



# A theoretical Blue Shark Management Strategy Evaluation for North Atlantic

Global BSH MSE Workshop  
Rome, Italy – October 2025

PRELIMINARY





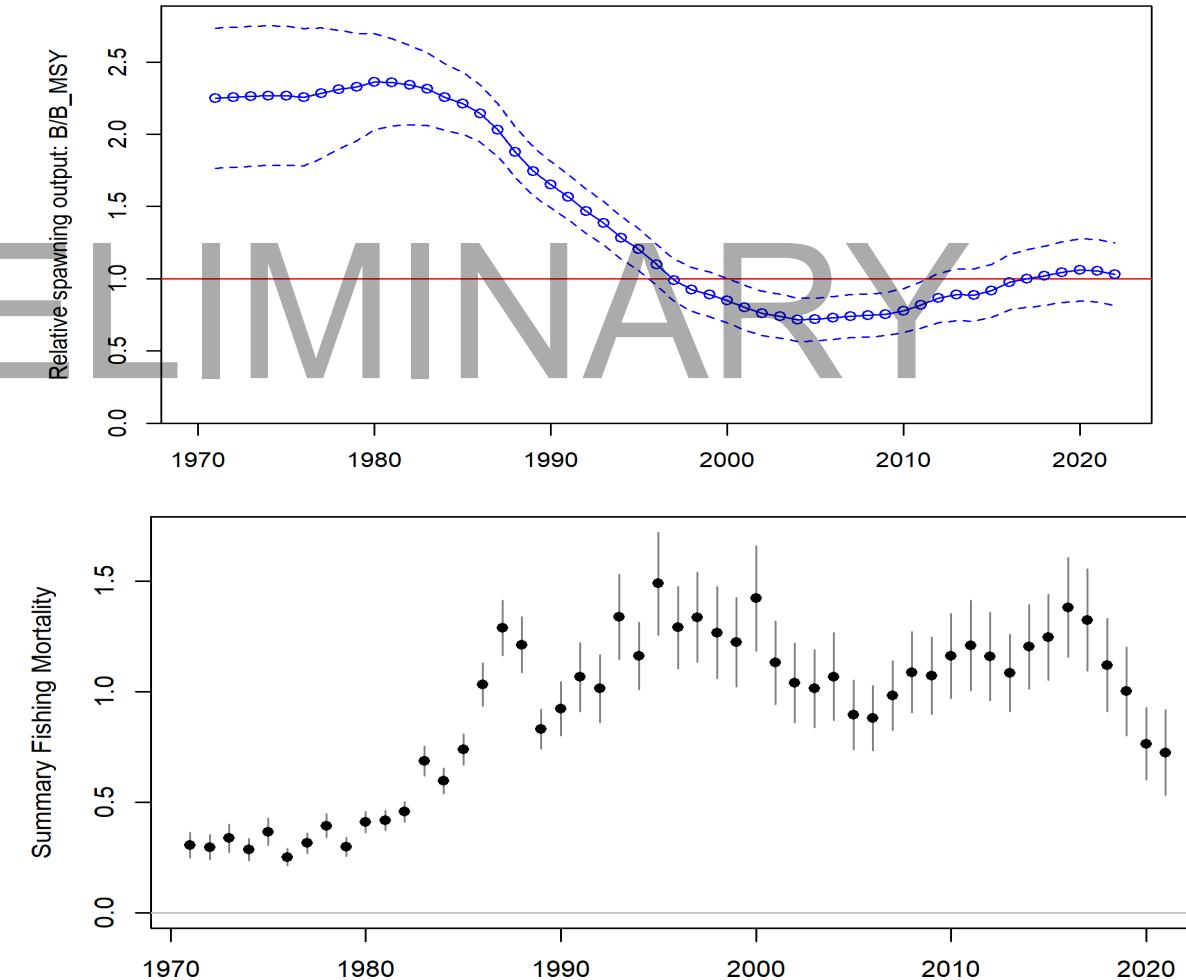
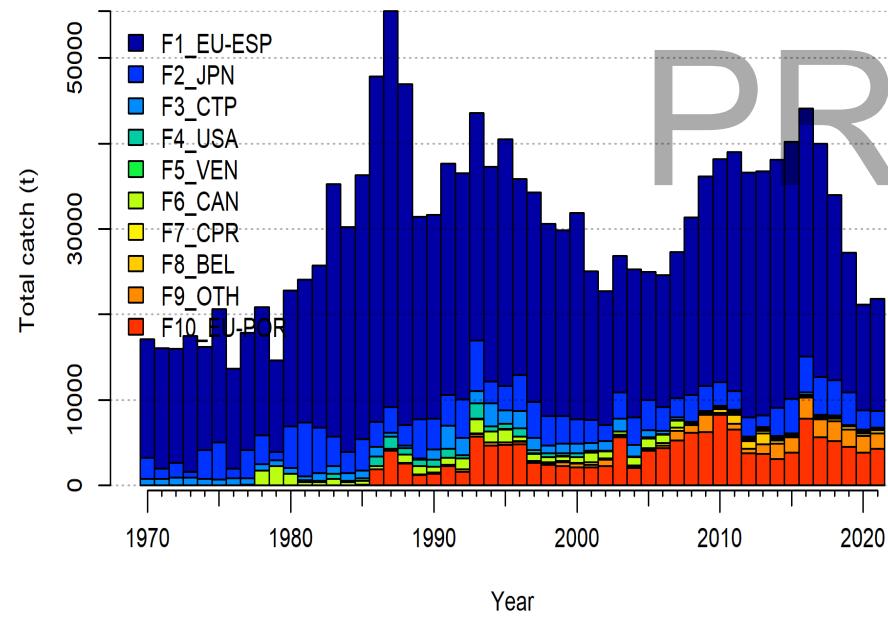
## Breakout Session Part 2

# Blue PRELIMINARY Shark Case Study: Base Case



# Stock Overview: North Atlantic Blue Shark

- Provide a brief summary on the fishery dynamics predicted by the SS3 model e.g., historical trend in spawning biomass, catch (discards), fishing mortality, SB/SB<sub>MSY</sub>, F/F<sub>MSY</sub>





# Candidate North Atlantic Management Procedures

- Briefly describe the Candidate Management Procedures evaluated in MSE

**Empirical MPs**, based on several CPUE indices, combined with equal weighting.

- Emp2 applies a constant harvest rate on the combined index (similar to the harvest rate of the 2 most recent years). TAC change constraint is 30%.
- Emp4 = Emp2 but using fewer CPUE indices (only SPN and JPN).
- Emp2CP30pc and Emp2CP20pc are based on Emp2 but use Control Points and incorporate alternative constraints on TAC change.
- Emp5 = Emp2 but with lower harvest rate (results not available in this presentation)

**Model-based MPs**, based on SPICT:

- 2 alternatives (Spict1 and Spict2), as provided in the workshop script, no time to investigate details
- 2 alternatives “correcting” TAC constraint: Spict1correct and Spict2correct



# Candidate North Atlantic Management Procedures

- *What are the main properties of the CMPs that would be considered in your MSE?*

Aim is to find a CMP that provides acceptable performance metrics (to be decided by managers). For this exercise, we considered the following axes:

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Status: probability of being in the green quadrant of Kobe plot

Safety: probability of being above Blim (or some proxy thereof, taken in this exercise as 0.4Bmsy)

Yield: maximise yield subject to Status and Safety constraints

Interannual variability in TAC: should be low, subject to other constraints and objectives



## Performance Metrics

- *What PMs are used to summarize the performance of the CMPs?*

Status: Probability of being in green quadrant of Kobe plot (average over all projection years 1-30)

Status\_11\_30: Probability of being in green quadrant of Kobe plot (average over projection years 11-30)

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Safety: Probability of SB>0.4SBmsy (average over all projection years 1-30)

Catch\_ST and Catch\_LT: average catch in short-term (average over years 1-10) and long-term (average over years 21-30)

AAVY: probability that the change in Catch over consecutive years does not exceed 20% (average over all projection years)



## Performance Metrics

- ▶ Provide a table of summary PM values for the CMPs evaluated in the MSE

### Base-case OM

| MP            | Status | Safety | Catch_ST | Catch_LT | AAVY | Status_11_30 |
|---------------|--------|--------|----------|----------|------|--------------|
| Emp2          | 0.3890 | 1.000  | 20,400   | 28,100   | 1    | 0.5040       |
| Emp4          | 0.2140 | 0.983  | 21,000   | 27,600   | 1    | 0.2670       |
| Emp2CP30pc    | 0.5640 | 1.000  | 16,500   | 28,400   | 1    | 0.6790       |
| Emp2CP20pc    | 0.5640 | 1.000  | 16,500   | 28,400   | 1    | 0.6790       |
| Spict1        | 0.7560 | 1.000  | 16,300   | 16,300   | 1    | 0.9960       |
| Spict2        | 0.7560 | 1.000  | 16,300   | 16,300   | 1    | 0.9960       |
| Spict1correct | 0.0194 | 0.519  | 24,700   | 3,640    | 0    | 0.0125       |
| Spict2correct | 0.0194 | 0.519  | 24,700   | 3,640    | 0    | 0.0125       |



## Breakout Session Part 3

# Alternative OMs: Reference and Robustness



## North Atlantic Alternative OM<sup>s</sup>

Key uncertainties: there was no time to explore this in the workshop

Two alternative OM<sup>s</sup> were considered, multiplying the base-case M by 0.8 and 1.25

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## Performance Metrics

- Provide a table of summary PM values for the CMPs evaluated in the MSE

All 3 OMs

| MP            | Status | Safety | Catch_ST | Catch_LT | AAVY | Status_11_30 |
|---------------|--------|--------|----------|----------|------|--------------|
| Emp2          | 0.563  | 1.000  | 20,100   | 26,900   | 1    | 0.6290       |
| Emp4          | 0.434  | 0.994  | 20,800   | 26,600   | 1    | 0.4620       |
| Emp2CP30pc    | 0.729  | 1.000  | 16,600   | 26,500   | 1    | 0.8280       |
| Emp2CP20pc    | 0.729  | 1.000  | 16,600   | 26,500   | 1    | 0.8280       |
| Spict1        | 0.847  | 1.000  | 15,600   | 15,500   | 1    | 0.9990       |
| Spict2        | 0.847  | 1.000  | 15,600   | 15,500   | 1    | 0.9990       |
| Spict1correct | 0.105  | 0.569  | 23,500   | 6,840    | 0    | 0.0375       |
| Spict2correct | 0.105  | 0.569  | 23,500   | 6,840    | 0    | 0.0375       |



# North Atlantic Operating Models

- ▶ *How robust are the cMPs to the uncertainty in the:*
  - a) *Reference Models?*
  - b) *Robustness models?*
  
- ▶ *What additional uncertainties would you consider in the:*
  - a) *Reference Models?*
  - b) *Robustness models?*

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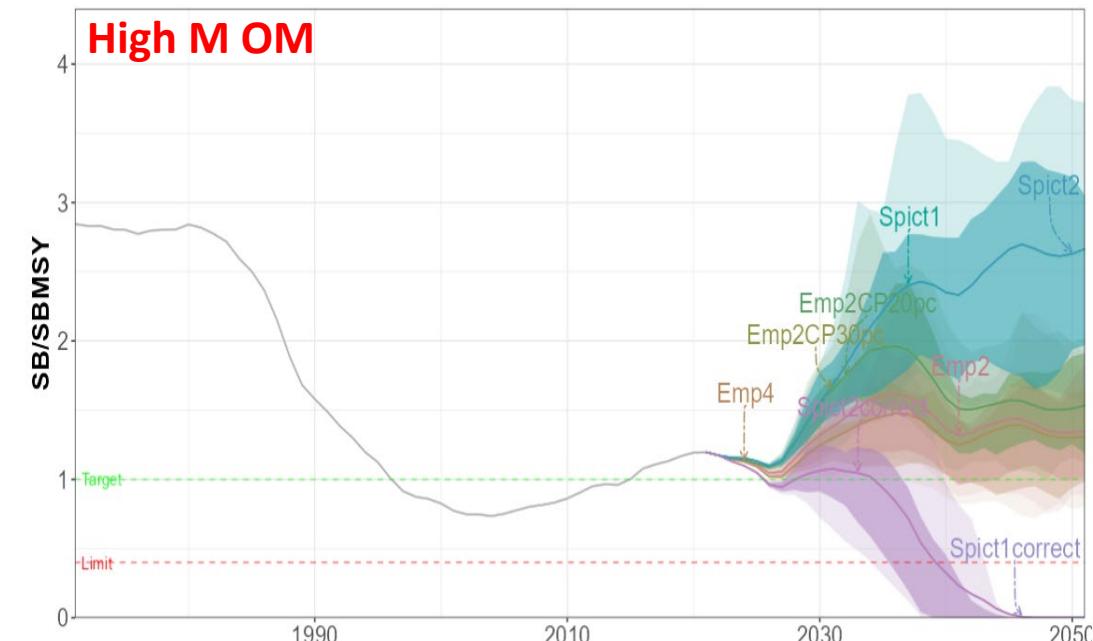
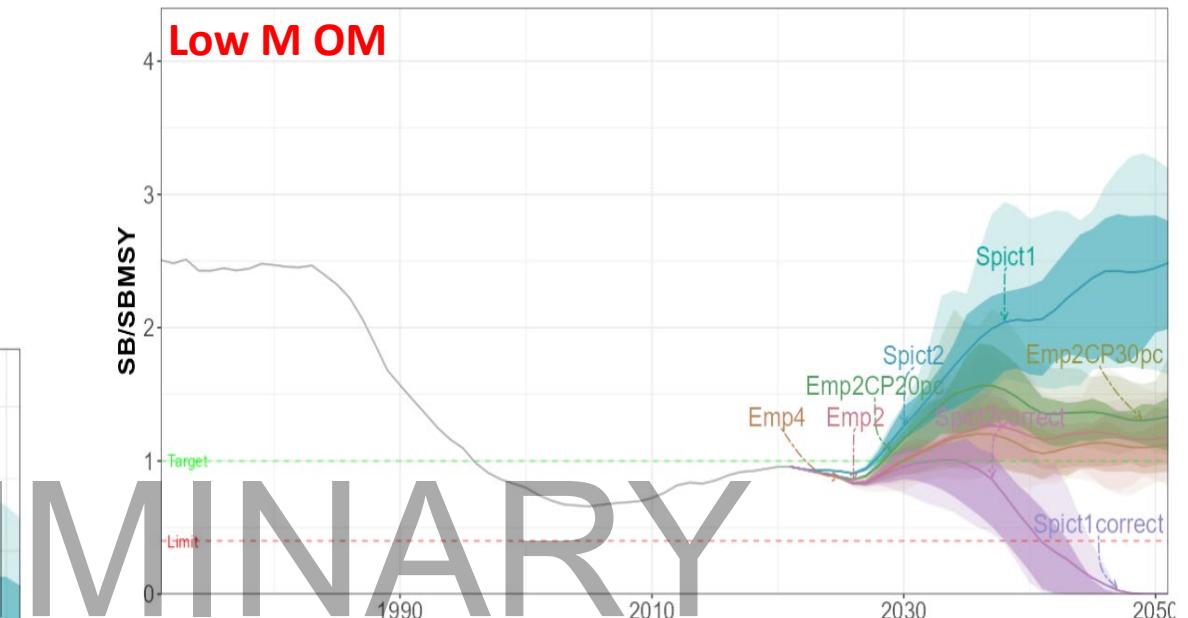
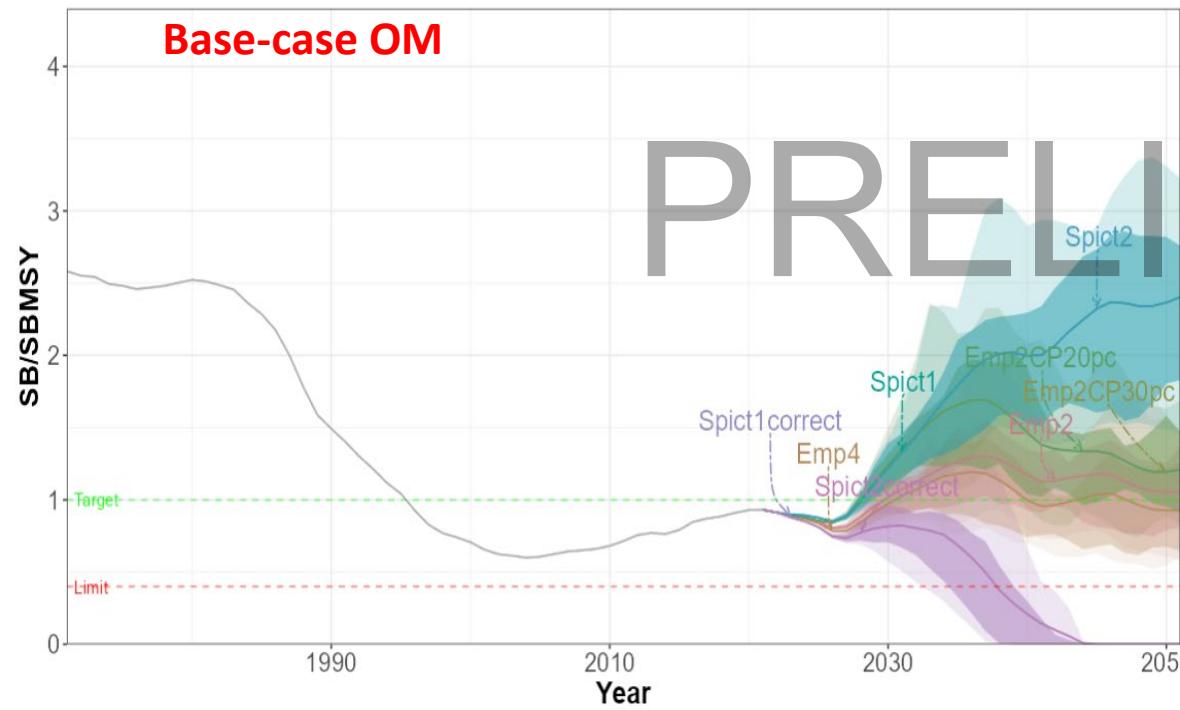
## Visualizing Results

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**Slick Breakout Session**



# Candidate MP Performance

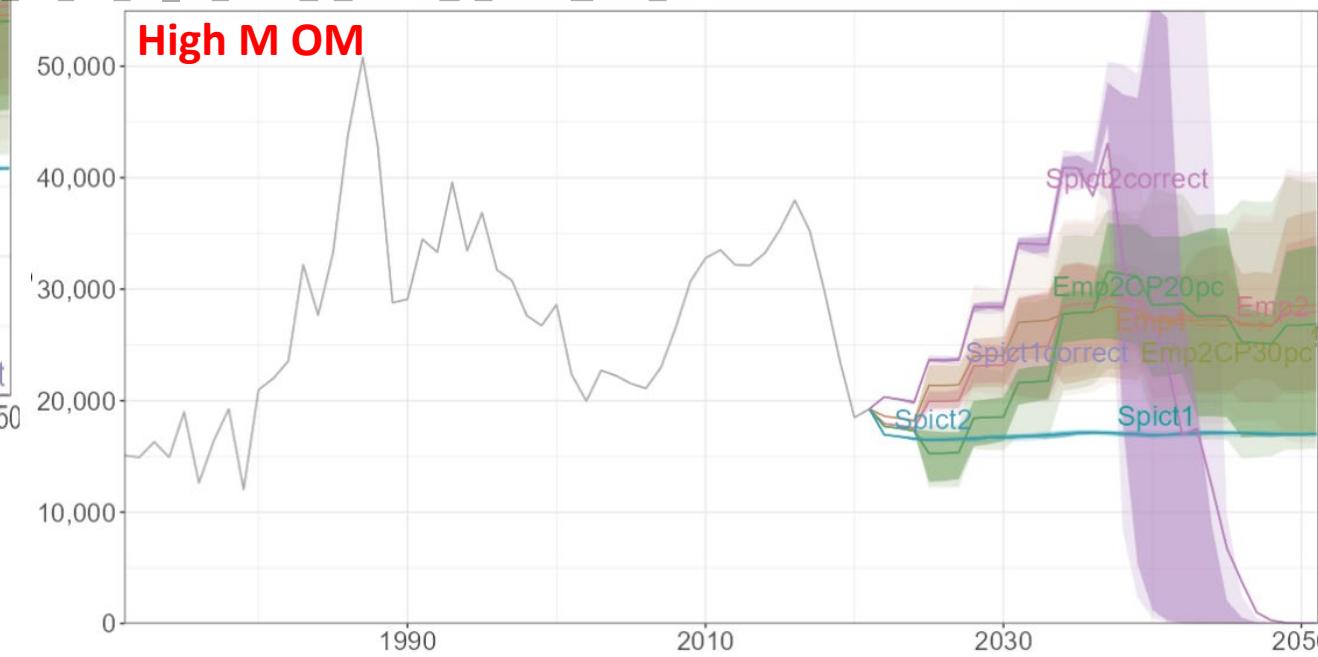
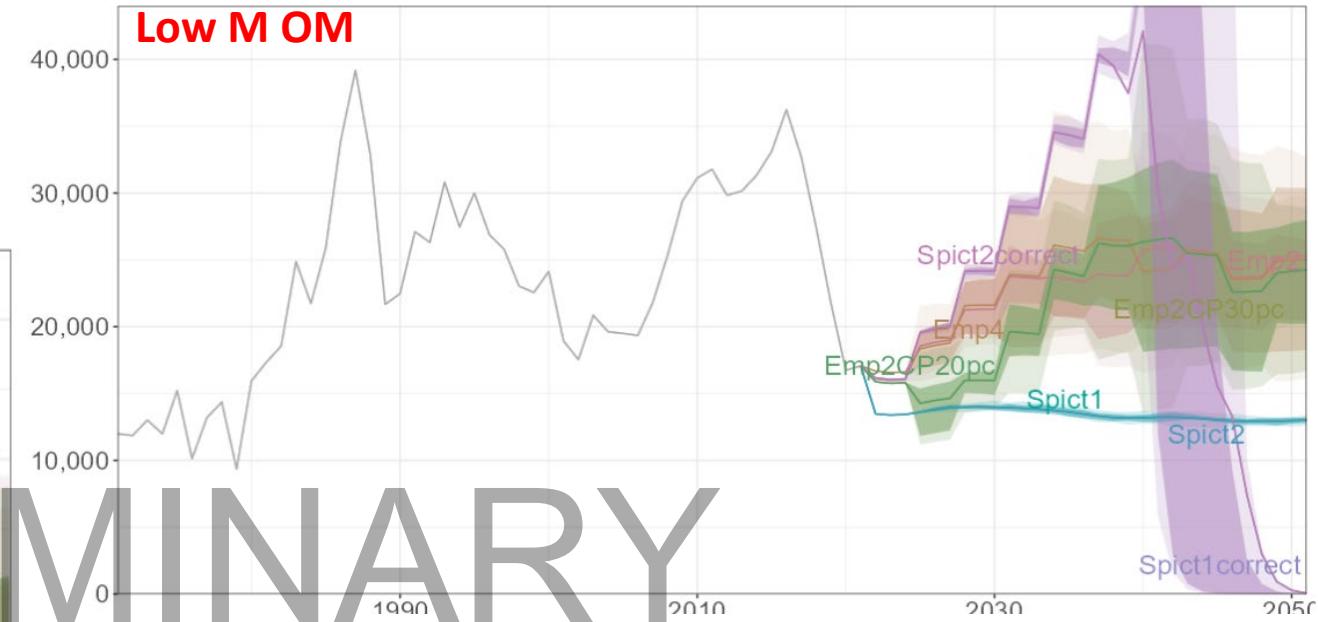
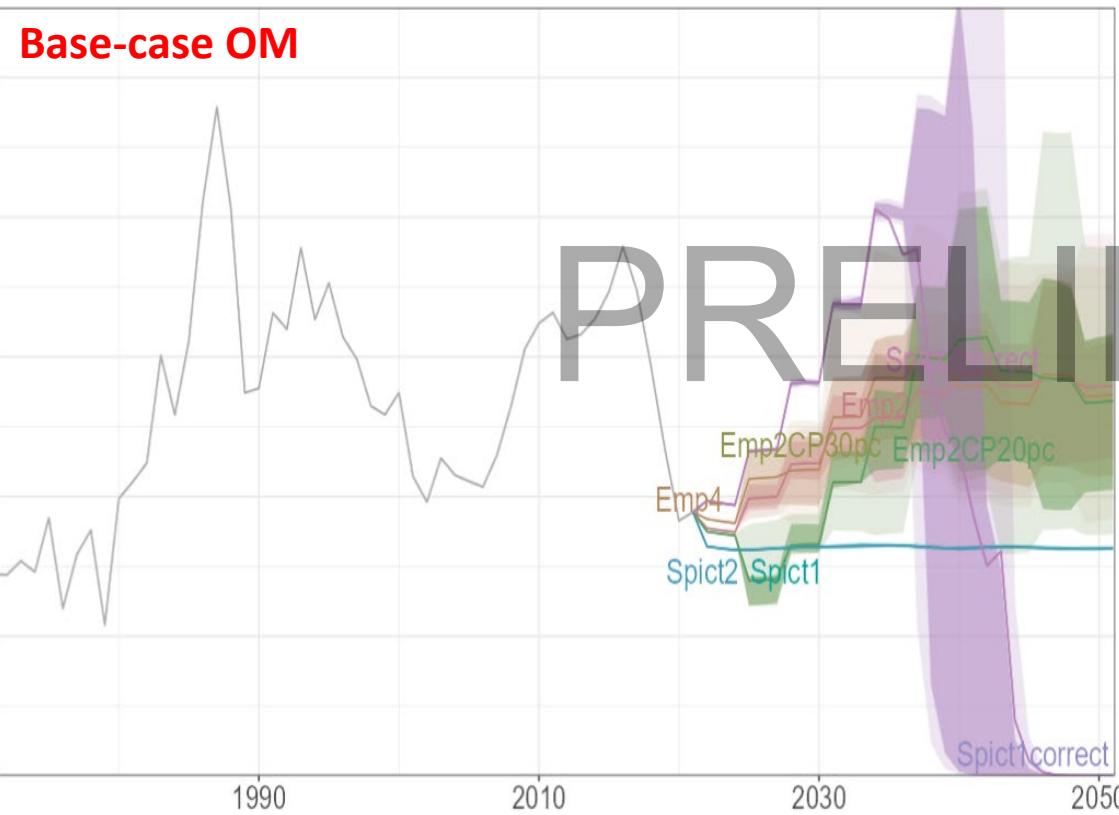
## Time Series Plots - Biomass





# Candidate MP Performance

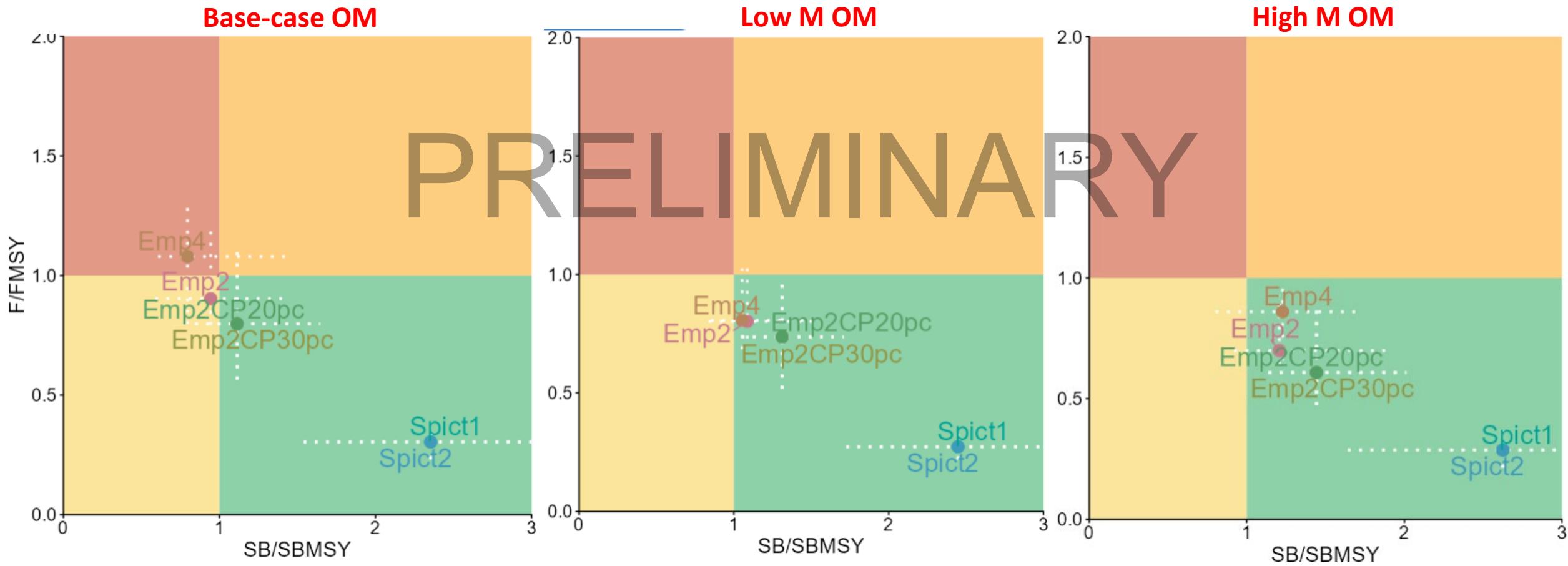
## Time Series Plots - Yield





# Candidate MP Performance

Kobe Plot in final projection projection year

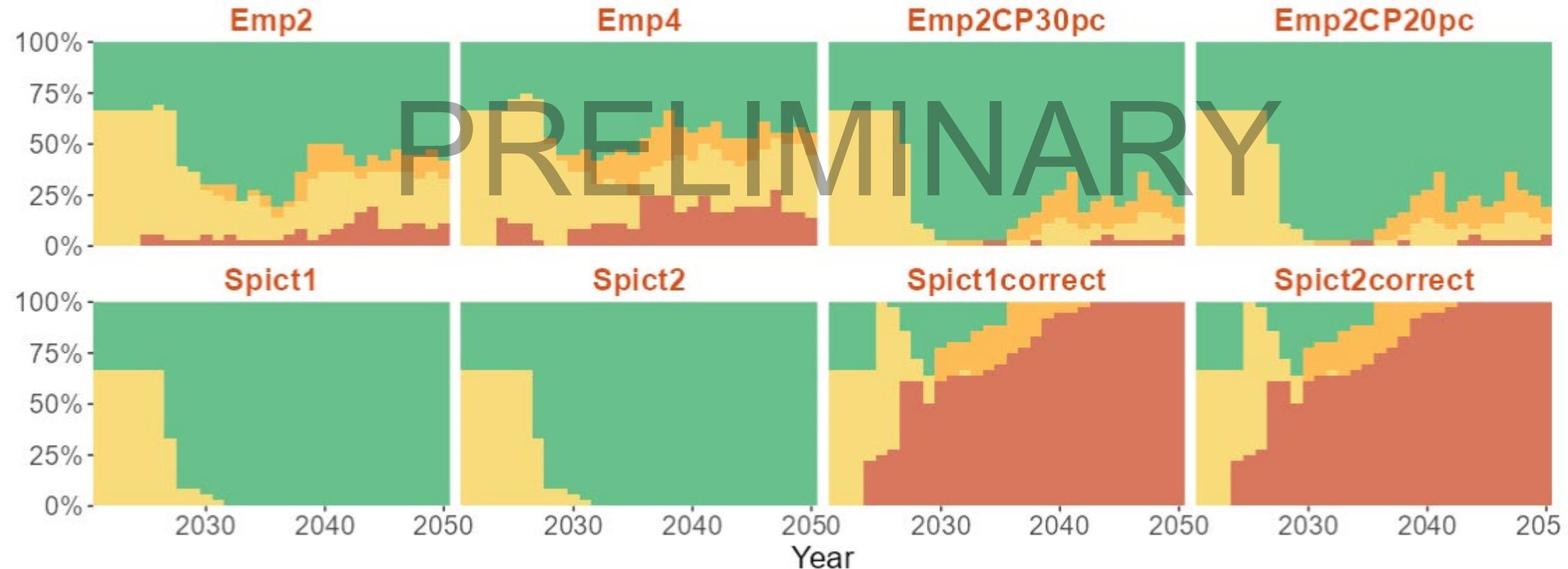




# Candidate MP Performance

Kobe Time Plot

All 3 OMs combined





# Candidate MP Performance

Quilt Table – Note: this is a repetition from an earlier slide

All 3 OMs

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## Key Results and Considerations

- Briefly describe the performance of the CMPs across the uncertainty in the OM<sup>s</sup> and, based on the example management objectives we're using, describe which CMP is the best candidate for this fishery

Based on the 3 OM<sup>s</sup>:

- All empirical MP<sup>s</sup> meet Safety Objective
- All empirical MP<sup>s</sup> except Emp4 result in more than 60% probability of being in green Kobe quadrant on average over years 11-30
- When including Control Points in Emp2, a higher probability of green Kobe is obtained (relative to Emp2), with less overall catch and more variable catches over time.

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- Include any key considerations for future efforts

- Careful consideration of OM grid is required, as well as designing and tuning alternative MP<sup>s</sup>



## Draft Workplan

- ▶ *Insert and discuss your group's draft workplan, key steps and challenges for your tRFMO to move forward with BSH MSE efforts and eventually reach MP adoption*

ICCAT intends to develop Management Procedures for North Atlantic and South Atlantic stocks over the next few years

The current proposal from the Scientific Committee (pending Commission approval) is to start with some preliminary work in 2026 and then start in full in 2027, aiming for a 3-year process (2027-2029).



# PRELIMINARY Questions from the group?