



NOAA
FISHERIES

A decision support tool for incorporating management impacts into stock assessment projections

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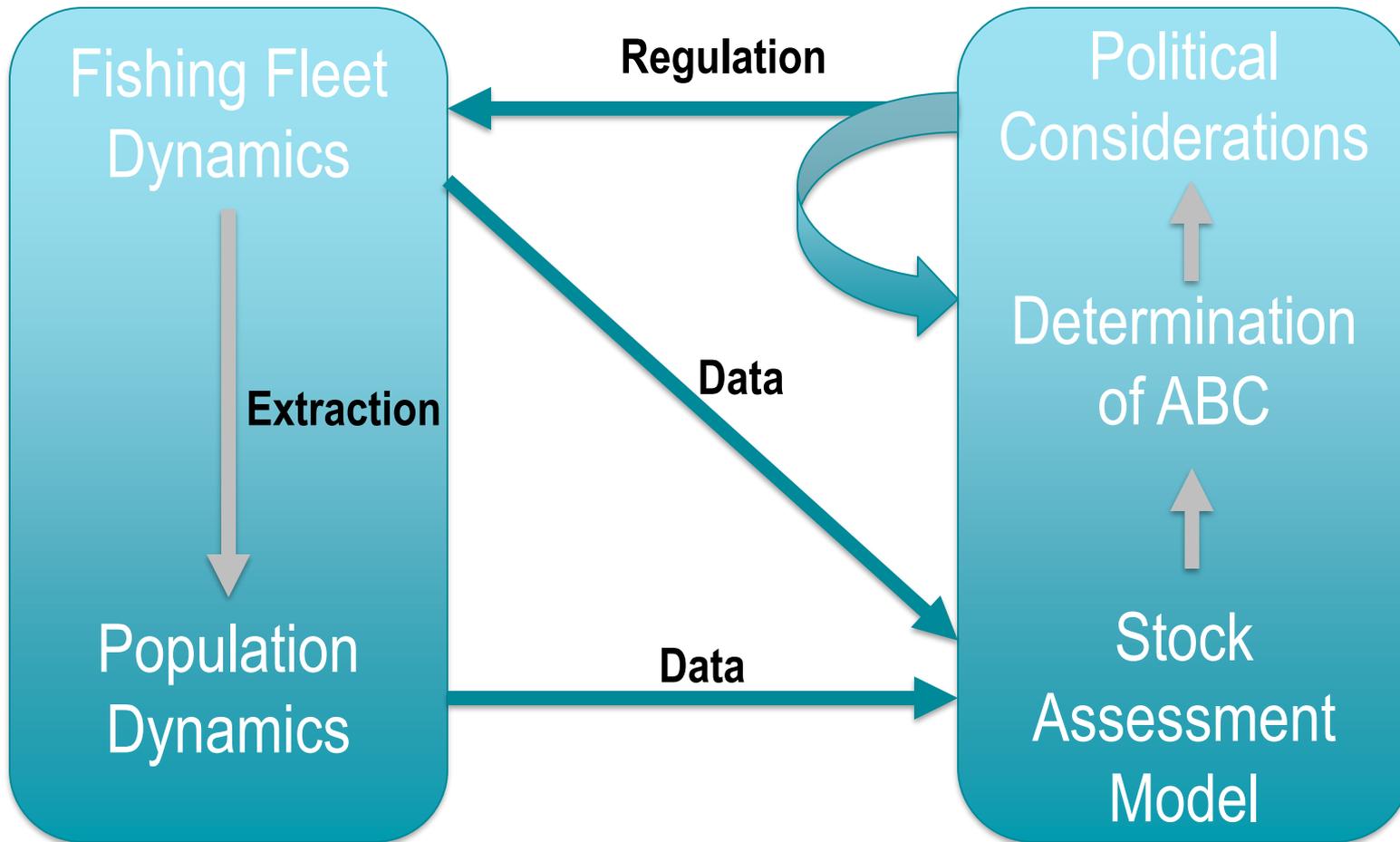
CAPAM, New Zealand

November 6th, 2019

What is the DST project?

- The decision support tool (DST) project was the result of a joint proposal between NOAA's SEFSC and SERO personnel.
- Goal was to improve incorporation of management decisions into stock assessment projections in years between formal assessments.
- Empower SERO personnel to test impacts of proposed management without requiring a request to SEFSC.
- Speed up the decision making process.

Need for the DST

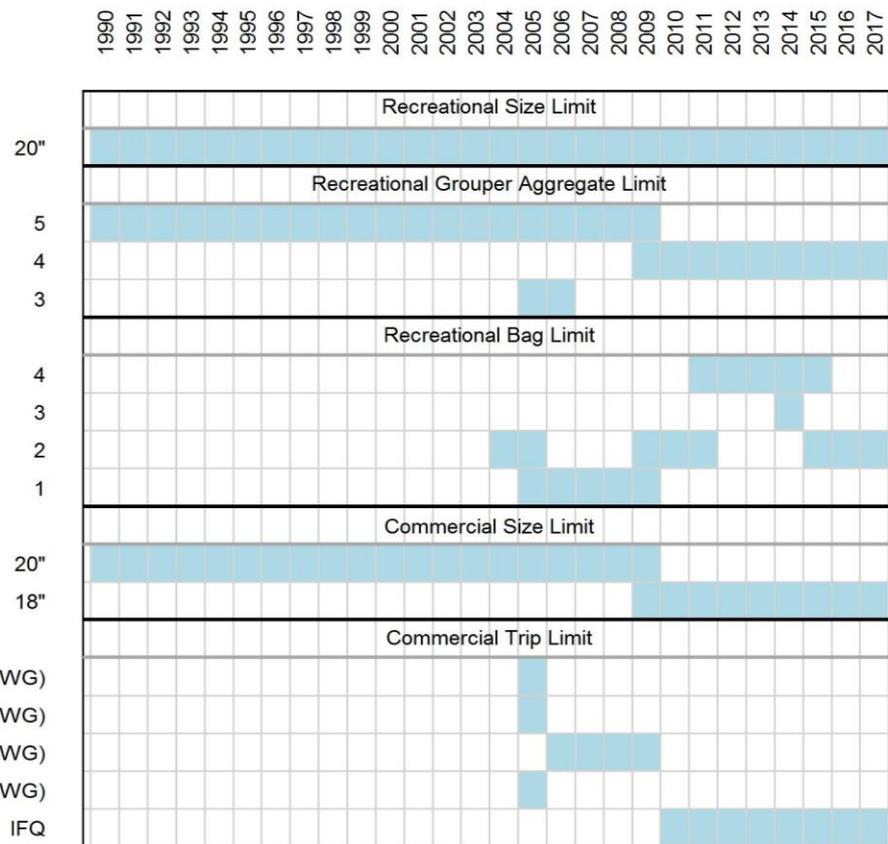


Need for the DST

- Stock assessment advice lags management action

Category	Action
Catch limits	Species ABC
Catch limits	Species ACL
Catch limits	Species ACT
Catch limits	Species Quota
Temporal controls	Closure
Temporal controls	Fishing year
Temporal controls	Reopening
Effort limits	Limited Access System
Effort limits	Permit Moratorium
Effort limits	Commercial Trip Limit
Effort limits	Recreational Bag Limit
Spatial controls	Closed area
Spatial controls	Restricted to Area
Selectivity controls	Prohibit the use of live bait
Selectivity controls	Minimum Size Limit
Selectivity controls	Mesh size
Other	Remove Species From FMP
Other	Restrictions on sale/purchase
Other	Description of Subzones

10,000 lbs gw (D&SWG)
 7,500 lbs gw (D&SWG)
 6,000 lbs gw (D&SWG)
 5,500 lbs gw (SWG)
 IFQ



Development of the DST

- The DST is an interactive GUI based software.
- It was developed in R using R shiny.
- Consists of a number of functions that can
 - Read/write SS3 files
 - Run the SS3 executable
 - Perform search routines to attain stock status or catch targets.
 - Apply unique projection scenarios not possible in SS3 alone.
 - Synthesize and output key results.

Getting started



NOAA FISHERIES
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Select Assessment Management Action Forecast Results

Stock Assessment Decision Support Tool

Beta Version 0.4

Welcome to the NOAA stock assessment decision support tool (DST).
The DST is designed to enable real-time update of fishery quota projections in response to proposed management changes.
This software is still in BETA production with new features being added and bugs being discovered. Please contact nathan.vaughan@noaa.gov with any questions, feature requests, and bug reports.

Assessment

Upload new assessment|

- Please select an assessment
- Upload new assessment
- Bigeye Tuna
- Gray triggerfish
- Greater amberjack
- Red snapper
- Shortfin mako
- Swordfish

Optional input files

Select Forecast File

Browse... No forecast file selected

Select Data File

Browse... No data file selected

Select Control File

Browse... No control file selected

Select Parameter File

Browse... No parameter file selected

Select Display File

Browse... No display file selected

Build New Assessment

How to add assessments?

- Copy in a full stock assessment folder
 - Requires a full assessment that has already been process by the DST.
 - Pros-Fast and already bug checked.
 - Cons-Large folder size
- Use the upload assessment option.
 - Pre-fit model
 - Requires SS3 Control, Data, Starter, Forecast, and par files.
 - Only structure files
 - Requires SS3 Control, Data, and Starter files.
 - Slow to fit model and may have issues if it was a difficult assessment to converge.

What questions can the DST address?

- Management Targets.

The screenshot displays the NOAA Fisheries Decision Support Tool (DST) interface, specifically the 'Management Action' tab. The interface includes a navigation bar with 'Select Assessment', 'Management Action', and 'Forecast Results'. A 'Reset Selection Values' button is located in the top left. The main content area is divided into several sections:

- Management Starting Year:** A slider ranging from 2016 to 2029, with the current selection at 2020.
- Optimal Fishing Target:** A list of radio button options: SPR, Spawning Biomass Ratio (selected), Maximize Catch, Use previous estimate, and Fixed forecast.
- Spawning Biomass Ratio:** A slider ranging from 0 to 1, with the current selection at 0.26.
- Optimal target year range:** A slider ranging from 2016 to 2116, with the current selection from 2095 to 2105.
- Implemented Fishing:** A list of radio button options: Implement Optimal (selected), Fixed Fraction Fmsy, and Constant Catch.

On the right side, there is a 'Forecast name' input field and an 'Update Forecast' button.

What questions can the DST address?

- The DST supports 7 key projection modifications.
 1. Fishery status targets
 - Can modify target category to SPR, SSB, or MSY.
 - Impact of switching to MSY from a proxy.
 - Can set target value.
 - Impact of sustainability proxies.
 - Can set target achievement year.
 - Impact of different rebuilding targets.
 2. Applied fishing patterns.
 - Can explore fishing at fixed catches.
 - Impact of applying a fixed catch quota averaged from a projection with trending catches.

What questions can the DST address?

- Allocations and fixed catches.

Allocations and Catch
Commercial Selectivity
Recreational Selectivity
Bycatch Selectivity

Group specific allocation fractions by:

Dead Weight
 Retained Weight
 Dead Numbers
 Retained Numbers

Match historic allocation

1872 2011 — 2016

1872 1887 1902 1917 1932 1947 1962 1977 1992 2007 2016

Commercial Catch Allocation Fraction

Allocate fleet fraction of group allocation by relative:

Catch
 F

Fleet allocation fractions within group

Show:

Annual
 Seasons

Handline East: Annual Fraction of Commercial

Handline West: Annual Fraction of Commercial

Longline East: Annual Fraction of Commercial

Longline West: Annual Fraction of Commercial

Fixed fleet inputs

Retained Catch in Weight (1000's Lbs)		2019
2017	2018	
<input type="text" value="3246.1265804"/>	<input type="text" value="2841.2701636"/>	<input type="text" value="2274.1316686"/>
Retained Catch in Weight (1000's Lbs)		2019
2017	2018	
<input type="text" value="7026.9176032"/>	<input type="text" value="6629.3805248"/>	<input type="text" value="6292.646866"/>
Retained Catch in Weight (1000's Lbs)		2019
2017	2018	
<input type="text" value="187.665411494"/>	<input type="text" value="157.485706928"/>	<input type="text" value="137.131111854"/>
Retained Catch in Weight (1000's Lbs)		2019
2017	2018	
<input type="text" value="126.689370148"/>	<input type="text" value="134.183755376"/>	<input type="text" value="138.76760128"/>

What questions can the DST address?

3. Fleet allocations

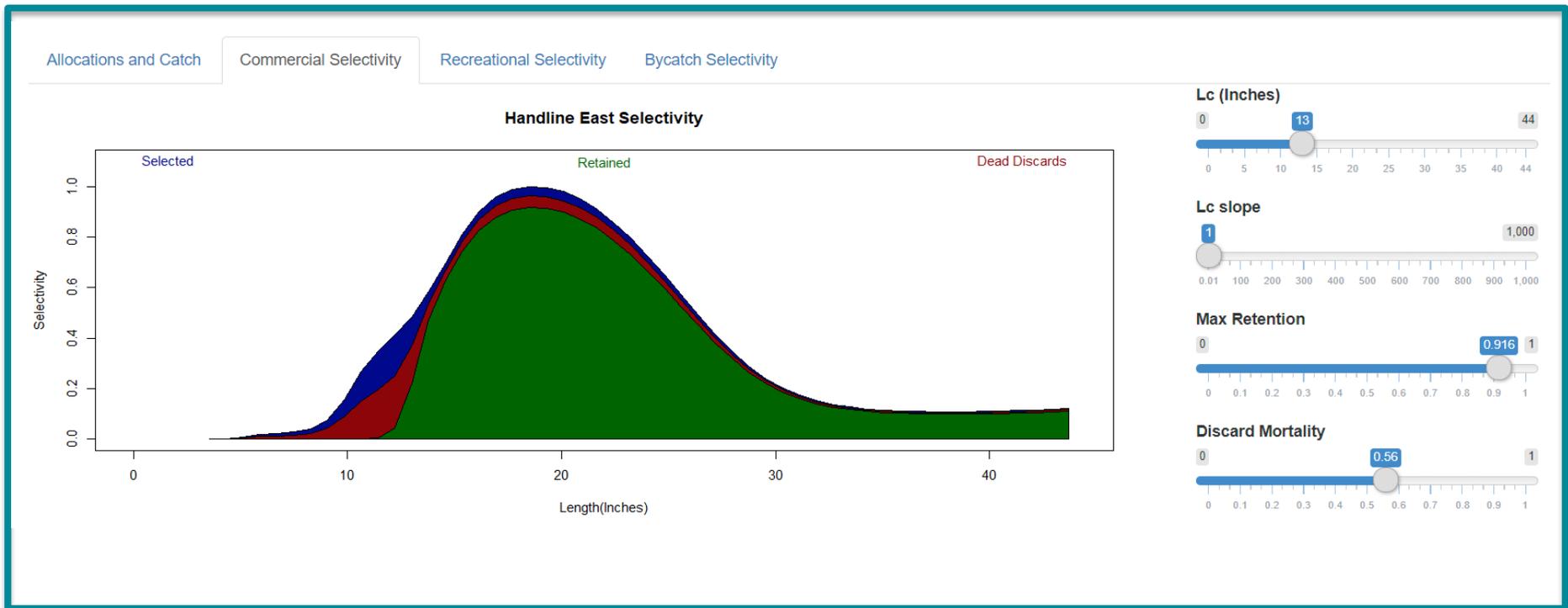
- Can modify allocation between fleets.
- Can modify allocation to be applied as fixed F proportions or fixed catch proportions.

4. Recent catches

- Allows input of new catches in years after assessment.
- Can be used to investigate the impact of carryover/payback provisions.

What questions can the DST address?

- Fleet dynamics



What questions can the DST address?

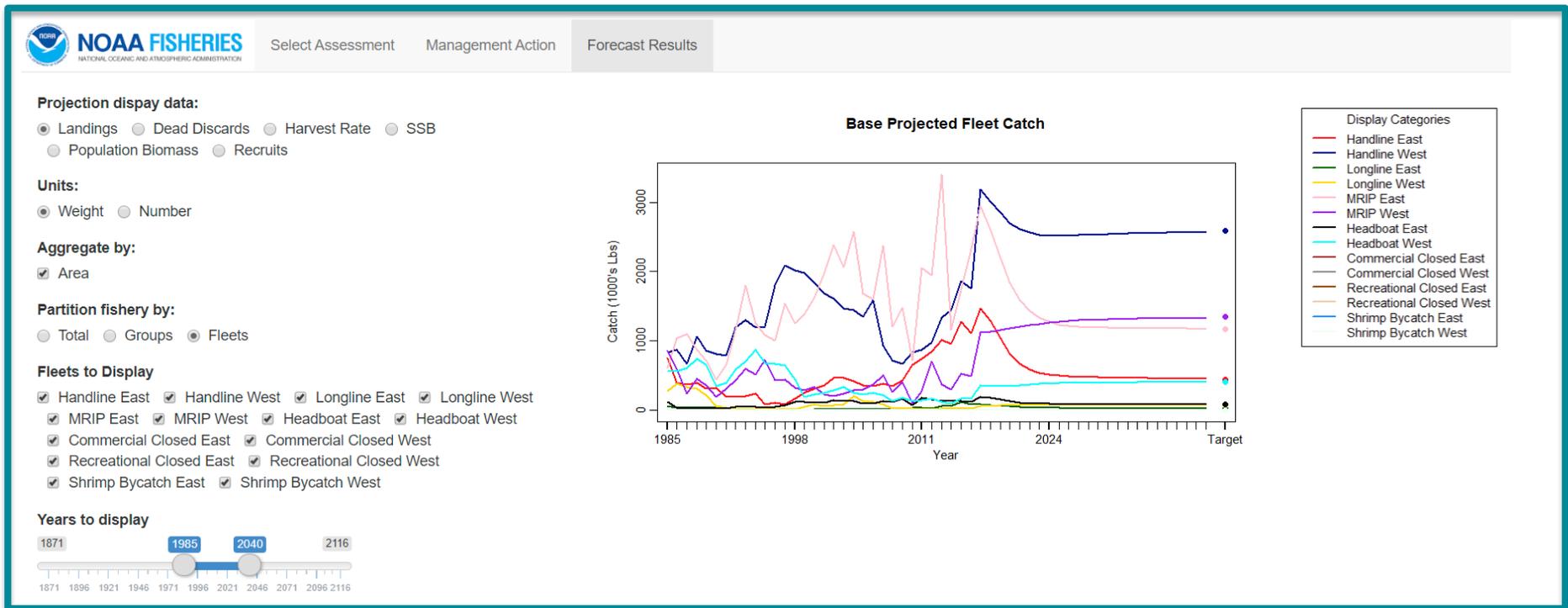
5. Change retention size.
 - Investigate minimum size regulations.

6. Change asymptotic retention rate.
 - Possibly apply to closed area/season impacts or bag/trip limits.

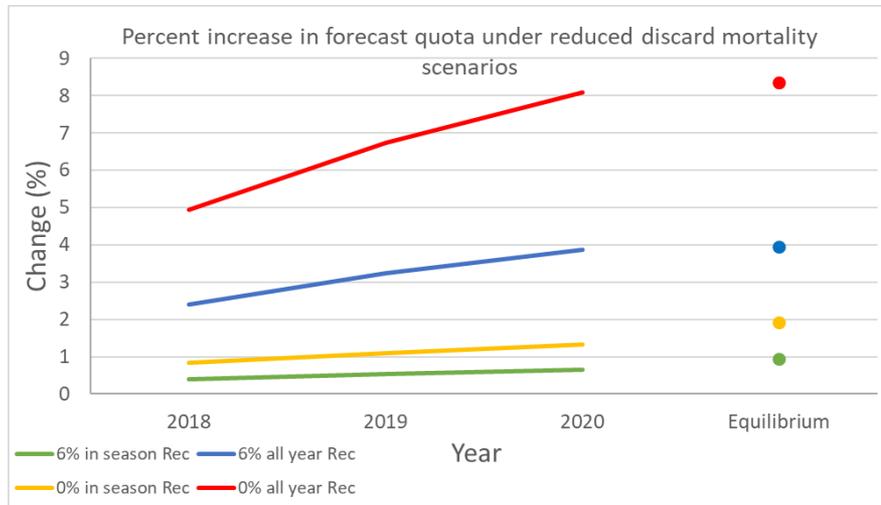
7. Change discard mortality rate.
 - Impact of gear changes.
 - Use of descender devices.
 - Change of spatial catch distribution.

What questions can the DST address?

- Model results



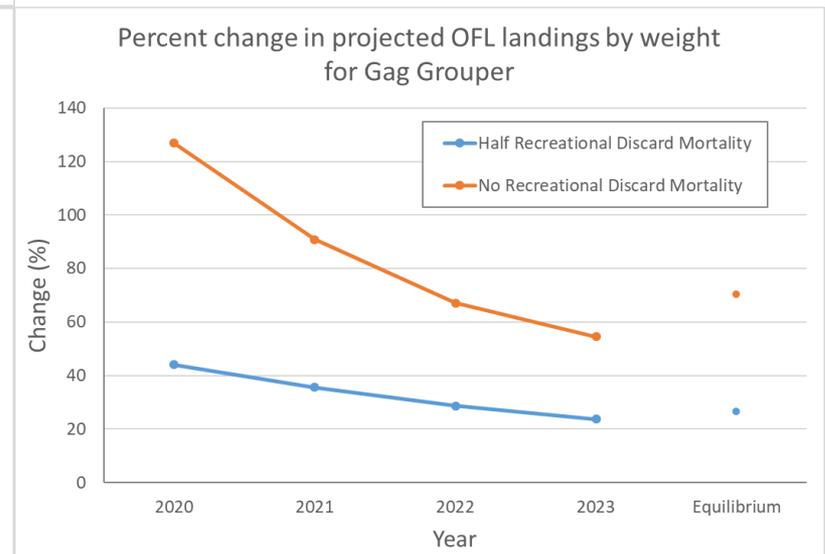
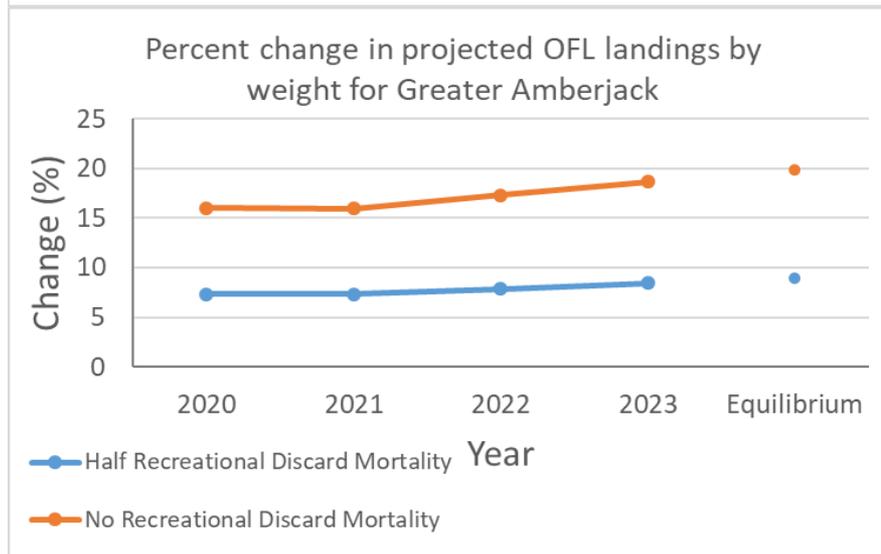
DST applications – Discard mortality



Red snapper

Greater amberjack

Gag grouper



DST applications – Carryover and payback

Red snapper

Year	OFL	Overage Random 1	Overage Random 2	50% Overage	25% Overage	10% Overage	ABC	10% Underage	25% Underage	50% Underage	Underage Random 1	Underage Random 2
2017	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2018	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2019	0.98	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2020	0.97	0.95	0.95	0.95	0.98	0.99	1.00	1.01	1.02	1.05	1.05	1.05
2021	0.97	0.98	0.97	0.99	1.00	1.00	1.00	1.00	1.00	1.01	0.99	0.98
2022	0.96	1.02	1.01	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.03	1.02
2023	0.96	0.99	1.03	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.04
2024	0.96	0.96	0.98	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.98
2025	0.96	1.02	1.03	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.02	1.03
2026	0.95	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.97
2027	0.95	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.99
2028	0.95	1.03	1.01	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.03	1.00
2029	0.95	1.02	1.03	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.01	1.02
2030	0.95	1.01	1.01	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

- SSB deviated minimally from ABC even under large $\pm 50\%$ overages/underages.
- Carryover/payback at 1:1 returned stock to within 1% of ABC in the following years.
- Slight deviations $< 1\%$ due to allocations by number in recreational fleets.

Greater amberjack

Year	OFL	Overage Random 1	Overage Random 2	50% Overage	25% Overage	10% Overage	ABC	10% Underage	25% Underage	50% Underage	Underage Random 1	Underage Random 2
2017	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2018	0.96	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2019	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2020	0.95	0.90	0.90	0.90	0.95	0.98	1.00	1.02	1.05	1.10	1.10	1.10
2021	0.94	0.96	0.94	1.00	1.00	1.00	1.00	1.00	1.00	1.01	0.97	0.95
2022	0.93	1.08	1.05	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.08	1.05
2023	0.91	0.97	1.10	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.96	1.10
2024	0.90	0.89	0.92	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.89	0.92
2025	0.88	1.07	1.07	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.08	1.08
2026	0.86	1.01	0.89	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.01	0.90
2027	0.85	0.96	0.96	0.99	0.99	1.00	1.00	1.00	1.00	1.00	0.96	0.97
2028	0.84	1.09	1.02	0.99	0.99	0.99	1.00	0.99	1.00	1.00	1.09	1.03
2029	0.83	1.02	1.07	0.99	0.99	0.99	1.00	0.99	0.99	0.99	1.03	1.08
2030	0.82	0.99	1.00	0.99	0.99	0.99	1.00	0.99	0.99	0.99	0.99	1.00

King mackerel

Year	OFL	Overage Random 1	Overage Random 2	50% Overage	25% Overage	10% Overage	ABC	10% Underage	25% Underage	50% Underage	Underage Random 1	Underage Random 2
2017	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2018	0.98	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2019	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2020	0.97	0.92	0.92	0.92	0.96	0.98	1.00	1.02	1.04	1.08	1.08	1.08
2021	0.96	0.97	0.96	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.96
2022	0.96	1.06	1.04	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.05	1.03
2023	0.95	0.98	1.08	1.01	1.00	1.00	1.00	1.00	1.00	0.99	0.97	1.07
2024	0.95	0.93	0.95	1.01	1.00	1.00	1.00	1.00	1.00	0.99	0.91	0.93
2025	0.94	1.07	1.07	1.01	1.00	1.00	1.00	1.00	1.00	0.99	1.05	1.05
2026	0.94	1.02	0.93	1.01	1.00	1.00	1.00	1.00	1.00	0.99	1.00	0.92
2027	0.94	0.98	0.98	1.01	1.00	1.00	1.00	1.00	1.00	0.99	0.97	0.97
2028	0.94	1.08	1.03	1.01	1.00	1.00	1.00	1.00	1.00	0.99	1.07	1.02
2029	0.93	1.03	1.06	1.01	1.00	1.00	1.00	1.00	1.00	1.00	1.02	1.05
2030	0.93	1.00	1.01	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

DST applications - ICCAT

- Fixed fleet allocation projection assumptions

	Fixed F	Fixed Catch	% Diff
Bigeye tuna	77297.4	73275.8	-5.2
Yellowfin tuna	123844	137244	10.82
Swordfish	12708	12740.4	0.255

- Minimum size limits Shortfin mako

Remaining issues

- Original intention was to host the DST online to allow users to log access curated assessments
 - We are still working on this
- Making the move to 3.30
 - The current version was built for 3.24
 - Moving to 3.30 will significantly change the internal projection mechanisms

Importance in next generation assessment

- Understanding the feedback between stock assessment results and management is critical to estimating robust OFL's
- Important to consider not just modeling capacity, but also policy change requirements
- Can we build software robust enough to provide a safe big red button?