Ecological Reference Point Assessment for Atlantic Menhaden

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Ecological Reference Points Working Group

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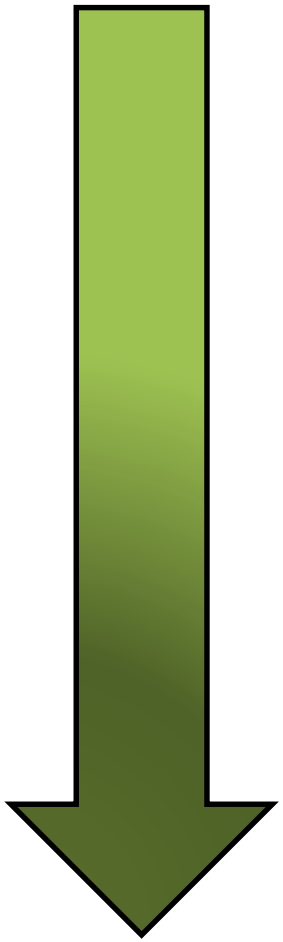
ERP WG TORs

- **Develop models** used to estimate population parameters (e.g., F, biomass, abundance) of Atlantic menhaden **that take into account Atlantic menhaden's role as a forage fish** and analyze model performance.

- **Develop methods** to determine reference points and total allowable catch for Atlantic menhaden **that account for Atlantic menhaden's role as a forage fish.**

ERP Models

Simple



Complex

Model (Abbreviation)
Surplus production model + time-varying r (**SPM TVr**)
Steele-Henderson surplus production model (**SPM S-H**)
Multi-species statistical catch-at-age model (**VADER**)
Ecopath with Ecosim with limited predator/prey field (**NWACS-MICE**)
Ecopath with Ecosim full model (**NWACS-Full**)

ERP Species

- The ERP WG identified a subset of key ERP species to incorporate into the models
- Not all models use all species
- Some models use more predators and/or prey groups

ERP Species

- Prey species
  - Atlantic menhaden
  - Atlantic herring
- Predator species
  - Bluefish
  - Spiny dogfish
  - Striped bass
  - Weakfish

→ All species had a benchmark assessment or assessment update with data through 2017 available

Model Comparisons

- ERP WG evaluated the models based on comparisons of:
  - Model performance, including estimates of age-1+ biomass and exploitation rate from each model compared with BAM output
  - Ability to address management objectives

Management 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

Management Advice

- The BAM captures menhaden population dynamics better than the NWACS models

- The NWACS models allow us to explore the effects of menhaden harvest on predator abundance and biomass

- The NWACS-MICE is a streamlined approach, requiring less time and resources to update than the NWACS-Full

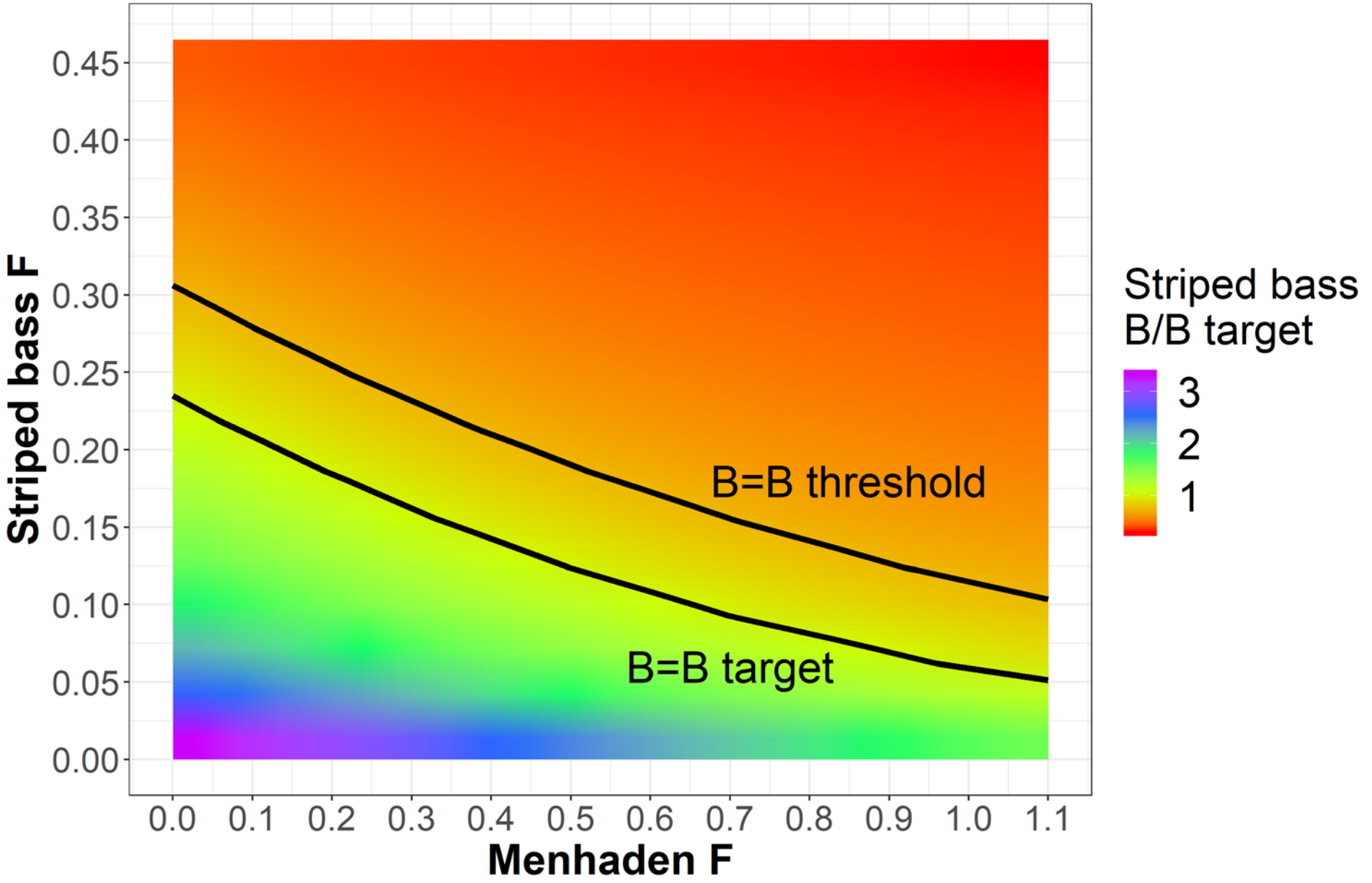
THE NWACS-MICE TOOL

Ecological Reference Points

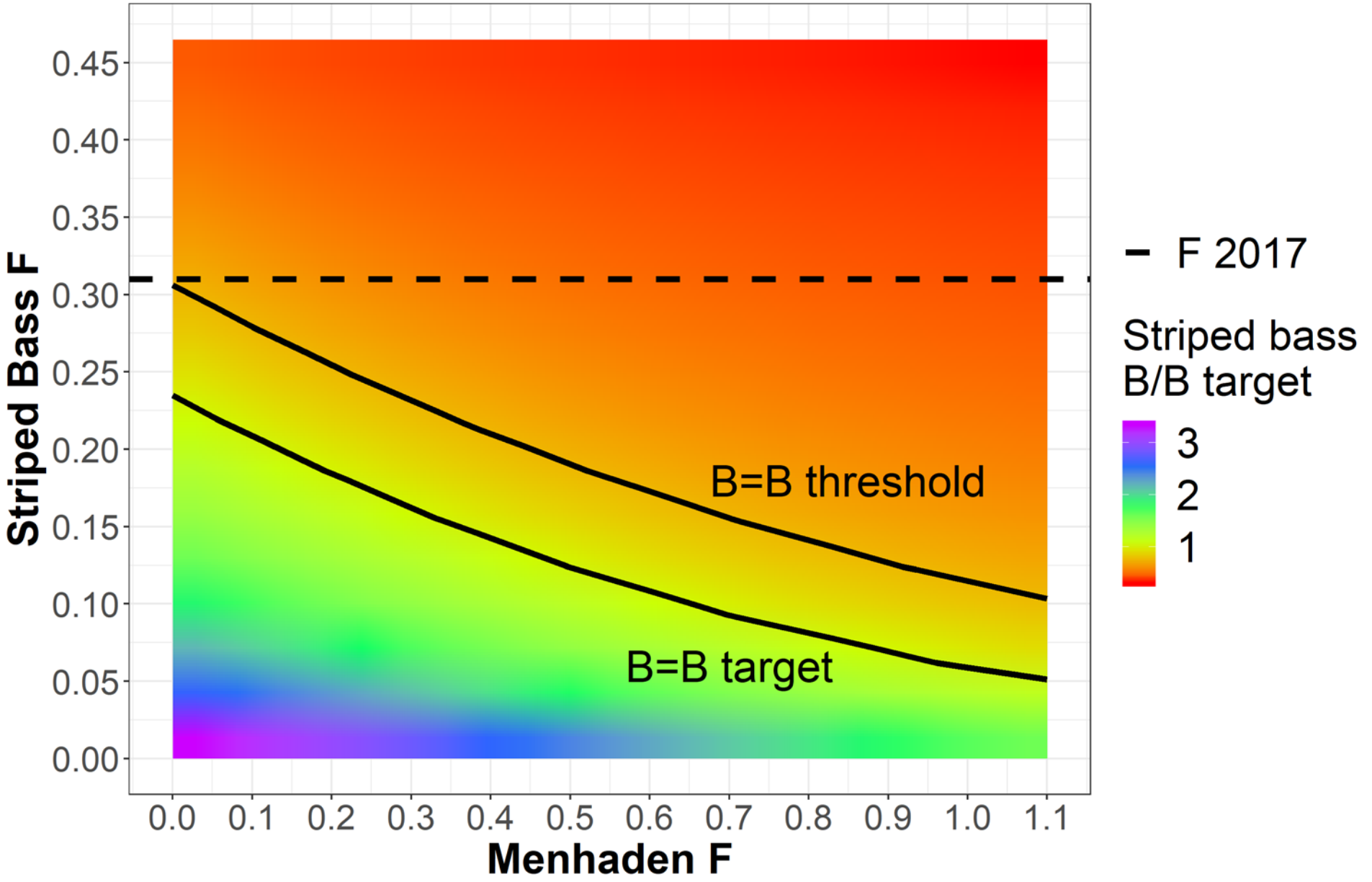
- There is no one “right” answer: the target and threshold levels of F for Atlantic menhaden depend on the management objectives for the ecosystem
  - Where do you want your predator populations to be?
  - What do you want your predator fisheries to look like?

→ NWACS-MICE can illustrate the tradeoffs between menhaden F and predator F/biomass

Example Trade Off Evaluation



Example Trade Off Evaluation



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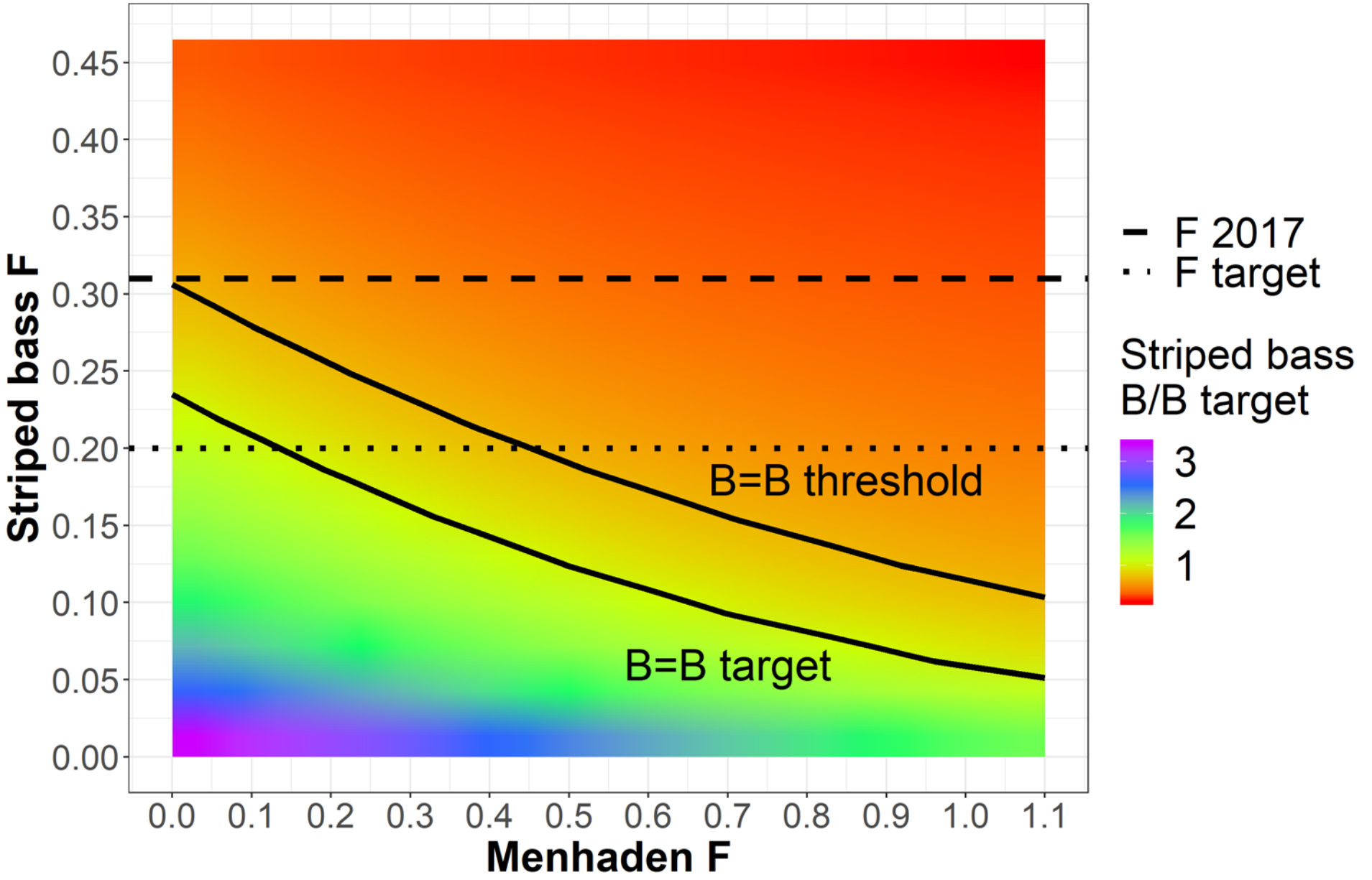

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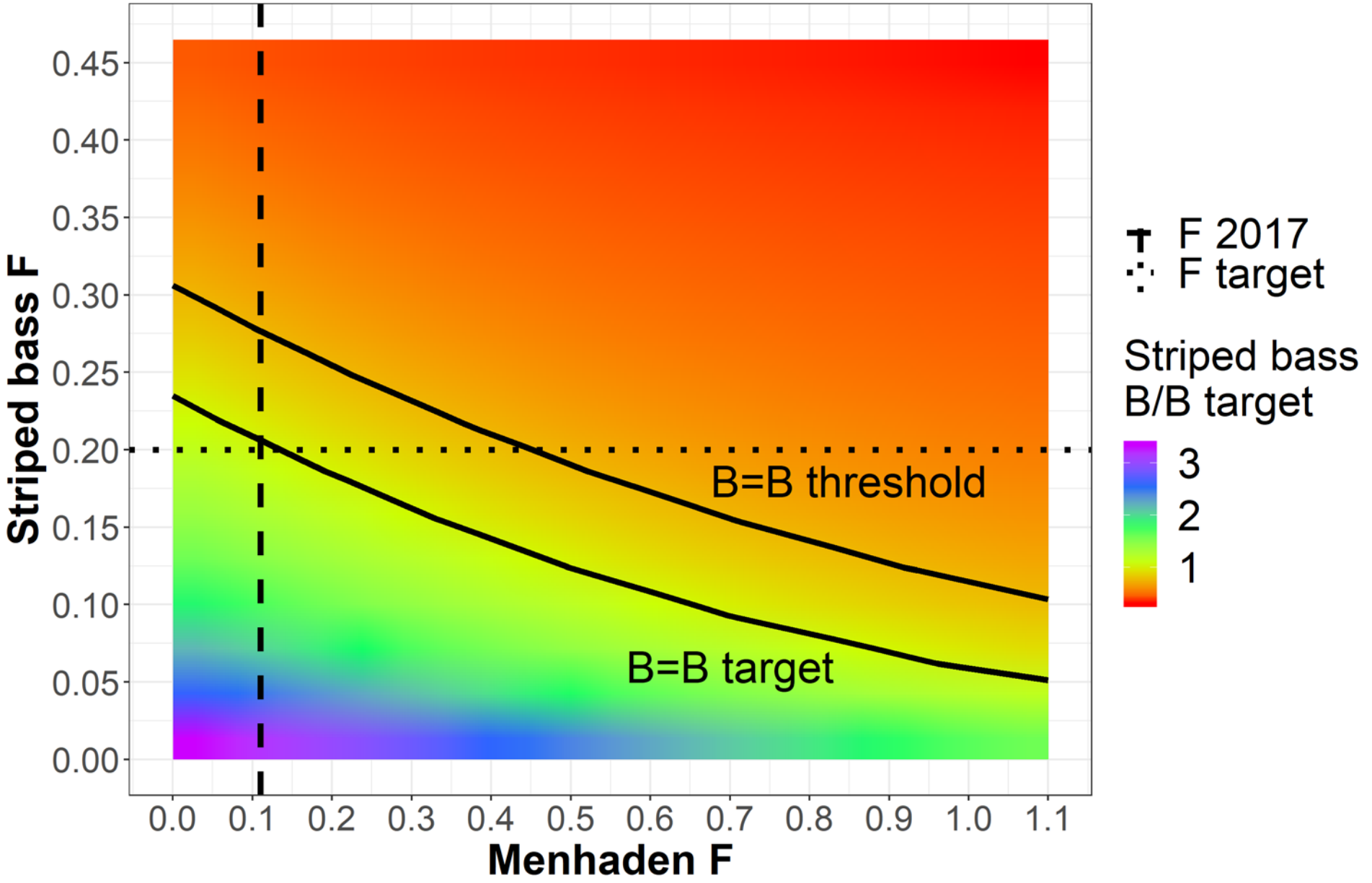

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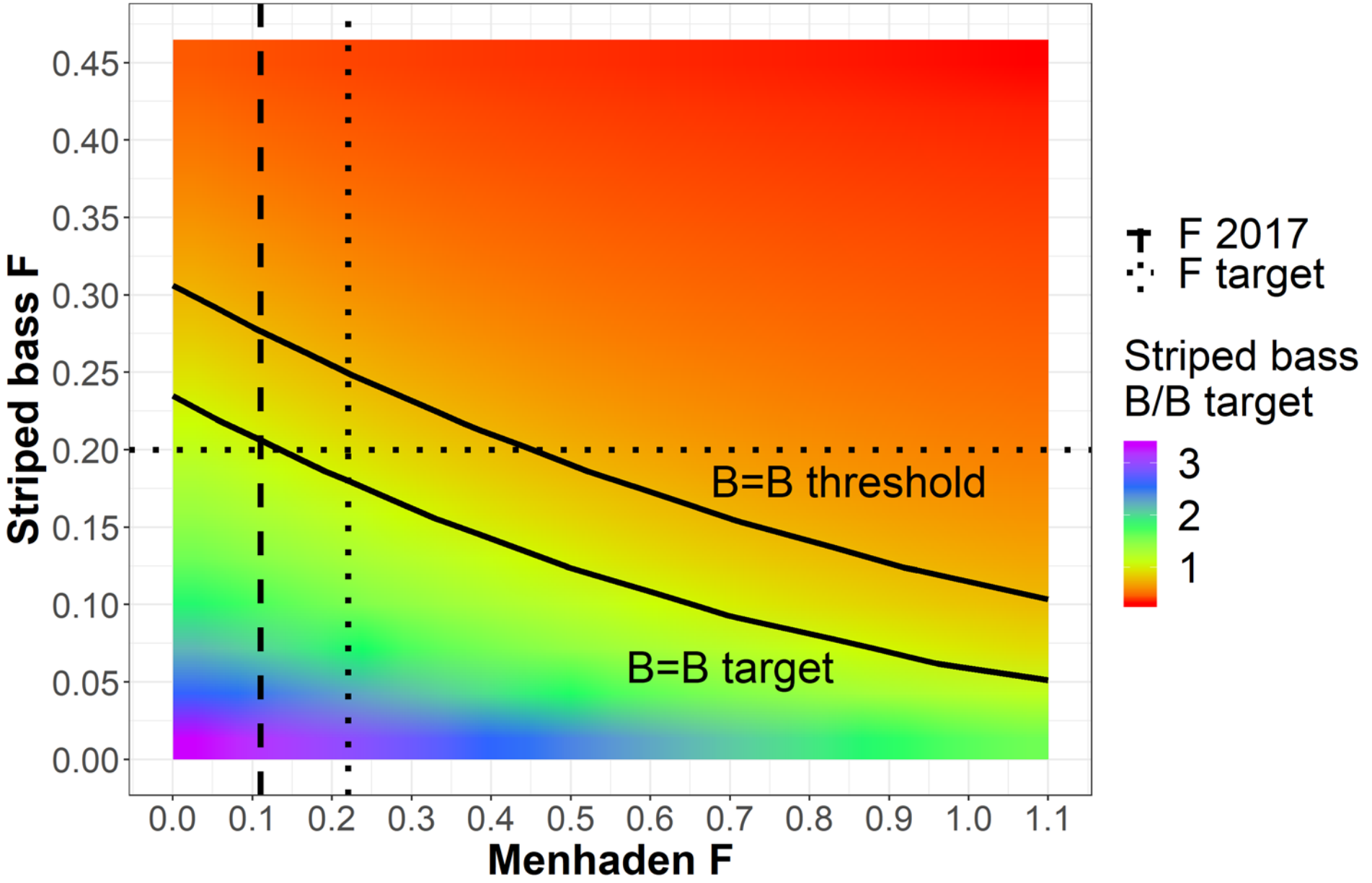

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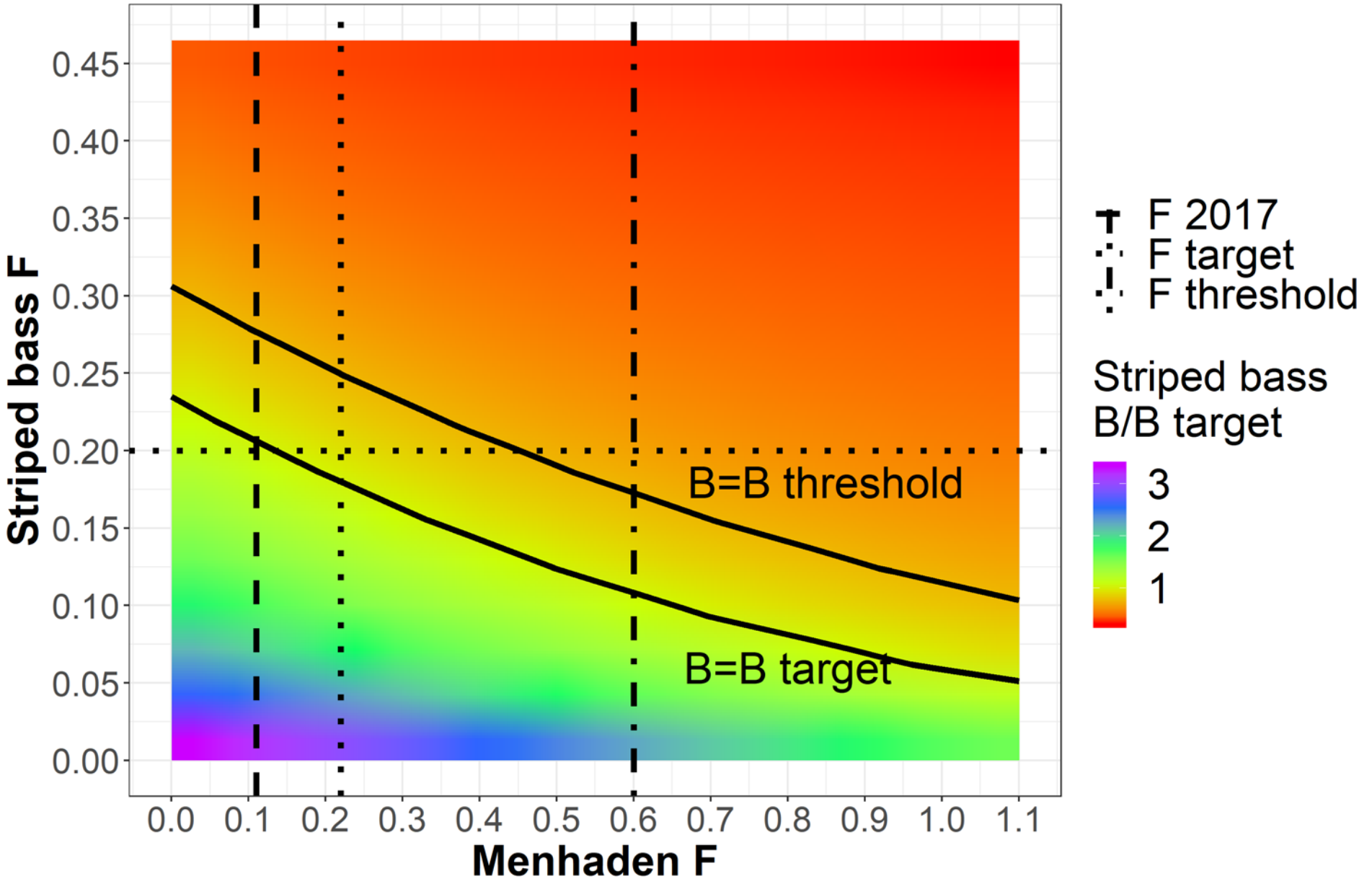


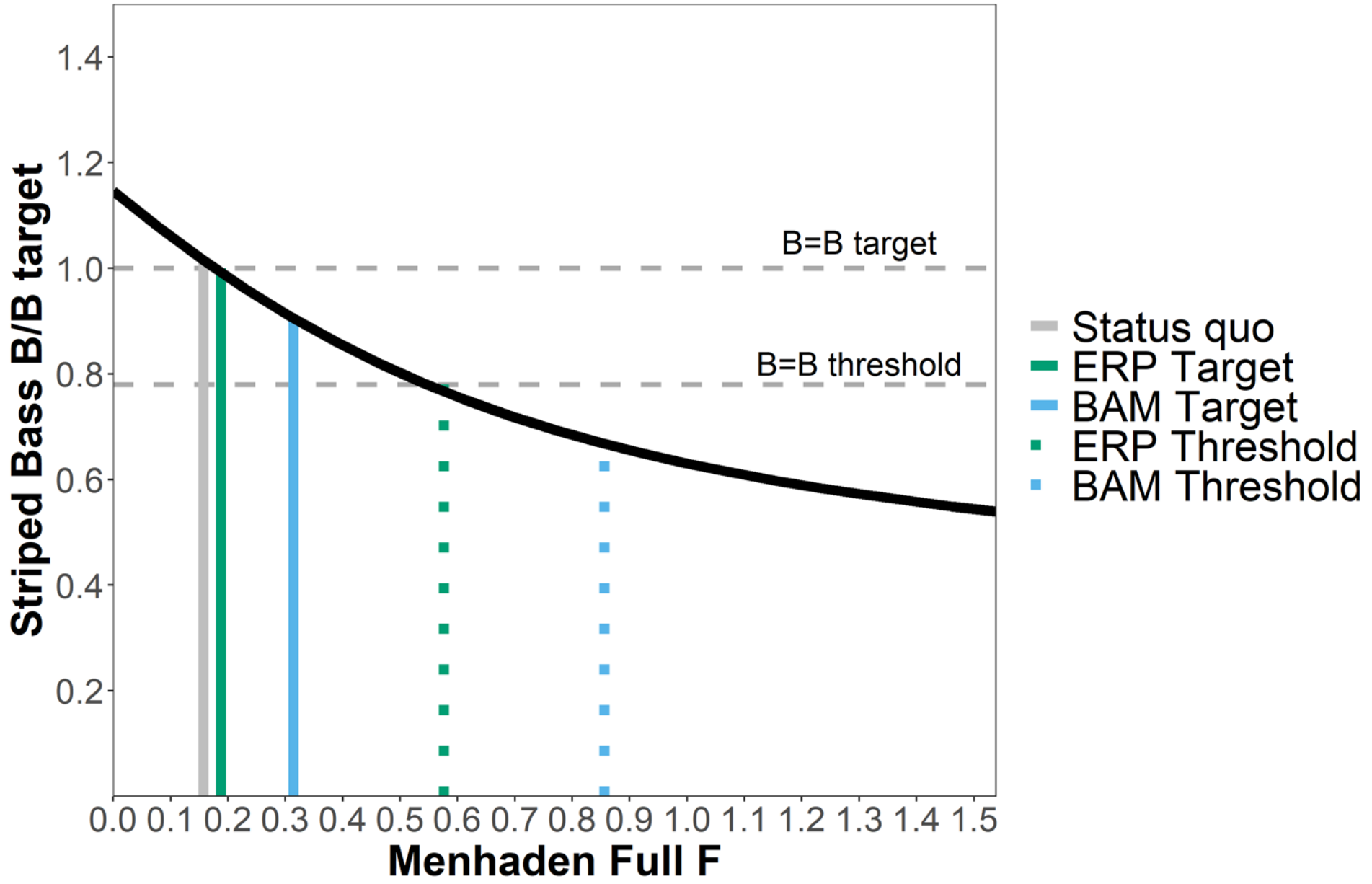
Example ERP Target & Threshold

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

Example ERP Target & Threshold



Identify ERPs for ATM

- ERP WG recommended exploring additional scenarios to examine the impact of different predator objectives on ERP reference points

Scenario	Striped Bass	Bluefish	Weakfish	Spiny Dogfish	Atlantic herring
✓ Example	F target	Status quo	Status quo	Status quo	Status quo
# 2	F target	F target	F target	F target	F target
# 3	F threshold	F threshold	F threshold	F threshold	F threshold
# 4	F target	F target	Status quo	Status quo	F target

Management Advice

This tool will allow the Board and Commission to evaluate the trade-offs between Atlantic menhaden F and predator biomass in a quantitative, transparent way to set ERPs that reflect ASMFC's objectives

Next step: Board will review follow-work/additional scenarios at May meeting

QUESTIONS