

Management Reference Points



NOAA
FISHERIES

NEFSC

Ecosystem Based Fishery Management Strategy Review

TOR 5: Evaluate Proposed Management Reference
Points

April 30-May 2 ,2018

Woods Hole MA

A Bit of History: Defining System-Level MSY and Fmsy on the Northeast U.S. Continental Shelf 1973-76

ICNAF Two Tier System

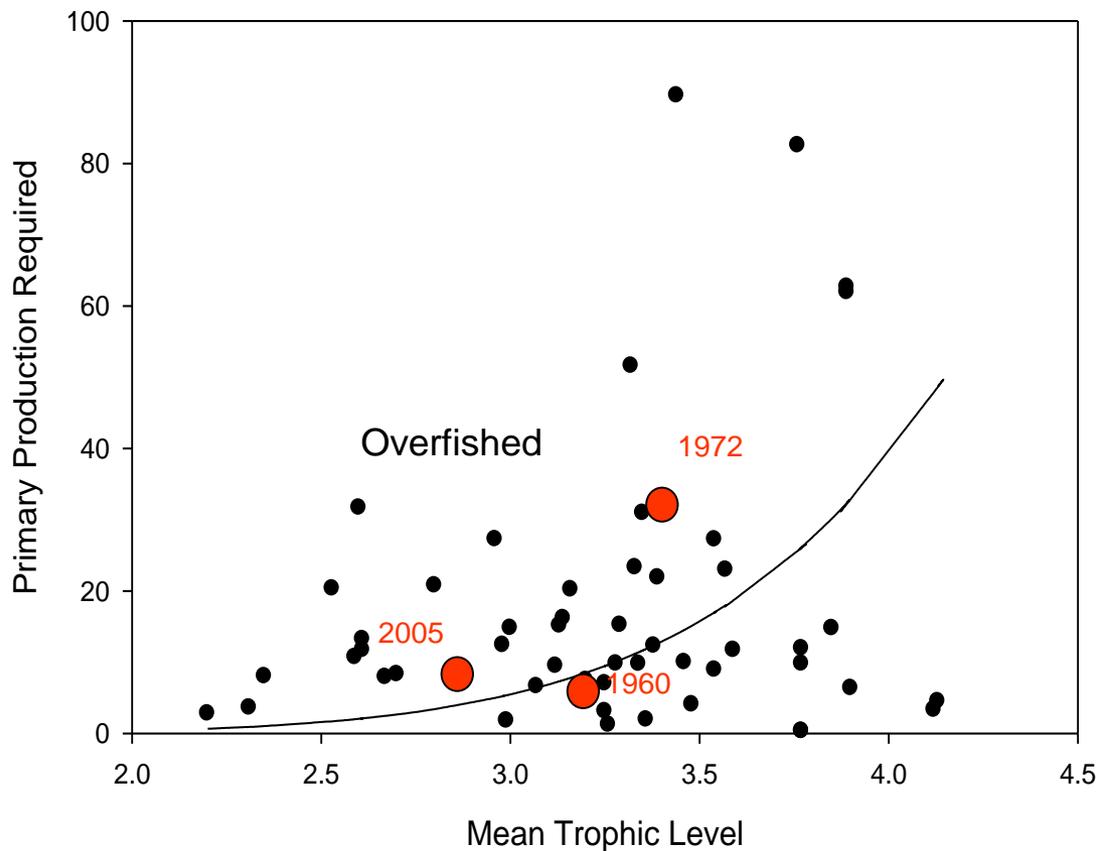
- Determine total system MSY for Northeast US Continental Shelf:
 - Aggregate Surplus Production Model
 - Multispecies MSY - 980,000 MT
 - Allocate catches for each species by country accounting for by-catch by Linear Programming
 - Compare with Single Species MSY - 1,300,00 MT
- Aggregate MSY ~25% lower than sum of SS MSYs

An Ecosystem Can be Considered Overfished (Murawski 2000) if:

- Biomasses of one or more important species assemblages or components fall below minimum biologically acceptable limits, such that:
 - 1) recruitment prospects are significantly impaired,
 - (2) rebuilding times to levels allowing catches near MSY are extended,
 - (3) prospects for recovery are jeopardized because of species interactions,
 - (4) any species is threatened with local or biological extinction;
- Diversity of communities or populations declines significantly as a result of sequential “fishing-down” of stocks, selective harvesting of ecosystem components, or other factors associated with harvest rates or species selection;
- The pattern of species selection and harvest rates leads to greater year-to-year variation in populations or catches than would result from lower cumulative harvest rates;
- Changes in species composition or population demographics as a result of fishing significantly decrease the resilience or resistance of the ecosystem to perturbations arising from non-biological factors;
- The pattern of harvest rates among interacting species results in lower cumulative net economic or social benefits than would result from a less intense overall fishing pattern or alternative species selection;
- Harvests of prey species or direct mortalities resulting from fishing operations impair the long-term viability of ecologically important, non-resource species (e.g., marine mammals, turtles, seabirds).



When is an Ecosystem Considered Overfished? Tudela (2005, 2008)

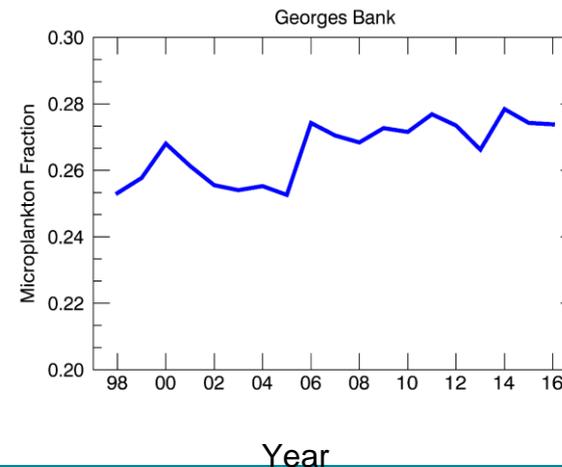
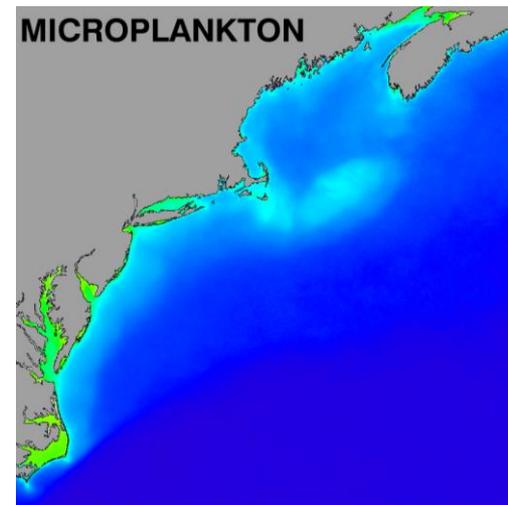


Options for Defining Ecosystem Overfishing Limit

Exploitation rate should not exceed the fraction of microplankton production in the system (based on Iverson 1991).

Must account for energetic needs of all consumers.

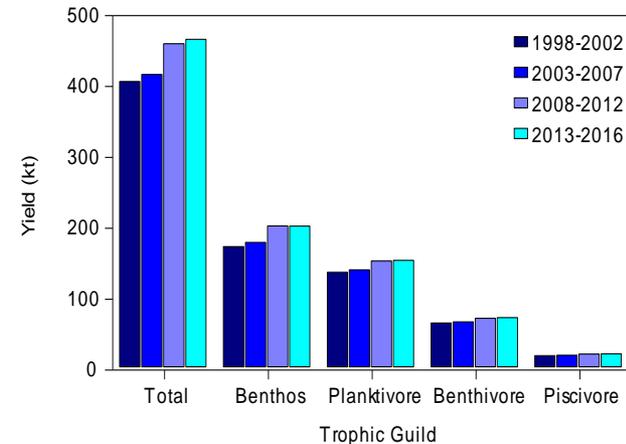
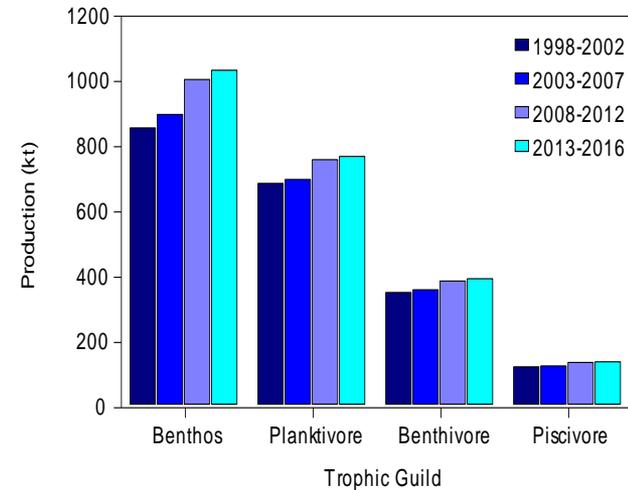
Moiseev (1994) proposed that Ecosystem exploitation rate not exceed 20%



Ecosystem-level Limit Reference Point

Determine the Dynamic 'Carrying Capacity' of the Ecosystem as a Function of Production at the Base of the Food Web.

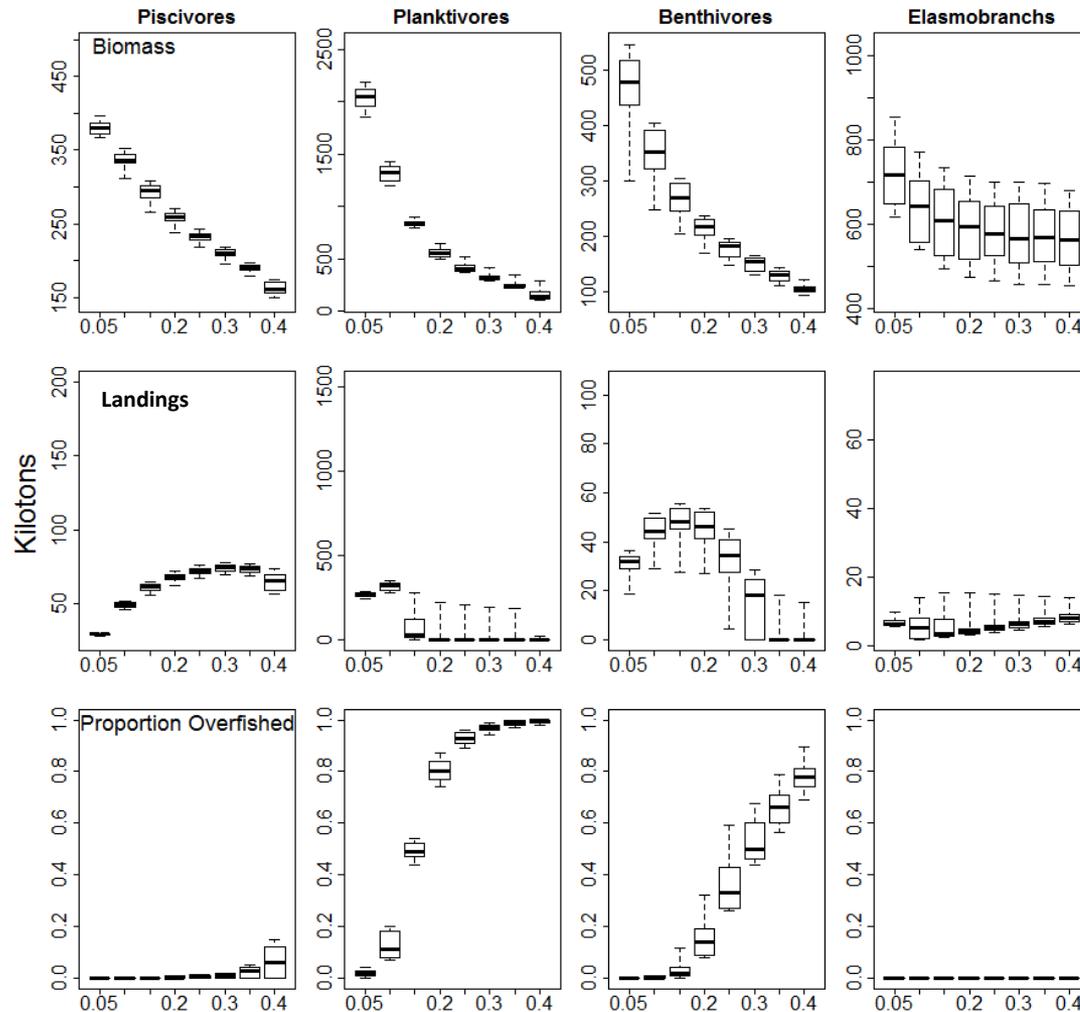
Determine Target Exploitation Rate and Calculate Median Yield



Hydra Simulations: Reference Points in a Virtual World

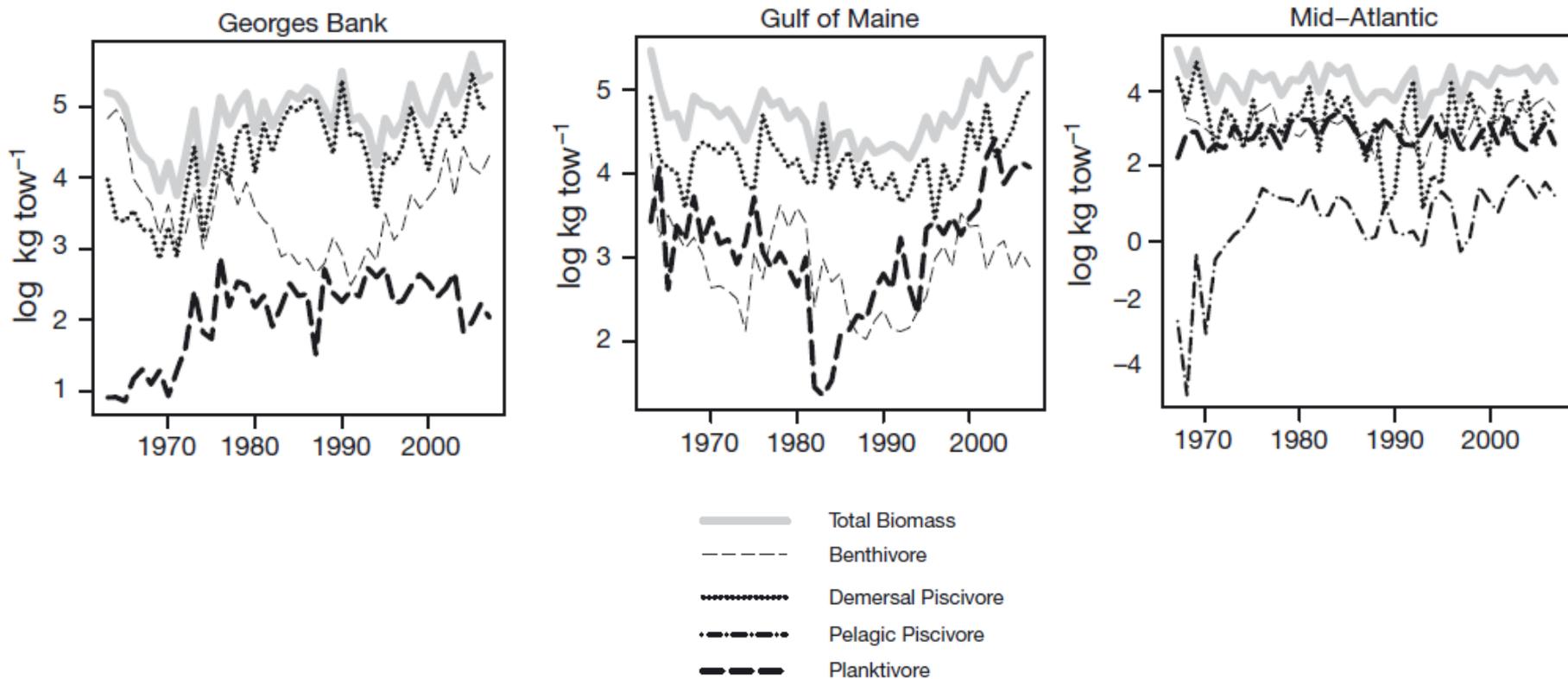
- Overall Catch Cap
- Ceilings on Catch for Fishery Functional Groups
 - Sum of Catch by FFGs not to Exceed Overall Catch Cap
- Biomass Floors
 - Fishery Functional Group Level
 - Total Biomass of FFG not to Fall Below 20% of Unfished Biomass
 - Individual Species Level
 - Biomass of any Species within FFG not to Fall Below 20% of Unfished Biomass

Status Determination in a Simulated World

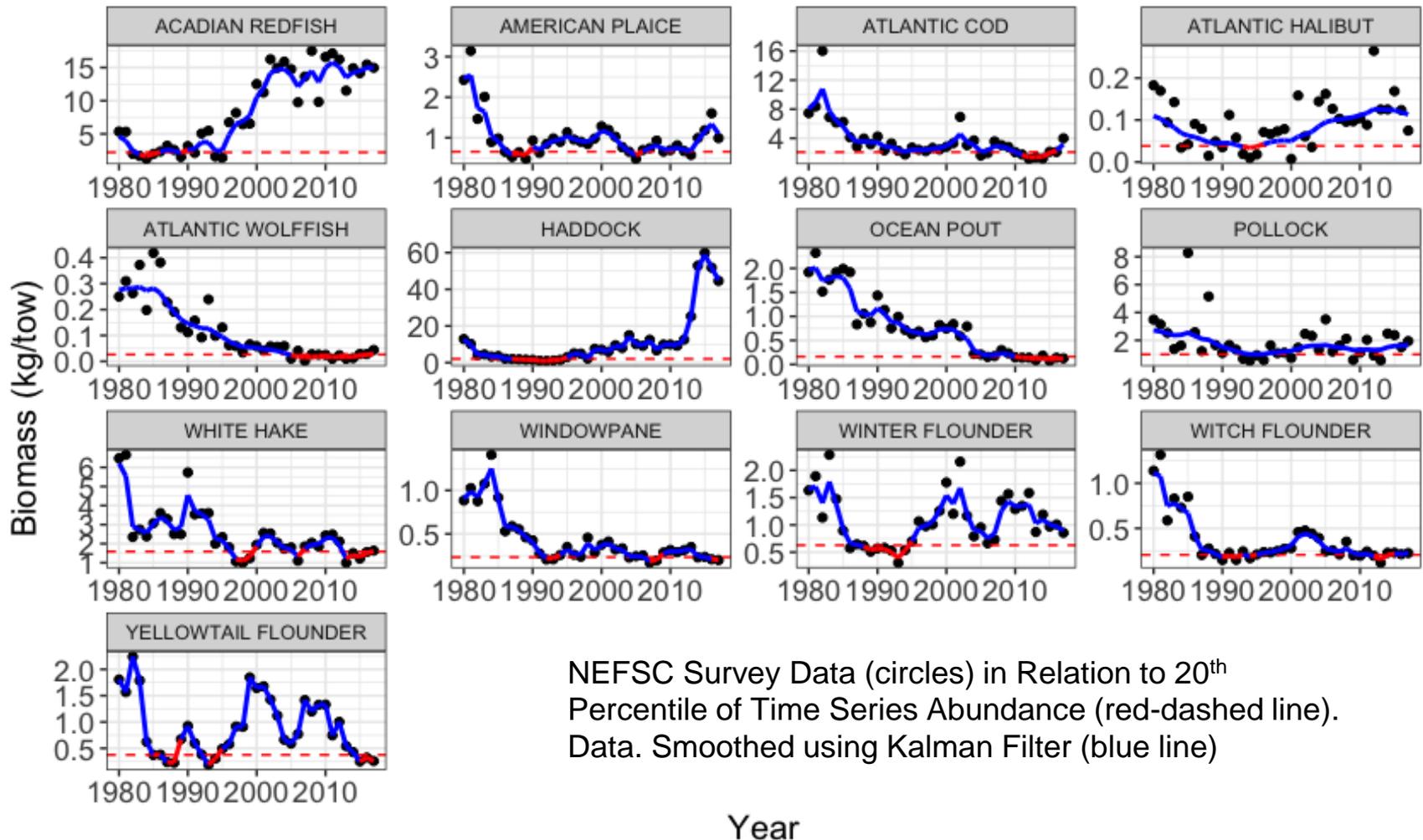


Real World Options

Can Overall Biomass in NEFSC Research Vessel Surveys Provide a Basis for Determination of Catch Caps for Target Exploitation Rates?



Determination of Overfished Status in Real World Data



NEFSC Survey Data (circles) in Relation to 20th Percentile of Time Series Abundance (red-dashed line). Data. Smoothed using Kalman Filter (blue line)