United States Department of Interior
Fish and Wildlife Service
Region 5
Federal Aid Division

2007 Annual Performance Report

State:	Massachusetts
Agency:	Division of Marine Fisheries
Project Title:	Massachusetts Fishery Resource Assessment
	FA Grant Agreement: F-56-R
Segment Number:	15
Period Covered:	January 1, 2007 – December 31, 2007
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Date Submitted:	March 14, 2008

Massachusetts Division of Marine Fisheries

Sport Fish Program
Massachusetts Fishery Resource Assessment: F-56-R-15
2007 Performance report

List of Active Jobs:

Job No. 1: Fishery Resource Assessment, Coastal Massachusetts
The Massachusetts Division of Marine Fisheries Resource Assessment Project completed the thirtieth annual spring and fall bottom trawl surveys of Massachusetts territorial waters in 2007. Detailed reports of the activities of each cruise follow.

Job No. 2: Winter Flounder Year-Class Strength
The Massachusetts Division of Marine Fisheries Resource Assessment Project completed the thirty-second annual seine survey of Nantucket Sound estuaries on the south shore of Cape Cod to assess southern New England stock winter flounder yoy cohort abundance. A report of the 2007 seine survey follows.

Appendix A: Indices of biomass, abundance, recruitment and abundance at age for select species.

Appendix B: Trends in observed bottom temperatures - Massachusetts bottom trawl survey, 1978 - 2007.

Appendix C: Corrections to the trawl survey database in 2007.

Appendix D: Outputs available to examine magnitude and trends in catch across individual strata. An example presenting winter flounder biomass indices from the spring survey.

CRUISE RESULTS

R/V GLORIA MICHELLE

2007 Massachusetts Inshore Spring
Bottom Trawl Survey
Cruise No. 200791

CRUISE PERIOD AND AREA

From May 7 through May 25, 2007 the Massachusetts Division of Marine Fisheries conducted its 30th spring bottom trawl survey. The survey extended from New Hampshire to Rhode Island boundaries seaward to three nautical miles including Cape Cod Bay and Nantucket Sound.

OBJECTIVES

Cruise objectives were 1) to determine the spring distribution, relative abundance, and size composition of fish and select invertebrate species; 2) to collect biological samples; and 3) to collect hydrographic data. Requested special collections were also undertaken.

METHODS

The study area is stratified based on five bio-geographic regions and six depth zones (Fig. 1). Trawl sites are allocated in proportion to stratum area and randomly chosen in advance within each sampling stratum. Randomly chosen stations in locations known to be untowable due to hard bottom are reassigned. Sampling intensity is approximately 1 station per 19 square nautical miles. A minimum of two stations are assigned to each stratum.

A standard tow of 20-minute duration at 2.5 knots was attempted at each station during daylight hours with a 3/4 size North Atlantic type two seam otter trawl (11.9 m headrope/15.5 m footrope) rigged with a 7.6 cm rubber disc sweep; 19.2 m, 9.5 mm chain bottom legs; 18.3 m, 9.5 mm wire top legs; and 1.8 X 1.0 m, 147 kg wooden trawl doors. The codend contains a 6.4 mm knotless liner to retain small fish. Prior to setting the net at each station, NOAA Corps officers surveyed the site by visually scanning for buoys marking fixed gear as well as determining the suitability of the bottom for towing the net based on the sounder image. Whenever necessary, sites were relocated due to untowable bottom or concentrations of fixed gear. Abbreviated tows of 13-19 minute duration were accepted as valid and expanded to the 20 minute standard.

Standard bottom trawl survey techniques were used when processing the catch. Generally, the

total weight (nearest 0.1 kg) and length-frequency (nearest centimeter) were recorded for each species on standard trawl logs. Collections of age and growth material, and biological observations were undertaken during the measuring operation. Specimens were also saved to fulfill requests. At each station, surface temperatures were measured with a bucket thermometer and surface salinity was recorded with a refractometer. Bottom temperatures were continuously recorded with an Onset Computer Tidbit ^{TM} attached to the net's headrope.

Fifteen MADMF employees participated in the survey as part of the scientific party, joined by two fisheries scientists from the National Marine Fisheries Service, an ichthyologist from Harvard University and graduate students from SMAST and the University of New Hampshire, (Table 1).

CRUISE SUMMARY

The spring 2007 survey got off to a great start. After 6 days, all of Region 5 was completed in addition to good progress in Cape Cod Bay. On day 7, May 13, the R/V would not start resulting in 1 ½ days layover in Gloucester while the alternator was replaced and batteries recharged. On the afternoon of May 14 the R/V was ready and stations 38-39 were completed en route to Sandwich. A strong SW gale kept the vessel tied to the dock in Sandwich on Tuesday, May 15. All remaining stations in Region 4 were completed on May 16, but a poor forecast postponed the 'Backside' trip in Region 3A. All 6 assigned stations in Buzzards Bay were completed on May 17 and the R/V moved on to Woods Hole. High winds made departure doubtful on May 18, but a failed starter kept the R/V at the dock, weather or not. A new starter was installed the same day, but continued strong winds forced another off day on May 19 All of Vineyard Sound, plus 11 stations in Nantucket Sound were completed on May 20 and 21 day-trips from Woods Hole. On May 22, the R/V departed Woods Hole at 4:00 am for the final 4 survey days. On the first day of the trip, 10 stations were completed along the backside of Martha's Vineyard and Nantucket. The R/V then steamed through the night to Race Point. On May 23 stations 82-90 were completed along the backside of Cape Cod taking advantage of favorable weather. Stations 91 and 92, on Monomoy Shoals and east of Great Point, in addition to six stations in eastern Nantucket Sound were completed on May 24 before the crew got a needed rest in Nantucket. Three final stations were accomplished in Nantucket Sound en route to Woods Hole to complete the spring survey.

One-hundred-one stations were completed over fifteen sampling days (Fig. 2, Table 2). All 101 completed stations are considered acceptable for assessment of all species, SHG <=136 (Table 3). There were no sub-standard stations (SHG 137 - 166) accepted for limited use (Fig. 3, Table 4). Nine attempted tows were aborted for various reasons as described in Table 5.

The primary goal of tallying weight, number, and a representative length frequency of each fish species in the catches was accomplished (Tables 6a and 6b). Unprecedented northern shrimp catches were observed in the two deepest strata of Region 4, the largest catch weighing more than 30 kg. Lymphocystis was extremely prevalent among American plaice in Region 5 (> 100 observations at stations 28 and 31). Gulf of Maine lobster catches were observed at record lows. Three Massachusetts Bay stations recorded greater than 90 kg of yellowtail flounder each.

Several large catches of cod (228 kg, 84 kg, 55 kg), were recorded in the northern portion of Region 3A with most fish 20-40 cm long. The deep stations of 3A also produced large catches of longhorn sculpins. Nantucket Sound catches were typically light with the exception of one station north of Tuckernuck Shoal that produced the largest spring catch of butterfish in the timeseries (128 kg). Smooth Dogfish were nearly absent. Small black sea bass (~25 cm) were consistently part of the catches of Region 1, and a fairly large catch of tautog (79 kg) was recorded at Clarks Cove.

Additional sampling goals were achieved (Table 7). To aid cooperative fisheries assessments, over 2,200 scale/otolith samples, as well as sex and maturity observations, were taken from Atlantic cod, Haddock, Pollock, American plaice, summer flounder, yellowtail flounder, winter flounder, windowpane flounder, black sea bass and scup. External pathology was monitored on over 3,750 flatfish. Considerable effort was expended processing more than 980 specimens of designated species to fulfill requests from federal, state, and university scientists, including approximately 180 little skates, 120 winter flounder, 593 YOY Atlantic cod, and various other species.

For further information on this survey or others in the time series, contact Jeremy King at (508) 990-2860 ext. 112.

Table 1. MADMF Spring Cruise 2007 Staffing List

Scientific Party

Name	Affiliation	Num. Days
Jeremy King	DMF - New Bedford	10
Vincent Manfredi	DMF - New Bedford	9
Matthew Camisa	DMF - New Bedford	8
Mark Szymanski	DMF - New Bedford	7
Derek Perry	DMF - New Bedford	4
Steve Wilcox	DMF - New Bedford	4
Greg Decelles	SMAST	4
Brian Kelly	DMF - New Bedford	3
Mark Rousseau	DMF - Gloucester	3
Reuben (J.A.) Macfarlan	DMF - Gloucester	3
Walter Bubbly	UNH	3
Paul Nitschke	NMFS - Woods Hole	2
Kelly Whitmore	DMF - New Bedford	1
Lou Camano	DMF - New Bedford	1
Brad Chase	DMF - Gloucester	1
Brant Macafee	DMF - Gloucester	1
Micah Dean	DMF - Gloucester	1
Scott Elzey	DMF - Gloucester	1
Rich McBride	NMFS - Woods Hole	1
Andrew Williston	Harvard University	1
Owen Nichols	SMAST	1
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R/V Gloria Michelle Crew

Name	Affiliation	Num. Days
Officers		
Tom Peltzer	NOAA OIC	16
Jason Appler	NOAA Officer	16
Andy Hall	NOAA Officer	1
Scott Sirois	NOAA Officer	1
Deck Crew		
Steve Flavin	NMFS - R/V Albatross	16
Bill Sutter	Contract Deckhand	16

Table 2. Station Information for the 2007 Massachusetts Spring Inshore Bottom Trawl Survey - Cruise No. 200791

STA	STRAT	DATE	TIME	DEPTH (M)	LATITUDE	LONG.	COURSE	DIST (N MI)	SURF SALIN ‰	SURF TEMP °C	BOT TEMP °C
1	26	5/7/2007	8:53	16	41°48.74	70°27.82	182	0.84	33	10.1	9.7
2	26	5/7/2007	10:07	13	41°51.27	70°29.97	339	0.85	32	10.4	9.4
3	27	5/7/2007	11:43	26	41°54.74	70°29.45	336	0.85	31	10.2	5.1
4	28	5/7/2007	13:00	37	41°54.72	70°25.22	295	0.88	32	10.0	4.8
5	29	5/7/2007	14:33	46	41°58.01	70°22.23	38	0.84	33	12.0	4.6
6	28	5/7/2007	16:20	31	41°52.35	70°20.87	148	0.82	32	10.2	5.3
7	25	5/8/2007	6:51	9	41°44.66	70°19.51	90	0.83	33	9.6	9.6
8	26	5/8/2007	8:00	15	41°46.36	70°16.70	319	0.82	33	9.8	9.4
9	27	5/8/2007	9:34	18	41°47.41	70°17.56	18	0.88	32	9.6	9.3
10	27	5/8/2007	10:47	26	41°50.73	70°18.63	278	0.82	32	9.5	5.5
11	26	5/8/2007	12:35	16	41°48.98	70°13.42	28	0.84	32	9.9	9.6
12	25	5/8/2007	13:42	9	41°49.96	70°09.89	22	0.80	31	9.6	10.6
13	25	5/8/2007	15:14	9	41°49.08	70°02.94	220	0.82	33	11.6	11.6
14	28	5/9/2007	7:48	34	42°05.95	70°32.49	204	0.53	33	9.5	4.3
15	29	5/9/2007	8:49	44	42°06.43	70°30.51	216	0.81	32	9.1	4.3
16	25	5/9/2007	10:32	9	42°08.64	70°41.11	152	0.82	33	10.0	7.7
17	32	5/9/2007	12:02	15	42°14.22	70°44.61	149	0.81	31	10.9	8.7
18	31	5/9/2007	13:46	10	42°16.81	70°51.22	319	0.82	32	11.8	7.8
19	32	5/9/2007	16:18	16	42°18.02	70°50.77	90	0.59	32	10.0	5.7
20	33	5/10/2007	6:12	23	42°18.60	70°47.86	237	0.54	32	10.3	4.3
21	35	5/10/2007	8:04	40	42°19.14	70°42.16	334	0.54	31	10.8	4.3
22	35	5/10/2007	9:18	53	42°21.84	70°41.68	19	0.56	32	11.4	4.3
23	36	5/10/2007	10:38	74	42°25.09	70°39.40	328	0.66	31	11.6	4.1
24	34	5/10/2007	12:21	41	42°28.99	70°45.78	238	0.81		11.5	4.1
25	34	5/10/2007	14:37	34	42°26.34	70°50.84	90	0.53	32	13.0	4.1
26	33	5/10/2007	15:33	21	42°26.99	70°53.55	107	0.81	32	13.4	4.3
27	35	5/11/2007	9:04	57	42°34.41	70°35.09	228	0.63	33	10.0	4.0
28	35	5/11/2007	10:00	50	42°35.44	70°34.91	229	0.82	33	10.0	4.0
29	34	5/11/2007	12:18	37	42°39.91	70°33.22	312	0.80	33	9.8	4.0
30	35	5/11/2007	14:11	52	42°41.80	70°33.87	138	0.51	33	10.6	4.3
31	36	5/12/2007	6:36	64	42°43.40	70°35.74	211	0.83	32	10.3	4.1
32	31	5/12/2007	8:11	9	42°41.26	70°43.24	231	0.82	33	9.0	6.1
33	31	5/12/2007	9:20	10	42°40.59	70°41.26	296	0.83	34	8.3	5.1
34	32	5/12/2007	10:01	13	42°41.70	70°42.97	210	0.82	33	9.5	4.6
35	33	5/12/2007	11:30	20	42°42.18	70°42.66	170	0.60	33	9.2	4.1
36	33	5/12/2007	12:43	21	42°44.98	70°44.91	33	0.72	32	10.0	4.0
37	34	5/12/2007	14:02	31	42°42.99	70°40.55	68	0.83	34	9.4	4.0
38	30	5/14/2007	16:25	60	42°06.08	70°21.48	336	0.84			4.3
39	30	5/14/2007	17:37	57	42°03.69	70°19.84	335	0.81	33	12.0	4.3
40	29	5/16/2007	7:18	46	41°59.24	70°24.40	17	0.69	33	10.4	4.3
41	29	5/16/2007	8:53	52	42°00.80	70°20.54	246	0.82	33	10.6	4.3
42	29	5/16/2007	10:03	47	42°00.21	70°15.72	268	0.80	33	10.2	4.3
43	27	5/16/2007	11:34	23	42°01.23	70°08.49	219	0.48	34	13.0	5.6
44	28	5/16/2007	13:13	36	41°56.76	70°14.61	251	0.84	33	11.3	4.9
45	28	5/16/2007	14:17	31	41°56.08	70°11.52	252	0.82	32	11.6	4.9
46	26	5/16/2007	15:47	12	41°54.53	70°07.80	237	0.77	33	13.2	12.6
47	27	5/16/2007	16:39	20	41°53.69	70°10.21	230	0.82	34	12.0	5.7
48	11	5/17/2007	7:53	8	41°39.79	70°44.91	174	0.81	33	13.3	13.5
49	11	5/17/2007	9:23	8	41°36.21	70°48.79	154	0.82	35	12.8	13.0
50	12	5/17/2007	10:04	13	41°34.76	70°47.54	138	0.50	33	12.5	12.2
51	12	5/17/2007	11:25	13	41°34.21	70°42.26	77	0.83	35	13.0	12.1
52	12	5/17/2007	12:22	15	41°32.09	70°43.33	45	0.81	34	12.9	11.6
53	12	5/17/2007	13:39	16	41°31.41	70°50.16	66	0.84	35	12.8	11.2
54	11	5/17/2007	14:54	6	41°34.70	70°54.31	158	0.80	34	13.1	12.6

Table 2 continued

STA	STRAT	DATE	TIME	DEPTH (M)	LATITUDE	LONG.	COURSE	DIST (N MI)	SURF SALIN ‰	SURF TEMP °C	BOT TEMP °C
55	12	5/20/2007	6:50	16	41°24.91	70°53.35	98	0.51	36	11.4	10.9
56	13	5/20/2007	7:42	27	41°23.61	70°51.73	17	0.83	35	11.4	10.4
57	13	5/20/2007	8:38	22	41°24.12	70°48.49	254	0.80	35	11.8	10.6
58	13	5/20/2007	9:39	22	41°22.33	70°49.03	256	0.81	35	11.5	10.6
59	14	5/20/2007	11:21	28	41°19.81	70°52.77	206	0.53	36	10.6	9.2
60	14	5/20/2007	12:43	30	41°21.59	70°55.19	232	0.78	35	10.5	9.2
61	16	5/20/2007	15:42	19	41°31.31	70°36.56	63	0.80	35	12.5	12.6
62	16	5/20/2007	17:13	16	41°30.67	70°33.51	95	0.78	35	12.8	12.9
63	16	5/21/2007	7:04	13	41°33.07	70°19.77	79	0.82	35	10.8	10.7
64	15	5/21/2007	8:15	6	41°35.20	70°19.35	115	0.82	35	12.6	12.4
65	15	5/21/2007	8:56	7	41°34.27	70°17.96	103	0.80	35	12.3	12.4
66	16	5/21/2007	10:12	12	41°31.53	70°13.51	334	0.85	35	9.8	9.7
67	15	5/21/2007	11:01	7	41°31.98	70°11.71	305	0.54	35	9.8	9.8
68	15	5/21/2007	12:05	8	41°35.97	70°08.36	249	0.83	35	13.0	12.4
69	15	5/21/2007	13:28	9	41°30.49	70°06.12	267	0.55	35	10.2	9.8
70	16	5/21/2007	14:27	13	41°29.05	70°11.90	68	0.80	35	10.8	9.9
71	15	5/21/2007	15:56	8	41°31.60	70°20.79	123	0.78	35	12.9	12.8
72	13	5/22/2007	6:25	22	41°18.10	70°41.73	64	0.82	34	11.7	11.0
73	13	5/22/2007	7:30	22	41°18.26	70°39.85	88	0.81	34	11.7	11.0
74	11	5/22/2007	8:47	9	41°20.58	70°38.28	87	0.80	35	12.8	12.1
75	12	5/22/2007	9:50	16	41°19.63	70°35.83	87	0.79	34	12.2	11.8
76	12	5/22/2007	11:03	16	41°19.46	70°30.71	176	0.75	35	12.4	11.6
77	17	5/22/2007	13:06	8	41°17.70	70°18.28	259	0.82	34	13.4	11.5
78	18	5/22/2007	14:15	12	41°16.22	70°16.41	323	0.87	35	12.8	11.5
79	19	5/22/2007	16:53	23	41°12.59	70°07.25	248	0.84	34	10.7	10.5
80	18	5/22/2007	17:16	14	41°13.18	70°04.07	68	0.83	35	10.6	10.4
81	17	5/22/2007	17:56	8	41°13.23	70°03.16	86	0.53	34	10.6	10.7
82	21	5/23/2007	4:44	65	42°06.60	70°13.22	256	0.81	34	10.6	4.6
83	20	5/23/2007	7:44	32	42°06.02	70°08.40	276	0.78		10.7	4.9
84	17	5/23/2007	9:04	9	42°02.75	70°03.25	312	0.57	34	10.8	10.4
85	20	5/23/2007	9:59	35	42°03.50	70°01.27	328	0.86	34	11.0	5.7
86	18	5/23/2007	11:00	16	42°01.93	70°01.65	320	0.47	33	10.8	9.5
87	21	5/23/2007	12:08	43	42°05.05	70°02.26	176	0.84	34	12.0	5.2
88	17	5/23/2007	14:15	10	41°56.38	69°58.32	159	0.84	34	10.8	9.9
89	18	5/23/2007	15:41	14	41°52.93	69°56.65	172	0.82	34	10.7	10.0
90	19	5/23/2007	18:35	21	41°43.35	69°52.91	358	0.53	34	9.6	7.1
91	18	5/24/2007	4:26	16	41°22.22	69°57.27	329	0.85	34	11.0	9.4
92	17	5/24/2007	6:03	11	41°27.62	70°00.84	65	0.56			9.9
93	16	5/24/2007	7:12	12	41°27.34	70°08.47	77	0.47	35	11.3	11.2
94	16	5/24/2007	8:15	12	41°25.72	70°10.61	78	0.55	34	11.4	11.0
95	16	5/24/2007	9:29	13	41°23.74	70°05.72	39	0.82	34	10.8	10.6
96	16	5/24/2007	11:00	12	41°19.85	70°08.75	258	0.81	34	13.0	12.7
97	15	5/24/2007	11:58	9	41°19.16	70°08.38	270	0.83	35	13.4	13.1
98	15	5/24/2007	13:02	9	41°19.49	70°11.43	300	0.84	34	13.8	13.5
99	15	5/25/2007	7:23	8	41°24.11	70°19.24	79	0.67	35	13.7	13.7
100	16	5/25/2007	9:39	20	41°27.32	70°19.44	87	0.81	34	13.0	12.8
101	16	5/25/2007	11:26	15	41°26.22	70°28.22	76	0.82	34	14.2	13.2

Table 3. Sampling Effort Assigned and Accomplished in Each Stratum on Cruise 200791
With Breakdown of Attempted Tows by Status.

Stratum	Region	Assigned Stations	Number of Stations Completed			Aborted Tows
			All Accepted Tows	Sub-Standard	Standard	
11	1	5	4	0	4	
12	1	7	7	0	7	
13	1	5	5	0	5	
14	1	2	2	0	2	
15	2	10	9	0	9	
16	2	11	11	0	11	1
17	3	5	5	0	5	
18	3	5	5	0	5	
19	3	2	2	0	2	2
20	3	2	2	0	2	1
21	3	2	2	0	2	
25	4	4	4	0	4	
26	4	5	5	0	5	
27	4	5	5	0	5	
28	4	5	5	0	5	
29	4	5	5	0	5	
30	4	2	2	0	2	
31	5	3	3	0	3	
32	5	3	3	0	3	1
33	5	4	4	0	4	
34	5	4	4	0	4	2
35	5	5	5	0	5	1
36	5	2	2	0	2	1
TOTALS		103	101	0	101	9

Note:

Standard Tows. SHG <=136. Recommended for use in all indices of abundance.

Sub-Standard Tows. SHG 137 - 166. Not recommended for use in indices other than spiny dogfish.

Aborted Tows. Not accepted for recording in database.

Table 4. Sub-Standard Tows (SHG 137 - 166) Completed on Cruise 200791. Not Advised for Indices of Abundance other than Spiny Dogfish.

Station	Stratum	SHG	Location	Description

No sub-standard tows accepted on cruise 200791.

Table 5. Attempted Tows Aborted During Cruise 200791.

Station	Stratum	Location	Description
19	32	Harding Ledge	Net damaged on rough bottom during tow.
25	34	Mass Bay	Lobster trawl intercepted and released.
27	35	Eastern Point	Ghost gear intercepted
29	34	Thachers Island	Hauled early due to fixed gear
31	36	NE of Dry Salvages	Lobster trawl intercepted and released.
83	20	Peaked Hill Bar	Net damaged on rough bottom during tow.
90	19	Pleasant Bay	Hung down during tow.
90	19	Pleasant Bay	Hauled early due to insufficient tow warp spread.
100	16	Horseshoe Shoal	Hung down during tow.

Table 6a. Total Catch Numbers and Weights Observed on the 2007
Massachusetts Spring Inshore Bottom Trawl Survey - Cruise 200791 - Sorted by Number

SPP CODE	COMMON NAME	COUNT	WEIGHT(kg)
181	NORTHERN SAND LANCE	11238	67.9
503	LONGFIN SQUID	5395	206.2
131	BUTTERFISH	4572	169.4
163	LONGHORN SCULPIN	4361	628.2
102	AMERICAN PLAICE	4146	395.8
73	ATLANTIC COD	4049	805.0
106	WINTER FLOUNDER	3627	737.6
72	SILVER HAKE	2826	76.6
105	YELLOWTAIL FLOUNDER	2669	676.1
26	LITTLE SKATE	2175	1395.5
33	ALEWIFE	873	43.4
143	SCUP	797	114.9
317	SPIDER CRAB UNCL	728	69.1
313	ATLANTIC ROCK CRAB	680	59.4
193	OCEAN POUT	677	419.0
108	WINDOWPANE	480	110.3
23	WINTER SKATE	479	350.6
77	RED HAKE	362	40.3
45	RAINBOW SMELT	341	3.8
401	SEA SCALLOP	337	15.2
322	LADY CRAB	265	17.6
103	SUMMER FLOUNDER	172	149.4
348	NORTHERN MOONSNAIL	162	13.9
32	ATLANTIC HERRING	161	1.7
104	FOURSPOT FLOUNDER	158	35.4
301	AMERICAN LOBSTER	151	54.5
171	NORTHERN SEAROBIN	147	10.6
15	SPINY DOGFISH	133	325.6
141	BLACK SEA BASS	132	36.1
183	DAUBED SHANNY	131	0.6
34	BLUEBACK HERRING	84	2.2
164	SEA RAVEN	81	58.7
177	TAUTOG	79	116.6
74	HADDOCK	76	97.1
336	CHANNELED WHELK	57	11.8
337	KNOBBED WHELK	53	17.4
182	SNAKEBLENNY	43	1.0
76	WHITE HAKE	38	6.1
172	STRIPED SEAROBIN	30	12.5
75	POLLOCK	29	0.2
78	SPOTTED HAKE	28	1.0
35	AMERICAN SHAD	27	1.9
107	WITCH FLOUNDER	26	7.9
403	ATLANTIC SURFCLAM	26	5.2
312	JONAH CRAB	20	4.1
338	MOON SNAIL, SHARK EYE, AND BABY-EAR	20	2.0
331	SEA URCHIN AND SAND DOLLAR UNCL	19	0.3
155	ACADIAN REDFISH	17	0.9
180	ROCK GUNNEL	17	0.1
117	SMALLMOUTH FLOUNDER	15	0.1
176	CUNNER	14	0.8
191	WRYMOUTH	9	1.8
116	NORTHERN PIPEFISH	7	0.0
502	NORTHERN SHORTFIN SQUID	6	0.5

Table 6a continued

SPP CODE	COMMON NAME	COUNT	WEIGHT(kg)
83	FOURBEARD ROCKLING	5	0.0
13	SMOOTH DOGFISH	4	11.6
185	OYSTER TOADFISH	4	2.2
314	BLUE CRAB	4	0.8
28	THORNY SKATE	3	2.7
409	OCEAN QUAHOG	3	0.7
139	STRIPED BASS	3	4.6
43	BAY ANCHOVY	3	0.0
109	GULF STREAM FLOUNDER	1	0.0
323	MANTIS SHRIMP UNCL	1	0.1
416	RAZOR AND JACKKNIFE CLAM UNCL	1	0.0
343	BLUE MUSSEL	1	0.1
318	HORSESHOE CRAB	1	0.5
165	ALLIGATORFISH	1	0.0
197	GOOSEFISH	1	0.1
305	SHRIMP UNCL		53.8
520	LONGFIN SQUID EGG MOPS		46.8
		53281	**7503.9**

Table 6b. Total Catch Numbers and Weights Observed on the 2007
Massachusetts Spring Inshore Bottom Trawl Survey - Cruise 200791 - Sorted by Weight

SPP CODE	COMMON NAME	COUNT	WEIGHT(kg)
26	LITTLE SKATE	2175	1395.5
73	ATLANTIC COD	4049	805.0
106	WINTER FLOUNDER	3627	737.6
105	YELLOWTAIL FLOUNDER	2669	676.1
163	LONGHORN SCULPIN	4361	628.2
193	OCEAN POUT	677	419.0
102	AMERICAN PLAICE	4146	395.8
23	WINTER SKATE	479	350.6
15	SPINY DOGFISH	133	325.6
503	LONGFIN SQUID	5395	206.2
131	BUTTERFISH	4572	169.4
103	SUMMER FLOUNDER	172	149.4
177	TAUTOG	79	116.6
143	SCUP	797	114.9
108	WINDOWPANE	480	110.3
74	HADDOCK	76	97.1
72	SILVER HAKE	2826	76.6
317	SPIDER CRAB UNCL	728	69.1
181	NORTHERN SAND LANCE	11238	67.9
313	ATLANTIC ROCK CRAB	680	59.4
164	SEA RAVEN	81	58.7
301	AMERICAN LOBSTER	151	54.5
305	SHRIMP UNCL		53.8
520	LONGFIN SQUID EGG MOPS		46.8
33	ALEWIFE	873	43.4
77	RED HAKE	362	40.3
141	BLACK SEA BASS	132	36.1
104	FOURSPOT FLOUNDER	158	35.4
322	LADY CRAB	265	17.6
337	KNOBBED WHELK	53	17.4
401	SEA SCALLOP	337	15.2
348	NORTHERN MOONSNAIL	162	13.9
172	STRIPED SEAROBIN	30	12.5
336	CHANNELED WHELK	57	11.8
13	SMOOTH DOGFISH	4	11.6
171	NORTHERN SEAROBIN	147	10.6
107	WITCH FLOUNDER	26	7.9
76	WHITE HAKE	38	6.1
403	ATLANTIC SURFCLAM	26	5.2
139	STRIPED BASS	3	4.6
312	JONAH CRAB	20	4.1
45	RAINBOW SMELT	341	3.8
28	THORNY SKATE	3	2.7
34	BLUEBACK HERRING	84	2.2
185	OYSTER TOADFISH	4	2.2
338	MOON SNAIL, SHARK EYE, AND BABY-EAR	20	2.0
35	AMERICAN SHAD	27	1.9
191	WRYMOUTH	9	1.8
32	ATLANTIC HERRING	161	1.7
182	SNAKEBLENNY	43	1.0
78	SPOTTED HAKE	28	1.0
155	ACADIAN REDFISH	17	0.9
176	CUNNER	14	0.8
314	BLUE CRAB	4	0.8

Table 6b continued

SPP CODE	COMMON NAME	COUNT	WEIGHT(kg)
409	OCEAN QUAHOG	3	0.7
183	DAUBED SHANNY	131	0.6
502	NORTHERN SHORTFIN SQUID	6	0.5
318	HORSESHOE CRAB	1	0.5
331	SEA URCHIN AND SAND DOLLAR UNCL	19	0.3
75	POLLOCK	29	0.2
180	ROCK GUNNEL	17	0.1
117	SMALLMOUTH FLOUNDER	15	0.1
323	MANTIS SHRIMP UNCL	1	0.1
343	BLUE MUSSEL	1	0.1
197	GOOSEFISH	1	0.1
116	NORTHERN PIPEFISH	7	0.0
83	FOURBEARD ROCKLING	5	0.0
43	BAY ANCHOVY	3	0.0
109	GULF STREAM FLOUNDER	1	0.0
416	RAZOR AND JACKKNIFE CLAM UNCL	1	0.0
165	ALLIGATORFISH	1	0.0
		53281	**7503.9**

Table 7. Number of individuals obtained for age, growth, maturity, external pathology and special studies during Massachusetts DMF Cruise 200791 from 7 May to 25 May 2007.

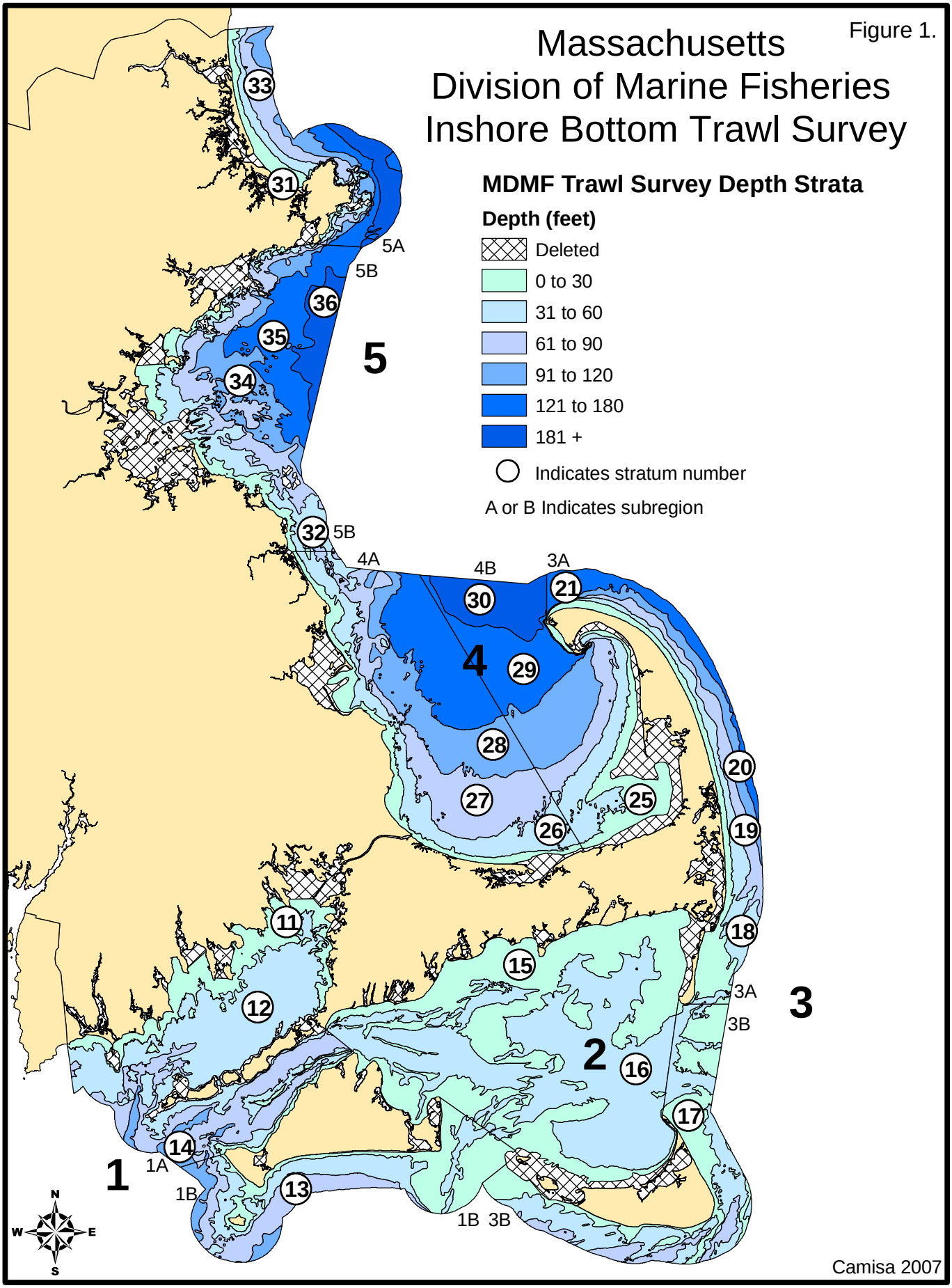
			Age and Growth Collection		
Species	Maturity Observation	External Pathology	Scales	Otoliths	Opercula
Atlantic Cod	345	2		345	
Haddock	27			27	
Pollock	1			1	
American Plaice	72	1202	72		
Summer Flounder	125	80	125		
Yellowtail Flounder	342	660	342		
Winter Flounder	1017	1760	1017		
Windowpane Flounder	111	54	111		
Black Sea Bass	50		50		
Scup	130		130		
TOTAL	**2,220**	**3,758**	**1,847**	**373**	**0**

OTHER COLLECTIONS:

120 winter flounder samples were collected for Brian Taplin (EPA) for a study of juvenile habitat use and subsequent recruitment.
Over 50 frozen samples of 14 fish species were collected for Kelly Goodwin (University of Arkansas) for a reference collection.
Over 180 little skates were collected for James Sulikowski (UNE) for a GOM size at maturity study.
38 fresh samples of 10 different fish species were collected for Pete Chase (NEFSC) for a maturity workshop.
593 YOY Atlantic cod were saved from seven stations for David Berlinsky for a stock ID study.
Derek Perry (DMF) conducted sampling of smooth dogfish while onboard.
Wally Bubbly (UNH) conducted sampling of spiny dogfish while onboard.
Assorted species saved for ID and public outreach (DMF).

Figure 1.

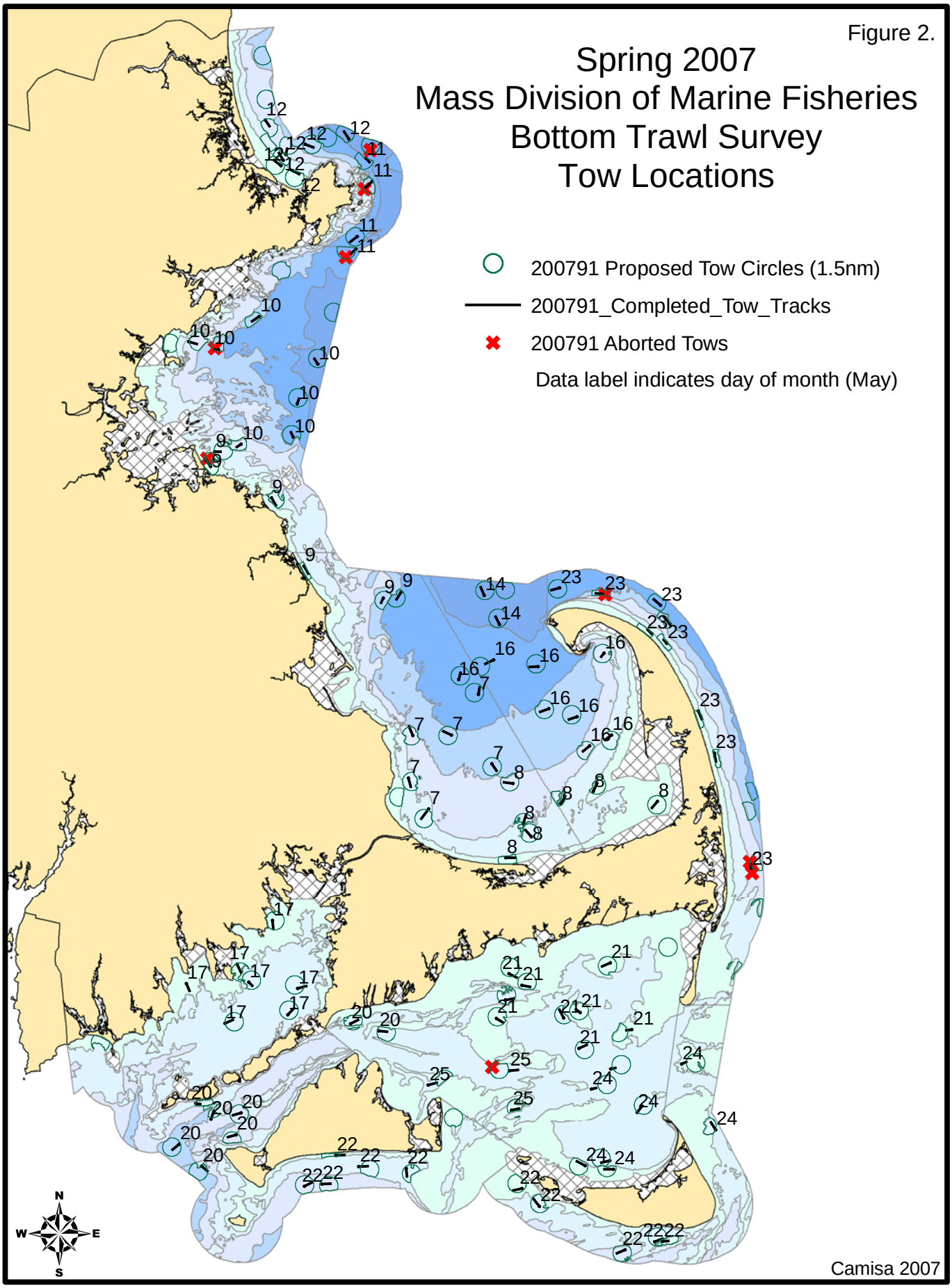
Massachusetts Division of Marine Fisheries Inshore Bottom Trawl Survey



Camisa 2007

Figure 2.

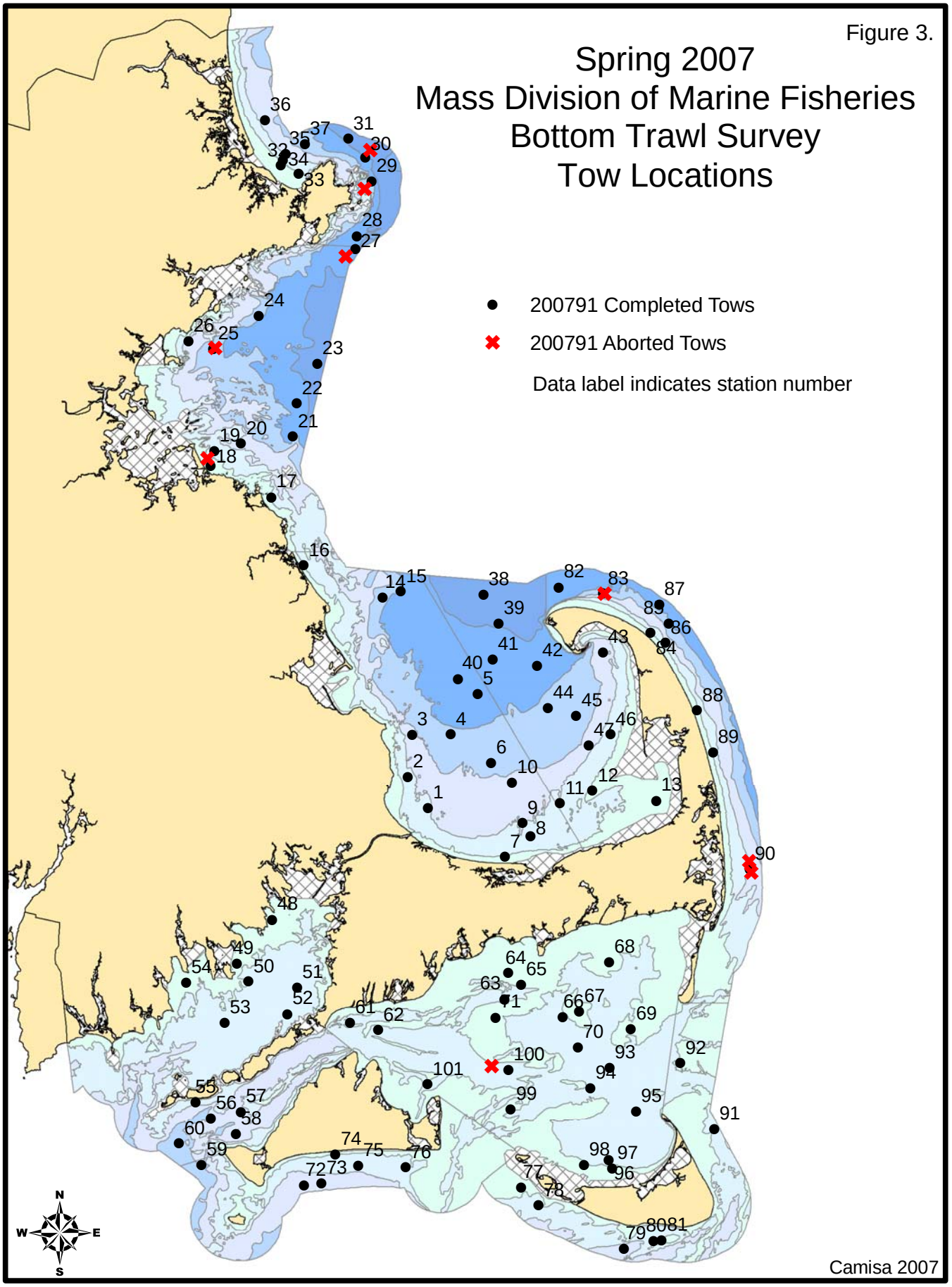
Spring 2007
Mass Division of Marine Fisheries
Bottom Trawl Survey
Tow Locations



Camisa 2007

Figure 3.

Spring 2007
Mass Division of Marine Fisheries
Bottom Trawl Survey
Tow Locations



CRUISE RESULTS

R/V GLORIA MICHELLE

2007 Massachusetts Inshore Fall
Bottom Trawl Survey
Cruise No. 200792

CRUISE PERIOD AND AREA

From Sept 4 through Sept 20, 2007 the Massachusetts Division of Marine Fisheries conducted its 30th fall bottom trawl survey. The survey extended from New Hampshire to Rhode Island boundaries seaward to three nautical miles including Cape Cod Bay and Nantucket Sound.

OBJECTIVES

Cruise objectives were 1) to determine the fall distribution, relative abundance, and size composition of fish and select invertebrate species; 2) to collect biological samples; and 3) to collect hydrographic data. Requested special collections were also undertaken.

METHODS

The study area is stratified based on five bio-geographic regions and six depth zones (Fig. 1). Trawl sites are allocated in proportion to stratum area and randomly chosen in advance within each sampling stratum. Randomly chosen stations in locations known to be untowable due to hard bottom are reassigned. Sampling intensity is approximately 1 station per 19 square nautical miles. A minimum of two stations are assigned to each stratum.

A standard tow of 20-minute duration at 2.5 knots was attempted at each station during daylight hours with a 3/4 size North Atlantic type two seam otter trawl (11.9 m headrope/15.5 m footrope) rigged with a 7.6 cm rubber disc sweep; 19.2 m, 9.5 mm chain bottom legs; 18.3 m, 9.5 mm wire top legs; and 1.8 X 1.0 m, 147 kg wooden trawl doors. The codend contains a 6.4 mm knotless liner to retain small fish. Prior to setting the net at each station, NOAA Corps officers surveyed the site by visually scanning for buoys marking fixed gear as well as determining the suitability of the bottom for towing the net based on the sounder image. Whenever necessary, sites were relocated due to untowable bottom or concentrations of fixed gear. Abbreviated tows of 13-19 minute duration were accepted as valid and expanded to the 20 minute standard.

Standard bottom trawl survey techniques were used when processing the catch. Generally, the

total weight (nearest 0.1 kg) and length-frequency (nearest centimeter) were recorded for each species on standard trawl logs. Collections of age and growth material, and biological observations were undertaken during the measuring operation. Specimens were also saved to fulfill requests. At each station, surface temperatures were measured with a bucket thermometer and surface salinity was recorded with a refractometer. Bottom temperatures were continuously recorded with an Onset Computer Tidbit ^{TM} attached to the net's headrope.

Seventeen MADMF employees participated in the survey as part of the scientific party, joined by cooperating scientists from the National Marine Fisheries Service, the Environmental Protection Agency and graduate students from SMAST/UMASS, and the University of Rhode Island (Table 1).

CRUISE SUMMARY

The fall survey 2007 was completed in seventeen consecutive days as scheduled. The weather was generally favorable throughout the September 4 – 20 survey period. A failed starter while tied up in Provincetown resulted in a one-half day delay which was overcome by completing 4 stations prior to anchoring the R/V off Chatham on May 12. The dispersal of planned stations allowed for three nights in Gloucester (May 7 – 9) and only one night in Hull (May 6) which resulted in a welcome reduction in the stations assigned for the northernmost sampling day (May 9) into Ipswich Bay. Region 3B was completed on May 17 without circumnavigating Nantucket thanks to completion of stations in the vicinity of Great Round Shoal on May 13 and 14. The remaining stations south of Madaket were accomplished by transiting through Muskeget Channel.

One-hundred-five stations were completed over seventeen sampling days (Fig. 2, Table 2). One-hundred-one completed stations are considered acceptable for assessment of all species, SHG <=136 (Table 3). There were four sub-standard stations (SHG 137 - 166) accepted for limited use (Fig. 3, Table 4). An extra station was completed in stratum 34 as a possible alternate to station 23 which came up with a significant amount of ghost gillnet and lobster gear hung in the mouth of the net. Subsequent analysis of the catch at station 23 led to a decision to accept the station as representative. Two other tows were aborted in Massachusetts Bay due to the interception of discarded/and or lost fishing gear. Large dogfish catches and high density of fixed gear continued to make accomplishing sampling goals a challenge in Region 3A. In addition to these challenges, stations 51 and 52 were moved south due to shoaling in the vicinity of Peaked Hill Bar. The abundance of dogfish in strata 19 - 21 resulted in four substandard tows and 1 abort in those strata. No standard hauls were accomplished in stratum 20 where the dogfish abundance was greatest. In the entire survey area, eight attempted tows were aborted as described in Table 5.

The primary goal of tallying weight, number, and a representative length frequency of each fish species in the catches was accomplished (Tables 6a and 6b). Scup and longfin squid were the most abundant species recorded. Juvenile squid were fairly abundant in all regions. Young-of-year (yoy) scup were particularly abundant in region 1, while region 2 catches were considerably lower. Both bay anchovy and yoy menhaden were recorded at more stations and in higher

abundance than previously recorded in the fall survey. Winter skate catches were low in regions 1 – 3 while little skates were particularly abundant in regions 4 and 5. Alligatorfish, although never common, were absent from the fall survey for the first time. Smooth dogfish pups were absent for the third fall survey since 2004, after being observed on each fall survey 1978 – 2003. Spiny dogfish biomass far exceeded all other species, driven by large catches in strata 19 and 20.

Additional sampling goals were achieved (Table 7). To aid cooperative fisheries assessments, over 1200 scale/otolith samples, as well as sex and maturity observations, were taken from Atlantic cod, Haddock, summer flounder, yellowtail flounder, winter flounder, windowpane flounder, black sea bass and scup. External pathology was monitored on over 4,300 flatfish. Considerable effort was expended processing more than 600 specimens of designated species to fulfill requests from federal, state, and university scientists, including skates, monkfish, winter flounder, river herring, lady crabs and black sea bass.

For further information on this survey or others in the time series, contact Jeremy King at (508) 990-2860 ext. 112.

Table 1. MADMF Fall Cruise 2007 Staffing List

Scientific Party

Name	Affiliation	Num. Days
Jeremy King	DMF - New Bedford	9
Matthew Camisa	DMF - New Bedford	8
Vincent Manfredi	DMF - New Bedford	8
Mark Szymanski	DMF - New Bedford	6
Brant McAfee	DMF - Gloucester	5
Derek Perry	DMF - New Bedford	4
Steve Wilcox	DMF - New Bedford	4
Mark Rousseau	DMF - Gloucester	3
Brian Kelly	DMF - New Bedford	3
Dave McElroy	URI	3
Matt Tweedie	UMASS - Dartmouth	2
Bill Hoffman	DMF - Gloucester	1
Brad Chase	DMF - Gloucester	1
Matt Ayer	DMF - Gloucester	1
Scott Elzey	DMF - Gloucester	1
Brad Schondelmier	DMF - New Bedford	1
Jim Rossignol	DMF - New Bedford	1
Mike Pol	DMF - New Bedford	1
Tom Currier	DMF - New Bedford	1
Eric Nelson	EPA - Boston	1
Paul Nitschke	NMFS - Woods Hole	1
Corey Heston	SMAST	1
Fiona Hogan	SMAST	1
		67

R/V Gloria Michelle Crew

Name	Affiliation	Num. Days
Officers		
Tom Peltzer	NOAA OIC	17
Jason Appler	NOAA Officer	17
Deck Crew		
Bill Sutter	Contract Deckhand	17
Werner Schreiner	NMFS - Milford	11
Jeff Pessutti	NMFS - Sandy Hook	6

Table 2. Station Information for the 2007 Massachusetts Fall Inshore Bottom Trawl Survey - Cruise No. 200792

STA	STRAT	DATE	TIME	DEPTH (M)	LATITUDE	LONG.	COURSE	DIST (N MI)	SURF SALIN ‰	SURF TEMP °C	BOT TEMP °C
1	26	9/4/2007	9:26	17	41°48.64	70°28.08	160	0.84	33	19.1	8.9
2	25	9/4/2007	10:48	8	41°49.63	70°30.90	188	0.84	32	18.5	11.5
3	27	9/4/2007	12:44	18	41°46.76	70°22.11	80	0.72	32	19.9	9.5
4	26	9/4/2007	13:45	18	41°46.15	70°21.14	78	0.53	33	20.0	9.8
5	26	9/4/2007	15:05	18	41°45.99	70°18.53	87	0.83	32	19.8	10.8
6	25	9/4/2007	16:13	10	41°44.88	70°17.68	73	0.54	33	19.0	16.3
7	26	9/5/2007	7:18	13	41°46.56	70°12.81	85	0.53	34	19.4	17.5
8	25	9/5/2007	8:39	9	41°48.55	70°04.89	75	0.69	33	19.9	19.8
9	26	9/5/2007	10:18	11	41°49.46	70°11.66	51	0.52	33	19.2	17.2
10	25	9/5/2007	12:01	7	41°55.27	70°06.04	12	0.53	33	19.8	19.4
11	27	9/5/2007	12:52	22	41°54.23	70°09.96	62	0.54	33	19.4	9.0
12	27	9/5/2007	13:50	25	41°51.79	70°13.13	49	0.53	33	19.3	8.8
13	28	9/5/2007	14:41	28	41°51.94	70°15.15	57	0.83	33	19.4	8.3
14	28	9/5/2007	16:01	36	41°55.38	70°18.26	50	0.82	33	19.8	7.8
15	27	9/6/2007	6:41	27	41°57.38	70°32.01	140	0.83	33	17.6	8.4
16	28	9/6/2007	7:54	35	41°59.85	70°32.28	200	0.82	34	17.6	7.7
17	27	9/6/2007	9:05	24	42°02.81	70°34.53	181	0.84	33	17.5	8.5
18	34	9/6/2007	12:58	39	42°18.77	70°43.22	152	0.49	32	17.4	7.7
19	32	9/6/2007	15:22	19	42°18.28	70°49.40	265	0.56	33	16.7	10.3
20	33	9/6/2007	16:12	23	42°18.70	70°47.95	248	0.57	33	16.8	9.5
21	32	9/7/2007	6:37	13	42°24.77	70°56.47	113	0.72	33	16.0	11.6
22	31	9/7/2007	7:52	10	42°24.89	70°57.33	187	0.66	32	16.4	13.0
23	34	9/7/2007	9:25	34	42°26.45	70°50.88	268	0.77	33	16.5	7.2
24	33	9/7/2007	10:17	25	42°27.01	70°52.56	234	0.82	32	17.0	8.1
25	35	9/7/2007	12:22	54	42°27.60	70°43.20	319	0.82	33	17.8	6.6
26	35	9/7/2007	13:27	45	42°31.15	70°42.75	204	0.84	33	18.0	7.0
27	36	9/7/2007	15:58	75	42°29.28	70°37.47	16	0.54	33	18.0	6.7
28	34	9/8/2007	6:24	36	42°33.06	70°43.15	247	0.62	33	14.5	7.7
29	35	9/8/2007	9:24	63	42°32.73	70°36.75	177	0.58	33	16.3	7.0
30	35	9/8/2007	10:31	53	42°35.50	70°34.52	224	0.82	33	14.7	6.9
31	36	9/8/2007	12:07	86	42°40.16	70°31.38	168	0.83			6.4
32	35	9/8/2007	13:48	42	42°43.02	70°36.90	299	0.80	32	18.4	6.1
33	34	9/8/2007	14:47	35	42°42.21	70°37.90	272	0.82			6.9
34	33	9/8/2007	15:40	21	42°41.59	70°40.20	74	0.83	32	17.1	8.5
35	31	9/9/2007	7:28	10	42°41.88	70°44.14	120	0.82	33	15.0	9.5
36	32	9/9/2007	9:08	18	42°45.75	70°46.53	170	0.63	32	16.8	8.9
37	33	9/9/2007	9:57	23	42°46.76	70°46.25	184	0.76	34	15.7	8.6
38	31	9/9/2007	10:52	10	42°45.04	70°47.03	333	0.50	32	16.2	10.7
39	34	9/9/2007	12:10	30	42°42.76	70°41.06	89	0.83	34	16.5	7.3
40	29	9/10/2007	8:06	50	42°07.01	70°29.16	338	0.82	34	17.7	6.7
41	29	9/10/2007	9:17	46	42°04.55	70°30.41	1	0.82	33	18.0	6.9
42	28	9/10/2007	10:48	37	41°59.64	70°29.18	340	0.83	34	18.2	6.9
43	28	9/10/2007	12:08	36	41°57.14	70°28.21	182	0.82	33	18.6	7.1
44	29	9/10/2007	14:40	42	41°58.15	70°18.90	252	0.63	33	19.8	6.7
45	29	9/10/2007	15:24	40	41°57.32	70°20.78	244	0.58	32	19.7	6.9
46	29	9/11/2007	7:22	37	41°58.08	70°15.21	251	0.85	33	19.4	6.9
47	30	9/11/2007	9:00	59	42°03.82	70°18.77	74	0.82	33	19.4	6.1
48	30	9/11/2007	10:06	61	42°05.12	70°18.93	75	0.85	33	19.0	6.0
49	20	9/11/2007	13:32	33	42°06.05	70°08.53	273	0.49	33	16.6	6.6
50	21	9/12/2007	14:02	47	42°04.87	70°01.46	305	0.51		17.3	7.3
51	17	9/12/2007	15:12	10	42°00.01	70°00.61	332	0.52	33	17.0	15.4
52	17	9/12/2007	16:01	10	41°58.19	69°59.40	336	0.54	33	16.8	14.1
53	19	9/12/2007	17:14	22	41°53.18	69°56.05	349	0.54		16.8	12.8
54	20	9/13/2007	5:45	33	41°49.39	69°53.41	338	0.17	33	16.1	9.7

Table 2 continued.

STA	STRAT	DATE	TIME	DEPTH (M)	LATITUDE	LONG.	COURSE	DIST (N MI)	SURF SALIN ‰	SURF TEMP °C	BOT TEMP °C
55	21	9/13/2007	6:41	39	41°48.93	69°52.34	352	0.17	34	15.8	10.0
56	18	9/13/2007	7:42	14	41°45.01	69°54.70	358	0.53	34	15.8	14.6
57	18	9/13/2007	8:33	14	41°43.53	69°54.25	1	0.53	34	16.2	13.8
58	19	9/13/2007	9:21	19	41°43.29	69°52.98	6	0.52	34	16.3	13.1
59	18	9/13/2007	12:28	15	41°27.56	70°02.11	47	0.82	34	19.2	17.2
60	17	9/13/2007	13:45	11	41°27.56	70°00.66	19	0.53	34	16.6	16.5
61	16	9/13/2007	14:32	17	41°27.48	70°04.33	92	0.81	33	17.2	17.0
62	16	9/13/2007	16:01	13	41°31.05	70°13.49	113	0.54	33	21.5	21.5
63	16	9/14/2007	7:02	10	41°33.61	70°09.58	281	0.84	34	20.1	21.3
64	15	9/14/2007	8:26	6	41°34.65	70°01.32	279	0.85	35	20.6	15.7
65	15	9/14/2007	9:53	9	41°30.54	70°06.65	233	0.84	34	20.6	19.3
66	17	9/14/2007	11:42	9	41°23.77	69°59.46	83	0.82	34	19.6	19.1
67	18	9/14/2007	12:55	19	41°26.48	69°59.14	276	0.83	34	17.4	17.2
68	16	9/14/2007	14:12	14	41°27.01	70°06.68	92	0.80	34	19.6	19.1
69	16	9/14/2007	15:22	12	41°28.25	70°12.55	64	0.74	34	21.2	21.2
70	16	9/15/2007	7:38	13	41°28.59	70°13.02	295	0.83	32	20.7	21.0
71	15	9/15/2007	8:37	9	41°28.51	70°15.23	286	0.79	33	20.8	20.9
72	16	9/15/2007	10:01	17	41°27.38	70°18.59	271	0.77	33	21.0	20.9
73	15	9/15/2007	11:05	8	41°25.94	70°19.95	258	0.89	32	20.2	20.4
74	16	9/15/2007	13:01	11	41°31.46	70°29.26	275	0.84	34	20.9	21.0
75	15	9/15/2007	15:18	9	41°34.98	70°22.98	62	0.83	34	21.4	21.3
76	15	9/15/2007	16:15	9	41°34.90	70°20.98	85	0.72	33	21.0	21.5
77	15	9/16/2007	6:49	7	41°31.86	70°20.86	116	0.63	34	20.8	20.9
78	15	9/16/2007	8:45	10	41°24.73	70°08.70	256	0.79	34	20.0	20.2
79	16	9/16/2007	10:03	13	41°22.88	70°12.39	260	0.81	34	20.2	20.1
80	15	9/16/2007	11:29	9	41°21.00	70°14.49	269	0.58	34	19.4	19.3
81	16	9/16/2007	12:31	14	41°22.01	70°08.90	262	0.84	34	20.6	20.4
82	16	9/16/2007	13:24	14	41°20.01	70°07.67	338	0.83	34	20.5	20.2
83	15	9/16/2007	14:24	9	41°18.98	70°08.19	286	0.85	34	20.4	19.6
84	11	9/17/2007	8:01	7	41°24.37	70°25.60	182	0.81	34	19.3	15.0
85	19	9/17/2007	10:36	22	41°14.56	70°16.64	105	0.83	34	18.6	17.7
86	18	9/17/2007	11:27	16	41°15.64	70°15.17	118	0.84	34	18.9	18.9
87	17	9/17/2007	12:17	9	41°16.30	70°13.90	133	0.52	34	18.9	18.9
88	12	9/18/2007	6:24	11	41°34.86	70°43.45	183	0.81	33	18.4	20.2
89	12	9/18/2007	7:57	12	41°36.92	70°42.13	200	0.53	35	20.0	20.0
90	11	9/18/2007	8:50	8	41°38.89	70°43.76	180	0.63	33	19.2	20.0
91	11	9/18/2007	11:32	7	41°36.36	70°48.90	156	0.56	34	20.0	19.8
92	12	9/18/2007	12:54	13	41°28.15	70°49.28	29	0.83	33	19.0	18.7
93	12	9/18/2007	14:02	16	41°27.55	70°53.37	44	0.53	34	19.0	18.6
94	12	9/18/2007	15:36	12	41°29.34	71°03.74	169	0.83	33	19.0	18.5
95	11	9/19/2007	6:13	9	41°25.26	70°45.30	51	0.83	34	18.3	18.5
96	13	9/19/2007	7:14	23	41°23.46	70°48.56	64	0.83	34	18.1	18.1
97	13	9/19/2007	8:06	25	41°23.53	70°50.32	74	0.84	34	18.3	17.9
98	13	9/19/2007	9:02	26	41°22.79	70°53.05	61	0.81	34	18.3	17.9
99	14	9/19/2007	10:20	31	41°21.87	70°55.44	76	0.80	34	18.4	15.2
100	14	9/19/2007	11:42	32	41°18.76	70°52.21	180	0.82		18.4	15.3
101	13	9/20/2007	8:22	22	41°18.09	70°39.60	256	0.84	33	18.8	18.4
102	13	9/20/2007	9:30	21	41°18.39	70°35.15	270	0.80	34	18.6	18.3
103	12	9/20/2007	10:26	16	41°19.52	70°36.87	93	0.83	34	19.0	18.5
104	11	9/20/2007	11:24	9	41°20.64	70°37.85	87	0.83	33	19.3	18.8
105	12	9/20/2007	12:37	15	41°19.64	70°41.17	86	0.84	34	19.4	18.8

Table 3. Sampling Effort Assigned and Accomplished in Each Stratum on Cruise 200792
With Breakdown of Attempted Tows by Status.

Stratum	Region	Assigned Stations	Number of Stations Completed			Aborted Tows
			All Accepted Tows	Sub-Standard	Standard	
11	1	5	5	0	5	1
12	1	7	7	0	7	
13	1	5	5	0	5	
14	1	2	2	0	2	
15	2	10	10	0	10	1
16	2	11	11	0	11	
17	3	5	5	0	5	
18	3	5	5	0	5	
19	3	2	3	1	2	
20	3	2	2	2	0	
21	3	2	2	1	1	1
25	4	4	4	0	4	
26	4	5	5	0	5	
27	4	5	5	0	5	
28	4	5	5	0	5	
29	4	5	5	0	5	1
30	4	2	2	0	2	
31	5	3	3	0	3	
32	5	3	3	0	3	
33	5	4	4	0	4	1
34	5	4	5	0	5	
35	5	5	5	0	5	2
36	5	2	2	0	2	1
TOTALS		103	105	4	101	8

Note:

Standard Tows. SHG <=136. Recommended for use in all indices of abundance.

Sub-Standard Tows. SHG 137 - 166. Not recommended for use in indices other than spiny dogfish.

Aborted Tows. Not accepted for recording in database.

Table 4. Sub-Standard Tows (SHG 137 - 166) Completed on Cruise 200792. Not Advised for Indices of Abundance other than Spiny Dogfish.

Station	Stratum	SHG	Location	Description
49	20	149	NE of Peaked Hill Bar	Dogfish tow. Most of the catch was released. Net damage at haulback.
53	19	142	N of Nauset	Dogfish tow. Most of the catch was released. Ghost gear intercepted.
54	20	141	Nauset	Dogfish tow. Hauled at 4 minutes due to slowing tow speed and sign on sounder.
55	21	141	Nauset	Dogfish tow. Hauled at 4 minutes due to sign on sounder.

Table 5. Attempted Tows Aborted During Cruise 200792.

Station	Stratum	Location	Description
18	35	Mass Bay	Ghost gear intercepted.
19	33	Harding Ledge	Ghost gear intercepted.
27	36	East of Salem Sound	Lobster trawl intercepted and released.
29	35	SE of Eastern Point	Net hung down while setting out.
44	29	Cape Cod Bay	Hauled to avoid gear interception.
49	21	N of Race Point	Dogfish tow - entire catch released.
80	15	Tuckernuck	Conch gear intercepted and released.
91	11	Bird Island - Buzzards Bay	Net hung down while setting out.

Table 6a. Total Catch Numbers and Weights Observed on the 2007
Massachusetts Fall Inshore Bottom Trawl Survey - Cruise 200792 - Sorted by Number

SPP CODE	COMMON NAME	COUNT	WEIGHT(kg)
143	SCUP	163,994	1,074.0
503	LONGFIN SQUID	46,305	271.7
15	SPINY DOGFISH	28,464	54,140.6
43	BAY ANCHOVY	28,120	14.8
131	BUTTERFISH	27,997	250.4
106	WINTER FLOUNDER	4,078	642.5
181	NORTHERN SAND LANCE	3,222	13.2
141	BLACK SEA BASS	3,210	22.9
26	LITTLE SKATE	3,202	2,159.2
102	AMERICAN PLAICE	2,613	288.7
36	ATLANTIC MENHADEN	2,372	2.1
72	SILVER HAKE	1,055	92.3
163	LONGHORN SCULPIN	905	68.1
313	ATLANTIC ROCK CRAB	790	72.8
77	RED HAKE	784	107.8
105	YELLOWTAIL FLOUNDER	657	162.4
23	WINTER SKATE	612	635.1
32	ATLANTIC HERRING	546	16.5
73	ATLANTIC COD	464	4.5
322	LADY CRAB	441	27.0
401	SEA SCALLOP	426	20.9
45	RAINBOW SMELT	383	5.6
301	AMERICAN LOBSTER	341	93.2
132	ATLANTIC MOONFISH	334	1.5
103	SUMMER FLOUNDER	249	209.4
312	JONAH CRAB	181	33.5
108	WINDOWPANE	180	22.3
317	SPIDER CRAB UNCL	166	24.5
208	MACKEREL SCAD	152	0.8
502	NORTHERN SHORTFIN SQUID	150	4.4
13	SMOOTH DOGFISH	128	407.8
211	ROUND SCAD	122	0.7
44	STRIPED ANCHOVY	117	0.1
117	SMALLMOUTH FLOUNDER	79	0.5
33	ALEWIFE	74	3.2
104	FOURSPOT FLOUNDER	72	17.1
193	OCEAN POUT	68	5.5
135	BLUEFISH	61	5.3
76	WHITE HAKE	60	6.4
596	VERMILION SNAPPER	53	0.1
164	SEA RAVEN	50	16.3
171	NORTHERN SEAROBIN	48	1.0
116	NORTHERN PIPEFISH	44	0.0
172	STRIPED SEAROBIN	44	19.6
176	CUNNER	35	0.5
107	WITCH FLOUNDER	29	8.5
182	SNAKEBLENNY	29	0.7
109	GULF STREAM FLOUNDER	21	0.3
83	FOURBEARD ROCKLING	18	1.1
34	BLUEBACK HERRING	17	0.5
155	ACADIAN REDFISH	14	0.1
196	NORTHERN PUFFER	14	0.0
348	NORTHERN MOONSNAIL	12	1.8
439	SNAKEFISH	12	0.0

Table 6a continued

SPP CODE	COMMON NAME	COUNT	WEIGHT(kg)
74	HADDOCK	10	4.6
342	NORTHERN HORSEMUSSEL	10	1.5
177	TAUTOG	8	4.6
695	GUAGUANCHE	8	0.1
336	CHANNELED WHELK	8	2.0
197	GOOSEFISH	8	8.7
145	WEAKFISH	7	0.5
180	ROCK GUNNEL	7	0.0
146	NORTHERN KINGFISH	6	0.3
318	HORSESHOE CRAB	6	12.7
337	KNOBBED WHELK	6	2.2
78	SPOTTED HAKE	5	0.6
168	LUMPFISH	5	0.0
557	SHORT BIGEYE	5	0.0
694	NORTHERN SENNET	5	0.1
35	AMERICAN SHAD	4	0.4
343	BLUE MUSSEL	4	0.4
28	THORNY SKATE	3	10.6
489	RED CORNETFISH	3	0.0
129	BLUE RUNNER	3	0.0
139	STRIPED BASS	2	3.7
556	GLASSEYE SNAPPER	2	0.0
331	SEA URCHIN AND SAND DOLLAR UNCL	2	0.0
187	RED GOATFISH	2	0.0
202	GRAY TRIGGERFISH	2	1.7
201	PLANEHEAD FILEFISH	2	0.0
21	ATLANTIC TORPEDO	1	16.0
183	DAUBED SHANNY	1	0.0
409	OCEAN QUAHOG	1	0.1
435	INSHORE LIZARDFISH	1	0.0
978	UNKNOWN 01	1	0.0
662	SPOTFIN BUTTERFLYFISH	1	0.0
657	DWARF GOATFISH	1	0.0
541	GAG	1	0.0
413	NORTHERN QUAHOG	1	0.4
402	BAY SCALLOP	1	0.1
314	BLUE CRAB	1	0.1
212	ROUGH SCAD	1	0.0
338	MOON SNAIL, SHARK EYE, AND BABY-EAR	1	0.1
213	SILVER RAG	1	0.0
307	SHRIMP (PINK,BROWN,WHITE)		7.9
520	LONGFIN SQUID EGG MOPS		4.1
		323,761	**61,063.3**

Table 6b. Total Catch Numbers and Weights Observed on the 2007
Massachusetts Fall Inshore Bottom Trawl Survey - Cruise 200792 - Sorted by Weight

SPP CODE	COMMON NAME	COUNT	WEIGHT(kg)
15	SPINY DOGFISH	28,464	54,140.6
26	LITTLE SKATE	3,202	2,159.2
143	SCUP	163,994	1,074.0
106	WINTER FLOUNDER	4,078	642.5
23	WINTER SKATE	612	635.1
13	SMOOTH DOGFISH	128	407.8
102	AMERICAN PLAICE	2,613	288.7
503	LONGFIN SQUID	46,305	271.7
131	BUTTERFISH	27,997	250.4
103	SUMMER FLOUNDER	249	209.4
105	YELLOWTAIL FLOUNDER	657	162.4
77	RED HAKE	784	107.8
301	AMERICAN LOBSTER	341	93.2
72	SILVER HAKE	1,055	92.3
313	ATLANTIC ROCK CRAB	790	72.8
163	LONGHORN SCULPIN	905	68.1
312	JONAH CRAB	181	33.5
322	LADY CRAB	441	27.0
317	SPIDER CRAB UNCL	166	24.5
141	BLACK SEA BASS	3,210	22.9
108	WINDOWPANE	180	22.3
401	SEA SCALLOP	426	20.9
172	STRIPED SEAROBIN	44	19.6
104	FOURSPOT FLOUNDER	72	17.1
32	ATLANTIC HERRING	546	16.5
164	SEA RAVEN	50	16.3
21	ATLANTIC TORPEDO	1	16.0
43	BAY ANCHOVY	28,120	14.8
181	NORTHERN SAND LANCE	3,222	13.2
318	HORSESHOE CRAB	6	12.7
28	THORNY SKATE	3	10.6
197	GOOSEFISH	8	8.7
107	WITCH FLOUNDER	29	8.5
307	SHRIMP (PINK,BROWN,WHITE)		7.9
76	WHITE HAKE	60	6.4
45	RAINBOW SMELT	383	5.6
193	OCEAN POUT	68	5.5
135	BLUEFISH	61	5.3
74	HADDOCK	10	4.6
177	TAUTOG	8	4.6
73	ATLANTIC COD	464	4.5
502	NORTHERN SHORTFIN SQUID	150	4.4
520	LONGFIN SQUID EGG MOPS		4.1
139	STRIPED BASS	2	3.7
33	ALEWIFE	74	3.2
337	KNOBBED WHELK	6	2.2
36	ATLANTIC MENHADEN	2,372	2.1
336	CHANNELED WHELK	8	2.0
348	NORTHERN MOONSNAIL	12	1.8
202	GRAY TRIGGERFISH	2	1.7
132	ATLANTIC MOONFISH	334	1.5
342	NORTHERN HORSEMUSSEL	10	1.5
83	FOURBEARD ROCKLING	18	1.1
171	NORTHERN SEAROBIN	48	1.0

Table 6b continued.

SPP CODE	COMMON NAME	COUNT	WEIGHT(kg)
208	MACKEREL SCAD	152	0.8
211	ROUND SCAD	122	0.7
182	SNAKEBLENNY	29	0.7
78	SPOTTED HAKE	5	0.6
117	SMALLMOUTH FLOUNDER	79	0.5
176	CUNNER	35	0.5
34	BLUEBACK HERRING	17	0.5
145	WEAKFISH	7	0.5
35	AMERICAN SHAD	4	0.4
343	BLUE MUSSEL	4	0.4
413	NORTHERN QUAHOG	1	0.4
109	GULF STREAM FLOUNDER	21	0.3
146	NORTHERN KINGFISH	6	0.3
44	STRIPED ANCHOVY	117	0.1
596	VERMILION SNAPPER	53	0.1
155	ACADIAN REDFISH	14	0.1
695	GUAGUANCHE	8	0.1
694	NORTHERN SENNET	5	0.1
409	OCEAN QUAHOG	1	0.1
402	BAY SCALLOP	1	0.1
314	BLUE CRAB	1	0.1
338	MOON SNAIL, SHARK EYE, AND BABY-EAR	1	0.1
116	NORTHERN PIPEFISH	44	0.0
196	NORTHERN PUFFER	14	0.0
439	SNAKEFISH	12	0.0
180	ROCK GUNNEL	7	0.0
168	LUMPFISH	5	0.0
557	SHORT BIGEYE	5	0.0
489	RED CORNETFISH	3	0.0
129	BLUE RUNNER	3	0.0
556	GLASSEYE SNAPPER	2	0.0
331	SEA URCHIN AND SAND DOLLAR UNCL	2	0.0
187	RED GOATFISH	2	0.0
201	PLANEHEAD FILEFISH	2	0.0
183	DAUBED SHANNY	1	0.0
435	INSHORE LIZARDFISH	1	0.0
978	UNKNOWN 01	1	0.0
662	SPOTFIN BUTTERFLYFISH	1	0.0
657	DWARF GOATFISH	1	0.0
541	GAG	1	0.0
212	ROUGH SCAD	1	0.0
213	SILVER RAG	1	0.0
		323,761	**61,063.3**

Table 7. Number of individuals obtained for age, growth, maturity, external pathology and special studies during Massachusetts DMF Cruise 200792 from 4 September to 20 September 2007.

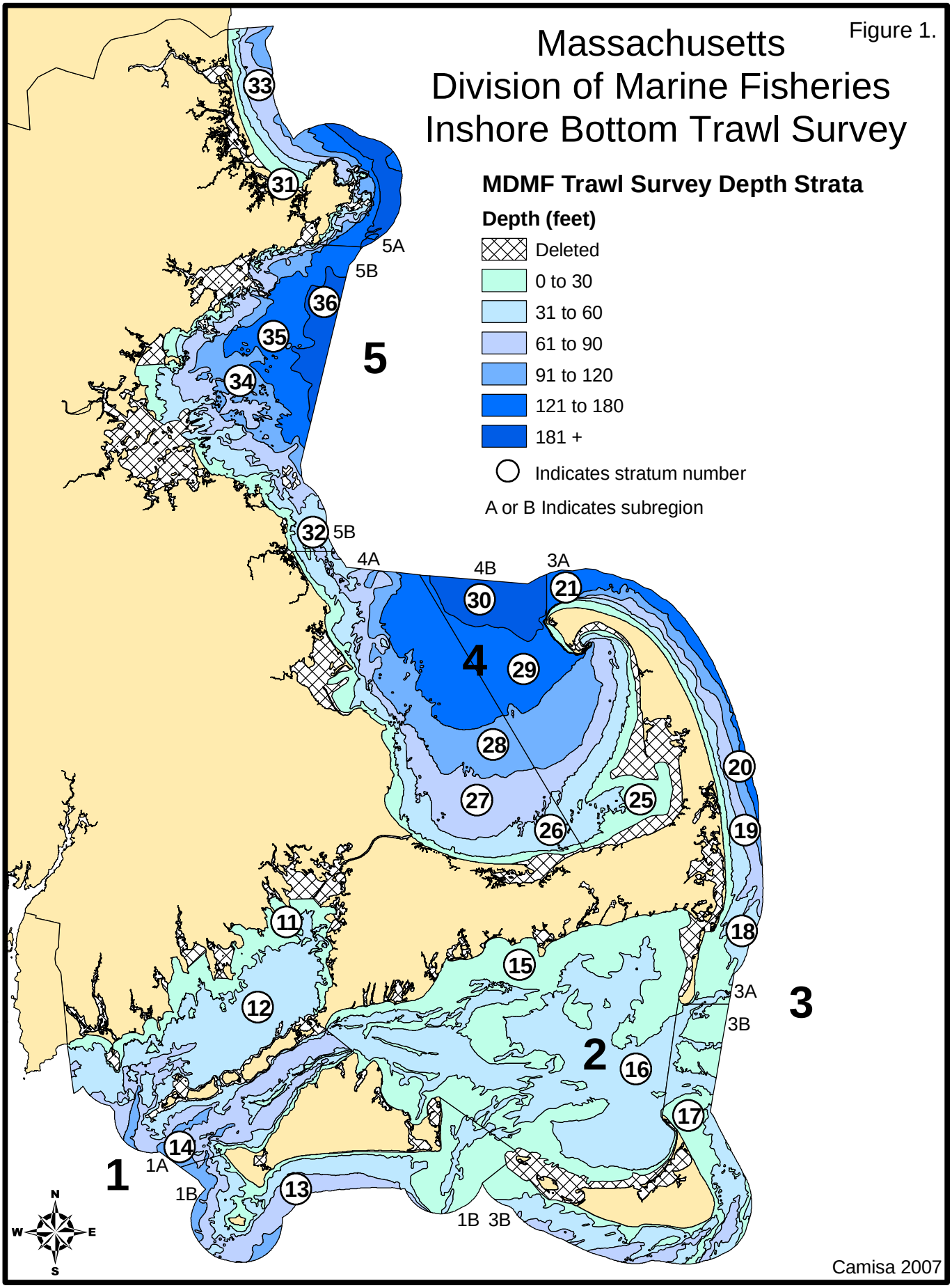
			Age and Growth Collection		
Species	Maturity Observation	External Pathology	Scales	Otoliths	Opercula
Atlantic Cod	12			12	
Haddock	4			4	
American Plaice		1050			
Summer Flounder	215	18	215		
Yellowtail Flounder	178	434	178		
Winter Flounder	683	2883	683		
Witch Flounder		10			
Windowpane Flounder	7	4		7	
Black Sea Bass	28		28		
Scup	150		150		
TOTAL	**1,277**	**4,399**	**1,254**	**23**	**0**

OTHER COLLECTIONS:

External pathology was conducted on 4,399 individual fish.
134 YOY Atlantic cod were saved from two stations for David Berlinsky for a stock ID study.
10 live winter flounder were collected for a tagging study (Greg Decelles SMAST).
4 monkfish were saved for a tagging study (Christa Bank SMAST).
Alewives and Blueback herring were saved from five stations for a study of mercury contamination (Mike Bosner, USGS).
Little skates were collected from 8 stations for a GOM size at maturity study (James Sulikowski UNE).
Several live little skates were saved for an age and growth validation study (Fiona Hogan SMAST).
YOY BSB were saved from eleven stations for a growth study (Matt Tweedie SMAST).
Several didemnum photos were taken at two stations for Robert Reid.
Derek Perry (DMF) conducted diet sampling of smooth dogfish while onboard.
Lady crabs collected for stock differentiation study, (Jean-Marc Gagnon, Canadian Museum of Nature).

Figure 1.

Massachusetts Division of Marine Fisheries Inshore Bottom Trawl Survey



Camisa 2007

Figure 2.

Fall 2007
Mass Division of Marine Fisheries
Bottom Trawl Survey
Tow Locations

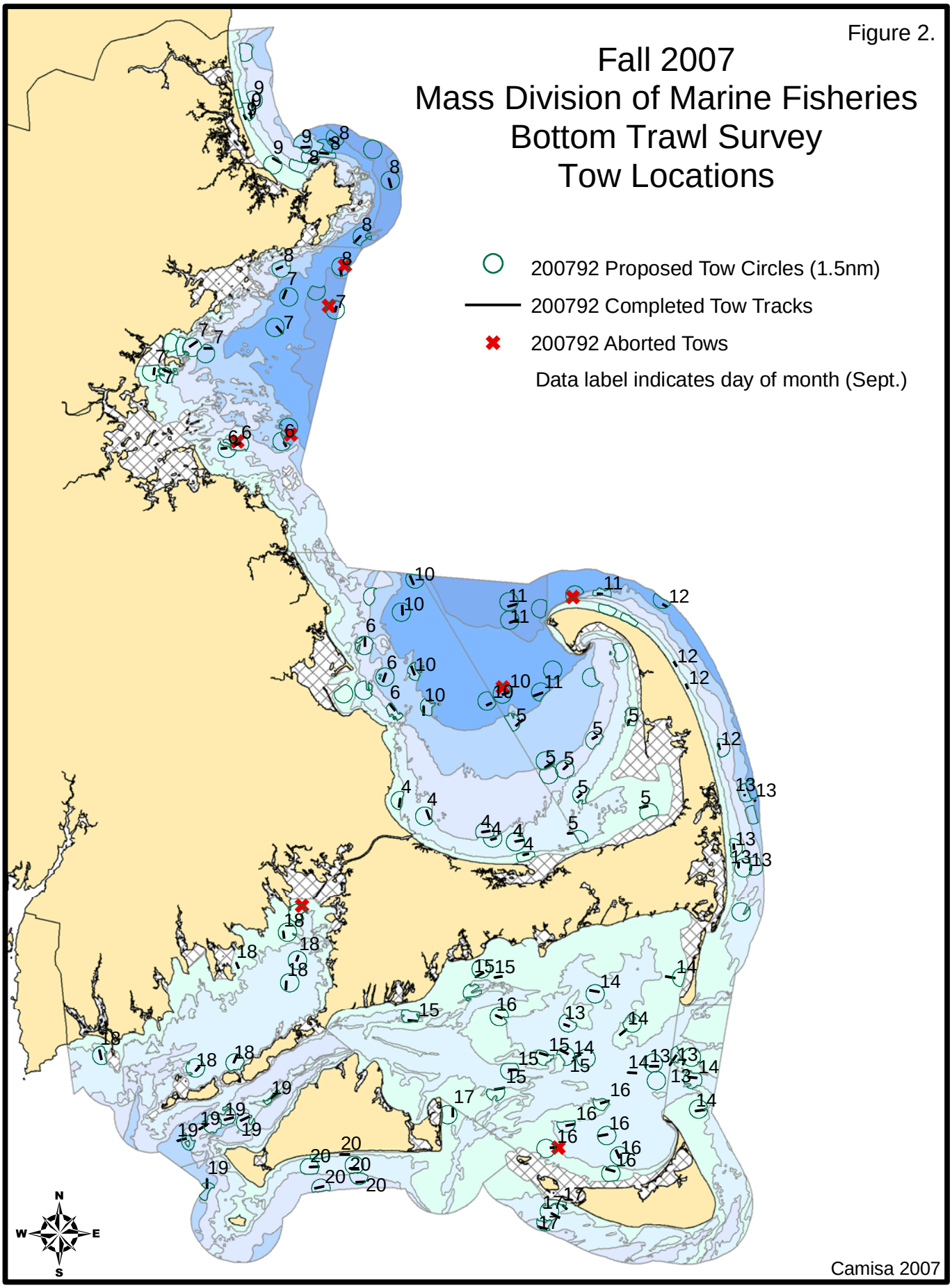
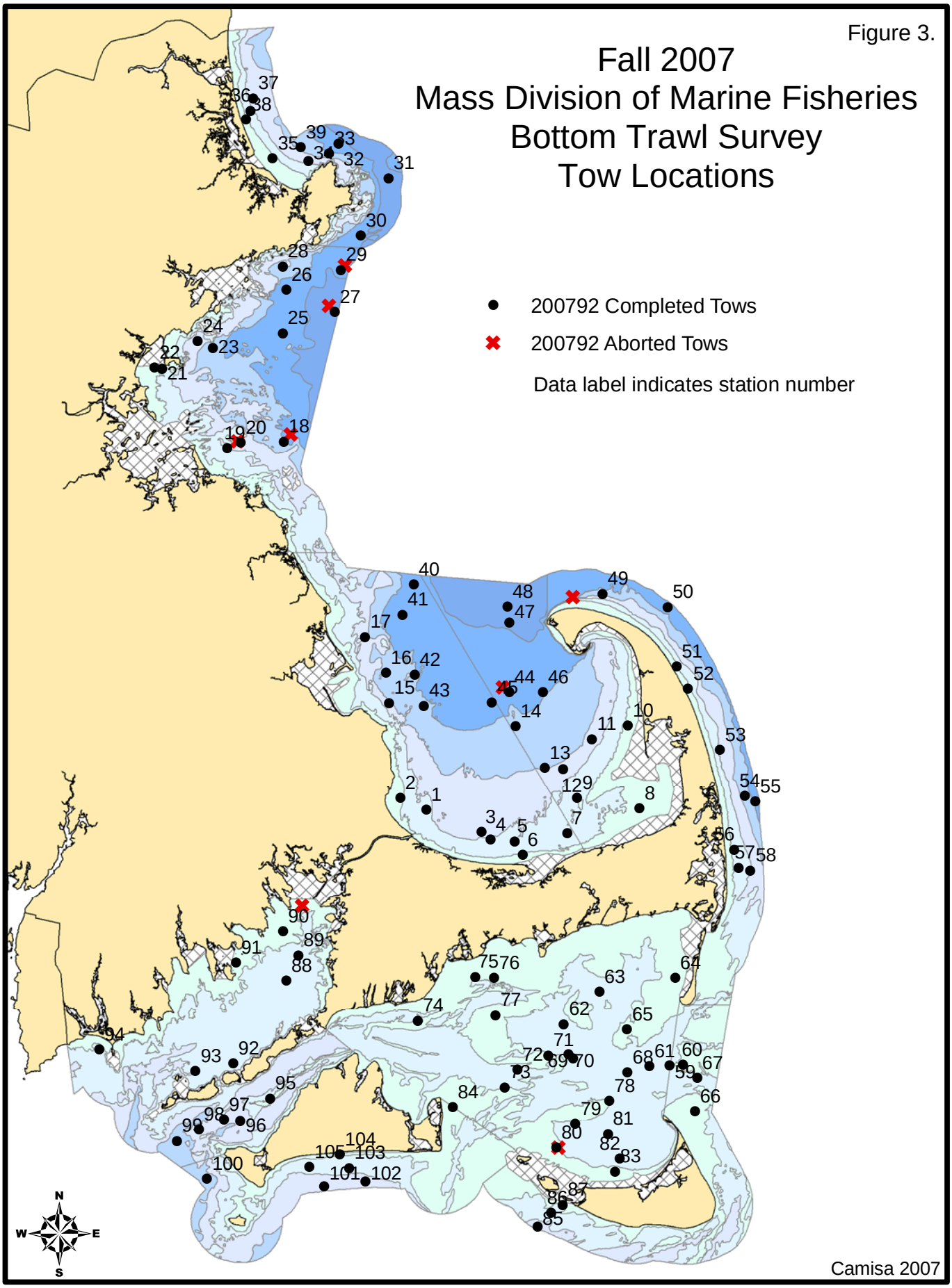


Figure 3.

Fall 2007
Mass Division of Marine Fisheries
Bottom Trawl Survey
Tow Locations



SURVEY REPORT

2007 Nantucket Sound Estuarine Winter Flounder Young of the Year (YOY) Seine Survey

SURVEY PERIOD, AREA, AND PARTICIPANTS

From June 25 – July 13, 2007 the Massachusetts Division of Marine Fisheries (MA DMF) conducted the 32nd Nantucket Sound Estuarine Winter Flounder YOY Seine Survey. The survey covers six Nantucket Sound estuaries on the south side of Cape Cod – Great Pond, Waquoit Bay, Cotuit Bay, Lewis Bay, Bass River, and Stage Harbor (Figure 1). The survey, led by Vincent M. Manfredi, was completed with assistance from project staff Jeremy King and Matthew Camisa as well as MA DMF staff from the New Bedford field station (Table 1).

OBJECTIVES

The primary objective of this survey is to provide a winter flounder YOY abundance index for the Southern New England Stock. All commercially and recreationally important finfish and invertebrates are counted. All species not counted are noted for presence.

METHODS

Seining of intertidal and shallow subtidal zones occurred from two hours before to two hours after high tide. Forty-nine fixed stations, originally chosen for efficient seining (i.e., smooth sediment bottom generally devoid of attached vegetation) and historic availability of 0-group winter flounder, were proportionately allocated by each estuary's littoral perimeter. A 6.4 meter straight seine of 4.8 mm nylon mesh equipped with a weighted lead line footrope to minimize escapement was set and hauled perpendicular to shore from a depth of 0.9 to 1.2 meters. To enumerate 0-group winter flounder density (# YOY per square meter), three replicate hauls at each station were quantified to area swept by maintaining a taut spreader rope and calculating distance over ground. Distance over ground was calculated as the hypotenuse of a right triangle, using the measurements of distance over the water's surface and depth at the beginning of the seine haul. Distance over the water's surface was measured with a sonic digital rangefinder (SONIN Multi-Measure Combo Pro ™) and water depth at the beginning of the seine haul was measured with a weighted and marked line. When the weather was inclement, preventing the use

of the rangefinder, distance over ground was measured by pacing. Statistical analysis of seine data employs stratification techniques; each estuary is considered a stratum and each station's replicate hauls (3) are treated as an individual sample. Stratified mean density and confidence limits were derived from standard and modified formulae for mean and variance.

SURVEY RESULTS

The pooled (all estuaries combined) winter flounder YOY index is equal to that of 2006 (Figure 2A and 2B, Table 2), and marks the seventh consecutive year below the time series median. Individual estuary indices fluctuated meagerly around last years' indices (Figure 3). All individual indices were at or below their respective timeseries median values this year. Three age 1+ winter flounder were captured among all estuaries, which continues an eight-year period where the catch has been below or equal to the timeseries median (Figure 4). Thirty-eight YOY summer flounder were caught among all estuaries in 2007, representing the third greatest area-wide catch on record and second consecutive year of strong recruitment for this species (Figure 5). A total of 44 species were encountered in seine hauls (Table 3). Smallmouth flounder, *Etropus microstomus*, were recorded for only the fourth year in the timeseries; all in the past decade. Nine neo-natal smooth dogfish pups were captured at one station in Waquoit Bay. Smooth dogfish have only been recorded during three previous surveys, all prior to 1983. Smooth dogfish observations are likely infrequent due to the low capture efficiency of the small seine on faster-moving bentho-pelagic fishes.

TEMPERATURE MONITORS

In December 2006, nine Onset Computer Corporation Pendant Temp Mini Loggers were deployed by project staff at strategic locations among all six estuaries (Figure 6). All loggers were anchored in subtidal waters. Locations were chosen to conceal loggers from tampering and so that differences in tidal flushing (which may cause temperature gradients within estuaries) could be monitored. Each logger was set to record ambient water temperature every 20 minutes. During the 2007 survey, each monitor was retrieved, downloaded and replaced. Data collections were satisfactory with the exception of the Oyster Pond Temperature Logger in Stage Harbor. This monitor was near a public dinghy storage area and was dragged onto the intertidal zone in early June, rendering a 20 day window of data useless. The unit was replaced and moved to a concealed location adjacent to the original site. Each logger will be collected, downloaded and replaced yearly during regular survey operations, adding a valuable data attribute to the existing survey. Data will be presented next year, when a complete annual dataset has been collected. For further information on this survey or others in the time series, please contact Vincent M. Manfredi (508)-990-2860 ext. 110.

Table 1. Seine survey personnel for 2007 sampling season.

2007 Nantucket Sound Estuarine Seine Survey Staff

Name	Agency / Affiliation	Days
Vincent M. Manfredi	DMF - New Bedford Quest Campus	10
Brian Kelly	DMF - New Bedford Quest Campus	5
Paul Caruso	DMF - New Bedford Quest Campus	3
Jeremy King	DMF - New Bedford Quest Campus	2

Table 2. YOY winter flounder catch statistics 1976 - 2007
all estuaries combined.

YEAR	STRATIFIED MEAN	STRATIFIED VARIANCE	95% CI		
1976	0.344	0.002	0.237	-	0.452
1977	0.641	0.004	0.508	-	0.774
1978	0.366	0.003	0.235	-	0.498
1979	0.507	0.004	0.366	-	0.648
1980	0.432	0.003	0.306	-	0.559
1981	0.340	0.003	0.208	-	0.471
1982	0.370	0.003	0.246	-	0.494
1983	0.231	0.001	0.176	-	0.287
1984	0.323	0.001	0.248	-	0.399
1985	0.335	0.002	0.254	-	0.415
1986	0.325	0.001	0.244	-	0.406
1987	0.274	0.001	0.208	-	0.340
1988	0.184	0.001	0.133	-	0.234
1989	0.421	0.002	0.325	-	0.518
1990	0.325	0.001	0.247	-	0.402
1991	0.267	0.001	0.188	-	0.345
1992	0.294	0.002	0.196	-	0.392
1993	0.067	0.000	0.047	-	0.086
1994	0.148	0.000	0.108	-	0.188
1995	0.154	0.001	0.107	-	0.201
1996	0.221	0.001	0.165	-	0.277
1997	0.392	0.003	0.278	-	0.506
1998	0.165	0.001	0.104	-	0.226
1999	0.201	0.001	0.143	-	0.258
2000	0.347	0.002	0.258	-	0.435
2001	0.214	0.001	0.157	-	0.272
2002	0.100	0.000	0.077	-	0.122
2003	0.197	0.001	0.128	-	0.267
2004	0.095	0.000	0.070	-	0.119
2005	0.075	0.000	0.054	-	0.096
2006	0.168	0.000	0.131	-	0.205
2007	0.168	0.000	0.126	-	0.210

Median (1976-2007)
0.270

Note : The idex presented in 2006 was 0.165 . The change presented this year reflects a format problem which caused a rounding error last year.

Table 3. Species occuring in the 2007 Nantucket Sound Estuarine
Winter Flounder YOY Seine Survey
(for species marked "Present" counts are not taken and presence is noted at each haul)

COMMON NAME	TAXONOMIC NAME	TOTAL NUMBER	PERCENT OCCURRENCE
Atlantic Silverside	*Menidia menidia*	Present	95.1
Winter Flounder Age 0	*Pseudopleuronectes americanus*	1994	95.1
Blue Crab	*Callinectes sapidus*	366	57.7
Crangon	*Crangon crangon*	Present	55.6
Northern Pipefish	*Syngnathus fuscus*	220	46.5
Striped Killifish	*Fundulus majalis*	Present	45.1
Mud Snail	*Nassarius obsoletus*	Present	41.5
Spider Crab Unclassified	*Majidae*	111	26.8
Alewife	*Alosa sapidissima*	513	22.5
Mummichog	*Fundulus heteroclitus*	Present	21.1
Green Crab	*Carcinus maenus*	53	20.4
Lady Crab	*Ovalipes ocellatus*	206	19.7
Summer Flounder (Fluke)	*Paralichthys dentatus*	38	18.3
Twospine Stickleback	*Gasterosteus wheatlandi*	Present	13.4
Grass Shrimp	*Paelmonetes pugio*	Present	10.6
Atlantic Rock Crab	*Cancer irroratus*	23	8.5
Bubble Snail	*Family Atyidae*	Present	8.5
White Mullet	*Mugil curema*	124	5.6
Naked Goby	*Gobiosoma bosc*	7	4.9
American Eel	*Anguilla rostrata*	49	4.2
Atlantic Herring	*Clupea harengus*	6	3.5
Bay Anchovy	*Anchoa mitchilli*	38	3.5
Northern Kingfish	*Menticirrihitus saxatalis*	5	3.5
Northern Sand Launce	*Ammodytes dubious*	Present	3.5
Cunner	*Tautogolabrus adspersus*	5	2.8
Atlantic Needlefish	*Strongylura marina*	6	2.1
Smallmouth Flounder	*Etropus microstomus*	3	2.1
Winter Flounder Age 1+	*Pseudopleuronectes americanus*	3	2.1
Channeled Whelk	*Busycon canniculata*	2	1.4
Grubby	*Myoxocephalus aeneus*	4	1.4
Knobbed Whelk	*Busycon carica*	2	1.4
Mottled Dog Whelk	*Nassa vibex*	2	1.4
Ribbed Mussel	*Geukensia demissus*	3	1.4
Sheepshead Minnow	*Cyprinodon variegatus*	2	1.4
Smooth Dogfish	*Mustelis canis*	9	1.4
Tautog	*Tautoga onitis*	15	1.4
Threespine Stickleback	*Gastersoteus aculeatus*	Present	1.4
White Perch	*Morone americana*	2	1.4
Windowpane	*Scopthalmus aquosus*	2	1.4
Bluefish	*Pomatomus saltatrix*	1	0.7
Horseshoe Crab	*Limulus polyphemus*	1	0.7
Inland Silverside	*Menidia beryllina*	1	0.7
Mantis Shrimp Unclassified	*Stomatopoda spp.*	1	0.7
Northern Quahog	*Mercenaria mercenaria*	1	0.7
Striped Searobin	*Prionotus evolans*	1	0.7

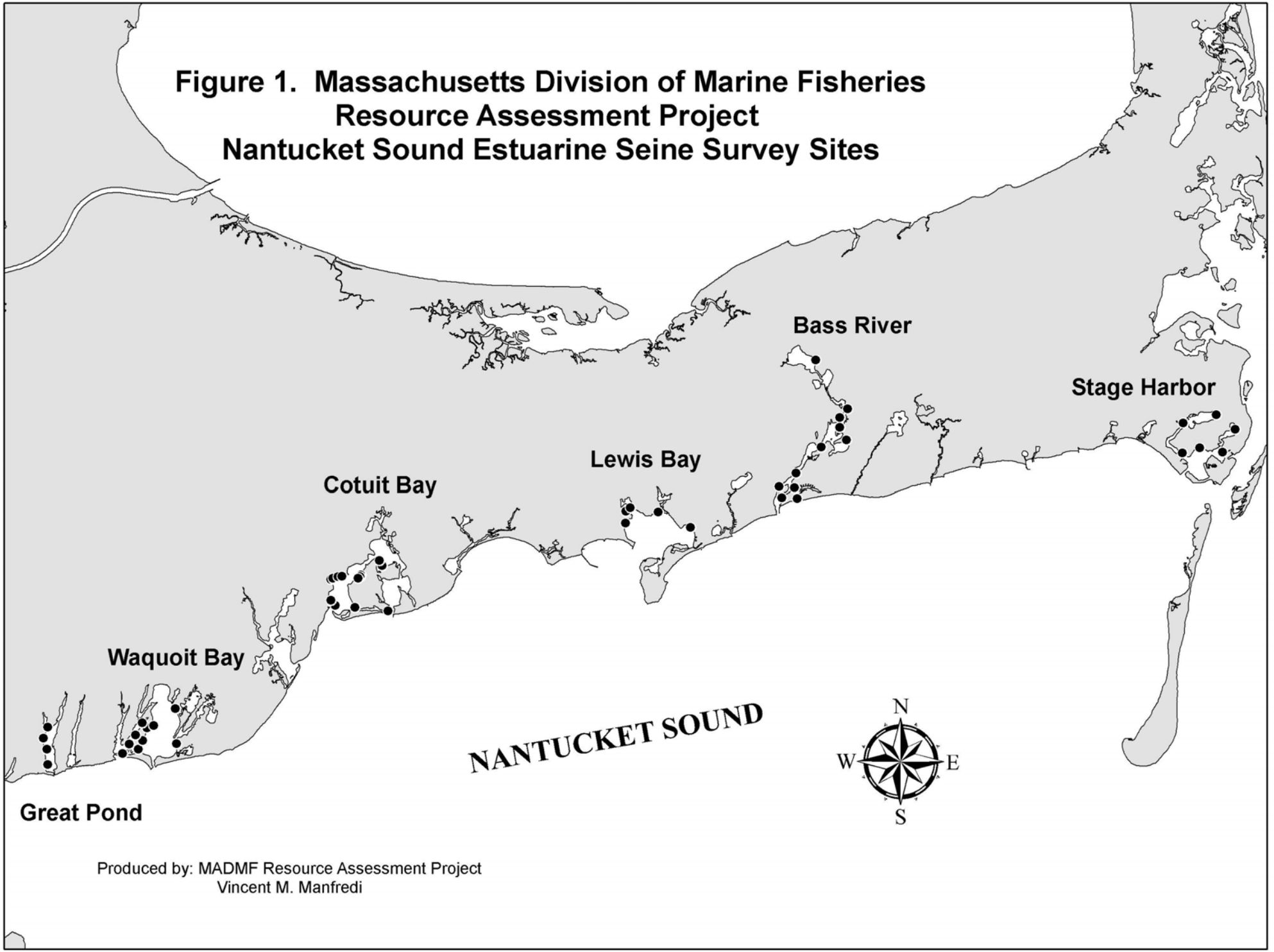
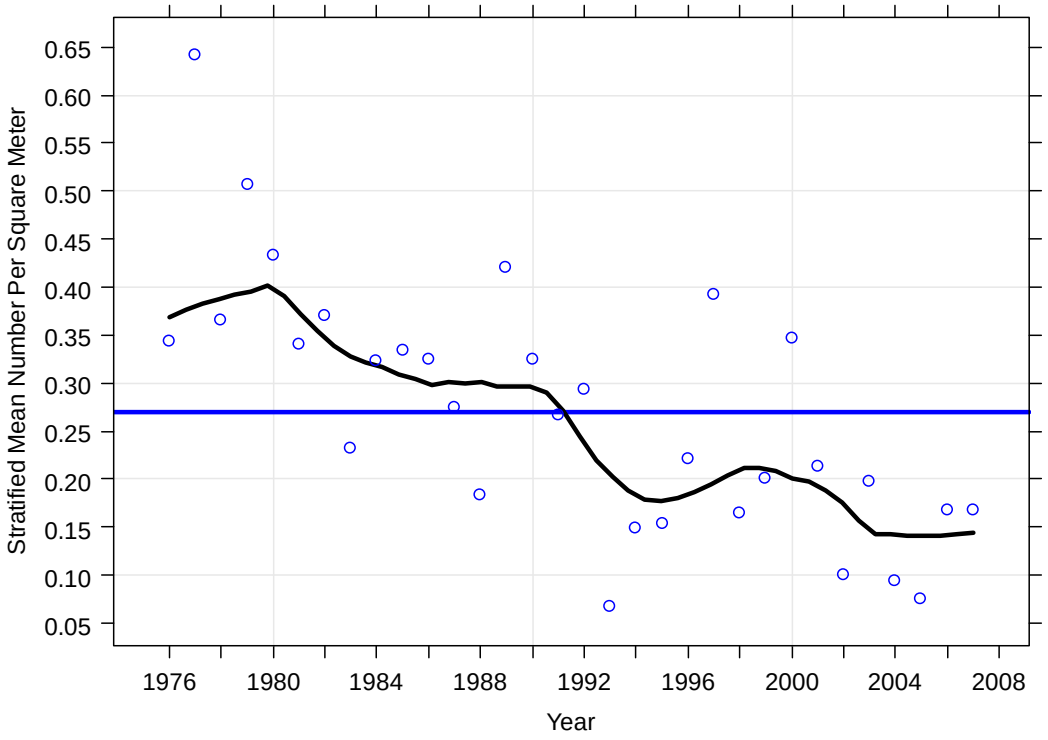


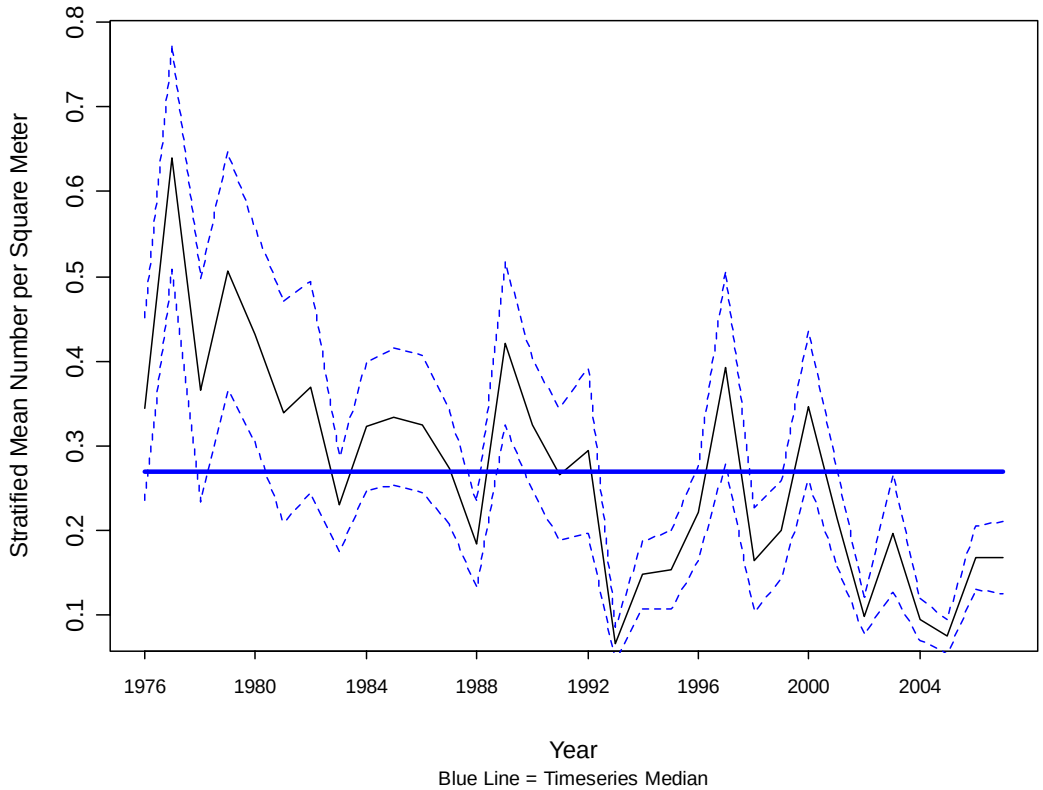
Figure 1. Massachusetts Division of Marine Fisheries
Resource Assessment Project
Nantucket Sound Estuarine Seine Survey Sites
Bass River
Stage Harbor
Lewis Bay
Cotuit Bay
Waquoit Bay
NANTUCKET SOUND
Great Pond
N
W
E
S
Produced by: MADMF Resource Assessment Project
Vincent M. Manfredi

Figure 2A. Stratifed Mean Number of YOY Winter Flounder Per Square Meter from the MADMF Seine Survey: 1976-2007



Black line: Loess smoothed index, span=0.3, degree=1.
Blue Line = Timeseries Median.

Figure 2B. Stratifed Mean Number of YOY Winter Flounder Per Square Meter with 95% Confidence Limits from the MADMF Seine Survey: 1976-2007



Blue Line = Timeseries Median

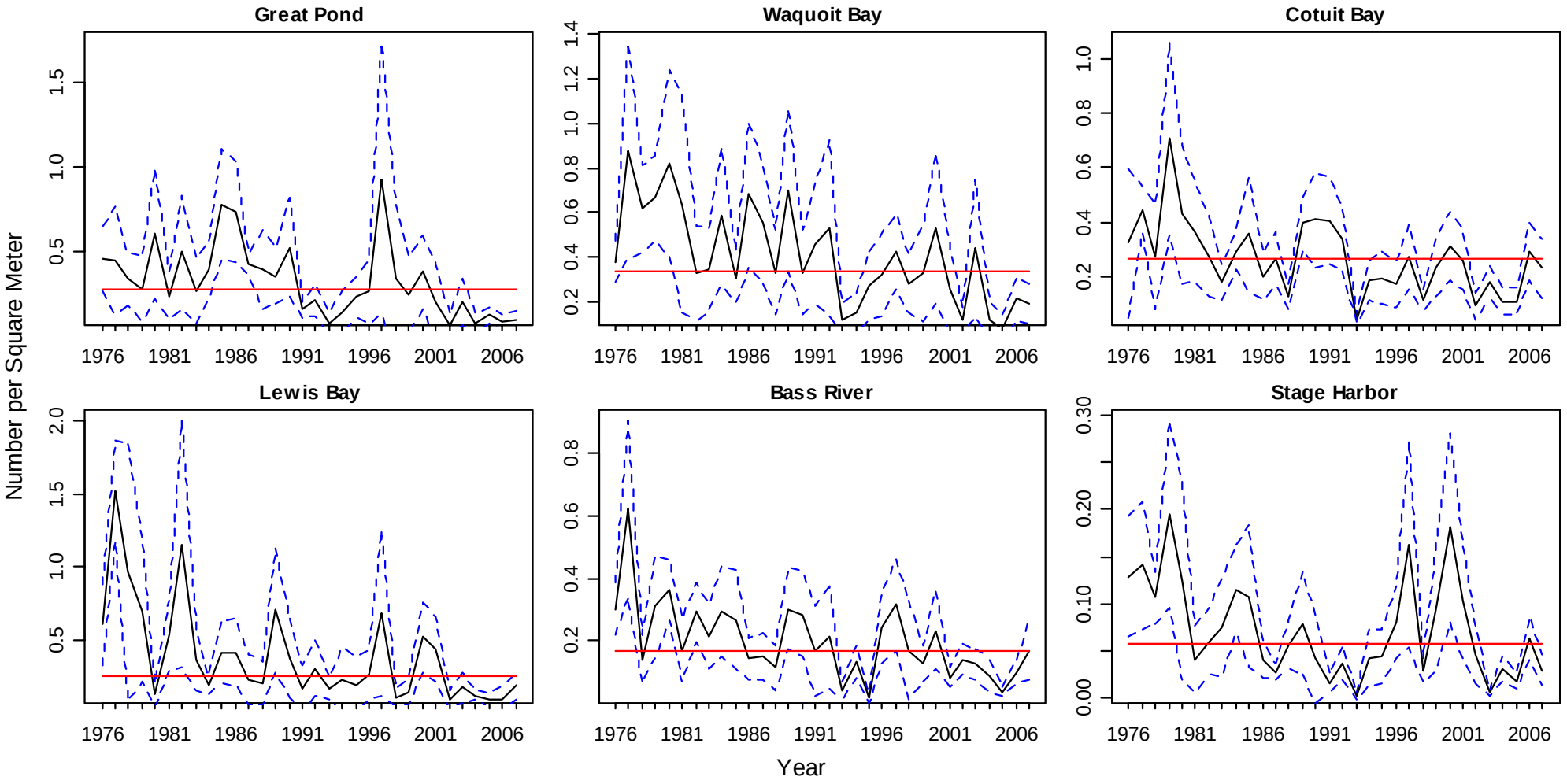


Figure 3. Number of YOY winter flounder per square meter for individual estuaries with 95% Confidence Intervals. The horizontal solid line represents a timeseries median for each estuary. Note that scales on the y-axis differ in magnitude.

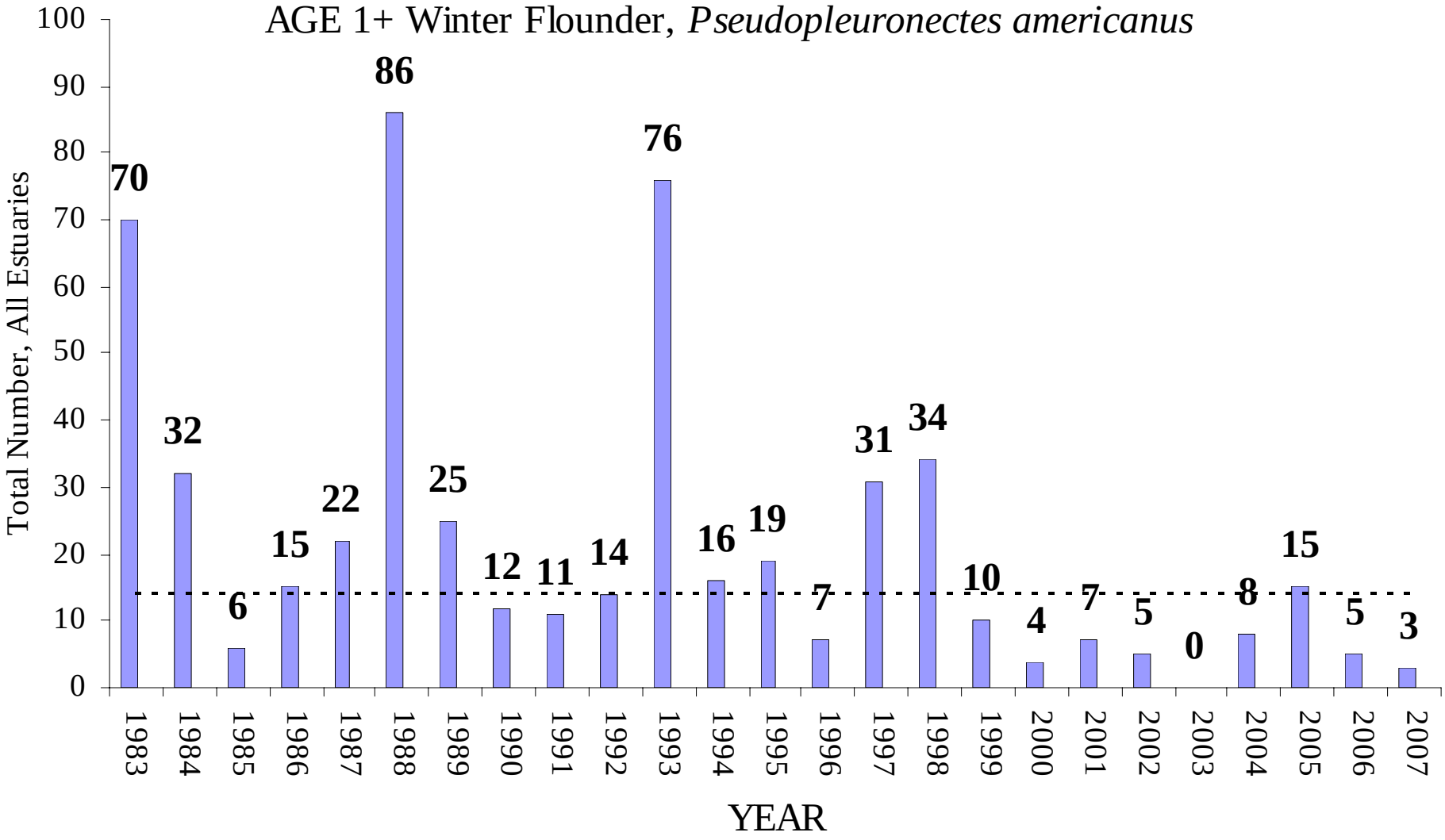


Figure 4. Total number of age 1+ winter flounder caught (1975 – 2007), all estuaries combined. The dashed line represents the timeseries median.

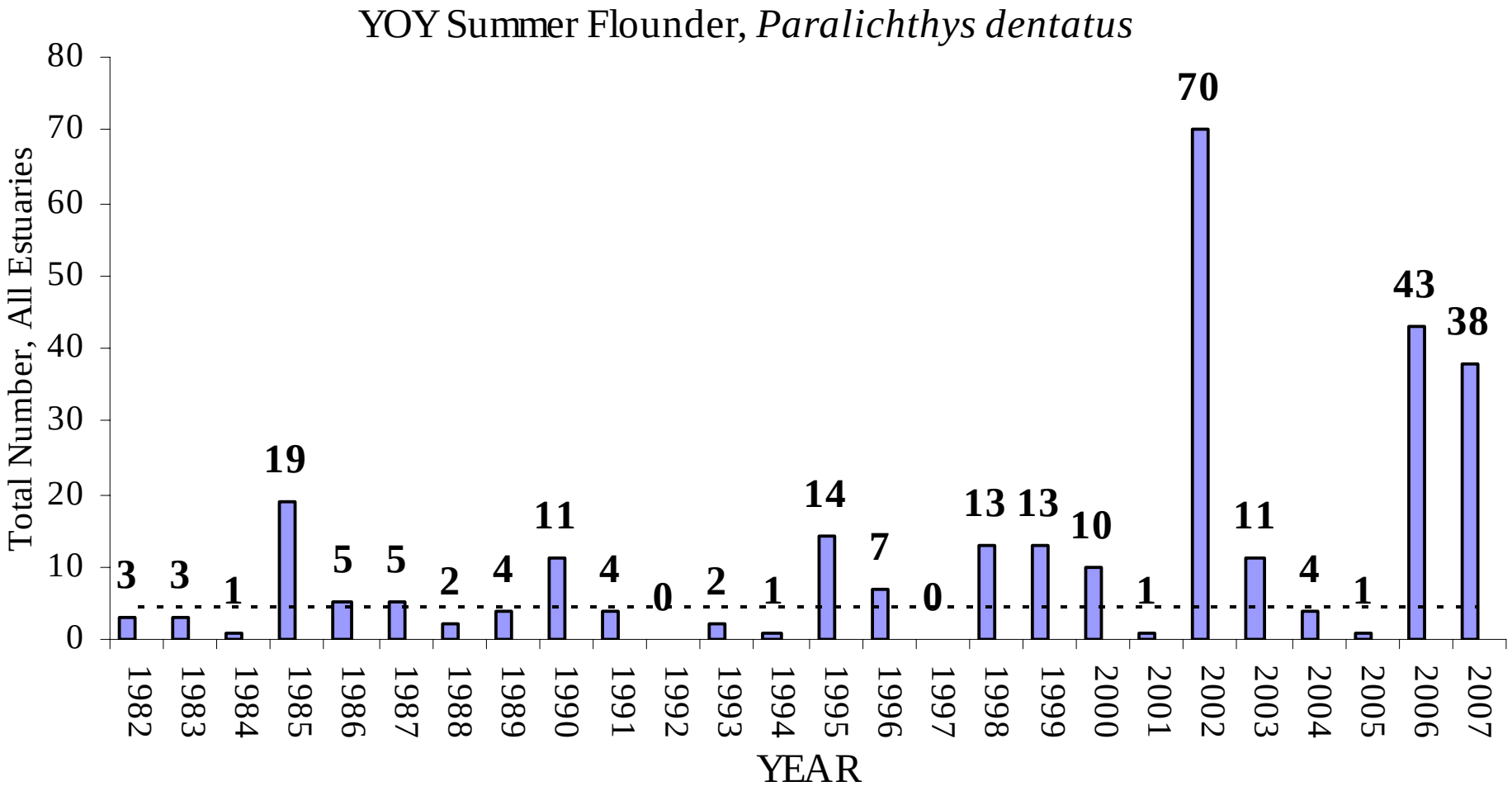


Figure 5. Total number of fluke (summer flounder) caught (1975 – 2007) all estuaries combined. The dashed line represents the timeseries median.

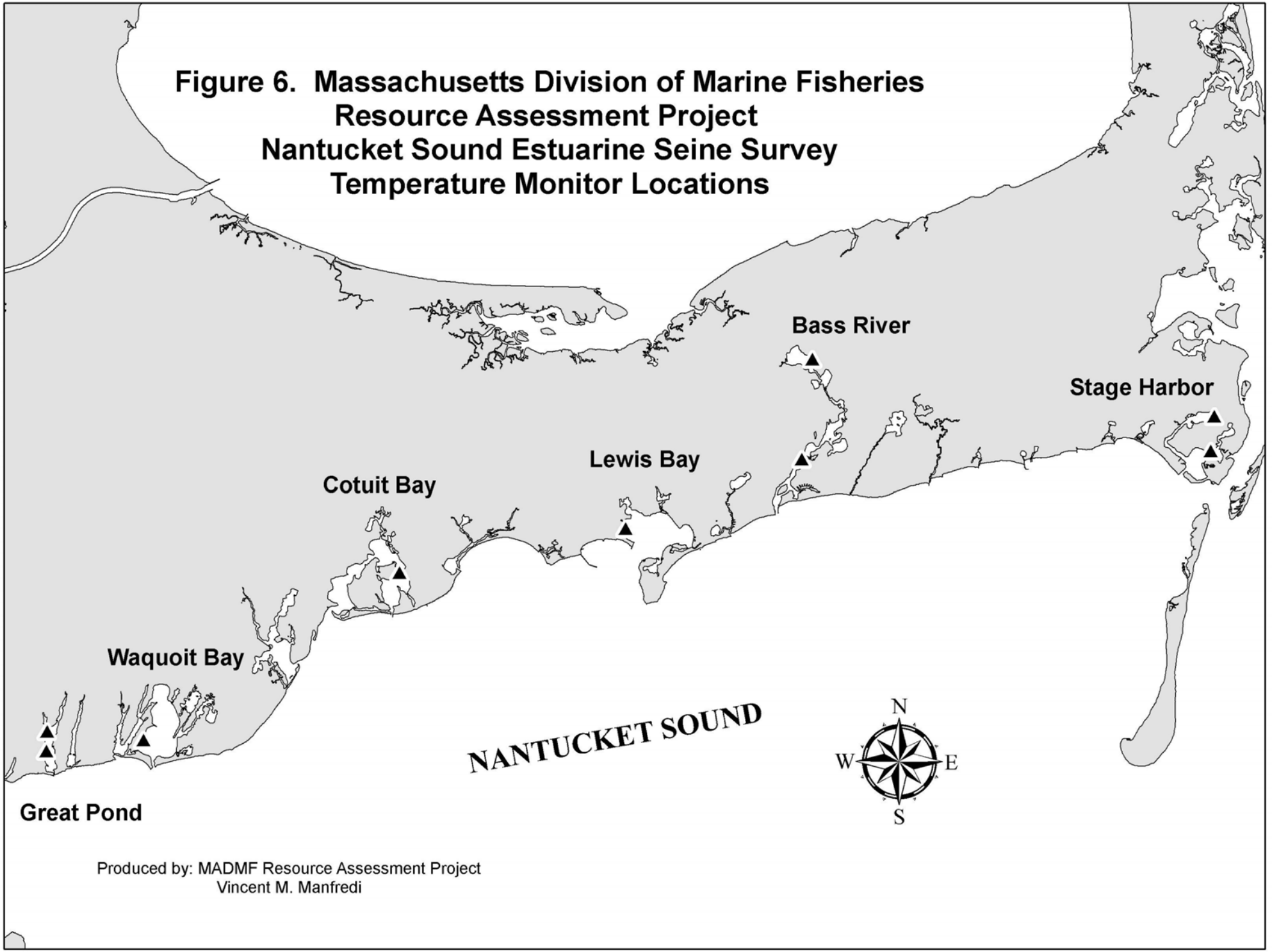


Figure 6. Massachusetts Division of Marine Fisheries
Resource Assessment Project
Nantucket Sound Estuarine Seine Survey
Temperature Monitor Locations
Bass River
Stage Harbor
Lewis Bay
Cotuit Bay
Waquoit Bay
NANTUCKET SOUND
N
W
E
S
Great Pond
Produced by: MADMF Resource Assessment Project
Vincent M. Manfredi

Appendix A.

Massachusetts Inshore Bottom Trawl Survey Results
Indices of Biomass, Abundance, Recruitment, and Abundance at Age for Select Species

The Massachusetts Division of Marine Fisheries has been conducting a bottom trawl survey of Massachusetts territorial waters every spring and fall since 1978. Survey indices provide a useful fishery-independent metric for tracking the relative abundance or biomass of many demersal fish and invertebrates in the survey area. Updated survey indices are presented here for 1) species or stocks routinely requested by staff from within the Massachusetts Division of Marine Fisheries as well as by other governmental and non-governmental scientific bodies, academic researchers and consultants and/or 2) those species which have been a large part of the survey biomass and/or demonstrate a particularly strong trend over the time series.

Additional survey data can be requested by contacting Jeremy King at 508-990-2860 ext. 112.

Contents:

Figure 1.

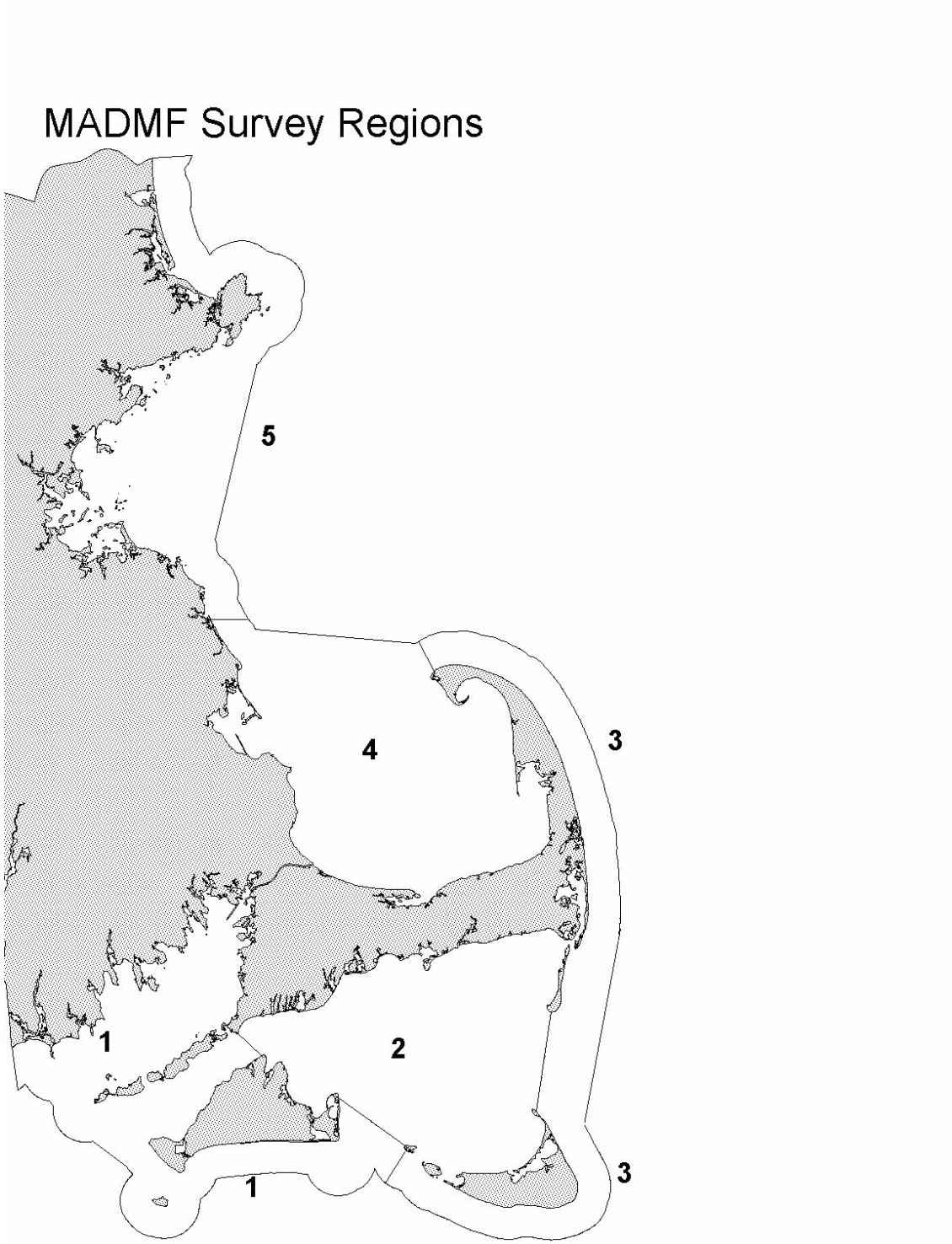
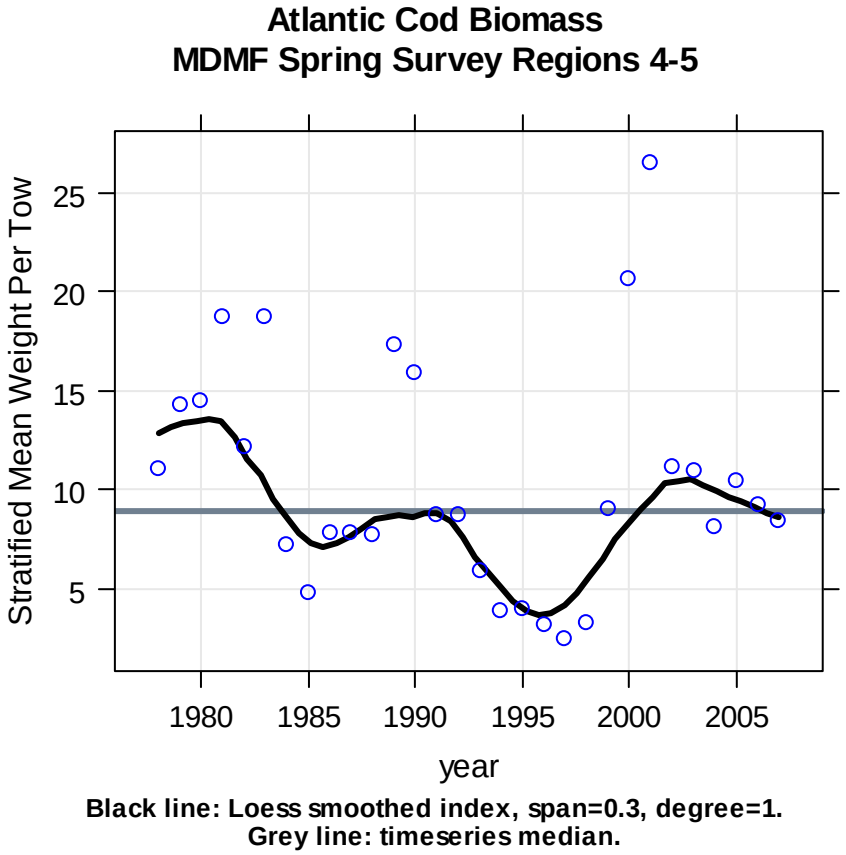


Figure 2. Paired figures of stratified mean weight per tow (kg) with (top) Loess smoothed trend line and (bottom) ± 2 standard errors. 1978 – 2007 Massachusetts DMF Trawl Survey.



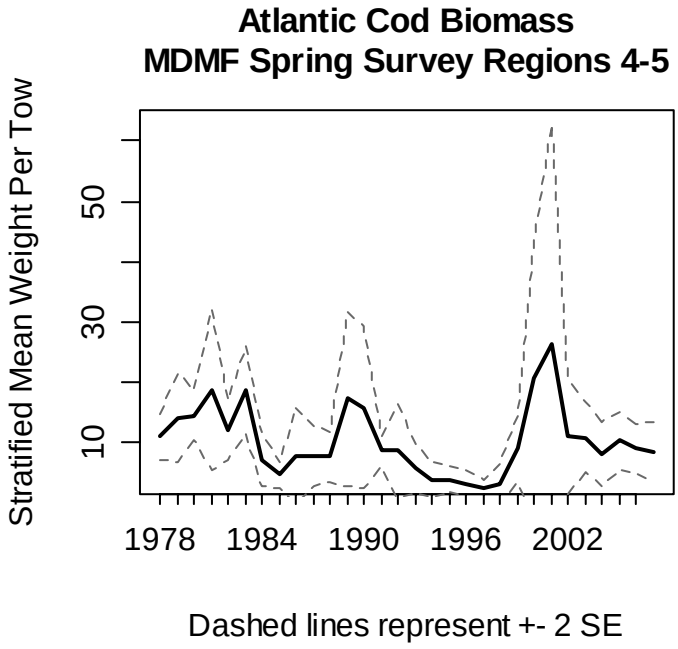
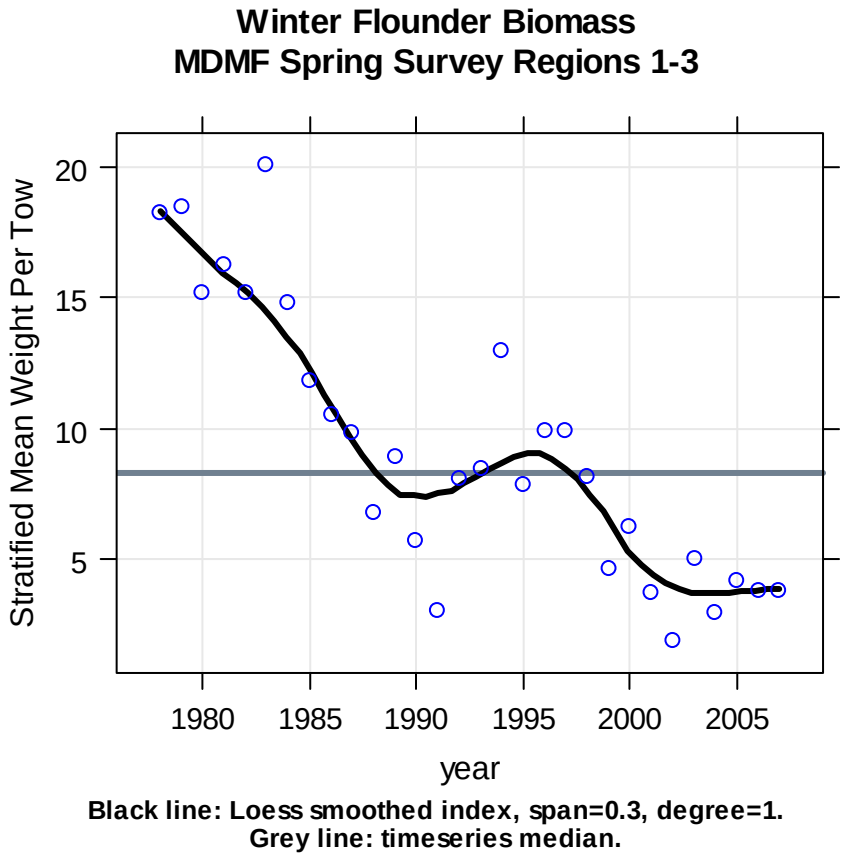
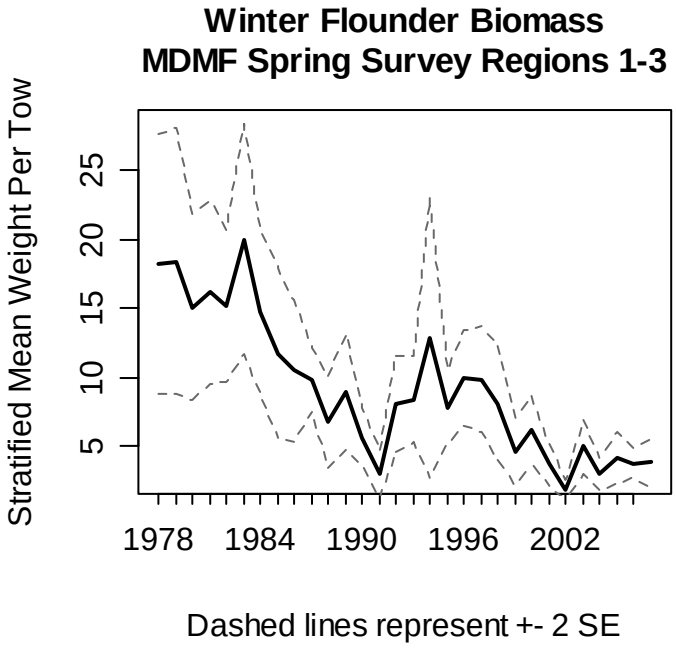


Figure 2 *continued*. Paired figures of stratified mean weight per tow (kg) with (top) Loess smoothed trend line and (bottom) ± 2 standard errors. 1978 – 2007 Massachusetts DMF Trawl Survey.





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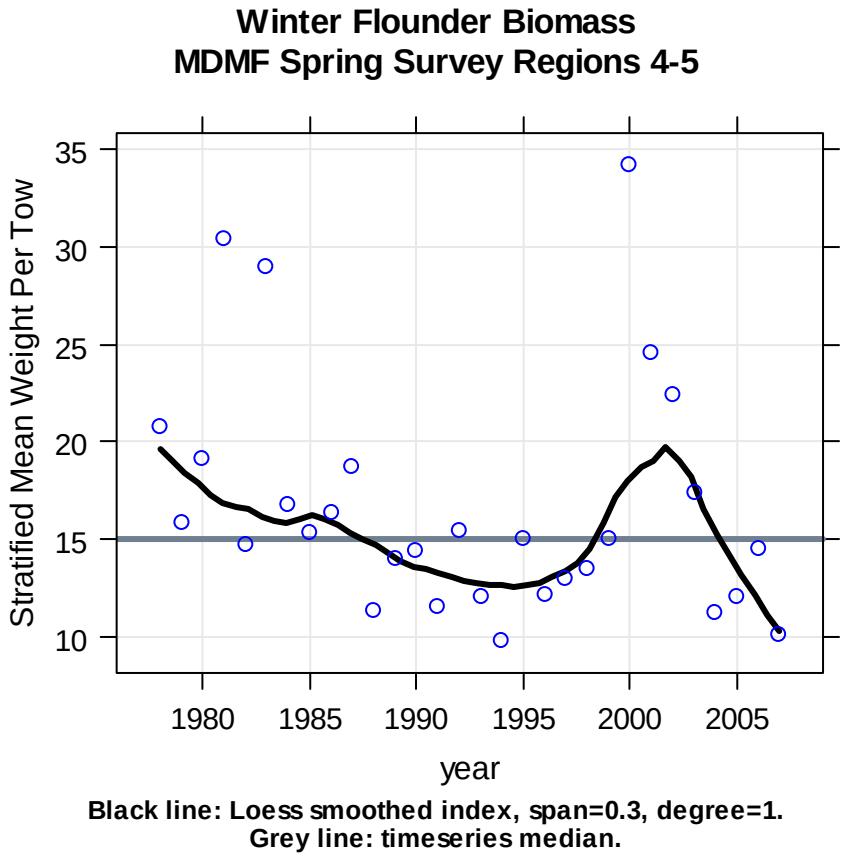

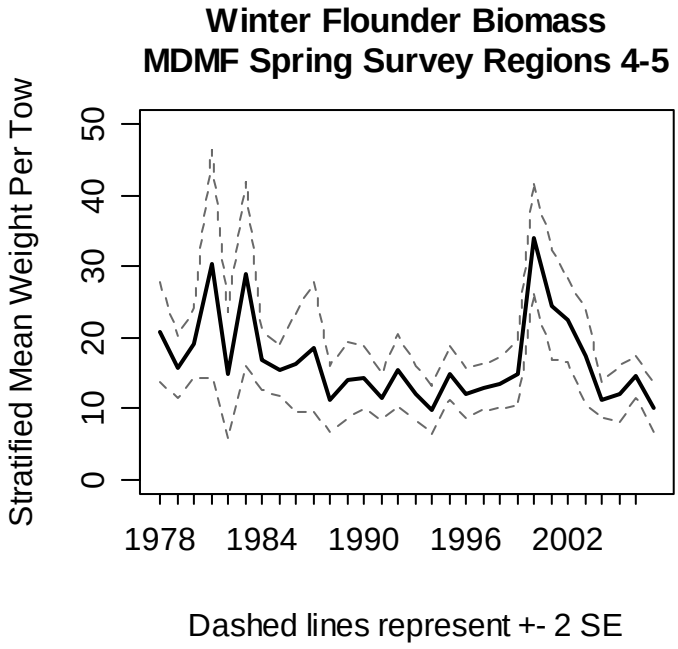

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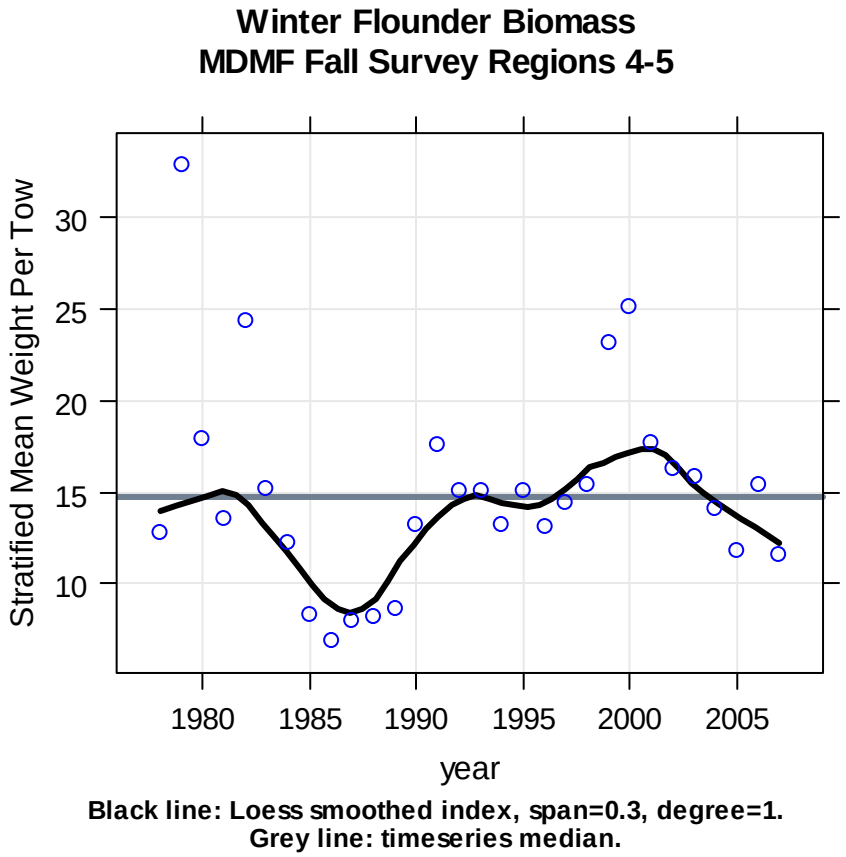

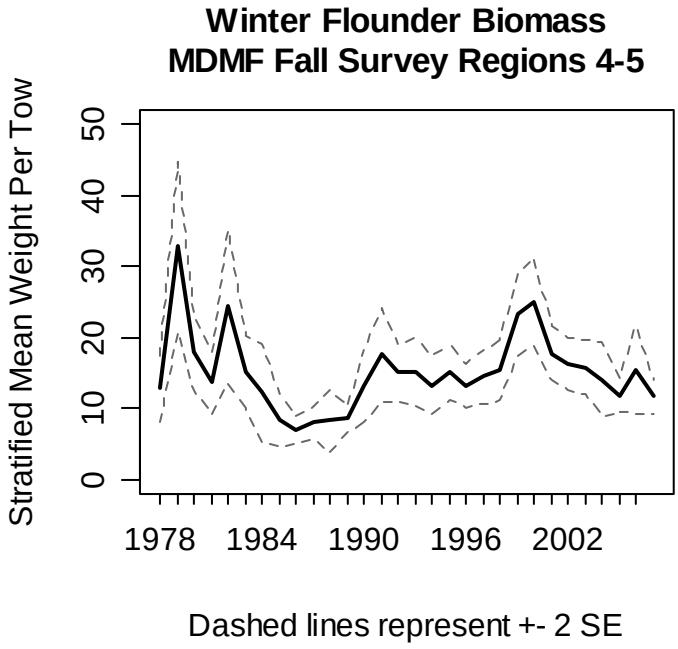

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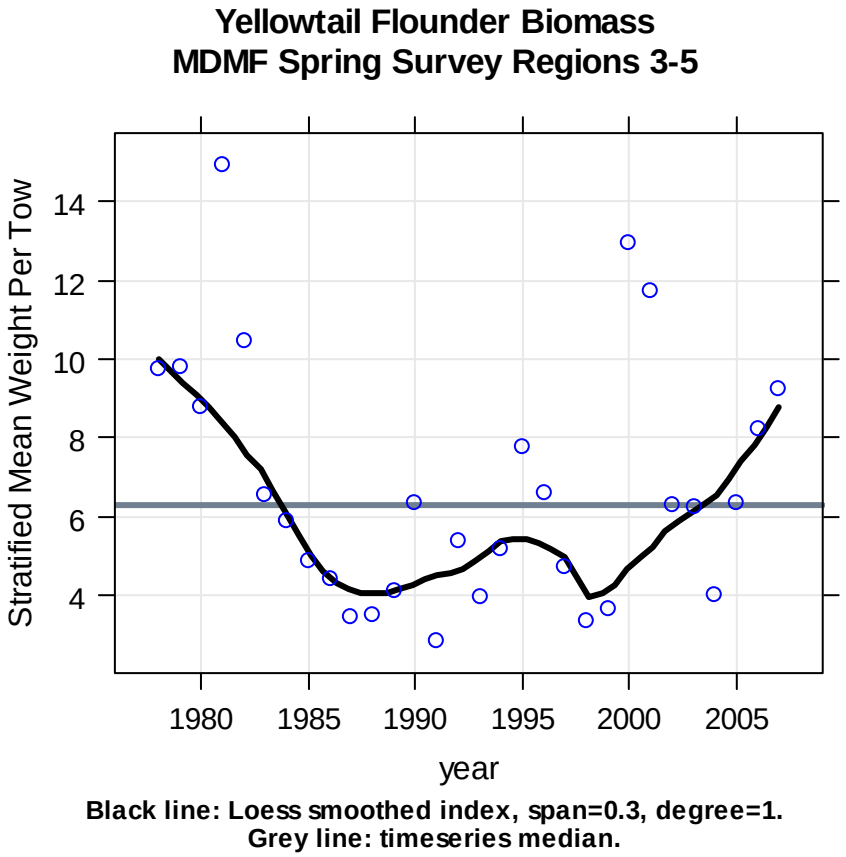

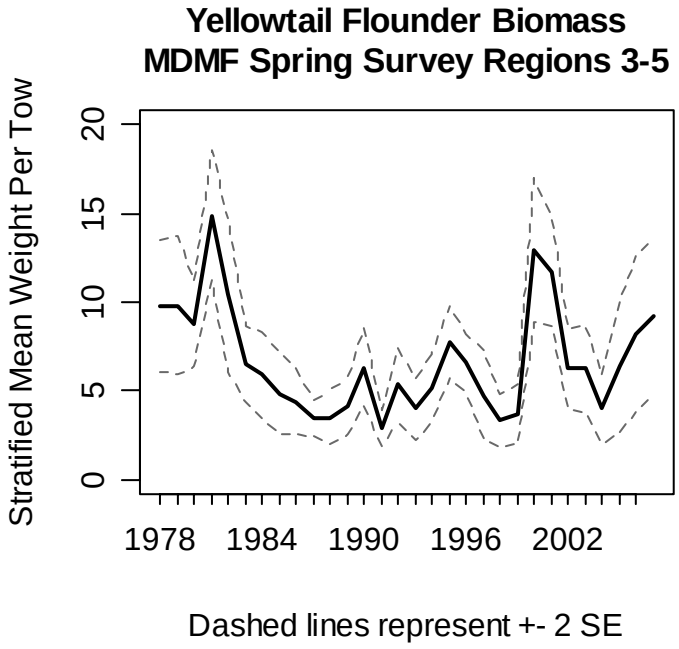

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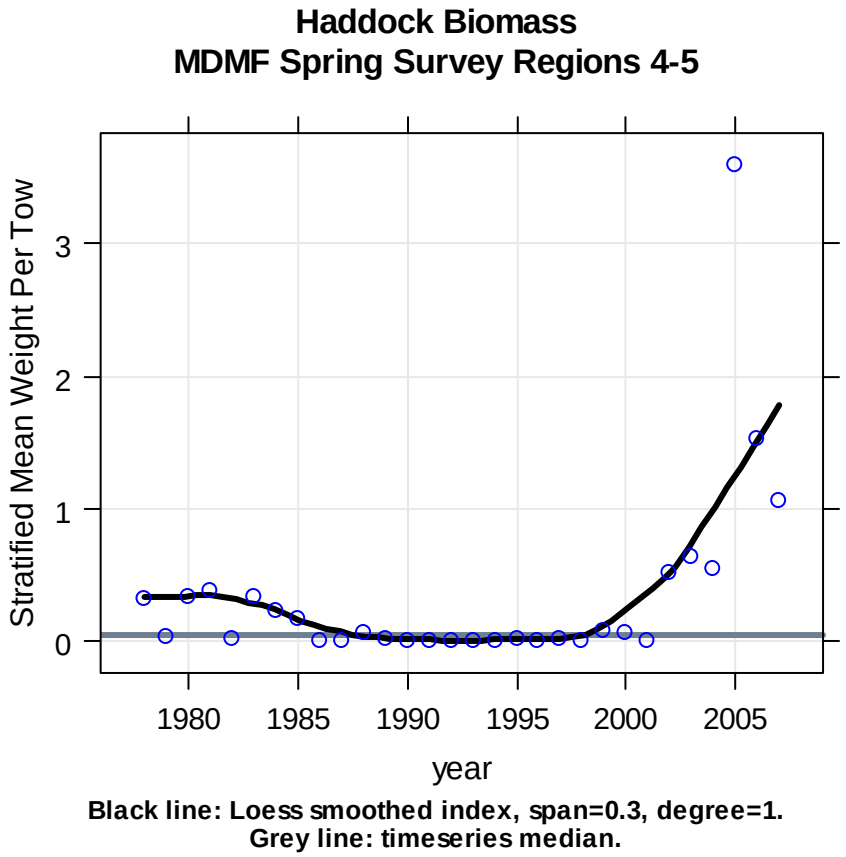

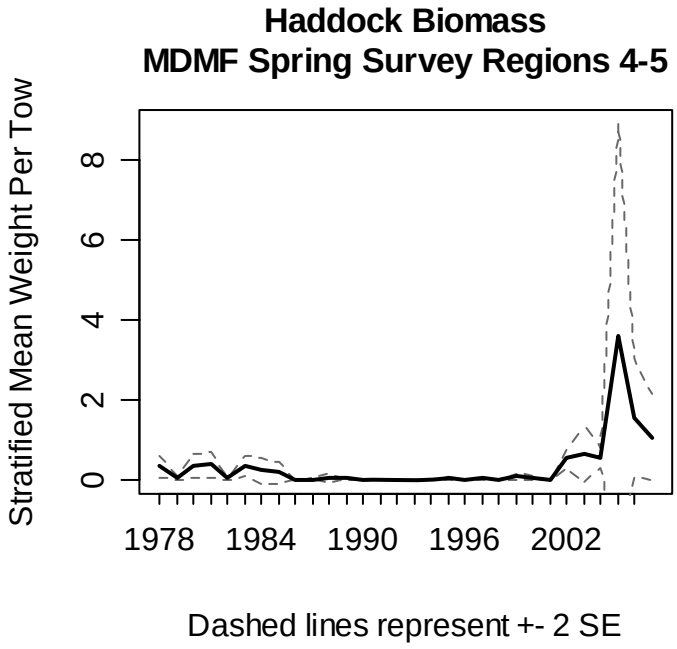

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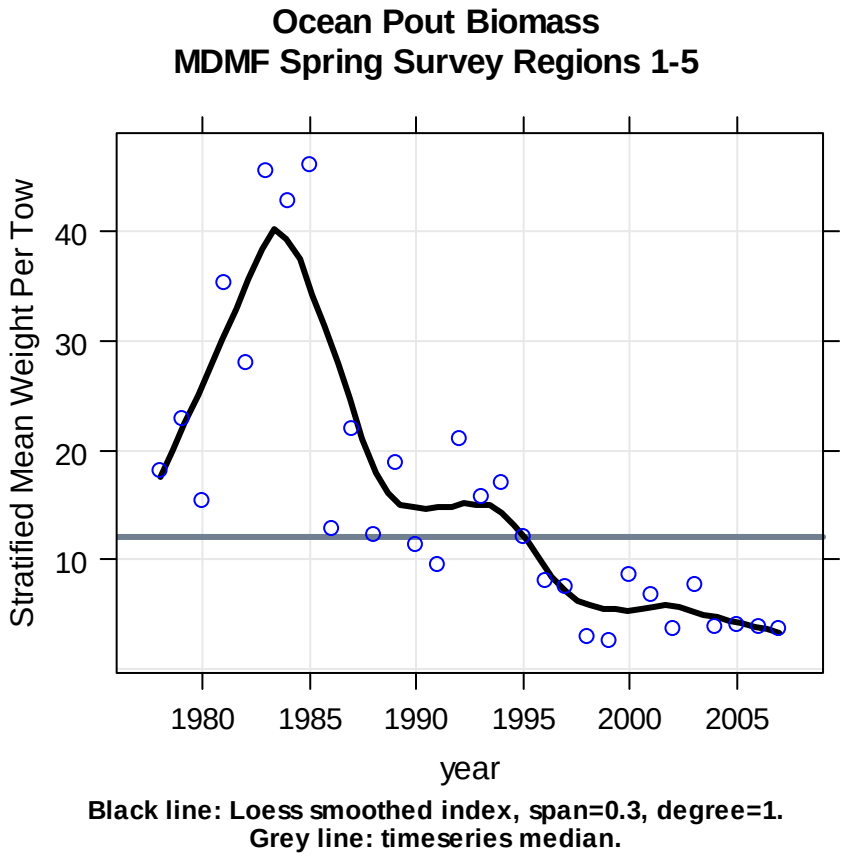

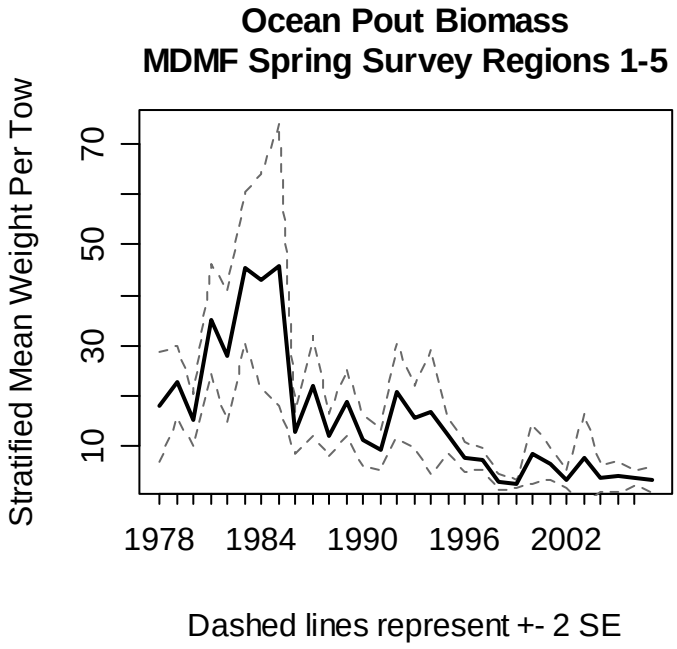

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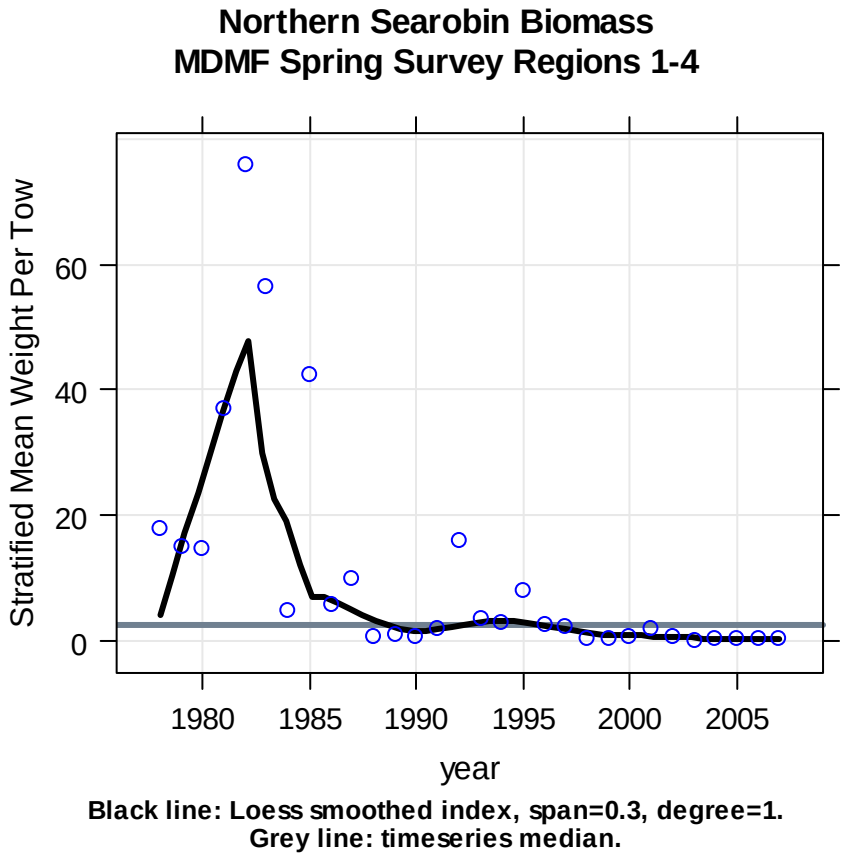

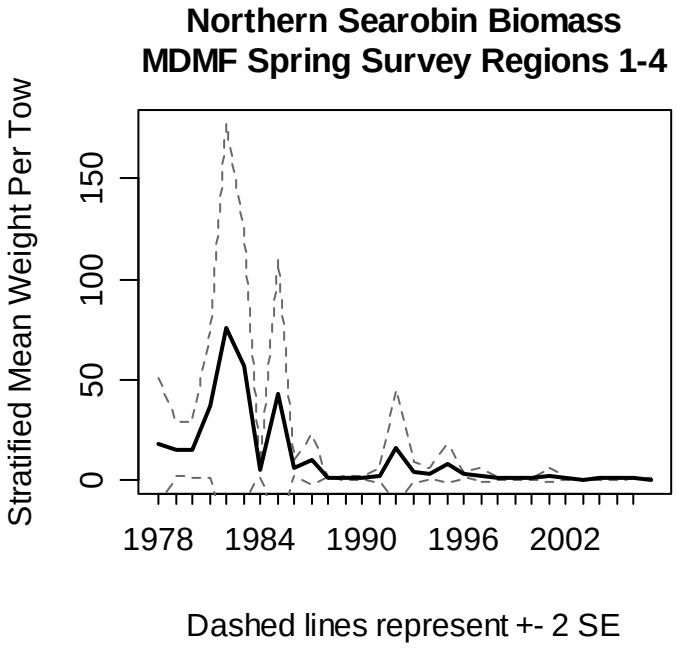

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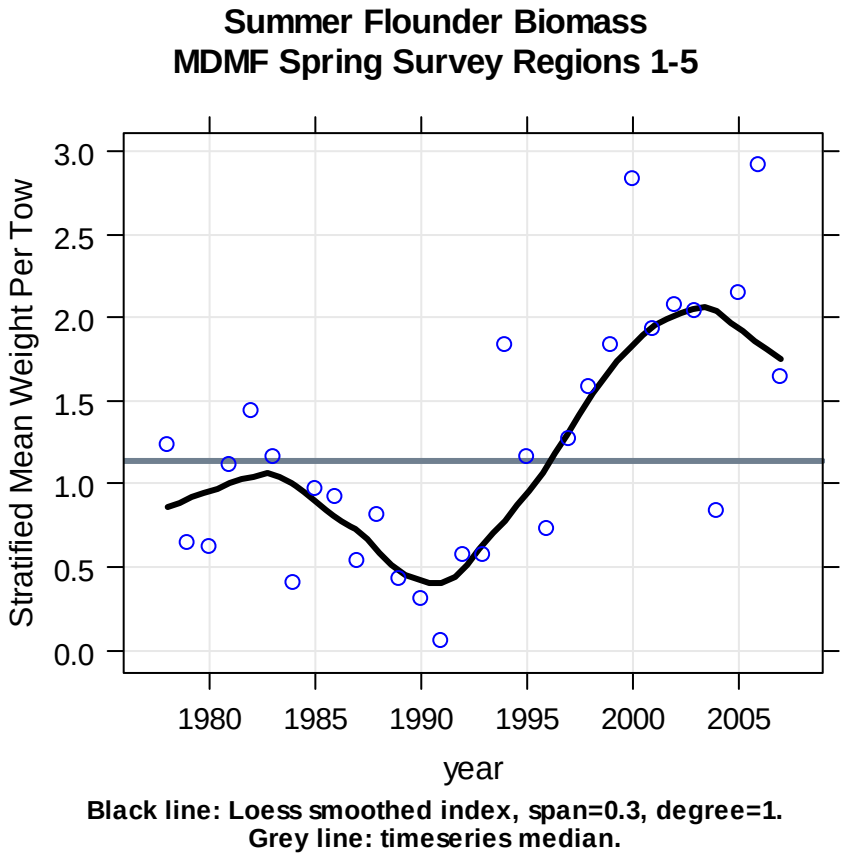

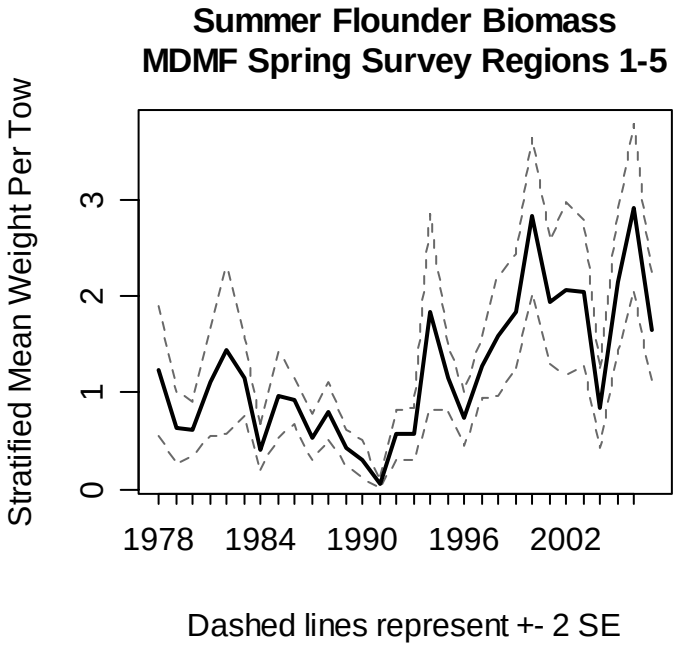

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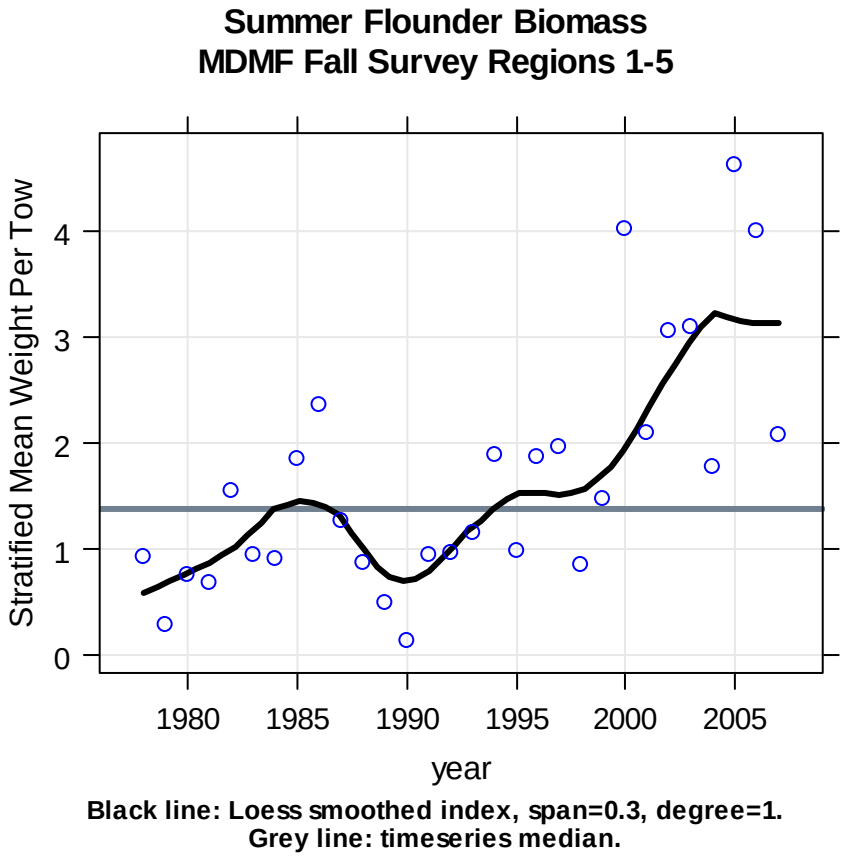

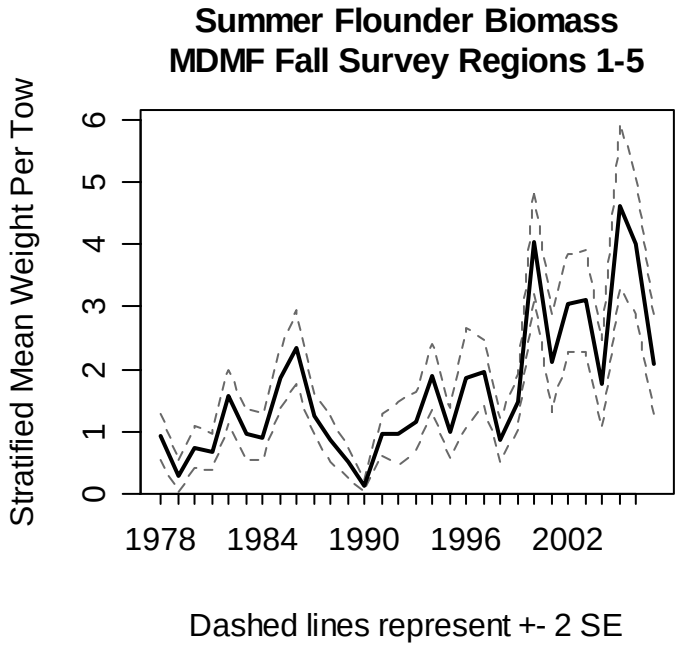

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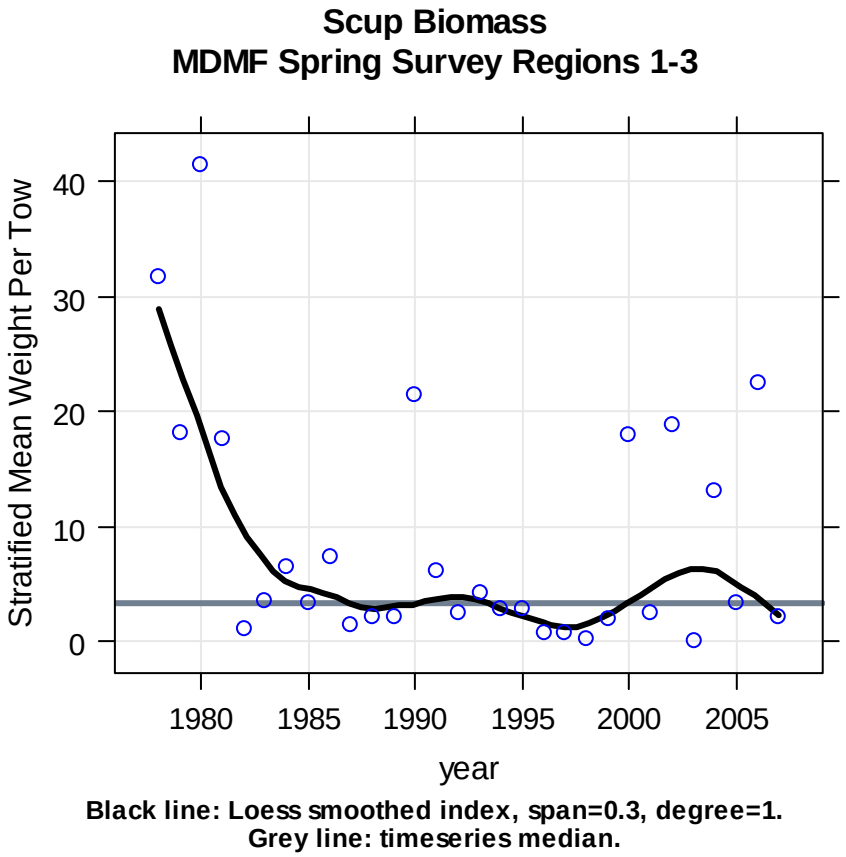

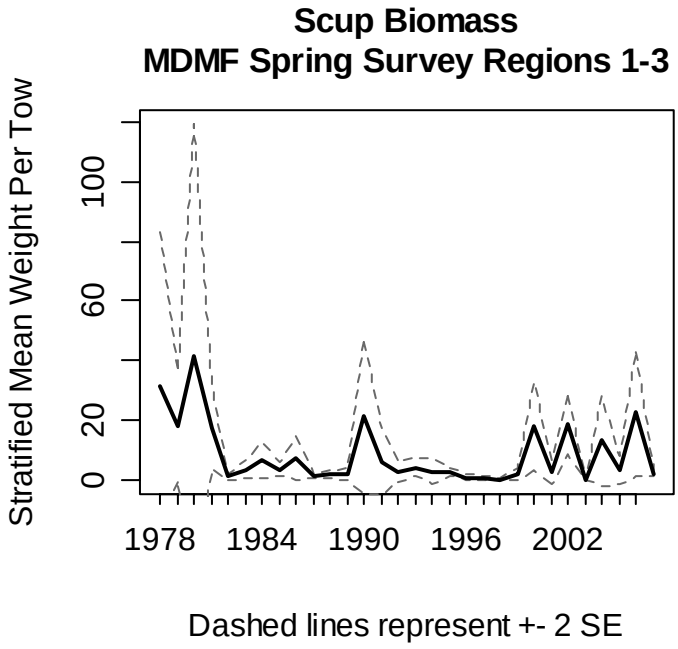

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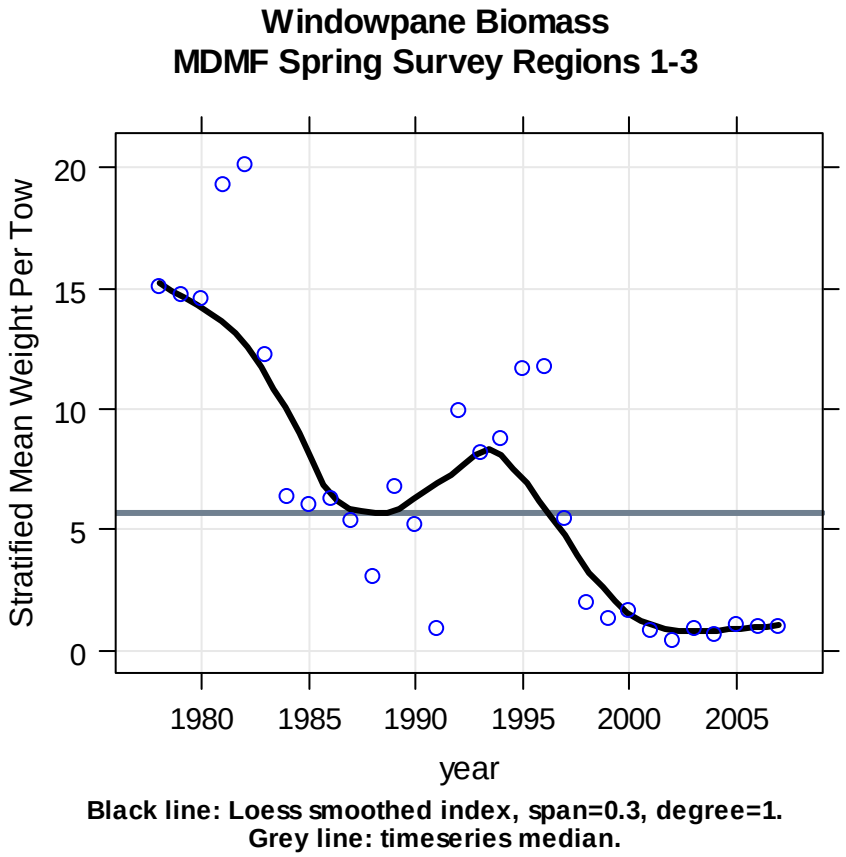

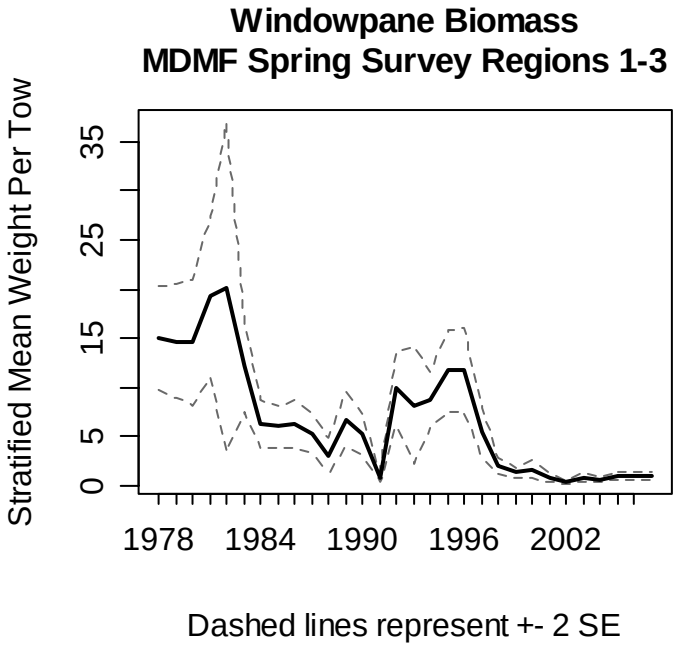

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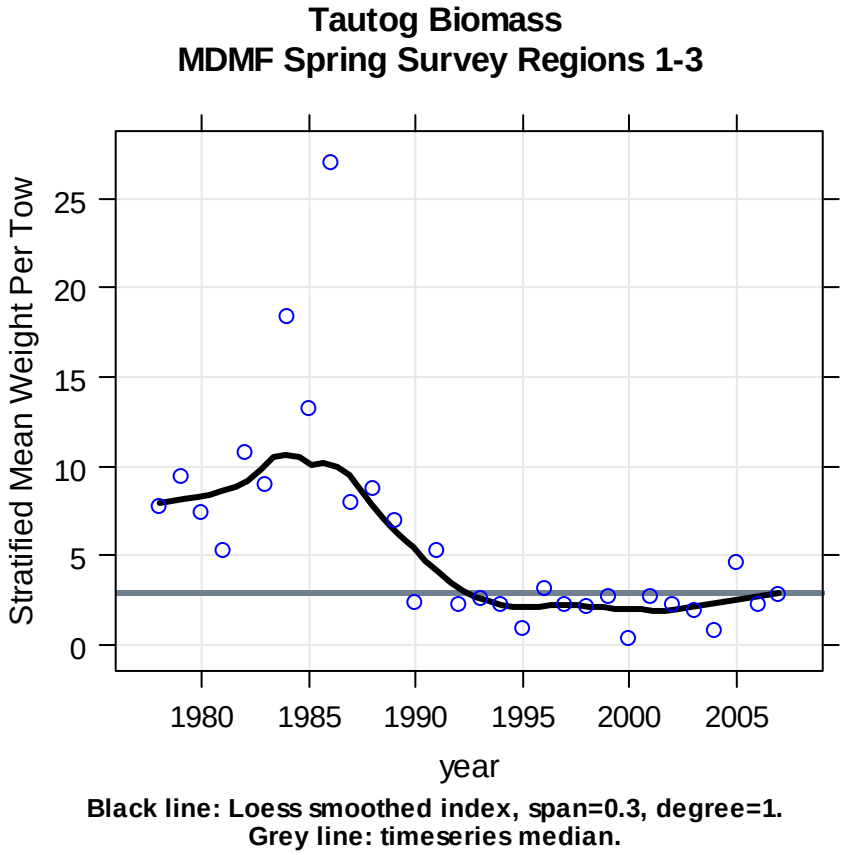

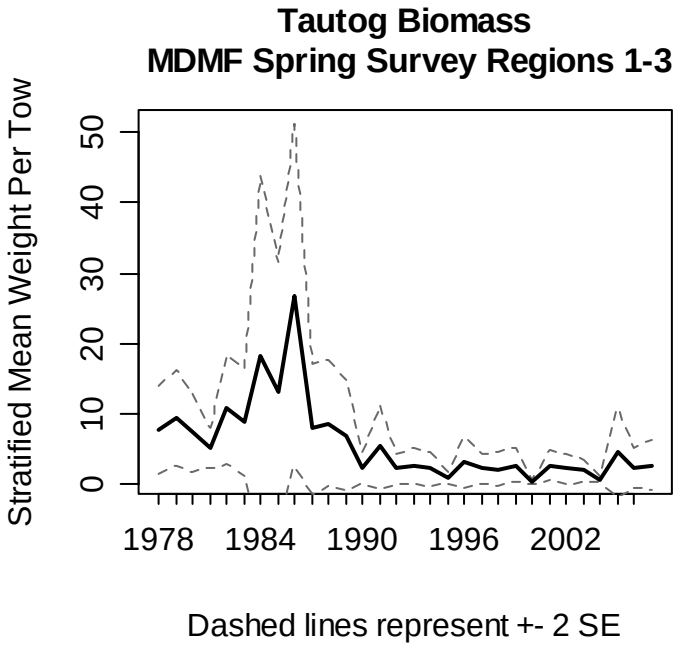

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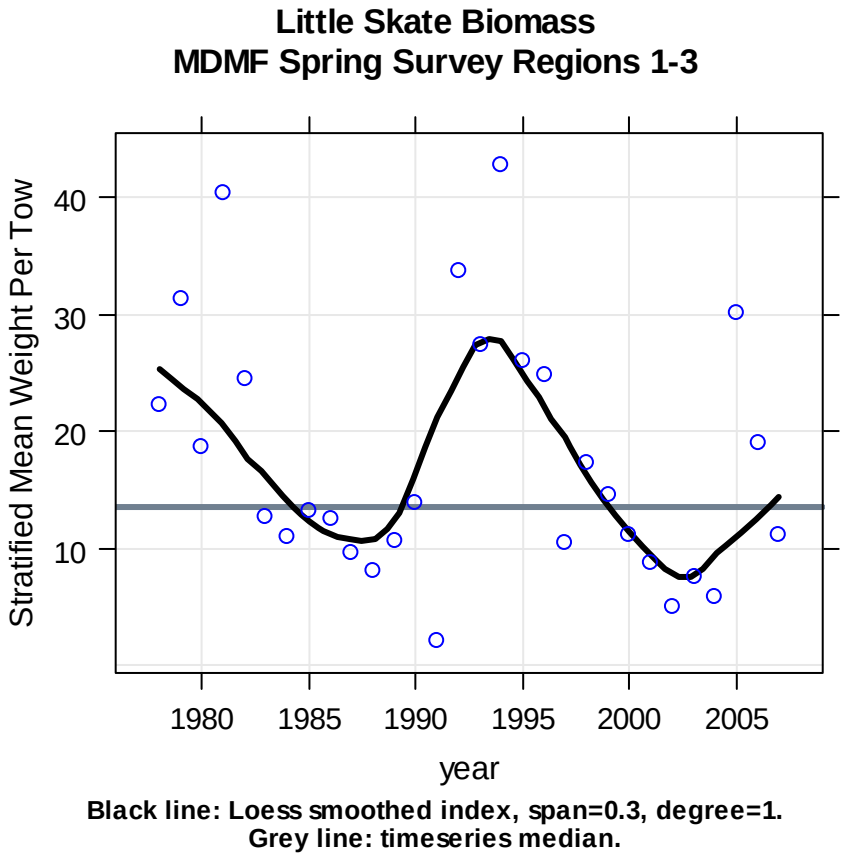

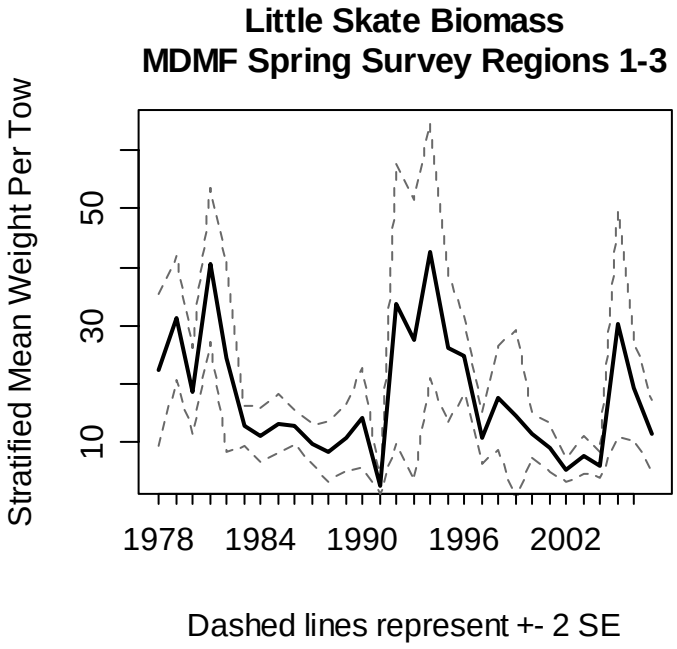

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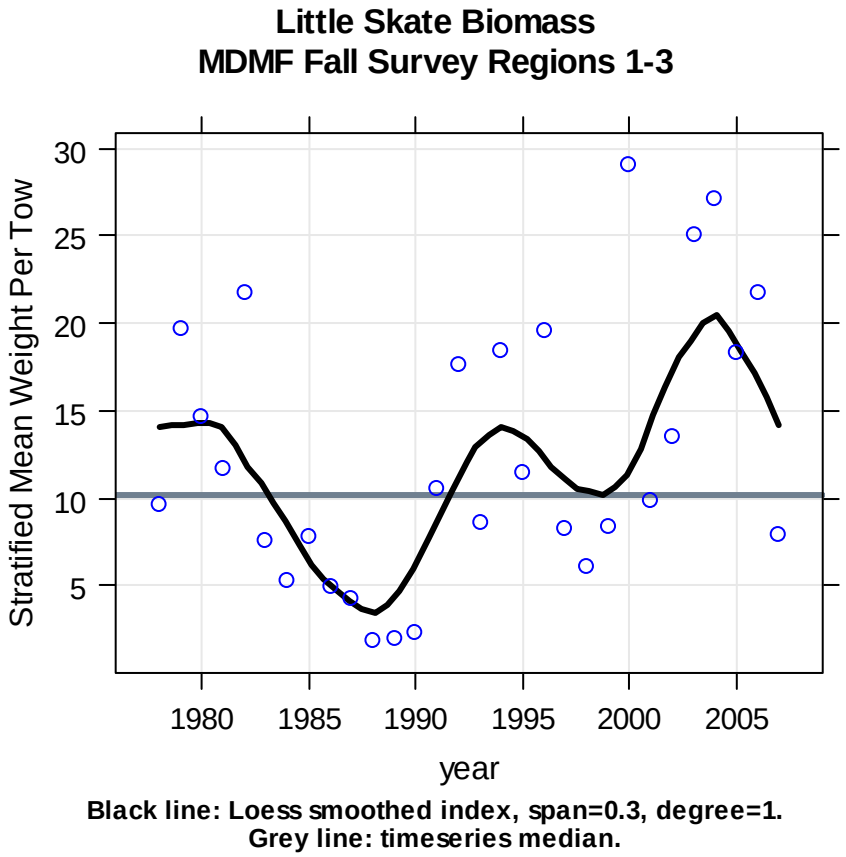


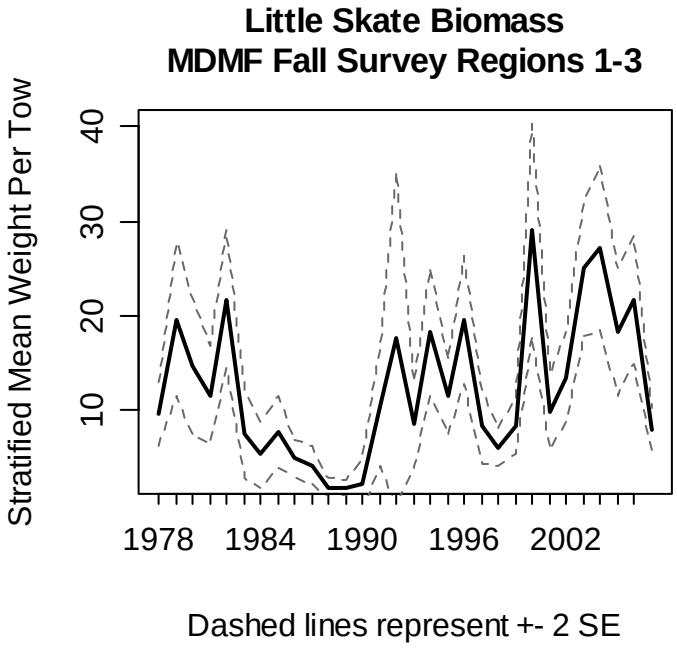
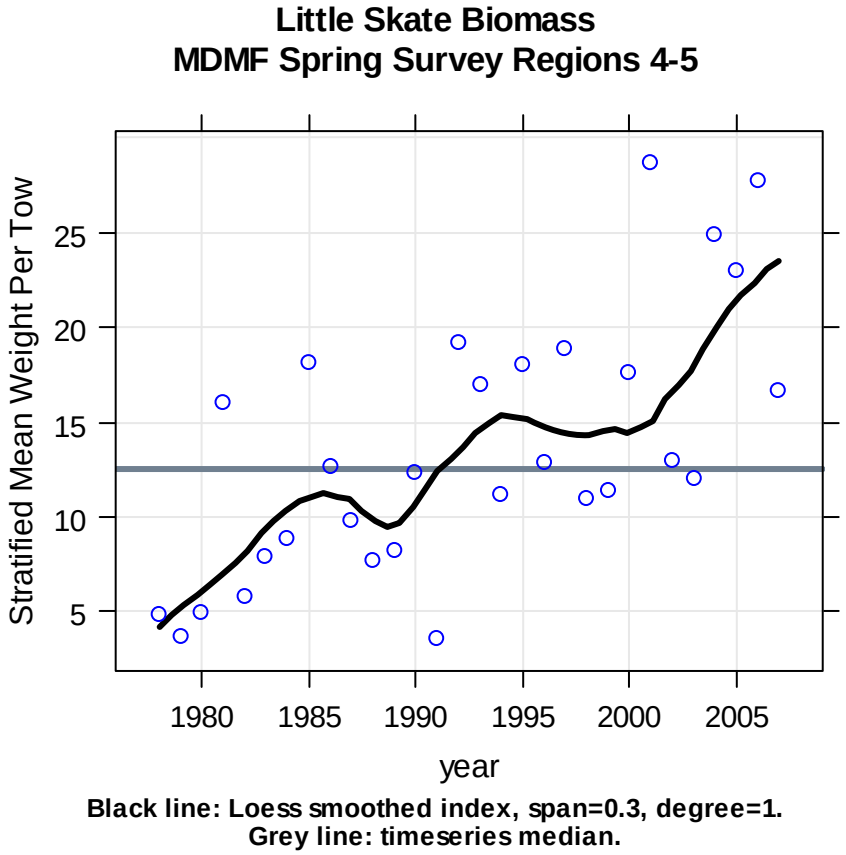


Figure 2 *continued*. Paired figures of stratified mean weight per tow (kg) with (top) Loess smoothed trend line and (bottom) ± 2 standard errors. 1978 – 2007 Massachusetts DMF Trawl Survey.



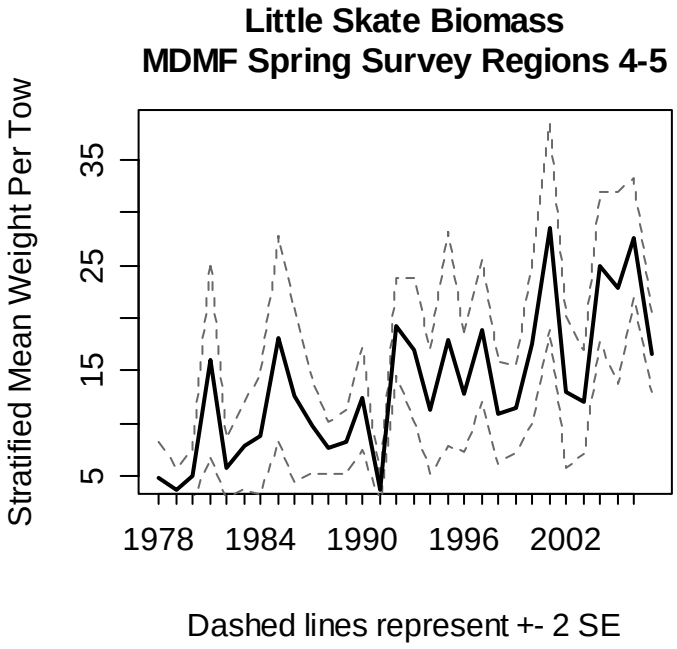
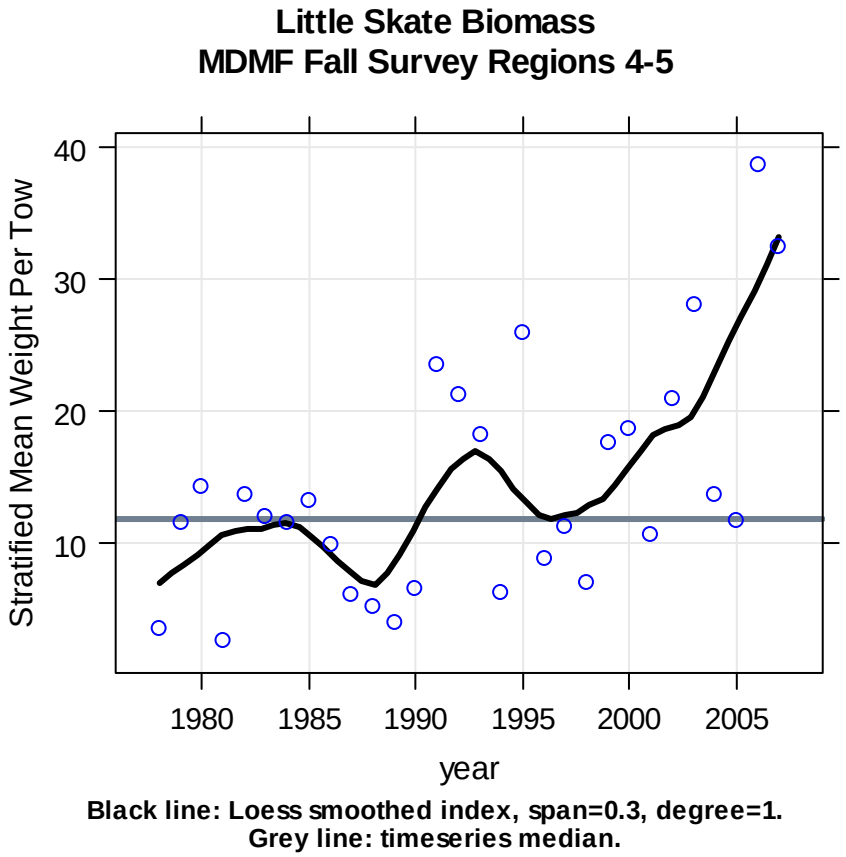


Figure 2 *continued*. Paired figures of stratified mean weight per tow (kg) with (top) Loess smoothed trend line and (bottom) ± 2 standard errors. 1978 – 2007 Massachusetts DMF Trawl Survey.



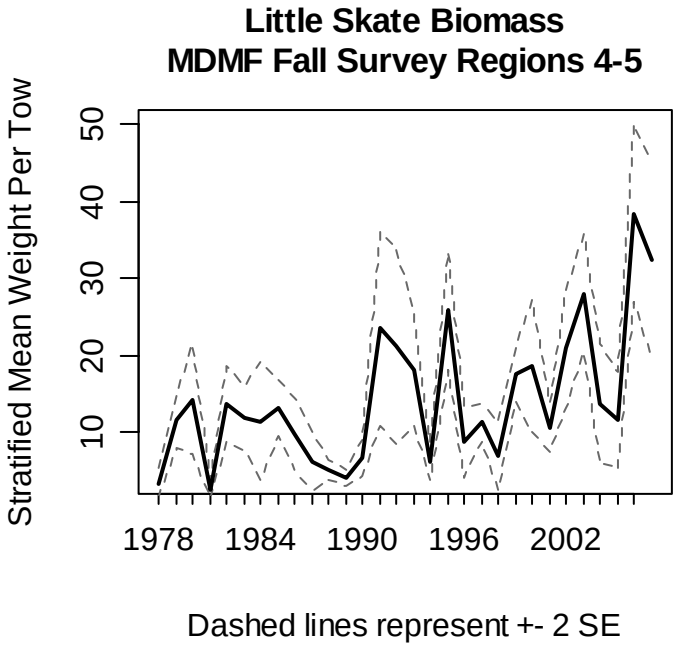
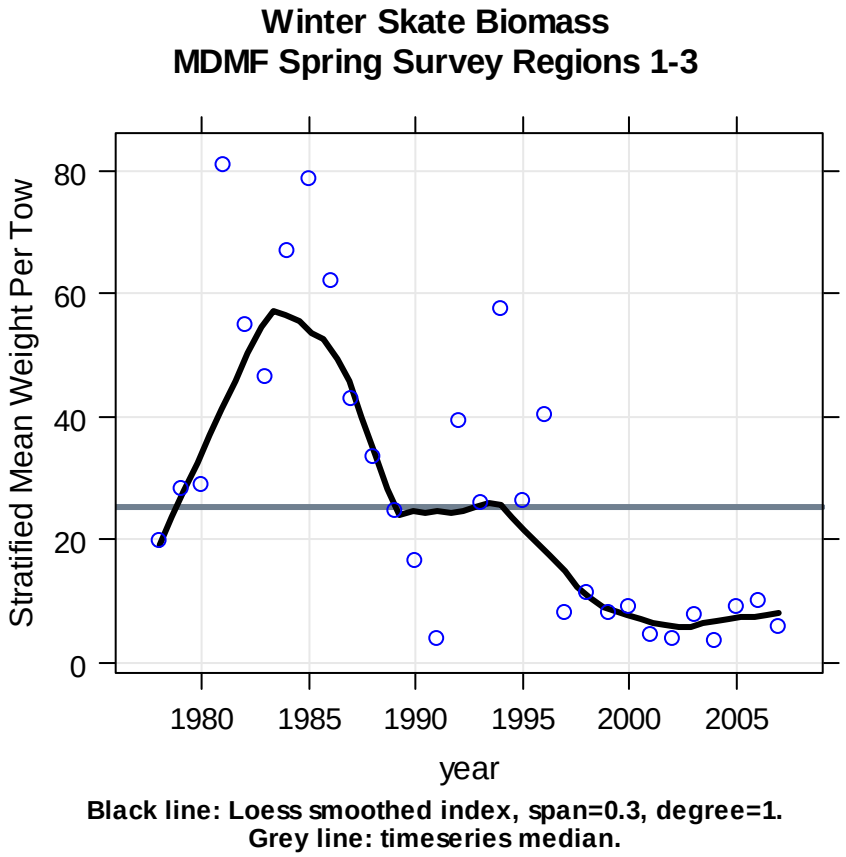


Figure 2 *continued*. Paired figures of stratified mean weight per tow (kg) with (top) Loess smoothed trend line and (bottom) ± 2 standard errors. 1978 – 2007 Massachusetts DMF Trawl Survey.



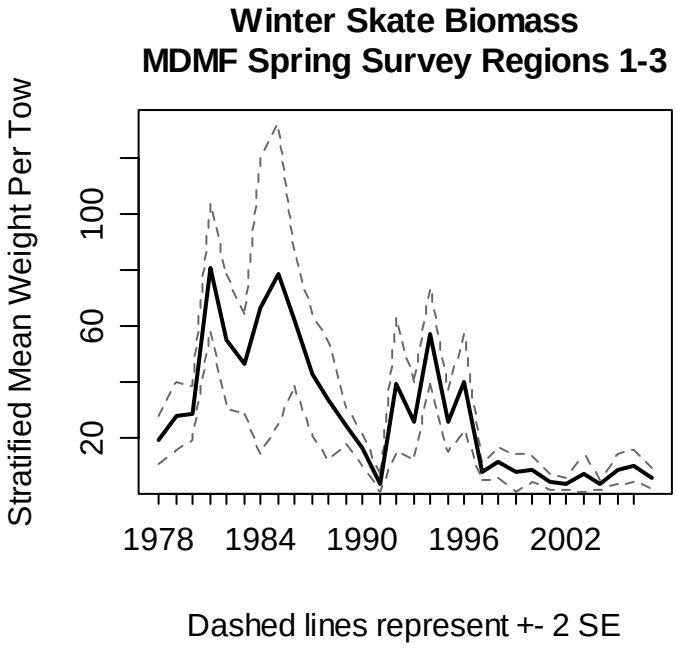
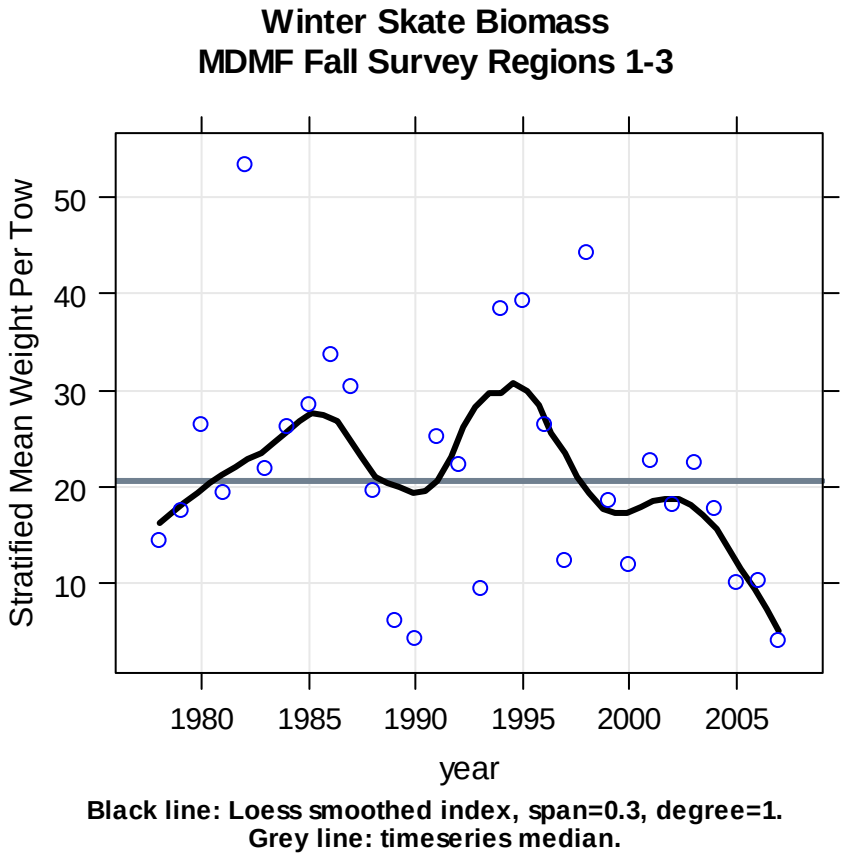


Figure 2 *continued*. Paired figures of stratified mean weight per tow (kg) with (top) Loess smoothed trend line and (bottom) ± 2 standard errors. 1978 – 2007 Massachusetts DMF Trawl Survey.



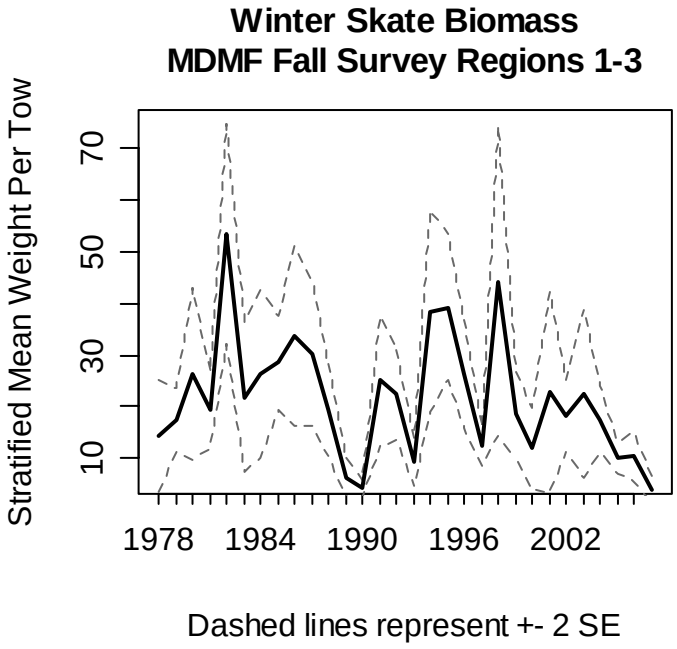
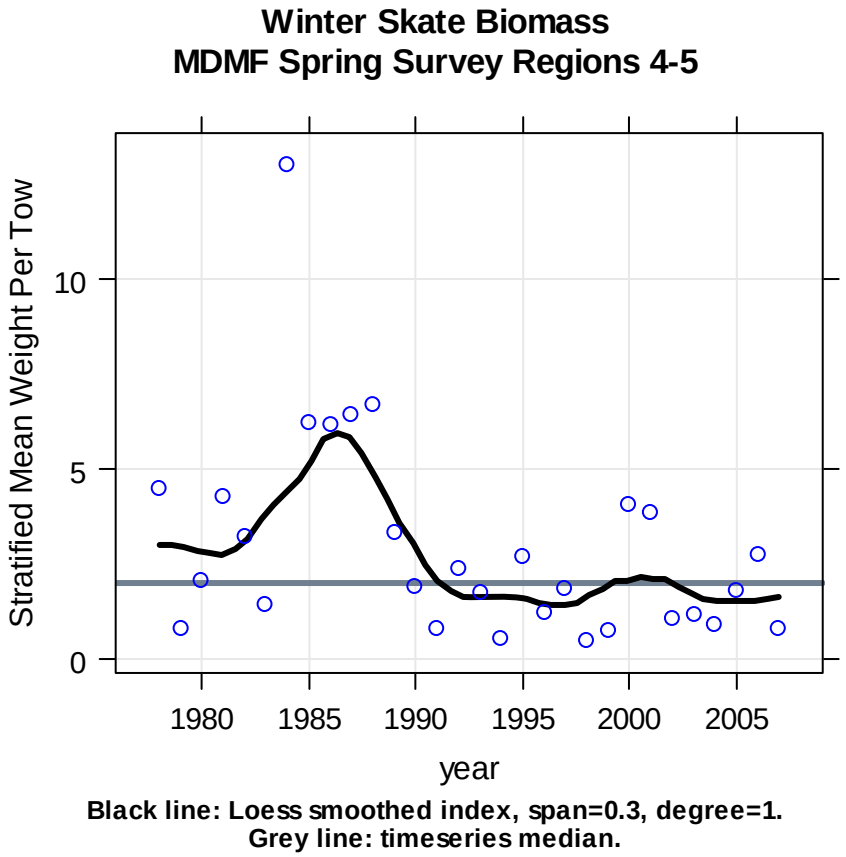


Figure 2 *continued*. Paired figures of stratified mean weight per tow (kg) with (top) Loess smoothed trend line and (bottom) ± 2 standard errors. 1978 – 2007 Massachusetts DMF Trawl Survey.



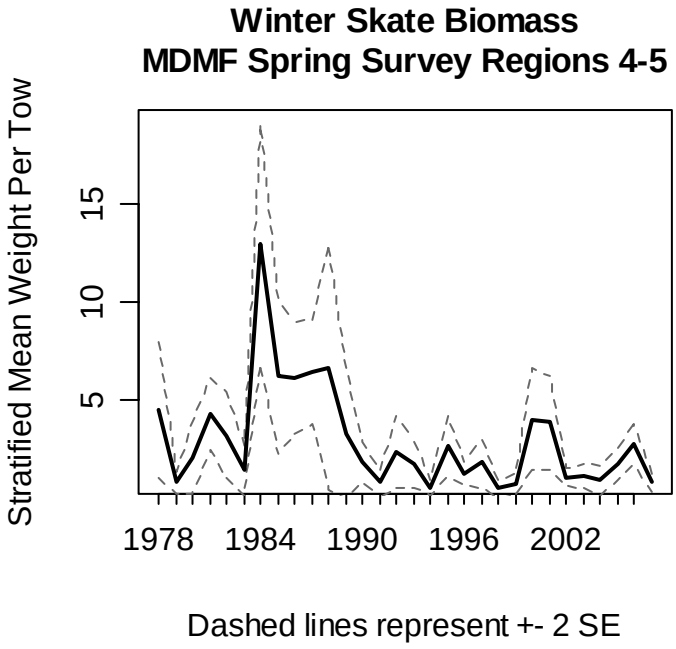
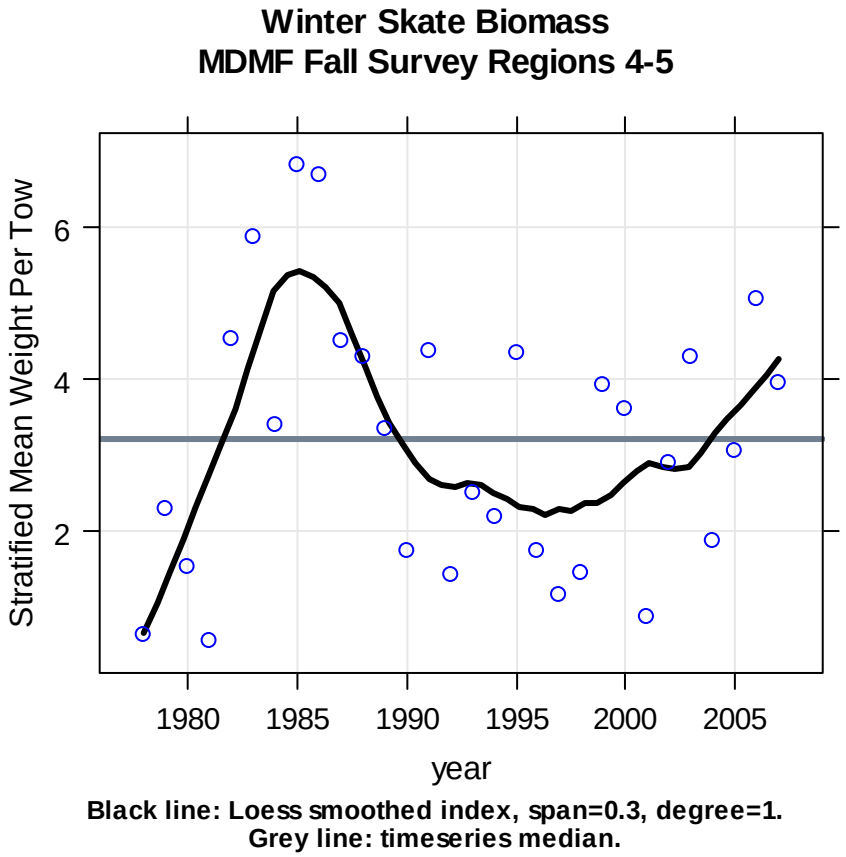


Figure 2 *continued*. Paired figures of stratified mean weight per tow (kg) with (top) Loess smoothed trend line and (bottom) ± 2 standard errors. 1978 – 2007 Massachusetts DMF Trawl Survey.



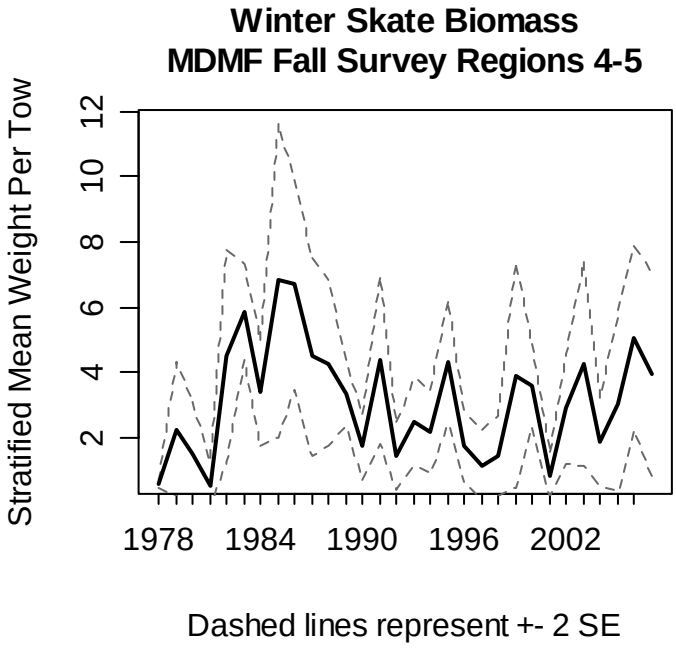
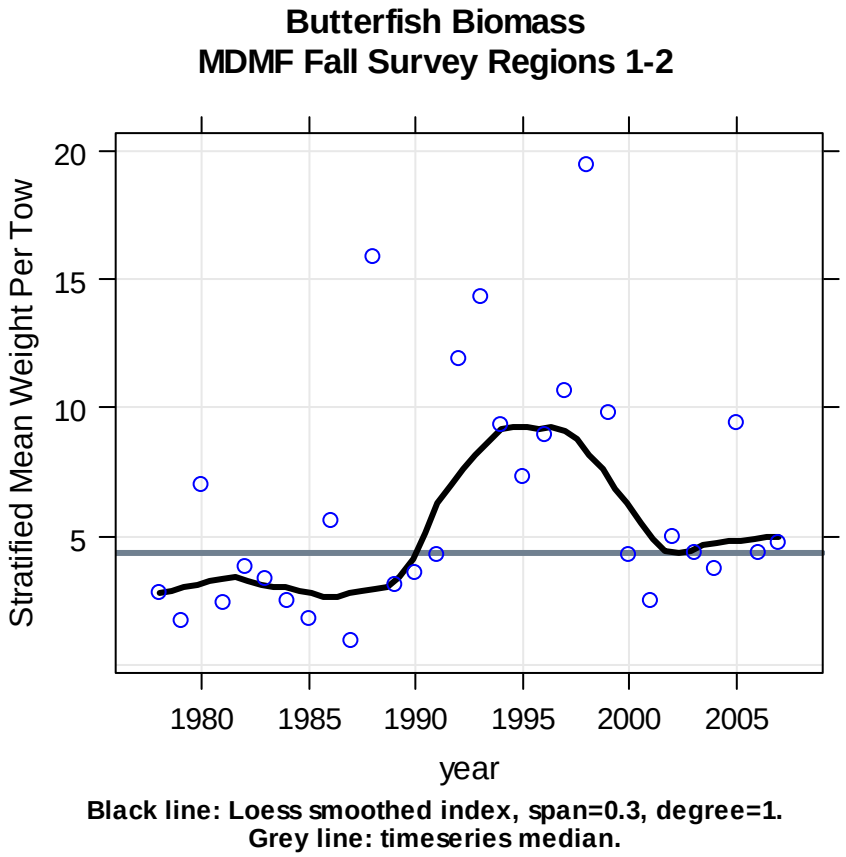


Figure 2 *continued*. Paired figures of stratified mean weight per tow (kg) with (top) Loess smoothed trend line and (bottom) ± 2 standard errors. 1978 – 2007 Massachusetts DMF Trawl Survey.



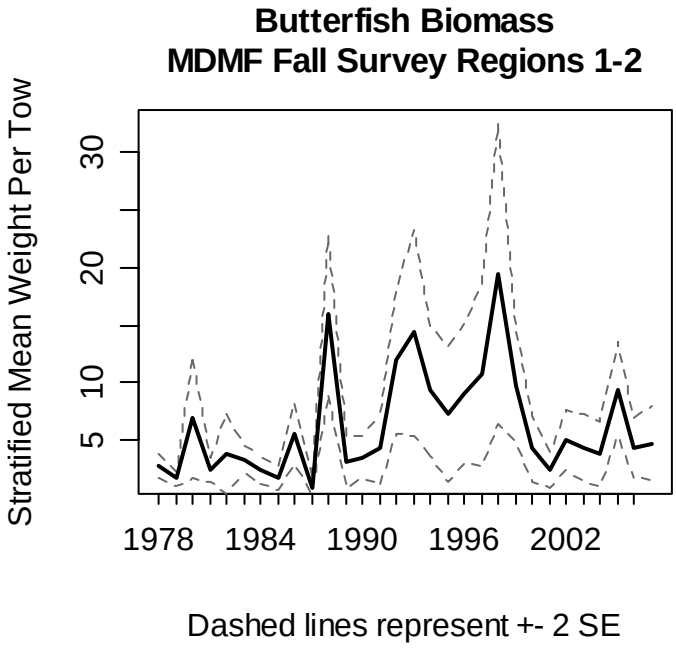
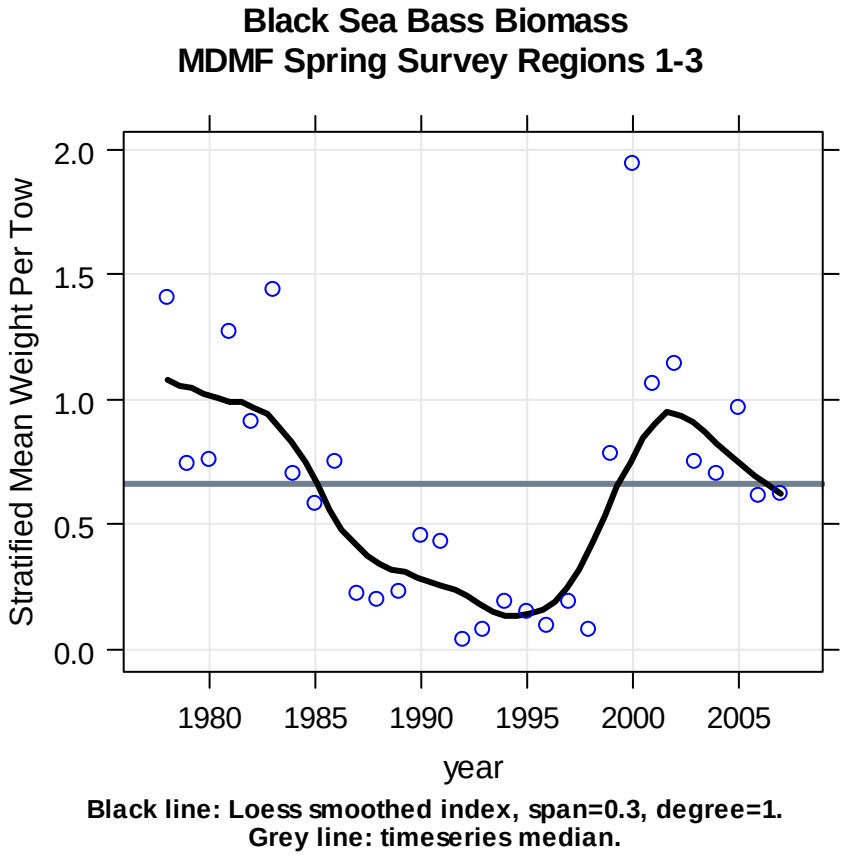


Figure 2 *continued*. Paired figures of stratified mean weight per tow (kg) with (top) Loess smoothed trend line and (bottom) ± 2 standard errors. 1978 – 2007 Massachusetts DMF Trawl Survey.



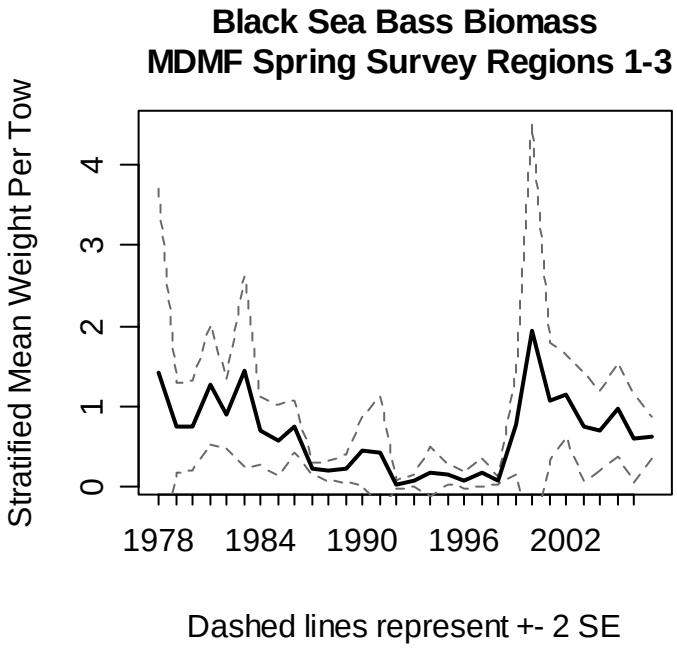
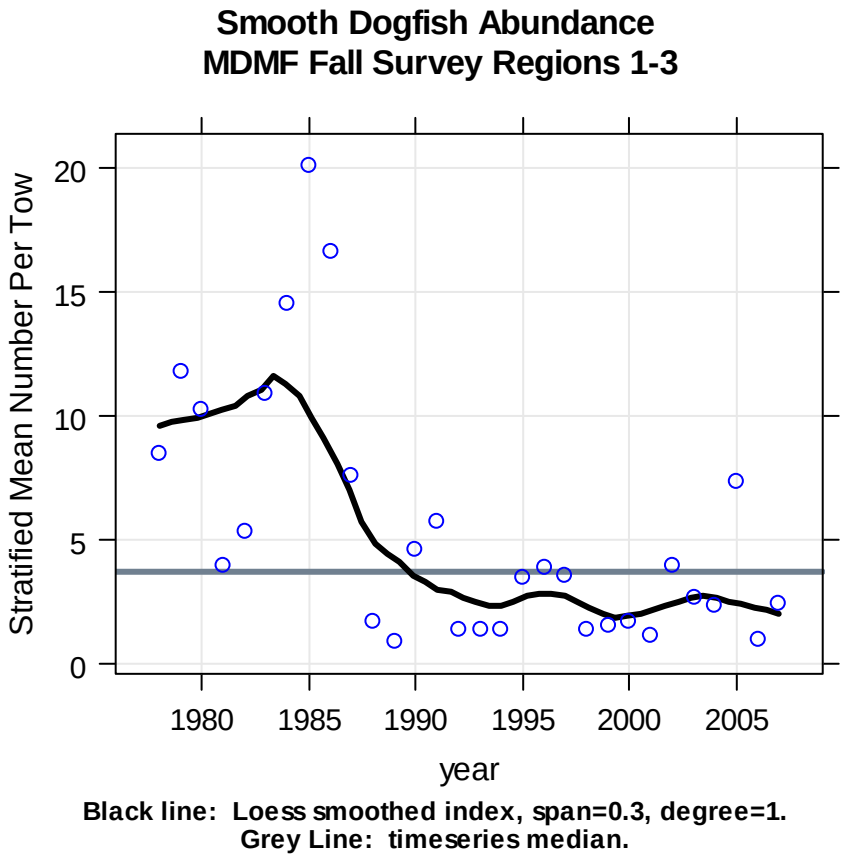


Figure 3. Paired figures of stratified mean number per tow with (top) Loess smoothed trend line and (bottom) ± 2 standard errors. 1978 – 2007 Massachusetts DMF Trawl Survey.



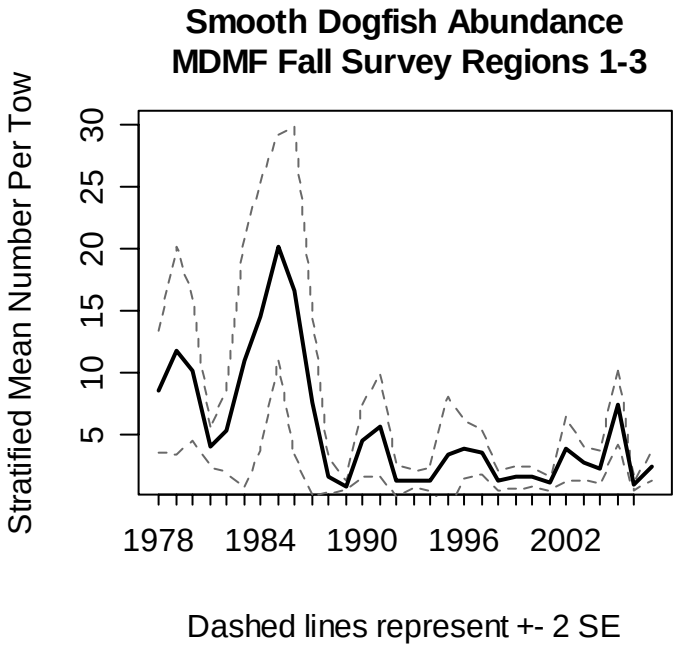
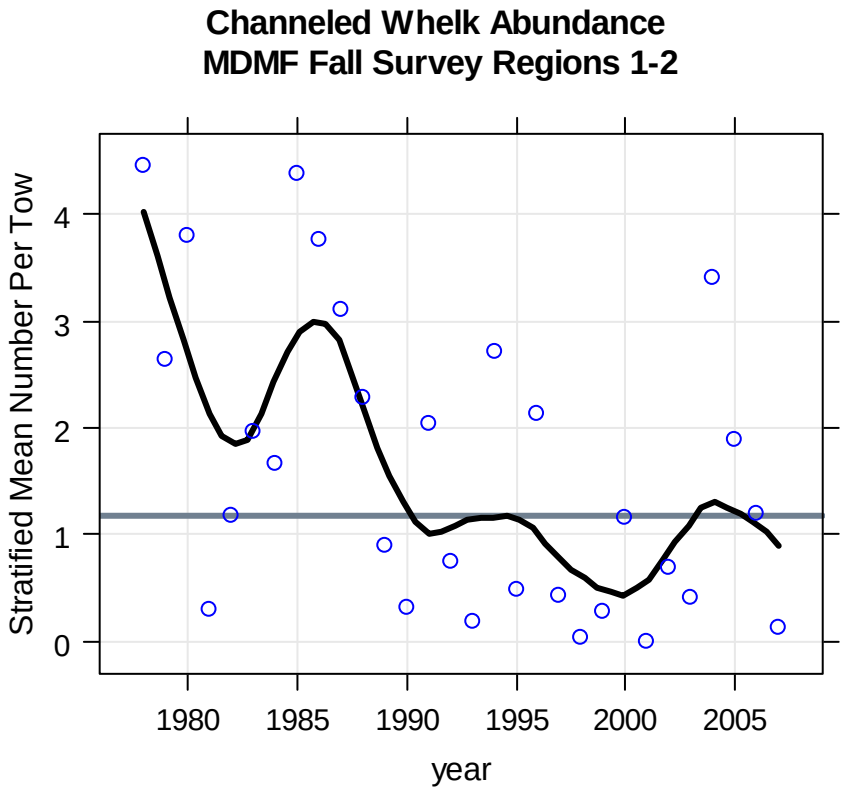


Figure 3 *continued*. Paired figures of stratified mean number per tow with (top) Loess smoothed trend line and (bottom) ± 2 standard errors. 1978 – 2007 Massachusetts DMF Trawl Survey.



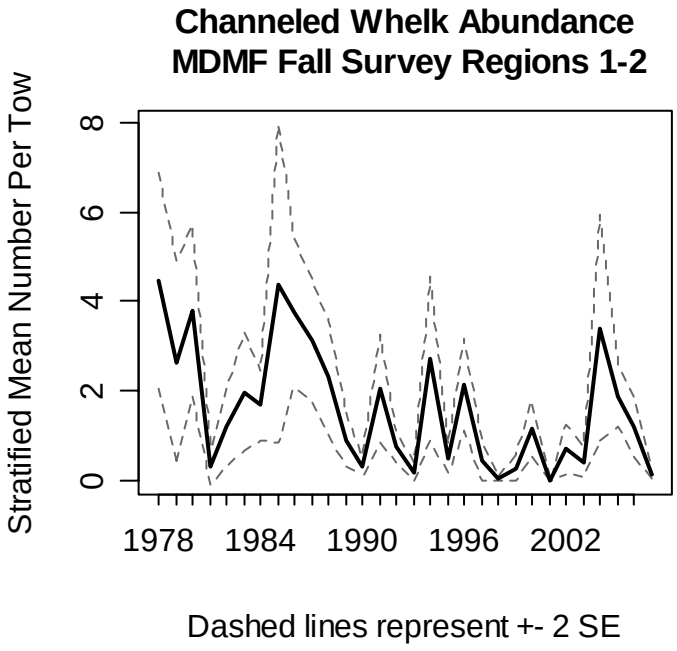
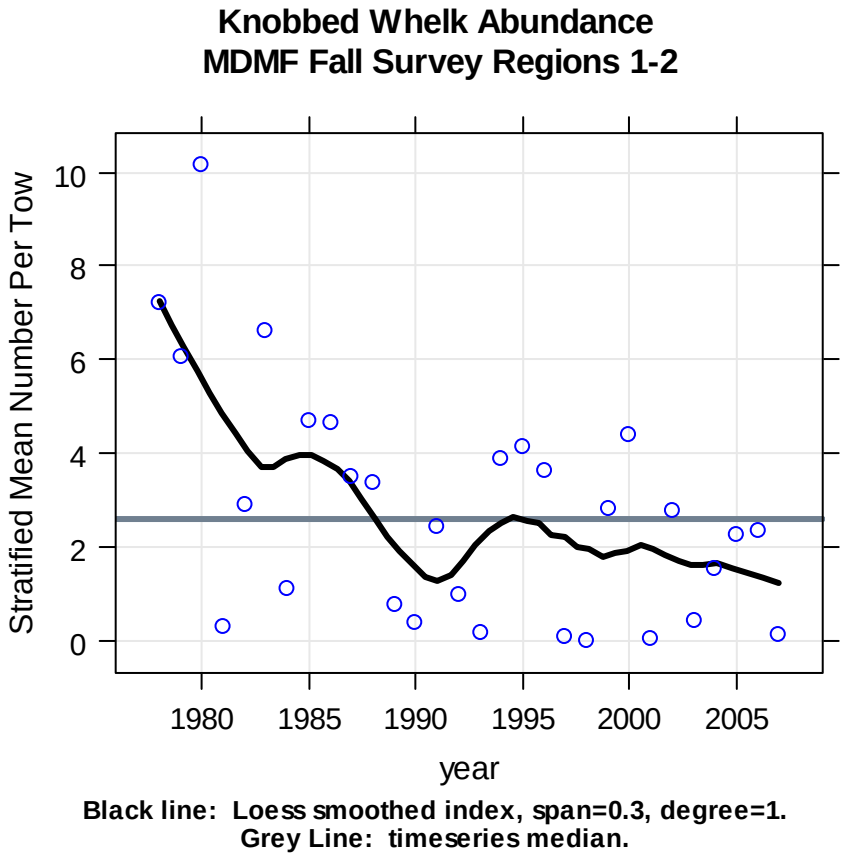


Figure 3 *continued*. Paired figures of stratified mean number per tow with (top) Loess smoothed trend line and (bottom) ± 2 standard errors. 1978 – 2007 Massachusetts DMF Trawl Survey.



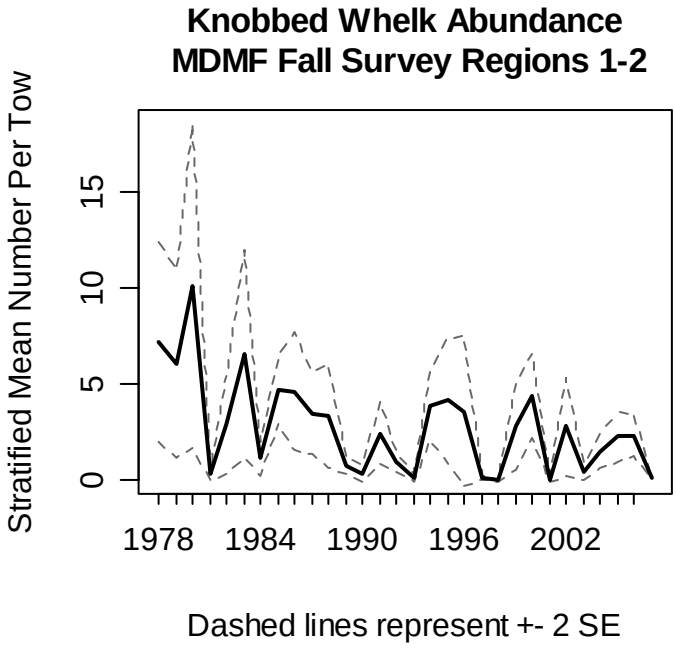
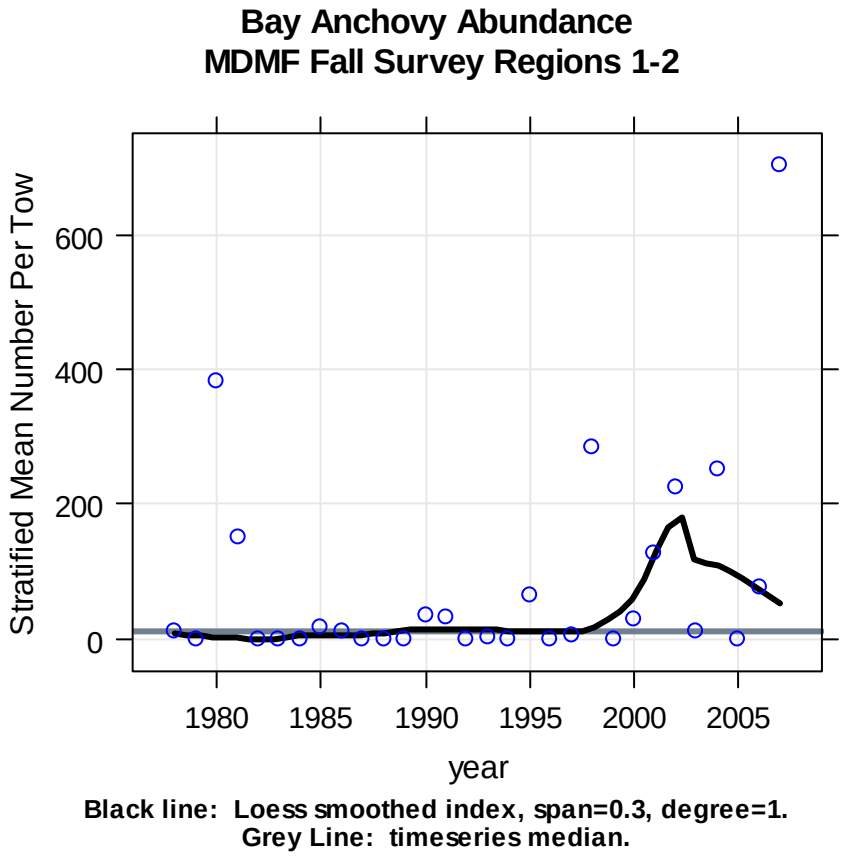


Figure 3 *continued*. Paired figures of stratified mean number per tow with (top) Loess smoothed trend line and (bottom) ± 2 standard errors. 1978 – 2007 Massachusetts DMF Trawl Survey.



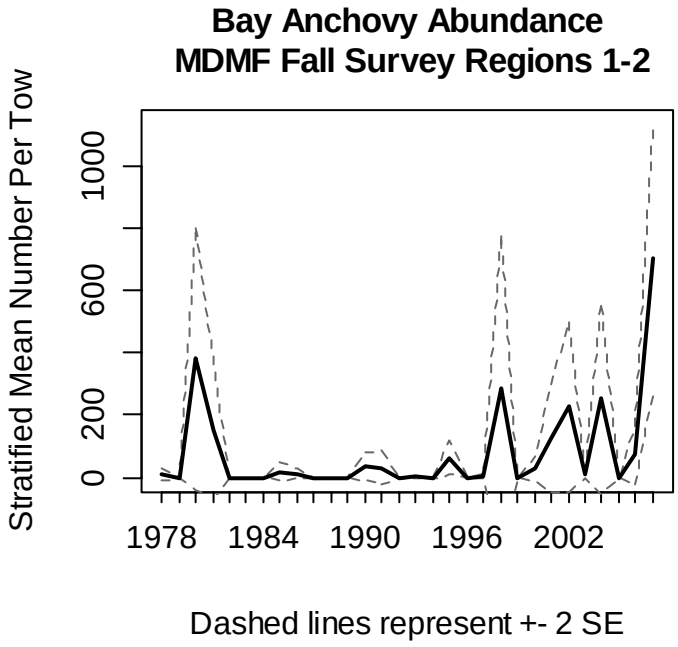
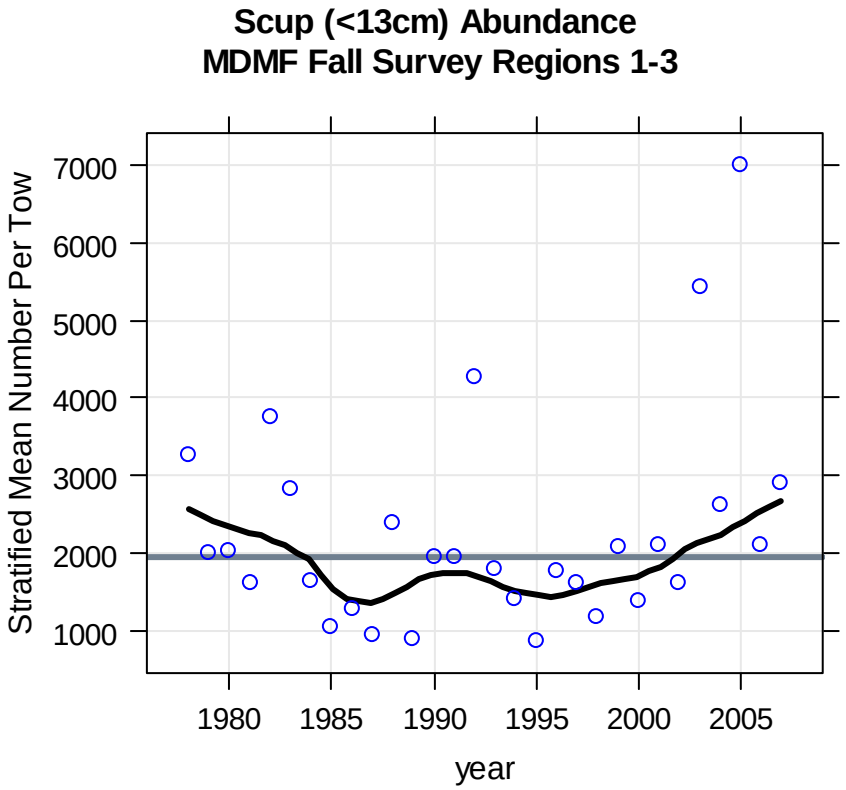
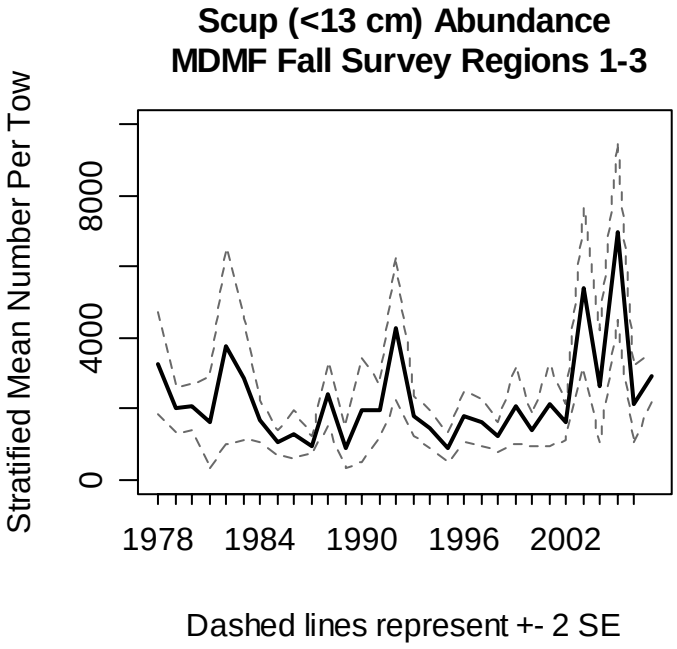


Figure 4. Paired figures of pre-recruit stratified mean number per tow with (top) Loess smoothed trend line and (bottom) ± 2 standard errors. 1978 – 2007 Massachusetts DMF Trawl Survey.

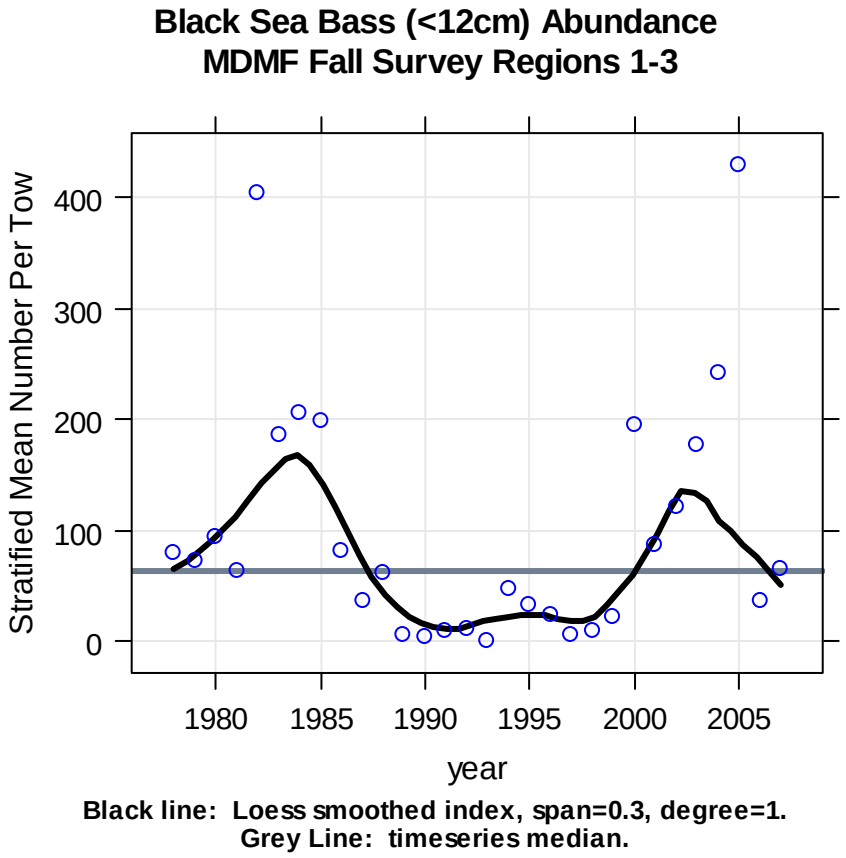


Black line: Loess smoothed index, span=0.3, degree=1.
Grey Line: timeseries median.



Dashed lines represent +- 2 SE

Figure 4 *continued*. Paired figures of pre-recruit stratified mean number per tow with (top) Loess smoothed trend line and (bottom) ± 2 standard errors. 1978 – 2007 Massachusetts DMF Trawl Survey.



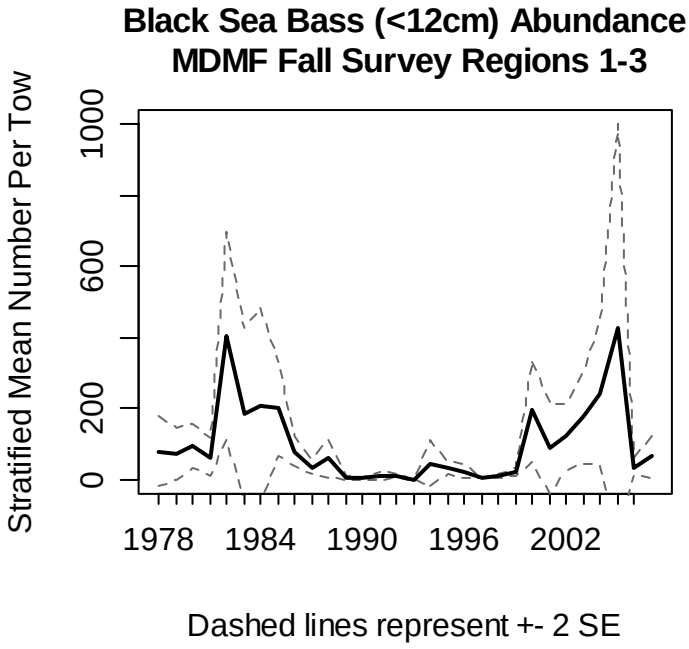
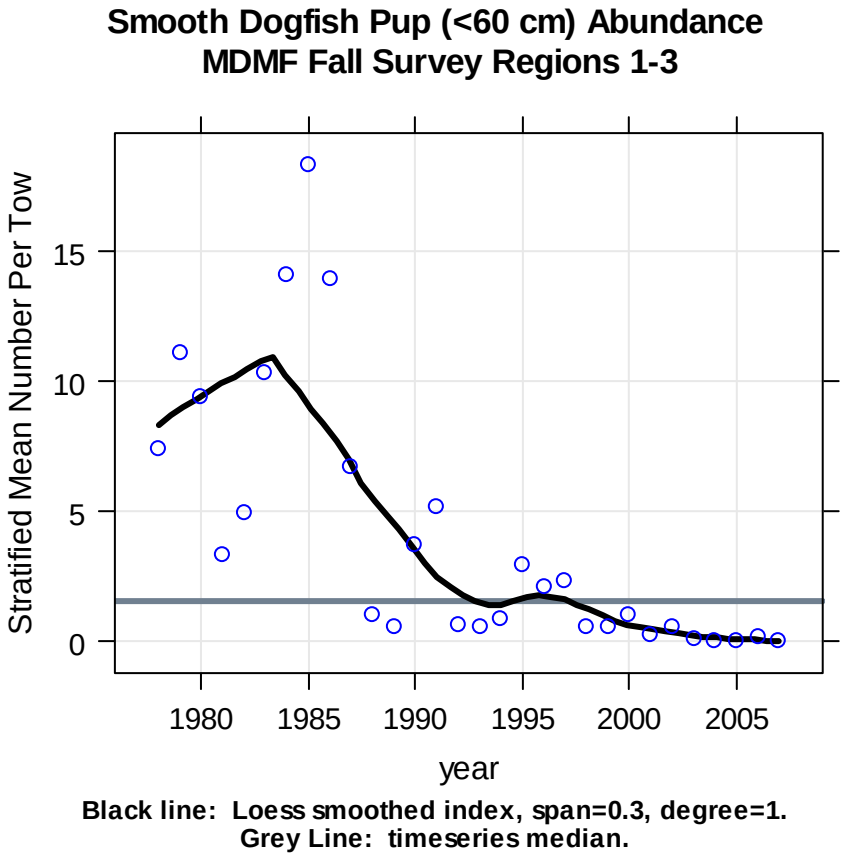


Figure 4 *continued*. Paired figures of pre-recruit stratified mean number per tow with (top) Loess smoothed trend line and (bottom) ± 2 standard errors. 1978 – 2007 Massachusetts DMF Trawl Survey.



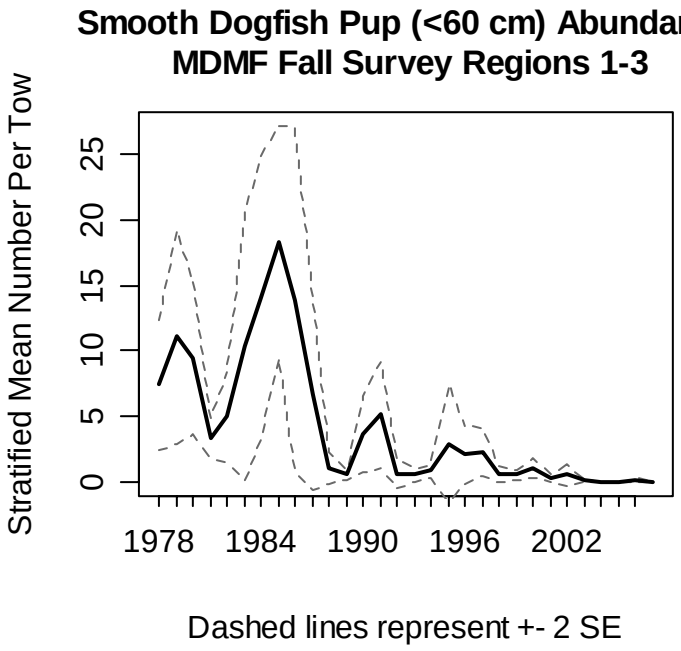
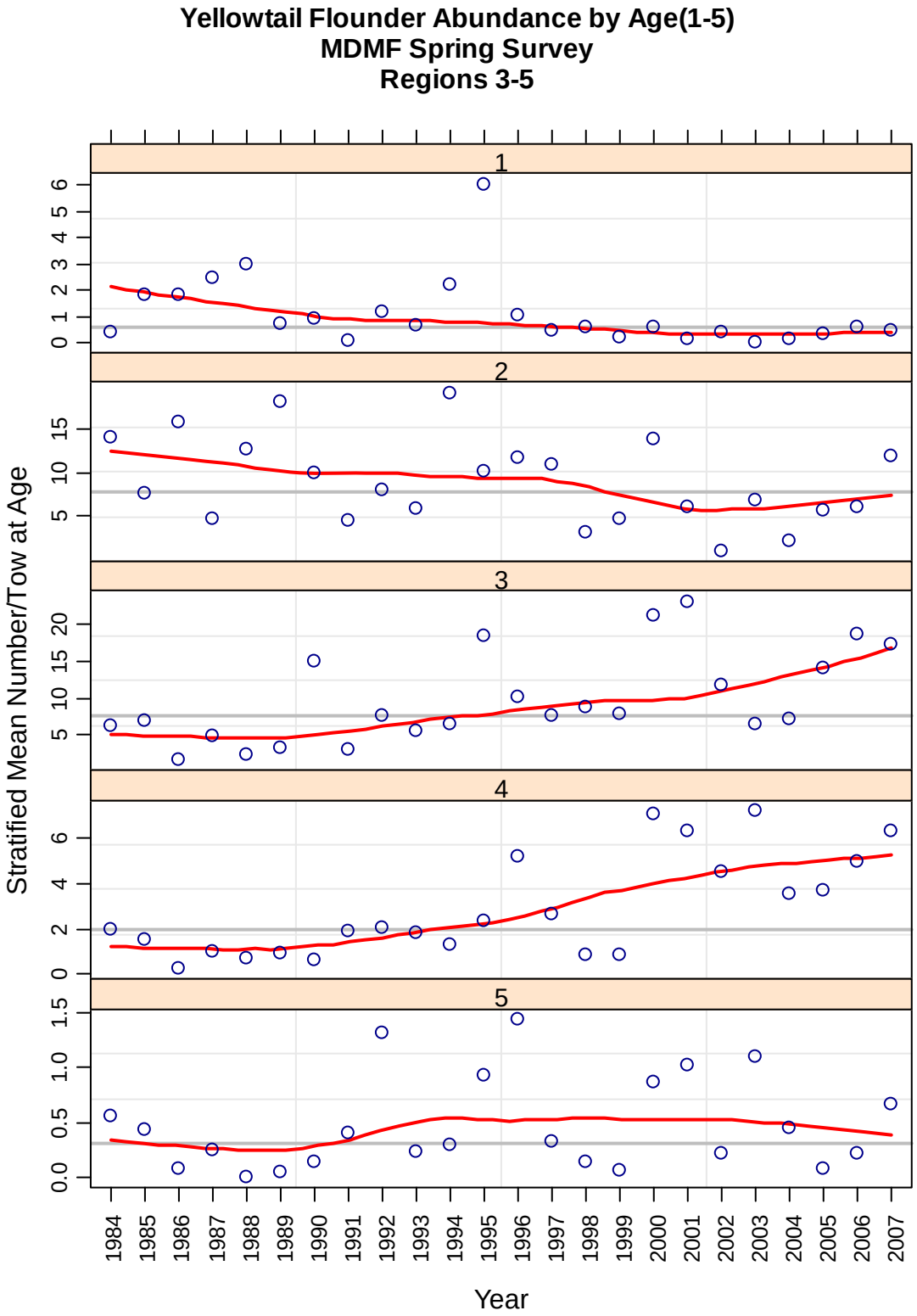
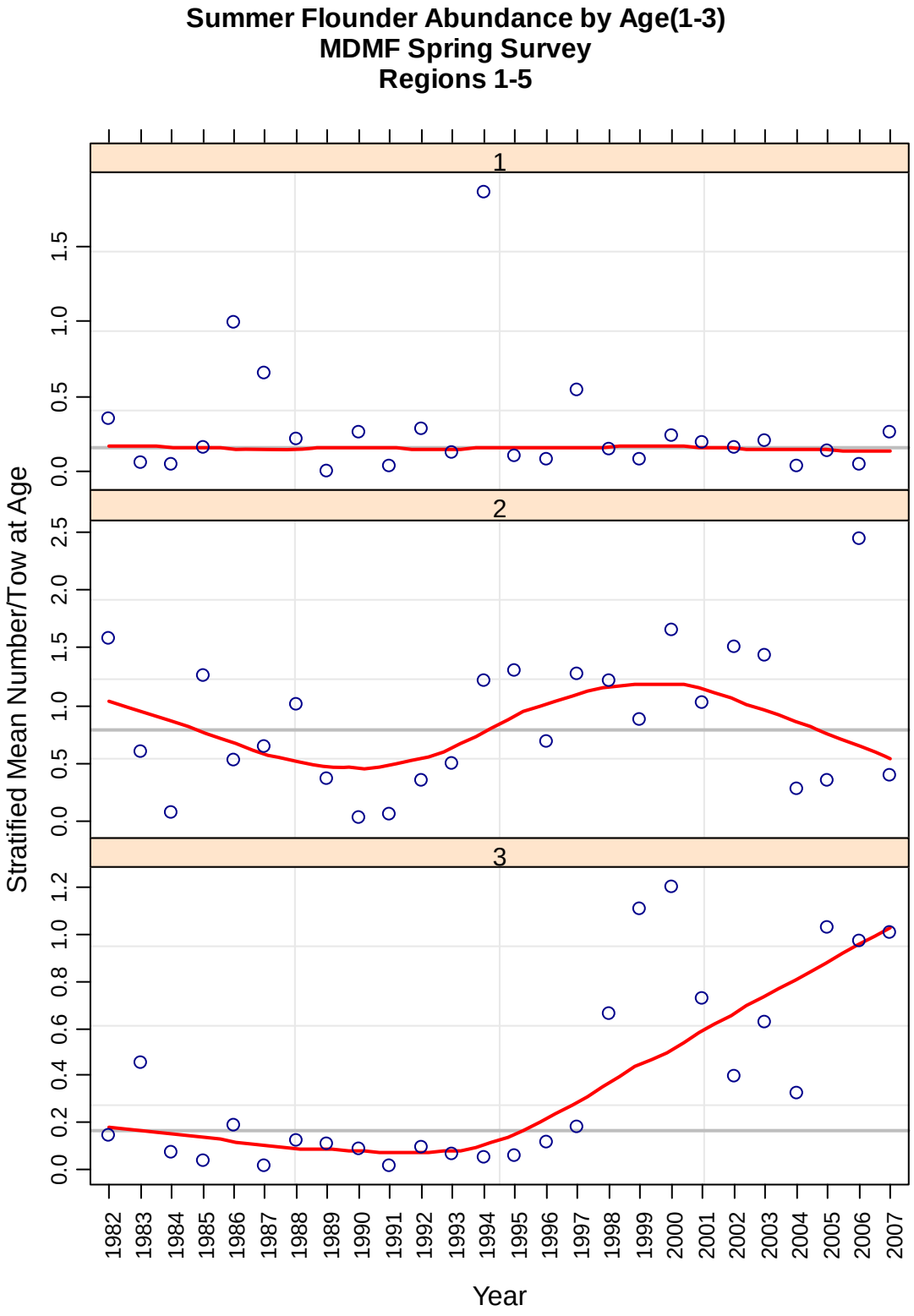


Figure 5. Abundance-at-age. Timeseries range varies dependent on age sample availability. Massachuseetts DMF Trawl Survey.



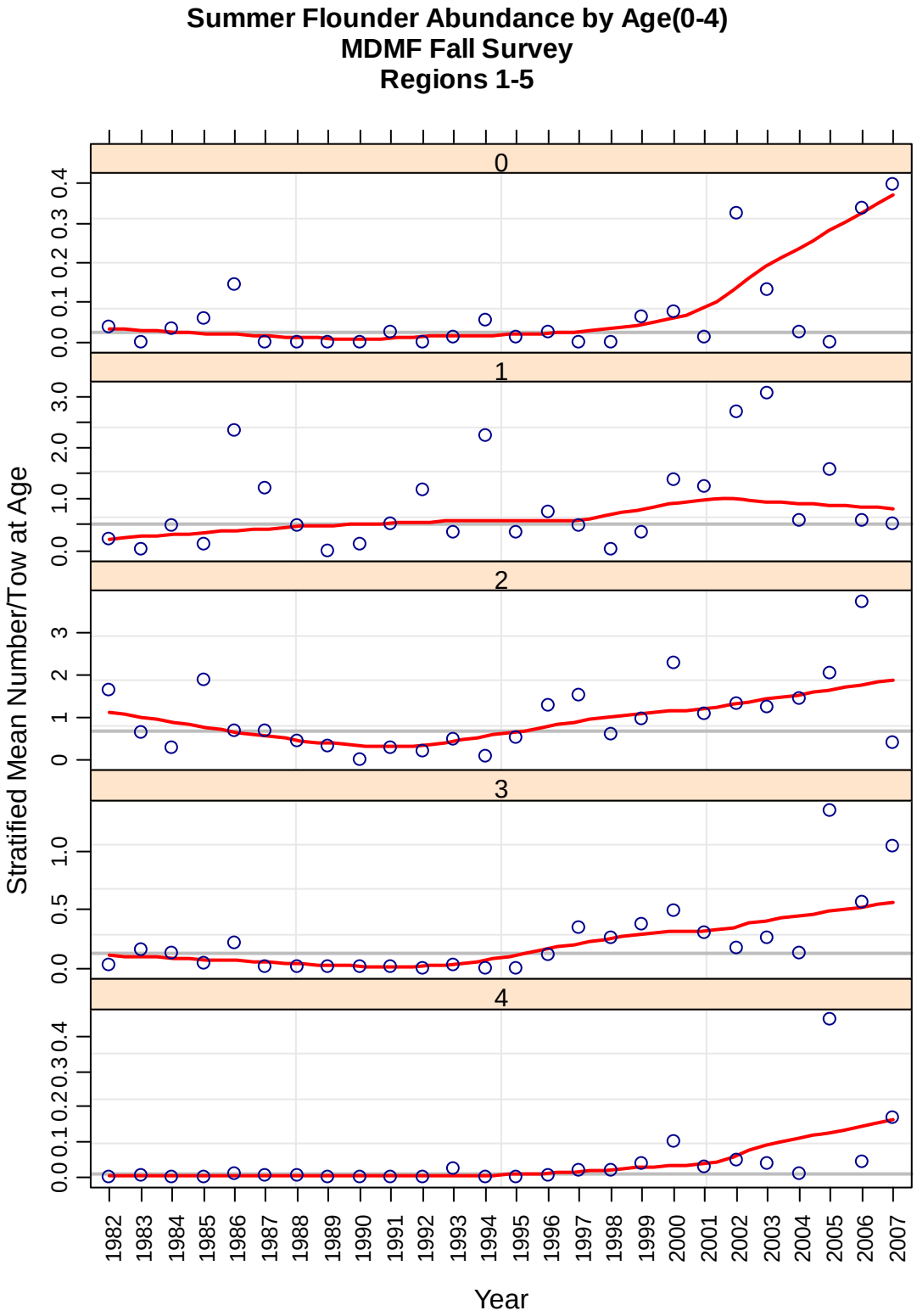
Red line: Loess smoothed index, span=0.5, degree=1.
Grey line: Timeseries median.
Y axis scales differ.

Figure 5 *continued*. Abundance-at-age. Timeseries range varies dependent on age sample availability. Massachuseetts DMF Trawl Survey.



Red line: Loess smoothed index, span=0.5, degree=1.
Grey line: Timeseries median.
Y axis scales differ.

Figure 5 *continued*. Abundance-at-age. Timeseries range varies dependent on age sample availability. Massachuseetts DMF Trawl Survey.



Red line: Loess smoothed index, span=0.5, degree=1.
Grey line: Timeseries median.
Y axis scales differ.

Appendix B.

Trends in Observed Bottom Temperatures
Massachusetts Bottom Trawl Survey.
1978 – 2007

A timeseries analysis of bottom temperatures recorded during spring and fall bottom trawl surveys (1978-2006) is updated here to include 2007 observations. For a detailed interpretation and description of methods used in data preparation and analysis, refer to the 2006 annual report, (2006 Annual Performance Report, F-56-R, Massachusetts Fishery Resource Assessment, Appendix E).

One change to the methodology utilized in 2006 was initiated for this analysis. Temperature observations at stations considered not representative (SHG >136) for typical indices are now included in the temperature analysis beginning in Fall 2004 as long as the tow duration is at least 5 minutes (the minimum time necessary for the temperature logger to acclimate). Elimination of temperature observations from stations with SHG >= 136 had the effect of producing fall temperature data gaps in Region 3 where large dogfish catches frequently result in SHG values >136. These tows, though non-representative for generation of abundance and biomass indices for most species, are used when generating spiny dogfish indices. The temperature data collected at these 'dogfish tows' since 2004 is consistent with temperature data collected at all other stations utilizing the Onset Computer Corporation Tidbit ^{TM} temperature logger and is therefore included in the following temperature summaries. Equipment failure or lack of station completion resulted in gaps in the timeseries where no temperatures were recorded for a stratum within a season-year (Table 1). Either strata or years with missing data were deleted from the analysis.

Season-Year	Strata
Spring 1978	36
Fall 1978	20
Fall 1983	31, 32, 33, 34, 35, and 36
Fall 1985	20
Fall 1987	31
Fall 1988	31
Fall 1989	28
Fall 1991	32
Fall 1995	11, 12, 13 and 14
Fall 1998	36

Table 1. Strata with missing temperature observations in the spring and fall DMF trawl survey timeseries (1978-2007).

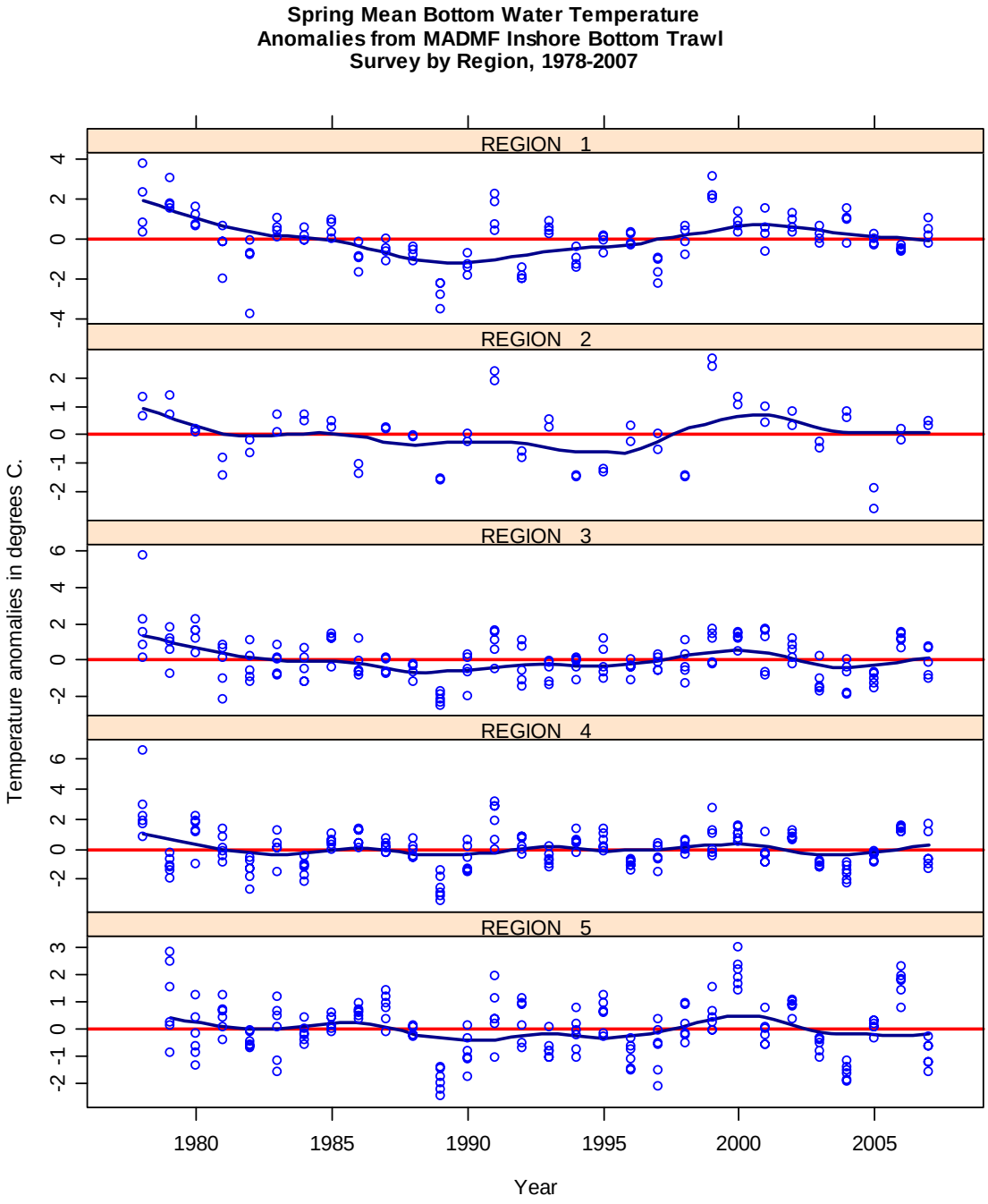


Figure 1. Spring mean bottom water temperature anomalies by region, 1978-2007. Multiple points within a year represent individual stratum anomalies for that year. Anomalies are deviations from the regional timeseries mean temperature in degrees Centigrade. The horizontal line is the regional mean, and the trendline is a loess fit with span = 0.25 and degree = 1. Note that a missing year is removed (1978 – region 5).

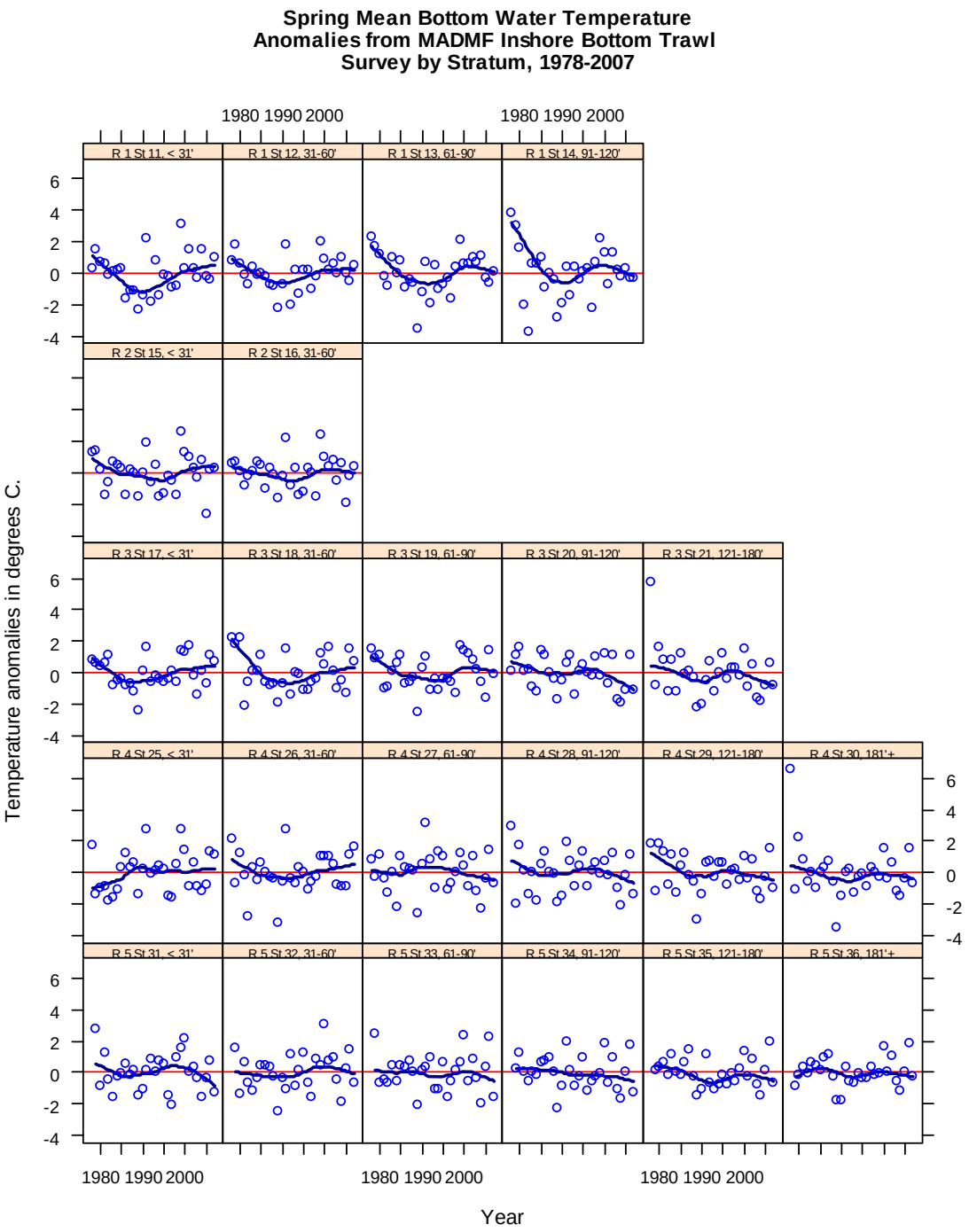


Figure 2. Spring mean bottom water temperature anomalies by depth stratum, 1978 – 2007. Anomalies are deviations from stratum timeseries means in degrees Centigrade. The horizontal line is the regional mean, and the trendline is a loess fit with span = 0.5 and degree = 1. Note that a missing year is removed (1978 – stratum 36).

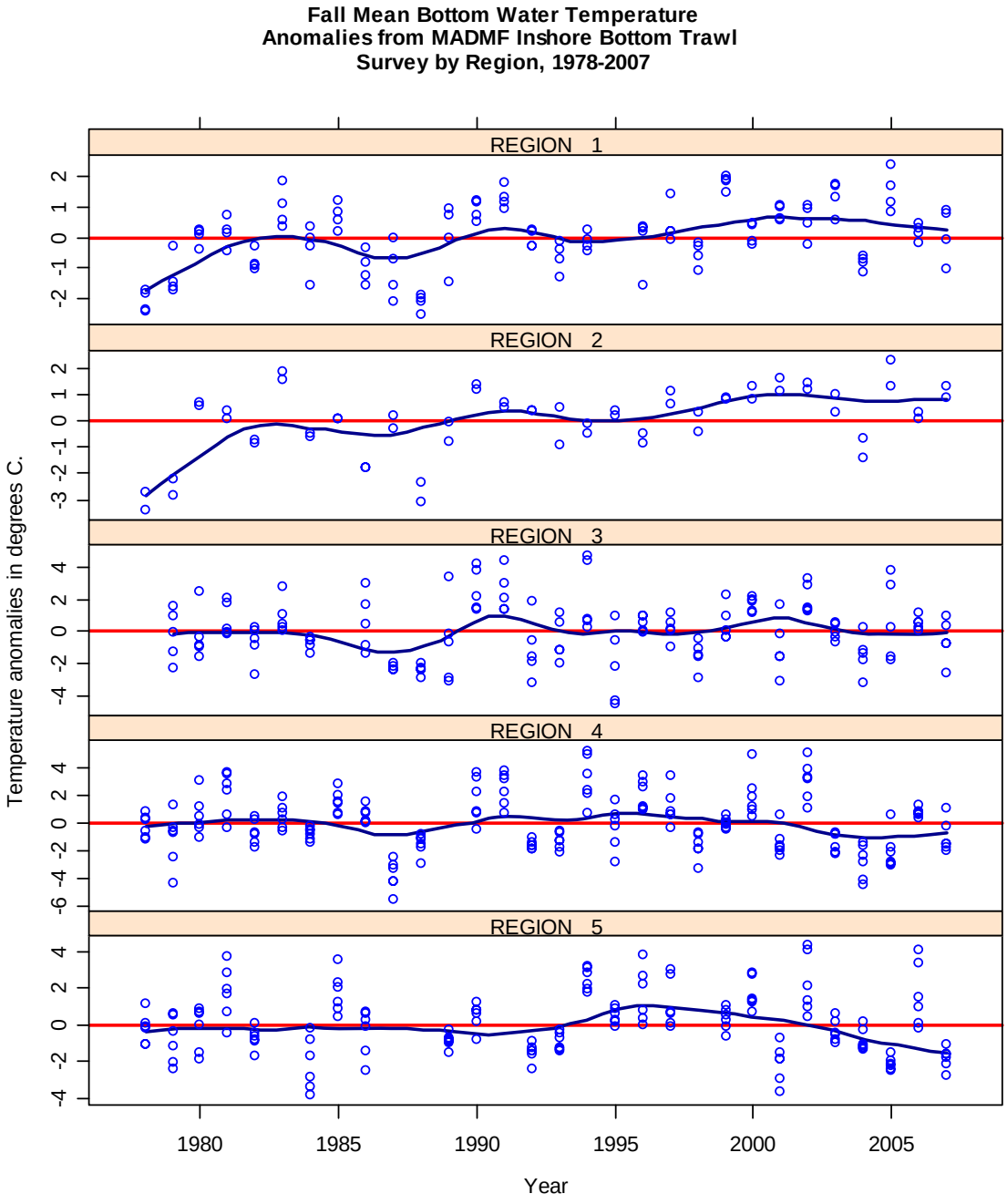


Figure 3. Fall mean bottom water temperature anomalies by region, 1978-2007. Multiple points within a year represent individual stratum anomalies for that year. Anomalies are deviations from the regional timeseries mean temperature in degrees Centigrade. The horizontal line is the regional mean, and the trendline is a loess fit with span = 0.25 and degree = 1. Note missing years removed (region 1: 1995, region 3: 1978 and 1985, region 4: 1989, and region 5: 1983, 1988, 1989, 1991 and 1998).

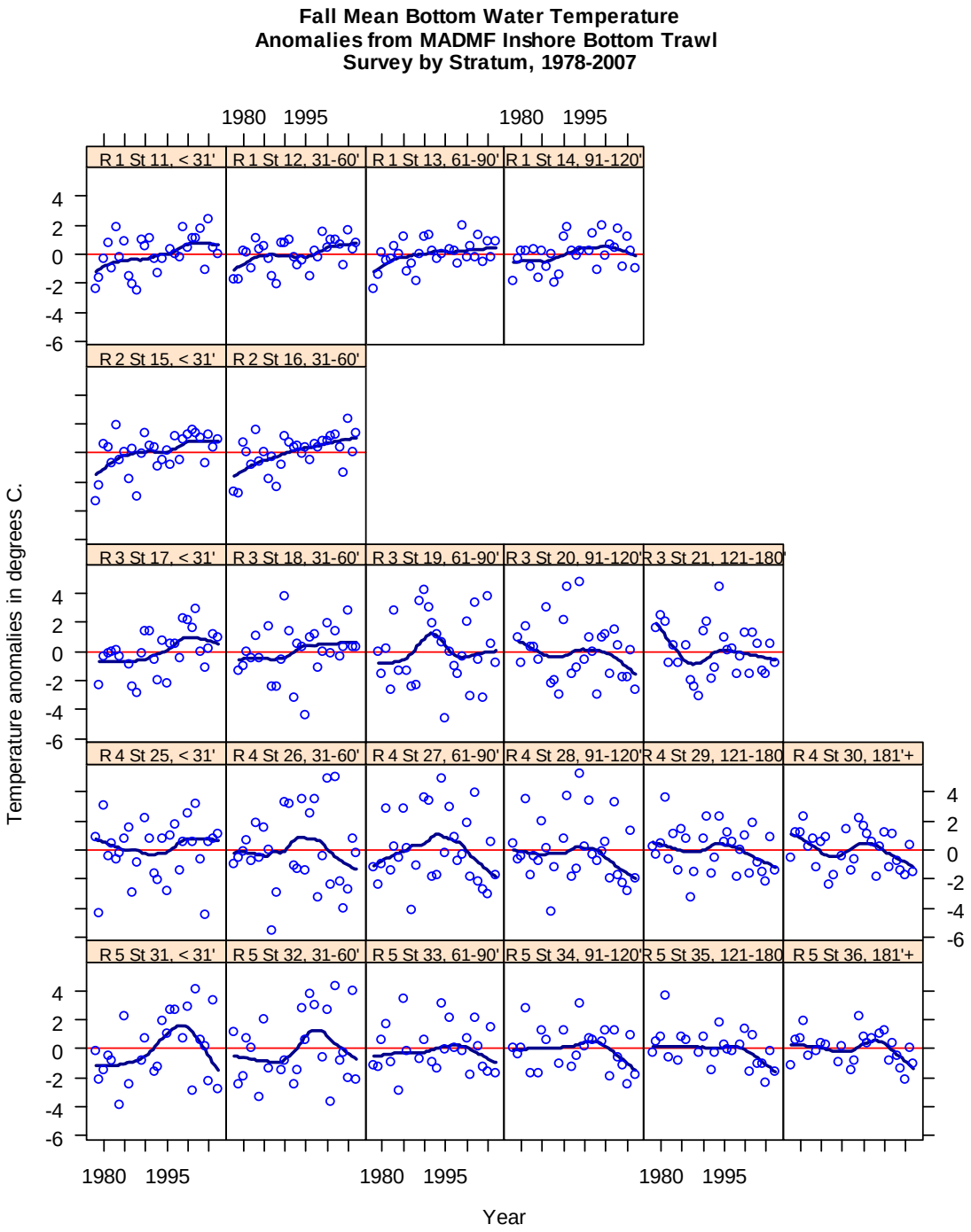


Figure 4. Fall mean bottom water temperature anomalies by depth stratum 1978 – 2007. Anomalies are deviations from stratum timeseries means in degrees Centigrade. The horizontal line is the regional mean, and the trendline is a loess fit with span = 0.5 and degree = 1. Note missing years removed (region 1: 1995, region 3: 1978 and 1985, region 4: 1989, and region 5: 1983, 1988, 1989, 1991, and 1998).

Appendix C.

Corrections to the trawl survey database in 2007.

1) The stratum-tow fields have been corrected in SVCAT, SVLEN, and SVBIO to match the SVSTA records for 21 stations from the 1980 spring survey (cruise6=198091). The SVSTA stratum-tow fields for these 21 stations were corrected in May 2006. The corrections to SVSTA records did not cascade to the other tables. Data collections executed since May 2006 linking SVSTA with catch data using the stratum-tow fields would have omitted these catch records.

Corrected stratum-tow assignments as seen in svsta.

CRUISE	STATION	STRATUM	TOW
198091	52	**9150**	1
198091	53	9150	**2**
198091	54	9150	**3**
198091	57	9150	**4**
198091	61	9150	**5**
198091	63	**9160**	**7**
198091	64	9150	**6**
198091	65	9160	**8**
198091	66	9160	**9**
198091	67	9150	**7**
198091	68	9160	**10**
198091	69	9150	**8**
198091	70	9170	**1**
198091	71	9170	**2**
198091	72	9170	**3**
198091	73	9180	**3**
198091	75	9180	**4**
198091	77	9170	**4**
198091	85	9150	**9**
198091	86	9150	**10**
198091	87	9160	**11**

Former incorrect stratum-tow assignments as seen in svcat.

CRUISE	STATION	STRATUM	TOW
198091	52	9170	1
198091	53	9150	1
198091	54	9150	2
198091	57	9150	3
198091	61	9150	4
198091	63	9180	3
198091	64	9150	5
198091	65	9160	7
198091	66	9160	8
198091	67	9150	6
198091	68	9160	9
198091	69	9150	7
198091	70	9170	2
198091	71	9170	3
198091	72	9170	4
198091	73	9180	4
198091	75	9180	5
198091	77	9170	5
198091	85	9150	8
198091	86	9150	9
198091	87	9160	10

2) Missing catch and length data was entered for 2 stations from spring 1989, (cruise6= 198991). It is unknown how long these data records have been missing. They may never have been included in the database. These stations are in strata 09280 and 09290. The species list includes atlantic herring, alewife, blueback herring, American shad, silver hake, atlantic cod, white hake, red hake, American plaice, fourspot flounder, yellowtail flounder, winter flounder, windowpane flounder, atlantic mackerel, longhorn sculpin, sea raven, snakeblenny, ocean pout and lobster.

Missing svcat records re-entered on November 6, 2007.

CRUISE	STRAT	STAT	SVS	EXPCATCHNUM	EXPCATCHWT
198991	9280	7	32	11	0.5
198991	9280	7	33	12	0.7
198991	9280	7	34	1	0
198991	9280	7	72	5	1.1
198991	9280	7	73	173	22.1
198991	9280	7	102	2	0.4
198991	9280	7	104	1	0.1
198991	9280	7	105	102	10.8
198991	9280	7	106	19	2.4
198991	9280	7	121	10	6.6
198991	9280	7	163	72	7.2
198991	9280	7	164	1	0.5
198991	9280	7	193	85	31.5
198991	9280	7	301	1	0.4
198991	9280	7	301	2	1.2
198991	9290	29	32	1555	64.4
198991	9290	29	33	45	0.7
198991	9290	29	34	30	0.5
198991	9290	29	72	183	10.8
198991	9290	29	76	1	0
198991	9290	29	77	74	13.6
198991	9290	29	102	145	6.9
198991	9290	29	104	21	2.8
198991	9290	29	105	19	3.1
198991	9290	29	106	74	13.6
198991	9290	29	108	6	0.8
198991	9290	29	163	16	2.3
198991	9290	29	164	1	0.1
198991	9290	29	182	1	0
198991	9290	29	193	131	117.2

Completed as of July 2007,
The following corrections were made to a variety of SVSTA, SVCAT and SVLEN records.

Changes to SVSTA

Cruise6	Station	Cable Reads	Cable Should Read
198891	47	7002	27
198692	63	8002	27
198692	64	2002	27

Cruise6	Station	Endlat reads	Endlat should read
200192	87	4117.87	4119.87
200192	97	4125.51	4123.51

Cruise6	Station	XBT reads	XBT should read
200492	1	6	7
200492	2	6	7
200492	3	6	7
200492	4	6	7
200492	18	6	7
200492	64	6	7
200492	65	6	7

Cruise6	Station	Start long reads	Start long should read
200692	68	7030.7358	7031.74
200692	83	7035.1653	7036.16

Changes to SVCAT and/or SVLEN

Cruise6	Station		Svspp reads	Svspp should read
198891	78		332	322

Cruise6	Station	Svspp	Catchnum reads	Catchnum should read
198992	4	108	503	505
				Add to length frequency
				1 @ 27cm which expands to 2 due to 1.54 expanfct

Cruise6	Station	Svspp	Length reads	Add length to database
199591	63	176	Missing	1 @ 12cm

Cruise6	Station	Svspp	catchwt reads	Catchwt should read
200091	90	338	Missing	0.0
200591	49	3131	Missing	1.3
199991	92	338	Missing	0.8
200692	57	322	Missing	0.4

Cruise6	Station	Svspp	Catchnum reads	Catchnum should read
198292	89	322	Missing	5

Cruise6	Station		Svspp reads	Svspp should read
200692	99		689	690

Appendix D.

Outputs available to examine survey catch by strata. An example presenting winter flounder biomass indices from the spring survey.

The following figures and table are presented as a sample of newly generated summaries provided to examine survey catch by strata. The example given presents biomass indices only. Similar figures can be generated for abundance. Figure 1 exhibits the timeseries of biomass indices for winter flounder in each of the twenty-three survey strata. Each row represents a survey region, while depth strata are aligned in columns. The black horizontal line indicates the timeseries median in each stratum. Comparing the median line in adjacent strata is useful to examine the influence of depth on winter flounder catches, indicating depth preferences. This example reveals that spring winter flounder biomass increases with depth in the relatively warm waters of region 1 (strata 11 – 14), but decreases with depth in the colder waters of region 4 (strata 25 – 30).

Figure 2 presents the biomass data transformed to Z-scores. The transformation improves the ability to compare trends across strata by standardizing the index in each stratum to a mean of zero and a standard deviation of 1. The loess smoothed index line assists in interpreting biomass trends over the timeseries for each stratum. In the spring winter flounder biomass example, a few trends are evident across adjacent strata. For instance both strata in region 2 (strata 15-16) and the adjacent, but deeper, stratum 13 in region 1 exhibit a dramatic decline from high biomass at the beginning of the survey timeseries. Examination of trends by strata rather just in aggregate may inform habitat usage patterns and habitat function trends as well as survey performance and indications of differing population parameters within and across stock management areas.

Table 1 is a record of all data presented in figure 1 (means by stratum and year). In addition, the stratified indices for stock areas are available at the far right side of the table. These stratified mean indices are generated using the individual stratum means in the table and weighting them with the stratum areas listed in the bottom row of the table.

Summaries of survey data by stratum can be requested by contacting Jeremy King at (508) 990-2860 ext. 112.

Figure 1. Biomass Indices by Stratum.

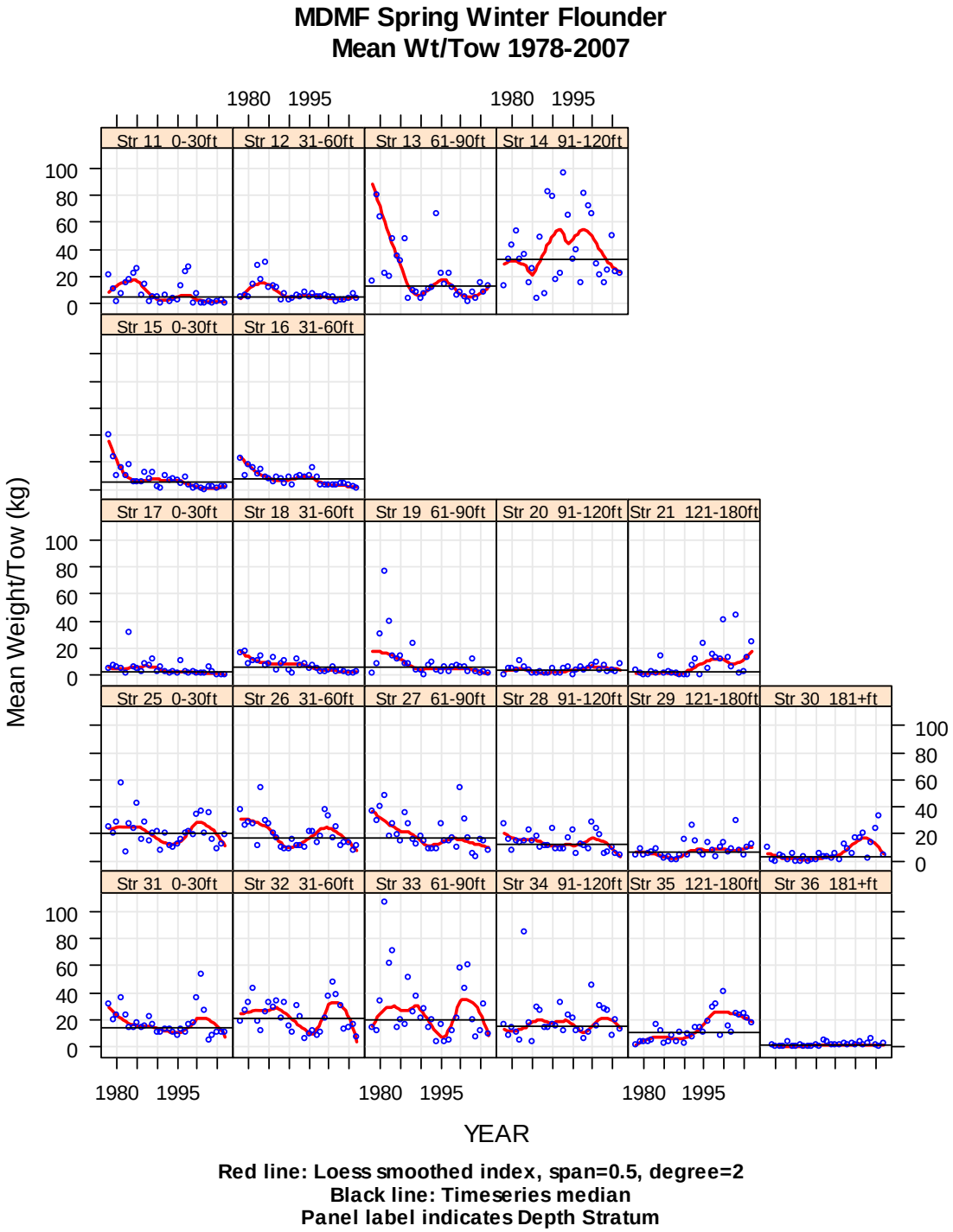
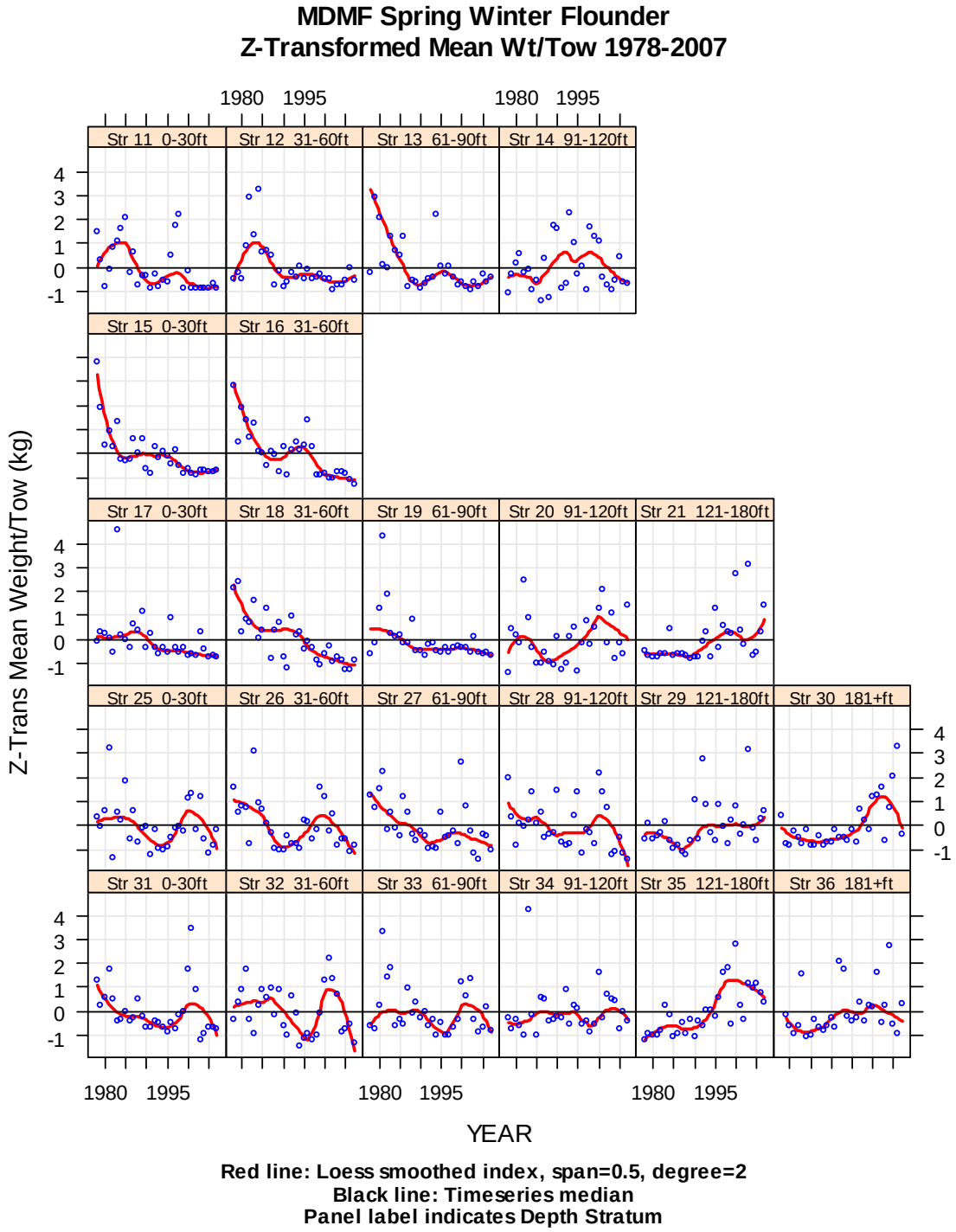


Figure 2. Biomass indices standardized to Z-scores (normalized variates) for comparisons in trends across strata.



	Region 1				Region 2		Region 3					Region 4						Region 5						Stratified Mean Weight per Tow	
Year	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**Reg 1-3**	**Reg 4-5**
1978	20.47	4.56	16.63	12.90	39.64	23.03	4.20	16.55	1.60	0.50	3.15	25.40	37.43	36.60	27.20	4.33	10.00	31.18	18.60	13.60	15.90	1.83	NA	**18.24**	**20.77**
1979	10.70	6.22	80.42	32.40	23.59	10.31	6.65	17.80	8.40	5.30	0.75	20.90	25.75	29.60	16.26	9.07	0.60	20.10	26.73	11.20	8.03	3.98	1.35	**18.42**	**15.79**
1980	1.13	4.23	63.88	43.05	10.45	18.25	5.98	8.43	30.40	4.60	0.50	28.20	28.46	39.72	8.18	4.76	0.00	23.70	32.97	33.76	14.15	3.65	0.70	**15.13**	**19.11**
1981	7.44	13.95	22.50	53.30	15.46	15.41	4.83	10.70	76.30	3.65	0.60	57.45	27.72	48.42	14.40	5.60	4.50	35.75	42.90	106.70	10.30	3.70	0.15	**16.20**	**30.38**
1982	14.92	27.96	20.27	32.90	9.75	11.46	1.45	10.05	39.55	10.60	2.05	6.30	11.70	17.86	13.72	6.32	2.80	23.20	18.45	61.67	4.50	5.14	0.70	**15.18**	**14.71**
1983	17.20	17.26	47.90	36.35	18.37	14.49	31.10	14.10	14.30	6.50	1.50	27.87	53.60	27.54	15.08	9.22	0.20	13.80	11.40	71.00	84.35	15.80	3.90	**20.01**	**28.98**
1984	21.58	30.16	34.75	15.60	5.28	8.29	5.75	7.05	12.20	3.20	14.10	24.10	29.92	18.92	23.16	4.14	5.50	13.95	25.17	13.90	17.47	11.84	0.00	**14.80**	**16.72**
1985	25.92	11.95	30.88	25.80	5.10	7.93	4.80	8.55	13.65	1.50	1.10	42.55	26.96	14.48	14.62	1.78	0.10	17.50	32.63	20.13	4.07	2.98	0.07	**11.79**	**15.30**
1986	6.02	12.56	47.60	4.00	5.26	5.34	2.64	12.90	8.80	1.50	1.90	15.40	20.70	35.10	17.58	2.64	0.00	13.67	29.13	15.95	28.83	4.03	1.07	**10.50**	**16.35**
1987	13.60	11.38	4.00	48.80	12.76	8.32	8.54	3.35	8.05	2.60	1.60	28.40	16.53	27.05	10.42	1.18	3.20	15.17	33.60	51.43	27.17	8.60	0.58	**9.85**	**18.64**
1988	1.64	2.70	9.53	7.55	7.44	7.56	6.98	8.67	23.50	1.65	1.25	14.23	9.62	15.53	11.26	0.28	0.10	22.67	20.60	25.70	13.80	4.03	0.40	**6.73**	**11.27**
1989	5.15	6.61	8.67	82.00	12.49	3.80	11.53	10.18	3.30	1.35	0.00	20.53	8.72	12.62	11.56	4.06	0.80	15.83	32.90	36.97	14.47	10.08	0.65	**8.92**	**13.94**
1990	5.00	2.19	3.25	78.60	2.14	9.36	2.84	3.45	3.70	4.30	0.65	21.50	8.76	17.68	23.86	15.30	1.20	10.90	15.27	21.57	16.70	2.58	1.20	**5.68**	**14.38**
1991	0.35	3.55	7.38	17.35	0.62	3.26	6.08	1.38	0.70	0.75	0.35	8.23	15.40	14.72	9.28	4.74	5.50	11.00	10.75	28.13	15.33	9.52	0.62	**3.01**	**11.51**
1992	5.40	6.08	10.75	21.55	9.75	8.55	2.83	11.33	7.40	1.40	7.45	19.97	11.48	8.45	8.32	26.44	2.55	13.27	29.70	14.25	33.10	7.37	4.60	**8.05**	**15.36**
1993	0.88	4.85	11.77	95.70	6.06	10.46	1.20	7.60	8.85	4.35	12.28	10.70	11.33	8.73	8.73	14.13	2.55	12.80	21.67	20.40	11.23	13.60	4.17	**8.42**	**12.05**
1994	3.56	7.96	65.83	65.10	8.13	8.79	2.68	8.33	3.75	5.40	0.65	10.20	9.73	8.68	16.82	6.38	1.35	10.60	5.60	3.85	23.20	13.70	1.25	**12.93**	**9.78**
1995	2.78	4.56	22.00	32.35	6.36	9.70	1.48	5.00	2.30	0.65	23.10	12.07	22.04	27.36	23.12	4.04	5.30	8.80	9.30	16.63	21.40	10.92	1.00	**7.85**	**14.96**
1996	12.38	6.93	14.48	39.80	3.67	15.43	10.10	6.60	5.77	3.70	5.20	16.17	21.42	14.44	5.80	13.86	1.15	12.53	11.77	3.90	11.20	18.97	1.15	**9.92**	**12.08**
1997	23.02	4.48	21.93	15.70	8.81	9.36	2.86	5.35	1.95	6.10	15.50	20.70	13.60	14.94	12.68	8.04	12.35	10.27	8.43	5.33	13.23	29.15	2.10	**9.89**	**12.96**
1998	26.56	4.68	12.28	81.40	3.40	3.09	1.64	2.95	5.45	3.55	12.55	21.60	17.85	17.10	11.68	3.30	8.35	16.25	10.77	11.85	6.05	31.28	1.00	**8.15**	**13.47**
1999	0.53	5.86	5.83	71.35	0.65	2.96	2.66	1.90	6.55	5.35	11.50	19.30	37.24	10.48	8.52	9.64	5.00	17.50	21.40	20.53	10.95	8.12	1.93	**4.61**	**14.96**
2000	6.86	4.53	8.63	65.60	2.01	3.59	0.86	4.00	5.60	7.55	40.15	34.37	33.10	53.74	28.52	13.46	16.40	35.90	37.25	58.07	44.87	40.85	1.80	**6.26**	**34.16**
2001	0.64	4.41	4.83	29.30	0.70	2.56	1.16	5.55	5.40	9.45	13.15	36.33	17.36	30.78	23.36	5.94	17.05	53.93	47.67	42.73	15.07	15.72	4.00	**3.69**	**24.51**
2002	0.38	1.15	1.68	21.05	0.04	2.51	0.82	2.73	2.45	3.75	6.40	19.97	24.92	16.98	18.72	8.62	19.95	26.87	38.47	60.40	30.20	10.10	0.85	**1.91**	**22.39**
2003	0.80	2.40	7.68	15.00	1.44	3.96	6.48	3.43	12.10	7.00	44.00	35.37	10.93	5.46	5.56	29.12	1.70	5.27	30.70	19.93	27.73	24.75	1.95	**5.00**	**17.32**
2004	0.60	2.70	3.70	24.90	1.64	3.83	2.36	3.00	2.20	2.00	1.40	15.20	13.80	2.62	6.54	7.38	12.90	7.97	12.83	6.93	26.80	22.83	5.60	**2.97**	**11.20**
2005	0.73	3.83	15.00	49.70	1.26	3.31	0.36	1.08	1.65	3.75	2.70	8.77	13.70	15.93	10.55	3.98	23.65	10.47	13.80	11.97	7.97	24.88	0.75	**4.14**	**11.98**
2006	2.26	7.59	7.66	23.10	1.30	1.93	0.68	1.26	2.85	2.45	12.40	12.50	8.14	14.55	5.92	10.26	33.50	11.07	16.50	31.97	19.67	20.54	0.15	**3.80**	**14.43**
2007	0.53	4.13	12.50	22.20	1.66	1.06	0.60	2.90	0.75	7.75	24.60	19.65	10.98	7.50	4.46	12.16	3.65	10.07	7.13	8.98	12.93	16.98	2.00	**3.82**	**10.06**
Median	5.1	4.8	12.4	32.4	5.3	8.1	2.8	6.1	5.7	3.7	2.9	20.3	16.9	16.5	12.2	6.3	3.4	13.9	21.0	20.3	15.2	10.5	1.1	8.3	15.0
Mean	8.0	7.7	20.8	38.8	7.5	7.9	4.7	6.9	10.6	4.1	8.8	21.8	20.0	20.5	13.9	8.3	6.7	17.7	22.5	28.3	19.7	13.2	1.6	9.2	16.7
Str-wts	100	168	88	20	192	210	86	89	40	21	26	62	90	92	94	105	33	36	55	66	53	68	39	1040	793

Winter Flounder Mean Wt/Tow(kg) by Stratum, and Stratified Mean Wt/tow by Stock Area. 1978 - 2007 MADMF Spring Survey.

NA indicates that no stations were completed in that year - stratum.

Str-wts represent the area of each stratum in square nautical miles.