



**STATE OF CONNECTICUT
DEPARTMENT OF ENERGY AND ENVIRONMENTAL
PROTECTION**

Katherine S. Dykes
Commissioner

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

**A STUDY OF MARINE RECREATIONAL
FISHERIES IN CONNECTICUT**



Federal Aid in Sport Fish Restoration
F19AF00242 (F-54-R-39)
Annual Performance Report
March 1, 2019 – February 28, 2020



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
F19AF00242 (F-54-R-39)
Annual Performance Report

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

Period Covered: March 1, 2019 - February 28, 2020

Job Title

Job 1: Marine Angler Survey
Job 2. Volunteer Angler Survey
Job 3. Public Outreach
Job 4. Marine Fisheries GIS
Job 5. Marine Finfish Survey

Job 6. Studies in Conservation Engineering

Job 7. Alosine Survey
Job 8. Estuarine Seine Survey
Job 9. Cooperative Interagency Resource Monitoring

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JOB 1: MARINE ANGLER SURVEY

MARINE ANGLER SURVEY

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JOB 1: MARINE ANGLER SURVEY

GOAL

Increase robustness of fisheries management decisions by providing supplemental catch, effort and size composition data for several important sportfish species through a voluntary catch card survey program targeting shore and private boat anglers.

OBJECTIVES

Provide estimates of:

- 1) Size composition of harvested and discarded black seabass, bluefish, scup, summer flounder, tautog, striped bass, and weakfish.
- 2) Catch rates (catch-per-effort) of black seabass, bluefish, scup, summer flounder, tautog, and striped bass.
- 3) Percentage of angling trips targeted for various species.

INTRODUCTION

CT DEEP has collected marine recreational fisheries information along the Connecticut coastline since 1979 under several state and federal programs. In 2013, NMFS assumed full angler survey responsibility for the federal Marine Recreational Information Program (MRIP) while DEEP continued to manage the site registry. Beginning in 2014, the Marine Angler Survey shifted focus to collection of length frequency of both harvested and released fish to supplement the MRIP survey. Length frequency data that includes released fish are difficult to obtain through traditional access point intercept surveys such as MRIP, and is particularly important for effective stock assessments. In addition, this program is designed to better characterize the private boat mode which lands a substantial proportion of fish caught in Connecticut waters (85% in 2019).

METHODS

Marine recreational fishing information was collected through a voluntary catch card program. Post-marked daily catch cards (Figure 1.1) were distributed to anglers departing and returning from selected private boat sites, previously identified as areas of high activity, to maximize catch card distribution. Boat-based anglers at these selected fishing sites were recruited by DEEP staff to voluntarily report their fishing trip effort information and collect length measurements on fish caught, including both kept and released fish (discards). Each participating boat angler or angler group was given a waterproof daily catch card, pencil, and measuring tape in addition to verbal instructions. Anglers were encouraged to mail the post-marked catch cards upon trip completion. Each card issued bears a unique identification number and all cards handed out to anglers were accounted for using the unique card ID number. As an incentive to maximize participation, anglers entering their Conservation ID/Fishing License Number are eligible to win a raffle prize at the end of the year. Boat-based anglers were also interviewed when their fishing trips were completed to aid in data collection.

In addition to the boat-based anglers, this survey also collects data from shore based anglers who are fishing at Enhanced Shore Fishing Sites. Anglers fishing from designated enhanced opportunity shore fishing sites are allowed to harvest scup at 8 inches minimum length (vs. 9 inches in other private and party/charter fishing modes) and summer flounder at 17 inches (vs 19 inches for other modes). There is a total of 43 sites along the Connecticut shoreline. The smaller minimum sizes were adopted out of concern that shore anglers were taking a disproportionate share of the 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. In order to ensure that these less restrictive regulations meet the required conservation of the fishery management plan, The Atlantic States Marine Fisheries Commission (ASMFC) Summer Flounder, Scup and Black Sea Bass Management Board requested that DEEP monitor the enhanced shore fishing sites to provide additional catch information.

Anglers are asked to provide the following information:

- 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 Fished (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)

Anglers are instructed to measure each fish to the nearest ½ inch (rounded down) and record its disposition by circling either Y (yes) or N (no) in the Kept column. Fishing boat vessel registration is also requested. All data are entered and stored in an electronic database.

RESULTS AND DISCUSSION

CT DEEP staff completed 95 boat launch assignments and 134 shore based assignments (229 total) at 8 boat launch sites and 33 Enhanced Shore Fishing Sites along Connecticut's coastline. Four launch sites in the east and west were chosen. Eastern sites were visited 60 times and western sites 35 times (Appendix 1.1). A total of 634 catch cards were distributed to Anglers, 322 distributed (provided) to anglers at boat launches, and another 312 distributed at Enhanced Shore Fishing Sites. One-hundred and eighty-eight cards were returned from those distributed at boat launches and 142 were returned from shore based anglers in 2019. This is a total of 330 returned cards (52%).

The catch data from the different modes were examined separately to address concerns regarding dissimilarities in angler catch rates as well as species length frequencies based on mode. Shore based fishermen were more likely to keep their fish releasing 66% of their catch while boat anglers returned over 70% of their catch. Striped bass was the most frequently released fish reported with 182 of 189 fish (96%) being returned to the water (Table 1.1). The most frequently harvested species was Scup with 151 of 280 (54%) fish reported to be taken home.

Volunteer anglers and DEEP staff measured a total of 1,053 fish in 2019 (Table 1.2, Figure 1.2). Of these, 873 were caught from the private boat mode and 180 were caught from shore. Targeted species (black sea bass, bluefish, scup, striped bass, summer flounder and tautog) accounted for 89% of the measured catch in 2019.

Length frequencies for various species by mode were also examined. There continues to be a need of having a smaller minimum size for scup at Enhanced Shore Fishing Site locations. The average length of a scup caught from shore was 9 inches, where the average length from a boat was 11 inches (Figure 1.3).

MODIFICATIONS

None.

Table 1.1. 2019 Measured Fish by Mode, Species and Disposition.
Species listed in bold type are targeted by this program

Mode	Fish Species	Number Released	% Released	Number Kept	Total
Shore Mode	American eel	1	100.0	0	1
	Atlantic croaker	1	100.0	0	1
	Black sea bass	1	100.0	0	1
	Bluefish	20	52.6	18	38
	Hickory shad	0	0.0	1	1
	Scup	20	34.5	38	58
	Dogfish UNC	0	0.0	1	1
	Striped bass	26	100.0	0	26
	Searobins UNC	25	100.0	0	25
	Summer flounder	18	94.7	1	19
	tautog	8	88.9	1	9
	Total	120	66.6	60	180
Private Boat	Atlantic bonito	5	50.0	5	10
	Atlantic menhaden	6	19.4	25	31
	black sea bass	87	78.4	24	111
	bluefish	46	63.0	27	73
	Dogfish UNC	6	100.0	0	6
	hickory shad	4	57.1	3	7
	scup	109	49.1	113	222
	Sea Robins UNC	31	91.2	3	34
	striped bass	156	95.7	7	163
	summer flounder	66	81.5	15	81
	tautog	98	74.8	33	131
	winter flounder	0	0.0	4	4
Total	614	70.3	265	873	
Shore and Private Boat	Total	734	69.7	325	1,053

Table 1.2. 2019 Total number of Fish Measured by Mode and Species.
Species listed in bold type are targeted by this program

Fish Species	Shore	% of Total (Shore)	Private Boat	% of total (Private boat)	Total Number Measured	% of Total (Modes Combined)
American eel	1	0.6%	0	0.0%	1	0.1%
Atlantic bonito	0	0.0%	10	1.1%	10	0.9%
Atlantic Menhaden	0	0.0%	31	3.6%	31	2.9%
Atlantic croaker	1	0.6%	0	0.0%	1	0.1%
Black sea bass	1	0.6%	111	12.7%	112	10.6%
Bluefish	38	21.1%	73	8.4%	111	10.5%
Dogfish UNC	1	0.6%	6	0.7%	7	0.7%
Hickory shad	1	0.6%	7	0.8%	8	0.8%
Scup	58	32.2%	222	25.4%	280	26.6%
Striped bass	26	14.4%	163	18.7%	189	17.9%
Searobins UNC	25	13.9%	34	3.9%	59	5.6%
Summer flounder	19	10.6%	81	9.3%	100	9.5%
tautog	9	5.0%	131	15.0%	140	13.3%
Winter flounder	0	0.0%	4	0.5%	4	0.4%
Total	180	100%	873	100%	1,053	100%

Table 1.3. Number of targeted trips and percent of targeted trips by mode for six recreationally important species.

Species	Shore Mode		Private boat Mode	
	Number of Targeted Trips	Percent of Targeted Trips	Number of Targeted Trips	Percent of Targeted Trips
Black Sea Bass	0	0.0%	12	7.8%
Bluefish	27	21.6%	10	6.5%
Scup	27	21.6%	20	13.1%
Striped Bass	55	44.0%	62	40.5%
Summer Flounder	6	4.8%	29	19.0%
Tautog	10	8.0%	20	13.1%

Figure 1.1. Connecticut Volunteer Marine Angler Catch Card.

Connecticut Volunteer Marine Angler Catch Card Survey for the Private Boat Mode
If you need assistance completing this form, please contact the DEEP Marine Fisheries Division (860.434.6043)

00001

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

Trip Start Time _____
 AM
 PM

Area(s) Fished-See map below

Please Mail Card after trip completion-Thank you!

Primary Fish Targeted _____
 Secondary Fish Targeted _____

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

Number of Anglers in Fishing Party _____

Number of Anglers that Caught Fish _____

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

Common Fish Name	Length	Kept? <small>(Circle one)</small>
		Y / N
		Y / N
		Y / N
		Y / N
		Y / N
		Y / N
		Y / N
		Y / N

Boat's Total Catch For Trip

Common Fish Name	# Kept	# Releasd

Check Box, if NO fish were caught

Figure 1.2. Connecticut DEEP Staff measuring a Scup Harvested by a Private Angler



Figure 1.3. Length Frequency Distribution of Scup for both Shore and Private Boat Mode measured by volunteer anglers.

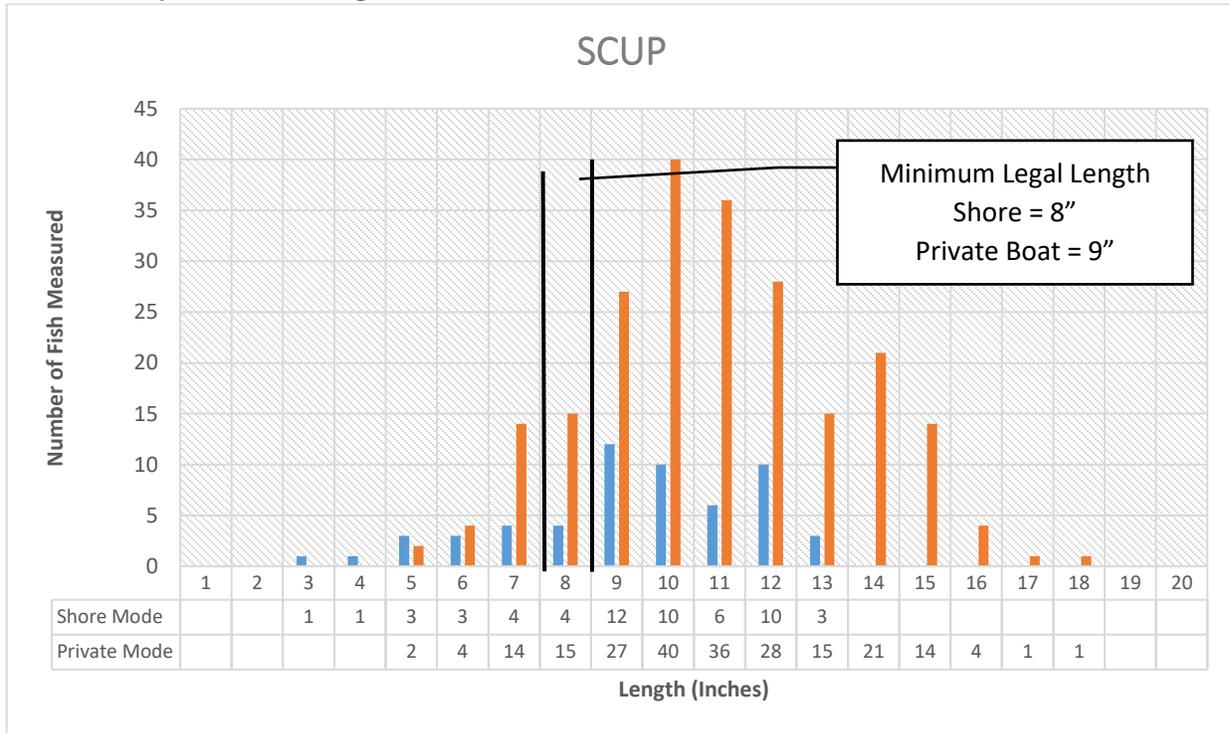


Figure 1.4. Length Frequency Distribution of Summer Flounder for both Shore and Private Boat Mode measured by volunteer anglers.

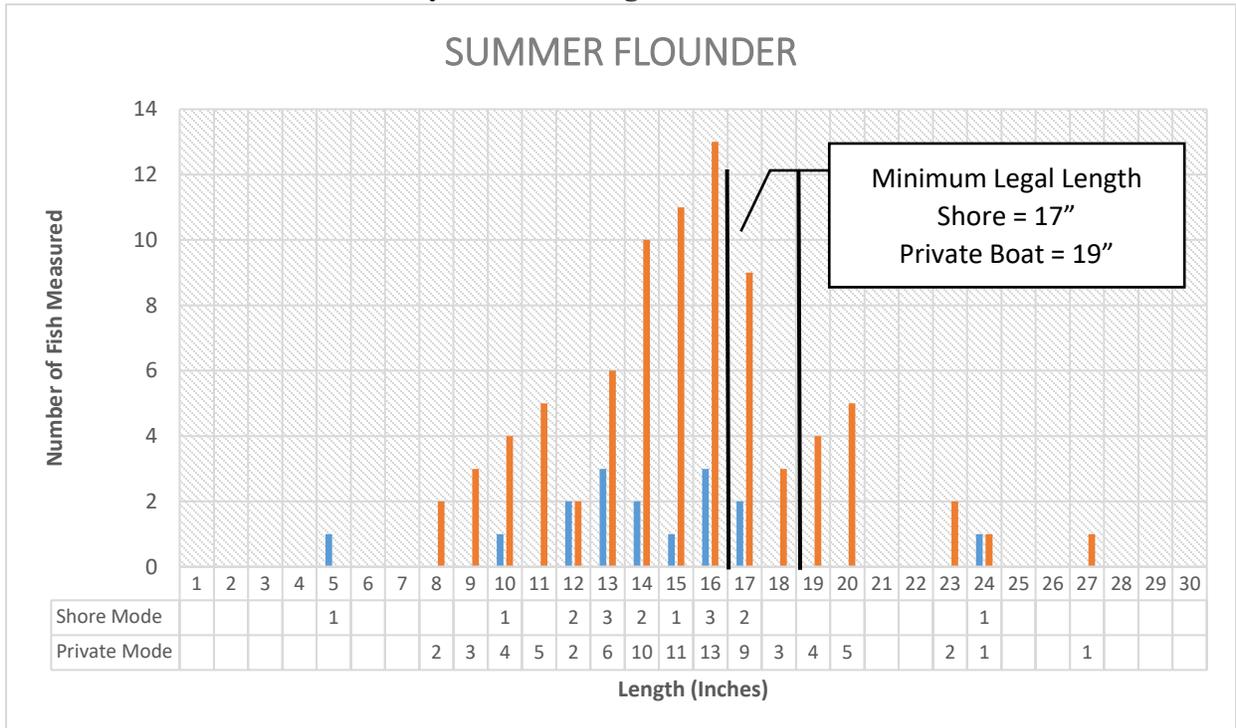


Figure 1.5. Length Frequency Distribution of Striped Bass for both Shore and Private Boat Mode measured by volunteer anglers.

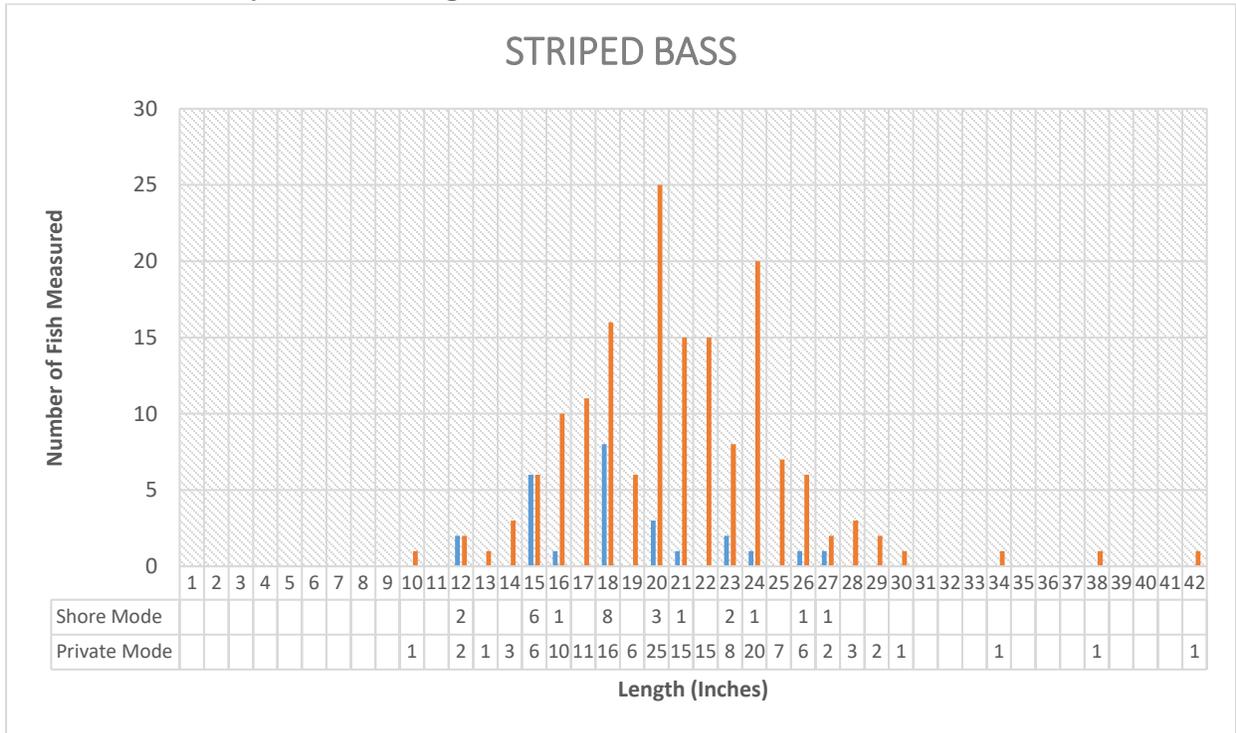
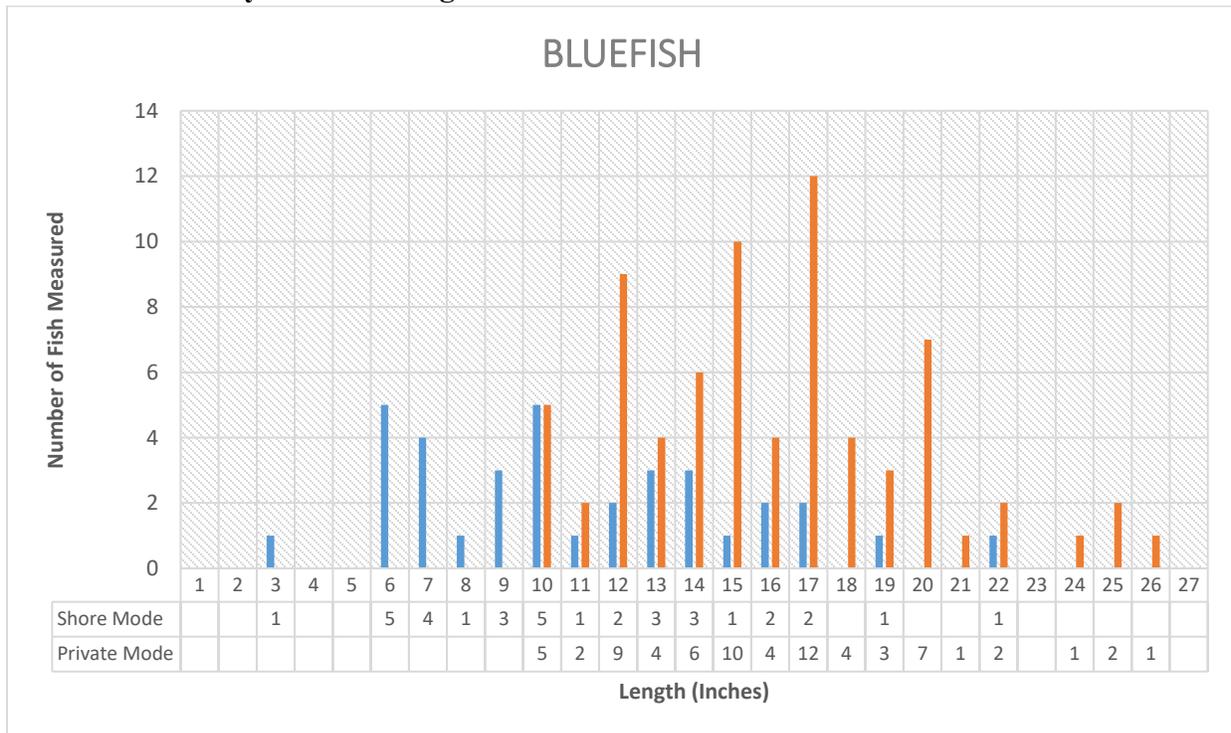
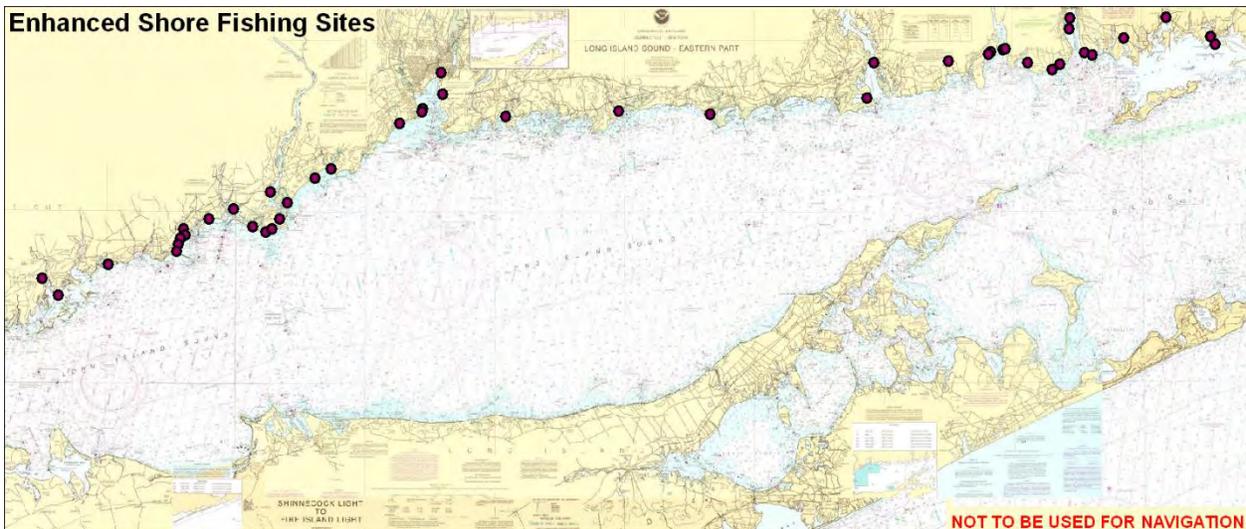


Figure 1.6. Length Frequency Distribution of Bluefish for both Shore and Private Boat Mode measured by volunteer anglers.



Appendix 1.1. Recreational Angler Sampling Locations. Boat Launches and Enhanced Shore Fishing Sites.



JOB 2: VOLUNTEER ANGLER SURVEY

VOLUNTEER ANGLER SURVEY

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JOB 2: VOLUNTEER ANGLER SURVEY

GOAL

Increase robustness of fisheries management decisions by providing supplemental catch, effort and size composition data for several important sportfish species through a voluntary logbook program.

OBJECTIVES

Provide estimates of:

1. Size structure of harvested and discarded bluefish, striped bass and other common sportfish.
2. Catch rates (catch-per-effort) of bluefish, striped bass, and other common sportfish.

INTRODUCTION

The Connecticut Volunteer Angler Survey (VAS) began in 1979 with the primary purpose of supplementing the National Marine Fisheries Service, Marine Recreational Fishery Statistics Survey/Marine Recreational Information Program by providing additional length measurement data. The survey emphasizes measurements of fish that are released, which are under-reported in the federal surveys. 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 and in 1997, length data for other marine finfish were added.

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 in a logbook (Appendix 2.1). The logbook contains fields in which to record 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 length measurements. Instructions for volunteers are provided on the inside cover of the postage paid logbook. Each participating angler is assigned a unique numeric code for confidentiality purposes. After the logbook data are entered into the survey database, logbooks are returned to each volunteer for their personal records. Furthermore, to improve communications with recreational anglers and to encourage more public participation, volunteers are notified of upcoming public hearings, including proposed and final changes in recreational fishing regulations.

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 software. The VAS logbook format was slightly modified so that the information collected would be compatible with ACCSP minimum data element standards (Appendix 2.1). Initially, one of the primary purposes of incorporating the VAS database into ACCSP SAFIS was to enable anglers to enter their own fishing information and compile their own statistics using eLogbook. However, because of the unique geographic location of Connecticut's shoreline, marine anglers often fish over multiple areas crossing interstate and federal boundaries during a single trip. The eLogbook software did not allow entry of data from fishing areas outside of Connecticut's marine waters. Therefore, as in previous years, paper logbooks were distributed to survey volunteers and Marine Fisheries staff completed VAS data entry.

The problem was resolved in 2014, but only a portion of the volunteers entered their own data in 2014 and 2015, with the remainder submitting paper logbooks.

Since the Survey began in 1997, the number of participants has ranged from 18 anglers participating in 1979 to 115 anglers in 1997. Advertising the VAS program through the annually published *Connecticut Angler's Guide* and on the agency web site (www.ct.gov/deep/fishing) has helped increase volunteer participation. The guide is distributed to all anglers who purchase a Connecticut fishing license and is also circulated by bait and tackle shops and other entities.

RESULTS AND DISCUSSION

In 2019, a total of 34 anglers participated in the program, recording 610 trips for an average of 18 trips each. In 2019, there was a 15% (5 anglers) increase from 2018 (4 anglers) in VAS anglers entering their own data through the eLogbook application on the ACCSP website (www.accsp.org), which was the fifth year of the program. Most of the anglers that entered their own data expressed favorable comments toward the SAFIS eLogbook.

The private boat mode comprised the most trips (70.9%) recorded, followed by shore based trips (27%), see Job 3 for description of regular and enhanced shore sites. Of the total, 88% of the recorded trips were successful in catching fish. VAS anglers recorded catching 27 species including near shore species to open ocean pelagic species (Table 2.2). This included eight principal recreational species (currently under fisheries management plans) which comprised 86% of the total catch (Table 2.3). With the exception of two pelagic species (scup and bluefish) the release rates for nearly all species was 87% or greater. Species that were infrequently captured (less than 20) were not included in the catch & release analysis due to their rare nature.

VAS participants measured 10,935 fish including 9,401 fish within the eight principal species. These data show a wide range in the release rate of the principal species (Table 2.3). For example, 62% of scup caught were released while 98% of striped bass caught were released. For bluefish, which has no minimum legal size, the release rate was 76% (Table 2.3). Anglers caught fewer winter flounder (1) and hickory shad (9) this year than last year (winter flounder n= 27 and hickory shad n= 22) therefore, length frequency graphs for those species were excluded in this years report. See Figure 2.1 through Figure 2.6 for length frequency information on the 2019 VAS harvest and catch & release data.

CONCLUSIONS

VAS anglers provide valuable recreational fisheries catch data at a relatively low cost. In addition, the length data on released fish provided by this program is difficult or unattainable through conventional access point angler intercept surveys and is essential for effective assessment of the recreational fishery coastwide and in Connecticut. 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 Program, P.O. Box 719, Old Lyme CT 06371.

MODIFICATIONS

None.

ACKNOWLEDGEMENTS

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

Table 2.1. Distribution of fishing trips by VAS anglers.

MODE	TRIPS	PERCENT
Private Boat	432	70.9%
Shore (Regular)	158	25.9%
Shore (Enhanced Fishing Site)	7	1.1%
Charter Boat	7	1.1%
Party Boat	6	1.0%
All Modes	610	

Table 2.2. Total measured angler catch by species and disposition. Eight principal recreational species are shown in bold type.

Species	Harvested		Released		Total
	Number	%	Number	%	Number
Scup	1197	38%	1983	62%	3180
Black Sea Bass	263	13%	1690	87%	1953
Striped Bass	37	2%	1603	98%	1640
Summer Flounder	134	11%	1049	89%	1183
Searobins	65	5%	1117	95%	1182
Tautog	85	12%	643	88%	728
Bluefish	171	24%	536	76%	707
Dogfish	6	3%	221	97%	227
Skates	0	0%	25	100%	25
Blue Sharks	0	0%	20	100%	20
Atlantic Menhaden	13	87%	2	13%	15
Chub Mackerel	0	0%	13	100%	13
Hickory Shad	2	22%	7	78%	9
Atlantic Bonito	6	75%	2	25%	8
Little Tunny	1	13%	7	88%	8
Dolphinfish	7	100%	0	0%	7
Spanish Mackerel	0	0%	6	100%	6
Bluefin Tuna	4	67%	2	33%	6
Cunner	2	67%	1	33%	3
Northern Kingfish	0	0%	3	100%	3
Weakfish	2	67%	1	33%	3
Atlantic Cod	2	100%	0	0%	2
Red Hake	2	100%	0	0%	2
Albacore Tuna	2	100%	0	0%	2
Winter Flounder	1	100%	0	0%	1
Mako Sharks	0	0%	1	100%	1
Wahoo	1	100%	0	0%	1
Total	2003	18%	8958	82%	10935

Table 2.3. Total measured catch and disposition for eight principal recreational species.

Species	Harvested		Released		Total
	Number	%	Number	%	Number
Scup	1197	38%	1983	62%	3180
Black Sea Bass	263	13%	1690	87%	1953
Striped Bass	37	2%	1603	98%	1640
Summer Flounder	134	11%	1049	89%	1183
Tautog	85	12%	643	88%	728
Bluefish	171	24%	536	76%	707
Hickory Shad	2	22%	7	78%	9
Winter Flounder	1	100%	0	0%	1
Total	1890	20.1%	7511	79.9%	9401

Figure 2.1. Length frequency of Summer Flounder caught by disposition.

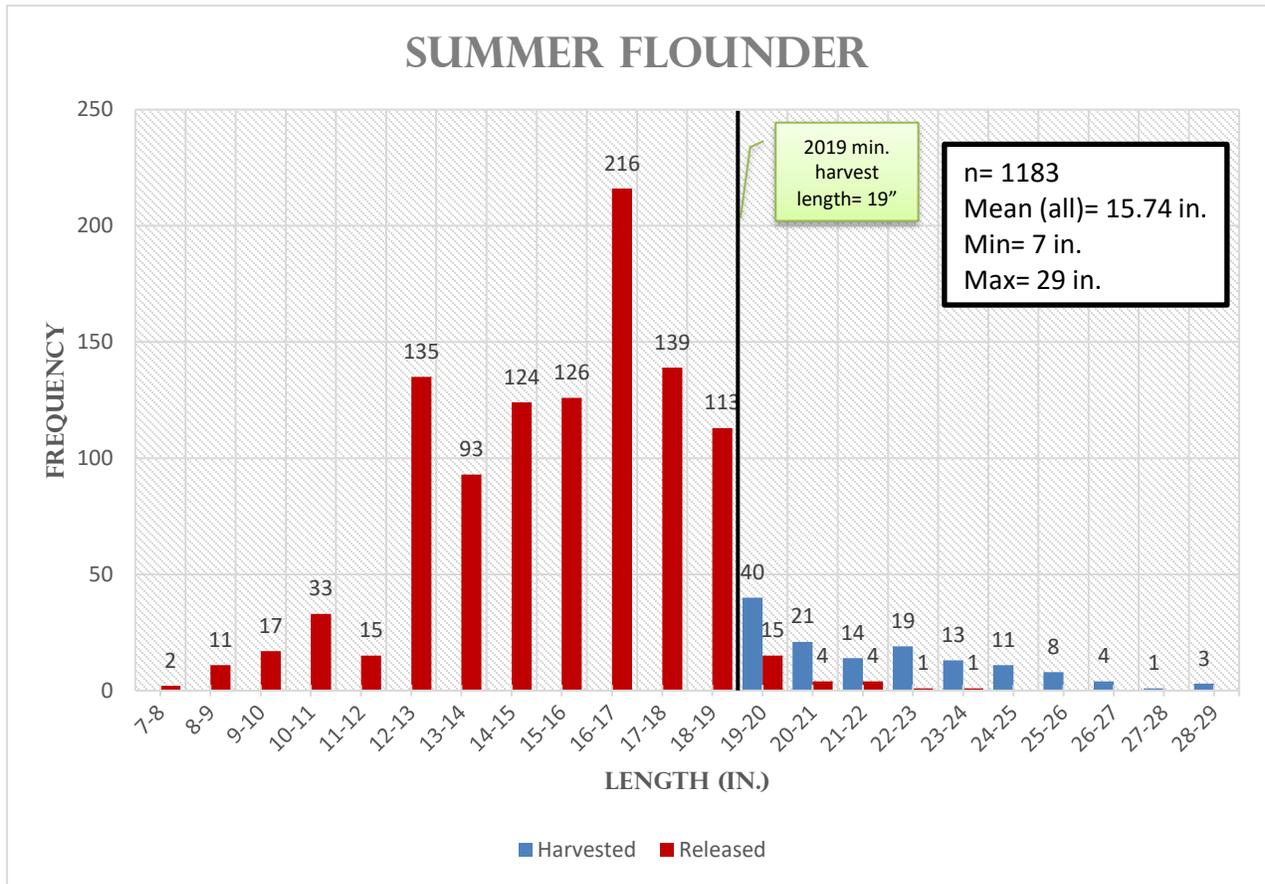


Figure 2.2. Length frequency of Striped Bass caught by disposition.

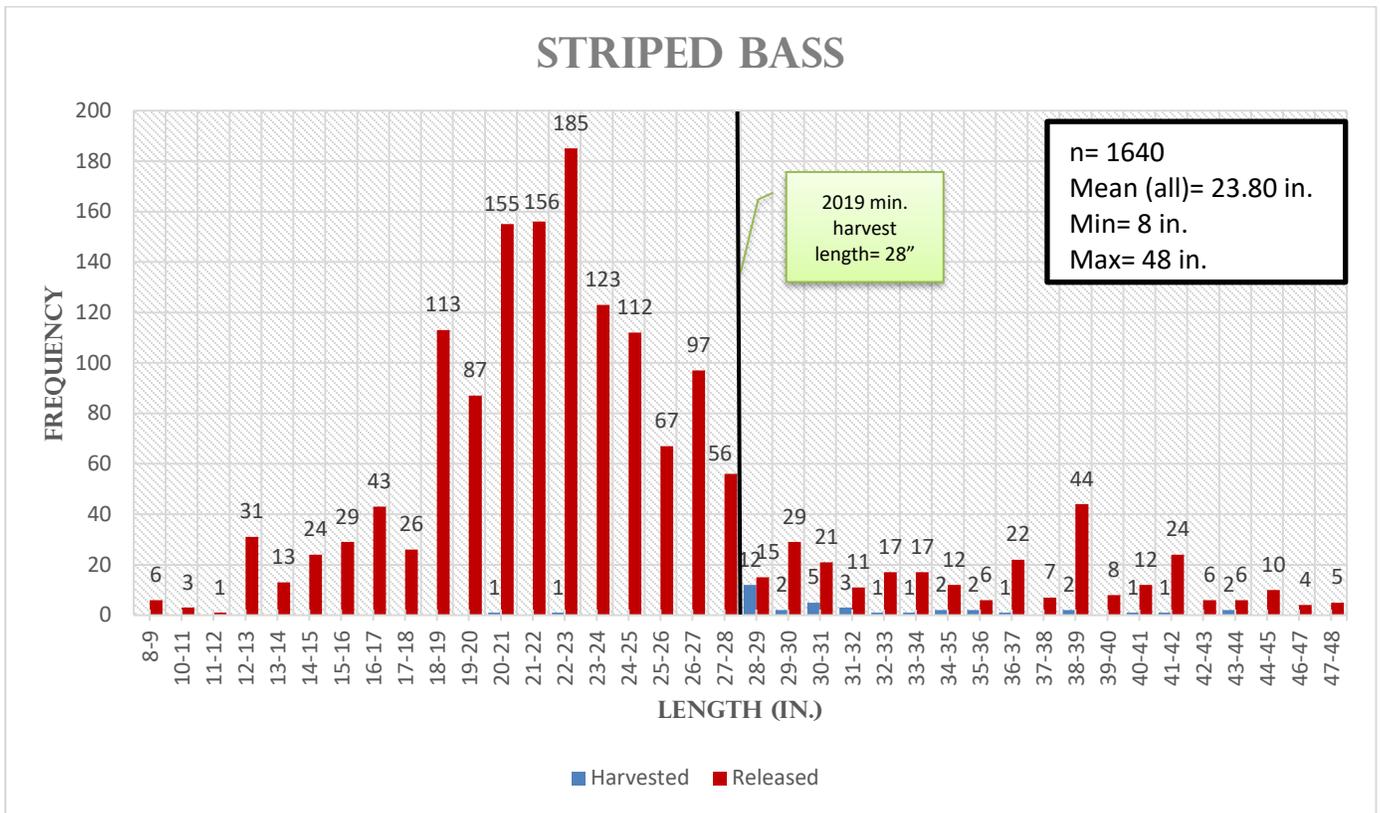


Figure 2.3 Length Frequency of Bluefish caught by disposition.

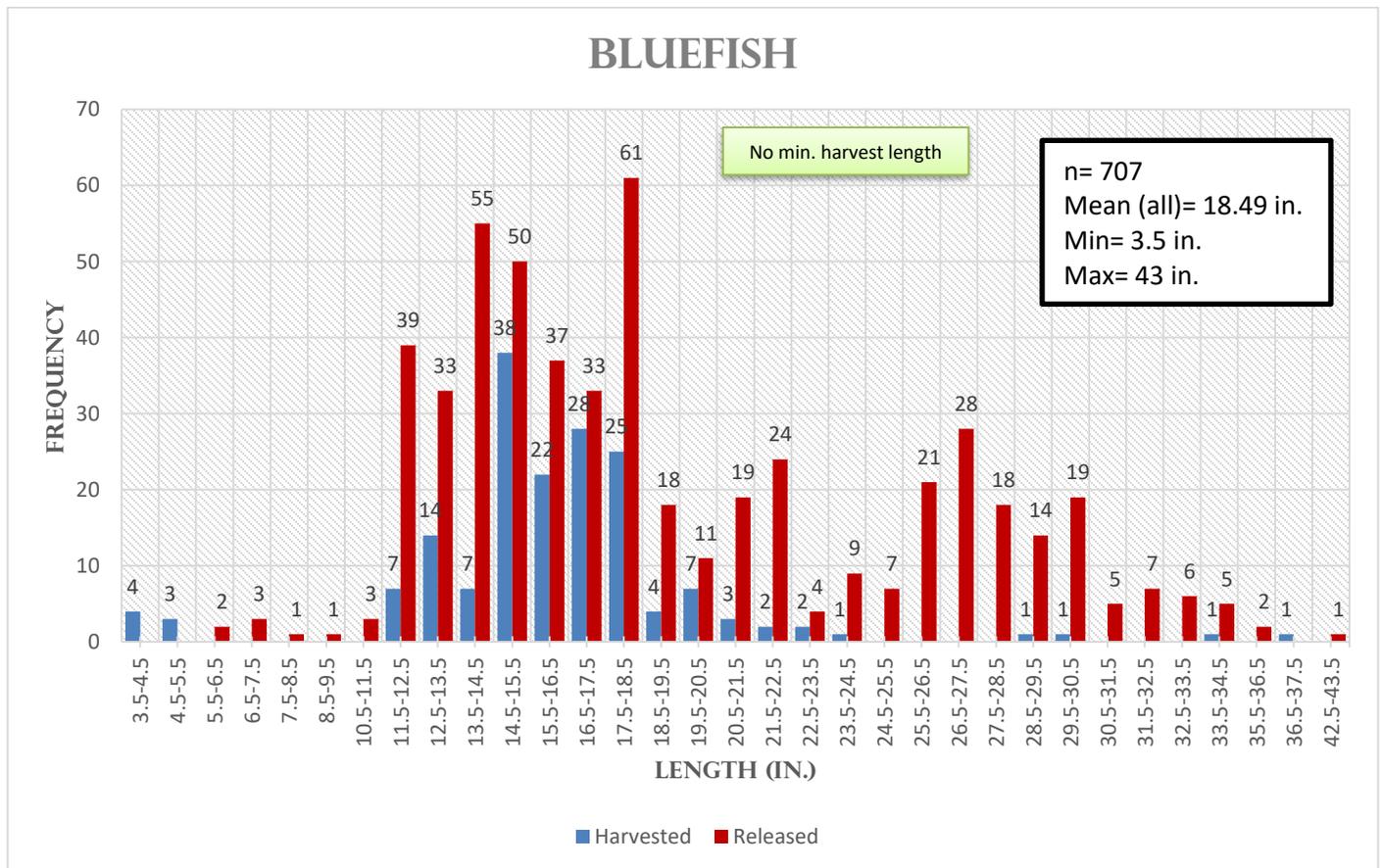


Figure 2.4 Length Frequency of Black Sea Bass caught by disposition.

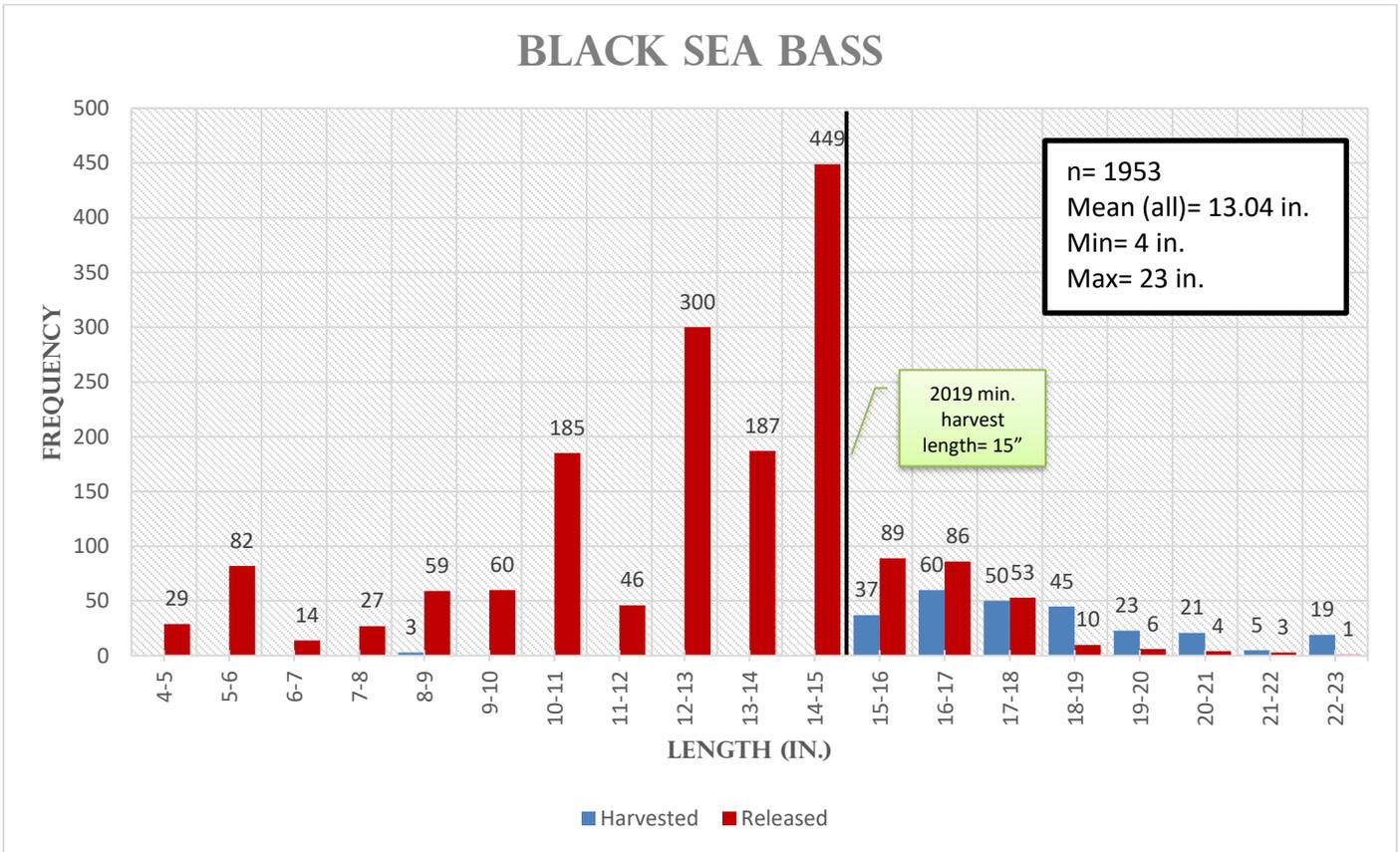


Figure 2.5 Length Frequency of Scup caught by disposition.

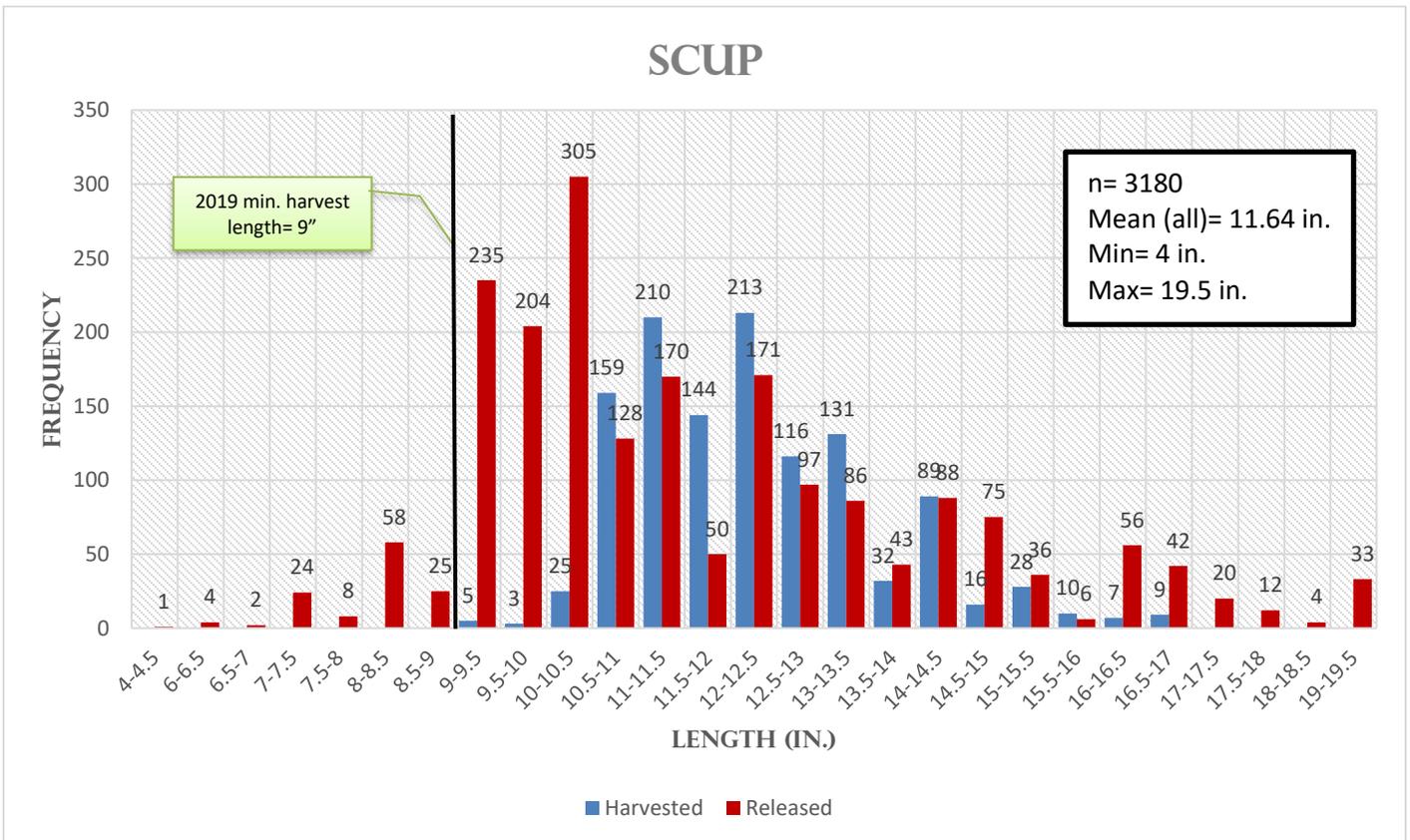
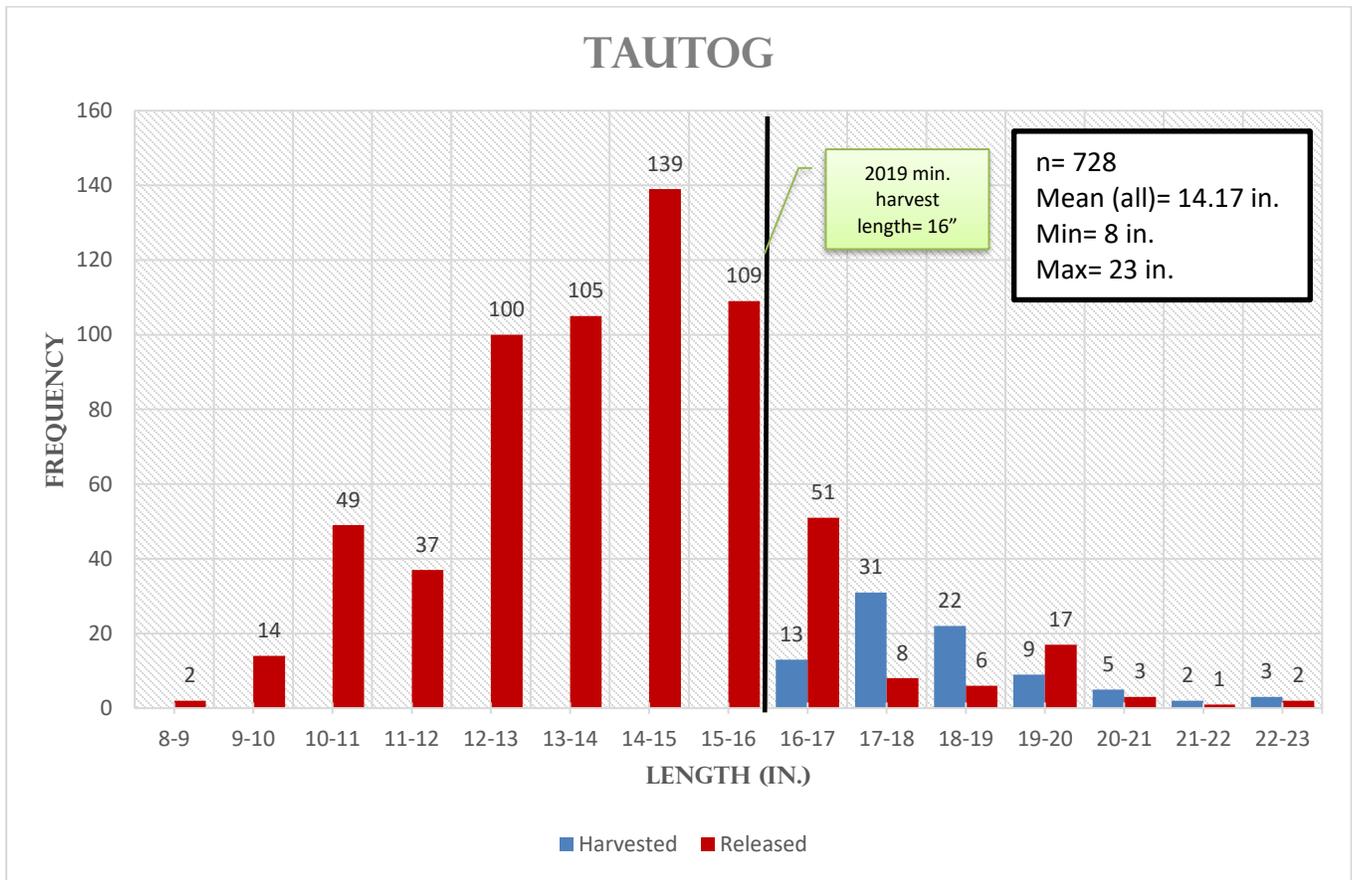


Figure 2.6 Length Frequency of Tautog caught by disposition.



APPENDIX 2.1. Connecticut Volunteer Angler Logbook

TAPE

CONNECTICUT MARINE VOLUNTEER ANGLER SURVEY

Rev.4/2017 - 12 Trip

Angler Code

--	--	--	--	--



Logged	_____
Entered	_____
Checked	_____

This space for office use only.

TAPE

Send Me More Logbooks



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

TAPE

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 make critical important 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

David R Molnar david.molnar@ct.gov or at 860 447-4334

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 appropriate 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 1 st (Primary) targeted species and 2 nd (secondary) targeted species.

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 than rows provide, continue onto the next effort or page as necessary.

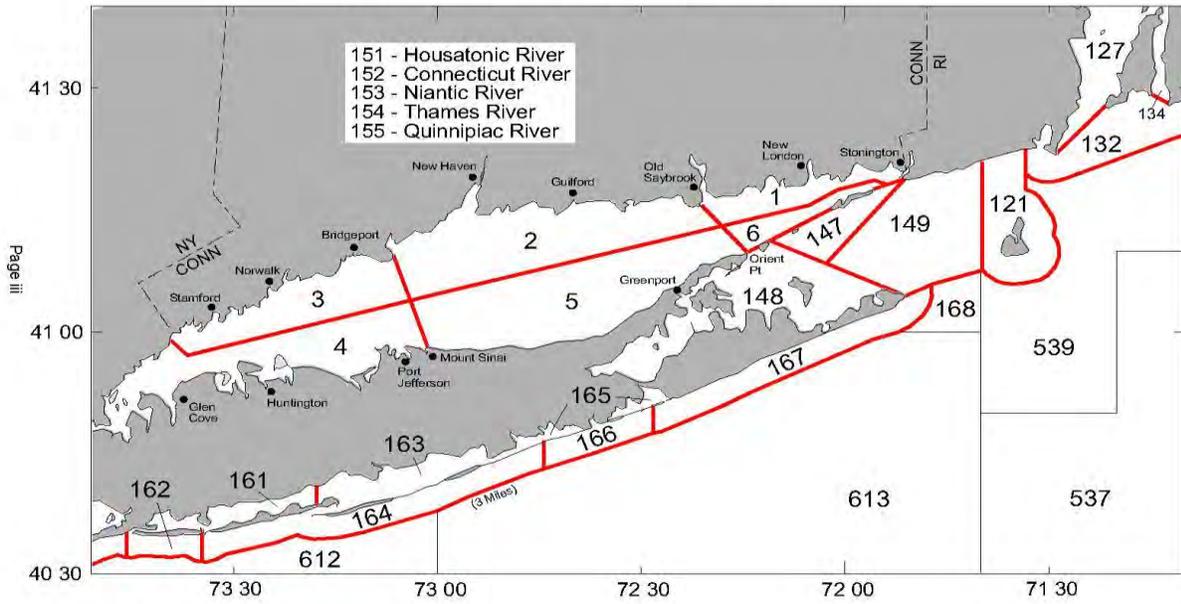
If you do not catch or harvest any fish, complete the trip header and effort information

(Date through 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 writing 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	
<p>Groundfish</p> <p>COD - Cod HADD - Haddock POLL - Pollock</p> <p>Flounders</p> <p>FLUK - Summer flounder / fluke FLBB - Winter flounder / blackback</p> <p>Other Finfish</p> <p>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</p>	<p>Other Finfish continued</p> <p>TAUG - Tautog / blackfish TRIG - Triggerfish WEAK - Weakfish / squeteague / gray sea trout</p> <p>Tuna / Large Pelagics</p> <p>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</p> <p>Sharks and Skates</p> <p>DGSP - Dogfish, spiny DGSM - Dogfish, smooth SKAT - Skate SHBL - Shark, blue</p>

Long Island Sound and Vicinity Fishing Area Chart



Page III

JOB 3: PUBLIC OUTREACH

JOB 3: PUBLIC OUTREACH

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Job 3: Public Outreach

GOAL

Increase awareness among anglers and the general public of state and federal efforts to enhance, restore and protect marine sportfish populations and habitats.

OBJECTIVES

1. Increase public awareness of research and monitoring activities that support sportfish management, as well as public awareness of how those activities are funded.
2. Administer the Marine Trophy Fish Award Program, an angler achievement program recognizing and rewarding anglers who catch trophy-sized marine fish.

SUMMARY

1. A total of 16,578 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 3.2).
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 five engagements with sportsmen clubs and other recreational environmental clubs was 181 (Table 3.2). 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 tackle shops and various media outlets including the DEEP website (www.ct.gov/deep/fishing).
4. Total attendance at two career day events at East Lyme and Salem Public Schools and the University of New Haven was 195 (Table 3.2). The students were encouraged to become actively involved in fisheries conservation, 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 3.2).

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 3.1) in the outreach plan. This report summarizes F54R outreach activities conducted from March 2019 to February 2020.

Table 3.1:

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 Inland Fisheries Division, and Marine Fisheries Program displays at two statewide fishing/boating/outdoor shows. The NE Fishing & Hunting Show was sponsored by Northeast Expos, Channel 30 and Connecticut Outdoor Recreation Coalition along with the CT Fishing and Outdoor Show. These fishing shows were held in March of 2019 at the Connecticut Convention Center and February, 2020 at the Mohegan Sun Casino. These shows attracted 16,125 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 Program Angler Surveys". F54R activities were highlighted at this show 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 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 CT DEEP Marine Fisheries Trophy Fish Award Program had a successful year in angler participation. Forty Nine marine angler's participated, by submitting 98 marine fisheries trophy fish

award affidavits in this outreach program, catching 18 different species. Forty two adult and seven youth anglers participated in 2019. Summer flounder, black sea bass and tautog were the most common trophy species captured. Seven harvest and four catch & release new state record holders and four trophy fish records were recognized. Marine anglers were presented with a framed Trophy Fish Award Certificate of achievement and trophy fish lapel pin in either bronze, silver or gold color (depending on award type). Another three marine anglers (2 adults (male & female) and 1 youth male were recognized as Angler of the Year for capturing the most and largest marine fish species. For a summary please see: [2019 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 CT DEEP 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. [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 CMTA Boating Show, Trophy Fish Award Program and other activities the Fisheries Division held during 2019. ‘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 hundreds to the public outreach displays at the office. Display topics included all F54R projects. Activities funded under other Federal Aid in Sport Fish Restoration projects were also highlighted; including Connecticut Pumpout Stations and Waste Reception Facilities (V-4), Motorboat Access Renovation and Development (F60D), Motorboat Access Area Operation and Maintenance (F70D), and Habitat Conservation and Enhancement (F61T).

Three articles describing Sport Fish Restoration projects were published in the Department’s Wildlife Magazine. The first summarized the NEW Saltwater Fishing Resource Maps in CT. A second highlighted the Connecticut River, one of CT’s best kept secrets. The third article describes the benefits of selective harvest and how it relates to fisheries management. Some of these articles were based on data gathered in Jobs 1 & 2.

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 195 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 3.2). 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.

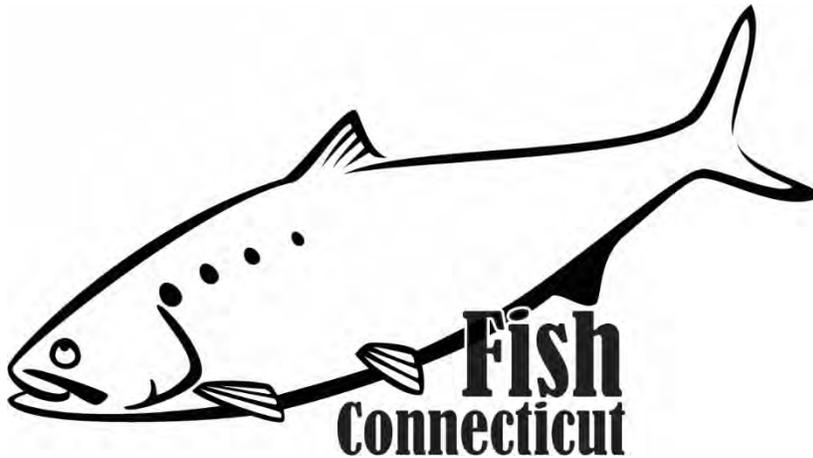


Figure 3.1: CT DEEP Marine Fisheries Program outreach display at the Fishing & Outdoor Expo held at Mohegan Sun, Uncasville, CT.



Figure 3.2: CT DEEP Marine Fisheries Program outreach display at the Fishing & Outdoor Expo held at Mohegan Sun, Uncasville, CT.



Table 3.2: Summary of talks, tours, career days and workshops given by project staff highlighting F54R activities, March 2019 – February 2020.

Date:	Presentation Type	Organization	Title / Topic	Target Audience	Total
3/29 - 03/31/2019	Outreach Display	Northeast Fish and Hunting Expo - CT Convention Center	Marine Fisheries Program	General Public	11,692
3/30/2019	Award Presentation	Northeast Fish and Hunting Expo	Trophy Fish Award Program Ceremony	Marine Anglers	34
4/11/2019	Talk	Fairfield County League of Sportsmen	Marine Fisheries Angler Survey	Marine Anglers	43
4/25/2019	Talk	West Haven Yacht Club	Marine Fisheries Management in Long Island Sound	Marine Anglers	35
4/30/2019	Talk	Milford Striped Bass Club	Marine Fisheries Angler Survey	Marine Anglers	42
5/16/2019	Talk	Stratford Boat Owners Association	Marine Fisheries Angler Survey	Marine Anglers	36
5/17/2019	Classroom	East Lyme and Salem Public Schools	Marine Ecosystems and Species	Students	175
10/10/2019	Talk	CT Surfcasters Association	Marine Fisheries Angler Survey	Marine Anglers	37
10/31/2019	Talk	Department of Ecology & Evolutionary Biology	Career Opportunities in Government	Students	20
1/23/2020	Talk	Sound Anglers Club	CT Marine Fisheries Regulations	Marine Anglers	31
2/14 - 02/16/2020	Outreach Display	Outdoor Expo Mohegan Sun	Marine Fisheries Program	General Public	4,433
				Total	16,578

JOB 4: MARINE FISHERIES GIS

JOB 4: MARINE FISHERIES GIS

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JOB 4: 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 Program (MFP) surveys that support sport fish restoration goals, help people visualize the spatial extent of MFP 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 Program.*
- 2) Provide maps and geospatial analyses of Marine Fisheries Program 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 most recent year of the Job (2018).

METHODS

GIS work was accomplished using ESRI products licensed by the Connecticut DEEP including ArcMap desktop and ArcGIS Online. Published products comply with Department policy pertaining to GIS data. Script development used 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 continued to be used as templates in subsequent years.

RESULTS

The majority of effort during this project segment revolved around four main areas of GIS work: (1) completing the update to the Popular Places to Fish (PP2F) layer for inclusion in both CT DEEP's online Saltwater Fishing Resource Maps and the CT DEEP's online LIS Blue Plan spatial data portal; (2) completing the documentation for spatial data layers of fish and invertebrate abundance and distribution from LIS Trawl Survey for inclusion in the LIS Blue Plan's Ecological Experts Group analysis of ecologically significant areas; (3) developing a new public data viewer for Recreational Species abundance and distribution in Long Island Sound based on data from the LIS Trawl Survey and (4) developing a stand-alone project for the web describing an analysis of land cover change along specific sections of the Connecticut River and how this relates to the natural history of American shad.

Recreational Fishing – A multi-year effort to update the layer of popular recreational fishing areas in CT DEEP’s online [Saltwater Fishing Resource Maps](#) using the Popular Places to Fish app for collecting new information (developed by project staff during previous project segments), was completed during this project segment. The improvement in spatial coverage is clear to see by comparing the amount of pinks shaded areas (in the water) in Figures 1 and 2.

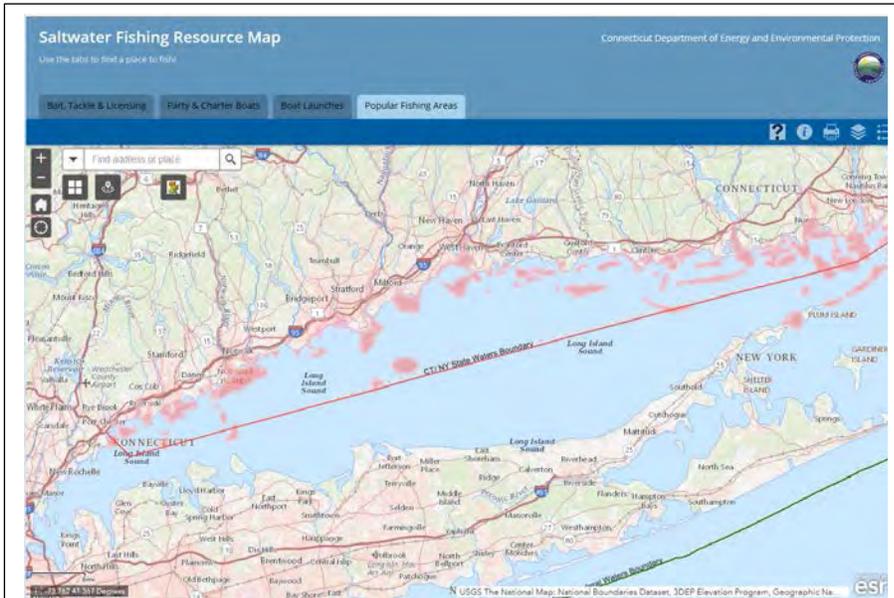


Figure 4.1: Old Popular Fishing Areas layer from CT DEEP Saltwater Fishing Resource Map – before new angler information was provided. Note the apparent lack of fishing areas (pink polygons in the water) in the far western and southern portions of the Sound.

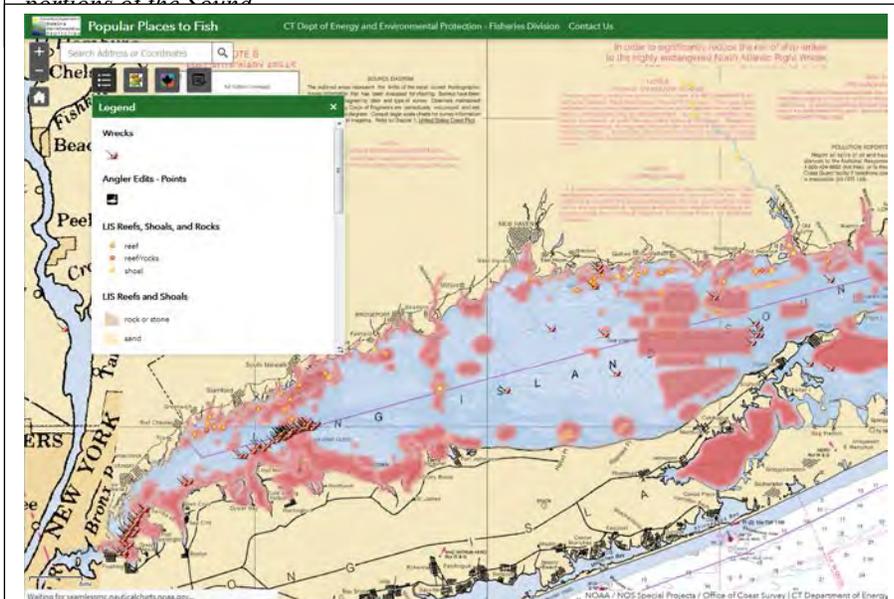


Figure 4.2: Popular Places to Fish app showing new Popular Fishing Areas layer provided to the LIS Blue Plan data viewer. Note how many more fishing areas (pink polygons in the water) have been identified, particularly in the far western and southern portions of the Sound.

An earlier version of Popular Fishing Areas (Figure 1), shows the layer as it existed prior to 2019 - *before new angler information was provided*. Note that the far western and southern portions of LIS had no fishing areas identified. We knew this was from a lack of information – not a lack of fishing areas – which is why we started to recruit anglers who would be willing to share their knowledge of fishing areas with us to improve the map layer.

Our efforts to recruit anglers were given a significant boost over the past year by the LIS Blue Plan effort to map all significant natural resources and human uses in the Sound. Through the outreach efforts of The Nature Conservancy staff and CT Blue Plan Team members, more avid anglers were recruited to help us more accurately map out areas important for recreational fishing in Long Island Sound and immediate vicinity.

The updated layer of popular recreational fishing areas is now included in the [Saltwater Fishing Resource Maps](#) and [LIS Blue Plan data viewer](#), where it can be used to assist resource managers assess potential impacts to recreational fishing resources or angling opportunities when new projects are proposed in Long Island Sound.

Living Marine Resources – Project staff completed another multi-year effort related to the LIS Blue Plan data viewer during this segment: providing abundance and distribution data for the living marine resources in the sound collected from the Long Island Sound Trawl Survey (LISTS, Job 5). See previous year’s report (Pacileo and Roberts 2019) for additional detail on the processes used to generate over 100 GIS layers based on the LIS Trawl Survey for pelagic finfish, demersal finfish and macroinvertebrates. For more information on the LIS Blue Plan, please see CT DEEP’s [Long Island Sound Blue Plan](#) website.

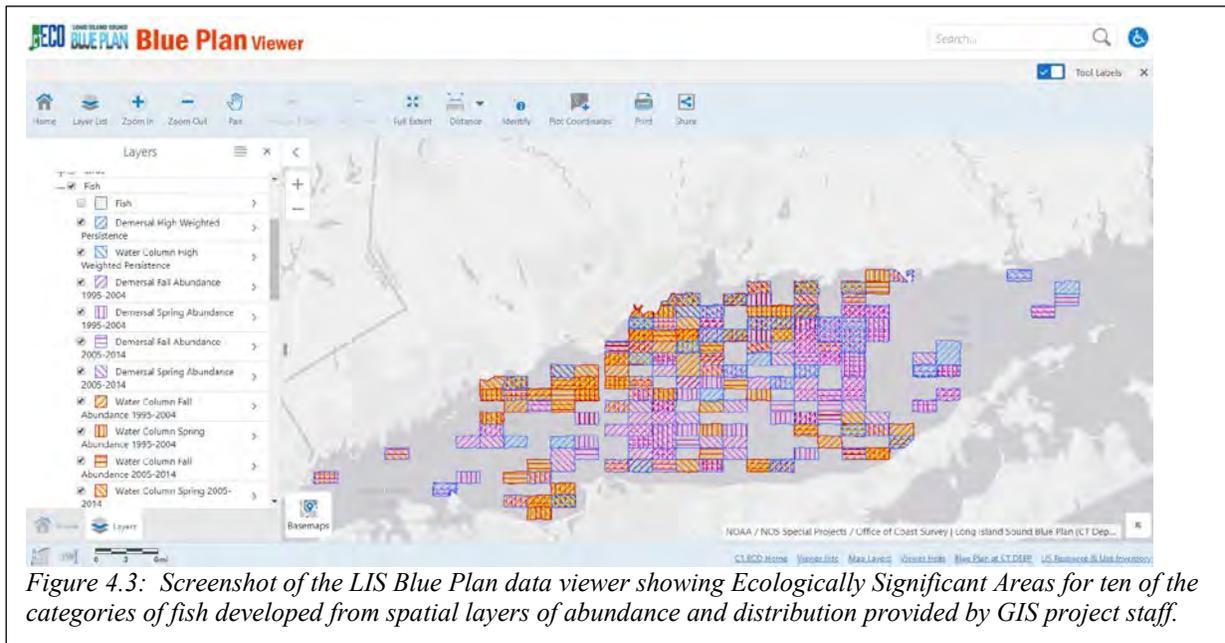


Figure 4.3: Screenshot of the LIS Blue Plan data viewer showing Ecologically Significant Areas for ten of the categories of fish developed from spatial layers of abundance and distribution provided by GIS project staff.



Figure 4.4: Screenshot of the LIS Blue Plan data viewer showing Ecologically Significant Areas for twelve of the categories of invertebrates developed from spatial layers of abundance and distribution provided by GIS project staff.

A new map viewer showing fish distribution and abundance for eleven (11) of the most popular recreational species monitored by the Long Island Sound Trawl Survey since 1984 is currently being developed. The viewer will display site summary data by season (spring or fall) and year (1984-2018). Users will have the ability to isolate data for any individual year or use a “time slider” to play an animation to view the change in distribution for the entire 34-year time-series of the Trawl Survey. The *Recreational Species Viewer* passed internal review from Marine Fisheries Program staff with very positive feedback and is currently being reviewed by the Agency’s webmaster prior to public release on an Agency website.

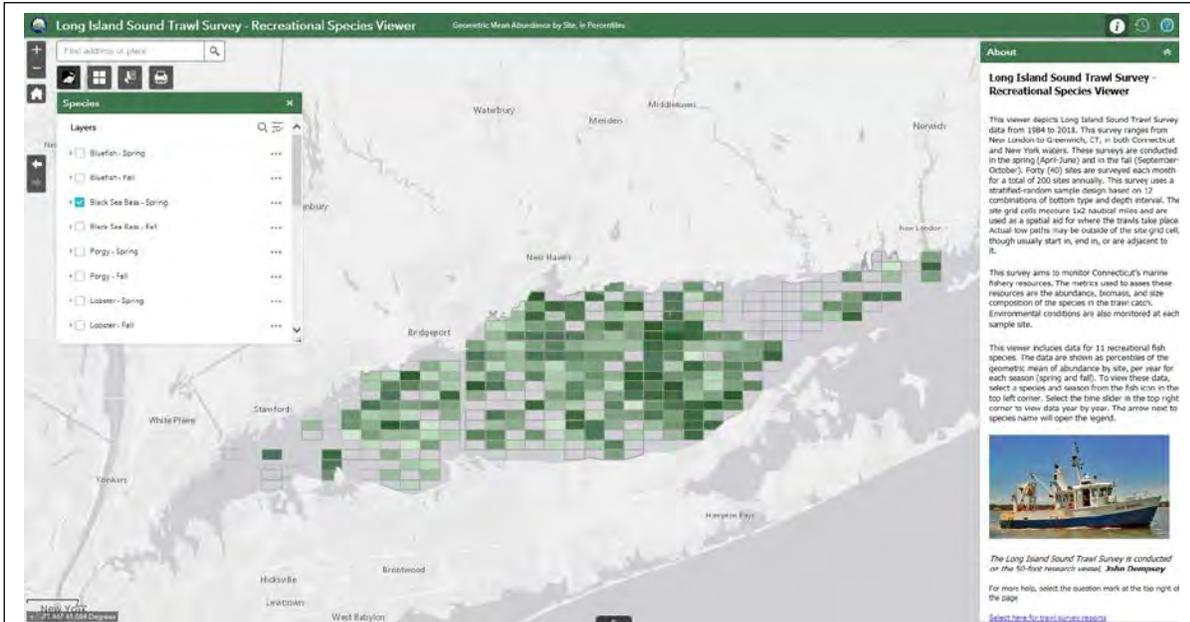


Figure 4.5: Screenshot from the Long Island Sound Trawl Survey – Recreational Species Viewer (under development) showing a composite of black sea bass spring distribution and abundance, 1984-2018.

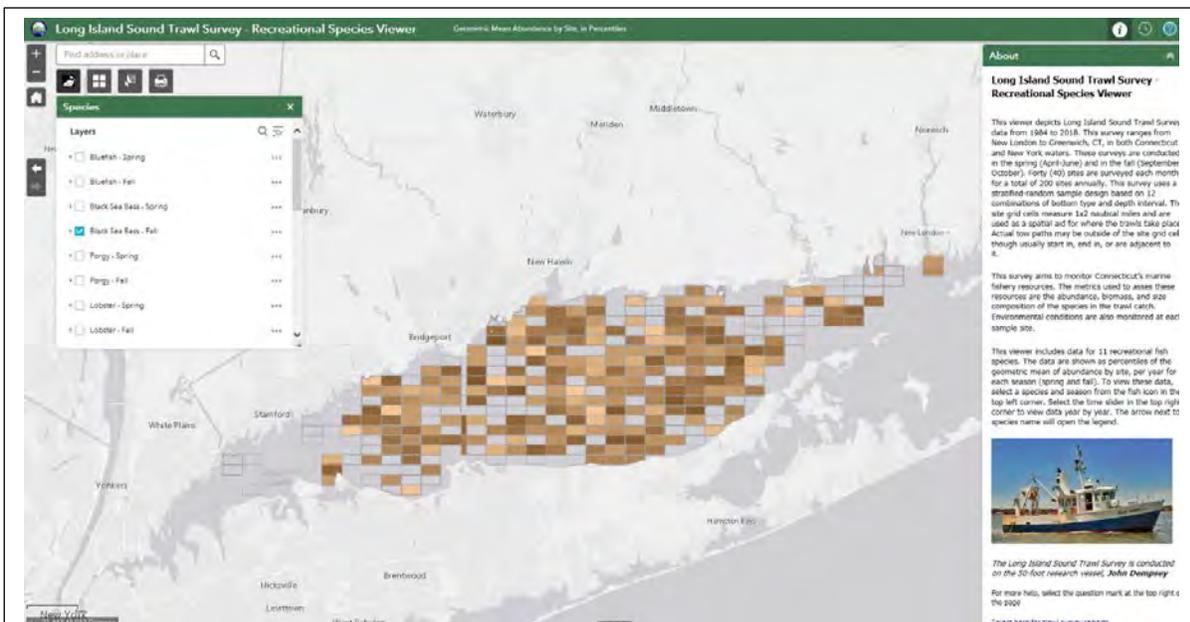


Figure 4.6: Screenshot from the Long Island Sound Trawl Survey – Recreational Species Viewer (under development) showing a composite of black sea bass fall distribution and abundance, 1984-2018.

Support for other Jobs in the Project – An ESRI StoryMap was created in collaboration with staff on the Alosine Survey (Job 7) as a stand-alone project for the web describing an analysis in GIS of land cover change along specific sections of the Connecticut River and the natural history of American shad. The “[American Shad & Land Cover on the Connecticut River, 1965-2016](#)” StoryMap features numerous scenic and historical images of the Connecticut River along with aspects of American shad fisheries and research. In addition, an analysis of land cover change in specific areas along the river adjacent to the Alosine Survey seine sites in Connecticut is presented to show how changes in land cover classifications might be related to trends in American shad abundance over a 50-year time-period.



Figure 4.7: Images from Shad StoryMap showing aerial imagery from 1965 on left and 2016 on right in the vicinity of the Deep River seine site.

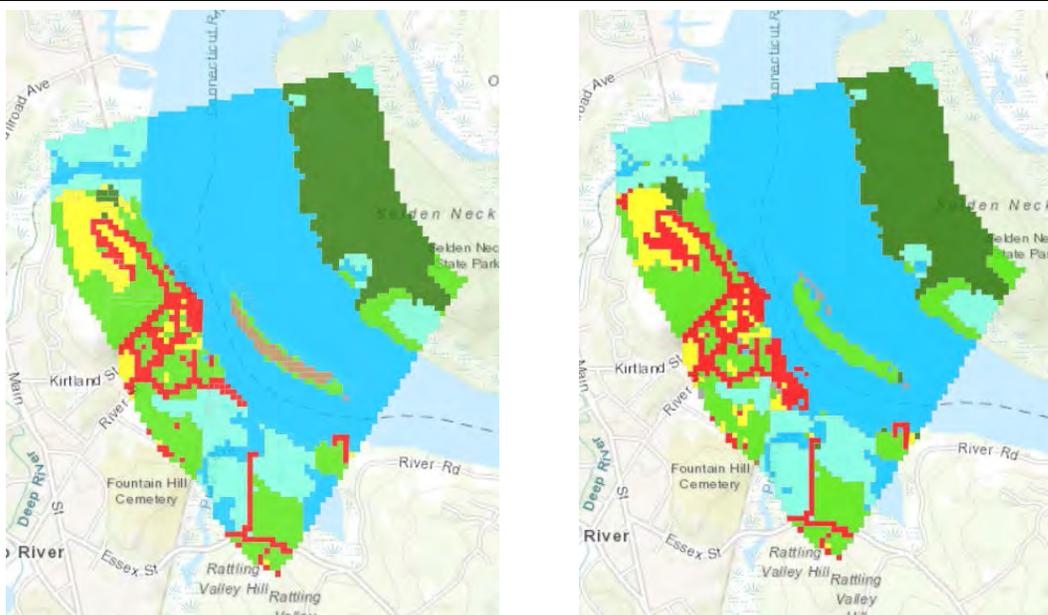


Figure 4.8: Images from the Shad StoryMap showing GIS layers of land cover classifications from 1965 on left and 2016 on right in the vicinity of the Deep River seine site.

MODIFICATIONS

None.

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Pacileo, D. and J. Roberts. 2019. Marine Fisheries GIS, Job 12. In: A Study of Marine Recreational Fisheries in Connecticut. Annual Progress Report, CT DEEP Fisheries Division, old Lyme, CT.

JOB 5: MARINE FINFISH SURVEY
LONG ISLAND SOUND TRAWL SURVEY

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JOB 5: LONG ISLAND SOUND TRAWL SURVEY (LISTS)

CRUISE RESULTS FROM THE 2019 SPRING AND FALL SURVEYS

STUDY PERIOD AND AREA

The Connecticut DEEP Marine Fisheries Program completed the thirty-sixth year of the Long Island Sound Trawl Survey in 2019. The Long Island Sound Trawl Survey (LISTS) 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 (LIS) is surveyed in the spring, from April through June, and during the fall, from September through October. This report includes results from the 2019 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

- 1) Provide 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) Provide length-frequency distributions of bluefish, scup, summer flounder, winter flounder, tautog, striped bass, weakfish, black sea bass, and other ecologically important species.
- 3) Provide annual total counts and biomass for all finfish species taken and annual total biomass for all common macro-invertebrate species taken.
- 4) Provide species list for LIS based on LISTS sampling, noting the presence of additional species from other sampling conducted by the Marine Fisheries Programs.
- 5) Provide fishery independent survey data to cooperative state researchers or agencies, such as the National Marine Fisheries Service (NMFS), Atlantic States Marine Fisheries Commission (ASMFC), New England and Mid-Atlantic Fishery Management Councils (NEFMC and MAFMC, respectively), 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 (LIS). A stratified-random design based on bottom type and depth interval was chosen and 40 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. Beginning in 2014, lengths were collected from all finfish species on each tow. In addition, at various times during the time-series, age structures were collected from bluefish, menhaden, tautog, scup, winter flounder, weakfish or summer flounder. 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 fishery resources.

METHODS

Sampling Design

LISTS is conducted from longitude 72° 03' (New London, Connecticut) to longitude 73° 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 mesh 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 km² (20 square nautical miles), with a minimum of two sites sampled per stratum (Table 5.2, Gottschall et al. 2000). Discrete stratum areas smaller than a sample site are not sampled.

Sampling Procedures

Prior to each tow, temperature (°C) and salinity (ppt), conductivity (mS/m) and dissolved oxygen (mg/l) were measured using an YSI model EXO2 data sonde. 2017 was the first year the EXO2 sonde was used by LISTS, previously a hand-held YSI meter was used. The sonde records numerous water quality parameters while descending from surface to bottom and values are subsequently extracted at the depths most closely matching the 1m below surface and 0.5m above bottom depths used previously in the LISTS timeseries.

The survey's otter trawl was 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 was placed onto a sorting table and sorted by species. Finfish, lobsters and squid were 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 were 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 all species where length was collected, electronic measuring boards were used to capture lengths to the millimeter. For finfish, either fork or total length was collected. Lobsters were measured to 0.1 mm carapace length. Squid were measured using the mantle length (mm), horseshoe crab measurements were taken using prosomal width (mm) and whelk (knobbed and channeled) shell widths were measured in millimeters. For analysis purposes, the lengths were put into centimeter grouped bins (e.g. measurements from 100 mm to 109 mm were processed as 10 cm).

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

Bluefish, menhaden, scup, summer flounder, tautog and winter flounder were 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). However, bluefish catches are hard to predict so the number of age samples varied greatly; sometimes more than the target number was collected solely from LISTS samples but other times LISTS samples needed to be augmented with samples from the recreational fishery to meet the target number. Sufficient numbers of bluefish age samples from LIS would also make it possible to develop an LIS-specific age key, so bluefish age samples

were sometimes still collected even after the target number was reached. Subsamples of scup, stratified by length group, were measured to the nearest mm (fork length) and scales from each individual were taken for ageing. Scup scales were removed posterior to the pectoral fin and ventral to the lateral line. The scales were pressed onto plastic laminate with an Ann Arbor roller press to obtain an impression of the scale, which was then viewed with a microfiche reader at 21x. Scales were also taken from all summer flounder greater than 59 cm. At least 15 scales were removed from the caudal peduncle area. These scales were pressed and aged to supplement the NMFS age key and were also included in the formulation of LISTS summer flounder catch-at-age matrix (see below). Subsamples of winter flounder, stratified by length group and area (as listed in bottom of Table 5.3), were iced and taken to the lab where they were measured to the millimeter (total length), weighed (gm) and sexed. Their maturity stage was determined (NMFS 1989), and otoliths were collected for age determination later. Amendment 2 of the ASMFC Atlantic menhaden Fishery Management Plan introduced a requirement of 10 fish for age samples per 300 metric tons landed in the commercial bait fishery to support improved stock assessments. Connecticut has such a small menhaden commercial fishery that one 10-fish sample would suffice. The same size/age component of the menhaden population taken in the commercial fishery was available to LISTS so menhaden scales were collected during LISTS sampling; 167 menhaden age samples were taken in 2019. LISTS age samples of menhaden provide one of the few fishery independent sources of age data for adult menhaden in northern waters and are therefore valuable for stock assessments. Menhaden fork length (mm), and sex were recorded and scales were taken about mid-body (lateral line) and below the insertion of the dorsal fin. The ASMFC Tautog Fishery Management Plan (FMP) requires CT DEEP to collect a minimum of 200 age structures per year. Due to the low numbers of tautog caught in LISTS in recent years (less than 250 fish), age structures were collected from most tautog taken in LISTS. Tautog were iced and taken to the lab, where their total length (mm), sex, and total weight (gm) were recorded and age structures were collected. LISTS has used opercula to age tautog since 1984 (Cooper 1967). The ASMFC Tautog Technical Committee requested that states collect paired age structures for comparison studies; therefore, LISTS began collecting tautog otoliths in addition to opercula in 2012. Results from an ASMFC Tautog Ageing Workshop in May 2012 indicated there was no clear benefit to switching from opercula to otoliths for Connecticut, so otoliths were collected (minimum of 50 paired structures per ASMFC) and archived for potential use in the future. Subsequent to the 2012 workshop, a study conducted by Massachusetts Division of Marine Fisheries showed pelvic fin spine sections may be a better structure (easier to read and non-lethal to collect) for ageing tautog (Elzey and Trull 2016). In 2016, LISTS started to collect tautog pelvic fin spines, archiving them for future ageing work.

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 young-of-year listed if present in the year's catch but are not quantified (Table 5.13, 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).

Although endangered species research and monitoring work is not eligible for Sport Fish Restoration funding, there is the possibility of encountering protected species during the course of conducting the work authorized by this funding for eligible species. Aside from the handling and processing of incidental catches of protected species mandated by the NOAA Greater Atlantic Regional Fisheries Office (GARFO) Protected Species Division, no additional project resources are used on protected species work. Sampling procedures have been modified in recent years to minimize the likelihood of injury to Atlantic Sturgeon (a Federally listed endangered species since 2012). 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 27 m, gear retrieval speed is reduced to decrease the stress induced by rapid changes in pressure. When an endangered species is detected in the net, it is removed as quickly and carefully as possible. Subsequent handling and processing of endangered species adhere to the Reasonable and Prudent Measures as well as the Terms and Conditions specified in the ESA Section 7 Biological Opinion's Incidental Take Statement issued by NOAA for CT in January 2013 (http://www.greateratlantic.fisheries.noaa.gov/protected/section7/bo/actbiops/usfws_state_fisheries_surveys_2013.pdf). Additionally, handling and processing of sturgeon 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). Nine (9) Atlantic Sturgeon were captured on seven (7) of the 200 tows completed in 2019. No other protected species were encountered. 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) was calculated for the common finfish and invertebrate species. To calculate the geometric mean, the numbers and weight per tow were logged (\log_e) to normalize the highly skewed catch frequencies typical of trawl surveys:

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

Means were 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 - 2019 for 38 finfish species, lobster, and long-finned squid (1986 - 2019). 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 in the time-series (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 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 and bluefish was derived using both ASMFC provided coastal keys for earlier years and LISTS keys since 2013. 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 had been converted to age, the proportion at age was 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 weakfish by using observed modes in the LISTS length frequencies to separate the two groups. Prior to 2019, a recruitment index was similarly calculated for bluefish using modal length groups, however, the ASMFC bluefish Technical Committee has accepted and has used LISTS full index-at-age for assessment purposes since 2013. The bluefish index-at-age methodology is now presented and described below.

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

- ◆ **Bluefish.** In 2012 a coast wide biological sampling program was initiated through ASMFC Addendum 1 of the bluefish management plan. This sampling program was initiated to address the lack of bluefish samples being collected by coastal states for use in the bluefish assessment. This was particularly a problem for the Northern States where few ages were available and contributing to the coastal key. Connecticut collected and aged bluefish samples in 1984, however few samples were collected annually after the initial Survey year. Since robust age-length keys were not available for the Long Island Sound region, until 2013, bluefish age keys for 1985-2012 were provided by the ASMFC Bluefish Technical Committee as combined coastwide annual keys for use to calculate indices-at-age for those earlier years. Currently the 1984 and the 2013-2019 index-at-age uses annual fall (Sept-Oct) age keys generated by CT LISTS ageing program. In 1984, 294 samples (scales) were aged and contributed to the key, along with 1,476 samples (otoliths) from the 2013-2019 period. In 2019, age samples were taken from 140 bluefish; one (1) from the spring period and 139 from the fall period.
- ◆ **Scup.** Scales from 627 scup were collected in 2019; 350 from the spring cruise and 277 from the fall cruise. Ageing is not yet complete for 2019. An index-at-age matrix was developed for 1984-2019 using spring (May-June only) and fall (September-October) LISTS data (Table 5.1). April data was omitted since very few scup are taken during the month. A total of 15,852 scup aged between 1984 and 2018 were used to make year and season specific age-length keys (1 cm intervals). For 2019, a pooled three year key using

2016, 2017 and 2018 ages were used to calculate a preliminary 2019 index-at-age. Results will be updated when the 2019 ages are available. Prior to 2019, 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. Indices-at-age were computed for both spring and fall each year. Since very few scup older than age 9 are taken (less than 4% in any given year), an age 10+ group was calculated by summing indices for ages 10 and up. To represent the full adult portion of the population an age 2+ index was 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 5.22), the average of the Chesapeake Bay and Hudson River striped bass von Bertalanffy parameters ($L_{\max} = 49.9$ in, $K = 0.13$, $t_0 = 0.16$, Vic Crecco, pers. comm.) were used in the rearranged von Bertalanffy equation:

$$t = (1/K) * (-\log_e ((L_{\max} - L_t) / L_{\max})) + t_0$$

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 2019 by apportioning the spring index by the percentage of fish at each age (Table 5.23).

- ◆ **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). LISTS also provides the age data from these fish (> 60cm) to NMFS. Only summer flounder greater than or equal to 60cm were sampled for age structures during the Spring 2017 LISTS cruise. Since the 2017 fall cruise, however, LISTS has also collected representative scale samples from smaller fluke to ensure a robust age-key once it became known that there would be no samples from NMFS for the fall 2017 period. The age-key was constructed using both LISTS and NMFS age data. In 2019, 576 summer flounder were aged: 419 from the spring (14 – 73 cm) and 157 from the fall (25 – 70 cm). 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).
- ◆ **Tautog.** An index-at-age matrix was developed for 1984-2015 (Table 5.25). Annual keys were calculated by combining all months in a particular year since so few tautog are captured by LISTS. Preliminary aging from 2016 (n=276), 2017 (n=75), 2018 (n=201) and 2019 (n=274) has been completed but not validated. The index-at-age matrix will be updated upon completion of the validation and QA/QC.
- ◆ **Weakfish.** Age 0 and age 1+ indices were calculated for both spring (1984 – 2019) and fall surveys (1984 – 2009, 2011 - 2019) (Table 5.26). 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+.

- ◆ **Winter flounder.** An index-at-age matrix was developed for 1984-2019 using April and May LISTS data (Table 5.27). 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 24,831 winter flounder aged between 1984 and 2019 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 by sex following Burnett (1989). 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 15⁰C (60⁰F), tend to spawn at the lower end of their temperature tolerance range, and are more abundant north of Long Island Sound than south of New York. Species in the warm temperate group prefer warmer temperatures (11-22⁰C or 50-77⁰F), 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 or 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 scup, bluefish, and weakfish (Figure

5.16). 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 2019 Spring and Fall Surveys

As noted in previous reports, the LISTS database of counts, weights and lengths were all collected electronically. This marks the second year in row in which the system was successfully used to capture all records electronically. Paper records were only used for ancillary notes (also known as metadata) and as a backup. See Job 6 in this report for details on the LISTS transition to electronic data acquisition.

April sampling started on April 10 and continued until May 1, completing 40 sites in nine (9) days underway. May sampling started on May 10 and continued until May 23, completing 40 sites in ten (10) days underway. June sampling began on June 4 and ended on June 24, taking ten (10) days underway to complete the 40 sites. The September Survey commenced on September 5 and concluded on September 26, completing 40 tows in twelve (12) days underway, not including six (6) days lost to inclement weather. The October Survey commenced on October 8 and concluded on October 30, completing 40 tows in ten (10) days underway, not including six (6) days lost to inclement weather. In total, 200 LISTS sites were completed in 51 days underway during the spring and fall 2019 surveys (Table 5.4), not including transit or changeover 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 sample, time, tow duration, latitude/longitude, average tow speed, distance towed and approximate area swept for each tow. Surface, bottom temperature and salinity data were collected but not available at the time of this report.

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 of tow time 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 survey is summarized in Table 5.10.

Cooperative Sample and Data Collection

As resources permit, LISTS staff participate 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 such as the National Marine Fisheries Service (NMFS), Atlantic States Marine Fisheries Commission (ASMFC), New England and Mid-Atlantic Councils (Councils), and researchers or graduate students associated with state or local universities. In recent years, many requests for samples have also come from high schools, aquariums, or other educational organizations needing finfish and invertebrates for teaching purposes. Additionally, Fisheries Division staff often have sample or data requests for media or other public outreach events (see Job 11 of this report). In 2019, a significant amount of project staff time went toward fulfilling large data requests for NMFS, ASMFC, and the Councils. Samples were provided to NY Department of Environmental Conservation, NMFS, CT Health Department, University of Connecticut, Audubon and New England Science and Sailing.

Number of Species Identified

LISTS observed 56 finfish species in 2019 (Table 5.11). One new vertebrate species was encountered during the 2019 surveys, smooth puffer (*Lagocephalus Laevigatus*). From 1984 to 2019, LISTS has identified 112 finfish species (Appendix 5.1), averaging 57 species per year with a range of 43 to 70 species (Figure 5.7). In addition, a total of 41 types of invertebrates were collected in 2019 (Table 5.12). 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 (1984-2019) of the finfish species collected each year and their respective rank by numbers. Annual total biomass of invertebrates is also included in this appendix (1992-2019), ranked by weight (kg). A total of 133,439 finfish weighing 22,184.7 kg were sampled in 2019 (Table 5.13). In the spring of 2019, a total of 58,277 finfish weighing 14,803.0 kg were sampled and a total of 75,164 finfish weighing 7,381.7 kg were sampled in fall of 2019 (Table 5.14). A total of 1,176.2 kg of invertebrates were taken in 2019 (Table 5.13). The total biomass of invertebrate catch taken in the spring of 2019 was 569.5 kg while a total of 606.7 kg of invertebrates were taken in fall (Table 5.15).

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 black sea bass (Table 5.37-5.38), scup (Table 5.51-5.52), and summer flounder (Table 5.55-5.56).

Length frequencies were prepared for 22 species:

alewife	spring and fall	1989 - 2019	Table 5.28;
American shad	spring and fall	1989 - 2019	Table 5.29;
American lobster	spring and fall (M&F)	1984 - 2019	Table 5.30-Table 5.34;
Atlantic herring	spring and fall	1989 - 2019	Table 5.35;
Atlantic menhaden	spring and fall	1996 – 2019	Table 5.36;
black sea bass	spring and fall	1987 – 2019	Table 5.37, Table 5.38
blueback herring	spring and fall	1989 - 2019	Table 5.39;
bluefish	spring and fall	1984 - 2019	Table 5.40, Table 5.41;
butterfish	spring and fall	1986 - 1990, 1992 - 2019	Table 5.42;
clearnose skate	spring and fall	1993 - 2019	Table 5.43, Table 5.44;
fourspot flounder	spring and fall	1989 - 1990, 1996 - 2019	Table 5.45;
hickory shad	spring and fall	1991 - 2019	Table 5.46;
horseshoe crab	spring and fall (M&F)	1998 - 2019	Table 5.47, Table 5.48;
long-finned squid	spring and fall	1986 - 1990, 1992 - 2019	Table 5.49, Table 5.50;
scup	spring and fall	1984 - 2019	Table 5.51, Table 5.52;
striped bass	spring and fall	1984 - 2019	Table 5.53, Table 5.54;
summer flounder	spring and fall	1984 - 2019	Table 5.55, Table 5.56;
tautog	spring and fall	1984 - 2019	Table 5.57, Table 5.58;
weakfish	spring and fall	1984 - 2019	Table 5.59, Table 5.60;
windowpane flounder	spring and fall	1989, 1990, 1994 - 2019	Table 5.61, Table 5.62;
winter flounder	April-May and fall	1984 - 2019	Table 5.63, Table 5.64;
winter skate	spring and fall	1995 - 2019	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

Relative indices of abundance, or the geometric mean counts per tow, were calculated from 1984-2019 for 38 finfish species plus lobster and long-finned squid (squid since 1986). All spring (April-June) and fall (September-October) data were used to compute the abundance indices presented in Tables 5.16 (spring) and 5.17 (fall), with the preferred seasonal index (for counts) denoted by an asterisk. Geometric mean biomass-per-tow indices have been calculated for 38 finfish and 15 invertebrate species (or species groups) since 1992, for both spring and fall (Table 5.18 and 5.19, respectively). Age specific indices of abundance were calculated for selected important recreational species, including scup, striped bass, summer flounder, and winter flounder (see below). Bluefish and weakfish recruitment indices were calculated using modal analyses of the length frequencies. For each of the 38 finfish species, plots including catch per tow in numbers and biomass in kilograms are illustrated in Figures 5.8 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; 1992-2019), American lobster (1984-2019), horseshoe crab (1992-2019), and long-finned squid (1986-2019).

Indices of Abundance: Important Recreational Species

Spring and fall abundance indices are presented in Tables 5.16-5.17. Indices of abundance at age were also calculated for seven important recreational species: bluefish (Table 5.20), scup (Table 5.21), striped bass (Table 5.22 age frequency, Table 5.23 indices at age), summer flounder (Table 5.24), tautog (Table 5.25), weakfish (Table 5.26) and winter flounder (Table 5.27). Bluefish and striped bass indices-at-age are based on the fall and spring surveys, respectively, whereas winter flounder indices-at-age are based on only the April and May cruises of the spring survey. Summer flounder, scup and weakfish indices-at-age are calculated and presented separately for each season. Modal distributions were used to calculate recruitment indices for bluefish and weakfish. Although age structures for bluefish are now being collected, it may take a few years before there is enough age data to construct a robust age key (see methods).

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 1984-2019 as an indicator of annual biological diversity or species richness. Trends in these indicators were tested for statistical significance by regression analysis. Results (Figure 5.18) show that the average number of warm temperate species captured/tow in spring and fall cruises has increased ($F=32.2$ and 86.7 respectively, $p<0.0001$); while the average number of cold temperate species has decreased, especially in spring ($F=52.5$, $p<0.0001$) but also in fall cruises ($F=20.2$, $p<0.0001$). Essentially, over the past couple decades, the finfish community structure in LIS has shifted away from the historical, two distinct winter-spring and summer-fall species assemblages and more toward a single spring-summer-fall species assemblage better adapted to the warming bottom water temperatures (Howell and Auster 2012).

MODIFICATIONS

For 2019, the bluefish recruitment index has been replaced with the full index-at-age that has been accepted and used by the ASMFC Technical Committee since 2013. This change is now consistent with ASMFC Bluefish Assessment methodology and has been made available since more robust age keys are now calculated annually from LISTS.

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**TABLES 5.1 - 5.27
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.

Bottom type	Depth Interval (m)				Totals
	0 - 9.0	9.1 - 18.2	18.3 - 27.3	27.4+	
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 2019.

In addition to the species listed below, other rarely occurring species (typically totaling less than 30 fish/year each) were measured. During 2019, 18 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 (mm)	All	min of 15 / tow
American lobster	CL (0.1 mm)	All	min of 50 / tow
American shad	FL (mm)	All	min of 15 / tow
anchovy, bay	FL (mm)	All	min of 10 / tow
Atlantic herring	FL (mm)	All	min of 15 YOY and min of 30 adults / tow
Atlantic menhaden	FL (mm)	All	min of 15 / tow
Atlantic sturgeon	FL (mm)	All	All
Blueback herring	FL (mm)	All	min of 15 / tow
Bluefish	FL (mm)	All	min of 30 YOY / tow, all adults
black sea bass	TL (mm)	All	All
butterfish	FL (mm)	All	min of 15 YOY and 15 adults / tow
cunner	TL (mm)	All	All
dogfish, smooth	FL (mm)	All	All
dogfish, spiny	FL (mm)	All	All
fourspot flounder	TL (mm)	All	min of 30 / tow
hake, red	TL (mm)	All	min of 30 / tow
hake, silver (whiting)	TL (mm)	All	min of 30 / tow
hake, spotted	TL (mm)	All	min of 30 / tow
hickory shad	FL (mm)	All	All
hogchoker	TL (mm)	All	min of 30 / tow
horseshoe crab	PW (mm)	All	All
northern searobin	FL (mm)	All	min of 30 / tow
moonfish	FL (mm)	All	min of 10 / tow
smallmouth flounder	TL (mm)	All	min of 10 / tow
skate, clearnose	TL (mm)	All	min of 30 / tow
skate, little	TL (mm)	All	min of 30 / tow
skate, winter	TL (mm)	All	All
striped bass	FL (mm)	All	All
striped searobin	FL (mm)	All	min of 30 / tow
scup	FL (mm)	All	min of 15 YOY and 30 / mode for age 1+
long-finned squid	ML (mm)	All	min of 30 / tow
summer flounder	FL (mm)	All	All
tautog	TL (mm)	All	All
weakfish	FL (mm)	All	min of 15 YOY / tow, all adults
whelk , channeled	PW (mm)	All	All
whelk , knobbed	PW (mm)	All	All
windowpane flounder	TL (mm)	All	min of 50 / tow
winter flounder	TL (mm)	All	min of 100 / tow

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: for fish < 60 cm, scales collected from 3 fish / cm
tautog	opercular bones otoliths or pelvic fin rays	Collected from a minimum of 200 fish/year. collected from minimum 50 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. In 2017, commencement of the spring survey was delayed until late-May due to repairs to the research vessel. In 2018, April sampling was curtailed due to delays in getting the Halon fire suppression system inspected/repared on the research vessel.

Cruise	Year																																				
	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	2015	2016	2017	2018	2019	
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	40	36	-	12	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	40	40	24	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	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	40	41**	40	40	40	40	40	40	-	40	-	40	40	40	40	40	40	40	40	40	40
Sept/Oct	-	-	-	-	-	-	-	-	40	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
October	35	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	-	40	40	-	40	40	40	-	40	40	40	39	40	40	40	40	40	
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	200	196	144	172	200	

Table 5.5. Station information for LISTS April 2019.

Standard LISTS tows in the spring begin with SP and fall begins with FA. Latitude (N) and Longitude (W) are displayed in decimal degrees. Water temperature and salinity and towlog data are not yet available. Area swept is estimated by assuming the effective sweep is 2/3rds of the footrope length.

Sample Number	Date	Site Number	Bottom Type	Depth Interva	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)
SP2019001	4/10/2019	14-28	T	1	9:07	30	41.2477	-72.5735	.	.	.	.	.	.	.
SP2019002	4/10/2019	13-27	T	2	11:04	30	41.2281	-72.6548	.	.	.	.	.	.	.
SP2019003	4/10/2019	10-27	T	4	12:58	30	41.1690	-72.7000	.	.	.	.	.	.	.
SP2019004	4/10/2019	13-35	T	4	15:57	30	41.2246	-72.3083	.	.	.	.	.	.	.
SP2019005	4/18/2019	07-31	S	4	8:26	30	41.1357	-72.4703	.	.	.	.	.	.	.
SP2019006	4/18/2019	01-29	S	2	10:25	30	41.0295	-72.5648	.	.	.	.	.	.	.
SP2019007	4/22/2019	06-30	S	4	8:21	30	41.1057	-72.5026	.	.	.	.	.	.	.
SP2019008	4/22/2019	04-27	T	3	9:52	30	41.0876	-72.6020	.	.	.	.	.	.	.
SP2019009	4/22/2019	00-27	T	2	11:53	30	41.0161	-72.5991	.	.	.	.	.	.	.
SP2019010	4/22/2019	58-25	S	1	13:53	30	40.9798	-72.7351	.	.	.	.	.	.	.
SP2019011	4/22/2019	03-27	T	3	15:29	30	41.0555	-72.6816	.	.	.	.	.	.	.
SP2019012	4/23/2019	08-28	S	3	8:35	30	41.1478	-72.5681	.	.	.	.	.	.	.
SP2019013	4/23/2019	06-27	S	3	9:58	30	41.1098	-72.6025	.	.	.	.	.	.	.
SP2019014	4/23/2019	09-24	T	3	12:38	30	41.1346	-72.7679	.	.	.	.	.	.	.
SP2019015	4/23/2019	14-33	S	2	15:38	30	41.2386	-72.4028	.	.	.	.	.	.	.
SP2019016	4/24/2019	12-35	T	4	7:44	30	41.2112	-72.2620	.	.	.	.	.	.	.
SP2019017	4/24/2019	14-34	S	1	9:25	30	41.2380	-72.3423	.	.	.	.	.	.	.
SP2019018	4/24/2019	08-23	M	3	12:15	30	41.1493	-72.8019	.	.	.	.	.	.	.
SP2019019	4/24/2019	11-20	T	2	13:45	30	41.1925	-72.9203	.	.	.	.	.	.	.
SP2019020	4/24/2019	13-20	M	1	15:51	30	41.2315	-72.9563	.	.	.	.	.	.	.
SP2019021	4/25/2019	01-12	M	4	9:08	30	41.0240	-73.2438	.	.	.	.	.	.	.
SP2019022	4/25/2019	57-12	T	2	10:52	30	40.9575	-73.2505	.	.	.	.	.	.	.
SP2019023	4/25/2019	59-11	M	3	12:30	30	41.0006	-73.2726	.	.	.	.	.	.	.
SP2019024	4/25/2019	01-10	T	3	13:39	30	41.0226	-73.3673	.	.	.	.	.	.	.
SP2019025	4/29/2019	04-22	M	4	8:54	30	41.0705	-72.8985	.	.	.	.	.	.	.
SP2019026	4/29/2019	59-22	M	3	10:27	30	40.9941	-72.8447	.	.	.	.	.	.	.
SP2019027	4/29/2019	00-21	M	3	11:52	30	41.0135	-72.8676	.	.	.	.	.	.	.
SP2019028	4/29/2019	59-18	M	3	13:19	30	40.9970	-72.9995	.	.	.	.	.	.	.
SP2019029	4/29/2019	01-20	M	4	14:58	30	41.0185	-72.9611	.	.	.	.	.	.	.
SP2019030	4/29/2019	02-21	M	4	16:11	30	41.0423	-72.8913	.	.	.	.	.	.	.
SP2019031	4/30/2019	07-15	T	1	8:16	30	41.1287	-73.1246	.	.	.	.	.	.	.
SP2019032	4/30/2019	06-12	M	1	9:45	30	41.1115	-73.2778	.	.	.	.	.	.	.
SP2019033	4/30/2019	05-13	M	2	11:27	30	41.0895	-73.2580	.	.	.	.	.	.	.
SP2019034	4/30/2019	05-15	M	2	12:49	30	41.0923	-73.1331	.	.	.	.	.	.	.
SP2019035	4/30/2019	06-14	M	2	14:09	21	41.1093	-73.2040	.	.	.	.	.	.	.
SP2019036	5/1/2019	05-17	T	3	8:33	30	41.1043	-73.0330	.	.	.	.	.	.	.
SP2019037	5/1/2019	01-15	M	4	10:16	30	41.0241	-73.1403	.	.	.	.	.	.	.
SP2019038	5/1/2019	00-15	T	4	12:15	25	41.0005	-73.1685	.	.	.	.	.	.	.
SP2019039	5/1/2019	06-17	T	2	13:38	30	41.1028	-73.0897	.	.	.	.	.	.	.
SP2019040	5/1/2019	12-20	T	1	15:11	30	41.2113	-72.9467	.	.	.	.	.	.	.

Table 5.6. Station information for LISTS May 2019.

Standard LISTS tows in the spring begin with SP and fall begins with FA. Latitude (N) and Longitude (W) are displayed in decimal degrees. Water temperature and salinity and towlog data are not yet available. 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)
SP2019041	5/10/2019	14-37	T	4	10:08	30	41.2357	-72.2563	.	.	.	.	.	.	.
SP2019042	5/10/2019	15-34	T	1	11:47	30	41.2487	-72.3198	.	.	.	.	.	.	.
SP2019043	5/13/2019	15-33	S	1	10:46	30	41.2552	-72.3354	.	.	.	.	.	.	.
SP2019044	5/14/2019	14-33	S	2	7:58	30	41.2473	-72.3505	.	.	.	.	.	.	.
SP2019045	5/14/2019	13-32	S	1	14:06	30	41.2308	-72.3963	.	.	.	.	.	.	.
SP2019046	5/14/2019	09-31	S	4	15:20	30	41.1620	-72.4443	.	.	.	.	.	.	.
SP2019047	5/15/2019	07-30	S	4	8:19	30	41.1295	-72.4728	.	.	.	.	.	.	.
SP2019048	5/15/2019	04-28	S	3	10:16	30	41.0808	-72.5828	.	.	.	.	.	.	.
SP2019049	5/15/2019	59-24	M	3	12:05	30	41.0005	-72.7393	.	.	.	.	.	.	.
SP2019050	5/15/2019	01-24	M	4	13:16	30	41.0182	-72.7990	.	.	.	.	.	.	.
SP2019051	5/15/2019	04-26	T	3	14:32	30	41.0653	-72.7026	.	.	.	.	.	.	.
SP2019052	5/15/2019	05-26	T	3	16:13	30	41.0922	-72.6865	.	.	.	.	.	.	.
SP2019053	5/16/2019	10-28	T	4	8:22	30	41.1748	-72.5758	.	.	.	.	.	.	.
SP2019054	5/16/2019	09-26	T	4	9:49	30	41.1615	-72.6401	.	.	.	.	.	.	.
SP2019055	5/16/2019	09-25	T	4	11:27	30	41.1621	-72.7168	.	.	.	.	.	.	.
SP2019056	5/16/2019	07-27	S	3	12:43	30	41.1147	-72.6736	.	.	.	.	.	.	.
SP2019057	5/17/2019	14-29	T	2	8:06	30	41.2357	-72.5745	.	.	.	.	.	.	.
SP2019058	5/17/2019	12-27	T	3	9:29	30	41.2007	-72.6478	.	.	.	.	.	.	.
SP2019059	5/17/2019	08-27	T	3	10:50	30	41.1415	-72.6221	.	.	.	.	.	.	.
SP2019060	5/17/2019	13-28	T	2	12:36	30	41.2286	-72.6313	.	.	.	.	.	.	.
SP2019061	5/17/2019	15-29	T	1	13:56	25	41.2392	-72.6083	.	.	.	.	.	.	.
SP2019062	5/20/2019	04-23	M	4	9:37	30	41.0826	-72.7923	.	.	.	.	.	.	.
SP2019063	5/20/2019	05-21	M	4	10:47	30	41.0956	-72.8733	.	.	.	.	.	.	.
SP2019064	5/20/2019	02-20	M	4	12:12	30	41.0485	-72.9116	.	.	.	.	.	.	.
SP2019065	5/20/2019	59-18	M	3	13:22	30	40.9966	-72.9998	.	.	.	.	.	.	.
SP2019066	5/20/2019	04-17	T	3	14:46	30	41.0770	-73.0699	.	.	.	.	.	.	.
SP2019067	5/21/2019	06-14	M	2	8:29	21	41.1161	-73.1593	.	.	.	.	.	.	.
SP2019068	5/21/2019	05-11	M	2	9:51	30	41.0992	-73.2700	.	.	.	.	.	.	.
SP2019069	5/21/2019	11-18	M	1	12:34	30	41.1888	-73.0020	.	.	.	.	.	.	.
SP2019070	5/21/2019	12-21	T	2	14:00	30	41.2180	-72.8687	.	.	.	.	.	.	.
SP2019071	5/21/2019	13-19	M	1	15:38	30	41.2260	-72.9763	.	.	.	.	.	.	.
SP2019072	5/22/2019	02-12	M	3	8:55	30	41.0452	-73.2365	.	.	.	.	.	.	.
SP2019073	5/22/2019	57-09	S	2	10:32	30	40.9508	-73.4073	.	.	.	.	.	.	.
SP2019074	5/22/2019	59-11	M	3	13:07	30	40.9901	-73.3224	.	.	.	.	.	.	.
SP2019075	5/22/2019	01-12	M	4	14:26	30	41.0226	-73.2820	.	.	.	.	.	.	.
SP2019076	5/22/2019	04-15	M	3	15:38	30	41.0622	-73.1930	.	.	.	.	.	.	.
SP2019077	5/23/2019	14-23	T	1	8:23	30	41.2268	-72.8680	.	.	.	.	.	.	.
SP2019078	5/23/2019	11-23	M	2	10:02	30	41.1782	-72.8548	.	.	.	.	.	.	.
SP2019079	5/23/2019	11-24	T	2	11:13	30	41.1877	-72.8158	.	.	.	.	.	.	.
SP2019080	5/23/2019	12-25	T	2	12:28	30	41.1953	-72.7788	.	.	.	.	.	.	.

Table 5.7. Station information for LISTS June 2019.

Standard LISTS tows in the spring begin with SP and fall begins with FA. Latitude (N) and Longitude (W) are displayed in decimal degrees. Water temperature and salinity and towlog data are not yet available. 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_Tem p (btm, (btm, ppt)	B_Salinity (btm, ppt)	Ave Speed (knots)	distance (nm)	Area Swept (sq.nm)
SP2019081	6/4/2019	15-34	T	1	7:14	30	41.2585	-72.3610	.	.	.	.	.	.	.
SP2019082	6/4/2019	05-30	S	3	10:07	23	41.0947	-72.5103	.	.	.	.	.	.	.
SP2019083	6/4/2019	06-30	S	4	11:30	30	41.0987	-72.5421	.	.	.	.	.	.	.
SP2019084	6/5/2019	14-28	T	1	8:05	30	41.2485	-72.5735	.	.	.	.	.	.	.
SP2019085	6/5/2019	12-28	T	3	9:33	30	41.2042	-72.6155	.	.	.	.	.	.	.
SP2019086	6/5/2019	09-29	S	3	11:12	30	41.1537	-72.5800	.	.	.	.	.	.	.
SP2019087	6/5/2019	08-27	T	3	12:53	30	41.1413	-72.6216	.	.	.	.	.	.	.
SP2019088	6/6/2019	17-37	T	1	13:27	30	41.2890	-72.1923	.	.	.	.	.	.	.
SP2019089	6/6/2019	14-37	T	4	15:26	26	41.2465	-72.2085	.	.	.	.	.	.	.
SP2019090	6/7/2019	14-33	S	2	7:09	30	41.2477	-72.3505	.	.	.	.	.	.	.
SP2019091	6/7/2019	13-32	S	1	8:05	30	41.2292	-72.3981	.	.	.	.	.	.	.
SP2019092	6/7/2019	09-26	T	4	10:01	30	41.1640	-72.6303	.	.	.	.	.	.	.
SP2019093	6/7/2019	04-26	T	3	11:30	30	41.0662	-72.6985	.	.	.	.	.	.	.
SP2019094	6/7/2019	03-28	T	3	12:51	30	41.0485	-72.6456	.	.	.	.	.	.	.
SP2019095	6/7/2019	08-31	S	4	14:36	30	41.1328	-72.4955	.	.	.	.	.	.	.
SP2019096	6/12/2019	13-35	T	4	7:45	30	41.2380	-72.2444	.	.	.	.	.	.	.
SP2019097	6/17/2019	02-29	T	2	8:50	30	41.0452	-72.5585	.	.	.	.	.	.	.
SP2019098	6/17/2019	58-24	S	1	10:54	30	40.9745	-72.7530	.	.	.	.	.	.	.
SP2019099	6/17/2019	01-24	M	4	12:14	30	41.0172	-72.7990	.	.	.	.	.	.	.
SP2019100	6/17/2019	03-24	M	4	13:34	30	41.0578	-72.7530	.	.	.	.	.	.	.
SP2019101	6/18/2019	06-17	T	2	8:07	30	41.1126	-73.0421	.	.	.	.	.	.	.
SP2019102	6/18/2019	00-19	M	3	9:49	30	40.9901	-73.0568	.	.	.	.	.	.	.
SP2019103	6/18/2019	00-21	M	3	11:12	30	41.0016	-72.9211	.	.	.	.	.	.	.
SP2019104	6/18/2019	02-21	M	4	12:25	30	41.0421	-72.8913	.	.	.	.	.	.	.
SP2019105	6/18/2019	07-20	M	3	13:50	30	41.1243	-72.9276	.	.	.	.	.	.	.
SP2019106	6/18/2019	08-17	M	2	15:38	30	41.1383	-73.0519	.	.	.	.	.	.	.
SP2019107	6/19/2019	00-10	T	4	9:30	30	41.0095	-73.3230	.	.	.	.	.	.	.
SP2019108	6/19/2019	57-09	S	2	10:53	30	40.9473	-73.4066	.	.	.	.	.	.	.
SP2019109	6/19/2019	56-12	T	2	12:37	30	40.9431	-73.2988	.	.	.	.	.	.	.
SP2019110	6/19/2019	56-14	T	2	14:22	30	40.9341	-73.2286	.	.	.	.	.	.	.
SP2019111	6/20/2019	01-14	M	4	8:55	30	41.0180	-73.1805	.	.	.	.	.	.	.
SP2019112	6/20/2019	02-13	M	3	10:08	30	41.0387	-73.2663	.	.	.	.	.	.	.
SP2019113	6/20/2019	03-12	M	3	11:23	16	41.0615	-73.2468	.	.	.	.	.	.	.
SP2019114	6/20/2019	06-12	M	1	12:42	30	41.1107	-73.2735	.	.	.	.	.	.	.
SP2019115	6/20/2019	11-18	M	1	14:56	30	41.1761	-73.0608	.	.	.	.	.	.	.
SP2019116	6/21/2019	09-17	T	2	7:53	30	41.1568	-73.0601	.	.	.	.	.	.	.
SP2019117	6/21/2019	12-19	M	2	9:36	30	41.2140	-72.9575	.	.	.	.	.	.	.
SP2019118	6/24/2019	10-22	M	2	8:22	30	41.1732	-72.8849	.	.	.	.	.	.	.
SP2019119	6/24/2019	06-23	M	4	9:47	30	41.1013	-72.8484	.	.	.	.	.	.	.
SP2019120	6/24/2019	09-24	T	3	11:20	30	41.1403	-72.7686	.	.	.	.	.	.	.

Table 5.8. Station information for LISTS September 2019.

Standard LISTS tows in the spring begin with SP and fall begins with FA. Latitude (N) and Longitude (W) are displayed in decimal degrees. Water temperature and salinity and towlog data are not yet available. 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	distance (nm)	Area Swept (sq.nm)
FA2019001	9/5/2019	15-33	S	1	7:13	30	41.2556	-72.3361	.	.	.	.	.	.	.
FA2019002	9/5/2019	15-29	T	1	9:28	30	41.2491	-72.5738	.	.	.	.	.	.	.
FA2019003	9/5/2019	14-23	T	1	11:17	30	41.2390	-72.8108	.	.	.	.	.	.	.
FA2019004	9/5/2019	10-29	S	3	14:51	30	41.1618	-72.5955	.	.	.	.	.	.	.
FA2019005	9/9/2019	14-33	S	2	7:20	30	41.2470	-72.3510	.	.	.	.	.	.	.
FA2019006	9/9/2019	09-29	S	3	9:14	30	41.1650	-72.5216	.	.	.	.	.	.	.
FA2019007	9/9/2019	08-25	T	4	10:53	30	41.1455	-72.7178	.	.	.	.	.	.	.
FA2019008	9/9/2019	08-30	S	4	12:54	30	41.1388	-72.5266	.	.	.	.	.	.	.
FA2019009	9/10/2019	09-31	S	4	7:47	30	41.1621	-72.4328	.	.	.	.	.	.	.
FA2019010	9/10/2019	01-29	S	2	9:30	30	41.0288	-72.5699	.	.	.	.	.	.	.
FA2019011	9/10/2019	00-27	T	2	11:38	30	41.0172	-72.6030	.	.	.	.	.	.	.
FA2019012	9/10/2019	00-24	M	3	13:18	30	41.0045	-72.7483	.	.	.	.	.	.	.
FA2019013	9/12/2019	12-25	T	2	8:43	30	41.2076	-72.7209	.	.	.	.	.	.	.
FA2019014	9/12/2019	10-22	M	2	10:39	30	41.1863	-72.8223	.	.	.	.	.	.	.
FA2019015	9/12/2019	09-23	T	3	12:20	30	41.1466	-72.8350	.	.	.	.	.	.	.
FA2019016	9/16/2019	13-33	S	1	7:12	30	41.2351	-72.3605	.	.	.	.	.	.	.
FA2019017	9/16/2019	03-26	T	3	9:38	30	41.0655	-72.6663	.	.	.	.	.	.	.
FA2019018	9/16/2019	01-25	T	4	11:04	30	41.0213	-72.6928	.	.	.	.	.	.	.
FA2019019	9/16/2019	03-25	T	3	12:37	30	41.0563	-72.7524	.	.	.	.	.	.	.
FA2019020	9/17/2019	10-25	T	3	8:47	30	41.1760	-72.7141	.	.	.	.	.	.	.
FA2019021	9/17/2019	04-24	M	4	10:16	30	41.0745	-72.7640	.	.	.	.	.	.	.
FA2019022	9/17/2019	05-24	T	4	12:24	30	41.0900	-72.7889	.	.	.	.	.	.	.
FA2019023	9/17/2019	07-24	T	4	13:43	30	41.1212	-72.7432	.	.	.	.	.	.	.
FA2019024	9/18/2019	02-23	M	4	9:31	30	41.0555	-72.7911	.	.	.	.	.	.	.
FA2019025	9/18/2019	00-19	M	3	11:07	30	41.0016	-72.9993	.	.	.	.	.	.	.
FA2019026	9/18/2019	00-17	M	4	13:03	30	41.0163	-73.0288	.	.	.	.	.	.	.
FA2019027	9/18/2019	07-15	T	1	14:59	30	41.1283	-73.1237	.	.	.	.	.	.	.
FA2019028	9/19/2019	05-13	M	2	8:41	30	41.0977	-73.2106	.	.	.	.	.	.	.
FA2019029	9/19/2019	01-10	T	3	11:25	30	41.0300	-73.3380	.	.	.	.	.	.	.
FA2019030	9/19/2019	03-12	M	3	13:33	18	41.0538	-73.2913	.	.	.	.	.	.	.
FA2019031	9/19/2019	06-14	M	2	14:43	30	41.1093	-73.2038	.	.	.	.	.	.	.
FA2019032	9/20/2019	13-19	M	1	7:39	30	41.2036	-73.0038	.	.	.	.	.	.	.
FA2019033	9/20/2019	13-20	M	1	9:26	30	41.2267	-72.9683	.	.	.	.	.	.	.
FA2019034	9/23/2019	00-12	M	4	9:35	30	41.0077	-73.2827	.	.	.	.	.	.	.
FA2019035	9/23/2019	56-13	T	2	11:32	30	40.9408	-73.2391	.	.	.	.	.	.	.
FA2019036	9/23/2019	59-12	M	3	14:02	30	40.9948	-73.2450	.	.	.	.	.	.	.
FA2019037	9/24/2019	11-24	T	2	8:43	30	41.1878	-72.8162	.	.	.	.	.	.	.
FA2019038	9/24/2019	06-22	M	4	10:39	30	41.1005	-72.8298	.	.	.	.	.	.	.
FA2019039	9/26/2019	09-19	T	2	7:56	30	41.1503	-72.9896	.	.	.	.	.	.	.
FA2019040	9/26/2019	07-22	M	3	9:34	30	41.1197	-72.8948	.	.	.	.	.	.	.

Table 5.9. Station information for LISTS October 2019.

Standard LISTS tows in the spring begin with SP and fall begins with FA. Latitude (N) and Longitude (W) are displayed in decimal degrees. Water temperature and salinity and towlog data are not yet available. 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)
FA2019041	10/8/2019	17-37	T	1	8:10	30	41.2877	-72.1910	.	.	.	.	.	.	.
FA2019042	10/8/2019	17-40	T	2	9:35	28	41.2917	-72.0768	.	.	.	.	.	.	.
FA2019043	10/8/2019	17-38	T	2	11:10	30	41.2878	-72.1618	.	.	.	.	.	.	.
FA2019044	10/8/2019	15-34	T	1	12:41	30	41.2475	-72.3158	.	.	.	.	.	.	.
FA2019045	10/8/2019	14-33	S	2	14:08	30	41.2481	-72.3520	.	.	.	.	.	.	.
FA2019046	10/15/2019	07-30	S	4	7:59	30	41.1292	-72.4748	.	.	.	.	.	.	.
FA2019047	10/15/2019	07-29	S	3	10:27	30	41.1193	-72.5355	.	.	.	.	.	.	.
FA2019048	10/15/2019	05-26	T	3	11:59	30	41.0898	-72.6888	.	.	.	.	.	.	.
FA2019049	10/15/2019	05-28	S	3	13:34	30	41.0848	-72.6068	.	.	.	.	.	.	.
FA2019050	10/15/2019	06-29	S	4	14:46	30	41.1035	-72.5598	.	.	.	.	.	.	.
FA2019051	10/16/2019	03-30	S	1	8:29	30	41.0653	-72.4955	.	.	.	.	.	.	.
FA2019052	10/16/2019	01-28	T	2	9:42	30	41.0306	-72.5767	.	.	.	.	.	.	.
FA2019053	10/16/2019	00-27	T	2	11:11	30	41.0096	-72.6473	.	.	.	.	.	.	.
FA2019054	10/21/2019	03-27	T	3	9:14	30	41.0641	-72.6233	.	.	.	.	.	.	.
FA2019055	10/21/2019	03-25	T	3	10:56	30	41.0665	-72.7056	.	.	.	.	.	.	.
FA2019056	10/21/2019	58-24	S	1	12:33	30	40.9833	-72.7982	.	.	.	.	.	.	.
FA2019057	10/21/2019	59-24	M	3	13:42	30	40.9908	-72.7848	.	.	.	.	.	.	.
FA2019058	10/23/2019	08-26	T	3	8:46	30	41.1468	-72.6213	.	.	.	.	.	.	.
FA2019059	10/23/2019	09-25	T	4	10:20	30	41.1325	-72.7029	.	.	.	.	.	.	.
FA2019060	10/23/2019	07-25	T	4	11:56	30	41.1306	-72.6890	.	.	.	.	.	.	.
FA2019061	10/23/2019	08-24	T	4	13:45	30	41.1390	-72.7521	.	.	.	.	.	.	.
FA2019062	10/24/2019	05-22	M	4	8:42	30	41.0923	-72.8898	.	.	.	.	.	.	.
FA2019063	10/24/2019	02-22	M	4	10:27	30	41.0420	-72.8401	.	.	.	.	.	.	.
FA2019064	10/24/2019	01-23	M	4	12:22	30	41.0367	-72.8028	.	.	.	.	.	.	.
FA2019065	10/24/2019	59-22	M	3	13:56	30	40.9937	-72.8423	.	.	.	.	.	.	.
FA2019066	10/24/2019	01-20	M	4	15:39	30	41.0295	-72.9121	.	.	.	.	.	.	.
FA2019067	10/25/2019	59-18	M	3	9:11	30	40.9970	-72.9960	.	.	.	.	.	.	.
FA2019068	10/25/2019	01-15	M	4	10:50	24	41.0241	-73.1415	.	.	.	.	.	.	.
FA2019069	10/25/2019	55-13	S	2	12:30	30	40.9276	-73.2500	.	.	.	.	.	.	.
FA2019070	10/25/2019	03-15	M	3	14:16	30	41.0568	-73.1682	.	.	.	.	.	.	.
FA2019071	10/28/2019	03-13	M	3	8:41	25	41.0566	-73.2191	.	.	.	.	.	.	.
FA2019072	10/28/2019	00-10	T	4	10:17	30	41.0092	-73.3285	.	.	.	.	.	.	.
FA2019073	10/28/2019	05-11	M	2	12:06	30	41.0906	-73.3093	.	.	.	.	.	.	.
FA2019074	10/28/2019	06-11	M	1	13:37	30	41.1008	-73.3208	.	.	.	.	.	.	.
FA2019075	10/29/2019	06-15	M	2	8:19	30	41.1028	-73.1479	.	.	.	.	.	.	.
FA2019076	10/29/2019	06-12	M	1	9:58	30	41.0980	-73.3188	.	.	.	.	.	.	.
FA2019077	10/29/2019	05-17	T	3	11:55	30	41.0953	-73.0822	.	.	.	.	.	.	.
FA2019078	10/29/2019	07-17	M	2	13:39	30	41.1176	-73.1025	.	.	.	.	.	.	.
FA2019079	10/30/2019	09-19	T	2	8:58	30	41.1503	-72.9894	.	.	.	.	.	.	.
FA2019080	10/30/2019	13-22	T	1	10:32	30	41.2221	-72.8705	.	.	.	.	.	.	.

Table 5.10. Samples with non-standard tow durations and reasons for incomplete tows, spring and fall 2019.

Standard LISTS tows begin with SP (spring) or FA (fall).

Sample	Date	Site	Bottom Type	Depth Interval	Time	Duration	Reason	Comments
April								
SP2019035	4/30/2019	06-14	M	2	14:09	21	Pots	Three part tow due to multiple pot interations.
SP2019038	5/1/2019	00-15	T	4	12:15	25	Ran out of room	
May								
SP2019061	5/17/2019	15-29	T	1	13:56	25	Ran out of room	Hung on string of old pots. Broke port wing cable.
SP2019067	5/21/2019	06-14	M	2	8:29	21	Pots	
June								
SP2019082	6/4/2019	05-30	S	3	10:07	23	Pots	Avoiding gear interation.
SP2019089	6/6/2019	14-37	T	4	15:26	26	Hang/Pots	Two part tow. Hung down, reset, slowed, hauledback.
SP2019113	6/20/2019	03-12	M	3	11:23	16	Pots	Two part tow. Gear on initial haulback.
SEPT								
FA2019030	9/19/2019	03-12	M	3	13:33	18	Hang	Hung after 18 minutes. Port side hang, but gear clean
OCT								
FA2019042	10/8/2019	17-40	T	2	9:35	28	Speed drop	Speed drop at start of boost (28 minutes). Gear clean upon retrieval.
FA2019068	10/25/2019	01-15	M	4	10:50	24	Speed drop	String of old gear on starboard wing
FA2019071	10/28/2019	03-13	M	3	8:41	25	Speed drop	Old gear outside of net, two pots outside the mouth of net had to be cut

Table 5.11. List of finfish species observed in 2019.

Fifty-six finfish species were observed in 2019. Since 1984, one hundred-twelve 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	<i>Anchoa mitchilli</i>	jack, crevalle	<i>Caranx hippos</i>
anchovy, striped	<i>Anchoa hepsetus</i>	kingfish, northern	<i>Menticirrhus saxatilis</i>
bigeye	<i>Priacanthus arenatus</i>	lizardfish, inshore	<i>Synodus foetens</i>
black sea bass	<i>Centropristis striata</i>	mackerel, Spanish	<i>Scomberomorus maculatus</i>
blue runner	<i>Caranx crysos</i>	menhaden, Atlantic	<i>Brevoortia tyrannus</i>
bluefish	<i>Pomatomus saltatrix</i>	moonfish	<i>Selene setapinnis</i>
butterfish	<i>Pepilus triacanthus</i>	perch, white	<i>Morone americana</i>
cod, Atlantic	<i>Gadus morhua</i>	pipefish, northern	<i>Syngnathus fuscus</i>
cusk-eel, fawn	<i>Lepophidium profundorum</i>	puffer, northern	<i>Sphoeroides maculatus</i>
dogfish, smooth	<i>Mustelus canis</i>	puffer, smooth	<i>Lagocephalus laevigatus</i>
dogfish, spiny	<i>Squalus acanthias</i>	ray, roughtail stingray	<i>Dasyatis centroura</i>
eel, American	<i>Anguilla rostrata</i>	rockling, fourbeard	<i>Enchelyopus cimbrius</i>
eel, conger	<i>Conger oceanicus</i>	sculpin, longhorn	<i>Myoxocephalus octodecemspin</i>
filefish, planehead	<i>Monacanthus hispidus</i>	scup	<i>Stenotomus chrysops</i>
flounder, fourspot	<i>Paralichthys oblongus</i>	searobin, northern	<i>Prionotus carolinus</i>
flounder, smallmouth	<i>Etropus microstomus</i>	searobin, striped	<i>Prionotus evolans</i>
flounder, summer	<i>Paralichthys dentatus</i>	sennet, northern	<i>Sphyraena borealis</i>
flounder, windowpane	<i>Scophthalmus aquosus</i>	shad, American	<i>Alosa sapidissima</i>
flounder, winter	<i>Pseudopleuronectes american</i>	shad, hickory	<i>Alosa mediocris</i>
goosefish	<i>Lophius americanus</i>	skate, clearnose	<i>Raja eglanteria</i>
hake, red	<i>Urophycis chuss</i>	skate, little	<i>Leucoraja erinacea</i>
hake, silver	<i>Merluccius bilinearis</i>	skate, winter	<i>Leucoraja ocellata</i>
hake, spotted	<i>Urophycis regia</i>	spot	<i>Leiostomus xanthurus</i>
harvestfish	<i>Pepilus paru</i>	striped bass	<i>Morone saxatilis</i>
herring, Atlantic	<i>Clupea harengus</i>	sturgeon, Atlantic	<i>Acipenser oxyrinchus</i>
herring, alewife	<i>Alosa pseudoharengus</i>	tautog	<i>Tautoga onitis</i>
herring, blueback	<i>Alosa aestivalis</i>	toadfish, oyster	<i>Opsanus tau</i>
hogchoker	<i>Trinectes maculatus</i>	weakfish	<i>Cynoscion regalis</i>

Names taken from: Common and scientific names of fishes from the United States, Canada and Mexico, Sixth Edition (Nelson et al. 2004).

Table 5.12. List of invertebrates observed in 2019.

In 2019, forty-one invertebrate "species" were identified. In most cases, invertebrates are identified to species; however, species that are very similar are identified to genus, and in difficult cases, to a higher taxon.

Common Name	Scientific Name	Common Name	Scientific Name
arks	<i>Noetia-Anadara spp.</i>	polychaetes	<i>Class polychfeta</i>
bryozoan, bushy	<i>Phylum Bryozoa</i>	sea cucumber	<i>Class Holothuroidea</i>
clam, hard clams	<i>Artica-Mercinaria-Pitar sp.</i>	sea grape	<i>Molgula spp.</i>
clam, surf	<i>Spisula solidissima</i>	sea urchin, green	<i>Strongylocentrotus droebach</i>
coral, star	<i>Astrangia poculata</i>	sea urchin, purple	<i>Arbacia punctulata</i>
crab, mud	<i>Family Xanthidae</i>	shrimp, coastal mud	<i>Upogebia affinis</i>
crab, Japanese shore	<i>Hemigrapsus sanguineus</i>	shrimp, ghost	<i>Gilvossius setimanus</i>
crab, blue	<i>Callinectes sapidus</i>	shrimp, mantis	<i>Squilla empusa</i>
crab, flat claw hermit	<i>Pagurus pollicaris</i>	shrimp, northern red	<i>Pandalus montagui</i>
crab, horseshoe	<i>Limulus polyphemus</i>	shrimp, sand	<i>Crangon septemspinosa</i>
crab, lady	<i>Ovalipes ocellatus</i>	slipper shell, common	<i>Crepidula fornicata</i>
crab, rock	<i>Cancer irroratus</i>	sponge spp.	<i>sponge spp.</i>
crab, spider	<i>Libinia emarginata</i>	sponge, deadman's fingers	<i>Haliclona spp.</i>
hydroid spp.	<i>hydroid spp.</i>	sponge, red bearded	<i>Microciona prolifera</i>
jelly, comb	<i>Phylum Ctenophora</i>	squid, longfin inshore	<i>Doryeuthis pealeii</i>
jelly, moon	<i>Aurelia aurita</i>	starfish spp.	<i>Asteriid spp.</i>
jellyfish, lion's mane	<i>Cyanea capillata</i>	Tubularia hydroids	<i>Tubularia, spp.</i>
lobster, American	<i>Homarus americanus</i>	whelk, channeled	<i>Busycotypus canaliculatus</i>
mussel, blue	<i>Mytilus edulis</i>	whelk, knobbed	<i>Busycon carica</i>
northern moon snail	<i>Lunatia heros</i>	worms, fan	<i>Myxicola infundibulum</i>
oyster, common	<i>Crassostrea virginica</i>		

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

Table 5.13. Total number and weight (kg) of finfish and invertebrates caught in 2019.

Finfish species are in order of descending count. Invertebrate species are in order of descending weight (nc = not counted). Young-of-year anchovies and Gadids are neither separated by species nor 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	53,617	40.2	11,169.4	50.3					
butterfish	43,434	32.5	1,114.1	5.0	<u>Finfish not ranked</u>				
silver hake	4,348	3.3	126.1	0.6	anchovy spp, (yoy)				
weakfish	3,766	2.8	245.5	1.1	Atlantic herring, (yoy)				
striped searobin	3,181	2.4	1,264.4	5.7	American sand lance (yoy)				
northern searobin	3,112	2.3	450.5	2.0	gadid spp, (yoy)				
moonfish	2,270	1.7	22.6	0.1					
bluefish	2,048	1.5	224.5	1.0	<u>Invertebrates</u>				
spotted hake	2,027	1.5	178.3	0.8	horseshoe crab	218	1.8	391.9	33.3
black sea bass	1,584	1.2	816.7	3.7	longfin inshore squid	10,934	92.1	368.4	31.3
windowpane flounder	1,427	1.1	242.5	1.1	spider crab	nc		115.9	9.9
alewife	1,401	1.0	86.1	0.4	common slipper shell	nc		71.8	6.1
bay anchovy	1,346	1.0	6.6	0.0	lion's mane jellyfish	386	3.3	67.6	5.8
summer flounder	1,309	1.0	464.3	2.1	bushy bryozoan	nc		60.2	5.1
Atlantic herring	1,294	1.0	302.7	1.4	mixed sponge species	nc		43.2	3.7
smooth dogfish	1,243	0.9	2,957.2	13.3	American lobster	25	0.2	7.6	0.6
red hake	1,215	0.9	77.5	0.3	mantis shrimp	223	1.9	7.2	0.6
Atlantic menhaden	815	0.6	280.7	1.3	flat claw hermit crab	nc		6.5	0.6
fourspot flounder	570	0.4	147.8	0.7	hydroid spp.	nc		5.7	0.5
striped bass	535	0.4	773.6	3.5	knobbed whelk	17	0.1	4.8	0.4
American shad	512	0.4	32.4	0.1	blue crab	21	0.2	3.9	0.3
winter flounder	422	0.3	103.1	0.5	common oyster	nc		3.8	0.3
little skate	418	0.3	220.9	1.0	channeled whelk	22	0.2	3.3	0.3
hogchoker	383	0.3	50.8	0.2	sand shrimp	nc		2.5	0.2
tautog	373	0.3	351.9	1.6	rock crab	nc		1.7	0.1
smallmouth flounder	186	0.1	4.1	0.0	hard clams	10	0.1	1.4	0.1
blueback herring	124	0.1	6.0	0.0	lady crab	nc		1.4	0.1
clearnose skate	113	0.1	213.8	1.0	mud crabs	nc		1.3	0.1
spot	66	0.0	8.2	0.0	northern moon snail	nc		1.1	0.1
Spanish mackerel	65	0.0	3.7	0.0	Tubularia, spp.	nc		1.0	0.1
blue runner	59	0.0	3.8	0.0	arks	nc		0.8	0.1
winter skate	41	0.0	72.7	0.3	deadman's fingers sponge	nc		0.6	0.0
striped anchovy	21	0.0	0.4	0.0	blue mussel	nc		0.4	0.0
fourbeard rockling	20	0.0	1.3	0.0	fan worm tubes	nc		0.4	0.0
Atlantic cod	15	0.0	5.1	0.0	star coral	nc		0.3	0.0
northern kingfish	14	0.0	1.9	0.0	comb jelly spp	nc		0.3	0.0
hickory shad	11	0.0	3.1	0.0	sea cucumber	2	0.0	0.2	0.0
Atlantic sturgeon	9	0.0	104.7	0.5	sea grape	nc		0.2	0.0
northern puffer	9	0.0	1.4	0.0	green sea urchin	2	0.0	0.1	0.0
northern pipefish	5	0.0	0.2	0.0	red bearded sponge	nc		0.1	0.0
crevalle jack	4	0.0	0.2	0.0	northern red shrimp	1	0.0	0.1	0.0
spiny dogfish	4	0.0	23.8	0.1	polychaetes	nc		0.1	0.0
oyster toadfish	4	0.0	1.1	0.0	coastal mud shrimp	1	0.0	0.1	0.0
bigeye	3	0.0	0.2	0.0	ghost shrimp	1	0.0	0.1	0.0
conger eel	2	0.0	0.3	0.0	Japanese shore crab	nc		0.1	0.0
fawn cusk-eel	2	0.0	0.1	0.0	moon jelly	nc		0.1	0.0
goosefish	2	0.0	0.8	0.0	starfish spp.	nc		0.1	0.0
inshore lizardfish	2	0.0	0.1	0.0	surf clam	1	0.0	0.1	0.0
white perch	2	0.0	0.2	0.0	purple sea urchin	1	0.0	0.1	0.0
American eel	1	0.0	0.6	0.0	Total	11,865		1,176.2	
planehead filefish	1	0.0	0.1	0.0					
harvest fish	1	0.0	0.1	0.0	Note: nc= not counted				
northern sennet	1	0.0	0.1	0.0					
rougtail stingray	1	0.0	16.8	0.1					
longhorn sculpin	1	0.0	0.1	0.0					
Total	133,439		22,184.7						

Table 5.14. Total counts and weight (kg) of finfish taken in the spring and fall sampling periods, 2019.

Species are listed in order of descending count. Young-of-year bay anchovy, striped anchovy, Atlantic herring, American sand lance and Gadids are not included. Number of tows (sample sizes): Spring = 120 and Fall = 80.

species	Spring				species	Fall			
	count	%	weight	%		count	%	weight	%
scup	33,941	58.2	8,517.3	57.5	butterfish	42,093	56.0	973.6	13.2
silver hake	4,283	7.3	122.1	0.8	scup	19,677	26.2	2,652.1	35.9
northern searobin	2,801	4.8	393.4	2.7	weakfish	3,649	4.9	217.9	3.0
striped searobin	2,505	4.3	987.3	6.7	moonfish	2,270	3.0	22.6	0.3
spotted hake	1,730	3.0	120.0	0.8	bluefish	2,047	2.7	223.9	3.0
alewife	1,341	2.3	82.9	0.6	smooth dogfish	822	1.1	1,885.9	25.5
butterfish	1,341	2.3	140.5	0.9	Atlantic menhaden	682	0.9	225.3	3.1
black sea bass	1,322	2.3	700.4	4.7	bay anchovy	680	0.9	3.5	0.0
Atlantic herring	1,294	2.2	302.7	2.0	striped searobin	676	0.9	277.0	3.8
windowpane flounder	1,174	2.0	206.2	1.4	American shad	347	0.5	21.3	0.3
summer flounder	1,123	1.9	350.2	2.4	northern searobin	311	0.4	57.1	0.8
red hake	1,120	1.9	68.8	0.5	spotted hake	297	0.4	58.2	0.8
bay anchovy	666	1.1	3.1	0.0	black sea bass	263	0.3	116.4	1.6
fourspot flounder	538	0.9	140.2	0.9	windowpane flounder	253	0.3	36.4	0.5
striped bass	463	0.8	608.4	4.1	summer flounder	186	0.2	114.1	1.5
smooth dogfish	421	0.7	1,071.4	7.2	hogchoker	147	0.2	20.1	0.3
little skate	412	0.7	218.1	1.5	tautog	101	0.1	75.0	1.0
winter flounder	408	0.7	100.1	0.7	red hake	94	0.1	8.7	0.1
tautog	272	0.5	276.9	1.9	striped bass	72	0.1	165.2	2.2
hogchoker	236	0.4	30.6	0.2	spot	66	0.1	8.2	0.1
smallmouth flounder	173	0.3	3.7	0.0	Spanish mackerel	65	0.1	3.7	0.1
American shad	165	0.3	11.1	0.1	silver hake	65	0.1	4.0	0.1
Atlantic menhaden	134	0.2	55.4	0.4	alewife	60	0.1	3.2	0.0
weakfish	117	0.2	27.6	0.2	blue runner	59	0.1	3.8	0.1
blueback herring	114	0.2	5.7	0.0	clearnose skate	43	0.1	77.2	1.0
clearnose skate	70	0.1	136.6	0.9	fourspot flounder	32	0.0	7.6	0.1
winter skate	40	0.1	72.1	0.5	striped anchovy	21	0.0	0.4	0.0
fourbeard rockling	19	0.0	1.3	0.0	winter flounder	14	0.0	3.0	0.0
Atlantic cod	15	0.0	5.1	0.0	smallmouth flounder	13	0.0	0.4	0.0
hickory shad	7	0.0	1.4	0.0	blueback herring	10	0.0	0.3	0.0
northern kingfish	5	0.0	0.9	0.0	northern kingfish	9	0.0	1.1	0.0
northern pipefish	5	0.0	0.2	0.0	Atlantic sturgeon	7	0.0	90.6	1.2
northern puffer	4	0.0	0.7	0.0	little skate	6	0.0	2.8	0.0
spiny dogfish	4	0.0	23.8	0.2	northern puffer	5	0.0	0.7	0.0
Atlantic sturgeon	2	0.0	14.1	0.1	crevalle jack	4	0.0	0.2	0.0
fawn cusk-eel	2	0.0	0.1	0.0	hickory shad	4	0.0	1.8	0.0
goosefish	2	0.0	0.8	0.0	bigeye	3	0.0	0.2	0.0
oyster toadfish	2	0.0	0.8	0.0	inshore lizardfish	2	0.0	0.1	0.0
white perch	2	0.0	0.2	0.0	oyster toadfish	2	0.0	0.3	0.0
bluefish	1	0.0	0.7	0.0	conger eel	1	0.0	0.3	0.0
conger eel	1	0.0	0.1	0.0	planehead filefish	1	0.0	0.1	0.0
American eel	1	0.0	0.6	0.0	harvestfish	1	0.0	0.1	0.0
longhorn sculpin	1	0.0	0.1	0.0	northern sennet	1	0.0	0.1	0.0
Total	58,277		14,803.0		fourbeard rockling	1	0.0	0.1	0.0
					rougtail stingray	1	0.0	16.8	0.2
					winter skate	1	0.0	0.6	0.0
					Total	75,164		7,381.7	

Table 5.15. Total catch of invertebrates taken in the spring and fall sampling periods, 2019.
Species are ranked by total weight (kg). Number of tows (sample sizes): Spring = 120 and Fall = 80.

species	Spring				species	Fall			
	count	%	weight	%		count	%	weight	%
horseshoe crab	127	11.4	221.21	38.8	longfin inshore squid	10,247	95.3	307.2	50.6
spider crab	nc		112.14	19.7	horseshoe crab	91	0.8	170.7	28.1
longfin inshore squid	687	62	61.16	10.7	lion's mane jellyfish	191	1.8	64.1	10.6
common slipper shell	nc		58.96	10.4	bushy bryozoan	nc		31.2	5.1
mixed sponge species	nc		43.11	7.6	common slipper shell	nc		12.9	2.1
bushy bryozoan	nc		29.01	5.1	mantis shrimp	190	1.8	6.0	1.0
American lobster	25	2	7.63	1.3	spider crab	nc		3.8	0.6
hydroid spp.	nc		5.44	1	knobbed whelk	8	0.1	3.2	0.5
flat claw hermit crab	nc		4.96	0.9	blue crab	12	0.1	2.5	0.4
common oyster	nc		3.71	0.7	flat claw hermit crab	nc		1.6	0.3
lion's mane jellyfish	194	17.4	3.57	0.6	channeled whelk	5	0.0	1.0	0.2
sand shrimp	nc		2.46	0.4	hard clams	3	0.0	0.5	0.1
channeled whelk	17	2	2.33	0.4	fan worm tubes	nc		0.4	0.1
rock crab	nc		1.62	0.3	mud crabs	nc		0.3	0.1
knobbed whelk	9	0.8	1.55	0.3	comb jelly spp	nc		0.3	0.0
blue crab	9	0.8	1.47	0.3	hydroid spp.	nc		0.2	0.0
lady crab	nc		1.39	0.2	sea cucumber	2	0.0	0.2	0.0
mantis shrimp	33	3	1.21	0.2	common oyster	nc		0.1	0.0
northern moon snail	nc		1.13	0.2	mixed sponge species	nc		0.1	0.0
mud crabs	nc		0.97	0.2	star coral	nc		0.1	0.0
Tubularia, spp.	nc		0.96	0.2	blue mussel	nc		0.1	0.0
hard clams	7	0.7	0.91	0.2	rock crab	nc		0.1	0.0
arks	nc		0.71	0.1	arks	nc		0.1	0.0
deadman's fingers sponge	nc		0.55	0.1	sand shrimp	nc		0.1	0.0
blue mussel	nc		0.34	0.1	ghost shrimp	1	0.0	0.1	0.0
star coral	nc		0.21	0	moon jelly	nc		0.1	0.0
sea grape	nc		0.15	0	purple sea urchin	1	0.0	0.1	0.0
green sea urchin	2	0.2	0.11	0	Total	10,751		606.7	
red bearded sponge	nc		0.1	0					
northern red shrimp	1	0.1	0.1	0					
polychaetes	nc		0.1	0					
coastal mud shrimp	1	0.1	0.05	0					
fan worm tubes	nc		0.05	0					
Japanese shore crab	nc		0.05	0					
starfish spp.	nc		0.05	0					
surf clam	1	0.1	0.05	0					
Total	1,113		569.5						

Note: nc= not counted

Table 5.16. Spring indices of abundance for selected species, 1984-2019.

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.

Species	Spring																													84-18 Mean							
	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	2015	2016	2017	2018	2019
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	0.77	1.71	0.07	1.20	1.57	1.03
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	1.94	1.78	4.56	4.17	3.79	0.62
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	0.02	0.05	0.05	0.04	0.01	
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	3.26	14.13	11.14	5.99	1.91	
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	0.06	0.02	0.03	0.03	0.00	0.17
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	0.87	1.80	2.90	1.58	1.12	
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	0.09	0.04	0.03	0.03	0.02	0.07
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	0.87	1.82	1.90	2.09	1.89	4.26
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	1.64	1.36	1.66	2.64	4.85	
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	5.95	5.02	3.26	3.41	4.33	4.17	4.68	27.01
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	3.93	3.40	0.76	2.41	1.50	45.91
hake, red *	15.04	3.02	4.67	3.84	3.64	13.12	4.75	4.35	4.83	6.00	8.99	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	0.26	1.05	0.66	1.05	2.58	3.49
hake, silver *	7.53	1.83	1.19	2.48	2.25	4.86	5.33	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	0.25	1.71	1.51	1.70	12.45	4.13
hake, spotted	0.00	0.00	0.02	0.01	0.22	0.01	0.02	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	0.43	4.92	5.12	2.66	6.10		
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	0.69	0.69	0.11	0.77	1.01	1.82
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	0.42	0.28	0.00	0.28	0.28	
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	0.21	0.49	1.22	0.97	0.70	
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	0.01	0.05	0.01	0.00	0.03	
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	0.31	0.33	0.08	0.09	0.10	4.44
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	0.66	1.04	0.74	0.25	0.38	
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	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	0.01	0.00	0.00	0.00	0.00	0.00	0.07
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	0.08	0.02	0.00	0.01	0.09	0.45
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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
sculpin, longhorn *	0.20	0.33	0.18	0.15	0.15	0.24	0.65	0.39	0.12	0.06	0.04	0.03	0.04	0.02	0.01	0.01	0.06	0.02	0.02	0.01	0.03	0.00	0.00	0.02	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.08	
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	10.13	131.15	362.67	104.70	46.67	27.89
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	0.10	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	0.00	0.01	0.00	0.00	0.00	0.00	0.07
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	0.57	1.82	4.13	2.18	6.83	2.00
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	1.92	5.91	14.42	5.75	6.33	
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	0.48	0.85	0.03	0.32	0.54	
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	0.01	0.07	0.03	0.11	0.04	0.08	0.02	0.02	0.02	0.04	
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	0.15	0.28	0.19	0.14	0.32	
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	0.61	0.43	0.55	0.52	0.84	7.10
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	0.09	0.07	0.05	0.02	0.18	0.16
spot																																					

Table 5.17. Fall indices of abundance for selected species, 1984-2019.

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.

Species	Fall																													84-18 Mean							
	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	2015	2016	2017	2018	2019
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	0.64	0.11	0.15	0.19	0.34	
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	0.65	1.37	0.91	1.29	1.86	
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	8.42	11.25	8.05	4.00	11.19	20.90
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	96.23	172.44	116.05	101.39	111.46	163.67
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	0.01	0.00	0.00	0.00	0.00	0.00
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	7.30	5.24	8.29	7.17	6.01	2.19
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	0.00	0.00	0.00	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	0.41	0.24	0.04	0.48	0.20	0.00
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	2.03	1.92	1.35	2.43	1.44	2.05
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	1.67	1.10	1.01	2.19	1.17	0.00
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	1.59	-	1.27	1.37	0.33	0.44	0.81	0.28	0.09	0.14	0.11	0.00
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	1.14	0.01	0.16	0.41	0.57	0.00
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	0.66	0.80	0.07	0.16	0.09	0.07	0.18	0.18	0.09	0.64	0.04	0.28	0.18	-	-	0.41	0.40	0.12	0.11	0.16	0.02	0.12	0.35	0.41	0.00
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	0.91	0.74	2.04	3.72	1.80	0.84
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	0.10	0.00	0.00	0.07	0.00	0.00
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	0.17	0.21	0.24	0.04	0.06	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	1.06	0.89	1.18	2.55	1.15	0.41
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	0.38	0.16	0.08	0.34	0.08	0.08
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	0.08	0.02	0.02	0.01	0.00	4.90
moonhaden, 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	2.49	0.80	0.43	0.75	2.20	0.72
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	1.06	0.77	1.16	0.79	4.57	1.36
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	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	0.01	0.00	0.00	0.00	0.01	0.00
scad, rough *	0.13	0.08	0.03	0.27	0.42	0.08	0.08	0.01	0.00	0.21	0.03	0.00	0.18	0.05	0.00	0.00	0.07	0.07	0.14	0.09	0.19	0.15	0.08	0.00	0.38	-	-	0.32	0.12	0.14	0.04	0.37	0.01	0.06	0.00	0.00	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	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	422.23	307.01	212.15	228.62	129.46	188.03
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	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	0.84	1.24	0.79	2.32	1.38	0.00
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	6.93	3.51	3.13	6.34	3.50	3.70
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	0.71	0.85	0.63	0.80	1.43	0.89
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	0.02	0.02	0.02	0.03	0.03	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	0.47	0.43	0.36	0.33	0.29	0.20
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	0.55	0.48	0.20	0.26	0.05	0.00
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	0.04	0.02				

Table 5.18. Finfish and invertebrate biomass indices for the spring sampling period, 1992-2019.

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	2015	2016	2017	2018	2019	
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	0.12	0.37	0.01	0.30	0.30	
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	1.44	1.48	3.05	2.20	2.21	
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	0.01	0.05	0.05	0.02	0.00	
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	0.66	2.03	1.54	1.06	0.49	
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	0.01	0.00	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	1.41	3.21	6.17	2.58	1.99	
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	0.20	0.09	0.09	0.05	0.06	
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	0.34	0.61	0.59	0.74	0.71	
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	1.07	1.05	1.36	1.48	1.94	
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	0.78	0.56	0.71	0.86	1.06	
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	1.01	0.82	0.26	0.77	0.45	
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	0.03	0.24	0.10	0.13	0.35	
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	0.03	0.20	0.13	0.12	0.71	
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	0.05	0.53	0.50	0.30	0.54	
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	0.18	0.16	0.02	0.16	0.40	
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	0.02	0.04	0.02	0.04	0.02	0.01	0.03	0.02	0.03	0.02	0.00	0.07	0.03	
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	0.05	0.14	0.28	0.26	0.18	
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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
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	0.39	0.23	0.39	0.15	0.23	
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
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	0.03	0.01	0.00	0.00	0.00	0.00	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	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.01
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	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
seup	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	3.53	20.25	58.66	27.33	15.36	
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	0.00	0.00	0.00	0.00	0.00	0.00
scarabin, 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	0.22	0.50	0.98	0.71	1.17	
scarabin, 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	1.21	3.13	6.54	3.09	3.10	
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	0.06	0.15	0.01	0.03	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	0.02	0.03	0.01	0.01	0.01	
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	0.23	0.39	0.30	0.21	0.48	
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	0.41	0.30	0.37	0.33	0.58	
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	0.12	0.10	0.05	0.02	0.23	
spot	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
striped bass	0.31	0.43	0.45	0.49	0.77	1.13	1.15	1.86	1.13	0.93	2.10	1.38	0.87	1.52	1.27	1.37	0.86	0.93	0.66	0.96	0.58	0.98	0.54	0.29	0.50	0.57	0.81	1.11	
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	0.00	0.07	0.00	0.00	0.03	
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	0.42	0.53	0.48	0.56	0.54	
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	0.01	0.23	0.33	0.02	0.11	
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	0.00	0.02	0.04	0.02	0.01	
crab, flat claw hermit	0.15	0.08	0.18	0.02	0.09	0.04	0.10	0.10	0.07	0.12	0.14	0.32	0.17	0.05	0.04	0.11	0.09	0.12	0.08	0.09	0.05	0.07	0.07	0.03	0.03	0.03	0.06	0.04	
crab, horseshoe	0.35	0.45	0.60	0.13	0.61	0.33	0.55	0.80	0.74	0.94	0.76	1.33	0.96	0.39	0.25	0.86	0.62	0.65	0.52	0.81	0.55	0.70	0.45	0.38	0.29	0.15	0.80	0.67	
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	0.00	0.00	0.03	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	0.02	0.05	0.01	0.02	0.01	
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	0.42	0.72	0.69	0.51	0.56	

Table 5.19. Finfish and invertebrate biomass indices for the fall sampling period, 1992-2019.

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	2015	2016	2017	2018	2019	
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	0.10	0.01	0.01	0.01	0.04	
black sea bass	0.01	0.01	0.00	0.01	0.01	0.05	0.07	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	0.49	0.59	0.47	0.71	0.91	
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	2.06	2.97	1.65	1.20	1.86	
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	4.08	6.58	5.56	5.69	4.98	
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	0.00	0.00	0.00	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	11.70	8.30	14.82	9.57	10.66	
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	0.00	0.00	0.00	0.01	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	0.06	0.06	0.02	0.16	0.07	
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	1.54	1.69	0.97	1.58	0.95	
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	0.37	0.26	0.28	0.44	0.29	
flounder, winter	0.84	0.99	0.78	0.45	1.56	1.04	0.87	1.37	1.28	0.62	0.55	0.34	0.32	0.41	0.16	0.22	0.49	0.26	-	0.28	0.40	0.11	0.17	0.22	0.11	0.03	0.06	0.03	
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	0.28	0.00	0.04	0.09	0.09	
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	0.03	0.00	0.02	0.06	0.05	
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	0.28	0.14	0.51	0.96	0.51	
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	0.01	0.00	0.00	0.01	0.00	
herring, blackback	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	0.03	0.05	0.03	0.00	0.00	
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	0.23	0.17	0.24	0.53	0.22	
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	0.07	0.03	0.02	0.08	0.01	
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	0.99	0.17	0.18	0.35	1.00	
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	0.12	0.06	0.05	0.03	0.23	
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	
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	0.00	0.00	0.00	0.00	0.00	
scad, rough	0.00	0.03	0.00	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	0.06	0.00	0.01	0.00	0.00
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	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	20.95	22.28	13.68	20.09	15.91	
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	
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	0.09	0.05	0.08	0.09	0.08	0.08	-	0.11	0.22	0.23	0.24	0.10	0.18	0.20	0.51	0.36	
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	2.84	1.72	1.74	2.91	1.82	
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	0.12	0.14	0.13	0.14	0.19	
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	0.01	0.01	0.01	0.02	0.02	
skate, clearnose	0.06	0.05	0.01	0.04	0.01	0.05	0.17	0.15	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	0.66	0.65	0.60	0.50	0.43
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	0.38	0.32	0.14	0.17	0.03	
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	0.05	0.02	0.14	0.00	0.01	
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	0.02	0.02	0.11	0.03	0.08	
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	0.38	0.20	0.30	0.52	0.42	
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	0.04	0.27	0.05	0.18	0.19	
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	0.08	0.19	0.07	0.17	0.20	
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	3.12	1.07	1.10	1.80	1.45	
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	0.04	0.02	0.01	0.01	0.03	
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	0.04	0.06	0.06	0.04	0.02	
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	0.58	0.75	0.95	1.72	0.82	
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	0.02	0.02	0.01	0.01	0.00	
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	0.00	0.00	0.00	0.00	0.00	
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	0.07	0.13	0.12	0.11	0.04	
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								

Table 5.20. Bluefish indices-at-age, 1984-2019.

The 1984 and the 2013-2019 index-at-age uses annual fall age keys generated by CT LISTS ageing program. Bluefish age keys for 1985-2012 were provided by the ASMFC Bluefish Technical Committee as a combined coastwide annual age keys to calculate LISTS indices-at-age for those earlier years.

Year	season	month	Count	PosTow	Tows	Geometric Mean	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6+
1984	FA	Sept/Oct	6,738	84.3	70	23.41	22.46846	0.41161	0.35053	0.14118	0.02432	0.00347	0.01042
1985	FA	Sept/Oct	5,301	87.5	80	19.01	16.97788	0.95184	0.62743	0.24627	0.14557	0.02202	0.03899
1986	FA	Sept/Oct	2,738	92.5	80	13.66	10.82247	1.18353	1.16988	0.18939	0.12798	0.08771	0.07904
1987	FA	Sept/Oct	2,598	93.8	80	14.32	12.16673	1.00642	0.50812	0.38414	0.13211	0.05764	0.06484
1988	FA	Sept/Oct	3,645	93.8	80	15.49	14.26504	0.21113	0.49008	0.13684	0.17035	0.12539	0.09118
1989	FA	Sept/Oct	8,636	88.8	80	26.25	24.99768	0.57512	0.45987	0.04245	0.01955	0.06846	0.08687
1990	FA	Sept/Oct	4,671	93.8	80	23.88	19.36665	2.96951	0.92831	0.16309	0.12845	0.12227	0.20173
1991	FA	Sept/Oct	5,699	98.8	80	33.43	28.49387	1.27891	3.26664	0.12095	0.05552	0.05045	0.16366
1992	FA	Sept/Oct	5,226	97.5	80	25.22	18.87085	1.75987	2.78912	1.32392	0.18181	0.06275	0.23169
1993	FA	Sept/Oct	6,456	91.7	120	18.92	16.77605	0.10982	1.03233	0.32124	0.56632	0.02988	0.08436
1994	FA	Sept/Oct	16,233	93.3	120	32.06	30.52338	0.76225	0.24109	0.16222	0.13727	0.16887	0.06492
1995	FA	Sept/Oct	5,518	92.5	80	24.46	21.69603	1.96209	0.59672	0.05471	0.04473	0.04053	0.06520
1996	FA	Sept/Oct	6,689	91.3	80	20.80	19.80478	0.22004	0.41286	0.24725	0.01322	0.02488	0.07697
1997	FA	Sept/Oct	10,777	92.5	80	37.90	36.59172	0.60241	0.47727	0.07386	0.06682	0.02814	0.05979
1998	FA	Sept/Oct	8,791	91.3	80	31.41	29.87079	0.97342	0.37865	0.15855	0.01072	0.00417	0.01370
1999	FA	Sept/Oct	7,792	96.3	80	45.31	41.87752	2.89157	0.22410	0.20336	0.05010	0.00776	0.05559
2000	FA	Sept/Oct	6,109	92.5	80	20.57	17.28053	2.02593	1.07170	0.14808	0.00112	0.02760	0.01503
2001	FA	Sept/Oct	3,957	93.8	80	24.24	21.47198	1.12599	1.40312	0.18378	0.02042	0.01072	0.02399
2002	FA	Sept/Oct	3,394	90	80	18.75	14.00653	3.78846	0.63786	0.09413	0.01921	0.07948	0.12433
2003	FA	Sept/Oct	3,682	92.5	40	28.53	27.33834	0.42510	0.60263	0.07313	0.02058	0.03197	0.03825
2004	FA	Sept/Oct	6,485	90	80	29.13	21.45225	5.51484	1.45586	0.33113	0.06769	0.16343	0.14479
2005	FA	Sept/Oct	6,507	88.8	80	18.89	17.76926	0.08680	0.65503	0.20716	0.08841	0.04539	0.03794
2006	FA	Sept/Oct	2,062	92.5	40	15.66	14.24365	0.48746	0.54706	0.28763	0.06386	0.00759	0.02276
2007	FA	Sept/Oct	9,339	87.5	80	30.66	27.26228	1.98415	0.71928	0.42779	0.10968	0.06798	0.08883
2008	FA	Sept/Oct	1,670	97.5	40	14.28	11.83085	0.56236	1.08556	0.36727	0.11927	0.15267	0.16203
2009	FA	Sept/Oct	3,604	97.5	80	18.12	15.68648	0.51962	0.43171	0.81205	0.29667	0.06847	0.29501
2010	FA						No Fall Sampling						
2011	FA	Sept/Oct	2,737	83.8	80	11.10	10.20763	0.23440	0.20973	0.17409	0.16426	0.04650	0.06339
2012	FA	Sept/Oct	3,832	90	80	15.06	14.34220	0.26758	0.18493	0.12859	0.08088	0.02196	0.03386
2013	FA	Sept/Oct	1,809	86.3	80	9.71	8.88876	0.03221	0.41116	0.18465	0.08857	0.04026	0.06441
2014	FA	Sept/Oct	4,451	91.1	79	18.61	18.13764	0.21114	0.06893	0.06270	0.06688	0.04180	0.02090
2015	FA	Sept/Oct	2,647	81.3	80	8.42	8.25160	0.02224	0.06037	0.01271	0.02224	0.03177	0.01906
2016	FA	Sept/Oct	2,785	82.5	80	11.25	8.50348	1.59796	0.42465	0.57513	0.06557	0.02101	0.06221
2017	FA	Sept/Oct	2,397	75	80	8.05	7.92900	0.04033	0.03025	0.03361	0.01008	0.00000	0.00672
2018	FA	Sept/Oct	697	82.5	80	4.00	3.40974	0.53462	0.03128	0.02063	0.00372	0.00000	0.00000
2019	FA	Sept/Oct	2,047	86.3	80	11.19	10.71582	0.30298	0.12894	0.02734	0.00000	0.00000	0.01093

Table 5.24. Summer flounder indices-at-age, 1984-2019.

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. In 2015-2018, LISTS age data for smaller fish were also incorporated into the age key. 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.

Year	Spring													
	0-12	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	3.0018	0	0.9679	0.7073	0.4854	0.4332	0.2981	0.0466	0.0369	0.0126	0.0072	0.0022	0.0022	0.0022
2015	1.6341	0	0.7770	0.3569	0.2050	0.1232	0.0904	0.0487	0.0176	0.0093	0.0017	0.0018	0.0020	0.0005
2016	1.3568	0	0.1449	0.4154	0.3449	0.1985	0.0952	0.0771	0.0503	0.0216	0.0055	0.0006	0.0028	0
2017	1.6498	0	0.5364	0.4108	0.3073	0.1483	0.1105	0.0495	0.0463	0.0235	0.0074	0.0098	0	0
2018	2.6395	0	1.5411	0.4948	0.2277	0.1749	0.0985	0.0390	0.0146	0.0182	0.0170	0.0083	0.0054	0
2019	4.8467	0	3.4315	0.7787	0.289	0.0957	0.1194	0.0673	0.0275	0.0144	0.0121	0.0057	0.0033	0.0021
84-18														
Mean	1.5468	0.0000	0.5991	0.4162	0.2549	0.1417	0.0732	0.0318	0.0161	0.0080	0.0030	0.0018	0.0010	0.0001

Year	Fall													
	0-12	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	2.3678	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	0.0000	-	-	-	-	-	-	-	-	-	-	-	-	-
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	3.5522	0.1633	0.4592	0.8283	1.4239	0.5848	0.0631	0.0296	0	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
2015	2.0218	0.0547	0.5740	0.6717	0.3957	0.1830	0.0821	0.0347	0.0135	0.0086	0	0.0038	0	0
2016	1.9198	0.0361	0.2401	0.6223	0.5563	0.2687	0.1223	0.0319	0.0421	0	0	0	0	0
2017	1.3544	0.2231	0.6948	0.1862	0.1197	0.0746	0.0320	0.0160	0.0000	0.0080	0	0	0	0
2018	2.4292	0.3096	0.8139	0.6373	0.2754	0.2147	0.1076	0.0161	0.0274	0.0181	0.0053	0.0015	0.0023	0
2019	1.4352	0.0180	0.6453	0.4521	0.1253	0.0856	0.0487	0.0184	0.0119	0.0157	0.0077	0.0043	0	0.0022
84-18														
Mean	1.9855	0.1356	0.7724	0.6541	0.2971	0.1215	0.0397	0.0135	0.0072	0.0023	0.0007	0.0006	0.0004	0.0000

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

Table 5.25. Tautog indices-at-age, 1984-2015.

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.

Year	Age										
	1 - 20+	1	2	3	4	5	6	7	8	9	10
1984	3.4691	0.0109	0.0816	0.1898	0.3030	0.4587	0.4955	0.2903	0.2852	0.3101	0.3529
1985	1.7967	0	0.0199	0.0962	0.1902	0.1651	0.1281	0.1836	0.3005	0.2020	0.0902
1986	1.7199	0.0012	0.0275	0.0961	0.0483	0.1029	0.2012	0.2409	0.2452	0.2863	0.1017
1987	1.2128	0.0237	0.0801	0.0594	0.0602	0.0999	0.1345	0.1910	0.1348	0.0957	0.0522
1988	0.9007	0.0031	0.0323	0.0474	0.0720	0.0445	0.0401	0.0755	0.1008	0.1641	0.0790
1989	1.2589	0	0.0433	0.0684	0.1365	0.0889	0.1154	0.1495	0.1600	0.1046	0.0817
1990	1.1615	0.0102	0.0829	0.1569	0.1117	0.1142	0.0498	0.0500	0.1245	0.0874	0.0623
1991	1.1466	0.0053	0.0251	0.0575	0.1184	0.1241	0.1486	0.0931	0.1253	0.1071	0.1067
1992	1.0254	0.0196	0.0489	0.0708	0.0414	0.0490	0.1231	0.1323	0.0849	0.0632	0.0636
1993	0.5695	0.0033	0.0212	0.0519	0.0302	0.0163	0.0606	0.0595	0.0423	0.0489	0.0522
1994	0.5837	0.0087	0.0368	0.0327	0.0678	0.0557	0.0551	0.0555	0.0799	0.0516	0.0312
1995	0.2530	0.0033	0.0093	0.0090	0.0295	0.0608	0.0267	0.0212	0.0346	0.0150	0.0219
1996	0.5628	0.0073	0.0518	0.0305	0.0086	0.0762	0.0452	0.0654	0.0712	0.0667	0.0609
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	0.0009	0.0468	0.0578	0.0832	0.0737	0.1403	0.1376	0.0897	0.0392	0.0467
2001	0.8946	0.0062	0.0305	0.0862	0.0830	0.1294	0.1197	0.1193	0.1058	0.0715	0.0454
2002	1.1665	0.0098	0.0237	0.0599	0.1009	0.1749	0.1972	0.1895	0.2091	0.0739	0.0419
2003	0.8977	0.0027	0.0132	0.0080	0.0598	0.1485	0.2385	0.1596	0.0893	0.0778	0.0185
2004	0.6936	0.0071	0.0209	0.0152	0.0360	0.0710	0.1930	0.1096	0.0494	0.0812	0.0441
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	0.6135	0.0034	0.0125	0.0170	0.0462	0.0478	0.0608	0.0918	0.0935	0.0966	0.0533
2008	0.7268	0.0061	0.0272	0.0439	0.0620	0.0848	0.1164	0.0708	0.0649	0.0831	0.0640
2009	0.4822	0.0145	0.0364	0.0070	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	0.0270	0.1148	0.0919	0.0808	0.0635	0.0389	0.0384	0.0499	0.0489	0.0115
2013	0.5781	0.0075	0.0653	0.0561	0.1211	0.0857	0.0912	0.0532	0.0386	0.0215	0.0214
2014	0.6958	0	0.0281	0.1540	0.0854	0.1112	0.1286	0.0754	0.0522	0.0243	0.0185
2015	0.6160	0.0422	0.0494	0.0710	0.0722	0.0758	0.0981	0.0900	0.0584	0.0266	0.0149
84-14											
Mean	0.9031	0.0084	0.0405	0.0617	0.0755	0.0962	0.1179	0.1083	0.1049	0.0813	0.0562

Year	Age									
	11	12	13	14	15	16	17	18	19	20+
1984	0.1259	0.2281	0.0933	0.0507	0.0448	0.0322	0.0468	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	0.0606	0.0543	0.0479	0.0313	0.0246	0.0267	0.0105	0.0004	0.0048	0.0202
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	0.0568	0.0397	0.0221	0.0250	0.0089	0.0169	0.0035	0.0033
1991	0.0609	0.0258	0.0399	0.0361	0.0216	0.0007	0.0159	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	0.0040	0.0080	0	0
2012	0	0.0077	0.0038	0	0.0038	0	0	0	0	0
2013	0.0066	0	0	0.0033	0.0033	0.0033	0	0	0	0
2014	0.0148	0	0	0.0033	0	0	0	0	0	0
2015	0.0060	0.0016	0.0033	0.0049	0	0	0.0016	0	0	0
84-14										
Mean	0.0414	0.0333	0.0205	0.0187	0.0118	0.0086	0.0057	0.0042	0.0022	0.0058

Table 5.26. Weakfish age 0 and age 1+ indices of abundance, 1984-2019.

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.

Year	Fall		Fall		Spring	
	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
2015	30.91	3.11	0.46	0.35	0.03	0.11
2016	5.87	0.73	0.81	0.59	0.85	0.43
2017	8.20	0.94	0.43	0.40	0.57	0.42
2018	25.66	1.68	0.56	0.40	0.04	0.12
2019	14.33	0.74	1.26	0.79	0.53	0.28
84-18						
mean	19.12	1.40	0.33	0.36	0.19	0.23

Table 5.27. Winter flounder indices-at-age, 1984-2019.

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).

Year	Catch-at-age: numbers			April-May												
	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	0.03	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	0.02	0	0	0
2014	5.90	2.34	0.47	0.84	0.64	2.08	1.36	0.62	0.26	0.06	0.03	0.01	0	0	0	0
2015	3.94	1.92	0.64	0.89	0.85	0.29	0.64	0.65	0.22	0.27	0.11	0.02	0	0.005	0.01	0
2016	3.98	1.32	0.63	1.02	0.98	0.66	0.32	0.46	0.16	0.11	0.17	0.06	0	0	0	0
2017	0.99	0.25	1.03	0.02	0.32	0.40	0.20	0	0.02	0	0.02	0	0	0	0	0
2018	3.59	1.28	0.42	0.96	0.50	0.86	0.81	0.24	0.06	0.09	0.03	0.01	0.03	0	0	0
2019	1.85	0.52	0.69	0.52	0.57	0.25	0.24	0.18	0.03	0.01	0.03	0.01	0.01	0.01	0	0
84-18																
Mean	55.32	8.71	5.13	7.11	25.51	13.98	5.74	1.97	0.63	0.22	0.10	0.04	0.02	0.00	0.00	0.00

Year	Catch-at-age: biomass (kg)			April-May												
	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	2.33	1.48	NA	0.03	0.09	0.73	0.74	0.44	0.21	0.06	0.03	0.01	0	0	0	0
2015	1.19	0.99	NA	0.02	0.09	0.08	0.27	0.33	0.13	0.16	0.07	0.01	0	0.01	0.004	0
2016	1.08	0.73	NA	0.03	0.13	0.19	0.14	0.25	0.10	0.07	0.10	0.04	0.03	0	0	0
2017	0.34	0.18	NA	0.00	0.04	0.16	0.10	0	0.02	0	0.02	0	0	0	0	0
2018	1.22	0.83	NA	0.03	0.06	0.30	0.46	0.16	0.06	0.09	0.02	0.01	0.03	0	0	0
2019	0.60	0.38	NA	0.02	0.10	0.10	0.13	0.13	0.04	0.01	0.04	0.01	0.01	0.004	0	0
84-18																
Mean	9.93	3.97	NA	0.25	2.58	3.14	2.25	1.04	0.39	0.16	0.07	0.03	0.02	0.00	0.00	0.00

Note years with non-standard # of tows: 1984: April = 0 tows, May = 13 tows, and 19 tows in June used to increase sample size; 1985: April = 0 tows, May = 41 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; 2016: April = 36 tows; 2017: April = 0 tows, May = 24 tows; 2018: Apr=12 tows, May 40 tows.

**TABLES 5.28 - 5.65
LENGTH FREQUENCIES
LISTS**

Table 5.28. Alewife length frequencies, spring and fall, 1 cm intervals, 1989–2019.

From 1989 - 1990, lengths were recorded from the first three tows of each day; since 1991, lengths have been recorded from every tow.

length	Spring																															
	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	2015	2016	2017	2018	2019	
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	0	0	0	0	0	0	1	
6	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	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	3	1	0	0	1	
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	12	9	0	1	17	
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	11	27	0	4	40	
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	16	81	0	4	28	
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	13	230	0	33	61	
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	7	303	0	46	119	
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	6	181	0	67	224	
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	6	351	0	111	230	
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	7	407	0	103	181	
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	5	375	0	119	70	
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	5	353	0	50	32	
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	5	263	6	53	9	
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	9	89	1	61	61	
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	3	32	0	90	124	
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	9	51	1	132	55	
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	20	21	0	83	22	
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	17	7	0	31	25	
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	12	4	0	24	22	
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	10	3	0	6	13	
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	7	4	0	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	1	3	0	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	0	0	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	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	0	0	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	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	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	185	2,796	8	1,021	1,340	

length	Fall																														
	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	2015	2016	2017	2018	2019
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	0	0	0	0	4	0
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	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	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	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	3	0	0	2	0
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	9	0	1	2	0
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	23	0	0	11	5
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	32	0	9	9	1
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	88	0	12	4	2
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	26	3	3	0	3
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	53	8	1	1	15
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	37	4	2	0	24
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	11	0	0	1	7
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	14	0	2	0	1
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	3	0	0	0	0
20	0	0	0	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	1
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	1	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	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	0	1	1	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	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	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	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	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	301	15	30	34	60

Table 5.29. American shad length frequencies, spring, 1 cm intervals, 1989-2019.

From 1989 - 1990, lengths were recorded from the first three tows of each day; since 1991, lengths have been recorded from every tow.

length	Spring																														
	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	2015	2016	2017	2018	2019
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	1	0	0	0	0	
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	0	0	1	0	0	1
8	0	0	0	0	2	2	4	0	0	5	1	1	0	0	1	0	3	0	0	0	0	0	0	0	1	0	0	2	0	1	2
9	0	0	0	0	6	0	13	0	6	4	4	4	2	13	5	1	3	0	0	0	1	0	0	0	10	7	1	14	0	1	8
10	0	0	0	1	4	1	12	1	12	11	12	22	1	30	3	7	6	0	0	7	6	5	1	0	31	21	21	38	0	9	12
11	0	0	1	2	3	1	4	4	12	16	9	24	0	71	10	1	5	0	5	19	6	7	4	3	17	20	18	51	0	6	19
12	0	0	1	3	1	1	2	4	14	36	10	17	2	57	5	3	4	0	9	25	13	6	8	12	23	20	23	68	1	13	16
13	4	0	9	5	3	3	9	5	45	49	21	12	0	30	6	11	6	0	11	53	24	15	20	23	15	12	4	135	1	10	22
14	13	0	29	7	2	6	10	83	54	54	24	8	0	20	0	21	14	6	20	98	29	30	41	42	10	7	5	65	0	9	16
15	36	1	53	10	4	16	12	108	123	55	41	13	2	20	0	24	11	32	34	82	37	47	59	64	10	2	8	61	0	8	14
16	20	4	40	7	4	36	32	117	194	43	30	17	4	31	1	3	3	13	25	34	26	39	16	32	9	2	2	56	0	3	3
17	9	4	9	16	6	36	36	37	125	53	22	15	0	18	2	3	1	1	18	17	14	8	9	14	2	1	3	95	0	0	3
18	5	3	3	17	3	103	27	32	55	22	10	9	0	14	0	1	0	4	7	9	12	2	3	5	2	0	2	54	0	1	2
19	0	2	1	16	3	271	13	15	7	11	10	4	0	3	0	1	0	1	1	2	3	3	0	0	0	1	0	32	0	0	1
20	1	1	2	13	2	118	5	3	1	1	17	1	0	2	1	1	4	0	1	0	2	0	0	0	1	1	0	16	0	0	2
21	0	2	8	12	4	40	1	6	1	0	18	0	0	2	3	1	2	0	2	3	1	2	1	0	0	0	1	0	0	0	8
22	0	1	14	6	3	7	0	6	2	7	31	0	0	5	2	3	6	0	1	3	1	0	0	2	8	8	7	1	0	3	12
23	0	2	17	14	2	11	2	10	3	1	18	4	0	2	5	1	1	0	3	0	3	0	0	8	0	8	12	2	0	2	4
24	0	0	8	4	1	3	0	9	0	2	10	2	2	3	0	0	2	0	4	0	0	1	0	12	0	1	4	2	0	3	15
25	0	2	2	3	0	3	0	5	1	5	4	0	1	1	0	0	1	0	3	0	0	0	0	10	1	1	1	2	0	0	2
26	0	1	1	0	0	2	0	4	0	1	1	1	0	0	0	0	2	0	3	0	0	0	0	3	0	0	1	0	0	1	
27	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	2	0	0	0	0	0
28	0	0	0	0	0	1	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
29	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
30	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
31	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	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	2	0	3	0	0	1	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	1	1	0	0	3	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0
34	0	1	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
35	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	1	0	0	0	0	1
36	0	0	0	1	0	0	0	0	2	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	1	0	1	0	0	2	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0
38	1	0	0	0	1	0	0	0	2	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	3	1	2	1	0	0	0	4	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0
40	1	0	0	2	0	1	1	0	1	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
41	0	0	1	3	2	2	1	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42	0	0	1	4	2	0	0	0	1	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
43	0	0	0	0	0	1	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0
44	0	0	1	2	2	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
45	1	0	0	5	0	1	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
46	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	0	0	0
47	0	0	0	0	0	1	2	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0
48	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	0	0	0	0	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	0	0	0
50	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
Total	91	24	202	163	61	675	189	451	669	379	313	157	14	336	44	83	79	60	151	353	179	165	162	233	142	120	114	697	3	69	164

Table 5.30. American shad length frequencies, fall, 1 cm intervals, 1989-2019.

From 1989 - 1990, lengths were recorded from the first three tows of each day; since 1991, lengths have been recorded from every tow.

length	Fall																															
	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	2015	2016	2017	2018	2019	
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	1	0	
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	0	1	0	0	0	0	0
8	0	0	2	0	0	1	0	0	2	1	1	0	0	0	0	1	2	0	0	2	0	-	1	2	0	3	0	0	0	0	2	0
9	0	0	5	1	2	5	7	0	4	0	4	0	1	1	4	4	2	0	2	2	0	-	3	2	0	6	0	2	0	1	2	
10	0	1	1	2	3	6	9	0	9	5	5	0	3	1	5	5	0	0	5	3	10	-	2	3	0	2	4	4	2	1	1	
11	0	0	3	3	20	20	7	1	11	9	22	0	1	0	9	1	3	0	14	1	17	-	2	1	0	0	9	1	4	2	0	
12	0	0	5	11	29	96	12	5	20	9	28	0	1	0	18	3	4	0	15	1	12	-	1	2	1	1	9	1	9	0	0	
13	0	0	2	10	25	112	12	2	8	4	16	0	0	0	4	1	1	0	11	2	11	-	1	0	0	1	9	3	3	1	0	
14	0	0	2	2	23	173	12	2	5	2	5	0	0	0	0	2	0	0	6	0	28	-	1	0	0	1	4	3	0	2	0	
15	0	0	2	0	10	72	2	0	0	2	1	0	0	0	0	0	0	0	7	0	8	-	1	0	2	4	3	6	0	3	12	
16	0	0	1	0	7	18	1	0	4	9	1	0	1	1	1	10	1	0	2	0	2	-	3	1	1	0	1	18	3	4	66	
17	0	0	21	7	3	2	1	0	8	54	12	2	4	10	14	67	2	1	0	0	1	-	3	1	7	0	1	62	6	9	149	
18	0	3	57	8	6	17	24	0	19	114	37	1	15	86	37	73	10	3	2	1	19	-	17	1	10	3	4	74	19	14	63	
19	32	31	36	33	47	40	60	0	49	176	92	15	32	113	84	83	13	3	3	5	23	-	18	4	21	6	22	60	30	34	24	
20	65	102	17	57	160	93	163	5	63	108	109	51	23	38	72	15	30	0	4	11	50	-	21	16	22	6	43	10	61	40	19	
21	63	40	5	45	306	136	172	10	36	15	143	53	11	6	9	6	16	0	4	17	39	-	21	36	10	3	19	1	63	32	6	
22	28	26	0	26	302	113	64	11	9	0	139	33	3	0	6	0	13	1	6	7	22	-	11	18	5	1	17	0	23	10	4	
23	2	1	0	4	92	84	19	8	3	0	39	6	0	0	0	0	1	0	2	0	3	-	3	3	0	0	10	0	4	5	0	
24	0	0	0	1	24	42	2	2	0	0	13	0	1	0	0	1	0	0	0	0	0	-	0	0	0	2	5	0	0	0	1	
25	0	0	0	0	0	8	1	2	0	0	4	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	1	0	0	0	0	
26	0	0	0	3	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	
27	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	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	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	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	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	0	0	0	0	0
32	0	0	0	0	0	0	0	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	0	0	0	0	0	0
34	0	0	0	0	0	0	0	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	0	0	0	0	0	0
36	0	0	0	0	0	0	0	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	0	0	0	0	0	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	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	0	0	0
40	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
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	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	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	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	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	0	0	0	0	0
48	0	0	0	0	0	0	0	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	0	0	0	0	0	0
50	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
Total	191	204	159	214	1,061	1,047	568	48	252	508	673	161	96	256	263	274	98	8	83	52	245	0	109	90	79	40	161	245	227	161	347	

Table 5.31. American lobster length frequencies-spring, female, 1 mm intervals, 1984–2019.
Lobsters were measured from each tow.

Female Length	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	2015	2016	2017	2018	2019		
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	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	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	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	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	0	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	0	0	0	0	0	0	0	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	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	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
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	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	0	0	0	0	0	0	0	0	0	0	0
28	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
29	0	0	0	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	0	0	0	0	0	0
30	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
31	0	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	0	0	0	0	0	0
32	0	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	0	0	0	0	0	0	0	0	0	0	0
33	0	1	0	2	2	6	8	0	5	1	6	21	14	13	35	18	8	3	0	2	1	1	0	0	5	1	0	2	0	0	0	0	0	0	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	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	0	0	
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	0	0	0	0	0	0	0	0	0	
37	0	4	1	2	0	0	10	9	6	7	11	27	21	42	58	29	36	2	3	4	0	2	0	0	3	3	0	0	0	0	0	0	0	0	0	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	0	0	0	0	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	1	0	0	0	0	0	
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	0	0	0	0	0	0	0	
41	2	3	1	18	2	3	22	9	10	23	8	18	18	17	71	36	58	11	8	4	2	2	13	1	3	2	0	1	1	1	1	1	0	0	0	0	0	
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	1	0	0	0	0	0	
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	1	0	0	0	0	0	
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	0	0	0	0	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	0	0	0	0	0	0	
46	4	3	1	12	3	8	4	18	26	30	2	34	22	42	88	64	102	15	22	4	0	1	1	4	3	3	1	1	2	3	1	1	1	0	0	0	0	
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	0	0	0	0	0	0	
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	0	0	0	0	0	0	
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	1	0	0	0	0	0	
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	1	0	0	0	0	0	
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	0	0	0	0	0	0	
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	2	0	0	0	0	0	
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	1	0	0	0	0	0	
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	0	0	0	0	0	0	
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	0	2	0	0	0	0	
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	0	0	0	0	0	0	
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	0	0	0	0	0	0	
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	0	0	0	0	0	0	
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	0	1	0	0	0	0	
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	0	1	0	0	0	0	
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	0	2	0	0	0	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	0	0	0	0	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	0	1	0	0	0	0	
64	10	16	9	16	8	13	38	33	41																													

Table 5.34. American lobster length frequencies—fall, male, 1 mm intervals, 1984–2019.

Lobsters were measured from each tow.

Length	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	2015	2016	2017	2018	2019		
	(70)	(80)	(80)	(80)	(80)	(80)	(80)	(80)	(120)	(120)	(80)	(80)	(80)	(80)	(80)	(80)	(80)	(80)	(80)	(80)	(80)	(80)	(40)	(80)	(40)	(80)	(80)	(80)	(80)	(79)	(80)	(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	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	0	0	0	0	0	0	0	0	0	0	0	0		
26	0	0	2	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		
27	0	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	0	0	0	0	0	0	0	0	0	0		
28	1	2	0	0	0	0	0	3	0	0	3	4	0	1	1	0	1	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0		
29	0	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	0	0	0	0	0		
30	0	0	0	0	0	0	0	3	0	3	0	4	0	3	2	0	0	0	0	0	0	0	0	1	0	0	0	0	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	0	0	1	0	1	0	0	0	0	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	0	1	0	0	0	0	0	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	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	0	0	1	1	0	0	0	0	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	0	0	0	0	0	0		
36	3	0	0	1	0	1	0	5	8	25	8	21	1	7	14	2	1	0	0	0	1	1	0	0	0	0	0	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	1	0	0	0	0	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	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	0	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	0	0	1	0	0	0	0	0	0	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	0	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	0	1	0	0	0	0	0	0	0			
43	1	0	3	3	2	1	7	49	17	56	12	23	41	5	21	2	2	0	0	0	0	1	1	1	1	0	0	0	0	0	0	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	0	2	0	0	0	0	0	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	0	1	0	0	0	0	0	0	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	0	0	0	0	0	0	0	0	0			
47	13	4	3	10	10	5	16	14	66	60	26	33	41	13	20	7	2	2	1	2	3	0	1	1	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	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	0	0	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	0	1	2	0	0	0	0	0	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	0	0	0	0	0	0	0	0	0		
52	15	5	11	17	3	16	31	43	65	78	82	56	30	86	42	9	4	2	0	3	4	1	1	1	3	0	0	0	0	0	0	0	0	0	0	0		
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	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	0	0	0		
56	18	12	25	18	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	0	0	0	0	0	0	0		
57	9	0	10	30	26	18	36	43	64	104	79	92	27	111	44	42	27	10	5	4	8	8	1	7	2	4	0	0	0	0	0	0	0	0	0	0		
58	29	15	24	23	13	30	34	51	68	107	58	48	80	42	57	21	10	8	5	6	7	3	1	1	5	0	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	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	0	0	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	0	0	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	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	0	0	0		
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	0	0	0	0	0	0	0	0	0	0		
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	0	0	0	0	0	0	0	0	0		
69	46	13	22	32	31	30	24	51	81	131	101	75	28	121	52	54	41	22	20	11	23	10	2	5	5	8	0	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	0	0	0		
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	0	0	0	0	0	0	0	0	0	0		
72	23	20	31	36	29	19	33	89	61	86	76	65	66	86	77	6																						

Table 5.36. Atlantic menhaden length frequency, spring and fall, 1 cm intervals, 1996-2019.

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.

length	Spring																							
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	0	0	0
9	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	125	0	0	0
10	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	7	0	0	0	115	0	0	0
11	0	0	0	1	0	0	13	0	0	0	0	0	0	0	0	0	3	0	0	0	72	0	0	0
12	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	15	0	0	0	39	0	0	0
13	0	0	0	0	0	0	6	0	0	0	2	0	0	0	0	0	8	0	0	0	8	0	0	0
14	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	5	0	0	0	3	0	0	0
15	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	1	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	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	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	0	0	0	0	0
20	0	0	0	0	1	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	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0
22	0	0	0	0	0	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	1	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	1	0	0	1	1	1	0	1
26	0	0	0	0	0	0	1	0	0	0	0	4	0	0	0	0	2	3	6	0	3	8	9	6
27	0	0	0	0	0	0	1	0	0	0	0	6	2	3	1	4	14	25	46	24	10	15	10	21
28	0	1	0	0	1	0	1	0	0	0	5	4	9	5	10	33	32	81	53	23	36	22	33	
29	0	1	0	0	1	0	0	1	3	0	1	5	2	2	1	18	53	59	79	75	34	40	17	35
30	0	1	0	0	0	0	1	1	0	0	4	1	5	0	10	28	27	34	54	13	18	13	35	
31	0	3	0	0	0	0	0	0	1	0	2	4	1	0	0	1	12	13	19	20	3	4	3	2
32	0	0	0	0	1	0	3	0	0	0	0	0	0	0	0	1	0	1	2	1	0	0	0	0
33	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
34	0	0	0	0	2	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	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	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	0	0	0	0	0	0	0	0	0	0	0	0	1	0
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0
Total	0	6	0	1	9	0	47	2	5	1	5	33	10	19	7	43	195	162	267	229	557	122	77	134

length	Fall																							
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
4	0	0	0	0	0	0	0	1	0	0	0	0	0	-	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	1	0	0	0	2
6	0	0	0	0	0	0	0	17	1	0	0	24	0	0	-	0	1	1	0	1	0	2	0	4
7	1	0	0	20	12	0	2	32	26	0	1	39	2	0	-	0	0	0	0	34	1	9	1	4
8	0	1	18	51	73	0	6	22	178	11	0	32	2	2	-	0	0	0	58	1	10	0	2	
9	0	11	53	152	128	0	8	9	135	22	0	12	6	0	-	0	0	0	73	0	8	0	0	
10	1	5	120	471	125	1	9	1	143	19	0	34	3	3	-	0	1	0	2	70	0	3	1	4
11	0	6	49	337	51	25	14	1	47	13	2	51	2	4	-	0	0	0	1	30	2	1	0	6
12	0	11	44	25	35	30	10	1	18	9	8	24	1	5	-	6	0	4	5	22	11	3	2	1
13	0	0	20	2	15	16	14	4	1	1	1	49	0	4	-	7	1	5	0	5	42	7	3	1
14	0	2	0	0	6	7	20	2	0	3	2	7	0	3	-	9	0	4	0	2	112	3	1	1
15	0	0	0	0	2	4	24	0	0	1	0	1	1	5	-	6	1	1	0	0	90	1	2	0
16	0	0	0	0	2	0	8	0	0	2	1	1	4	4	-	3	0	1	0	0	19	0	0	0
17	0	0	0	0	3	0	12	0	0	0	0	0	3	0	-	0	1	0	0	0	2	0	0	0
18	0	0	0	0	0	0	17	0	0	0	0	0	0	1	-	0	2	0	0	0	0	0	0	0
19	0	0	0	0	0	0	16	0	0	0	0	0	0	1	-	0	2	0	0	0	0	0	0	0
20	0	0	0	1	0	0	2	0	0	0	0	0	0	0	-	0	2	0	0	0	0	0	0	0
21	0	0	0	1	0	0	1	0	0	1	0	0	0	0	-	0	1	0	0	0	0	0	0	0
22	0	0	0	0	0	0	1	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
24	0	0	0	1	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	3	1	2	1	1
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	1	7	5	1	2	4	12
26	0	0	0	0	0	0	1	0	0	0	0	3	0	0	-	0	7	2	2	14	2	3	13	34
27	2	0	0	0	0	0	1	0	0	1	0	21	9	4	-	4	27	6	68	131	11	11	24	101
28	3	1	0	3	0	0	2	0	3	4	0	35	2	7	-	18	68	13	164	249	17	22	47	180
29	23	17	0	6	1	0	18	5	10	21	2	31	1	1	-	48	66	12	132	233	4	14	35	192
30	30	25	0	28	3	0	29	8	44	54	2	18	0	5	-	30	35	14	63	100	1	11	8	93
31	11	17	1	42	7	1	39	8	65	43	2	7	0	2	-	4	11	5	2	18	0	4	8	38
32	2	6	1	27	12	0	27	3	51	21	1	2	0	0	-	2	0	1	9	2	0	1	1	5
33	0	1	0	19	4	2	25	2	10	5	0	0	0	0	-	0	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	0	0	0	0	0
35	0	0	0	0	1	0	5	0	1	1	0	0	0	0	-	0	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	70	455	1,051	317	117	151	681

Table 5.37. Black sea bass length frequencies, spring, 1 cm intervals, 1986-2019.

Since 1987, black sea bass have been measured from every tow.

length	Spring																																						
	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	2015	2016	2017	2018	2019					
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	0	0	0	1					
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	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	0	0	0	0	0	2				
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	0	0	1	0	1	0	0	0	0	6				
8	0	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	3	0	2	0	0	0	0	0	13				
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	1	0	9	2	2	0	0	0	0	1	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	0	0	0	2	4					
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	0	0	0	0	4					
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	1	2	0	1	3					
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	0	0	0	2	1					
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	0	0	0	1	0	1				
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	2	0	0	1	7	1	0	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	0	0	0	9	2	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	4	0	0	0	0	14	2	0	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	6	1	0	1	15	1	0	0	0				
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	14	1	1	0	12	9	0	0	0				
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	24	9	0	2	22	15	3	0	0				
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	1	33	9	2	0	23	7	2	0	0				
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	0	2	14	24	4	0	0			
23	0	1	0	0	2	0	0	1	1	0	3	0	1	0	1	2	1	0	2	1	0	0	4	3	3	1	2	4	22	10	8	2	13	25	2	0	0		
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	1	5	8	27	5	0	0			
25	2	0	0	2	0	1	2	2	1	0	2	1	0	0	0	2	0	1	0	0	4	1	2	0	2	1	11	39	4	6	3	51	9	0	0	0			
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	6	4	3	87	20	0	0	0		
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	7	5	2	124	33	0	0	0		
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	3	2	125	5	2	2	155	81	0	0	0			
29	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	2	0	6	0	0	1	1	2	4	0	3	0	152	17	2	1	132	92	0	0	0			
30	0	0	0	1	2	0	0	1	2	0	0	1	0	1	3	1	0	4	0	0	0	0	2	4	1	2	0	139	41	8	14	100	119	0	0	0			
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	51	8	6	79	138	0	0	0		
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	94	12	10	30	141	0	0	0		
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	91	27	10	32	128	0	0	0		
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	106	50	13	22	108	0	0	0		
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	129	57	13	19	90	0	0	0		
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	107	89	31	14	51	0	0	0		
37	0	0	0	0	1	0	0	0	0	0	0	1	1	0	2	0	5	6	2	0	1	0	1	1	3	2	5	3	10	11	81	110	52	18	42	0	0	0	
38	1	0	1	0	0	1	0	0	0	0	0	0	0	0	1	3	2	11	3	0	1	0	1	0	4	2	4	8	4	9	62	102	60	21	20	0	0	0	
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	56	72	60	22	20	0	0	0		
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	38	77	80	23	17	0	0	0		
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	37	69	62	17	23	0	0	0		
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	21	67	44	30	19	0	0	0		
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	9	53	44	34	11	0	0	0	0	
44	2	0	0	1	0	2	0	0	0	0	0	0	0	0	0	5	2	1	1	1	0	0	0	0	1	2	3	1	10	36	44	22	19	0	0	0	0		
45	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	7	0	1	0	0	1	1	0	1	0	1	0	3	2	1	4	36	25	24	11	0	0	0	
46	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	6	2	1	0	0	0	1	0	0	1	2	2	2	2	2	25	24	22	17	0	0	0	0	
47	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	5	0	2	0	0	1	0	2	0	0	2	1	3	1	10	17	23	13	0	0	0	0		
48	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	1	0	1	4	15	14	8	15	0	0	0	0	
49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	1	0	0	0	0	0	0	1	3	0	4	10	20	8	12	0	0	0	0	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	1	0	0	2	2	11	9	5	0	0	0	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	1	1	2	0	10	5	4	0	0	0	0	0	
52	0	0	0	1	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	1	4	6	6	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	0	1	3	6	2	0	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	1	1	0	0	1	2	1	2	1	0				

Table 5.38. Black sea bass length frequencies, fall, 1 cm intervals, 1986-2019.

Since 1987, black sea bass have been measured from every tow.

length	Fall																																		
	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	2015	2016	2017	2018	2019	
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	1	0	0	1	1	
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	0	1	2	2	0	
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	0	2	0	2	1	
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	1	1	1	3	0	
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	1	0	5	5	3	
8	0	2	0	1	0	4	0	1	2	0	1	0	0	1	5	8	0	15	2	0	4	0	2	-	1	2	1	2	1	0	4	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	0	1	5	2	0	
10	0	0	0	0	0	2	0	0	1	0	0	0	0	0	1	3	0	5	2	0	2	0	0	-	0	2	0	0	0	0	0	0	1	1	
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	0	0	0	0	2	
12	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	3	0	0	0	3	0	0	1	
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	-	0	4	0	0	0	3	1	0	4	
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	2	0	-	0	14	0	0	0	22	0	0	14	
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1	0	-	0	21	0	0	0	19	1	0	12	
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	0	15	2	0	12	
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	0	19	2	0	14	
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	0	5	6	0	14	
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	0	11	9	1	14	
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	0	5	6	0	7	
21	0	0	0	0	0	1	0	0	1	0	1	0	1	0	4	1	0	17	0	0	1	3	4	9	4	-	0	9	1	2	0	2	2	4	
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	0	0	3	0	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	0	1	6	2	1	
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	0	0	10	4	0	
25	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	2	-	0	0	14	1	0	1	5	3	1	
26	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	-	1	0	18	2	0	1	9	2	0	
27	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	0	0	1	0	2	-	1	1	15	3	3	5	8	3	0	
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	4	2	0	-	1	2	13	10	2	2	7	12	2	
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	2	6	3	14	2	
30	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	5	0	0	0	0	0	1	0	-	5	1	8	10	1	3	3	14	7	
31	0	0	0	0	1	0	2	0	0	0	0	0	0	1	0	1	1	0	0	0	2	1	0	-	4	1	4	21	4	2	4	17	6		
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	5	0	0	15	8	
33	0	0	0	0	2	0	0	0	0	0	0	0	0	3	2	0	0	0	2	0	0	0	0	0	-	1	1	4	23	3	1	0	8	11	
34	0	0	1	0	2	0	0	0	0	0	0	0	0	0	2	2	0	0	1	0	1	1	0	-	1	1	0	21	9	4	0	8	20		
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	11	3	0	12	18	
36	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	8	3	1	11	16		
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	6	2	2	2	13	
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	5	6	0	3	11	
39	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	2	0	1	-	2	2	1	7	8	7	2	0	9		
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	13	7	2	0	6	
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	4	10	3	0	5	
42	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	2	0	0	0	-	3	4	3	2	5	7	6	0	4		
43	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	4	4	2	1	4		
44	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	3	1	0	0	0	0	0	0	-	1	3	2	0	2	5	4	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	3	1	1	0	2	2	0		
46	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	1	3	5	0	3		
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	1	0	1	0	5	3	1	0		
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	-	0	2	2	0	0	2	5	3	3		
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	1	0	0	6	3	2	1		
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	1	2	0	2	6	2	1		
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	1	0	0	0	0	1	0	1		
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	1	1	1	0	0	0	1	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	0	1	0	0	0	0	1		
54	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	0	0	0	0	1	0	
55	0	0	0	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	
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	0	0	0	0	0	1	0	
57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	0	0
58	0	0	0																																

Table 5.39. Blueback herring length frequencies, spring and fall, 1 cm intervals, 1989-2019.

From 1989 - 1990, lengths were recorded from the first three tows of each day; since 1991, lengths have been recorded from every tow.

length	Spring																														
	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	2015	2016	2017	2018	2019
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	6	0	0	0	0
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	17	3	0	0	4
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	30	13	0	0	17
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	24	45	0	9	17
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	32	52	0	22	27
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	29	40	0	37	7
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	10	23	0	4	7
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	3	5	0	3	2
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	1	0	6	2	2
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	0	1	0	24	1
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	0	0	0	78	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	0	1	0	162	2
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	1	2	0	143	3
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	0	0	0	42	1
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	0	0	0	23	1
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	1	0	0	15	3
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	0	1	0	6	4
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	0	0	0	0	11
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	0	0	0	0	2
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	0	0	0	0	1
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	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	0	0	0	0	1
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	153	187	0	574	113

length	Fall																														
	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	2015	2016	2017	2018	2019
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	4	0
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	0	0	0	2	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	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	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	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	0	0	1	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	1	0	1	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	1	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	0	0	3	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	0	17	0	5	
14	77	0	1	6	18	247	40	1	111	28	1	0	117	7	0	17	3	8	1	1	3	-	4	0	2	26	151	31	0	4	
15	24	0	0	1	20	94	3	3	34	16	0	3	52	3	4	6	2	4	14	2	5	-	9	0	3	60	92	37	0	0	
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	6	1	14	0	0
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	0	0	1	0	0
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	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	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	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	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	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	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	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	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	-	25	1	0	10	94	261	88	6	10

Table 5.41. Bluefish length frequencies, fall, 1 cm intervals, 1984-2019.

Bluefish lengths were recorded from every tow.

length	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	2015	2016	2017	2018	2019		
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	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	0	0	0	0	0	1	
7	0	1	0	0	0	0	0	0	2	33	0	1	0	0	3	12	2	0	1	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
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	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	2	1	0	0	14		
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	13	16	12	4	43		
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	110	93	75	9	59		
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	170	268	191	27	122		
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	229	334	273	56	226		
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	576	373	182	273	24	235		
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	484	121	214	17	213		
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	439	111	62	26	183		
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	217	106	156	23	153		
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	157	116	297	14	173		
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	138	198	323	48	179		
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	46	229	226	49	152		
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	50	172	108	82	89		
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	51	159	46	101	64		
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	68	103	27	48	32		
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	27	76	12	34	9		
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	18	24	8	19	4		
26	0	5	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	6	26	4	5	3			
27	2	0	0	0	5	4	5	0	2	8	2	0	0	59	165	0	4	21	0	0	11	7	8	2	0	0	0	0	2	0	0	1	1	2	7	1		
28	0	0	0	0	0	0	0	1	0	0	1	0	0	0	4	44	0	5	1	0	8	7	2	1	0	0	0	1	2	0	0	1	1	0	1	0	2	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	0	1	0	1	0	0	0	
30	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0	0	1	0	0	0	1	1	1	2	0	2	1	1		
31	0	0	0	1	0	0	1	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	3	0	0	1	
32	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	4	0	2	0	0	0	0	0	0	1	0	3	0	3	0	2	3
33	0	0	0	2	0	0	4	0	0	0	0	2	0	0	1	0	0	0	2	1	0	10	0	2	1	0	1	0	0	2	0	4	0	4	0	6	5	
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	0	3	0	8	6		
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	0	10	2	11	16		
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	1	3	0	3	0	3	0	15	10	
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	0	10	5	19	10		
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	1	19	2	22	4		
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	1	23	1	10	5		
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	2	42	2	2	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	5	27	2	0	1		
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	4	14	0	0	1		
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	3	2	1	0	0		
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	1	0	0	0	1		
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	0	1	2	0	0	0	1		
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	7	3	2	0	1	2	0	1	2	0	2	
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	1	5	1	1	1		
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	0	1	1	0	2		
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	0	3	1	0	6		
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	1	8	1	1	4		
51	12	31	18	5	5																																	

Table 5.42. Butterfish length frequencies, 1 cm intervals, spring and fall, 1986-1990, 1992-2019.

Prior to 2014, length frequencies of butterfish were taken from the first three tows of each day; since 2014, lengths have been recorded from every tow.

length	Spring																																		
	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	2015	2016	2017	2018	2019		
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	0	0	0	0			
4	0	0	0	0	0	0	0	2	0	0	0	0	3	0	9	0	15	0	1	8	1	5	0	3	3	3	3	0	2	2	0	1			
5	0	0	0	0	0	2	0	0	0	2	0	0	4	0	51	1	29	1	0	1	5	3	53	0	9	2	39	20	7	16	40	2	4		
6	0	0	0	0	0	0	0	35	0	21	3	0	0	207	0	7	20	0	2	0	1	276	1	35	6	109	35	65	9	110	13	0			
7	0	0	0	2	0	0	0	57	1	7	0	3	0	202	0	3	95	1	0	0	3	233	0	50	0	218	26	62	2	93	0	0			
8	0	0	0	2	0	0	0	18	0	0	0	0	1	107	0	0	101	2	4	0	0	228	0	34	3	76	14	35	2	8	1	4			
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	1	26	7	33	11		
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	50	539	8	46	23		
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	463	2916	46	269	14		
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	1063	6194	231	902	32		
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	668	3693	595	785	146		
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	552	1807	371	262	108		
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	443	1288	332	172	91		
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	387	1064	498	244	224		
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	311	645	502	279	226		
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	359	261	182	156	187		
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	265	45	65	93	181		
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	39	5	7	35	70		
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	10	1	1	3	14		
22	4	0	0	0	7	0	1	0	0	0	0	0	5	3	0	1	4	4	1	0	0	0	0	0	0	0	0	0	6	0	1	1	4		
23	0	0	0	0	1	2	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	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	0	1	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	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	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	0	0	0	0	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	4,788	18,515	3,099	3,296	1,340		

length	Fall																																	
	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	2015	2016	2017	2018	2019	
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	0	0
3	0	0	0	0	0	0	0	0	3	0	0	0	2	0	0	0	0	0	0	0	0	0	0	-	24	0	0	0	0	0	0	0	0	1
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	30	4	7		
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	108	98	85	98	49	
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	981	151	304	818	519	
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	2,164	3,546	12,643	2,448	862	3,639	2,722	
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	2,395	14,503	23,067	8,977	3,402	4,866	8,628	
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	2,127	20,159	6,886	13,489	5,562	5,006	12,747	
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	1,662	14,199	613	11,727	8,036	8,296	10,391	
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	5,337	666	4,517	5,992	8,175	4,438	
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	1,474	959	1,032	2,949	4,394	927	
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	836	88	669	1,070	487	
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	2,684	1,657	384	317	138	301	233	
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	2,051	1,342	627	928	351	330	150	
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	1,224	836	366	1,963	1,232	438	155	
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	176	1,069	1,031	340	157	
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	74	167	797	448	207	
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	62	75	651	316	156	
20	4	8	2	26	8	8	3	0	0	11	20	14	7	4	155</																			

Table 5.43. Clearnose skate length frequencies, spring, 1 cm intervals, 1993-2019.

length	Spring																											
	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
30	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	
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	1
47	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	0	0	1
48	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
49	0	0	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
50	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	1
51	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
52	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0	1	0
53	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	1	0
54	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2	1	4	2	0	0	0	0	0
55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0
56	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	1	1	2	0	1	0	0	0	2
57	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	1	0	1	0	0	0	0	0
58	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0	1	0	2	0	0	0	1
59	0	0	0	0	0	0	0	0	0	4	1	0	0	1	2	0	0	1	0	0	1	0	1	0	3	0	0	4
60	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	0	0	8	0	1	0	2	1	0	0	0
61	0	0	1	0	0	0	1	0	0	2	0	0	0	0	1	0	0	0	0	7	0	2	2	5	1	1	2	2
62	0	0	0	0	0	0	2	0	0	1	0	0	0	2	0	2	2	0	0	5	1	1	2	4	2	1	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	1	3	1	2	3	3
64	0	0	0	0	0	0	0	1	0	3	0	1	0	0	1	0	1	0	1	9	0	3	2	3	0	1	0	0
65	0	0	0	0	0	0	0	0	1	1	0	0	0	0	2	2	1	0	1	4	0	2	1	2	0	2	5	5
66	0	0	0	0	0	0	0	0	0	1	2	0	0	0	3	0	1	0	4	4	2	3	1	1	2	0	4	4
67	0	0	0	0	0	0	0	0	1	2	0	0	0	1	1	1	2	0	1	9	4	1	1	4	1	1	7	7
68	0	0	0	0	0	0	1	0	0	1	0	0	1	0	1	2	1	0	1	6	2	3	2	4	0	1	6	6
69	0	0	0	0	0	0	0	0	1	4	0	1	1	0	4	0	2	0	0	7	2	4	2	5	1	1	4	4
70	0	0	0	0	0	0	0	0	0	4	0	0	0	0	4	0	4	0	3	5	3	4	1	3	2	2	3	3
71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	4	0	1	1	5	2	3	3	3	3
72	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	1	0	0	3	1	2	1	2	2	0	3	3
73	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1	0	0	5	0	0	1	4	0	0	1	1
74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	1	1	1	0	1	0	1
75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	1	2	1	1	0	0
76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	1	1
77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	1	1
78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	2	0	0	2	0
79	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	1
80	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	3
81	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	2	1	0	0	1	1
82	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	1	1
83	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
84	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2
85	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	1	1	1
86	0	0	0	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
87	0	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
88	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
89	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
90	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
91	0	0	0	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
92	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
Total	0	0	1	0	0	0	5	3	6	31	8	5	2	9	22	12	21	1	13	95	24	42	35	64	19	23	69	

Table 5.44. Clearnose skate length frequencies, fall, 1 cm intervals, 1993-2019.

length	Fall																												
	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019		
16	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	0		
19	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	
20	0	0	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	
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	1	
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	1	0	0	
41	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	
43	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	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	3	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	1	0	0	0	0	0	0	0	
47	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	
48	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	
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	1	0	0	0	0	0	0	0	1	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	0	1	0	0	0	0	0	1	
52	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	
53	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	
54	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0	0	0	0	0	1	3	2	0	3	3	1	3	2	
55	0	0	0	0	0	0	0	1	0	0	0	3	2	1	1	0	0	0	1	2	0	3	1	0	0	1	0	1	
56	0	0	0	0	0	0	0	0	0	0	2	0	2	0	2	0	0	0	0	3	2	0	5	2	1	1	0	0	
57	0	0	0	0	0	0	0	0	0	1	0	0	4	0	0	1	0	1	0	1	4	1	0	4	0	0	0	1	
58	0	0	0	0	0	1	0	2	2	3	0	0	4	1	1	0	0	0	1	5	3	0	3	0	0	0	3	2	
59	2	0	0	0	0	1	0	1	3	0	0	0	1	2	0	0	0	0	3	1	4	2	8	0	0	1	0	0	
60	0	0	0	0	0	0	0	1	2	0	0	0	7	3	1	0	1	0	1	4	2	1	4	4	1	0	4	0	
61	0	0	0	0	0	1	0	4	1	2	1	7	3	1	0	1	0	3	9	4	0	6	1	3	3	2	2	1	
62	0	0	0	0	1	0	1	0	4	0	1	0	7	1	2	1	2	0	0	8	7	2	3	5	2	2	1	0	
63	0	0	0	0	0	2	3	1	0	2	0	0	2	2	1	2	1	0	3	9	12	0	2	1	2	4	2	0	
64	0	0	0	0	0	0	3	1	5	5	2	1	7	1	6	1	6	0	1	14	12	3	2	1	3	1	3	0	
65	0	0	0	0	0	3	1	2	1	1	2	1	7	1	6	1	6	0	1	14	12	3	2	1	3	1	3	0	
66	0	0	1	0	1	4	0	0	5	2	9	3	4	0	5	3	3	0	5	12	12	3	8	2	3	1	1	1	
67	0	0	0	1	0	1	2	1	3	2	5	4	6	2	3	2	4	0	1	17	17	4	2	6	0	3	1	0	
68	0	0	0	0	0	1	1	0	3	0	4	0	5	1	8	3	2	0	5	11	17	4	5	6	2	1	4	0	
69	0	0	0	0	0	0	0	3	3	0	3	1	11	2	6	0	1	0	3	11	19	8	3	6	6	1	1	0	
70	0	0	0	0	0	0	0	0	5	0	2	1	6	2	2	1	3	0	1	12	18	7	6	3	4	1	3	0	
71	0	0	0	0	0	0	0	0	4	0	5	1	2	1	5	2	1	0	1	9	10	3	5	3	1	6	1	0	
72	0	0	0	0	0	0	0	1	1	0	3	1	6	0	3	2	5	0	2	5	6	2	2	2	1	2	1	0	
73	0	0	0	0	0	0	0	0	3	3	1	0	1	1	3	1	2	0	0	3	10	3	3	5	2	3	1	0	
74	0	0	0	0	0	0	0	0	1	1	4	0	1	0	5	0	2	0	4	5	2	2	1	2	1	2	0	0	
75	0	0	0	0	0	1	0	1	1	2	0	0	2	0	4	1	2	0	1	4	4	1	2	2	2	3	0	0	
76	0	0	0	0	0	2	0	0	0	0	0	0	1	0	0	1	1	0	1	2	0	2	1	1	2	1	3	0	
77	0	0	2	0	0	0	0	0	1	4	0	0	0	0	3	1	0	0	0	4	1	1	0	1	0	3	0	0	
78	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	3	1	3	0	1	0	0	0	0	
79	0	0	0	0	0	0	1	0	0	0	1	2	1	0	4	1	0	0	0	3	0	2	0	1	0	0	1	0	
80	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	2	0	0	1	1	1	1	0	3	1	0	0	
81	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	2	1	0	0	1	0	0	2	0	0	1	2	0	
82	0	0	0	0	0	1	0	0	1	0	0	0	1	0	1	0	1	0	0	1	0	1	0	1	1	0	0	0	
83	0	0	0	0	0	0	1	0	0	0	0	1	1	0	1	0	0	0	0	1	0	0	2	1	0	1	1	0	
84	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
85	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	0	0	0	1	1	0	0	0	2	0	0	0	
86	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	2	0	0	1	0	0	0	0	0	0	
87	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
88	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	
89	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	2	0	1	2	0	0	0	
90	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	
91	0	0	0	0	0	0	0	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	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	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	1	0	0	0	0	0	0	1	
94	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	
95	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	
96	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	0	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	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	0	0	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	96	69	53	57	43		

Table 5.45. Fourspot flounder length frequencies, spring and fall, 2 cm intervals (midpoint given), 1989, 1990, 1996-2019.
Prior to 2014, Fourspot flounder lengths were recorded from the first three tows of each day; since 2014, lengths have been recorded from every tow.

length	Spring																									
	1989	1990	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
13	2	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0
15	5	2	0	0	5	5	0	0	3	0	3	0	0	0	0	0	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	0	3	0	0	0
19	19	19	8	16	14	61	22	5	89	8	8	0	6	7	7	4	2	1	24	2	6	3	12	2	0	2
21	17	42	31	60	13	28	26	4	99	6	4	1	18	11	9	10	3	10	42	11	5	1	51	6	0	3
23	11	341	198	161	16	32	239	42	33	8	4	14	24	9	17	6	5	45	56	20	9	1	79	10	7	0
25	56	528	279	353	105	72	422	181	84	124	26	71	29	44	39	37	33	157	258	185	64	19	211	53	37	14
27	103	225	208	456	209	97	256	300	199	228	82	75	33	105	81	91	55	150	441	209	172	52	235	105	137	75
29	120	139	193	392	233	81	201	245	191	187	129	64	44	170	108	127	55	107	461	189	179	87	185	104	188	152
31	89	60	117	192	137	66	139	153	175	163	178	68	61	121	94	90	69	93	303	139	107	77	111	48	146	126
33	51	27	54	76	60	60	81	45	89	88	113	52	36	52	70	51	36	49	92	100	78	41	69	15	65	123
35	8	33	15	22	16	25	39	11	26	47	35	31	13	43	34	31	24	27	31	27	29	26	39	9	13	34
37	2	12	6	3	4	7	12	8	7	12	5	11	4	9	11	7	9	9	4	16	8	6	10	6	6	8
39	0	4	3	0	2	1	1	2	3	6	2	3	1	7	2	0	4	5	0	0	0	3	2	0	1	1
41	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	1	0	0	0	0	1	0	0	0	0
43	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0
45	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
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	316	1,007	358	600	538

length	Fall																									
	1989	1990	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
5	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	1	-	0	0	0	0	0	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	0	0	0	0	0
9	5	0	0	23	19	0	2	2	0	4	1	0	2	1	1	7	-	4	0	0	3	1	0	0	0	0
11	9	4	2	46	27	5	4	17	5	2	12	4	5	0	7	16	-	17	3	1	11	3	0	0	1	0
13	10	15	5	68	22	24	6	25	3	3	9	9	13	2	8	59	-	28	4	11	26	20	3	0	5	2
15	6	17	35	55	21	42	5	15	9	0	13	17	4	5	11	45	-	22	13	10	47	23	9	0	4	0
17	0	0	42	16	3	16	1	0	3	0	1	26	3	2	16	20	-	4	12	2	49	11	8	0	3	0
19	0	0	22	0	0	4	1	0	1	0	0	2	0	0	7	6	-	0	0	4	5	1	2	0	0	0
21	0	0	0	2	2	3	2	0	2	0	1	0	0	1	0	0	-	0	0	1	0	0	0	0	0	0
23	1	2	9	2	5	0	17	1	5	0	0	0	1	1	0	1	-	0	0	0	1	0	3	0	1	0
25	0	3	42	7	16	5	58	3	7	3	4	1	0	6	1	2	-	2	3	0	1	0	1	0	5	0
27	0	7	41	10	22	4	77	5	13	7	6	5	0	7	1	6	-	1	9	2	4	1	4	1	19	2
29	0	3	24	5	22	5	54	10	18	11	13	5	0	20	6	8	-	1	11	2	4	4	9	3	32	9
31	0	1	20	3	6	3	25	1	18	4	30	6	0	12	5	6	-	1	6	2	8	2	6	0	25	8
33	0	0	6	1	1	1	7	1	13	7	19	2	1	3	1	11	-	3	6	0	0	5	1	2	10	9
35	0	0	4	0	1	0	5	0	6	5	6	7	0	4	4	1	-	2	2	2	1	0	2	1	3	1
37	0	0	0	0	0	0	2	1	3	0	2	0	0	0	0	1	-	1	0	0	0	0	1	0	2	0
39	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	-	0	0	0	0	0	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	71	49	7	110	31

Table 5.46. Hickory shad length frequencies, spring and fall, 1 cm intervals, 1991-2019.

Hickory shad were measured from every tow, with the exception of one fish in each of fall 1996, fall 1997, and fall 1998.

length	Spring																												
	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
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	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	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	0	0	0	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	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	0	0	0	0	3
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	0	2	0	0	2
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	0	1	0	0	0
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	0	3	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	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	0	1	0	0	1	0	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	0	0	0	0	0
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	0	0	1	0	0
27	0	0	0	0	0	1	0	1	0	1	0	1	0	0	18	3	5	0	1	0	0	3	0	2	0	0	0	1	0
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	1	1	0	0	0
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	1	1	1	0	0
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	0	4	0	0	1
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	0	2	0	0	0
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	1	0	0	0	0
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	1	0	0	0	1
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	2	1	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	1	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	2	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	0	0	0	0	0
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	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	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	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	1	0	0	0	0	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	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	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
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
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	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	9	16	2	2	7

length	Fall																												
	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
19	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
20	0	0	0	0	0	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	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	0	0	0	0	0
23	0	0	0	3	0	0	0	0	1	0	0	0	0	0	0	2	0	0	-	2	1	0	0	0	0	0	0	0	0
24	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1	0	0	-	2	1	0	0	0	0	0	0	0	1
25	0	0	0	6	0	1	1	0	2	0	0	0	0	0	2	1	2	0	-	0	2	0	0	0	1	0	0	0	0
26	0	1	2	8	0	3	1	0	5	0	0	0	0	4	3	0	0	0	-	3	1	0	0	0	0	0	0	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	0	0	0	0	0
28	0	1	0	1	0	3	0	0	2	0	0	1	0	1	1	1	0	0	-	0	1	3	0	0	0	0	0	0	0
29	0	0	0	2	0	0	0	0	0	2	0	0	0	1	2	3	0	0	-	0	4	7	0	1	1	1	0	0	0
30	0	1	0	1	1	0	1	0	0	0	0	0	0	8	7	2	0	3	-	0	3	7	2	0	0	0	0	1	0
31	0	0	1	0	1	0	2	1	2	0	0	0	1	0	15	1	2	0	-	0	7	5	1	0	0	0	0	2	0
32	0	1	0	0	1	2	2	1	7	3	1	0	2	0	12	1	1	0	-	0	3	1	0	1	0	1	0	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	0	0	0	1	0
34	0	2	0	0	1	4	2	0	3	4	0	1	1	0	5	1	0	0	-	0	4	1	1	1	1	0	0	0	3
35	0	0	2	0	0	0	0	0	0	2	0	0	0	2	1	1	0	0	-	0	0	1	0	0	0	0	0	0	0
36	0	1	0	0	0	0	0	0	0	0	0	1	0	1	2	1	0	0	-	0	1	1	1	0	0	0	0	0	0
37	0	1	1	0	0	0	1	0	2	1	0	0	0	1	2	0	0	0	-	0	0	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	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	0	0	0	0	0	0	0	0	0	0	2	1	0	1	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	1	0	0	0	-	0	0	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	3	2	2	4	4

Table 5.47. Horseshoe crab length frequencies by sex, spring, 1 cm intervals, 1998-2019.

Horseshoe crabs were measured (prosomal width) from every tow.

Sex	length	1998*	Spring																				
			1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
F	13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F	14	1	3	0	1	2	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
F	15	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2
F	16	1	0	0	3	2	1	1	0	0	1	0	0	0	1	0	2	0	0	0	0	0	1
F	17	1	0	2	2	1	4	1	0	1	1	0	0	0	1	0	0	1	0	0	0	0	2
F	18	2	1	0	3	2	4	0	0	2	1	1	0	0	0	2	3	1	0	0	0	0	1
F	19	4	1	2	2	5	5	0	0	3	4	1	0	0	2	0	5	1	2	0	3	3	
F	20	5	2	0	7	1	2	3	0	3	2	0	0	1	2	0	4	0	0	0	0	4	
F	21	8	2	1	8	6	2	1	0	3	8	1	0	3	5	4	5	3	4	0	3	4	
F	22	8	6	4	13	10	7	2	0	10	4	6	0	3	3	2	3	3	2	0	0	8	
F	23	14	15	18	19	22	17	3	2	9	14	4	3	4	9	7	14	7	4	4	8	4	
F	24	15	7	15	32	29	25	5	4	15	11	12	6	3	15	19	13	3	5	3	8	9	
F	25	15	10	23	25	22	20	8	5	11	16	10	9	9	14	19	11	11	14	4	13	12	
F	26	23	13	28	26	22	23	3	2	16	12	10	4	16	14	17	26	9	4	0	9	11	
F	27	15	9	18	18	18	18	8	4	10	9	9	5	18	11	8	22	10	6	2	11	13	
F	28	8	6	9	6	7	4	2	2	5	4	10	3	8	10	13	9	3	2	1	8	7	
F	29	3	0	3	4	4	4	0	3	5	1	3	4	1	3	2	3	1	0	1	4	2	
F	30	1	0	3	2	0	0	3	2	0	2	1	1	4	0	1	1	1	0	0	0	0	
F	31	0	0	0	0	4	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	
F	32	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
M	14	0	0	0	0	0	0	0	0	1	0	0	0	0	0	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	0	0	0	0	0	
M	16	0	0	0	2	5	2	0	1	2	0	0	2	0	0	0	0	0	0	0	1	0	
M	17	5	2	4	7	9	9	0	0	3	2	3	0	1	5	0	1	1	1	0	2	2	
M	18	11	8	12	19	24	21	2	0	17	10	3	2	5	7	6	9	4	3	1	4	5	
M	19	22	13	32	42	25	33	3	0	19	12	10	7	7	8	16	17	7	5	1	3	13	
M	20	15	16	30	20	33	31	7	0	21	10	11	7	15	13	10	13	12	2	0	12	14	
M	21	18	5	13	14	16	10	1	0	6	12	5	3	3	9	6	6	7	1	0	8	6	
M	22	4	5	7	6	7	6	2	0	4	2	1	1	4	5	3	1	0	0	0	2	2	
M	23	1	0	3	1	4	2	1	0	0	1	1	0	0	0	2	1	0	0	0	2	1	
M	24	2	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	
M	25	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	3	1	0	0	0	0	
M	26	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
M	27	0	0	0	0	0	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	0	0	0	0	0	
M	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	
M	30	0	0	0	1	0	0	0	0	0	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	0	0	0	0	0	
Total		51	204	125	228	285	285	251	60	25	166	141	104	57	105	138	138	173	88	55	17	101	126

*note: horseshoe crabs were not sexed during the spring of 1998.

Table 5.48. Horseshoe crab length frequencies by sex, fall, 1 cm intervals, 1998-2019.

Horseshoe crabs were measured (prosomal width) from every tow.

Sex	length	Fall																					
		1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
F	13	0	0	2	0	0	0	3	0	1	0	0	0	-	0	0	0	0	2	0	0	0	0
F	14	0	0	0	0	0	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	0	0	0	1	1
F	16	0	0	0	0	0	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	1	0	0	0	0
F	18	0	2	0	1	0	1	1	1	0	0	0	0	-	0	0	0	0	1	1	1	0	1
F	19	3	2	2	2	0	1	0	0	1	0	1	1	-	0	0	0	2	1	0	0	2	0
F	20	5	1	1	4	4	2	3	0	2	0	0	2	-	0	0	0	0	1	1	1	0	1
F	21	3	2	2	3	1	4	6	3	1	1	1	0	-	0	0	0	1	2	1	0	1	0
F	22	3	8	13	13	10	3	9	4	1	2	6	6	-	6	0	2	2	0	1	1	1	4
F	23	8	15	15	12	8	8	13	10	7	7	6	14	-	6	2	3	4	6	9	6	5	5
F	24	7	19	30	27	21	9	24	10	6	17	14	22	-	18	10	12	8	10	14	4	13	4
F	25	17	12	20	31	33	13	19	6	12	26	17	17	-	19	9	11	11	7	17	13	23	8
F	26	19	23	33	31	18	9	29	12	10	22	15	24	-	25	16	27	10	9	12	12	26	20
F	27	14	7	21	22	18	7	22	8	3	17	11	28	-	16	5	15	10	3	9	12	19	7
F	28	2	4	10	8	13	6	15	5	4	8	11	22	-	11	3	10	6	5	6	9	13	6
F	29	2	3	2	5	2	3	8	2	0	4	1	5	-	2	4	2	3	1	2	2	2	1
F	30	0	1	1	2	0	2	1	2	0	2	0	2	-	0	1	2	0	0	1	2	1	1
F	31	0	1	0	0	1	0	0	2	0	0	0	1	-	0	0	0	1	0	1	0	0	0
F	32	0	0	0	0	0	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	0	0	0	0	0
F	34	0	0	0	0	0	1	0	0	0	0	0	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	0	0	0	0	0
M	12	0	0	0	0	0	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	0	0	0	0	0
M	14	0	0	0	0	0	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	0	0	0	0	0
M	16	0	0	2	1	5	3	0	0	0	1	1	0	-	1	0	0	0	0	0	0	0	0
M	17	6	5	7	6	3	5	11	0	1	3	1	2	-	3	0	1	1	1	1	1	3	3
M	18	12	14	28	18	14	15	21	3	9	3	9	18	-	13	4	2	5	1	7	2	2	5
M	19	10	20	39	27	31	11	39	13	4	12	21	14	-	9	4	6	13	3	5	6	8	8
M	20	20	23	35	32	22	8	30	12	9	19	23	31	-	10	1	17	4	9	7	8	18	10
M	21	6	11	18	15	9	4	15	4	2	10	6	13	-	7	1	7	6	4	8	8	10	2
M	22	5	3	8	4	6	0	10	2	5	6	2	5	-	6	0	5	0	1	3	4	6	1
M	23	0	0	3	2	6	1	1	0	2	3	1	3	-	0	1	2	0	0	1	1	0	1
M	24	0	0	1	3	0	0	1	0	1	2	0	2	-	0	0	0	0	0	0	1	0	1
M	25	0	0	2	0	0	0	0	0	0	0	0	1	-	0	0	1	0	0	0	0	0	0
M	26	2	0	0	3	0	0	0	0	1	0	0	1	-	0	0	0	0	0	0	0	0	0
M	27	0	0	0	0	0	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	0	0	0	0	0
M	29	0	0	0	1	0	0	0	0	0	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	125	87	66	109	94	155	90

Table 5.49. Long-finned squid length frequencies, spring, 1 cm intervals, 1986-1990, 1992-2019.

From 1986 – 1990, and 1992-2013, Length frequencies of squid taken from the first three tows of each day; since 2014, lengths have been recorded from every tow.

length	Spring																																		
	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	2015	2016	2017	2018	2019		
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	0	0	2	2	0		
3	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	2	4	17	33	9			
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	36	29	35	65	43		
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	111	70	59	123	37		
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	117	63	45	86	24		
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	58	52	33	89	17		
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	52	48	26	52	27		
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	45	39	27	58	14		
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	83	70	38	61	38		
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	125	144	49	86	29		
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	213	229	61	89	58		
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	155	313	75	95	62		
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	166	251	92	109	58		
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	95	160	65	78	68		
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	70	90	54	85	39		
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	86	90	32	54	34		
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	54	88	22	47	27		
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	45	70	14	39	18		
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	45	67	21	26	16		
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	36	26	13	24	17		
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	26	42	7	15	12		
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	10	32	12	21	9		
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	5	16	7	13	12		
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	1	14	5	10	7		
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	1	8	0	8	4		
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	0	4	5	6	3		
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	1	0	1	6	4		
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	0	0	0	0	2	0	
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	0	0	0	0	2	0	
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	0	1	0	0	0	0	
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	0	0	0	0	0	0	
33	0	25	7	7	6	9	0	1	5	0	1	5	0	1	1	0	1	0	0	0	1	0	0	2	0	0	0	0	0	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	0	0	0	0	0	0	
35	1	38	0	0	2	0	0	1	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
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	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	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	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	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	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	1,638	2,020	817	1,382	688		

Table 5.50. Long-finned squid length frequencies, fall, 1 cm intervals, 1986-1990, 1992-2019.

From 1986 – 1990, and 1992-2013, Length frequencies of squid taken from the first three tows of each day; since 2014, lengths have been recorded from every tow.

length	Fall																																	
	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	2015	2016	2017	2018	2019	
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	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	60	68	30	75	
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	30	95	175	83	135	
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	85	91	108	293	262	
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	208	322	279	1222	937	
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	1,443	634	1,066	838	2328	1908	
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	1,814	1,818	1,475	1,650	2,342	1,867	
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	1,560	2,753	1,566	1,854	1,701	1,630	
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	1,394	3,618	1,633	1,805	1,041	1,270	
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	1,366	3,465	1,327	1,465	712	867	
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	1,198	3,348	1,015	1,234	536	507	
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	3,227	611	1,092	424	270	
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	2,233	545	780	313	139	
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	1,698	240	548	209	99	
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	1,340	132	427	194	95	
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	767	88	279	105	46	
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	489	42	257	79	54	
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	266	64	216	72	38	
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	282	14	119	35	14	
19	0	1	0	0	0	0	3	12	0	1	0	1	34	9	2	4	0	1	11	2	0	0	0	-	0	7	0	37	93	7	69	17	24	
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	156	9	60	12	3	
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	42	0	26	1	0	
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	4	0	14	7	7	
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	28	0	4	1	2	
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	1	0	3	0	0	
25	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	-	0	0	0	0	4	0	0	2	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	1	0	0	1	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	1	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	1	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	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	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	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	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	26,594	10,402	13,370	11,762	10,249	

Table 5.51. Scup length frequencies, spring, 1 cm intervals, 1984-2019.

Lengths were recorded from every tow.

length	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	2015	2016	2017	2018	2019		
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	0	0	0	0	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	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	0	1	0	13	0	0	0	0	0	0	0	0	72	8	0	3
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	32	2,674	27	15	102		
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	435	15,025	475	340	373		
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	2,585	27,025	1,615	1,191	729		
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	3,918	23,949	1,143	796	553		
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	2,111	12,415	644	241	185		
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	785	6,004	622	60	78		
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	86	2,758	2,738	314	36		
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	60	556	8,588	1,836	141		
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	229	3,003	7,944	3,322	751		
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	784	9,775	3,796	5,607	1,098		
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	1,319	10,201	1,916	10,492	995		
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	1,196	5,162	1,282	9,542	2,155		
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	593	1,389	3,012	5,012	5,114		
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	371	618	3,939	3,119	6,183		
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	510	1,214	3,105	3,055	4,696		
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	699	1,311	1,618	2,679	3,222		
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	802	1,012	917	1,699	2,229		
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	896	1,010	612	1,030	1,696		
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	847	1,220	564	664	1,144		
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	426	1,367	590	431	720		
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	243	1,206	722	439	541		
29	1	14	6	3	2	0	0	2	2	0	0	0	0	1	0	1	6	19	36	147	81	331	332	622	115	198	234	153	468	565	753	346	155	741	530	472	407	
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	158	435	390	278	308		
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	118	324	195	200	207		
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	148	262	154	132	138		
33	0	2	1	0	0	0	0	0	0	0	0	1	0	0	0	0	4	2	11	4	11	16	266	65	57	57	14	78	105	152	100	102	166	99	72	52		
34	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	3	1	4	2	8	1	30	37	47	16	4	44	63	106	61	63	127	60	43	37		
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	3	0	1	2	17	18	26	10	4	32	31	36	20	31	109	55	26	27		
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	34	48	14	12	7		
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	8	41	8	4	3		
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	10	28	8	3	4		
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	0	1	0	3	2	3	0	3	3	2	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	0	0	0	0	0	1	3	0	1	3	0	0	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	0	1	2	0	0	0	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	0	0	0	0	0	0	0	0	0	0	0	0	1	1
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	0	1	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	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	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	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	0	0	1	0	0	0	0	0	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	19,760	131,250	47,392	53,127	33,937		

Table 5.52. Scup length frequencies, fall, 1 cm intervals, 1984-2019.

Lengths were recorded from every tow.

length	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	2015	2016	2017	2018	2019				
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	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	0	2	0	24	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	21	4	40	317	34				
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	799	55	136	691	253				
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	3,154	370	622	1,756	1,211				
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	8,512	1,759	2,740	2,464	2,398				
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	15,560	3,354	4,964	4,353	2,375				
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	11,241	1,747	5,374	4,135	1,608				
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	5,762	697	2,624	1,109	571				
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	2,094	1,073	676	373	115				
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	532	3,881	456	60	142				
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	281	6,261	1,054	206	584				
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	1,335	5,499	1,202	592	1,188				
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	2,361	3,665	1,117	556	1,101				
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	2,667	1,753	744	338	540				
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	1,813	575	1,039	334	147				
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	735	799	1,329	941	81				
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	218	1,942	1,027	1,849	197				
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	241	3,058	435	2,377	572				
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	397	1,819	451	1,885	1,150				
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	479	802	513	1,251	1,774				
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	337	667	409	816	1,459				
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	248	722	250	550	836				
25	46	49	38	27	4	6	21	47	23	12	17	1	12	5	66	49	96	769	726	1,072	146	59	181	123	170	-	822	112	238	277	313	576	196	380	520					
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	516	672	173	211	308				
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	400	798	133	129	177				
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	232	615	198	152	98				
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	145	564	159	97	92				
30	8	16	2	1	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	3	4	22	75	122	101	36	27	51	35	-	196	63	116	88	95	299	91	70	78
31	7	7	1	1	0	0	1	2	1	0	0	0	0	1	0	0	1	2	3	14	23	45	46	26	43	22	28	-	111	26	47	64	98	157	91	33	30			
32	2	1	0	0	0	0	3	0	0	0	1	0	0	0	0	1	0	0	0	1	14	25	18	20	37	20	21	-	76	17	36	49	76	94	47	17	17			
33	1	2	0	3	0	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	67	58	33	8	11			
34	0	1	0	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	18	40	31	5	8			
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	12	9	13	3	2				
36	0	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	5	2	3	1	2			
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	5	0	0	0	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	3	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	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	0	1	0	0	0	0	0			
Total	3,050	10,641	5,030	4,344	9,496	10,592	13,249	41,363	12,705	30,983	37,272	9,782	11,609	7,957	18,939	99,319	64,927	30,198	49,829	9,602	51,706	49,133	10,533	63,921	22,507	19,371	-	24,021	31,842	7,925	30,172	60,772	44,388	28,370	28,083	19,679				

Table 5.54. Striped bass length frequencies, fall, 2 cm intervals (midpoint given), 1984–2019.

All striped bass taken in the Survey were measured on each tow.

length	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	2015	2016	2017	2018	2019					
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	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	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	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	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	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	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	0	0	0	0	0	0	0	0	0	0	0	1	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	0	0	0	0	0	0	0	0	0	0	0	0			
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	0	0	2	4		
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	0	0	0	0	0	3	0	0	12	2		
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	0	0	0	0	0	0	0	0	0	0	0	0	14	1		
45	0	0	1	0	0	0	0	0	0	0	0	0	0	4	3	2	2	0	0	1	0	18	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	21	2
47	0	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	0	5	6	5	6	0	4	25	9	0			
49	0	0	0	0	0	0	0	0	0	0	1	0	0	9	2	9	1	0	0	0	14	2	4	22	1	1	0	0	6	5	3	5	0	1	17	4	0	0			
51	0	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	0	2	2	2	4	16	0	2	10	13	0			
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	0	2	2	4	7	18	1	4	11	7	0				
55	0	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	0	3	2	6	26	3	1	6	7	0				
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	15	4	2	2	5	0	0				
59	0	0	0	0	0	0	0	0	0	1	0	0	0	7	3	0	8	0	2	0	13	6	3	5	3	8	0	0	6	1	4	14	5	0	1	2	0				
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	0	2	1	2	4	10	10	1	3	6	0	0			
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	0	3	0	5	2	1	4	1	1	1	1	0			
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	0	6	0	2	1	4	4	1	0	1	0	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	0	3	0	0	5	2	3	0	0	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	0	2	0	2	1	1	2	1	0	1	0	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	0	1	2	0	1	1	1	1	1	0	0	1	0		
73	0	0	0	0	0	0	0	0	0	2	1	4	0	2	3	1	2	2	0	1	3	0	0	0	4	1	0	5	1	1	0	0	0	0	0	2	1	0	0		
75	0	0	0	0	0	0	0	1	0	0	1	2	1	1	0	1	3	2	1	1	1	2	0	1	0	0	0	1	1	0	1	1	0	0	0	0	2	0	0		
77	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1	4	0	4	0	1	0	0	2	3	0	0	5	1	0	1	0	0	0	1	1	2	0	0		
79	0	0	0	0	0	0	0	0	0	2	1	0	0	1	1	0	1	1	2	1	1	0	1	0	1	0	3	1	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	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	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	0	0	2	0	0	0	0	0	0	0	0		
85	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	2	1	0	1	0	3	0	1	0	0	0	1	0	1	0	1	0	1	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	0	0	0	0	0	0	0	0	1	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	0	0	1	0	0	1	0	0	0	0	0	0	0	0	
91	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	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	1	0	0	0	0	0	0	0	0	0	0	1	0	
95	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	2	0	0	0	0	0	0	0	0	0	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	0	2	1	5	0	0	0	0	0	0	0	0	0	0	0	0	1	0
99	0	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	0	0	0	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	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	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	
105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	0	1	0	1	0	0	0	0	0	0	0	0	0	0	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	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	0	1	0	0	0	0	0	0	0	0	0	0	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	128	36	27	132	72	0	0			

Table 5.55. Summer flounder length frequencies, spring, 1 cm intervals, 1984-2019.
All summer flounder taken in the Survey were measured, with the exception of one fish in 1990.

length	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	2015	2016	2017	2018	2019		
11	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	0	
12	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	
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
14	0	0	0	0	0	0	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0	0	0	1	0	0	0	0	0	7
16	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	14	0	0	4	0	0	0	0	0	0	0	0	0	5
17	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	1	1	3	0	0	1	0	0	0	0	0	0	1	9
18	0	0	0	19	0	0	1	0	0	0	0	0	0	1	0	0	0	2	0	0	2	1	0	26	0	1	3	0	0	0	0	2	0	0	2	0	0	15
19	0	0	0	17	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	11	1	2	7	0	0	0	1	3	1	0	1	0	11	
20	0	0	5	22	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	1	1	0	25	3	8	9	1	0	9	3	4	0	0	3	26		
21	0	0	6	17	0	0	0	0	0	0	3	2	1	0	0	0	1	0	0	3	0	0	0	21	2	8	12	0	0	6	2	15	0	0	12	38		
22	0	0	6	21	0	0	1	0	1	0	4	1	1	0	0	0	0	2	1	3	0	1	0	16	1	11	16	1	2	12	6	13	0	0	10	56		
23	0	0	4	10	1	0	0	3	1	0	5	0	1	2	0	0	0	4	0	9	1	1	21	2	10	21	3	0	9	9	22	0	0	8	85			
24	0	0	9	13	1	0	0	2	0	3	8	0	1	3	0	0	3	3	0	6	0	0	0	18	4	21	35	5	2	20	13	26	0	1	28	89		
25	1	0	13	20	1	0	2	4	1	6	12	1	1	7	1	2	3	2	2	21	3	3	0	3	3	22	51	16	2	22	16	40	3	5	32	117		
26	2	0	16	13	5	0	2	6	1	11	18	1	2	1	0	6	3	12	4	32	2	5	0	5	8	25	48	20	7	20	21	43	2	10	45	97		
27	6	0	27	12	15	0	5	6	5	11	14	2	9	9	2	8	4	14	9	47	6	9	0	6	5	30	45	30	15	38	40	45	5	8	41	80		
28	5	0	18	5	7	0	9	6	12	9	1	17	9	3	7	9	31	17	63	8	5	0	9	13	28	40	37	24	28	43	31	5	8	40	82			
29	2	0	21	1	11	0	6	11	2	6	9	8	28	13	2	24	13	29	33	72	17	5	2	10	21	25	38	53	32	28	49	25	9	24	38	37		
30	4	1	8	0	1	0	9	14	7	4	7	8	22	16	3	23	15	31	40	61	9	8	2	9	12	16	23	37	20	13	42	22	9	5	38	23		
31	5	0	9	3	17	0	10	9	5	8	12	4	22	11	1	20	8	22	49	42	5	11	3	10	16	8	14	55	31	20	32	27	16	6	18	27		
32	0	4	9	1	6	1	5	6	7	5	9	2	7	15	3	11	14	8	36	31	12	9	10	3	13	13	6	33	25	17	27	15	9	4	8	26		
33	0	3	4	4	6	0	7	4	1	2	13	0	7	10	4	11	14	8	20	24	6	6	11	3	12	13	4	37	19	19	37	10	11	7	7	34		
34	0	6	3	1	6	1	1	4	1	6	8	1	4	7	6	12	12	5	20	26	5	8	7	6	8	15	5	35	22	13	28	10	13	10	11	26		
35	2	2	1	1	7	2	0	1	5	1	8	1	8	4	5	11	10	5	21	23	8	4	10	3	6	5	2	46	36	23	23	11	10	8	8	22		
36	0	2	2	1	3	2	1	3	1	4	14	0	4	8	16	14	18	9	30	41	16	7	5	4	6	15	13	42	29	26	29	13	20	9	11	31		
37	1	1	2	4	5	0	0	3	1	2	6	1	6	12	12	12	17	11	27	35	18	1	9	8	4	13	3	27	31	38	19	17	5	2	5	31		
38	2	1	2	2	3	1	1	3	1	4	3	0	7	8	21	13	24	5	23	37	26	3	7	8	10	19	14	32	30	36	20	16	7	10	12	27		
39	1	2	1	2	2	0	1	2	1	3	4	0	5	8	17	5	12	7	38	34	25	6	3	14	4	17	6	23	37	25	13	11	10	5	13	21		
40	0	3	4	1	4	0	1	3	4	2	1	2	2	6	22	6	17	10	29	42	22	7	3	15	6	18	6	17	17	38	18	14	12	5	8	10		
41	1	0	3	0	4	2	0	3	1	2	5	1	3	4	13	8	16	8	23	35	26	6	2	11	11	17	6	21	17	30	15	8	5	4	7	12		
42	0	1	1	0	1	1	0	0	2	3	6	5	5	2	13	10	16	14	14	31	23	5	3	10	7	14	5	10	21	29	15	15	5	5	8	7		
43	0	0	2	0	1	1	0	0	0	1	0	2	1	4	9	6	10	14	27	25	5	2	20	6	14	8	15	22	17	15	5	9	2	12	13	13		
44	0	0	0	0	2	0	0	4	4	0	1	0	2	2	8	6	18	7	14	18	16	4	1	13	5	14	3	9	14	21	10	8	8	3	1	9		
45	0	0	1	1	1	0	0	4	0	0	3	0	3	2	7	5	11	9	7	15	2	1	3	13	1	16	4	10	9	18	13	9	5	1	1	7		
46	0	0	2	1	1	1	0	4	1	1	3	0	0	4	3	4	8	9	8	25	18	6	1	13	7	10	14	14	18	10	6	9	4	6	1	4		
47	0	0	1	2	2	0	1	0	1	0	0	0	1	2	6	6	10	5	12	18	10	5	2	12	7	4	6	12	10	11	6	6	5	5	3	3		
48	0	0	1	1	1	0	0	1	0	0	1	0	0	2	8	8	1	8	7	13	16	5	2	18	5	9	7	15	14	14	10	7	4	5	4	3		
49	1	0	0	0	0	2	0	1	1	0	1	1	3	0	4	9	6	2	7	19	10	1	1	18	4	4	3	5	9	6	7	3	5	5	4	4		
50	0	0	2	0	0	0	0	1	1	0	1	0	0	2	5	6	5	4	10	12	3	5	3	20	11	4	4	9	7	8	12	6	2	3	2	1		
51	0	0	3	0	1	0	0	0	0	0	0	0	1	1	10	3	3	8	9	7	10	3	4	6	4	12	5	6	8	10	4	2	6	1	5	0		
52	0	0	1	0	1	0	2	0	0	1	1	2	0	2	0	4	3	4	6	11	8	3	4	8	11	5	0	7	6	6	9	0	2	2	3	4		
53	0	0	0	0	0	0	0	1	0	0	0	0	3	3	5	5	2	4	4	10	8	3	0	2	4	3	2	11	2	7	9	8	1	2	2	1		
54	0	2	0	0	1	0	0	0	1	1	0	0	2	1	5	5	5	3	10	4	8	4	0	5	10	8	1	8	4	6	7	3	3	3	3	2		
55	0	0	1	0	0	1	0	0	0	1	1	0	1	1	1	3	3	5	4	6	6	1	2	6	8	6	1	7	4	7	10	1	2	1	2	2		
56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	3	5	7	2	3	1	1	9	13	8	0	7	1	3	7	3	1	2	5	5		
57	0	0	0	0	0	1	1	0	0	0	2	0	0	1	3	3	2	3	5	7	0	1	0	4	1	8	2	7	2	3	7	4	2	1	4	2		
58	0	0	0	0	1	0	0	0	0	1	0	0	1	1	1	6	5	1	2	6	4	3	0	4	4	8	1	6	3	5	1	2	4	3	6	3		
59	0	0	0	0	0	1	0	0	0	1	0	0	1	2	2	2	3	1	4	7	4	1	1	1	1	9	2	1	5	4	2	5	1	2	1	1		
60	0	1	0	0	0	0	0	0	0	1	1	0	1	0	1	2	0	1	4	1	2	2	0	1	2	4	2	3	0	2	2	0	1	1	0	2		
61	0																																					

Table 5.56. Summer flounder length frequencies, fall, 1 cm intervals, 1984-2019.
All summer flounder taken in the Survey were measured, with the exception of two fish in 1985.

length	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	2015	2016	2017	2018	2019		
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	0	0	0	0	0		
12	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	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	1	0	0	0	-	0	0	0	0	0	0	0	0	0	0	0	
14	0	0	0	0	0	0	0	0	0	0	0	0	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	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	0	0	0	0	0	1	0
16	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	1	1	0
17	0	0	2	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	0	0	0	0	-	0	0	0	0	0	0	0	0	0	2	0
18	0	2	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0	1	2	-	0	0	0	0	0	0	0	0	0	0	0	0
19	0	1	1	0	0	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	3	-	0	0	0	0	0	0	0	0	0	0	0
20	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2	4	-	0	0	2	0	0	1	0	2	0	0	
21	0	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	0	1	2	4	-	0	0	0	0	0	0	0	0	1	2	0	
22	0	2	1	0	0	0	0	0	0	1	0	1	2	0	0	0	0	1	3	0	1	0	0	0	5	1	-	0	0	1	3	0	0	2	2	0	0	
23	0	2	2	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	4	0	2	2	0	0	6	5	-	0	2	5	1	0	3	0	3	0	5	0
24	0	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	0	0	2	3	3	-	1	0	1	0	0	0	1	4	0	1	4	0
25	0	4	0	0	0	0	0	2	0	4	0	0	1	0	0	1	1	0	4	0	4	0	0	1	2	4	-	2	1	4	3	0	2	1	2	1	2	1
26	0	3	1	1	0	0	0	0	1	0	0	0	0	0	2	3	1	5	0	2	1	0	4	8	6	-	1	2	1	1	1	1	0	5	8	0	0	
27	0	3	2	0	0	0	1	1	0	0	0	0	0	0	0	1	8	0	12	0	3	1	0	0	9	8	-	3	1	3	0	0	3	4	3	0	0	
28	0	2	1	3	0	0	0	0	0	1	0	1	0	0	1	0	0	12	0	1	0	0	1	1	2	-	4	3	6	1	0	0	6	4	2	0	0	
29	0	0	1	4	0	0	0	1	0	1	0	0	0	0	0	2	1	7	0	9	1	0	5	7	4	-	1	2	7	4	5	1	7	6	4	0	0	
30	0	2	1	2	1	0	0	1	0	0	1	0	1	1	0	1	0	1	8	0	1	3	0	14	3	1	-	3	3	10	5	2	1	5	8	7	0	0
31	0	1	5	7	2	0	0	1	0	0	0	3	2	0	3	2	13	5	0	4	2	0	4	2	4	-	8	4	16	2	6	0	6	10	10	0	0	
32	3	0	7	13	4	0	0	2	0	3	4	5	2	7	0	5	2	9	6	0	3	15	2	10	1	3	-	8	12	26	4	10	2	7	11	14	0	0
33	7	0	3	17	6	0	3	1	3	5	4	3	10	10	1	11	1	19	8	3	3	18	3	4	1	5	-	21	22	19	6	17	6	8	17	12	0	0
34	8	1	21	15	7	0	5	3	5	16	5	7	18	17	8	6	3	37	23	6	1	31	2	12	0	17	-	25	15	17	4	9	10	12	13	26	0	0
35	14	3	12	20	13	0	5	8	9	13	2	6	15	20	3	12	5	67	47	9	2	24	0	7	1	17	-	10	27	16	8	15	11	10	19	13	0	0
36	12	4	21	16	18	0	6	14	12	8	3	4	16	17	4	22	14	54	52	10	3	20	1	11	1	20	-	23	32	20	12	16	9	10	22	7	0	
37	9	13	23	12	23	0	8	7	7	23	7	2	17	27	6	17	9	55	54	19	3	17	5	4	7	14	-	15	26	17	15	24	14	10	24	17	0	0
38	15	7	18	11	18	0	5	12	7	13	8	3	18	38	8	24	13	49	92	12	5	17	5	3	12	18	-	28	38	14	17	20	12	7	13	16	0	0
39	5	3	17	10	19	0	6	15	8	16	17	3	20	34	9	26	20	32	66	16	13	15	4	6	17	22	-	26	35	11	12	20	12	8	15	6	0	
40	11	5	10	9	21	0	8	22	3	24	7	5	30	26	7	27	18	39	79	8	12	26	8	7	16	19	-	22	28	25	13	27	15	7	9	7	0	
41	5	6	16	7	15	1	10	8	9	12	3	11	19	28	14	25	13	23	41	8	9	31	2	12	20	15	-	19	27	21	10	16	8	3	10	4	0	
42	8	11	18	1	12	1	9	5	6	10	3	5	14	16	20	29	20	16	32	10	14	18	7	9	17	16	-	15	22	12	8	8	19	3	3	6	0	
43	3	13	8	4	9	0	9	8	7	6	1	4	9	11	14	14	11	12	29	12	11	12	9	8	10	13	-	12	15	5	13	13	5	8	8	0	0	
44	2	7	4	2	10	0	6	9	7	2	2	0	5	4	15	10	7	3	45	10	14	13	8	8	5	11	-	11	8	16	11	10	11	3	2	6	0	
45	1	9	5	1	8	1	9	4	2	4	3	2	10	6	17	12	6	13	31	11	18	12	5	6	4	9	-	6	15	17	3	5	9	2	3	6	0	
46	0	8	5	1	7	0	3	0	4	8	1	1	7	5	20	4	1	9	22	8	16	8	2	4	3	18	-	2	7	9	6	7	11	5	6	3	0	
47	2	3	1	5	1	3	0	5	2	3	6	1	6	16	4	7	6	13	10	13	7	2	4	2	9	-	4	8	7	2	8	5	3	5	2	0	0	
48	1	6	0	2	2	2	2	1	3	1	4	0	4	2	10	1	12	14	11	6	16	6	4	6	3	14	-	5	7	8	3	4	9	4	1	2	0	
49	2	6	1	0	1	1	1	2	5	2	3	1	4	5	5	3	6	9	13	4	10	9	4	7	2	6	-	3	4	11	1	2	8	5	3	0	0	
50	2	1	2	0	1	1	0	5	2	3	0	1	3	3	5	4	5	10	7	4	6	2	1	6	1	5	-	1	12	5	1	4	2	5	3	0	0	
51	1	0	2	1	0	1	0	3	2	3	0	2	5	1	4	3	6	10	7	4	3	5	0	9	1	2	-	1	3	6	3	3	3	0	3	0	0	
52	0	1	0	0	0	2	1	3	3	2	1	0	2	2	1	7	4	3	4	2	7	4	4	7	0	7	-	1	5	1	3	3	4	2	2	1	0	
53	1	0	2	2	1	2	0	4	1	1	0	0	1	3	6	5	3	5	1	3	0	4	0	8	1	3	-	0	6	7	3	0	2	3	4	0	0	
54	0	2	1	0	0	0	1	3	2	0	0	1	0	2	1	1	4	5	0	0	1	0	2	3	0	4	-	3	2	5	1	5	1	1	4	1	0	
55	1	0	0	2	1	0	1	1	0	1	0	1	0	1	3	2	1	4	1	2	3	3	0	4	0	4	-	1	12	3	2	1	4	2	0	0	0	
56	0	0	1	2	1	0	0	0	1	1	0	0	0	2	0	0	1	3	5	1	3	0	0	2	1	1	-	0	0	3	1	1	2	0	1	0	0	
57	2	0	0	0	0	0	1	0	0	1	1	1	1	0	2	2	1	2	5	1	1	1	2	1	0	1	-	1	0	1	2	1	1	1	3	2	0	
58	0	0	0	0	1	0	1	0	0	1	2	0	0	2	1	4	2	1	6	3	1	0	0	4	0	0	-	1	0	2	1	2	1	1	0	1	0	0
59	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	2	1	3	1	1	2	1	0	4	0	4	-	0	2	1	2	2	0	0	2	1	0	0
60	0	0	0	1	0	0	0	0	0	1	0	0	0</																									

Table 5.57. Tautog length frequencies, spring, 1 cm intervals, 1984-2019.

All tautog taken in the Survey were measured.

length	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	2015	2016	2017	2018	2019		
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	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	0	0	0	0	0		
9	0	0	0	0	0	0	0	0	2	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	
10	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	
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	0	1	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	0	1	1	0	0	0	
13	0	0	0	1	1	0	4	1	0	1	0	0	2	1	0	0	0	2	0	0	3	0	0	0	0	1	0	1	0	1	4	2	1	1	2	0	1	0
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	0	6	0	1	0	0	
15	0	0	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	2	0	1	0	5	0	2	0	0	
16	0	0	0	3	1	3	6	1	0	0	2	0	3	3	0	0	0	1	1	0	1	0	1	0	1	2	1	0	0	2	2	0	1	3	0	0	5	
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	0	4	1	3	3	1	0	2	2	
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	0	5	0	0	3	0	
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	1	9	0	2	7	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	2	1	0	0	0	1	3	9	6	2	3	0	4	7	
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	3	6	2	3	5	0	
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	6	9	2	1	6	0	
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	8	1	2	3	4	0	
24	5	1	3	1	4	8	8	3	0	3	5	1	1	0	2	1	1	6	6	2	2	2	5	1	0	3	1	1	5	6	1	3	1	2	7	0	0	
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	6	2	1	7	4	0	
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	2	8	2	10	9	0	
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	7	8	3	4	4	0	
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	7	5	1	4	2	3	6	0	0	
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	6	5	0	3	11	0	
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	6	5	1	12	10	0	
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	11	9	0	4	11	0	
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	8	8	0	5	9	0	
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	13	7	4	9	9	0	
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	12	7	2	9	9	0	
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	13	16	3	8	15	0	
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	10	13	1	7	13	0	
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	16	8	2	9	7	0	
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	19	9	3	4	16	0	
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	14	12	3	12	9	0	
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	8	11	4	7	7	0	
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	21	16	0	6	9	0	
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	13	10	1	5	8	0	
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	12	8	3	7	7	0	
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	14	8	3	5	9	0	
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	10	6	3	1	8	0	
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	7	3	2	3	7	0	
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	10	0	1	1	8	0	
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	2	3	2	3	3	0	
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	2	7	4	1	9	0	
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	5	3	0	1	2	0	
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	2	0	1	2	1	0	
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	2	2	2	0	0	0	
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	1	0	1	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	0	2	1	1	0	0	
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	0	0	0	0	1	1	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														

Table 5.59. Weakfish length frequencies, spring, 2 cm intervals (midpoint given), 1984-2019.

Weakfish were measured from every tow.

length	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	2015	2016	2017	2018	2019	
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	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	0	2	0	2	1	3	0	1	11	2	1	8
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	3	93	6	0	50	
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	0	73	6	0	20	
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	0	15	9	1	4	
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	0	4	7	0	1	
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	0	5	7	0	2	
31	0	0	0	0	1	0	1	6	3	3	3	7	15	21	21	8	5	9	1	0	2	20	1	0	0	0	0	11	8	4	0	4	4	1	2		
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	17	1	0	0	10	13	1	6		
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	0	9	12	0	4	
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	0	13	8	2	10	
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	0	15	6	0	6	
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	0	5	2	1	1	
43	0	0	0	1	0	0	0	1	1	0	0	0	0	2	3	6	0	0	1	0	0	0	0	1	0	0	0	0	8	1	0	0	1	0	0	0	
45	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	4	1	0	0	0	0	0	0	0	0	0	0	0	3	1	4	0	0	0	0	0	
47	0	0	0	0	0	0	0	1	1	0	0	0	0	1	2	2	1	0	1	0	0	0	0	2	0	0	1	0	2	2	1	0	1	1	0	0	
49	0	0	1	0	0	0	0	0	0	0	0	1	0	1	5	3	1	0	1	0	0	0	4	1	0	0	0	0	1	4	0	0	0	0	0	0	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	1	3	0	0	0	3	0	1	1	
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	0	1	0	0	7	3	0	0	0	1	0	1	
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	1	0	0	0	1	
57	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	0	0	0	0	0	0	
59	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	0	0	0	0	0	
61	0	0	0	0	0	0	0	0	1	1	0	0	0	0	4	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	6	2	0	0	1	0	0	0	0	0	0	0	0	1	0	1	0	1	0	1	0	0
65	0	0	0	0	0	3	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
67	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	0	1	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	3	0	0	0	1	0	0	0	0	0	0	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	1	2	0	0	0	0	0	0	0	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	2	1	4	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0
75	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	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	2	0	0	0	2	0	0	0	0	0	0	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	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	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
83	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	5	261	88	7	117	

Table 5.60. Weakfish length frequencies, fall, 2 cm intervals (midpoint given), 1984-2019.

Weakfish were measured from every tow, with the exceptions of 968 juveniles in 1988 and 863 juveniles in 1989 that were not measured.

length	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	2015	2016	2017	2018	2019		
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	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	0	0	6	0	0	1	0	0	0	8	
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	10	16	1	60	181		
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	177	190	58	853	802		
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	1,418	305	457	588	1,237	831		
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	1,071	802	1,419	2,160	855		
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	3,602	2,305	1,785	2,110	1,556	391		
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	3,109	607	1,057	702	153		
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	1,780	215	281	415	59		
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	793	124	121	292	11		
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	374	1	10	123	0		
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	53	1	0	23	2		
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	1	7	3	3	15		
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	0	22	18	4	51		
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	14	47	37	28	111		
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	20	44	29	33	92		
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	16	45	12	21	33		
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	15	22	10	11	9		
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	16	9	10	7	9		
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	6	6	8	2	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	2	5	11	0	5		
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	1	6	6	3	5		
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	0	4	4	1	8		
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	0	5	7	1	8		
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	0	3	8	1	4		
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	1	5	3	0	0		
55	0	1	1	0	0	0	1	4	1	0	0	0	0	4	2	3	0	2	1	0	0	0	2	0	0	0	-	2	4	1	0	0	1	0	1	2		
57	1	2	0	0	2	0	0	0	3	0	0	0	0	2	2	4	2	0	1	0	0	0	1	0	0	0	-	2	1	1	0	0	0	0	0	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	0	0	0	1	1	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	0	0	0	0	0	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	0	0	0	0	0	0	
65	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	5	0	0	0	0	0	0	1	0	-	0	0	0	0	0	0	0	0	1	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	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	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	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	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	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	0	0	0	0	0	0	
79	2	2	4	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	
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	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	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	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	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	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	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	10,070	4,429	5,813	7,538	3,648		

Table 5.61. Windowpane flounder length frequencies, spring, 1 cm intervals, 1989, 1990, 1994-2019.

Prior to 2014, lengths were recorded from the first three tows of each day; since 2014, lengths have been recorded from every tow.

length	Spring																												
	1989	1990	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
4	0	0	1	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	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	3	1	0	2	0	
6	0	0	0	0	0	2	0	2	5	1	1	10	2	0	0	1	0	4	4	9	0	0	10	2	8	1	8	6	
7	0	0	0	0	1	4	2	4	17	2	7	22	3	0	0	7	3	8	9	9	5	0	7	0	26	5	10	11	
8	0	2	4	1	3	5	4	3	27	7	6	23	6	0	0	31	5	17	10	20	19	10	41	2	47	26	15	21	
9	0	40	16	3	2	9	5	2	11	10	21	20	11	0	0	18	6	10	13	24	16	4	31	1	133	34	31	32	
10	25	66	67	12	34	15	7	8	17	13	12	11	19	7	2	4	11	23	8	10	10	16	24	3	168	56	24	28	
11	69	96	169	86	79	37	19	20	5	29	8	3	24	12	1	4	11	8	7	11	10	20	8	3	105	42	24	19	
12	89	74	305	148	162	76	60	40	3	23	10	7	25	16	7	8	17	4	20	2	0	16	10	3	77	16	6	13	
13	337	53	362	259	288	136	131	37	10	29	5	9	58	25	12	22	13	6	72	9	3	8	15	9	35	11	5	3	
14	430	66	232	189	381	309	200	45	11	26	8	13	100	22	34	28	44	17	93	7	7	10	18	4	17	8	10	1	
15	414	124	152	180	487	362	211	96	24	43	15	13	101	23	42	60	51	37	107	15	32	19	15	11	9	0	5	3	
16	305	180	126	89	310	606	177	123	27	55	12	15	72	37	36	107	119	62	117	19	64	16	21	25	2	1	9	4	
17	174	212	209	70	331	754	130	165	23	73	9	15	65	22	48	129	137	97	166	23	81	17	26	36	4	0	5	9	
18	78	178	372	99	339	588	165	160	32	94	24	23	56	4	45	132	116	90	104	58	133	20	37	32	4	4	12	20	
19	65	132	357	139	548	440	260	194	26	78	19	26	45	16	20	110	101	75	124	58	155	30	37	46	7	9	19	39	
20	174	144	289	143	604	366	362	386	75	89	15	31	60	13	24	130	76	51	76	47	135	40	71	27	16	8	23	77	
21	216	116	217	85	567	429	461	357	136	95	22	45	32	22	24	186	122	50	88	66	97	62	75	26	16	10	59	82	
22	299	143	139	82	401	438	311	301	166	232	45	50	42	29	27	246	155	63	172	75	97	121	102	49	30	23	70	96	
23	319	108	163	57	409	368	229	217	138	290	110	92	39	42	28	181	216	92	198	107	117	140	170	57	49	33	85	112	
24	270	103	147	54	280	323	227	217	125	245	141	123	66	36	41	158	132	84	199	122	128	166	229	95	79	31	80	143	
25	177	87	183	54	236	231	188	206	121	208	133	111	109	47	31	162	118	82	155	134	121	142	228	96	83	52	79	126	
26	189	103	184	70	235	191	178	136	106	126	114	76	100	52	52	186	103	67	161	120	118	138	175	108	87	59	75	97	
27	138	79	138	56	187	222	162	161	91	88	69	88	86	49	37	104	100	60	148	103	102	86	145	89	68	41	54	85	
28	148	38	70	44	117	145	138	97	56	83	62	68	71	29	38	100	111	45	103	69	100	55	111	50	36	24	41	60	
29	78	26	68	24	97	98	67	53	47	59	41	37	48	24	24	65	52	30	146	42	70	41	56	42	14	25	31	38	
30	99	35	42	27	66	75	58	42	37	39	42	35	51	20	14	33	46	24	51	24	45	27	27	21	10	9	11	23	
31	50	20	25	12	31	23	34	39	12	25	19	22	32	13	8	14	22	11	67	25	33	12	21	13	5	9	8	15	
32	8	15	13	4	25	12	13	26	16	21	17	9	16	5	2	23	19	6	21	7	7	6	11	4	2	2	3	6	
33	16	3	2	9	5	8	6	3	8	15	7	2	10	1	3	2	5	1	33	14	13	8	5	3	2	2	3	1	
34	0	5	5	0	4	1	1	1	2	5	4	4	9	3	0	4	5	2	20	11	11	4	9	0	4	0	1	1	
35	0	4	5	1	3	0	3	4	5	10	2	4	5	0	0	3	3	3	11	1	4	2	5	3	1	1	1	1	
36	0	4	2	2	1	1	0	0	1	2	0	5	0	2	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0
37	0	0	0	1	0	0	3	1	1	2	2	1	1	0	0	0	0	0	8	0	0	0	0	0	0	0	0	1	
38	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
39	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	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
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
42	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	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	863	1,146	542	810	1,173	

Table 5.62. Windowpane flounder length frequencies, fall, 1 cm intervals, 1989, 1990, 1994-2019.

Prior to 2014, lengths were recorded from the first three tows of each day; since 2014, lengths have been recorded from every tow.

length	Fall																												
	1989	1990	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
6	1	0	1	0	0	0	0	0	3	1	0	0	3	0	0	0	0	1	-	0	0	0	0	0	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	0	0	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	0	0	0	0	0	
9	25	2	28	6	70	17	2	2	2	2	0	21	15	49	2	6	2	15	-	2	3	1	4	3	0	0	0	0	
10	18	11	78	10	165	50	2	4	3	9	1	20	22	67	1	14	5	17	-	9	6	7	9	1	0	0	2	0	
11	15	9	60	22	227	75	31	11	7	14	0	13	27	111	5	18	3	24	-	19	1	7	13	1	2	0	2	0	
12	16	12	50	15	270	107	33	6	9	9	1	6	16	155	2	26	15	29	-	31	5	6	7	0	1	0	0	3	
13	23	6	30	10	285	173	47	3	11	9	6	0	14	145	8	44	43	19	-	19	10	10	14	0	5	0	4	1	
14	33	14	11	13	306	154	48	5	23	6	0	4	8	109	3	36	58	27	-	36	14	10	14	4	9	3	5	1	
15	58	23	23	9	250	110	39	6	18	3	5	8	3	62	2	37	38	25	-	43	18	11	10	12	15	3	19	7	
16	140	38	15	16	181	60	34	3	11	3	5	9	3	33	0	30	28	31	-	41	19	13	24	8	24	5	24	7	
17	188	44	35	26	112	78	33	11	30	7	14	4	9	12	7	21	20	35	-	72	37	13	19	11	66	16	45	11	
18	91	53	47	48	101	119	54	11	15	12	8	11	2	8	19	19	16	47	-	70	19	19	28	16	63	34	57	27	
19	46	46	49	47	145	179	95	44	29	6	10	7	11	20	32	26	10	45	-	52	44	31	12	19	86	48	39	28	
20	49	28	39	48	131	213	96	67	30	13	9	6	18	30	39	39	31	24	-	41	50	29	18	18	62	93	29	36	
21	21	11	23	24	125	165	69	38	52	18	9	11	35	50	25	36	40	28	-	35	87	23	27	21	20	86	23	21	
22	14	14	16	19	65	123	37	18	28	22	21	2	25	48	25	42	25	26	-	51	58	28	34	23	8	51	20	12	
23	3	10	20	6	67	63	32	12	37	30	39	6	10	14	12	32	27	20	-	47	79	30	43	29	13	24	34	12	
24	9	4	7	9	25	49	13	11	33	19	39	11	15	13	9	19	32	23	-	40	45	15	55	24	9	8	43	16	
25	4	3	6	3	22	28	9	6	18	19	25	14	8	10	10	6	9	9	-	16	24	29	50	28	14	13	43	20	
26	2	0	8	3	19	29	9	4	16	9	10	18	4	3	4	8	16	6	-	18	22	17	29	25	15	15	29	15	
27	6	2	3	1	11	17	8	3	5	11	12	17	4	5	3	4	5	4	-	7	14	16	21	24	21	8	19	12	
28	2	1	4	1	3	12	1	1	4	5	6	9	2	3	3	3	2	7	-	9	1	13	7	5	5	12	8	11	
29	2	2	0	1	2	17	0	1	6	3	1	4	2	3	1	3	2	1	-	2	0	2	4	9	5	5	4	7	
30	2	1	2	1	0	5	0	0	1	2	2	2	0	1	1	0	0	0	-	3	1	2	2	2	2	2	6	3	1
31	0	0	0	0	0	0	0	0	0	1	0	3	1	2	0	0	2	1	-	0	0	1	1	3	0	0	1	2	
32	1	0	0	1	0	0	0	0	0	0	0	2	0	1	0	0	0	1	-	0	1	0	0	0	0	0	0	1	1
33	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	1
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	286	445	430	454	252	

Table 5.64. Winter flounder length frequencies, fall, 1 cm intervals, 1984-2019.

Winter flounder were measured from every tow.

length	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	2015	2016	2017	2018	2019		
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	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	0	1	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	
7	0	0	0	0	1	0	1	3	4	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	
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	0	0	1	0	0	0	
9	0	0	0	0	3	4	0	1	8	83	3	0	3	4	2	0	0	0	0	0	1	0	0	0	3	-	0	0	0	0	0	0	0	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	0	0	0	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	0	0	0	0	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	3	0	0	0	0	0	
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	8	0	0	0	0	0	
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	12	6	0	0	0	0	
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	12	11	0	2	1	1	
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	21	5	1	0	4	4	
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	10	1	0	0	1	1	
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	9	5	1	0	3	3	
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	9	7	0	1	0	0	
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	4	4	1	0	0	0	
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	9	4	0	1	0	0	
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	10	6	1	0	1	1	
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	3	1	0	2	1	1	
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	10	6	0	0	0	0	
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	5	3	1	0	1	1	
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	2	1	1	1	0	0	
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	2	5	1	1	0	0	
28	34	6	2	11	12	33	16	17	13	10	8	3	14	14	8	13	25	20	9	11	4	5	0	4	6	0	-	6	16	2	3	1	4	2	0	0	0	
29	13	3	1	5	9	30	12	7	7	12	10	1	17	7	7	17	15	22	10	10	6	1	0	4	7	3	-	5	7	3	4	4	2	1	1	0	0	
30	14	6	2	3	13	10	14	5	7	7	7	0	10	7	3	8	13	17	8	10	2	1	1	9	13	1	-	3	5	4	5	3	5	1	1	0	0	
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	5	5	1	1	0	0	
32	6	0	1	2	6	4	3	2	1	4	3	1	4	2	4	5	6	4	6	11	3	1	0	6	3	4	-	2	7	3	1	3	0	0	0	0	0	
33	5	1	2	0	1	1	4	6	0	3	2	1	3	4	5	9	9	6	10	12	2	1	1	0	4	1	-	2	4	1	2	5	2	0	1	0	0	
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	1	1	0	1	0	0	
35	4	0	0	4	0	3	1	0	0	0	1	1	1	3	4	6	3	4	4	4	3	1	0	2	3	0	-	1	5	1	2	2	2	0	1	0	0	
36	1	0	1	0	0	0	1	0	0	0	0	1	0	2	0	2	4	3	4	4	2	1	0	2	3	2	-	4	0	1	2	0	2	1	1	0	0	
37	0	0	0	0	0	0	0	0	0	0	0	3	0	0	1	0	0	1	3	1	2	2	0	1	3	2	-	2	2	0	2	3	5	0	1	1	0	
38	1	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	2	1	5	4	2	2	0	0	4	2	-	1	4	0	1	8	3	0	0	0	0	
39	2	0	0	0	0	0	0	0	0	3	0	0	0	1	0	1	1	3	5	0	2	2	0	0	2	0	-	0	1	0	1	1	0	0	0	0	0	
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	3	2	2	0	1	3	2	-	0	0	0	0	1	0	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	1	0	0	0	0	0	
42	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0	0	0	-	0	0	0	1	0	0	0	0	0	0	0
43	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	0	3	0	0	0	0	1	
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	0	0	0	0	1	0	
45	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2	0	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	1	1	0	0	0	0	0	0	0	-	1	0	0	0	0	0	0	0	0	0	0
Total	949	575	769	781	2,422	2,717	2,914	1,321	1,300	2,771	1,765	657	1,984	1,370	1,146	1,699	1,364	907	527	262	392	557	108	213	387	351	-	211	547	61	128	170	97	13	17	14	14	

Table 5.65. Winter skate length frequencies, spring and fall, 2 cm intervals (midpoint given), 1995-2019.

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.

length	Spring																								
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
27	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	1
33	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	1
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	1	0	0	0	1	2
37	0	0	0	0	0	0	1	0	0	3	0	0	1	1	1	1	1	7	7	2	0	0	1	0	0
39	0	0	0	0	0	0	0	1	2	2	0	0	1	0	1	0	1	5	3	3	2	1	2	0	5
41	0	0	0	0	0	0	0	1	1	2	0	0	1	1	1	2	0	4	3	5	1	0	0	1	2
43	0	0	0	0	3	0	1	2	4	1	0	0	1	2	1	2	0	9	3	0	0	0	0	0	0
45	0	0	0	0	1	3	0	0	0	6	0	0	2	1	1	2	0	7	5	4	0	0	0	0	1
47	0	0	0	0	0	2	0	0	0	4	3	0	3	0	0	0	1	1	3	5	0	1	0	0	0
49	0	0	0	0	0	2	0	0	1	2	1	1	1	2	2	0	0	3	2	7	1	0	0	0	2
51	0	1	0	1	0	0	0	1	1	0	1	0	0	0	1	0	0	3	3	2	1	2	0	0	3
53	0	0	0	0	1	3	1	0	1	0	0	1	1	0	1	0	0	1	3	6	2	1	0	0	2
55	0	0	2	3	1	1	0	0	1	1	1	4	3	0	1	0	0	2	5	5	4	1	0	0	0
57	1	2	4	3	2	0	0	0	6	0	0	1	2	1	3	0	2	2	4	2	3	1	1	0	1
59	5	4	1	5	3	2	0	1	1	2	0	1	0	0	2	1	0	2	2	3	2	2	0	0	3
61	1	5	2	1	0	0	3	1	1	1	3	1	1	3	2	0	1	2	4	1	1	1	0	0	1
63	2	2	2	4	1	0	0	1	2	3	2	2	0	1	1	0	2	1	3	1	1	0	0	0	0
65	4	2	4	7	0	0	0	0	0	0	1	1	1	2	0	0	2	3	2	0	0	1	0	0	0
67	1	1	2	2	1	1	0	1	1	1	3	3	0	1	1	1	2	3	2	2	0	0	0	0	3
69	2	0	1	4	2	0	0	1	4	1	0	1	2	3	2	0	3	1	2	4	0	1	1	0	0
71	1	3	2	3	1	2	2	1	2	2	0	1	2	3	0	0	0	4	1	1	2	0	0	0	3
73	0	3	0	0	0	1	2	4	0	2	1	4	3	1	1	1	3	5	2	3	0	3	0	0	1
75	4	4	1	5	3	1	2	1	3	1	0	1	4	3	3	4	3	5	0	1	0	0	0	1	2
77	0	2	3	6	7	2	1	1	1	1	0	0	2	4	0	1	2	0	1	3	1	0	0	0	2
79	1	2	1	4	1	1	2	3	1	1	1	0	4	3	2	1	4	2	0	0	1	0	1	0	3
81	0	4	0	3	2	1	1	2	3	3	0	1	1	1	1	0	2	3	0	1	0	0	0	0	0
83	0	3	0	2	0	0	1	0	1	1	0	0	1	0	3	1	1	4	0	2	1	0	0	0	0
85	0	2	1	1	0	3	1	2	1	0	0	0	0	0	0	0	3	1	0	1	0	0	0	0	0
87	0	0	0	0	0	0	1	1	1	0	0	0	0	0	1	0	0	0	1	0	1	0	0	0	1
89	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
91	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
93	0	0	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	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	25	15	6	3	39

length	Fall																								
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	-	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	-	0	2	0	0	0	0	0	0	0
41	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	-	0	1	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	1	0	0	0	0
45	2	0	1	0	0	0	0	1	0	0	0	0	0	0	0	-	0	4	3	2	1	0	1	0	1
47	0	0	0	0	1	0	0	0	0	1	1	0	0	1	0	-	0	1	0	1	0	0	1	0	0
49	1	5	1	0	0	0	0	0	0	0	1	0	0	0	0	-	0	1	4	1	0	0	0	0	0
51	0	0	1	0	2	0	0	0	0	0	0	0	0	1	0	-	0	2	1	0	0	0	0	0	0
53	2	0	2	1	0	0	1	1	0	0	1	0	0	0	0	-	0	2	0	1	0	0	0	0	0
55	1	2	1	0	1	0	4	0	0	0	0	0	0	1	0	-	0	0	1	2	0	1	0	0	0
57	2	6	2	0	0	0	0	3	0	0	2	0	0	1	1	-	3	0	0	0	0	0	1	0	0
59	2	2	2	1	0	0	1	1	0	0	0	0	0	0	1	-	0	1	0	0	1	1	0	0	0
61	0	5	0	0	0	3	0	0	0	0	0	1	0	0	0	-	0	0	1	1	0	1	0	0	0
63	1	4	1	0	0	0	1	0	0	0	2	0	0	0	0	-	0	0	1	1	0	0	0	0	0
65	2	3	0	1	1	0	0	1	0	3	0	0	0	1	1	-	1	0	0	0	0	0	1	0	0
67	1	2	2	1	0	0	2	0	0	0	3	0	0	1	1	-	0	0	1	2	1	0	1	0	0
69	0	2	1	1	0	0	0	1	0	0	0	0	1	1	1	-	0	1	3	0	0	0	2	0	0
71	0	0	0	0	0	0	0	1	0	2	0	0	2	1	1	-	0	0	1	2	0	0	2	0	0
73	0	2	1	1	1	0	0	2	0	1	1	0	0	0	0	-	1	1	0	1	0	0	0	0	0
75	1	3	1	0	1	0	1	1	0	1	1	0	1	1	1	-	0	1	0	0	0	0	2	0	0
77	0	1	0	0	0	0	1	2	0	1	0	0	0	2	0	-	0	0	0	0	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	0	0	0	0	0
81	0	0	0	1	0	0	1	1	0	0	1	0	1	1	1	-	0	1	0	0	0	0	0	0	0
83	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	-	0	1	0	0	0	0	0	0	0
85	0	0	0	0	0	0	0	1	0	0	0	0	0	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	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	5	2	13	0	1

**FIGURES 5.1 - 5.18
LISTS**

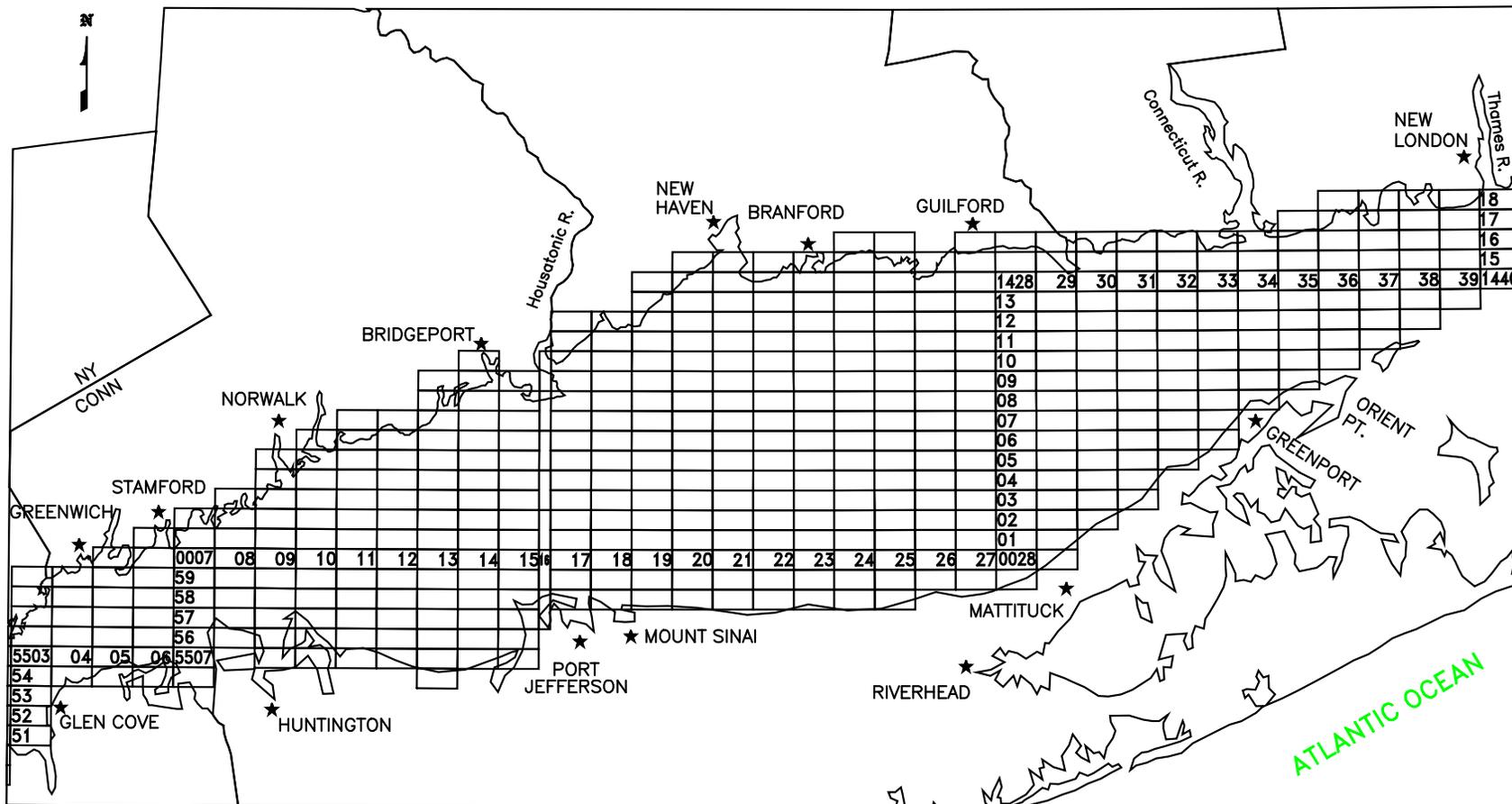
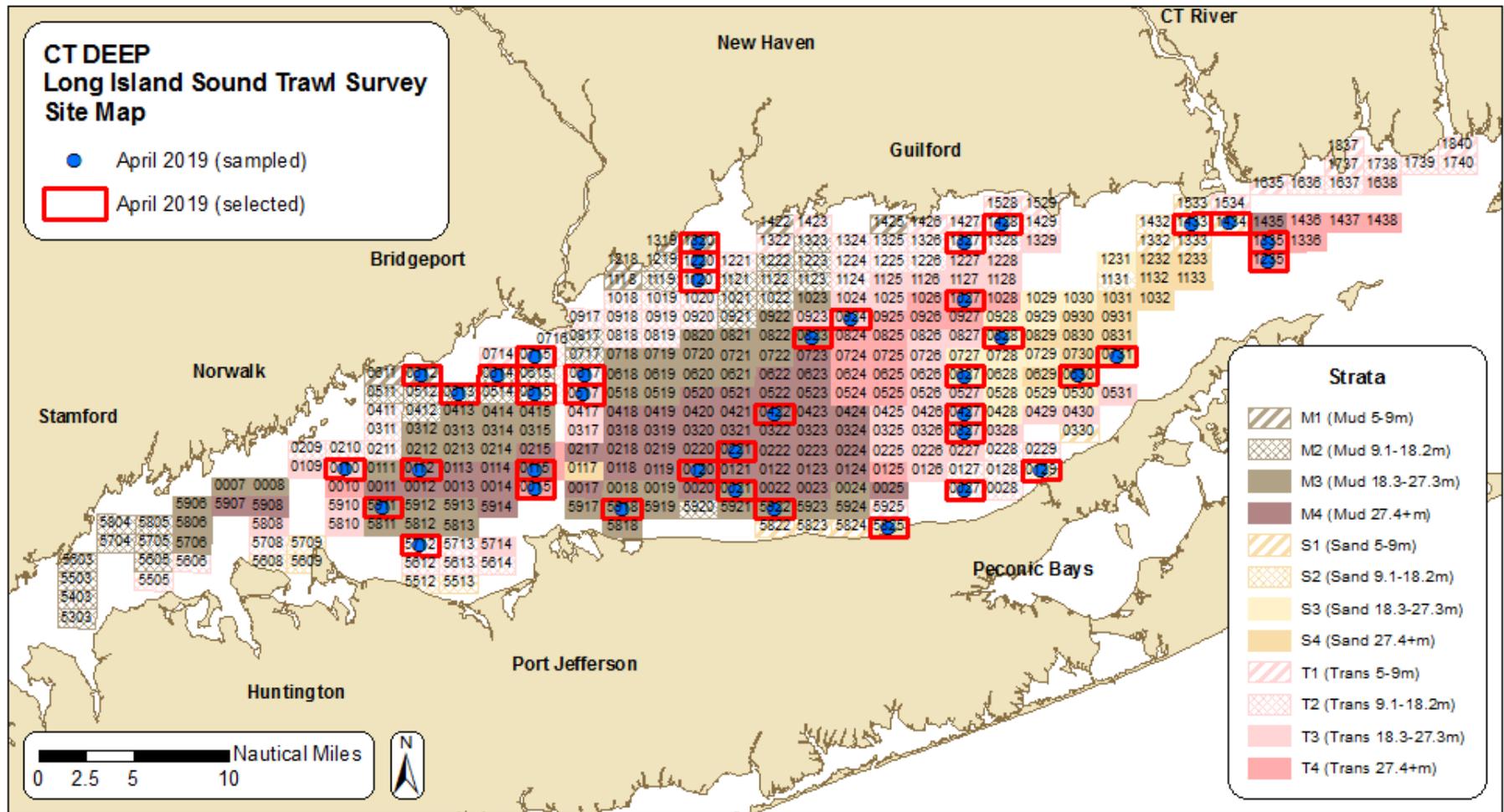


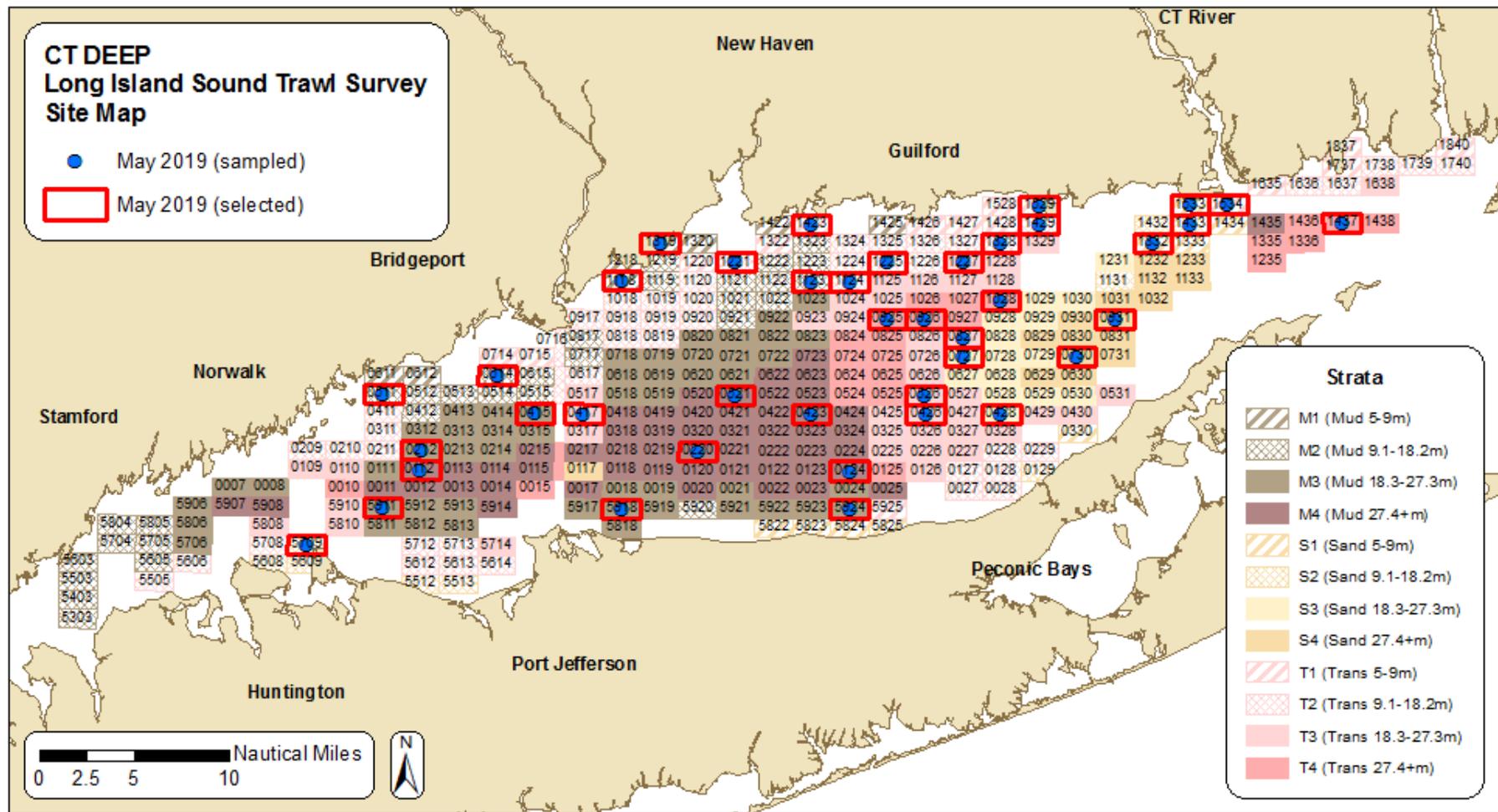
Figure 5.1. Trawl Survey site grid. Each sampling site is 1x2 nmi (nautical miles). A four-digit number identifies the site: the first two digits are the row numbers (corresponding to minutes of latitude) and the last two digits are the column numbers (corresponding to two nautical miles in length on 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 2019 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.



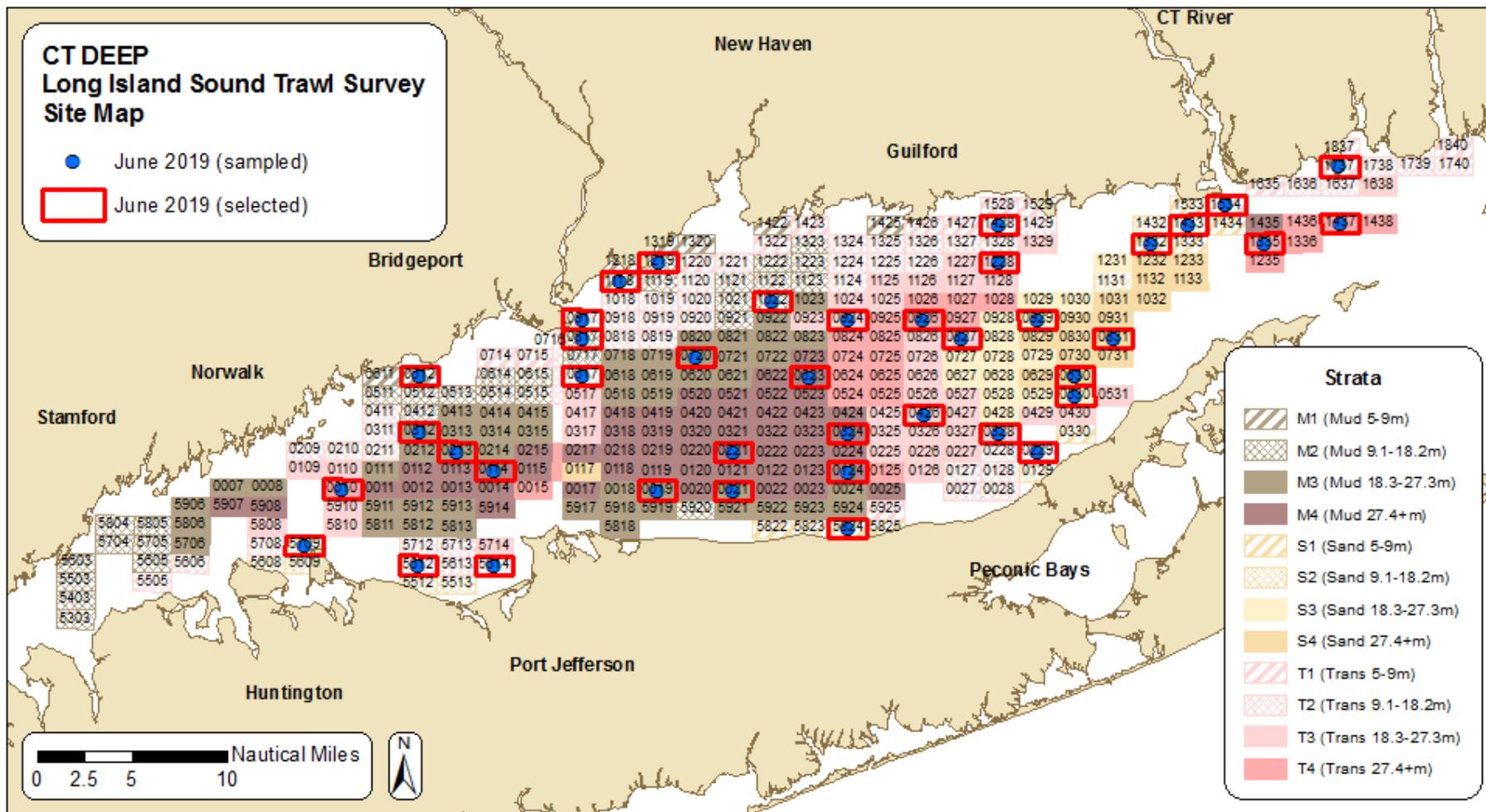
Sample	Site Sampled	Sampled Strata	Site Selected	Selected Strata	Reason Moved
					No sites were moved during this cruise

Figure 5.3. May 2019 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.



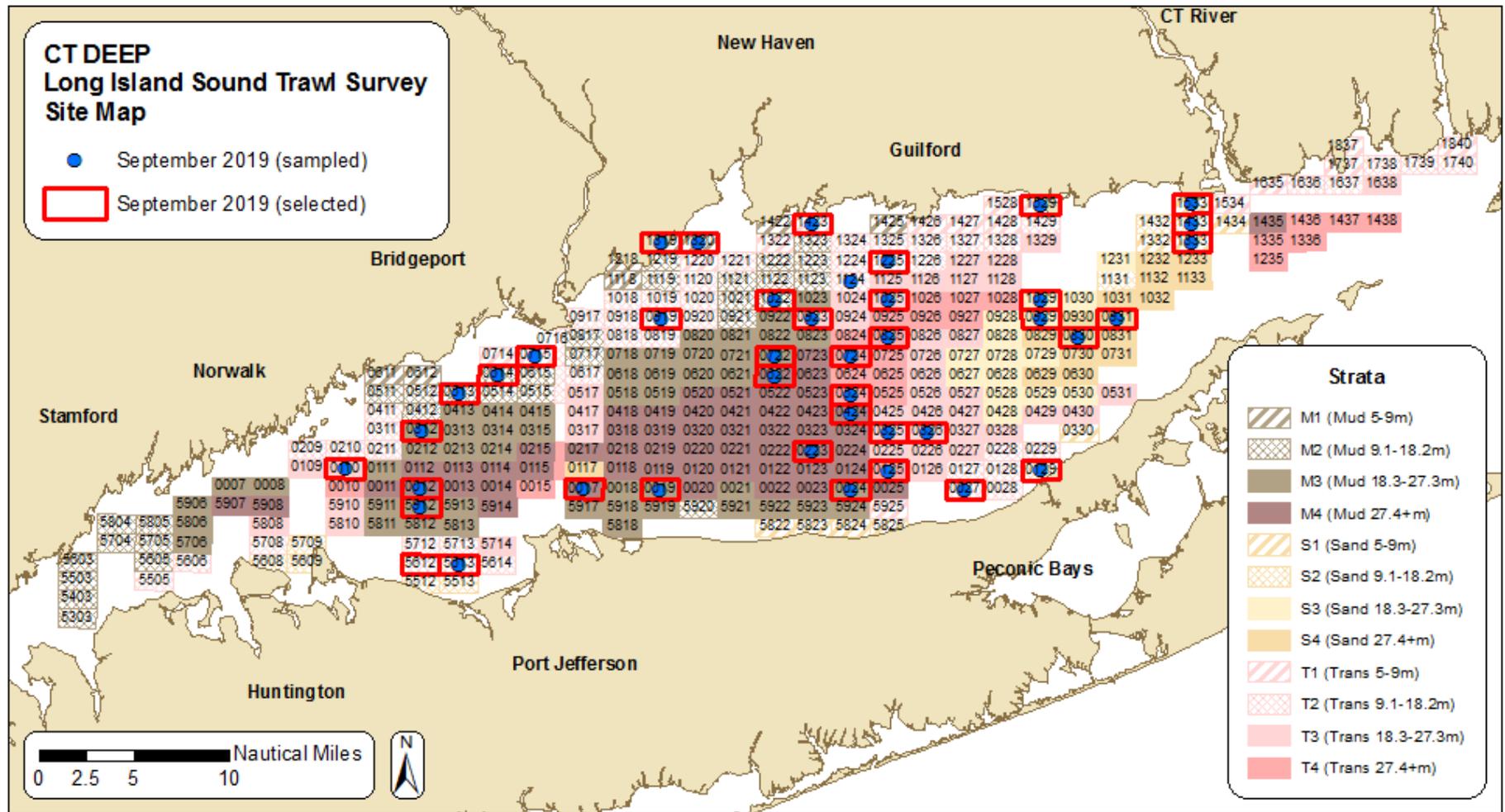
Sample	Site Sampled	Sampled Strata	Site Selected	Selected Strata	Reason Moved
					No sites were moved during this cruise

Figure 5.4. June 2019 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.



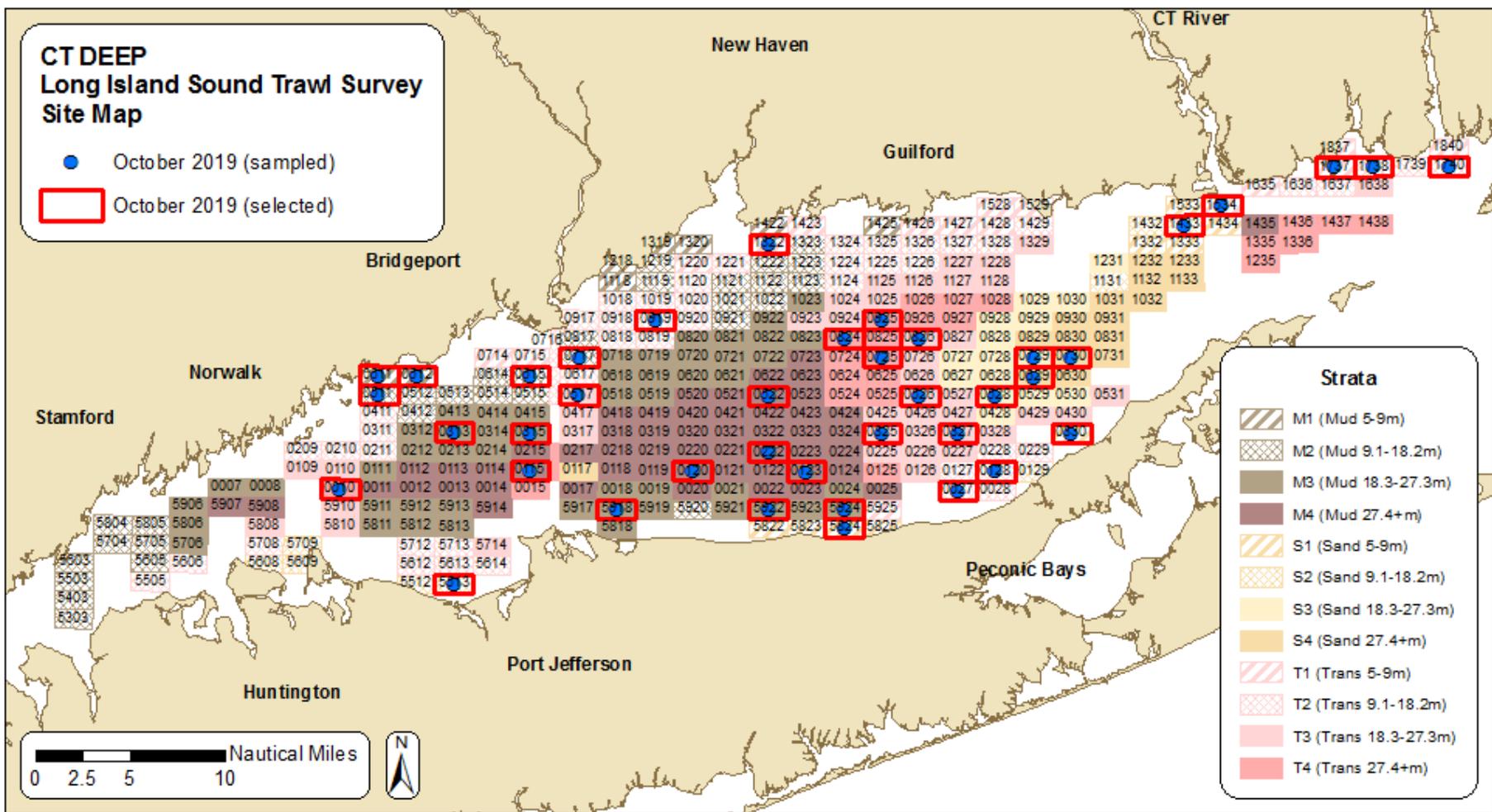
Sample	Site Sampled	Sampled Strata	Site Selected	Selected Strata	Reason Moved
					No sites were moved during this cruise

Figure 5.5. September 2019 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
FA2019037	1124	T2	5612	T2	Have had trouble with pot gear here in the past

Figure 5.6. October 2019 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 5.7. Number of finfish species observed annually, 1984-2019. *Note: not all years have the same number of tows. See Table 5.4 for details on number of tows completed each year. Average number of finfish species caught per year is 57.4 for the time-series*

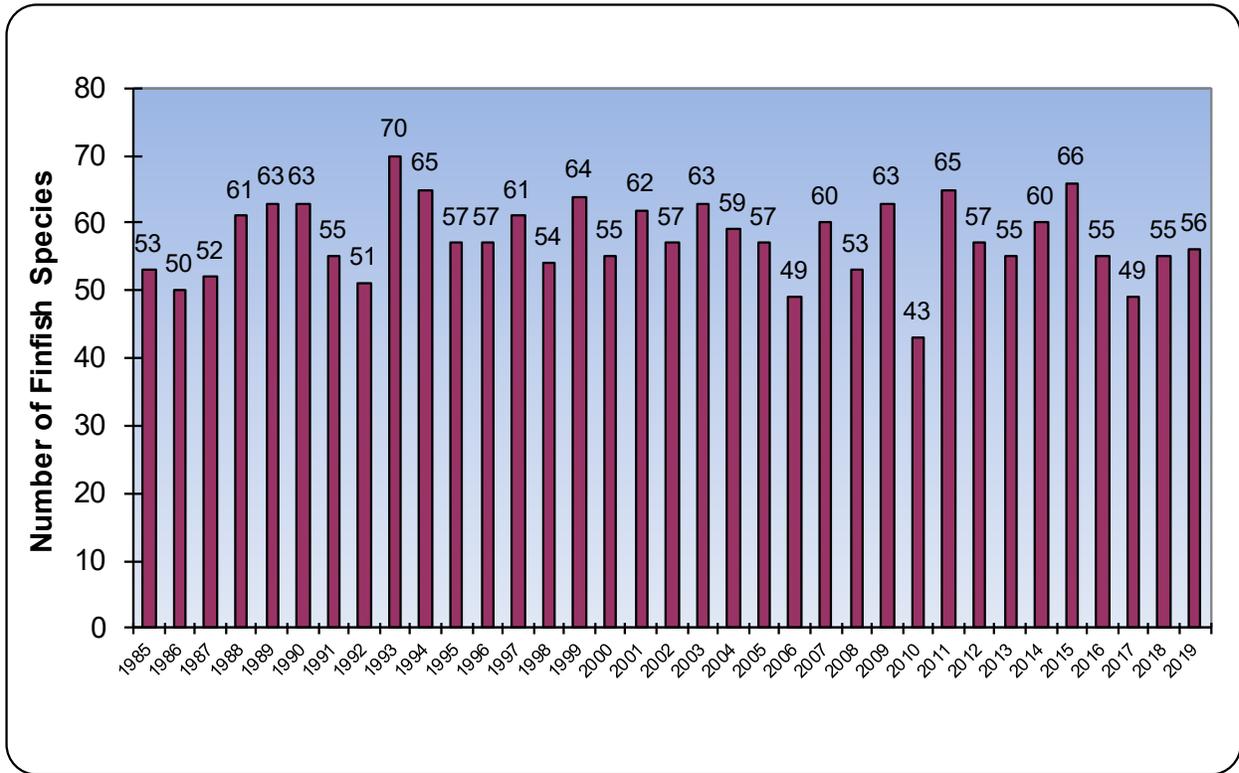
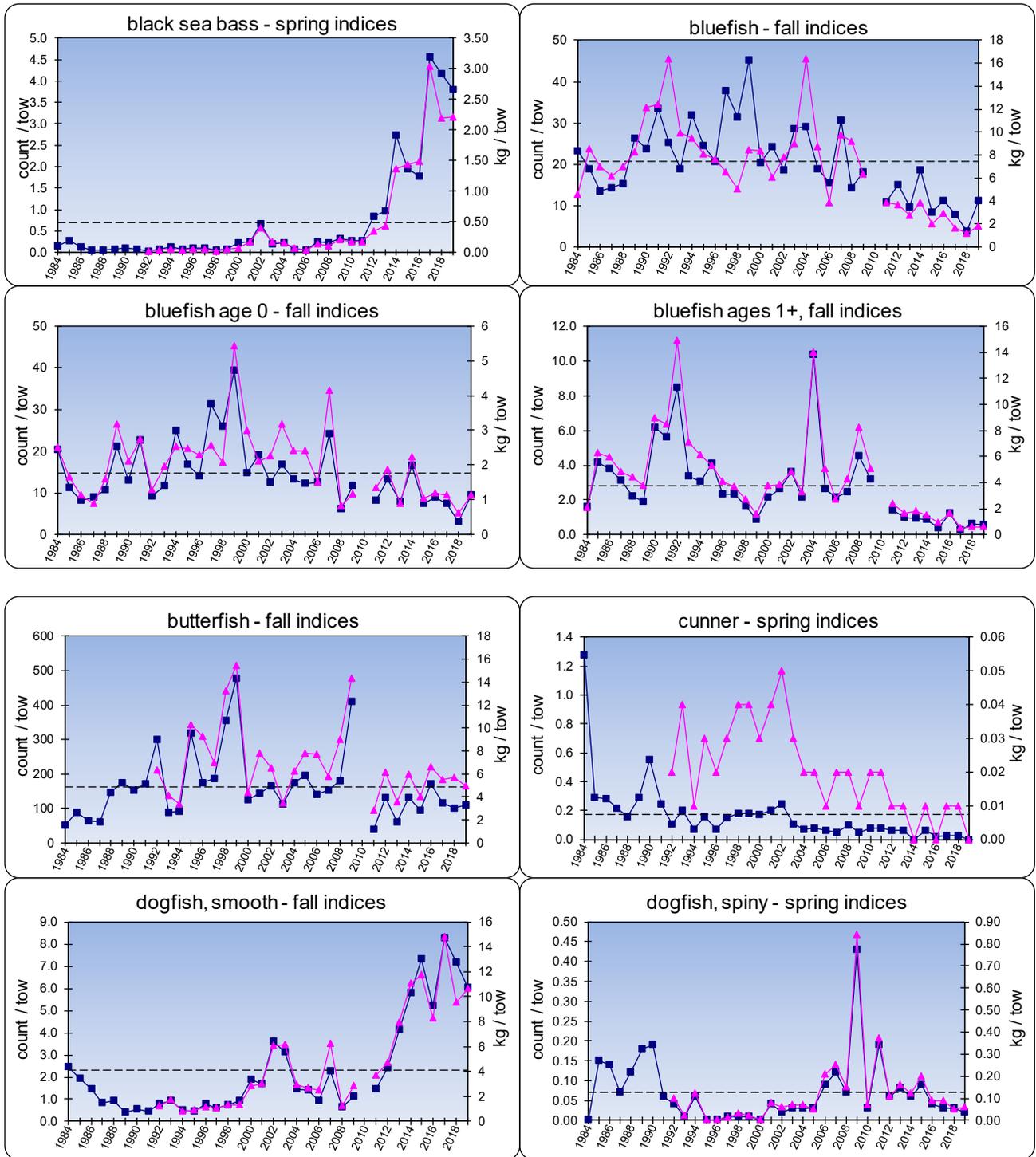
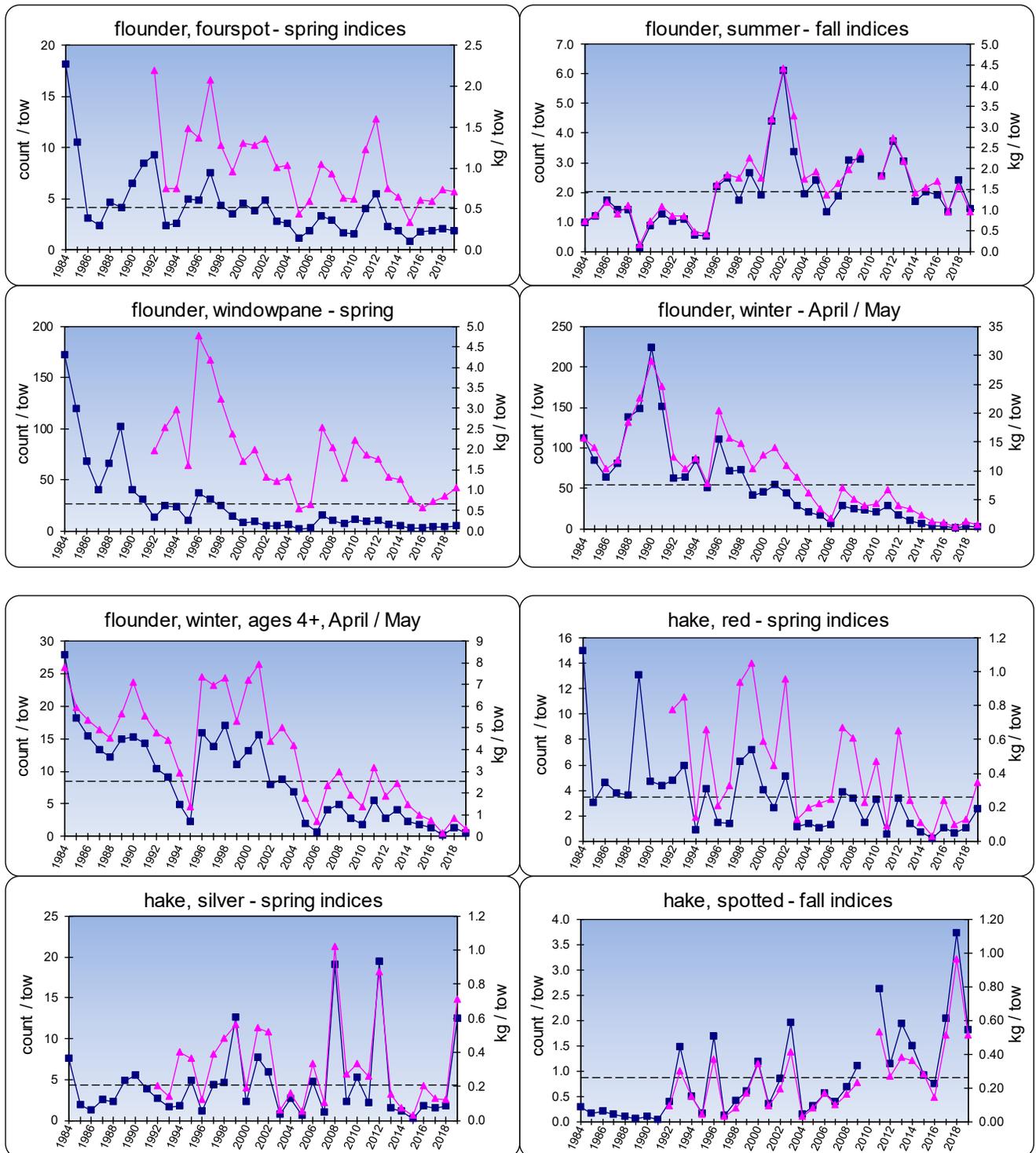


Figure 5.8. Plots of abundance indices for: black sea bass, bluefish (total, age 0, and ages 1+), butterfish, cunner, and dogfish (smooth and spiny).



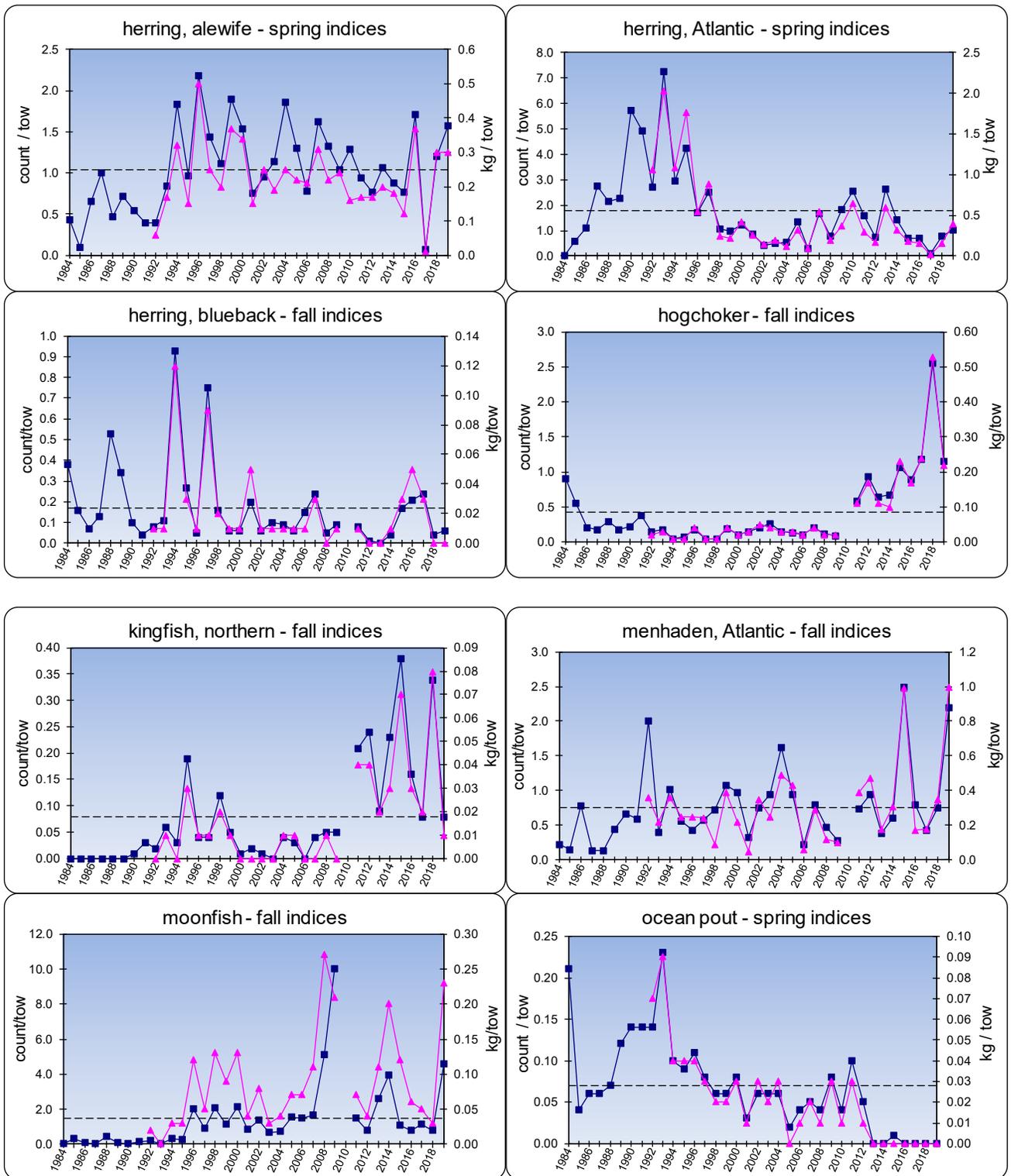
Legend:
■ = count / tow
▲ = kg / tow
 ---- = mean count / tow

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



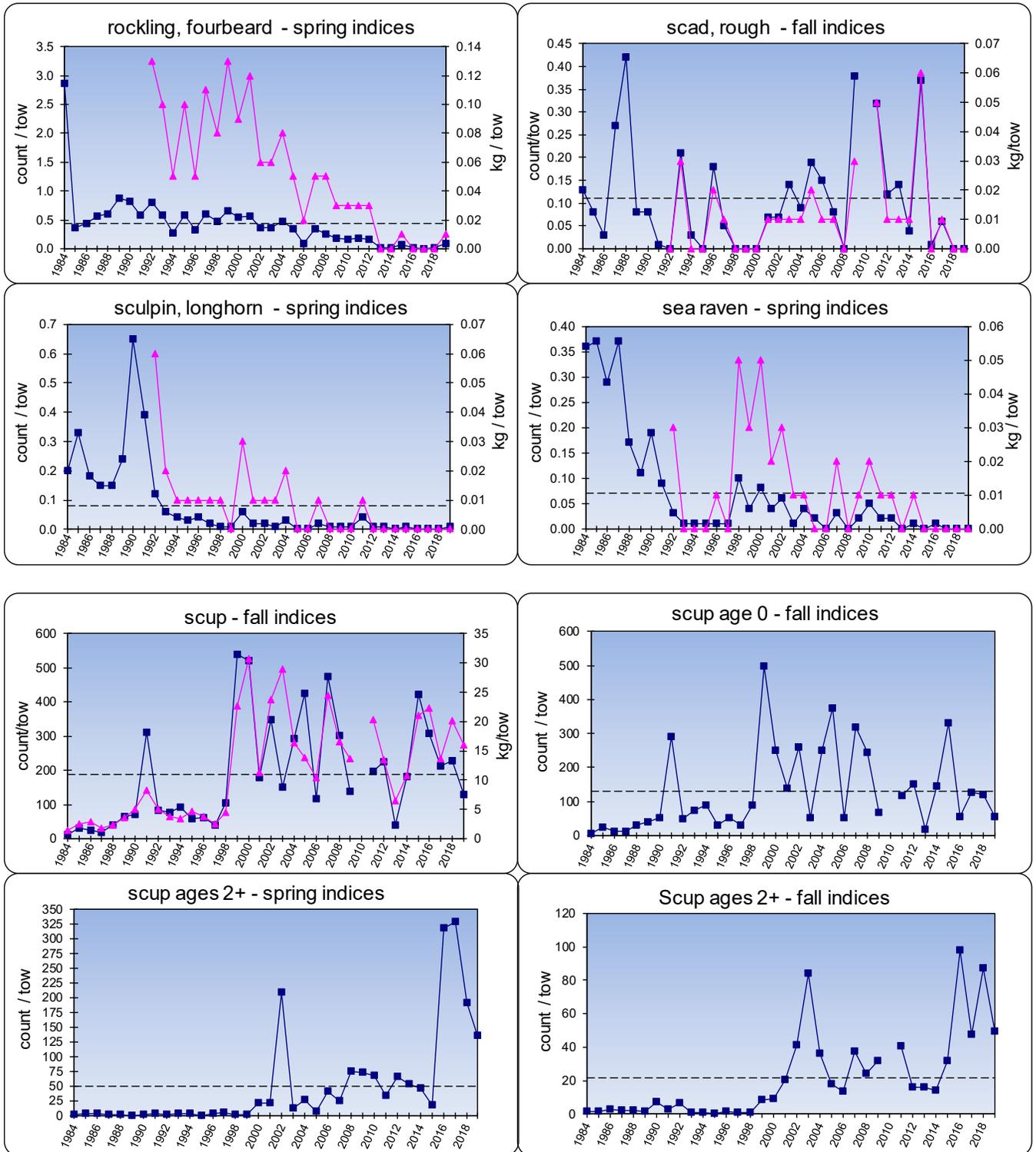
Legend:
 ■ = count / tow
 ▲ = kg / tow
 --- = mean count / tow

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



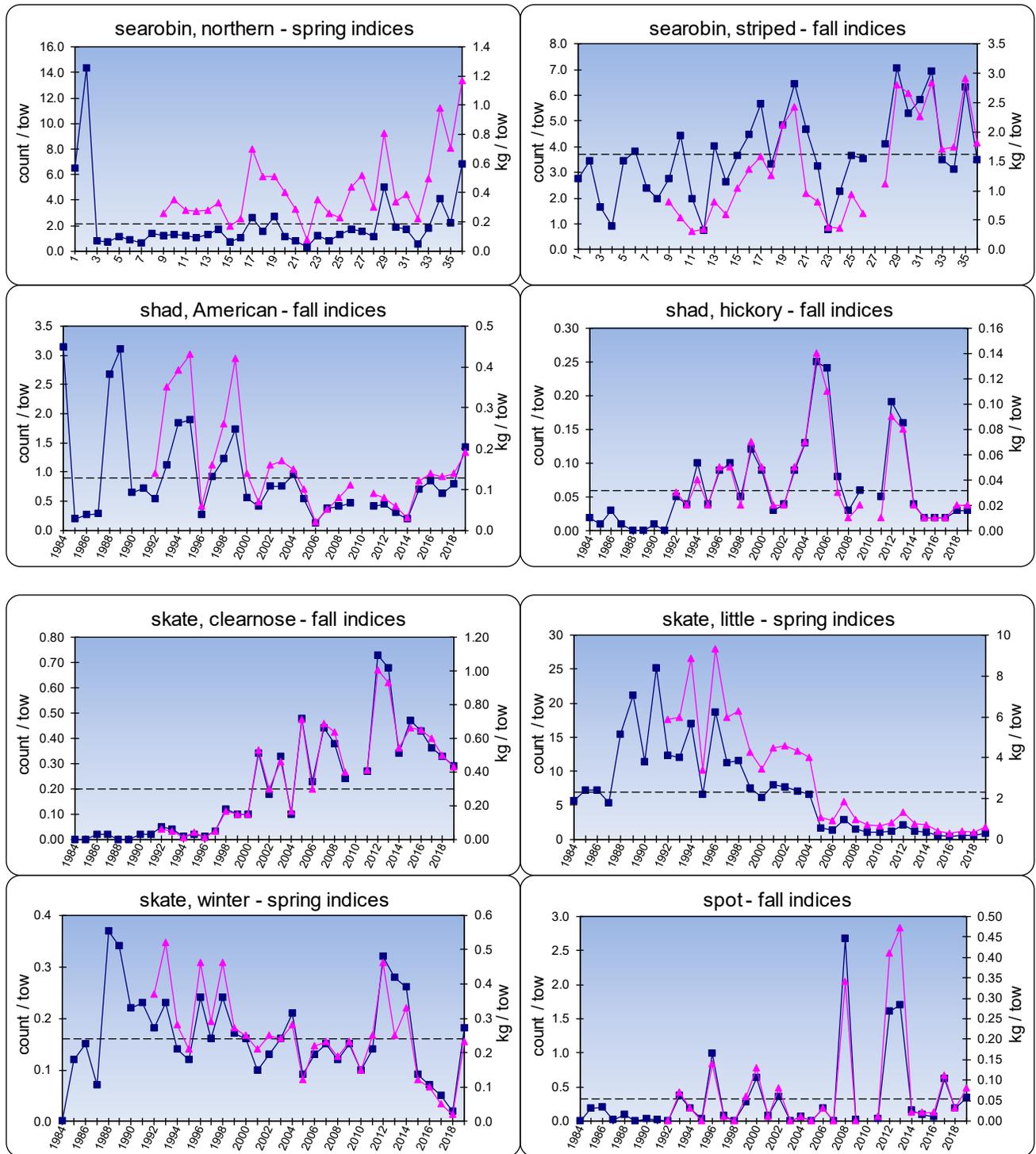
Legend:
■ = count / tow
▲ = kg / tow
 ---- = mean count / tow

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+).



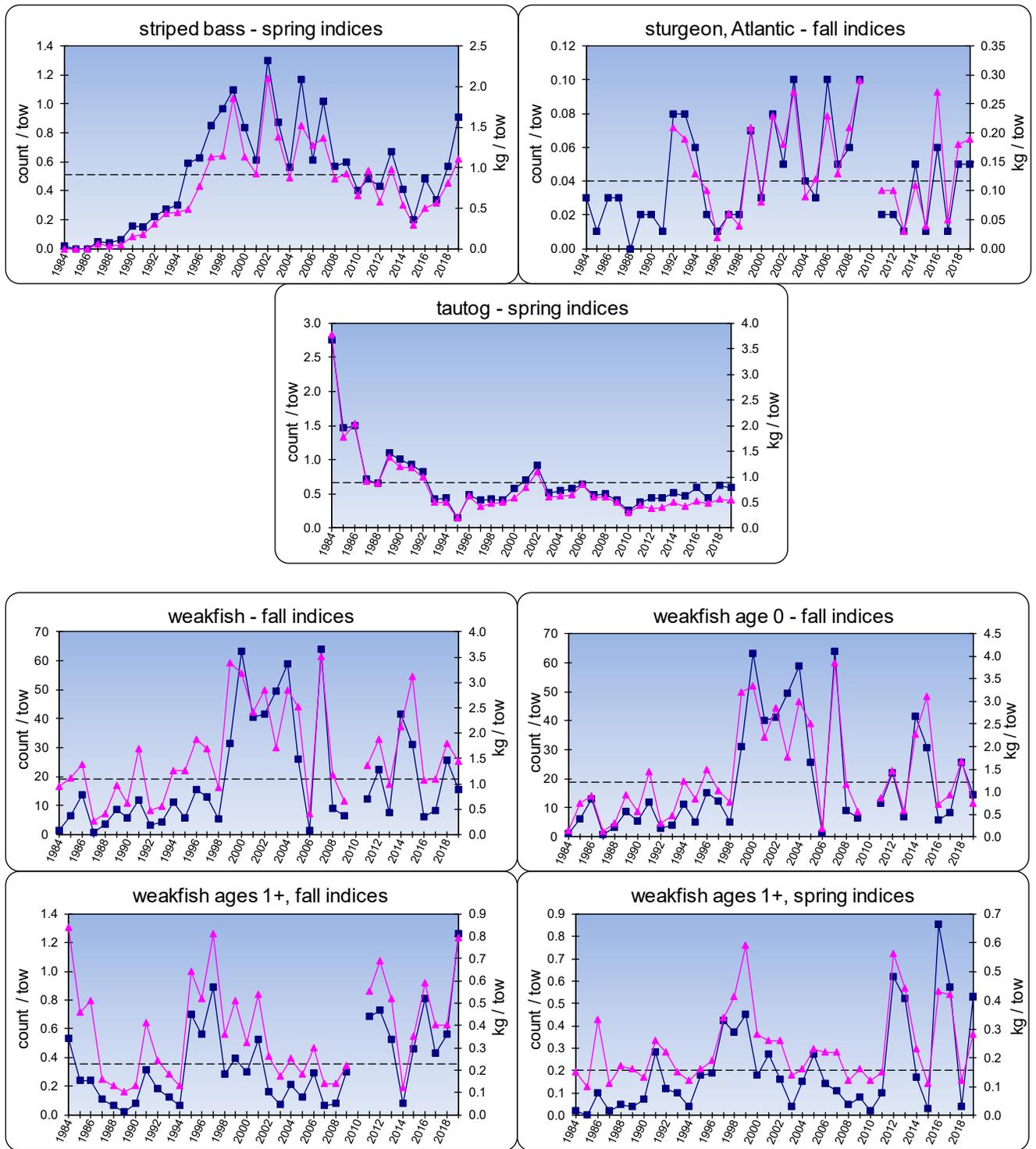
Legend:
■ = count / tow
▲ = kg / tow
 ---- = mean count / tow

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

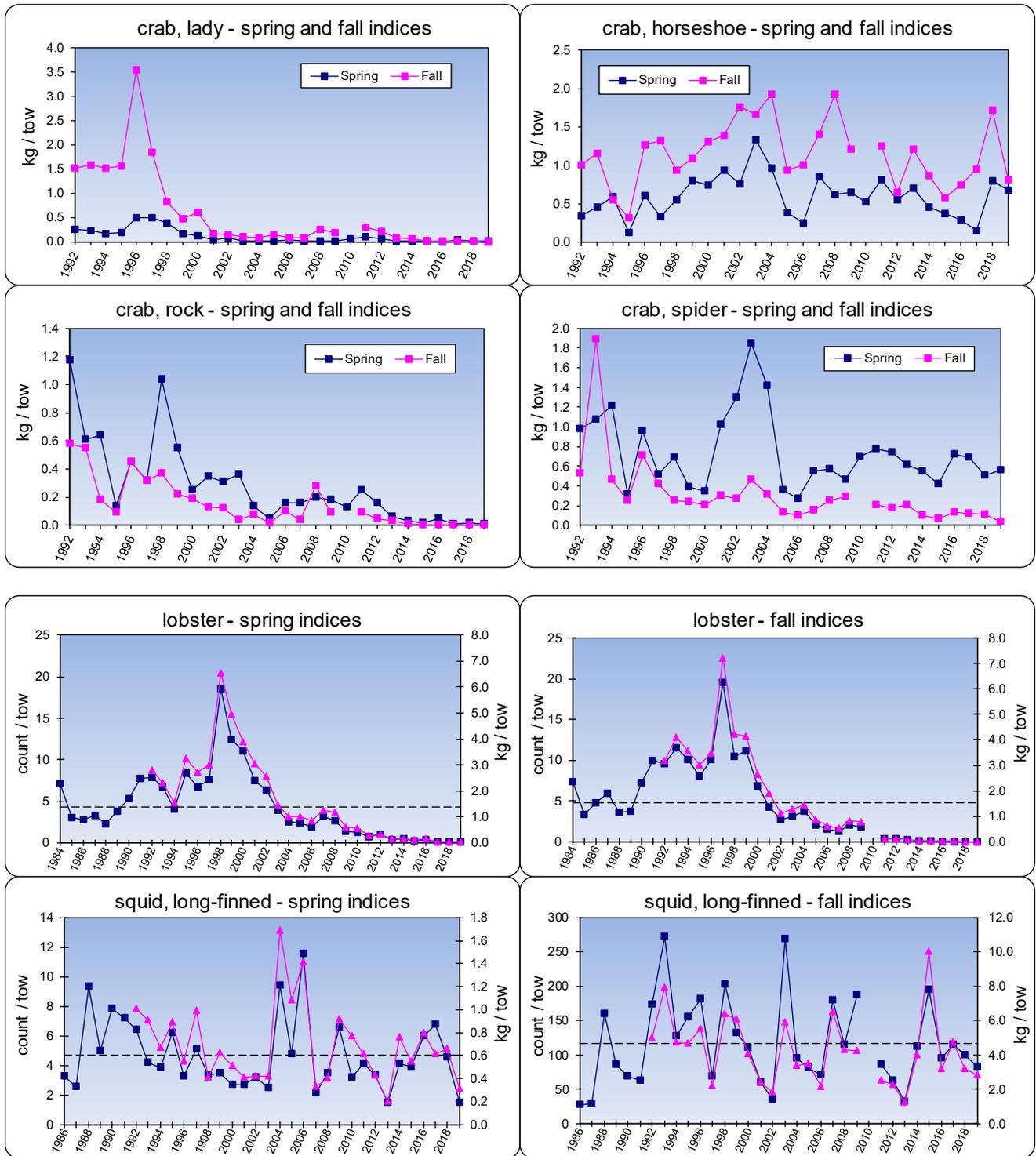
Figure 5.13. Plots of abundance indices for: striped bass, Atlantic sturgeon, tautog, and weakfish (all ages, age 0, and ages 1+).



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, 1984-2019. This index measures the diversity of species supported within the Sound's various habitats.

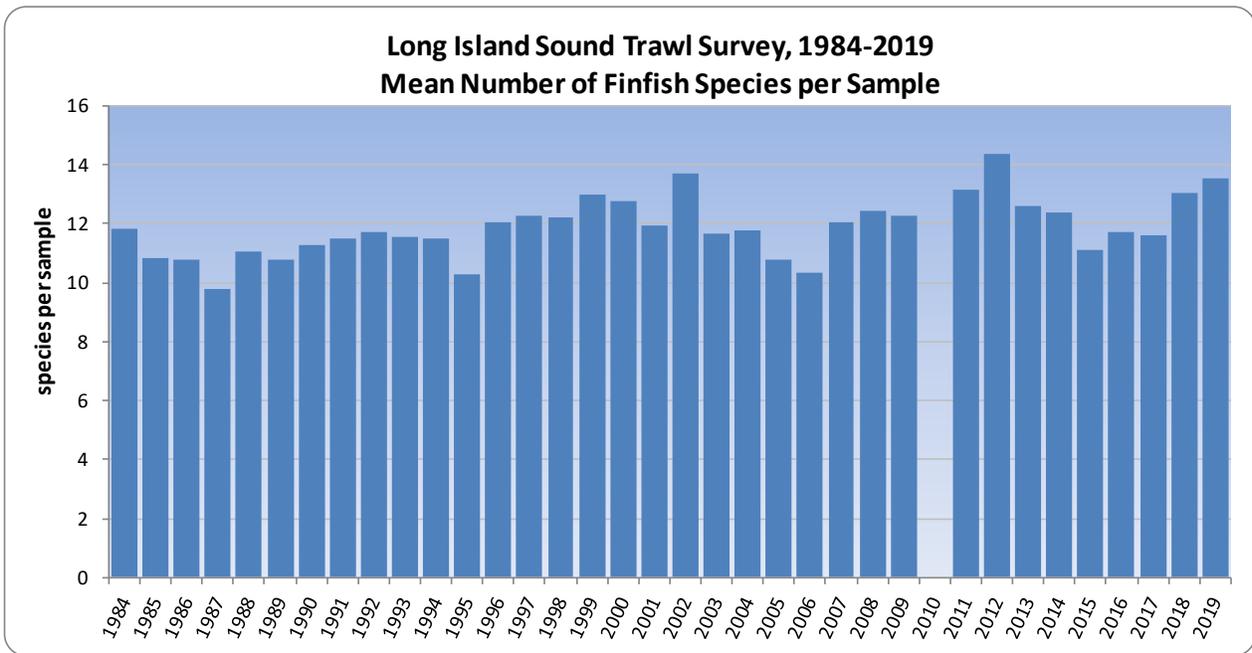


Figure 5.16. Open water forage abundance, 1992-2019. The geometric mean is calculated as the aggregate sample biomass per tow of 14 of the most common forage species sampled in the survey. This index measures the available food base which supports both resident and migratory species. The average since 1992 is 14.41 kg/tow (red line).

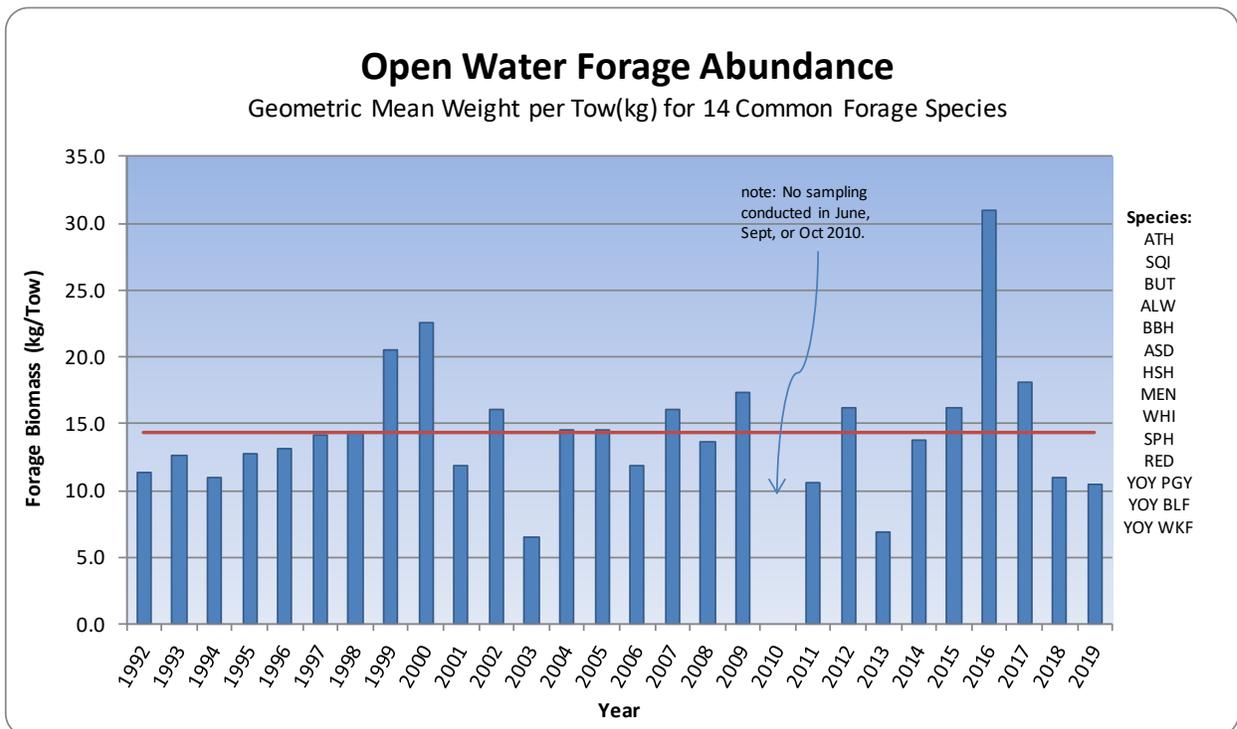


Figure 5.17. Geometric mean biomass of finfish and invertebrates per sample, spring and fall, 1992-2019.
 This index measures the diversity of species supported within the Sound's various habitats.

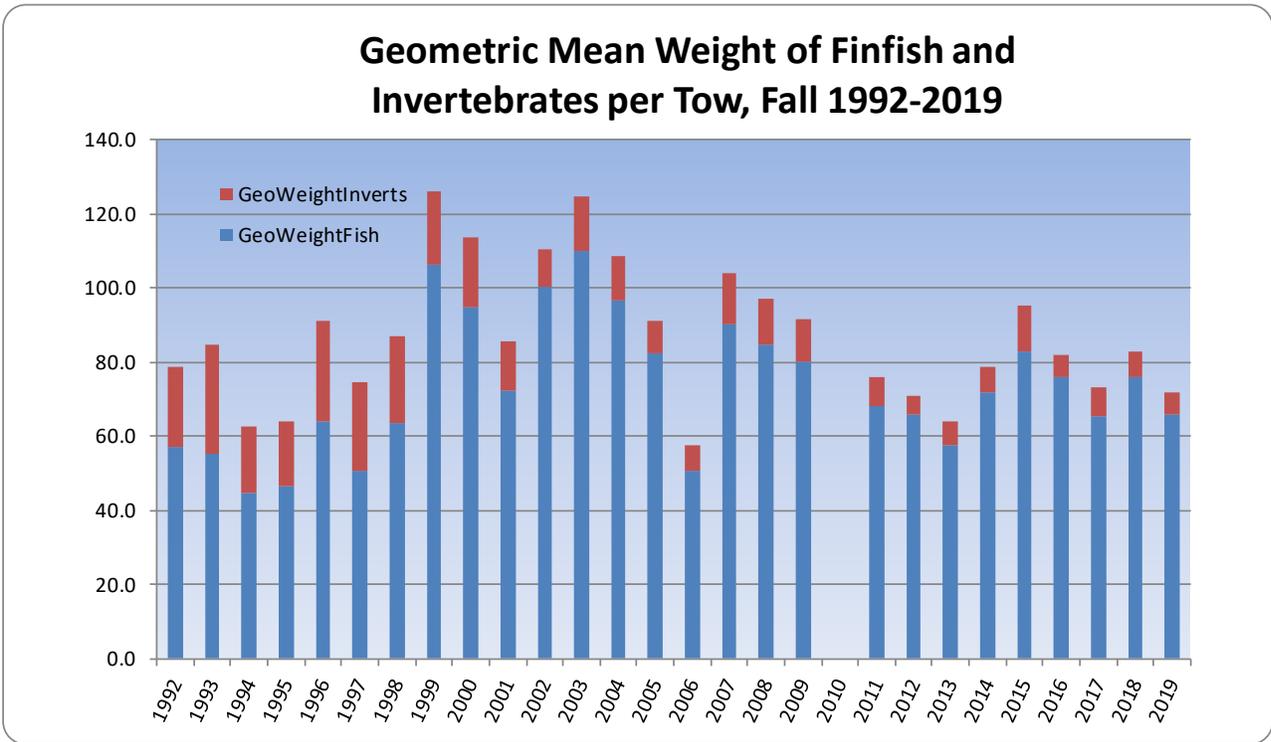
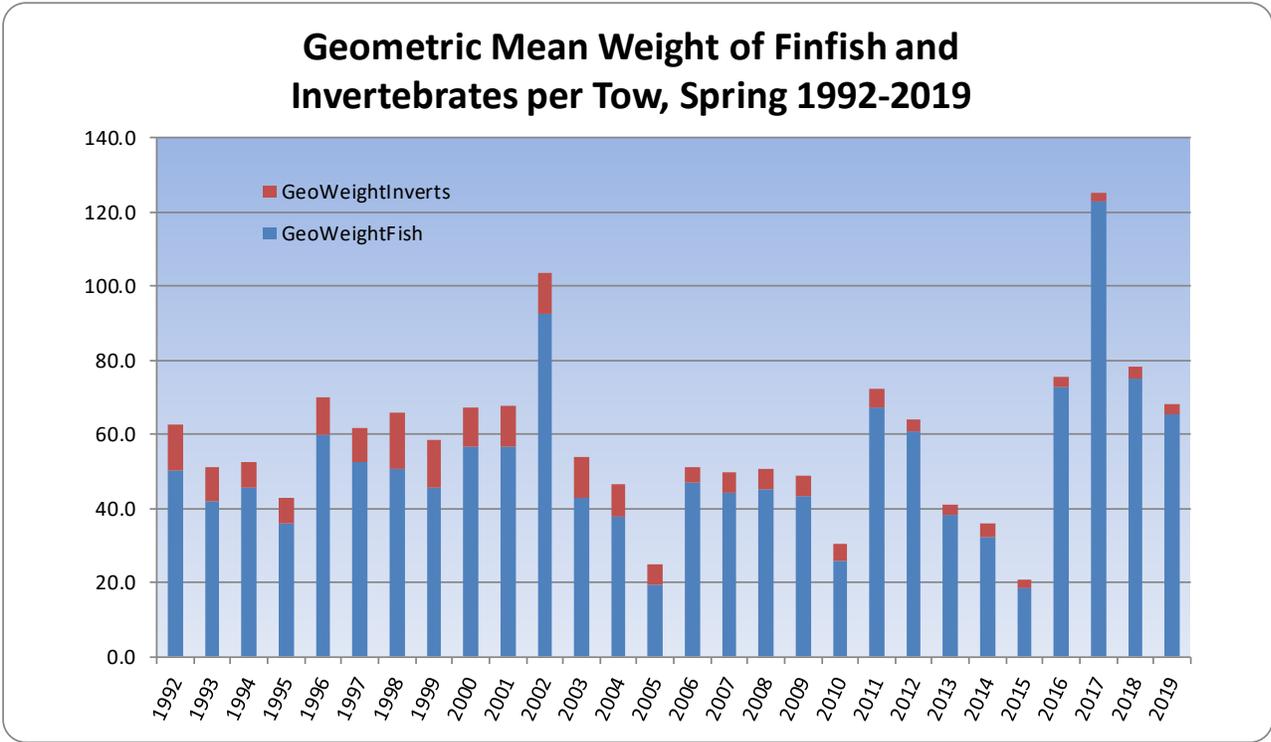
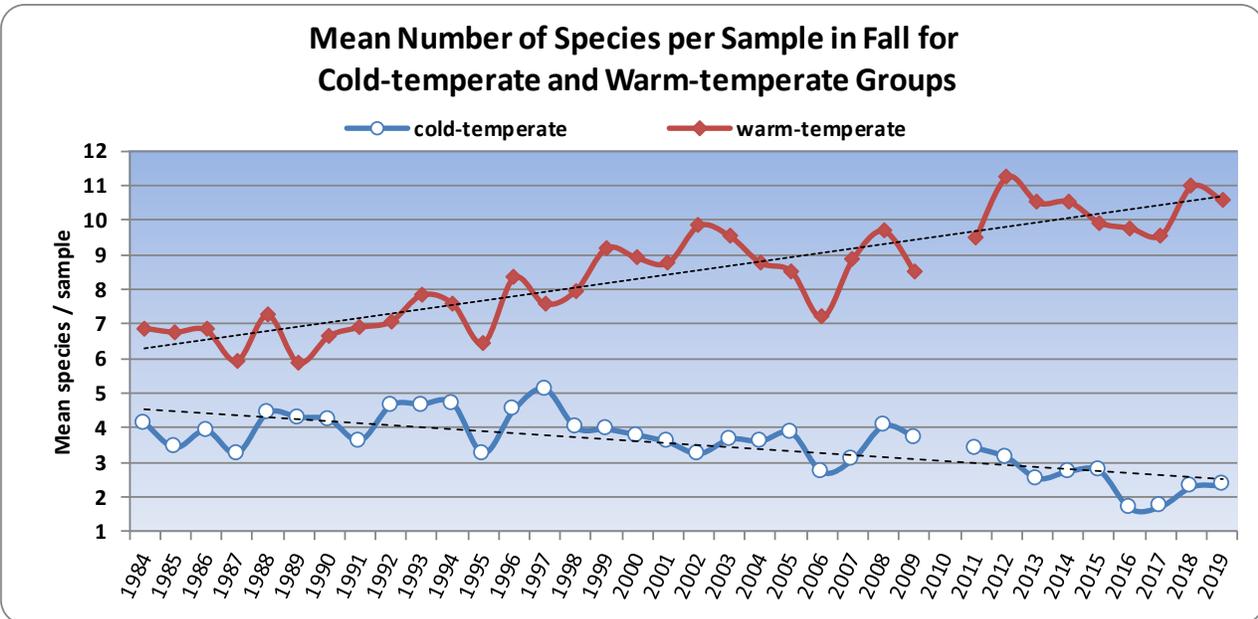
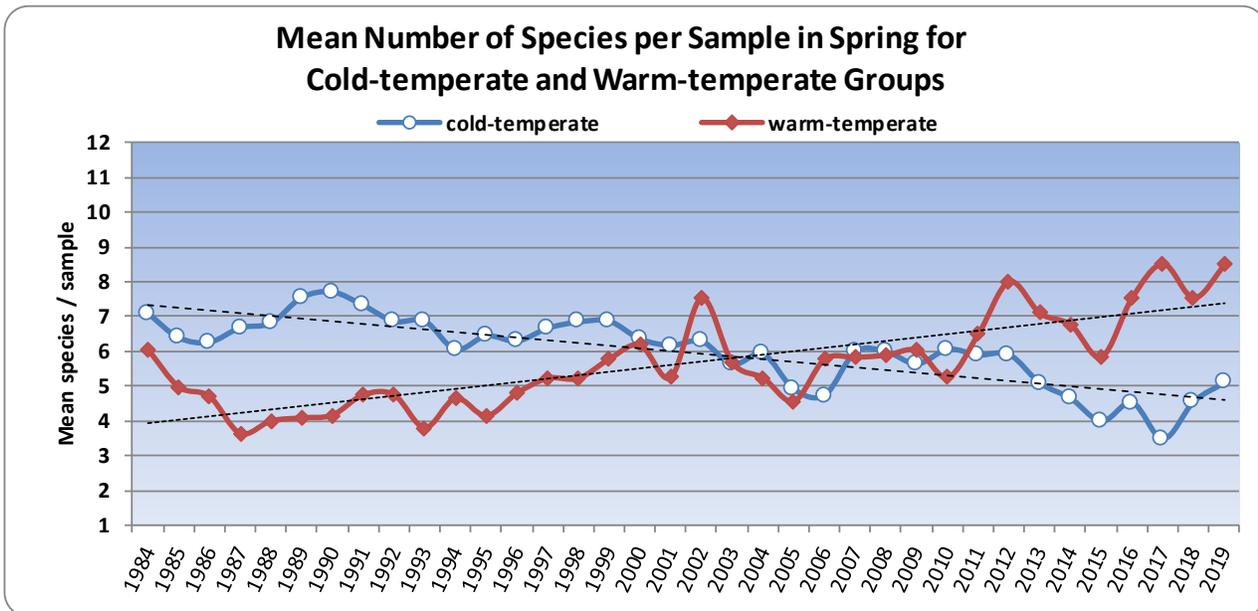


Figure 5.18. Trends in the number of cold temperate versus warm temperate species per sample captured in spring and fall LIS Trawl Surveys. See Appendix 2.5 for list of species included in analysis.



**APPENDICES
LISTS**

Appendix 5.1. List of finfish species identified by A Study of Marine Recreational Fisheries in Connecticut (F54R) and other CT DEEP Marine Fisheries programs. LISTS has collected one hundred-eleven (112) finfish species from 1984-2019.

This appendix contains a list of 157 species identified from all sampling programs conducted since 1984 except Marine Angler Surveys (Jobs 1-3). Species are listed alphabetically by common name (Nelson et al. 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 (non-F54R & F54R)	Inshore Seine Surveys in CT and/or 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	<i>Anchoa mitchilli</i>	LISTS;NRRWS;ESS;ISS;IS;SS;NCA;MISC
anchovy, striped	<i>Anchoa hepsetus</i>	LISTS;ESS;IS;SS
banded rudderfish	<i>Seriola zonata</i>	LISTS;ESS
bass, largemouth	<i>Micropterus salmoides</i>	ISS;ESS;TN;CTR
bass, rock	<i>Ambloplites rupestris</i>	ISS; TN;CTR
bass, smallmouth	<i>Micropterus dolomieu</i>	ISS; TN;CTR
bass, striped	<i>Morone saxatilis</i>	LISTS;NRRWS;ESS;ISS; SS;NCA;MISC;EPA;TN;CTR
bigeye	<i>Priacanthus arenatus</i>	LISTS;IS
bigeye, short	<i>Pristigenys alta</i>	LISTS
black sea bass	<i>Centropristis striata</i>	LISTS;NRRWS;ESS;IS; SS;NCA;MISC;EPA
blenny, feather	<i>Hypsoblennius hentz</i>	LISTS;ESS
bluefish	<i>Pomatomus saltatrix</i>	LISTS;NRRWS;ESS;ISS;SS;MISC;EPA;CTR
bluegill	<i>Lepomis macrochirus</i>	TN;CTR
bonefish	<i>Albula vulpes</i>	ISS
bonito, Atlantic	<i>Sarda sarda</i>	LISTS;EPA
bullhead, brown	<i>Ameiurus nebulosus</i>	ISS;NCA;TN;CTR
burrfish, striped	<i>Chilomycterus schoepfi</i>	LISTS;ESS
burrfish, web	<i>Chilomycterus antillarum</i>	ESS
butterfish	<i>Peprilus triacanthus</i>	LISTS;NRRWS;ESS;ISS;IS; SS;NCA;MISC;EPA
butterfly fish, banded	<i>Chaetodon striatus</i>	ESS
carp	<i>Cyprinus carpio</i>	ISS;NCA;TN;CTR
catfish, channel	<i>Ictalurus punctatus</i>	ISS;NCA;TN;CTR
catfish, white	<i>Ameiurus catus</i>	NCA;TN;CTR
cod, Atlantic	<i>Gadus morhua</i>	LISTS;SS
cornetfish, bluespotted	<i>Fistularia tabacaria</i>	LISTS;ESS;IS
cornetfish, red	<i>Fistularia petimba</i>	LISTS;IS
crappie, black	<i>Pomoxis nigromaculatus</i>	ISS;NCA;TN;CTR
crappie, white	<i>Pomoxis annularis</i>	TN;CTR
croaker, Atlantic	<i>Micropogonias undulates</i>	LISTS;ISS;IS
cunner	<i>Tautoglabrus adspersus</i>	LISTS;NRRWS;ESS;ISS;IS; SS;MISC;EPA
cusck-eel, fawn	<i>Lepophidium profundorum</i>	LISTS
cusck-eel, striped	<i>Ophidion marginatum</i>	LISTS;SS
dace	<i>Rhinichthys spp.</i>	ISS
darer, tessellated	<i>Etheostoma olmstedii</i>	ISS
dogfish, smooth	<i>Mustelus canis</i>	LISTS;NRRWS;ESS;IS;SS;MISC;EPA
dogfish, spiny	<i>Squalus acanthias</i>	LISTS;NRRWS;MISC
drum, black	<i>Pogonias cromis</i>	LISTS
eel, American	<i>Anguilla rostrata</i>	LISTS;NRRWS;ESS;ISS;IS;SNFH;SS;NCA;EPA;TN;CTR
eel, conger	<i>Conger oceanicus</i>	LISTS;IS;SS;ESS
fallfish	<i>Semotilus corporalis</i>	ISS
filefish, orange	<i>Aluterus schoepfi</i>	LISTS;IS;SS
filefish, planehead	<i>Stephanolepis hispidus</i>	LISTS;EPA
filefish, scrawled	<i>Aluterus scriptus</i>	IS

Appendix 5.1 cont.

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

Appendix 5.1 cont.

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

Appendix 5.2. Annual total count of finfish, lobster, horseshoe crab and squid taken in the LISTS, 1984-2019.

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), Atlantic herring (yoy), and sand lance, (yoy) are estimated.

Common name (number of tows)	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	2015	2016	2017	2018	2019	Total		
anchovy, bay	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	399	1,239	1,069	641	1,346	39,177																
anchovy, striped	nc	11	0	0	216	0	47	2	0	0	0	6	1	5	0	1	3	1	0	2	8	0	222	21	546														
anchovy, spp (yoy-est)	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	19,220	2,536	12,888	2,492	1,391	106,501																
bigeye	0	0	0	1	2	2	1	0	0	1	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	3	15			
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	1	0	0	0	0	0	20		
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	1,109	1,181	980	1,434	1,584	10,241		
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	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	438	
blue runner	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	2,650	2,793	2,408	702	2,048	196,961		
bonito, Atlantic	0	2	0	1	1	1	0	0	0	2	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	9	
buterfish, 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	0	0	0	0	0	0	2	
buterfish	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	53,265	65,596	35,814	42,025	43,434	2,296,769		
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	5	1	4	11	15	292		
Gadus spp. (yoylarvae)	0	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	5	16	2	0	17	7	142		
coronfish, red	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	14	0	0	0	0	17		
corste fish, 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	0	0	0	0	0	0	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	159	164	112	264	218	6,503		
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	1	0	1	2	6	0	0	0	1	0	56		
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	13	4	4	4	0	2,032		
cus-eel, fawn	0	0	0	0	0	0	0	0	0	0	0	0	0	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	6
cus-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	0	3	0	1	0	15		
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	1,438	1,338	1,624	1,598	1,243	23,040		
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	19	9	3	5	4	2,281		
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	0	0	0	2	0	0	3	
eel, American	2	0	1	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1	10	
eel, american (yoylarvae)	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	4														
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	0	0	0	0	0	2	22	
eel, conger (yoylarvae)	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	3														
flétfish, 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	0	0	0	0	0	0	4	
flétfish, planehead	4	20	1	0	25	13	23	1	0	10	1	0	3	0	0	3	0	0	0	1	0	0	1	0	1	1	0	0	0	0	4	2	0	0	1	1	117		
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	0	0	0	0	0	0	0	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	386	1,056	366	711	570	67,769		
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	73	148	44	86	186	2,318		
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	808	462	354	753	1,309	21,064		
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	1,150	1,593	974	1,266	1,427	267,049		
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	1,340	1,108	112	500	422	435,267		
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	1	0	1	0	0	2	0	0	0	0	0	20	
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	1	0	2	0	1	0	0	0	27		
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	0	0	0	0	0	0	1	
goatfish, red	1	0	0	0	0	2	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	1	0	0	0	0	0	0	29		
goby, naked	0	0	0	0	0	0	0	0	0	0	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	
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	0	2	70	0	1	2	159	
grubby	0	1	1	1	5	9	6	0	0	0	5	1	2	11	5	2	0	1	0	1	2	0	0	1	0	0	0	4	0	0	0	0	0	0	0	0	0	59	
gunnel, rock	0	6	0	6	5	10	9	0	0	0	1	0	3	0	0	0	3	1																					

Appendix 5.2 cont.

Common name (number of tows)	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	2015	2016	2017	2018	2019	Total		
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	92	74	12	15	25	181,086		
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	1	0	0	0	0	0	0	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	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	4	0	3	10	0	760		
mackerel, Spanish	0	0	0	0	0	11	0	2	1	233	106	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	65	422		
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	1,279	876	239	227	815	15,635		
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	891	265	273	143	2,270	19,343		
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	1	1	0	0	0	0	0	0	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	2	0	0	0	0	621		
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	1	0	0	2	0	0	0	0	0	0	3		
perch, white	0	0	0	0	0	2	0	0	0	4	1	0	1	4	0	1	1	0	8	2	0	0	0	0	4	1	0	1	1	0	1	0	0	0	0	2	34		
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	0	1	0	0	0	3		
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	0	1	2	0	0	3	5	89	
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	0	1	0	0	0	57		
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	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	11	5	4	5	9	248		
puffer, smooth	0	0	0	0	0	0	0	0	0	0	0	0	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		
ray, bluntnose stingray	0	0	0	0	0	0	0	0	0	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	1		
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	2		
ray, roughtail stingray	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
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	20	3	0	1	20	5,429		
rofflefish, 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	0	0	0	0	0	0	0	1	
salmon, Atlantic	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
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	4	0	7	0	0	0	31,793	
sand lance, (toy-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	0	0	0	0	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	3	0	0	0	0	0	111	
scad, mackerel	0	0	0	0	0	0	1	2	6	0	4	1	3	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	21	
scad, rough	34	32	19	89	180	81	41	1	0	100	13	0	35	65	0	0	10	10	12	14	62	14	13	0	59	0	150	19	28	5	144	1	7	0	0	0	1,239		
scad, round	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	1	2	0	4	11	12	0	3	0	1	0	1	0	1	1	0	0	0	0	0	0	44		
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	2	1	9	1	1	0	2	0	0	1	918		
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	80,534	175,632	75,763	81,228	53,617	1,657,665		
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	0	1	0	0	0	551		
sea turtle, Kemp's ridley	0	0	0	0	0	0	0	0	0	0	0	0	0	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	
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	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	805	3,178	1,430	2,949	3,112	45,366		
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	2,728	5,886	3,942	4,223	3,181	69,023		
seasnail	1	0	0	0	1	0	8	0	0	0	0	0	0	0	0	0	0	0	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19		
sennet, northern	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	0	0	0	0	0	0	0	0	0	0	35	
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	275	944	230	230	512	26,093		

Appendix 5.2 cont.

Total count of finfish, lobster, horseshoe crab and squid taken in the LISTS, 1984-2019.

<u>Year</u>	<u>Tows</u>	<u>Total Count</u>
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	160	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
2015	200	211,566
2016	196	293,181
2017	144	162,833
2018	172	169,361
2019	200	146,966
	7,499	6,905,367

Appendix 5.3. Annual total weight (kg) of finfish, lobster, horseshoe crab and squid taken in LISTS, 1992-2019.

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 (number of tows)	1992 160	1993 240	1994 240	1995 200	1996 200	1997 200	1998 200	1999 200	2000 200	2001 200	2002 200	2003 200	2004 199	2005 200	2006 120	2007 200	2008 160	2009 200	2010 78	2011 172	2012 200	2013 200	2014 199	2015 200	2016 196	2017 144	2018 172	2019 200	Total 5,280	
anchovy, bay	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	3.1	8.7	7.7	3.3	6.6	190.7							
anchovy, striped	nw	nw	nw	nw	0.2	0.0	0.0	0.0	6.1	0.0	1.2	0.0	0.1	0.0	0.0	0.1	0.1	0.4	0.0	0.1	0.2	0.1	0.0	0.1	0.5	0.0	4.1	0.4	13.7	
Anchovy, spp (yoy-est)	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	3.3	3.1	7.9	1.7	1.4	43.7							
bigeye	0.0	0.0	0.1	0.0	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	0.1	0.0	0.1	0.0	0.1	0.0	0.2	0.8
bigeye, short	0.0	0.1	0.1	0.0	0.3	0.2	0.0	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	0.1	0.0	0.1	0.0	0.0	0.0	0.0	1.1
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	678.0	823.4	714.8	690.7	816.7	5,285.3	
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	0.0	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	6.7	1.5	0.1	19.9	3.8	40.0	
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	324.4	1,118.7	263.6	161.4	224.5	28,139.7	
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	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	0.5	0.0	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	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	1,011.2	2,036.1	1,426.0	1,412.7	1,114.1	48,533.7	
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	4.7	4.9	0.1	3.2	5.1	39.5	
Gadus spp. (yoy/larvae)	nw	1.5	0	0	1.8	0.3	0.4	0	0.4	1.1	0.2	0	0.4	1.1	0.2	0	6.3													
corbina, 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	0.1	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.8	
corbina, blue spotted	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	0.0	0.0	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	288.3	315.5	224.4	512.3	391.9	14,275.9	
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	1.5	0.0	0.0	0.1	0.0	0.0	5.0
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	1.8	0.5	0.5	0.5	0.0	91.0	
cusck-eeel, fawn	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3
cusck-eeel, 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	0.0	0.1	0.0	0.1	0.0	1.2	
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	2,804.1	2,785.6	3,391.3	3,024.9	2,957.2	47,109.7	
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	80.8	43.6	15.6	16.7	23.8	2,492.2	
drum, black	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	0	0	0	0.3	
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	0.0	0.0	0.0	0.0	0.0	0.6	3.7
eel, American (yoy)	nw	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	0.3												
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	0.3	0.0	0.0	0.0	0.3	6.7	
eel, conger (yoy)	nw	0.1	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	0.0	0.3												
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	0.0	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	0.1	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.4	0.2	0.0	0.0	0.1	0.1	2.8	
flounder, American plaice	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
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	76.3	175.3	67.9	147.6	147.8	6,990.3	
flounder, smallmouth	0.6	2.6	1.5	1.2	2.3	2.4	6.4	5.2	2.7	3.8	4.9	3.0	2.8	2.4	0.6	2.6	3.2	4.7	1.4	3.5	7.5	5.2	6.0	3.6	4.2	2.0	2.9	4.1	93.3	
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	449.3	386.4	244.0	397.0	464.3	12,798.9	
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	191.1	154.7	127.1	189.6	242.5	11,891.0	
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	319.7	261.0	27.7	132.2	103.1	31,529.6	
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	0.7	0.0	0.0	0.0	0.0	0.0	0.0	3.7
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	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0	2.0	
goatfish, red	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
goby, naked	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2
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	0.1	23.3	0.0	0.1	0.0	0.9	42.6	
grubby	0.0	0.0	0.3	0.1	0.2	0.7	0.3	0.2	0.0	0.1	0.1	0.1	0.0	0.2	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	0.0	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	0.1	0.0	0.0	0.0	0.0	0.0	0.0	3.4
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	0.0	0.1	0.0	1.6	0.0	5.1	
hake, red	127.7	254.4	63.9	145.6	95.5	80.5																								

Appendix 5.3 cont.

Common name (number of tows)	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total	
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	0.0	0.1	0.1	3.7	19.4		
mientaden, 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	361.2	69.4	72.2	80.5	280.7	2,673.8	
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	14.6	5.2	4.2	2.6	22.6	226.1	
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	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	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	0.5	0.0	0.0	0.0	0.0	98.2	
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	0.2	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.2	5.0	
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	0.0	0.1	0.0	0.0	0.0	0.3	
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	0.2	0.0	0.0	0.2	0.2	5.3	
pollock	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.8	0.1	0.5	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	2.1	
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	0.0	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	0.8	0.9	0.7	0.3	1.4	16.5	
ray, bluntnose stingray	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	
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	5.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.7	
ray, roughtail stingray	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	24.4	0.0	4.1	0.0	0.0	0.0	0.0	0.0	0.0	13.0	5.0	0.0	0.0	7.8	45.4	0.0	18.9	16.8	
rocking, 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	2.0	0.3	0.0	0.1	1.3	227.7	
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	0.0	0.0	0.0	0.0	0.0	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	0.0	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	0.1	0.0	0.1	0.0	0.1	0.0	26.2
sand lance, (joy - 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	0.0	0.0	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	0.3	0.0	0.0	0.0	0.0	2.3	
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	0.1	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	1.1	
scad, rough	0.0	4.4	0.2	0.0	1.5	2.0	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	7.1	0.1	0.6	0.0	0.0	0.0	34.1	
scad, round	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.1	0.2	0.0	0.0	0.3	0.3	0.3	0.0	0.3	0.0	0.1	0.0	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	2.5	
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	0.7	0.0	0.0	0.0	0.1	37.3	
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	6,045.5	16,006.0	9,616.8	12,947.0	11,169.0	155,035.2	
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	0.0	0.2	0.0	0.0	0.0	56.0	
sea turtle, Kemp's ridley	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.8	0.0	0.0	0.0	0.0	3.8	
seahorse	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	0.0	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	133.2	452.1	196.2	460.8	450.5	4,825.4	
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	1,058.2	1,964.4	1,400.0	1,582.6	1,264.4	19,163.1	
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	0.0	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	0.0	0.2	0.0	0.0	0.1	3.0	
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	24.7	46.2	21.0	17.6	32.3	1,180.6	
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	0.0	0.0	0.0	0.0	0.0	0.0	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	5.5	4.2	1.3	2.2	3.1	282.6	
shark, sand tiger	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.8	0.0	0.0	0.0	21.8	
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	0.0	0.0	0.0	0.0	0.0	0.0	
silverside, Atlantic	0.1	1.0	0.3	0.9	0.0	0.1	0.0	0.1	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.1	0.2	0.3	0.1	0.0	0.3	0.1	0.4	0.3	0.0	0.0	0.0	0.0	4.6	
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	0.0	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	225.0	228.7	147.1	149.8	213.8	3,400.8	
skate, little	1,389.0	2,534.8	3,091.5	1,055.3	2,801.8	1,945.8	2,085.5	1,829.6	1,604.7	2,022.6	2,121.9	2,187																		

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	.	.	<u>Invertebrates</u>				
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	.	.	<u>Invertebrates</u>				
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	.	.	<u>Invertebrates</u>				
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	.	.	<u>Invertebrates</u>				
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	.	.	<u>Invertebrates</u>				
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	.	.	<u>Invertebrates</u>				
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	.	.	<u>Invertebrates</u>				
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	<u>Invertebrates</u>				
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	%	species	count	%	weight	%
butterfish	35,361	33.0	847.8	7.1	goosefish	3	0	0.3	0
scup	18,785	17.6	581.4	4.8	American sand lance	3	0	0.3	0
winter flounder	16,090	15.0	1,855.7	15.4	Atlantic bonito	2	0	6.4	0.1
windowpane flounder	7,953	7.4	547.6	4.6	lumpfish	2	0	0.2	0
Atlantic herring	6,269	5.9	1,119.8	9.3	moonfish	2	0	0.2	0
little skate	5,186	4.8	2,172.3	18.1	sea lamprey	2	0	1.0	0
bluefish	4,402	4.1	1,343.2	11.2	Atlantic salmon	1	0	0.1	0
red hake	3,963	3.7	232.0	1.9	American eel	1	0	1.6	0
fourspot flounder	1,262	1.2	182.3	1.5	northern sennet	1	0	0.1	0
weakfish	1,142	1.1	60.3	0.5	orange filefish	1	0	0.1	0
striped searobin	1,079	1.0	165.4	1.4	round herring	1	0	0.1	0
northern searobin	935	0.9	96.8	0.8	red cornetfish	1	0	0.1	0
American shad	791	0.7	101.1	0.8	red goatfish	1	0	0.1	0
alewife	788	0.7	48.2	0.4	short bigeye	1	0	0.1	0
silver hake	500	0.5	21.1	0.2	sea raven	1	0	0.6	0
spotted hake	331	0.3	36.7	0.3	yellow jack	1	0	0.1	0
smooth dogfish	283	0.3	857.6	7.1	Total	107,035		12,012.4	
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	<u>Invertebrates</u>				
tautog	157	0.1	308.2	2.6	American lobster	10,306	20.6	2,173.5	34.4
Spanish mackerel	136	0.1	2.2	0	long-finned squid	39,723	79.4	1,176.5	18.6
blueback herring	96	0.1	4.3	0	blue mussel	nc	nc	945.1	15.0
rough scad	92	0.1	3.8	0	horseshoe crab	nc	nc	673.8	10.7
striped bass	78	0.1	198.7	1.7	spider crab	nc	nc	511.2	8.1
ocean pout	66	0.1	16.4	0.1	lady crab	nc	nc	428.0	6.8
cunner	64	0.1	6.1	0.1	rock crab	nc	nc	155.9	2.5
Atlantic sturgeon	60	0.1	633.6	5.3	flat claw hermit crab	nc	nc	45.7	0.7
winter skate	59	0.1	213.2	1.8	starfish spp.	nc	nc	37.4	0.6
spot	57	0.1	4.5	0	boring sponge	nc	nc	36.6	0.6
hogchoker	56	0.1	5.2	0	whelks	nc	nc	34.0	0.5
Atlantic silverside	54	0.1	1.0	0	mantis shrimp	nc	nc	31.6	0.5
northern puffer	23	0	0.4	0	lion's mane jellyfish	nc	nc	27.6	0.4
smallmouth flounder	23	0	2.1	0	bluecrab	nc	nc	20.0	0.3
Atlantic croaker	20	0	1.1	0	northern moon snail	nc	nc	8.9	0.1
black sea bass	16	0	5.0	0	common oyster	nc	nc	2.0	0
spiny dogfish	14	0	58.4	0.5	surf clam	nc	nc	1.0	0
Atlantic mackerel	11	0	0.9	0	hard clams	nc	nc	0.9	0
longhorn sculpin	11	0	3.2	0	purple sea urchin	nc	nc	0.7	0
planehead filefish	9	0	0.7	0	arks	nc	nc	0.7	0
hickory shad	9	0	4.1	0	mud crabs	nc	nc	0.4	0
northern pipefish	9	0	0.4	0	star coral	nc	nc	0.3	0
rainbow smelt	9	0	0.6	0	blood star	nc	nc	0.2	0
crevalle jack	5	0	0.4	0	common slipper shell	nc	nc	0.2	0
northern kingfish	5	0	0.6	0	sand shrimp	nc	nc	0.1	0
Atlantic tomcod	5	0	0.8	0	sand dollar	nc	nc	0.1	0
clearnose skate	4	0	7.7	0.1	northern red shrimp	nc	nc	0.1	0
white perch	4	0	0.3	0	polychaetes	nc	nc	0.1	0
conger eel	3	0	0.2	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	%	species	count	%	weight	%
butterfish	64,930	50.1	1,664.5	15.2	spot	3	0	0.3	0
winter flounder	15,558	12.0	1,614.7	14.7	Atlantic cod	2	0	0.1	0
scup	13,985	10.8	770.5	7.0	conger eel	2	0	1.2	0
Atlantic herring	9,135	7.0	1,631.7	14.9	haddock	2	0	0.2	0
bluefish	5,524	4.3	1,156.1	10.5	northern pipefish	2	0	0.1	0
windowpane flounder	3,815	2.9	356.2	3.2	sea raven	2	0	0.7	0
weakfish	2,881	2.2	275.7	2.5	African pompano	1	0	0.1	0
fourspot flounder	2,584	2.0	402.9	3.7	crevalle jack	1	0	0.1	0
little skate	2,372	1.8	1,055.3	9.6	grubby	1	0	0.1	0
red hake	1,977	1.5	145.6	1.3	Atlantic mackerel	1	0	0.1	0
silver hake	1,941	1.5	61.6	0.6	mackerel scad	1	0	0.1	0
northern searobin	1,317	1.0	166.9	1.5	northern puffer	1	0	0.1	0
American shad	755	0.6	81.4	0.7	oyster toadfish	1	0	0.5	0
striped searobin	682	0.5	277.5	2.5	yellowtail flounder	1	0	0.1	0
alewife	386	0.3	24.6	0.2	Total	129,609		10,966.8	
Atlantic menhaden	318	0.2	41.9	0.4	<u>Invertebrates</u>				
blueback herring	255	0.2	7.5	0.1	American lobster	9,944	29.3	2,141.9	55.1
fourbeard rockling	169	0.1	14.7	0.1	long-finned squid	23,974	70.7	796.4	20.5
smooth dogfish	168	0.1	566.8	5.2	lady crab	nc	nc	535.0	13.8
striped bass	165	0.1	185.3	1.7	horseshoe crab	nc	nc	116.8	3
summer flounder	121	0.1	79.6	0.7	spider crab	nc	nc	95.4	2.5
American sand lance	95	0.1	0.4	0	lion's mane jellyfish	nc	nc	78.3	2
spotted hake	72	0.1	6.5	0.1	rock crab	nc	nc	47.0	1.2
tautog	61	0	95.1	0.9	blue mussel	nc	nc	14.0	0.4
cunner	41	0	4.4	0	flat claw hermit crab	nc	nc	12.8	0.3
winter skate	41	0	89.2	0.8	boring sponge	nc	nc	11.2	0.3
Atlantic silverside	39	0	0.9	0	whelks	nc	nc	10.8	0.3
moonfish	33	0	2.1	0	mantis shrimp	nc	nc	8.1	0.2
yellow jack	32	0	2.1	0	bluecrab	nc	nc	6.0	0.2
ocean pout	30	0	6.5	0.1	northern moon snail	nc	nc	5.8	0.1
northern kingfish	25	0	2.5	0	starfish spp.	nc	nc	4.7	0.1
smallmouth flounder	19	0	1.2	0	arks	nc	nc	1.4	0
hogchoker	17	0	1.7	0	hard clams	nc	nc	0.7	0
black sea bass	12	0	4.7	0	purple sea urchin	nc	nc	0.7	0
hickory shad	6	0	2.5	0	sand shrimp	nc	nc	0.4	0
Atlantic sturgeon	6	0	145.5	1.3	ghost shrimp	nc	nc	0.3	0
longhorn sculpin	5	0	1.3	0	mud crabs	nc	nc	0.2	0
clearnose skate	4	0	11.0	0.1	common razor clam	nc	nc	0.1	0
goosefish	4	0	3.3	0	shore shrimp	nc	nc	0.1	0
rainbow smelt	4	0	0.3	0	Total	33,918		3,888	
Atlantic tomcod	4	0	0.8	0					

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	<u>Invertebrates</u>				
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	rougthead 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	<u>Invertebrates</u>				
northern searobin	579	0.4	60.4	0.5	American lobster	16,467	55.3	3,800.9	64.6
summer flounder	486	0.3	326.0	2.5	lady crab	nc	nc	592.5	10.1
striped bass	319	0.2	509.9	3.9	long-finned squid	13,048	43.8	515.2	8.8
moonfish	287	0.2	4.6	0	horseshoe crab	204	0.7	472.4	8.0
fourbeard rockling	199	0.1	17.3	0.1	spider crab	nc	nc	188.3	3.2
tautog	190	0.1	271.8	2.1	rock crab	nc	nc	94.1	1.6
smooth dogfish	167	0.1	527.3	4.1	lion's mane jellyfish	nc	nc	88.0	1.5
Atlantic menhaden	116	0.1	38.5	0.3	bushy bryozoan	nc	nc	28.0	0.5
spotted hake	77	0.1	19.0	0.1	flat claw hermit crab	nc	nc	21.7	0.4
rough scad	65	0	2.0	0	boring sponge	nc	nc	16.5	0.3
smallmouth flounder	58	0	2.4	0	whelks	22	0.1	14.8	0.3
winter skate	48	0	109.7	0.8	bluecrab	33	0.1	13.6	0.2
cunner	43	0	4.1	0	mantis shrimp	nc	nc	9.3	0.2
hickory shad	25	0	9.1	0.1	starfish spp.	nc	nc	7.3	0.1
black sea bass	22	0	10.5	0.1	hard clams	nc	nc	3.8	0.1
hogchoker	15	0	1.8	0	blue mussel	nc	nc	3.5	0.1
ocean pout	15	0	4.8	0	northern moon snail	nc	nc	3.3	0.1
grubby	11	0	0.7	0	northern comb jelly	nc	nc	2.0	0
spot	10	0	1.1	0	arks	nc	nc	1.8	0
Atlantic mackerel	8	0	1.7	0	common oyster	nc	nc	1.8	0
northern kingfish	7	0	0.9	0	surf clam	nc	nc	0.9	0
spiny dogfish	7	0	13.7	0.1	common slipper shell	nc	nc	0.7	0
Atlantic sturgeon	5	0	37.8	0.3	mud crabs	nc	nc	0.6	0
clearnose skate	4	0	7.4	0.1	sand shrimp	nc	nc	0.2	0
longhorn sculpin	4	0	0.8	0	common razor clam	nc	nc	0.2	0
white perch	4	0	0.9	0	blood star	nc	nc	0.1	0
crevalle jack	3	0	0.6	0	star coral	nc	nc	0.1	0
sea raven	3	0	0.4	0	northern red shrimp	nc	nc	0.1	0
Atlantic silverside	2	0	0.1	0	shore shrimp	nc	nc	0.1	0
goosefish	2	0	1.6	0	purple sea urchin	nc	nc	0.1	0
inshore lizardfish	2	0	0.2	0	Total	29,774		5,882	
round scad	2	0	0.2	0					

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	rougtail 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	<u>Invertebrates</u>				
moonfish	1,188	0.6	13.4	0.1	American lobster	16,211	36.7	3,873.9	60.2
American shad	901	0.4	60.2	0.4	long-finned squid	27,443	62.1	767.0	11.9
Atlantic herring	893	0.4	74.6	0.5	horseshoe crab	303	0.7	489.4	7.6
alewife	456	0.2	35.1	0.2	blue mussel	nc	nc	309.0	4.8
summer flounder	436	0.2	431.3	2.9	lady crab	nc	nc	291.2	4.5
striped bass	400	0.2	484.2	3.2	rock crab	nc	nc	241.4	3.8
northern searobin	360	0.2	39.4	0.3	spider crab	nc	nc	157.2	2.4
smooth dogfish	310	0.1	989.8	6.6	lion's mane jellyfish	nc	nc	63.1	1.0
Atlantic menhaden	306	0.1	9.2	0.1	flat claw hermit crab	nc	nc	56.0	0.9
blueback herring	211	0.1	5.1	0	bushy bryozoan	nc	nc	55.6	0.9
tautog	194	0.1	347.1	2.3	boring sponge	nc	nc	24.9	0.4
spotted hake	142	0.1	12.2	0.1	knobbed whelk	51	0.1	22.5	0.3
fourbeard rockling	133	0.1	11.6	0.1	starfish spp.	nc	nc	18.2	0.3
smallmouth flounder	97	0	6.4	0	bluecrab	49	0.1	12.8	0.2
cunner	65	0	8.1	0.1	channeled whelk	40	0.1	10.1	0.2
winter skate	62	0	180.7	1.2	whelks	52	0.1	9.8	0.2
hickory shad	40	0	15.9	0.1	northern moon snail	nc	nc	8.6	0.1
round herring	31	0	0.6	0	mantis shrimp	nc	nc	5.6	0.1
sea raven	30	0	11.3	0.1	common oyster	nc	nc	5.4	0.1
northern puffer	28	0	0.5	0	hard clams	nc	nc	3.7	0.1
clearnose skate	20	0	36.8	0.2	arks	nc	nc	2.0	0
black sea bass	18	0	10.6	0.1	red bearded sponge	nc	nc	1.4	0
spiny dogfish	18	0	44.5	0.3	surf clam	nc	nc	1.1	0
Atlantic sturgeon	17	0	189.7	1.3	sea grape	nc	nc	0.8	0
northern kingfish	15	0	1.3	0	mud crabs	nc	nc	0.7	0
Atlantic mackerel	13	0	1.1	0	boreal squid	18	0	0.7	0
ocean pout	13	0	2.7	0	purple sea urchin	nc	nc	0.6	0
hogchoker	12	0	1.9	0	common slipper shell	nc	nc	0.5	0
haddock	7	0	0.5	0	star coral	nc	nc	0.4	0
yellow jack	6	0	0.7	0	moon jelly	nc	nc	0.2	0
grubby	5	0	0.3	0	ghost shrimp	nc	nc	0.1	0
round scad	4	0	0.3	0	Total	44,167		6,434	
American sand lance	4	0	0.3	0					

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	%	species	count	%	weight	%
butterfish	191,100	54.1	4,171.6	21.9	goosefish	2	0	0.3	0
scup	101,095	28.6	3,641.3	19.1	grubby	2	0	0.2	0
weakfish	12,416	3.5	771.3	4.0	northern pipefish	2	0	0.1	0
winter flounder	10,288	2.9	2,011.7	10.6	longhorn sculpin	2	0	0.3	0
bluefish	7,843	2.2	1,218.0	6.4	oyster toadfish	2	0	1.8	0
silver hake	5,126	1.5	99.6	0.5	Atlantic silverside	1	0	0.1	0
windowpane flounder	4,643	1.3	594.2	3.1	gizzard shad	1	0	0.1	0
little skate	3,686	1.0	1,829.6	9.6	haddock	1	0	0.1	0
red hake	2,973	0.8	226.5	1.2	round scad	1	0	0.1	0
Atlantic herring	2,511	0.7	45.4	0.2	striped cusk-eel	1	0	0.1	0
striped searobin	1,690	0.5	497.0	2.6	sharksucker	1	0	0.3	0
alewife	1,393	0.4	107.6	0.6	Spanish mackerel	1	0	0.2	0
fourspot flounder	1,393	0.4	203.9	1.1	Atlantic tomcod	1	0	0.7	0
Atlantic menhaden	1,187	0.3	90.9	0.5	white perch	1	0	0.4	0
American shad	987	0.3	117.3	0.6	Total	353,203		19,054.7	
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	Invertebrates				
northern searobin	547	0.2	52.0	0.3	American lobster	13,922	38.1	3,397.9	61.6
striped bass	397	0.1	815.4	4.3	long-finned squid	21,580	59.0	826.4	15.0
spotted hake	381	0.1	38.8	0.2	horseshoe crab	384	1.1	634.1	11.5
smooth dogfish	305	0.1	923.0	4.8	lady crab	nc	nc	159.7	2.9
fourbeard rockling	233	0.1	28.8	0.2	rock crab	nc	nc	118.6	2.2
tautog	217	0.1	326.6	1.7	spider crab	nc	nc	95.4	1.7
striped anchovy	216	0.1	6.1	0	bushy bryozoan	nc	nc	78.0	1.4
American sand lance	178	0.1	0.3	0	flat claw hermit crab	nc	nc	32.5	0.6
smallmouth flounder	96	0	5.2	0	knobbed whelk	61	0.2	24.8	0.4
hickory shad	56	0	19.4	0.1	bluecrab	89	0.2	21.3	0.4
cunner	51	0	5.9	0	channeled whelk	81	0.2	21.1	0.4
black sea bass	50	0	17.2	0.1	mantis shrimp	376	1.0	19.3	0.4
spot	45	0	5.7	0	boring sponge	nc	nc	19.3	0.4
winter skate	41	0	89.8	0.5	lion's mane jellyfish	61	0.2	16.7	0.3
hogchoker	39	0	5.0	0	blue mussel	nc	nc	14.1	0.3
Atlantic sturgeon	39	0	498.6	2.6	northern moon snail	nc	nc	9.1	0.2
clearnose skate	22	0	39.4	0.2	starfish spp.	nc	nc	8.8	0.2
bigeye scad	21	0	1.4	0	common oyster	nc	nc	4.7	0.1
Atlantic mackerel	21	0	3.1	0	arks	nc	nc	2.8	0.1
yellow jack	20	0	1.9	0	common slipper shell	nc	nc	1.8	0
blueback herring	19	0	1.1	0	mud crabs	nc	nc	1.7	0
ocean pout	17	0	3.9	0	hard clams	nc	nc	1.5	0
northern puffer	14	0	1.1	0	sand shrimp	nc	nc	1.0	0
spiny dogfish	10	0	51.1	0.3	purple sea urchin	nc	nc	1.0	0
sea raven	9	0	4.9	0	northern red shrimp	nc	nc	0.9	0
crevalle jack	8	0	0.7	0	surf clam	nc	nc	0.4	0
inshore lizardfish	7	0	0.5	0	sea grape	nc	nc	0.2	0
northern kingfish	6	0	0.6	0	star coral	nc	nc	0.1	0
northern sennet	6	0	0.5	0	common razor clam	nc	nc	0.1	0
planehead filefish	3	0	0.3	0	moon jelly	nc	nc	0.1	0
bigeye	2	0	0.2	0	nemerteans	nc	nc	0.1	0
conger eel	2	0	0.5	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	<u>Invertebrates</u>				
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	%	species	count	%	weight	%
scup	58,325	37.7	5,828.4	30.7	American eel	1	0	0.6	0
butterfish	45,264	29.3	1,834.0	9.7	planehead filefish	1	0	0.1	0
weakfish	12,739	8.2	415.0	2.2	goosefish	1	0	0.4	0
winter flounder	9,826	6.4	1,993.6	10.5	naked goby	1	0	0.1	0
little skate	4,311	2.8	2,022.6	10.6	northern sennet	1	0	0.1	0
bluefish	3,986	2.6	751.2	4.0	rock gunnel	1	0	0.1	0
silver hake	3,945	2.6	152.2	0.8	red goatfish	1	0	0.1	0
windowpane flounder	3,065	2.0	475.5	2.5	rougtail stingray	1	0	2.5	0
fourspot flounder	2,167	1.4	362.7	1.9	short bigeye	1	0	0.1	0
striped searobin	2,061	1.3	861.0	4.5	yellowtail flounder	1	0	0.2	0
northern searobin	1,594	1.0	222.7	1.2	Total	154,514		18,997.8	
red hake	1,382	0.9	109.7	0.6					
summer flounder	875	0.6	628.1	3.3	<u>Finfish not ranked</u>				
alewife	638	0.4	41.7	0.2	American sand lance, yoy				
spotted hake	606	0.4	34.9	0.2	anchovy spp, yoy				
smooth dogfish	598	0.4	1,407.6	7.4	Atlantic herring, yoy				
Atlantic herring	497	0.3	72.6	0.4					
bay anchovy	443	0.3	3.6	0	<u>Invertebrates</u>				
tautog	319	0.2	491.2	2.6	American lobster	5,626	35.1	1,531.2	39.2
blueback herring	279	0.2	11.1	0.1	horseshoe crab	503	3.1	870.7	22.3
fourbeard rockling	251	0.2	21.5	0.1	long-finned squid	9,080	56.6	346.2	8.9
moonfish	225	0.1	3.8	0	spider crab	nc	nc	302.5	7.7
striped bass	214	0.1	472.5	2.5	bushy bryozoan	nc	nc	162.9	4.2
black sea bass	134	0.1	74.8	0.4	starfish spp.	nc	nc	154.7	4.0
American shad	109	0.1	9.6	0.1	rock crab	nc	nc	86.3	2.2
smallmouth flounder	98	0.1	3.8	0	blue mussel	nc	nc	84.7	2.2
Atlantic menhaden	86	0.1	4.7	0	lady crab	nc	nc	79.0	2.0
hogchoker	85	0.1	10.5	0.1	flat claw hermit crab	nc	nc	57.6	1.5
clearnose skate	65	0	132.4	0.7	knobbed whelk	118	0.7	53.3	1.4
cunner	51	0	5.9	0	channeled whelk	190	1.2	48.0	1.2
spiny dogfish	48	0	128.6	0.7	boring sponge	nc	nc	30.0	0.8
striped anchovy	47	0	1.2	0	lion's mane jellyfish	182	1.1	25.9	0.7
winter skate	38	0	112.2	0.6	northern moon snail	nc	nc	17.5	0.4
inshore lizardfish	21	0	2.2	0	mantis shrimp	304	1.9	16.5	0.4
Atlantic sturgeon	18	0	270.6	1.4	bluecrab	38	0.2	6.2	0.2
hickory shad	14	0	6.7	0	sea grape	nc	nc	6.1	0.2
spot	13	0	1.3	0	common slipper shell	nc	nc	5.3	0.1
rough scad	10	0	0.7	0	hydroid spp.	nc	nc	5.0	0.1
northern puffer	8	0	0.7	0	arks	nc	nc	4.0	0.1
sea raven	7	0	4.1	0	mud crabs	nc	nc	3.6	0.1
ocean pout	6	0	2.3	0	hard clams	nc	nc	3.0	0.1
round herring	5	0	0.1	0	sand shrimp	nc	nc	2.8	0.1
longhorn sculpin	5	0	1.5	0	common oyster	1	0	1.2	0
fawn cusk-eel	4	0	0.2	0	fan worm tubes	nc	nc	1.0	0
northern pipefish	4	0	0.3	0	purple sea urchin	nc	nc	0.8	0
American sand lance	4	0	0.3	0	moon jelly	nc	nc	0.4	0
seasnail	4	0	0.3	0	ghost shrimp	nc	nc	0.3	0
yellow jack	3	0	0.3	0	bobtail squid	1	0	0.1	0
conger eel	2	0	0.3	0	common razor clam	nc	nc	0.1	0
northern kingfish	2	0	0.2	0	northern red shrimp	nc	nc	0.1	0
oyster toadfish	2	0	0.4	0	surf clam	nc	nc	0.1	0
Atlantic silverside	1	0	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	%	species	count	%	weight	%
scup	100,481	47.0	13,814.1	46.0	inshore lizardfish	1	0	0.1	0
butterfish	66,550	31.1	1,924.2	6.4	northern kingfish	1	0	0.2	0
weakfish	10,713	5.0	442.0	1.5	rock gunnel	1	0	0.1	0
winter flounder	6,884	3.2	1,584.1	5.3	rainbow smelt	1	0	0.1	0
little skate	4,242	2.0	2,121.9	7.1	rougtail stingray	1	0	24.4	0.1
bluefish	3,450	1.6	1,099.7	3.7	Total	213,796		30,062.0	
striped searobin	2,394	1.1	1,065.0	3.5					
northern searobin	2,123	1.0	267.3	0.9	Finfish not ranked				
red hake	2,103	1.0	206.6	0.7	anchovy spp, yoy				
silver hake	2,013	0.9	89.6	0.3	Atlantic herring, yoy				
windowpane flounder	1,991	0.9	343.3	1.1					
fourspot flounder	1,859	0.9	326.9	1.1	Invertebrates				
summer flounder	1,356	0.6	989.3	3.3	blue mussel	nc	nc	2,497.8	43.9
smooth dogfish	1,019	0.5	2,814.3	9.4	American lobster	3,880	29.7	1,005.7	17.7
bay anchovy	992	0.5	6.6	0	horseshoe crab	517	4.0	862.9	15.2
alewife	855	0.4	70.2	0.2	spider crab	nc	nc	348.4	6.1
spotted hake	798	0.4	48.2	0.2	long-finned squid	8,034	61.5	279.9	4.9
American shad	593	0.3	40.3	0.1	lady crab	nc	nc	117.0	2.1
tautog	565	0.3	921.1	3.1	starfish spp.	nc	nc	91.8	1.6
striped bass	469	0.2	855.2	2.8	bushy bryozoan	nc	nc	85.0	1.5
moonfish	424	0.2	7.4	0	boring sponge	nc	nc	83.9	1.5
black sea bass	394	0.2	188.3	0.6	rock crab	nc	nc	74.6	1.3
Atlantic menhaden	366	0.2	96.3	0.3	flat claw hermit crab	36	0.3	55.8	1.0
Atlantic herring	365	0.2	63.9	0.2	channeled whelk	174	1.3	43.6	0.8
smallmouth flounder	139	0.1	4.9	0	northern moon snail	nc	nc	40.3	0.7
fourbeard rockling	106	0	9.7	0	knobbed whelk	40	0.3	19.1	0.3
hogchoker	100	0	13.3	0	bluecrab	84	0.6	16.1	0.3
blueback herring	68	0	2.4	0	lion's mane jellyfish	71	0.5	12.3	0.2
clearnose skate	59	0	107.3	0.4	mantis shrimp	226	1.7	11.2	0.2
cunner	55	0	7.2	0	arks	nc	nc	7.8	0.1
spot	52	0	7.2	0	common slipper shell	nc	nc	7.3	0.1
hickory shad	45	0	19.6	0.1	hydroid spp.	nc	nc	7.3	0.1
winter skate	45	0	133.5	0.4	sea grape	nc	nc	5.3	0.1
Atlantic sturgeon	18	0	275.3	0.9	hard clams	3	0	5.2	0.1
spiny dogfish	17	0	48.0	0.2	mud crabs	nc	nc	4.7	0.1
ocean pout	13	0	4.3	0	purple sea urchin	nc	nc	2.3	0
yellow jack	13	0	1.4	0	sand shrimp	nc	nc	1.6	0
sea raven	11	0	4.1	0	rubbery bryozoan	nc	nc	1.0	0
rough scad	10	0	0.7	0	surf clam	nc	nc	1.0	0
oyster toadfish	8	0	4.7	0	deadman's fingers sponge	nc	nc	0.5	0
northern puffer	6	0	0.3	0	blood star	nc	nc	0.4	0
Atlantic mackerel	5	0	2.5	0	common oyster	nc	nc	0.4	0
short bigeye	5	0	0.2	0	mixed sponge species	nc	nc	0.4	0
goosefish	3	0	0.6	0	northern red shrimp	nc	nc	0.3	0
American sand lance	3	0	0.1	0	anemones	nc	nc	0.1	0
longhorn sculpin	3	0	0.9	0	bobtail squid	1	0	0.1	0
northern sennet	2	0	0.2	0	ghost shrimp	nc	nc	0.1	0
northern pipefish	2	0	0.2	0	ribbed mussel	nc	nc	0.1	0
Atlantic bonito	1	0	2.4	0	sea cucumber	1	0	0.1	0
crevalle jack	1	0	0.1	0	Total	13,067		5,691	
gizzard shad	1	0	0.1	0					
grubby	1	0	0.1	0					

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	%	Species	count	%	weight	%
butterfish	25,483	34.4	524.6	3.7	barndoor skate	1	0	0.4	0
scup	17,552	23.7	4,389.3	30.6	Planehead filefish	1	0	0.1	0
weakfish	5,596	7.6	131.9	0.9	rainbow smelt	1	0	0.1	0
winter flounder	4,245	5.7	1,276.5	8.9	sea lamprey	1	0	1.3	0
bluefish	3,717	5.0	655.0	4.6	Spanish mackerel	1	0	2.1	0
little skate	2,867	3.9	1,554.1	10.8	Total	74,107		14,323.6	
bay anchovy	2,254	3.0	12.5	0.1					
windowpane flounder	1,858	2.5	333.9	2.3	Finfish not ranked				
fourspot flounder	1,658	2.2	327.7	2.3	anchovy spp, yoy				
striped searobin	1,529	2.1	687.0	4.8	Atlantic herring, yoy				
northern searobin	1,468	2.0	240.7	1.7					
summer flounder	1,151	1.6	825.0	5.8	Invertebrates				
red hake	681	0.9	31.1	0.2	Horseshoe crab	399	1.7	670.5	23.2
alewife	608	0.8	49.4	0.3	spider crab	nc	nc	640.6	22.2
smooth dogfish	552	0.7	1,508.8	10.5	American lobster	1,958	8.3	479.7	16.6
spotted hake	527	0.7	41.6	0.3	long-finned squid	19,231	81.9	421.3	14.6
Atlantic herring	448	0.6	87.8	0.6	boring sponge	nc	nc	107.5	3.7
American shad	305	0.4	23.5	0.2	rock crab	nc	nc	80.9	2.8
silver hake	217	0.3	8.3	0.1	starfish spp.	nc	nc	73.7	2.6
striped bass	215	0.3	542.1	3.8	flat claw hermit crab	nc	nc	61.3	2.1
tautog	210	0.3	325.4	2.3	channeled whelk	334	1.4	58.8	2.0
Atlantic menhaden	121	0.2	16.1	0.1	bushy bryozoan	nc	nc	54.3	1.9
fourbeard rockling	111	0.1	9.0	0.1	lion's mane jellyfish	1,307	5.6	40.6	1.4
blueback herring	98	0.1	3.4	0	knobbed whelk	96	0.4	35.1	1.2
moonfish	97	0.1	1.3	0	sea grape	nc	nc	31.1	1.1
hogchoker	89	0.1	8.3	0.1	northern moon snail	nc	nc	20.9	0.7
black sea bass	57	0.1	45.7	0.3	blue mussel	nc	nc	19.7	0.7
Atlantic cod	57	0.1	2.7	0	common slipper shell	nc	nc	16.8	0.6
clearnose skate	55	0.1	105.9	0.7	lady crab	nc	nc	12.0	0.4
smallmouth flounder	38	0.1	2.4	0	hydroid spp.	nc	nc	9.6	0.3
winter skate	38	0.1	90.6	0.6	ribbed mussel	nc	nc	8.8	0.3
cunner	36	0	5.9	0	sand shrimp	nc	nc	6.8	0.2
haddock	26	0	1.3	0	arks	nc	nc	6.5	0.2
Atlantic sturgeon	23	0	391.9	2.7	mud crabs	nc	nc	6.5	0.2
hickory shad	22	0	10.3	0.1	rubbery bryzoan	nc	nc	6.0	0.2
American sand lance	19	0	0.2	0	mantis shrimp	110	0.5	4.9	0.2
ocean pout	14	0	2.9	0	bluecrab	24	0.1	4.3	0.1
rough scad	12	0	0.5	0	hard clams	nc	nc	3.9	0.1
oyster toadfish	9	0	5.0	0	star coral	nc	nc	1.9	0.1
spiny dogfish	7	0	34.8	0.2	coastal mud shrimp	4	0	0.7	0
rock gunnel	6	0	0.4	0	purple sea urchin	nc	nc	0.6	0
round scad	4	0	0.3	0	blood star	nc	nc	0.4	0
glasseye snapper	3	0	0.1	0	northern red shrimp	2	0	0.4	0
conger eel	3	0	1.1	0	Japanese shore crab	4	0	0.3	0
Atlantic mackerel	3	0	0.3	0	anemones	nc	nc	0.1	0
crevalle jack	2	0	0.2	0	sand dollar	1	0	0.1	0
northern pipefish	2	0	0.2	0	common razor clam	1	0	0.1	0
northern puffer	2	0	0.2	0	moon jelly	nc	nc	0.1	0
longhorn sculpin	2	0	0.9	0	northern cyclocardia	nc	nc	0.1	0
sea raven	2	0	1.3	0	mixed sponge species	nc	nc	0.1	0
striped anchovy	2	0	0.1	0	Total	23,471		2,887	
Atlantic silverside	1	0	0.1	0					

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	%	species	count	%	weight	%
butterfish	94,735	46.7	1,842.7	9.7	American plaice	1	0	0.1	0
scup	61,521	30.3	6,801.1	35.7	conger eel	1	0	0.1	0
weakfish	17,505	8.6	426.9	2.2	gizzard shad	1	0	0.1	0
bluefish	6,504	3.2	2,140.6	11.2	goosefish	1	0	0.1	0
winter flounder	4,021	2.0	839.9	4.4	pollock	1	0	0.1	0
little skate	3,044	1.5	1,689.8	8.9	rougtail stingray	1	0	4.1	0
windowpane flounder	2,275	1.1	333.7	1.8	oyster toadfish	1	0	0.8	0
bay anchovy	1,523	0.8	10.3	0.1	yellow jack	1	0	0.1	0
silver hake	1,417	0.7	27.3	0.1	Total	202,887		19,056.6	
fourspot flounder	1,406	0.7	309.3	1.6					
striped searobin	1,308	0.6	465.4	2.4	<u>Finfish not ranked</u>				
alewife	859	0.4	56.1	0.3	anchovy spp, yoy				
Atlantic herring	851	0.4	58.3	0.3	Atlantic herring, yoy				
red hake	829	0.4	51.6	0.3					
northern searobin	784	0.4	112.0	0.6	<u>Invertebrates</u>				
Atlantic menhaden	746	0.4	110.7	0.6	long-finned squid	23,022	86.5	953.4	28.8
summer flounder	644	0.3	627.2	3.3	horseshoe crab	534	2.0	873.4	26.4
smooth dogfish	503	0.2	1,435.3	7.5	American lobster	1,843	6.9	481.5	14.5
striped bass	378	0.2	811.8	4.3	spider crab	nc	nc	355.5	10.7
American shad	356	0.2	24.2	0.1	blue mussel	nc	nc	250.2	7.6
tautog	232	0.1	353.7	1.9	bushy bryozoan	nc	nc	50.9	1.5
spotted hake	230	0.1	37.8	0.2	flat claw hermit crab	nc	nc	42.4	1.3
blueback herring	218	0.1	6.5	0	channeled whelk	199	0.7	42.3	1.3
moonfish	182	0.1	3.4	0	starfish spp.	nc	nc	41.7	1.3
fourbeard rockling	173	0.1	13.0	0.1	boring sponge	nc	nc	41.7	1.3
black sea bass	124	0.1	40.5	0.2	rock crab	1	0.0	35.2	1.1
hogchoker	83	0	9.5	0	lion's mane jellyfish	803	3.0	34.0	1.0
American sand lance	70	0	0.2	0	common slipper shell	nc	nc	22.9	0.7
winter skate	53	0	100.3	0.5	sea grape	nc	nc	16.4	0.5
smallmouth flounder	50	0	2.8	0	lady crab	nc	nc	14.5	0.4
hickory shad	39	0	14.2	0.1	northern moon snail	nc	nc	11.5	0.3
spiny dogfish	38	0	104.7	0.5	knobbed whelk	21	0.1	7.7	0.2
Atlantic cod	33	0	4.7	0	mantis shrimp	159	0.6	7.0	0.2
clearnose skate	22	0	48.2	0.3	arks	nc	nc	7.0	0.2
cunner	21	0	3.7	0	mud crabs	nc	nc	5.4	0.2
ocean pout	18	0	5.4	0	sand shrimp	nc	nc	4.7	0.1
rough scad	14	0	0.7	0	bluecrab	13	0	2.8	0.1
round scad	11	0	0.3	0	hard clams	nc	nc	2.3	0.1
spot	8	0	0.9	0	surf clam	5	0	1.0	0
Atlantic sturgeon	8	0	117.6	0.6	purple sea urchin	nc	nc	0.8	0
haddock	7	0	0.6	0	mixed sponge species	nc	nc	0.6	0
sea raven	7	0	2.4	0	hydroid spp.	nc	nc	0.6	0
northern kingfish	5	0	0.5	0	deadman's fingers sponge	nc	nc	0.5	0
northern puffer	5	0	0.4	0	rubbery bryozoan	nc	nc	0.4	0
longhorn sculpin	5	0	3.4	0	star coral	nc	nc	0.3	0
seasnail	4	0	0.2	0	northern red shrimp	nc	nc	0.3	0
crevalle jack	2	0	0.2	0	northern cyclocardia	nc	nc	0.2	0
northern pipefish	2	0	0.2	0	blood star	nc	nc	0.1	0
rock gunnel	2	0	0.2	0	coastal mud shrimp	1	0	0.1	0
Atlantic tomcod	2	0	0.2	0	sea cucumber	2	0	0.1	0
white perch	2	0	0.5	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	%	species	count	%	weight	%
butterfish	92,996	52.2	2,097.3	16.8	haddock	2	0	0.2	0
scup	52,642	29.6	3,080.7	24.7	seasnail	2	0	0.2	0
weakfish	9,191	5.2	449.9	3.6	glasseye snapper	1	0	0.1	0
bluefish	6,532	3.7	1,333.8	10.7	inshore lizardfish	1	0	0.1	0
winter flounder	4,692	2.6	566.1	4.5	lookdown	1	0	0.1	0
windowpane flounder	1,982	1.1	177.5	1.4	pollock	1	0	0.1	0
little skate	1,317	0.7	682.5	5.5	Total	178,073		12,474.3	
Atlantic herring	1,168	0.7	131.1	1.1					
bay anchovy	814	0.5	5.8	0	<u>Finfish not ranked</u>				
striped searobin	757	0.4	183.7	1.5	anchovy spp, yoy				
alewife	742	0.4	47.6	0.4	Atlantic herring, yoy				
fourspot flounder	688	0.4	125.9	1					
red hake	585	0.3	56.0	0.4	<u>Invertebrates</u>				
summer flounder	506	0.3	406.1	3.3	blue mussel	nc	nc	971.0	32.6
striped bass	469	0.3	675.1	5.4	long-finned squid	17,542	83.2	683.5	22.9
smooth dogfish	467	0.3	1,421.7	11.4	American lobster	1,389	6.6	364.3	12.2
moonfish	356	0.2	6.0	0	horseshoe crab	161	0.8	304.2	10.2
northern searobin	265	0.1	21.3	0.2	starfish spp.	nc	nc	198.4	6.7
Atlantic menhaden	235	0.1	77.9	0.6	lion's mane jellyfish	1,806	8.6	97.3	3.3
spotted hake	234	0.1	17.4	0.1	spider crab	nc	nc	92.0	3.1
tautog	179	0.1	269.2	2.2	bushy bryozoan	nc	nc	64.6	2.2
American shad	177	0.1	18.2	0.1	lady crab	nc	nc	48.8	1.6
silver hake	165	0.1	7.1	0.1	boring sponge	nc	nc	26.1	0.9
hickory shad	136	0.1	43.1	0.3	flat claw hermit crab	nc	nc	23.1	0.8
blueback herring	111	0.1	5.4	0	channeled whelk	101	0.5	23.0	0.8
fourbeard rockling	106	0.1	6.8	0.1	common slipper shell	nc	nc	12.2	0.4
clearnose skate	102	0.1	187.1	1.5	rubbery bryozoan	nc	nc	11.0	0.4
rough scad	62	0	1.9	0	knobbed whelk	23	0.1	9.7	0.3
hogchoker	61	0	8.7	0.1	rock crab	nc	nc	9.3	0.3
smallmouth flounder	44	0	2.4	0	ribbed mussel	nc	nc	7.6	0.3
black sea bass	42	0	26.4	0.2	hard clams	nc	nc	7.2	0.2
spiny dogfish	41	0	102.0	0.8	northern moon snail	nc	nc	4.7	0.2
Atlantic mackerel	37	0	5.7	0	sea grape	nc	nc	4.5	0.2
winter skate	31	0	59.9	0.5	mantis shrimp	64	0.3	3.8	0.1
yellow jack	28	0	3.0	0	arks	nc	nc	3.5	0.1
cunner	24	0	4.1	0	hydroid spp.	nc	nc	3.4	0.1
round scad	12	0	0.3	0	mud crabs	nc	nc	2.5	0.1
Atlantic cod	10	0	0.9	0	sand shrimp	nc	nc	2.1	0.1
rock gunnel	9	0	0.6	0	deadman's fingers sponge	nc	nc	1.1	0
Atlantic sturgeon	9	0	152.7	1.2	purple sea urchin	nc	nc	0.7	0
northern sennet	8	0	0.7	0	bluecrab	3	0	0.6	0
American sand lance	6	0	0.2	0	mixed sponge species	nc	nc	0.4	0
northern puffer	5	0	0.3	0	surf clam	nc	nc	0.4	0
northern kingfish	4	0	0.6	0	star coral	nc	nc	0.3	0
northern pipefish	4	0	0.3	0	sand dollar	1	0	0.2	0
ocean pout	3	0	0.7	0	northern red shrimp	nc	nc	0.2	0
sea raven	3	0	0.5	0	boreal squid	1	0	0.1	0
crevalle jack	2	0	0.2	0	Japanese shore crab	5	0	0.1	0
gizzard shad	2	0	0.2	0	northern cyclocardia	nc	nc	0.1	0
goosefish	2	0	0.7	0	common oyster	nc	nc	0.1	0
grubby	2	0	0.2	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	<u>Finfish not ranked</u>				
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	<u>Invertebrates</u>				
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 bryozoan	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	<u>Finfish not ranked</u>				
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	<u>Invertebrates</u>				
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 bryozoan	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 bryozoan	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
rougtail 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	%	species	count	%	weight	%
butterfish	108,087	53.6	3,186.9	17	striped cusk-eel	1	0	0.1	0
scup	46,991	23.3	6,332.1	33.8	spot	1	0	0.2	0
bay anchovy	11,128	5.5	35.3	0.2	northern stargazer	1	0	0.1	0
Atlantic herring	6,330	3.1	239.2	1.3	Atlantic tomcod	1	0	0.1	0
winter flounder	4,068	2	524.0	2.8	white perch	1	0	0.1	0
bluefish	3,657	1.8	1,157.4	6.2	yellow jack	1	0	0.1	0
weakfish	2,604	1.3	108.7	0.6	yellowtail flounder	1	0	0.2	0
moonfish	2,575	1.3	19.5	0.1	Total	201,476		18,750	
windowpane flounder	2,496	1.2	342.8	1.8					
northern searobin	2,012	1	194.3	1	Finfish not ranked				
striped searobin	1,507	0.7	471.8	2.5	anchovy spp, yoy				
American sand lance	1,227	0.6	2.0	0	Atlantic herring, yoy				
alewife	1,175	0.6	96.0	0.5	American sand lance (yoy)				
fourspot flounder	1,036	0.5	169.8	0.9					
silver hake	947	0.5	50.0	0.3	Invertebrates				
red hake	897	0.4	59.5	0.3	long-finned squid	24,130	91.4	648.4	30.2
summer flounder	881	0.4	694.4	3.7	horseshoe crab	340	1.3	645.8	30
little skate	709	0.4	390.0	2.1	American lobster	853	3.2	244	11.3
smooth dogfish	588	0.3	2,213.3	11.8	spider crab	.	.	144.1	6.7
striped bass	466	0.2	897.4	4.8	lion's mane jellyfish	641	2.4	89.3	4.2
American shad	422	0.2	28.9	0.2	lady crab	.	.	63.6	3
spotted hake	327	0.2	32.1	0.2	rock crab	.	.	42.4	2
blueback herring	291	0.1	14.6	0.1	common slipper shell	.	.	37	1.7
tautog	163	0.1	285.4	1.5	flat claw hermit crab	.	.	33.8	1.6
spiny dogfish	148	0.1	545.7	2.9	bushy bryozoan	.	.	33.3	1.5
black sea bass	121	0.1	59.5	0.3	starfish spp.	.	.	26.6	1.2
smallmouth flounder	96	0	4.7	0	channeled whelk	127	0.5	26	1.2
clearnose skate	69	0	148.5	0.8	hydroid spp.	.	.	25.7	1.2
Atlantic menhaden	69	0	18.0	0.1	knobbed whelk	39	0.1	11.6	0.5
rough scad	59	0	2.8	0	mantis shrimp	215	0.8	10.7	0.5
fourbeard rockling	47	0	3.9	0	Tubularia, spp.	.	.	9	0.4
winter skate	44	0	108.5	0.6	northern moon snail	.	.	7.2	0.3
hogchoker	39	0	4.5	0	anemones	.	.	5.6	0.3
blue runner	34	0	2.3	0	mixed sponge species	.	.	5.4	0.3
ocean pout	22	0	4.8	0	sea grape	.	.	5.0	0.2
Atlantic sturgeon	18	0	286.6	1.5	boring sponge	.	.	4.2	0.2
cunner	18	0	1.8	0	blue crab	19	0.1	4.1	0.2
pollock	18	0	0.8	0	sand shrimp	.	.	3.8	0.2
Atlantic cod	15	0	1.0	0	deadman's fingers sponge	.	.	3.5	0.2
hickory shad	13	0	3.6	0	blue mussel	8	0	3.5	0.2
northern kingfish	7	0	0.4	0	mud crabs	.	.	3.1	0.1
glasseye snapper	6	0	0.6	0	common oyster	1	0	3.1	0.1
Atlantic mackerel	5	0	0.4	0	arks	2	0	2.5	0.1
northern sennet	5	0	0.4	0	surf clam	18	0.1	1.7	0.1
northern puffer	5	0	0.4	0	hard clams	4	0	1.1	0.1
sea raven	5	0	1.7	0	red bearded sponge	.	.	0.8	0
striped anchovy	5	0	0.4	0	purple sea urchin	4	0	0.8	0
Atlantic silverside	3	0	0.3	0	rubbery bryozoan	.	.	0.6	0
oyster toadfish	3	0	0.8	0	star coral	.	.	0.2	0
inshore lizardfish	2	0	0.2	0	ghost shrimp	2	0	0.2	0
northern pipefish	2	0	0.2	0	coastal mud shrimp	2	0	0.1	0
rock gunnel	2	0	0.2	0	northern cyclocardia	1	0	0.1	0
longhorn sculpin	2	0	0.3	0	northern red shrimp	1	0	0.1	0
crevalle jack	1	0	0.1	0	sea cucumber	1	0	0.1	0
planehead filefish	1	0	0.1	0	tunicates, misc	1	0	0.1	0
round scad	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	%	species	count	%	weight	%
American sand lance	13,061	35.3	5.2	0.1	<u>Invertebrates</u>				
scup	7,157	19.3	1,971.6	44.3	long-finned squid	1,906	62.9	161.4	28.4
butterfish	2,894	7.8	166.9	3.7	horseshoe crab	58	1.9	112.2	19.8
windowpane flounder	2,850	7.7	449.3	10.1	American lobster	293	9.7	83.6	14.7
winter flounder	2,579	7.0	450.5	10.1	spider crab	.	.	81.6	14.4
silver hake	1,747	4.7	35.4	0.8	bushy bryozoan	.	.	23.1	4.1
Atlantic herring	1,318	3.6	179.0	4	rock crab	.	.	16.7	2.9
northern searobin	1,128	3	149.5	3.4	starfish spp.	.	.	15.1	2.7
red hake	990	2.7	64.3	1.4	common slipper shell	.	.	11.2	2
spotted hake	665	1.8	15.8	0.4	lion's mane jellyfish	401	13.2	7.8	1.4
summer flounder	517	1.4	229.6	5.2	lady crab	.	.	7.7	1.4
bay anchovy	475	1.3	2.8	0.1	flat claw hermit crab	.	.	6.8	1.2
fourspot flounder	402	1.1	92.0	2.1	hydroid spp.	.	.	6.7	1.2
little skate	281	0.8	148.3	3.3	channeled whelk	33	1.1	4.5	0.8
alewife	172	0.5	14.3	0.3	northern moon snail	.	.	4.1	0.7
American shad	165	0.4	8.6	0.2	blue mussel	.	.	3.1	0.5
striped searobin	141	0.4	66.4	1.5	common oyster	.	.	2.9	0.5
blueback herring	101	0.3	3.4	0.1	sea grape	.	.	2.7	0.5
striped bass	71	0.2	173.2	3.9	sand shrimp	.	.	2.3	0.4
tautog	53	0.1	83.1	1.9	deadman's fingers sponge.	.	.	2.3	0.4
black sea bass	37	0.1	20.1	0.5	blue crab	10	0.3	2.0	0.4
fourbeard rockling	35	0.1	2.9	0.1	arks	.	.	1.6	0.3
hogchoker	34	0.1	4.4	0.1	mud crabs	.	.	1.6	0.3
smallmouth flounder	31	0.1	1.4	0	rubbery bryozoan	.	.	1.2	0.2
rock gunnel	29	0.1	0.5	0	mantis shrimp	19	0.6	1.1	0.2
Atlantic cod	21	0.1	2.1	0	Unknown Jellyfish	300	9.9	0.8	0.1
winter skate	16	0	37.7	0.8	Tubularia, spp.	.	.	0.5	0.1
cunner	11	0	1.3	0	anemones	5	0.1	0.4	0.1
smooth dogfish	10	0	34.4	0.8	surf clam	2	0.1	0.4	0.1
Atlantic menhaden	7	0	2.7	0.1	knobbed whelk	1	0	0.3	0.1
ocean pout	6	0	1.4	0	mixed sponge species	.	.	0.3	0.1
sea raven	6	0	1.6	0	northern comb jelly	1	0	0.2	0
northern pipefish	4	0	0.3	0	purple sea urchin	4	0.1	0.2	0
spiny dogfish	3	0	16.2	0.4	boring sponge	.	.	0.1	0
bluefish	2	0	6.1	0.1	red bearded sponge	.	.	0.1	0
hickory shad	2	0	0.4	0	coastal mud shrimp	.	.	0.1	0
pollock	2	0	0.1	0	star coral	.	.	0.1	0
American plaice	1	0	0.1	0	hard clams	.	.	0.1	0
Atlantic silverside	1	0	0.1	0	sea cucumber	.	.	0.1	0
Atlantic sturgeon	1	0	5.6	0.1	Total	3,033		567.0	
clearnose skate	1	0	4.5	0.1	Note: nc= not counted				
longhorn sculpin	1	0	0.4	0					
weakfish	1	0	1.0	0					
Total	37,029		4,455						

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	%	species	count	%	weight	%
butterfish	42,141	36.7	1,600.8	9.9	striped burrfish	1	0	0.5	0
scup	34,458	30.0	6,759.0	41.7	striped anchovy	1	0	0.1	0
American sand lance	9,535	8.3	7.5	0.0	silver perch	1	0	0.1	0
bay anchovy	4,693	4.1	10.5	0.1	oyster toadfish	1	0	0.2	0
winter flounder	3,092	2.7	613.8	3.8	white perch	1	0	0.1	0
windowpane flounder	2,831	2.5	395.9	2.4	white mullet	1	0	0.1	0
bluefish	2,765	2.4	584.7	3.6	yellowtail flounder	1	0	0.3	0
weakfish	2,583	2.3	192.6	1.2	Total	114,706		16,210.3	
striped searobin	1,630	1.4	558.7	3.4					
Atlantic herring	1,482	1.3	199.4	1.2	<u>Finfish not ranked</u>				
fourspot flounder	1,400	1.2	224.2	1.4	anchovy spp, yoy				
summer flounder	1,051	0.9	713.0	4.4	Atlantic herring, yoy				
silver hake	948	0.8	40.3	0.2	American sand lance (yoy)				
northern searobin	803	0.7	85.5	0.5					
spotted hake	725	0.6	76.8	0.5	<u>Invertebrates</u>				
little skate	674	0.6	359.4	2.2	horseshoe crab	257	1.7	505.2	33.5
moonfish	640	0.6	6.3	0	long-finned squid	13,020	86.4	370.7	24.6
smooth dogfish	613	0.5	2,031.7	12.5	spider crab	.	.	151.8	10.1
alewife	512	0.4	29.8	0.2	lady crab	.	.	132.4	8.8
red hake	278	0.2	25.1	0.2	American lobster	230	1.5	52.0	3.4
American shad	271	0.2	17.5	0.1	rock crab	.	.	45.5	3.0
striped bass	243	0.2	721.9	4.5	hydroid spp.	.	.	30.5	2.0
Atlantic menhaden	181	0.2	69.8	0.4	mantis shrimp	971	6.4	29.6	2.0
rough scad	150	0.1	6.8	0	bushy bryozoan	.	.	24.9	1.7
hogchoker	147	0.1	16.8	0.1	knobbed whelk	62	0.4	23.8	1.6
Atlantic cod	109	0.1	9.2	0.1	flat claw hermit crab	.	.	22.1	1.5
tautog	106	0.1	151.7	0.9	channeled whelk	99	0.7	19.0	1.3
black sea bass	91	0.1	54.2	0.3	starfish spp.	.	.	14.4	1.0
blueback herring	72	0.1	3.2	0	blue crab	69	0.5	12.4	0.8
smallmouth flounder	67	0.1	3.5	0	lion's mane jellyfish	345	2.3	11.3	0.7
spiny dogfish	58	0.1	203.5	1.3	mixed sponge species	.	.	11.0	0.7
clearnose skate	56	0	109.8	0.7	blue mussel	1	0	6.7	0.4
inshore lizardfish	43	0	4.6	0	northern moon snail	.	.	5.6	0.4
fourbeard rockling	43	0	4.0	0	boring sponge	.	.	5.5	0.4
winter skate	37	0	101.2	0.6	hard clams	.	.	5.3	0.4
northern kingfish	34	0	3.7	0	common slipper shell	.	.	5.2	0.3
ocean pout	27	0	4.5	0	sand shrimp	.	.	4.5	0.3
blue runner	24	0	1.7	0	Tubularia, spp.	.	.	3.5	0.2
cunner	14	0	1.9	0	mud crabs	.	.	2.6	0.2
northern puffer	9	0	0.9	0	rubbery bryozoan	.	.	1.7	0.1
longhorn sculpin	9	0	2.0	0	common oyster	1	0	1.6	0.1
hickory shad	8	0	1.5	0	sea grape	.	.	1.5	0.1
Atlantic sturgeon	5	0	181.9	1.1	arks	.	.	1.4	0.1
pollock	5	0	0.5	0	surf clam	7	0	1.0	0.1
spot	5	0	0.7	0	purple sea urchin	3	0	0.6	0
crevalle jack	4	0	0.4	0	red bearded sponge	.	.	0.3	0
grubby	4	0	0.1	0	northern comb jelly	.	.	0.3	0
northern pipefish	4	0	0.3	0	anemones	6	0	0.2	0
rock gunnel	4	0	0.2	0	star coral	.	.	0.2	0
conger eel	3	0	1.1	0	coastal mud shrimp	1	0	0.1	0
sea raven	3	0	0.9	0	common razor clam	1	0	0.1	0
striped cusk-eel	2	0	0.2	0	ghost shrimp	1	0	0.1	0
Atlantic tomcod	2	0	0.2	0	northern red shrimp	1	0	0.1	0
American plaice	1	0	0.1	0	polychaetes	.	.	0.1	0
Atlantic croaker	1	0	0.2	0	tunicates, misc	.	.	0.1	0
northern sennet	1	0	0.1	0	water jelly	1	0	0.1	0
round scad	1	0	0.1	0	Total	15,076		1,505.0	
rougtail stingray	1	0	13.0	0.1					

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	%	species	count	%	weight	%
butterfish	60,539	37.9	1,891.3	10.8	longhorn sculpin	1	0	0.2	0
scup	53,119	33.2	6,170.2	35.1	white perch	1	0	0.2	0
silver hake	7,519	4.7	171.0	1.0	white mullet	1	0	0.1	0
weakfish	6,785	4.2	409.2	2.3	Total	159,770		17,570.3	
bluefish	3,851	2.4	532.7	3.0					
northern searobin	3,642	2.3	405.2	2.3	Finfish not ranked				
windowpane flounder	3,536	2.2	501.1	2.9	anchovy spp, yoy				
winter flounder	3,365	2.1	604.9	3.4	Atlantic herring, yoy				
striped searobin	2,973	1.9	1,086.4	6.2	American sand lance (yoy)				
fourspot flounder	2,597	1.6	454.5	2.6					
red hake	1,720	1.1	148.6	0.8	Invertebrates				
little skate	1,406	0.9	657.9	3.7	horseshoe crab	199	1.7	385.8	30.6
bay anchovy	1,296	0.8	8.6	0.0	long-finned squid	9,767	84.5	333.9	26.5
summer flounder	980	0.6	718.5	4.1	spider crab	.	.	162.4	12.9
spot	858	0.5	107.5	0.6	American lobster	349	3.0	70.0	5.6
alewife	708	0.4	47.0	0.3	boring sponge	.	.	47.9	3.8
spotted hake	626	0.4	64.2	0	lady crab	.	.	45.3	3.6
smooth dogfish	610	0.4	1,833.3	10.4	rock crab	.	.	40.7	3.2
Atlantic herring	571	0.4	61.5	0.4	mantis shrimp	846	7.3	26.6	2.1
Atlantic menhaden	426	0.3	144.6	0.8	bushy bryozoan	.	.	20.4	1.6
black sea bass	410	0.3	141.0	0.8	flat claw hermit crab	.	.	18.3	1.5
hogchoker	340	0.2	30.7	0.2	blue crab	72	0.6	14.5	1.2
American shad	321	0.2	25.3	0.1	knobbed whelk	36	0.3	13.8	1.1
clearnose skate	280	0.2	491.7	3	channeled whelk	76	0.7	13.7	1.1
moonfish	262	0.2	3.6	0.0	blue mussel	1	0.0	9.4	0.7
smallmouth flounder	258	0.2	7.5	0.0	common slipper shell	.	.	9.4	0.7
striped bass	170	0.1	278.0	1.6	mixed sponge species	.	.	7.4	0.6
tautog	135	0.1	128.9	0.7	Tubularia, spp.	.	.	5.0	0.4
winter skate	97	0.1	179.8	1	hydroid spp.	.	.	4.8	0.4
northern kingfish	59	0.0	8.4	0	lion's mane jellyfish	50	0.4	4.4	0.3
northern puffer	47	0.0	3.1	0.0	mud crabs	.	.	3.9	0.3
blueback herring	46	0	1.6	0.0	starfish spp.	.	.	3.3	0.3
fourbeard rockling	43	0	3.5	0	northern red shrimp	118	1.0	3.0	0.2
hickory shad	42	0	14.1	0	northern moon snail	.	.	1.8	0.1
blue runner	27	0	2.7	0.0	sand shrimp	.	.	1.7	0.1
cunner	20	0	2.8	0	arks	.	.	1.4	0.1
rough scad	19	0	1.1	0	hard clams	3	0	1.3	0.1
spiny dogfish	16	0	62.8	0	red bearded sponge	.	.	1.2	0.1
ocean pout	14	0	2.0	0	sea grape	.	.	1.1	0.1
Atlantic sturgeon	7	0	154.2	1	deadman's fingers sponge	.	.	0.8	0.1
sea raven	5	0	1.1	0	purple sea urchin	7	0	0.8	0
northern sennet	3	0	0.3	0	common oyster	.	.	0.8	0
striped anchovy	3	0	0.2	0.0	surf clam	10	0.1	0.8	0
crevalle jack	2	0	0.2	0	star coral	.	.	0.4	0
goosefish	2	0	0.8	0	rubbery bryozoan	.	.	0.4	0
pinfish	2	0	0.2	0	sea cucumber	3	0	0.4	0
round herring	2	0	0.1	0	tunicates, misc	16	0	0.4	0
American sand lance	2	0	0.2	0	water jelly	4	0	0.3	0
African pompano	1	0	0.1	0	coastal mud shrimp	1	0	0.2	0
conger eel	1	0	0.3	0	northern comb jelly	.	.	0.1	0
gizzard shad	1	0	0.1	0	moon jelly	.	.	0.1	0
northern pipefish	1	0	0.1	0	Total	11,558		1,257.9	
rock gunnel	1	0	0.1	0					
rougtail stingray	1	0	5.0	0					

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 gadids, 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	%
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						
					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 bryozoan	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 5.4. cont. 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 gadids, 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	%	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						
					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

Appendix 5.4. cont. . Total number and weight (kg) of finfish and invertebrates caught in 2015.

Finfish species are in order of descending count. Invertebrate species are in order of descending weight (nc = not counted). Young-of-year gadids, 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	80,534	49.3	6,045.5	38.7	round scad	1	0.0	0.1	0.0
butterfish	53,265	32.6	1,011.2	6.5	rock gunnel	1	0.0	0.1	0.0
weakfish	10,077	6.2	530.4	3.4	rougtail stingray	1	0.0	7.8	0.0
striped searobin	2,728	1.7	1,058.2	6.8	short bigeye	1	0.0	0.1	0.0
bluefish	2,650	1.6	324.4	2.1	sea lamprey	1	0.0	1.2	0.0
smooth dogfish	1,438	0.9	2,804.1	17.9	Atlantic thread herring	1	0.0	0.1	0.0
winter flounder	1,340	0.8	319.7	2.0	Total	163,223		15,625	
Atlantic menhaden	1,279	0.8	361.2	2.3	Finfish not ranked				
windowpane flounder	1,150	0.7	191.1	1.2	anchovy spp, (yoy)				
black sea bass	1,109	0.7	678.0	4.3	Atlantic herring, (yoy)				
moonfish	891	0.5	14.6	0.1	American sand lance (yoy)				
summer flounder	808	0.5	449.3	2.9	gadid spp, (yoy)				
northern searobin	805	0.5	133.2	0.9	Invertebrates				
Atlantic herring	630	0.4	71.8	0.5	longfin inshore squid	28,266	97.0	1366.2	69.6
alewife	485	0.3	30.5	0.2	horseshoe crab	159	0.5	288.3	14.7
red hake	480	0.3	44.5	0.3	spider crab	nc		133.3	6.8
bay anchovy	399	0.2	3.1	0.0	common slipper shell	nc		29.8	1.5
little skate	387	0.2	192.0	1.2	American lobster	92	0.3	24.0	1.2
fourspot flounder	386	0.2	76.3	0.5	knobbed whelk	37	0.1	15.7	0.8
tautog	308	0.2	339.7	2.2	bushy bryozoan	nc		10.1	0.5
spotted hake	302	0.2	40.1	0.3	mantis shrimp	187	0.6	9.8	0.5
American shad	275	0.2	24.7	0.2	flat claw hermit crab	nc		8.1	0.4
hogchoker	255	0.2	31.2	0.2	sea grape	1	0.0	7.8	0.4
blueback herring	249	0.2	7.1	0.0	boring sponge	nc		7.6	0.4
striped bass	187	0.1	405.2	2.6	lion's mane jellyfish	347	1.2	6.5	0.3
rough scad	144	0.1	7.1	0.0	mixed sponge species	nc		6.3	0.3
clearnose skate	131	0.1	225.0	1.4	channeled whelk	26	0.1	5.8	0.3
silver hake	100	0.1	6.5	0.0	blue crab	22	0.1	4.7	0.2
northern kingfish	97	0.1	7.1	0.0	blue mussel	nc		4.2	0.2
smallmouth flounder	73	0.0	3.6	0.0	northern moon snail	1	0.0	4.0	0.2
blue runner	68	0.0	6.7	0.0	hydroid spp.	nc		3.9	0.2
winter skate	30	0.0	51.8	0.3	rock crab	nc		3.8	0.2
fourbeard rockling	20	0.0	2.0	0.0	sand shrimp	nc		3.7	0.2
spiny dogfish	19	0.0	80.8	0.5	mud crabs	nc		2.9	0.1
red cornetfish	14	0.0	0.6	0.0	starfish spp.	nc		2.5	0.1
spot	14	0.0	1.7	0.0	lady crab	nc		2.4	0.1
cunner	13	0.0	1.8	0.0	arks	nc		1.5	0.1
hickory shad	12	0.0	5.5	0.0	common oyster	nc		0.8	0.0
northern puffer	11	0.0	0.8	0.0	rubbery bryozoan	nc		0.7	0.0
Atlantic croaker	6	0.0	1.5	0.0	Tubularia, spp.	nc		0.5	0.0
Atlantic silverside	5	0.0	0.4	0.0	coastal mud shrimp	2	0.0	0.4	0.0
Atlantic cod	5	0.0	4.7	0.0	surf clam	2	0.0	0.4	0.0
crevalle jack	4	0.0	0.4	0.0	red bearded sponge	nc		0.3	0.0
Atlantic mackerel	4	0.0	0.4	0.0	deadman's fingers sponge	nc		0.3	0.0
American sand lance	4	0.0	0.1	0.0	fan worm tubes	nc		0.3	0.0
bigeye scad	3	0.0	0.3	0.0	hard clams	1	0.0	0.3	0.0
planehead filefish	2	0.0	0.2	0.0	polychaetes	nc		0.3	0.0
glasseye snapper	2	0.0	0.1	0.0	brown shrimp	2	0.0	0.2	0.0
goosefish	2	0.0	0.1	0.0	comb jelly spp	nc		0.2	0.0
ocean pout	2	0.0	0.5	0.0	star coral	nc		0.2	0.0
northern pipefish	2	0.0	0.2	0.0	ghost shrimp	1	0.0	0.2	0.0
longhorn sculpin	2	0.0	0.7	0.0	purple sea urchin	2	0.0	0.2	0.0
striped anchovy	2	0.0	0.1	0.0	anemones	nc		0.1	0.0
oyster toadfish	2	0.0	0.9	0.0	sand dollar	1	0.0	0.1	0.0
yellowtail flounder	2	0.0	0.7	0.0	common razor clam	1	0.0	0.1	0.0
Atlantic sturgeon	1	0.0	15.8	0.1	tunicates, misc	nc		0.1	0.0
bigeye	1	0.0	0.1	0.0	Total	29,150		1,958.6	
conger eel	1	0.0	0.3	0.0	Note: nc= not counted				
mahogany snapper	1	0.0	0.1	0.0					
round herring	1	0.0	0.1	0.0					

Appendix 5.4. cont. . Total number and weight (kg) of finfish and invertebrates caught in 2016.

Finfish species are in order of descending count. Invertebrate species are in order of descending weight (nc = not counted). Young-of-year gadids, 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)=196.

species	count	%	weight	%	species	count	%	weight	%
scup	175,632	63.4	16,006.2	56.2					
butterfish	65,596	23.7	2,036.1	7.1					
striped searobin	5,886	2.1	1,964.4	6.9	Finfish not ranked				
weakfish	4,689	1.7	297.6	1.0	anchovy spp, (yoy)				
northern searobin	3,178	1.1	452.1	1.6	Atlantic herring, (yoy)				
alewife	2,811	1.0	132.0	0.5	American sand lance (yoy)				
bluefish	2,793	1.0	1,118.7	3.9	gadid spp, (yoy)				
spotted hake	2,456	0.9	113.8	0.4	Invertebrates				
windowpane flounder	1,593	0.6	154.7	0.5	longfin inshore squid	12,424	94.1	464.4	41.1
smooth dogfish	1,338	0.5	2,785.6	9.8	horseshoe crab	164	1.2	315.5	28.0
bay anchovy	1,239	0.4	8.7	0.0	spider crab	nc		140.6	12.5
black sea bass	1,181	0.4	823.4	2.9	lion's mane jellyfish	221	1.7	72.1	6.4
winter flounder	1,108	0.4	261.0	0.9	American lobster	74	0.6	25.2	2.2
fourspot flounder	1,056	0.4	175.3	0.6	common slipper shell	nc		19.2	1.7
American shad	944	0.3	46.2	0.2	bushy bryozoan	nc		11.2	1.0
silver hake	891	0.3	32.9	0.1	mantis shrimp	206	1.6	9.5	0.8
Atlantic menhaden	876	0.3	69.4	0.2	knobbed whelk	23	0.2	8.8	0.8
red hake	668	0.2	50.3	0.2	flat claw hermit crab	nc		8.7	0.8
summer flounder	462	0.2	386.4	1.4	boring sponge	nc		7.4	0.7
blueback herring	448	0.2	12.2	0.0	rock crab	nc		6.8	0.6
little skate	377	0.1	193.1	0.7	channeled whelk	29	0.2	6.0	0.5
hogchoker	354	0.1	41.8	0.1	hydroid spp.	nc		5.9	0.5
Atlantic herring	340	0.1	37.1	0.1	blue crab	20	0.1	5.0	0.4
tautog	306	0.1	288.5	1.0	hard clams	22	0.2	3.2	0.3
moonfish	265	0.1	5.2	0.0	mud crabs	nc		2.5	0.2
striped bass	167	0.1	261.9	0.9	mixed sponge species	nc		1.9	0.2
smallmouth flounder	148	0.1	4.2	0.0	sand shrimp	nc		1.8	0.2
clearnose skate	134	0.0	228.7	0.8	lady crab	nc		1.7	0.2
goosefish	70	0.0	23.3	0.1	Tubularia, spp.	nc		1.5	0.1
northern kingfish	31	0.0	4.8	0.0	northern moon snail	nc		1.3	0.1
hickory shad	18	0.0	4.2	0.0	arks	3	0.0	1.3	0.1
winter skate	17	0.0	31.6	0.1	starfish spp.	1	0.0	0.9	0.1
blue runner	15	0.0	1.5	0.0	blue mussel	1	0.0	0.8	0.1
Atlantic sturgeon	12	0.0	318.3	1.1	common oyster	5	0.0	0.6	0.1
spot	12	0.0	1.7	0.0	surf clam	1	0.0	0.5	0.0
spiny dogfish	9	0.0	43.6	0.2	comb jelly spp	nc		0.2	0.0
striped anchovy	8	0.0	0.5	0.0	star coral	nc		0.2	0.0
northern puffer	5	0.0	0.9	0.0	ghost shrimp	1	0.0	0.2	0.0
cunner	4	0.0	0.5	0.0	anemones	nc		0.1	0.0
inshore lizardfish	4	0.0	0.3	0.0	bobtail squid	1	0.0	0.1	0.0
oyster toadfish	4	0.0	1.7	0.0	red bearded sponge	nc		0.1	0.0
Atlantic silverside	3	0.0	0.3	0.0	common razor clam	1	0.0	0.1	0.0
fourbeard rockling	3	0.0	0.3	0.0	Japanese shore crab	1	0.0	0.1	0.0
striped cusk-eel	3	0.0	0.1	0.0	polychaetes	1	0.0	0.1	0.0
northern sennet	2	0.0	0.2	0.0	tunicates, misc	nc		0.1	0.0
bluntnose stingray	1	0.0	0.6	0.0	purple sea urchin	nc		0.1	0.0
Atlantic cod	1	0.0	4.9	0.0	water jelly	1	0.0	0.1	0.0
crevalle jack	1	0.0	0.1	0.0	Total	13,200		1,125.8	
haddock	1	0.0	0.1	0.0	Note: nc= not counted				
pinfish	1	0.0	0.1	0.0					
pollock	1	0.0	0.1	0.0					
rougthead stingray	1	0.0	45.4	0.2					
rough scad	1	0.0	0.1	0.0					
sea raven	1	0.0	0.2	0.0					
sand tiger shark	1	0.0	21.8	0.1					
Total	277,166		28,495						

Appendix 5.4. cont. . Total number and weight (kg) of finfish and invertebrates caught in 2017.

Finfish species are in order of descending count. Invertebrate species are in order of descending weight (nc = not counted). Young-of-year gadids, 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)=144.

species	count	%	weight	%	species	count	%	weight	%
scup	75,763	56.4	9,616.8	51.4					
butterfish	35,814	26.7	1,426.0	7.6	<u>Finfish not ranked</u>				
weakfish	5,904	4.4	311.2	1.7	anchovy spp, (yoy)				
striped searobin	3,942	2.9	1,400.0	7.5	Atlantic herring, (yoy)				
bluefish	2,408	1.8	263.6	1.4	American sand lance (yoy)				
smooth dogfish	1,624	1.2	3,391.3	18.1	gadid spp, (yoy)				
northern searobin	1,430	1.1	196.2	1.0					
spotted hake	1,253	0.9	111.2	0.6	<u>Invertebrates</u>				
bay anchovy	1,069	0.8	7.7	0.0	longfin inshore squid	14,186	96.5	584.5	54.5
black sea bass	980	0.7	714.8	3.8	horseshoe crab	112	0.8	224.4	20.9
windowpane flounder	974	0.7	127.1	0.7	spider crab	nc		129.4	12.1
hogchoker	391	0.3	50.1	0.3	boring sponge	nc		46.9	4.4
fourspot flounder	366	0.3	67.9	0.4	common slipper shell	nc		20.8	1.9
summer flounder	354	0.3	244.0	1.3	bushy bryozoan	nc		12.1	1.1
silver hake	309	0.2	12.3	0.1	flat claw hermit crab	nc		8.3	0.8
moonfish	273	0.2	4.2	0.0	knobbed whelk	36	0.2	7.3	0.7
Atlantic menhaden	239	0.2	72.2	0.4	mantis shrimp	173	1.2	7.3	0.7
American shad	230	0.2	21.0	0.1	blue crab	18	0.1	4.1	0.4
red hake	152	0.1	11.9	0.1	American lobster	12	0.1	4.0	0.4
spot	114	0.1	10.5	0.1	lion's mane jellyfish	102	0.7	3.7	0.3
little skate	113	0.1	63.0	0.3	lady crab	nc		3.5	0.3
winter flounder	112	0.1	27.7	0.1	blue mussel	nc		2.7	0.3
blueback herring	89	0.1	3.5	0.0	channeled whelk	18	0.1	2.4	0.2
tautog	77	0.1	99.0	0.5	sand shrimp	nc		1.6	0.1
clearnose skate	73	0.1	147.1	0.8	hard clams	5	0.0	1.2	0.1
striped bass	73	0.1	186.8	1.0	comb jelly spp	24	0.2	1.2	0.1
smallmouth flounder	44	0.0	2.0	0.0	hydroid spp.	nc		1.1	0.1
alewife	38	0.0	2.0	0.0	arks	6	0.0	1.1	0.1
winter skate	19	0.0	34.1	0.2	mud crabs	nc		1.1	0.1
northern kingfish	11	0.0	2.3	0.0	northern moon snail	nc		1.0	0.1
Atlantic herring	10	0.0	1.1	0.0	rock crab	nc		0.8	0.1
American sand lance	7	0.0	0.1	0.0	surf clam	10	0.1	0.8	0.1
rough scad	7	0.0	0.6	0.0	red bearded sponge	nc		0.5	0.0
Atlantic cod	4	0.0	0.1	0.0	purple sea urchin	3	0.0	0.4	0.0
cunner	4	0.0	0.5	0.0	star coral	nc		0.2	0.0
hickory shad	4	0.0	1.3	0.0	anemones	nc		0.1	0.0
northern puffer	4	0.0	0.7	0.0	ghost shrimp	1	0.0	0.1	0.0
Atlantic mackerel	3	0.0	1.3	0.0	jingle shell clams	1	0.0	0.1	0.0
spiny dogfish	3	0.0	15.6	0.1	common oyster	nc		0.1	0.0
black drum	2	0.0	0.2	0.0	mixed sponge species	nc		0.1	0.0
Atlantic sturgeon	1	0.0	60.9	0.3	Total	14,707		1,072.9	
blue runner	1	0.0	0.1	0.0	Note: nc= not counted				
bigeye	1	0.0	0.1	0.0					
crevalle jack	1	0.0	0.1	0.0					
glasseye snapper	1	0.0	0.1	0.0					
inshore lizardfish	1	0.0	0.1	0.0					
naked goby	1	0.0	0.1	0.0					
Spanish mackerel	1	0.0	0.1	0.0					
oyster toadfish	1	0.0	0.3	0.0					
Total	134,295		18,710.9						

Appendix 5.4. cont. . Total number and weight (kg) of finfish and invertebrates caught in 2018.

Finfish species are in order of descending count. Invertebrate species are in order of descending weight (nc = not counted). Young-of-year gadids, 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	%	species	count	%	weight	%
scup	81,228	53.4	12,947.2	56.1					
butterfish	42,025	27.6	1,412.7	6.1	Finfish not ranked				
weakfish	7,544	5.0	270.2	1.2	anchovy spp, (yoy)				
striped searobin	4,223	2.8	1,582.6	6.9	Atlantic herring, (yoy)				
northern searobin	2,949	1.9	460.8	2.0	American sand lance (yoy)				
smooth dogfish	1,598	1.0	3,024.9	13.1	gadid spp, (yoy)				
black sea bass	1,434	0.9	690.7	3.0					
windowpane flounder	1,266	0.8	189.6	0.8	Invertebrates				
alewife	1,052	0.7	87.5	0.4	horseshoe crab	264	1.9	512.3	44.3
spotted hake	1,015	0.7	151.7	0.7	longfin inshore squid	13,146	92.2	408.8	35.3
hogchoker	811	0.5	98.9	0.4	spider crab	nc		77.1	6.7
summer flounder	753	0.5	397.0	1.7	bushy bryozoan	nc		39.4	3.4
fourspot flounder	711	0.5	147.6	0.6	common slipper shell	nc		29.4	2.5
bluefish	702	0.5	161.4	0.7	lion's mane jellyfish	458	3.2	13.8	1.2
bay anchovy	641	0.4	3.3	0.0	mantis shrimp	297	2.1	11.6	1.0
blueback herring	579	0.4	36.5	0.2	mixed sponge species	nc		10.8	0.9
winter flounder	500	0.3	132.2	0.6	hydroid spp.	nc		10.2	0.9
silver hake	450	0.3	18.3	0.1	flat claw hermit crab	nc		8.7	0.7
red hake	361	0.2	25.8	0.1	knobbed whelk	15	0.1	6.5	0.6
Atlantic herring	352	0.2	45.0	0.2	American lobster	15	0.1	3.8	0.3
striped bass	269	0.2	457.4	2.0	channeled whelk	23	0.2	3.4	0.3
American shad	230	0.2	17.6	0.1	Tubularia, spp.	nc		3.2	0.3
tautog	230	0.2	209.0	0.9	rock crab	nc		2.7	0.2
Atlantic menhaden	227	0.1	80.5	0.3	blue crab	18	0.1	2.7	0.2
striped anchovy	222	0.1	4.1	0.0	sand shrimp	nc		1.7	0.1
blue runner	195	0.1	19.9	0.1	northern moon snail	nc		1.3	0.1
little skate	151	0.1	82.4	0.4	arks	nc		1.2	0.1
moonfish	143	0.1	2.6	0.0	hard clams	3	0.0	1.2	0.1
smallmouth flounder	86	0.1	2.9	0.0	lady crab	nc		1.1	0.1
clearnose skate	81	0.1	149.8	0.6	star coral	nc		0.9	0.1
northern kingfish	75	0.0	9.9	0.0	fan worm tubes	nc		0.8	0.1
spot	36	0.0	3.8	0.0	mud crabs	nc		0.7	0.1
Atlantic cod	11	0.0	3.2	0.0	sea grape	nc		0.6	0.1
Atlantic mackerel	10	0.0	0.7	0.0	surf clam	4	0.0	0.6	0.0
Atlantic sturgeon	7	0.0	98.6	0.4	blue mussel	nc		0.4	0.0
inshore lizardfish	7	0.0	0.5	0.0	Jonah crab	nc		0.4	0.0
crevalle jack	6	0.0	0.5	0.0	comb jelly spp	nc		0.4	0.0
hickory shad	6	0.0	2.2	0.0	red bearded sponge	nc		0.3	0.0
northern puffer	5	0.0	0.3	0.0	water jelly	3	0.0	0.2	0.0
spiny dogfish	5	0.0	16.7	0.1	purple sea urchin	2	0.0	0.2	0.0
cunner	4	0.0	0.5	0.0	Japanese shore crab	nc		0.2	0.0
northern pipefish	3	0.0	0.2	0.0	boring sponge	nc		0.1	0.0
winter skate	3	0.0	4.1	0.0	coastal mud shrimp	1	0.0	0.1	0.0
harvestfish	2	0.0	0.2	0.0	green sea urchin	1	0.0	0.1	0.0
rougtail stingray	2	0.0	18.9	0.1	jingle shell clams	1	0.0	0.1	0.0
oyster toadfish	2	0.0	0.8	0.0	green crab	1	0.0	0.1	0.0
Atlantic croaker	1	0.0	0.1	0.0	polychaetes	nc		0.1	0.0
planehead filefish	1	0.0	0.1	0.0	Total	14,252		1,156.5	
goosefish	1	0.0	0.9	0.0					
haddock	1	0.0	1.6	0.0	Note: nc= not counted				
fourbeard rockling	1	0.0	0.1	0.0					
striped cusk-eel	1	0.0	0.1	0.0					
Spanish mackerel	1	0.0	0.1	0.0					
northern stargazer	1	0.0	0.2	0.0					
Total	152,220		23,074.2						

Appendix 5.4. cont. . Total number and weight (kg) of finfish and invertebrates caught in 2019.

Finfish species are in order of descending count. Invertebrate species are in order of descending weight (nc = not counted). Young-of-year gadids, 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	53,617	40.2	11,169.4	50.3					
butterfish	43,434	32.5	1,114.1	5.0	<u>Finfish not ranked</u>				
silver hake	4,348	3.3	126.1	0.6	anchovy spp, (yoy)				
weak fish	3,766	2.8	245.5	1.1	Atlantic herring, (yoy)				
striped searobin	3,181	2.4	1,264.4	5.7	American sand lance (yoy)				
northern searobin	3,112	2.3	450.5	2.0	gadid spp, (yoy)				
moonfish	2,270	1.7	22.6	0.1					
bluefish	2,048	1.5	224.5	1.0	<u>Invertebrates</u>				
spotted hake	2,027	1.5	178.3	0.8	horseshoe crab	218	1.8	391.9	33.3
black sea bass	1,584	1.2	816.7	3.7	longfin inshore squid	10,934	92.1	368.4	31.3
windowpane flounder	1,427	1.1	242.5	1.1	spider crab	nc		115.9	9.9
alewife	1,401	1.0	86.1	0.4	common slipper shell	nc		71.8	6.1
bay anchovy	1,346	1.0	6.6	0.0	lion's mane jellyfish	386	3.3	67.6	5.8
summer flounder	1,309	1.0	464.3	2.1	bushy bryozoan	nc		60.2	5.1
Atlantic herring	1,294	1.0	302.7	1.4	mixed sponge species	nc		43.2	3.7
smooth dogfish	1,243	0.9	2,957.2	13.3	American lobster	25	0.2	7.6	0.6
red hake	1,215	0.9	77.5	0.3	mantis shrimp	223	1.9	7.2	0.6
Atlantic menhaden	815	0.6	280.7	1.3	flat claw hermit crab	nc		6.5	0.6
fourspot flounder	570	0.4	147.8	0.7	hydroid spp.	nc		5.7	0.5
striped bass	535	0.4	773.6	3.5	knobbed whelk	17	0.1	4.8	0.4
American shad	512	0.4	32.4	0.1	blue crab	21	0.2	3.9	0.3
winter flounder	422	0.3	103.1	0.5	common oyster	nc		3.8	0.3
little skate	418	0.3	220.9	1.0	channeled whelk	22	0.2	3.3	0.3
hogchoker	383	0.3	50.8	0.2	sand shrimp	nc		2.5	0.2
tautog	373	0.3	351.9	1.6	rock crab	nc		1.7	0.1
smallmouth flounder	186	0.1	4.1	0.0	hard clams	10	0.1	1.4	0.1
blueback herring	124	0.1	6.0	0.0	lady crab	nc		1.4	0.1
clearnose skate	113	0.1	213.8	1.0	mud crabs	nc		1.3	0.1
spot	66	0.0	8.2	0.0	northern moon snail	nc		1.1	0.1
Spanish mackerel	65	0.0	3.7	0.0	Tubularia, spp.	nc		1.0	0.1
blue runner	59	0.0	3.8	0.0	arks	nc		0.8	0.1
winter skate	41	0.0	72.7	0.3	deadman's fingers sponge	nc		0.6	0.0
striped anchovy	21	0.0	0.4	0.0	blue mussel	nc		0.4	0.0
fourbeard rockling	20	0.0	1.3	0.0	fan worm tubes	nc		0.4	0.0
Atlantic cod	15	0.0	5.1	0.0	star coral	nc		0.3	0.0
northern kingfish	14	0.0	1.9	0.0	comb jelly spp	nc		0.3	0.0
hickory shad	11	0.0	3.1	0.0	sea cucumber	2	0.0	0.2	0.0
Atlantic sturgeon	9	0.0	104.7	0.5	sea grape	nc		0.2	0.0
northern puffer	9	0.0	1.4	0.0	green sea urchin	2	0.0	0.1	0.0
northern pipefish	5	0.0	0.2	0.0	red bearded sponge	nc		0.1	0.0
crevalle jack	4	0.0	0.2	0.0	northern red shrimp	1	0.0	0.1	0.0
spiny dogfish	4	0.0	23.8	0.1	polychaetes	nc		0.1	0.0
oyster toadfish	4	0.0	1.1	0.0	coastal mud shrimp	1	0.0	0.1	0.0
bigeye	3	0.0	0.2	0.0	ghost shrimp	1	0.0	0.1	0.0
conger eel	2	0.0	0.3	0.0	Japanese shore crab	nc		0.1	0.0
fawn cusk-eel	2	0.0	0.1	0.0	moon jelly	nc		0.1	0.0
goosefish	2	0.0	0.8	0.0	starfish spp.	nc		0.1	0.0
inshore lizardfish	2	0.0	0.1	0.0	surf clam	1	0.0	0.1	0.0
white perch	2	0.0	0.2	0.0	purple sea urchin	1	0.0	0.1	0.0
American eel	1	0.0	0.6	0.0	Total	11,865		1,176.2	
planehead filefish	1	0.0	0.1	0.0	Note: nc= not counted				
harvestfish	1	0.0	0.1	0.0					
northern sennet	1	0.0	0.1	0.0					
rougtail stingray	1	0.0	16.8	0.1					
longhorn sculpin	1	0.0	0.1	0.0					
Total	133,439		22,184.7						

Appendix 5.5: Endangered Species Interactions: Nine (9) Atlantic Sturgeon were captured on seven (7) of the 200 tows completed in 2019; an encounter rate (3.5%) comparable to the average for the LISTS time series of tows (2.4%). The captures occurred at seven sites in the deeper mud and transition sites off the North shore of Long Island and central Sound. All encounters were reported to NMFS within 24 hours and all fish were released alive and uninjured. Details 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	Tissue Sample	Photo	Release time	Release lat (N)	Release lon (W)
FA2019012	9/10/2019	00-24	13:18	30	ATS	1,524	1,330	19.29			ADDED	YES	YES	14:07	41 00.46	72 46.45
FA2019012	9/10/2019	00-24	13:18	30	ATS	1,052	942	5.63			ADDED	YES	NO	14:11	41 00.82	72 46.02
FA2019018	9/16/2019	01-25	11:04	30	ATS	1,275	1,100	10.77			ADDED	YES	YES	11:49	41 00.79	72 44.87
FA2019018	9/16/2019	01-25	11:04	30	ATS	1,480	1,290	16.80			ADDED	YES	YES	11:55	41 00.79	72 44.87
FA2019046	10/15/2019	07-30	7:59	30	ATS	1,174	1,030	6.72			ADDED	YES	YES	9:19	41 07.554	72 31.24
FA2019058	10/23/2019	08-26	8:46	30	ATS	1,065	1,000	6.79			ADDED	YES	YES	9:33	41 08.38	72 39.54
FA2019067	10/25/2019	59-18	9:11	30	ATS	1,670	1,465	24.64			ADDED	NO	YES	9:57	41 00.02	73 04.98
SP2019052	5/15/2019	05-26	16:13	30	ATS	790	675	2.21			ADDED	YES	YES	16:57	41 05.94	72 38.73
SP2019087	6/5/2019	08-27	12:53	30	ATS	1,320	1,130	11.92			ADDED	YES	YES	13:44	41 08.13	72 40.65

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 ~3-15⁰C, 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 < 7-10⁰C; prefers ~11-22⁰C, and spawns at higher end of temperature tolerance.

Cold Temperate Group		Warm Temperate Group	
Common Name	Scientific Name	Common Name	Scientific Name
alewife	<i>Alosa pseudoharengus</i>	American eel	<i>Anguilla rostrata</i>
American plaice	<i>Hippoglossoides platessoides</i>	American shad	<i>Alosa sapidissima</i>
Atlantic herring	<i>Clupea harengus</i>	Atlantic bonito	<i>Sarda sarda</i>
Atlantic cod	<i>Gadus morhua</i>	Atlantic croaker	<i>Micropogonias undulates</i>
Atlantic mackerel	<i>Scomber scombrus</i>	Atlantic silversides	<i>Menidia menidia</i>
Atlantic salmon	<i>Salmo salar</i>	black seabass	<i>Centropristis striata</i>
Atlantic seasnail	<i>Liparis atlanticus</i>	blueback herring	<i>Alosa aestivalis</i>
Atlantic sturgeon	<i>Acipenser oxyrinchus</i>	bluefish	<i>Pomatomus saltatrix</i>
Atlantic tomcod	<i>Microgadus tomcod</i>	butterfish	<i>Peprilus triacanthus</i>
bamdoor skate	<i>Dipturus laevis</i>	clearnose skate	<i>Raja eglanteria</i>
cunner	<i>Tautoglabrus adspersus</i>	conger eel	<i>Conger oceanicus</i>
fawn cusk-eel	<i>Lepophidium profundorum</i>	gizzard shad	<i>Dorosoma cepedianum</i>
fourspot flounder	<i>Hippoglossina oblonga</i>	hickory shad	<i>Alosa mediocris</i>
grubby	<i>Myoxocephalus aeneus</i>	hogchoker	<i>Trinectes maculatus</i>
haddock	<i>Melanogrammus aeglefinus</i>	lined seahorse	<i>Hippocampus erectus</i>
little skate	<i>Leucoraja erinacea</i>	menhaden	<i>Brevoortia tyrannus</i>
longhorn sculpin	<i>Myoxocephalus octodecemspinosus</i>	naked goby	<i>Gobiosoma bosc</i>
lumpfish	<i>Cyclopterus lumpus</i>	northern kingfish	<i>Menticirrhus saxatilis</i>
monkfish (goosefish)	<i>Lophius americanus</i>	northern puffer	<i>Sphaeroides maculatus</i>
northern pipefish	<i>Syngnathus fuscus</i>	northern searobin	<i>Prionotus carolinus</i>
ocean pout	<i>Zoarces americanus</i>	oyster toadfish	<i>Opsanus tau</i>
pollock	<i>Pollachius virens</i>	scup (porgy)	<i>Stenotomus chrysops</i>
rainbow smelt	<i>Osmerus mordax</i>	sea lamprey	<i>Petromyzon marinus</i>
red hake	<i>Urophycis chuss</i>	smallmouth flounder	<i>Etropus microstomus</i>
rock gunnel	<i>Pholis gunnellus</i>	smooth dogfish	<i>Mustelus canis</i>
rockling	<i>Enchelyopus cimbrius</i>	spot	<i>Leiostomus xanthurus</i>
searaven	<i>Hemitripteris americanus</i>	spotted hake	<i>Urophycis regia</i>
spiny dogfish	<i>Squalus acanthias</i>	striped bass	<i>Morone saxatilis</i>
whiting (silver hake)	<i>Merluccius bilinearis</i>	striped cusk-eel	<i>Ophidion marginatum</i>
windowpane	<i>Scophthalmus aquosus</i>	striped searobin	<i>Prionotus evolans</i>
winter flounder	<i>Pseudopleuronectes americanus</i>	summer flounder	<i>Paralichthys dentatus</i>
winter skate	<i>Leucoraja ocellata</i>	tautog (blackfish)	<i>Tautoga onitis</i>
yellowtail flounder	<i>Limanda ferruginea</i>	white perch	<i>Morone Americana</i>
		weakfish	<i>Cynoscion regalis</i>

JOB 6: STUDIES IN CONSERVATION ENGINEERING

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JOB 6: STUDIES IN CONSERVATION ENGINEERING

GOAL

Evaluate new technologies and methodologies for potential inclusion in the Long Island Sound Trawl Survey or other Surveys of this Project.

OBJECTIVES

- 1) *Characterize catch composition and selectivity patterns using different gear combinations for Connecticut's marine fishery-independent monitoring surveys. Particular emphasis will be placed on evaluating modern trawl net design/materials and door combinations for potential use on the Long Island Sound Trawl Survey.*
- 2) *Evaluate impacts of gear changes on associated thirty-year time series data which are used in numerous coastal stock assessments, management decisions, essential fish habitat analysis and climate change studies.*
- 3) *Assess electronic data acquisition systems for fisheries research for potential benefits of modernizing the Long Island Sound Trawl Survey or other Surveys of this Project.*
- 4) *Assess new software applications to integrate the components of an onboard electronic data acquisition system with a computerized database for data collection and QA/QC for the Long Island Sound Trawl Survey or other Surveys of this Project.*

INTRODUCTION

Work during this segment focused solely on Objectives 3 and 4, however future segments may focus on other Objectives.

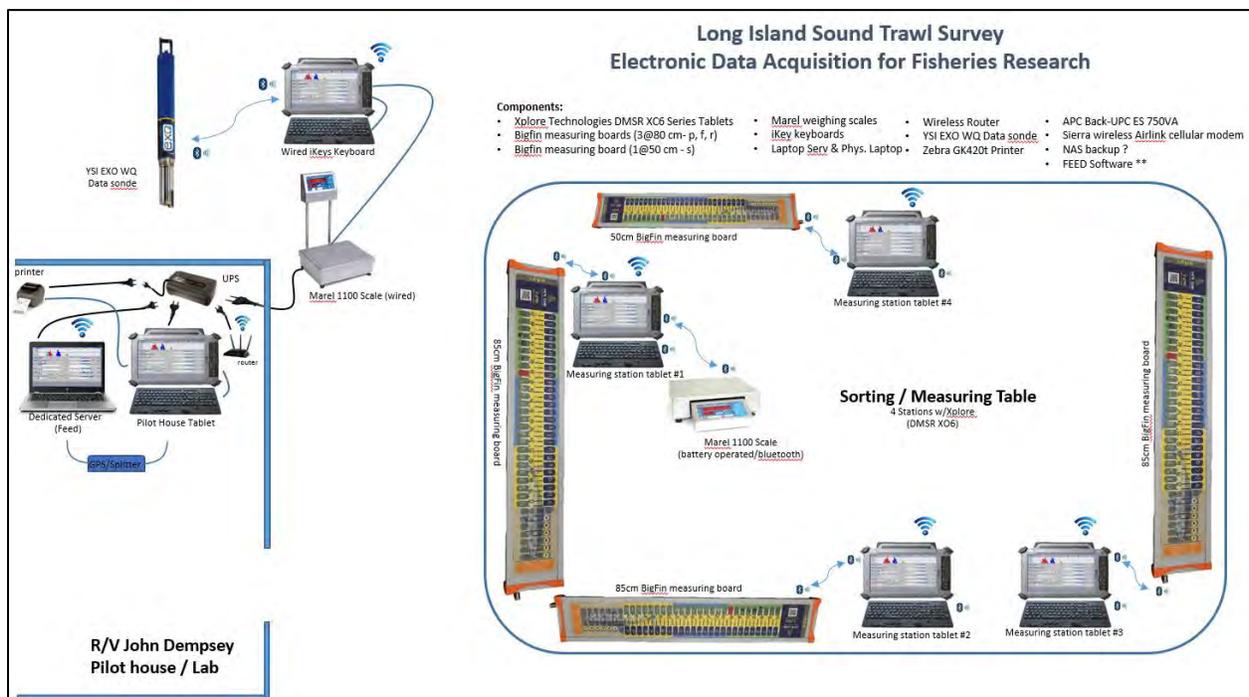
Long Island Sound Trawl Survey (LISTS) staff have successfully upgraded the data collection processes that have been in place since the inception of the survey 35 years ago. Although paper and pencil for recording data on research vessels has worked well for LISTS for decades, a number of similar fish surveys along the coast have been using electronic data acquisition hardware and software successfully for quite some time. Some surveys, notably the Northeast Federal bottom trawl surveys, have been mostly digital for over a decade now. Recent improvements in software and hardware are making a digital onboard system more realistic for the LISTS. Project staff canvassed staff from other surveys and investigated the components that would be required to configure a mostly wireless data collection system for the 50' R/V John Dempsey that would likely include an onboard computer network of electronic scales, measuring boards and mobile devices. Although electronic fisheries data acquisition systems can be expensive, they typically improve the accuracy and efficiency of fisheries independent surveys by streamlining sampling procedures and decreasing transcription errors at sea, as well as decreasing or eliminating data entry errors and QA/QC procedures in the office. All of these improvements result in better quality data being available more quickly for fisheries management decisions.

METHODS

Two main aspects of LISTS make it difficult for LISTS to mimic the setup on the other Surveys. The first issue is the smaller vessel with much less deck space available to LISTS compared to other surveys. Other surveys have enough deck space to accommodate metal tables with windshields affixed to the deck while still having deck space to spill the codend and sort the catch. For LISTS, the sorting table becomes the measuring table once sorting is completed, so measuring workstations cannot be left set up on deck in between tows. Thus, any components for measuring stations need to be easily set up and taken down multiple times each day.

The second main issue for LISTS is that all of the gear has to be removed from the research vessel so gear for the Long Island Sound Ambient Water Quality Monitoring Program (Job 10) can be loaded. This means that, even if measuring stations could be affixed to the deck for the trawl survey, they would need to be removed for the water survey. This unloading/loading of gear occurs at least ten times each year and frequently there is only a few hours available to complete the transition.

The other large-scale trawl surveys that were canvassed about their electronic data acquisition systems were primarily set up with hardwired components on semi-permanent workstations. LISTS' need to be able to easily and quickly set up and remove components for electronic measuring stations means components need to be wireless and/or Bluetooth capable as much as possible.



Schematic of how the components of an electronic data acquisition system might be situated on the R/V John Dempsey.

RESULTS

Significant progress has been made in converting to electronic data acquisition for this long-standing, standardized trawl survey (LISTS methods and results are detailed in Job 5). Notably, 2019 marks the second year that all LISTS data was captured electronically at sea with minimal disruption.

LISTS project staff were satisfied with the electronic system for standard species processing onboard (such as, species counts, weights and lengths) as well as the non-standard subsampling procedures. However, more attention needs to be given to the processing of aged species in addition to post processing procedures for continued use of this system. LISTS project staff were satisfied with the operation of the YSI EXO water quality Data Sonde for this segment and anticipates continued use of the sonde for the next segment.

The LISTS project staff carried out daily backups of the database and the YSI EXO Data Sonde files. There is still a need to develop summarizing reports on a tow by tow basis while underway to ensure data quality and reduce post processing efforts prior to data analysis. To that end, a printer still needs to be added to the system in the pilot house for tow by tow error checking. Custom brackets for the measuring boards need to be designed and fabricated. Steps were taken in the pilot house to address storage needs for the electronic system.

While the data acquisition system was originally designed to be based mostly on a wireless platform, it has proven slow and unreliable. Instead, wired connections are established to the three to four tablets used during processing on deck each tow. These connections are made possible by data cables run from the pilot house to the deck, up a boom centrally located over the deck and then hung over the sorting table once the catch has been sorted.

Considerable attention has been placed on system maintenance protocols in 2019. While the tablets being used are “ruggedized” and made to be used in a wet outdoor environment, there is clear evidence of corrosion on some of the terminal connections, they will need to be replaced at regular intervals. Staff have developed daily protocols and actions against the corrosive deterioration that the equipment is showing and have ordered backup tablets. Furthermore, regular replacement schedules are being developed for all exposed equipment to minimize failures and down time.

An extensive set of user guides for the daily operation of the electronic system was developed. These manuals are critical for the ability to troubleshoot issues while underway, allowing for more successful sampling with less down time. The manuals include guides to set up the hardware and software, how to troubleshoot and fix any glitches in the hardware and software, how to process a tow at all three types of stations (tow deployment, weigh station and measuring stations), how to install new application versions and how to shut down and back-up the system at the end of each day. Due to the software applications and processing methods still being modified to maximize efficiency, these documents will need to be updated in the future.

For this project segment, there were fewer modifications than 2018 to the software used to complete the survey. Information on current LISTS protocols for sampling, sub-sampling,

recording data at sea, data entry, and database management (including data dictionary and error checking procedures) have been shared with the contractor who is developing the custom FEED application for LISTS. The software developer has been quite responsive to requests for changes to the applications and development is moving along well.

MODIFICATIONS

Due to the nature of evaluating new technologies, it is not known ahead of time which ideas will be implemented. Therefore, the specific Objectives of this Job are likely to change over time. In the next segment of the Project, we expect to continue to develop the electronic system to be as complete and reliable as the previous paper recording method. There will continue to be beta testing of new hardware and software components as they become available. As this occurs, long-standing protocols for data collection, processing and post-processing may need to be modified.

JOB 7: ALOSINE SURVEY

JOB 7: ALOSINE SURVEY

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JOB 7: ALOSINE SURVEY

GOAL

Goal: Monitor abundance and distribution of American shad and forage species in Connecticut's major rivers and nearshore waters.

OBJECTIVES

Provide:

- 1) Information characterizing adult American shad spawning populations: size composition, age structure, spawning history, and sex ratio.
- 2) Annual indices of relative abundance for juvenile shad and forage species.

STUDY PERIOD AND AREA

This report contains information on adult American shad monitoring and seine studies on juvenile American shad (*Alosa sapidissima*) and common nearshore species in 2019. Areas of the Connecticut River sampled, range from Holyoke, MA to Essex, CT. Time series data collected under previous funding sources are also included for comparative purposes.

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 are currently small commercial and recreational fisheries that occur in the Connecticut portion of the Connecticut River. The Connecticut River is the only river system in the state that allows shad harvest and requires annual licenses for both commercial and recreational fisheries. Sustainable fisheries for states have been managed since 2012 under the Atlantic States Marine Fisheries Commission Amendment 3 to the coast wide Fishery Management Plan for American shad. Connecticut monitors 3 metrics on an annual basis to determine the overall sustainability of the shad stock. Sustainability metrics are: fish passage counts for adults, relative juvenile abundance, and adult escapement. The commercial fishery is managed through area, gear, seasonal restrictions, and rest days. The recreational fishery is managed through a daily bag limit of 10 fish (a combined aggregate of American and hickory shad).

Historically, American shad were 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. Commercial data are collected from mandatory annual reporting of landings from commercial shad license holders. Landings information is compiled and used to estimate the maximum losses to the spawning stock from fishing. The recreational fishery predominantly occurs north of Hartford, CT at River Kilometer (RKM) 83 and south of the Holyoke Dam in Massachusetts (RKM 139). Data on the recreational fisheries was last monitored by a roving creel survey conducted in 2010.

The Connecticut Department of Energy and Environmental Protection (CT DEEP) has conducted annual fisheries independent research studies on adult American shad in the CT River since 1974, to monitor annual changes in stock composition. Holyoke Gas and Electric (HGE) monitors fish passage, which includes adult American shad passage, at the first main stem dam on the CT River in Holyoke, Massachusetts. The HGE staff compiles daily tallies of fish passed through the fish lift facility, samples periodically for size structure and sex ratio, and collects scale samples. CT DEEP processes and reads scale samples collected by HGE staff to estimate age structure and spawning history (i.e. proportion of the run comprised of repeat spawners).

Juvenile shad are monitored by CT DEEP through an annual seine survey conducted since 1978. The seine survey provides an annual index of relative abundance for juvenile American shad, which is used to characterize year class strength and potential recruitment to the spawning run in future years.

METHODS

American shad adults

Fishery Dependent Data

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 of shad landed by sex.

Fishery Independent Data

Holyoke Lift

The 2019 adult American shad age structure and sex ratio were calculated from samples collected at the Holyoke Dam Fish lift, located at river kilometer 139, 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 HGE staff. The Massachusetts Division of Fisheries provides the annual sex ratio, which is 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 2019, 1,102 scale samples were obtained from the Holyoke Fish lift. Adult shad collected at the Holyoke Lift were sexed, measured to fork length (mm), weighed (g), and 15-25 scales were removed. All scale samples collected were separated by sex and stratified into 1 cm length groups. All viable scale samples collected were cleaned with an ultrasonic cleaner, dried and mounted between 2 glass microscope slides.

Scales are magnified with a microscope using transmitted light, viewed through a Luminera camera, and displayed on a computer screen using Image Pro Premier Software. Digital photos are taken of each sample and cataloged. Image files of each scale sample are identified only by a sample number.

Age determinations were made with consensus of two or more readers on the displayed images by counting annuli and spawning scars according to the criteria of Cating (1953). When discrepancies between the two readers could not be resolved, the scales were examined by a third reader. Samples that were poor quality or did not have two or more viable scales were not aged. Shad were noted to be repeat spawners when the presence of spawning scar(s) at the periphery of the scale were identified. All annuli and spawning scars on scale images were digitally marked and stored as a line profile using Image Pro Premier Software.

Prior to 2015, Scale samples were processed by cleaning with an ultrasonic cleaner and pressed onto acetate using a roller press. The pressed scale images were read using a microfiche reader. When the new image analysis system was implemented, comparisons of scale ages were made using both the Microfiche and Image analysis equipment to ensure that the interpretation of scale ages remained consistent.

Juvenile Seine Survey

A single seine haul was conducted at seven fixed locations one day a week from mid-July 10th through mid-October 16, 2019. 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 (Crecco et al. 1981; Marcy 2004). 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 -hailed by hand in to shore. Clupeids (*Alosa sapidissima*, *A. aestivalis*, *A. pseudoharengus*, and *Brevoortia tyrannus*) were returned to the laboratory for measurement and identification. All fish species other than family clupeidae, were identified, quantified or estimated and released. Invertebrate species are either counted or noted as present. 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).

A relative abundance index for young of the year American shad was calculated as a geometric mean catch per unit effort. 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 2019) for methods used to calculate the geometric mean. Forage species are reported as percent occurrence.

RESULTS

Results collected during the funding timeframe of March 1, 2019 through February 28, 2020 are presented below. To compare the 2019 CT River juvenile shad indices to other CPUE values of the time series, data collected with other sources of funds are also presented.

Commercial Fishery Landings

The Connecticut River American shad commercial fishery reported a total catch of 5,496 lbs in 2019, which is the lowest reported in the time series (Figure 7.1). Four boats reported landings and 6 commercial shad licenses were sold in 2019. The number of shad boats fishing annually continues to remain low as few new participants enter the fishery. Some shad fishermen continue to purchase the license even if they have not actively fished in several years. Commercial shad landings represent less than 2% of the total number of shad reported at the Holyoke fish lift in 2019.

Commercial shad catch reports were skewed towards females (92%), with males accounting for 8% 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 Age Structure

The environmental conditions during the 2019 fish passage season were heavily impacted by substantial snow melt and precipitation events that caused high discharge during April (Figure 7.2). The Holyoke Fish lift was open for fish passage from May 6 through July 15, 2019 except for closings (3 days in May, 2 days in June, and 4 days in July) due to high water or operational factors. Total lift numbers of American shad at the Holyoke Dam were obtained from the staff at the Holyoke fish lift. The number of shad passed at Holyoke in 2019 (314,361) was the 20th 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 2019 was above the long term mean of 310,643 (CL range 270,926 to 350,360). From May 9 to June 5th, 92% of the season's passage occurred (Normandeau 2019).

There were 1,102 American shad collected for scale samples, 0.5% of the annual fish passage count. Scale samples were collected over 47 dates from May 9 through June 20. Samples were collected during 98% of the days when shad passage occurred at the lift (Normandeau 2019). The 2019 shad run sex ratio was derived from information collected at the Holyoke fish lift which is located at River Kilometer 139, upstream of both the commercial and sport fisheries. The combined impact of these modest fisheries is likely not significant enough to affect the composition of the run. The weighted sex ratio of shad sampled at Holyoke was 36% male and 64% female.

Length frequency of American shad collected at the Holyoke lift ranged from 31.6 to 54.0 cm FL for male shad and 34.0 to 54.0 cm FL among female shad. Average size among males was 38.1 cm FL and among females was 44.8 cm FL.

The preliminary examination 2019 male population of spawning adult shad was produced from the 2012-2016 year classes. The largest percentage (45.5%) of male shad scales examined were from five year old fish, 38.9% were from four year old fish and 11.45% were 6 year old fish. Three and seven year old fish each represented 3.9 and 0.3 % of the population, respectively (Table 7.2). The majority of female shad (57.9%) sampled in 2019 were five year old fish. Six year old fish contributed to 33.1% of the 2019 run and 8.7% were 4 year old fish. Seven year old fish represented 0.29%. The examination of scale samples for incidence of overall repeat spawning has not yet been completed.

Juvenile Seine Survey

Seining for juvenile in the Connecticut River was conducted from July 10th through October 16th, 2019. A total of 12,044 juvenile American shad were collected for the season (Table 7.3). The highest catch in 2019 was 5,336 shad collected at the Holyoke site in mid August, representing 52.8% of the total Holyoke catch for the season and 44% of the annual catch (Table 7.3). The stations with the largest proportion of the season's catches were Holyoke (84%) and Wilson (12%). The geometric mean CPUE for shad in 2019 (4.52) ranks as the 30th largest in the 44 year time series (Table 7.4; Figure 7.4). The 2019 value is in contrast to the 2018 value of 22.76, which ranked as the highest value in the time series and was 5 times the value of the 2019 index. Throughout the time series these two sites are often the highest catch sites and are the main drivers of the index (Figure 7.5). The values of the annual index of juvenile abundance (geometric mean catch/haul) have varied without trend throughout time series.

In the 102 hauls completed in 2019, over 156,000 fish representing 40 species or taxonomic groups were collected (Table 7.5). 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. In 2019, the five most abundant species or groups collected were menhaden, shiners, American shad, blueback herring and *Fundulus* spp (Table 7.5).

MODIFICATIONS

None.

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Table 7.1. Annual American shad commercial fishery harvest. Landings are reported by weight (lbs.) and by sex, 2000-2019.

Year	Total (lbs)	Male Wt (lbs)	Female Wt (lbs)
2000	107,416	7,491	99,925
2001	59,234	3,980	55,254
2002	108,099	22,555	85,544
2003	111,127	17,518	93,609
2004	66,328	8,000	58,328
2005	69,333	6,136	67,070
2006	38,547	5,445	33,102
2007	51,572	5,701	43,497
2008	28,419	2,637	25,782
2009	40,680	4,045	32,187
2010	24,641	2,994	21,192
2011	32,805	3,354	29,451
2012	61,975	10,187	51,788
2013	63,324	10,406	52,918
2014	62,707	7,789	54,918
2015	52,713	6,661	46,052
2016	33,998	3,081	30,917
2017	42,191	6,589	35,602
2018	19,939	1,606	18,334
2019	5,496	426	5,070

Table 7.2. Fishery independent spawning history and age distribution of American shad in the Connecticut River at the Holyoke Lift, 2019.

*Age estimates are preliminary

2019 American Shad Age Structure at the Holyoke Lift						
Age	3	4	5	6	7	Total
%Bucks	3.92%	38.86%	45.48%	11.45%	0.30%	
Shad (n)	8,157	80,943	94,748	23,844	627	208,319
		4	5	6	7	
%Roes		8.65%	57.93%	33.14%	0.29%	
Shad (n)		9,168	61,424	35,144	306	106,042
	3	4	5	6	7	
% All	1.91%	23.42%	51.84%	22.53%	0.29%	
Shad (n)	6,019	73,613	162,968	70,835	926	314,361

Table 7.3 Catch and effort of juvenile American shad from the 2019 CT River seine survey

Date	HOLYOKE	ENFIELD	WILSON	GLASTONBURY	SALMON RIVER	DEEP RIVER	ESSEX	Catch	Effort
7/10/2019	339	0	0	1	12	10	0	362	7
7/17/2019	606	0	0	13	54	0	0	673	7
7/24/2019	129	0	96	0	19	21	2	267	7
7/31/2019	0	0	183	16	86	2	0	287	7
8/7/2019	6	3	74	2	74	11	1	171	7
8/14/2019	5336	0	126	5	0	0	0	5467	7
8/21/2019	3416	0	8	10	0	1	0	3435	7
8/29/2019	23	0	347	64	6	1	0	441	7
9/4/2019	113	2	113	4	3	0	0	235	7
9/12/2019	64	0	7	24	1	0	0	96	7
9/18/2019	63	0	435	1	0	1	0	500	7
9/25/2019	16	0	1	4	0	0	0	21	7
10/2/2019	0	0	1	11	0	5	0	17	7
10/9/2019			32	0	4	10	0	46	5
10/16/2019	0		0	7	3	13	3	26	6
Total	10111	5	1423	162	262	75	6	12044	102

Table 7.4 Geometric mean relative abundance index (CPUE) of juvenile American shad(ASD), 1978-2019.

Year	Juv ASD	Year	Juv ASD
1978	5.89	2000	4.42
1979	7.84	2001	2.73
1980	9.21	2002	5.55
1981	6.05	2003	6.88
1982	1.81	2004	5.62
1983	4.99	2005	10.08
1984	3.37	2006	1.82
1985	7.14	2007	8.15
1986	6.29	2008	5.06
1987	9.89	2009	3.40
1988	5.68	2010	10.23
1989	4.85	2011	3.08
1990	10.39	2012	3.03
1991	4.26	2013	3.16
1992	7.55	2014	8.09
1993	9.49	2015	8.53
1994	12.22	2016	16.70
1995	1.34	2017	5.00
1996	6.50	2018	22.76
1997	7.15	2019	4.52
1998	3.65		
1999	5.47		

Table 7.5. List of fish species or group and percent frequency of occurrence of fish collected in Connecticut River seine survey, 2019.

**includes more than one species*

Species or Group	% abundance	Species or Group	% abundance
alewife	0.08	menhaden	65.78
American eel	0.01	naked goby	<0.01
American shad	7.72	northern kingfish	<0.01
Atlantic needlefish	<0.01	northern pike	0.01
Atlantic silverside	0.12	chain pickerel	<0.01
bay anchovy	0.02	pipefish	<0.01
black crappie	0.45	rock bass	0.04
blue crab	0.29	smallmouth bass	0.13
blueback herring	5.14	shiner*	13.79
bluefish	0.15	shrimp*	<0.01
bowfin	<0.01	stickleback*	<0.01
carp	<0.01	striped bass	<0.01
catfish*	0.01	sunfish*	1.76
		tessellated darter	0.5
comb jellyfish	<0.01	white perch	0.01
crayfish	0.01	white sucker	0.18
crevalle jack	<0.01	yellow perch	0.49
dace	0.01		
fallfish	0.07		
gizzard shad	0.01		
golden shiner	0.09		
hogchoker	0.5		
killifish & mummichog*	2.42		
largemouth bass	0.05		

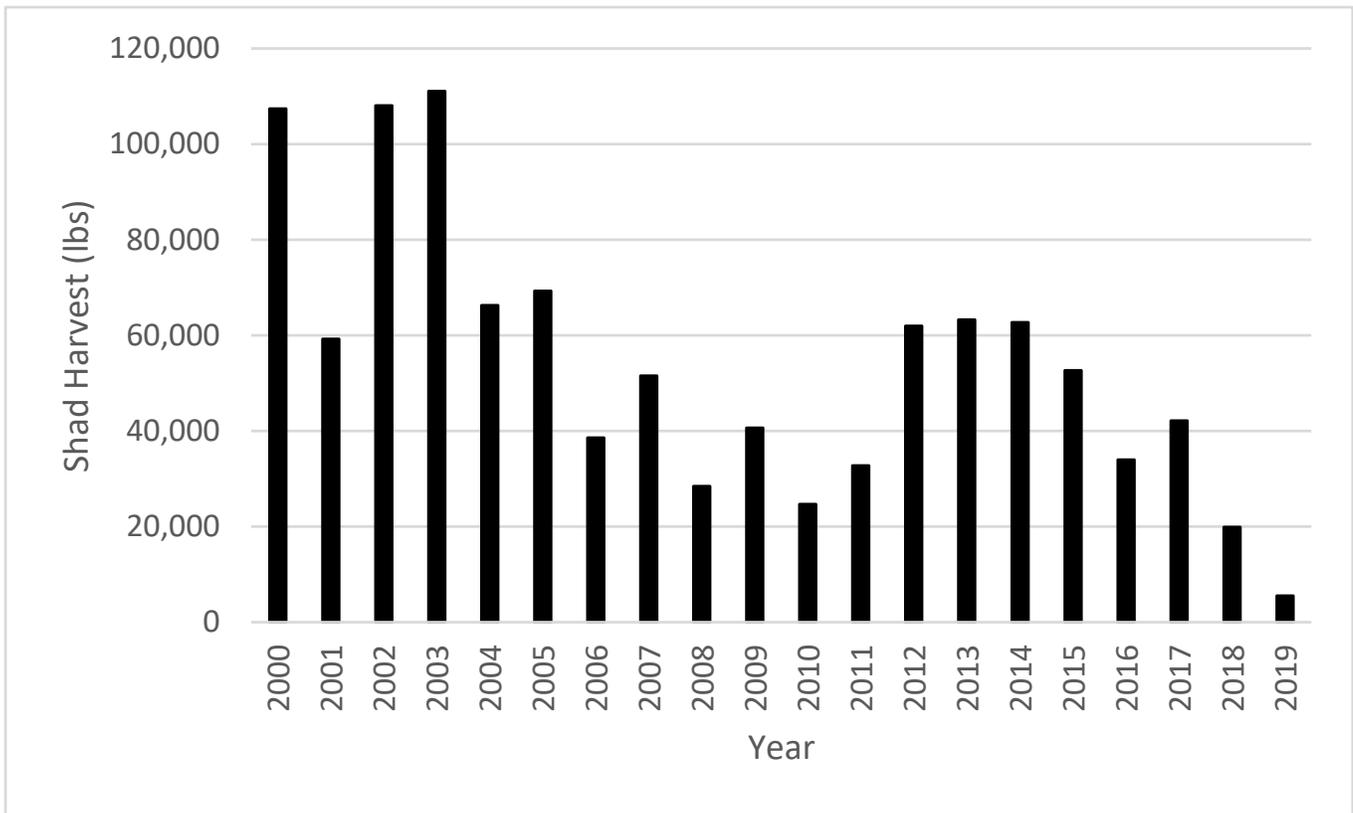


Figure 7.1. Commercial Landings (lbs) for CT River adult American shad, 1990-2019.

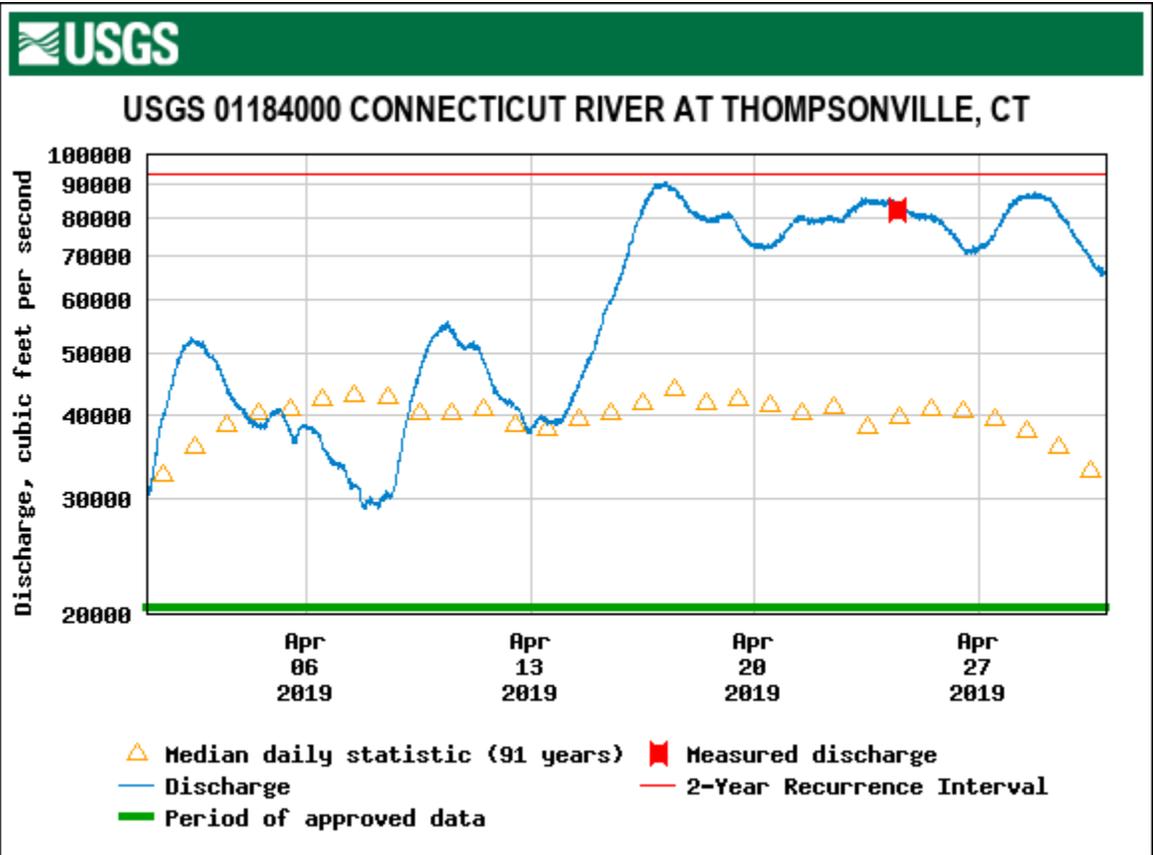


Figure 7.2 USGS Daily flows (Ft³/sec) at the Thompsonville gage station (RKM 110) compared to median flows during April 2019.

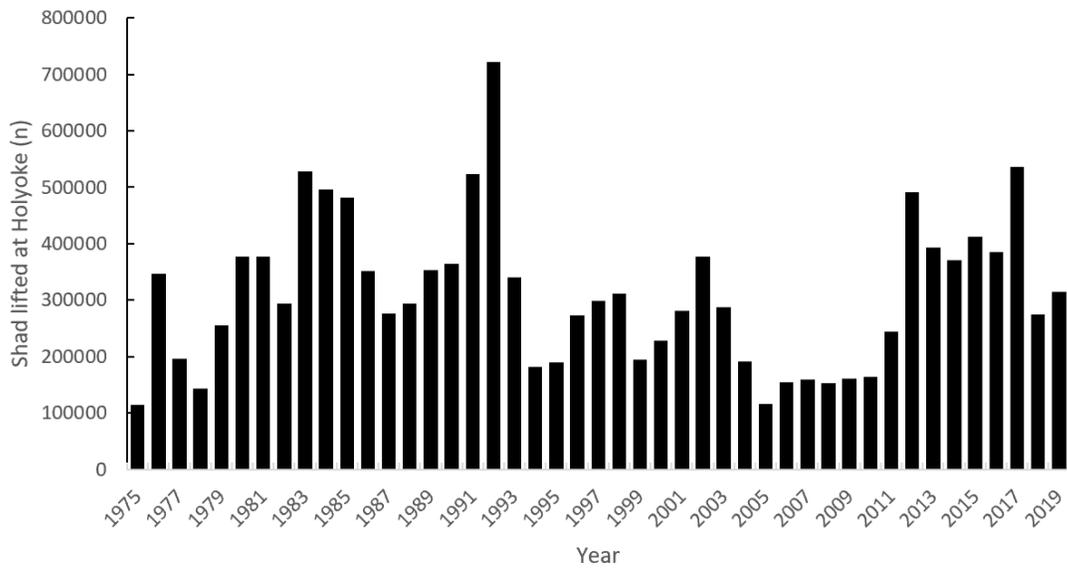


Figure 7.3 Number of adult shad lifted at the Connecticut River Holyoke Dam (RKM 139), 1975-2019

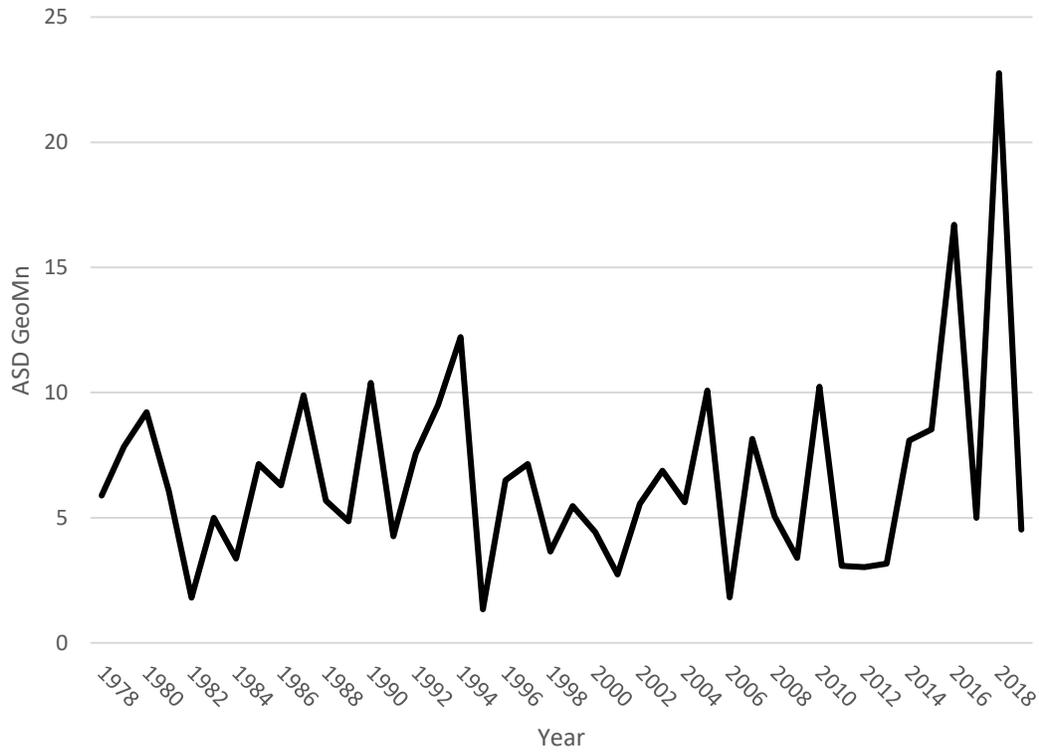


Figure 7.4 Annual geometric mean catch per unit effort of Connecticut River juvenile American shad by station, 1978-2019.

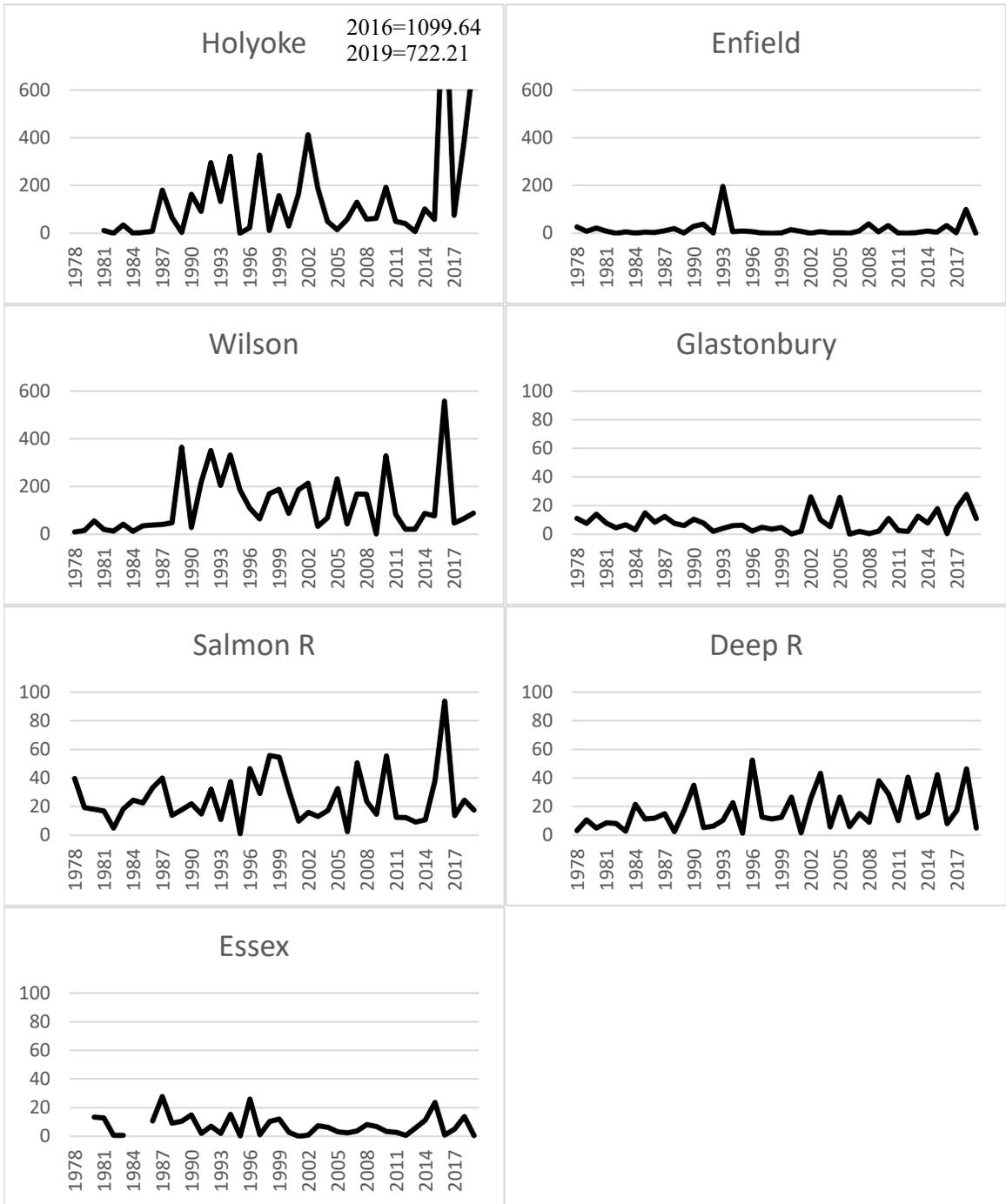


Figure 7.5. Annual CPUE of Connecticut River juvenile American shad by station, 1978-2019. Upper river sites (Holyoke, Enfield Wilson) have a Y axis max of 600 and lower river sites (Glastonbury, Salmon R, Deep R, Essex) have a Y axis max value of 100.

JOB 8: ESTUARINE SEINE SURVEY

JOB 8: ESTUARINE SEINE SURVEY

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Beach seining with 25' bag seine.

JOB 8: ESTUARINE SEINE SURVEY

GOAL

Monitor the abundance and size composition of nearshore young-of-year sportfish and forage fish, along with environmental parameters, to evaluate the effects of fishing and environmental conditions on the distribution and abundance of sportfish in Long Island Sound.

OBJECTIVES

Provide:

1. Indices of abundance for juvenile sportfish (age-0 and 1+).
2. An annual index of forage species abundance.

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 45° 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. All sites have been sampled since 1988 except Milford which was added in 1990.

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 silverside, which are not separated from Atlantic silverside 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 (retransformed natural log) mean catch per standard haul is calculated for total finfish catch and individually for the 22 most abundant species, with separate indices for young-of-year (YOY) and winter flounder age 1 and older. Winter flounder YOY catch is also reported for each site. 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 finfish 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 2019 at eight sites, yielding a total catch of 13,131 fish of 25 species and 12,655 invertebrates of 14 species. Geometric mean catch of all finfish (fish/haul) in 2019 was 273 fish/haul, above the 30-year time series median of 160 fish/haul (Figure 8.2). Although total catch varies considerably from year to year, the increasing trend is significant ($df=30$, $r^2=0.30$, $p=0.0013$). Dominant species contributing to this increase include young-of-year (YOY) black sea bass, tautog, scup (porgy), northern kingfish, menhaden and a resurgence of five forage species. Other species that contributed to increased total catch in 2019 compared to 2018 were Atlantic Menhaden (85%), Grubby (170%), Inshore Lizardfish (106%), Northern Kingfish (157%), Northern Puffer (98%), Northern Searobin (111%), and Striped Searobin (183%).

Geometric means were calculated for 30 species commonly captured since the survey began in 1988 (Table 8.1). The most frequently caught species was Atlantic silverside, which occurred in all samples, followed by striped killifish, mummichog, tautog, northern pipefish, northern kingfish, northern puffer, scup, black sea bass, and YOY winter flounder (Table 8.2). This rank order has changed from previous years, with a notable increase in forage fish species and winter flounder YOY in 2017 with a decrease in 2018 (Figure 8.3).

Scup, black sea bass and northern kingfish occurrence and abundance increased well above the 30-year time series average in 2016 and 2017 (Tables 8.1 and 8.2). Occurrence of tautog, cunner and sheepshead minnow also ranked high in the time series. Windowpane flounder was again absent in 2019 after re-occurring at low abundance in 2011 and 2014, but absent in 2009-10, 2012-13, and 2015-19 (Table 8.1).

Relative Abundance of Juvenile Winter Flounder and Tautog

The 2019 index of YOY winter flounder (0.688 fish/haul) is 38% greater than the 2018 index. A modest increase from the lowest abundance recorded in 2013 occurred from 2014-2017 (Table 8.3, Figure 8.3). Total catch in 2019 increased 55% from 2018 (Table 8.4). The time series has a significant negative trend ($df=30$, $r^2=0.43$, $p<0.001$), and indicates that a relatively strong year class has not been produced since 1996 (Table 8.1, Figure 8.3). As in previous years, highest abundance was seen at eastern sites (Waterford, Groton,) and Clinton. Bridgeport had no catch (Table 8.3) and the frequency of occurrence of this species has decreased over the time series (Figure 8.3) indicating that juvenile production has contracted in several areas of the Sound. Mean length of YOY winter flounder captured at all sites in 2019 was 69mm and shows no trend over the 30-year time series, ranging from 47.3 to 71.1mm.

The 2019 index of YOY tautog (1.5 fish/haul) was above the series average of 1.0 tautog /haul, increasing from 2017 (1.3 fish/haul) and decreasing from 2015 (4.8 fish/haul) which was the highest abundance in the time series (Table 8.1, Figure 8.4). Overall, the time series has a significant increasing trend ($df=30$, $r^2=0.32$, $p<0.001$). Relatively abundant year classes have been produced in 1998-99, 2002-04, 2007-08, 2012 and 2014-15, 2017-2018.

The frequency of occurrence of this species has also increased over the time series (Figure 8.4) indicating that juvenile production and survival is improving in several areas of the Sound.

Presence of Other Important Recreational Finfish

YOY scup and black sea bass are recent additions to the seine survey (Table 8.1, Figures 8.5 and 8.6). Scup occurred in 1999 but the highest relative abundance has been in the last four years of the time series. Record numbers for YOY scup occurred in 2015 (9.4 fish/haul), with a time series high occurring in 2018 (10.6 fish/haul), which is above the time series mean (1.18 fish/haul).

YOY black sea bass first appeared in Survey catches in 1991 and every year since 1998, reaching their record highest abundance in 2015 (16.3 fish/haul). The 2016 index (5.8 fish/haul) is third highest behind 2014 and 2015. The 2019 index was 2.8 fish/haul, the eighth highest in the times series and slightly lower than 2017 index of abundance. Total catch in 2019 increased 67% from 2018 (Table 8.4).

YOY bluefish show a pattern similar to black seabass, first appearing in the catch in 1991 and almost consistently since 1998. Their abundance increased dramatically in 2014 and 2015, returning to abundance near the time series mean (0.29 fish/haul) in 2016 (Table 8.1). No juvenile bluefish (snappers) were captured in 2017, making it the eighth time in the 30-year time series that no snappers were seen. In 2018, juvenile bluefish reappeared with an abundance of 0.44 fish/haul and increased in 2019 with an abundance of 0.62 fish/haul.

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 silverside, striped killifish, mummichog, and sheepshead minnow (Figure 8.7). The 2019 index (161 fish /haul), above the series average of (102 fish/haul) for the time series, increasing from 2017 (107 fish/haul) and decreasing from the 2015 index which was the second highest in the time series.

Although numerically driven by the abundance of silverside, all four forage fish species increased in abundance and occurrence in 2015-2017 and were at or above their time series mean of 102. The time series high occurred in 2003, with a mean catch of 206 forage fish (Table 8.7). Although the forage index varies considerably from year to year, common for short-lived forage species, the increasing trend is significant (r^2 0.16, $p=0.03$, Figure 8.7).

Relative Abundance of Invertebrate Species

A total of 12,655 invertebrates of 14 species or taxon groups were captured in 2019 (Table 8.6, Appendix 8.2), a total similar to 2013 (13,483). Seven crab species were present in the seine hauls, along with two shrimp species. Mud snail, hermit crab, sand shrimp, shore shrimp, green crab, and comb jellyfish were the most abundant and at greater than 50% occurrence (Table 8.6).

Seventy-nine blue crabs were captured in 2019. Blue crabs were captured at Groton, Waterford, Old Lyme, Clinton, New Haven, and Milford sites but continued at relatively low abundances in 2017, 2018 (n=11 and 19 crabs) down from a time series high in 2009 (n=333 crabs). The 2019 index (n=79 blue crabs) is third highest behind 2006 and 2009. The Japanese shore crab re-appeared in 2015 and 2016, with only one captured at the Old Lyme site. No Japanese shore crabs were captured in 2017 or 2018, but one was captured in 2019. The shore shrimp returned to moderate abundance in 2016, 2017, after increasing substantially in 2014-15, then decreasing in 2018 and 2019 (Table 8.6). Sand shrimp decreased significantly from 2015 until 2016, then increased significantly in 2017 until 2019 (Table 8.6). Spider crab abundance has also increased nearly ten-fold from 2011 until 2017 compared to earlier years, with the highest catch in 2017, and decreased significantly in 2018 and 2019 (Table 8.6).

MODIFICATIONS

None.

Beach seining with 25' bag seine at the Old Lyme site.



Table 8.1: Geometric mean catch of finfish species commonly captured in seine samples, 1988-2019.

See Appendix 8.1 for complete taxonomic names.

Species	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
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	0.0	0.1	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	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	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	0.0	1.0	8.2
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	36.1	80.1	113.6
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	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	1.0	0.4	0.2
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	0.0	0.1	0.1
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	0.1	0.0	0.2
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	0.2	0.3	0.2
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	0.1	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	0.2	0.3	0.5
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	1.2	0.0	0.0
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	1.4	3.4	2.9
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	0.1	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	0.2	0.1	0.2
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	1.4	0.5	0.3
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	0.2	0.7	0.7
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	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	0.5	1.0	0.6
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	0.2	0.6	0.7
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	0.1	0.0	0.0
striped bass	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
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	7.5	14.5	14.9
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	0.4	0.3	0.7
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	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	0.6	1.5	1.1
weakfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
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	0.0	0.0	0.1
winter flounder-age 1+	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	0.0	0.0	0.0
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	1.3	3.1	8.1

Table 8.1 continued: Geometric mean catch of finfish species commonly captured in seine samples, 1988-2019.

See Appendix 8.1 for complete taxonomic names.

Species	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>	<u>2015</u>	<u>2016</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>
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	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	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	0.1	0.0	0.0	0.3	0.0
Atlantic menhaden	0.4	0.2	0.4	0.6	0.1	0.3	0.0	0.1	0.0	0.1	1.2	9.9	0.4	0.5	1.6	1.4
Atlantic silverside	85.1	81.3	37.7	74.9	57.5	66.8	96.9	66.5	45.0	35.0	64.8	114.5	73.0	75.9	117.4	111.3
Atlantic tomcod	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
black sea bass	0.4	0.1	0.5	0.6	0.3	1.1	0.4	3.2	5.2	3.7	10.8	16.3	5.8	3.2	4.6	2.8
blueback herring	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	0.8	0.0
bluefish	0.2	0.1	0.2	0.0	0.0	0.3	0.0	0.2	0.4	0.1	0.8	3.4	0.3	0.0	0.4	0.6
cunner	0.5	0.3	0.1	0.5	0.1	0.2	0.1	0.0	0.4	0.0	0.5	0.1	0.0	0.2	0.2	0.2
fourspine stickleback	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
grubby	1.3	0.8	0.3	0.3	0.2	0.5	0.3	0.7	0.2	0.2	0.2	0.2	0.0	0.3	0.1	0.6
inshore lizardfish	0.0	0.0	1.9	0.2	0.3	0.2	0.1	0.2	0.2	0.1	1.6	0.4	0.0	0.4	0.3	0.6
mumichog	2.3	1.5	2.5	7.3	2.9	3.8	1.7	3.1	1.6	0.9	5.0	5.3	2.2	3.3	4.5	5.6
naked goby	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0
northern kingfish	0.3	0.1	0.0	0.0	0.2	0.3	0.5	0.2	0.5	0.7	1.1	1.0	0.1	0.8	0.3	2.0
northern pipefish	0.7	0.5	0.6	0.8	0.7	1.9	0.6	1.1	1.4	1.7	2.6	2.0	0.5	0.8	2.2	1.4
northern puffer	0.7	0.5	0.4	1.2	0.2	0.3	0.4	0.4	0.9	1.1	1.1	1.4	0.2	0.2	0.6	1.5
rainbow smelt	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
scup	0.2	0.9	0.1	1.0	0.1	1.9	0.1	0.2	2.1	0.1	2.6	9.4	1.3	2.5	10.6	2.7
sheepshead minnow	0.5	0.2	0.2	3.3	1.2	0.5	0.3	0.5	0.8	0.2	0.6	0.3	0.5	0.5	1.8	1.0
smallmouth flounder	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.9	0.4	0.5	0.1	0.2	0.1	0.0	0.1	0.0
striped bass	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
striped killifish	12.9	19.4	7.1	21.2	21.7	12.3	15.9	28.7	5.3	3.8	14.5	17.1	10.2	10.4	23.7	20.2
striped searobin	0.5	0.2	0.1	0.3	0.3	0.8	0.2	0.1	0.1	0.2	1.1	0.7	0.0	0.0	0.0	0.4
summer flounder	0.0	0.0	0.2	0.1	0.1	0.0	0.1	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0
tautog	1.4	0.7	0.4	2.4	1.0	0.4	0.4	0.3	1.3	0.6	3.5	4.8	1.1	1.3	3.7	1.5
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	0.0	0.1	0.0
windowpane flounder	0.2	0.2	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
winter flounder	0.1	0.2	0.1	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
winter flounder YOY	11.0	5.6	0.9	4.7	2.0	0.8	1.0	1.1	0.3	0.3	0.5	0.6	0.6	1.0	0.4	0.7

Table 8.2: Frequency of occurrence of finfish species commonly captured in seine samples, 1988-2019.

See Appendix 8.1 for complete taxonomic names.

Species	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
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	0.00	0.04	0.02
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	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	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	0.02	0.27	0.58
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	0.92	1.00	0.96
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	0.00	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	0.25	0.17	0.13
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	0.00	0.04	0.06
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	0.13	0.02	0.10
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	0.15	0.13	0.17
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	0.06	0.00	0.00
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	0.17	0.21	0.29
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	0.56	0.04	0.00
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	0.42	0.54	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	0.08	0.02	0.02
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	0.13	0.04	0.15
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	0.48	0.19	0.25
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	0.17	0.35	0.31
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	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	0.23	0.35	0.25
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	0.10	0.15	0.19
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	0.13	0.00	0.00
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	0.00	0.00	0.06
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	0.71	0.85	0.81
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	0.29	0.25	0.40
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	0.00	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	0.40	0.54	0.50
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	0.00	0.00	0.13
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	0.00	0.02	0.10
winter flounder –age 1+	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	0.04	0.02	0.00
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	0.58	0.79	0.85

Table 8.2 cont.: Frequency of occurrence of finfish species commonly captured in seine samples, 1988-2019. See Appendix 8.1 for complete taxonomic names.

Species	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
alewife	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
American sand lance	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
American shad	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.04	0.00	0.13	0.1	0.00
Atlantic menhaden	0.08	0.06	0.13	0.17	0.02	0.15	0.02	0.02	0.04	0.04	0.23	0.54	0.1	100	0.29	0.23
Atlantic silverside	1	1	1	1	1	1	1	1	0.98	1	4	1	1	0.00	1	1
Atlantic tomcod	0.02	0.02	0.00	0.00	0.02	0.00	0	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
black sea bass	0.25	0.08	0.23	0.23	0.15	0.27	0.13	0.58	0.75	0.58	0.77	0.9	0.88	0.77	0.94	0.50
blueback herring	0.00	0.00	0.00	0.02	0.00	0.00	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.23	0.00
bluefish	0.15	0.04	0.08	0.00	0.02	0.15	0.02	0.1	0.21	0.08	0.23	0.77	0.21	0.00	0.27	0.35
cunner	0.29	0.21	0.13	0.25	0.1	0.17	0.08	0.04	0.23	0.02	0.31	0.1	0.00	0.13	0.13	0.15
fourspine stickleback	0.02	0.00	0.02	0.00	0.00	0.02	0	0.04	0.00	0.00	0.15	0.00	0.04	0.06	0.08	0.00
grubby	0.5	0.46	0.27	0.15	0.19	0.27	0.21	0.42	0.23	0.2	0.19	0.15	0.02	0.19	0.08	0.40
inshore lizardfish	0.06	0.00	0.6	0.13	0.19	0.15	0.13	0.1	0.15	0.13	0.6	0.25	0.00	0.29	0.29	0.31
mummichog	0.35	0.27	0.48	0.65	0.48	0.5	0.4	0.42	0.35	0.27	0.54	0.65	0.4	0.5	0.54	0.65
naked goby	0.04	0.00	0.08	0.00	0.02	0.00	0	0.02	0.08	0.06	0.08	0.02	0.02	0.04	0.04	0.00
northern kingfish	0.17	0.1	0.02	0.02	0.19	0.17	0.23	0.13	0.29	0.35	0.4	0.38	0.1	0.4	0.21	0.56
northern pipefish	0.48	0.25	0.29	0.42	0.23	0.52	0.4	0.44	0.6	0.6	0.69	0.75	0.31	0.5	0.83	0.58
northern puffer	0.4	0.31	0.29	0.44	0.23	0.23	0.21	0.31	0.42	0.38	0.48	0.31	0.21	0.23	0.38	0.54
rainbow smelt	0.08	0.00	0.00	0.00	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	0.13	0.29	0.04	0.29	0.02	0.38	0.04	0.06	0.42	0.08	0.48	0.71	0.38	0.71	0.96	0.54
sheepshead minnow	0.15	0.15	0.06	0.4	0.27	0.13	0.1	0.13	0.25	0.07	0.17	0.13	0.13	0.15	0.4	0.23
smallmouth flounder	0.00	0.00	0.02	0.00	0.13	0.15	0.06	0.4	0.17	0.29	0.06	0.15	0.13	0.02	0.1	0.02
striped bass	0.00	0.00	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	0.02
striped killifish	0.73	0.96	0.65	0.88	0.94	0.75	0.9	0.98	0.65	0.58	0.88	0.88	0.79	0.85	1	0.94
striped searobin	0.38	0.13	0.13	0.27	0.19	0.4	0.17	0.06	0.08	0.15	0.49	0.29	0.02	0.04	0.04	0.21
summer flounder	0.00	0.00	0.19	0.06	0.15	0.02	0.04	0.00	0.08	0.12	0.06	0.13	0.02	0.02	0.04	0.04
tautog	0.54	0.42	0.17	0.54	0.42	0.35	0.31	0.23	0.6	0.33	0.63	0.83	0.67	0.5	0.85	0.65
weakfish	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	0.00	0.08	0.00
windowpane flounder	0.21	0.15	0.06	0.04	0.1	0.00	0.04	0.02	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00
winter flounder –age 1+	0.17	0.21	0.15	0.08	0.15	0.04	0.04	0.04	0.05	0.00	0.06	0.04	0.02	0.06	0.02	0.04
winter flounder YOY	0.98	0.94	0.46	0.92	0.71	0.52	0.6	0.63	0.27	0.23	0.33	0.46	0.35	0.48	0.4	0.46

Table 8.3: Mean catch of young-of-year winter flounder at eight sites sampled by seine, 1988-2019.

BPT=Bridgeport, CLT=Clinton, GRT=Groton, GRW=Greenwich, MIL=Milford, OLM=Old Lyme, WTF=Waterford

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	1.70	1.14	1.53	0.70	-	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	4.10	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	1.40	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	2.60	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	0.20	1.12	4.12	1.24	0.59	0	0.91	9.10	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	1.70	51.13	32.30	8.1
2004	1.00	*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	7.30	5.6
2006	0.12	1.38	5.53	0.12	0	0	3.30	1.29	0.9
2007	0.78	5.65	17.90	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	0.26	0.70	0.76	0	0.12	0.26	0.44	0.3
2013	0	0	1.14	0.26	0	0	0.65	0.57	**0.28
2014	0.12	0.12	1.82	0.26	0.12	0.12	1.35	0.65	0.47
2015	0	0.59	1.96	0.70	0.12	0.12	0.51	2.40	0.64
2016	0.12	0	1.49	0.20	0	0	1.14	6.03	0.63
2017	0	0.12	13.53	0.91	0.26	0.26	0.12	4.19	1.03
2018	0	0.31	1.29	0.41	0	0	0.41	1.80	0.42
2019	0	0.65	2.56	0.44	0.26	0.12	0.41	2.91	0.68

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

Table 8.4: Total catch of finfish species commonly captured in seine samples, 1988-2019. See Appendix 8.1 for complete taxonomic names.

Species	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	2015	2016	2017	2018	2019	Total	
Atlantic Menhaden	3	2	2	4	1,074	3	9	2		11	2,003	377	1,236	1	1,284	5,098	1,117	75	117	144	21	54	3	43	2	14	3,404	3,948	150	703	614	1514	23,032	
Atlantic Silverside	4,750	3,316	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	5,122	5,089	3,267	5,087	3,245	4,156	7,063	4,657	4,142	3,958	3,832	7,549	6,459	4,869	6,963	6,999	175,475	
Black Sea Bass				10			41	43			27	14	2	687	63	27	110	15	82	109	33	304	86	489	783	1,197	1,950	1,794	500	338	267	537	9,508	
Bluefish			3	194	10		5	2			3	24	1		13	5	23	8	30		7	53	1	26	54	17	194	289	45		44	55	1,106	
Cunner	15	27	2	5	19		42	24	63	1	23	142	26	15	110	15	54	35	18	58	8	28	15	2	42	1	73	7		28	23	15	936	
Fourspine Stickleback	33	76		183	11	21	1		3		24	3	1	7			9		2			8		2			13		2	3	11		413	
Grubby	111	3	2	7	61	6	38	19	21	28	17	55	15	73	33	95	143	76	31	32	16	51	25	55	18	19	18	16	1	35	4	50	1,174	
Inshore Lizardfish	5		2			4	6			46	6	16	15	103	2		3		169	18	26	22	10	16	23	11	135	38		30	19	62	787	
Mummichog	1,031	197	171	765	573	1,256	1,943	78	149	190	396	115	1,008	246	811	702	637	543	398	1,203	498	857	299	775	329	199	1,098	999	519	676	748	791	20,200	
Naked Goby			1	4				1			1	1		4	2	2	2		13		2			2	4	4	6	5	1	7	2		64	
Northern Kingfish				3	4	23	2	9	3	10	7	6	5	17	5	21	38	11	1	1	23	42	76	30	54	81	149	113	10	142	24	199		1,109
Northern Pipefish	65	23	33	106	120	82	117	52	241	38	295	141	96	189	87	25	72	92	82	75	156	307	49	248	152	204	413	142	48	63	147	126		4,086
Northern Puffer	4	22	13	34	4	37	15	40	25	5	5	13	63	14	79	101	75	93	34	241	19	41	51	28	98	202	97	448	18	17	56	163	2,155	
Northern Searobin		2	1				1	1					3	40	24	5	4	13	2	10			1	9			6	35	105		45	41	143	491
Rainwater Killifish									3	4			2		6	35	53	19	3										4	55	6		190	
Scup												1		58	172	131	50	154	6	170	14	413	21	30	375	18	485	1,573	198	212	646	532		5,259
Sheepshead Minnow	174	815	5	345	4	1	2	30		14	19	12	267	59	402	276	205	28	104	1,439	304	203	82	219	238	59	154	60	742	352	296	340		7,250
Smallmouth Flounder	1			1		8	14	7	2	5		40	3	12					1		14	21	5	114	63	49	15	13	7	1	10	1	407	
Striped Killifish	1,511	1,383	748	659	465	773	1,923	520	269	289	1,066	539	1,797	1,494	1,698	3,410	1,548	1,470	1,063	1,994	1,874	1,508	1,300	1,964	720	493	1,158	1,531	1,482	961	1,412	1,358	40,380	
Striped Searobin	22	12	5	94	5	71	5	1	9	40	178	51	7	33	33	62	38	19	6	32	36	82	14	4	7	14	121	84	1	2	2	45	1,135	
Summer Flounder						2	6		1		1								16	8	8	1	6		6	7	3	11	1	2	2	2	83	
Tautog	23	5	23	72	32	16	104	88	42	19	135	174	67	59	153	140	145	64	93	321	131	25	33	27	123	73	467	446	75	140	255	141	3,711	
Windowpane Flounder	49	4	22	19	35	30	9	13	71	50	12	10	4		1	5	15	15	3	2	17		2	4			2						394	
Winter Flounder 1+	12	6		7	6	14	13	12	21	282	9	4	7	2	3		9	11	7	6	13	2	2	2	2		3	2	1	3	1	2	464	
Winter Flounder YOY	900	117	276	410	1,055	483	1,401	916	1,486	874	999	1,497	708	138	302	1,310	914	470	110	365	190	72	71	86	22	24	48	48	74	140	29	51	15,586	

Table 8.5: Total catch of finfish species infrequently captured in seine samples, 1988-2019. See Appendix 8.1 for complete taxonomic names

Species	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	2015	2016	2017	2018	2019	Total	
Alewife							1								28	1																1	31	
American Eel	1	3					1				5														1	2	15			2	1	31		
American Sand Lance					1		10																13										24	
American Shad		18	1								151																	42		50			262	
Anchovy, spp (YOY)																					15												3,066	
Atlantic Needlefish																					2							3,051					3	
Atlantic Tomcod						3					1						1	3			1			8							2		19	
Banded Butterflyfish																														3			3	
Banded Gunnel											2	3					4	2	3	1	3			1									19	
Banded Rudderfish																							1										1	
Bay Anchovy								4	69		27			1	11		1	12					1				520	24					670	
Black Spotted Stickleback																														2			2	
Blue Spotted Coronet Fish												1														2							3	
Blueback Herring		26																			9				1	1		11		165			216	
Burrfish, Striped				15	2		1			1	9	142	3	8	2	17								10									214	
Butterfish												1														4							22	
Crevalle Jack	6							1															1										8	
Feather Blenny																									36					7			43	
Flying Gurnard																					1													1
Gizzard Shad																								4										4
Grey Snapper			1																															1
Hogchoker							2																1											3
Lined Seahorse							4			1		2								2	7	2	1	2				1	4	7			33	
Little Skate										1					1																			2
Moonfish																														16				16
Northern Sennet																			1															1
Northern Star Gazer		5																																5
Oyster Toadfish	5			1						1	1			1		1	2	1	1	1	2	1				6	2	4	2	4	3			39
Pumpkin Seed				2													3																	5
Rainbow Smelt						5	2										34																	41
Rock Gunnel			1		1	1	1			3							1					1												9
Smooth Dogfish			1																															1
Spot																											6							6
Striped Anchovy																							3											3
Striped Bass												1				6							1									1		9
Threespine Stickleback														11																				11
Weakfish																15											4			10			29	
Web Burrfish																																		2
White Mullet	1	1	8		3										1					7	7	11	75	68		22			15	31	16		266	
White Perch																		3				11		6									20	
Yellow Jack																							1											1

Table 8.6: Total catch of invertebrate species captured in seine samples, 2004-2019.

See Appendix 8.2 for complete taxonomic names.

Species	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Blue crab	1	2	84	31	4	333	35	23	27	18	17	18	6	11	19	79
Boreal squid				1												
Brown shrimp			11										3			
Channeled whelk							1				3					
Common slipper shell			13													
Flat-claw hermit crab	761	532	703	153	244	539	558	441	283	367	562	308	2,878	829	658	1,157
Green crab	234	266	341	147	644	176	308	228	175	253	273	213	256	460	432	345
Horseshoe crab													1			
Japanese shore crab	1		1	1				6	1			1	1			1
Jonah crab						2										
Knobbed whelk																1
Lady crab	298	119	66	195	92	42	19	24	18	13	41	102	12	20	2	52
Mantis shrimp									1							
Mole crab	1	5														
Moon jellyfish							319						461	16	200	200
Mud crab	60	55	74	30	85	67	308	80	80	1,100	43	142	9	1	20	31
Mud snail	948	2,071	4,478	3,569	3,810	3,128	2,699	2,683	3,072	5,787	6,938	11,132	11,687	6,061	6,927	9,422
Northern comb jelly						346	36			3,620	1,200		185	1,648	111	300
Northern moon snail														6		2
Oyster drill			38												69	
Rock crab	2						1									
Sand shrimp	278	373	1,027	525	2,625	762	902	1,507	246	1,794	662	207	33	518	650	531
Scallop (bay)											3	3	1	2		
Shore shrimp	990	404	1,149	707	1,390	535	619	762	402	511	1,011	4,795	478	1,517	921	526
Spider crab	4	5	6	1	3	1	7	33	13	20	14	45	53	161	21	8
Squid (longfin)												6				
Starfish spp.							1									

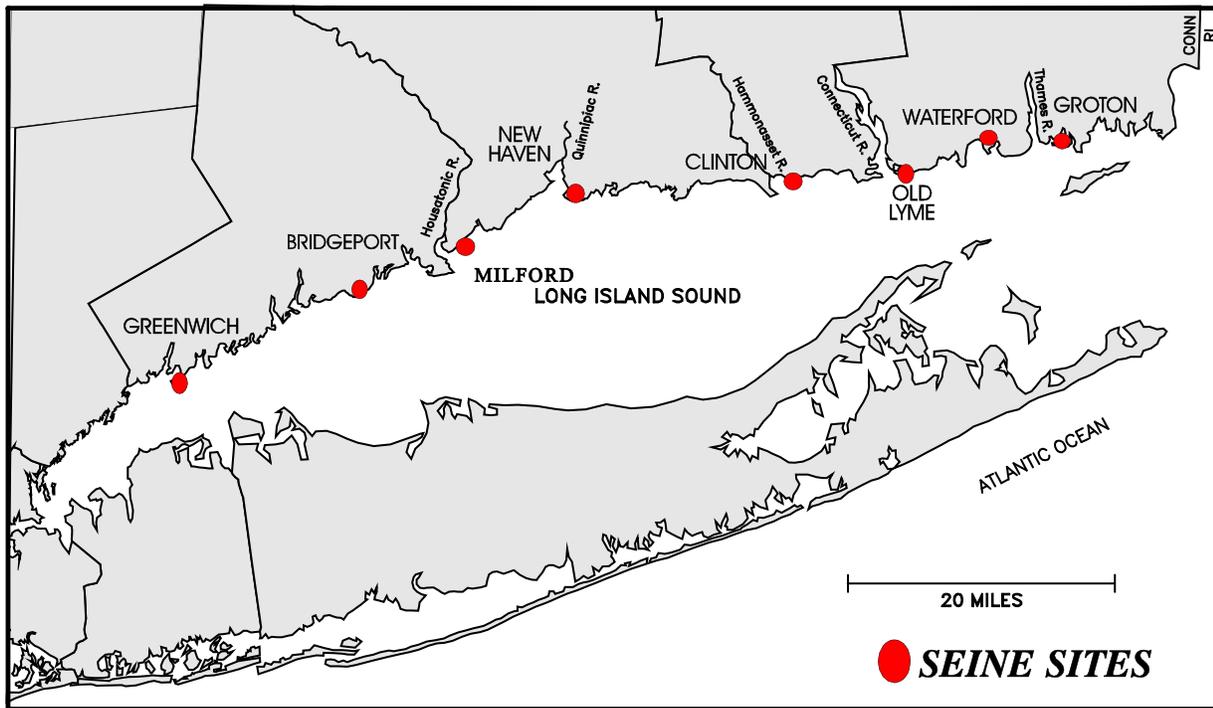


Figure 8.1: Sampling locations of the Estuarine Seine Survey.

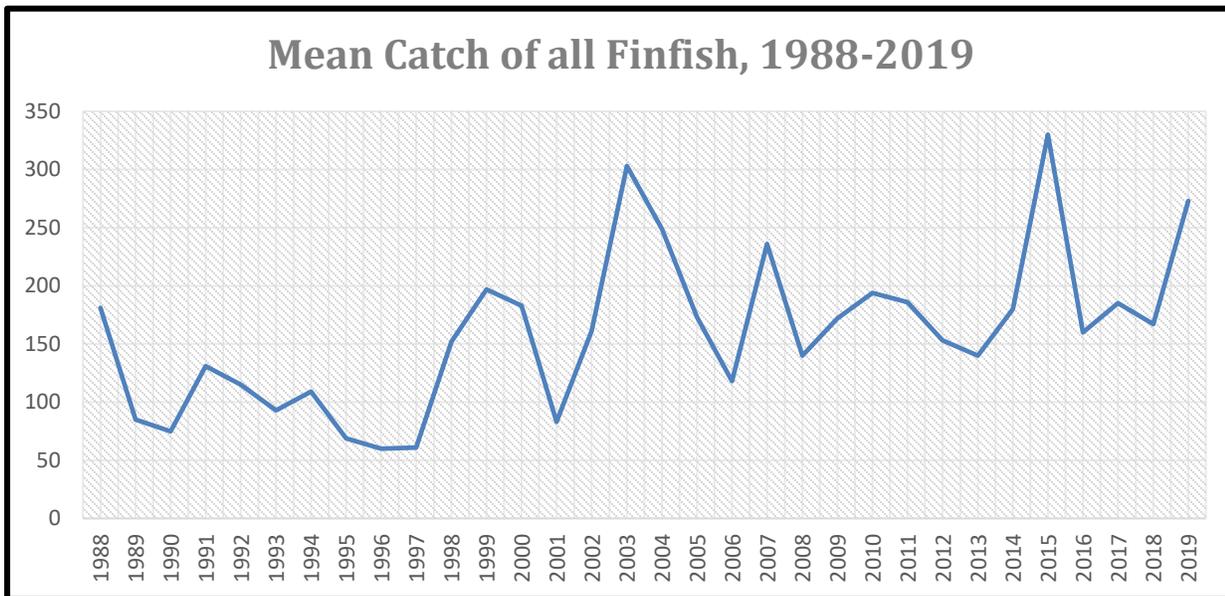


Figure 8.2: Mean catch of all finfish captured in seine samples, 1988-2019. *Geometric mean catch (numbers) per haul includes samples at all sites. Note that sampling at the Milford site began in 1990.*

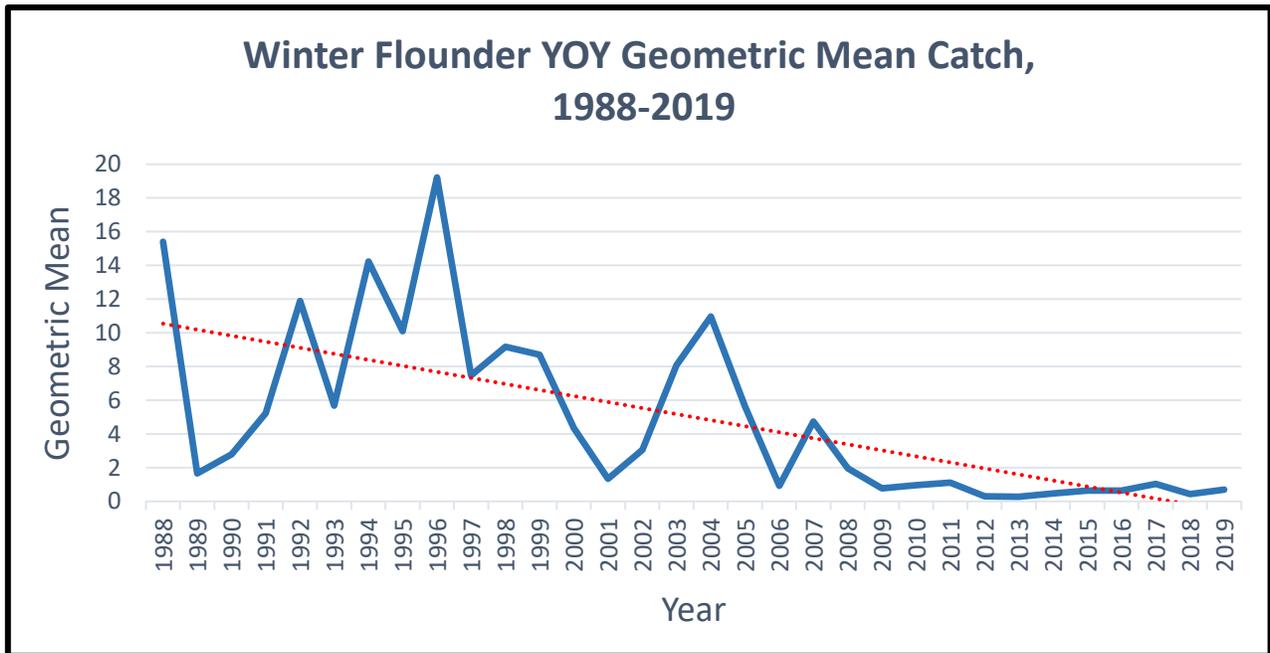


Figure 8.3: Mean catch and occurrence of young-of-year winter flounder, 1988-2019. *The negative trend (dashed line) is significant ($r^2 = 0.43$, $p < 0.001$, $df = 30$).*

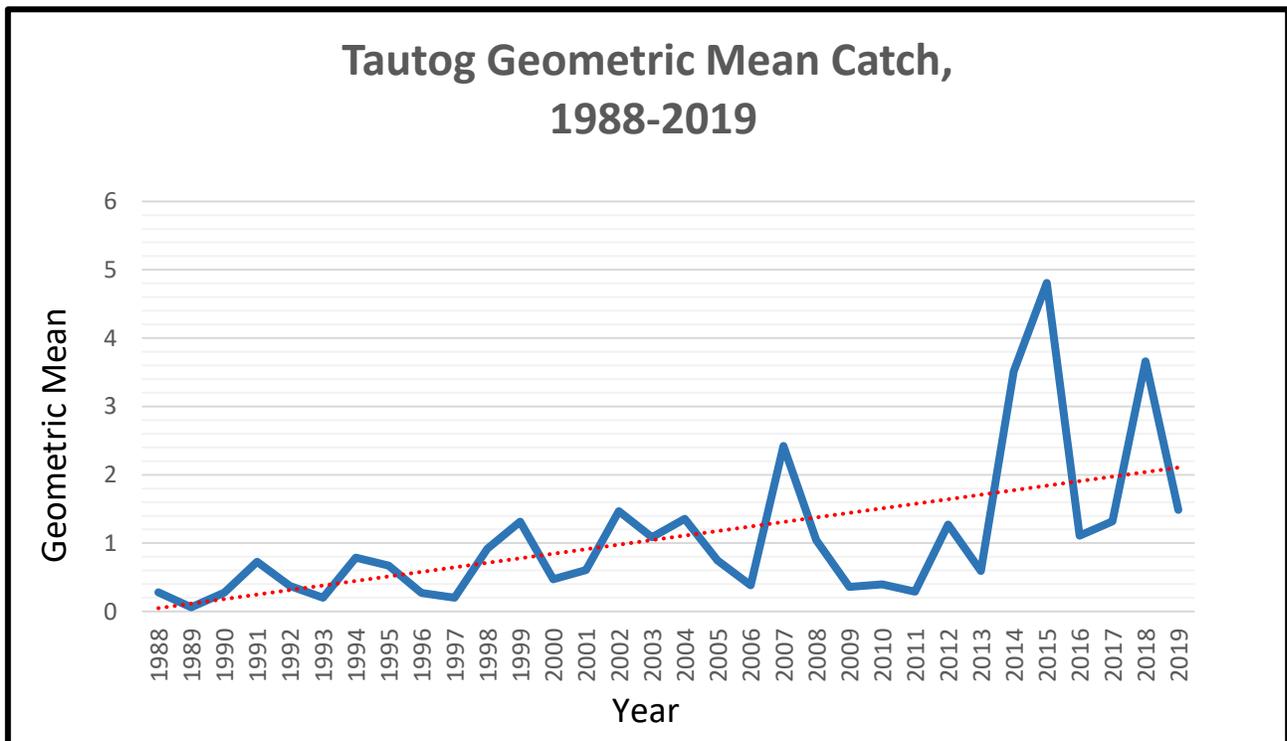


Figure 8.4: Mean catch and occurrence of young-of-year tautog, 1988-2019. *The positive trend (dashed line) is significant ($r^2 = 0.32$, $p < 0.001$, $df = 30$).*

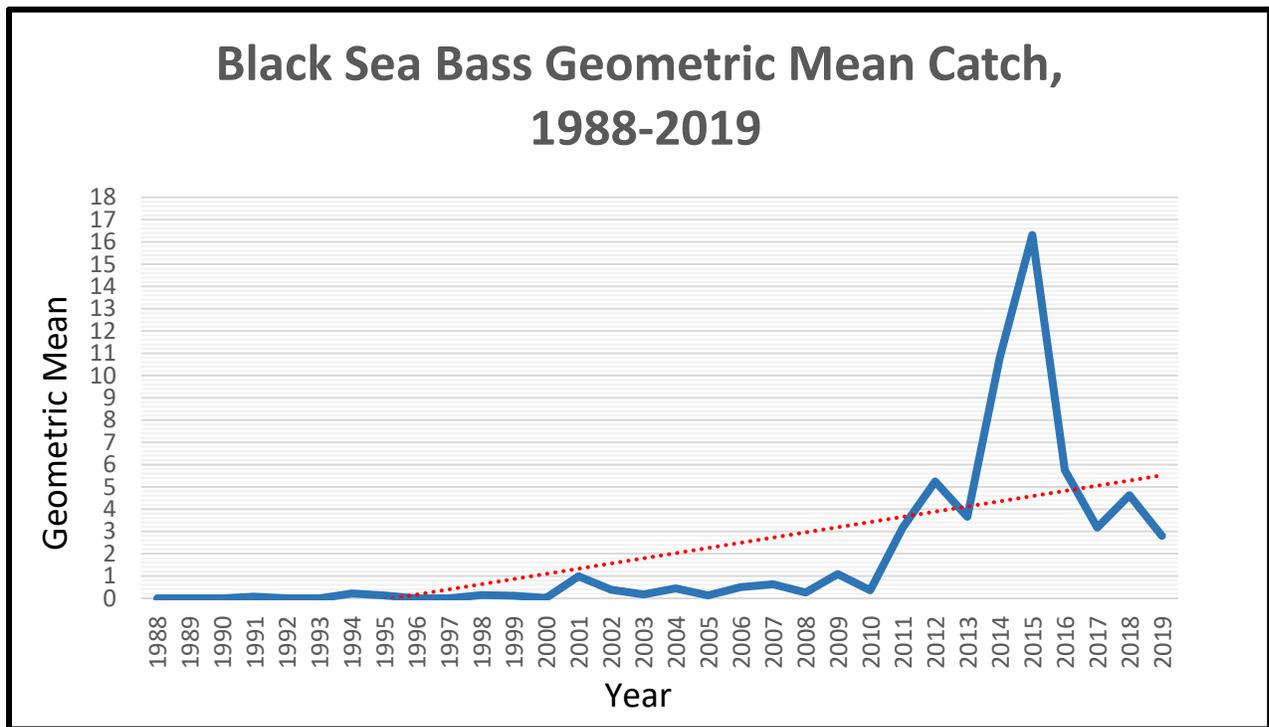


Figure 8.5: Mean catch of black seabass young-of-year, 1988-2019. The positive trend (dashed line) is significant ($r^2 = 0.38$, $p < 0.001$, $df = 30$).

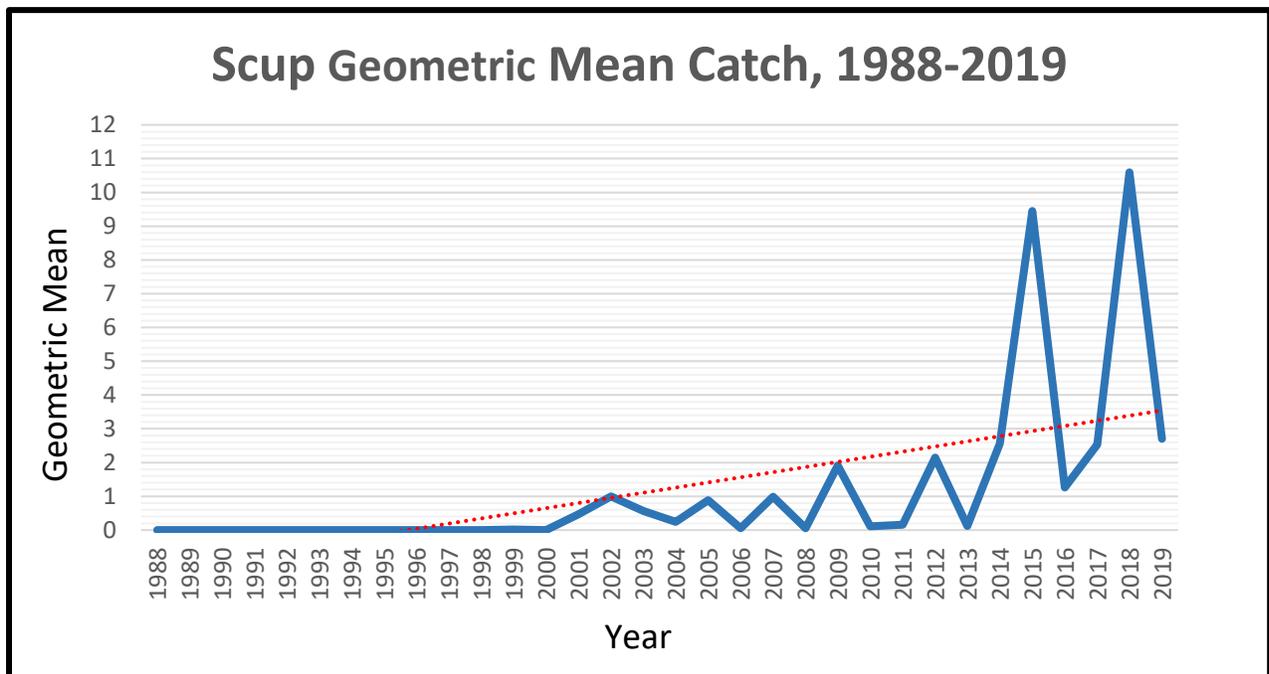


Figure 8.6: Mean catch of scup young-of-year, 1988-2019. Annual percent of hauls catching one or more scup are also shown. The positive trend (dashed line) is significant ($r^2 = 0.33$, $p < 0.0005$, $df = 30$).

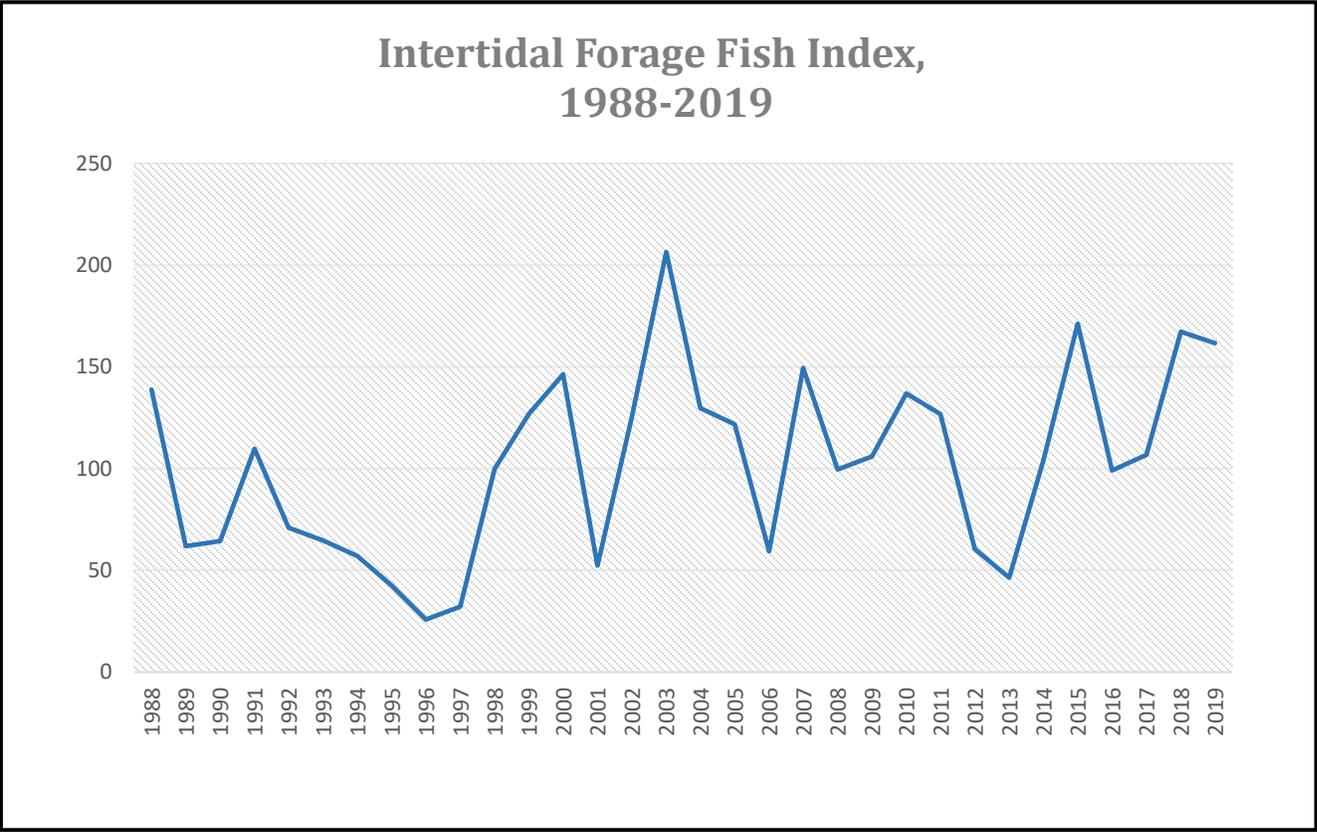


Figure 8.7: Mean catch of forage fish, 1988-2019. Forage species included in the index are *Atlantic silversides*, *striped killifish*, *mummichog*, and *sheepshead minnow*. See Appendix 8.1 for complete taxonomic names.

Table 8.7: Mean catch of forage fish, 1988-2019.

1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
139	62	64	110	71	65	57	42	26	32	100	127
2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	
146	52	125	206	130	122	59	149	100	106	137	
2011	2012	2013	2014	2015	2016	2017	2018	2019			
127	60	46	104	171	99	107	167	161			

Appendix 8.1: Finfish species captured in the Estuarine Seine Survey, 1988-2019.

<u>COMMON NAME</u>	<u>SPECIES CODE</u>	<u>SCIENTIFIC NAME</u>
Alewife	ALW	<i>Alosa pseudoharengus</i>
American eel	EEL	<i>Anguilla rostrata</i>
American shad	ASD	<i>Alosa sapidissima</i>
American sand lance	ASL	<i>Ammodytes americanus</i>
Atlantic needlefish	ANF	<i>Strongylura marina</i>
Atlantic silversides	ASS	<i>Menidia menidia</i>
Atlantic tomcod	TOM	<i>Microgadus tomcod</i>
Banded butterflyfish	BBF	<i>Chaetodon striatus</i>
Banded gunnel	BGN	<i>Pholis fasciata</i>
Banded rudderfish	RUD	<i>Seriola zonata</i>
Bay anchovy	ACH	<i>Anchoa mitchilli</i>
Black-spot stickleback	BSS	<i>Gasterosteus wheatlandi</i>
Black sea bass	BSB	<i>Centropristis striata</i>
Blueback herring	BBH	<i>Alosa aestivalis</i>
Bluefish	BLF	<i>Pomatomus saltatrix</i>
Blue spotted coronetfish	BSC	<i>Fistularia tabacaria</i>
Crevalle jack	CRJ	<i>Caranx hippos</i>
Cunner	CUN	<i>Tautoglabrus adspersus</i>
Feather Blenny	FBL	<i>Hypsoblennius hentzi</i>
Flying Gurnard	FGD	<i>Dactylopterus volitans</i>
Four-spine stickleback	FSS	<i>Apeltes quadracus</i>
Gizzard Shad	GIZ	<i>Dorosoma cepedianum</i>
Gray snapper	GRA	<i>Lutjanus griseus</i>
Grubby	GRB	<i>Myoxocephalus aeneus</i>
Hogchoker	HOG	<i>Trinectes maculatus</i>
Inshore lizardfish	LIZ	<i>Synodus foetens</i>
Little skate	LSK	<i>Raja erinacea</i>
Menhaden	MEN	<i>Brevoortia tyrannus</i>
Moonfish	MOO	<i>Mene maculata</i>
Mummichog	MUM	<i>Fundulus heteroclitus</i>
Naked goby	NKG	<i>Gobiosoma boscii</i>
Nine-spine stickleback	NSS	<i>Pungitius pungitius</i>
Northern kingfish	NKF	<i>Menticirrhus saxatilis</i>
Northern pipefish	PIP	<i>Syngnathus fuscus</i>
Northern puffer	PUF	<i>Sphaeroides maculatus</i>
Northern searobin	NSR	<i>Prionotus carolinus</i>
Northern stargazer	STR	<i>Astroscopus guttatus</i>
Pumpkinseed	PUM	<i>Lepomis gibbosus</i>
Rainbow smelt	RSM	<i>Osmerus mordax</i>
Rainwater killifish	RWK	<i>Lucania parva</i>
Rock gunnel	RGN	<i>Pholis gunnellus</i>
Northern seahorse	SEH	<i>Hippocampus erectus</i>
Northern sennet	NOS	<i>Sphyræna borealis</i>
Scup	PGY	<i>Stenotomus chrysops</i>
Sheepshead minnow	SHM	<i>Cyprinodon variegatus</i>
Shorthorn Sculpin	SHS	<i>Myoxocephalus scorpius</i>
Skilletfish	SKL	<i>Gobiesox strumosus</i>
Smallmouth flounder	SMF	<i>Etropus microstomus</i>
Smooth dogfish	SMD	<i>Mustelus canis</i>
Spotted hake	SPH	<i>Urophycis regius</i>
Striped anchovy	STA	<i>Anchoa hepsetus</i>
Striped bass	STB	<i>Morone saxatilis</i>
Striped burrfish	SBF	<i>Chilomycterus schoepfi</i>
Striped killifish	SKF	<i>Fundulus majalis</i>
Striped searobin	SSR	<i>Prionotus evolans</i>
Summer flounder	SFL	<i>Paralichthys dentatus</i>
Tautog	BKF	<i>Tautoga onitis</i>
Three-spine stickleback	TSS	<i>Gasterosteus aculeatus</i>

Appendix 8.1, continued:

Toadfish	TDF	<i>Opsanus tau</i>
Weakfish	WKF	<i>Cynoscion regalis</i>
Web Burrfish	WBF	<i>Chilomycterus antillarum</i>
White mullet	WML	<i>Mugil curema</i>
Windowpane flounder	WPF	<i>Scophthalmus aquosus</i>
Winter flounder (YOY)	WFO	<i>Pseudopleuronectes americanus</i>
Winter flounder (AGE 1+)	WFL	<i>Pseudopleuronectes americanus</i>
Yellow jack	YJK	<i>Caranx bartholomaei</i>

Appendix 8.2: Invertebrate species captured in the Estuarine Seine Survey, 1988-2019.

<u>COMMON NAME</u>	<u>SPECIES CODE</u>	<u>SCIENTIFIC NAME</u>
Bay Scallop	SCA	<i>Argopecten irradians</i>
Blue crab	BCR	<i>Callinectes sapidus</i>
Brown Shrimp	BNS	<i>Panaeus aztecus</i>
Chaneled Whelk	CHW	<i>Busycotypus canaliculatus</i>
Common Slipper Shell	CSL	<i>Crepidula fornicata</i>
Northern Comb Jelly	COM	<i>Bolinopsis infundibulum</i>
Green crab	GCR	<i>Carcinus maenas</i>
Flat-claw hermit crab	HER	<i>Pagurus spp.</i>
Horseshoe crab	HSC	<i>Limulus polyphemus</i>
Japanese crab	JSC	<i>Hemigrapsus sanguineus</i>
Jonah crab	JCR	<i>Cancer borealis</i>
Knobbed whelk	KNW	<i>Busycon carica</i>
Lady crab	LCR	<i>Ovalipes ocellatus</i>
Long-finned squid	SQI	<i>Loligo pealeii</i>
Mantis shrimp	MAN	<i>Squilla empusa</i>
Moon Jelly	MOJ	<i>Aurelia aurita</i>
Mud crab	BMC	<i>Panopeus spp.</i>
Mole crab	MLR	<i>Emerita talpoida</i>
Mud snail	MSN	<i>Nassarius obsoletus</i>
Northern moon snail	NMS	<i>Lunatia heros</i>
Oyster drill	OYD	<i>Urosalpinx cinerea</i>
Rock crab	RCR	<i>Cancer irroratus</i>
Sand shrimp	CRG	<i>Crangon septemspinosa</i>
Sea Star	STF	<i>Asterias forbesi</i>
Shore shrimp	PAL	<i>Palaemonetes spp.</i>
Spider crab	SPI	<i>Libinia emarginata</i>

2019 Long Island Sound Hypoxia Season Review



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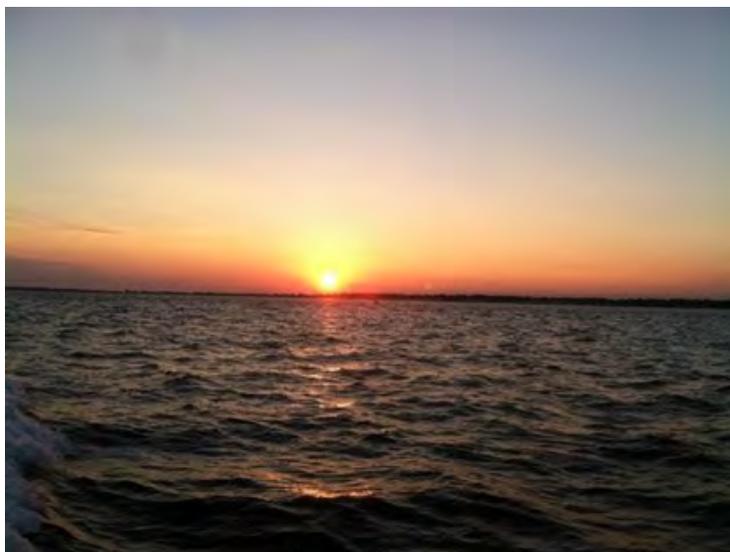
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Introduction

Designated as an estuary of national significance by Congress in 1987, Long Island Sound (LIS) is home to a diverse network of flora and fauna, with over four (4) million people living in the Sound's coastal communities. It is an estuary of recreational, commercial, and socioeconomic value. The Sound is bordered by the states of Connecticut and New York and has a watershed area extending through Massachusetts, New Hampshire, Vermont, Maine, and Quebec that encompasses over 16,000 square miles. Nearly nine (9) million people live within the watershed. Over time, the Sound has been subject to the effects of increased stress, including nutrient loading, as a result of changes in land use, especially urbanization, habitat alterations, and climate change (Latimer *et al.*, 2014).

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 (LISS), 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 effects to organisms even above this level. Nutrients, especially nitrogen, fuel the growth of microscopic algae called phytoplankton in the Sound. The phytoplankton die and settle to the bottom. Bacteria break down the organic material from the algae for food and fuel while using up oxygen. Seasonal weather patterns, particularly during the summer months, exacerbate the effects of nutrient loading. Calm weather patterns limit the mixing of the water column and replenishment of oxygen to the bottom waters, resulting in [a decrease in bottom water DO over the course of the summer](#). Hypoxic conditions are mainly confined to the western Sound.

In response to the critical need to document summer hypoxic conditions in Long Island Sound, the Connecticut Department of Energy and Environmental Protection (CT DEEP) and the Interstate Environmental Commission (IEC) have monitored dissolved oxygen, as well as other key water quality parameters relevant to hypoxia, since 1991. This report presents a summary of data collected by CT DEEP and IEC during the 2019 hypoxia season.



Methods Overview

Since 1991, CT DEEP has conducted an intensive year-round water quality monitoring program on LIS. [In situ physico-chemical parameters, nutrient samples, and plankton samples](#) are collected monthly from 17 sites on a year-round basis. Beginning in mid-June and extending through mid-September, an additional survey is added that samples up to 48 stations every other week for physico-chemical parameters ([Figure 1](#)).

IEC has conducted summer season monitoring in the far Western LIS (WLIS, [Figure 1](#), map inset) and the Upper East River since 1991. Since 2014, IEC's monitoring program has implemented modifications, including the collection of nutrients, to align it with CT DEEP's program. IEC collects physico-chemical data from 22 stations weekly along with nutrient data biweekly ([Figure 1](#)). Beginning in October 2018, IEC expanded its WLIS monitoring program to sample year-round.

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. LISICOS continuously monitors in situ water quality parameters and meteorological parameters at up to eight stations across the Sound. Sensors are attached to moored buoys at surface, middle, and bottom depths. Data are transmitted every 15 minutes in real-time via satellite where they are stored in a database and uploaded to the LISICOS [website](#). The system is maintained by the University of Connecticut.

CT DEEP and IEC data provide a snapshot of hypoxic conditions during a specific timeframe 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.

Further information on sampling and analytical methods for water quality parameters can be found in the EPA-approved [DEEP](#), [IEC](#), and [LISICOS](#) Quality Assurance Project Plans.

Dissolved oxygen data from 13 of IEC's 22 stations and all of CT DEEP's stations are incorporated into hypoxia maps to provide areal estimates presented in this report. The 13 IEC stations (A1, A2M, A3, A4, HA-3, HB, A5, HC1, HC, BIS, B2, B3M, B4) represent open water portions of the Western Narrows. DO data collected from IEC's embayment stations are not utilized in areal estimates.

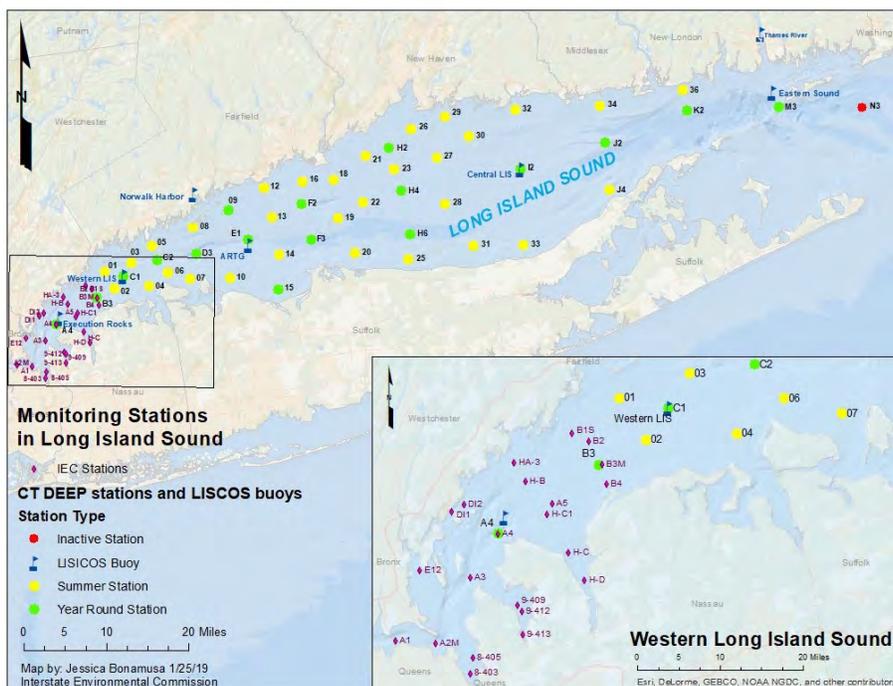


Figure 1. Hypoxia Monitoring Stations in Long Island Sound

CT DEEP collects monthly surface and bottom water samples from ten stations (Figure 2) distributed across LIS for phytoplankton community analyses. Stations were chosen to examine the “spatial distribution and temporal dynamics of phytoplankton population structure and diversity in LIS” as well as to “investigate the potential contribution of the settlement of the phytoplankton materials from the surface water to hypoxia/ anoxia in the bottom water” (Zhang and Lin 2018). CT DEEP also collects monthly composite water samples and conducts oblique plankton tows from six stations (triangles, Figure 2) for zooplankton community analyses. Samples are processed and analyzed by researchers with the Marine Sciences Department at the University of Connecticut. Collection methods and processing methods are available in EPA approved Quality Assurance Project Plans. Results are detailed in project reports submitted to CT DEEP annually. Results from 2019 are not yet available.

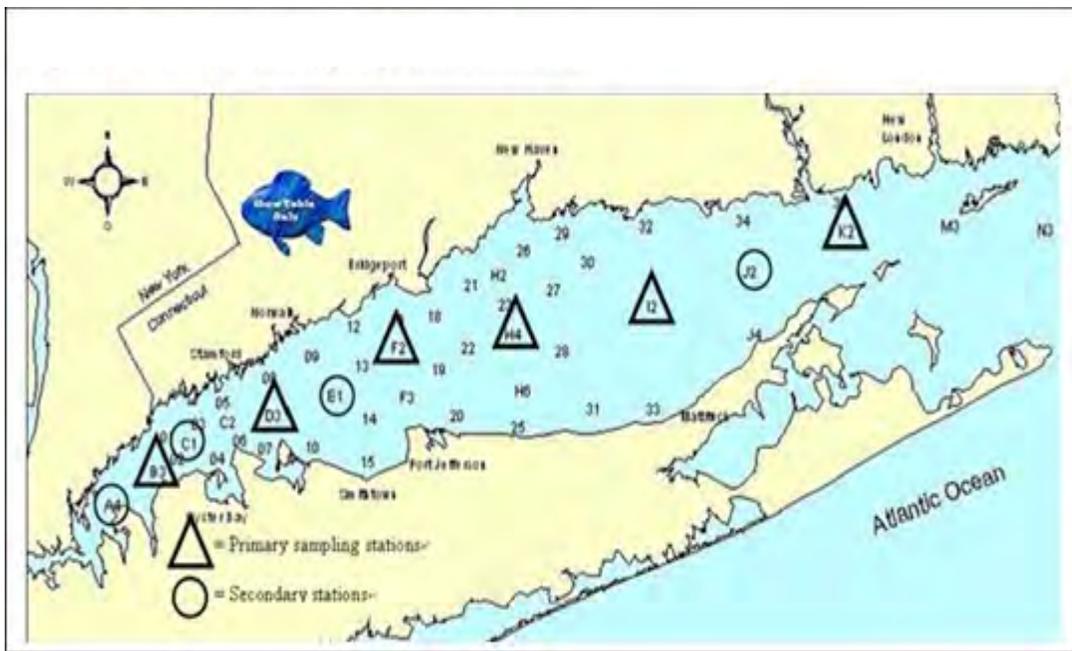


Figure 2. Location of Plankton Sampling Stations across Long Island Sound.
 Triangles= zooplankton and phytoplankton locations Circles = phytoplankton locations

Quality Assurance

The IEC and CTDEEP have been collecting data from the Sound since 1991. Both IEC and CTDEEP programs are designed to collect high quality data. IEC and CTDEEP sample collection and handling procedures are outlined in EPA-approved Quality Assurance Project Plans (QAPPs) and method-specific standard operating procedures (SOPs, see Methods section for hyperlinks to program quality assurance documents). Shared program goals include maintaining a long-term database of collected information and monitoring the extent of hypoxia within the Sound throughout the summertime (late June through mid-September) to assess achievement of the Comprehensive Conservation and Management Plan (CCMP) for restoring LIS.

Primary measures of data quality include completeness, representativeness, and comparability. IEC and CT DEEP met data quality objectives for completeness, representativeness and comparability as specified in their respective QAPPs. Station locations for both programs were chosen to be representative of ambient conditions Sound-wide. Since the expansion of IEC's program to year-round monitoring in the fall of 2018, both programs now sample representative temporal conditions over the whole year. Most sampling and analytical procedures have remained unchanged over the course of the monitoring program. Consistent field and laboratory procedures, well-documented by the appropriate SOPs, help ensure consistent and reproducible data. Quality Control checks performed by the programs' analytical laboratories, including continuing calibration verifications (CCV), blanks, duplicates, and spike samples, are used to flag suspect data and to ensure accuracy and precision of the results. Additionally, CT DEEP's analytical laboratory participates in a multi-lab comparison program that provides data specifically to assess its ability to produce data comparable to several other laboratories located in the Northeast and Mid-Atlantic regions of the United States. IEC began participating in this multi-lab comparison program in the fall of 2019. Additionally, IEC participates semi-annually in the New York State Department of Health's proficiency testing program.



RESULTS

During the summer of 2019, CT DEEP conducted eight surveys between May 29th and 10 September 10th while IEC conducted ten surveys between June 25th and September 10th (Table 1). Hypoxia maps and in situ profiles from stations in WLIS are available in [Appendix A](#). All data are available electronically upon request. Summaries of CT DEEP bi-weekly sampling are available on the Department's [website](#), and summaries of IEC weekly sampling are available on the Commission's [website](#).



Dissolved Oxygen

DO levels below 3.0 mg/L are considered hypoxic, causing mobile animals to emigrate from impacted areas and sessile animals to die or be physically or behaviorally impaired. However, early studies in LIS by CT DEEP Marine Fisheries biologists found that DO can become limiting below 4.8 mg/L for sensitive fish species, while more tolerant species are not affected until DO falls below 2.0 mg/L (Simpson et al, 1995, 1996). That study documented a 4% reduction in finfish biomass when DO levels were between 3.0-3.9 mg/L, a 41% reduction occurs at 2.0-2.9 mg/L DO, and an 82% reduction in waters with concentrations between 1.0 and 1.9 mg/L. Finfish biomass was reduced by 100% (total avoidance) in waters with DO less than 1.0 mg/L (Simpson et al, 1995, 1996).

Hypoxic conditions were documented during four CT DEEP surveys (Table 1), with stations A4, B3, C1, O9, E1, I5, O1, O2, O3, and I4 exhibiting dissolved oxygen concentrations below 3.0 mg/L at some point during the course of the season.

Hypoxic conditions were observed during six IEC surveys (excluding embayment stations). All 13 of IEC's open-water stations exhibited hypoxic conditions at some point over the course of the season. (Table 1).

Timing and Duration

The 2019 hypoxic event lasted an estimated **48 days**, beginning on July 12th and ending on August 28, based on CT DEEP and IEC data. Compared to the previous 31 years, 2019 was below the average of 55 days (Figure 3). The [LISIGOS Execution Rocks Buoy](#) estimated the duration was 45.03 days.

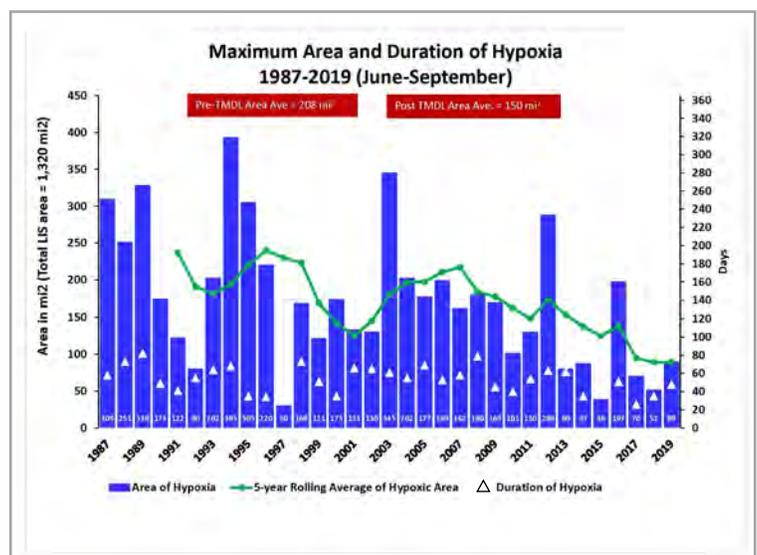


Figure 3. Maximum Area and Duration of Hypoxia. Blue bars represent area, white triangles represent duration, and the green line is the five-year rolling average of hypoxic area. The total area of Long Island Sound is 1,320 mi².

Table I. CT DEEP and IEC Cruise Summary Information. See Figure I for station locations.

Cruise	Start Date	End Date	Number of Stations Sampled	Number of Hypoxic Stations	Hypoxic Area (mi ²)	Minimum DO	Station Where Minimum DO Occurred
WQJUN19	5/29/2019	5/31/2019	17	0	0	6.86	B3
HYJUN19	6/12/2019	6/12/2019	22	0	0	6.29	B3
IEC RUN #1	6/25/2019	6/25/2019	22	0	NA	3.96	HC1*
WQJUL19	7/1/2019	7/3/2019	35	0	0	4.23	15
IEC RUN #2	7/2/2019	7/2/2019	22	0	NA	3.31	H-D*
IEC RUN #3	7/9/2019	7/9/2019	22	1	NA	2.89	9-413*
HYJUL19	7/15/2019	7/17/2019	39	1	17.8	2.47	A4
IEC RUN #4	7/15/2019	7/15/2019	22	4	NA	2.05	HC*
IEC RUN #5	7/24/2019	7/24/2019	22	14	NA	1.28	HC*
WQAUG19	7/29/2019	8/1/2019	42	4	89.42	1.29	A4
IEC RUN #6	7/30/2019	7/30/2019	22	18	NA	0.5	9-413*
IEC RUN #7	8/7/2019	8/7/2019	22	11	NA	1.19	B4
HYAUG19	8/12/2019	8/14/2019	41	7	74.13	0.89	A4
IEC RUN #8	8/13/2019	8/13/2019	22	15	NA	0.88	A4
IEC RUN #9	8/22/2019	8/22/2019	22	16	NA	0.33	9-413*
WQSEP19	8/27/2019	8/30/2019	41	2	20.31	2.74	E1
IEC RUN #10	9/3/2019	9/3/2019	22	0	NA	3.16	9-413*
HYSEP19	9/10/2019	9/10/2019	23	0	0	4.99	14

Bold= Maximum Extent of Hypoxia

NA= Not Applicable

Area estimates

To maintain the continuity and comparability of the long-term data set, areal estimates are based on CT DEEP data only. Re-interpolation using both the CT DEEP and IEC stations data from 1991-2019 is planned. CT DEEP and IEC data are synoptic over the sampling area, providing a snapshot of conditions for each survey period, while the LISICOS data provide continuous measurements at specific buoy locations throughout the year. This often results in disparity between the datasets.

Estimated Maximum Area Between 3.0 and 4.8 mg/L

In 2019, the maximum area of LIS bottom waters between 3.0 and 4.8 mg/L occurred during the HYAUG19 survey conducted (August 12-14) and was estimated at 409 mi². From 1991-2019, the area affected by [concentrations between 3.0 and 4.8 mg/L](#) averaged 581 mi² and varied from 414 to 730 mi².

Estimated Maximum Area Below 3.0 mg/L

The 2019 peak hypoxic event occurred during [IEC Run #6 and the WQAUG19 cruises](#) between July 29 and August 1. The maximum hypoxic area was **89.4 square miles**. Compared to the previous 31-year average (160.2 mi²), 2019 was below average in area (Figure 3). The lowest dissolved oxygen concentration (0.89 mg/L) documented by CT DEEP during 2019 occurred on August 12 at Station A4 (Appendix A, pg. A3). The lowest dissolved oxygen concentration documented by IEC during 2019 at an open water station was 0.51 mg/L and occurred on July 30 at Station H-C1 (Appendix A). The [Execution Rocks Buoy](#) recorded its lowest reading, 0.07 mg/L, on 8/10/19.

Estimated Maximum Area Below 2.0 mg/L

Based on CT DEEP data, in 2019 the maximum area below 2.0 mg/L was **21.1 square miles** and occurred during the [HYAUG19 cruise](#). The average area with [concentrations less than 2.0 mg/L](#), calculated from 1991-2019, was 48.14 mi². The IEC documented concentrations below 2.0 mg/L at eight of their open-water stations on 24 July, nine of their open-water stations on 30 July, seven of their open-water stations on 7 August, and five of their open-water stations on 13 August. At the LISICOS Execution Rocks buoy, there was 35.06 cumulative days below 2.0 mg/L.

Estimated Maximum Area Below 1.0 mg/L

The maximum area below 1.0 mg/L based on CT DEEP data in 2019 was **14.75 square miles**. At the LISICOS Execution Rocks buoy there were 19.65 cumulative days of DO concentrations less than 1.0 mg/L. The overall average area with [concentrations less than 1.0 mg/L](#) from 1991-2019 is 11.19 mi². The greatest area with DO below 1 mg/L (62 square miles) occurred during the summer of 2003.

Frequency

Figure 4 shows the frequency of hypoxia occurrence for stations over the 1994-2019 period. The percent of WLIS stations (inset Figure 4) that experience hypoxic conditions continues to be between 90 and 100% (Figure 4). However, stations C2, D3, E1, O9, and 15 have exhibited signs of [improvement](#); in the 1990's these stations were hypoxic about 60-80% of the time, while over the past four years they were hypoxic only about 10-30% of the time.

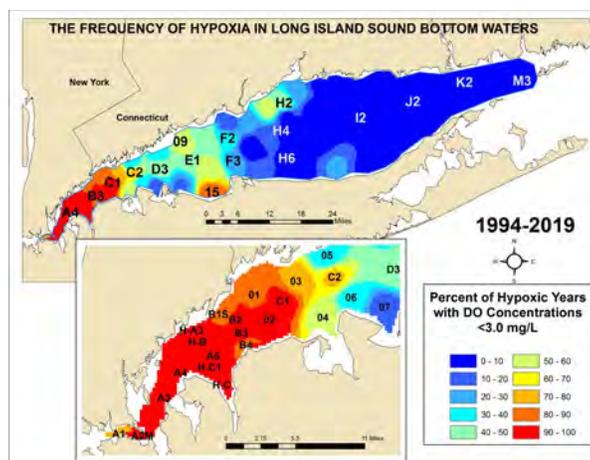


Figure 4. Frequency of Hypoxia in Long Island Sound Bottom Waters

WATER TEMPERATURE

Water temperature plays a major role in the timing and severity of the summer hypoxia events. Water temperature differences in the Western Sound during the summer months are particularly influential in contributing to the difference in dissolved oxygen content between surface and bottom waters. Density stratification in the water column creates a barrier between the surface and bottom waters, and it is this barrier, the pycnocline (where the change in density with depth is at its greatest), that prevents mixing between the layers.

In 2019, stratification began to set up in May (Figure 5), when the difference between surface and bottom water temperatures (Delta T) ranged from 0.16°C to 3.71°C, and peaked in the Western Narrows in early July. The maximum Delta T (based on CT DEEP data) in 2019 was 7.25°C and occurred on July 16 at Station H6. Destratification (fall turnover) began around mid-August. The 2019 maximum surface temperature was 25.57°C recorded on July 30 at Station 06. The minimum surface temperature was 1.37°C, recorded on March 7 at Station 15. The 2019 maximum bottom temperature was 22.96°C, recorded on August 13 at Station 15. The minimum bottom temperature was 1.35°C, recorded on March 7 at Station 15.

Both surface and bottom water temperatures in LIS appear to be increasing. The surface and bottom temperatures from four of CT DEEP's 17 year round monitoring stations are plotted in Figure 6.

Additional information is available on the [LISS website](#).

2019 temperature data are available by station in [Appendix A](#).

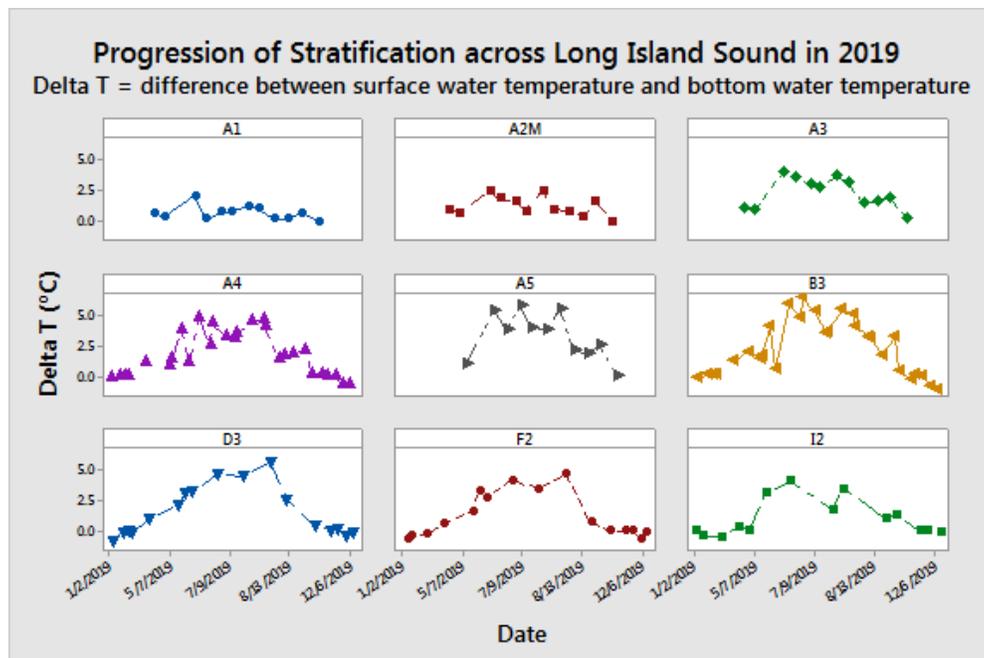


Figure 5. Progression of stratification across Long Island Sound in 2019, where Delta T = surface water temperature minus bottom water temperature.

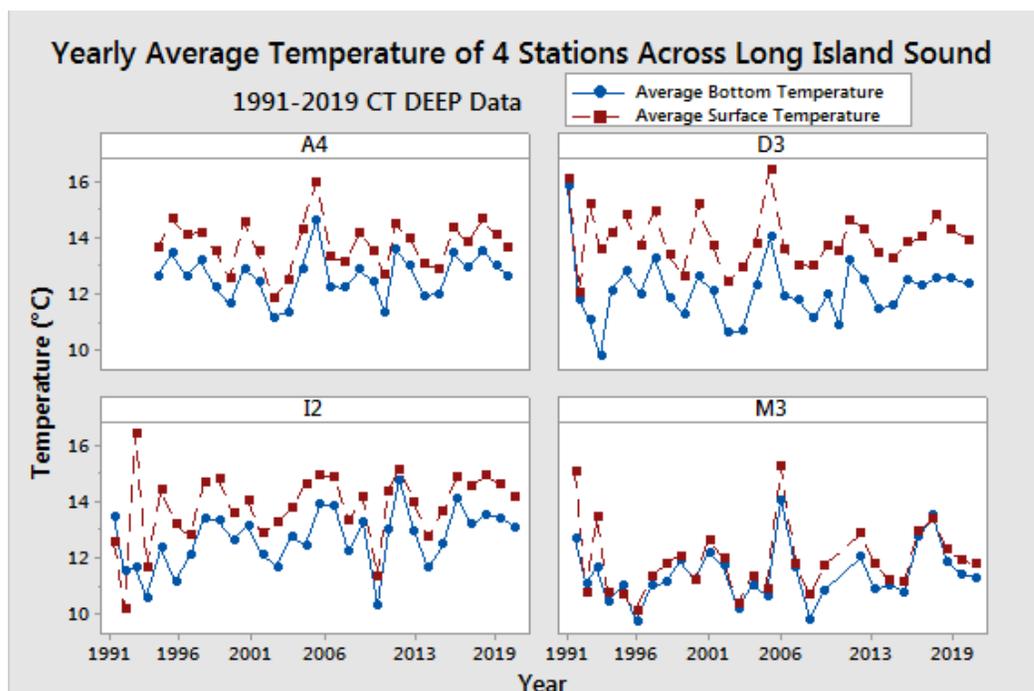


Figure 6. Yearly Average Water Temperatures of Long Island Sound.

Water Clarity

Water clarity, a measure of light penetration through the water column, is an important indicator of the health of seagrass beds, and, thus, the ecosystem as a whole (see page 16). In Long Island Sound, water clarity improves as you move eastward. The eastern portion of the Sound is a wide and deep channel with considerable influx from the Atlantic Ocean, whereas the Western Sound is more narrow and shallow, and its surrounding land is densely populated and developed with many sewage treatment facilities on or near the coast. This results in less of an exchange of waters on the western end and also increases the concentrations of pollutants in the water that may affect water clarity.

Figure 7 highlights the west-east water clarity gradient. In 2019, the western-most axial station (A1, near Whitestone Bridge) had an average summer Secchi disk depth of 1.6 meters (Figure 7a) and a year-round average of 1.5 meters (Figure 7b). The average Secchi disk depths gradually increased, with the eastern-most axial station (M3 near Fishers Island), having a summer average Secchi disk depth of 4.3 meters and a yearly average of 3.9 meters. Individual station data from 2019 are available in [Appendix B](#).

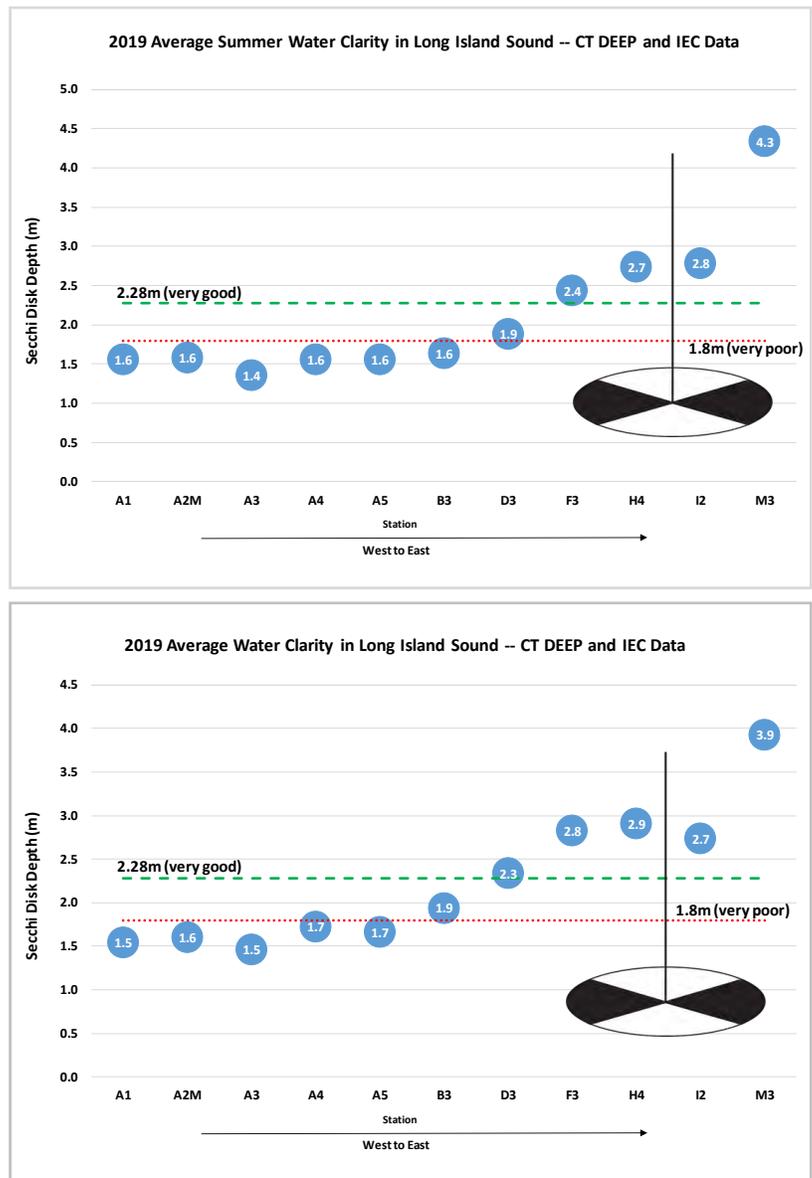


Figure 7. Average water clarity across Long Island Sound in 2019. a) Summer and b) Year-round

pH

In Long Island Sound, eutrophication can contribute to coastal acidification (Wallace et. al., 2014). Excess nutrients fuel algae and phytoplankton growth, and as the phytoplankton die and decay, carbon dioxide (CO₂) is released. This release has the same effect on pH as carbon dioxide from atmospheric deposition (NECAN undated; Appendix D, pg. D4). EPA guidelines for measuring changes in pH and carbonate chemistry in eastern coastal waters (Pimenta and Gear, 2018) indicate that two of four parameters are needed to describe the seawater carbonate system - pCO₂ (partial pressure of carbon dioxide), DIC (dissolved inorganic carbon), total alkalinity, and pH, along with temperature and salinity measurements. CT DEEP and IEC only collect one of the four needed parameters - pH. pH data from 2019 are available upon request.

In 2018, the LISICOS Western Sound buoy was equipped with near bottom pH (SeaBird Hydrocat) and pCO₂ (SunBurst) sensors. The sensors were installed at a depth of ~21 meters. The Central LIS Buoy is also equipped with near bottom pCO₂ and pH sensors. UCONN is still performing internal QA/QC on the data. However, preliminary data show prolonged periods of decreased pH and increased pCO₂ concentrations over the summer months. The sensors were taken out of service in early 2019 for reconditioning and recalibration by the manufacturer and will be reinstalled as soon as possible.

Researchers from UCONN began sampling in May 2019 for the [RESPIRE Project](#). Piggybacking on CT DEEP cruises, the study aims to quantify components of the respiration process by examining key parameters including organic matter degradation rates, nutrients, DO, pCO₂, pH, total alkalinity, and temperature. The project is expected to last two years.

Chlorophyll-a

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. In 2019, the spring bloom occurred in March. [Year-round](#) chlorophyll-a data collected by CT DEEP in 2019 show smaller blooms in May and September. IEC began collecting year round data in October 2018. The maximum chlorophyll a concentration measured at an axial station was 23.1 ug/L at Station A4 on March 5.

Western Sound data collected by IEC between March and September 2019 and CT DEEP data collected between January and September 2019 are available in [Appendix G](#). Data from additional stations and years are available upon request.



Nutrients

DEEP has collected monthly nutrient data from 17 stations year round since 1991. IEC began collecting bi-weekly nutrient data in the summer of 2014 at 11 of their 22 stations. Samples are analyzed for dissolved organic carbon (DOC), dissolved inorganic phosphorus (DIP), dissolved silica (SiO₂), and nitrate + nitrite (NO_x), particulate silica, particulate carbon, particulate nitrogen, ammonia, particulate phosphorus, orthophosphate, and total suspended solids. Data for these nutrient parameters from all 17 of DEEP's stations and 11 IEC stations are available upon request. The Western Sound LISICOS Buoy is equipped with near surface (~3 meters deep) SUNA v2 Nitrate and Cycle Phosphate sensors. The Execution Rocks and CLIS Buoys are also equipped with near surface SUNA Nitrate sensors.

Discussion

Weather

The Northeast Regional Climate Center (NRCC) at Cornell University is tasked with disseminating climate data and information for 12 states, including NY and CT. The summer of 2019 was relatively warm and dry (Figures 8 and 9). While average June temperatures were only slightly above the normals (e.g., 68.7°F in Bridgeport and 72.2°F at LaGuardia), the last 10 days of the month and the beginning of July saw a consistent increase in temperature. The trend continued, producing the all-time warmest month for Hartford, when 19 days in July recorded maximum temperatures above 90°F. The first half of August remained exceptionally hot, though the second half cooled considerably, resulting in an average monthly temperature about ~1°F above the normal. Both June and August were drier than usual. Precipitation in July, on the other hand, was significantly above normal (e.g., Bridgeport received 219% of its 3.46 in. normal), due to storm events.

Climate information is useful as physical processes influence the timing and duration of hypoxia. Bratton et. al. (2015), Wilson et. al., (2015), and O'Donnell et. al., (2008) note that the frequency of high pressure systems traveling north through LIS during the summer months impacts hypoxia, particularly that westerly winds increase stratification and easterly winds reduce stratification.

CCMP Goals

The Long Island Sound Study (LISS) updated the Comprehensive Conservation and Management Plan (CCMP) for LIS in 2015. One of the four [CCMP Goals](#) is to improve water quality by reducing contaminant and nutrient loads to the Sound. To achieve the goals, the LISS identified ecosystem targets and indicators related to **hypoxia, nitrogen loading, and water clarity**.

Hypoxia

- *The maximum area of hypoxia in the bottom waters of LIS (shall) measurably be reduced from pre-2000 TMDL averages to increase attainment of water quality standards for dissolved oxygen by 2035, as measured by the five-year running average size of the zone.*

Meeting the ecosystem target for maximum area of hypoxia is ahead of schedule. The LIS pre-2000 baseline for maximum area of hypoxia is 208 square miles. The 2015-2019 five-year running average is 89 square miles (Figure 3), a 57% reduction from the pre-TMDL baseline. However, further management action will need to be taken to achieve water quality standards and meet the CCMP goal. Considerable variability from year to year still occurs, influenced by weather patterns.

A better indicator of progress towards DO criteria attainment would be to examine representative stations for attainment of water quality standards with respect to the 3.0 mg/L threshold, as well as the 4.8 mg/L threshold. Additionally, LISS is considering examining the duration of DO in the 3.0 -4.8 mg/L tiers and the water column profiles at each station to better quantify deviations from water quality standards.

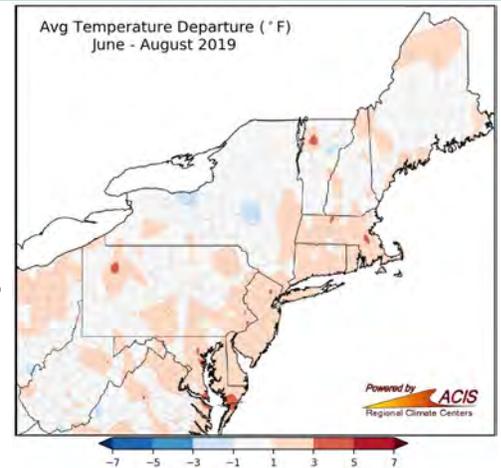


Figure 8. 2019 Northeast Average Summer Temperature Departure in °F. From NRCC.

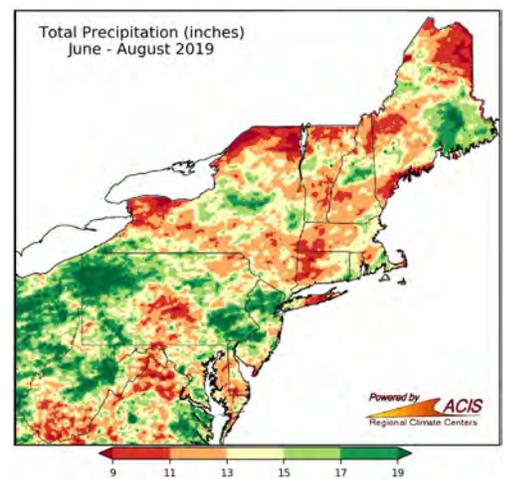


Figure 9. 2019 Northeast Total Summer Precipitation in Inches. From NRCC.

Nitrogen Loading

Another goal of the CCMP is to reduce to point source nitrogen loading from waste water treatment plants (WWTPs). The LIS 2000 Dissolved Oxygen TMDL specifies the primary pollutant contributing to hypoxia in LIS is nitrogen. The major sources of nitrogen to LIS are WWTPs, combined sewer overflows, nonpoint sources including stormwater, and atmospheric deposition.

The TMDL requires a 58.5% reduction in nitrogen entering LIS via point source discharges (i.e., WWTPs).

- *Attain wastewater treatment facility nitrogen loading at the recommended 2000 Dissolved Oxygen Total Maximum Daily Load allocation level by 2017 and maintain the loading cap. Have all practices and measures installed to attain the allocations for stormwater and nonpoint source inputs from the entire watershed by 2025.*

Figure 10 illustrates the reduction in hypoxic area as well as a downward trend in nitrogen discharges from both NY and CT WWTPs. Connecticut began requiring nitrogen reductions in WWTP discharges in 1998, the [CT Nitrogen Trading program](#) began in 2002, and the New York nitrogen reductions began in 2010, all identified in Figure 10.

In 2019 the wetter than normal winter and spring decreased the efficiency of nitrogen removal of the treatment systems resulting in an increase in loads to LIS; precipitation in Connecticut was 4.33 inches above the normal annual average while New York was 5.58 inches above normal. In CT, the combined waste water treatment plant (WWTP) discharge to LIS was 8,848 equalized pounds/day (lbs/day) of nitrogen, slightly below the TMDL target of 9,507 lbs/day. NY WWTP's discharged 13,364 TE lbs/day of nitrogen to LIS in 2019, which is slightly above their TMDL target of 13,228 lbs/day. However, the total combined 2019 loading to LIS was still well below the early 1990s baseline, and over 500 lbs/day below the TMDL target of 22,774 TE bs/day.

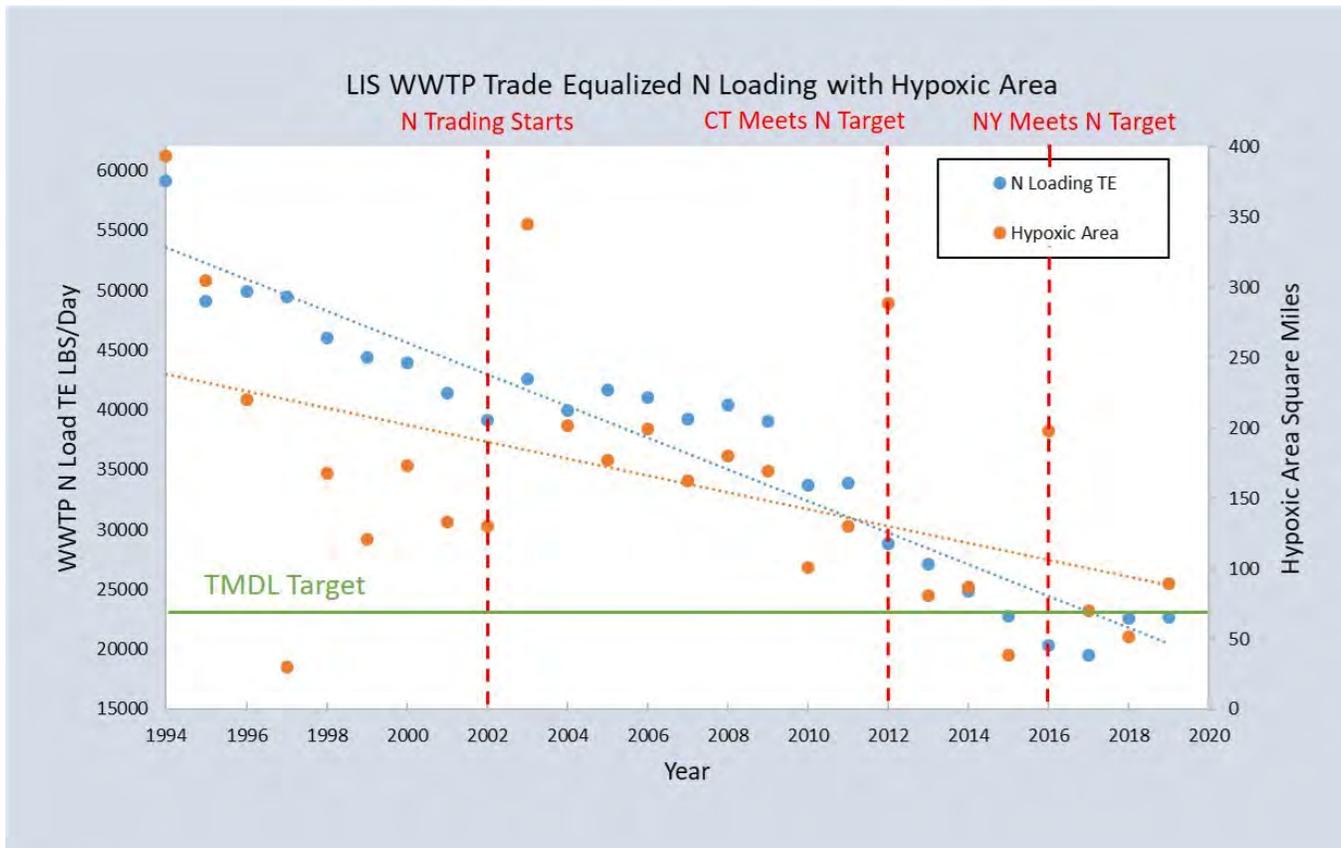


Figure 10. Graph of WWTP Nitrogen Discharge versus Hypoxic Area

Water Clarity

- Improve water clarity by 2035 to support healthy eelgrass communities and attainment of the eelgrass extent target.

The CCMP targets 2015 annual Secchi disk depth data as the baseline against which improvements are measured. Threshold values developed as part of the [Long Island Sound Report Card](#) are used to track progress. Annual average Secchi disk depths greater than 2.28 meters are considered very good while depths less than 1.8 meters are considered very poor.

Eelgrass in Long Island Sound is currently limited to embayments in the far eastern Sound, having disappeared from most of its historic range. Most of the eelgrass in Long Island Sound is found in <4 m of water, except where water quality is exceptionally good (i.e. seagrass beds near Fisher’s Island). IEC and CT DEEP do not monitor embayments under their LIS monitoring programs; therefore, open water data are currently used to evaluate this indicator until data collected from embayments by the Unified Water Study in 2018 and 2019 are quality checked and graded.

Generally, with the exception of stations in the Western Narrows, water clarity across LIS is good (Figure 7b and II). Water clarity in the Western Sound is especially impacted by suspended sediments, organic matter, and plankton in the water column.

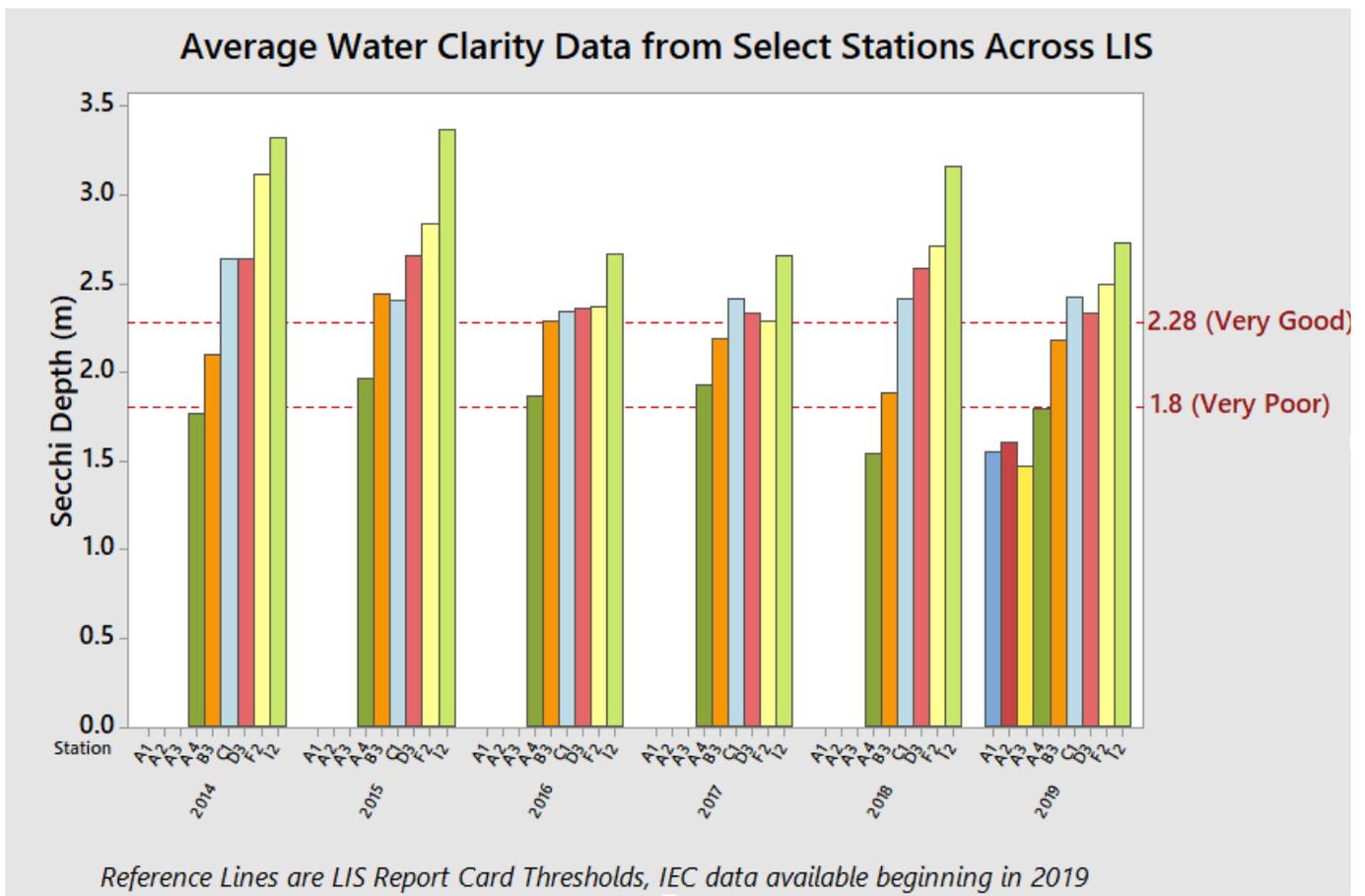
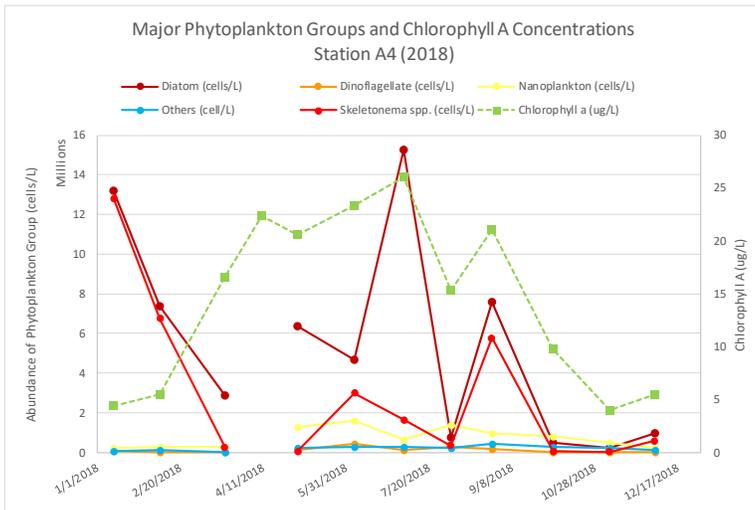


Figure II. Year round average water clarity data from select stations across Long Island Sound.

Phytoplankton and chlorophyll



CT DEEP collects and delivers phytoplankton and chlorophyll samples to researchers at UCONN for abundance analysis and species identification. The graphs below examine the relationship between surface chlorophyll a and phytoplankton abundance (cell counts) at Station A4 in the Western Narrows. In 2018, the most recent year phytoplankton data are available, diatoms were the dominant species (Figure 12). The long term trend in chlorophyll-a and cell counts is shown in Figure 13. Additional data analyses at multiple stations are needed to tease out relationships to hypoxia and water quality.

Figure 12. Comparison of Major Phytoplankton Groups and chlorophyll a concentrations at Station A4 during 2018.

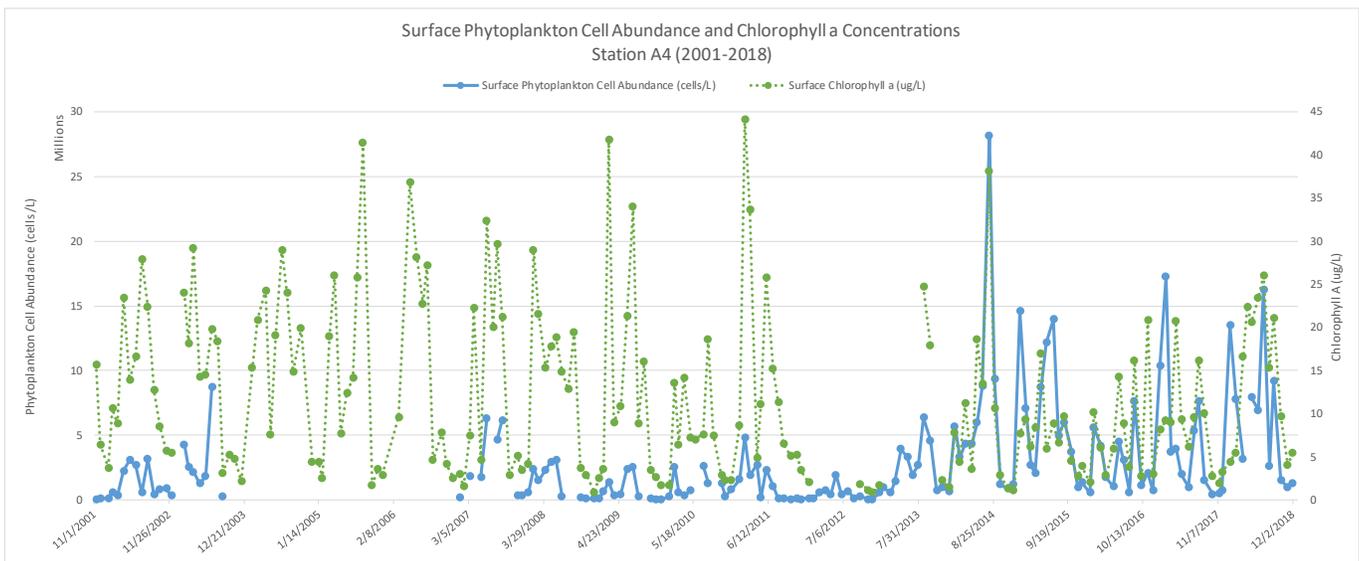


Figure 13. Time series (2001-2018) plot of surface chlorophyll a concentrations and phytoplankton cell abundance at Station A4, Western LIS.

Future Monitoring Plans

Carbonate Chemistry Parameters

In March 2018, EPA released guidelines for measuring changes in carbonate chemistry in eastern coastal waters (Grear and Pimenta 2018). Likewise, the National Oceanic and Atmospheric Administration (NOAA) published a list of considerations for managers to consider when developing acidification monitoring programs (Goldsmith et. al., in press). Two of four parameters are needed to describe the seawater carbonate system— $p\text{CO}_2$, dissolved Inorganic Carbon (DIC), total alkalinity (TA), and pH, along with temperature and salinity measurements. The CT DEEP and IEC monitoring programs only measure one of those parameters— pH. Two of the four LISICOS buoys are equipped with $p\text{CO}_2$ and pH sensors. New projects to examine productivity and carbonate chemistry across LIS (the RESPIRE Project, Vlahos 2018 and Shell Day 2019 , NECAN) highlight the need for the LISWQMP and IEC WSMP to collect sufficient data to effectively assess changes to the LIS carbonate system. Following the completion of the RESPIRE Project, the flow through TA analyzer utilized by UCONN will remain on the research vessel and CT DEEP will continue to collect TA measurements during LIS WQMP cruises.

Embayments

While LIS proper has been well sampled for decades, LIS embayments have not. This is beginning to change; the 2015 update of the CCMP recognized the importance of characterizing nutrient loading and hypoxia impacts within the embayments. The Unified Water Study, a citizen science based monitoring program administered by Save the Sound, began in 2017 and has successfully completed its third year of sampling. In late 2019, CTDEEP began a project to examine the benthic macroinvertebrate communities in embayments as a way to assess the biological community response to management actions, including nutrient reductions. In 2020, as part of an intensification of the [EPA National Coastal Condition Assessment](#) probabilistic sampling program, 60 sites in embayments across Connecticut and Long Island will be sampled to provide additional data for validating the Index of Biological Integrity developed as part of the aforementioned CT DEEP project. In 2018 and 2019, USGS and EPA Region 1 conducted monitoring in the [Pawcatuck Watershed](#) in support of model development to address nutrient loading and hypoxia. In 2020, USGS will conduct upland monitoring with an emphasis on the watersheds of embayments identified in the [CT Integrated Water Resource Management Plan](#) in support of a project to upgrade the existing statewide HSPF model.

East River

During the summer of 2020, researchers from UCONN will deploy an Acoustic Doppler Current Profiler (ADCP) in the East River, near Throgs Neck. The project, funded by CT Sea Grant, will gather data on the magnitude and timing of tides to inform managers on positive and negative impacts of flood protection strategies proposed across the East River. The project will also improve LIS models and potentially assist with refining volume transport rate estimates. Flux measurements at East River/Throgs Neck have been identified as necessary to constrain the LIS sound wide model. The addition of nutrient sensors at the location of the ADCP would allow for the calculation of nitrogen flux estimates. Funding for the nutrient sensors is being explored.

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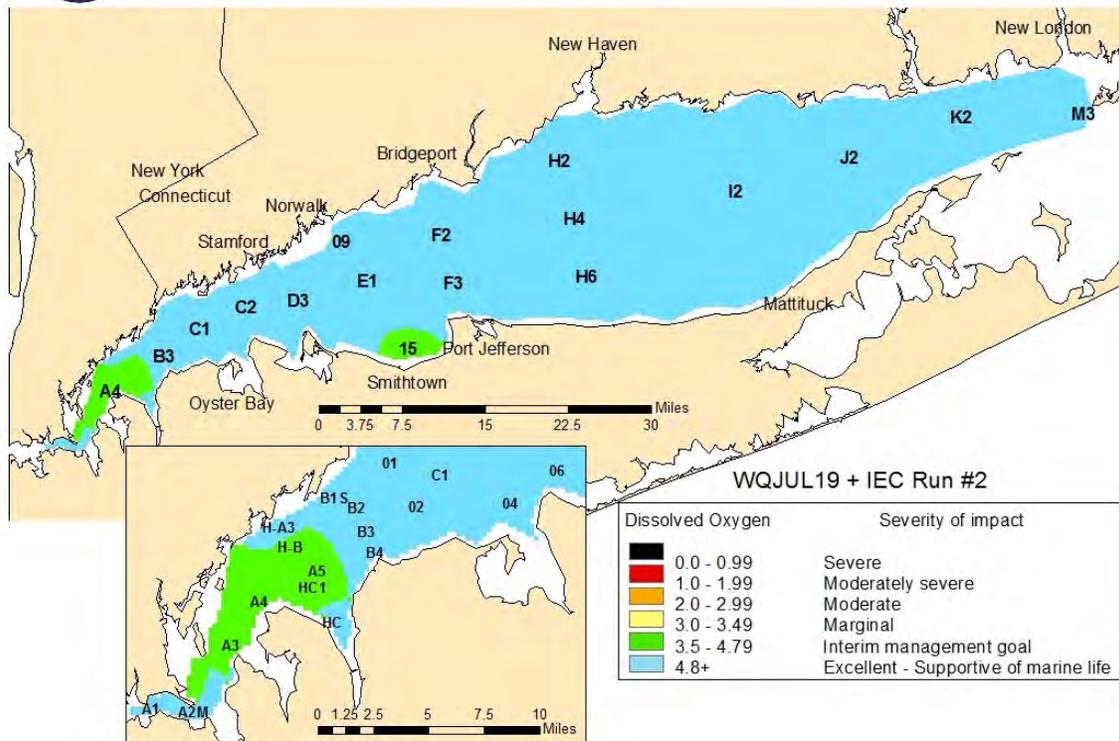
Appendix A – 2019 DEEP and IEC Summer Dissolved Oxygen, Temperature, and Salinity Data by Survey DEEP WQJUL19 and IEC Run #2

Select a station name to open a new window that contains profile data.



Dissolved Oxygen in Long Island Sound Bottom Waters

1 - 3 July 2019



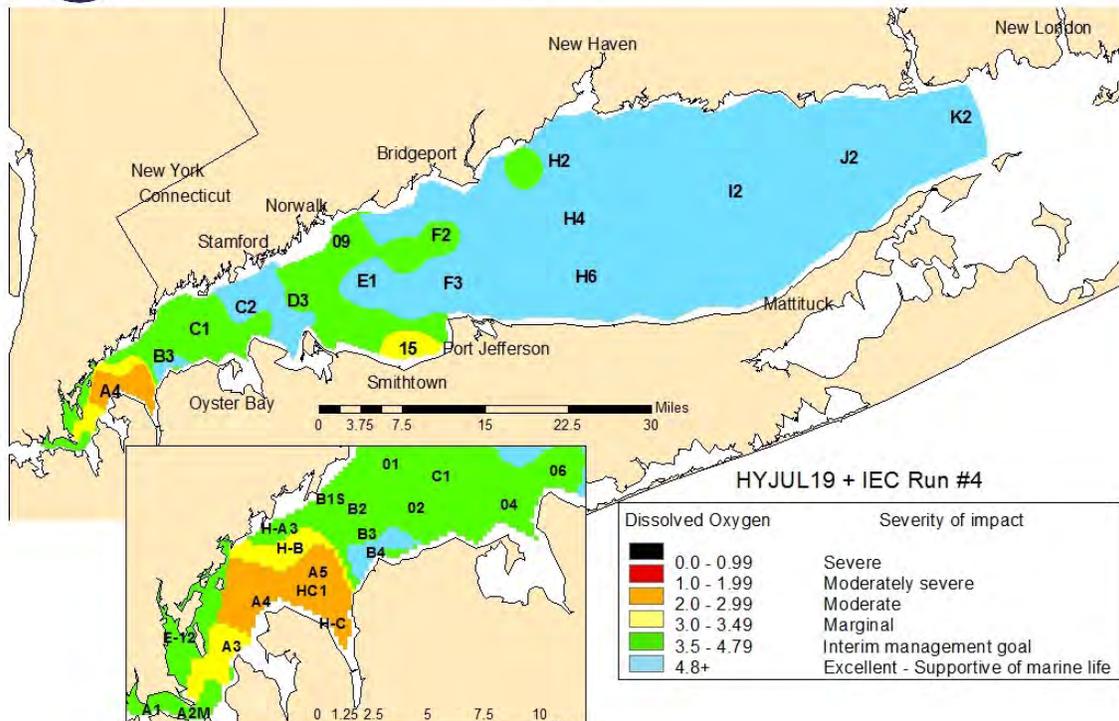
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| <u>A2M</u> | <u>H-C</u> | <u>C1</u> | <u>O7</u> |
| <u>A3</u> | <u>B1S</u> | <u>O3</u> | <u>O9</u> |
| <u>A4 (DEEP)</u> | <u>B2</u> | <u>O4</u> | <u>E1</u> |
| <u>A4 (IEC)</u> | <u>B3 (DEEP)</u> | <u>O5</u> | <u>O10</u> |
| <u>H-A3</u> | <u>B3M (IEC)</u> | <u>C2</u> | <u>15</u> |
| <u>H-B</u> | <u>B4</u> | <u>O6</u> | <u>14</u> |
| <u>A5</u> | <u>O1</u> | <u>O8</u> | <u>Excel file of all stations</u> |

Appendix B – 2019 DEEP and IEC Summer Dissolved Oxygen, Temperature, and Salinity Data by Survey DEEP HYJUL19 and IEC Run #4

Select a station name to open a new window that contains profile data.



Dissolved Oxygen in Long Island Sound Bottom Waters
15 - 17 July 2019



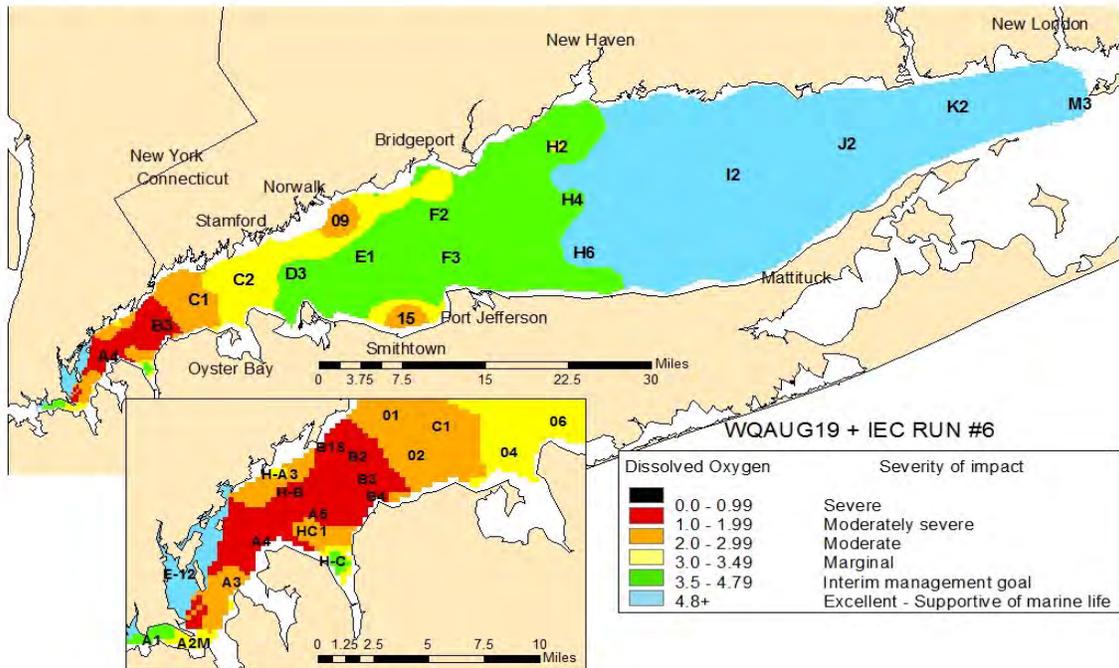
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| <u>A2M</u> | <u>H-C</u> | <u>C1</u> | <u>O7</u> |
| <u>A3</u> | <u>B1S</u> | <u>O3</u> | <u>O9</u> |
| <u>A4 (DEEP)</u> | <u>B2</u> | <u>O4</u> | <u>E1</u> |
| <u>A4 (IEC)</u> | <u>B3 (DEEP)</u> | <u>O5</u> | <u>O10</u> |
| <u>H-A3</u> | <u>B3M (IEC)</u> | <u>C2</u> | <u>O15</u> |
| <u>H-B</u> | <u>B4</u> | <u>O6</u> | <u>O14</u> |
| <u>A5</u> | <u>O1</u> | <u>O8</u> | <u>Excel file of all stations</u> |

Appendix C – 2019 DEEP and IEC Summer Dissolved Oxygen, Temperature, and Salinity Data by Survey DEEP WQAUG19 and IEC Run #6

Select a station name to open a new window that contains profile data.



Dissolved Oxygen in Long Island Sound Bottom Waters
29 July - 1 August 2019



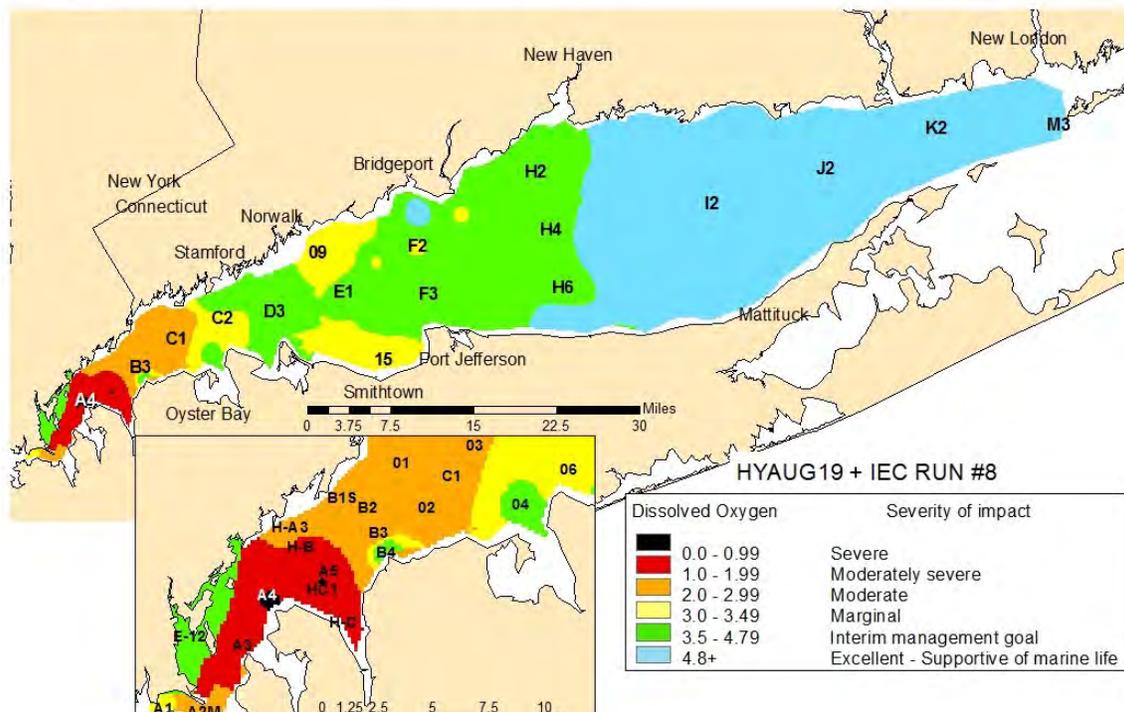
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| <u>A2M</u> | <u>H-C</u> | <u>C1</u> | <u>O7</u> |
| <u>A3</u> | <u>B1S</u> | <u>O3</u> | <u>O9</u> |
| <u>A4 (DEEP)</u> | <u>B2</u> | <u>O4</u> | <u>E1</u> |
| <u>A4 (IEC)</u> | <u>B3 (DEEP)</u> | <u>O5</u> | <u>I0</u> |
| <u>H-A3</u> | <u>B3M (IEC)</u> | <u>C2</u> | <u>I5</u> |
| <u>H-B</u> | <u>B4</u> | <u>O6</u> | <u>I4</u> |
| <u>A5</u> | <u>O1</u> | <u>O8</u> | <u>Excel file of all stations</u> |

Appendix D – 2019 DEEP and IEC Summer Dissolved Oxygen, Temperature, and Salinity Data by Survey DEEP HYAUG19 and IEC Run #8

Select a station name to open a new window that contains profile data.



Dissolved Oxygen in Long Island Sound Bottom Waters
12 - 14 August 2019



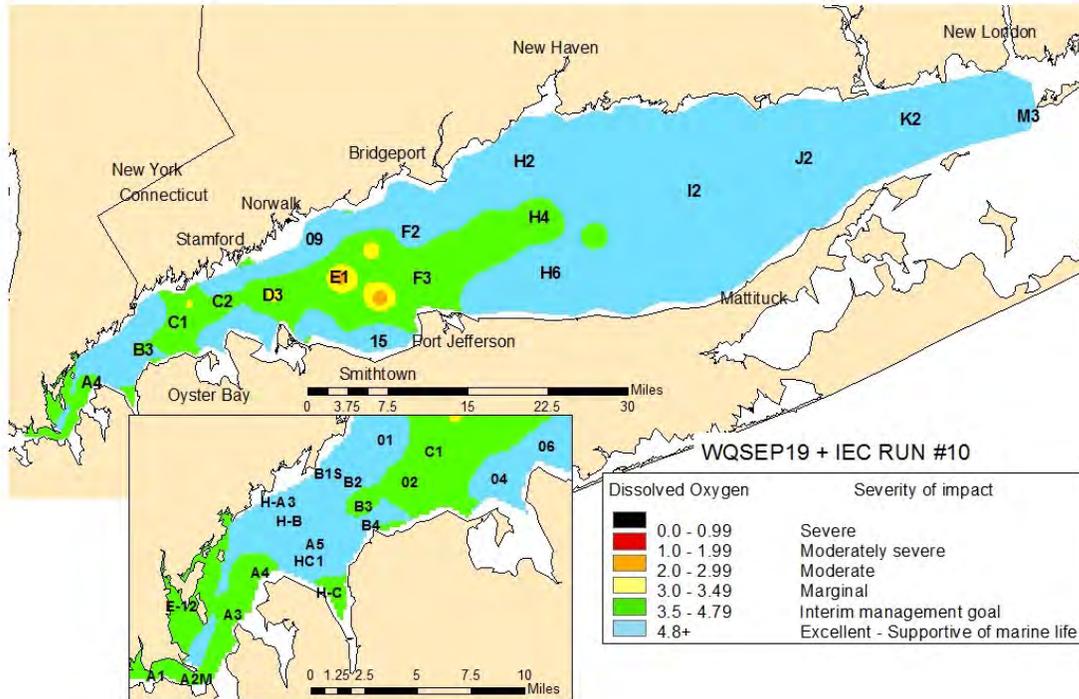
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| <u>A3</u> | <u>B1S</u> | <u>O3</u> | <u>O9</u> |
| <u>A4 (DEEP)</u> | <u>B2</u> | <u>O4</u> | <u>E1</u> |
| <u>A4 (IEC)</u> | <u>B3 (DEEP)</u> | <u>O5</u> | <u>O10</u> |
| <u>H-A3</u> | <u>B3M (IEC)</u> | <u>C2</u> | <u>O15</u> |
| <u>H-B</u> | <u>B4</u> | <u>O6</u> | <u>O14</u> |
| <u>A5</u> | <u>O1</u> | <u>O8</u> | <u>Excel file of all stations</u> |

Appendix E – 2019 DEEP and IEC Summer Dissolved Oxygen, Temperature, and Salinity Data by Survey DEEP WQSEP19 and IEC Run #10

Select a station name to open a new window that contains profile data.



Dissolved Oxygen in Long Island Sound Bottom Waters
27 - 30 August and 3 September 2019



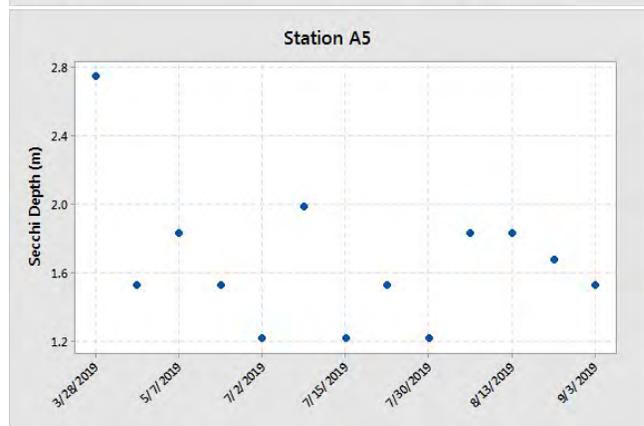
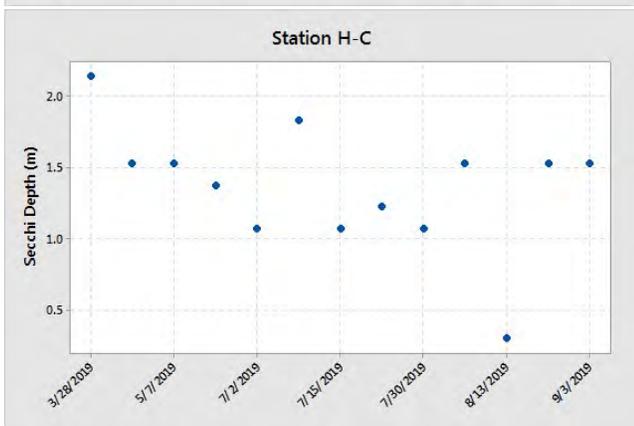
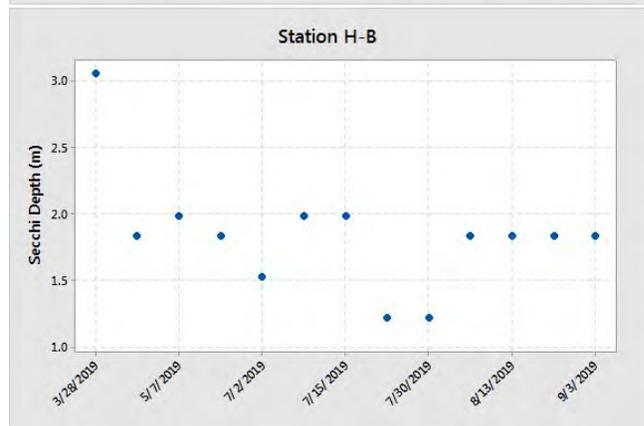
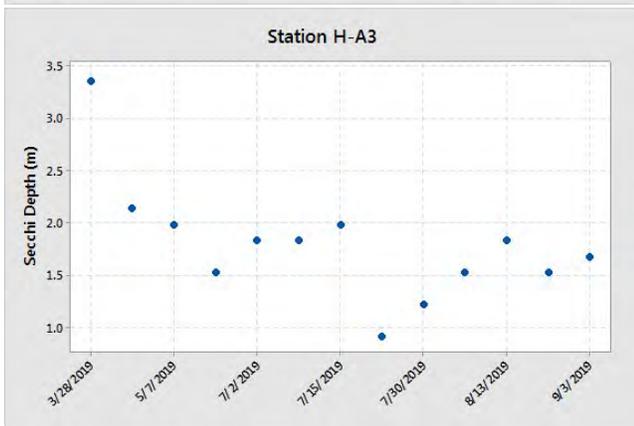
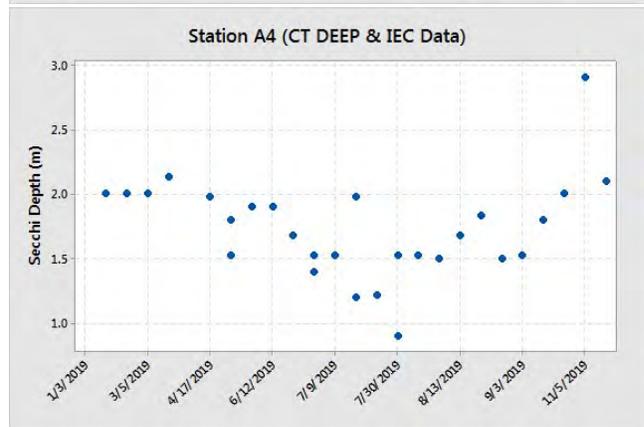
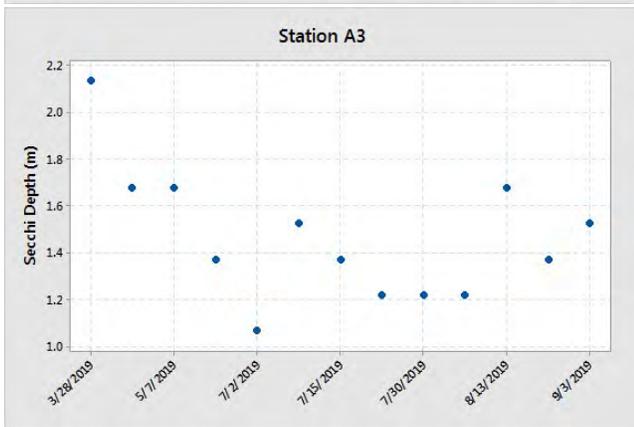
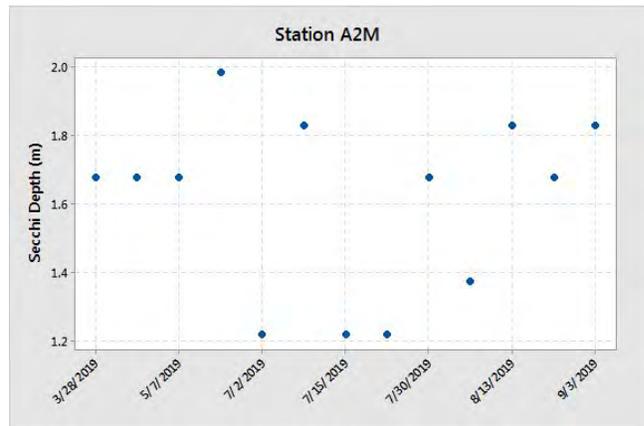
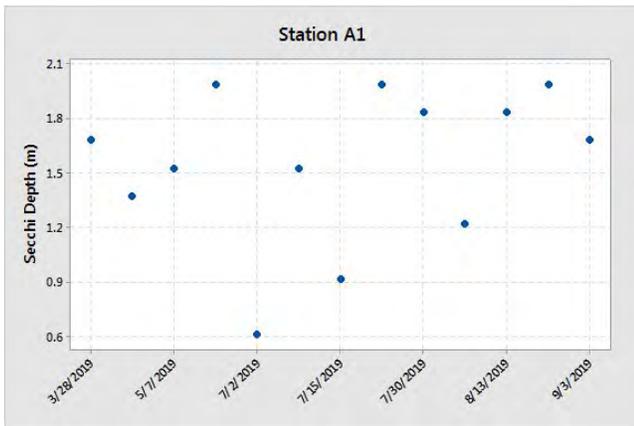
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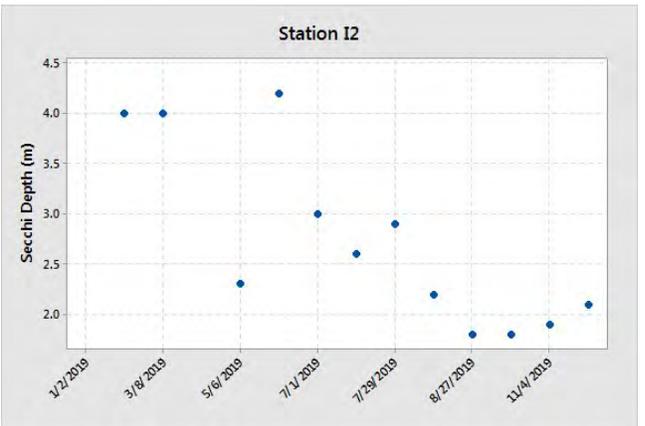
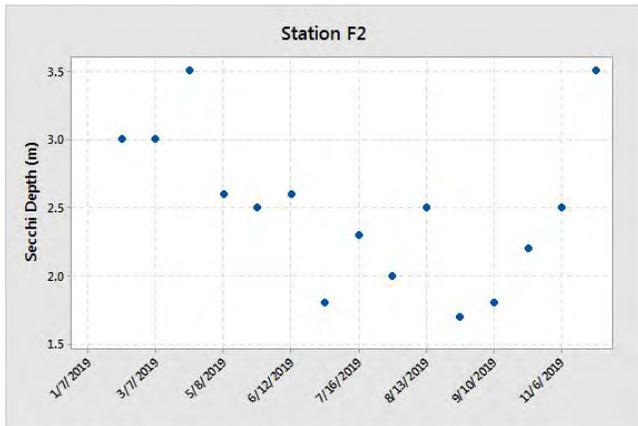
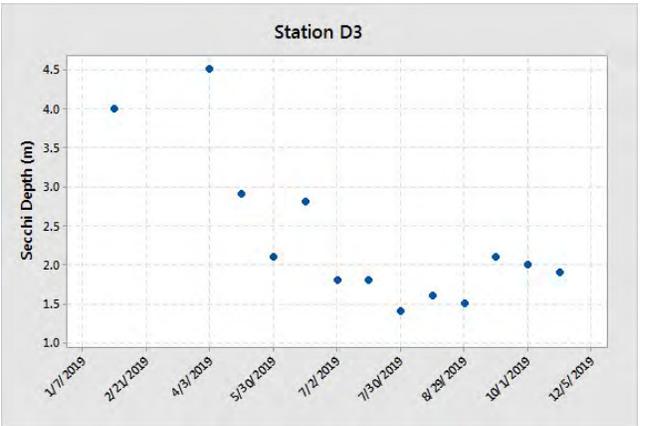
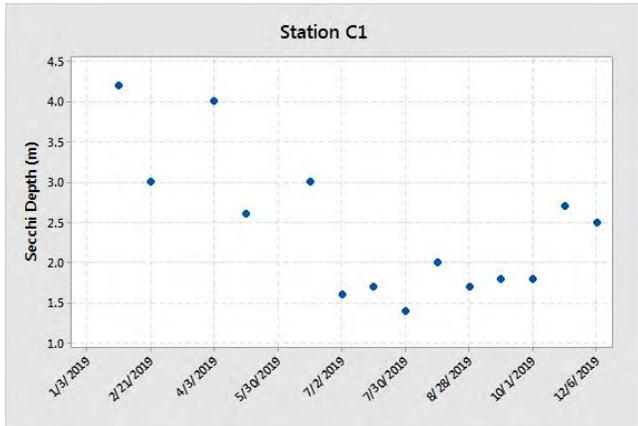
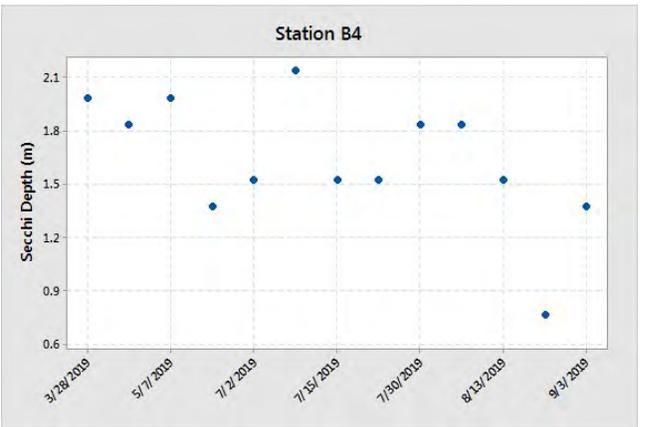
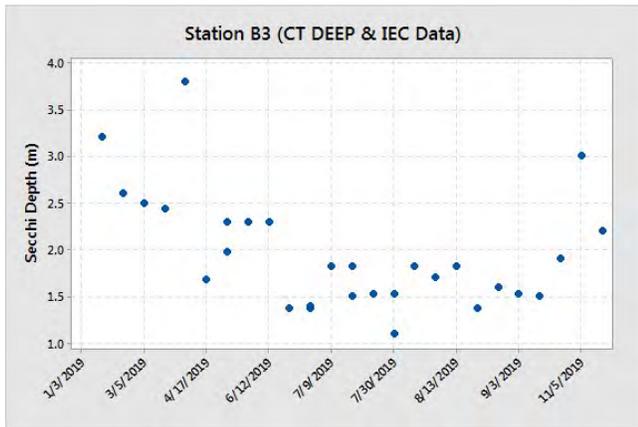
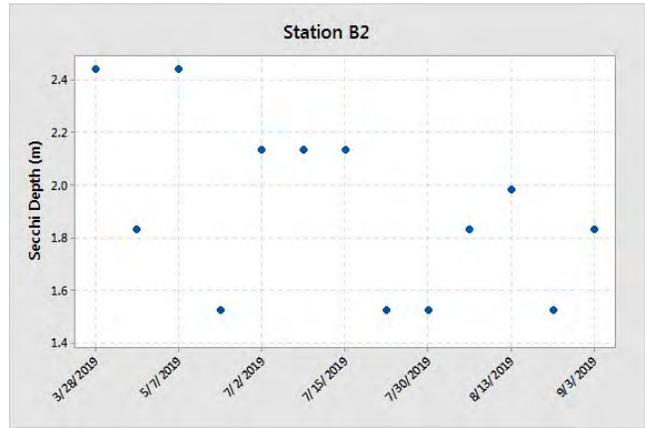
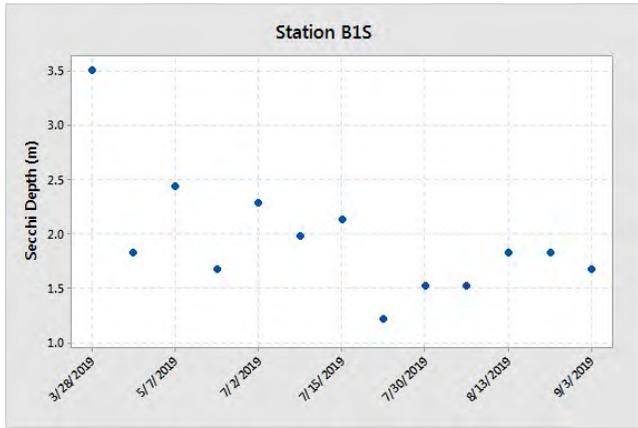
[Excel file of all stations](#)

Appendix F – 2019 Year-Round Water Clarity Data

Individual value plots showing each Secchi disk depth recorded by the IEC and CT DEEP in 2019.

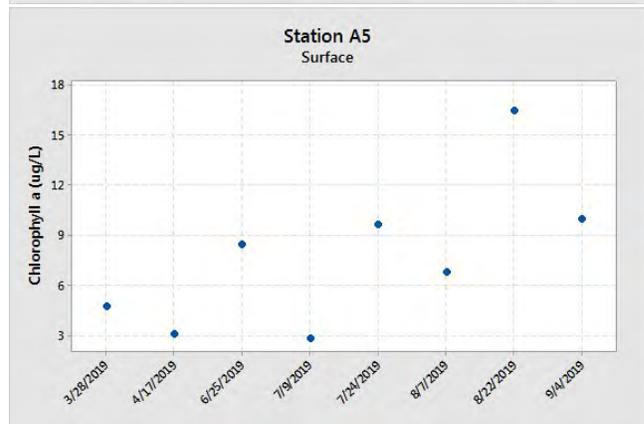
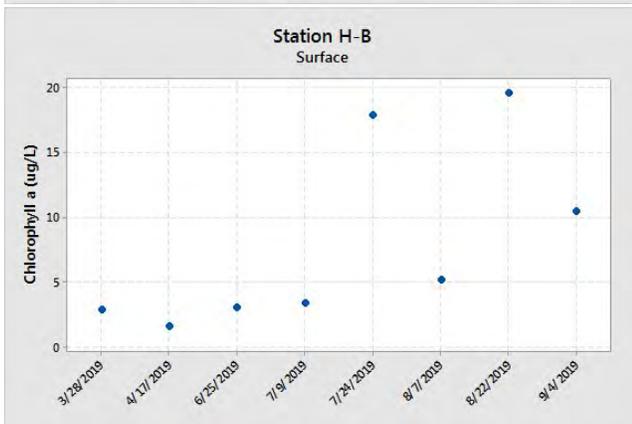
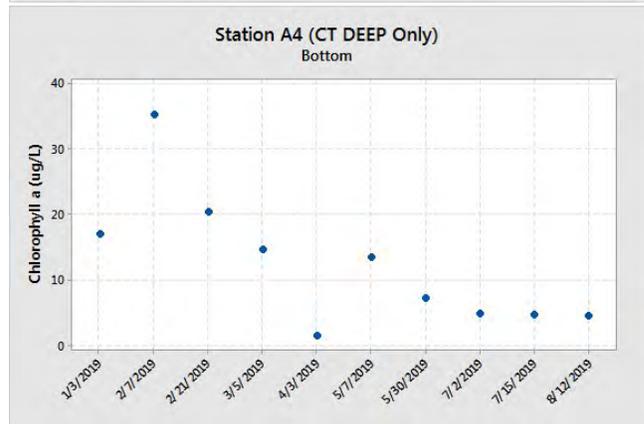
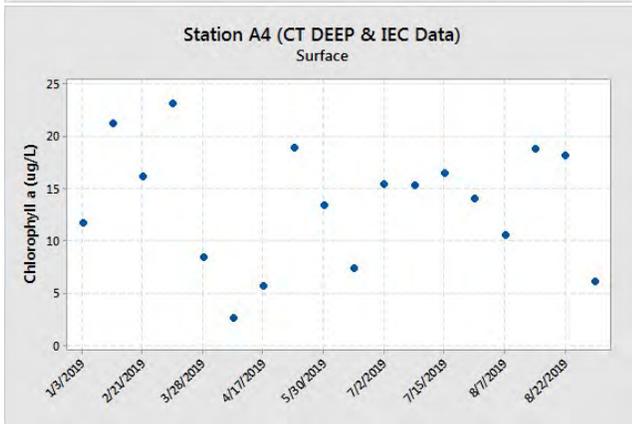
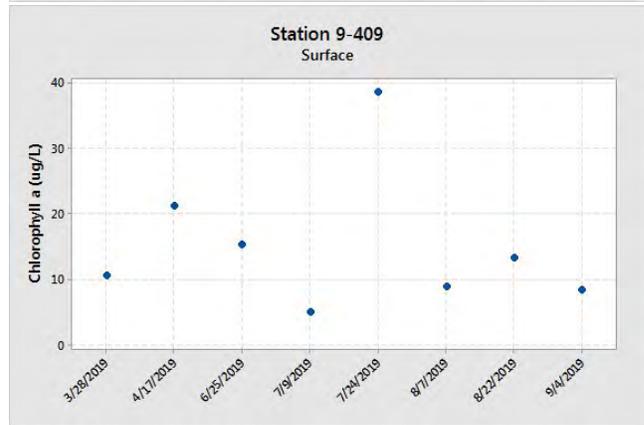
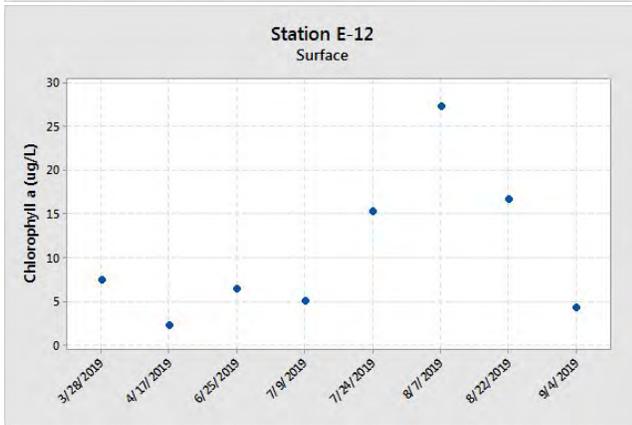
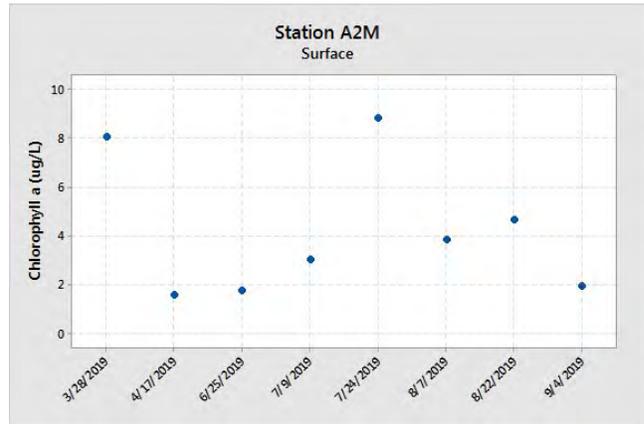
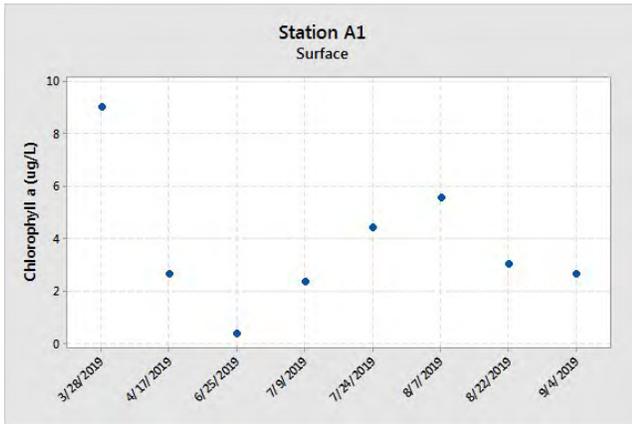
Additional stations are available upon request. See [Figure I](#) for station locations.

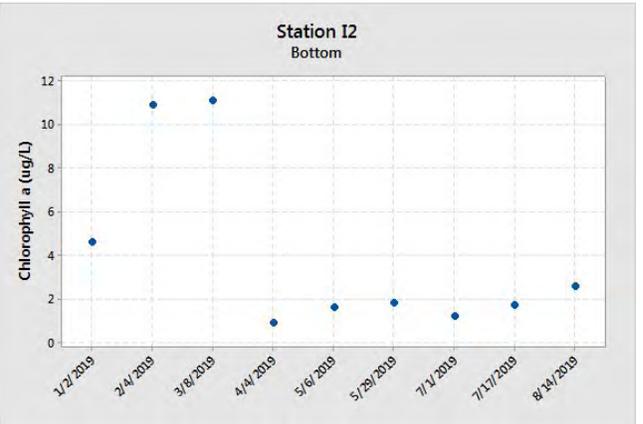
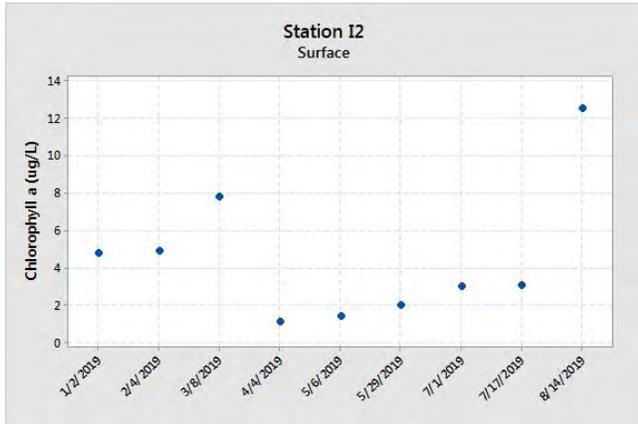
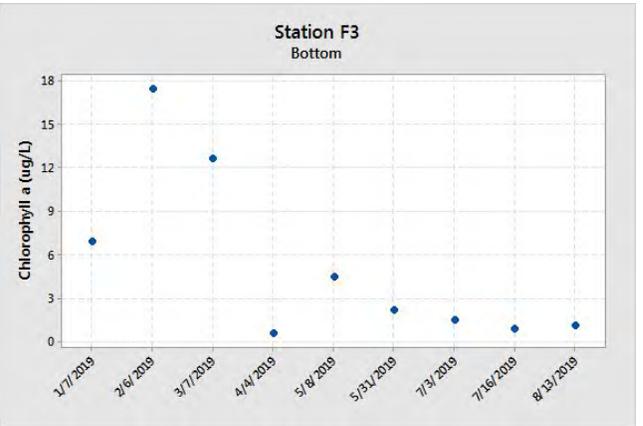
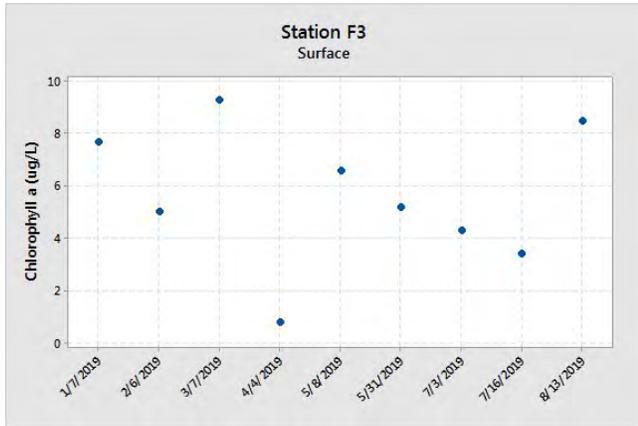
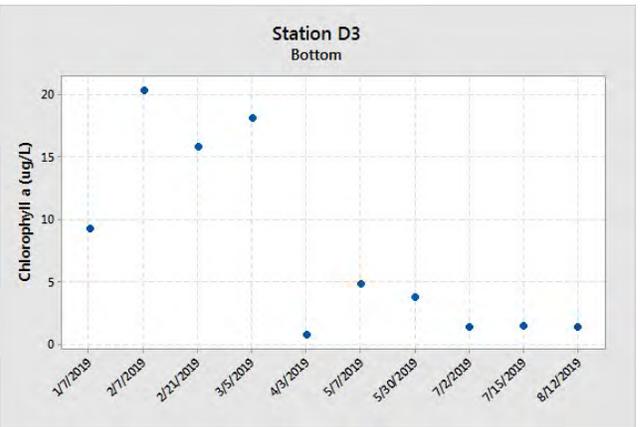
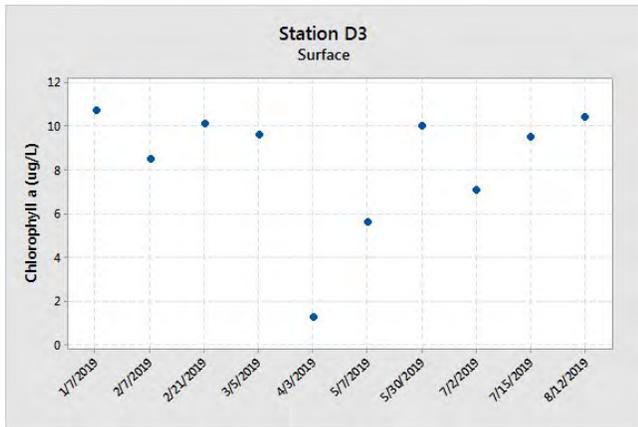
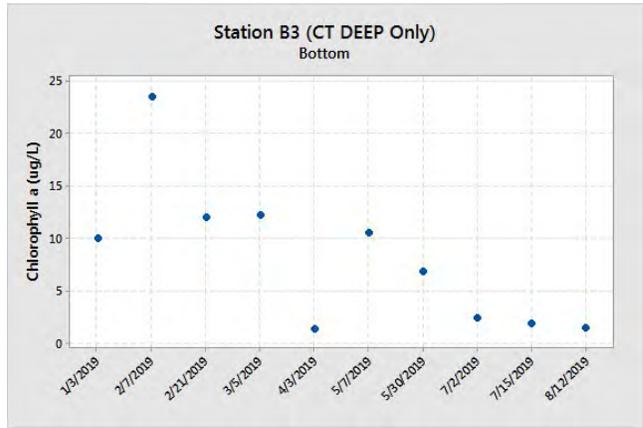
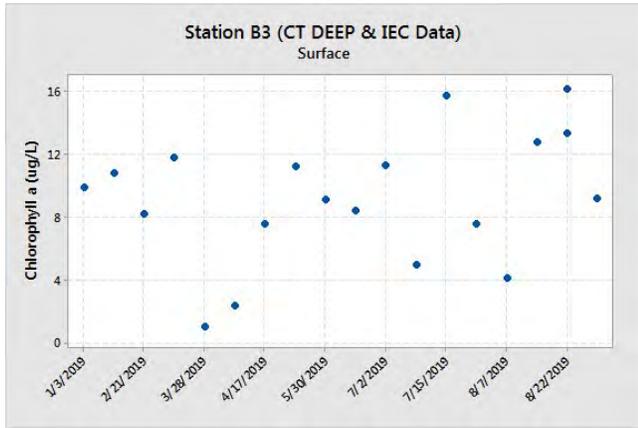




Appendix G – 2019 Year-Round Chlorophyll Data

Individual value plots showing each chlorophyll a concentration recorded by the IEC and CT DEEP. CT DEEP data collected between January and September 2019. IEC data collected between March and September 2019. Additional stations are available upon request. See [Figure 1](#) for station locations.





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