



C. Summary of Science and Technical Approach

The science and technical approach used for stock assessments depends on which of four levels of assessment is being targeted, “Benchmark (or “Full”) Assessments for West Coast groundfish include at least one index of abundance and some length and/or age data. Estimated parameters in benchmark assessments include equilibrium recruitment and some selectivity parameters while other quantities, such as growth, natural mortality, retention, and the steepness of the stock-recruit relationship are estimated only when data are adequate to inform estimation within the model. All benchmark assessments were conducted using the Stock Synthesis (SS) modeling framework. This software tool is highly flexible, well-tested and reviewed, and has been applied to more than 60 stocks around the world, including about 30 West Coast groundfish stocks. The US West Coast is the region for which SS was first developed, and the NWFSC assessment team has a long history of collaborating with SS developer Richard Methot to test and expand the features available, and produce freely available code to process model output using the R programming language.

Update assessments are simply temporal extensions of previously approved benchmark assessments, in which the model’s existing data series are updated with more recent or corrected observations. No model exploration is undertaken in an Update, and the focus is on confirming that the fits to data and other diagnostics are still acceptable.

Data-limited methods have greatly expanded since the MSA was reauthorized in 2006 and the mandate to stop overfishing and provide annual catch limits for all species in a fishery management plan (FMP) by 2011. Data-poor and data-moderate assessments include methods that use either catch-only or catch and indices of abundance, respectively, with fewer estimated parameters than for benchmark assessments. An independent peer review of the data-poor methods DCAC and DB-SRA was conducted in 2011, with the two methods being endorsed. Two CIE-staffed methods reviews, one SSC subcommittee data and methods review, and one STAR panel were conducted for data-moderate methods and assessments in 2012 and 2013, with similarly supportive results. During this time period, ongoing development of each method, improvement on parameter inputs, and substantial simulation and comparative testing across data-poor, data-moderate and benchmark methods has both increased understanding of each approach while also helping refine applications. Catch-only methods have provided OFLs for at least 50 stocks in the groundfish FMP, while data-moderate, Category 2 analyses were recently conducted for 8 groundfish species (some with models for two coastal areas). This progress represents a huge increase in the capacity to inform catch recommendations beyond just simple average catches for almost all stocks in the FMP.

The data used in stock assessments of all categories are processed using a variety of computational tools. These include software for aggregating length and age data, estimating indices of abundance with associated uncertainty, and estimating discard rates with associated uncertainty. These data-processing methods have undergone various levels of refinement and review, with the greatest focus being on software to calculate survey indices using a Generalized Linear Mixed Model framework, which has been the subject of multiple peer-reviewed papers and review by SSC and CIE members of STAR panels.

Benchmark Assessments are typically assigned to Category 1 by the SSC, although some may be designated Category 2, depending on the quantity and quality of data available for the model. Data moderate methods are generally designated Category 2, and data-poor methods are designated category 3. Category 1 stocks have the smallest precautionary difference between the estimated OFL and ABC, while Category 3 stocks have the largest.