NCDMF Stock Assessment Program
External Peer Review

Assessment Information

Assessment Species:	Southern flounder (*Paralichthys lethostigma*)
Stock Assessment Report:	Stock Assessment of Southern Flounder, *Paralichthys lethostigma*, in North Carolina Waters—2014
Date Sent:	November 10, 2014

Dear Reviewer-

Thank you for agreeing to review the 2014 stock assessment of the North Carolina southern flounder stock. The purpose of the external peer review process is to ensure that the assessment and results presented are scientifically sound and that decision makers are provided adequate advice. Peer reviewers are asked to address the terms of reference in the terms of reference report that follows. Please be as specific as possible in recording your comments and suggestions for revision and improvement. Any additional suggestions to improve the stock assessment are appreciated. Reviewers are also welcome to make comments directly in the assessment report using the Track Changes feature in Microsoft Word.

Please return this form, the terms of reference report, and any additional comments to laura.lee@ncdenr.gov. We would like to have your review by December 5, 2014. A copy of the final report will be provided after it has been presented to the North Carolina Marine Fisheries Commission.

Thank you,

Laura M. Lee
Senior Stock Assessment Scientist
North Carolina Division of Marine Fisheries

TERMS OF REFERENCE REPORT FOR EXTERNAL PEER REVIEW

Reviewer Information

Reviewer Name:	Genevieve Nesslage
Business Mailing Address:	ASMFC 1050 N. Highland St, Suite 200A-N Arlington, VA 22201
Business E-Mail:	gnesslage@asmfc.org
Business Phone:	703-842-0727

1) Evaluate the thoroughness of data evaluation and presentation including:
   a) Justification for inclusion or elimination of available data sources

To the extent of my knowledge, all available, reliable sources of landings, biosamples, and survey data were included in the assessment. There was no mention of SEAMAP, but I assume that is because that program's surveys do not catch southern flounder.

The analytical team was well justified in their decisions to use fishery-independent juvenile and adult survey data sources in place of the Beaufort Bridgenet ichthyoplankton survey and fishery-dependent CPUE indices.

The assessment report notes (page 48) that there is little correlation and possibly some conflict among surveys used in the assessment. Unless movement rates between regions within NC waters can be obtained to support a spatially explicit assessment model, the analytical team may want to consider more careful inclusion/exclusion criteria or a model-based combination of indices into stock-wide indices to provide the model with more coherent information about what the trends in overall stock abundance might be.

   b) Consideration of survey and data strengths and weaknesses (e.g., temporal and spatial scale, gear selectivities, sample size)

Description of data collection was thorough and transparent with regard to both strengths and weaknesses.

   c) Calculation and standardization of indices and other statistics

The methodology described was appropriate for the treatment of surveys not designed to target southern flounder. No diagnostics were provided to evaluate GLM performance. Without additional information, this portion of the TOR cannot be evaluated thoroughly.

A plot of all JAI and adult surveys in the same (respective) figures would have been useful for comparing trends.

Also, an overall description and visualization of landings trends (both total and by fleet) would have been helpful to include in the report as well.

2) Evaluate the adequacy, appropriateness, and application of data used in the assessment.

Focusing on the use of lengths (the most reliable type of data widely available for this species) was appropriate. The calculation/estimation of length-based maturity and selectivity curves was the best approach given the data.

Instead of averaging natural mortality estimates across all available approaches, would careful consideration of the assumptions of each model in relation to southern flounder biology help eliminate some of the options? Incorporating expert judgment into the selection of natural mortality estimators may result in values more suitable for the species.

As mentioned above, it might be worthwhile considering the application of a set of specific, explicit inclusion/exclusion criteria when selecting indices. Alternatively, a model-based combination of regional indices into stock-wide indices might provide the assessment model with more coherent information about what the trends in overall stock abundance might be. The model is likely struggling to make sense of differences among what may be (in some cases) sound- or river-specific trends.

Overall, I found description of the data and data treatment outside the model to be outstanding; however, details regarding how data were treated in the model were lacking. Much of this information is obtainable in the Stock Synthesis dat and control files, but justification for the values chosen is not outlined in the report. For example, the SEs applied to fishery catch and the errors assigned to annual index values were not discussed. How were effective samples sizes determined? Also, justification for fishery selectivity time blocks was not apparent. These are important decisions that affect model performance and results. More extensive description and justification is needed.

3) Evaluate the adequacy, appropriateness, and application of method(s) used to assess the stocks.

The analytical team should be applauded for adopting a modern, sophisticated (yet not overly complicated) approach to assessing this stock. Continued development and use of an integrated model is encouraged. Additional comments on methods by subtopic are provided below.

Model fit:

Plots of model fit to fleet landings were not provided. I assume they fit well; otherwise, the model should have been deemed highly unreliable and not used. However, I was surprised that such standard output was missing from the report. I suggest including the core, standard r4SS figures in future assessments that utilize SS as a modeling platform.

Poor fits to the Program 915 and 135 surveys were not surprising given they were highly constrained by the small specified SEs (<0.2) shown in the SS data file. The model should not be expected to be able to fit the high values for Program 135's index in the 1990s unless the SEs are loosened up. Even if annual SEs from GLM models were used (which I am assuming…a description is not in the report), it is almost impossible to believe that those indices track stock trends that well. Using a higher, ad hoc level of variance would allow the model the freedom to balance all the data sources in the model better and still try to fit those higher data points if at all possible.

As the report states, the model produced poor fits to indices and length composition fits were not stellar. The magnitude of retrospective pattern was disconcerting as well. Again, it is unclear

how well the model fit total landings. In general, the model does not appear to be performing well given the data and current configuration.

Migration and selectivity:

The issue of emigration outside NC waters is troubling. However, the analytical team expertly included several structural decisions to account for the movement and emigration of larger/older fish as best they could, including the use of dome-shaped selectivity for inshore fisheries and the use of annual recruitment deviations in place of a stock recruitment function. These model configuration decisions allowed for a more realistic portrayal of stock dynamics and avoided overestimation of fishing mortality on larger/older fish for inshore fisheries that target smaller/younger fish.

I question, though, the forcing of ocean fleet selectivities to be asymptotic given known emigration. If length data are available from the returned tagged fish, could they be used in some way to inform specification or partial estimation of the descending limb of the selectivity curve for this fleet?

Ultimately, these issues and others raised in the report (e.g., recruitment potentially being subsidized by SC/GA/FL spawners) cannot be addressed well or at all by the available data. In the absence of better tagging and migration studies, a regional assessment approach is recommended.

General selectivity:

In the interest of reducing the number of parameters, could the inshore recreational and commercial time blocks be dropped from the assessment? Figures 27 and 28 indicate they are not changing fishery selectivity that much. Perhaps I missed the justification for these time blocks and the need for them. If so, please disregard this comment.

The shift in ocean fleet selectivity to larger fish made sense given regulation changes; however, that issue should be discussed and used to bolster time block decisions in the report.

An alternative selectivity function that is more flexible in shape may improve model fit. The double normal forces the curve to adopt a particular shape and that may be causing some of the apparent length composition fitting issues. Although it requires more parameters, I suggest trying the spline option if you have not done so already.

Growth:

On page 43, the report states that conditional ages at length are used, but the control file has -1s in the Low and High Bin columns for the first fleet (commercial gill net?). The explanation for this was not clear.

To help improve fit to length composition data, I highly recommend loosening up (increasing) the specified CVs on your vonB parameters. These CVs may not be large enough to accommodate the true variation in the observed data. This may lead to overestimation of fishing mortality and patterning in the length composition fits.

Model components:

A table of likelihood components showing the relative contribution of each data source for the base and alternate models would have been helpful for comparison with the text in Sections 3.2.7 and 3.3.

4) Evaluate the methods used to estimate stock status determination criteria. Evaluate the adequacy and appropriateness of recommended stock status determination criteria.

The justification for a management target and threshold of 25–35% SPR was not provided and alternate reference points were not recommended. It is unclear to me why southern flounder management would differ from summer flounder which (unless I am mistaken) uses a threshold of $F_{35\%}$ and target $SSB_{35\%}$. Why a lower %MSP for a similar fish that grows and matures quite rapidly and displays relatively low variability in recruitment for a finfish?

5) Does the stock assessment provide a valid basis for management for at least the next five years given the available data and current knowledge of the species stock dynamics and fisheries?

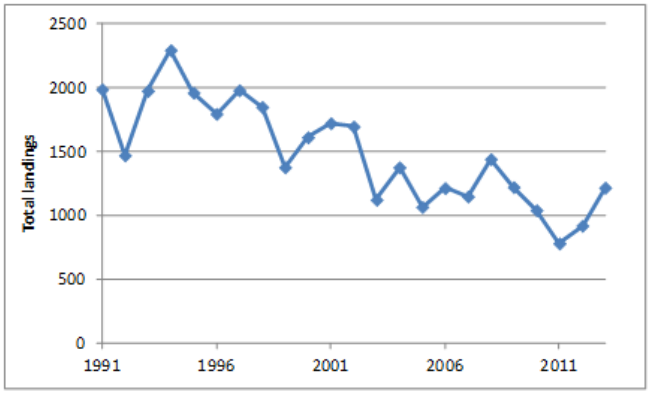
○ Yes

◉ No

Comment on response.

Despite the outstanding efforts of the analytical team, this assessment suffers from either uninformative data or too short a time series to detect trends in the stock. The model has great difficulty fitting contradictory and/or trendless data. It is quite possible that the data sources are actually informative but there have been no major changes (large declines or increases) in the stock since 1991.

My concern with stock status stems from counterintuitive data and results. If I interpreted Table 12 correctly, estimated landings have halved since 1991, but there has been no marked increase in survey trends or expansion of length or age structure in the catch. [Note: population length structure was not plotted, but the report did not make note of an estimated expansion in length structure of the stock so I assume none was noticeable.] Estimated discards have risen, but most discards appear to come from the recreational fishery which is still a small percentage of the overall catch.

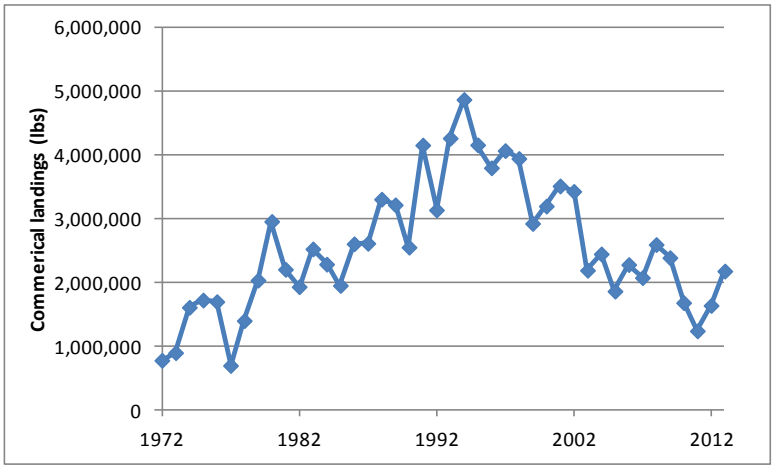


Estimated recruitment has declined, but I worry that is an artifact of the model trying to maintain some fit to stable length composition data in the face of halved landings and largely trendless surveys.

In short, it does not make sense that the stock has been experiencing overfishing across the entire time series if there has been no marked response to halving the catch. I think the model simply

cannot construct a coherent story about how the stock is responding to fishing mortality without a longer time series, more informative surveys trends, and more informative length structure changes.

I suggest placing the 1991+ data in the context of the history of the fishery to the maximum extent possible. A quick plot of total commercial landings of southern flounder since the 1970s (http://portal.ncdenr.org/web/mf/statistics/comstat/floundersou) indicates there has been significant contrast in the landings data if the time series could be extended back farther.



My naïve interpretation is that regulations limiting the gillnet fishery (particularly in Pamlico Sound) in the late 1990s and early 2000s may have contributed to a decline landings (Table 10). However, NC fisheries biologists and the analytical team would know best how to interpret these data.

I suggest the analysts consider supplementing their current SS model runs with alternate configurations that incorporate historical catch data and the statewide Program 120 survey extended back to the early 1980s (if the survey data can be standardized for changes in design and implementation). Estimates of total commercial and recreational harvest statistics appear to be available that far back as well. Use of the Program 120 survey would provide the model with information on recruitment without having to specify (or estimate) a stock-recruitment relationship. I am not familiar enough with the data to know if this is feasible, but, if it is, it might be worth trying and comparing with results from the 1991+ base run.

It is also possible that the NC portion of the stock is at the northernmost tip of the species' range and it may not be possible to assess this stock with confidence without adopting a more regional approach. At a broader spatial scale, trends in indices and stock responses to fishing and environmental influences may become apparent.

Given my reservations about the model's interpretation of the available data, I am concerned that the stock status determinations made in the assessment may be poorly informed by the short time series of available data relative to the history of the fishery. I suggest more exploration of historical data and growth parameterization be conducted before a final stock status determination be made and used for management.

6) Evaluate appropriateness of research recommendations. Suggest additional recommendations warranted, clearly denoting research and monitoring needs that may appreciably improve the reliability of future assessments.

Research recommendations are appropriate given the monitoring and modeling challenges presented by this stock. I am particularly concerned with recommendation #2 given application of gill net discard frequencies to recreational data may not be appropriate (especially for the offshore recreational fishery). If post-release mortality for some of these fisheries/gears is truly at or near 100%, this is an important recommendation to address.

I suggest the following addition to *Analysis* recommendations:

- Develop additional model runs in SS using all available historical catch and survey time series, if possible.

7) Are you aware of any reference material not cited in this report that should be included?

No.

8) Would you be willing to act as an external peer reviewer for a future NCDMF stock assessment?

(●) Yes

( ) No

9) Do you have any additional comments?

Please consult tracked edits and comments in the document for additional (minor) content and editorial comments.