

Atlantic Sea Scallop Abundance in MADMF Spring and Fall Bottom Trawl Surveys, 1978 – 2017

Regions 3 – 5 : East of CC/CC Bay/M. Bay/Ipswich Bay

Mr. Matt Camisa and Dr. Cate O'Keefe, MA DMF

Why is the PDT looking at this?

Background:

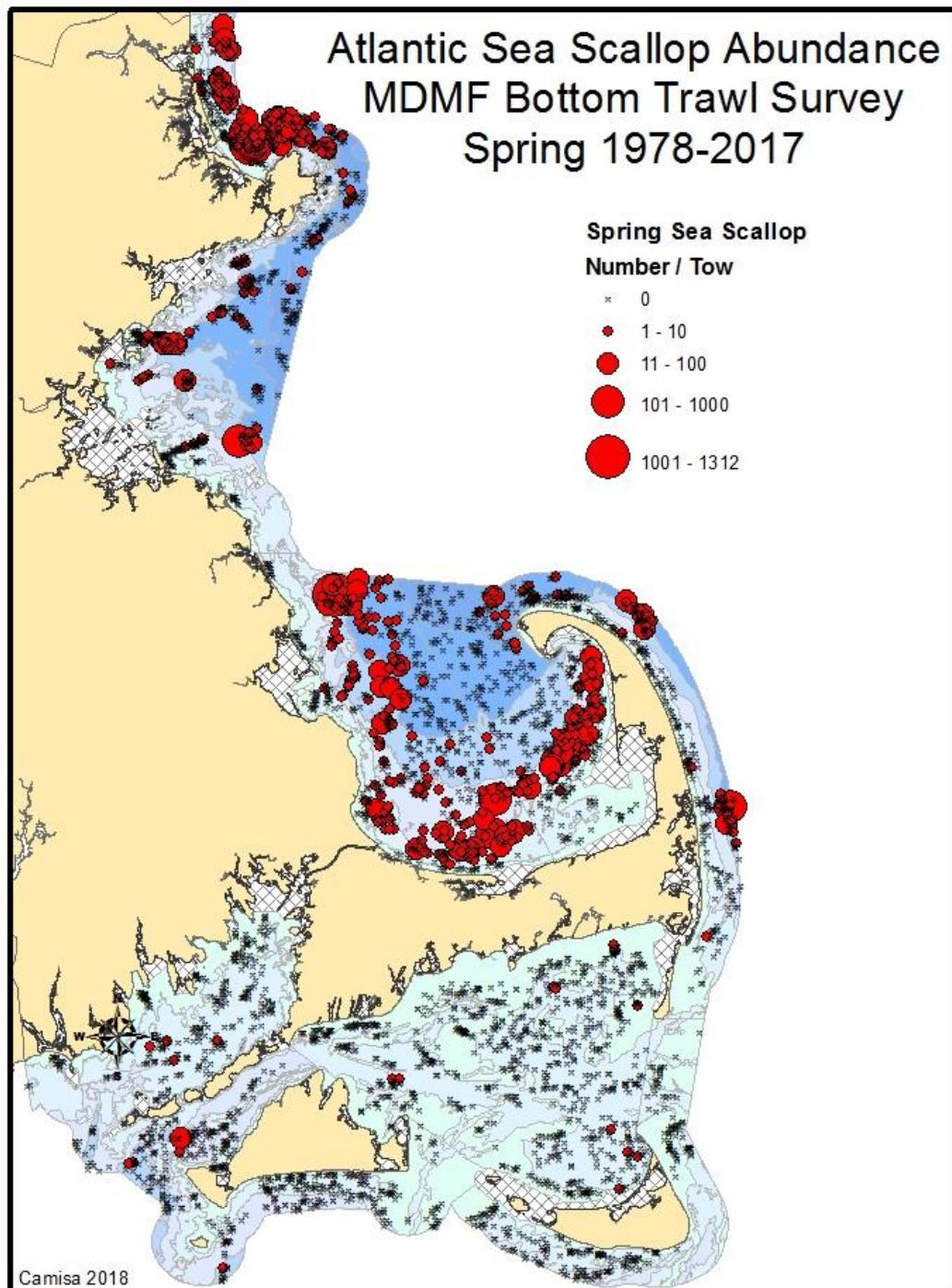
- As part of the Gulf of Maine Appendix prepared for SARC 65, the SAW workgroup considered scallop catch in regional trawl surveys.
- There are four ongoing trawl surveys in the GOM, including the MA DMF trawl survey.
- The SAW discussed potential uses for trawl survey data, including:
 - Examining the spatial distribution of presence/absence of animals
 - Comparing any signals with fishery dependent information

Council Staff Request to MA DMF:

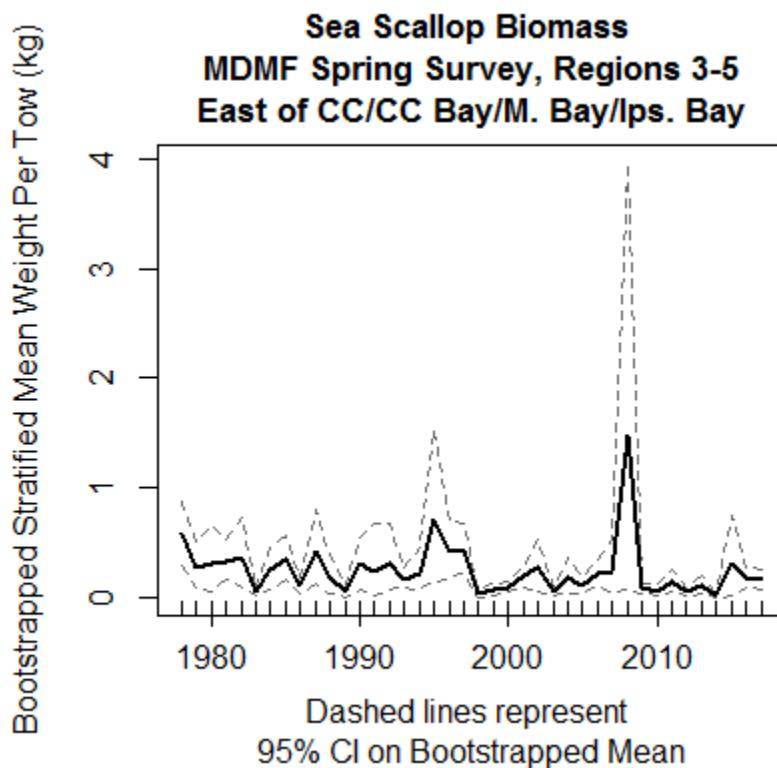
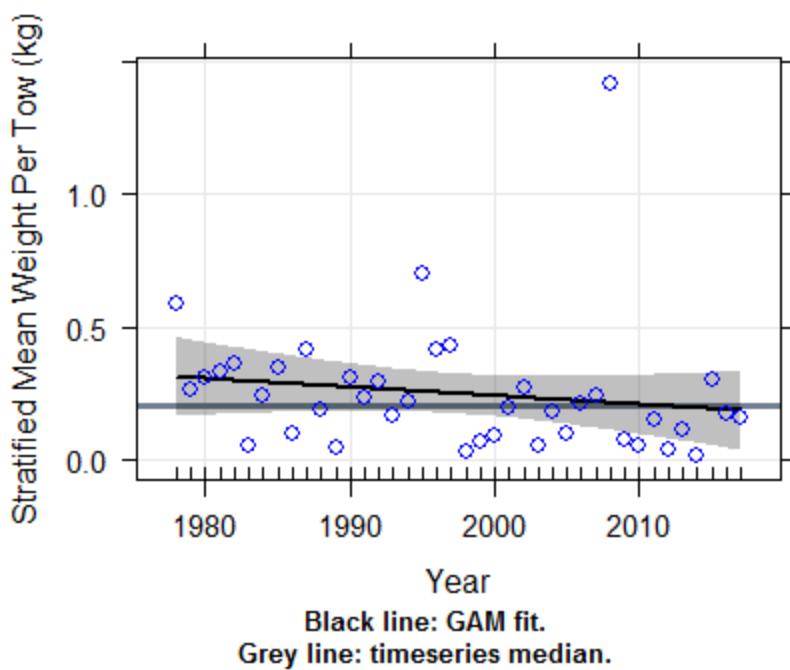
- Compile scallop catch data in the spring/fall MA DMF trawl survey
 - Similar to earlier analysis prepared for the scallop PDT in FW26

Potential Next Steps/Applicability: FW30 specifications and NGOM work priority

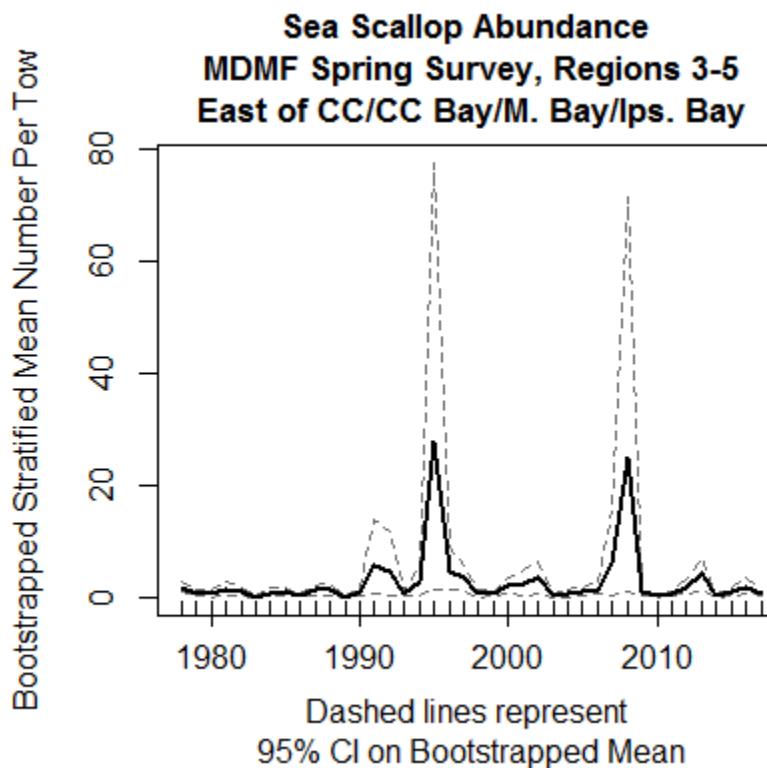
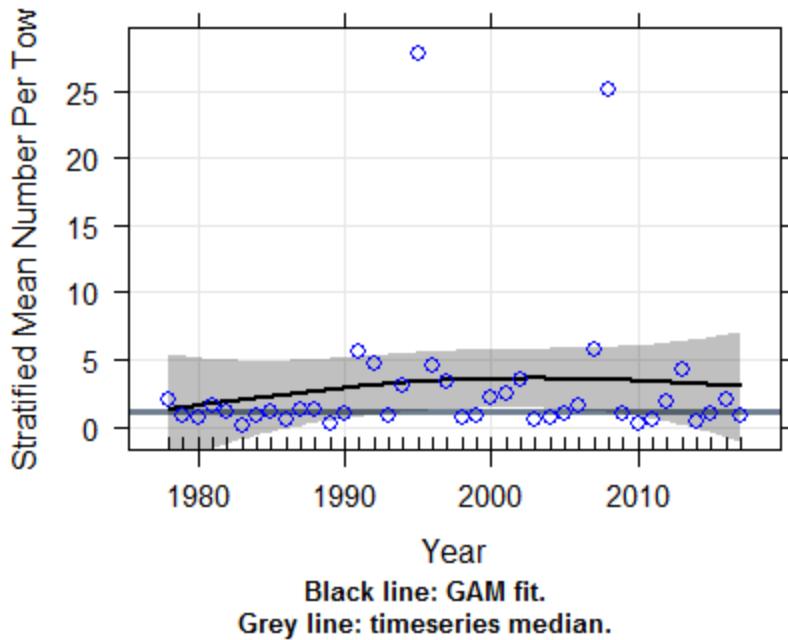
- Consider in conjunction with other dedicated scallop surveys in the GOM when:
 - Determining where dedicated scallop surveys may take place in the GOM (this area is outside of the NEFSC shellfish strata)
 - Evaluating the extent of potential SAMS areas in the GOM
 - Evaluating catch setting
- Add to the Affected Environment section of FW30



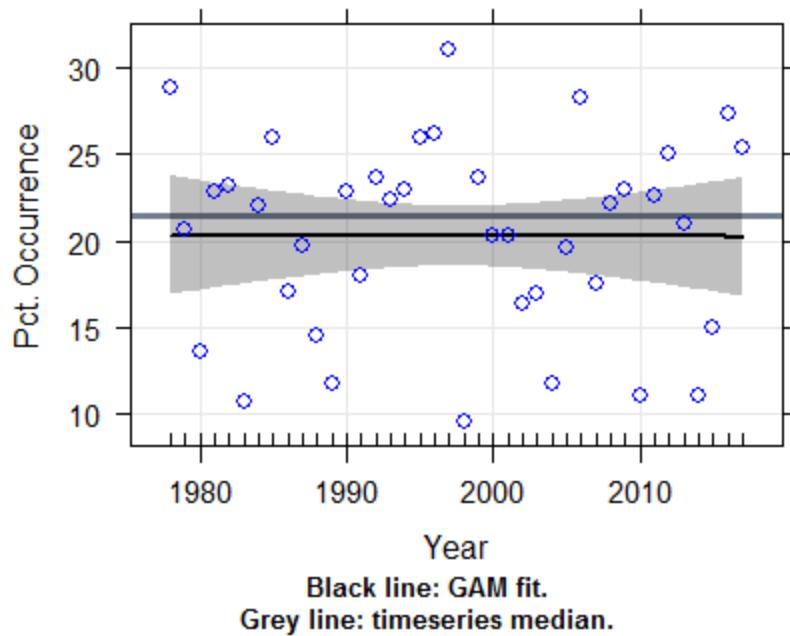
Sea Scallop Biomass
MDMF Spring Survey, Regions 3-5
East of CC/CC Bay/M. Bay/Ips. Bay



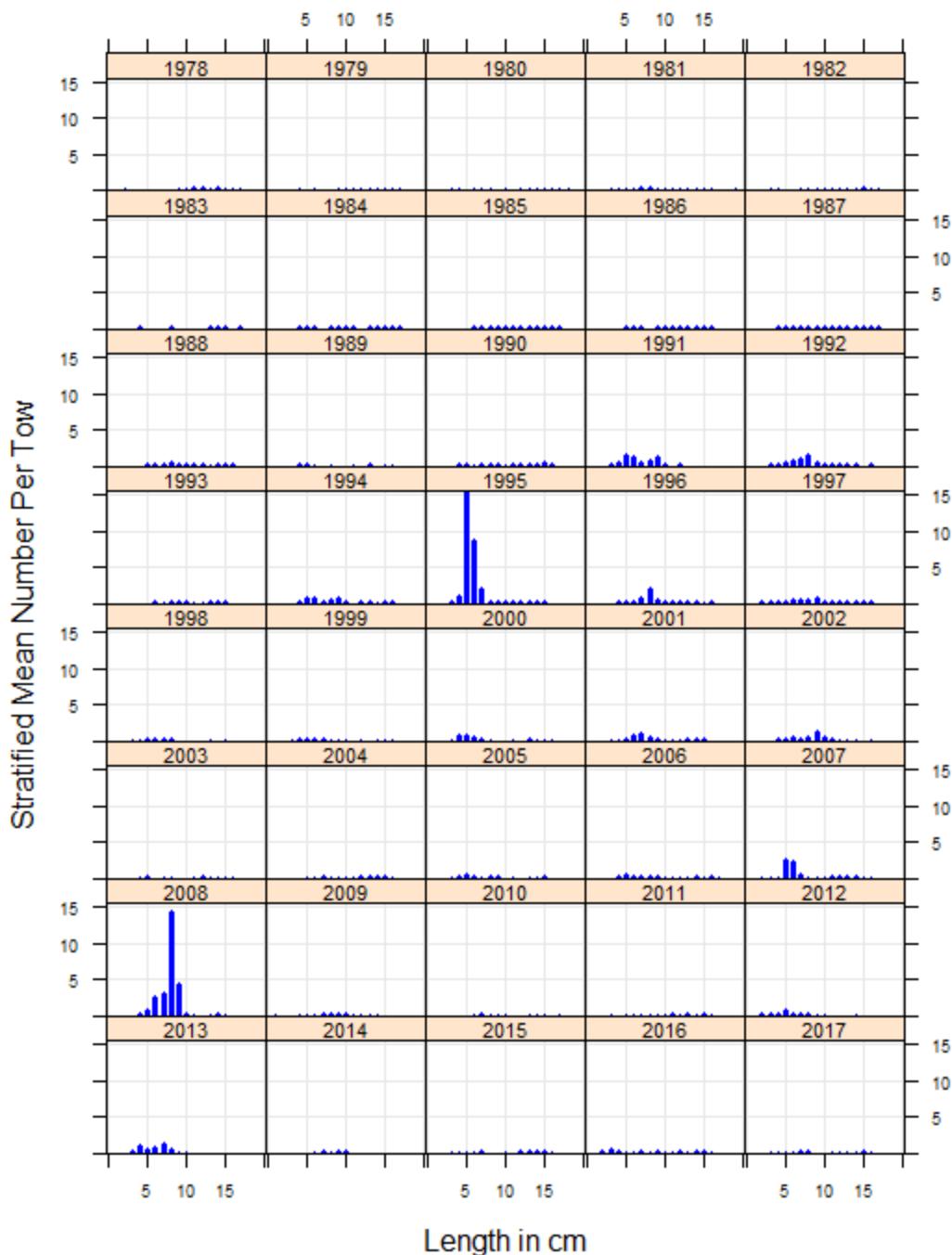
Sea Scallop Abundance
MDMF Spring Survey, Regions 3-5
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Sea Scallop Occurrence in Survey Stations
MDMF Spring Survey, Regions 3-5
East of CC/CC Bay/M. Bay/Ips. Bay



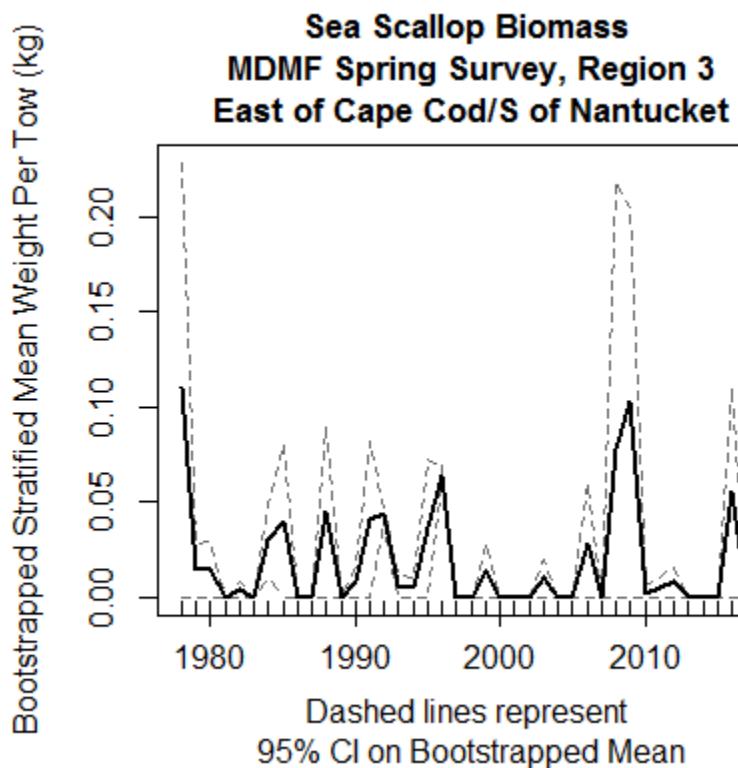
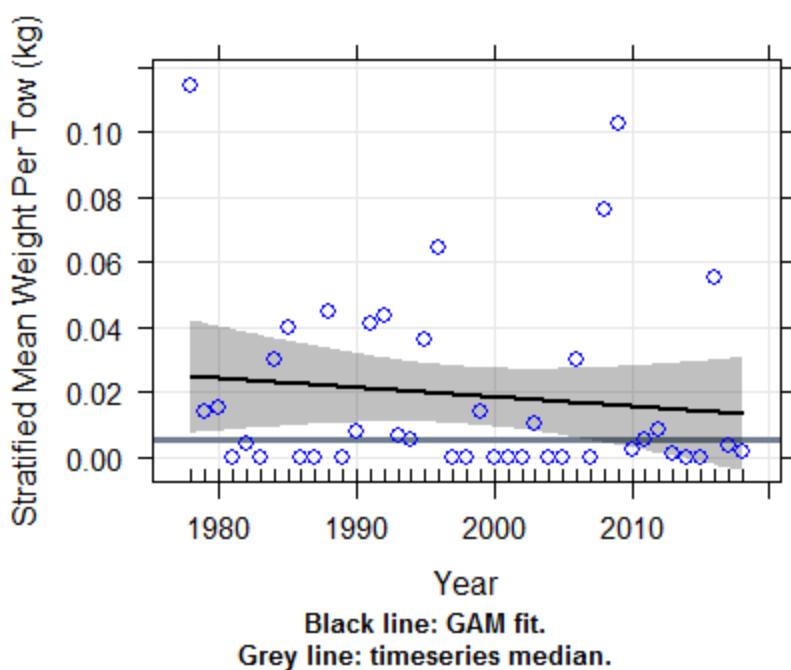
Sea Scallop
MDMF Spring Survey, Regions 3-5
East of CC/CC Bay/M. Bay/Ips. Bay



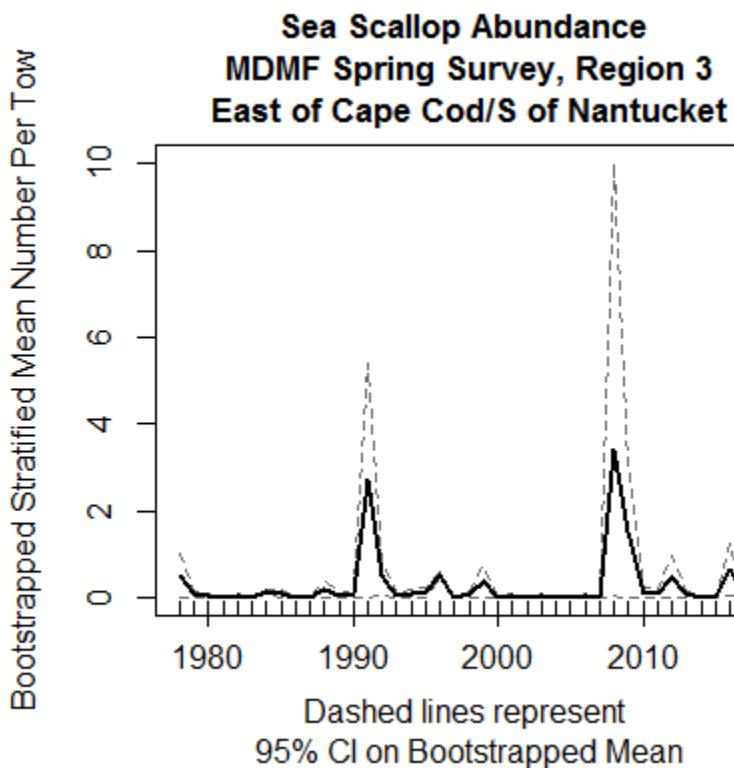
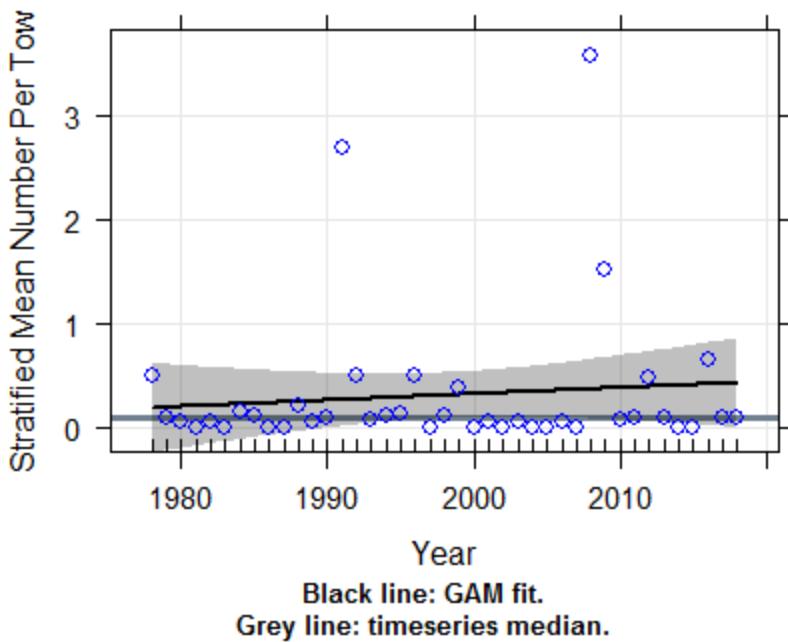
Sea Scallop
 MDMF Spring Survey, Regions 3-5
 East of CC/CC Bay/M. Bay/Ips. Bay

Year	Wt. per tow (kg)	Std.Err.Wt.	Number per tow	Std.Err.N
1978	0.59	0.18	1.95	0.6
1979	0.27	0.12	0.81	0.35
1980	0.31	0.18	0.72	0.34
1981	0.33	0.1	1.59	0.7
1982	0.36	0.19	1.08	0.46
1983	0.05	0.03	0.15	0.06
1984	0.24	0.11	0.79	0.45
1985	0.35	0.12	1.15	0.48
1986	0.1	0.05	0.5	0.18
1987	0.41	0.19	1.3	0.51
1988	0.19	0.11	1.29	0.64
1989	0.05	0.03	0.16	0.07
1990	0.31	0.2	1.02	0.53
1991	0.24	0.21	5.59	4.16
1992	0.3	0.19	4.7	3.66
1993	0.17	0.06	0.75	0.26
1994	0.22	0.12	3.01	1.63
1995	0.7	0.44	27.75	25.03
1996	0.42	0.15	4.5	2.35
1997	0.43	0.13	3.43	1.25
1998	0.03	0.02	0.69	0.43
1999	0.07	0.03	0.81	0.32
2000	0.09	0.02	2.14	0.92
2001	0.2	0.06	2.5	1.36
2002	0.27	0.16	3.49	1.91
2003	0.05	0.02	0.49	0.19
2004	0.18	0.1	0.69	0.36
2005	0.1	0.04	1.01	0.45
2006	0.22	0.08	1.58	0.66
2007	0.24	0.15	5.81	4.76
2008	1.41	1.27	25.17	22.89
2009	0.08	0.03	0.97	0.4
2010	0.06	0.04	0.3	0.13
2011	0.15	0.06	0.6	0.2
2012	0.04	0.02	1.84	0.8
2013	0.11	0.05	4.24	1.67
2014	0.02	0.01	0.33	0.14
2015	0.3	0.24	0.91	0.54
2016	0.18	0.06	1.94	0.85
2017	0.16	0.06	0.85	0.39

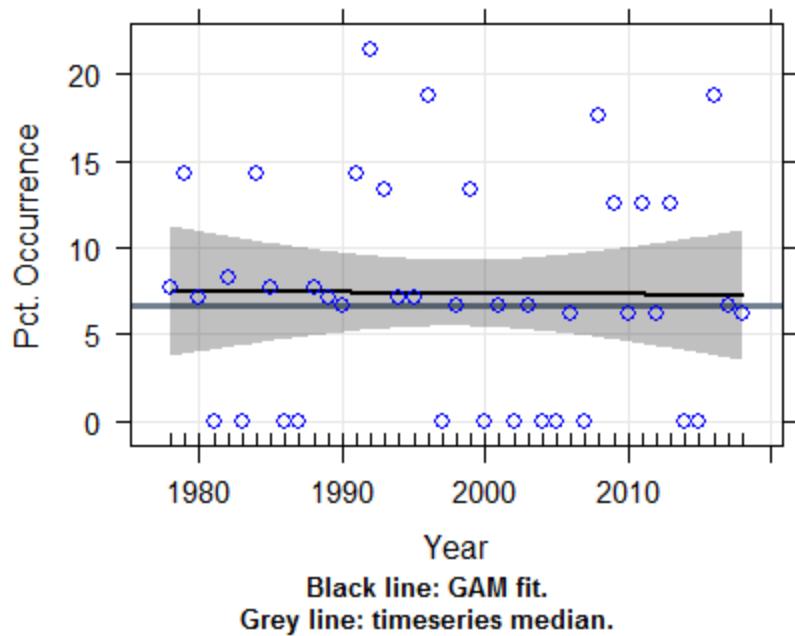
Sea Scallop Biomass
MDMF Spring Survey, Region 3
East of Cape Cod/S of Nantucket



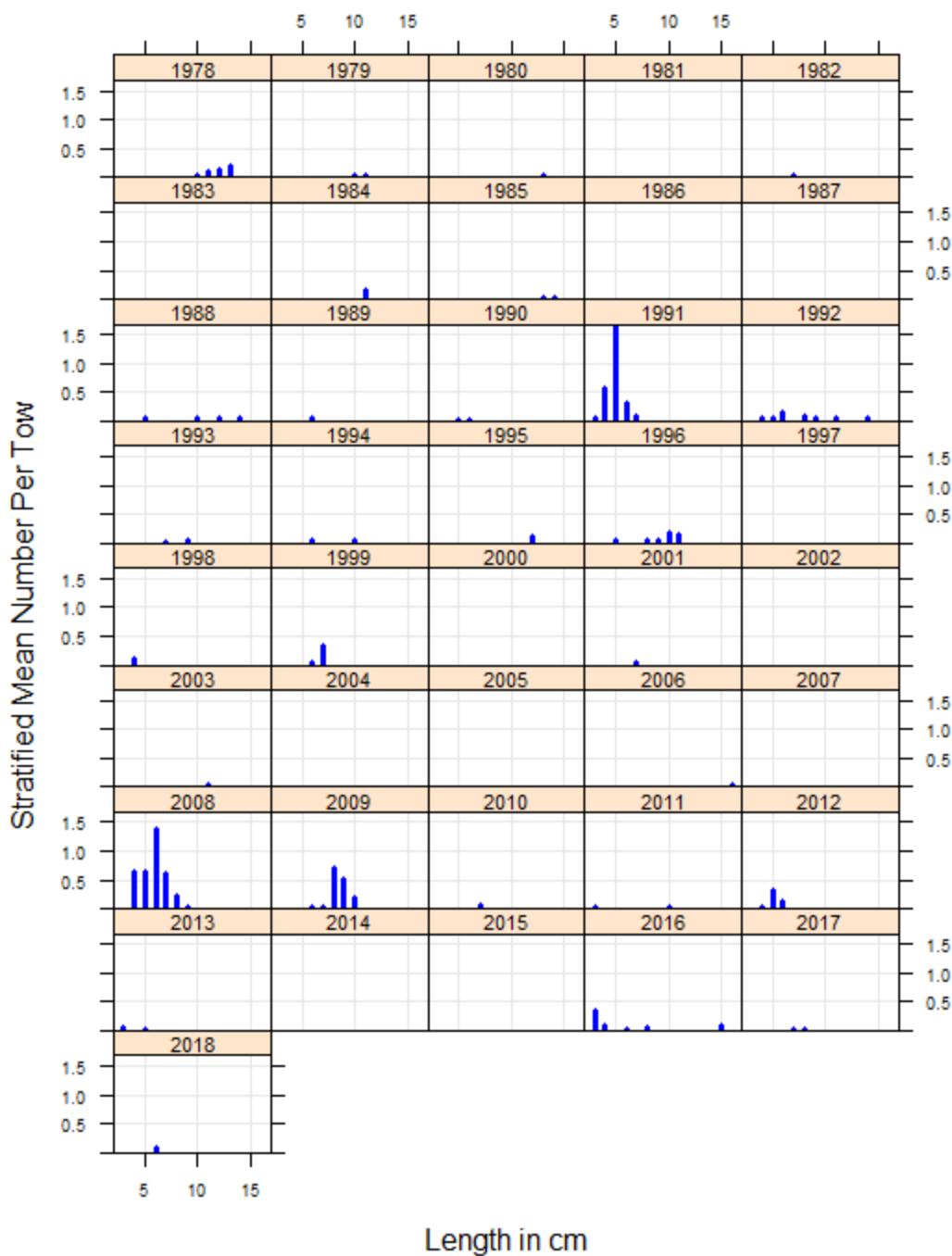
Sea Scallop Abundance
MDMF Spring Survey, Region 3
East of Cape Cod/S of Nantucket



Sea Scallop Occurrence in Survey Stations
MDMF Spring Survey, Region 3
East of Cape Cod/S of Nantucket



Sea Scallop
MDMF Spring Survey, Region 3
East of Cape Cod/S of Nantucket

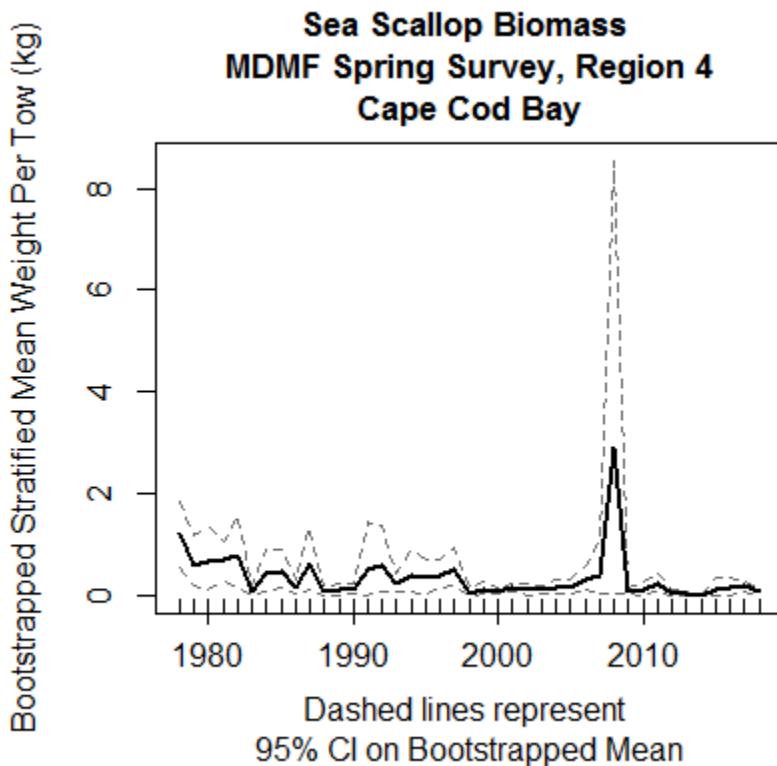
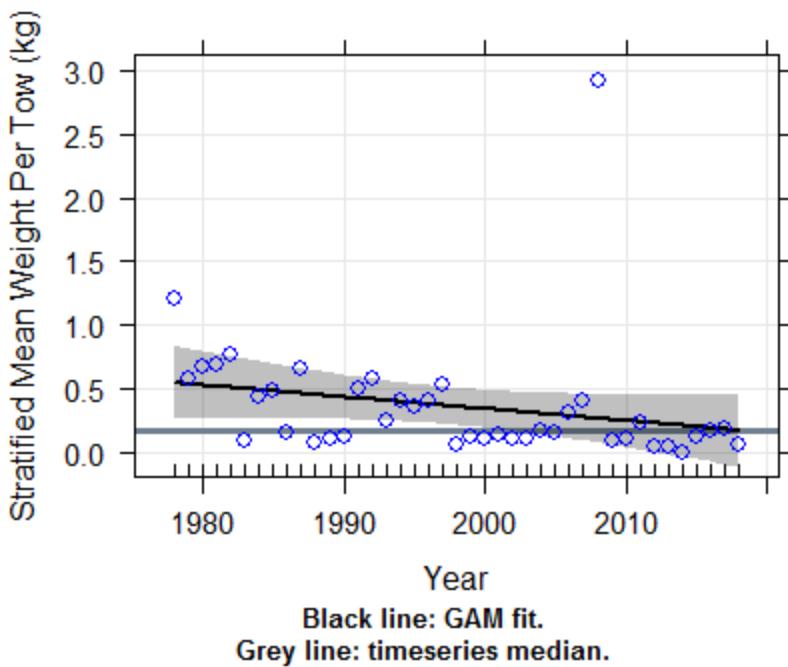


Sea Scallop

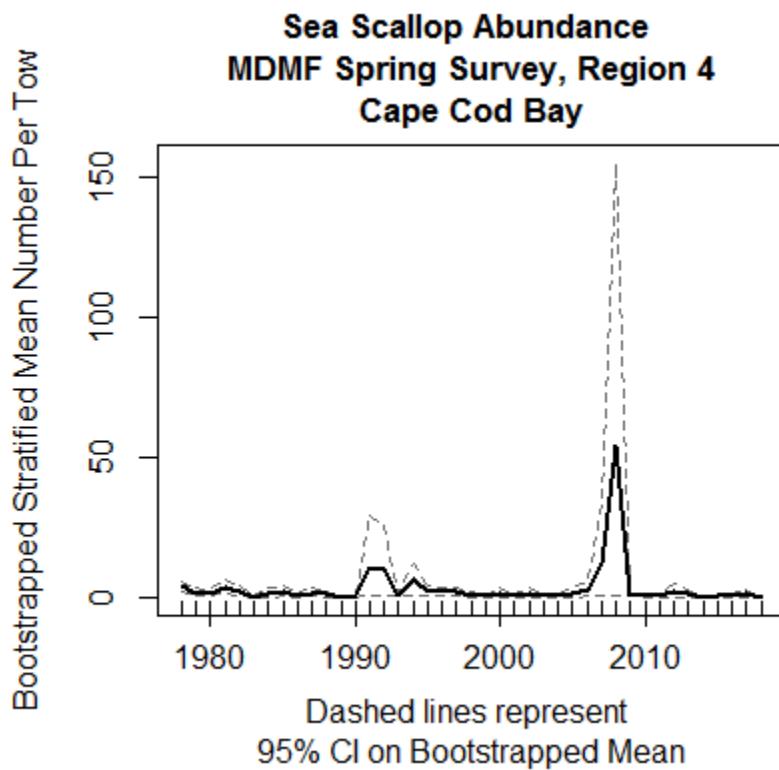
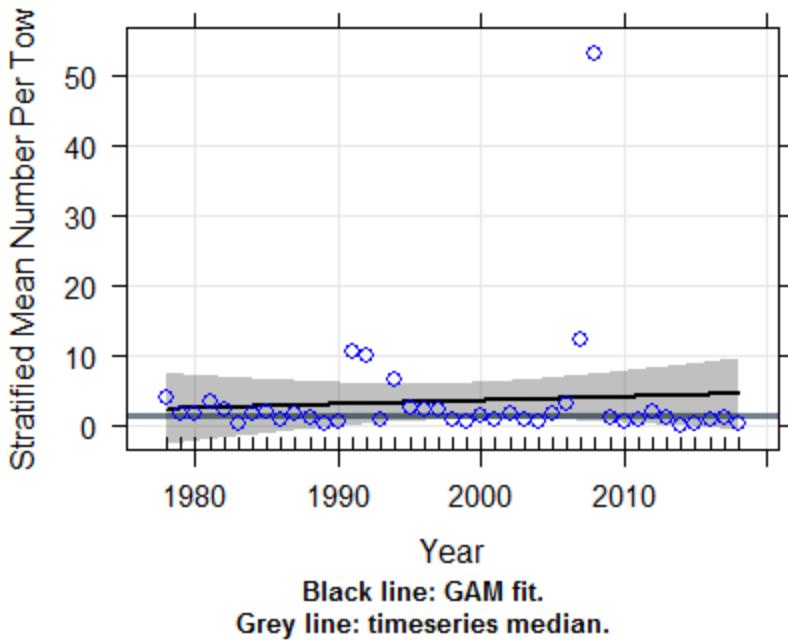
MDMF Spring Survey, Region 3
East of Cape Cod/S of Nantucket

Year	Wt. per tow (kg)	Std.Err.Wt.	Number per tow	Std.Err.N
1978	0.11	0.11	0.5	0.5
1979	0.01	0.01	0.09	0.06
1980	0.01	0.01	0.05	0.05
1981	0	0	0	0
1982	0	0	0.04	0.04
1983	0	0	0	0
1984	0.03	0.02	0.15	0.05
1985	0.04	0.04	0.1	0.1
1986	0	0	0	0
1987	0	0	0	0
1988	0.04	0.04	0.2	0.2
1989	0	0	0.05	0.05
1990	0.01	0.01	0.08	0.08
1991	0.04	0.04	2.7	2.61
1992	0.04	0	0.49	0.35
1993	0.01	0	0.06	0.05
1994	0	0	0.1	0.1
1995	0.04	0.04	0.12	0.12
1996	0.06	0	0.49	0.06
1997	0	0	0	0
1998	0	0	0.1	0.1
1999	0.01	0.01	0.38	0.31
2000	0	0	0	0
2001	0	0	0.04	0.04
2002	0	0	0	0
2003	0.01	0.01	0.05	0.05
2004	0	0	0	0
2005	0	0	0	0
2006	0.03	0.03	0.05	0.05
2007	0	0	0	0
2008	0.08	0.07	3.58	3.25
2009	0.1	0.09	1.52	1.4
2010	0	0	0.07	0.07
2011	0.01	0	0.09	0.06
2012	0.01	0.01	0.48	0.48
2013	0	0	0.09	0.06
2014	0	0	0	0
2015	0	0	0	0
2016	0.06	0.05	0.64	0.55
2017	0	0	0.08	0.08
2018	0	0	0.08	0.08

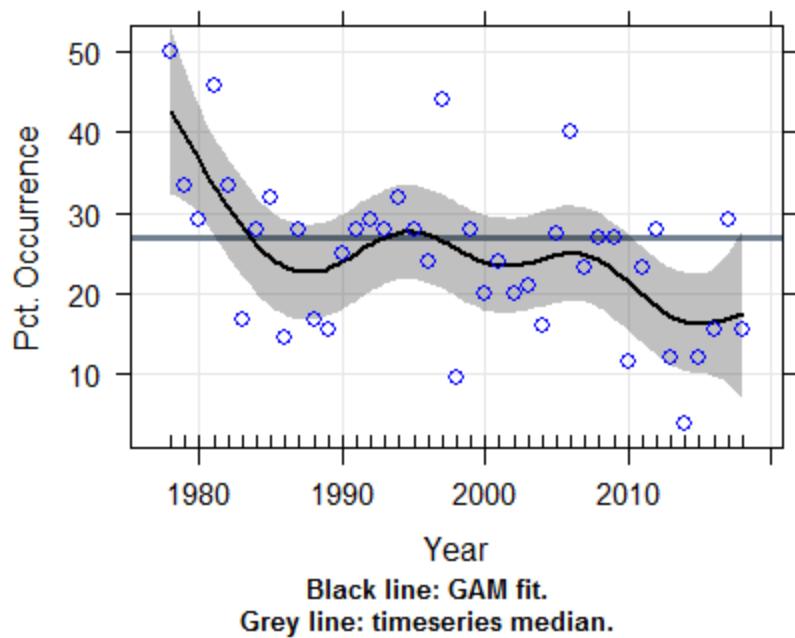
**Sea Scallop Biomass
MDMF Spring Survey, Region 4
Cape Cod Bay**



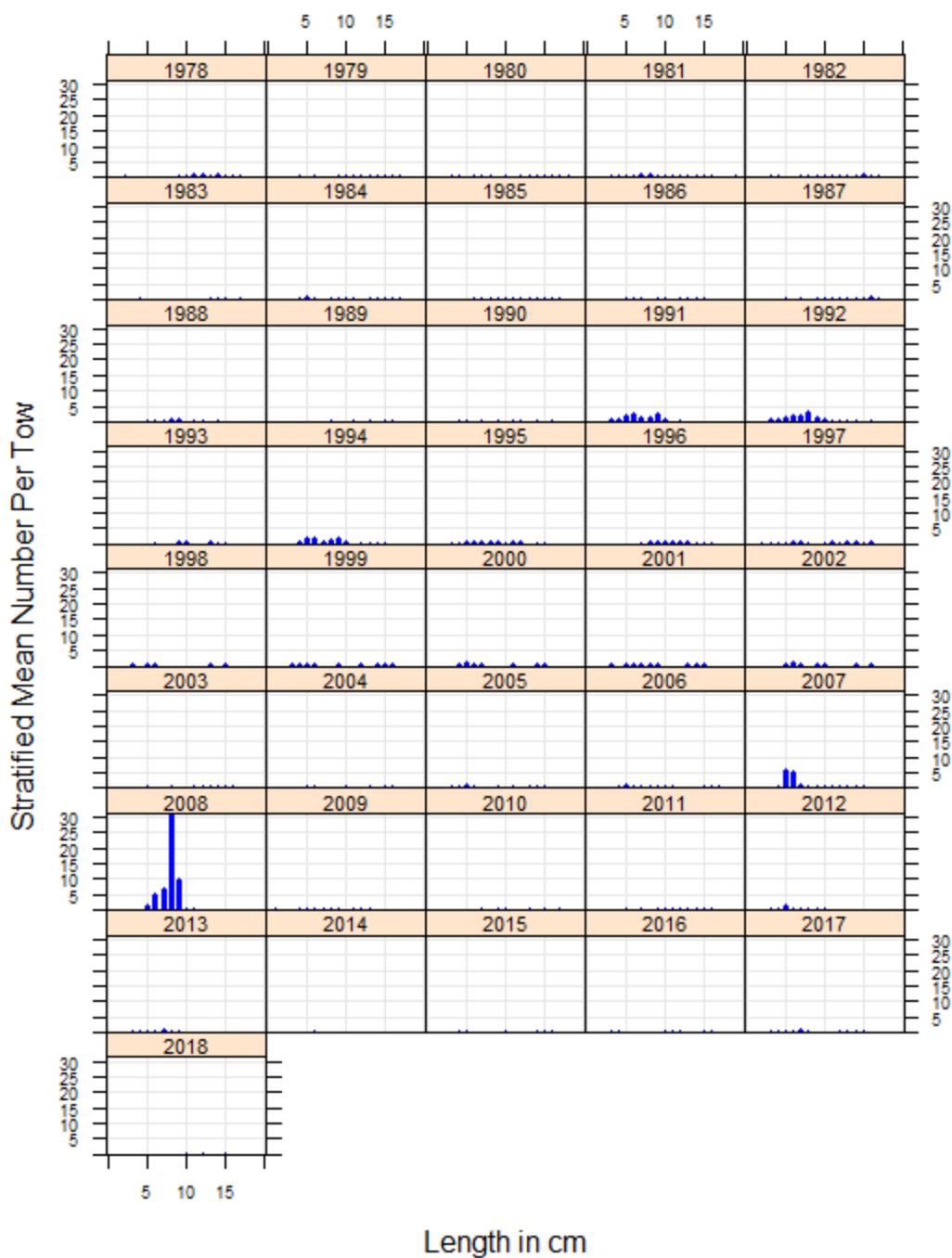
**Sea Scallop Abundance
MDMF Spring Survey, Region 4
Cape Cod Bay**



**Sea Scallop Occurrence in Survey Stations
MDMF Spring Survey, Region 4
Cape Cod Bay**



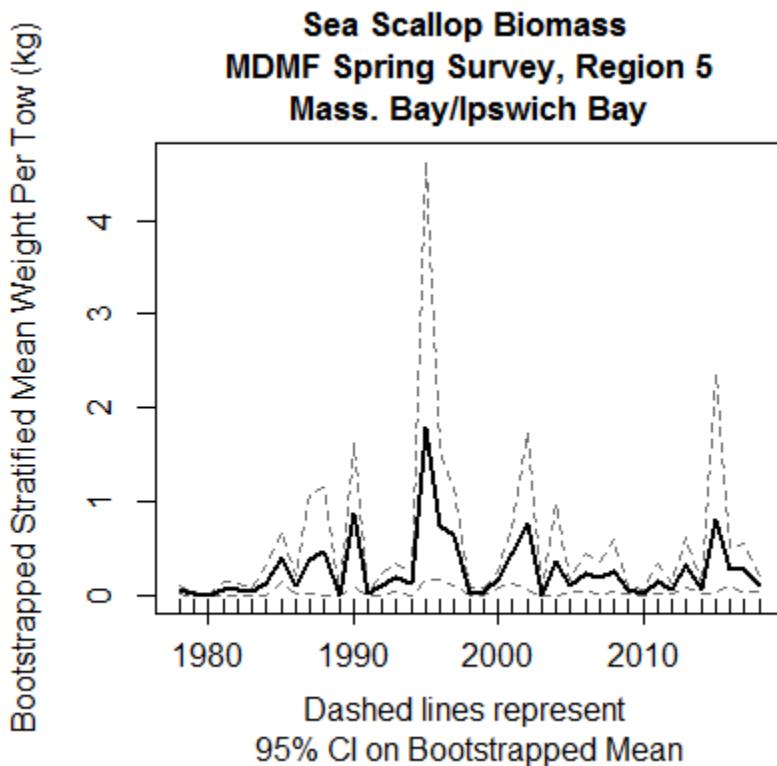
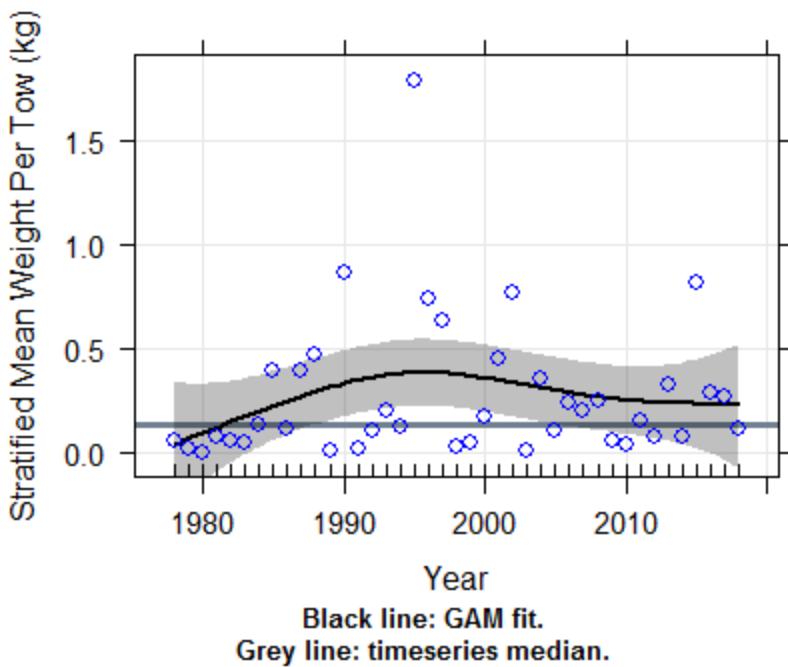
Sea Scallop
MDMF Spring Survey, Region 4
Cape Cod Bay



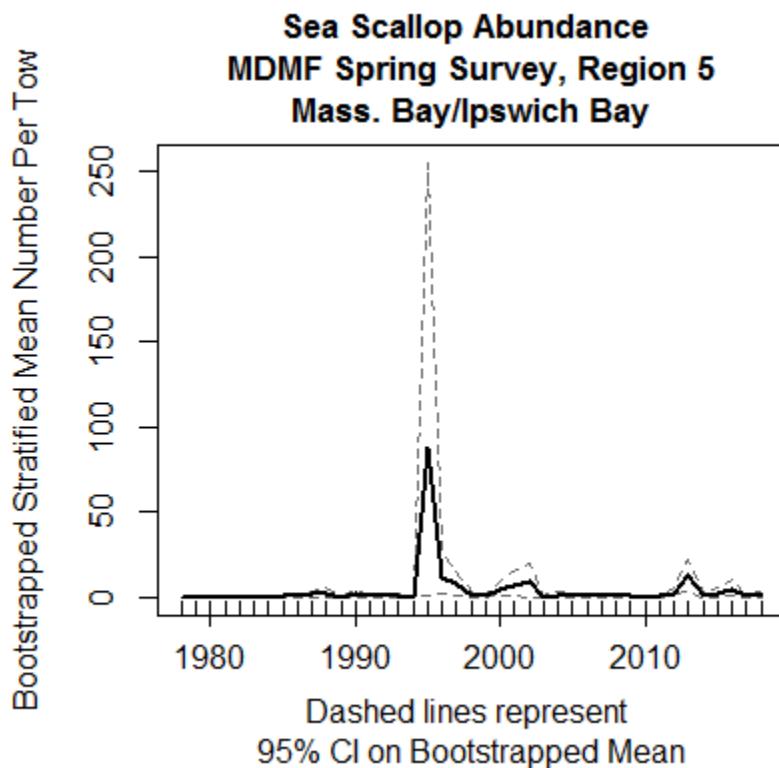
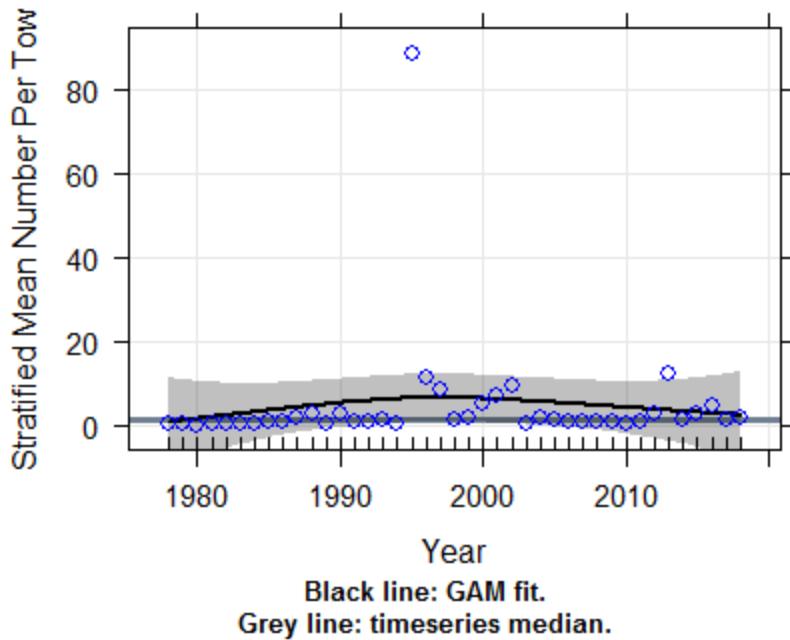
Sea Scallop
 MDMF Spring Survey, Region 4
 Cape Cod Bay

Year	Wt. per tow (kg)	Std.Err.Wt.	Number per tow	Std.Err.N
1978	1.21	0.4	3.9	1.29
1979	0.58	0.27	1.71	0.77
1980	0.68	0.39	1.57	0.74
1981	0.69	0.22	3.39	1.55
1982	0.77	0.42	2.18	1.01
1983	0.09	0.05	0.25	0.13
1984	0.43	0.24	1.49	0.99
1985	0.49	0.23	1.94	1.04
1986	0.15	0.1	0.65	0.35
1987	0.66	0.35	1.75	0.92
1988	0.08	0.05	1	0.62
1989	0.1	0.07	0.23	0.13
1990	0.11	0.06	0.54	0.2
1991	0.49	0.47	10.47	9.1
1992	0.57	0.41	9.81	8.1
1993	0.24	0.11	0.87	0.36
1994	0.4	0.25	6.36	3.6
1995	0.35	0.23	2.41	1.03
1996	0.4	0.17	2.1	0.85
1997	0.53	0.22	2.08	0.79
1998	0.05	0.04	0.77	0.68
1999	0.12	0.07	0.54	0.21
2000	0.1	0.04	1.46	1.12
2001	0.14	0.05	0.82	0.37
2002	0.1	0.06	1.58	1.03
2003	0.11	0.05	0.74	0.39
2004	0.17	0.08	0.46	0.23
2005	0.15	0.09	1.51	0.86
2006	0.31	0.14	2.99	1.45
2007	0.41	0.32	12.36	10.55
2008	2.92	2.8	53.19	50.7
2009	0.08	0.04	0.92	0.41
2010	0.1	0.08	0.38	0.26
2011	0.23	0.11	0.76	0.39
2012	0.04	0.04	1.96	1.53
2013	0.04	0.03	1.14	0.75
2014	0	0	0.04	0.04
2015	0.12	0.1	0.32	0.19
2016	0.17	0.09	0.83	0.48
2017	0.18	0.07	1.18	0.82
2018	0.06	0.03	0.15	0.07

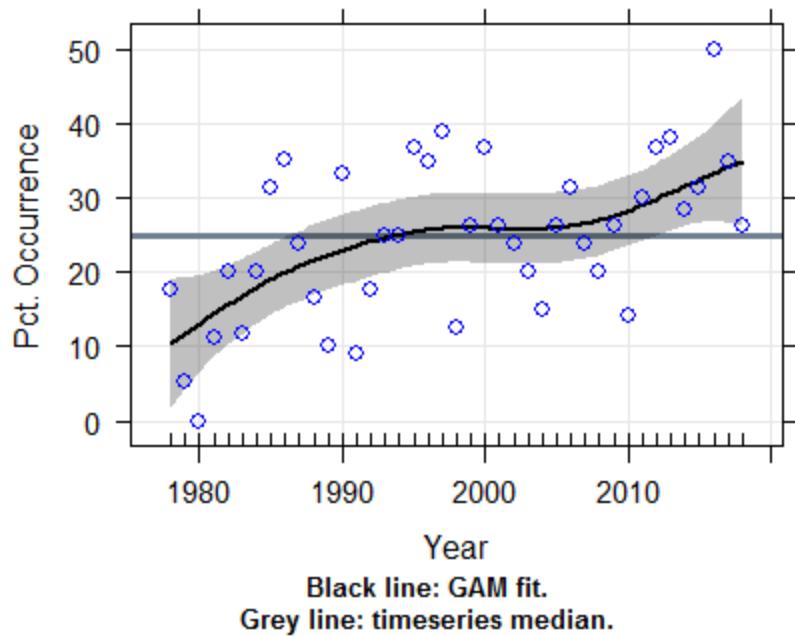
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Mass. Bay/Ipswich Bay



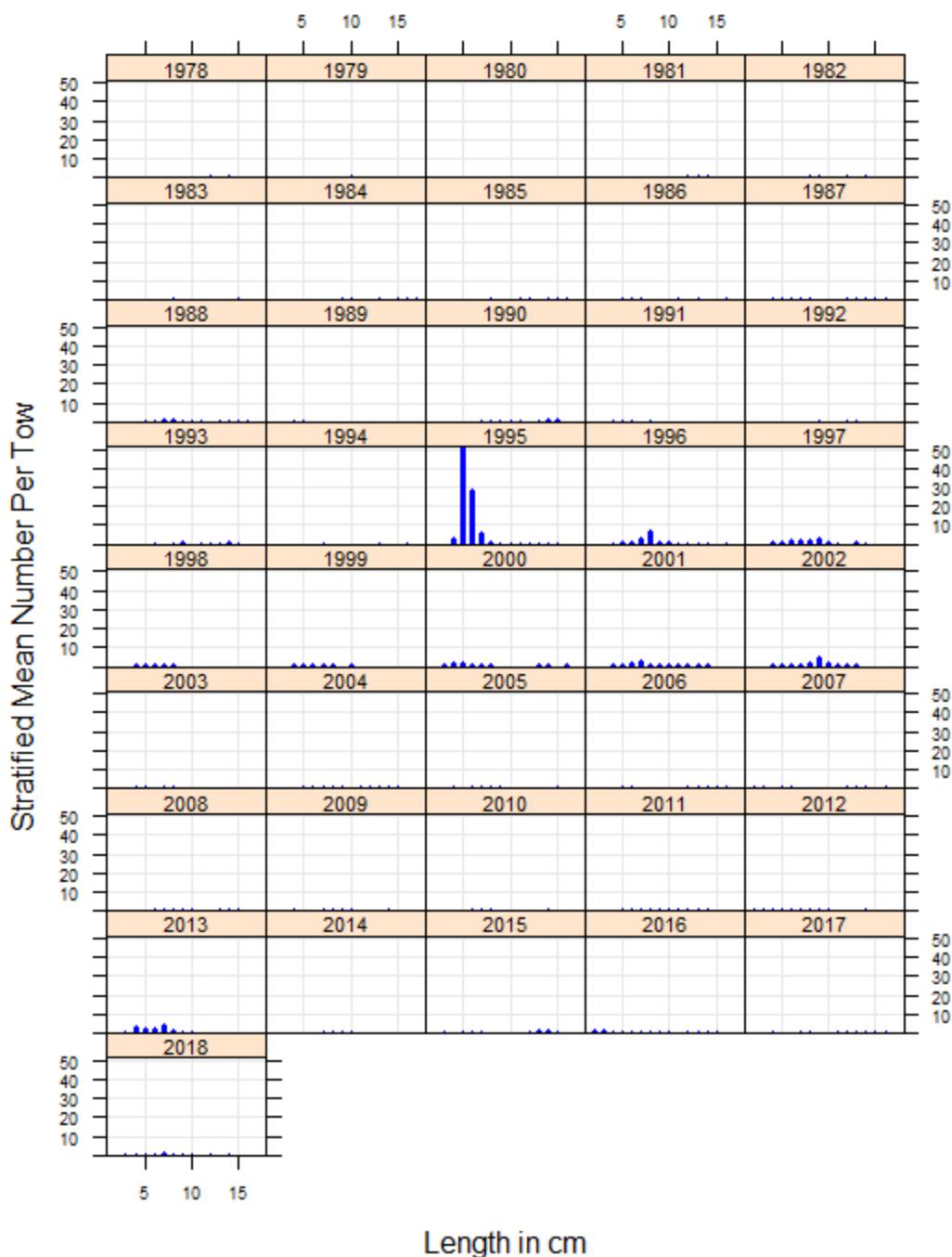
**Sea Scallop Abundance
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Mass. Bay/Ipswich Bay**



Sea Scallop Occurrence in Survey Stations
MDMF Spring Survey, Region 5
Mass. Bay/Ipswich Bay



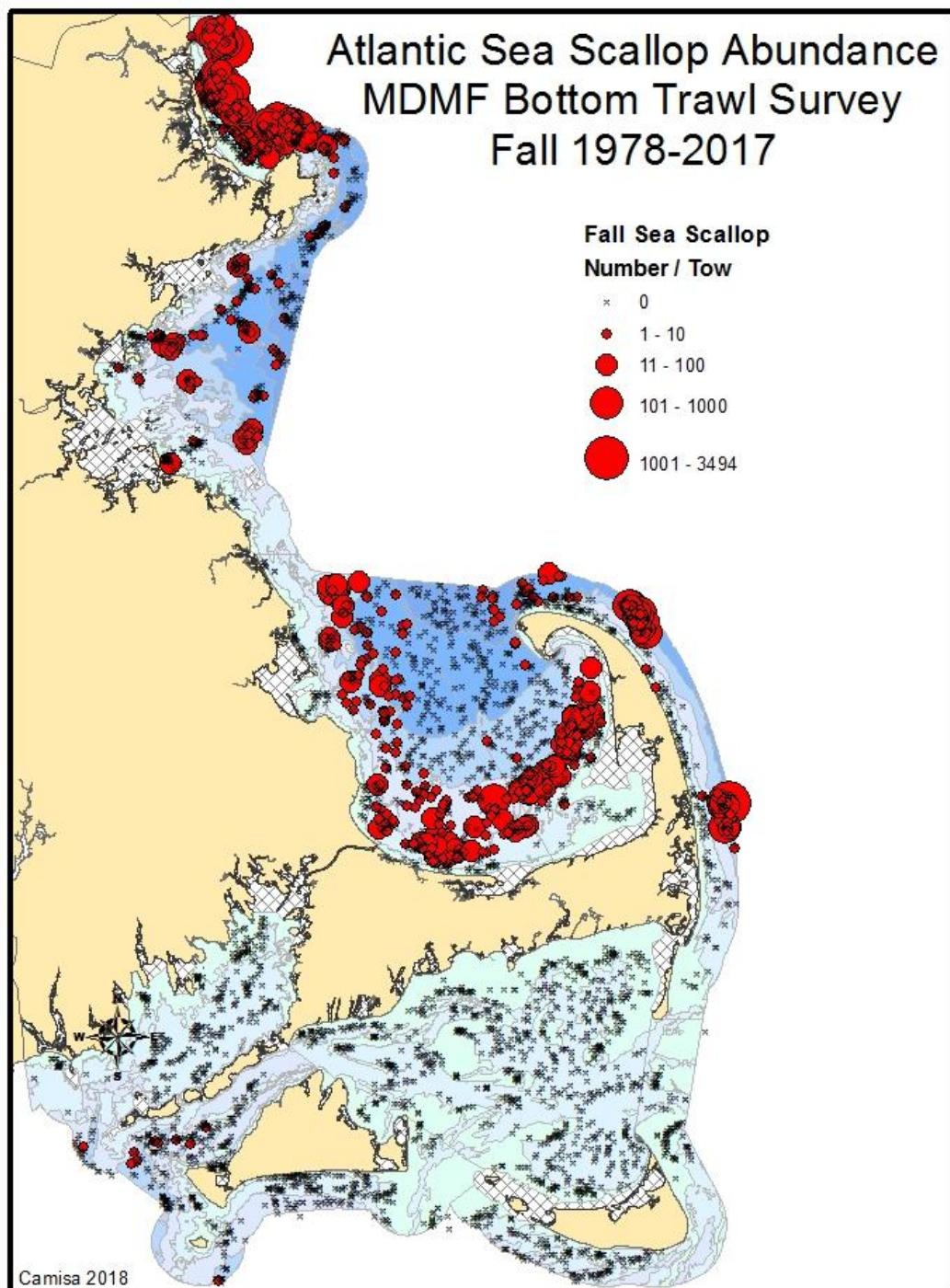
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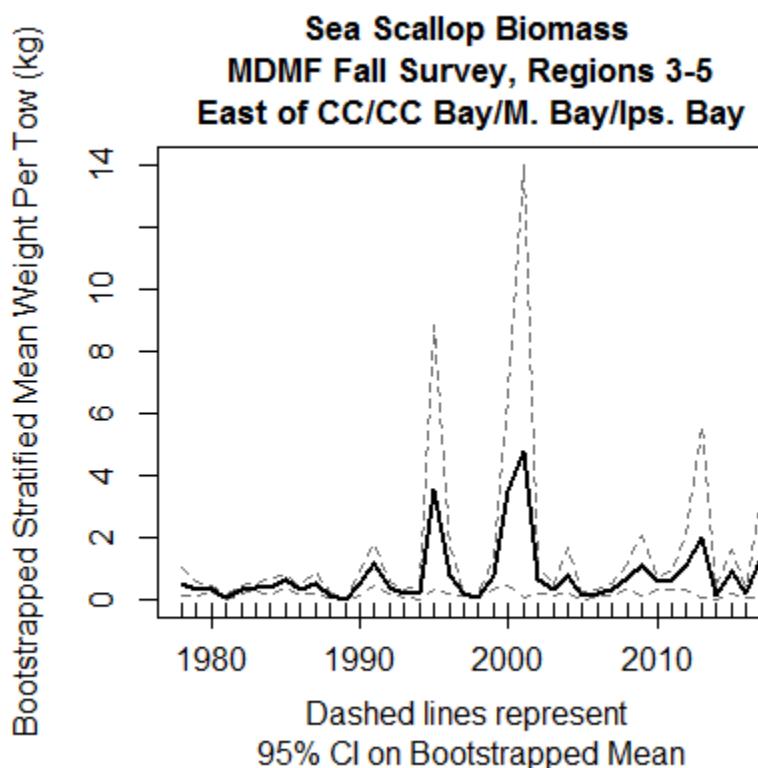
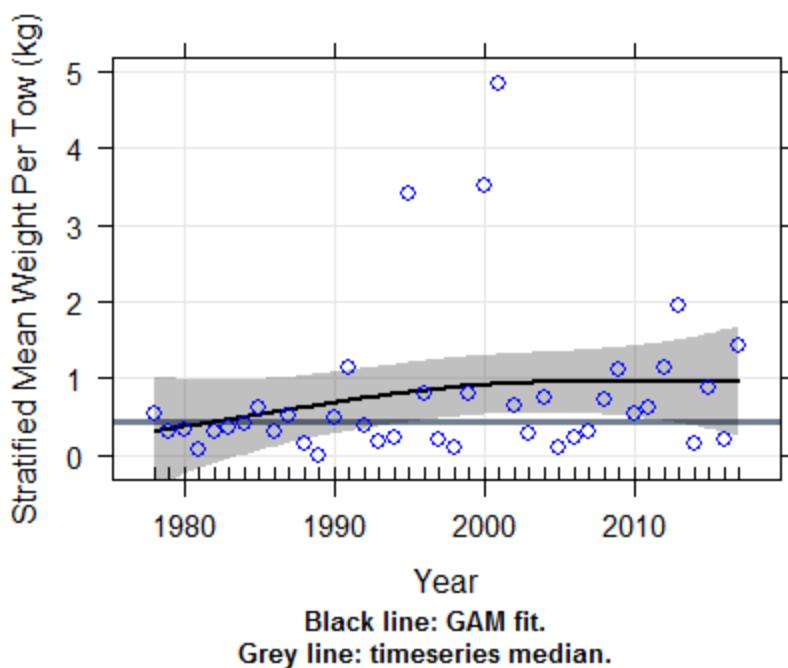
Sea Scallop

MDMF Spring Survey, Region 5
 Mass. Bay/Ipswich Bay

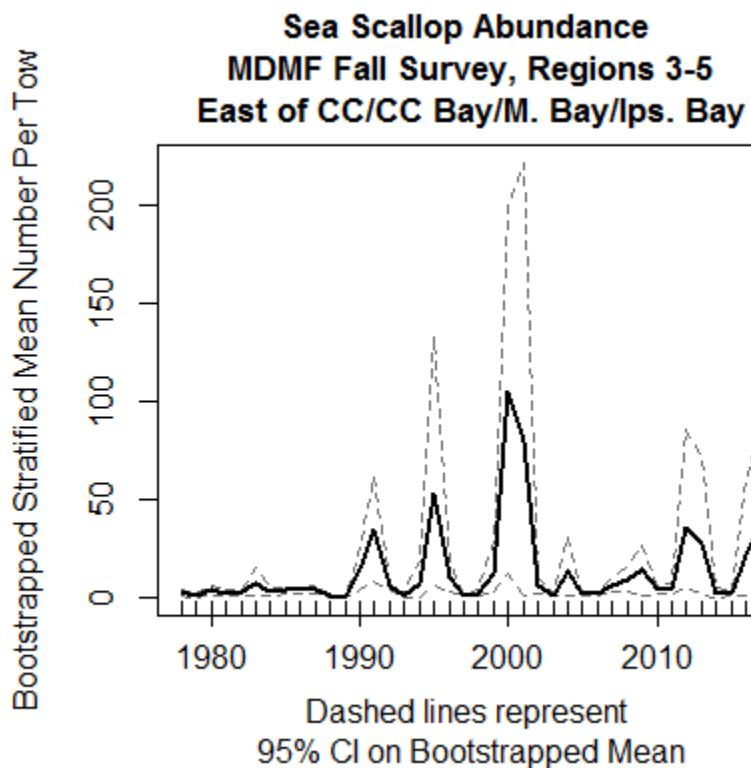
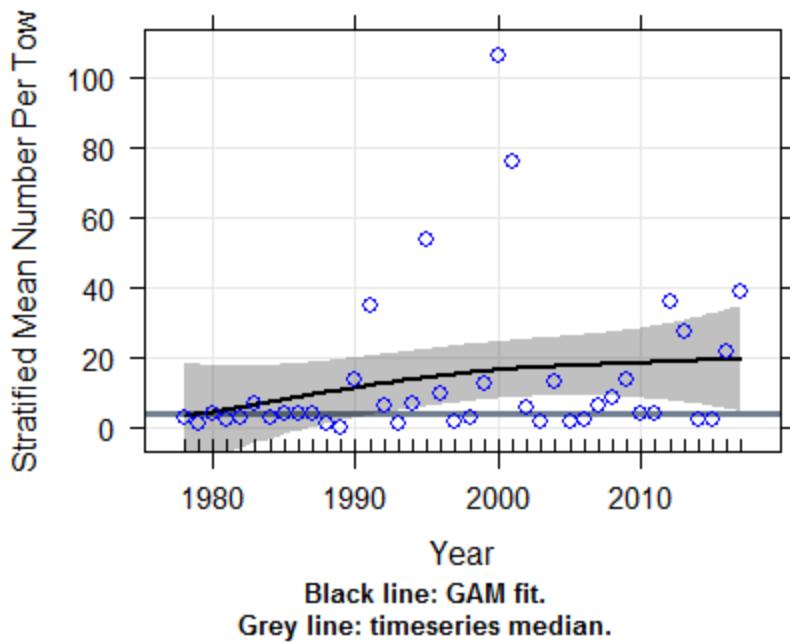
Year	Wt. per tow (kg)	Std.Err.Wt.	Number per tow	Std.Err.N
1978	0.06	0.03	0.2	0.12
1979	0.01	0.01	0.05	0.05
1980	0	0	0	0
1981	0.07	0.06	0.22	0.19
1982	0.06	0.04	0.28	0.18
1983	0.05	0.04	0.12	0.09
1984	0.13	0.1	0.26	0.14
1985	0.39	0.17	0.83	0.3
1986	0.11	0.05	0.68	0.28
1987	0.39	0.35	1.68	0.98
1988	0.47	0.37	2.63	1.92
1989	0.01	0.01	0.14	0.07
1990	0.86	0.66	2.53	1.75
1991	0.02	0.02	0.66	0.63
1992	0.1	0.07	0.49	0.35
1993	0.19	0.1	1.14	0.69
1994	0.12	0.09	0.38	0.22
1995	1.79	1.43	88.64	83.28
1996	0.74	0.42	11.42	7.73
1997	0.63	0.29	8.28	4
1998	0.03	0.03	1.07	0.99
1999	0.04	0.02	1.56	0.97
2000	0.17	0.05	4.94	2.54
2001	0.45	0.19	7.07	4.5
2002	0.76	0.52	9.25	6.17
2003	0	0	0.47	0.27
2004	0.35	0.32	1.61	1.14
2005	0.1	0.04	1.09	0.75
2006	0.24	0.13	0.73	0.32
2007	0.2	0.1	0.78	0.37
2008	0.25	0.18	0.93	0.4
2009	0.06	0.03	0.57	0.24
2010	0.03	0.02	0.36	0.18
2011	0.15	0.1	0.76	0.31
2012	0.07	0.03	2.76	1.29
2013	0.33	0.16	12.33	5.45
2014	0.07	0.03	1.05	0.46
2015	0.82	0.78	2.54	1.78
2016	0.28	0.12	4.69	2.7
2017	0.26	0.16	1	0.36
2018	0.11	0.05	1.71	0.93



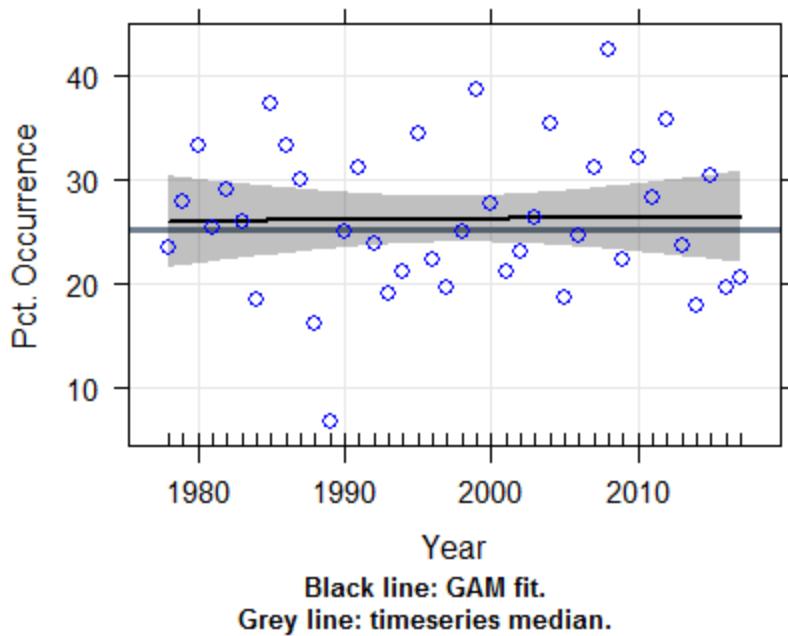
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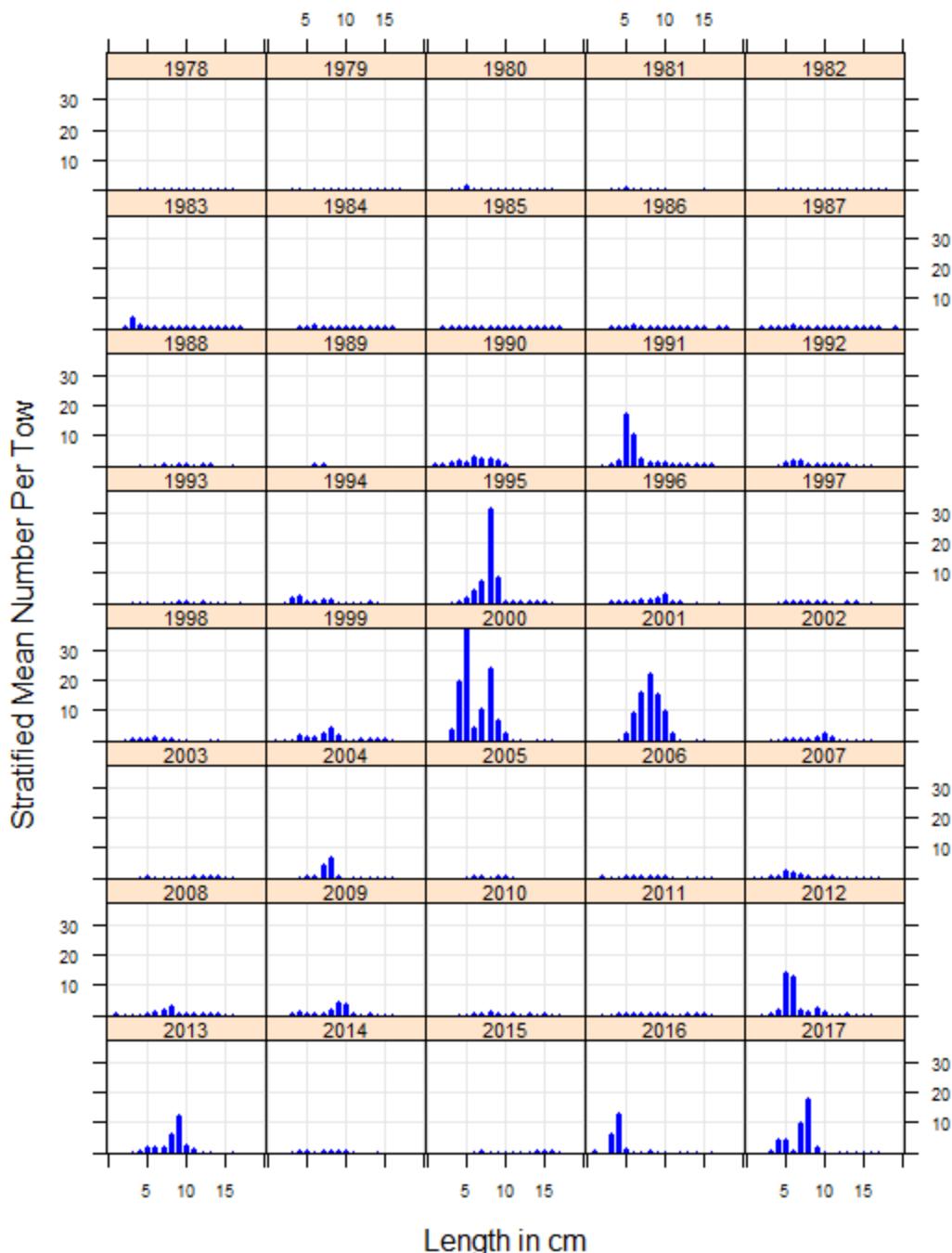
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Sea Scallop Occurrence in Survey Stations
MDMF Fall Survey, Regions 3-5
East of CC/CC Bay/M. Bay/Ips. Bay



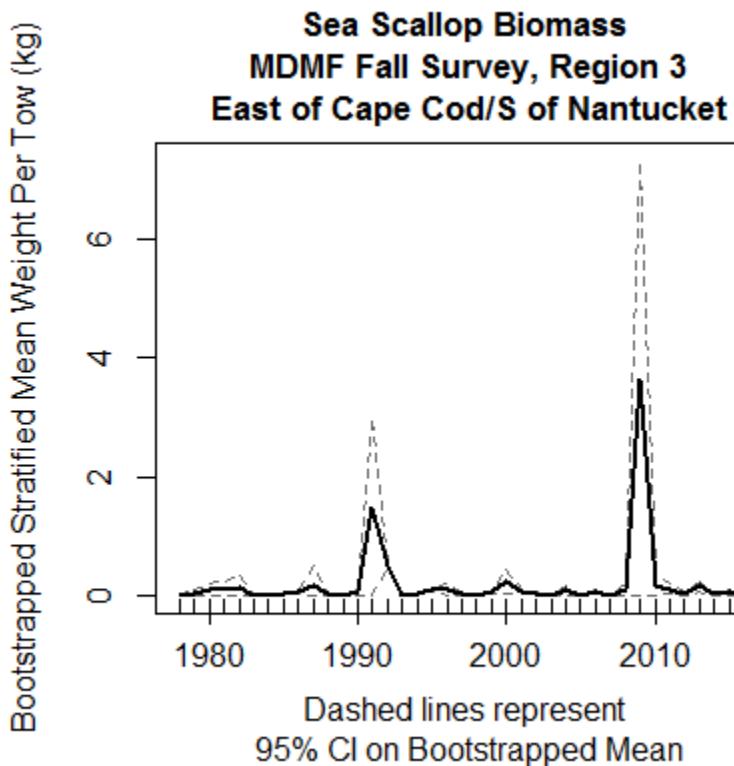
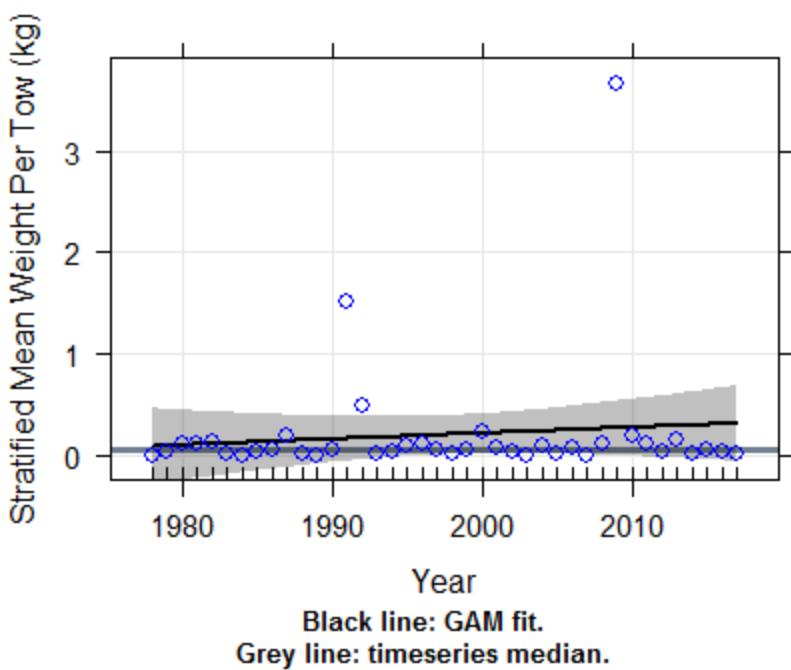
Sea Scallop
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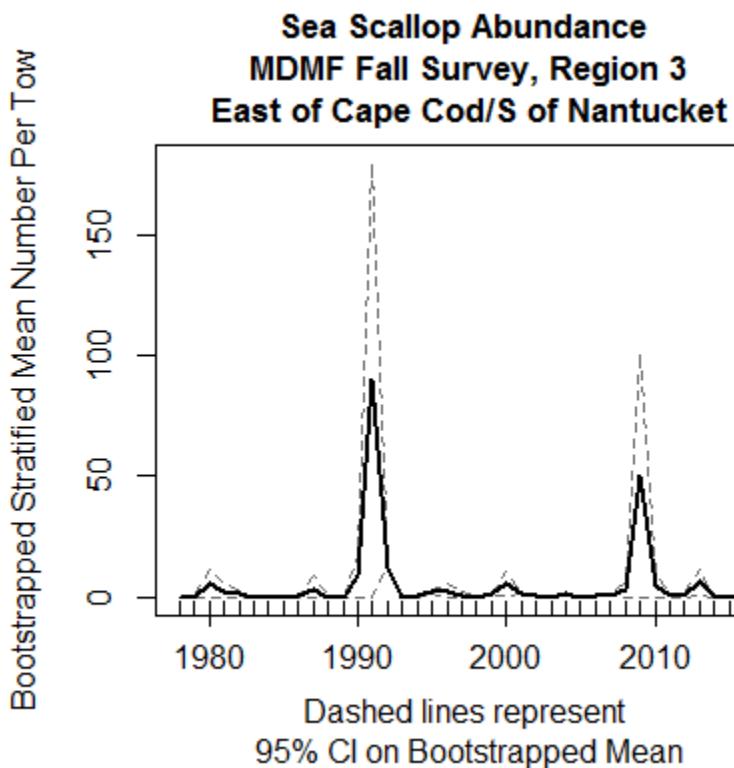
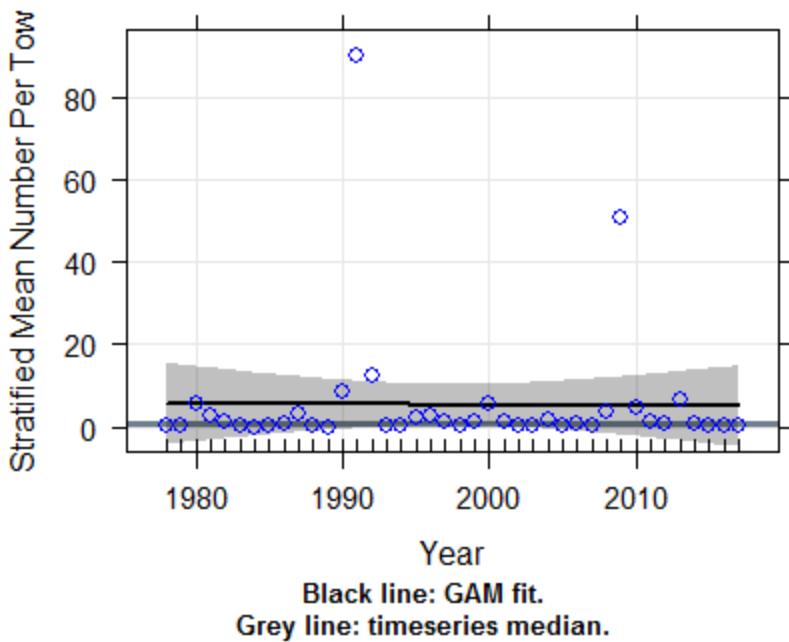
Sea Scallop Biomass
 MDMF Fall Survey, Regions 3-5
 East of CC/CC Bay/M. Bay/Ips. Bay

Year	Wt. per tow (kg)	Std.Err.Wt.	Number per tow	Std.Err.N
1978	0.54	0.37	2.70	1.10
1979	0.30	0.15	1.23	0.55
1980	0.33	0.06	3.75	1.69
1981	0.07	0.03	2.26	1.27
1982	0.29	0.08	2.72	1.02
1983	0.36	0.07	6.54	4.48
1984	0.39	0.17	2.78	1.08
1985	0.61	0.11	3.69	0.72
1986	0.31	0.08	3.56	1.12
1987	0.52	0.22	4.05	1.59
1988	0.14	0.08	0.85	0.42
1989	0	0	0.12	0.05
1990	0.48	0.27	13.73	6.72
1991	1.13	0.47	34.60	22.11
1992	0.39	0.13	6.18	1.78
1993	0.16	0.07	0.99	0.52
1994	0.21	0.16	6.53	5.91
1995	3.40	2.75	53.37	42.05
1996	0.78	0.51	9.60	4.97
1997	0.19	0.05	1.34	0.33
1998	0.09	0.03	2.49	1.14
1999	0.79	0.35	12.59	8.60
2000	3.51	2.59	105.79	78.74
2001	4.83	4.64	75.88	72.75
2002	0.64	0.26	5.67	2.57
2003	0.29	0.11	1.38	0.45
2004	0.74	0.46	12.88	9.95
2005	0.09	0.07	1.70	0.83
2006	0.21	0.06	2.06	0.58
2007	0.30	0.10	6.27	2.20
2008	0.71	0.23	8.56	3.88
2009	1.10	0.86	13.59	11.80
2010	0.54	0.12	3.99	1.15
2011	0.62	0.19	3.85	1.59
2012	1.15	0.60	35.91	26.43
2013	1.95	1.82	27.02	22.85
2014	0.14	0.11	2.24	1.57
2015	0.88	0.63	2.31	1.30
2016	0.19	0.10	21.44	18.87
2017	1.41	1.09	38.72	28.78

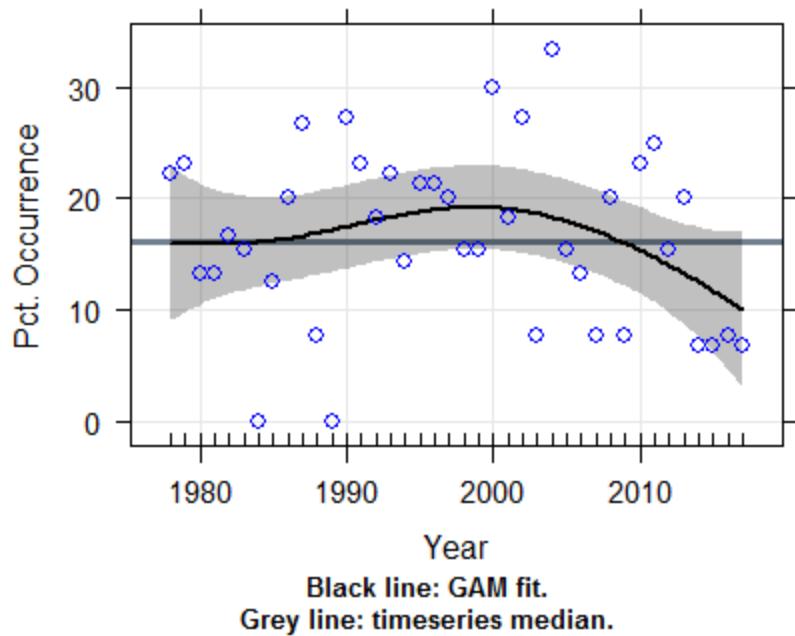
Sea Scallop Biomass
MDMF Fall Survey, Region 3
East of Cape Cod/S of Nantucket



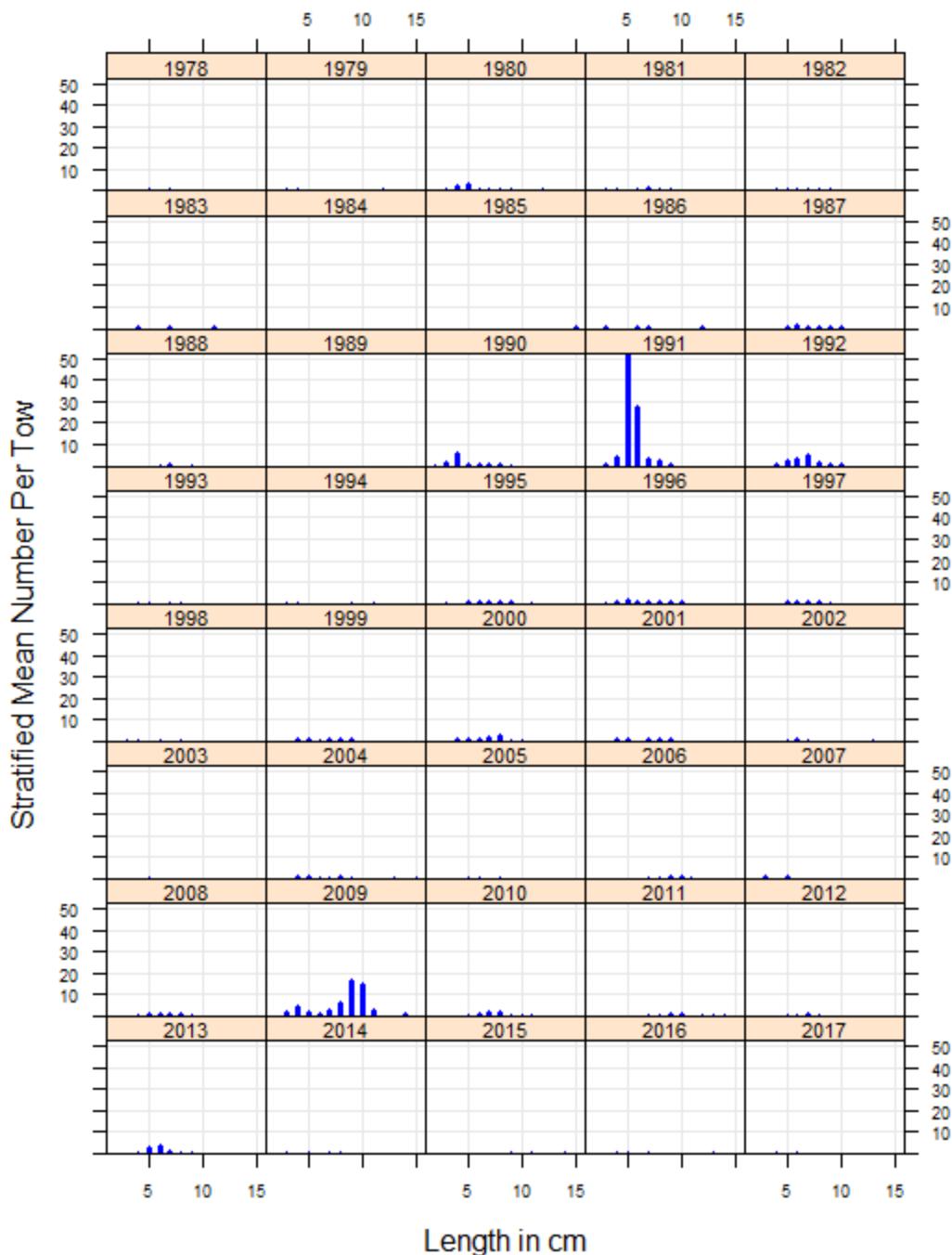
Sea Scallop Abundance
MDMF Fall Survey, Region 3
East of Cape Cod/S of Nantucket



Sea Scallop Occurrence in Survey Stations
MDMF Fall Survey, Region 3
East of Cape Cod/S of Nantucket



Sea Scallop
MDMF Fall Survey, Region 3
East of Cape Cod/S of Nantucket



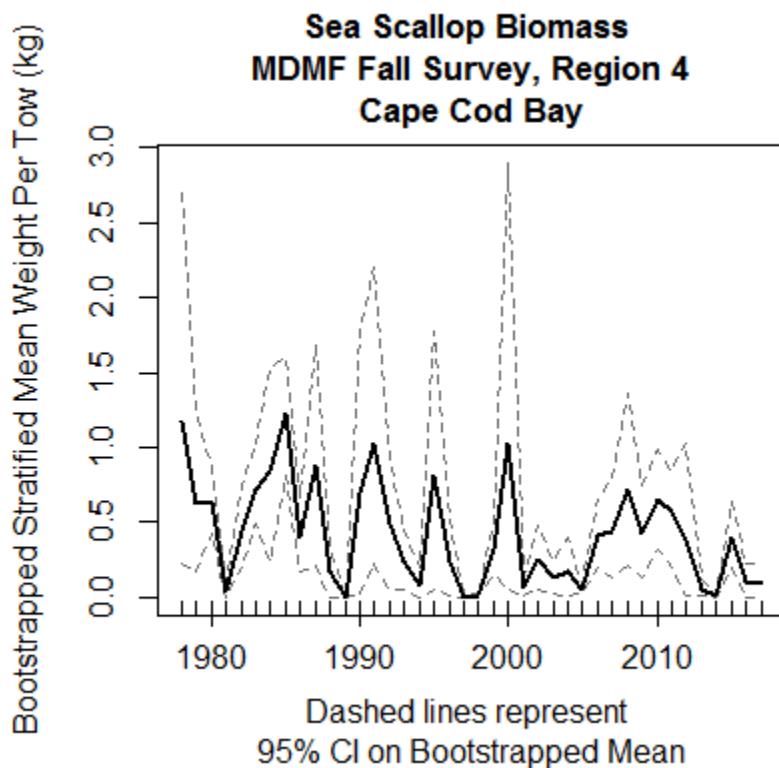
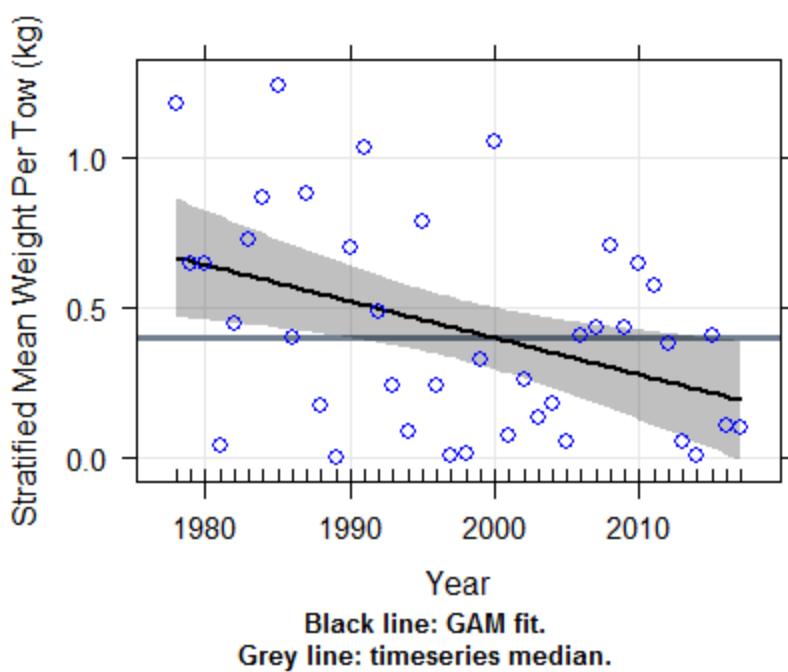
Sea Scallop

MDMF Fall Survey, Region 3

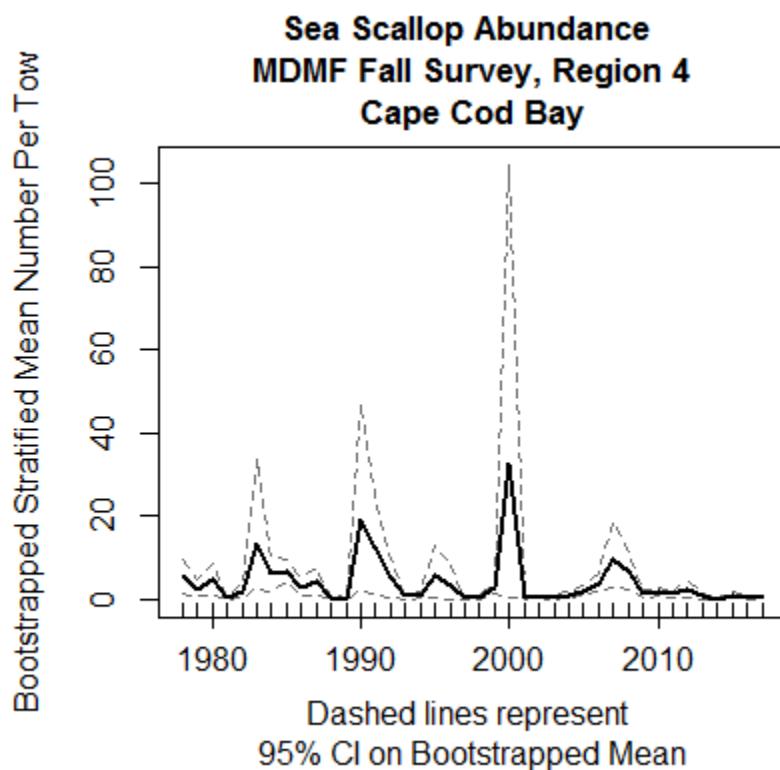
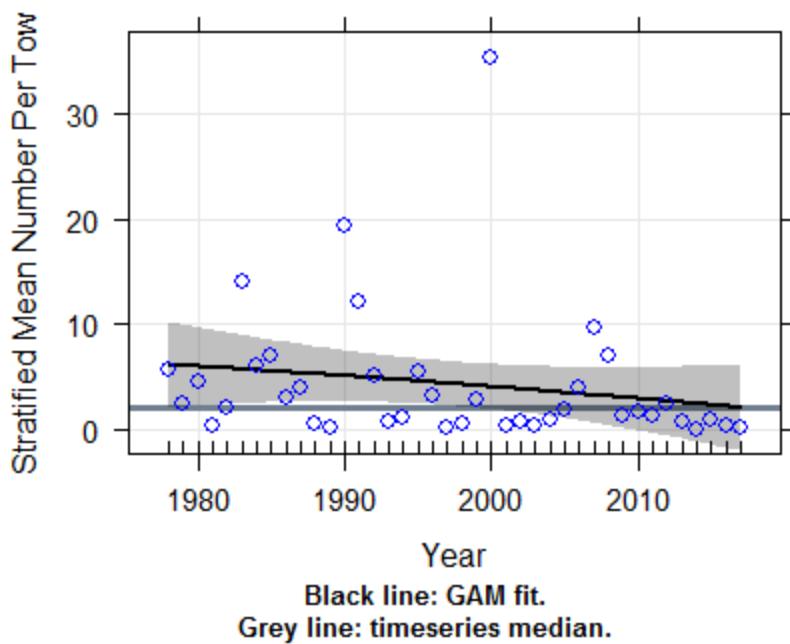
East of Cape Cod/S of Nantucket

Year	Wt. per tow (kg)	Std.Err.Wt.	Number per tow	Std.Err.N
1978	0	0	0.14	0.1
1979	0.04	0.02	0.2	0.09
1980	0.1	0.1	5.77	5.57
1981	0.11	0.08	2.78	2.03
1982	0.12	0.1	1.32	1.04
1983	0.01	0.01	0.13	0.09
1984	0	0	0	0
1985	0.04	0.04	0.05	0.05
1986	0.05	0.02	0.58	0.48
1987	0.18	0.17	3.31	2.96
1988	0.02	0.02	0.28	0.28
1989	0	0	0	0
1990	0.06	0.05	8.45	7.33
1991	1.51	1.34	89.81	82.46
1992	0.49	0.02	12.45	0.24
1993	0.01	0.01	0.31	0.15
1994	0.03	0.01	0.38	0.3
1995	0.09	0.02	2.04	0.88
1996	0.1	0.09	2.72	2.12
1997	0.04	0.03	1.11	0.8
1998	0	0	0.24	0.2
1999	0.05	0.02	1.38	0.5
2000	0.23	0.2	5.46	4.87
2001	0.08	0	1.33	0.05
2002	0.03	0.02	0.47	0.05
2003	0	0	0.05	0.05
2004	0.09	0.07	1.58	0.66
2005	0	0	0.21	0.17
2006	0.08	0.02	0.76	0.2
2007	0	0	0.43	0
2008	0.11	0.07	3.59	2.36
2009	3.66	3.66	50.54	50.54
2010	0.18	0.16	4.42	3.77
2011	0.11	0.08	1.07	0.89
2012	0.02	0.02	0.78	0.69
2013	0.15	0.07	6.51	3.33
2014	0.02	0.02	0.55	0.55
2015	0.05	0.05	0.2	0.2
2016	0.02	0.02	0.4	0.4
2017	0	0	0.08	0.08

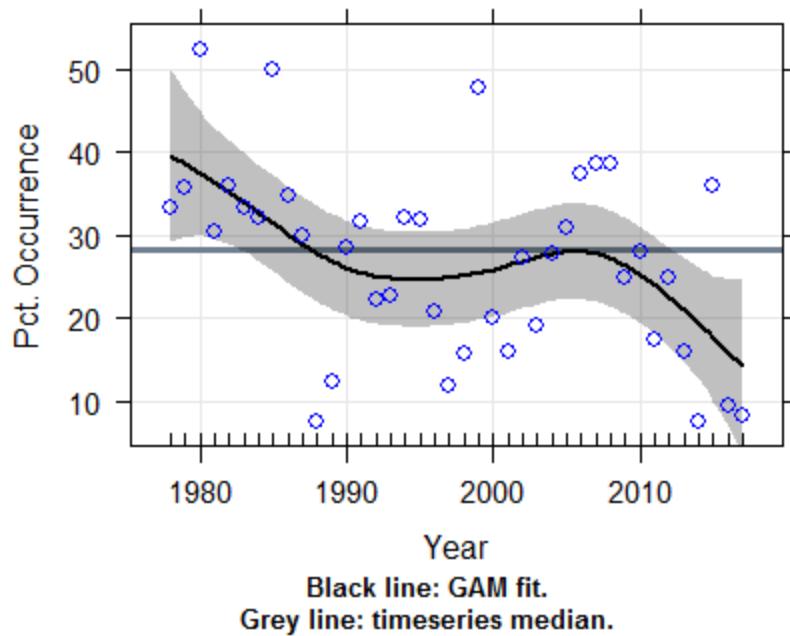
Sea Scallop Biomass
MDMF Fall Survey, Region 4
Cape Cod Bay



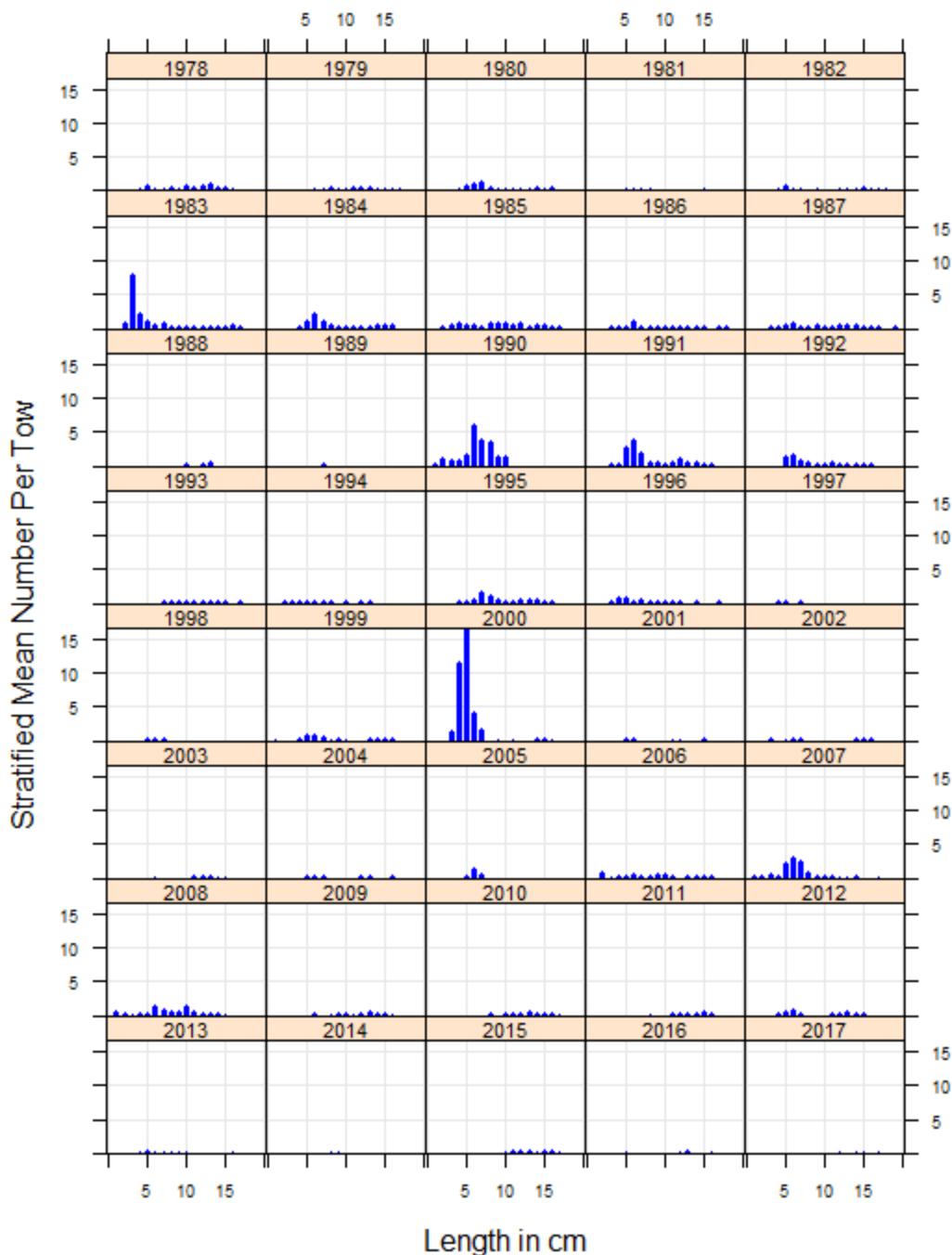
**Sea Scallop Abundance
MDMF Fall Survey, Region 4
Cape Cod Bay**



Sea Scallop Occurrence in Survey Stations
MDMF Fall Survey, Region 4
Cape Cod Bay



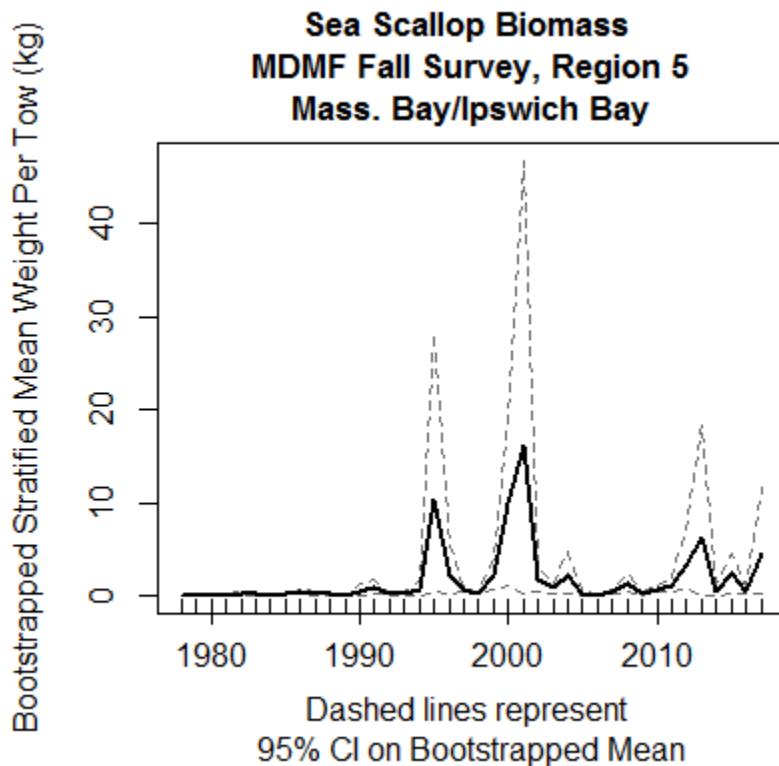
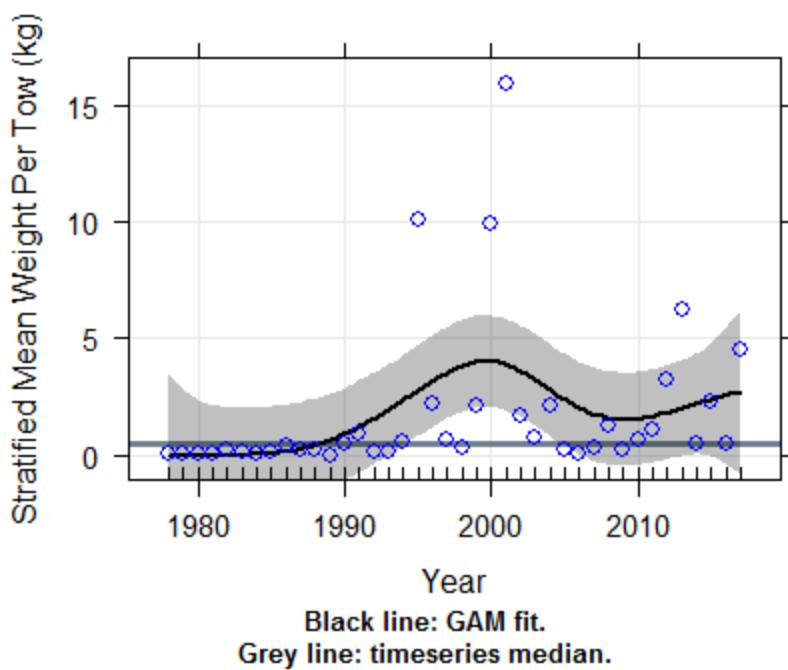
Sea Scallop
MDMF Fall Survey, Region 4
Cape Cod Bay



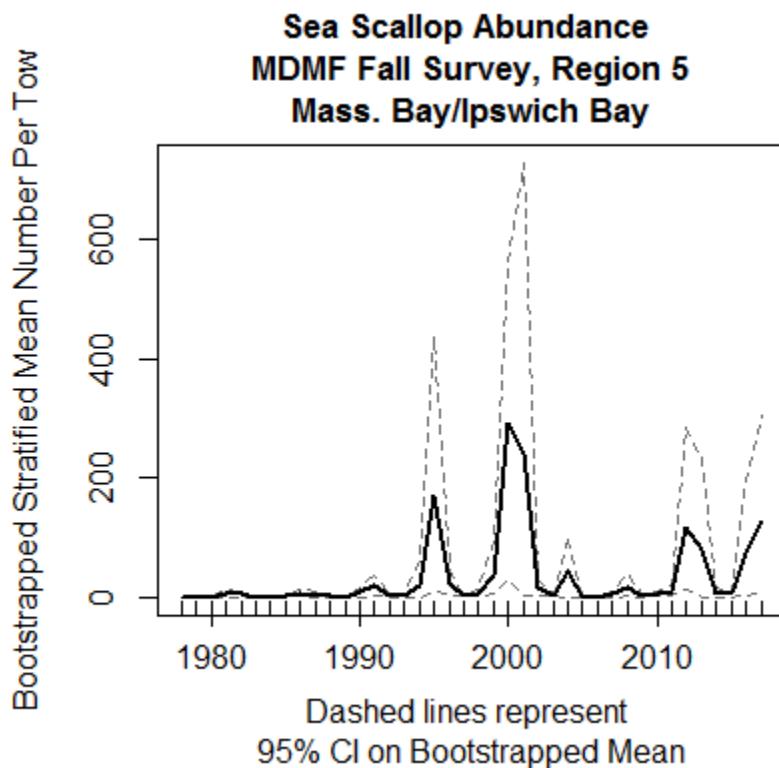
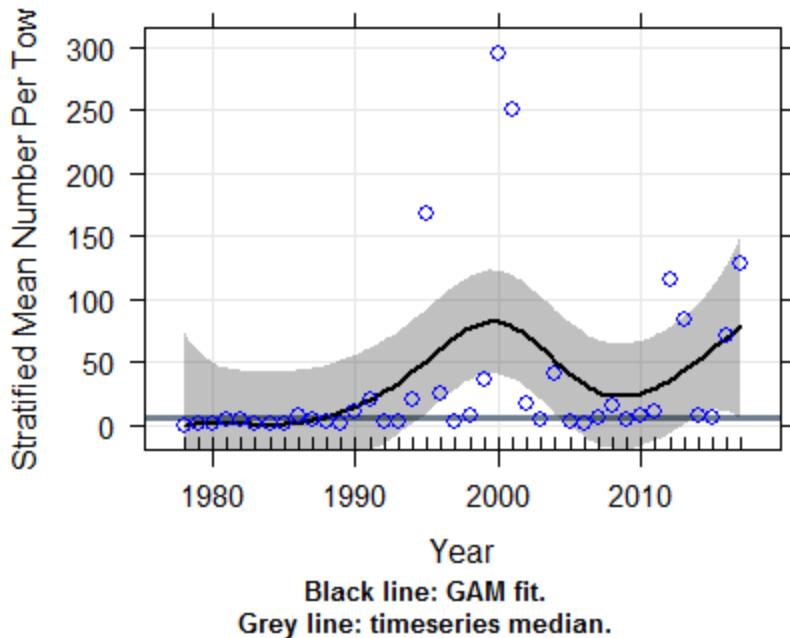
Sea Scallop
 MDMF Fall Survey, Region 4
 Cape Cod Bay

Year	Wt. per tow (kg)	Std.Err.Wt.	Number per tow	Std.Err.N
1978	1.18	0.8	5.69	2.39
1979	0.64	0.34	2.49	1.22
1980	0.64	0.12	4.6	2.11
1981	0.04	0.03	0.33	0.09
1982	0.44	0.15	2.05	1.05
1983	0.73	0.15	14.03	9.92
1984	0.86	0.37	6.03	2.4
1985	1.24	0.23	6.97	1.51
1986	0.4	0.15	2.93	1.17
1987	0.88	0.46	4	2.24
1988	0.17	0.17	0.57	0.57
1989	0	0	0.12	0.12
1990	0.7	0.56	19.31	13.73
1991	1.03	0.57	12.2	7.31
1992	0.49	0.29	5.18	3.8
1993	0.24	0.12	0.8	0.39
1994	0.08	0.06	1.11	0.44
1995	0.78	0.54	5.54	3.71
1996	0.24	0.15	3.31	2.44
1997	0	0	0.23	0.14
1998	0.01	0.01	0.48	0.23
1999	0.32	0.11	2.77	0.92
2000	1.06	0.91	35.21	34.64
2001	0.07	0.04	0.41	0.23
2002	0.26	0.13	0.68	0.27
2003	0.13	0.06	0.43	0.21
2004	0.18	0.11	0.96	0.5
2005	0.05	0.02	1.95	0.71
2006	0.4	0.13	3.92	1.27
2007	0.43	0.19	9.67	4.44
2008	0.71	0.32	6.95	2.54
2009	0.43	0.17	1.39	0.56
2010	0.65	0.18	1.74	0.54
2011	0.57	0.19	1.4	0.47
2012	0.38	0.33	2.47	1.44
2013	0.05	0.03	0.72	0.45
2014	0.01	0	0.08	0.06
2015	0.4	0.13	0.98	0.35
2016	0.1	0.07	0.3	0.26
2017	0.1	0.07	0.19	0.13

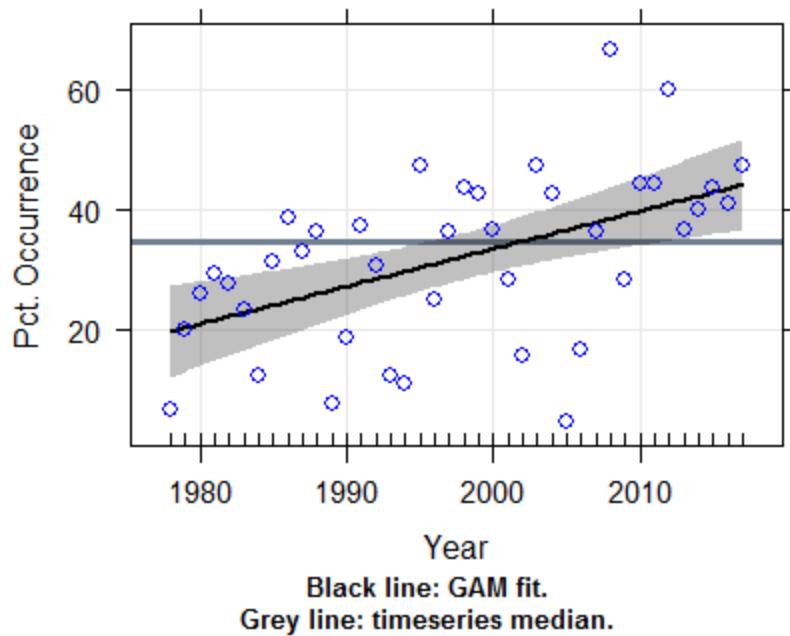
Sea Scallop Biomass
MDMF Fall Survey, Region 5
Mass. Bay/Ipswich Bay



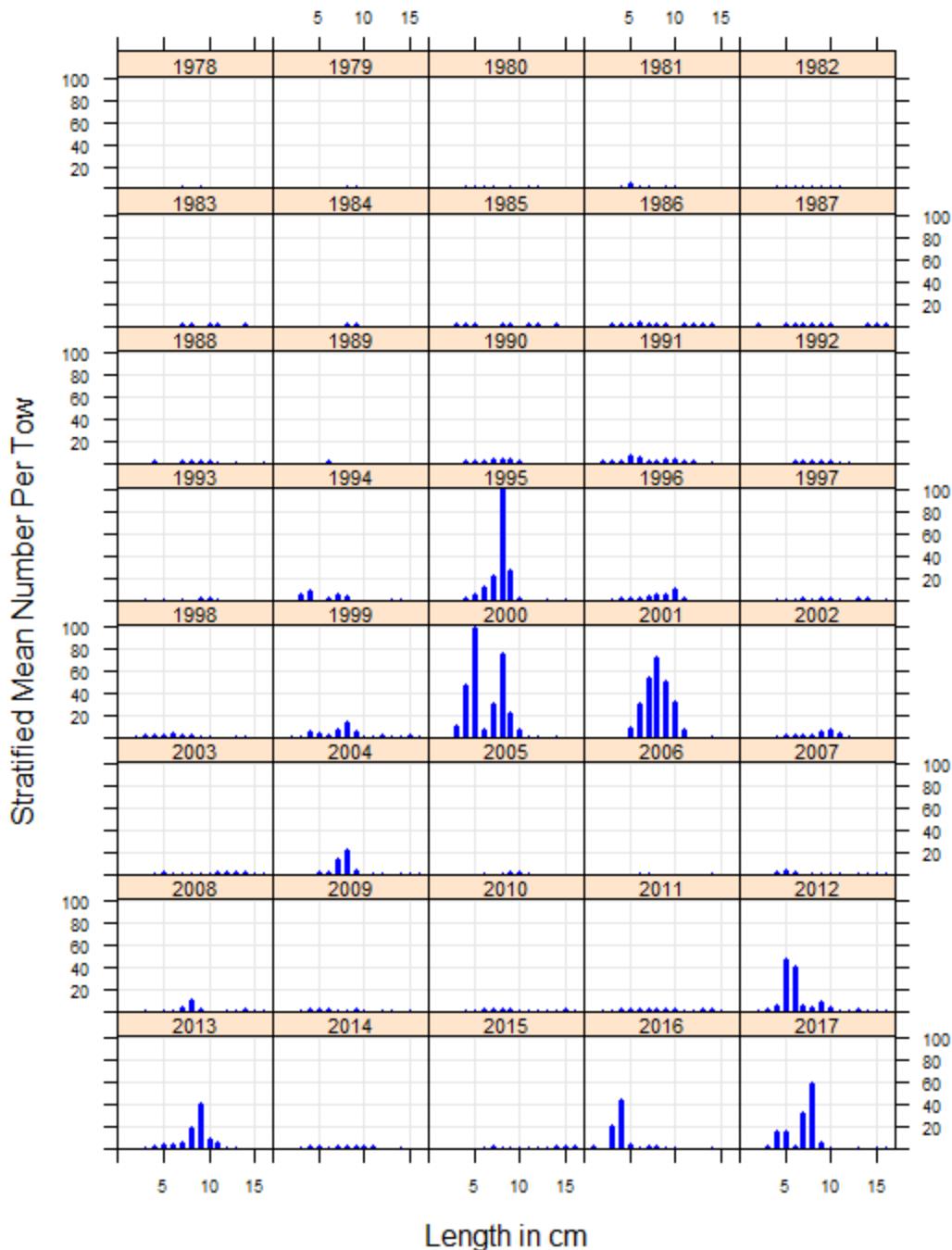
Sea Scallop Abundance
MDMF Fall Survey, Region 5
Mass. Bay/Ipswich Bay



Sea Scallop Occurrence in Survey Stations
MDMF Fall Survey, Region 5
Mass. Bay/Ipswich Bay



Sea Scallop
MDMF Fall Survey, Region 5
Mass. Bay/Ipswich Bay



Sea Scallop
 MDMF Fall Survey, Region 5
 Mass. Bay/Ipswich Bay

Year	Wt. per tow (kg)	Std.Err.Wt.	Number per tow	Std.Err.N
1978	0.01	0.01	0.14	0.14
1979	0.02	0.01	0.19	0.09
1980	0.04	0.03	0.81	0.56
1981	0.07	0.06	4.72	3.87
1982	0.22	0.13	4.88	2.88
1983	0.09	0.06	0.59	0.31
1984	0.02	0.01	0.21	0.15
1985	0.11	0.05	1.52	0.58
1986	0.4	0.18	6.97	3.28
1987	0.23	0.11	4.82	3.35
1988	0.19	0.08	1.86	1.15
1989	0	0	0.21	0
1990	0.49	0.35	9.73	6.21
1991	0.93	0.61	20.08	12
1992	0.16	0.1	2.48	1.64
1993	0.17	0.15	1.85	1.62
1994	0.56	0.53	19.75	19.64
1995	10.07	9.12	167.6	139.83
1996	2.17	1.69	24.72	16.03
1997	0.6	0.15	3.2	0.84
1998	0.27	0.1	7.35	3.78
1999	2.1	1.15	36.62	28.59
2000	9.9	8.51	294.69	256.8
2001	15.92	15.46	250.82	242.13
2002	1.71	0.85	17.48	8.55
2003	0.76	0.34	3.9	1.47
2004	2.12	1.52	40.11	33.11
2005	0.22	0.22	2.55	2.55
2006	0.03	0.02	0.34	0.26
2007	0.32	0.15	5.6	2.6
2008	1.22	0.61	15.07	12.18
2009	0.17	0.08	3.81	1.9
2010	0.69	0.27	7.01	2.06
2011	1.1	0.56	9.83	5.2
2012	3.23	1.94	115.14	87.94
2013	6.27	6.04	83.46	75.98
2014	0.45	0.37	6.89	5.21
2015	2.28	2.1	6.04	4.3
2016	0.45	0.3	70.57	62.79
2017	4.55	3.64	128.51	95.79