Gulf of Maine Northern Shrimp Stock Status Update 2015

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2015

Prepared by the

ASMFC Northern Shrimp Technical Committee

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Outline

- Summary of Biology
- 2015 Survey Review
- 2015 Stock Status Review
- NSTC Recommendations for 2016

Gulf of Maine N. Shrimp Biology

- GOM N. shrimp occur at southern extent of species' range; thought to be discrete stock
- Deep water, soft bottom habitats; 90-180 m
- Protandric hermaphrodites -
  - Live ~5 yrs: mature as male, mate in summer (2½); transition to female (3), mate as female (3½ - 4½);
- Females migrate inshore to hatch eggs in winter, return offshore late spring. Larvae/juveniles stay inshore ~1 year, then migrate offshore
- Most desirable product at ~age 4-5 (female)
- Fishery reflects weak / strong year classes

Assessment Data

Fishery-Dependent

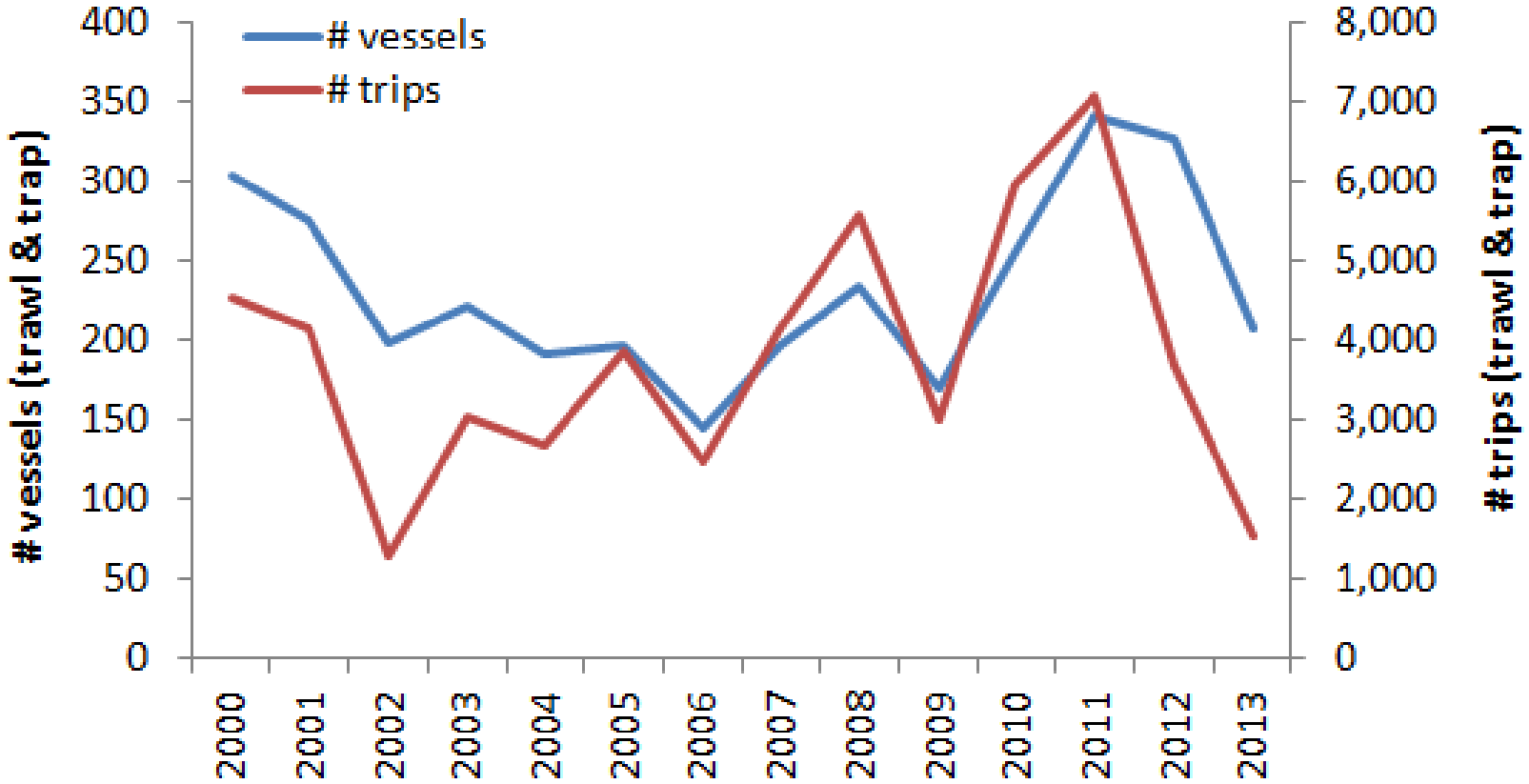
- 1985-2013 port sampling program
- Vessel trip reports
- 2014 & 2015 winter sampling during moratorium
- 2015 Research Set Aside (RSA) of 25 mt

Fishery-Independent

Resource Surveys

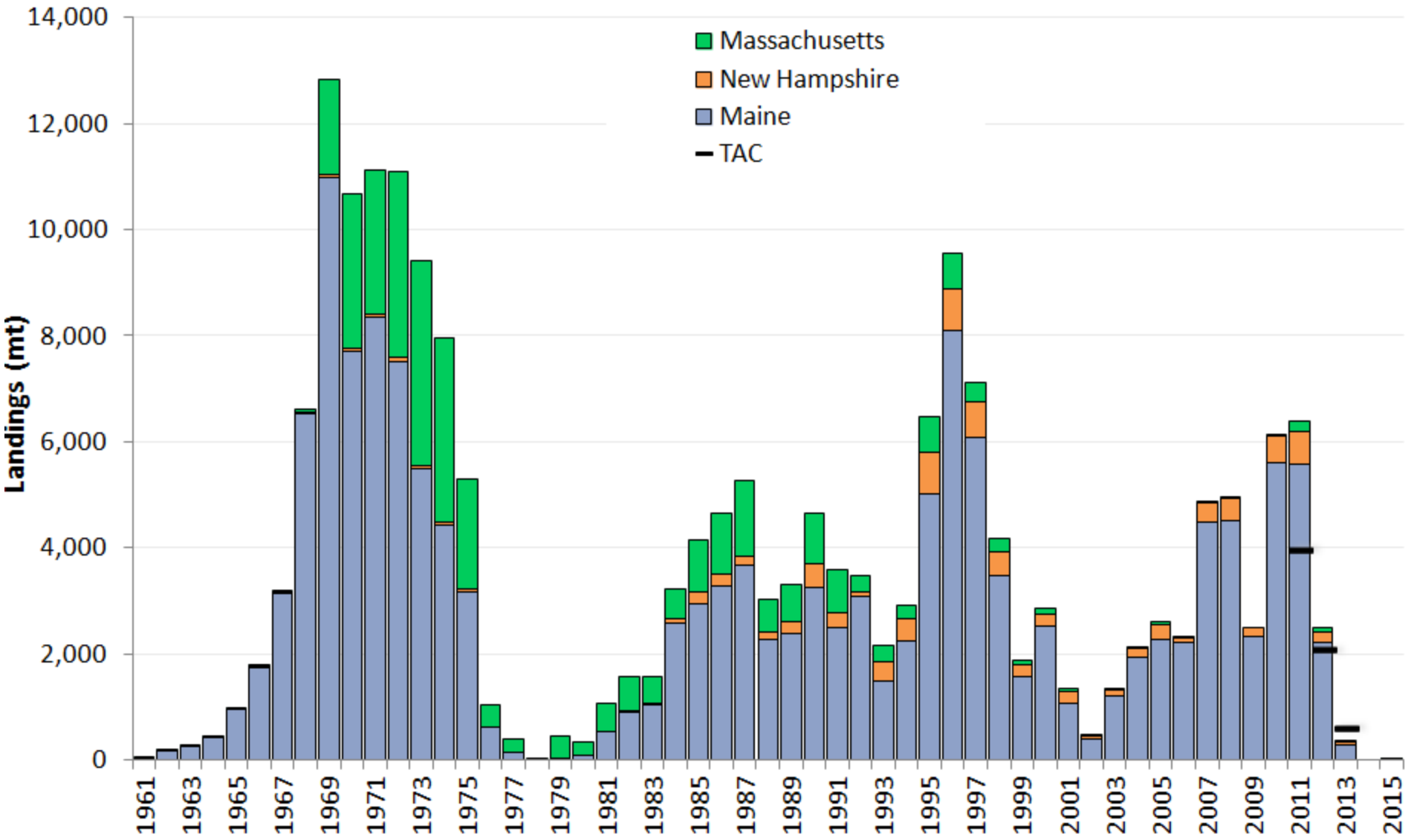
- ASMFC summer shrimp survey (1984-2015)
- ME-NH inshore survey (2003-2015)
- NEFSC fall survey (1968-2008; 2009-2014)

Fishing Effort History



(Trawl & Trap)	Vessels	Trips
2011	342	7,095
2012	327	3,666
2013	208	1,549

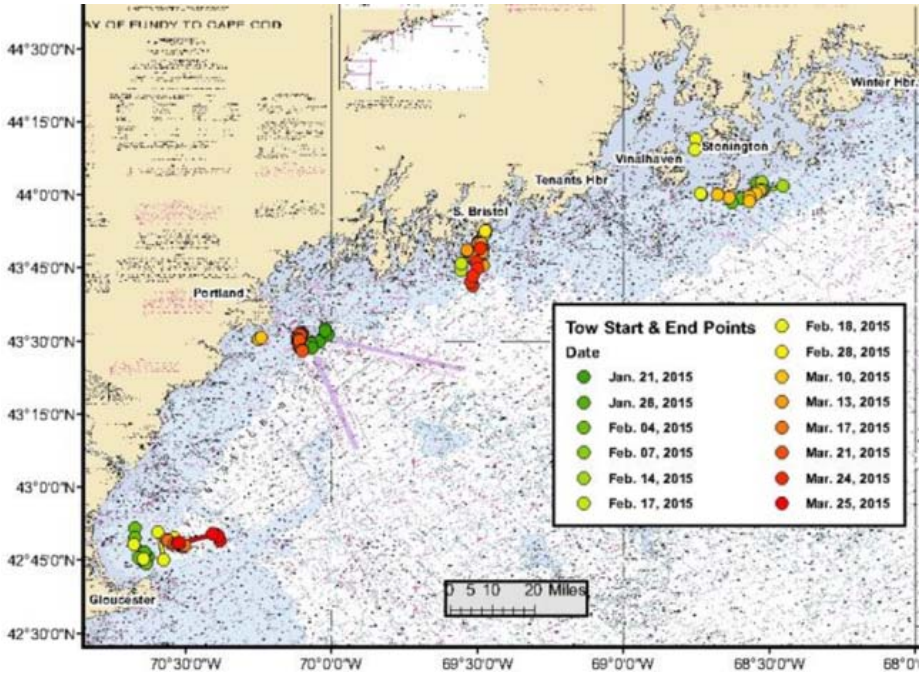
Landings History

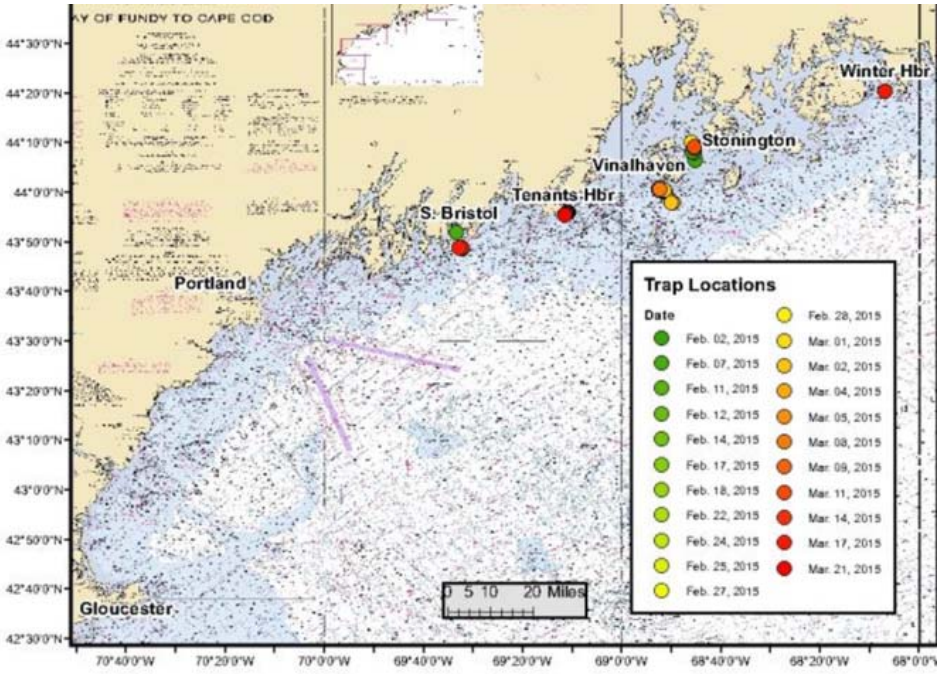


2015 RSA

Purpose – RSA

- Maintain time series on winter size distribution & egg-hatch





<u>Trawl</u>

- Four vessels; 5 trips ea.
- 3 samples per trip (~2 weeks) Jan – Mar

<u>Trap</u>

- Five vessels; 10 traps ea.
- 1 sample per ~2 weeks Jan – Mar

2015 RSA

Results

- Total = 6.7 mt
  27% of RSA (25 mt)

Trawl

- 49 samples
- 13,600 lbs (6.2 mt)
  25% of RSA

Trap

- 15 samples
- 1,108 lbs (0.5 mt)
  2% of RSA

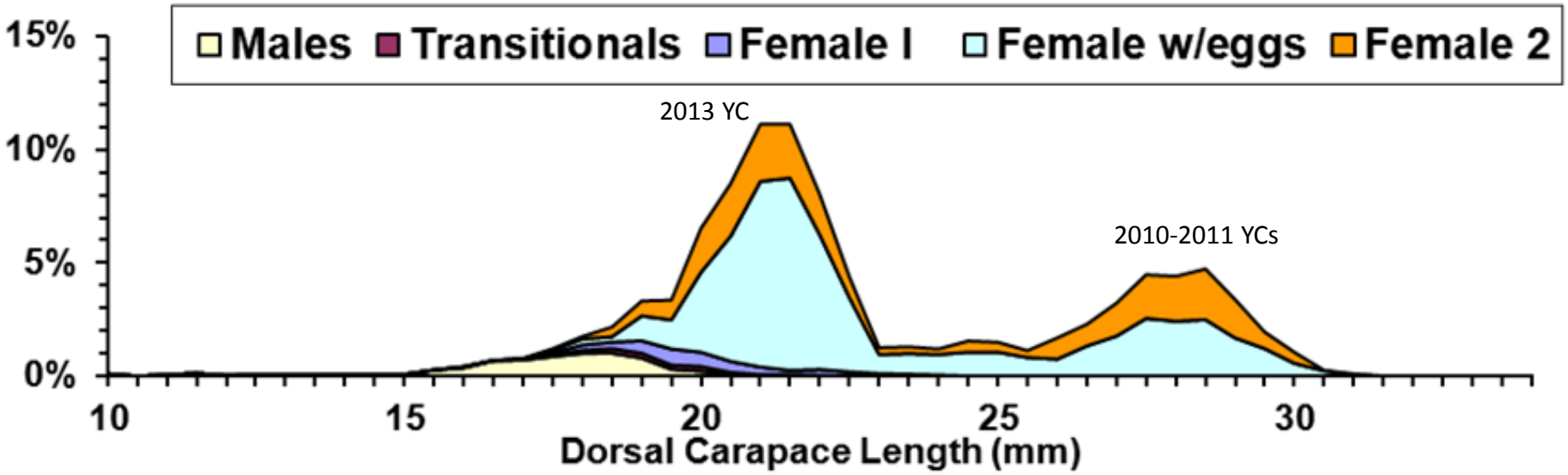

Photo by Katherine Thompson (UME)


Photo by Elaine Jones (ME DMR)

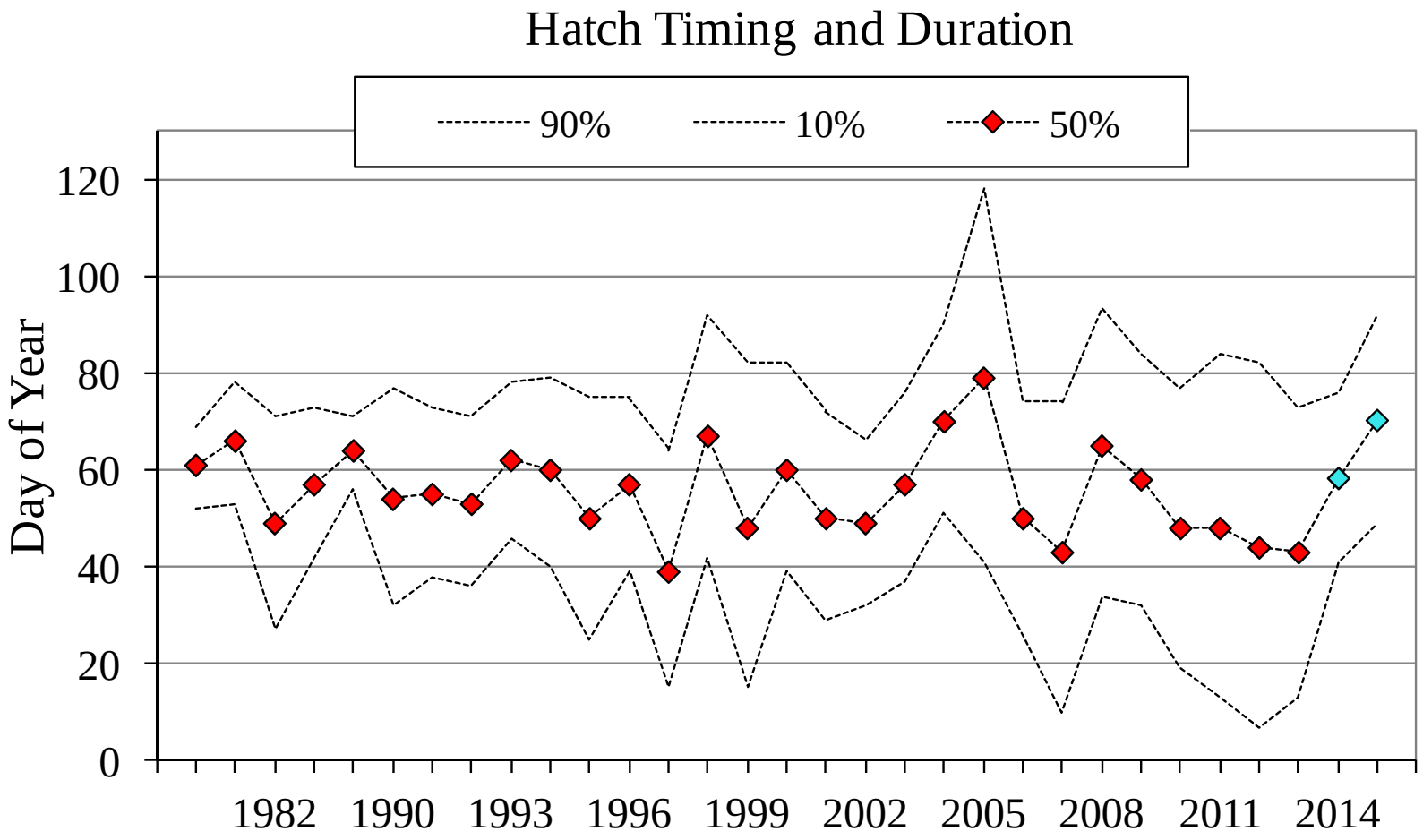
2015 RSA

- Length frequency distribution
  - Assumed 2013 & 2010 YCs

- Unusually high percentage of small ovigerous females (2013 YC)
- Early transition to female (skip male stage) possible indication of stressed population



2015 RSA



- 2015 egg hatch relatively late; midpoint (blue) Mar. 11
- 2014 & 2015 similar to pre-2000 fisheries; later start and shorter duration as compared to 2010-2013

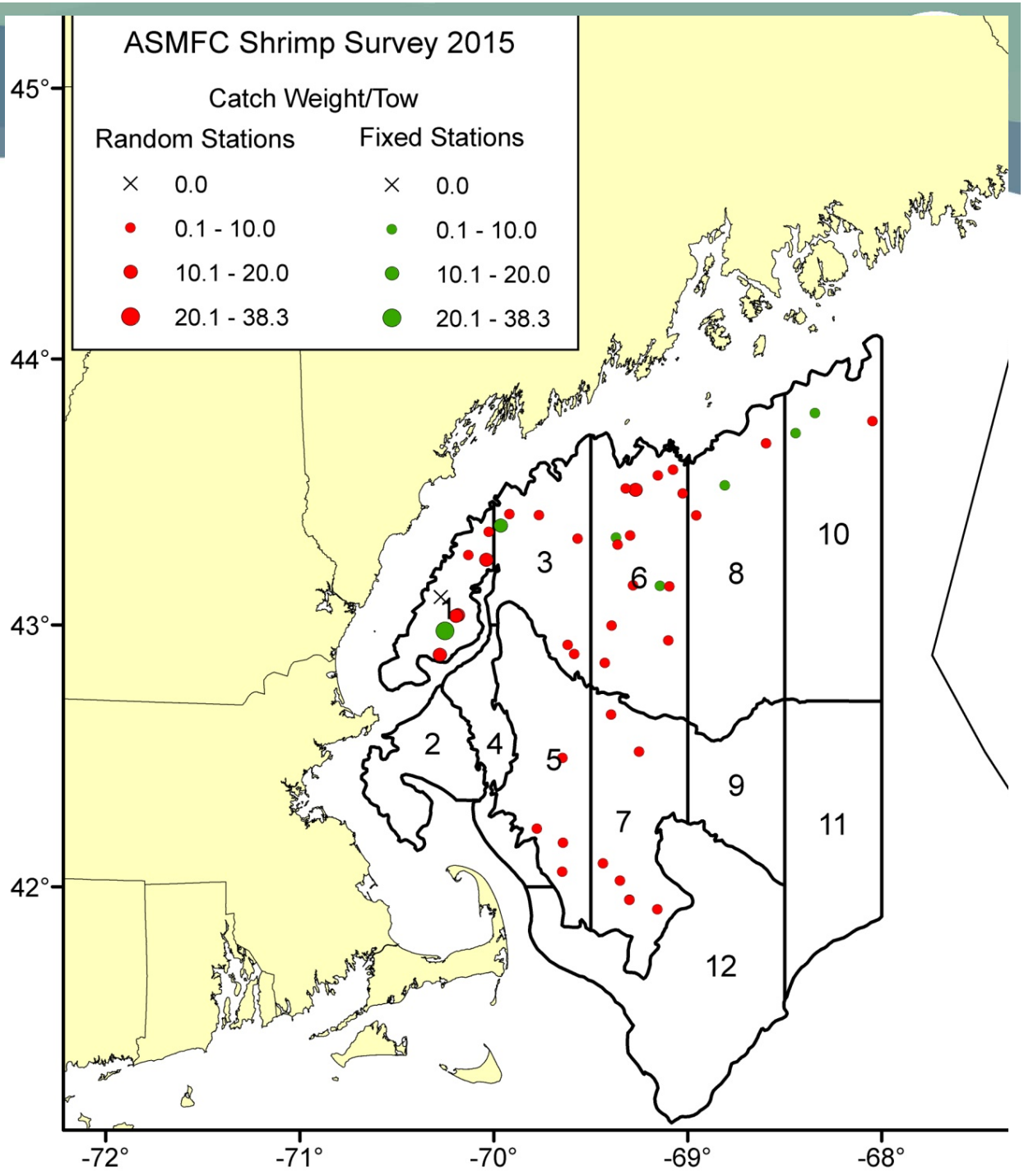
2015 Resource Surveys

- ASMFC Summer Shrimp Survey (1984-2015)
- ME/NH Inshore Trawl Survey (2003-2015)
- NEFSC Fall Bottom Trawl Survey (1968-2008; 2009-2014)

Photos: Kate Ostirikis & Anna Webb (MA DMF)

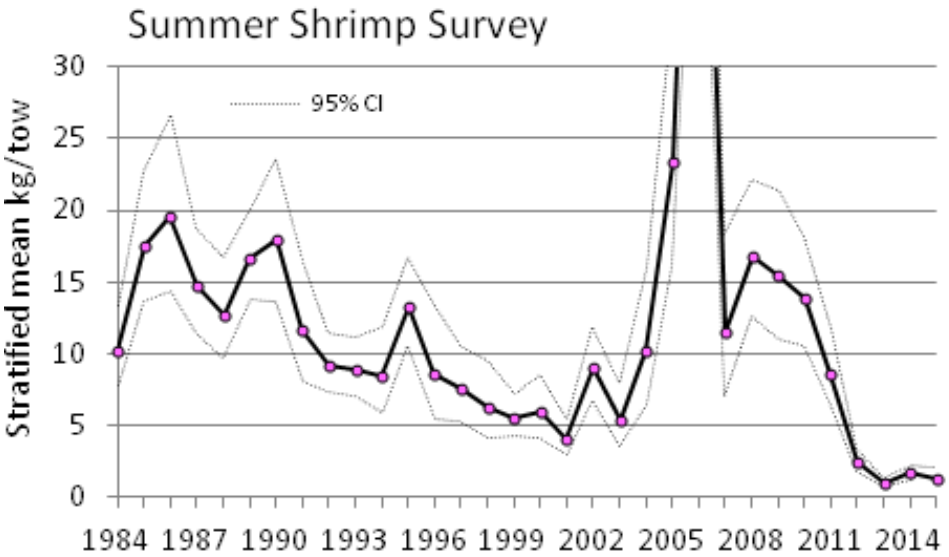
2015 ASMFC Summer Shrimp Survey

- Second lowest total biomass in 32-yr series (1.3 kg/tow)
- All strata, small tows
- Stratum 1 – colder/deeper water, typically larger tows

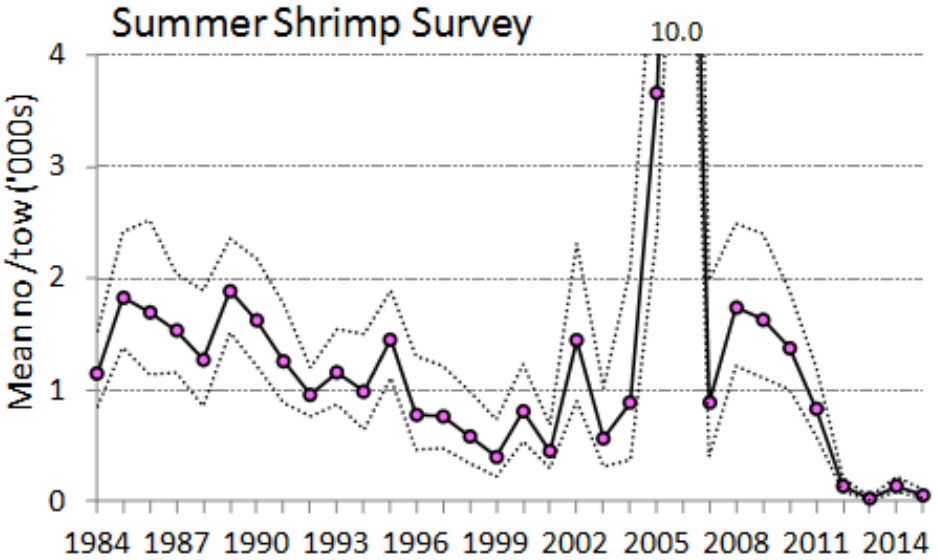


2015 ASMFC Summer Shrimp Survey

Biomass

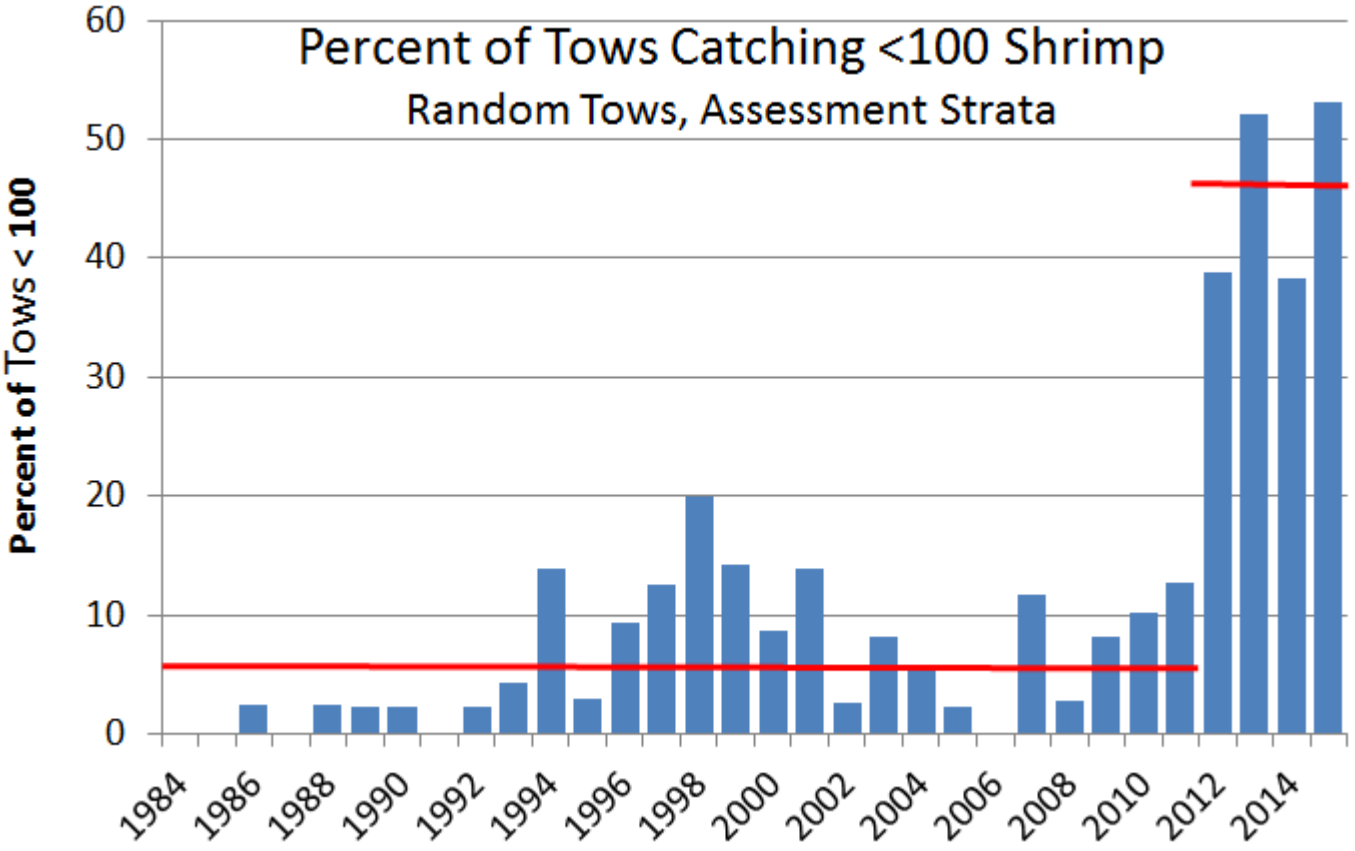


Abundance



	Biomass	Abundance
• 32-yr ave. =	12.2 kg/tow	1,370 /tow
• High 2006 =	66.0 kg/tow	10,000 /tow
• Low 2012 - 2015 (ave) =	1.3 kg/tow	74 /tow

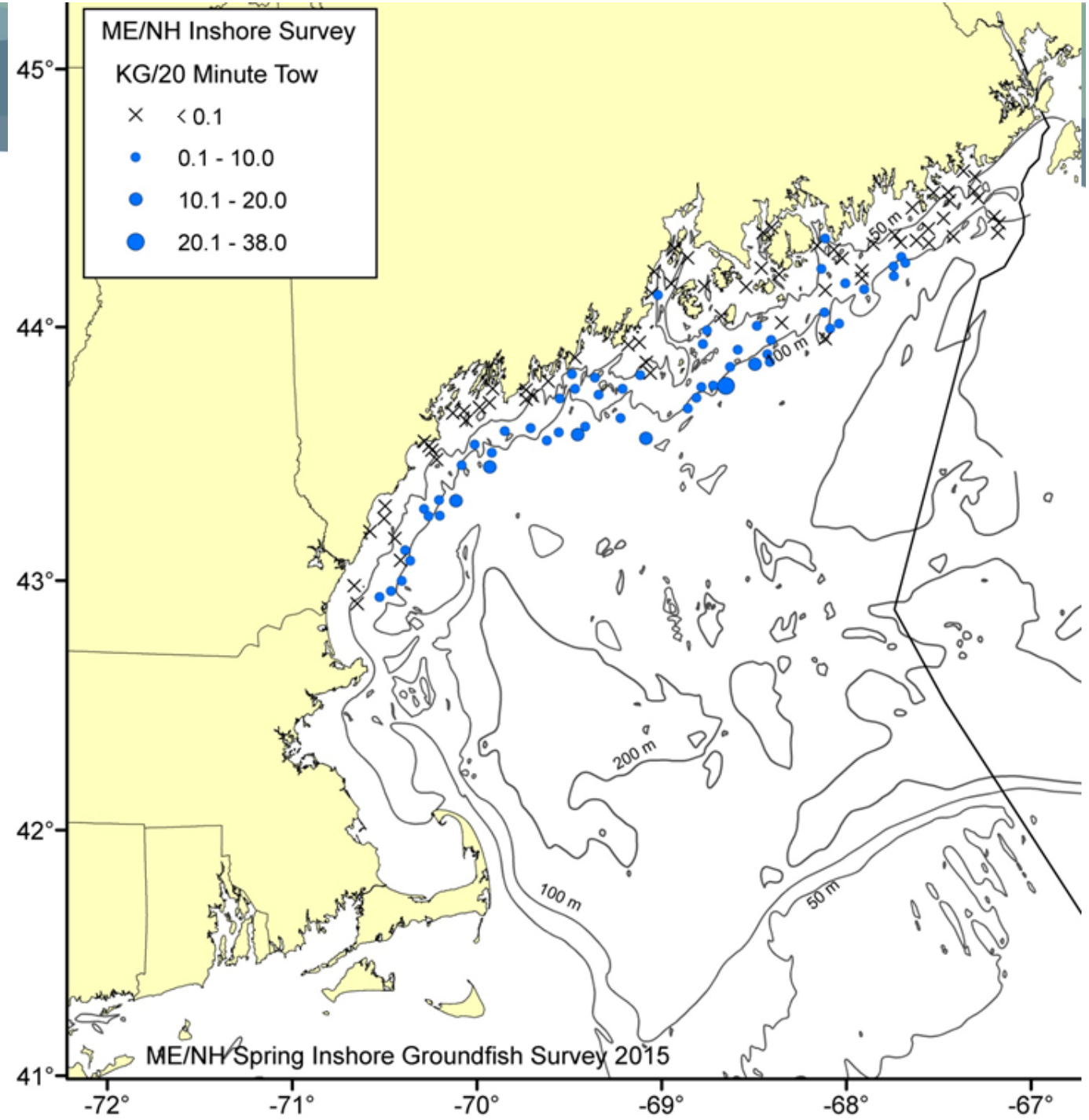
2015 ASMFC Summer Shrimp Survey



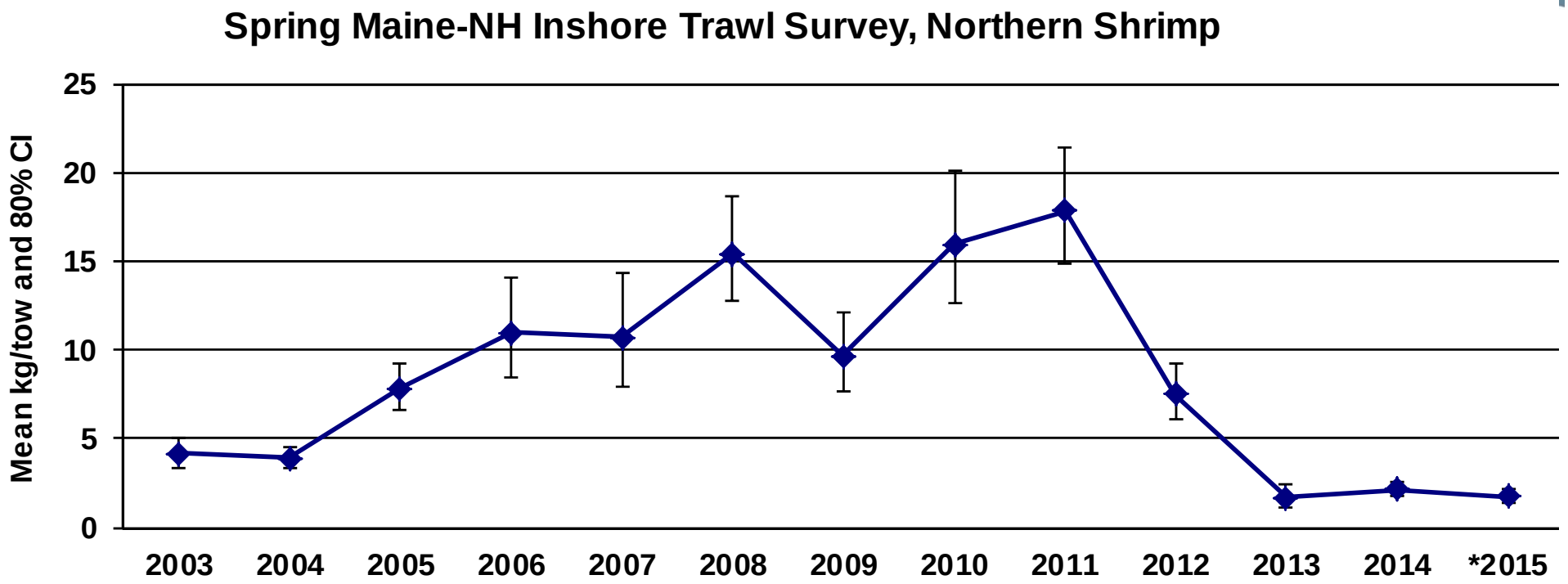
- Ave. 1984-2011 – 6% of tows
- Ave. 2012-2015 – 46% tows

2015 ME/NH Spring Inshore Survey

- 2015 was second lowest total biomass in 13-yr ME/NH series (1.72 kg/tow)



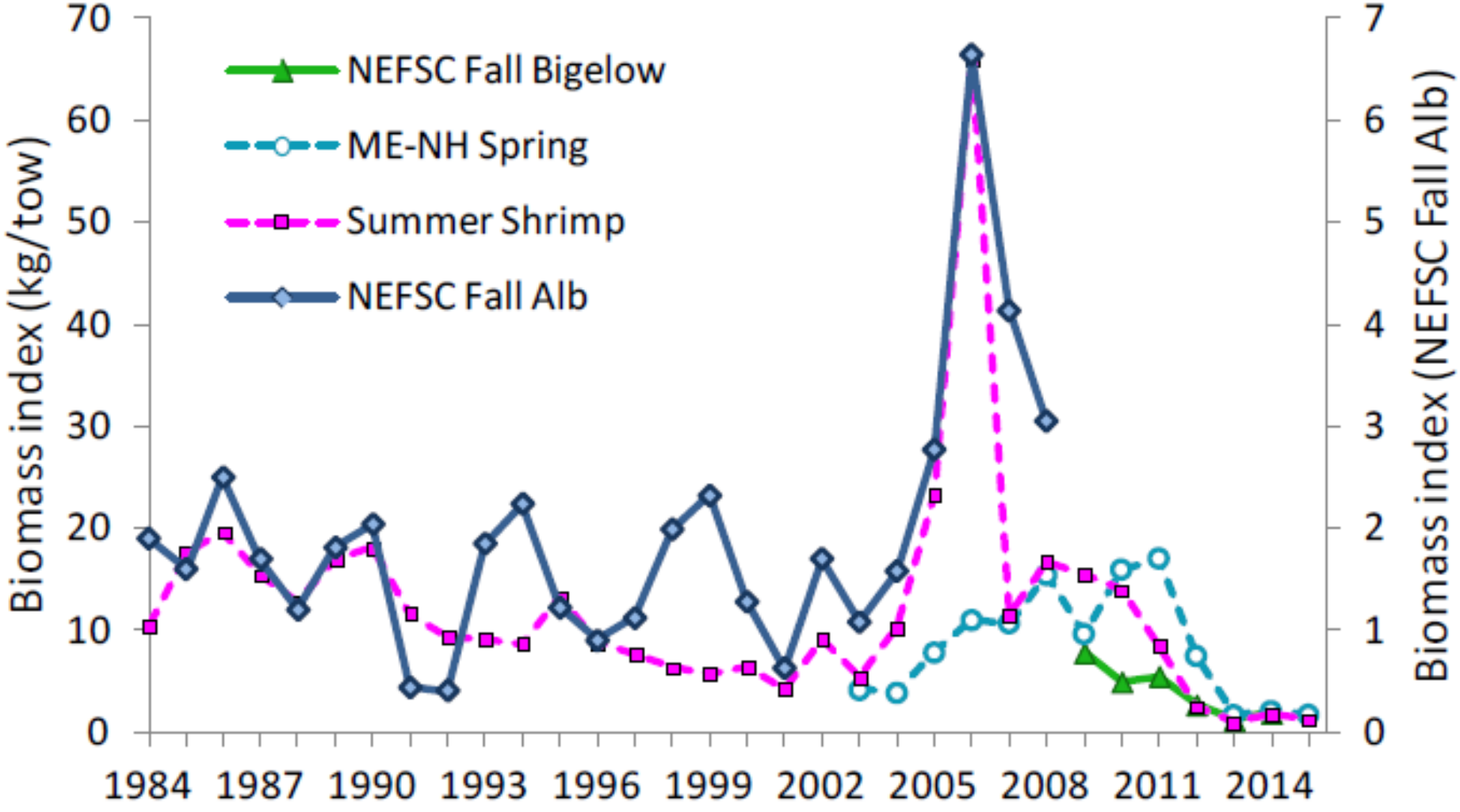
2015 ME/NH Inshore Survey



- 13-yr ave. = 8.4 kg/tow
- Series high 2011 = 17.9 kg/tow
- Abrupt decline 2013 – 2015 ave. = 1.8 kg/tow

- Consistent with low biomass indices from Summer Survey

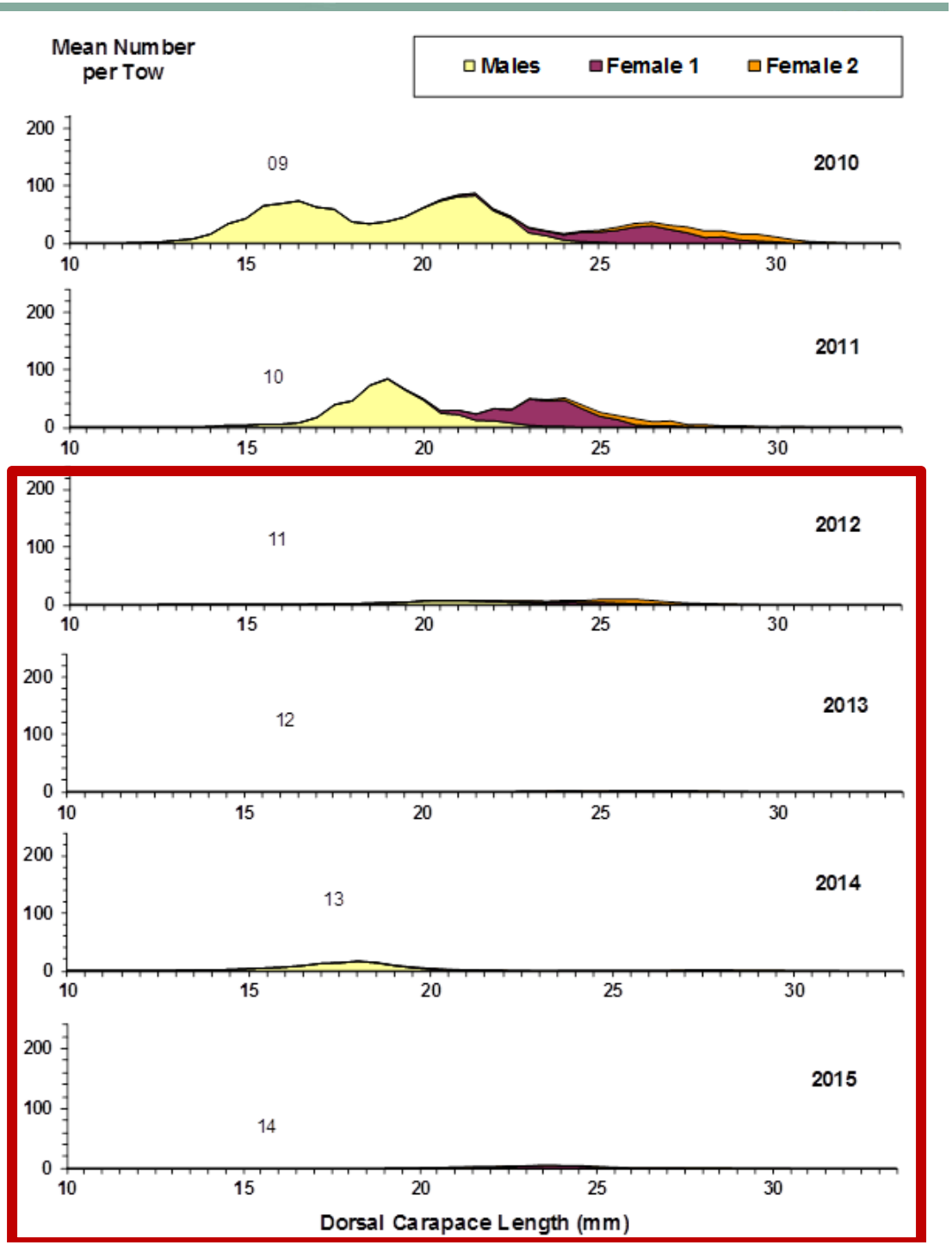
2015 Resource Surveys



2015 Length & Stage Composition

ASMFC Summer Shrimp Survey

- Dramatic decline of fishable biomass (>22 mm CL) since 2009
- Extremely low abundance <u>all</u> stages 2012-2015
- 5 yrs consecutive weak/failed recruitment
  - 2010, 2011, 2012, 2013, 2014 YCs
- 2014 YC – lowest despite colder temps



2015 Length & Stage Composition

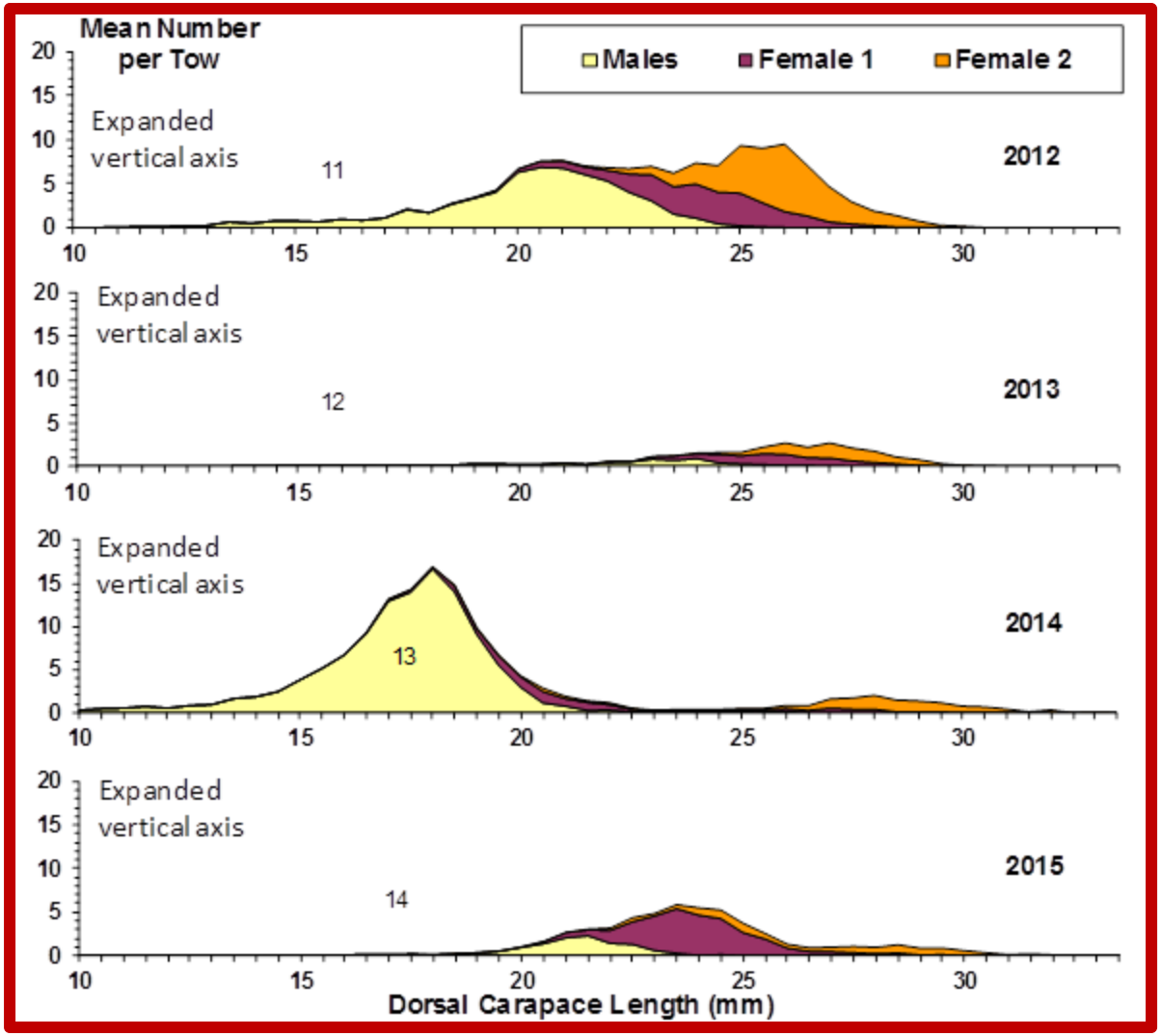
ASMFC Summer Shrimp Survey

- 2013 YC
  - Fast growing
- Small mean size Fs in 2015
  - ~24.7 mm
- Fishable biomass

Ave = 5.6 kg/tow

- 2013 0.3 kg/tow
- 2014 0.2 kg/tow
- 2015 0.4 kg/tow

***SAME DATA w/ EXPANDED SCALE** : 200 to 20 per tow



2015 Stock Status - Methods

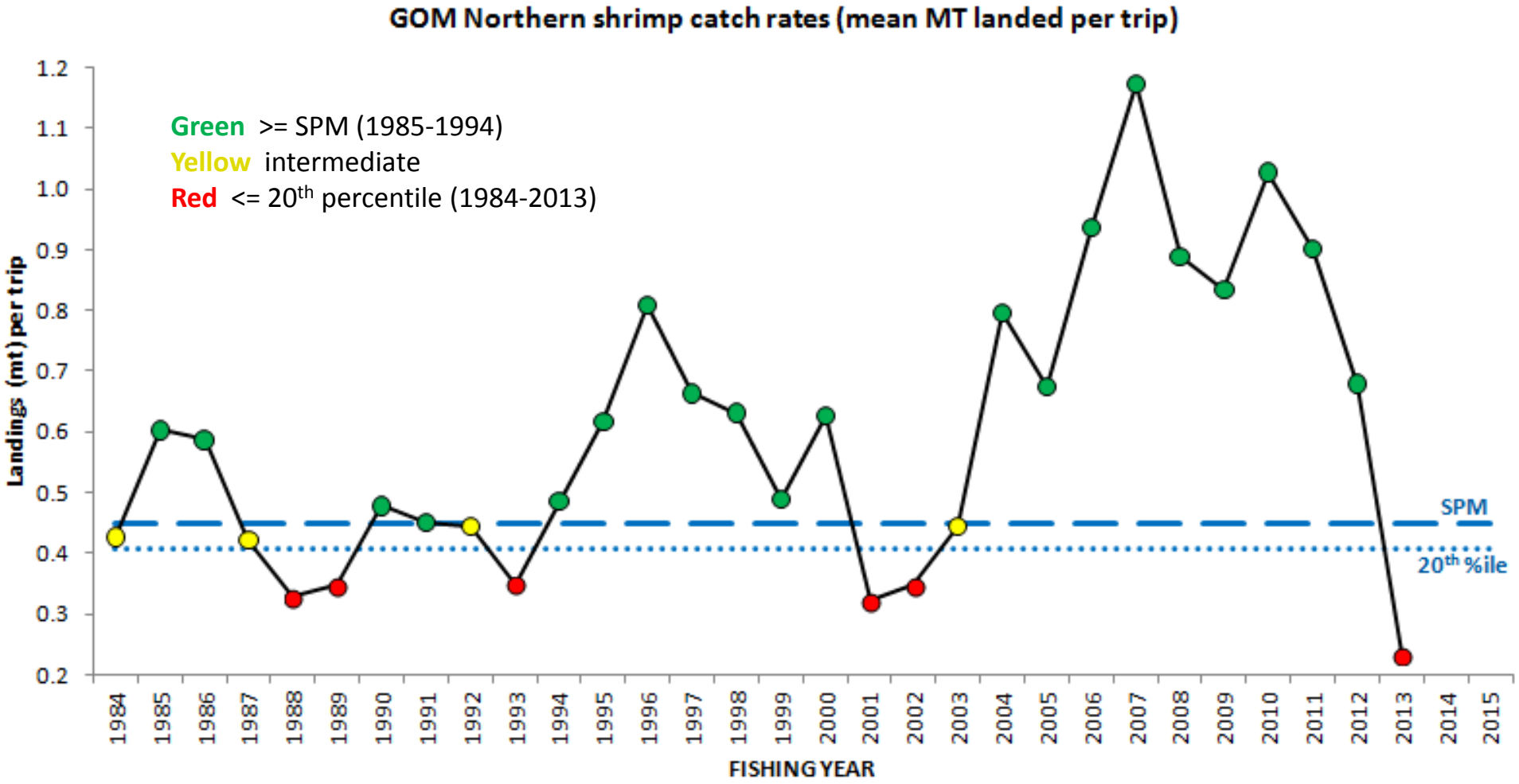
NSTC applied traffic light approach (TLA) (Caddy 1999) to a suite of GOM N. shrimp indicators:

- Fishery-dependent Indices
- Fishery-independent Indices
- Environmental Conditions

2015 Traffic Light Approach (TLA)

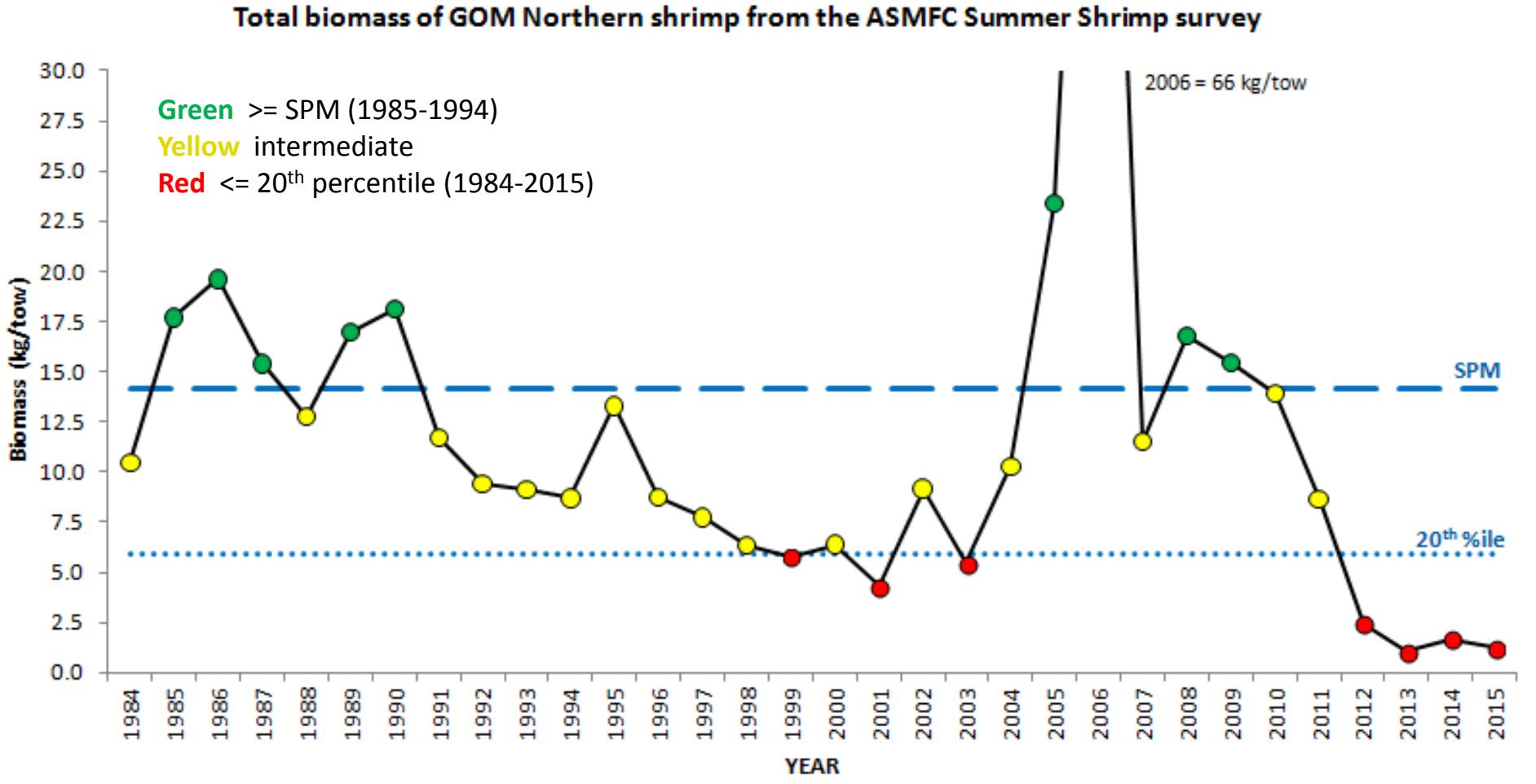
- Annual indices categorized as:
  - Green = favorable
  - Yellow = intermediate
  - Red = unfavorable
- Defined conditions relative to references:
  - Stable period mean (SPM) (1985-1994)
  - 20th percentile of time series (1984-2015)

2015 TLA – Catch Rates (mt/trip)



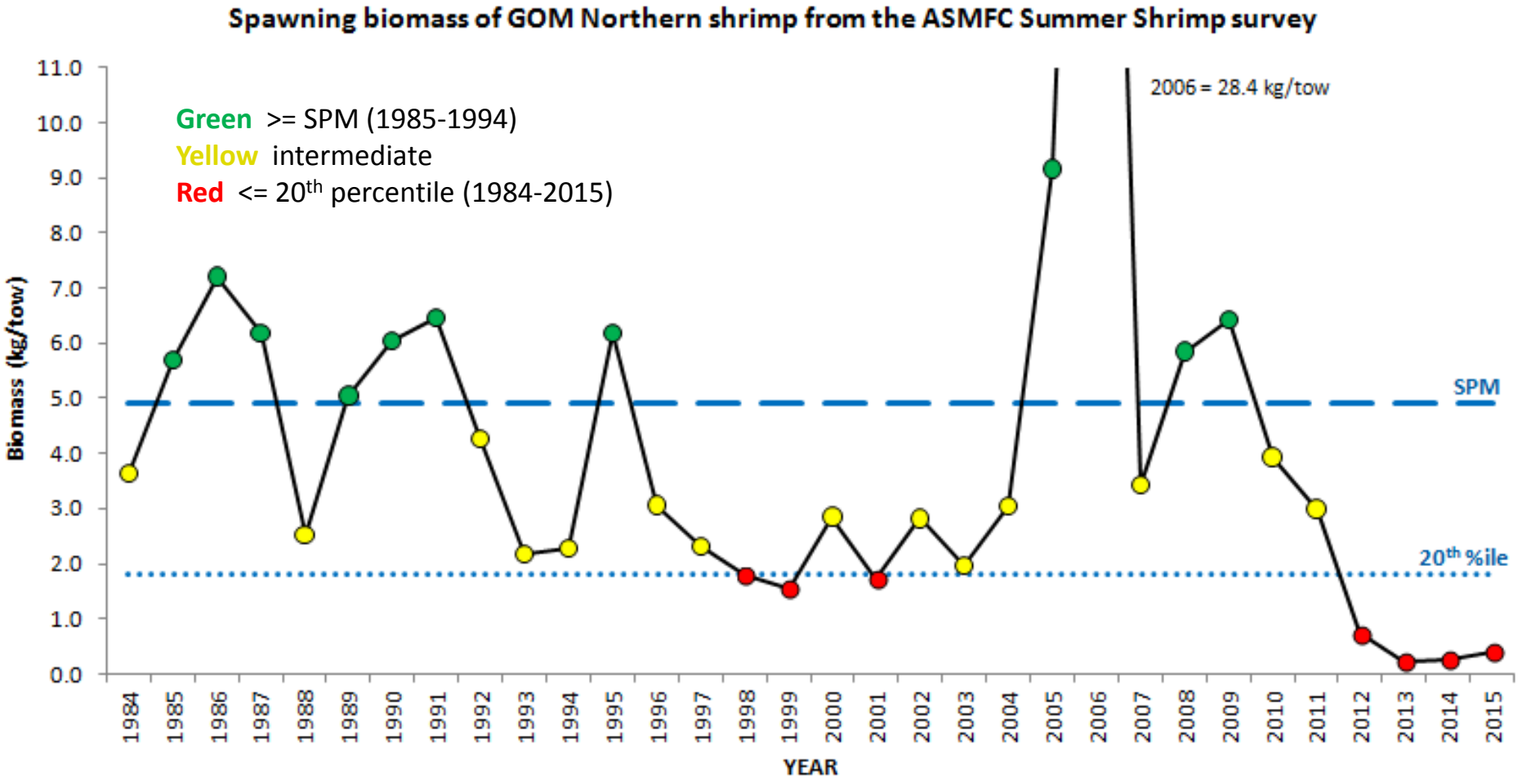
- 2008-2011 ave. = 2,012 lbs/trip (0.9 mt/trip)
- 2013 ave. = 482 lbs/trip (0.2 mt/trip) – record low

2015 TLA – Total Biomass (all stages)



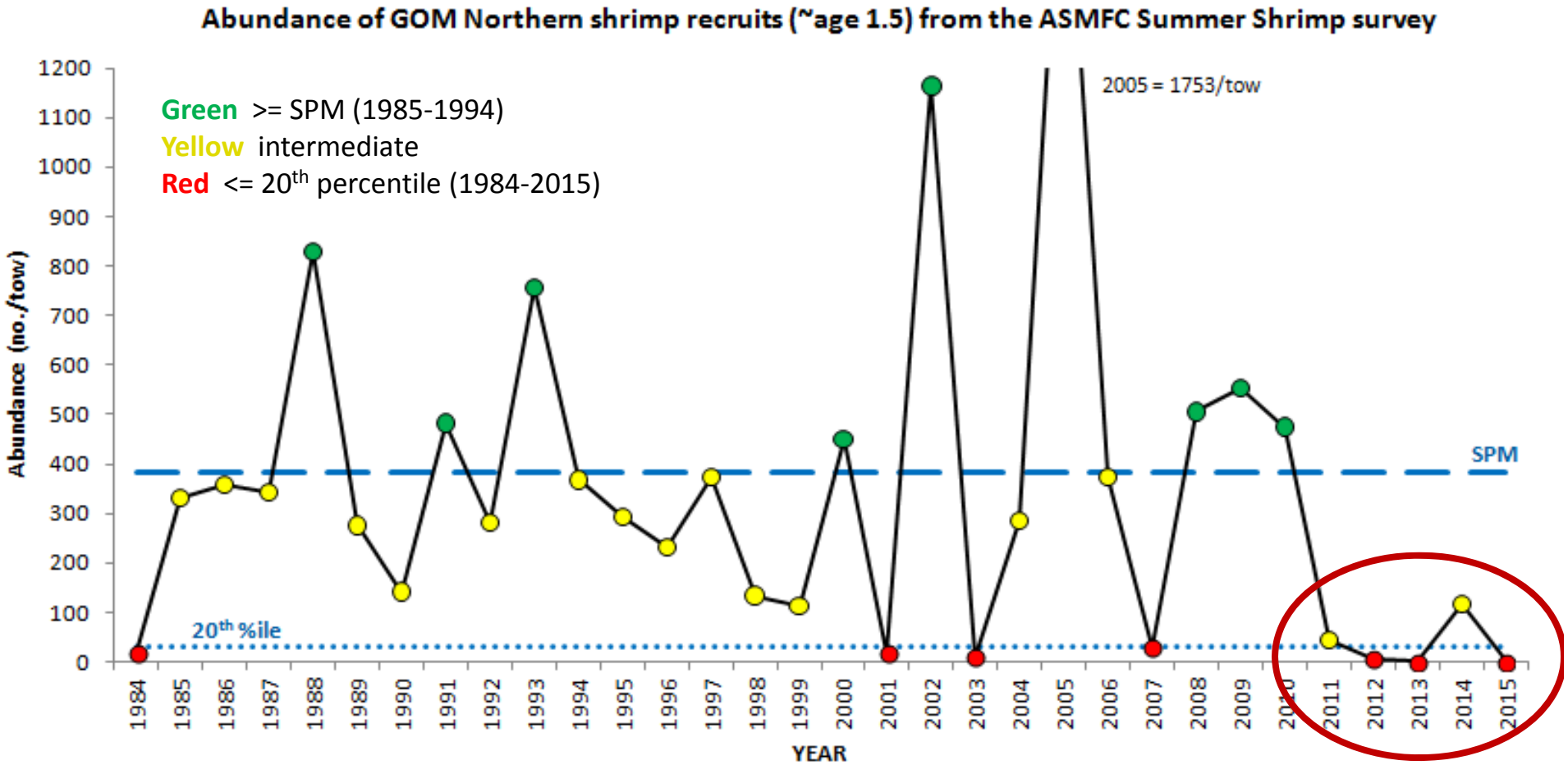
- Rapid decline since 2010
- 2015 second lowest total biomass in time series

2015 TLA – Spawning Biomass



- Extreme lows 2012-2015 (0.2 – 0.7 kg/tow. vs. SPM = 4.9 kg/tow)

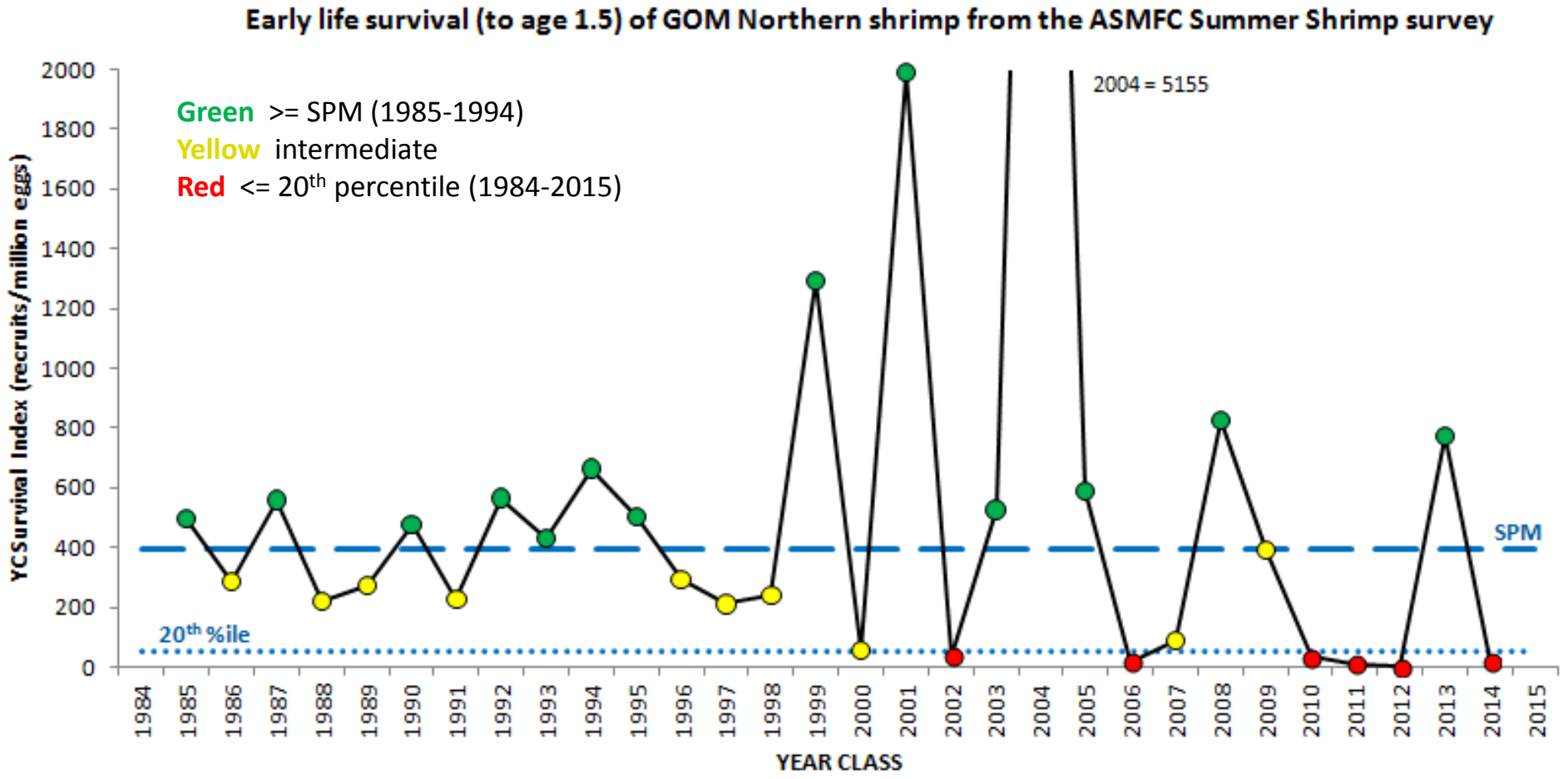
2015 TLA – Recruit Abundance



- Weak/failed recruitment - 2011-2015 (2010-2014 YCs)
- 2015 lowest recorded recruitment in time series (0.8/tow)

➢ Unprecedented five years consecutive low recruitment

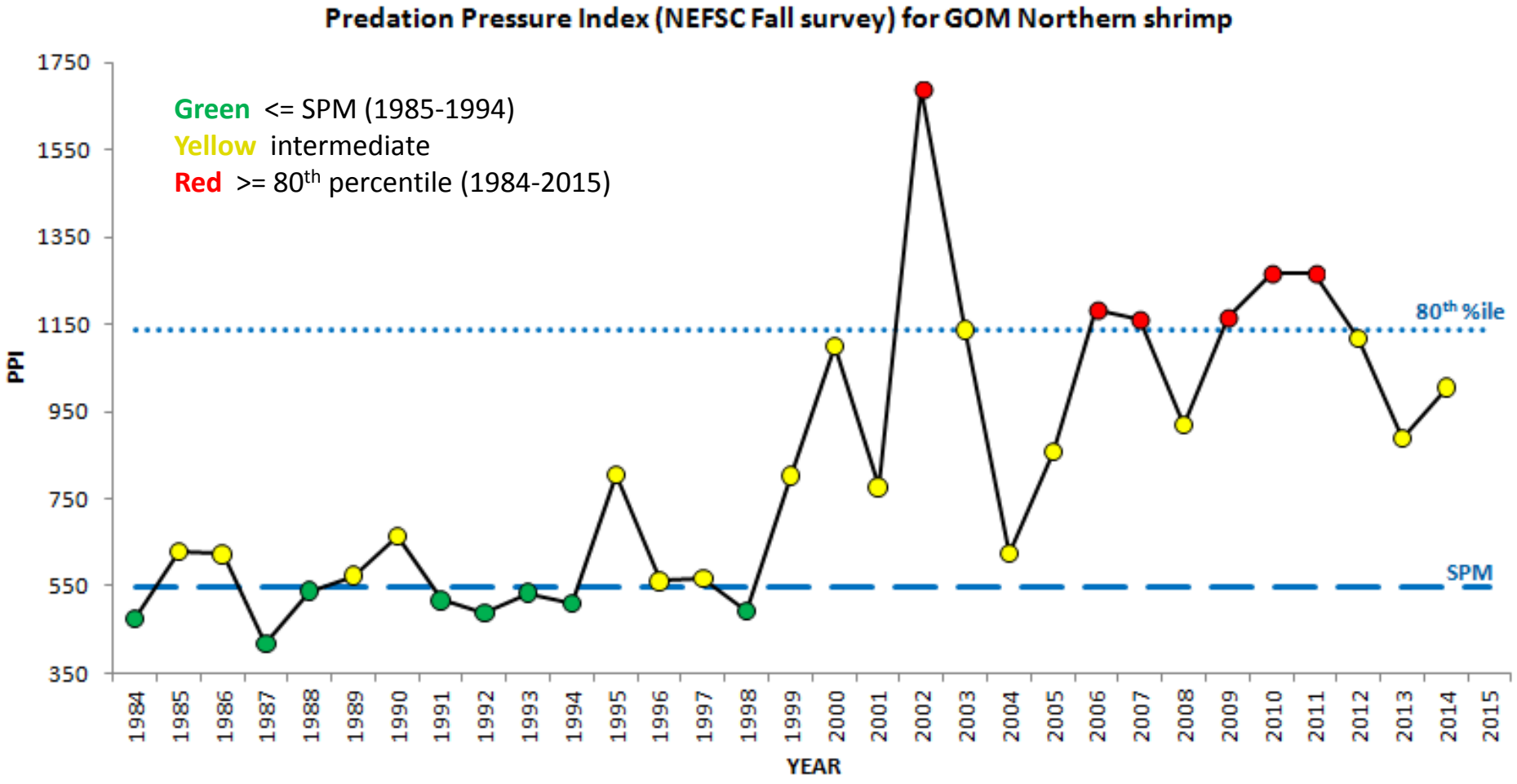
2015 TLA – Early Life Survival



- Survival index = # eggs that survived to become recruits at age 1.5
- Very low survival of weak 2010, 2011, 2012, and 2014 YCs

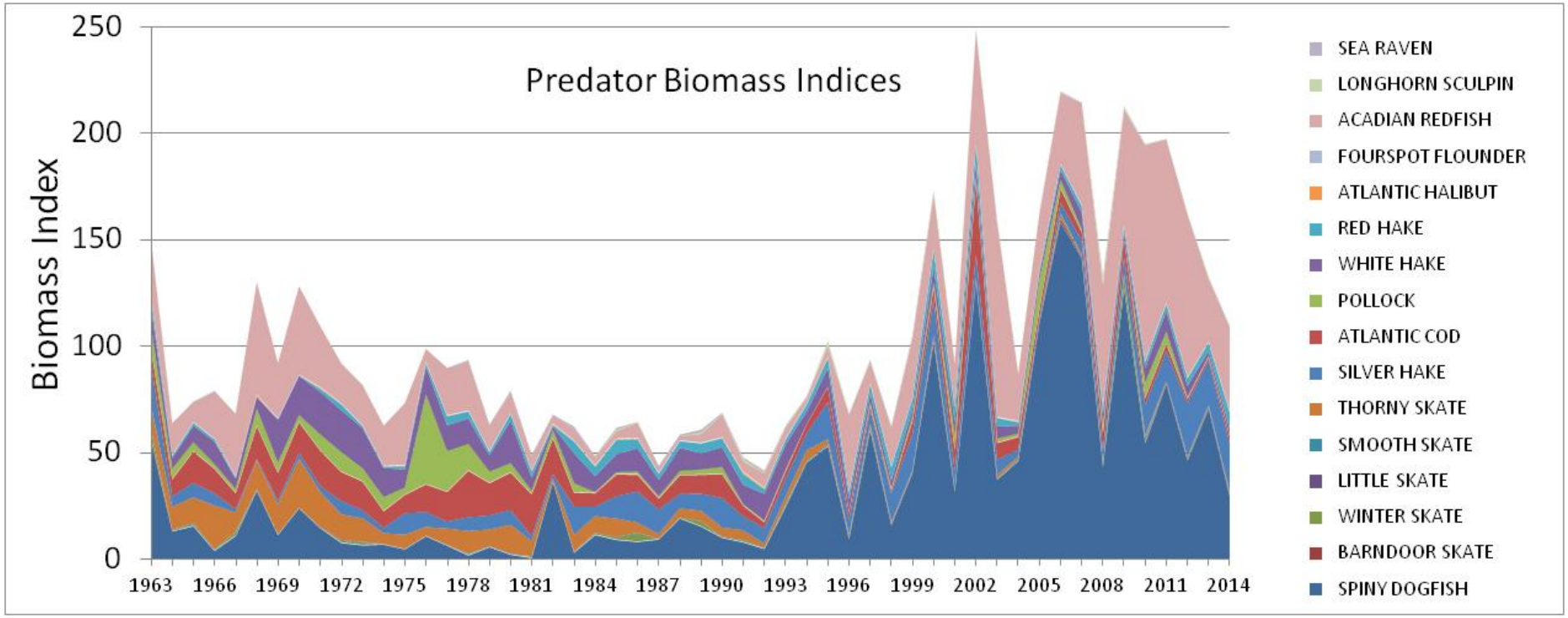
➢ 2013 good – cooler winter, however 2014 failed despite similar conditions

2015 TLA – Predation Pressure



- 2009-2011 high predation pressure >80th percentile
- 2012-2014 declined due to decrease in aggregate predator biomass
- Overall increasing trend since 1990s, well above SPM recent yrs

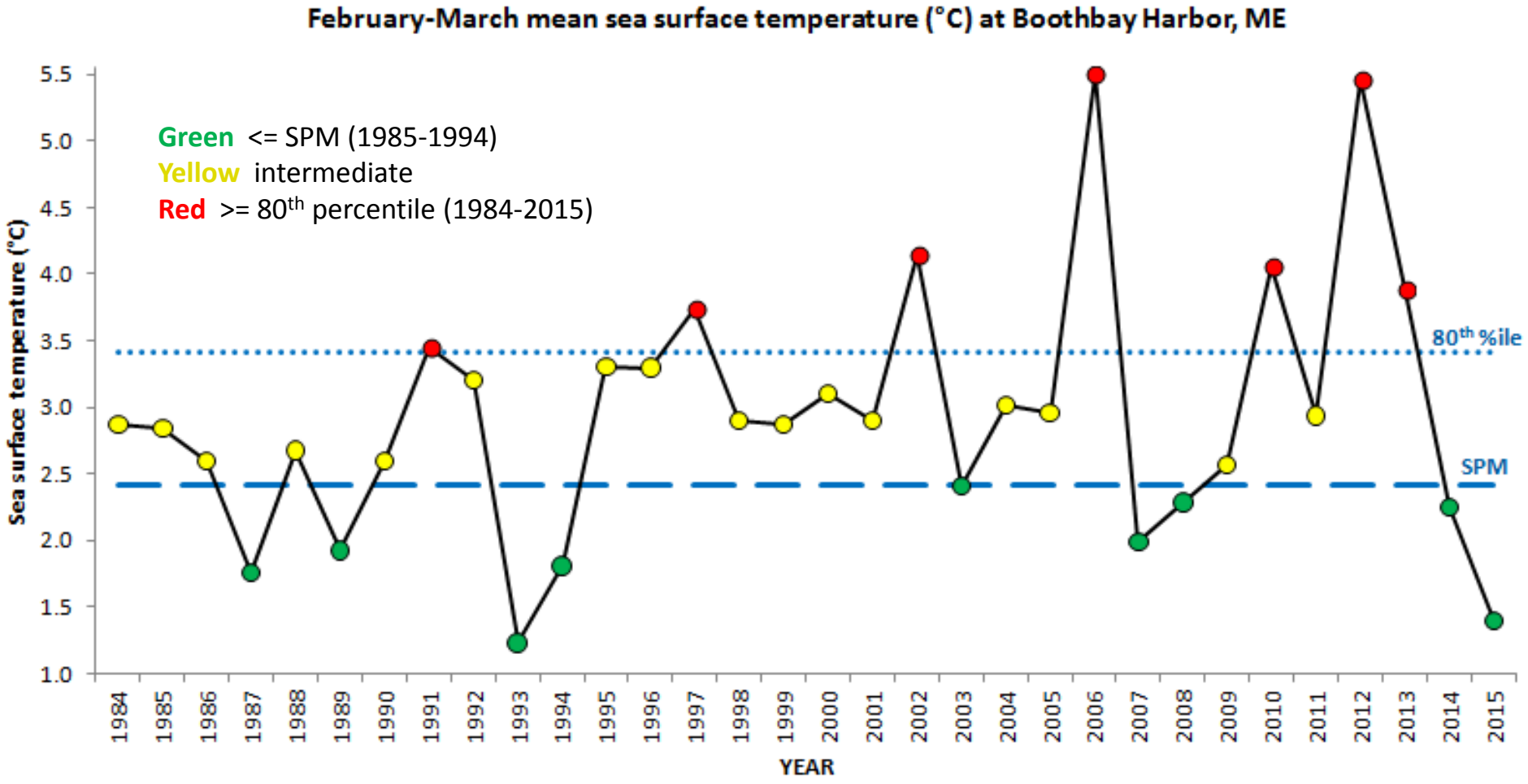
2015 TLA – Predation Pressure



2015 TLA - Environmental Conditions

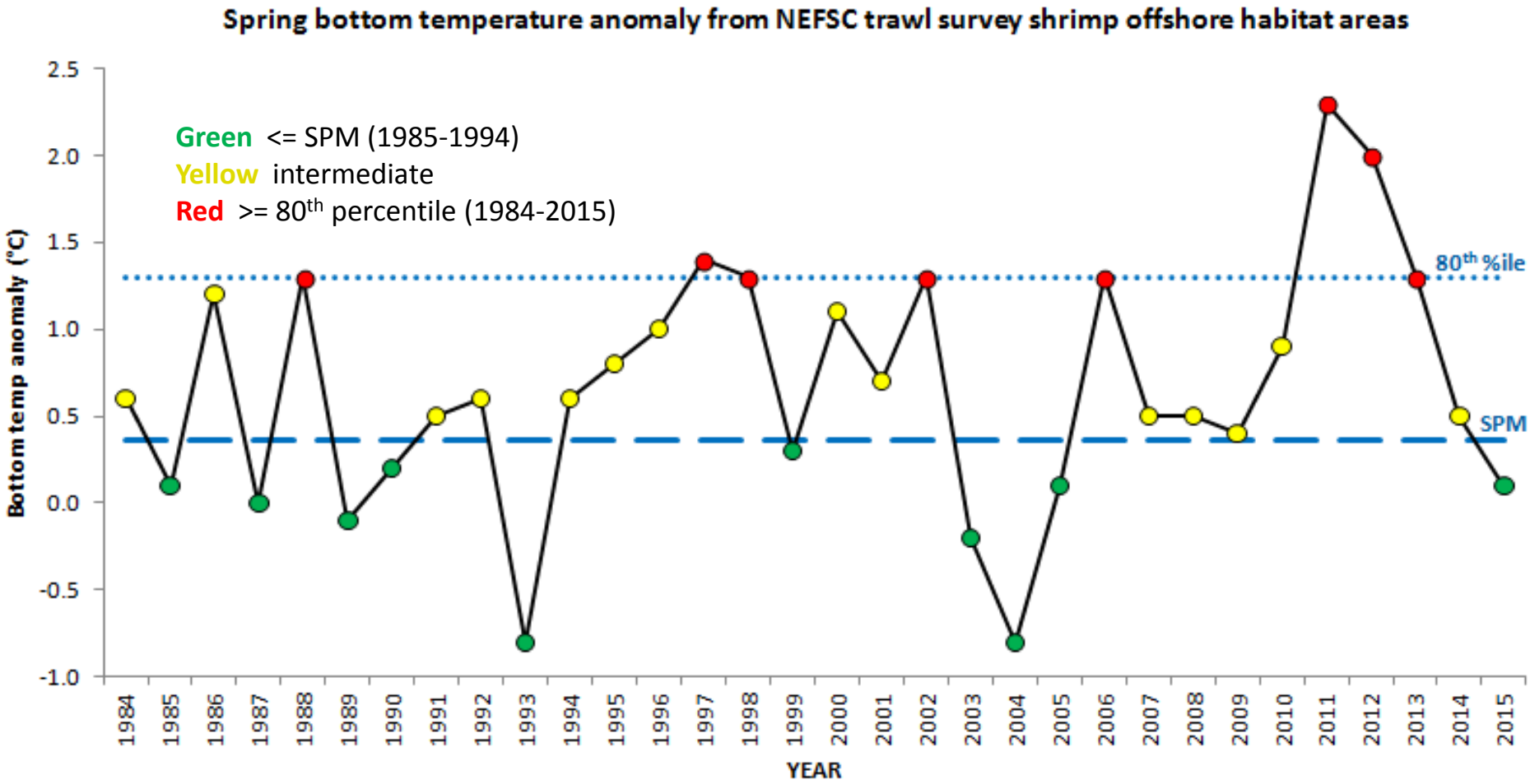
- Temperature
  - Colder springs better for recruitment (Richards et al. 1996, 2012)
  - Temperature affects hatch timing – earlier and longer hatch period with warmer waters (Richards 2012)

2015 TLA – Boothbay Harbor SST



- Center of nursery area; Critical time period for early life survival
- High Feb-Mar SST 2012-2013; cooler in 2014 & 2015

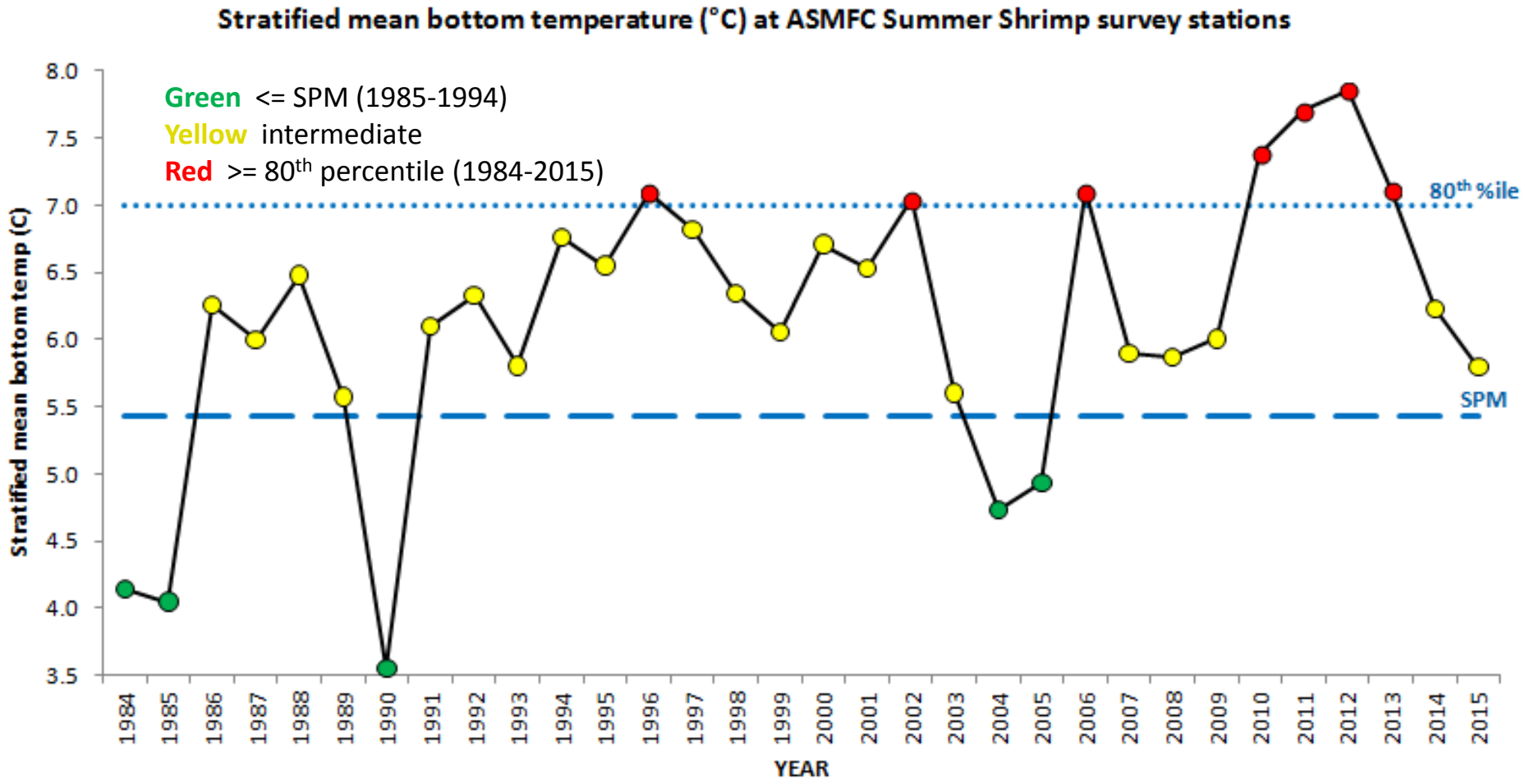
2015 TLA – NEFSC Spring Ocean Temp



- Bottom temp from GOM offshore shrimp habitat
- Highest anomaly on record 2011-2012 (2.3° C)
- 2013 remained high, cooler 2014 & 2015 (near SPM)

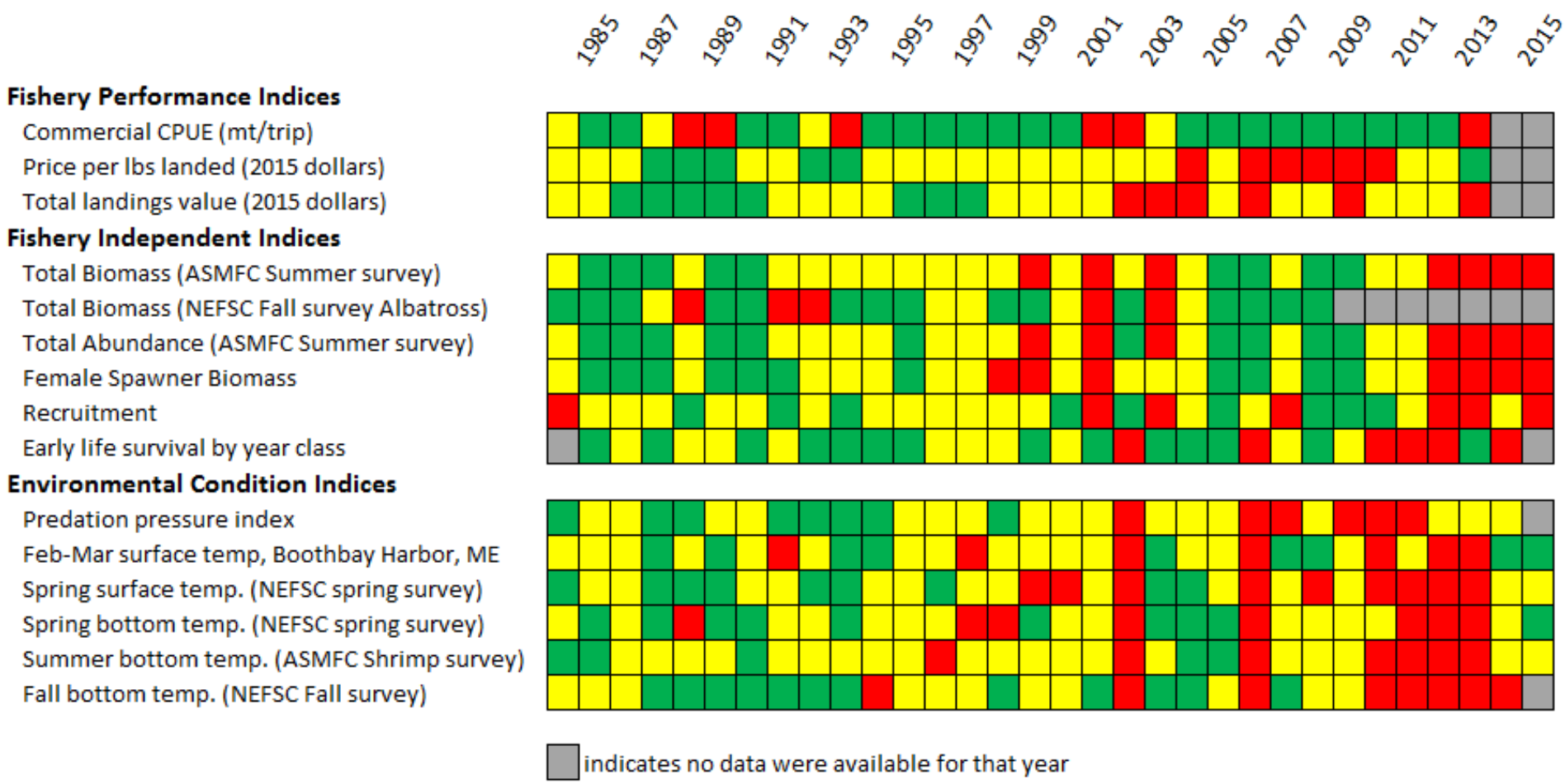
KW2

2015 TLA – ASMFC Summer Ocean Temp



- Extreme bottom temps 2010-2013 >7º C (~45º F)
- 2014 & 2015 cooler but above SPM
- Increasing trend, expected to rise further with climate change

2015 TLA - Indicators



Green - Favorable: at/more favorable than stable period (1985-1994)

Yellow - Intermediate

Red - Unfavorable: at/less favorable than 20th percentile (1984-2015)

2015 FTLA Stock Status Summary

- Total biomass – record lows
  - ❖ Under 10th percentile for last four years (2012-2015)
- Spawning biomass – record lows
  - ❖ Under 10th percentile for last four years (2012-2015)
- Recruitment – record lows
  - ❖ Under 10th percentile for three of four yrs
  - ❖ Low or failed recruitment for *five* consecutive years
- Bottom temperature – unfavorable
  - ❖ Upper 10th percentile 2011-2013
  - ❖ Lower in 2014/2015 but long-term trend increasing

2015 Stock Status

2015 GOM N. Shrimp Stock Status = **POOR**

- Given severe declines across survey indices, NSTC considers stock collapsed with little prospect of recovery in near future
- Short-term commercial prospects - very poor
  - Fishable biomass index <10% of stable period
  - Small size of females
- Long-term commercial prospects - very poor
  - Unprecedented consecutive five years of weak recruitment, impacting 2016-2019 fisheries

2015 NSTC Recommendations

Northern Shrimp Technical Committee recommends extending the moratorium on fishing to the 2016 season

- Capacity of this depleted stock to withstand fishing pressure remains at an all-time low.
- Despite more favorable water temperature and no fishing in 2014-2015, record low recruitment.
- Protect slightly stronger 2013 year class as females enter spawning stock this winter.

K. Ostrikis (MA DMF)

2016 Winter RSA Recommendation

Approach

- Obtain samples consistent with historical time series collected during commercial fishery
- Examine length/stage frequency distribution and timing of egg hatch

- 3 trawl vessels: MA/NH, Portland, ME, and Pemaquid Point, ME
  - Regions w/ largest portion of landings recent years
- 1 trap vessel: midcoast ME

2016 Winter RSA Recommendation

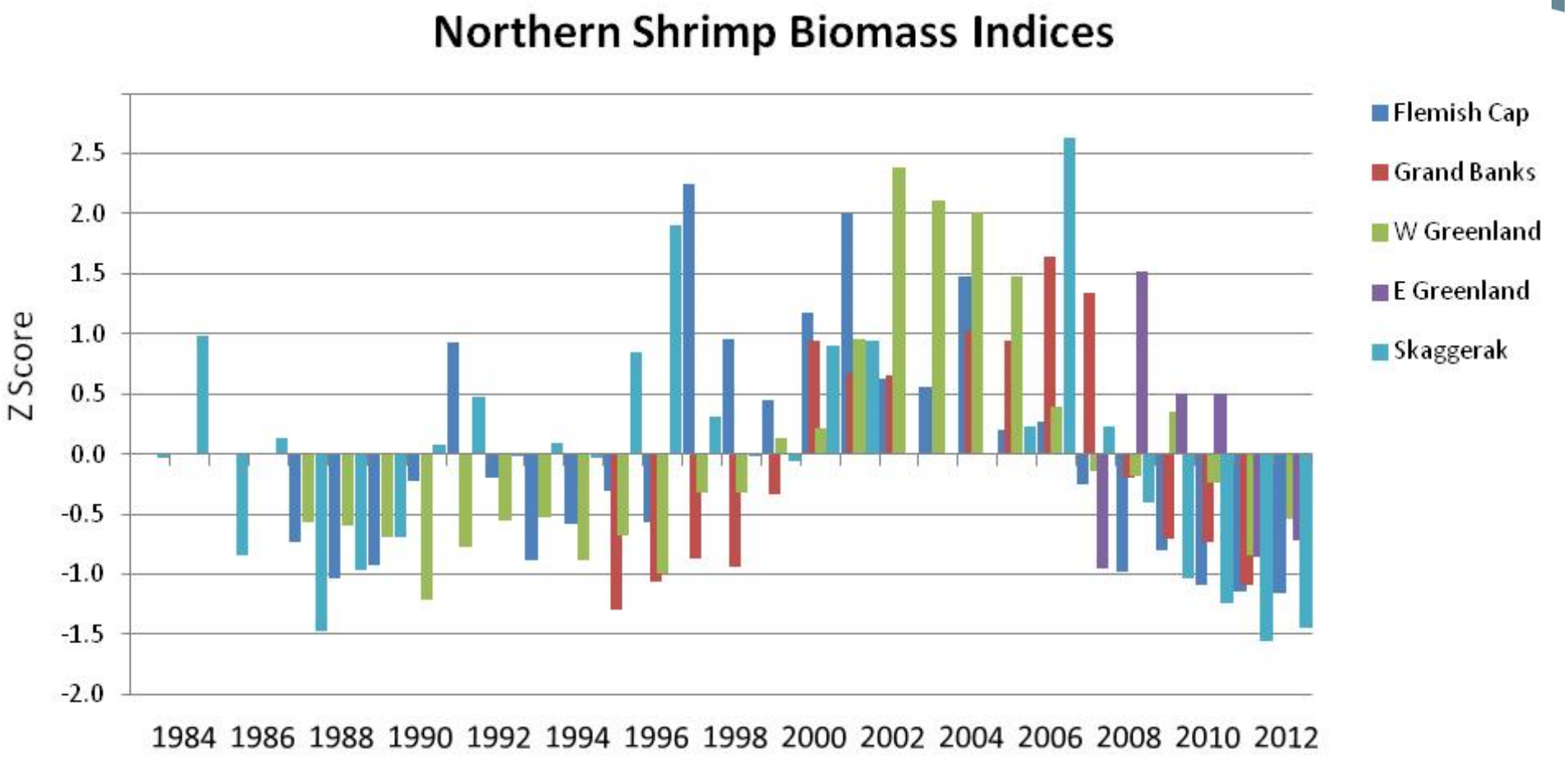
Budget & Quota

- $10,000 from ASMFC
  - Trawlers provided day rate and can sell catch
  - Trapper not paid, can sell catch

- RSA = 7.25 mt (16,000 lbs)
  - Trawlers
    - Trip limit 1,000 lbs; 15 total trips
      - 5 trips (1 per ~2 wks Jan- early April)
    - = 15,000 lbs (6.80 mt)
  - Trapper
    - Weekly limit 100 lbs; 10 weeks
    - = 1,000 (0.45 mt)

K. Ostrikis (MA DMF)

State of Other Stocks



- Moratorium in Grand Banks and Flemish Cap
- E. Scotian Shelf – declining biomass, unfavorable env., poor recruitment, decreasing size of shrimp – TAC reduction recommended

Northern Shrimp Survey Overview

Peter Chase

Northeast Fisheries Science Center

December 7, 2015

BACKGROUND

•Conducted annually (in some form) since 1983 on the R/V Gloria Michelle

•Survey funding comes through the ASMFC

•Staffed by NEFSC and State agencies of MA, NH, and Maine

•NEFSC has lead responsibility for organizing and conducting the survey, and for processing and archiving the resulting data

NOAA FISHERIES

SURVEY BASICS

•Stratified random sampling design.

• 12 original strata in Gulf of Maine (2 have been dropped recently).

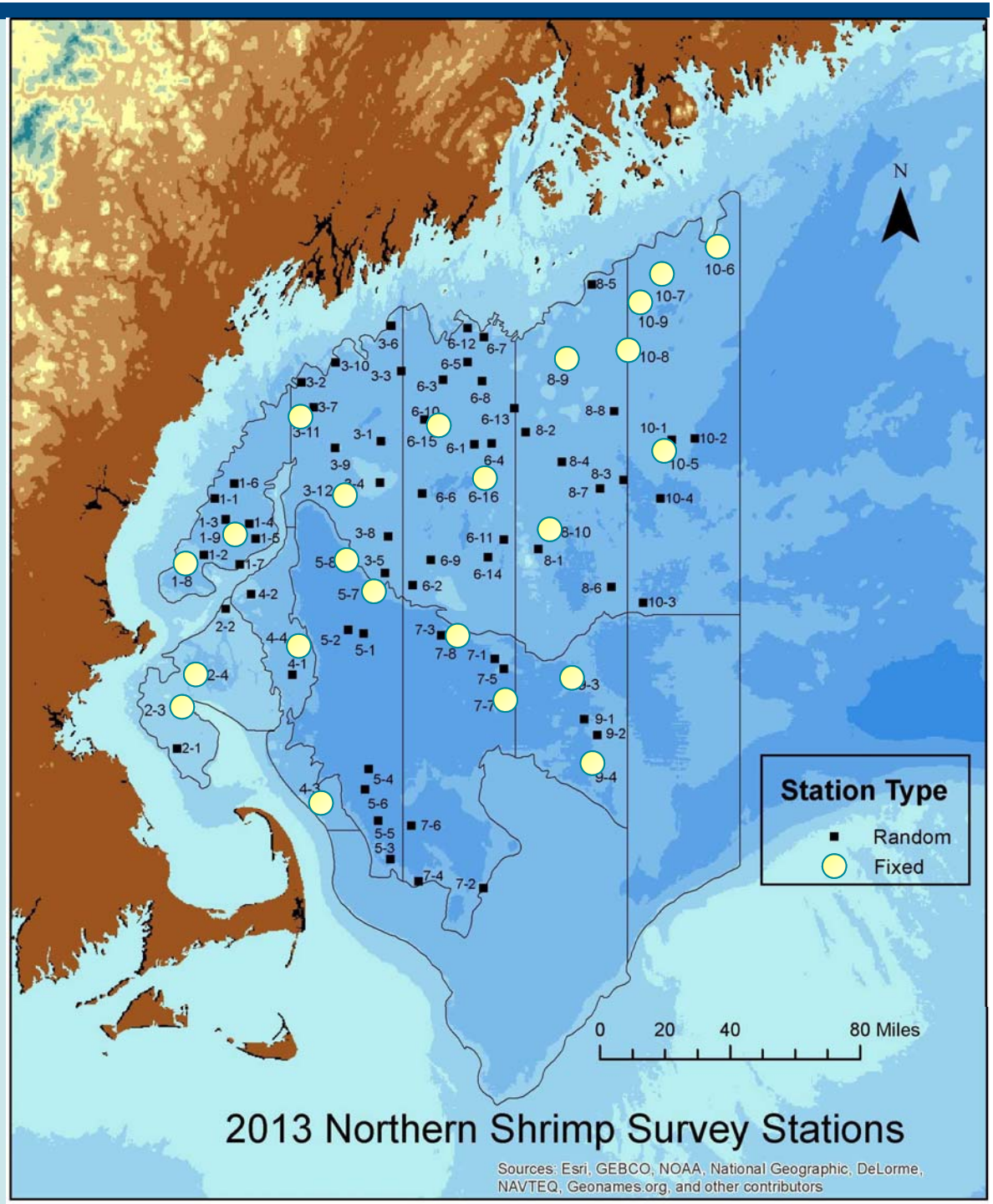
• 2 historical fixed stations per strata (5 in stratum 10).

• Currently a total of 84 stations are plotted. Recent budgets have supported 22 sea days during July/August.

• Gear used: modified 4 seam commercial shrimp trawl with 350kg Portuguese polyvalent doors.

•Tows are 15 minutes at 2 knots.

NOAA FISHERIES



THE VESSEL

•Gloria Michelle is owned by the NEFSC, chartered for various projects including MADMF groundfish survey, shrimp survey, and a variety of shorter cruises.

•72’ steel hull stern trawler, 20’ beam, built in 1974

•Home port Woods Hole, MA

Major repairs completed in 2015:

- MSD System, Head & 210 Gallon Holding Tank
- Rebuilt Main Engine
- New 20kW Northern Lights Generator
- New radar, sounder, satellite compass, Nav-tex
- Starboard Fuel Tank & Hydraulic Tank cleaned
- New net reel motor
- New fish hold escape hatch
- Rebuilt Reduction Gear
- New boiler exhaust
- New mast supports
- New Port/Stbd railings

NOAA FISHERIES

Current Dry Dock Period: Yank Marine Shipyard

- Currently hauled out in Tuckahoe, NJ at Yank Marine
- Hull UT tested, overall **hull found to be in great condition (good for minimum of 10+ more years of safe use)**
- Blasting & painting entire vessel, minus A-Frame
- All house windows replaced
- Aft wheel house plexi windows renewed
- Extensive topsides metal renewed
- Net reel blast, paint, renew
- Hydraulic through deck fittings renewed
- Zincs renewed
- Navigation lights converted to LED

NOAA FISHERIES

SURVEY STRENGTHS

•Long time series, continuous since 1983

•Only trawl survey with an extended time series in offshore portions of the Gulf of Maine during the summer.

•Primary source of fishery independent data for the assessment of Northern Shrimp. Finfish data also incorporated into assessments for various fish species.

•Operations have been updated/improved considerably over the past few years, e.g.:

-Introduction of FSCS 2.0 (advanced electronic data entry system)
-NOTUS trawl monitoring
-Net mounted CTD
-Improved bridge electronics
-Checker table for catch

NOAA FISHERIES

SURVEY CHALLENGES

•Failure of deck equipment has either ended survey or greatly limited station production for 3 years in a row (40 of 84 plotted stations completed in 2015).

•The uncertainty in the success of the survey is not acceptable for species management.

•Winches are old (65+ years), fail often and are unsafe when used with larger fishing gear.

•Shrimp trawl doors are too big (unsafe) for the winches, and likely too big for the vessel.

•We know that the GM will be around for many more years so these problems should be addressed soon.

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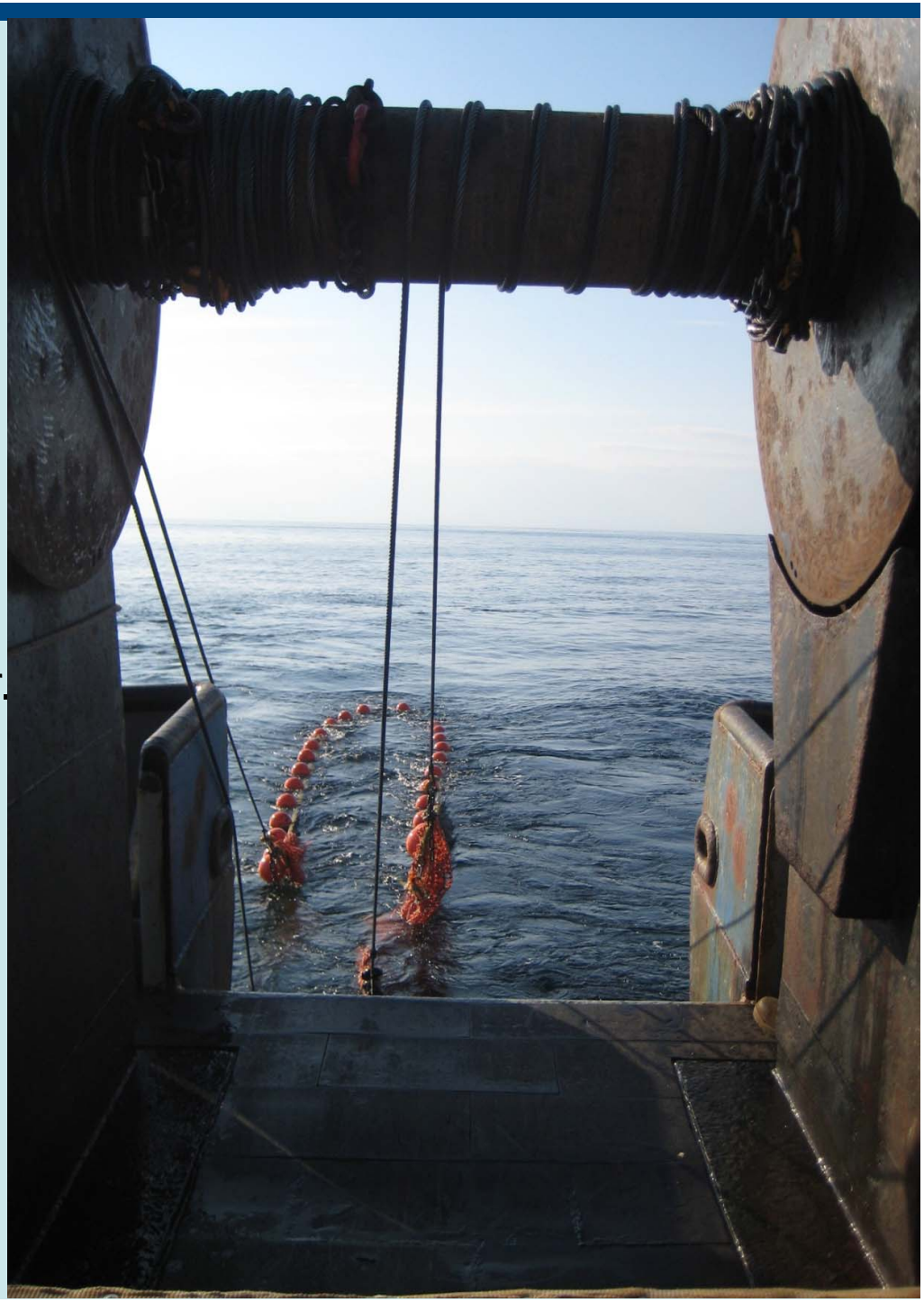

FUTURE DIRECTION

- To address these problems we propose:
  - Replacing existing winches with a more modern and powerful split winch system
  - Switching to more manageable (modern) doors and conduct a calibration.

- Strong preference for making all changes at the same time.

- These changes would be for increased survey productivity and **for the increased safety of crew and scientists at sea.**

- Source of funding is uncertain at this time but changes need to be made soon.

NOAA FISHERIES

Questions, Comments, or Concerns?

Thank you for your time!

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