

Ocean Quahog OFL-CV Determination

Draft

7/16/20

1. Data Quality

- Accurate landings data – mandatory logbook reporting
- Discards are variable but low compared to landings (generally <5%)
- Long-term survey, recently redesigned (restratified), covering stock area to improve survey efficiency and precision
- No new survey data since the last assessment
- Dredge efficiency and selectivity data and evaluation available to inform models
- Comprehensive length-frequency information from landings and survey; little age and growth information is available
- Recruitment data sparse, but probably adequate for assessment of this long-lived species

2. Model appropriateness and identification during the assessment process

- SS3 model; two areas (S and N) to provide assessment for whole stock. Other models applied in the past
- Model well documented but its efficacy constrained by low F. Trends well described but scale still uncertain
- Model generally captures fishery-specific traits for this long-lived species
- Comparison made among the assessment baseline model and models with different structures
- Comprehensive model testing and simulations, including MCMC run to evaluate model performance and uncertainty

3. Informed by retrospective analysis

- Comparisons for several previous assessments and assessment models
- Scales differ between early assessments (before 2004) and more recent assessment, but trends are similar
- Current assessment (2020) and previous (2017) very similar; SSB a bit higher in 2020.
- No retrospective adjustment of spawning stock biomass or fishing mortality required in 2019. (?? Difficult to ascertain since SS3 only applied for second time in 2020)

4. Informed by comparison with simpler analyses

- Swept area biomasses from surveys are supportive of, and similar to, modeled stock.
- Probability distributions for B and F reference points similar to those from SS3

5. Informed by ecosystem factors or comparisons with other species

- No stock-relevant ecosystem factors included in the assessment or model

- No ecosystem factors outside the stock assessment included in developing reference points.
- Awareness of probable ongoing climate change and probable future offshore or northward shifts in distribution, or potential changes in productivity

6. Informed by measures of trend in recruitment (primarily affecting the accuracy of forecasts)

- Recruitment trends or levels not well known or described, but perhaps not critical for this long-lived species
- No indication of highly variable recruitment
- No stock-recruitment relationship
- OFL estimates apparently are adjusted by the recruitment proxy generated in the model
- SS3 model has issues with the low and apparently invariable recruitments. The assessment analyst “tricked” the model by introducing a large recruitment near the middle of the time series that then allowed SS3 to perform.

7. Informed by prediction error

- Prediction errors are considered
- Model performance and precision compared to earlier assessments (bridging)
- Model performance consistent with earlier modeling. Scale shifts but trends are consistent
- Prediction CV for $F_{2020}/F_{thr} = 0.342$ is 0.295; Prediction CV for $SSB_{2020}/SSB_{thr} = 2.17$ is 0.108
- Projected biomass from the last assessment was within the confidence bounds of the biomass estimated in the current assessment

8. Assessment accuracy under different fishing pressures

- Estimates and projections probably are valid (accurate) but consistently low F make it difficult to confirm scales
- The long time series of survey data, catches and trends lend credence to the assessment results despite low F, uncertainty in recruitment, uncertainty in selectivity, questions about growth patterns
- Exploitation is low; $F < 0.01$ and has not varied greatly over the years. Relative F may be declining in the most recent years and $F/F_{thr} < 0.3$ in most recent years
- While scale is uncertain, relative SSB/SSB_{thr} remains > 2 , with little change over years or in projected years, probably as expected given the low F and little incentive for fishery to increase effort

9. Informed by simulation analysis or full MSE

- The exploitation rate is low and simulations and projections show little stock biomass response under conditions of future catches at status quo, quota, or OFL. There is

potential for overfishing in long-term projections if catches were taken at OFL (an unlikely circumstance)

- No MSE conducted, but a simulation-based approach to assessment has been conducted and informs management strategies and alternatives.

Draft Narrative

The ocean quahog is a lightly fished stock under limited entry management. The assessment update is a Level 1 Management Track Assessment. The stock is neither overfished nor experiencing overfishing. Catches are well documented; they tend to be concentrated in a relatively few ten-minute squares. Fishery-independent surveys conducted since the 1980s indicate little long-term change in stock biomass. Most catches continue to be taken in the southern region of the fishery, with modest landings from the north (Georges Bank). Discards and bycatch mortality (small clams) are at low levels and reasonably well documented. No changes were made in the ocean quahog assessment for 2020 beyond updating to the latest version of the Stock Synthesis model. No new survey data were available. However, data from the newly designed and re-stratified NEFSC Clam Survey were used in this updated assessment. Recruitment is poorly defined but no obvious patterns or trends are seen. The poorly defined recruitment may be of minor concern because of individual longevity (>100 years) and low fishing mortality (likely $F < 0.01$). Reference points are ratios rather than absolute values, allowing conclusions about stock status despite considerable scale uncertainty. The low F and prevailing market conditions suggest that stock status will not change rapidly. In this regard, it is notable that SSB/SSB_{thr} is >2.1 and exploitation level F/F_{thr} is <0.3 in recent years. No retrospective adjustment of spawning stock biomass or fishing mortality in 2019 was made in the assessment update. Comparison of past estimates of biomass trajectories (2009 to 2020) from KLAMZ and SS modeling indicate quite good agreement. Population projections for ocean quahog are reasonably well determined and projected biomass from the 2017 assessment was within the confidence bounds of the biomass estimated in the 2020 assessment. Empirical estimates of biomass (swept area abundance) and exploitation rate are supportive of the SS3 model assessment results. In a seven-year projection under “status quo,” “quota,” and “OFL” scenarios, the stock would not be overfished under any of the scenarios and, only under the OFL scenario might overfishing occur. Market conditions suggest that “status quo” landings may prevail, at least in the near future. No particular ecosystem factors were included in the assessment; there is awareness of shifting climate and changing regional temperature that may affect stock productivity and spatial variability. The assessment model is age- and length-based, but the model is fitted to length composition information rather than age-composition data. More age data are desirable and aging analysis is ongoing, but high cost of aging ocean quahogs constrains adoption of age-based assessment modeling.