

# Massachusetts Division of Marine Fisheries Inshore Bottom-Trawl Survey

Northeast Trawl  
Advisory Panel  
16 December, 2015



**Marine Fisheries**  
Commonwealth of Massachusetts



# Outline

- Briefly describe the data (coverage, species, protocols, data available, analysis etc.)
- Discuss to what extent the data are currently used in assessments, if at all
- Discuss the potential for usage and potential roadblocks/considerations
- Consider any potential additions that might enhance the value to the stock assessments.

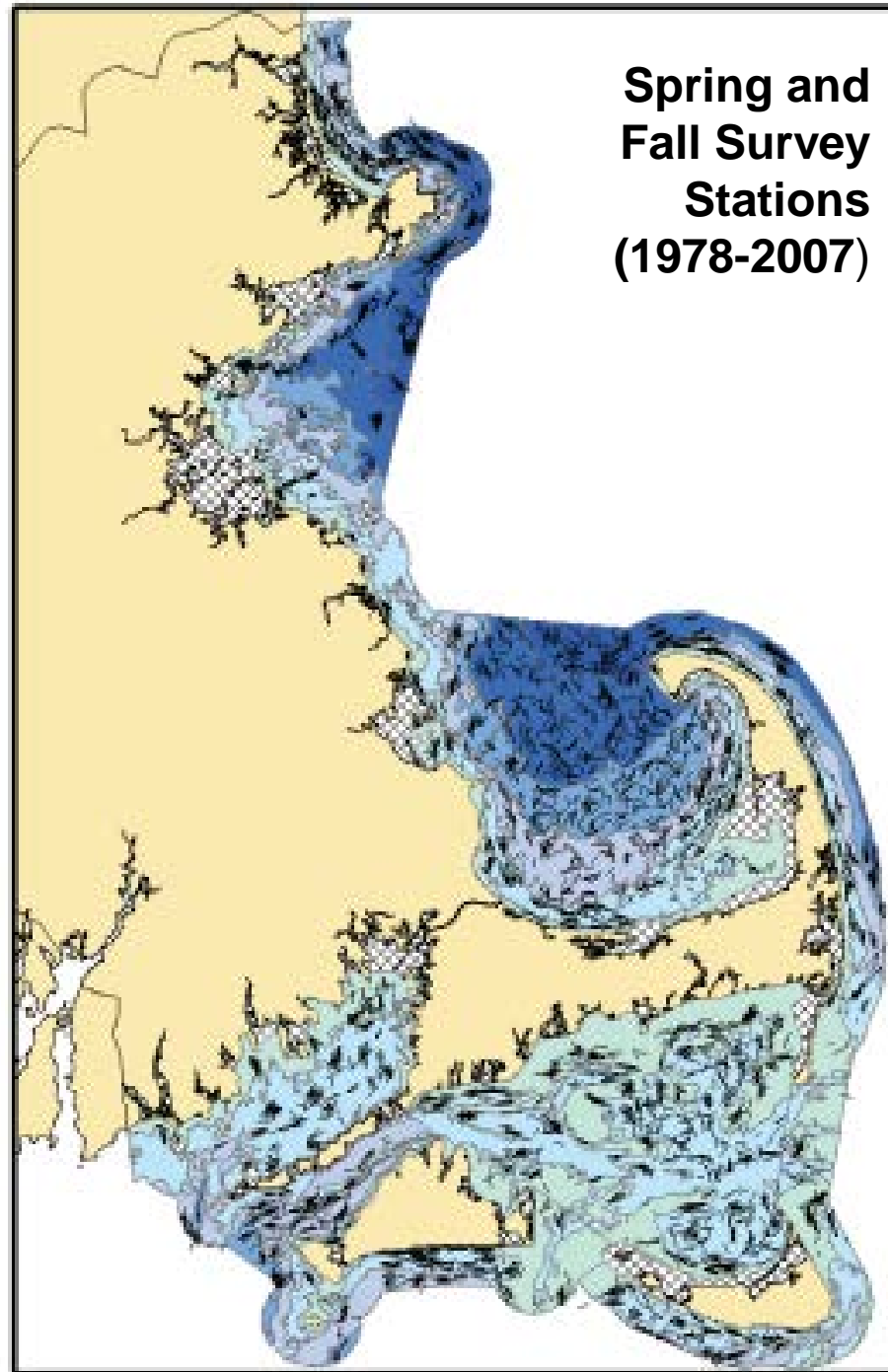
# Mission

- Quantifying the distribution, relative abundance, and size composition of finfish and select invertebrates within the territorial waters of Massachusetts (inclusive of Nantucket Sound)
- Core function of the Division of Marine Fisheries
- Continuously conducted since 1978

# Coverage

- State waters plus center of Nantucket Sound, by agreement.
- Some areas are excluded permanently due to depth restrictions (hatched)
- Absences due to known hangs, hard bottom, and other features
- Assignment proportionally by area of stratum
- Stations are randomly assigned within each stratum (range: 2-11 sta/stratum)
- Approx. 1 station per 19 sq. nm
- Approx. 100 stations/survey
- Spring (May) as adults arrive to spawn
- Fall (September) as juveniles prepare to migrate

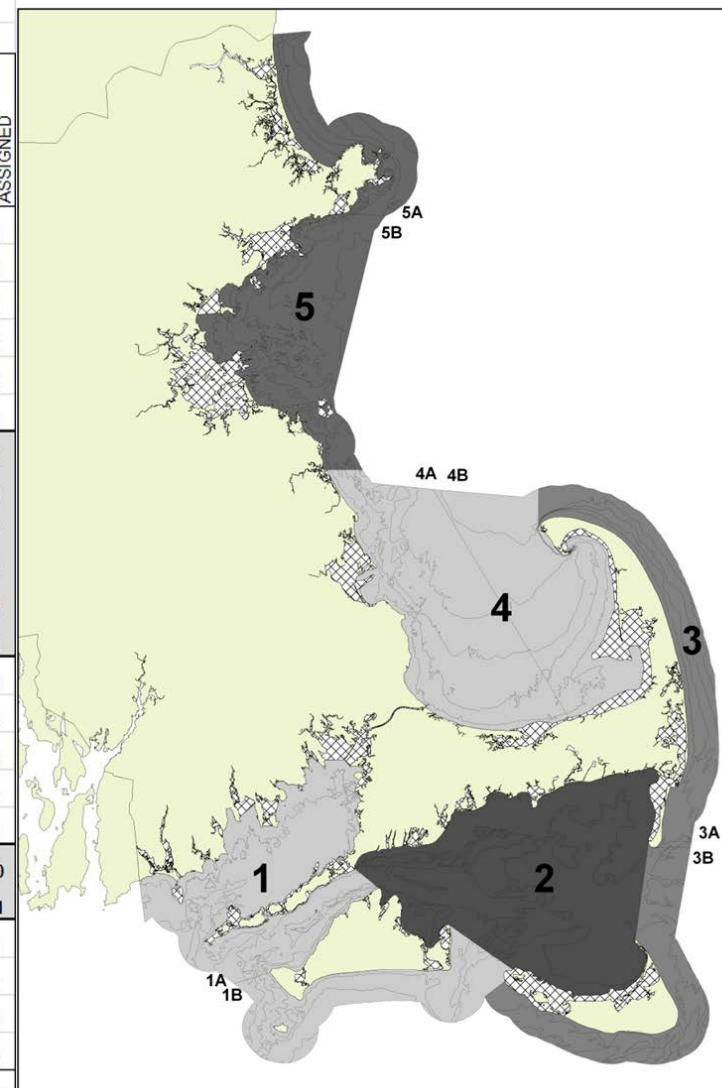
**Spring and  
Fall Survey  
Stations  
(1978-2007)**



# Strata

- Five bio-geographic regions
- Six depth zones (30 m/zone)
- Also subregions (A/B) only to ensure spatial coverage
- 23 strata
- Stratum areas range from 20-210 sq nm

MADMF TRAWL SURVEY						
STATION ASSIGNMENT BY STRATUM						
REGION	STRATUM	DEPTH (METERS)	DEPTH (FEET)	SUBSTRATUM A	SUBSTRATUM B	# STATIONS ASSIGNED
5	31	0 - 9.1	0 - 30	2	1	3
	32	9.2 - 18.3	31 - 60	1	2	3
	33	18.4 - 27.4	61 - 90	2	2	4
	34	27.5 - 36.6	91 - 120	2	2	4
	35	36.7 - 54.9	121 - 180	2	3	5
	36	>=55.0	>180	1	1	2
4	25	0 - 9.1	0 - 30	2	2	4
	26	9.2 - 18.3	31 - 60	3	2	5
	27	18.4 - 27.4	61 - 90	3	2	5
	28	27.5 - 36.6	91 - 120	3	2	5
	29	36.7 - 54.9	121 - 180	3	2	5
	30	>=55.0	>180	0	2	2
3	17	0 - 9.1	0 - 30	2	3	5
	18	9.2 - 18.3	31 - 60	2	3	5
	19	18.4 - 27.4	61 - 90	1	1	2
	20	27.5 - 36.6	91 - 120	2	0	2
	21	36.7 - 54.9	121 - 180	2	0	2
	22	>=55.0	>180	0	0	0
2	15	0 - 9.1	0 - 30	10		10
	16	9.2 - 18.3	31 - 60	11		11
1	11	0 - 9.1	0 - 30	3	2	5
	12	9.2 - 18.3	31 - 60	5	2	7
	13	18.4 - 27.4	61 - 90	3	2	5
	14	27.5 - 36.6	91 - 120	1	1	2
TOTAL STATION ASSIGNMENT						103



# Protocols

- Daytime only; runs continuously if possible until complete
- Stations are assessed for presence of fixed gear
- If unoccupiable, pre-selected alternate station is attempted
- Goal is 20 minutes at 2.5 knts
  - Acceptable if:  $\geq 13$  minutes OR if lots of dogfish (dogfish index only)
  - Data are expanded to 20 minutes (assumption of linearity)
- Data quality: 3 digit Station-Haul-Gear (SHG) code
  - Station: 1 if successfully occupied (random, stratified)
  - Haul: 1-7 – relative success (length, ghost gear,...)
  - Gear: 1-9 - damage to gear recorded
  - If SHG  $\leq 136$ , representative
  - If SHG is  $> 136$ , data are excluded from most indices, except dogfish
- Follow NEFSC sampling protocols
- Catch is sorted by species (and sex for crabs, sharks), weighed, and otoliths, scales, or both are taken for select species. Maturity also assessed.
  - FSCS 1.6 – electronic data recording
  - Special requests from researchers

# Gear & Vessels

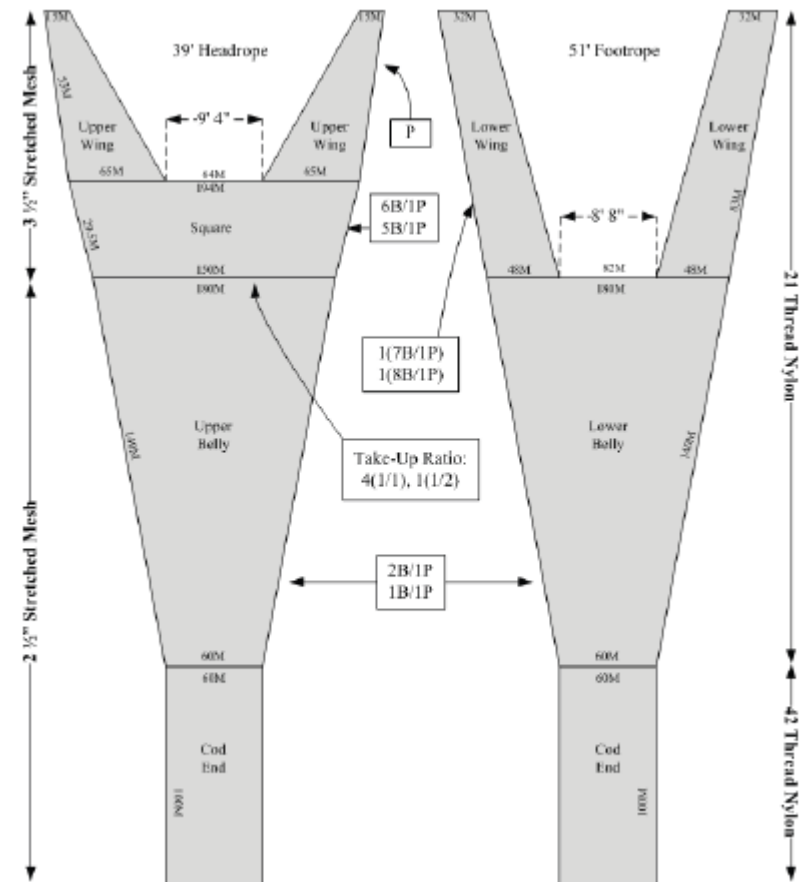
- F/V Frances Elizabeth (1978 – 1981)
- R/V Gloria Michelle (1982 – present)
- $\frac{3}{4}$  size Yankee (whiting) trawl: 39 ft HR/51 ft FR
- 3.5 inch cookie sweep
- Wooden, low aspect Tomkiewicz doors
- (325 lb; 72 in x 40 in)
- 0.25 in codend
- 63 ft of 3/8 in chain in bottom legs and 60 ft of 3/8 wire top legs
- No net mensuration; no flume tank modeling (yet); area swept is crudely estimated



F/V Frances Elizabeth



R/V Gloria Michelle



# Species

## Spring

- Abundances (>25,000)
  - Scup
  - Pollock
  - Northern sand lance
  - Longhorn sculpin
  - Atlantic cod
- Weights (>300,000)
  - Scup
  - Black sea bass
  - Longhorn sculpin
  - Northern sea robin
  - Winter flounder

## Fall

- Abundances (>10,000 kg)
  - Scup
  - Longfin squid
  - Butterfish
  - Black sea bass
  - Bay anchovy
- Weights (>500,000 kg)
  - Spiny dogfish
  - Scup
  - Butterfish
  - Little skate
  - Winter fl.



# Data

- Data are entered in NEFSC FSCS system on deck
- Audited by DMF personnel
- Loaded into SVDBS at NEFSC
- Accessed by stock assessors or others from there
- Mid-Atlantic species data provided to MA DMF assessors and Mid-Atlantic partners
- Annual report posted to MA DMF website
- Develop indices of stratified mean weight and number per tow and other overall measures of abundance
- Historical performance of survey documented in a MA DMF Technical Report, available on website

# Use in Assessments - NEFSC

NEFSC, 2015

Table 3: Data used in each assessment. The column heads are US commercial landings (US c-land), US commercial discards (US c-disc), US recreational landings (US r-land), US recreational discards (US r-disc), Canadian catch (CA catch), NEFSC spring, fall and winter surveys (NEFSC S, NEFSC F and NEFSC W), Massachusetts spring and fall surveys (MA S and MA F), Maine/New Hampshire spring and fall surveys (ME/NH S and ME/NH F) and Canadian Department of Fisheries and Oceans February survey (DFO S).

Stock	Catch					Surveys							
	US c-land	US c-disc	US r-land	US r-disc	CA Catch	NEFSC S	NEFSC F	NEFSC W	MA S	MA F	ME/NH S	ME/NH F	DFO S
CODGM	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	No	No	No	No
CODGB	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	Yes
HADGM	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No	No	No	No	No
HADGB	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No	No	No	Yes
YELCCGM	Yes	Yes	No	No	No	Yes	Yes	No	Yes	Yes	Yes	Yes	No
YELSNEMA	Yes	Yes	No	No	No	Yes	Yes	Yes	No	No	No	No	No
FLWGB	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No	No	No	Yes
FLWSNEMA	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	No	No	No
REDUNIT	Yes	Yes	No	No	No	Yes	Yes	No	No	No	No	No	No
PLAUNIT	Yes	Yes	No	No	Yes	Yes	Yes	No	Yes	Yes	No	No	No
WITUNIT	Yes	Yes	No	No	No	Yes	Yes	No	No	No	No	No	No
HKWUNIT	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No	No	No	No
POLUNIT	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No	No	No	No	No
CATUNIT	Yes	Yes	Yes	No	No	Yes	Yes	No	Yes	No	No	No	No
HALUNIT	Yes	Yes	No	No	Yes	No	Yes	No	No	No	No	No	No
FLDGMGB	Yes	Yes	No	No	No	No	Yes	No	No	No	No	No	No
FLDSNEMA	Yes	Yes	No	No	No	No	Yes	No	No	No	No	No	No
OPTUNIT	Yes	Yes	No	No	No	Yes	No	No	No	No	No	No	No
FLDWGM	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	No
YELGB	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No	No	No	Yes

# Use in Assessments - NEFSC

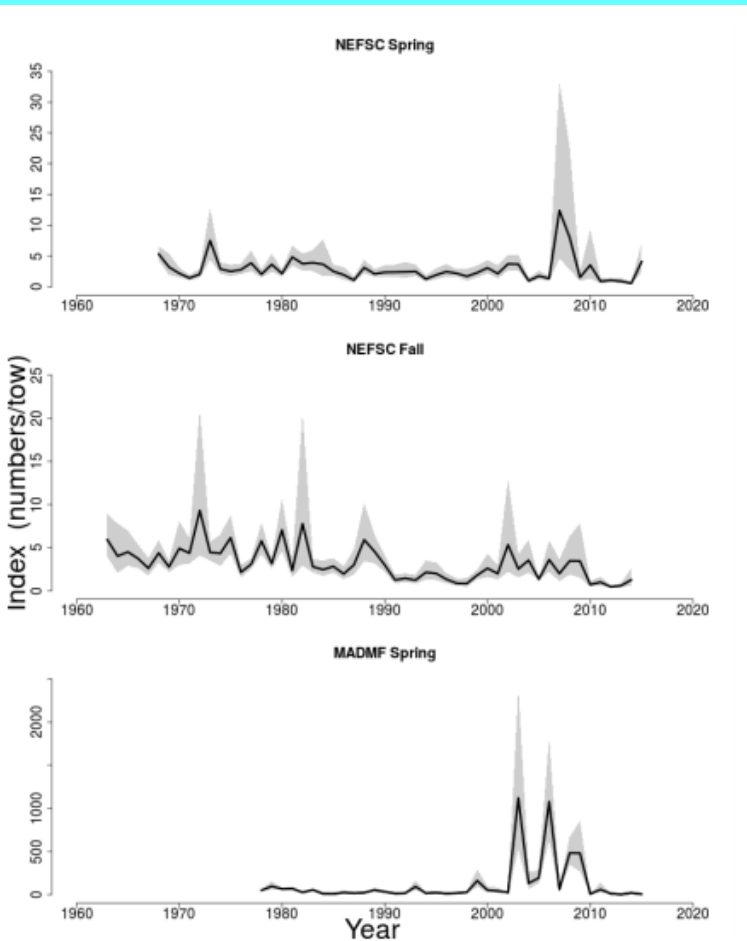
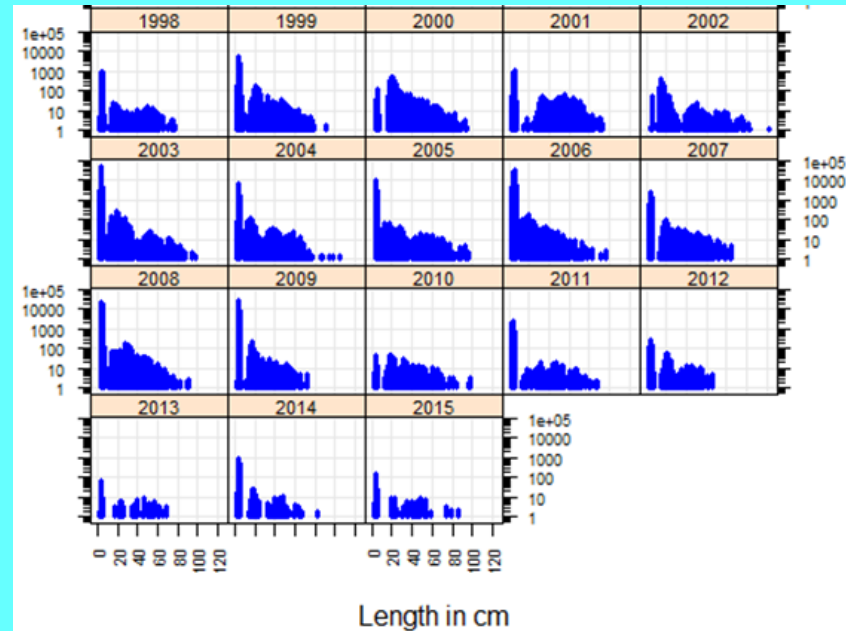
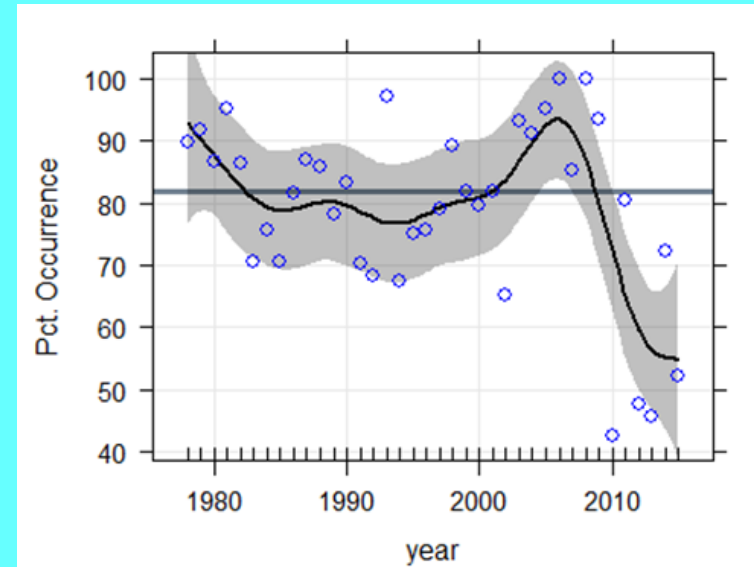


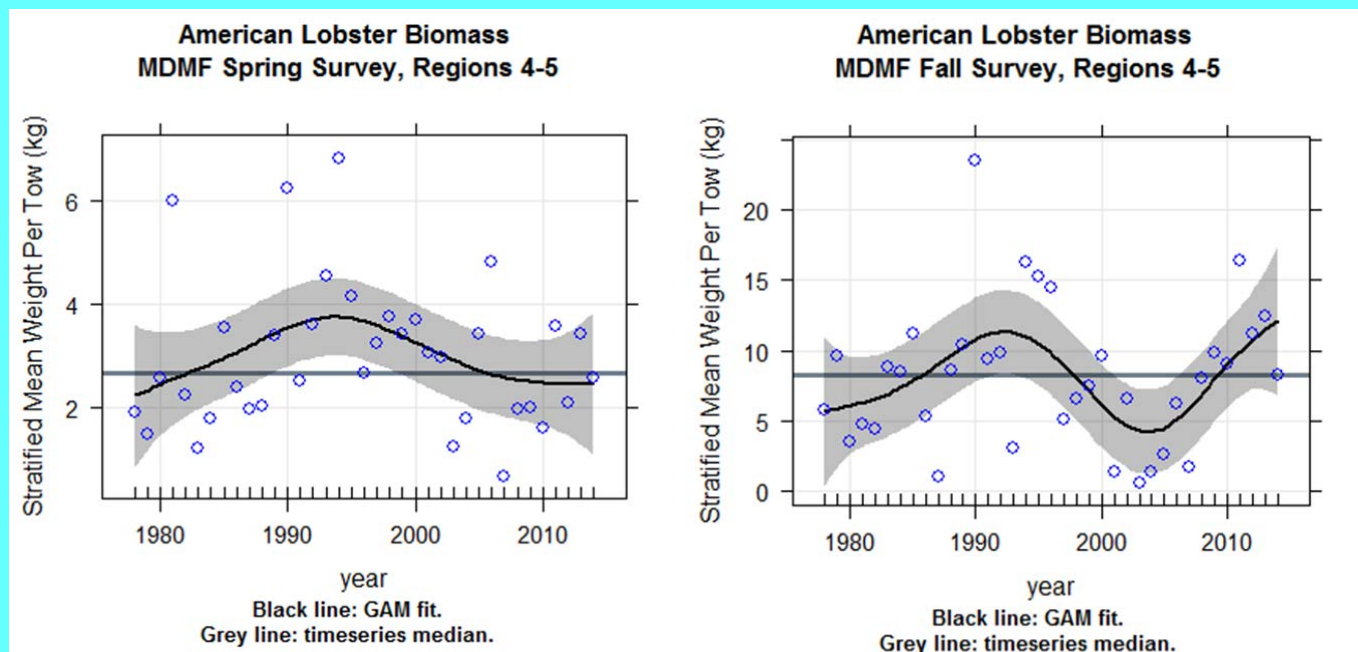
Figure 13: Indices of biomass for the Gulf of Maine Atlantic cod between 1963 and 2015 for the Northeast Fisheries Science Center (NEFSC) spring and fall bottom trawl surveys and Massachusetts Division of Marine Fisheries (MADMF) spring bottom trawl survey. The 90% lognormal confidence intervals are shown.



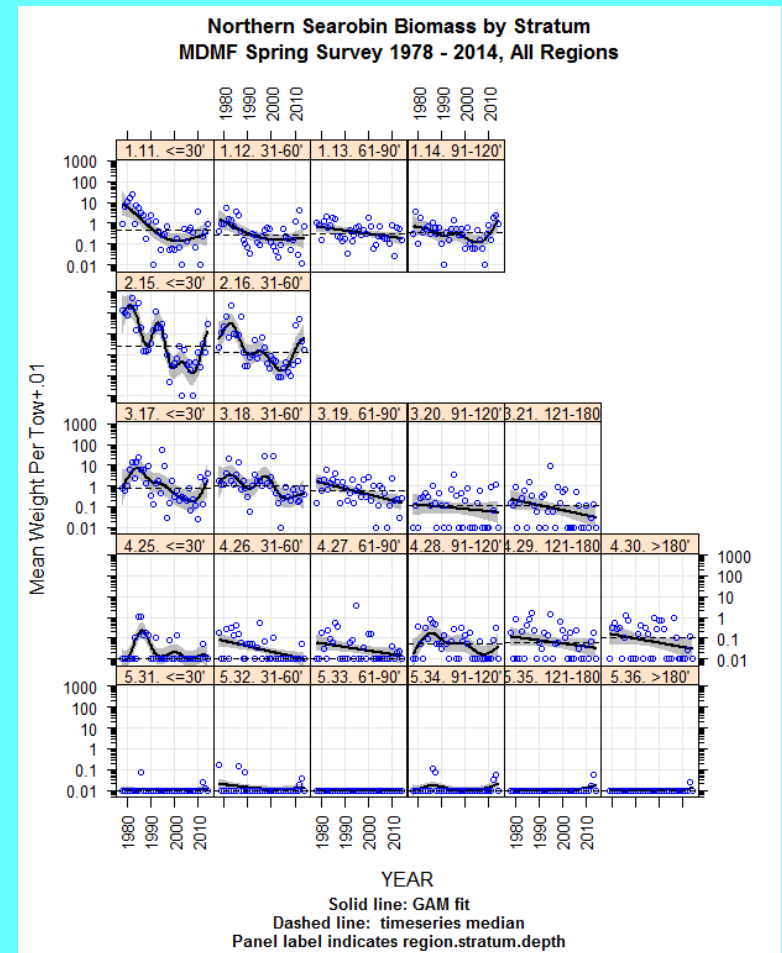
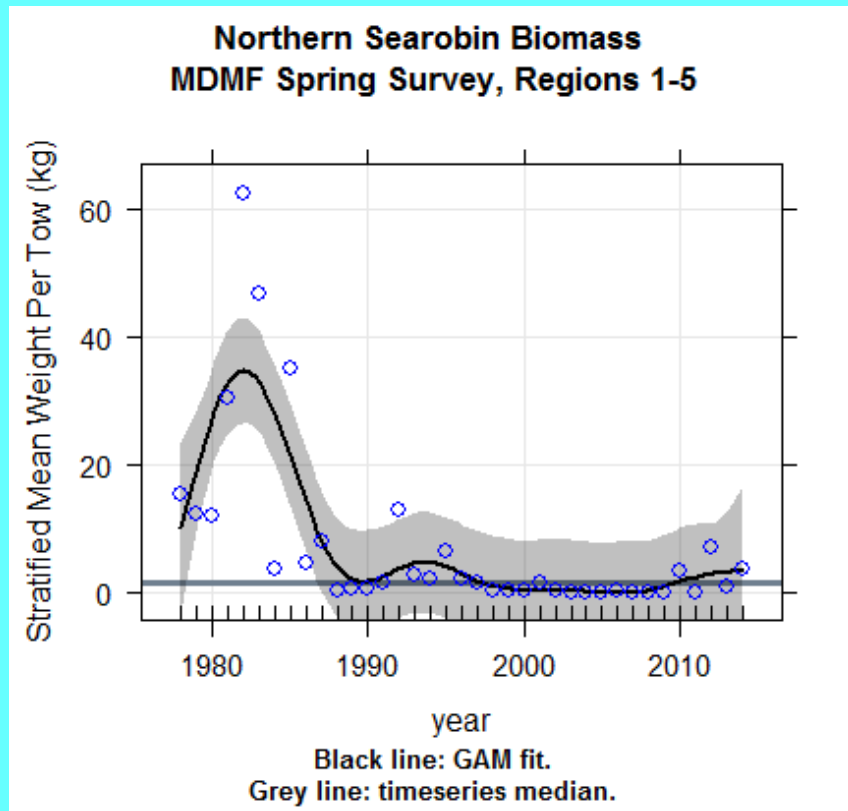
NEFSC, 2015

# Use in Assessments - Other

- Scup
- Summer flounder/fluke
- Black sea bass
- Tautog
- Lobster
- Bluefish (considered)
- Weakfish (considered)
- Horseshoe crabs

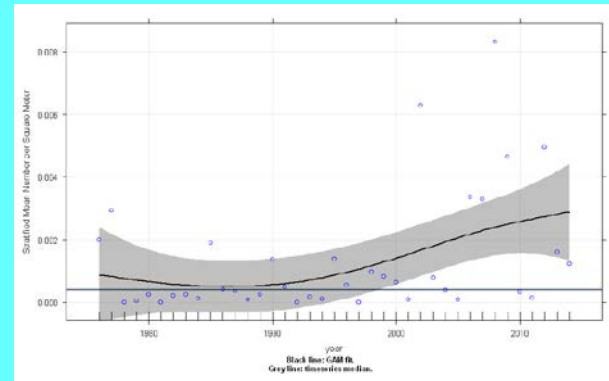
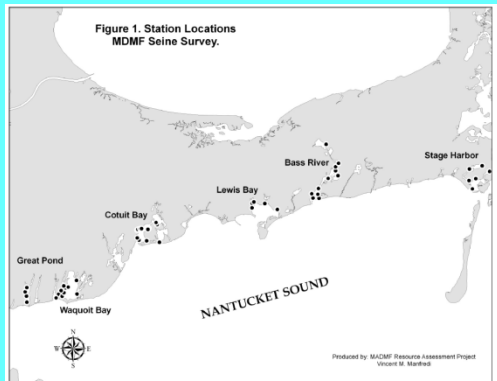


# Northern Searobin



# Other Surveys

- Beach seine juvenile survey (1975 – present)
  - YOY summer flounder/fluke
- Ventless trap survey (2005 - present)
  - Lobster recruitment
  - Black sea bass and tautog (future)
- Eel trap and river herring counts
- New! Cod IBS beginning in April



# Potential for Usage/Roadblocks

- We don't know of any, other than the data itself (species or ages not caught by our survey)

# Potential Additions

- Anything to improve quality
  - Increase sample size
  - Fixed gear issues
    - Lost stations
    - Randomness
- Newly added: own age keys for age-based assessments
- In planning: sidescan sonar for net measurements: swept area estimates
- Break or calibrate?



# Acknowledgements

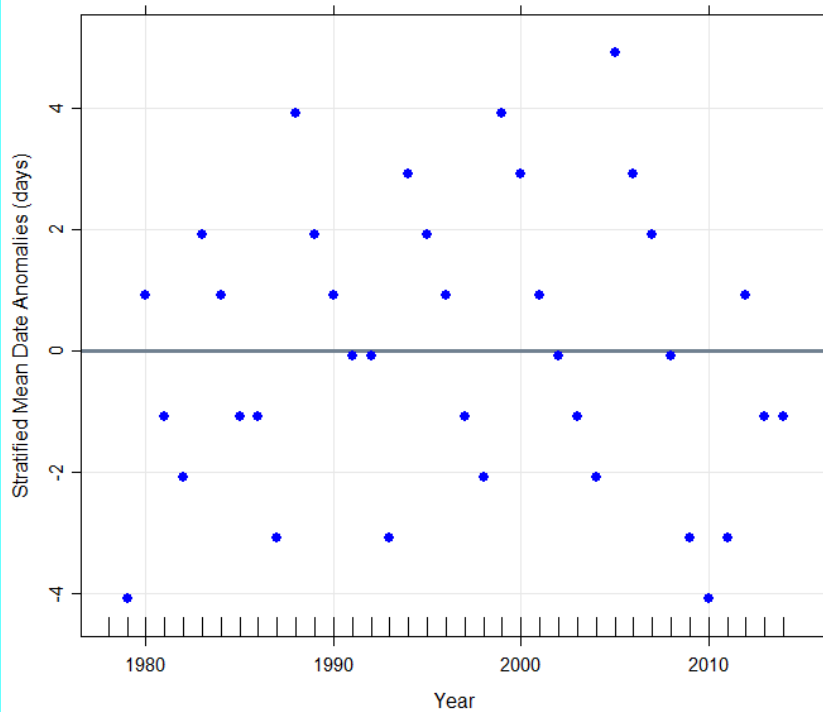
- Matt Camisa and Vin Manfredi
- OIC and crew of R/V Gloria Michelle
- NEFSC Woods Hole
- NOAA OMAO
- USFWS Sportfish Restoration Program provides 75% of funding

**Marine Fisheries**  
Commonwealth of Massachusetts



# Survey Timing

Timing of MDMF Trawl Survey Sampling  
Anomalies from Timeseries Mean  
Spring 1978-2014, Regions 1:5



Timing of MDMF Trawl Survey Sampling  
Anomalies from Timeseries Mean,  
Fall 1978-2014, Regions 1:5

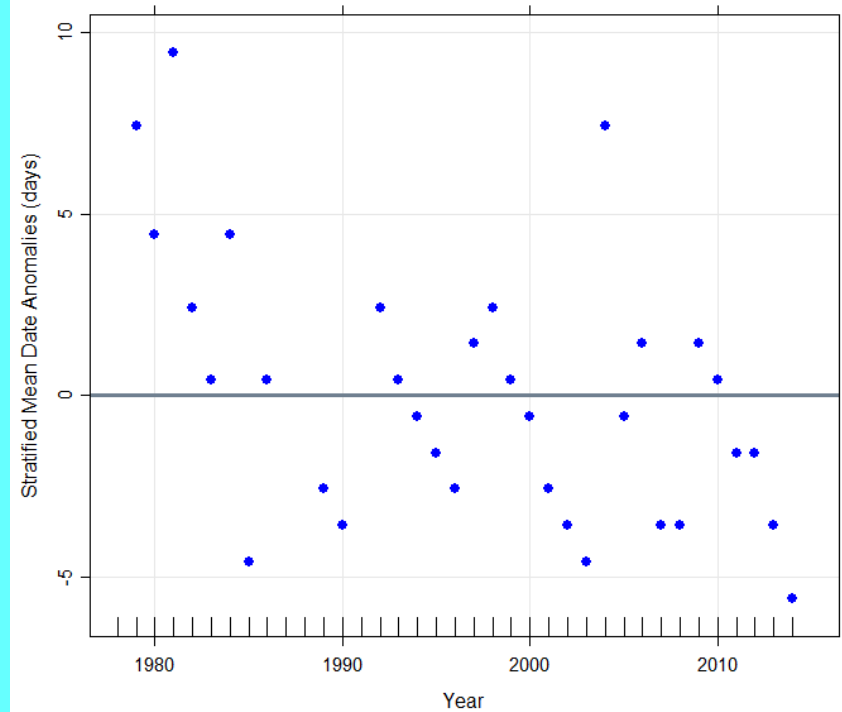
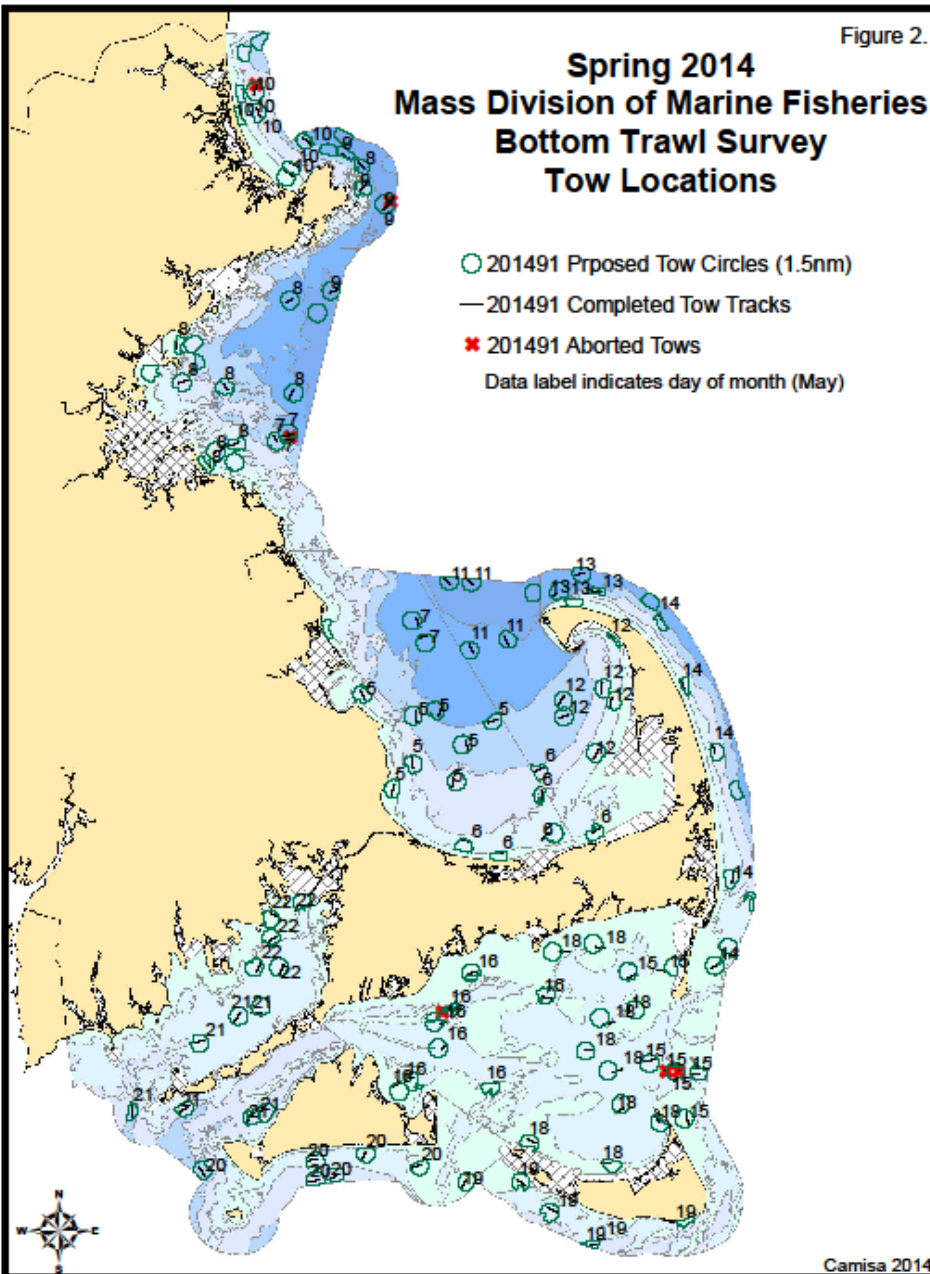


Figure 2.

### Spring 2014 Mass Division of Marine Fisheries Bottom Trawl Survey Tow Locations

- 201491 Proposed Tow Circles (1.5nm)
  - 201491 Completed Tow Tracks
  - ✖ 201491 Aborted Tows
- Data label indicates day of month (May)



## 2014 Spring Survey

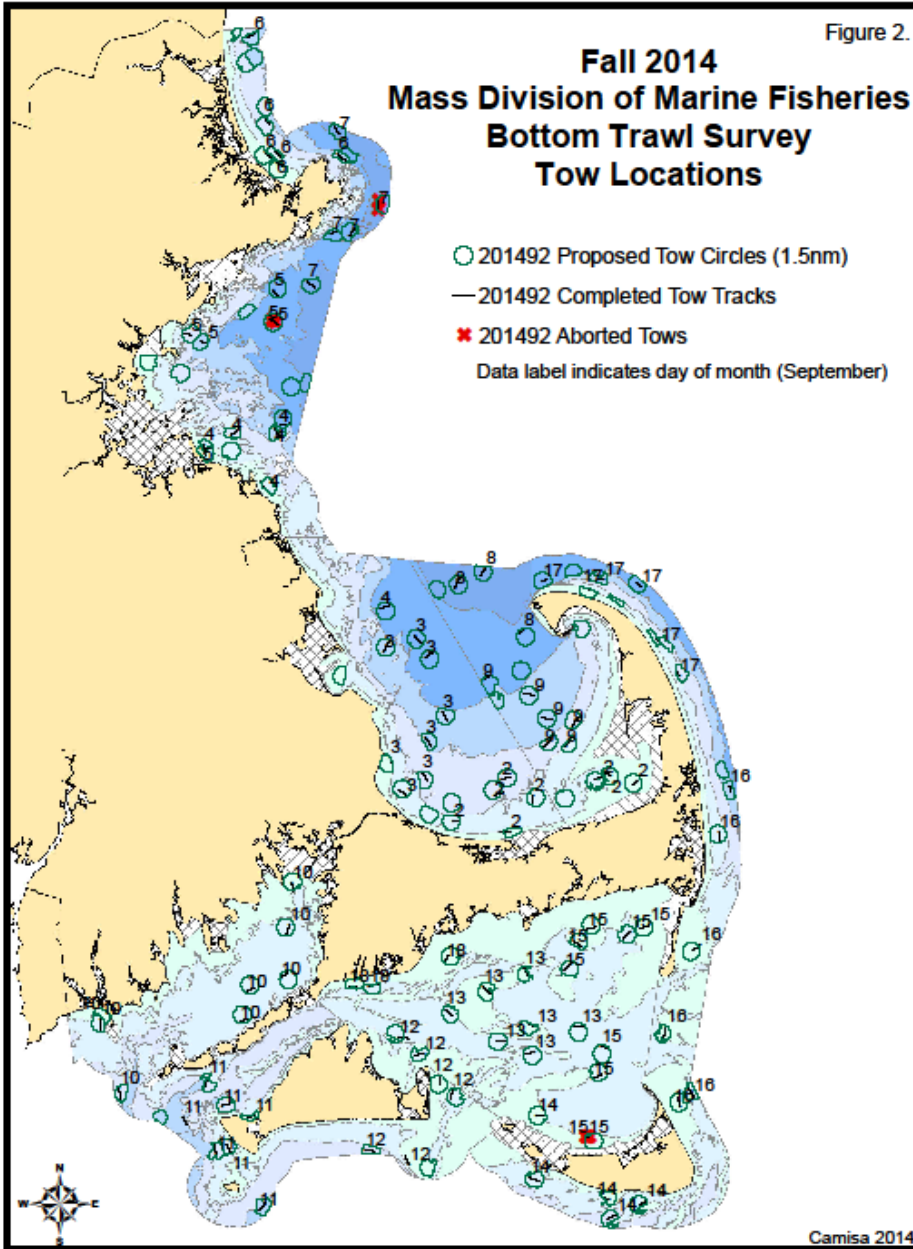
102 stations were completed. All 102 stations are considered representative and acceptable for assessment of all species.

One assigned station not completed in stratum 16.

Figure 2.

### Fall 2014 Mass Division of Marine Fisheries Bottom Trawl Survey Tow Locations

- 201492 Proposed Tow Circles (1.5nm)
- 201492 Completed Tow Tracks
- ✖ 201492 Aborted Tows
- Data label indicates day of month (September)

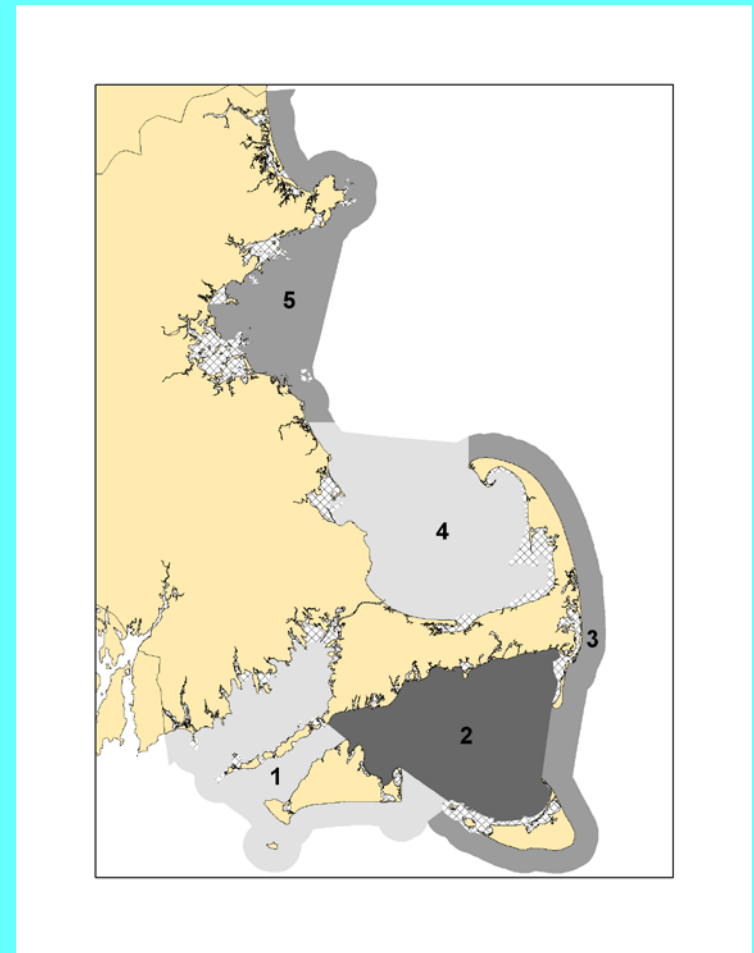
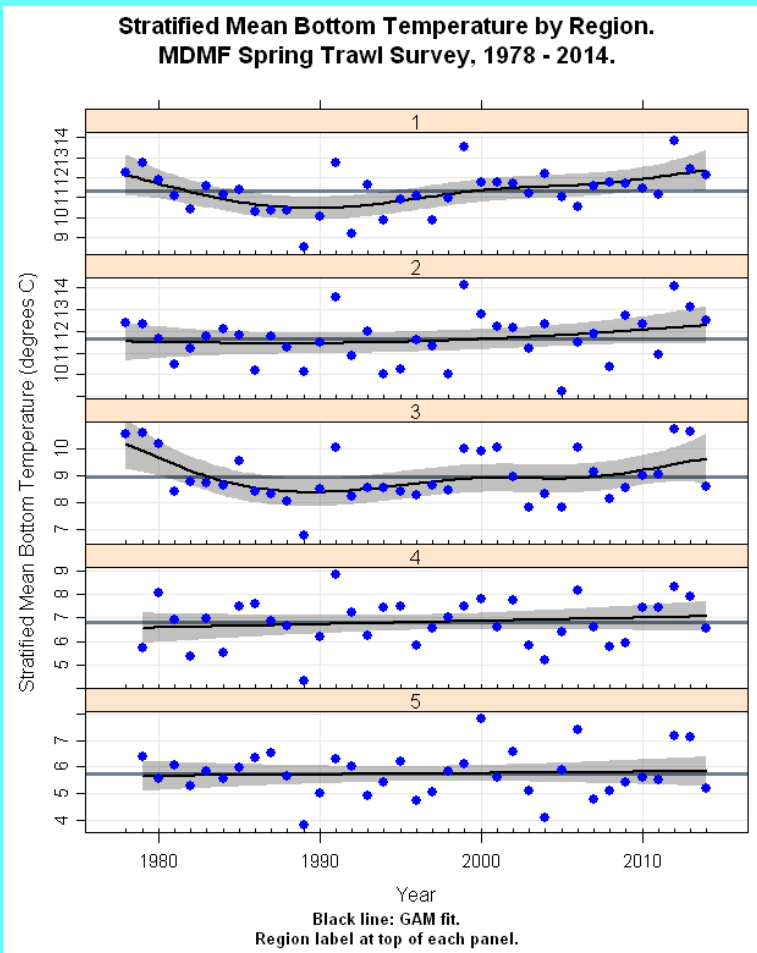


## 2014 Fall Survey

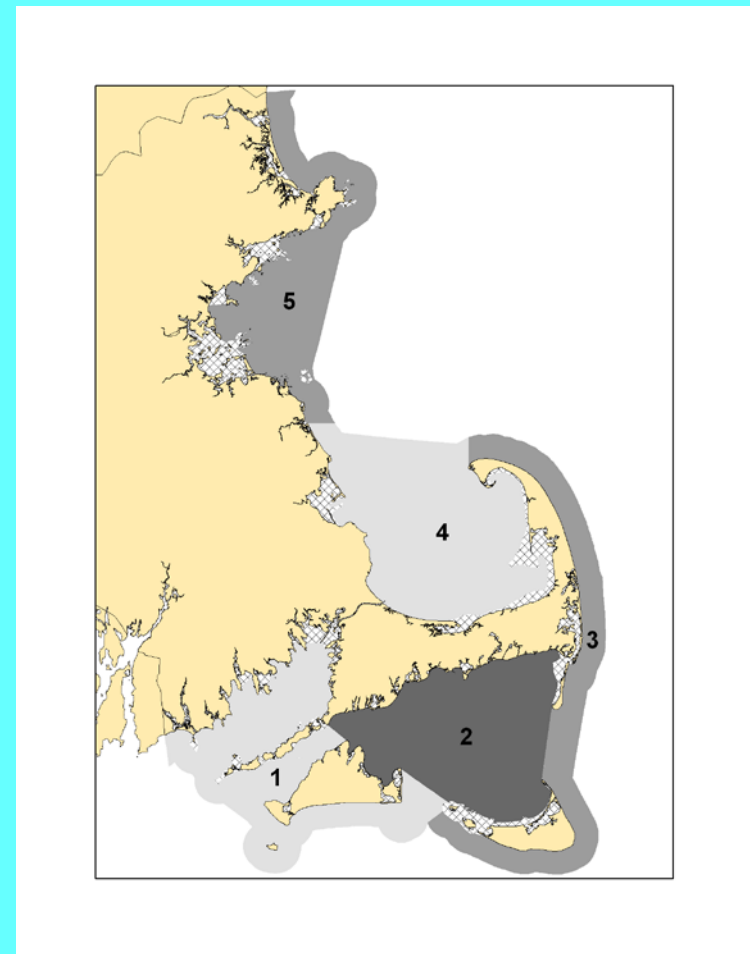
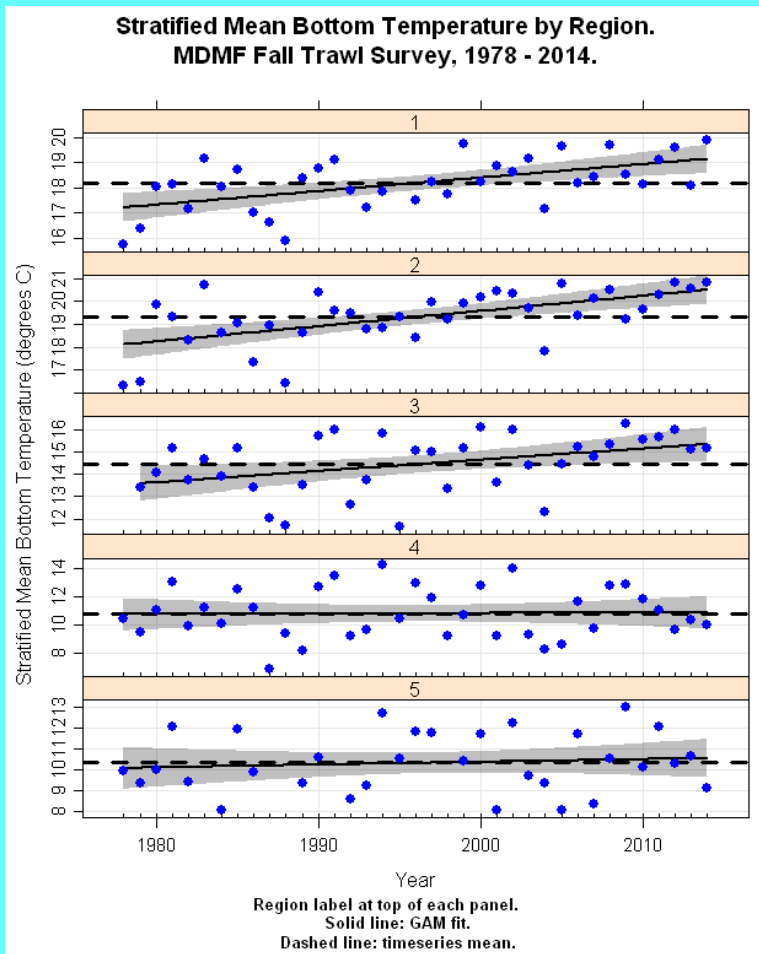
100 completed stations are considered acceptable for assessment of all species. 1 station is accepted for spiny dogfish only.

Three assigned stations were not completed successfully; one each in strata 15, 20, and 33.

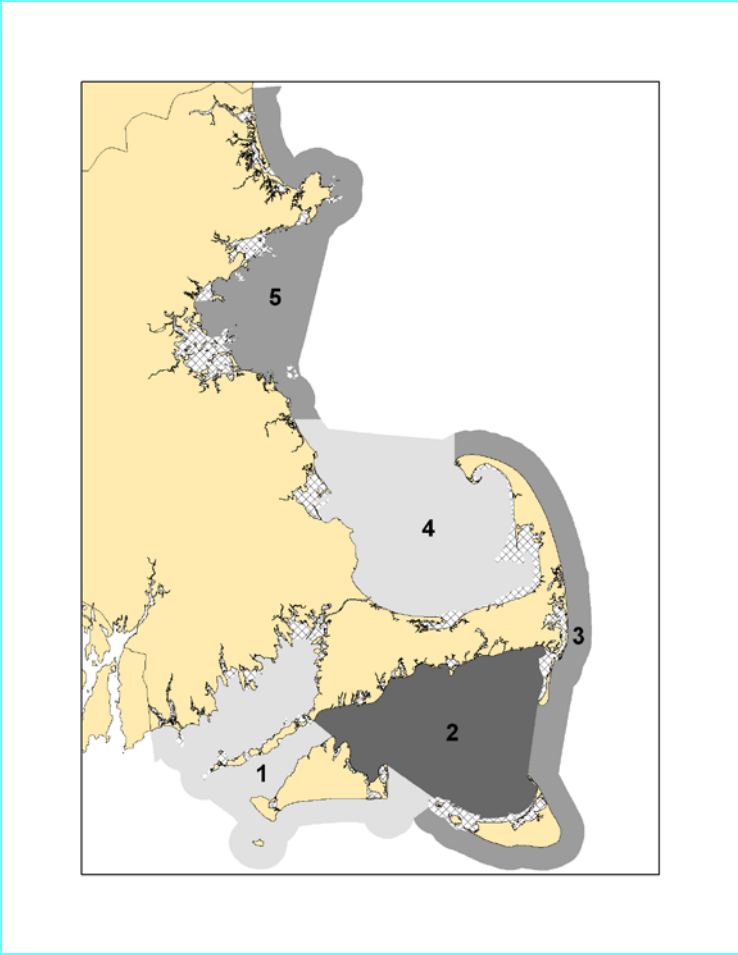
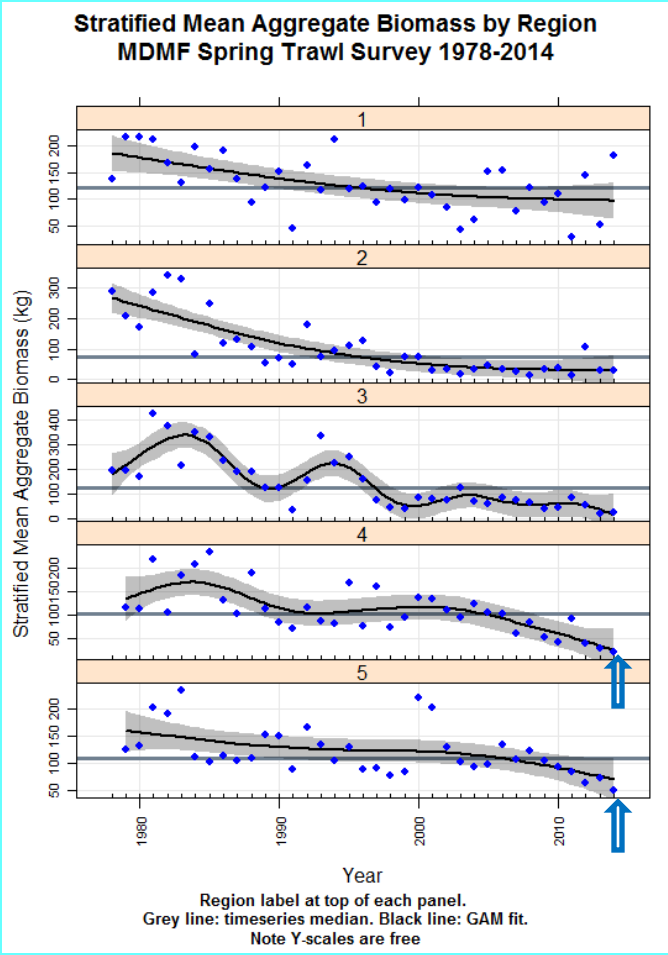
# Observed Bottom Temperatures – Spring Survey



# Observed Bottom Temperatures – Fall Survey

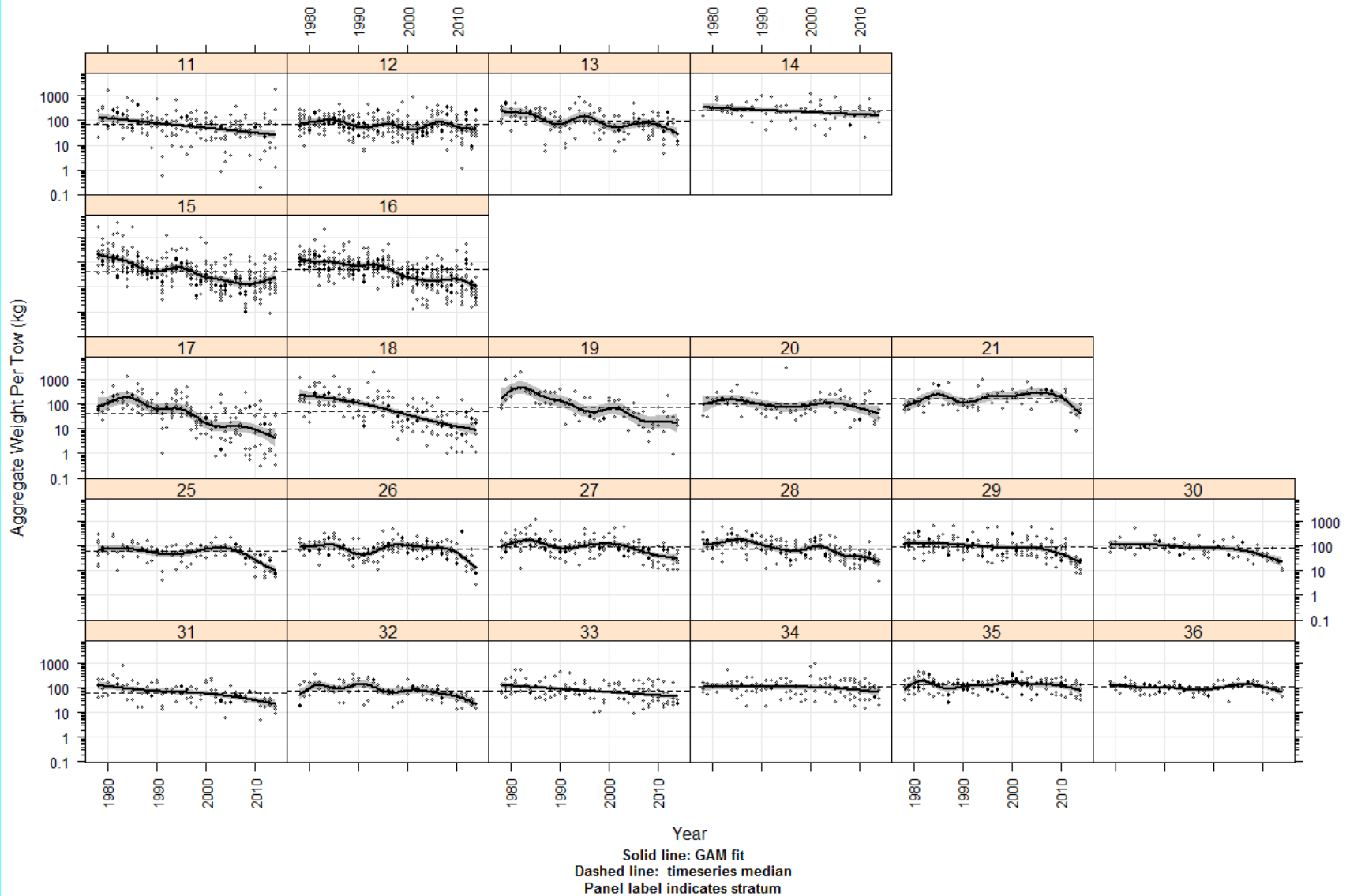


# Regional Trends in Aggregate Biomass



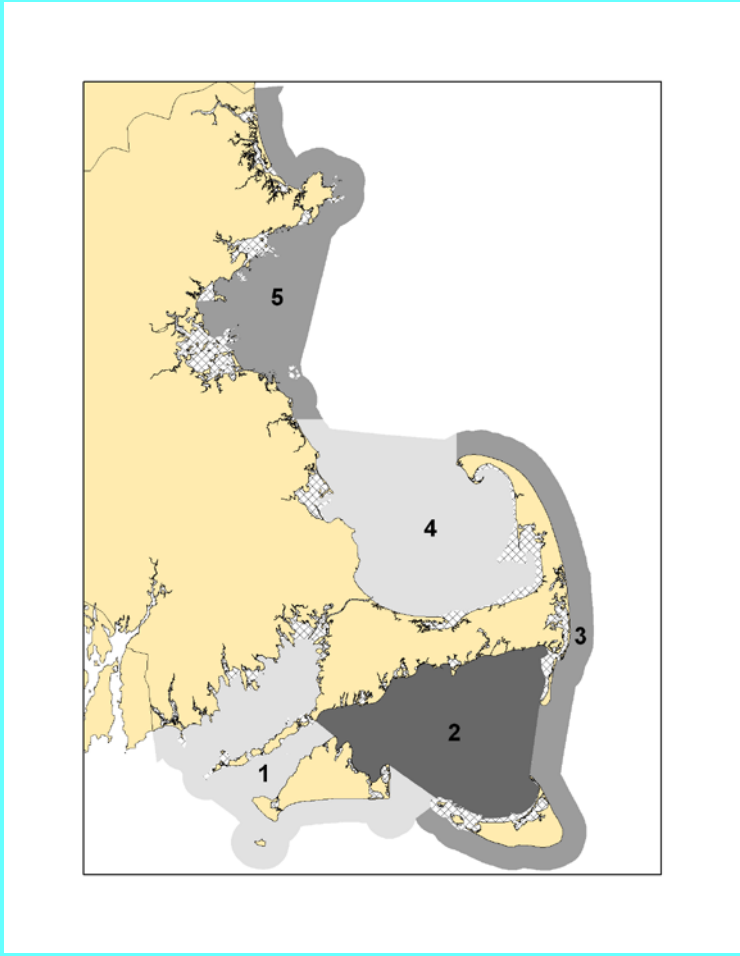
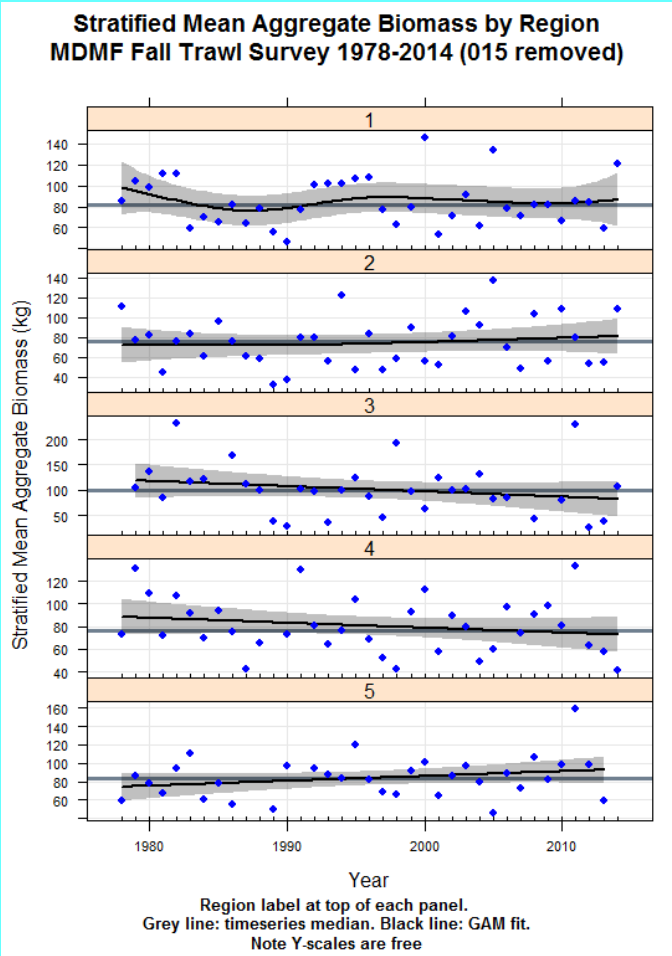
# Stratum Trends in Aggregate Biomass

Aggregate Biomass per Tow by Year and Stratum  
Spring MDMF Trawl Survey 1978-2014



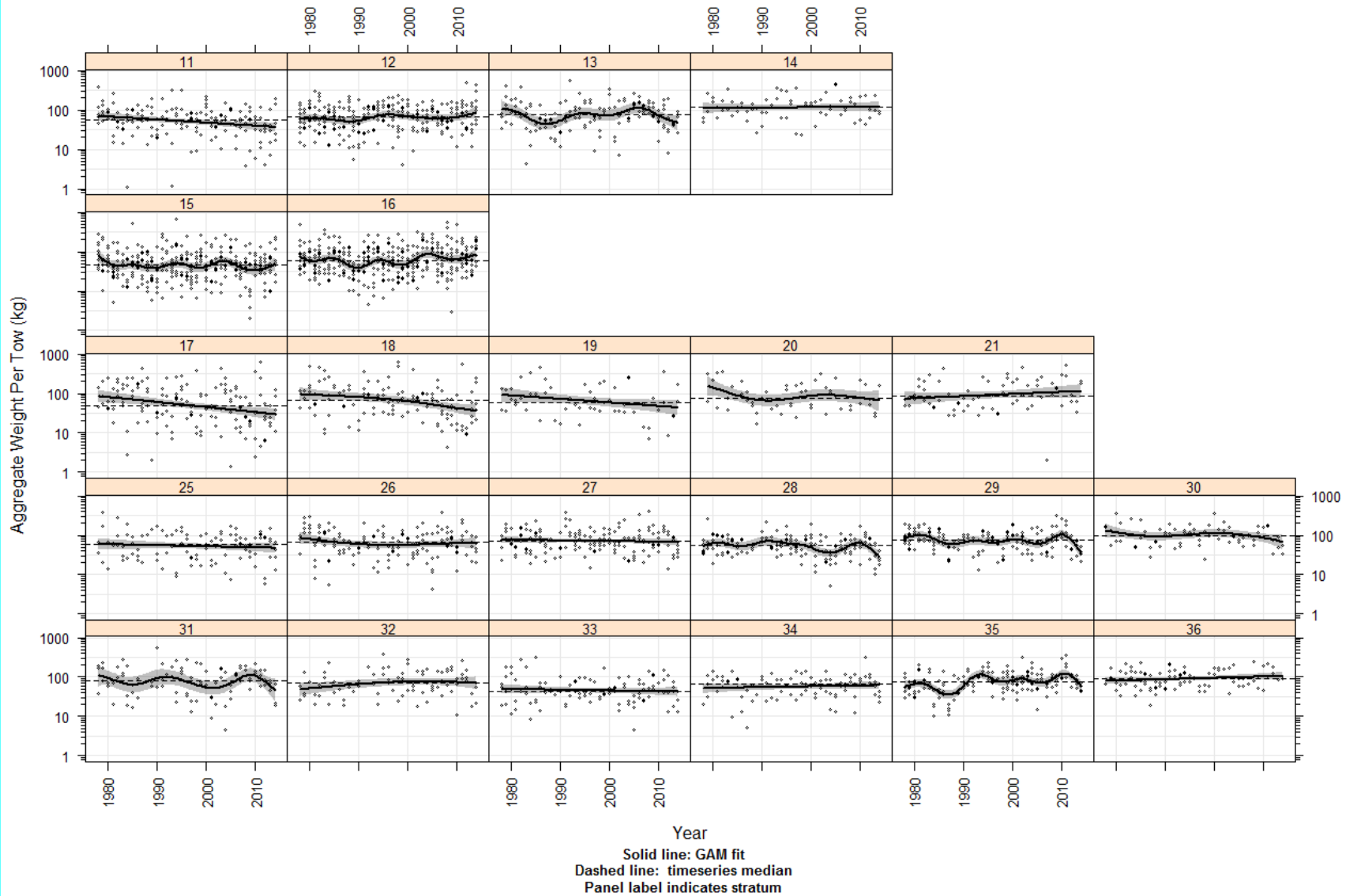


# Regional Trends in Aggregate Biomass



# Stratum Trends in Aggregate Biomass

Aggregate Biomass per Tow by Year and Stratum  
Fall MDMF Trawl Survey 1978-2014 (015 REMOVED)

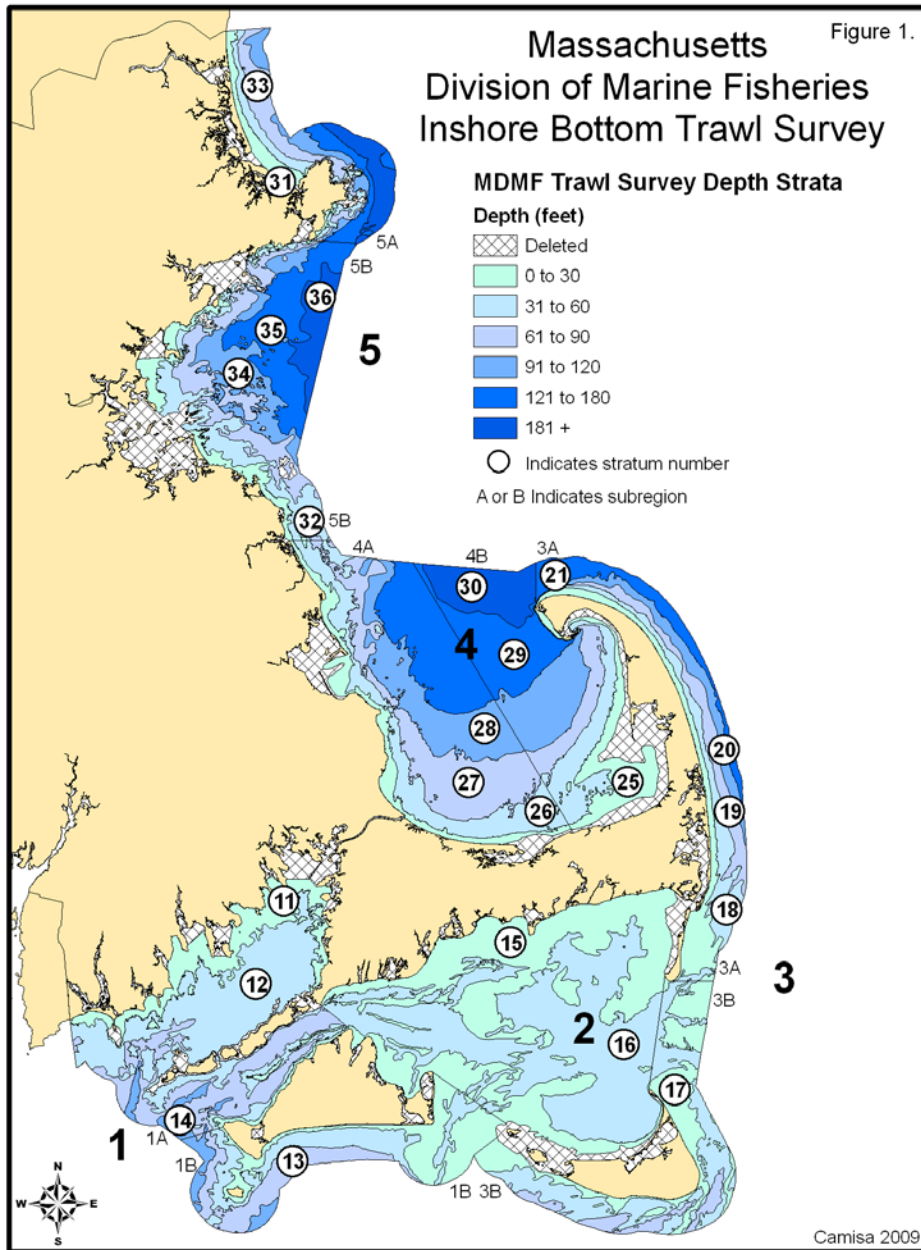




Any questions?



# Survey Area



- 5 Geographic Regions
- 6 Depth Zones
- 23 Strata
- Strata range from 20 sq.nmi (14) to 210 sq.nmi (16)
- Total survey area over 1,800 sq.nmi
- Includes both GOM and SNE stock areas.
- Some overlap with NEFSC surveys