	0	1	7	1	0	0	1	1	0	1	0	0	4	3	2	0	0	1	1	3	0	0	4	0	2	0
46	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	2	2	2	0	1	0	2	1	2	0	0	3	0	0	0
47	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	1	0	0	0	4	0	0	0	0	1	0	1	0
48	0	0	1	1	0	0	0	3	3	1	0	0	0	0	1	1	1	1	0	0	0	1	2	0	1	0	0	0	0	0	0
49	0	0	2	1	3	0	0	1	2	2	0	0	0	0	0	5	0	1	3	1	1	0	1	0	0	1	0	0	0	0	0
50	0	0	2	1	1	1	0	1	8	0	0	0	2	4	2	3	1	0	5	1	1	0	3	1	1	0	0	1	0	1	0
51	0	0	0	0	4	1	1	6	4	2	0	0	1	6	1	3	0	1	4	3	5	1	0	0	0	1	0	1	0	0	0
52	0	0	2	2	3	1	0	5	3	1	1	0	2	3	0	6	2	0	3	3	1	1	4	1	0	3	0	2	1	2	0
53	0	0	2	1	3	0	0	1	4	0	1	0	0	3	2	0	0	2	3	0	2	1	2	1	0	4	0	1	1	2	0
54	0	0	3	0	4	0	0	2	0	0	1	0	0	1	0	2	0	1	4	1	1	2	0	0	0	0	0	2	0	1	0
55	0	0	1	1	7	0	1	2	0	1	0	0	3	1	1	1	1	0	2	0	0	0	0	3	1	4	0	1	0	1	0
56	0	0	2	2	3	0	0	0	0	1	0	1	0	1	3	1	0	0	0	0	0	0	0	2	0	0	0	0	0	2	0
57	0	0	1	0	5	0	0	2	1	1	0	0	0	0	0	1	0	1	0	1	0	1	2	0	1	1	0	0	0	0	0
58	0	1	0	0	3	1	1	0	0	1	0	0	0	0	0	1	1	0	0	1	0	1	0	1	0	0	0	0	1	0	0
59	0	0	0	0	3	0	0	0	0	0	1	0	0	1	0	2	0	0	0	3	1	1	1	1	0	0	0	1	0	1	0
60	0	0	0	0	1	1	0	0	1	0	1	0	0	2	0	1	0	0	0	1	0	0	0	1	1	3	1	1	0	0	1
61	0	0	3	0	1	1	0	0	1	1	3	0	0	1	0	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0
62	0	0	0	0	1	0	0	1	0	0	3	0	0	0	1	0	0	0	0	1	0	1	0	1	1	1	0	0	0	0	0
63	0	0	1	0	0	0	0	0	1	1	1	0	0	0	2	2	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
64	0	0	1	1	0	1	0	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0	0	1	1	0	2	0	0	0
65	0	0	0	0	0	2	0	1	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0
66	0	0	0	0	0	1	0	1	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0	1	1	0	1	0	1	0	0
67	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	0	0	0	4	0	0	1	1	0
68	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0
69	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	0	0	0	0
70	0	0	1	0	0	0	1	2	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0
72	0	0	1	0	0	1	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
74	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	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
76	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
77	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
78	0	0	3	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
79	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
80	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
81	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
82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**0**	**1**	**35**	**13**	**43**	**13**	**17**	**147**	**42**	**13**	**12**	**6**	**15**	**38**	**23**	**51**	**26**	**29**	**56**	**36**	**18**	**25**	**39**	**39**	**29**	**52**	**2**	**28**	**19**	**20**	**6**

Table 5.42. Bluefish length frequencies, fall, 1 cm intervals, 1984-2014.

Bluefish 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**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
6	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	1	0	0	0	0	0	2	33	0	1	0	0	3	12	2	0	1	1	0	0	0	2	0	0	0	0	0	0	0	0
8	1	5	0	2	0	0	0	14	96	1	11	1	0	13	85	40	0	15	1	0	3	1	3	1	0	1	0	0	0	0	4
9	1	6	0	3	3	0	3	38	228	4	71	0	0	135	344	252	2	25	8	8	15	76	8	30	0	28	0	0	1	0	2
10	0	4	7	16	39	3	21	115	184	27	183	6	4	941	647	720	14	89	56	33	342	308	76	86	2	93	0	4	0	2	42
11	38	13	13	79	76	76	53	200	290	56	1266	156	3	2006	1127	484	50	213	96	70	730	421	239	41	19	317	0	2	10	12	167
12	350	52	20	108	270	249	57	280	269	171	2842	397	10	2905	2008	338	42	136	149	77	748	451	349	157	120	442	0	15	36	22	363
13	958	96	45	322	332	494	49	260	123	432	2880	428	54	1258	1558	316	168	122	250	33	420	499	64	379	301	324	0	40	90	71	495
14	1483	556	138	500	183	596	99	202	96	283	2023	154	93	518	834	337	284	122	216	12	299	273	131	231	483	136	0	132	157	250	574
15	1076	1232	376	482	151	903	409	241	401	149	1763	61	510	351	433	300	126	336	126	32	129	117	110	134	225	120	0	196	501	486	305
16	1028	1284	533	399	307	1187	540	405	566	146	1033	145	1399	469	160	503	155	679	70	200	113	231	172	328	45	475	0	476	871	363	181
17	770	783	399	147	472	1155	643	681	495	552	829	497	1924	536	127	361	216	568	36	460	161	389	229	821	22	630	0	603	761	204	404
18	246	351	258	92	458	1380	729	589	498	1177	512	902	1227	407	97	190	476	363	33	697	241	668	181	1664	49	350	0	491	523	126	638
19	180	204	128	26	322	1057	493	574	340	1268	529	995	618	363	114	244	724	307	116	790	315	859	106	1733	40	116	0	278	272	53	466
20	182	64	125	6	360	499	280	383	208	854	482	602	329	188	117	446	1270	228	247	681	348	751	79	1379	49	63	0	168	185	37	330
21	64	32	44	13	172	404	227	245	56	320	321	333	158	144	82	467	976	164	370	330	328	437	29	772	20	20	0	72	127	14	156
22	38	12	48	7	171	149	102	270	25	119	336	148	17	98	115	490	491	90	407	97	293	268	43	518	7	7	0	34	75	9	115
23	30	9	38	2	22	49	48	128	3	95	133	54	15	56	100	606	350	71	316	7	257	161	21	335	1	4	0	18	36	6	43
24	19	15	9	3	12	11	49	119	1	33	184	7	3	16	181	515	230	49	236	2	214	119	22	151	2	1	0	18	30	1	25
25	0	9	6	2	6	7	14	92	0	33	81	7	4	9	189	517	107	27	120	0	126	59	6	69	0	1	0	3	18	0	17
26	0	5	0	0	1	0	5	27	0	8	54	1	0	3	108	311	9	14	29	0	42	25	6	16	1	0	0	1	5	0	9
27	2	0	0	0	0	5	4	5	0	2	8	2	0	0	59	165	0	4	21	0	11	7	8	2	0	0	0	0	2	0	0
28	0	0	0	0	0	0	0	1	0	0	1	0	0	0	4	44	0	5	1	0	8	0	2	1	0	0	0	1	2	0	0
29	0	2	0	0	0	0	0	0	0	0	0	0	0	0	4	10	0	0	0	0	2	0	0	3	2	0	0	1	1	0	1
30	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	1	0	0	1	0	1	0	0	0	0	1
31	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0	4	0	2	0	0	0	0	0	2	0	1
33	0	0	0	2	0	0	4	0	0	0	0	2	0	0	1	0	0	0	2	0	10	0	2	1	0	1	0	0	2	0	4
34	0	0	0	1	0	0	8	0	1	0	0	5	0	0	1	0	0	0	7	0	39	0	3	0	0	0	0	1	3	0	5
35	0	0	0	3	1	0	9	0	2	0	0	17	0	1	0	0	0	0	6	1	41	0	1	3	0	1	0	0	1	0	4
36	1	2	0	3	1	1	11	1	2	0	6	31	0	1	1	0	0	3	12	2	58	0	12	0	2	9	0	2	2	1	3
37	3	6	1	13	1	0	29	0	19	0	4	61	0	1	1	1	2	12	15	4	129	0	15	5	3	26	0	3	3	0	17
38	11	16	5	18	1	1	70	6	44	0	7	81	2	18	8	2	13	21	24	7	197	0	32	11	17	59	0	5	11	2	12
39	14	50	30	38	5	9	75	12	74	4	23	111	0	34	20	5	18	31	44	13	231	0	18	34	25	52	0	13	7	1	7
40	40	72	57	48	12	22	127	38	85	7	57	80	11	60	31	3	46	55	82	9	159	8	17	43	24	55	0	13	11	1	2
41	24	61	62	36	12	50	118	92	84	12	58	45	7	49	15	12	83	35	70	6	53	7	8	35	11	29	0	10	9	2	0
42	18	39	81	25	16	51	101	110	55	16	75	25	12	37	15	5	50	18	57	6	22	22	9	37	6	25	0	19	4	3	2
43	14	24	20	16	15	50	55	118	22	26	50	12	10	15	13	6	23	13	29	7	11	21	2	31	7	10	0	16	6	1	4
44	5	8	12	13	22	24	20	82	17	36	20	7	10	12	12	0	11	6	8	3	7	31	0	24	5	8	0	8	3	2	2
45	1	6	8	8	10	10	5	55	18	44	12	3	13	8	18	1	5	9	2	3	8	26	2	16	5	2	0	6	4	4	0
46	8	3	27	5	9	13	8	35	21	38	3	6	18	2	16	2	2	11	2	8	12	21	0	12	6	0	0	7	3	2	0
47	5	8	36	4	16	6	17	34	51	37	4	13	43	4	13	5	7	4	6	6	16	17	1	13	5	3	0	1	4	5	0
48	3	28	24	5	11	10	5	44	72	35	1	8	45	16	15	5	5	8	8	10	21	14	3	15	9	3	0	4	1	9	3
49	18	27	28	6	8	11	12	44	107	46	8	12	29	11	18	4	9	17	6	9	26	20	3	16	11	7	0	10	2	22	0
50	13	27	25	9	11	9	17	43	112	26	5	12	26	6	10	0	15	17	6	9	33	31	3	12	15	10	0	3	3	13	0
51	12	31	18	5	5	10	19	30	98	24	8	9	12	10	14	7	17	9	7	9	26	26	1	14	14	11	0	9	4	6	1
52	16	27	14	2	9	18	10	11	101	22	17	18	10	4	5	4	26	8	13	4	10	13	7	11	14	5	0	5	5	6	0
53	15	17	7	12	9	14	6	10	61	4	25	7	7	6	3	6	14	4	6	3	12	9	5	11	14	4	0	1	3	7	0
54	11	16	7	16	2	12	1	5	54	10	36	5	8	4	6	3	8	3	5	0	13	4	5	10	8	2	0	3	2	2	2
55	9	9	2	9	6	9	4	0	36	1	20	1	2	1	3	1	8	2	7	6	18	4	2	1	4	2	0	2	3	5	0
56	8	7	2	15	1	9	1	0	28	12	17	3	5	1	1	3	1	3	3	7	14	3	2	1	3	2	0	1	3	5	0
57	5	2	2	15	0	3	0	3	26	21	15	0	5	7	1	7	2	1	9	1	34	11	5	4	0	6	0	0	0	3	0
58	2	2	7	6	6	5	3	5	16	33	4	0	4	8	3	3	6	3	2	1	25	5	3	3	4	3	0	1	0	3	2
59	2	3	8	5	6	2	0	1	13	35	7	1	4	2	3	9	0	5	7	3	14	10	2	10	1	5	0	2	3	0	8
60	5	8	3	6	4	1	2	5	4	67	9	4	4	4	3	2	6	5	2	3	11	5	3	22	4	7	0	1	0	3	5
61	1	12	2	3	4	3	3	1	6	41	11	0	4	6	2	1	5	5	1	2	7	7	3	10	7	7	0	2	1	6	1
62	2	3	3	3	5	2	2	3	7	34	8	4	2	1	5	2	1	3	2	1	11	13	0	18	4	5	0	0	1	3	1
63	0	10	8	2	10	2	7	3	4	20	12	1	0	4	5	1	5	0	4	2	10	14	2	6	6	3	0	3	4	4	2
64	0	6	10	3	4	1	7	1	4	27	12	3	1	0	3	2	8	0	1	1	12	4	1	13	0	1	0	0	0	3	4
65	0	6	1	3	8	1	6	0	8	3	27	3	0	2	4	1	3	2	4	0	10	10	2	10	5	7	0	0	0	3	0
66	0	5	7	2	7	2	9	0	1	8	28	3	1	1	4	0	4	1	5	0	6	6	1	8	5	6	0	0	0	1	4
67	0	6	4	1	7	2	3	1	2	8	21	2	2	3	1	3	3	4	1	1	3	5	0	5	9	12	0	2	2	4	2
68	1	6	5	5	13	6	4	4	0	1	30	3	0	0	1	3	3	2	3	1	5	7	0	5	6	11	0	2	2	1	4
69	0	1	3	5	4	4	8	5	4	1	5	1	2	1	1	3	0	3	4	0	7	3	0	6	4	11	0	1	1	2	0
70	0	1	9	3	4	13	5	4	6	0	10	2	0	0	1	4	3	0	5	2	5	1	0	0	8	11	0	2	0	3	3
71	1	0	4	1	3	6	10	1	5	1	7	3	3	1	0	3	5	1	2	0	1	0	0	1	3	15	0	4	0	3	1
72	1	1	2	3	4	3	9	3	6	5	4	2	0	2	1	0	1	1	3	1	4	1	0	3	2	11	0	6	1	4	1
73	0	1	1	5	3	4	7	2	9	6	3	2	1	3	0	0	1	1	1	0	2	2	0	2	1	9	0	2	4	1	1
74	0	0	2	1	0	3	5	3	10	2	3	3	5	2	2	1	1	0	1	0	1	2	0	1	1	4	0	3	1	2	0
75	2	1	3	2	9	2	8	5	7	6	2	1	2	1	2	4	0	1	0	1	0	2	0	0	0	8	0	2	2	1	1
76	0	2	1	1	2	3	7	6	3	3	5	2	3	2	0	1	0	0	2	0	2	1	0	0	1	2	0	2	0	1	2
77	0	1	0	0	1	1	3	0	3	1	3	1	5	4	1	0	0	0	1	0	1	0	0	0	0	2	0	1	2	3	0
78	0	2	2	1	0	2	1	1	2	3	2	1	0	1	0	1	0	1	0	0	0	0	0	1	0	1	0	2	0	0	1
79	0	0	0	0	1	1	0	1	2	3	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	0	1	0	0	0
80	0	1	0	0	0	0	2	0	1	0	3	0	2	0	0	1	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0
81	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
82	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
83	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**6,738**	**5,300**	**2,740**	**2,598**	**3,645**	**8,636**	**4,671**	**5,699**	**5,225**	**6,459**	**16,232**	**5,514**	**6,688**	**10,776**	**8,789**	**7,788**	**6,112**	**3,957**	**3,395**	**3,681**	**6,489**	**6,506**	**2,064**	**9,336**	**1,667**	**3,604**	**0**	**2,735**	**3,829**	**1,809**	**4,450**

Table 5.43. Butterfish length frequencies, 1 cm intervals, spring and fall, 1986-1990, 1992–2014.
Length frequencies of butterfish 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	2007	2008	2009	2010	2011	2012	2013	2014
3	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	2	0	1	2	4	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	2	0	0	0	0	3	0	9	0	15	0	1	1	8	1	5	0	3	3	3	3
5	0	0	0	0	0	2	0	6	0	2	0	0	4	0	51	1	29	1	0	1	5	3	53	0	9	2	39	20
6	0	0	0	0	0	0	0	35	0	21	3	0	0	0	207	0	7	20	0	2	0	1	276	1	35	6	109	35
7	0	0	0	2	0	0	0	57	1	7	0	3	0	0	202	0	3	95	1	0	0	3	233	0	50	0	218	26
8	0	0	0	2	0	0	0	18	0	0	0	0	0	1	107	0	0	101	2	4	0	0	228	0	34	3	76	14
9	0	0	0	0	0	0	0	0	4	0	57	5	4	0	15	0	4	47	0	61	12	1	197	198	7	279	4	40
10	4	0	0	40	0	2	0	4	7	0	165	183	10	0	5	4	10	146	10	201	73	53	225	530	2	768	13	231
11	29	0	0	269	5	16	3	28	20	19	618	622	16	84	51	44	130	427	27	540	292	74	461	291	28	1,523	95	718
12	39	0	3	208	7	32	17	45	80	190	1,005	656	55	961	272	202	616	433	216	1,632	794	409	1,426	47	217	1,489	427	608
13	26	0	6	34	16	88	25	75	62	485	1,598	466	152	1,265	317	656	546	201	442	3,108	531	976	1,196	110	1,347	1,214	639	326
14	61	0	7	2	28	111	10	76	30	327	1,296	190	145	317	145	990	129	71	425	1,690	130	739	439	237	1,819	735	531	188
15	66	0	27	3	26	50	9	117	24	255	1,033	173	122	122	236	851	137	64	234	493	234	646	237	376	1,443	396	200	107
16	57	0	20	10	26	49	25	156	44	275	951	267	148	31	381	669	155	126	124	173	190	654	201	301	1,228	330	149	278
17	25	0	14	7	38	41	23	92	25	178	654	175	137	47	332	490	64	107	81	104	146	396	154	61	982	237	149	313
18	20	0	0	0	18	38	10	44	14	83	307	88	106	28	284	335	36	50	71	72	85	405	113	41	599	83	129	252
19	7	0	0	4	16	27	4	9	3	48	110	70	24	23	128	249	26	21	59	84	22	179	49	5	286	35	13	150
20	0	0	1	2	7	10	0	4	1	13	72	29	27	21	53	142	16	9	12	27	18	56	9	13	67	40	14	37
21	4	0	0	1	5	1	0	0	0	2	22	3	8	7	7	26	4	1	4	1	0	1	7	0	33	0	0	7
22	4	0	0	0	7	0	1	0	0	0	0	5	3	0	1	4	4	1	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	1	2	0	0	0	0	15	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	0	1	0	0	0	0	0	0
25	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
26	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
27	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
Total	**342**	**0**	**78**	**584**	**200**	**469**	**127**	**768**	**315**	**1,905**	**7,906**	**2,935**	**965**	**2,907**	**2,804**	**4,666**	**1,933**	**1,921**	**1,710**	**8,196**	**2,544**	**4,598**	**5,509**	**2,211**	**8,191**	**7,143**	**2,808**	**3,353**

Fall

length	1986	1987	1988	1989	1990	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
2	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
3	0	0	0	0	0	0	0	0	3	0	0	0	2	0	0	0	0	2	0	0	0	0	0	-	24	0	0	0
4	0	2	87	0	0	0	20	1	8	2	2	1	3	0	16	15	0	7	0	1	15	0	6	-	0	10	8	0
5	0	3	1,141	23	3	475	436	16	268	180	33	20	13	72	69	53	52	29	260	2	152	29	324	-	78	64	71	80
6	0	10	5,778	144	62	2,429	3,144	197	426	601	461	317	250	334	409	616	685	710	658	34	1,270	230	1,997	-	345	280	662	802
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	1,951	771	9,132	-	1,075	1,559	2164	3546
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	4,508	4,744	18,840	-	3,621	5,148	2395	14503
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	5,086	8,864	16,054	-	5,715	7,742	2127	20159
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	7,584	6,576	5,377	-	3,197	7,792	1662	14199
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	6,404	4,103	1,678	-	648	3,451	798	5337
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	2,614	1,812	5,041	-	2,451	1,426	382	1474
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	1,122	457	9,925	-	2,295	647	867	781
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	278	4	6,842	-	729	429	2684	1657
15	95	1,334	196	139	234	101	797	679	597	2,104	197	272	212	30	2,026	190	95	420	188	184	405	131	2,211	-	240	670	2051	1342
16	106	387	197	210	415	177	390	41	951	1,196	238	388	92	151	1,521	85	156	320	203	688	420	368	1,167	-	103	1,296	1224	836
17	184	124	228	117	133	130	124	144	853	392	335	574	158	392	391	152	66	208	137	398	228	539	836	-	120	1,318	990	502
18	48	59	115	102	83	347	54	110	429	59	407	168	80	198	310	266	8	89	177	77	145	243	117	-	84	749	821	550
19	30	10	19	27	91	16	19	2	68	34	211	263	62	106	199	206	0	29	44	39	110	11	63	-	24	105	175	188
20	4	8	2	26	8	8	3	0	0	11	20	14	7	4	155	94	13	16	11	3	1	68	15	-	1	66	30	62
21	18	2	0	0	0	1	8	1	0	0	10	62	6	1	31	15	1	1	4	0	0	1	0	-	1	0	0	3
22	0	0	0	2	0	0	8	0	0	0	0	0	0	0	0	14	1	1	1	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	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	0	0	1	-	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	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	0	0	1	-	0	0	0	0
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**	**32,293**	**28,951**	**79,627**	-	**20,751**	**32,752**	**19,111**	**66,021**

Table 5.44. Clearnose skate length frequencies, spring, 1 cm intervals, 1993-2014.

	Spring																					
length	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
47	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
50	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0
51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0
53	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2	1	4
55	0	0	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	1	0	1	0	0	0	0	1	0	0	1	1	2
57	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	1	0
58	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0	1
59	0	0	0	0	0	0	0	0	0	4	1	0	0	1	2	0	0	0	1	0	0	1
60	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	0	0	8	0	1
61	0	0	1	0	0	0	1	0	0	2	0	0	0	0	1	0	0	0	0	7	0	2
62	0	0	0	0	0	0	2	0	0	1	0	0	0	2	0	2	2	0	0	5	1	1
63	0	0	0	0	0	0	0	0	0	2	1	0	0	1	0	1	0	0	1	3	1	1
64	0	0	0	0	0	0	0	1	0	3	0	1	0	0	1	0	1	0	1	9	0	3
65	0	0	0	0	0	0	0	0	1	1	0	0	0	0	2	2	1	0	1	4	0	2
66	0	0	0	0	0	0	0	0	0	1	2	0	0	0	3	0	1	0	4	4	2	3
67	0	0	0	0	0	0	0	0	1	2	0	0	0	1	1	1	2	0	1	9	4	1
68	0	0	0	0	0	0	1	0	0	1	0	0	1	0	1	2	1	0	1	6	2	3
69	0	0	0	0	0	0	0	0	1	4	0	1	1	0	4	0	2	0	0	7	2	4
70	0	0	0	0	0	0	0	0	0	4	0	0	0	0	4	0	4	0	3	5	3	4
71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	4	0	1
72	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	1	0	0	3	1	2
73	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1	0	0	5	0	0
74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	1	1
75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0
79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	1	0	1	0	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	1	0	0	1	0
82	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	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
84	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0
85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
86	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
87	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
88	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	1	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
91	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
92	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Total	**0**	**0**	**1**	**0**	**0**	**0**	**5**	**3**	**6**	**31**	**8**	**5**	**2**	**9**	**22**	**12**	**21**	**1**	**13**	**95**	**24**	**42**

Table 5.45. Clearnose skate length frequencies, fall, 1 cm intervals, 1993-2014.

	Fall																					
length	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	**0**
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	**0**
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	**0**
43	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
47	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
51	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0
52	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
53	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0
54	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0	0	0	0	1	3	2	0
55	0	0	0	0	0	0	0	0	1	0	0	0	3	2	1	1	0	0	0	1	2	0
56	0	0	0	0	0	0	0	0	0	0	2	0	2	0	2	0	0	0	0	3	2	0
57	0	0	0	0	0	0	0	0	0	1	0	0	4	0	0	0	1	0	1	4	1	0
58	0	0	0	0	0	1	0	2	2	3	0	0	4	1	1	0	0	0	1	5	3	0
59	2	0	0	0	0	1	0	1	3	0	0	0	1	2	0	0	0	0	3	1	4	2
60	0	0	0	0	0	0	0	1	2	0	0	0	7	3	1	0	1	0	1	4	2	1
61	0	0	0	0	0	0	1	0	4	1	2	1	7	3	1	0	1	0	3	9	4	0
62	0	0	0	0	1	0	1	0	4	0	1	0	7	1	2	1	2	0	0	8	7	2
63	0	0	0	0	0	2	3	1	0	2	0	0	2	2	1	2	1	0	3	9	12	0
64	0	0	0	0	0	0	3	1	5	5	2	0	3	0	3	0	1	0	2	9	16	2
65	0	0	0	0	0	3	1	2	1	1	2	1	7	1	6	1	6	0	1	14	12	3
66	0	0	1	0	1	4	0	0	5	2	9	3	4	0	5	3	3	0	5	12	12	3
67	0	0	0	1	0	1	2	1	3	2	5	4	6	2	3	2	4	0	1	17	17	4
68	0	0	0	0	0	1	1	0	3	0	4	0	5	1	8	3	2	0	5	11	17	4
69	0	0	0	0	0	0	0	3	3	0	3	1	11	2	6	0	1	0	3	11	19	8
70	0	0	0	0	0	0	0	0	5	0	2	1	6	2	2	1	3	0	1	12	18	7
71	0	0	0	0	0	0	0	0	4	0	5	1	2	1	5	2	1	0	1	9	10	3
72	0	0	0	0	0	0	0	1	1	0	3	1	6	0	3	2	5	0	2	5	6	2
73	0	0	0	0	0	0	0	0	3	3	1	0	1	1	3	1	2	0	0	3	10	3
74	0	0	0	0	0	0	0	0	1	1	4	0	1	0	5	0	2	0	4	5	2	2
75	0	0	0	0	0	1	0	1	1	2	0	0	2	0	4	1	2	0	1	4	4	1
76	0	0	0	0	0	2	0	0	0	0	0	0	1	0	0	1	1	0	1	2	0	2
77	0	0	2	0	0	0	0	0	1	4	0	0	0	0	3	1	0	0	0	4	1	1
78	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	3	1	3
79	0	0	0	0	0	0	1	0	0	0	1	2	1	0	4	1	0	0	0	3	0	2
80	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	2	0	0	1	1	1
81	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	2	1	0	0	1	0	0
82	0	0	0	0	0	1	0	0	1	0	0	0	1	0	1	0	1	0	0	0	1	0
83	0	0	0	0	0	0	1	0	0	0	0	1	1	0	1	0	0	0	0	1	0	0
84	0	0	0	0	0	0	0	0	0	0	0	0	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	2	0	0	0	0	1	1	0
86	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	2	0	0	1
87	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0
88	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
89	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	2
90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
92	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1
93	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
98	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
99	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0
Total	**2**	**0**	**3**	**1**	**4**	**20**	**17**	**15**	**59**	**29**	**47**	**17**	**100**	**27**	**75**	**25**	**46**	**0**	**44**	**185**	**193**	**62**

Table 5.46. Fourspot flounder length frequencies, spring and fall, 2 cm intervals (midpoint given), 1989, 1990, 1996-2014.

Fourspot 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	2007	2008	2009	2010	2011	2012	2013	2014
13	2	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	1	0	1	0	0
15	5	2	0	0	5	5	0	0	3	0	3	0	0	0	0	0	0	0	0	0	0
17	21	8	1	3	8	12	1	2	17	2	13	0	0	6	0	0	6	2	5	1	1
19	19	19	8	16	14	61	22	5	89	8	8	0	6	7	7	4	2	1	24	2	6
21	17	42	31	60	13	28	26	4	99	6	4	1	18	11	9	10	3	10	42	11	5
23	11	341	198	161	16	32	239	42	33	8	4	14	24	9	17	6	5	45	56	20	9
25	56	528	279	353	105	72	422	181	84	124	26	71	29	44	39	37	33	157	258	185	64
27	103	225	208	456	209	97	256	300	199	228	82	75	33	105	81	91	55	150	441	209	172
29	120	139	193	392	233	81	201	245	191	187	129	64	44	170	108	127	55	107	461	189	179
31	89	60	117	192	137	66	139	153	175	163	178	68	61	121	94	90	69	93	303	139	107
33	51	27	54	76	60	60	81	45	89	88	113	52	36	52	70	51	36	49	92	100	78
35	8	33	15	22	16	25	39	11	26	47	35	31	13	43	34	31	24	27	31	27	29
37	2	12	6	3	4	7	12	8	7	12	5	11	4	9	11	7	9	9	4	16	8
39	0	4	3	0	2	1	1	2	3	6	2	3	1	7	2	0	4	5	0	0	0
41	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	1	0	0	0	0	1
43	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0
45	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Total	**504**	**1,440**	**1,113**	**1,734**	**822**	**548**	**1,439**	**999**	**1,015**	**879**	**602**	**394**	**271**	**585**	**472**	**455**	**302**	**655**	**1,719**	**899**	**659**

Fall

length	1989	1990	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
5	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	1	-	0	0	0	0
7	0	1	0	1	4	0	0	1	0	0	1	0	2	0	0	1	-	1	0	1	1
9	5	0	0	23	19	0	2	2	0	4	1	0	2	1	1	7	-	4	0	0	3
11	9	4	2	46	27	5	4	17	5	2	12	4	5	0	7	16	-	17	3	1	11
13	10	15	5	68	22	24	6	25	3	3	9	9	13	2	8	59	-	28	4	11	26
15	6	17	35	55	21	42	5	15	9	0	13	17	4	5	11	45	-	22	13	10	47
17	0	0	42	16	3	16	1	0	3	0	1	26	3	2	16	20	-	4	12	2	49
19	0	0	22	0	0	4	1	0	1	0	0	2	0	0	7	6	-	0	0	4	5
21	0	0	0	2	2	3	2	0	2	0	1	0	0	1	0	0	-	0	0	1	0
23	1	2	9	2	5	0	17	1	5	0	0	0	1	1	0	1	-	0	0	0	1
25	0	3	42	7	16	5	58	3	7	3	4	1	0	6	1	2	-	2	3	0	1
27	0	7	41	10	22	4	77	5	13	7	6	5	0	7	1	6	-	1	9	2	4
29	0	3	24	5	22	5	54	10	18	11	13	5	0	20	6	8	-	1	11	2	4
31	0	1	20	3	6	3	25	1	18	4	30	6	0	12	5	6	-	1	6	2	8
33	0	0	6	1	1	1	7	1	13	7	19	2	1	3	1	11	-	3	6	0	0
35	0	0	4	0	1	0	5	0	6	5	6	7	0	4	4	1	-	2	2	2	1
37	0	0	0	0	0	0	2	1	3	0	2	0	0	0	0	1	-	1	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	-	0	0	0	0
Total	**31**	**53**	**252**	**239**	**171**	**112**	**266**	**83**	**106**	**46**	**118**	**85**	**33**	**64**	**68**	**192**	-	**87**	**69**	**38**	**161**

Table 5.47. Hickory shad length frequencies, spring and fall, 1 cm intervals, 1991-2014.

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	2007	2008	2009	2010	2011	2012	2013	2014
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	3	0	0	0	0	0	1	0	0
18	0	0	0	1	0	1	0	0	2	0	0	0	0	0	1	7	1	2	1	0	0	0	0	0
19	0	0	0	1	0	0	1	0	0	0	0	0	0	3	5	6	0	1	1	0	0	0	0	0
20	0	0	0	0	0	2	0	2	0	0	0	0	0	2	4	2	0	0	0	0	1	2	0	0
21	0	0	0	0	0	1	0	0	0	0	0	0	0	2	3	1	1	0	0	1	0	1	0	1
22	0	0	0	0	0	0	0	0	1	0	2	0	0	1	1	0	0	0	0	0	0	0	0	0
23	0	0	1	0	0	0	0	0	1	0	0	0	1	2	0	2	1	0	0	0	0	0	0	0
24	1	0	0	0	0	0	0	0	1	0	0	1	0	0	1	1	1	0	0	0	0	0	1	0
25	0	0	0	0	0	0	0	2	0	0	0	0	0	1	1	6	5	0	0	0	0	0	1	1
26	0	0	0	0	0	0	0	1	0	0	0	2	0	0	6	5	2	0	0	0	0	2	0	3
27	0	0	0	0	0	0	1	0	1	0	0	1	0	0	18	3	5	0	1	0	0	3	0	2
28	0	0	0	1	0	1	1	1	2	2	0	4	1	0	14	3	3	0	1	1	0	1	3	4
29	0	0	0	0	0	0	2	4	1	7	0	5	0	2	5	2	1	0	1	0	0	1	0	1
30	0	0	1	1	1	0	1	5	1	5	0	5	3	1	6	5	2	0	0	0	0	1	0	4
31	0	0	0	0	1	1	1	2	1	4	0	2	0	0	1	0	2	0	1	0	0	0	0	1
32	0	2	0	0	0	3	0	6	6	2	1	2	1	1	0	5	1	0	0	0	0	0	0	1
33	0	0	0	0	0	2	1	2	3	1	0	3	2	0	0	0	1	0	0	0	0	0	0	0
34	0	0	0	0	0	0	1	3	1	2	2	1	3	1	2	1	1	0	0	0	0	0	0	1
35	0	0	1	0	0	1	0	2	2	2	0	4	2	2	2	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	2	1	1	0	4	1	0	1	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	1	0	0	1	2	0	0	0	0	0	0	0	0	0	1	0	1
38	0	0	0	0	0	0	0	1	0	0	1	2	2	1	1	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
41	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0
42	0	0	0	0	0	0	0	0	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	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	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	0	0	0	0	0	0
46	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**1**	**2**	**3**	**4**	**2**	**12**	**9**	**34**	**24**	**26**	**10**	**40**	**16**	**20**	**75**	**53**	**27**	**3**	**6**	**2**	**1**	**14**	**5**	**20**

Fall

length	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
19	0	0	0	0	0	0	1	0	0	0	0	0	0	0	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	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	0	0	0
22	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	-	0	0	0	0
23	0	0	0	3	0	0	0	0	1	0	0	0	0	0	0	2	0	0	0	-	2	1	0	0
24	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	-	2	1	0	0
25	0	0	0	6	0	1	1	0	2	0	0	0	0	0	2	1	2	0	0	-	0	2	0	0
26	0	1	2	8	0	3	1	0	5	0	0	0	0	4	3	0	0	0	0	-	3	1	0	0
27	0	0	0	3	0	2	0	0	5	2	0	1	0	3	0	1	0	0	0	-	0	0	0	0
28	0	1	0	1	0	3	0	0	2	0	0	1	0	1	1	1	0	0	2	-	0	1	3	0
29	0	0	0	2	0	0	0	0	0	2	0	0	0	1	2	3	0	0	0	-	0	4	7	0
30	0	1	0	1	1	0	1	0	0	0	0	0	0	0	8	7	2	0	3	-	0	3	7	2
31	0	0	1	0	1	0	2	1	2	0	0	0	1	0	15	1	2	0	2	-	0	7	5	1
32	0	1	0	0	1	2	2	1	7	3	1	0	2	0	12	1	1	0	0	-	0	3	1	0
33	0	2	1	2	0	1	3	2	2	2	3	1	2	1	5	0	1	2	0	-	0	1	1	1
34	0	2	0	0	1	4	2	0	3	4	0	1	1	0	5	1	0	0	0	-	0	4	1	1
35	0	0	2	0	0	0	0	0	0	2	0	0	0	2	1	1	0	0	0	-	0	0	1	0
36	0	1	0	0	0	0	0	0	0	0	0	1	0	1	2	1	0	0	0	-	0	1	1	1
37	0	1	1	0	0	0	1	0	2	1	0	0	0	1	2	0	0	0	0	-	0	0	0	0
38	0	0	0	0	0	0	0	1	0	0	0	0	0	2	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	0	-	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	1	0	0	-	0	0	0	0
41	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**	**10**	**7**	**27**	**4**	**16**	**15**	**5**	**32**	**16**	**4**	**5**	**6**	**18**	**60**	**22**	**10**	**2**	**7**	**0**	**7**	**29**	**27**	**6**

Table 5.48. Horseshoe crab length frequencies by sex, spring, 1 cm intervals, 1998-2014.
Horseshoe crabs were measured (prosomal width) from every tow.

			Spring															
Sex	length	1998*	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
F	13		1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
F	14		1	3	0	1	2	0	1	0	0	0	0	0	0	0	0	0
F	15		0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0
F	16		1	0	0	3	2	1	1	0	0	1	0	0	0	1	0	2
F	17		1	0	2	2	1	4	1	0	1	1	0	0	0	1	0	0
F	18		2	1	0	3	2	4	0	0	2	1	1	0	0	0	2	3
F	19		4	1	2	2	5	5	0	0	3	4	1	0	0	2	0	5
F	20		5	2	0	7	1	2	3	0	3	2	0	0	1	2	0	4
F	21		8	2	1	8	6	2	1	0	3	8	1	0	3	5	4	5
F	22		8	6	4	13	10	7	2	0	10	4	6	0	3	3	2	3
F	23		14	15	18	19	22	17	3	2	9	14	4	3	4	9	7	14
F	24		15	7	15	32	29	25	5	4	15	11	12	6	3	15	19	13
F	25		15	10	23	25	22	20	8	5	11	16	10	9	9	14	19	11
F	26		23	13	28	26	22	23	3	2	16	12	10	4	16	14	17	26
F	27		15	9	18	18	18	18	8	4	10	9	9	5	18	11	8	22
F	28		8	6	9	6	7	4	2	2	5	4	10	3	8	10	13	9
F	29		3	0	3	4	4	4	0	3	5	1	3	4	1	3	2	3
F	30		1	0	3	2	0	0	3	2	0	2	1	1	4	0	1	1
F	31		0	0	0	0	4	0	0	0	0	1	1	0	0	0	0	0
F	32		0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
M	14		0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
M	15		0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0
M	16		0	0	0	2	5	2	0	1	2	0	0	2	0	0	0	0
M	17		5	2	4	7	9	9	0	0	3	2	3	0	1	5	0	1
M	18		11	8	12	19	24	21	2	0	17	10	3	2	5	7	6	9
M	19		22	13	32	42	25	33	3	0	19	12	10	7	7	8	16	17
M	20		15	16	30	20	33	31	7	0	21	10	11	7	15	13	10	13
M	21		18	5	13	14	16	10	1	0	6	12	5	3	3	9	6	6
M	22		4	5	7	6	7	6	2	0	4	2	1	1	4	5	3	1
M	23		1	0	3	1	4	2	1	0	0	1	1	0	0	0	2	1
M	24		2	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0
M	25		0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	3
M	26		0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0
M	27		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M	28		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M	29		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M	30		0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
U	22		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		51	204	125	228	285	285	251	60	25	166	141	104	57	105	138	138	173

No sex recorded in the spring of 1998

Table 5.49. Horseshoe crab length frequencies by sex, fall, 1 cm intervals, 1998-2014.
Horseshoe crabs were measured (prosomal width) from every tow.

		Fall																
Sex	**length**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
F	**13**	0	0	2	0	0	0	3	0	1	0	0	0	-	0	0	0	0
F	**14**	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
F	**15**	0	0	0	0	2	0	0	0	0	0	0	0	-	0	0	0	0
F	**16**	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
F	**17**	1	1	0	0	2	1	0	1	1	0	1	0	-	0	0	0	0
F	**18**	0	2	0	1	0	1	1	1	0	0	0	0	-	0	0	0	0
F	**19**	3	2	2	2	0	1	0	0	1	0	1	1	-	0	0	0	2
F	**20**	5	1	1	4	4	2	3	0	2	0	0	2	-	0	0	0	0
F	**21**	3	2	2	3	1	4	6	3	1	1	1	0	-	0	0	0	1
F	**22**	3	8	13	13	10	3	9	4	1	2	6	6	-	6	0	2	2
F	**23**	8	15	15	12	8	8	13	10	7	7	6	14	-	6	2	3	4
F	**24**	7	19	30	27	21	9	24	10	6	17	14	22	-	18	10	12	8
F	**25**	17	12	20	31	33	13	19	6	12	26	17	17	-	19	9	11	11
F	**26**	19	23	33	31	18	9	29	12	10	22	15	24	-	25	16	27	10
F	**27**	14	7	21	22	18	7	22	8	3	17	11	28	-	16	5	15	10
F	**28**	2	4	10	8	13	6	15	5	4	8	11	22	-	11	3	10	6
F	**29**	2	3	2	5	2	3	8	2	0	4	1	5	-	2	4	2	3
F	**30**	0	1	1	2	0	2	1	2	0	2	0	2	-	0	1	2	0
F	**31**	0	1	0	0	1	0	0	2	0	0	0	1	-	0	0	0	1
F	**32**	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
F	**33**	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
F	**34**	0	0	0	0	0	1	0	0	0	0	0	0	-	0	0	0	0
M	**11**	0	0	0	1	0	0	0	0	0	0	0	0	-	0	0	0	0
M	**12**	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
M	**13**	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
M	**14**	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
M	**15**	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
M	**16**	0	0	2	1	5	3	0	0	0	1	1	0	-	1	0	0	0
M	**17**	6	5	7	6	3	5	11	0	1	3	1	2	-	3	0	1	1
M	**18**	12	14	28	18	14	15	21	3	9	3	9	18	-	13	4	2	5
M	**19**	10	20	39	27	31	11	39	13	4	12	21	14	-	9	4	6	13
M	**20**	20	23	35	32	22	8	30	12	9	19	23	31	-	10	1	17	4
M	**21**	6	11	18	15	9	4	15	4	2	10	6	13	-	7	1	7	6
M	**22**	5	3	8	4	6	0	10	2	5	6	2	5	-	6	0	5	0
M	**23**	0	0	3	2	6	1	1	0	2	3	1	3	-	0	1	2	0
M	**24**	0	0	1	3	0	0	1	0	1	2	0	2	-	0	0	0	0
M	**25**	0	0	2	0	0	0	0	0	0	0	0	1	-	0	0	1	0
M	**26**	2	0	0	3	0	0	0	0	1	0	0	1	-	0	0	0	0
M	**27**	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
M	**28**	0	0	0	0	0	0	0	1	0	0	0	0	-	0	0	0	0
M	**29**	0	0	0	1	0	0	0	0	0	0	0	0	-	0	0	0	0
Total		**145**	**177**	**295**	**274**	**229**	**117**	**281**	**101**	**83**	**165**	**148**	**234**	-	**152**	**61**	**41**	**29**

Table 5.50. Long-finned squid length frequencies, spring, 1 cm intervals, 1986-1990, 1992-2014.
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**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	14	0	0	0	0	1	0
3	0	0	0	0	0	0	0	0	1	5	1	18	4	11	0	6	0	6	0	1	2	111	17	1	0	5	4	5
4	0	0	3	0	0	3	9	31	48	23	11	103	10	32	5	44	11	51	1	12	8	220	66	1	6	28	17	35
5	0	1	35	0	1	7	64	137	87	39	35	323	32	36	12	48	16	70	11	18	36	220	128	5	17	45	46	63
6	0	6	53	0	0	8	99	117	175	23	46	444	20	31	15	36	6	88	20	13	35	148	141	2	45	64	31	62
7	2	2	60	0	0	17	96	108	178	33	45	324	18	20	24	27	9	65	4	9	21	66	74	9	42	40	22	41
8	3	10	30	0	3	20	49	63	141	34	42	290	18	13	26	36	12	51	7	8	19	55	30	7	15	31	22	38
9	2	2	40	2	0	20	42	83	170	40	45	159	43	24	41	18	26	24	6	12	30	54	63	4	23	59	31	44
10	2	9	53	1	9	17	47	71	248	55	51	135	47	18	52	41	24	59	10	30	50	106	67	40	38	130	57	32
11	1	23	76	4	4	28	60	141	367	75	69	67	82	39	74	49	33	84	28	61	53	173	163	72	39	155	75	40
12	19	103	152	6	11	70	133	125	367	78	98	33	88	92	90	75	53	198	51	123	60	220	317	132	77	108	78	70
13	24	232	202	12	24	58	163	133	258	95	125	50	106	111	87	72	88	321	146	163	64	112	367	171	75	60	34	99
14	22	243	294	36	43	91	163	108	146	81	180	18	99	96	52	86	74	448	208	119	58	105	209	167	65	44	26	136
15	22	368	300	48	83	87	210	79	132	77	213	13	94	101	39	62	63	414	234	137	37	75	177	133	65	37	16	146
16	14	343	271	111	146	67	289	80	80	43	166	5	71	76	34	47	41	475	227	138	36	76	114	78	50	63	16	195
17	7	479	252	81	142	53	218	67	98	42	174	14	39	59	31	46	42	352	180	102	13	61	126	73	41	24	4	113
18	36	208	223	92	145	59	195	28	66	44	105	10	41	58	16	22	27	200	134	77	21	48	99	50	41	16	18	71
19	23	361	222	95	128	30	150	24	53	24	83	5	20	32	26	12	11	144	64	40	19	20	54	60	28	21	9	65
20	24	328	143	62	90	52	80	18	65	19	78	9	22	35	22	14	15	124	81	57	11	25	42	21	44	19	8	77
21	27	214	102	30	67	45	90	13	30	15	39	1	16	24	16	18	14	136	53	33	5	34	21	35	21	36	4	46
22	13	238	100	42	53	46	43	16	17	12	51	8	12	19	17	6	12	115	53	26	9	14	22	28	16	24	3	61
23	13	160	46	40	54	22	28	7	9	4	55	3	9	18	3	9	13	49	36	32	3	7	9	14	21	13	7	53
24	13	174	33	35	48	11	23	7	5	9	61	0	16	11	10	6	14	64	41	21	6	10	16	14	23	3	4	28
25	6	195	65	28	63	9	21	9	12	0	33	3	10	14	9	2	7	40	23	22	4	3	9	9	6	6	1	30
26	6	242	37	58	32	21	37	5	26	2	36	4	3	12	9	6	5	28	28	8	4	5	12	7	2	2	0	29
27	7	197	41	27	53	13	10	4	14	2	7	1	4	6	0	1	2	17	9	9	1	2	5	0	7	4	0	12
28	2	133	19	32	51	11	27	3	0	1	10	0	2	1	4	2	0	15	9	6	1	1	4	1	0	5	0	14
29	2	86	10	8	30	15	7	2	7	3	1	3	5	0	2	3	2	5	3	4	1	1	2	0	0	2	0	9
30	5	121	24	12	31	3	1	2	9	1	14	1	0	0	1	8	2	11	0	6	1	0	3	0	3	2	0	6
31	3	78	14	11	5	4	8	1	3	0	0	0	1	1	1	0	0	3	2	2	1	0	1	0	0	0	0	1
32	0	61	7	6	9	1	7	0	0	1	0	0	0	0	1	3	0	1	1	0	0	0	1	0	2	0	0	2
33	0	25	7	7	6	9	0	1	5	0	5	0	1	1	0	1	0	0	0	1	0	0	2	0	0	0	0	0
34	0	0	0	0	9	2	2	1	8	0	4	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	2
35	1	38	0	0	2	0	0	1	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0
36	0	38	4	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
37	2	0	0	5	2	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
38	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
39	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
40	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**301**	**4,719**	**2,918**	**896**	**1,347**	**900**	**2,371**	**1,485**	**2,825**	**880**	**1,883**	**2,044**	**933**	**993**	**721**	**809**	**622**	**3,658**	**1,670**	**1,290**	**609**	**1,986**	**2,361**	**1,134**	**812**	**1,047**	**534**	**1,625**

Table 5.51. Long-finned squid length frequencies, fall, 1 cm intervals, 1986-1990, 1992-2014.
Length frequencies of squid 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**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
0	0	0	0	5	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	13	0	12	0	0	0	0	0	0	0	0	0	0	0	4	0	0	3	12	0	0	14	-	0	0	11	0
2	0	31	0	1	0	49	0	9	25	24	6	20	29	2	0	11	0	1	10	74	9	33	90	-	12	10	67	6
3	0	126	59	112	74	266	914	80	156	57	125	115	104	53	36	80	90	170	91	107	20	87	343	-	80	101	51	25
4	0	320	212	468	278	1,507	2,336	477	460	598	491	642	362	384	230	261	886	693	763	249	420	294	939	-	618	469	127	517
5	0	892	826	743	830	2,906	3,502	1,332	1,223	1,371	1,091	1,888	1,214	1,215	663	695	2,225	1,757	1,539	587	1,367	417	2,332	-	1,417	705	273	1443
6	3	1,019	1,165	677	836	5,015	4,358	1,803	1,896	1,869	1,278	2,737	1,782	1,842	923	1,067	3,185	2,705	2,337	913	2,780	604	2,894	-	1,405	731	426	1814
7	13	817	722	446	469	5,210	4,331	2,152	2,254	2,751	1,169	3,412	2,390	2,204	996	1,193	2,566	2,759	2,552	917	3,822	780	2,746	-	1,315	698	550	1560
8	135	654	333	283	220	3,110	3,811	2,225	2,080	2,224	935	2,939	1,808	1,797	839	929	1,885	1,787	2,006	611	3,549	908	1,791	-	840	638	570	1394
9	16	692	146	108	129	1,594	2,913	2,486	2,124	1,853	570	1,993	1,829	1,081	616	488	1,785	907	1,283	385	2,119	777	1,131	-	670	584	418	1366
10	13	503	65	58	42	894	1,772	2,055	1,540	1,264	446	1,216	1,332	695	528	354	861	626	970	204	1,974	480	808	-	637	399	306	1198
11	0	310	62	70	39	737	1,178	1,607	905	698	291	675	780	556	264	214	215	392	541	183	1,379	332	326	-	343	359	178	862
12	0	165	21	38	24	284	737	843	387	579	153	368	423	380	154	145	58	144	307	85	728	193	222	-	211	232	123	574
13	0	82	24	34	17	242	408	415	159	297	126	328	277	247	132	87	2	96	194	31	447	103	108	-	139	148	62	315
14	0	77	9	17	6	40	278	329	110	160	44	199	235	204	68	53	1	103	64	26	253	47	41	-	40	97	53	253
15	0	31	11	17	3	18	185	181	77	83	31	103	133	128	66	13	2	48	44	9	150	18	27	-	86	64	14	213
16	0	4	11	13	2	0	53	99	33	46	15	90	111	73	32	10	0	43	30	8	159	7	14	-	18	35	2	106
17	0	14	0	10	4	0	73	75	15	16	13	23	120	101	8	6	0	1	24	17	103	5	2	-	7	8	6	50
18	0	1	23	6	1	0	20	31	2	6	10	16	82	34	3	0	0	8	2	11	74	0	1	-	25	12	4	53
19	0	1	0	0	0	0	3	12	0	1	0	1	34	9	2	4	0	1	1	11	2	0	0	-	0	7	0	37
20	0	13	0	5	1	0	2	7	0	0	1	1	22	3	2	1	0	4	2	1	3	0	0	-	0	1	0	21
21	0	15	0	4	0	0	0	3	0	0	0	0	22	9	1	0	0	0	0	0	1	0	0	-	0	5	2	6
22	0	2	0	3	1	0	0	11	0	6	0	1	17	0	0	0	0	0	1	0	0	0	0	-	0	2	1	0
23	0	0	0	3	0	0	2	1	0	0	0	0	4	0	0	0	0	0	1	0	0	0	0	-	1	0	0	0
24	0	1	0	3	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	5	0	0	-	0	0	0	0
25	0	0	0	0	0	0	1	0	0	0	0	0	0	1	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	0	0	0	0	-	0	0	0	0
27	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
28	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
29	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
30	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
Total	**180**	**5,783**	**3,689**	**3,136**	**2,976**	**21,872**	**26,877**	**16,233**	**13,446**	**13,903**	**6,795**	**16,767**	**13,111**	**11,018**	**5,563**	**5,615**	**13,761**	**12,245**	**12,765**	**4,441**	**19,364**	**5,085**	**13,829**	-	**7,864**	**5,306**	**3,244**	**11,813**

Table 5.52. Scup spring length frequencies, 1 cm intervals, 1984-2014.
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**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
6	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
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	13	0	0	0	0	0	0
8	0	0	0	6	3	84	0	12	0	0	0	11	0	0	10	24	61	0	16	0	0	4	56	4	145	3	0	0	35	0	15
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	145	606	148	0	19	435	60	77
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	926	1,700	1,966	14	115	3,169	338	455
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	1,033	2,055	3,476	22	203	3,888	460	1,007
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	486	950	3,418	7	178	2,589	300	1,402
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	78	586	1,141	1	77	1,241	93	623
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	76	357	561	3	16	262	74	123
15	2	4	4	11	4	137	40	3	3	77	7	3	3	11	66	1	201	220	247	7	42	56	251	298	426	593	40	19	62	98	108
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	1,177	1,971	1,430	222	100	52	504	226
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	1,607	3,916	2,151	614	215	206	1,343	669
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	1,444	3,722	1,953	780	312	642	2,764	755
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	918	1,978	1,078	527	270	1,123	3,058	520
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	390	1,315	798	424	257	909	1,402	718
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	266	2,149	1,320	599	655	377	271	1,539
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	458	2,835	1,941	723	1,260	200	296	2,305
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	603	2,340	1,522	641	1,387	313	665	1,674
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	558	1,351	1,149	580	1,123	568	738	711
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	272	854	909	573	930	816	591	326
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	128	642	793	523	658	1,000	312	379
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	91	382	504	350	651	931	461	338
28	0	12	4	5	4	3	3	1	6	2	2	0	1	3	3	2	13	88	282	201	730	379	427	109	230	267	243	637	721	689	316
29	1	14	6	3	2	0	0	2	2	0	0	0	1	0	1	6	19	36	147	81	331	332	622	115	198	234	153	468	565	753	346
30	0	11	3	1	0	1	0	2	1	1	1	1	1	3	0	0	8	8	71	33	116	171	618	156	64	90	41	321	467	627	299
31	0	1	0	1	2	0	0	1	0	0	1	0	1	4	0	1	6	3	35	23	37	101	441	167	54	42	34	235	307	496	227
32	0	2	1	0	1	1	1	0	1	0	0	1	0	0	0	3	3	2	10	11	28	41	317	126	68	32	15	123	174	310	174
33	0	2	1	0	0	0	0	0	0	0	1	0	0	0	0	0	4	2	11	4	11	16	266	65	57	57	14	78	105	152	100
34	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	3	1	4	2	8	1	30	37	47	16	4	44	63	106	61
35	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	1	0	3	0	1	2	17	18	26	10	4	32	31	36	20
36	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	1	4	9	11	11	2	28	17	23	8
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2	3	4	8	1	15	6	8	1
38	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1	0	0	0	5	4	10	3
39	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	1	0	3	2	3	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	0	0	0	0	1	3	0	1
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2
42	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
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
44	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
45	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
46	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
47	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	0	0	0	0
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**	**11,764**	**31,052**	**27,623**	**7,155**	**10,435**	**21,283**	**17,042**	**15,528**

Table 5.53. Scup fall length frequencies, 1 cm intervals, 1984-2014.
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**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	-	0	0	0	0
3	0	8	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	13	4	9	0	0	-	4	0	0	0
4	1	61	0	0	17	1	3	14	196	0	6	0	0	18	4	1	1	28	117	19	143	363	11	74	0	34	-	21	29	4	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	381	0	234	-	131	119	7	204
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	1,303	4	1,106	-	705	567	116	1,033
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	4,516	871	2,923	-	1,769	1,849	180	4,259
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	10,576	3,092	3,078	-	3,977	4,036	563	7,657
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	13,782	6,383	1,316	-	4,882	5,961	1275	6,878
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	10,376	7,196	610	-	2,365	5,770	701	3,654
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	2,547	1,733	75	-	632	2,695	375	1,526
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	1,316	84	10	-	112	726	118	362
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	1,645	27	81	-	42	154	70	205
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	3,269	193	598	-	248	482	288	230
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	4,216	367	1,890	-	883	1,483	454	537
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	3,003	493	2,445	-	1,425	2,233	331	589
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	1,468	330	1,777	-	1,138	2,015	203	416
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	555	110	830	-	613	1,332	83	271
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	676	88	320	-	293	455	176	143
20	21	15	36	52	93	43	266	13	145	95	34	18	75	32	33	436	396	769	621	586	189	308	147	1,121	185	343	-	110	199	505	190
21	47	8	44	87	87	34	424	56	254	111	41	9	70	34	33	289	337	967	797	693	339	194	158	1,179	228	336	-	186	212	640	151
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	655	238	226	-	288	388	478	201
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	365	150	190	-	408	319	164	335
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	189	94	170	-	649	184	179	358
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	181	123	170	-	822	112	238	277
26	38	53	13	28	10	3	10	19	17	10	11	0	0	4	2	13	35	55	271	720	878	173	42	170	147	167	-	643	106	162	190
27	38	64	9	36	7	1	2	13	22	10	7	0	2	1	2	19	42	27	184	558	790	212	23	91	99	128	-	502	122	129	100
28	31	18	12	11	3	1	3	6	13	7	6	0	2	1	1	4	20	11	67	261	731	214	15	78	85	107	-	383	116	108	100
29	9	21	4	7	0	0	1	1	6	4	2	0	0	0	3	2	13	14	32	101	433	174	23	32	59	86	-	341	59	135	57
30	8	16	2	1	0	0	0	0	0	3	0	0	0	0	0	0	3	4	22	75	122	101	36	27	51	35	-	196	63	116	88
31	7	7	1	1	0	0	1	2	1	0	0	0	1	0	0	1	2	3	14	23	45	46	26	43	22	28	-	111	26	47	64
32	2	1	0	0	0	0	3	0	0	0	1	0	0	0	0	1	0	0	1	14	25	18	20	37	20	21	-	76	17	36	49
33	1	2	0	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	5	10	3	6	27	14	13	-	31	11	24	22
34	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	5	2	10	11	13	-	16	1	9	7
35	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	1	1	0	1	1	6	7	-	10	0	7	4
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	4	0	0	1	4	2	-	7	1	2	3
37	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	2	-	2	0	1	0
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	1	0
39	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
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	1
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**	**63,921**	**22,507**	**19,371**	-	**24,021**	**31,842**	**7,925**	**30,172**

Table 5.54. Striped bass spring length frequencies, 2 cm intervals (midpoint given), 1984–2014.

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**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
11	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	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	0	1	0	0	1	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	8	0	0	0	1	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	0	2	0	0	0	3	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	2	0	5	0	0	5	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	0	0	21	0	0	5	3	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	7	1	24	1	0	10	11	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	9	4	24	1	2	8	9	1
27	0	0	0	0	0	0	5	1	2	0	2	28	2	5	30	2	24	15	38	4	1	67	1	12	4	7	1	0	8	11	0
29	0	0	0	0	1	0	9	2	0	1	1	24	4	12	21	14	28	16	27	11	4	50	1	10	6	5	0	0	8	7	2
31	0	0	0	0	0	1	6	2	1	2	2	12	4	14	20	10	29	5	17	7	5	19	1	4	4	1	0	0	5	4	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	5	4	6	0	0	2	7	1
35	0	0	0	0	1	0	3	2	1	1	0	8	20	2	19	16	3	4	7	7	13	7	6	6	1	2	1	1	2	7	5
37	0	0	0	0	0	0	3	1	0	0	1	8	26	25	25	15	2	11	12	11	11	4	5	16	2	5	2	1	3	10	12
39	0	0	0	0	0	1	0	0	0	0	3	3	19	42	23	13	2	14	14	7	4	7	6	35	2	10	3	0	3	9	33
41	0	0	0	0	0	2	2	1	3	1	3	4	17	30	25	19	6	7	20	3	2	20	2	26	2	19	1	0	1	2	31
43	0	0	0	0	0	0	0	1	3	5	1	0	7	16	17	11	3	2	17	5	1	13	4	25	6	14	0	0	4	2	12
45	0	0	0	1	0	0	0	0	5	2	2	3	12	6	19	9	4	1	17	2	3	12	2	11	7	21	0	0	5	4	12
47	0	0	0	0	2	0	0	0	0	3	6	0	7	10	15	10	5	6	9	3	2	17	0	7	10	30	2	6	1	4	22
49	0	0	0	0	2	0	2	1	2	3	4	1	5	13	14	6	4	3	8	5	6	17	1	12	9	28	7	4	1	6	19
51	0	0	0	0	0	1	0	1	4	3	4	2	7	7	12	6	4	3	9	7	1	4	6	5	10	32	2	8	5	3	13
53	0	0	0	1	0	0	0	1	2	5	4	2	7	4	8	11	5	2	5	6	6	9	6	8	12	19	5	11	1	4	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	4	12	9	7	11	5	3	10
57	0	0	0	0	0	0	0	2	2	2	8	1	2	3	6	21	4	5	9	9	6	13	3	15	12	13	8	13	6	0	2
59	0	0	0	2	0	1	0	0	0	4	2	2	2	7	7	22	4	5	10	11	4	5	5	5	8	17	6	5	6	6	3
61	0	0	0	0	0	0	0	2	1	2	5	2	3	3	2	26	4	10	17	7	6	6	4	12	5	17	3	13	1	2	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	15	5	15	2	12	1	3	2
65	0	0	0	0	0	0	0	0	0	1	4	0	3	5	10	15	10	4	13	9	4	8	6	4	1	12	4	8	2	6	2
67	0	0	0	0	0	1	0	0	1	1	0	1	3	4	6	10	9	6	19	14	6	4	3	8	4	8	1	15	4	3	1
69	0	0	0	0	0	0	2	0	0	3	3	3	1	3	1	10	3	13	15	10	5	7	2	5	3	3	2	9	4	4	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	4	5	7	2	12	3	3	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	3	3	3	2	7	1	4	0
75	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	6	1	2	4	10	5	5	1	3	0	3	4	8	3	2	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	2	1	1	0	9	0	2	0
79	0	0	0	0	0	0	0	1	1	0	0	3	2	3	0	1	2	1	7	1	1	4	2	0	1	1	1	5	1	7	5
81	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	2	2	0	4	0	2	4	1	2	2	0	1	1	2	5	0
83	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	1	4	0	1	1	1	0	0	0	1	0	3	0
85	0	0	0	0	0	0	0	2	0	0	0	0	2	1	0	0	0	1	3	2	0	1	0	0	0	0	0	1	1	0	1
87	0	0	0	0	0	0	0	0	1	1	1	0	1	1	1	0	0	1	0	4	2	0	2	1	1	0	0	0	0	0	0
89	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	3	0	0	0	0	0	1	1	0
91	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	1	0	0	0	1	0	1	0	0	0	0	2	0
93	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	3	1	0	0	0	0	0	1
95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	0	0	0	0	0	1	1	0
97	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	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	0	0	0	0	0	0	1	0	0	**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**	**287**	**160**	**382**	**69**	**165**	**125**	**160**	**205**

Table 5.55. Striped bass fall length frequencies, 2 cm intervals (midpoint given), 1984–2014.
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	2007	2008	2009	2010	2011	2012	2013	2014
21	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	0	0	0
23	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	1	0	0
25	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	-	7	2	0	0
27	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	-	13	1	0	0
29	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	-	9	1	0	0
31	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	-	4	2	0	0
33	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
35	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	-	3	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	0	0	0	-	1	4	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	0	0	0	-	1	0	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	0	0	0	-	0	0	0	0
43	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2	1	0	1	0	19	0	0	0	1	0	-	0	4	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	2	0	0	-	0	1	3	0
47	0	0	0	0	0	0	0	0	0	0	0	0	4	3	0	11	0	0	1	1	18	1	1	10	0	2	-	0	5	6	5
49	0	0	0	0	0	0	0	0	0	1	0	0	9	9	2	9	1	0	0	0	14	2	4	22	1	1	-	0	6	5	3
51	0	0	0	0	0	0	0	0	0	4	2	0	8	4	1	9	0	0	3	0	29	2	5	18	2	4	-	2	2	2	4
53	1	0	0	0	0	0	0	0	0	2	2	1	5	14	7	5	5	0	3	0	27	7	7	16	7	7	-	2	2	4	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	10	4	10	-	3	3	2	6
57	0	0	0	1	1	0	0	1	1	5	0	2	3	11	5	5	5	2	7	1	11	6	3	6	3	8	-	0	0	3	8
59	0	0	0	0	0	0	0	0	1	0	0	0	0	7	3	0	8	0	2	0	13	6	3	5	3	8	-	0	6	1	4
61	0	0	0	0	3	0	0	1	0	1	0	2	2	3	1	2	4	2	2	0	12	1	6	4	3	4	-	2	1	2	4
63	0	0	0	0	2	0	0	1	1	1	1	0	0	3	2	3	6	7	3	1	9	5	2	5	1	6	-	3	0	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	7	1	6	-	6	0	2	1
67	0	0	0	0	1	0	0	1	0	1	2	2	1	1	0	1	6	1	6	0	8	4	3	4	0	5	-	3	0	0	0
69	0	0	0	0	1	0	0	0	0	1	1	0	2	2	0	0	4	3	4	0	6	0	3	6	2	6	-	2	0	2	1
71	0	0	0	0	1	0	0	0	1	0	0	1	1	1	2	0	3	3	5	0	3	3	0	0	0	1	-	1	2	0	1
73	0	0	0	0	0	0	0	0	0	2	1	4	0	2	3	1	2	2	0	1	3	0	0	0	4	1	-	5	1	1	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	1	0	0	-	1	1	0	1
77	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1	4	0	4	0	1	0	0	2	3	0	-	5	1	0	1
79	0	0	0	0	0	0	0	0	0	2	1	0	0	1	1	0	1	1	2	1	1	0	1	0	3	1	-	0	0	0	0
81	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	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	1	0	1	0	0	0	0	0	0	0	0	0	0	0	-	0	0	2	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	1	0	3	-	1	0	0	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	1	0	0	-	0	0	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	0	0	0	-	1	0	0	1
91	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	-	0	0	0	0
93	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	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	0	0	2	-	0	0	0	0
97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	5	-	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	1	0	0	-	0	0	0	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	0	0	0	-	0	0	0	0
103	0	0	0	0	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
105	0	0	0	0	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
107	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
109	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	0	0	0
111	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
113	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	-	0	0	0	0
Total	1	0	1	1	10	0	0	6	8	22	16	15	48	80	37	62	64	28	56	8	243	47	47	131	39	83	-	77	46	40	49

Table 5.56. Summer flounder length frequencies, spring, 2 cm intervals (midpoint given), 1984–2014.
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**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
13	0	0	0	1	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
15	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	15	0	0	1	0	0	0	1
17	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	28	1	1	7	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	37	1	3	10	0	0	0	1
21	0	0	11	39	0	0	0	0	0	0	3	2	2	1	0	0	2	1	1	3	0	0	0	46	5	16	21	1	0	15	5
23	0	0	10	31	1	0	1	3	2	0	9	1	2	2	0	0	0	6	1	13	1	2	1	37	3	21	38	4	2	21	15
25	1	0	22	33	2	0	2	6	1	9	20	1	2	10	1	2	6	5	2	27	3	3	0	21	7	43	86	21	4	41	29
27	8	0	43	25	20	0	7	12	6	22	32	3	11	10	2	14	7	26	13	79	8	14	0	11	13	55	94	50	22	58	61
29	7	0	39	6	18	0	15	17	14	15	10	9	45	22	5	32	21	60	50	135	25	10	2	19	34	53	78	90	56	56	92
31	9	1	17	3	18	0	19	23	12	12	19	12	44	27	4	42	23	53	89	104	14	19	5	19	28	24	37	92	51	33	74
33	0	7	13	5	12	1	12	9	8	7	22	2	14	25	7	22	28	16	57	54	18	15	21	6	25	26	10	70	44	36	65
35	2	8	4	2	13	3	1	5	6	7	16	2	12	11	11	22	22	10	41	49	13	12	17	9	14	20	7	81	58	35	50
37	1	3	4	5	8	2	1	6	2	6	20	1	10	20	28	26	34	20	57	75	34	8	14	12	10	28	16	69	60	64	48
39	3	3	3	4	5	1	2	5	2	7	7	0	12	16	38	18	36	12	61	71	51	9	10	22	14	36	20	55	66	62	33
41	1	3	7	1	8	2	1	6	5	4	6	3	5	10	35	14	33	19	51	77	49	13	5	26	17	35	12	38	34	68	33
43	0	1	3	0	2	2	0	0	2	4	6	7	6	6	22	16	22	24	28	58	48	10	5	30	13	28	13	25	43	46	29
45	0	0	1	1	3	0	0	8	4	0	4	0	5	4	15	11	29	16	21	33	18	5	4	26	6	30	7	19	23	39	23
47	0	0	3	3	3	1	1	4	2	1	3	0	1	6	9	10	18	14	20	43	28	12	3	25	14	14	16	26	24	28	16
49	1	0	1	1	1	2	0	2	1	0	2	1	3	2	12	17	7	10	14	32	26	6	3	35	9	13	10	20	23	20	17
51	0	0	5	0	1	0	0	1	1	0	1	0	1	3	15	9	8	12	19	19	13	8	7	26	15	16	9	15	15	18	16
53	0	0	1	0	1	0	2	1	0	1	1	2	3	5	5	9	5	8	10	21	16	6	4	10	15	8	2	18	8	13	18
55	0	2	1	0	1	1	0	0	1	2	1	0	3	2	6	8	8	8	14	10	13	5	2	11	18	14	2	15	8	12	17
57	0	0	0	0	0	1	1	0	0	0	2	0	0	1	5	4	5	8	12	9	3	2	1	13	14	16	2	14	3	6	14
59	0	0	0	0	1	1	0	0	0	2	0	0	2	3	3	8	8	2	6	12	8	4	1	5	5	17	3	7	8	9	3
61	0	2	0	0	0	0	0	0	0	1	2	1	1	0	1	3	4	4	6	5	5	3	0	2	4	7	3	7	1	3	4
63	0	0	0	0	0	0	0	0	0	1	0	0	0	1	2	0	2	1	7	10	9	0	4	6	5	8	2	8	6	3	3
65	0	1	0	0	0	0	0	1	1	0	1	0	0	0	1	1	2	4	2	8	2	1	0	7	3	4	6	4	5	5	1
67	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	2	3	5	4	0	1	1	1	1	1	6	0	1	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	3	0	1	1	0	1	0	2
71	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1	1	2	0	3	4	0	0	0	0	0	0	1	3	3
73	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	1	0	1	2	2	0	1
75	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0	0	0	1	2	0	1	1	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	0	0	0	0	0	1	0	0
79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Total	**33**	**32**	**189**	**203**	**118**	**18**	**67**	**109**	**72**	**101**	**188**	**51**	**186**	**188**	**230**	**289**	**334**	**342**	**588**	**962**	**416**	**172**	**110**	**512**	**297**	**538**	**516**	**758**	**569**	**696**	**675**

Table 5.57. Summer flounder length frequencies, fall, 2 cm intervals (midpoint given), 1984–2014.
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**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	-	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	-	0	0	0	0
15	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	2	0	1	-	0	0	0	0
17	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	2	0	0	0	0	2	-	0	0	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	1	1	5	-	0	0	0	0
21	0	7	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	2	0	0	1	4	8	-	0	0	2	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	0	11	6	-	0	2	6	4
25	0	6	0	0	0	0	0	2	0	4	0	0	2	0	0	1	1	0	5	0	5	0	0	3	5	7	-	3	1	5	3
27	0	6	3	1	0	0	1	1	0	1	0	0	0	0	0	3	11	1	17	0	5	2	0	4	17	14	-	4	3	4	1
29	0	2	2	7	0	0	0	1	0	1	1	0	1	0	0	1	2	1	19	0	10	1	0	6	8	6	-	5	5	13	5
31	0	3	6	9	3	0	0	1	1	0	1	0	4	3	0	4	2	14	13	0	5	5	0	18	5	5	-	11	7	26	7
33	10	0	10	30	10	0	3	3	3	8	8	8	12	17	1	16	3	28	14	3	6	33	5	14	3	8	-	29	34	45	10
35	22	4	33	35	20	0	10	11	14	29	7	13	33	37	11	18	8	104	70	15	3	55	2	19	1	34	-	35	42	33	12
37	21	17	44	28	41	0	14	21	19	31	10	6	33	44	10	39	23	109	106	29	6	37	6	15	8	34	-	38	58	37	27
39	20	10	35	21	37	0	11	28	15	29	25	6	38	72	17	50	33	81	158	28	18	32	9	9	29	40	-	54	73	25	29
41	16	11	26	16	36	1	18	30	12	37	10	16	49	54	21	52	31	61	119	16	21	57	10	20	36	34	-	41	55	46	23
43	11	24	26	5	21	1	18	13	13	16	4	9	23	27	34	43	31	28	61	22	25	30	16	17	27	29	-	27	37	27	13
45	3	16	9	3	18	1	15	13	9	6	5	2	15	10	32	22	13	16	77	21	32	25	13	14	9	20	-	17	23	33	14
47	2	11	6	6	8	3	3	5	6	11	7	2	13	11	36	8	8	15	35	18	29	15	4	8	5	27	-	6	15	16	8
49	3	12	1	2	3	3	3	3	8	3	7	1	8	7	15	4	18	23	24	10	26	15	8	13	5	20	-	9	11	19	4
51	3	1	4	1	1	2	0	8	4	6	0	3	8	4	9	7	11	20	14	8	9	7	1	15	2	7	-	2	15	11	4
53	1	1	2	2	1	4	1	7	4	3	1	0	3	5	7	12	7	8	5	5	7	8	4	16	1	10	-	1	11	8	6
55	1	2	1	2	1	0	2	4	2	1	0	2	0	3	4	3	5	9	1	2	4	3	2	7	0	8	-	4	14	8	3
57	2	0	1	2	1	0	1	0	1	2	1	1	1	2	2	2	2	5	10	2	4	1	2	3	1	2	-	1	0	4	3
59	0	0	1	0	1	0	1	0	0	1	3	0	0	2	1	6	3	4	7	4	3	1	0	8	0	4	-	1	2	3	3
61	0	0	0	1	0	0	1	0	0	1	0	0	0	1	2	1	2	0	1	2	0	1	0	2	0	4	-	4	1	2	2
63	1	1	0	0	1	0	0	1	1	0	0	0	0	0	2	0	2	1	2	2	1	0	1	1	0	3	-	1	0	1	0
65	0	0	0	0	0	1	0	1	0	0	0	0	0	0	2	0	1	1	1	1	0	1	1	1	0	0	-	0	0	2	0
67	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	1	0	1	-	1	0	1	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	0	0	2	-	0	0	0	2
71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	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	0	0	1	-	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	0	0	0	-	0	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**	**95**	**219**	**178**	**343**	-	**294**	**409**	**377**	**184**

Table 5.58. Tautog length frequencies, spring, 1 cm intervals, 1984-2014.
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	2007	2008	2009	2010	2011	2012	2013	2014
7	0	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
8	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
9	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1
12	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	1	1	1	0	0	2	2	0	1	0	0	0	0	0	0	0
13	0	0	0	1	1	0	4	1	0	1	0	0	2	1	0	0	0	2	0	0	0	3	0	0	0	1	0	1	4	2	1
14	0	0	0	1	0	4	3	0	2	3	2	0	0	1	0	0	4	2	1	0	1	1	0	0	1	1	2	0	2	0	1
15	0	0	2	2	1	4	7	1	1	0	2	0	1	2	0	0	2	2	0	0	0	0	0	1	0	2	0	2	0	0	1
16	0	0	0	3	1	3	6	1	0	0	2	0	3	3	0	0	0	1	1	0	1	1	0	1	2	1	0	0	2	2	0
17	2	1	2	3	2	3	8	3	3	1	2	0	0	2	0	0	5	2	2	1	0	2	3	0	0	0	0	0	4	1	3
18	2	2	0	3	4	3	14	7	4	4	1	1	0	4	1	0	4	2	2	0	0	0	0	0	1	1	1	1	3	2	1
19	2	0	2	3	4	11	11	6	2	1	1	0	2	1	0	3	0	6	2	2	0	0	0	2	1	0	0	0	2	0	0
20	5	2	2	0	3	7	15	7	2	1	2	1	0	2	1	0	1	3	1	1	0	2	0	0	2	0	0	1	3	9	6
21	3	1	5	2	5	7	12	4	1	5	2	0	0	5	0	3	3	2	4	0	2	1	0	0	0	0	2	3	3	2	5
22	2	5	0	1	7	11	13	11	2	2	1	1	0	5	2	0	2	6	0	1	0	3	3	1	1	0	1	2	3	4	1
23	7	0	6	4	4	12	15	9	2	2	5	1	0	2	2	1	4	7	5	0	1	2	2	2	2	0	0	3	6	1	1
24	5	1	3	1	4	8	8	3	0	3	5	1	1	0	2	1	1	6	6	2	2	2	2	5	1	0	3	1	1	5	6
25	6	8	2	4	4	7	7	5	4	1	2	1	1	7	1	2	4	5	6	2	1	2	2	1	2	1	1	2	3	4	4
26	6	4	7	0	2	4	15	6	0	3	1	0	0	2	2	1	2	7	3	0	3	1	2	1	2	0	0	1	8	3	8
27	5	3	8	3	2	9	5	6	1	1	3	1	1	3	6	2	6	1	8	3	1	0	0	3	1	0	0	5	0	2	3
28	3	8	5	2	3	11	12	6	3	3	9	1	0	2	0	1	4	4	5	1	1	4	1	2	2	0	1	1	1	7	5
29	7	7	3	3	4	7	4	2	3	3	7	1	2	3	2	1	3	0	4	3	4	3	1	4	6	0	0	0	4	4	2
30	6	4	9	3	2	15	10	6	1	3	1	1	1	4	2	1	2	3	12	3	6	1	5	2	1	0	0	1	1	4	5
31	9	3	6	2	8	5	12	1	1	3	4	0	1	5	1	0	1	6	9	3	4	2	4	1	1	2	1	2	4	3	4
32	8	3	6	6	4	6	6	5	2	0	2	1	3	7	9	3	2	3	13	10	9	4	3	5	2	2	2	1	6	3	2
33	5	4	7	8	4	6	7	7	3	1	4	0	2	4	0	6	6	6	18	8	3	4	4	3	2	4	0	0	3	2	5
34	5	7	12	4	5	11	6	6	2	0	2	0	2	9	3	3	6	5	13	5	1	1	5	3	4	3	1	2	1	6	6
35	10	4	6	3	10	5	9	10	7	0	3	0	4	4	3	3	3	5	15	4	6	1	4	6	4	1	0	3	2	2	6
36	7	1	17	13	13	11	7	7	2	2	4	1	1	4	4	2	11	14	17	7	7	5	7	3	3	5	2	1	2	3	5
37	8	8	22	13	12	8	6	11	2	1	5	1	4	4	1	7	9	6	23	12	14	8	5	4	6	4	2	2	0	5	11
38	9	10	17	11	14	5	14	18	10	3	4	1	2	1	3	5	11	7	22	8	10	4	5	2	4	6	3	2	9	5	12
39	8	5	18	7	6	14	7	7	3	2	8	2	9	5	5	5	8	10	25	7	15	9	9	3	17	6	6	3	2	9	6
40	8	8	38	8	14	22	10	17	8	2	7	2	4	2	7	4	10	11	27	10	9	8	9	9	2	5	1	5	4	5	1
41	11	6	27	12	12	16	9	10	6	2	5	2	9	3	9	3	18	16	28	5	12	10	7	7	6	16	1	5	2	5	8
42	11	14	22	10	19	21	12	17	6	3	7	1	6	7	7	10	16	12	24	15	9	6	3	13	6	12	1	4	3	6	8
43	13	9	28	9	18	24	6	8	10	7	5	1	5	8	6	9	11	17	24	9	12	5	8	14	3	9	2	4	4	5	5
44	15	6	31	12	20	27	17	13	11	1	9	1	1	7	8	5	17	12	37	3	19	5	6	15	8	11	2	4	1	3	4
45	20	21	23	12	15	25	32	18	10	10	6	1	6	5	9	12	11	11	33	13	10	5	9	10	7	5	2	3	2	6	2
46	15	9	22	10	17	31	20	18	10	1	8	1	2	6	3	5	8	10	28	11	8	7	7	15	10	8	0	3	4	1	4
47	16	9	37	11	23	22	14	23	15	7	10	3	6	5	7	7	9	10	18	7	1	7	10	17	4	3	4	2	2	2	4
48	15	13	25	8	21	31	21	18	7	5	1	1	3	7	6	8	5	7	20	3	6	10	7	13	0	4	1	2	1	3	1
49	17	11	12	9	19	29	17	20	7	6	12	0	2	3	4	3	5	8	9	4	3	5	11	14	3	7	1	4	5	0	3
50	13	5	10	5	16	27	12	16	9	6	7	1	2	2	7	7	3	10	8	7	5	4	4	17	7	10	2	5	2	2	1
51	9	12	21	5	19	12	26	13	11	3	6	2	6	1	7	2	4	7	10	1	6	4	5	10	3	2	1	2	2	0	5
52	10	8	5	7	14	10	20	10	8	6	7	0	2	3	7	3	5	4	8	3	2	1	8	5	5	2	2	3	1	1	2
53	8	4	11	3	11	17	17	6	8	2	2	1	4	4	2	0	1	5	8	1	0	1	2	5	3	5	0	2	2	1	0
54	3	3	6	6	12	8	14	11	6	6	3	1	7	4	5	2	2	1	5	1	5	2	3	6	5	4	2	2	0	0	1
55	9	0	5	5	11	13	10	5	7	2	3	2	1	3	2	2	6	4	5	1	0	0	4	8	3	2	1	0	1	0	0
56	2	0	7	8	7	9	11	8	3	3	1	3	1	1	3	1	0	2	1	3	1	0	0	3	3	2	0	1	0	0	0
57	2	0	11	2	1	5	5	5	7	1	1	0	3	2	1	3	7	0	3	1	0	1	0	1	2	1	0	0	0	2	0
58	3	2	0	3	3	6	2	4	4	1	2	0	1	1	0	2	2	1	2	1	0	0	0	2	0	0	0	1	0	0	0
59	4	1	3	2	3	5	6	3	3	3	2	0	0	0	0	0	0	2	3	0	1	0	0	2	3	0	0	0	0	1	0
60	2	0	1	0	2	2	1	2	1	1	1	0	0	1	0	0	0	1	0	0	1	0	0	2	1	0	1	0	0	0	0
61	1	2	0	2	3	2	1	1	2	1	0	0	0	1	1	0	0	0	1	0	1	0	0	1	1	0	0	1	0	0	0
62	0	0	1	3	0	1	2	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
63	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0
64	0	0	0	0	0	3	0	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
66	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67	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
68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Total	**337**	**234**	**514**	**258**	**411**	**566**	**528**	**407**	**226**	**129**	**189**	**40**	**113**	**168**	**151**	**139**	**245**	**277**	**521**	**183**	**207**	**149**	**170**	**247**	**153**	**150**	**52**	**93**	**115**	**133**	**160**

Table 5.59. Weakfish length frequencies, spring, 2 cm intervals (midpoint given), 1984-2014.
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**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
5	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	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	0	2	1	3	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	0	1	3	0	3	10	4	0
23	0	0	0	0	0	0	0	0	1	0	0	3	0	0	1	0	0	1	2	1	9	3	6	1	0	1	0	2	5	8	1
25	0	0	0	0	1	0	1	0	0	0	2	3	1	0	1	2	3	4	1	2	9	10	3	0	2	0	0	0	0	6	0
27	0	0	0	0	0	0	2	4	0	0	3	5	3	5	4	1	2	13	3	0	3	27	4	4	0	0	0	2	4	10	5
29	0	0	0	0	0	0	2	4	1	3	3	7	12	12	16	5	1	20	0	0	2	22	2	4	1	1	0	0	5	12	1
31	0	0	0	0	1	0	1	6	3	3	3	7	15	21	21	8	5	9	1	0	2	20	1	0	0	0	0	0	11	8	4
33	0	0	0	0	0	0	0	12	0	3	2	1	5	19	10	10	1	5	0	0	0	11	0	3	0	0	0	0	17	1	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	1	0	0	0	1	28	2	1
37	0	0	0	1	0	0	2	5	0	0	0	1	2	2	3	1	0	0	1	0	0	1	0	2	1	0	0	2	31	3	1
39	0	0	0	0	1	0	0	4	0	0	0	0	1	1	0	2	0	0	2	0	0	0	0	1	0	0	0	3	26	6	2
41	0	0	0	0	0	0	0	0	0	0	0	0	0	4	7	3	0	2	1	0	0	0	1	6	0	0	0	1	15	3	0
43	0	0	0	1	0	0	0	1	1	0	0	0	0	2	3	6	0	0	1	0	0	0	0	1	0	0	0	0	8	1	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	0	0	0	0	0	3	1	4
47	0	0	0	0	0	0	0	1	1	0	0	0	0	1	2	2	1	0	1	0	0	0	0	2	0	0	1	0	2	2	1
49	0	0	1	0	0	0	0	0	0	0	0	1	0	1	5	3	1	0	1	0	0	0	4	1	0	0	0	0	1	4	0
51	0	0	0	0	0	1	0	1	2	0	0	0	0	0	6	3	2	0	1	0	0	0	2	0	0	0	0	0	1	3	0
53	0	0	0	0	0	0	0	0	3	0	0	0	0	0	2	3	0	0	0	0	0	0	0	0	1	0	0	0	7	3	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	0	0	0	0	0	6	4	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	0	0	0	0	0	3	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	1	0	0	0	0	1	1	1
61	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	4	0	0	0	0	0	0	0	1	0	0	0	0	1	1	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	0	0	0	0	0	1	0	1
65	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	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	0	0	0	0	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	0	0	0	0	0	0	0	1
75	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	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	0	0	2	0	0	0	0	0
79	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	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	2	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	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**	**31**	**6**	**10**	**1**	**16**	**187**	**86**	**24**

Table 5.60. Weakfish length frequencies, fall, 2 cm intervals (midpoint given), 1984-2014.

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**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
3	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
5	0	0	0	0	2	1	0	0	0	1	0	2	0	3	0	0	24	13	0	6	0	0	1	0	0	0	-	0	6	0	0
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	101	9	9	-	9	81	23	24
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	904	18	117	-	83	519	127	671
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	2,578	70	528	-	302	1,475	276	1418
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	4,876	492	938	-	455	1,246	379	2,358
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	4,570	931	692	-	620	1,606	485	3602
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	2,084	594	212	-	665	1,017	239	1,586
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	991	253	43	-	225	332	125	396
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	645	129	2	-	82	140	78	273
23	1	14	10	1	0	1	6	267	9	6	71	11	8	106	50	357	100	84	94	0	74	89	1	352	15	1	-	8	50	24	101
25	1	13	1	0	0	1	0	65	2	0	0	3	0	5	0	234	22	5	13	0	31	26	0	173	6	0	-	1	8	2	14
27	0	14	0	0	0	0	0	0	2	0	0	0	0	0	0	38	0	2	13	0	0	1	0	70	0	1	-	0	1	0	3
29	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	4	0	0	11	0	0	0	0	1	0	0	-	9	0	1	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	0	0	7	-	10	6	5	1
33	0	0	0	0	0	0	0	0	2	0	0	3	3	0	1	0	3	0	0	1	2	0	2	0	0	12	-	16	7	3	1
35	2	1	0	0	0	0	0	1	1	1	0	6	12	8	3	1	12	0	1	0	4	0	4	0	0	14	-	21	18	22	0
37	5	0	2	1	0	0	1	0	2	0	0	13	19	18	10	0	9	3	1	0	1	2	6	0	0	9	-	9	18	11	1
39	3	0	2	0	0	0	1	2	8	2	2	16	21	31	10	3	13	7	3	1	4	4	1	2	2	6	-	8	7	24	2
41	4	2	4	1	0	0	2	1	1	3	5	23	41	37	13	5	9	18	3	0	6	6	2	3	1	1	-	2	7	13	3
43	5	1	4	4	0	0	0	9	0	8	4	38	18	43	11	14	6	24	3	0	1	6	4	3	1	0	-	1	5	12	0
45	7	4	0	3	1	0	1	9	0	8	1	27	11	28	10	15	1	22	1	0	6	2	1	1	1	0	-	4	12	6	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	0	1	0	-	6	6	4	0
49	0	1	1	0	0	0	1	22	0	1	4	5	1	10	2	9	1	8	0	0	0	3	0	1	0	1	-	10	10	4	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	0	0	0	-	11	8	3	0
53	1	0	0	0	1	0	0	19	2	2	0	0	0	2	1	0	0	2	0	0	0	0	0	0	0	1	-	6	7	2	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	0	0	0	-	2	4	1	0
57	1	2	0	0	2	0	0	0	3	0	0	0	0	2	2	4	2	0	1	0	0	0	1	0	0	0	-	2	1	1	0
59	1	1	0	0	0	0	0	0	2	0	0	0	0	0	2	0	0	0	3	0	0	0	0	0	0	0	-	0	2	5	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	0	0	0	-	0	0	2	0
63	0	0	0	0	0	0	0	0	3	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	-	0	0	1	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	0	1	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	0	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	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	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	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	0	0	0	-	0	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	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	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	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	0	0	0	-	0	0	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	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	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	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	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**	**17,355**	**2,524**	**2,594**	**-**	**2,567**	**6,599**	**1,878**	**10,455**

Table 5.61. Windowpane flounder length frequencies, spring, 1 cm intervals, 1989, 1990, 1994-2014.
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**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
4	0	0	1	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	0
5	4	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	2	0	0	2
6	0	0	0	0	0	2	0	2	5	1	1	10	2	0	0	1	0	4	4	9	0	0	10
7	0	0	0	0	1	4	2	4	17	2	7	22	3	0	0	7	3	8	9	9	5	0	7
8	0	2	4	1	3	5	4	3	27	7	6	23	6	0	0	31	5	17	10	20	19	10	41
9	0	40	16	3	2	9	5	2	11	10	21	20	11	0	0	18	6	10	13	24	16	4	31
10	25	66	67	12	34	15	7	8	17	13	12	11	19	7	2	4	11	23	8	10	10	16	24
11	69	96	169	86	79	37	19	20	5	29	8	3	24	12	1	4	11	8	7	11	10	20	8
12	89	74	305	148	162	76	60	40	3	23	10	7	25	16	7	8	17	4	20	2	0	16	10
13	337	53	362	259	288	136	131	37	10	29	5	9	58	25	12	22	13	6	72	9	3	8	15
14	430	66	232	189	381	309	200	45	11	26	8	13	100	22	34	28	44	17	93	7	7	10	18
15	414	124	152	180	487	362	211	96	24	43	15	13	101	23	42	60	51	37	107	15	32	19	15
16	305	180	126	89	310	606	177	123	27	55	12	15	72	37	36	107	119	62	117	19	64	16	21
17	174	212	209	70	331	754	130	165	23	73	9	15	65	22	48	129	137	97	166	23	81	17	26
18	78	178	372	99	339	588	165	160	32	94	24	23	56	4	45	132	116	90	104	58	133	20	37
19	65	132	357	139	548	440	260	194	26	78	19	26	45	16	20	110	101	75	124	58	155	30	37
20	174	144	289	143	604	366	362	386	75	89	15	31	60	13	24	130	76	51	76	47	135	40	71
21	216	116	217	85	567	429	461	357	136	95	22	45	32	22	24	186	122	50	88	66	97	62	75
22	299	143	139	82	401	438	311	301	166	232	45	50	42	29	27	246	155	63	172	75	97	121	102
23	319	108	163	57	409	368	229	217	138	290	110	92	39	42	28	181	216	92	198	107	117	140	170
24	270	103	147	54	280	323	227	217	125	245	141	123	66	36	41	158	132	84	199	122	128	166	229
25	177	87	183	54	236	231	188	206	121	208	133	111	109	47	31	162	118	82	155	134	121	142	228
26	189	103	184	70	235	191	178	136	106	126	114	76	100	52	52	186	103	67	161	120	118	138	175
27	138	79	138	56	187	222	162	161	91	88	69	88	86	49	37	104	100	60	148	103	102	86	145
28	148	38	70	44	117	145	138	97	56	83	62	68	71	29	38	100	111	45	103	69	100	55	111
29	78	26	68	24	97	98	67	53	47	59	41	37	48	24	24	65	52	30	146	42	70	41	56
30	99	35	42	27	66	75	58	42	37	39	42	35	51	20	14	33	46	24	51	24	45	27	27
31	50	20	25	12	31	23	34	39	12	25	19	22	32	13	8	14	22	11	67	25	33	12	21
32	8	15	13	4	25	12	13	26	16	21	17	9	16	5	2	23	19	6	21	7	7	6	11
33	16	3	2	9	5	8	6	3	8	15	7	2	10	1	3	2	5	1	33	14	13	8	5
34	0	5	5	0	4	1	1	1	2	5	4	4	9	3	0	4	5	2	20	11	11	4	9
35	0	4	5	1	3	0	3	4	5	10	2	4	5	0	0	3	3	3	11	1	4	2	5
36	0	4	2	2	1	1	0	0	1	2	0	5	0	2	0	0	1	0	0	0	1	0	1
37	0	0	0	1	0	0	3	1	1	2	2	1	1	0	0	0	0	0	8	0	0	0	0
38	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
39	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
40	0	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	0
42	0	0	0	0	1	0	0	0	0	0	0	0	0	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**	**2,258**	**1,920**	**1,129**	**2,511**	**1,244**	**1,734**	**1,236**	**1,744**

Table 5.62. Windowpane flounder length frequencies, fall, 1 cm intervals, 1989, 1990, 1994-2014.
Lengths were recorded from the first three tows of each day.

	Fall																						
length	**1989**	**1990**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
6	1	0	1	0	0	0	0	0	3	1	0	0	3	0	0	0	0	1	-	0	0	0	0
7	5	0	5	0	6	0	1	0	0	0	0	2	0	0	0	0	0	4	-	1	0	0	0
8	8	3	18	5	24	15	1	0	6	9	0	5	11	14	5	4	0	15	-	4	2	2	1
9	25	2	28	6	70	17	2	2	2	2	0	21	15	49	2	6	2	15	-	2	3	1	4
10	18	11	78	10	165	50	2	4	3	9	1	20	22	67	1	14	5	17	-	9	6	7	9
11	15	9	60	22	227	75	31	11	7	14	0	13	27	111	5	18	3	24	-	19	1	7	13
12	16	12	50	15	270	107	33	6	9	9	1	6	16	155	2	26	15	29	-	31	5	6	7
13	23	6	30	10	285	173	47	3	11	9	6	0	14	145	8	44	43	19	-	19	10	10	14
14	33	14	11	13	306	154	48	5	23	6	0	4	8	109	3	36	58	27	-	36	14	10	14
15	58	23	23	9	250	110	39	6	18	3	5	8	3	62	2	37	38	25	-	43	18	11	10
16	140	38	15	16	181	60	34	3	11	3	5	9	3	33	0	30	28	31	-	41	19	13	24
17	188	44	35	26	112	78	33	11	30	7	14	4	9	12	7	21	20	35	-	72	37	13	19
18	91	53	47	48	101	119	54	11	15	12	8	11	2	8	19	19	16	47	-	70	19	19	28
19	46	46	49	47	145	179	95	44	29	6	10	7	11	20	32	26	10	45	-	52	44	31	12
20	49	28	39	48	131	213	96	67	30	13	9	6	18	30	39	39	31	24	-	41	50	29	18
21	21	11	23	24	125	165	69	38	52	18	9	11	35	50	25	36	40	28	-	35	87	23	27
22	14	14	16	19	65	123	37	18	28	22	21	2	25	48	25	42	25	26	-	51	58	28	34
23	3	10	20	6	67	63	32	12	37	30	39	6	10	14	12	32	27	20	-	47	79	30	43
24	9	4	7	9	25	49	13	11	33	19	39	11	15	13	9	19	32	23	-	40	45	15	55
25	4	3	6	3	22	28	9	6	18	19	25	14	8	10	10	6	9	9	-	16	24	29	50
26	2	0	8	3	19	29	9	4	16	9	10	18	4	3	4	8	16	6	-	18	22	17	29
27	6	2	3	1	11	17	8	3	5	11	12	17	4	5	3	4	5	4	-	7	14	16	21
28	2	1	4	1	3	12	1	1	4	5	6	9	2	3	3	3	2	7	-	9	1	13	7
29	2	2	0	1	2	17	0	1	6	3	1	4	2	3	1	3	2	1	-	2	0	2	4
30	2	1	2	1	0	5	0	0	1	2	2	2	0	1	1	0	0	0	-	3	1	2	2
31	0	0	0	0	0	0	0	0	0	1	0	3	1	2	0	0	2	1	-	0	0	1	1
32	1	0	0	1	0	0	0	0	0	0	0	2	0	1	0	0	0	1	-	0	1	0	0
33	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
Total	**782**	**337**	**578**	**344**	**2,613**	**1,858**	**694**	**267**	**397**	**242**	**223**	**215**	**268**	**968**	**218**	**473**	**429**	**484**	-	**668**	**560**	**335**	**446**

Table 5.63. Winter flounder length frequencies, April-May, 1 cm intervals, 1984-2014.
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**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
5	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	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	0	0	0	0	0	0	0	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	1	6	2	1	1	0	0	1
9	1	7	6	52	16	17	38	29	7	208	41	97	21	15	41	18	3	20	4	2	22	32	0	2	19	13	7	6	7	0	6
10	3	9	35	49	29	70	139	54	18	433	137	307	61	75	128	50	23	55	5	11	36	73	5	10	85	42	35	21	22	3	12
11	26	28	188	114	135	312	375	121	75	698	442	618	246	260	283	135	84	161	34	28	129	164	6	37	238	147	117	67	72	12	20
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	73	367	229	179	113	139	20	46
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	91	322	220	174	110	162	12	33
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	80	233	169	152	107	128	16	20
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	80	142	119	146	68	101	25	24
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	163	136	155	109	53	67	39	12
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	180	74	147	112	53	60	52	17
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	203	85	237	138	73	65	99	13
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	242	94	214	130	73	58	99	11
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	246	51	232	160	101	110	108	12
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	194	59	166	109	122	122	77	8
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	156	56	129	108	118	133	66	24
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	135	67	100	72	84	141	41	21
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	128	55	48	89	109	82	34	28
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	137	60	44	92	105	69	35	40
26	90	187	375	333	541	982	846	858	242	383	219	231	719	461	527	304	223	249	285	129	61	36	13	144	62	42	58	95	58	35	35
27	62	232	240	281	420	736	639	788	181	320	216	318	568	496	505	360	251	259	259	150	84	36	23	168	81	39	67	102	82	50	58
28	43	129	244	230	366	648	586	598	181	197	173	260	549	416	518	418	252	311	187	170	92	25	29	168	84	35	75	72	52	51	66
29	29	86	189	220	253	502	525	511	160	221	122	244	460	401	466	389	285	326	248	200	103	32	17	200	73	28	77	81	70	78	66
30	42	70	178	154	266	339	305	397	133	178	103	180	540	365	448	362	279	299	215	206	96	35	20	186	86	28	52	72	58	47	71
31	24	71	124	151	120	247	307	241	96	200	117	130	367	313	323	321	300	286	201	166	112	33	27	136	93	32	55	58	56	59	81
32	20	85	77	113	169	163	171	157	98	142	91	76	375	260	277	249	227	228	171	167	95	38	28	133	87	42	45	65	47	61	60
33	7	69	86	61	111	73	218	108	60	139	72	63	267	193	195	228	262	172	155	138	122	45	20	87	90	36	34	79	63	75	69
34	7	45	56	85	69	47	113	107	38	159	65	42	190	166	140	191	220	189	109	116	94	48	20	74	99	43	37	51	51	80	59
35	12	19	42	47	54	68	70	65	35	112	52	30	119	136	136	159	195	189	107	115	88	31	20	50	80	45	28	50	42	76	48
36	4	11	39	53	33	65	44	30	26	79	49	33	84	89	79	103	150	143	94	73	91	34	18	53	61	44	28	26	37	66	42
37	4	8	15	20	25	20	24	25	26	36	25	12	50	68	32	90	120	133	60	53	93	27	15	24	36	20	25	27	27	61	41
38	0	15	17	19	15	18	48	7	4	10	21	16	28	37	37	35	80	77	59	79	46	25	4	17	18	17	16	23	18	43	32
39	0	4	18	11	22	3	18	13	0	17	15	14	12	18	13	18	54	70	24	44	56	25	6	9	6	9	14	16	18	27	28
40	0	0	18	8	9	8	12	9	3	3	16	7	13	10	5	20	16	35	32	38	34	11	3	2	7	5	19	16	7	29	22
41	0	0	1	2	6	7	3	1	0	5	6	3	1	6	3	14	20	26	11	17	18	7	5	9	5	4	9	7	2	21	15
42	0	1	3	0	8	3	8	5	0	2	6	3	6	2	2	4	7	10	9	7	9	9	1	9	2	2	4	6	2	6	4
43	0	0	2	3	3	0	1	1	0	2	1	0	2	1	0	3	11	3	4	13	1	3	0	3	3	2	1	2	3	7	2
44	0	1	4	0	2	1	1	1	1	0	0	1	3	0	1	3	4	1	1	3	7	2	0	1	1	0	0	1	1	6	4
45	0	1	0	1	1	0	8	1	0	0	0	0	0	0	0	1	2	0	3	4	2	2	1	2	2	0	2	2	1	1	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	2	1	0	0	0	1	0	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	0	0	0	0	0	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	1	1	0	0	0	0	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	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	0	0	0	0	0	0	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	0	0	0	0	0	0	0	0
52	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
53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
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**	**3,636**	**3,127**	**2,887**	**2,576**	**2,235**	**2,234**	**1,617**	**1,152**

Table 5.64. Winter flounder length frequencies, fall, 1 cm intervals, 1984-2014.
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**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
5	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	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	0	0	0	-	0	0	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	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	0	0	0	-	0	0	0	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	0	0	3	-	0	0	0	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	0	0	0	-	1	0	0	0
11	1	3	2	2	8	6	4	9	6	42	10	16	16	6	3	0	0	6	0	0	9	0	0	0	1	1	-	0	2	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	3	2	11	-	2	4	0	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	9	10	21	-	5	14	0	3
14	25	57	82	54	243	343	130	139	85	409	230	87	218	113	137	128	53	123	24	5	65	77	8	10	23	36	-	7	38	1	3
15	31	63	116	67	295	367	260	144	149	435	219	96	255	165	190	194	111	122	37	10	61	98	17	9	45	51	-	19	59	3	7
16	60	55	104	72	302	293	345	91	182	377	187	77	225	176	192	243	156	116	40	9	48	99	23	9	60	48	-	28	62	3	12
17	65	49	118	53	207	315	327	110	140	247	146	61	173	175	160	268	170	80	43	11	37	66	11	6	43	50	-	22	61	5	9
18	89	53	86	72	167	213	319	99	111	151	142	64	132	116	87	225	169	66	33	10	19	52	5	10	49	35	-	25	50	6	12
19	111	41	50	79	212	199	326	108	99	85	141	41	119	126	60	158	148	32	31	8	21	33	5	7	25	31	-	18	26	4	10
20	97	36	45	83	184	146	310	95	97	68	124	32	136	78	46	108	107	28	35	9	7	24	7	16	17	14	-	11	25	3	8
21	100	37	27	53	184	121	245	96	84	51	111	23	96	65	25	86	89	25	23	10	8	14	4	19	6	10	-	11	16	0	8
22	67	33	22	54	138	105	176	79	68	39	56	19	97	38	28	52	62	20	38	10	4	9	7	15	6	4	-	5	15	3	3
23	63	22	17	44	104	107	146	73	42	39	38	13	65	55	24	29	41	16	28	17	2	6	3	17	4	5	-	7	22	2	2
24	38	17	13	25	77	68	91	40	37	38	24	10	58	32	15	27	47	33	31	15	1	1	3	18	4	2	-	4	20	4	4
25	34	14	9	21	40	85	53	48	28	29	26	5	47	23	14	29	35	24	28	10	0	7	2	9	9	6	-	4	30	2	5
26	36	10	7	14	32	39	49	20	17	30	28	2	25	26	11	19	30	31	27	18	5	6	2	12	10	0	-	2	20	5	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	8	9	3	-	7	20	3	9
28	34	6	2	11	12	33	16	17	13	10	8	3	14	14	8	13	25	20	9	11	4	5	0	4	6	0	-	6	16	2	3
29	13	3	1	5	9	30	12	7	7	12	10	1	17	7	7	17	15	22	10	10	6	1	0	4	7	3	-	5	7	3	4
30	14	6	2	3	13	10	14	5	7	7	7	0	10	7	3	8	13	17	8	10	2	1	1	9	13	1	-	3	5	4	5
31	8	1	2	2	4	12	1	8	3	8	8	2	13	5	11	7	8	4	4	16	2	1	0	7	8	1	-	2	7	1	2
32	6	0	1	2	6	4	3	2	1	4	3	1	4	2	4	5	6	4	6	11	3	1	0	6	3	4	-	2	7	3	1
33	5	1	2	0	1	1	4	6	0	3	2	1	3	4	5	9	9	6	10	12	2	1	1	0	4	1	-	2	4	1	2
34	1	2	0	0	0	1	0	1	1	2	2	0	3	3	5	1	10	2	7	10	3	0	0	0	5	2	-	3	4	1	1
35	4	0	0	4	0	3	1	0	0	0	1	1	1	1	3	4	6	3	4	4	3	1	0	2	3	0	-	1	5	1	2
36	1	0	1	0	0	0	1	0	0	0	1	0	2	0	0	2	4	3	4	4	2	1	0	2	3	2	-	4	0	1	2
37	0	0	0	0	0	0	0	0	0	0	3	0	0	1	0	0	1	1	3	1	2	2	0	1	3	2	-	2	2	0	2
38	1	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	2	1	5	4	2	2	0	0	4	2	-	1	4	0	1
39	2	0	0	0	0	0	0	0	0	3	0	0	0	1	0	1	1	3	5	0	2	2	0	0	2	0	-	0	1	0	1
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	3	2	2	0	1	3	2	-	0	0	0	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	0	0	0	-	1	1	0	2
42	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0	0	0	-	0	0	0	1
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	-	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	0	0	0	-	0	0	0	1
45	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	0	-	0	0	0	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	0	0	0	-	1	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**	**213**	**387**	**351**	**-**	**211**	**547**	**61**	**128**

Table 5.65. Winter skate length frequencies, spring and fall, 2 cm intervals (midpoint given), 1995-2014.
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	2007	2008	2009	2010	2011	2012	2013	2014
27	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
29	0	0	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	0	0
33	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	1
37	0	0	0	0	0	0	1	0	0	3	0	0	1	1	1	1	1	7	7	2
39	0	0	0	0	0	0	0	1	2	2	0	0	1	0	1	0	1	5	3	3
41	0	0	0	0	0	0	0	1	1	2	0	0	1	1	1	2	0	4	3	5
43	0	0	0	0	0	3	0	1	2	4	1	0	0	1	2	1	0	0	9	3
45	0	0	0	0	1	3	0	0	0	6	0	0	2	1	1	2	0	7	5	4
47	0	0	0	0	0	2	0	0	0	4	3	0	3	0	0	0	1	1	3	5
49	0	0	0	0	0	2	0	0	1	2	1	1	1	2	2	0	0	3	2	7
51	0	1	0	1	0	0	0	1	1	0	1	0	0	0	1	0	0	3	3	2
53	0	0	0	0	1	3	1	0	1	0	0	1	1	0	1	0	0	1	3	6
55	0	0	2	3	1	1	0	0	1	1	1	4	3	0	1	0	0	2	5	5
57	1	2	4	3	2	0	0	0	6	0	0	1	2	1	3	0	2	2	4	2
59	5	4	1	5	3	2	0	1	1	2	0	1	0	0	2	1	0	2	2	3
61	1	5	2	1	0	0	3	1	1	1	3	1	1	3	2	0	1	2	4	1
63	2	2	2	4	1	0	0	1	2	3	2	2	0	1	1	0	2	1	3	1
65	4	2	4	7	0	0	0	0	0	0	1	1	1	2	0	0	2	3	2	0
67	1	1	2	2	1	1	0	1	1	1	3	3	0	1	1	1	2	3	2	2
69	2	0	1	4	2	0	0	1	4	1	0	1	2	3	2	0	3	1	2	4
71	1	3	2	3	1	2	2	1	2	2	0	1	2	3	0	0	0	4	1	1
73	0	3	0	0	0	1	2	4	0	2	1	4	3	1	1	1	3	5	2	3
75	4	4	1	5	3	1	2	1	3	1	0	1	4	3	3	4	3	5	0	0
77	0	2	3	6	7	2	1	1	1	1	0	0	2	4	0	1	2	0	1	3
79	1	2	1	4	1	1	2	3	1	1	1	0	4	3	2	1	4	2	0	0
81	0	4	0	3	2	1	1	2	3	3	0	1	1	1	1	0	2	3	0	1
83	0	3	0	2	0	0	1	0	1	1	0	0	1	0	3	1	1	4	0	2
85	0	2	1	1	0	3	1	2	1	0	0	0	0	0	0	0	0	3	1	0
87	0	0	0	0	0	0	1	1	1	0	0	0	0	1	0	0	0	1	0	1
89	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
91	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
93	0	0	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Total	**22**	**40**	**27**	**55**	**26**	**29**	**18**	**26**	**37**	**45**	**18**	**23**	**37**	**35**	**32**	**16**	**30**	**77**	**72**	**67**

Fall

length	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	-	0	0	0	0
39	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	-	0	2	0	0
41	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	-	0	1	0	0
43	0	0	2	0	0	0	0	2	0	0	0	0	0	1	0	-	2	1	1	0
45	2	0	1	0	0	0	0	1	0	0	0	0	0	0	0	-	0	4	3	2
47	0	0	0	0	1	0	0	0	0	1	1	0	0	1	0	-	0	1	0	1
49	1	5	1	0	0	0	0	0	0	0	1	0	0	0	0	-	0	1	4	1
51	0	0	1	0	2	0	2	0	0	0	0	0	0	1	0	-	0	2	1	0
53	2	0	2	1	0	0	1	1	0	0	1	0	0	0	0	-	0	2	0	1
55	1	2	1	0	1	0	4	0	0	0	0	0	0	1	0	-	0	0	1	2
57	2	6	2	0	0	0	0	3	0	0	2	0	0	1	1	-	3	0	0	0
59	2	2	2	1	0	0	1	1	0	0	0	0	0	0	1	-	0	1	0	0
61	0	5	0	0	0	0	3	0	0	0	0	0	1	0	0	-	0	0	1	1
63	1	4	1	0	0	0	1	0	0	0	2	0	0	0	0	-	0	0	1	1
65	2	3	0	1	1	0	0	1	0	3	0	0	0	1	1	-	1	0	0	0
67	1	2	2	1	0	0	2	0	0	0	3	0	1	1	1	-	0	0	1	2
69	0	2	1	1	0	0	0	1	0	0	0	0	1	1	1	-	0	1	3	0
71	0	0	0	0	0	0	0	1	0	2	0	0	2	1	1	-	0	0	1	2
73	0	2	1	1	1	0	0	2	0	1	1	0	0	0	0	-	1	1	0	1
75	1	3	1	0	1	0	1	1	0	1	1	0	1	1	1	-	0	1	0	0
77	0	1	0	0	0	0	1	2	0	1	0	0	0	2	0	-	0	0	0	0
79	0	0	0	0	0	0	1	1	0	0	0	0	0	1	1	-	0	0	0	0
81	0	0	0	1	0	0	1	1	0	0	1	0	1	1	1	-	0	1	0	0
83	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	-	0	1	0	0
85	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	-	0	0	0	0
87	0	0	0	0	0	0	2	0	0	0	0	0	0	1	0	-	0	0	0	0
Total	**15**	**37**	**19**	**7**	**7**	**1**	**20**	**19**	**0**	**9**	**13**	**0**	**7**	**16**	**11**	-	**7**	**20**	**17**	**14**

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FIGURES 5.1 - 5.19
LISTS

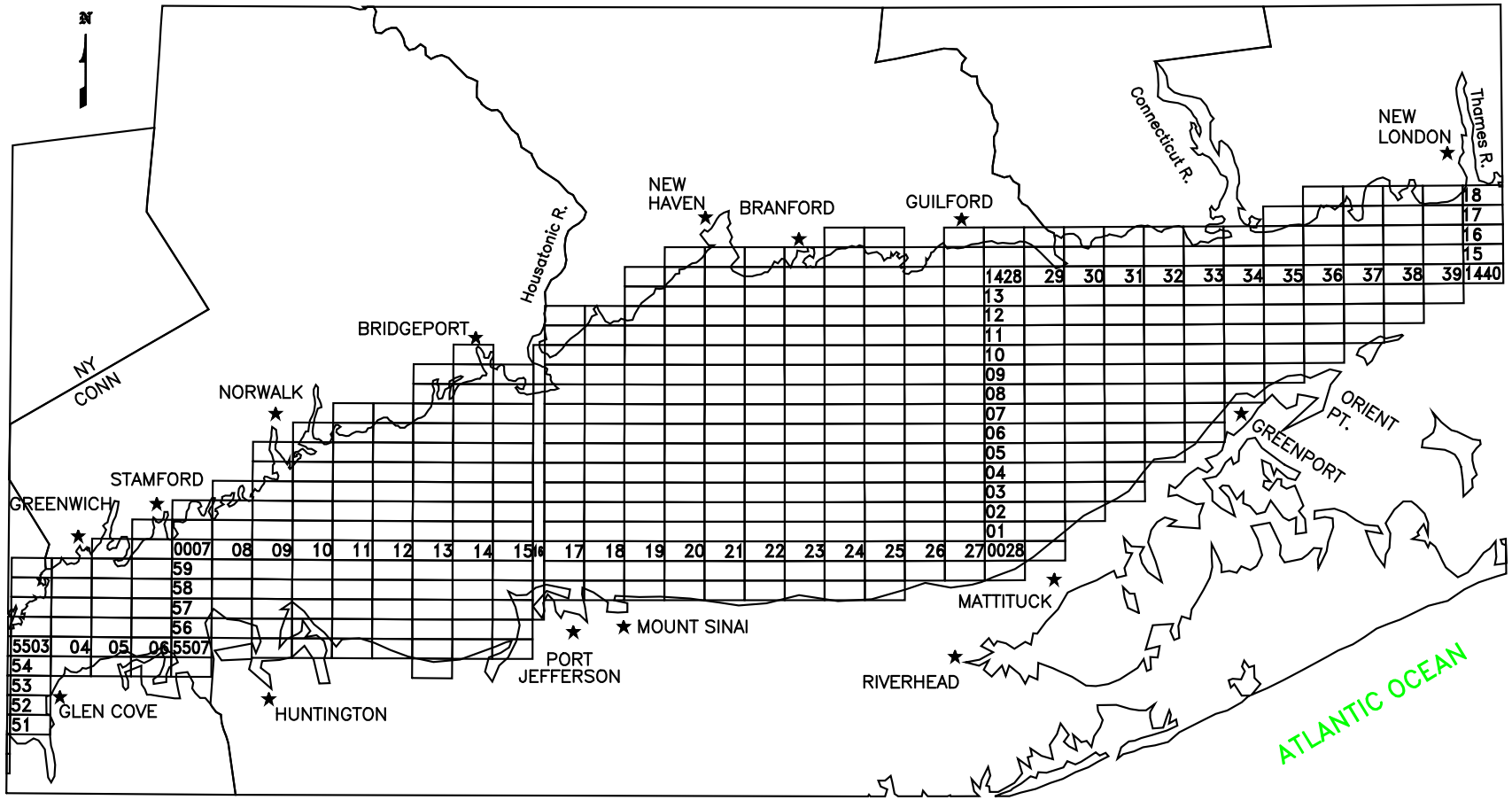
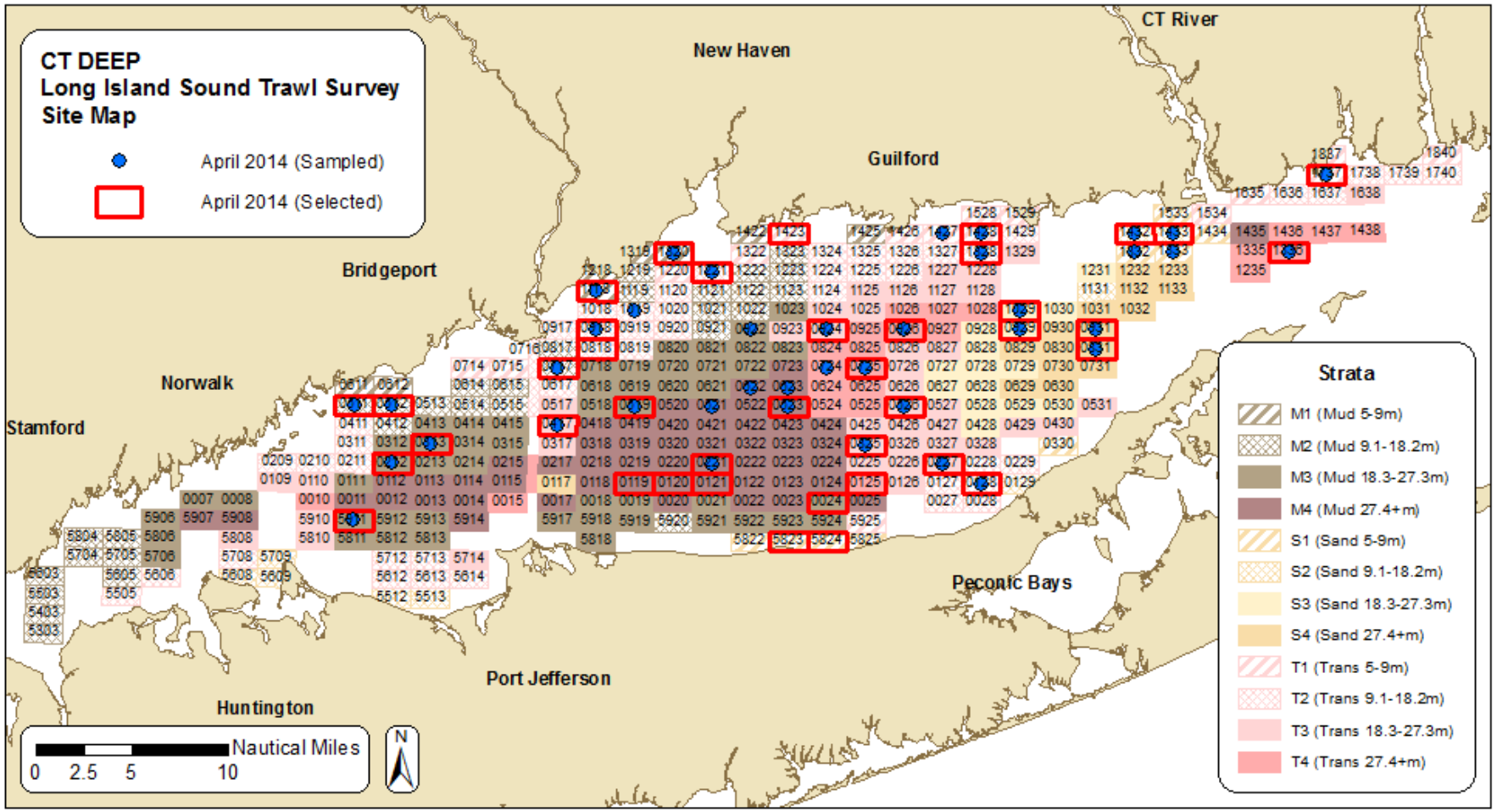


Figure 5.1. Trawl Survey site grid. *Each sampling site is 1x2 nmi (nautical miles). A four-digit number identifies the site: the first two digits are the row numbers (corresponding to minutes of latitude) and the last two digits are the column numbers (corresponding to two nautical miles in length on 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.)*

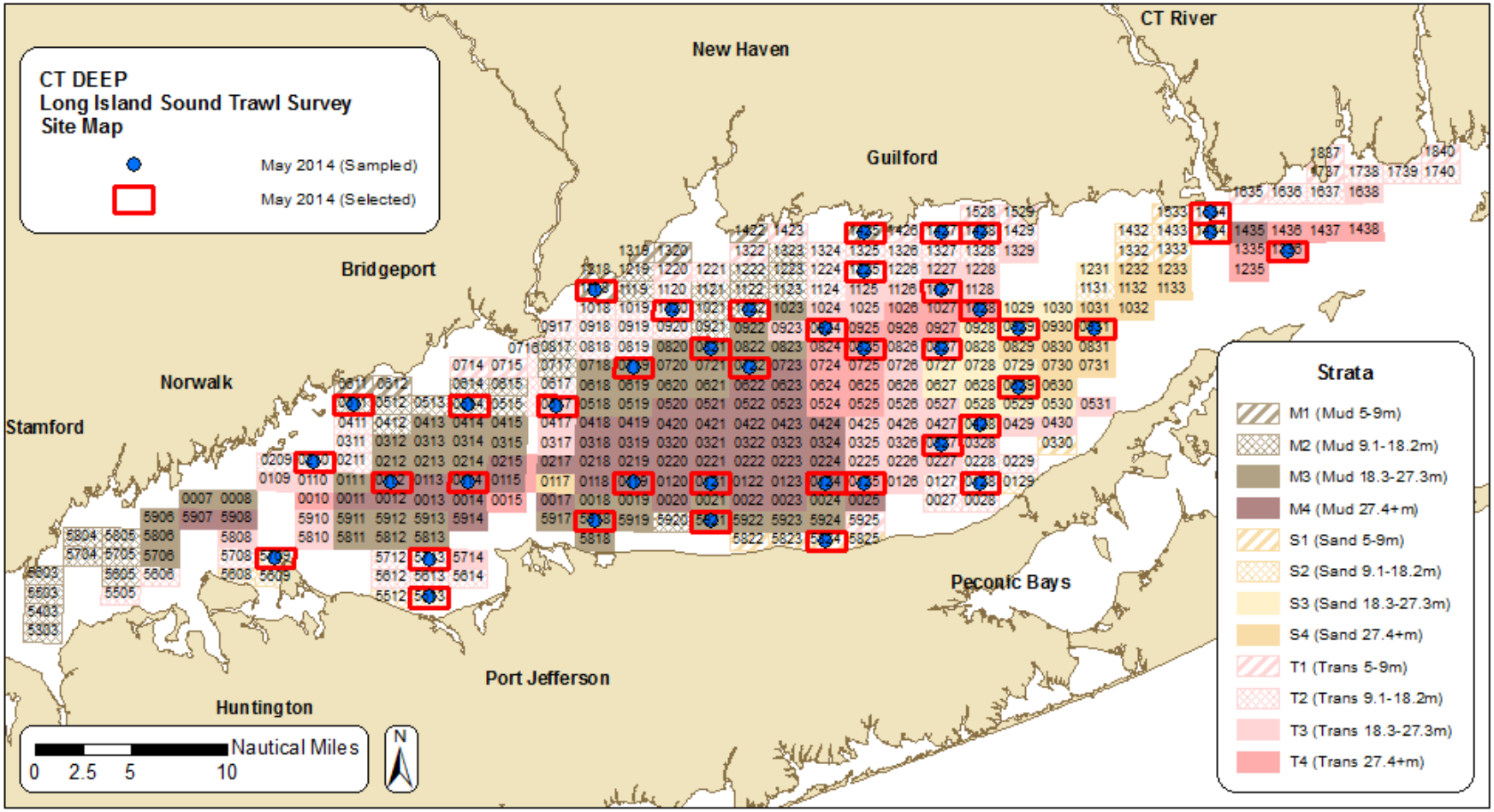
Figure 5.2. April 2014 sites selected and sampled. *The red outlined rectangles are the sites selected for the cruise and the blue dots are the sites sampled. Samples collected from a different site than published in the "**Notice to Fishermen**" are noted in table below map.*



Persistent unfavorable weather conditions forced nine sites to be moved this month:

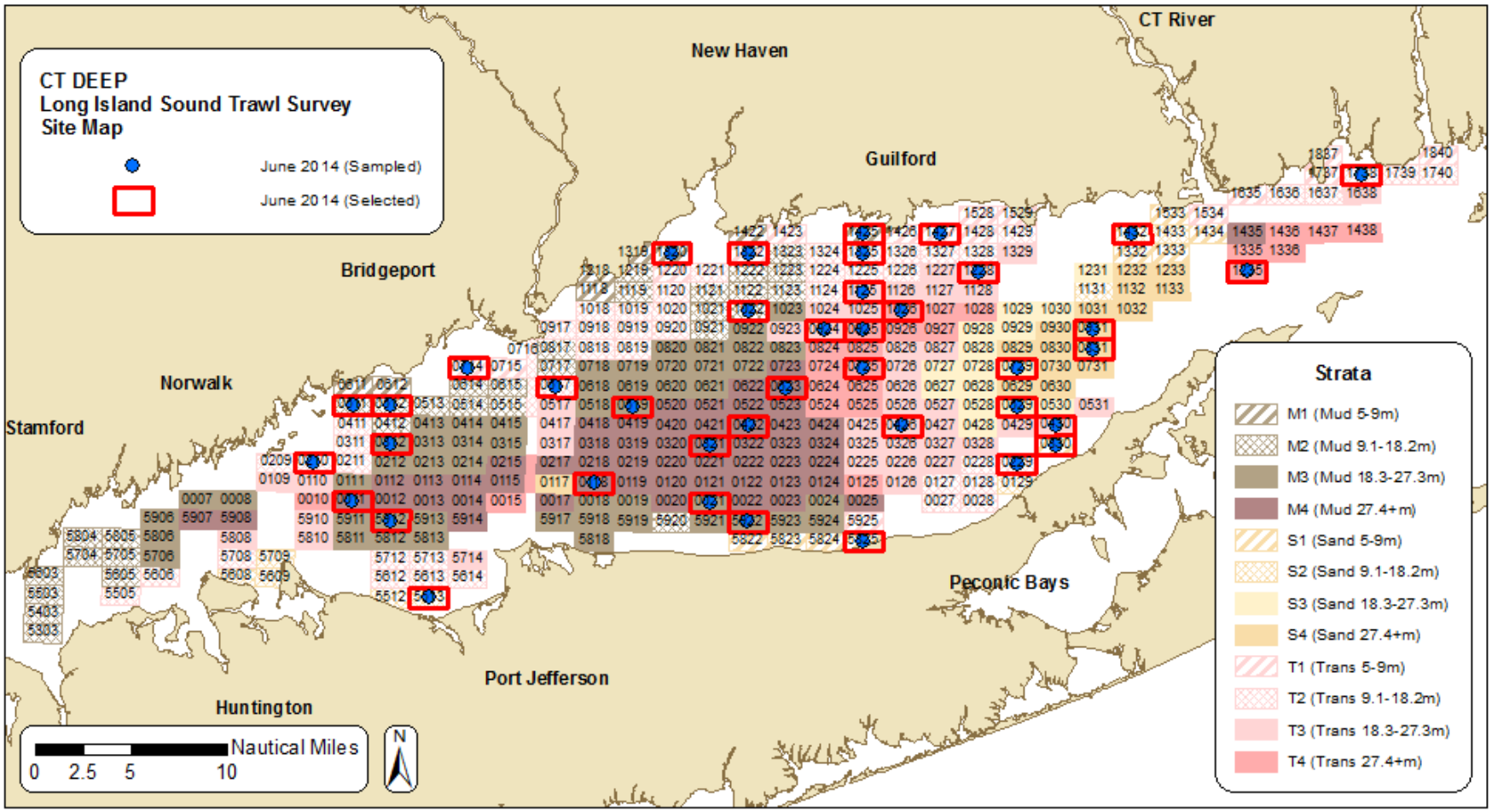
Sample	Site Sampled	Sampled Strata	Site Selected	Selected Strata	Sample	Site Sampled	Sampled Strata	Site Selected	Selected Strata
SP2014030	1019	T2	0818	T2	SP2014037	0724	T4	0125	T4
SP2014033	0922	M3	0024	M3	SP2014038	1427	T1	1423	T1
SP2014034	0521	M4	0119	M4	SP2014039	1332	S1	5823	S1
SP2014035	0622	M4	0120	M4	SP2014040	1333	S1	5824	S1
SP2014036	0623	M4	0121	M4					

Figure 5.3. May 2014 sites selected and sampled. *The red outlined rectangles are the sites selected for the cruise and the blue dots are the sites sampled. Samples collected from a different site than published in the "**Notice to Fishermen**" are noted in table below map.*



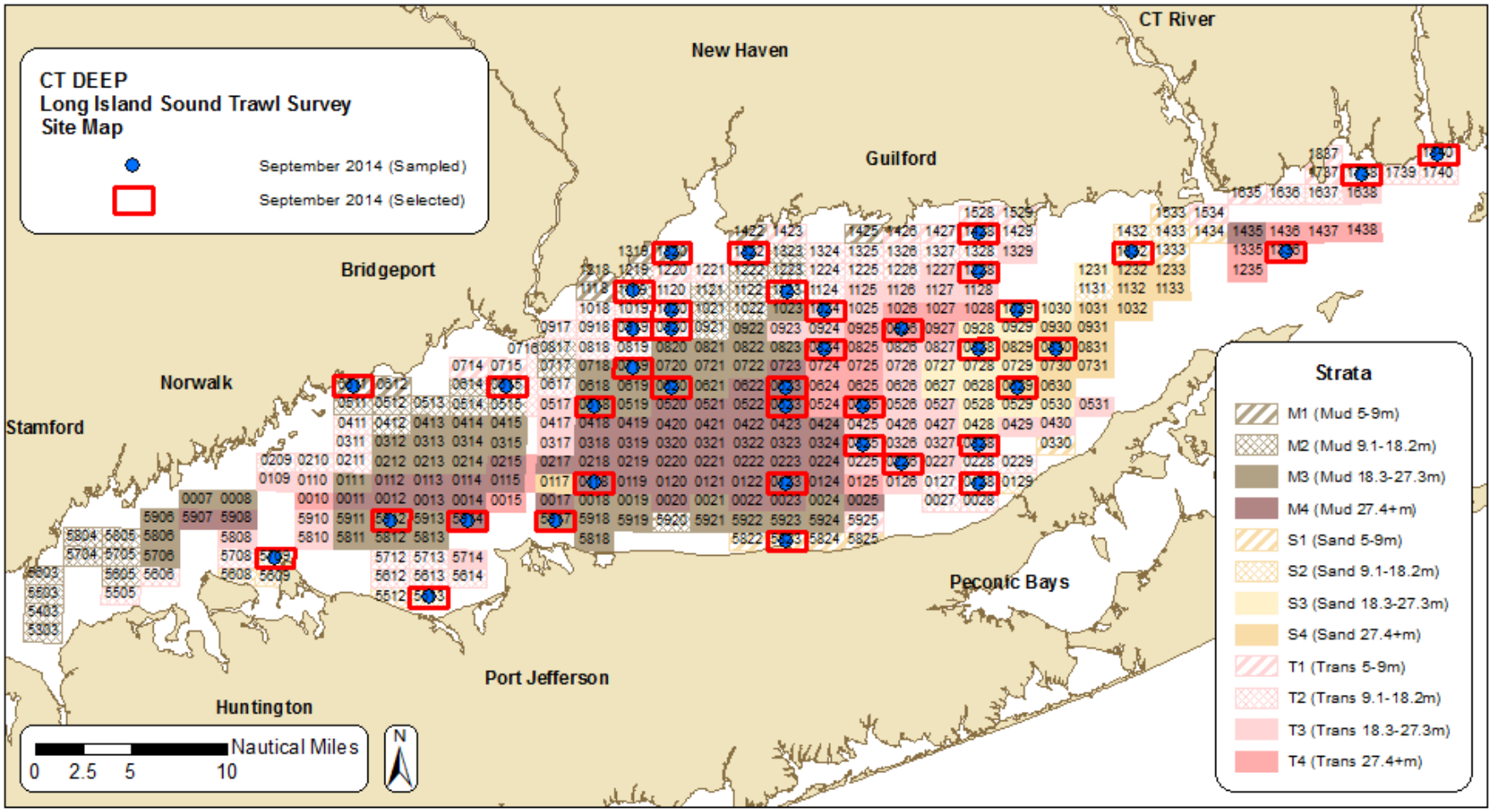
Sample	Site Sampled	Sampled Strata	Site Selected	Selected Strata	Reason Moved
No sites were moved during this cruise.					

Figure 5.4. June 2014 sites selected and sampled. *The red outlined rectangles are the sites selected for the cruise and the blue dots are the sites sampled. Samples collected from a different site than published in the "**Notice to Fishermen**" are noted in table below map.*



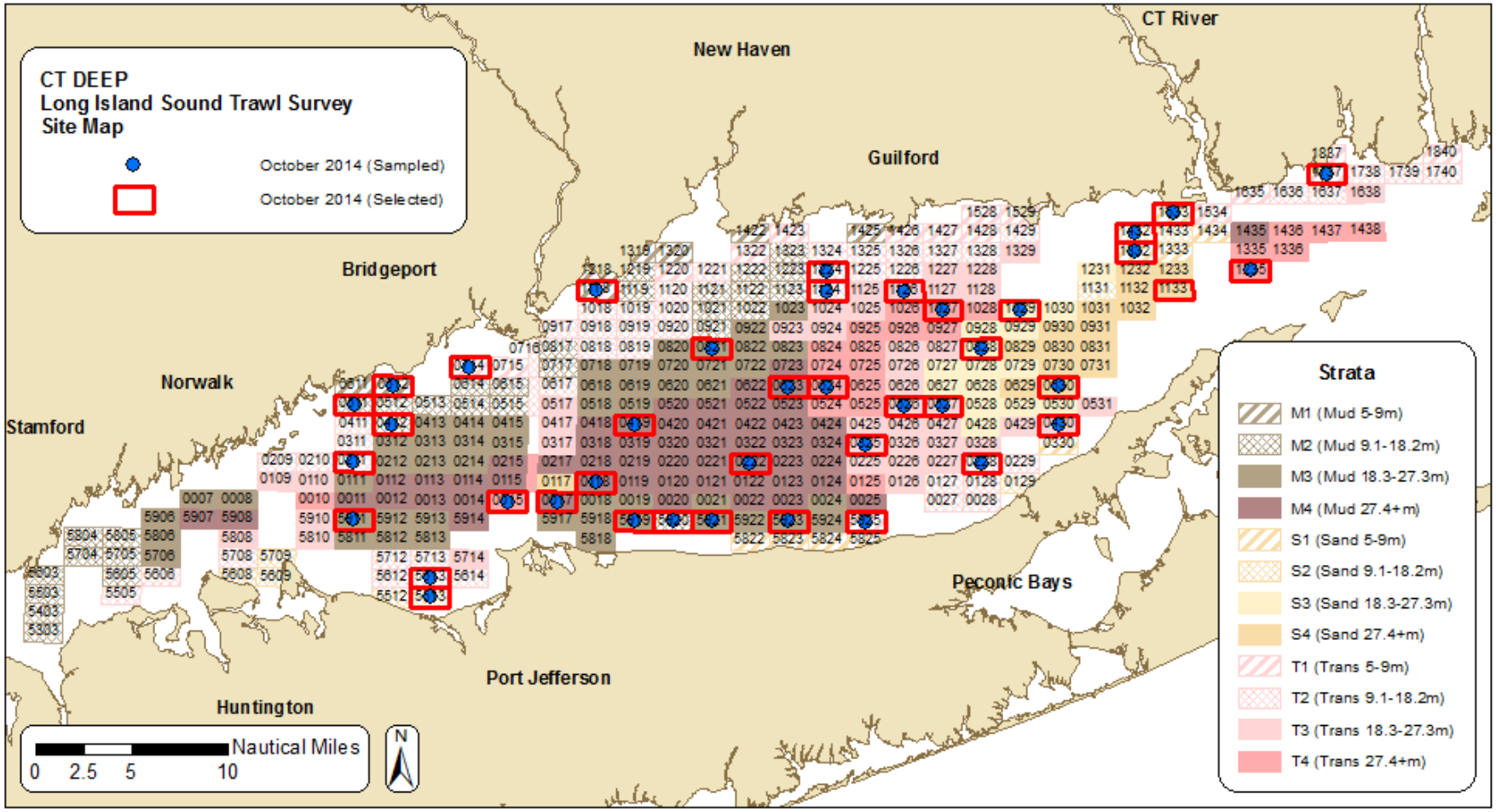
Sample	Site Sampled	Sampled Strata	Site Selected	Selected Strata	Reason Moved
SP2013083	1133	S4	0830	S4	sampled different site (same strata) for EPA

Figure 5.5. September 2014 sites selected and sampled. *The red outlined rectangles are the sites selected for the cruise and the blue dots are the sites sampled. Samples collected from a different site than published in the "**Notice to Fishermen**" are noted in table below map.*



Sample	Site Sampled	Sampled Strata	Site Selected	Selected Strata	Reason Moved
No sites were moved during this cruise.					

Figure 5.6. October 2014 sites selected and sampled. *The red outlined rectangles are the sites selected for the cruise and the blue dots are the sites sampled. Samples collected from a different site than published in the "**Notice to Fishermen**" are noted in table below map.*



Sample	Site Sampled	Sampled Strata	Site Selected	Selected Strata	Reason Moved
One site was not sampled during this cruise.					

Figure 5.7. Number of finfish species observed annually, 1984-2014. *Note: there was no October sampling in 2006 and there was no June, September or October sampling in 2010. Average number of finfish species caught per year is 57.6 for the time-series. See Table 5.4 for details on number of tows completed each year.*

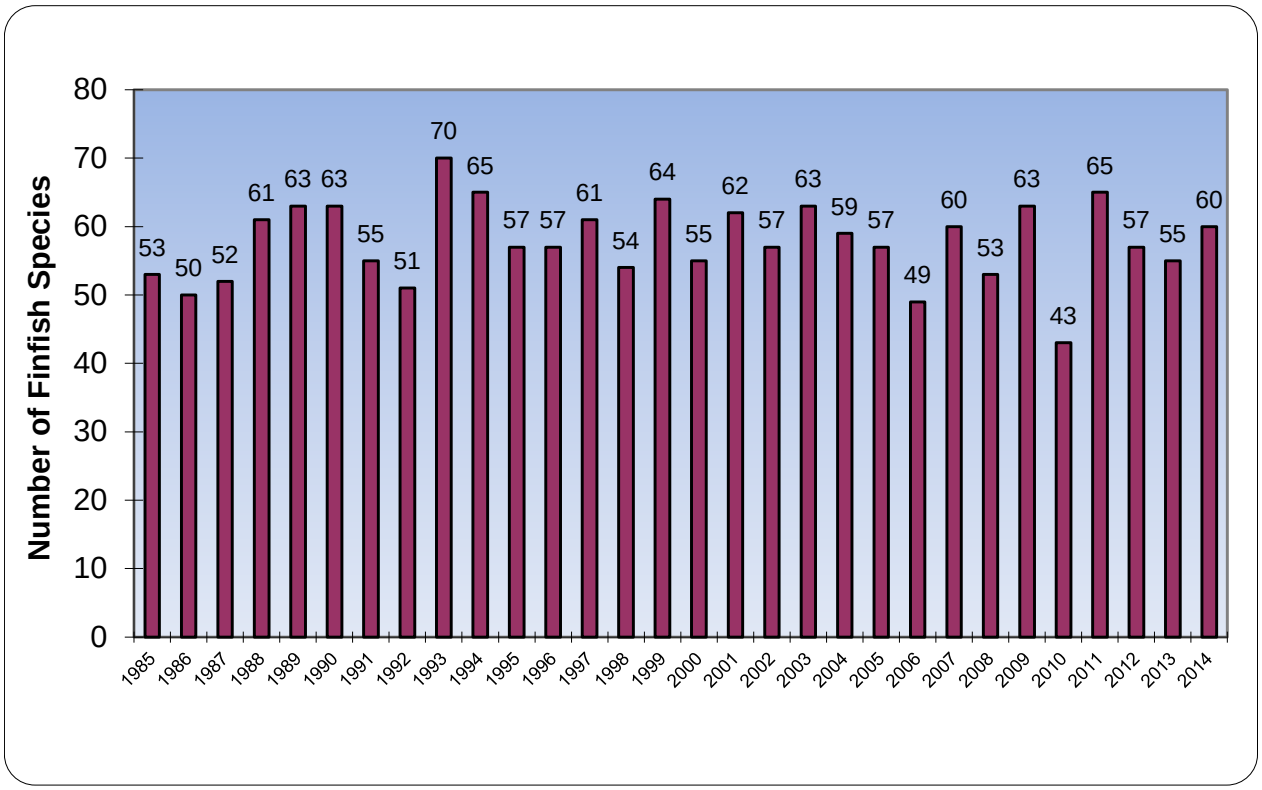
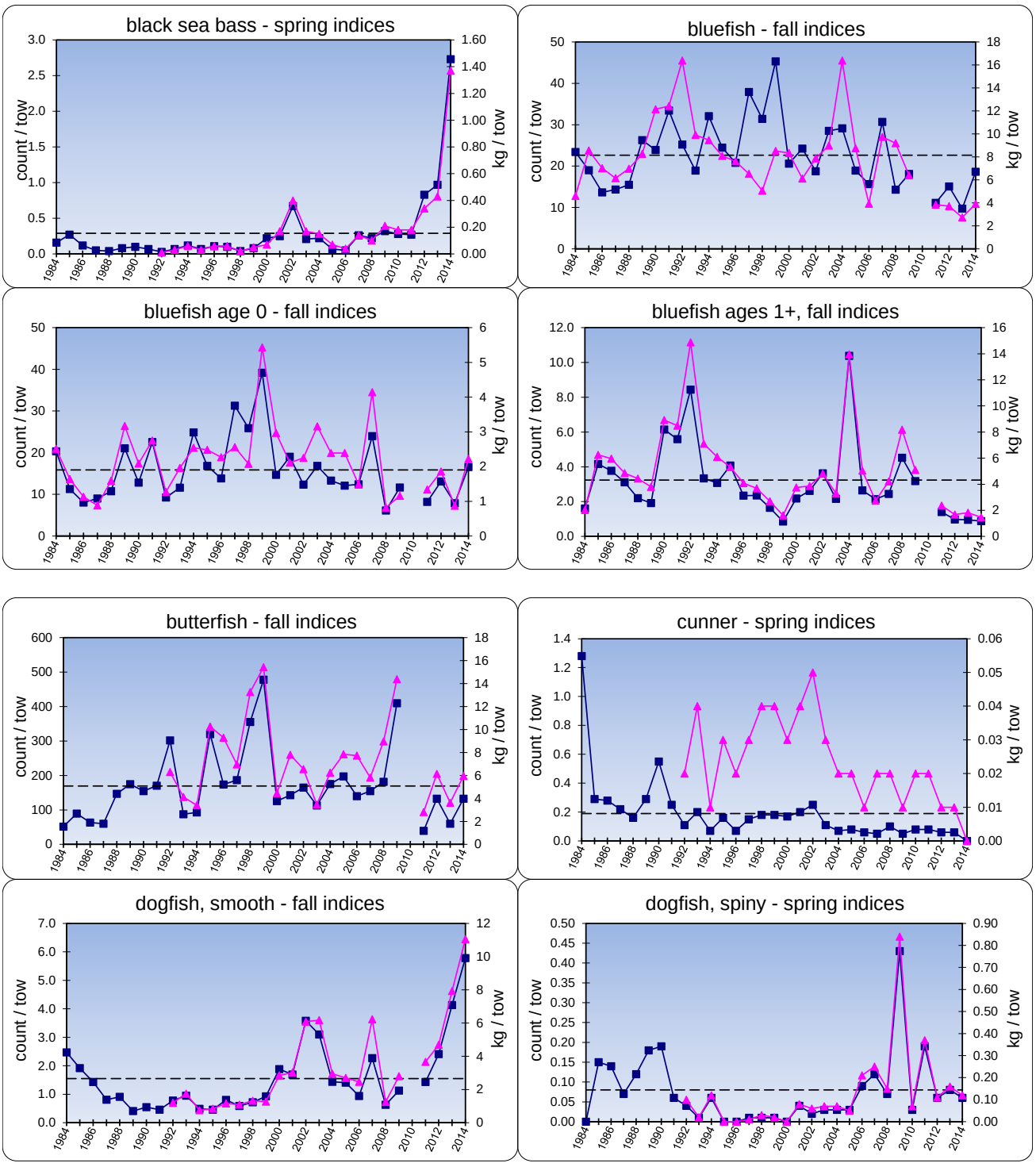


Figure 5.8. Plots of abundance indices for: black sea bass, bluefish (total, age 0, and ages 1+), butterfish, cunner, and dogfish (smooth and spiny).



Legend:

■ = count / tow

▲ = kg / tow

---- = mean count / tow

Figure 5.9. Plots of abundance indices for: flounders (fourspot, summer, windowpane, winter, and winter ages 4+) and hakes (red, silver, and spotted).

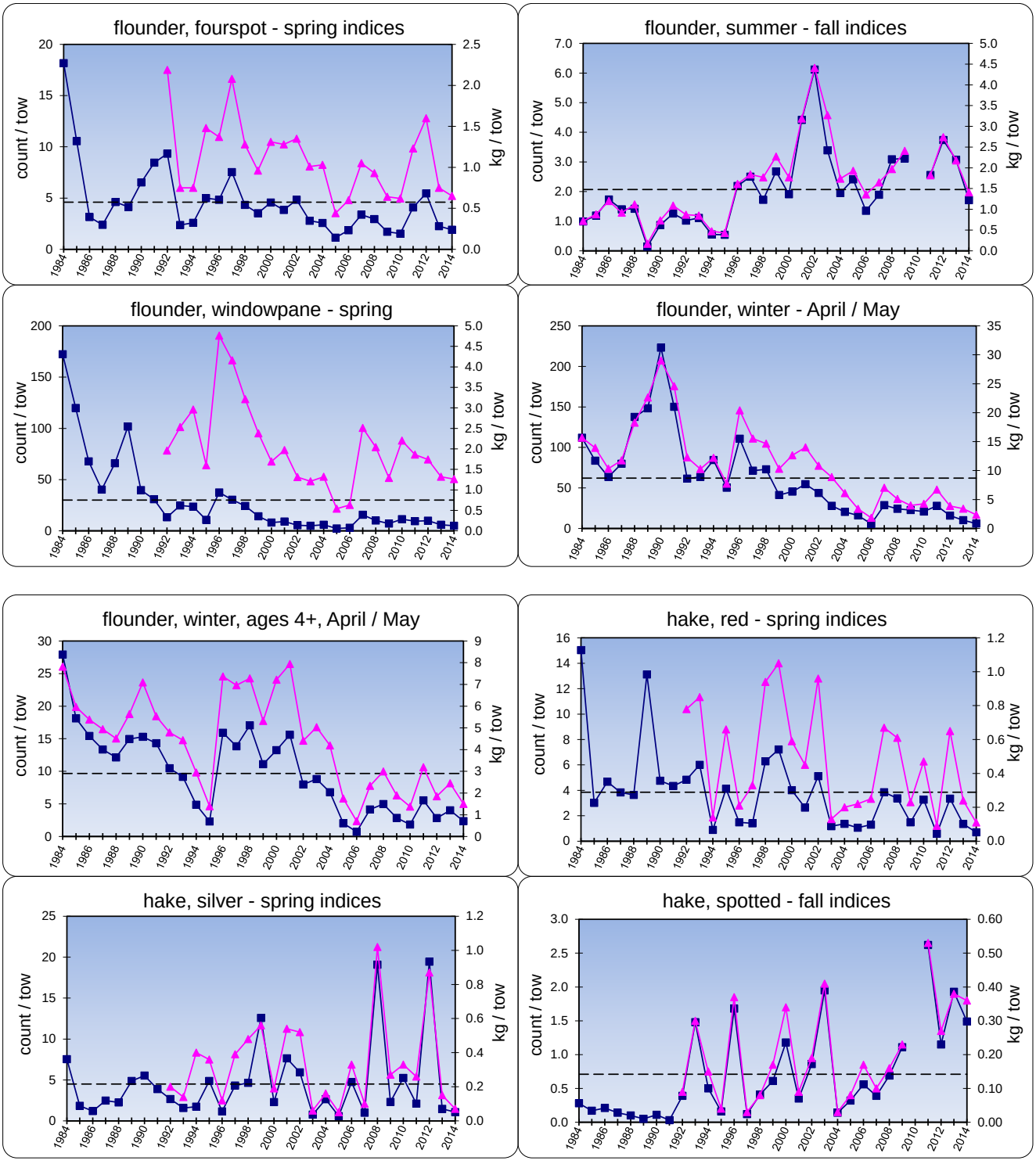
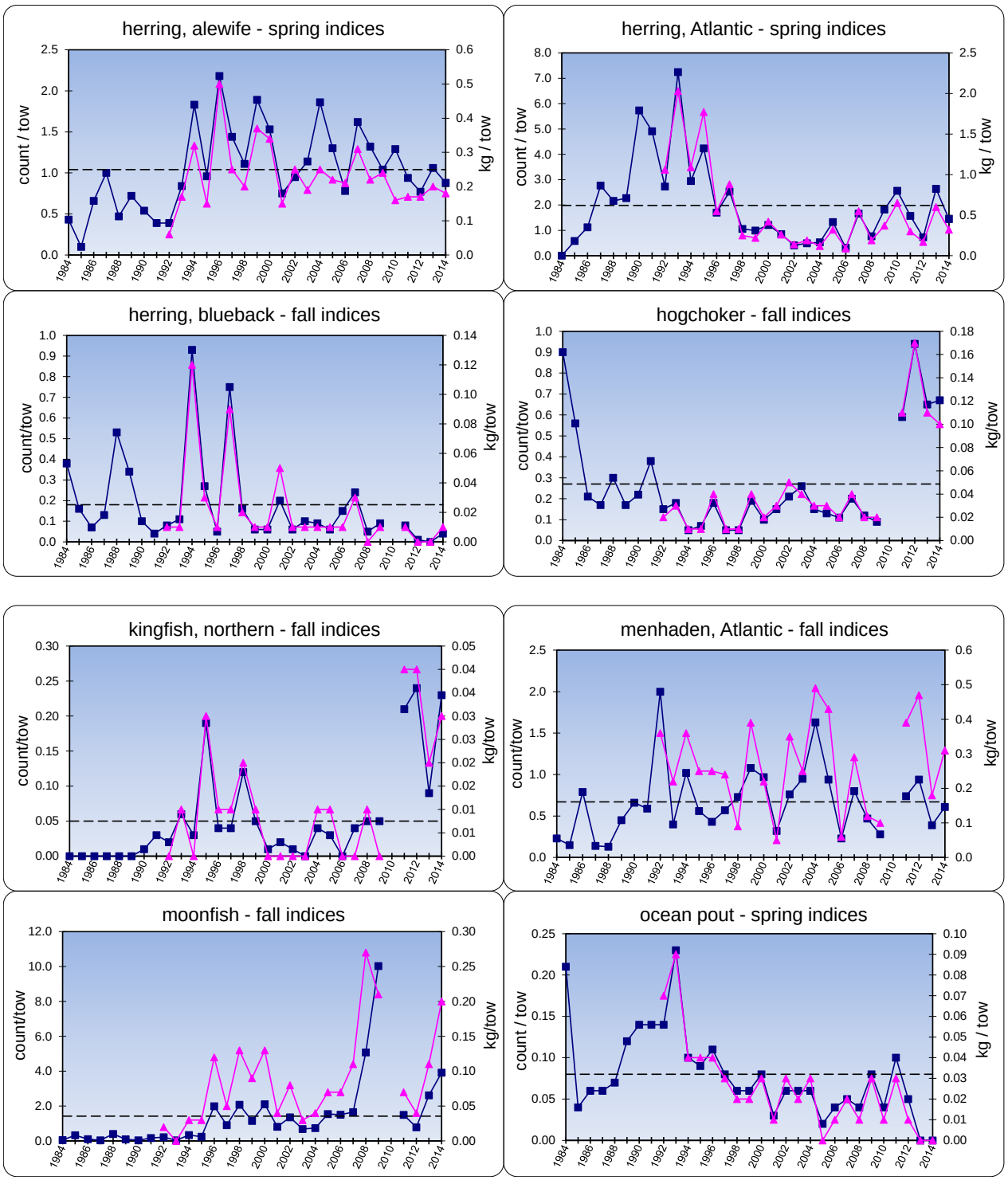


Figure 5.10. Plots of abundance indices for: herrings (alewife, Atlantic, and blueback), hogchoker, Northern kingfish, Atlantic menhaden, moonfish, and ocean pout.



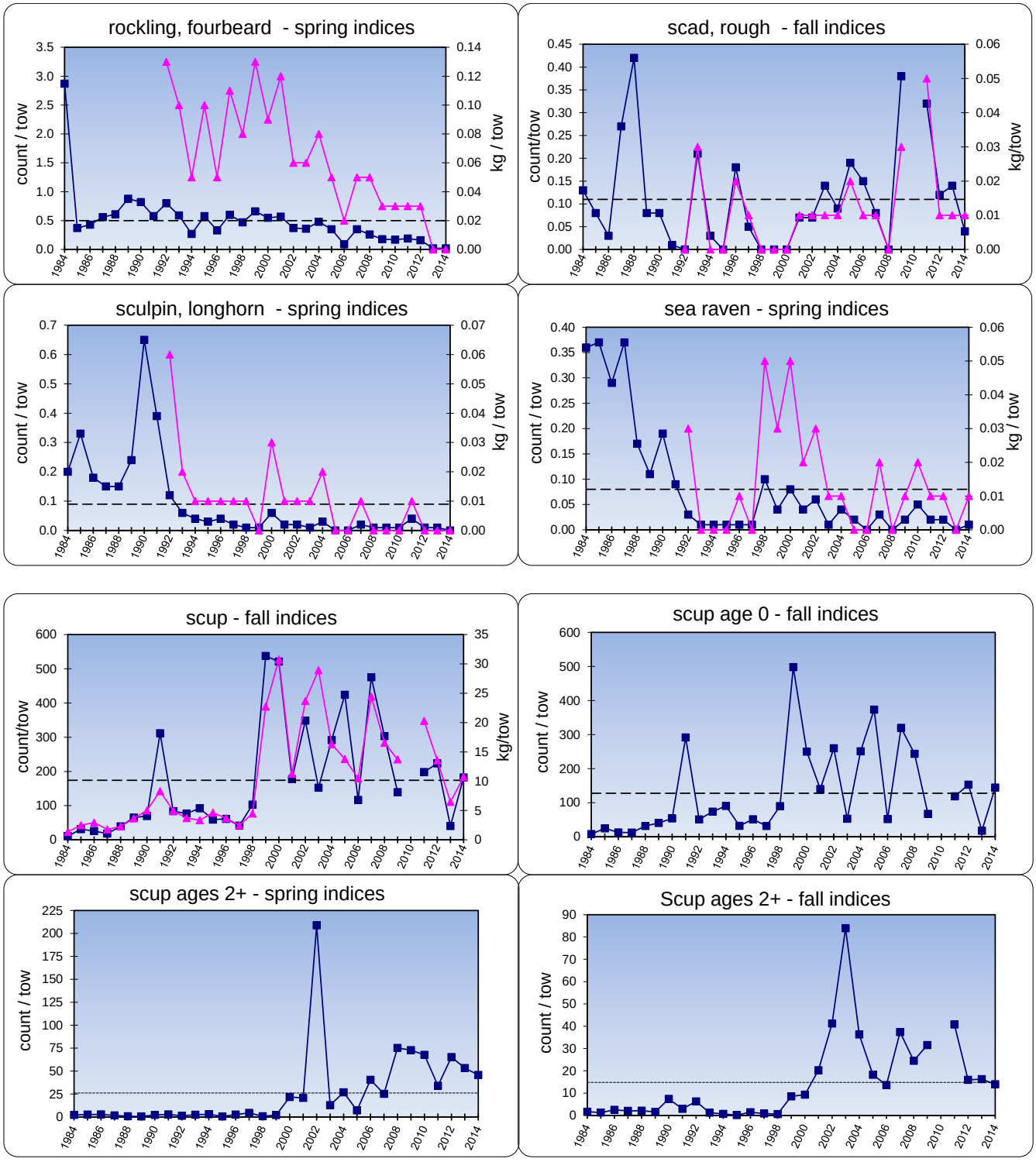
Legend:

■ = count / tow

▲ = kg / tow

---- = mean count / tow

Figure 5.11. Plots of abundance indices for: fourbeard rockling, rough scad, longhorn sculpin, sea raven, and scup (all ages, age 0, and ages 2+).



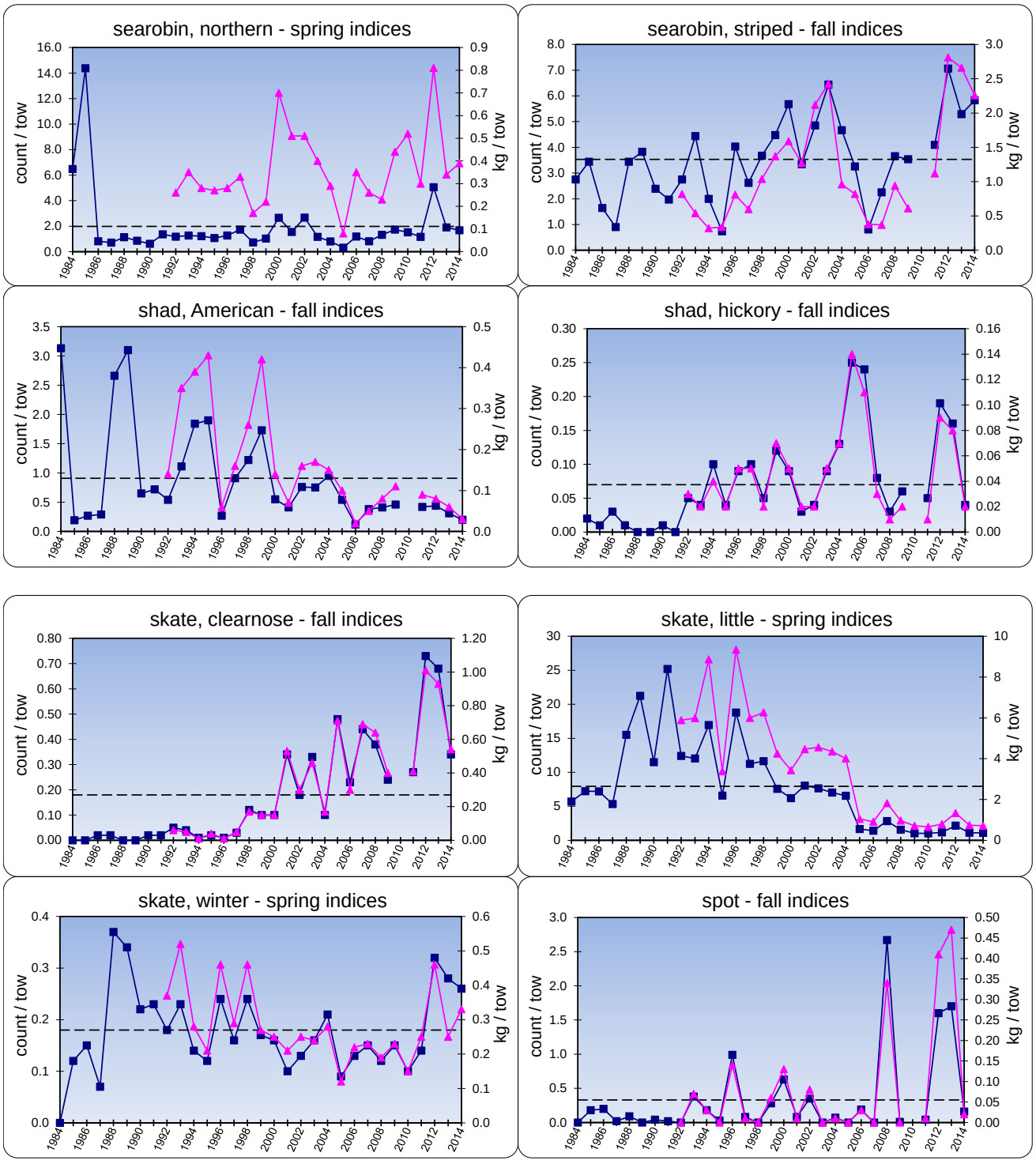
Legend:

■ = count / tow

▲ = kg / tow

---- = mean count / tow

Figure 5.12. Plots of abundance indices for: searobins (striped and northern), shad (American and hickory), skates (clearnose, little, and winter), and spot.



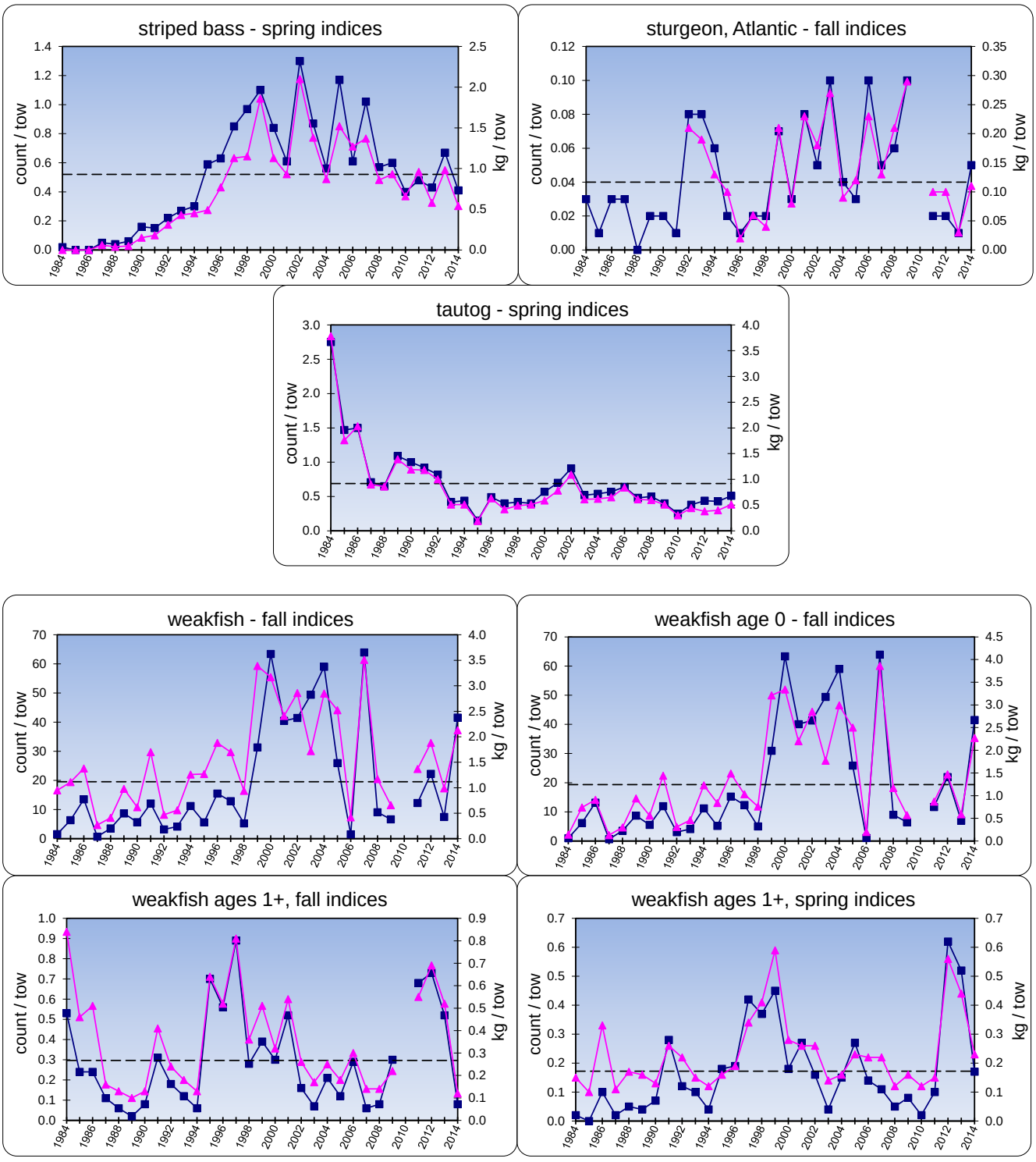
Legend:

■ = count / tow

▲ = kg / tow

---- = mean count / tow

Figure 5.13 Plots of abundance indices for: striped bass, Atlantic sturgeon, tautog, and weakfish (all ages, age 0, and ages 1+).



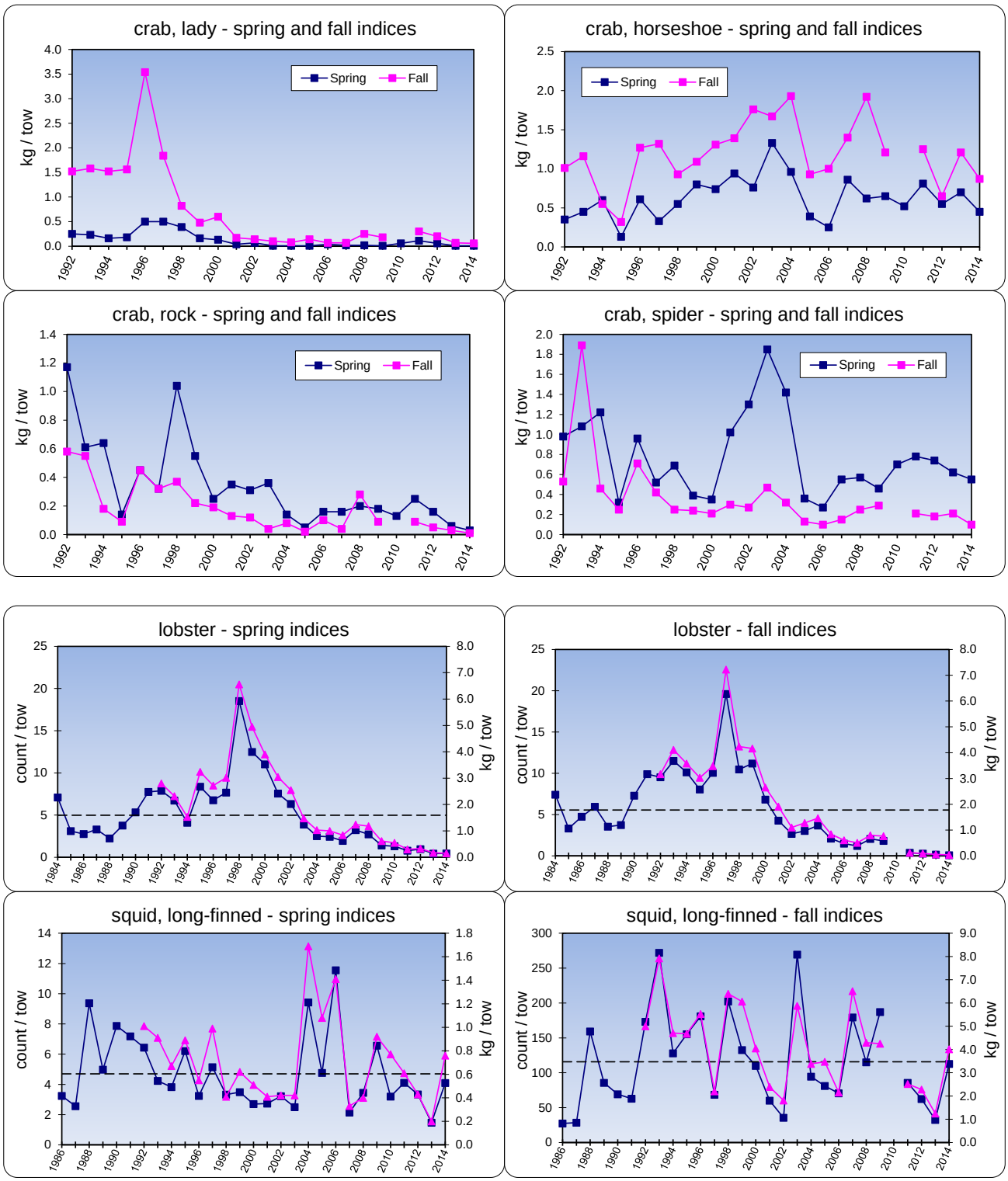
Legend:

■ = count / tow

▲ = kg / tow

---- = mean count / tow

Figure 5.14. Plots of abundance and biomass indices for: crabs (lady, rock, and spider), horseshoe crab, American lobster, and long-finned squid.



Legend for bottom four graphs:

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

Figure 5.15. Mean number of finfish species per sample, spring and fall, 1984-2014. This index measures the diversity of species supported within the Sound's various habitats.

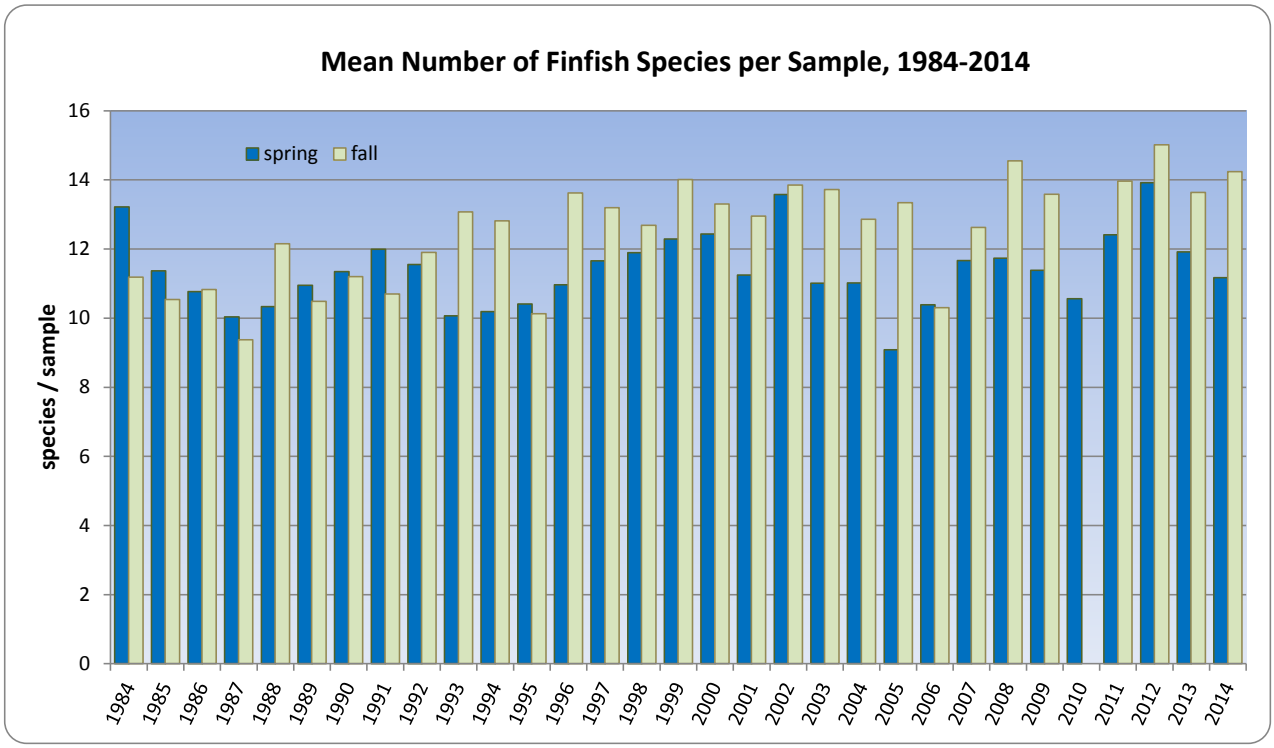


Figure 5.16. Open water forage abundance, 1992-2014. The geometric mean is calculated as the aggregate sample biomass per tow of 14 of the most common forage species sampled in the survey. This index measures the available food base which supports both resident and migratory species. The average since 1992 is 13.74 kg/tow (red line).

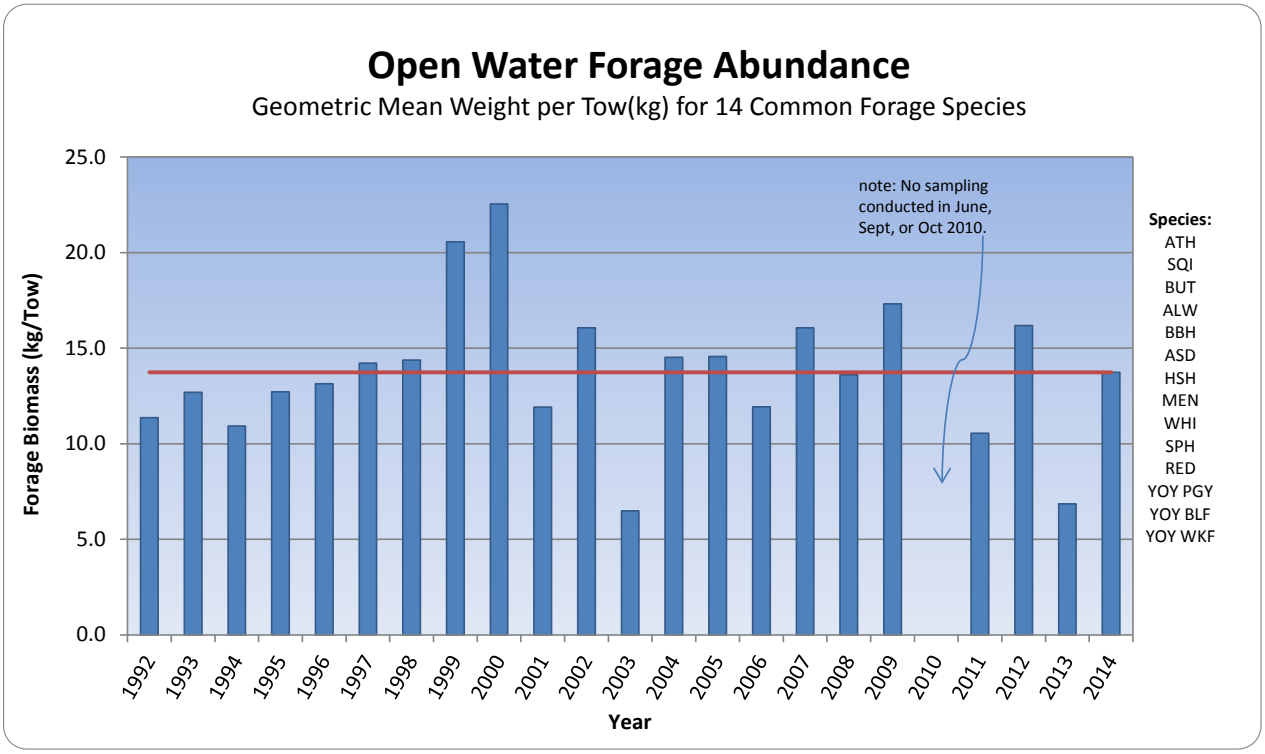
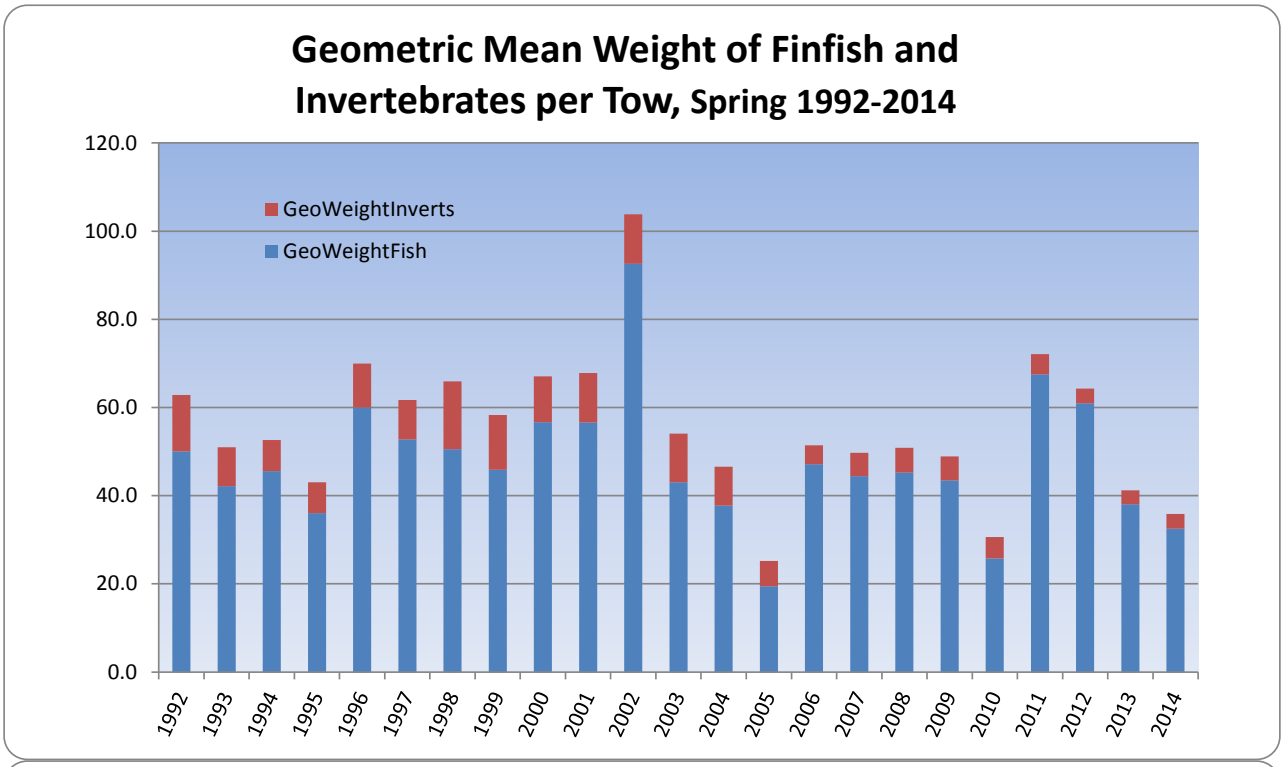


Figure 5.17. Geometric mean biomass of finfish and invertebrates per sample, spring and fall, 1992-2014. This index measures the diversity of species supported within the Sound's various habitats.



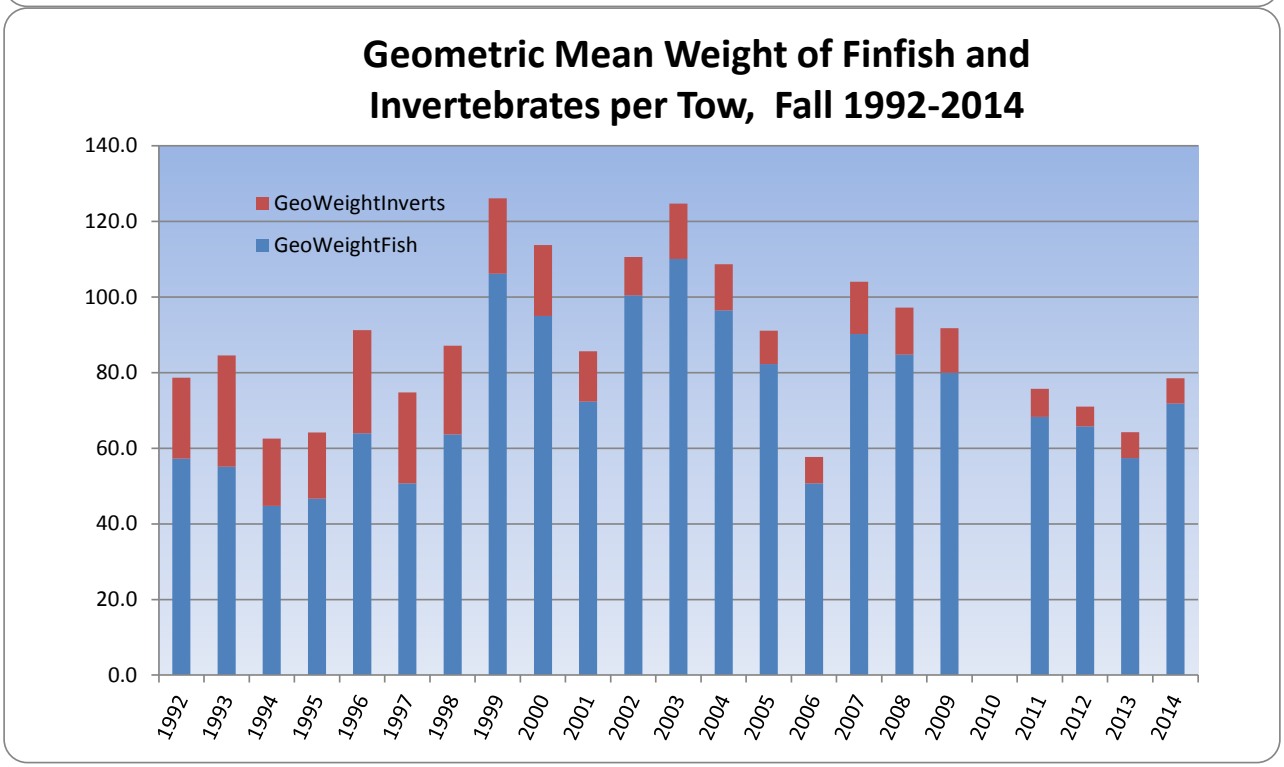


Figure 5.18: Percent of sampled winter flounder that were sexually mature by length group for female and male flounder captured in LISTS over five time periods, 1990-2013.

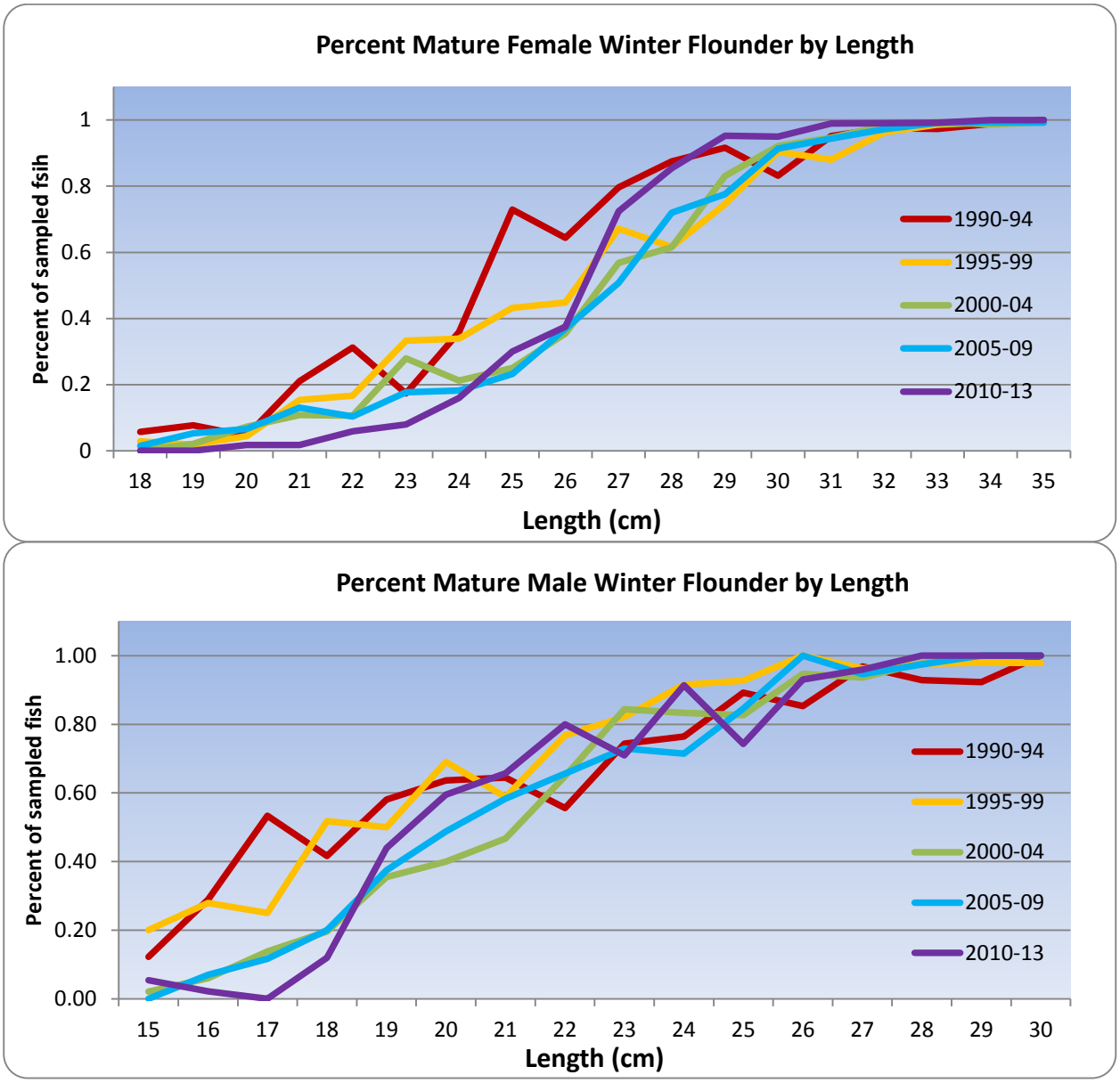
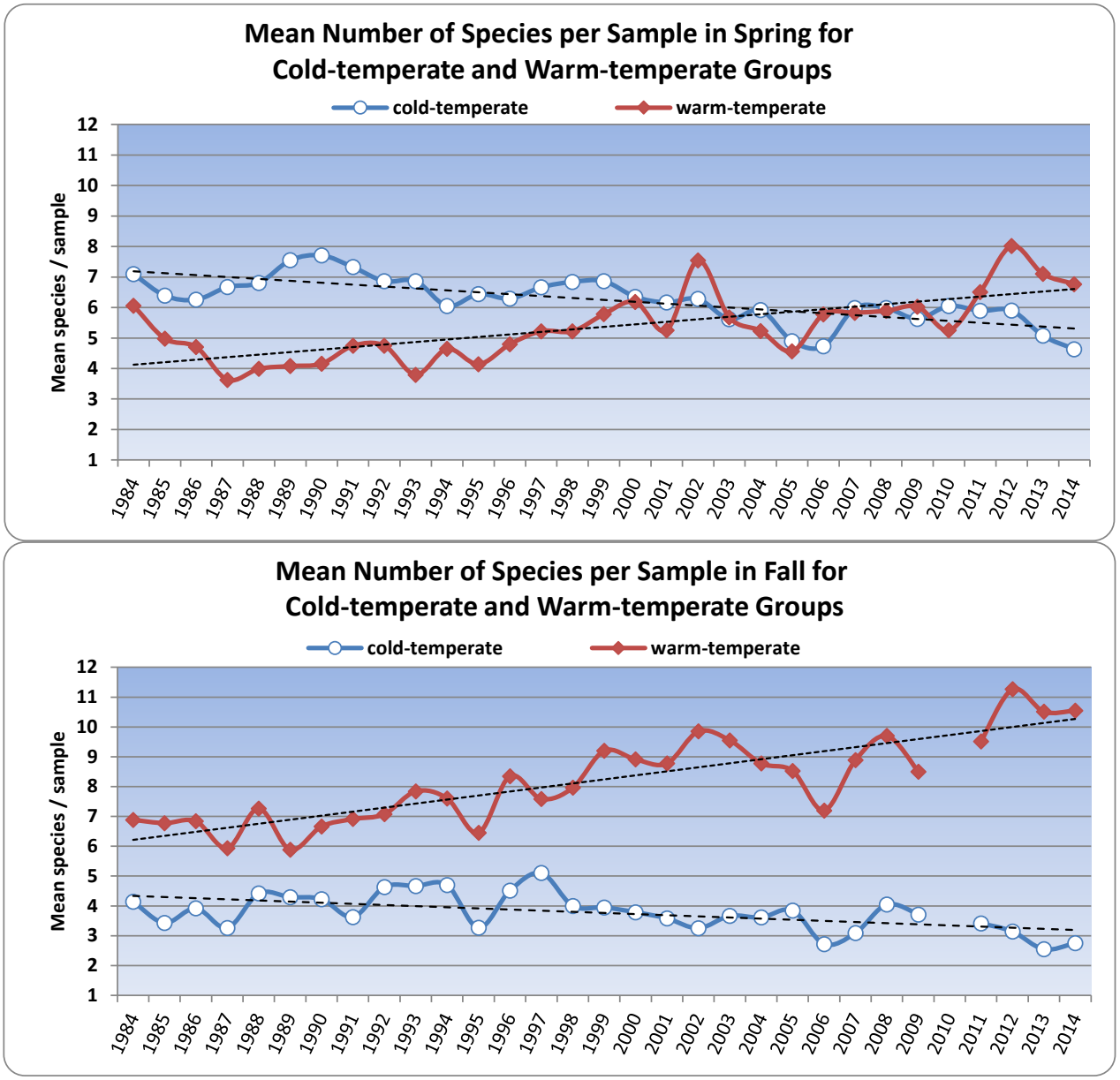


Figure 5.19. Trends in the number of cold temperate versus warm temperate species per sample captured in spring and fall LIS Trawl Surveys. See Appendix 2.5 for list of species included in analysis.



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APPENDICES
LISTS

Appendix 5.1. List of finfish species identified by A *Study of Marine Recreational Fisheries in Connecticut* (F54R) and other CT DEP Marine Fisheries Division programs. LISTS has collected one hundred-six finfish species from 1984-2014.
This appendix contains a list of 147 species identified (Bold type indicates new species) from all sampling programs conducted since 1984. Species are listed alphabetically by common name (AFS 2004). Sampling program abbreviations, survey time periods and gear type are as follows:

Survey Abbreviation	Survey Description	Time Period	Gear Type
CTR	CT River Creel Survey	1997-1998	bus stop creel survey mainstem of CT River
EPA	cooperative sampling in western LIS with EPA	1986-1990	used LISTS net
ESS (F54R)	Estuarine Seine Survey	1988 to present	7.6m (25 ft) beach seine
IS (F54R)	Inshore Survey of Juvenile Winter Flounder	1990-1994	beam trawls (also a little data from 1995-1996)
ISS (F54R-starting 2008)	Inshore Seine Surveys in CT & TH rivers	1979 to present	15.2m (50 ft) bag seine set by boat
LISTS (F54R)	Long Island Sound Trawl Survey	1984 to present	14m (50 ft) trawls with 2" codend mesh
MISC	misc sampling conducted on R/V Dempsey	various	various
NCA	"inshore" EPA NCA C2K sampling	2000	skiff trawls
NRRWS	sampling in western end of LIS, the "Narrows"	2000-2007	14m (50 ft) trawls with 2" codend mesh
SNFH (F54R)	Study of Nearshore Finfish Habitat	1995-1996	plankton net
SS (F54R)	Summer Survey	1991-1993, 1996	14m (50 ft) trawls with codend liner in LIS
TN	Trap Net Survey	1997-1998	trap nets in rivers

Common Name	Scientific Name	Survey
anchovy, bay	*Anchoa mitchilli*	LISTS;NRRWS;ESS;ISS;IS; SS;NCA;MISC
anchovy, striped	*Anchoa hepsetus*	LISTS; ESS; IS; SS
banded rudderfish	*Seriola zonata*	LISTS; ESS
bass, largemouth	*Micropterus salmoides*	ISS; TN;CTR
bass, rock	*Ambloplites rupestris*	ISS; TN;CTR
bass, smallmouth	*Micropterus dolomieui*	ISS; TN;CTR
bass, striped	*Morone saxatilis*	LISTS;NRRWS;ESS;ISS; SS;NCA;MISC;EPA;TN;CTR
bigeye	*Priacanthus arenatus*	LISTS; IS
bigeye, short	*Pristigenys alta*	LISTS
black sea bass	*Centropristes striata*	LISTS;NRRWS;ESS; IS; SS;NCA;MISC;EPA
blenny, feather	*Hypsoblennius hentz*	LISTS
bluefish	*Pomatomus saltatrix*	LISTS;NRRWS;ESS;ISS; SS; MISC;EPA; CTR
bluegill	*Lepomis macrochirus*	TN;CTR
bonefish	*Albula vulpes*	ISS
bonito, Atlantic	*Sarda sarda*	LISTS; EPA
bullhead, brown	*Ameiurus nebulosus*	ISS; NCA; TN;CTR
burrfish, striped	*Chilomycterus schoepfi*	LISTS; ESS
burrfish, web	*Chilomycterus antillarum*	ESS
butterfish	*Peprilus triacanthus*	LISTS;NRRWS;ESS;ISS;IS; SS;NCA;MISC;EPA
carp	*Cyprinus carpio*	ISS; NCA; TN;CTR
catfish, channel	*Ictalurus puctatus*	ISS; NCA; TN;CTR
catfish, white	*Ameiurus catus*	NCA; TN;CTR
cod, Atlantic	*Gadus morhua*	LISTS; SS
cornetfish, bluespotted	*Fistularia tabacaria*	LISTS; ESS; IS
cornetfish, red	*Fistularia petimba*	LISTS; IS
crappie, black	*Pomoxis nigromaculatus*	ISS; NCA; TN;CTR
crappie, white	*Pomoxis annularis*	TN;CTR
croaker, Atlantic	*Micropogonias undulatus*	LISTS; IS
cunner	*Tautogolabrus adspersus*	LISTS;NRRWS;ESS;ISS;IS; SS; MISC;EPA
cusk-eel, fawn	*Lepophidium profundorum*	LISTS
cusk-eel, striped	*Ophidion marginatum*	LISTS; SS
darter, tessellated	*Etheostoma olmstedi*	ISS
dogfish, smooth	*Mustelus canis*	LISTS;NRRWS;ESS; IS; SS; MISC;EPA
dogfish, spiny	*Squalus acanthius*	LISTS;NRRWS; MISC
drum, black	***Pogonias cromis***	**LISTS**
eel, American	*Anguilla rostrata*	LISTS;NRRWS;ESS;ISS;IS;SNFH;SS;NCA; EPA;TN;CTR
eel, conger	*Conger oceanicus*	LISTS; IS; SS
fallfish	*Semotilus corporalis*	ISS
filefish, orange	*Aluterus schoepfi*	LISTS; IS; SS
filefish, planehead	*Monacanthus hispidus*	LISTS; EPA
filefish, scrawled	*Aluterus scriptus*	IS
flounder, American plaice	*Hippoglossoides platessoide*	LISTS
flounder, fourspot	*Paralichthys oblongus*	LISTS;NRRWS; IS; SS; MISC;EPA

Appendix 5.1 cont.

Common Name	Scientific Name	Survey
flounder, smallmouth	*Etropus microstomus*	LISTS;NRRWS;ESS; IS; SS;NCA;MISC
flounder, summer	*Paralichthys dentatus*	LISTS;NRRWS;ESS;ISS;IS; SS;NCA;MISC;EPA;TN;CTR
flounder, windowpane	*Scophthalmus aquosus*	LISTS;NRRWS;ESS;ISS;IS; SS;NCA;MISC;EPA;TN;CTR
flounder, winter	*Pseudopleuronectes americanus*	LISTS;NRRWS;ESS;ISS;IS;SNFH;SS;NCA;MISC;EPA;TN;CT
flounder, yellowtail	*Pleuronectes ferrugineus*	LISTS; IS
glasseye snapper	*Priacanthus cruentatus*	LISTS
goatfish, dwarf	*Upeneus parvus*	LISTS
goatfish, red	*Mullus auratus*	LISTS
goby, code	*Gobiosoma robustum*	IS
goby, naked	*Gobiosoma bosci*	LISTS; ESS;ISS;IS
goldfish	*Carassius auratus*	CTR
goosefish	*Lophius americanus*	LISTS; IS; SS; MISC
grubby	*Myoxocephalus aeneus*	LISTS; ESS;ISS;IS;SNFH;SS; EPA
gunnel, banded	*Pholis fasciata*	ESS; IS
gunnel, rock	*Pholis gunnellus*	LISTS; ESS;ISS;IS;SNFH;SS
gurnard, flying	*Dactylopterus volitans*	ESS
haddock	*Melanogrammus aeglefinus*	LISTS; SS
hake, red	*Urophycis chuss*	LISTS;NRRWS; IS; SS; MISC;EPA
hake, silver	*Merluccius bilinearis*	LISTS;NRRWS; SS; MISC;EPA
hake, spotted	*Urophycis regia*	LISTS;NRRWS; ESS; IS; SS; MISC;EPA
harvestfish	*Peprilus paru*	LISTS
herring, Atlantic	*Clupea harengus*	LISTS;NRRWS; IS;SNFH;SS; MISC;EPA
herring, alewife	*Alosa pseudoharengus*	LISTS;NRRWS;ESS;ISS; SNFH;SS; MISC;EPA;TN;CTR
herring, blueback	*Alosa aestivalis*	LISTS;NRRWS;ESS;ISS;IS;SNFH;SS; EPA;TN;CTR
herring, round	*Etrumeus teres*	LISTS; EPA
hogchoker	*Trinectes maculatus*	LISTS;NRRWS;ESS;ISS;IS; SS; MISC;EPA;TN
jack, blue runner	*Caranx crysos*	LISTS; EPA
jack, crevalle	*Caranx hippos*	LISTS;NRRWS; ESS; ISS; EPA
jack, yellow	*Caranx bartholomaei*	LISTS;NRRWS; ESS; IS; MISC;EPA
killifish, rainwater	*Lucania parva*	ESS
killifish, striped	*Fundulus majalis*	ESS; IS
kingfish, northern	*Menticirrhus saxatilis*	LISTS;NRRWS;ESS;ISS;IS; SS; EPA
lamprey, sea	*Petromyzon marinus*	LISTS; IS; TN
lizardfish, inshore	*Synodus foetens*	LISTS;NRRWS;ESS;ISS;IS; SS; MISC
lookdown	*Selene vomer*	LISTS; ISS
lumpfish	*Cyclopterus lumpus*	LISTS; IS;SNFH
mackerel, Atlantic	*Scomber scombrus*	LISTS; ISS; SS; EPA
mackerel, Spanish	*Scomberomorus maculatus*	LISTS; SS; EPA
menhaden, Atlantic	*Brevoortia tyrannus*	LISTS;NRRWS;ESS;ISS;IS;SNFH;SS;NCA;MISC;EPA
minnow, sheepshead	*Cyrinodon variegatus*	ESS;ISS
moonfish	*Selene setapinnis*	LISTS;NRRWS; SS; MISC;EPA
mullet, white	*Mugil curema*	LISTS;ESS;ISS
mummichog	*Fundulus heteroclitus*	ESS; IS
needlefish, Atlantic	*Strongylura marina*	ESS;ISS
ocean pout	*Macrozoarces americanus*	LISTS;NRRWS; MISC;EPA
oyster toadfish	*Opsanus tau*	LISTS;NRRWS;ESS;ISS;IS;SNFH;SS; EPA
perch, white	*Morone americana*	LISTS;NRRWS;ESS;ISS;IS;SNFH; NCA; TN;CTR
perch, yellow	*Perca flavescens*	ISS; SNFH; TN;CTR
perch, silver	*Bairdiella chrysoura*	LISTS
pickerel, chain	*Esox niger*	ISS; TN
pike, northern	*Esox lucius*	ISS; TN;CTR
pinfish	*Lagodon rhomboides*	LISTS
pipefish, northern	*Syngnathus fuscus*	LISTS;NRRWS;ESS;ISS;IS;SNFH;SS;NCA; EPA
pollock	*Pollachius virens*	LISTS;NRRWS; SNFH;SS; EPA
pompano, African	*Alectis ciliaris*	LISTS; ISS
puffer, northern	*Sphoeroides maculatus*	LISTS;NRRWS;ESS;ISS;IS; SS
pumpkinseed	*Lepomis gibbosus*	ESS;ISS; NCA; TN;CTR
radiated shanny	*Ulvaria subbifurcata*	SNFH
ray, bullnose	*Myliobatis freminvillei*	LISTS

Appendix 5.1 cont.

Common Name	Scientific Name	Survey
ray, roughtail stingray	*Dasyatis centroura*	LISTS
rockling, fourbeard	*Enchelyopus cimbrius*	LISTS;NRRWS; IS;SNFH;SS; MISC;EPA
salmon, Atlantic	*Salmo salar*	LISTS; TN
sand lance, American	*Ammodytes americanus*	LISTS; ESS; IS;SNFH;SS
sandbar (brown) shark	*Carcharhinus plumbeus*	LISTS
scad, bigeye	*Selar crumenophthalmus*	LISTS; SS; MISC
scad, mackerel	*Decapterus macarellus*	LISTS; SS
scad, rough	*Trachurus lathami*	LISTS;NRRWS; SS; MISC;EPA
scad, round	*Decapterus punctatus*	LISTS;NRRWS
sculpin, longhorn	*Myoxocephalus octodecemspinosus*	LISTS;NRRWS; ISS; SNFH; MISC
scup	*Stenotomus chrysops*	LISTS;NRRWS;ESS;ISS;IS; SS;NCA;MISC;EPA
sea raven	*Hemitripterus americanus*	LISTS; SNFH; MISC;EPA
seahorse, lined	*Hippocampus erectus*	LISTS; ESS; IS
searobin, northern	*Prionotus carolinus*	LISTS;NRRWS;ESS; IS;SNFH;SS; MISC;EPA
searobin, striped	*Prionotus evolans*	LISTS;NRRWS;ESS;ISS;IS; SS;NCA;MISC;EPA
seasnail	*Liparis atlanticus*	LISTS; SNFH
sennet, northern	*Sphyraena borealis*	LISTS; ESS
shad, American	*Alosa sapidissima*	LISTS;NRRWS;ESS;ISS; SS; MISC;EPA;TN;CTR
shad, gizzard	*Dorosoma cepedianum*	LISTS;NRRWS; ISS; TN
shad, hickory	*Alosa mediocris*	LISTS;NRRWS; ISS; SS; MISC;EPA; CTR
sharksucker	*Echeneis naucrates*	LISTS
shiner, golden	*Notemigonus crysoleucas*	ISS; TN
shiner, spottail	*Notropis hudsonius*	ISS; NCA; TN;CTR
silverside, Atlantic	*Menidia menidia*	LISTS;NRRWS;ESS;ISS;IS;SNFH;SS; MISC;EPA
silverside, inland	*Menidia beryllina*	SNFH
skate, barndoor	*Dipturus laevis*	LISTS
skate, clearnose	*Raja eglanteria*	LISTS;NRRWS; IS
skate, little	*Leucoraja erinacea*	LISTS;NRRWS;ESS; IS; SS;NCA;MISC;EPA; CTR
skate, winter	*Leucoraja ocellata*	LISTS;NRRWS; SS; MISC
smelt, rainbow	*Osmerus mordax*	LISTS; ESS; IS;SNFH;SS; TN;CTR
snapper, grey	*Lutjanus griseus*	ESS; IS
spot	*Leiostomus xanthurus*	LISTS;NRRWS; ISS;IS; SS; MISC;EPA
stargazer, northern	Astroscopus guttatus	LISTS; ESS
stickleback, four-spine	*Apeltes quadracus*	ESS; IS
stickleback, nine-spine	*Pungitius pungitius*	ESS; IS
stickleback, three-spine	*Gasterosteus aculeatus*	ESS; IS; TN
sturgeon, Atlantic	*Acipenser oxyrinchus*	LISTS
sucker, white	*Catostomus commersoni*	ISS; NCA; TN;CTR
tautog	*Tautoga onitis*	LISTS;NRRWS;ESS;ISS;IS; SS;NCA;MISC;EPA
tomcod, Atlantic	*Microgadus tomcod*	LISTS;NRRWS;ESS;ISS;IS;SNFH;SS; EPA; CTR
triggerfish, gray	*Balistes capriscus*	LISTS
trout, brook	*Salvelinus fontinalis*	TN;CTR
trout, brown	*Salmo trutta*	CTR
walleye	*Sander vitreus*	TN
weakfish	*Cynoscion regalis*	LISTS;NRRWS;ESS;ISS;IS; SS;NCA;MISC;EPA

Appendix 5.2. Annual total count of finfish, lobster and squid taken in the LISTS, 1984-2014.

Counts include all tows- number of tows conducted shown in second row. Refer to Appendix 5.4 for details on number of tows conducted per month. Note: nc = not counted. Anchovy spp., (yoy) and sand lance, (yoy) are estimated.

Common name	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
(number of tows)	200	246	316	320	320	320	297	200	160	240	240	200	200	200	200	200	200	200	200	200	199	200	120	200	120	200	78	172	200	200	199	6,547
anchovy, bay	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	548	2,303	443	992	2,434	1,523	814	1,492	2,440	1,128	11,128	475	4,693	1,296	1,350	1,424	34,483
anchovy, striped	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	11	0	0	216	0	47	0	2	0	0	0	6	1	5	0	1	3	1	0	293
anchovy, spp (yoy-est)	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	2,667	15,700	935	1,515	3,410	13,110	3,254	2,179	1,267	8,537	1,135	0	2,382	93	2,004	9,786	67,974
bigeye	0	0	0	1	2	2	1	0	0	0	1	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
bigeye, short	1	2	0	0	1	2	0	0	0	1	1	0	3	2	0	0	0	1	5	0	0	0	0	0	0	0	0	0	0	0	0	19
black sea bass	34	53	44	24	22	21	39	39	5	20	34	12	27	22	18	50	69	134	394	64	124	42	19	116	122	121	37	91	410	449	1,295	3,952
blenny, feather	0	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
blue runner	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	0	34	0	24	27	0	10	100
bluefish	9,927	8,946	5,712	3,517	3,857	12,568	8,195	5,845	5,269	6,469	16,245	5,524	6,705	10,815	8,814	7,843	6,135	3,986	3,450	3,766	6,504	6,532	2,100	9,378	1,699	3,657	2	2,765	3,851	1,829	4,457	186,361
bonito, Atlantic	0	2	0	1	1	1	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	9
burrfish, striped	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	2
butterfish	37,137	67,944	44,624	42,519	60,746	94,928	80,778	40,537	95,961	67,087	54,378	64,930	49,360	70,985	136,926	191,100	60,490	45,264	66,550	36,133	94,735	92,996	50,022	49,137	48,766	108,087	2,894	42,141	60,539	29,569	69,372	2,056,635
cod, Atlantic	0	0	0	0	0	0	1	0	0	0	0	2	0	1	0	0	1	0	0	58	33	10	0	0	0	15	21	109	0	0	5	256
Gadus spp. (yoy/larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	36	0	0	0	34	8	17	0	0	5	100
cornetfish, red	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3
corntefish, blue spotted	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	1	1
crab, horseshoe	0	0	0	0	0	0	0	0	0	0	0	0	0	204	303	384	420	503	517	450	534	161	109	333	289	340	58	257	199	265	261	5,586
croaker, Atlantic	0	0	0	0	0	0	0	0	0	41	3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	2	49
cunner	359	98	97	129	72	268	196	75	30	65	25	41	17	43	65	51	50	51	55	42	21	24	8	16	26	18	11	14	20	20	2	2,008
cusk-eel, fawn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4
cusk-eel, striped	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	2	0	0	6	11
dogfish, smooth	846	919	850	526	564	374	284	193	304	420	361	168	275	167	310	305	467	598	1,019	570	503	467	332	580	328	588	10	613	610	1,051	1,197	15,799
dogfish, spiny	89	252	173	76	434	99	417	14	6	14	58	0	1	7	18	10	4	48	17	85	38	41	11	32	35	148	3	58	16	21	15	2,241
drum, black	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	1	1
eel, American	2	0	1	0	0	2	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	9
eel, american (yoy/larvae)	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0	0	0	1	0	0	0	0	0	0	0	1
eel, conger	0	0	0	0	0	0	0	0	1	3	0	2	1	0	0	2	0	2	0	3	0	0	0	0	0	0	0	3	1	1	0	19
eel, conger (yoy/larvae)	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	1	0	0	0	0	0	0	0	1	0	0	2
filefish, orange	0	1	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
filefish, planehead	4	20	1	0	25	13	23	1	0	10	1	0	3	0	0	3	0	1	0	1	0	0	1	0	1	1	0	0	0	0	4	113
flounder, American plaice	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	3
flounder, fourspot	2,691	2,759	2,126	2,112	4,653	2,924	4,698	3,553	2,774	1,447	1,674	2,584	2,815	4,122	1,908	1,393	2,590	2,167	1,859	1,877	1,406	688	466	1,094	902	1,036	402	1,400	2,597	1,144	820	64,680
flounder, smallmouth	2	0	2	15	39	13	4	20	12	30	17	19	41	58	97	96	61	98	139	49	50	44	7	48	89	96	31	67	258	128	152	1,780
flounder, summer	208	249	716	531	414	47	242	263	186	293	282	121	434	486	436	582	555	875	1,356	1,181	644	506	203	733	477	881	517	1,051	980	1,071	859	17,377
flounder, windowpane	26,200	18,936	22,514	15,588	26,919	31,082	14,738	8,482	2,980	8,526	6,678	3,815	14,116	10,324	6,483	4,643	2,488	3,065	1,991	2,177	2,275	1,982	1,077	4,051	3,511	2,496	2,850	2,831	3,536	2,096	2,191	260,639
flounder, winter	13,921	13,851	19,033	22,696	36,706	45,563	59,981	26,623	9,548	16,843	21,481	15,558	22,722	14,701	15,697	10,288	8,867	9,826	6,884	4,676	4,021	4,692	1,699	4,550	4,973	4,068	2,579	3,092	3,365	1,912	1,372	431,786
flounder, yellowtail	0	0	0	0	7	0	1	0	0	0	0	1	0	1	0	0	1	1	0	0	0	0	1	1	2	1	0	1	0	0	0	18
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	1	6	0	0	0	1	0	24
goatfish, dwarf	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
goatfish, red	1	0	0	0	0	0	2	1	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	21	1	29
goby, naked	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
goosefish	1	8	1	1	1	15	3	8	10	4	8	4	1	2	3	2	1	1	3	0	1	2	1	0	0	0	0	0	2	0	0	83
grubby	0	1	1	1	5	9	6	0	0	0	5	1	2	11	5	2	0	0	1	2	0	2	0	1	0	0	0	4	0	0	0	59
gunnel, rock	0	6	0	6	5	10	9	0	0	0	1	0	3	0	0	0	3	1	1	6	2	9	2	1	2	2	29	4	1	0	0	104
haddock	0	0	0	0	0	0	0	0	0	0	0	2	0	1	7	1	0	0	0	26	7	2	0	0	0	0	0	0	0	5	0	50
hake, red	3,696	1,161	3,061	2,258	3,808	7,365	3,300	2,085	1,606	4,183	546	1,977	872	748	3,015	2,973	2,393	1,382	2,103	873	829	585	625	2,788	1,723	897	990	278	1,720	849	398	61,085
hake, silver	1,525	724	1,464	1,848	3,427	3,551	4,243	1,537	544	508	2,136	1,941	489	1,973	1,870	5,126	679	3,945	2,013	496	1,417	165	1,267	290	6,587	947	1,747	948	7,519	519	323	61,767
hake, spotted	78	69	96	55	255	12	42	73	68	497	184	72	384	77	142	381	1,425	606	798	656	230	234	321	340	1,267	327	665	725	626	927	505	12,134
harvestfish	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	3
herring, alewife	284	37	242	819	415	473	287	103	122	934	1,431	386	1,402	1,194	456	1,393	1,572	638	855	746	859	742	573	1,537	931	1,175	172	512	708	376	555	21,929
herring, Atlantic	112	510	2,536	2,549	2,721	2,560	25,029	4,003	4,565	6,271	3,850	9,135	972	3,455	893	2,511	770	497	365	459	851	1,168	66	1,932	356	6,330	1,318	1,482	571	3,566	1,838	93,239
herring, Atlantic (yoy-est)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,540	1,542	1,380	9,046	539	1,007	10,334	12	3,255	47	48	623	11,196	487	41,056
herring, blueback	1,722	117	267	104	247	367	124	38	175	106	1,199	255	97	630	211	19	143	279	68	110	218	111	63	156	74	291	101	72	46	68	58	7,536
herring, round	22	15	0	1	0	0	0	0	2	6	2	0	0	0	31	0	0	5	0	0	0	0	0	0	0	0	0	0	2	0	0	86
hogchoker	293	282	140	87	113	118	259	104	61	73	37	17	45	15	12	39	40	85	100	92	83	61	22	78	38	39	34	147	340	250	246	3,349

Appendix 5.2 cont.

Common name	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
(number of tows)	200	246	316	320	320	320	297	200	160	240	240	200	200	200	200	200	200	200	200	200	199	200	120	200	120	200	78	172	200	200	199	6,547
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	2	0	1	0	4	2	0	2	50
jack, yellow	0	0	0	0	0	41	8	11	2	2	6	32	6	2	6	20	3	3	13	1	1	28	0	0	0	1	0	0	0	0	0	186
kingfish, northern	0	0	0	0	0	1	1	4	2	10	7	25	6	7	15	6	2	2	1	1	5	4	0	4	3	7	0	34	59	14	51	271
lamprey, sea	0	0	0	1	1	0	1	1	0	2	0	0	1	1	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	11
lizardfish, inshore	0	0	0	0	0	2	0	0	0	0	1	0	0	2	1	7	1	21	1	0	0	1	4	2	10	2	0	43	0	0	30	128
lobster, American	5,995	3,549	4,924	6,923	6,032	7,645	9,696	8,524	8,160	12,583	9,123	9,944	9,490	16,467	16,211	13,922	10,481	5,626	3,880	2,923	1,843	1,389	748	1,648	1,096	853	293	230	349	144	178	180,868
lookdown	0	0	0	0	0	0	2	0	0	0	3	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	7
lumpfish	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
mackerel, Atlantic	68	17	20	29	45	376	46	2	4	17	11	1	5	8	13	21	2	0	5	8	0	37	0	9	0	5	0	0	0	0	2	751
mackerel, Spanish	0	0	0	0	0	11	0	2	1	233	106	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	355
menhaden, Atlantic	161	304	718	600	335	623	407	348	1,115	298	411	318	88	116	306	1,187	492	86	366	799	746	235	28	426	47	69	7	181	426	234	723	12,198
moonfish	7	226	23	7	142	60	10	24	62	6	149	33	921	287	1,188	645	1,817	225	424	133	182	356	361	979	689	2,575	0	640	262	868	2,200	15,501
mullet, white	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2
ocean pout	26	3	14	14	30	58	39	42	18	66	42	30	26	15	13	17	18	6	13	14	18	3	5	12	9	22	6	27	14	0	0	619
perch, silver	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	3
perch, white	0	0	0	0	0	2	0	0	0	4	1	0	1	4	0	1	1	0	0	8	2	0	0	0	4	1	0	1	1	0	1	32
pinfish	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
pipefish, northern	1	0	1	0	3	0	0	0	5	21	2	2	0	1	0	2	4	4	2	6	2	4	3	2	0	2	4	4	1	2	1	79
pollock	5	0	3	8	6	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	18	2	5	0	1	0	56
pompano, African	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
puffer, northern	1	2	6	0	3	2	2	5	1	28	4	1	3	1	28	14	4	8	6	3	5	5	0	8	0	5	0	9	47	3	10	214
ray, bullnose ray	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
ray, roughtail stingray	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	1	0	0	0	1	0	0	1	1	0	0	8
rockling, fourbeard	376	89	184	312	563	686	393	163	150	242	93	169	109	199	133	233	185	251	106	113	173	106	14	87	81	47	35	43	43	3	4	5,385
rudderfish, banded	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2
salmon, Atlantic	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
sand lance, American	nc	nc	nc	nc	nc	nc	nc	nc	nc	3	25	95	0	2	4	178	4	4	3	19	70	6	0	30	7,495	1,227	13,061	9,535	2	7	12	31,782
sand lance, (yoy-est)	nc	nc	nc	nc	nc	nc	nc	nc	nc	0	1,000	5	0	0	100	1,075	0	430	0	0	0	0	5,444	2	3,750	7,932	0	15,600	0	0	0	35,338
scad, bigeye	0	0	0	0	15	63	1	1	0	0	3	0	2	1	1	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	108
scad, mackerel	0	0	0	0	0	0	1	2	6	0	4	1	3	0	1	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1	21
scad, rough	34	32	19	89	180	81	41	1	0	100	13	0	35	65	0	0	0	10	10	12	14	62	14	13	0	59	0	150	19	28	5	1,087
scad, round	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	1	2	0	0	4	11	12	0	3	0	1	0	1	0	1	1	43
sculpin, longhorn	14	82	51	32	107	107	263	139	31	11	7	5	7	4	2	2	14	5	3	5	5	0	0	3	2	2	1	9	1	1	0	915
scup	8,806	18,054	16,449	9,761	12,566	37,642	21,193	45,790	13,646	32,218	38,456	13,985	16,087	9,582	23,742	101,095	101,464	58,325	100,481	26,926	61,521	52,642	28,829	75,681	53,560	46,991	7,157	34,457	53,119	24,961	45,705	1,190,891
sea raven	57	59	70	88	52	34	44	19	4	1	1	2	2	3	30	9	19	7	11	3	7	3	0	5	0	5	6	3	5	0	1	550
seahorse, lined	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
searobin, northern	585	2,267	546	280	605	381	357	609	313	951	878	1,317	672	579	360	547	2,014	1,594	2,123	1,632	784	265	630	691	809	2,012	1,128	803	3,642	1,934	2,584	33,894
searobin, striped	1,434	2,295	2,035	1,482	2,086	2,211	2,353	865	857	1,491	1,298	682	1,008	819	1,321	1,690	3,129	2,061	2,394	2,235	1,308	757	366	755	612	1,507	141	1,630	2,973	2,724	2,544	49,063
seasnail	0	0	0	0	1	0	8	0	0	0	0	0	0	0	0	0	0	4	0	0	4	2	0	0	0	0	0	0	0	0	0	19
sennet, northern	1	0	0	0	0	1	0	0	0	2	0	0	0	0	0	6	0	1	2	0	0	8	0	2	0	5	0	1	3	0	0	32
shad, American	1,852	425	642	1,036	3,208	4,007	550	361	380	1,142	1,723	755	501	922	901	987	316	109	593	689	356	177	68	236	405	422	165	271	321	222	162	23,902
shad, gizzard	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	1	1	2	0	1	0	0	0	0	1	0	0	9
shad, hickory	71	4	7	6	4	40	2	1	12	10	31	6	29	25	40	56	42	14	45	41	39	136	75	37	5	13	2	8	42	33	30	906
shark, sandbar (brown)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
sharksucker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
silverside, Atlantic	0	0	0	0	0	0	0	0	1	54	3	39	0	2	0	1	2	1	0	1	0	0	0	1	2	3	1	0	0	3	1	115
skate, barndoor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
skate, clearnose	0	0	3	2	1	1	3	2	8	8	1	4	1	4	20	22	18	65	59	68	22	102	36	97	37	69	1	56	280	218	104	1,311
skate, little	2,751	4,614	4,303	3,847	9,471	9,349	11,902	6,479	3,495	6,051	6,714	2,372	6,203	4,068	4,305	3,686	3,340	4,311	4,242	4,071	3,044	1,317	593	1,277	682	709	281	674	1,406	583	770	116,908
skate, winter	1	20	34	17	114	120	85	50	31	62	51	41	88	48	62	41	31	38	45	82	53	31	23	44	51	44	16	37	97	91	82	1,629
smelt, rainbow	0	0	0	0	5	4	2	2	0	9	9	4	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	37
spot	0	34	38	10	29	0	8	2	0	124	53	3	195	10	0	45	204	13	52	1	8	0	14	0	308	1	0	5	858	1,917	20	3,950
squid, long-finned	0	0	11,018	15,135	33,400	21,304	23,789	12,322	32,780	58,312	25,396	23,974	22,720	13,048	27,443	21,580	16,585	9,080	8,034	21,350	23,022	17,542	7,802	24,212	10,490	24,130	1,906	13,020	9,767	5,393	13,436	547,990
stargazer, northern	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	1	0	2
striped bass	10	13	12	30	31	59	117	38	42	81	81	165	232	319	400	397	293	214	469	383	378	469	144	422	199	466	71	243	170	200	255	6,401
sturgeon, Atlantic	11	3	6	6	7	13	9	3	30	60	60	6	3	5	17	39	7	18	18	29	8	9	21	18	7	18	1	5	7	4	13	461
tautog	734	773	796	624	629	791	693	501	265	164	224	61	136	190	194	217	287	319	565	225	232	179	186	280	179	163	53	106	135	161	194	10,255
toadfish, oyster	3	4	9	0	0	3	4	1	0	2	0	1	0	0	3	2	6	2	8	9	1	0	1	5	3	3	0	1	0	5	2	78
tomcod, Atlantic	2	1	0	8	2	3	3	4	8	5	2	4	2	1	0	1	0	0	0	0	2	0	0	0	0	1	0	2	0	0	0	51
triggerfish, gray	0	1	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
weakfish	366	2,740	7,751	327	1,341	5,914	2,246	4,320	1,317	2,060	8,156	2,881	6,375	3,904	3,495	12,416	23,595	12,739	10,713	8,183	17,505	9,191	241	17,386	2,531	2,604	1	2,583	6,785	1,964	10,477	192,106

Appendix 5.2 cont.

Total count of finfish, lobster and squid taken in the LISTS, 1984-2014.

Year	Tows	Total Count
1984	200	122,527
1985	246	152,574
1986	316	153,383
1987	320	136,139
1988	320	216,479
1989	320	294,026
1990	297	277,183
1991	200	174,235
1992	160	186,975
1993	240	230,301
1994	240	204,795
1995	200	163,532
1996	200	165,756
1997	200	170,761
1998	200	258,082
1999	200	392,831
2000	200	271,608
2001	200	172,622
2002	200	229,284
2003	200	131,812
2004	199	250,439
2005	200	200,991
2006	120	109,330
2007	200	215,638
2008	120	164,948
2009	200	239,154
2010	78	39,340
2011	172	146,254
2012	200	170,798
2013	200	102,413
2014	199	177,250
	6,547	5,921,460

Appendix 5.3. Annual total weight (kg) of finfish, lobster and squid taken in LISTS, 1992-2014.

Weights include all tows – number of tows shown in second row. Refer to Appendix 5.4 for details on number of tows conducted per month. Note: nw = not weighed.

Common name	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
(number of tows)	160	240	240	200	200	200	200	200	200	200	200	200	199	200	120	200	160	200	78	172	200	200	199	4,368
anchovy, bay	nw	nw	nw	nw	nw	nw	nw	5.6	12.2	3.6	6.6	13.3	10.3	5.8	8.3	14.5	7.7	35.3	2.8	10.5	8.6	6.8	9.4	**161.3**
anchovy, striped	nw	nw	nw	nw	0.2	0.0	0.0	6.1	0.0	1.2	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.4	0.0	0.1	0.2	0.1	0.0	**8.6**
Anchovy, spp (yoy-est)	nw	nw	nw	nw	nw	nw	nw	0.5	4.5	0.8	1.5	2.0	3.0	1.5	0.6	0.8	5.1	0.7	0.0	1.0	0.4	1.3	2.6	**26.3**
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.4**
bigeye, short	0.0	0.1	0.1	0.0	0.3	0.2	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**1.0**
black sea bass	1.8	6.4	11.0	4.7	12.1	10.5	10.6	17.2	22.6	74.8	188.3	49.6	40.5	26.4	9.3	46.8	29.8	59.5	20.1	54.2	141.0	181.2	543.3	**1,561.7**
blenny, feather	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	0.2	0.0	0.0	0.0	0.0	0.0	0.0	**0.2**
blue runner	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.0	2.3	0.0	1.7	2.7	0.0	0.9	**8.0**
bluefish	2,462.9	2,226.1	2,341.7	1,156.1	1,118.2	977.6	899.0	1,218.0	1,408.0	751.2	1,099.7	791.6	2,140.6	1,333.8	358.6	1,801.3	641.4	1,157.4	6.1	584.7	532.7	517.7	522.7	**26,047.1**
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**12.0**
burrfish, striped	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.5	0.0	0.0	0.0	**1.0**
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	1,631.4	1,446.2	1,442.0	3,186.9	166.9	1,600.8	1,891.3	1,252.5	1,707.6	**41,533.6**
cod, Atlantic	0.0	0.0	0.0	0.1	0.0	0.3	0.0	0.0	0.1	0.0	0.0	2.8	4.7	0.9	0.0	0.0	0.0	1.0	2.1	9.2	0.0	0.0	0.3	**21.5**
Gadus spp. (yoy/larvae)	nw	nw	nw	nw	nw	nw	nw	nw	nw	nw	nw	nw	nw	1.5	0	0	0	1.8	0.3	0.4	0	0	0.4	**4.4**
cornetfish, red	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	**0.2**
corntefish, blue spotted	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**
crab, horseshoe	514.1	807.9	463.1	116.8	717	472.4	489.4	634.1	689.4	870.7	862.9	751	873.4	304.2	205.8	596.4	496.8	645.8	112.2	505.2	385.8	531.8	497.3	**12,543.5**
croaker, Atlantic	0.0	2.5	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2	0.0	0.1	0.2	**3.4**
cunner	3.7	6.2	2.1	4.4	2.6	4.1	8.1	5.9	5.3	5.9	7.2	6.7	3.7	4.1	1.3	3.0	3.6	1.8	1.3	1.9	2.8	1.8	0.2	**87.7**
cusk-eel, fawn	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.2**
cusk-eel, striped	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.2	0.0	0.0	0.6	**1.0**
dogfish, smooth	863.2	1,339.1	934.6	566.8	862.8	527.3	989.8	923.0	1,038.5	1,407.6	2,814.3	1,527.4	1,435.3	1,421.7	1,176.6	2,110.2	1,134.2	2,213.3	34.4	2,031.7	1,833.3	2,162.3	2,799.2	**32,146.6**
dogfish, spiny	30.7	58.4	199.6	0.0	2.1	13.7	44.5	51.1	9.9	128.6	48.0	239.5	104.7	102.0	47.0	122.3	127.7	545.7	16.2	203.5	62.8	91.5	62.2	**2,311.7**
drum, black	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**
eel, American	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**3.1**
eel, American (yoy)	nw	nw	nw	nw	nw	nw	nw	nw	nw	nw	nw	nw	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.1**
eel, conger	0.1	0.2	0.0	1.2	0.1	0.0	0.0	0.5	0.0	0.3	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.3	1.2	0.0	**6.1**
eel, conger (yoy)	nw	nw	nw	nw	nw	nw	nw	nw	nw	nw	nw	nw	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	**0.2**
filefish, orange	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.2**
filefish, planehead	0.0	0.8	0.1	0.0	0.3	0.0	0.0	0.3	0.0	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.4	**2.4**
flounder, American plaice	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	**0.3**
flounder, fourspot	382.4	193.6	202.4	402.9	407.2	615.3	306.0	203.9	398.6	362.7	326.9	350.1	309.3	125.9	88.1	224.9	186.3	169.8	92.0	224.2	454.5	203.4	145.0	**6,375.4**
flounder, smallmouth	0.6	2.6	1.5	1.2	2.3	2.4	6.4	5.2	2.7	3.8	4.9	3.0	2.8	2.4	0.6	2.6	3.2	4.7	1.4	3.5	7.5	5.2	6.0	**76.5**
flounder, summer	142.1	193.1	173.0	79.6	266.4	326.0	431.3	459.8	471.3	628.1	989.3	845.7	627.2	406.1	180.5	590.9	398.0	694.4	229.6	713.0	718.5	726.6	567.4	**10,857.9**
flounder, windowpane	286.1	578.9	597.2	356.2	1,223.6	986.1	741.1	594.2	368.8	475.5	343.3	378.8	333.7	177.5	128.9	510.8	524.0	342.8	449.3	395.9	501.1	326.6	365.6	**10,986.0**
flounder, winter	1,344.8	1,898.0	2,060.9	1,614.7	3,335.0	2,439.4	2,450.3	2,011.7	1,921.4	1,993.6	1,584.1	1,421.9	839.9	566.1	271.2	951.3	751.9	524.0	450.5	613.8	604.9	576.8	459.7	**30,685.9**
flounder, yellowtail	0.0	0.0	0.0	0.1	0.0	0.3	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.4	1.0	0.4	0.2	0.0	0.3	0.0	0.0	0.0	**3.0**
glasseye snapper	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.7	0.1	0.6	0.0	0.0	0.0	0.1	0.0	**1.8**
goatfish, red	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.1	**0.9**
goby, naked	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.1**
goosefish	2.5	0.5	2.0	3.3	0.1	1.6	3.2	0.3	0.2	0.4	0.6	0.0	0.1	0.7	1.2	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	**17.5**
grubby	0.0	0.0	0.3	0.1	0.2	0.7	0.3	0.2	0.0	0.0	0.1	0.1	0.0	0.2	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	**2.4**
gunnel, rock	0.0	0.0	0.1	0.0	0.2	0.0	0.0	0.0	0.2	0.1	0.1	0.4	0.2	0.6	0.1	0.1	0.2	0.2	0.5	0.2	0.1	0.0	0.0	**3.3**
haddock	0.0	0.0	0.0	0.2	0.0	0.1	0.5	0.1	0.0	0.0	0.0	1.3	0.6	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	**3.4**
hake, red	127.7	254.4	63.9	145.6	95.5	80.5	217.5	226.5	162.6	109.7	206.6	73.4	51.6	56.0	37.4	200.4	141.3	59.5	64.3	25.1	148.6	61.1	33.5	**2,642.7**
hake, silver	22.0	21.9	127.6	61.6	20.0	70.8	88.3	99.6	28.8	152.2	89.6	13.9	27.3	7.1	37.7	14.6	208.5	50.0	35.4	40.3	171.0	23.6	10.6	**1,422.4**
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	23.9	65.8	32.1	15.8	76.8	64.2	66.8	59.5	**947.9**
harvestfish	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	0.0	0.0	0.0	0.0	0.1	0.2	0.0	**0.3**
herring, Atlantic	797.5	1,120.0	769.3	1,631.7	189.8	515.1	74.6	45.4	124.1	72.6	63.9	89.1	58.3	131.1	10.3	234.2	52.1	239.2	179.0	199.4	61.5	321.2	91.2	**7,070.6**
herring, Atlantic (yoy-est)	nw	nw	nw	nw	nw	nw	nw	nw	nw	1.5	1.9	2.8	2.4	1.2	0.2	4.2	0.4	1.9	0.3	0.5	1.2	7.3	0.5	**26.3**
herring, alewife	9.2	54.5	83.2	24.6	134.6	81.3	35.1	107.6	96.0	41.7	70.2	55.3	56.1	47.6	49.5	101.3	51.1	96.0	14.3	29.8	47.0	34.1	43.2	**1,363.3**
herring, blueback	8.5	4.7	31.2	7.5	6.2	16.5	5.1	1.1	6.8	11.1	2.4	4.0	6.5	5.4	2.5	9.1	3.2	14.6	3.4	3.2	1.6	4.3	4.2	**163.1**
herring, round	0.2	0.3	0.2	0.0	0.0	0.0	0.6	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	**1.5**
hogchoker	5.6	7.3	3.9	1.7	5.4	1.8	1.9	5.0	5.9	10.5	13.3	8.6	9.5	8.7	3.2	11.4	5.6	4.5	4.4	16.8	30.7	27.2	27.8	**220.7**
jack, crevalle	0.0	0.5	0.5	0.1	0.0	0.6	0.0	0.7	0.0	0.0	0.1	0.2	0.2	0.2	0.0	0.1	0.0	0.1	0.0	0.4	0.2	0.0	0.2	**4.1**
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	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	**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	0.0	0.4	0.4	0.4	0.0	3.7	8.4	2.3	3.2	**28.8**
lamprey, sea	0.0	1.0	0.0	0.0	0.7	0.1	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.1	0.8	0.0	0.0	0.0	0.0	0.0	0.0	**4.0**
lizardfish, inshore	0.0	0.0	0.1	0.0	0.0	0.2	0.1	0.5	0.1	2.2	0.1	0.0	0.0	0.1	0.4	0.2	0.5	0.2	0.0	4.6	0.0	0.0	2.8	**12.1**
lobster, American	1,537.9	2,700.3	1,956.1	2,141.9	2,113.5	3,800.9	3,873.9	3,397.9	2,184.5	1,531.2	1,005.7	690.9	481.5	364.3	197.9	396.5	314.1	244.0	83.6	52.0	70.0	37.3	31.5	**29,207.4**
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	**0.5**
lumpfish	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.2**
mackerel, Atlantic	1.0	1.3	0.9	0.1	0.5	1.7	1.1	3.1	0.8	0.0	2.5	1.9	0.0	5.7	0.0	0.8	0.0	0.4	0.0	0.0	0.0	0.0	0.2	**22.0**

Appendix 5.3 cont.

Common name	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
(number of tows)	160	240	240	200	200	200	200	200	200	200	200	200	199	200	120	200	160	200	78	172	200	200	199	4,368
mackerel, Spanish	1.5	5.3	6.4	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**15.5**
menhaden, Atlantic	60.6	103.9	87.8	41.9	40.5	38.5	9.2	90.9	31.8	4.7	96.3	344.9	110.7	77.9	5.5	63.9	10.4	18.0	2.7	69.8	144.6	87.5	267.8	**1,809.8**
moonfish	1.5	0.6	4.1	2.1	11.6	4.6	13.4	9.6	15.0	3.8	7.4	2.3	3.4	6.0	3.5	12.0	13.4	19.5	0.0	6.3	3.6	10.0	23.2	**176.9**
mullet, white	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	0.0	0.0	0.0	0.1	0.1	0.0	0.0	**0.2**
ocean pout	7.7	16.4	9.1	6.5	7.2	4.8	2.7	3.9	4.9	2.3	4.3	2.9	5.4	0.7	0.9	3.2	2.1	4.8	1.4	4.5	2.0	0.0	0.0	**97.7**
perch, silver	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	0.0	0.0	0.0	0.1	0.0	0.0	0.2	**0.3**
perch, white	0.0	0.3	0.3	0.0	0.1	0.9	0.0	0.4	0.2	0.0	0.0	1.4	0.5	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.2	0.0	0.2	**4.8**
pinfish	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	0.0	0.0	0.0	0.0	0.2	0.0	0.0	**0.2**
pipefish, northern	0.4	0.6	0.2	0.1	0.0	0.1	0.0	0.1	0.2	0.3	0.2	0.4	0.2	0.3	0.2	0.2	0.0	0.2	0.3	0.3	0.1	0.2	0.1	**4.7**
pollock	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.8	0.1	0.5	0.0	0.1	0.0	**2.0**
pompano, African	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.1**
puffer, northern	0.1	0.9	0.4	0.1	0.3	0.1	0.5	1.1	0.4	0.7	0.3	0.3	0.4	0.3	0.0	0.5	0.0	0.4	0.0	0.9	3.1	0.3	1.3	**12.4**
ray, bullnose ray	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	0.0	0.0	0.0	0.0	0.0	5.7	0.0	**5.7**
ray, roughtail stingray	0.0	0.0	0.0	0.0	0.0	50.6	3.4	0.0	0.0	2.5	24.4	0.0	4.1	0.0	0.0	0.0	3.0	0.0	0.0	13.0	5.0	0.0	0.0	**106.0**
rockling, fourbeard	12.8	15.7	8.5	14.7	8.6	17.3	11.6	28.8	14.7	21.5	9.7	9.2	13.0	6.8	1.5	7.6	7.1	3.9	2.9	4.0	3.5	0.2	0.4	**224.0**
rudderfish, banded	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	0.0	0.0	0.0	0.0	0.0	0.0	0.4	**0.4**
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.1**
sand lance, American	nw	0.3	0.6	0.4	0.0	0.1	0.3	0.3	0.3	0.3	0.1	0.2	0.2	0.2	0.0	0.3	7.2	2.0	5.2	7.5	0.2	0.1	0.2	**26.0**
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	2.9	0.1	0.2	2.3	0.0	3.8	0.0	0.0	0.0	**11.3**
scad, bigeye	0.0	0.0	0.3	0.0	0.1	0.1	0.1	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**2.0**
scad, mackerel	0.2	0.0	0.4	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	**1.1**
scad, rough	0.0	4.4	0.2	0.0	1.5	2.0	0.0	0.0	0.0	0.7	0.7	0.5	0.7	1.9	0.5	0.7	0.0	2.8	0.0	6.8	1.1	1.3	0.5	**26.3**
scad, round	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.1	0.2	0.0	0.0	0.3	0.3	0.3	0.0	0.3	0.0	0.1	0.0	0.1	0.0	0.1	0.1	**2.4**
sculpin, longhorn	9.0	3.2	1.6	1.3	2.1	0.8	1.0	0.3	5.0	1.5	0.9	2.0	3.4	0.0	0.0	0.8	0.3	0.3	0.4	2.0	0.2	0.4	0.0	**36.5**
scup	837.7	867.9	878.1	770.5	739.4	530.5	740.5	3,641.3	6,679.0	5,828.4	13,814.0	5,221.9	6,801.1	3,080.7	4,636.1	5,333.5	6,509.9	6,332.1	1,971.6	6,759.5	6,170.2	5,945.6	5,161.4	**99,250.9**
sea raven	3.9	0.6	0.2	0.7	1.5	0.4	11.3	4.9	9.2	4.1	4.1	1.6	2.4	0.5	0.0	3.6	0.0	1.7	1.6	0.9	1.1	0.0	1.5	**55.8**
seahorse, lined	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.1**
searobin, northern	35.6	97.9	66.7	166.9	57.4	60.4	39.4	52.0	251.2	222.7	267.3	252.2	112.0	21.3	74.5	74.2	58.8	194.3	149.5	85.5	405.2	161.7	225.9	**3,132.6**
searobin, striped	305.1	260.0	208.6	277.5	278.7	230.5	509.7	497.0	1,036.1	861.0	1,065.0	805.1	465.4	183.7	113.5	217.0	263.0	471.8	66.4	558.7	1,086.4	1,112.5	1,020.8	**11,893.5**
seasnail	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.7**
sennet, northern	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.1	0.2	0.0	0.0	0.7	0.0	0.2	0.0	0.4	0.0	0.1	0.3	0.0	0.0	**2.7**
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	15.8	20.2	28.9	8.6	17.5	25.3	15.3	12.3	**1,038.8**
shad, gizzard	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.2	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	**0.9**
shad, hickory	4.9	4.4	7.6	2.5	10.2	9.1	15.9	19.4	17.1	6.7	19.6	20.1	14.2	43.1	19.1	10.4	1.1	3.6	0.4	1.5	14.1	10.8	10.5	**266.3**
sharksucker	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.3**
silverside, Atlantic	0.1	1.0	0.3	0.9	0.0	0.1	0.0	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.2	0.3	0.1	0.0	0.0	0.3	0.1	**3.9**
skate, barndoor	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.4**
skate, clearnose	10.3	11.3	1.8	11.0	1.7	7.4	36.8	39.4	37.9	132.4	107.3	130.8	48.2	187.1	52.4	193.3	78.1	148.5	4.5	109.8	491.7	387.0	207.7	**2,436.4**
skate, little	1,389.0	2,534.8	3,091.5	1,055.3	2,801.8	1,945.8	2,085.5	1,829.6	1,604.7	2,022.6	2,121.9	2,187.3	1,689.8	682.5	310.6	697.0	327.4	390.0	148.3	359.4	657.9	317.8	428.2	**30,678.7**
skate, winter	105.3	220.9	139.2	89.2	212.7	109.7	180.7	89.8	66.5	112.2	133.5	162.1	100.3	59.9	60.0	117.8	140.8	108.5	37.7	101.2	179.8	111.2	133.8	**2,772.8**
smelt, rainbow	0.0	0.6	0.6	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**1.7**
spot	0.0	10.6	4.3	0.3	14.1	1.1	0.0	5.7	17.8	1.3	7.2	0.1	0.9	0.0	1.2	0.0	21.3	0.2	0.0	0.7	107.5	195.4	1.8	**391.5**
squid, long-finned	844.9	1,629.1	965.4	796.4	720.4	515.2	767.0	826.4	582.3	346.2	279.9	573.2	953.4	683.5	326.0	773.6	330.1	648.4	161.4	370.7	333.9	170.8	582.3	**14,180.5**
stargazer, northern	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	0.0	0.1	0.0	0.0	0.0	0.1	0.0	**0.2**
striped bass	89.4	210.3	198.6	185.3	373.5	509.9	484.2	815.4	602.6	472.5	855.2	770.3	811.8	675.1	418.7	888.0	456.3	897.4	173.2	721.9	278.0	421.0	407.5	**11,716.1**
sturgeon, Atlantic	244.8	633.6	848.6	145.5	19.9	37.8	189.7	498.6	79.0	270.6	275.3	550.2	117.6	152.7	368.7	336.4	111.3	286.6	5.6	181.9	154.2	98.0	272.4	**5,879.0**
tautog	508.3	320.0	373.9	95.1	225.9	271.8	347.1	326.6	463.5	491.2	921.1	346.0	353.7	269.2	301.4	551.4	309.4	285.4	83.1	151.7	128.9	160.8	192.5	**7,478.0**
toadfish, oyster	0.0	1.2	0.0	0.5	0.0	0.0	0.9	1.8	2.5	0.4	4.7	5.0	0.8	0.0	1.2	2.0	1.9	0.8	0.0	0.2	0.0	0.9	0.6	**25.4**
tomcod, Atlantic	1.3	0.8	0.3	0.8	0.3	0.1	0.0	0.7	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.0	0.2	0.0	0.0	0.0	**4.8**
triggerfish, gray	0.0	0.9	0.0	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**3.2**
weakfish	94.8	121.2	344.5	275.7	414.9	362.0	268.2	771.3	554.5	415.0	442.0	194.8	426.9	449.9	52.2	584.8	116.1	108.7	1.0	192.6	409.2	203.7	334.8	**7,138.8**
Total	**14,705.1**	**20,454.3**	**18,919.6**	**14,222.0**	**18,586.1**	**17,963.5**	**20,336.1**	**24,114.0**	**22,817.2**	**21,948.8**	**32,413.8**	**19,910.6**	**21,569.3**	**14,030.5**	**11,353.6**	**19,512.0**	**15,546.5**	**20,494.8**	**4,890.3**	**17,316.4**	**18,561.7**	**16,792.2**	**17,487.4**	**423,945.8**

Appendix 5.4. 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 5.4. 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 5.4. 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 5.4. 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 5.4. cont. Total number and weight (kg) of finfish and invertebrates caught in LISTS in 1988.
Finfish species are in order of descending count. Invertebrate species are in order of descending weight. Number of tows (sample size)=200.

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

Appendix 5.4. 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 5.4. 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	%	species	count	%	weight	%
winter flounder	47,184	31.1	.	.	seasnail	8	0	.	.
butterfish	45,373	29.9	.	.	planehead filefish	7	0	.	.
scup	15,393	10.2	.	.	moonfish	7	0	.	.
windowpane flounder	9,825	6.5	.	.	rock gunnel	7	0	.	.
Atlantic herring	8,779	5.8	.	.	yellow jack	7	0	.	.
little skate	6,456	4.3	.	.	grubby	4	0	.	.
bluefish	4,688	3.1	.	.	spot	4	0	.	.
fourspot flounder	3,270	2.2	.	.	Atlantic sturgeon	4	0	.	.
silver hake	2,334	1.5	.	.	oyster toadfish	4	0	.	.
red hake	2,237	1.5	.	.	goosefish	3	0	.	.
weakfish	1,921	1.3	.	.	smallmouth flounder	3	0	.	.
striped searobin	866	0.6	.	.	Atlantic tomcod	3	0	.	.
tautog	554	0.4	.	.	clearnose skate	2	0	.	.
American shad	406	0.3	.	.	lookdown	2	0	.	.
fourbeard rockling	299	0.2	.	.	red goatfish	2	0	.	.
longhorn sculpin	243	0.2	.	.	rainbow smelt	2	0	.	.
northern searobin	232	0.2	.	.	bigeye scad	1	0	.	.
Atlantic menhaden	219	0.1	.	.	bigeye	1	0	.	.
smooth dogfish	209	0.1	.	.	hickory shad	1	0	.	.
summer flounder	170	0.1	.	.	mackerel scad	1	0	.	.
cunner	168	0.1	.	.	northern kingfish	1	0	.	.
alewife	160	0.1	.	.	northern puffer	1	0	.	.
spiny dogfish	150	0.1	.	.	red cornetfish	1	0	.	.
hogchoker	84	0.1	.	.	sandbar shark	1	0	.	.
winter skate	61	0	.	.	sea lamprey	1	0	.	.
blueback herring	46	0	.	.	yellowtail flounder	1	0	.	.
striped bass	45	0	.	.	**Total**	**151,600**		-	
sea raven	42	0	.	.					
ocean pout	39	0	.	.					
black sea bass	27	0	.	.	**Invertebrates**				
spotted hake	21	0	.	.	American lobster	5,369	27.0.	.	
Atlantic mackerel	10	0	.	.	long-finned squid	14,538	73.0.	.	
rough scad	10	0	.	.	**Total**	**19,907**		-	

Appendix 5.4. 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 5.4. cont. Total number and weight (kg) of finfish and invertebrates caught in LISTS in 1992.
Finfish species are in order of descending count. Invertebrate species are in order of descending weight (nc = not counted). Number of tows (sample size)=160.

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

Appendix 5.4. 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 5.4. cont. Total number and weight (kg) of finfish and invertebrates caught in LISTS in 1994.
Finfish species are in order of descending count. Invertebrate species are in order of descending weight (nc = not counted). Number of tows (sample size)=200.

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

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

Appendix 5.4. 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	%	species	count	%	weight	%
butterfish	70,985	50.3	2,017.2	15.5	American sand lance	2	0	0.1	0
winter flounder	14,701	10.4	2,439.4	18.8	short bigeye	2	0	0.2	0
bluefish	10,815	7.7	977.6	7.5	yellow jack	2	0	0.2	0
windowpane flounder	10,324	7.3	986.1	7.6	bigeye scad	1	0	0.1	0
scup	9,582	6.8	530.5	4.1	Atlantic cod	1	0	0.3	0
fourspot flounder	4,122	2.9	615.3	4.7	haddock	1	0	0.1	0
little skate	4,068	2.9	1,945.8	15.0	northern pipefish	1	0	0.1	0
weakfish	3,904	2.8	362.0	2.8	northern puffer	1	0	0.1	0
Atlantic herring	3,455	2.4	515.1	4.0	roughtail stingray	1	0	50.6	0.4
silver hake	1,973	1.4	70.8	0.5	sea lamprey	1	0	0.1	0
alewife	1,194	0.8	81.3	0.6	Atlantic tomcod	1	0	0.1	0
American shad	922	0.7	66.8	0.5	yellowtail flounder	1	0	0.3	0
striped searobin	819	0.6	230.5	1.8	**Total**	**141,040**		**12,974.6**	
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	**Invertebrates**				
summer flounder	486	0.3	326.0	2.5	American lobster	16,467	55.3	3,800.9	64.6
striped bass	319	0.2	509.9	3.9	lady crab	nc	nc	592.5	10.1
moonfish	287	0.2	4.6	0	long-finned squid	13,048	43.8	515.2	8.8
fourbeard rockling	199	0.1	17.3	0.1	horseshoe crab	204	0.7	472.4	8.0
tautog	190	0.1	271.8	2.1	spider crab	nc	nc	188.3	3.2
smooth dogfish	167	0.1	527.3	4.1	rock crab	nc	nc	94.1	1.6
Atlantic menhaden	116	0.1	38.5	0.3	lion's mane jellyfish	nc	nc	88.0	1.5
spotted hake	77	0.1	19.0	0.1	bushy bryozoan	nc	nc	28.0	0.5
rough scad	65	0	2.0	0	flat claw hermit crab	nc	nc	21.7	0.4
smallmouth flounder	58	0	2.4	0	boring sponge	nc	nc	16.5	0.3
winter skate	48	0	109.7	0.8	whelks	22	0.1	14.8	0.3
cunner	43	0	4.1	0	bluecrab	33	0.1	13.6	0.2
hickory shad	25	0	9.1	0.1	mantis shrimp	nc	nc	9.3	0.2
black sea bass	22	0	10.5	0.1	starfish spp.	nc	nc	7.3	0.1
hogchoker	15	0	1.8	0	hard clams	nc	nc	3.8	0.1
ocean pout	15	0	4.8	0	blue mussel	nc	nc	3.5	0.1
grubby	11	0	0.7	0	northern moon snail	nc	nc	3.3	0.1
spot	10	0	1.1	0	northern comb jelly	nc	nc	2.0	0
Atlantic mackerel	8	0	1.7	0	arks	nc	nc	1.8	0
northern kingfish	7	0	0.9	0	common oyster	nc	nc	1.8	0
spiny dogfish	7	0	13.7	0.1	surf clam	nc	nc	0.9	0
Atlantic sturgeon	5	0	37.8	0.3	common slipper shell	nc	nc	0.7	0
clearnose skate	4	0	7.4	0.1	mud crabs	nc	nc	0.6	0
longhorn sculpin	4	0	0.8	0	sand shrimp	nc	nc	0.2	0
white perch	4	0	0.9	0	common razor clam	nc	nc	0.2	0
crevalle jack	3	0	0.6	0	blood star	nc	nc	0.1	0
sea raven	3	0	0.4	0	star coral	nc	nc	0.1	0
Atlantic silverside	2	0	0.1	0	northern red shrimp	nc	nc	0.1	0
goosefish	2	0	1.6	0	shore shrimp	nc	nc	0.1	0
inshore lizardfish	2	0	0.2	0	purple sea urchin	nc	nc	0.1	0
round scad	2	0	0.2	0	**Total**	**29,774**		**5,882**	

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

Appendix 5.4. 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

species	count	%	weight	%
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 5.4. 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 5.4. 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 and Atlantic herring 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

species	count	%	weight	%
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 5.4. 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 5.4. 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 5.4. 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

species	count	%	weight	%
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 5.4. 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 5.4. 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 and American sand lance 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 5.4. cont. Total number and weight (kg) of finfish and invertebrates caught in 2007.
Finfish species are in order of descending count. Invertebrate species are in order of descending weight (nc = not counted). Young-of-year bay and striped anchovy are neither separated by species or quantified; young-of-year Atlantic herring and American sand lance are not quantified. Number of tows (sample size)=200.

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

Note: nc= not counted

Appendix 5.4. cont. Total number and weight (kg) of finfish and invertebrates caught in 2008.
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 and American sand lance are not quantified. Number of tows (sample size)=120.

species	count	%	weight	%	species	count	%	weight	%
scup	53,560	38	6,509.9	45.7	sea lamprey	1	0	0.8	0
butterfish	48,766	34.6	1,442.0	10.1	striped anchovy	1	0	0.1	0
American sand lance	7,495	5.3	7.2	0.1	**Total**	**140,777**		**14,239.8**	
silver hake	6,587	4.7	208.5	1.5					
winter flounder	4,973	3.5	751.9	5.3	**Finfish not ranked**				
windowpane flounder	3,511	2.5	524.0	3.7	anchovy spp, yoy				
weakfish	2,531	1.8	116.1	0.8	Atlantic herring, yoy				
red hake	1,723	1.2	141.3	1.0	American sand lance (yoy)				
bluefish	1,699	1.2	641.4	4.5					
spotted hake	1,267	0.9	65.8	0.5	**Invertebrates**				
bay anchovy	1,128	0.8	7.7	0.1	horseshoe crab	289	2.2	496.8	29.2
alewife	931	0.7	51.1	0.4	long-finned squid	10,490	80.5	330.1	19.4
fourspot flounder	902	0.6	186.3	1.3	American lobster	1,096	8.4	314.1	18.5
northern searobin	809	0.6	58.8	0.4	spider crab	nc	nc	145.8	8.6
moonfish	689	0.5	13.4	0.1	rock crab	nc	nc	64.0	3.8
little skate	682	0.5	327.4	2.3	bushy bryozoan	nc	nc	54.2	3.2
striped searobin	612	0.4	263.0	1.8	lady crab	nc	nc	36.3	2.1
summer flounder	477	0.3	398.0	2.8	starfish spp.	nc	nc	32.1	1.9
American shad	405	0.3	20.2	0.1	boring sponge	nc	nc	30.1	1.8
Atlantic herring	356	0.3	52.1	0.4	channeled whelk	177	1.4	29.3	1.7
smooth dogfish	328	0.2	1,134.2	8.0	mixed sponge species	nc	nc	27.8	1.6
spot	308	0.2	21.3	0.1	hydroid spp.	nc	nc	24.6	1.4
striped bass	199	0.1	456.3	3.2	flat claw hermit crab	nc	nc	22.8	1.3
tautog	179	0.1	309.4	2.2	common slipper shell	nc	nc	15.7	0.9
black sea bass	122	0.1	29.8	0.2	lion's mane jellyfish	520	4	14.3	0.8
smallmouth flounder	89	0.1	3.2	0	mantis shrimp	244	1.9	9.1	0.5
fourbeard rockling	81	0.1	7.1	0	sea grape	nc	nc	6.6	0.4
blueback herring	74	0.1	3.2	0	arks	124	1	6.1	0.4
winter skate	51	0	140.8	1.0	knobbed whelk	17	0.1	5.9	0.3
Atlantic menhaden	47	0	10.4	0.1	blue mussel	nc	nc	5.8	0.3
hogchoker	38	0	5.6	0	northern moon snail	1	0	5.6	0.3
clearnose skate	37	0	78.1	0.5	sand shrimp	nc	nc	4.0	0.2
spiny dogfish	35	0	127.7	0.9	blue crab	16	0.1	3.8	0.2
cunner	26	0	3.6	0	mud crabs	nc	nc	3.5	0.2
inshore lizardfish	10	0	0.5	0	rubbery bryzoan	nc	nc	3.1	0.2
ocean pout	9	0	2.1	0	common oyster	1	0	2.1	0.1
Atlantic sturgeon	7	0	111.3	0.8	hard clams	8	0.1	1.4	0.1
hickory shad	5	0	1.1	0	purple sea urchin	15	0.1	0.9	0.1
feather blenny	4	0	0.2	0	northern red shrimp	21	0.2	0.7	0
white perch	4	0	0.1	0	deadman's fingers sponge	nc	nc	0.6	0
northern kingfish	3	0	0.4	0	surf clam	9	0.1	0.6	0
oyster toadfish	3	0	1.9	0	red bearded sponge	nc	nc	0.4	0
Atlantic silverside	2	0	0.2	0	Jonah crab	2	0	0.4	0
rock gunnel	2	0	0.2	0	star coral	nc	nc	0.3	0
longhorn sculpin	2	0	0.3	0	sea cucumber	2	0	0.3	0
yellowtail flounder	2	0	0.4	0	tunicates, misc	nc	nc	0.3	0
Atlantic croaker	1	0	0.1	0	anemones	nc	nc	0.2	0
planehead filefish	1	0	0.1	0	coastal mud shrimp	1	0	0.1	0
glasseye snapper	1	0	0.1	0	green crab	1	0	0.1	0
pollock	1	0	0.1	0	moon jelly	1	0	0.1	0
roughtail stingray	1	0	3.0	0	northern cyclocardia	1	0	0.1	0
					Total	**13,036**		**1,700.1**	

Appendix 5.4. cont. Total number and weight (kg) of finfish and invertebrates caught in 2009.
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 and American sand lance are not quantified. Number of tows (sample size)=200.

species	count	%	weight	%
butterfish	108,087	53.6	3,186.9	17
scup	46,991	23.3	6,332.1	33.8
bay anchovy	11,128	5.5	35.3	0.2
Atlantic herring	6,330	3.1	239.2	1.3
winter flounder	4,068	2	524.0	2.8
bluefish	3,657	1.8	1,157.4	6.2
weakfish	2,604	1.3	108.7	0.6
moonfish	2,575	1.3	19.5	0.1
windowpane flounder	2,496	1.2	342.8	1.8
northern searobin	2,012	1	194.3	1
striped searobin	1,507	0.7	471.8	2.5
American sand lance	1,227	0.6	2.0	0
alewife	1,175	0.6	96.0	0.5
fourspot flounder	1,036	0.5	169.8	0.9
silver hake	947	0.5	50.0	0.3
red hake	897	0.4	59.5	0.3
summer flounder	881	0.4	694.4	3.7
little skate	709	0.4	390.0	2.1
smooth dogfish	588	0.3	2,213.3	11.8
striped bass	466	0.2	897.4	4.8
American shad	422	0.2	28.9	0.2
spotted hake	327	0.2	32.1	0.2
blueback herring	291	0.1	14.6	0.1
tautog	163	0.1	285.4	1.5
spiny dogfish	148	0.1	545.7	2.9
black sea bass	121	0.1	59.5	0.3
smallmouth flounder	96	0	4.7	0
clearnose skate	69	0	148.5	0.8
Atlantic menhaden	69	0	18.0	0.1
rough scad	59	0	2.8	0
fourbeard rockling	47	0	3.9	0
winter skate	44	0	108.5	0.6
hogchoker	39	0	4.5	0
blue runner	34	0	2.3	0
ocean pout	22	0	4.8	0
Atlantic sturgeon	18	0	286.6	1.5
cunner	18	0	1.8	0
pollock	18	0	0.8	0
Atlantic cod	15	0	1.0	0
hickory shad	13	0	3.6	0
northern kingfish	7	0	0.4	0
glasseye snapper	6	0	0.6	0
Atlantic mackerel	5	0	0.4	0
northern sennet	5	0	0.4	0
northern puffer	5	0	0.4	0
sea raven	5	0	1.7	0
striped anchovy	5	0	0.4	0
Atlantic silverside	3	0	0.3	0
oyster toadfish	3	0	0.8	0
inshore lizardfish	2	0	0.2	0
northern pipefish	2	0	0.2	0
rock gunnel	2	0	0.2	0
longhorn sculpin	2	0	0.3	0
crevalle jack	1	0	0.1	0
planehead filefish	1	0	0.1	0
round scad	1	0	0.1	0
striped cusk-eel	1	0	0.1	0
spot	1	0	0.2	0
northern stargazer	1	0	0.1	0
Atlantic tomcod	1	0	0.1	0
white perch	1	0	0.1	0
yellow jack	1	0	0.1	0
yellowtail flounder	1	0	0.2	0
Total	**201,476**		**18,750**	
Finfish not ranked				
anchovy spp, yoy				
Atlantic herring, yoy				
American sand lance (yoy)				
Invertebrates				
long-finned squid	24,130	91.4	648.4	30.2
horseshoe crab	340	1.3	645.8	30
American lobster	853	3.2	244	11.3
spider crab	.	.	144.1	6.7
lion's mane jellyfish	641	2.4	89.3	4.2
lady crab	.	.	63.6	3
rock crab	.	.	42.4	2
common slipper shell	.	.	37	1.7
flat claw hermit crab	.	.	33.8	1.6
bushy bryozoan	.	.	33.3	1.5
starfish spp.	.	.	26.6	1.2
channeled whelk	127	0.5	26	1.2
hydroid spp.	.	.	25.7	1.2
knobbed whelk	39	0.1	11.6	0.5
mantis shrimp	215	0.8	10.7	0.5
Tubularia, spp.	.	.	9	0.4
northern moon snail	.	.	7.2	0.3
anemones	.	.	5.6	0.3
mixed sponge species	.	.	5.4	0.3
sea grape	.	.	5.0	0.2
boring sponge	.	.	4.2	0.2
blue crab	19	0.1	4.1	0.2
sand shrimp	.	.	3.8	0.2
deadman's fingers sponge	.	.	3.5	0.2
blue mussel	8	0	3.5	0.2
mud crabs	.	.	3.1	0.1
common oyster	1	0	3.1	0.1
arks	2	0	2.5	0.1
surf clam	18	0.1	1.7	0.1
hard clams	4	0	1.1	0.1
red bearded sponge	.	.	0.8	0
purple sea urchin	4	0	0.8	0
rubbery bryzoan	.	.	0.6	0
star coral	.	.	0.2	0
ghost shrimp	2	0	0.2	0
coastal mud shrimp	2	0	0.1	0
northern cyclocardia	1	0	0.1	0
northern red shrimp	1	0	0.1	0
sea cucumber	1	0	0.1	0
tunicates, misc	1	0	0.1	0
Total	**26,409**		**2,148.2**	

Note: nc= not counted

Appendix 5.4. cont. Total number and weight (kg) of finfish and invertebrates caught in 2010.
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 and American sand lance are not quantified. Number of tows (sample size)=78.

species	count	%	weight	%
American sand lance	13,061	35.3	5.2	0.1
scup	7,157	19.3	1,971.6	44.3
butterfish	2,894	7.8	166.9	3.7
windowpane flounder	2,850	7.7	449.3	10.1
winter flounder	2,579	7.0	450.5	10.1
silver hake	1,747	4.7	35.4	0.8
Atlantic herring	1,318	3.6	179.0	4
northern searobin	1,128	3	149.5	3.4
red hake	990	2.7	64.3	1.4
spotted hake	665	1.8	15.8	0.4
summer flounder	517	1.4	229.6	5.2
bay anchovy	475	1.3	2.8	0.1
fourspot flounder	402	1.1	92.0	2.1
little skate	281	0.8	148.3	3.3
alewife	172	0.5	14.3	0.3
American shad	165	0.4	8.6	0.2
striped searobin	141	0.4	66.4	1.5
blueback herring	101	0.3	3.4	0.1
striped bass	71	0.2	173.2	3.9
tautog	53	0.1	83.1	1.9
black sea bass	37	0.1	20.1	0.5
fourbeard rockling	35	0.1	2.9	0.1
hogchoker	34	0.1	4.4	0.1
smallmouth flounder	31	0.1	1.4	0
rock gunnel	29	0.1	0.5	0
Atlantic cod	21	0.1	2.1	0
winter skate	16	0	37.7	0.8
cunner	11	0	1.3	0
smooth dogfish	10	0	34.4	0.8
Atlantic menhaden	7	0	2.7	0.1
ocean pout	6	0	1.4	0
sea raven	6	0	1.6	0
northern pipefish	4	0	0.3	0
spiny dogfish	3	0	16.2	0.4
bluefish	2	0	6.1	0.1
hickory shad	2	0	0.4	0
pollock	2	0	0.1	0
American plaice	1	0	0.1	0
Atlantic silverside	1	0	0.1	0
Atlantic sturgeon	1	0	5.6	0.1
clearnose skate	1	0	4.5	0.1
longhorn sculpin	1	0	0.4	0
weakfish	1	0	1.0	0
Total	**37,029**		**4,455**	

species	count	%	weight	%
Invertebrates				
long-finned squid	1,906	62.9	161.4	28.4
horseshoe crab	58	1.9	112.2	19.8
American lobster	293	9.7	83.6	14.7
spider crab	.		81.6	14.4
bushy bryozoan	.		23.1	4.1
rock crab	.		16.7	2.9
starfish spp.	.		15.1	2.7
common slipper shell	.		11.2	2
lion's mane jellyfish	401	13.2	7.8	1.4
lady crab	.		7.7	1.4
flat claw hermit crab	.		6.8	1.2
hydroid spp.	.		6.7	1.2
channeled whelk	33	1.1	4.5	0.8
northern moon snail	.		4.1	0.7
blue mussel	.		3.1	0.5
common oyster	.		2.9	0.5
sea grape	.		2.7	0.5
sand shrimp	.		2.3	0.4
deadman's fingers sponge	.		2.3	0.4
blue crab	10	0.3	2.0	0.4
arks	.		1.6	0.3
mud crabs	.		1.6	0.3
rubbery bryzoan	.		1.2	0.2
mantis shrimp	19	0.6	1.1	0.2
Unknown Jellyfish	300	9.9	0.8	0.1
Tubularia, spp.	.		0.5	0.1
anemones	5	0.1	0.4	0.1
surf clam	2	0.1	0.4	0.1
knobbed whelk	1	0	0.3	0.1
mixed sponge species	.		0.3	0.1
northern comb jelly	1	0	0.2	0
purple sea urchin	4	0.1	0.2	0
boring sponge	.		0.1	0
red bearded sponge	.		0.1	0
coastal mud shrimp	.		0.1	0
star coral	.		0.1	0
hard clams	.		0.1	0
sea cucumber	.		0.1	0
Total	**3,033**		**567.0**	

Note: nc= not counted

Finfish not ranked
anchovy spp, yoy
Atlantic herring, yoy
American sand lance (yoy)

Appendix 5.4. cont. Total number and weight (kg) of finfish and invertebrates caught in 2011.
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 and American sand lance are not quantified. Number of tows (sample size)=172.

species	count	%	weight	%
butterfish	42,141	36.7	1,600.8	9.9
scup	34,458	30.0	6,759.0	41.7
American sand lance	9,535	8.3	7.5	0.0
bay anchovy	4,693	4.1	10.5	0.1
winter flounder	3,092	2.7	613.8	3.8
windowpane flounder	2,831	2.5	395.9	2.4
bluefish	2,765	2.4	584.7	3.6
weakfish	2,583	2.3	192.6	1.2
striped searobin	1,630	1.4	558.7	3.4
Atlantic herring	1,482	1.3	199.4	1.2
fourspot flounder	1,400	1.2	224.2	1.4
summer flounder	1,051	0.9	713.0	4.4
silver hake	948	0.8	40.3	0.2
northern searobin	803	0.7	85.5	0.5
spotted hake	725	0.6	76.8	0.5
little skate	674	0.6	359.4	2.2
moonfish	640	0.6	6.3	0
smooth dogfish	613	0.5	2,031.7	12.5
alewife	512	0.4	29.8	0.2
red hake	278	0.2	25.1	0.2
American shad	271	0.2	17.5	0.1
striped bass	243	0.2	721.9	4.5
Atlantic menhaden	181	0.2	69.8	0.4
rough scad	150	0.1	6.8	0
hogchoker	147	0.1	16.8	0.1
Atlantic cod	109	0.1	9.2	0.1
tautog	106	0.1	151.7	0.9
black sea bass	91	0.1	54.2	0.3
blueback herring	72	0.1	3.2	0
smallmouth flounder	67	0.1	3.5	0
spiny dogfish	58	0.1	203.5	1.3
clearnose skate	56	0	109.8	0.7
inshore lizardfish	43	0	4.6	0
fourbeard rockling	43	0	4.0	0
winter skate	37	0	101.2	0.6
northern kingfish	34	0	3.7	0
ocean pout	27	0	4.5	0
blue runner	24	0	1.7	0
cunner	14	0	1.9	0
northern puffer	9	0	0.9	0
longhorn sculpin	9	0	2.0	0
hickory shad	8	0	1.5	0
Atlantic sturgeon	5	0	181.9	1.1
pollock	5	0	0.5	0
spot	5	0	0.7	0
crevalle jack	4	0	0.4	0
grubby	4	0	0.1	0
northern pipefish	4	0	0.3	0
rock gunnel	4	0	0.2	0
conger eel	3	0	1.1	0
sea raven	3	0	0.9	0
striped cusk-eel	2	0	0.2	0
Atlantic tomcod	2	0	0.2	0
American plaice	1	0	0.1	0
Atlantic croaker	1	0	0.2	0
northern sennet	1	0	0.1	0
round scad	1	0	0.1	0
roughtail stingray	1	0	13.0	0.1
striped burrfish	1	0	0.5	0
striped anchovy	1	0	0.1	0
silver perch	1	0	0.1	0
oyster toadfish	1	0	0.2	0
white perch	1	0	0.1	0
white mullet	1	0	0.1	0
yellowtail flounder	1	0	0.3	0
Total	**114,706**		**16,210.3**	

Finfish not ranked

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

Invertebrates

horseshoe crab	257	1.7	505.2	33.5
long-finned squid	13,020	86.4	370.7	24.6
spider crab	.	.	151.8	10.1
lady crab	.	.	132.4	8.8
American lobster	230	1.5	52.0	3.4
rock crab	.	.	45.5	3.0
hydroid spp.	.	.	30.5	2.0
mantis shrimp	971	6.4	29.6	2.0
bushy bryozoan	.	.	24.9	1.7
knobbed whelk	62	0.4	23.8	1.6
flat claw hermit crab	.	.	22.1	1.5
channeled whelk	99	0.7	19.0	1.3
starfish spp.	.	.	14.4	1.0
blue crab	69	0.5	12.4	0.8
lion's mane jellyfish	345	2.3	11.3	0.7
mixed sponge species	.	.	11.0	0.7
blue mussel	1	0	6.7	0.4
northern moon snail	.	.	5.6	0.4
boring sponge	.	.	5.5	0.4
hard clams	.	.	5.3	0.4
common slipper shell	.	.	5.2	0.3
sand shrimp	.	.	4.5	0.3
Tubularia, spp.	.	.	3.5	0.2
mud crabs	.	.	2.6	0.2
rubbery bryzoan	.	.	1.7	0.1
common oyster	1	0	1.6	0.1
sea grape	.	.	1.5	0.1
arks	.	.	1.4	0.1
surf clam	7	0	1.0	0.1
purple sea urchin	3	0	0.6	0
red bearded sponge	.	.	0.3	0
northern comb jelly	.	.	0.3	0
anemones	6	0	0.2	0
star coral	.	.	0.2	0
coastal mud shrimp	1	0	0.1	0
common razor clam	1	0	0.1	0
ghost shrimp	1	0	0.1	0
northern red shrimp	1	0	0.1	0
polychaetes	.	.	0.1	0
tunicates, misc	.	.	0.1	0
water jelly	1	0	0.1	0
Total	**15,076**		**1,505.0**	

Note: nc= not counted

Appendix 5.4. cont. Total number and weight (kg) of finfish and invertebrates caught in 2012.
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 and American sand lance are not quantified. Number of tows (sample size)=200.

species	count	%	weight	%
butterfish	60,539	37.9	1,891.3	10.8
scup	53,119	33.2	6,170.2	35.1
silver hake	7,519	4.7	171.0	1.0
weakfish	6,785	4.2	409.2	2.3
bluefish	3,851	2.4	532.7	3.0
northern searobin	3,642	2.3	405.2	2.3
windowpane flounder	3,536	2.2	501.1	2.9
winter flounder	3,365	2.1	604.9	3.4
striped searobin	2,973	1.9	1,086.4	6.2
fourspot flounder	2,597	1.6	454.5	2.6
red hake	1,720	1.1	148.6	0.8
little skate	1,406	0.9	657.9	3.7
bay anchovy	1,296	0.8	8.6	0.0
summer flounder	980	0.6	718.5	4.1
spot	858	0.5	107.5	0.6
alewife	708	0.4	47.0	0.3
spotted hake	626	0.4	64.2	0
smooth dogfish	610	0.4	1,833.3	10.4
Atlantic herring	571	0.4	61.5	0.4
Atlantic menhaden	426	0.3	144.6	0.8
black sea bass	410	0.3	141.0	0.8
hogchoker	340	0.2	30.7	0.2
American shad	321	0.2	25.3	0.1
clearnose skate	280	0.2	491.7	3
moonfish	262	0.2	3.6	0.0
smallmouth flounder	258	0.2	7.5	0.0
striped bass	170	0.1	278.0	1.6
tautog	135	0.1	128.9	0.7
winter skate	97	0.1	179.8	1
northern kingfish	59	0.0	8.4	0
northern puffer	47	0.0	3.1	0.0
blueback herring	46	0	1.6	0.0
fourbeard rockling	43	0	3.5	0
hickory shad	42	0	14.1	0
blue runner	27	0	2.7	0.0
cunner	20	0	2.8	0
rough scad	19	0	1.1	0
spiny dogfish	16	0	62.8	0
ocean pout	14	0	2.0	0
Atlantic sturgeon	7	0	154.2	1
sea raven	5	0	1.1	0
northern sennet	3	0	0.3	0
striped anchovy	3	0	0.2	0.0
crevalle jack	2	0	0.2	0
goosefish	2	0	0.8	0
pinfish	2	0	0.2	0
round herring	2	0	0.1	0
American sand lance	2	0	0.2	0
African pompano	1	0	0.1	0
conger eel	1	0	0.3	0
gizzard shad	1	0	0.1	0
northern pipefish	1	0	0.1	0
rock gunnel	1	0	0.1	0
roughtail stingray	1	0	5.0	0

species	count	%	weight	%
longhorn sculpin	1	0	0.2	0
white perch	1	0	0.2	0
white mullet	1	0	0.1	0
Total	**159,770**		**17,570.3**	
Finfish not ranked				
anchovy spp, yoy				
Atlantic herring, yoy				
American sand lance (yoy)				
Invertebrates				
horseshoe crab	199	1.7	385.8	30.6
long-finned squid	9,767	84.5	333.9	26.5
spider crab	.	.	162.4	12.9
American lobster	349	3.0	70.0	5.6
boring sponge	.	.	47.9	3.8
lady crab	.	.	45.3	3.6
rock crab	.	.	40.7	3.2
mantis shrimp	846	7.3	26.6	2.1
bushy bryozoan	.	.	20.4	1.6
flat claw hermit crab	.	.	18.3	1.5
blue crab	72	0.6	14.5	1.2
knobbed whelk	36	0.3	13.8	1.1
channeled whelk	76	0.7	13.7	1.1
blue mussel	1	0.0	9.4	0.7
common slipper shell	.	.	9.4	0.7
mixed sponge species	.	.	7.4	0.6
Tubularia, spp.	.	.	5.0	0.4
hydroid spp.	.	.	4.8	0.4
lion's mane jellyfish	50	0.4	4.4	0.3
mud crabs	.	.	3.9	0.3
starfish spp.	.	.	3.3	0.3
northern red shrimp	118	1.0	3.0	0.2
northern moon snail	.	.	1.8	0.1
sand shrimp	.	.	1.7	0.1
arks	.	.	1.4	0.1
hard clams	3	0	1.3	0.1
red bearded sponge	.	.	1.2	0.1
sea grape	.	.	1.1	0.1
deadman's fingers sponge	.	.	0.8	0.1
purple sea urchin	7	0	0.8	0
common oyster	.	.	0.8	0
surf clam	10	0.1	0.8	0
star coral	.	.	0.4	0
rubbery bryozoan	.	.	0.4	0
sea cucumber	3	0	0.4	0
tunicates, misc	16	0	0.4	0
water jelly	4	0	0.3	0
coastal mud shrimp	1	0	0.2	0
northern comb jelly	.	.	0.1	0
moon jelly	.	.	0.1	0
Total	**11,558**		**1,257.9**	

Note: nc= not counted

Appendix 5.4. cont. Total number and weight (kg) of finfish and invertebrates caught in 2013.
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 and American sand lance are not quantified. Number of tows (sample size)=200.

species	count	%	weight	%
butterfish	29,569	35.4	1,252.5	7.9
scup	24,961	29.9	5,945.6	37.5
Atlantic herring	3,566	4.3	321.2	2.0
striped searobin	2,724	3.3	1,112.5	7.0
windowpane flounder	2,096	2.5	326.6	2.1
weakfish	1,964	2.4	203.7	1.3
northern searobin	1,934	2.3	161.7	1.0
spot	1,917	2.3	195.4	1.2
winter flounder	1,912	2.3	576.8	3.6
bluefish	1,829	2.2	517.7	3.3
bay anchovy	1,350	1.6	6.8	0.0
fourspot flounder	1,144	1.4	203.4	1.3
summer flounder	1,071	1.3	726.6	4.6
smooth dogfish	1,051	1.3	2,162.3	13.6
spotted hake	927	1.1	66.8	0.4
moonfish	868	1.0	10.0	0.1
red hake	849	1.0	61.1	0.4
little skate	583	0.7	317.8	2.0
silver hake	519	0.6	23.6	0.1
black sea bass	449	0.5	181.2	1.1
alewife	376	0.5	34.1	0.2
hogchoker	250	0.3	27.2	0.2
Atlantic menhaden	234	0.3	87.5	0.6
American shad	222	0.3	15.3	0.1
clearnose skate	218	0.3	387.0	2.4
striped bass	200	0.2	421.0	2.7
tautog	161	0.2	160.8	1.0
smallmouth flounder	128	0.2	5.2	0.0
winter skate	91	0.1	111.2	0.7
blueback herring	68	0.1	4.3	0.0
hickory shad	33	0.0	10.8	0.1
rough scad	28	0.0	1.3	0.0
red goatfish	21	0.0	0.5	0.0
spiny dogfish	21	0.0	91.5	0.6
cunner	20	0.0	1.8	0.0
northern kingfish	14	0.0	2.3	0.0
American sand lance	7	0.0	0.1	0.0
haddock	5	0.0	0.4	0.0
oyster toadfish	5	0.0	0.9	0.0
Atlantic sturgeon	4	0.0	98.0	0.6
Atlantic silverside	3	0.0	0.3	0.0
northern puffer	3	0.0	0.3	0.0
fourbeard rockling	3	0.0	0.2	0.0
bullnose ray	2	0.0	5.7	0.0
harvestfish	2	0.0	0.2	0.0
northern pipefish	2	0.0	0.2	0.0
conger eel	1	0.0	1.2	0.0
Atlantic croaker	1	0.0	0.1	0.0
glasseye snapper	1	0.0	0.1	0.0
pollock	1	0.0	0.1	0.0
round scad	1	0.0	0.1	0.0
red cornetfish	1	0.0	0.1	0.0
longhorn sculpin	1	0.0	0.4	0.0
striped anchovy	1	0.0	0.1	0.0
northern stargazer	1	0.0	0.1	0.0
Total	**83,413**		**15,843.7**	

species	count	%	weight	%
Finfish not ranked				
anchovy spp, (yoy)				
Atlantic herring, (yoy)				
American sand lance (yoy)				
gadid spp, (yoy)				
Invertebrates				
blue mussel	3	0.0	622.1	31.9
horseshoe crab	265	3.4	531.8	27.3
long-finned squid	5,393	69.6	170.8	8.8
spider crab	nc		156.5	8.0
lion's mane jellyfish	1,067	13.8	150.0	7.7
common slipper shell	nc		61.0	3.1
American lobster	144	1.9	37.3	1.9
bushy bryozoan	nc		26.8	1.4
boring sponge	nc		26.1	1.3
mantis shrimp	646	8.3	21.6	1.1
flat claw hermit crab	nc		21.4	1.1
knobbed whelk	51	0.7	18.7	1.0
channeled whelk	95	1.2	18.6	1.0
hydroid spp.	nc		13.2	0.7
lady crab	nc		13.2	0.7
rock crab	nc		13.0	0.7
blue crab	52	0.7	10.4	0.5
Tubularia, spp.	nc		6.7	0.3
common oyster	nc		5.3	0.3
mud crabs	nc		3.5	0.2
sand shrimp	nc		2.9	0.1
northern moon snail	nc		2.9	0.1
surf clam	8	0.1	2.4	0.1
starfish spp.	1	0.0	2.1	0.1
sea grape	nc		2.1	0.1
arks	nc		1.9	0.1
hard clams	6	0.1	0.9	0.0
comb jelly spp	nc		0.8	0.0
red bearded sponge	nc		0.6	0.0
rubbery bryzoan	nc		0.5	0.0
purple sea urchin	10	0.1	0.5	0.0
coastal mud shrimp	4	0.1	0.3	0.0
deadman's fingers sponge	nc		0.3	0.0
mixed sponge species	nc		0.3	0.0
star coral	nc		0.2	0.0
sea cucumber	2	0.0	0.2	0.0
fan worm tubes	nc		0.1	0.0
ghost shrimp	1	0.0	0.1	0.0
Japanese shore crab	1	0.0	0.1	0.0
northern red shrimp	1	0.0	0.1	0.0
ribbed mussel	nc		0.1	0.0
Total	**7,750**		**1,947.4**	

Note: nc= not counted

Appendix 5.5: Endangered Species Interactions: Thirteen (13) Atlantic sturgeon (ATS) were captured on two of the 199 tows completed in 2014. This yields a lower encounter rate (1.0%) than the average for the LISTS time series of tows (2.4%). One tow occurred over transition bottom type in the 18.3-27.3m depth interval, while the other occurred over sand bottom type in the 5-9m depth interval. All individuals were released alive and uninjured. Each sturgeon was scanned for a passive integrated transponder (PIT). Since no PITs were detected, a PIT was inserted near the base of each dorsal fin. T-bar tags were inserted into sturgeon until the supply ran out (USFWS no longer supplies these tags). All captures were reported to NMFS within 24 hours. Details for each fish are provided below:

Sample	Date	Site	Tow Start	Duration (min)	Species	Total Length (mm)	Fork Length (mm)	Weight (kg)	Left Pec T-bar	Dorsal T-bar	PIT	Photo	Tissue Sample	Release time	Release lat (N)	Release lon (W)
FA2014015	9/15/2014	1228	8:11	30	ATS	1,205	1,065	8.9	NONE	NONE	ADDED	YES	YES	10:03	41.2025	72.5630
FA2014015	9/15/2014	1228	8:11	30	ATS	1,265	1,095	9.6	NONE	NONE	ADDED	YES	YES	10:10	41.2023	72.5622
FA2014015	9/15/2014	1228	8:11	30	ATS	1,357	1,188	13.3	NONE	NONE	ADDED	YES	YES	10:15	41.2017	72.2272
FA2014015	9/15/2014	1228	8:11	30	ATS	1,458	1,280	16.7	ADDED	NONE	ADDED	YES	YES	9:59	41.2025	72.5643
FA2014015	9/15/2014	1228	8:11	30	ATS	1,470	1,282	13.8	ADDED	NONE	ADDED	YES	YES	9:52	41.2027	72.5655
FA2014015	9/15/2014	1228	8:11	30	ATS	1,610	1,425	23.8	ADDED	NONE	ADDED	YES	YES	9:42	41.2027	72.5678
FA2014015	9/15/2014	1228	8:11	30	ATS	1,630	1,443	22.9	ADDED	NONE	ADDED	YES	YES	9:48	41.2027	72.5665
FA2014015	9/15/2014	1228	8:11	30	ATS	1,705	1,508	30.5	ADDED	NONE	ADDED	YES	YES	9:30	41.2027	72.5713
FA2014015	9/15/2014	1228	8:11	30	ATS	1,880	1,625	40.7	ADDED	NONE	ADDED	YES	YES	9:23	41.2028	72.5732
FA2014015	9/15/2014	1228	8:11	30	ATS	1,905	1,655	35.4	ADDED	NONE	ADDED	YES	YES	9:36	42.2027	72.5698
FA2014015	9/15/2014	1228	8:11	30	ATS	2,010	1,780	42.3 (est)	ADDED	NONE	ADDED	YES	YES	9:12	41.2030	72.5765
FA2014067	10/29/2014	1533	9:46	30	ATS	1,020	880	5.4	NONE	NONE	ADDED	YES	YES	10:40	41.2456	72.3479
FA2014067	10/29/2014	1533	9:46	30	ATS	1,190	1,035	9.1	NONE	NONE	ADDED	YES	YES	10:35	41.2467	72.3453

Appendix 5.6: Cold and warm temperate species captured in LISTS. Thirty-three (33) species are included in the cold temperate group, while thirty-four (34) species are included in the warm temperate group. Cold temperate species are defined as being more abundant north of Cape Cod, MA than south of New York, behaviorally adapted to cold temperatures including subfreezing but prefers ~3-15^{0}C, and spawns at lower end of temperature tolerance. Warm temperate species are defined as being more abundant south of New York than north of Cape Cod, MA, behaviorally avoids temperatures < 7-10^{0}C; prefers ~11-22^{0}C, and spawns at higher end of temperature tolerance.

Cold Temperate Group	
Common Name	Scientific Name
alewife	*Alosa pseudoharengus*
American plaice	*Hippoglossoides platessoides*
Atlantic herring	*Clupea harengus*
Atlantic cod	*Gadus morhua*
Atlantic mackerel	*Scomber scombrus*
Atlantic salmon	*Salmo salar*
Atlantic seasnail	*Liparis atlanticus*
Atlantic sturgeon	*Acipenser oxyrinchus*
Atlantic tomcod	*Microgadus tomcod*
barndoor skate	*Dipturus laevis*
cunner	*Tautogolabrus adspersus*
fawn cusk-eel	*Lepophidium profundorum*
fourspot flounder	*Hippoglossina oblonga*
grubby	*Myoxocephalus aeneus*
haddock	*Melanogrammus aeglefinus*
little skate	*Leucoraja erinacea*
longhorn sculpin	*Myoxocephalus octodecemspinosus*
lumpfish	*Cyclopterus lumpus*
monkfish (goosefish)	*Lophius americanus*
northern pipefish	*Syngnathus fuscus*
ocean pout	*Zoarces americanus*
pollock	*Pollachius virens*
rainbow smelt	*Osmerus mordax*
red hake	*Urophycis chuss*
rock gunnel	*Pholis gunnellus*
rockling	*Enchelyopus cimbrius*
searaven	*Hemitripterus americanus*
spiny dogfish	*Squalus acanthias*
whiting (silver hake)	*Merluccius bilinearis*
windowpane	*Scophthalmus aquosus*
winter flounder	*Pseudopleuronectes americanus*
winter skate	*Leucoraja ocellata*
yellowtail flounder	*Limanda ferruginea*

Warm Temperate Group	
Common Name	Scientific Name
American eel	*Anguilla rostrata*
American shad	*Alosa sapidissima*
Atlantic bonito	*Sarda sarda*
Atlantic croaker	*Micropogonias undulates*
Atlantic silversides	*Menidia menidia*
black seabass	*Centropristis striata*
blueback herring	*Alosa aestivalis*
bluefish	*Pomatomus saltatrix*
butterfish	*Peprilus triacanthus*
clearnose skate	*Raja eglanteria*
conger eel	*Conger oceanicus*
gizzard shad	*Dorosoma cepedianum*
hickory shad	*Alosa mediocris*
hogchoker	*Trinectes maculates*
lined seahorse	*Hippocampus erectus*
menhaden	*Brevoortia tyrannus*
naked goby	*Gobiosoma bosci*
northern kingfish	*Menticirrhus saxatilis*
northern puffer	*Sphoeroides maculates*
northern searobin	*Prionotus carolinus*
oyster toadfish	*Opsanus tau*
scup (porgy)	*Stenotomus chrysops*
sea lamprey	*Petromyzon marinus*
smallmouth flounder	*Etropus microstomus*
smooth dogfish	*Mustelus canis*
spot	*Leiostomus xanthurus*
spotted hake	*Urophycis regia*
striped bass	*Morone saxatilis*
striped cusk-eel	*Ophidion marginatum*
striped searobin	*Prionotus evolans*
summer flounder	*Paralichthys dentatus*
tautog (blackfish)	*Tautoga onitis*
white pearch	*Morone Americana*
weakfish	*Cynoscion regalis*

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JOB 7: ALOSINE SURVEY

JOB 7: INSHORE SURVEY

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JOB 7: AMERICAN SHAD MONITORING AND INSHORE SEINE SURVEYS

GOAL

To monitor relative abundance and distribution of American shad and other fish in Connecticut's nearshore waters.

OBJECTIVES

Provide:
1) Information on the adult American shad spawning population: commercial catch, age structure, sex ratio and size.
2) Annual indices of relative abundance for juvenile shad, blueback herring and common nearshore marine species.

STUDY PERIOD AND AREA

This report contains information on adult American shad monitoring and seine studies on juvenile American shad (*Alosa sapidissima*), blueback herring (*Alosa aestivalis*), menhaden (*Brevoortia tyrannus*) and common nearshore marine species in 2014. Areas of the Connecticut River sampled range from Holyoke, MA to Essex, CT. The Thames River seine survey begins just south of Norwich Harbor and ends in Uncasville, CT. Time series data collected under a previous funding source are also included.

INTRODUCTION

Annual spawning migrations of American shad in the Connecticut River have supported both recreational and commercial fisheries in the State of Connecticut, as well as recreational fisheries in upriver states, for generations. There is currently a small commercial driftnet fishery that occurs in the lower Connecticut River. Connecticut requires an annual commercial shad license for the Connecticut River. The fishery is managed through area, gear, and season restriction as well as rest days. The Connecticut River is the state's only occurrence of a commercial shad fishery. American shad were once one of Connecticut's top five most economically important commercial finfish species in terms of landings. The commercial fishery occurs in the main stem of the Connecticut River south of the Putnam Bridge in Glastonbury, CT. The recreational fishery predominantly occurs north of Hartford, CT at River Kilometer (RKM) 83 and south of the Holyoke Dam in Massachusetts (RKM 139).

The Connecticut Department of Energy and Environmental Protection (CT DEEP) has conducted annual research studies on adult American shad in the CT River since 1974, to monitor annual changes in stock composition. Data are collected from mandatory annual reporting of commercial landings. Landings information is compiled and used to estimate the maximum losses to the spawning stock from fishing. The Massachusetts Division of Fish and Wildlife monitors fish passage, which includes adult American shad passage, at the first main stem dam on the CT River in Holyoke, Massachusetts. Data on the recreational fisheries are monitored periodically by a

roving creel survey. Juvenile shad are monitored by CT DEEP through an annual seine survey conducted since 1978. Sampling was expanded to the Thames River system after 1996 to monitor the effect of the operation of the Greenville Dam fish lift on anadromous fish restoration. CT DEEP initiated the seine survey in the Thames River to estimate juvenile production of shad and blueback herring. Sites were chosen based on previous work conducted by the department. The survey has documented few juvenile shad and river herring, but has been continued to monitor catches of forage fish and juvenile fish of recreationally important species such as menhaden, tautog *(Tautoga onitis*), winter flounder (*Pseudopleuronectes americanus*) and bluefish (*Pomatomus saltatrix*).

METHODS

American shad adults

Commercial fishermen are required by regulation to report daily landings and fishing effort for American shad annually to CT DEEP. Landings information was compiled and used to estimate the maximum losses to the spawning stock from fishing. Harvest was tallied by pounds and number of shad landed by sex.

The adult American shad age structure and sex ratio were calculated from samples collected at the Holyoke Dam Fish lift, located at river kilometer 140, in Holyoke, MA. Information on the number of fish lifted daily, the number of lift days (days the lift is in operation) and the daily sex ratio at Holyoke were obtained from the Massachusetts Division of Fisheries. The annual sex ratio was calculated by weighting the daily sex ratios by the number of fish lifted daily. A daily subset of fish lifted are sampled for scales. In 2014, all scale samples were obtained from the Holyoke Fish lift. In previous years, samples were collected in the lower portion of the CT River, but this effort was discontinued due to limited staff availability.

Adult shad collected at the Holyoke Lift were sexed, measured to fork length (mm) and 15-25 scales removed. All scale samples collected were separated by sex and stratified into 1 cm length groups. Scale samples were processed by cleaning with an ultrasonic cleaner and pressed onto acetate for aging. Age determinations were made as the consensus of two or more readers of projected images (43x) counting annuli and spawning scars according to the criteria of Cating (1953). Repeat spawners were noted by the presence of spawning scar(s) at the periphery of the scale. The age and repeat spawning frequency were extrapolated to the annual lift count by direct proportion.

Juvenile Surveys:

Connecticut River Seine Survey

A single seine haul was conducted at seven fixed locations one day a week from July 16th through October 15th, 2014. Seine haul locations and techniques were identical to those used in past Connecticut River seine surveys. The sampling sites were previously chosen based on location, physical conditions and accessibility (Marcy 2004, Crecco et. al. 1981, Savoy and Shake 1993). The seven stations were sampled during daylight hours with an 18.3 m nylon bag seine (0.5 cm delta mesh) and 30.5 m lead ropes. The seine was fished with the aid of a boat to deploy it upstream

and offshore to sweep down through the site. Using the lead ropes, the seine was towed in a downstream arc to the shore and beached. Clupeids (*Alosa sapidissima, A. aestivalis, A. pseudoharengus,* and *Brevoortia tyrannus*) were returned to the laboratory for measurement and identification. In the laboratory, juvenile clupeids were identified to species by the criteria of Lippson and Moran (1974) and counted. For each sample, up to 40 randomly selected clupeids of each species were measured to total length (mm). All fish species other than family clupeidae, were identified, quantified or estimated and released. Invertebrate species are either counted or noted as present.

A relative abundance index was calculated as a geometric mean catch per unit effort for both shad and blueback herring. The geometric mean is the preferred method when reporting to ASMFC for annual compliance reports because it normalizes clustered data. See Job 5 (Gottschall and Pacileo 2013) for methods used to calculate the geometric mean.

Thames River Seine Survey

Eight fixed stations were sampled twice a month from July 17th through August 28th. The method of seine deployment, gear used and sample processing in the Thames River was identical to that used for the Connecticut River seine survey.

RESULTS

Commercial Fishery Landings

The Connecticut River American shad commercial fishery took 12,953 fish in 2014 which is a 34% increase from the 2013 landings (Figure 7.1). The 2014 commercial harvest ranked 10th lowest out of last 25 years. The catch is reported as pounds and is converted to numbers of fish by sex (Table 7.1). Sixteen commercial shad licenses were sold in 2014, a number licenses comparable to recent years (Table 7.1, Figure 7.2). Shad landings appear consistent with the fluctuations of passage at the Holyoke fish lift (Figure 7.3), which supports the assertion that the lift numbers represent a consistent percentage of the annual shad spawning stock in the Connecticut River.

Nine boats reported landings in 2014. The number of shad boats fishing annually continues to remain low as few new participants enter the fishery (Figure 7.4). Some shad fishermen continue to purchase the license even if they have not actively fished in several years.

Commercial shad catch reports were skewed towards females (88%), with males accounting for 12% of the reported landings (Table 7.1). Males are most likely underreported, less represented in the catch due to mesh size selectivity, or a combination of the two factors. Male shad are less valuable to sell to markets.

Connecticut River Adult American shad

The Holyoke Fish lift was open for fish passage from April 24 through July 15, 2014 except for closings due to high water or operational factors. Total lift numbers of American shad at the Holyoke Dam were obtained from the Massachusetts Division of Fisheries and Wildlife. The number of shad passed at Holyoke in 2014 (370,506) was the 11th highest value since 1975 (Figure 7.3). The number of American shad lifted upstream annually at the Holyoke Dam has been highly variable through the time series, however 2014 was well above the long term mean of 301,000 (median = 289,000, range 110,000 to 720,000).

The 2014 shad run sex ratio was derived from information collected at the Holyoke fish lift which is located at River Kilometer 140, upstream of both the commercial and sport fisheries. The combined impact of these small fisheries is likely not significant enough to affect the composition of the run. The weighted sex ratio of shad sampled at Holyoke was 66% male and 34% female (Figure 7.5).

American shad scales (n=513) were collected on 29 days over a 66 day span during lift operation. The shad age structure from scale samples was expanded based on the number of fish lifted at Holyoke Dam. Scale samples that were able to be aged totaled 496 (187 females and 309 males). Samples not aged had either regenerated scales or were missing data on the fish.

Length frequency of American shad collected at the Holyoke lift ranged from 32.0 to 49.0 cm FL for male shad and 37.0 to 53.5 cm FL among female shad. Length frequencies of both sexes were fairly normally distributed (Figures 7.5 and 7.6). Average size among males was 40.6 cm FL and among females was 46.4 cm FL.

The 2014 male population of spawning adult shad was produced from the 2008-2010 year classes. A large percentage (56%) of male shad scales examined were from four year old fish, while 35% were from 5 year old fish and 6% were 3 year old fish. Six and seven year old fish represented 3.2% and 0.3 % of the population, respectively (Table 7.2).

The majority of female shad (61%) sampled in 2014 were five year old fish from the 2009 year class. Six year old fish contributed to 21.9% of the 2014 run and 12.3% were 4 year old fish. Seven year old fish represented 4.3%. The incidence of overall repeat spawning in 2014 increased. The percentage of repeat spawning fish was 15.9% for males and 22.5% among females, with an overall repeat spawn rate of 18.4% (Table 7.2).

Seine Survey

Juvenile collections in the Connecticut River were conducted from July 16th through October 15th, 2014. A total of 3,358 juvenile American shad were collected for the season (Table 7.3). The highest catch in 2014 was 604 shad collected at the Wilson site (RKM 89) in early September, representing 49% of the total Wilson catch for the season and 18% of the overall catch (Table 7.3). The stations with the largest proportion of the season's catch were Holyoke (43%) and Wilson (36%). A total of 4,903 blueback herring were collected in 2014 (Table 7.4).

The geometric mean CPUE for shad in 2014 more than doubled from 2013 and ranks as the 9th largest in the time series (Table 7.5). The annual index of juvenile abundance (geometric mean catch/haul) has varied without trend over the time series. The geometric mean CPUE for American shad was slightly more than double that of blueback herring.

In the 90 hauls completed in 2014, over 35,000 fish representing 29 species or taxonomic groups were collected (Table 7.6). To minimize mortality and to facilitate returning large catches of fish quickly to the water, some fish were identified only to the family or genus level (e.g. sunfish, catfish, killifish). Large catches of common species estimated with a visual count to minimize handling and processing time. Estimated catches are noted as such in the database. In 2014, the most abundant species collected were menhaden, shiners, blueback herring and American shad. Shiners, juvenile shad, yellow perch (*Perca flavescens*), sunfish and juvenile bluebacks had the five highest frequencies of occurrence (Table 7.6).

The ratio of blueback catches to shad varied seasonally in 2014 (Figure 7.6) as well as through the time series (Figure 7.7). In 2014, blueback catches exceeded shad catches. Historically, blueback catches would far exceed those of American shad. The 2014 *Alosa spp.* CPUE indices were both below average. The blueback geometric mean CPUE is the 7th lowest in the time series.

Annual catches of American shad by station over time has been variable with Holyoke and Wilson typically being the sites with the largest annual catches of juvenile shad (Figure 7.8). The Enfield and Glastonbury sites provided the lowest catches of the season again in 2014. The southernmost station (Essex) produced the highest number of zero catches and fifth lowest catch of the season. The Salmon River site ranks as the highest total catch for blueback herring, with 47% of the season's catch. The single highest seine haul of bluebacks was at Salmon River on August 13th (574) but was only 12% of the season's total catch of blueback herring (Table 7.4).

Thames River Seine Survey

The 2014 Thames River survey was conducted bi-weekly from July 17th through August 28th with 27 seine hauls. Over 32,000 fish were collected representing 45 groups or species (Table 7.8). Atlantic silversides had the highest presence in the catch (28%), followed by menhaden, bluefish and *Fundulus spp.* Other notable species collected in 2014 were: Winter flounder, striped bass (*Marone saxatilis*), scup (*Stenotomus chrysops*), snapper bluefish, summer flounder (*Paralichthys dentatus*) and tautog. A longhorn sculpin (*Myoxocephalus octodecemspinosus*) was collected for the first time in this survey in 2014.

Over the time series, menhaden catches have varied widely from a low in 2013 of just 31 fish to over a million fish collected in 2000. The 2014 menhaden index, geometric mean CPUE 22.78, ranked third highest out of 17 (Table 7.8). Juvenile menhaden catches have been variable with the lowest CPUE in 2013 (0.14) and a peak geometric mean CPUE of 117.5 in 2002.

MODIFICATIONS

Job 7 will not be active during the next grant period as the work is being transferred to another source of funds.

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Table 7.1. Annual American shad commercial fishery harvest. Landings are reported by weight (lbs.) and counts, by sex, 1990-2014.

Year	Total lbs.	# Male	Male Wt (lbs.)	Mn Wt Male	# Female	Female Wt (lbs.)	Mn Wt Female	# of Boats	Total Trips
1990	259,425	8,568			21,142			20	402
1991	149,300	9,174			23,112			21	416
1992	144,300	7,171			26,768			16	410
1993	96,660	5,173			17,790			15	332
1994	104,000	1,812			19,400			16	312
1995	61,576	1,862	5,893	3.2	12,299	55,682	4.5	19	352
1996	66,757	2,298	6,941	3	13,660	59,816	4.4	13	264
1997	91,003	2,812	10,275	3.7	18,743	80,728	4.3	11	271
1998	89,342	2,983	9,440	3.2	18,529	79,902	4.3	12	280
1999	44,574	872	3,373	3.9	9,506	41,201	4.3	11	195
2000	107,416	2,342	7,491	3.2	21,228	99,925	4.7	11	210
2001	59,234	1,469	3,980	2.7	13,074	55,254	4.2	13	193
2002	108,099	7,153	22,555	3.2	20,653	85,544	4.1	11	248
2003	111,127	5,176	17,518	3.4	21,244	93,609	4.4	14	249
2004	66,328	2,456	8,000	3.3	13,436	58,328	4.3	14	226
2005	69,333	1,873	6,136	3.3	15,336	67,070	4.4	12	218
2006	38,547	1,864	5,445	2.9	7,372	33,102	4.5	12	185
2007	51,572	1,688	5,701	3.4	9,888	43,497	4.4	13	199
2008	28,419	858	2,637	3.1	6,486	25,782	4	10	203
2009	40,680	1156	4,045	3.5	6,437	32,187	5	13	182
2010	24,641	855	2,994	3.5	4,238	21,192	5	7	202
2011	32,183	953	3,334	3.5	5,772	28,849	5	8	218
2012	61,623	2,810	9,835	3.5	10,358	51,788	5	9	160
2013	40,598	1,249	4,371	3.5	7,245	36,227	5	5	85
2014	61,544	2,147	7,516	3.5	10,806	54,028	5	9	160

Table 7.2. Fishery independent spawning history and age distribution of American shad in the upper Connecticut River, 2014

2014 American Shad Age Structure							
	3	**4**	**5**	**6**	**7**	**Total**	**% Repeat Spawn**
Bucks	18	173	108	10	1	309	15.86
%	5.8	56.0	35.0	3.2	0.3		
Shad (n)	14,245	136,907	85,468	7,914	791	244,534	
		4	**5**	**6**	**7**	**Total**	**% Repeat Spawn**
Roes		23	114	41	8	187	22.46
%		12.3	60.96	21.93	4.28		
Shad (n)		15,494	76,796	27,620	5,389	125,298	
	3	**4**	**5**	**6**	**7**		**% Repeat Spawn**
Combined	18	196	222	51	9	496	18.35
%	3.63	39.52	44.76	10.28	1.81		
Shad (n)	13,446	146,410	165,831	38,096	6,723	370,506	

Table 7.3. Catch and effort of juvenile American shad from the 2014 CT River seine survey.

Date	HOLYOKE	ENFIELD	WILSON	GLASTONBURY	SALMON RIVER	DEEP RIVER	ESSEX	Catch	Effort
7/16/2014	3	25	3	0	20	4	27	82	7
7/23/2014	0	11	46	2	2	42	6	109	7
7/30/2014	214	19	6	4	6	6	0	255	7
8/6/2014	0	20	143	10	6	3	40	222	7
8/13/2014	472	0	94	32	16	72	17	703	7
8/20/2014	1	0	162	6	8	22	41	240	7
8/27/2014	76	19	47	12	3	10	0	167	7
9/3/2014	39	1	74	0	7	20	0	141	7
9/10/2014	104	0	604	5	16	4	19	752	7
9/17/2014	17	0	18		11	6	0	52	6
9/24/2014	360	0	0		43	17	0	420	6
10/1/2014	144		17		9	12	0	182	5
10/8/2014	0		9		8	0	0	17	5
10/15/2014	0		0		8	0	8	16	5
Total	1430	95	1223	71	163	218	158	3358	90

Table 7.4. Catch and effort of juvenile blueback herring from the 2014 CT River seine survey.

Date	HOLYOKE	ENFIELD	WILSON	GLASTONBURY	SALMON RIVER	DEEP RIVER	ESSEX	Catch	Effort
7/16/2014	0	0	1	0	5	16	20	42	7
7/23/2014	0	1	0	0	3	42	56	102	7
7/30/2014	0	0	0	1	6	0	0	7	7
8/6/2014	0	0	1	1	273	77	178	530	7
8/13/2014	0	0	0	37	574	0	0	611	7
8/20/2014	0	0	0	23	188	411	20	642	7
8/27/2014	0	0	0	3	44	0	5	52	7
9/3/2014	0	0	0	0	490	439	0	929	7
9/10/2014	0	0	0	7	162	18	0	187	7
9/17/2014	0	0	0		460	452	0	912	6
9/24/2014	0	0	0		33	556	0	589	6
10/1/2014	0		0		48	116	0	164	5
10/8/2014	0		1		0	8	80	89	5
10/15/2014	0		0		3	4	40	47	5
Total	0	1	3	72	2289	2139	399	4903	90

Table 7.5. Geometric mean relative abundance index (CPUE) of juvenile American shad and blueback herring, 1978-2014.

Year	Juv Shad	Juv BBH
1978	5.89	
1979	7.84	24.8
1980	9.21	26.75
1981	6.05	11.49
1982	1.81	6.09
1983	4.99	16.47
1984	3.37	11.57
1985	7.14	18.23
1986	6.29	13.61
1987	9.89	21.58
1988	5.68	17.04
1989	4.85	7.52
1990	10.39	14.41
1991	3.92	11.36
1992	7.21	9.87
1993	9.49	14.43
1994	12.22	13.92
1995	1.34	5.03
1996	6.5	5.91
1997	6.75	9.66
1998	3.65	4.39
1999	5.47	5.57
2000	4.42	4.17
2001	2.73	3.83
2002	5.55	3.95
2003	6.88	5.88
2004	5.62	2.36
2005	10.08	4.1
2006	1.82	3.5
2007	8.15	6.61
2008	5.06	2.2
2009	3.4	1.77
2010	10.23	12.82
2011	3.08	2.93
2012	3.03	2.22
2013	3.16	6.89
2014	8.03	3.69

Table 7.6. List of fish species or group and percent frequency of occurrence of fish collected in Connecticut River seine survey, 2008-2014.
**includes more than one species*

Species	2008	2009	2010	2011	2012	2013	2014
alewife	6.98	9.28	7.77	12.05	14.77	6.59	6.67
American eel	13.95	19.59	17.48	8.43	18.18	12.09	12.22
American shad	61.63	60.82	72.82	63.86	48.86	63.74	75.56
Atlantic needlefish					3.41	1.1	
Atlantic silverside	3.49	5.15	14.56	2.41	12.5		4.44
bay anchovy	2.33	2.06	0.97	4.82	10.23	6.59	5.56
black crappie	13.95	6.19	20.39	20.48	21.59	18.68	16.67
blue crab		7.22	17.48	6.02	12.5	12.09	5.56
blueback herring	46.51	36.08	60.19	45.78	36.36	51.65	45.56
bluefish	1.16	6.19	11.65	6.02	12.5	5.49	8.89
carp	4.65	5.15	19.42	12.05	15.91	15.38	3.33
catfish*	16.28	11.34	27.18	10.84	15.91	17.58	24.44
crevalle jack			3.88				
fallfish	4.65	3.09	3.88	2.41	3.41	5.49	4.44
gizzard shad			4.85		1.14		
goby		1.03					
golden shiner	15.12	12.37	28.16	15.66	19.32	13.19	8.89
hickory shad	4.65	3.09				1.1	2.22
hogchoker	2.33	8.25	15.53	18.07	18.18	26.37	10
killifish & mummichog*	43.02	27.84	37.86	55.42	42.05	41.76	35.56
largemouth bass	26.74	18.56	25.24	19.28	26.14	13.19	23.33
menhaden	3.49	11.34	13.59	4.82	18.18	12.09	26.67
northern kingfish			0.97				
northern pike	13.95	5.15	1.94	9.64	5.68	8.79	13.33
chain pickerel	1.16		0.97	4.82	3.41		
pipefish			4.85	1.2	2.27		
rock bass	19.77	5.15	25.24	13.25	10.23	2.2	10
smallmouth bass	39.53	14.43	20.39	30.12	22.73	23.08	28.89
shiner*	73.26	59.79	64.08	65.06	55.68	51.65	75.56
stickleback*	4.65	5.15	13.59	1.2	1.14	1.1	4.44
striped bass			2.91	2.41	1.14	2.2	3.33
summer flounder	1.16				1.14		
sunfish*	52.33	38.14	59.22	53.01	57.95	48.35	46.67
tessellated darter	33.72	26.8	31.07	30.12	39.77	29.67	36.67
white perch	22.09	7.22	18.45	16.87	10.23	1.1	4.44
white sucker	11.63	12.37	27.18	12.05	9.09	4.4	37.78
winter flounder			0.97				
yellow perch	47.67	29.9	44.66	50.6	35.23	50.55	55.56

Table 7.7. List of fish species or group and percent frequency of occurrence of fish collected in Thames River seine survey, 2005-2014. **includes more than one species*

Species	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
alewife	6.67	1.56	17.86	1.59	8.06	1.77	5.36	7.50	5.26	1.11
American eel		6.25		1.59	4.84	0.71	1.79	2.50	1.32	
American shad			5.36		6.45		1.79	5.00		
Atlantic herring					3.23					
Atlantic needlefish	6.67	1.56								1.11
Atlantic silverside	80.00		82.14	74.60	80.65	21.63	98.21	100.00	75.00	27.78
bay anchovy		10.94	7.14	14.29	9.68	3.55	10.71	27.50	10.53	1.11
blueback herring			1.79	1.59	1.61	0.35		2.50	2.63	2.22
bluefish	60.00	45.31	44.64	31.75	46.77	15.25	41.07	85.00	48.68	13.33
brown trout							1.79			
butterfish	3.33			1.59	4.84	1.06	1.79			1.11
carp		1.56	1.79			0.35				
catfish*				1.59						
crevalle jack	23.33	12.50	5.36	1.59	11.29	3.55				1.11
cunner					1.61			5.00		
darter				1.59			1.79			
gizzard shad								2.50		
golden shiner							1.79		1.32	
hogchoker							17.86	7.50	7.89	3.33
horseshoe crab	3.33									
killifish & mummichog*	43.33	25.00	32.14	42.86	20.97	6.03	69.64	52.50	60.53	12.22
longhorn sculpin										1.11
largemouth bass		1.56							2.63	
lizardfish		6.25	5.36					2.50	1.32	
menhaden	20.00	35.94	42.86	12.70	22.58	2.13	17.86	50.00	10.53	15.56
naked goby		3.13	8.93	9.52		1.77	16.07	15.00	9.21	3.33
northern kingfish	3.33						7.14	10.00	1.32	1.11
northern pike	3.33						3.57			
oyster toadfish						0.35				
pipefish	13.33	15.63	26.79	11.11	9.68	1.42		20.00	3.95	
scup	6.67		14.29					20.00	1.32	1.11
sheepshead minnow	3.33		3.57	3.17			1.79		2.63	
spot			1.79	1.59				10.00	1.32	
spottaill shiner	6.67	9.38	3.57	6.35	3.23	1.06	7.14	5.00		3.33
stickleback*	16.67	12.50	5.36	36.51	32.26	2.13	42.86	5.00	11.84	3.33
striped bass	3.33	6.25	21.43	11.11	8.06	1.77	7.14	17.50	21.05	1.11
striped mullet									5.26	
striped sea robin			3.57					2.50		
summer flounder		4.69	5.36	15.87	4.84	0.35	3.57		10.53	6.67
sunfish*		1.56					7.14		3.95	1.11
tautog	20.00	6.25	21.43	12.70	1.61	1.77	3.57	12.50	2.63	
tomcod			3.57	4.76	3.23	0.35	1.79	2.50	5.26	
white mullet		4.69		3.17	1.61	3.90	1.79	7.50	2.63	
white perch	13.33	3.13	8.93	1.59	1.61	0.35	1.79		2.63	
white sucker									1.32	
windowpane flounder			7.14				1.79			
winter flounder	23.33	10.94	37.50	26.98	9.68	1.77	3.57	20.00	15.79	4.44
yellow perch									1.32	

Table 7.8. Number collected, number of seine hauls and geometric mean catch per haul (G Mn) of Thames River juvenile menhaden, 1998-2014.

Year	Menhaden	Seine Hauls	G Mn
1998	429,209	151	12.63
1999	594,724	144	20.61
2000	1,020,000	112	50.25
2001	5,458	119	2.13
2002	840,458	55	117.46
2003	248,984	80	12.78
2004	30,274	56	3.91
2005	3,118	30	1.19
2006	129,719	64	6.08
2007	100,082	56	6.39
2008	195	63	0.37
2009	39,909	62	2.11
2010	212	64	0.18
2011	418	56	0.58
2012	8,662	40	3.49
2013	31	76	0.14
2014	27,332	27	22.78

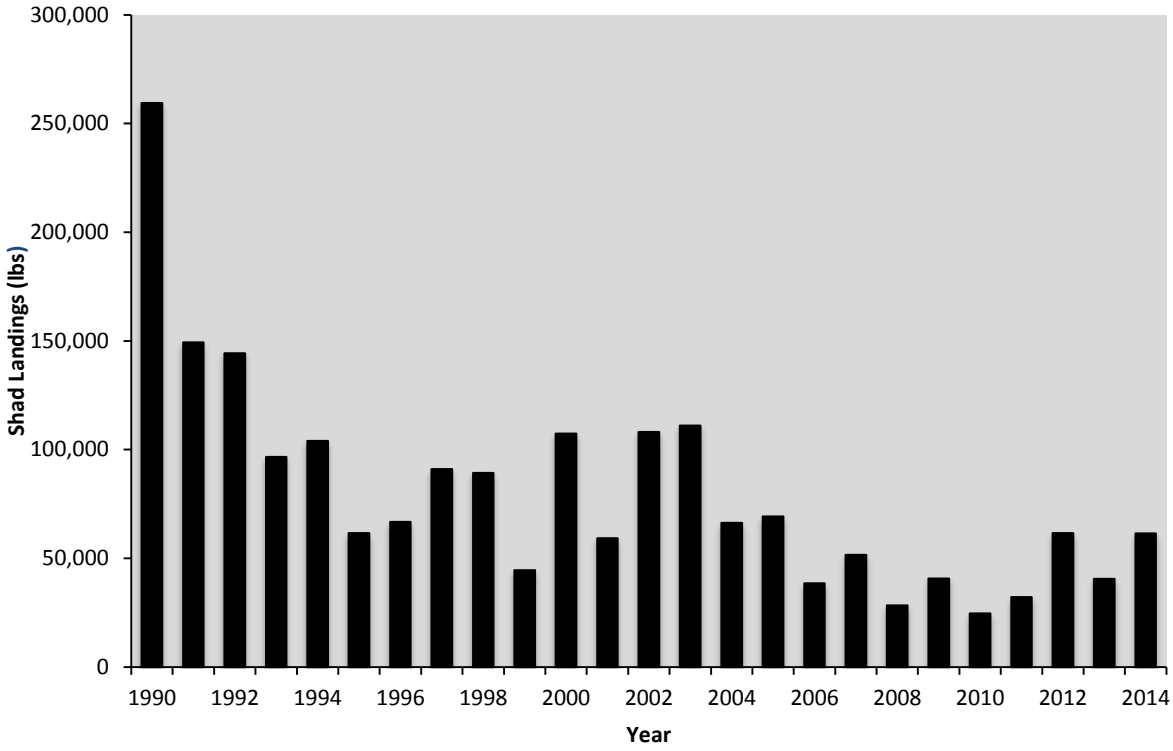

Figure 7.1 Commercial Landings (lbs) for Adult American shad, 1990-2014.

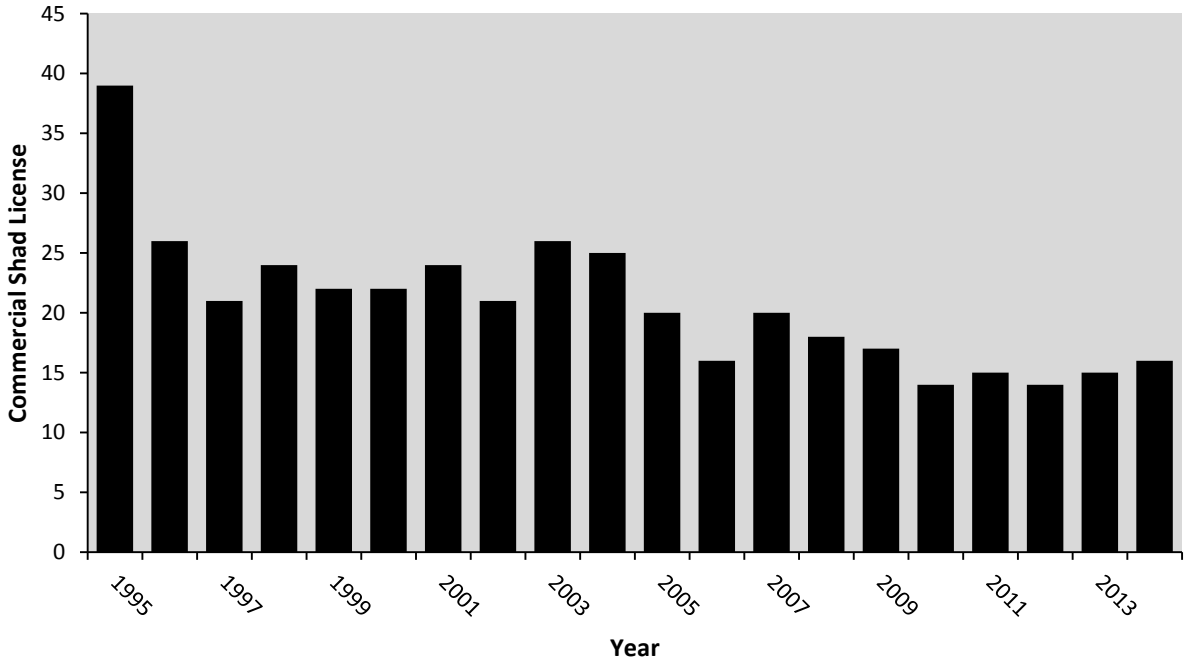

Figure 7.2. Number of Commercial shad license sales, 1995-2014.

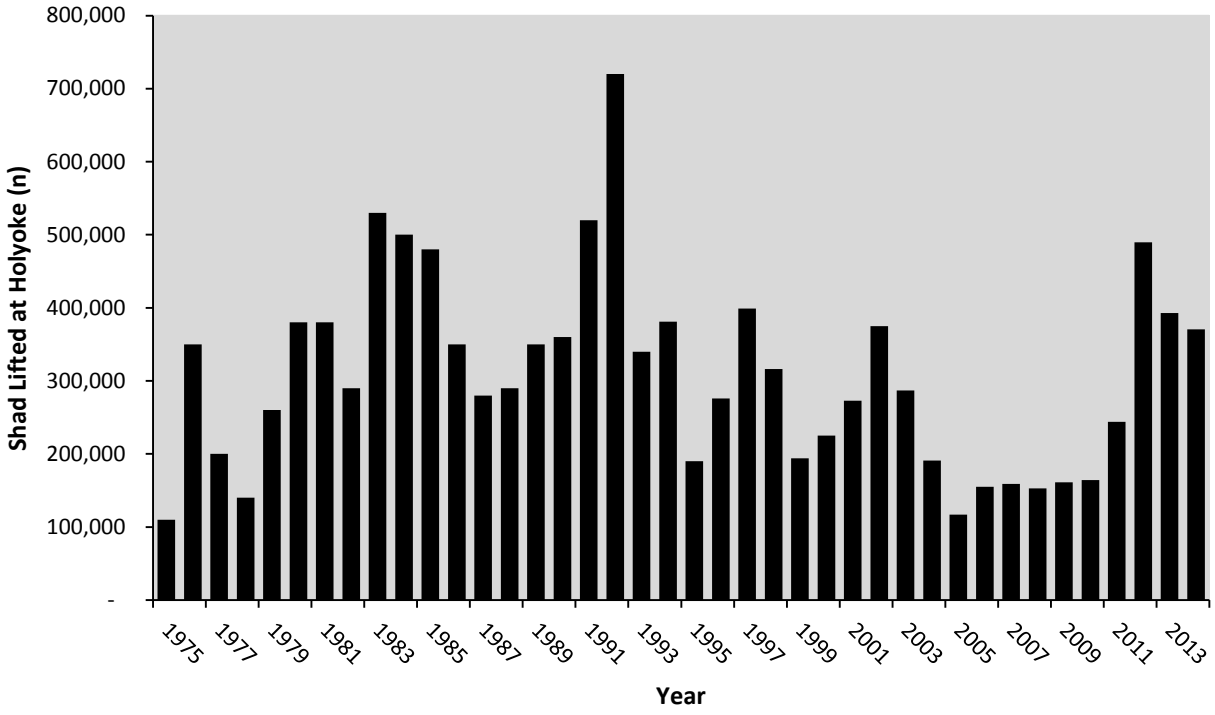

Figure 7.3. Number of adult shad lifted at the Connecticut River Holyoke Dam (RKM 140), 1975-2014.

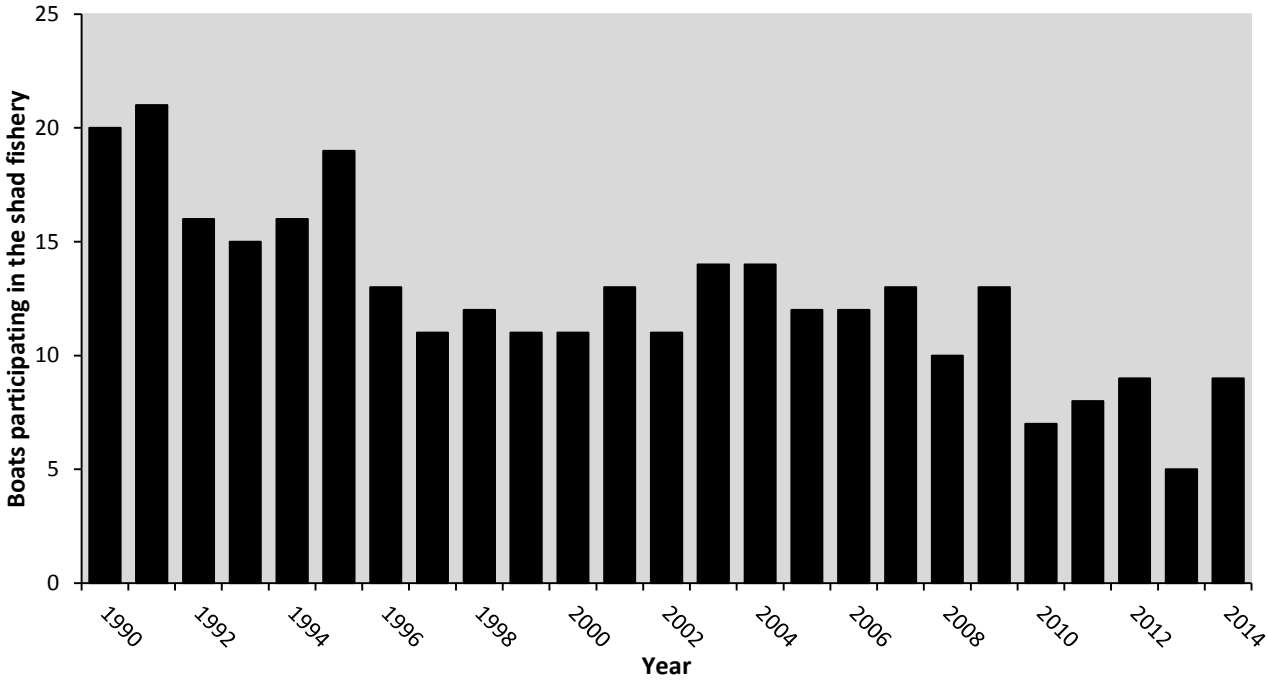

Figure 7.4. Number of boats participating in the commercial shad fishery, 1990-2014.

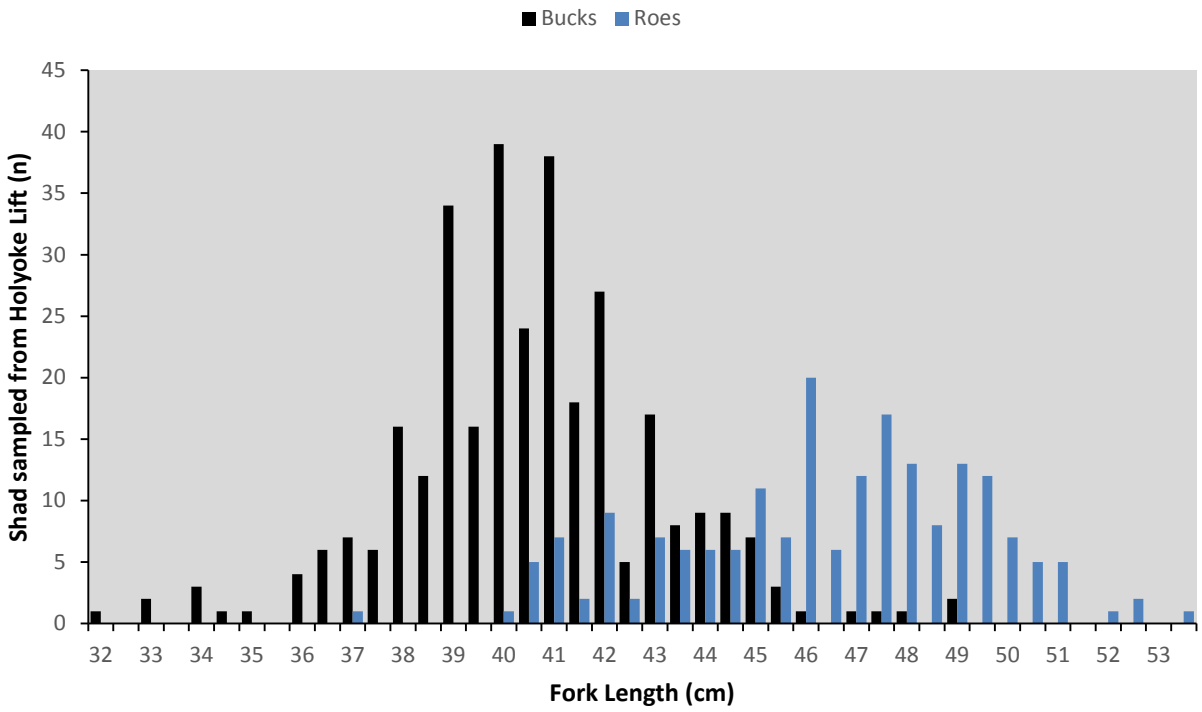

Figure 7.5 American shad length frequencies (FL, cm) by sex based on collections at the Holyoke Lift, 2014.

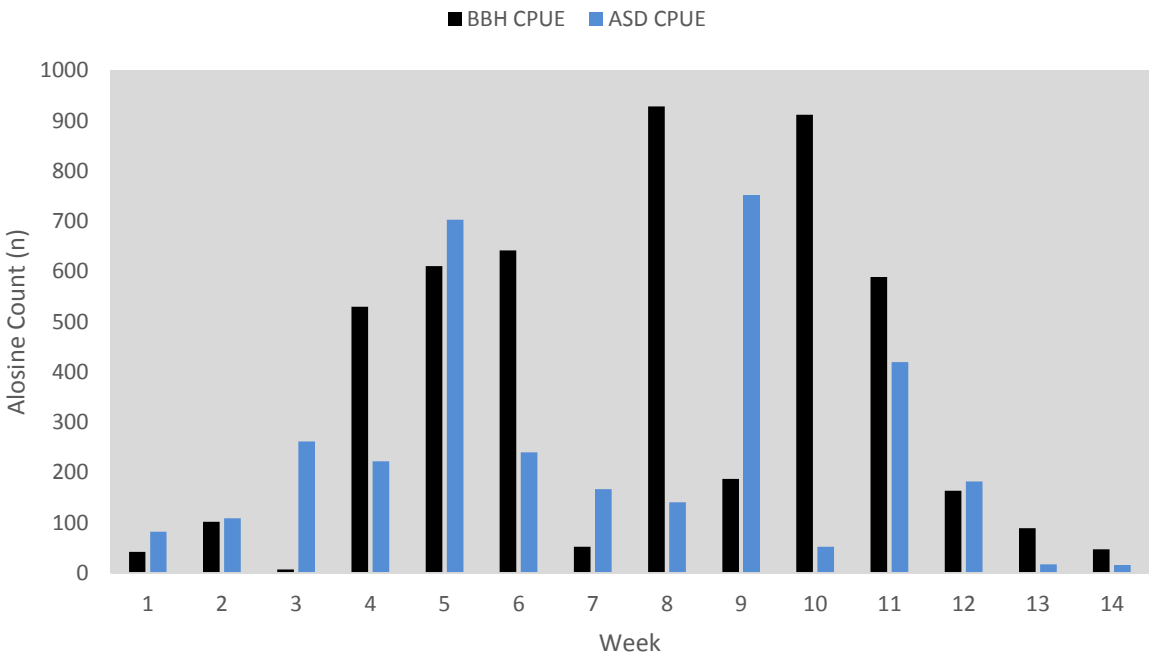

Figure 7.6. Weekly catch per unit effort of juvenile shad and blueback herring, 2014.

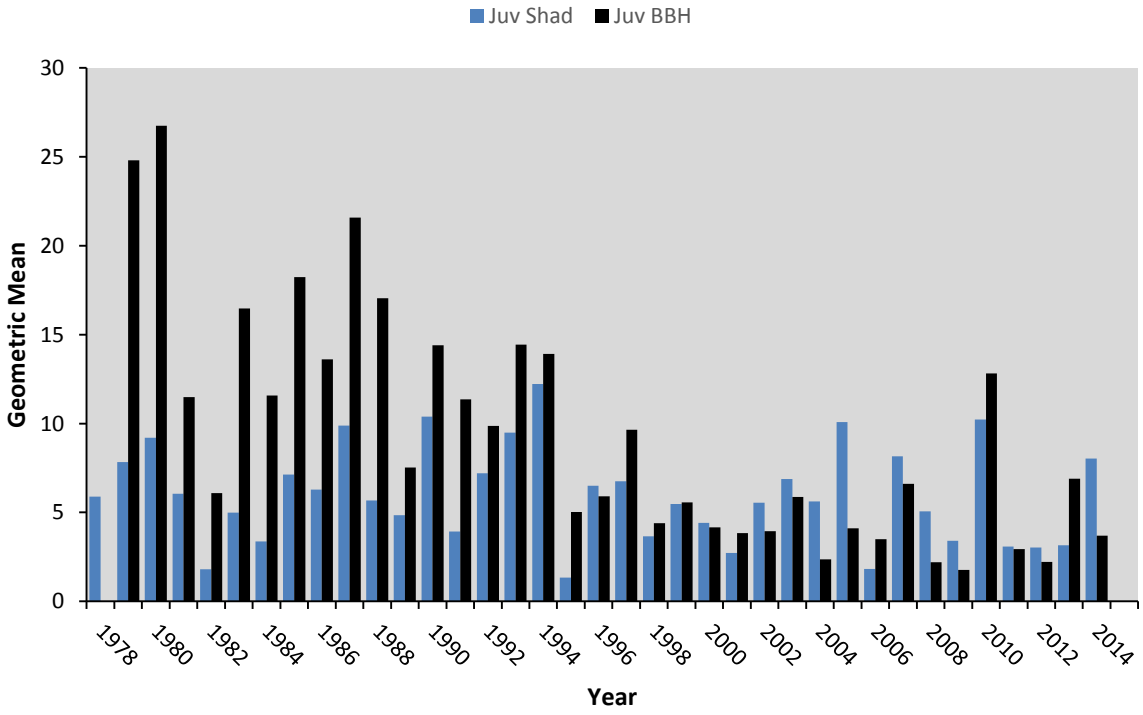

Figure 7.7 Annual Geometric mean cpue of juvenile shad and blueback herring, 1978-2014.

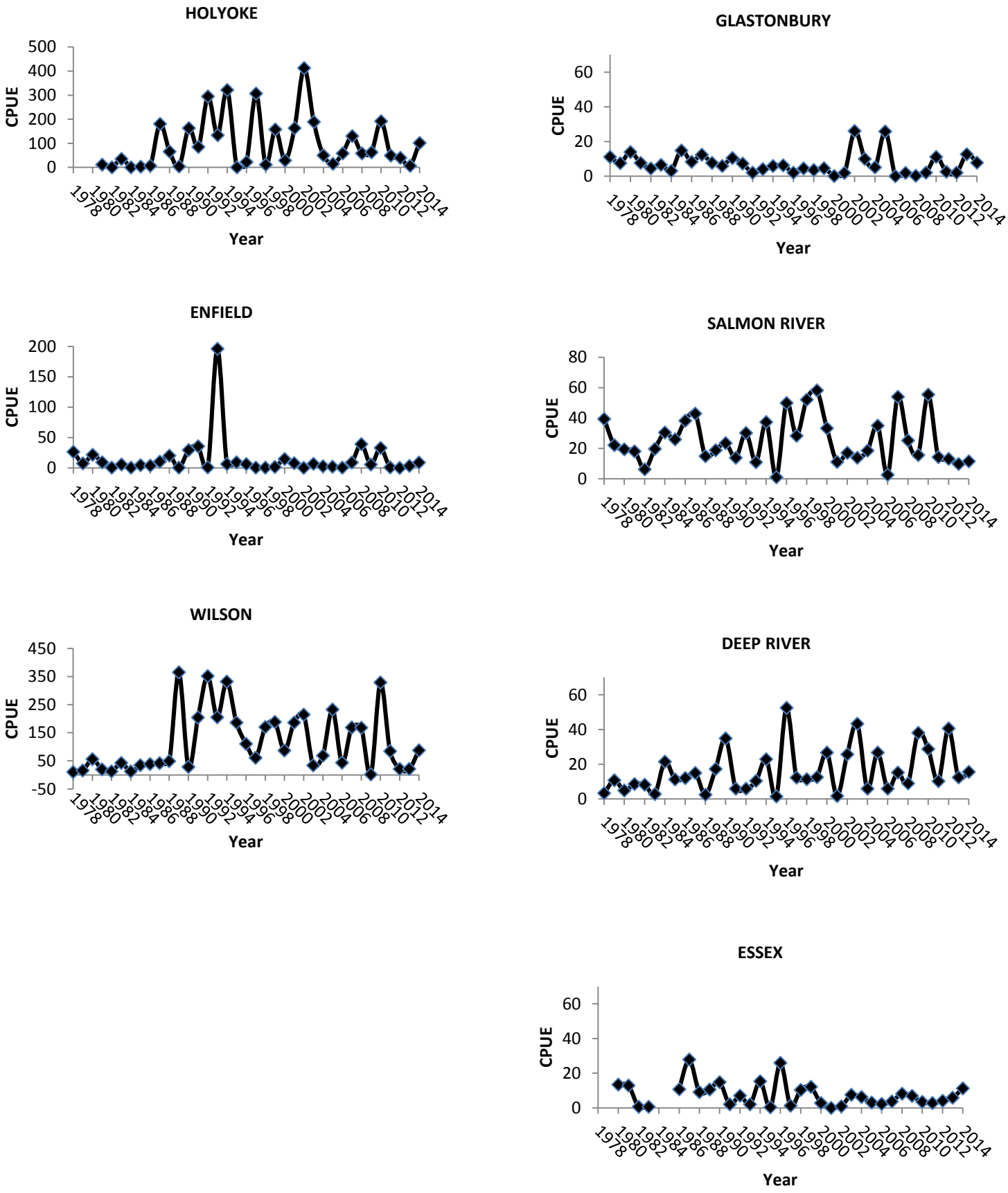

Figure 7.8. Annual CPUE of Connecticut River juvenile American shad by station, 1978-2014.

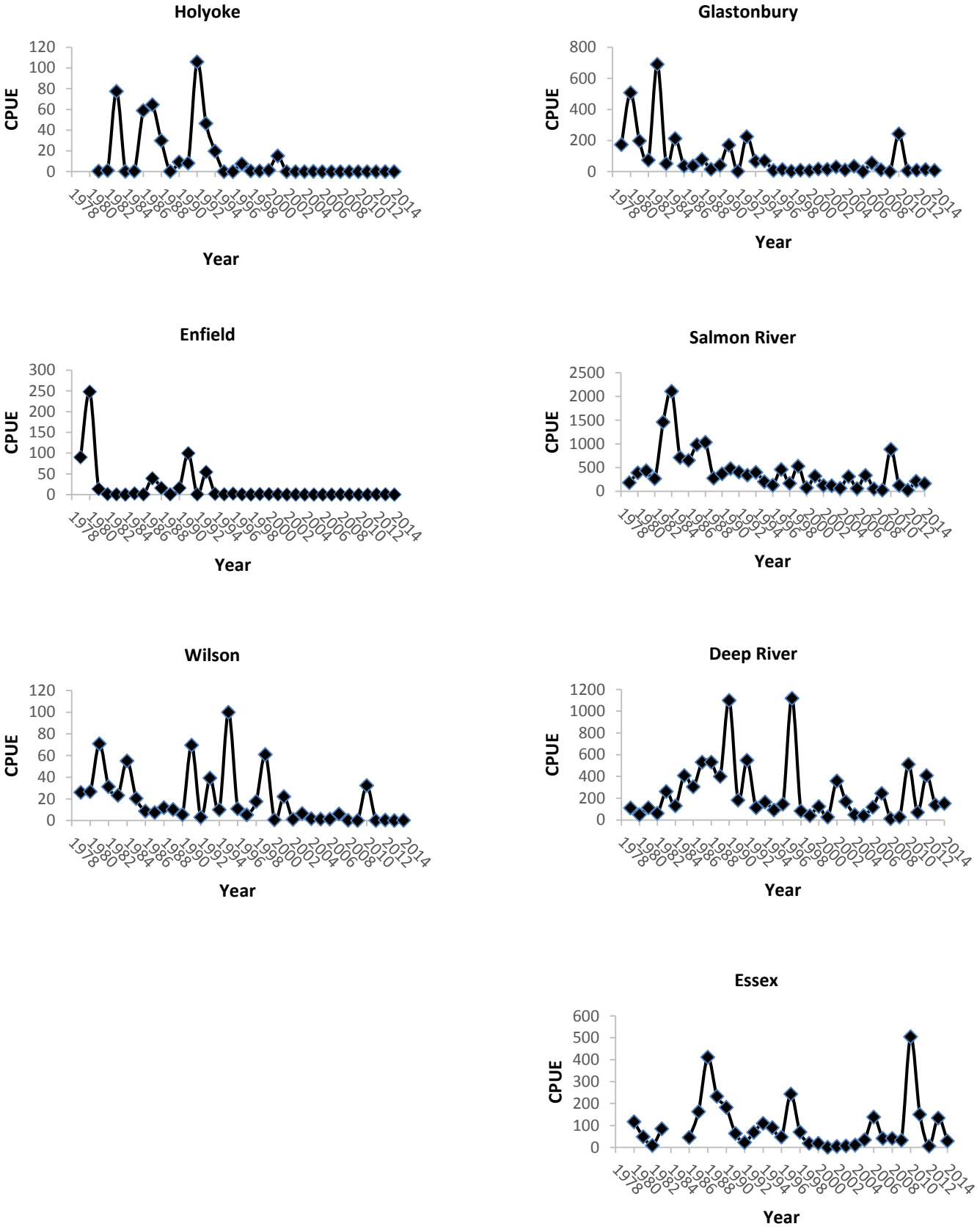

Figure 7.9. Annual CPUE of Connecticut River juvenile blueback herring by station, 1978-2014.

JOB 8: ESTUARINE SEINE SURVEY

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JOB 8: 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 2014 annual index of recruitment for young-of-year winter flounder (0.47 fish/haul) ranked the third lowest out of 27 annual indices.

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

Mean catch of all finfish (301 fish/haul) ranked the second highest out of 27 annual indices and extremely higher than the series average of 146 fish/haul (Figure 8.2). Geometric means were calculated for 22 species commonly captured since the survey began in 1988 (Table 8.1).

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 2014 (104 forage fish/haul) was the eleventh highest of the 27-year series, and well above the time series average of 95 forage fish/haul.

METHODS

Eight sites (Figure 8.1) are sampled during September using an eight-meter (25 ft.) bag seine with 6.4mm (0.25 in.) bar mesh. Area swept is standardized to 4.6 m (15 ft.), width by means of a taut spreader rope and a 30m (98 ft.), measured distance, parallel to, or at a 45º angle to the shoreline, against the current or tide if present. At each site, six seine hauls are 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. In addition to September sampling, the original seven sites were sampled in June, July, and August 2013 to compare with samples taken in these months in 1988-1990. Sampling methods were the same as described above.

Finfish, crabs, and other invertebrates taken in each sample are identified to species or lowest practical taxon (full listing given in Appendix 8.1, 8.2) 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 (n>1000) to minimize discard mortality. Winter flounder are measured to total length (mm), and classified as young-of-year (YOY) if less than 12 cm and age 1+ if 12cm or larger. The age of flounder near this size was verified in 1990-1992 by examination of the sagittal otolith. Physical data recorded at each seine location included water temperature and salinity at one-meter depth. The geometric or retransformed natural log mean catch per standard haul is calculated for catches at each site and collectively for the 22 most

abundant species, with separate indices for young-of-year and winter flounder age 1 and older. Confidence intervals (95%) for each geometric mean are retransformations of the corresponding log intervals. Frequency of occurrence is given as a percentage of all samples taken each year.

Diversity in the catch, or species richness, was computed for finish species captured in the Survey over the time series. Species were divided into three groups based on their temperature preferences and seasonal spawning habits as documented in the literature. Criteria used to assign species into a cold temperate group, warm temperate group, or subtropical group are listed in Job 5.

RESULTS

A total of 48 seine hauls were taken in 2014 at eight sites, yielding a total catch of 14,425 fish of 29 species and 10,752 invertebrates of eleven species. Mean catch of all finfish (301 fish/tow) was the second highest in the 27 year time series (Figure 8.2). This catch is significantly above the long-term mean of 146 fish/tow which can be attributed to above average catches of black sea bass, tautog, scup (porgy), northern kingfish, striped searobin and large catches of bay anchovy along with yoy menhaden. Atlantic silversides were caught in slightly below average abundance. All other forage fish abundances were two or three times above the time series average.

Geometric means were calculated for 22 species commonly captured since the survey began in 1988 (Table 8.1). The most frequently caught species was Atlantic silversides, which occurred in all samples, followed by striped killifish (88%), black sea bass (77%), northern pipefish (69%), tautog (63%), inshore lizardfish (60%), mummichog (54%), northern puffer (48%), scup (48%), striped searobin (46%), and northern kingfish (40%). This rank order has changed from the previous years, with a notable decrease in winter flounder (age 0 and age 1+), mummichog, grubby and windowpane flounder occurrence rates and an increases in black sea bass, northern pipefish, northern puffer inshore lizardfish and northern kingfish occurrence. Fifteen of the 22 species monitored increased in abundance in 2014, four other fish species decreased slightly and three were unchanged. Tautog abundance and occurrence rate increased significantly in 2014 to record highs (Figure 8.4). Tautog abundance and occurrence rate increased significantly in 1998-99, returned to the series average in 2005, 2010 and 2011 after a previous record year in 2007. Previous to 2005, tautog relative abundance significantly increased to all-time abundance levels in 2002-04 and 2012 (Figure 8.4). The abundance of cunner, the other labridae species commonly seen in the survey, fell in 2011 and 2013 but rebounded above the time series averages in 2012 and 2014 after declining in abundance since 2007.

In 2014, only one of the forage species monitored decreased slightly in abundance from the previous year (Atlantic silverside). Three of the forage species monitored increased in abundance by a factor of 2 to 3 times their previous year abundance. Forage fish species Atlantic silverside was slightly below the 27 year time-series average in 2014. Scup occurrence and abundance increased well above the 27 year time series average in 2014,

increasing to its largest abundance in 27 years. Snapper bluefish also occurred in record abundance in 2014. Striped bass and weakfish were not observed in the survey in 2014. Weakfish young-of-year were present in 2014 and also occurred in 2003. Black sea bass and northern kingfish occurred in record abundance in 2014. Striped and northern sea robin, inshore lizardfish occurrence ranked second highest in the 27 year time series. In 2014, cunner reached its third highest abundance. All other species occurred in less than 10% of all samples, with occurrence rates similar to previous years.

Bay scallop occurred for the first time in the time series. Four-spine stickleback re-occurred in 2014, absent from the survey in 2012-13. Two blue-spotted coronetfish were also captured. Three juvenile summer flounder were captured in 2014. Juvenile summer flounder have also occurred in 2006-08, 2010 and 2013 of the 27 year time series. Windowpane flounder re-occurred at low abundance in 2011 after being absent in 2009-10 and 2012-14. Other notable catches: black sea bass, bay scallop, scup, American eel, tautog, oyster toadfish, and menhaden along with inshore lizardfish at the Waterford site. The Clinton site saw large numbers of YOY black sea bass, scup, tautog, striped searobin, northern searobin and cunner. The Greenwich site saw age 1 winter founder, tautog, fourspine stickleback, scup, along with forage species Atlantic silverside and striped killifish. The New Haven site saw many black sea bass and bay anchovy along with weakfish. Black sea bass, scup, striped searobin, northern kingfish, menhaden, spot and large numbers of forage species were captured at the Old Lyme site. Bridgeport saw the lowest species diversity with Atlantic silverside and snapper bluefish being common. The Groton (Bluff Point) site saw largest numbers of YOY winter flounder, along with black sea bass, blue-spotted coronetfish, sheepshead minnow, naked goby, fourspine stickleback and northern searobin.

Relative Abundance of Juvenile Winter Flounder and Tautog

The 2014 index of YOY winter flounder (0.47 fish/haul) ranked third lowest out of the 27 annual indices (Table 8.2, Figure 8.3 and 8.7). Overall, the time series indicates that relatively strong year classes were only produced many years ago in 1988, 1992, 1994, and 1996 (Figure 8.3).

The 2014 index of YOY tautog (3.5 fish/haul) was the highest ranking out of 27 annual indices (Table 8.1, Figure 8.4), significantly higher than the series average of 0.8 tautog / haul. Overall, the time series indicates an increasing trend in abundance of young-of-year tautog from 1988 to 2008, with relatively abundant year classes produced in 1998-99, 2002-04, 2007-08, 2012 and 2014. The 2006, 2009-11 and 2013 mean was below the long-term average. ($P \leq 0.05$, $t=2.3$, $df=26$), (Table 8.1, Figure 8.4).

Presence of Other Important Recreational Finfish

YOY scup is a recent addition to the seine survey. The species occurred in 1999, with the highest relative abundance in the last ten years of the time series. In 2014, the species was present in record numbers, reflecting excellent recruitment and survival for the species in

2014 (Table 8.3, Figure 8.7). Juvenile striped bass first occurred in the survey in 1999 with one individual captured. In 2003, six more YOY striped bass were taken (Table 8.3, Figure 8.8). One large individual (369mm) was captured in 2008. Four juvenile weakfish occurred in 2014, the first time since 2003 and only the second time in the entire time series. YOY summer flounder have occurred in eleven years (more recently) in the 27-year time series (1993, 1994, 1996, and 1998, 2006 – 2010, 2012-14). The 2006 summer flounder abundances were the highest of the time series, followed by 2007, 2008, 2010, 2012 and 2014. No summer flounder were captured in 2011. YOY black sea bass first appeared in 1991 and every year since 1997, reaching their record highest abundance in 2014 (Figure 8.7). Snapper bluefish occurred in 21 out of 27 years of the time series, reaching peak abundance in 1999 and 2014. Juvenile tautog occurred every year in the seine survey except 1989 and reached record abundance in 2014. White perch appeared in record numbers in 2008 and only once prior, (2005) were present in 2011, and absent in 2012-14. Atlantic tomcod, a threatened species re-appeared in 2008 and 2011, none were present in 2009, 2010 and 2012-14. Inshore lizardfish were captured at above average abundances for the time series in 2014 (second highest). Fourspine stickleback were absent in 2012-13, and appear to be dropping out of the survey, occurring only five times in the past decade. However, they re-occurred in 2014 at three of the eight sites.

Relative Abundance of Forage Species

Seine survey catches are numerically 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 items for piscivorous fish. An index of forage fish abundance was generated using the catch of four of the most common forage species caught: Atlantic silversides, striped killifish, mummichog, and sheepshead minnow (Figure 8.5, Figure 8.6). The index for 2014 was the eleventh highest in the 27 year time series. Three of the four forage fish species increased in abundance and occurrence in 2014. Atlantic silverside abundance increased in 2014 (65 fish/haul) and was exactly at the series mean of 65 fish/haul for the time series (Table 8.1). Atlantic silversides were the most abundant, and the only species present at all sites in all samples (Table 8.1). There was a substantial increase in striped killifish, and mummichog abundance in 2014. A decrease in these species' abundance in 2012-13 reversed a five-year trend of increasing abundance from 2007-2011 and 2014. Striped killifish increased substantially in abundance in 2014, to the seventh highest in the time series. This species of killifish abundance and occurrence (14.5 fish/tow, 88% occurrence) was well above the series mean of 11 fish/tow. In 2014, mummichog abundance (5 fish/haul) was also well above the long-term average of 2.75 in 2014. Sheepshead minnow had record abundance (3.35) in 2007 and decreased in 2008 through 2010 and 2013. Sheepshead increased slightly in 2011 and again in 2012, the index of abundance of this forage fish in 2014 (0.6 fish/haul) was substantially higher, ranking fifth in the time series. Collectively, forage fish abundance has declined since 2003 (Figure 8.5) but the trend was reversed in 2014, with forage fish abundance ranking eleventh highest in the time series.

Forage fish abundance had shown a general increase since 1997 (Figure 8.5) after a period of lower abundance (decreasing trend) from 1991-1996. In 2013, forage fish abundance was again below the series mean of 98 fish/haul, with a mean catch of 46 fish per haul

(large decline from 2007). Forage fish abundance is driven numerically by the occurrence of adult Atlantic silverside (Figure 8.6) and more recently striped killifish, mummichog and sheepshead minnow, the second, third and fourth most abundant forage species. Striped killifish are more suited to marine habitats, than other 'Fundulus' species captured in the estuarine seine survey. Striped killifish were captured at extremely low numbers in 2012-13, suggesting very poor year class production and survival 2–3 years ago, since the survey captures adults more effectively. Mummichog, the third most abundant forage fish (Table 8.3) in the survey, peaked in abundance in 2007. The lowest time series abundance occurred in 1997. Mummichog appeared to be stable with an above average catches since 1999 but are more recently declining in abundance until 2014 (trend reversed). Sheepshead minnow the least abundant of the four forage fish species monitored has recently shown elevated abundances in 2002-04 and 2007-09, with a record year in 2007 (3.35 fish/tow) and above average catches in 2008 (1.2 fish/tow) followed by slight decreases in 2009 and 2010. In 2011, 2012 and 2014, the sheepshead minnow catch rebounded and was slightly above the series average. The 2014 mean catch was 0.6 fish per tow, above the series mean of 0.5 fish/tow.

Relative Abundance of Invertebrate Species

A total of 10,752 invertebrates of eleven species were captured in 2014 (Table 8.3), (Appendix 8.2). Six crab species were present in the seine hauls, along with two shrimp species, one gastropod and bivalve. Mud snail, sand shrimp, shore shrimp, green crab, and hermit crab were the most abundant. Mud snails, shore shrimp, sand shrimp, hermit and green crab had greater than 50% occurrence in 2014 (Table 8.3). Blue crab abundance continued to remain low in 2014 (12 crabs) from an all-time high in 2009 (333 crabs). The Asian shore crab (Japanese crab) re-appeared in 2011 and 2012 but were absent from 2008-10, 2013 and 2014. The shore shrimp increased substantially in abundance in 2014 from the previous year (Table 8.3). Sand shrimp decrease significantly in abundance in 2014. Mud snail abundance was again above the time series average (2013-14). Mud crabs reached an all-time high abundance in 2013 after dropping in 2011, 2012 and 2014 from a previous higher abundance in 2010. Spider crab abundance was at a time-series high in 2011 and increased slightly above the time series average in 2013 and 2014.

Comparison of 2013-2014 Summer Samples with 1988-1990

A total of 39 seine hauls were taken in June, July, and August 2014 (six hauls at seven sites except three at Greenwich in June due to heavy surf). Combined with data taken in the same manner in June-September 2013 (N=42), mean catch of all finfish at the seven sites varied from 12.9-66.8 fish/sample in June and July, respectively, to 95.5-134.2, respectively, in August and September.

This seasonal pattern was similar to the pattern seen in 1988-1990 (June=35.0, July=44.6, August=114.0, September=100.7 fish/sample) with lowest abundance in June and peak abundance in August and September. This seasonal progression probably reflects resident and migrant species moving into the nursery grounds and/or recruiting to the mesh size of the sampling gear. Standard errors for these monthly mean values (CV range of 24-42%) make them statistically indistinguishable with the exception of the low value in June 2013-2014.

In contrast to the seasonal increase in abundance seen in total finfish from June through September, winter flounder YOY abundance was highest in June and declined over the summer. Although a seasonal decline in abundance was also noted in June-September of 1988 -1990 (slope = -0.13, r^2=0.53), the slope of the decline in 2013-4 was almost three times as steep (slope= -0. 37, r^2=0.91). This increased decline in abundance reduced moderate production seen in June 2013 and 2014, which was not statistically different from values recorded in June 1988-1990, to the extremely low abundance recorded in September 2013-2014 (Figure 8.7). Mean water temperature for these beach sites was not significantly different by month, with lowest values in June (mean1988-90 = 21.2^{0}C, SE=0.23; mean 2013-14 = 20.7^{0}C, SE=0.45) and highest values in July (mean 1988-90 = 24.9^{0}C, SE=0.20; mean 2013-14 = 24.0^{0}C, SE=0.52).

Finfish Species Richness

Over the time series, the mean number of cold temperate species captured per seine haul (Figure 8.8, Table 8.4) varied from 1.6 to 2.8 with a slight negative trend (r^2=0.11, p=0.049) while the mean number of warm temperate species increased significantly (r^2=0.58, p<0.001). The mean number of warm temperate species increased from about three species per sample to more than five over the 27-year time series. These changes primarily reflect a decreasingly frequent catch of winter flounder and windowpane flounder (cold-temperate species), and an increasingly frequent catch of black sea bass, northern kingfish, and smallmouth flounder (warm temperate species). Subtropical species richness showed no trend, averaging about one species per haul almost every year.

MODIFICATIONS

In 2015 the seven original seine sites (all sites except Milford) will be sampled in June, July, and August as well as September. These catch data will be compared to catches made in the same summer months in 1988-1990.

Table 8.1: Geometric mean catch of species commonly taken in seine samples, 1988-2014. *See Appendix 8.1 for complete species names.*

Species	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
alewife	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
American sand lance	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
American shad	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
Atlantic menhaden	0.1	0.0	0.0	0.0	0.5	0.0	0.1	0.0	0.0	0.1	0.4	0.4	0.4
Atlantic silverside	68.2	31.6	45.0	88.5	51.2	42.7	37.7	27.0	17.7	23.1	74.3	102.5	99.7
Atlantic tomcod	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
black sea bass	0.0	0.0	0.0	0.1	0.0	0.0	0.2	0.1	0.0	0.0	0.1	0.1	0.0
blueback herring	0.0	0.1	0.0	0.5	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0
bluefish	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.9	0.0
cunner	0.2	0.3	0.0	0.1	0.2	0.0	0.3	0.2	0.3	0.0	0.3	0.5	0.3
fourspine stickleback	0.3	0.4	0.0	0.7	0.1	0.1	0.0	0.0	0.0	0.0	0.2	0.0	0.0
grubby	0.8	0.1	0.0	0.1	0.5	0.1	0.4	0.3	0.2	0.3	0.2	0.5	0.1
inshore lizardfish	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.4	0.1	0.2	0.2
mummichog	2.8	1.6	1.1	1.9	1.6	3.7	3.3	0.7	1.2	0.5	2.0	0.8	3.2
naked goby	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
northern kingfish	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.1	0.0	0.1	0.1	0.1	0.0
northern pipefish	0.7	0.3	0.4	1.0	0.9	0.9	1.1	0.5	1.0	0.4	2.1	1.0	1.0
northern puffer	0.1	0.3	0.1	0.4	0.1	0.4	0.2	0.5	0.2	0.1	0.1	0.2	0.6
rainbow smelt	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
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
sheepshead minnow	0.8	1.0	0.1	0.6	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.4
smallmouth flounder	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.3	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
striped killifish	11.9	7.9	5.9	4.2	3.1	4.9	5.1	3.9	2.0	1.5	7.2	4.5	8.6
striped searobin	0.2	0.2	0.1	0.2	0.1	0.9	0.1	0.0	0.1	0.4	1.9	0.6	0.1
summer flounder	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
tautog	0.3	0.1	0.3	0.7	0.4	0.2	0.8	0.7	0.3	0.2	0.9	1.3	0.5
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
windowpane flounder	0.6	0.1	0.2	0.2	0.3	0.3	0.1	0.2	0.7	0.4	0.1	0.1	0.1
winter flounder	0.2	0.1	0.0	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1
winter flounder YOY	15.4	1.7	2.9	5.2	11.9	5.7	14.2	10.1	19.2	7.5	9.2	8.7	4.3

Table 8.1: Geometric mean catch of species commonly taken in seine samples, 1988-2014. *See Appendix 8.1 for complete species names.*

Species	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Alewife	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**
American sand lance	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**
American shad	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**
Atlantic menhaden	0.0	1.0	8.2	0.4	0.2	0.4	0.6	0.1	0.3	0.0	0.1	0.03	0.08	**1.2**
Atlantic silverside	36.1	80.1	113.6	85.1	81.3	37.7	74.9	57.5	66.8	96.9	66.5	44.9	34.9	**64.8**
Atlantic tomcod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	**0.0**
black sea bass	1.0	0.4	0.2	0.4	0.1	0.5	0.6	0.3	1.1	0.4	3.2	5.2	3.7	**10.8**
blueback herring	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.01	**0.0**
bluefish	0.1	0.0	0.2	0.2	0.1	0.2	0.0	0.0	0.3	0.0	0.2	0.4	0.2	**0.8**
cunner	0.2	0.3	0.2	0.5	0.3	0.1	0.5	0.1	0.2	0.1	0.0	0.4	0.02	**0.5**
fourspine stickleback	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	**0.15**
grubby	0.2	0.3	0.5	1.3	0.8	0.3	0.3	0.2	0.5	0.3	0.7	0.2	0.2	**0.2**
inshore lizardfish	1.2	0.0	0.0	0.0	0.0	1.9	0.2	0.3	0.2	0.1	0.2	0.2	0.13	**1.6**
mummichog	1.4	3.4	2.9	2.3	1.5	2.5	7.3	2.9	3.8	1.7	3.1	1.6	0.9	**5.0**
naked goby	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.06	0.05	**0.08**
northern kingfish	0.2	0.1	0.2	0.3	0.1	0.0	0.0	0.2	0.3	0.5	0.2	0.5	0.7	**1.1**
northern pipefish	1.4	0.5	0.3	0.7	0.5	0.6	0.8	0.7	1.9	0.6	1.1	1.4	1.7	**2.6**
northern puffer	0.2	0.7	0.7	0.7	0.5	0.4	1.2	0.2	0.3	0.4	0.4	0.9	1.1	**1.1**
rainbow smelt	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
scup	0.5	1.0	0.6	0.2	0.9	0.1	1.0	0.1	1.9	0.1	0.2	2.1	0.12	**2.6**
sheepshead minnow	0.2	0.6	0.7	0.5	0.2	0.2	3.3	1.2	0.5	0.3	0.5	0.8	0.2	**0.6**
smallmouth flounder	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.9	0.4	0.5	**0.1**
striped bass	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**
striped killifish	7.5	14.5	14.9	12.9	19.4	7.1	21.2	21.7	12.3	15.9	28.7	5.3	3.8	**14.5**
striped searobin	0.4	0.3	0.7	0.5	0.2	0.1	0.3	0.3	0.8	0.2	0.1	0.08	0.17	**1.1**
summer flounder	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.0	0.1	0.0	0.08	0.1	**0.04**
tautog	0.6	1.5	1.1	1.4	0.7	0.4	2.4	1.0	0.4	0.4	0.3	1.3	0.6	**3.5**
weakfish	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.03**
windowpane flounder	0.0	0.0	0.1	0.2	0.2	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0	**0.03**
winter flounder	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.02	0.0	**0.04**
winter flounder YOY	1.3	3.1	8.1	11.0	5.6	0.9	4.7	2.0	0.8	1.0	1.1	0.3	0.27	**0.47**

Table 8.1 cont.: Percent occurrence of species commonly taken in seine samples, 1988-2014. See Appendix 8.1 for species names.

Species	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
alewife	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00
American sand lance	0.00	0.00	0.00	0.00	0.02	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00
American shad	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Atlantic menhaden	0.06	0.05	0.04	0.04	0.19	0.06	0.10	0.04	0.00	0.06	0.06	0.15	0.10
Atlantic silverside	0.97	0.93	0.96	1.00	1.00	0.96	1.00	0.96	0.94	0.92	0.98	0.94	1.00
Atlantic tomcod	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.02	0.00	0.00
black sea bass	0.00	0.00	0.00	0.04	0.00	0.00	0.15	0.04	0.00	0.00	0.06	0.08	0.02
blueback herring	0.00	0.05	0.04	0.13	0.04	0.00	0.06	0.02	0.00	0.00	0.02	0.08	0.02
bluefish	0.00	0.00	0.00	0.10	0.02	0.00	0.02	0.00	0.00	0.02	0.13	0.46	0.04
cunner	0.17	0.19	0.04	0.10	0.15	0.00	0.23	0.15	0.13	0.02	0.21	0.23	0.19
fourspine stickleback	0.17	0.19	0.00	0.23	0.15	0.04	0.02	0.00	0.04	0.00	0.13	0.04	0.02
grubby	0.33	0.07	0.04	0.10	0.31	0.06	0.33	0.25	0.19	0.29	0.17	0.27	0.10
inshore lizardfish	0.06	0.00	0.04	0.00	0.00	0.06	0.10	0.00	0.00	0.29	0.06	0.17	0.19
mummichog	0.47	0.48	0.35	0.40	0.38	0.50	0.42	0.35	0.42	0.15	0.42	0.29	0.44
naked goby	0.00	0.00	0.02	0.06	0.00	0.00	0.00	0.02	0.00	0.00	0.02	0.02	0.00
northern kingfish	0.00	0.00	0.00	0.06	0.08	0.10	0.04	0.15	0.04	0.13	0.10	0.08	0.04
northern pipefish	0.42	0.31	0.37	0.63	0.35	0.50	0.58	0.33	0.44	0.33	0.73	0.48	0.54
northern puffer	0.08	0.24	0.09	0.27	0.08	0.31	0.17	0.40	0.15	0.06	0.10	0.19	0.35
rainbow smelt	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00
scup	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00
sheepshead minnow	0.31	0.31	0.09	0.21	0.04	0.02	0.02	0.04	0.00	0.04	0.04	0.06	0.17
smallmouth flounder	0.03	0.00	0.00	0.02	0.00	0.13	0.10	0.06	0.04	0.04	0.00	0.21	0.06
striped bass	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00
striped killifish	0.78	0.67	0.65	0.73	0.58	0.65	0.58	0.69	0.54	0.40	0.75	0.67	0.63
striped searobin	0.11	0.12	0.11	0.10	0.08	0.48	0.10	0.02	0.10	0.35	0.60	0.38	0.10
summer flounder	0.00	0.00	0.00	0.00	0.00	0.04	0.10	0.00	0.02	0.00	0.02	0.00	0.00
tautog	0.22	0.05	0.22	0.42	0.31	0.19	0.33	0.33	0.13	0.17	0.38	0.46	0.23
weakfish	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
windowpane flounder	0.31	0.10	0.13	0.23	0.23	0.19	0.17	0.19	0.35	0.23	0.13	0.13	0.06
winter flounder	0.25	0.12	0.00	0.15	0.08	0.23	0.17	0.19	0.10	0.15	0.10	0.06	0.15
winter flounder YOY	0.97	0.71	0.74	0.92	0.98	0.88	0.98	0.94	1.00	0.94	0.92	0.88	0.77

Table 8.1 cont.: Percent occurrence of species commonly taken in seine samples, 1988-2014. See Appendix 8.1 for species names.

Species	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
alewife	0.00	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
American sand lance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	**0.00**
American shad	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**
Atlantic menhaden	0.02	0.27	0.58	0.08	0.06	0.13	0.17	0.02	0.15	0.02	0.02	0.04	0.04	**0.23**
Atlantic silverside	0.92	1.00	0.96	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00	**1.00**
Atlantic tomcod	0.00	0.00	0.00	0.02	0.02	0.00	0.00	0.02	0.00	0.00	0.06	0.00	0.00	**0.00**
black sea bass	0.25	0.17	0.13	0.25	0.08	0.23	0.23	0.15	0.27	0.13	0.58	0.75	0.58	**0.77**
blueback herring	0.00	0.04	0.06	0.00	0.00	0.00	0.02	0.00	0.00	0.02	0.00	0.02	0.00	**0.00**
bluefish	0.13	0.02	0.10	0.15	0.04	0.08	0.00	0.02	0.15	0.02	0.10	0.21	0.08	**0.23**
cunner	0.15	0.13	0.17	0.29	0.21	0.13	0.25	0.10	0.17	0.08	0.04	0.23	0.02	**0.31**
fourspine stickleback	0.06	0.00	0.00	0.02	0.00	0.02	0.00	0.00	0.02	0.00	0.04	0.00	0.00	**0.15**
grubby	0.17	0.21	0.29	0.50	0.46	0.27	0.15	0.19	0.27	0.21	0.42	0.23	0.20	**0.19**
inshore lizardfish	0.56	0.04	0.00	0.06	0.00	0.60	0.13	0.19	0.15	0.13	0.10	0.15	0.13	**0.60**
mummichog	0.42	0.54	0.44	0.35	0.27	0.48	0.65	0.48	0.50	0.40	0.42	0.35	0.27	**0.54**
naked goby	0.08	0.02	0.02	0.04	0.00	0.08	0.00	0.02	0.00	0.00	0.02	0.08	0.06	**0.08**
northern kingfish	0.13	0.04	0.15	0.17	0.10	0.02	0.02	0.19	0.17	0.23	0.13	0.29	0.35	**0.40**
northern pipefish	0.48	0.19	0.25	0.48	0.25	0.29	0.42	0.23	0.52	0.40	0.44	0.60	0.60	**0.69**
northern puffer	0.17	0.35	0.31	0.40	0.31	0.29	0.44	0.23	0.23	0.21	0.31	0.42	0.38	**0.48**
rainbow smelt	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
scup	0.23	0.35	0.25	0.13	0.29	0.04	0.29	0.02	0.38	0.04	0.06	0.42	0.08	**0.48**
sheepshead minnow	0.10	0.15	0.19	0.15	0.15	0.06	0.40	0.27	0.13	0.10	0.13	0.25	0.07	**0.17**
smallmouth flounder	0.13	0.00	0.00	0.00	0.00	0.02	0.00	0.13	0.15	0.06	0.40	0.17	0.29	**0.06**
striped bass	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	**0.00**
striped killifish	0.71	0.85	0.81	0.73	0.96	0.65	0.88	0.94	0.75	0.90	0.98	0.65	0.58	**0.88**
striped searobin	0.29	0.25	0.40	0.38	0.13	0.13	0.27	0.19	0.40	0.17	0.06	0.08	0.15	**0.49**
summer flounder	0.00	0.00	0.00	0.00	0.00	0.19	0.06	0.15	0.02	0.04	0.00	0.08	0.12	**0.06**
tautog	0.40	0.54	0.50	0.54	0.42	0.17	0.54	0.42	0.35	0.31	0.23	0.60	0.33	**0.63**
weakfish	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.02**
windowpane flounder	0.00	0.02	0.10	0.21	0.15	0.06	0.04	0.10	0.00	0.04	0.02	0.00	0.00	**0.04**
winter flounder	0.04	0.02	0.00	0.17	0.21	0.15	0.08	0.15	0.04	0.04	0.04	0.04	0.00	**0.06**
winter flounder YOY	0.58	0.79	0.85	0.98	0.94	0.46	0.92	0.71	0.52	0.60	0.63	0.27	0.23	**0.33**

Table 8.2: Mean catch of young-of-year winter flounder at eight sites sampled by seine, 1988-2014.

Year	BPT	CLT	GRT	GRW	MIL	NHH	OLM	WTF	All Sites
1988	*18.72	2.73	11.39	9.63		38.66	58.19	29.57	**15.4**
1989	1.7	1.14	1.53	0.7		2.14	2.04	2.99	**1.7**
1990	3.97	0.19	2.21	0.51	1.62	5.69	16.83	2.64	**2.9**
1991	1.77	4.1	5.62	1.99	2.46	6.45	15.32	18.25	**5.2**
1992	3.34	5.53	6.25	9.42	4.29	40.15	47.99	32.52	**11.9**
1993	1.22	1.4	8.59	4.33	3.62	11.47	13.34	16.66	**5.7**
1994	4.46	8.11	38.36	4.26	4.62	35.34	61.65	21.03	**14.2**
1995	1.94	3.19	30.28	7.22	1.77	18.93	34.23	36.58	**10.1**
1996	7.67	11.81	15.67	*12.61	*6.58	*49.29	91.34	30.53	***19.2**
1997	2.87	6.61	23.69	3.43	1.64	3.79	52.01	11.25	**7.5**
1998	1.24	4.03	17.63	8.12	0.91	22.37	57.19	21.89	**9.2**
1999	1.04	2.6	25.7	7.95	3.49	0.94	*137.07	36.12	**8.7**
2000	2.14	0.51	0.76	6.65	0.78	1.74	48.34	*41.56	**4.3**
2001	0.2	1.12	4.12	1.24	0.59	0	0.91	9.1	**1.3**
2002	0.91	2.66	3.06	5.08	0.26	1.08	15.55	8.98	**3.1**
2003	1.88	4.61	*45.78	5.88	0.89	1.7	51.13	32.3	**8.1**
2004	1	*18.36	33.84	11.27	3.36	33.06	11.13	13.04	**11.0**
2005	1.94	11.14	16.7	7.71	5.14	1.64	4.06	7.3	**5.6**
2006	0.12	1.38	5.53	0.12	0	0	3.3	1.29	**0.9**
2007	0.78	5.65	17.9	4.44	0.78	6.42	7.89	7.11	**4.7**
2008	0.51	2.45	10.84	0.51	0	1.57	2.62	5.94	**2.0**
2009	0.91	1.62	2.29	0.12	0.51	0.12	0.12	1.75	**0.8**
2010	0.41	1.11	1.71	1.33	0.12	0.41	1.88	1.57	**1.0**
2011	0.12	0.98	1.18	2.26	0.78	0.12	4.27	1.45	**1.1**
2012	0.00	0.26	0.70	0.76	0.00	0.12	0.26	0.44	**0.3**
2013	0.00	0.00	1.14	0.26	0.00	0.00	0.65	0.57	****0.275**
2014	**0.12**	**0.12**	**1.82**	**0.26**	**0.12**	**0.12**	**1.35**	**0.65**	**0.47**

*record high for a site/year.
**record low for time-series

Table 8.3: Total catch 1988-2014. Invertebrates not counted 1988-2003.

Species	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
alewife					1								28	1
American eel					1				5					
American sand lance			1		10									
American shad	1													
American shad (1+)									151					
Anchovy, spp (YOY)														
Atlantic menhaden	2	4	1,074	3	9	2		11	2,003	377	1,236	1	1,284	5,098
Atlantic needlefish														
Atlantic silverside	5,356	6,383	5,468	5,263	6,311	2,352	1,942	3,249	6,345	10,120	8,738	4,417	5,730	13,278
Atlantic tomcod				3					1					
banded gunnel									2	3				
banded rudderfish														
bay anchovy						4	69		27			1	11	
black sea bass		10			41	43			27	14	2	687	63	27
blue spotted coronet fish										1				
blueback herring	3	194	10		5	2			3	24	1		13	5
bluecrab														
bluefish		15	2		1			1	9	142	3	8	2	17
boreal squid														
brown shrimp														
burrfish, striped										1				
butterfish						1								
channeled whelk														
common slipper shell														
crevalle jack														
cunner	2	5	19		42	24	63	1	23	142	26	15	110	15
flat claw hermit crab														
flying gurnard														
fourspine stickleback		183	11	21	1		3		24	3	1	7		
gizzard shad														
green crab														
grey snapper	1													
grubby	2	7	61	6	38	19	21	28	17	55	15	73	33	95
hogchoker							2							

Table 8.3 continued

Species	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
alewife												**30**
American eel									1		**2**	**13**
American sand lance							13					**24**
American shad												**1**
American shad (1+)												**169**
Anchovy, spp (YOY)					15							**15**
Atlantic menhaden	1,117	75	117	144	21	54	3	43	2	14	**3404**	**16100**
Atlantic needlefish					2							**2**
Atlantic silverside	5,122	5,089	3,267	5,087	3,245	4,156	7,063	4,657	4,142	3,958	**3832**	**142636**
Atlantic tomcod	1	3			1			8				**17**
banded gunnel	4	2	3	1	3			1				**19**
banded rudderfish							1					**1**
bay anchovy	1	12					1				**520**	**686**
black sea bass	110	15	82	109	33	304	86	489	783	1,197	**1950**	**6072**
blue spotted coronet fish											**2**	**3**
blueback herring				9			3		1	1		**299**
bluecrab	*1*	*2*	*84*	*31*	*4*	*333*	*35*	*23*	*27*	*18*	***17***	***675***
bluefish	23	8	30		7	53	1	26	54	17	**194**	**613**
boreal squid				1								**1**
brown shrimp			*11*									**11**
burrfish, striped								10		4		**15**
butterfish										21		**22**
channeled whelk							*1*				***3***	***4***
common slipper shell			*13*									***13***
crevalle jack							1					**7**
cunner	54	35	18	58	8	28	15	2	42	1	**73**	**863**
feather blenny									36			**36**
flat claw hermit crab	*761*	*532*	*703*	*153*	*244*	*539*	*558*	*441*	*283*	*367*	***562***	***5093***
flying gurnard				1								**1**
fourspine stickleback	9		2			8		2			**13**	**397**
gizzard shad								4				**4**
green crab	*234*	*266*	*341*	*147*	*644*	*176*	*308*	*228*	*175*	*253*	***273***	***2995***
grey snapper												**1**
grubby	143	76	31	32	16	51	25	55	18	19	**18**	**1087**
hogchoker						1						**3**

Table 8.3: continued

Species	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
inshore lizardfish	5		2			4	6			46	6	16	15	103	2
Japanese shore crab															
Jonah crab															
lady crab															
lined seahorse							4			1			2		
little skate										1					1
mantis shrimp															
mole crab															
moon jelly															
mud crabs															
mud snail															
mummichog	1,031	197	171	765	573	1,256	1,943	78	149	190	396	115	1,008	246	811
naked goby			1	4				1			1	1		4	2
northern comb jelly															
northern kingfish				3	4	23	2	9	3	10	7	6	5	17	5
northern pipefish	65	23	33	106	120	82	117	52	241	38	295	141	96	189	87
northern puffer	4	22	13	34	4	37	15	40	25	5	5	13	63	14	79
northern searobin		2	1				1	1					3	40	24
northern sennet															
northern star gazer		5													
oyster drill															
oyster toadfish	5			1						1	1			1	
pumpkinseed				2											
rainbow smelt						5	2								
rainwater killifish									3	4			2		6
rock crab															
rock gunnel			1		1	1	1			3					
sand shrimp															
scup												1		58	172
sheepshead minnow	174	815	5	345	4	1	2	30		14	19	12	267	59	402
shore shrimp															
smallmouth flounder	1			1		8	14	7	2	5		40	3	12	
smooth dogfish			1												
spider crab															
***starfish spp*.**															
striped anchovy															
striped bass												1			

Table 8.3: continued

Species	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
inshore lizardfish		3		169	18	26	22	10	16	23	11
Japanese shore crab		*1*		*1*	*1*				*6*	*1*	
Jonah crab							*2*				
lady crab		298	119	66	195	92	42	19	24	18	*13*
lined seahorse					2	7	2	1	2		
little skate											
mantis shrimp										*1*	
mole crab		*1*	*5*								
moon jelly								319			
mud crabs		*60*	*55*	*74*	*30*	*85*	*67*	*308*	*80*	*80*	*1107*
mud snail		*948*	*2,071*	*4,478*	*3,569*	*3,810*	*3,128*	*2,699*	*2,683*	*3072*	*5,787*
mummichog	702	637	543	398	1,203	498	857	299	775	329	199
naked goby	2	2		13		2			2	4	4
northern comb jelly							346	36			*3,620*
northern kingfish	21	38	11	1	1	23	42	76	30	54	81
northern pipefish	25	72	92	82	75	156	307	49	248	152	204
northern puffer	101	75	93	34	241	19	41	51	28	98	202
northern searobin	5	4	13	2	10			1	9		6
northern sennet				1							
northern star gazer											
oyster drill				*38*							
oyster toadfish	1	2	1	1	1	2	1				6
pumpkinseed		3									
rainbow smelt		34									
rainwater killifish	35	53	19	3							
rock crab		*2*						*1*			
rock gunnel		1				1					
sand shrimp		*278*	*373*	*1,027*	*525*	*2,625*	*762*	*902*	*1,507*	*246*	*1,794*
scup	131	50	154	6	170	14	413	21	30	375	18
sheepshead minnow	276	205	28	104	1,439	304	203	82	219	238	59
shore shrimp		*990*	*404*	*1,149*	*707*	*1,390*	*535*	*619*	*762*	*402*	*511*
smallmouth flounder				1		14	21	5	114	63	49
smooth dogfish											
spider crab		*4*	*5*	*6*	*1*	*3*	*1*	*7*	*33*	*13*	*20*
starfish spp.								1			
striped anchovy							3				
striped bass	6					1					

Table 8.3: continued

Species	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
inshore lizardfish	135											638
Japanese shore crab												*10*
Jonah crab												*2*
lady crab	41											*937*
lined seahorse												21
little skate												2
mantis shrimp												*1*
mole crab												*6*
moon jelly												*319*
mud crabs												*1,866*
mud snail	*693*8											*39283*
mummichog	1098											16467
naked goby	6											49
northern comb jelly	*1200*											*5,202*
northern kingfish	149											621
northern pipefish	413											3560
northern puffer	97											1453
northern searobin	35											157
northern sennet												1
northern star gazer												5
oyster drill												*38*
oyster toadfish	2											26
pumpkinseed												5
rainbow smelt												41
rainwater killifish												125
rock crab												*3*
rock gunnel												9
sand shrimp	*662*											*10,701*
scallop (bay)	*3*											*3*
scup	485											2098
sheepshead minnow	154											5460
shore shrimp	*1011*											*8460*
smallmouth flounder	15											375
smooth dogfish												1
spider crab	*14*											*1073*
spot	6											6
starfish spp.												1
striped anchovy												3
striped bass												8

Table 8.3: continued.

Species	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
striped killifish	1,511	1,383	748	659	465	773	1,923	520	269	289	1,066	539	1,797	1,494
striped searobin	22	12	5	94	5	71	5	1	9	40	178	51	7	33
summer flounder						2	6		1		1			
tautog	23	5	23	72	32	16	104	88	42	19	135	174	67	59
threespine stickleback														11
weakfish														
web burrfish														
white mullet	1	1	8		3									
white perch														
windowpane flounder	49	4	22	19	35	30	9	13	71	50	12	10	4	
winter flounder	12	6		7	6	14	13	12	21	282	9	4	7	2
winter flounder YOY	900	117	276	410	1,055	483	1,401	916	1,486	874	999	1,497	708	138
yellow jack														
Grand Total	8,722	6,063	6,677	9,323	8,953	8,102	12,028	4,215	4,422	5,162	11,767	13,503	14,076	7,689

Species	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**Total**
striped killifish	1,698	3,410	1,548	1,470	1,063	1,994	1,874	1,508	1,300	1,964	720	493	**1158**	**33636**
striped searobin	33	62	38	19	6	32	36	82	14	4	7	14	**121**	**1101**
summer flounder					16	8	8	1	6		6	7	**3**	**65**
tautog	153	140	145	64	93	321	131	25	33	27	123	73	**467**	**2657**
threespine stickleback														**11**
weakfish		15											**4**	**19**
web burrfish					1				1					**2**
white mullet	1				7	7	11		75	68		22		**194**
white perch				3			11			6				**20**
windowpane flounder	1	5	15	15	3	2	17		2	4			**2**	**394**
winter flounder	3		9	11	7	6	13	2	2	2	2		**3**	**455**
winter flounder YOY	302	1,310	914	470	110	365	190	72	71	86	22	24	**48**	**15244**
yellow jack									1					**1**
Grand Total	**11,056**	**24,783**	**14,010**	**12,153**	**13,662**	**16,696**	**15,606**	**14,188**	**15,125**	**14,718**	**11,641**	**20,194**	**14,425**	**304,534**

Table 8.4: Cold and warm temperate species captured in the Estuarine Seine Survey.

Cold Temperate Species		Warm Temperate Species	
Common name	**Scientific Name**	**Common name**	**Scientific Name**
alewife	*Alosa pseudoharengus*	American eel	*Anguilla rostrata*
American sand lance	*Ammodytes americanus*	American shad	*Alosa sapidissima*
Atlantic tomcod	*Microgadus tomcod*	Atlantic silversides	*Menidia menidia*
cunner	*Tautogolabrus adspersus*	bay anchovy	*Anchoa mitchilli*
grubby	*Myoxocephalus aeneus*	blueback herring	*Alosa aestivalis*
little skate	*Leucoraja erinacea*	black seabass	*Centropristis striata*
northern pipefish	*Syngnathus fuscus*	bluefish	*Pomatomus saltatrix*
rock gunnel	*Pholis gunnellus*	butterfish	*Peprilus triacanthus*
rainbow smelt	*Osmerus mordax*	feather blenny	*Hypsoblennius hentz*
winter flounder	*Pseudopleuronectes americanus*	gizzard shad	*Dorosoma cepedianum*
windowpane flounder	*Scophthalmus aquosus*	hogchoker	*Trinectes maculates*
		lined seahorse	*Hippocampus erectus*
		menhaden	*Brevoortia tyrannus*
		naked goby	*Gobiosoma bosci*
		northern kingfish	*Menticirrhus saxatilis*
		northern puffer	*Sphoeroides maculates*
		northern searobin	*Prionotus carolinus*
		northern stargazer	*Astroscopus guttatus*
		oyster toadfish	*Opsanus tau*
		pumkinseed	*Lepomis gibbosus*
		scup	*Stenotomus chrysops*
		silver perch	*Bairdiella chrysoura*
		smooth dogfish	*Mustelus canis*
		smallmouth flounder	*Etropus microstomus*
		spotted hake	*Urophycis regia*
		spot	*Leiostomus xanthurus*
		striped searobin	*Prionotus evolans*
		striped anchovy	*Anchoa hepsetus*
		striped bass	*Morone saxatilis*
		summer flounder	*Paralichthys dentatus*
		tautog (blackfish)	*Tautoga onitis*
		white perch	*Morone Americana*
		weakfish	*Cynoscion regalis*

Figure 8.1: *Sampling locations of the seine survey along the coast of Connecticut.*

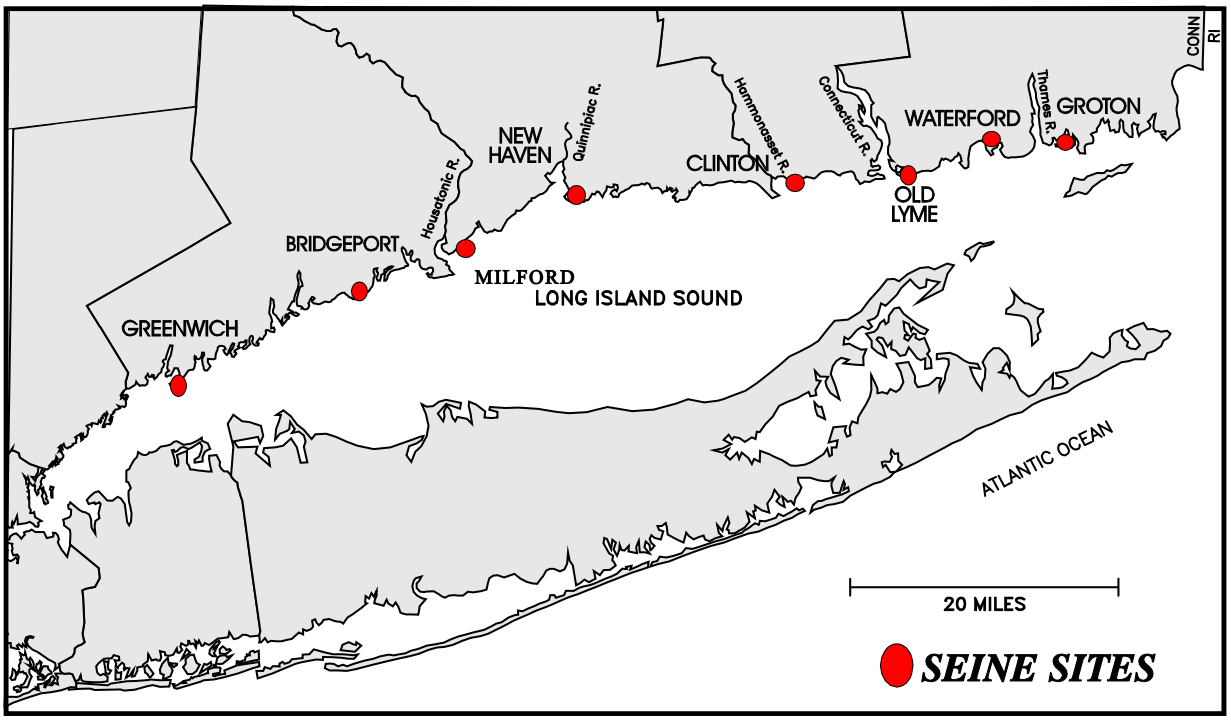

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Figure 8.2: Mean catch (numbers) of all finfish taken in seine samples, 1988-2014.
Mean catch per haul includes samples at all sites. Note that sampling at the Milford site began in 1990.

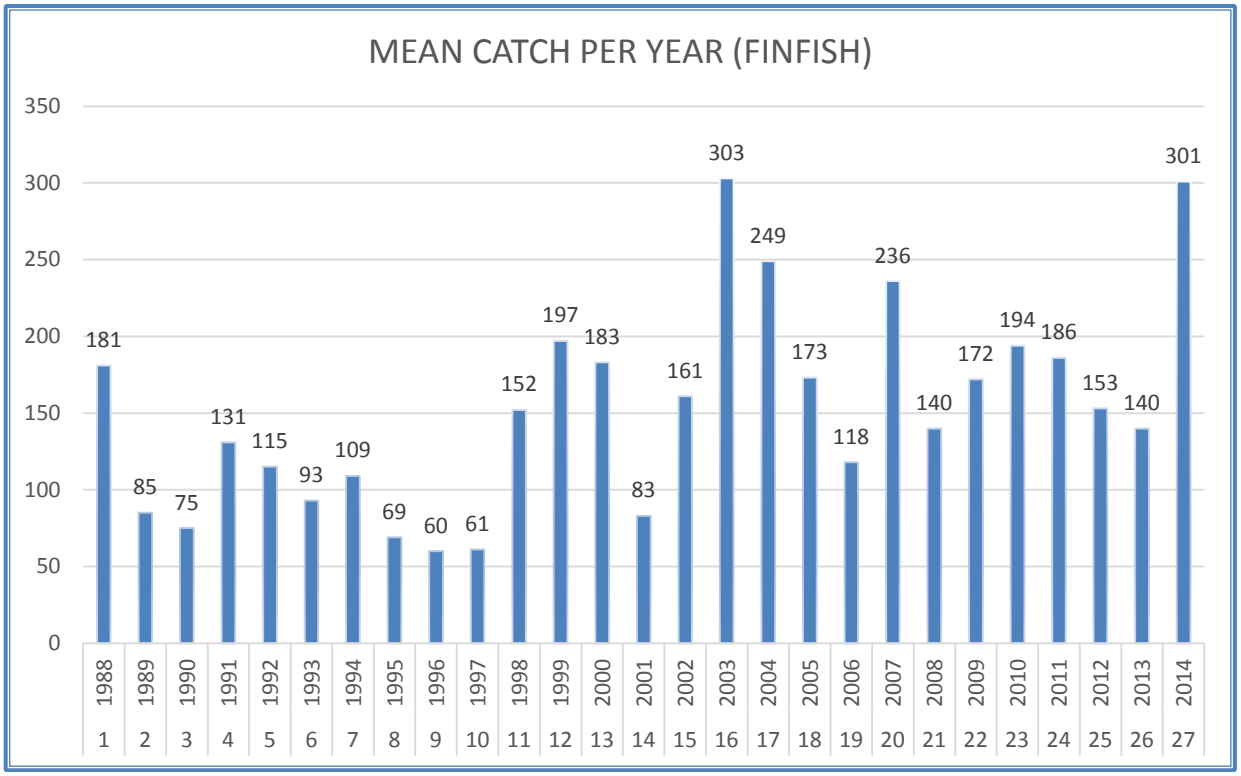


Figure 8.3: Mean catch of young-of-year winter flounder, 1988-2014. *The trend line is shown as a horizontal line with an arrow. Note that all sites are included with sampling at the Milford site beginning in 1990.*

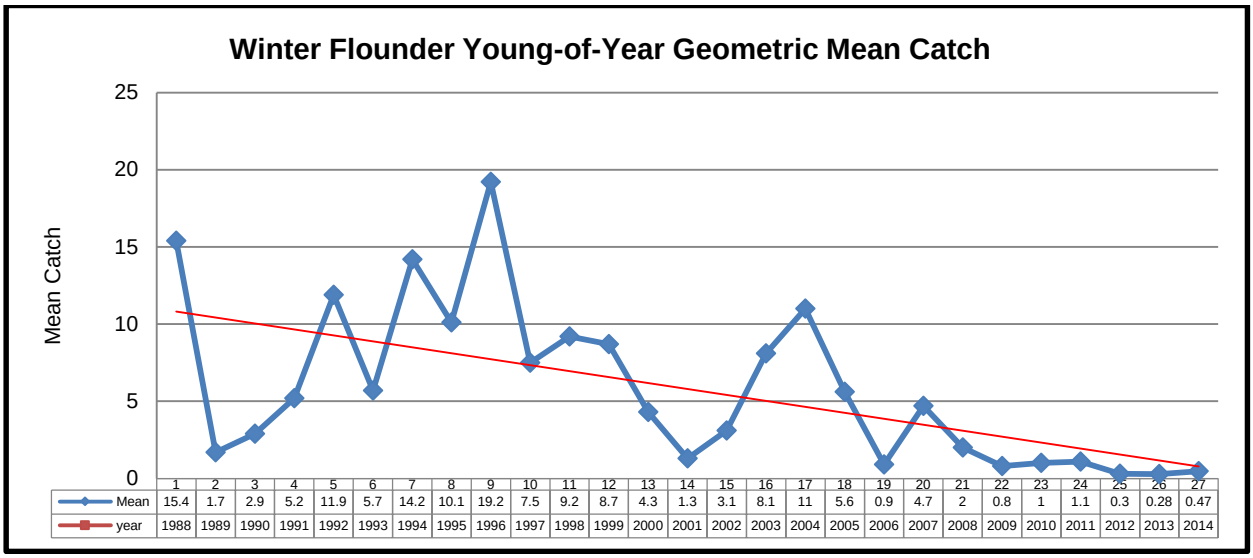


Figure 8.4: Mean catch of young-of-year tautog taken in seine samples, 1988-2014. *Geometric mean catch per haul (numbers) and occurrence (percent) includes samples at all sites. The time series trend line is shown by the yellow line. Note that sampling at the Milford site began in 1990.*

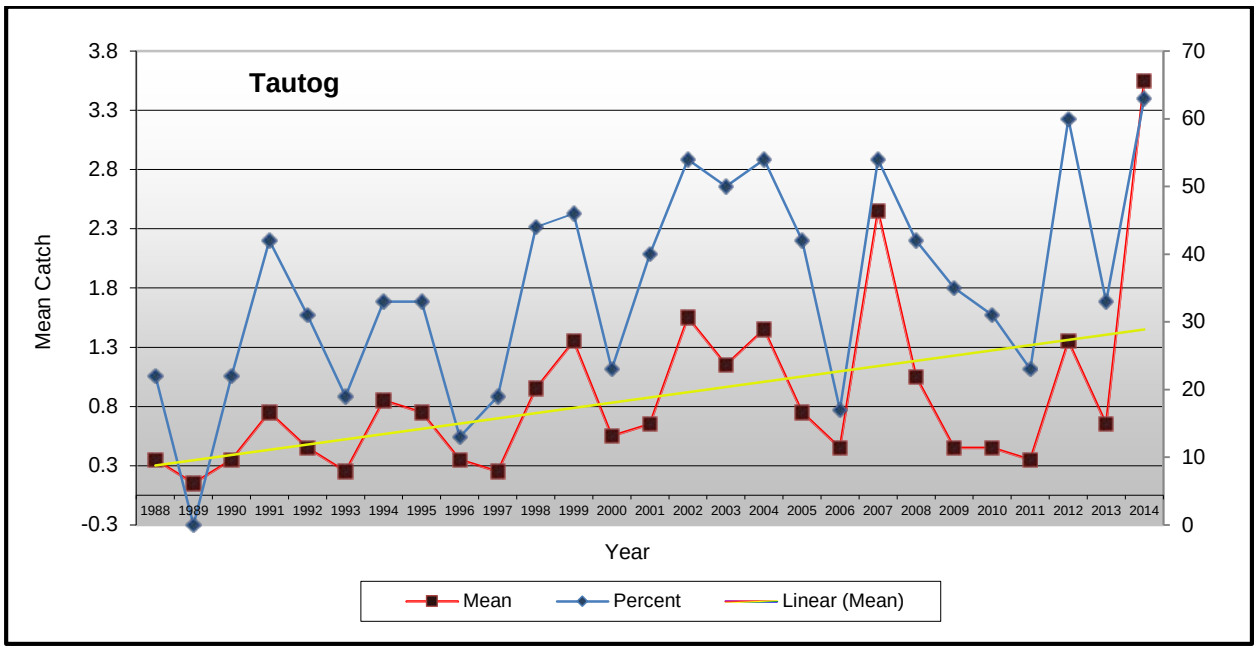


Figure 8.5: Mean catch of forage fish at eight sites sampled by seine, 1988-2014.
Forage species include Atlantic silversides, mummichog, sheepshead minnow, and striped killifish.
The 95% confidence interval (CI) for each mean is also listed. See Appendix 2.1 for complete species names.

MEAN CATCH PER STANDARD HAUL

YEAR	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
MEAN	139	62	65	110	71	65	57	43	26	32	100	127	146
95% CI	97-189	52-107	45-94	81-149	52-104	41-103	34-99	32-57	18-36	20-50	83-145	85-190	108-197

YEAR	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
MEAN	52	125	206	130	122	59	150	100	106	137	127	60
95% CI	32-86	97-162	152-281	108-155	101-147	43-82	119-187	82-121	86-131	112-167	105-153	41-89

YEAR	2013	2014
MEAN	46	**104**
95% CI	31-68	**85-128**

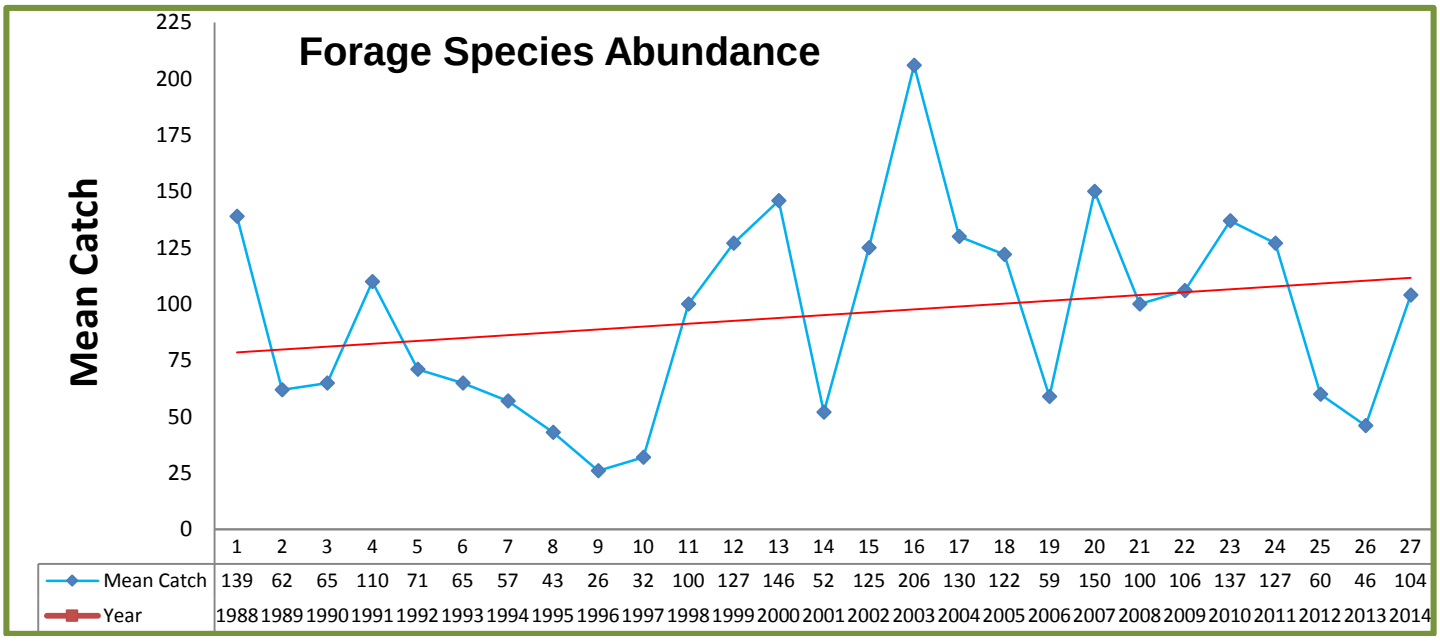


Figure 8.6: Total Catch of Four Species of Forage Fish, 1998-2014

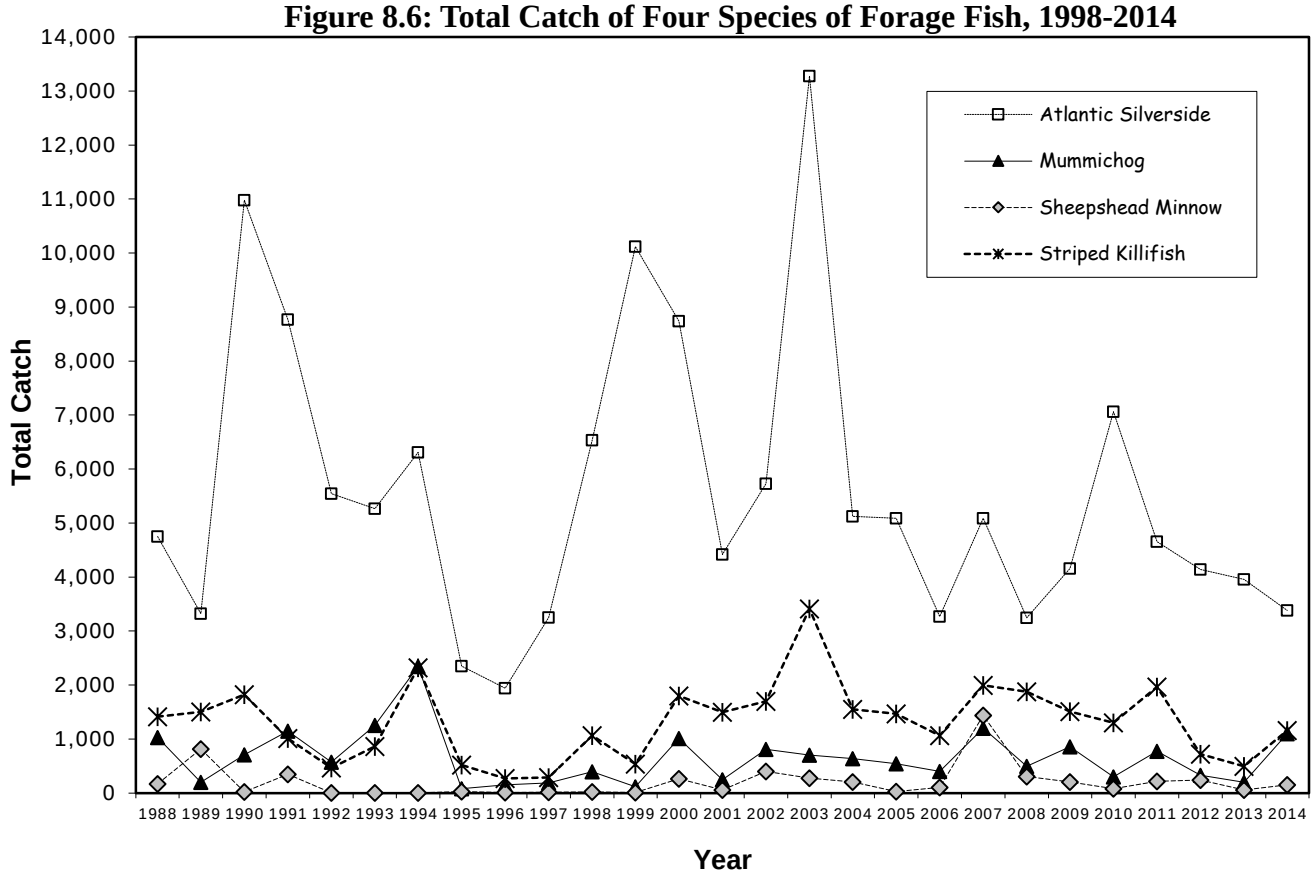


Figure 8.7: Total Catch of Juvenile Black Sea Bass and Scup, Recreational Important Finfish, 1988-2014

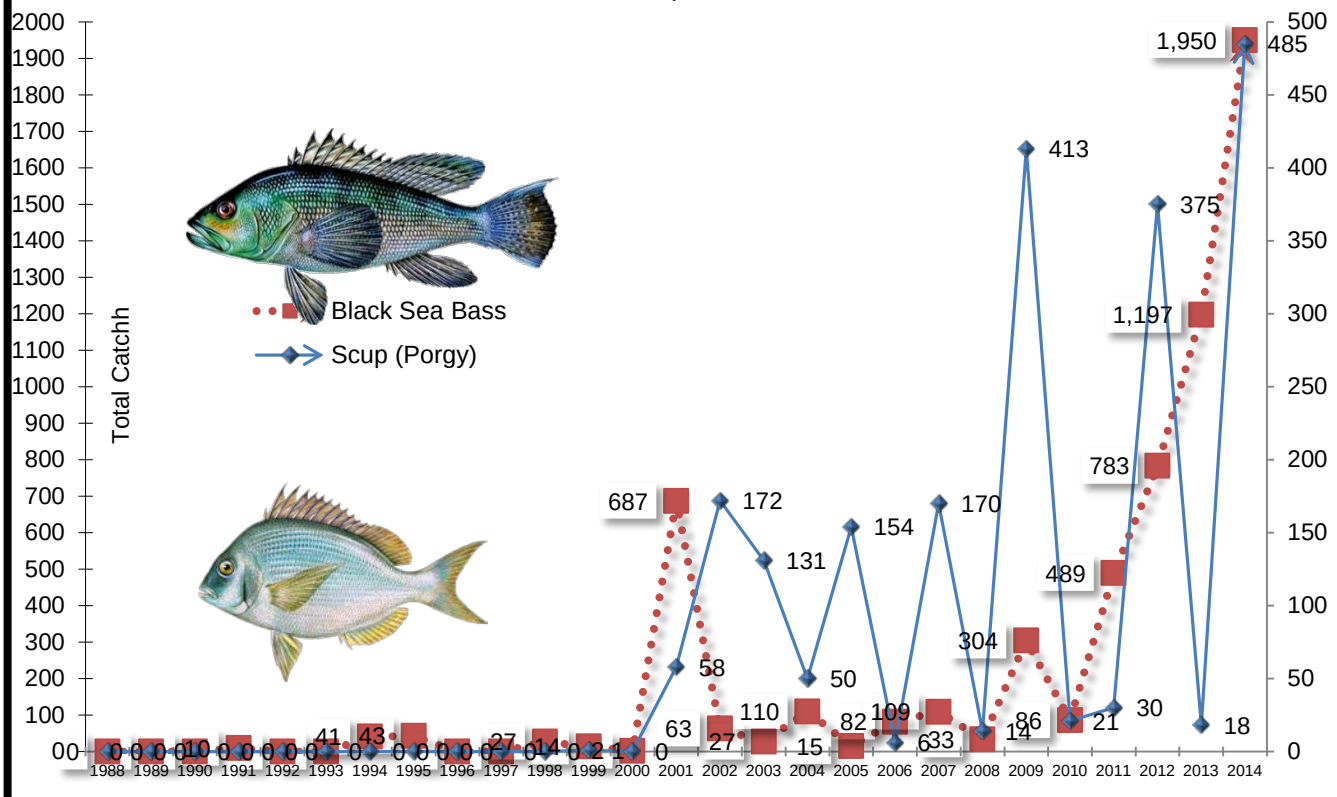


Figure 8.8: Total Catch of Juvenile Striped Bass, Summer Flounder and Weakfish, Recreational Important Finfish, 1988-2014

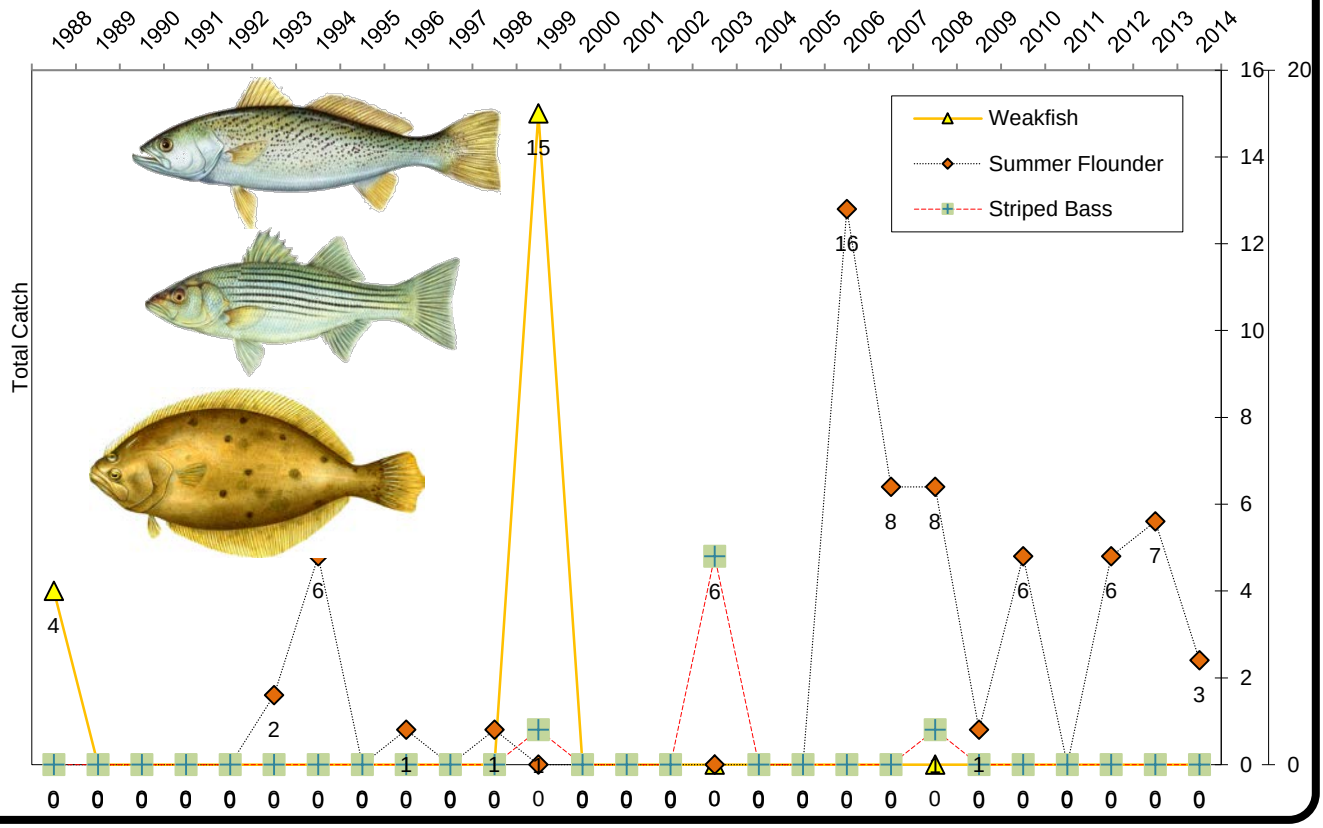
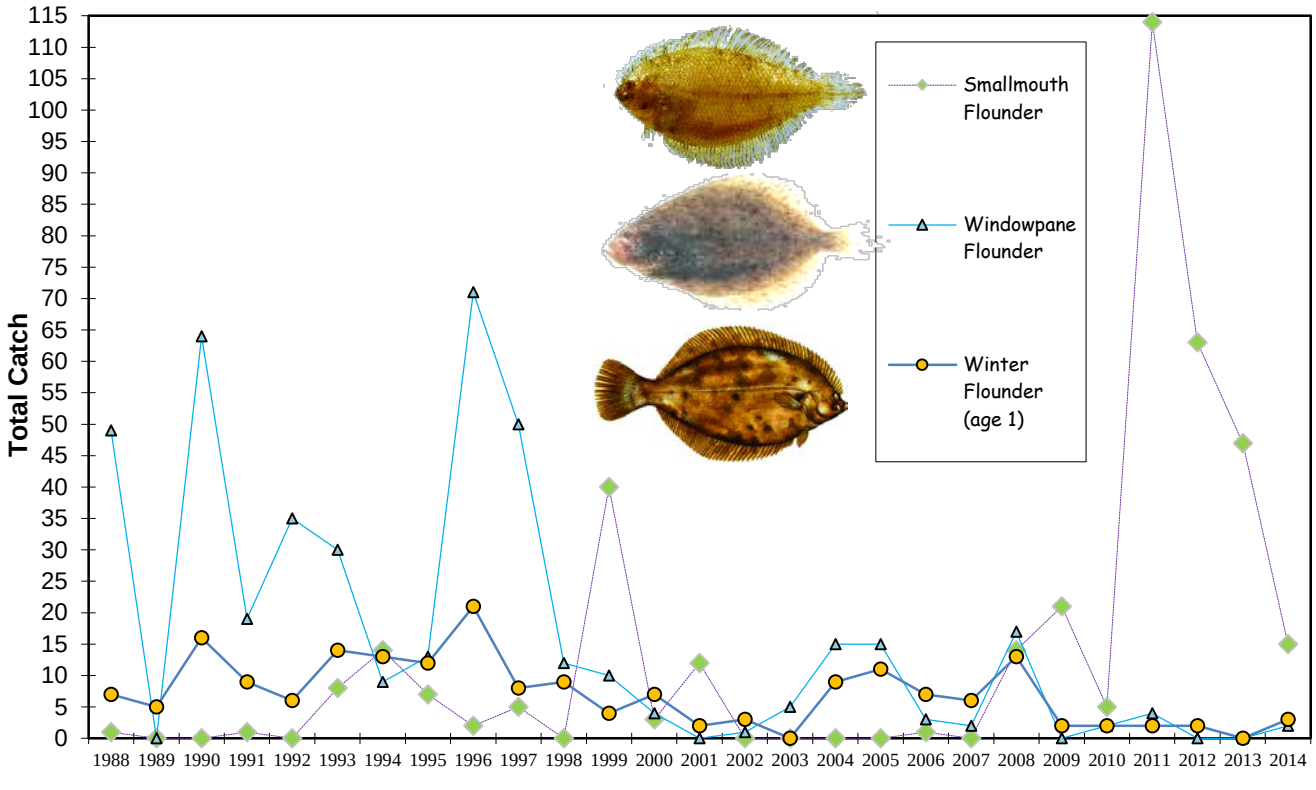


Figure 8.9: Total Catch of Three Species of Juvenile Flounders, 1998-2014



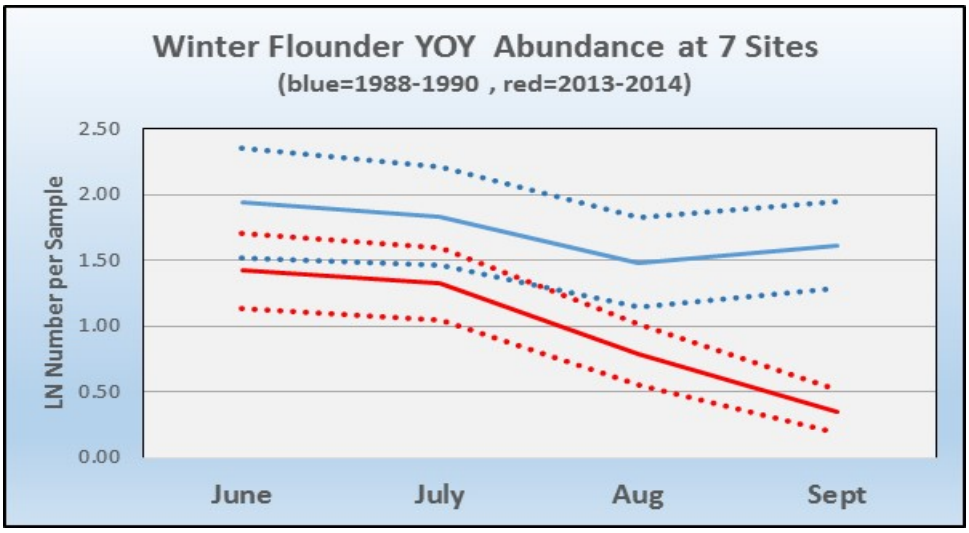


Figure 8.10 Seasonal change in winter flounder young of year (YOY) abundance, 1988-1990 and 2013-2014. Confidence intervals (95%) are shown as dotted lines.

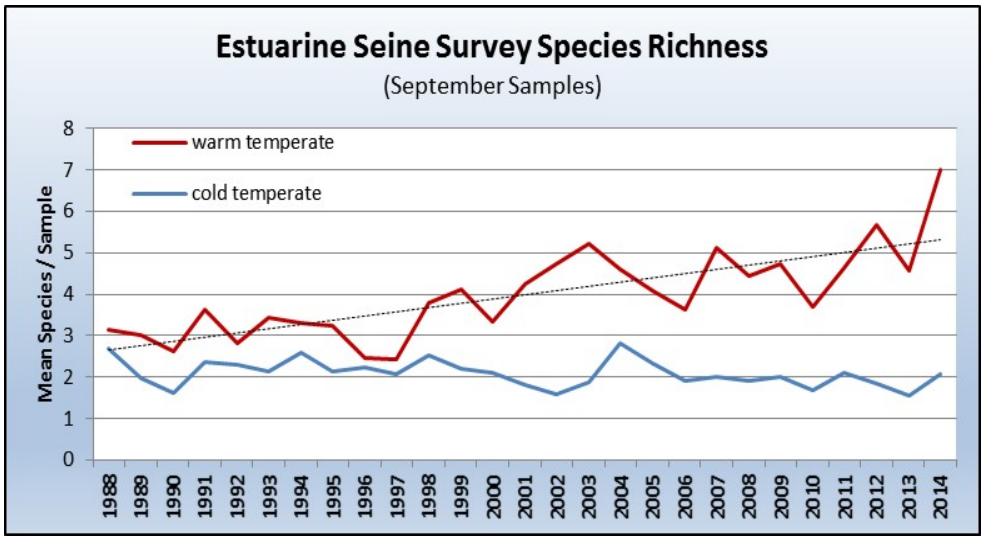


Figure 8.11: Trend in species richness for cold and warm temperate species. Mean species per sample captured in September, 1988-2014, are shown. See Table 2.4 for species listings by group.

Appendix 8.1: Finfish species taken in the Estuarine Seine Survey, 1988-2014.

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 needlefish	**ANF**	*Strongylura marina*
Atlantic silversides	**ASS**	*Menidia menidia*
Atlantic tomcod	**TOM**	*Microgadus tomcod*
Banded gunnel	**BGN**	*Pholis fasciata*
Banded rudderfish	**RUD**	*Seriola zonata*
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*
Feather Blenny	**FBL**	*Hypsoblennius hentzi*
Flying Gurnard	**FGD**	*Dactylopterus volitans*
Four-spine stickleback	**FSS**	*Apeltes quadracus*
Gizzard Shad	**GIZ**	*Dorosoma cepedianum*
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 variegates*
Shorthorn Sculpin	**SHS**	*Myoxocephalus scorpius*
Skilletfish	**SKL**	*Gobiesox strumosus*
Smallmouth flounder	**SMF**	*Etropus microstomus*
Smooth dogfish	**SMD**	*Mustelus canis*
Spotted hake	**SPH**	*Urophycis regius*
Striped anchovy	**STA**	*Anchoa hepsetus*
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*

Appendix 8.1: Finfish species taken in the Estuarine Seine Survey, 1988-2014.

Winter flounder (YOY)	**WFO**	*Pseudopleuronectes americanus*
Winter flounder (AGE 1+)	**WFL**	*Pseudopleuronectes americanus*
Yellow jack	**YJK**	*Caranx bartholomaei*

Appendix 8.2: Invertebrate species taken in the Estuarine Seine Survey, 1988-2014.

COMMON NAME	**SPECIES CODE**	***SCIENTIFIC NAME***
Bay Scallop	**SCA**	*Argopecten irradians*
Blue crab	**BCR**	*Callinectes sapidus*
Brown Shrimp	**BNS**	*Panaeus aztecus*
Chaneled Whelk	**CHW**	*Busycotypus canaliculatus*
Northern Comb Jelly	**COM**	*Bolinopsis infundibulum*
Green crab	**GCR**	*Carcinus maenas*
Hermit crab	**HER**	*Pagurus spp.*
Horseshoe crab	**HSC**	*Limulus polyphemus*
Japanese crab	**JCR**	*Hemigrapsus sanguineus*
Lady crab	**LCR**	*Ovalipes ocellatus*
Mantis shrimp	**MAN**	*Squilla empusa*
Moon Jelly	**MOJ**	*Aurelia aurita*
Mud crab	**BMC**	*Panopeus spp.*
Mole crab	**MLR**	*Emerita talpoida*
Mud snail	**MSN**	*Nassarius obsoletus*
Rock crab	**RCR**	*Cancer irroratus*
Sand shrimp	**CRG**	*Crangon septemspinosa*
Sea Star	**STF**	*Asterias forbesi*
Shore shrimp	**PAL**	*Palaemonetes spp.*
Shortfin Squid	**ILL**	*Illex illecebrosus*

Figure 8.12: Beach seining with 25’ bag seine, 2014

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JOB 9: VOLUNTEER ESTUARINE FISHERIES DATABASE

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GOAL

Identify estuarine near-shore waters critical to the production and growth of recreationally important finfish for the purpose of protecting and enhancing these populations in shallow water habitats and promote citizens' greater understanding and appreciation of local marine resources through participation in local volunteer survey projects.

OBJECTIVES

1) Provide reliable indices of relative abundance for finfish and key water quality measurements by standardizing samples taken in Connecticut near-shore waters by local volunteers.
2) Document the occurrence of uncommon or rare species and their distribution by habitat type in order to determine their vulnerability to local extinction due to human activities and/or climate change.
3) Provide embayment-specific size and/or growth estimates for recreationally important species helpful to immediate and long-term local and regional assessments.
4) Develop and maintain a state-wide fisheries database of all volunteer survey programs in order to maximize their usefulness to all citizen groups, educational programs, municipalities, statewide regulatory programs and interstate management plans.

INTRODUCTION

Environmental literacy for all of the state's citizens has been a high priority of the Department since its inception. Several citizens' groups formed in response to CT DEEP educational programs and/or to address local environmental issues have spent thousands of volunteer hours gathering species-specific fisheries abundance data and accompanying water quality information. This job was developed as a mechanism for establishing a flexible data framework where volunteer datasets can be collated, standardized, and accessed. This database should provide data useful for protecting the state's near-shore estuarine ecosystem which is particularly vulnerable to physical flux and alternation or degradation due to human activities.

METHODS

Data were obtained from three citizen groups (Tables 9.1-3, Figures 9.1-3) that have gathered fisheries and water quality data for more than a decade. Based on interviews with the groups' leaders, these data were collated into a Volunteer Estuarine Fisheries Database (VEFD) and synthetic summaries were made for purposes of comparison. For each program, a matrix was generated in Excel or Access software documenting the date, location, and quantity of each species captured in their sampled area by gear type. The total number of each finfish species was computed as a percentage of the total finfish catch by year. Additionally, relative abundance of finfish grouped by thermal guild (Howell and Auster 2012) as well as total species number was computed for each study area as a generalized measure of embayment health. Water temperature data taken simultaneously with resource sampling was also summarized.

RESULTS

Harbor Watch, Norwalk

Harbor Watch, a Program sponsored by Earthplace Nature Center in Westport CT, has run a beam trawl survey in the Norwalk River since 1990. The program was initiated under the guidance of Richard Harris, Program Director, and CT DEEP Marine Fisheries Division staff. The sampling program divides the saline portion of the river into 20 fishable grids which overlap previously established water quality sampling stations (Figure 9.1). Benthic finfish and invertebrates are captured using a one-meter beam trawl (0.63cm mesh**)** towed for 5 minutes within one of the sample grids. Samples are made at least weekly at grids representing upper, middle, and lower reaches of the river. Sampling is accomplished with the help of students from Wilton High School.

From 1990-1994, the Harbor Watch program documented a high diversity of benthic fish. The largest concentrations of the target species, juvenile winter flounder (*Pleuronectes americanus*), were captured from the I-95 Bridge south to the Maritime Center (grids A-D, Figure 9.1, Harris et al. 2014). From 1995-2005 comparable surveys were not performed due to extensive boat repairs and sampling outside Norwalk Harbor. In mid-August of 2005 a large (> one million) fish kill of menhaden, *Brevoortia tyrannus* occurred in the upper harbor caused by herding of bluefish, *Pomatomus saltatrix* into a zone of depleted dissolved oxygen (<3 ppm, Harris et al. 2014). Extensive dredging began in the upper harbor in 2005-2006. Dredge operations, in conjunction with masses of dead fish still in the harbor, curtailed sampling and further disturbance came in July 2006 when another smaller menhaden kill occurred. Limited sampling occurred in 2007 and resumed to a full program in 2008. The outer harbor was dredged in 2010, but did not hinder sampling in the harbor proper. Beam trawl sampling captured 8-16 finfish species annually for years with comparable effort in June through October (Table 9.1). The year following the major fish kill and harbor dredge operations reported low diversity and a low average catch rate, however the lowest diversity and catch rate were reported in 2010. When species are grouped by thermal guild (Figure 9.4), it appears that warm temperate species have become more common in recent years.

Bottom water temperatures taken weekly at six stations in the Norwalk River beginning in 1987 (Figure 9.1, Table 9.5) show a clear warming trend in the river for years with complete sampling during summer months (July-September). Warming was greatest in the upper river (Station 1 and 1a, Figure 9.1). When regressed over years, readings at each station show a positive slope, significant ($p<0.05$) for all but the outer harbor (Station 5, Figure 9.1).

Cedar Island Marina Research Laboratory, Clinton

The Cedar Island Marina Research Laboratory staff have conducted a series of fish trap and beam trawl surveys in the vicinity of the Marina since 1989 (Figure 9.2). The beam trawl survey employs a one-meter beam trawl (0.63cm mesh) at 5-12 stations within and adjacent to the floating docks of the marina (Figure 9.2). Tow distances varied from 36-150m to accommodate the configuration of the docks (Gilman 2008) and the constrictions of adjacent Hammonasset River. Sampling occurred year round in some years and only a few months in others. Years with complete sampling June-October include 1990-1991 and 2010-2011. Finfish inhabiting the off-bottom marina area were also sampled beginning in 1995 with unbaited fish traps (11.8cm cube, 1.3cm square mesh) tethered permanently at 6-8 locations off the marina docks and monitored for fish and invertebrate catch at intervals varying from 3-14 days. Years with comparable sampling during June-September

include 1996, 2000-2001, and 2005-2006.

Beam trawl sampling captured 6-16 finfish species annually for four years with comparable effort in June through October (Table 9.1). Abundance and diversity in the marina and adjacent area were fairly similar to values recorded in Norwalk River samples. Comparable abundance but lower diversity was recorded in abbreviated (June-July only) sampling in 2011-2012. When species were grouped by guild for years with complete sampling (Table 9.6, Figure 9.5), warm temperate species were more common in 2009-2010 than in 1990-1991. Winter flounder dominated the cold temperate group and their decline in abundance was primarily responsible for this change.

Fish trap catches within the marina captured 6-11 finfish species in five years with comparable effort for June through September (Table 9.3). Demersal species were more commonly captured with this gear compared to the beam trawl, and both abundance and diversity increased somewhat over the time series (Table 9.6). Cold temperate species composed at least 70% of the total catch, and warm temperate species less than 30% of the catch in all years (Figure 9.6).

Project Oceanology, Connecticut River

Project Oceanology was formed in 1972 by a group of teachers and public school administrators from southeastern Connecticut with the goal of maximizing the marine environment as an education resource. The membership of this non-profit organization includes public school districts, colleges, universities and educational institutions (www.oceanology.org). Early school groups were introduced to local marine species through trips on a 50-ft wooden launch donated by the US Navy which was replaced in 1986 by a 56-ft confiscated lobster boat donated by the US Customs Service. Since 1991, class activities have taken place on a 65-ft steel hull research stern trawler as well as on a fleet of smaller skiffs. Approximately 25,000 students and the general public participate in Project Oceanology's programs each year (www.oceanology.org).

Consistent trawl sampling has been reported for an area off the mouth of the Connecticut River (Figure 9.3) from 2004 to 2013. An otter trawl (net sweep 9.2 m, 2.5cm mesh) is towed for 20 minutes in spring (late April-May) and fall (October-early November) and all species caught are identified and enumerated. Average annual catch has varied with the highest values in recent years (Table 9.2). Grouping seasonal catch data into 4-6 year intervals (Table 9.7) resulted similar species diversity and species guild representation (Figure 9.7) in both seasons over the years sampled.

MODIFICATIONS

No modifications are expected.

LITERATURE CITED

Gilman, M. 2008. Population and diet change in a Long Island Sound subtidal community after 18 years. Master's Thesis, Southern Connecticut State University, 82 pages.

Harris, R., P. Fraboni, N. Cantatore, and J. Cooper, 2014. Harbor Watch Report on Norwalk Harbor Juvenile Benthic Marine Fish, May through October 2014, 9 pages.

Howell, P and P. Auster, 2012. Phase shift in an estuarine finfish community associated with warming temperatures. Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science, 4:1, 481-495.

Table 9.1: Beam trawl total finfish catch in the Norwalk River, Norwalk and Hammonasset River, Clinton, June-October, 1990-201. Geometric mean of all finfish species are shown with upper and lower 95% confidence intervals (U95, L(%). The total number of tows taken (N), the percent of tows catching finfish (Positive Tows) and the total number of species caught over the entire time period are also listed.

	NORWALK				Positive	Total	CLINTON				Positive	Total
Year	N	Mean	U95	L95	Tows	Species	N	Mean	U95	L95	Tows	Species
1990	33	2.46	3.76	1.52	79%	9	110	5.40	6.49	4.47	100%	16
1991	45	2.49	3.74	1.57	76%	12	86	4.90	6.05	3.94	100%	15
1992	44	9.78	14.15	6.67	98%	14						
1993	57	4.74	6.49	3.40	86%	12						
2003	39	1.95	3.05	1.15	77%	16						
2006	56	0.84	1.25	0.50	52%	8						
2008	47	1.18	1.72	0.75	60%	16						
2009	63	1.53	2.11	1.06	73%	9	28	1.14	1.91	0.58	79%	6
2010	41	0.48	0.75	0.25	41%	6	60	0.93	1.29	0.63	62%	9
2011	68	1.12	1.51	0.80	65%	13						
2012	49	1.39	1.90	0.97	71%	14						
2013	64	1.26	1.78	0.84	64%	12						
2014	55	1.55	2.13	1.08	73%	14						

Table 9.2: Otter trawl total finfish catch off the mouth of the Connecticut River, 2004-2013. Samples were made in spring (April-May) and fall (October-November). Geometric mean of all finfish species are shown with upper and lower 95% confidence intervals (U95, L(%). The total number of tows taken (N), the percent of tows catching finfish (Positive Tows) and the total number of species caught over the entire time period are also listed.

SPRING	Connecticut River				Positve	Total	FALL	Connecticut River				Positve	Total
Year	N	Mean	U95	L95	Tows	Species	Year	N	Mean	U95	L95	Tows	Species
2004	5	1.61	6.21	0.00	60%	5	**2004**	4	0.00			0%	0
2005	5	3.72	13.67	0.52	100%	4	**2005**	3	3.85	72.91	0.00	67%	5
2006	3	9.69	106.32	0.06	100%	6	**2006**	4	2.94	17.26	0.00	75%	4
2007	5	3.44	9.58	0.86	100%	4	**2007**	5	5.74	9.84	3.18	100%	8
2008	4	9.73	23.08	3.78	100%	7	**2008**	6	6.09	20.87	1.30	83%	8
							2009	5	50.51	108.51	23.23	100%	10
2010	4	19.10	74.24	4.37	100%	6	**2010**	4	7.69	20.87	2.45	100%	5
							2011	2	38.12	56.08	27.28	100%	11
2012	1	19.00			100%	7	**2012**	4	38.62	133.44	10.68	100%	8
2013	4	2.08	8.42	0.01	75%	5							

Table 9.3: Fish trap finfish catch within Cedar Island Marina, Clinton l996-2006.

Year	N	Mean Catch	Fish Species
1996	31	1.03	7
2000	27	0.93	6
2001	79	1.67	9
2005	39	2.33	9
2006	93	4.04	11

Table 9.4: Finfish species occurrence in Norwalk River beam trawl samples, June-October, 1990-2014. Five thermal guilds were present: cold temperate-demersal (CD), cold-temperate-epibenthic (CE), warm temperate-demersal (WD), warm temperate-epibenthic (WE), and warm temperate-pelagic (WP). Common species appearing in most years are in bold type.

Guild	Common Name	1990	1991	1992	1993	1994	2006	2008	2009	2010	2011	2012	2013	2014
W E	American Eel	0.5%	0.7%	0.4%			1.0%							
W D	Atlantic Silversides			0.2%	0.2%	0.6%			0.5%		2.8%	0.7%	1.2%	
W E	Banded Killifish							5.6%			2.2%			
W P	Bay Anchovy											0.7%		
W D	Black Sea Bass											2.9%		
W P	Bluefish											0.7%		
C D	Cunner	2.8%	**1.8%**	**4.4%**	**1.2%**	**3.2%**		24.7%	0.9%		2.8%	7.2%	0.4%	0.6%
C E	Fourbeard Rockling			0.1%			8.2%							
C E	Fourspine Stickleback							2.2%						
C E	Grubby		0.2%	1.2%			13.4%	6.7%	0.9%	1.9%	0.6%			
W E	Hogchoker		0.4%											1.3%
W D	Inshore Lizardfish				0.2%						1.1%			
W P	Menhaden (bunker)											1.4%		
C E	Mummichog			1.3%		0.4%							0.2%	
W E	Naked Goby			0.2%				2.2%	0.5%	5.7%	2.2%	6.5%	2.7%	3.2%
W D	Northern Kingfish													0.6%
C E	Northern Searobin	6.9%	**5.3%**	**9.3%**	**4.3%**	**3.0%**		**5.6%**	**19.2%**		**10.0%**	15.2%	1.9%	16.0%
W E	Norhtern Pipefish	11.6%	**7.5%**	**5.9%**	**15.9%**	**4.4%**	**14.4%**	**14.6%**	**11.3%**	**20.8%**	**20.6%**	12.3%	2.7%	23.7%
W E	Northern Puffer			0.1%		0.2%						0.7%	0.4%	5.1%
C E	Oyster Toadfish				0.2%	0.2%								0.6%
W D	Rock gunnel	1.4%			1.0%			2.2%						
W E	Scup (Porgy)								0.5%					1.9%
W E	Seahorse							2.2%						
W D	Skilletfish												0.2%	
W E	Spot							1.1%						
W E	Striped Killifish		2.9%											
W E	Striped Searobin						2.1%			17.0%				
W E	Summer flounder	0.5%	0.7%	0.2%	0.4%	0.2%	3.1%	3.4%	0.9%	1.9%	1.1%	0.7%	1.0%	
W D	Smallmouth Flounder		0.2%								0.6%	1.4%	0.2%	0.6%
C D	Tautog (Blackfish)	6.0%	1.8%	0.6%	0.2%			3.4%			2.8%	1.4%		5.1%
W D	Tomcod	1.9%				0.8%		2.2%			0.6%			
C E	White Perch				0.2%									
C E	Windowpane Flounder		0.4%	0.3%	3.5%		2.1%	2.2%					0.6%	2.6%
C E	Winter Flounder_YOY	64.8%	**76.7%**	**75.5%**	**65.9%**	**85.7%**	**51.5%**	**21.3%**	**65.3%**	**50.9%**	**52.8%**	47.8%	88.7%	38.5%
C E	Winter Flounder_Age1	3.7%	1.5%	0.2%	6.9%	1.4%	4.1%			1.9%				

Table 9.5: Mean bottom water temperature measured weekly June-September at six stations in the Norwalk River, 1987-2010. Data are shown in degrees centigrade. Station locations are shown in Figure 9.1. Regression statistics for the time series at each station are shown: R-square adjusted for sample size showing what percentage of the annual variance in temperature is explained by the increasing trend, P-value that the slope is different from zero (i.e. no change; values less than 0.05 are statistically significant), and the slope or annual rate of the change in temperature.

	STATION					
YR	1	2	3	4	4A	5
1987	21.83	22.15	22.04	22.18		22.02
1989	21.77	21.77	21.85	21.48		21.00
1990	21.86	22.16	22.03	22.03	22.17	21.74
1991	22.49	22.61	22.59	22.45	22.42	21.87
1992	20.92	21.16	21.25	21.32	21.18	20.98
1996	21.99	22.37	22.41	21.67	22.10	21.14
1998	23.08	22.82	22.76	22.33	22.50	21.62
1999	22.79	22.94	23.01	22.76	22.73	22.30
2001	22.54	22.43	22.31	21.99	22.13	21.60
2002	22.60	22.70	22.78	22.31	22.47	21.87
2003	21.84	22.07	22.11	21.66	21.92	20.99
2004	22.17	22.37	22.61	22.21	22.37	21.58
2005	23.41	23.41	23.52	23.08	23.37	22.28
2010	23.87	23.76	23.67	23.16	23.52	22.26
adjR2	0.42	0.41	0.49	0.25	0.35	0.03
P	**0.007**	**0.008**	**0.003**	**0.039**	**0.025**	0.265
slope	0.075	0.063	0.068	0.044	0.065	0.022

Table 9.6: Finfish species occurrence in the Hammonasset River, Clinton, beam trawl and fish trap samples, 1990-2012. Trawl catches shown here were taken June-October except 2011-12 taken in June-July only. Fish trap catches shown here were taken June-September. Five thermal guilds were present: cold temperate-demersal (CD), cold-temperate-epibenthic (CE), warm temperate-demersal (WD), warm temperate-epibenthic (WE), and cold temperate-pelagic (CP).

		Beam Trawl Catch						Fish Trap Catch				
Guild	Common Name	1990	1991	2009	2010	2011	2012	1996	2000	2001	2005	2006
W E	American Eel		0.2%		2.1%					2%		
C P	Atlantic Mackerel								4%			
C D	Atlantic Tomcod	0.1%		1.2%				63%		3%	14%	5%
W D	Atlantic Silversides	0.1%			1.1%							
W P	Bay Anchovy	0.2%										
W D	Black Sea Bass		1.2%							1%		18%
W P	Bluefish		0.2%									
C D	Cunner	0.2%	0.5%					13%	8%	44%	22%	29%
C E	Fourbeard Rockling											
C E	Grubby	3.1%	0.5%	16.5%	2.1%	4.1%	15.3%					
W E	Hogchoker	6.0%	1.7%		1.1%			3%				
C E	Longhorn Sculpin									1%	25%	30%
W D	Inshore Lizardfish	0.4%										
C E	Mummichog											0.3%
W E	Naked Goby	0.1%	0.5%		8.5%		1.4%					
W D	Northern Kingfish											
C E	Northern Searobin						9.7%					
W E	Northern Pipefish	3.3%	2.2%	41.2%	18.1%	11.0%	44.4%	6%	8%	1%	1%	1%
W E	Northern Puffer	0.6%	0.9%				2.8%					
C E	Oyster Toadfish	2.3%	1.4%	1.2%	6.4%			6%	60%	38%	16%	2%
C E	Red Hake								4%			
W D	Rock gunnel											0.3%
W E	Scup (Porgy)										10%	
W E	Smooth Flounder		7.0%									
W E	Striped Searobin	3.1%	4.0%	5.9%	4.3%							
W E	Summer flounder	0.3%	0.6%								2%	2%
W D	Tautog (Blackfish)	0.8%	0.3%					6%	16%	10%	8%	8%
C E	Windowpane Flounder	0.9%										
C E	Winter Flounder_YOY	78.5%	78.8%	29.4%	56.4%	84.9%	26.4%	3%		1%	1%	5%
C E	Winter Flounder_Age1+			4.7%								

Table 9.7: Finfish species occurrence in Project Oceanology otter trawl catches off the mouth of the Connecticut River, 2004-2013. Trawl catches shown here were taken in spring (April-May) and fall (October-November). Six thermal guilds were present: cold temperate-demersal (CD), cold-temperate-epibenthic (CE), warm temperate-demersal (WD), warm temperate-epibenthic (WE), and warm temperate-pelagic (WP), and semitropical-pelagic (SP).

		2004-07		2008-13	
Guild	**Common Name**	SPRING	FALL	SPRING	FALL
C E	Atlantic Seasnail		1.4%		
W P	Blueback Herring			0.6%	
W P	Bluefish				0.1%
W P	Butterfish	0.9%	6.8%		4.2%
W E	Hogchoker		2.7%		27.7%
S P	Moonfish				2.2%
W D	Northern Kingfish	3.5%			0.1%
C E	Northern Searobin	1.8%	2.7%		0.1%
C E	Rock Gunnel	4.4%			
W E	Northern Pipefish		2.7%		
W E	Scup (Porgy)		1.4%	**1.1%**	
W E	Summer flounder	3.5%		9.0%	0.9%
C E	Skate species	28.9%	50.0%	27.5%	44.6%
W D	Smooth Dogfish		1.4%		
W E	Smallmouth Flounder			1.1%	0.7%
W E	Spotted Hake	0.9%		7.3%	0.7%
W E	Striped Searobin			0.6%	
W D	Striped Bass	3.5%			3.0%
W D	Tautog (Blackfish)		5.4%	0.6%	0.1%
C E	Winter Flounder		5.4%	21.9%	0.3%
W D	Weakfish		20.3%		1.8%
C E	Windowpane Flounder	52.6%		30.3%	13.2%
Total species		9	11	10	15
Total tows		18	16	14	21

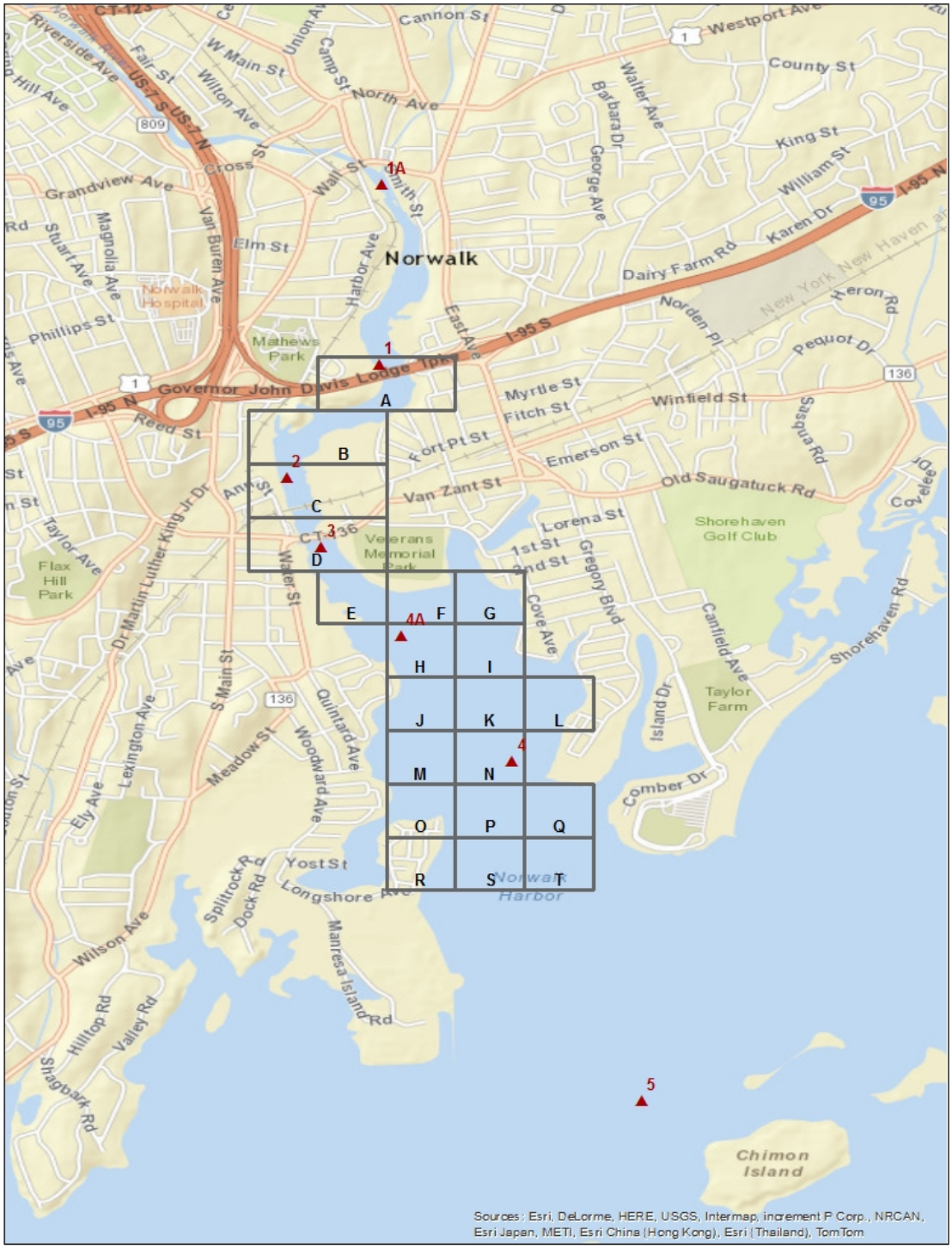


Figure 9.1: Harbor Watch sampling locations in the Norwalk River. Beam trawl sampling was completed within the lettered grids while water quality sampling stations are shown by the numbered triangles (Figure provided by Harbor Watch).

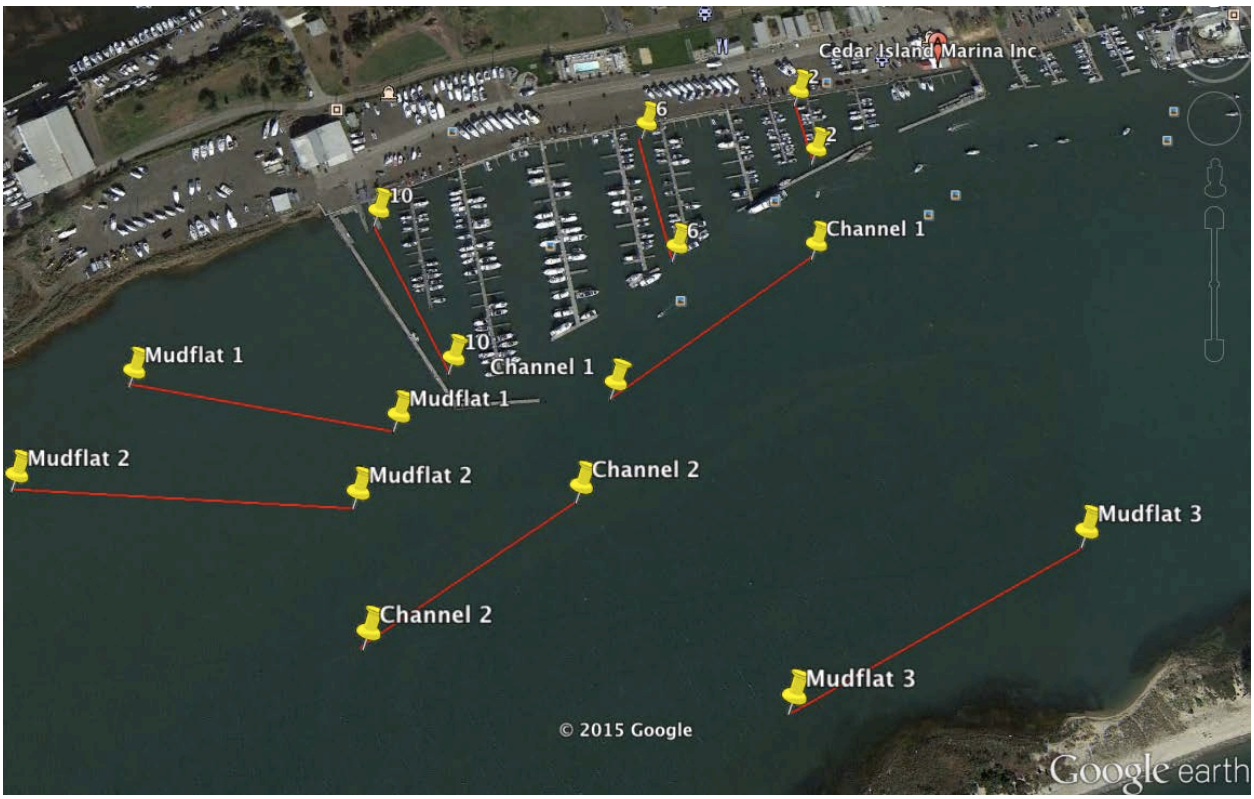


Figure 9.2: Cedar Island Marina Research Laboratory sampling locations in the Hammonasset River, Clinton. Beam trawl samples were taken at all tracks labeled by name or number. Fish traps were set at middle pier locations within the marina (Figure provided by Cedar Island Marina).

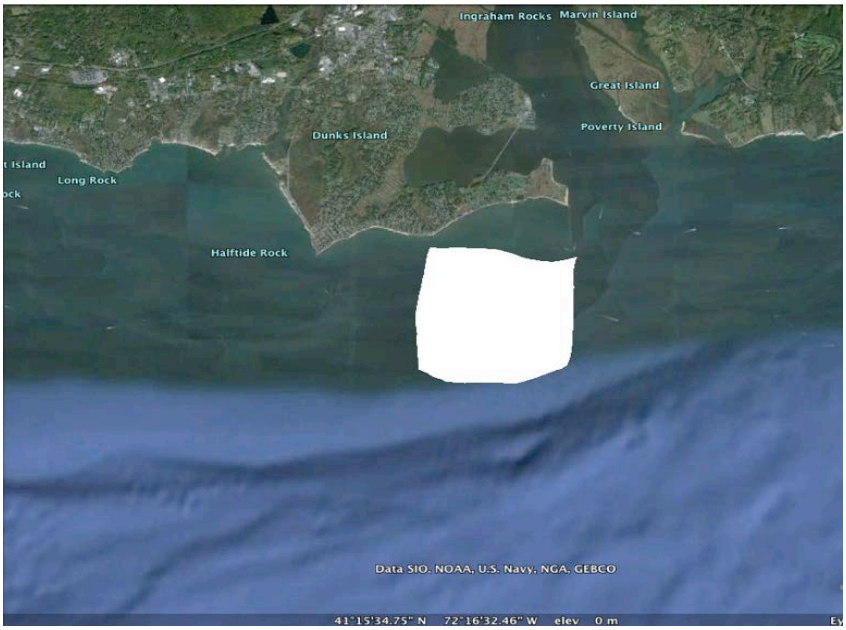


Figure 9.3: Project Oceanology sampling location off the mouth of the Connecticut River. Trawl coordinates are within the white box. (Figure provided by Project Oceanology)

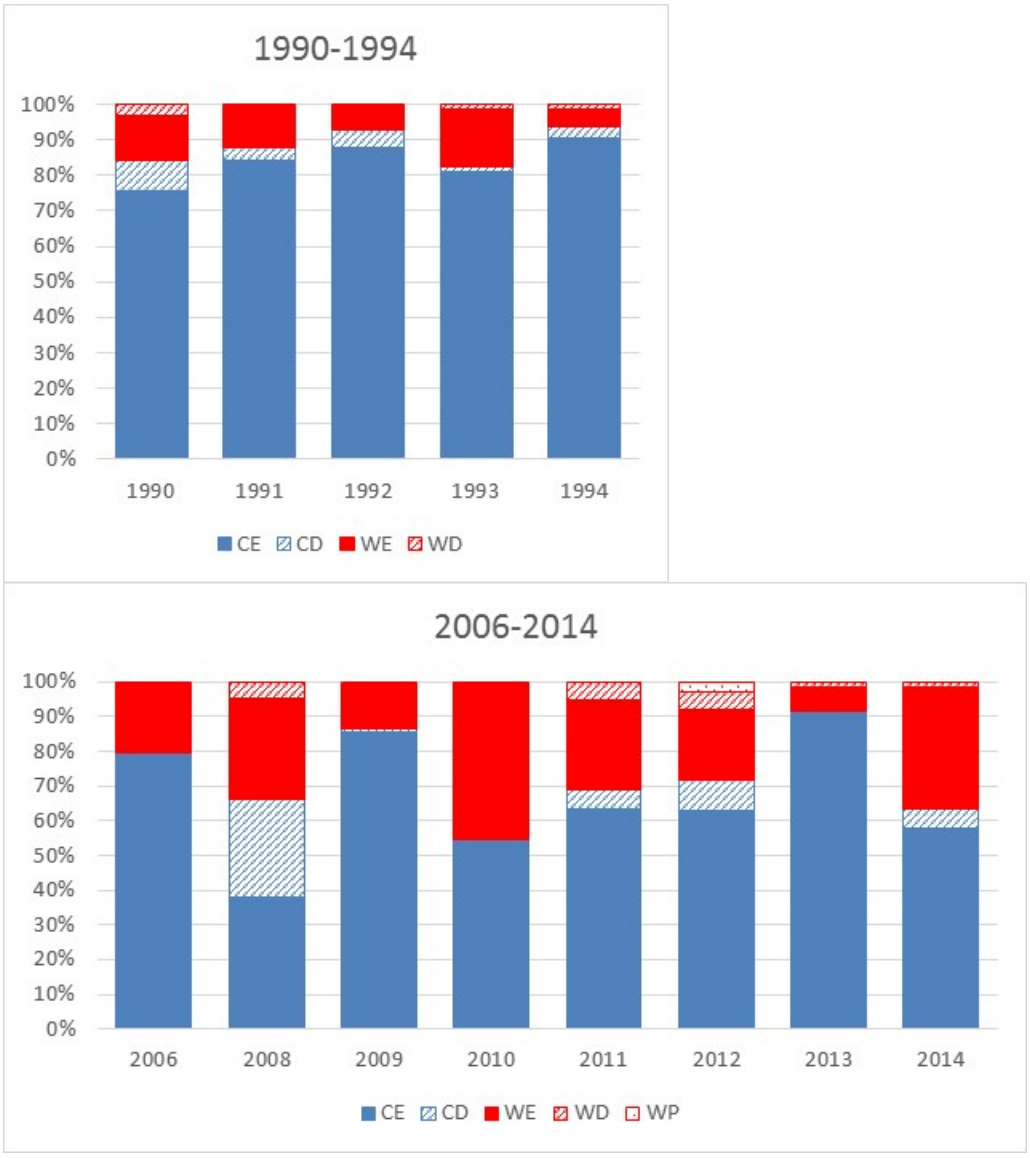


Figure 9.4: Percentage of finfish guilds captured in the Norwalk River beam trawl samples for years with comparable effort June-October. Cold temperate epibenthic (CE) and demersal (CD) species are compared to warm temperate epibenthic (WE), demersal (WD) and pelagic (WP) species abundance in all samples each year. Individual species occurrences are listed in Table 9.4.

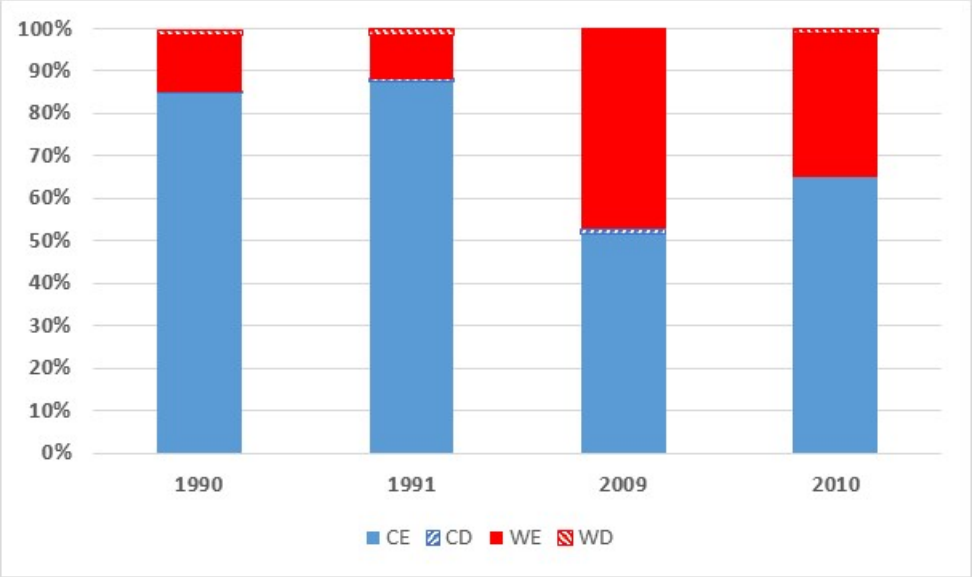


Figure 9.5: Percentage of finfish guilds captured in Hammonasset River, Clinton, beam trawl samples for years with comparable effort June-October. Cold temperate epibenthic (CE) and demersal (CD) species are compared to warm temperate epibenthic (WE) and demersal (WD) species abundance in all samples each year. Individual species occurrences are listed in Table 9.6.

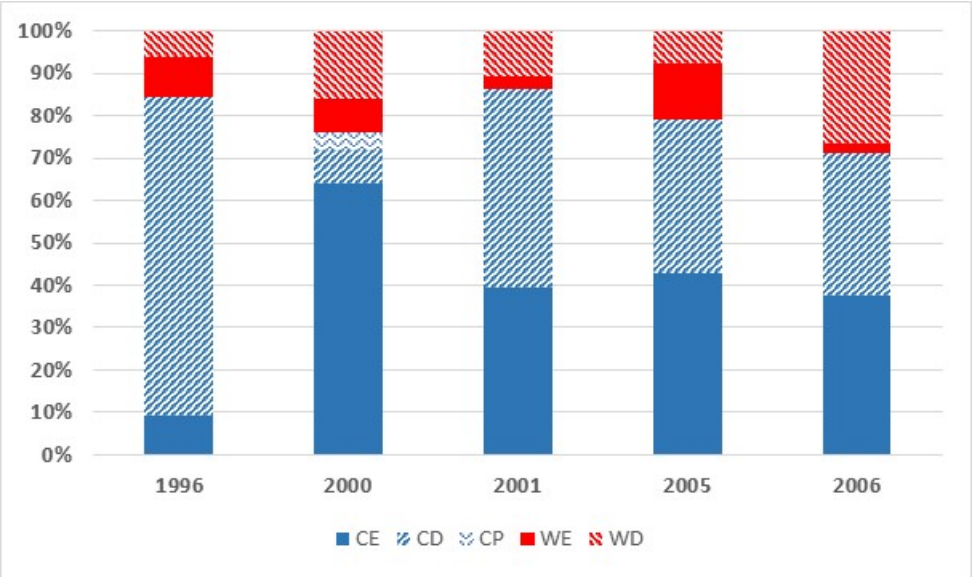


Figure 9.6: Percentage of finfish guilds captured in Cedar Island Marina, Clinton, fish trap samples for years with comparable effort June-September. Cold temperate epibenthic (CE), demersal (CD), and pelagic (CP) species are compared to warm temperate epibenthic (WE) and demersal (WD) species abundance in all samples each year. Individual species occurrences are listed in Table 9.6.

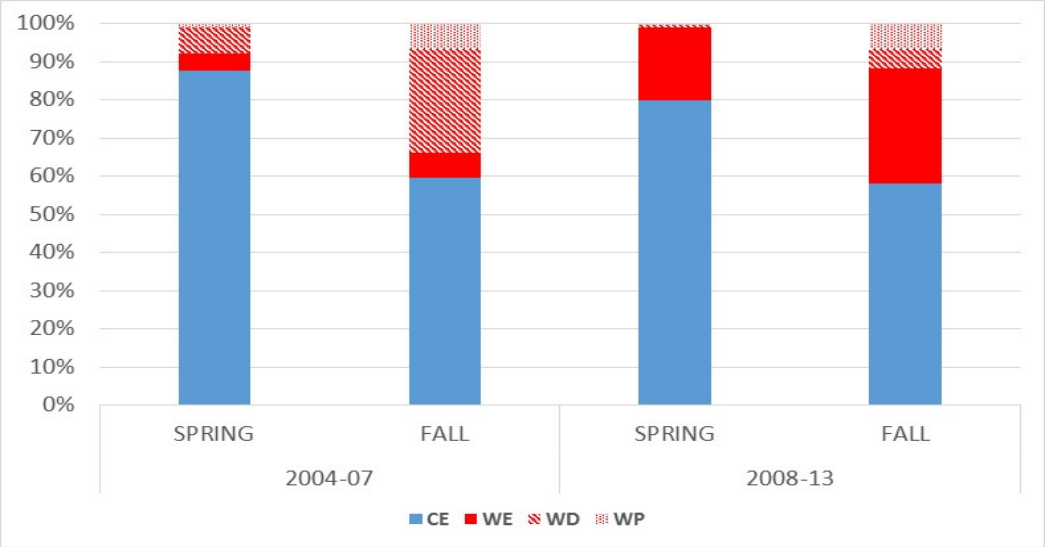
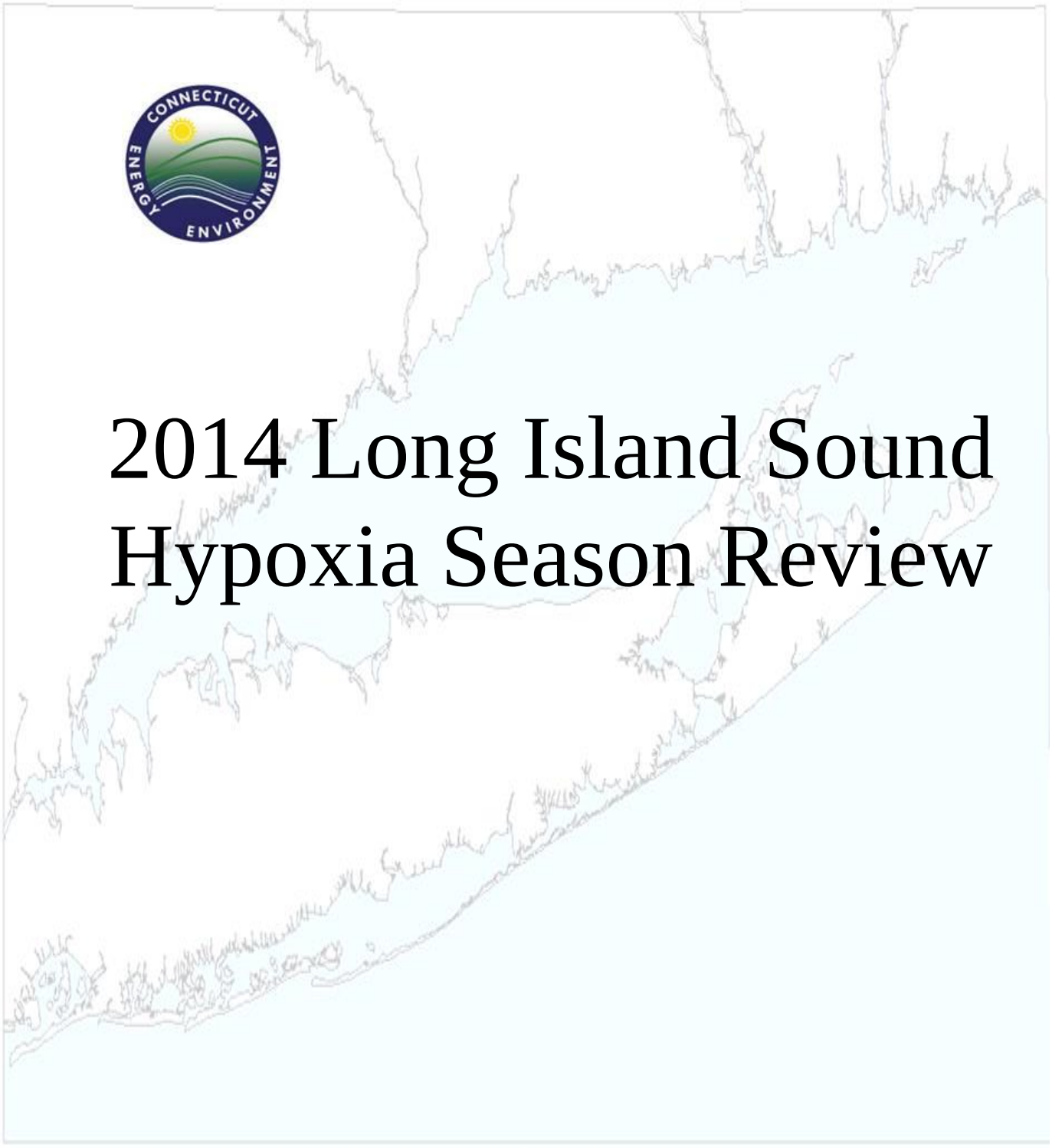


Figure 9.7: Percentage of finfish guilds captured in Project Oceanology trawl samples off the Connecticut River for years with comparable effort. Spring (April-May) and fall (October-November) catches are shown. Cold temperate epibenthic (CE) species are compared to warm temperate epibenthic (WE), demersal (WD), and pelagic (WP) species abundance in all samples each year. Individual species occurrences are listed in Table 9.7.



2014 Long Island Sound Hypoxia Season Review

CONNECTICUT DEPARTMENT OF ENERGY & ENVIRONMENTAL PROTECTION
79 ELM STREET, HARTFORD, CT 06106
ROBERT J. KLEE, COMMISSIONER

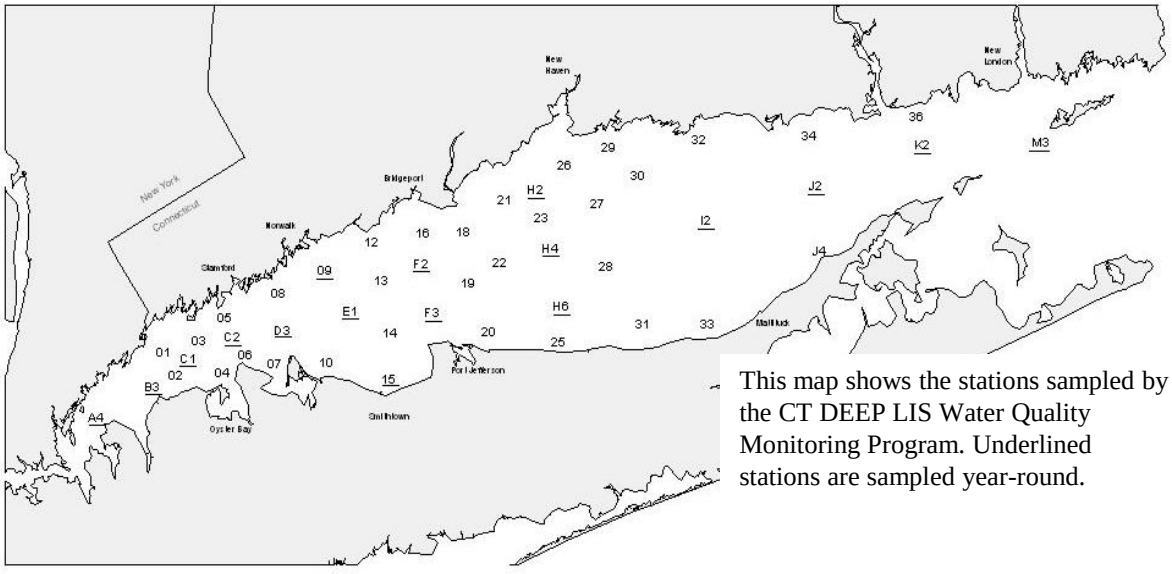
MONITORING LONG ISLAND SOUND 2014

Program Overview

Since 1991, the Connecticut Department of Energy & Environmental Protection (CT DEEP, formerly the Department of Environmental Protection, (CTDEP)) has conducted an intensive year-round water quality monitoring program on Long Island Sound (LIS). Water quality is monitored at up to forty-eight (48) sites by staff aboard the Department's Research Vessel *John Dempsey*.

R/V John Dempsey

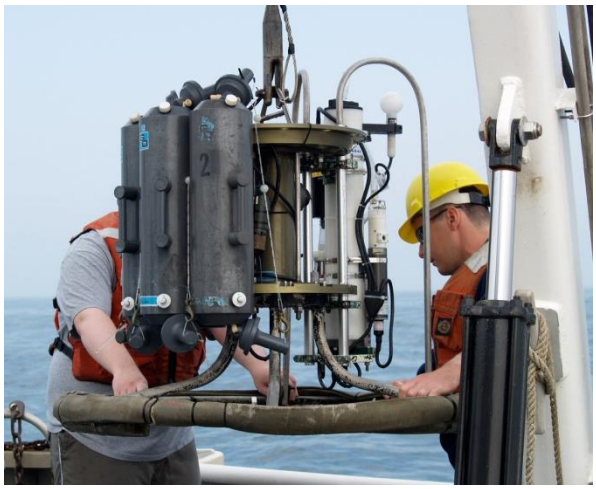
Data from the surveys are used to quantify and identify annual trends and differences in water quality parameters relevant to hypoxia (low dissolved oxygen), especially nutrients, temperature, and chlorophyll. These data are also used to evaluate the effectiveness of the management program to reduce nitrogen concentrations. During the summer (June -September) CT DEEP conducts additional summer hypoxia surveys at bi-weekly intervals to better define the areal extent and duration of hypoxia.



This map shows the stations sampled by the CT DEEP LIS Water Quality Monitoring Program. Underlined stations are sampled year-round.

Methods

Dissolved oxygen, temperature, pH, and salinity data are collected *in situ* using an electronic instrument called a Conductivity Temperature Depth recorder (CTD) that takes measurements from the surface to the bottom of the water column. The CTD, a Sea-Bird model SBE-19 SeaCat Profiler equipped with auxiliary dissolved oxygen, photosynthetically-active radiation (PAR) and pH sensors, is attached to a Rosette Sampler and lowered through the water column at a rate of approximately 0.2 meters per second and measurements are recorded every 0.5 seconds. *In situ* data are reviewed in real-time.



Water samples are collected using Niskin water sampling bottles that are attached to the Rosette Sampler. The Rosette is lowered off the stern of the *Dempsey* and the bottles are triggered remotely to take a water sample at any depth. Parameters for which surface and bottom waters are tested include dissolved silica, particulate silica, particulate carbon, dissolved organic carbon, dissolved nitrogen, particulate nitrogen, ammonia, nitrate + nitrite, particulate phosphorus, total dissolved phosphorus, orthophosphate, chlorophyll *a*, and total suspended solids.

Samples are filtered aboard the mini laboratory and preserved for later analyses at the Center for Environmental Science and Engineering at the University of Connecticut. From October to May, *in situ* and nutrient samples are collected once a month from 17 sites. Bi-weekly hypoxia surveys start in mid-June and end in September with up to 48 stations being sampled during each survey for *in situ* parameters.

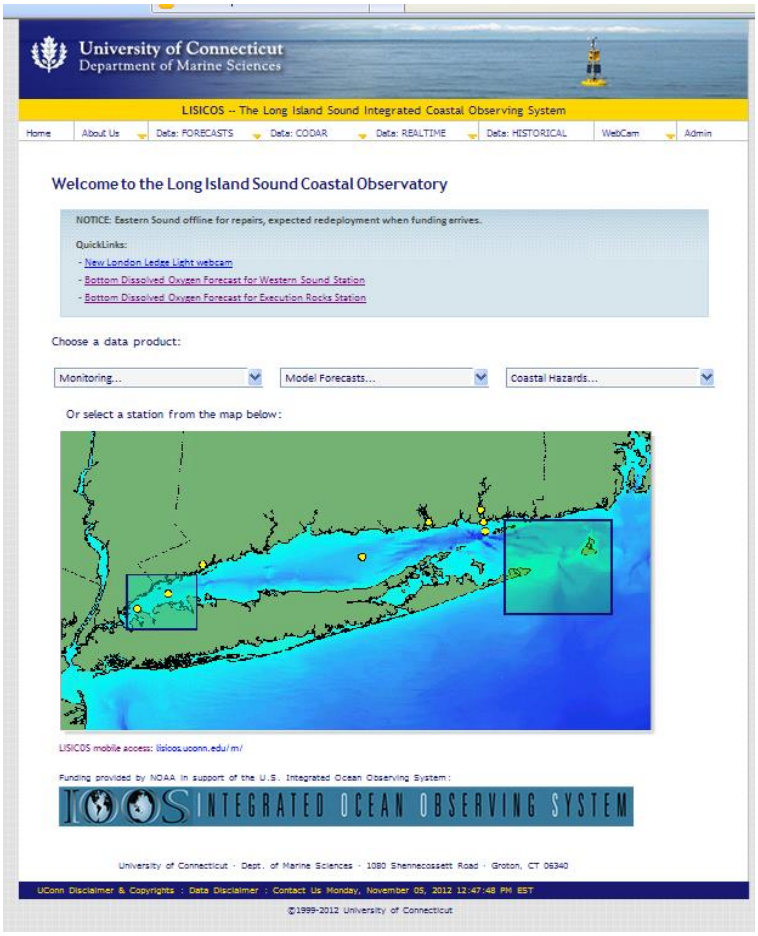
Since 2002, CT DEEP has collected zooplankton samples from six stations and phytoplankton from ten stations across Long Island Sound. The samples are sent to researchers at the University of Connecticut who identify species composition, abundance, community structure, and spatial and temporal distribution throughout the Sound.

LISICOS

The Long Island Sound Integrated Coastal Observing System (LISICOS) was established in 2003 as a component of a regional/national ocean observing system. The system was conceptualized as part of a water quality monitoring program that combined the traditional ship-based point sampling surveys with continuous, real-time sampling stations. Funding for the program was first provided through the Environmental Protection Agency EMPACT grant program and is now provided by the National Oceanic and Atmospheric Administration.

The initial goal was to develop "a capability to observe and understand the LIS ecosystem and predict its response to natural and anthropogenic changes".

LISICOS monitors water quality parameters (e.g., salinity, temperature, dissolved oxygen, surface waves, photosynthetically available radiation, chlorophyll) and meteorological parameters (e.g., wind speed, direction, barometric pressure, wave height) at up to eight stations across the Sound. Sensors are attached to a moored buoy at various depths (surface, mid, bottom). Data are transmitted every 15 minutes in real-time via satellite (telemetered) where they are stored in a database and uploaded to the internet. The system is maintained by the University of Connecticut.

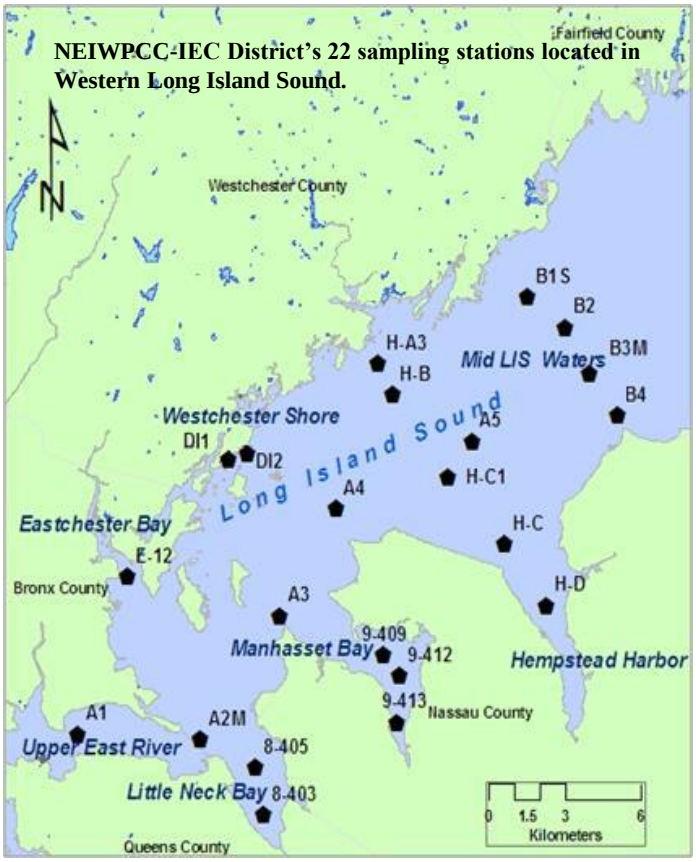


IEC District

The Interstate Environmental Commission District (IEC) is a tri-state water and air pollution control agency. Established in 1936 the IEC serves the States of New York, New Jersey, and Connecticut (www.iec-nynjct.org). The IEC's area of jurisdiction runs west from New Haven, CT and Port Jefferson, NY on Long Island Sound.

IEC has conducted monitoring in far western LIS and the Upper East River since 1991. IEC collects *in situ* data from 22 stations between June and September. *In situ* parameters include pH, temperature, salinity, water clarity (Secchi disk depth) and dissolved oxygen. More information about the program can be found on the IEC website under the Publications menu http://www.iec-nynjct.org/publications.htm.

Provisional IEC dissolved oxygen data collected during 2014 have been used to create hypoxia map interpolations in the far western Sound and appear on pages 12-17 adjacent to CTDEEP hypoxia maps. These maps are for illustrative purposes only.



NEIWPCC-IEC District's 22 sampling stations located in Western Long Island Sound.

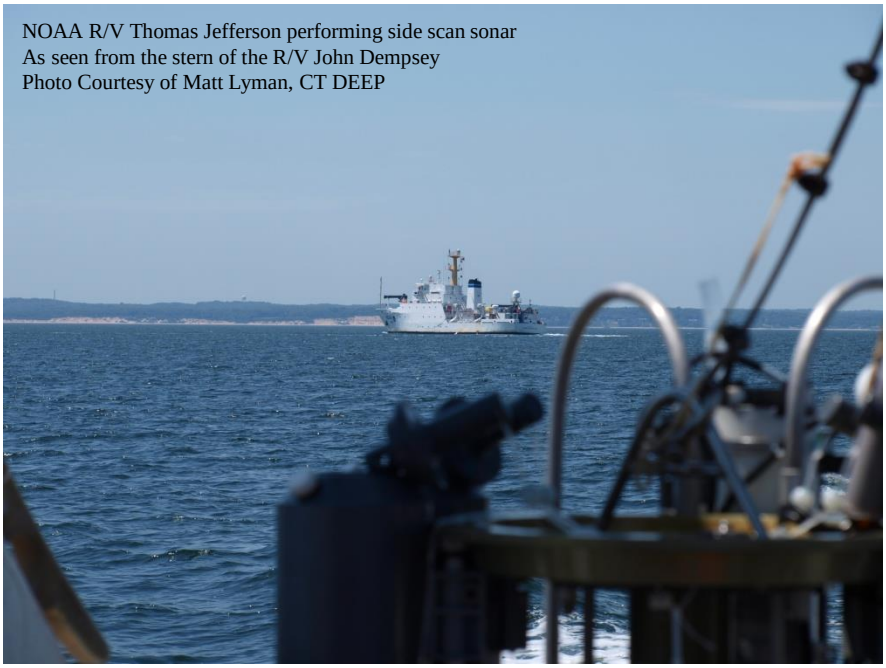

NEIWPCC-IEC District Analyst utilizes a multi-parameter meter at station A2M during a summer monitoring survey

This report presents a summary of the 2014 *in situ* data collected by CT DEEP. Data from LISICOS and IEC are presented with permission for informational purposes.

The CT DEEP LIS Water Quality Monitoring Program is synoptic in nature and is intended to characterize water quality conditions at one moment in time over a broad area (the entire Sound). Water column profile data provided by the program are useful for future determinations of volume of hypoxic waters. CT DEEP's program supports a long term monitoring database designed to detect changes in hypoxia due to changing conditions (i.e. management actions, climate change, productivity). The program also provides nutrient and biological data not available from fixed station buoy applications.

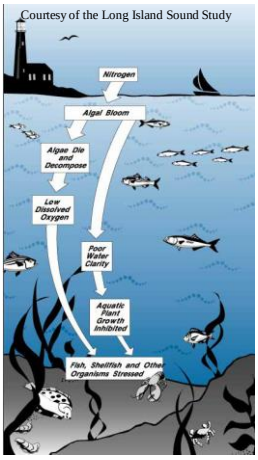
The LISICOS water quality sensors are attached to fixed locations and provide a holistic view of the conditions over a long span of time (i.e., continuous data from one station). The LISICOS continuously recording buoys have shown instances where vertical mixing within the water column raises the DO concentrations above the hypoxic thresholds for extended periods of time (e.g., days). These episodic conditions are not captured by CT DEEP surveys which occur bi-monthly during the hypoxic season.

As such CT DEEP's data provides a snapshot of hypoxic conditions at one time while the LISICOS data provide a continuous measurement of hypoxia at specific buoy locations. Together these monitoring programs are better able to characterize the extent and duration of hypoxia across LIS. Both types of data contribute to a better understanding of hypoxia in LIS.



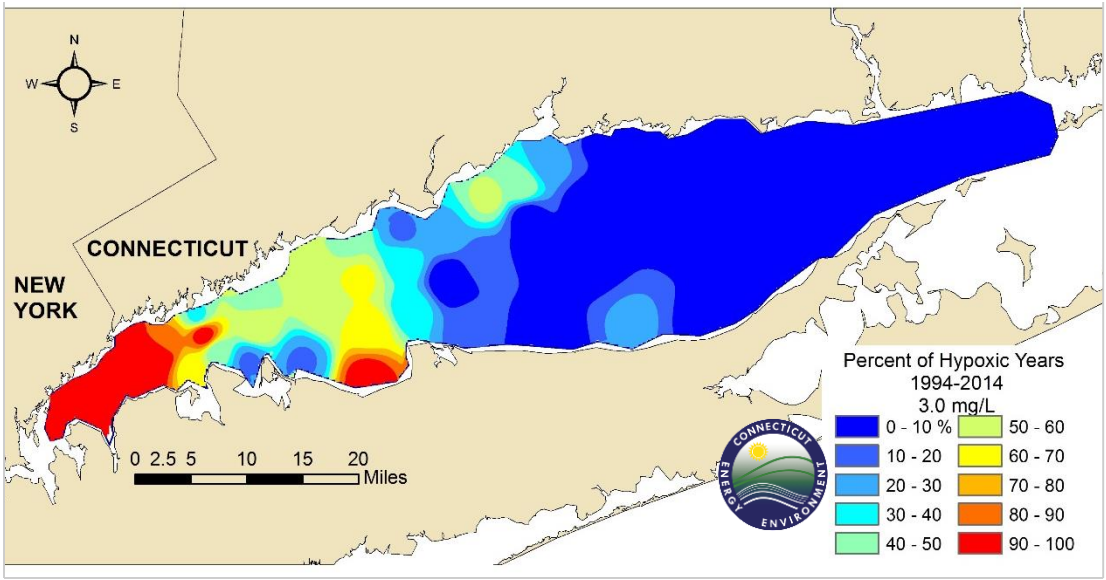
NOAA R/V Thomas Jefferson performing side scan sonar
As seen from the stern of the R/V John Dempsey
Photo Courtesy of Matt Lyman, CT DEEP

What is Hypoxia?



The term "hypoxia" means low dissolved oxygen ("DO") concentrations in the water. Marine organisms need oxygen to live, and low concentrations, depending on the duration and the size of the area affected, can have serious consequences for a marine ecosystem. As defined by the Long Island Sound Study, hypoxia exists when DO drops below a concentration of 3 milligrams per liter (mg/L), although ongoing national research suggests that there may be adverse affects to organisms even above this level, depending upon the length of exposure. In 2011, Connecticut adopted revised water quality criteria for dissolved oxygen. These criteria, designed to protect the state's waters from degradation, define hypoxia as DO concentrations below 3.0 mg/L. Low oxygen levels can occur naturally in estuaries during the summer, when calm weather conditions prevent the mixing of the water column that replenishes bottom water oxygen during the rest of the year. However, studies of the limited historical data base for the Sound suggest that summer oxygen depletion in Western Long Island Sound has grown worse since the 1950s.

THE FREQUENCY OF HYPOXIA IN LONG ISLAND SOUND BOTTOM WATERS



How Does Low Oxygen Impact the Sound?

Each summer low oxygen levels render hundreds of square miles of bottom water unhealthy for aquatic life. DO levels follow seasonal patterns with a decrease in bottom water DO over the course of the summer. Hypoxic conditions during the summer are mainly confined to the Narrows and Western Basin of Long Island Sound. Those areas comprise the section of the Sound west of a line from Stratford, CT to Port Jefferson, NY. The maximum extent of the hypoxic condition typically occurs in early August.

Photo By Lloyd Langevin, June 2007

2014 Important Facts

CT DEEP conducted eight cruises during the summer of 2014 between 2 June and 16 September. Over the course of the season, seven (7) different stations were documented as hypoxic and of the 263 site visits completed in 2014, hypoxic conditions were found twice. Compared to the 23-year averages, 2014 was below average in area and duration. In fact, 2014 had the fourth smallest area behind 1997, 1992, and 2013 (see page 9) and the 35 day duration joined 1995 and 2000 in a three-way-tie for the second shortest duration on record (see page 9).

Cruise	Start Date	End Date	Number of stations sampled	Number of hypoxic stations
WQJUN14	6/2/2014	6/4/2014	17	0
HYJUN14	6/19/2014	6/19/2014	21	0
WQJUL14	6/30/2014	7/2/2014	38	0
HYJUL14	7/14/2014	7/15/2014	30	0
WQAUG14	8/4/2014	8/6/2014	43	7
HYAUG14	8/18/2014	8/20/2014	41	0
WQSEP14	9/2/2014	9/4/2014	44	1
HYSEP14	9/15/2014	9/16/2014	29	0

The peak event occurred during the WQAUG14 cruise between 4 and 6 August. The lowest dissolved oxygen concentration (1.67 mg/L) was also documented during the WQAUG14 cruise at Station B3. The hypoxia area maps for 2014 appear on pages 12-17.

Based on CT DEEP and NEIWPCC-IEC data

	Event #1	Event #2	Total
Estimated Start Date	7/24/2014	8/27/2014	
Estimated End Date	8/13/2014	9/9/2014	
Duration (days)	21	14	**35**
Maximum Area (mi^2)			**87.1**

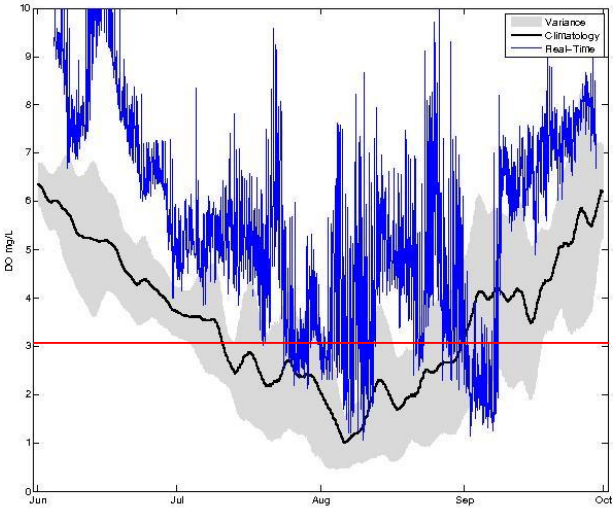
Start date and end date are estimated by plotting CT DEEP and NEIWPCC-IEC data from stations A4 and B3 in Excel using a line with markers chart and then interpolating when the DO concentration drops below/rises above 3.0 mg/L. In 2014, IEC often sampled the same weeks as CT DEEP. Therefore, LISICOS data were also included. There was a clear period when concentrations rose above 3 mg/L and remained there for 14 days in the middle of August before again dropping below the Hypoxia threshold. Concentrations remained above 3.0 mg/L threshold during the HYSEP14 cruise.

Duration Based on Buoy Data Obtained From the LISICOS Network on 29 September 2014

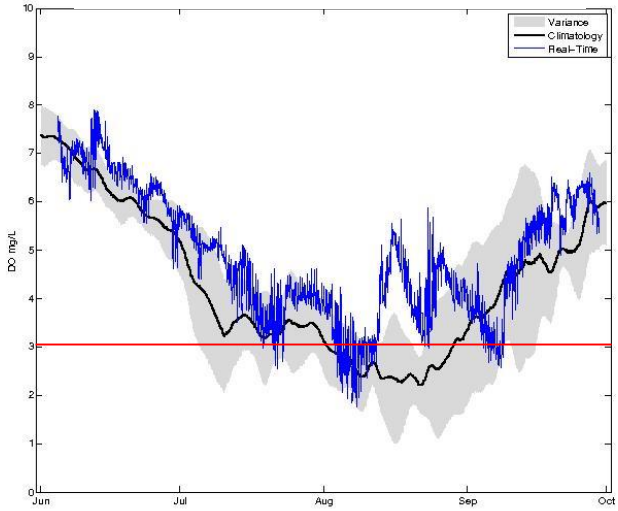
The figures below are from the LISICOS website and depict the 2014 real-time bottom dissolved oxygen data (blue line); the average of the 9 or 12 year dataset, depending on the station (black line); and the variability observed over the historical station record (gray shading).

There were three periods of decreased oxygen in the bottom waters that were captured by the LISICOS buoys.

Execution Rocks Bottom Dissolved Oxygen



Western LIS Bottom Dissolved Oxygen



Based on LISICOS Buoy Data Collected Between 1 June to 29 September

	Execution Rocks	Western LIS
Estimated Dates Event #1	7/24/14-8/13/14	7/21/14-7/23/14
Estimated Dates Event #2	8/21/14-8/23/14	8/3/14-8/12/14
Estimated Dates Event #3	8/27/14-9/8/14	9/5/14-9/8/14
Duration below 3.0 mg/L (cumulative days)	15.43	7.65
Duration below 2.0 mg/L (cumulative days)	4.02	0.28
Duration below 1.0 mg/L (cumulative days)	0.00	0.00
Minimum DO value (mg/L)	1.07 (10 August)	1.76 (8 August)
Days with no data		5.06

Data obtained from the LISICOS Execution Rocks and Western Sound Buoy Bottom Dissolved Oxygen Prediction Tool webpages (http://lisicos.uconn.edu/do_fcst.php?site=exrx and http://lisicos.uconn.edu/do_fcst.php?site=wlis). Duration is calculated by LISICOS by summing the time (in days) of the number of samples where DO was below the specified value (T. Fake, pers comm. 18 October 2012). ***Data are provisional and subject to change.***

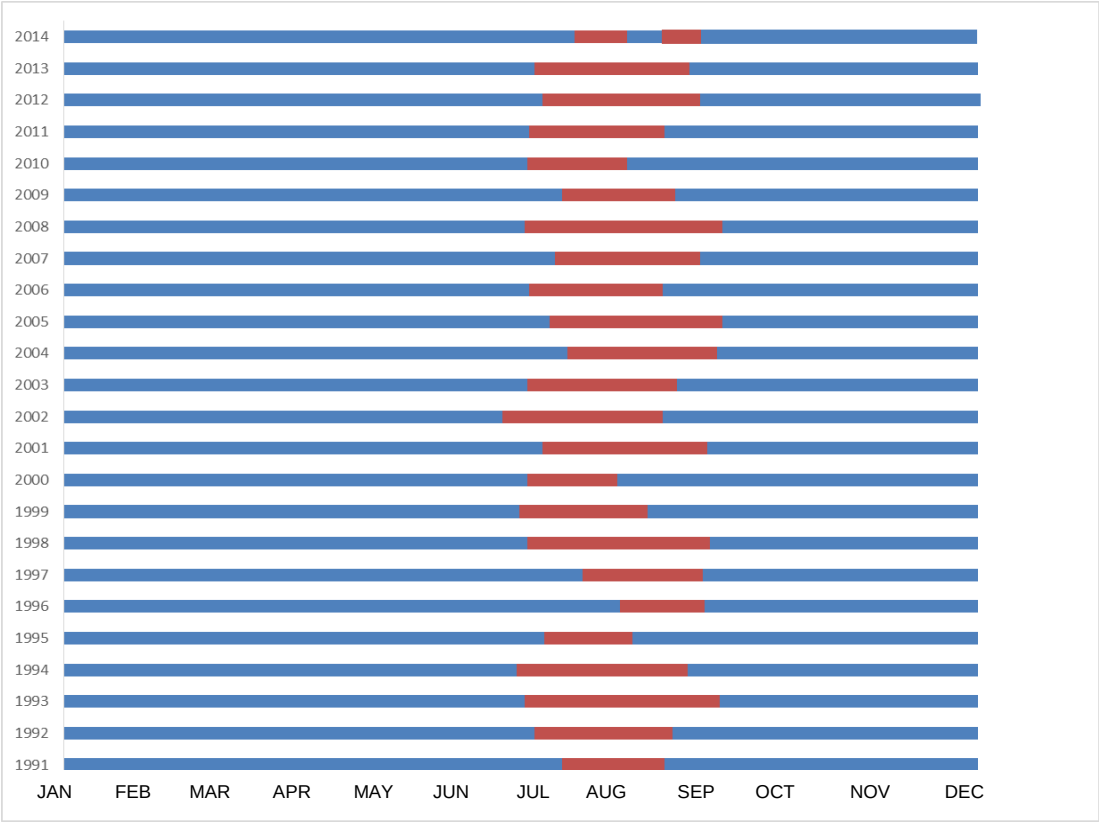
Timing and Duration of Hypoxia, 1991 - 2014

Year	Estimated Start Date	Estimated End Date	Maximum Area (mi^2)	Duration (days)
1991	July 19	Aug 28	122	41
1992	July 7	Aug 30	80	55
1993	July 9	Sept 10	202	64
1994	July 1	Sept 6	393	68
1995	July 12	Aug 15	305	35
1996	Aug 10	Sept 12	220	34
1997	July 27	Sept 12	30	48
1998	July 5	Sept 15	168	73
1999	July 2	Aug 21	121	51
2000	July 2	Aug 6	173	35
2001	July 10	Sept 14	133	66
2002	June 25	Aug 28	130	65
2003	July 5	Sept 3	345	61
2004	July 20	Sept 12	202	55
2005	July 14	Sept 20	177	69
2006	July 6	Aug 27	199	53
2007	July 16	Sept 11	162	58
2008	July 3	Sept 19	180.1	79
2009	July 19	Sept 1	169.1	45
2010	July 5	August 13	101.1	40
2011	July 6	August 28	130.3	54
2012	July 10	Sept 10	288.5	63
2013	July 8	Sept 7	80.7	62
2014	July 24	Sept 9*	87.1	35
Average	July 12	Sept 3	175	55
Deviation	±10 days	±12 days	± 87 mi^2	± 13 days

The figure and table below display the onset, duration, and end of the hypoxia events from 1991 through 2014 based on the 3.0 mg/L standard.

Based on the LISS standard of 3.0 mg/L, the average date of onset was July 11 (± 10 days), the average end date was September 3 (± 12 days), and the average duration was 55 days (± 13 days). The earliest onset of hypoxia (red text) occurred on 25 June 2002 and the latest end date (green text) occurred on 20 September 2005. The maximum area of hypoxia was 393 square miles (blue text) and occurred in 1994. The longest hypoxic event occurred in 2008 (magenta text) and lasted 79 days.

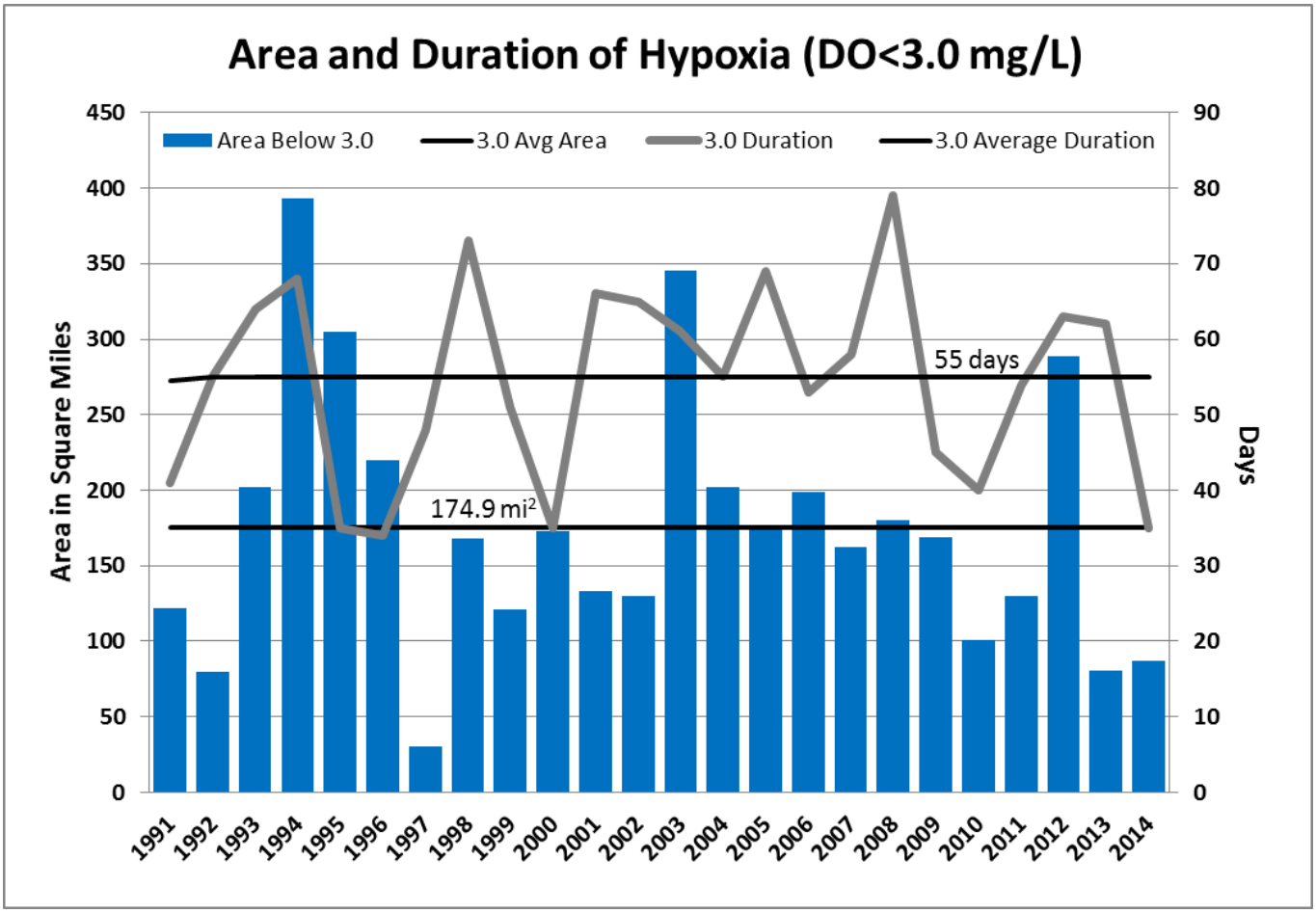
* In 2014 there was a clear period of 14 days where the DO concentration rose above the 3.0 mg/L threshold in the middle of August before dipping again during late August and early September.



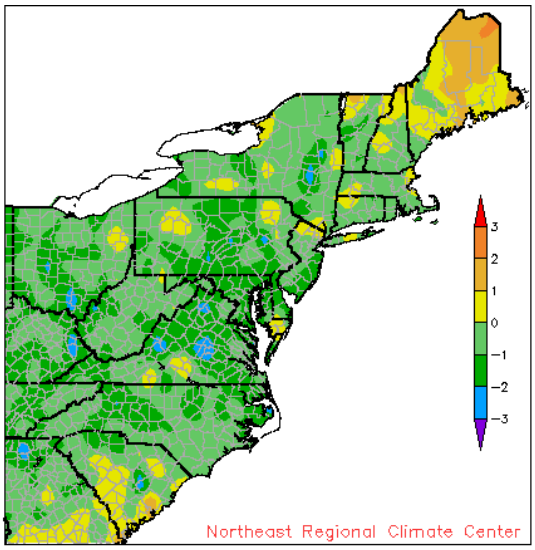
Timing and Duration of Hypoxia based on 3.0 mg/L

Yearly Comparison of Maximum Areal Extent and Duration of Hypoxia

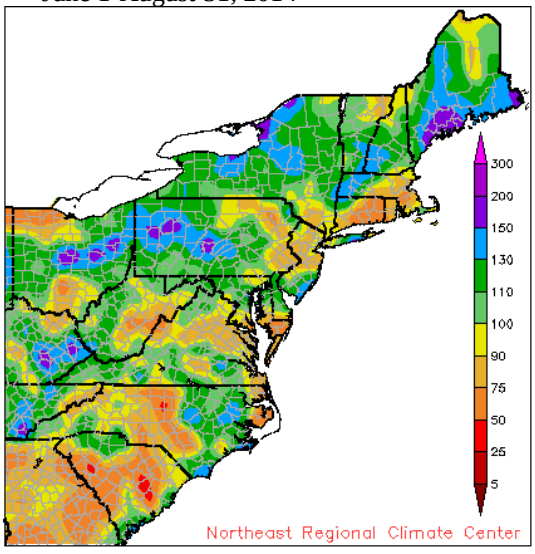
This graph utilizes the data presented on the previous page to illustrate the year-to-year differences in the maximum areal extent of hypoxic conditions. Based on the 3.0 mg/L DO standard the average areal extent was 174.9 mi^2 and the average duration was 55 days.



2014 Summer Weather Conditions



Departure from Normal Temperature (ºF)
June 1-August 31, 2014



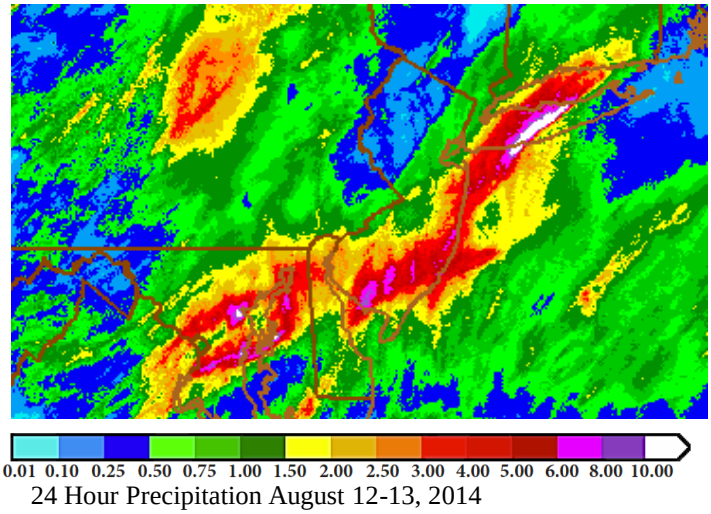
Percent of Normal Precipitation (%)
June 1- Aug 31, 2014

The Northeast Regional Climate Center at Cornell is tasked with disseminating climate data and information for 12 states. The NRRC included the following graphics in their Eastern Region Quarterly Climate Impacts and Outlook Summary (September 2014). http://www.nrcc.cornell.edu/newsletter/2014-09.pdf

Average spring air temperatures were below normal for the area through March but warmer to above normal in May. June-August average temperatures across the Northeast were cooler than normal. September temperatures, however, were above normal (1.7ºF in CT).

Spring precipitation was about normal for CT and Long Island, while snowfall during March was below normal. Precipitation over the summer was above normal for some Northeast states and below normal for others. Hurricane Arthur provided some wet weather for 4th of July celebrations. In Connecticut, August rainfall was 80% of normal. Long Island was abnormally dry, until 12-13 August. September and October have been dry with the region classified as being abnormally dry or in a moderate drought by the US Drought Monitor http://www.nrcc.cornell.edu/page_drought.html.

This information is useful as physical processes influence the timing and duration of hypoxia.



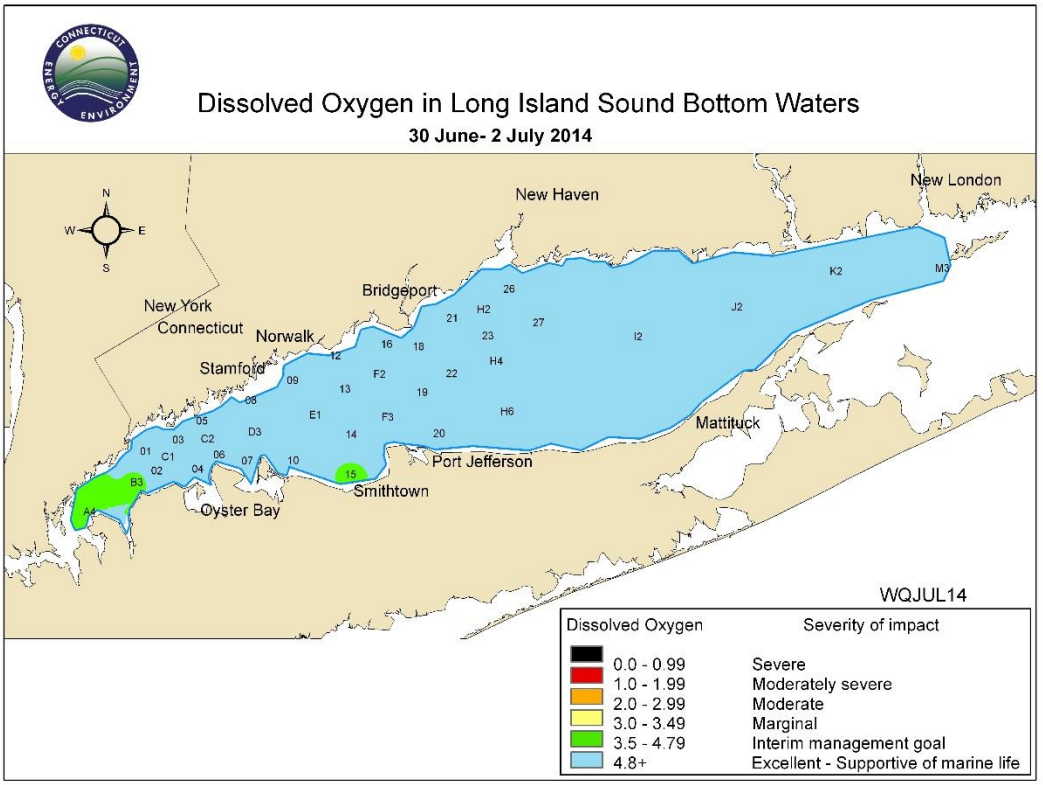
24 Hour Precipitation August 12-13, 2014

Islip, NY, saw 13.57 inches of rain on August 12-13. The site set a New York State 24-hour precipitation record, had its wettest August on record, and tied its all-time wettest month on record. This was a 200-year storm event, meaning rainfall of that magnitude is only expected to occur once in a 200-year period. The preliminary NOAA Atlas-14 amounts were extremely close to the Northeast Regional Climate Center Extreme Precipitation Analysis for the 10–100 year event for durations of 6 and 24 hours. Baltimore, MD, and Portland, ME, which both saw over 6 inches of rain on the 12th or 13th, had their highest amount of precipitation for any calendar day that was non-tropical based. In addition, Portland set hourly and consecutive two-hour rainfall records

Hypoxia Maps

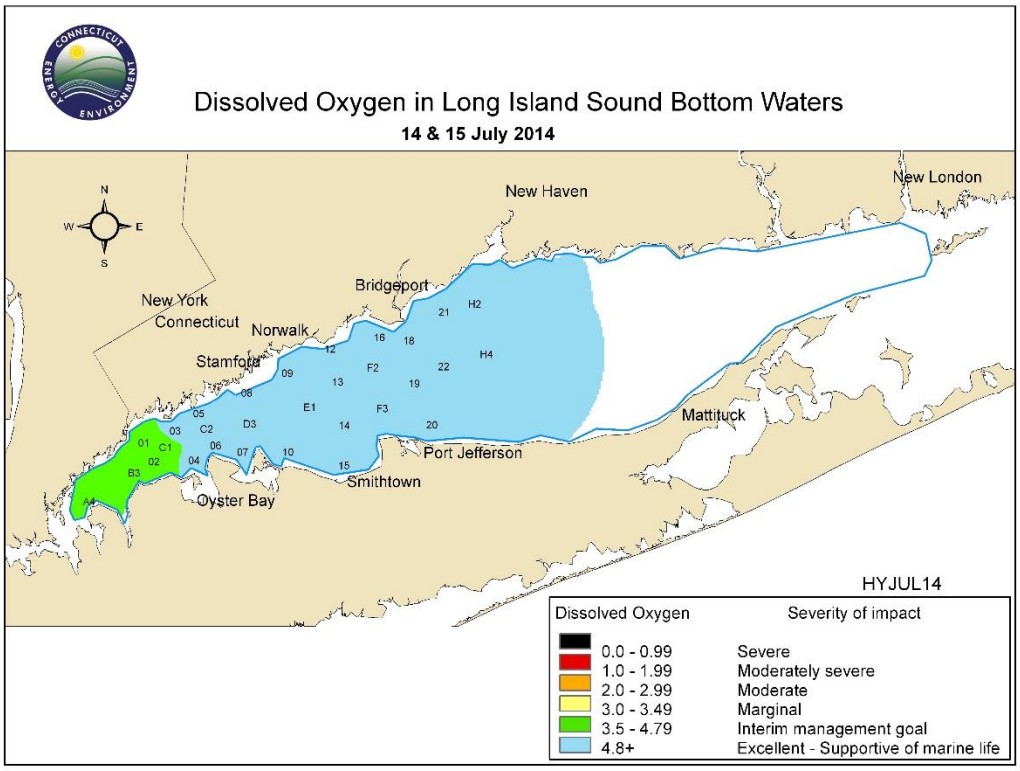
The following maps depict the development of hypoxia based on CT DEEP cruise data through the 2014 season. Data for all surveys are available upon request. NEIWPCC-IEC data were also mapped to provide additional details on hypoxic conditions in the far western Sound.

During the HYJUN14 survey all stations (CT DEEP and IEC) had DO concentrations above 4.8 mg/L.

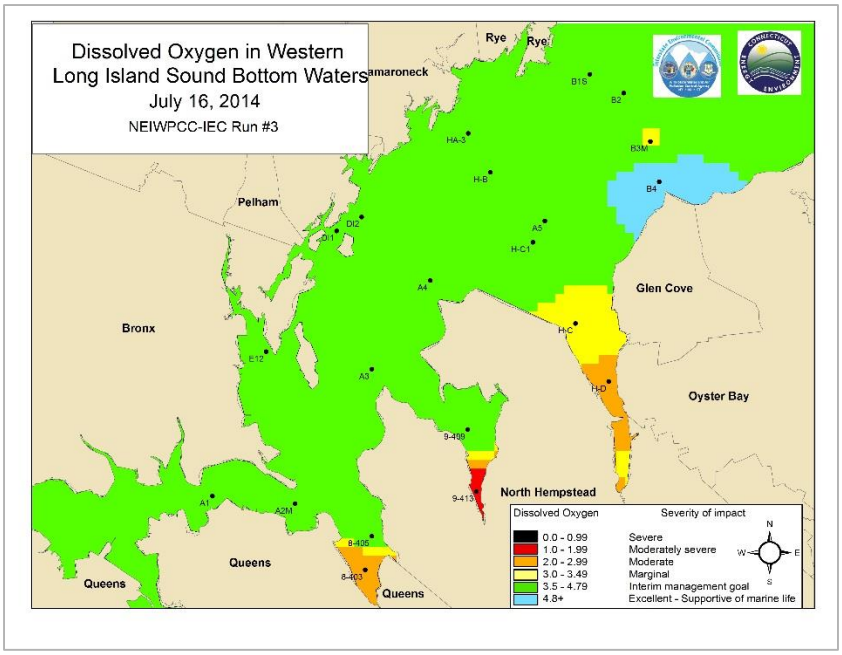


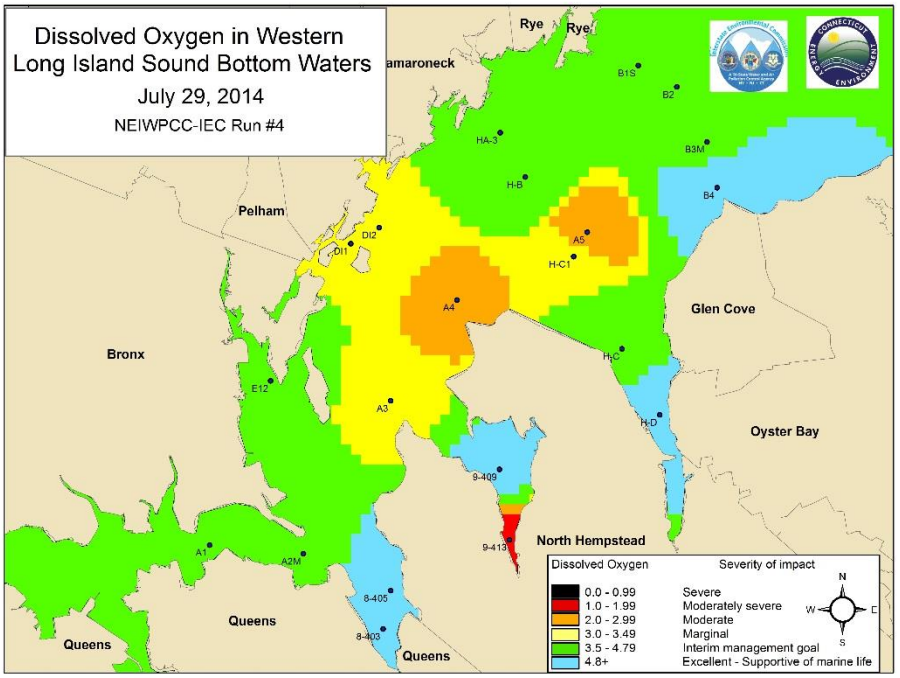
During the WQJUL14 survey DO concentrations were less than 4.8 mg/L at three CT DEEP stations. IEC data during this week are not available.

During the HYJUL14 survey, DO concentrations dropped below 4.8 mg/L at 5 stations with no stations below 3.5 mg/L.



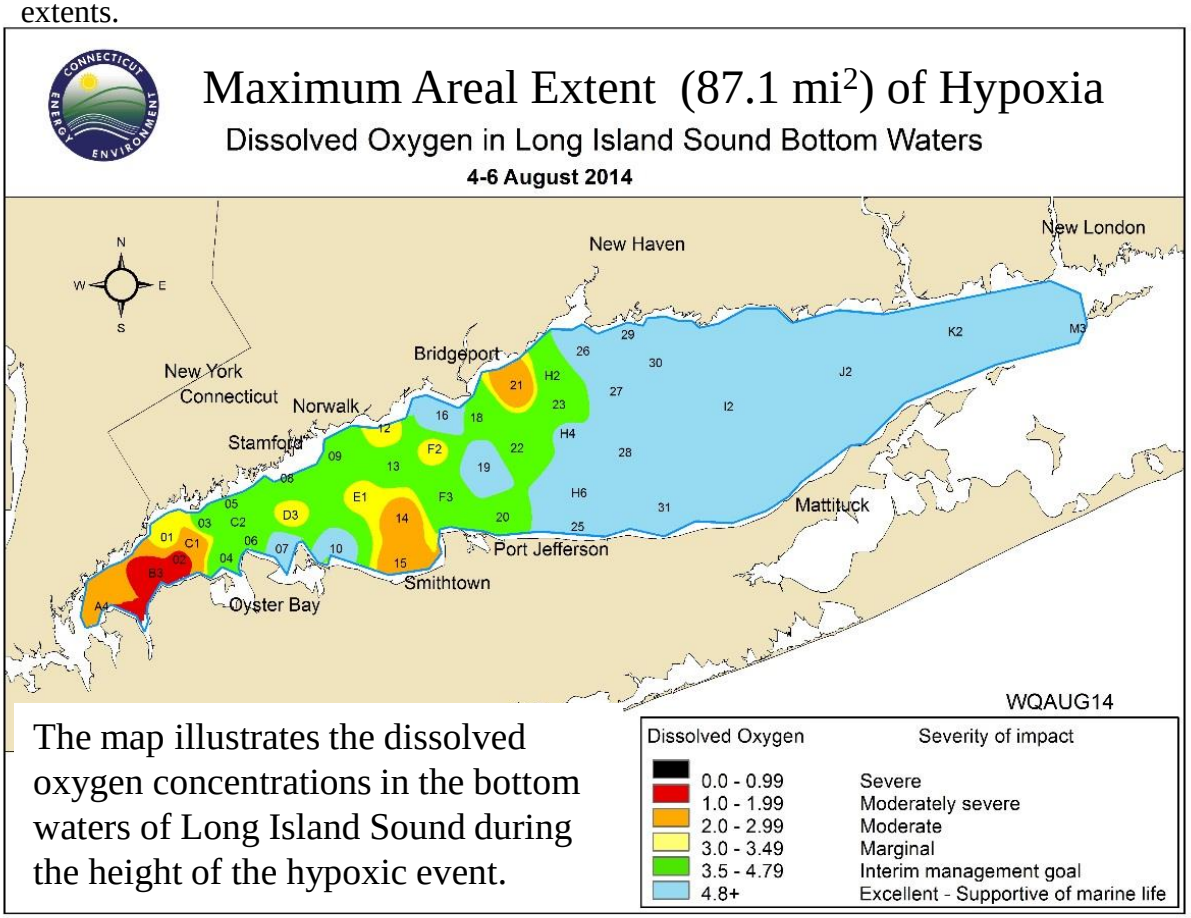
During IEC Run #3, 21 out of 22 stations revealed DO concentrations below 4.8 mg/L. Of those, two stations were below 3.5 mg/L, 2 stations were below 3 mg/L and one station was below 2 mg/L.



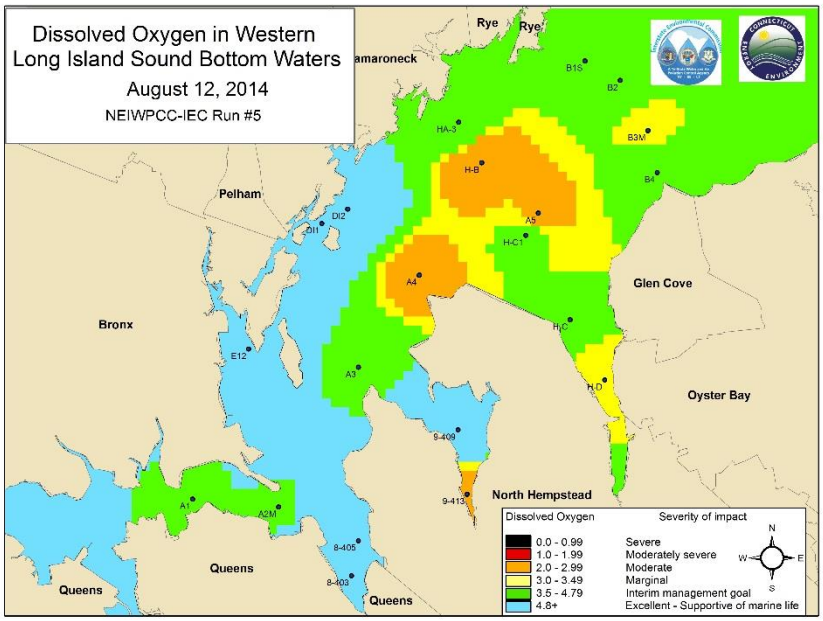


IEC Run #4 occurred a week prior to the CTDEEP WQAUG14 survey. Conditions continued to deteriorate. At Station A4 the DO had dropped to 2.68 mg/L. Station B3 was at 4.29 mg/L.

During the WQAUG14 survey, DO concentrations plummeted. Five stations had DO concentrations below 3 mg/L including A4 and C1. At Station B3 concentrations dropped below 2.0 mg/L. An additional 5 stations exhibited DO concentrations below 3.5 mg/L. This would be the height of the hypoxic event. 2014 had the fourth lowest areal extent over the course of the 23-year sampling program, with only 1991, 1997, and 2013 having lower areal extents.



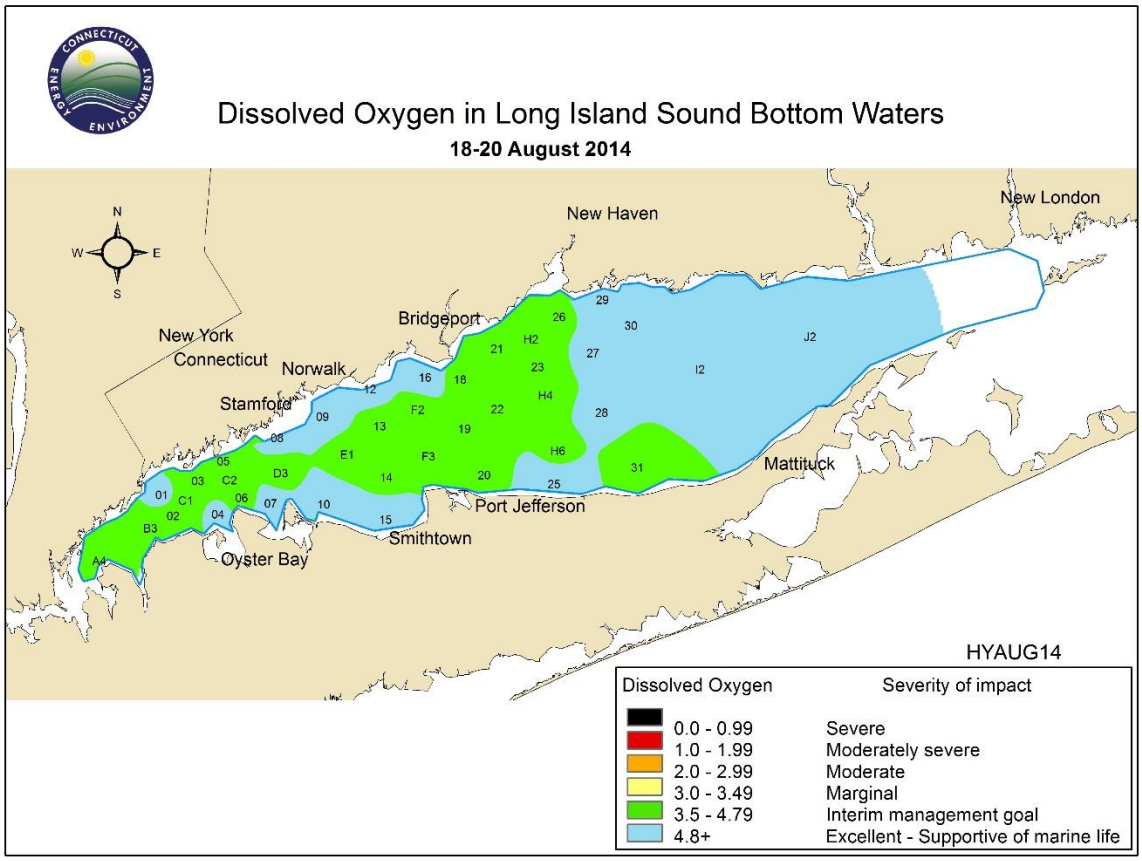
The map illustrates the dissolved oxygen concentrations in the bottom waters of Long Island Sound during the height of the hypoxic event.



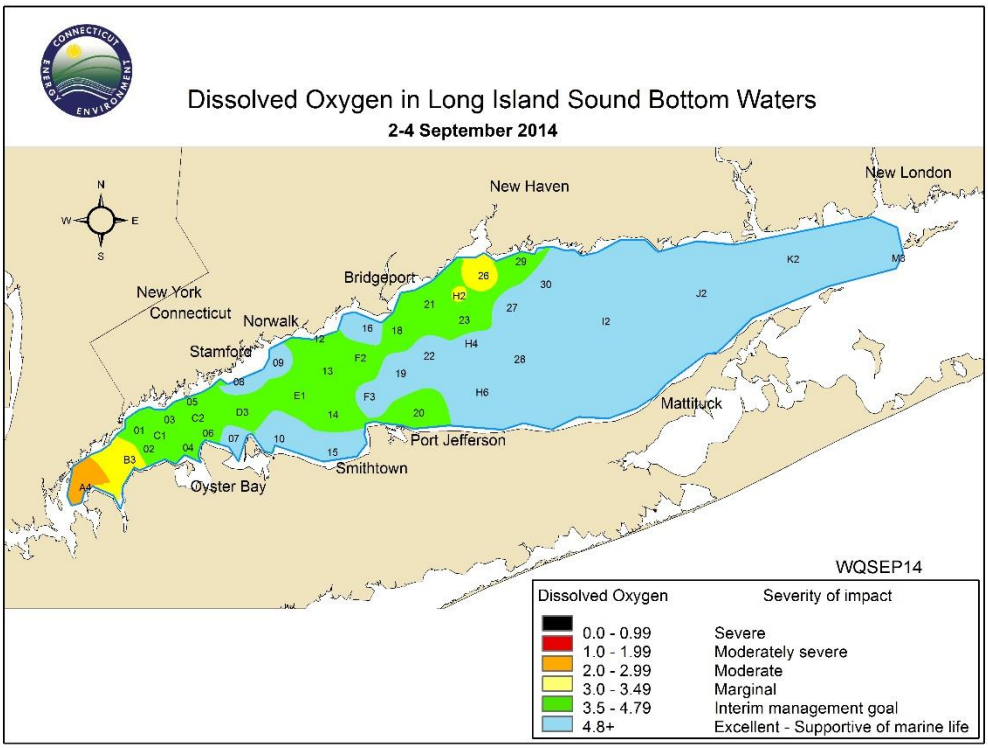
Concentrations improved for IEC Run #5 with DO at A4 measuring 2.74 mg/L and B3 measuring 3.38 mg/L.

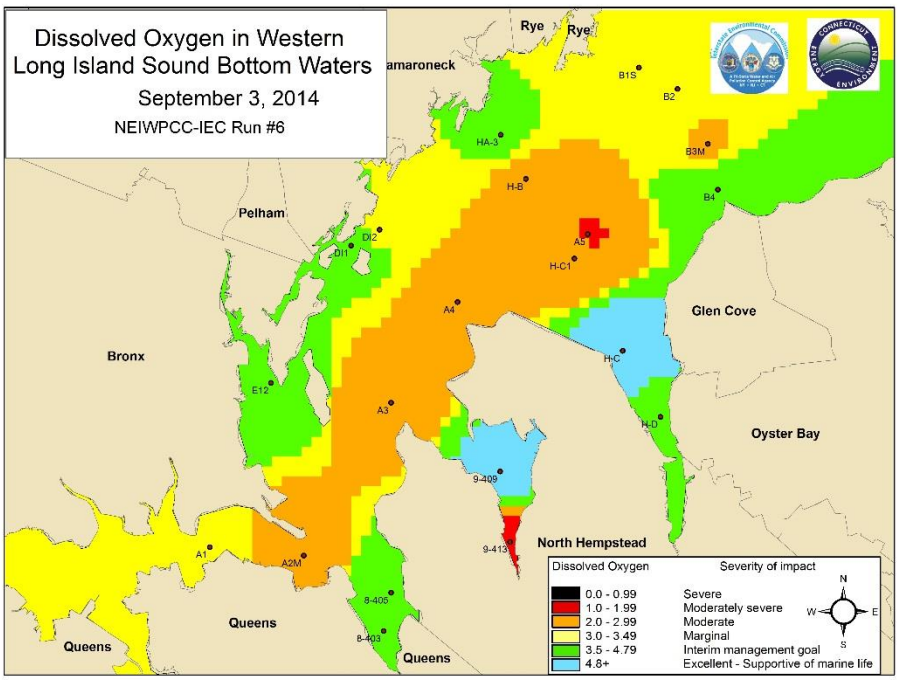
A climatic event brought heavy rain and wind to the area on 13 August. A record 13.51 inches of rain fell on Long Island with 2-5 inches falling across Connecticut. Winds gusted to 38 mph at Bridgeport.

During the HYAUG14 survey DO concentrations across the Sound were greater than 3.0 mg/L. 25 stations had concentrations between 3.5 and 4.8 mg/L. LISICOS data show that A4 remained above the 3.0 mg/L mark for about 7 days following the storm, before dipping back to 2.4 mg/L on 21 August.

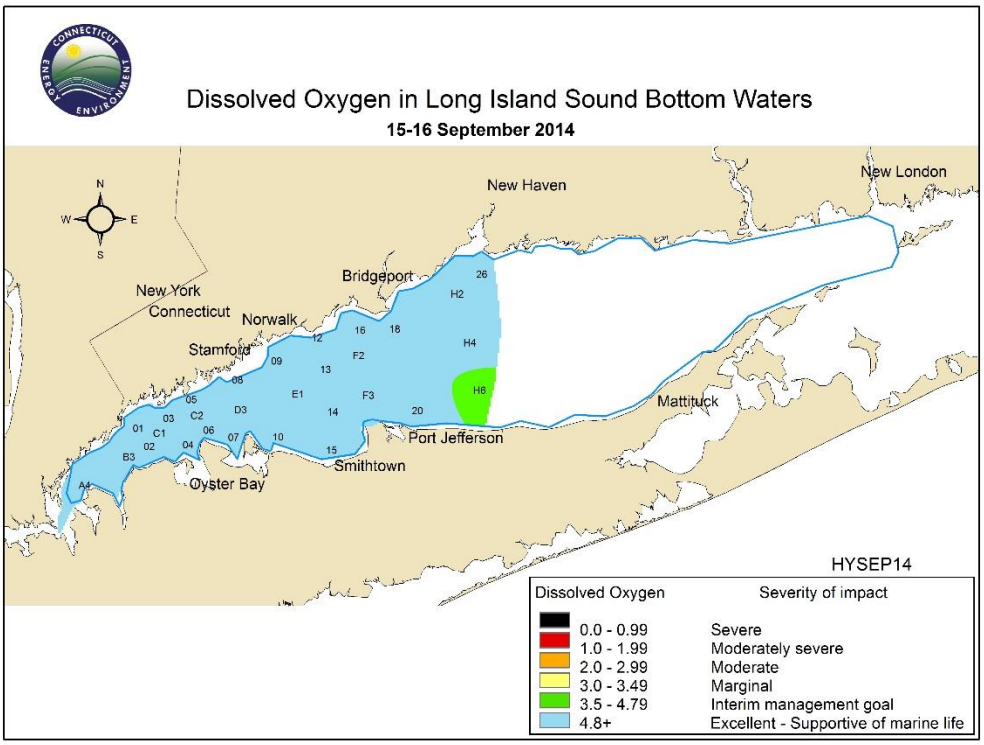


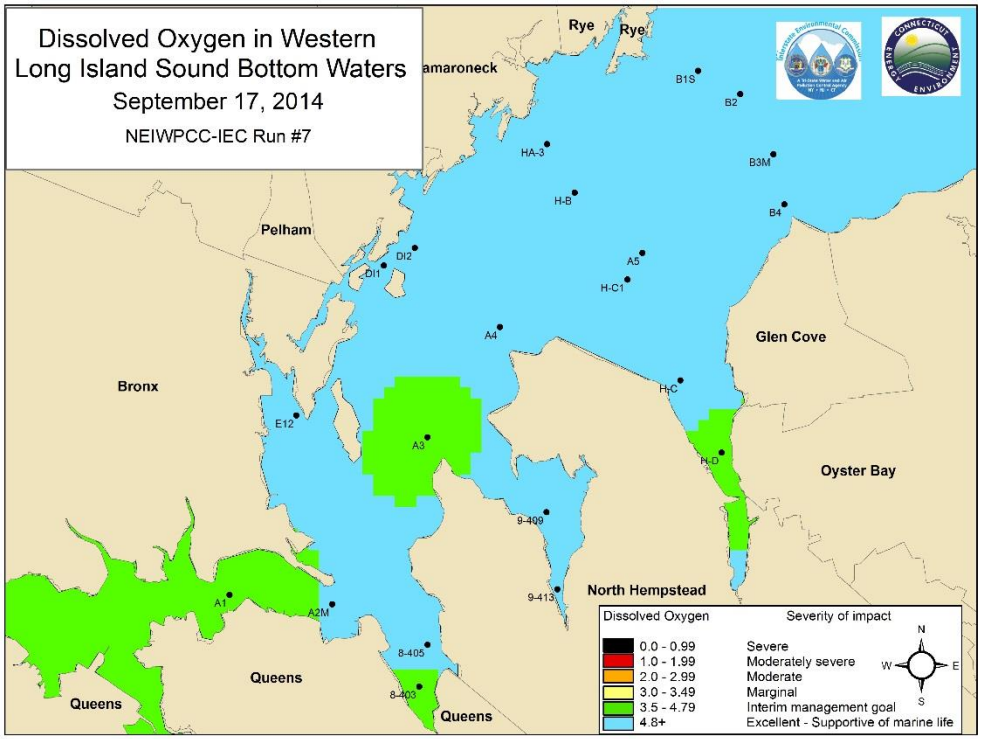
The WQSEP13 survey and IEC Run #6 found conditions had worsened slightly. A brief period of heat and humidity atypical for September helped concentrations at A4 and B3 to fall back to 2.74 and 3.3 mg/L, respectively. Two stations off New Haven Harbor were below 3.5 mg/L and an additional 19 stations were below 4.8 mg/L. IEC found concentrations at an additional six stations in WLIS to be below 3 mg/L with Station A5 measuring 1.97 mg/L.





Conditions rebounded for the HYSEP13 survey with only one CT DEEP station exhibiting DO concentrations below 4.8 mg/L (H6). IEC found four stations with DO less than 4.8 mg/L. The LISICOS buoy data showed concentrations climbing above 3.0 mg/L and staying above 3 beginning on or about 8 September.

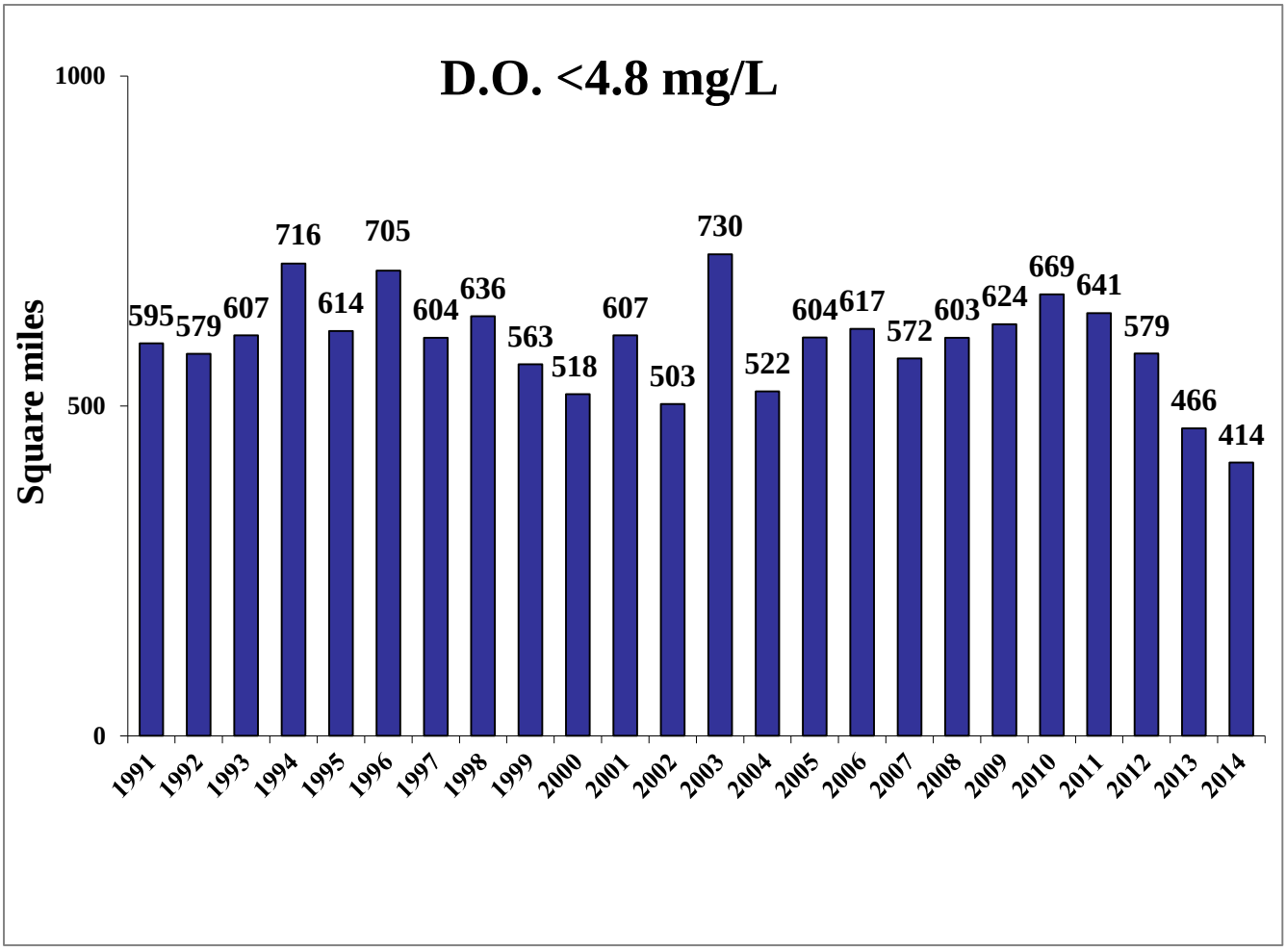




Area of Dissolved Oxygen Below the Chronic Criterion for Growth and Protection of Aquatic Life for LIS

Aquatic organisms are harmed based on a combination of minimum oxygen concentration and duration of the low DO excursion. A DO concentration of 4.8 mg/L meets the chronic criterion for growth and protection of aquatic life regardless of the duration.

This chart illustrates the maximum area of bottom waters within Long Island Sound with DO concentrations less than 4.8 mg/L. In 2014, the maximum area occurred during the HYAUG14 survey and was estimated at 414 square miles and was the lowest over the 23-year sampling program. From 1991-2014, the area affected by concentrations less than 4.8 mg/L averages 595.3 square miles and varies slightly from 414 to 730 square miles.

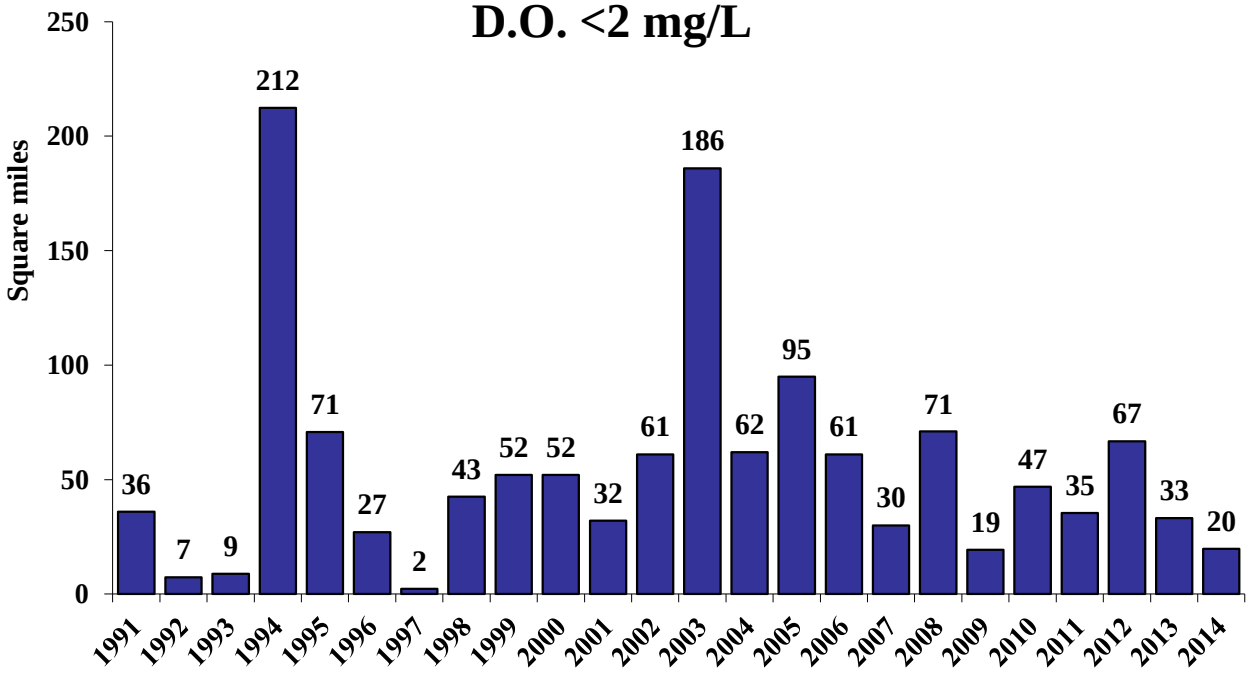


Severe Hypoxia

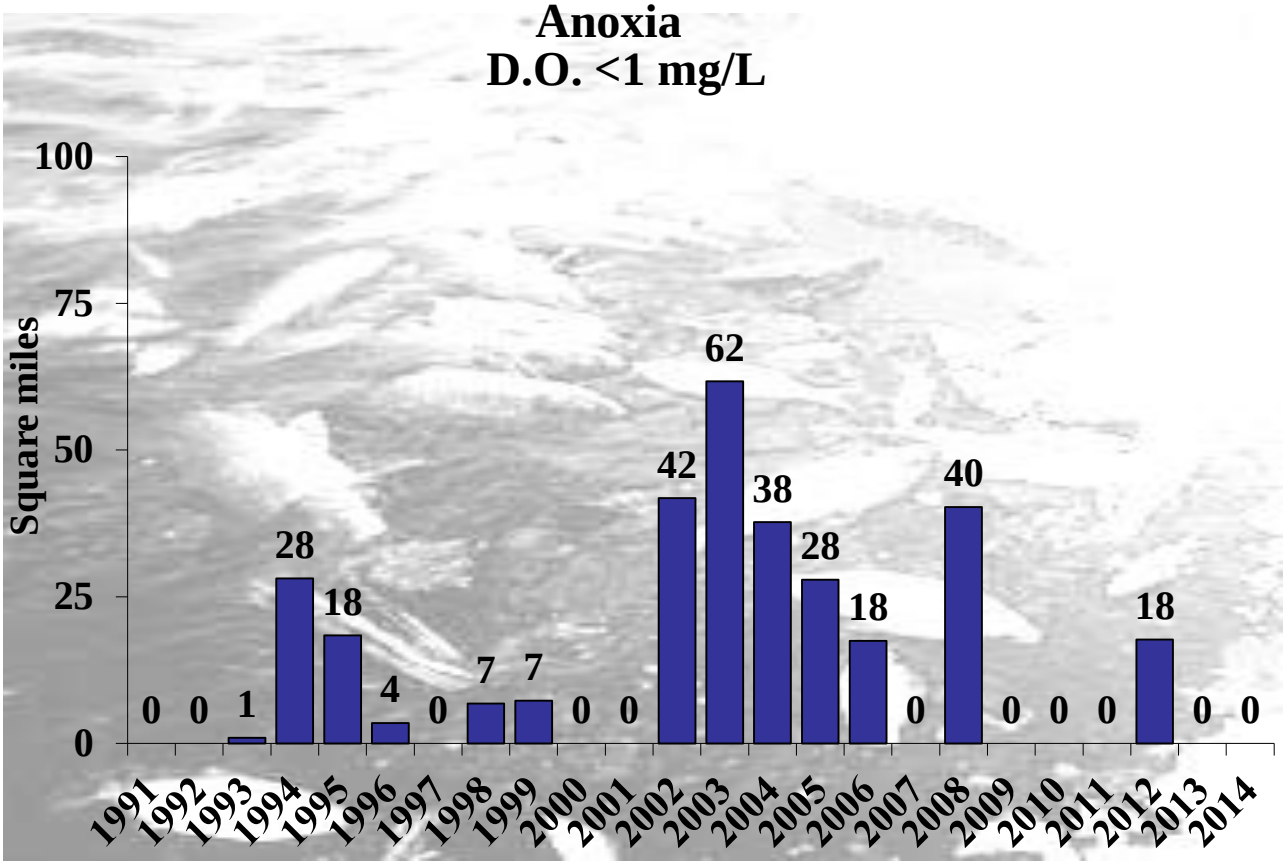
The Long Island Sound Study provides information on LIS Hypoxia for inclusion in EPA's *Report on the Environment* (http://www.epa.gov/ncea/roe/) which reports on "the best available indicators of information on national conditions and trends in air, water, land, human health, and ecological systems…". The ROE Report uses 2.0 mg/L as a benchmark to liken conditions in the Gulf of Mexico to LIS. In this report, the term severe hypoxia is used to describe DO < 2.0 mg/L and is discussed below.

This chart illustrates the maximum area of bottom waters of Long Island Sound with concentrations less than 2 mg/L. In 2014, the maximum area of LIS affected by severe hypoxia was 19.8 mi^2, a decrease from 2013. The average area, calculated from 1991-2014, is 55.4 mi^2. Based on CT DEEP data there were 2 days when DO was less than 2.0 mg/L. Based on the LISICOS Execution Rocks data there were 4.02 days below 2.0 mg/L.

For comparisons, the average size of the hypoxic zone in the northern Gulf of Mexico from 1985-2010 is roughly 5330 mi^2 (larger than the State of CT). The maximum area of the Gulf of Mexico hypoxic zone occurred in 2002 and was estimated at 8,841 mi^2 (22,898 km^2). The 2014 hypoxic zone covered 5052 mi^2 (13080 km^2) and was smaller than 2013 (http://www.gulfhypoxia.net/Research/Shelfwide%20Cruises/2014/PressRelease2014.pdf).



In LIS, 1994 and 2003 appear to be especially bad years for concentrations less than 2 mg/L. 1994 had cold winter bottom water temperatures and an unusually warm June which led to the establishment of strong stratification. The highest average Delta T in July 1994 was 8.54 ºC. 2003 was the second hottest summer since 1895 and the 28th wettest which also led to the Sound being very strongly stratified. Strong stratification (Delta T greater than 4) lasted for four months in 1994 (May-August) and only one month (July) in 2003.

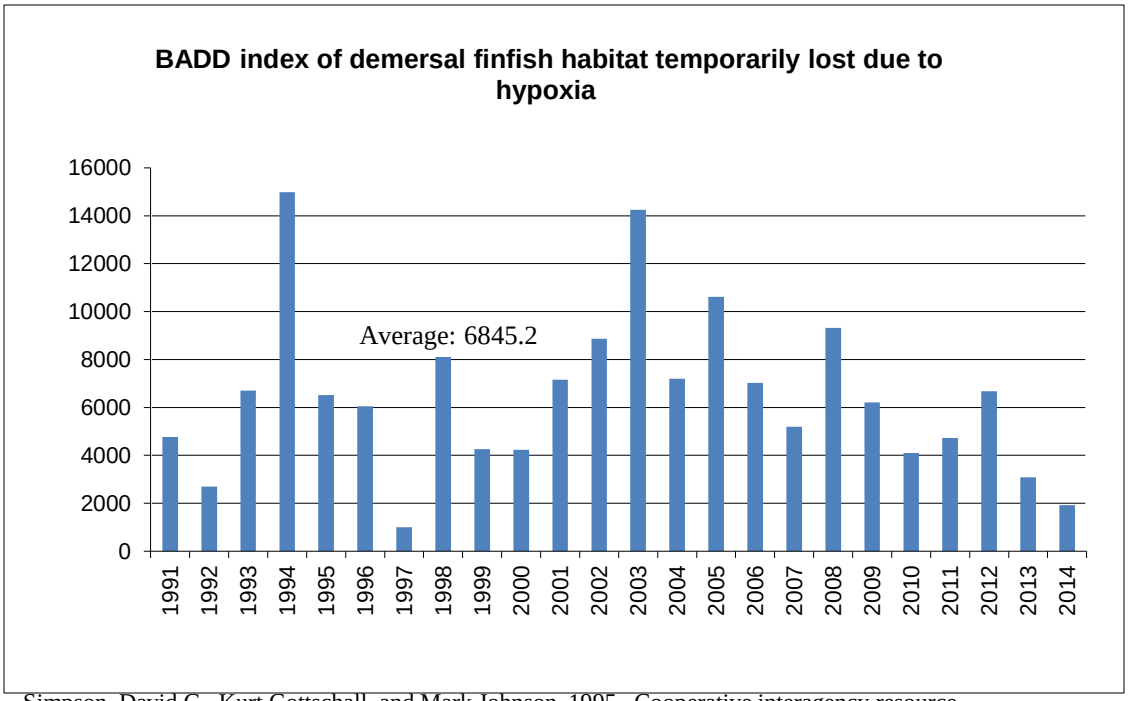


For management purposes the Long Island Sound Study defines anoxia as DO concentrations less than 1 mg/L. In ten of the twenty-two years there was no anoxia reported by CT DEEP. The greatest area with D.O. below 1 mg/L observed in LIS, based on ~biweekly sampling by CT DEEP, was during the summer of 2003. Prior to 2002, the average area of bottom waters affected by anoxia was 5.92 mi^2. From 2002-2012 the average area affected was 22.24 mi^2. The overall average area affected from 1991-2013 is 13.5 mi^2. A consistent decline was observed from 2003-2007. During the summer of 2008 three stations (A4, B3, and 02) were observed to have gone anoxic. In 2009, 2010, and 2011 CT DEEP did not document any stations with DO < 1 mg/L. However, in 2009 and 2010 the Interstate Environmental Commission documented two stations that were anoxic. In 2011, no stations were documented to have gone anoxic by either the IEC or CT DEEP. However, the lowest concentration reported at the LISICOS Execution Rocks buoy (Station A4) for 2011 was 0.61 mg/L. In 2012, CT DEEP documented two stations that were anoxic (A4 and B3). IEC documented two anoxic stations (A3 (further west than A4, Hewlett Point and H-C in Hempstead Harbor). LISICOS also documented anoxic conditions (4.04 days and minimum DO of 0.52 mg/L). In 2013 and 2014, anoxic conditions were not documented by CT DEEP, IEC or LISICOS.

HABITAT IMPAIRMENT ASSOCIATED WITH HYPOXIA

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 less than 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 3.0 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 4% reduction occurs at 3.0-3.9 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 24 July – 9 September (35 days *see page 7 for details). The index is then expressed as a percentage of the available area-days (sample area 2,723 km^2 x 35 d, or 95,305 area-days).

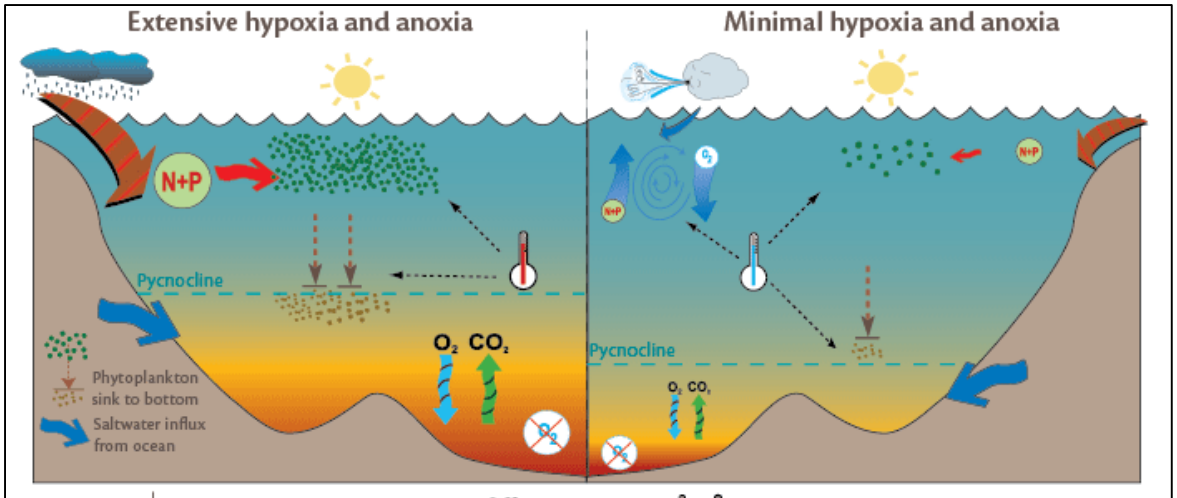


Simpson, David G., Kurt Gottschall, and Mark Johnson. 1995. Cooperative interagency resource assessment (Job 5). In : A study of marine recreational fisheries in Connecticut, CT DEP Marine Fisheries Office, PO Box 719, Old Lyme, CT 06371, p 87-135.

Simpson, David G., Kurt Gottschall, and Mark Johnson. 1996. Cooperative interagency resource assessment (Job 5). In : A study of marine recreational fisheries in Connecticut, CT DEP Marine Fisheries Office, PO Box 719, Old Lyme, CT 06371, p 99-122.

WATER TEMPERATURE AND HYPOXIA

In LIS, water temperature plays a major role in the ecology of the Sound especially in the timing and severity of the summer hypoxia event. CT DEEP's monitoring program records water temperatures and salinity year round, but data collected during the hypoxia monitoring cruises are used to help estimate the extent of favorable conditions for the onset, extent, and end of the hypoxic event. The conceptual diagram below, while developed for Chesapeake Bay, applies to Long Island Sound. In LIS, there are two key contributors to hypoxia: nutrient enrichment and stratification. (Stratification is discussed more on page 24.) Nutrients, especially nitrogen, flow into the Sound from numerous sources including point sources like wastewater treatment plants and nonpoint sources such as stormwater runoff. This enrichment leads to excessive growth of phytoplankton, particularly in the spring. Temperature can stimulate or impede phytoplankton growth. As the plankton die, they begin to decay and settle to the bottom. Bacterial decomposition breaks down the organic material from the algae, using up oxygen in the process.



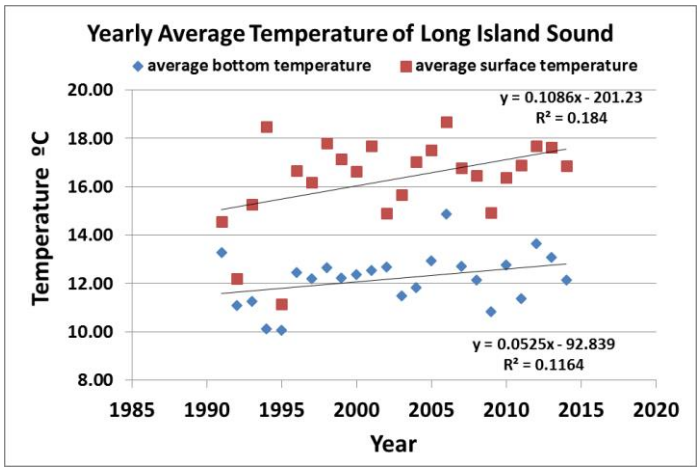
	Loads	Phytoplankton	Decomposition	Temperature	Wind event
Large amount of low dissolved oxygen	Large nitrogen and phosphorus loads	Elevated nutrients cause large phytoplankton blooms	High oxygen consumption by decaying phytoplankton	Warm water a) Stimulates decomposition b) Stratifies water column c) Stimulates phytoplankton	No wind event: water column remains stratified
Little amount of low dissolved oxygen	Small nitrogen and phosphorus loads	Less nutrients lead to small phytoplankton blooms	Low oxygen consumption by decaying phytoplankton	Cool water: a) Slow decomposition b) Mixed water column c) Slow phytoplankton growth	Wind events destratifies water column: a) Bottom water aerated b) Nutrients move to surface

Conceptual diagram detailing the factors that determine the dissolved oxygen content of the tidal waters of Chesapeake Bay
Diagram courtesy of the Integration and Application Network (ian.umces.edu), University of Maryland Center for Environmental Science. Source: Ecocheck

2014 Water Temperature Data

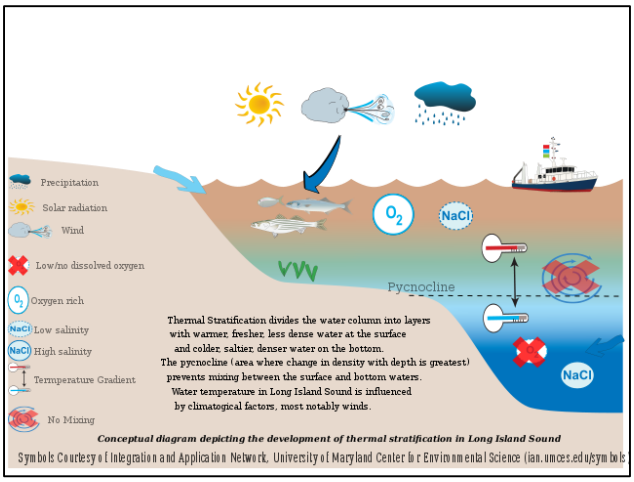
2014 maximum, minimum, and average water temperature (ºC) data are summarized below. Data are integrated across Long Island Sound (i.e., all stations and all depths) and are displayed by cruise. Data were obtained using the CT DEEP Sea Bird Sea Cat Conductivity, Temperature, Depth (CTD) profiler.

Cruise	2014 Max	1991-2014 Max	2014 Min	1991-2014 Min	2014 Average	1991-2014 Average
WQJAN	4.538	9.311	0.621	0.500	2.819	4.477
WQFEB	3.231	6.748	-0.158	-1.325	1.128	2.113
CHFEB	0.458	4.464	**-0.288**	**-0.288**	-0.058	2.219
WQMAR	2.255	6.611	-0.499	-0.783	0.562	2.319
CHMAR	No Survey	6.575	No Survey	0.113	No Survey	3.519
WQAPR	4.479	10.072	1.757	1.309	2.764	4.768
WQMAY	11.647	14.145	6.806	5.054	8.078	8.597
WQJUN	17.343	21.436	9.748	8.239	12.657	12.764
HYJUN	20.023	22.458	12.421	11.116	16.265	15.858
WQJUL	22.687	25.336	14.146	11.639	16.907	17.375
HYJUL	23.163	27.493	16.505	15.038	18.663	19.301
WQAUG	25.749	27.067	18.832	14.018	21.013	20.514
HYAUG	23.349	25.517	20.897	18.678	21.732	21.659
WQSEP	**25.857**	**25.857**	19.328	16.390	22.351	21.721
HYSEP	22.242	23.484	20.847	19.533	21.707	21.673
WQOCT	20.869	21.571	19.477	14.161	20.283	19.211
WQNOV		16.601		10.467		13.893
WQDEC		12.712		0.000		9.188

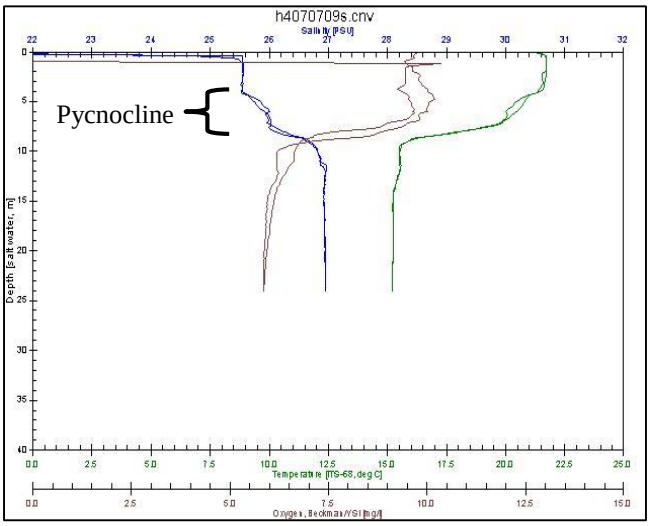


The Sound is coldest during February and March and warmest during August and September. The yearly average surface and bottom temperature of the Sound show slight increases over the period 1991-2014.

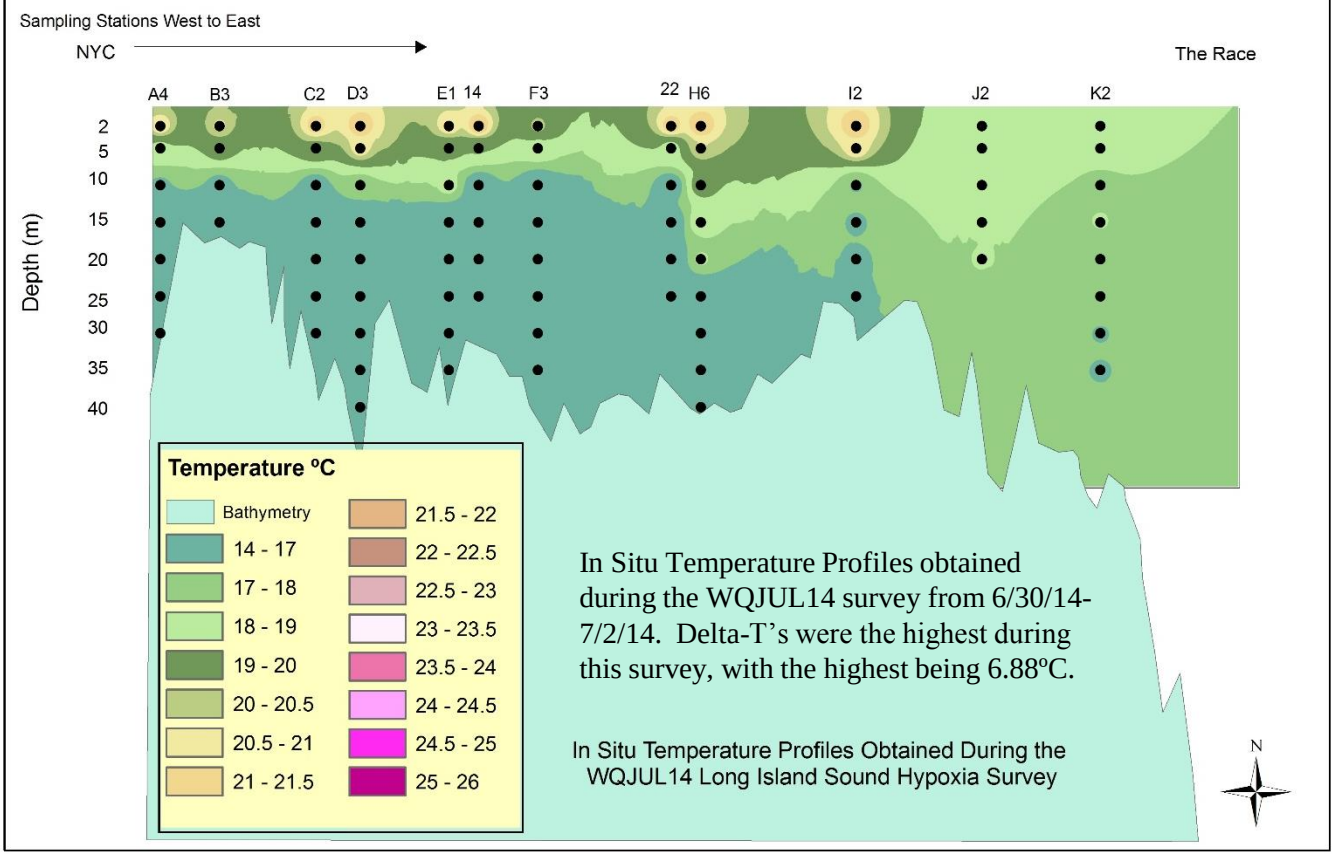
Delta T and Stratification

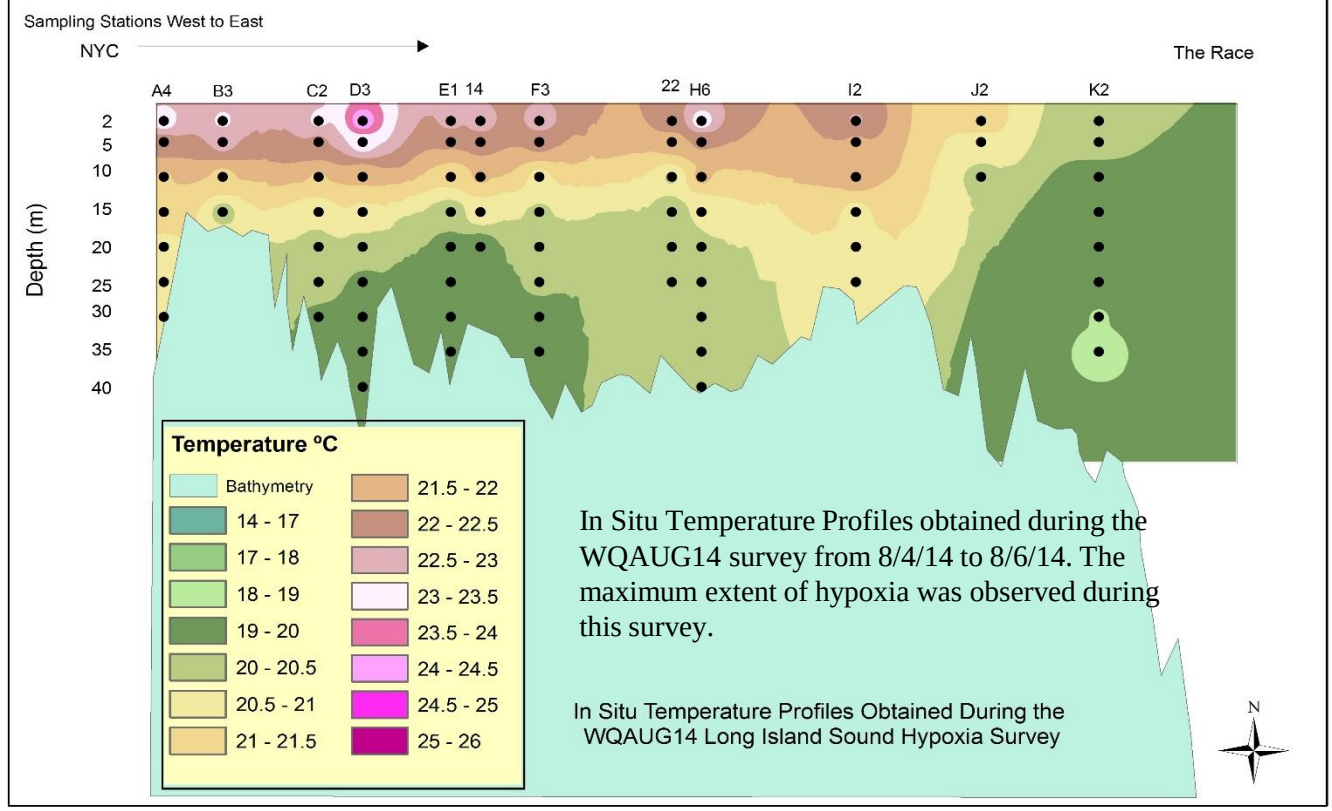


The temperature difference between the bottom waters and the surface waters is known as “Delta T". This Delta T, along with salinity differences, creates a density difference, or "density gradient" resulting in a separation or "stratification" of water layers that hinders the oxygenated surface waters from circulating downward and mixing with the oxygen starved bottom waters. The pycnocline, or zone where water density increases rapidly with depth due to the changes in temperatures and salinity, inhibits oxygenated surface waters from mixing with oxygen deplete bottom waters exacerbating the hypoxia. The pycnocline typically develops in LIS in late spring/early summer when rapid surface water warming exceeds the rate of warming in the bottom waters and persists into early fall when it is disrupted by strong winds associated with storms which lead to mixing or cooling air temperatures. With the dissolution of the pycnocline, hypoxic conditions are alleviated/eliminated. The smallest Delta Ts occur during the winter when the water column is well mixed. The largest Delta T’s occur during the early summer. The greater the delta T the greater is the potential for hypoxia to be more severe

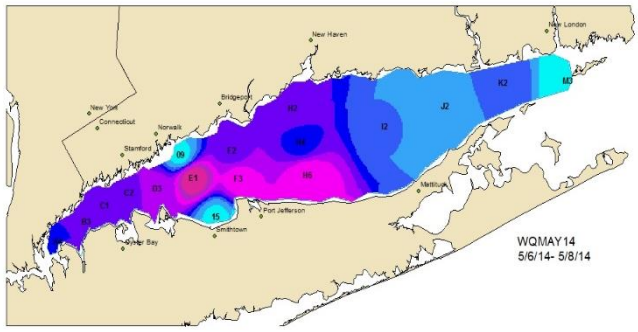


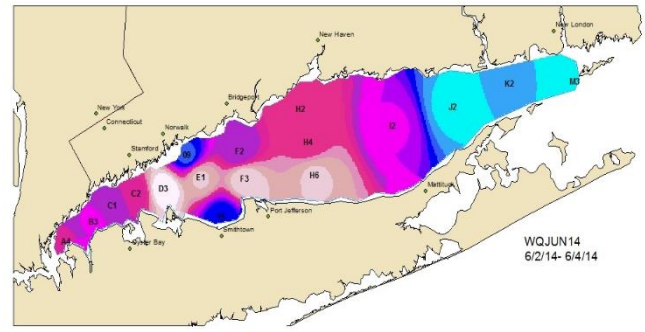
The temperature graphs on page 25 show computer interpolations along the west-east axis of LIS generated from profile data collected during two CT DEEP surveys. During the WQJUL14 survey, surface water temperatures had warmed to an average of 20.67 ºC while the bottom water remained cooler around an average of 15.45ºC. This set up the largest differences in temperatures between the surface and bottom waters. The second graph shows how the water column was thermally stratified during theWQAUG14 survey when hypoxic conditions were at their worst. The graphs on page 26 show how the Delta T’s varied over the course of the summer sampling season. Delta T’s increased from the WQAPR14 survey through the WQJUL14 survey, setting up the stratification and leading to the maximum extent of hypoxia in early August. By the September survey Delta T’s decreased to around 1.5ºC over much of the Sound. Delta T’s continued to decrease during the HYSEP14 survey to around 0.03ºC, allowing the oxygenated surface waters to mix through to the bottom, leading to the end of the hypoxic event. The graphs also show how the Delta T varies spatially. The western Sound has higher Delta T’s due to the limited flushing capacity, topology, and geology. In the east where cooler, oxygen rich, off- shore ocean water mixes with the Sound water, Delta T’s are much lower and hypoxia rarely occurs.

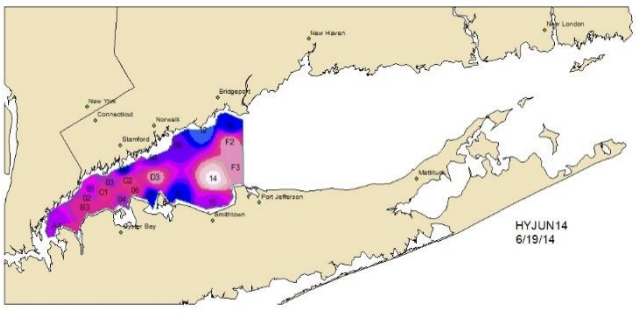

Sampling Stations West to East
NYC
The Race
A4
B3
C2
D3
E1
14
F3
22
H6
I2
J2
K2
Depth (m)
2
5
10
15
20
25
30
35
40
Temperature ºC
Bathymetry
14 - 17
17 - 18
18 - 19
19 - 20
20 - 20.5
20.5 - 21
21 - 21.5
21.5 - 22
22 - 22.5
22.5 - 23
23 - 23.5
23.5 - 24
24 - 24.5
24.5 - 25
25 - 26
In Situ Temperature Profiles obtained during the WQJUL14 survey from 6/30/14-7/2/14. Delta-T's were the highest during this survey, with the highest being 6.88ºC.
In Situ Temperature Profiles Obtained During the WQJUL14 Long Island Sound Hypoxia Survey
N

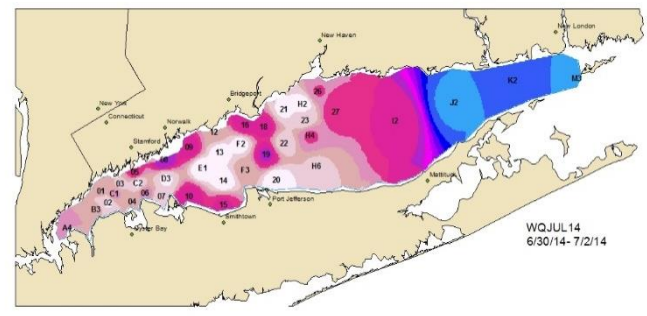

Sampling Stations West to East
NYC
The Race
A4
B3
C2
D3
E1
14
F3
22
H6
I2
J2
K2
Depth (m)
2
5
10
15
20
25
30
35
40
Temperature ºC
Bathymetry
14 - 17
17 - 18
18 - 19
19 - 20
20 - 20.5
20.5 - 21
21 - 21.5
21.5 - 22
22 - 22.5
22.5 - 23
23 - 23.5
23.5 - 24
24 - 24.5
24.5 - 25
25 - 26
In Situ Temperature Profiles obtained during the WQAUG14 survey from 8/4/14 to 8/6/14. The maximum extent of hypoxia was observed during this survey.
In Situ Temperature Profiles Obtained During the WQAUG14 Long Island Sound Hypoxia Survey
N

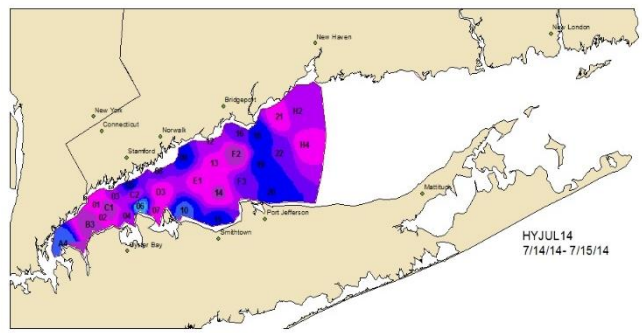
2014 Delta-T Maps

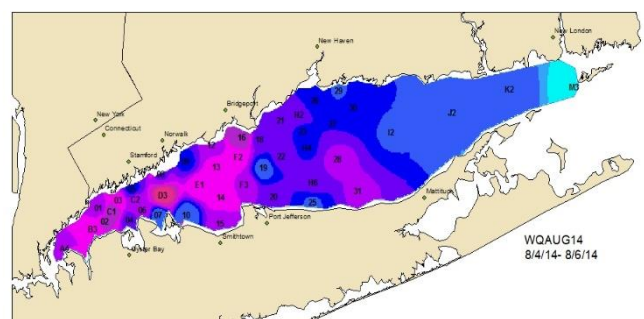


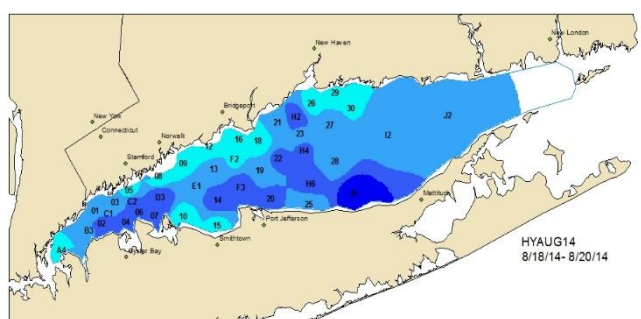


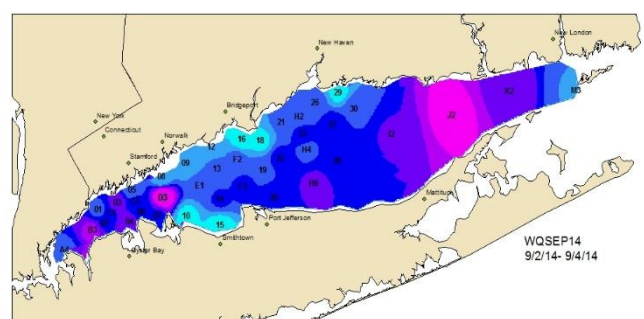












0 - 0.5
>0.5 - 1
>1 - 1.5
>1.5 - 2
.2 - 2.5
>2.5 - 3
>3 - 3.5
.3.5 - 4
>4- 4.5
>4.5 - 5
>5 - 5.5
>5.5 - 6
>6 - 6.5
>6.5 - 7
>7 - 7.5
>7.5 - 8
>8- 8.5
>8.5 - 9
>9

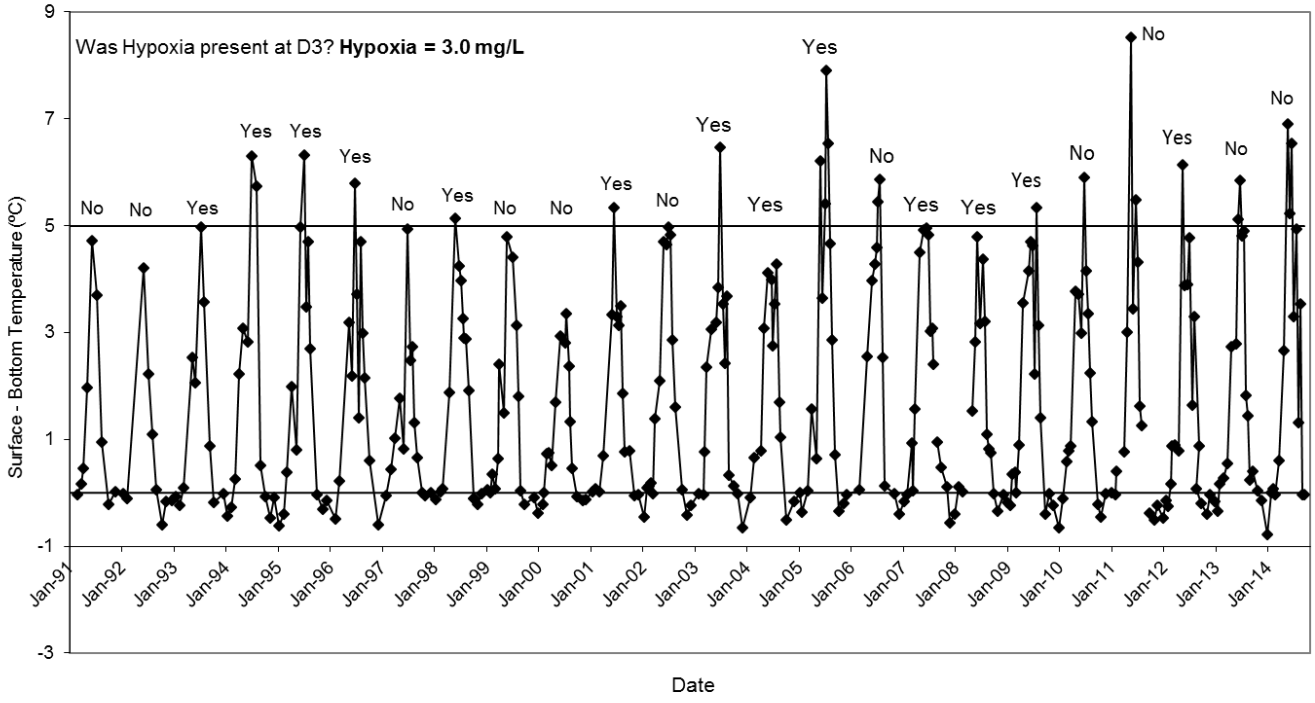
Delta-T ºC

N
W
E
S

This table summarizes the minimum winter temperatures (January, February, and March), the maximum summer temperatures (June, July, August, and September), the maximum Delta T, and maximum hypoxic area at **Station D3**. Station D3 is located in the eastern-most and deepest portion of the Narrows (see map on page 1). The CT DEP 1991-1998 Data Review report (Kaputa and Olsen, 2000) found a positive correlation between the maximum Delta T observed at D3 and the maximum area of hypoxia in the same year. Delta T was not correlated to the duration of hypoxia. 2012 had the warmest minimum winter temperature, 2004 had the lowest water temperature recorded, 2006 had the highest, 2011 had the highest ΔTmax, and 1994 had the largest area of hypoxia.

Year	Minimum Winter Temp (ºC)	Maximum Summer Temp (ºC)	Maximum ΔT (ºC)	Maximum Area of Hypoxia (mi^2) DO<3.0 mg/L
1991	2.69	22.23	4.75	122
1992	1.86	20.89	4.83	80
1993	1.06	22.68	5.33	202
1994	-0.68	24.08	6.33	**393**
1995	0.95	23.78	6.33	305
1996	-0.19	23.78	5.91	220
1997	1.87	21.81	4.96	30
1998	3.40	23.20	5.22	168
1999	2.67	23.41	5.51	121
2000	0.57	21.99	6.02	173
2001	1.67	23.20	5.38	133
2002	4.03	23.47	5.52	130
2003	-0.52	22.88	6.74	345
2004	**-0.93**	23.09	4.33	202
2005	0.53	25.10	8.19	177
2006	2.17	**25.11**	6.72	199
2007	0.83	23.03	5.12	162
2008	2.45	22.47	4.91	180.1
2009	0.72	24.31	5.90	169.1
2010	1.35	24.91	6.36	101.1
2011	0.66	22.32	**8.34**	130.3
2012	**4.09**	24.85	6.13	288.5
2013	2.00	24.23	5.85	80.7
2014	0.07	25.86	6.90	87.1

Kaputa, Nicholas P., and Christine B. Olsen. 2000. Long Island Sound summer hypoxia monitoring survey 1991-1998 data review. CTDEP Bureau of Water Management, Planning and Standards Division, 79 Elm Street, Hartford, CT 06106-5127, 45 p.



Time series of ΔT (surface water temperature - bottom water temperature) at station D3, 1991 through 2014.

Prior to 2004, when Station D3 became hypoxic the observed maximum delta-T was greater than 5ºC. Since 2004, this trend/pattern does not seem to hold. Over the period of record, 2011 had the highest observed Delta T at Station D3 (>8ºC) but the lowest dissolved oxygen concentration recorded in 2011 at D3 was 3.22 mg/L. In 2012, the Delta T was again over 5ºC and D3 was in fact hypoxic (lowest dissolved oxygen was 2.84 mg/L). In 2013, D3 was not hypoxic despite the Delta T again being over 5ºC (lowest concentration was 3.13 mg/L). In 2014, the maximum Delta T at D3 was 6.90ºC but D3 was not hypoxic (lowest DO 3.33 mg/L).

Salinity

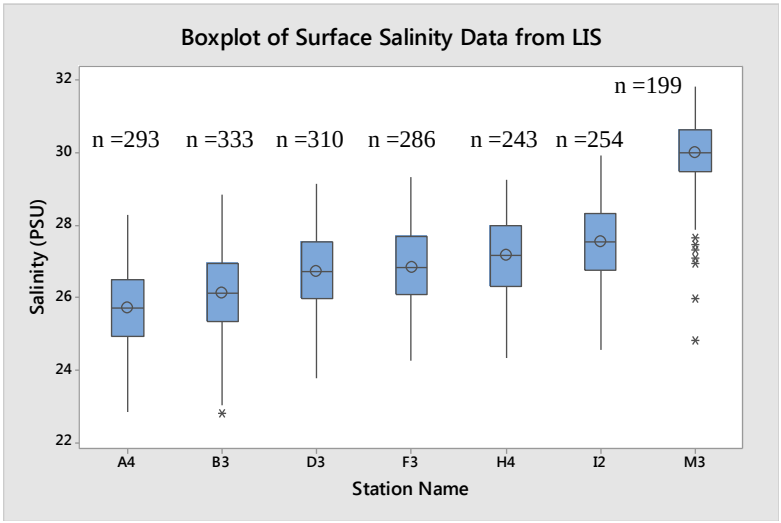
Salinity is a measure of the dissolved salts content of seawater. It is usually expressed in practical salinity units (PSU). Salinity levels across Long Island Sound vary from 23 PSU in the Western Sound at Station A4 to 33 PSU in the eastern Sound at Station M3. The Thames, Connecticut, and Housatonic rivers are the major sources of freshwater entering the Sound. Summary statistics for salinity data collected from seven stations across the Sound from 1991-2014 are presented in the tables below. Data collected this year are also presented separately.

	1991-2014 Bottom Water Statistics							
Station Name	Count	Minimum	Maximum	Mean	Median	SE Mean	Standard Deviation	Variance
A4	303	23.823	28.727	26.37	26.361	0.0529	0.921	0.849
B3	351	24.259	28.926	26.641	26.633	0.0491	0.92	0.847
D3	328	24.912	29.215	27.27	27.39	0.0483	0.876	0.767
F3	307	25.153	29.432	27.627	27.681	0.0483	0.846	0.716
H4	263	25.508	29.7	27.777	27.822	0.0512	0.83	0.688
I2	285	25.762	29.985	28.086	28.165	0.0494	0.833	0.694
M3	239	28.608	32.622	30.606	30.587	0.0467	0.722	0.522

	2014 Bottom Water Statistics						
Station Name	Count	Minimum	Maximum	Mean	Median	SE Mean	Standard Deviation	Variance
A4	15	25.462	27.810	26.647	26.727	0.170	0.658	0.433
B3	15	25.645	28.073	26.869	27.014	0.175	0.679	0.461
D3	15	26.345	28.299	27.411	27.628	0.148	0.574	0.330
F3	14	26.765	28.480	27.808	28.017	0.143	0.537	0.288
H4	13	26.843	28.578	28.002	28.199	0.150	0.541	0.293
I2	11	26.880	29.035	28.224	28.446	0.214	0.710	0.504
M3	10	29.051	31.173	30.511	30.838	0.218	0.689	0.474

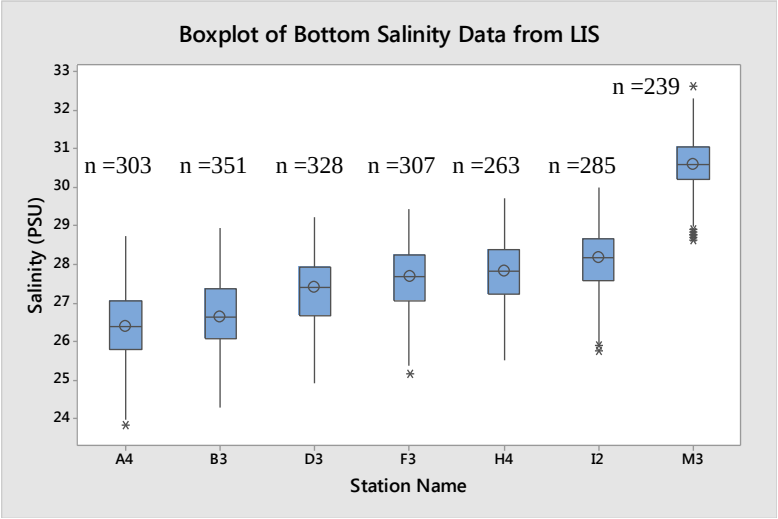
	1991-2014 Surface Statistics							
Station Name	Count	Minimum	Maximum	Mean	Median	SE Mean	Standard Deviation	Variance
A4	293	22.833	28.278	25.681	25.694	0.0609	1.043	1.088
B3	333	22.8	28.84	26.074	26.126	0.0586	1.07	1.145
D3	310	23.772	29.146	26.701	26.692	0.06	1.056	1.115
F3	286	24.246	29.307	26.843	26.835	0.0636	1.075	1.155
H4	243	24.315	29.262	27.103	27.17	0.0685	1.067	1.139
I2	254	24.56	29.909	27.513	27.545	0.0645	1.028	1.056
M3	199	24.789	31.837	29.937	29.993	0.0745	1.051	1.105

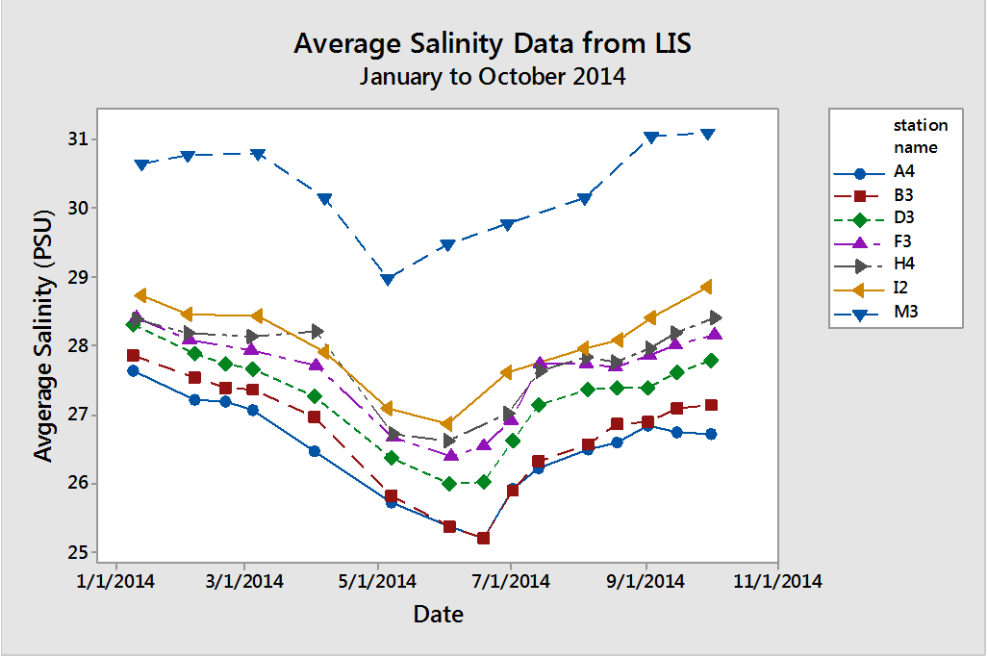
	2014 Surface Statistics							
Station Name	Count	Minimum	Maximum	Mean	Median	SE Mean	Standard Deviation	Variance
A4	15	24.218	26.890	25.904	26.123	0.245	0.951	0.904
B3	14	24.637	27.505	26.255	26.429	0.271	1.014	1.029
D3	15	25.174	28.283	26.835	27.084	0.267	1.033	1.068
F3	13	25.576	28.230	26.939	27.179	0.267	0.964	0.928
H4	12	25.860	28.169	27.276	27.495	0.263	0.912	0.831
I2	11	26.553	28.772	27.632	27.557	0.239	0.794	0.631
M3	10	26.950	30.926	29.326	30.097	0.483	1.529	2.337



This box plot, based upon data collected during CT DEEP surveys from January 1991 – October 2014, shows the median surface salinity, range, interquartile range, and outliers by station. Surface in this case refers to data collected two (2) meters below the air/water interface. Salinity increases from west to east across the Sound.

This box plot, based upon data collected during CT DEEP surveys from January 1991-October 2014 shows the median bottom salinity, range, interquartile range, and outliers by station. Bottom in this case refers to data collected five (5) meters above the sediment/water interface. The bottom waters are generally saltier than the surface waters.

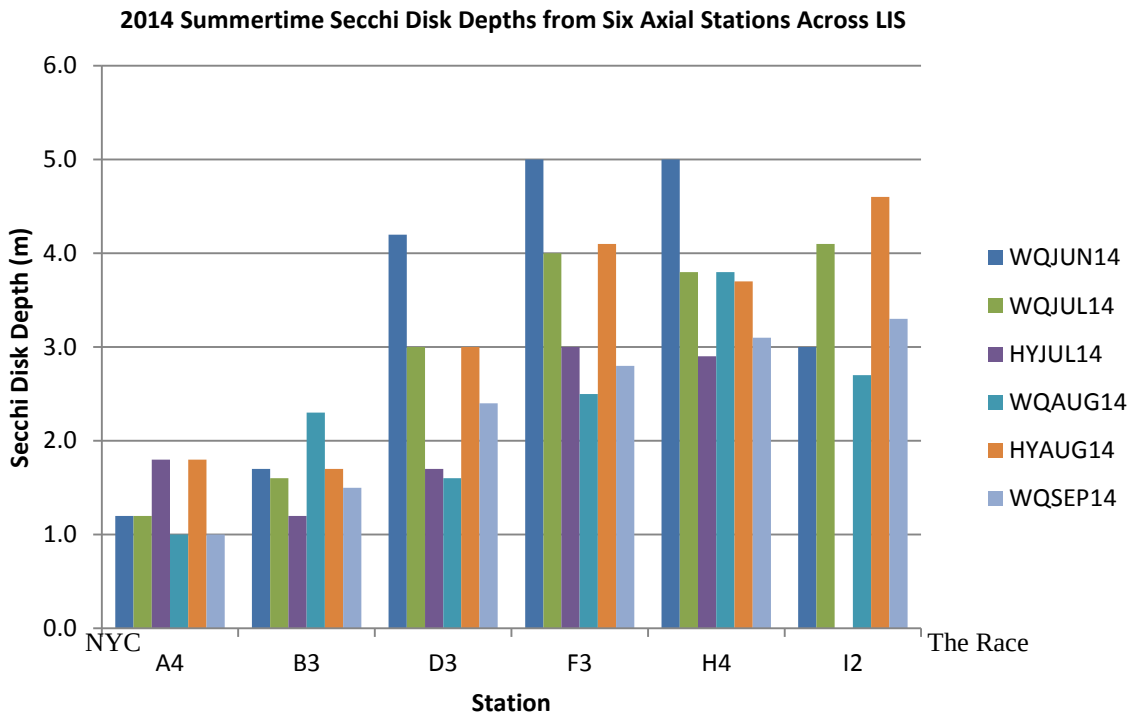




This plot illustrates the temporal variability of the mean salinity values by station from January-October 2014.

Water Clarity

Water clarity is measured by lowering a Secchi disk into LIS by a measured line until it disappears. It is then raised until it reappears. The depth where the disk vanishes and reappears is the Secchi disk depth. The depth to disappearance is related to the transparency of the water. Transparency may be reduced by both absorption and scattering of light. Water absorbs light, but absorption is greatly increased by the presence of organic acids that stain the water a brown "tea" color and by particles. Scattering is largely due to turbidity, which can be attributable to both inorganic silt or clay particles, or due to organic particles such as detritus or planktonic algae suspended in the water. CT DEEP began taking Secchi Disk measurements in June 2000. Since then, 3037 measurements have been entered into our database; of those 1,847 are from the 17 stations sampled annually. The 2000-2014 average Secchi depth is 2.3 m with a minimum depth of 0.4 m (WQSEP05, station A4) and a maximum depth of 6.2 m (WQNOV00 Station K2). Below is a graph depicting Secchi disk depths from six of the axial stations sampled by CT DEEP LISS Water Quality Monitoring Program between May and September 2014.



2014 data

- **Average Secchi Disk Depth: 2.83 m (n=294)**
- **Minimum Secchi Disk Depth: 1.0 m on multiple dates/stations**
- **Maximum Secchi Disk Depth: 5.1 m at Station 09 during the WQAPR14 cruise**

2013 data

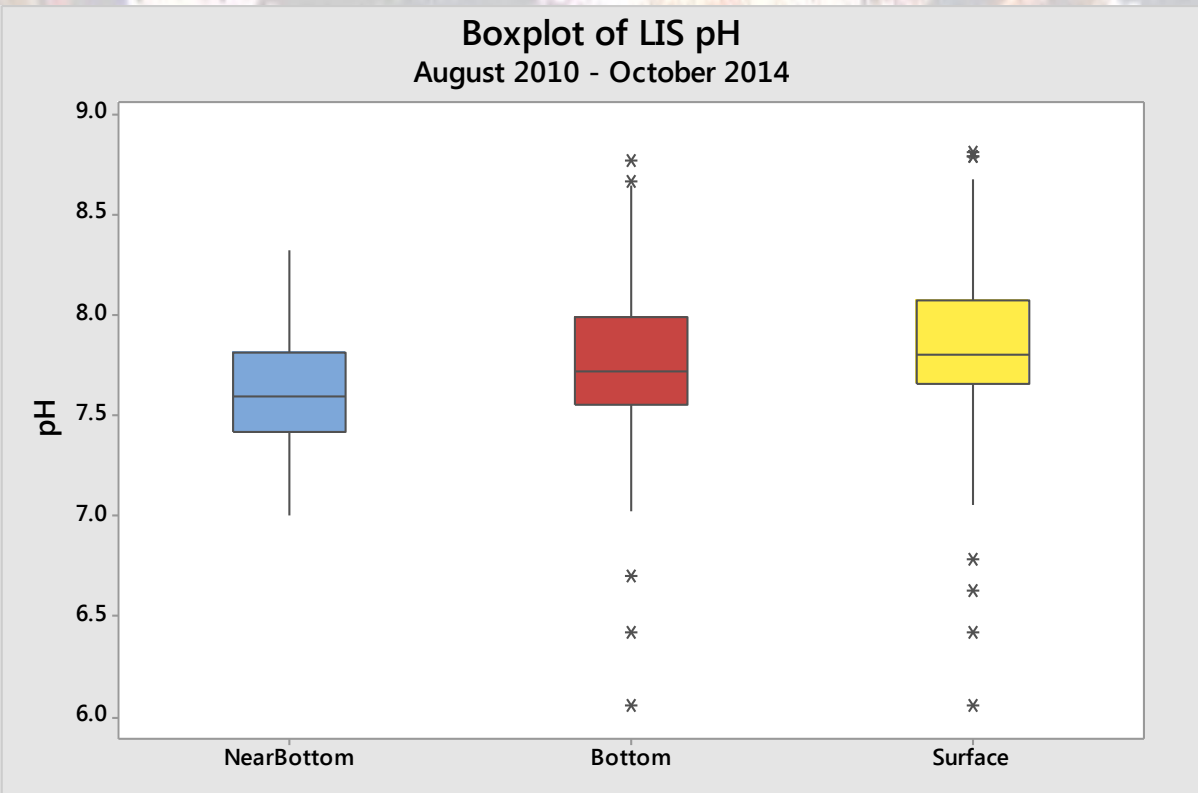
- **Average Secchi Disk Depth: 2.33 m (n=260)**
- **Minimum Secchi Disk Depth: 0.9 m at Station A4 during the WQAUG13 cruise**
- **Maximum Secchi Disk Depth: 4.2 m at Stations J2 during the WQAPR13 cruise**

pH and Ocean Acidification

Human activities have resulted in increases in atmospheric carbon dioxide (CO_2). The ocean absorbs CO_2, greatly reducing greenhouse gas levels in the atmosphere and minimizing the impact on climate. When CO_2 dissolves in seawater carbonic acid is formed. This acid formation reduces the pH of seawater and reduces the availability of carbonate ions. Carbonate ions are utilized by marine organisms in shell and skeletal formation. According to the NOAA Pacific Marine Environmental Laboratory Ocean Acidification Home Page, the pH of the ocean surface waters has already decreased from an average of 8.21 SU to 8.10 SU since the beginning of the industrial revolution and the Intergovernmental Panel on Climate Change predicts a decrease of an additional 0.3 SU by 2100. (See http://www.pmel.noaa.gov/co2/OA/background.html.)

With this issue in mind, CT DEEP upgraded its SeaCat Profilers and began collecting and reporting pH data in August 2010. Data collected through the WQOCT14 survey are summarized below.

	n	Maximum	Minimum	Mean	Median	SE Mean	StDev	Variance	Q1	Q3
Near Btm	993	8.3150	7.0030	7.6165	7.5940	0.00791	0.2491	0.0621	7.4420	7.8160
Bottom	1019	8.762	6.061	7.7604	7.7210	0.00949	0.3028	0.0917	7.5490	7.9910
Surface	1558	8.8060	6.0660	7.8445	7.7970	0.00700	0.2763	0.0763	7.6520	8.0700



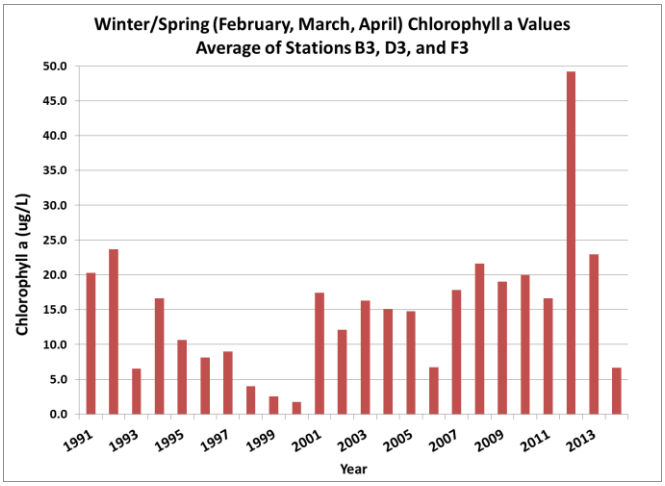
Chlorophyll a

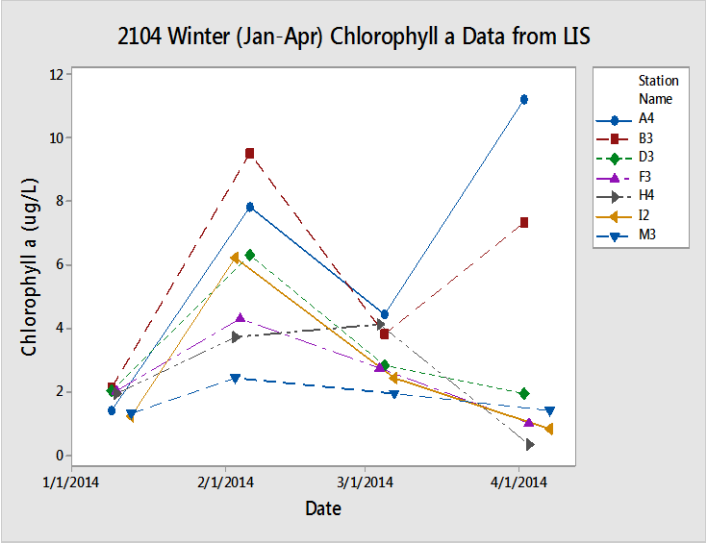
Chlorophyll is a pigment found in plants that gives them their green color. It allows plants to absorb light from the sun and convert it to chemical energy during photosynthesis. In photosynthesis carbon dioxide and water are combined to produce sugar giving off oxygen as a byproduct. Microscopic plants, called phytoplankton, form the basis of the food web in Long Island Sound. However, as in most cases in nature, too much phytoplankton may not be a good thing. Water temperature, nutrient concentrations, and light availability all factor into the amount of phytoplankton biomass found in the Sound.

The concentration of chlorophyll *a* is used as a measure to estimate the quantity of phytoplankton biomass suspended in the surface waters. It is most commonly used because it is easy to measure and because photosynthetic production is directly proportional to the amount of chlorophyll present.

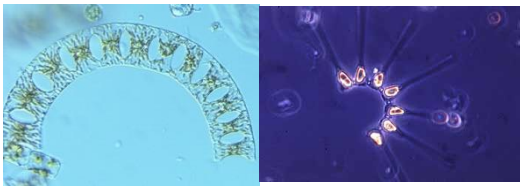
Chlorophyll a concentrations are measured *in situ* using the CTD fluorometer as well as through the collection of grab samples using Niskin bottles. The grab samples are brought back into the onboard lab, filtered, and then sent to UConn for analysis.

The spring phytoplankton bloom occurs in Long Island Sound between February and April. Historically high levels of chlorophyll a in the western Sound during this time have been linked to summertime hypoxia conditions.

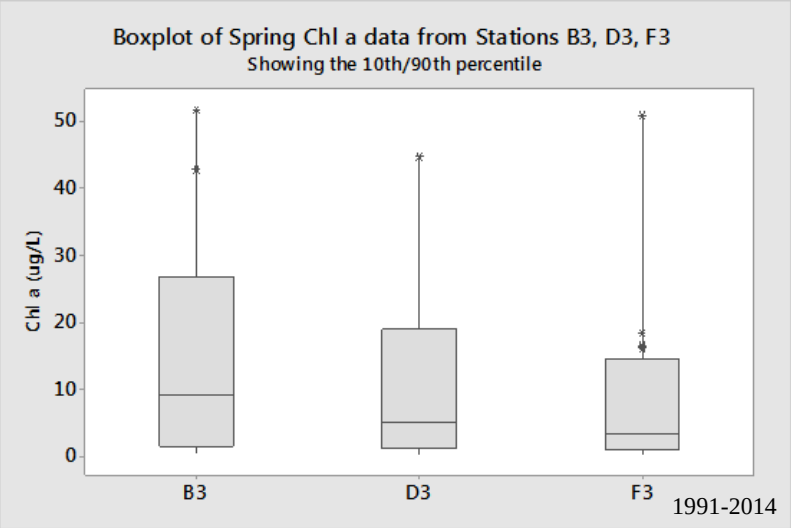




This plot illustrates the temporal variability of the surface chlorophyll a values (grab samples) by station from January-April 2014. The spring bloom was captured during the WQFEB14 (2/3-6/14) survey.



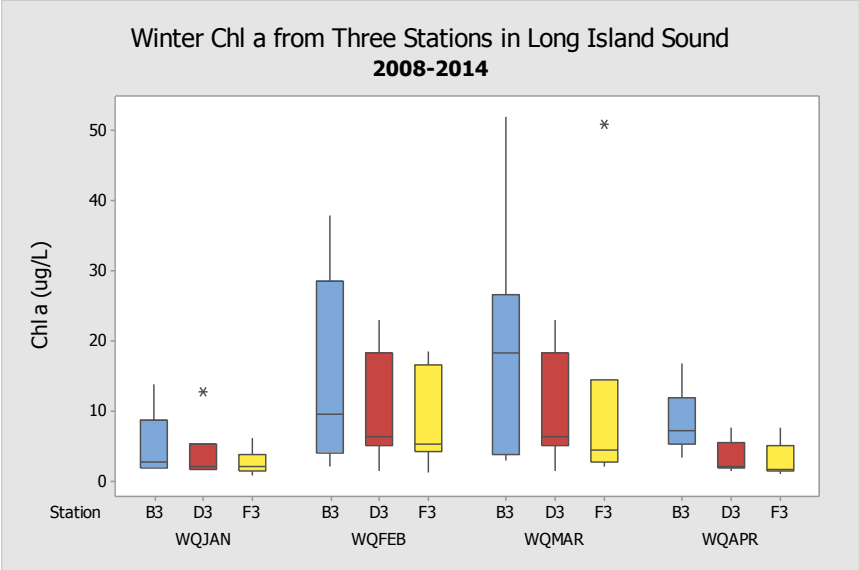
The Integration and Application Network at the University of Maryland Center for Environmental Science is preparing a report card for Long Island Sound to be released to the public in 2015. Chlorophyll a is a potential indicator with proposed thresholds at 5 ug/L and 20 ug/L. The National Coastal Condition Report also uses these thresholds and ranks data in three categories- poor, fair, and good. Chlorophyll a concentrations less than 5 ug/L are good; concentrations between 5 and 20 ug/L are fair; and concentrations greater than 20 ug/L are poor.



This boxplot examines spring (January- April) surface chlorophyll a data from three stations- B3, D3, and F3, in the western/central portion of LIS from 1991 to October 2014. At stations D3 and F3, 90% of the individual data are less than 20 ug/L and 75% of the data at B3 are less than 20 ug/L. This would place these stations in the fair category. The average concentration at each station is less than 20 ug/L but above 5 ug/L.

	n	Min	10th %	25th %	Median	75th %	90th %	Maximum	Mean	St Dev
B3	86	0.40	1.653	3.50	9.33	17.69	26.91	51.90	12.16	1.16
D3	85	0.50	1.26	2.488	5.10	12.15	19.1	44.80	8.00	7.902
F3	68	0.50	1.1	1.50	3.450	7.075	14.52	51.00	5.693	0.873

This boxplot examines recent data by survey. CHFEB and CHMAR surveys were not included because they did not occur in all years.



Photos By Lloyd Langevin, June 2007

Acknowledgements

Funding for the CT DEEP Long Island Sound Water Quality Monitoring Program is provided through a grant from the EPA through the Long Island Sound Study.

JOB 11: PUBLIC OUTREACH

JOB 11: PUBLIC OUTREACH

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JOB 11 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 14,421 outdoor and environmental writers, marine anglers and boaters, marina operators, fishing tackle retailers, Fisheries Advisory Council (FAC) members, students, and members of the general public attended outreach events. The importance of research and monitoring to good fisheries management was incorporated into the programs (Table 11.2).

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 two engagements with sportsmen clubs and other recreational environmental clubs was 46 (Table 11.2). The audience was encouraged to become actively involved in the fishery management process by attending public hearings and FAC meetings. Notices of public hearings were sent to hundreds of tackle shops and various media outlets including the DEEP website (www.ct.gov/deep/fishing).

4. Total attendance at four career day events with Connecticut high schools was 179 (Table 11.2). The students were encouraged to become actively involved in fisheries biology and management.

5. The message that the majority of marine finfish research and monitoring are funded through Federal excise taxes on fishing and motorboat fuels was emphasized at major department outreach events (Table 11.2).

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 11.1) in the outreach plan. This report summarizes F54R outreach activities conducted from March 2014 to February 2015 (segment 34).

Table 11.1:

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 DEEP)
6. General public

RESULTS AND DISCUSSION

Outdoor and Environmental Writers

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

Marine Anglers and Marine Boaters

Project personnel organized and assisted in DEEP, Marine and Inland Fisheries Division displays at two statewide fishing/hunting and boating shows. The shows were sponsored by CMTA, Channel 3, Channel 30 and Connecticut Outdoor Recreation Coalition and were held in February of 2015 at the Connecticut Convention Center. These shows attracted 13,626 anglers, non-anglers, boaters, tackle retailers, legislators and general outdoor recreation enthusiasts. The theme for these show were "Enhanced Fishing Opportunities", Trophy Fish Close to Home" and "Marine Fisheries Division Angler Surveys". F54R activities were highlighted at these shows in displays entitled "Trophy Fish Award Program" and "Marine Angler Surveys, (a marine fisheries cooperative management program)". Audiences learned the importance of research and monitoring which are funded through excise taxes on fishing tackle and motorboat fuels. Colorful posters and pictures, brief project specific text and taxidermy reproductions helped draw attention to marine species monitored under F54R programs and solicit questions and discussion of those programs.

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

The Connecticut Department of Environmental Protection (DEEP) hosted the 'Seventh Annual Trophy Fish Award Ceremony' at the Northeast Fishing and Hunting Expo in the Connecticut Convention Center in Hartford on Saturday February 14, 2015. Seventy-five (43 marine anglers)

were recognized for their fishing achievements during 2014. Four new state record holders, including the two new species awards, were honored. The Connecticut Department of Energy & Environmental Protection (DEEP) hosted the ceremony. Seventy anglers were presented framed certificates recognizing their achievement of having caught or landed the largest fish in one of several species categories during 2014. Another five anglers were recognized as angler of the year. For a summary please see: 2014 Marine Fisheries Trophy Fish Award Program Summary

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 on the CTDEEP website. Timely DEEP press releases, species fact sheets, Connecticut angler guides and Marine Fisheries Brochure are mailed to tackle retailers to keep them informed. Correspondence between the marine fisheries office staff and retailers are ongoing.

Fisheries Advisory Council

The Fisheries Advisory Council, which represents a cross section of Connecticut residents with interests in fisheries issues, met quarterly to discuss statewide fisheries issues. For each quarterly meeting staff produce a report of recent project activities which is distributed to FAC members and posted on our web site. Marine FAC Quarterly Report. After each meeting most Council members report Council discussions back to the fishing and environmental groups they represent. Council members also discussed monitoring and funding issues at meetings with state legislators. Many Council members visited Marine Fisheries displays at the Northeast Fishing and Hunting Expo, CMTA Boating Show, Trophy Fish Award Program and other activities the Fisheries Division held during 2014-15. 'A Study of Marine Recreational Fisheries in Connecticut' was emailed to Fishery Advisory Council members to keep them informed.

General Public

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

Four articles describing Sport Fish Restoration projects were published in the Department's Wildlife Magazine. The first summarized for the public the Division's program to increase shore-based sport fishing opportunities by reducing minimum size limits for two abundant marine species, summer flounder (fluke) and scup (porgy), at 45 public fishing access areas (see Job 3). A second highlighted the map products produced in GIS software which will greatly increase the readability of the 2015 CT Wildlife Action Plan (see Job 12). Other articles described uses for two indices designed to measure the abundance of the Sound's forage fish, and how ageing data are used to develop effective minimum harvest sizes. These last two articles were based on data gathered in Job 5 and Job 8.

Sport Fish Restoration projects were also highlighted at public schools and universities throughout the year. Presentations titled "Marine Fisheries Management / Sportfish Restoration and Marine Resource Management" were provided to students. These outreach events highlighted the importance of coastal resources and all facets of marine resource protection. Approximately 339 students attended Marine Fisheries Division presentations.

Finally, project staff led numerous workshops and speaking engagements throughout the state, as well as informational tours and talks at the Marine Fisheries Office (Table 11.2). These talks and tours reached all target audiences, especially the business community, teachers and students. Audiences learned how to become active participants in the fisheries management process, through public informational hearings and FAC Meetings.

MODIFICATIONS

None.

Figure 11.1: 2014 CT DEEP Trophy Fish Award Program Marine Trophy Fish Awards being presented at the Northeast Fishing and Hunting Expo, Hartford CT, February 2015 (CT DEEP Marine Fisheries Division Trophy Fish Award Program).

Table 11.2: Summary of talks, tours, career days and workshops given by project staff highlighting F54R activities, March 2014 – February 2015 (segment 32).

DATE:	PRESENTATION TYPE:	ORGANIZATION	TITLE / TOPIC:	Target Audience	TOTAL
4/4/2014	Career Day	University of New Haven	Marine Fisheries Careers	college students	52
4/8/2014	Career Day	Cheshire High School	Marine Fisheries Careers	high school sophomores'	55
4/17/2014	Career Day / Mentoring	Fermi /Enfield High School	Marine Fisheries Biologist	students	6
4/22/2014	Earth Day Presentation	Connecticut College	Lobster Die Off	students	46
4/22/2014	Earth Day Presentation	Connecticut College	Climate Change	students	46
5/29/2014	Talk	Hole in the Wall Town Beach, Niantic	Marine Species in Long Island Sound	students	210
6/6/2014	Fishing Derby	Fort Trumbull	Fishing	students	18
6/26/2014	Marine Field Presentation	CCSU Marine Biology	Marine Fisheries Biology	students	46
8/3/2014	Talk	Bruce Museum Seaside Center Greenwich	Diversity in Long Island Sound	students	22
10/15/2014	Career Day	Cheshire High School	Marine Careers	students	66
2/4-8/2015	Outreach Display	CMTA Boating Show	Enhanced Fishing Opportunities	general public	6,889
2/13-15/2015	Outreach Display	Northeast Fish and Hunting Expo	Enhanced Fishing Opportunities	general public	6,737
2/14/2015	Award Presentation	Northeast Fish and Hunting Expo	Trophy Fish Award Program Ceremony	marine anglers	204
2/23/2015	Talk	Stratford Yacht and Angling Club	Marine Fisheries Management	marine anglers	24
					14,421

JOB 12: MARINE FISHERIES GIS

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JOB 12: MARINE FISHERIES GIS

GOAL

To maintain a geographic information system (GIS) of Project data to support map applications and geospatial analyses, assist with planning and executing Connecticut DEEP Marine Fisheries Division (MFD) surveys that support sport fish restoration goals, help people visualize the spatial extent of MFD project sampling efforts, assist in evaluating the effects of fishing and environmental conditions on the distribution and abundance of living resources in Long Island Sound, evaluate effects of marine spatial planning projects on living marine resources and fisheries in Long Island Sound, and improve coordination with other agencies.

OBJECTIVES

1) Provide GIS-compatible, or GIS-ready, datasets and geo-referenced layers of data collected through other Jobs of this Project that are sanctioned by the Marine Fisheries Division.

2) Provide maps and geospatial analyses of Marine Fisheries Division data or other information relevant to managing living marine resources in Long Island Sound.

INTRODUCTION

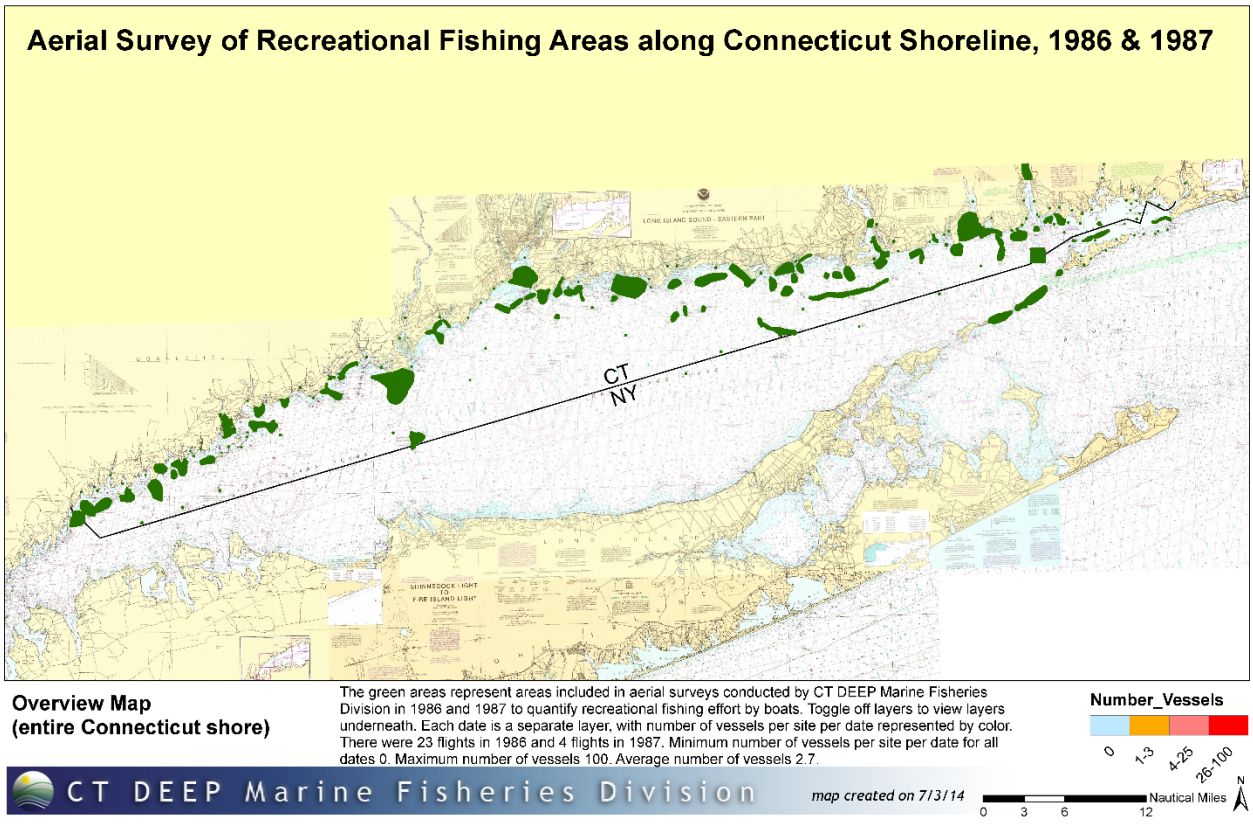
In recent years, there has been an increased need for staff to use geospatial technology to map and analyze marine environmental or fisheries related information. Project staff have also experienced an increasing number of requests to provide geospatial data to others (intra-agency, inter-agency, NGOs, academic institutions, etc) for use in, for example, fisheries stock assessments, habitat assessments, environmental sensitivity maps, and public outreach efforts. Therefore, in 2012, a new job was created within the project to support this need for geospatial datasets, data layers, analyses and products. This report includes results from the third year of the Job.

METHODS

GIS work was accomplished using ESRI ArcMap software and extensions licensed by the Connecticut DEEP. Published layers comply with Department policy pertaining to GIS data. Custom scripts were developed using well established scripting utilities (*e.g.* Python, HTML, CSS, Javascript). Products designed for the Internet adhere to Agency requirements for Agency websites, pages and products. A number of the custom applications, scripts and tools created during earlier segments of the Job continue to be used as templates in subsequent years.

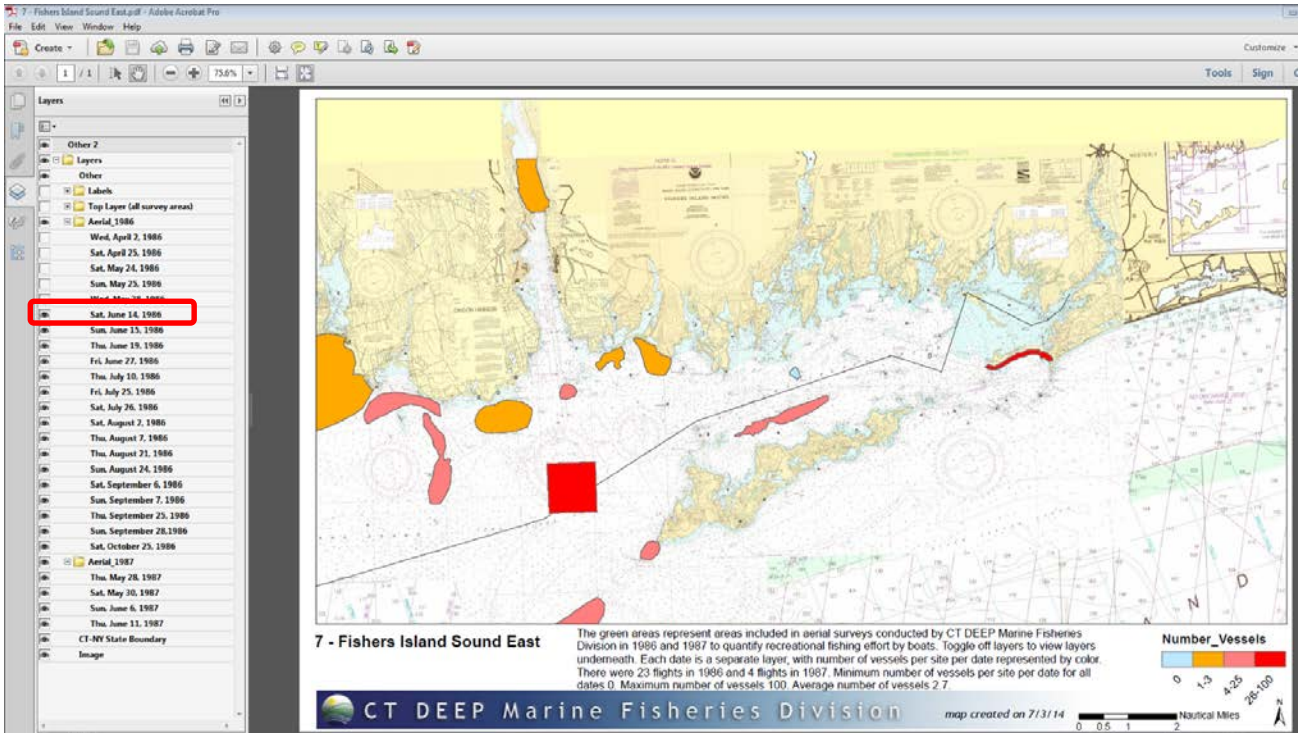
RESULTS

There have been numerous requests for map layers of areas in Long Island Sound that are important for recreational fishing. Angler surveys have been a major component of this project since its inception, including aerial surveys conducted in the mid-eighties. Data from the aerial surveys were previously archived in a spreadsheet. During this segment of the project, GIS staff worked with a Biologist who collected the data to visually digitize features from NOAA navigational charts that corresponded to areas delineated by the aerial surveys. Aerial surveys were conducted on 21 days in 1986 and 4 days in 1987, primarily along the Connecticut coast, Connecticut waters of Long Island Sound, Fishers Island Sound and the vicinity of Race Point, New York. One hundred ninety-six (196) polygons corresponding to areas in the aerial surveys were created and published in PDFs with data layers attached. This format allows viewers to get an overview of the areas surveyed, as well as detailed information collected during each flight, such as date, time of day, day of the week, weather conditions and the level of fishing effort present at each area on any flight.

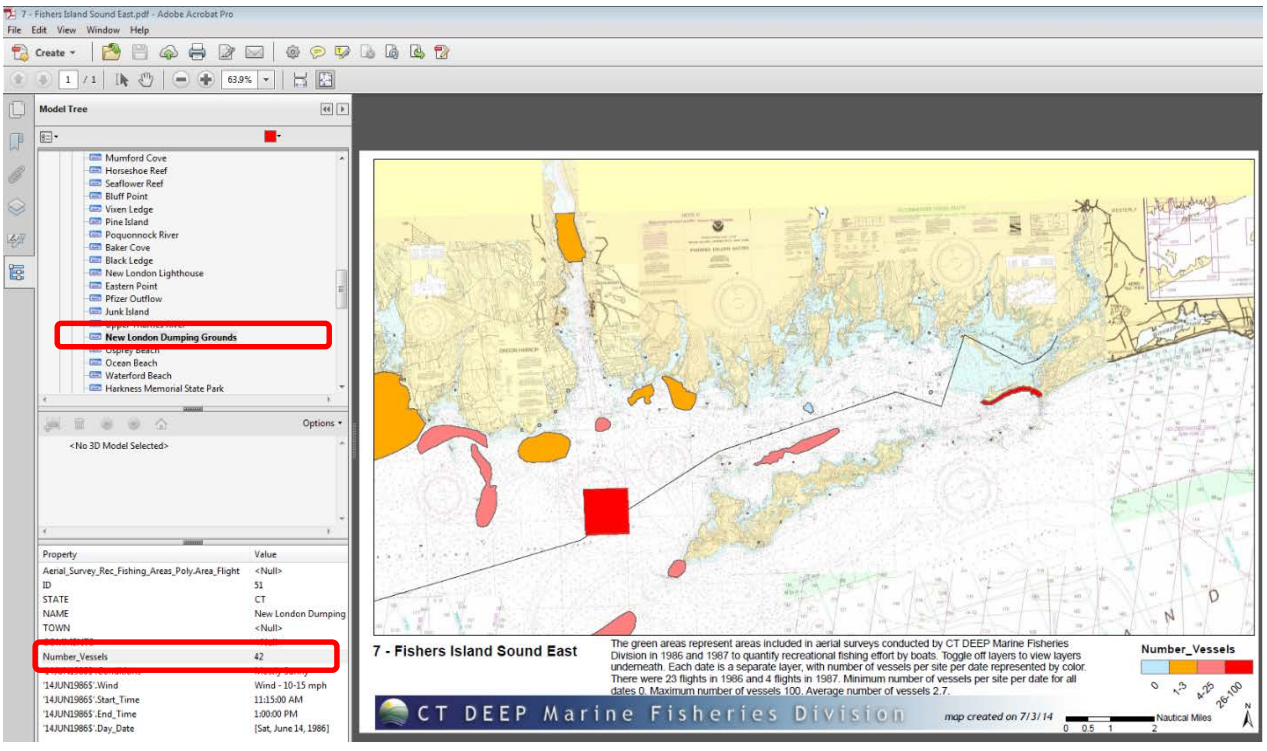


Above is the PDF overview map showing all the locations in the aerial surveys (green polygons).

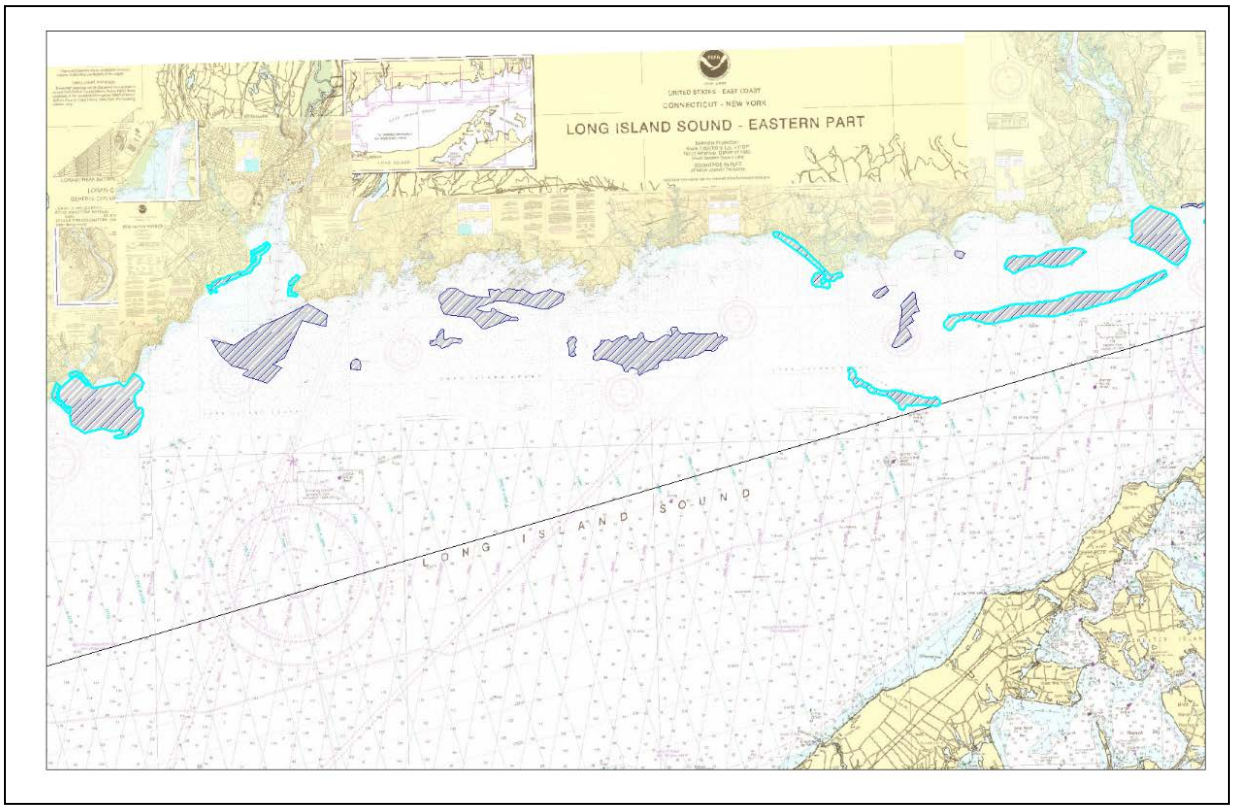
Below is one portion of eastern Long Island Sound and Fishers Island Sound showing the fishing effort, as measured by the number of vessels counted during the aerial survey, at each location on June 14, 1986. By turning layers on/off in the left column, the effort for any specific date can be displayed.



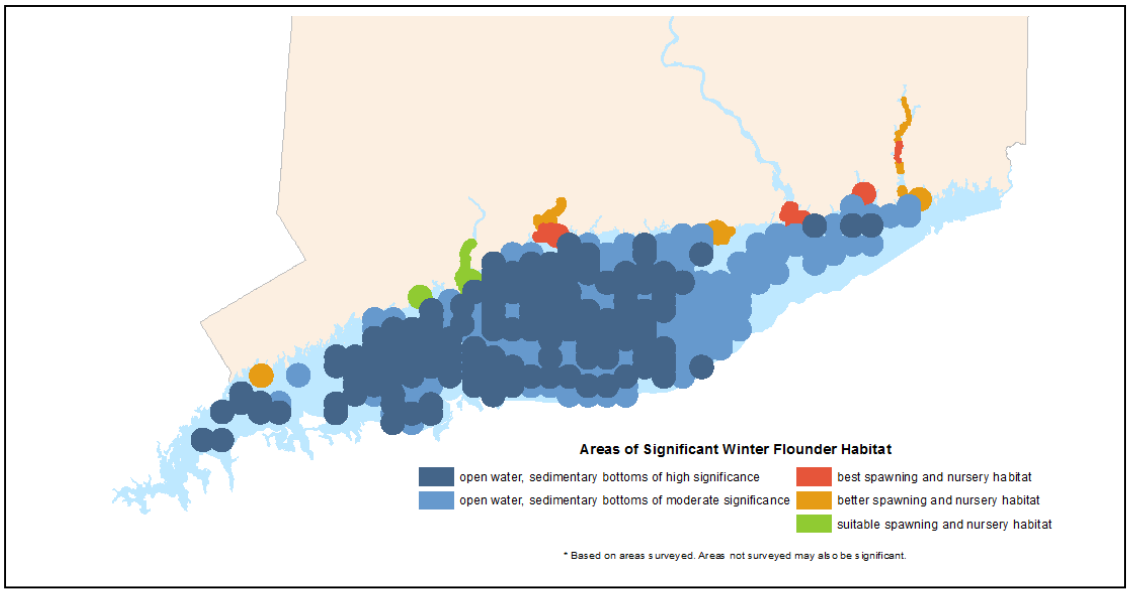
The image below shows the data recorded for one site, New London Dumping Ground, on the June 14, 1986 flight. The dark red color represents high fishing effort (26-100 vessels) while the data in the lower left of the screen display shows the actual number of vessels fishing was 42.



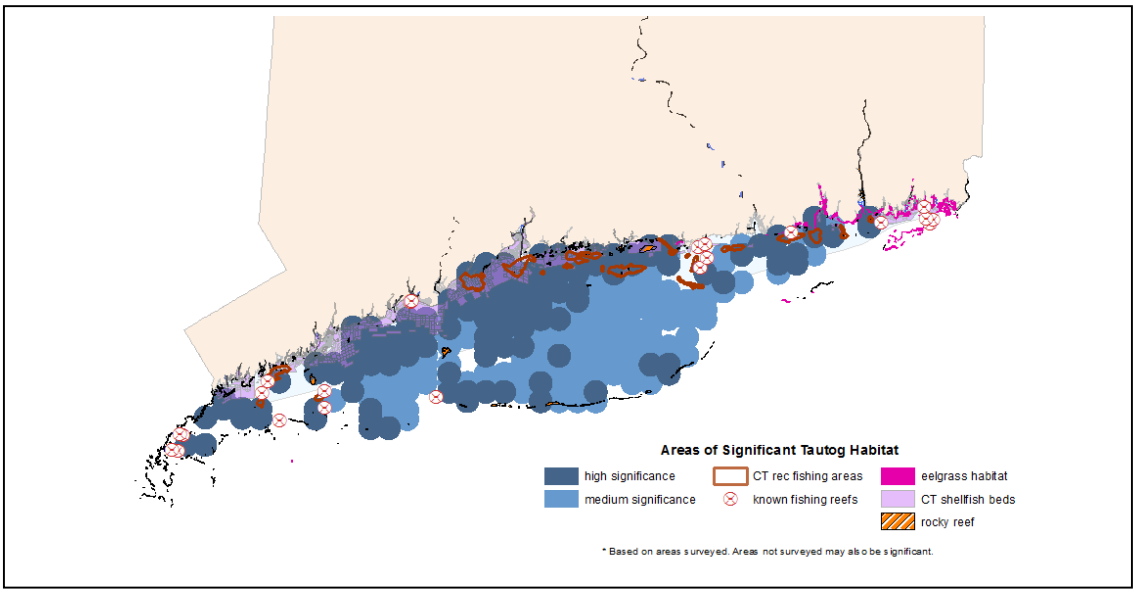
Another data layer to show areas important to recreational fishing in Connecticut was developed by canvasing Marine Fisheries Division (MFD) staff members. GIS staff visually digitized features on NOAA navigational charts to correspond to areas identified by MFD as being historically productive fishing areas for ten of the main recreational species in Long Island Sound; black sea bass, bluefish, bonito, hickory shad, scup (porgy), striped bass, summer flounder, tautog, weakfish and winter flounder. In the image below, fishing areas in Connecticut waters of eastern Long Island Sound are shaded grey and the areas outlined in bright blue are known as being productive fishing areas for striped bass.



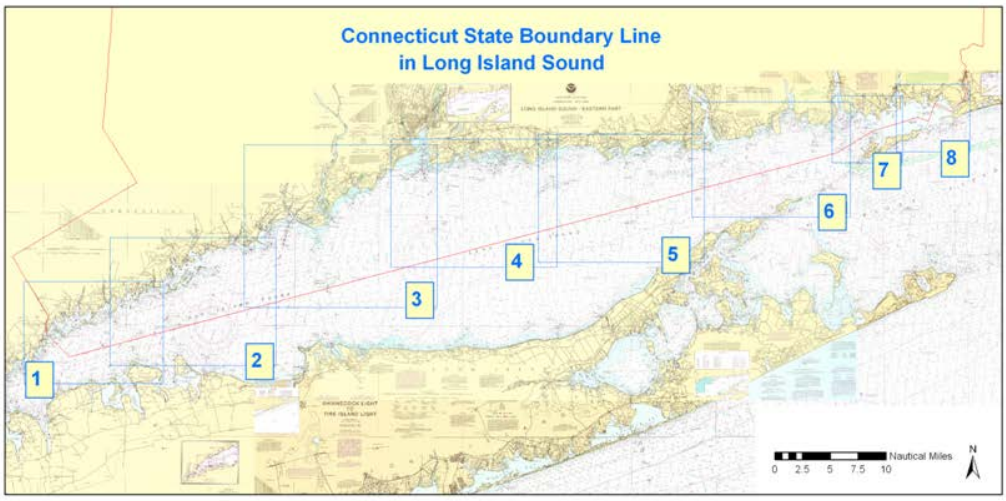
During this project segment, maps were developed to show areas of significant habitat for a number of species using data from various sources, including four Jobs in this project and outside data sources. Below is a map of significant winter flounder habitats based on data from the Long Island Sound Trawl Survey, the Estuarine Seine Survey and the Beam Trawl Survey.



Significant habitats were also mapped for tautog (blackfish), using data from the Long Island Sound Trawl Survey (1984-2013), the historically productive fishing area layer described above selected for tautog, as well as GIS data from outside sources, including USFWS and NROC Northeast Regional Ocean Data Portal. Maps of significant habitat for these two species are being used by MFD in a planning process for the State Wildlife Grants Program administered by USFWS.



Several states have areas of jurisdiction in Long Island Sound and fishing regulations can vary between these states. When on the waters or shores of each state, anglers must comply with all regulations of that state, regardless of the port they intend to return to. Anglers contacted MFD for help in determining which State's jurisdiction they were in at different fishing locations in Long Island and Fishers Island Sounds. In response to anglers' requests for assistance, MFD posted versions of NOAA navigational charts with the Connecticut state boundary line on the Agency website (http://www.ct.gov/deep/lib/deep/fishing/saltwater/connecticut_state_boundary_line_in_long_island_sound.pdf). There is an overview map (shown below) with links to smaller sections for more detail.



Connecticut State Boundary (red line) superimposed on NOAA navigational charts for Long Island Sound and Fisher Island Sound.
Map Sections 1-8 (outlined in blue) may be viewed separately to see more detail.
Not to be used for navigation.

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Select a link below to view a map for a specific section of the Sound.

Section 1: Greenwich to Stamford (4.9 MB)
Section 2: Stamford to Fairfield (4.4 MB)
Section 3: Fairfield to New Haven (4.3 MB)
Section 4: New Haven to Falkner Island (4.2 MB)
Section 5: Falkner Island to Connecticut River (4.3 MB)
Section 6: Connecticut River to Thames River (4.7 MB)
Section 7: Thames River to Mystic River (5.4 MB)
Section 8: Mystic River to Pawcatuck River (5.2 MB)

Please see **Table 6.** Points Defining the Connecticut State Waters Boundary Line, on page 31 of the Marine Fisheries Information Circular

MODIFICATIONS

None.