

ANNUAL REPORT FY11
Habitat Assessment Funded Research

Project Title: Detecting an environmental gradient in maturity, spawning rates, and fecundity of inshore winter flounder stocks: does thermal habitat create spatial heterogeneity of life history parameters within stock boundaries?

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Goals: The objective of this study is to determine if there is significant but as yet unreported spatial heterogeneity in reproductive traits within the two inshore stocks of winter flounder (i.e., currently managed as ‘southern New England/Middle Atlantic’ and ‘Gulf of Maine’ stocks). The hypothesis is that a latitudinal habitat gradient (i.e., temperature) in combination with limited migrations (i.e., with respect to latitude) lead to life history variations in growth and reproduction. The application is that these variations lead to notable differences in reproductive potential of the stocks, and to the extent that there is within-stock variation, this uncertainty is not currently accounted for in stock assessment models.

Approach: Samples will be collected in partnership with the State of New Jersey and the State of Maine by placing a NMFS contractor onboard their winter-spring groundfish surveys. Maturity and skip spawning rates of individual fish will be evaluated using gonad histology. Fecundity will be measured using the auto-diametric method. Ages will be estimated from otoliths. Target sample size is 150 females per state survey. Supplemental data from other parts of the stock areas will be collected by an industry ‘study fleet’ (funded by the Northeast Cooperative Research Program) and ‘special request’ sampling aboard the NEFSC’s spring groundfish survey. In all, the data will provide a spatially-intensive snapshot of variation in female winter flounder reproductive parameters across > 4 degrees latitude.

Work Completed: **This project is on track, on schedule.** We have hired a contractor, Megan Winton, to lead the field and laboratory work. Dr. Mark Wuenschel and Ms. Winton participated in a trip aboard the R/V “SeaWolf” offshore of New Jersey in late October. This ‘shakedown’ cruise allowed final adjustments of field procedures and it produced useful samples for maturity and skip spawning estimation.

Applications: Previous work (submitted to “Journal of Sea Research”) has identified variation in maturity schedules both between and within the coastal stock areas for winter flounder. This variation creates uncertainty in estimation of spawning stock biomass, which is a legislatively-mandated reference point (Magnuson-Stevens Fishery and Conservation Act, 2007).

The currently-funded proposal will allow us to investigate this type of uncertainty in greater detail. In particular, sampling in the Gulf of Maine will address whether this variation in maturity exists as a smooth gradient or if it is discontinuous, mostly likely in association with capes or other habitat features of the Gulf of Maine. It will also add greater habitat-associated detail to estimates of skip spawning rates and potential annual fecundity. From a biological perspective, it

is already clear that productivity is dramatically different between the two coastal stocks. This habitat-oriented research aims to empirically link stock productivity to the thermal environment within a spatial context.

This ultimate application is to examine spatial patterns in fish density and reproductive potential within a stock, thereby to test if incorporating habitat-specific reproductive information reduces uncertainty of the assessment relative to assuming constant reproductive potential. Discussions with stock assessment partners have focused on how to get this new information into the next stock assessment. Existing computer programs (e.g., the toolbox) do not allow for within-stock variation of maturity in the analytical model yet, so this project has the potential to eventually advance our options for incorporation of habitat-related variation in NEFSC stock assessments.

Publications/Presentations/Webpages: Reference to previous work:

McBride, Richard S., Mark J. Wuenschel, Paul Nitschke, Grace Thornton, and Jeremy R. King. In review. Spatial variation in size at age at maturity of female winter flounder, *Pseudopleuronectes americanus*, as determined with gonad histology. Submitted to Journal of Sea Research. (NMFS MMS#2011-212).

McElroy, W. David, Yvonna K. Press, Emilee K. Towle, Mark J. Wuenschel, and Richard S. McBride. In review. Reproductive potential of female winter flounder, *Pseudopleuronectes americanus*: Comparison of fecundity and skipped spawning among three stocks. Submitted to Journal of Sea Research. (NMFS MMS#2011-218).