

the last year for which recruitment deviations can be estimated and the last year for which an ABC forecast is needed. The forecasting approach developed by Shertzer, Williams, and Prager takes this ‘calculate  $F$  from catch’ rather than ‘calculate catch from  $F$ ’ approach and also takes into account implementation error in management of the fishery to attain the target catch. Here, I show how a comparable procedure can be implemented within the Stock Synthesis assessment model which conducts the forecast as a continuous time series process in the final stage of an assessment analysis. In this approach, the forecast time period will include annual values for quantities like the probability that  $F$  exceeds the overfishing limit and the probability that biomass is below the overfished limit.

### **Some aspects of scientific uncertainty in west coast stock assessments**

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The 2006 reauthorized Magnuson-Stevens Fishery Conservation and Management Act requires that the Scientific and Statistical Committees (SSC) of the regional Fishery Management Councils provide acceptable biological catch recommendations, which must account for scientific uncertainty in the estimation of overfishing limits (OFLs). Quantifying scientific uncertainty in estimates of OFL is challenging. Multiple sources of error are likely to occur, including measurement error, parameter estimation error, model specification error, forecast error, and uncertainty about overall stock productivity. Although many sources of uncertainty exist, the focus of the Pacific Fishery Management Council’s SSC has been on quantification of parameter estimation error and model specification error, particularly the latter. While not all inclusive, the study of these two factors is possible using currently available information. We summarize the first order approximate estimates of the standard error on terminal biomass from stock assessments, which we term ‘within’ variation. To quantify variation ‘among’ stock assessments, as a proxy for model specification error, we characterize retrospective variation among multiple assessments of the same stock. Results show that for 16 stocks the mean of the coefficient of variation on terminal biomass (‘within’ variation) is 0.19 (s.d. = 0.09). In contrast, the average coefficient of variation ascribable to model specification error (i.e. among-assessment variation) is 0.51 (s.d. = 0.19), which is the far greater of the two sources of uncertainty.

### **Dominant sources of scientific uncertainty in recent Gulf of Mexico stock assessments—implications for ACLs**

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The Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006 mandates the use of annual catch limits (ACLs) set such that overfishing does not occur, and calls for strong accountability measures to prevent exceeding the ACL. Furthermore, the law assigns enhanced responsibilities to the Scientific and Statistical Committees (SSCs) of the regional Fishery Management Councils (FMCs). The SSCs have been charged with reviewing the relevant scientific information, considering the scientific uncertainty and recommending appropriate ACLs to the FMCs, who cannot exceed the ACL specified by the SSC. The precise methodology for quantifying scientific uncertainty has not been described or uniformly applied across FMCs. Sources of scientific uncertainty include, but are not limited to: measurement error, model structure, model mis-specification, uncertainty regarding biological parameters, and forecast error. This study will identify the dominant sources of scientific uncertainty for several frequently assessed Gulf of Mexico stocks including: king mackerel, gag grouper, and red grouper. This information could be used by the Gulf of Mexico FMC SSC to assist the construction of appropriate buffers to prevent overfishing.

# PROCEEDINGS

## **11<sup>TH</sup> NATIONAL STOCK ASSESSMENT WORKSHOP**

*Characterization of Scientific Uncertainty in Assessments to Improve Determination of Acceptable Biological Catches (ABCs)*

## **JOINT SESSION OF THE NATIONAL STOCK AND HABITAT ASSESSMENT WORKSHOPS**

*Incorporating Habitat Information in Stock Assessments*

## **1<sup>ST</sup> NATIONAL HABITAT ASSESSMENT WORKSHOP**

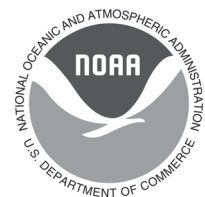
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