# Red Snapper Stock Assessment Process

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Ad Hoc Red Snapper
Private Angler Advisory
Panel Meeting
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Tampa, FL

# What is a stock assessment model?

- Set of equations representing a simplified version of the dynamics of a fish population and the fisheries
- ‘Tuned’ to fit real observations (data) of the fish and the fisheries
- Provides advice on where the fish population is relative to management benchmarks and predicts how it will respond to future management actions

# Simplest example of an assessment model

$$N_2 = N_1 - C_1$$

Catch in year 1

Number of fish in year 1

Number of fish in year 2

# Simplest example of an assessment model

$$N_2 = N_1 - C_1$$

$$U_1 = q\ N_1$$

$$U_2 = q\ N_2$$

Catch per hour
(assume proportional to abundance)

# Simplest example of an assessment model

$C_1$ = 1,000 fish

$U_1$ = 1.0 fish per hour

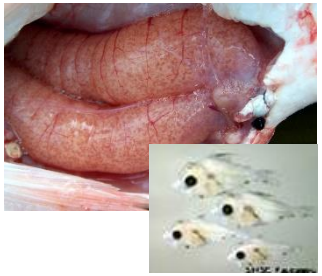
$U_2$ = 0.5 fish per hour

Substituting data into the equations:

$$N_1 = \frac{U_1 C_1}{U_1 - U_2} = \frac{1.0 * 1{,}000}{1.0 - 0.5} = 2{,}000$$

$$N_2 = N_1 - C_1 = 2{,}000 - 1{,}000 = 1{,}000$$

# Real stock assessments use more data to estimate more things – and use more equations



Biology and Ecology

Age data

Size data

Recreational Fisheries Monitoring

Scientific Surveys

Bycatch

Commercial Fisheries

# 2014 Stock Assessment: Data Inputs

- Age Structured Model (Stock Synthesis)
- Covers period 1872-2014
- Assessed as 2 stocks: East and West of Mississippi River
- Managed as 1 Gulfwide stock

## Fisheries Dependent Data

Catch, Discards, Effort, CPUE, Age

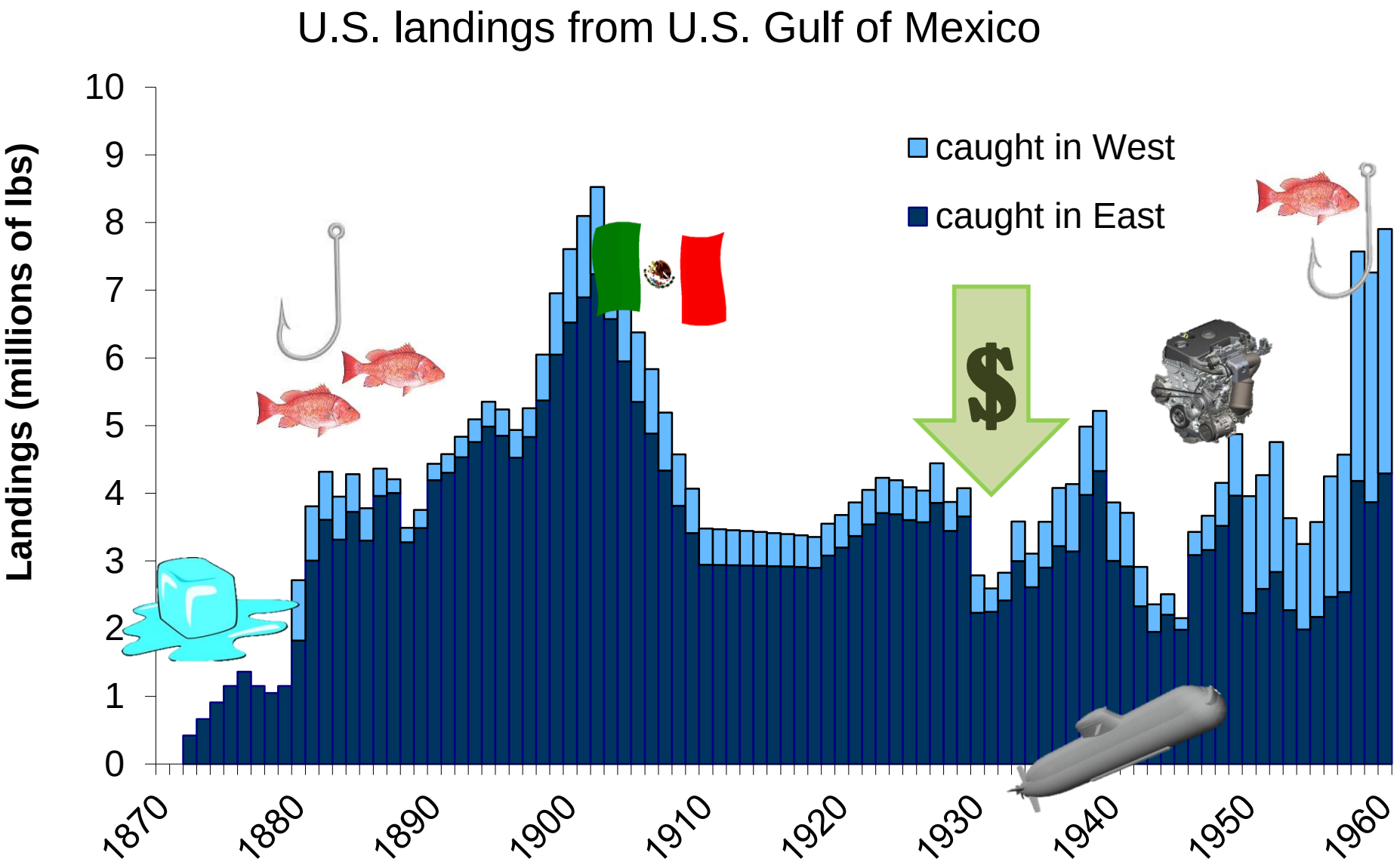
- Com Handline
- Com Longline
- Rec Private Boat + Charter Boat
- Headboat
- Com Closed Season
- Rec Closed Season
- Shrimp Bycatch

## Fisheries Independent Data

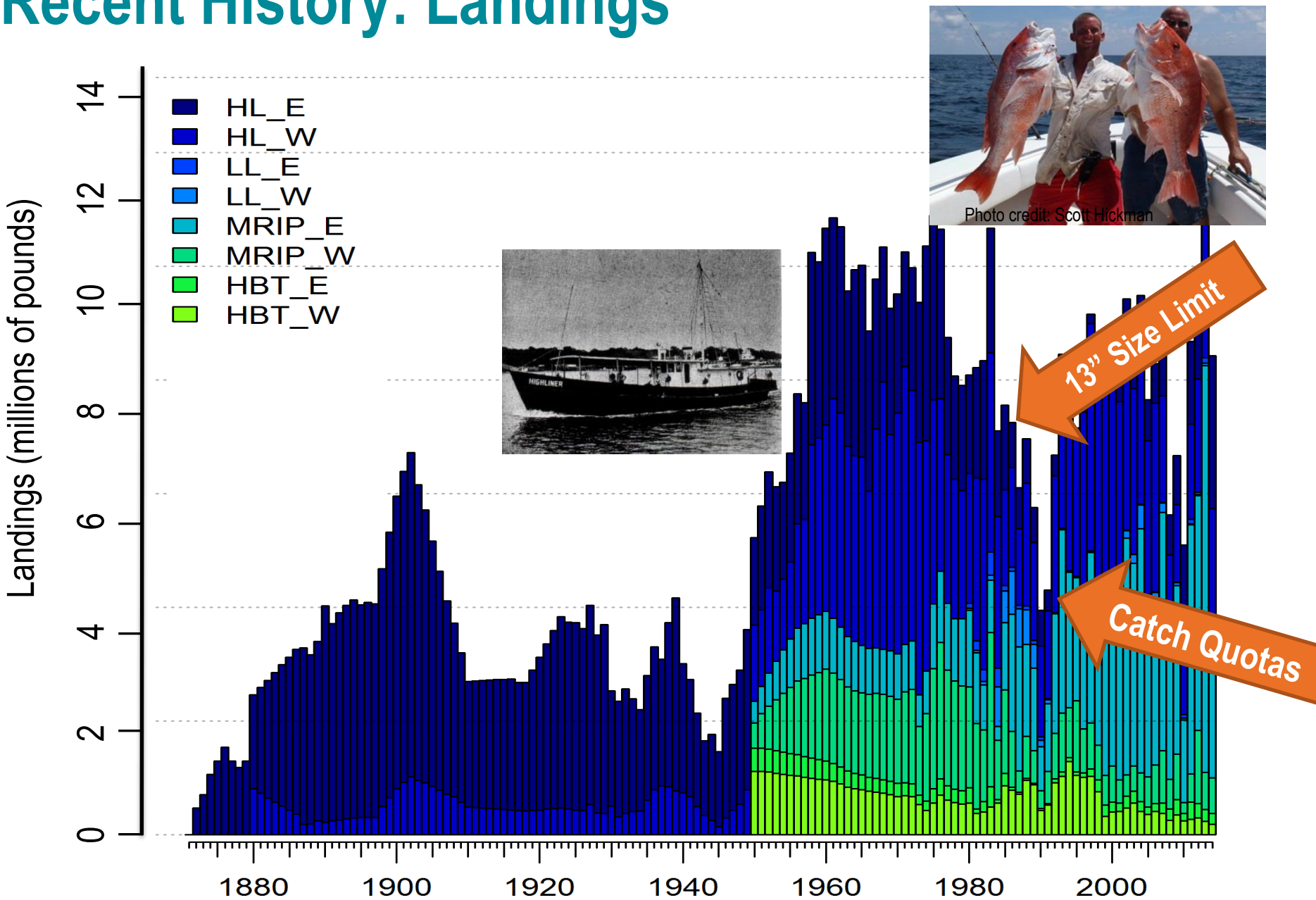
CPUE, Age composition

- SEAMAP Video survey
- SEAMAP Plankton survey
- SEAMAP Summer Trawl survey
- SEAMAP Fall Trawl survey
- NFMS bottom longline survey
- Artificial Reef ROV (third party surveys)

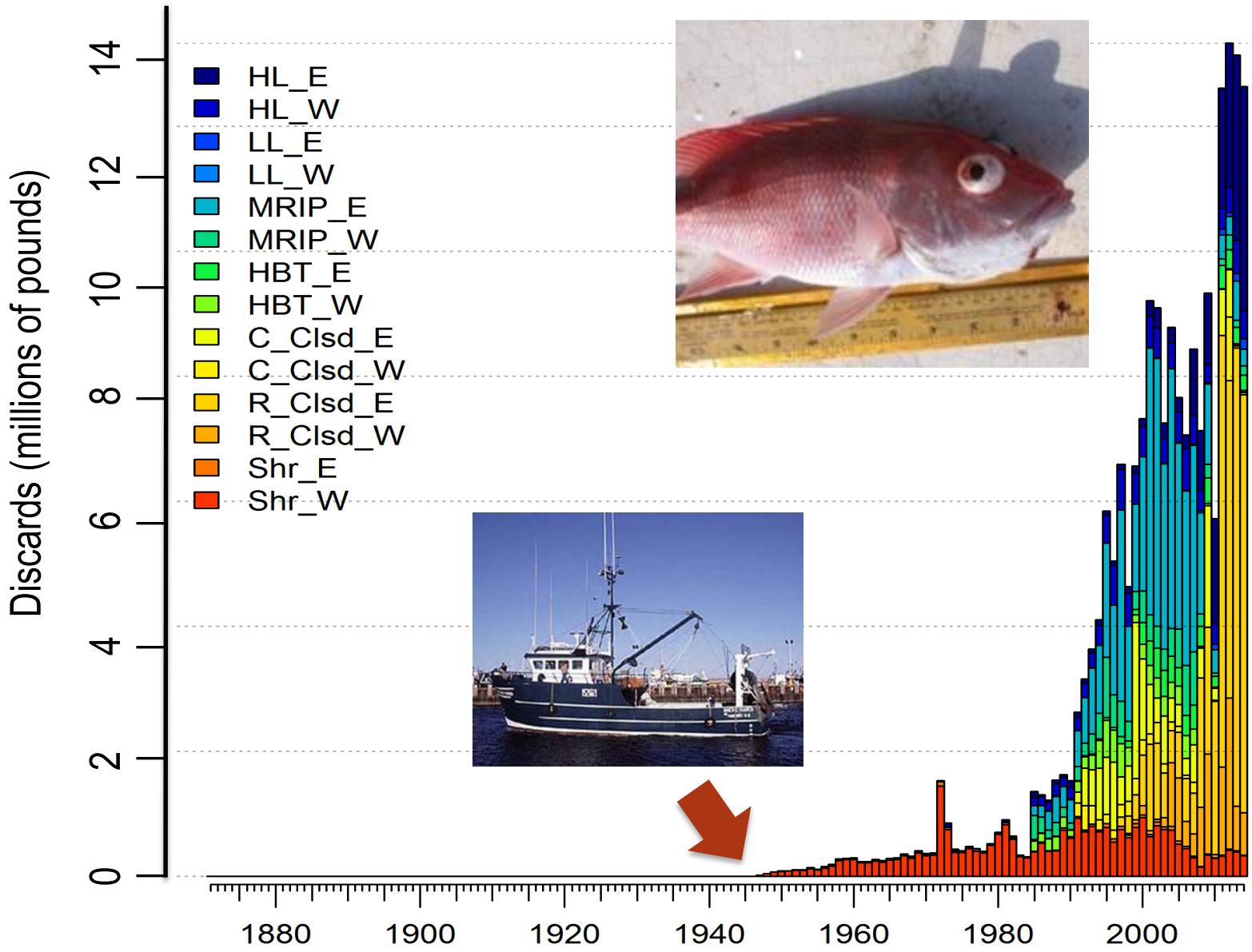
# Early History of the Fishery



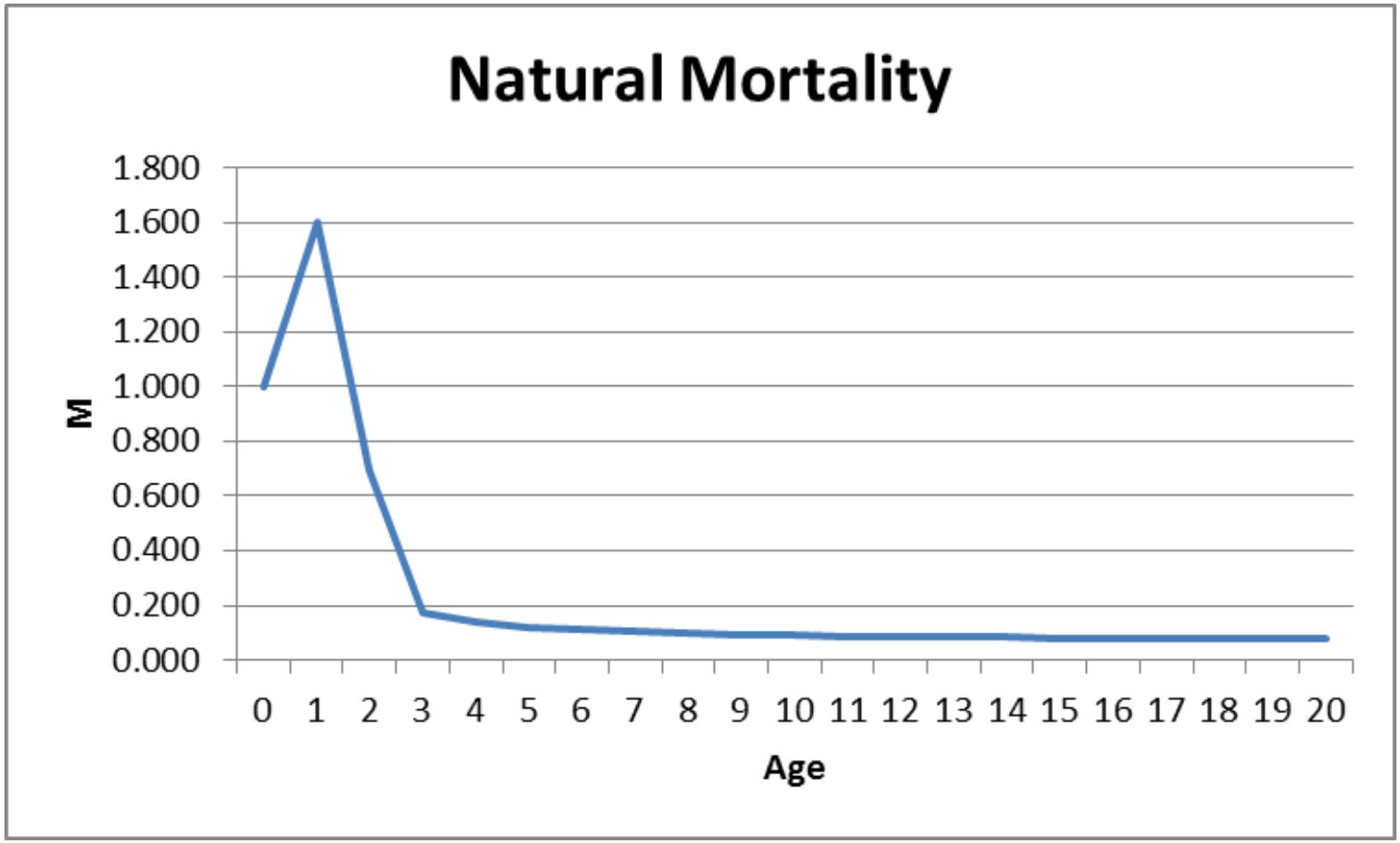
# Recent History: Landings



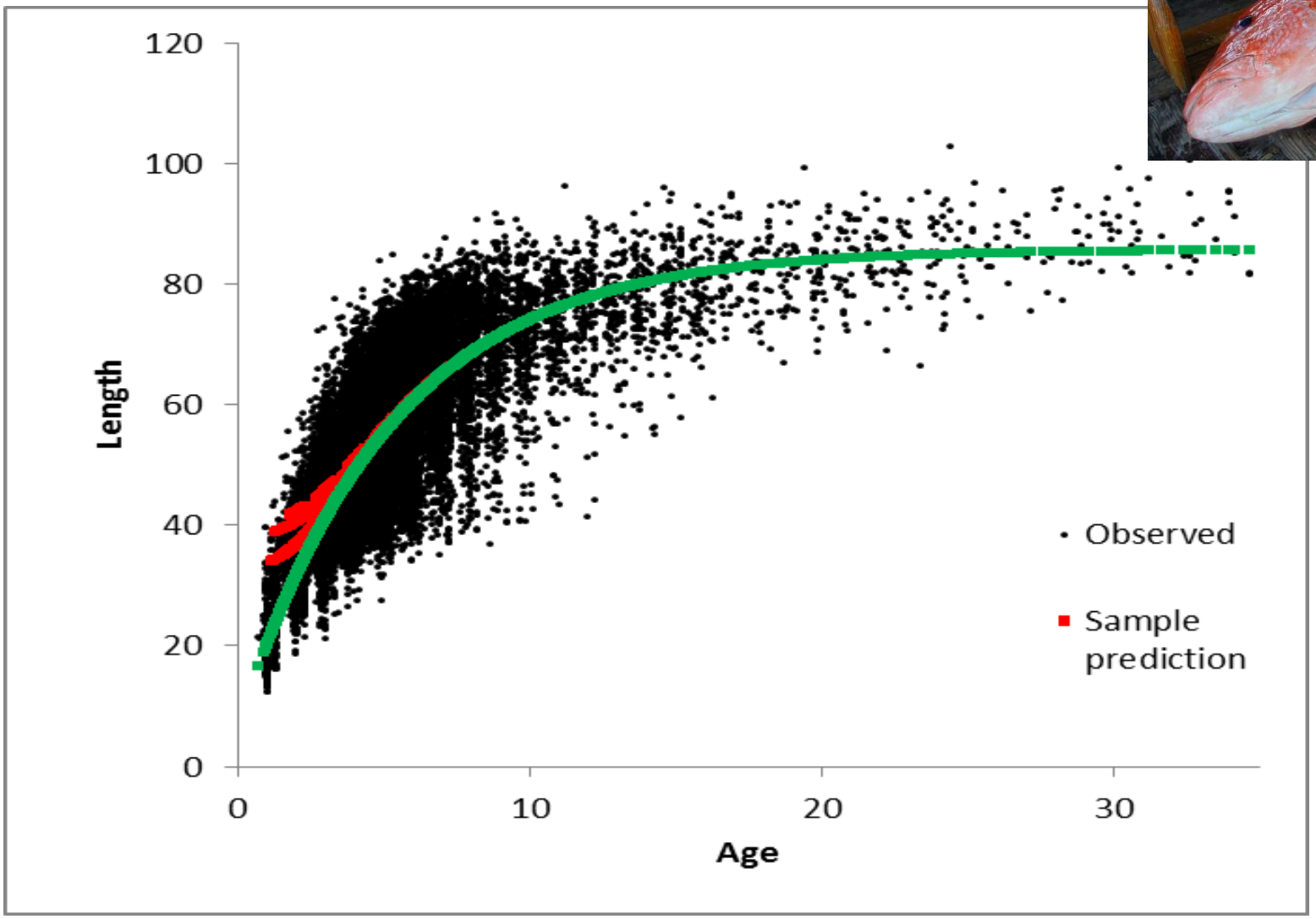
# Recent History: Discards



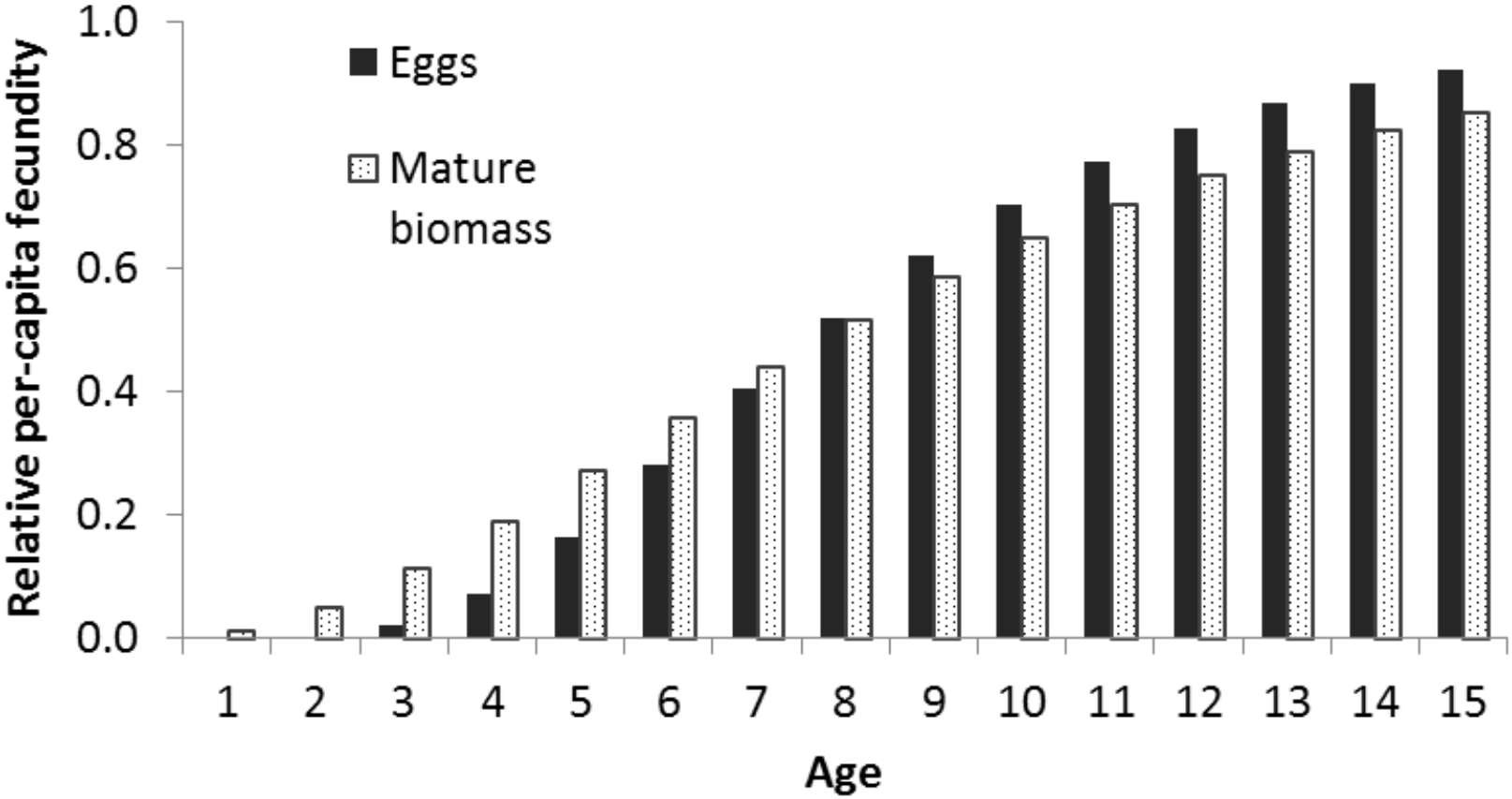
# Natural Mortality



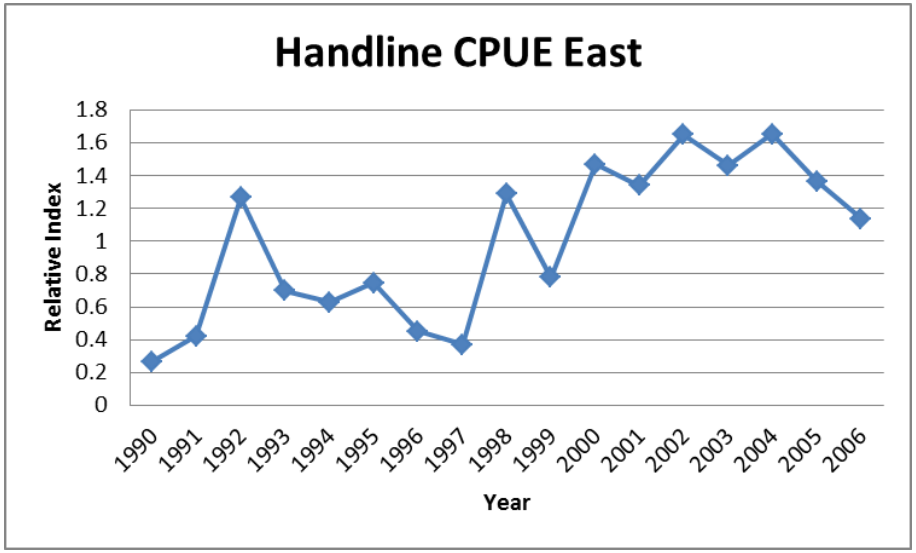
# Growth

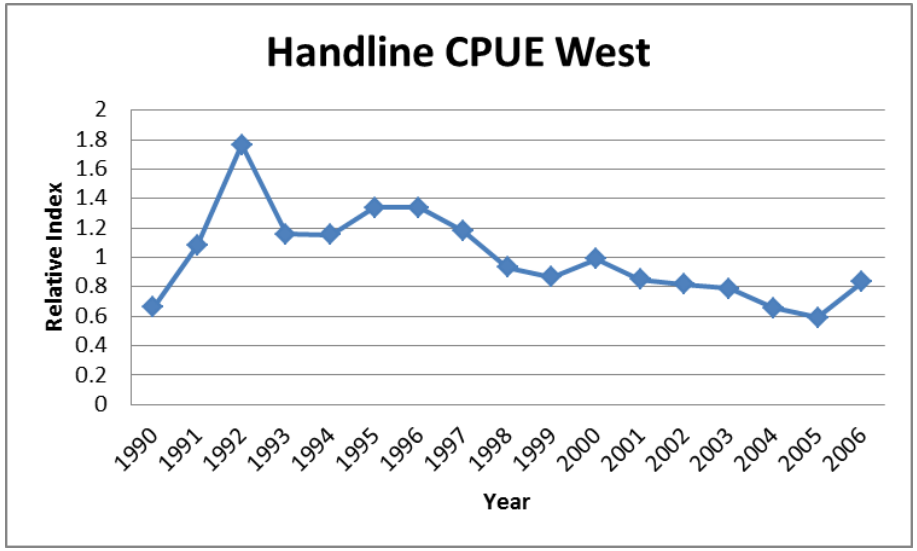

120
100
80
60
40
20
0
Length
0
10
20
30
Age
Observed
Sample prediction

# Reproduction

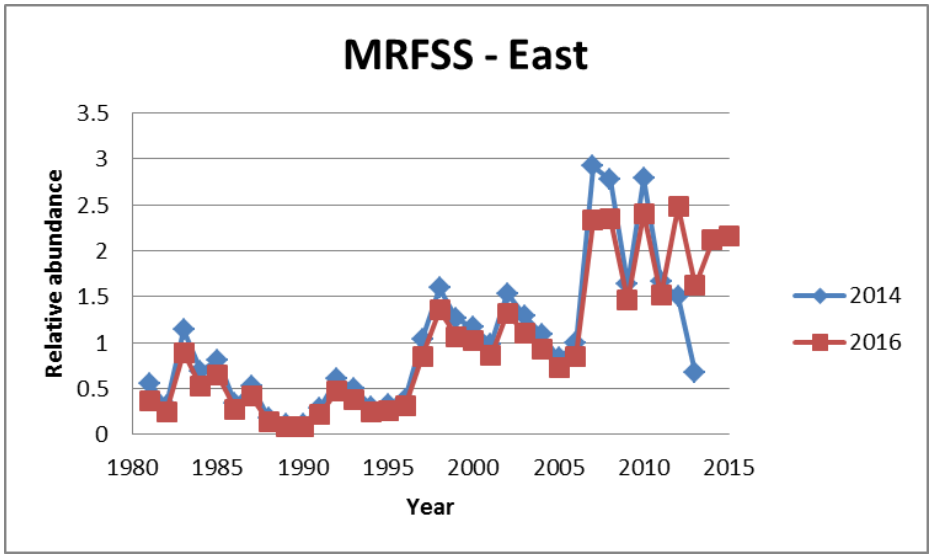


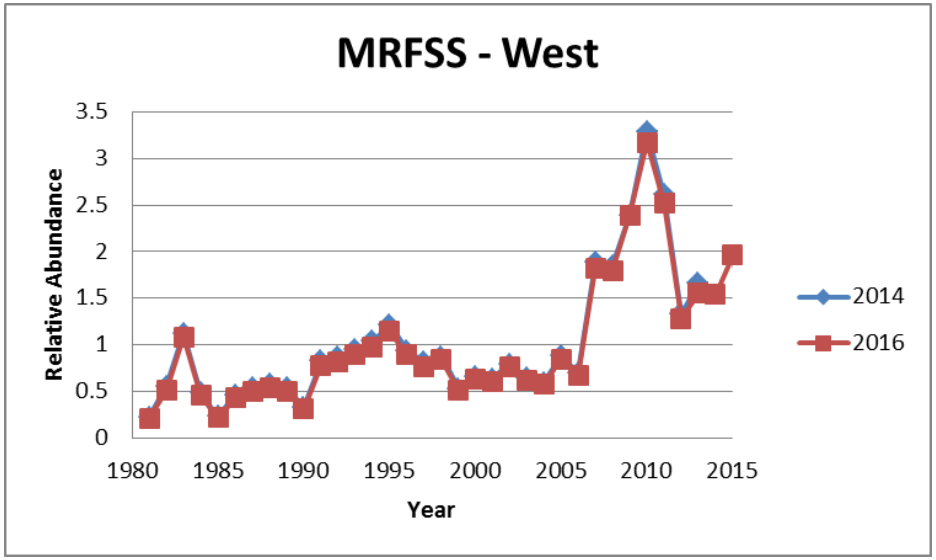
# Fisheries Dependent Indices of Abundance (CPUE) Commercial HL



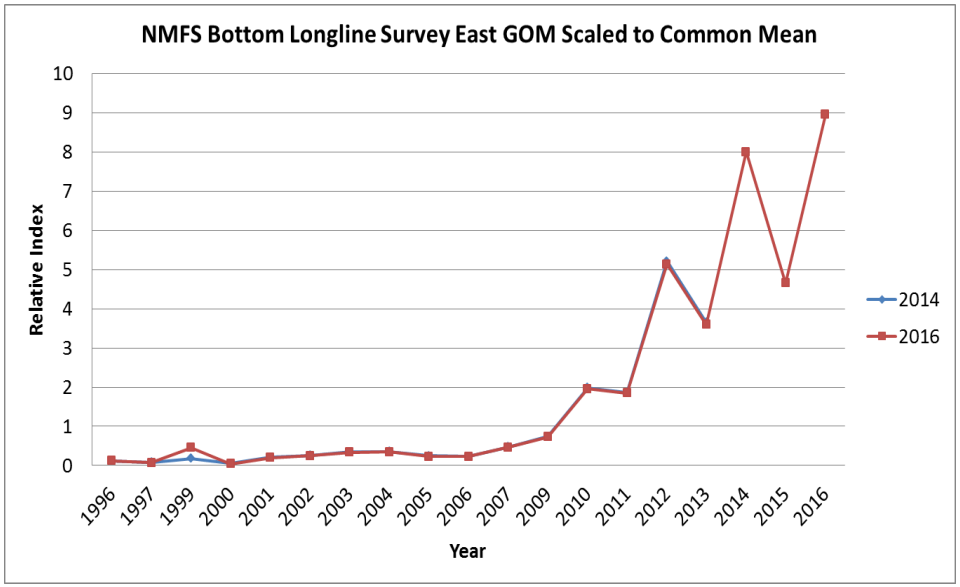
# Fisheries Dependent Indices of Abundance (CPUE) Recreational (PR+CB)



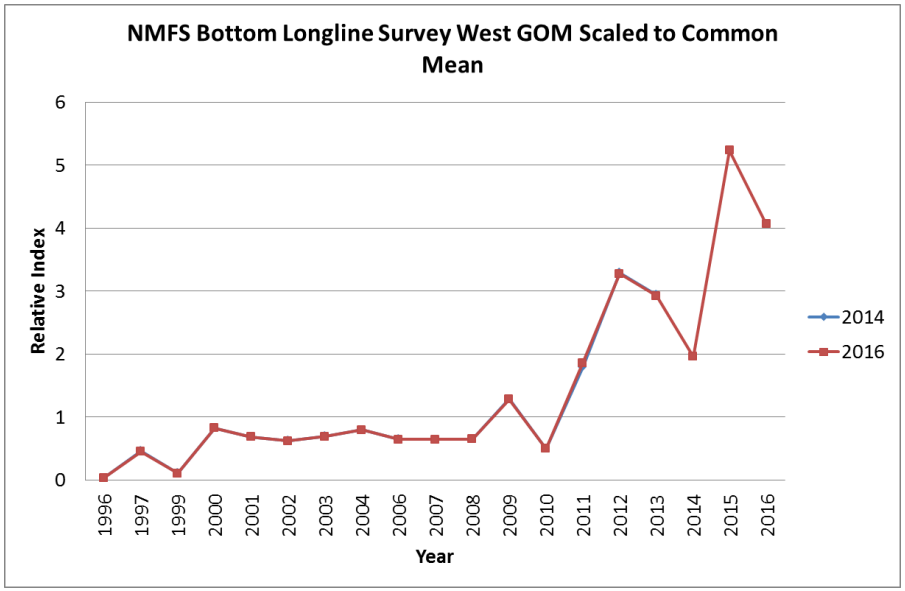



# Fisheries Independent Indices of Abundance NMFS Bottom Longline (SSB)

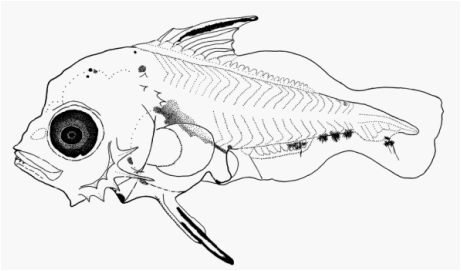
EAST



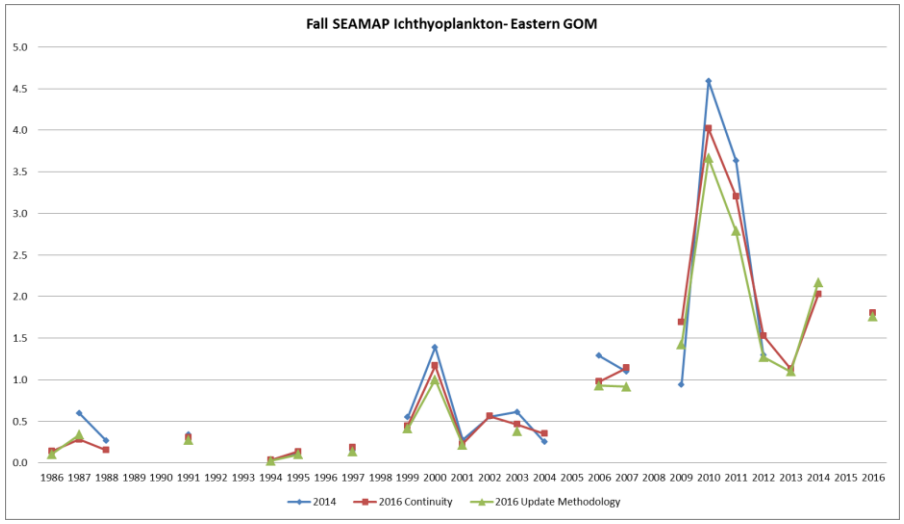

WEST



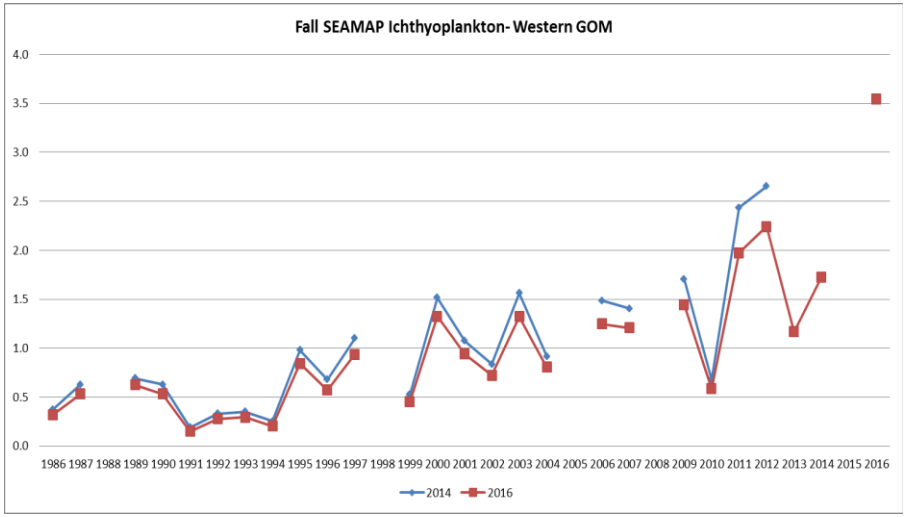
# Fisheries Independent Indices SEAMAP Larval Survey (SSB) (1986-2016)



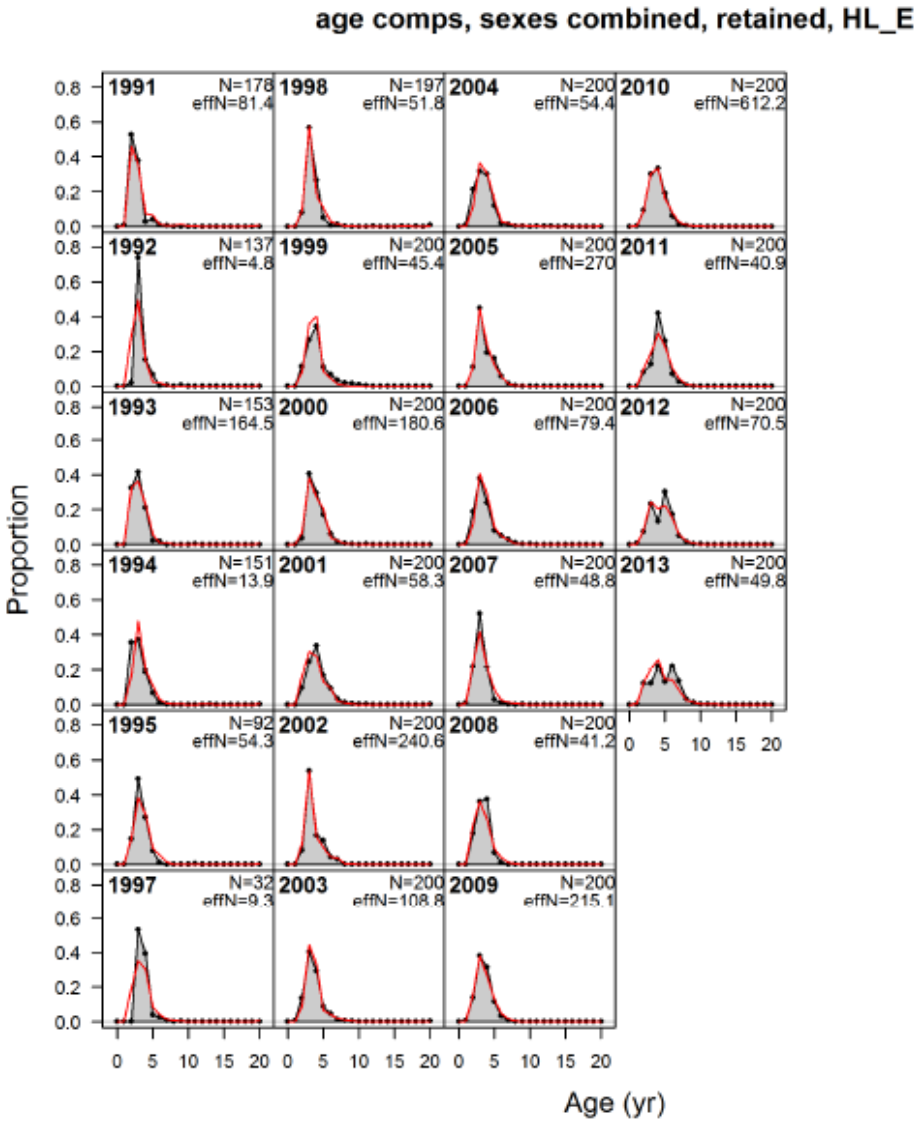
EAST




WEST

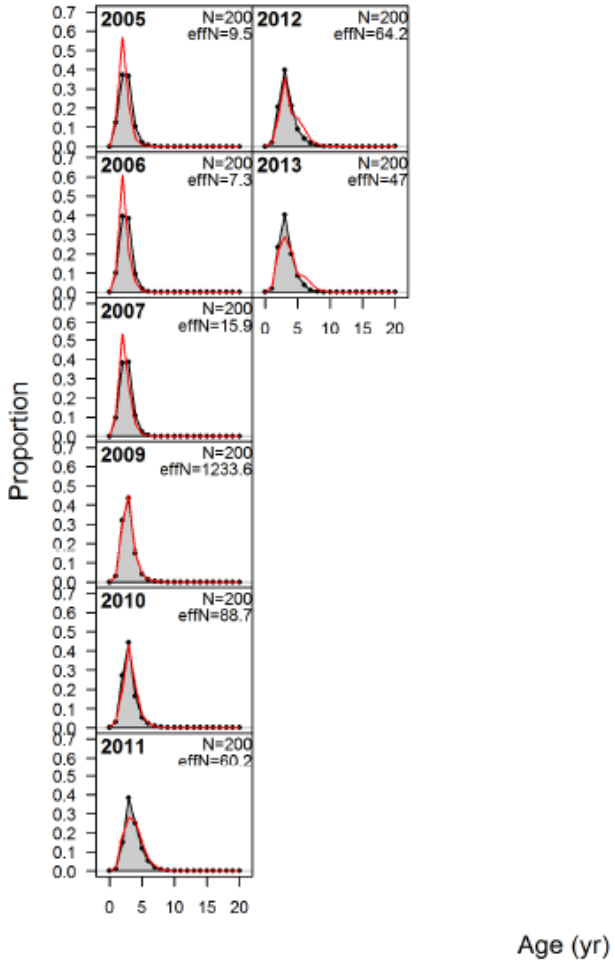


# Fisheries Data: Landings Age Composition (e.g. COM_HL_E)

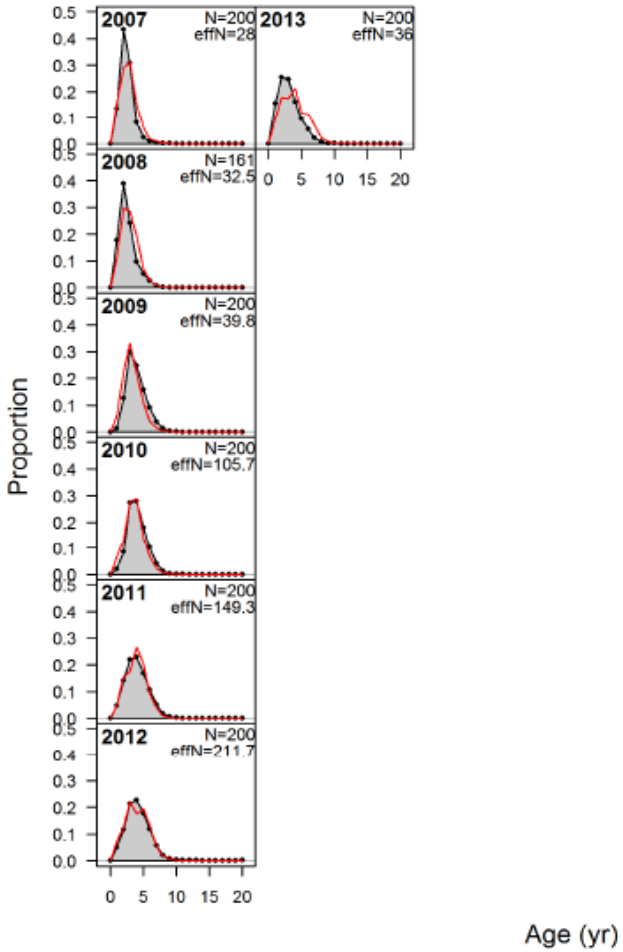


# Fisheries Data: Discard Age Composition

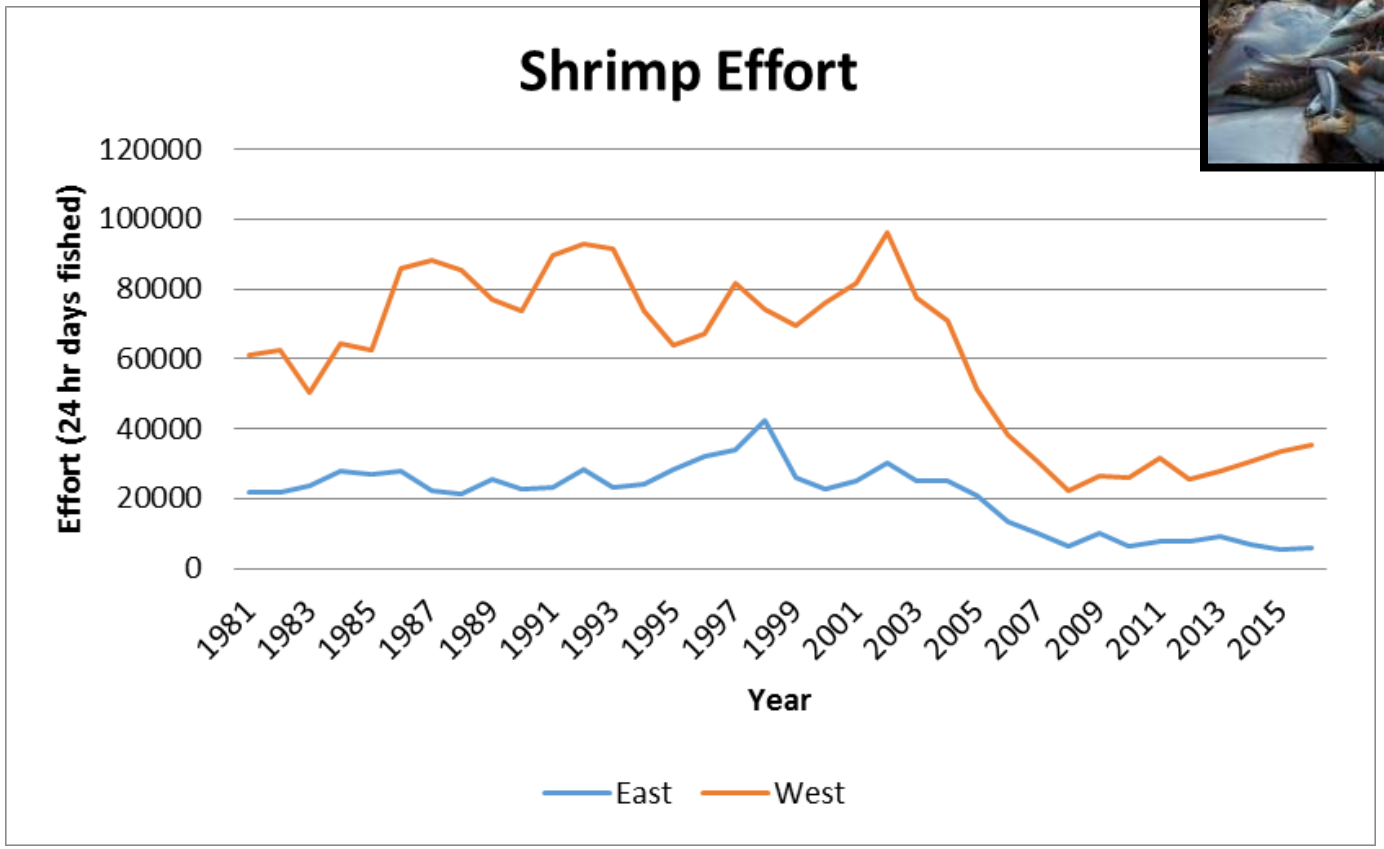
Recreational: HB EAST (observer)




Commercial HL EAST: Reef-fish observer

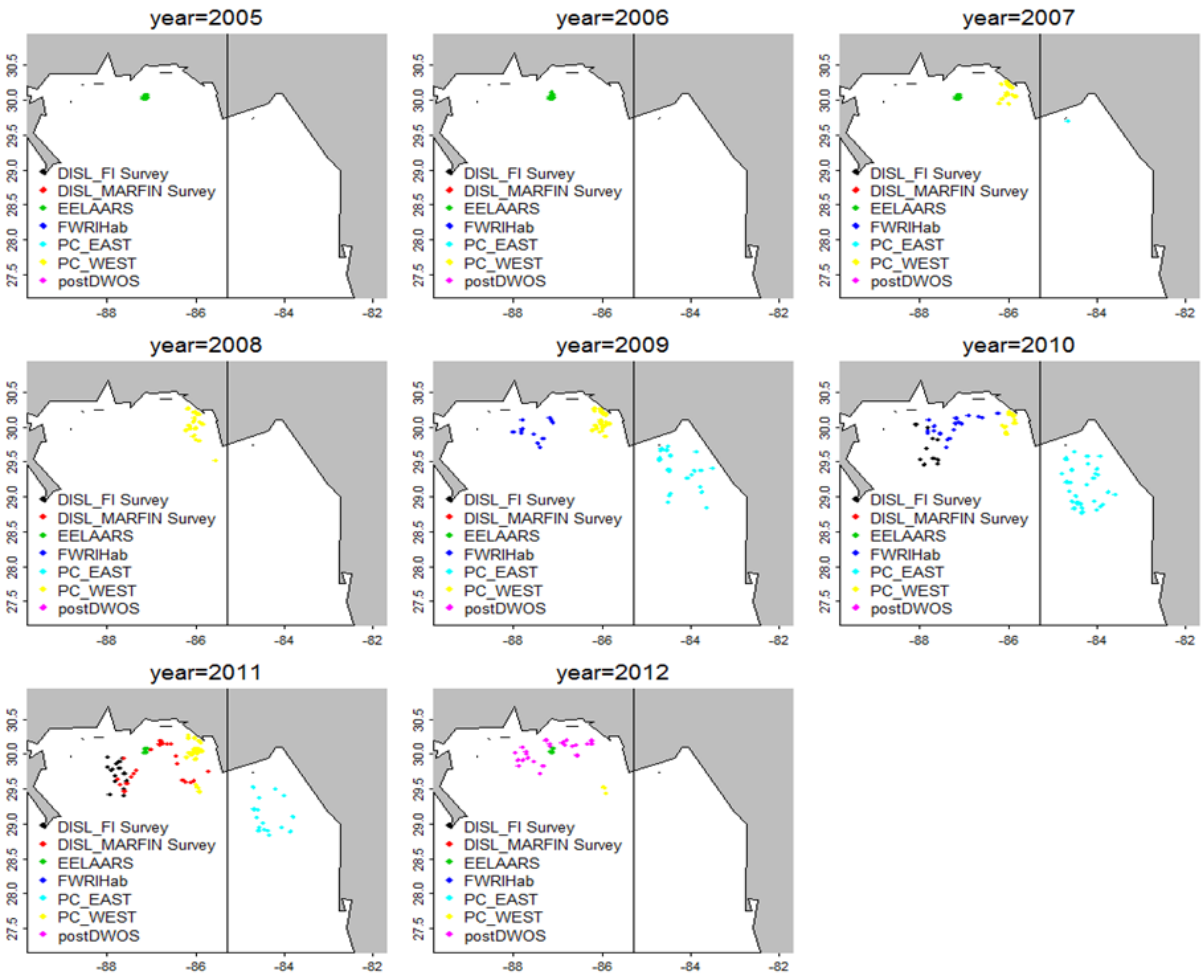


# Shrimp Effort & Bycatch



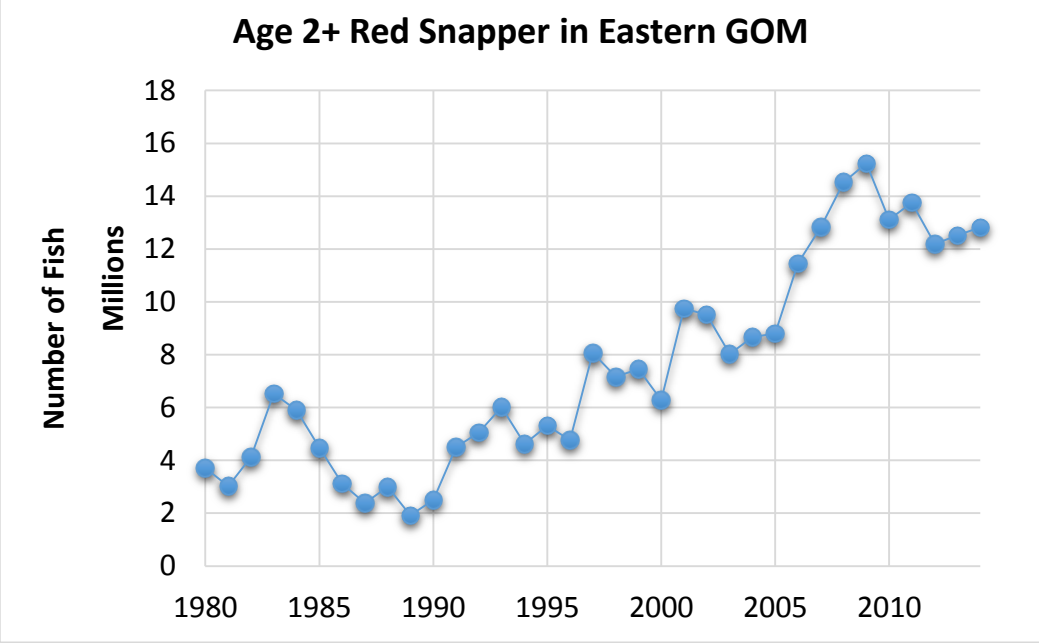
# ROV/Camera surveys of artificial reefs

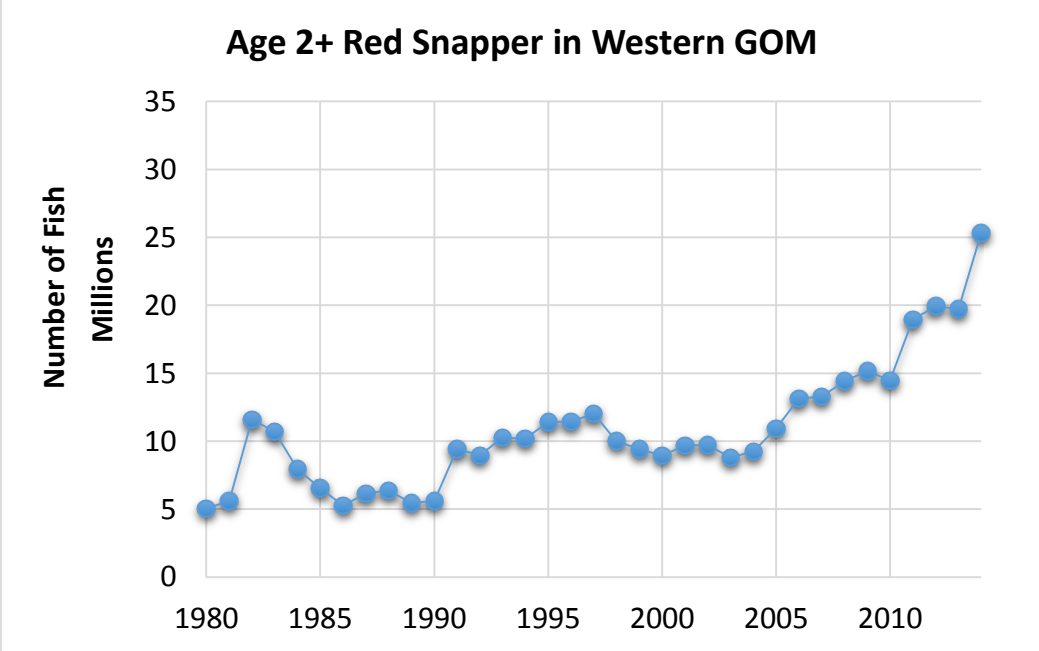
- U. West Florida surveys (Patterson et al. 2009)
- Dauphin Island Sea Lab (DISL) surveys
- Panama City NMFS and FWRI ROV/Fixed Camera studies



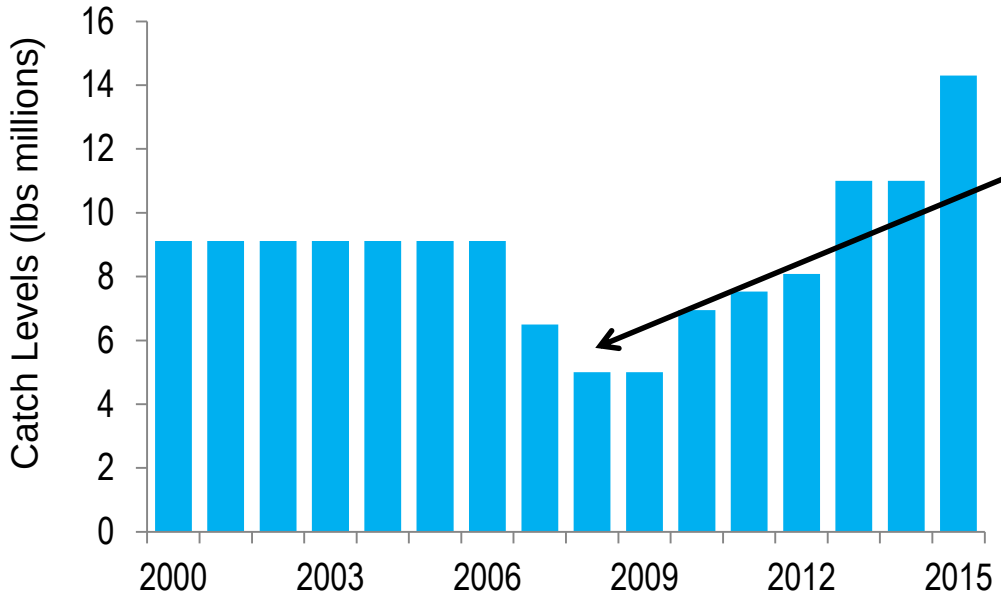
# Stock Assessment Results

# The Latest SEDAR Red Snapper Assessment agrees that red snapper are more abundant than most fishers have ever seen



# What led to the increase in red snapper?

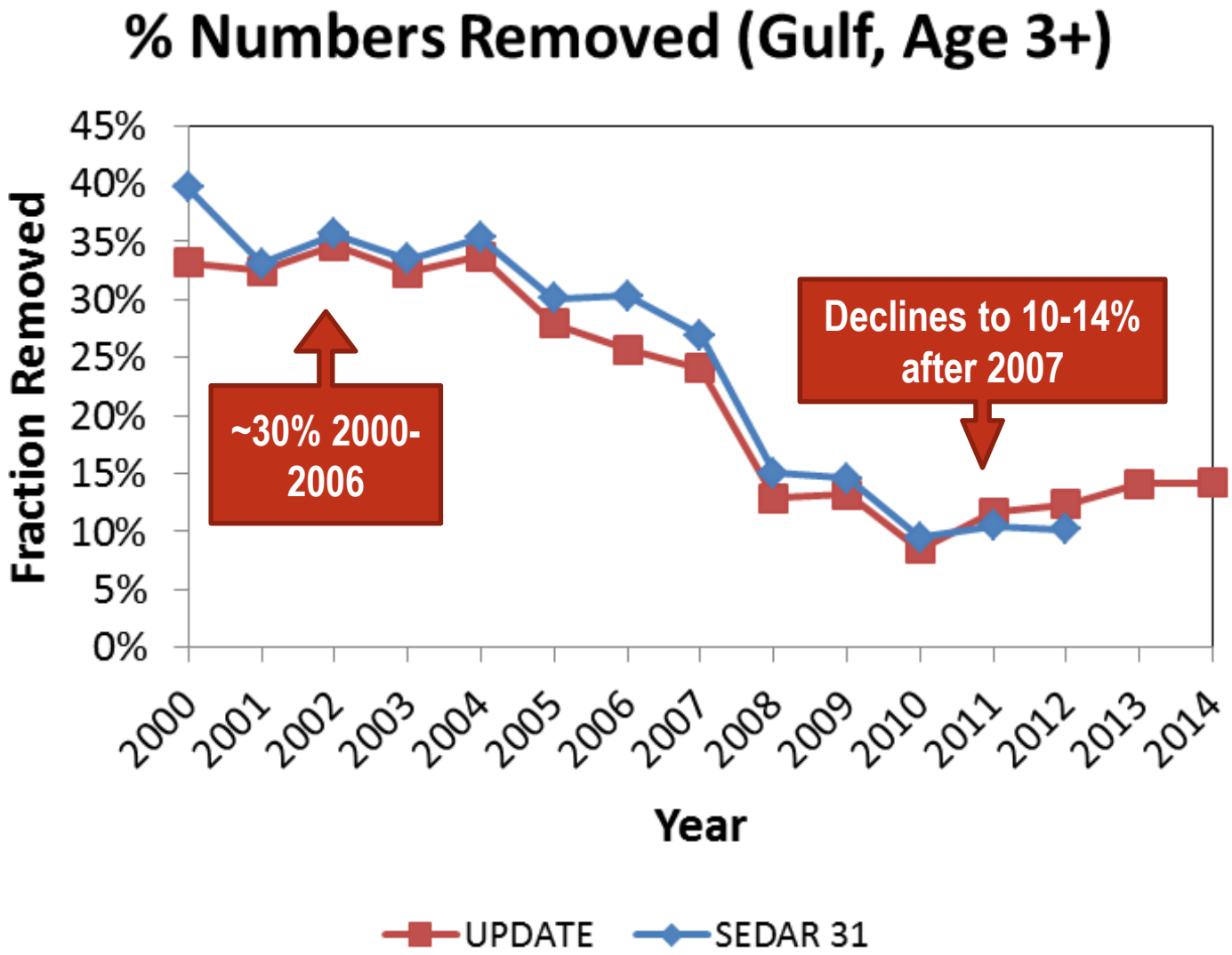



2007 Rebuilding plan revised; Resulted in lower fishing mortality; overfishing ending

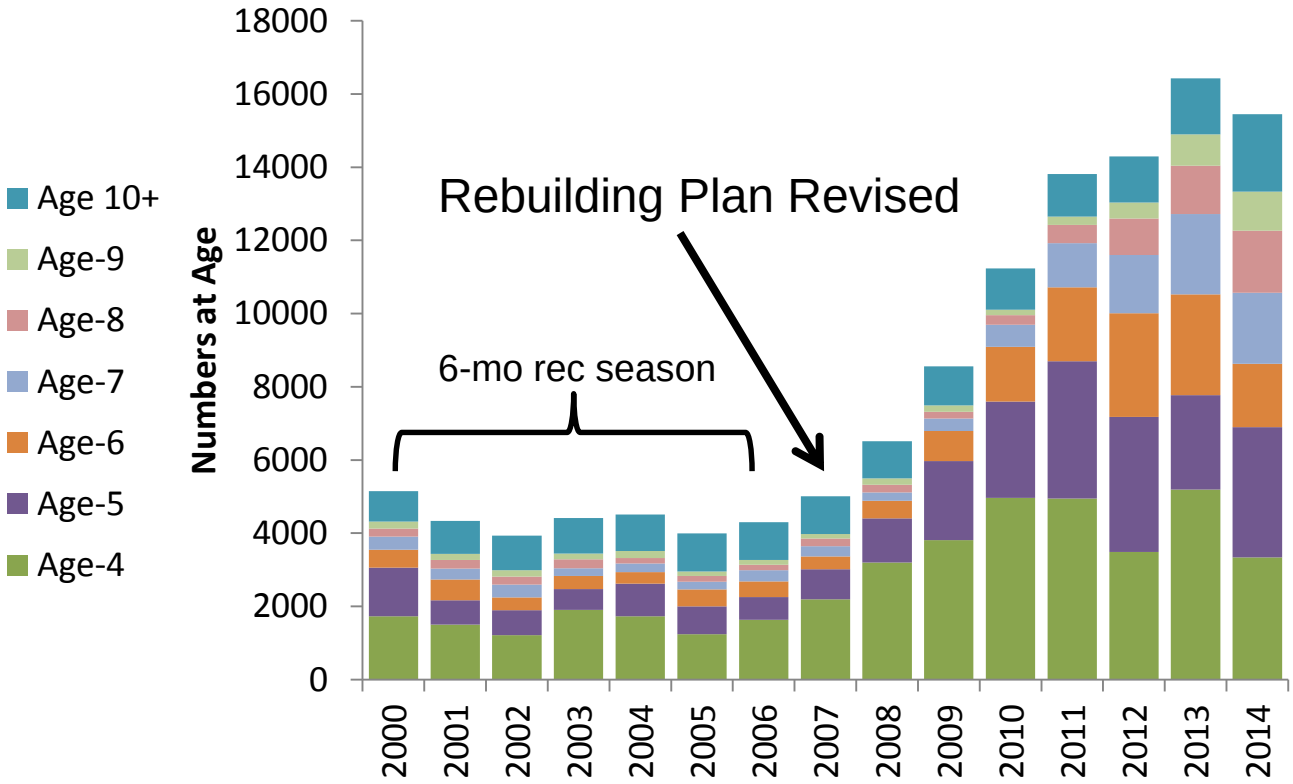
Strong recruitment: lots of young fish (2004-2006)

**Marked Decline in Shrimp Effort**

# Fraction of Red Snapper Removed by Fishing

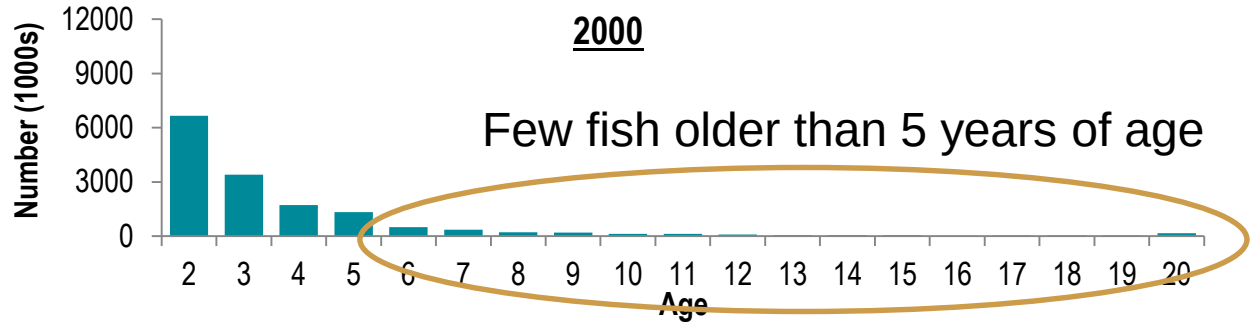


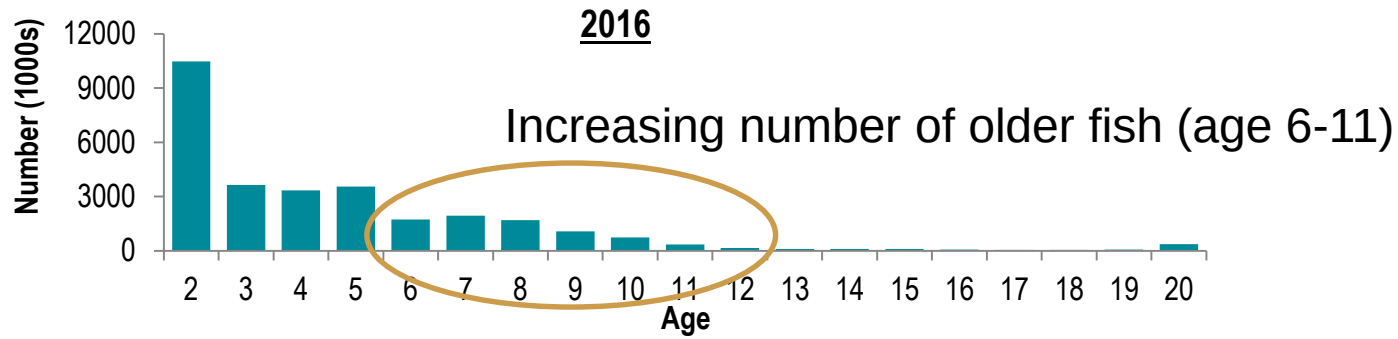
# Numbers of Fish at Age (4+)

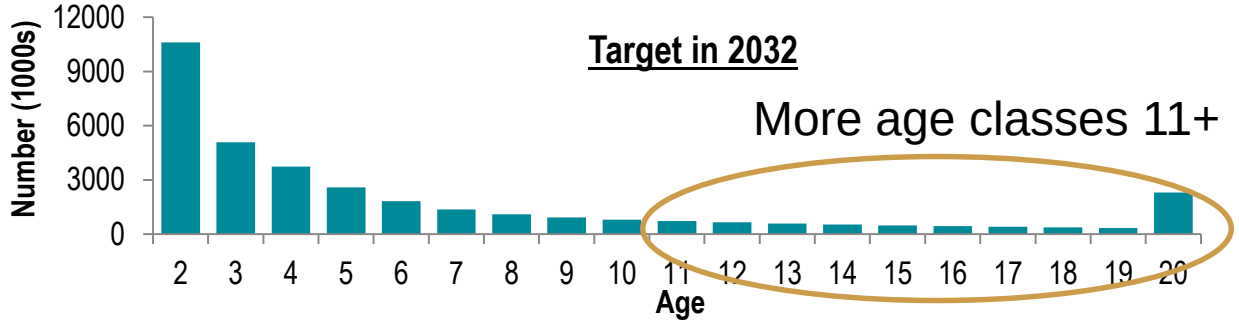



Very little change in age composition of population until 2007 when the rebuilding plan was revised; 3-fold increase in age 4+ abundance since 2007

# Why are they still considered overfished?

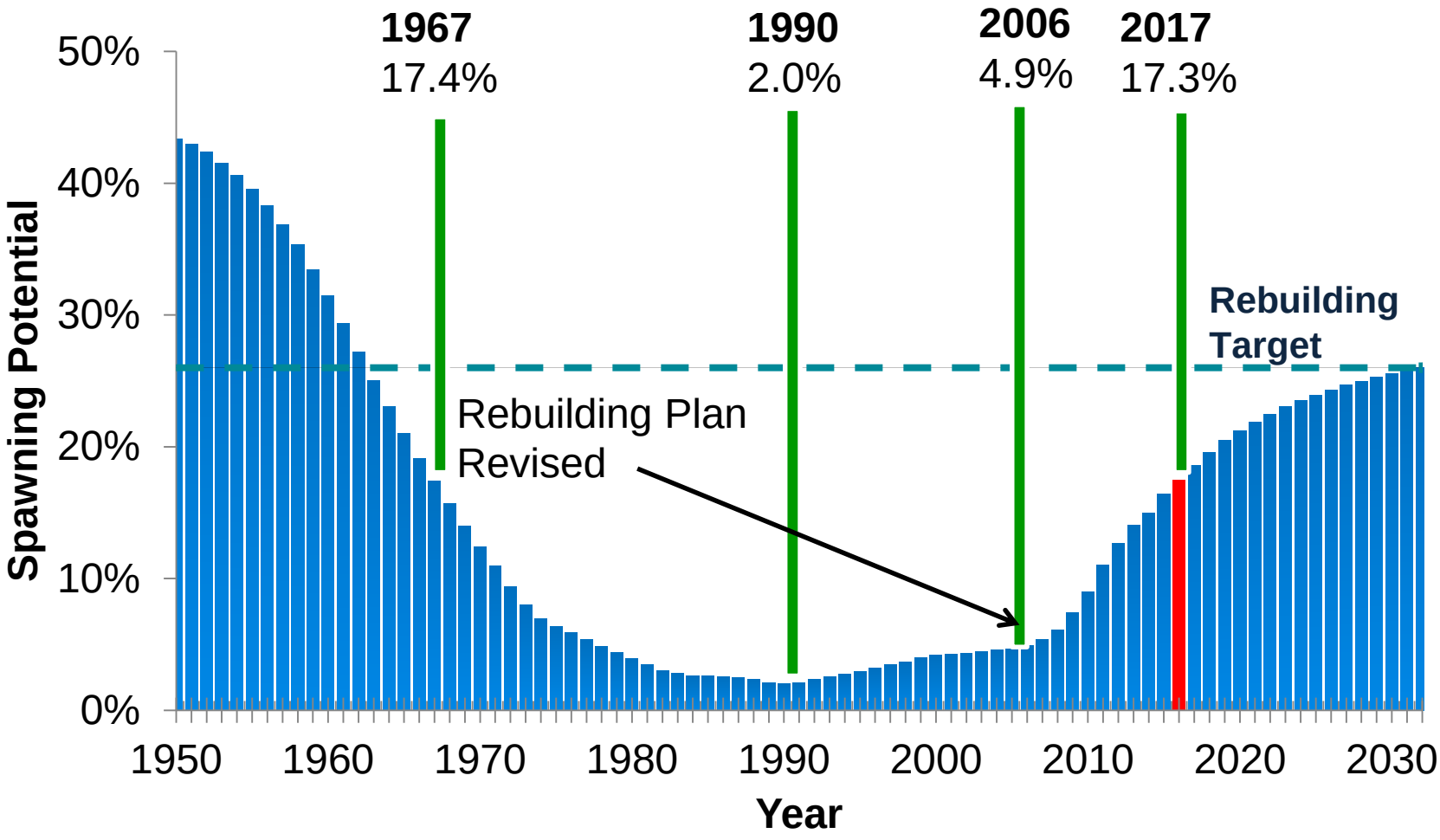


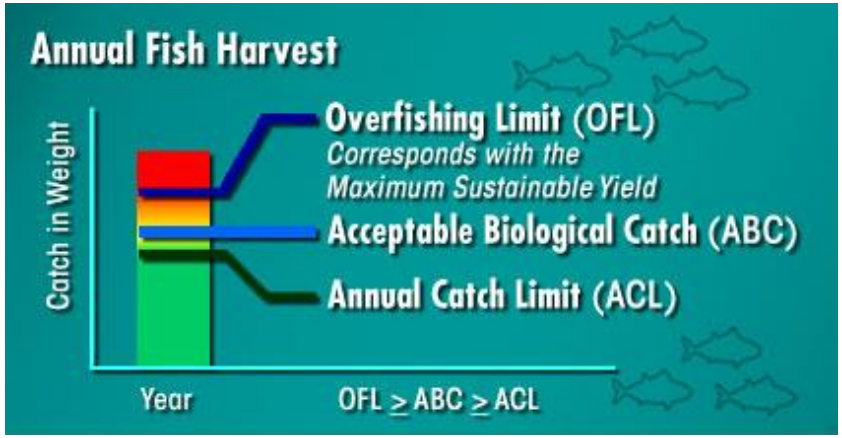



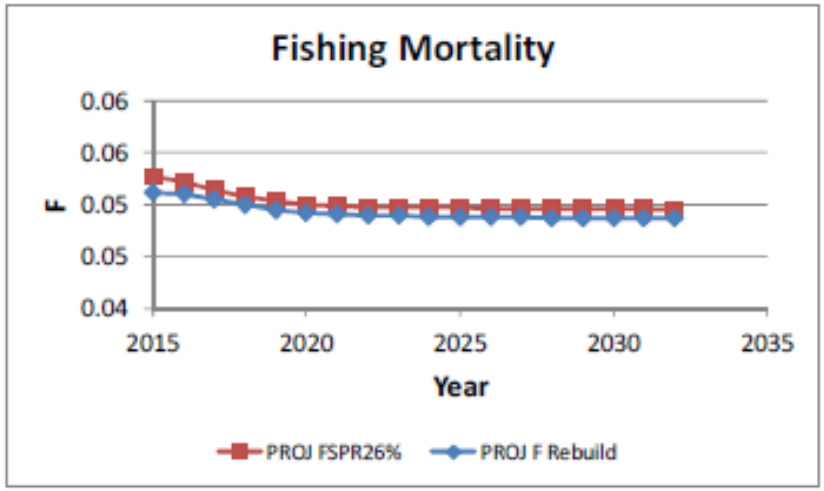

Live up to 50+ years

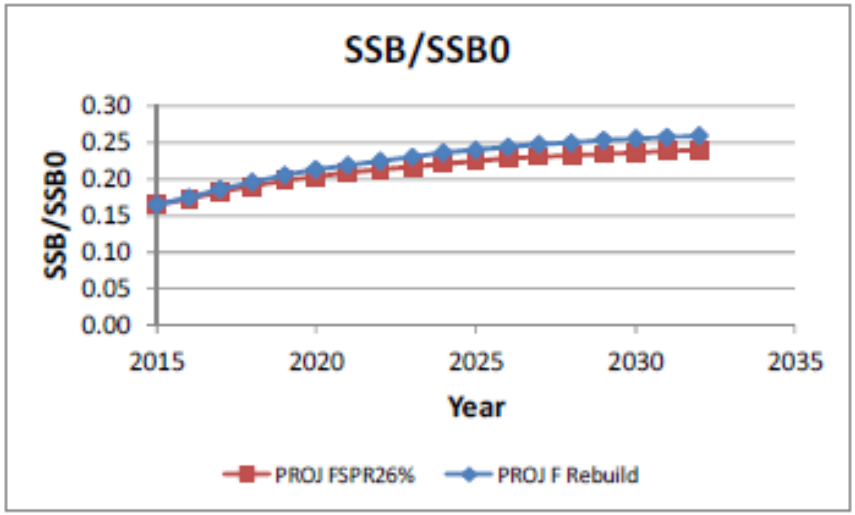
# How long until they are forecasted to recover?

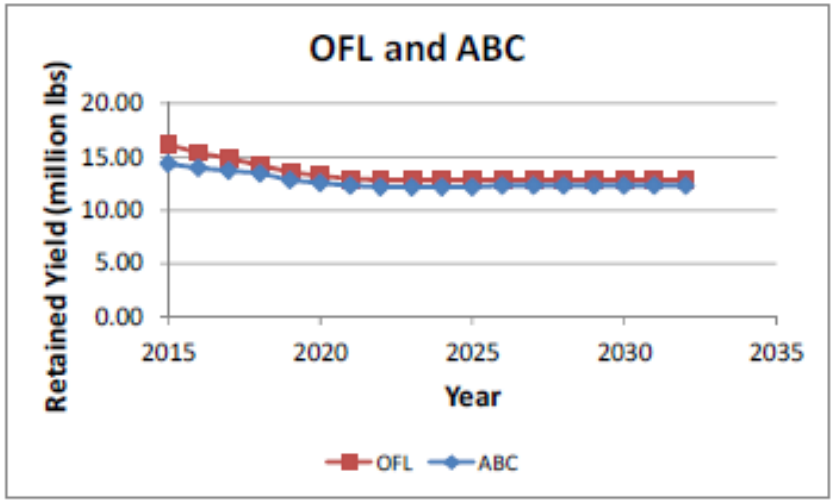


# Projections Used to Estimate OFL, ABC



# Primary Criticisms of the Assessment

**Recreational statistics:** Widespread belief that NMFS overestimates the recreational catch

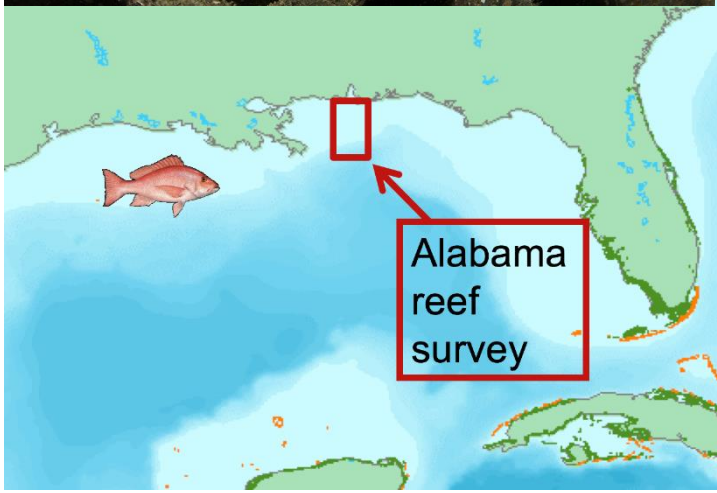
**Artificial reefs:** Common misunderstanding that NMFS does not count fish on artificial reefs

**Rebuilding target:** Recreational anglers are not interested in achieving the MSY, but 'maximum sustainable fishing opportunity'

# Contribution of artificial reefs

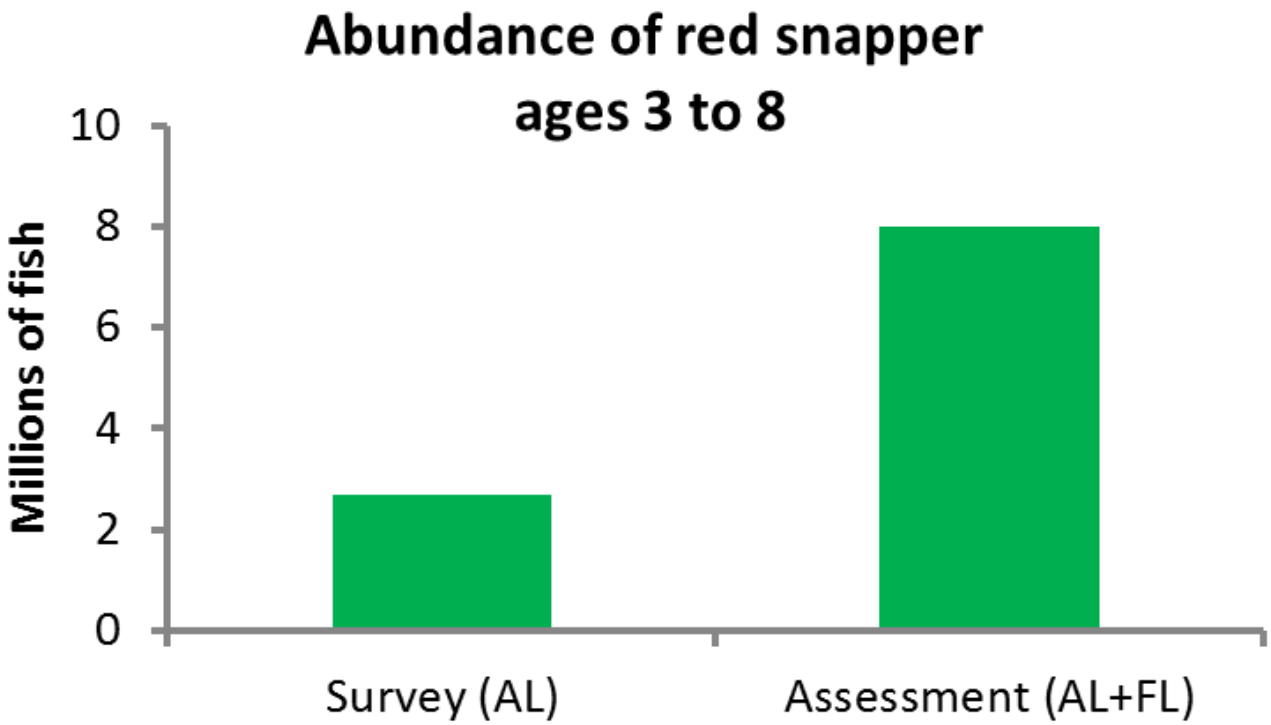
- Assessment uses catch data and catch per unit effort indices of abundance from all habitats, natural and artificial

- The SEAMAP/NMFS surveys used in the assessment do not cover artificial reefs, however:
  - larval surveys implicitly represent spawners on all habitats
  - third-party surveys of artificial reefs off Alabama and Florida are used in the assessment



# Contribution of artificial reefs

**Alabama Artificial and Natural Reef Survey:** Survey estimates for ages 3-8 are about 30% of the estimates from the stock assessment for the eastern Gulf




Powers, S. Red Snapper Population estimates in Alabama's Reef Permit Zone. GMFMC Presentation September 2014

# Contribution of artificial reefs

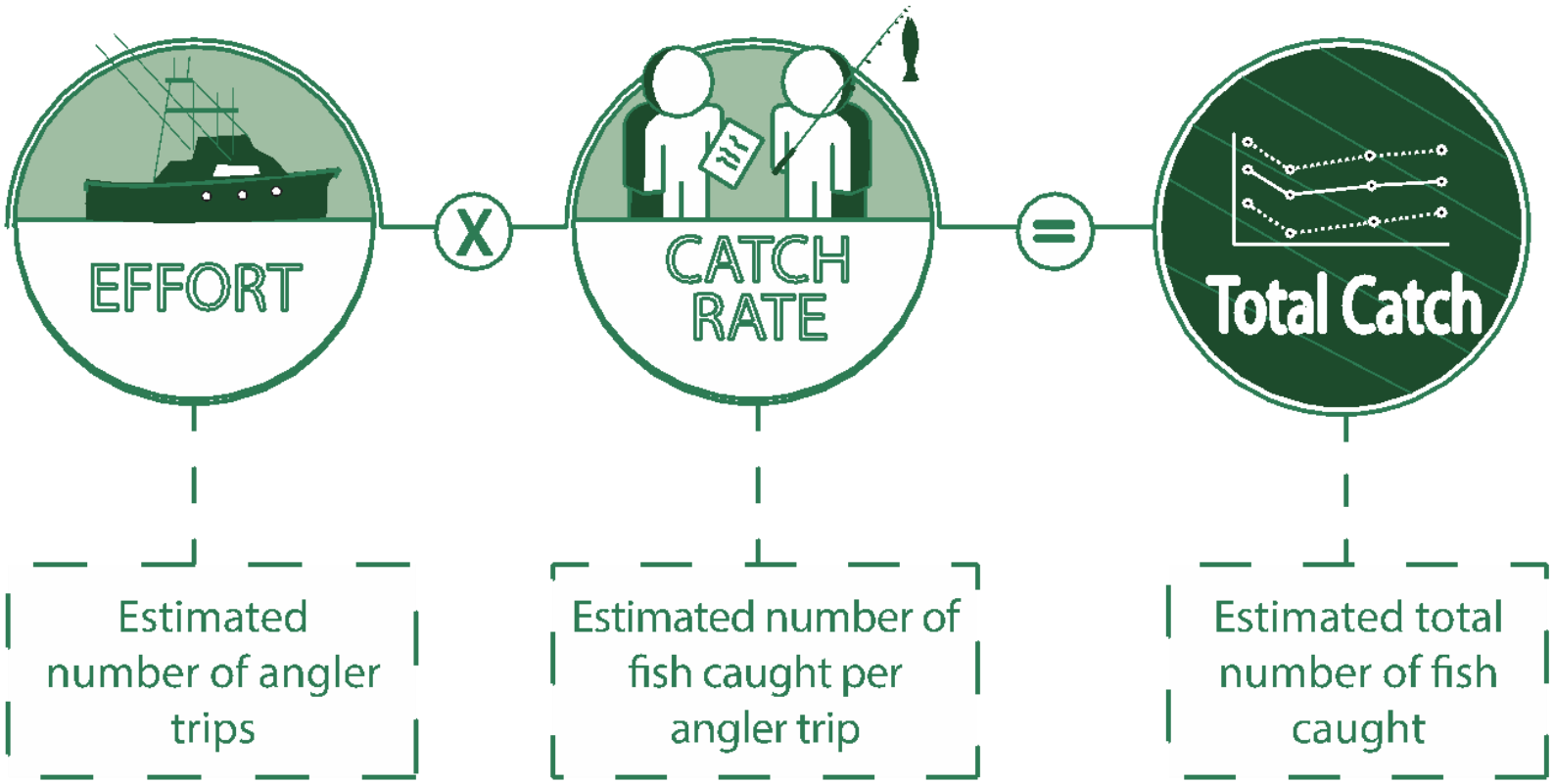
Clearly make red snapper easier to catch, but do they increase production?

- Higher density on artificial habitats, but much more natural habitat
- If number of eggs produced on artificial reefs is small compared to natural reefs, then creation of artificial reefs probably has not substantially enhanced total production

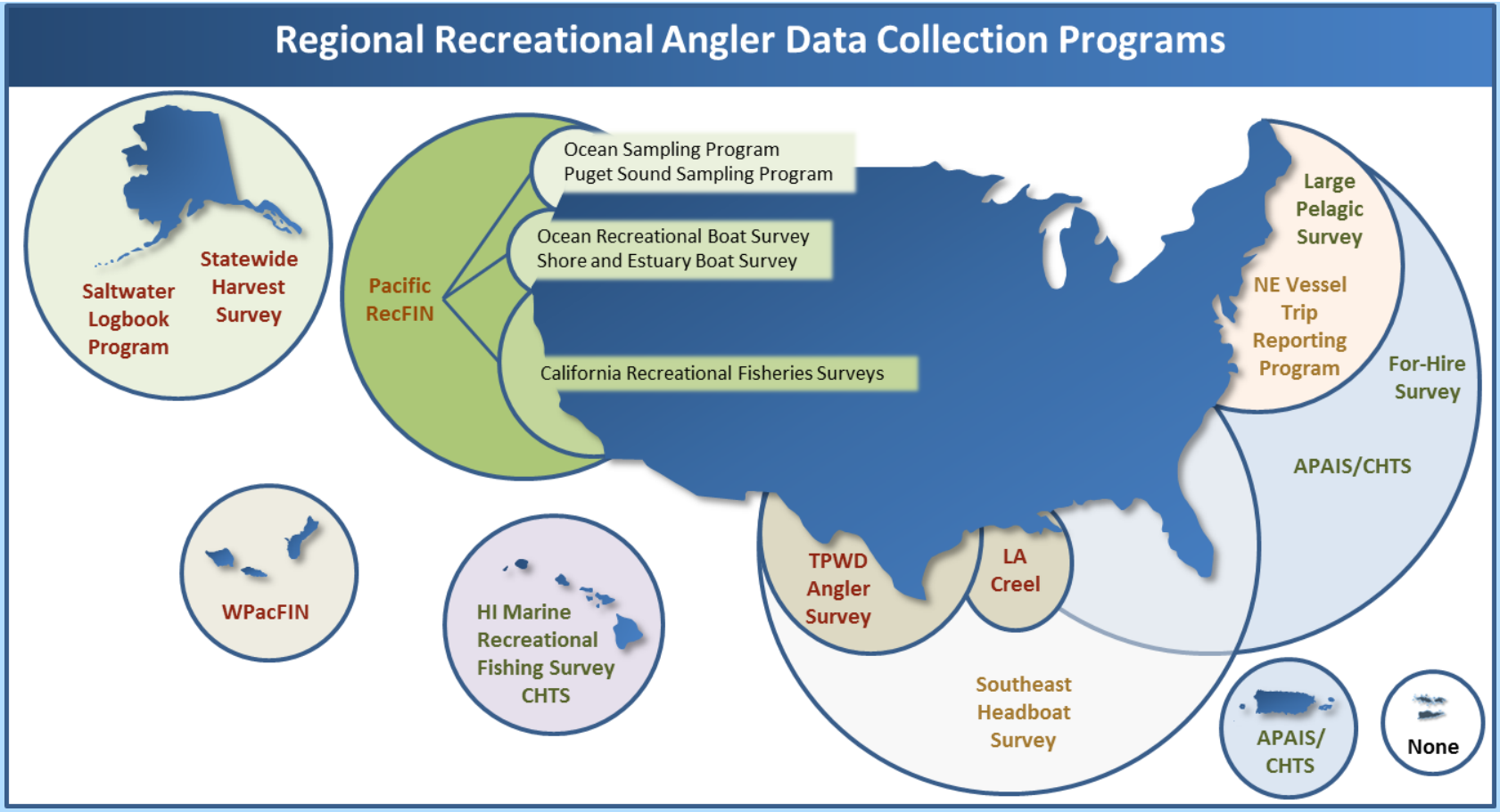
Need improved maps of artificial and natural structures combined with fish count surveys (advanced tech?)

More process studies to address relative quality/quantity of eggs produced and post-settlement survival on artificial reefs

# Estimating Recreational Fishery Catch



# Estimating Recreational Fishing Activity




**Data generated by a series of regional surveys**

| | MRIP/APAIS together with CHTS<br><br>Replaced in 2018 with:<br><br>FES (mail) for private)<br><br>FHS for charters | Federally-permitted head boats: the SE Region Headboat Survey (logbook-based, administered by SEFSC | Louisiana private boats and charter boats, the state-designed and administered LA Creel Surveys.<br><br>Instituted by the state as a replacement for the MRIP general survey to achieve higher sample size/greater precision and more timely preliminary estimates | Texas private boats and charter boats, the state-designed and administered TPWD Angler Survey, in place continuously since the 1970's |
|---|---|---|---|---|
| Florida | X | X | | |
| Alabama | X | X | | |
| Mississippi | X | X | | |
| Louisiana | | X | X | |
| Texas | | X | | X |

**APAIS: Access Point Angler Intercept Survey; CHTS: Coastal Household Telephone Survey; FES: Fishing Effort Survey; FHS: For Hire Survey.**

# Status of LA Creel Survey

MRIP certification of LA Creel was announced on December 29th. A calibration will be needed before LA Creel estimates for 2014-2017 can be used in combination with MRIP estimates for years prior to 2014 in Louisiana. With the help of MRIP consultants, NOAA will be working with Harry Blanchet and Joey Shepard to develop reasonable ratio calibration methods.

# Challenge: MRIP is Less Effective for Short-season (e.g., red snapper) Fisheries

- MRIP is effective in developing accurate and reasonably precise stock-wide estimates of annual catch for species encountered frequently—works well for stock assessments and post-season ACL accounting.

- However, federal red snapper season is very short and fishing is very intense (“pulse” fishery).

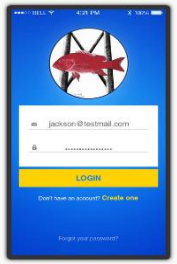
# Solution: Help Gulf States Develop Supplemental Surveys for Short Red Snapper Season

Collaborative Planning Process:

- NMFS and Gulf FIN conducted three workshops (2013, 2014 and 2015) with MRIP expert consultants and Gulf partners to develop testable designs for surveys.
- Based on the workshops' results, four of the states are pursuing implementation.
- NMFS funded pilot projects in Alabama and Texas. We also made the MRIP expert consultant team available to all four states to assist in their survey development and testing and to conduct independent peer reviews of the pilot test results.

# GOM Red Snapper Supplemental Surveys: Status

**Mississippi Tails 'N Scales:** Pilot testing and peer review complete. Certification expected soon.




**Alabama Snapper Check:** Pilot testing and peer review complete. Certification expected soon.

Next steps for AL and MS will be (1) deciding how to integrate the supplemental surveys with the general MRIP surveys and (2) developing appropriate calibration methods for converting new integrated estimates with past MRIP estimates of red snapper catches.

**Florida Gulf Reef Fish Survey:** Pilot testing ongoing. Peer review will occur Feb 6-7, 2018 in St. Pete. Next steps: develop methods for integration and calibration.

**Texas iSnapper:** Testing complete. Awaiting state decision on how it wants to proceed.