Completion Report on the Maine-New Hampshire Inshore Trawl Survey (September 30, 2005 – August 1, 2006)

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TABLE OF CONTENTS 2

Included with report: CD of raw data for Fall 2005

ACKNOWLEDGEMENTS

Logistically, this continues to be a complex project requiring assistance from many people. Without their help, the survey could not have been completed.

We would like to thank staff from the Maine DMR and New Hampshire F&G who helped with mailings, car shuttles, and contributed to data collection and entry. We appreciate the hard work put in by the commercial boat crew. F/V Robert Michael crew members Captain Curt Rice, Jerry Balzano, and T.J. Small, as well as shore engineer Randy Greenleaf, were all most helpful, professional and enjoyable to work with. Jeff Flagg provided invaluable assistance by mending and transporting nets to keep the survey running, and storing gear during the off-season. Science crew members included Joshua Carloni, Rob Royer, Ryan McDonnell, Eileen Brewer, Laurice Churchill, Connie Devenger, Kathleen Reardon, and Sarah Pike. We are especially grateful for support from Colonel Joe Fessenden, Lieutenants Jon Cornish and Alan Talbot, and some 20 Marine Patrol Officers who helped both on and off the water, handling gear, helping to communicate with lobstermen, and whose presence added to our security.

We also express many thanks to all of the facilities along the coast that provided dockage for the survey vessels. Alison Ferreira successfully assisted us through our federal permitting processes. Sarah Cotnoir, Wendy Parker, Linda Mercer, Carl Wilson and Dan Schick helped with all aspects of the project providing technical guidance, field assistance, administrative support, and general advice.

Once again, we are grateful to NOAA National Weather Service's James Mansfield and Mark Turner for broadcasting our schedule to mariners to avoid gear conflicts and address the communications concerns raised by fixed gear fishermen. Lastly, we appreciate the support and cooperation of those fixed gear fishermen throughout the survey area that moved gear and suggested alternate sites when necessary. The Lobster Zone Councils, Maine Lobster Advisory Council, Maine Lobstermen's Association, and Downeast Lobstermen's Association also provided many comments and suggestions to help minimize gear conflicts and improve cooperation.

EXECUTIVE SUMMARY

This report summarizes the sixth fall survey of a comprehensive bottom trawl survey of groundfish and other species for Maine and New Hampshire's inshore waters. We continue to build a time series for long-term monitoring of inshore stocks of the Gulf of Maine. Funds designated by Congress to assist ground fishermen were administered and distributed through the Northeast Region Cooperative Research Partners Program (NCRPP) with the goal of fostering research partnerships between commercial fishermen and scientists.

The fall survey completed 54 of the 115 tow objective. This was the lowest completion rate thus far in our six year time series. Forty three of the unsuccessful tows were solely due to an abundance of lobster gear. Weather and untowable bottom were responsible for the remainder of the incomplete tows. We believe that because the fall lobster run coincided with the fall trawl survey, cooperation by the lobstermen suffered.

Bottom temperatures were comparable to past years. Despite the lower tow success rate, a total of 84 species were sampled and catches were very similar to past fall surveys. For the first time, Norwegian shrimp, *Pontophilus norvegicus*, was encountered.

Trawl survey data has a wide array of uses beyond groundfish stock assessments. This is a multispecies survey that provides broad information on finfish and invertebrate populations and communities that can contribute to how we manage our marine environments. The survey compliments surveys conducted by the National Marine Fisheries Service in the outer waters of the Gulf of Maine and state surveys conducted by other Atlantic coast states in their inshore waters. Prior to this survey, no fishery-independent information was available for approximately 80% of the U.S. Gulf of Maine's inshore waters.

INTRODUCTION

The Maine-New Hampshire Inshore Trawl Survey is a collaborative partnership between commercial fishermen and state researchers to assess inshore fish stocks along the Maine and New Hampshire coasts. Beginning in the fall of 2000, the survey has now completed five and a half years of biannual survey work. The sixth fall season of the project was funded through the Northeast Region Cooperative Research Partners Program of the National Marine Fisheries Service. From its inception, the project has been supported by federal funds appropriated to the National Marine Fisheries Service to foster cooperative research using commercial vessels. Collaborative research enables fishermen to contribute their knowledge and experience toward the progress of scientific data collection and ultimately to resource management decisions, and strengthens the trust between fishermen and scientists. Including fishermen in the planning and execution of the inshore trawl survey has made overcoming the difficult process of maintaining the consistency and quality of this work possible.

Fishery-independent trawl surveys provide a baseline index of the distribution and relative abundance of a variety of fish and invertebrate species. As they continue on an annual basis, these surveys reflect trends in abundances of populations. Abundance indices derived from research trawl surveys that maintain consistent and standardized efforts can be utilized to enhance catch statistic based assessments and together with additional research efforts, population estimates are possible.

Goal and Objectives

The overall goal of this project is to establish a solid foundation for a long-term fishery-independent monitoring program in Maine and New Hampshire's inshore waters (5-80^{+} fathoms).

Specific objectives are:

- To document the distribution and relative abundance of marine resources in the nearshore Gulf of Maine.
- To gather information on biological parameters (growth rates and reproduction).
- To collect environmental data, including temperature and salinity, that affect fish distribution.
- To develop recruitment indices for assessments of target species.
- To involve fishermen in scientific data collection.
- To improve survey logistics by enlisting cooperation of the fixed gear fishermen.

MATERIALS AND METHODS

Materials and methods are presented in "Maine-New Hampshire Inshore Groundfish Trawl Survey Procedures and Protocols, 2005," which is available at (http://www.maine.gov/dmr/rm/trawl/procandprot.pdf). This protocol manual includes descriptions of survey design, station selection, survey vessels, net design, public notification, sample collection and catch handling, and other information on survey operations.

Incorporation of Peer Review Recommendations

In August of 2005, a technical peer review of the ME/NH survey was conducted by the NEC and NCRPP to assess and improve the value of this survey. The overall consensus of the review was that the survey is valuable and maintains high scientific standards (Chouinard et al, 2005). The survey is considered to be an excellent example of a cooperative project with extensive outreach work and good data accessibility. Several modifications were recommended, all of which were addressed by the Fall 2005 survey:

- Decreasing the percentage of fixed stations – reduced by half starting in fall 2005. We now sample one fixed station per region per strata, for a total of 20 fixed stations (17% fixed).
- Creating tow and catch qualifiers for the database – we now have qualifiers for tow type, tow quality, and gear condition.
- Increasing biological sampling – starting with the fall 2005 survey, a species priority list for biological sampling (sex and maturity, stomach contents and otolith collection) is determined for each survey.

Analysis and Presentation of Data

Appendix A provides a list of the stations completed during the Fall 2005 survey, including temperature and salinity data. Stratified means and errors reported in Appendix B were calculated utilizing the same formulas reported for the NMFS' SURVAN formulas (Kramer and Forrester, 1994). A list of all the species encountered by the trawl survey since its inception is provided in Appendix C. Bubble plots, abundance indices, and length frequency graphs for four species of interest are provided in Appendix D. In addition, raw data for the fall 2005 are on the CD provided with this report.

RESULTS - FALL 2005

The fall 2005 Inshore Trawl Survey started in New Hampshire on October 10th and ended on November 11th in Downeast Maine. Overall, it was a difficult survey due to bad weather and lower levels of cooperation from the lobster industry. Of the 115 tows set as a survey target, we were able to sample only 45 published sites and 9 alternate stations, for a total of 54 successful tows (a 47% completion rate). This compares to our previous lowest completion rate of 68% in fall 2003.

The volume of total mixed catch varied from a minimum of 15 kg to a maximum of 1897 kg, averaging 183 kg. The total number of species caught was 84 with a low of 15 and a high of 33 in any particular tow and an average of 24. Other than Norwegian shrimp, *Pontophilus norvegicus*, which was seen for the first time in the trawl survey, the species assemblage was typical of past surveys.

Fall 2005 average bottom temperatures, by stratum, ranged from 7.0 to 10.9^{o} C (Table 1), with an overall average temperature of 9.5^{o} C. This was warmer than the fall 2004 average of 8.6^{o} C,

but comparable to previous fall average temperatures (9.5^{o} C for 2000, 10.2^{o} C for 2001. 10.5^{o} C for 2002 and 9.2^{o} C for 2003).

Table 1. Average bottom temperatures (^{o} C) for the Fall 2005 survey.

Region						
		1	**2**	**3**	**4**	**5**
Stratum	**1**	10.0	10.4	10.9	10.4	9.8
	2	8.6	9.5	10.6	10.2	n/a
	3	7.2	8.8	10.4	10.3	n/a
	4	7.0	7.8	10.3	9.7	n/a

Despite the low tow completion rates for fall 2005, the fall survey index for American Lobster was double that of the previous year (Appendix D, Figure 2). Regional abundance and size distribution of the catch remained similar to all previous fall surveys (App. D, Figures 1, 3.). A significant increase in young of the year white hake was seen this fall which was reflected in the stratified mean number for 2005 (App. D, Figure 4). Abundance appears to be somewhat greater in the eastern half of the survey area. The number of juvenile Atlantic cod remains low, with an absence of the quantities seen in previous years in the 1-2 year old fish (app. D, Figure 5). Abundance trends for goosefish (monkfish) still decline, most notably in the juveniles of lengths between 10 and 40 centimeters (App. D, Figure 6).

DISCUSSION

Before the fall 2005 survey, we believed the challenge of surveying the inshore waters of the Maine and New Hampshire coasts had been surmounted. However, following a summer of poor lobster landings, the timing of the fall 2005 survey seemed to overlap perfectly with late season lobster catch. Although 123 stations were published and sent to fishermen with the objective of achieving 115 tows, 43 (35%) tows were not completed solely because of the abundance of lobster gear, more than double the rate from last year (18 out of 120, or 15%). Cooperation by the fixed gear industry for fall surveys in general has been variable since the first fall 2000 survey when only 5% of the tows were missed due to gear. In 2001, the rate increased to 22%. In fall 2002 and 2003, the rates were 14% and 29%, respectively.

At one time, an inshore survey along the coasts of Maine and New Hampshire was believed impossible due to the rough bottom topography and the abundance of lobster fishing gear. In the initial planning phase, conversations were held with local fishermen to identify these difficult areas. Although it has been found that some areas are indeed “untowable,” other areas were not.

Long hours spent searching for towable bottom has demonstrated that large areas of the coast do not have to be eliminated as "untowable." The short tow duration of 20 minutes gives some leeway to find small towable areas in difficult terrain. The total survey coverage area is set and does not need any modifications due to logistics. Information about towable areas and non-towable areas has been documented from ten surveys. The fall 2005 survey added to this information base which aids survey planning for this and other surveys.

This project in particular requires continuing outreach to local Maine and New Hampshire fishermen to reiterate the importance of the survey and the data it collects. Without it, we would not have willing cooperation by the lobster industry. Regular articles are published in several fishing related publications. Staff attend lobster zone councils meetings on a yearly basis, presentations are given at the Maine Fishermen's Forum, and notices of the surveys are always sent to all lobster and gillnet license holders. The extra funds and added staff time are well worth the effort if they improve the tow success rate which in turn increases the value of the data collected. The success of the survey is also enhanced by its ability to adhere to a fairly strict schedule of predetermined tow locations and dates. This enables the fixed gear fishermen to rely on the fact that the tows conducted in their areas will be done in a timely fashion.

All data from the survey are provided to NMFS for use in stock assessments, as well as made publicly available. In addition to the NMFS, scientists and managers with the Maine and New Hampshire state agencies, the University of Maine, Bigelow Laboratories for Ocean Sciences and other non-government organizations are using the survey results. Tangible products and results delivered to date include the following:

- Five and a half annual reports
- Survey Procedures and Protocols Manual
- Electronic data provided annually to NMFS-NEFSC, academia, and public
- Inshore trawl survey data are a key component of the new American lobster stock re-evaluation
- Peer reviewed publication on differentiation of two Gulf of Maine American lobster stocks
- Data provided on Winter flounder, *Pseudopleuronectes americanus*, for use in developing Amendment I to the fishery management plan.
- Data provided to support management measures on monkfish, herring and American shad
- Data used in determination of fishing season for Northern shrimp, *Pandalus borealis*
- Basis for design of species-specific survey for sea scallop, *Placopecten magelanicus*
- Basis for design of video resource assessment project for Jonah crab, *Cancer borealis*
- Platform and collections for various special studies and other (e.g. otoliths, stomach analyses, ichthyoplankton, genetic fin clips, and Infections Salmon Anemia.

Dealing with the large quantity of fixed gear in inshore waters continues to be an area for improvement. Increased outreach, minor scheduling modifications, and consideration of new strategies may be needed to maintain a satisfactory level of completion into the future. Despite this survey's setback, we remain confident that the northern Gulf of Maine can be successively and consistently sampled via trawl survey. The information collected by the unique coverage of

this survey promises to be very valuable to the understanding of marine ecosystems in the Gulf of Maine.

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Kramer, W.P. and J.S. Forrester. 1994. Bottom Trawl Survey Analysis Program (SUN SURVAN Version 7.0) Program Report. Vol. 1. National Marine Fisheries Service, Northeast Fisheries Science Center. Massachusetts.

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APPENDIX A

Fall 2005

10/10	1	FL05__1	13751.6	25964.6	42 56.180	70 44.800	0811	20	14.5	9.54	31.35
10/10	1	FL05__1	13759.3	25964.1	42 55.490	70 45.380					
10/10	1	FL05__2	13740.9	25928.7	42 53.810	70 41.110	1048	20	29.6	7.44	31.83
10/10	1	FL05__2	13733.5	25929.8	42 54.530	70 40.580					
10/10	1	FL05__3	13743.5	25915.8	42 52.460	70 40.290	1319	20	33.6	7.51	31.84
10/10	1	FL05__3	13736.0	25917.4	42 53.180	70 39.820					
10/11	1	FL05__4	13694.4	25947.9	42 59.400	70 38.830	0729	19	14.3	10.49	31.59
10/11	1	FL05__4	13701.6	25946.5	42 58.680	70 39.300					
10/11	1	FL05__5	13623.0	25839.4	42 55.170	70 23.990	0954	20	42.7	6.26	32.35
10/11	1	FL05__5	13628.6	25846.6	42 55.400	70 25.060					
10/11	1	FL05__6	13589.2	25837.6	42 57.620	70 20.860	1337	20	65.7	6.00	32.53
10/11	1	FL05__6	13590.2	25845.4	42 58.270	70 21.610					
10/11	1	FL05__7	13593.1	25899.8	43 03.090	70 26.440	1552	20	49.9	6.83	32.32
10/11	1	FL05__7	13584.9	25899.5	43 03.690	70 25.720					
10/16	1	FL05__8	13397.7	25979.0	43 25.550	70 17.120	0836	17	35.2	10.79	32.21
10/16	1	FL05__8	13390.7	25976.2	43 25.770	70 16.310					
10/17	1	FL05__9	13394.5	25957.4	43 23.680	70 14.830	0733	20	47.4	8.41	32.69
10/17	1	FL05__9	13386.4	25957.9	43 24.330	70 14.200					
10/17	1	FL05_10	13347.5	25925.7	43 24.060	70 07.800	0937	20	60.1	8.04	32.77
10/17	1	FL05_10	13346.5	25919.2	43 23.510	70 07.090					
10/17	1	FL05_11	13387.9	26017.5	43 30.000	70 20.010	1352	12	13.0	9.91	32.33
10/17	1	FL05_11	13391.6	26015.4	43 29.530	70 20.090					
10/17	1	FL05_12	13329.3	25979.6	43 30.660	70 11.520	1542	20	33.5	8.65	32.59
10/17	1	FL05_12	13338.2	25979.5	43 30.010	70 12.240					
10/18	2	FL05_13	13235.8	25996.9	43 39.230	70 05.430	0851	16	21.3	10.98	32.16
10/18	2	FL05_13	13228.8	25995.8	43 39.620	70 04.800					
10/19	2	FL05_14	13244.9	25938.6	43 32.780	70 00.250	0721	20	51.8	8.30	32.83
10/19	2	FL05_14	13236.2	25938.8	43 33.400	69 59.530					
10/19	2	FL05_15	13173.7	25921.8	43 36.130	69 52.300	0953	20	44.5	8.71	32.80
10/19	2	FL05_15	13165.5	25922.9	43 36.720	69 51.580					
10/19	2	FL05_16	13184.4	25880.2	43 31.110	69 48.680	1201	20	69.0	7.02	32.89
10/19	2	FL05_16	13176.5	25881.5	43 31.870	69 48.250					
10/19	2	FL05_17	13132.0	25856.4	43 32.400	69 41.480	1421	20	61.5	8.21	32.99
10/19	2	FL05_17	13130.5	25862.4	43 33.100	69 42.010					
10/19	2	FL05_18	13109.2	25886.4	43 37.020	69 42.700	1606	20	49.6	8.56	32.89
10/19	2	FL05_18	13101.4	25888.3	43 37.740	69 42.210					
10/20	2	FL05_19	13104.8	25911.0	43 39.730	69 44.910	0938	20	29.1	9.40	32.83
10/20	2	FL05_19	13113.0	25909.7	43 39.040	69 45.490					
10/20	2	FL05_20	13032.7	25915.4	43 45.140	69 38.960	1501	15	34.1	10.12	32.86
10/20	2	FL05_20	13036.1	25911.9	43 44.570	69 38.860					
10/21	2	FL05_21	13004.9	25866.1	43 41.910	69 30.680	0752	20	65.0	8.31	33.07
10/21	2	FL05_21	13010.9	25862.0	43 41.090	69 30.750					
10/21	2	FL05_22	12957.0	25778.6	43 35.960	69 15.580	1135	14	75.0	7.78	33.14
10/21	2	FL05_22	12952.8	25781.6	43 36.520	69 15.550					
10/22	2	FL05_23	12948.3	25916.5	43 51.090	69 31.670	0811	16	19.7	9.82	32.56
10/22	2	FL05_23	12953.1	25913.0	43 50.430	69 31.670					

10/22	2	FL05_24	12944.4	25900.0	43 49.650	69 29.310	1035	20	35.6	8.85*	32.82*
10/22	2	FL05_24	12936.8	25903.0	43 50.460	69 28.980					
10/22	2	FL05_25	12921.4	25885.5	43 49.650	69 25.420	1241	20	32.7	9.45	32.80
10/22	2	FL05_25	12912.7	25885.5	43 50.220	69 24.610					
10/22	2	FL05_26	12896.0	25867.1	43 49.360	69 20.780	1607	20	40.3	9.78	31.27
10/22	2	FL05_26	12904.7	25865.7	43 48.650	69 21.390					
10/27	3	FL05_27	12880.3	25816.8	43 44.920	69 12.720	0905	15	51.3	10.64	32.61
10/27	3	FL05_27	12883.7	25813.3	43 44.340	69 12.600					
10/27	3	FL05_28	12914.6	25724.3	43 32.740	69 04.210	1235	20	76.1	9.95*	33.25*
10/27	3	FL05_28	12913.9	25729.8	43 33.390	69 04.860					
10/27	3	FL05_29	12849.1	25720.3	43 36.350	68 56.650	1513	20	71.6	10.48*	32.99*
10/27	3	FL05_29	12841.5	25722.9	43 37.120	68 56.190					
10/27	3	FL05_30	12898.8	25738.0	43 35.190	69 04.280	1718	20	72.0	10.56*	32.94*
10/27	3	FL05_30	12891.7	25735.4	43 35.340	69 03.210					
10/29	3	FL05_31	12646.4	25880.4	44 07.220	68 58.800	0835	20	39.8	10.55	32.19
10/29	3	FL05_31	12638.0	25880.6	44 07.790	68 58.010					
10/29	3	FL05_32	12629.7	25902.3	44 10.750	69 00.350	1012	21	31.4	10.62	32.24
10/29	3	FL05_32	12637.5	25899.0	44 09.870	69 00.610					
10/29	3	FL05_33	12568.7	25902.4	44 14.720	68 54.530	1227	20	14.9	10.90	31.87
10/29	3	FL05_33	12577.2	25900.4	44 13.960	68 55.050					
10/29	3	FL05_34	12536.4	25901.6	44 16.760	68 51.300	1440	20	13.6	10.82	31.96
10/29	3	FL05_34	12544.4	25900.0	44 16.060	68 51.810					
10/30	3	FL05_35	12657.3	25823.7	44 00.168	68 51.546	0828	19	29.8	10.59	32.31
10/30	3	FL05_35	12659.5	25828.5	44 00.574	68 52.514					
10/31	3	FL05_36	12733.8	25740.1	43 45.869	68 47.206	0807	20	58.9	10.40	32.81
10/31	3	FL05_36	12727.6	25743.8	43 46.716	68 47.062					
10/31	3	FL05_37	12696.0	25731.5	43 47.240	68 41.840	1417	15	53.0	10.06	33.11
10/31	3	FL05_37	12702.2	25731.2	43 46.840	68 42.440					
11/1	3	FL05_38	12667.3	25776.6	43 54.188	68 45.506	0730	20	50.8	10.37	32.77
11/1	3	FL05_38	12660.2	25779.5	43 54.986	68 45.225					
11/1	3	FL05_39	12645.3	25758.8	43 53.551	68 40.508	0918	19	50.6	10.39	31.63
11/1	3	FL05_39	12637.5	25759.3	43 54.118	68 39.717					
11/1	4	FL05_40	12592.0	25714.7	43 51.753	68 27.522	1141	20	70.9	10.30*	33.03*
11/1	4	FL05_40	12600.2	25713.8	43 51.167	68 28.285					
11/1	4	FL05_41	12559.7	25743.8	43 57.222	68 28.678	1331	19	48.6	10.28*	32.66*
11/1	4	FL05_41	12567.5	25744.3	43 56.770	68 29.620					
11/2	4	FL05_42	12490.7	25811.3	44 09.430	68 32.420	0700	15	31.0	10.26	31.93
11/2	4	FL05_42	12484.6	25812.8	44 09.991	68 31.919					
11/2	4	FL05_43	12419.5	25816.9	44 14.670	68 25.830	1007	20	26.8	10.26	31.99
11/2	4	FL05_43	12416.2	25821.5	44 15.410	68 26.280					
11/2	4	FL05_44	12429.7	25840.9	44 16.780	68 30.990	1152	18	15.4	10.51	31.89
11/2	4	FL05_44	12433.6	25837.0	44 16.090	68 30.750					
11/2	4	FL05_45	12369.1	25853.5	44 22.140	68 26.880	1344	17	15.6	10.62*	31.91*
11/2	4	FL05_45	12375.5	25851.9	44 21.550	68 27.260					
11/3	4	FL05_46	12503.9	25703.4	43 55.930	68 15.580	0630	20	61.7	8.76	33.63
11/3	4	FL05_46	12496.0	25705.0	43 56.600	68 14.940					
11/3	4	FL05_47	12452.2	25725.8	44 01.820	68 13.538	0842	20	53.5	10.24*	32.82*
11/3	4	FL05_47	12445.0	25728.6	44 02.630	68 13.170					
11/3	4	FL05_48	12397.4	25708.5	44 03.210	68 03.690	1105	18	61.4	10.01*	32.96*
11/3	4	FL05_48	12390.6	25708.6	44 03.630	68 02.940					

11/4	4	FL05_49	12268.3	25805.3	44 23.050	68 07.040	0933	15	18.9	10.12	32.21
11/4	4	FL05_49	12263.7	25807.9	44 23.630	68 07.030					
11/4	4	FL05_50	12296.4	25804.8	44 21.150	68 10.120	1133	20	27.4	10.12	32.22
11/4	4	FL05_50	12290.2	25808.0	44 21.926	68 10.046					
11/4	4	FL05_51	12309.3	25784.2	44 17.912	68 07.703	1336	16	35.2	10.25	32.35
11/4	4	FL05_51	12314.2	25781.6	44 17.260	68 07.750					
11/11	5	FL05_52	12004.4	25765.3	44 35.860	67 26.300	0900	20	9.2	9.65	32.20
11/11	5	FL05_52	12011.1	25766.0	44 35.490	67 27.340					
11/11	5	FL05_53	11976.8	25745.3	44 35.380	67 17.570	1243	20	26.7		
11/11	5	FL05_53	11969.4	25745.1	44 35.880	67 16.490					
11/11	5	FL05_54	11967.2	25762.4	44 38.130	67 20.610	1457	20	9.2	9.91	32.32
11/11	5	FL05_54	11960.7	25765.4	44 38.964	67 20.491					

*Readings reflect lowest depth measurements, but may not be actual bottom conditions.

APPENDIX B

Stratified means were calculated using all stations sampled, fixed and random. We are currently updating our database to easily calculate stratified statistics on the random stations only.

Fall Surveys*

Acadian Redfish	0.61	0.20	6.87	2.15	2.57	0.96	17.12	13.53	19.76	6.62	134.95	106.08
Aesop Shrimp	12.13	5.58	122.47	29.02	296.43	85.14	215.53	73.35	882.04	321.50	817.73	123.49
Alewife	224.83	75.05	144.61	51.85	367.11	110.27	184.13	53.51	237.59	52.54	174.54	32.18
Alligatorfish	0.31	0.19	0.33	0.13	1.73	0.88	0.07	0.03	0.68	0.48	6.17	0.05
American Lobster	113.35	21.02	115.58	22.05	127.28	23.98	89.71	9.21	71.25	10.98	144.11	21.99
American Plaice	22.35	6.25	21.91	1.86	14.51	2.48	45.86	5.86	38.33	3.72	65.55	8.35
American Shad	0.57	0.18	0.22	0.10	1.16	0.41	6.38	4.78	0.99	0.36	2.19	0.71
Atlantic Cod	4.03	1.90	3.31	0.63	0.93	0.22	3.93	0.69	2.36	0.81	3.51	1.81
Atlantic Halibut	0.16	0.06	0.22	0.08	0.16	0.04	0.16	0.04	0.19	0.08	0.21	0.05
Atlantic Herring	898.13	301.94	717.91	178.36	1132.48	374.71	439.70	160.88	693.46	229.44	968.45	202.40
Atlantic Mackerel	2.14	0.94	11.61	6.23	14.47	6.33	25.91	8.95	7.01	3.88	27.15	20.86
Atlantic Menhaden	17.14	6.23			43.47	16.76	11.40	2.87	1.99	0.93	51.53	15.56
Atlantic Silverside	4.73	1.29	0.19	0.12	1.38	0.36	3.29	2.06	1.31	0.44	2.30	1.51
Atlantic Sturgeon	0.05	0.05	0.19	0.22	0.13	0.10			0.01	0.01		
Atlantic Wolffish									0.01	0.01		
Blueback Herring		0.00		0.00	4.20	1.53	7.65	2.62	5.02	1.48	15.02	9.26
Bristled Longbeak	89.04	22.81	151.04	31.36	554.11	132.51	311.60	41.04	447.65	55.56	353.93	43.25
Butterfish	2.23	0.77	11.88	3.22	51.32	14.89	14.27	4.36	43.88	6.94	31.23	16.48
Cunner	0.20	0.11	0.10	0.06	1.22	1.02	1.32	0.74	1.99	1.37	0.20	0.11
Daubed Shanny		0.00	0.01	0.01		0.00		0.00				
Fourbeard Rockling	0.34	0.09	1.50	0.33	1.09	0.22	1.96	0.34	2.19	0.37	2.18	0.45
Fourspot Flounder	0.23	0.07	0.52	0.12	0.09	0.03	0.21	0.09	0.06	0.02	0.74	0.68
Goosefish	4.73	0.60	12.61	1.21	3.73	0.76	3.66	0.53	3.31	0.52	1.92	0.34
Greenland Halibut			0.03	0.02	0.04	0.02	0.03	0.02	0.02	0.02	0.14	0.04
Haddock	3.90	1.22	6.06	1.91	0.35	0.13	6.34	2.36	3.32	1.05	5.61	0.59
Jonah Crab	1.77	0.36	14.97	1.62	5.99	1.55	5.53	0.89	10.31	1.75	5.41	1.16
Little Skate	2.44	1.14	1.90	0.35	2.90	1.69	0.87	0.20	0.94	0.21	0.96	0.74
Longfin Squid	4.59	1.17	15.33	2.76	24.12	4.09	2.16	0.79	14.63	5.23	3.67	0.51
Longhorn Sculpin	32.13	7.27	24.81	4.65	46.25	6.56	29.39	3.45	23.85	3.82	15.44	3.07
Lumpfish	0.04	0.02	0.14	0.05	0.16	0.05	0.51	0.22	0.32	0.07	0.16	0.06
Northern Shrimp	87.55	50.72	48.02	20.34	30.74	13.78	244.50	59.36	294.20	83.47	837.52	155.77
Ocean Pout	0.07	0.03	0.36	0.12	0.02	0.02	0.11	0.04	0.33	0.19	0.05	0.02
Octopus unclass.	0.09	0.05	0.28	0.06	0.35	0.17	0.08	0.05	0.15	0.11	0.02	0.02
Pollock	2.19	1.21	0.32	0.07	4.90	2.93	0.69	0.25	0.22	0.08	0.70	0.05
Rainbow Smelt	51.10	24.06	63.70	26.17	31.99	20.90	31.33	8.34	49.11	17.49	112.74	23.87
Red Hake	26.19	3.21	36.69	4.16	19.20	2.63	28.15	2.28	14.23	1.67	10.91	1.59
Rock Crab	2.82	1.09	6.61	1.79	1.79	0.50	1.25	0.44	4.27	0.87	3.76	1.59
Scup	6.69	1.93			1.53	0.85	1.38	1.02	66.88	49.07	0.02	0.02
Sea Cucumber	0.81	0.36	3.55	3.45	2.81	0.07	0.16	0.16	1.10	0.65	2.40	2.02
Sea Raven	1.78	0.28	1.16	0.42	2.06	0.63	1.18	0.34	1.25	0.34	1.56	0.15
Sea Scallop	39.34	11.08	33.82	8.25	7.64	1.80	3.34	1.32	2.60	0.96	3.26	1.19
Sevenspine Bay Shrimp	25.22	9.75	51.32	27.97	558.70	334.20	303.30	185.80	204.61	107.59	540.12	158.30

Shortfin Squid	1.25	0.75	1.26	0.19	0.95	0.20	2.50	0.48	1.85	0.42	2.65	0.45
Shorthorn Sculpin	0.30	0.12	0.09	0.08	0.41	0.24	0.05	0.02	0.23	0.07	0.87	0.50
Silver Hake	782.02	74.43	744.53	104.06	507.60	79.77	1066.49	90.00	363.36	49.13	44.58	5.87
Smooth Skate	0.20	0.08	0.43	0.16	0.15	0.08	0.23	0.08	0.28	0.06	0.14	0.06
Snakeblenny		0.00	0.03	0.02	0.09	0.05	0.02	0.02	0.07	0.04	0.07	0.04
Spiny Dogfish	3.92	0.52	8.85	2.05	14.15	2.08	18.72	3.02	54.96	11.66	24.81	3.82
Spotted Hake	0.01	0.01	0.02	0.02	0.01	0.01	0.02	0.02				
Thorny Skate	0.26	0.07	0.23	0.10	0.36	0.16	0.47	0.12	0.57	0.17	0.26	0.05
White Hake	12.66	1.12	18.93	2.22	23.26	1.87	32.05	2.79	17.52	2.30	45.23	4.66
Windowpane	4.15	0.65	2.22	0.66	13.12	2.77	8.01	1.49	2.65	0.68	4.82	1.35
Winter Flounder	37.05	3.13	31.73	4.34	33.02	5.13	32.35	5.05	32.08	5.44	39.86	3.37
Winter Skate	0.26	0.09	0.11	0.06	0.39	0.13	0.11	0.05	0.28	0.14		
Witch Flounder	3.79	0.70	32.55	4.54	4.47	0.90	7.30	1.15	10.29	1.88	22.21	2.36
Wrymouth	0.15	0.09	0.45	0.12	0.06	0.03	1.11	0.72	1.34	0.77	0.41	0.13
Yellowtail Flounder	2.51	1.27	1.44	0.49	0.83	0.27	0.61	0.41	0.96	0.33	0.45	0.21

*Due to an error in the calculations of strata sizes, the means and errors reported in this table may differ from those published in a previous report. The error was only one of measurement; neither the total area covered nor the individual stratum sizes have changed.

APPENDIX C

The following is a list of taxa we have encountered in all surveys conducted since 2000.

Finfish species

Flatfish

Atlantic halibut	*Hippglossus hippoglossus*
Greenland halibut	*Reinhardtius hippoglossoides*
American plaice	*Hippoglossoides platessoides*
Summer flounder	*Paralichthys dentatus*
Four-spot flounder	*Paralichthys oblongus*
Yellowtail flounder	*Limanda ferruginea*
Winter flounder	*Pseudopleuronectes americanus*
Witch flounder	*Glyptocephalus cynoglossus*
Windowpane	*Scophthalmus aquosus*
Gulf Stream flounder	*Citharichthys arctifrons*

Gadids

Atlantic cod	*Gadus morhua*
Haddock	*Melanogrammus aeglefinus*
Pollock	*Pollachius virens*
Silver hake	*Merluccius bilinearis*
Cusk	*Brosme brosme*
White hake	*Urophycis tenuis*
Red hake	*Urophycis chuss*
Spotted hake	*Urophycis regia*
Four-beard rockling	*Enchelyopus cimbrius*

Other Benthics

Acadian redfish	*Sebastes fasciatus*
Ocean pout	*Macrozoarces americanus*
Goosefish	*Lophius americanus*
Spiny dogfish	*Squalus acanthias*
Atlantic hagfish	*Mxyine glutinosa*
Sea raven	*Hemitripterus americanus*
Alligatorfish	*Aspidophoroides monopterygius*
Lumpfish	*Cyclopterus lumpus*
Atlantic torpedo	*Torpedo nobiliana*
Winter skate	*Raja ocellata*
Little skate	*Raja erinacea*
Smooth skate	*Raja senta*
Thorny skate	*Raja radiata*
Barndoor skate	*Raja laevis*
Longhorn sculpin	*Myoxocephalus octodecemspinosus*
Shorthorn sculpin	*Myoxocephalus scorpius*
Moustache sculpin	*Triglops murrayi*

Northern searobin	*Prionotus carolinus*
Snakeblenny	*Lumpenus lumpretaeformis*
Daubed shanny	*Lumpenus maculatus*
American sand lance	*Ammodytes americanus*
Atlantic silverside	*Menidia menidia*
Three-spine stickleback	*Gasterosteus aculeatus*
Black sea bass	*Centropristis striata*
Atlantic tomcod	*Microgadus tomcod*
Cunner	*Tautogolabrus adspersus*
Grubby	*Myoxocephalus aenaeus*
Slender snipe eel	*Nemichthys scolopaceus*
Striped seasnail	*Liparis liparis*
Seasnail	*Liparis atlanticus*
Gulf seasnail	*Liparis coheni*
Gelationous seasnail	*Liparis fabricii*
Radiated shanny	*Ulvaria subbifurcata*
Rock gunnel	*Pholis gunnellus*
Wolf eelpout	*Lycenchelys verrillii*
Pearlsides	*Maurolicus muelleri*
Wrymouth	*Cryptacanthodes maculatus*
Sturgeon	*Acipenser spp.*
Sea Lamprey	*Petromyzon marinus*
American eel	*Anguilla rostrata*
Atlantic wolfish	*Anarhicas lupus*

Pelagics

Atlantic herring	*Clupea harengus*
Alewife	*Alosa pseudoharengus*
Blueback herring	*Alosa aestivalis*
American shad	*Alosa sapidissima*
Atlantic menhaden	*Brevoortia tyrannus*
Rainbow smelt	*Osmerus mordax*
Buckler dory	*Zenopsis conchifera*
Atlantic mackerel	*Scomber scombrus*
Butterfish	*Peprilus triacanthus*
Capelin	*Mallotus villosus*
Scup	*Stenotomas chrysops*
Rough scad	*Trachurus lathami*
Round scad	*Decapterus punctatus*
Bigeye scad	*Selar crumenopthalmus*
Atlantic moonfish	*Vomer setapinnis*
Short Bigeye	*Pristigenys alta*
Silver anchovy	*Engraulis eurystole*
Barracudina sp.	*Paralepidae spp.*

Invertebrates

Crustaceans

American lobster	*Homarus americanus*
Green crab	*Carcinus maenus*
Hermit crab (unclass.)	*Diogenidae/Paguridae spp*
Jonah crab	*Cancer borealis*
Northern stone crab	*Lithodes sp.*
Red Crab	*Geryon quinquedens*
Rock crab	*Cancer irroratus*
Snow crab	*Chionectes opilio*
Spider crab (unclass.)	*Majidae spp.*
Aesop shrimp	*Pandalus montagui*
Arctic Eualid	*Eaulus fabricii*
Lobster shrimp	*Axius serratus*
Bristled longbeak	*Dichelopandalus leptocerus*
Krill	*Euphausid spp.*
Northern shrimp	*Pandalus borealis*
Mantis shrimp	*Stomatopod sp.*
Norwegian shrimp	*Pontophilus norvegicus*
Pink glass shrimp	*Pasiphaea multidentata*
Polar Lebbeid	*Lebbeus polaris*
Propinquus	*Pandalus propinquus*
Sevenspine bay shrimp	*Crangon septemspinosa*
Spiny Lebbeid	*Lebbeus groenlandicus*

Molluscs

Blue mussel	*Mytilus edulis*
Sea scallop	*Placopecten magelanicus*
Iceland scallop	*Chlamys islandica*
Horse mussel	*Modiolus modiolus*
Ocean quahog	*Arctica islandica*
False quahog	*Pitar morrhuana*
Northern Cardita	*Venercardia borealis*
Ax head clam	*Yoldia thraciaeformis*
Waved Astarte	*Astarte undata*
Squid (unclass.)	*Rossia spp.*
Shortfin squid	*Illex illecebrosus*
Longfin squid	*Loligo pealei*
Octopus (unclass.)	*Cephalopoda spp.*
Ten-Ridged whelk	*Neptunea decemcostata*
Stimpson's whelk	*Colus stimpsoni*
Quahog	*Mercenaria mercenaria*
Waved whelk	*Buccinum undatum*

Others

Sand dollar	*Echinoidae sp*.
Sea urchin	*Stronglyocentrotus droebachiensis*
Starfish (unclass.)	various species
Boreal Asterias	*Asterias vulgaris*
Sea sponges	various species
Rat-tail cucumber	*Caudina arenata*
Sea cucumber	*Cucumaria frondosa*
Anemone	various species
Barnacle	various species

APPENDIX D

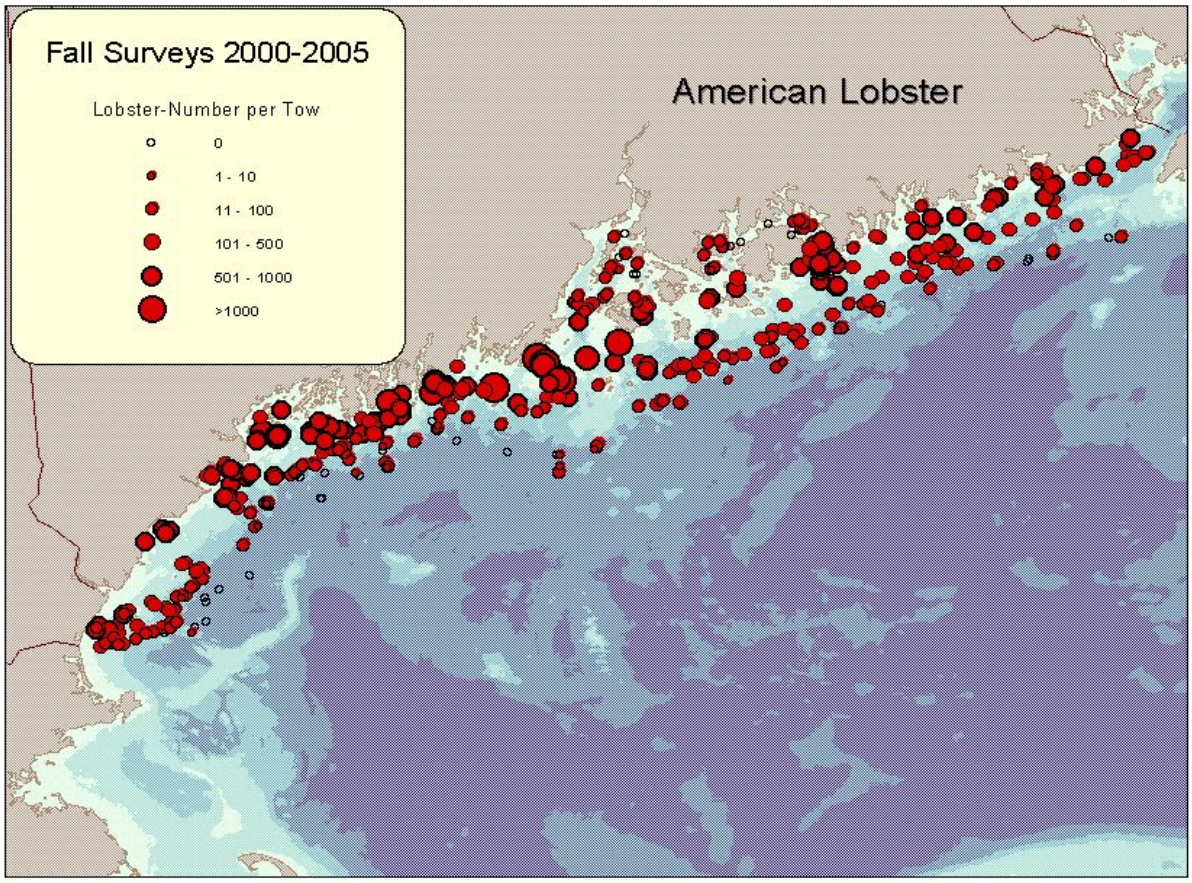


Figure 1. Distribution of lobster caught in fall trawl surveys shown as number per tow for 2000 through 2005

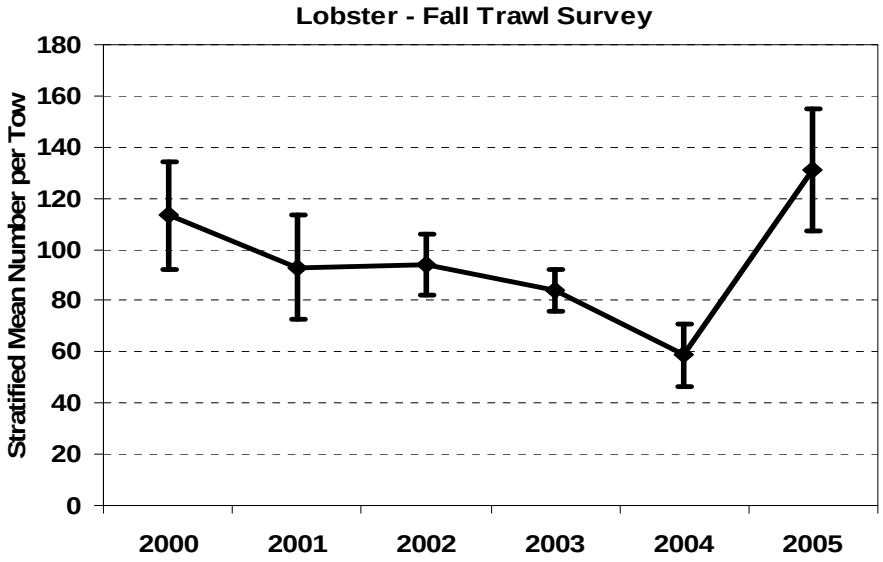
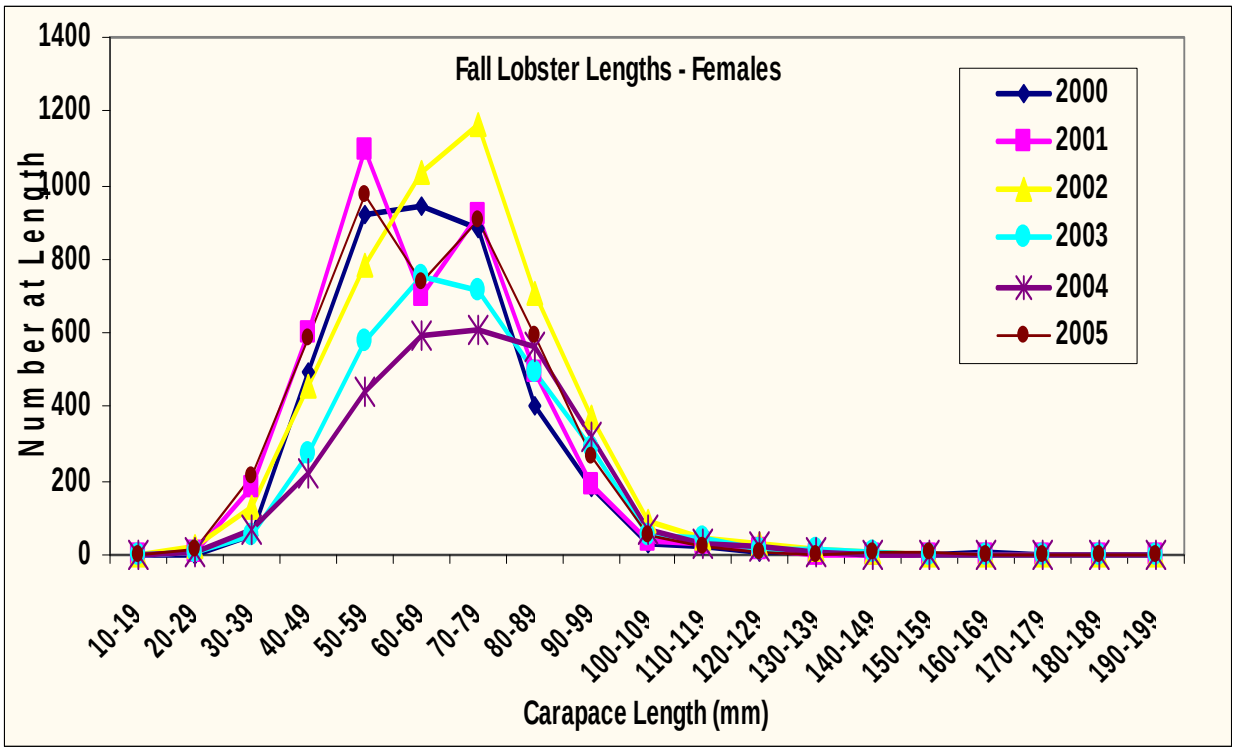


Figure 2. Stratified mean number of lobster per tow with standard error for fall surveys 2000 through 2005.



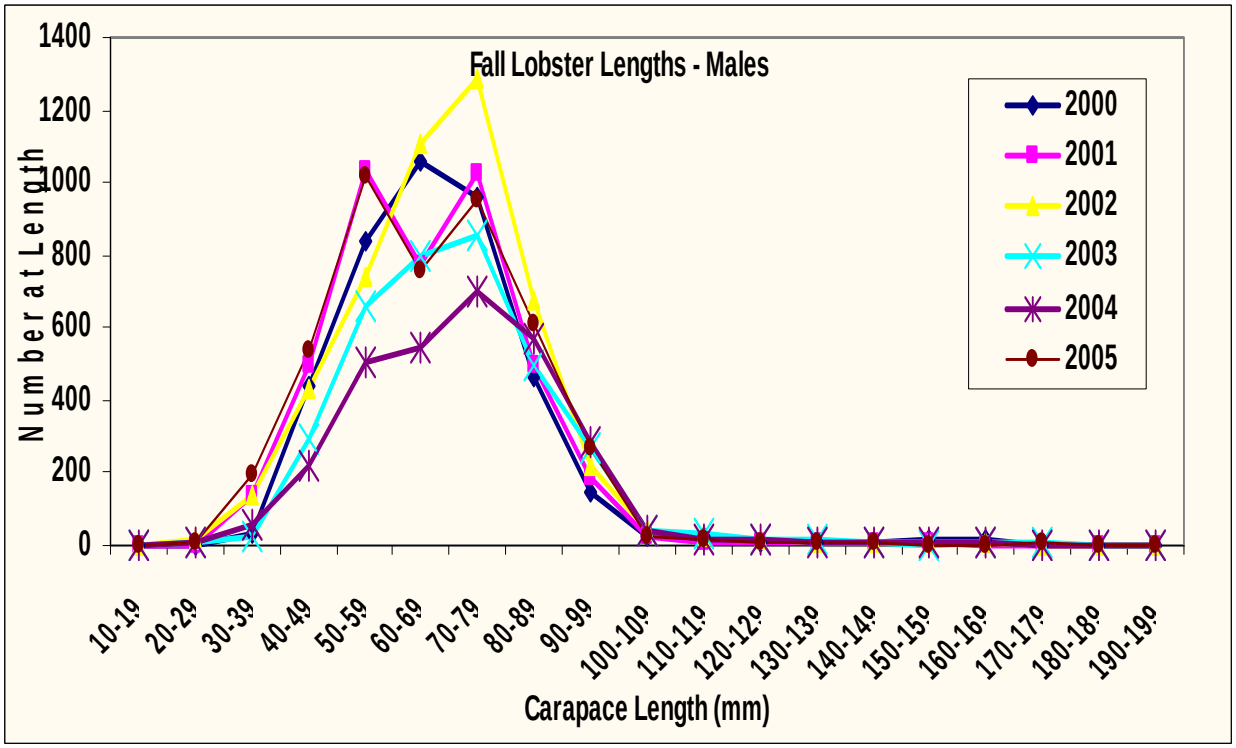
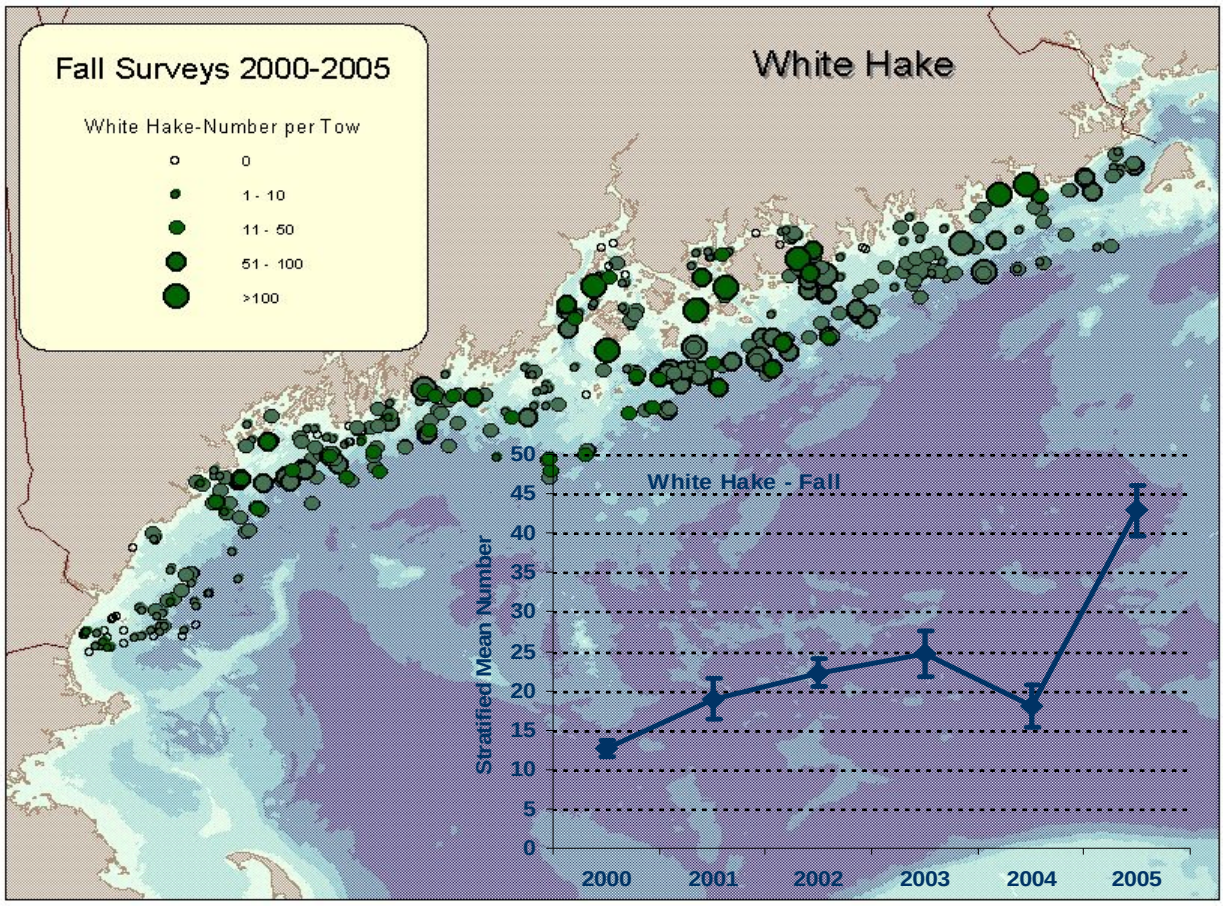


Figure 3. Length frequency plots for lobsters by sex shown as standardized number per 10 mm length bins.



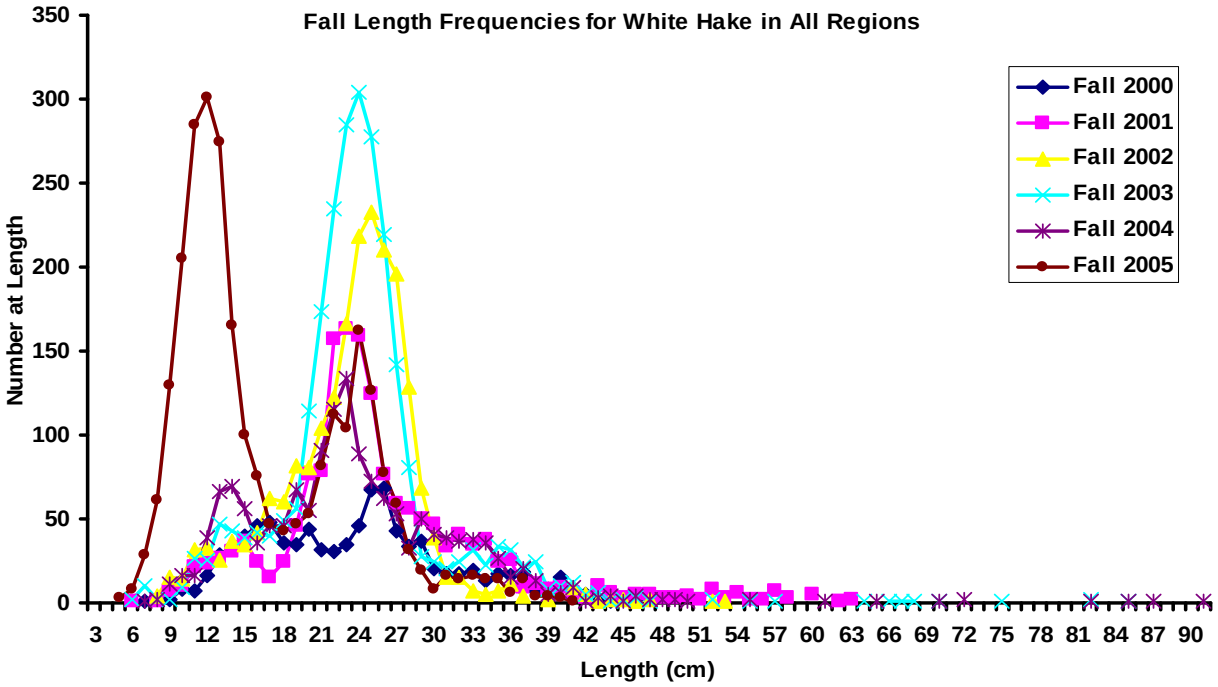
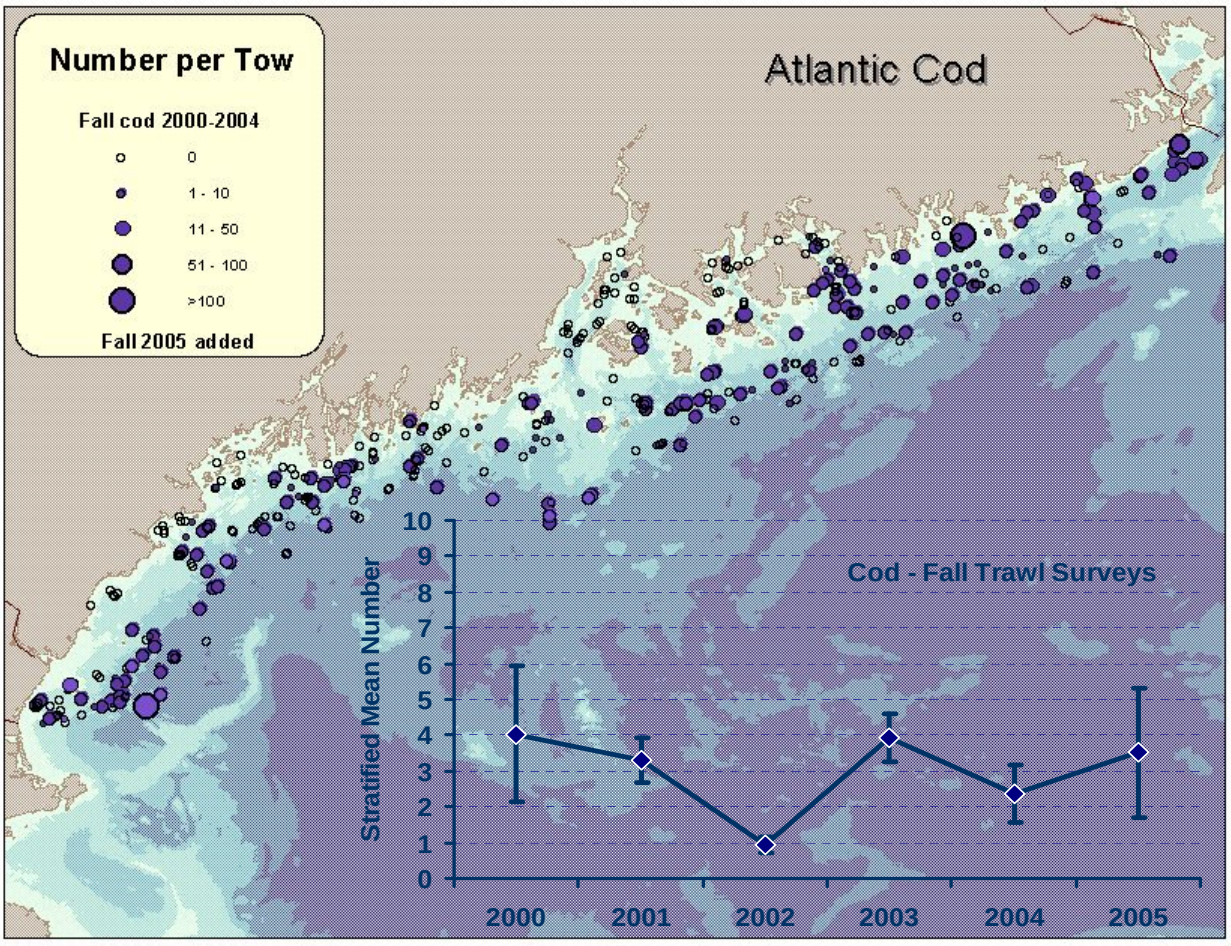


Figure 4. Regional distribution bubble plot, fall survey indices, and length frequencies for white hake.



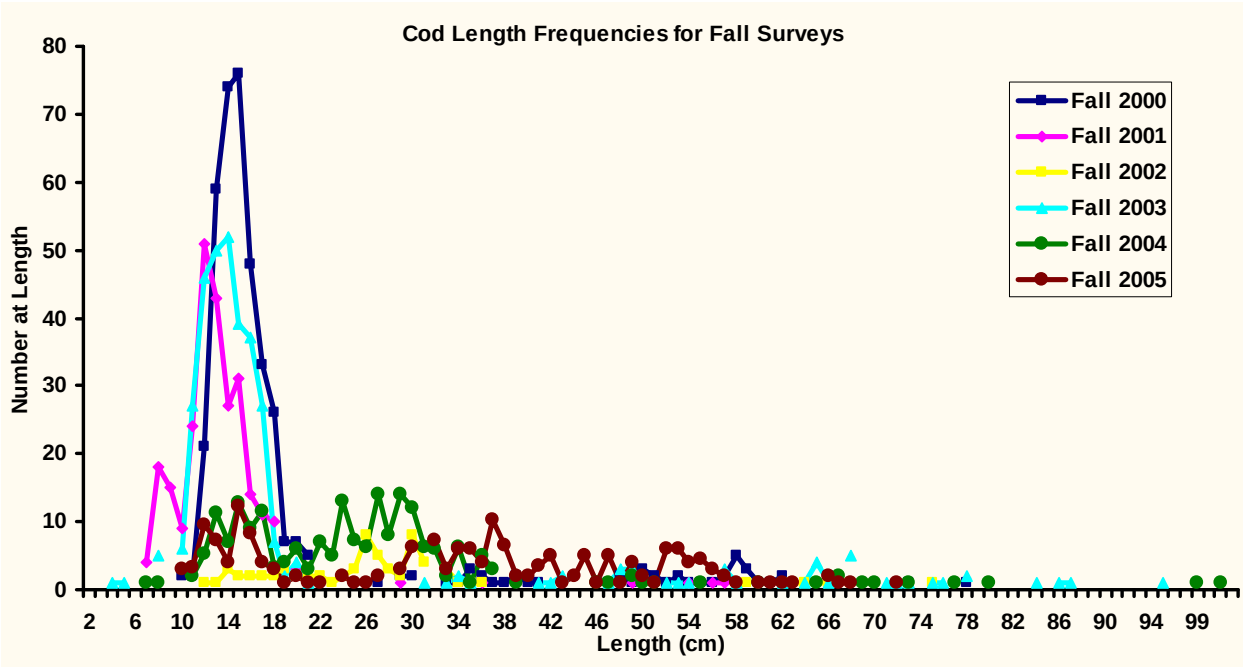
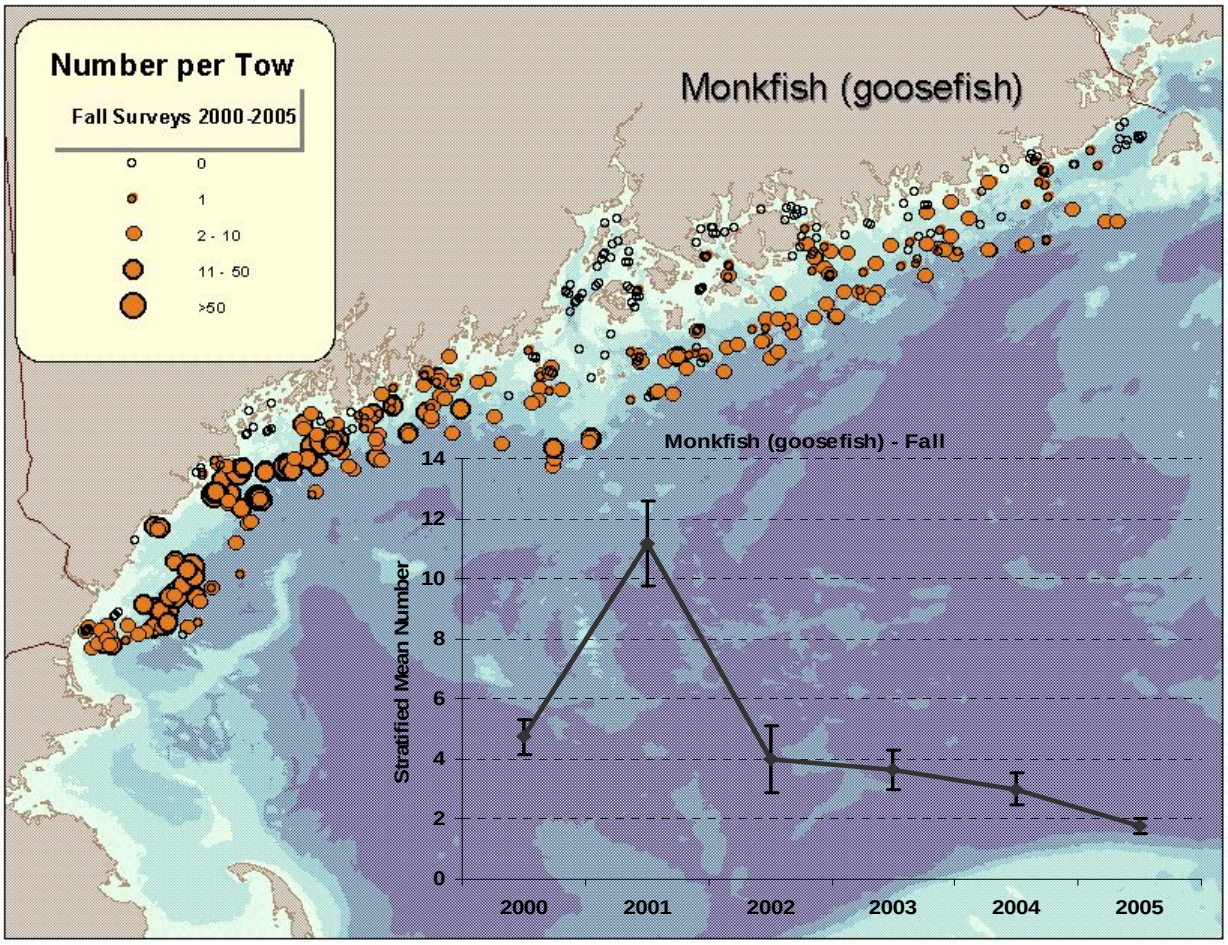


Figure 5. Regional distribution bubble plot, fall survey indices, and length frequencies for Atlantic cod.



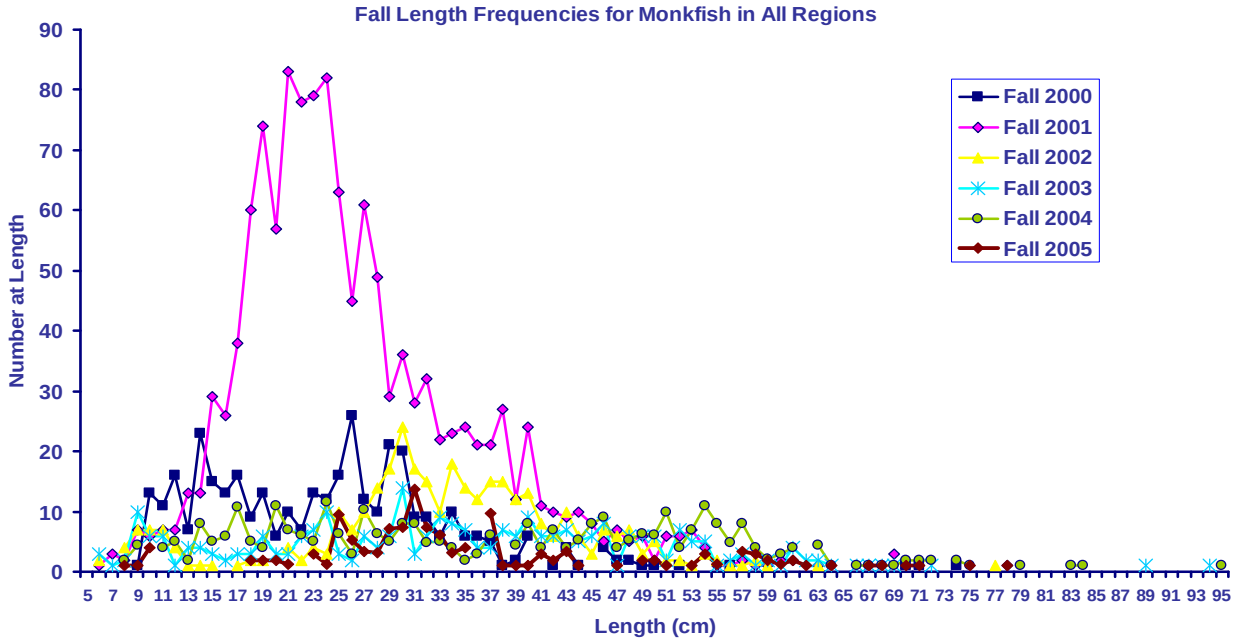


Figure 6. Regional distribution bubble plot, fall survey indices, and length frequencies for goosefish.