A Proposed Method for Gauging Risk Tolerance when Setting Catch Limits

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New ABC Control Rule

- Action 2 in ABC CR Amendment: "Council will specify the acceptable risk of overfishing."

- Must do this for all managed species.

- Council's "Risk Tolerance" with stock's current biomass gives a P* value.

- Is there a way to help the Council determine how tolerant they should be of risk when considering ABCs?

NMFS PSA Approach

- Approach taken by NMFS in PSA can work here.

- Set of attributes related to risk of overfishing.

- Only consider attributes related to setting the ABC.
  - Specifically, the size of the buffer between OFL and ABC.
  - i.e. The P* value: Higher risk = lower P* value = larger buffer between OFL and ABC

- Score each attribute for each stock.

- Calculate an overall score for each stock.

- Categorize as Low, Moderate, or High.

Risk Tolerance Method

- Each attribute scored either Low (1), Moderate (2), or High (3)
- Attributes fall into 2 main categories
  1. Biological Attributes
  2. Human Dimension Attributes
- Biological Attributes
  - Related to biology of species
  - Only change with new scientific info
  - Higher score = less vulnerable to overfishing = higher risk tolerance (higher P*)
  - Includes natural M and age at maturity

Method (cont)

- Human Dimension Attributes
  - Deals with management, value, desirability, social issues, and ecological issues
  - Higher score = more vulnerable (to overfishing or causing socio-economic impacts) = lower risk tolerance (lower P*)
  - Attributes include ability to regulate fishery, potential for discard losses, commercial value, recreational desirability, social concerns, importance to the ecosystem, and climate change concerns
- Ecosystem Importance and Climate Change
  - Treated as on/off switches
  - Either not scored or scored High

Method (cont)

- Each category score (Biological and Human Dimension) is calculated by averaging scores of all attributes
- If no scores for any attribute in a category, default of Moderate (2)
- Overall Risk score more tricky
  - Biological: higher score = less vulnerable
  - Human Dimension: higher score = more vulnerable
- Borrowed equation from NMFS PSA Analysis

$$\sqrt{(Bio - 3)^2 + (Human\ Dim - 1)^2}$$

- Risk Tolerance = Low: R>2, Moderate, 1<R≤2, High: R≤1

Biological Attributes

- Both attributes measure productivity
  - Higher productivity = less vulnerable to overfishing = higher risk tolerance
  - Took criteria from NMFS PSA analysis
- Natural Mortality (M)
  - Higher M = higher productivity
  - Low: M<0.2, Moderate: 0.2<M<0.4, High: M>0.4
- Age at Maturity
  - Higher age of maturity = lower productivity
  - Low: A>4yrs, Moderate: 2<A<4, High: A<2

Stress feedback on criteria for ranking. Just our starting points.

Human Dimension

- Ability to Regulate Fishery
  - How well can management constrain harvest to ACL
  - Better can constrain harvest = less vulnerable to overfishing
  - Should consider variability in landings, state consistency with regs, amt landings in state waters, if overage due to change in ACL mid-season
  - Low: Consistently below ACL
  - Moderate: Only exceeds ACL 1-2 out of last 5 yrs and/or <15%
  - High: exceeds ACL 3+ out of last 5 yrs and/or by >15%

Feedback on criteria for ranking. Just our starting points.

Human Dimension (cont)

- Potential for Discard Losses
  - High discard losses = more vulnerable to overfishing
  - Caused by large amt of discards, high discard M, or both
  - Look at dead discards (DD) vs. landings, DD as % Total Catch
  - Low: DD<20%, Moderate: 20%<DD<40%, High: DD>40%
- Annual Commercial Revenue
  - Relative importance (value) to commercial sector
  - Look at % of species annual revenue to total annual revenue of all species in analysis
  - Long-term risk: higher % revenue = larger potential economic impact = lower risk tolerance
  - Low: $<4%, Moderate: 4%<$<10%, High: $>10%

Feedback on criteria for ranking. Comm Revenue: got from looking at the data.

Human Dimension (cont)

- Recreational Desirability
  - Importance to recreational sector
  - % trips report targeting species
  - Higher % targeting, more important to rec sector
  - Long-term risk: more important = higher potential impact to fishery = lower risk tolerance
  - Low: T<5%, Moderate: 5%<T<10%, High: T>10%
- Ecological Attributes
  - On/off switch: not scored or High
  - Difficult to develop criteria for 3 categories
  - Very little info for most species, but important if known

Feedback on criteria for ranking. Rec Desirability got from looking at the data. All trips that reported targeting any of the species in this analysis.

Ecological Attributes

- Ecosystem Importance
  - Importance of species to South Atl. ecosystem
  - Can have large negative impacts to many species if removed
  - Ex. Important predator/prey species, reef maintenance/building
- Climate Change
  - Species is affected by climate change such that it is more vulnerable to overfishing
  - Affect productivity or ability to effectively manage
  - Ex. Range expansion/collapse, interaction with new species, change in habitat availability/suitability

Ecosystem Importance Example: Red Grouper is a reef builder
Climate Change Example: Blueline and maybe Snowy have expanded into Mid-Atlantic where SAFMC has no jurisdiction. Were no regs, but Mid now has some regs for Blueline.

Social Issues

- Christina Wiegand will be presenting this attribute.
- Please refer to document at end of presentation.

Example Risk Tolerance Categories

Assessed Stocks		ORCS Stocks	
Species	**Risk Tolerance**	**Species**	**Risk Tolerance**
Black Sea Bass	High	Atlantic Spadefish	High
Greater Amberjack	High	Bar Jack	High
Red Porgy	High	Gray Triggerfish	High
Vermilion Snapper	High	Lane Snapper	High
Black Grouper	Mod	Margate	High
Blueline Tilefish	Mod	Red Hind	High
Gag	Mod	Rock Hind	High
Golden Tilefish	Mod	Scamp	High
Mutton Snapper	Mod	Tomtate	High
Red Grouper	Mod	White Grunt	High
Red Snapper	Mod	Cubera Snapper	Mod
Yellowtail Snapper	Mod	Gray Snapper	Mod
FLK/EFL Hogfish	Low	Silk Snapper	Mod
Snowy Grouper	Low	GA-NC Hogfish	Low
Wreckfish	Low	Yellowedge Grouper	Low

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Do these seem right? If not, can change 2 things: Attribute Scores or Final Risk Tolerance Categories (what risk score goes into what risk tolerance category, see slide 6).

Example Categories (cont)

| Decision Tree Stocks	
Species	**Risk Tolerance**
Coney	High
Graysby	High
Sand Tilefish	High
Scup	High
Whitebone Porgy	High
Yellowfin Grouper	High
Wahoo	High
Almaco Jack	Mod
Banded Rudderfish	Mod
Blackfin Snapper	Mod
Jolthead Porgy	Mod
Knobbed Porgy	Mod
Lesser Amberjack	Mod
Misty Grouper	Mod
Queen Snapper	Mod
Sailors Choice	Mod
Saucereye Porgy	Mod
Yellowmouth Grouper	Mod
Dolphin	Mod

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Do these seem right? If not, can change 2 things: Attribute Scores or Final Risk Tolerance Categories (what risk score goes into what risk tolerance category, see slide 6).

South Atlantic Council Risk Tolerance Analysis Tool
Social Attributes
Black Sea Bass

<u>Importance of the commercial black sea bass fishery to South Atlantic fishing communities:</u>

1. Top commercial black sea bass communities based on value regional quotient:
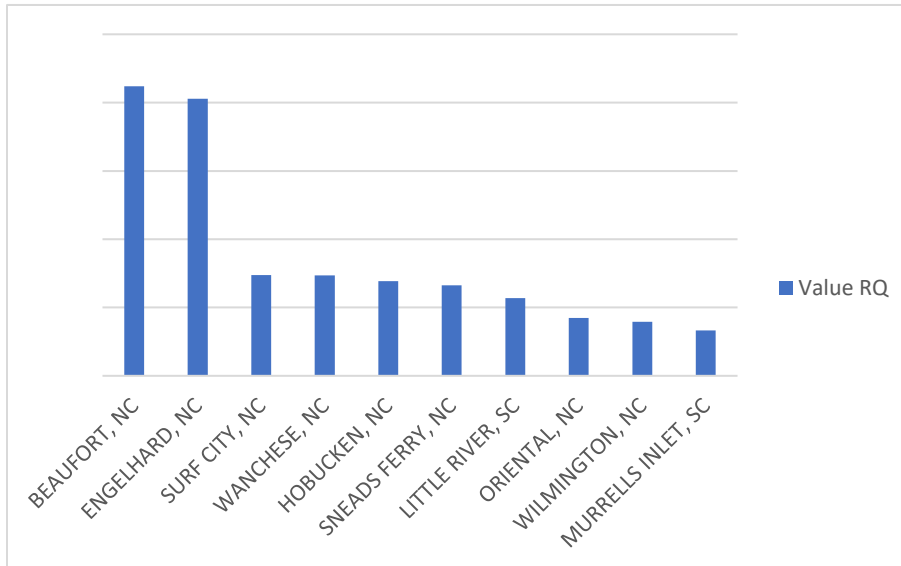
Source: SERO, Community ALS, 2016
* RQ values are excluded to maintain confidentiality.

2. Black sea bass value local quotient for top commercial black sea bass communities:
    a. A community is considered highly reliant on the commercial black sea bass fishery if the value local quotient is greater than 5% for black sea bass.
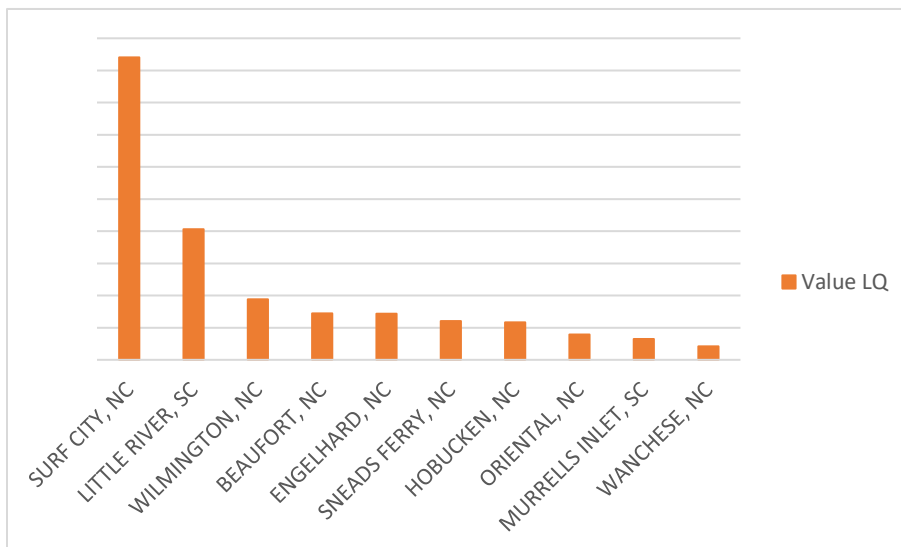
Source: SERO, Community ALS, 2016
* LQ values are excluded to maintain confidentiality.

3. *Does this information match or contradict available qualitative information*?

    a. Fishery Performance Report – November 2017
        i. In Florida, during times of peak abundance there were a few brothers who were responsible for most black sea bass landings (using pots). None of those fishermen have fished for black sea bass in recent years and may be selling their endorsements.
        ii. Several black sea bass endorsements have been transferred in recent years when snapper grouper permits changed hands. New permit holders have been opting not to use their endorsements in some months in favor of targeting other available species (North Carolina).

4. *How vulnerable are the top communities identified?*

Top Communities	Poverty	Personal Disruption	Population Composition
Beaufort, NC	Not Vulnerable	Vulnerable	Not Vulnerable
Engelhard, NC	Vulnerable	Vulnerable	Not Vulnerable
Surf City, NC	Not Vulnerable	Not Vulnerable	Not Vulnerable
Wanchese, NC	Vulnerable	Not Vulnerable	Not Vulnerable
Hobucken, NC*	Not Vulnerable	Not Vulnerable	Not Vulnerable
Sneads Ferry, NC	Not Vulnerable	Not Vulnerable	Not Vulnerable
Little River, SC	Not Vulnerable	Not Vulnerable	Not Vulnerable
Oriental, NC	Not Vulnerable	Not Vulnerable	Not Vulnerable
Wilmington, NC	Vulnerable	Vulnerable	Not Vulnerable
Murrells Inlet, SC	Not Vulnerable	Not Vulnerable	Not Vulnerable

Source: SERO Community Profiles
* Oriental, NC was used as a proxy for Hobucken, NC.

<u>Importance of the recreational black sea bass fishery to South Atlantic fishing communities:</u>

1. Top recreational communities based on number of black sea bass directed trips:

Top Communities	Community BSB Trips vs. Total BSB Trips
Mayport, FL	15.7%
Morehead City, NC	9.7%
Fernandina Beach, FL	8.4%
Wrightsville Beach, NC	5.3%
Jacksonville, FL	4.7%
Carolina Beach, NC	3.9%
Savannah, GA	3.9%
Emerald Isle, NC	3.2%
Cedar Point, NC	3.1%

Source: SEFSC, 2015-2017 average.

2. The number of trips targeting all snapper grouper species vs. number of trips targeting black sea bass for top communities.
   a. A community is considered to highly reliant on the recreational black sea bass fishery if greater than 65% of directed trips targeted and/or landed black sea bass.

Top Communities	BSB Trips vs. All Recreational Trips
Mayport, FL	40%
Morehead City, NC	25%
Fernandina Beach, FL	*77%*
Wrightsville Beach, NC	54%
Jacksonville, FL	17%
Carolina Beach, NC	55%
Savannah, GA	*83%*
Emerald Isle, NC	*79%*
Cedar Point, NC	*77%*
Cape Canaveral, FL	6%

Source: SEFSC, 2015-2017 average.

3. *Does this information match or contradict available qualitative information?*

   a. Fishery Performance Report – November 2017
      i. In Florida, demand for black sea bass on charters has decreased (minimum size is too large).
      ii. In Georgia, charter vessels have started targeting sheepshead instead of black sea bass.
      iii. In North Carolina, black sea bass are not the reason people book charters, but rather part of the "grab bag" that attracts people.

4. *How vulnerable are the top communities identified?*

Top Communities	Poverty	Personal Disruption	Population Composition
Mayport, FL*	Not Vulnerable	Vulnerable	Vulnerable
Morehead City, NC	Vulnerable	Not Vulnerable	Not Vulnerable
Fernandina Beach, FL	Vulnerable	Not Vulnerable	Not Vulnerable
Wrightsville Beach, NC	Not Vulnerable	Not Vulnerable	Not Vulnerable
Jacksonville, FL	Not Vulnerable	Vulnerable	Vulnerable
Carolina Beach, NC	Not Vulnerable	Vulnerable	Not Vulnerable
Savannah, GA	Very Vulnerable	Vulnerable	Vulnerable
Emerald Isle, NC	Not Vulnerable	Not Vulnerable	Not Vulnerable
Cedar Point, NC*	Not Vulnerable	Not Vulnerable	Not Vulnerable
Cape Canaveral, FL	Not Vulnerable	Vulnerable	Not Vulnerable

Source: SERO Community Profiles
*Jacksonville, FL was used as a proxy for Mayport, FL.

Final risk tolerance ranking for black sea bass communities:

Low Risk	0 – 6 reliant communities
Medium Risk	7 – 13 reliant communities
High Risk	14 – 20 reliant communities

Out of the top twenty communities landing black sea bass, six communities are considered to be reliant upon the black sea bass fishery (two commercial, four recreational) making black sea bass a low risk fishery. Qualitative data supports this ranking, with information from the FPRs indicating that participation in both the recreational and commercial fishery has declined in recent years. Except for Savannah, Georgia, communities identified as reliant upon the black sea bass fishery are not vulnerable to sudden changes or social disruption from changes to the regulatory environment. It should be noted that *individual* fishermen landing a comparatively higher amount of black sea bass, for example those holding black sea bass pot endorsements, are more likely to experience long-term negative effects from overfishing.

Appendix A – Variable Descriptions

Regional Quotient (RQ): measures the relative importance of a given species or species group across all communities in the region and represents the proportional distribution of commercial landings. The RQ is calculated by dividing the total value (or pounds) of a species landed in a given community, by the total value (or pounds) for that species for all communities in the region. The measure is a way to quantify the importance of a species or species group to communities around the South Atlantic and suggest where impacts from management actions are more likely to be experienced.

Local Quotient (LQ): measures the proportion of an individual vessel's total landings of one species in a fishing year compared to landings of all species in that year, averaged across communities. An individual vessel LQ illustrates if a species is a large part of a vessel's catch, which can indicate that the vessel (and associated captain, owner, crew, fish house) is relatively more reliant on a species.

Directed Trips: the expanded number of directed trips from combined Marine Recreational Information Program (MRIP) survey data and the Southeast Regional Headboat Survey (SRHS) data. Directed trips include those trips where a species was targeted and/or landed.

Fishery Performance Report (FPR): The intent of the FPRs is to assemble information from Council Advisory Panel members' experience and observations on the water and in the marketplace to complement scientific and landings data. FPRs have been completed for a small number of species and will continue to be completed as appropriate (typically prior to stock assessments). Questions related to social and economic influences include:

- For the commercial sector, how has price and demand for species x changed?
- How has demand for charter/headboat trips targeting species x changed?
- What communities are dependent on the species x fishery?
- Have changes in infrastructure (docks, marinas, fish houses) affected fishing opportunities for species x?
- How have fishermen and communities adapted to changes in the species x fishery?

The black sea bass FPR can be found HERE.

Vulnerability Indices: The three indices are poverty, population composition, and personal disruptions. The variables included in each of the indices have been identified through the literature as being important components that contribute to a community's vulnerability. Indicators such as increased poverty rates for different groups; more single female-headed households; more households with children under the age of 5; and disruptions like higher separation rates, higher crime rates, and unemployment all are signs of populations having vulnerabilities. The data used to create these indices are from the American Community Survey estimates at the U.S. Census Bureau.

Principal component and single solution factor analysis are used so that each community receives a factor score for each index to compare to other communities. Those communities that exceed the thresholds of ½ and 1 standard deviation for all indices would be expected to be

vulnerable and highly vulnerable, respectively, to sudden changes or social disruption that might accrue from regulatory change. The vulnerability indices use normalized factor scores and comparison is relative, but the score is related to the percent of communities with similar attributes. More detail on the design of the social vulnerability indices can be found in Jepson and Colburn 2013 and Jacob et al. 2013.

Jacob, S., P. Weeks, B. Blount, and M. Jepson. 2013. Development and evaluation of social indicators of vulnerability and resiliency for fishing communities in the Gulf of Mexico. Marine Policy 37:86-95.

Jepson, M. and L. L. Colburn. 2013. Development of social indicators of fishing community vulnerability and resilience in the U.S. Southeast and Northeast Regions. U.S. Dept. of Commerce, NOAA Technical Memorandum NMFS-F/SPO-129, 64 p.