Gulf of Mexico Lane Snapper Updated Headboat Index of Abundance and OFL and ABC

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Outline

Background

SEDAR 49 Data Limited Stocks Evaluation- Review

Updated Headboat Index

Updated OFL and ABC

Background

Southeast Data Assessment Review (SEDAR) 49 Data Limited Species Evaluatio

- **Conducted evaluation of data-limited methods (DLM)** to establish overfishing limits (OFL) and allowab biological catches (ABC)

- **3 Step Approach** to SEDAR 49 Evaluation
  - Feasibility of data review,
  - Application of MSE for identification of most relevant management method(s), and
  - Catch estimation for most relevant method(s)

Anon (2017):

- Summarized the (status quo) methods used for setting OFL and ABC under the GMFMC ABC Tier 3a and 3b control rule (per GMFMC 2011)

Noting,

- Status quo method required **identification of a reference period of landing** (1999-2008 for lane snapper),
- Removals during the reference period (landings + discards) have no trend & are small relative to the stock biomass,
- OFL & ABC set at the mean of the reference period landings plus or minus some multiple of the standard deviation,
- **Acknowledging, this method did not identify** MSY, just some level of recent catch that may or may not be sustain

Feasibility of DLM analyses (Data and Methods Review)

- SEDAR 49 DW Determined for lane snapper:
  - Time series of catch (1986-2014),
  - Abundance information for the headboat fishery (1986-2014)
  - Length data time series from PR angler vessels and headboats

    <u>Were adequate for application of the DLM methods using Management Strategy Evaluation (MSE)</u>

- SEDAR 49 DW noted for the index of Abundance:

  "The index received a good quality score and was recommended for analysis because of a high proportion positive of observations, large sample size, and a relatively low CV"

- SEDAR 49 DW identified 4 DLM methods for lane snapper having adequate data for use in providing management information: Islope, Itarget, Ltarget, and Lstep

GMFMC SSC Review of SEDAR 49 DLM Evaluation

Anon (January and March 2017):

- Summarized the results of the 4 DLM methods for which data were sufficient (Islope, Itarget, Ltarget, and Lstep)

- Noted: SEDAR 49 DLM approach utilized scientifically robust procedures (i.e., MSE)
  - Methods were evaluated to **determine which were feasible** given the available data,
  - **Methods that performed poorly in simulation** (i.e., resulted in a high probability of overfishing) were then **eliminated**,
  - **MSE allowed the selected methods to be compared to the status quo methods**. From this, a subset of methods could be selected to provide management advice.

- **Determined in the context of using DLM methods for establishing catch advice vs the status quo method that:**

> *"the **data limited approach** provided the **best scientific information** available, and that the **"Itarget" method** (Geromont and Butterworth (2014) **provided the best management advice for lane snapper**".*

***Recognizing** that the 'Itarget' DLM method incorporates a time series of abundance information, auxiliary to the catch time series that can provide information on changes in stock condition*

Purpose of this Presentation

Results are presented in the following slides for:

- Updated Index of Abundance for southeast headboats 1986-2018 (see Cummings September 2019)
  - Incorporates four (4) new years of data (2015-2018)
- Application of Itarget DLM method using updated headboat index of abundance to estimate updated OFL and ABC for lane snapper (Cummings and Sagarese September 2019)
- Sources of information for headboat index and OFL/ABC update are described in Cummings 2019 and Cummings and Sagarese 2019.

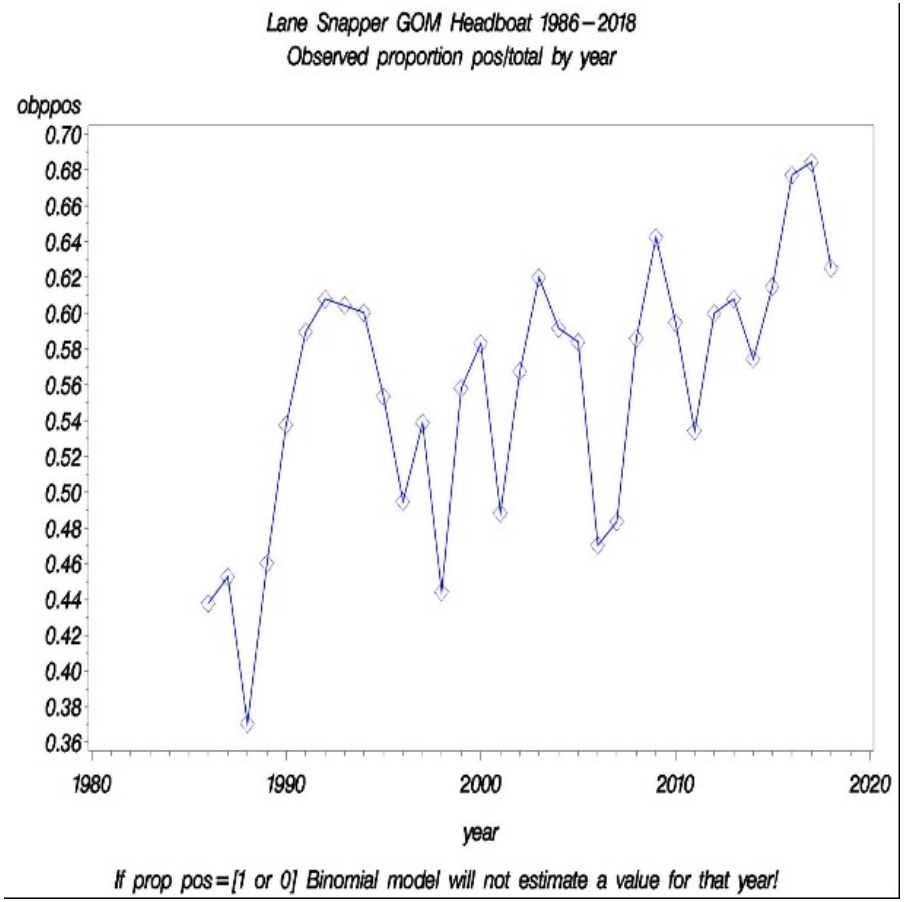
Updated Headboat CPUE through 2018

Available Data- Observations of catch and effort (angler hours) from headboats fishing in the Gulf of Mexico from 1986 through 2018

Methods

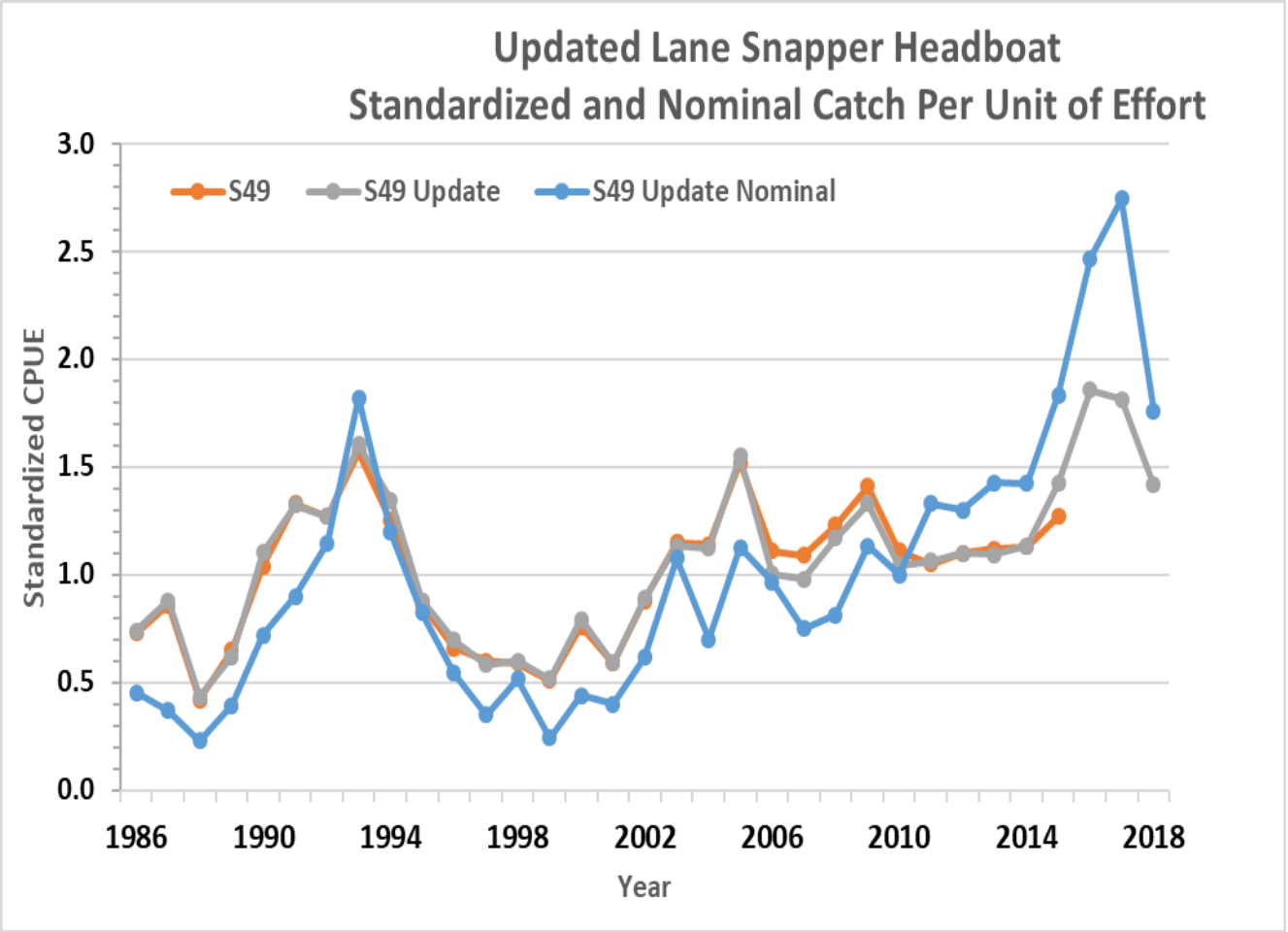
- Procedures follow SEDAR 49 DW-02 (Smith and Rios 2016) for data filtering, observation exclusion, variable corrections, modeling approach
  - CPUE was calculated for each trip (positive and zero success trips) as the catch of lane snapper divided by the number of angler hours,
  - Stephens MacCall (2004) method used to identify subset of observations targeting and/or likely fishing in areas where lane snapper could be encountered,
  - Standardization methods using general linear modeling involved the separate application of a binomial and lognormal model fitted to the proportion of positive lane snapper fishing success trips and the set of positive observations followed by combining the two independent binomial/lognormal model results

Proportion Positive Lane Snapper headboat CPUE



- Lane snapper occurred in between 38 and 68% of trips when the Stephens MacCall procedure was applied to subset the data
- Generally showing an increasing trend in the number of successful (positive) headboat trips for lane snapper over the time series was predicted

Lane Snapper Updated Headboat CPUE 1986-2018

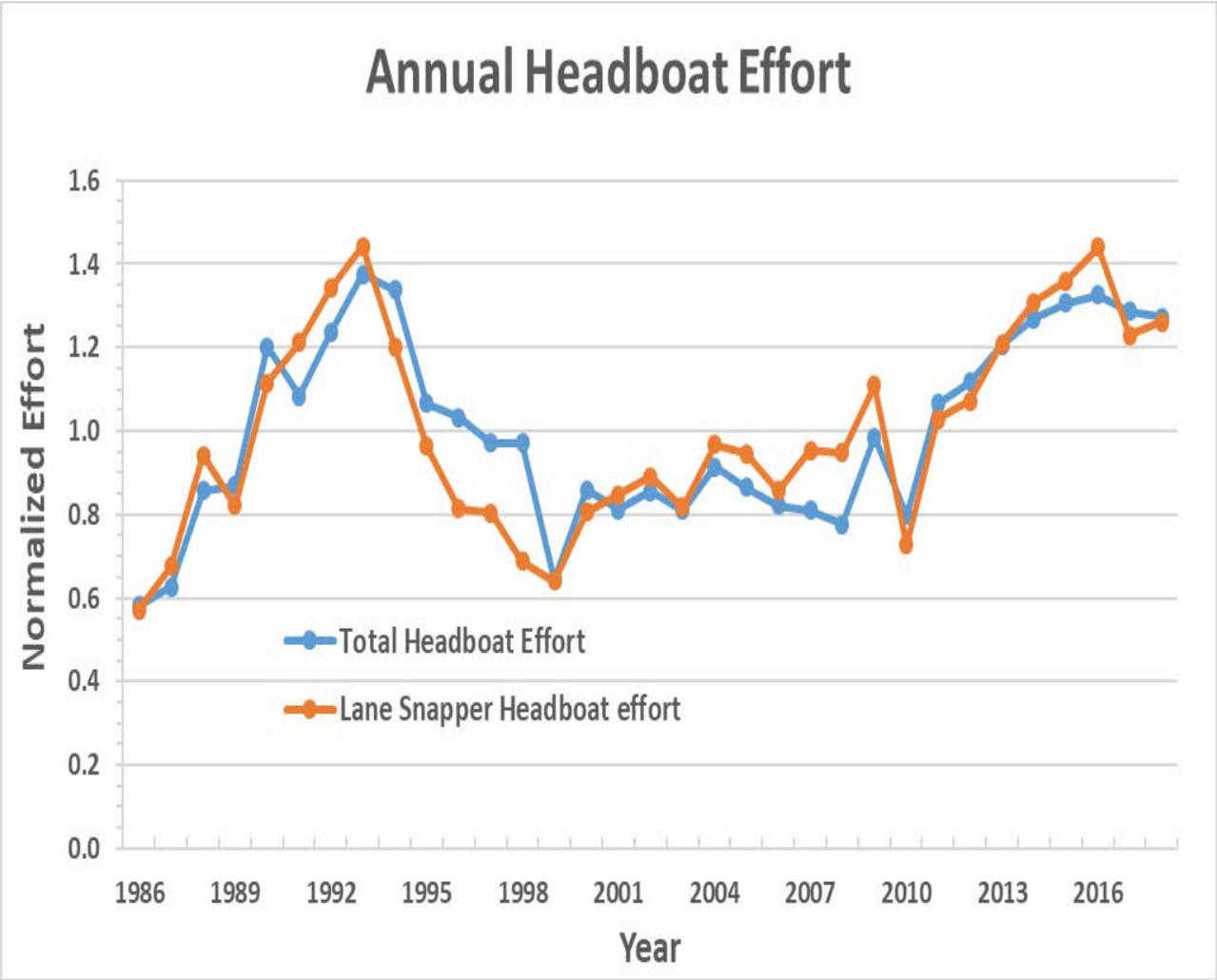


Standardized CPUE
(Updated=brown line)

- Increased from 1986-1993
- Declined 1994 - 2001
- Increased 2001- 2005
- Without trend 2006-2014
- Exhibited a brief 3 year strong increasing trend (through 2016)
- Declined from 2017 to 2018

- Large increase in standardized CPUE in last 5 years (2014-2018) vs the status quo reference period (1999-2008)

Total Headboat fishery and Lane Snapper effort

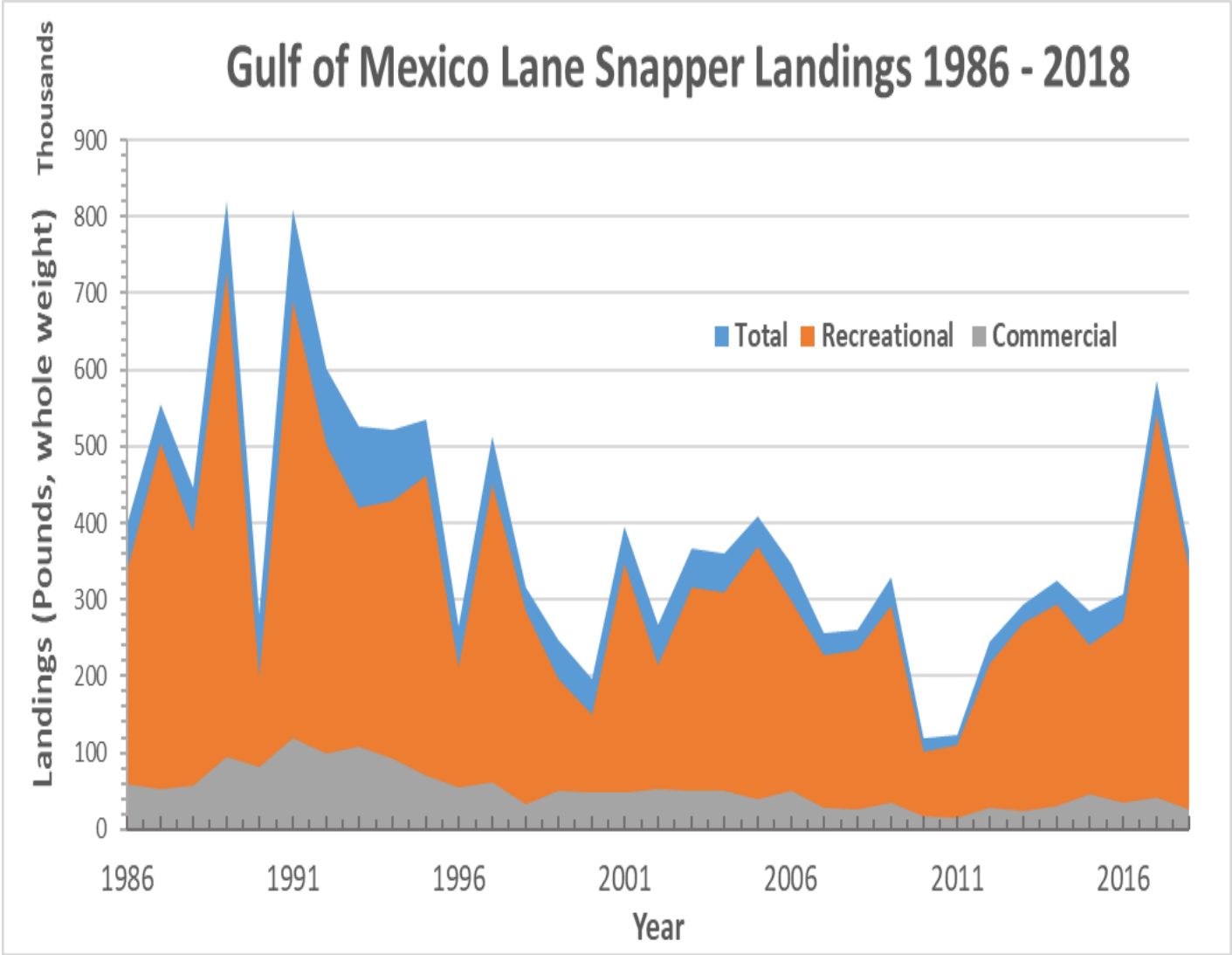


Normalized lane snapper and total headboat effort snapper (orange line)

- Steady increase 1986-1993
- Declined through 1999
- Steady increase since 1999 (except in 2010, and after 2017)

- Generally follows similar trend in total headboat effort (blue line) with minor divergences

Updated Lane Snapper Total Landings 1986-2018



- Lane snapper landings varied from 118 - 820 thousand pounds over the time series
- Recreational component averaged 86% of total across all years

- Regulations:
  - 8 inch total length size limit and 20 fish aggregate recreational bag limit

  - OFL and ABC (March 2017) defined as 364,082 and 355,501 pounds ww

Updated Calculations of OFL and ABC

Approach- Apply the Data Limited Method 'Itarget_0.5_0.7_1.0'

The TAC was calculated for lane snapper as:

$$\text{if } I_y^{recent} < 0.7 \text{ x } I^{ave}, \quad \boldsymbol{w} \text{ x } C^{ave} \left[\frac{I_y^{recent}}{0.7 \text{ x } I^{ave}}\right]^2$$

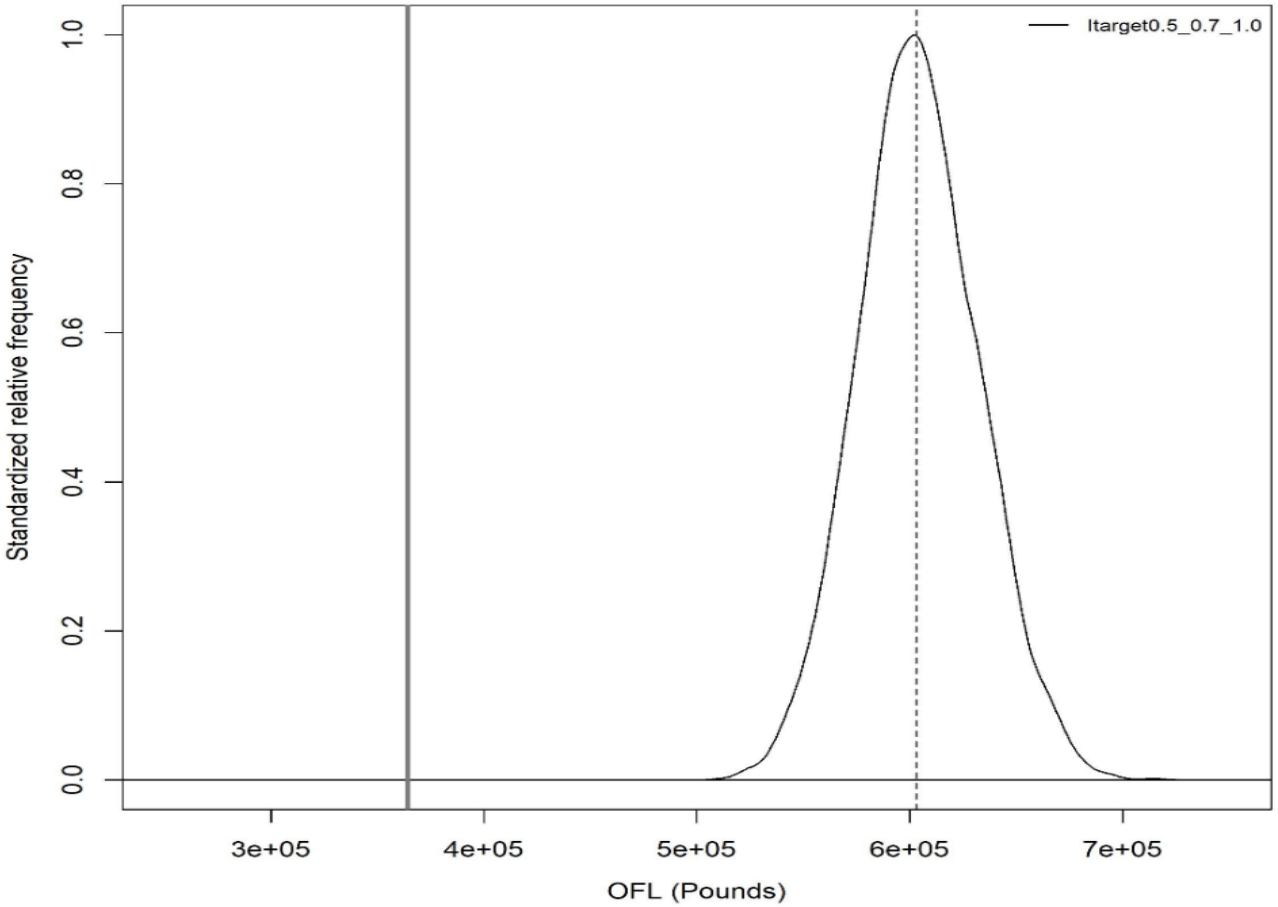
$$\text{if } I_y^{recent} \geq 0.7 \text{ x } I^{ave}, \quad C^{ave}\left[\mathbf{w} + (1-\mathbf{w})\frac{(I_y^{recent} - 0.7 \text{ x } I^{ave})}{(I^{target} - 0.7 \text{ x } I^{ave})}\right.$$

- Where:
- C^{ave} = average catch over reference time series (1999-2008)
- I^{ave} = average index over reference time series (1999-2008)
- I^{recent} = average index over 5 most recent years (2014-2018)
- $I^{target} = I^{ave}$ x I^{multi} - where the "I^{multi}" scalar on I^{ave} was set as 1.0 for SEDAR 49 evaluations based on the assumption that the stock was near MSY during the reference period.
- w = 0.5, where w is the smoothing parameter that defines the catch advice when $I^{recent} = 0.7\ I^{ave}$.

Geromont and Butterworth (2014)

Updated Relative frequency of OFL for Lane Snapper from the DLM 'Itarget_0.5_0.7_1.0'

Thick gray line = calculated OFL (estimated TAC= 364,082 pounds ww) at the 50% probability of exceeding OFL from the March 2017 SSC Review of the SEDAR 49 data limited evaluation.



Updated Gulf of Mexico lane snapper OFL and ABC (and 2017 March estimates for comparison)

Method	ABC		OFL	SD	SE	CV
	30%	40%	50%			
Updated Itarget0.5_0.7_1.0 2019	588,965	596,349	603,195	27,616	276	0.046
Itarget0.5_0.7_1.0 SEDAR 49, March 2017	355,501	360,059	364,082	16,965	170	0.047

Following the determination of the March 2017 GMFMC SSC that OFL and ABC should be defined as the 50th and 30th percentiles of the OFL distribution

Units = pounds whole weight

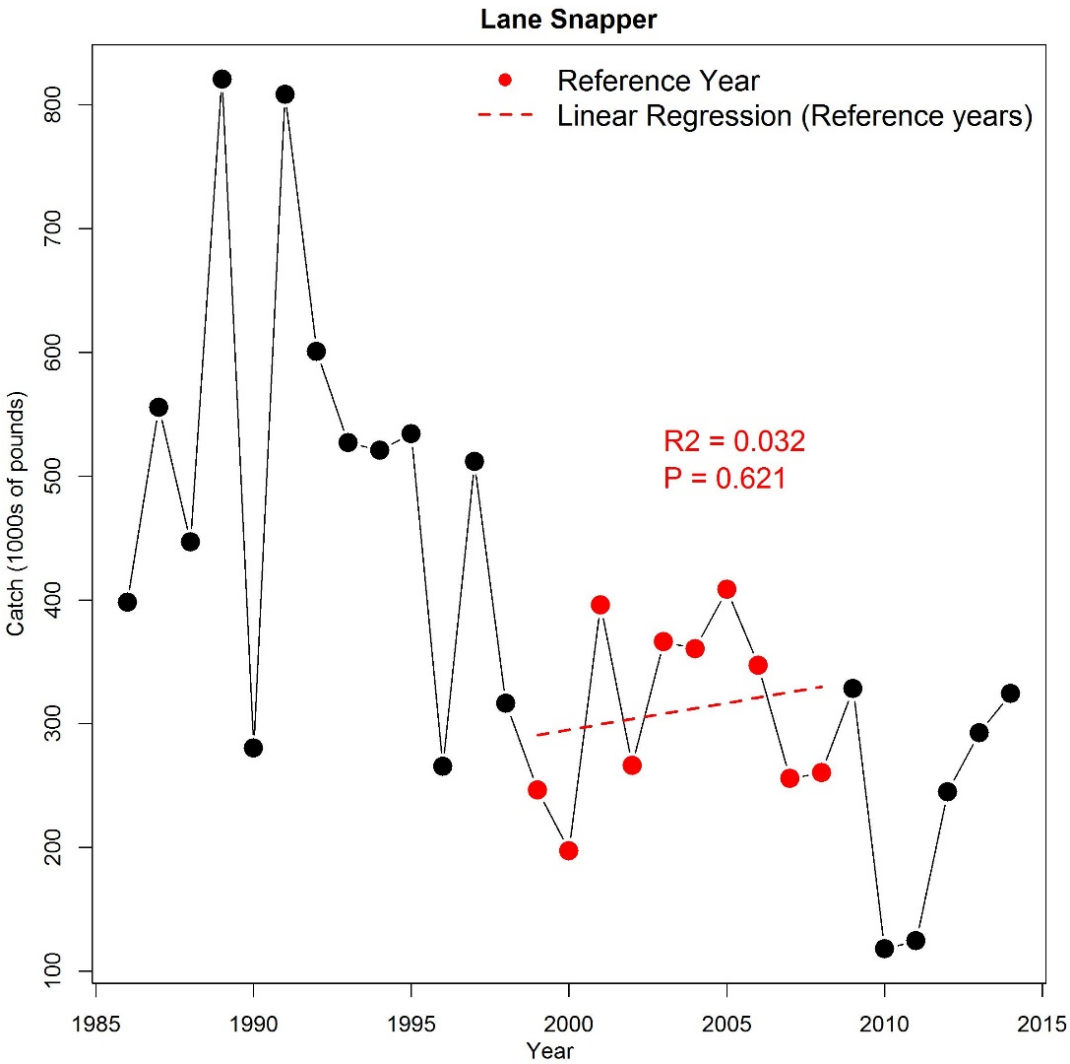
Acknowledgements

- Thanks are given to John Walter, Shannon Calay and Jeff Isely for review and editoral input
- Thanks provided to numerous SEFSC, SFD staff for historical continuity relating to developing catch per unit of effort subsetting and standardization approach dating to mid 1980s as applied to reeffish, coastal mackerels, and many highly migratory species

Thank you and any questions please

Extra

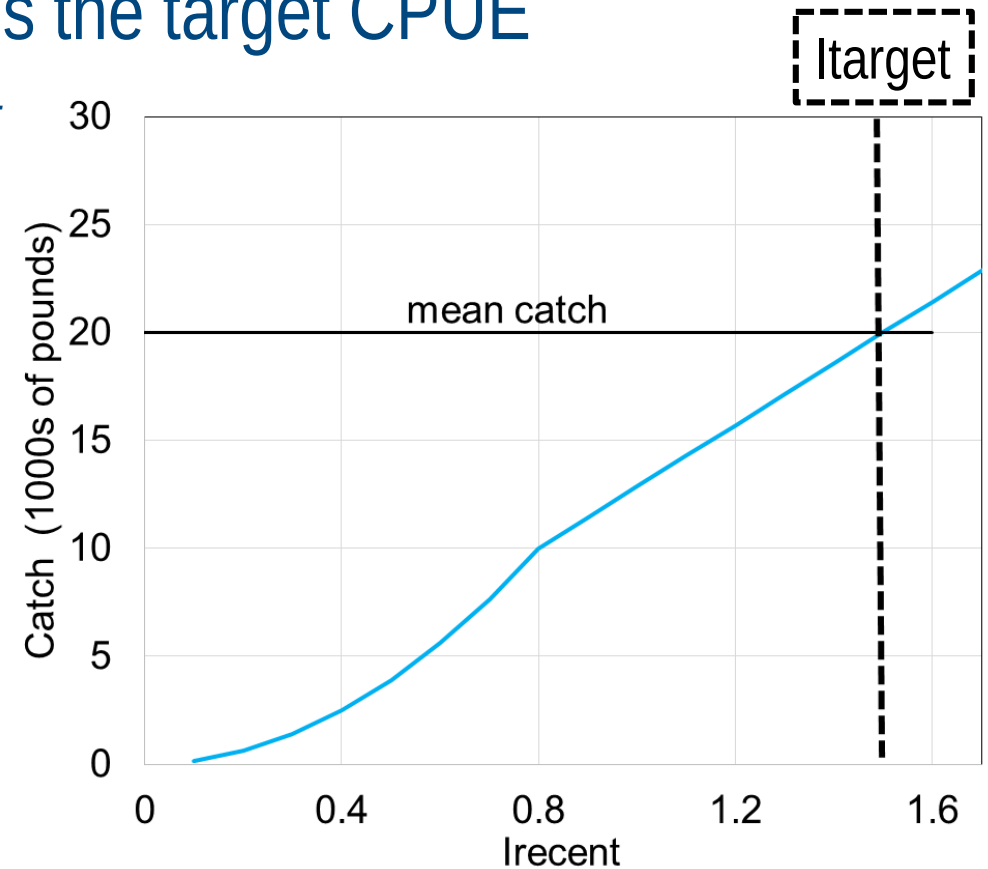
Lane Snapper Reference Catch



Tuning of data-limited methods: Itarget

- **Itarget scalar** = determines the target CPUE
- *Itarget* = *Itarget scalar* x I^{REF}
- How much of mean index during reference period do we want to achieve?

Stock Status During Reference Period	Itarget Scalar
Overexploited	>1
Near MSY	1
Underexploited	<1



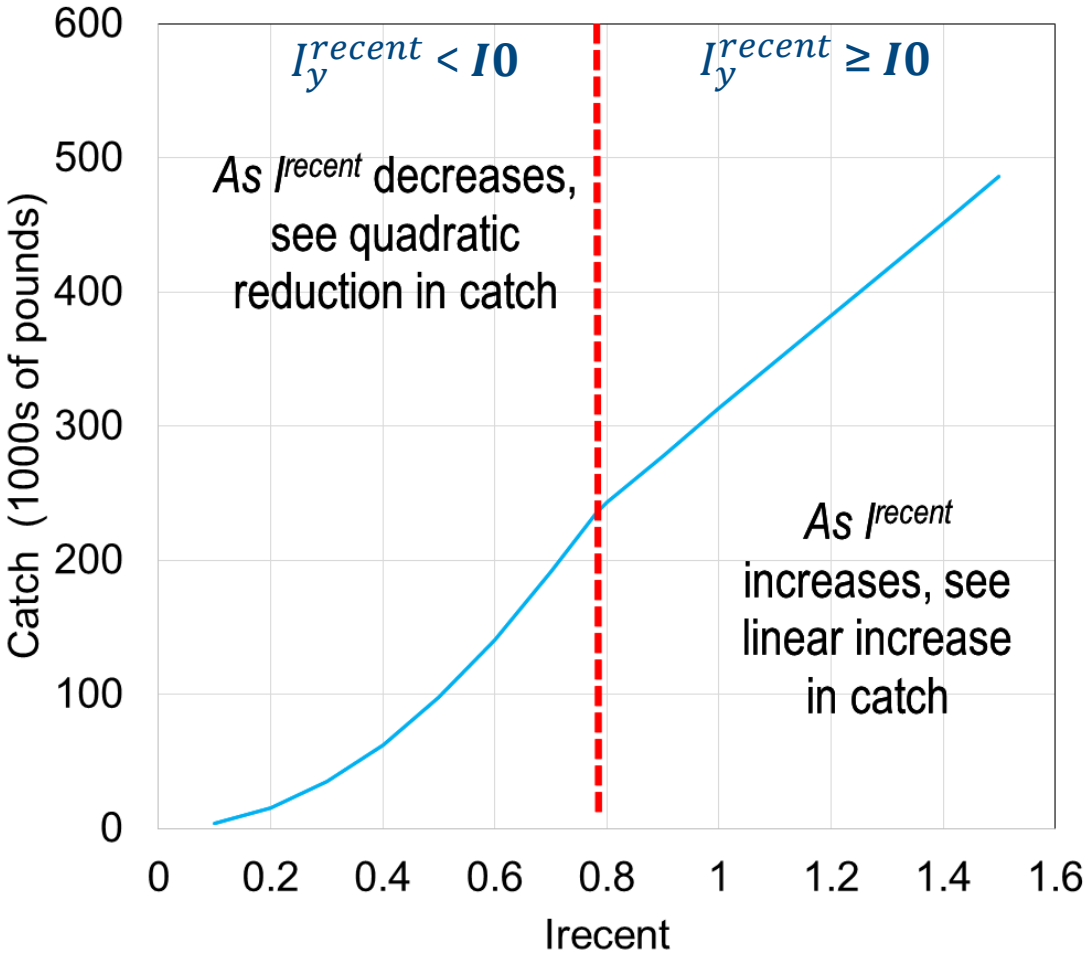
Example (overexploited)

Geromont and Butterworth (2014)

Tuning of data-limited methods: Itarget

- *I0* = determines lower limit
- *I0 = I0 scalar* x I^{REF}

Conditions	I0 scalar
Stock overexploited or is likely to require a long rebuilding period if overfished, low productivity	0.8
Stock near MSY	0.7
Stock underexploited, high productivity	0.5

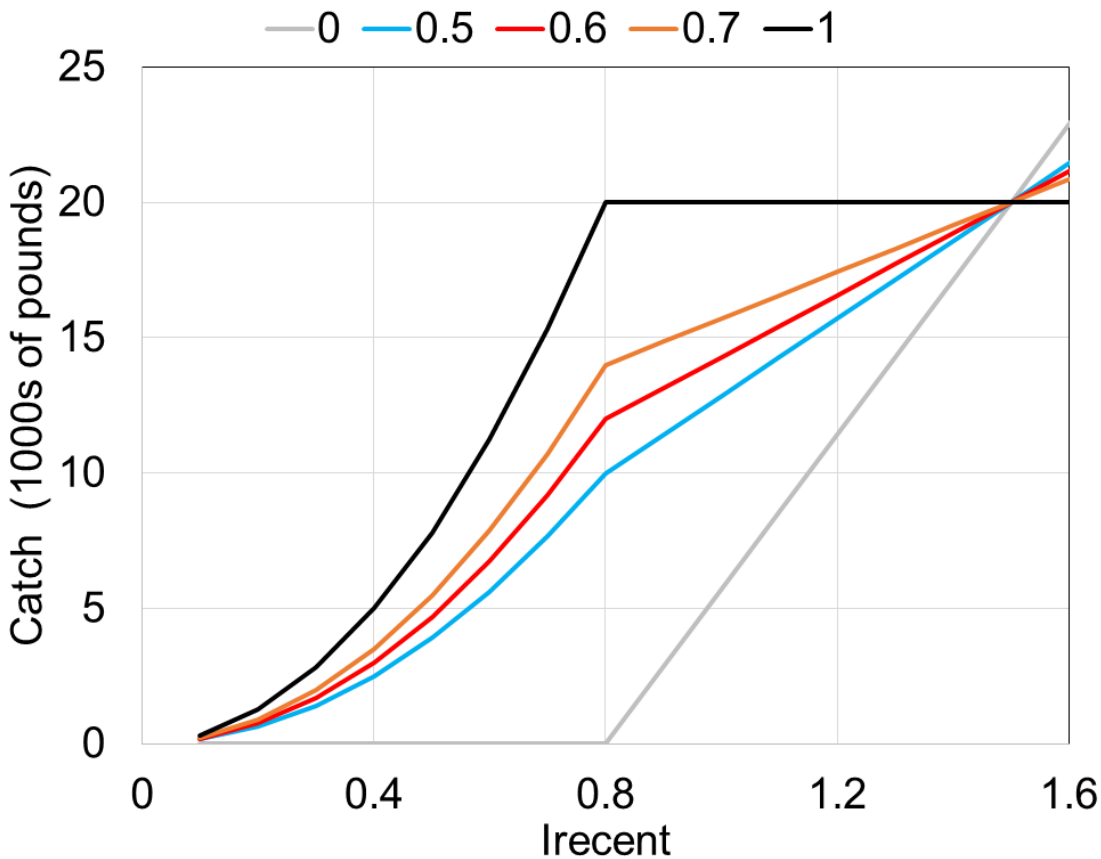


Geromont and Butterworth (2014)

Tuning of data-limited methods: Itarget

- Smoothing parameter (w) = controls the rate of change in catch advice

W	Condition
0	Catch advice = 0 below limit (I0)
0.5	Relatively large slope when above limit (I0)
0.6	Intermediate slope both above and below limit (I0)
0.7	Relatively large slope when below limit (I0)
1.0	Catch advice capped when above limit (I0)



Geromont and Butterworth (2014)