



South Atlantic Ecosystem Model Update

**Create the Future: Develop Refined and
Focused South Atlantic Ecosystem
Model/Model Suite & the Companion Physical
Modeling Requirements**

**Habitat Protection and Ecosystem-Based Management
Committee**

Hilton Head, South Carolina

September 14, 2015

Brett Boston – Workshop Facilitator



Our Project Team

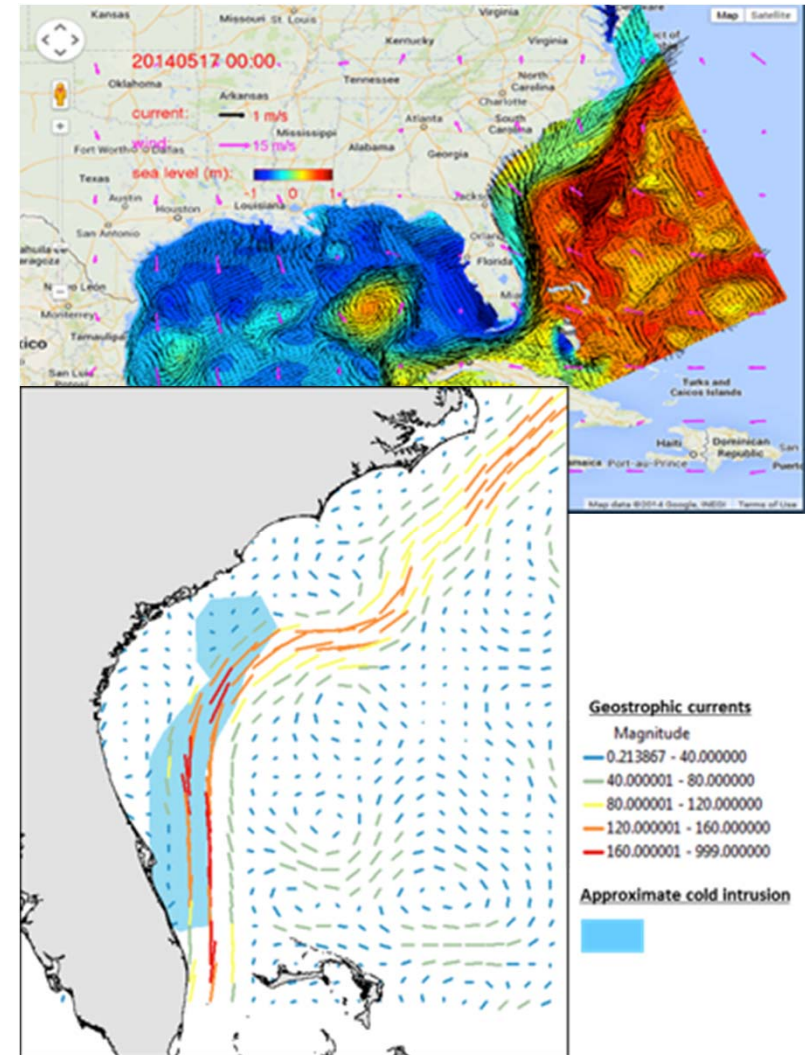
– Principal investigators –

- **Dr. Marcel J. Reichert** – Marine Resources Research Institute, South Carolina Department of Natural Resources
- **Dr. Luiz Barbieri** – Florida Fish and Wildlife Conservation Commission, FWRI
- **Dr. Thomas Okey** – Ocean Integrity Research, Victoria, BC, Canada
- **Dr. Jerald S. Ault** – Professor and Director, Fisheries Ecosystem Modeling and Assessment Research, Rosenstiel School of Marine and Atmospheric Science, University of Miami
- **Dr. Ruoying He** – Department of Marine, Earth and Atmospheric Sciences, North Carolina State University
- **Dr. Peter Sheng** – Professor and Director, Coastal and Oceanographic Engineering Program, University of Florida
- **Vembu Subramanian** – RCOOS Program Manager and Data Management Coordinator, SECOORA
- **Dr. Patrick N. Halpin** – Director, Geospatial Analysis Program Duke University
- **Roger Pugliese** – Senior Fisher Biologist, South Atlantic Fishery Management Council



As a reminder, the models will:

- Link to hydrodynamic oceanographic models and satellite data
- Provide more realistic predictions about spatial policy options
- Predict impacts of episodic events that are limited in space (oil spills, red tides, upwelling)
- Meet the immediate needs of the SSC and the South Atlantic Council





Develop Refined and Focused South Atlantic Ecopath with Ecosim (EwE) Model & the Companion Physical Modeling Requirements

Engage SAFMC SSC in needs assessment

Develop useful tools for the Council – initial focus to include species in the snapper grouper complex (e.g., red snapper and gray trigger fish)

Define existing and desired data technology needs and coverage needs

Create tools to conduct ecosystem-based evaluations of fisheries policies and tradeoffs

Identify tradeoffs among conflicting management objectives , e.g. conservation vs. profits

Integrate environmental data into the stock management process



Create the best possible information for use by managers and decision-makers

- Work with managers and decision-makers to ensure models meet their needs
- Recruit top researchers to assist in an inclusive, long-term management effort
- Build an ecosystem modeling technical advisory group that ensures our approach includes both practical science and leading-edge thinking
- Multi-year modeling that seeks the best available science from all disciplines
- Establish linkages to coastal/ocean ecosystems, estuarine and riverine systems



Funding Sources



- The South Atlantic LCC has committed \$150,000 to coastal integration funding as part of completing the connectivity of Blueprint 2.1 and enhancing linkages with developing SAFMC FEP



- The Southeast Coastal Ocean Observing Regional Association (SECOORA) is funding refined oceanographic models to support ecosystem modeling, enhance ecosystem condition forecasting and ecosystem-based fishery management.



*A robust plan and expert model development team leaves us **well-positioned to leverage available ecosystem partner funding** to create the next generation of South Atlantic Ecosystem Models which support and enhance regional Conservation and Management*



SALCC Project Overview:

Develop a South Atlantic Ecosystem Model

SALCC funded a collaborative regional effort to build a South Atlantic Ecosystem Model that will facilitate the connection of inland and coastal marine management strategies and actions to potential resource and economic impacts in estuarine and coastal marine environments, with the following two goals:

1. Improve and Expand the Functionality of the South Atlantic Landscape Conservation Cooperative Blueprint

The SALCC Blueprint is unique in its ability to connect across terrestrial, freshwater, and marine systems. Improving, the availability of and quality of current models to connect impacts across those ecosystems is a major focus for modeling efforts and Blueprint Users. Improving these models is a high priority for Blueprint Coastal and Marine Blueprint Users, the Indicator Revision Teams, and the Conservation Design Team.

2. Identify and Sustain Benefits for Blueprint Users

Inland to Marine: Improve the ability to reliably quantify how SALCC and SAFMC conservation actions contribute to the productivity and sustainability of estuarine and coastal marine ecosystems.

Estuarine and Coastal Marine: Improve the ability to quantify how Coastal and Inland actions impact Estuarine and Marine systems.





SALCC Project Overview:

Scope of Work

A pilot project for conceptual and practical development of a marine ecosystem model for the area managed by the South Atlantic Fishery Management Council, which encompasses the SALCC's regional coastline, inland areas, conservation management areas.

- Develop and assimilate the appropriate range of biological, physical and habitat data needed to ensure development of a reliable spatial model that integrates land to sea dynamics and connections for the southeastern United States.
- A Working Group will identify the appropriate resource process indicators that link with the SALCC perspective that we will model.
- The work will initiate development of a prototype ecosystem model to be refined and reconfigured to incorporate the latest information; including spatial and temporal information from parallel models and research efforts in the ocean, estuaries, and other interfaces.





SALCC Project Overview:

Scope of Work

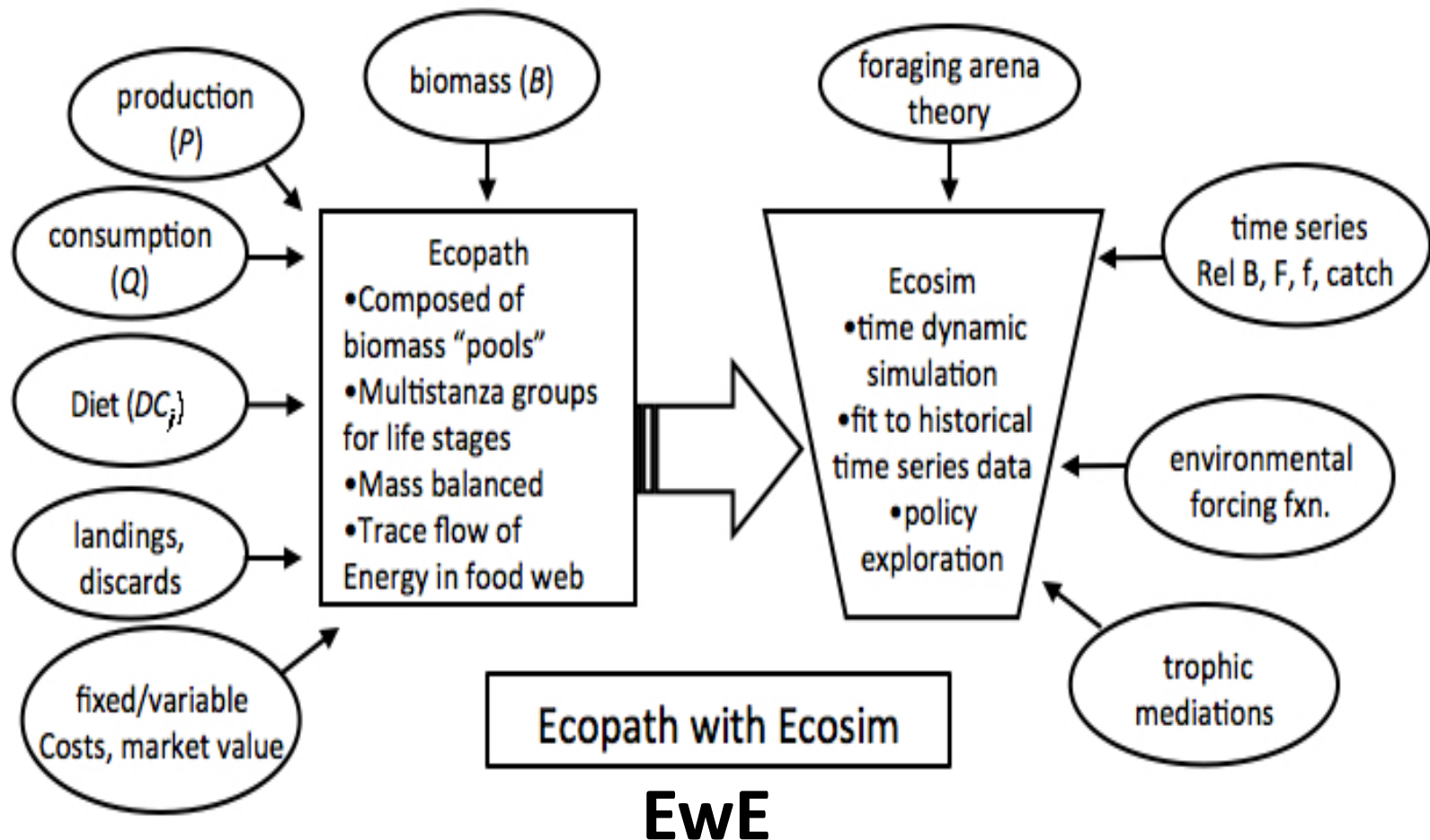
A pilot project for conceptual and practical development of a marine ecosystem model for the area managed by the South Atlantic Fishery Management Council, which encompasses the SALCC's regional coastline, inland areas, conservation management areas.

- Evaluate a means of linking inland/coastal models (SALCC urban, flow, and water quality SPARROW) with marine transport and circulation (SABGOM), and marine species-community models (e.g., EwE, ACES, Atlantis, Roffer)
- Use coupled coastal and marine models developed in project to further inform future snapper-grouper complex assessments (e.g., red snapper and grey triggerfish).
- The work will also be designed to guide potential improvements in South Atlantic LCC Marine and Estuarine Indicators, thereby enhancing collaborations amongst SALCC partners on conservation actions.





Creation of a base South Atlantic (EwE) model will be an essential first step for linking to the existing SALCC Blueprint.





Phase 1 Outcomes

**A 2-year project with funding!
To improved & enhanced Ecosystem model
for the South Atlantic Region**

- **Connect EwE with the SALCC Blueprint for Estuaries and Rivers (Food Web)**
- **ID and better utilize existing marine datasets**
- **Develop analytical tools & metrics for evaluation of fishery management alternatives**
- **Expand risk assessment capabilities through use more of the available data**
- **Provide better description of interactive influences: stock, productivity, uncertainty**
- **Suggest potential improvements in South Atlantic LCC Marine and Estuarine Indicators**
- **Collaborate with South Atlantic LCC post-doc working on coupling conservation actions and South Atlantic Indicators**
- **Inform Food Webs and Connectivity FEP II Section Writing Team - State of the SA Ocean and SA Food Web**





Phase 2: Refining and linking Phase 1 Model to other models creating a suite of decision support tools.

Meet the immediate needs of the SSC and the South Atlantic Council for better understanding of the management decisions they face. This includes the ability to understand levels of uncertainty and to have the ability to evaluate the (biological and other) consequences for alternative management scenarios and, correlated views on the potential impact of any decision.





Grant 1

Develop South Atlantic Ecopath with Ecosim Model

Principal Researcher: Tom Okey

This latest iteration of the South Atlantic Basin model is the starting point for developing an updated EwE model that can be the core of an integrated end-to-end model of the SAB ecosystem that can achieve the broad objectives expressed herein. The updating and refinement can be achieved using resources such as the GOM gag model ([Chagaris and Mahmoudi 2013](#)), based on the original West Florida Shelf model ([Okey and Mahmoudi 2002](#), [Okey et al. 2004](#)), as well as a variety of additional resources that include new data and information.

The spatial and temporal dynamic parts will continue to be refined through Year 2 and beyond as analyses proceed.





Grant 2

Data Conditioning

Principal Researcher: Marcel Reichert

SC-DNR's MARMAP and SEAMAP-SA fishery independent monitoring programs have collected long-term abundance and life history data from Cape Hatteras, NC to the St. Lucie, FL, dating back to the 70's and 80'. Since 2010, reef fish sampling efforts have been done in collaboration with SEFIS (SEFSC, Beaufort, NC). Sampling has been conducted annually with a variety of gears (incl. trawls, fish traps, and long lines). Available data include detailed sampling location coordinates, oceanographic variables (incl. water column temperature and salinity), species composition, relative abundance by species, and information on age, growth, reproduction, diet, and genetic variability of a variety of selected species.

Making data available for use in modeling efforts involves extracting relevant information, summarizing data, and possible base line analyses.





Grant 3

Review of Estuarine Data and Models

Principal Researcher: Peter Sheng

Identify estuarine data and model along the Northeast and Central Florida coast to pilot usefulness and options for developing linked estuarine-marine models for predicting SALCC estuarine indicators. The model will be design to evaluate the success for South Atlantic Conservation Blueprint Indicators.

These indicators include:

- (1) coastal condition: index of water quality, sediment quality, and benthic condition;
- (2) wetland patch size: index based on the size of wetland patches; and
- (3) (3) water-vegetation edge: index of length of edge between open water and vegetation. During the first year, University of Florida (UF) will gather and review all available data (both fishery independent and fishery dependent) related to the above indices from several state and regions





Grant 4

A Coupled Marine Environmental Assessment and Prediction System for the Southeastern U.S. Coastal Ocean in Support of Effective Marine Ecosystem-Based Management **Principal Investigator: Ruoying He**

Contribute to the efforts of building regional marine ecosystem predictability, by implementing advanced regional marine environment assessment and prediction system. Such a system will predict coastal ocean conditions over the entire south Atlantic footprint with a high degree of scientific accuracy and provide detailed information to stakeholders in a timely and clear fashion.

Methodology: The proposed regional ocean modeling effort will be built upon NCSU's existing circulation nowcast/forecast modeling system to directly facilitate and enhance the effort of the South Atlantic Fishery Management Council (SAFMC) in support of the move to Ecosystem Based management to develop an ecosystem modeling suite with an emphasis on a fully parameterized Ecopath and Ecosim model for the South Atlantic Region.





Grant 5

South Atlantic Fisheries Ecosystem Modeling & Prediction

Principal Investigator: Jerald S. Ault

Refine an existing fisheries ecosystem model designed to evaluate multiple interacting threats to sustainability of fisheries resources, including direct impacts of fishing on target species, trophic impacts of fishing on prey species, and a variety of environmental impacts (e.g., degradation of water quality/habitats).

This project builds upon previous efforts that developed a combined fisheries ecosystem modeling-prediction tool that explicitly couples ocean physics and biological process models to produced forecasts that simultaneously evaluated fishing and non-fishing (water management) regulatory policies for sustainability of natural resources called ACES (Atlantic Coast Ecosystem Simulation).

The project will assess multispecies fisheries risks from exploitation and environmental factors.

The project will refine and implement an integrated suite of mathematical predictive models in a robust ecosystem modeling framework for SALCC, building on existing efforts within and external to NOAA. Research will focus on developing the component layers of the ACES model by strategically utilizing environmental models and data.





SALCC Funding

	SALCC Yr1	SALCC Yr2	Total SALCC	Additional Funding Sought Yr2+
Okey	\$30,000	\$17,000	\$47,000	\$3,000
SCDNR	\$18,000	\$0	\$18,000	\$2,000
Sheng	\$15,000	\$23,000	\$38,000	\$7,000
NCSU	\$26,000	\$21,000	\$47,000	\$6,000
Ault				\$55,000
Total	\$89,000	\$61,000	\$150,000	\$73,000

Investment
Needed



SOUTH ATLANTIC
LANDSCAPE CONSERVATION COOPERATIVE



Development of New Sections for the South Atlantic Fishery Ecosystem Plan II which supports the EFH 5 year Review

Notice to Invited Participants	August 2015
Pre-webinar coordination	September 2015
Webinars conducted	October 2015
Webinar Summary provided	November 2015
Section review/draft update	By March 2016



Development of New Sections for the South Atlantic Fishery Ecosystem Plan II which supports the EFH 5 year Review

Timeline SAFMC Species Section Review

Notice to Invited Participants	Nov/Dec 2015
Pre-webinar coordination	Nov/Jan 2015
Webinars conducted	February 2016
Webinar Summary provided	March 2016
Section review/draft update	By June 2016



SAFMC Writing Team Webinars

Oyster Reefs and Shell Banks Habitat
Soft Bottom Sub-tidal Habitat
Estuarine Emergent Marsh (Salt and Brackish) Habitat

Artificial Reef Habitat
Live/Hard Bottom Habitat
Seagrass/SAV Habitat
Estuarine Shrub/Scrub (Mangroves)
Intertidal Flats Habitat
Estuarine Water Column
Deepwater Coral Habitat
Coral and Coral Reefs



Pre-Webinar

Notice to Invited Participants

August 2015

Pre-webinar coordination

September 2015

Pre-writing data gathering via

<https://www.surveymonkey.com/r/SAFMC>



Webinar Schedule

Artificial Reef Habitat	Monday, October 5	9:00am-11:30am
Live/Hard Bottom Habitat	Monday, October 5	1:00pm-3:30pm
Seagrass/SAV Habitat	Tuesday, October 6	9:00am-11:30am
Estuarine Shrub/Scrub (Mangroves)	Tuesday, October 6	1:00pm-3:30pm
Intertidal Flats Habitat	Wednesday, October 7	9:00am-11:30am
Estuarine Water Column	Wednesday, October 7	1:00pm-3:30pm
Deepwater Coral Habitat	Thursday, October 8	9:00am-11:30am
Coral and Coral Reefs	Friday, October 8	1:00pm-3:30pm
Oyster Reefs & Shell Banks Habitat	Monday, October 1	9:00am-11:30am
Soft Bottom Subtidal Habitat	Monday, October 1	1:00pm-3:30pm
Estuarine Emergent Marsh (Salt and Brackish) Habitat	Tuesday, October 2	9:00am-11:30am



Other Webinars

Facilitated Pre-Meeting Webinars New Section Writing Teams:

SA Food Webs and Connectivity	Tuesday, October 20	9:00am-11:30am
SA Climate Variability and Fisheries	Tuesday, October 20	1:00pm-3:30pm

Misc. Section Review Teams Facilitated Webinars

Threats to Habitat	Thursday, October 22	9:00am-11:30am
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Other Species Webinars

Protected Resources	Wednesday, October 21	9:00am-11:30am
Anadromous /Catadromous Species	Wednesday, October 21	1:00pm-3:30pm

Species Webinars and In-person Meeting

SAFMC Managed Species Section Review Team Facilitated Webinars	Jan 25 -Feb 12, 2016
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EFH Update: an Integrated part of FEP II To Address 5 Year Review Needs

Contract with FWRI with EFH funds to address 5 Year Review Needs:

- Review literature and summarize pertinent information to augment life-history habitat associations within the Council's Eco-Species database, species and EFH/habitat sections of Volume II of the developing Fishery Ecosystem Plan II.
- Provide background materials in table and summary format to support Council FEP II Managed Species Section writing teams review in January/February 2016. Additional review of gray and other literature based on input from Webinar.
- Update the Ecospecies system with habitat associations by life stage for managed species within the Council's Eco-Species database developed through review and new information provided after managed species and habitat Writing Team review and update of associated Sections of Volume II of the developing Fishery Ecosystem Plan II.



Meeting Schedule

SA Food Webs and Connectivity

Nov. 19-20, 2015

FWRI, St. Petersburg, FL

Follow Habitat Ecosystem AP

SA Climate Variability and Fisheries

Dec. 1-2, 2015

Charleston, SC

Prior to SECOORA Board Meeting



Facilitated Webinar

Introduction – Development of SAFMC Fishery Ecosystem Plan II

General Overview of Outline and Section – Group Solutions

Team Discussion on Section Revision and Update Needs

Review / Revision Schedule – Team Leader



Session Revision & Updates

- Review existing section
- Available/applicable South Atlantic activities
- Guidance for updating section
- Assess available materials
- What additional perspective are needed?
- Ecosystem modeling: suite of ocean models
- Summarize what we know and *could know*
- Consider SALCC/SARP connectivity modeling
- SAES model development
- Determine team tasks and timetables



FEP II EFH Update Development / 5 Year Review Timeline

September 2015 Council Meetings: Status FEP II Development and EFH Updates and Regional Ecosystem Modeling

December 2015 Council Meeting: Approve Redrafted EFH Policies on Energy Exploration, Development and Transportation, and Outline/Draft of New EFH Policy Statement for Artificial Reefs for inclusion into FEP II.

March 2016 Council Meeting: Status FEP II Development (Habitat and Misc. Sections) and EFH Updates. Review Outline for New EFH Policy Statement for Climate Variability and Fisheries for inclusion into FEP II and Approve Artificial Reef Policy Statement.

June 2016 Council Meeting: Status FEP II Development (Species and Appendices) and Review Draft EFH Policy Statement for Climate Variability and Fisheries for inclusion into FEP II.

September 2016 Council Meeting: Status FEP II Development and EFH Updates and EFH Updates and Approve EFH Policy Statements for Food Webs and Connectivity and Climate Variability and Fisheries for inclusion into FEP II.

December 2016 Council Meeting: Finalize and Approve FEP II /EFH Updates, FEP II Executive Summary supporting EFH 5 Year Review.



Questions?