



**NOAA  
FISHERIES**

Southeast Fisheries  
Science Center

# Interim ABC Analyses Based on Surveys in the Gulf of Mexico

How they work and the species they  
can be applied to

Clay Porch

Gulf of Mexico Fishery Management Council

October 2019

Galveston, TX



**NOAA FISHERIES**

# A Challenge

Stock assessments represent best scientific information available, but they can be 2-3 years out of date

## *Solutions:*

### 1. Annual assessments

- expensive
- time consuming (still a year out of date)

### 2. Forecasts from last assessment

- Unpredictable events:
  - Recruitment event/failure
  - Environmental disasters (Hurricane, Red tide)
  - Man-made disasters (Deepwater Horizon)



# A Challenge

Stock assessments represent best scientific information available, but they can be 2-3 years out of date

*Solutions:*

1. Annual assessments
  - expensive
  - time consuming (still a year out of date)
2. Forecasts from last assessment
  - Unpredictable events:
3. Interim ABC Analyses

# Interim ABC Analyses

A quantitative method of adjusting catch advice (ABC) for a stock between full assessments

Required:

- A completed and accepted stock assessment

*Ideally:*

- Uses most current, easily updated data (e.g., survey abundance trends or mortality rates)
- Is simple to explain
- Accounts for uncertainty
- Is vetted through Management Strategy Evaluations (simulation tests)

# As simple as it gets:

$$ABC_y = ABC_{ref} \left( \frac{I_y}{I_{ref}} \right)$$

$ABC_{ref}$  = ABC from most recent assessment

$I_{ref}$  = observed index of biomass in reference year

$I_y$  = observed index of biomass in year y

- ✓ Uses most current data
- ✓ Is simple to explain
- ✗ Accounts for uncertainty
- ✗ Vetted through Management Strategy Evaluations



# Adding uncertainty

$$ABC_y = ABC_{ref} \left( \frac{I_y + bs}{I_{ref} + bs} \right)$$

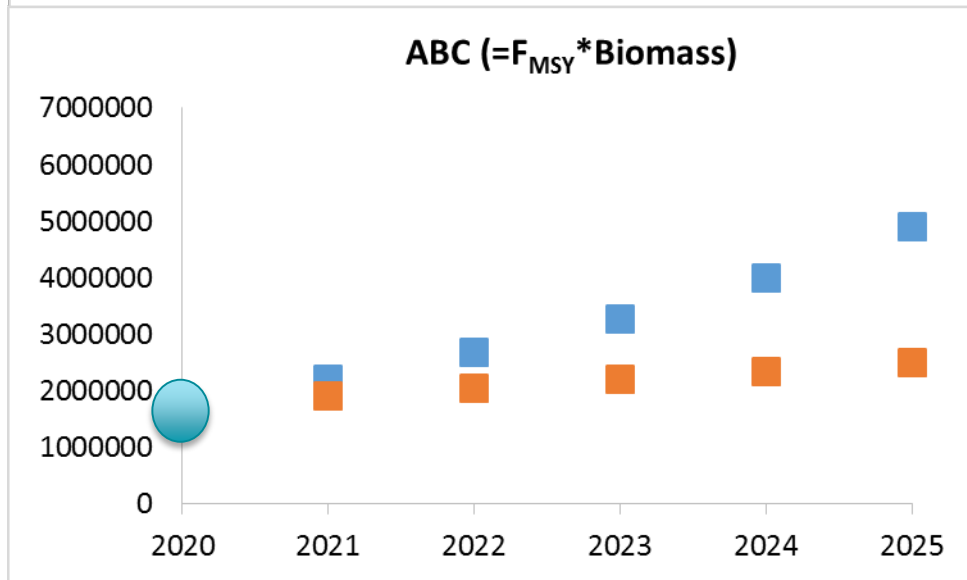
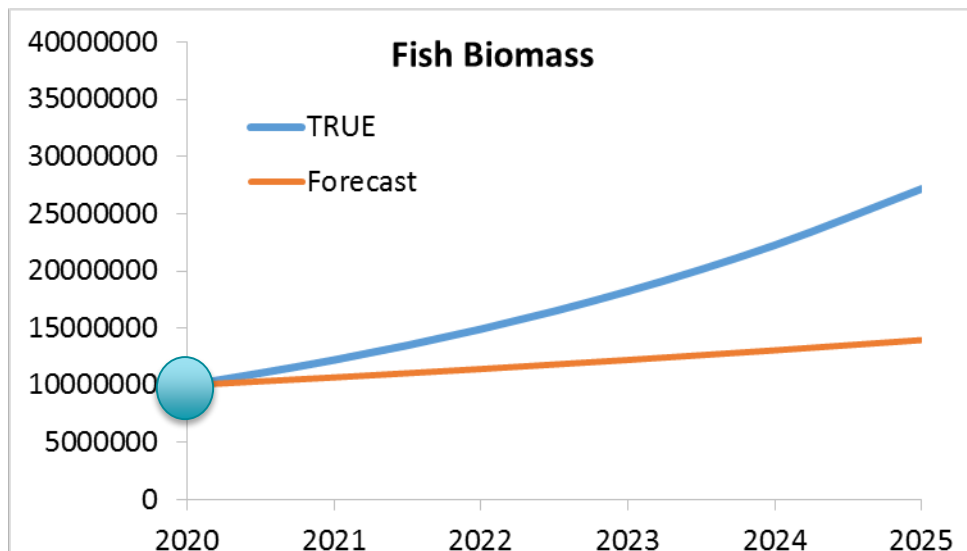
$s$  = average standard error of index

$b$  = buffer

- ✓ Uses most current data
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- ✓ Accounts for uncertainty
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# How it works: A simple example



Last year of assessment



'True but unknown' biomass



'Forecasted' biomass

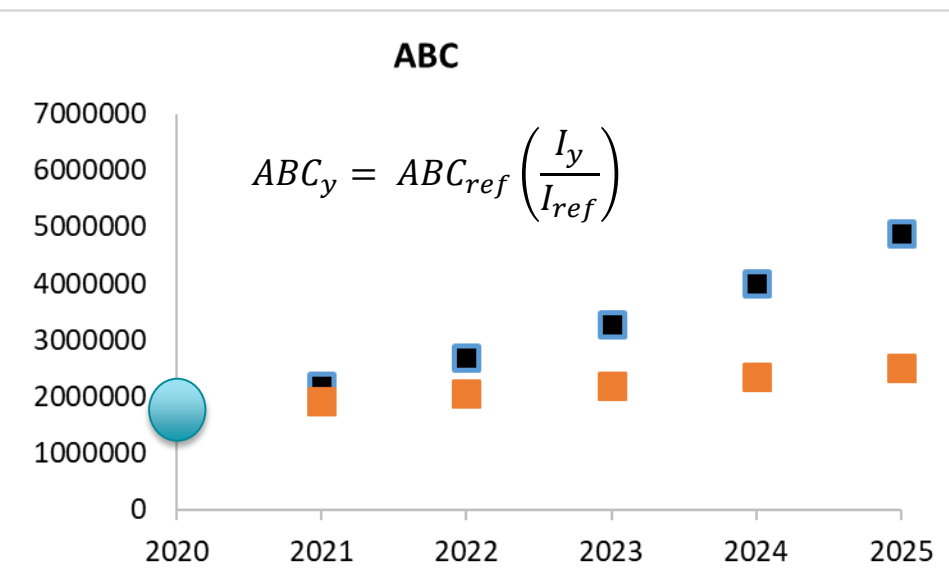
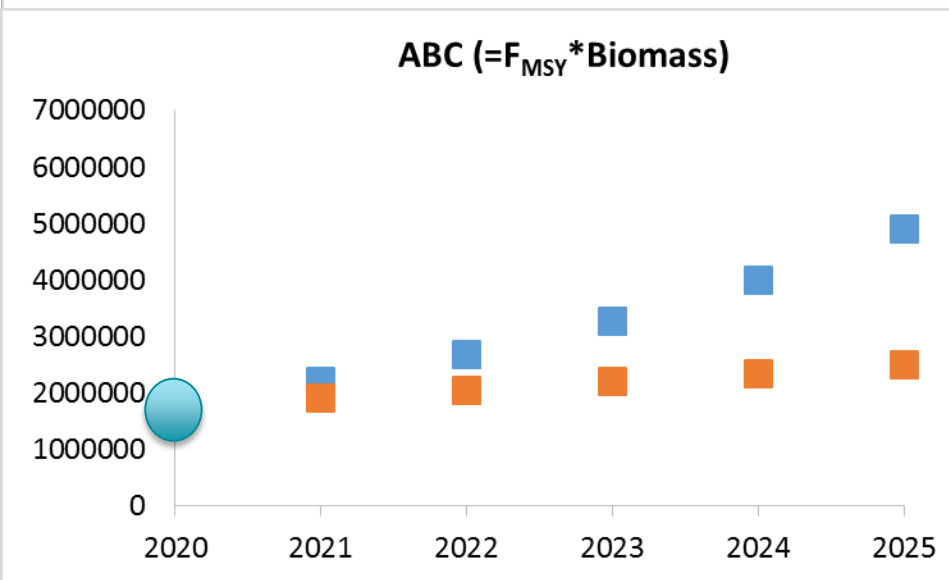
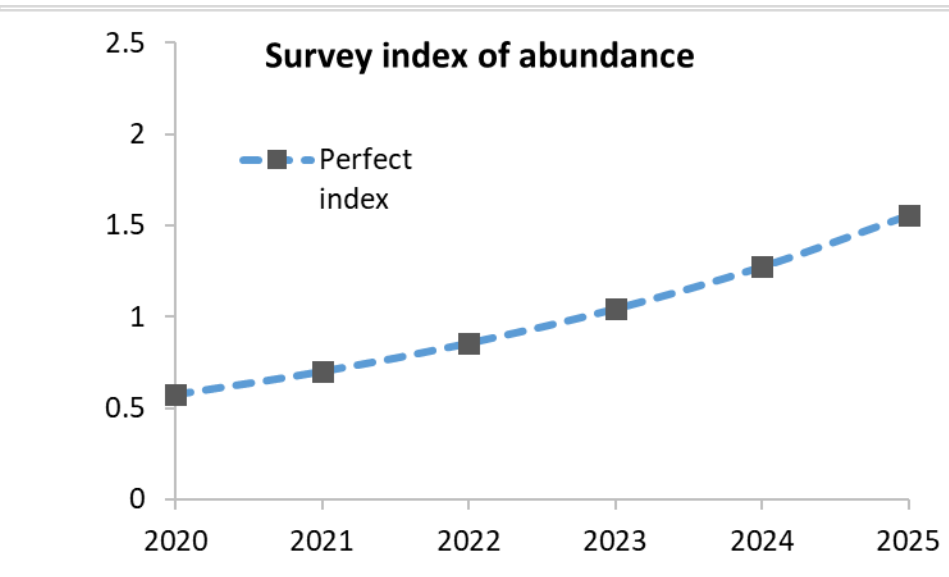
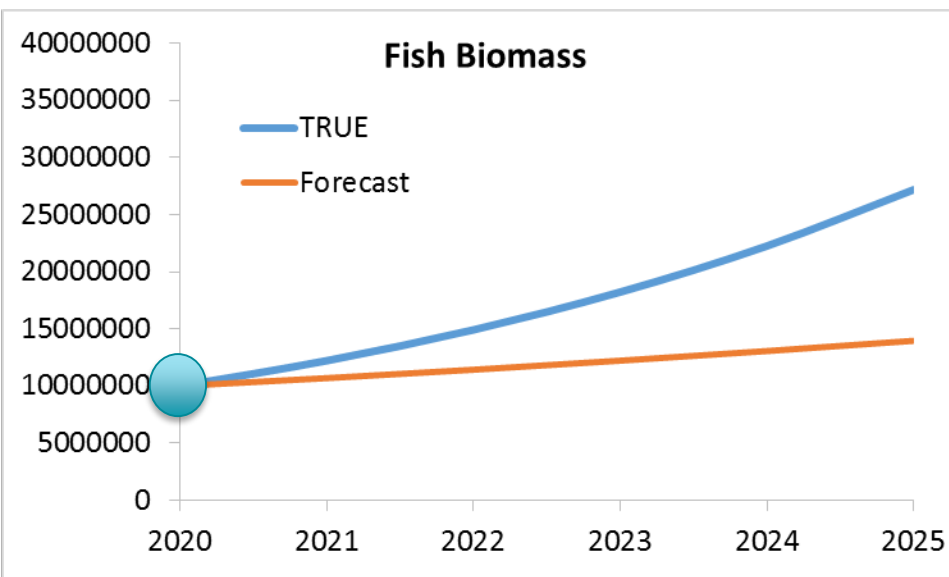


'True' ABC

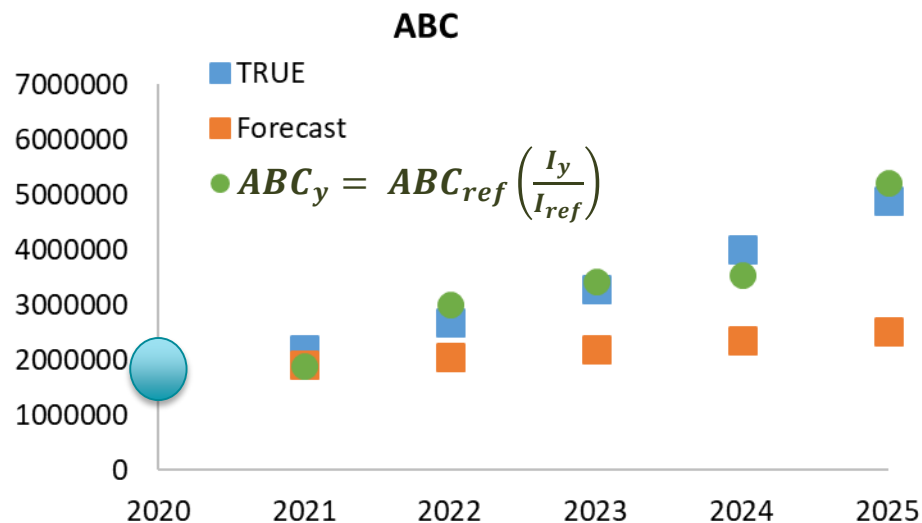
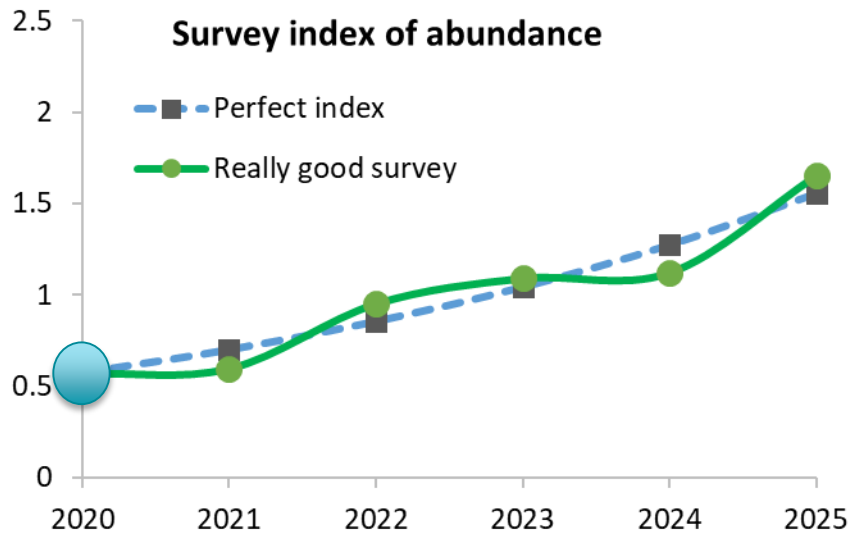


'Forecasted' ABC  
(assessment projections)

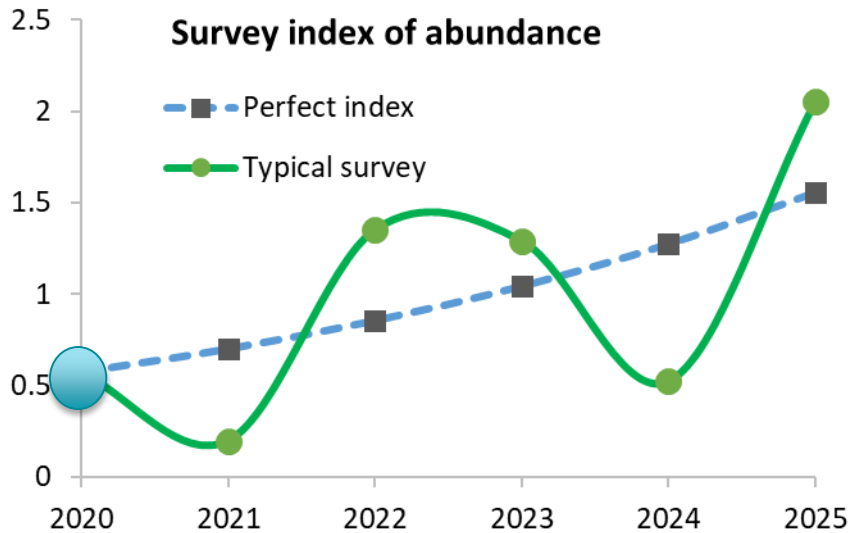
# How it works: Near perfect survey



# How it works: Really good survey

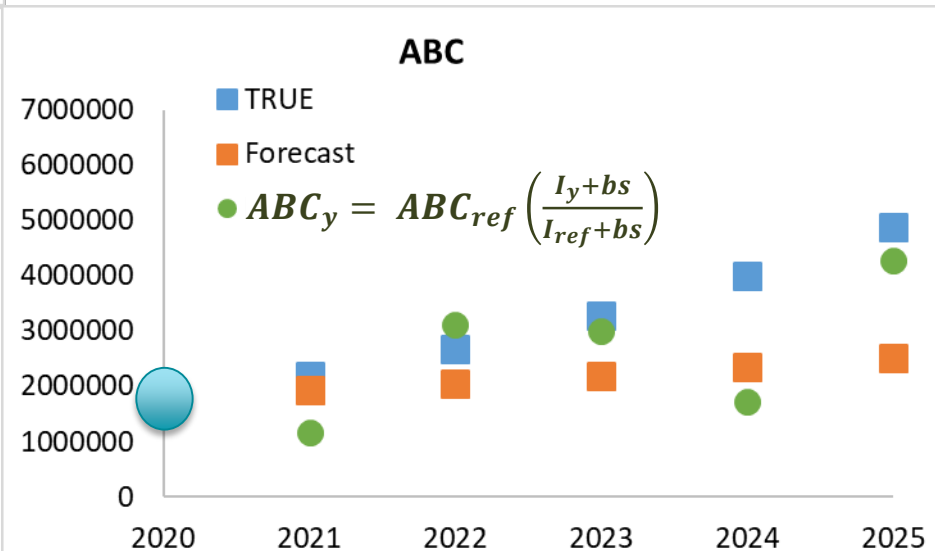
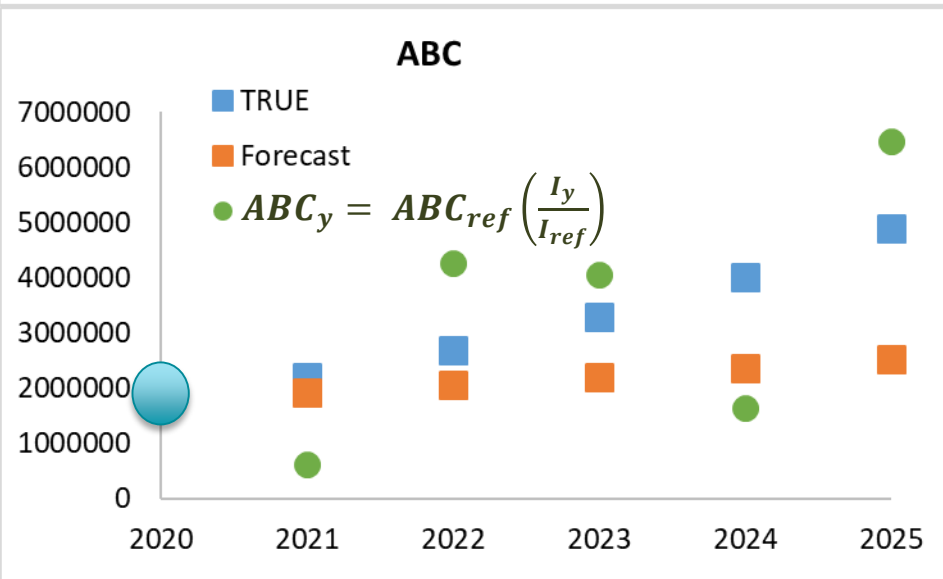


# How it works: More typical survey?

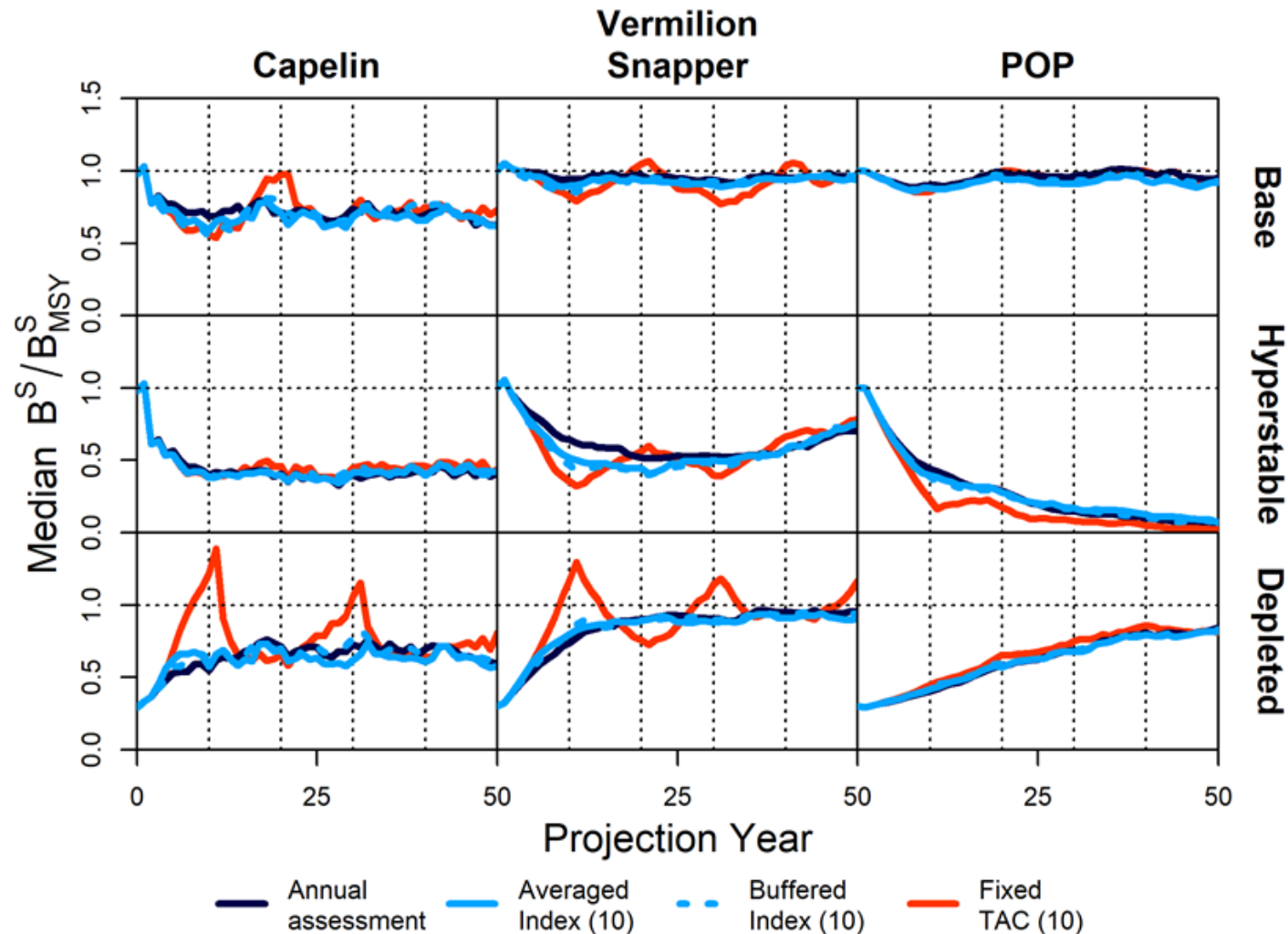


Buffered interim analysis (b=2)

$$ABC_y = ABC_{ref} \left( \frac{I_y + bs}{I_{ref} + bs} \right)$$



# Management Strategy Evaluation results



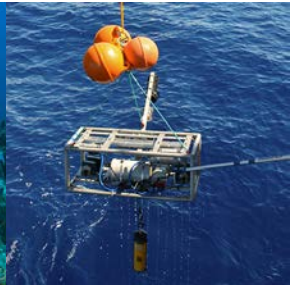
Huynh, Q.C., et al. (in review). The interim management procedure approach for assessed stocks: responsive management advice and lower assessment frequency. Fish and Fisheries.

# Many other types of interim ABC analyses possible and under consideration

- Depends on data available and processing time
- Survey indices of abundance usually easiest to process
  - Should track biomass vulnerable to the fishery or be appropriately time-referenced (e.g. a survey of young fish before they enter the fishery)
  - Can't be too noisy (needs to have a meaningful signal)
  - Should be simulation tested (considering nuances of the survey and ecology of the animal)
  - Survey-based index is best, but in certain situations a fishery catch per unit effort index might be considered

# Time lines

Survey	processing time	Delivery w/2019
Bottom longline survey	1 month	Jan 2020
Reef fish video survey	12 months	May 2020
Reef fish diver survey	2 months	Jan 2020
Trawl survey	2 months	Jan 2020
Larval fish survey	18 months	April 2021
Fishery CPUE	6 months	June 2020



# Gulf species that can be considered

Must have been assessed and at least 1 defensible survey or CPUE index

Red Snapper

BLL, Video

Vermilion Snapper

Video, Trawl

Gray Snapper

Video, Diver

Red Grouper

BLL, Video

Gag Grouper

Video

Scamp

Video

Yellowedge Grouper

BLL

Greater Amberjack

Video

Gray Trigger

Video?

King Mackerel

Larval, Fishery CPUE?

Yellowtail Snapper

Diver, Video?



Red Grouper Interim Analysis  
completed in 2018



# Acknowledgements

Matthew W. Smith, Skyler R. Sagarese, John Walter, Shannon Cass-Calay, William Harford, Nathan Vaughan

