SOUTH ATLANTIC FISHERY MANAGEMENT COUNCIL

SOCIO-ECONOMIC PANEL OF THE SCIENTIFIC AND STATISTICAL COMMITTEE

SEP Meeting Overview

April 8-9, 2020

Webinar

PURPOSE

This meeting is convened to discuss and provide input to the SSC and Council on:

- Recent and developing Council actions
- Citizen Science and FISHstory
- SEFSC technical memorandum on the economics of the commercial king and Spanish mackerel fishery
- Best fishing practices outreach and persuasion
- Allocations

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1. Introduction

1.1. Documents

Attachment 1a. Socio-Economic Panel Agenda
Attachment 1b. Minutes from the April 2019 meeting

1.2. ACTIONS

- Review and approve the agenda
- Approve the April 2019 Minutes
- Introductions
- Opportunity for public comment

2. Recent and Developing Council Actions

2.1. Document

Attachment 2. Recent and Developing SAFMC Amendments

2.2. Overview

Council staff will provide a briefing on recent and upcoming amendments and actions (***Attachment 2***). The briefing will go into details on Snapper Grouper Vision Blueprint Amendment 26 (Recreational), Snapper Grouper Vision Blueprint Amendment 27 (Commercial), Snapper Grouper Amendment 29 (Best Fishing Practices and Powerhead Regulations), Dolphin Wahoo Amendment 10 (Revise Dolphin and Wahoo Management Measures), and CMP Framework Amendment 8 (King mackerel trip limits, Season 2).

Vision Blueprint Regulatory Amendment 26 (Recreational)
The Council initiated development of this amendment in June 2016 to address short-term recreational management measures identified in the Vision Blueprint. Actions in the amendment include modification to the composition and limits of the recreational aggregates and measures to reduce discards. The final rule published on February 27, 2020 and regulations will become effective on March 30, 2020.

Vision Blueprint Regulatory Amendment 27 (Commercial)
In June 2016, the Council directed staff to begin development of an amendment to address items identified in the Vision Blueprint addressing commercial management measures. Actions include commercial split seasons and/or trip limit adjustments for several species/complexes and size limit changes. The final rule published on January 27, 2020 and regulations became effective on February 26, 2020.

Regulatory Amendment 29 (Best Fishing Practices and Powerhead Regulations)
At their March 2018 meeting, the Council removed actions pertaining to best fishing practices and powerhead regulations from Amendment 46 and requested that staff begin development of a

framework amendment. The Council was concerned that other actions in Amendment 46 (recreational permitting and reporting) would take significant time to be developed and did not want to delay action on other issues. The Council reviewed an options paper at their June 2018 meeting and approved the amendment for scoping with actions addressing venting and descending devices, circle hooks, allowable rigs, and powerheads. The Council reviewed scoping comments at their September 2018 meeting. Actions and alternatives addressing venting and descending devices, circle hooks, and powerheads were approved for analysis. The action pertaining to allowable rigs was removed. The Council reviewed a draft public hearing document at their March 2019 meeting. Preferred alternatives were selected that would require a descending device be on board vessels fishing for or possessing snapper grouper species, require vessels fishing for or possessing snapper grouper species to use non-offset circles north of 28 degrees north latitude, and would allow the use of powerheads to harvest snapper grouper species in federal waters off South Carolina. The amendment was submitted to NMFS on January 13, 2020.

Dolphin Wahoo Amendment 10 (Dolphin and Wahoo Management Measures)
In March 2016, the Council directed staff to begin development of a joint dolphin wahoo and snapper grouper amendment to examine different ways to allocate or share quota between the commercial and recreational sectors for dolphin and yellowtail snapper. Options included a common pool allocation, a reserve category, temporary or permanent shifts in allocation, combined annual catch limits, and creating gear allocations in the commercial dolphin fishery. Over multiple meetings, the Council has considerably revised the amendment to now include actions that would:

- Revise ACLs for dolphin and wahoo
- Revise section allocations for dolphin and wahoo
- Revise the definition of optimum yield in the dolphin fishery
- Revise accountability measures for dolphin and wahoo
- Allow the possession of dolphin and wahoo when unauthorized gears for use in the Dolphin Wahoo fishery are onboard properly permitted vessels
- Remove the operator card requirement in the Dolphin Wahoo fishery
- Modify the recreational limit of dolphin
- Modify gear, bait, and training requirements in the longline fishery for dolphin and wahoo to align with Highly Migratory Species requirements
- Allow filleting of dolphin at sea onboard for-hire vessels in the waters north of the Virginia/North Carolina border

The Council will review revised ABC recommendations from the SSC for dolphin and wahoo at the June 2020 meeting and provide guidance on further development of Amendment 10.

Framework Amendment 8 (King mackerel trip limits, Season 2)
At the March 2019 meeting the Council reviewed Mackerel Cobia Advisory Panel concerns regarding low commercial trip limits in the Atlantic southern zone during season two (October to the end of February). During the winter months, fishermen are only able to fish a small number of days due to the weather. Additionally, due to changes in the fishery, more fish are on the market during this time of the year, resulting in lower prices. When the weather is decent, AP members felt it would be helpful if fishermen had access to a higher trip limit to make trips

worthwhile. The Council directed staff to begin work on a framework amendment to address season two trip limits for Atlantic king mackerel. At the June 2019 meeting the Council approved actions and alternatives to be included in Framework Amendment 8. The Council also requested emergency action to raise the season two trip limit south of the Flagler/Volusia County line from 50-fish to 75-fish for the 2019/2020 season. This amendment is intended to make a permanent change to the season two trip limit. At the September 2019 meeting the Council reviewed the analysis and added an additional alternative which they subsequently selected as their preferred (100-fish during season 2 with no step up in February). The amendment was submitted to NMFS on February 19, 2020. A proposed rule is currently under development.

2.3. Presentation and Discussion

John Hadley, SAFMC staff

2.4. ACTIONS

Discuss and make recommendations as appropriate. In general, this agenda item is meant to brief the SEP on Council actions that were largely driven by social or economic concerns or may be presented to the group for review later in the meeting.

The SEP had no specific recommendations.

3. Citizen Science update and FISHstory Walkthrough

3.1. Documents

Attachment 3. Citizen Science update presentation

3.2. Overview

Staff will present a brief update on the Council's Citizen Science Program, highlighting activities that have occurred since the Spring 2019 SEP meeting. Additionally, staff will provide an overview and demonstration of the FISHstory pilot project that will launched in early 2020. The FISHstory project will document historic catch and length estimates from the 1940s-1970s from a headboat fleet in Daytona Beach, FL. The project uses an online crowdsourcing platform, Zooniverse, to build an interface that will allow members of the public (e.g. citizens) to be trained to identify and count species in the photos. A team of species ID experts, comprised of fishermen and scientists, will help validate the species identified by citizens. Once species are verified, one key species will be selected for length analysis. A project design team - comprised of scientists, fishermen, and outreach experts – have been developing the FISHstory project interface and training materials in Zooniverse. Staff will provide a demonstration of the FISHstory test project.

3.3. Presentation and Discussion

Julia Byrd and Allie Iberle, SAFMC staff

3.4. ACTIONS

The SEP will have an opportunity to discuss and make recommendations as appropriate.

Discussion Questions:

1. Are there any additional data fields that could be collected from the historic photos that would be helpful for management?
2. Are the training materials in the project adequate for non-fish experts to contribute to data collection?
3. Are there any supporting materials that would be helpful to develop to assist in bringing this project into classrooms?
4. If additional funding is obtained for the project to expand geographically, are you aware of other individuals or organizations with archives of similar historic photos we should potentially contact?

The SEP was impressed by the progress that has been made in a year, and the many projects in various stages of development. The following comments were noted. These are primarily related to the FISHistory project. Follow-up questions clarified that fish size measurement, vessel name, date, captain name are all being collected in house.

Oral history could be an important addition to Fishstory. Not only are the oral histories important, but also they can be an opening to people being willing to share photos they might not otherwise. The NOAA Oral History project has extremely useful resources for gathering oral histories and uploading, and the regional office has good expertise. Collection and digitization of photos is important, as we are hearing stories of 50-70 years of photos being lost in hurricanes.

Fishstory data has the potential of being used for artificial intelligence (AI) training, which then could be used for AI species identification if the project was to be scaled up. UNCW has students in the Data Science program who would love to use this for a masters or Ph.D. project. Fishstory could also be a great lab/extra credit assignment for students in a variety of related disciplines.

RE: slide #4 (base info of # and condition of infrastructure, etc). Jen and Tracy are wrapping up a Sea Grant funded project in Georgia that is directly related, and should have results within a year.

Julia Byrd mentioned that more bottom habitat mapping is desired. UNCW, Dept of Environmental Sciences, has recently hired Joni Backstrom, a new professor whose research specialty is bottom mapping. He has bottom mapping equipment, prior industry experience, etc. He's been mapping areas from Morehead City, NC, to the South Carolina line, and he could potentially map other areas of interest.

4. SEFSC technical memorandum on the economics of the King Mackerel and Spanish Mackerel fisheries.

4.1. Document

Attachment 4a. NOAA Technical Memorandum: Economics of the U.S. South Atlantic and Gulf of Mexico King Mackerel and Spanish Mackerel Fisheries - 2016
Attachment 4b. Presentation slides for SEP discussion of technical memorandum on the economics of the commercial King and Spanish mackerel fisheries

4.2. Overview

In the spring of 2019, the Southeast Fisheries Science Center (SEFSC) released the technical memorandum *Economics of the U.S. South Atlantic and Gulf of Mexico King Mackerel and Spanish Mackerel Fisheries – 2016* (***Attachment 4a***). The tech memo provides summary information and economic estimates for the King and Spanish mackerel fishery as a whole and for specific Segments of Interest (SOI) that consist of areas or groups of gear types used within the king and Spanish mackerel fisheries. The Committee will receive a summary presentation from the SEFSC on the methods and major findings from the tech memo (***Attachment 4b***).

4.3. Presentation and Discussion

Dr. Christopher Liese, SEFSC staff

4.4. ACTIONS

Review the analysis, discuss the uncertainties, and determine if it is the best scientific information available.

Discussion Questions:

1. Among the findings in the tech memo are estimates of net revenue and net cash flow that are potentially useful for better analyzing the economic effects of fishery management actions on the commercial sector. These results are intended to be incorporated into amendments to the Coastal Migratory Pelagics Fishery Management Plan either by reference or direct application to estimate net economic effects to commercial participants and net costs or benefits. In doing so, it is assumed that this tech memo represents best scientific information available.
    a. Does the SEP agree that the tech memo should be considered best scientific information available?

2. Does the SEP have any additional recommendations?

    The SEP endorsed this tech memo as best available science for use on economic analysis in Fishery Management Plans. The economics reports produced by Chris Liese are outstanding in their level of detail and consistency across fisheries. They quickly convey complex information in an easy to understand format. The automated data cleaning, data analysis, and report generation software and procedures that have been developed greatly increase the efficiency of the economic analysis process, reduce the time between data

collection and availability of summary reports, and allow more frequent updating of economic information.

Where possible, the production of similar reports for other fisheries would be very valuable for assessing the economic health of the fisheries, the economic impacts ("multiplier effects) of fishery activity on other sectors of the economy, and the impacts of regulatory changes on the fisheries themselves.

Although the estimates of net revenue were described as "low," around 2%-5%, many industries that sell a commodity product (where each seller is selling a very similar product), such as the grocery industry, have similar margins. So, these margins may not be "low," but rather simply representative of an industry where there are many sellers (i.e., fishermen) selling a very similar product (mackerel).

It is important to note that while estimates of average net revenue per fisherman are very useful for assessing the effects of regulatory changes on an SOI as a whole, the variation in net revenue across fishermen is also important. Some fishermen are "highliners" who will have net revenue higher than the average, while others may have very low net revenue or even negative net revenue (at least in the short-run). A given regulatory change will have different effects on these different types of fishermen. The information provided in the report that gives the percentage distribution of net revenue across fishermen for a given SOI is very useful for understanding the distribution of impacts of a given regulation across the various types of fishermen in an SOI; this is a large improvement over simply having an estimate of the impact on the "average" fisherman.

5. Discussion on best fishing practices and persuasion

5.1. Document

Attachment 5. Best fishing practices outreach presentation

5.2. Overview

Recently the Council approved Snapper Grouper Regulatory Amendment 29 which includes actions related to best fishing practices (i.e. descending devices and circle hooks) intended to improve the survivorship of released snapper grouper species. The Council has expressed an interest in implementing an outreach campaign to support the amendment and educate stakeholders on the new requirements related to descending devices including device options and proper use. Staff will update the SEP on current and future outreach efforts and give a brief overview of relevant literature on persuasion.

5.3. Presentation and Discussion

Cameron Rhodes, Christina Wiegand, and Dr. Brian Cheuvront, SAFMC staff

5.4. ACTIONS

Provide direction on the most effective ways to move forward with a best fishing practices outreach campaign and language to be used in outreach materials.

Discussion Questions:

1. What methods/tools should be used to communicate information on Regulatory Amendment 29 and proper descending device use? Social media, website, infographics, brochures, press releases?
2. What strategies should be used to make the material engaging for fishermen who might utilize these devices?
3. Which attitudes are most important to target during creation of outreach materials?
4. What language should be used when conducting outreach to ensure both cognitive and peripheral routes of persuasion are being addressed?
5. How can the Council encourage leaders in the fishing industry to participate in outreach and work with other fishermen to use descending devices as part of being experienced and successful anglers?
6. How can staff evaluate whether outreach efforts are achieving all six steps necessary for effective influence?
7. Some research shows that the link between attitudes and behavior is not as strong as originally predicted. Should Council outreach efforts move from attitudes to behavior change?

The SEP offered suggestions to take into consideration, including:

1. *The need to acknowledge/handle different fisher audiences differently (e.g. what works for rec anglers or charter/headboats probably won't be similarly appealing to commercial fishers).*
2. *The need to overcome commercial fisher attitudes that some SEP members have encountered, such as a doubt that snapper populations need this special treatment, and doubt that the devices truly work. Be positive, don't try to convince them that "good fishers" care for the ecosystem by doing this (very likely to backfire).*
3. *The potential generational differences—what works for the older generations may not be relevant for Millennials or Gen Z--means different outreach strategies may be needed to be effective. There are a huge variety of ways fishers get information, ranging from NMFS fisheries bulletins to forwarded emails.*

The SEP suggested looking to the Public Health literature for contemporary best practices on encouraging behavior modification (e.g. "how to get people with diabetes to change their eating habits" or "how to encourage more condom use in high HIV areas") as this field is based on changing how people act. Jennifer Sweeney Tookes and Tracy Yandle volunteered to look over any materials before they are deployed to communities or focus groups. The SEP liked some of the kitschy ideas like the "west coast descender rap" and endorsed a cartoon of a fish being sent below a boat on a descender, who swims off, then back with a beer and a thank you note for saving his life, both of which he attaches to the rising descender.

6. Discussion on allocations

6.1. Document

Attachment 6a. StoryMap focusing on allocations (link only, see below)
Attachment 6b. Allocations discussion presentation slides

Additional background material:
Attachment 6c. NMFS Recommended Practices and Factors to Consider When Reviewing and Making Allocations Decisions

6.2. Overview

Due to revisions based on revised MRIP estimates (i.e. recreational data) and new ABCs expected from the SSC, the Council will be continuing to discuss sector allocation revisions for many fish species that the Council manages. Prior to the March 2020 meeting, the Council last discussed how to make sector allocations for most fish species ahead of the development of the Comprehensive ACL Amendment that went into effect in 2012. At the March 2020 meeting, Council staff presented information on sector allocation policy history and led a discussion on ways the Council can look at future sector allocations. The staff-led portion of the discussion included review of a StoryMap broadly covering the topic of allocations (*https://arcg.is/19ybGG*), and a presentation reviewing current allocation methods used in the Council's fishery management plans and potential alternative methods. The Council discussed methods they would like to consider for determining sector allocations in the future. Staff will review past actions on sector allocations and recent Council discussions from their March 2020 meeting with the SEP (***Attachment 6b***).

6.3. Presentation and Discussion

John Hadley and Christina Wiegand, SAFMC staff

6.4. ACTIONS

Review past actions on allocations and recent Council discussions, consider available data and approaches, including "out of the box" options, and recommend ways to incorporate social and economic considerations in future allocation discussions.

Discussion Questions:

1. Does the SEP recommend an approach or approaches that should be used when conducting economic analyses of allocations?
2. Does the SEP recommend an approach or approaches that should be used when conducting social analyses of allocations?
3. What social and economic data sources are available for conducting analyses related to allocations?
4. What factors should the Council take into account when considering whether to reallocate?

5. How should social and economic information related to allocations be best presented to the Council for consideration?

The SEP offered many recommendations on allocation.

1. Does the SEP recommend an approach or approaches that should be used when conducting economic analyses of allocations?

A traditional economic analysis would use the equimarginal principle to compare the desirability of alternative fishery section allocations. Under this principle, each additional unit of a resource (here, pounds of fish) is allocated to the sector where it is most highly valued, with declining marginal returns for each sector as they receive each additional unit allocated. Economic theory suggests that the marginal value per pound declines as more quota is allocated to either the commercial sector or the recreational sector. At a minimum, implementing the equimarginal principle requires estimates of the marginal value per unit (i.e., per pound) of landings for each sector (commercial, recreational, charter etc).

In the commercial sector, we need at least an estimate of the commercial harvesters' producer surplus including opportunity costs. We have some of those estimates from the Liese reports noted above. Ideally, we would also have those estimates further down the product chain on the commercial side, so we could review the impacts on processors, wholesalers, retailers, and final consumers for the commercial sector. The producer surplus for the commercial sector as a whole is thus the sum of the producer surpluses from the harvest, processing, wholesale, distribution and retail sectors. To this is added the consumer surplus of the final consumers of commercially-landed seafood to obtain the overall surplus for the commercial sector. In the commercial sector, marginal value declines due to declining profit (i.e., "producer surplus") per fish as catch increases. With constant ex-vessel price per pound, profit is declining due to the increasing marginal costs of fishing effort.

In the recreational sector, the marginal value of quota is downward sloping due to the diminishing returns to the enjoyment (i.e., "consumer surplus") of catching additional fish within a given time period. Consumer surplus per pound of fish is the difference between angler willingness to pay to catch (and keep) a pound of fish and the amount that they must actually pay (i.e., the cost of the recreational fishing trip to the angler). Consumer surplus for the recreational sector is the sum of the consumer surpluses of the customers of the for-hire (i.e., charter and party boat modes) sector and the private (e.g., boat and shore modes) recreational sectors. The owners of the for-hire fleet also generate some producer surplus since they are engaged in a commercial enterprise, which should be added to the consumer surplus estimates.

The most efficient sector allocation occurs when the marginal value of competing uses of a scarce resource are equalized across sectors (Carter, Agar and Waters 2008, Gentner et al. 2010). For example, if fishery quota is allocated so that the marginal value of commercial harvest is greater than the marginal value of recreational harvest, then society is better off with a reallocation away from the recreational sector and towards the commercial sector. The most efficient allocation is the quota allocation that results in the same marginal value in each sector.

For the commercial harvest sector, the marginal value of catch for a multispecies fishing firm is estimated from a profit function that depends on the quantity of catch, ex-vessel prices for the catch, opportunity cost of the captain/crew, and the prices and quantities of production inputs. Trip cost data are used to estimate fleet trip costs using regression models. Estimated trip costs are then used to develop estimates of input compensated supply curves for harvesters. The input compensated supply curves are used to develop estimates of the marginal and non-marginal values of landings in the commercial fishery across a range of potential allocations. Profit functions could also be developed for seafood processors, wholesalers, distributers and retailers. Estimates of the consumer surplus enjoyed by the final consumers of commercially-caught seafood can be obtained from estimates of consumer demand for seafood based on surveys of seafood consumers.

For the recreational sector, revealed and stated preference methods have been used to estimate the marginal value of recreational catch. The travel cost method is a revealed preference approach to estimating the consumer surplus of recreational activities, such as recreational fishing, in which many of the benefits and costs occur outside normal market transactions (Haab et al. 2012). With the travel cost method an implicit price of the recreation experience is constructed, including the costs of travel and for-hire fishing fees. Recreation behavior such as fishing site choice and frequency tends to negatively correlate with travel costs. Anglers tend to choose sites with low travel costs and when they choose sites further away, tend to visit those less often. This behavior can be used to construct anglers' demand curve for recreational fishing, as can models of boat fuel consumption (Carter et al 2016). Consumer surplus can then be calculated from the demand curve. Stated preference approaches use hypothetical behavior questions in angler surveys to estimate the value of the catch (Carter and Liese 2012). Stated preference surveys mimic the logic of the travel cost method and are particularly useful in management situations where the travel cost method is difficult to implement. Combinations of the revealed and stated preference approaches can be used to account for biases and limitations of each approach (Hindsley et al. 2018).

References:

Carter, David W., Juan J. Agar and James R. Waters, "Economic Framework for Fishery Allocation Decisions with an Application to Gulf of Mexico Red Grouper, NOAA Technical Memorandum NMFS-SEFSC-576, September 2008.

Carter, David W., and Christopher Liese. "The economic value of catching and keeping or releasing saltwater sport fish in the Southeast USA." North American Journal of Fisheries Management 32, no. 4 (2012): 613-625.

Carter, David W., Akbar Marvasti, Christopher Liese, and Scott Crosson. "Valuing Sportfishing Harvest with the Demand for Boat Fuel" Marine Resource Economics (2016) 31:3, 323-338

Gentner, Brad, James Kirkley, Paul R. Hindsley and Scott Steinback, Summer Flounder Allocation Analysis, NOAA Technical Memorandum NMFS-F/SPO-111. October 2010.

Haab, Timothy, Robert Hicks, Kurt Schnier, and John C. Whitehead. "Angler heterogeneity and the species-specific demand for marine recreational fishing." Marine Resource Economics 27, no. 3 (2012): 229-251.

Hindsley, Paul, Craig E. Landry, Kurt Schnier, John C. Whitehead, Mohammadreza Zarei, "Joint Estimation of Revealed and Stated Preference Recreational Data for Evaluation of the Economic Effects of the Allocation of Fishery Harvests," Final Report to the National Marine Fisheries Service, December 2018.

2. Does the SEP recommend an approach or approaches that should be used when conducting social analyses of allocations?

Beyond the existing Coburn/Jepson community measures of commercial and recreational engagement that are already incorporated into FMP Amendments, the SEP suggested that advisory panel reports and oral histories be consulted, with the latter particularly useful for looking at social impacts in communities where fishing for some species may have ceased because of regulatory changes. There is also a literature on job satisfaction on commercial fisheries, although much of that work by Pollnac and company has concentrated on northeastern US fisheries. One exception is Crosson (2015), which found that family history was an important indicator of fisheries engagement in North Carolina.

A recurring problem in fisheries allocation is how to address the "fairness" of alternative allocations for the stakeholders involved. One new approach comes from the "fair division" literature, a branch of "social choice" theory, which is a part of political science. This literature typically focuses on how to allocate resources efficiently and fairly using various voting or auction procedures (Moulin 2003, Brams 2008). Much of the work to date is theoretical; however, Haake, Raith and Su (2002) present a procedural algorithm that attempts to make the idea practical for management purposes. The algorithm is used in a participatory setting (a meeting with the various stakeholders together; the meeting could be in-person or online) to allocate a resource (such as a fishery resource, an ACL) in a way that achieves both efficiency (maximum value for society from the resource) and fairness (no stakeholder would want to trade his allocation for any other stakeholder's allocation). Haake, Raith and Su describe the assumptions that must hold in order to (1) guarantee that the algorithm will find a solution and (2) ensure that that process scales to accommodate any number of stakeholders. Importantly, the resource can be sub-divided into various differentiated "segments" (such as different fishing areas, different depths, different target species, different seasons, etc.), and the algorithm can be used to find the allocation of the differentiated segments that is both efficient and fair. Further, the stakeholders can also be differentiated in terms of their preferences, costs, skills, experience, etc.--the algorithm will still find the allocation that is efficient and fair. Perhaps even more surprising is that the algorithm doesn't need to know how the characteristics of the segments vary across segments, nor how the characteristics of the stakeholders vary across stakeholders, in order to arrive at the efficient and fair allocation. To the SEP's knowledge, there has been no application of such "fair division" methods in fisheries. It might be worth doing some research to adapt the Haake, Raith and Su method to a fisheries context and then attempting a "dry run"

of the method with some real stakeholders, but for a hypothetical fishery, to test the method, discover and iron out any kinks, and gauge acceptability to stakeholders.

References:

Brams, S.J. 2008. Mathematics and Democracy: Designing Better Voting and Fair-Division Procedures. Princeton University Press. Princeton, NJ.

Crosson, Scott. "Anticipating Exit from North Carolina's Commercial Fisheries" Society & Natural Resources (2015), 28:7, 797-806.

Moulin, H.J. 2003. Fair Division and Collective Welfare. MIT Press. Cambridge, MA.

Haake, C.-J., M.G. Raith and F.E. Su. 2002. Bidding for envy-freeness: A procedural approach to n-player fair-division problems. Social Choice and Welfare. 19:723-749.

3. What social and economic data sources are available for conducting analyses related to allocations?

Several sources of economic data were mentioned that may be suitable for an analysis of allocation. The SEFSC collects and reports on trip-level and annual landings, revenues and costs for various commercial fisheries in the Southeast. Earlier in this meeting, the SEP reviewed Christopher Liese's report about the economics of the commercial king mackerel and Spanish mackerel fisheries, and in last year's meeting reviewed a similar report about the economics of the snapper-grouper fishery. For recreational fisheries, there are a number of existing WTP estimates as noted in the literature mentioned under Part 1 of this section.

When conducting an analysis, economists should check to make sure that the data exhibit diminishing marginal value per pound as sector allocation increases and increasing marginal value per pound as sector allocation decreases. If marginal values per pound are constant, then the policy implication is that total economic benefits would be maximized by allocating 100% of allowable catches to only one sector. This outcome is not realistic and suggests that there probably is a deficiency in data and that the quantitative analysis should be discounted in favor of a qualitative description of potential gains and losses due to reallocation.

The SEP does not recommend the use of Input/Output (I/O) models to determine sector allocations. Structurally, the I/O models used in the Southeast do not include non-linearities or constraints that would limit the growth of economic impacts per pound as sector allocation increases. Thus, the same sector would always generate larger economic impacts per pound regardless of the size of quota to be allocated. The policy implication is an all or nothing outcome. One sector would receive 100% of the allocation and all other sectors would receive 0% allocations, which is not a realistic outcome. An alternative class of model, called Computable General Equilibrium (CGE) models, includes non-linearities and constraints, but

has not been developed for fisheries in the Southeast. Sherman Robinson is the "father" of CGE models:

https://www.ifpri.org/profile/sherman-robinson

More recently: Dixon, Peter and Dale W. Jorgenson, ed. (2013). Handbook of Computable General Equilibrium Modeling, Vols. 1A and 1B, North Holland

On the general issue of how to best collect data and construct the datasets needed to run stock assessment, allocation, or any other type of model, this recent paper by Robinson might also be helpful:

"A Bayesian methodology for building consistent datasets for structural modeling"

https://www.ifpri.org/publication/bayesian-methodology-building-consistent-datasets-structural-modeling

4. What factors should the Council take into account when considering whether to reallocate?

In theory, a sector's allocation represents a constraint on its ability to land fish in an aggregate sense. Mathematically, there is an implied shadow price that represents the marginal value of an additional pound of quota for each sector with an allocation. Re-allocation is suggested for fisheries for which there are relatively large and sustained differences in the implied shadow prices by sector. For example, if one sector consistently fails to harvest its allocation, then the Council could reasonably conclude that the marginal value of quota is zero for this sector and that some of its total allowable catch could be re-allocated to another sector with a binding allocation. However, keep in mind that any reallocation of currently unused quota that results in a lower encounter rate for fishermen with the species may inflict unintended costs. The recreational sector, in particular, may prefer to fish a stock below MSY because other aspects of the experience produce important value.

Usually, however, all sectors face binding allocations. Are there indicators that suggest disparities in their implied shadow prices? One possible indicator is the hypothetical length of season that would result without other management actions, such as trip limits or bag limits, designed to slow each sector's harvest. Under this reasoning, longer seasons imply less restrictive allocations and smaller shadow prices for season length. In this case, shadow price is interpreted as the marginal value of an additional day of fishing and is a derivative of marginal value per pound of quota. Re-allocation would be justified to equalize marginal values of an additional day of fishing across sectors. The problem is to determine the length of each hypothetical season that would equalize these shadow prices. It is tempting to assume that re-allocation to equalize hypothetical season length would approximately equalize marginal value of an additional day of fishing, but this assumption probably is not valid. Nevertheless, economic efficiency probably would be enhanced if quota were re-allocated to sectors with consistently short hypothetical fishing seasons from those sectors with consistently long

hypothetical seasons. Traditional management actions such as trip limits and bag limits can continue to be used to slow each sector's rate of harvest and lengthen actual fishing seasons.

5. How should social and economic information related to allocations be best presented to the Council for consideration?

The Council is familiar with efficiency. But they should also be presented with concepts such as:

- *Pareto efficiency and improvements*
- *shadow values and prices*
- *equity and fairness (see discussion of "fair division" in section 2 above)*
- *local vs. regional vs. national impacts of alternative allocations*
- *consumer and producer surplus*
- *impacts on sales, jobs, labor income, tax revenues*
- *economic "multiplier" effects throughout the supply chain and distribution chain*

7. Other Business

The SEP received initial information from Scott Crosson about NOAA actions on the Covid-19 crisis. NOAA economists nationwide gathered initial qualitative information about the status of regional fisheries in mid-March, which were compiled into a report for Congress by NOAA headquarters. The CARES Act includes $300M for US fisheries aid, and NOAA is now compiling state-by-state summaries of the different fisheries' landings by group over the past half decade. This is being done from existing data sources such as trip tickets, not from any ongoing surveys, although those will likely follow at some point in the near future. NOAA information on Covid-19 and its effects on fisheries can be accessed at https://www.fisheries.noaa.gov/national/noaa-fisheries-coronavirus-covid-19-update.

Council staff briefed the SEP on the desire to help fishermen and fishing businesses where possible and on plans to potentially engage the Council's advisory panels to gather information that agencies or academia could use going forward to supplement economic relief efforts. Within this context, staff explained that they do not want to do more harm than good when it comes to survey fatigue or overly burdening fishermen since there likely will be multiple organizations reaching out to them at a later date. The SEP recommended that staff consider compiling resources and

information on where fishermen could turn to for potential economic relief while the COVID 19 crisis is ongoing.

8. Opportunity for Public Comment

There was no public comment received.

9. Report and Recommendations Review

10. Next SEP Meeting

- Spring 2020, Charleston SC