

**United States Department of Interior  
Fish and Wildlife Service  
Region 5  
Wildlife and Sport Fish Restoration Program**



**2020 Annual Performance Report**

State: Massachusetts

Agency: Division of Marine Fisheries

Project Title: Massachusetts Fishery Resource Assessment

FA Grant Agreement: F-56-R

Segment Number: 24

ASAP ID No. F12AF00099

Period Covered: January 1, 2020 – December 31, 2020

Prepared By: Matthew Camisa, Aquatic Biologist III  
Vincent Manfredi, Aquatic Biologist II  
Mark Szymanski, Aquatic Biologist II  
Robert Glenn, Environmental Analyst IV

Submitted By: Stephanie Cunningham,  
Federal Aid and Grants Coordinator

Date Submitted: 2/1/2021

Sport Fish Program  
Massachusetts Fishery Resource Assessment: F-56-R-24  
2020 Performance Report

List of Active Jobs:

[Job No. 1: Fishery Resource Assessment, Coastal Massachusetts](#)

Due to COVID-19 concerns, the Massachusetts Division of Marine Fisheries Resource Assessment Project was unable to complete the forty-third annual spring and fall bottom trawl surveys of Massachusetts territorial waters in 2020. Detailed reports of the planned activities and cancellation letters for each cruise follow.

[Job No. 2: Winter Flounder Year-Class Strength](#)

The Massachusetts Division of Marine Fisheries Resource Assessment Project completed the forty-fifth 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 2020 seine survey follows.

[Appendix A:](#) Indices of biomass, abundance, and recruitment for select species.

[Appendix B:](#) Trends in observed bottom temperatures - Massachusetts bottom trawl survey.

[Appendix C:](#) Corrections to the trawl survey database in 2020.

## CRUISE PLANS

### R/V GLORIA MICHELLE

2020 Massachusetts Inshore Spring  
Bottom Trawl Survey  
Cruise No. 202091

### CRUISE PERIOD AND AREA

From May 4 through May 25, 2020 the Massachusetts Division of Marine Fisheries planned to conduct its 43rd spring bottom trawl survey. The survey area 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; and 2) to collect biological samples. 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 would have been 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 survey 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 are relocated due to untowable bottom or concentrations of fixed gear. Abbreviated tows of 13-19 minute duration are accepted as valid and expanded to the 20 minute standard.

Standard bottom trawl survey techniques are used when processing the catch. The total weight and length-frequency of each species were recorded directly into Fisheries Scientific Computer System (FSCS) data tables. Collections of age and growth material, and biological observations are undertaken during the measuring operation. Specimens are

also saved to fulfill requests. Bottom temperatures are continuously recorded with an Onset Water Temp Pro v2 attached to the net's headrope.

## DISCUSSION

All survey preparations for the spring 2020 survey were completed on time including our letter to fixed gear fishermen, survey schedule, list of volunteers and modified vessel and vehicle logistics to mitigate for COVID-19 risks. Out of an abundance of caution, and despite the best efforts of both DMF staff and NOAA Corps officers, the decision was made on April 10<sup>th</sup>, 2020 to cancel the spring trawl survey. It would be nearly impossible to socially distance and adhere to current CDC guidelines onboard the Gloria Michelle while conducting normal survey operations. Please see the attached letter to fixed gear fishermen showing our planned stations as well as the survey cancellation letter sent to Jon Hare, director of science and research at NEFSC.

For further information on this survey or others in the time series, contact Matthew Camisa at (508) 742-9743.



**Daniel J. McKiernan**  
Acting Director

# *Commonwealth of Massachusetts*

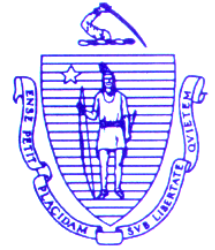
## **Division of Marine Fisheries**

251 Causeway Street, Suite 400

Boston, Massachusetts 02114

(617) 626-1520

fax (617) 626-1509



**Charles D. Baker**  
Governor

**Karyn E. Polito**

Lieutenant Governor

**Kathleen Theoharides**

Secretary

**Ronald S. Amidon**

Commissioner

**Mary-Lee King**

Deputy Commissioner

February 3, 2020

Fixed Gear Fishermen of Massachusetts,

*Marine Fisheries* will be conducting its annual spring trawl survey throughout state coastal waters beginning May 4, 2020. Surveys have been conducted each May and September since 1978 to provide a consistent sampling of benthic fishes and mobile invertebrates. Survey data is used to monitor the condition of fish stocks, as well as to inform the environmental review process that minimizes construction impacts on fisheries resources. Maintaining access to the planned sampling sites is critical to the integrity of the survey.

Please review the attached table of station locations and the accompanying figures which plot the sample sites. Station location information can also be accessed on our website (<http://www.mass.gov/eea/agencies/dfg/dmf/programs-and-projects/resource-assessment-surveys-project.html>). **We kindly ask for your cooperation and insist that all fixed gear be kept clear of station locations (1.5 n. mi. diameter circle as shown in figure - center point reported in table) for the indicated periods until station completion.** While we will make every attempt to complete stations during the assigned period to minimize inconvenience to fixed gear fishermen, *Marine Fisheries* is prepared to attach restrictions to permit renewals (under 322 CMR 7.01 (7)), mandating that fixed gear not be set on designated trawl survey sites for the announced dates. It remains our hope that this action will be unnecessary.

Sign-up to receive text notifications of trawl survey progress on the *Marine Fisheries* website (<http://www.mass.gov/dmf/trawlsurvey>). A daily updated list of completed survey stations will be sent via text, and posted on the *Marine Fisheries* website and on Twitter (handle: @MassDMF). The Massachusetts Lobstermen's Association will also post survey information on their webpage (<http://www.lobstermen.com>), as well as on Facebook (username: lobstermensassoc) and Twitter (handle: @masslobstermens). In the event of a delay due to weather, the schedule will be resumed as soon as working conditions permit. Fishermen can contact the R/V *Gloria Michelle* on VHF channels 13 or 16 to determine the updated daily schedule.

Personnel aboard the NOAA R/V *Gloria Michelle*, a 65' western rigged steel stern trawler with a blue hull and white deckhouse, will carefully check each site for marked gear by cruising along a selected tow path before the net is set. Twenty-minute tows undertaken at 2.5 knots cover approximately 0.8 nautical miles. We encourage communicating helpful information to the R/V officers (via channels 13 or 16).

Your cooperation is greatly appreciated and is vital to the effective monitoring of marine resources in the Commonwealth. If you have any questions about the survey, please contact me ([matt.camisa@mass.gov](mailto:matt.camisa@mass.gov) , (508) 742-9743). **If you have any questions about the *Marine Fisheries* website, Facebook, or Twitter, please contact Story Reed ([story.reed@mass.gov](mailto:story.reed@mass.gov) , 617- 626-1524).**

Sincerely,

Matt Camisa  
Senior Marine Fisheries Biologist

Cc. Dan McKiernan, Acting Director

Massachusetts Division of Marine Fisheries  
May 2020 Spring Trawl Survey Station Locations  
Massachusetts Bay to New Hampshire

\* Loran coordinates taken from NOAA paper charts.  
Please refer to Lat/Long for best accuracy.

Area Description	Depth	Range of Dates	Latitude	Longitude	Loran W/Y	Sta. ID#
Cape Ann and North	0-30'	May 8-11	42°40.90	-70°43.44	13827.1/44369.3	31-1
	0-30'	May 8-11	42°43.26	-70°45.47	13827.6/44385.6	31-2
	31'-60'	May 8-11	42°45.21	-70°46.10	13821.1/44397.1	32-1
	31'-60'	May 8-11	42°47.42	-70°47.75	13820.0/44411.7	32-2
	61'-90'	May 8-11	42°41.57	-70°40.44	13804.0/44366.9	33-1
	61'-90'	May 8-12	42°36.70	-70°36.44	13804.2/44333.6	33-2
	61'-90'	May 8-11	42°49.29	-70°46.51	13801.8/44418.8	33-3
	91'-120'	May 8-11	42°49.58	-70°44.76	13788.6/44417.1	34-1
	91'-120'	May 8-11	42°43.25	-70°40.73	13796.7/44376.4	34-2
	91'-120'	May 8-11	42°51.93	-70°45.46	13780.1/44430.4	34-3
	121'-180'	May 8-11	42°41.77	-70°34.91	13767.3/44357.5	35-1
	121'-180'	May 8-12	42°35.53	-70°35.94	13807.2/44326.1	35-2
	121'-180'	May 8-11	42°43.41	-70°37.86	13777.4/44371.8	35-3
	181'+	May 8-11	42°40.22	-70°31.07	13751.2/44342.4	36-1
	181'+	May 8-11	42°41.82	-70°32.63	13752.6/44353.6	36-2
Massachusetts Bay	0-30'	May 7-9	42°26.35	-70°55.29	13978.9/44311.6	31-4
	0-30'	May 6-9	42°17.04	-70°51.76	14002.1/44252.1	31-5
	31'-60'	May 7-9	42°27.02	-70°54.64	13971.4/44314.0	32-4
	31'-60'	May 6-9	42°17.07	-70°48.40	13980.3/44246.1	32-5
	31'-60'	May 6-9	42°17.20	-70°51.31	13998.3/44252.1	32-6
	61'-90'	May 7-9	42°23.66	-70°53.98	13983.9/44294.1	33-5
	61'-90'	May 6-9	42°18.49	-70°48.29	13972.7/44254.1	33-6
	61'-90'	May 7-9	42°26.59	-70°53.31	13964.8/44309.3	33-7
	91'-120'	May 7-9	42°23.16	-70°49.00	13954.2/44282.1	34-5
	91'-120'	May 7-12	42°32.77	-70°43.79	13872.0/44326.0	34-6
	91'-120'	May 7-9	42°26.55	-70°50.38	13946.0/44303.6	34-7
	121'-180'	May 7-12	42°31.26	-70°42.20	13869.5/44314.5	35-5
	121'-180'	May 7-12	42°34.25	-70°36.36	13816.6/44319.8	35-6
	121'-180'	May 7-12	42°22.50	-70°42.20	13914.0/44265.8	35-7
	181'+	May 7-12	42°27.83	-70°38.58	13864.0/44288.8	36-4
	181'+	May 7-12	42°25.28	-70°39.15	13880.9/44275.9	36-5

Massachusetts Division of Marine Fisheries  
May 2020 Spring Trawl Survey Station Locations  
Cape Cod Bay and East of Cape Cod.

\* Loran coordinates taken from NOAA paper charts.  
Please refer to Lat/Long for best accuracy.

Area Description	Depth	Range of Dates	Latitude	Longitude	Loran W/Y	Sta. ID#
Western Cape Cod Bay	0-30'	May 4-7	41°50.52	-70°31.14	13996.0/44057.8	25-1
	0-30'	May 6-8	42°08.59	-70°41.15	13975.5/44183.4	25-2
	0-30'	May 4-7	41°45.71	-70°27.11	13993.2/44022.0	25-3
	31'-60'	May 4-7	41°51.17	-70°29.70	13984.6/44059.5	26-1
	31'-60'	May 4-7	41°48.15	-70°14.02	13904.5/44017.0	26-2
	31'-60'	May 4-7	41°47.88	-70°27.93	13988.5/44036.5	26-3
	61'-90'	May 4-7	41°47.98	-70°17.31	13924.8/44021.0	27-1
	61'-90'	May 4-8	42°03.23	-70°34.67	13960.0/44140.5	27-2
	61'-90'	May 4-7	41°49.28	-70°21.90	13946.2/44035.8	27-3
	91'-120'	May 4-7	41°51.98	-70°25.57	13956.0/44058.0	28-1
	91'-120'	May 4-7, 10-12	41°52.05	-70°21.82	13933.0/44052.5	28-2
	91'-120'	May 4-7, 10-12	41°53.43	-70°21.16	13922.6/44060.0	28-3
	121'-180'	May 4-8	42°01.69	-70°30.55	13941.5/44124.5	29-1
	121'-180'	May 4-8, 10-12	41°58.73	-70°25.07	13922.0/44097.8	29-2
	121'-180'	May 6-8, 10-12	42°06.76	-70°28.90	13908.0/44151.7	29-3
Eastern Cape Cod Bay	0-30'	May 4-7	41°49.12	-70°03.08	13836.0/44006.8	25-5
	0-30'	May 4-7	41°47.11	-70°07.72	13872.0/44001.3	25-6
	31'-60'	May 10-13	41°54.10	-70°07.89	13841.0/44043.5	26-5
	31'-60'	May 4-7	41°49.62	-70°08.05	13862.6/44017.0	26-6
	61'-90'	May 10-13	41°56.21	-70°09.34	13839.5/44058.0	27-5
	61'-90'	May 10-13	41°54.61	-70°09.54	13848.5/44049.0	27-6
	91'-120'	May 10-13	41°57.44	-70°15.31	13869.4/44074.5	28-5
	91'-120'	May 10-13	41°55.86	-70°13.56	13866.3/44062.5	28-6
	121'-180'	May 10-13	42°00.82	-70°13.48	13842.2/44091.5	29-5
	121'-180'	May 10-13	41°59.15	-70°14.23	13854.8/44083.0	29-6
	181'+	May 10-14	42°04.60	-70°22.86	13881.2/44128.8	30-1
	181'+	May 10-14	42°03.77	-70°18.78	13860.5/44117.2	30-2
	181'+	May 10-14	42°06.80	-70°20.12	13854.2/44137.0	30-3
East of Cape Cod	0-30'	May 12-15	41°54.42	-69°57.59	13779.4/44030.0	17-1
	0-30'	May 12-15	42°00.57	-70°01.14	13770.5/44071.0	17-2
	31'-60'	May 12-15	41°58.59	-69°58.91	13767.2/44056.2	18-1
	31'-60'	May 13-15	41°39.17	-69°54.86	13834.0/43934.5	18-2
	31'-60'	May 13-15	41°47.18	-69°54.69	13796.5/43982.8	18-3
	61'-90'	May 12-14	42°05.78	-70°09.39	13794.6/44114.0	19-1
	61'-90'	May 13-15	41°42.44	-69°52.65	13806.5/43951.5	19-2
	91'-120'	May 13-15	41°49.71	-69°53.61	13778.5/43996.4	20-1
	91'-120'	May 13-15	41°46.25	-69°52.33	13787.3/43974.0	20-2
	91'-120'	May 12-14	42°05.84	-70°06.76	13779.0/44110.2	20-3
	121'-180'	May 12-14	42°07.07	-70°13.95	13815.5/44128.5	21-1
	121'-180'	May 12-14	42°05.49	-70°13.18	13818.9/44118.2	21-2
	121'-180'	May 13-15	41°48.87	-69°52.22	13774.5/43989.5	21-3

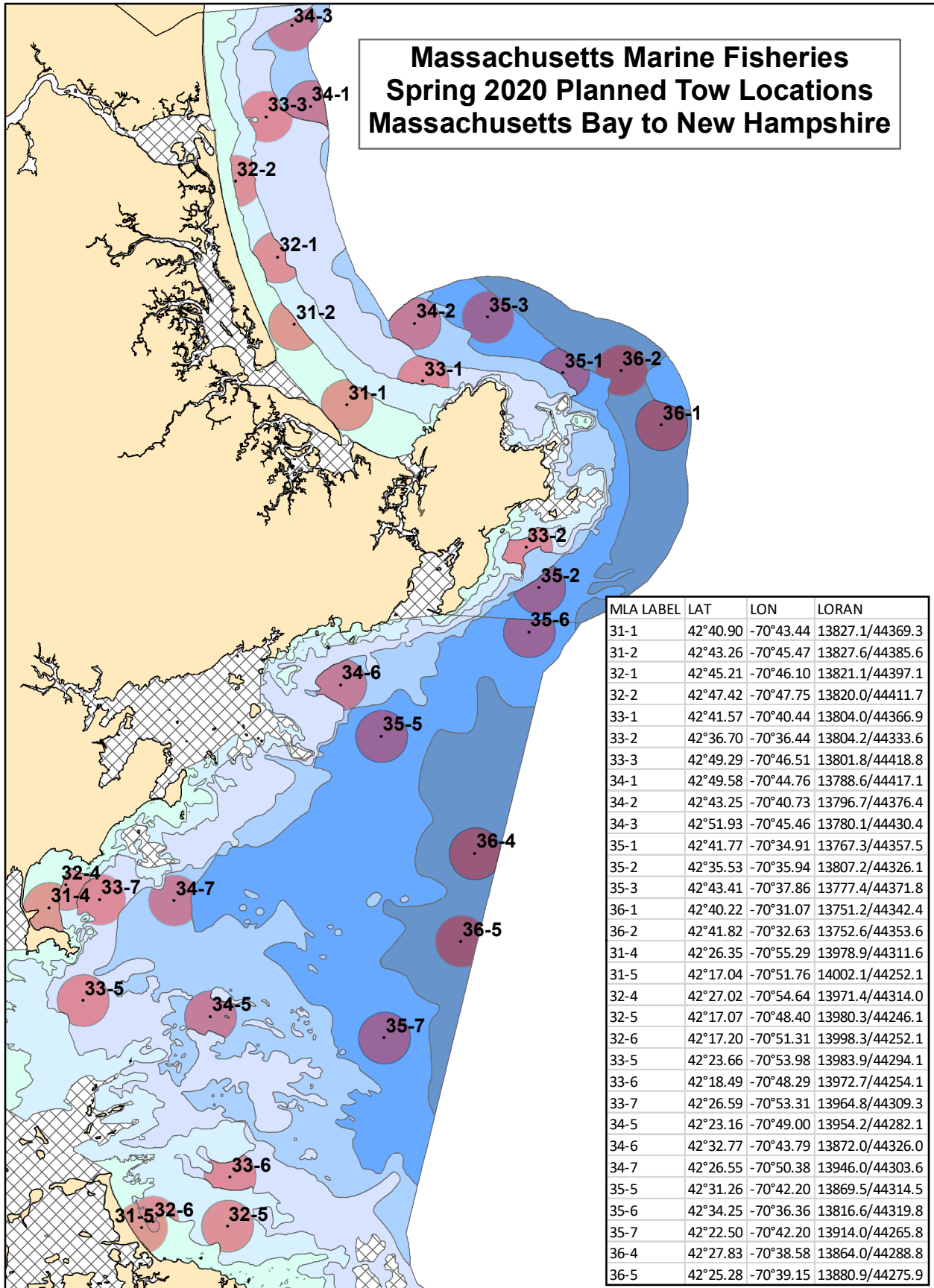
Massachusetts Division of Marine Fisheries  
May 2020 Spring Trawl Survey Station Locations  
South of Cape Cod

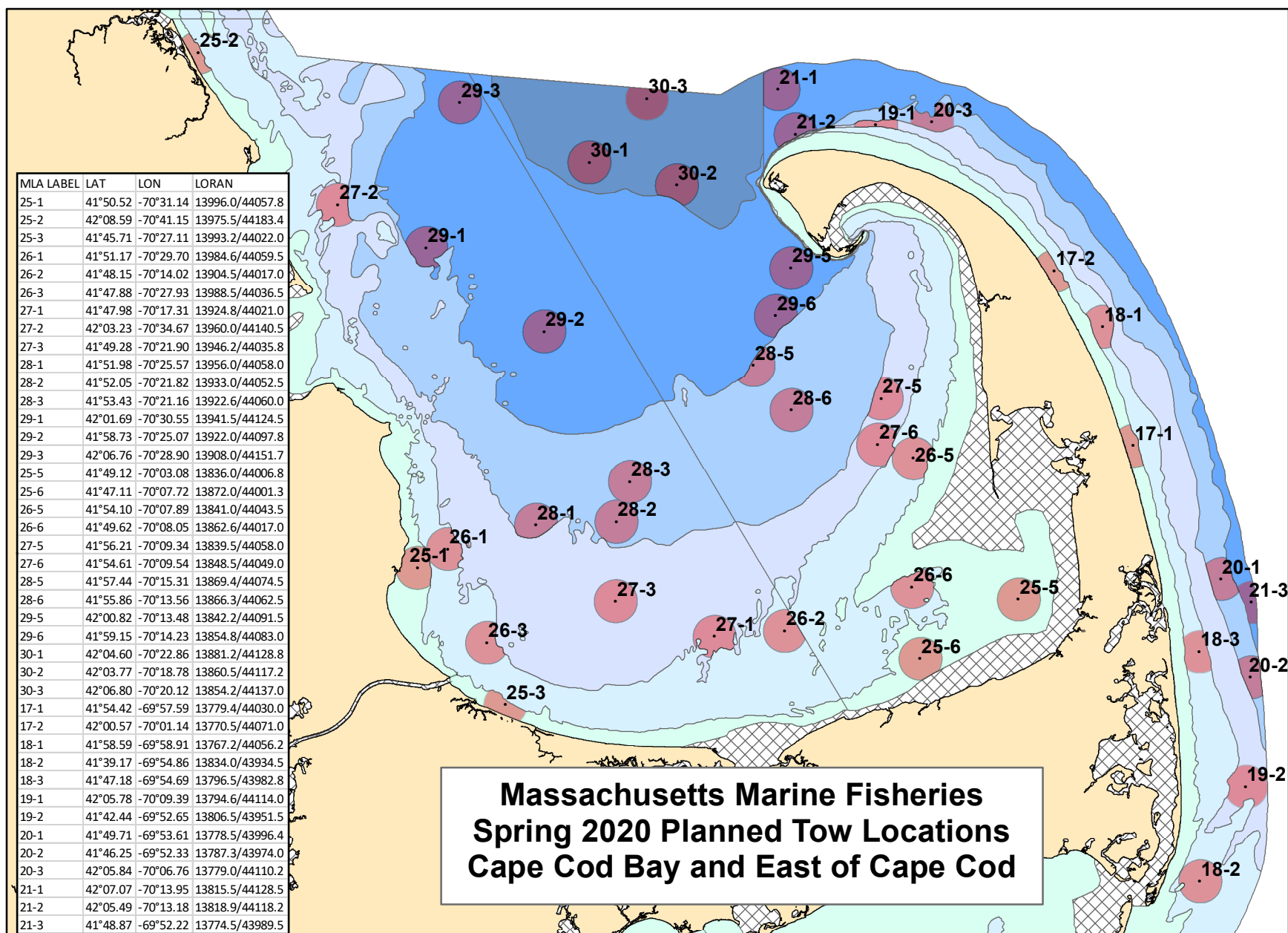
\* Loran coordinates taken from NOAA paper charts.  
Please refer to Lat/Long for best accuracy.

Area Description	Depth	Range of Dates	Latitude	Longitude	Loran W/Y	Sta. ID#
Buzzards Bay and Vineyard Sound	0-30'	May 14-25	41°37.91	-70°44.54	14132.0/43999.4	11-1
	0-30'	May 14-25	41°30.03	-71°03.98	14283.0/43977.7	11-2
	0-30'	May 14-25	41°36.11	-70°48.58	14164.0/43994.0	11-3
	31'-60'	May 14-25	41°35.57	-70°45.98	14150.3/43986.5	12-1
	31'-60'	May 14-25	41°27.62	-70°53.46	14227.9/43945.5	12-2
	31'-60'	May 14-25	41°35.26	-70°43.97	14139.6/43981.4	12-3
	31'-60'	May 14-25	41°25.87	-71°02.73	14291.3/43947.8	12-4
	31'-60'	May 14-25	41°33.94	-70°41.05	14127.3/43968.5	12-5
	61'-90'	May 14-25	41°28.99	-70°41.53	14150.4/43937.0	13-1
	61'-90'	May 14-25	41°26.40	-71°00.92	14278.2/43948.6	13-2
	61'-90'	May 14-25	41°22.48	-70°48.52	14218.0/43904.0	13-3
	91'-120'	May 14-25	41°21.20	-70°55.90	14267.5/43906.0	14-1
South of Martha's Vineyard	0-30'	May 14-25	41°19.17	-70°29.01	14115.4/43855.0	11-5
	0-30'	May 14-25	41°20.72	-70°36.32	14152.0/43875.2	11-6
	31'-60'	May 14-25	41°19.99	-70°41.17	14183.5/43876.7	12-7
	31'-60'	May 14-25	41°18.85	-70°31.79	14133.0/43856.7	12-8
	61'-90'	May 14-25	41°17.36	-70°44.19	14212.0/43863.4	13-5
	61'-90'	May 14-25	41°18.23	-70°32.86	14141.5/43853.8	13-6
	91'-120'	May 14-25	41°18.39	-70°52.09	14255.0/43881.2	14-3
Nantucket Sound	0-30'	May 14-25	41°35.99	-70°03.05	13895.0/43926.8	15-1
	0-30'	May 14-25	41°31.92	-70°21.70	14020.8/43927.5	15-2
	0-30'	May 14-25	41°35.19	-70°15.98	13973.5/43940.0	15-3
	0-30'	May 14-25	41°36.26	-70°13.44	13954.0/43942.8	15-4
	0-30'	May 14-25	41°31.94	-70°03.88	13917.5/43902.8	15-5
	0-30'	May 14-25	41°33.57	-70°26.25	14040.7/43944.2	15-6
	0-30'	May 14-25	41°32.02	-70°35.32	14101.0/43947.5	15-7
	0-30'	May 14-25	41°24.52	-70°28.67	14092.3/43889.5	15-8
	0-30'	May 14-25	41°34.84	-70°01.35	13890.2/43917.3	15-9
	0-30'	May 14-25	41°20.92	-70°15.57	14030.3/43848.7	15-10
	31'-60'	May 14-25	41°20.93	-70°03.0	13959.0/43832.7	16-1
	31'-60'	May 14-25	41°31.10	-70°15.24	13986.7/43913.2	16-2
	31'-60'	May 14-25	41°27.47	-70°26.84	14069.6/43906.3	16-3
	31'-60'	May 14-25	41°22.11	-70°08.38	13984.5/43847.0	16-4
	31'-60'	May 14-25	41°33.79	-70°05.68	13919.8/43916.8	16-5
	31'-60'	May 14-25	41°27.39	-70°17.65	14016.0/43893.0	16-6
	31'-60'	May 14-25	41°28.42	-70°09.12	13962.3/43888.0	16-7
	31'-60'	May 14-25	41°25.36	-70°14.30	14005.0/43875.8	16-8
	31'-60'	May 14-25	41°23.50	-70°06.68	13969.2/43853.7	16-9
	31'-60'	May 14-25	41°29.80	-70°29.84	14077.7/43925.5	16-10
	31'-60'	May 14-25	41°28.38	-70°06.43	13947.2/43884.0	16-11
South and East of Nantucket	0-30'	May 13-25	41°27.82	-70°00.45	13915.5/43872.6	17-4
	0-30'	May 14-25	41°14.07	-70°06.75	14007.7/43793.0	17-5
	0-30'	May 14-25	41°17.85	-70°17.44	14053.3/43831.0	17-6
	31'-60'	May 14-25	41°16.61	-70°20.09	14073.7/43826.5	18-5
	31'-60'	May 14-25	41°12.91	-70°04.63	14000.6/43783.2	18-6
	31'-60'	May 14-25	41°13.29	-70°10.85	14034.0/43793.2	18-7
	61'-90'	May 14-25	41°13.75	-70°13.84	14049.4/43800.0	19-4



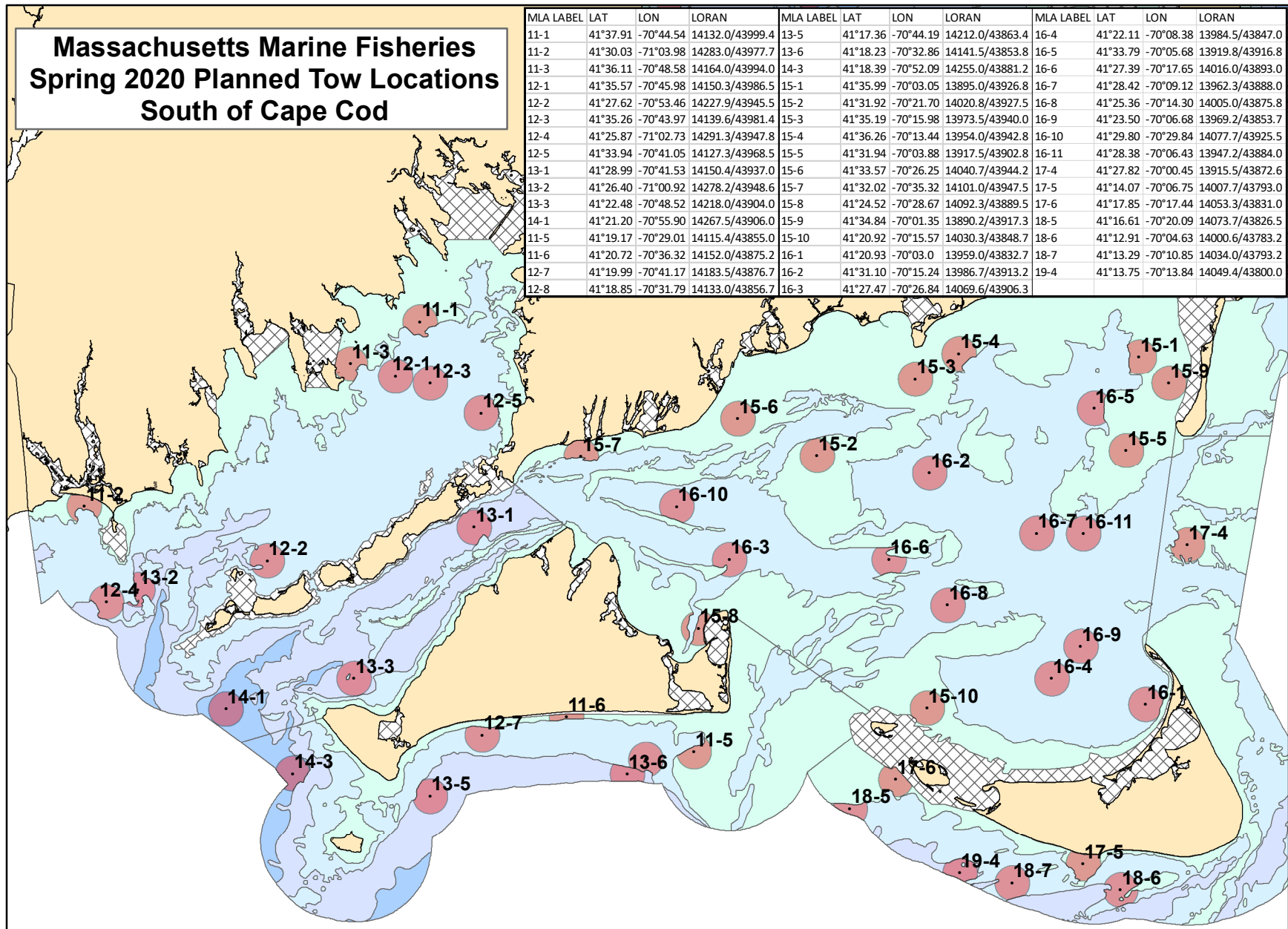
# **Massachusetts Marine Fisheries Spring 2020 Planned Tow Locations Massachusetts Bay to New Hampshire**





# **Massachusetts Marine Fisheries Spring 2020 Planned Tow Locations South of Cape Cod**

MLA LABEL	LAT	LOX	LORAN	MLA LABEL	LAT	LOX	LORAN	MLA LABEL	LAT	LOX	LORAN
11-1	41°37.91	-70°44.54	14132.0/43999.4	13-5	41°17.36	-70°44.19	14212.0/43863.4	16-4	41°22.11	-70°08.38	13984.5/43847.0
11-2	41°30.03	-71°03.98	14283.0/43977.7	13-6	41°18.23	-70°32.86	14141.5/43853.8	16-5	41°33.79	-70°05.68	13919.8/43916.8
11-3	41°36.11	-70°48.58	14164.0/43994.0	14-3	41°18.39	-70°52.09	14255.0/43881.2	16-6	41°27.39	-70°17.65	14016.0/43893.0
12-1	41°35.57	-70°45.98	14150.3/43986.5	15-1	41°35.99	-70°03.05	13895.0/43926.8	16-7	41°28.42	-70°09.12	13962.3/43888.0
12-2	41°27.62	-70°53.46	14227.9/43945.5	15-2	41°31.92	-70°21.70	14020.8/43927.5	16-8	41°25.36	-70°14.30	14005.0/43875.8
12-3	41°35.26	-70°43.97	14139.6/43981.4	15-3	41°35.19	-70°15.98	13973.5/43940.0	16-9	41°23.50	-70°06.68	13969.2/43853.7
12-4	41°25.87	-71°02.73	14291.3/43947.8	15-4	41°36.26	-70°13.44	13954.0/43942.8	16-10	41°29.80	-70°29.84	14077.7/43925.5
12-5	41°33.94	-70°41.05	14127.3/43968.5	15-5	41°31.94	-70°03.88	13917.5/43902.8	16-11	41°28.38	-70°06.43	13947.2/43884.0
13-1	41°28.99	-70°41.53	14150.4/43937.0	15-6	41°33.57	-70°26.25	14040.7/43944.2	17-4	41°27.82	-70°00.45	13915.5/43872.6
13-2	41°26.40	-71°00.92	14278.2/43948.6	15-7	41°32.02	-70°35.32	14101.0/43947.5	17-5	41°14.07	-70°06.75	14007.7/43793.0
13-3	41°22.48	-70°48.52	14218.0/43904.0	15-8	41°24.52	-70°28.67	14092.3/43889.5	17-6	41°17.85	-70°17.44	14053.3/43831.0
14-1	41°21.20	-70°55.90	14267.5/43906.0	15-9	41°34.84	-70°01.35	13890.2/43917.3	18-5	41°16.61	-70°20.09	14073.7/43826.5
11-5	41°19.17	-70°29.01	14115.4/43855.0	15-10	41°20.92	-70°15.57	14030.3/43848.7	18-6	41°12.91	-70°04.63	14000.6/43783.2
11-6	41°20.72	-70°36.32	14152.0/43875.2	16-1	41°20.93	-70°03.0	13959.0/43832.7	18-7	41°13.29	-70°10.85	14034.0/43793.2
12-7	41°19.99	-70°41.17	14183.5/43876.7	16-2	41°31.10	-70°15.24	13986.7/43913.2	19-4	41°13.75	-70°13.84	14049.4/43800.0
12-8	41°18.85	-70°31.79	14133.0/43856.7	16-3	41°27.47	-70°26.84	14069.6/43906.3				





**Daniel J. McKiernan**  
*Acting Director*

# *Commonwealth of Massachusetts*

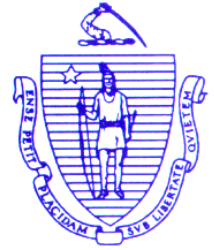
## **Division of Marine Fisheries**

251 Causeway Street, Suite 400

Boston, Massachusetts 02114

(617) 626-1520

fax (617) 626-1509



**Charles D. Baker**  
*Governor*

**Karyn E. Polito**

*Lieutenant Governor*

**Kathleen Theoharides**

*Secretary*

**Ronald S. Amidon**

*Commissioner*

**Mary-Lee King**

*Deputy Commissioner*

April 10, 2020

Dr. Jonathan Hare, NEFSC Science and Research Director  
NOAA/NMFS  
166 Water Street  
Wood's Hole, MA 02543

Dear Jon,

After much consideration, and in an abundance of caution, the Massachusetts Division of Marine Fisheries has made the difficult decision to cancel the Spring 2020 bottom trawl survey aboard the R/V Gloria Michelle due to the COVID-19 global pandemic. As you are aware, it would be nearly impossible to conduct normal survey operations on the Gloria Michelle while following CDC guidelines to minimize infection risk by avoiding groups of people and maintaining the 6 ft. social distancing minimum at all times while on the vessel. While we are hopeful that infection rates will greatly subside by May, it seems highly unlikely that overall risk to state and federal personnel will be sufficiently low to allow for the survey to be completed in the scheduled time period. Moreover, staff need considerable time to gear up for the survey to successfully execute all the activities involved.

Unfortunately, delaying the survey was considered, but this would be problematic because the survey is carefully timed to occur in early to mid-May and this timing has been maintained for over 40 years. The fish and shellfish results in such a delayed survey would be biased in comparison to the long-term time series.

Ultimately, we prefer not to risk the health of the crew, scientists and volunteers regardless of how important data from this survey are to fisheries management. We really appreciate the continued support and cooperation by both NEFSC and NOAA Corp staff and look forward to resuming survey operations this fall.

If you have any questions or concerns please feel free to contact either Bob Glenn ([robert.glenn@mass.gov](mailto:robert.glenn@mass.gov)) or Matt Camisa ([matt.camisa@mass.gov](mailto:matt.camisa@mass.gov)) on my staff.

Sincerely,

Daniel J. McKiernan, Acting Director

CC: NMFS - Nathan Keith, Ann Webber, Sarah Pike, Ben Vandine;  
DMF - Michael Armstrong, Kevin Creighton, Robert Glenn, Matt Camisa, Stephanie Cunningham

## CRUISE RESULTS

### R/V GLORIA MICHELLE

2020 Massachusetts Inshore Fall  
Bottom Trawl Survey  
Cruise No. 202092

### CRUISE PERIOD AND AREA

From September 8 through September 28, 2020 the Massachusetts Division of Marine Fisheries planned to conduct its 43rd 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; and 2) to collect biological samples. 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 would have been 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 survey 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 are relocated due to untowable bottom or concentrations of fixed gear. Abbreviated tows of 13-19 minute duration are accepted as valid and expanded to the 20 minute standard.

Standard bottom trawl survey techniques are used when processing the catch. The total weight and length-frequency of each species are recorded directly into Fisheries Scientific Computer System (FSCS) data tables. Collections of age and growth material, and biological observations are undertaken during the measuring operation. Specimens are

also saved to fulfill requests. Bottom temperatures are continuously recorded with an Onset Water Temp Pro v2 attached to the net's headrope.

## DISCUSSION

All survey preparations for the fall 2020 survey were completed on time including our letter to fixed gear fishermen, survey schedule, list of volunteers and modified vessel and vehicle logistics to mitigate for COVID-19 risks. Despite the best efforts of both DMF staff and NOAA Corps officers, once again the decision was made on August 10th, 2020 to cancel the fall survey. It would be nearly impossible to socially distance and adhere to current CDC guidelines onboard the Gloria Michelle while conducting normal survey operations. Please see the attached letter to fixed gear fishermen showing our planned stations, the COVID-19 mitigation measures document developed for the fall survey as well as the cancellation letter sent to Jon Hare, director of science and research at NEFSC.

For further information on this survey or others in the time series, contact Matthew Camisa at (508) 742-9743.





# The Commonwealth of Massachusetts

## Division of Marine Fisheries

251 Causeway Street, Suite 400, Boston, MA 02114

p: (617) 626-1520 | f: (617) 626-1509

[www.mass.gov/marinefisheries](http://www.mass.gov/marinefisheries)



CHARLES D. BAKER  
Governor

KARYN E. POLITO  
Lt. Governor

KATHLEEN A. THEOHARIDES  
Secretary

RONALD S. AMIDON  
Commissioner

DANIEL J. MCKIERNAN  
Director

July 30, 2020

Fixed Gear Fishermen of Massachusetts,

*Marine Fisheries* will be conducting its annual fall trawl survey throughout state coastal waters beginning September 8, 2020. Surveys have been conducted each May and September since 1978 to provide a consistent sampling of benthic fishes and mobile invertebrates. Survey data is used to monitor the condition of fish stocks, as well as to inform the environmental review process that minimizes construction impacts on fisheries resources. Maintaining access to the planned sampling sites is critical to the integrity of the survey.

Please review the attached table of station locations and the accompanying figures which plot the sample sites. Station location information can also be accessed on our website (<http://www.mass.gov/eea/agencies/dfg/dmf/programs-and-projects/resource-assessment-surveys-project.html>). **We kindly ask for your cooperation and insist that all fixed gear be kept clear of station locations (1.5 n. mi. diameter circle as shown in figure - center point reported in table) for the indicated periods until station completion.** While we will make every attempt to complete stations during the assigned period to minimize inconvenience to fixed gear fishermen, *Marine Fisheries* is prepared to attach restrictions to permit renewals (under 322 CMR 7.01 (7)), mandating that fixed gear not be set on designated trawl survey sites for the announced dates. It remains our hope that this action will be unnecessary.

Sign-up to receive text notifications of trawl survey progress on the *Marine Fisheries* website (<http://www.mass.gov/dmf/trawlsurvey>). A daily updated list of completed survey stations will be sent via text, and posted on the *Marine Fisheries* website and on Twitter (handle: @MassDMF). The Massachusetts Lobstermen's Association will also post survey information on their webpage (<http://www.lobstermen.com>), as well as on Facebook (username: lobstermensassoc) and Twitter (handle: @masslobstermens). In the event of a delay due to weather, the schedule will be resumed as soon as working conditions permit. Fishermen can contact the R/V *Gloria Michelle* on VHF channels 13 or 16 to determine the updated daily schedule.

Personnel aboard the NOAA R/V *Gloria Michelle*, a 65' western rigged steel stern trawler with a blue hull and white deckhouse, will carefully check each site for marked gear by cruising along a selected tow path before the net is set. Twenty-minute tows undertaken at 2.5 knots cover approximately 0.8 nautical miles. We encourage communicating helpful information to the R/V officers (via channels 13 or 16).

Your cooperation is greatly appreciated and is vital to the effective monitoring of marine resources in the Commonwealth. If you have any questions about the survey, please contact me ([matt.camisa@mass.gov](mailto:matt.camisa@mass.gov) , (508) 742-9743). *If you have any questions about the **Marine Fisheries** website, Facebook, or Twitter, please contact Story Reed ([story.reed@mass.gov](mailto:story.reed@mass.gov) , 617- 626-1524).*

Sincerely,

A handwritten signature in blue ink, reading "Matthew J. Camisa".

Matt Camisa  
Senior Marine Fisheries Biologist

Cc. Dan McKiernan Director



Massachusetts Division of Marine Fisheries  
September 2020 Fall Trawl Survey Station Locations  
Massachusetts Bay to New Hampshire

\* Loran coordinates taken from NOAA paper charts.  
Please refer to Lat/Long for best accuracy.

Area Description	Depth	Range of Dates	Latitude	Longitude	Loran	Sta. ID#
Cape Ann and North	0-30'	September 12-15	42°40.52	-70°41.82	13818.5/44364.3	31-1
	0-30'	September 12-15	42°41.77	-70°44.39	13828.3/44357.7	31-2
	31'-60'	September 12-15	42°41.26	-70°41.27	13811.0/44367.0	32-1
	31'-60'	September 12-15	42°42.64	-70°43.94	13821.1/44379.5	32-2
	61'-90'	September 12-15	42°46.18	-70°45.89	13814.5/44401.7	33-1
	61'-90'	September 12-15	42°43.18	-70°42.86	13811.1/44380.4	33-2
	61'-90'	September 12-15	42°41.69	-70°40.44	13803.4/44367.6	33-3
	91'-120'	September 12-15	42°49.58	-70°45.43	13793.0/44418.3	34-1
	91'-120'	September 12-15	42°39.54	-70°33.99	13773.6/44344.2	34-2
	91'-120'	September 12-15	42°42.84	-70°40.66	13798.6/44374.3	34-3
	121'-180'	September 12-15	42°36.87	-70°33.08	13781.7/44328.0	35-1
	121'-180'	September 12-15	42°41.42	-70°33.89	13762.9/44354.0	35-2
	121'-180'	September 12-15	42°34.99	-70°35.38	13806.5/44322.0	35-3
	181'+	September 12-15	42°39.67	-70°31.16	13754.8/44339.7	36-1
	181'+	September 12-15	42°37.63	-70°31.13	13765.0/44328.8	36-2
Massachusetts Bay	0-30'	September 10-13	42°16.84	-70°51.44	14000.8/44250.4	31-3
	0-30'	September 11-13	42°26.94	-70°55.16	13975.4/44315.3	31-4
	31'-60'	September 11-13	42°26.59	-70°54.61	13973.7/44312.3	32-3
	31'-60'	September 10-13	42°17.28	-70°51.53	13999.0/44253.1	32-4
	31'-60'	September 10-12	42°13.88	-70°44.22	13969.0/44219.9	32-5
	61'-90'	September 11-13	42°24.68	-70°53.80	13977.6/44299.5	33-4
	61'-90'	September 10-13	42°18.54	-70°48.32	13972.7/44254.7	33-5
	61'-90'	September 11-13	42°26.74	-70°53.01	13962.8/44309.9	33-6
	91'-120'	September 11-13	42°23.19	-70°49.17	13955.0/44282.8	34-4
	91'-120'	September 11-13	42°26.82	-70°50.17	13943.5/44304.9	34-5
	91'-120'	September 11-16	42°32.72	-70°43.97	13873.3/44325.6	34-6
	121'-180'	September 11-16	42°30.70	-70°40.69	13862.8/44308.7	35-4
	121'-180'	September 11-16	42°28.33	-70°43.90	13895.4/44301.5	35-5
	121'-180'	September 12-16	42°33.88	-70°37.13	13823.6/44319.3	35-6
	121'-180'	September 11-16	42°31.05	-70°43.07	13876.0/44315.0	35-7
	181'+	September 11-16	42°30.49	-70°40.44	13862.4/44307.0	36-3
	181'+	September 11-16	42°30.19	-70°37.01	13842.2/44299.0	36-4

Massachusetts Division of Marine Fisheries  
September 2020 Fall Trawl Survey Station Locations  
Cape Cod Bay and East of Cape Cod.

\* Loran coordinates taken from NOAA paper charts.  
Please refer to Lat/Long for best accuracy.

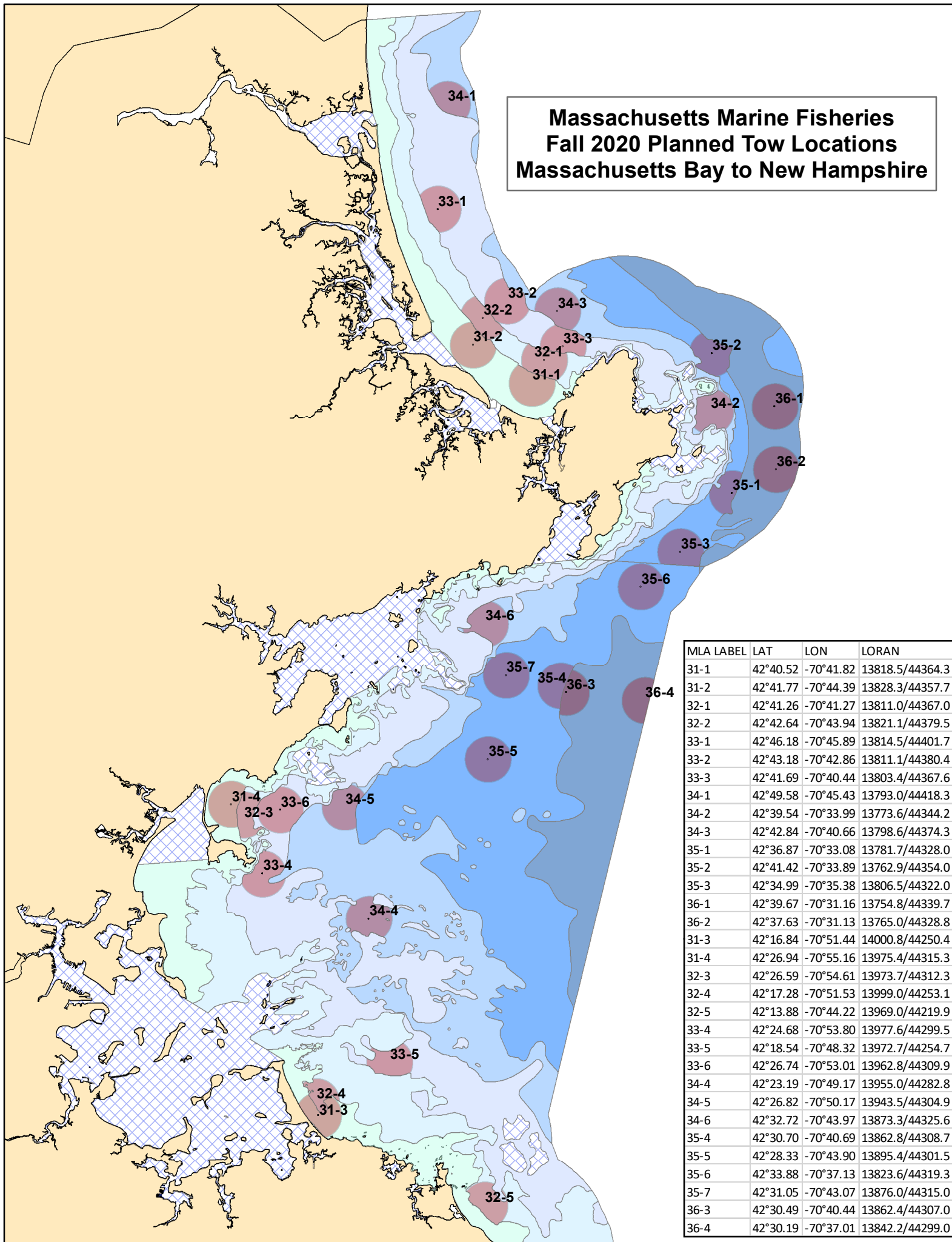
Area Description	Depth	Range of Dates	Latitude	Longitude	Loran	Sta. ID#
Western Cape Cod Bay	0-30'	September 10-12	42°08.17	-70°40.90	13976.0/44180.5	25-1
	0-30'	September 8-11	41°45.79	-70°27.41	13994.8/44023.2	25-2
	0-30'	September 8-11	41°57.93	-70°36.66	13996.5/44112.2	25-3
	31'-60'	September 8-11	41°46.37	-70°17.04	13930.5/44011.0	26-1
	31'-60'	September 8-11	41°50.63	-70°29.51	13986.0/44056.0	26-2
	31'-60'	September 8-11	41°48.65	-70°28.88	13990.9/44042.7	26-3
	31'-60'	September 10-12	42°08.76	-70°40.56	13970.9/44183.7	26-4
	61'-90'	September 8-11	41°48.54	-70°24.74	13966.5/44035.7	27-1
	61'-90'	September 8-12	42°02.38	-70°34.50	13963.0/44135.5	27-2
	61'-90'	September 10-12	42°06.34	-70°34.75	13946.1/44159.4	27-3
	61'-90'	September 8-11	41°48.29	-70°20.43	13941.9/44027.8	27-4
	91'-120'	September 8-11	41°59.71	-70°29.18	13942.4/44110.5	28-1
	91'-120'	September 8-11, 14-17	41°53.21	-70°22.37	13931.1/44060.3	28-2
	91'-120'	September 8-11	41°52.47	-70°25.45	13952.8/44060.8	28-3
	121'-180'	September 8-11	41°57.05	-70°23.82	13922.0/44086.0	29-1
	121'-180'	September 10-12	42°06.96	-70°29.98	13913.8/44154.8	29-2
	121'-180'	September 8-11	42°00.59	-70°27.72	13929.4/44113.5	29-3
Eastern Cape Cod Bay	0-30'	September 8-11	41°49.88	-70°09.61	13870.5/44021.0	25-4
	0-30'	September 8-11	41°49.24	-70°03.11	13835.4/44007.7	25-5
	31'-60'	September 15-18	41°55.03	-70°07.32	13833.4/44048.4	26-5
	31'-60'	September 8-11	41°48.07	-70°10.94	13887.0/44011.7	26-6
	31'-60'	September 15-18	41°53.07	-70°08.01	13846.6/44037.8	26-7
	61'-90'	September 15-18	41°52.65	-70°11.84	13871.0/44040.8	27-5
	61'-90'	September 15-18	41°60.00	-70°08.24	13815.1/44078.9	27-6
	61'-90'	September 15-18	41°55.24	-70°09.44	13844.8/44052.6	27-7
	91'-120'	September 15-18	41°56.91	-70°14.32	13865.9/44070.0	28-4
	91'-120'	September 15-18	41°55.71	-70°10.60	13849.5/44057.5	28-5
	91'-120'	September 15-18	41°54.93	-70°16.51	13888.4/44066.7	28-6
	121'-180'	September 14-17	41°59.97	-70°21.29	13893.1/44099.3	29-4
	121'-180'	September 14-17	41°58.37	-70°16.40	13871.3/44081.8	29-5
	121'-180'	September 14-17	41°58.56	-70°19.26	13887.7/44087.6	29-6
	181'+	September 14-18	42°04.91	-70°15.49	13835.5/44118.8	30-1
	181'+	September 14-18	42°06.13	-70°24.29	13882.9/44140.3	30-2
	181'+	September 14-18	42°06.49	-70°16.51	13834.0/44129.7	30-3
East of Cape Cod	0-30'	September 17-20	41°35.83	-69°56.60	13858.9/43916.6	17-1
	0-30'	September 16-20	41°47.27	-69°55.60	13801.0/43984.8	17-2
	31'-60'	September 15-18	42°05.21	-70°07.85	13788.5/44108.4	18-1
	31'-60'	September 17-20	41°39.80	-69°53.25	13821.8/43936.5	18-2
	31'-60'	September 16-20	41°47.47	-69°54.81	13795.9/43984.9	18-3
	61'-90'	September 16-20	41°57.58	-69°57.35	13762.8/44047.2	19-1
	61'-90'	September 17-20	41°43.43	-69°52.68	13801.9/43957.7	19-2
	91'-120'	September 17-20	41°46.70	-69°52.29	13785.0/43976.8	20-1
	91'-120'	September 15-18	42°05.86	-70°06.67	13778.4/44110.0	20-2
	91'-120'	September 16-20	41°49.79	-69°53.35	13776.8/43996.7	20-3
	121'-180'	September 15-18	42°07.07	-70°13.95	13815.9/44128.8	21-1
	121'-180'	September 16-20	41°49.39	-69°52.46	13773.5/43993.3	21-2
	121'-180'	September 15-18	42°07.52	-70°10.07	13790.2/44125.0	21-3

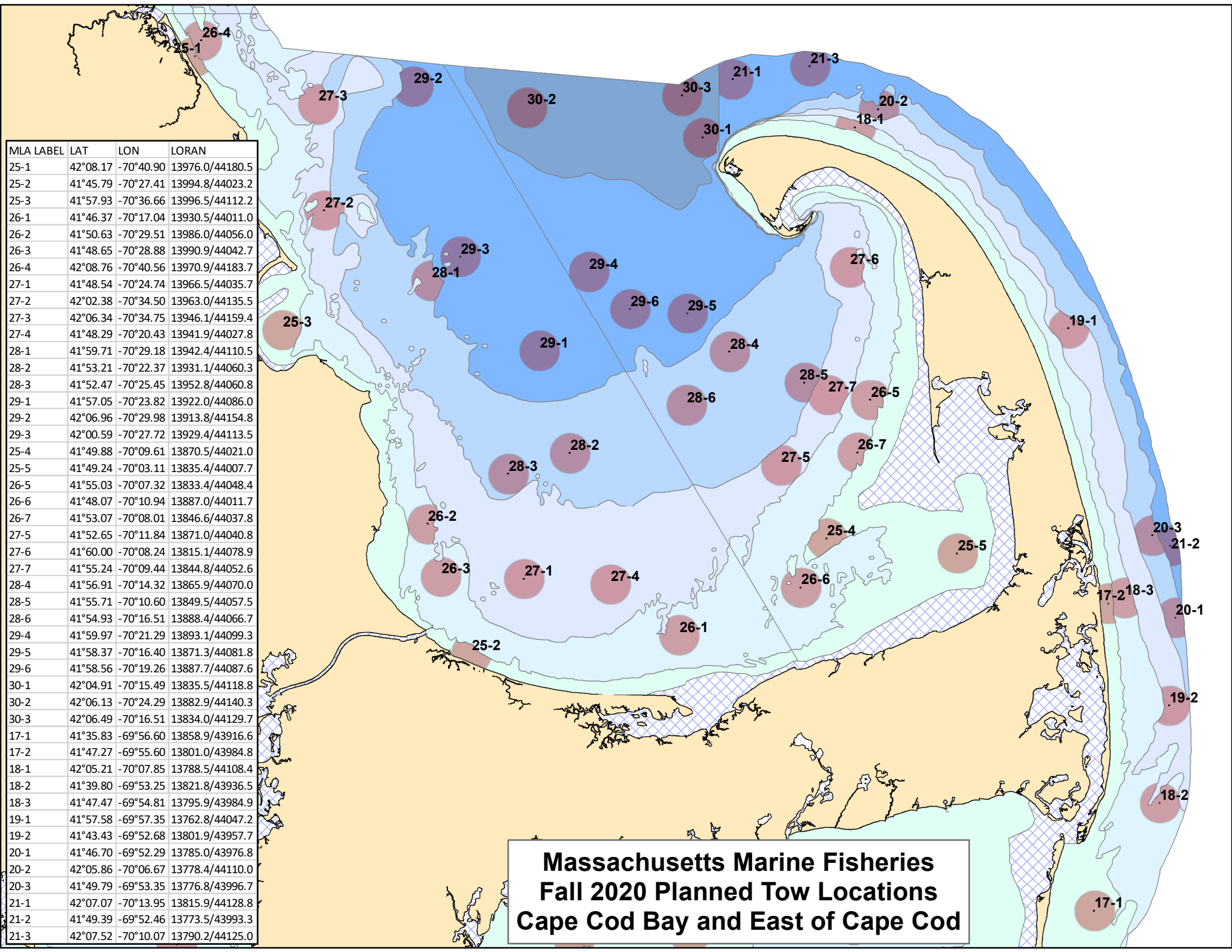
Massachusetts Division of Marine Fisheries  
September 2020 Fall Trawl Survey Station Locations  
South of Cape Cod

\* Loran coordinates taken from NOAA paper charts.  
Please refer to Lat/Long for best accuracy.

Area Description	Depth	Range of Dates	Latitude	Longitude	Loran	Sta. ID#
Buzzards Bay and Vineyard Sound	0-30'	September 19-29	41°35.96	-70°48.66	14165.1/44395.5	11-1
	0-30'	September 19-29	41°37.92	-70°44.54	14131.9/44399.7	11-2
	0-30'	September 19-29	41°29.96	-71°03.58	13280.9/44976.5	11-3
	31'-60'	September 19-29	41°31.19	-70°47.73	14178.8/43960.9	12-1
	31'-60'	September 19-29	41°35.04	-70°42.23	14130.0/43977.6	12-2
	31'-60'	September 19-29	41°36.95	-70°43.78	14131.2/43992.2	12-3
	31'-60'	September 19-29	41°26.15	-71°03.07	14292.3/43950.2	12-4
	31'-60'	September 19-29	41°28.42	-70°59.64	14262.5/43960.4	12-5
	61'-90'	September 19-29	41°27.49	-70°57.41	14252.8/43950.8	13-1
	61'-90'	September 19-29	41°22.89	-70°52.33	14239.0/43912.4	13-2
	61'-90'	September 19-29	41°24.39	-70°53.87	14243.0/43924.6	13-3
	91'-120'	September 19-29	41°20.95	-70°54.46	14259.1/43902.1	14-1
	91'-120'	September 19-29	41°24.01	-70°52.51	14236.1/43920.1	14-2
Southwest of Gay Head and South of Martha's Vineyard	0-30'	September 19-29	41°17.39	-70°24.39	14095.5/44837.3	11-4
	0-30'	September 19-29	41°20.63	-70°31.81	14126.0/43869.9	11-5
	31'-60'	September 19-29	41°22.76	-70°24.31	14073.3/43872.3	12-6
	31'-60'	September 19-29	41°20.05	-70°32.96	14135.0/43866.9	12-7
	61'-90'	September 19-29	41°18.69	-70°50.97	14247.0/43882.0	13-4
	61'-90'	September 19-29	41°15.58	-70°45.85	14228.5/43853.7	13-5
Nantucket Sound	91'-120'	September 19-29	41°19.06	-70°52.71	14256.2/43887.0	14-3
	0-30'	September 19-29	41°28.37	-70°15.16	13997.3/43886.0	15-1
	0-30'	September 19-29	41°20.84	-70°01.95	13953.3/43831.0	15-2
	0-30'	September 19-29	41°31.67	-70°20.62	14015.5/43924.8	15-3
	0-30'	September 19-29	41°35.22	-70°16.74	13977.7/43941.4	15-4
	0-30'	September 19-29	41°36.16	-70°12.90	13951.3/43941.8	15-5
	0-30'	September 19-29	41°35.47	-70°09.57	13934.8/43932.7	15-6
	0-30'	September 19-29	41°20.98	-70°16.30	14034.5/43850.0	15-7
	0-30'	September 19-29	41°32.37	-70°17.45	13994.0/43924.5	15-8
	0-30'	September 19-29	41°35.04	-70°22.48	14012.1/43948.5	15-9
	0-30'	September 19-29	41°28.87	-70°22.61	14038.8/43909.8	15-10
	31'-60'	September 19-29	41°22.12	-70°09.94	13993.5/43849.0	16-1
	31'-60'	September 19-29	41°28.67	-70°13.05	13984.0/43895.0	16-2
	31'-60'	September 19-29	41°25.75	-70°14.20	14003.0/43878.1	16-3
	31'-60'	September 19-29	41°33.60	-70°07.94	13934.6/43918.9	16-4
	31'-60'	September 19-29	41°29.43	-70°15.54	13995.1/43903.2	16-5
	31'-60'	September 19-29	41°32.81	-70°14.68	13976.0/43923.4	16-6
	31'-60'	September 19-29	41°28.45	-70°07.76	13954.5/43886.5	16-7
	31'-60'	September 19-29	41°24.64	-70°06.87	13965.0/43861.5	16-8
	31'-60'	September 19-29	41°29.39	-70°10.30	13965.0/43896.0	16-9
	31'-60'	September 19-29	41°33.32	-70°18.74	13997.5/43932.4	16-10
	31'-60'	September 19-29	41°26.48	-70°16.08	14011.0/43885.4	16-11
South and East of Nantucket	0-30'	September 19-29	41°14.12	-70°07.29	14010.4/43794.5	17-3
	0-30'	September 19-29	41°15.27	-70°11.00	14027.4/43806.5	17-4
	0-30'	September 17-29	41°22.42	-69°59.43	13932.8/43837.7	17-5
	31'-60'	September 17-29	41°22.54	-69°57.56	13921.7/43836.0	18-4
	31'-60'	September 19-29	41°13.37	-70°09.82	14027.8/43793.0	18-5
	31'-60'	September 19-29	41°13.06	-70°04.69	14000.1/43784.5	18-6
	61'-90'	September 19-29	41°12.42	-70°09.58	14030.2/43786.3	19-3

# **Massachusetts Marine Fisheries Fall 2020 Planned Tow Locations Massachusetts Bay to New Hampshire**



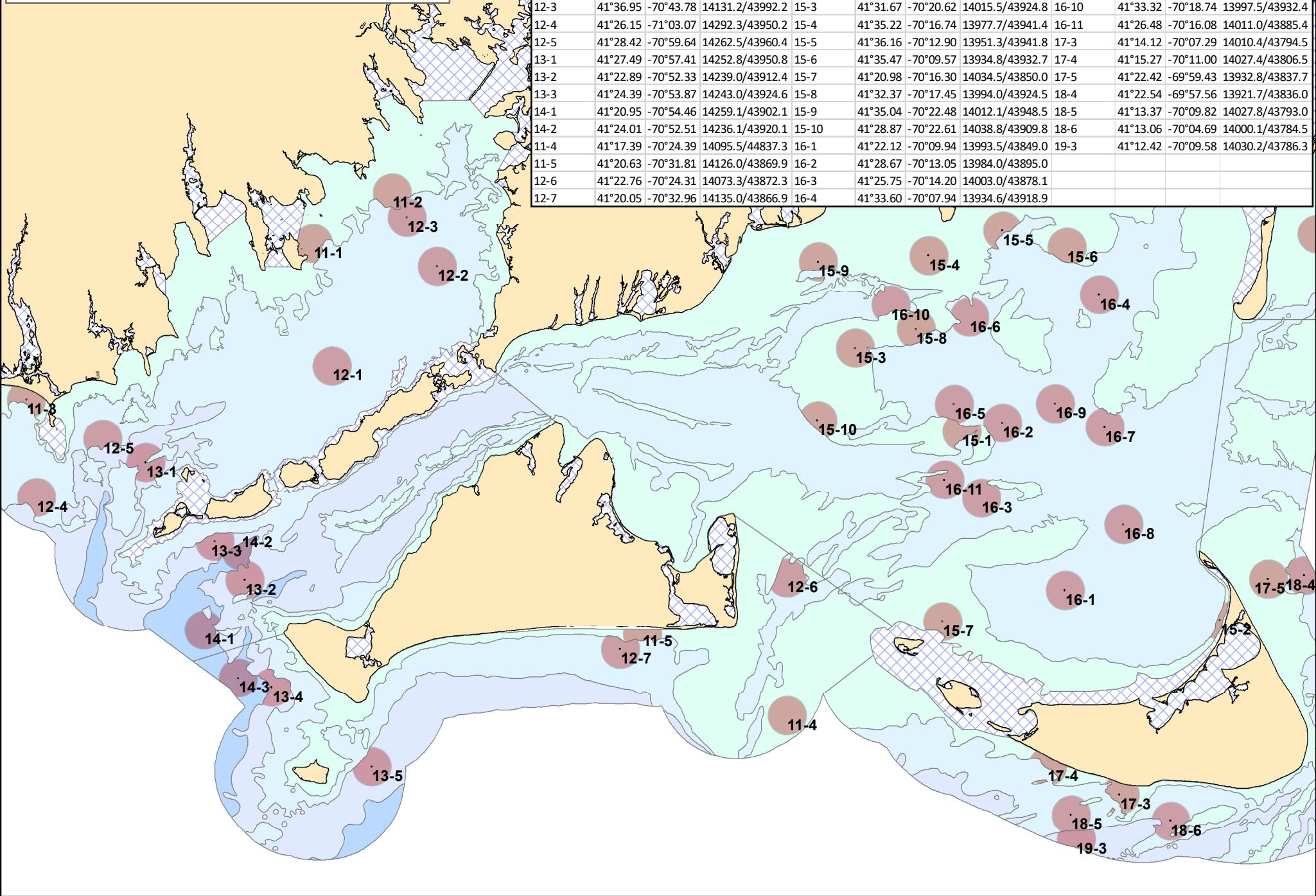


**Massachusetts Marine Fisheries  
Fall 2020 Planned Tow Locations  
Cape Cod Bay and East of Cape Cod**



Massachusetts Marine Fisheries  
Fall 2020 Planned Tow Locations  
South of Cape Cod

MLA LABEL	LAT	LOX	LORAN	MLA LABEL	LAT	LOX	LORAN	MLA LABEL	LAT	LOX	LORAN
11-1	41°35.96	-70°48.66	14165.1/44395.5	13-4	41°18.69	-70°50.97	14247.0/43882.0	16-5	41°29.43	-70°15.54	13995.1/43903.2
11-2	41°37.92	-70°44.54	14131.9/44399.7	13-5	41°15.58	-70°45.85	14228.5/43853.7	16-6	41°32.81	-70°14.68	13976.0/43923.4
11-3	41°29.96	-71°03.58	13280.9/44976.5	14-3	41°19.06	-70°52.71	14256.2/43887.0	16-7	41°28.45	-70°07.76	13954.5/43886.5
12-1	41°31.19	-70°47.73	14178.8/43960.9	15-1	41°28.37	-70°15.16	13997.3/43886.0	16-8	41°24.64	-70°06.87	13965.0/43861.5
12-2	41°35.04	-70°42.23	14130.0/43977.6	15-2	41°20.84	-70°01.95	13953.3/43831.0	16-9	41°29.39	-70°10.30	13965.0/43896.0
12-3	41°36.95	-70°43.78	14131.2/43992.2	15-3	41°31.67	-70°20.62	14015.5/43924.8	16-10	41°33.32	-70°18.74	13997.5/43932.4
12-4	41°26.15	-71°03.07	14292.3/43950.2	15-4	41°35.22	-70°16.74	13977.7/43941.4	16-11	41°26.48	-70°16.08	14011.0/43885.4
12-5	41°28.42	-70°59.64	14262.5/43960.4	15-5	41°36.16	-70°12.90	13951.3/43941.8	17-3	41°14.12	-70°07.29	14010.4/43794.5
13-1	41°27.49	-70°57.41	14252.8/43950.8	15-6	41°35.47	-70°09.57	13934.8/43932.7	17-4	41°15.27	-70°11.00	14027.4/43806.5
13-2	41°22.89	-70°52.33	14239.0/43912.4	15-7	41°20.98	-70°16.30	14034.5/43850.0	17-5	41°22.42	-69°59.43	13932.8/43837.7
13-3	41°24.39	-70°53.87	14243.0/43924.6	15-8	41°32.37	-70°17.45	13994.0/43924.5	18-4	41°22.54	-69°57.56	13921.7/43836.0
14-1	41°20.95	-70°54.46	14259.1/43902.1	15-9	41°35.04	-70°22.48	14012.1/43948.5	18-5	41°13.37	-70°09.82	14027.8/43793.0
14-2	41°24.01	-70°52.51	14236.1/43920.1	15-10	41°28.87	-70°22.61	14038.8/43909.8	18-6	41°13.06	-70°04.69	14000.1/43784.5
11-4	41°17.39	-70°24.39	14095.5/44837.3	16-1	41°22.12	-70°09.94	13993.5/43849.0	19-3	41°12.42	-70°09.58	14030.2/43786.3
11-5	41°20.63	-70°31.81	14126.0/43869.9	16-2	41°28.67	-70°13.05	13984.0/43895.0				
12-6	41°22.76	-70°24.31	14073.3/43872.3	16-3	41°25.75	-70°14.20	14003.0/43878.1				
12-7	41°20.05	-70°32.96	14135.0/43866.9	16-4	41°33.60	-70°07.94	13934.6/43918.9				



## **COVID19 Mitigation for going back to sea for NEFSC**

This draft policy was developed from discussions with UNOLS and other fleet managers, and information gathered from George Washington (GW) Marine Medical Access (MMA), GW MMA Coronavirus Guidance, and the NOAA Small Boat Program (SBP).

This document will highlight actions taken by crew of the R/V Gloria Michelle to mitigate the risk of infection by covid-19, and safety measures required by the scientific party specific to the DMF survey in September.

### **Roles and Responsibilities:**

In this mitigation plan, the captain of the R/V Gloria Michelle is responsible for the sanitation of the vessel, and compliance of safety measures of crew and scientists while on board the vessel. The Chief Scientist is responsible to screen the scientific party, checking frequently with the health condition of each member of the party, and to relay to the captain any screening documents or change in health status of the scientists prior to departure. While underway, the Chief Scientist is responsible for screening scientists daily and communicating frequently with the captain on any changes.

### **COVID Exposure Mitigation PPE**

- Each person must be provided and assigned cloth or surgical style mask or face covering. An inventory of PPE must be maintained to support projected replacement needs.
- The vessel will provide PPE for FTEs and contractors. Visiting scientists will provide their own PPE.
- In accordance with DOC and NOAA Policy, all personnel must wear face coverings aboard NOAA Small Boats when in cabin spaces with multiple occupants or on deck within six-foot proximity to other persons.
- Disposable gloves should be used for shared workstations, and immediately removed and disposed at completion of the task.
- Each person shall also be assigned individual Type III PFD's, foul weather gear, hard hats, safety glasses, gloves, and ear protection to eliminate common or shared use PPE. Individuals are responsible for cleaning and disinfecting assigned equipment pre and post mission.

### **Shelter-in-Place (SIP) Criteria:**

Shelter in place means to stay at home or your current place of residence leaving only for essential activities related to urgent or emergency medical issues, food, and outdoor exercise. Do not visit restaurants, bars, hair salons, barber shops, gyms or indoor religious services. Do not participate in public gatherings or social functions. Do not host events or entertain people in your home. If you are living with other people, then those people must also comply with this SIP criteria. Prepare food at home or use a restaurant's curbside or home delivery service. Maintain safe personal and environmental hygiene by frequently washing hands and disinfecting surfaces and objects that you touch often. Maintain 6 feet social distancing and wear a two layered cloth face mask over your nose and mouth when outside the place of residence. Wash your hands immediately when you return to your residence.

## **Precautions taken prior to getting underway:**

### **Crew:**

- Arrive at debarkation port and Shelter-in-Place for 7 days prior to departure. If crew lives within driving distance of the port, they may SIP at home.
- Take a diagnostic RT-PCR test 3 days prior to cruise departure. Remain SIP until day of departure. Notify Captain of results, positive or negative as soon as received.
- Crews must self-administer a daily temperature check to identify fever conditions
- Report daily to the captain with results of self-screening questionnaire and self-test of temperature.
- 48-hours prior to departure, crew shall completely disinfect all indoor surfaces, including but not limited to the deck, bulkheads, horizontal surfaces, leaning posts, benches, tables, chairs, handles, doors, stateroom racks, oven, sinks, faucets, and the head. Cleaning shall be done with bleach ( $\frac{1}{3}$  cup of bleach to one gallon of water) and alcohol products with over 70% concentration. Crew shall wear proper PPE, including face masks, and gloves when cleaning. Outdoor surfaces shall be cleaned with soap and water (Simple Green). Follow CDC guidelines for cleaning workplaces.
- If the crew needs time to move into staterooms, stage time on board so as to minimize contact.

### **Scientific Party:**

- Arrive at debarkation port and Shelter-in-Place for 7 days prior to departure. If scientists live within 4 hour driving distance of the port, they may SIP at home.
- Take diagnostic RT-PCR test 3 days prior to cruise departure. Remain SIP until day of departure. Notify Chief Scientist of results, positive or negative as soon as received.
- Report daily to the Chief Scientist with results of self-screening questionnaire and self-test of temperature. Chief Scientist must report to captain daily with these responses.
- Scientific Party is responsible for wearing proper PPE in transportation to the vessel. Chief Scientist is responsible for providing PPE.
- When traveling to the vessel, take separate vehicles to minimize potential exposure to each other.

### **Shelter-in-Place requirements:**

- All persons sailing on the Gloria Michelle will be required to do a seven (7) day Shelter in Place (SIP) prior to coming aboard.
- The SIP must be done local to the location of the ship embarkation/ departure. The SIP will be done in residence if the person is local to the location of the ship embarkation/ departure (within 3 hour drive of the vessel) or in a hotel if they are not.
- During SIP movement is restricted to essential activities with PPE.

### **Staging:**

- Up to 3 members of the scientific party may arrive on the vessel to pre-stage. Scientists who are staging the vessel prior to departure shall undergo diagnostic RT-PCR testing 3 days before staging begins and again 3 days prior to the cruise departure. So far as



possible, stage the vessel immediately prior to sailing in order to minimize exposure risks between stage and sailing.

- Plan your preparations in order to minimize the amount of time spent inside the vessel. Detail your plan with the Captain 24 hours prior to arrival, making note of those times when you will need to gain access to the fish hold or the pilothouse.
- Scientists must maintain social distancing protocol while on the back deck and wear PPE while indoors.
- Scientists are responsible for disinfecting all surfaces that they touched while inside the vessel using Clorox wipes or a 70% alcohol solution, including but not limited to sorting tables, benches, keyboards, laptops, desks, chairs, and stairwell handles.
- If the scientific party needs an officer to run the hydraulics, please plan this with the captain at least 24hrs prior to arrival.

### **Staffing:**

Staffing cruises will be at the minimum level required to achieve cruise priority objectives. Sampling and objectives may be reduced at the discretion of the captain. Volunteers and outside agency contractors will not be permitted to sail without strong justification, and prior approval from the captain.

### **Travel and In-ports:**

The R/V Gloria Michelle will only onload/offload scientific parties from Woods Hole, MA.

### **Interaction at public facilities**

When tied up alongside, the following measures must be taken by all crew and scientists:

- Maintain social distancing and comply with local and state requirements.
- All crew and scientists must avoid walking near gatherings of people and public spaces. So far as possible, restrict movement to dock and vessel.
- Wear nitrile gloves while refueling and remove gloves when completed.
- Be cognizant of what you touch and incidental exposure to the public. Wash hands or use sanitizer wipes after each encounter.
- Prohibit the public from vessel access.
- Limit interaction with outside support personnel (i.e. mechanics, service technicians, etc.) and ensure that they comply with distancing and PPE provisions of this document.
- At the discretion of the captain, the crew and scientists may be required to remain on the vessel when tied up alongside for the night.

### **Pre-Mission Safety Brief:**

- All individuals getting underway must participate in the pre-mission safety brief prior to each leg.
- Maintain social distance between crew members during the meeting.
- The safety brief will include the basic safety brief required by all hands, and include the covid-19 mitigation plan. This brief will run through the covid-19 risk assessment attached, and all parties must reach a consensus about the risk involved and mitigation measures prior to departure.
- Embarked personnel should be encouraged to communicate health status, potential COVID exposures and confirm their willingness to participate. All personnel are

empowered to excuse themselves from participation based upon their assessment of the implemented mitigations and personal health.

- Confirm that all engaged persons have been cleared for participation by local unit policies and supervisors.
- Confirm that all engaged persons have self-administered a temperature check. Persons with an elevated temperature must be restricted from the mission.
- Elements of the established mission risk assessment (GAR) must be expanded to include implications of COVID 19 exposure mitigations
- Include specific instructions on equipment handling, maintaining social distancing, PPE, and sanitation protocols under COVID exposure mitigation plans.
- Identify the impacts and challenges presented by COVID exposure mitigations such as impact on communication, workload, and crew fatigue.
- Resolve any raised individual concerns or noted plan deficiencies.

### **Precautions Taken While Underway:**

#### **Crew:**

- At the start of the day, all crew must conduct a self-assessment and temperature check. If the crewmember has symptoms or a fever (temperature over 100.4° Fahrenheit or 38° Celsius), that crewmember will be quarantined to the main deck stateroom. The vessel will immediately cease operations and return to the home port of the potentially infected individual, unless other arrangements are more suitable, and mutually agreed upon by the vessel captain and chief scientist.
- The OIC, JOIC, and deckboss are required to work closely together in the pilothouse and on the back deck. Therefore, whenever two or more individuals are in the pilothouse, they must keep one or both doors open whenever prudent and wear a facemask when within 6ft of each other. Common instruments such as the helm, radar, and electronic chart systems must be wiped down at the end of the workday.
- Crew must maintain minimum duration in shared common spaces.
- In the event of a mechanical failure, hanged net, or crossed doors, the crew will wear mask and gloves within 6ft of each other.
- Crew will be issued individual PFDs, hardhats, and PPE for the duration of the cruise, and is responsible for care and use. These PPE are to be cleaned after every workday.
- Crew are required to wear face masks whenever there is another person in the same space while within the house.
- One radio will be issued to each individual crewmember, thereby avoiding shared communications equipment. These radios will be cleaned prior to their return to the chargers at the end of every day.

#### **Scientists:**

- At the start of the day, all scientists must conduct a self-assessment and temperature check.
- Scientists will be issued individual PFDs, hardhats, and PPE for the duration of the cruise, and is responsible for care and use. These PPE are to be cleaned after every workday.

- The Chief Scientist will be issued a radio, which will be cleaned prior to its return to the charger at the end of every day.
- Scientists are required to wear face masks and gloves at all times while within the house.
- One scientist must be assigned to a workspace at a time on the back deck.
- When sorting and weighing the catch, scientists are required to wear mask and gloves on the back deck.
- Only one scientist may be allowed to operate the server in the Fish Hold.
- All scientists must wipe down their workspaces at the end of each tow.
- Scientists are not permitted forward of the head in the house unless given permission by the captain.
- If possible, meals will be eaten outdoors and 6 feet away from others.

#### **Pilothouse:**

- Only the OIC and JOIC are permitted on the pilothouse, unless otherwise permitted by the OIC.
- Mask and gloves are required in the pilothouse.
- A scientific point of contact is permitted to be on board while conducting tows.
  - After the tow, the scientist must wipe down the workspace.
- At the end of every day, all surfaces must be disinfected and wiped down.

#### **Galley:**

- No gatherings are permitted in the galley. The galley is designated for food preparation only unless otherwise permitted by the captain.
- Only one individual is permitted to be in the galley for food preparation. Food prep must be completed with face mask and gloves, and the individual will plate food for each person. All surfaces must be wiped down and disinfected before and after food preparation.
- The vessel will provide breakfast lunch and dinner for the crew and scientists.
- Common surfaces must be wiped down and disinfected at the end of every day.

#### **Head:**

- All individuals are permitted to use the head.
- Wipe down all surfaces after use, and wash hands for 20 seconds after use.
- Common surfaces must be wiped down and disinfected at the end of every day.

#### **Fish Hold:**

- The number of people permitted in the Fish Hold at one time is 3. Ensure that each person is 6 feet away from others, and that face masks are in use.
- Common surfaces must be wiped down and disinfected at the end of every day.

#### **Staterooms:**

- Only two persons are allowed in the 4-man stateroom, and one in the 2-man stateroom.
- Four crew members are permitted in the main deck stateroom.
- Only one person is permitted in each stateroom at a time. At night, individuals in their rack must close their curtains as this will act as their “facemask” and limit droplet spread.

**Engine Room:**

- Up to two people may be permitted in the Engine Room at a time. No scientists are permitted in the engine room unless given permission by the captain.
- Common surfaces must be wiped down at the end of every day.

**In the event of symptomatic persons:**

- If someone starts to exhibit symptoms or a fever (temperature over 100.4° Fahrenheit or 38° Celsius), that person will be quarantined to the 2-man stateroom. The vessel will immediately cease operations and return to Woods Hole unless other arrangements are more suitable, and mutually agreed upon by the vessel captain and chief scientist.
- The symptomatic patient will go get tested at Cape Cod Hospital in Falmouth, MA. All individuals will leave the vessel and quarantine until the results of the test come back.
- If the symptomatic patient tests positive for covid-19, all persons will be notified and required to quarantine at their place of residence for 14 days. The remainder of the survey will be cancelled.
- If the symptomatic patient tests negative, the survey may resume at the start of the next leg.

**Emergency procedures:**

- Non-life-threatening injury:
  - Person requiring care should make every effort to provide self-treatment.
  - If aid is needed, both the injured person and the person rendering aid should don PPE to include: gloves, face shield, and face mask.
  - Personnel not involved in the medical treatment should maintain the appropriate 6 feet of physical distancing.
- Life threatening injury:
  - Every effort should be made to minimize the number of personnel treating the injured person.
  - Emergency Medical Services (EMS) should be notified immediately.
  - The person(s) rendering aid should don all appropriate PPE to include: gloves, face shield, and face mask.
  - A bag valve mask (BVM) should be used as the primary breathing method, if available
  - The use of a pocket mask is the secondary method for resuscitation.

**Closing Comments:**

The guidance put forward in this document is designed to facilitate the individual risk assessments that are required for each individual survey. This may be amended or modified by the captain based on the current risk of covid exposure in the area of operations, and state and local guidance.

# Revised Survey Schedule Option B

Date	Location
Monday	8/24/2020 Staging
Tuesday	8/25/2020 Staging
Wednesday	8/26/2020 Staging
Thursday	8/27/2020 Staging
Friday	8/28/2020 Staging
Monday	8/31/2020 Staging
Tuesday	9/1/2020 Staging
Wednesday	9/2/2020 Gear Trials WH-WH
Thursday	9/3/2020 Gear Trials WH-WH
Friday	9/4/2020 Gear Trials WH-WH
Monday	9/7/2020 PM Transit to Canal
Tuesday	9/8/2020 Sandwich to Hull
Wednesday	9/9/2020 Hull to Gloucester
Thursday	9/10/2020 Gloucester to Gloucester
Friday	9/11/2020 Gloucester to Gloucester
Saturday	9/12/2020 Gloucester to WH
Sunday	9/13/2020 WH Pier
Monday	9/14/2020 WH to Sandwich
Tuesday	9/15/2020 Sandwich to Sandwich
Wednesday	9/16/2020 Sandwich to P-Town
Thursday	9/17/2020 P-town to anchorage
Friday	9/18/2020 anchorage to WH
Saturday	9/19/2020 WH Pier
Sunday	9/20/2020 WH to ACK
Monday	9/21/2020 ACK to WH
Tuesday	9/22/2020 WH to Anchorage
Wednesday	9/23/2020 anchorage to WH
Thursday	9/24/2020 WH to WH
Friday	9/25/2020 WH pier
Saturday	9/26/2020 WH to WH
Sunday	9/27/2020 WH to WH
Monday	9/28/2020 WH to WH



# The Commonwealth of Massachusetts

## Division of Marine Fisheries

251 Causeway Street, Suite 400, Boston, MA 02114

p: (617) 626-1520 | f: (617) 626-1509

[www.mass.gov/marinefisheries](http://www.mass.gov/marinefisheries)



CHARLES D. BAKER  
Governor

KARYN E. POLITO  
Lt. Governor

KATHLEEN A. THEOHARIDES  
Secretary

RONALD S. AMIDON  
Commissioner

DANIEL J. MCKIERNAN  
Director

Dr. Jonathan Hare, NEFSC Science and Research Director  
NOAA/NMFS  
166 Water Street  
Wood's Hole, MA 02543

Dear Jon,

After much consideration, and in an abundance of caution, the Massachusetts Division of Marine Fisheries has made the difficult decision to cancel the Fall 2020 bottom trawl survey aboard the R/V Gloria Michelle due to the COVID-19 global pandemic. Despite all of the efforts and collaboration between NOAA Corps officers and Marine Fisheries staff to develop a detailed COVID-19 mitigation plan, conducting normal survey operations on the Gloria Michelle while following CDC guidelines to minimize infection risk would be extremely difficult at best. While we are hopeful that infection rates in Massachusetts will not significantly increase in September, it seems highly unlikely that overall risk to state and federal personnel will be sufficiently low to allow for the survey to be completed as scheduled.

Unfortunately, delaying the survey would be problematic because the fall survey is carefully timed to occur entirely in September and this timing has been maintained for over 40 years. Results from a delayed survey would be biased in comparison to the long-term time series.

Ultimately, we prefer not to risk the health of the crew, scientists and volunteers regardless of how important data from this survey are to fisheries management. We really appreciate the continued support and cooperation by both NEFSC and NOAA Corp staff and look forward to resuming survey operations in May 2021.

If you have any questions or concerns please feel free to contact either Bob Glenn ([robert.glenn@mass.gov](mailto:robert.glenn@mass.gov)) or Matt Camisa ([matt.camisa@mass.gov](mailto:matt.camisa@mass.gov)) on my staff.

Sincerely,

Daniel J. McKiernan, Director

CC: NMFS - Nathan Keith, Ann Webber, Sarah Pike, Ben Vandine;  
DMF - Michael Armstrong, Kevin Creighton, Robert Glenn, Matt Camisa, Stephanie Cunningham

**SURVEY REPORT**  
**2020 Nantucket Sound Estuarine Winter Flounder**  
**Young of the Year (YOY)**  
**Seine Survey**

**SURVEY PERIOD AND AREA**

From June 15 – July 2, 2020 the Massachusetts Division of Marine Fisheries (MDMF) conducted its 45<sup>th</sup> 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).

**OBJECTIVES**

Survey objectives were 1) to provide a winter flounder YOY abundance index for the Southern New England Stock; and 2) count all commercially and recreationally important finfish and invertebrate species encountered. All species not counted are noted for presence.

**METHODS**

Seining of intertidal and shallow subtidal zones occurs from two hours before until 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 depths between 0.9 to 1.2 meters. Winter flounder density (# YOY per square meter) was determined by aggregating catch from three replicate hauls at each station. Consistent area swept was maintained using a fixed-length spreader rope. Haul distance 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<sup>TM</sup>) and water depth at the beginning of the seine haul was measured with a weighted and marked line. When inclement weather prevents use of the rangefinder, distance over ground was measured by pacing. Statistical analysis of seine data employed stratification techniques; each estuary was considered a stratum and each station's three replicate hauls were treated as one individual sample. Stratified mean density and confidence limits were derived from standard and modified formulae for mean and variance. Four MADMf employees participated in the survey as part of the scientific party (Table 1).

**RESULTS**

141 seine hauls were conducted at 49 stations over 9 sampling days. The station at High Bank in Bass River was abandoned permanently due to construction of a large private dock over the remaining beach where the seine could be deployed. A replacement was employed in the immediate vicinity that appears stable for long term use (decadal scale) at Salt Box Association Beach. At Stage Harbor, Sears Point will be re-evaluated next year for replacement, as *Spartina*

and coastal armoring have made the long-term availability of this site questionable. One haul was dropped at each of four stations due to shoreline vegetation, shoreline alterations or obstructions; Follins Pond, Heirs Landing, Mill Pond and Vineyard Avenue. Thirty-eight species were encountered in 2020 (Table 2). The 2020 pooled (all estuaries combined) winter flounder YOY index is (0.238 YOY / m<sup>2</sup>), marking another year in the last decade that produced above median recruitment (Figure 2, Table 3) and the Age 1+ winter flounder index remained below the timeseries median for the 11<sup>th</sup> consecutive year (Figure 3). All estuary specific indices for YOY winter flounder increased in 2020 (Figure 4). The YOY Fluke index increased and is the third highest observation in the timeseries (Figure 5). The blue crab index increased and is the ninth highest timeseries observation (Figure 6). All bottom temperature monitors were collected and successfully downloaded (Figure 7). For further information on this survey or additional data, please contact Vincent M. Manfredi (508)-742-9732.

Table 1. 2020 Seine Survey Staffing List

Name	Affiliation	Num. Days
Matthew Camisa	MDMF	1
Dr. John Logan	MDMF	2
Vincent Manfredi	MDMF	9
Mark Szymanski	MDMF	6



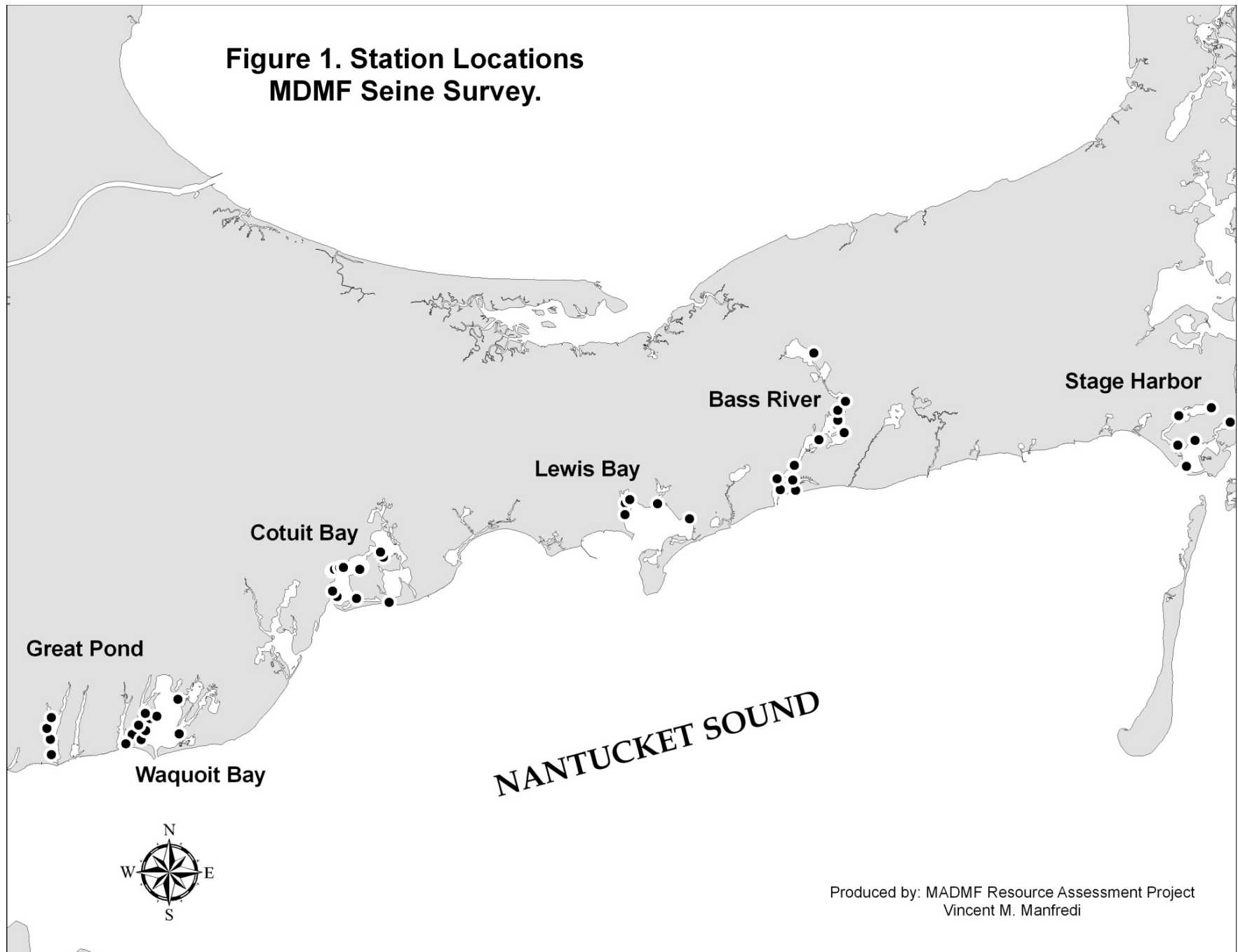
Table 2. Catch Observations of All Recorded Species During the 2020 Seine Survey  
(for species marked present, counts are not taken but presence is noted at all hauls)

Common Name	Taxonomic Name	Total Number	% Occurrence
YOY Winter Flounder	<i>Pseudopleuronectes americanus</i>	1723	90.1%
Atlantic Silverside	<i>Menidia menidia</i>	Present	87.9%
Mud Snail	<i>Nassarius obsoletus</i>	Present	81.6%
Sand Shrimp	<i>Crangon septemspinosa</i>	Present	71.6%
Blue Crab	<i>Callinectes sapidus</i>	405	60.3%
Mummichog	<i>Fundulus heteroclitus</i>	Present	50.4%
Grass Shrimp	<i>Paelmonetes pugio</i>	Present	36.9%
Striped Killifish	<i>Fundulus majalis</i>	Present	31.9%
Northern Pipefish	<i>Sygnathus fuscus</i>	Present	24.1%
YOY Summer Flounder	<i>Paralichthys dentatus</i>	52	17.7%
Alewife / Blueback Herring	<i>Alosa spp.</i>	287	14.2%
Fourspine Stickleback	<i>Apeltes quadracus</i>	Present	13.5%
Northern Kingfish	<i>Menticirrhitis saxatilis</i>	120	12.1%
Northern Puffer	<i>Sphoeroides maculatus</i>	241	12.1%
Rainwater Killifish	<i>Lucania parva</i>	459	12.1%
Green Crab	<i>Carcinus maenus</i>	21	11.3%
Atlantic Needlefish	<i>Strongylura marina</i>	63	9.9%
Spider Crab Uncl.	<i>Majidae</i>	16	7.1%
Threespine Stickleback	<i>Gasterosteus aculeatus</i>	Present	4.3%
White Mullet	<i>Mugil curema</i>	13	4.3%
Atlantic Herring	<i>Clupea harengus</i>	63	3.5%
Grubby	<i>Myoxocephalus aeneus</i>	6	2.8%
Northern Sand Lance	<i>Ammodytes dubius</i>	20	2.8%
Lady Crab	<i>Ovalipes ocellatus</i>	9	2.8%
Bay Anchovy	<i>Anchoa mitchilli</i>	8	2.1%
Oyster	<i>Crassostrea virginica</i>	3	2.1%
Bubble Snail	<i>F. Atyidae</i>	Present	2.1%
Spot	<i>Leiostomus xanthurus</i>	2	1.4%
Horseshoe Crab	<i>Limulus polyphemus</i>	2	1.4%
Blue Mussel	<i>Mytilus edulis</i>	22	1.4%
American Eel	<i>Anguilla rostrata</i>	2	1.4%
Northern Quahog	<i>Mercenaria mercenaria</i>	2	1.4%
Sheepshead Minnow	<i>Cyprinodon variegatus</i>	Present	1.4%
Naked Goby / Seaboard Goby	<i>Gobiosoma spp.</i>	3	1.4%
Age 1+ Winter Flounder	<i>Pseudopleuronectes americanus</i>	1	0.7%
Hogchoker	<i>Trinectes maculatus</i>	1	0.7%
Striped Searobin	<i>Prionotus evolans</i>	1	0.7%
Tautog	<i>Tautoga onitis</i>	2	0.7%
Ribbed Mussel	<i>Guekensia demissus</i>	2	0.7%

Table 3. YOY Winter Flounder Abundance, All Estuaries. MDMF Seine Survey 1976-2020

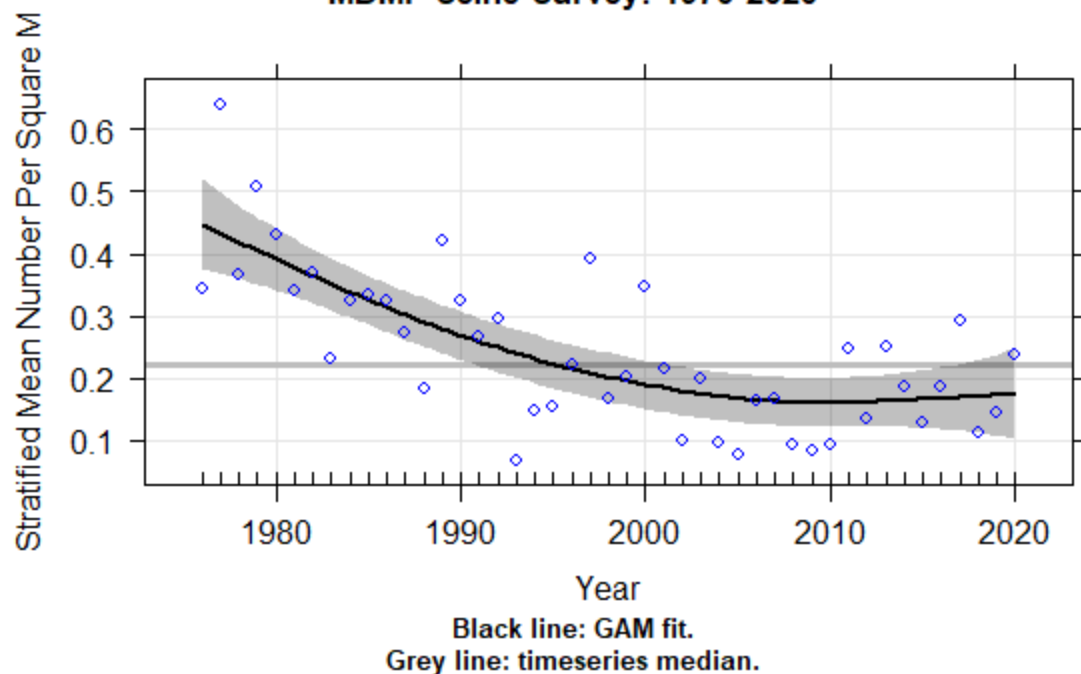
Year	Stratified Mean	Standard Error	Lower CI	Upper CI
1976	0.344	0.042	0.236	0.452
1977	0.641	0.062	0.508	0.774
1978	0.366	0.057	0.235	0.498
1979	0.507	0.060	0.366	0.648
1980	0.432	0.057	0.306	0.559
1981	0.340	0.056	0.208	0.471
1982	0.370	0.055	0.246	0.494
1983	0.231	0.027	0.176	0.287
1984	0.323	0.036	0.248	0.399
1985	0.335	0.039	0.254	0.415
1986	0.325	0.039	0.244	0.406
1987	0.274	0.032	0.208	0.340
1988	0.184	0.024	0.133	0.234
1989	0.421	0.046	0.325	0.518
1990	0.325	0.038	0.247	0.402
1991	0.267	0.038	0.188	0.346
1992	0.294	0.047	0.196	0.392
1993	0.067	0.009	0.047	0.086
1994	0.148	0.019	0.108	0.188
1995	0.154	0.023	0.107	0.201
1996	0.221	0.027	0.165	0.277
1997	0.392	0.053	0.278	0.506
1998	0.165	0.029	0.104	0.226
1999	0.201	0.028	0.143	0.258
2000	0.347	0.043	0.258	0.435
2001	0.214	0.028	0.157	0.272
2002	0.100	0.011	0.077	0.122
2003	0.197	0.032	0.128	0.267
2004	0.095	0.012	0.070	0.120
2005	0.075	0.010	0.054	0.096
2006	0.164	0.018	0.126	0.202
2007	0.167	0.021	0.125	0.210
2008	0.092	0.011	0.069	0.115
2009	0.083	0.013	0.056	0.109
2010	0.092	0.014	0.063	0.122
2011	0.247	0.026	0.194	0.301
2012	0.135	0.014	0.106	0.163
2013	0.250	0.025	0.198	0.302
2014	0.186	0.028	0.130	0.242
2015	0.127	0.018	0.090	0.163
2016	0.187	0.020	0.146	0.228
2017	0.291	0.050	0.182	0.400
2018	0.111	0.021	0.065	0.156
2019	0.145	0.019	0.104	0.185
2020	0.238	0.049	0.133	0.342

**Figure 1. Station Locations  
MDMF Seine Survey.**

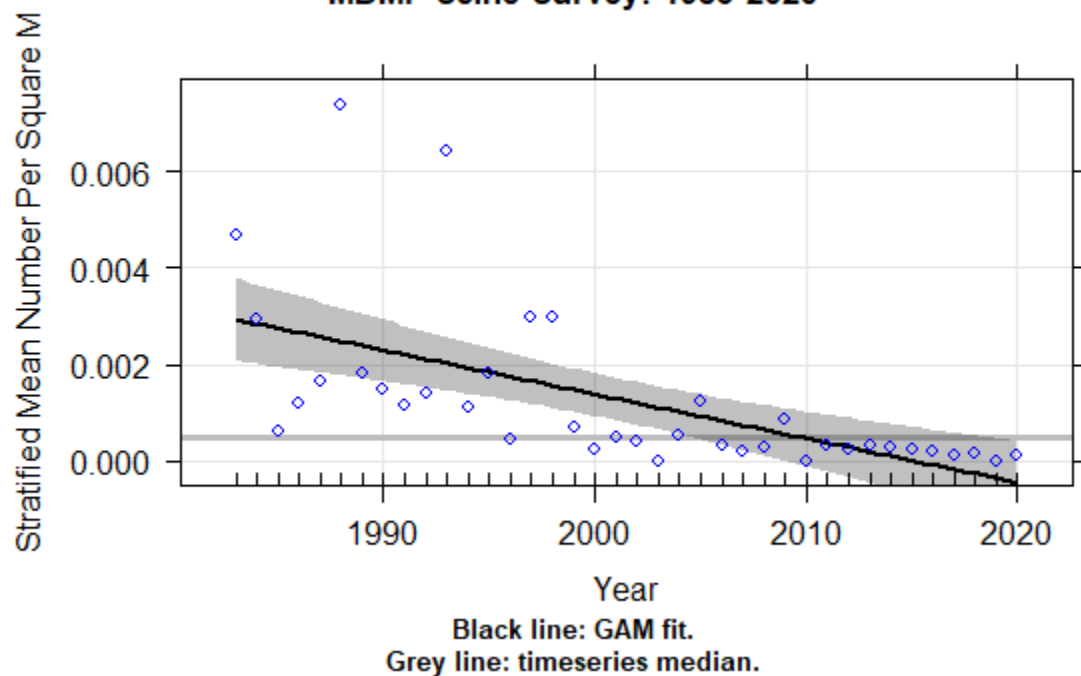


Produced by: MADMF Resource Assessment Project  
Vincent M. Manfredi

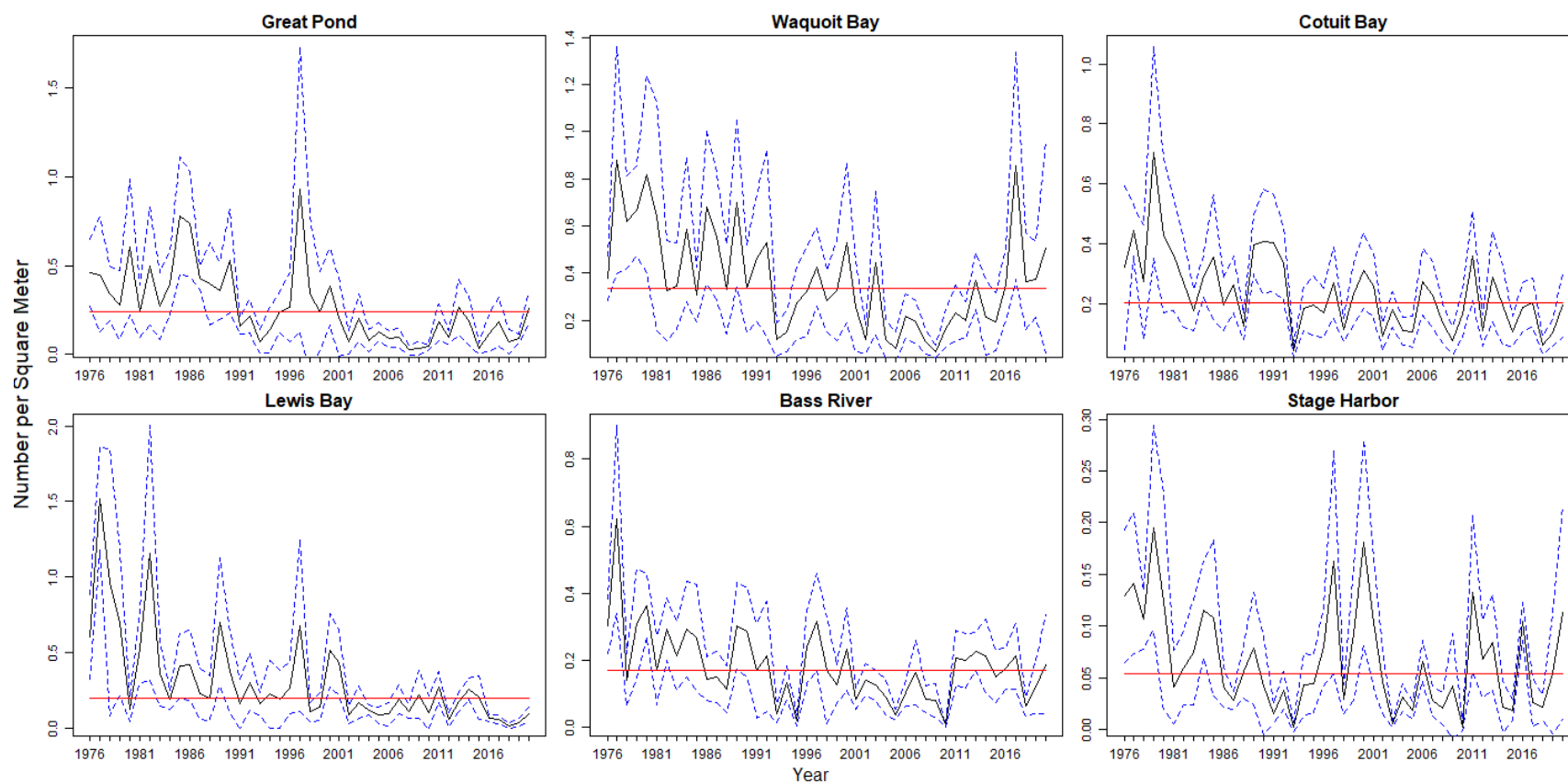
**Figure 2. YOY Winter Flounder Abundance  
MDMF Seine Survey: 1976-2020**



**Figure 3. Age 1+ Winter Flounder Abundance  
MDMF Seine Survey: 1983-2020**

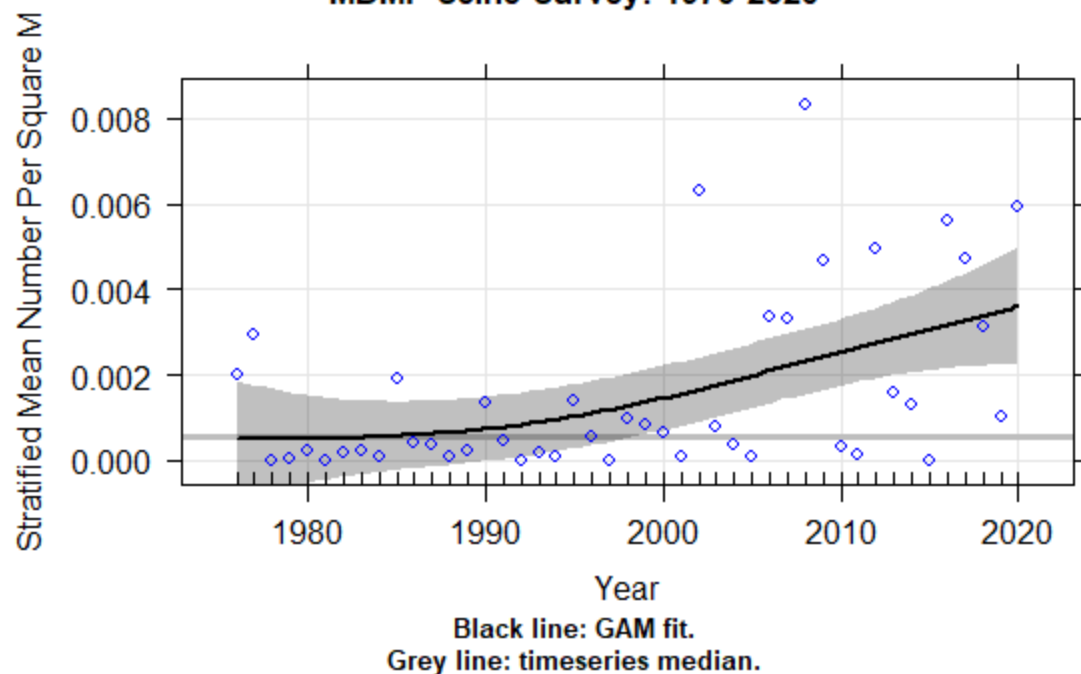


**Figure 4. Abundance of YOY winter flounder by estuary, MDMF Seine Survey 1976 – 2020.**

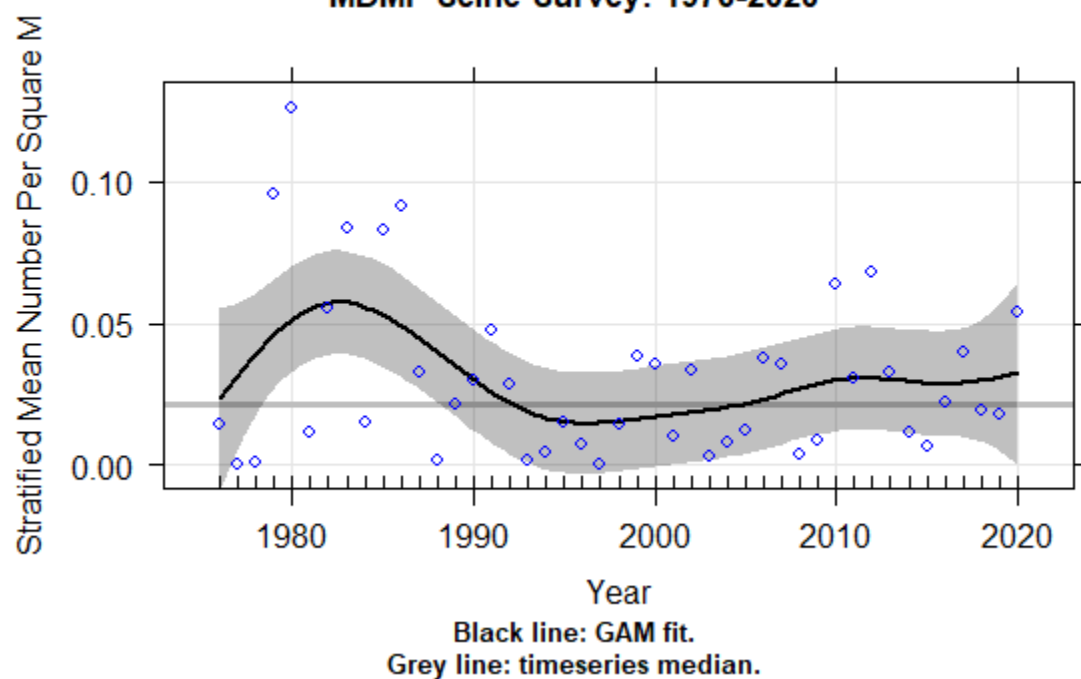


Dashed Lines = 95% Confidence Intervals  
Horizontal Line = Timeseries Median for each Estuary  
Note: y-axis scales differ in magnitude.

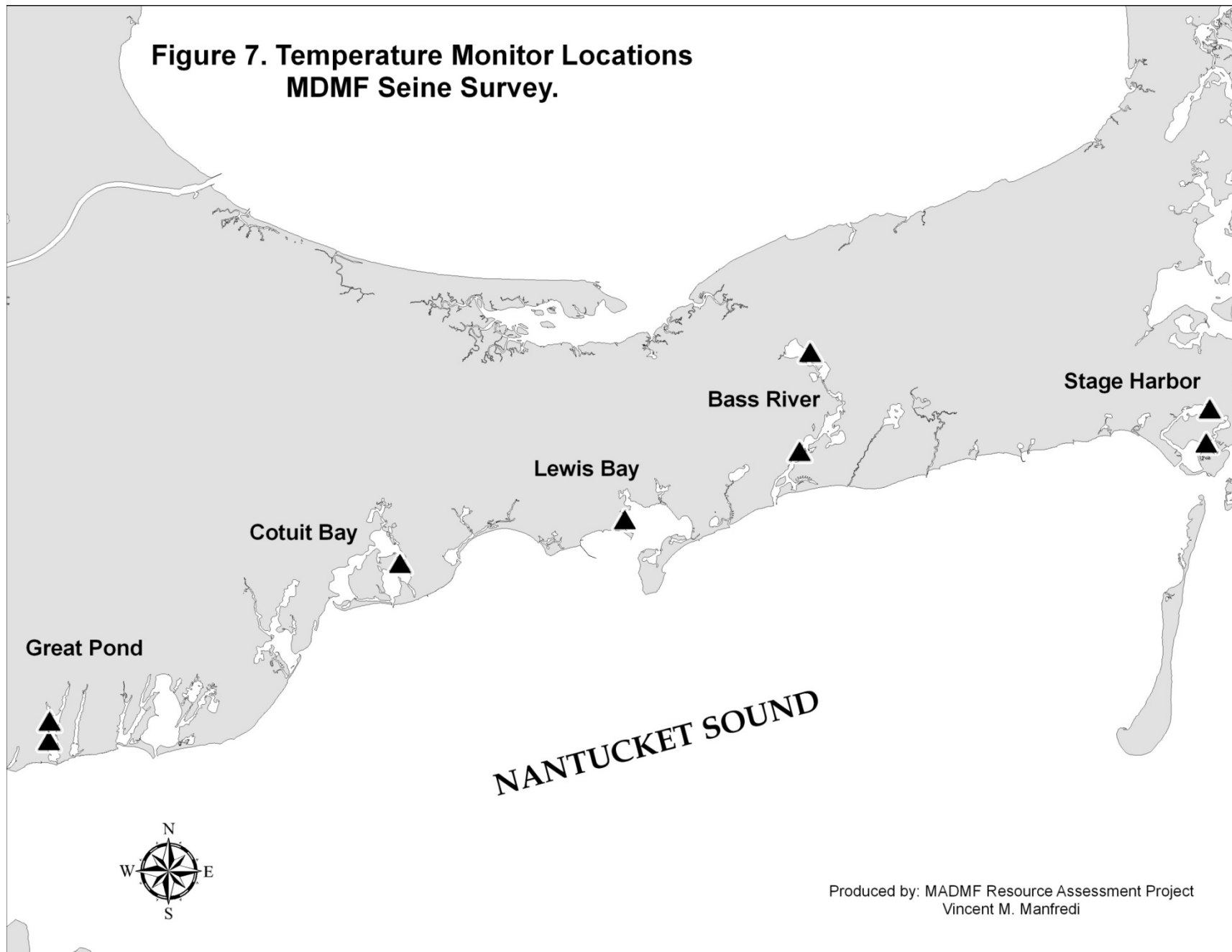
**Figure 5. YOY Summer Flounder Abundance  
MDMF Seine Survey: 1976-2020**



**Figure 6. Blue Crab Abundance  
MDMF Seine Survey: 1976-2020**



**Figure 7. Temperature Monitor Locations  
MDMF Seine Survey.**



## 2020 Seine Survey Station Photographs



A. High Bank, Bass River

A newly constructed private pier and encroaching Spartina grass have made survey operations impossible in future years.



B. Sears Point, Stage Harbor

A newly installed stone revetment has caused heavy erosion of the beach, leaving room for one haul with no replicates. Spartina also is encroaching here. Owner will be nourishing beach, so we will wait one more year to decide to move the station.



Appendix A: Massachusetts Inshore Bottom Trawl Survey 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 Matthew Camisa at 508-742-9743 or [matt.camisa@mass.gov](mailto:matt.camisa@mass.gov).

Contents:

Figure 1. Massachusetts trawl survey regions.

Figure 2 (a-ff). Stratified mean weight per tow (kg) with GAM smoothed trend line.  
1978–2019 Massachusetts DMF trawl survey.

- (a.) Spring **Winter Flounder** Regions 1 - 3
- (b.) Spring **Yellowtail Flounder** Regions 3 - 5
- (c.) Spring **Winter Flounder** Regions 4 - 5
- (d.) Fall **Winter Flounder** Regions 4 - 5
- (e.) Spring **Summer Flounder** Regions 1 - 5
- (f.) Fall **Summer Flounder** Regions 1 - 5
- (g.) Spring **Windowpane** Regions 1 - 3
- (h.) Fall **Windowpane** Regions 1 - 3
- (i.) Spring **Windowpane** Regions 4 - 5
- (j.) Fall **Windowpane** Regions 4 - 5
- (k.) Spring **Little Skate** Regions 1 - 3
- (l.) Fall **Little Skate** Regions 1 - 3
- (m.) Spring **Little Skate** Regions 4 - 5
- (n.) Fall **Little Skate** Regions 4 - 5
- (o.) Spring **Winter Skate** Regions 1 - 3
- (p.) Fall **Winter Skate** Regions 1 - 3
- (q.) Spring **Winter Skate** Regions 4 - 5
- (r.) Fall **Winter Skate** Regions 4 - 5
- (s.) Spring **Atlantic Cod** Regions 4 - 5
- (t.) Fall **Red Hake** Regions 4 - 5
- (u.) Spring **Ocean Pout** Regions 1 - 5
- (v.) Spring **Northern Sea Robin** Regions 1 - 5
- (w.) Spring **Longhorn Sculpin** Regions 3 - 5
- (x.) Fall **Longhorn Sculpin** Regions 3 - 5
- (y.) Spring **Scup** Regions 1 - 3
- (z.) Spring **Black Sea Bass** Regions 1 - 3
- (aa.) Spring **Tautog** Regions 1 - 3
- (bb.) Fall **Tautog** Regions 1 - 3
- (cc.) Fall **Butterfish** Regions 1 - 2
- (dd.) Spring **American Plaice** Regions 4 - 5
- (ee.) Fall **Lobster** Regions 4 - 5
- (ff.) Spring **Haddock** Regions 4 - 5

Figure 3 (a – b). Stratified mean number per tow with GAM smoothed trend line.  
1978 – 2019 Massachusetts DMF trawl survey.

- (a) Spring **Channeled Whelk** Regions 1 - 2
- (b) Fall **Channeled Whelk** Regions 1 - 2
- (c) Fall **Knobbed Whelk** Regions 1 - 2
- (d) Spring **Spotted Hake** Regions 1 - 5

Figure 4 (a & b). Pre-recruit stratified mean number per tow with GAM smoothed trend line.  
1978 – 2019 Massachusetts DMF trawl survey.

- (a) Fall **Age-0 Scup** (<13 cm) Regions 1 – 3
- (b) Fall **Age-0 Black Sea Bass** (<12 cm) Regions 1 - 3

Figure 1. Massachusetts trawl survey regions

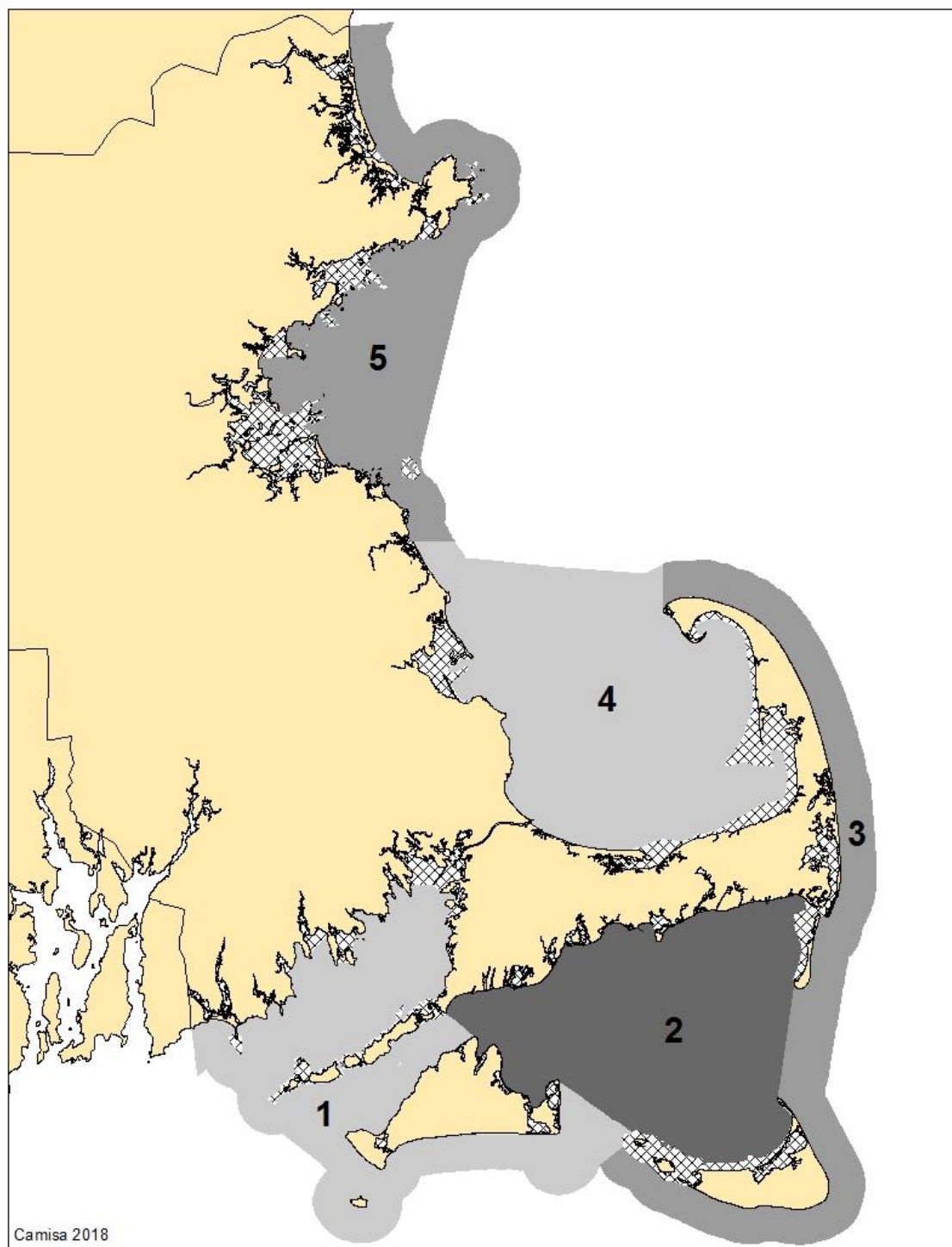


Figure 2. (a & b) Stratified mean weight per tow (kg) with GAM smoothed trend line. 1978 – 2019 Massachusetts DMF Trawl survey.

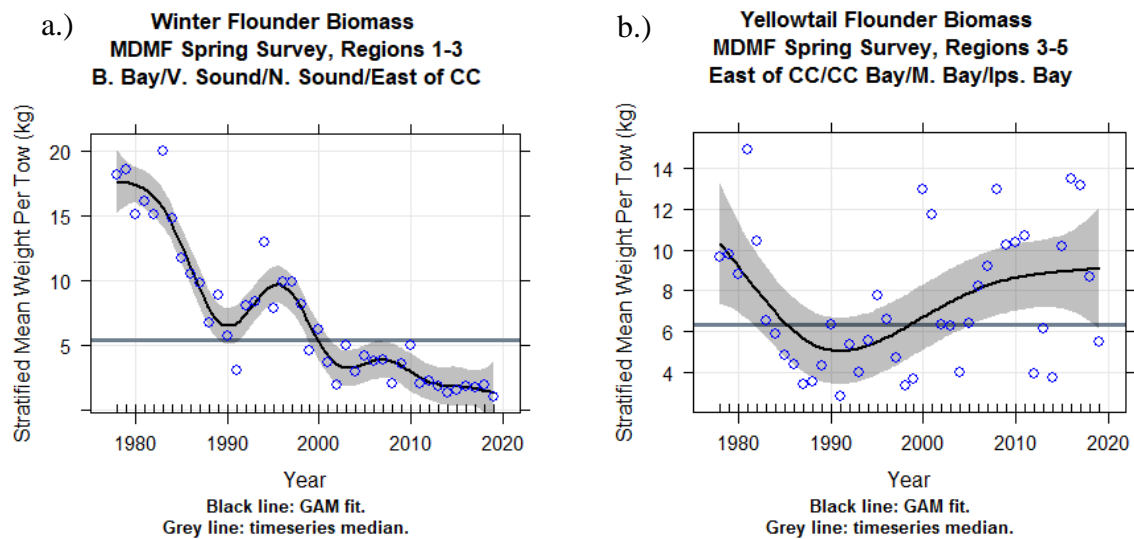


Figure 2. (c & d) Stratified mean weight per tow (kg) with GAM smoothed trend line. 1978 – 2019 Massachusetts DMF Trawl survey.

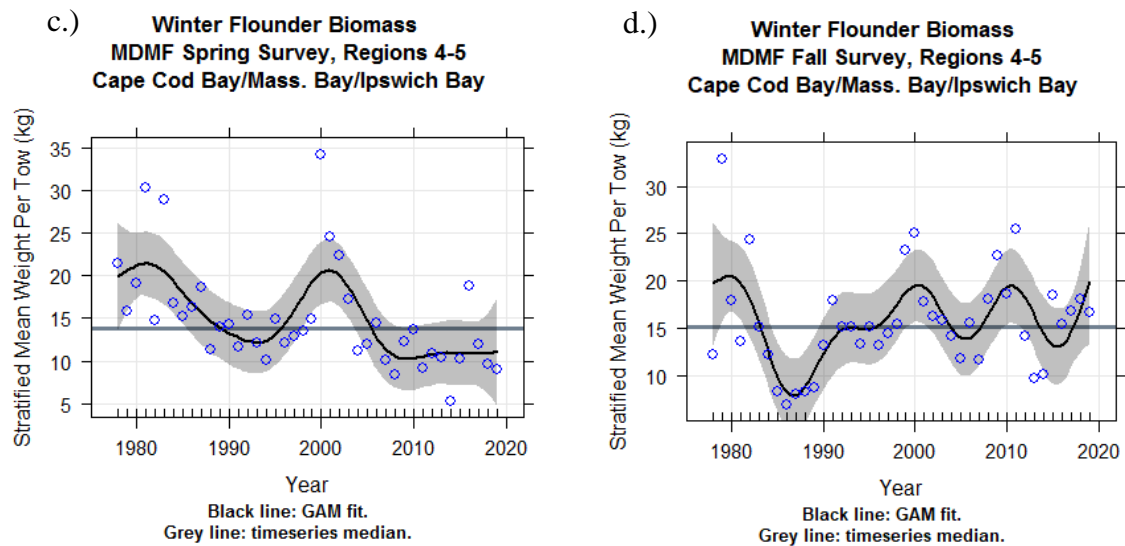


Figure 2. (e & f). Stratified mean weight per tow (kg) with GAM smoothed trend line. 1978 – 2019 Massachusetts DMF Trawl survey.

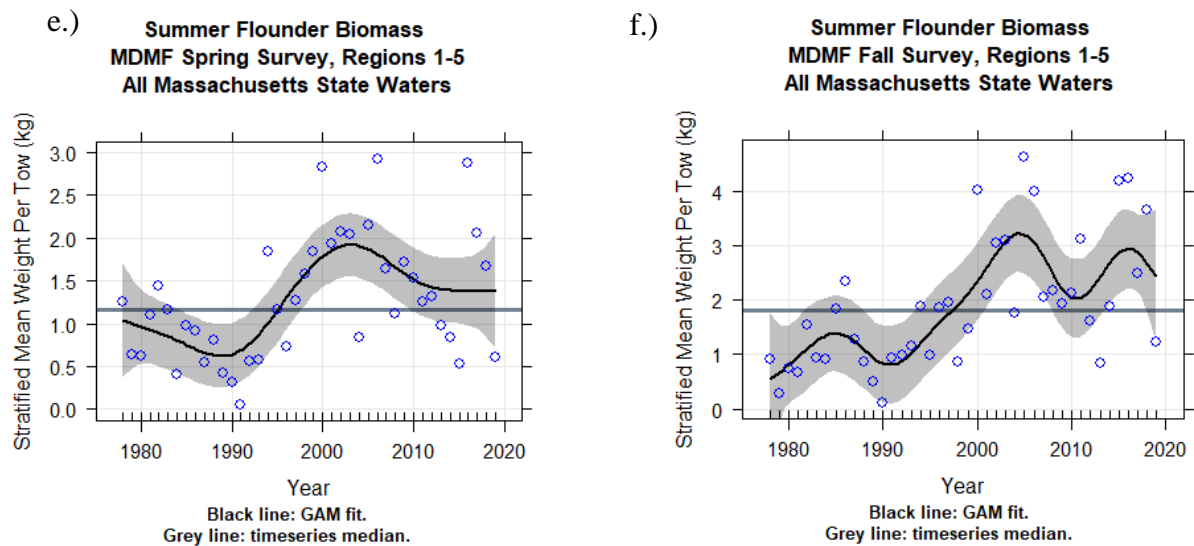


Figure 2. (g & h). Stratified mean weight per tow (kg) with GAM smoothed trend line. 1978 – 2019 Massachusetts DMF Trawl survey.

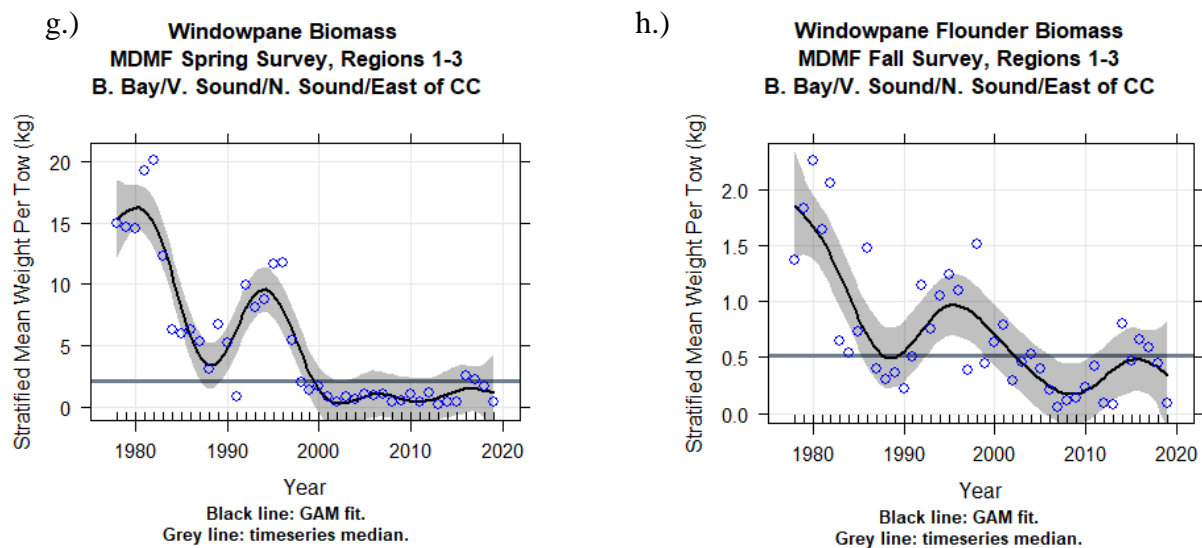


Figure 2. (i & j). Stratified mean weight per tow (kg) with GAM smoothed trend line. 1978 – 2019 Massachusetts DMF Trawl survey.

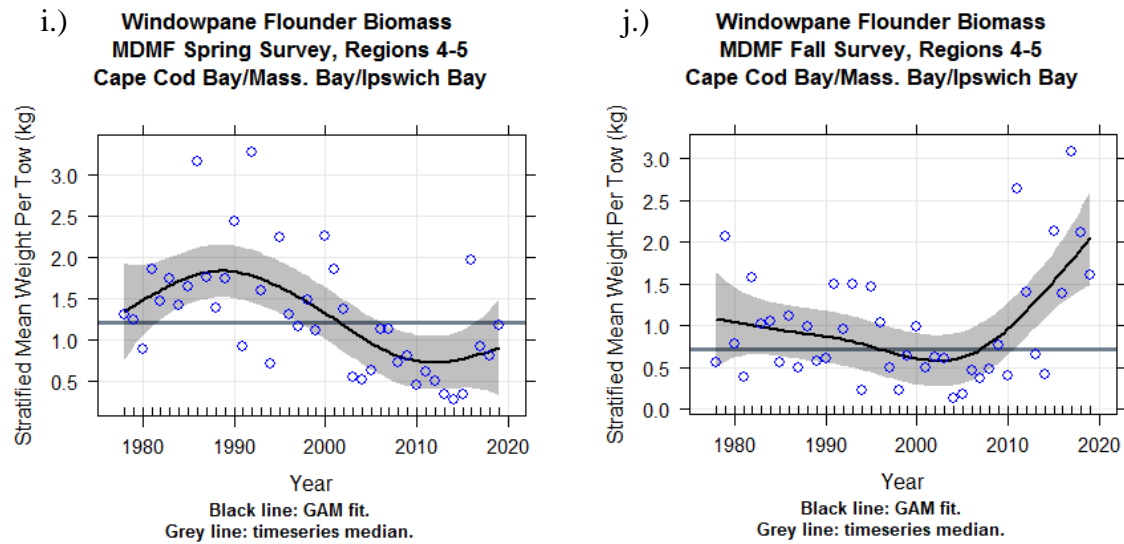


Figure 2. (k & l). Stratified mean weight per tow (kg) with GAM smoothed trend line. 1978 – 2019 Massachusetts DMF Trawl survey.

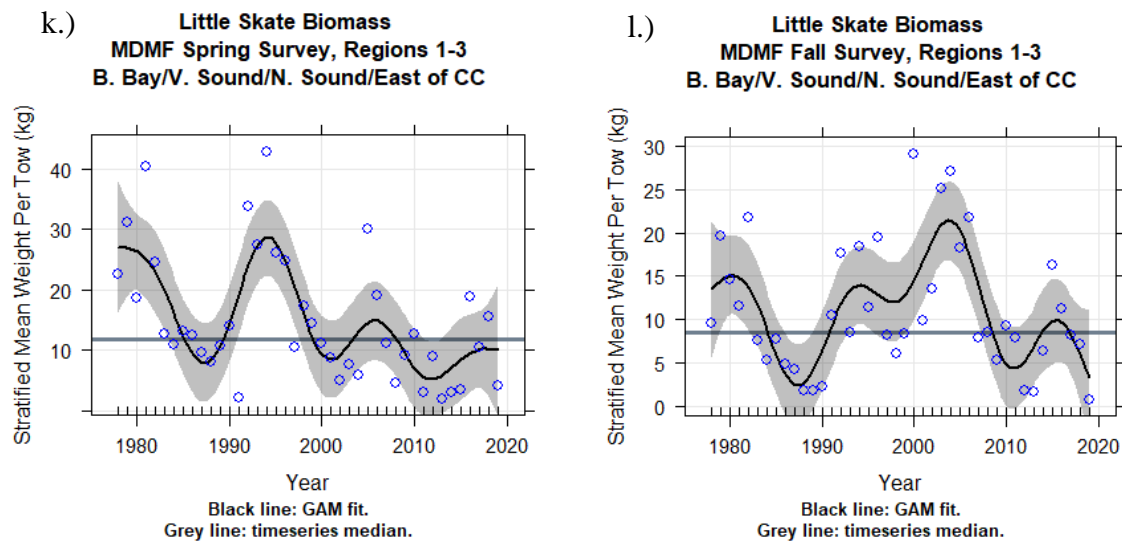


Figure 2. (m & n). Stratified mean weight per tow (kg) with GAM smoothed trend line. 1978 – 2019 Massachusetts DMF Trawl survey.

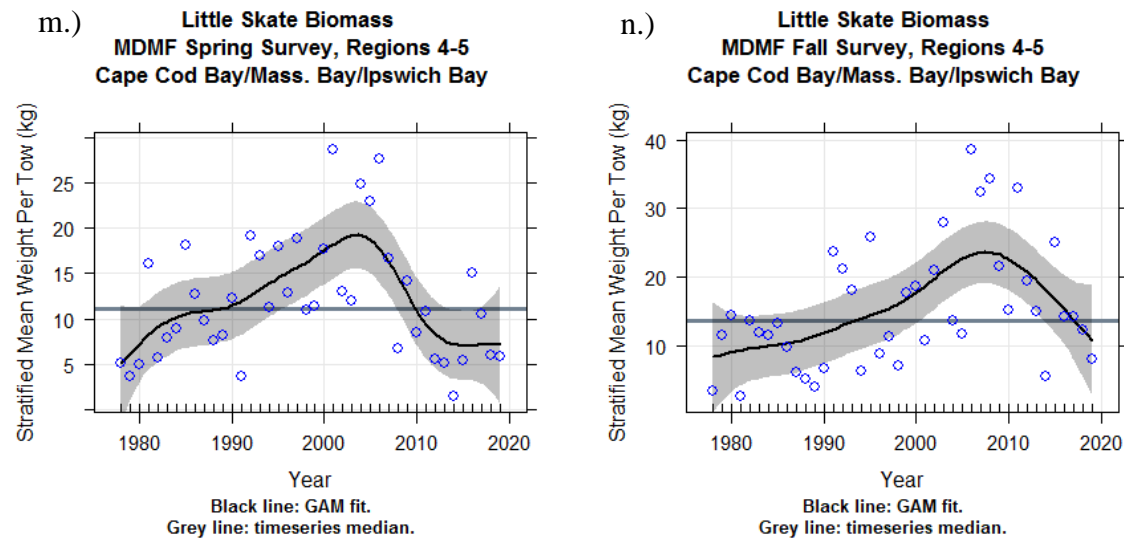


Figure 2. (o & p). Stratified mean weight per tow (kg) with GAM smoothed trend line. 1978 – 2019 Massachusetts DMF Trawl survey.

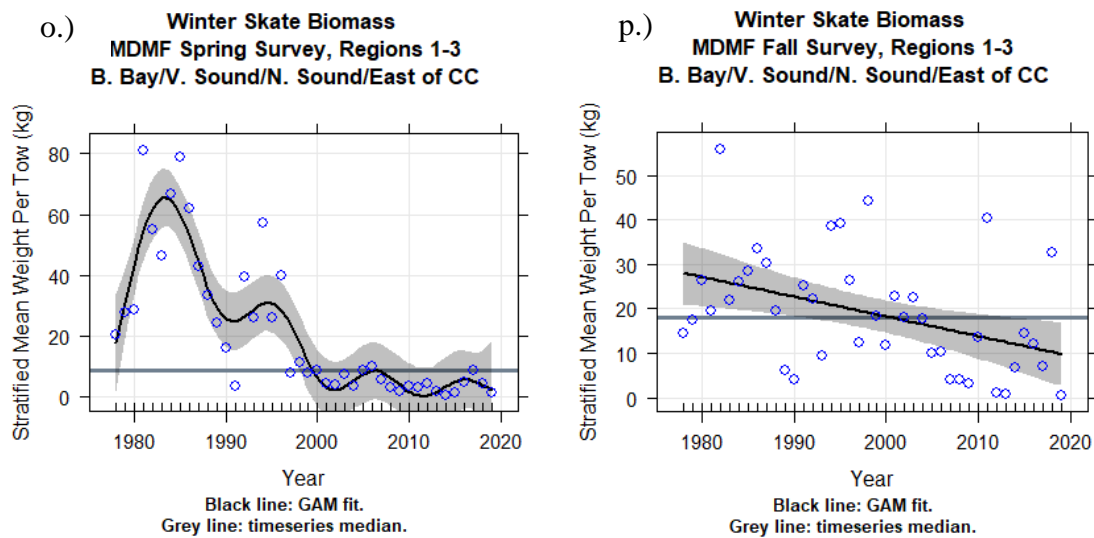




Figure 2. (q & r). Stratified mean weight per tow (kg) with GAM smoothed trend line. 1978 – 2019 Massachusetts DMF Trawl survey.

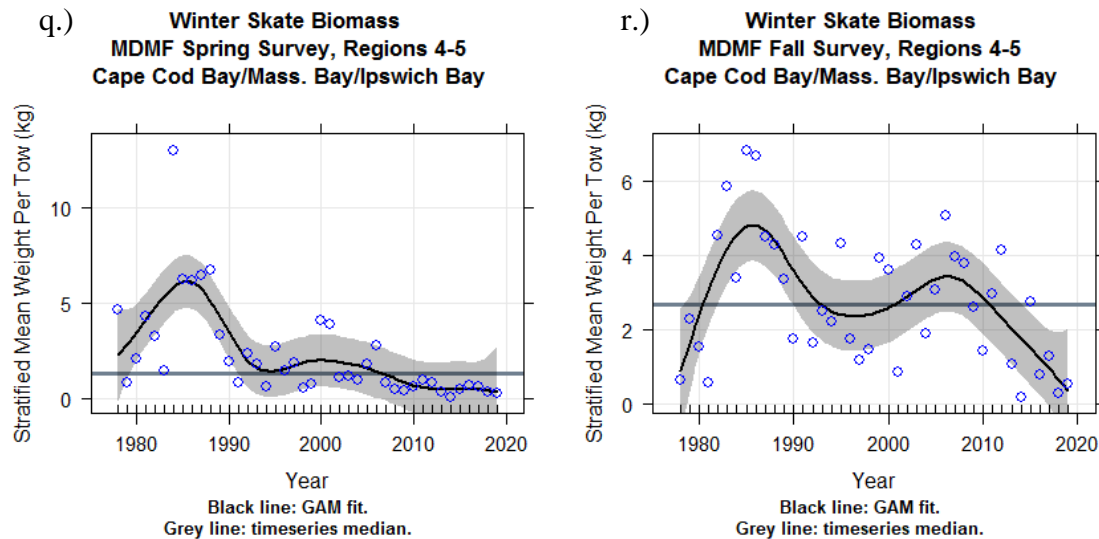


Figure 2. (s & t). Stratified mean weight per tow (kg) with GAM smoothed trend line. 1978 – 2019 Massachusetts DMF Trawl survey.

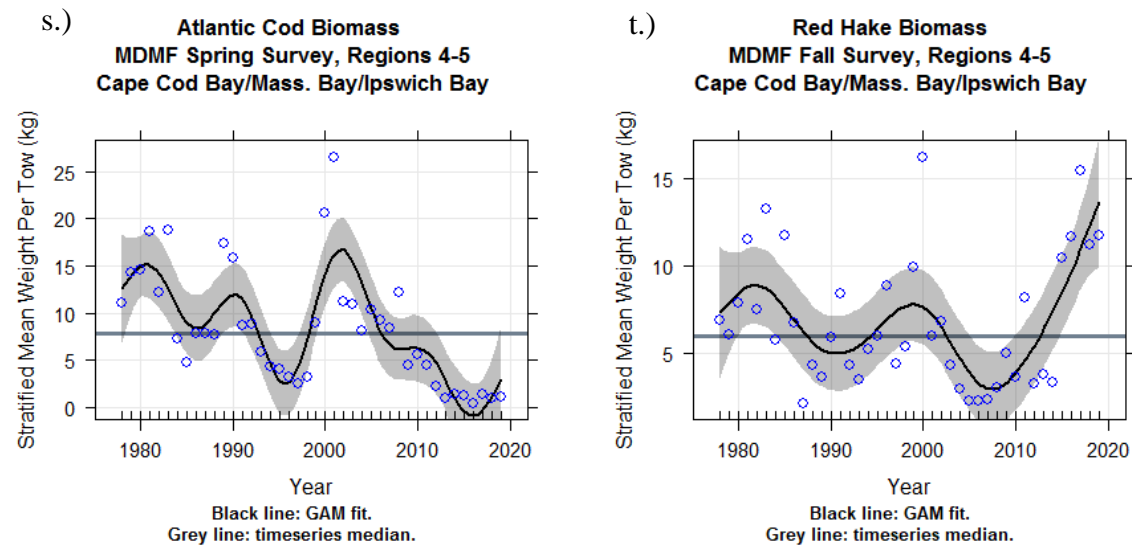


Figure 2. (u & v). Stratified mean weight per tow (kg) with GAM smoothed trend line. 1978 – 2019 Massachusetts DMF Trawl survey.

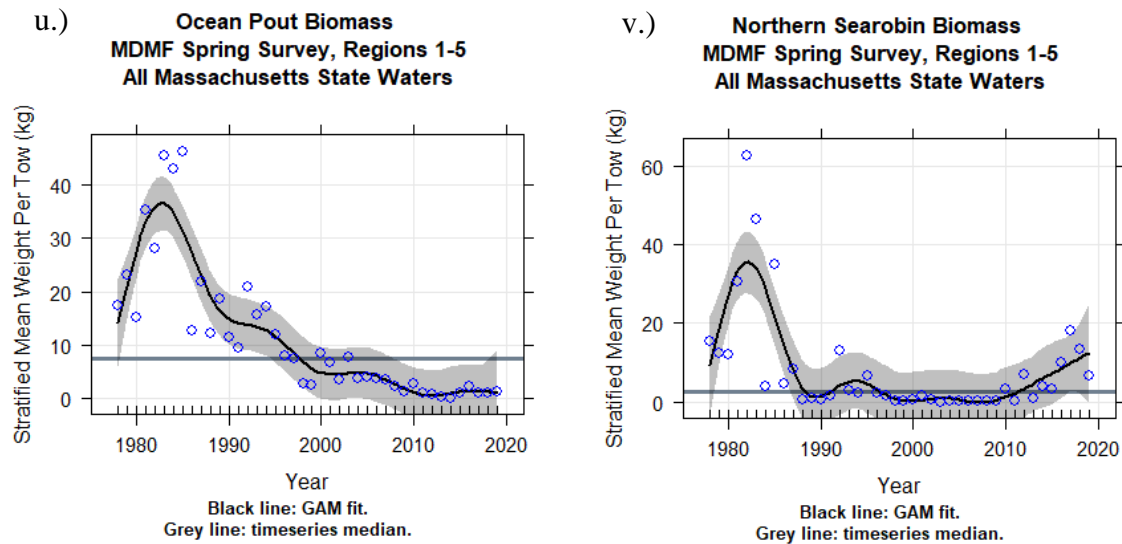


Figure 2. (w & x). Stratified mean weight per tow (kg) with GAM smoothed trend line. 1978 – 2019 Massachusetts DMF Trawl survey.

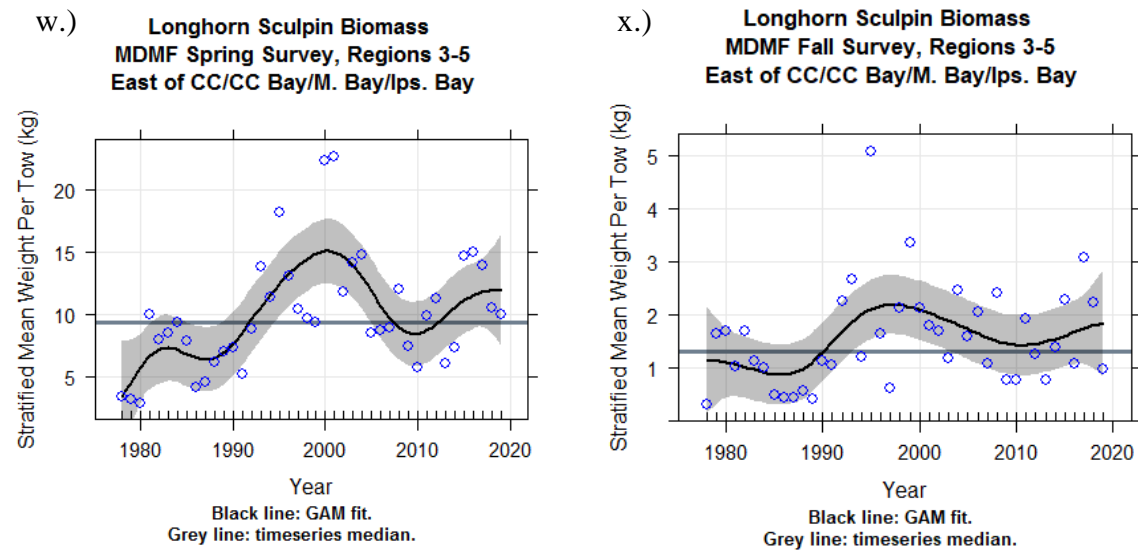


Figure 2. (y & z). Stratified mean weight per tow (kg) with GAM smoothed trend line. 1978 – 2019 Massachusetts DMF Trawl survey.

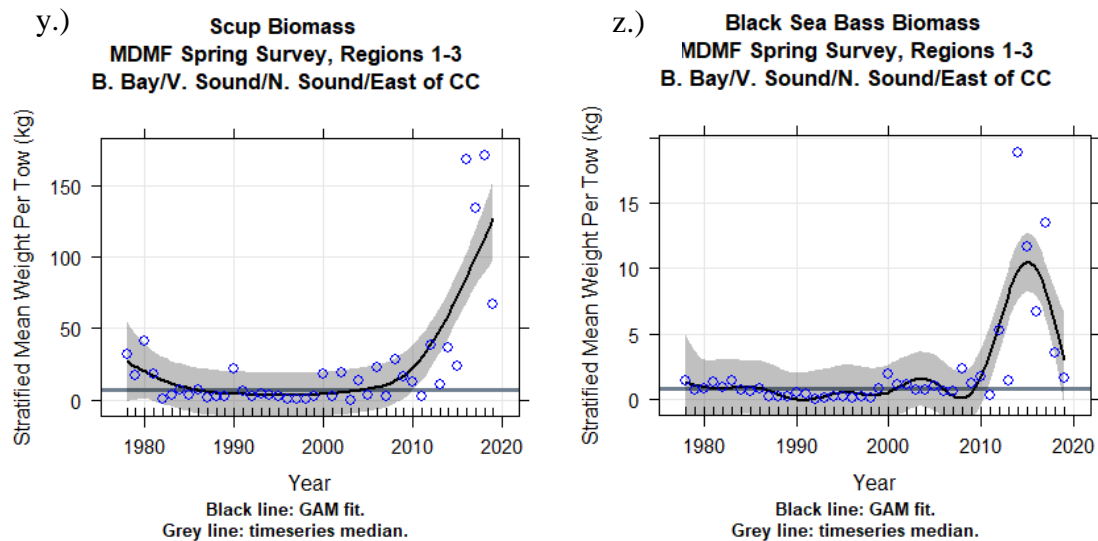


Figure 2. (aa & bb). Stratified mean weight per tow (kg) with GAM smoothed trend line. 1978 – 2019 Massachusetts DMF Trawl survey.

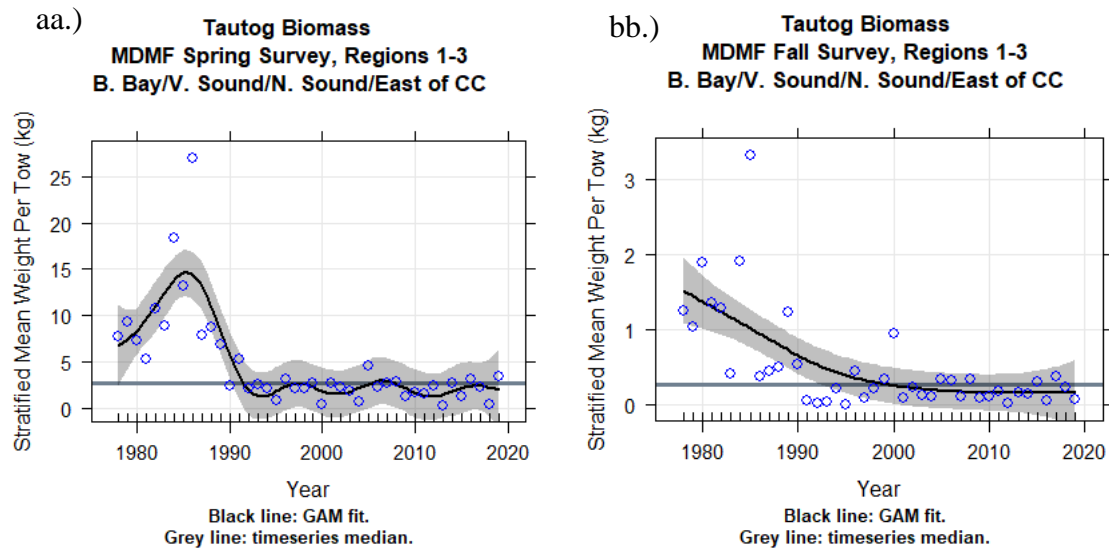


Figure 2. (cc & dd). Stratified mean weight per tow (kg) with GAM smoothed trend line. 1978 – 2019 Massachusetts DMF Trawl survey.

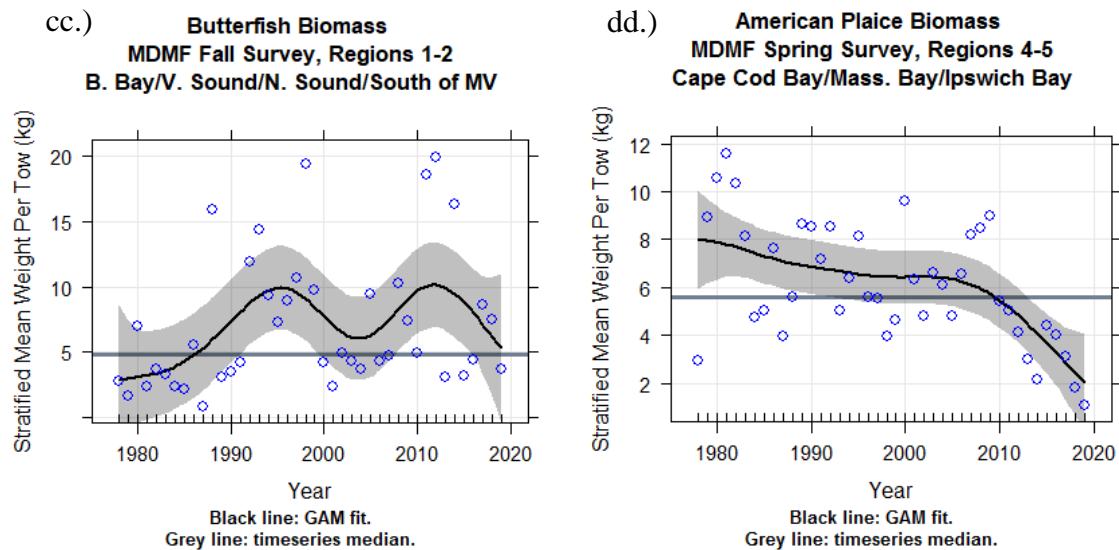


Figure 2. (ee & ff). Stratified mean weight per tow (kg) with GAM smoothed trend line. 1978 – 2019 Massachusetts DMF Trawl survey.

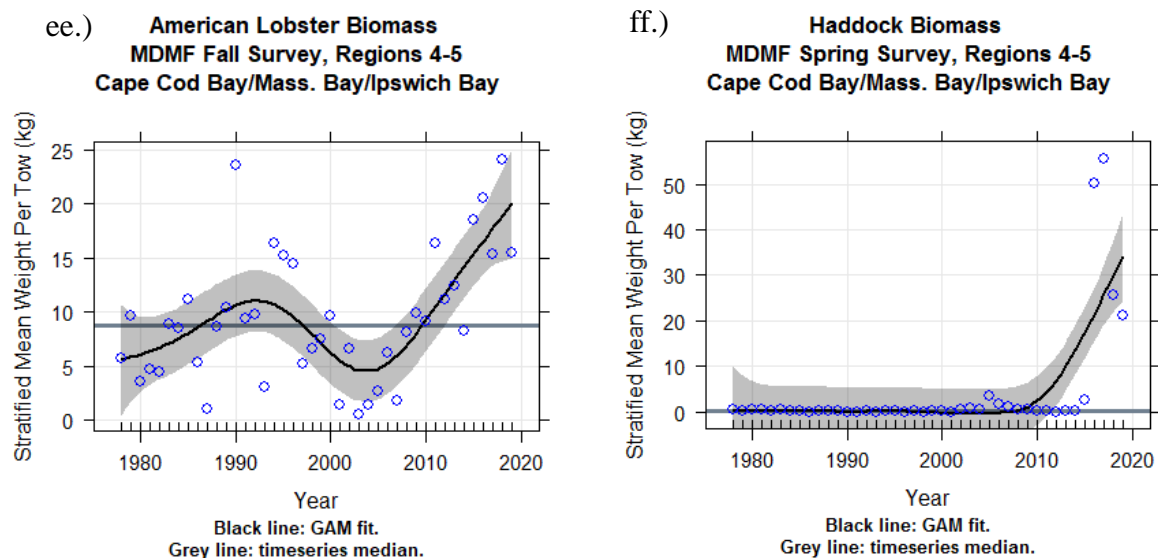


Figure 3. (a & b). Stratified mean number per tow with GAM smoothed trend line. 1978 – 2019 Massachusetts DMF Trawl survey.

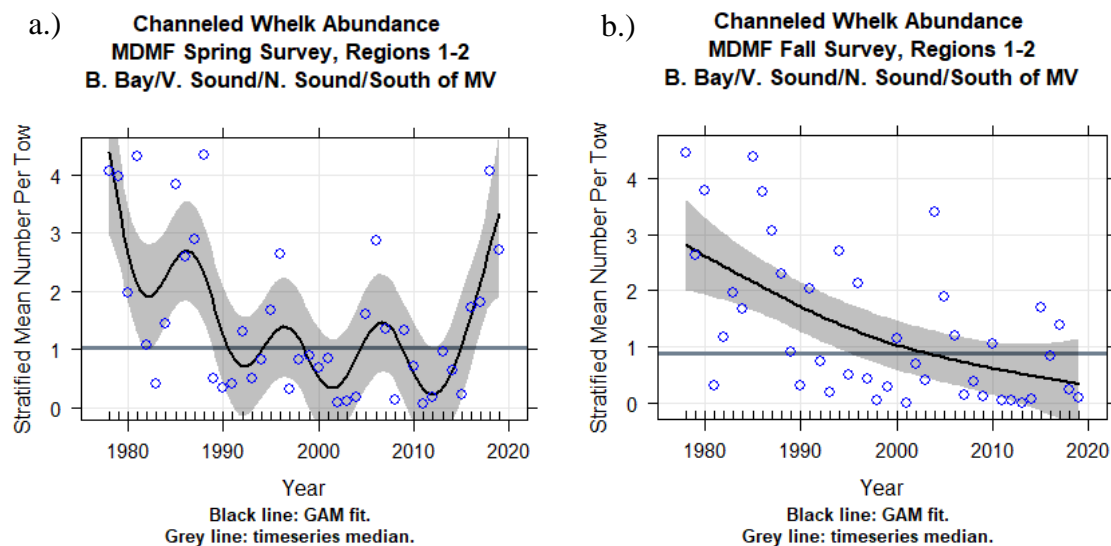


Figure 3. (c & d). Stratified mean number per tow with GAM smoothed trend line. 1978 – 2019 Massachusetts DMF Trawl survey.

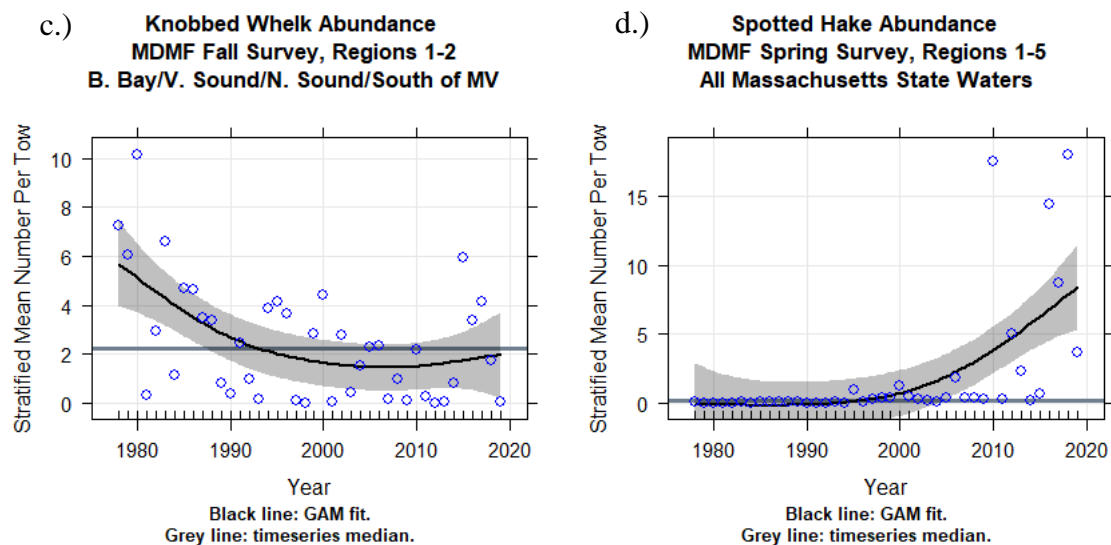
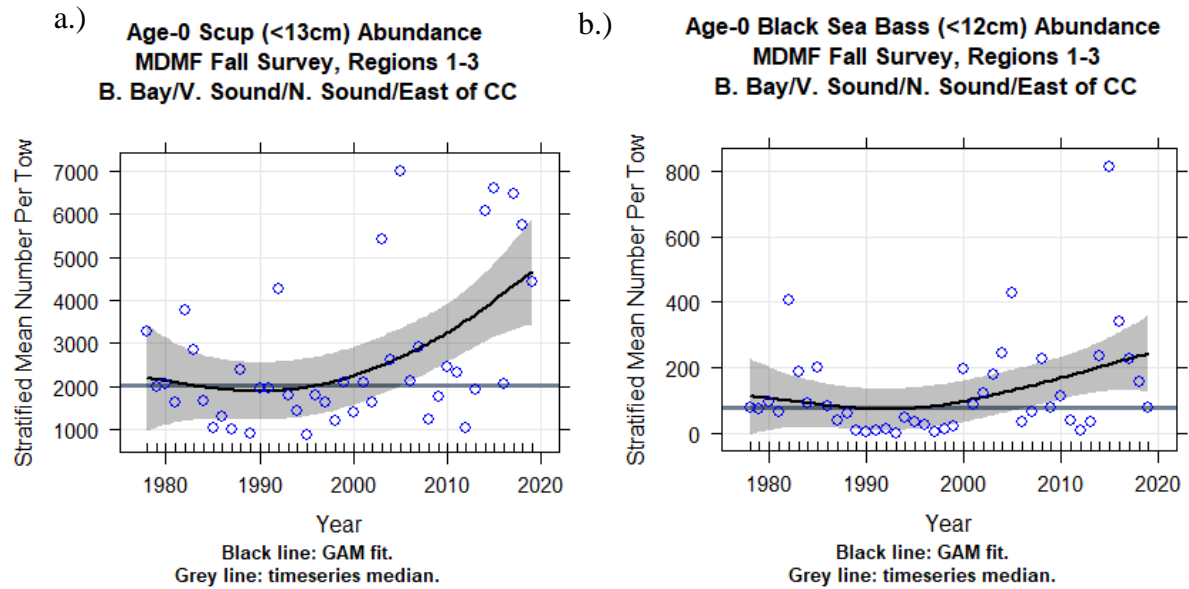


Figure 4. (a & b). Pre-recruit stratified mean number per tow with GAM smoothed trend line. 1978 – 2019 Massachusetts DMF Trawl survey.



## Appendix B.

### Trends in Observed Bottom Temperatures

#### Massachusetts Bottom Trawl Survey.

1978 – 2019

Due to COVID-19 concerns, both spring and fall trawl surveys were cancelled in 2020 so there are no updates to the bottom temperature analyses. A timeseries analysis of bottom temperatures recorded during spring and fall bottom trawl surveys is presented here through 2019 only. 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).

There is one difference between the methods employed in 2006 and the methods reported here. Temperature observations from non-representative stations (SHG >136) are included in the dataset 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). Some of these observations were omitted from the 2006 analysis. Elimination of temperature observations from non-representative stations had the effect of producing fall temperature data gaps in Region 3 where large dogfish catches frequently result in hauls of less than 13 minutes duration. 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 temperature loggers and is therefore included in the following temperature summaries. Please refer to Table 1 and 2 for a listing of data gaps.

	Region 1				Region 2		Region 3					Region 4						Region 5					
Year	11	12	13	14	15	16	17	18	19	20	21	25	26	27	28	29	30	31	32	33	34	35	36
1978	12.1	11.8	13.1	13.0	13.2	11.5	10.3	11.5	10.5	6.5	11.5	11.1	10.7	7.8	7.8	8.2	N/A	11.7	7.8	6.8	7.2	7.9	N/A
1979	13.3	13.1	11.8	11.3	13.3	11.5	12.0	11.9	9.9	7.5	5.0	7.3	7.9	6.7	4.2	4.0	3.9	10.4	8.5	6.4	5.5	4.9	3.5
1980	12.5	11.7	11.8	11.1	12.2	11.1	10.2	11.5	10.1	8.0	7.4	7.8	9.8	8.1	8.0	7.2	7.2	6.7	5.6	5.3	6.5	5.2	4.2
1981	12.4	11.0	10.4	7.5	10.5	10.4	10.5	7.6	7.9	6.5	6.5	7.9	8.2	6.5	6.3	6.6	5.8	8.8	7.6	5.4	5.3	5.4	4.8
1982	11.7	10.5	9.8	5.8	11.4	11.0	10.9	8.9	8.0	6.6	4.6	7.0	5.8	5.6	4.9	4.4	4.4	7.1	6.3	5.1	4.7	4.7	4.3
1983	11.9	11.7	11.6	10.1	12.4	11.2	9.2	9.5	9.0	5.5	6.5	7.2	8.9	7.0	6.2	6.5	5.0	6.0	6.1	6.2	5.3	6.0	5.0
1984	12.1	11.0	10.6	10.1	12.3	11.9	9.3	9.6	9.6	5.2	4.5	7.6	8.1	4.8	4.5	4.1	4.0	7.3	6.6	5.2	5.1	4.9	4.9
1985	12.1	11.1	11.4	10.5	12.1	11.6	9.4	10.6	10.1	7.8	7.0	10.3	8.9	8.0	6.8	5.8	5.0	7.6	7.3	6.2	5.9	4.7	4.5
1986	10.1	10.8	9.7	9.1	10.5	9.9	9.0	9.0	8.3	7.5	5.7	10.0	8.5	7.3	7.5	6.4	5.3	8.1	7.5	6.2	6.0	5.5	5.3
1987	10.7	10.4	10.2	9.5	12.1	11.4	9.2	8.7	8.3	6.4	5.9	9.1	8.1	7.2	6.2	5.1	5.7	7.4	7.3	6.6	6.2	6.2	5.6
1988	10.8	10.4	10.0	9.1	11.5	11.1	8.6	8.4	8.6	6.0	5.5	9.4	8.1	7.2	5.9	4.8	4.4	7.7	6.8	5.8	5.3	4.6	4.1
1989	9.5	9.0	7.1	6.7	10.9	9.5	7.5	7.5	6.6	4.7	3.6	7.4	5.4	4.4	4.3	2.4	1.5	6.1	4.5	3.8	3.0	3.3	2.6
1990	10.4	10.5	9.4	7.6	12.0	11.0	9.9	8.8	9.2	5.9	3.8	9.0	8.0	7.5	4.7	4.0	3.5	6.5	6.6	5.9	4.5	3.7	2.6
1991	14.1	13.0	11.3	9.9	13.8	13.3	11.4	10.9	10.0	7.0	5.2	11.6	11.3	10.2	8.1	6.0	5.0	7.8	5.9	6.2	7.2	6.1	4.7
1992	9.9	9.2	8.6	8.1	11.4	10.3	9.2	8.1	7.9	7.5	6.5	8.7	8.1	8.0	7.0	5.9	5.2	8.4	8.1	6.7	5.4	4.1	3.8
1993	12.6	11.5	11.1	9.9	12.4	11.5	9.7	9.4	8.6	5.0	4.5	8.9	7.9	6.0	5.4	5.0	3.7	7.6	6.1	4.7	4.6	3.7	3.7
1994	10.3	9.9	9.6	9.1	10.3	9.8	9.4	9.4	7.8	6.5	5.7	9.2	8.9	8.3	6.7	6.0	4.7	8.4	7.2	4.7	5.1	4.0	4.3
1995	11.7	11.2	9.9	9.6	10.6	10.0	9.2	8.4	8.5	6.9	6.8	9.0	8.6	8.0	7.6	6.0	4.9	7.9	8.2	6.5	6.2	4.7	4.1
1996	11.6	11.3	10.3	9.8	11.7	11.5	9.4	8.4	8.5	6.4	5.4	7.3	7.4	5.9	5.4	4.6	4.1	6.1	6.3	4.2	4.1	4.0	4.0
1997	10.9	10.1	9.0	7.3	11.4	11.2	9.9	8.9	8.4	6.2	6.1	7.2	7.9	6.6	6.4	5.5	5.3	5.5	5.4	5.2	4.7	4.7	4.7
1998	11.0	11.1	11.0	10.2	10.5	9.6	9.2	9.1	7.7	7.4	6.1	9.3	8.2	7.0	6.8	5.6	5.0	8.5	7.8	6.0	5.0	4.3	4.2
1999	15.0	13.3	12.7	11.7	14.6	13.6	11.3	10.6	10.7	6.2	5.5	11.5	9.6	8.2	6.1	4.8	4.7	9.1	7.3	6.4	5.2	4.9	4.3
2000	12.1	12.0	11.2	10.8	13.3	12.2	11.1	9.9	10.4	7.6	7.2	10.2	9.5	7.4	7.1	6.3	6.5	9.7	10.0	8.1	7.2	6.2	6.0
2001	13.3	11.5	11.2	8.8	12.9	11.6	11.5	11.1	10.2	5.7	4.9	7.9	9.7	6.1	6.0	4.9	4.6	7.6	7.7	5.2	4.7	4.5	4.5
2002	12.2	11.7	11.5	10.8	12.2	12.0	9.6	9.1	9.8	7.5	6.3	9.4	9.1	8.0	7.5	6.3	5.6	7.9	8.0	6.7	6.2	5.7	5.5
2003	11.5	11.3	11.2	9.7	11.6	10.8	8.4	8.5	9.1	4.7	4.2	7.9	7.7	5.8	5.2	4.1	3.8	7.2	6.5	5.4	4.2	4.0	3.9
2004	13.3	12.1	11.7	9.3	12.9	11.8	9.9	9.0	8.3	4.5	3.9	7.6	7.6	4.7	4.1	3.6	3.5	6.0	5.1	3.8	3.6	3.4	3.2
2005	11.6	11.2	10.4	9.8	9.3	9.2	9.1	8.2	7.4	5.3	5.0	7.9	7.6	6.6	6.0	5.1	4.6	7.2	7.3	6.1	5.3	5.0	4.4
2006	11.4	10.5	9.9	9.2	12.1	10.9	11.0	10.7	10.4	7.5	6.4	10.1	9.6	8.5	7.3	6.8	6.5	8.0	8.4	8.1	7.0	6.7	6.2
2007	12.8	11.6	10.7	9.2	12.2	11.6	10.5	10.2	8.8	5.3	4.9	9.9	10.1	6.2	4.8	4.4	4.3	6.3	6.3	4.2	4.1	4.2	4.1
2008	11.3	13.1	10.2	10.0	10.5	10.2	9.2	9.0	7.8	5.3	4.6	8.7	7.3	5.5	4.7	4.6	3.9	7.2	7.5	4.8	4.0	4.0	3.8
2009	12.6	11.8	11.1	8.8	13.1	12.4	9.5	9.5	9.2	4.4	4.2	9.2	8.1	6.3	4.7	3.8	3.6	8.2	7.7	5.5	4.3	4.1	3.6
2010	11.6	11.7	11.1	10.0	12.7	12.0	10.1	9.4	9.3	7.5	4.8	11.0	10.8	8.5	5.2	4.5	4.5	7.8	7.4	5.3	4.7	4.6	4.6
2011	11.6	11.2	10.6	9.9	11.3	10.6	9.6	9.6	9.2	7.1	7.0	9.5	8.2	6.7	8.1	6.4	4.8	7.9	7.4	5.0	4.7	4.5	4.4
2012	15.4	13.5	13.2	11.8	14.4	13.8	11.4	11.2	11.6	8.3	7.2	11.2	9.9	8.5	7.3	6.6	6.3	8.9	8.4	7.5	6.6	6.2	5.7
2013	13.5	12.7	11.2	10.3	13.5	12.8	11.3	11.8	11.0	7.4	6.6	9.8	10.1	8.0	7.3	6.1	5.5	9.4	8.6	7.6	6.5	5.9	5.2
2014	13.4	12.1	11.0	10.9	13.2	11.8	9.9	9.5	8.7	5.1	4.2	9.3	8.3	7.4	6.0	4.1	3.4	6.7	6.6	5.6	4.7	4.1	3.9
2015	13.4	12.2	10.8	10.1	13.3	12.2	9.5	9.7	8.9	5.8	4.9	10.5	9.3	6.8	6.0	3.7	3.6	6.4	6.9	5.1	4.5	4.2	4.1
2016	13.0	12.1	10.5	9.7	13.8	13.0	10.3	10.5	11.4	8.7	6.8	9.9	9.6	9.6	9.4	6.6	6.0	8.2	8.3	7.1	6.0	5.9	5.5
2017	13.5	13.2	11.9	10.9	13.7	12.8	10.9	10.6	10.1	7.0	6.2	9.9	7.6	6.3	6.3	5.0	4.8	8.1	6.4	5.4	5.0	4.9	4.6
2018	12.2	11.8	11.4	10.7	12.7	11.7	9.9	9.4	9.3	6.9	5.8	9.8	7.6	6.0	5.5	5.1	5.0	8.0	6.7	5.6	5.1	4.9	4.8
2019	11.7	11.3	10.8	9.5	11.2	11.0	10.2	10.0	10.7	6.7	5.8	8.9	7.9	6.9	6.5	5.0	4.7	7.3	7.6	6.0	4.9	4.6	4.5
Median	12.1	11.5	10.9	9.8	12.2	11.5	9.9	9.4	9.1	6.5	5.7	9.2	8.2	7.0	6.2	5.1	4.7	7.7	7.3	5.7	5.1	4.7	4.4
Mean	12.1	11.5	10.8	9.7	12.2	11.4	9.9	9.6	9.2	6.4	5.7	9.1	8.6	7.0	6.2	5.3	4.7	7.7	7.1	5.8	5.3	4.9	4.4
Maximum	15.4	13.5	13.2	13.0	14.6	13.8	12.0	11.9	11.6	8.7	11.5	11.6	11.3	10.2	9.4	8.2	7.2	11.7	10.0	8.1	7.2	7.9	6.2
Minimum	9.5	9.0	7.1	5.8	9.3	9.2	7.5	7.5	6.6	4.4	3.6	7.0	5.4	4.4	4.1	2.4	1.5	5.5	4.5	3.8	3.0	3.3	2.6

**Table 1. Stratum mean bottom temperatures recorded on the MDMF spring survey, 1978 – 2019.**



	Region 1				Region 2		Region 3					Region 4						Region 5					
Year	11	12	13	14	15	16	17	18	19	20	21	25	26	27	28	29	30	31	32	33	34	35	36
1978	16.0	16.3	14.7	14.5	16.1	16.5	13.0	13.7	12.6	N/A	7.8	16.5	12.0	9.4	9.6	8.2	7.0	13.7	13.6	9.2	9.5	8.1	6.5
1979	16.7	16.5	15.8	16.0	16.9	16.1	13.6	14.7	14.2	10.2	9.7	11.3	12.3	8.1	8.9	7.9	8.8	11.7	10.0	9.1	8.8	8.8	8.2
1980	18.1	18.5	17.4	16.5	19.9	19.8	15.5	15.1	13.7	8.4	10.6	18.7	12.9	9.6	9.2	8.6	8.8	12.3	10.5	10.9	9.2	9.1	8.4
1981	19.2	18.4	16.8	16.6	19.6	19.1	16.2	16.4	15.5	11.0	10.2	15.3	13.7	13.5	12.9	11.9	9.9	13.4	13.1	12.2	12.0	11.8	9.6
1982	17.3	17.4	16.9	15.4	18.3	18.3	15.9	14.7	12.6	10.4	7.7	16.1	12.3	9.2	7.8	7.5	7.8	13.0	12.5	9.4	7.5	7.7	7.1
1983	20.3	19.5	17.8	16.7	20.9	20.5	16.0	16.6	14.1	9.5	8.5	15.0	14.9	10.8	9.2	9.0	8.3	N/A	N/A	N/A	N/A	N/A	N/A
1984	18.6	18.5	17.2	14.7	18.6	18.6	15.5	15.5	13.9	8.7	7.3	15.4	13.0	10.0	8.8	6.9	6.4	10.0	9.1	7.5	7.5	7.5	7.4
1985	19.3	18.8	18.5	16.5	19.1	19.0	16.9	15.4	15.6	13.6	9.1	16.4	14.6	13.6	11.6	9.8	8.2	16.2	14.4	13.8	10.4	9.2	8.1
1986	16.9	17.8	16.0	15.5	17.3	17.4	15.0	13.3	14.0	12.3	8.5	17.2	13.1	10.6	9.7	9.0	8.4	11.4	11.0	10.2	9.9	8.9	7.8
1987	16.4	16.7	16.7	16.3	19.2	18.7	13.5	13.1	12.9	7.0	6.1	12.7	7.8	6.4	5.4	5.0	5.1	N/A	8.6	6.4	6.2	5.6	4.9
1988	16.0	16.2	15.5	14.3	16.1	16.7	13.0	12.7	12.9	7.3	5.7	15.1	11.0	9.6	8.1	6.6	5.9	N/A	10.7	10.1	8.5	6.9	6.4
1989	19.3	18.9	17.2	14.9	19.0	18.3	15.7	16.7	11.9	5.6	4.5	12.0	8.9	8.1	7.5	6.8	5.1	13.0	11.2	9.6	8.5	7.7	6.8
1990	19.0	19.0	18.4	17.5	20.5	20.3	17.3	16.7	16.4	11.5	9.5	17.9	16.3	14.2	10.3	9.1	7.2	14.6	11.6	10.9	10.5	9.1	7.8
1991	19.6	19.2	18.6	18.1	19.5	19.7	17.2	16.8	16.1	13.7	10.7	16.4	16.2	13.8	13.3	10.5	9.0	16.6	N/A	12.1	10.2	8.9	8.5
1992	18.2	18.0	17.6	16.5	19.6	19.4	15.3	12.8	13.2	7.7	6.5	14.1	12.0	8.7	7.7	6.7	6.2	11.7	10.0	9.4	8.0	6.8	6.2
1993	17.1	17.5	16.9	16.2	18.1	19.4	13.9	16.6	14.2	8.4	7.0	13.6	12.4	8.8	8.3	7.7	6.9	12.6	11.0	9.0	8.8	8.0	6.9
1994	18.2	18.1	17.2	16.6	18.8	18.9	16.6	16.3	15.9	14.1	12.6	16.4	16.6	15.5	14.8	10.6	9.7	15.8	15.2	13.4	12.4	10.1	9.8
1995	N/A	N/A	N/A	N/A	19.2	19.4	13.7	11.7	10.7	8.7	8.3	12.8	11.7	10.4	9.8	8.8	9.2	14.9	13.0	10.3	9.3	8.6	8.5
1996	18.8	16.8	17.6	16.5	18.2	18.6	16.2	17.0	15.3	10.2	8.2	16.6	15.4	13.5	13.0	9.4	8.6	16.5	16.2	12.8	10.0	8.3	8.0
1997	18.4	18.6	17.5	17.7	20.2	19.7	16.4	17.2	14.3	9.3	8.3	17.4	16.3	11.4	9.3	8.9	8.1	16.5	15.4	13.3	9.8	8.2	8.3
1998	18.7	18.1	16.6	15.2	19.0	19.4	15.4	14.9	13.8	6.3	6.5	14.3	10.7	9.4	8.8	6.4	5.7	13.9	10.8	8.4	7.9	6.8	N/A
1999	20.3	19.8	19.3	18.2	19.9	19.9	18.1	16.0	14.9	9.2	7.7	16.2	12.2	10.2	9.5	8.4	7.8	14.6	11.8	10.4	9.7	8.6	8.7
2000	18.9	18.7	17.0	16.2	20.4	20.0	18.0	17.3	16.6	10.4	9.4	18.5	17.7	12.4	10.1	9.2	8.8	16.7	15.1	11.0	10.4	9.7	8.9
2001	19.5	19.3	17.8	16.9	20.7	20.2	15.2	16.2	12.2	7.9	6.5	16.2	10.7	8.7	7.4	6.6	6.4	10.9	8.7	8.5	7.3	6.8	6.9
2002	19.4	19.2	17.0	16.8	20.4	20.3	18.1	16.8	16.5	10.7	9.4	18.8	18.1	14.4	12.6	10.1	8.7	17.9	16.7	12.5	10.2	9.2	8.1
2003	20.2	19.0	18.6	18.0	20.0	19.4	15.8	15.6	14.7	9.7	8.7	15.0	10.9	8.3	7.7	7.5	6.8	14.4	11.6	10.5	8.6	7.3	7.2
2004	17.5	17.4	16.7	15.5	18.0	17.6	14.7	13.2	11.2	7.5	6.7	12.0	9.2	8.4	7.3	6.8	6.1	14.0	12.2	9.1	8.0	7.5	6.3
2005	20.9	20.0	18.1	17.5	20.3	21.2	16.1	15.9	16.6	7.5	6.5	16.2	10.3	7.5	6.7	6.2	5.9	11.6	10.4	8.8	6.9	6.0	5.5
2006	18.9	18.6	17.0	16.5	19.5	19.3	17.0	16.3	15.8	10.1	8.7	16.4	14.1	11.1	10.7	9.1	7.9	17.2	16.4	11.8	10.0	8.4	7.7
2007	18.4	19.0	18.1	15.3	19.9	20.3	16.8	16.3	14.5	8.2	8.7	16.8	12.8	8.8	7.6	6.8	6.1	11.1	10.3	8.7	7.4	6.7	6.6
2008	19.8	20.1	19.1	18.2	20.8	20.2	18.2	16.9	14.3	8.4	7.7	19.8	19.2	12.0	9.4	8.4	7.4	15.4	13.3	10.7	8.9	8.4	7.6
2009	19.0	18.7	17.8	17.6	19.3	19.1	17.2	16.8	17.9	14.6	10.0	17.4	15.8	13.3	12.0	9.5	8.4	16.9	17.2	16.2	11.3	8.9	7.5
2010	18.7	18.5	17.1	16.3	19.6	19.7	17.3	17.0	15.1	10.9	8.9	15.9	15.6	13.5	9.6	8.0	7.7	13.8	11.7	10.5	9.1	8.5	8.0
2011	19.7	19.8	17.7	16.6	20.7	19.9	17.1	16.2	16.4	13.9	9.0	15.0	13.1	10.3	9.9	9.3	8.5	15.6	15.0	13.5	11.8	9.0	8.0
2012	19.6	20.2	18.8	17.8	20.3	21.3	17.0	17.3	19.4	9.0	8.3	11.8	10.4	9.5	8.9	8.8	8.5	13.0	11.8	10.4	9.6	8.9	8.9
2013	18.2	18.5	17.6	15.7	20.8	20.3	16.5	16.6	15.7	9.5	9.0	15.9	11.2	9.7	9.0	8.6	8.4	14.2	12.5	11.2	9.9	8.8	7.9
2014	20.3	20.4	19.0	17.2	21.2	20.5	17.9	15.6	16.3	8.9	7.8	16.8	12.7	9.0	8.1	7.3	6.9	11.3	11.1	9.1	8.4	7.9	7.3
2015	21.5	20.7	18.9	16.2	20.9	20.1	18.7	16.2	15.9	10.0	9.2	15.7	14.5	10.3	9.7	8.7	7.8	16.9	12.5	11.7	9.7	8.4	7.7
2016	21.1	20.4	18.3	16.8	21.2	21.2	18.2	18.2	18.8	12.5	10.4	19.3	17.7	16.0	13.0	9.9	9.4	18.3	17.7	14.3	10.9	10.1	13.4
2017	19.9	19.2	18.4	16.6	19.4	19.3	16.1	15.2	14.3	9.1	8.2	15.5	16.2	10.0	8.8	7.6	7.2	12.8	10.3	8.7	8.0	7.7	6.9
2018	21.3	20.3	19.9	19.0	21.7	21.2	17.9	16.5	16.6	11.0	10.4	18.7	14.8	11.3	11.0	10.3	10.0	16.0	14.7	12.1	11.2	10.8	9.2
2019	20.5	19.9	18.0	17.0	18.7	19.5	18.1	18.4	16.8	11.3	10.0	17.3	14.0	9.6	8.8	8.1	8.1	15.7	15.6	12.9	10.2	8.3	N/A
Median	19.0	18.7	17.6	16.5	19.6	19.5	16.3	16.2	14.8	9.5	8.5	16.2	13.0	10.1	9.2	8.5	7.9	14.2	12.0	10.5	9.5	8.4	7.8
Mean	18.9	18.7	17.6	16.5	19.5	19.4	16.2	15.8	14.8	9.8	8.4	15.9	13.5	10.7	9.6	8.3	7.7	14.2	12.6	10.7	9.3	8.3	7.8
Maximum	21.5	20.7	19.9	19.0	21.7	21.3	18.7	18.4	19.4	14.6	12.6	19.8	19.2	16.0	14.8	11.9	10.0	18.3	17.7	16.2	12.4	11.8	13.4
Minimum	16.0	16.2	14.7	14.3	16.1	16.1	13.0	11.7	10.7	5.6	4.5	11.3	7.8	6.4	5.4	5.0	5.1	10.0	8.6	6.4	6.2	5.6	4.9

**Table 2. Stratum mean bottom temperatures recorded on the MDMF fall survey, 1978 – 2019.**

# **Stratum Mean Bottom Water Temperature Observations MDMF Spring Survey, 1978-2019**

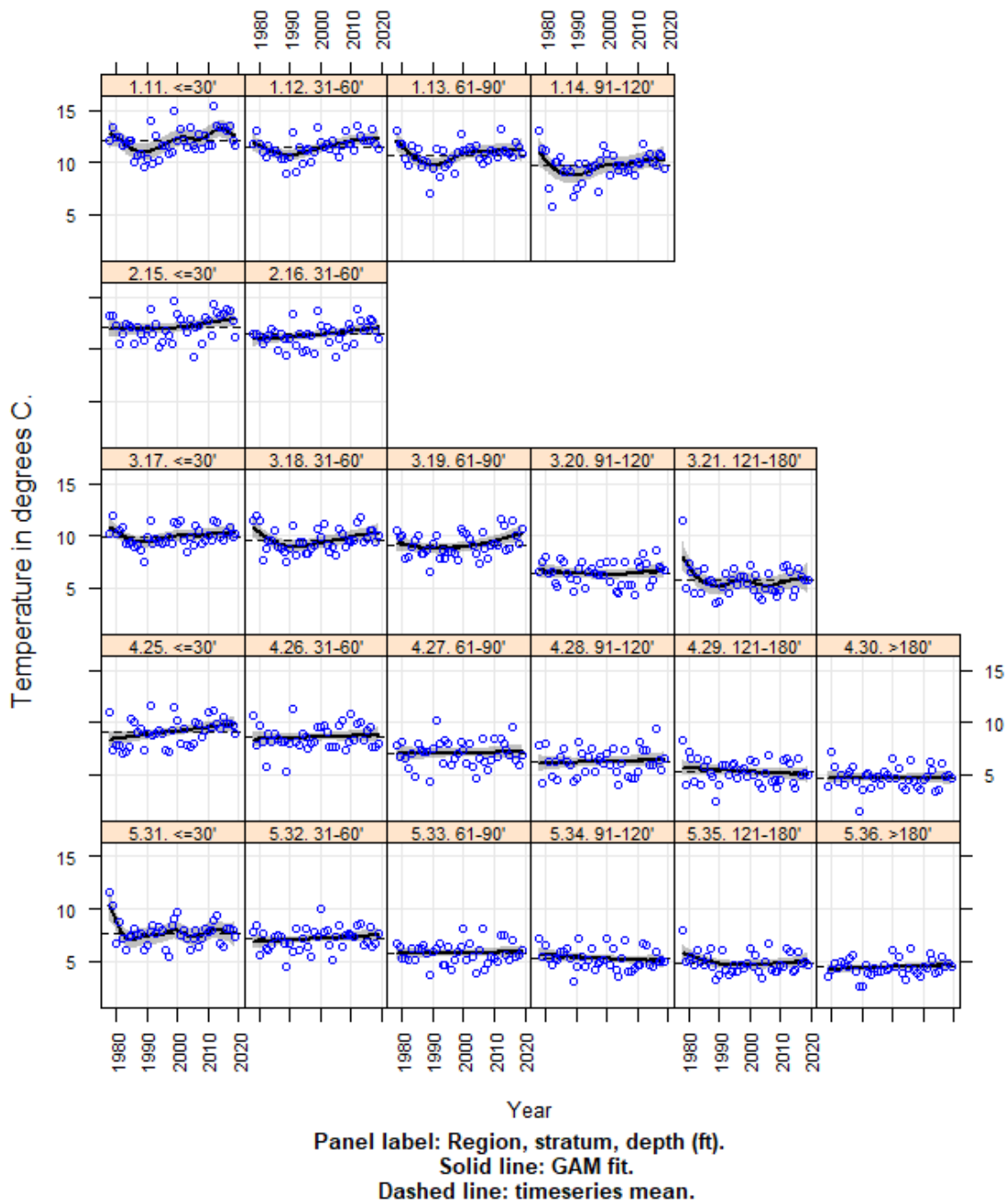


Figure 1.

# **Stratified Mean Bottom Temperature by Region. MDMF Spring Trawl Survey, 1978 - 2019.**

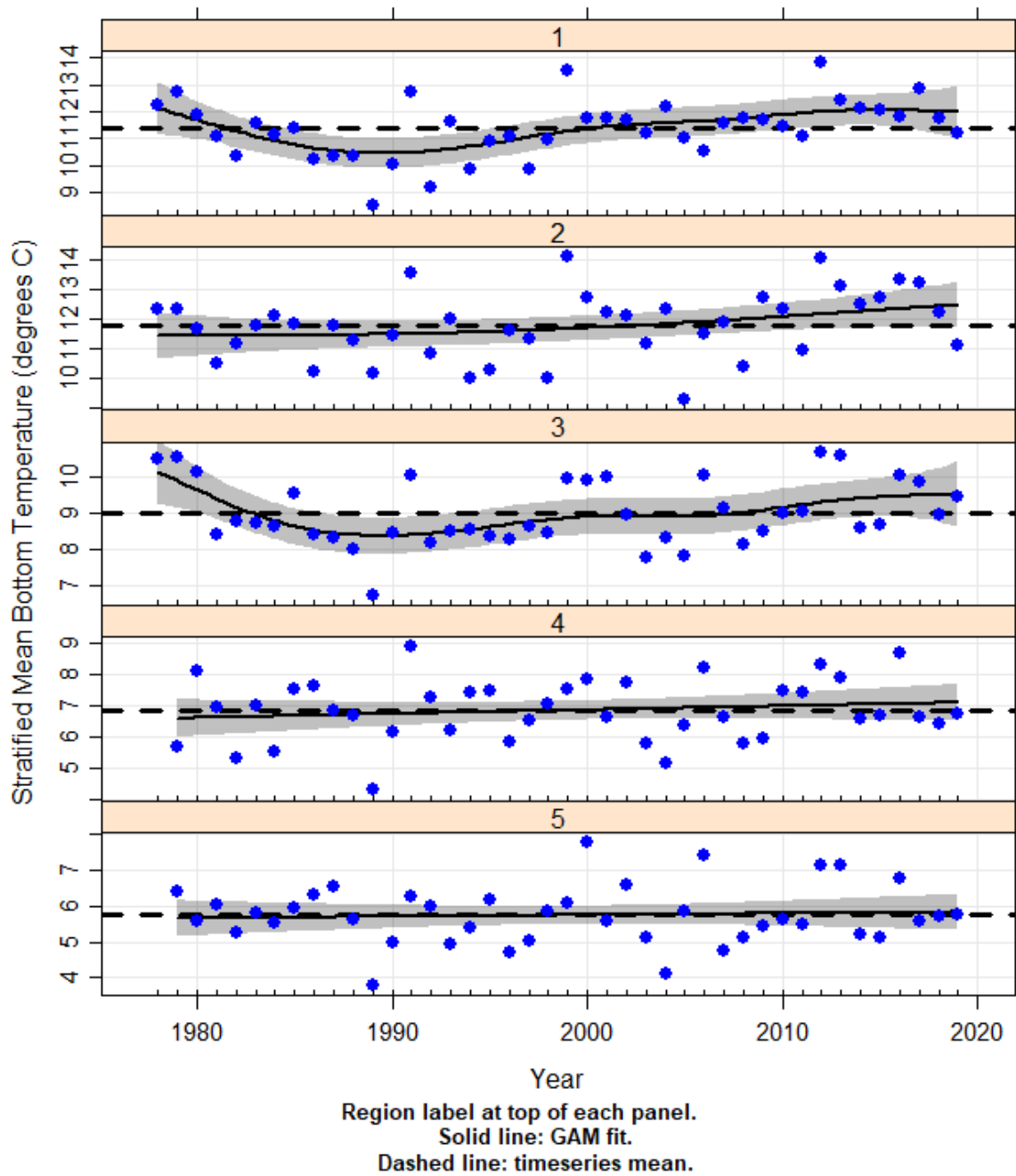


Figure 2.

# **Stratum Mean Bottom Water Temperature Observations** **MDMF Fall Survey, 1978-2019**

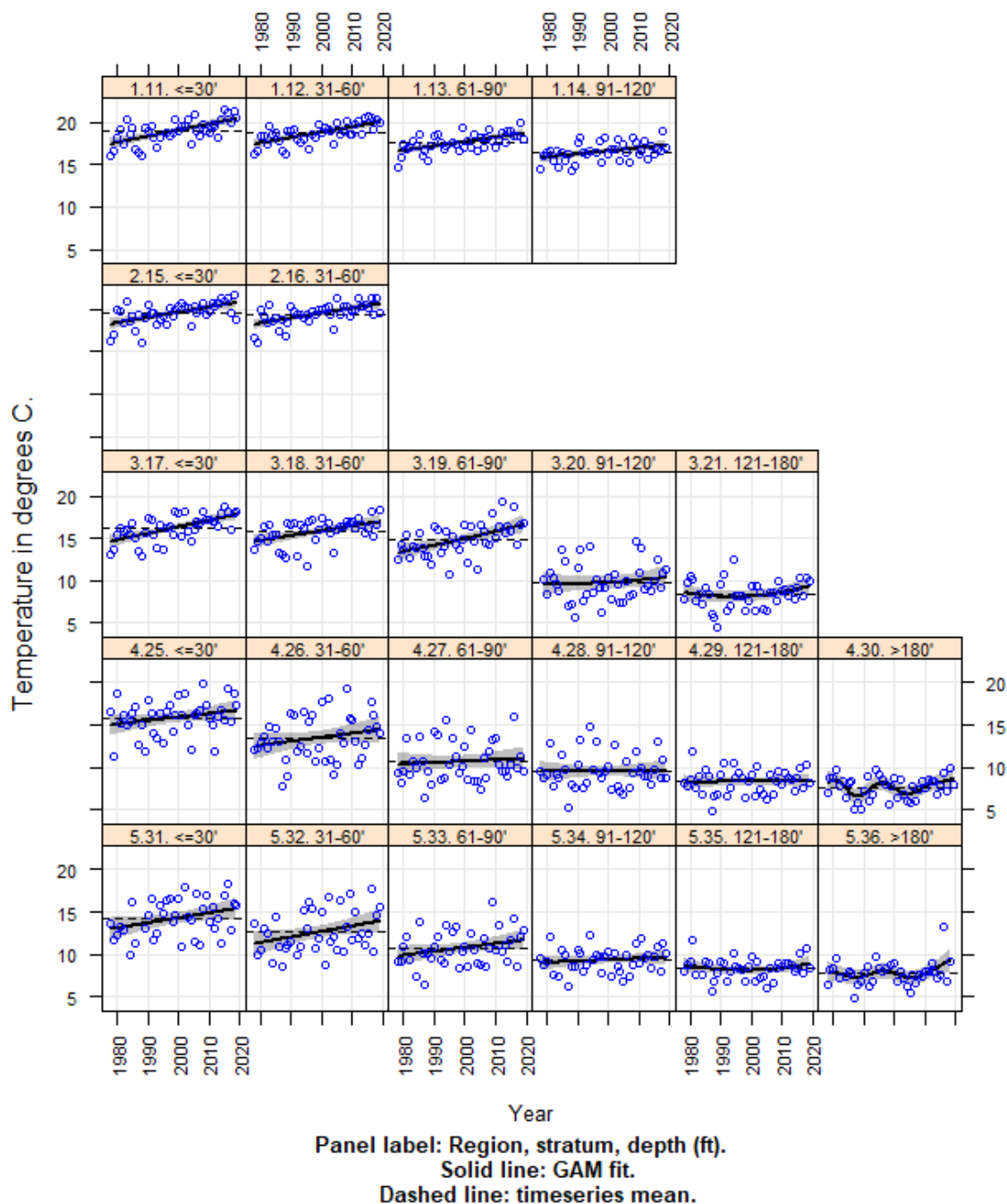


Figure 3.

**Stratified Mean Bottom Temperature by Region.  
MDMF FALL Trawl Survey, 1978 - 2019.**

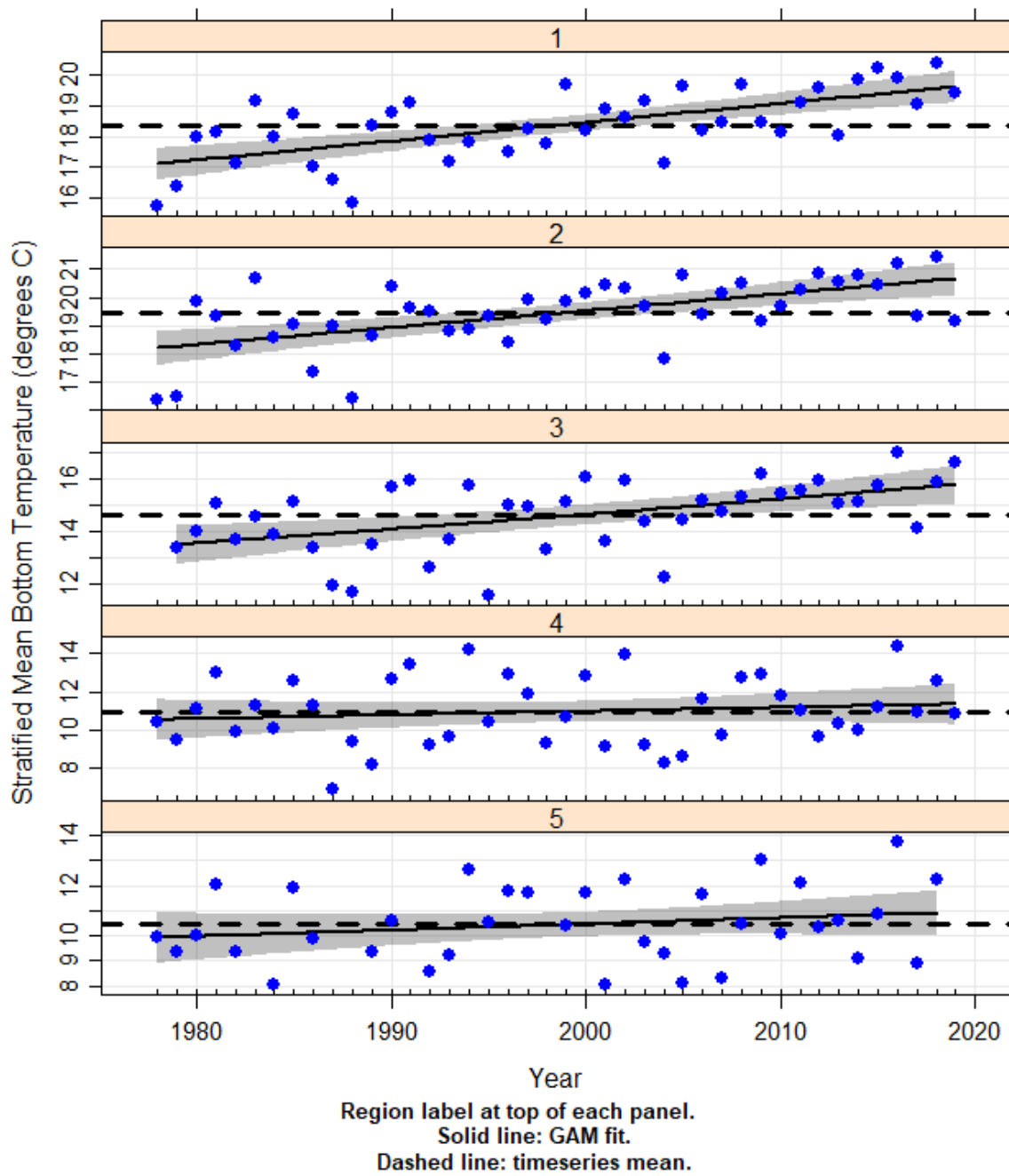


Figure 4.

# Appendix C. Corrections to the trawl survey database in 2020

Desspeed errors in UNION_FSCS_SVSTA. Completed 1/8/2020 Camisa			
CRUISE6	STATIONS	DESSPEED READS	DESSPEED SHOULD READ
201191	1-104	3.8	2.5
201891	1-105	3.8	2.5
201792	1-99	3.8	2.5
201892	1-95	3.8	2.5
201991	1-108	null	2.5

Trashcount errors in UNION_FSCS_SVCAT. Completed 1/8/2020 Camisa.							
DB READS				DB SHOULD READ			
CRUISE6	STATION	SVSPP	EXPCATCHNUM	EXPCATCHWT	SVSPP	EXPCATCHNUM	EXPCATCHWT
201792	70	998	5	13.53	998	0	13.53

Duplicate Barcode ID errors in UNION_FSCS_SVBIO. Completed 1/8/2020 Camisa.								
CRUISE6	STATION	SVSPP	INDID	LENGTH	WEIGHT	SEX	MATURITY	AGE_DATA_FLAG
201891	20	105	1	41	0.635	2 D	Y	deleted this row
201891	21	106	12	32	0.421	2 S	null	set age data flag to Y
201892	64	105	3	36	0.334	2 T	Y	deleted this row

Lat/Lon corrections in UNION_FSCS_SVSTA. Completed 1/8/2020 Camisa.							
Database reads							
Cruise6	Station	Beglat	Beglon	decdeg_beglat	decdeg_beglon	dopdist	towdur
201692	33	4155.9178	7006.8235	41.931963	-70.113725	0.36	9
Database should read							
Cruise6	Station	Beglat	Beglon	decdeg_beglat	decdeg_beglon	dopdist	towdur
201692	33	4156.1312	7006.7562	41.935552	-70.112603	0.54	15

1/10/2020. Millimeter length issues in UNION\_FSCS\_SVLEN and UNION\_FSCS\_SVBIO

During the fall 2019 audit, we discovered several American lobster and Jonah crab lengths recorded in hundredths of millimeters that were supposed to be recorded in tenths of centimeters. A thorough investigation revealed that this happened on Jonah crabs and American lobsters between 201891 and 201992 due to an incorrect FSCS2 DMF protocol while using electronic calipers. 121 rows of Jonah crab length frequencies need to be update in 201792, 28 rows in 201891, 284 rows in 201892 and 51 rows in 201991. 444 rows of female and 455 rows of male American lobster length frequencies need to be updated in 201991. In addition, 3 jonah crab and 6 American lobster expcatchnum values needed to be updated after short tow, mix and sub-sample expansions were applied to the corrected length frequencies. Jonah crab lengths and expcatchnum values were corrected in UNION\_FSCS\_SVLEN and UNION\_FSCS\_SVCAT between 1/10/2020 and 2/20/2020. American lobster lengths and expcatchnum values were corrected in UNION\_FSCS\_SVLEN and UNION\_FSCS\_SVCAT between 1/14/2020 and 1/15/2020. All the 201992 lengths were addressed for both species during the audit process.

For a detailed spreadsheet of the Jonah crab or American lobster database corrections in 2020, please contact

Matthew J Camisa  
Senior Marine Fisheries Biologist  
Resource Assessment Project  
MA Division of Marine Fisheries  
836 South Rodney French Boulevard  
New Bedford, MA 02744  
Phone 508-742-9743  
Fax 508-990-0449  
[matt.camisa@state.ma.us](mailto:matt.camisa@state.ma.us)

Mantis shrimp correction in UNION_FSCS_SVCAT. Completed 8/5/2020 Camisa									
database reads					database should read				
CRUISE6	STATION	SVSPP	EXPCATCHNUM	EXPCATCHWT	CRUISE6	STATION	SVSPP	EXPCATCHNUM	EXPCATCHWT
198691	94	323	1	null	198691	94	323	1	0.036

Ladycrab correction in UNION_FSCS_SVCAT. Completed 8/5/2020 Camisa									
database reads					database should read				
CRUISE6	STATION	SVSPP	EXPCATCHNUM	EXPCATCHWT	CRUISE6	STATION	SVSPP	EXPCATCHNUM	EXPCATCHWT
201691	13	322	0	null	201691	13	322	97	12.25