Research Priorities and Recommendations to Support Interjurisdictional Fisheries Management

WEAKFISH

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Fishery-Dependent Priorities

High

- Increase observer coverage to identify the magnitude of discards for all commercial gear types from both directed and non-directed fisheries.[1]

Moderate

- Continue studies on temperature, size, and depth specific recreational hook and release mortality rates, particularly catches from warm, deep waters. Investigate methods to increase survival of released fish.
- Continue studies on mesh size selectivity, particularly trawl fisheries.[2]
- Improve methods to estimate commercial bycatch. Refine estimates of discard mortality based on factors such as distance from shore and other geographical differences for all sizes including below minimum size.

Low

- Determine the onshore versus offshore components of the weakfish fishery.
- Collect catch and effort data including size and age composition of the catch, determine stock mortality throughout the range, and define gear characteristics. In particular, increase length frequency sampling in fisheries from Maryland and further north.
- Develop latitudinal, seasonal, and gear specific age length keys coastwide. Increase sample sizes for gear specific keys.

Modeling / Quantitative Priorities

High

- Evaluate predation of weakfish, by an expanded suite of predators (e.g., marine mammals), including leveraging ongoing ASMFC work on multispecies models by including weakfish as both predator and prey.
- Develop a bioenergetics model that encompasses a broader range of ages than Hartman and Brandt (1995) and use it to evaluate diet and growth data.

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[1] Some additional Mid-Atlantic trawl fleet observer coverage has been implemented under ACCSP funding.

[2] Gillnet selectivity has been investigated by Swihart et al (2000). Some gear selectivity information in Amendment 3 to the ASMFC Weakfish FMP. Information can also be obtained from the North Carolina Pamlico Sound Independent Gill Net Survey.

- Conduct simulations with the proposed Z based control rules, or thresholds/targets in a time varying environment to explore alternative management options, particularly under a stock recovery scenario.
- Transfer Bayesian model code to more broadly accessible platform. The method likely has broad applicability for other stocks in the region and beyond.

Moderate

- Analyze the recruitment dynamics of weakfish and examine the effects of the relationship between adult stock size and environmental factors on year class strength; explore inconsistencies between YOY and Age 1 results from the assessment model.
- Conduct a simulation-estimation analysis to explore trends in natural mortality.
- Look for consistency and similarity among GLM survey estimation methods and check for sensitivity to collinearity of different drivers with the YEAR effect.
- Currently, spatial asynchrony in the Bayesian model includes a variance parameter for each age and year, but most of the variation seems to be among years. Evaluate whether annual variance is more parsimonious.
- Assessment model input weights-at-age are poorly estimated or at best variable. Conduct sensitivity analyses to evaluate how much of this is real and how it affects model performance.

Low

- Explore alternatives for dealing with uncertainties in age-length keys and catch data through length based or condition-based models, recognizing these come with new issues, like proper representation of growth.
- Catch measurement errors appeared relatively small; explore whether other process or measurement error processes are perhaps overly constraining the fit, possibly through simulation estimation.

Life History, Biological, and Habitat Priorities

High

- Develop a coastwide tagging program to identify stocks and determine migration, stock mixing, and characteristics of stocks in over wintering grounds. Determine the relationship between migratory aspects and the observed trend in weight-at-age.[3]
- Monitor weakfish diets over a broad regional and spatial scale, with emphasis on new studies within estuaries.
- Continue to investigate the geographical extent of weakfish hybridization.
- Estimate weakfish mortality through independent approaches (e.g. alternative models, tagging) to corroborate trends in mortality from the assessment model.
- Conduct a meta-analysis of all factors likely to influence changes in natural mortality to see if the aggregate effect shows stronger statistical likelihood of occurrence than the significance shown by each individual driver effect on its own.

[3] Tagging work to evaluate mortality, movement, stock mixing, and weakfish predator information was begun in North Carolina in 2013. Otolith samples have been obtained by Old Dominion University, but funding has not been available for processing.

Moderate

- Identify and delineate weakfish spawning habitat locations and environmental preferences to quantify spawning habitat.
- Compile data on larval and juvenile distribution from existing databases to obtain preliminary indications of spawning and nursery habitat location and extant.
- Examine geographical and temporal differences in growth rate (length and weight-at-age).
- Determine the impact of power plants and other water intakes on larval, post larval, and juvenile weakfish mortality in spawning and nursery areas. Calculate the resulting impact on adult stock size.[4]
- Monitor predation on weakfish from both fish and marine mammal species.
- Determine the impact of scientific monitoring surveys on juvenile weakfish mortality. Calculate the resulting impact on adult stock size.

Management, Law Enforcement, and Socioeconomic Priorities

High

- Improve implementation of the process for organizing and collecting data from different agencies and sources to assure timely and high quality data input into the model.

Moderate

- Assemble socioeconomic data as it becomes available from ACCSP.

Low

- Define restrictions necessary for implementation of projects in spawning and over wintering areas and develop policies on limiting development projects seasonally or spatially.

[4] Data are available for power plants in the Delaware Bay area and North Carolina. Also see Heimbuch et al. 2007. Assessing coastwide effects of power plant entrainment and impingement on fish populations: Atlantic menhaden example. *North American Journal of Fisheries Management*. 27: 569-577.