Ecological Reference Point Assessment: Additional Analysis

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August, 2020

Outline

- Introduction
- Additional Analysis
- Conclusions and Recommendations
- Questions and Wrap-up

Introduction: Advice

- ERP WG recommends a combination of the BAM single-species model and the NWACS-MICE model as a tool for managers to evaluate trade-offs between menhaden harvest and predator biomass to establish reference points and quotas menhaden that account for Atlantic menhaden's role as a forage fish.

Introduction

ERP WG developed an example ERP target and threshold based on striped bass

→ **ERP target:** maximum F on menhaden that sustains striped bass at their B target when striped bass are fished at their F target

→ **ERP threshold:** maximum F on menhaden that keeps striped bass at their B threshold when striped bass are fished at their F target

All other ERP species are fished at their status quo (2017 levels) in this example

Additional Analysis

- The Atlantic Menhaden Board tasked the ERP Work Group (ERP WG) with conducting additional runs of the NWACS-MICE tool to explore the sensitivity of the ERPs to different assumptions about ecosystem conditions.

Additional Analysis

Table 1. ERP Ecosystem Scenarios

ERP Scenario	striped bass	Bluefish	Weakfish	Spiny Dogfish	Atlantic herring
1. Example ERPs (2017 status quo)	*F* target	2017 status quo	2017 status quo	2017 status quo	2017 status quo
2. All at *B* target	*F* target	*F* target	*F* target	*F* target	*F* target
3. All at *B* threshold	*F* target	*F* threshold	*F* threshold	*F* threshold	*F* threshold
4. Bluefish & herring at *B* target	*F* target	*F* target	Status quo	Status quo	*F* target

Note that for the other ERP focal species, “F target” and “F threshold” are defined as the F rates within the NWACS-MICE model that let these species approximate their biomass targets and thresholds, respectively.

Additional Analysis

Status quo/2017 conditions

ERP Focal Species	2017 F Status	2017 Biomass Status
Atlantic herring	Not overfishing	Below target, not overfished (yet)
Bluefish	**Overfishing**	**Overfished**
Spiny dogfish	Below F target	Above SSB target
Weakfish	**Total mortality too high**	**Depleted**

Additional Analysis

ERP targets and thresholds under different ecosystem scenario

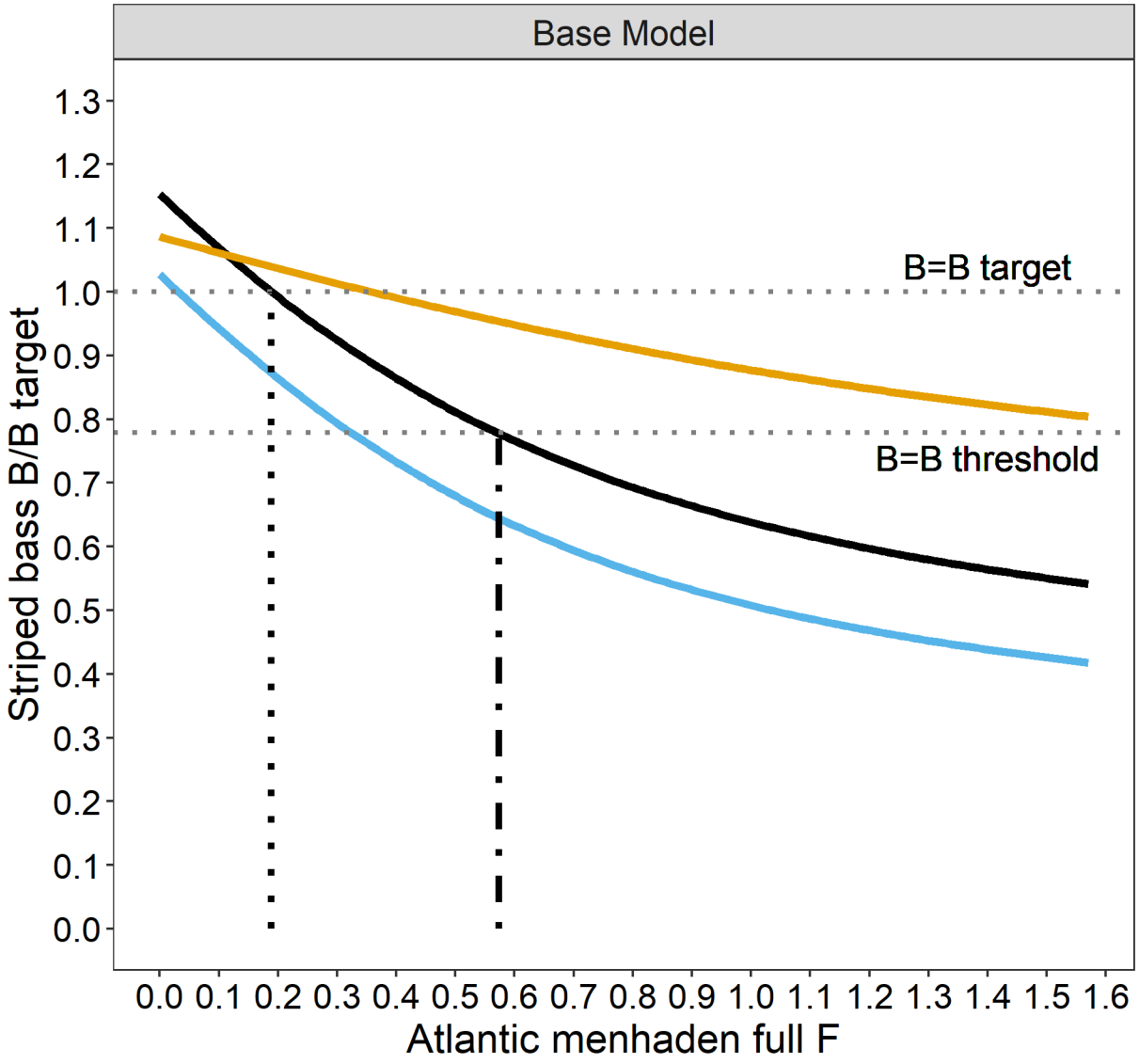
	Atlantic Menhaden Full F equivalent	
Scenario	**ERP target**	**ERP threshold**
1. Example ERPs	0.19	0.57
2. All at *B* target	0.36	*
3. All at *B* threshold	0.03	0.32
	Target	**Threshold**
Single species BRPs	0.31	0.86

*: When Atlantic herring were at their biomass target and striped bass were fished at their *F* target, the ERP threshold was undefined, meaning none of the Atlantic menhaden *F* values explored pushed striped bass to their biomass threshold.

Additional Analysis

- The relationship between Atlantic herring and striped bass was very strong in these runs and was sensitive to the model estimates of Atlantic herring vulnerability
  - Predicted higher consumption of Atlantic herring at high biomass then expected given diet data.
  - While an important component of striped bass diets, the model may be overestimating the importance of Atlantic herring on a coastwide, annual level. More work needed.

Additional Analysis



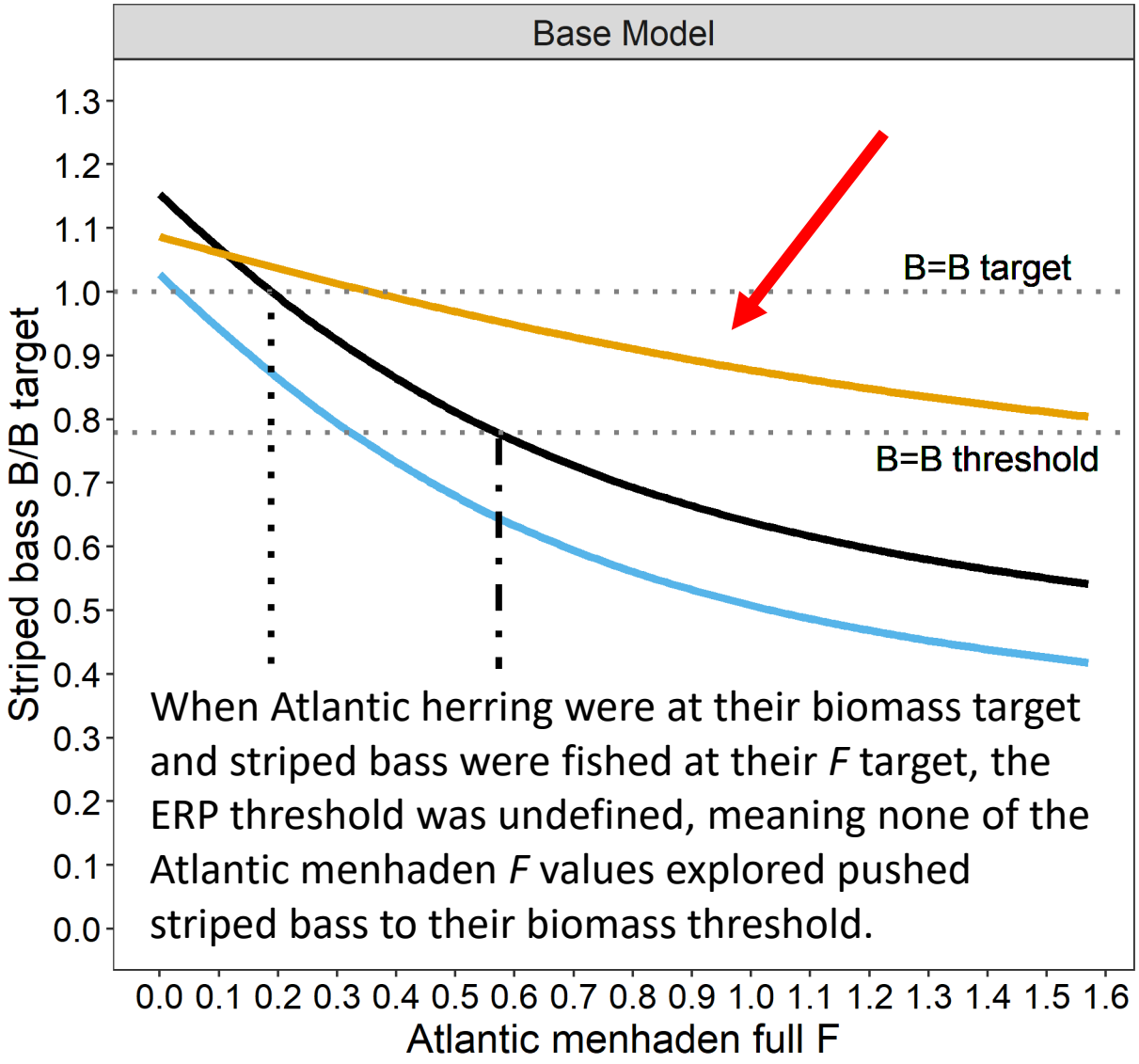
Scenario

- 1. All at status quo
- 2. All at B target
- 3. All at B threshold

ERP

- Target
- Threshold

Additional Analysis



Scenario

- 1. All at status quo
- 2. All at B target
- 3. All at B threshold

ERP

- Target
- Threshold

Additional Analysis

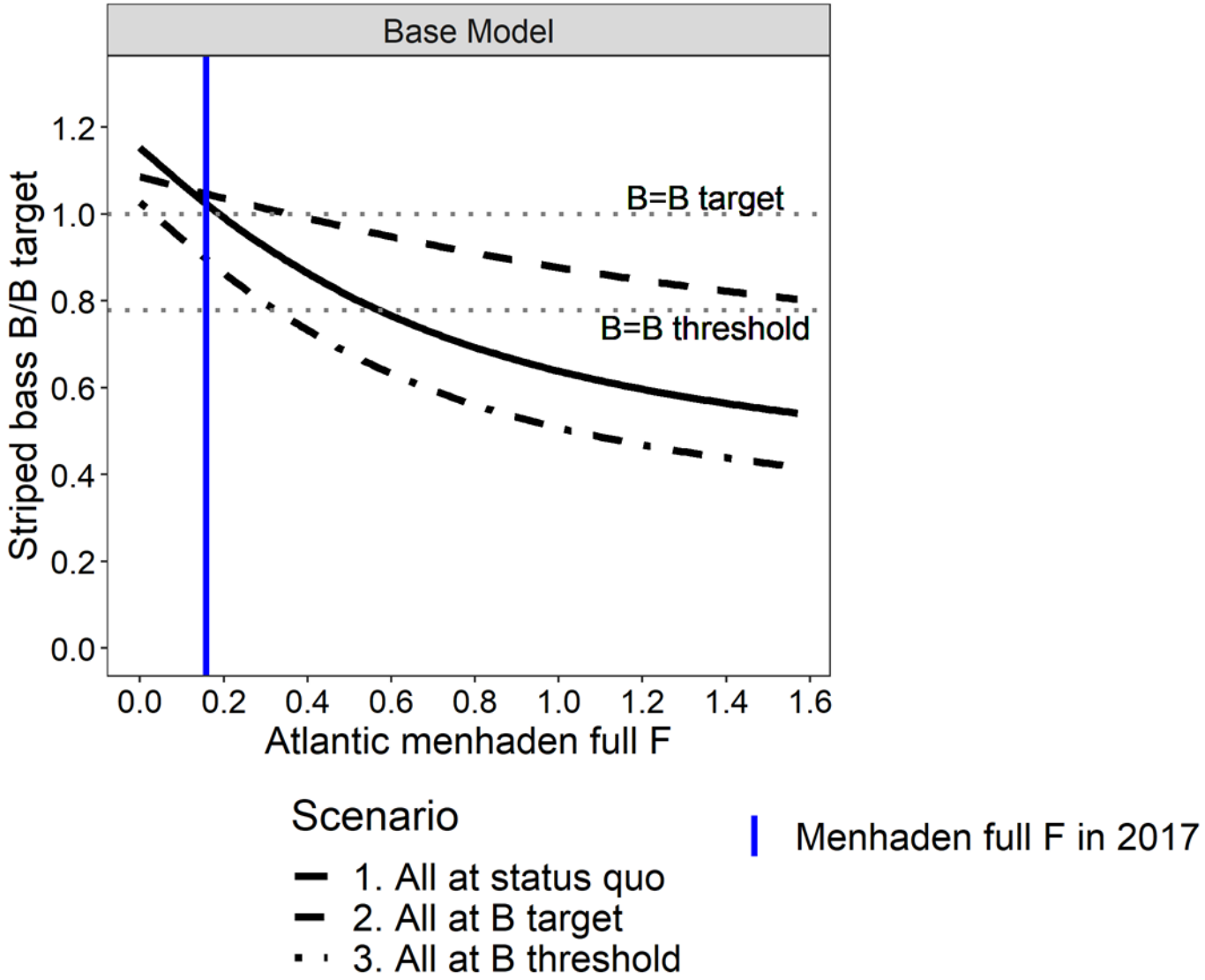
- Atlantic herring are an important component of striped bass diets in some regions and seasons,
- Sensitivity analyses indicate the model is overestimating the importance of Atlantic herring on a coastwide, annual level.
- It was observed that the model predicted a higher proportion of Atlantic herring in the diets of striped bass than what has been observed in coastwide diet studies.

Additional Analysis

- Seasonal variability sensitivity runs to the Atlantic herring-striped bass relationship were examined
- This predicted lower levels of Atlantic herring in striped bass diets compared to the peer-reviewed model without seasonality
  - More in line with observed data
- Sensitivity to Atlantic herring in the NWACS-MICE is due to the lack of seasonal and spatial dynamics, rather than reflecting realistic ecological dynamics.

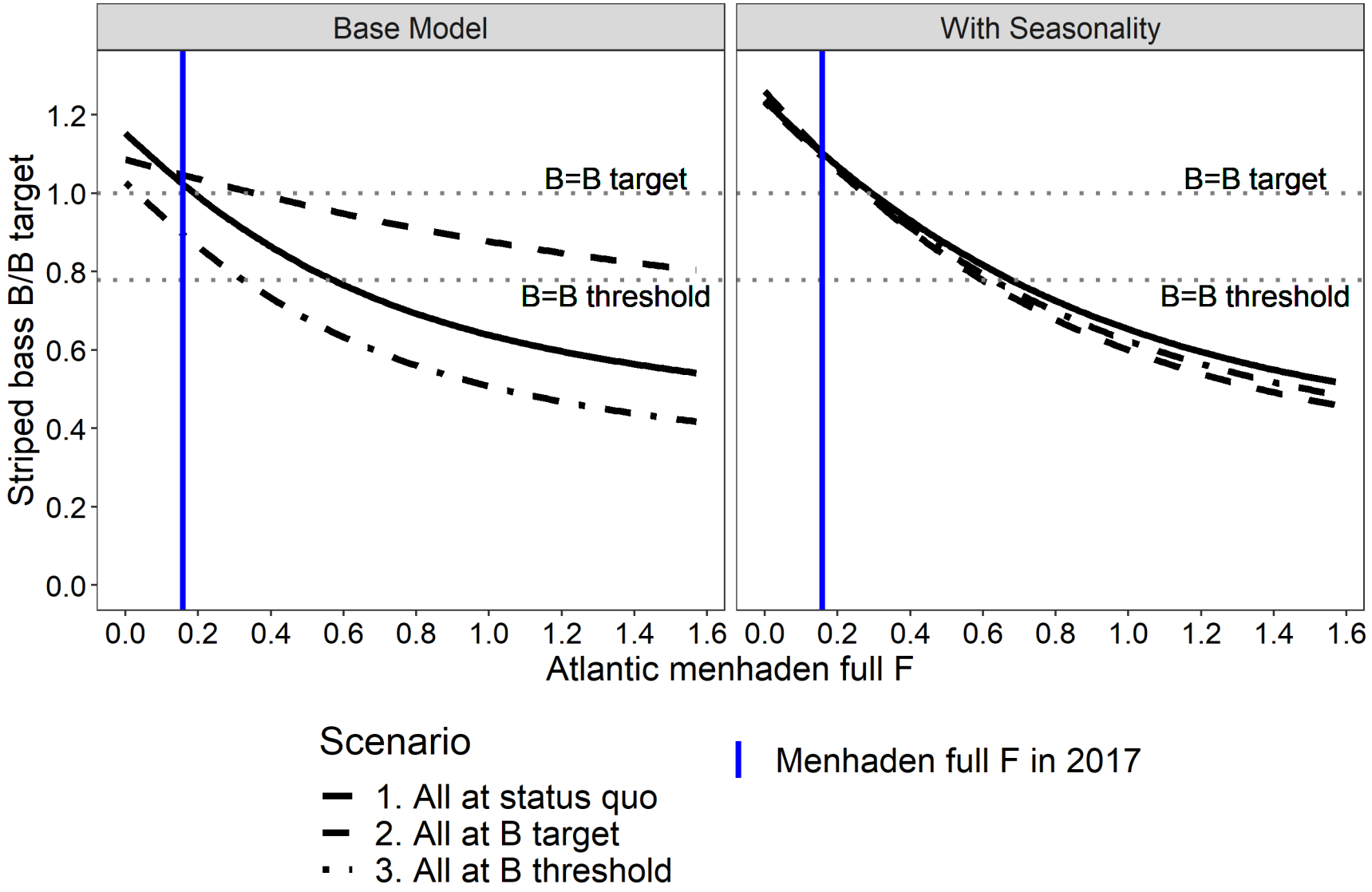
Additional Analysis

Figure 2



Additional Analysis

Figure 2



Additional Analysis

- However, the seasonal variability sensitivity runs were only used for exploration
  - Only account for the seasonality between Atlantic herring and striped bass rather than all predator and prey
  - Have not been fully examined and tested by the ERP work group
  - Need to be fully vetted through peer-review prior to use in management.
- Need to explore seasonal variability further in the next benchmark

Conclusions

- The ERP WG and Menhaden TC recommend using the example ERPs, based on 2017 status-quo levels (scenario 1), for the near-term management of Atlantic menhaden.

- The example ERPs (scenario 1) aim to provide enough menhaden to sustain striped bass, the most sensitive predator in these models, when striped bass are at their biomass target under these conditions.

Conclusions

- The sensitivity to Atlantic herring biomass shown in scenarios 2-3 is likely due to the lack of seasonal and spatial dynamics, rather than reflect realistic ecological dynamics.
- This is a source of uncertainty that the Board could consider when setting specifications, particularly given Atlantic herring are now well below their biomass target.
- The Board could approach this in two ways
  - Apply a buffer to the TAC
  - Adjust the probability of reaching the F target (see draft Risk and Uncertainty Policy)

Conclusions

Example ERPs (presented at 2020 Winter Meeting):

Reference Point	ERP
F Target	0.19
F Threshold	0.57

At the current TAC of 216,000 mt
F_{2017} for menhaden = 0.16

Probability of exceeding ERP target			Probability of exceeding ERP threshold		
2019	2020	2021	2019	2020	2021
60%	71%	66%	0%	0%	0%

Conclusions

ERP targets and thresholds under different ecosystem scenario

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→ Next step to TACs and probability to reach ERP F_{target} based on Board's risk tolerance

Ecological Reference Points Working Group

Matt Cieri (Chair), Maine Department of Marine Resources
Kristen Anstead, Atlantic States Marine Fisheries Commission
Max Appelman, Atlantic States Marine Fisheries Commission
Jason Boucher, Delaware Division of Fish and Wildlife
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QUESTIONS

Public Comment on Ecological Reference Points (ERPs)

Atlantic Menhaden Management Board

August 4, 2020

Summary

- Many comments were submitted on ERPs
  - 16 Letters representing 100+ Organizations
  - 1000+ Form Letters
  - 200+ Individual Comments

- Overwhelming majority: approve ERPs to manage Atlantic Menhaden
  - Many not specific on ERP definition
  - Specified ERPs that allow Striped Bass to rebuild
  - Important forage species that supports recreational fisheries and coastal economies

Setting 2021-2022 Specifications

Atlantic Menhaden Board

August 4, 2020

Outline

- Background
- Questions for Board Consideration
- Timeline

Background: TAC Specification

- Set an annual or multi-year TAC through Board action
  - Based on best available science (e.g., projection analysis)
- Ecological reference points (ERP) established
- Beaufort Assessment Model (BAM) used for short-term projections

Background: TAC Specification

- BAM projection methods changes
  - Using ERP in model
  - Updated recruitment projections

- In setting a TAC, the Board should consider the level of risk they are willing to accept
  - Single Species vs ecosystem reference point buffers

Projection Methods

- Monte Carlo bootstrap (MCB) runs of 2020 benchmark of the BAM used as the basis for projections

- Recruitment projected using non-linear time series analysis

- Incorporates uncertainty in recruitment, 2017 abundance, natural mortality, selectivity

Past Projection Runs

- Based on percent increase to current TAC (e.g., 10 – 40% increase)

- Based on percent probability of exceeding the *F* target and *F* threshold (e.g., 50 – 60% probability)

Example Analysis

Projection Run	TAC	Risk of exceeding F_{target}		
		2018	2019	2020
1. Current TAC	200,000	9.5%	0.5%	0%
2. 5% increase to current TAC	210,000	12%	1.5%	0%
3. 10% incr to current TAC	220,000	15.5%	3.5%	0%

Projection Run	TAC	Risk of exceeding F_{target}	Risk of exceeding $F_{threshold}$
7. 50% probability of being below the F target in 2018	314,500	50%	5%
8. 55% probability of being below the F target in 2018	288,500	45%	3%
9. 60% probability of being below the F target in 2018	286,000	40%	3%

From 2017 analysis

Board Input Needed

- What scenarios should the TC conduct projections for?

  1. Board chooses **risk levels**, TC provides TAC that has the requested probability of exceeding the ERP target or threshold

  2. Board chooses **TAC levels**, TC provides risk of exceeding ERP target and threshold

Timeline

- **August 2020**: Board approves ERPs; directs TC on projections
- **August-September**: TC work, meet, develop memo
- **Annual Meeting (October) 2020**: Board reviews TC work and sets TAC for 2021-2022
  - If a TAC is not set at the Annual Meeting, 2021 TAC = 216,000 MT (2018-2019 TAC)
- **Annual Meeting 2022:** Assessment update completed, new projections available, 2023-2026 TAC set

QUESTIONS?