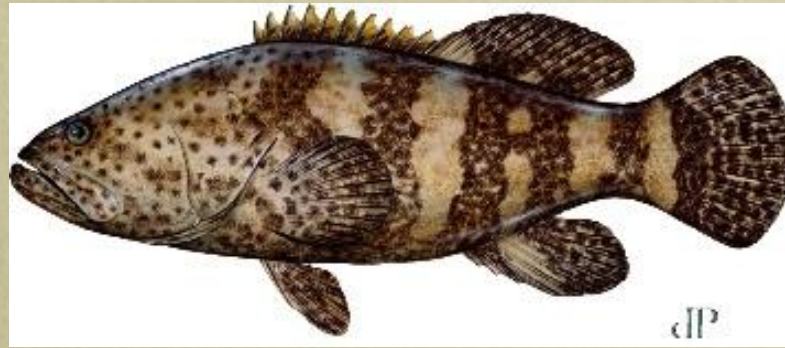


# SEDAR 47: Presentation to the Gulf of Mexico Fishery Management Council 17Oct2016



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Adult Goliath Grouper aggregating at the MG111 barge wreck off of Jupiter, FL in 65 feet of water. Photo by Mr. Walt Stearns, Underwater Journal (<http://www.waltstearns.com/underwaterjournal.html> )



# Assessment efforts

- SEDAR 3 (2003)
  - Data workshop concluded that data were insufficient to conduct a quantitative stock assessment, but survey data were subsequently discovered leading to the Review Panel recommending that an assessment should be attempted.
- SEDAR 6 (2006)
  - Review workshop only to consider Goliath Grouper and Hogfish assessments.
  - First use of the “catch-free” model and relative benchmarks



# Assessment efforts

- SEDAR 23 (2010) – rejected by Review Panel
  - Data, Assessment, and Review Workshops, Catch-free model used
  - Review Panel rejected the assessment, among other reasons, because it could not provide absolute benchmarks (TORs)
- FWC update (2015)
  - Revised and updated indices for the Catch-free model.
  - Primarily designed to inform the FWC commissioners on current trends in the population since SEDAR 47 was already being planned.



# Assessment efforts

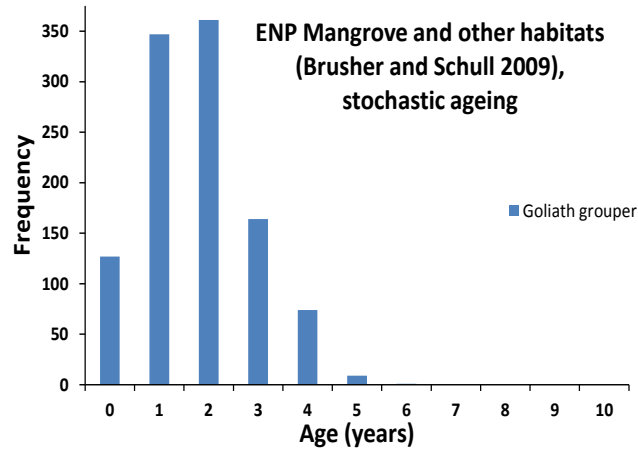
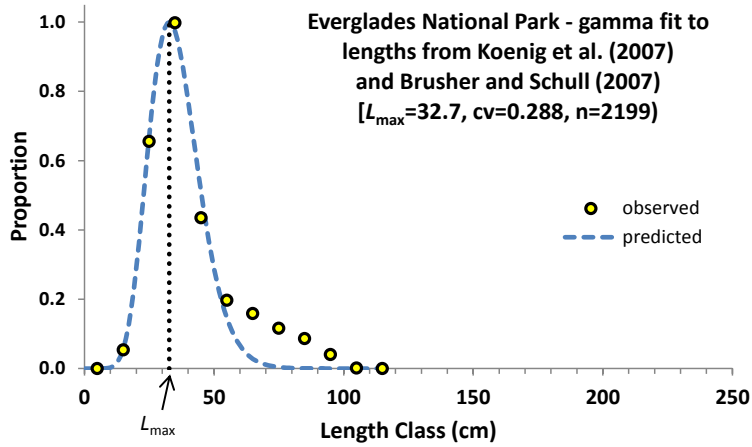
- In planning the analyses for SEDAR 47, data sources were considered to determine whether new types of data suitable for the assessment had become available.
  - Research studies had been conducted on estuarine and offshore portions of the population
    - Good information on sizes of individuals, movements, site fidelity, genetics, potential for nursery habitat identification, mercury levels, and other aspects of its life history.
    - Some potential information on age composition of offshore fish available, but still undergoing evaluation and was not available for the SEDAR 47.
  - Without new data suitable for the assessment, we did not hold data or assessment workshops
    - We used the recommendations from SEDAR 23 to structure data inputs for this assessment.



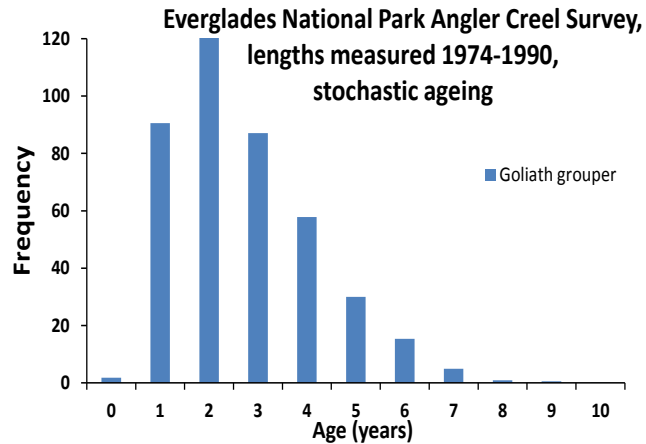
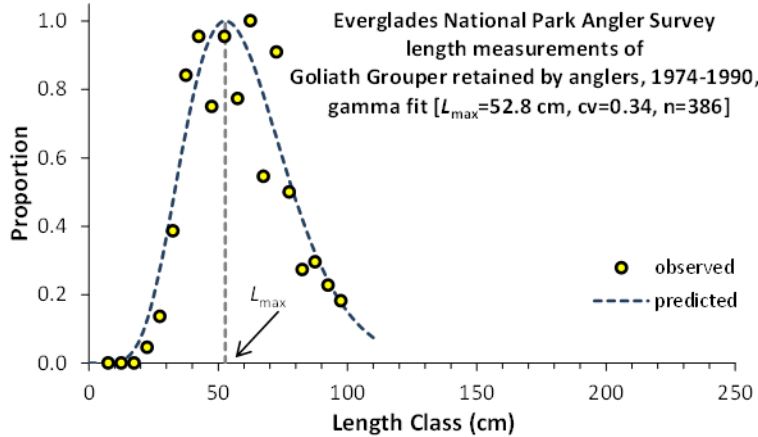
# Since SEDAR 23:

- Length measurements
  - Underwater
  - Capture, episodic mortality events
- Dorsal fin rays
  - Genetics (kinship analyses in progress)
  - Ages – fin rays still being evaluated
- Mark-recapture
  - Movements
  - Site fidelity
  - Potential estimate of total mortality – (depends on ages)
- Refinements to model inputs
  - new structure for MRFSS/MRIP index
  - recreational data re-estimated
  - two models:
    - Catch-free (Porch et al. 2004)
    - Stochastic Stock Reduction Analysis (Martell et al. 2008)

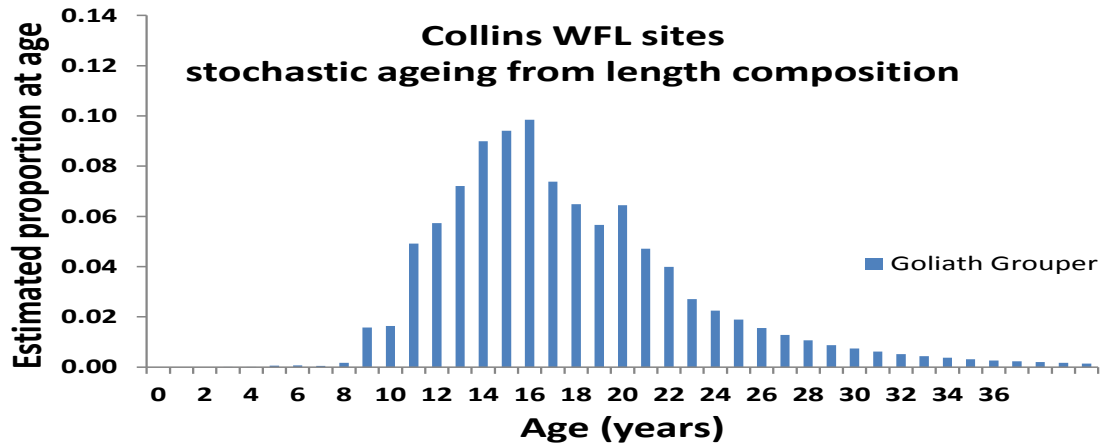
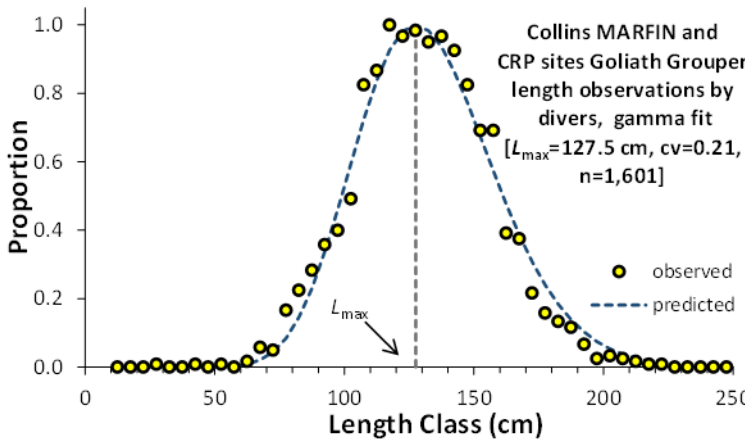




Length-frequencies, stochastic ageing

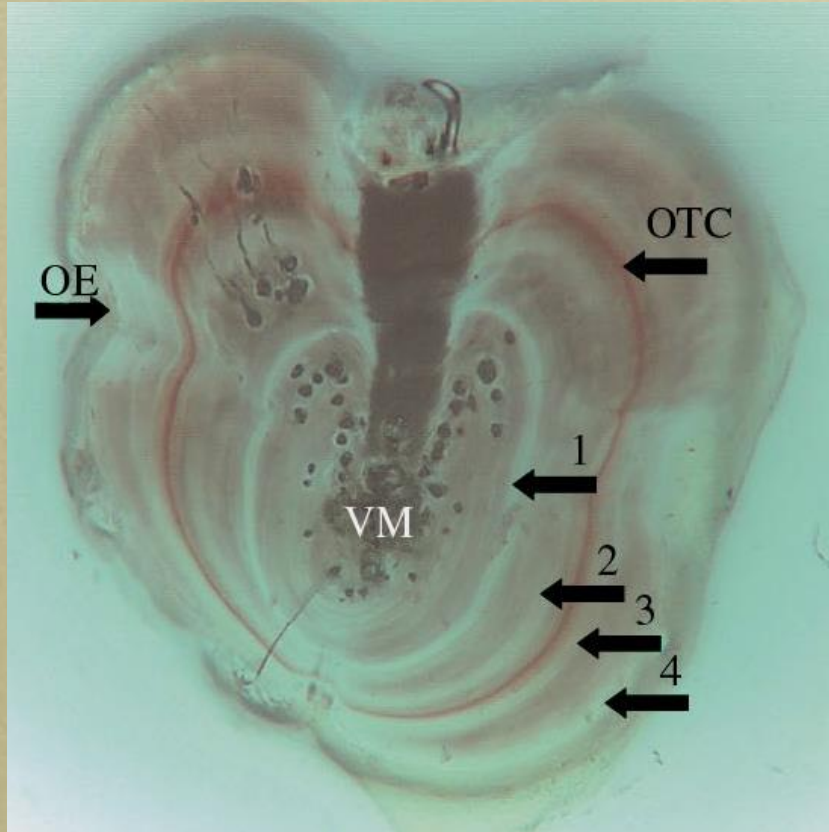


Estuarine vs. Offshore

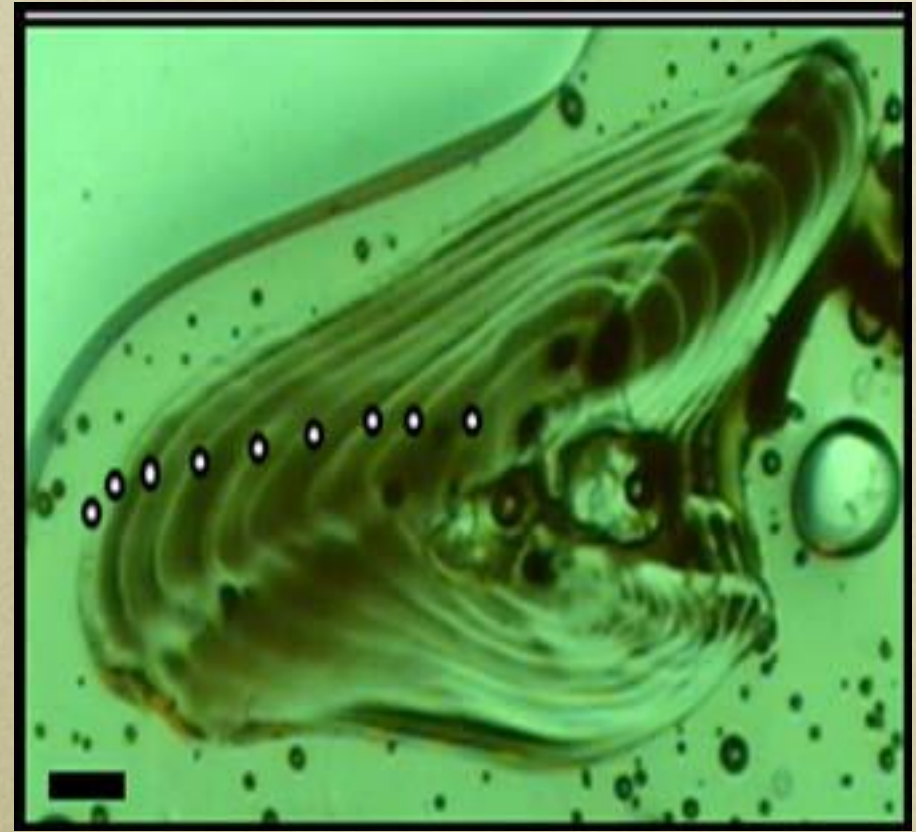


# Non-lethal ageing techniques

Dorsal spine cross-section  
(Brusher and Schull 2009)



Dorsal fin ray cross-section  
(Murie et al. 2009)



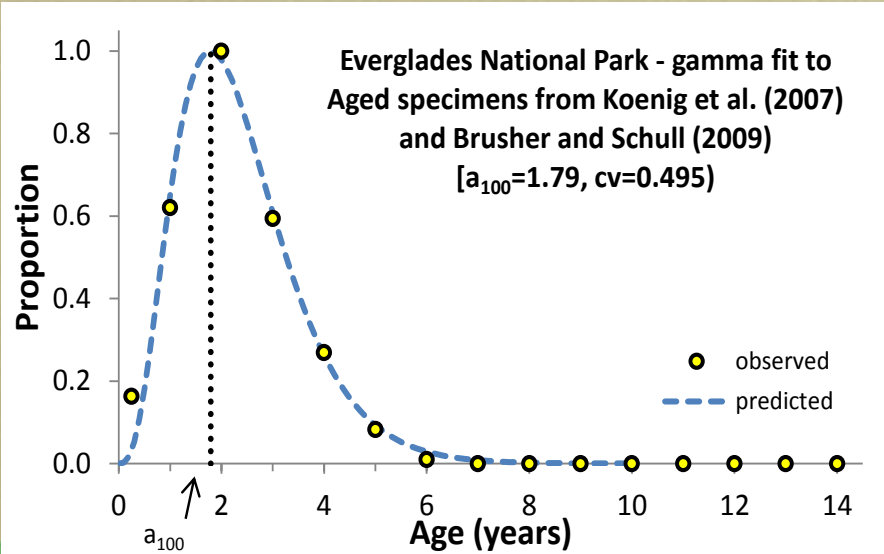
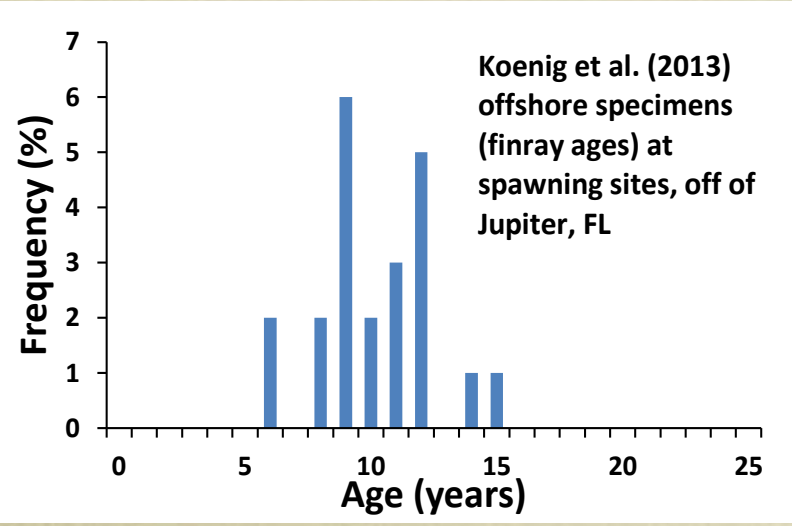
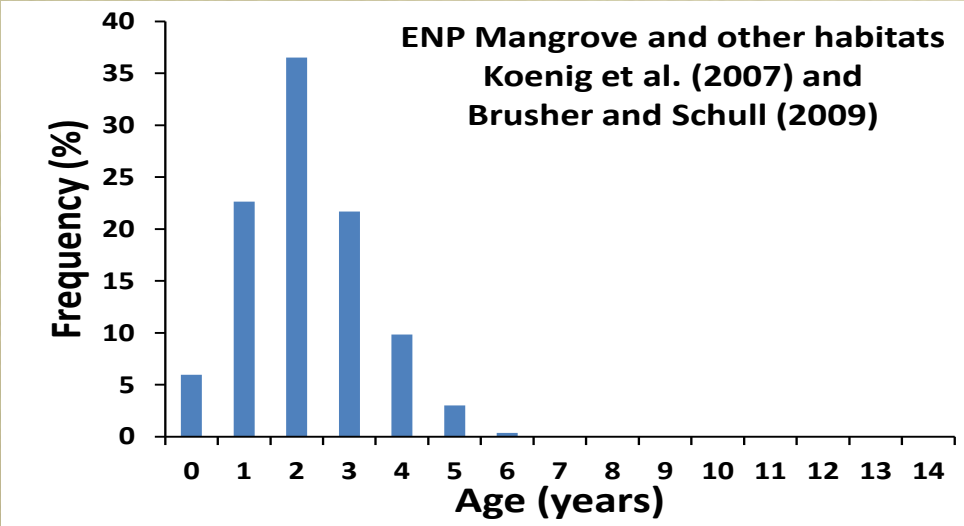
Brusher, J. H., and J. Schull. 2009. Non-lethal age determination for juvenile goliath grouper (*Epinephelus itajara*) from southwest Florida. *Endangered Species Research* 7:205-212.

Murie, D., D. Parkyn, C. C. Koenig, F. C. Coleman, J. Schull, and S. Frías-Torres. 2009. Evaluation of finrays as a non-lethal ageing method for protected goliath grouper *Epinephelus itajara* in Florida *Endangered Species Research* 7:213-220.

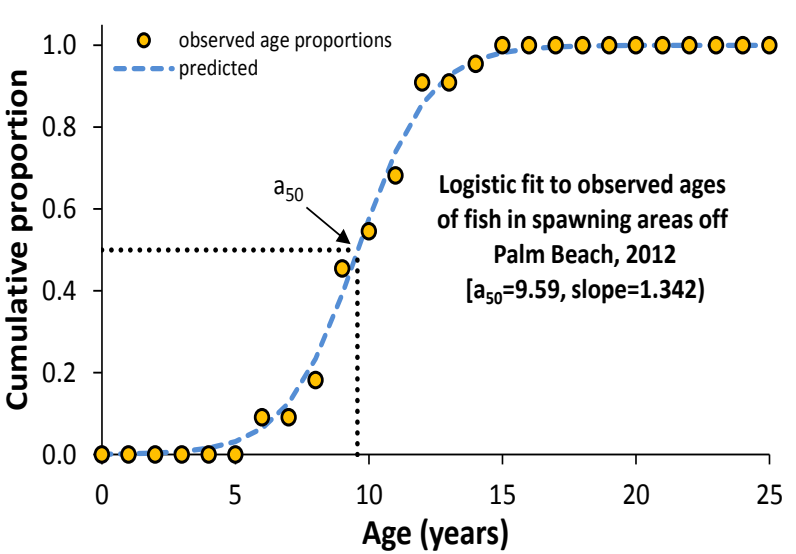




# Estuarine and offshore vulnerability curves (SEDAR 47) estimated for Goliath Grouper – aged specimens



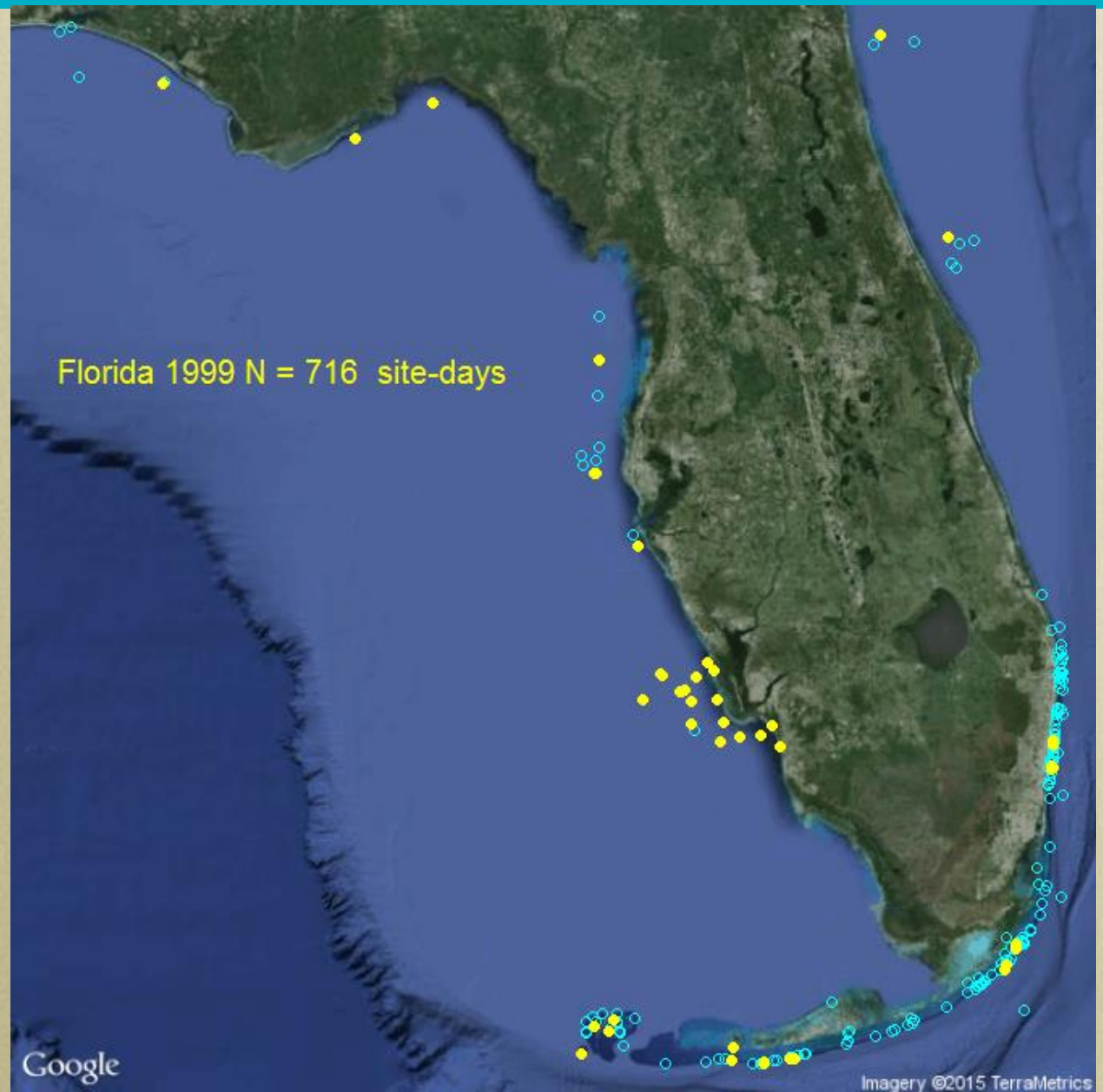
Estuarine Fish



Offshore Fish



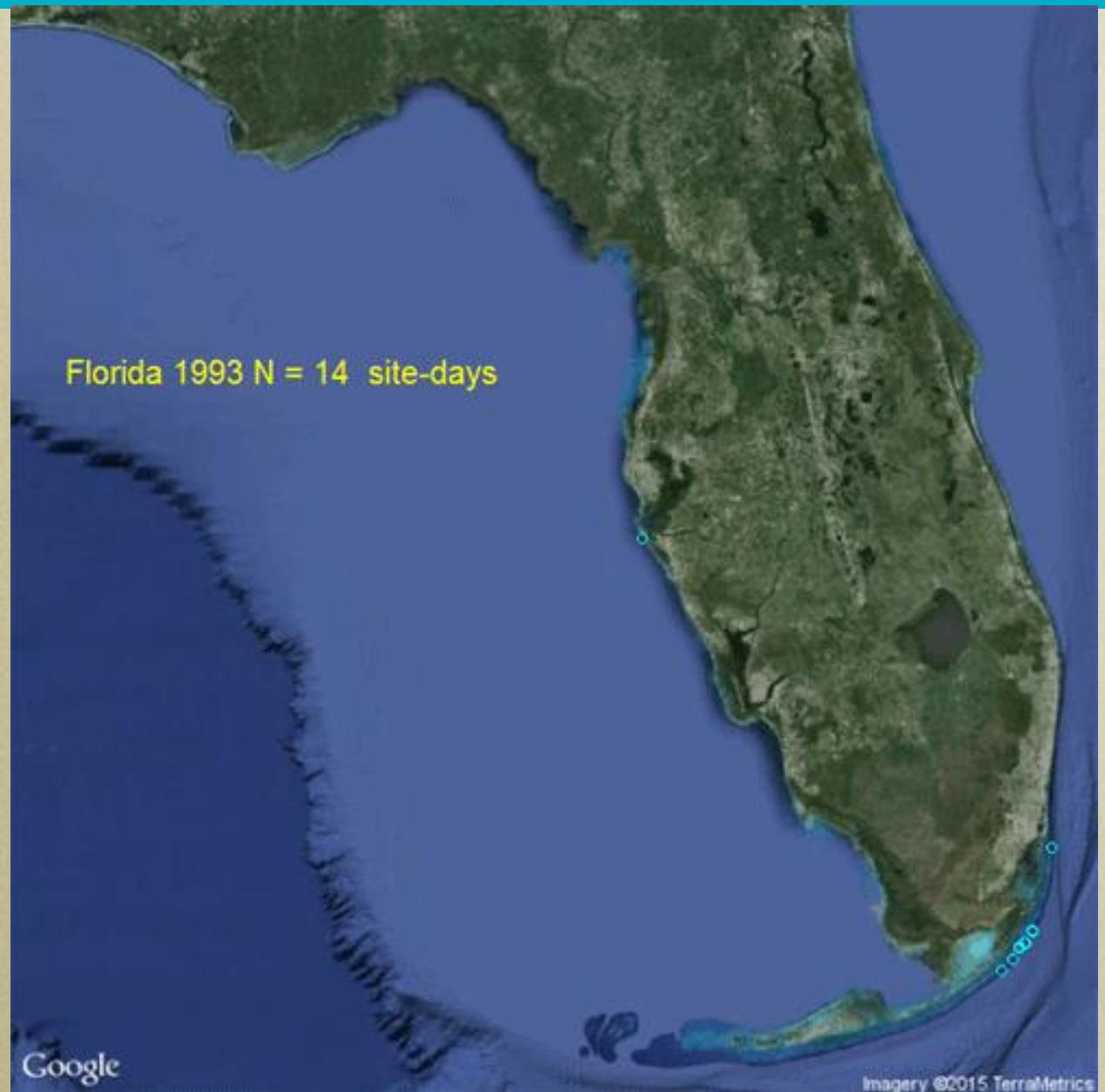
# REEF (Reef Environmental Education Foundation)



open blue circles: sites without Goliaths  
yellow dots: sites with Goliaths at least once in a year.



# REEF 1993-2014

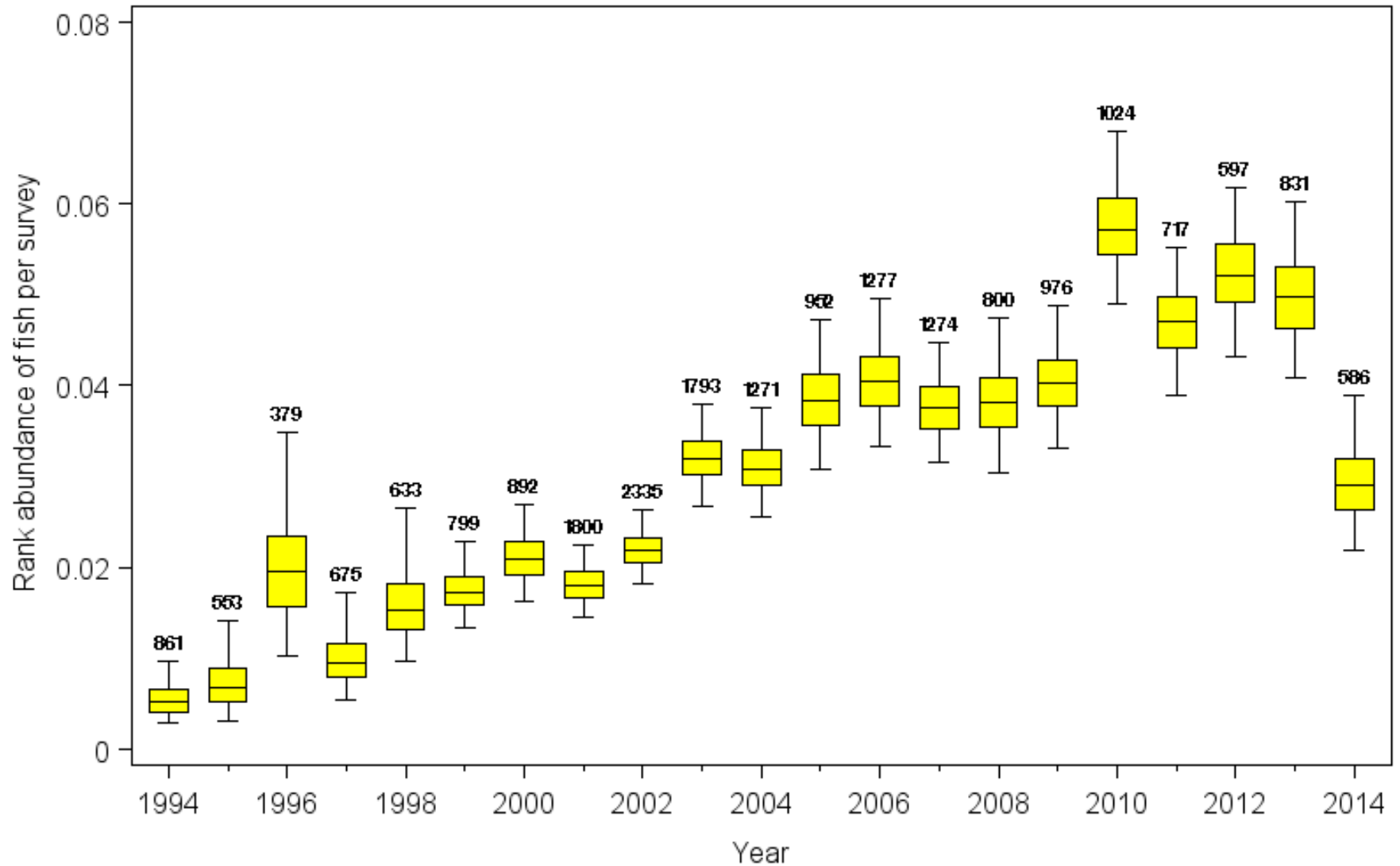


open blue circles: sites without Goliaths  
yellow dots: sites with Goliaths at least once in a year.

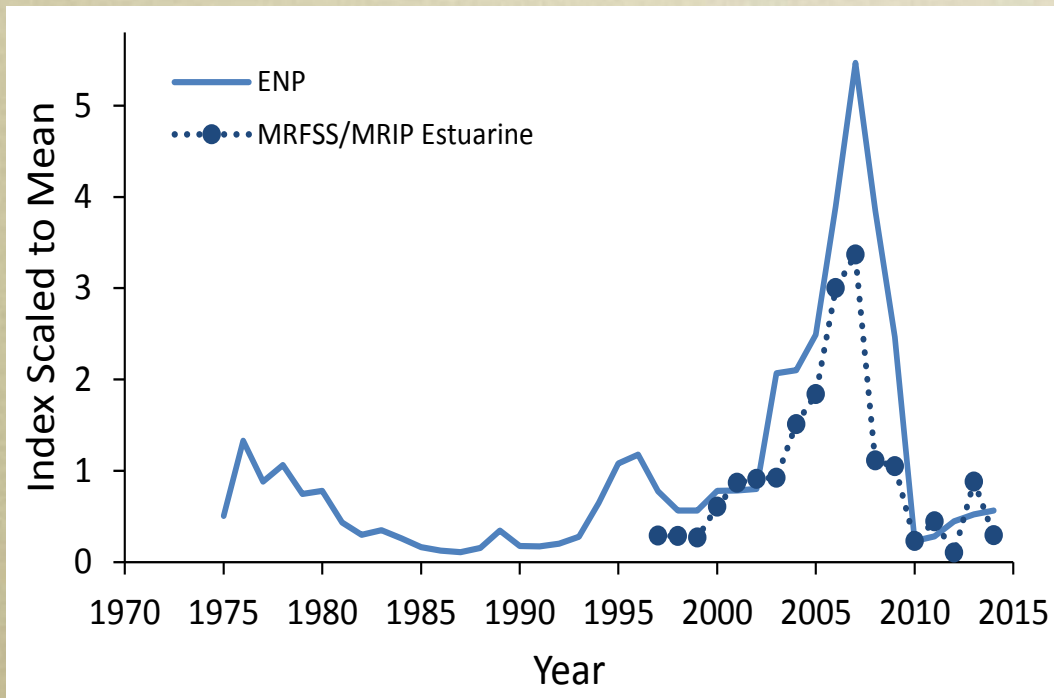


# REEF Index

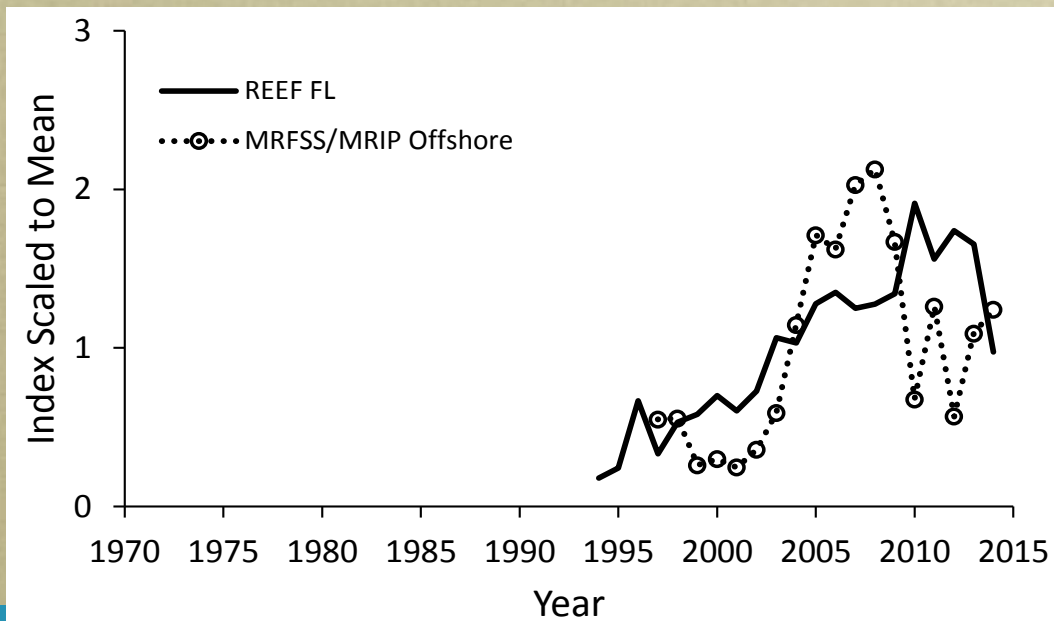
REEF Index: new\_hab\_FL\_S47



The indices scaled to their means



Estuarine Indices



Offshore Indices



Fig. 4.4.1 a,b

# The Catch-free and SSRA models are types of Age-structured Surplus Production Models (ASPM)

- Replaces estimation of production model parameters through incorporation of a stock-recruitment relationship dependent on spawning stock size
- Attempts to account for age structure of the population through time
- Projects population forward through time through age-structured simulations, accounting for time lags, fleet selectivities, and age schedules for biological parameters (e.g., growth, maturity, fecundity, etc., most often fixed rather than model-estimated)
- Tuned with age-aggregated or age-structured abundance indices, each with its own unique age-selection
- Typically, ASPMs do not directly incorporate age or size composition of catches, and age schedules are specified by the user (estimated externally to the model)
- The Catch-free model is unique among this class of models in that it does not use any information on fishery removals for its estimates.

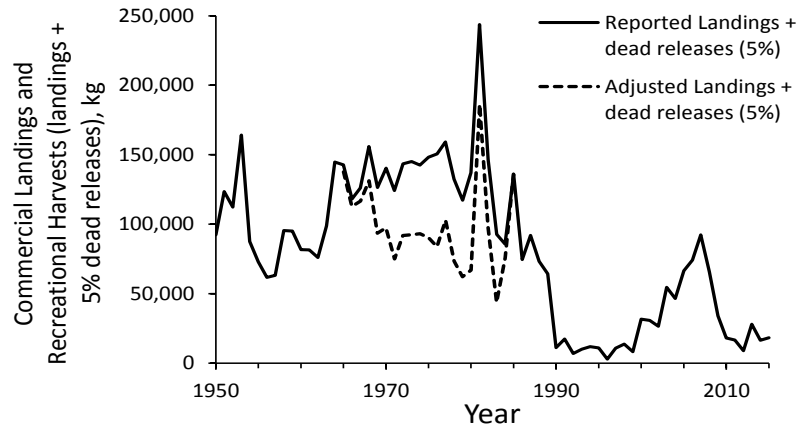


# Typical Age-structured Surplus Production Model inputs

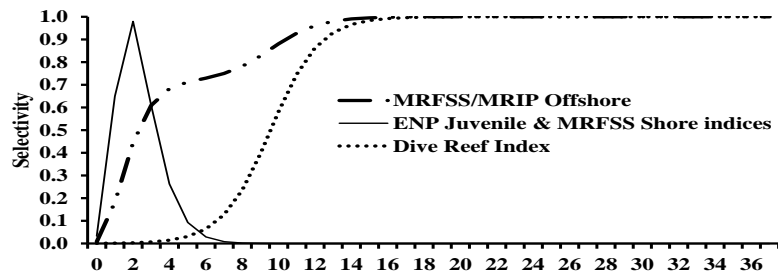
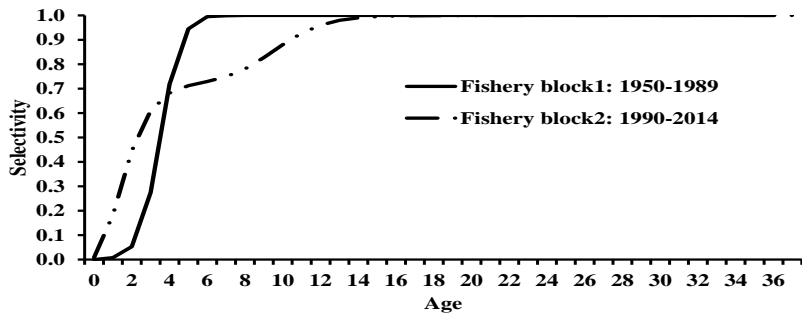
Biological parameters

(growth, maturity, fecundity, weight-at-age)

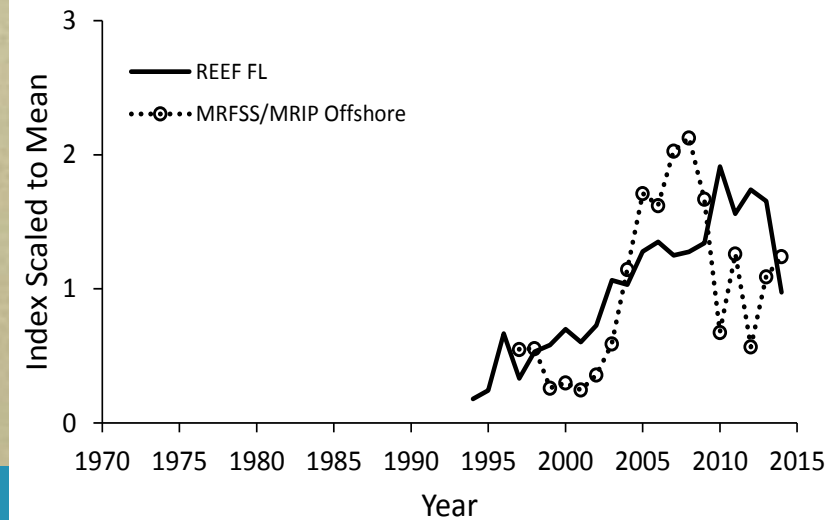
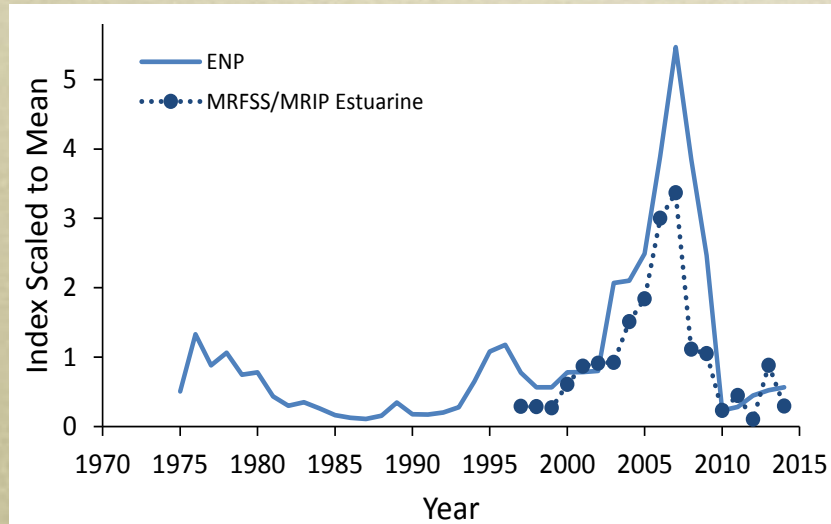
## Harvests (removals)



## Vulnerabilities/selectivities

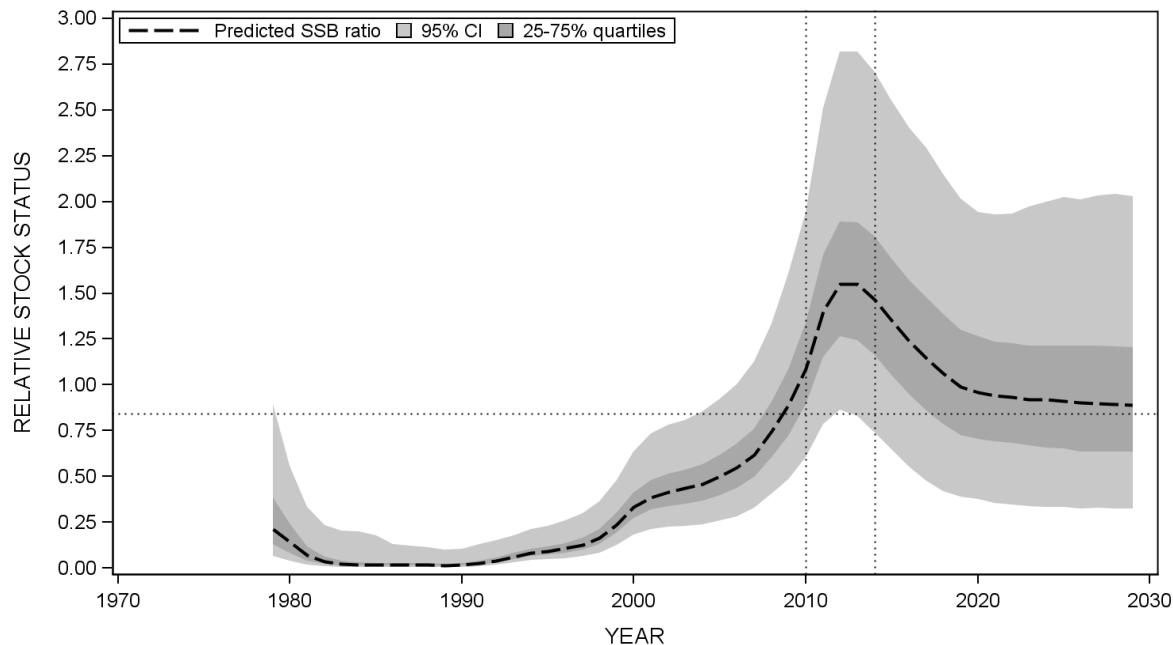


## Indices of abundance



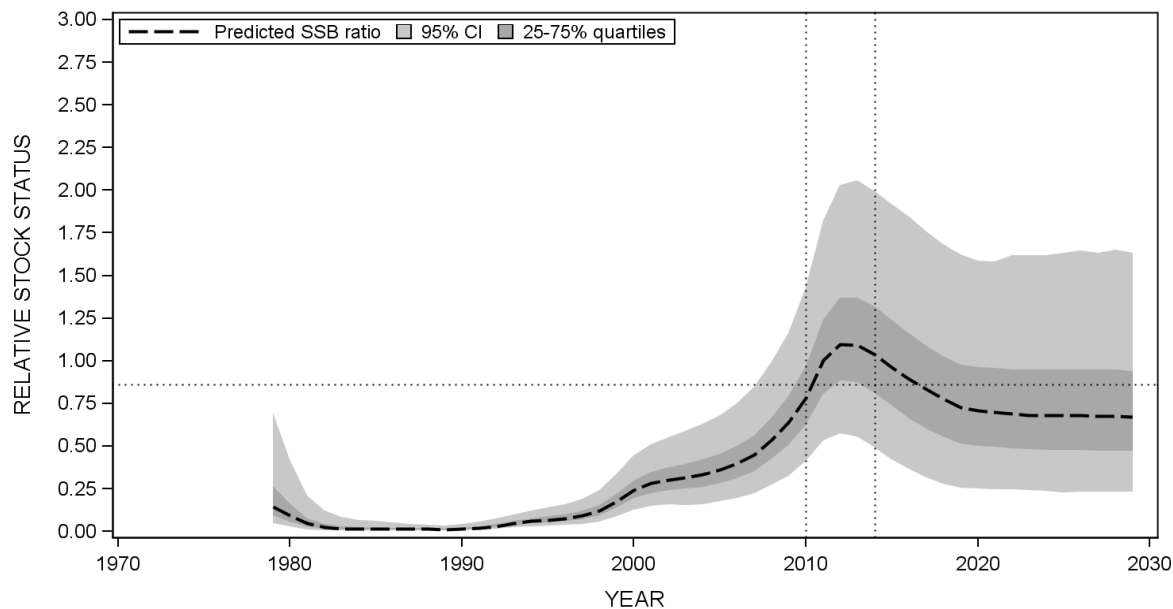
**M=0.18 per year**

Relative stock status under two different levels of natural mortality, “ $F_{\text{current}}$ ” for projections



**M=0.12 per year**

SSB2014/SSB50SPR





# Assessment efforts

- SEDAR 47 (2016)
  - Further revisions and updates to indices
  - Models: Catch-free and stochastic stock reduction analysis
  - Analyses rejected by Review Panel.
    - Did not feel the reconstruction of fishery removals was sufficiently vetted.
    - Did not accept the indices of abundance as presented.
    - Did not accept the proxies we used for age structure for fishery catches or indices.
    - Expressed concern that Data and Assessment Workshops were not held for this SEDAR.
    - Made recommendations for a designed fishery-independent survey which would provide more acceptable data to examine changes in population abundance and distribution for this species.

