eFEP Development

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New England
Fishery Management Council

Today's presentation

- Contrast our eFEP development with Lenfest Blueprint
- Brief summary of operating model demonstration

Lenfest Blueprint

"The process will undoubtedly be conducted in different ways by different RFMCs"

- Actionable outcome
  - Management decisions affected by ecological considerations
  - Cross plan and cross jurisdictional application
- Multispecies
- Maintains FMP overlay approach – EBFM applied to individual plans
- Encourages MSE

NEFMC Process

Don't design solution without understanding the problem

- Phase I – decide on application
- Phase II – develop example Fishery Ecosytem Plan (eFEP)
- Phase III – testing, verification, engage public (scoping)
- Phase IV – develop alternatives for final FEP
- Phase V – implement and make adjustments

NEFMC Approach

- To prepare:

1. A policy describing goals and objectives, and approaches, for taking account of ecosystem processes in fishery management, and
2. An example of a fishery ecosystem plan that is based on fundamental properties of ecosystem (e.g., energy flow and predator/prey interactions) as well as being realistic enough and with enough specification such that it could be implemented. The example should not be unduly constrained by current perceptions about legal restrictions or policies.

NEFMC Process

- To prepare:

3. With respect to number 2, it is understood that the example might not be implemented, but it should make clear what a fishery ecosystem plan would actually entail and it should focus debate. To the extent practicable, these documents should be completed in about one year. In consideration of these documents, the Council will adopt a plan for implementation. The EBFM PDT will have the technical lead in developing these documents and the EBFM committee will recommend the documents for Council consideration.

Develop Example Fishery Ecosystem Plan (eFEP) Phase II

- EBFM PDT technical lead
  - ☑Progress report: Committee meeting in early April and June Council meeting
- Describe an Operating model and Operational Framework for a Georges Bank Ecosystem Production Unit (EPU) – Report due in September
- Strategic Goals and Objectives
  - ☑Draft Goals – measurable outcomes, involve compromises
  - ☑Draft Objectives (methods to achieve goals)
- eFEP Components – draft management outline, defining issues and considerations

Phase III
July 2017 to June 2017

- eFEP Management Strategy Evaluation
  - Operating model defined by Phase II
  - Participation by fishermen and interested parties
  - Identify goal, objectives, performance metrics
  - Evaluate tradeoffs and optimize outcomes
  - Verification of model
  - Testing

Lenfest	NEFMC/NEPA process
Ecosystem status and trends (Step 1)	Ecosystem status report (Affected environment)
	Phase I – choose policy instrument and management structure to develop EBFM
Early EBFM tool development (page 37)	Phase II – develop example FEP and operating models, for demonstration and communication in Phase III • Ecosystem catch cap • Catch limits for functional groups or stock complexes

Lenfest	NEFMC/NEPA process
Develop aspirational vision and objectives (Step 2)	Phase III (scoping) – Choose EBFM goals and objectives; evaluate management strategies; heavy public participation
Operationalize the plan • Performance metrics • Identify and evaluate management strategies (Step 3)	

Lenfest	NEFMC/NEPA process
Select best strategies and implement the plan (Step 4)	Phase IV – Develop final FEP with EIS, submit for review,
Performance assessment and adaptive management (Step 5)	Phase V – Monitor and amend FEP

Lenfest Blueprint – Tools

- Tendency to hold EBFM science tools to the same technical standards as those for conventional fisheries management (sic).
  - "These technical standards are unrealistic and inappropriate"
  - "EBFM tool development is best done iteratively" to identify critical unknowns and subsequent models become increasingly robust and relevant.
- Tools should be developed early; well understood behaviors and properties; vetted (page 37)

Committee guidance to focus eFEP development on the following steps:

1. Describe a trophic web area based operating model that specifies:
   - an ecosystem area
   - species present in the area that will be dynamically model
   - species present in the area that will be treated as externalities (they participate in the food web, but their numbers and biomass is determined outside the model- e.g., mammals, birds, most benthic invertebrates)
   - feeding models that account for preference, suitability and availability
   - matrix of production attributable to ecosystem area (incorporating seasonality)
   - stochastic nature of these relationships- could use Bayesian approach

Committee guidance to focus eFEP development on the following steps:

2. Test alternative approaches to management including:
   - current single species approach
   - guild (trophic level) approach
   - Total ecosystem productivity approach

3. For each approach, specify (worked examples):
   - criteria for overfishing
   - rebuilding strategy
   - mechanism to protect most targeted or vulnerable stocks (min, biomass, but not necessarily linked to BMSY)

Draft Operational Framework Sep 2016

(http://s3.amazonaws.com/nefmc.org/1c.-Draft-Operational-Frameowrk-and-Operational-Models-to-Support-Fishery-Ecoysstem-Plan-Development.pdf)

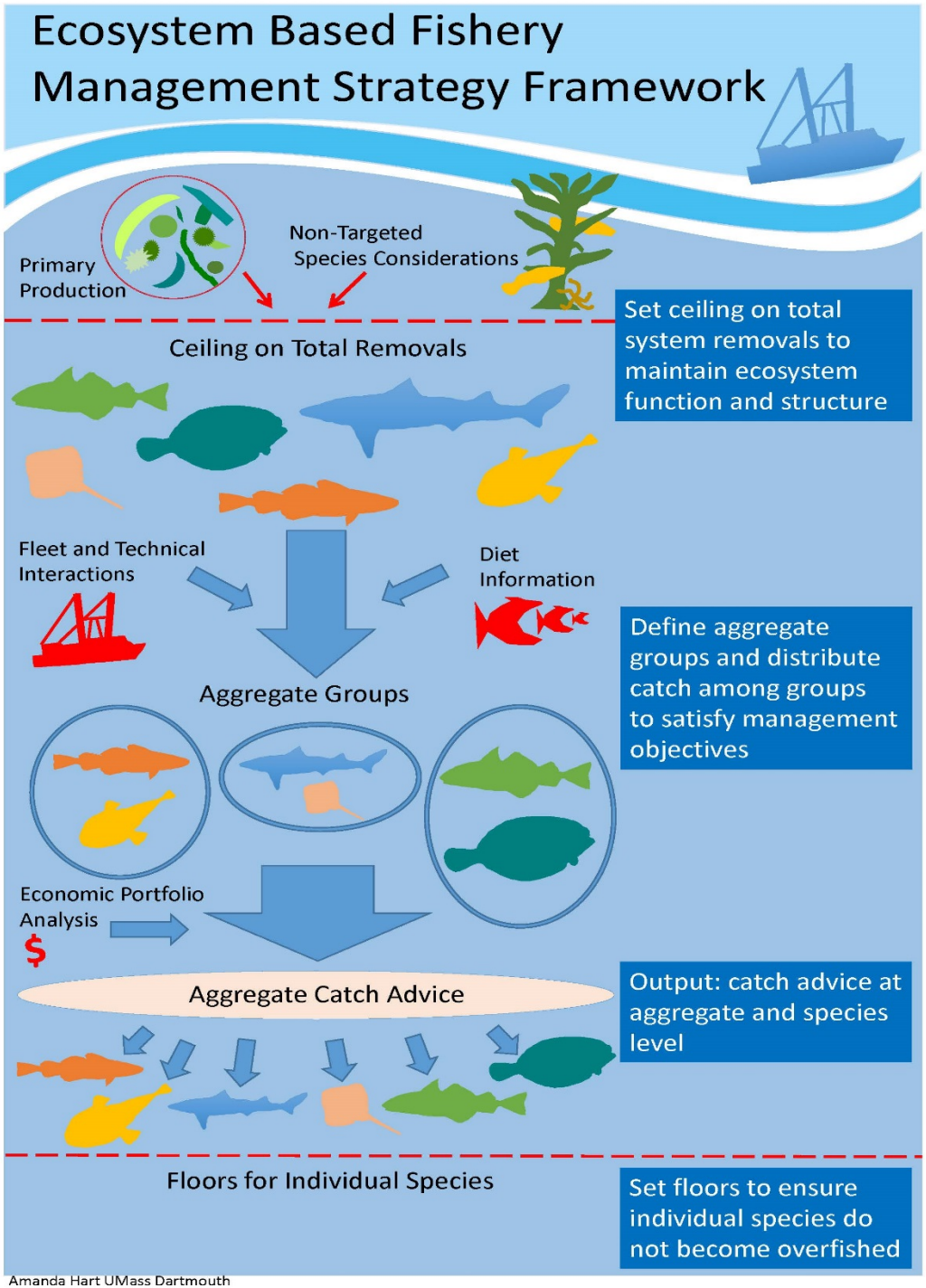
- **Ecosystem simulation models**
  - Hydra – 10 species length-structured model with trophic interactions
  - Ecosym/Ecopath (EwE) – mass-balance energy flow
  - Atlantis – end-to-end with physical and biological processes
- **Operating model**
  - Combination of above models to provide strategic advice and guidance
- **Operational Framework**
  - Operating model
  - Management Strategy Evaluation process
  - Assessments to provide tactical advice
  - Functional groups and EPU catch cap
  - Overfishing definition
  - Overfished/depleted definition

Ecosystem Catch Advice Framework

- Overall catch cap based on system energetics
- Derived from satellite-based measures of primary production
- Allowance for diversions to microbial loop and non-fished species

Ecosystem Catch Advice Framework

- Catch limits defined for stock complexes
  - Not to exceed the EPU catch cap
- Minimum biomass thresholds to protect species from depletion
  - Measures to prevent too much catch of highly-valued vulnerable, less-resilient species
- Catch limits balanced to achieve multiple objectives

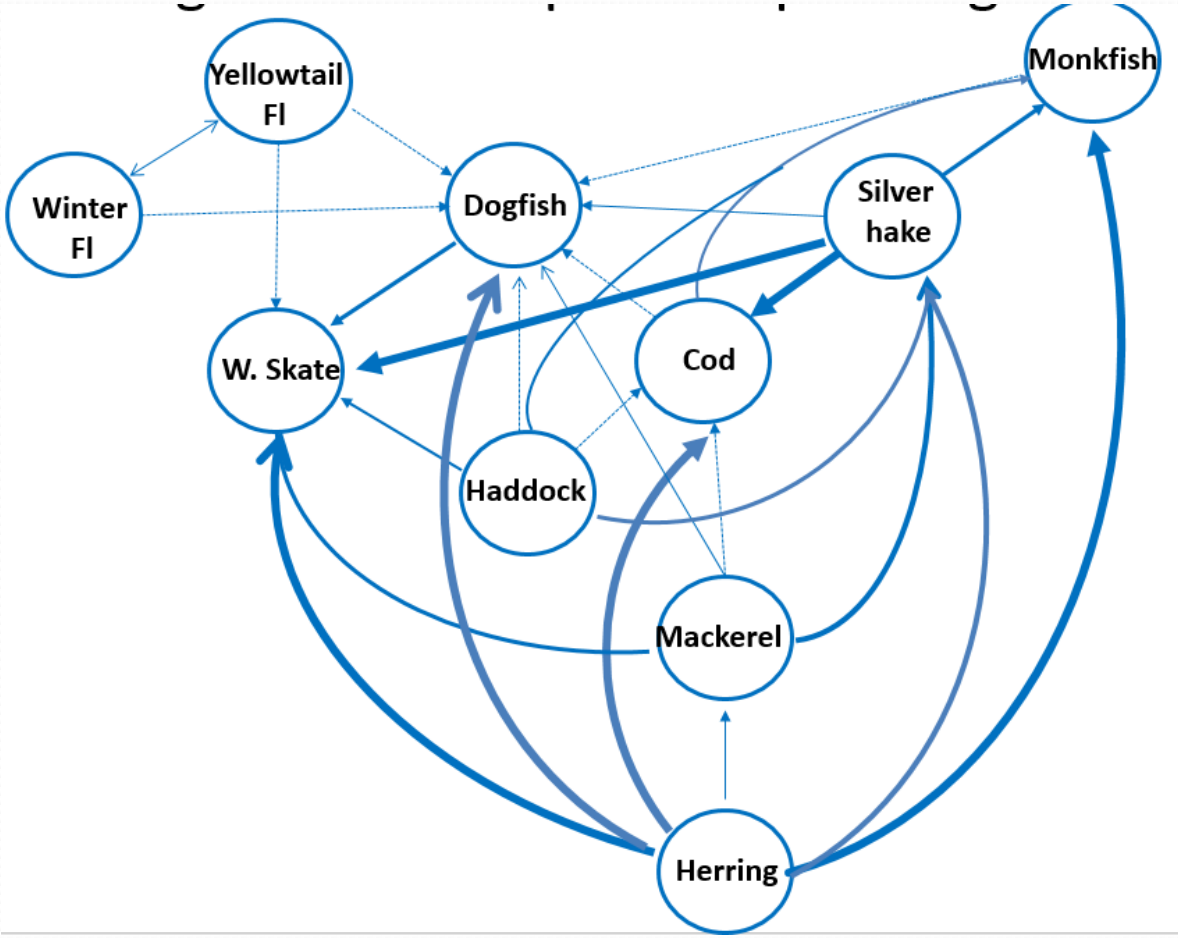

Ecosystem Based Fishery Management Strategy Framework
Primary Production
Non-Targeted Species Considerations
Ceiling on Total Removals
Set ceiling on total system removals to maintain ecosystem function and structure
Fleet and Technical Interactions
Diet Information
Aggregate Groups
Define aggregate groups and distribute catch among groups to satisfy management objectives
Economic Portfolio Analysis
$
Aggregate Catch Advice
Output: catch advice at aggregate and species level
Floors for Individual Species
Set floors to ensure individual species do not become overfished

Operating Model (OM) example

- Example application of harvest control rules (HCRs)
- Demonstration of how OMs could be used to evaluate alternatives management strategies
- Performance metrics and multiple objectives

Operating Model (OM) example

- OM: Hydra
- 10 species on Georges Bank
  - Majority of commercial catch
  - Species having parameterized trophic interactions



Interaction strength

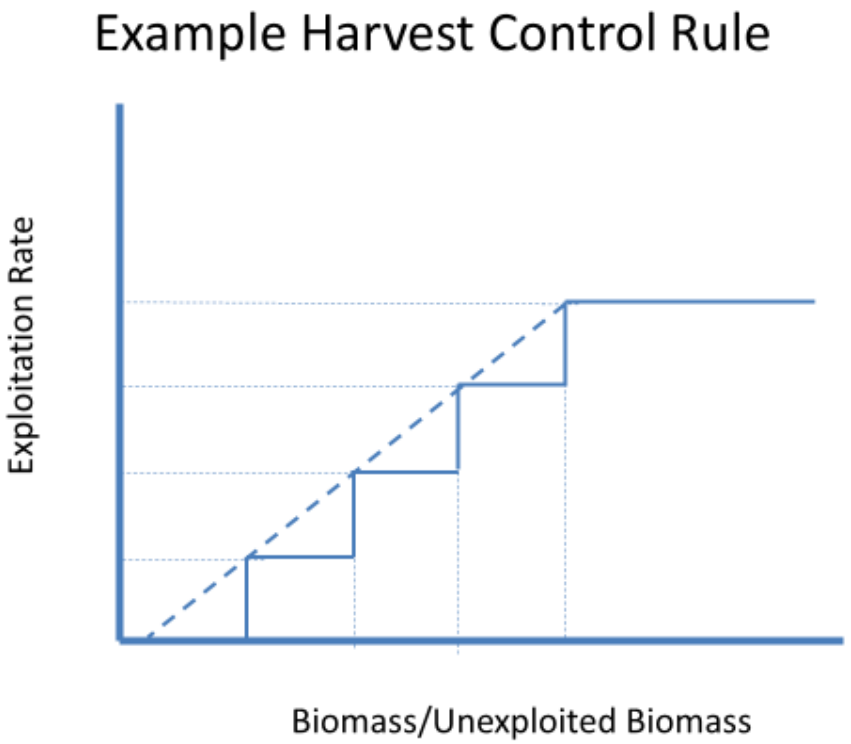
Stock complex – group related species at a defined trophic level.

Functional group – Intersection of stock complexes with a fishery, i.e. they are caught together.

Species	Fishery Functional Group: Species Complex				
Common Name	Demersal Trawl-Piscivore	Demersal Trawl-Benthivore	Fixed Gear Piscivore	Fixed Gear Benthivore	Pelagic Trawl Planktivore
Atlantic cod					
Silver hake					
Monkfish					
Spiny dogfish					
Winter skate					
Winter flounder					
Yellowtail flounder					
Haddock					
Atlantic herring					
Atlantic mackerel					

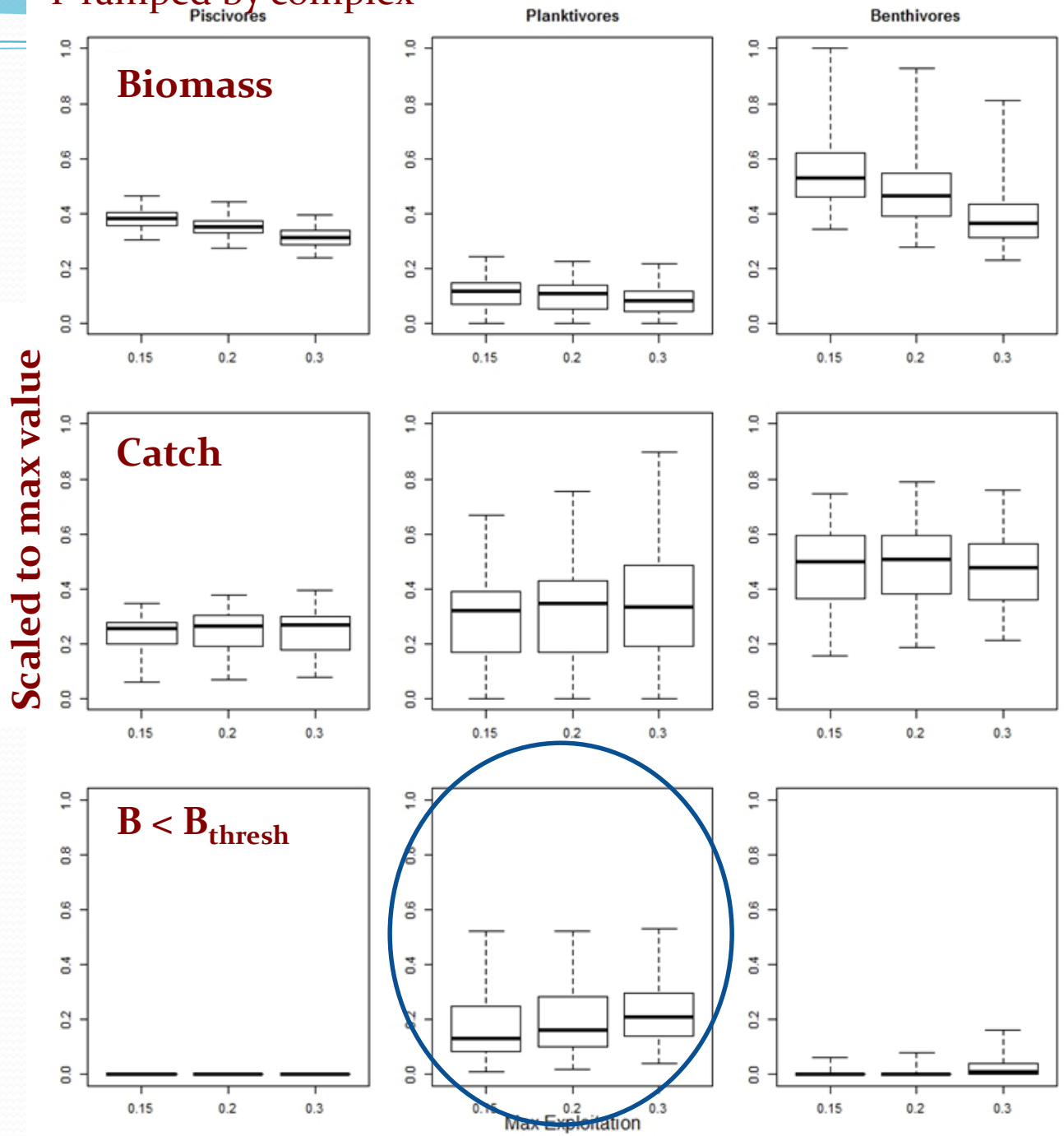
Example HCRs

- Constant mortality – three alternative levels
- Hockey stick with alternative minimum biomass thresholds



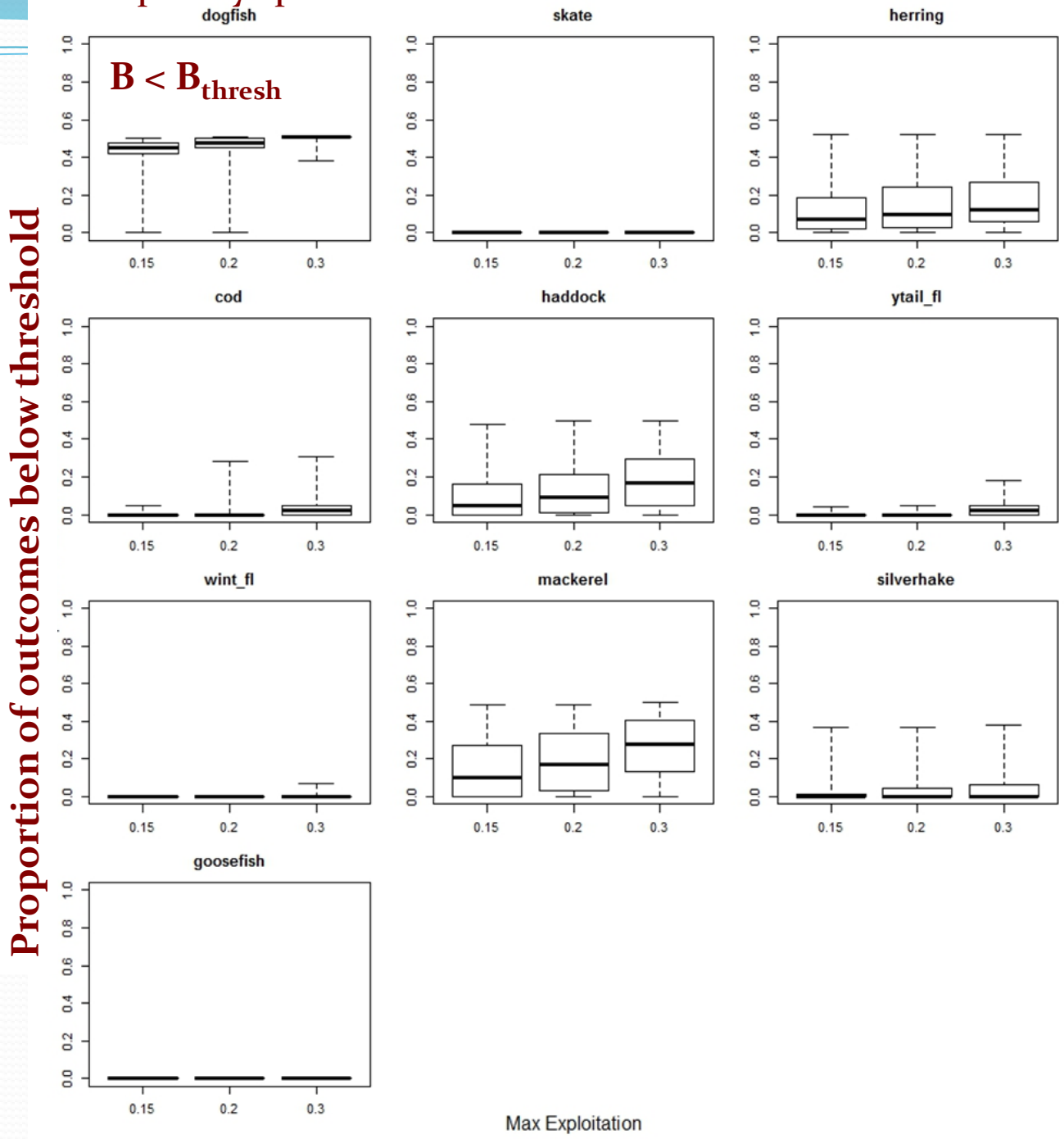
F ramped by complex

- Scaled biomass and catch
- Proportion of runs exceeding threshold
- Catch lower & fewer runs above biomass threshold at F=0.3
- Threshold and F ramping improved performance at F=0.3

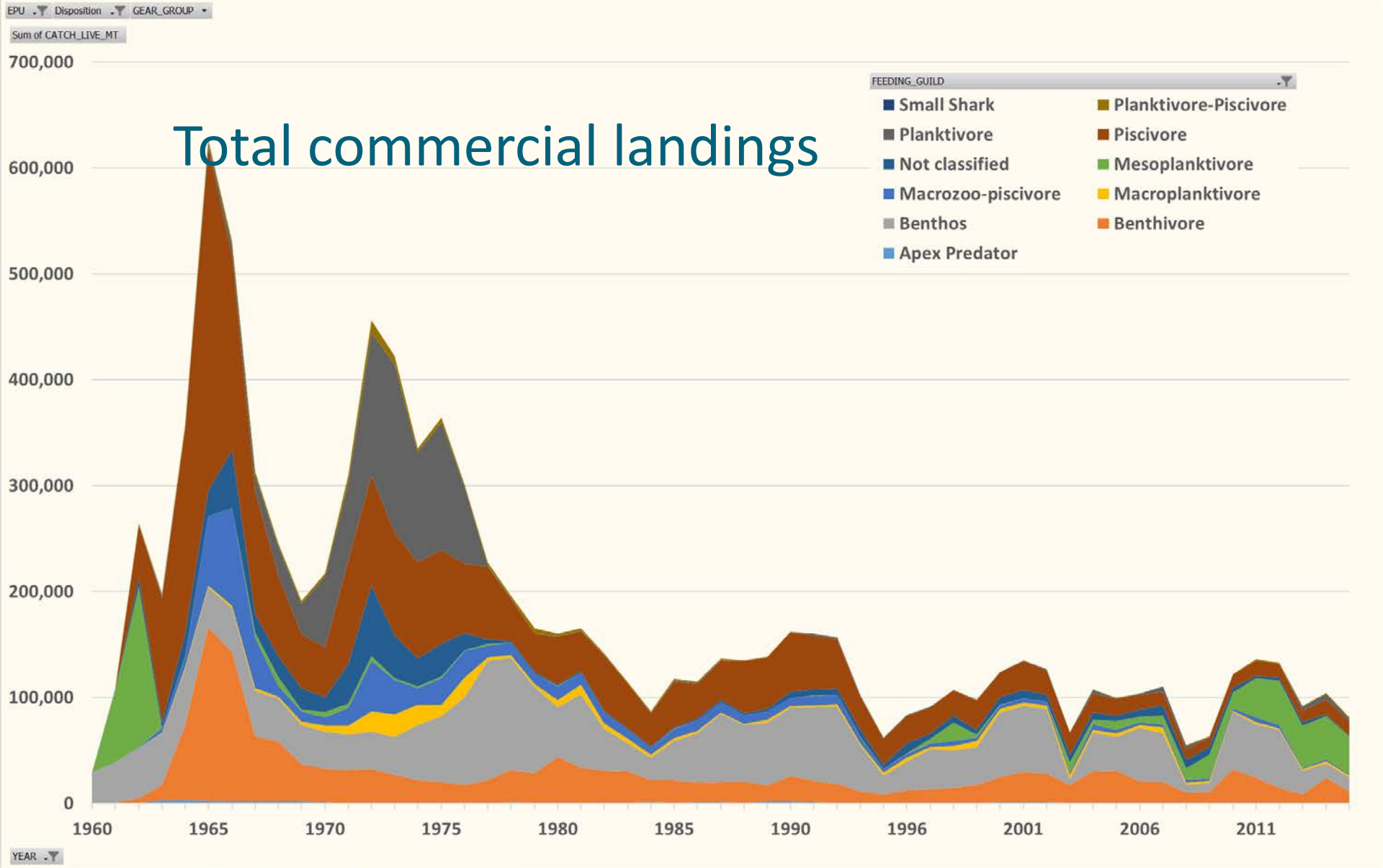


F ramped by species

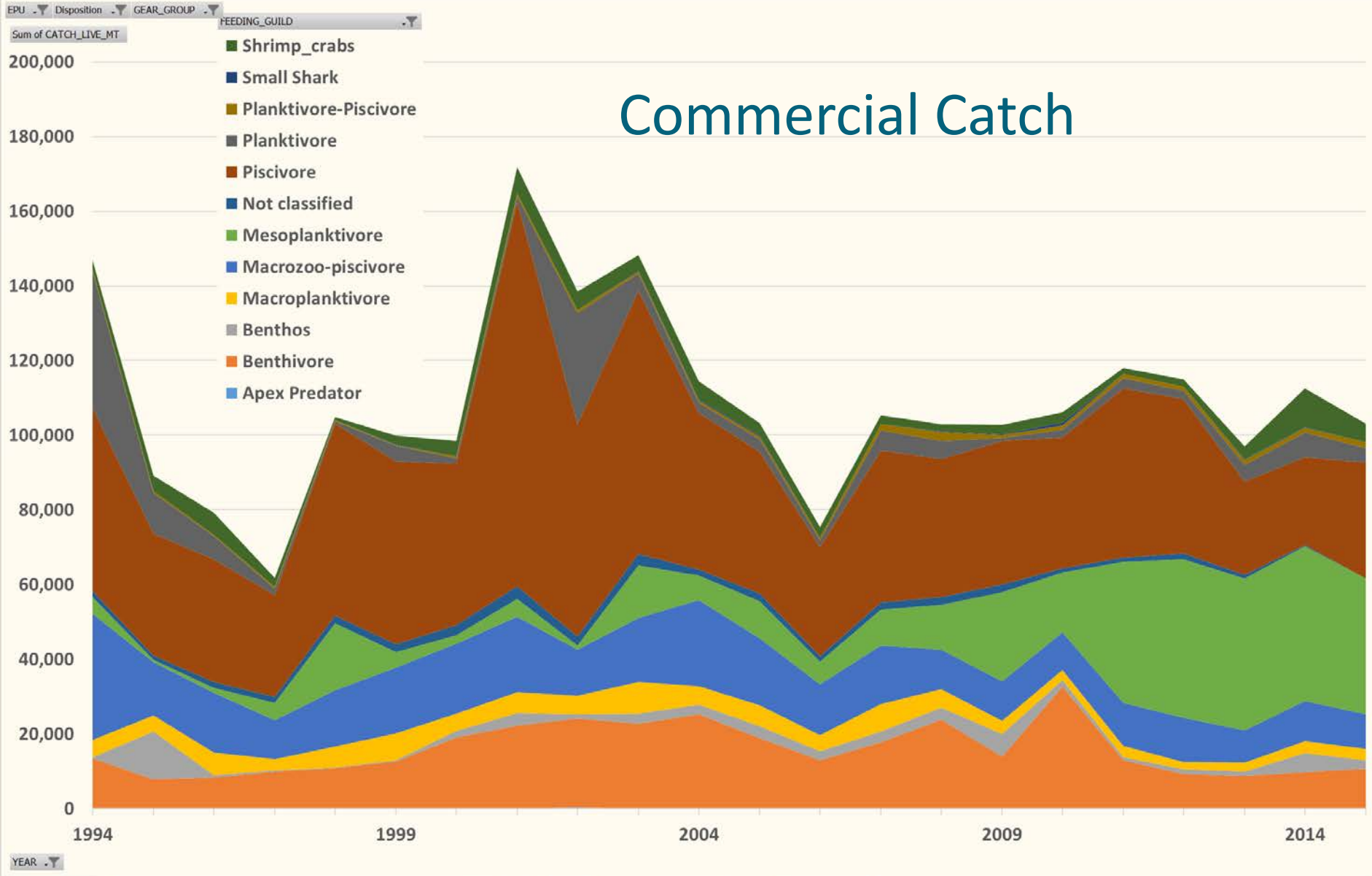
- Proportion of runs exceeding threshold (generally 20%B_0)
- More risk at F=0.3, particularly for dogfish, herring, cod, mackerel, and yellowtail flounder.
- F ramp applied to complex when a stock is below its threshold.



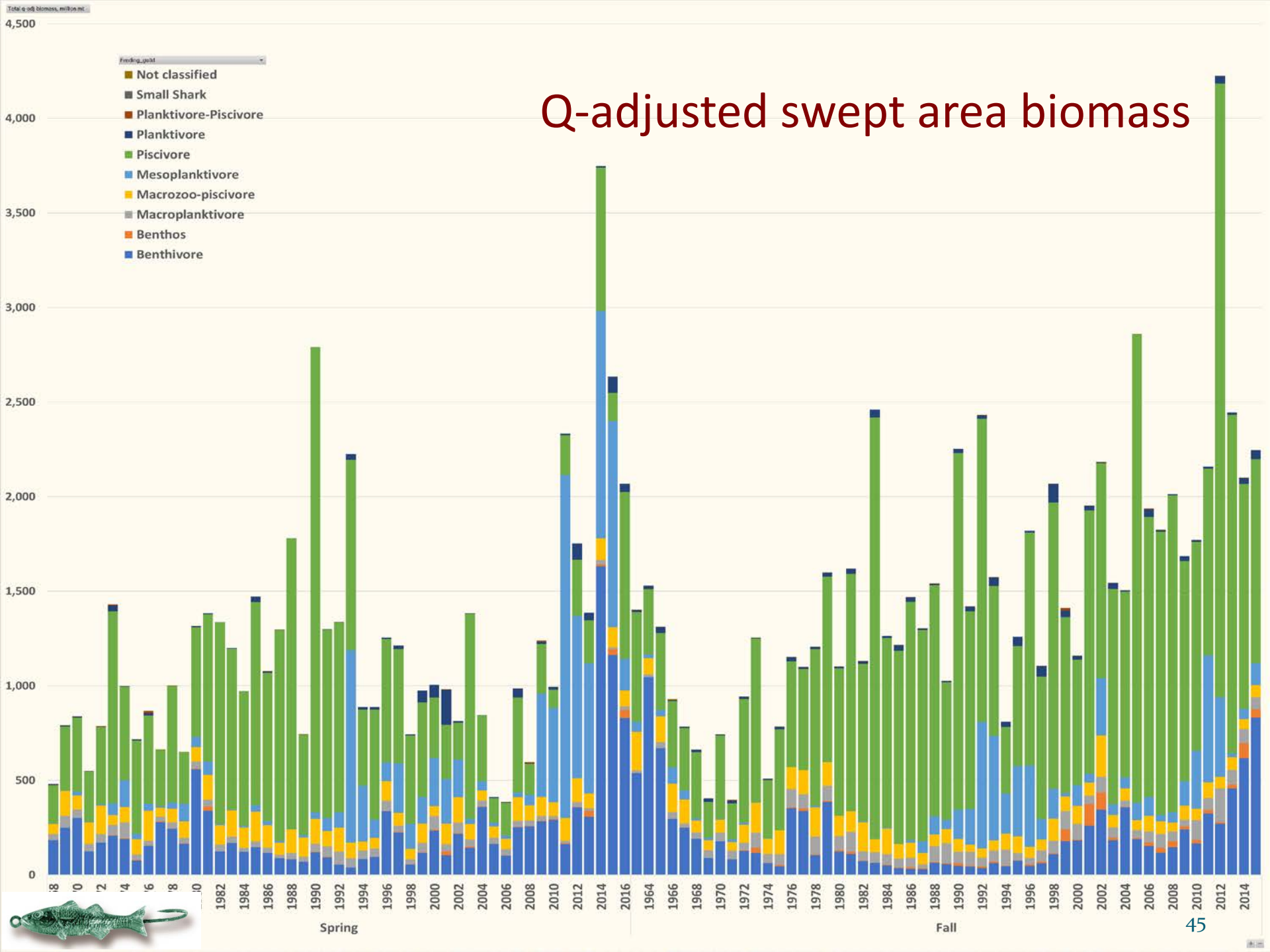
Total commercial landings



Commercial Catch



Q-adjusted swept area biomass



FEP Concept

- Place based approach
- Ecosystem cap based on primary productivity
- Catch limits by stock complex (functional group)

FEP Structure

- Catch control rules
- Stock complex specifications
- Species specifications or other conservation measures when overfished and/or valuable or vulnerable

FEP Elements

- Goals and objectives
- Ecological overfishing thresholds
- Species depletion/ecosystem risk
- Ecological habitat consideration and spatial management
- Forage fish
- Bycatch
- Access to fisheries
- Coordination by management bodies

FEP Technolgy

- Realistic operating models to support strategic decision-making
- Compatible assessments for tactical decision-making
- Management Strategy Evaluation – to be developed, Phase III