

*Science, Service, Stewardship*

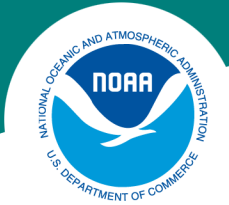


# **SEDAR 43 Gulf of Mexico Gray Triggerfish Standard Assessment**

## **Data and Assessment Workshop**

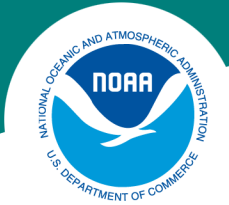
Jeff Isely

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## **SEDAR 43 Gulf of Mexico Gray Triggerfish Assessment Terms of Reference Updated: November 2014**

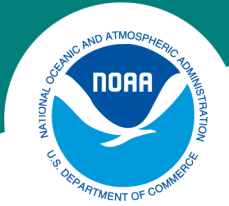
1. Using data through 2013, provide a model consistent with the previous assessment configuration. Incorporate and evaluate any recommended changes for this assessment.
2. Evaluate and document the following specific changes in input data or deviations from the benchmark model previous assessment model:
  1. Review updated life history information (age and growth, mortality, and reproductive parameters).
  2. Evaluate the effect of circle hooks on fishery dependent catch rates of gray triggerfish.
  3. If warranted, incorporate a change in catchability and or selectivity due to the implementation of circle-hooks.
3. Review the stock recruitment relationship related to males only, females only, and males and females combined.
4. Evaluate the fishery-independent video and trap surveys conducted by NMFS Panama City Lab and FWRI.
5. Document any revisions or corrections made to the model and input datasets, and provide updated input data tables.
  1. Provide commercial and recreational landings and discards in numbers and weight (pounds).



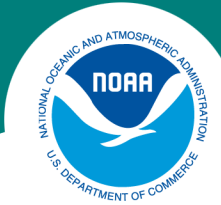
## **SEDAR 43 Gulf of Mexico Gray Triggerfish Assessment Terms of Reference Updated: November 2014**

6. Update model parameter estimates and their variances, model uncertainties, and estimates of stock status and management benchmarks.
7. In addition to the base model, conduct sensitivity analysis to address uncertainty in data inputs and model configuration and consider runs that represent plausible, alternate states of nature.
8. Project future stock conditions regardless of the status of the stock. Develop rebuilding schedules, if warranted. Provide the estimated generation time for each unit stock. Stock projections shall be developed in accordance with the following scenarios to evaluate (preliminary, to be modified as appropriate)
  1. Landings fixed at 2013 target.
  2. FOY= 75%, FMSY (project when OY will be achieved)
  3. FREBUILD (if necessary)
  4. F=0 (if necessary)
9. Develop a stock assessment report to address these TORs and fully document the input data, methods, and results.

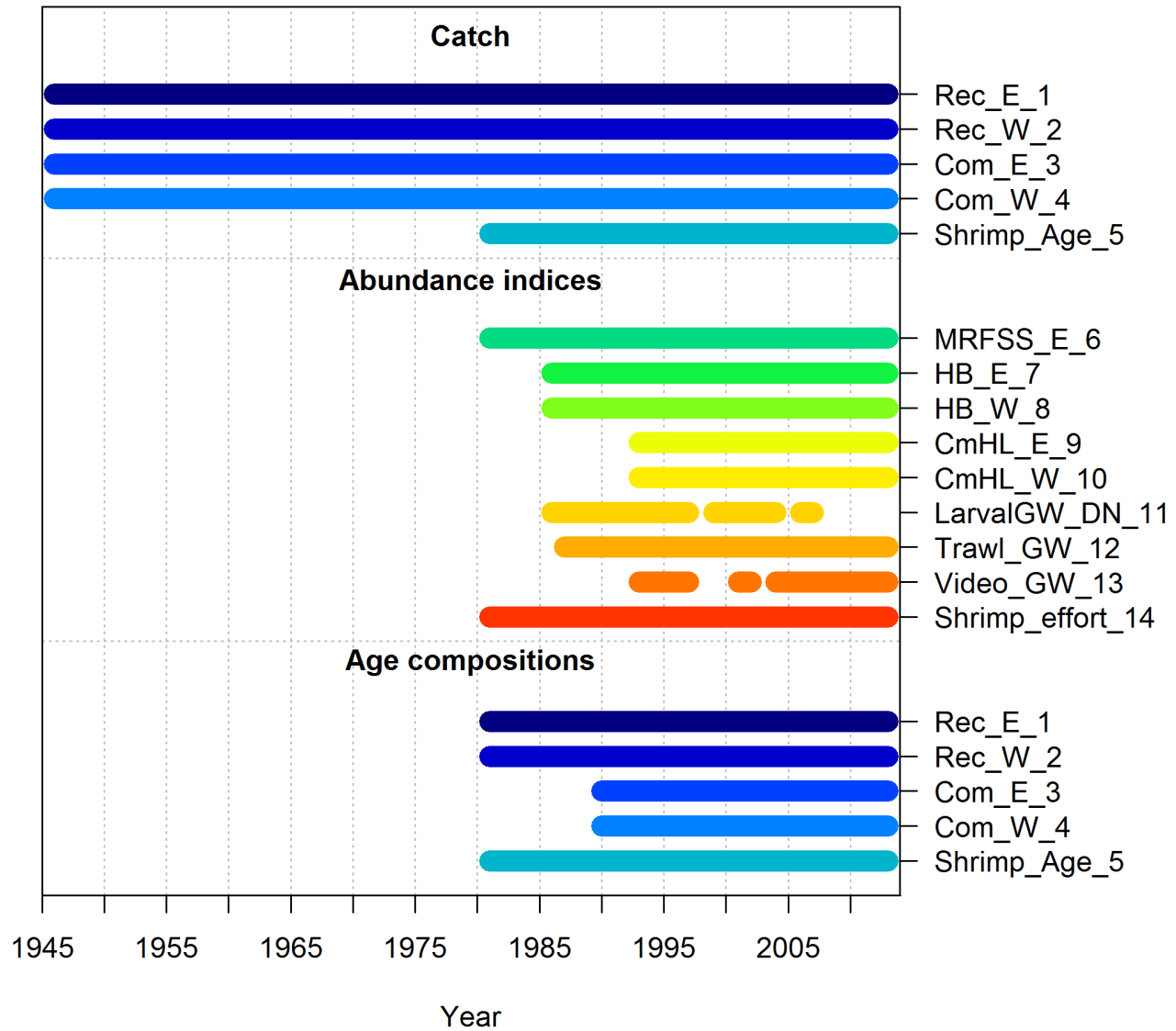
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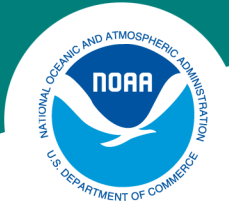
# Data



**Data by type and year**



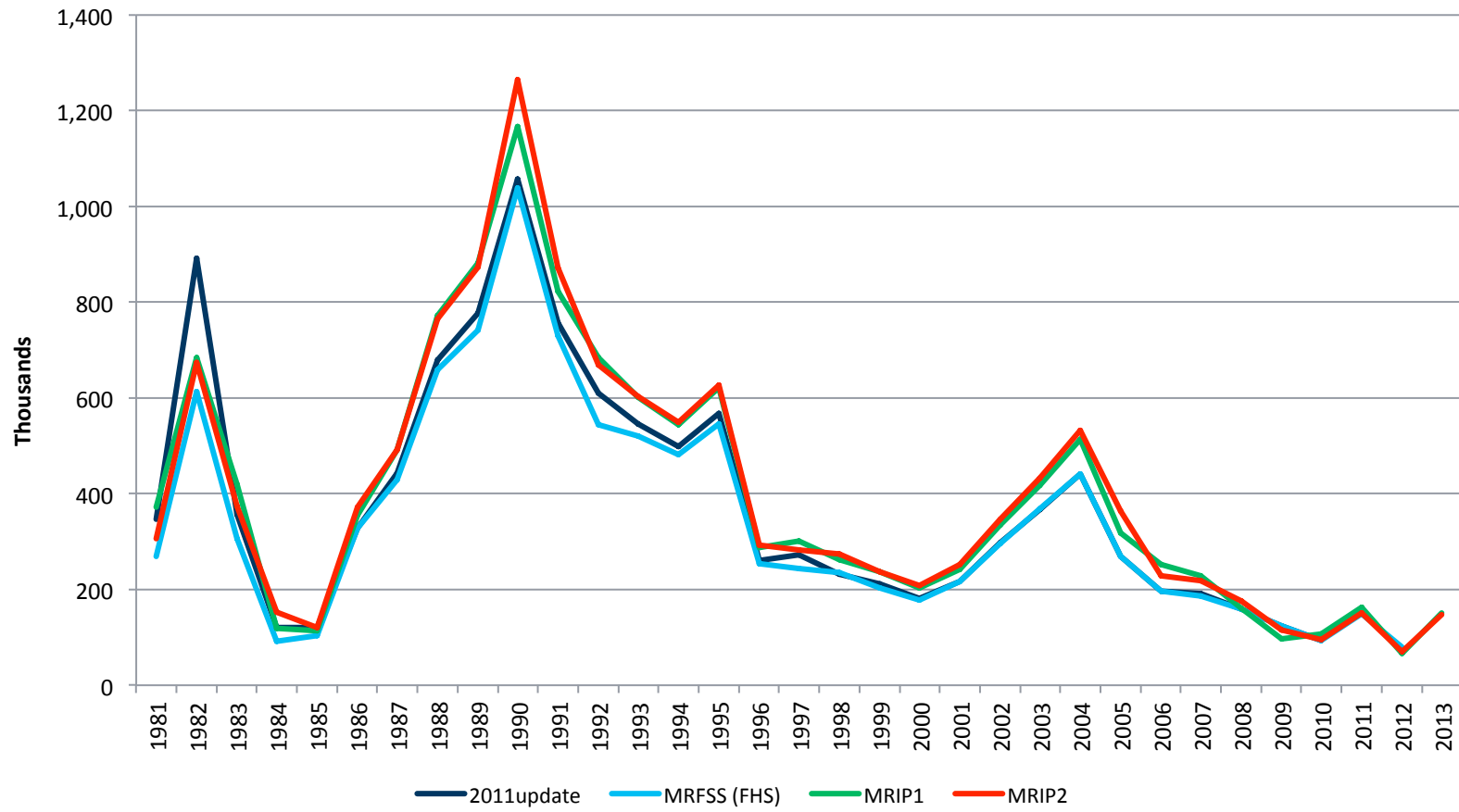
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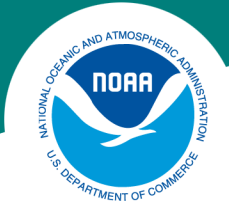


# Landings

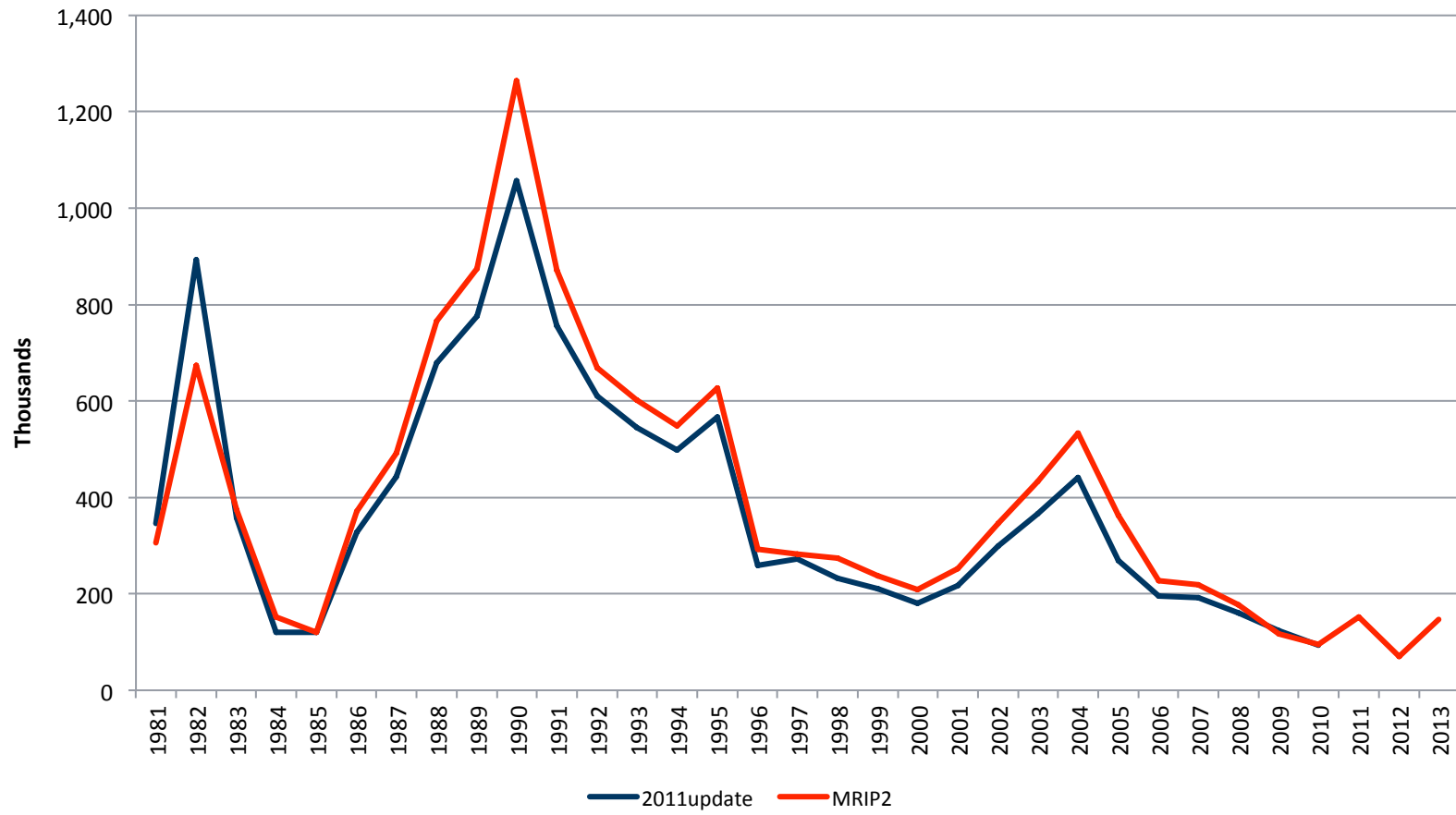


## MRFSS/MRIP Landings (numbers) (AB1) Comparisons

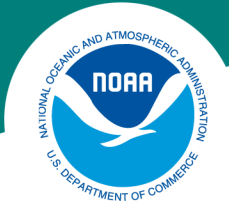




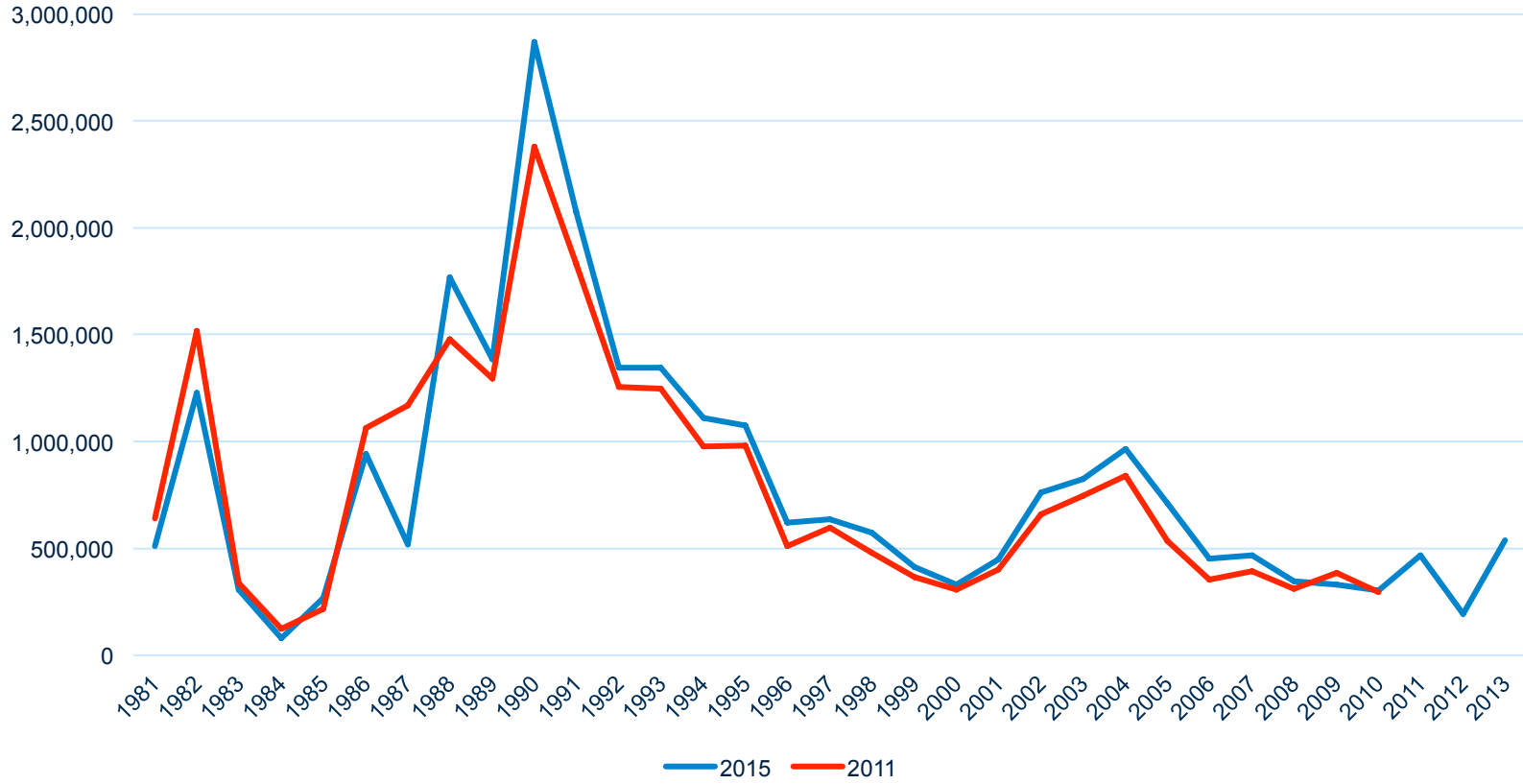
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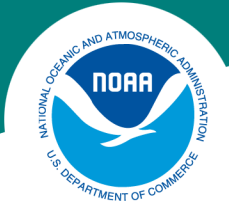




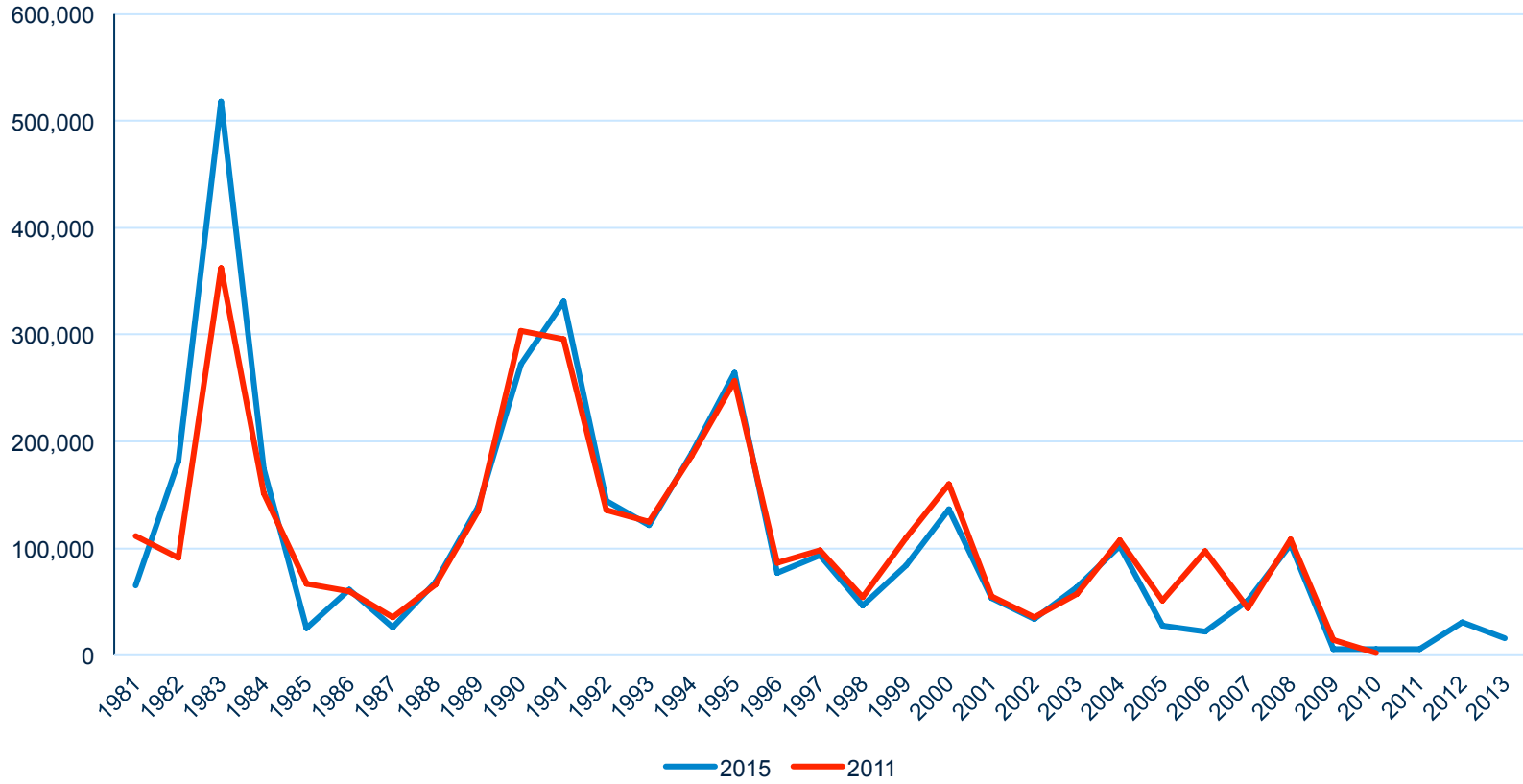


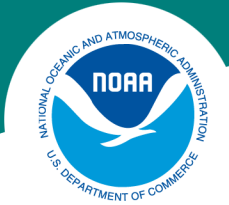
## Rec East (lbs)



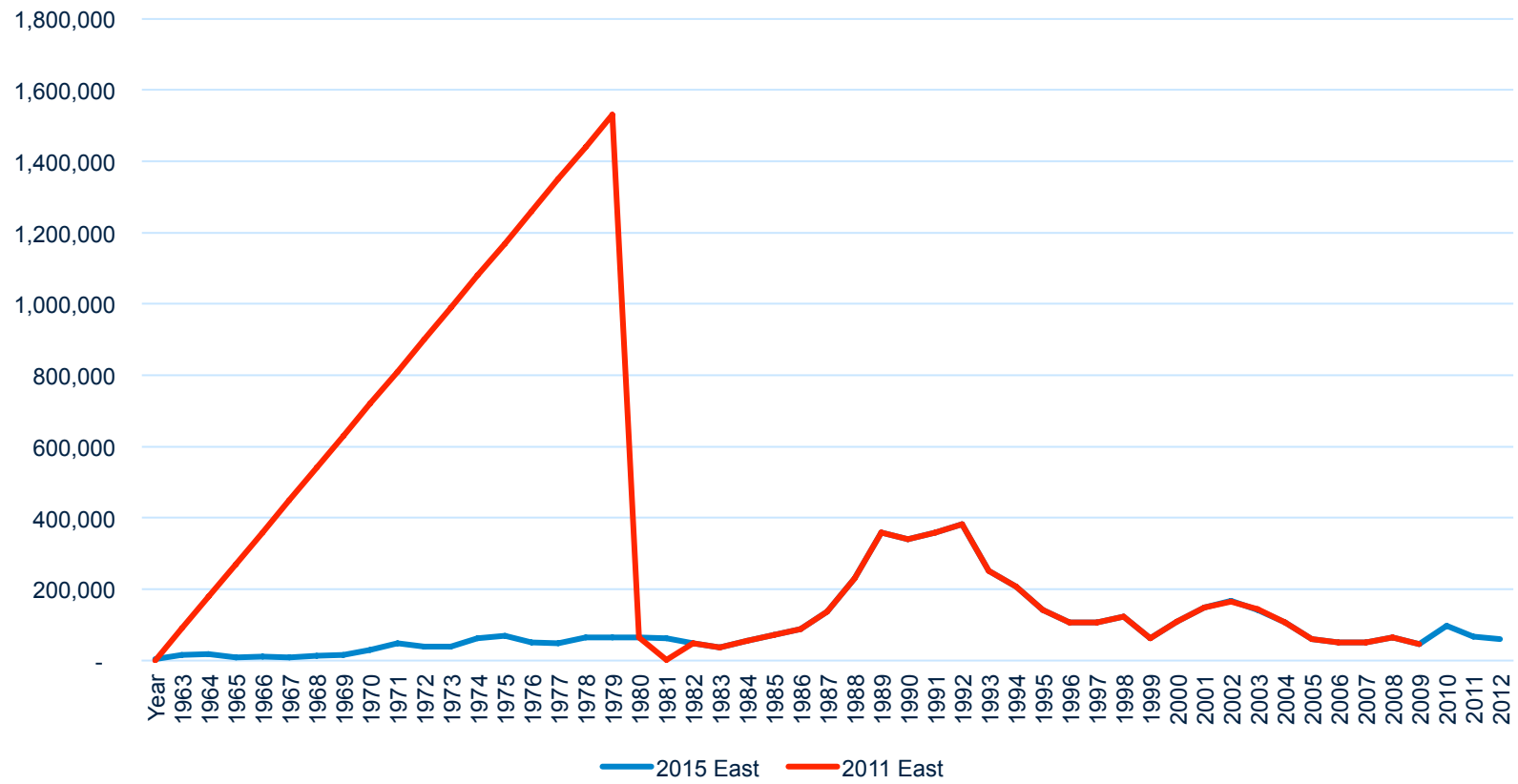


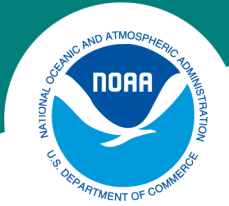
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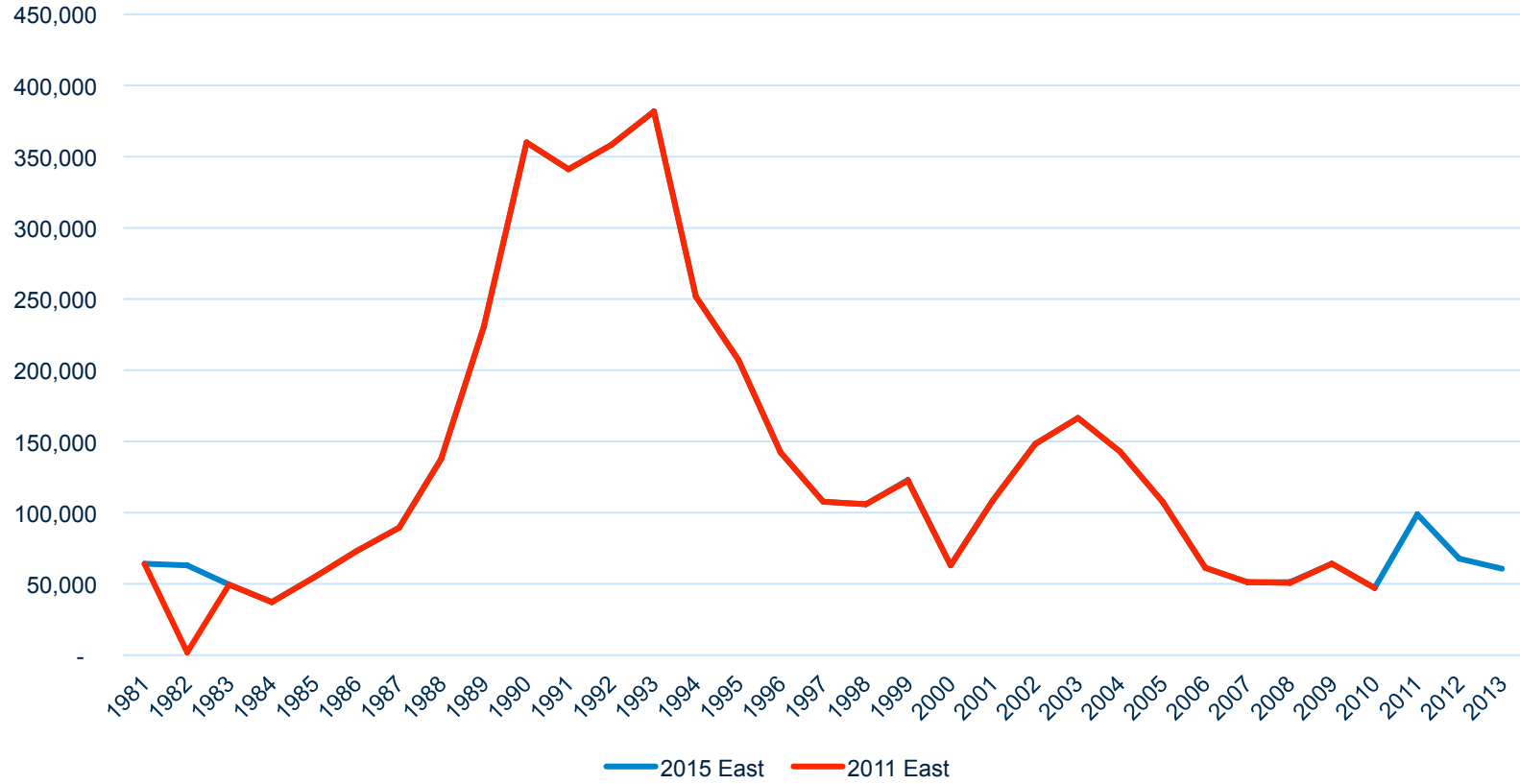


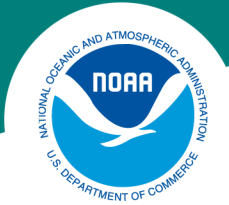
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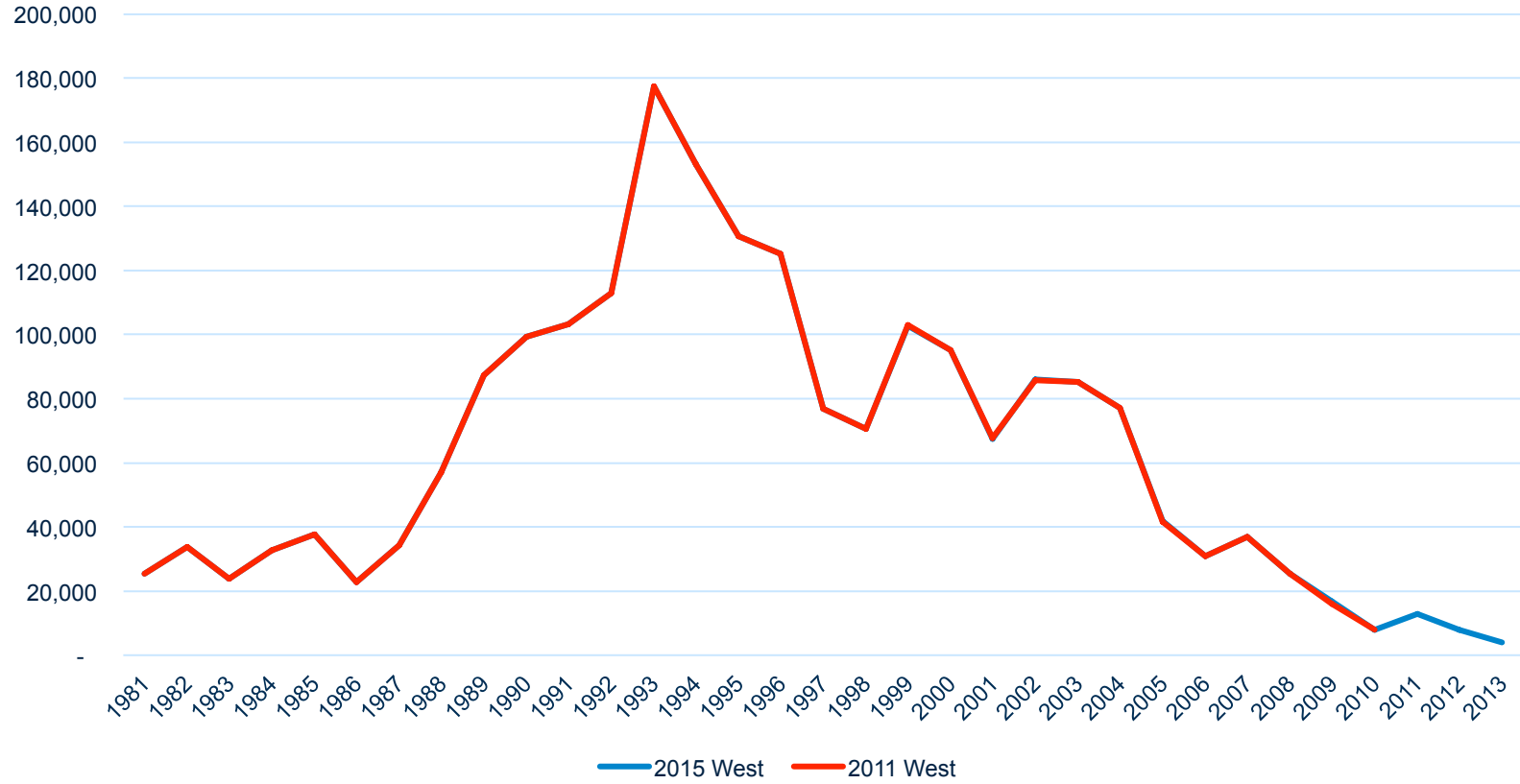


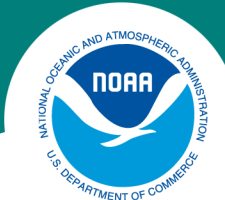
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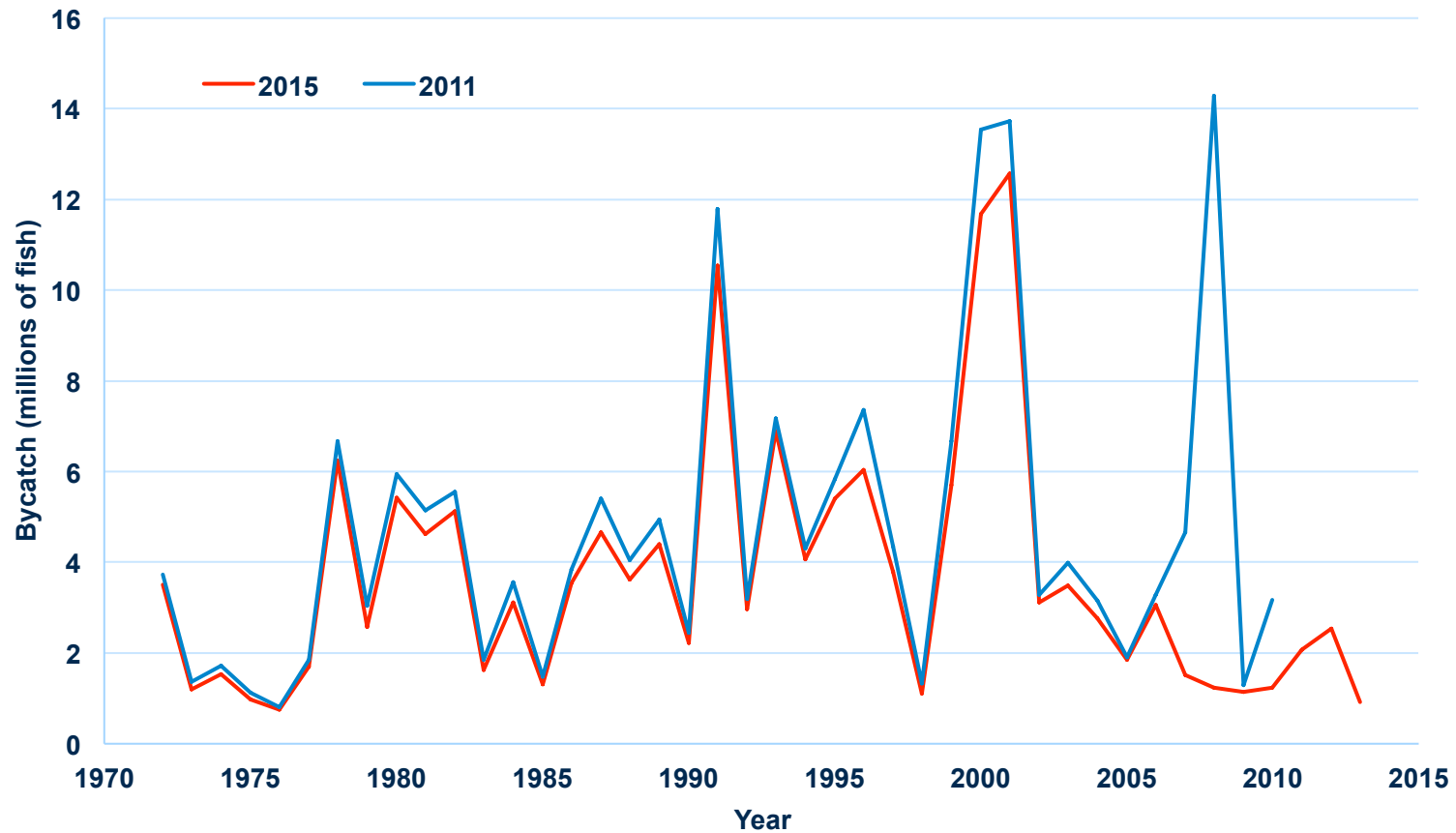


## Commercial West (lbs)

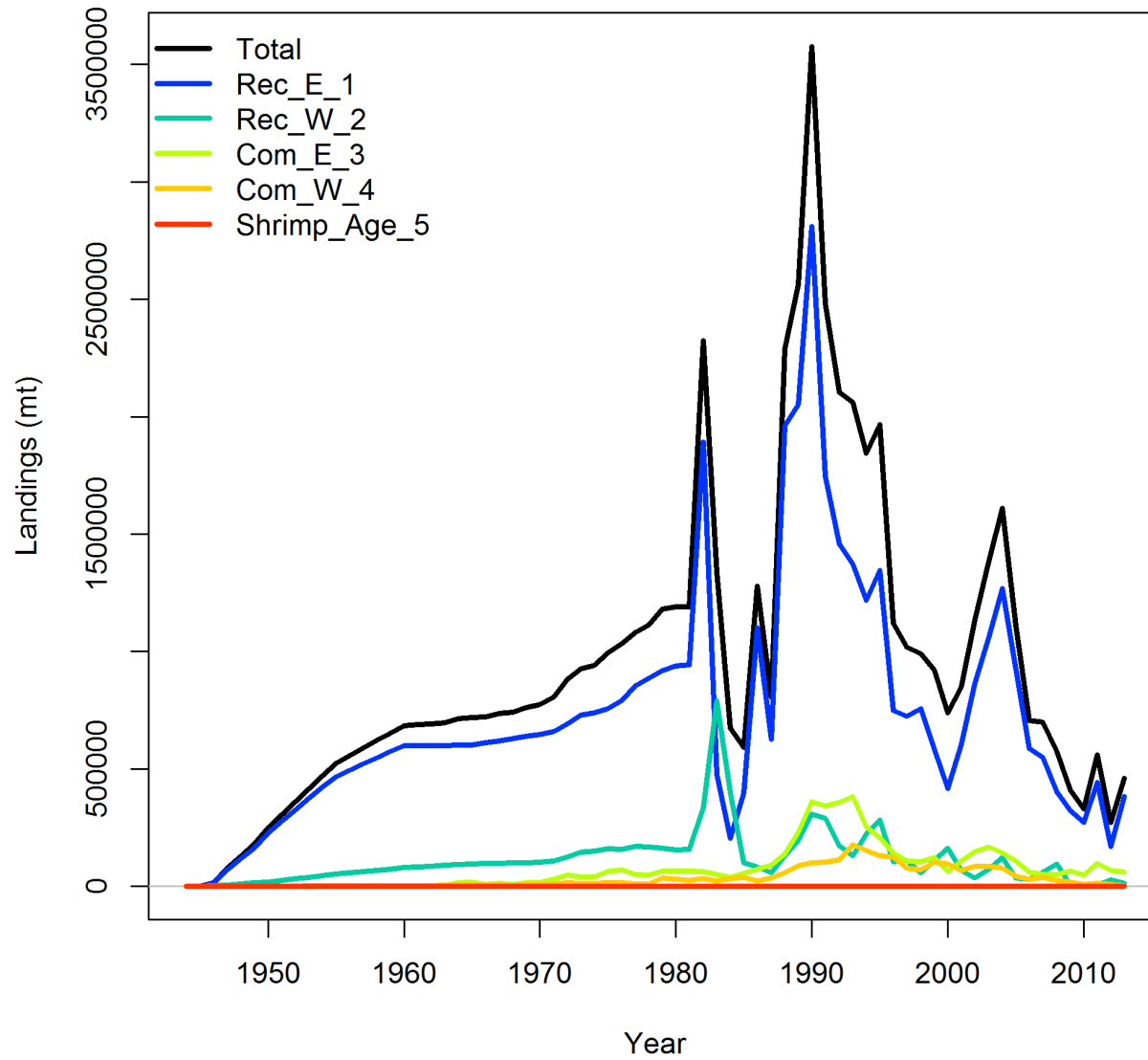
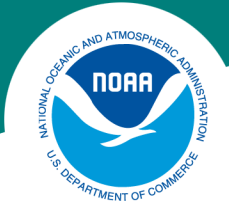




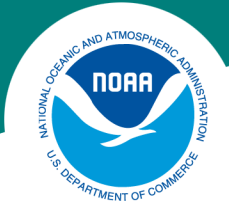
## Shrimp Discards



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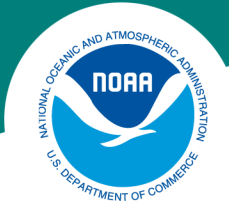


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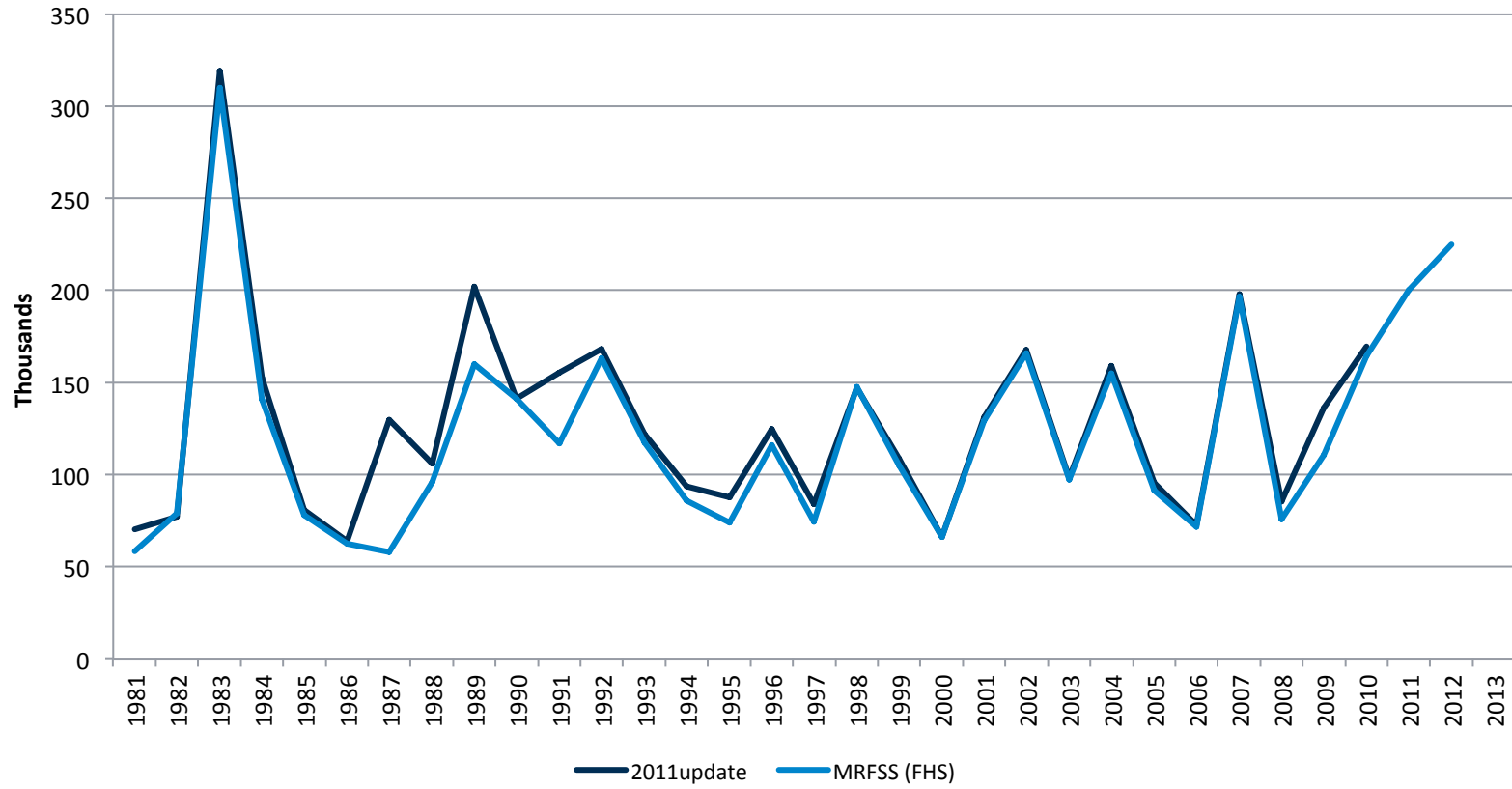


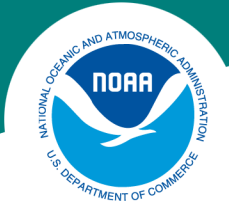
# Discards



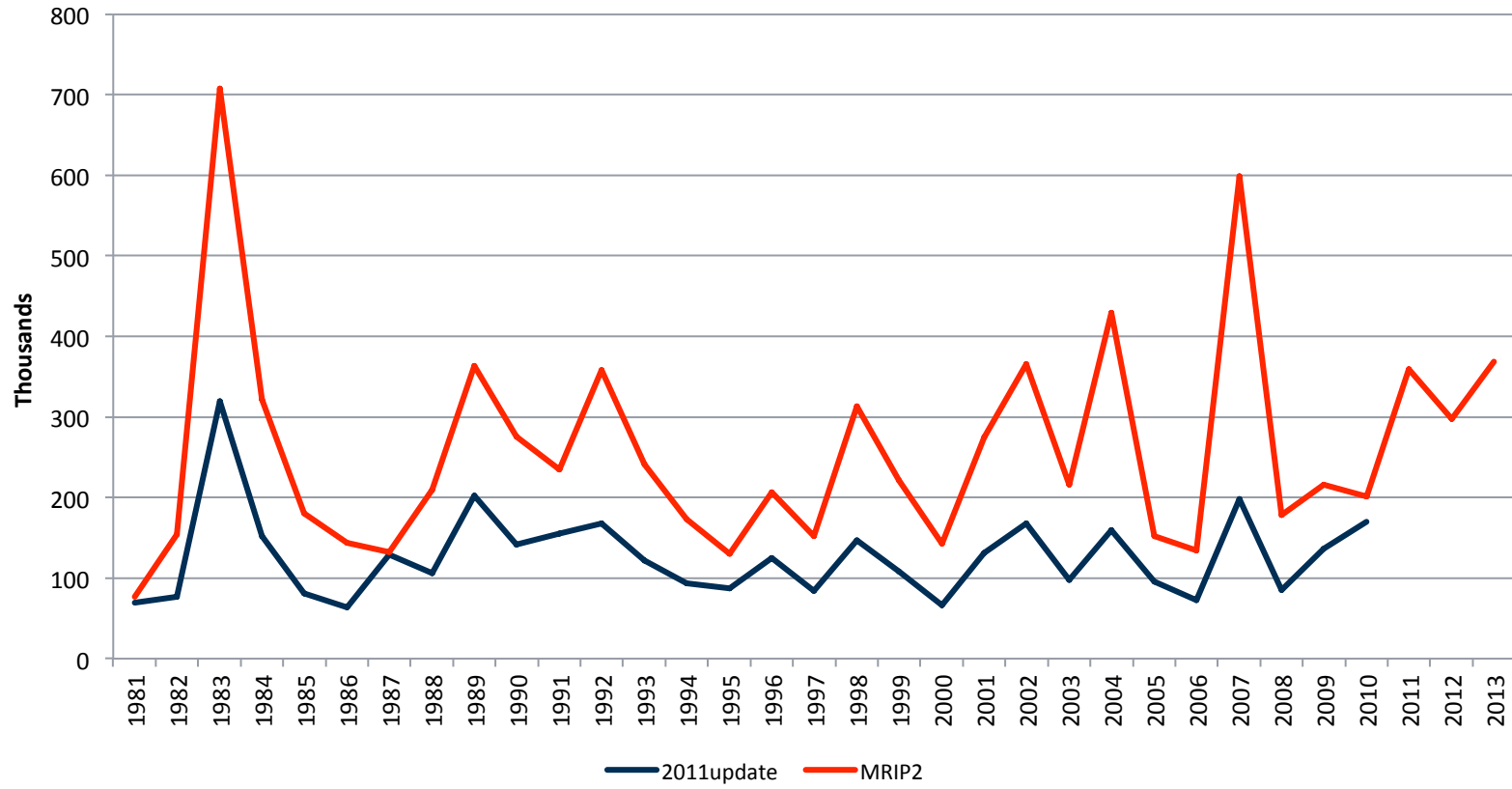


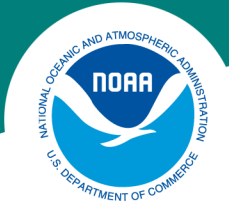
## MRFSS/MRIP Discards (numbers) (B2) Comparisons



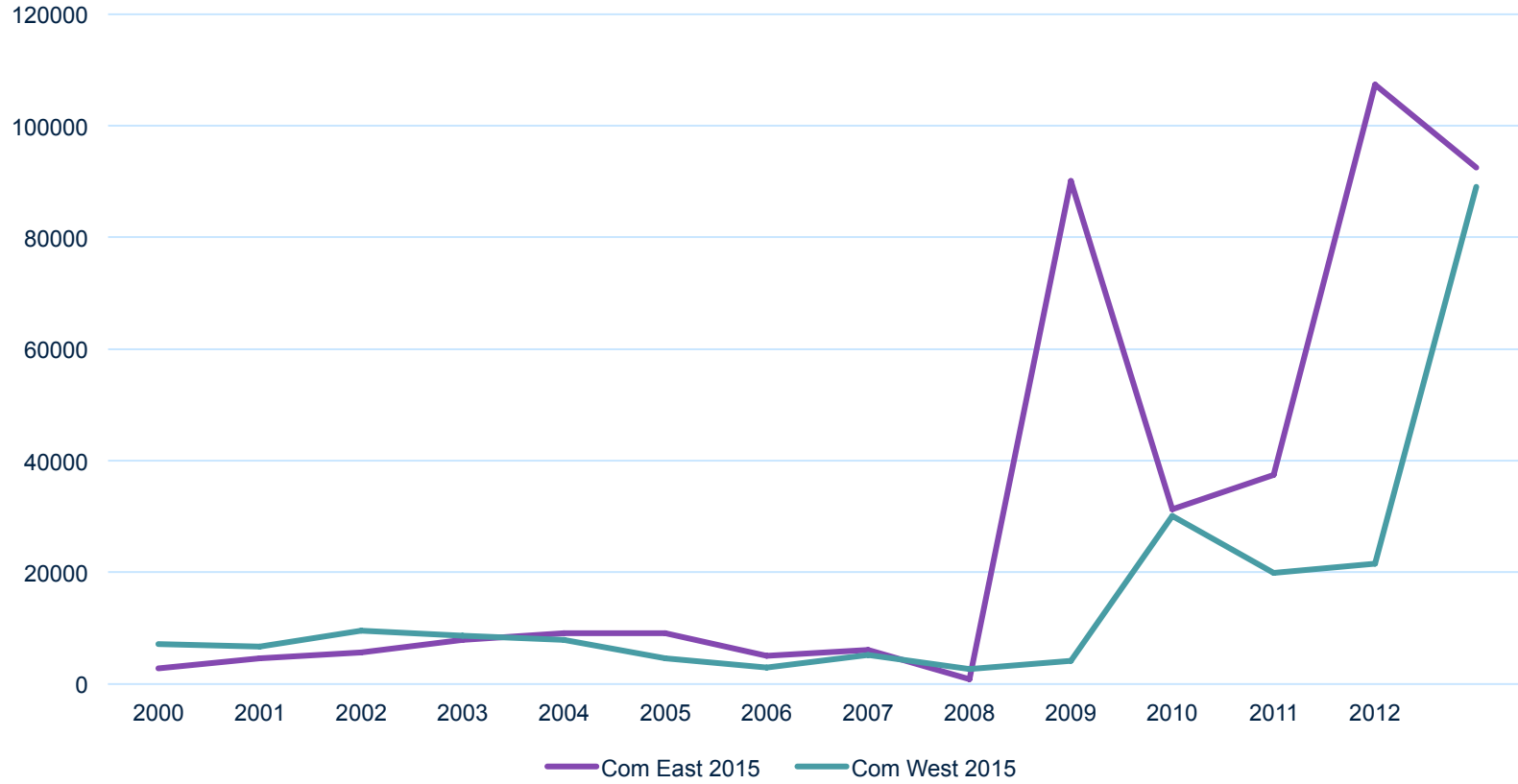


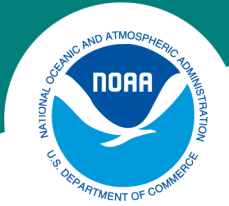
## MRFSS/MRIP Discards (lbs) (B2) Comparisons



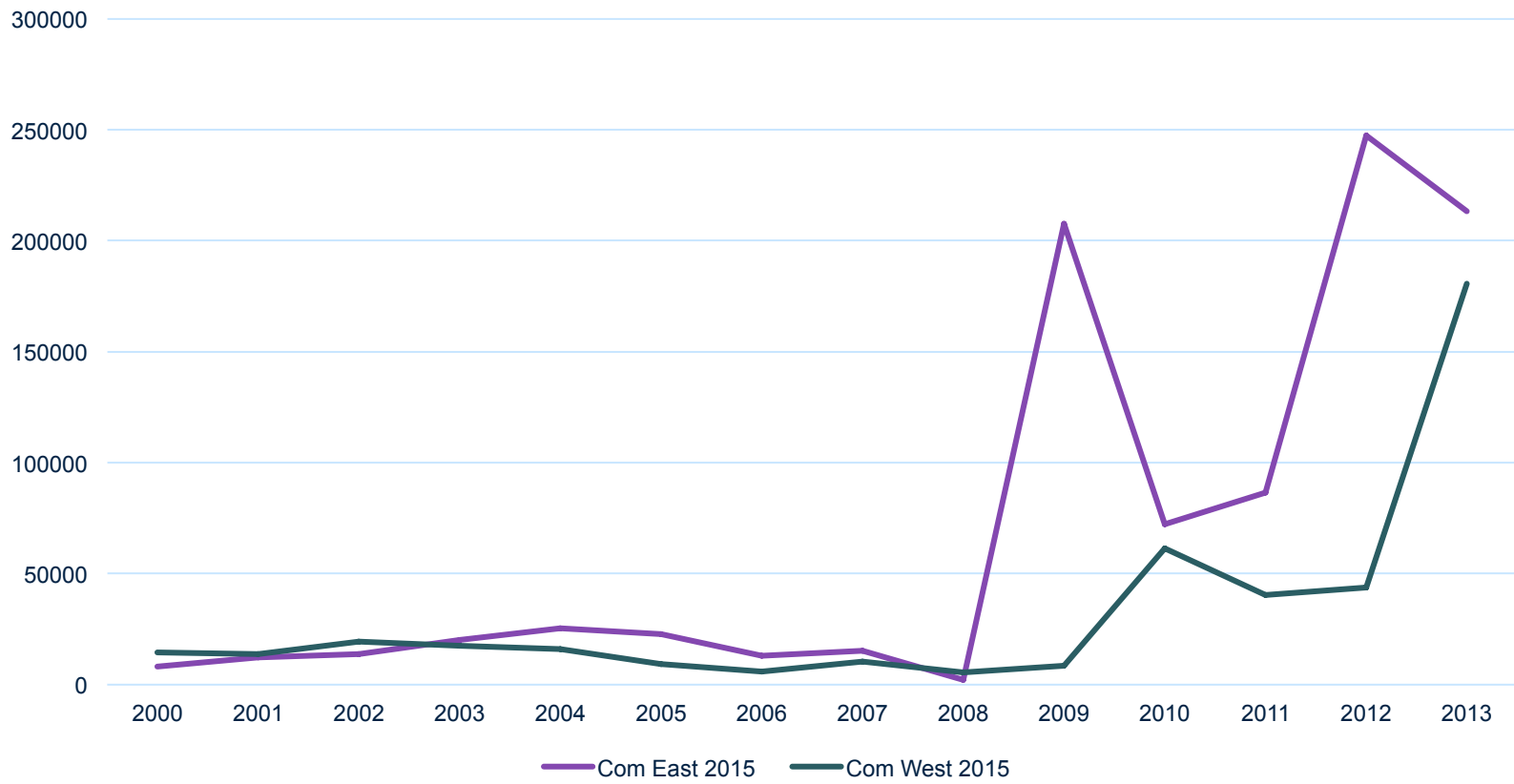


## Commercial Discards (Numbers)

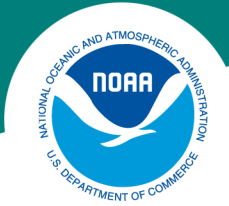




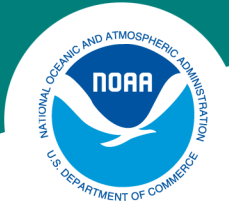
## Commercial Discards (Whole Pounds)



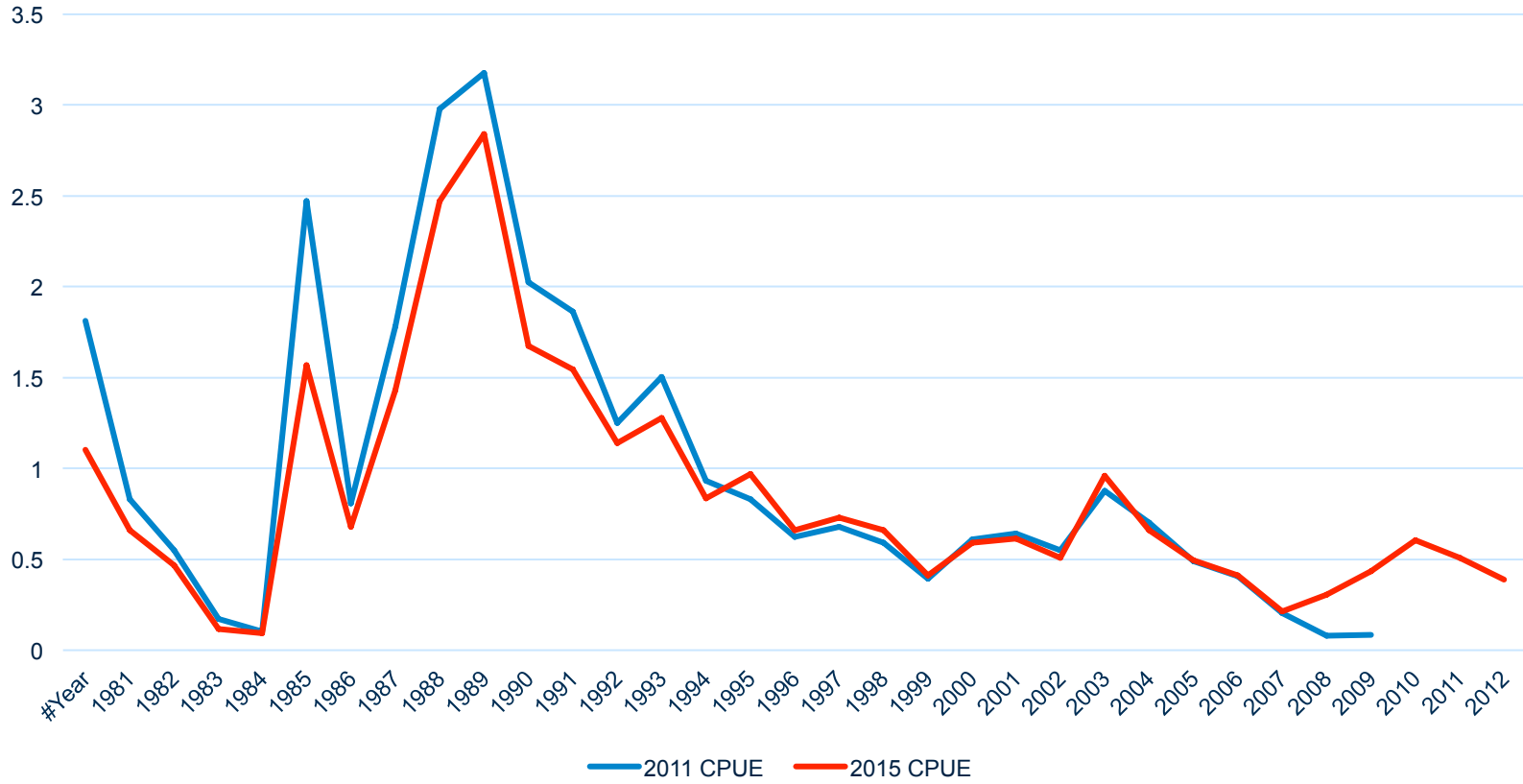
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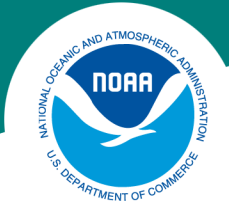


# Indices

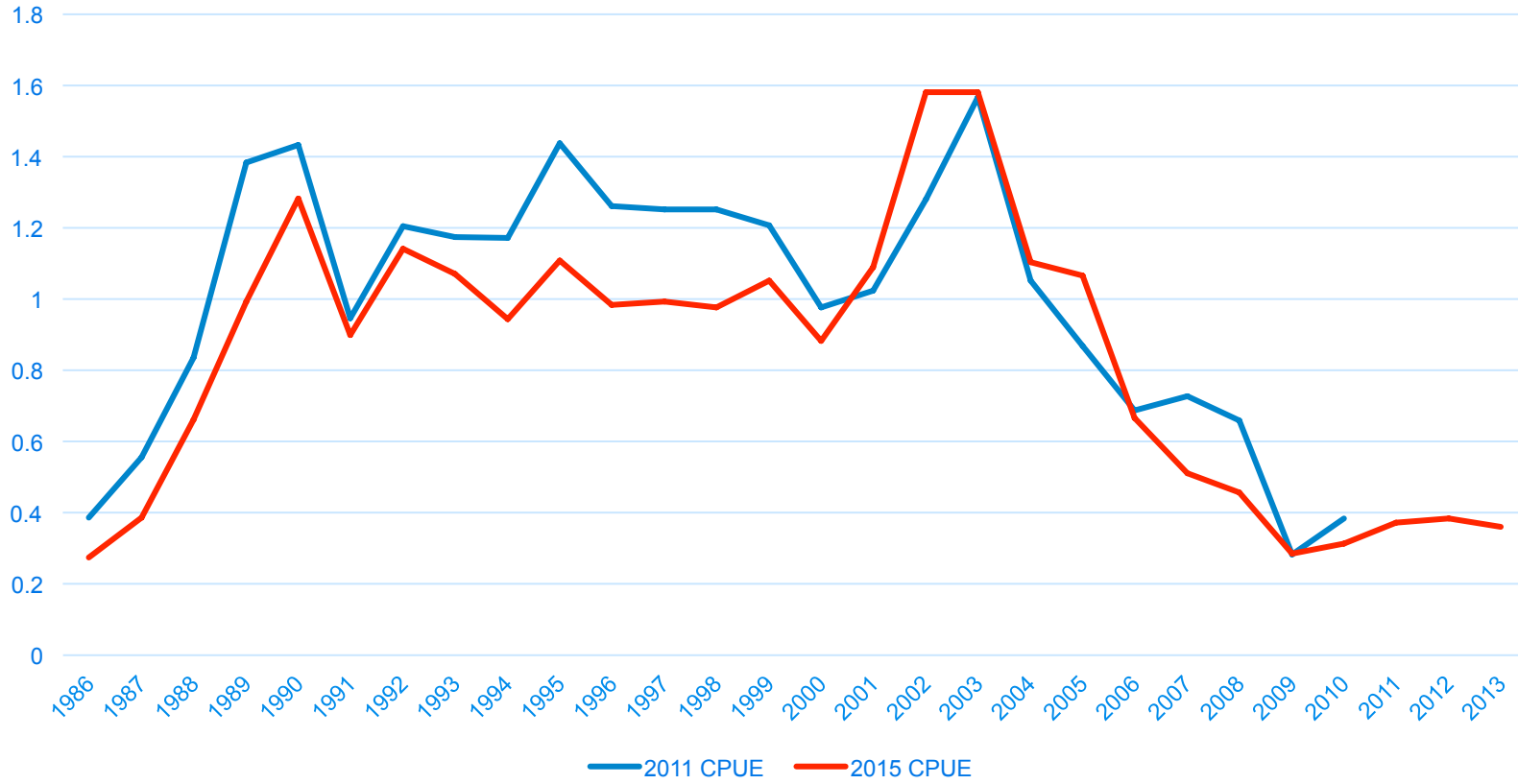


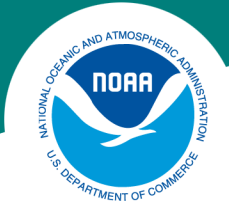
## MRFSS East CPUE



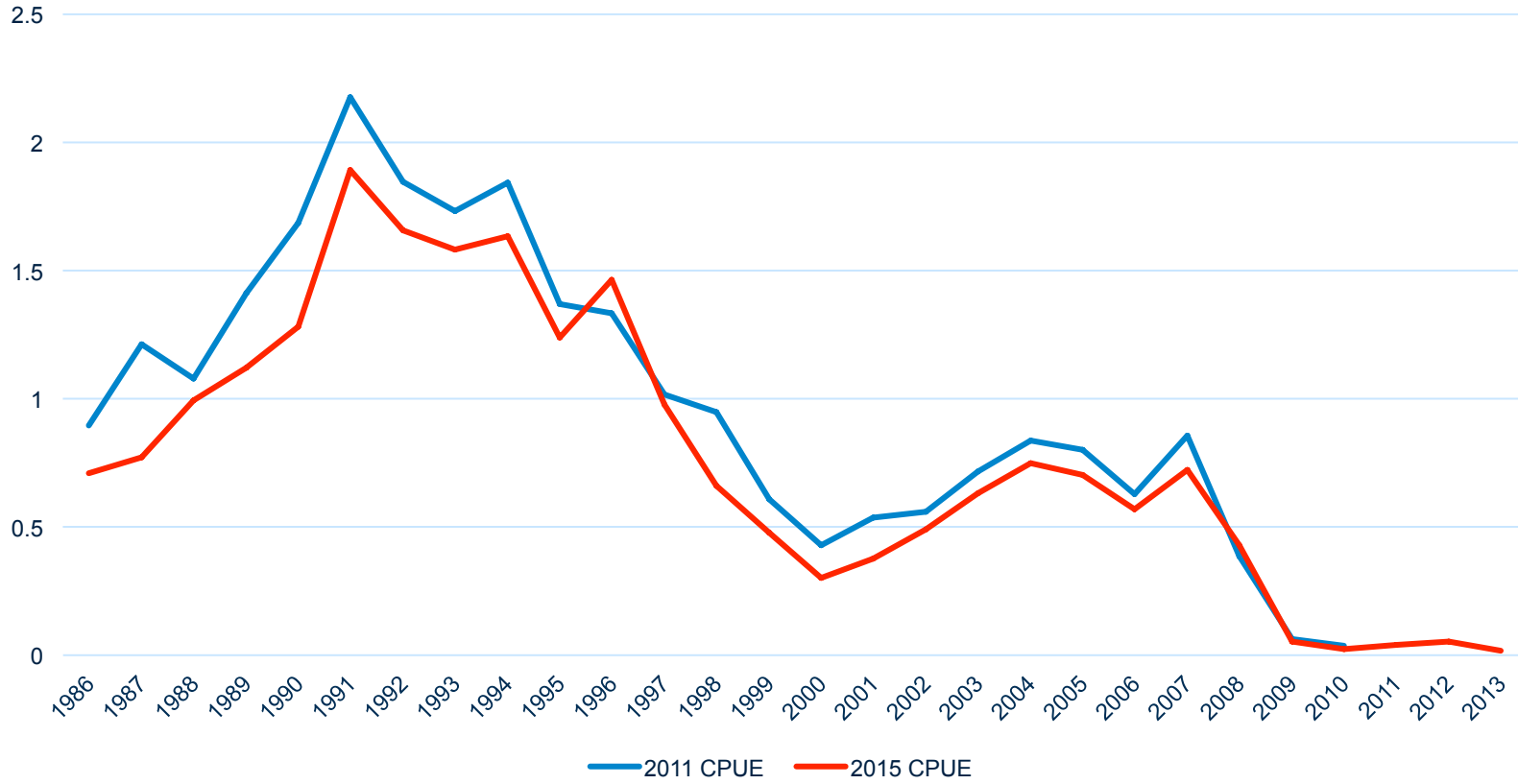


## Headboat East CPUE

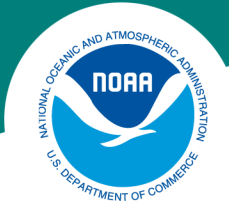




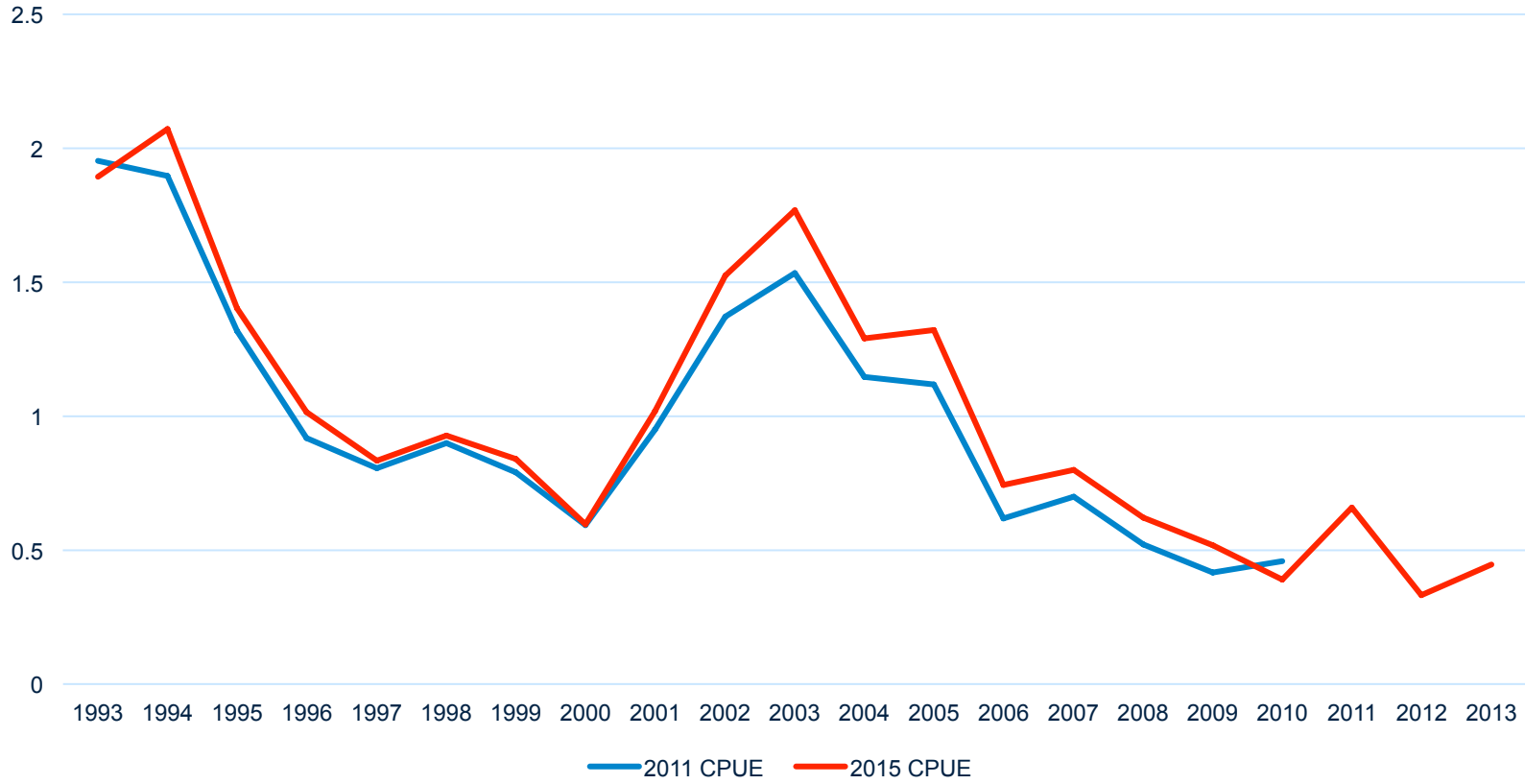
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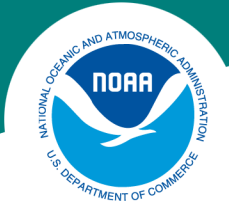




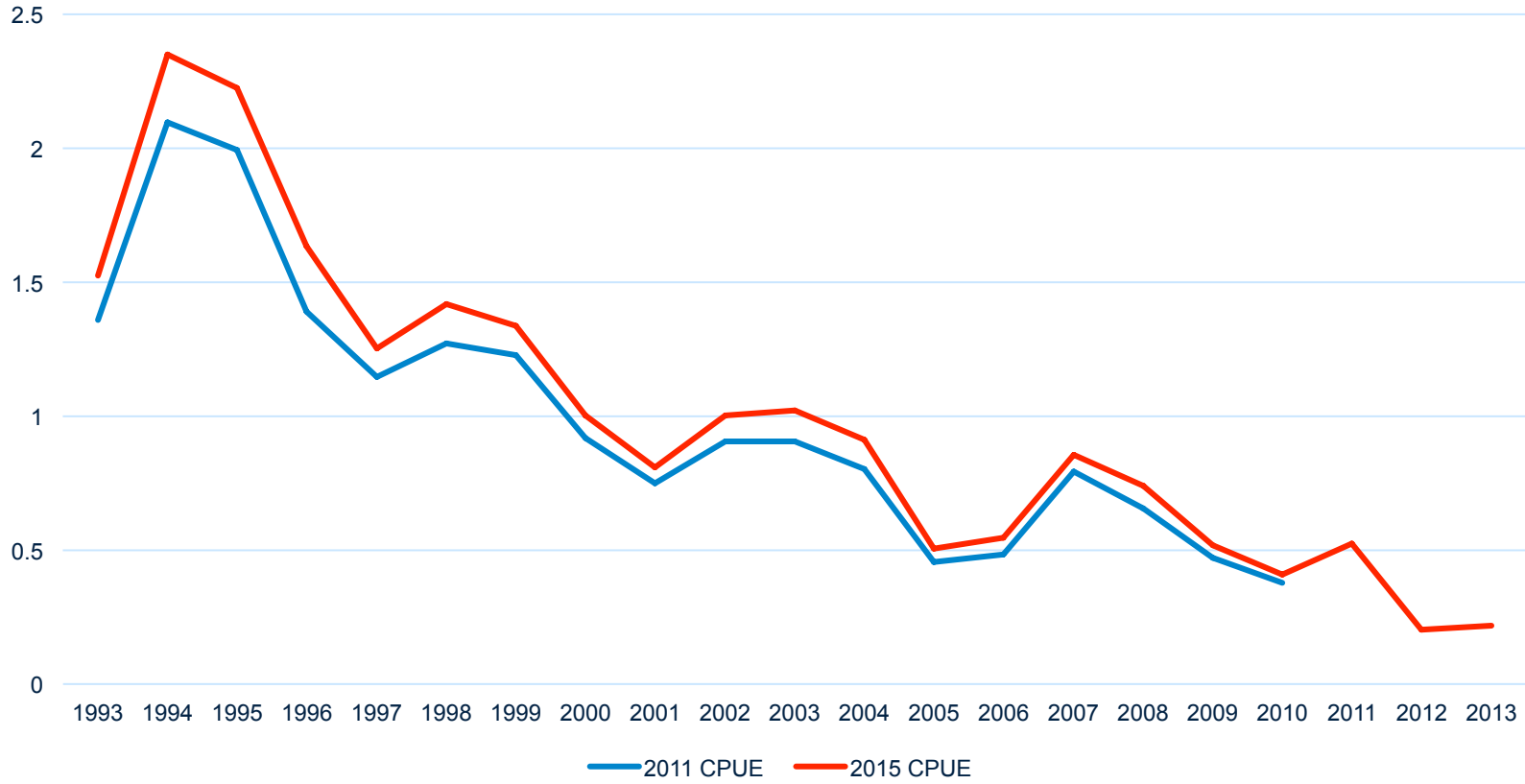


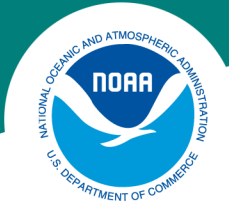
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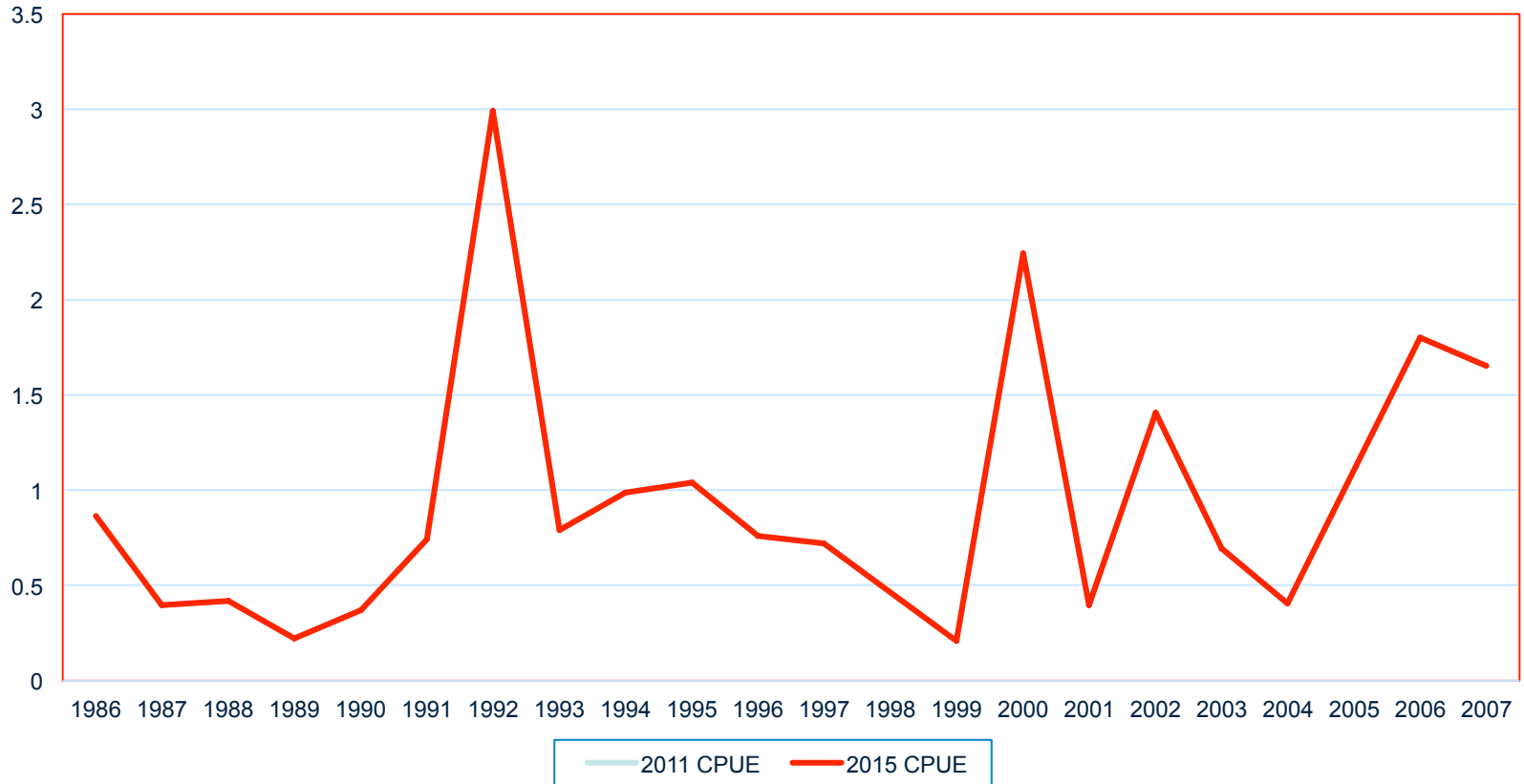


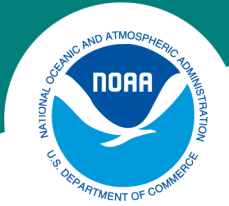
## Com HL West CPUE



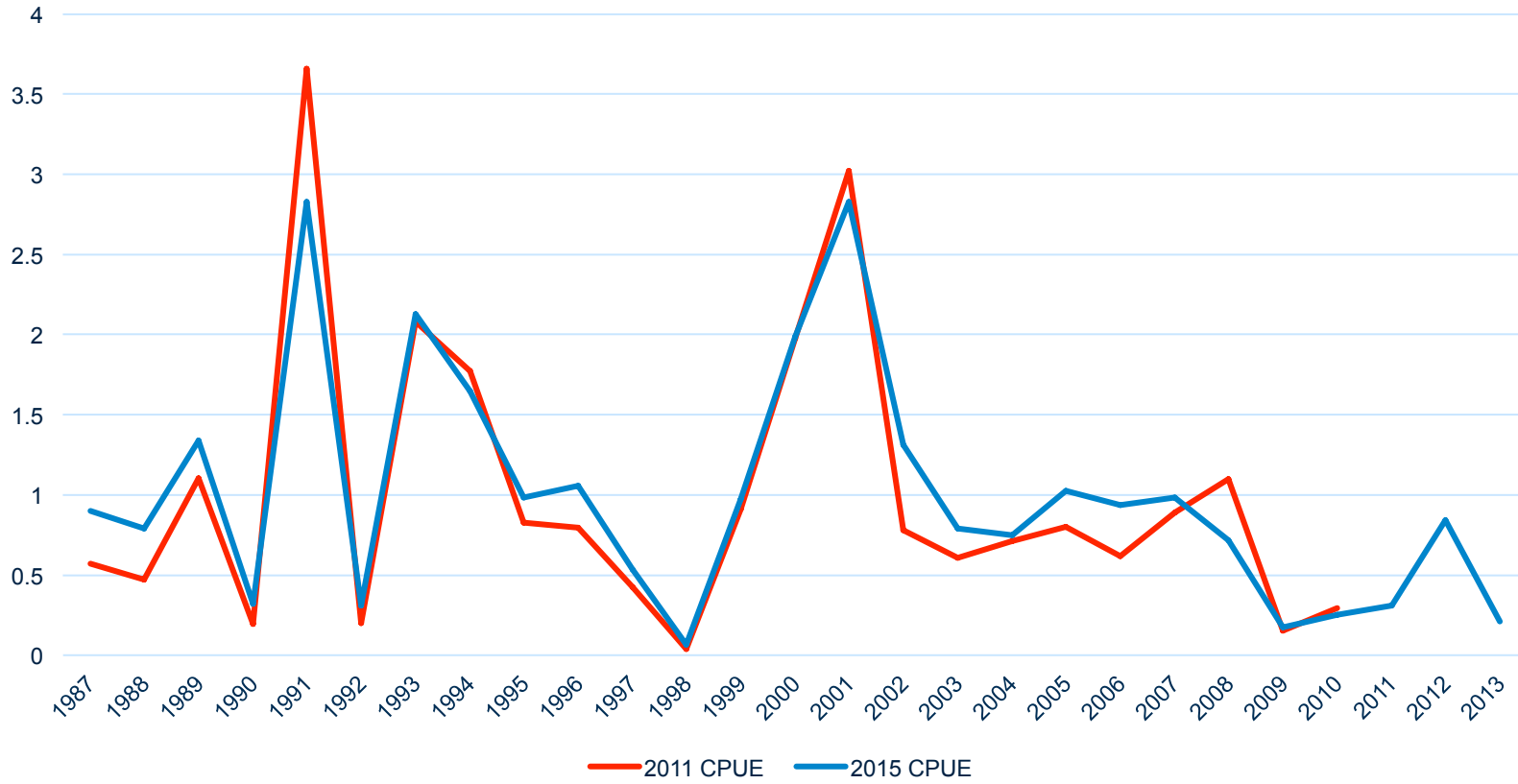


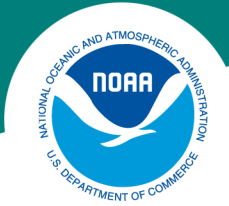
## Larval CPUE



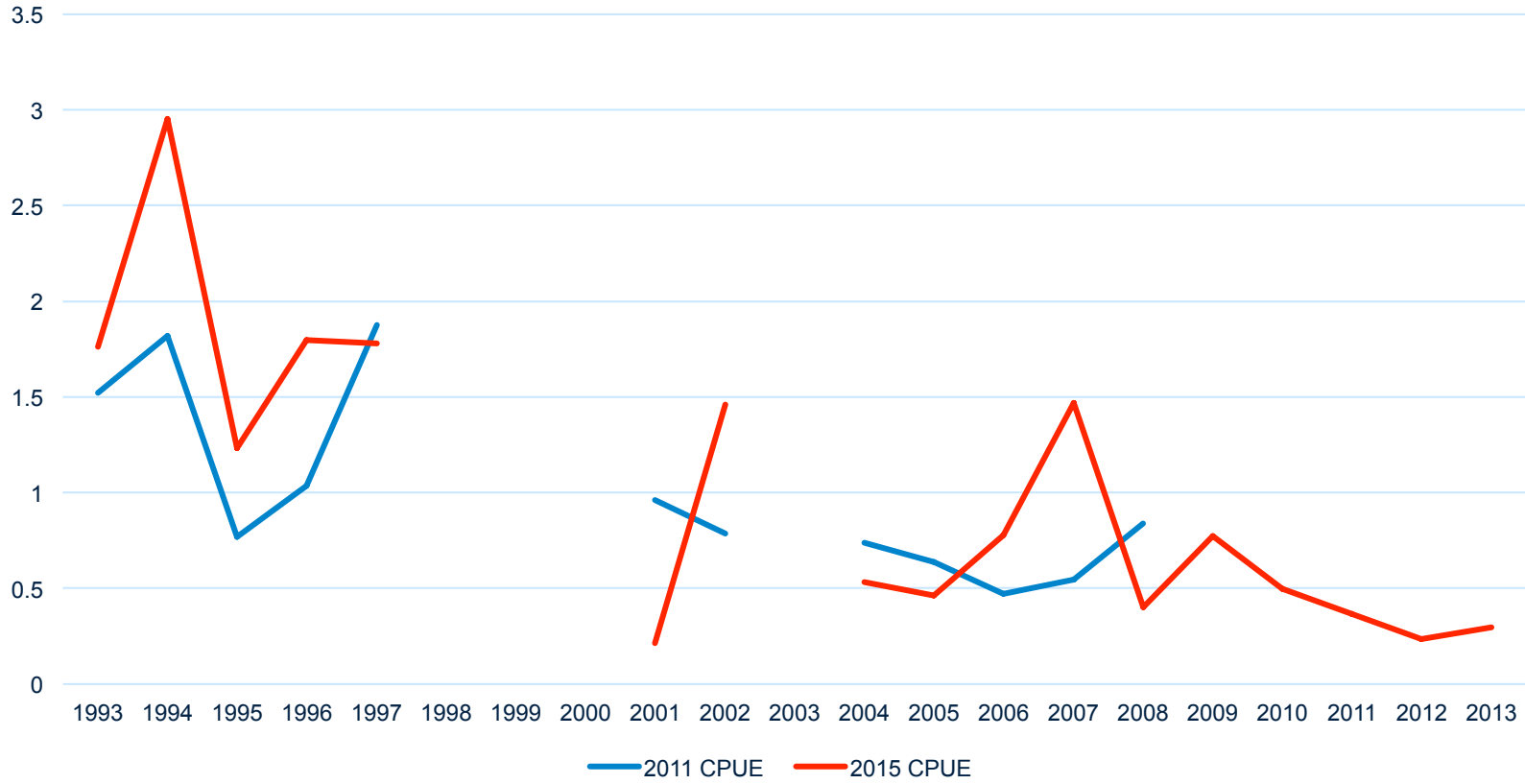


## SEAMAP Trawl CPUE



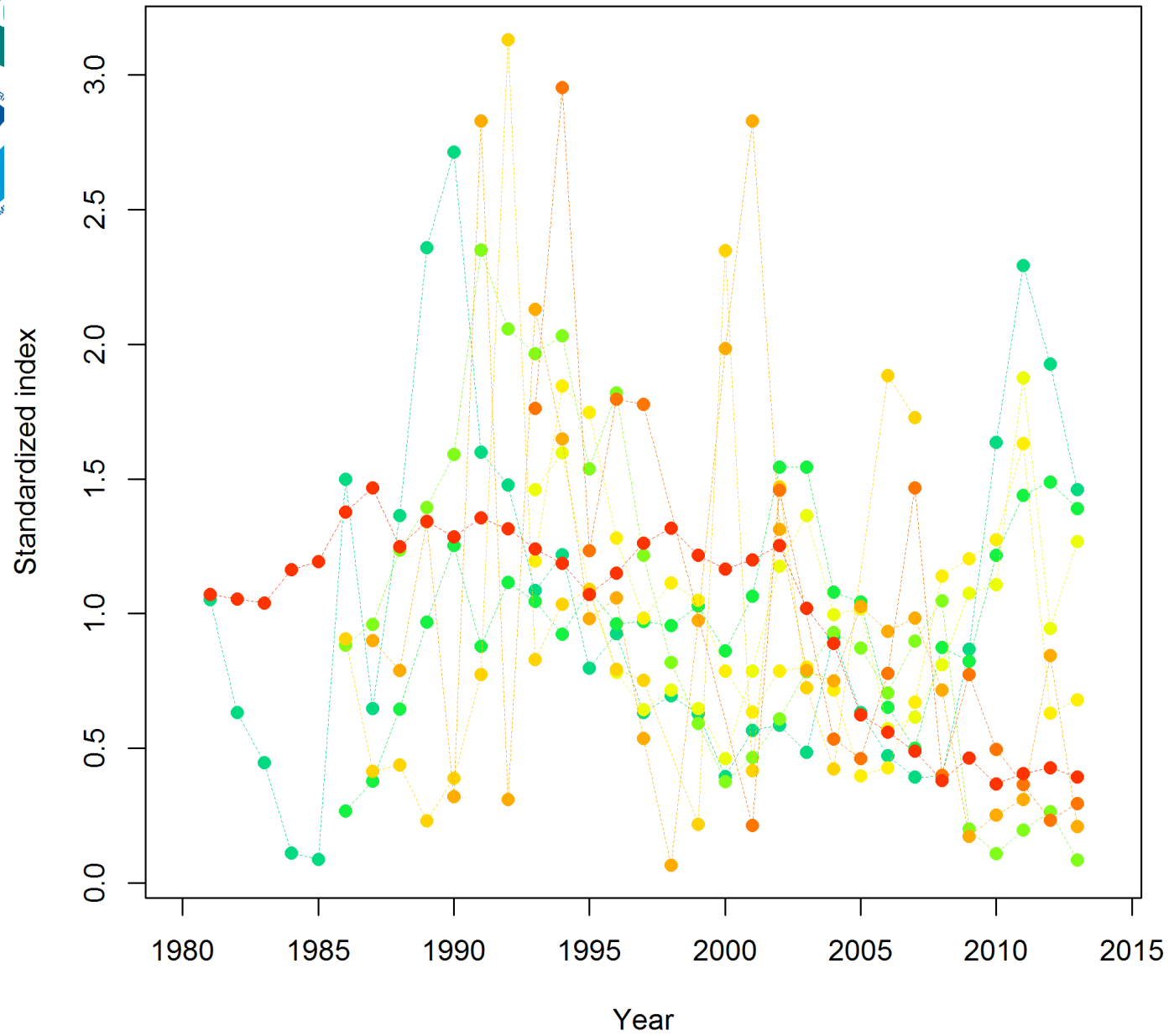


## 2011 vs. Seamap/Panama City Video

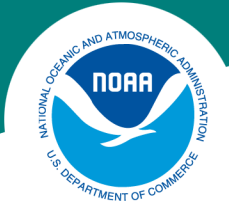




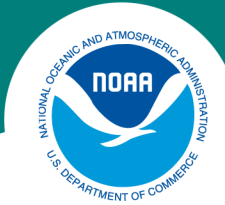
All cpue plot



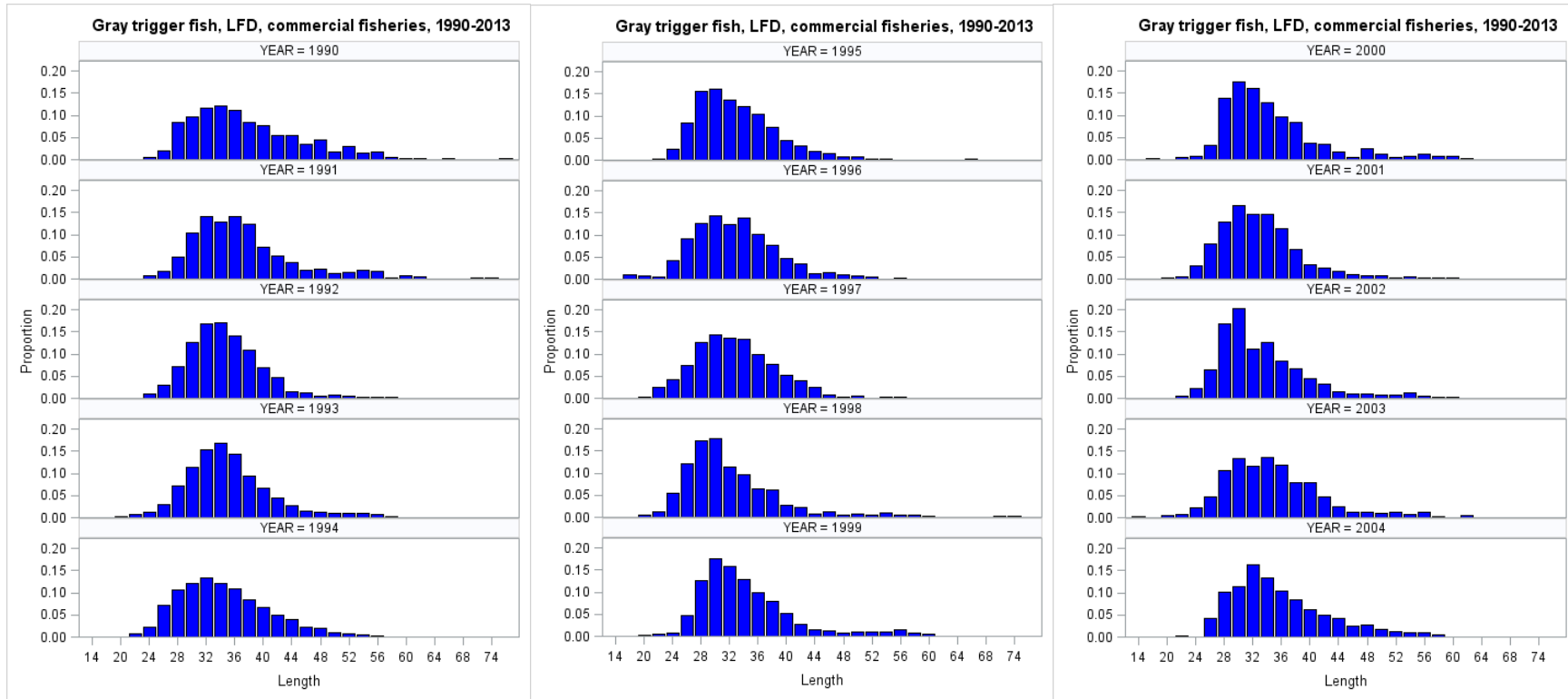
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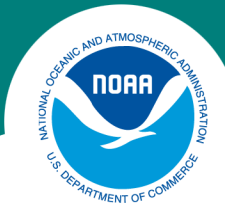
# Size and Age Composition



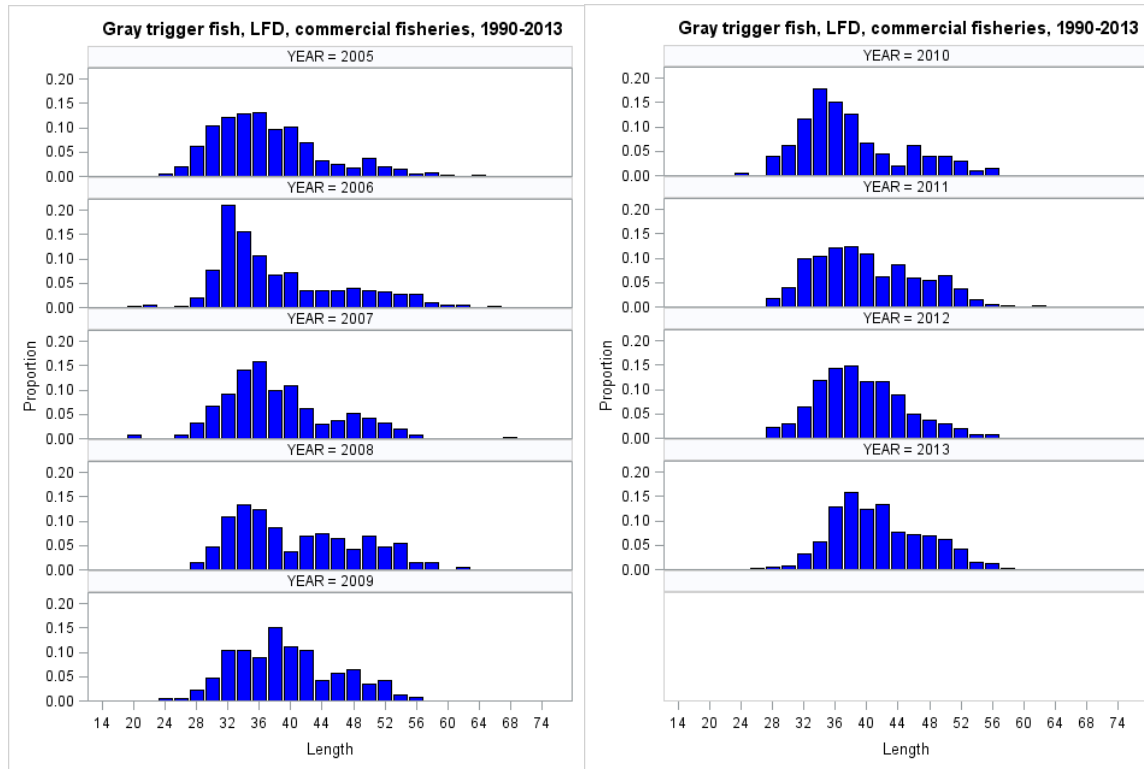
# Length frequency distributions for commercial length samples

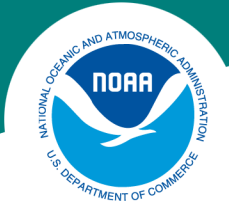




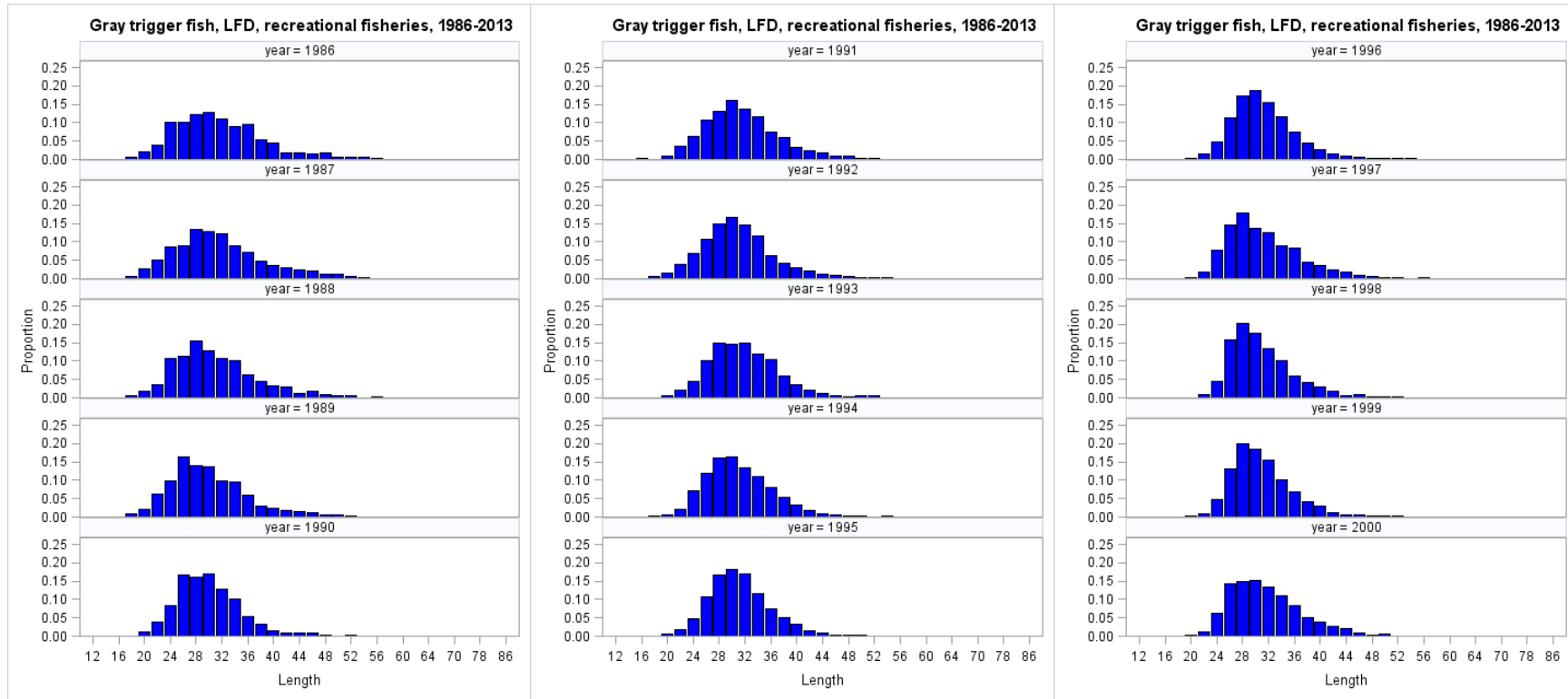


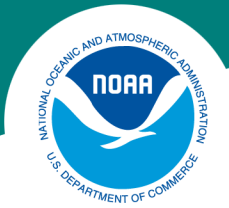
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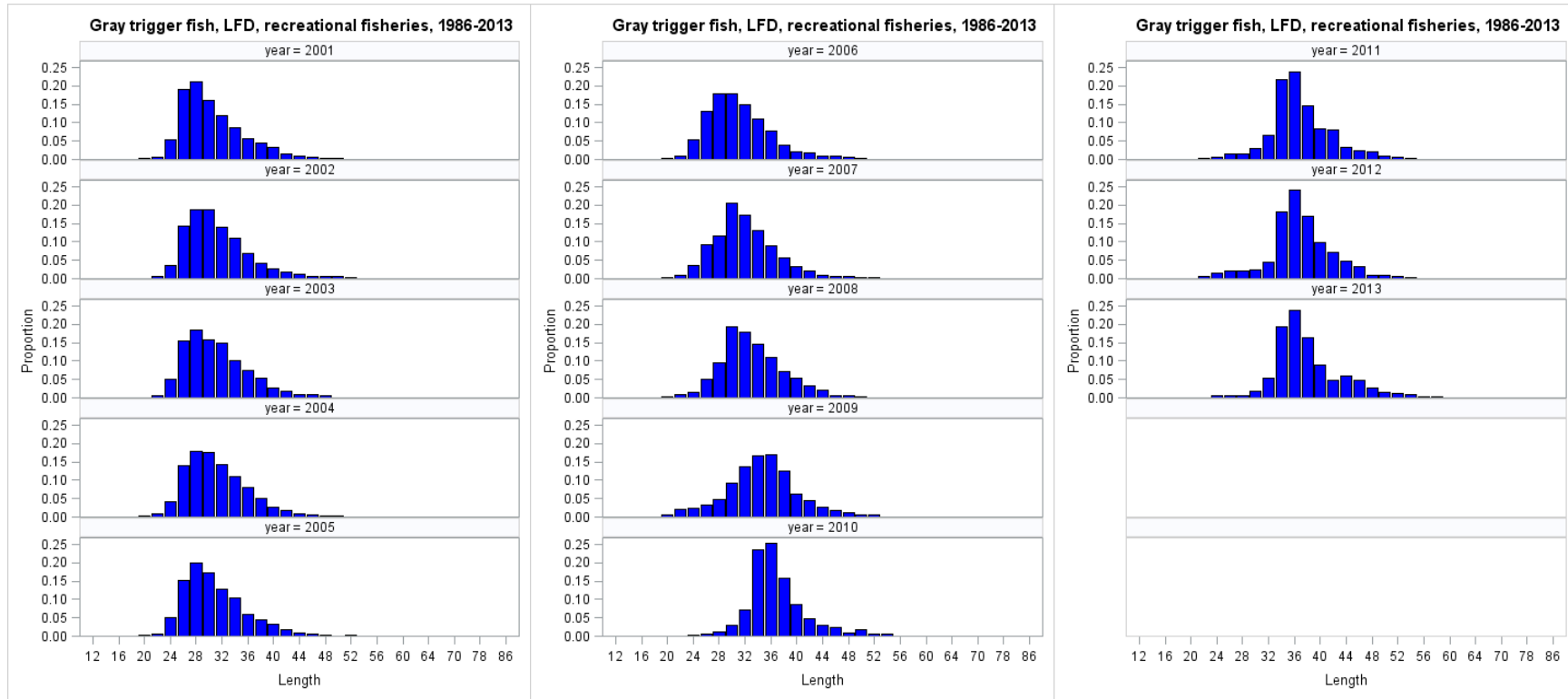


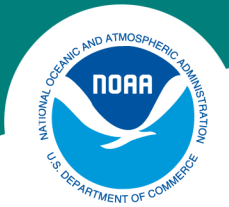
# Length frequency distributions for recreational length samples



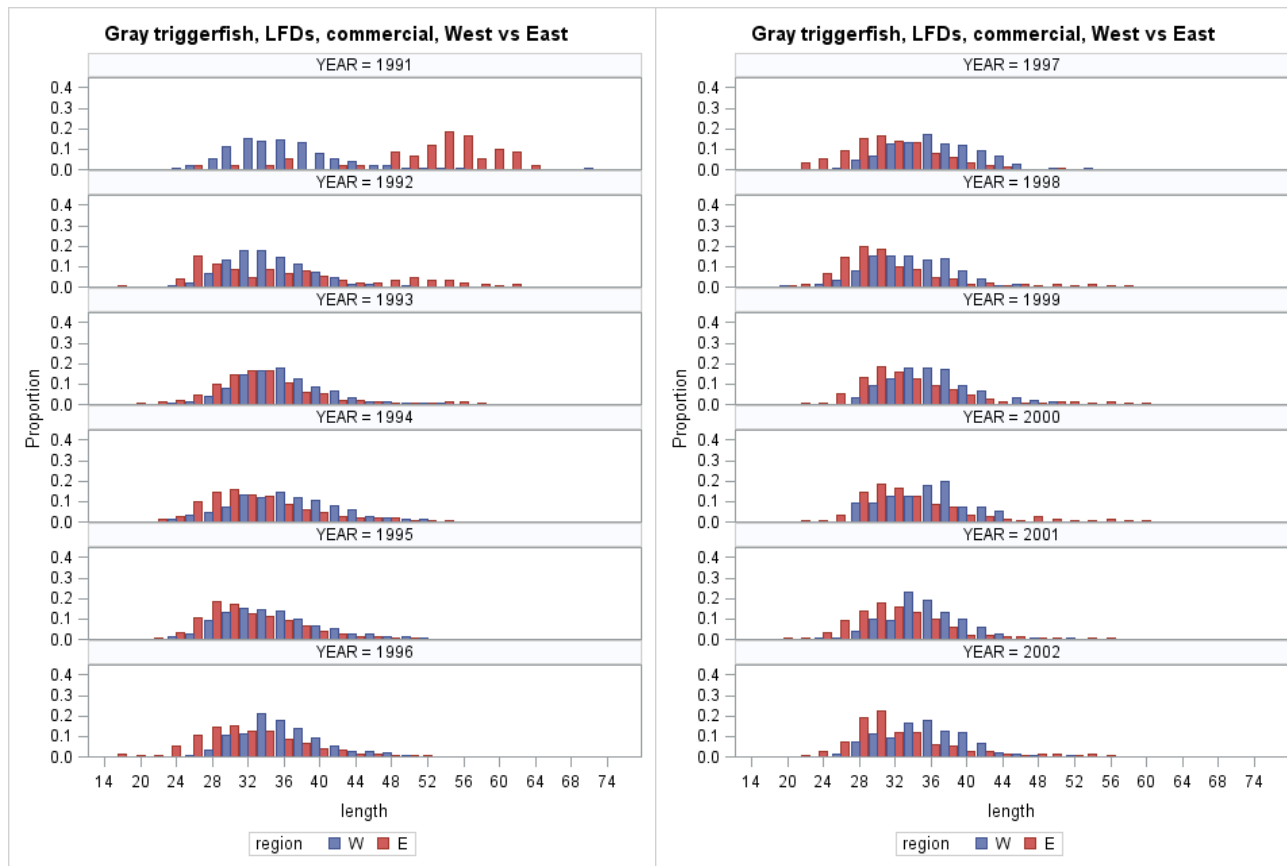


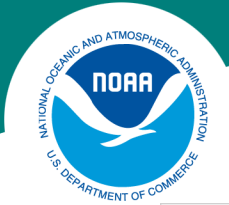
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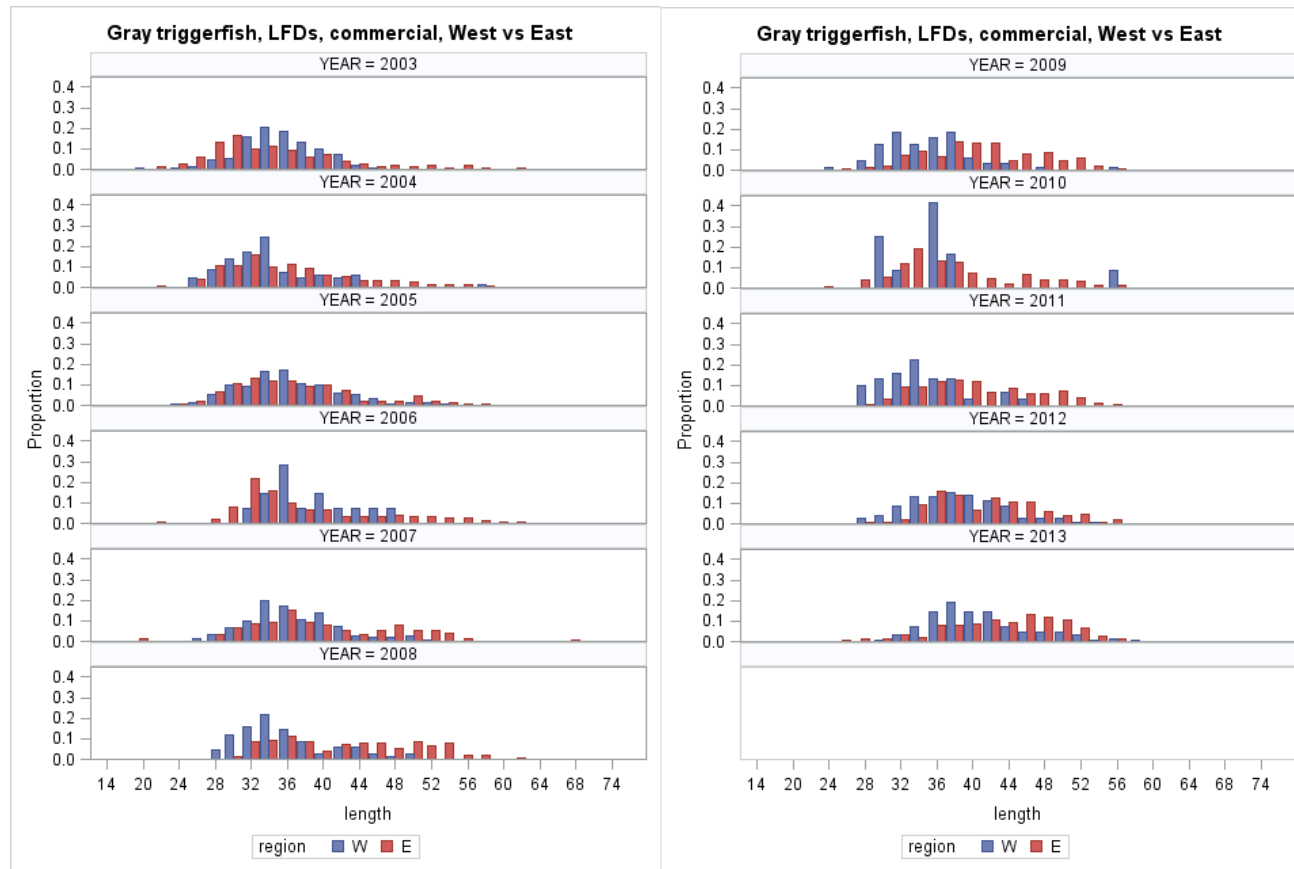


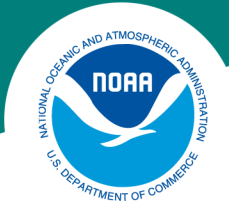
## Length frequency distributions for commercial length samples collected from the east and west



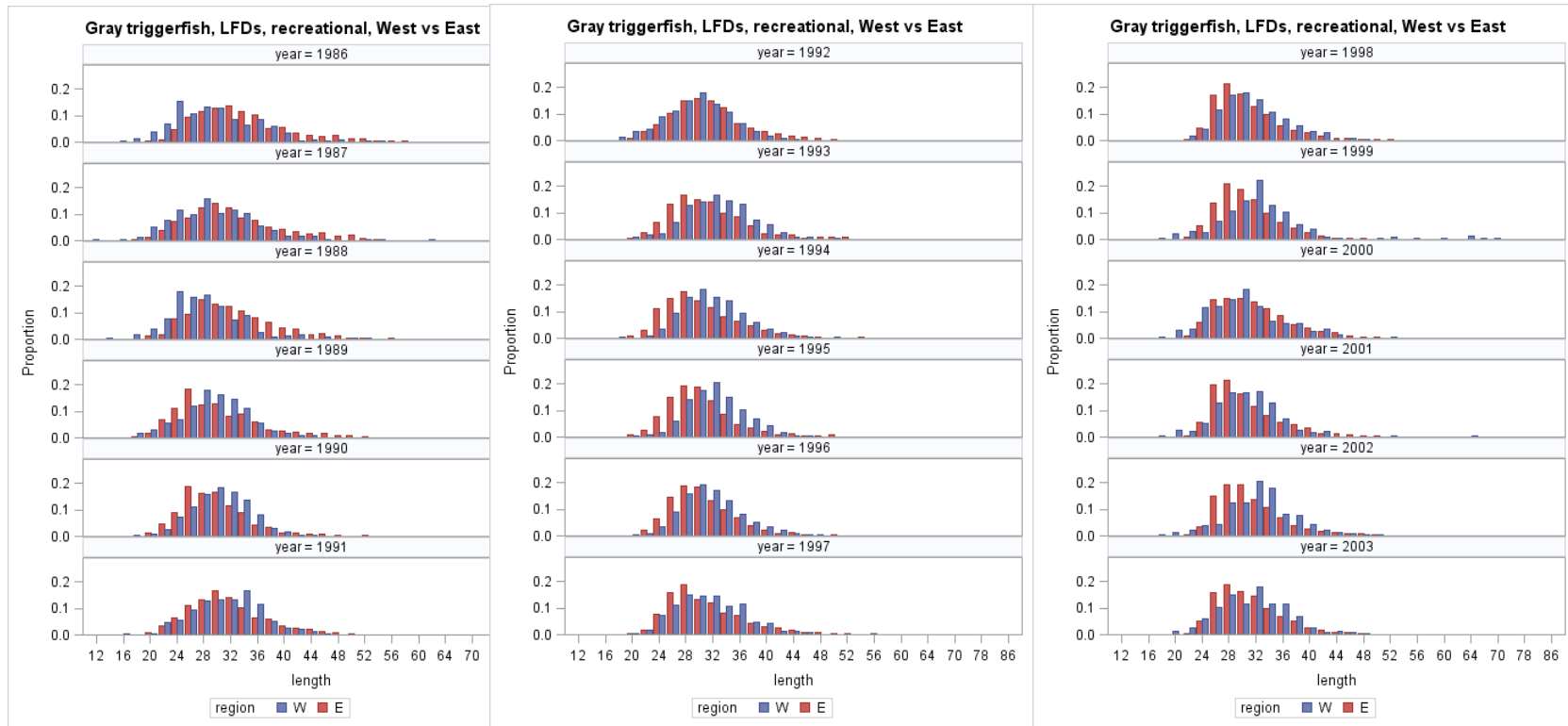


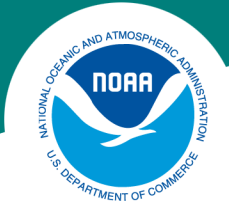
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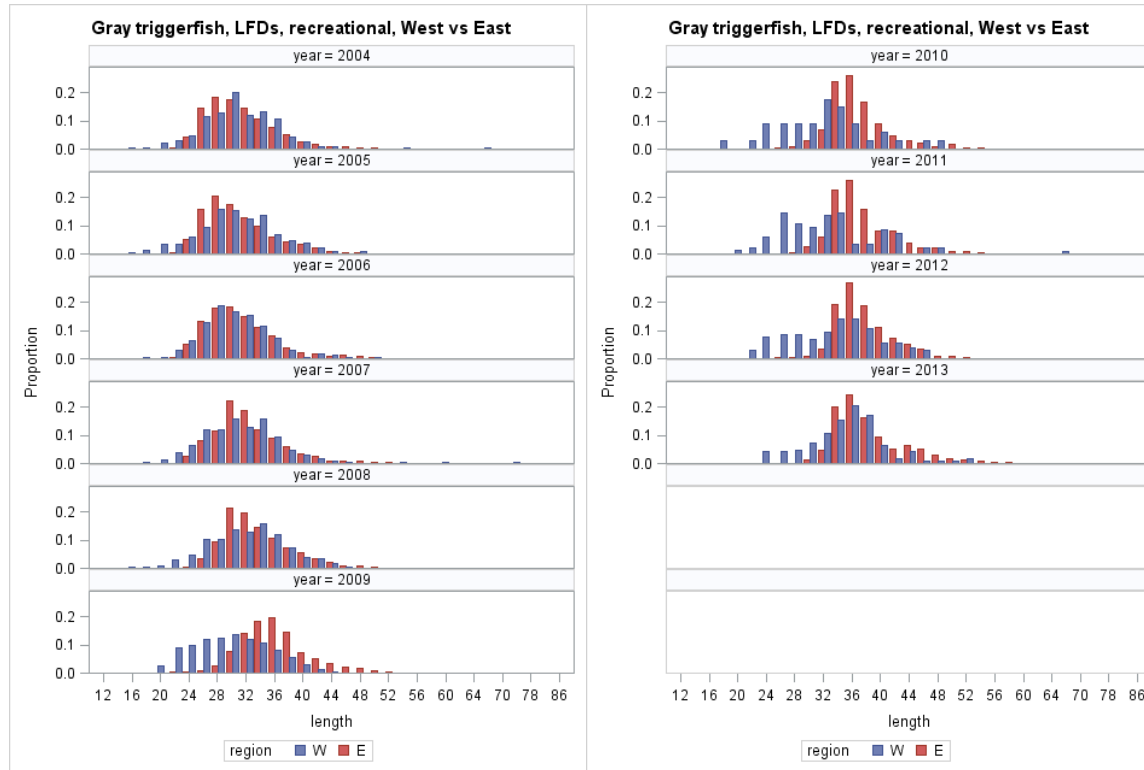


## Length frequency distributions for recreational length samples collected from the east and west



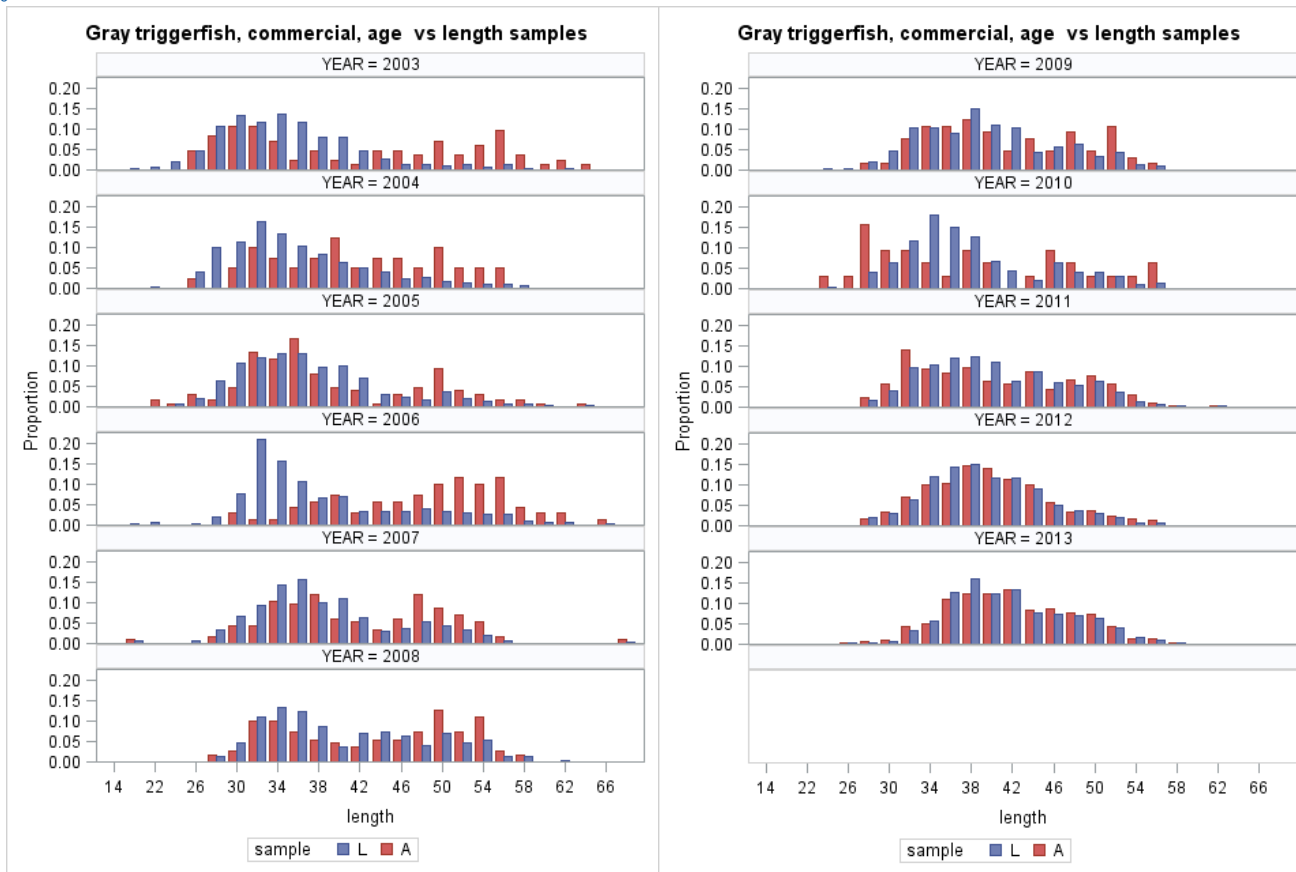


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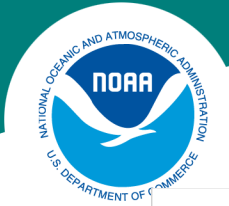




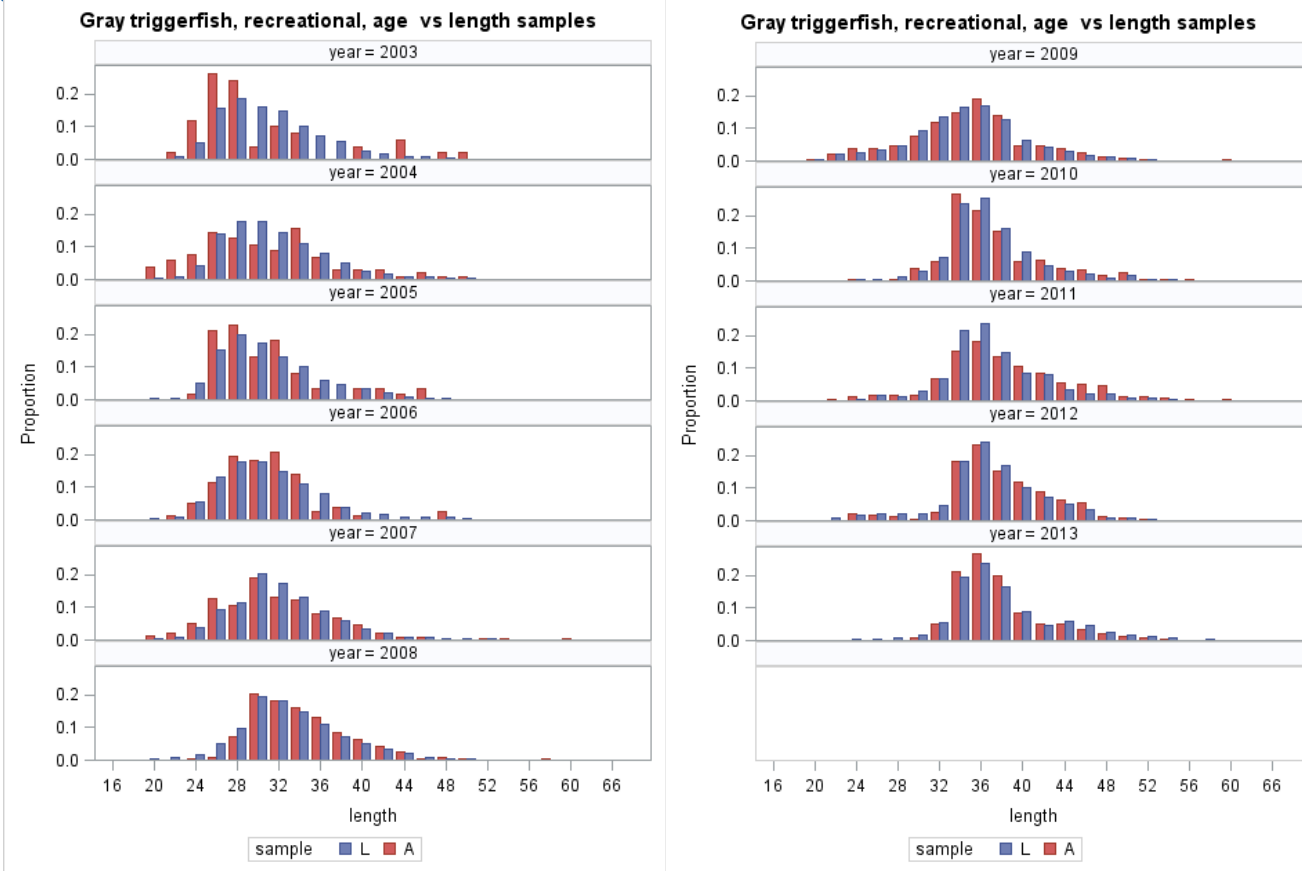
## Length frequency distributions for commercial length and age samples



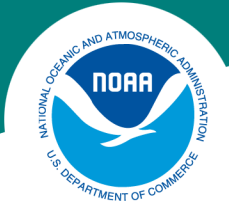




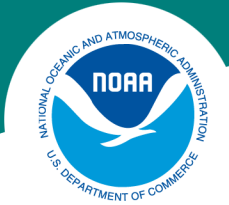
## Length frequency distributions for recreational length and age samples



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# Biology



## **Growth**

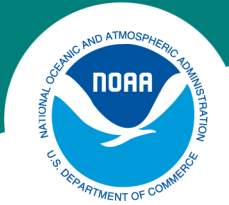
Growth model parameters and model likelihood results for Gray Triggerfish from the Gulf of Mexico (2003-2013 ; Table 6), along with the previous predicted growth model parameters for SEDAR09 update (2003-2010).

During SEDAR09 update, the size-modified growth model was compiled using Solver in Excel and now the model is compiled in ADMB; therefore, a model run was completed using the data from SEDAR09 update.

The size-modified growth model compiled in ADMB has alternative variance structures

- (1) constant standard deviation (STDEV) with age,
- (2) constant coefficient of variation (CV) with age, and
- (3) increase in CV with age.

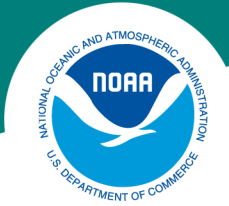
Fractional ages and fork lengths were fit to the size-modified growth model.



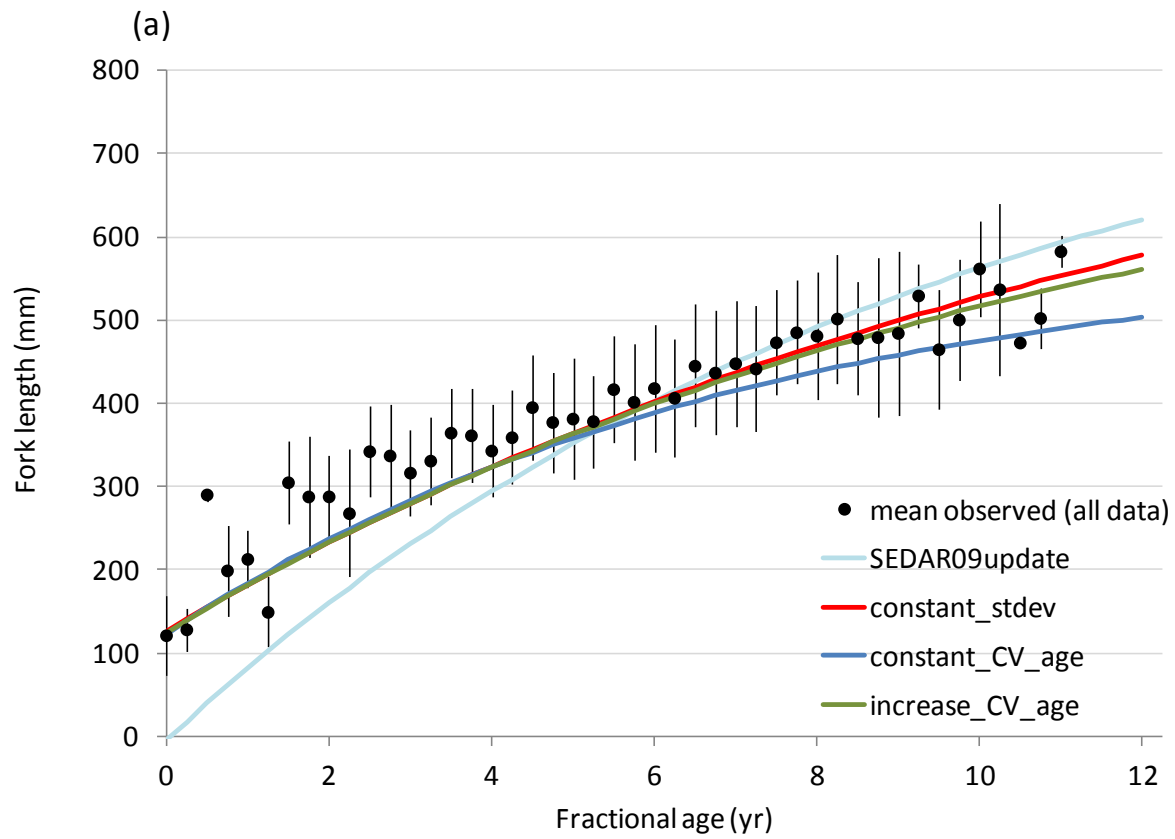
## Growth

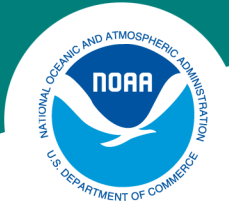
Parameter	SEDAR09 update	SEDAR09 update replicate	All data constant STDEV	<b>All data constant CV</b>	All data Increase CV age
Sample size	2393	2393	4796	<b>4796</b>	4796
Asymptotic length ( $L_{\infty}$ )	87.11	86.82	89.06	<b>58.97</b>	79.51
Growth coefficient (k)	0.1043	0.1051	0.0744	<b>0.1405</b>	0.0877
Size at time zero ( $t_0$ )	0.0532	0.0638	-2.0640	<b>-1.6569</b>	-1.9425
Sigma or CV	76.01	7.6	6.7997	<b>0.2185</b>	0.0743-0.2740
Objective function	$9.2 \times 10^3$	$5.1 \times 10^3$	$1.4 \times 10^4$	<b><math>1.4 \times 10^4</math></b>	$1.4 \times 10^4$
Delta AICc (phase 3)	---	$-3.7 \times 10^2$	$-1.0 \times 10^4$	<b><math>-1.0 \times 10^3</math></b>	$-2.8 \times 10^3$

The recommended model is all data with a constant CV with age (in bold).

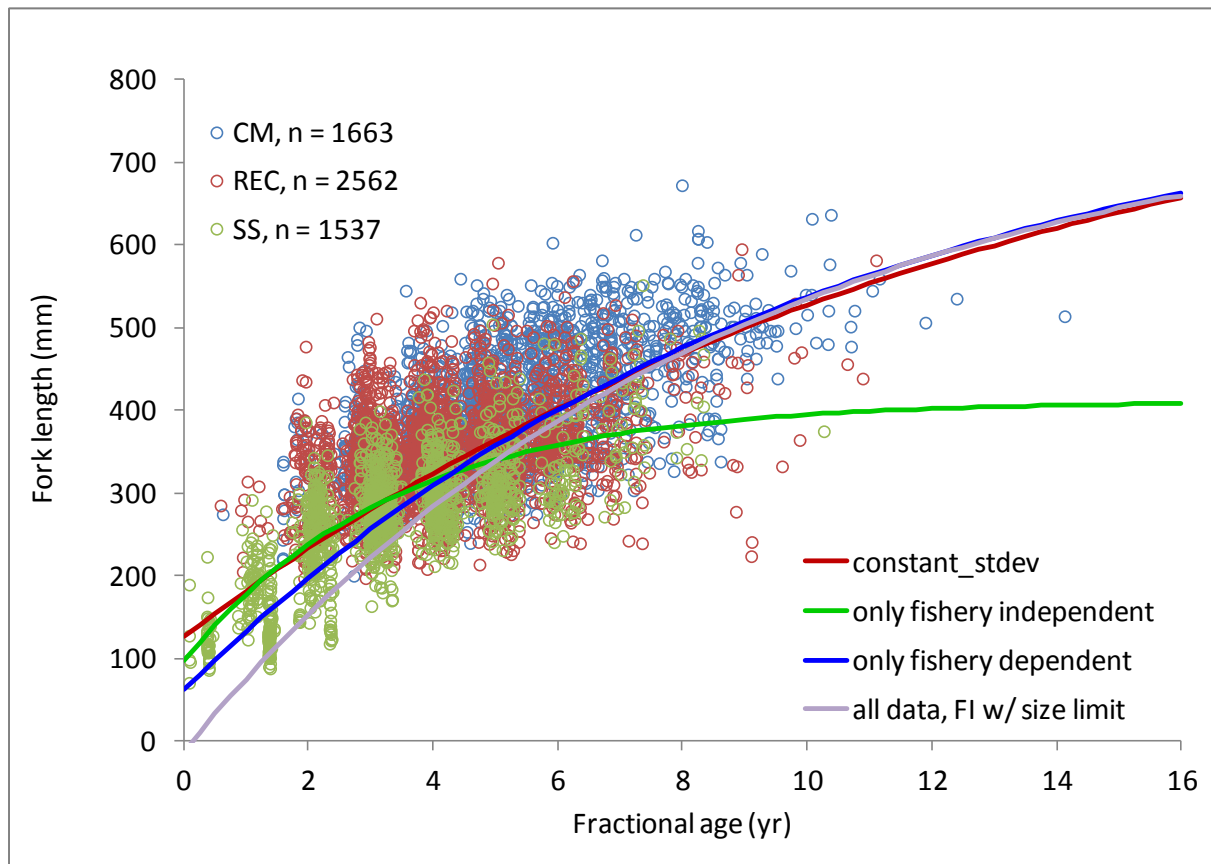


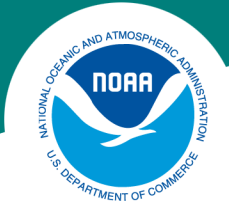
# Growth



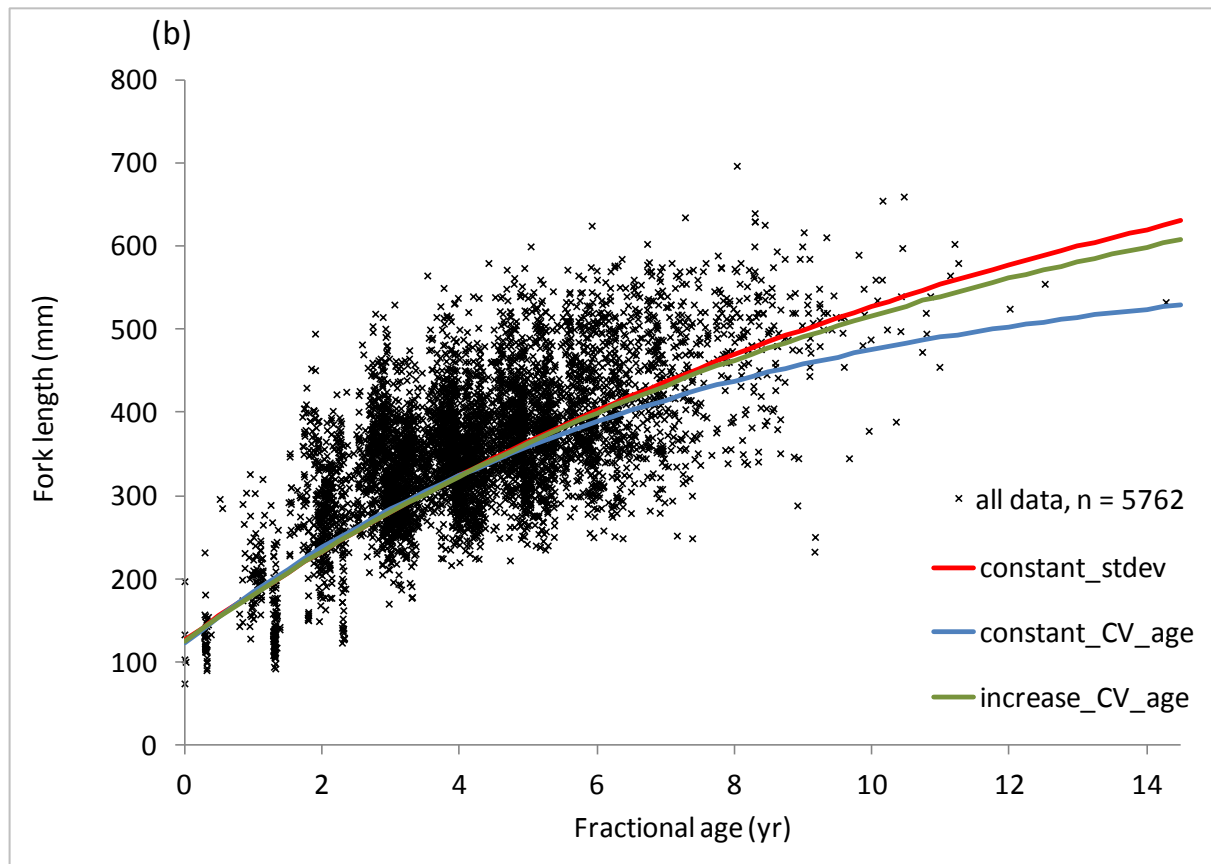


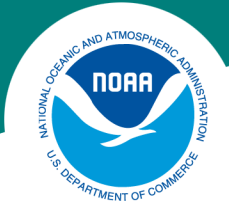
# Growth



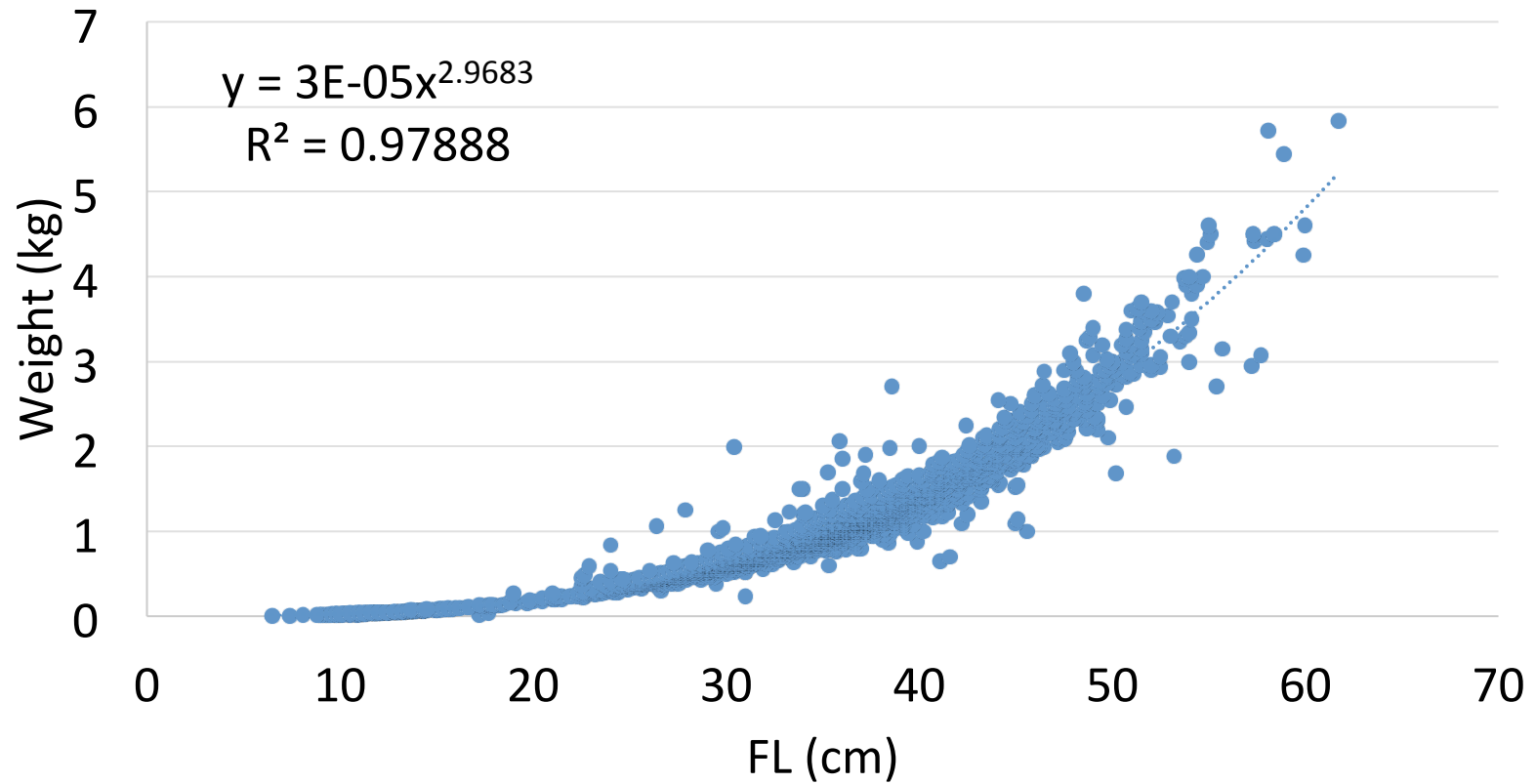


# Growth

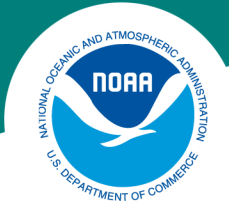




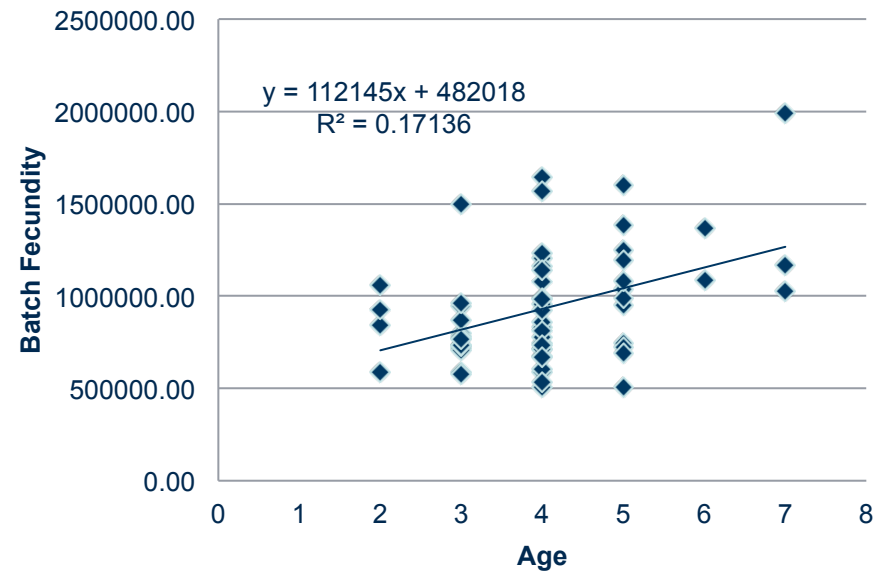
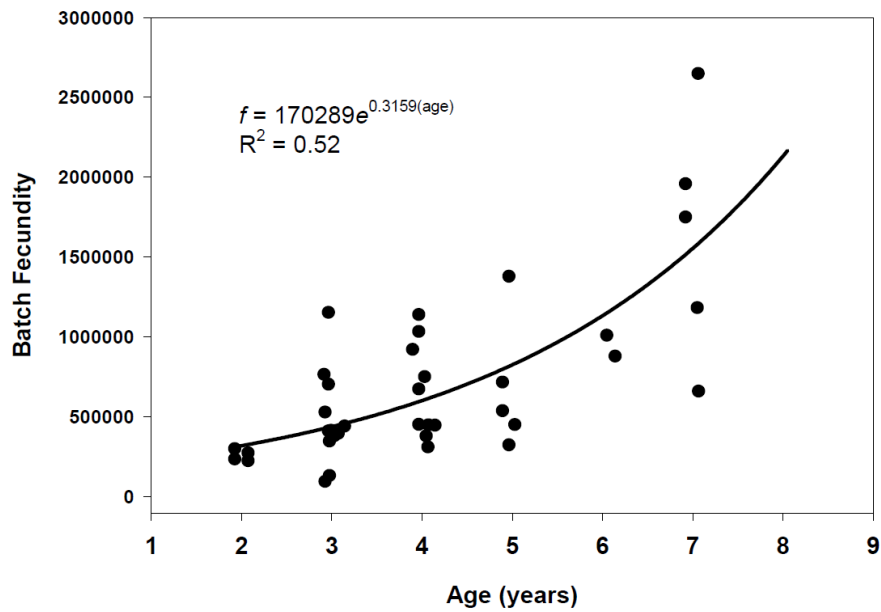
## Length:Weight Relationship

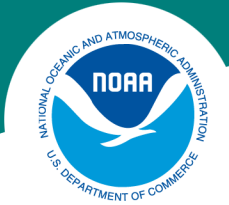






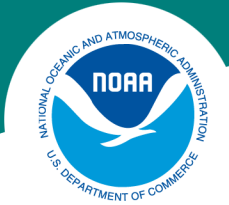
# Fecundity





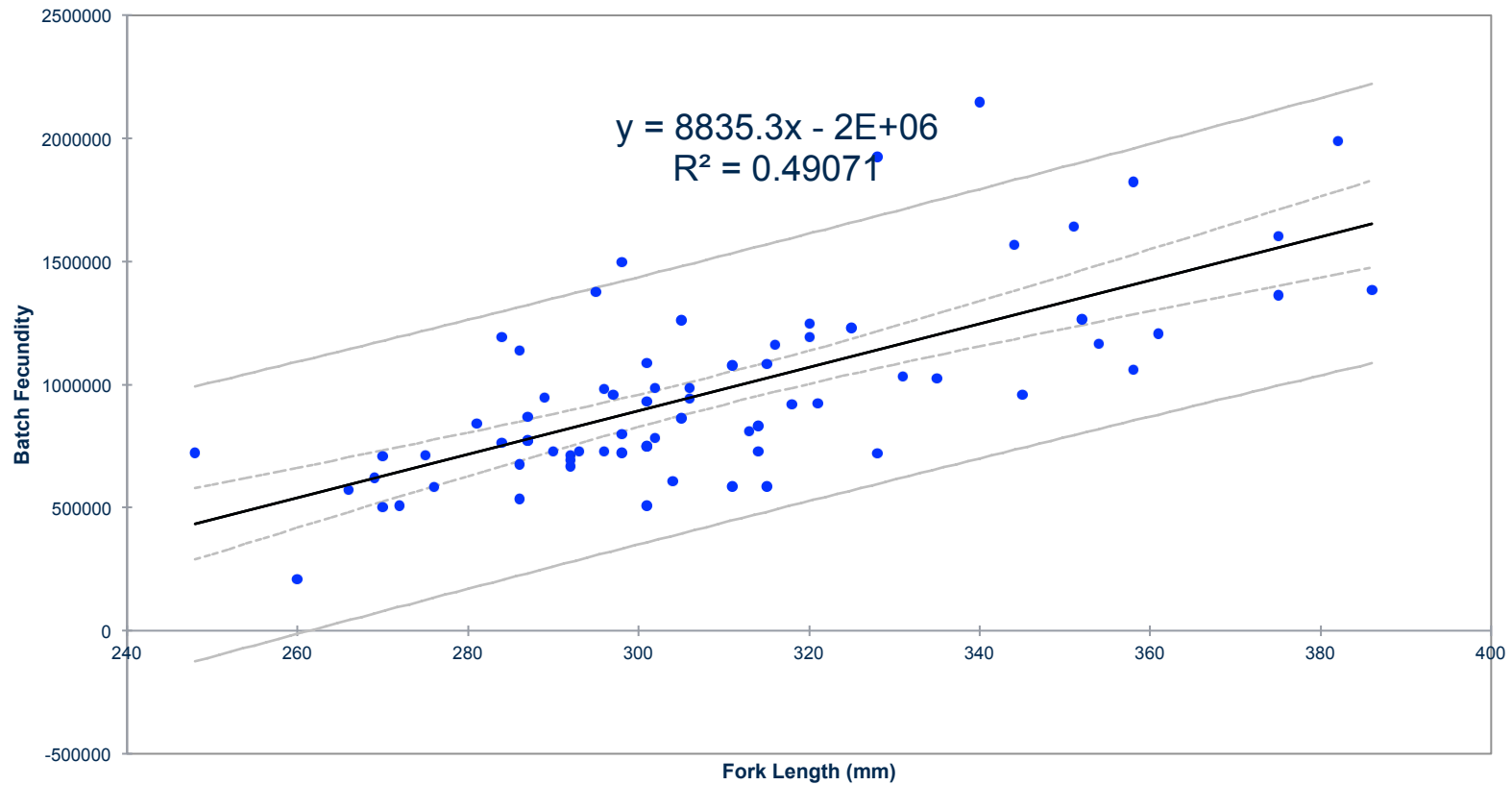
## Fecundity

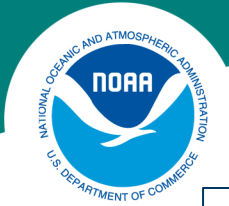
Age (years)	Maturity	Maturity	Fecundity	Fecundity
	SEDAR9 Update (proportion)	SEDAR43 (proportion)	SEDAR9 Update (millions of eggs)	SEDAR43 (millions of eggs)
0	0	0	0	0
1	0.875	0	0.23355	0
2	1	0.79	0.320312	0.594163
3	1	0.91	0.439306	0.706308
4	1	0.98	0.602506	0.818453
5	1	0.99	0.826332	0.930598
6	1	1	1.133309	1.042743
7	1	1	1.554325	1.154888
8	1	1	2.131747	1.267033
9	1	1	2.923676	1.379178
10+	1	1	4.009801	1.491323



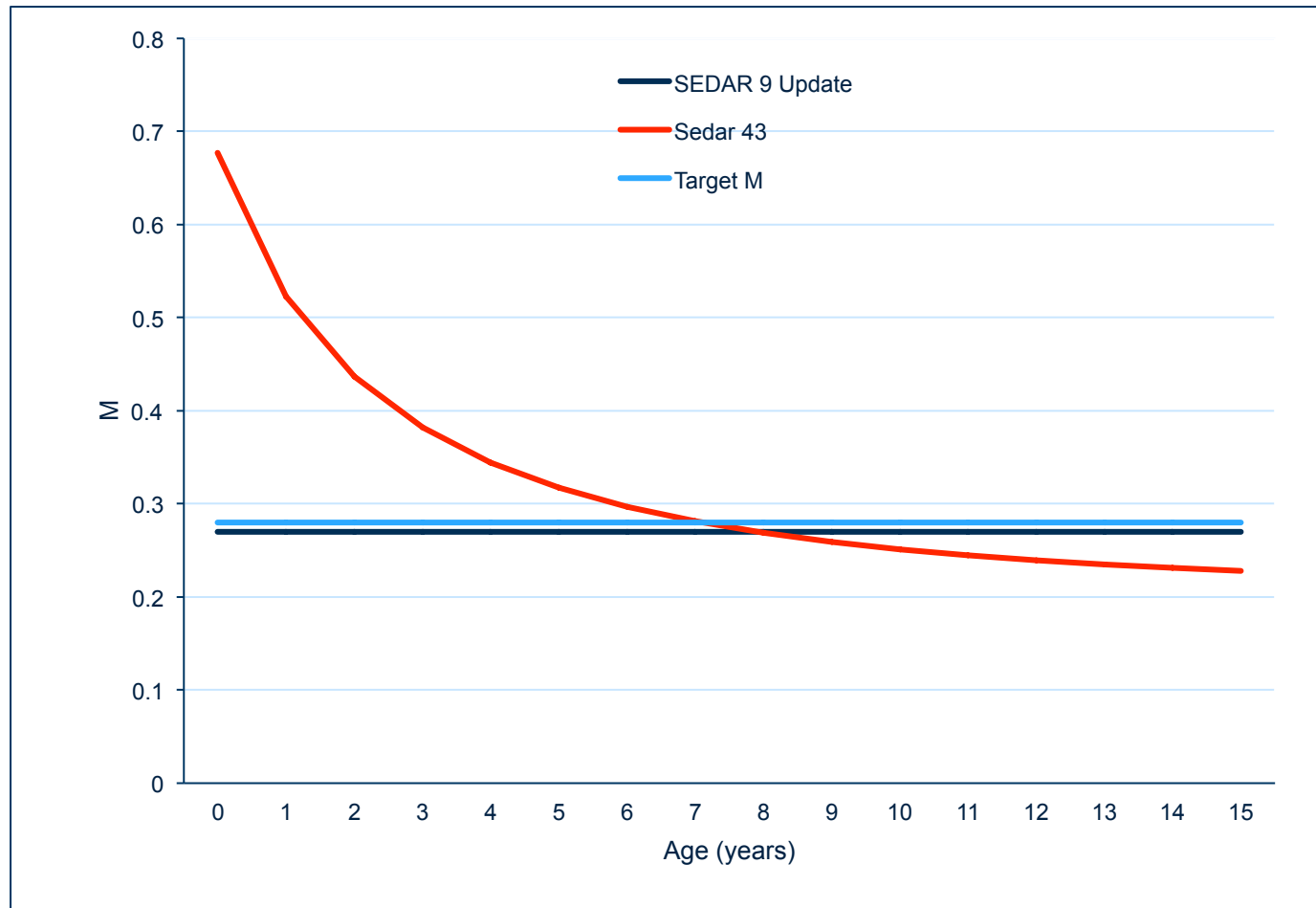
# Fecundity

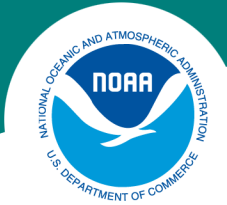
Regression of Batch Fecundity by Fork Length (mm) ( $R^2=0.491$ )





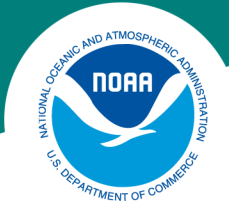
## Mortality





## Mortality

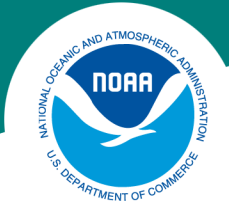
Age	SEDAR 9 Update	Sedar 43	Target M
0	0.27	0.68	0.28
1	0.27	0.52	0.28
2	0.27	0.44	0.28
3	0.27	0.38	0.28
4	0.27	0.34	0.28
5	0.27	0.32	0.28
6	0.27	0.30	0.28
7	0.27	0.28	0.28
8	0.27	0.27	0.28
9	0.27	0.26	0.28
10	0.27	0.25	0.28
11	0.27	0.24	0.28
12	0.27	0.24	0.28
13	0.27	0.23	0.28
14	0.27	0.23	0.28
15	0.27	0.23	0.28



## **Questions to resolve**

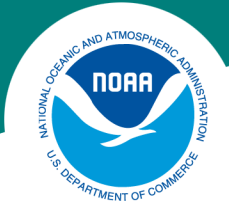
1. Video index: combined or separate
2. Growth based on constant CV
3. Length-based vs. Age-based fecundity
4. Lorenzen Mortality vs. constant Mortality

**NOAA  
FISHERIES  
SERVICE**



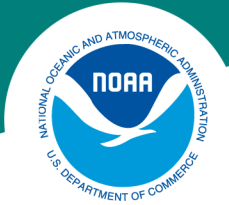
# Assessment

**NOAA  
FISHERIES  
SERVICE**



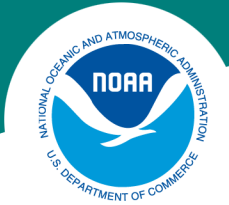
# Continuity Model





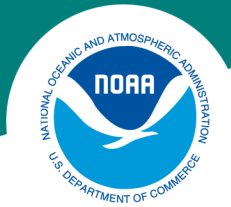
## **2011 Update Assessment**

- SS Demonstration to Mimic SSASPM
- Landings
  - East/West Gulf
  - Rec 1981-2010, Weight
  - Com 1981-2010, Weight
  - Virgin SS 1964, linear ramp in Com East (pooled landings)
- Shrimp Bycatch as numbers
- No discards
- Age comp from pooled (across years) smoothed (across age classes)  
age-length key
- Indices: MRFSS East, HB East, HB West, Com HL East, Com HL West,  
SEAMAP Larval, SEAMAP Trawl, SEAMAP Video



## 2015 Standard Assessment Continuity Model

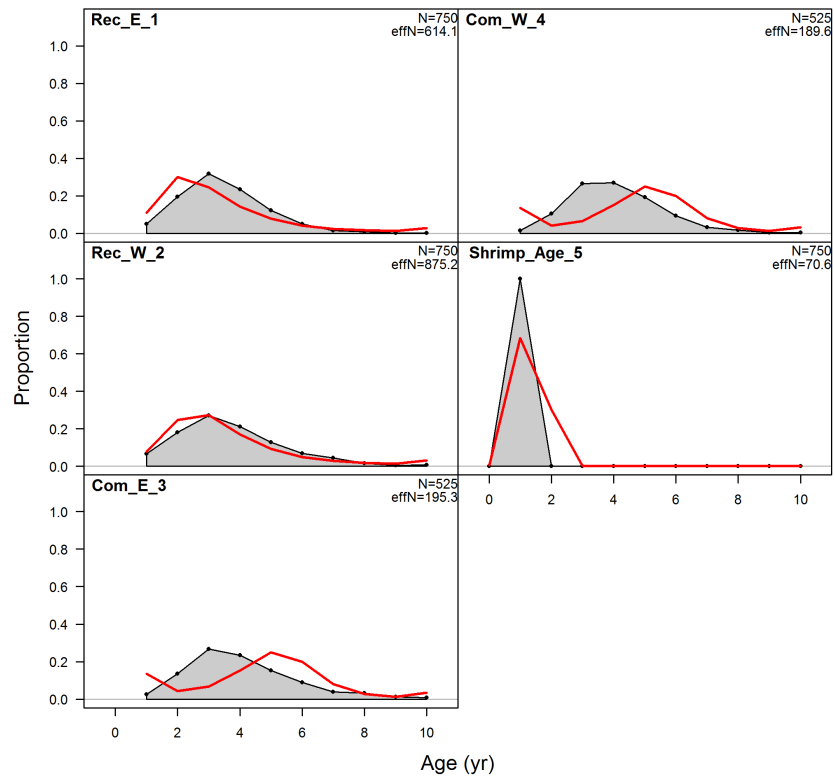
- Same SS configuration as in SEDAR9 update
- Data
  - Add 2011-2013 landings
  - Add historic landings (Rec and Com from 1945)
  - Update cpue indices
  - Age composition based on *annual* age-length keys
  - Update fecundity
  - Update growth curve
  - *SEAMAP Video cpue index updated to SEAMAP/Panama City cpue index*
- Model
  - Changed the selectivity pattern for Shrimp Bycatch



# Continuity Model Results

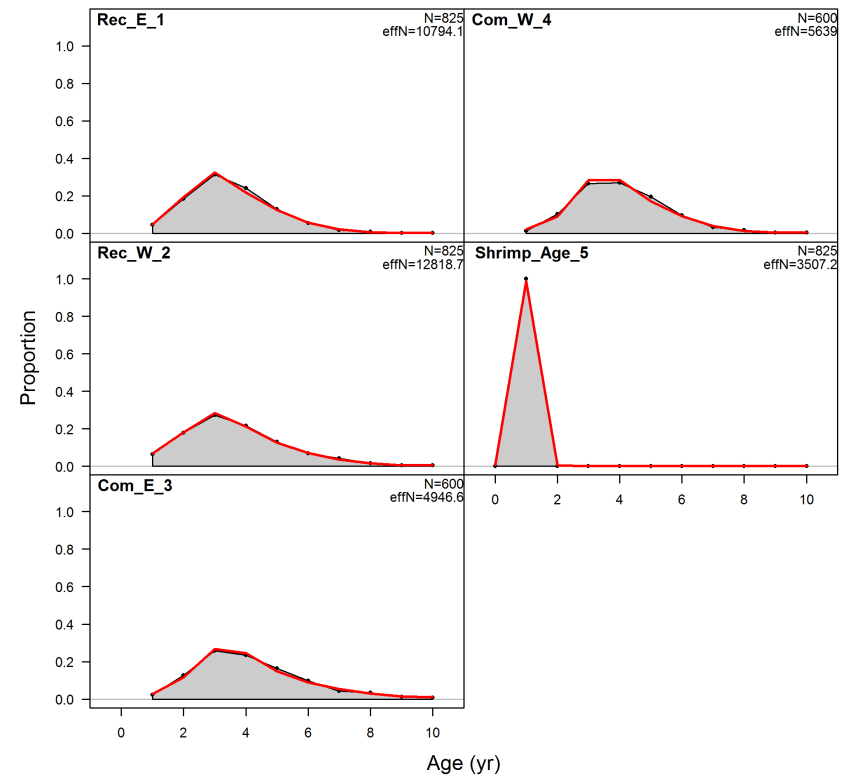
## 2011 Update

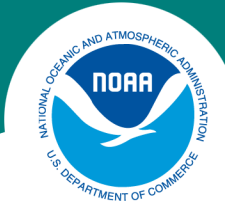
age comps, sexes combined, retained, aggregated across time by fleet



## 2015 Standard

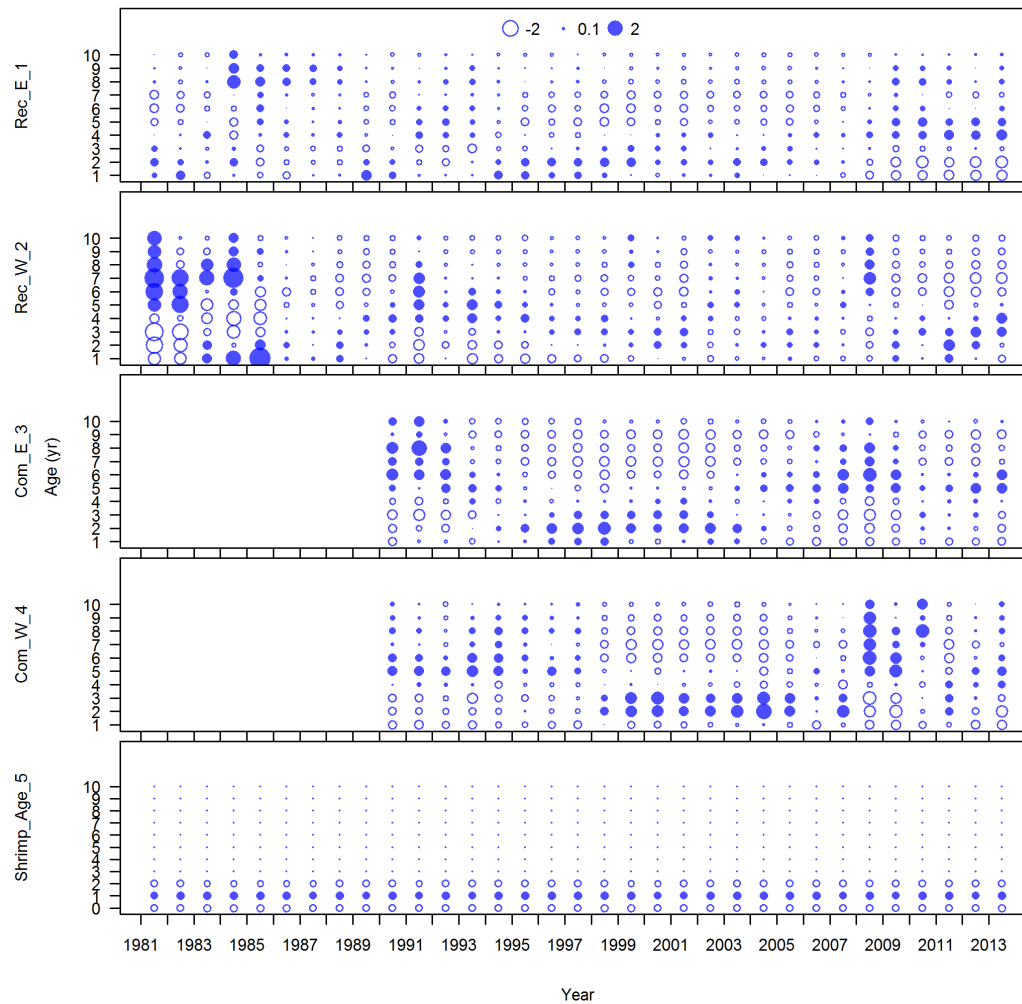
age comps, sexes combined, retained, aggregated across time by fleet

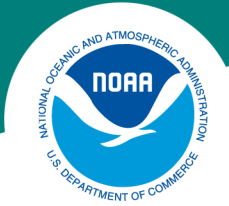




# Continuity Model Results

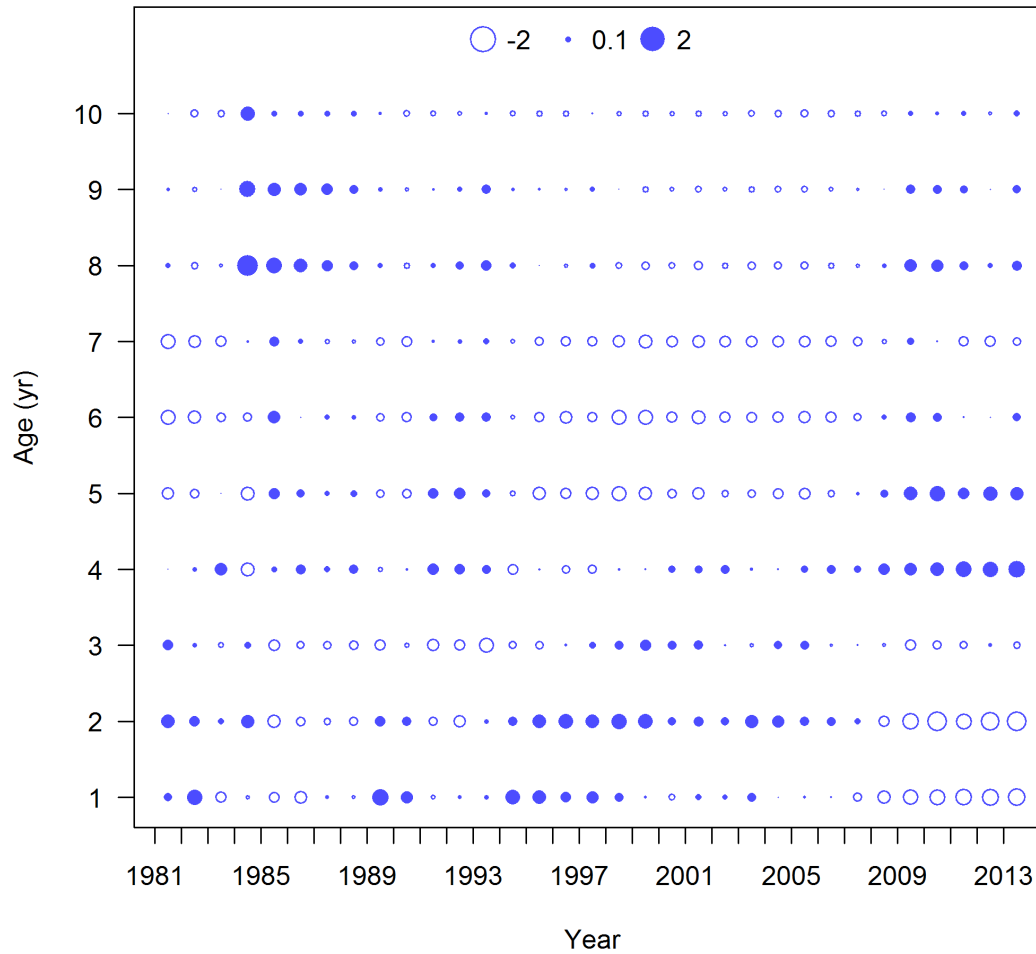
Pearson residuals, sexes combined, retained, comparing across fleets

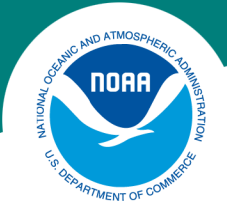




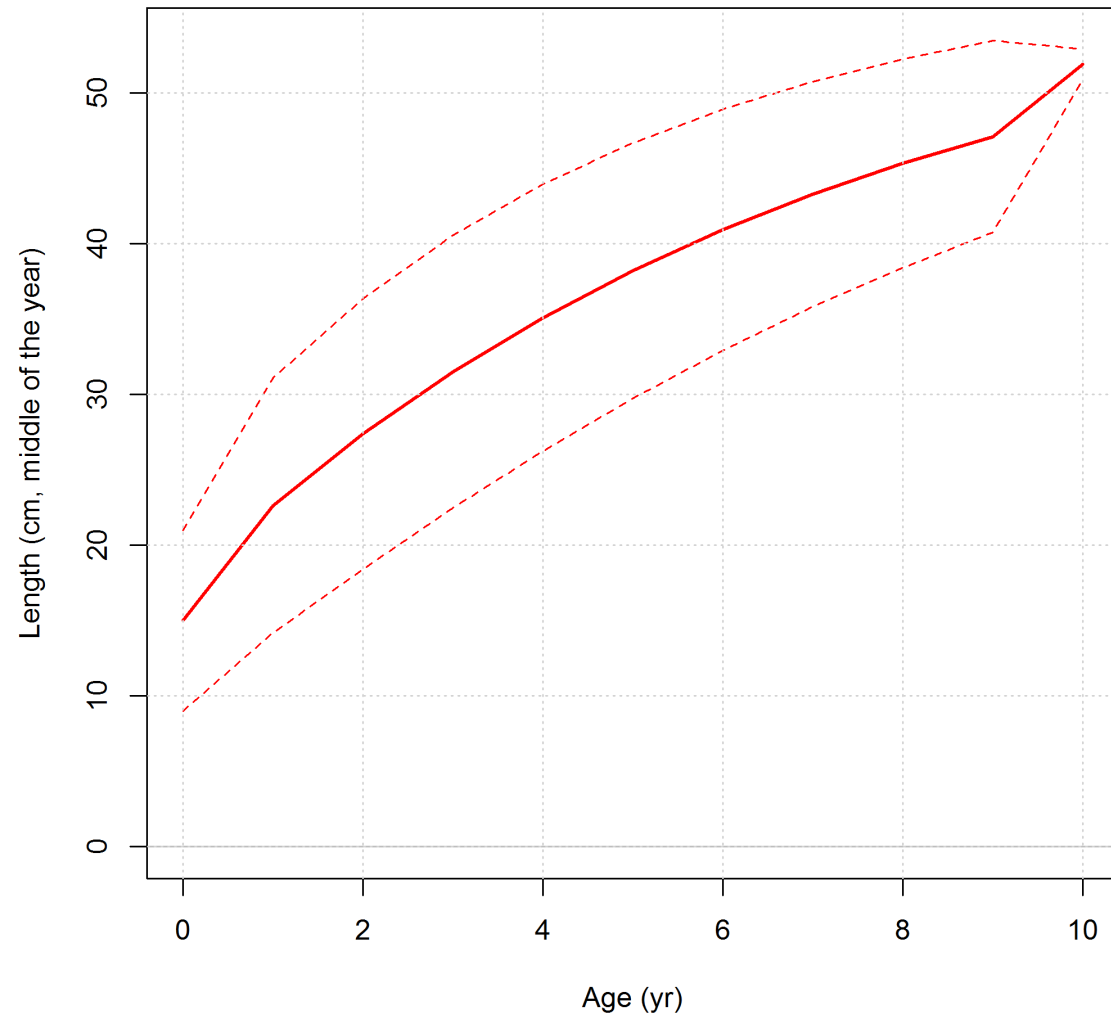
# Rec\_East

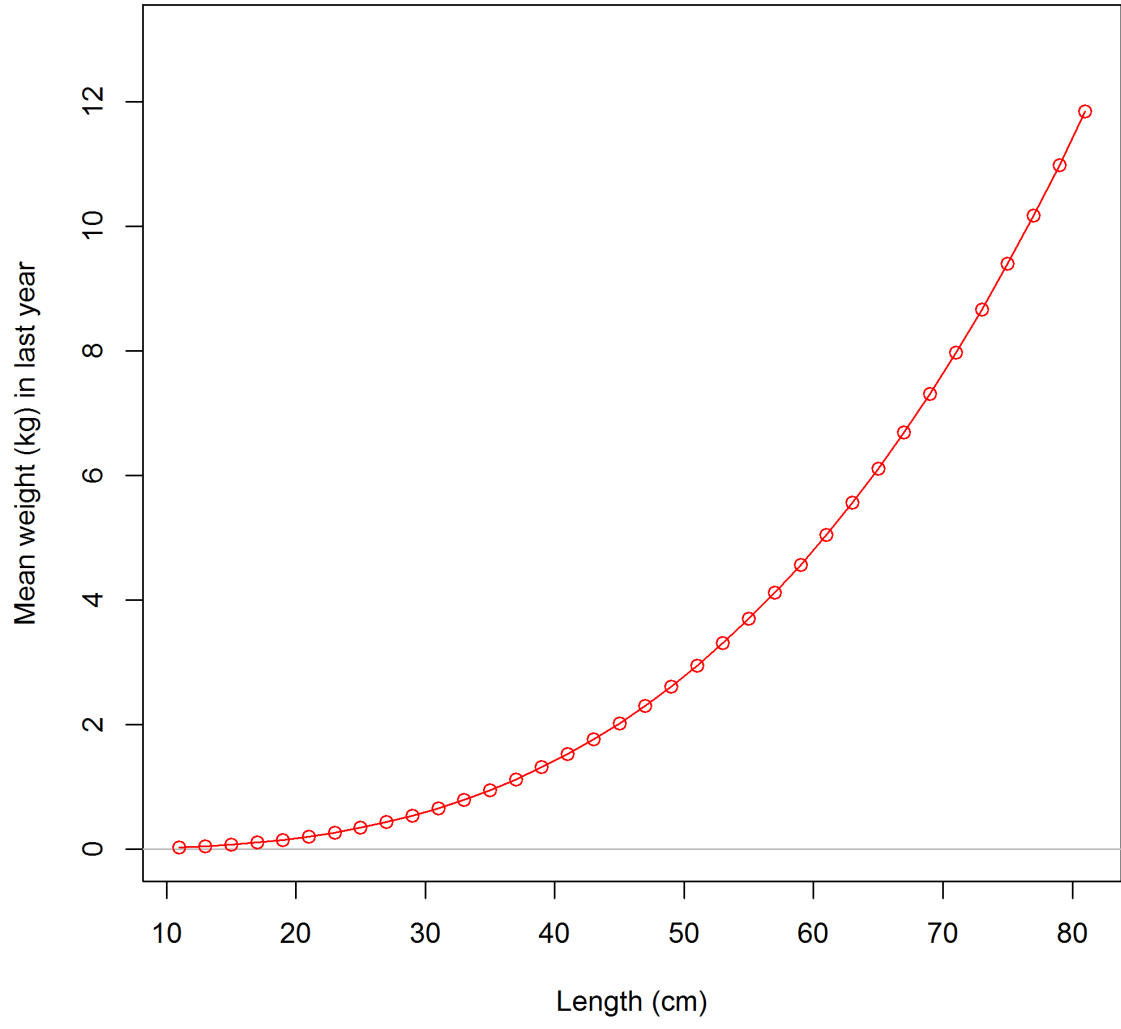
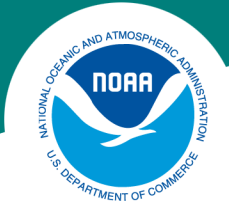
Pearson residuals, sexes combined, retained, Rec\_E\_1 (max=1.44)

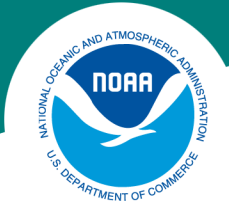




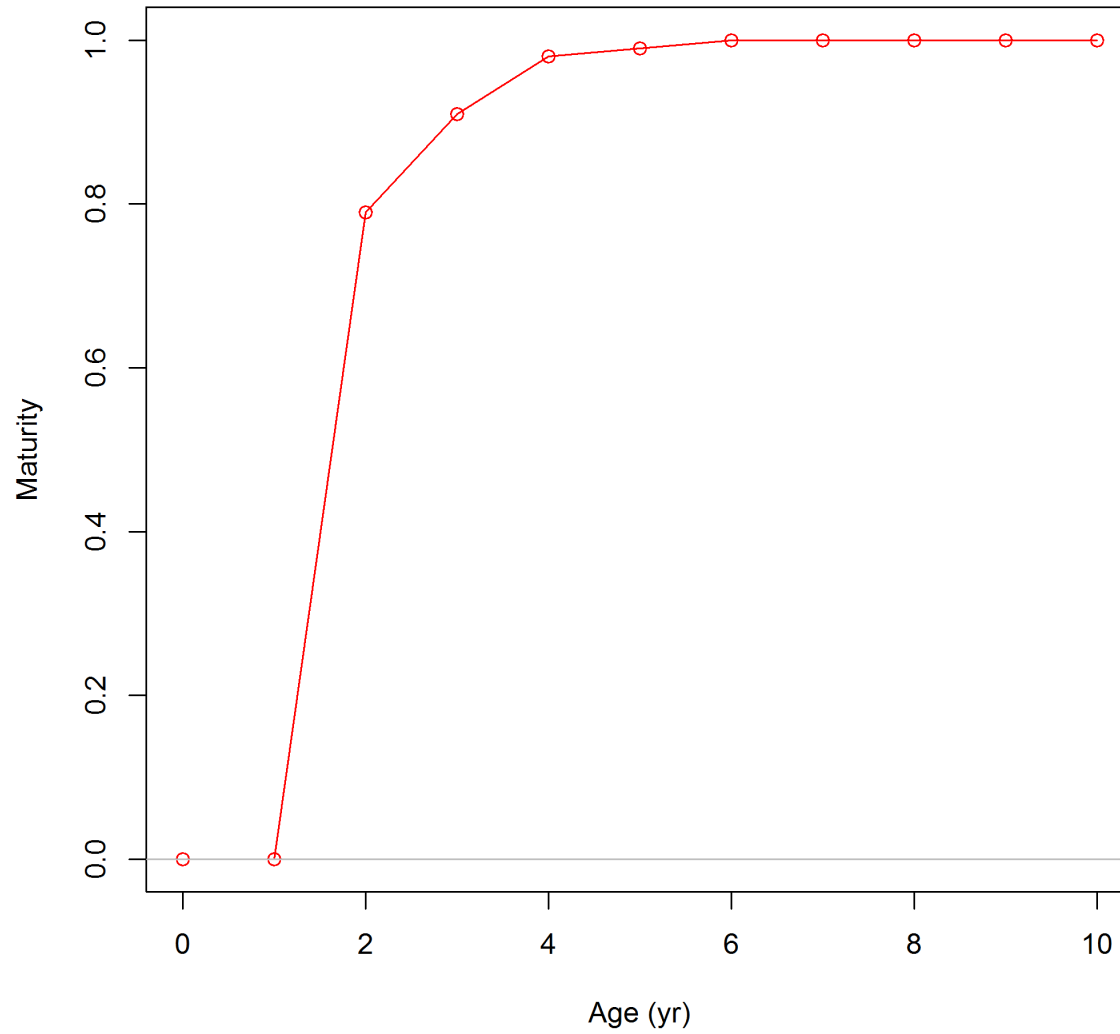
Ending year expected growth



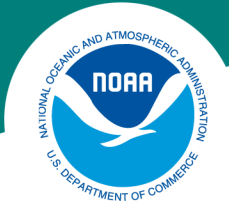




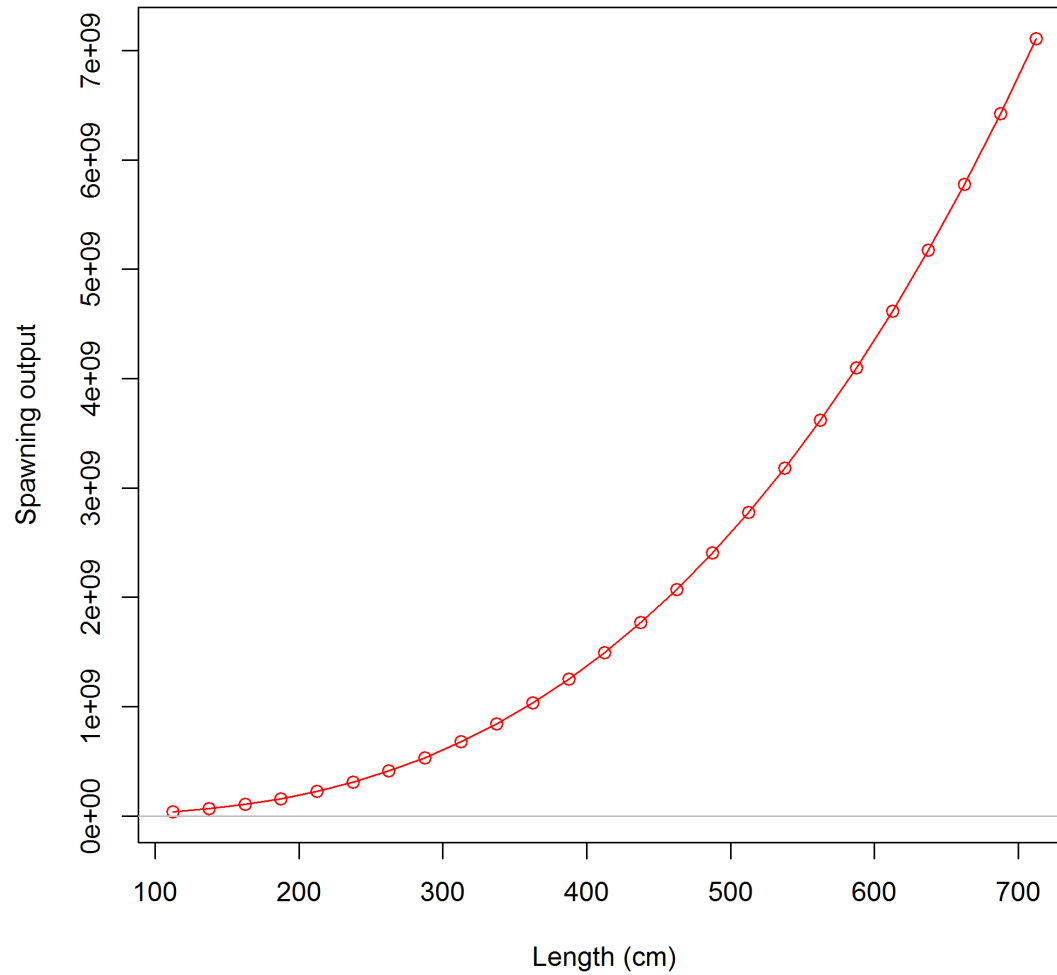
## Maturity

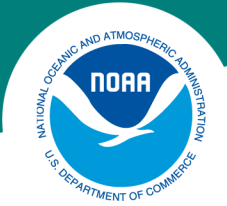




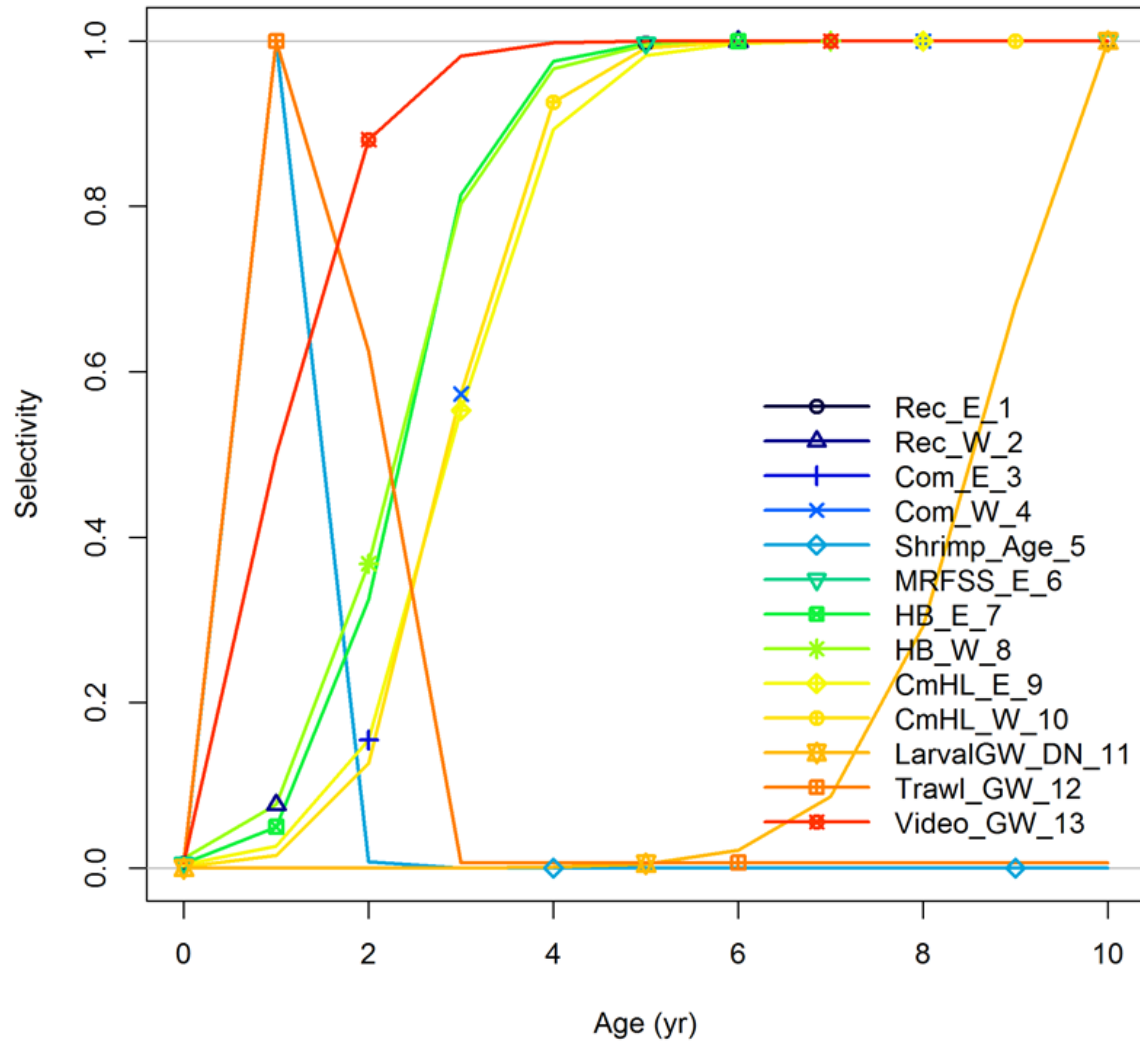


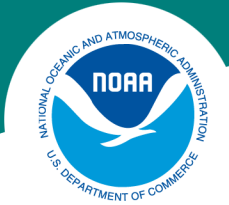
## Spawning Output





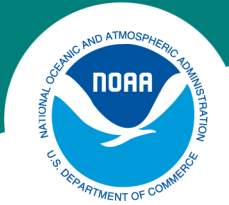
**Age-based selectivity by fleet in 2013**





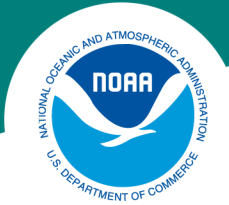
## Proposed Base

- Convert shrimp bycatch to an effort series
- Convert selectivity on fishery-dependent fleets to double normal
- For Terms of Reference:
  - Add Recreational and Commercial discards (with adjustable mortality rate for sensitivity runs)
  - Adjust for circle hook effect (in  $q$ )
  - (Add regulatory time blocks to account for size limit changes.)



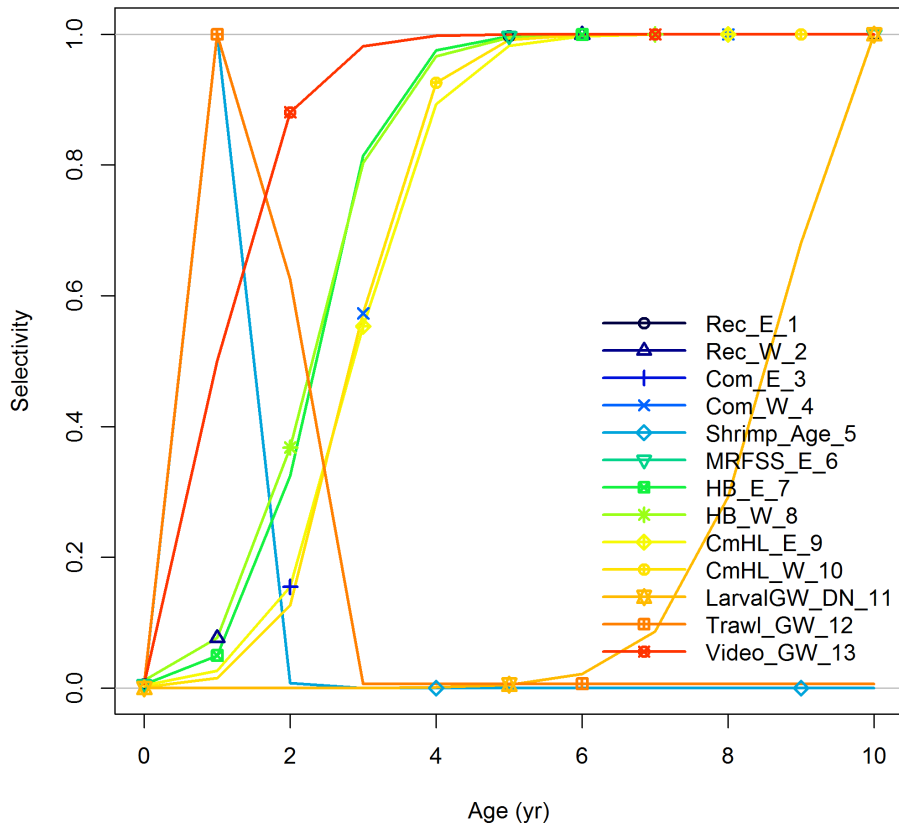
## Sensitivity Analyses

- Discard Mortality (0, 5%, 10%)
- Circle hook effect (1:1, 2.21:1, 4.42:1)
- M
- Slope
- R0

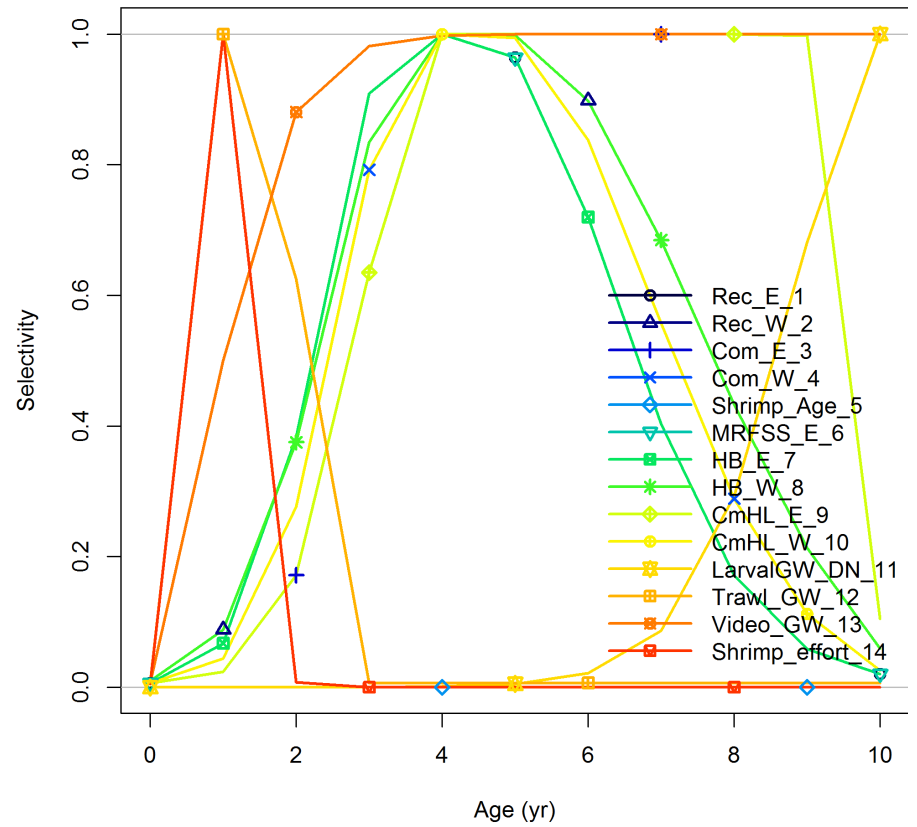


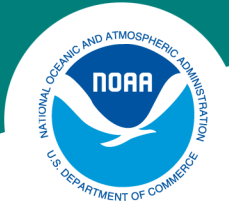
# Selectivity

Age-based selectivity by fleet in 2013

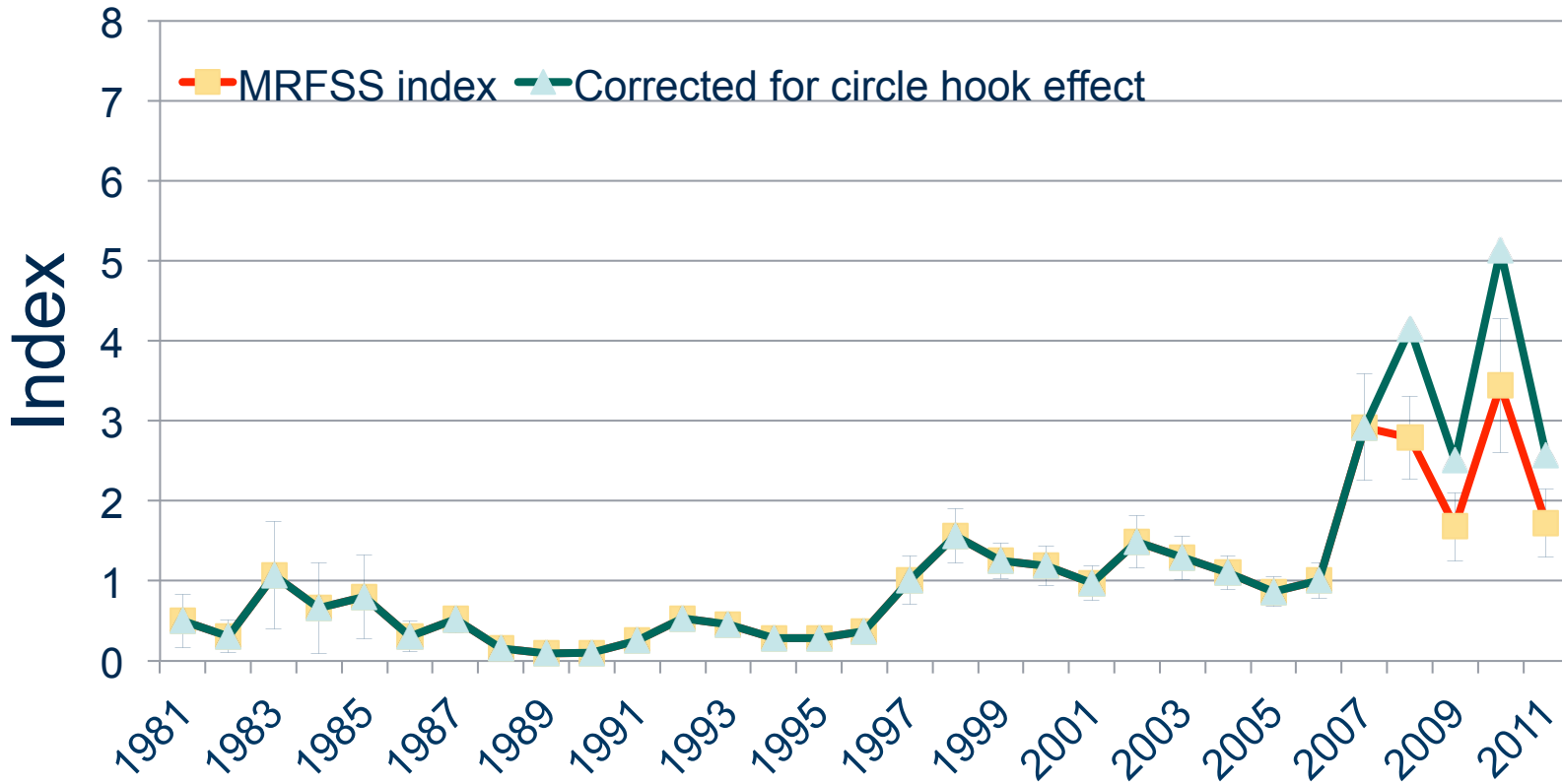


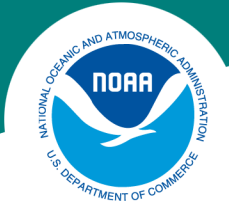
Age-based selectivity by fleet in 2013





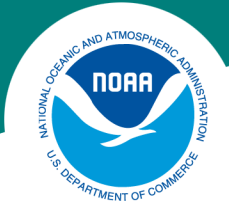
## Circle Hook Effect on CPUE Index



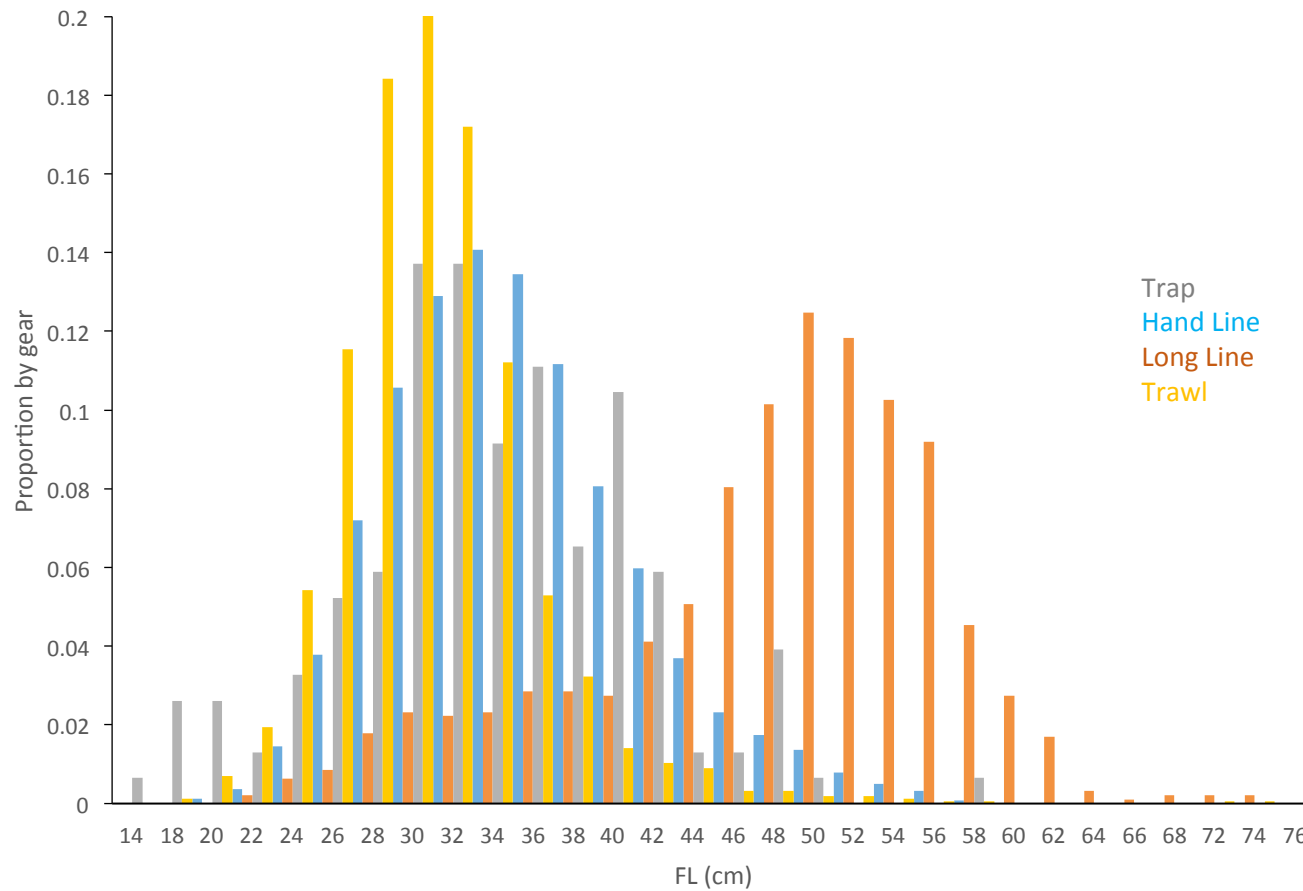


## **Proposed Alternative Base**

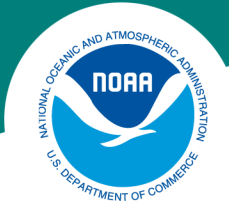
- Proposed Base Plus
  - Pool East and West data by fishery
  - Separate Com into HL, LL and Trap
  - Separate Rec into Charter/Private and Headboat
  - Create Appropriate pooled indices



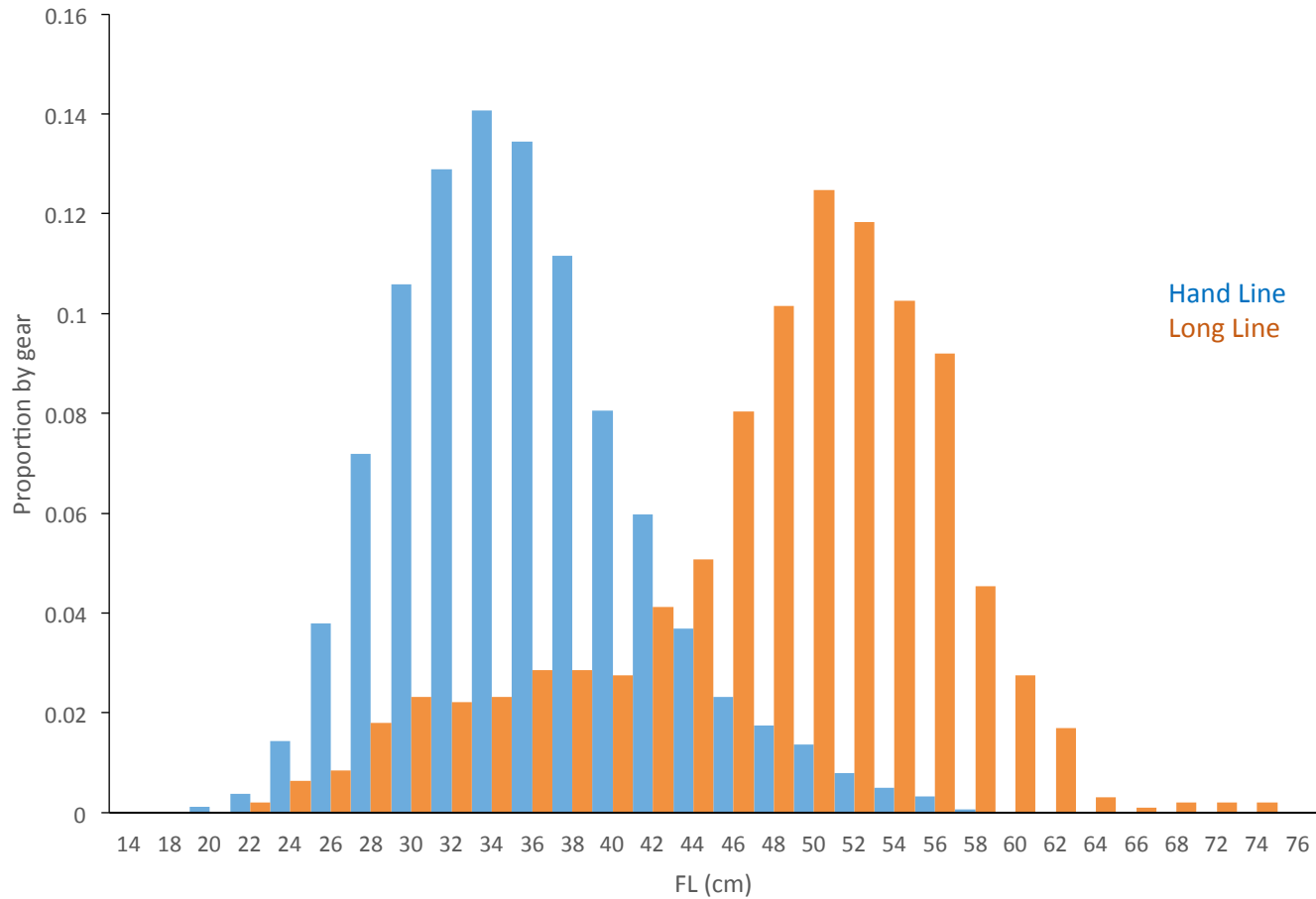
## Length frequency distributions for commercial length samples by gear

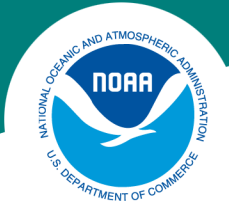




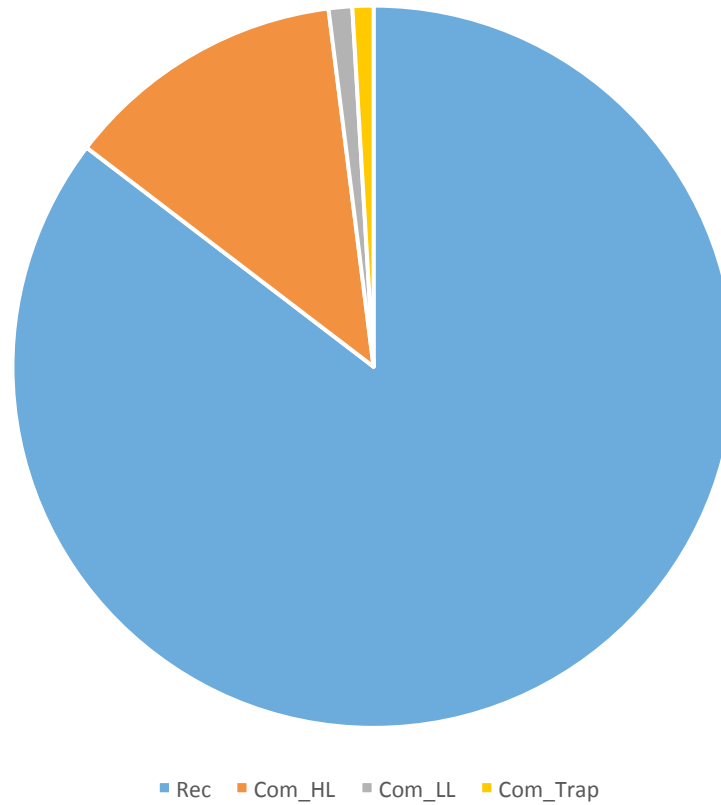


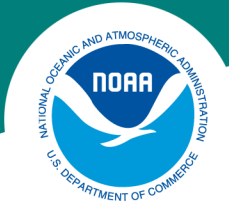
## Length frequency distributions for commercial length samples by gear: Hand Line and Long Line



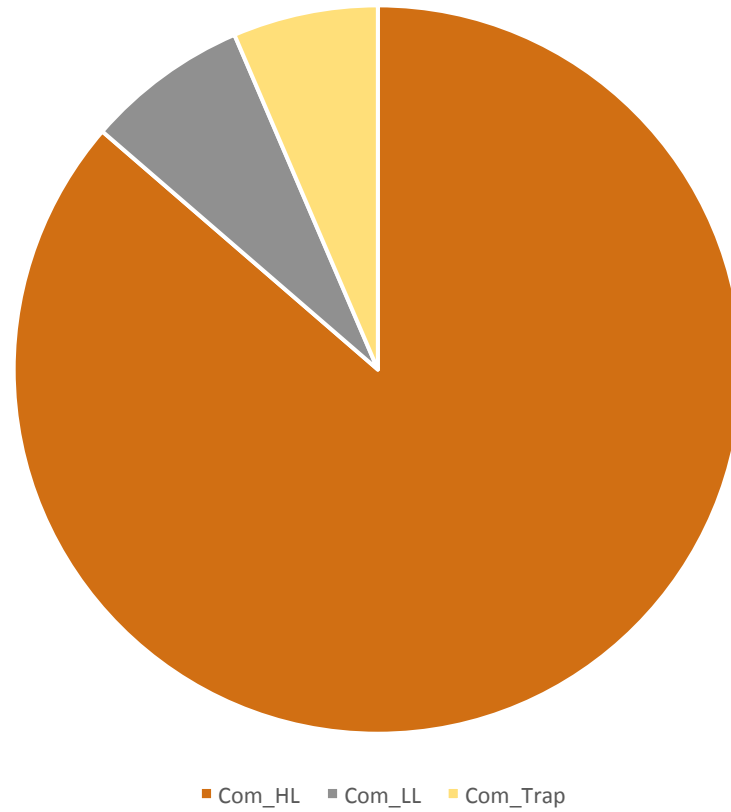


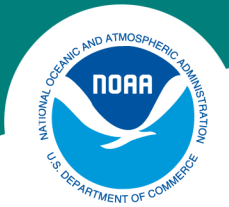
## Recreational and Commercial Landings by Gear



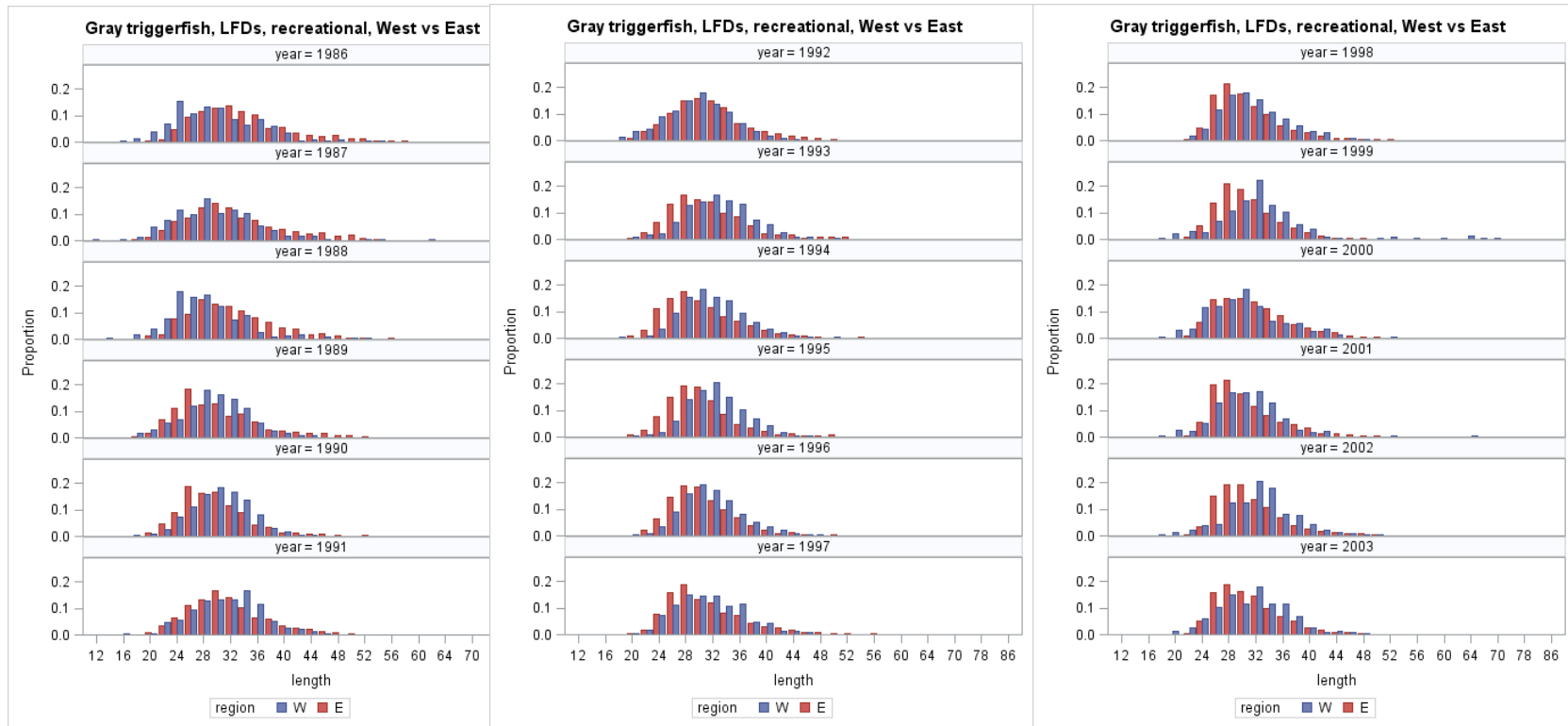


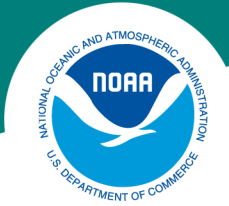
## Commercial Landings by Gear



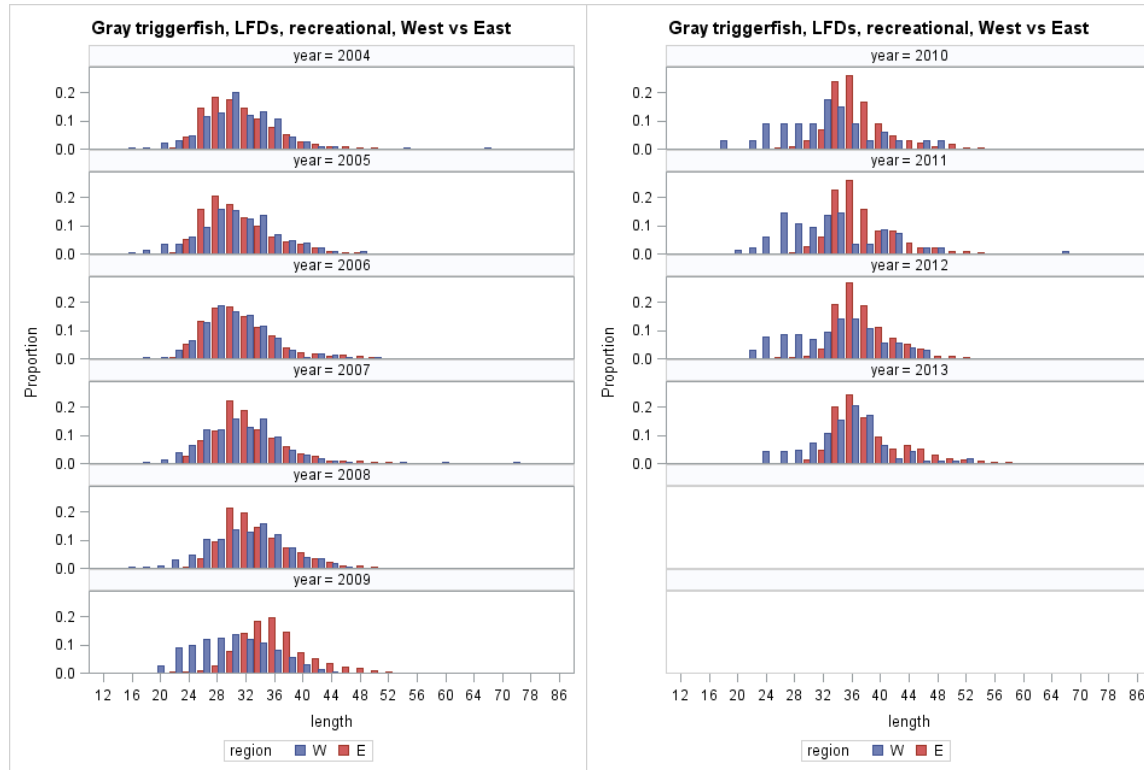


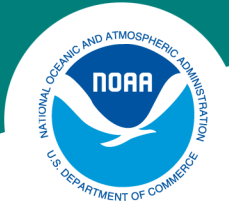
## Length frequency distributions for recreational length samples collected from the east and west



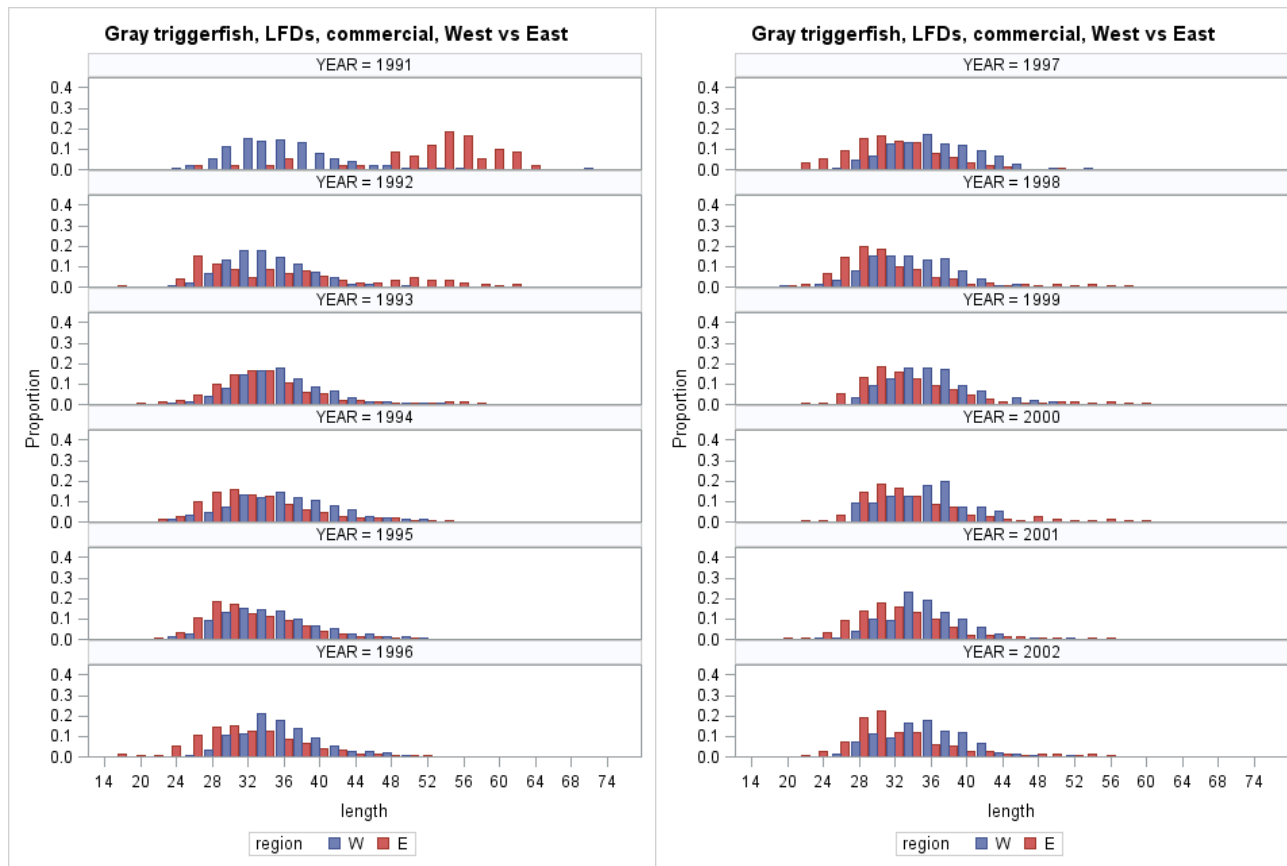


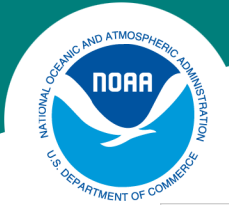
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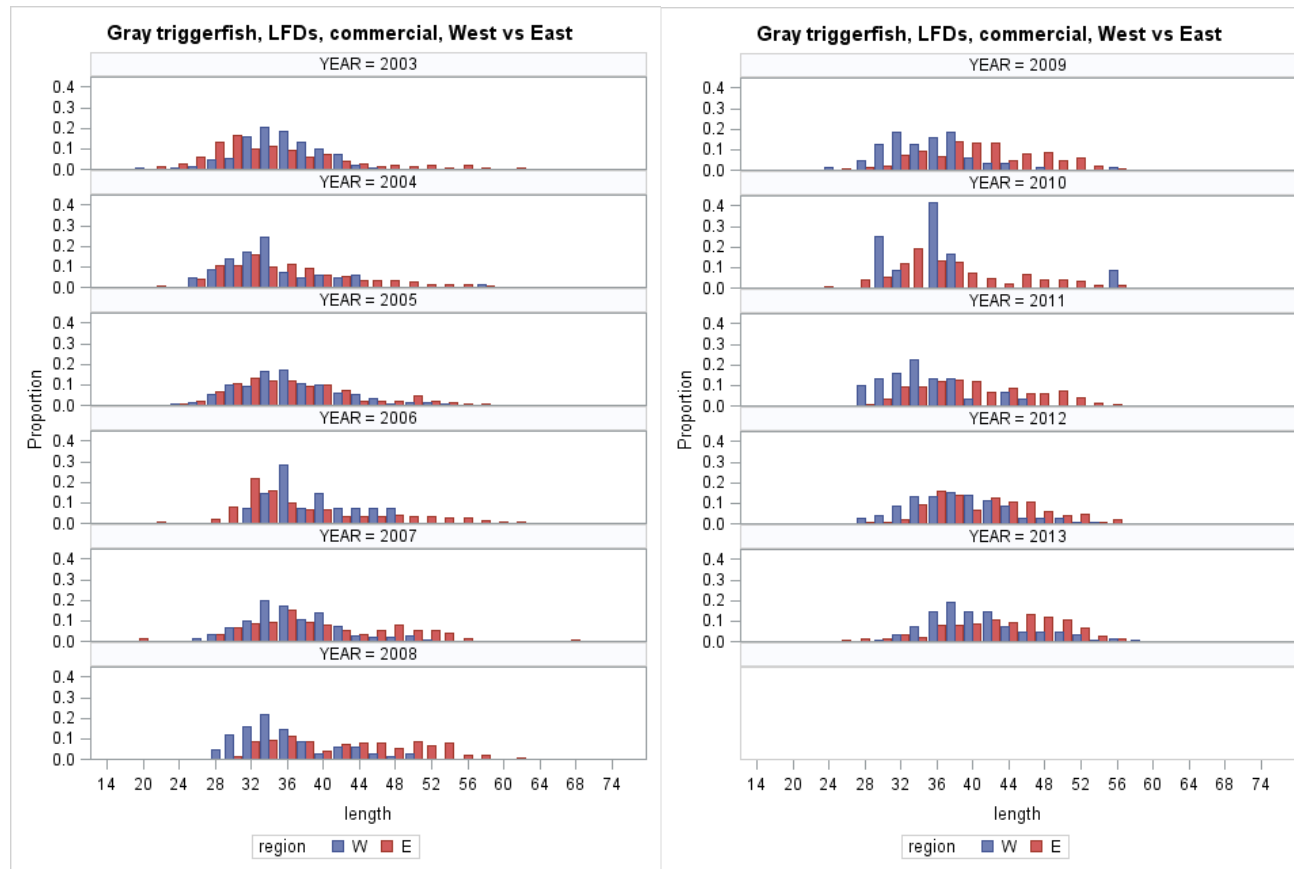


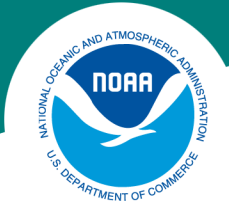
## Length frequency distributions for commercial length samples collected from the east and west



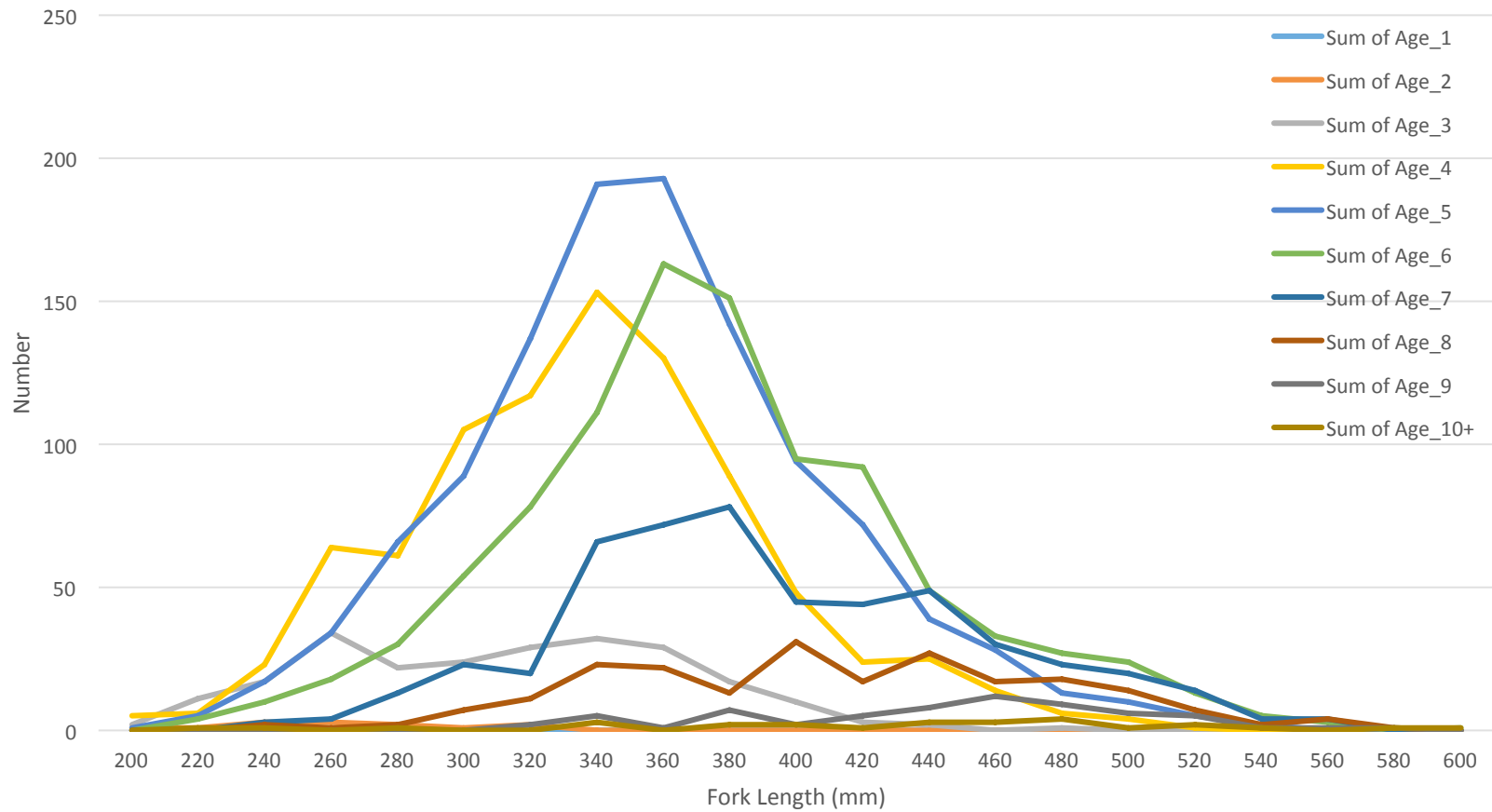


## Length frequency distributions for commercial length samples collected from the east and west

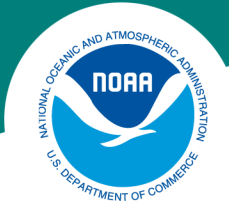




# Age Distribution by Length Recreational







# Age Distribution by Length Commercial

