



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

Daniel C. Esty
Commissioner

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

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



Federal Aid in Sport Fish Restoration
F-54-R-31 Annual Performance Report
March 1, 2011 – February 29, 2012

Job 2.2: Estuarine Seine Survey



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
F-54-R-31
Annual Performance Report

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

Period Covered: March 1, 2011 - February 29, 2012

Job Title

Prepared by:

Job 1: Marine Angler Survey Part 1: Marine Recreational Fishery Statistics survey Part 2: Volunteer Angler Survey	Roderick E. MacLeod
Job 2: Marine Finfish Survey Part 1: Long Island Sound Trawl Survey Part 2: Estuarine Seine Survey	Kurt F. Gottschall Deborah J. Pacileo David R. Molnar
Job 3: Inshore Survey	Jacqueline M. Benway
Job 4: Studies in Conservation Engineering	Inactive
Job 5: Cooperative Interagency Resource Monitoring	Matthew J. Lyman Katie O'Brien-Clayton
Job 6: Public Outreach	David R. Molnar



Approved by:

David G. Simpson, Director
Marine Fisheries Division

Date: August 30, 2012

Cover: A wonderful moment with family enjoying a great catch of summer flounder (fluke).

PART 2: ESTUARINE SEINE SURVEY

TABLE OF CONTENTS

OBJECTIVES	2
METHODS	2
RESULTS	3
Relative Abundance of Juvenile Winter Flounder and Tautog.....	3
Presence of other Important Recreational Finfish	4
Relative Abundance of Forage Species	4
Relative Abundance of Invertebrate Species	5
MODIFICATIONS	5
LITERATURE CITED	5
Appendix 2.1: Finfish species taken in the Estuarine Seine Survey, 1988-2011.	19
Appendix 2.2: Invertebrate species taken in the Estuarine Seine Survey, 2011.....	19

LIST OF TABLES

Table 2.1: Geometric mean catch and percent occurrence of species commonly taken in seine samples, 1988-2011	6
Table 2.2: Mean catch of young-of-year winter flounder at eight sites sampled by seine, 1988-2011	8
Table 2.3: Total catch of all finfish and invertebrate species taken in seine samples, 1988-2011	10

LIST OF FIGURES

Figure 2.1: Sampling locations of the seine survey along the coast of Connecticut	14
Figure 2.2: Mean catch of all finfish taken in seine samples, 1988-2011	14
Figure 2.3: Mean catch of young-of-year winter flounder, 1988-2011	15
Figure 2.4: Mean catch and occurrence rate of tautog taken in seine samples, 1988-2011	15
Figure 2.5: Mean catch of forage fish at eight sites sampled by seine, 1988-2011.....	19
Figure 2.6: Total catch of forage fish at eight sites sampled by seine, 1988-2011.....	17
Figure 2.7: Total catch of juvenile black sea bass and scup, recreational important finfish at eight sites sampled by seine, 1988-2011	17
Figure 2.8: Total catch of juvenile striped bass, summer flounder and weakfish, recreational important finfish at eight sites sampled by seine, 1988-2011.....	18
Figure 2.9: Total catch of three species of juvenile flounder at eight sites sampled by seine, 1988-2011	18
Figure 2.10: Haul seining in 2011.....	20

JOB 2 PART 2: ESTUARINE SEINE SURVEY

OBJECTIVES

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

The 2011 annual index of recruitment for young-of-year winter flounder (1.1 fish/haul) ranked the third lowest (22nd) out of 24 annual indices.

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

Mean catch of all finfish (186 fish/haul) ranked sixth highest out of 24 annual indices and was above the series average of 145 fish/haul (Figure 2.2). Geometric means were calculated for 22 species commonly captured since the survey began in 1988 (Table 2.1).

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

An index of forage abundance was generated using the catch of four of the most common forage species caught: Atlantic silversides, striped killifish, mummichog, and sheepshead minnow. The index for 2011 (127 forage fish/haul) was the seventh highest of the 24-year series, and slightly above the time series average of 97 forage fish/haul.

METHODS

Eight sites (Figure 2.1) 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. Sites in Groton, Waterford, Old Lyme, Clinton, New Haven, Bridgeport and Greenwich have been sampled since 1988. The Milford site was added in 1990.

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

RESULTS

A total of 48 seine hauls were taken in 2011 at eight sites, yielding a total catch of 8,931 fish of 29 species and 5,787 invertebrates of ten species. Mean catch of all finfish (186 fish/tow) was the sixth highest in the time series (Figure 2.2). This catch is above the long-term mean of 145 fish/tow which can be attributed to above average catches of black sea bass, as well as mummichog, striped killifish, sheepshead minnow, smallmouth flounder, northern pipefish and grubby. Atlantic silversides were caught in average abundance. Geometric means were calculated for 22 species commonly captured since the survey began in 1988 (Table 2.1). The most frequently caught species was Atlantic silversides, which occurred in all samples, followed by striped killifish (98%), yoy winter flounder (63%), black sea bass (58%), northern pipefish (44%), grubby and mummichog (42%), smallmouth flounder (40%) and tautog (23%). This rank order has changed from the previous years, with a notable decrease in winter flounder (age 0 and age 1+), mummichog, sheepshead minnow and windowpane flounder occurrence rates along with an increase in black sea bass, northern pipefish, smallmouth flounder and grubby (sculpin) occurrence. Only eight of the 22 species monitored decreased in abundance in 2011, while fourteen other fish species increased and seven were unchanged. Tautog abundance and occurrence rate increased significantly in 1998-99, returned to the series average in 2005, 2010 and 2011 after a record year in 2007. Previous to 2005, tautog relative abundance had significantly increased to all-time abundance levels in 2002-04 (Figure 2.4). In 2011, three forage species increased slightly in abundance from the previous year (mummichog, sheepshead minnow and striped killifish). Forage fish species Atlantic silverside was slightly below the 24-year time-series average in 2011. Scup occurrence and abundance fell to the 24 year time series average in 2011. The abundance of cunner the other labridae species commonly seen in the survey fell again in 2011. None were captured for the fourth time in the 24 year time-series and have declined since 2007. Snapper bluefish occurred at the time series average in 2011 after a 2007 absence. Striped bass and weakfish were not observed in the survey in 2011. Weakfish young-of-year were absent and have only occurred in 2003. All other species occurred in less than 10% of all samples, with occurrence rates similar to previous years. One new species of finfish, a juvenile gizzard shad (*Dorosoma cepedianum*) was captured in 2011, at the New Haven site. No juvenile summer flounder were captured in 2011. Summer flounder (juvenile) have occurred in 2006-08 and 2010 of the 24 year time series. Windowpane flounder re-occurred at low abundance in 2011 after being absent in 2009-10. Other notable catches: at the Waterford site; lined seahorses, striped burrfish, white perch, inshore lizardfish and Atlantic tomcod. The New Haven site saw striped burrfish, white mullet and gizzard shad. The Old Lyme (CT River) site saw abundant blue crabs, the re-occurrence of windowpane flounder, Atlantic tomcod and northern kingfish. The Groton site saw Atlantic tomcod, sheepshead minnow and 285 black sea bass. The Bridgeport and Greenwich sites (western Long Island Sound) saw snapper bluefish, white mullet and smallmouth flounder in 2011.

Relative Abundance of Juvenile Winter Flounder and Tautog

The 2011 index of YOY winter flounder (1.1 fish/haul) ranked third lowest out of the 24 annual indices (Table 2.2, Figure 2.3 and 2.7). Overall, the time series indicates that relatively strong year classes were only produced many years ago in 1988, 1992, 1994, and 1996 (Figure 2.3).

The 2011 index of YOY tautog (0.3 fish/haul) was the second lowest ranking (tie) out of 24 annual indices (Table 2.1, Figure 2.4), well below the series average of 0.7 tautog / haul. Overall, the time series indicates an increasing trend in abundance of young-of-year tautog from 1988 to 2008, with good year classes produced in 1998-99, 2002-04 and 2007-08, even though the 2006 and 2009-11 mean was below the long-term average. ($P \leq 0.03$, $t=2.3$, $df=23$), (Table 2.1, Figure 2.4).

Presence of Other Important Recreational Finfish

YOY scup is another recent addition to the seine survey, first occurring in 1999, with the highest relative abundance in the last nine years of the time series, a reflection of strong recruitment and survival in recent years (Table 2.3, Figure 2.7). Juvenile striped bass first occurred in the survey in 1999 with one individual captured. In 2003 six more YOY stripers were taken (Table 2.3, Figure 2.8). One large individual (369mm) was captured in 2008. YOY summer flounder have occurred in nine years (more recently) of the 23-year time series (1993, 1994, 1996, and 1998, 2006 - 2010). The 2010 summer flounder abundance was the third highest of the time series. No summer flounder were captured in 2011. YOY black sea bass first appeared in 1991 and every year since 1997, reaching their highest abundance in 2011, (Figure 2.7). Snapper bluefish have occurred in 18 out of 24 years of the time series, reaching peak abundance in 1999. Juvenile tautog have occurred every year in the seine survey except 1989. White perch appeared in record numbers in 2008 and only once prior (2005) were present in 2011. Atlantic tomcod, a threatened species re-appeared in 2008 and 2011, none were present in 2009 and 2010.

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 for piscivorous fish. An index of forage fish abundance was generated using the catch of four of the most common forage species caught: Atlantic silversides, striped killifish, mummichog, and sheepshead minnow (Figure 2.5, Figure 2.6). The index for 2011 was the seventh highest in the 24 year time series. Only one of the four forage fish species (Atlantic silverside) decreased in occurrence in 2011. Atlantic silverside abundance declined in 2011 from the fourth highest in 2010. Atlantic silversides were the most abundant, and the only species present at all sites in all samples (Table 2.1). There was a substantial increase in striped killifish, mummichog and sheepshead minnow abundance in 2011. An increase in these species' abundance in 2011 reversed a two-year decrease from 2009-2010. Striped killifish, increased in abundance

in 2011, to the highest in the long time-series. Mummichog abundance (3.1) was above the long-term average of 2.4 in 2011. Sheepshead minnow had a record abundance (3.35) in 2007 and decreased in 2008 through 2010. In 2011, the index of abundance of this forage fish (0.5) was substantially higher, ranking sixth in the time series. Striped killifish abundance and occurrence increased significantly and was above the series mean levels in 2011 (28.7 fish/tow, 98% occurrence). Collectively, killifish abundance has not been high in 2001-2004, 2006 and 2009. However, it was the only forage fish species to remain at high levels in 2008.

Forage fish abundance has generally been increasing since 1997 (Figure 2.5) after a period of lower abundance (decreasing trend) since 1991. In 2011, forage fish abundance rose above the series mean of 97 fish/haul, with a mean catch of 127 fish per haul (slight decline from 2010). Forage fish abundance is driven numerically by the occurrence of adult Atlantic silverside (Figure 2.6) and more recently striped killifish, mummichog and sheepshead minnow, the second and third most abundant forage species. Striped killifish are more suited to marine habitats, than other 'Fundulus' species captured in the estuarine seine survey. Striped killifish were captured at historically high numbers in 2011, suggesting excellent year class production and survival 2 –3 years ago, since the survey captures adults more effectively. Mummichog, the third most abundant forage fish (Table 2.3) in the survey, peaked in abundance in 2007. The lowest time series abundance occurred in 1997, mummichog appear to be stable with an above average catches since 1999. Sheepshead minnow the least abundant of the four forage fish species monitored has recently shown elevated abundances in 2002-04 and 2007-09, with a record year in 2007 (3.35 fish/tow) and above average catches in 2008 (1.2 fish/tow) followed by slight decreases in 2009 and 2010. In 2011, the sheepshead minnow catch rebounded and was slightly above average (0.5 fish/tow).

Relative Abundance of Invertebrate Species

A total of 5,787 invertebrates of ten species were captured in 2011 (Table 2.3), (Appendix 2.2). Seven crab species were present in the seine hauls, along with two shrimp species and one gastropod. Mud snail, sand shrimp, shore shrimp, green crab, and hermit crab were the most abundant, and only mud snails, shore shrimp, sand shrimp, and hermit crab had greater than 50% occurrence in 2011 (Table 2.3). Blue crab abundance continued to remain low in 2011 from an all-time high in 2009 (333 crabs). The Asian shore crab (Japanese crab) re-appeared in 2011 from being absent from 2008-10. Both sand and shore shrimp increased in abundance in 2011 from the previous year (Table 2.3). Mud snail abundance was at the time series average. Mud crabs dropped significantly in 2011 from an all-time high in 2010. Spider crab abundance was at a time-series high in 2011.

MODIFICATIONS

None.

LITERATURE CITED

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

Table 2.1: Geometric mean catch of species commonly taken in seine samples, 1988-2011. *See Appendix 3.1 for complete species names.*

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

Table 2.1: Geometric mean catch of species commonly taken in seine samples, 1988-2011. *See Appendix 3.1 for complete species names.*

Species	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
alewife	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
American sand lance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
American shad	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Atlantic menhaden	0.0	1.0	8.2	0.4	0.2	0.4	0.6	0.1	0.3	0.0	0.1
Atlantic silverside	36.1	80.1	113.6	85.1	81.3	37.7	74.9	57.5	66.8	96.9	66.5
Atlantic tomcod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
black sea bass	1.0	0.4	0.2	0.4	0.1	0.5	0.6	0.3	1.1	0.4	3.2
blueback herring	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
bluefish	0.1	0.0	0.2	0.2	0.1	0.2	0.0	0.0	0.3	0.0	0.2
cunner	0.2	0.3	0.2	0.5	0.3	0.1	0.5	0.1	0.2	0.1	0.0
fourspine stickleback	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
grubby	0.2	0.3	0.5	1.3	0.8	0.3	0.3	0.2	0.5	0.3	0.7
inshore lizardfish	1.2	0.0	0.0	0.0	0.0	1.9	0.2	0.3	0.2	0.1	0.2
mummichog	1.4	3.4	2.9	2.3	1.5	2.5	7.3	2.9	3.8	1.7	3.1
naked goby	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
northern kingfish	0.2	0.1	0.2	0.3	0.1	0.0	0.0	0.2	0.3	0.5	0.2
northern pipefish	1.4	0.5	0.3	0.7	0.5	0.6	0.8	0.7	1.9	0.6	1.1
northern puffer	0.2	0.7	0.7	0.7	0.5	0.4	1.2	0.2	0.3	0.4	0.4
rainbow smelt	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
scup	0.5	1.0	0.6	0.2	0.9	0.1	1.0	0.1	1.9	0.1	0.2
sheepshead minnow	0.2	0.6	0.7	0.5	0.2	0.2	3.3	1.2	0.5	0.3	0.5
smallmouth flounder	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.9
striped bass	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
striped killifish	7.5	14.5	14.9	12.9	19.4	7.1	21.2	21.7	12.3	15.9	28.7
striped searobin	0.4	0.3	0.7	0.5	0.2	0.1	0.3	0.3	0.8	0.2	0.1
summer flounder	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.0	0.1	0.0
tautog	0.6	1.5	1.1	1.4	0.7	0.4	2.4	1.0	0.4	0.4	0.3
weakfish	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
windowpane flounder	0.0	0.0	0.1	0.2	0.2	0.0	0.0	0.2	0.0	0.0	0.1
winter flounder	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.1	0.0	0.0	0.0
winter flounder YOY	1.3	3.1	8.1	11.0	5.6	0.9	4.7	2.0	0.8	1.0	1.1

Table 2.1 cont.: Percent occurrence of species commonly taken in seine samples, 1988-2011. See Appendix 3.1 for species names.

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

Table 2.1 cont.: Percent occurrence of species commonly taken in seine samples, 1988-2011. See Appendix 3.1 for species names.

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

Table 2.2: Mean catch of young-of-year winter flounder at eight sites sampled by seine, 1988-2011.

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

*record high for a site/year.

** record low for time-series

Table 2.3: Total catch 1988-2011.

<u>Species</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>	<u>1993</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>	<u>1997</u>	<u>1998</u>	<u>1999</u>	<u>2000</u>	<u>2001</u>
alewife							1							
American eel	1	3					1				5			
American sand lance					1		10							
American shad			1											
American shad (1+)		18									151			
Anchovy, spp (YOY)														
Atlantic menhaden	3	2	2	4	1,074	3	9	2		11	2,003	377	1,236	1
Atlantic needlefish														
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
Atlantic tomcod						3					1			
banded gunnel											2	3		
banded rudderfish														
bay anchovy								4	69		27			1
black sea bass				10			41	43			27	14	2	687
blue spotted coronet fish												1		
blueback herring		26	3	194	10		5	2			3	24	1	
bluecrab														
bluefish				15	2		1			1	9	142	3	8
boreal squid														
brown shrimp														
burrfish, striped												1		
butterfish								1						
channeled whelk														
common slipper shell														
crevalle jack	6													
cunner	15	27	2	5	19		42	24	63	1	23	142	26	15
flat claw hermit crab														
flying gurnard														
fourspine stickleback	33	76		183	11	21	1		3		24	3	1	7
gizzard shad														
green crab														
grey snapper			1											
grubby	111	3	2	7	61	6	38	19	21	28	17	55	15	73
hogchoker									2					

**Table 2.3: Total catch
1988-2011.**

<u>Species</u>	<u>2002</u>	<u>2003</u>	<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>Grand Total</u>
alewife	28	1									30
American eel											10
American sand lance									13		24
American shad											1
American shad (1+)											169
Anchovy, spp (YOY)							15				15
Atlantic menhaden	1,284	5,098	1,117	75	117	144	21	54	3	43	12,683
Atlantic needlefish							2				2
Atlantic silverside	5,730	13,278	5,122	5,089	3,267	5,087	3,245	4,156	7,063	4,657	130,704
Atlantic tomcod			1	3			1			8	17
banded gunnel			4	2	3	1	3			1	19
banded rudderfish									1		1
bay anchovy	11		1	12					1		126
black sea bass	63	27	110	15	82	109	33	304	86	489	2,142
blue spotted coronet fish											1
blueback herring	13	5				9			3		298
<i>bluecrab</i>			1	2	84	31	4	333	35	23	513
bluefish	2	17	23	8	30		7	53	1	26	348
<i>boreal squid</i>						1					1
<i>brown shrimp</i>					11						11
burrfish, striped										10	11
butterfish											1
<i>channeled whelk</i>									1		1
<i>common slipper shell</i>					13						13
crevalle jack									1		7
cunner	110	15	54	35	18	58	8	28	15	2	747
<i>flat claw hermit crab</i>			761	532	703	153	244	539	558	441	3,931
flying gurnard						1					1
fourspine stickleback			9		2			8		2	384
gizzard shad										4	4
<i>green crab</i>			234	266	341	147	644	176	308	228	2,344
grey snapper											1
grubby	33	95	143	76	31	32	16	51	25	55	1,013
hogchoker								1			3

Table 2.3: Total catch 1988-2011.

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

Table 2.3: Total catch 1988-2011.

<u>Species</u>	<u>2002</u>	<u>2003</u>	<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>Grand Total</u>
inshore lizardfish	2		3		169	18	26	22	10	16	469
<i>Japanese shore crab</i>			1		1	1				6	9
<i>Jonah crab</i>								2			2
<i>lady crab</i>			298	119	66	195	92	42	19	24	855
lined seahorse						2	7	2	1	2	21
little skate	1										2
<i>mole crab</i>			1	5							6
<i>moon jelly</i>									319		319
<i>mud crabs</i>			60	55	74	30	85	67	308	80	759
<i>mud snail</i>			948	2,071	4,478	3,569	3,810	3,128	2,699	2,683	23,386
mummichog	811	702	637	543	398	1,203	498	857	299	775	14,841
naked goby	2	2	2		13		2			2	35
<i>northern comb jelly</i>								346	36		382
northern kingfish	5	21	38	11	1	1	23	42	76	30	337
northern pipefish	87	25	72	92	82	75	156	307	49	248	2,791
northern puffer	79	101	75	93	34	241	19	41	51	28	1,056
northern searobin	24	5	4	13	2	10			1	9	116
northern sennet					1						1
northern star gazer											5
<i>oyster drill</i>					38						38
oyster toadfish		1	2	1	1	1	2	1			18
pumpkinseed			3								5
rainbow smelt			34								41
rainwater killifish	6	35	53	19	3						125
<i>rock crab</i>			2						1		3
rock gunnel			1				1				9
<i>sand shrimp</i>			278	373	1,027	525	2,625	762	902	1,507	7,999
scup	172	131	50	154	6	170	14	413	21	30	1,220
sheepshead minnow	402	276	205	28	104	1,439	304	203	82	219	5,009
<i>shore shrimp</i>			990	404	1,149	707	1,390	535	619	762	6,556
smallmouth flounder					1		14	21	5	114	248
smooth dogfish											1
<i>spider crab</i>			4	5	6	1	3	1	7	33	60
starfish spp.									1		1
striped anchovy								3			3
striped bass		6					1				8

Table 2.3: Total catch 1988-2011.

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

<u>Species</u>	<u>2002</u>	<u>2003</u>	<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>Grand Total</u>
striped killifish	1,698	3,410	1,548	1,470	1,063	1,994	1,874	1,508	1,300	1,964	31,265
striped searobin	33	62	38	19	6	32	36	82	14	4	859
summer flounder					16	8	8	1	6		49
tautog	153	140	145	64	93	321	131	25	33	27	1,991
threespine stickleback											11
weakfish		15									15
web burrfish					1				1		2
white mullet	1				7	7	11		75	68	182
white perch				3			11			6	20
windowpane flounder	1	5	15	15	3	2	17		2	4	392
winter flounder	3		9	11	7	6	13	2	2	2	450
winter flounder YOY	302	1,310	914	470	110	365	190	72	71	86	15,150
<u>yellow jack</u>									1		1
Grand Total	11,056	24,783	14,010	12,153	13,662	16,696	15,606	14,188	15,125	14,718	272,699

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

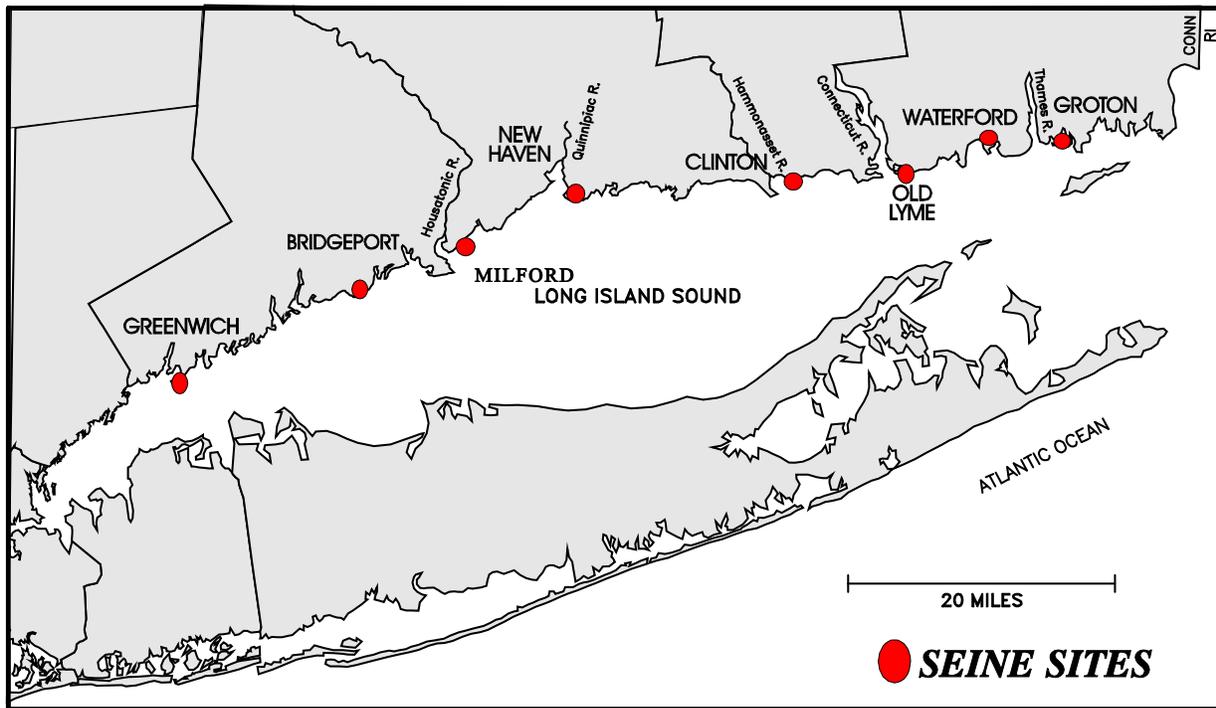


Figure 2.2: Mean catch (numbers) of all finfish taken in seine samples, 1988-2011. Mean catch per haul includes samples at all sites. Note that sampling at the Milford site began in 1990.

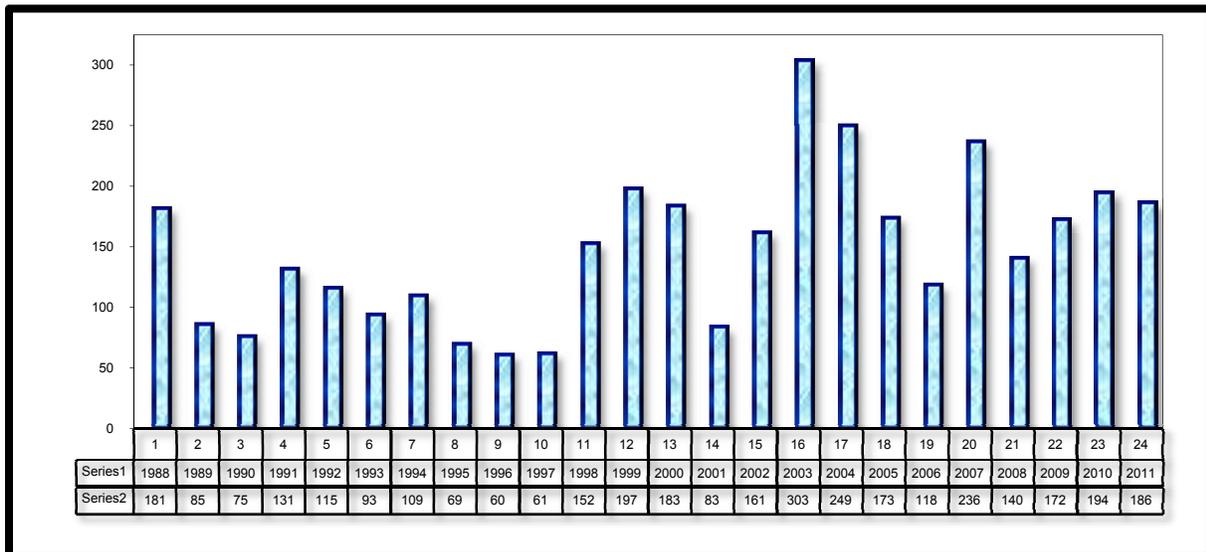


Figure 2.3: Mean catch of young-of-year winter flounder, 1988-2011. The trend line is shown as a horizontal line with an arrow. Note that all sites are included with sampling at the Milford site beginning in 1990.

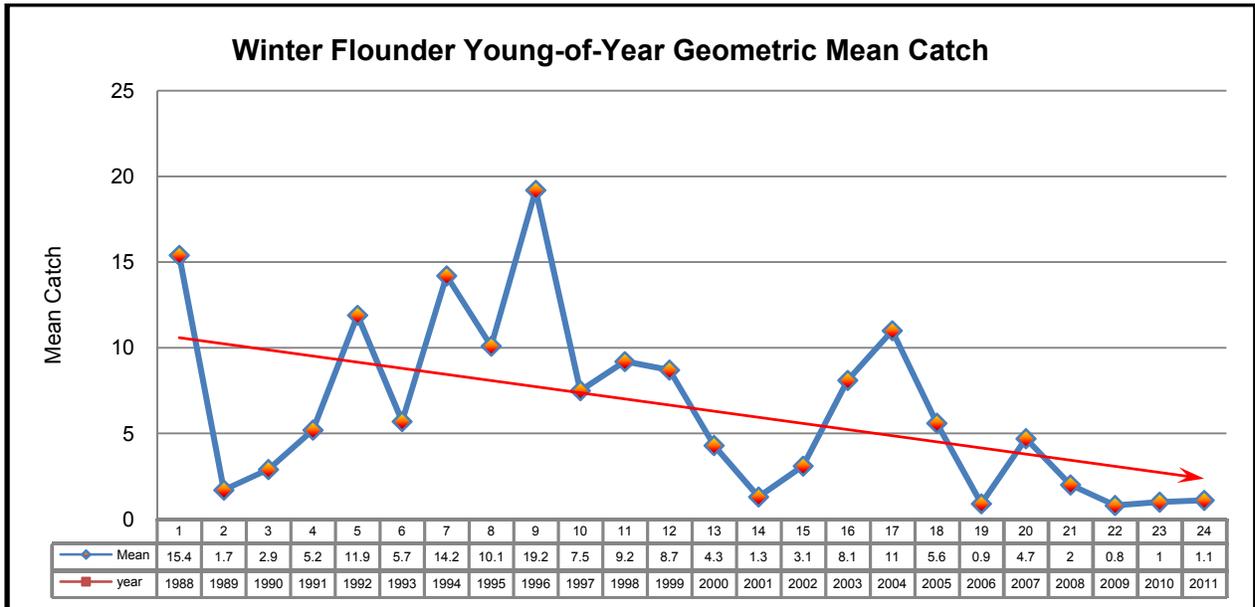


Figure 2.4: Mean catch of young-of-year tautog taken in seine samples, 1988-2011. Geometric mean catch per haul (numbers) and occurrence (percent) includes samples at all sites. The time series trend line is shown by the yellow line. Note that sampling at the Milford site began in 1990.

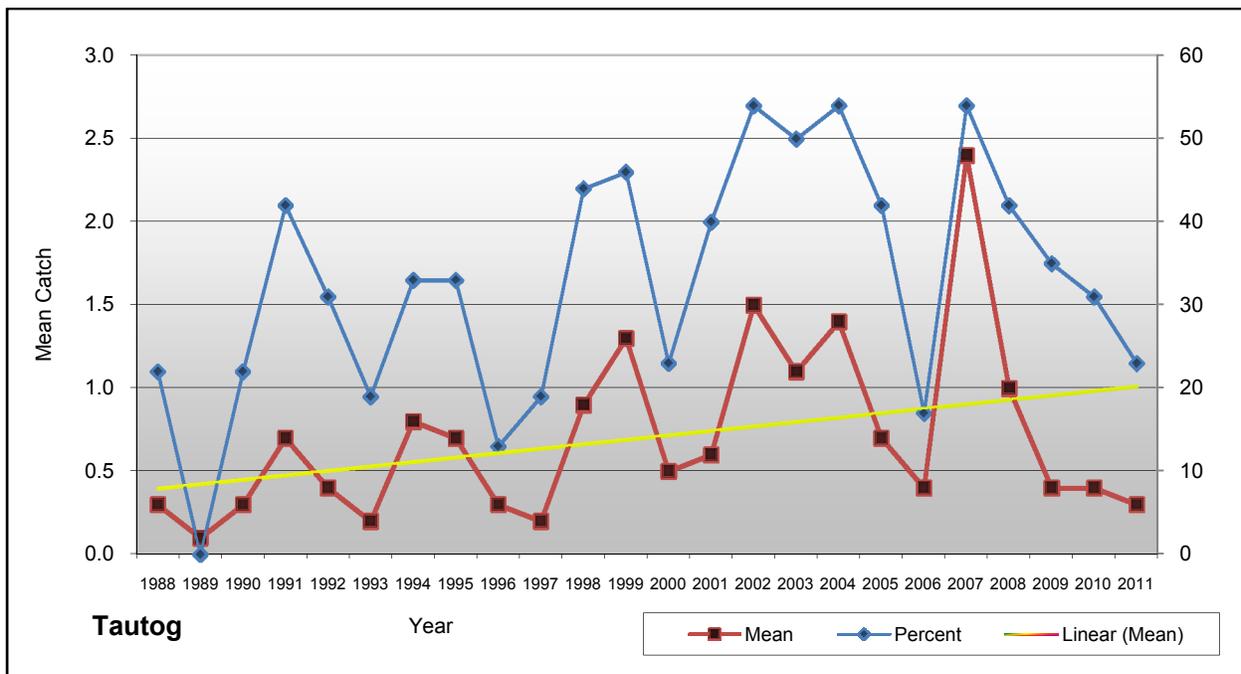


Figure 2.5: Mean catch of forage fish at eight sites sampled by seine, 1988-2011.
 Forage species include Atlantic silversides, mummichog, sheepshead minnow, and striped killifish.
 The 95% confidence interval (CI) for each mean is also listed. See Appendix 2.1 for complete species names.

MEAN CATCH PER STANDARD HAUL

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

YEAR	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
MEAN	146	52	125	206	130	122	59	150	100	106	137	127
95% CI	108-197	32-86	97-162	152-281	108-155	101-147	43-82	119-187	82-121	86-131	112-167	105-153

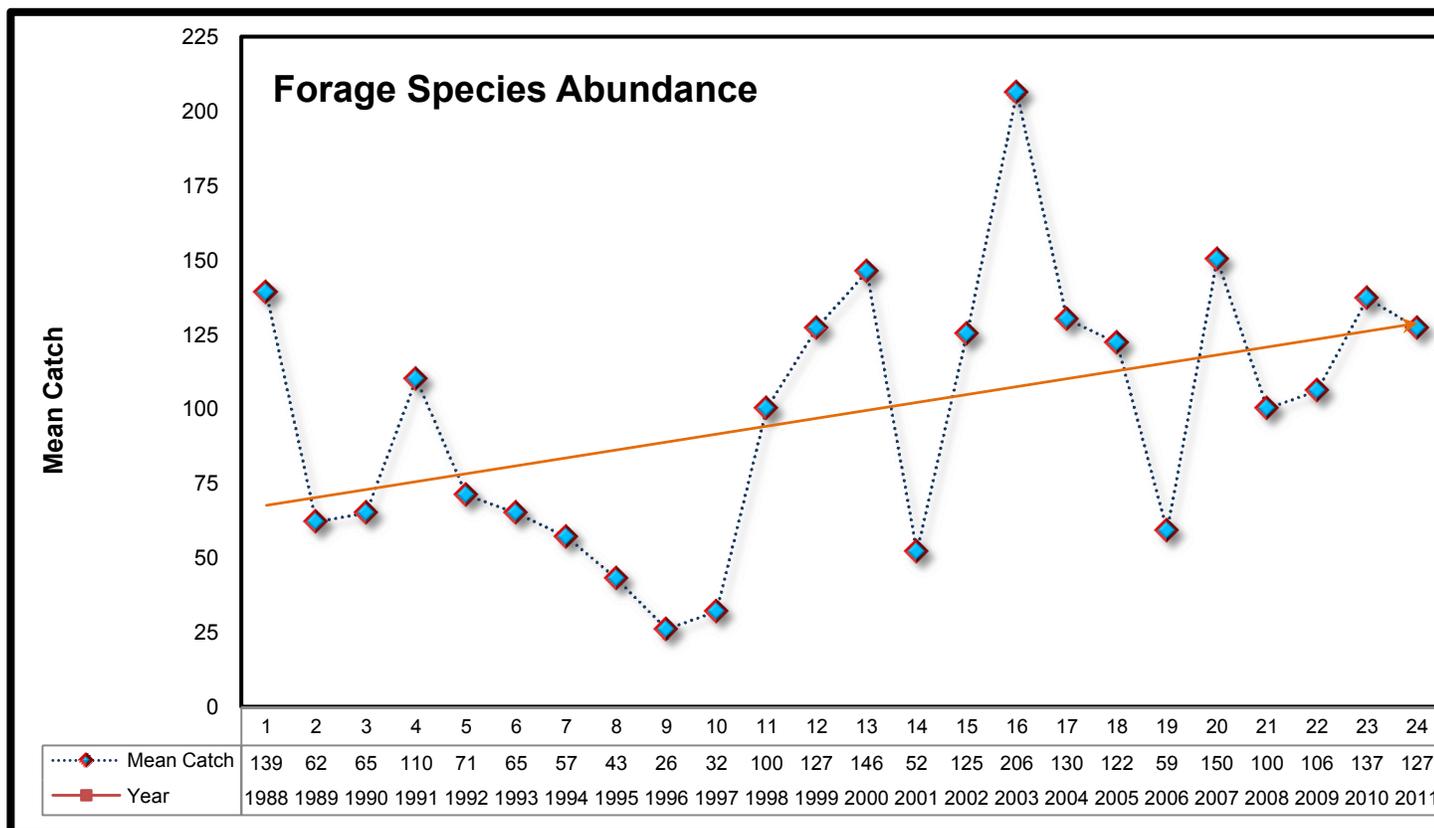


Figure 2.6: Total Catch of Four Species of Forage Fish, 1998-2011

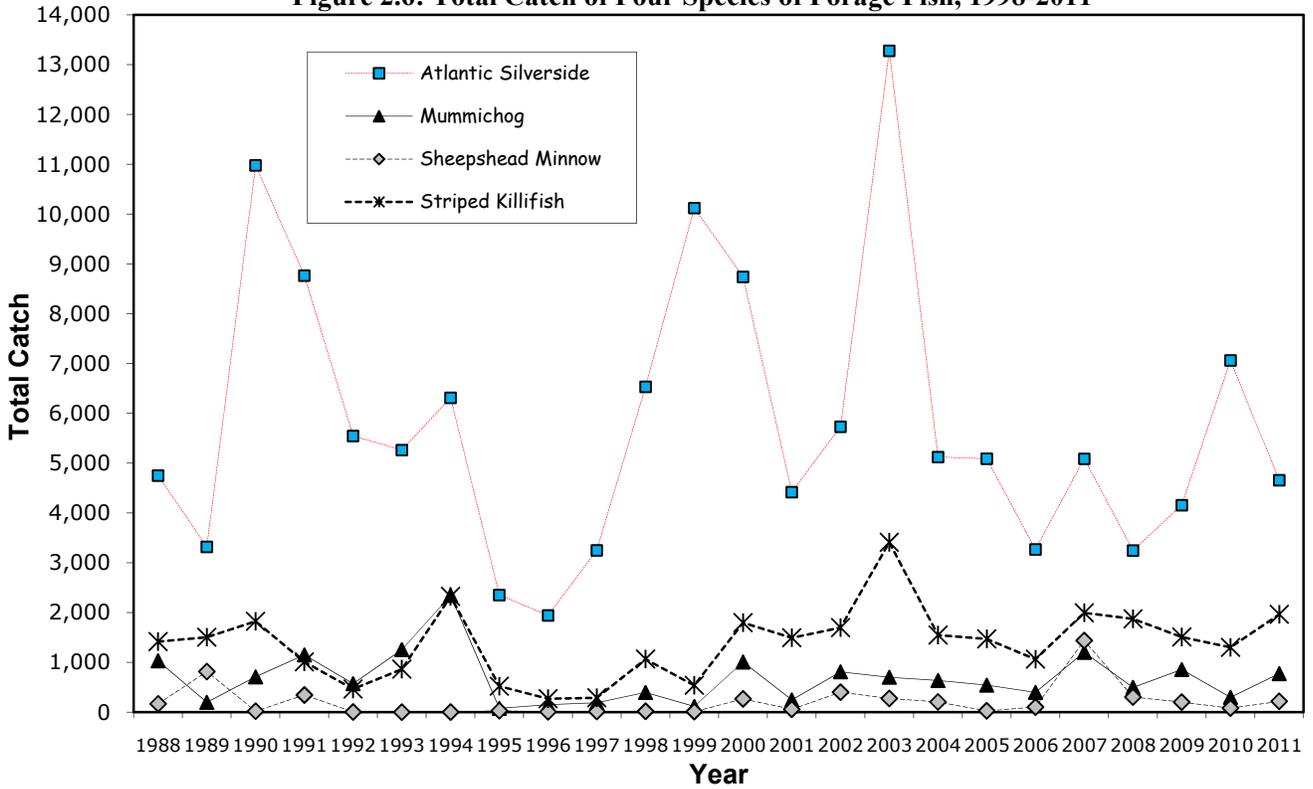


Figure 2.7: Total Catch of Juvenile Black Sea Bass and Scup, Recreational Important Finfish, 1988-2011

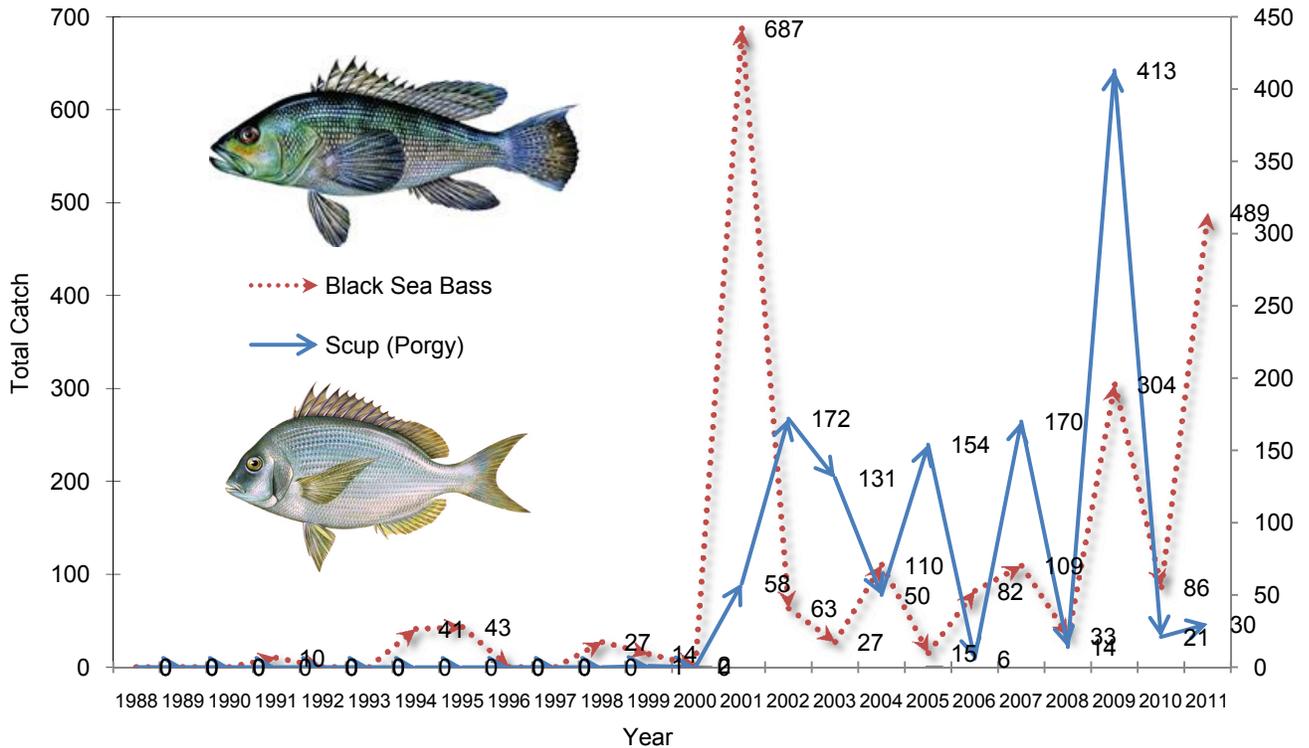


Figure 2.8: Total Catch of Juvenile Striped Bass, Summer Flounder and Weakfish, Recreational Important Finfish, 1988-2011

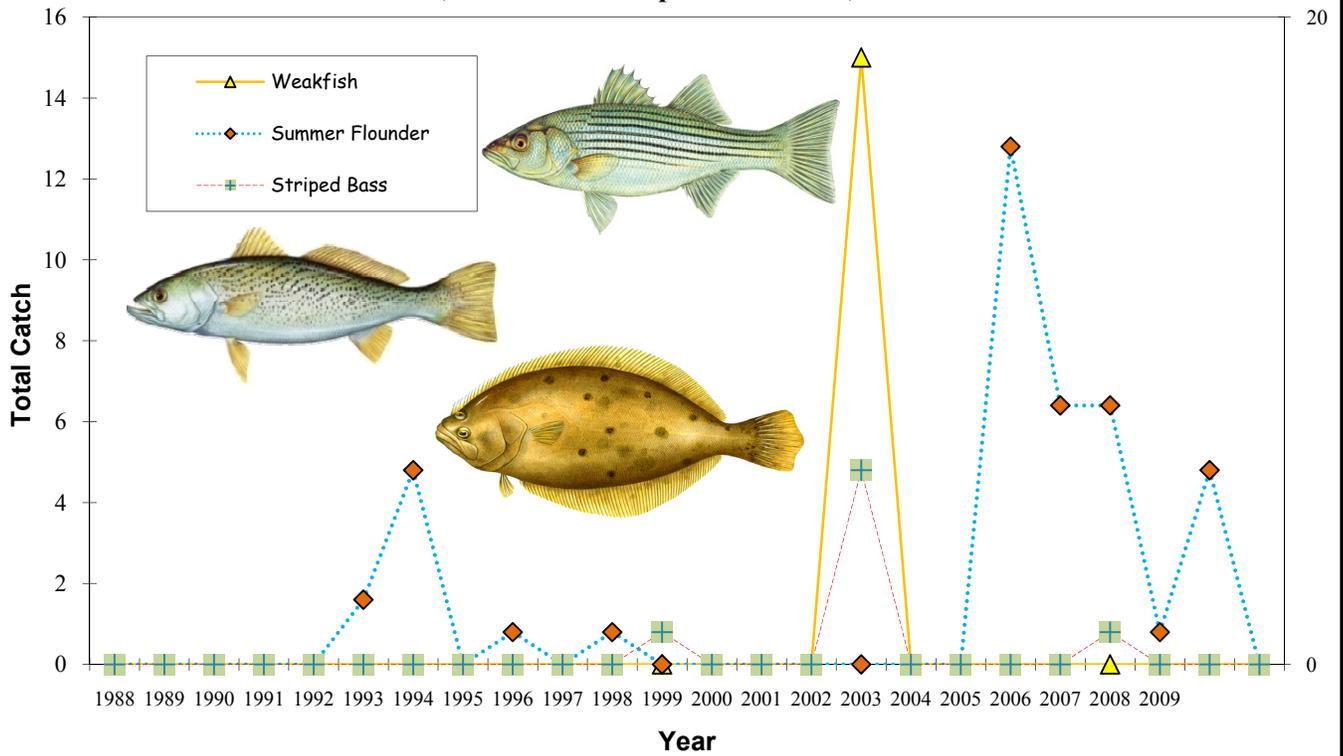
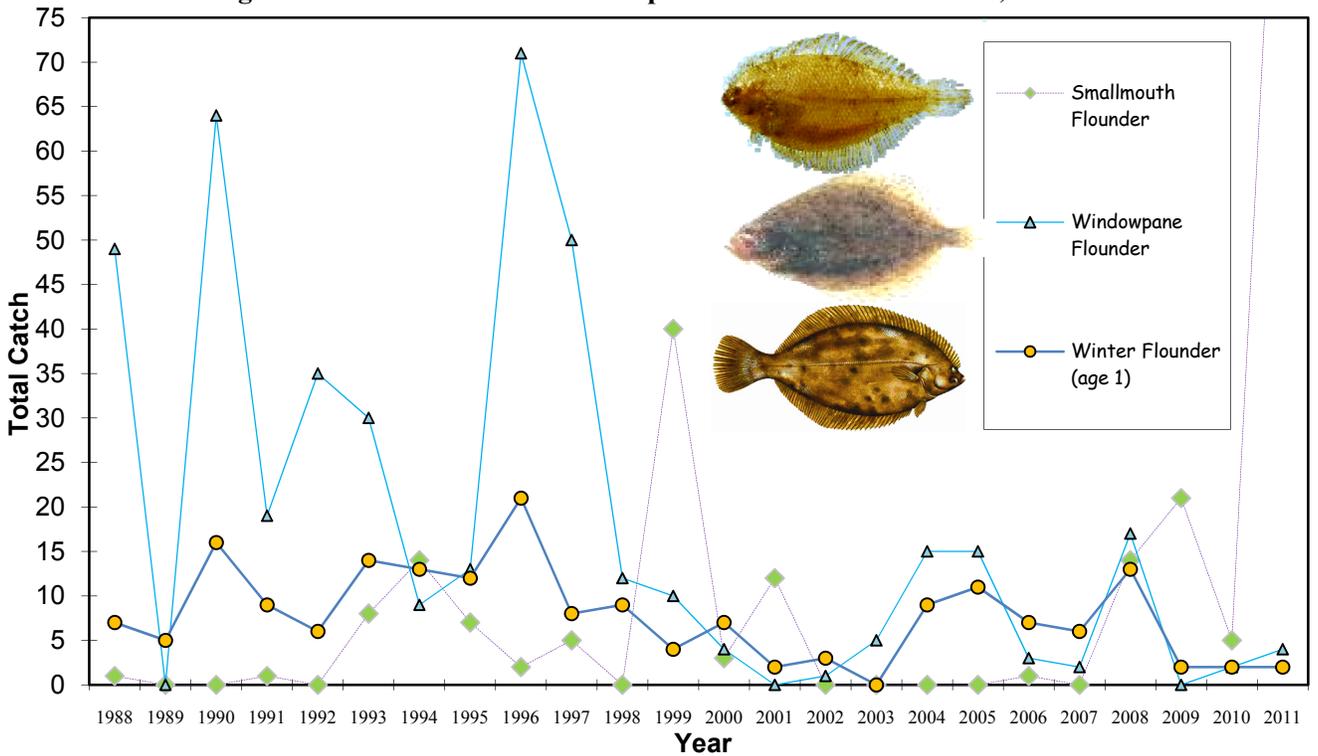


Figure 2.9: Total Catch of Three Species of Juvenile Flounders, 1998-2011



Appendix 2.1: Finfish species taken in the Estuarine Seine Survey, 1988-2011.

<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 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>
Creville jack	CRJ	<i>Caranx hippos</i>
Cunner	CUN	<i>Tautoglabrus adspersus</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>
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>
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>
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>Scopthalmus 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 2.2: Invertebrate species taken in the Estuarine Seine Survey, 1988-2011.

<u>COMMON NAME</u>	<u>SPECIES CODE</u>	<u>SCIENTIFIC NAME</u>
Blue crab	BCR	<i>Callinectes sapidus</i>
Brown Shrimp	BNS	<i>Panaeus aztecus</i>
Channeled Whelk	CHW	<i>Busycotypus canaliculatus</i>
Northern Comb Jelly	COM	<i>Bolinopsis infundibulum</i>
Green crab	GCR	<i>Carcinus maenas</i>
Hermit crab	HER	<i>Pagurus spp.</i>
Horseshoe crab	HSC	<i>Limulus polyphemus</i>
Japanese crab	JCR	<i>Hemigrapsus sanguineus</i>
Lady crab	LCR	<i>Ovalipes ocellatus</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>
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>
Shortfin Squid	ILL	<i>Illex illecebrosus</i>

Figure 2.10: Haul Seining in 2011.

