Draft Narrative, OFL-CV for Surf Clam
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Data Quality

Survey

- Survey has been restratified to improve precision, and covers the range of the stock area.
- Efficiency of survey gear has been estimated through several experiments and is variable between experiments for any gear configuration
- Because new strata are larger there are now many fewer gaps in stratum sampling. This reduces the need for data "borrowing."
- The Georges Bank components are lower than previous estimates. Sampling intensity there has increased, and the commercial dredge used recently has higher efficiency.
- There is one shallow inshore component that is exploited but cannot be surveyed under current protocols.
- Restratification led to reduced survey area, and so area swept estimates are lower, reducing the total number in that estimate.
- Age and length data were considered adequate.
- Large uncertainty envelope may lead to overinterpretation of trends in indices.

Landings and discards

- Landings data are believed to be accurate.
- Regular observer coverage of the fishery was implemented recently (2015). Estimated discards are low.

Model appropriateness and identification

- The SS3 model structure in this assessment is a single model with two areas, compared to previous assessments where separate models were generated for each area and results combined. Although scale information continues to be problematic, the situation is improved relative to the previous assessment.
- The entire survey time series (stratified number per tow) was used for trend; swept area abundance estimates after 1997 were used for scale. Most recent series (MCD) was used for both scale and trend but only available for three years.
- Previous estimates of efficiency were used as an informative prior for q.
- Domed selectivity was allowed, although this is at odds with previous selectivity experiments (focusing on selectivity of small sizes, but flat-topped).
- A number-weighted F was estimated over the two areas (vs. a total F dominated by high F in Georges Bank, but low stock numbers there).
- More parameters were estimated this year (183).
- The model incorporated time-varying growth (in southern area), which improved fits to length composition data.
- Model sensitivities included comparisons of trajectories of earlier assessments with models incorporating changes to new model (SS3), restratification, and addition of discard estimates.
- Model sensitivities included comparisons of trajectories of models incorporating area effects, estimating growth in the north, estimating selectivity in both areas, removing apparently

erroneous length composition data, allowing time varying growth in the south, and changing the method of estimating overall stock F; sensitivity to R_0, the scale-setting parameter; and a variety of other features.

- MCMC was used to evaluate uncertainties from maximum likelihood estimates. in R_0 (unfished recruitment parameter) and recruitment parameters, with roughly similar results as MLE approximate.
- There is some sensitivity to initial starting parameter values.
- Stock-recruitment relationship appears flat, because of the high steepness parameter: there were no observations of recruitment at low stock sizes to inform this parameter.
- L_{inf} declined over time.

Retrospective patterns

- Historical retrospective showed approximately similar trends although different scales. This model scales biomass lower than previous ones.
- Peels based on 6 years indicate only minor internal retrospective patterns: Mohn's rho does not indicate the need for adjustments.

Comparison with simpler analyses

- Swept area biomass estimates and ratios of efficiency-corrected swept area/catch (F proxy) were of similar scale to model results.

Ecosystem factors

- No ecosystem factors were considered explicitly in the assessment, although the separation into two areas allows responsiveness to potentially different productivities in the two areas, and time-varying growth allows responsiveness to changing but unspecified ecological factors.
- If distribution moves deeper as temperatures increase, that shift would be reflected in deeper survey strata that sample ocean quahog.
- Increasing ocean acidification may affect growth.

Trends in recruitment affecting accuracy of forecasts

- Time series average recruitment was used in projections; however, projections are relatively insensitive to recruitment assumptions because of the six year lag in recruitment to the fishery.
- Neither survey nor commercial operations select for young surfclams.
- The effect of a single year's recruitment on stock size and stock status is likely small because of the number of ages in the stock.

Prediction error

- Most of the prediction error would seem to be related to uncertainties of scale (bias rather than variance).
- Performance and precision is compared to earlier assessments (see sensitivity analyses above).
- $F/F_{threshhold} = 0.26$, with CV = 0.25; $SSB/SSB_{threshold} = 2.38$ with CV = 0.11.

Assessment accuracy under different fishing pressures

- Fishing mortality appears low relative to natural mortality, which makes scale estimates difficult, reduces the amount of information that can be obtained from fishery dependent data, and increases reliance on estimates of survey efficiency.
- Increases in F are emerging in the Georges Bank component, however. This may lead to increased accuracy associated with dynamics in that area.

Simulation analysis or full MSE

- Multiple and detailed sensitivity analyses were conducted within the SS3.0 assessment model framework to evaluate potential impacts of data streams and alternate SS3.0 model formulations, and results were also compared with previous SS3 assessment model formulations.
- A “Plan B” simplified approach was also developed and compared.