

Review of Projections for South Atlantic Blueline Tilefish

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This document responds to a request to provide scientific advice regarding whether projections from the SEDAR 32 Blueline Tilefish stock assessment represent the current state of the stock and are appropriate in setting new reference points and fishing level recommendations, and to review the Terms of Reference for the June 3, 2015 meeting of the SSC (see May 22, 2015 Memorandum).

A benchmark stock assessment of Blueline Tilefish was completed in 2013 using data through 2011 (the terminal year of the assessment). The assessment was conducted through the standard SEDAR process, reviewed by 6 reviewers (including 3 CIE reviewers) at the September 2013 SEDAR Review Workshop, and presented to the SSC in October 2013. The assessment included several sets of projections, and in addition between October 2013 and the April 2014 SSC meeting, the Science Center responded to four different requests for projections that made various assumptions about fishing mortality and interim year landings (20 projection scenarios; see SEDAR 32 assessment document and documents dated Nov 25, 2013; Apr 7, 2014; Apr 28, 2014; and May 23, 2014). These projections, the projection methodology in general, and an additional analysis of age composition data to investigate recent year class strength were presented and reviewed at the April 2014 SSC meeting. The projection methodology was considered appropriate and identical to methods applied in concurrent and past SEDAR assessments. The analysis of age compositions did not reveal evidence of a recent strong year class of Blueline Tilefish. The geographic extent over which the assessment should be applied was reviewed and discussed at the April 2015 SSC meeting. The recommendation was that the assessment be considered a coastwide stock assessment.

The benchmark stock assessment conducted under SEDAR 32 has been recommended as the best scientific information available to inform the management of Blueline Tilefish by the SEDAR Review Panel and at multiple meetings of the SSC. The May 22, 2015 memorandum refers to the appropriateness of the projections from this assessment for "...specifying new reference points and fishing level recommendations..." Reference points (e.g., MSY , F_{msy}) were specified and approved in the original SEDAR 32 assessment and are not affected by projections, so the current request in the May 22 memorandum relates only to fishing level recommendations. Concern was expressed that "...the level of reported blueline tilefish landings in 2014 is similar to the magnitude of biomass estimated by the projections." We assume that 'biomass' refers to spawning stock biomass, not population biomass. Spawning stock biomass is smaller than population biomass, because it comprises only mature females. Landings, particularly when taken from a single year, do not provide information on population abundance or the state of a stock. The estimated landings in 2014 were 450,232 lb or 204.2 metric tons (mt). We do not have an estimate of the standard error, but note that landings are never known precisely. However, the point estimate of landings (204.2 mt) is well within the projected uncertainty in

spawning stock biomass, which ranges about three-fold around a point estimate near 150 mt (95% confidence intervals, 80-280 mt; see April 28 document Fig. 4, top left panel). That estimate of landings is well below estimated total biomass.

It is not implausible that the stock could withstand higher landings than projected for some period of time. The inference from the assessment and all of the projections conducted to date is that the current level of landings is not sustainable in the long-term. This is illustrated in an early set of projections (see Table 2 of November 25, 2013 document) that assumed landings for each year from 2012-2014 (484,815 lb) that were similar in magnitude to those that were subsequently observed, but unknown at the time the projection was conducted (2012: 464,974 lb, 2013: 497,263 lb, 2014: 450,232 lb). In the projection, this assumed level of landings resulted in a near three-fold decline in projected spawning stock biomass. This illustrates that as fishing continues above MSY levels, spawning stock biomass declines, and actual landings can become a high proportion of spawning biomass. The current memorandum expressed concerns about the projections because estimated 2014 landings are 'similar in magnitude to [spawning] biomass estimated by the projections'; this concern seems warranted, as this observation is consistent with the conclusion from the assessment that overfishing is occurring.

April 2015 SSC Meeting Terms of Reference

Review Blueline Tilefish stock projections

The projections from the SEDAR 32 Blueline Tilefish stock assessment use standard methodology that has been used and reviewed in a number of other SEDAR assessments. The methodology was reviewed during the SEDAR 32 Blueline Tilefish Review Workshop and at the October 2013 SSC meeting. The projection methodology and revised projections were the focus of the April 2014 SSC meeting. There have been no additional projections or changes to the projection methodology since the April 2014 SSC meeting. Therefore, there should be no need to conduct additional review of the projections.

Identify uncertainties and discuss their impact on projection results and fishing level recommendation and management

Projections are forecasts of the future and, hence, are uncertain. The assumptions of the projection methodology are outlined in the SEDAR 32 stock assessment document and in the projection documents noted above. The primary assumptions are that the relevant fisheries continue to fish at their estimated current proportions of total fishing effort and maintain the same selectivity pattern after the terminal year of the assessment (2011); the estimated spawner-recruit relationship applies in the future and past recruitment deviations are a reflection of future uncertainty in recruitment; the projections are conditioned on the assumptions inherent in the catch-age stock assessment model (they are based on a single model structure).

Key sources of uncertainty in the assessment are carried through the projection period. For Blueline Tilefish, these include uncertainty in natural mortality, steepness, spawner-recruit parameters, and in initial (2012) abundance at age. The effect of this uncertainty can be seen in the error bars associated

with projected spawning stock biomass, fishing mortality, and recruitment (see projection documents noted above). Uncertainty associated with implementation error (e.g., delay in management action) was not included, but implementation error will generally lead to higher uncertainty than that estimated for subsequent years of the projection.

Determine whether projection assumptions such as interim year landings are met, and comment on the consequences of this determination for fishing level recommendations and management

The projection assumptions are described above and in the SEDAR 32 assessment and associated documents. Interim year landings were used for 2012 and 2013 in the projections while assumed landings of 224,000 lb (landings associated with 75% F_{msy} under equilibrium conditions) were used for 2014. Management was assumed to begin in 2015. At the time the projections were conducted, 2013 landings were considered preliminary. The 2014 landings are still considered preliminary but were estimated at 450,232 lb (commercial: 360,640 lb; recreational: 89,592 lb), above the assumed 224,000 lb that were used in the projections. Higher realized landings than assumed for the interim years of the projection would result in lower ABCs in subsequent years.

Determine whether existing projections represent Best Scientific Information Available, and whether they are adequate to support fishing level recommendations for both the current and future years

The assessment and associated projections have undergone extensive review and no methodological flaws have been discovered. No alternative projections are available or have been proposed. Therefore, these projections and their associated uncertainty represent the best scientific information currently available.

Provide guidance for revised projections, if necessary

Because the April 2014 projections represent Best Scientific Information Available, as noted above, revised projections should not be necessary.

Provide revised Fishing Level Recommendations, including ABC and OFL, if appropriate

Regulatory measures were put in place for Blueline Tilefish under an Emergency Action Rule implemented for the 2014 fishing season. Actual landings in 2014 exceeded those specified in the regulatory amendment. Based on accountability measures in use for other fisheries, landings overages in 2014 could be subtracted from the ABC for future years from the quota of the fishery that incurred the overage. However, this method of fish accounting does not factor in the compound mortality rate, such that a fish harvested now does not equal a fish left for future harvest. Accounting for this aspect of the population dynamics would typically require a further reduction in future landings in order to return to the original population trajectory. Similarly, an underage would allow for slightly more fish to be harvested in subsequent years to return to the original population trajectory. In general, landings above those used in the projections and delays in restricting harvest will necessitate more severe reductions in future years in order to achieve management objectives.