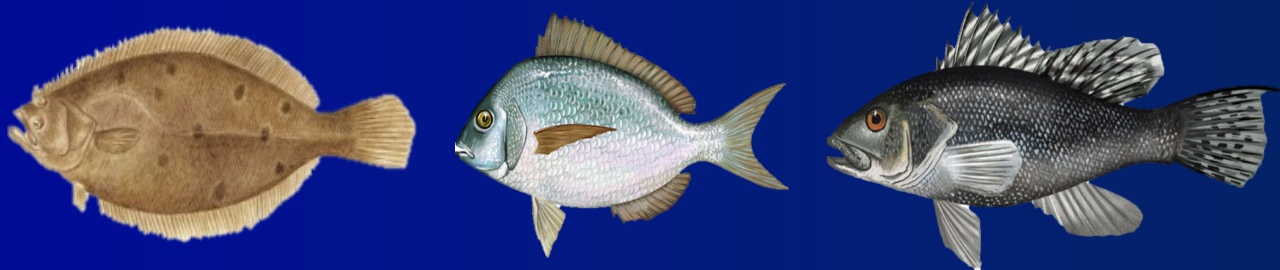




*Summer Flounder, Scup, Black Sea Bass*  
Review of Percent Change Approach,  
Accountability Measures, and  
New Fishery Models



Council and Board  
December 13, 2022

# Overview

- Percent Change Approach for setting recreational measures
- Com/rec allocation revisions
- Recreational accountability measures (AMs)
- New tools for predicting impacts of measures on harvest and discards (RDM and RFDM)
- Next steps

# Percent Change Approach

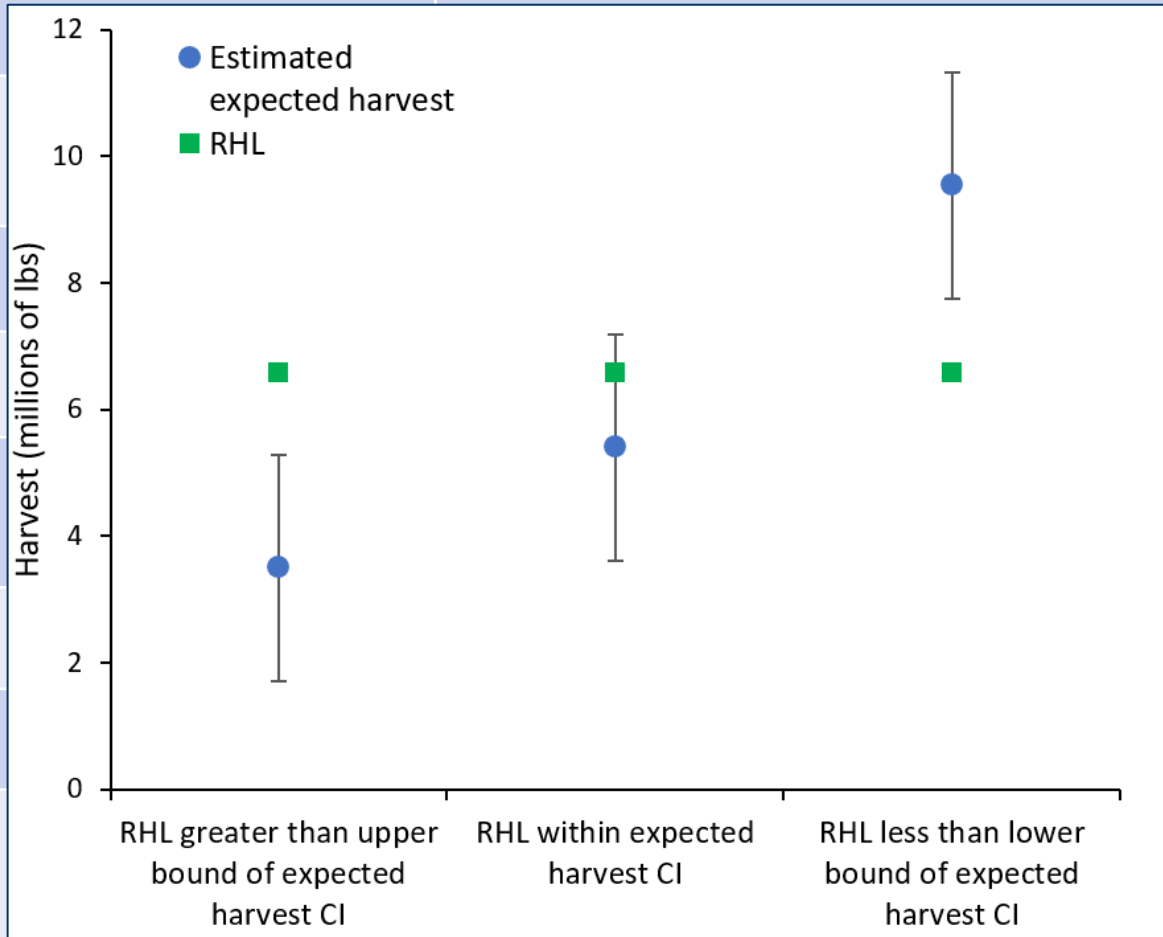
- Approved by Council and Policy Board for use starting with 2023 rec. measures for these 3 species.
  - To be replaced with a new approach in time for 2026 measures.
- Target level of harvest is no longer the RHL.
- Target level of harvest will vary based on:
  - RHL compared to a confidence interval around estimate of expected harvest under current measures and
  - Biomass compared to the target level.

*Column 1*  
**2023 RHL vs  
 expected harvest  
 under 2022 measures**

**RHL greater than  
 upper bound of  
 expected harvest CI**  
 (RHL underage  
 expected)

**RHL within expected  
 harvest CI**  
 (harvest expected to be  
 close to RHL)

**RHL less than lower  
 bound of expected  
 harvest CI**  
 (RHL overage expected)



| <i>Column 1</i><br><b>2023 RHL vs<br/> expected harvest<br/> under 2022 measures</b>               | <i>Column 2</i><br><b>Biomass compared to<br/> target level (SSB/SSB<sub>MSY</sub>)</b> |  |
|--|---|--|
| <b>RHL greater than<br/> upper bound of<br/> expected harvest CI</b><br>(RHL underage<br>expected) | <b>Very high</b><br>greater than 150% of target   |  |
|  | <b>High</b><br>at least target, but no higher<br>than 150% of target                    |  |
|  | <b>Low</b><br>below target stock size   |  |
| <b>RHL within expected<br/> harvest CI</b><br>(harvest expected to be<br>close to RHL)             | <b>Very high</b><br>greater than 150% of target   |  |
|  | <b>High</b><br>at least target, but no higher<br>than 150% of target                    |  |
|  | <b>Low</b><br>below target stock size   |  |
| <b>RHL less than lower<br/> bound of expected<br/> harvest CI</b><br>(RHL overage expected)        | <b>Very high</b><br>greater than 150% of target   |  |
|  | <b>High</b><br>at least target, but no higher<br>than 150% of target                    |  |
|  | <b>Low</b><br>below target stock size   |  |

| <i>Column 1</i><br><b>2023 RHL vs expected harvest under 2022 measures</b>            | <i>Column 2</i><br><b>Biomass compared to target level (SSB/SSB<sub>MSY</sub>)</b> | <i>Column 3</i><br><b>Change in Harvest</b>  |
|---|--|--|
| <b>RHL greater than upper bound of expected harvest CI</b><br>(RHL underage expected) | <b>Very high</b><br>greater than 150% of target                                    | <b>Liberalization</b> % = difference between harvest estimate and 2023 RHL, <b>not to exceed 40%</b> |
|   | <b>High</b><br>at least target, but no higher than 150% of target                  | <b>Liberalization</b> % = difference between harvest estimate and 2023 RHL, <b>not to exceed 20%</b> |
|   | <b>Low</b><br>below target stock size  | <b>Liberalization: 10%</b>   |
| <b>RHL within expected harvest CI</b><br>(harvest expected to be close to RHL)        | <b>Very high</b><br>greater than 150% of target                                    | <b>Liberalization: 10%</b>   |
|   | <b>High</b><br>at least target, but no higher than 150% of target                  | <b>No liberalization or reduction: 0%</b>  |
|   | <b>Low</b><br>below target stock size  | <b>Reduction: 10%</b>  |
| <b>RHL less than lower bound of expected harvest CI</b><br>(RHL overage expected)     | <b>Very high</b><br>greater than 150% of target                                    | <b>Reduction: 10%</b>  |
|   | <b>High</b><br>at least target, but no higher than 150% of target                  | <b>Reduction</b> % = difference between harvest estimate and 2023 RHL, <b>not to exceed 20%</b>      |
|   | <b>Low</b><br>below target stock size  | <b>Reduction</b> % = difference between harvest estimate and 2023 RHL, <b>not to exceed 40%</b>      |

# Revisions to Com/Rec Allocations

| Allocation Changes      |   |  |
|-------------------------|---|--|
| Species                 | Previous Allocations                      | Revised Allocations                    |
| <b>Summer flounder*</b> | 60% Com; 40% Rec<br><i>Landings-based</i> | 55% Com; 45% Rec<br><i>Catch-based</i> |
| <b>Scup</b>             | 78% Com; 22% Rec<br><i>Catch-based</i>    | 65% Com; 35% Rec<br><i>Catch-based</i> |
| <b>Black sea bass*</b>  | 49% Com; 51% Rec<br><i>Landings-based</i> | 45% Com; 55% Rec<br><i>Catch-based</i> |

\*Previous and revised allocations are not directly comparable due to the switch from landings-based to catch-based allocations.

| Impacts on 2023 RHL    |  |  |
|------------------------|--|--|
| Species                | 2023 RHL prior to revised com/rec allocation | Revised 2023 RHL accounting for new com/rec allocation |
| <b>Summer flounder</b> | 10.36  | <b>10.62</b> (+2.5%)                                   |
| <b>Scup</b>            | 5.41   | <b>9.27</b> (+71%)                                     |
| <b>Black sea bass</b>  | 5.95   | <b>6.57</b> (+10%)                                     |

# Accountability Measures

- Minor changes made through Harvest Control Rule Framework/Addenda.
- AMs still triggered based on comparison of 3 yr avg catch to 3 yr avg rec. ACL.
- AM response still varies based on stock status.
- Paybacks of overages still only required when stocks are below their target biomass level.



# Rec. Accountability Measures

- 1. If the stock is overfished, under a rebuilding plan, or stock status is unknown:** Exact overage amount must be paid back as soon as possible. **Payback** may be evenly spread over 2 years if doing so allows for identical measures for the upcoming 2 years.
- 2. If biomass is above the threshold, but below the target, and the stock is not under a rebuilding plan:**
  - **If only the ACL exceeded:** Adjust bag/size/season, taking into account performance of the measures and conditions that precipitated the overage.
  - **If most recent F exceeds Fmsy:** adjustment to the rec. ACT will be made as soon as possible as a payback that will be scaled based on stock biomass where  $\text{payback} = (\text{overage amount}) * (B_{msy} - B) / \frac{1}{2} B_{msy}$ . **Payback** may be evenly spread over 2 years if doing so allows for identical measures for the upcoming 2 years. If F/Fmsy not available for most recent year of catch data, catch vs ABC comparison will be used.
- 3. If biomass is above the target:** Adjustments to measures will be made, taking into account the performance of the measures and conditions that precipitated the overage.

# Accountability Measures

| Species        | Year           | Rec. ACL     | Rec. harvest | Rec. dead discards | Rec. dead catch | % Over (+) or Under (-) ACL |
|----------------|----------------|--------------|--------------|--------------------|-----------------|-----------------------------|
| Summer founder | 2019           | 11.51        | 7.80         | 3.04               | 10.84           | -6%                         |
|                | 2020           | 11.51        | 10.06        | 3.19               | 13.26           | +15%                        |
|                | 2021           | 12.48        | 6.81         | 2.03               | 9.00            | -28%                        |
|                | <b>Average</b> | <b>11.83</b> | <b>8.23</b>  | <b>2.76</b>        | <b>11.03</b>    | <b>-7%</b>                  |
| Scup           | 2019*          | 8.01         | 5.41         | 0.41               | 5.82            | -27%                        |
|                | 2020           | 7.87         | 12.91        | 1.15               | 14.06           | +79%                        |
|                | 2021           | 7.66         | 16.62        | 1.36               | 17.98           | +135%                       |
|                | <b>Average</b> | <b>7.85</b>  | <b>11.65</b> | <b>0.97</b>        | <b>12.62</b>    | <b>+61%</b>                 |
| Black sea bass | 2019*          | 4.59         | 3.46         | 0.50               | 3.96            | -14%                        |
|                | 2020           | 8.09         | 9.05         | 3.46               | 12.50           | +55%                        |
|                | 2021           | 7.93         | 11.97        | 4.20               | 16.16           | +104%                       |
|                | <b>Average</b> | <b>6.87</b>  | <b>8.16</b>  | <b>2.72</b>        | <b>10.87</b>    | <b>+58%</b>                 |

\* 2019 values for scup and black sea bass are in old MRIP and were provided by GARFO/NEFSC

# Accountability Measures

- AMs for stocks above their biomass target: Adjustments to measures will be made, taking into account the performance of the measures and conditions that precipitated the overage.
- 10/20/22 GARFO letter to Council: Due to recent actions taken by MAFMC/ASMFC, no additional action needed beyond changes required by Percent Change Approach.

# New Tools for Predicting Harvest

- **Recreational Demand Model (RDM)**
  - Developed by Northeast Fisheries Science Center
- **Recreational Fleet Dynamics Model (RFDM)**
  - Developed by RI DEM
- Use of these models is not required under the Percent Change Approach
- Both are an improvement over past methods of using only MRIP data to predict future harvest.

# SSC Review

- Both models were reviewed by a subset of Council's SSC in September 2021.
- Several changes were made to both models after the SSC sub-group review. The models have not been reviewed a second time.

# Recreational Demand Model (RDM): Overview

Goal is to simulate trip outcomes under a given stock structure and set of management measures

## Model input

**Biological inputs:**  
*Historical/projected numbers-at-age stock assessment data*

*Catch-per-trip/catch-at-length distributions*

**Economic inputs**  
*Trip cost distributions*

*Information about angler preferences for harvesting/releasing fish*

*Management measures*

## Simulation algorithm

*Simulate individual trip outcomes*

*Calculate fishing utility*

*Calculate angler welfare, angler effort, and subsequent harvest and discards*

## Model output

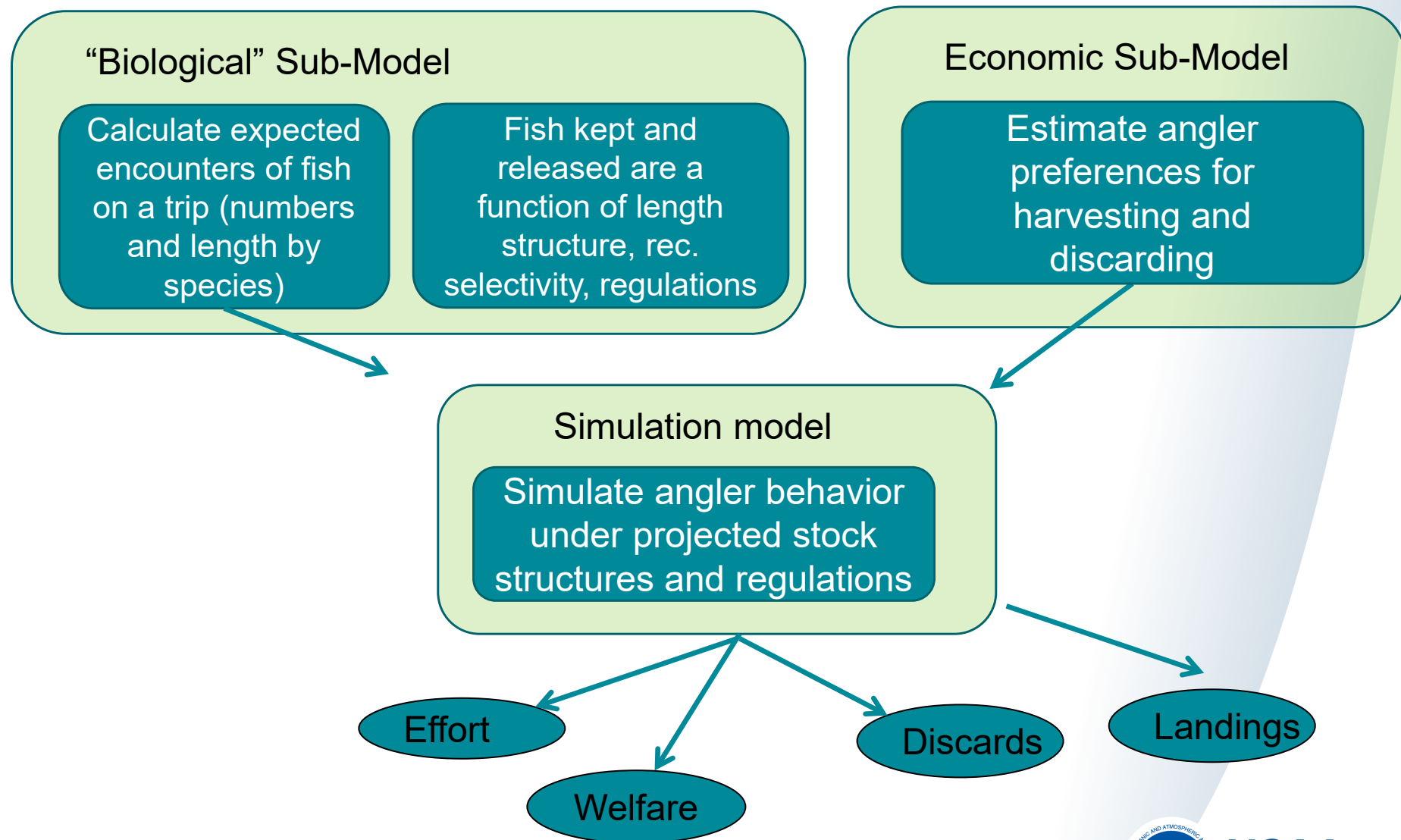
*Total recreational harvest and discards*

*Total angler welfare/other metrics of fishing success*



**NOAA**  
**FISHERIES**

# Recreational Demand Model: Overview



# Recreational Fleet Dynamics Model (RFDM): Overview

- Aims to emulate response to regulation changes (how does harvest and/or discards change given adjustments to management measures)
- Use available data (MRIP, regulatory history, and stock information) to estimate how harvest and discards will respond to changes in management measures
- Multiple model configurations and combinations of variables were tested to determine best model for each species



# Recreational Fleet Dynamics Model: Data Inputs

- Data through 2021, but excludes 2020
- Regulatory variables (wave, bag, season length, minimum size)
  - Scup with addition of mode
- Stock status and management variables (RHL, SSB, lagged R)

| State       | Year | Wave | Mode               | Catch  | K.D | Bag | MinLen | SeasonLen | RHL  | SSB    | LagRecr |
|-------------|------|------|--------------------|--------|-----|-----|--------|-----------|------|--------|---------|
| CONNECTICUT | 2022 | 2    | Private/Rental/Shc | 416    | D   | 30  | 10     | 61        | 6.08 | 156947 | 100436  |
| CONNECTICUT | 2022 | 3    | Forhire            | 8942   | D   | 30  | 10     | 61        | 6.08 | 156947 | 100436  |
| CONNECTICUT | 2022 | 3    | Forhire            | 16136  | K   | 30  | 10     | 61        | 6.08 | 156947 | 100436  |
| CONNECTICUT | 2022 | 3    | Private/Rental/Shc | 112373 | D   | 30  | 10     | 61        | 6.08 | 156947 | 100436  |
| CONNECTICUT | 2022 | 3    | Private/Rental/Shc | 86421  | K   | 30  | 10     | 61        | 6.08 | 156947 | 100436  |
| CONNECTICUT | 2022 | 4    | Forhire            | 28057  | D   | 50  | 10     | 62        | 6.08 | 156947 | 100436  |

# RFDM Description – Scup

**Harvest** =  $s(\text{Year}) + \text{Mode} + s(\text{MinLength}) + s(\text{Wave}) + \text{State} + s(\text{Season}) + s(\text{Bag Limit}) + \text{SSB}$

**Discards** =  $s(\text{Year}) + \text{Mode} + s(\text{MinLength}) + s(\text{Wave}) + \text{State} + s(\text{Season}) + s(\text{Bag Limit}) + \text{RHL}$

# Choice of Model for 2023

- MC recommendations for preferred model for setting 2023 measures varied by species based on capabilities of the models and model performance.
- GARFO 12/8 letter:
  - GARFO makes determination on best available science when approving mgmt measures.
  - GARFO considers Recreational Demand Model to be best available science for setting 2023 measures for all 3 species.
    - Incorporates data on angler behavior.
    - Has narrower confidence intervals than Rec. Fleet Dynamics Model.

- **10/20: GARFO letter** stating no additional action is needed to address triggering of AMs for scup and BSB.
- **10/26: MC meeting** to review models and discuss process.
- **11/15: MC meeting** to recommend preferred model for 2023 for each species, resulting % change, and other recommendations for measures.
  - Recommended RDM for summer flounder, RFDM for scup and BSB.
- **11/30: AP meeting** to provide AP input.
- **12/6: Revised RDM results** provided to staff, changing the Percent Change Approach outcome for summer flounder from 10% liberalization to 10% reduction.
- **12/8: GARFO letter** stating RDM is best available science and should be used for all 3 species for 2023.

# Next Steps

- **Today:** Council/Board determine required coastwide percent change for each species.
  - As well as fed. waters measures for scup, conservation equivalency measures for summer flounder and black sea bass.
- **January:** TC meetings to develop guidance for state measures.
- **January/February:** States develop proposals for state waters measures.
- **February/March:** Board reviews and considers approval of state waters measures.
- **March or later:** Final rule for federal waters measures, including waiving of federal summer flounder and black sea bass measures, if approved.

# Questions/Discussion

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# Changes to Process Since Setting Last Year's Rec. Measures

## ■ Revisions to com/rec allocations

- Increased the 2023 RHLs compared to what would have been implemented under the previous allocations

## ■ Improved tools are available for analyzing impacts of measures on harvest and discards

- RDM and RFDM, both available for all 3 species
- Not required, but recommended for use by staff and MC

## ■ Percent Change Approach

- Approved through Harvest Control Rule FW/addenda for setting rec. measures starting with 2023
- Defines target level of coastwide harvest measures will aim to achieve
- Target is no longer the RHL

# RFDM Description – Black Sea Bass

**Harvest** =  $s(\textit{Year}) + s(\textit{MinLength}) + s(\textit{Wave}) + \textit{State} + s(\textit{Season}) + s(\textit{Bag}) + \textit{LaggedRecr} + \textit{RHL}$

**Discards** =  $s(\textit{Year}) + s(\textit{MinLength}) + s(\textit{Wave}) + \textit{State} + s(\textit{Season}) + s(\textit{Bag}) + \textit{LaggedRecr} + \textit{RHL}$



# RFDM Description – Summer Flounder

**Harvest** =  $s(\textit{Year}) + s(\textit{MinLength}) + s(\textit{Wave}) +$   
 $\textit{State} + s(\textit{Season}) + s(\textit{Bag}) + \textit{LaggedRecr} +$   
RHL

**Discards** =  $s(\textit{Year}) + s(\textit{MinLength}) + s(\textit{Wave}) +$   
 $\textit{State} + s(\textit{Season}) + s(\textit{Bag}) + \textit{LaggedRecr} +$  RHL

# Data Inputs

| Data                                  | Rec. Demand Model | Rec. Fleet Dynamics Model |
|---------------------------------------|-------------------|---------------------------|
| <b>MRIP harvest and discards</b>      | Y                 | Y                         |
| <b>Time series of bag/size/season</b> |                   |                           |
| By state                              | Y                 | Y                         |
| By wave                               | Y                 | Y                         |
| By mode                               | N*                | Scup only*                |
| <b>Time series of RHLs</b>            | N                 | Y                         |
| <b>Angler behavior</b>                | Y                 | N                         |
| <b>Stock status</b>                   |                   |                           |
| Numbers at length                     | Y                 | N                         |
| SSB                                   | N                 | Scup only                 |
| Recruitment                           | N                 | Fluke and BSB only        |

# Other Considerations

| Considerations  | Rec. Demand Model | Rec. Fleet Dynamics Model |
|---|-------------------|---------------------------|
| Reviewed by SSC and improved based on review                                  | Y                 | Y                         |
| Accounts for uncertainty and can produce CI                                   | Y                 | Y                         |
| Can evaluate measures at the state/regional level                             | Y                 | Y                         |
| Can evaluate federal waters measures independently from state waters measures | N                 | N                         |
| Can evaluate slot limits  | Y                 | N*                        |
| MC/TC can produce model results on their own                                  | N                 | Y                         |

\*Limited to past measures. May be possible to evaluate slot limits in the future after slots 27 are used and associated MRIP estimates are available.

# Percent Change Approach vs. Targeting 2023 RHL

| Species         | Model                  | Estimated 2023 Harvest Under 2022 Measures | 80% Confidence Interval | 2023 RHL | Stock Size Category | Percent Change Approach Requirement | Change to Meet RHL (Old Method) |
|-----------------|------------------------|--|-------------------------|----------|---------------------|-------------------------------------|---------------------------------|
| Summer Flounder | RDM: Previous (Nov 10) | 8.38                                       | 7.56-9.52               | 10.62    | Low                 | 10% liberalization                  | 27% liberalization              |
|                 | RDM: Current (Dec 6)   | 10.92                                      | 9.23-12.94              |          |                     | 10% reduction                       | 3% reduction                    |
|                 | RFDM: Current (Nov 15) | 12.77 (with NJ adjustment: 10.45 or 10.18) | 7.01-22.26              |          |                     | 10% reduction                       | 17% reduction                   |
| Scup            | RDM: Previous (Nov 10) | 17.21                                      | 13.56-22.68             | 9.27     | Very High           | 10% reduction                       | 46% reduction                   |
|                 | RDM: Current (Dec 6)   | 14.31                                      | 9.90-17.40              |          |                     | 10% reduction                       | 35% reduction                   |
|                 | RFDM: Current (Nov 15) | 14.42*                                     | 8.95-23.08*             |          |                     | 10% liberalization                  | 36% reduction                   |
| Black Sea Bass  | RDM: Previous (Nov 10) | 11.05                                      | 10.00-11.96             | 6.74     | Very High           | 10% reduction                       | 39% reduction                   |
|                 | RDM: Current (Dec 6)   | 7.93                                       | 7.17-8.63               |          |                     | 10% reduction                       | 15% reduction                   |
|                 | RFDM: Current (Nov 15) | 11.96*                                     | 8.17-16.81*             |          |                     | 10% reduction                       | 44% reduction                   |

\*Converted to pounds based on average weight of harvest in 2021 from MRIP data

# 2023 Process

- 1) What is expected 2023 harvest under 2022 measures, including confidence interval (CI)?
- 2) How do these CIs compare to the 2023 RHLs?
- 3) When combined with relevant biomass category, what percent change in harvest should measures aim to achieve?
- 4) Are additional changes needed due to the triggering of AMs for scup and black sea bass?
- 5) How should measures be adjusted to achieve the necessary percent change?