Some Climate Change & Fisheries Issues

- Tropical species moving to South Atlantic area
- South Atlantic spp. moving to Mid Atlantic area
  - Blueline Tilefish
  - Snowy Grouper
  - Wreckfish
- Climate change vs “normal” variability
- Climate change and fishing effects
  - Reduced competition/predation by fishing allows recruitment of warmer “replacement” species from the south
- Ocean acidification effects on species, habitats
Example of Apparent Climate Change

Total Blueline Tilefish Landings

- Pounds Whole Weight
- Year


- Hatt N
- S Hatt

SOUTH ATLANTIC FISHERY MANAGEMENT COUNCIL
...To Conserve and Manage
State record
Blueline Tilefish

Virginia state record
Snowy Grouper
Norfolk Canyon

Fish and fisheries shifting northward

IGFA Record
Blueline Tilefish
Norfolk Canyon

Norfolk Canyon
Wreckfish
“Expatriated” pelagic larvae of SAB outer shelf and slope species may recruit to MAB outer shelf and slope.

Satellite-tracked drifters deployed on SAB spawning site 60-d track.
Winter bottom temperatures and fish diversity (mean number of species per trawl tow).

High diversity and community stability is associated with warmer waters of the middle shelf and southern part of the SAB.

May shift northward.
Shelf-edge warm waters are important spawning grounds for Gag and other species.
Tracks of Satellite-Tracker Drifters Deployed on Spawning Sites of Reef Fishes 2005-2007

Genetic connectivity and Stock ID?
Drifter Tracks Associated with Gag Spawning
Defection of the Gulf Stream at the Charleston Bump

Sets up the Charleston Gyre

Short-term variability vs. climate change

Temperature may affect recruitment
Sea Surface Temperature Isotherms in March (a peak of gag spawning)

Note 22° Isotherm
NOAA Oceanographic Monthly Summary

Sedberry et al. (2001)
Spawning in Gag (Grouper)

- It takes the right combination of moon phase, water temperature, day length, sex ratio, primary productivity and ocean circulation to produce a good year class of gag.
- Many conditions are variable
- Climate change may affect some conditions
- Can gag adapt?
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<thead>
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<th>Stock</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
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<td>Sedberry et al. (2006); SEDAR-25 (2011)</td>
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<td>Harris et al. (2004)</td>
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<td>Kelly (2014)</td>
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<td>Harris et al. (2007)</td>
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*Farmer et al. in prep.*
White Marlin Tag Pop-up Locations

O = tagging site
White Marlin Temperature Preferences

27 – 29 °C

n = 16,968
Charting a New Course
A Workshop to Design a Fishery Citizen Science Program for the U.S. South Atlantic

What is citizen science?
Citizen science is a growing field in which trained members of the public collaborate and engage with scientists in the inquiry and discovery of new knowledge. Public participation in scientific research advances science, research, and policy and fosters an informed and engaged citizenship.

Why are we doing this?
For many years the South Atlantic Fishery Management Council (Council) has grappled with the challenge of ensuring adequate and timely science to support management despite limited resources, a multitude of species to manage, and a complex and highly diverse ecosystem. Discussions of data shortcomings and the resulting scientific uncertainties often lead to offers from fishermen to provide their vessels as research platforms, collect samples and record their own observations to help increase scientific knowledge and ‘fill the gaps’. The Council recognizes the desire of constituents to get involved and the need to have a well-designed program and accompanying sampling protocols to ensure that information collected through such efforts is useful. To meet this growing need, the Council intends to develop a comprehensive Fishery Citizen Science Program.

Initial Steps
In March 2015, the Council created a Citizen Science organizing committee. As a first step, the committee has recommended convening a workshop where interested citizens, fisheries managers and scientists, and citizen science practitioners gather to develop recommendations for designing such a program.

Vision
The committee crafted the following draft vision for a Fishery Citizen Science Program to serve as a guidepost for the proposed workshop:

“A collaborative fisheries research and monitoring program run by the South Atlantic Fishery Management Council that effectively blends citizen science and technical science to expand the base of information available for Council decision-making.”
Redmap - What's on the move in Australian seas?
Fishing · Scuba Diving · Boating

Check out the Redmap t-shirt design competition! Open Oct 1 – Nov 5th 2015.

Break out your best marine drawings or graphic designs for your chance to win a custom designed t-shirt (with your design on it!) courtesy of Bolt and Run Co. AND a copy of Edgar's Australian Marine Life!

There are two children and two adult categories. See the website for more info.

5.0 of 5 stars · 16 reviews
View Reviews
Gray’s Reef National Marine Sanctuary (Georgia) 2006 to 2013

Periodic variability, with increasing trend in CO₂
Scott Noakes, UGA
**Atmospheric CO₂**
- 15 ppm in 5 years
- = 0.783%/year

**Worldwide Seawater CO₂**
- 1.2 to 2.1 ppm/year
- = ~0.5%/year

**Atmospheric CO₂**
- 21 ppm in 7 years
- Average=391.7 ppm*
- = 0.77%/year

**Seawater CO₂**
- 78 ppm in 7 years
- Average=411.6 ppm*
- = 2.7%/year

*Note: Averages based on Gray’s Reef data set*
Hard/Soft Corals and Hard Substrates

Are likely to be impacted

Oculina arbuscula

Phyllangia americana

Titanideum frauenfeldii

Telesto fruticulosa

Scott Noakes, UGA
Key Challenges

- Flexibility in management jurisdictions and exchange of ideas/data among them
  - Changing stock structure
- Sorting out climate change vs climate variability vs effects of fishing on population ecology
- Multidisciplinary approach, connecting physics, meteorology, oceanography and biology
- More MPAs?
- Fishery-independent data need
- Fishery-dependent data need
  - Precise catch, effort, location, etc. from all sectors