Findings of the Mid-Atlantic Fishery Management Council Expert Review Panel of the Project Report "Commercial and Recreational Allocation for Summer Flounder"

Introduction and Acknowledgement

This report is a consensus report of an Expert Review Panel created to conduct a scientific peer review of the Mid-Atlantic Fishery Management Council (MAFMC) contracted research paper "Commercial and Recreational Allocation for Summer Flounder." The views expressed are those of the individual members and do not represent official positions of their employing agency or institution.

The panel expresses its gratitude to MAFMC staff Dr. José Montañez and Ms. Kiley Dancy for providing the review materials to the panel and managing the meeting logistics and to Mr. Kirby Rootes-Murdy from the Atlantic States Marine Fisheries Commission for his assistance throughout the process.

Background

The MAFMC and the Atlantic States Marine Fisheries Commission (ASMFC) are developing an amendment to the Fishery Management Plan (FMP) for Summer Flounder, Scup, and Black Sea Bass, to include a comprehensive review of all aspects of the FMP relating to summer flounder. One major issue that the MAFMC and ASMFC plan to address through the amendment is the current quota allocation between the commercial and recreational sectors of the fishery.

The MAFMC and ASMFC are interested in using an empirical basis to help evaluate allocation decisions in the summer flounder fisheries. The MAFMC contracted Dr. Kurt Schnier (University of California, Merced) and Dr. Rob Hicks (College of William & Mary) to develop a model to examine the economic efficiency of the current allocation system.

This project includes the development of two separate models, one for the commercial sector and one for the recreational sector. Each of these models is used to construct a behavioral simulation, calibrated using existing data. The simulation model is used to estimate the marginal value for summer flounder in the recreational and commercial fisheries under alternative sector allocations.

Because of the importance of allocation decisions the MAFMC convened an Expert Panel to conduct a scientific peer review of the analytical framework and empirical application of recreational and commercial models developed by Drs. Schnier and Hicks. The Panel included members from the MAFMC's Scientific and Statistical Committee (Dr. Doug Lipton, NOAA Fisheries Senior Economist; Dr. David Tomberlin, NOAA Fisheries Office of Science and Technology; Dr. Mark Holliday, NOAA Fisheries Policy Office, retired; and Dr. Lee Anderson, University of Delaware, Professor Emeritus), and an outside expert Dr. Jorge Holzer (University of Maryland). The panel was moderated by Dr. Eric Thunberg (NOAA Fisheries Northeast Fisheries Science Center). Other attendees included Kiley Dancy (MAFMC staff), Kirby Rootes-Murdy (ASMFC staff), Michael Luisi (Maryland DNR/MAFMC chairman), José Montañez (MAFMC staff, via webinar), Brandon Muffley (MAFMC staff, via webinar), Annie Hawkins (Kelley Drye & Warren), and Greg DiDomenico (Garden State Seafood Association).

The Review Panel met on November 18, 2016, in Baltimore, MD (meeting agenda attached). Review materials, including the report prepared by Drs. Schnier and Hicks were provided to the panel approximately one month prior to the meeting. During the meeting, the report authors provided a detailed presentation of both the recreational and commercial allocation models. The

Review Panel commends both Drs. Schnier and Hicks for the clarity and openness of their presentations.

The following provides comments from the Expert Panel on each of the five Terms of Reference (TORs) provided by the MAFMC. This report summarizes the Panel deliberations that occurred during the Review Panel meeting. Each panel member was also asked to provide written comments on the report. These comments are included as attachments to this consensus report.

TOR 1: Were the theoretical and statistical model specifications for the recreational valuation module done in a manner consistent with professional standards?

a. **Are the statistical methods themselves compliant with theory?**
b. **Are the statistical methods appropriate for the problem being addressed?**
c. **How appropriate were the data used in the analysis? Are the data sufficient to estimate the model? Do missing data pose a risk of biasing the parameter estimates or the model results? Are appropriate reasons listed for not including specific data sets? What proxy data are used and was it the most appropriate data to use?**
d. **Were alternative model specifications investigated and tested? Were assumptions underlying the statistical analysis of the models clearly stated?**

Findings – The Review Panel finds that the recreational valuation module was consistent with economic theory and the statistical methods applied were consistent with professional standards. The Random Utility Model (RUM) is appropriate for estimating marginal recreation values based on the available data. The Review Panel found that the data were used appropriately and that alternative data were either not available or would not have resulted in improved estimates of recreational fishing values. Alternative model specifications were investigated. The Review Panel did raise several issues that need to be considered.

- The Marine Recreational Information Program (MRIP) data were the appropriate data to use for this purpose. However, these data were not scrutinized nor adjusted by the authors for outliers or anomalies that could influence the estimated parameters either up or down. Statistical information on the properties of the data used is provided in the report but only at aggregated levels. Given high interest and skepticism surrounding MRIP data the authors should be prepared to document in detail which, how, and when these data were used and any steps taken to minimize MRIP quality impacts on the model.

- The report is written at a fairly general level, which omits a substantial amount of technical detail. However, omitting this information makes it difficult to replicate the study. A technical appendix would be appropriate to more thoroughly document the data and procedures.

- The recreational valuation model was based on a single year (2014) yet the site-specific catch rates were based on a multi-year average pooled across multiple intercept sites within a county. One limitation is assuming that the mean of pooled catch rates, over a number years with ever-changing stock and regulatory conditions, accurately reflects angler expected catch rates in 2014. It is also important to note that the choice of model year (i.e., 2014) affects the estimated total valuation since it depends on the number of trips that targeted or caught summer flounder as well as the total number of recreational fishing trips in that year.

- In addition to trips that targeted and caught summer flounder, the model included both angler trips that targeted summer flounder but did not succeed in catching any summer flounder as well as trips that take place within the management unit that didn't target summer flounder but still caught summer flounder incidentally. That these latter two sets of anglers derive value from summer flounder quota is a valid assumption of the research. However, this will need to be more clearly explained as attributing value to anglers that did not catch any

summer flounder will be hard for a lay audience to understand.

- Although attributing value to trips that did not catch or target summer flounder is a valid assumption, the model does not evaluate any angler entry-exit or opt-out decisions to link recreational choices to the level of quota. Instead, the number of trips is fixed regardless of how large or small the allocated quota is. This is a strong assumption that needs to be further evaluated for its influence on the model outcome.

- In the absence of a trip response there is nothing that would drive a change in the number of trips or recreational expenditures. This means that the caveat noted by the authors that the recreational values do not include producer surplus from related industries (e.g. bait/tackle, food, beverages, etc.) is *not* a limitation of the model at least as it was constructed and estimated. By contrast, the commercial valuation model is based on simulating a change in the number of commercial fishing trips that would be necessary to harvest the commercial quota. This means that omission of profits from related industries (e.g., purchases of gear, repairs, fuel, ice, bait etc.) is a limitation of the commercial module.

TOR 2 Were the theoretical and statistical model specifications for the commercial module done in a manner consistent with professional standards?

a. Are the statistical methods themselves compliant with theory?
b. Are the statistical methods appropriate for the problem being addressed?
c. How appropriate were the data used in the analysis? Are the data sufficient to estimate the model? Do missing data pose a risk of biasing the parameter estimates or the model results? Are appropriate reasons listed for not including specific data sets? What proxy data are used and was it the most appropriate data to use?
d. Were alternative model specifications investigated and tested? Were assumptions underlying the statistical analysis of the models clearly stated?

Findings - The Review Panel finds that one aspect of the RUM model as it was applied to the commercial fishing module was not compliant with economic theory. Specifically, the revenue-based RUM model implies that the marginal utility of profit depends on the different sources of species revenue is inconsistent with professional standards that holds that the marginal utility of profit does not depend on the source of revenue. The Review Panel recommends re-estimating the commercial RUM model in terms of catch, which would be consistent with professional standards. In all other respects the statistical methods were compliant with theory and were consistent with the problem being addressed. The available data were used appropriately although the Review Panel raised several issues that may need to be further explored or at least noted in the report. These issues as well other comments on the commercial valuation module are noted below.

- The observer data is appropriate for the purposes of the commercial valuation model, however, relatively little attention has been paid to the statistical properties of these data and their limitations. These limitations include:

- The selection of observed trips is not random. Trip selection is based on a mixture of requirements guided by protected species interactions and the Standardized Bycatch Reporting Methodology policy. Moreover, the priorities between these two purposes has changed over the years that have been included in the commercial RUM model.
- Certain vessel classes are underrepresented (e.g. smaller vessels, vessels without a valid Coast Guard safety inspection, or vessels in remote ports).
- Vessel operator fishing choices are known to differ while carrying an observer as compared to trips when an observer is not present.

- The RUM model uses data over a 15-year period from 2000 to 2014. These years reflect: many changes in the summer flounder stock size and distribution both in time and space; regulatory changes (including trip limits); changes in species jointly landed with summer flounder; changes in input prices, as well as technological change. These changes confound the estimation of the RUM model parameters and resulting valuation. These limitations need to be noted in the report.

- The commercial model takes into account state-by-state summer flounder allocations as well as quota limits on black sea bass and scup. This does reflect the management of these species but as quota limits for black sea bass and scup are reached revenue from these species no longer contributes to net return, which for marginal trips could result in negative profit. The commercial model still retains these trips and would continue to select from these trips as long as the summer flounder quota for the state is not exceeded. This process needs to be noted.

- The mean marginal valuation (MV) is flat no matter how little or large the commercial quota is. This is because (1) The marginal productivity is unchanged and there are no price effects that would tend to drive MV up at low quotas or down at high quotas, and (2) Every trip in the dataset is assumed equally likely to be drawn. Note that the lower confidence interval of the commercial valuation module does decline but this is driven by trips that become constrained by the black sea bass or scup quota or by a state summer flounder quota being reached rather than economic or technical factors.

TOR 3: Was the link between the commercial module and recreational module done in a manner consistent with professional standards?

Findings: The Review Panel finds that the link between the commercial and recreational modules was done in a manner that was consistent with professional standards and that was internally consistent within the theoretical and empirical methods used in the recreational and commercial modules. The Review Panel raised several concerns related to the stated recreational and commercial caveats and the synthesis of the two modules. These concerns include:

Recreational Module

- The opportunity cost of time was the only thing for which an adjustment beyond the model result has been made. The inability of the RUM model (given the available data) to account for the opportunity cost of time was a significant omission cited by the authors. The Review Panel accepted the authors' use of benefits transfer to remedy this omission to be a practice consistent with professional standards as its use is well documented in the literature. However,

in terms of where and how the application of benefits transfer was presented in the report (in the draft reviewed by the Panel it appears after the initial comparison of estimates of commercial and recreational benefits) it gives the appearance as being a justification after the fact. Further explanation of the conceptual basis and uncertainties associated with applying benefits transfer in this case is needed.

- In this research, the absence of an economic add-on survey to MRIP for 2014 meant that the opportunity cost of time, as well as other recreational fishing costs were underestimated. While the direction of bias is known its magnitude is not. The benefits transfer adjustment for the opportunity cost of time was based on some but not all of the results shown in Gentner et al 2010. Consideration of the full range of estimates would be appropriate.

- The potential impact of assuming no localized depletion was noted as a caveat in the commercial module but the potential for reduced recreational values due to congestion effects associated with high recreational allocation was not noted. Increased recreational participation may adversely impact catch rates in some geographic areas, and competition and congestion at fishing sites may diminish the value of a recreational fishing day. These effects would not be captured in the RUM model.

- The recreational module does not take into account potential behavioral changes associated with anglers that may have stronger recreational preferences than others. Instead, all trips are selected with equal probability. This is a strong assumption that should be noted by the authors.

Commercial Module

- The procedures used to estimate the commercial values result in flat marginal values. In the modeling context lower total values are driven by constraints on black sea bass and/or scup and not by any economic factors such as declining marginal productivity or price effects.

- Benefits transfer was applied to the opportunity cost of time for recreational anglers but was not applied to the consumer surplus (CS) associated with consumer demand for summer flounder. While an estimate of CS may not be available for summer flounder there may be other studies where CS has been estimated that could be referenced. If the application of benefits transfer conceptually is inappropriate in this circumstance, then it should be documented why.

- The data used to estimate commercial profit do not result, strictly speaking, in an estimate of economic surplus commensurate with that of the recreational values. The methods used to estimate net return are consistent with common practice but it should be noted that these estimates are accounting profit and not producer surplus. It would be correct and less confusing to simply refer to the commercial values as profit rather than producer surplus.

TOR 4: Were the results of the analysis (synthesis of the two modules) clearly interpreted? Can the model be used to map out a benefit curve given changes in allocation across commercial and recreational fisheries and can the results be used for management purposes? Can the model be used to consider allocation alternatives that were not specifically analyzed? Is it possible to make modifications to the current model that would allow for the measurement of benefits (both total and marginal) in situations where allocations are not binding?

Findings - The Review Panel finds that: 1) The synthesis of the two modules was clearly interpreted; 2) The model can be used to trace out a marginal benefit curve given changes in allocation across commercial and recreational fisheries; 3) The model can be used to consider allocation alternatives that were not specifically analyzed, and 4) Modifications to the current model would be unnecessary to measure marginal or total benefits when quota allocations are not binding.

With respect to whether or not the model results can be used for management purposes the Review Panel found that the model is considered best available science and can be used to inform a management decision.

The Review Panel found that the model results do not suggest that the existing allocation is inefficient, or that a reallocation would result in an increase in net benefits based on equi-marginal principles. Moreover, the model results do not provide a strong basis for arguing for or against any specific allocation. With the exception of very large changes in allocation, the confidence intervals for both the estimated recreational and commercial marginal benefits overlap. This means that for a wide range of summer flounder allocation options, the sector and total economic value to commercial fishermen and recreational anglers would be largely unchanged, based on the models and their associated data.

The Review Panel notes that the authors adopted an equi-marginal principle to formulate their recommendation on allocation of quota between sectors. This mean that the optimal allocation occurs when the value of the last pound of quota allocated to the commercial and recreational sectors results in the greatest combined economic value of the fishery, all else equal. The Review Panel found the equi-marginal principle to be consistent with professional standards as a useful approach to assessing allocations. However, this is not the only factor Councils may take into consideration: the relative risk of overages in one sector or another; the relative likelihood of quota not being taken by one sector or another; uncertainties not captured explicitly in the model that might affect sectors differentially, such as changes in fuel costs; transferability of quota within/between sectors, and relative economic impacts beyond the fishery itself (e.g., processing for commercial, tourist infrastructure for recreational). The synthesis of the two modules does not investigate how these additional factors might deviate the Council from the equi-marginal/economically efficient outcome derived by the models.

The Review Panel provided several additional comments.

- The recreational and commercial modules were primarily constructed based on 2014 conditions to evaluate whether or not the existing 60/40 allocation is optimal. This means that commercial and recreational values are conditioned on 2014 summer flounder stock size and availability, stock size and availability of alternative target species, recreational participation, and commercial fleet size and structure. The model results and its utility for projecting forward to allocation decisions under future biological, environmental, social, and economic conditions has to be understood within this context.

- The differences in estimated commercial values between the results for model 1 and model 3 suggests that state by state allocations in the commercial sector may be introducing much larger allocative inefficiencies compared with current levels of commercial-recreational allocations (i.e., within sector reallocations could result in higher benefits to the nation, as the modeled value of summer flounder quota was much higher in some states than others).

- Given the lack of information on the probabilities of accessing the quota by the heterogeneous harvesters in each sector, the results should be used with caution. The study currently assumes that, within each sector, every harvester is equally likely to access the quota. However, this may not hold in practice.

- The authors' included a recommendation in the report the Panel reviewed to use the lower bound estimates, as this would be a more conservative approach. The Review Panel believes the authors should not imposes their own risk factor on behalf of the MAFMC. This is best left to the MAFMC to decide. The Review Panel notes that the model results are reported showing the full confidence interval so there is no need to make any statements regarding preference for any particular upper or lower bound estimate.

TOR 5: Can this model be used to assess allocation in other fisheries? Could future models be run by other individuals without major modifications (e.g., Council and/or ASMFC staff)? Can the model be easily updated to support new MRIP estimates?

Findings – The Review Panel finds that the theory and methods to assess summer flounder allocations would be applicable to other fisheries. These methods would still be applicable to the revised MRIP estimates but the values would need to be adjusted to accommodate the new sample frame for trips. In general, applying the model to other fisheries would likely be limited to species with high encounter rates in the MRIP intercept survey. This is because application of the RUM model requires a reasonably high number of trips that targeted and/or caught the species of interest. The panel notes that even under these circumstances, an economic add-on to the MRIP intercept survey would be highly advisable, for example, to obtain necessary data to compute opportunity costs. Allocation models for species with low encounter rates would likely require employing a different method such as a "stated preference" survey.

With respect to whether the summer flounder allocation model or similar models for other species could be run by other individuals (e.g., MAFMC and/or ASMFC staff)**,** the Review Panel finds that the software and computational requirements demand specialized expertise. The model would not be able to be run by other individuals without major modifications.

ATTACHMENT

AGENDA and BACKGROUND

Summer Flounder Allocation Model Peer Review

Friday, November 18, 2016, 9:00 AM-5:00 PM

DoubleTree Baltimore-BWI Airport
890 Elkridge Landing Rd., Linthicum Heights, MD 21090
(410) 859-8400

http://www.mafmc.org/council-events/2016/nov-18-sf-allocation-peer-review-meeting

Agenda

Friday, November 18, 2016

9:00- 9:20	Introductions; Overview of Meeting Objectives and Agenda
9:20 - 10:00	Presentation: recreational module (Kurt Schnier/Rob Hicks)
10:00-10:30	Discussion, Q&A, and response to recreational module terms of reference
10:30 - 10:45	Break
10:45 - 12:00	*Continued:* Discussion, Q&A, and response to recreational module terms of reference
12:00 - 1:00	*Working Lunch:* Presentation: commercial module (Kurt Schnier/Rob Hicks); begin Q&A and discussion
1:00 - 3:30	Discussion, Q&A, and response to commercial module terms of reference
3:30 – 3:45	Break
3:45 - 5:00	Presentation: synthesis of model results; discussion and response to remaining terms of reference
5:00	Adjourn

Note: The meeting will be treated as a working meeting. The agenda reflects approximate times. Questions from the review panel may be entertained at any time during presentations.

Comments from Mark C. Holliday, Ph.D. (NOAA Fisheries Service, Retired)
Mid-Atlantic Council Scientific and Statistical Committee
November 21, 2016

O**verall:**

The research meets or exceeds the standards for a scientifically-based and statistically defensible modeling of marginal economic benefits of the allocation of the summer flounder catch between commercial and recreational sectors. The specifications are sufficiently supported by the stated assumptions and the documented caveats in the paper such that it is consistent with professional standards. The theory has been well tested previously for the recreational model and the commercial model is well documented. There are significant limits to the economic data collected by management authorities to conduct such research, and the authors did not conduct any additional primary data collection. Nonetheless, the information set used is considered to be the best available. The research result satisfactorily documents that the current 60/40 allocation is not sub-optimal, from an economic efficiency perspective based on an accounting of marginal benefits of those with direct engagement in fishing. Moreover, the authors' models of commercial and recreational fishing behavior showed clearly that modest reallocations between the two sectors would not produce substantial changes in overall benefits from the fishery.

From a public policy view the two behavioral models are by definition a limited (i.e., economic efficiency) specification of the full suite of issues facing angler and fishermen choices, as well as the Council's factors going into the allocation decision. This affects the broader utility of the models for decision-making. It is a very useful tool that takes a static look at confirming whether the 1993 allocation was the best one or not, all else being equal.

The research did not target looking forward to what should be the optimal allocation in the future given projected or hypothetical conditions with respect to stock productivity, stock availability, changes in fishing effort (trips) by existing fishermen (as well as entry and exit into the commercial and recreational fisheries), and changes in the summer flounder markets/prices through product competition/substitution, trade and aquaculture. The paper acknowledges the shortcomings of a static view, stating all else being equal, and discounts the distributional and social impacts of allocation important not only to decision makers but to angler and fishermen choice sets. The Council's long term interest is a tool to project an optimal allocation for the future under changing conditions (whether that is an annual specification, one that is revisited every x years, or in perpetuity). These considerations were presumably beyond the scope of work.

It is noted that the research was extremely data-intensive, computationally complex, and it pushed the limits of currently available statistical software and hardware. There are few analysts who could undertake this type of work successfully. These factors may limit the model's broader application to other species. Moreover, besides summer flounder (one of the most commonly observed species in the recreational data set), there may be an insufficient number of data observations for other species to satisfy the requirements of the model.

Specific Comments:

1. With respect to the recreational model, the site-specific mean catch rates per wave appear to be based on a multi-year average and computed across multiple locations in the MRIP site register at the county level, yet the allocation decision modeled was for a single year (2014). Two issues stand out: 1. How well do the means, representing a changing catch rate over a period of years, reflect the catch rate choice in 2014? The fact that there are differing regulations by State, and within a State, different regulations over time, indicates that summer flounder management is facing ever-changing conditions. The different

states value quantity of fish, size of fish, and access to fish (seasonality) differently. However, the site-specific quality measure is mean catch per wave. How did modeling 2014 accurately represent the dynamics of catch rates over time, particularly as a function of stock abundance and regulatory measures we've seen over the last 5-10 years? Was the 2014 catch rate choice to be modeled more likely a probability range versus a mean?; 2. How aggregation of sites within a county was handled is not discussed in any detail. The catch rates are not likely normally distributed. While sites in the register are weighted in proportion to their likelihood of producing a fishing trip (angler avidity) the probability of encountering summer flounder catch at a site and its computed catch rate (# fish/trip) will have different probabilities. How does this affect the angler choice set of selecting a county? Was catch rate distribution across sites within counties looked at, and how would calculation of means be affected? Inclusion of some of the statistical properties of the catch rate computation (n's, means, range, etc.) and discussion within the paper would document whether this had any effect.

2. The use of MRIP data does qualify for the "best available data" but that does not mean it has received sufficient attention by the authors. Very often no information is provided on the sample sizes used to calculate the parameters nor are their statistical properties documented. In addition, the authors do not indicate whether they subjected the raw data to any form of quality control. What is presented are tables or figures of estimates at the aggregate level (the finest detail being State estimates of catch and trips). Biases in the underlying raw data (e.g., digit bias), small sample sizes and coding errors can manifest themselves in anomalous results. From a credibility standpoint, examination of these data is critical as many participants have already viewed the raw and estimated data for States like New Jersey and New York and are skeptical of their validity. Because of the context in which this research was conducted it was suggested it needed to spend extra effort to anticipate criticism of the outcomes if the data were not sufficiently reviewed. The paper makes no mention of this issue; it should at least document what was/was not done to the raw data to assess outliers and their treatment (e.g. MRIP data showing summer flounder in Puerto Rico as cited by one of the authors in the November 18th meeting).

3. Similarly, the utility of observer data as the commercial source of data is given short attention by the authors. Its use is also justified as the only set meeting the model's criteria yet little time is spent discussing any actual evaluation of the data set. There is some uncertainty in the behavior of fishermen on observed versus unobserved trips, and this would be useful to evaluate in the context of how they data set is used in the current model. Moreover, the selection of trips to observe is not random: certain fisheries and gears were targeted for inclusion because that was where funding or regulatory requirements directed effort to be undertaken (e.g., Marine Mammal Protection Act funding; Standard Bycatch Reduction Methodology litigation outcomes). In addition, certain classes of vessels may be underrepresented (e.g., vessels too small to carry an observer; vessels in ports too remote or costly to get observers to; vessels excluded because they did not have a valid USCG safety inspection). This could affect calculation of trip costs, statistical areas fished and calculation of success rates, and/or revenue functions.

To investigate and mitigate the potential bias, comparisons of variables on trip data and tow data from other sources such as the NEFSC study fleet or other State and federal research could reveal some statistical differences. Even if there were differences identified, sensitivity analysis of the final estimated value per pound of summer flounder to the input data could find they had no impact but this type of analysis is not discussed. It would be valuable to know more about the data used including sample fraction, distribution by state, the statistical properties of the data set, and for example, the comparison of the author's cost, revenue and profit models to other researcher's work on the same topic. One could look at how representative were the sampled observer trips to the overall fleet, i.e., in terms of vessel size, number of trips, total revenue, trip location, home port, etc. Moreover, at the November 18th meeting a new NEFSC data set for weighting observer trips was revealed, and that might be useful to investigate if additional funds were made available. Comparing the author's results to other published estimates was

used in the paper's recreational section when model results were presented, for example. And attention to the question about confidence in the underlying data will be essential to the Council's ability to apply this work.

4. The use of opportunity cost estimates from Gentner to fill out a hole in the available data/model output is defensible and common in the economics literature, but the rationale and explanation in the paper is given very short treatment and justification. The authors do ascribe the positive use as a "benefits transfer" approach for opportunity costs, but they didn't propose to use this approach for any other missing information listed in their string of caveats. For example, would this technique be appropriate for the "missing" consumer surplus component on the commercial model side, why or why not? Instead they direct the reader to do their own reading of cited literature if they wish to better understand the applicability of this approach to the subject model's outcomes.

5. An additional caveat not discussed that could impact the utility of the model is that it does not account for changes in fishery availability over time as a result of climate changes impacts. If the center of the range of summer flounder is moving northward then historical catch areas will shift in the future and the models based on historical distributions of catch will become less representative of fishermen's true choices. The current costs to reach the more productive sites will be invalid. The authors might minimally describe the direction of any change in value based on distribution of fleet or fishing trips by State/port (albeit fishermen may continue to relocate in the long term).

6. Comments on Section 4.4.5 were discussed at length on November 18th; the principle is that the author's should not project their risk aversion profile on behalf of the Council. The risk policy decision is reserved for the Council to consider.

7. Several additional recreational and commercial caveats are worth noting:

- My comments and rationale for benefits transfer accounting in Figure 5.2 occurring elsewhere were discussed in detail at the November 18th meeting.
- Countering the potential for underestimating the marginal value schedule for the recreational sector caused by increases in participation and number of trips is the negative effect of such increased participation on the value of the recreational experience. Congestion in the form of crowed fishing sites, increased competition and impacts on catch rates (localized depletion) may occur with increased trips, lowering the marginal benefits value.
- Commercial caveats about dissipating value benefits over time as a result of open access was not tested or evaluated empirically for this specific fishery, and may be countered if additional forms of catch shares (as in Maryland) or sector separation tools are employed. Commercial caveats about costs per haul to increase as a result of localized depletion due to increased fishing could just as well be offset through economies of scale; it is impossible to say without any data or analysis what the net result will be.

Minor Comments/Editorial Suggestions (Needs a strong copyediting)

Search on "patter" replace with "pattern" or "patterns"; search on Massachussetts and replace with Massachusetts; search on "graphical" and replace with "graphically" (as appropriate)

P6 Para1: The range listed is not correct for summer flounder, which is east coast of Florida to Nova Scotia. What is cited appears to be the range for southern flounder *Paralichthys lethostigma*.

P6 Para 2: "Federal regulations" not "Official policies" are established by NMFS

P7 Para1: "...perception of overall health." unclear what has undergone a transition; declining stock health change is not a perception but a reality

p7 Para 3: Define/cite equimarginal principle (not principal)

P8 Para 1: Edwards (1990) not cited in reference section; using the term economic *impact* in first sentence is confounding efficiency vs. impact; *Maximizing total welfare*...to whom, accounting stance of producer and consumer surplus outside this analysis.

P8 Para 3: ...traditional*ly*

P9 Para 2: ...*motivate*??? "Inform"? "Provide a context"?

P8 Para 3: after "(Chapter 4)" add "*sectors";* in line 5 "...to develop *a"*

P10 Para 1: "...annual *ex vessel value*"; line 3: Are prices throughout paper expressed in constant dollars when evaluating trends?

P10 Para 2: "...is similar *to* the percentage"

P10 Para 3: Reference is made to comparing observer data to VTR data to investigate robustness of observer data - is this Table 2.4 on place where this is done/discussed? Why only 3 years (2012-2014) used in the table analysis, would like to see # observed trips vs. all trips, trips with VTRs, trips with VTRs AND observers. What analytical tests were run to evaluate differences (text says "for the most part" spatial data were similar -- were any statistical comparisons made? Only see one correlation coefficient mentioned. The validity of the observer data is foundational to the successful use of the model - expected to see more analysis.

P15 Figure 2.2: In B&W, figure could be misleading; legend has Observer data on top vertically whereas data line for observers is below VTR -- use dashed line or symbols in-line in addition to color as not many photocopies of paper will be in color. If the intent is to show seasonality then perhaps put observers on Y2 scale to better reveal monthly differences in values.

P16 Para 1: More documentation of the data range of the queries run for Section 2.3 should be included - heard to reproduce what you did. Suggest moving footnote 5 into first paragraph of Section 2.3 text - mapping MRIP and other conventions used for catch, harvest, landings, etc. is very confusing.

P16 Para 2: Last sentence incomplete...

P16 Para 3: line 3 "...except that ~~the~~"

P17 Para1: Table 2.7 shows 6 years of data but 7,398,558 is not the mean of those years but the point estimate for 2014. Same comment for Para 2 re: it is estimated catch, not mean estimated catch.

P17 Para 2: What defines a "sizable" amount of uncertainty -- a value-judgment being made here. The CV's for NY and NJ are under 20 percent, which for recreational survey results is almost the gold standard. If they are "sizable," what did you do to account for this uncertainty in your model/analysis?

P17 Para 2: More illuminating than saying total catch is declining would be to look at data and say catch is declining along with declining effort, or effort is stable of going up yet catch is going down; i.e., catch by itself is only part of the picture.

P22 Para 2: What is the conclusion being drawn here? Is there any? Where is the table /figure showing drop in trips from 2014-2015? The narrative of trends and the supporting for them in the form of tables and figures throughout 2.3.2 could be tightened up considerably with more and better cross references and stronger/clearer topic sentences for each paragraph trend.

P25 Para1: What is the rationale for choosing 2014, and would results hold if other years were chosen instead?

P25 Para2: Where is table or figure showing target species data?

P27 Para 1: "...our work ~~follows~~ uses"; You spelled out MRIP acronym twice, first use only is sufficient

P31 Para 3. "...mean catch of summer *flounder by* county per wave"

P32 Para 2: Confusing text and mixed tense from "Genter et al" onwards - rewrite please

P37 Figure 3.1: Label the different series peaks

P42: What does Footnote 14 refer to in the text?

P68 Para 3 "...produce*r* surplus"

Appendix Tables 5.1 - 5.3: Punctuate the numbers with commas (by thousands); add row and column totals as appropriate

Comments from Dr. Doug Lipton, NOAA Fisheries Senior Economist
Mid-Atlantic Council Scientific and Statistical Committee
November 30, 2016

1) Not meant as a critique of the authors, but of the process: A more iterative process for the analysis would be helpful in the future, similar to the procedures use for stock assessment. The analysts had to make many choices during the study regarding what data to use and the specific modeling approach to adopt. The review panel is asked to come in at the end of the process when there is little time to make substantive changes to the analysis. By reviewing the data and modeling choices earlier in the process, there is an opportunity to test and compare alternative approaches, and thus, lead to higher confidence in the output.

2) The RUM model as applied to the recreational sector aggregates fishing intercept sites to the county level and assigns catch rates to the county. The only travel cost considered is from the angler's home zip to the county centroid. There is no accounting for where the angler actually fishes on the water, and thus, the time spent to access better fishing grounds. This approach is necessitated by the data, but there needs to be a strong acknowledgement of the large amount of error this adds to the model results.

3) The recreational RUM model assigns average summer flounder keep and release for the county and wave as the angler expectation. Trips taken early in the wave, thus, have expectations that are formed mostly by data collected after they have taken their trip. Some examination of the data to see if this is an issue (e.g., low catches early in the wave, high catches late in the wave) impacted the results. Other approaches such as using some data from preceding wave (albeit, means losing observations in the first wave) could be explored.

4) The observed keep and release of summer flounder may be a result of either a binding bag limit on the trip, catch of undersized fish, angler preference to keep fewer than the bag limit, or some combination. Since there are variations in State bag and size limits, this may also confound the analysis. The implementation of the policy where it is assumed there will be an increase in keep may be overstating the welfare effects since it assumes all angers want to keep more fish.

5) The implementation of the 60 day lag (average catch for the 60 previous days) of catches in the commercial RUM model appears naïve given the known seasonality in the fishery. A more sophisticated spatial choice model could be explored in future work including looking at polynomial distributed lag models and combinations of annual and more recent lags.

6) The commercial RUM model of site choice, in addition to the issue discussed regarding species specific revenues, is estimated from data from 2000-2014. There should be some consideration of the fact that over this period, we observe North Carolina fishermen traveling longer distances to catch the statewide quota, and fishermen more closely located to fishing grounds, unable to make summer flounder trips due to lower state quotas. This phenomenon is demonstrated in the Model 1 simulations compared to Model 3, but how does it affect the distance parameter in the estimation and what are the implications for the simulations?

Comments from Dr. Jorge Holzer, University of Maryland
November 29, 2016

Overall, this is a well-executed project. The comments below refer to the commercial specification and the way the simulations on quota reallocation between the two sectors were conducted (due to the lack of additional data).

1. In the specification of the utility in the random utility model (RUM), it is unclear what the rationale is for assuming that the marginal utility of a dollar depends on where that dollar comes from (i.e. eq. 4.1. on p. 49, includes separate terms –and separate parameters to be estimated– for the revenues of the different species caught). It is suggested this specification is modified so that it uses total revenues, rather than individual revenues, to explain harvesters' choices. Alternatively, authors could use catch per species rather than revenues per species.

2. Note that, even if the suggestions in 1) are adopted, there is still a seeming mismatch between the computation of marginal values in p.55 and the utility, as specified in the RUM model and determining the probabilities of visiting the different sites. Indeed, while the former are based exclusively on expected profits, the latter are based on the specified utility, which does not include trip costs but includes the variable "distance".

3. In the commercial model, unlike the recreational model, constant marginal utility of the catch is assumed at the trip level. In other words, the utility associated with an additional pound of catch of summer flounder is the same, regardless of the total catch during the trip. This assumption, combined with the fact that, when drawing trips during the simulations, each trip in the dataset has identical probability of being drawn, effectively implies that, by design, the average marginal utility for the commercial sector will be a horizontal line. Similarly, when drawing recreational trips to meet the recreational allocation, it is assumed (again, due to lack of the necessary data to do otherwise) that each trip has the same probability of being drawn. These assumptions implied in the way the simulations are conducted are strong, although justified by the lack of additional data. Therefore, it is suggested that, in the list of caveats, it is explicitly stated that little is known about the probabilities of access of different harvesters/anglers. In the absence of transferable property rights in both fisheries and lacking additional data, the assumption of uniform random access (i.e. equal prob. of access) is the best the authors had to work with. However, there is no guarantee that the actual sorting of marginal values in the fishery is consistent with this assumption.

Comments from Dr. David Tomberlin, NOAA Office of Science and Technology
Mid-Atlantic Council Scientific and Statistical Committee
December 1, 2016

COMMENTS FOR COUNCIL:

The equimarginal principle is a useful approach to assessing allocations, but there are other factors for consideration: the relative risk of overages in one sector or another; the relative likelihood of quota not being taken by one sector or another; uncertainties not captured explicitly in the model that might affect sectors differentially, such as changes in fuel costs; and relative economic impacts beyond the fishery itself (e.g., processing for commercial, tourist infrastructure for rec).

COMMENTS FOR AUTHORS:

GENERAL:
Footnote 10 (ie that the model is limited to change in allocation only and not a change in TAC) is a significant limitation. Is there any way to help readers understand the likely implications of this limitation and how they might think about the case of simultaneous change?

It'd be good to explore benefits transfer from all three Gentner et al models rather than just the one preferred. Alternatively, you could look at how far the ratio of included to not-included would have to wander before it starts to look like evidence that an allocation shift might be needed (I don't have a specific method in mind for doing this, just throwing it out there as an idea that might help round out the picture).

DETAILS:

Pg. 29 point 3: does "overlap" mean geographic overlap or something else?

Pg. 31: how many observations were dropped in getting to the subset that meets the < 150 mile criterion? And was the subsetting on a) simply < 150 miles or b) jointly on <150 miles and also single day?

Pg. 32: if travel cost is the "lower bound" estimate, why not examine the upper bound too? I mean just explain why it's not as easy to do as the lower bound, not that you need to do it (unless it is in fact easy).

Section 3.2 / RUM model: any thoughts on what indexing by time might do (e.g., onshore / offshore movement of the fish suggest site productivity will vary during the season); is indexing by time irrelevant, unlikely to be informative, or just intractable?

Fig. 3.1: labeling is not clear in draft version

Section 4.1: summary stats on the data used for estimation would be nice, also an idea of what share of total fluke catch is accounted for by the observations kept in the data set

Comments from Dr. Lee G. Anderson, Professor Emeritus, University of Delaware
Mid-Atlantic Council Scientific and Statistical Committee
December 2, 2016

I made specific comments on copy editing and small issues during the meeting and in the review of the final panel report.

I think it should be acknowledged that this is the first time that the rum model was used in this way for commercial fisheries. It received high marks from the review panel during the discussion, although there were some suggestions for improvements. This is the first time I recall seeing estimates of the marginal benefit curves rather than just point estimates. I am pleased that the council supported this innovative work.

I think that it should be emphasized that although the report did not come out the way in a way that made either commercial or recreational interests happy (each would have like a report that gave them higher values), it did produce a definitive answer. Given the best information we have we cannot say that the current allocation is wrong on economic efficiency grounds. It is also important to keep in mind that these results are only applicable to this case at this time. It cannot be generalized to other fisheries.

This brings up a related point. Perhaps the report should have included a brief explanation of the equal-marginal principle and how it is to be interpreted. One important aspect has recently been made clear in the literature is that even if studies can show that the value of an extra fish allocated to a certain sector will have a higher value, this only become policy relevant if the actual way fish are allocated by regulation will send that fish to the higher value user.