



# SOUTH CAROLINA DEPARTMENT OF NATURAL RESOURCES

## Aquatic Saltwater Resources of the Lower Savannah River and Salkahatchie River Basin

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S.C. Department of Natural Resources  
Marine Resources Research Institute  
Inshore Fisheries Research Section

*Live Life Outdoors*



# SCDNR Marine Resources Research Institute

**Mission:** Conduct research and monitoring programs to assess the condition of our coastal resources and provide data required to address policy and management issues related to those resources

# Presentation Roadmap

## Estuarine Finfish Research Section

Species Monitoring (Inshore Fisheries)

Trammel Net Survey

**C**ooperative **A**tlantic **S**tates **S**hark **P**upping **A**nd **N**ursery (COASTSPAN) Survey

Electrofishing Survey

Adult Red Drum & Shark Longline Survey

Stock Enhancement (Mariculture) – Impacts of Tropical Systems

## Crustacean & Molluscan Research Section

Estuarine Trawl Survey – joint monitoring program with Inshore Fisheries Section

Oyster Demographics Project

## Environmental Research Section

South Carolina Estuarine and Coastal Assessment Program (SCECAP)

Watershed and Coastal Development Studies

Tidal Creek Research





# SCDNR Inshore Fisheries Research Section

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# Two Primary Species Interest Groups

## Estuarine Finfish



Sheepshead

## Small and Large Coastal Sharks



Atlantic Sharpnose



Sand Tiger Shark



Scalloped/Carolina Hammerhead



Bull Shark

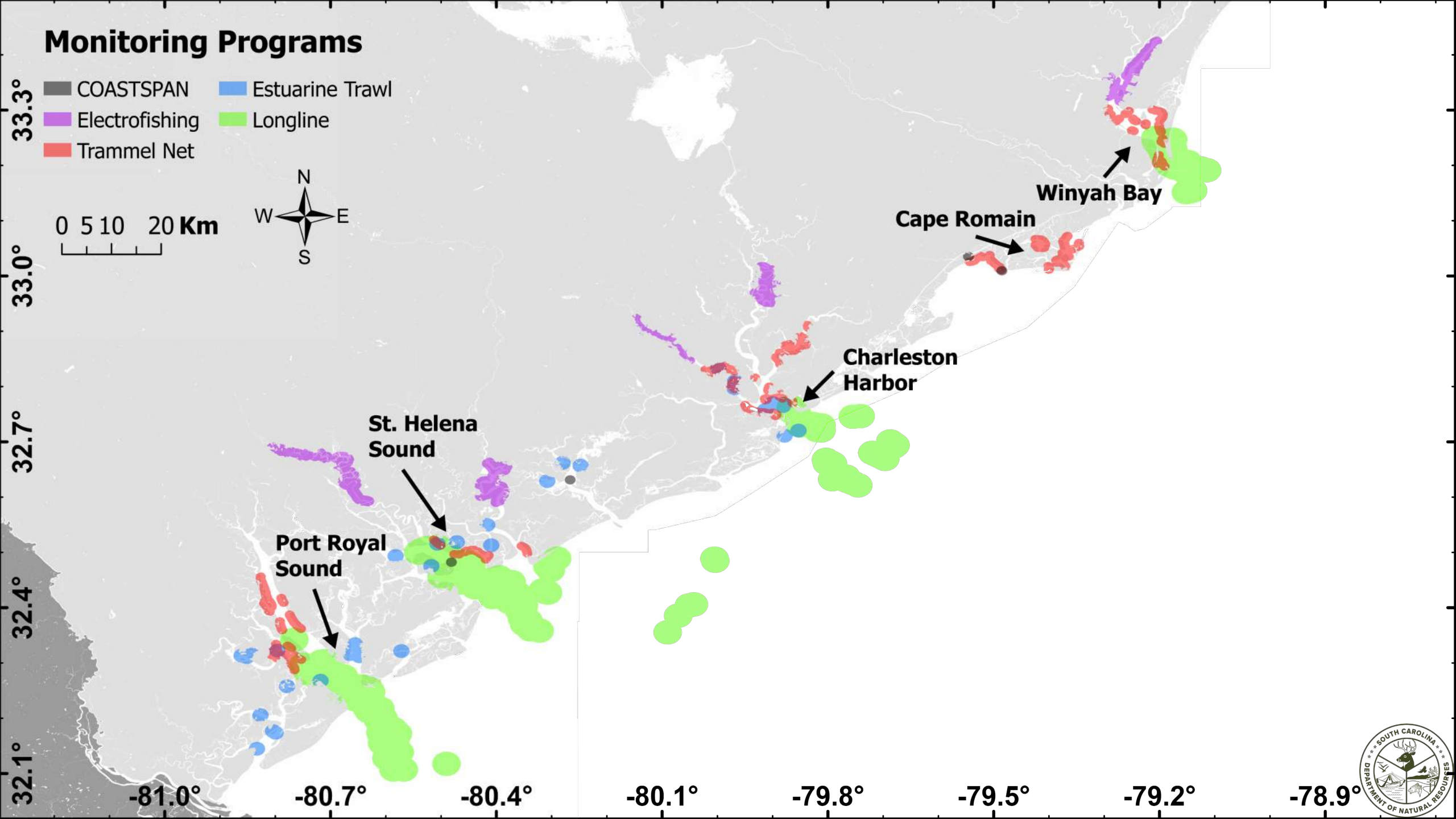


Tiger Shark

# Monitoring Programs

- COASTSPAN
- Estuarine Trawl
- Electrofishing
- Longline
- Trammel Net

0 5 10 20 Km



# Trammel Net Survey

Monthly since **1991**

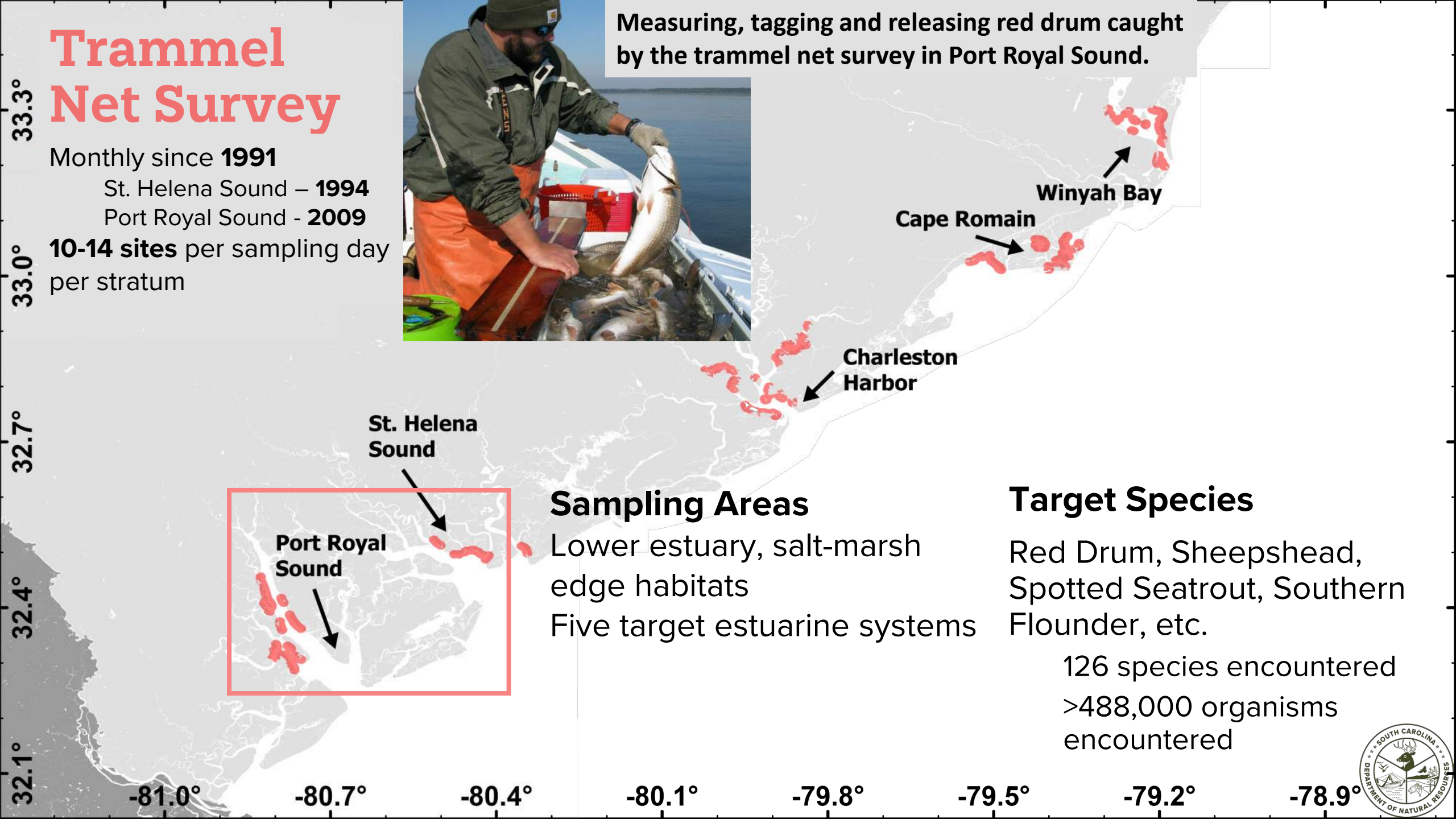
St. Helena Sound – **1994**

Port Royal Sound - **2009**

**10-14 sites** per sampling day  
per stratum



Measuring, tagging and releasing red drum caught by the trammel net survey in Port Royal Sound.



St. Helena Sound

Port Royal Sound

## Sampling Areas

Lower estuary, salt-marsh edge habitats  
Five target estuarine systems

## Target Species

Red Drum, Sheepshead, Spotted Seatrout, Southern Flounder, etc.

126 species encountered  
>488,000 organisms encountered



# COASTSPAN Survey

Seasonally (April – Sept.) since **1998**

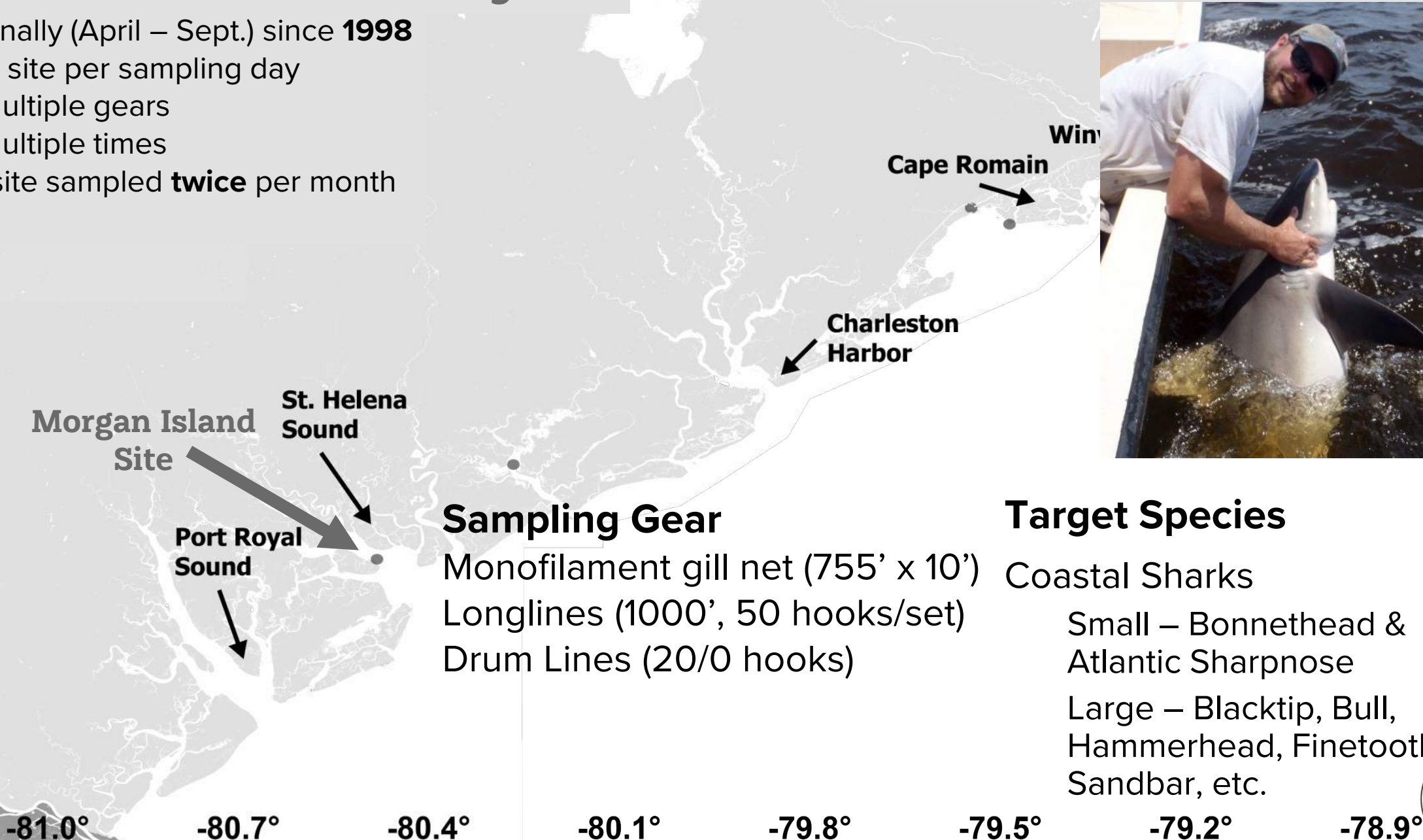
Single site per sampling day

Multiple gears

Multiple times

Each site sampled **twice** per month

33.3°  
33.0°  
32.7°  
32.4°  
32.1°



After being measured and tagged, a bull shark is readied for release.



## Sampling Gear

Monofilament gill net (755' x 10')

Longlines (1000', 50 hooks/set)

Drum Lines (20/0 hooks)

## Target Species

Coastal Sharks

Small – Bonnethead & Atlantic Sharpnose

Large – Blacktip, Bull, Hammerhead, Finetooth, Sandbar, etc.





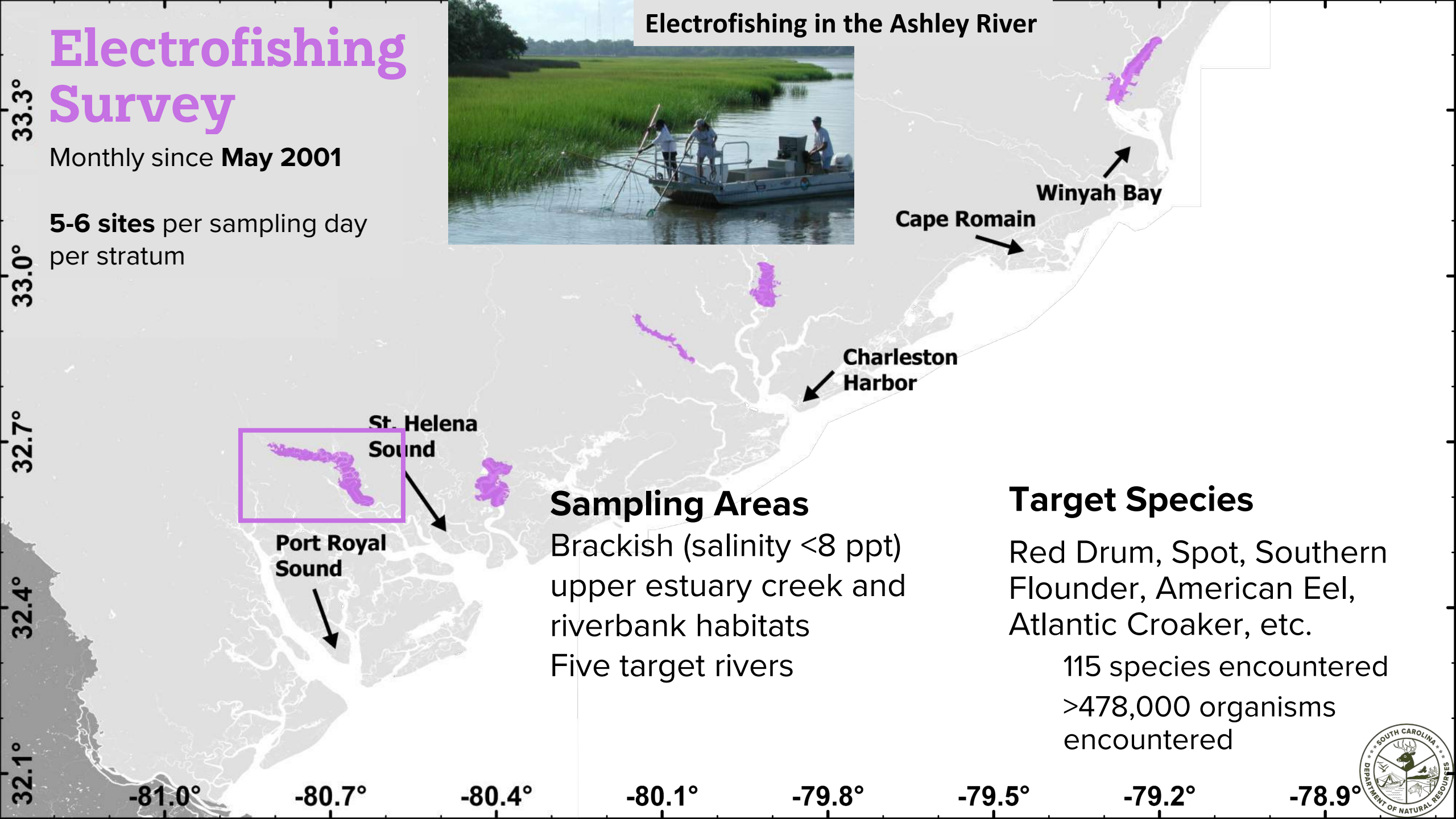
# Electrofishing Survey

Monthly since **May 2001**

**5-6 sites** per sampling day per stratum



Electrofishing in the Ashley River



## Sampling Areas

Brackish (salinity <8 ppt)  
upper estuary creek and  
riverbank habitats  
Five target rivers

## Target Species

Red Drum, Spot, Southern  
Flounder, American Eel,  
Atlantic Croaker, etc.

115 species encountered  
>478,000 organisms  
encountered



# Adult Red Drum & Shark Longline Survey

Seasonally (late-summer/fall) since **2007**

~**360 sets** per year

**3** six-week periods \* **4** sampling areas \* **30** sites per area

Sampling Gear

1/3 mile monofilament longlines

40 hooks per set

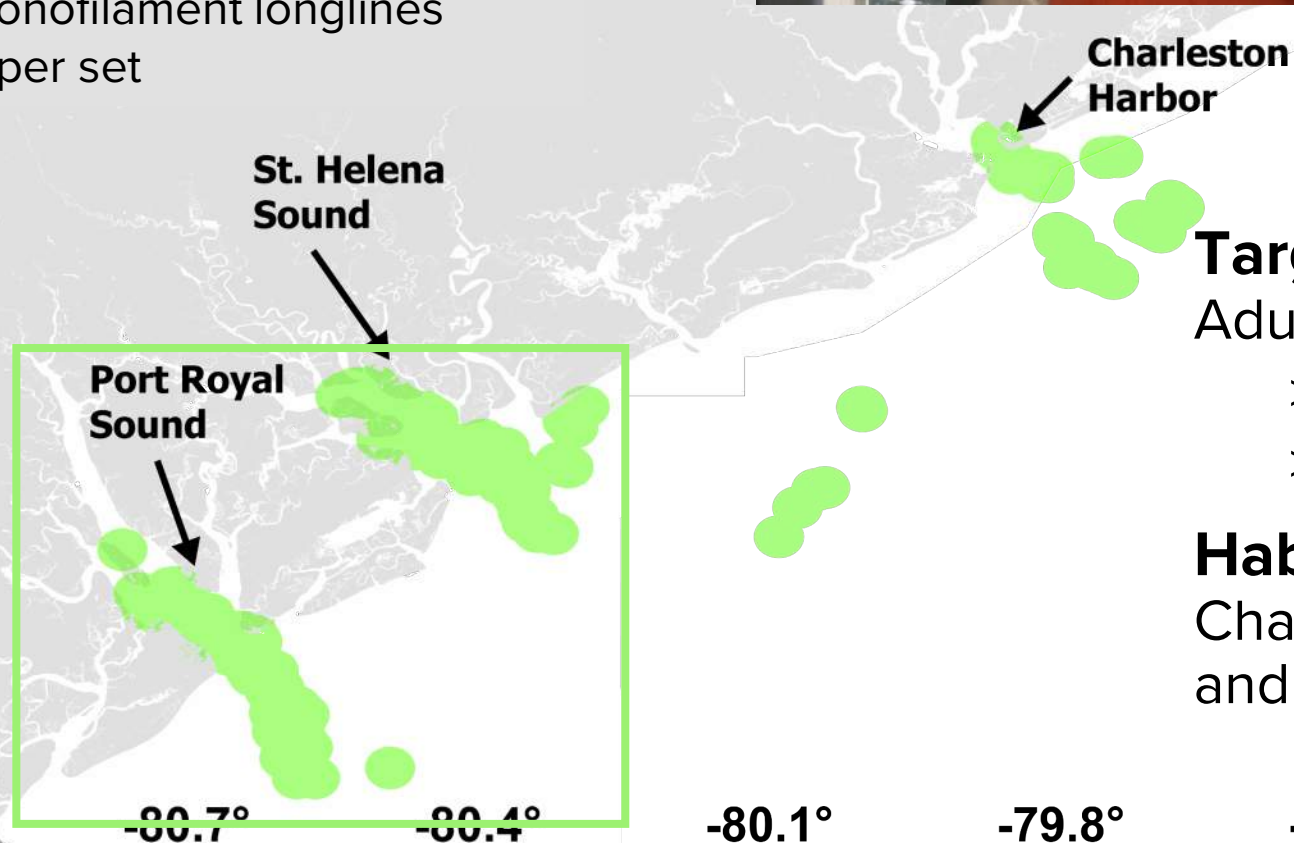


Adult red drum captured by the longline survey in Charleston Harbor



33.3°  
33.0°  
32.7°  
32.4°  
32.1°

-81.0° -80.7° -80.4° -80.1° -79.8° -79.5° -79.2° -78.9°



## Target Species

Adult Red Drum & coastal sharks

>50 species encountered

>1,500 animals caught year<sup>-1</sup>

## Habitat

Channel at the entrance of estuaries and adjacent near-shore waters



# Processing of Captured Fish

Fish brought on board and when possible placed in live well

- All fish identified and counted

- Most fish measured to nearest mm

Some fish tagged

- Red drum, black drum, sheepshead, southern flounder, most shark species

Water conditions recorded

- Tidal stage, water temp., salinity, dissolved oxygen

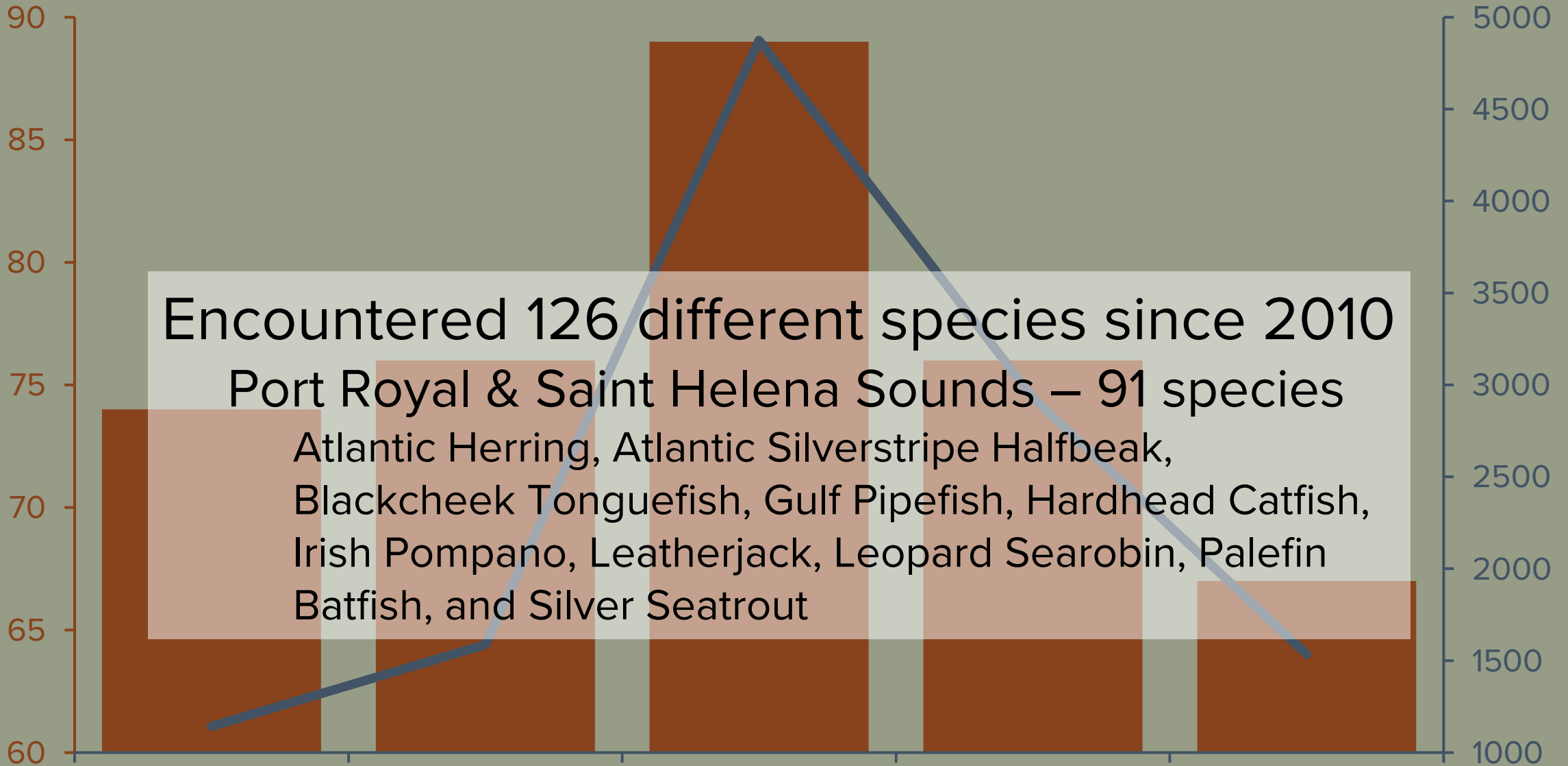


# Some Example Data Products

Inshore Fisheries Surveys



Species



Encountered 126 different species since 2010

Port Royal & Saint Helena Sounds – 91 species

Atlantic Herring, Atlantic Silverstripe Halfbeak, Blackcheek Tonguefish, Gulf Pipefish, Hardhead Catfish, Irish Pompano, Leatherjack, Leopard Searobin, Palefin Batfish, and Silver Seatrout

Trammel Collections

Port Royal Sound

Saint Helena Sound

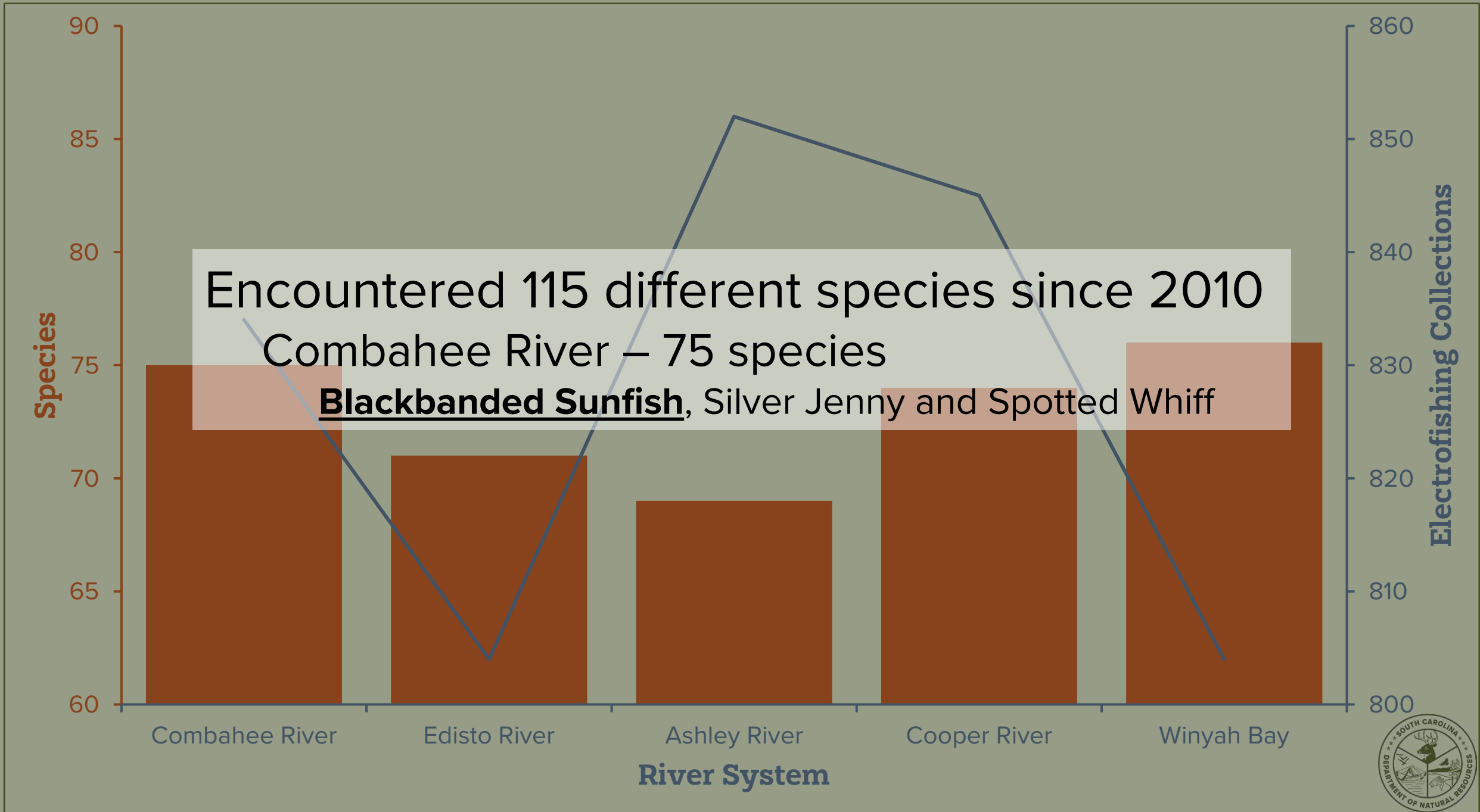
Charleston Harbor

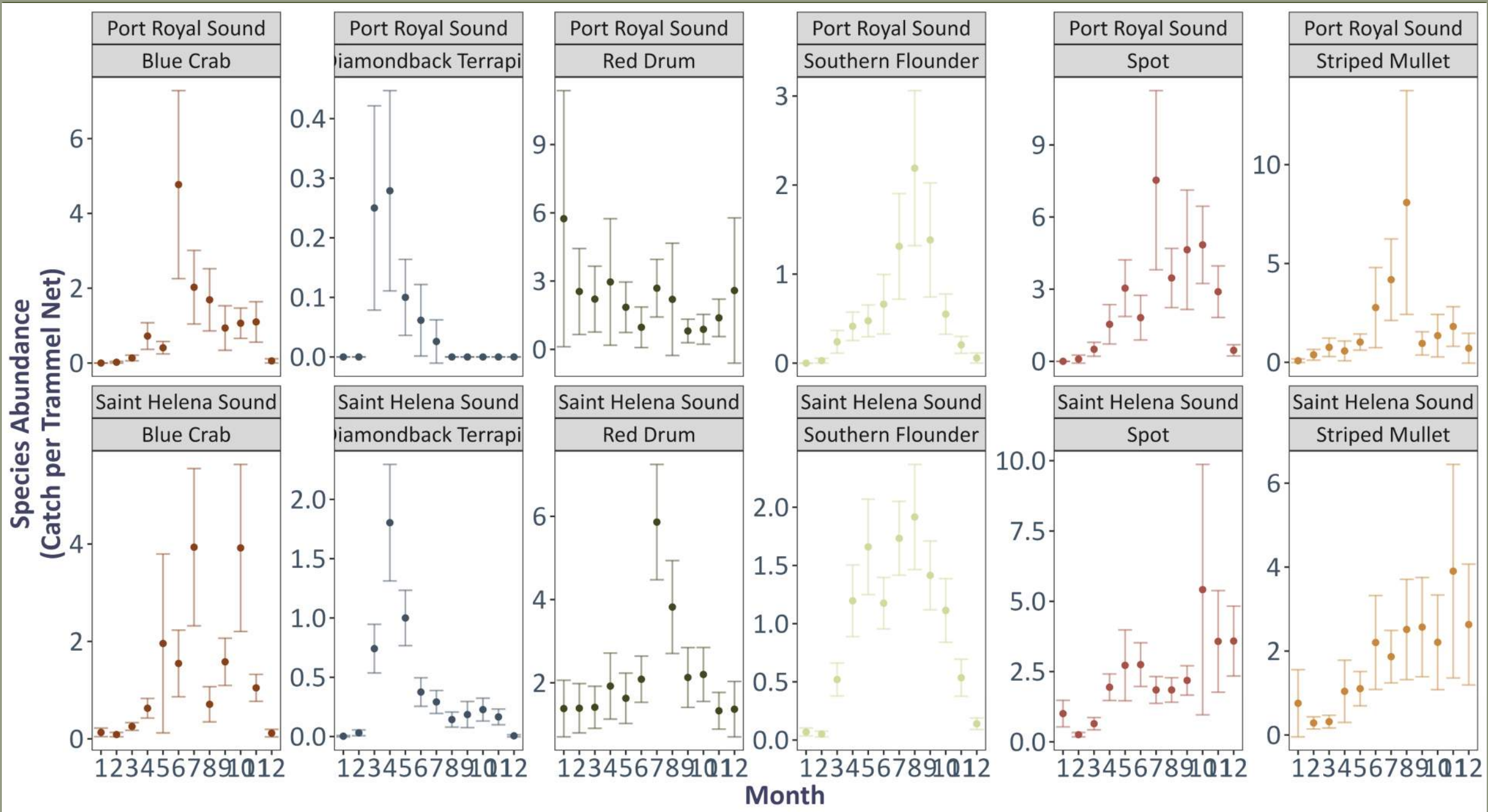
Cape Romain & Bulls Bays

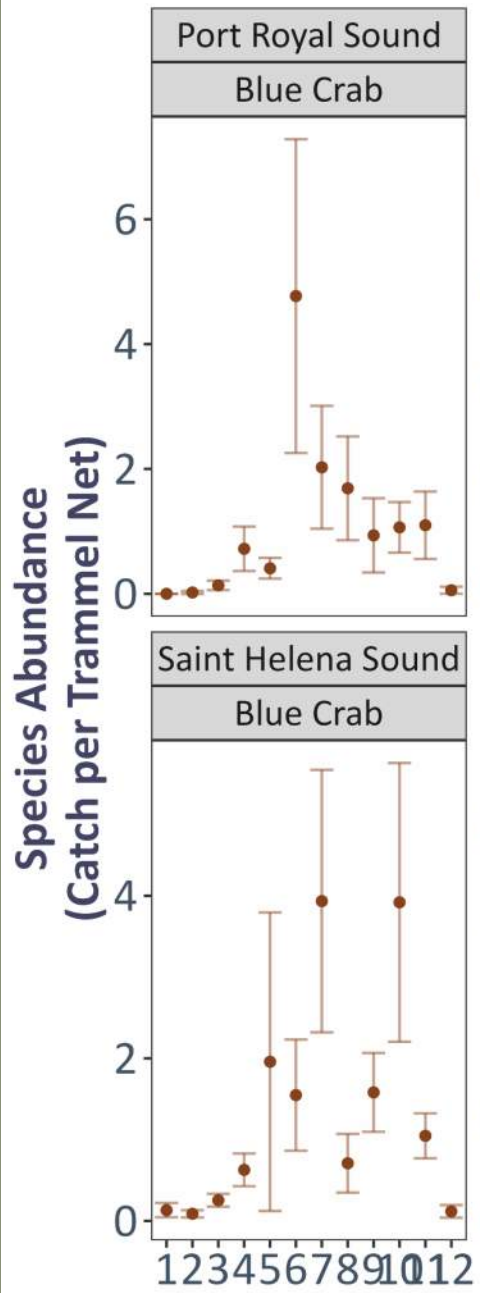
Winyah Bay

Estuary



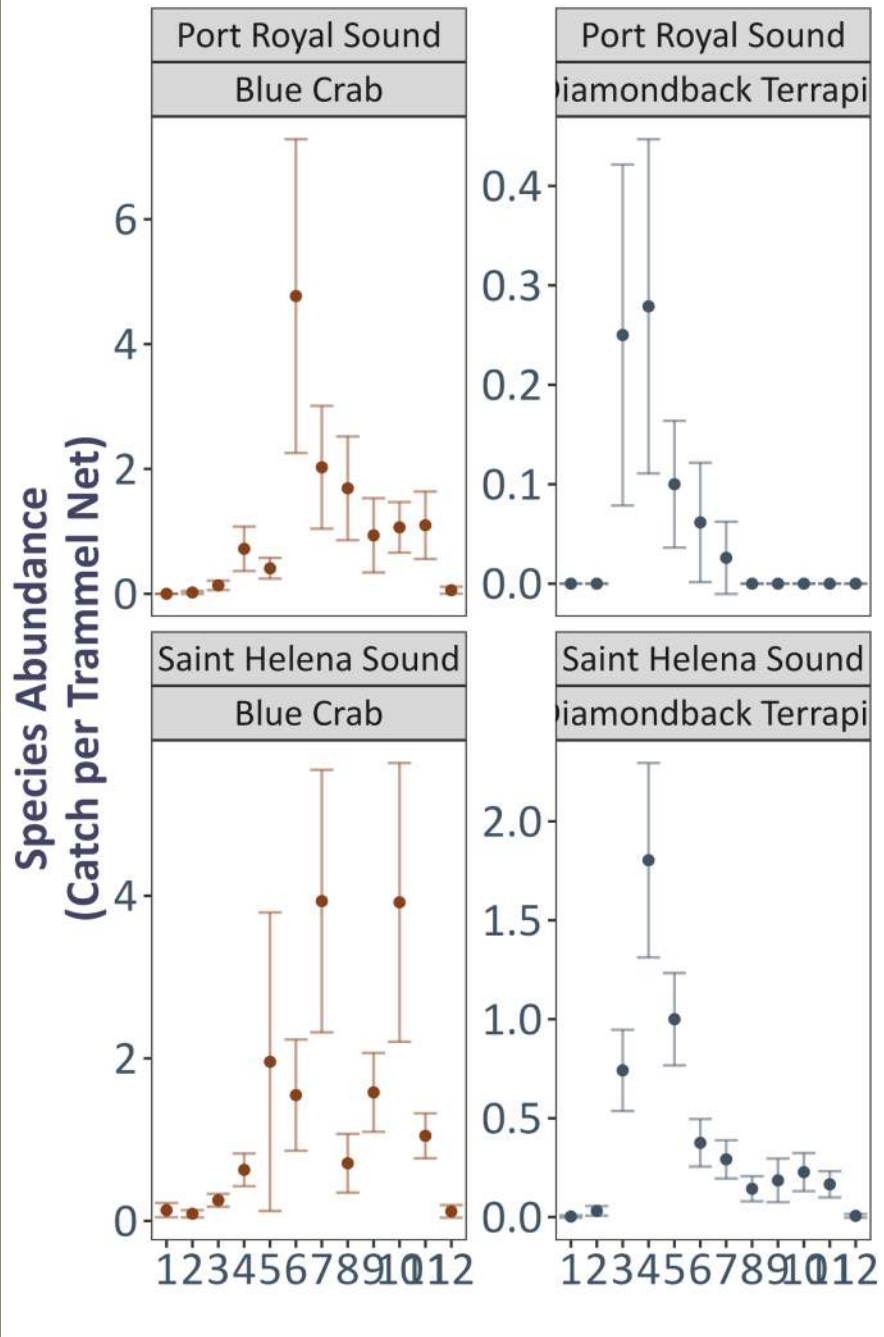




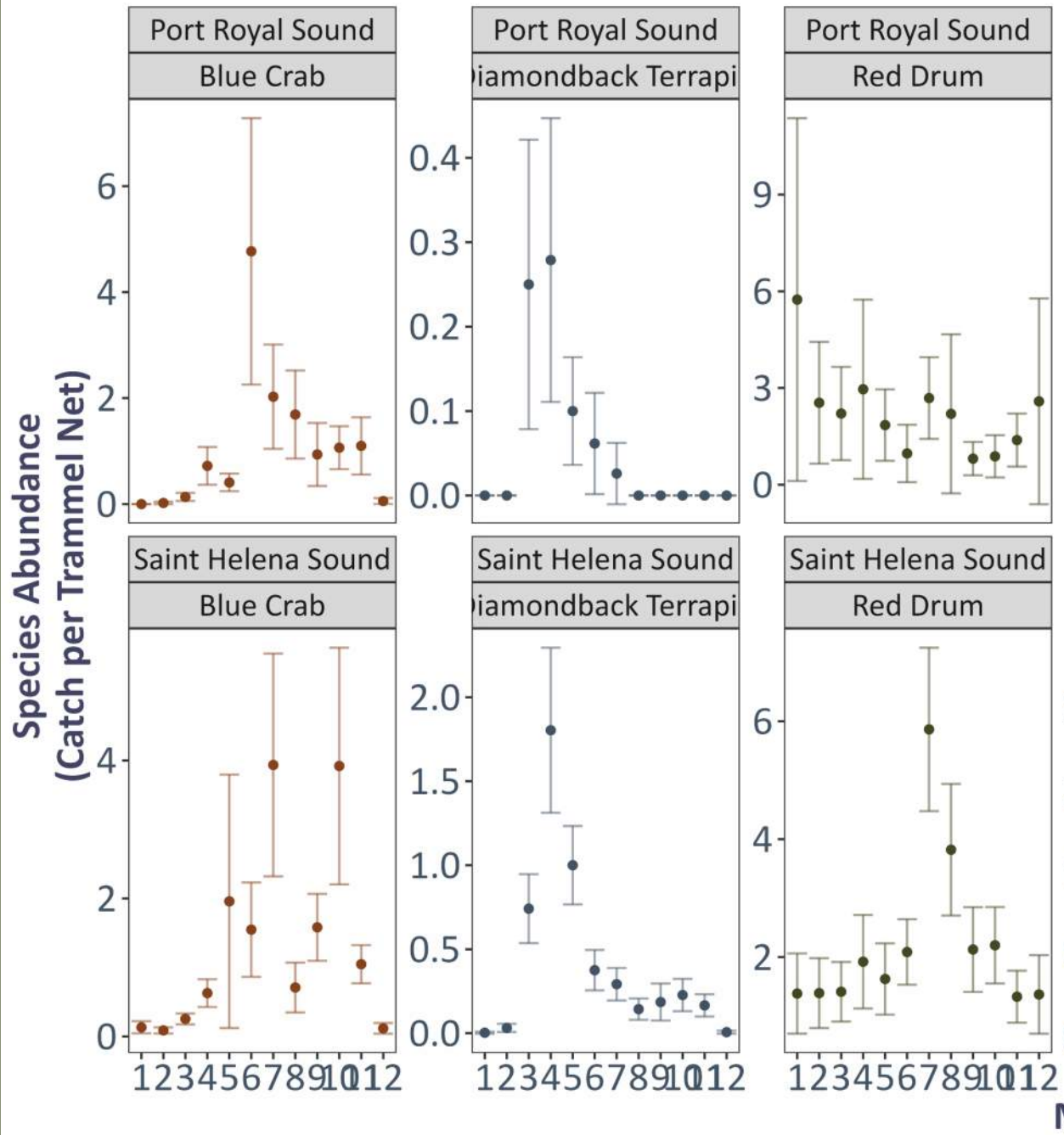


Month

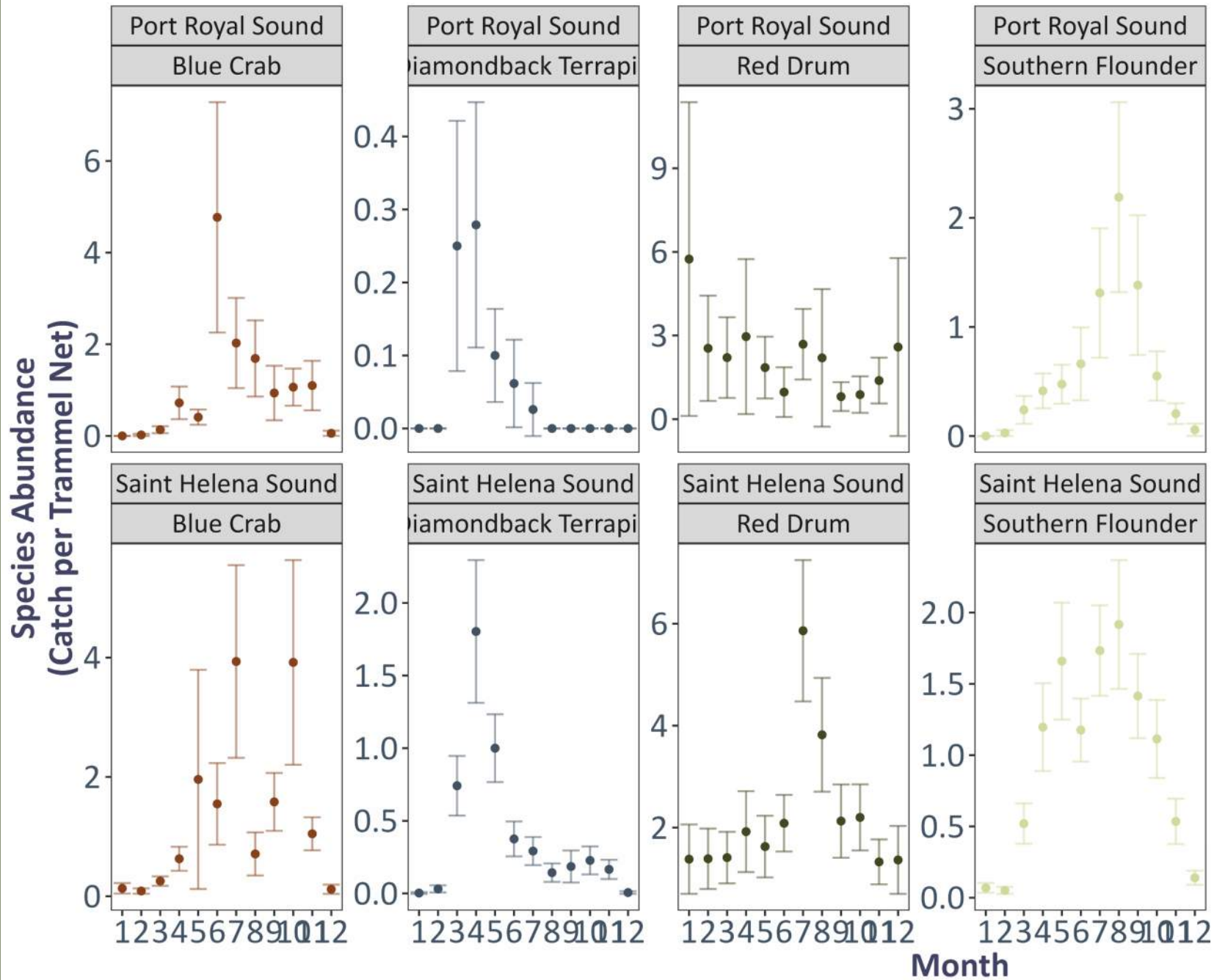


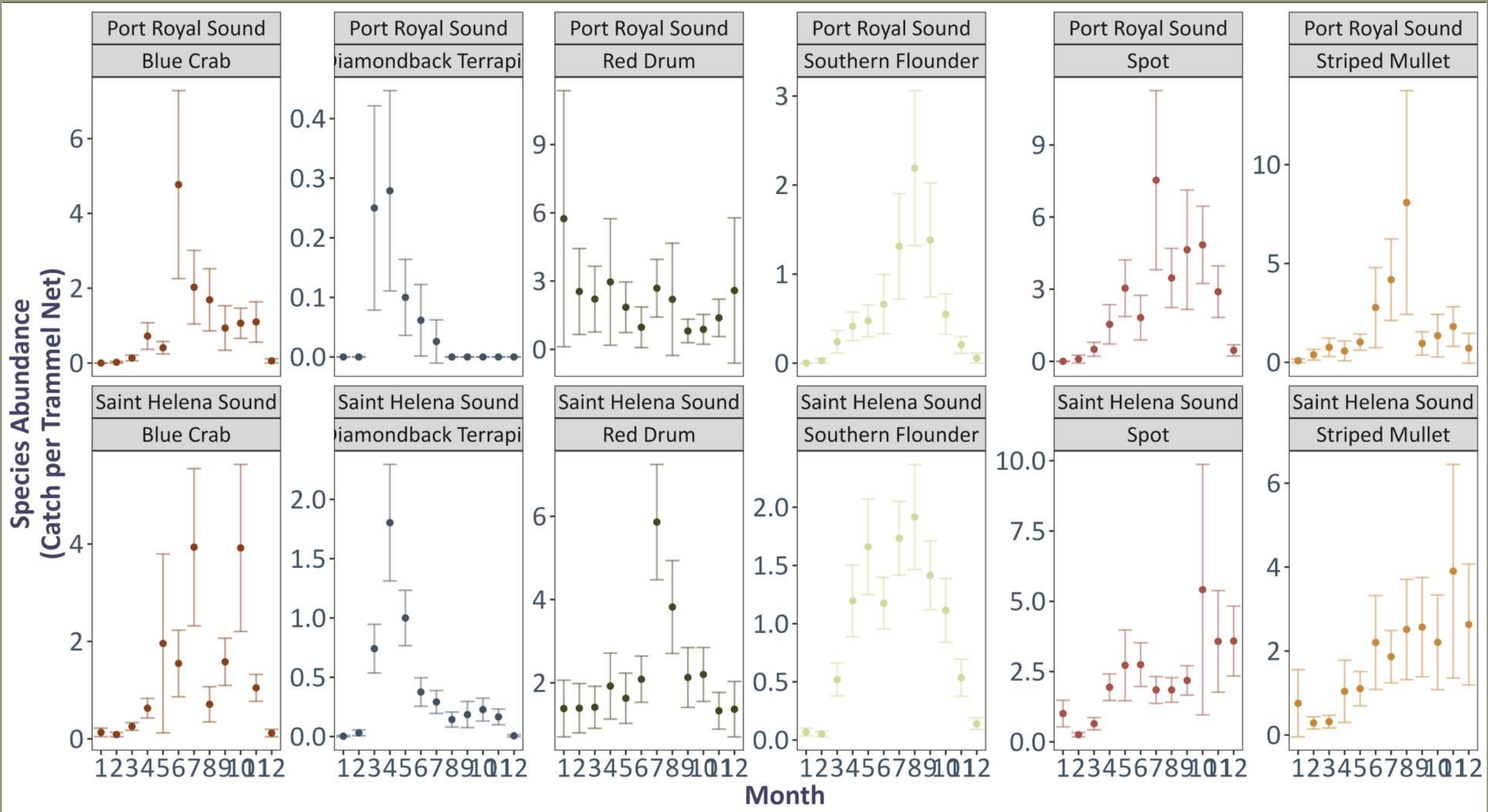


Month

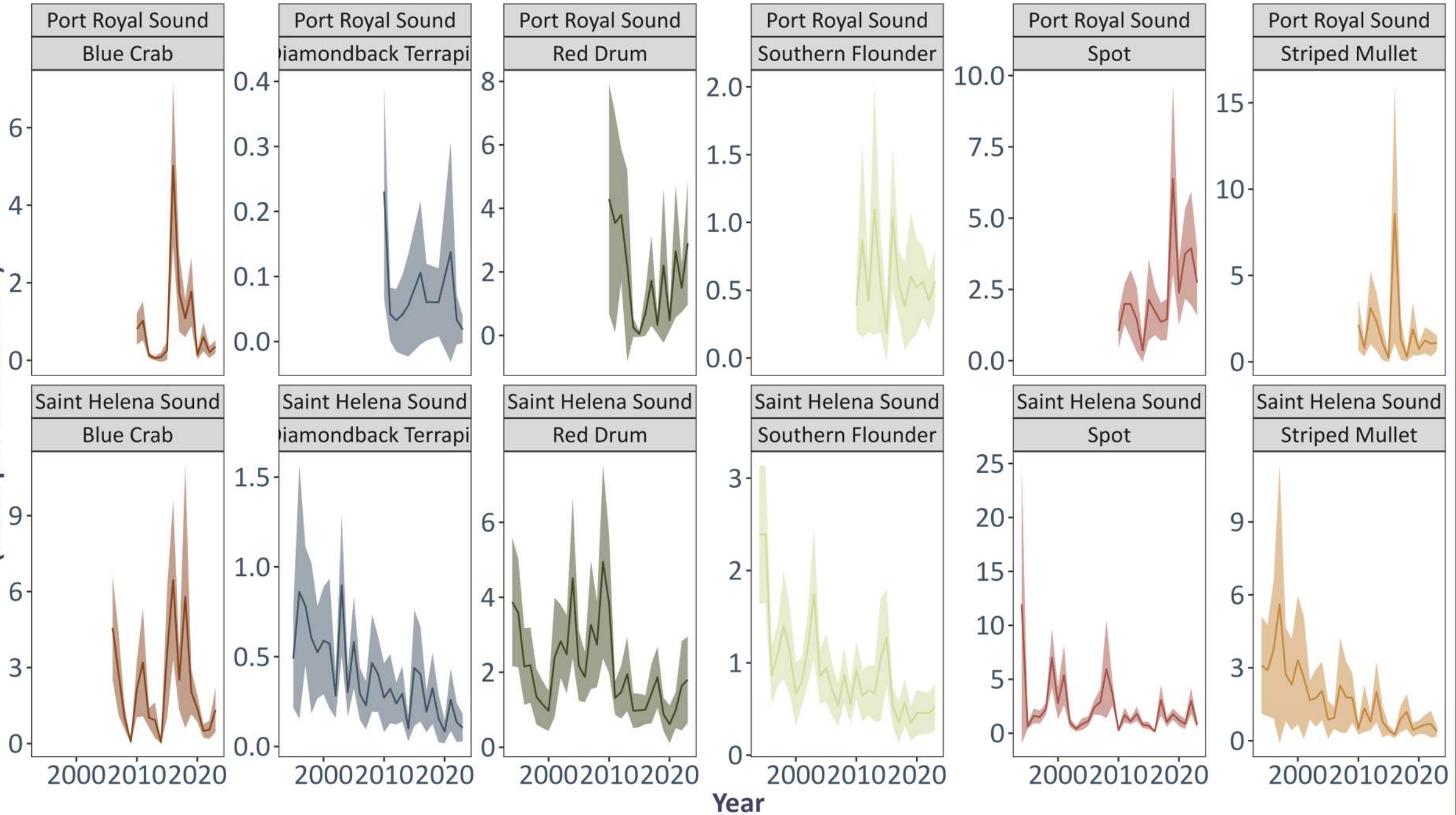


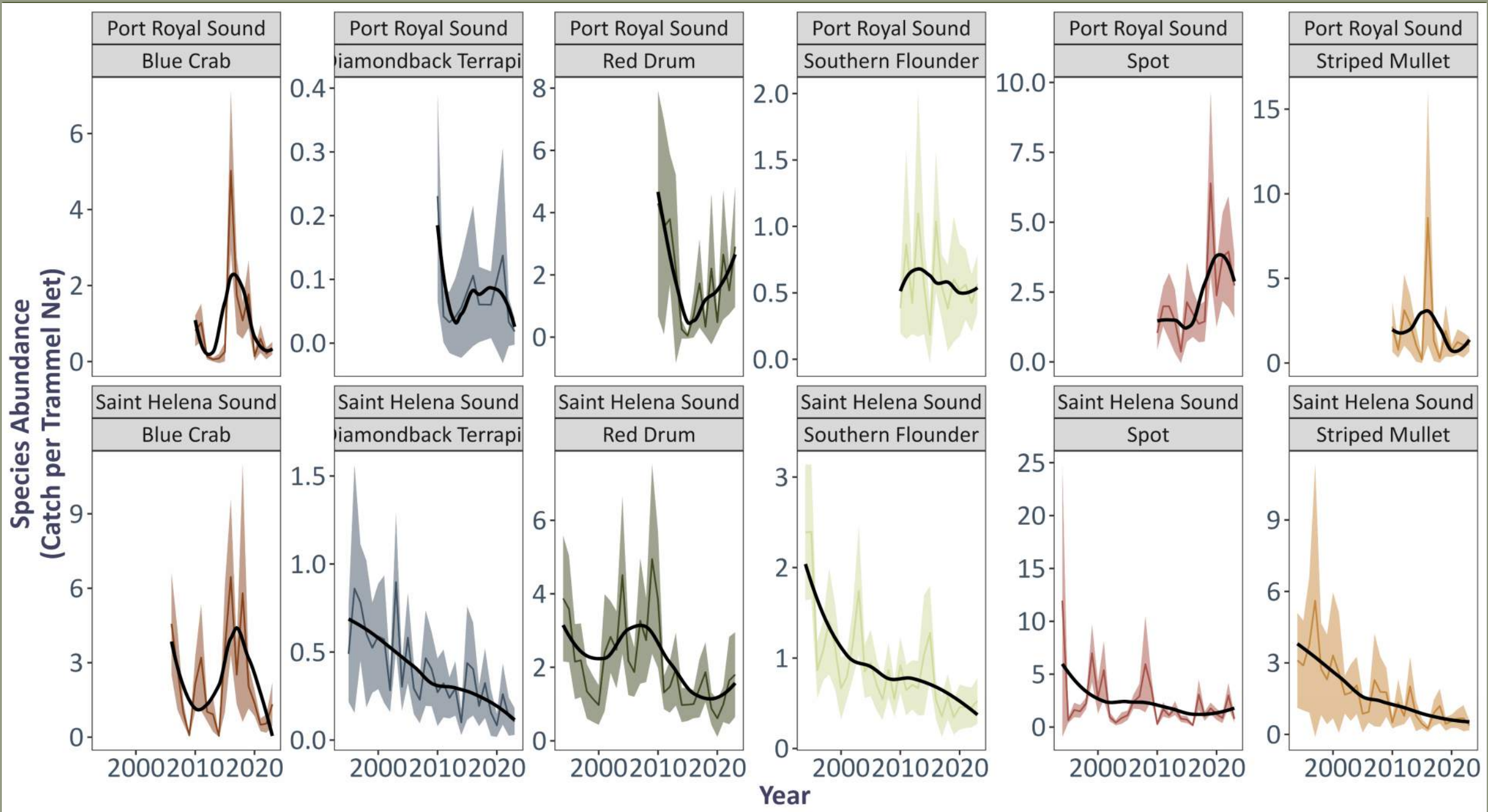
Month

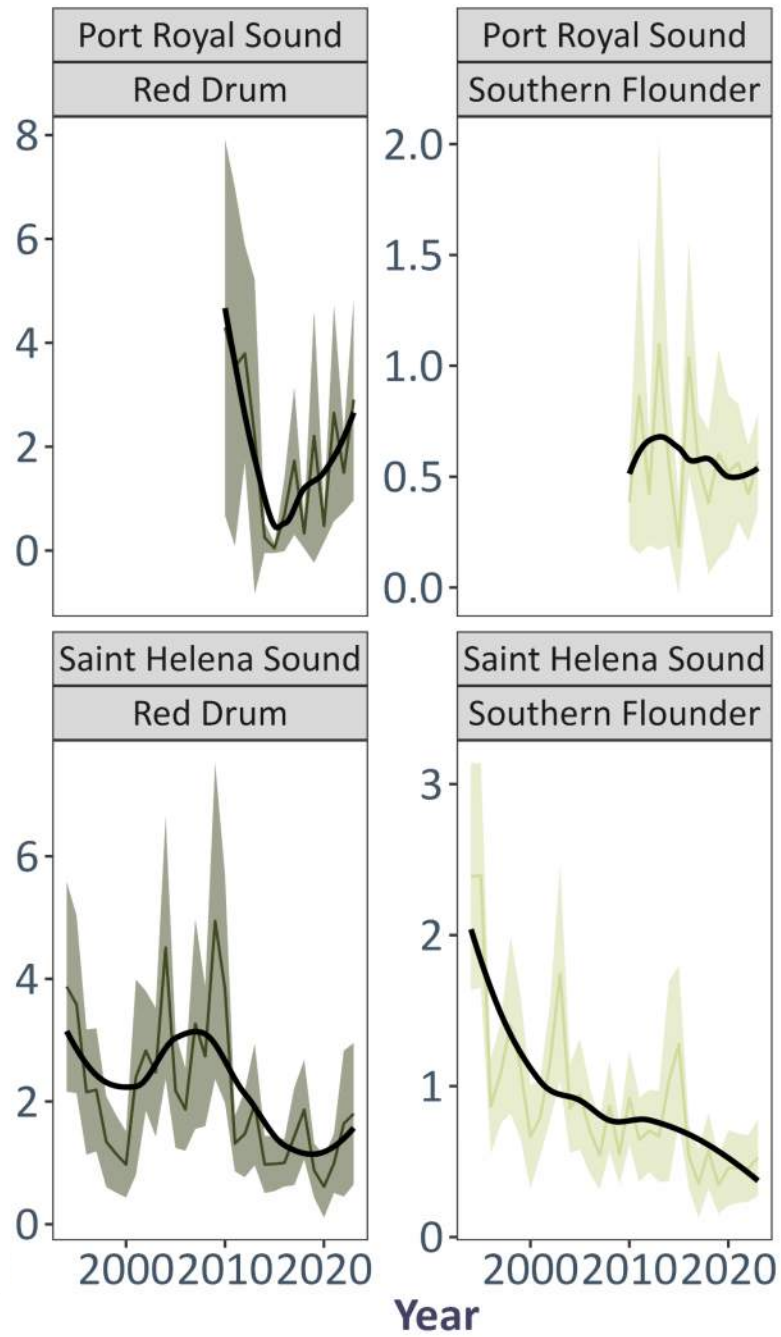
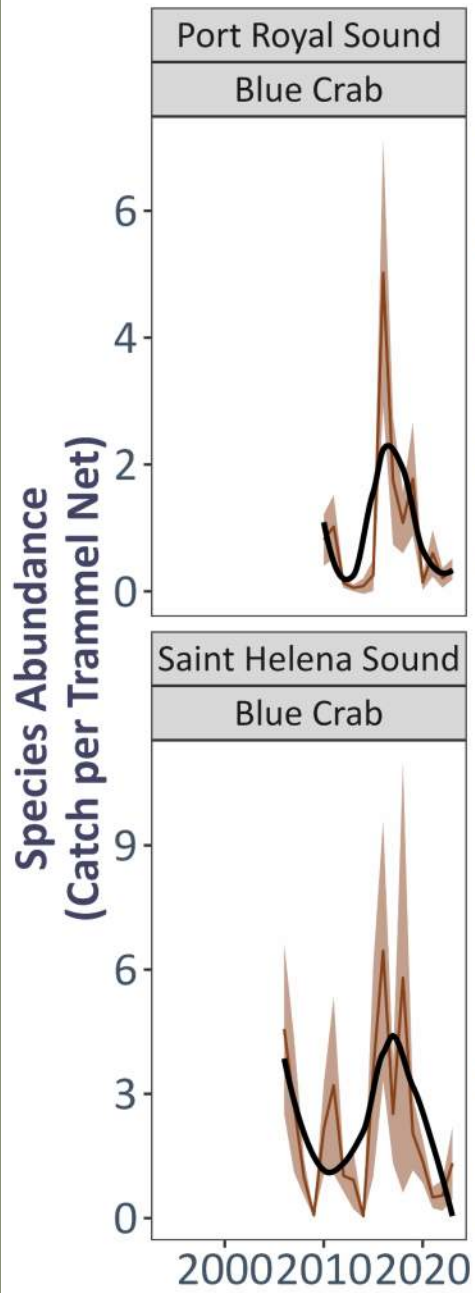




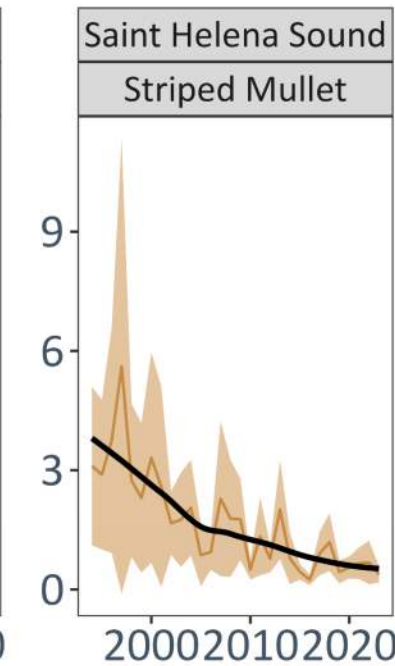
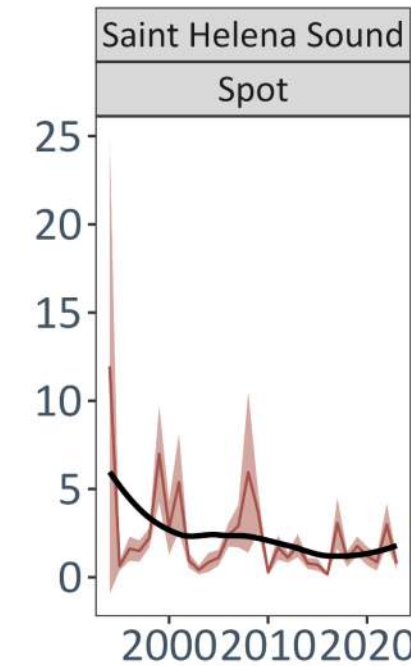
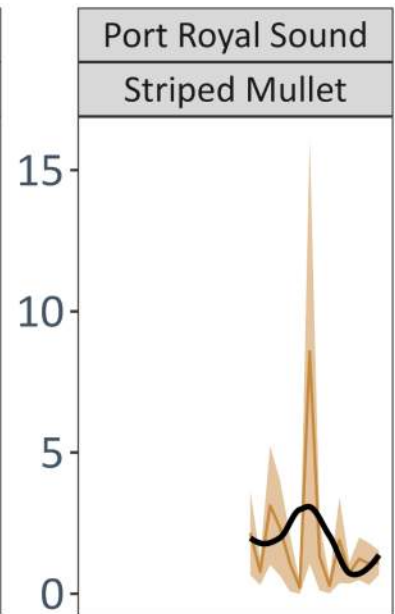
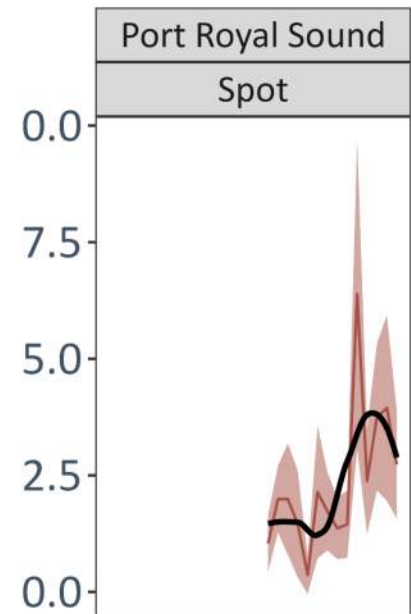
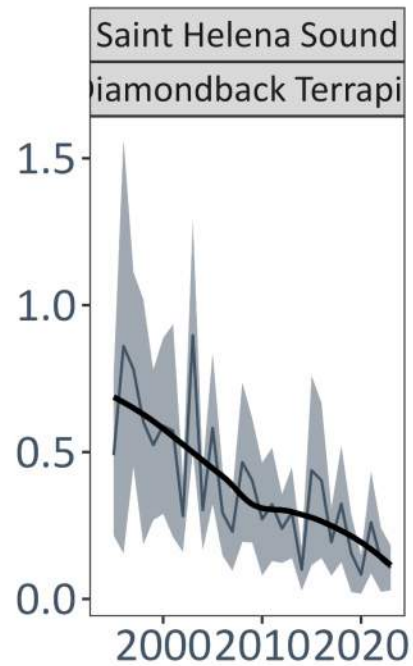
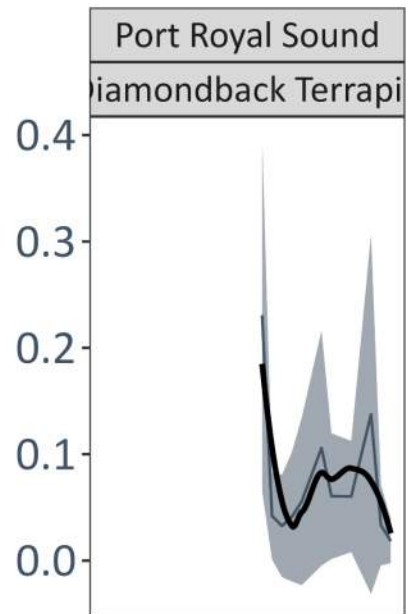
Species Abundance  
(Catch per Trammel Net)





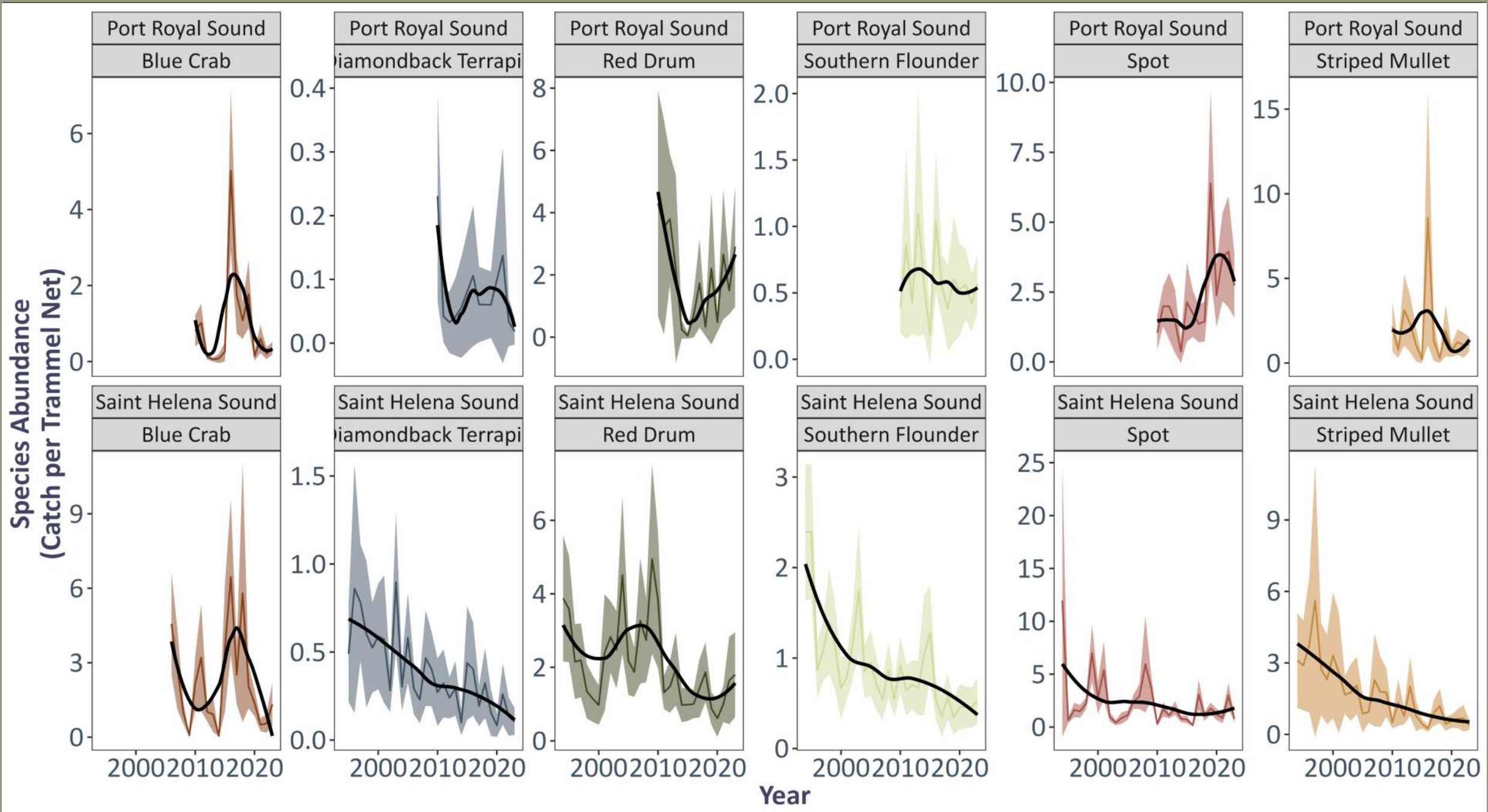


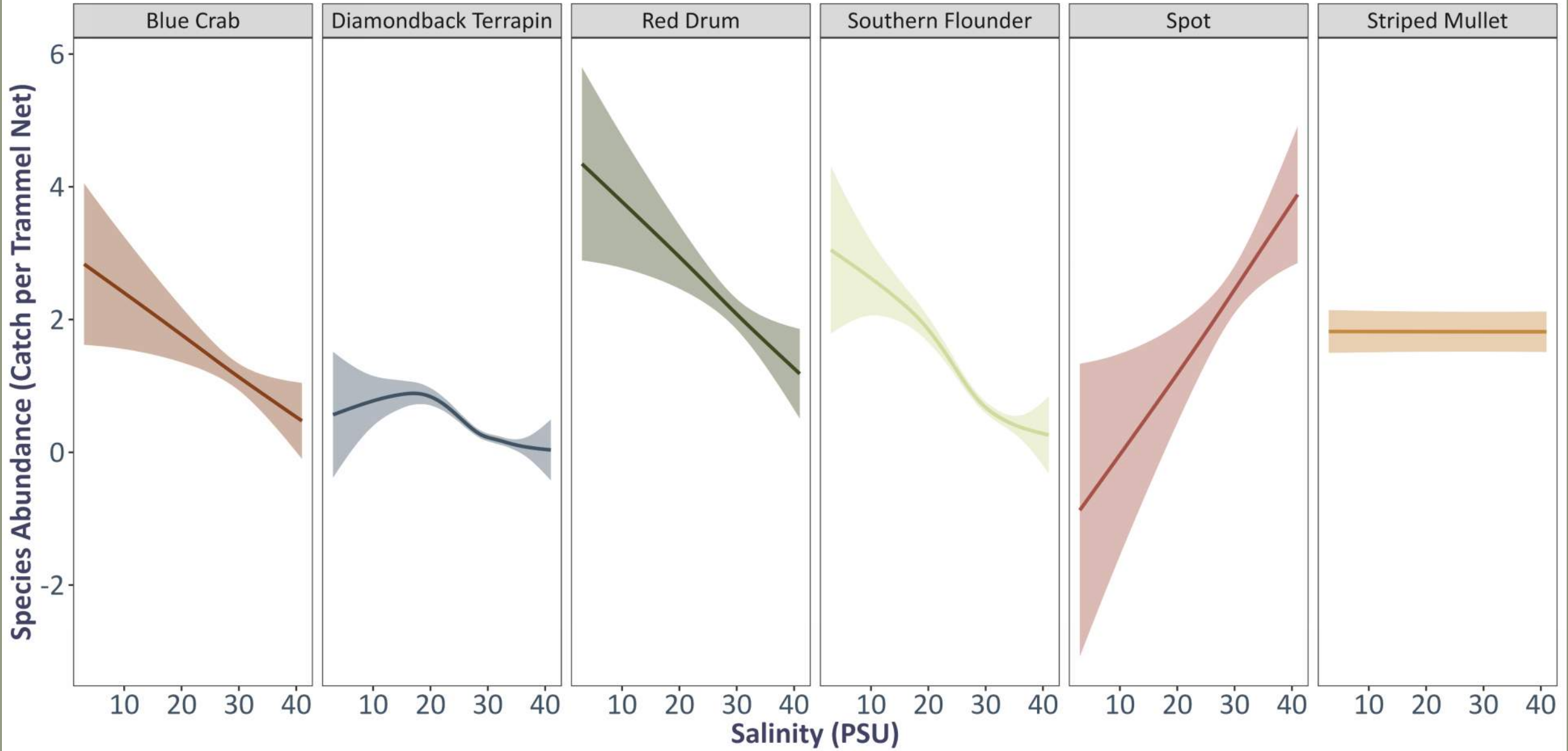
Species Abundance  
(Catch per Trammel Net)



Year







# Abundance of Data

Inshore Fisheries has an abundance of data useful for looking at relationship between estuarine communities and environmental variables

Just provided a snapshot of the type of questions that could be investigated here, using some examples from the trammel net and electrofishing surveys

Not fully investigated the relationship between survey abundance and environmental conditions to date

If there are specific questions, we are happy to investigate further



# Estuarine Finfish Research Section

Tropical System Affects on Hatchery Contribution, Wild Recruitment, and Distribution of Juvenile Red Drum



# Marine Stock Enhancement Research

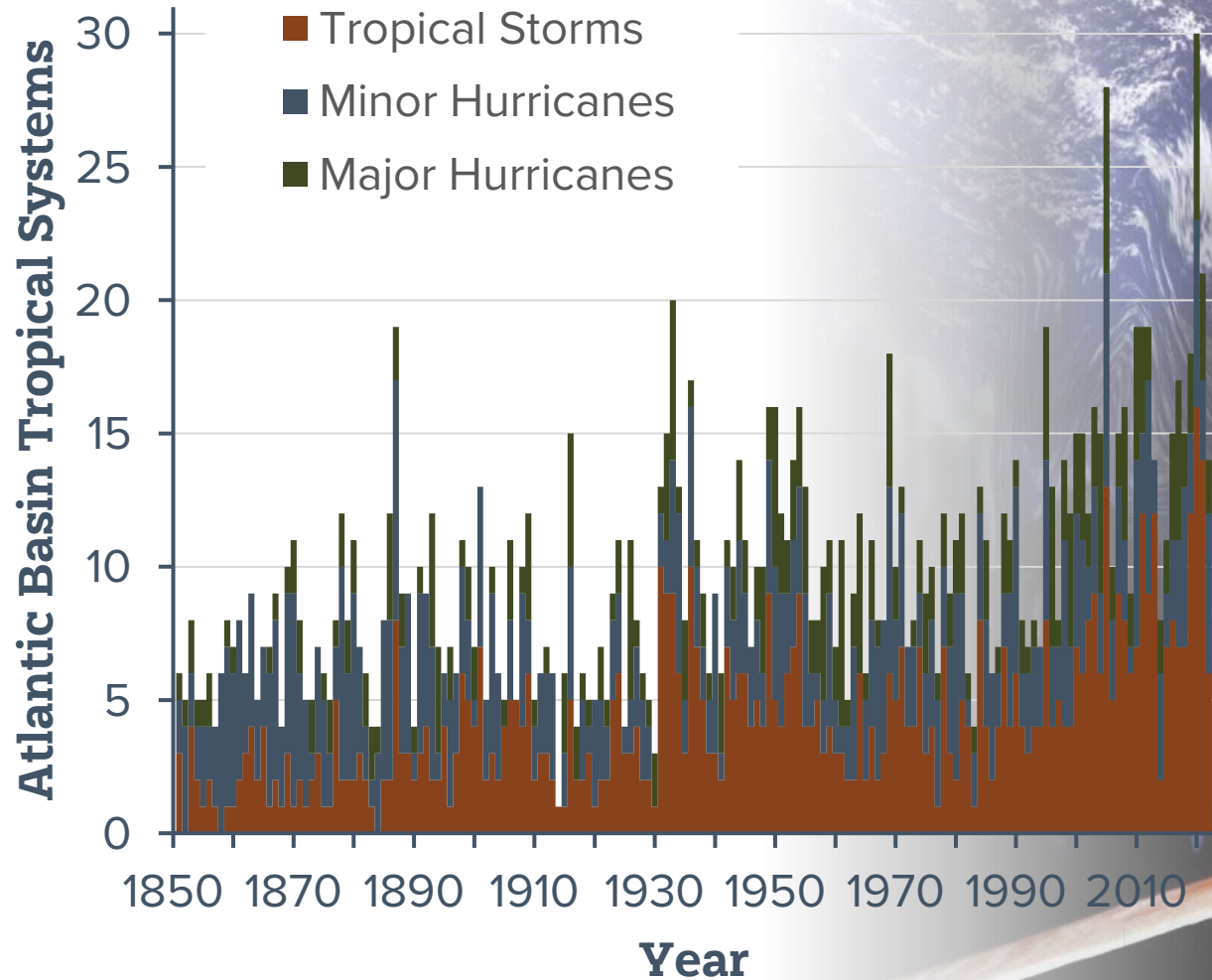
Began in SC in 1988 with Red  
Drum to investigate alternatives  
to harvest reductions

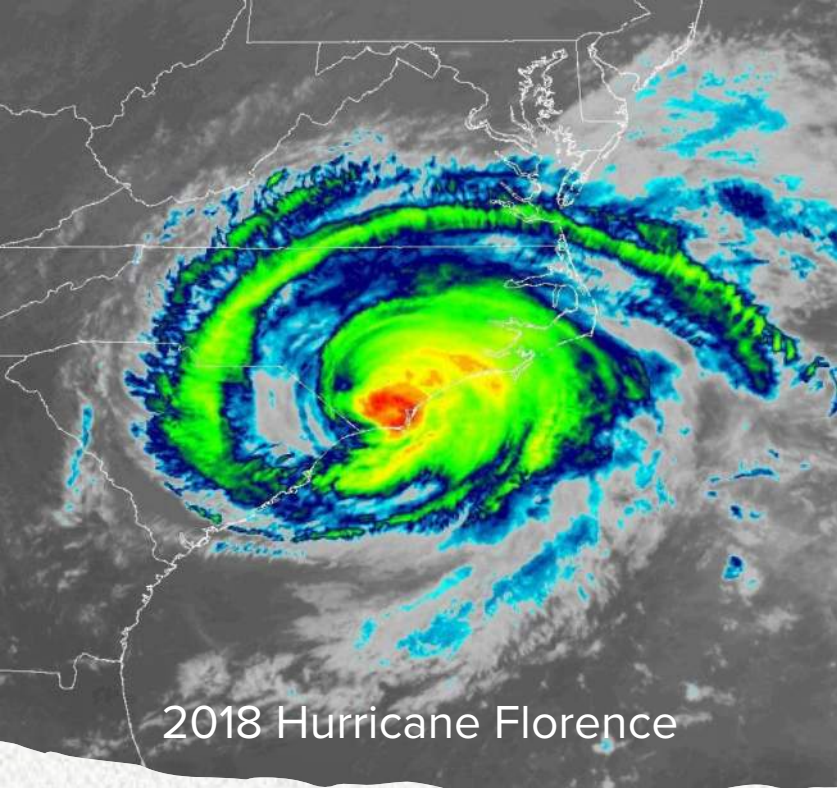
Opportunity to use cultured  
animals to answer questions  
about wild populations

Hatchery fish identified from wild  
fish using genetic markers

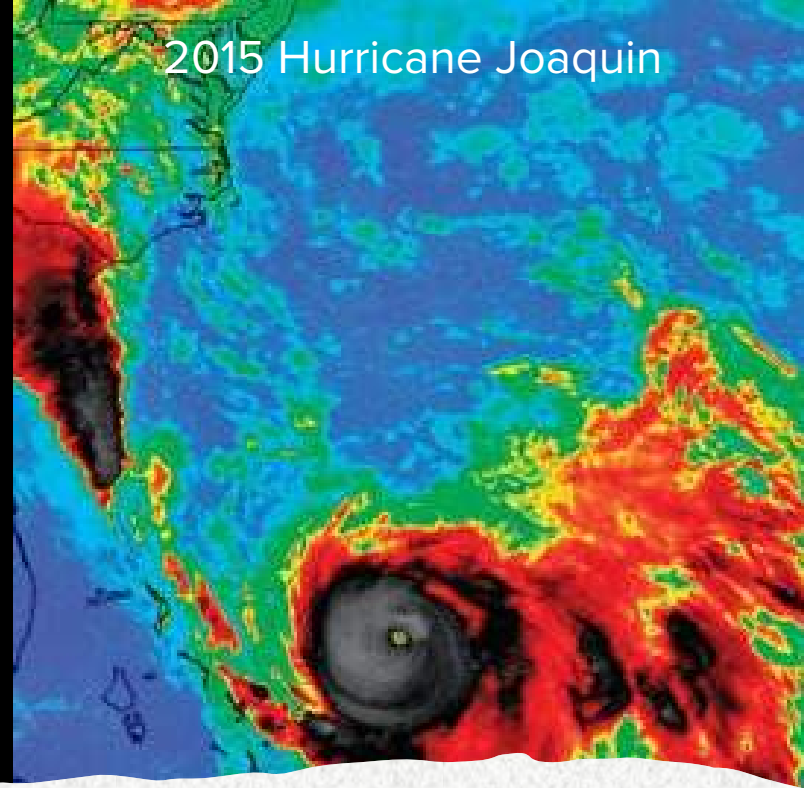


# Climate Change and Increased Tropical Activity in the Western Atlantic

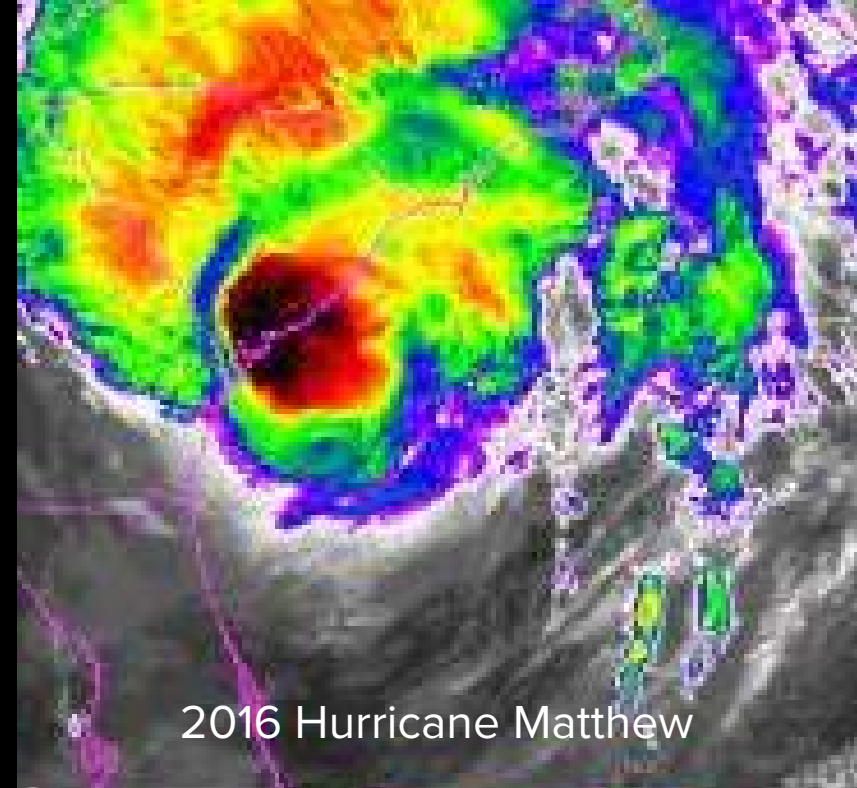




2018 Hurricane Florence

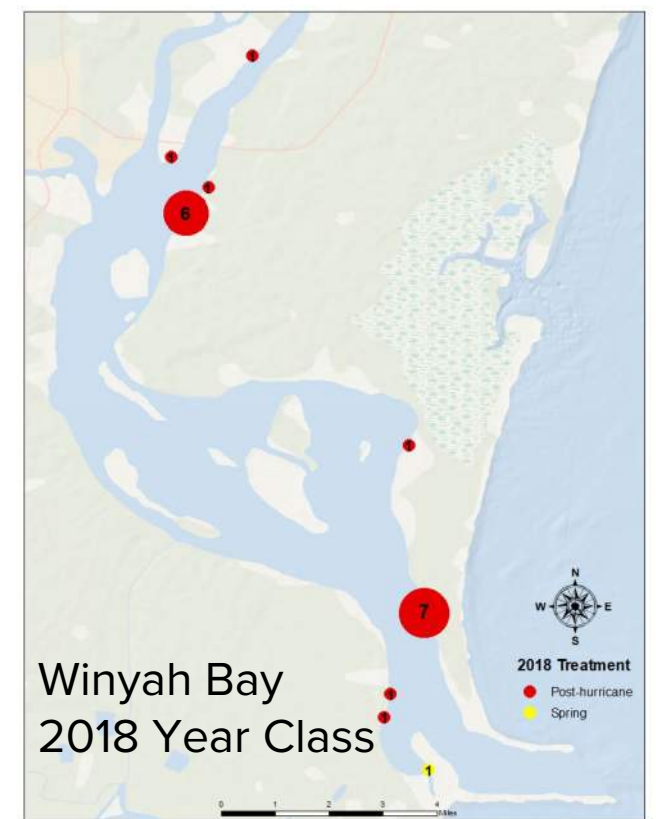
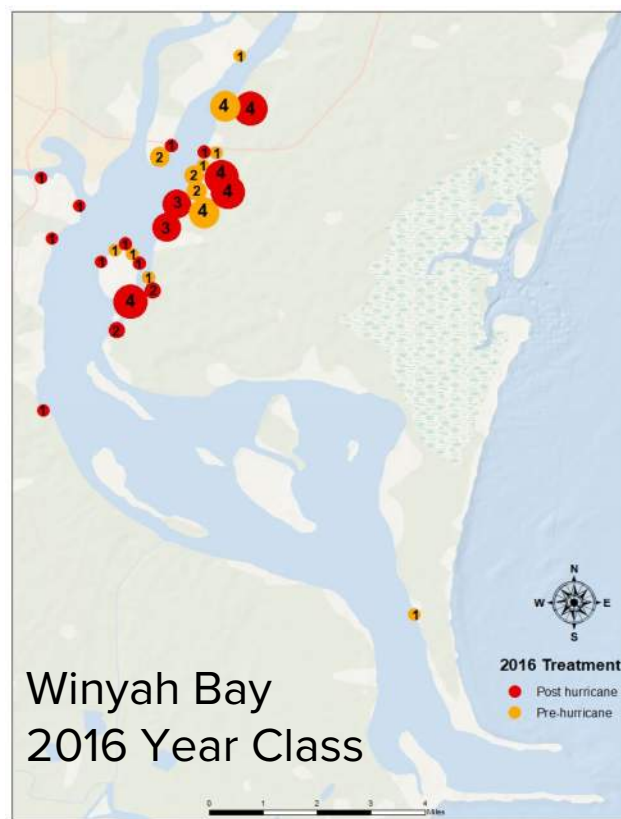
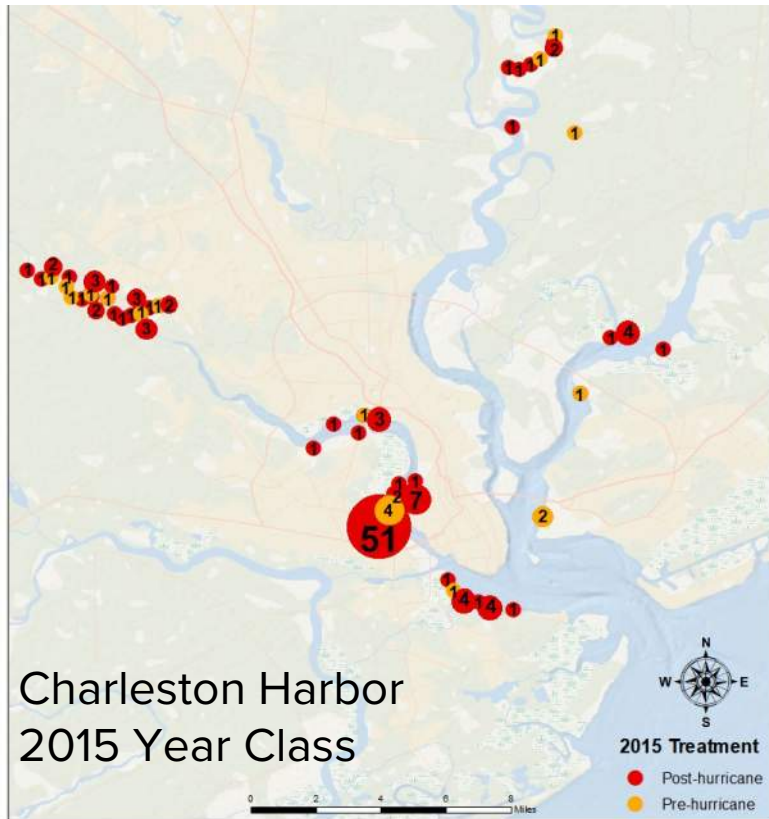


2015 Hurricane Joaquin



2016 Hurricane Matthew

Tropical Systems  
Evaluated



## Storms Impact Recruitment Success

- Post-hurricane stocking performed better than pre-hurricane stocking
- Poor survival of natural recruits?
- Increased tropical activity, especially during the peak reproductive time for Red Drum could be a major player in larval recruitment
- Salinity change, anoxic conditions, reduction in food availability, physically being washed out of system



# Crustacean & Mollusk Research Section

Estuarine Trawl Survey

(Another Monitoring Program, jointly administered by MRD CMRS and Inshore Fisheries)



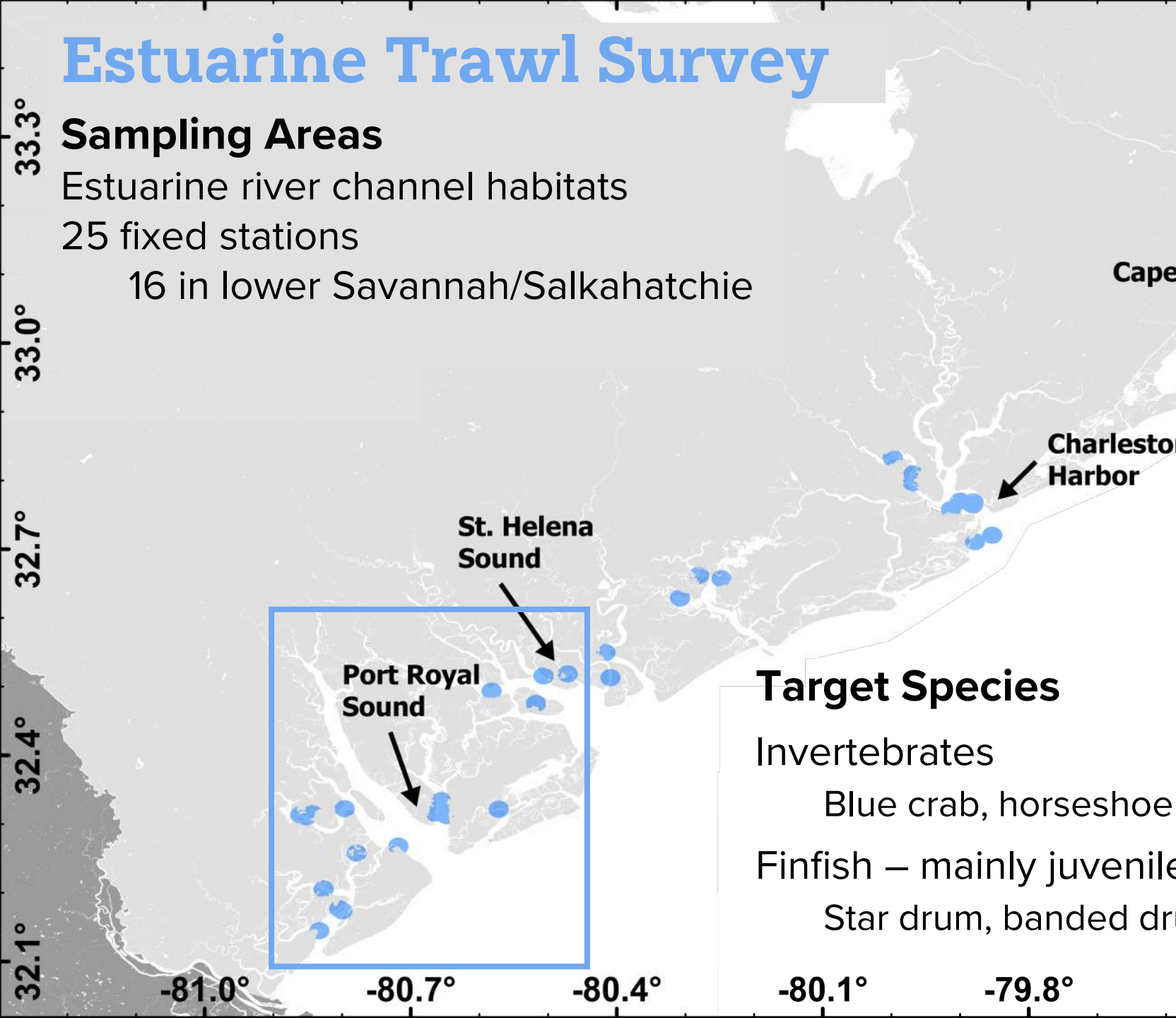
# Estuarine Trawl Survey

## Sampling Areas

Estuarine river channel habitats

25 fixed stations

16 in lower Savannah/Salkahatchie



Charleston Harbor – monthly  
South Trip – 4 times annually  
Mar, Apr, Aug, Dec

## Target Species

Invertebrates

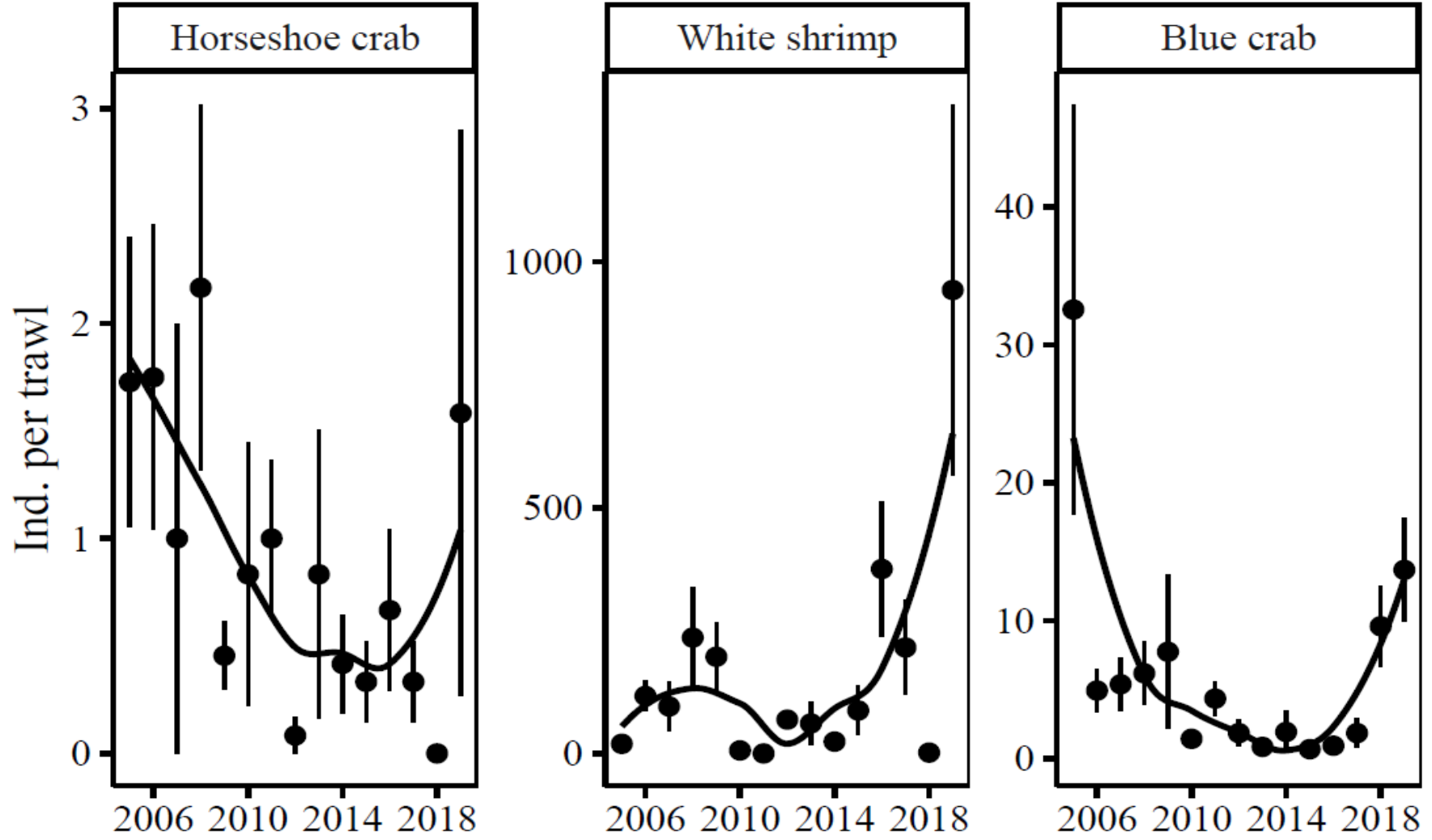
Blue crab, horseshoe crab, white shrimp, brown shrimp

Finfish – mainly juveniles

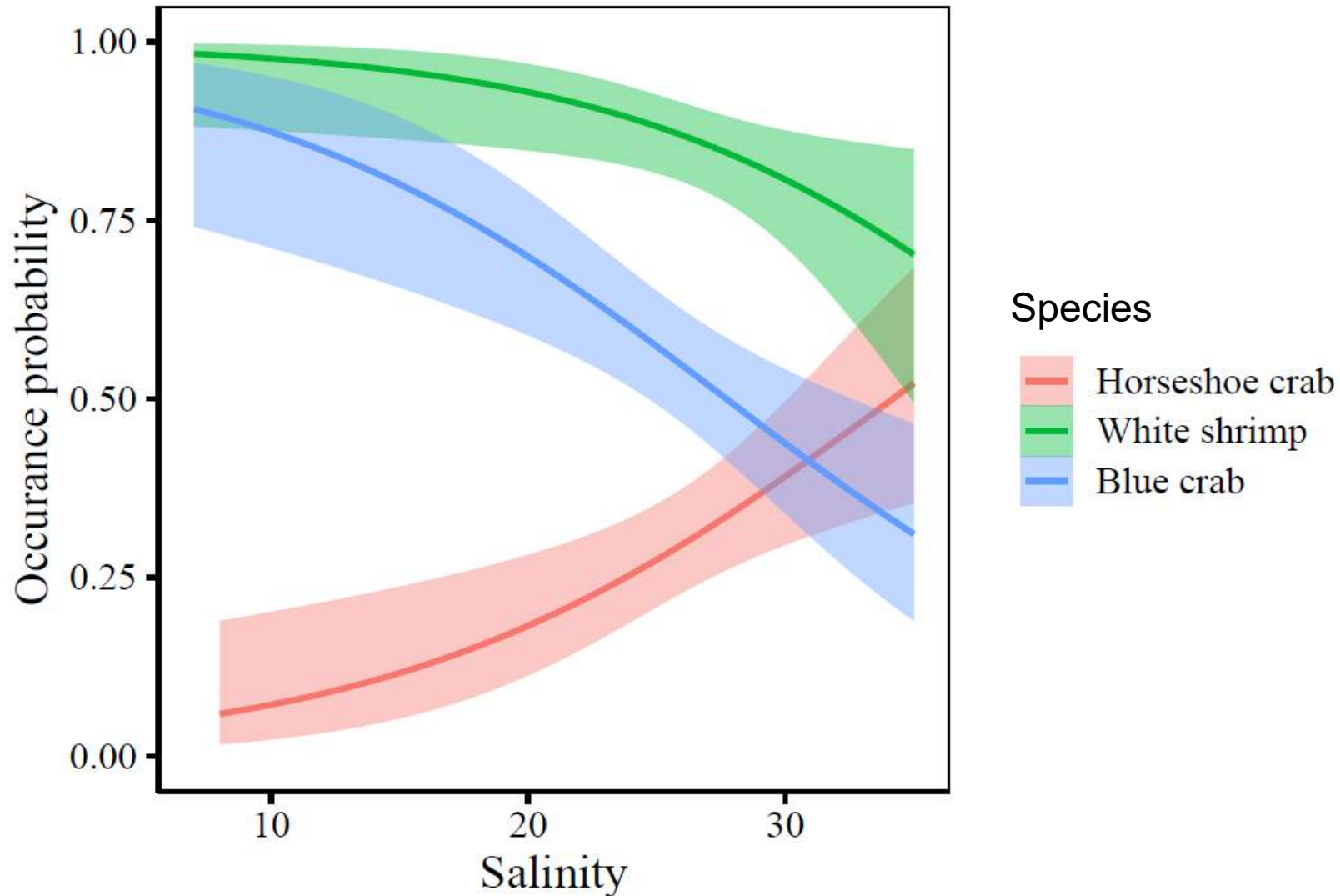
Star drum, banded drum, silver perch, etc.



# Long-term Variability in Species Abundances



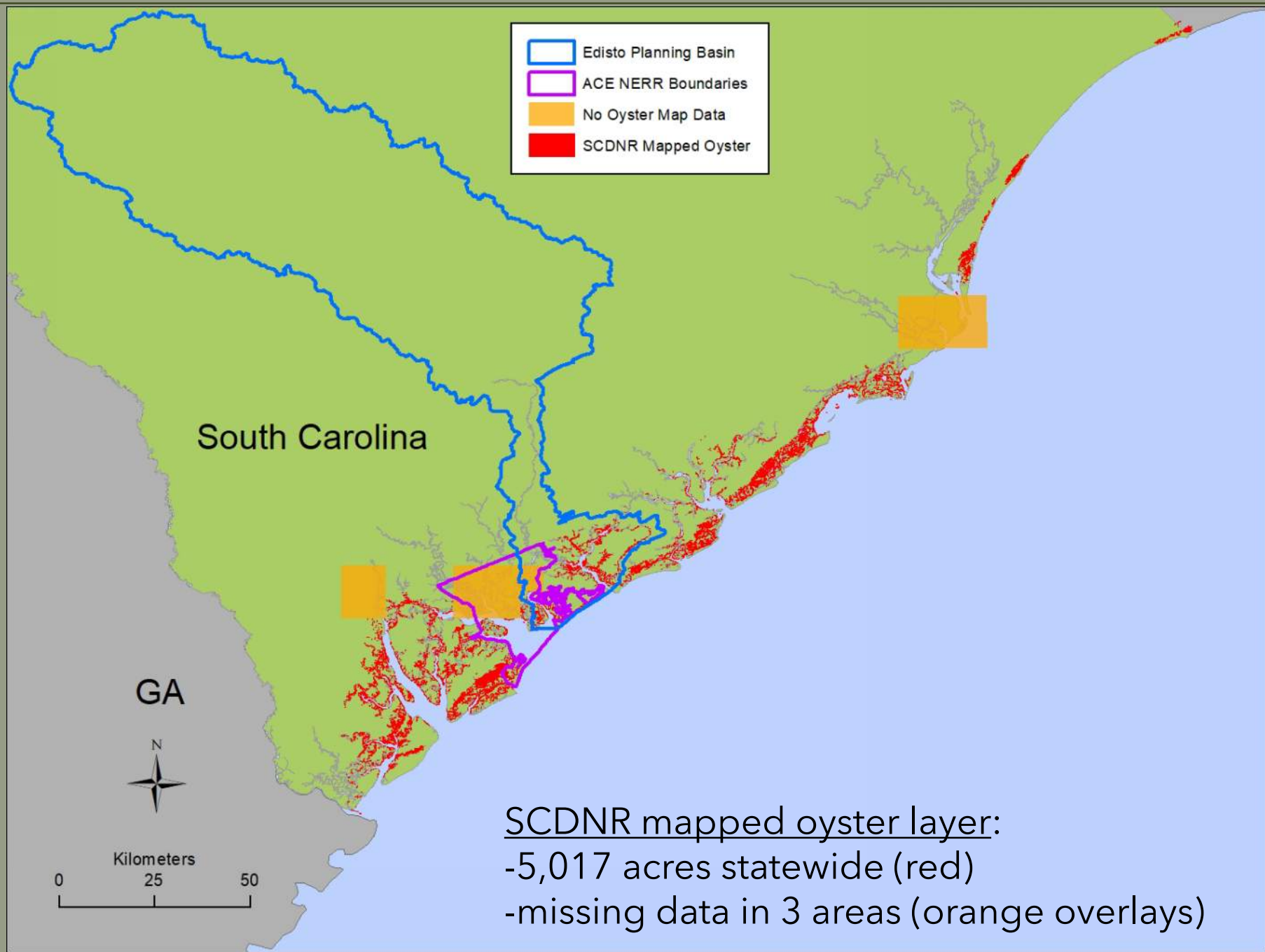
# Species Specific Responses to Salinity



# Crustacean & Mollusk Research Section

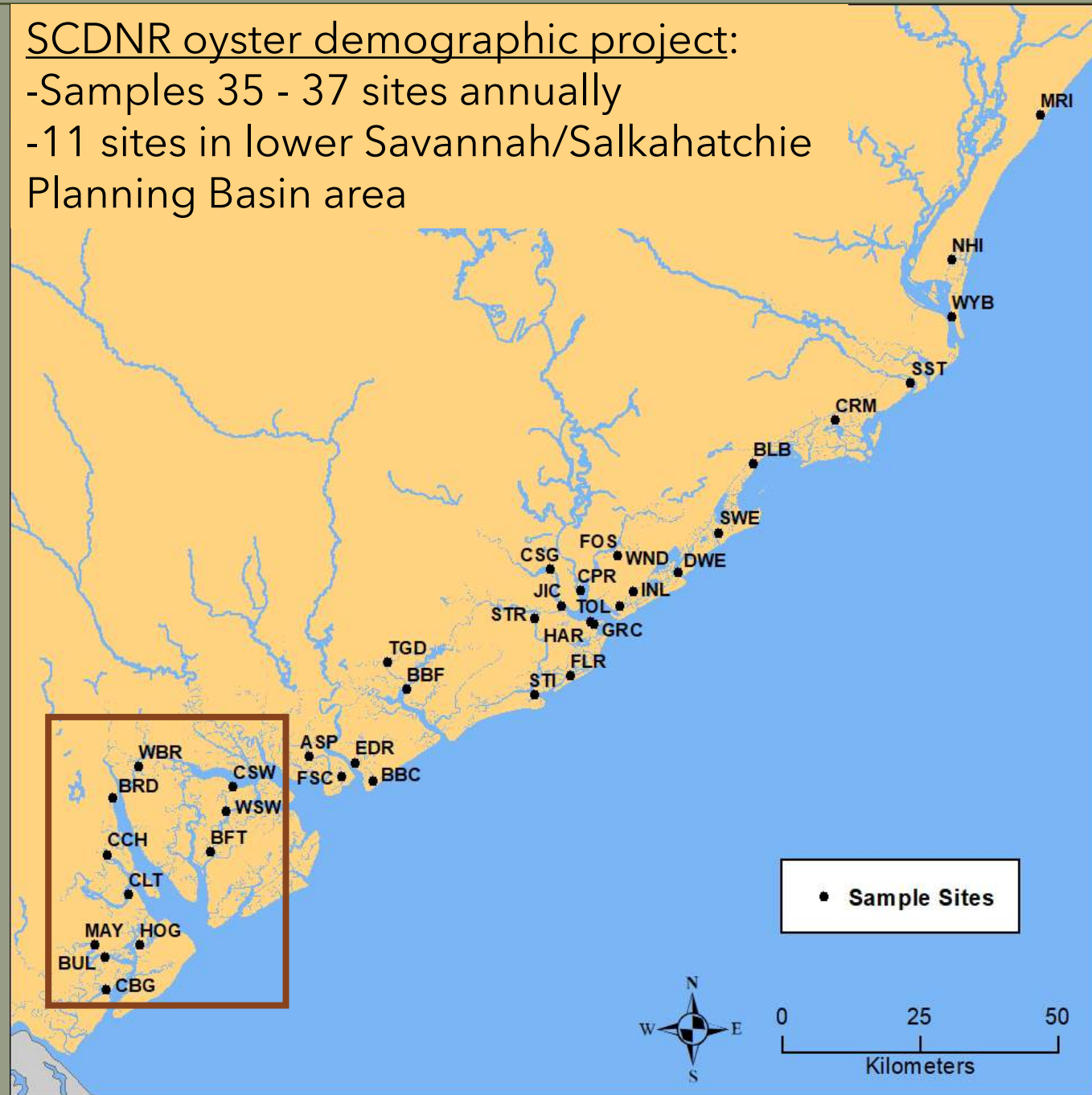
Oyster Demographic Project





SCDNR oyster demographic project:

- Samples 35 - 37 sites annually
- 11 sites in lower Savannah/Salkahatchie Planning Basin area



# Survey Methods

Collect representative oysters

Measure salinity, temperature, and dissolved oxygen

Assess oysters as living or “boxes”

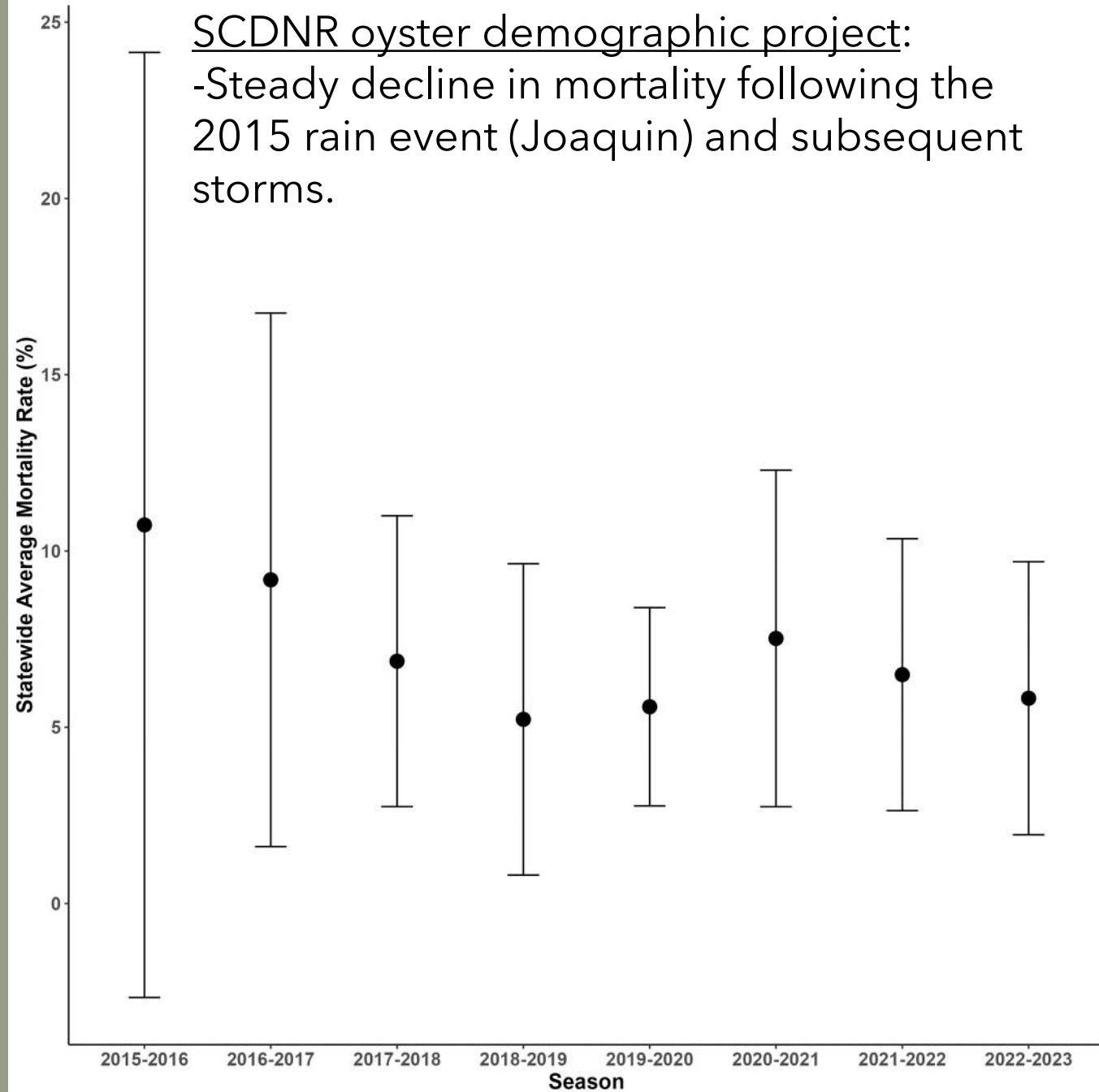
Measure all live oysters and boxes





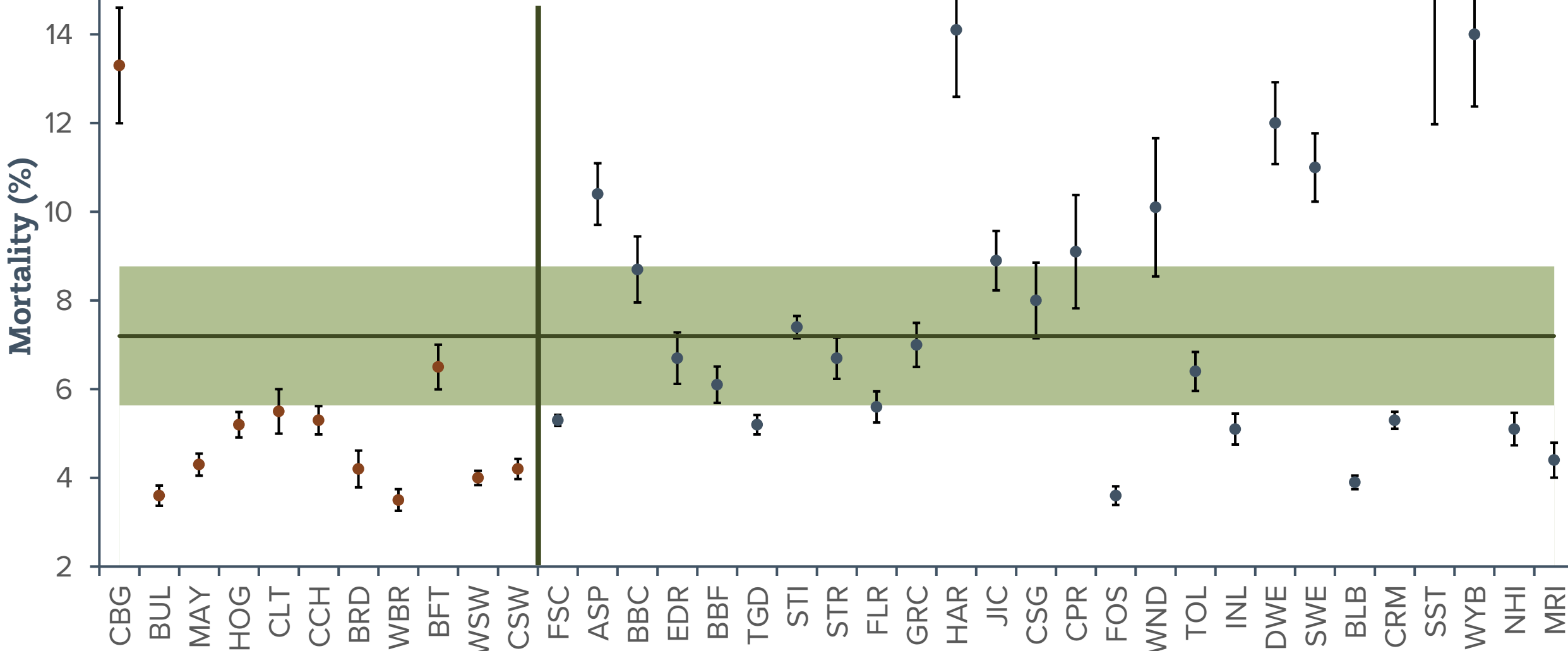
## SCDNR oyster demographic project:

-Steady decline in mortality following the 2015 rain event (Joaquin) and subsequent storms.



# Mortality Rates

Statewide Avg: 7.2% (95% CI: 5.6-8.7%)

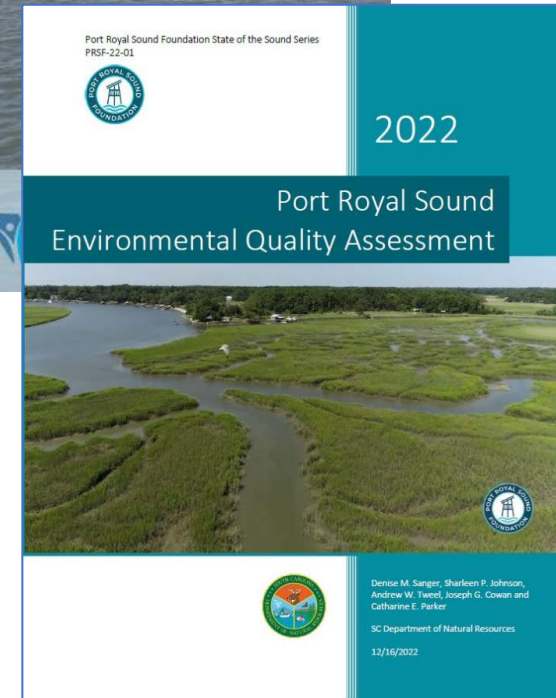
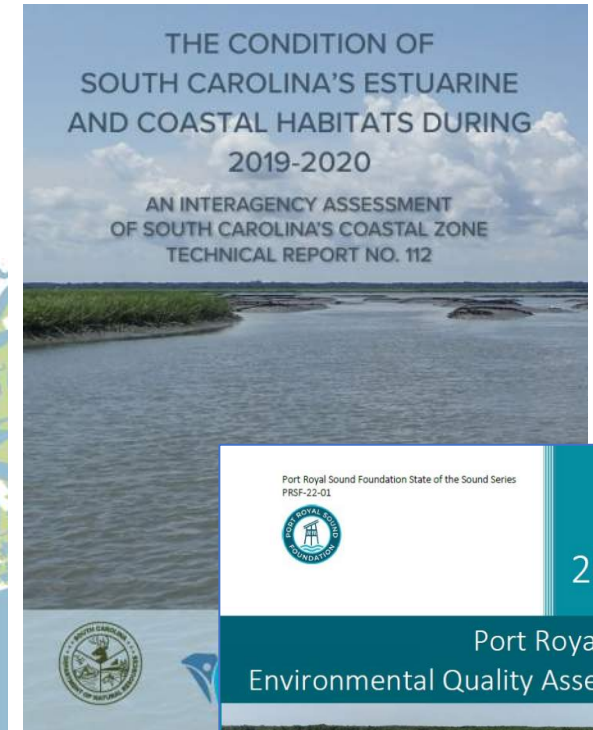
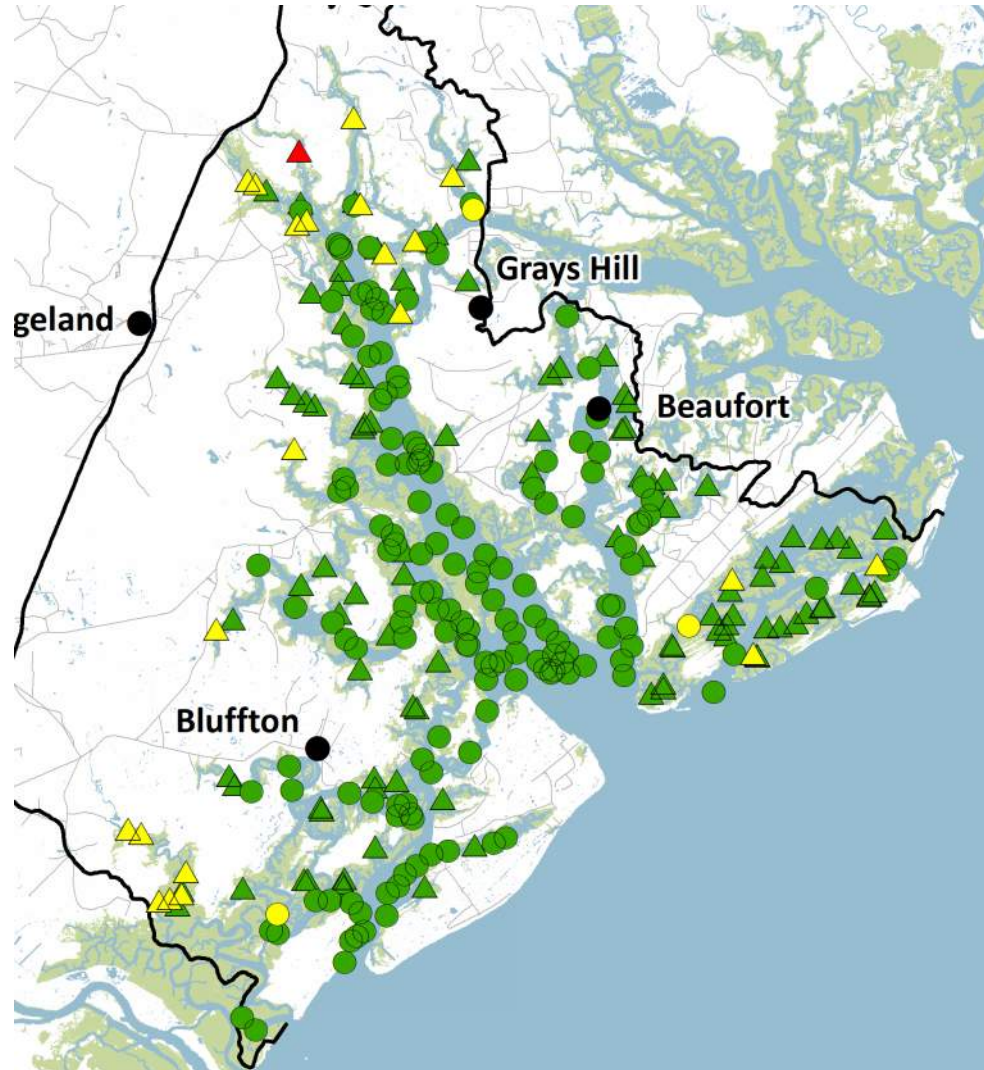


# Environmental Research Section

South Carolina Estuarine and Coastal Assessment Program (SCECAP)



# Environmental Quality Assessments

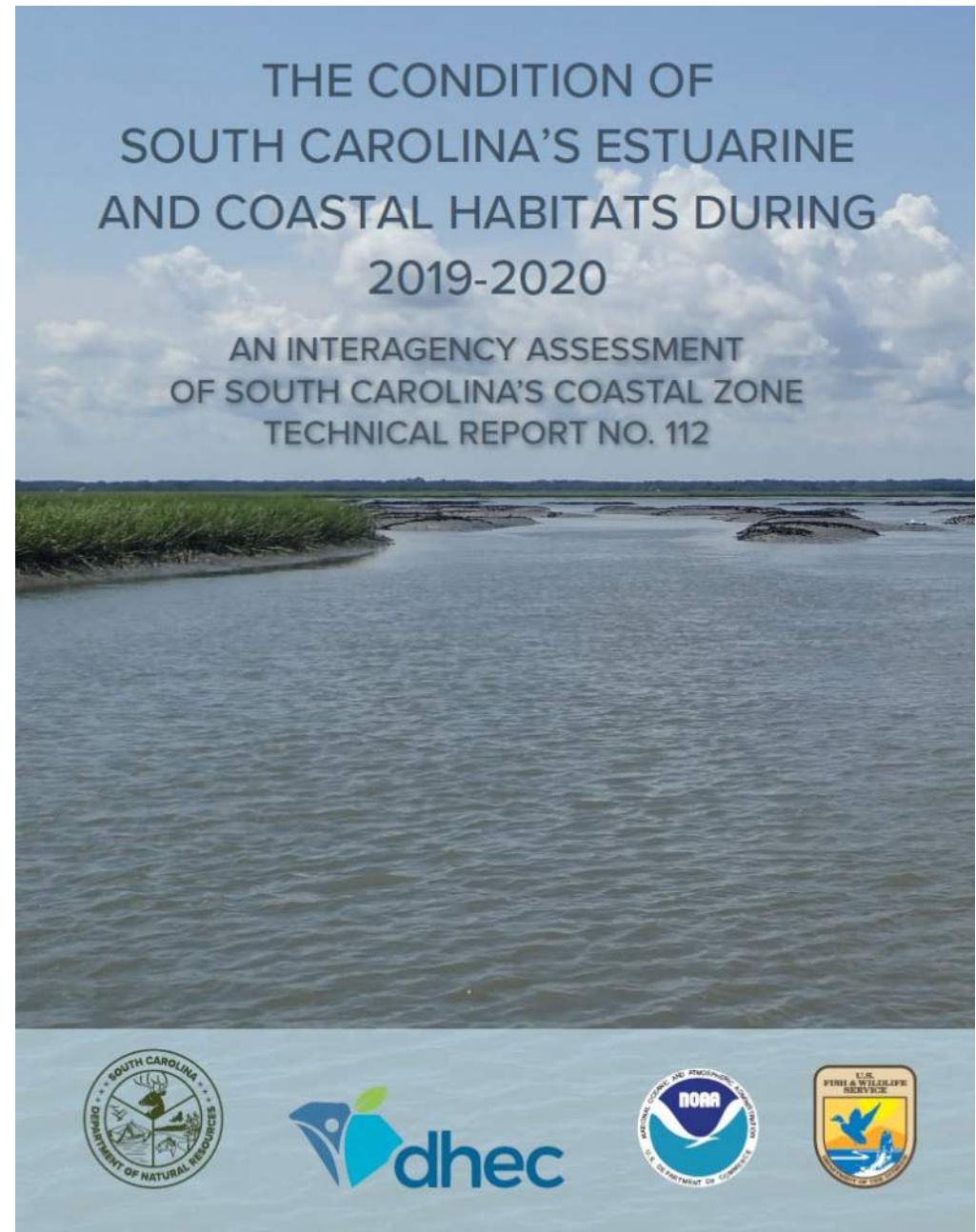


# SCECAP Report

New report available, summarizing findings from 1999-2020 coastwide

Assess stations based on a...

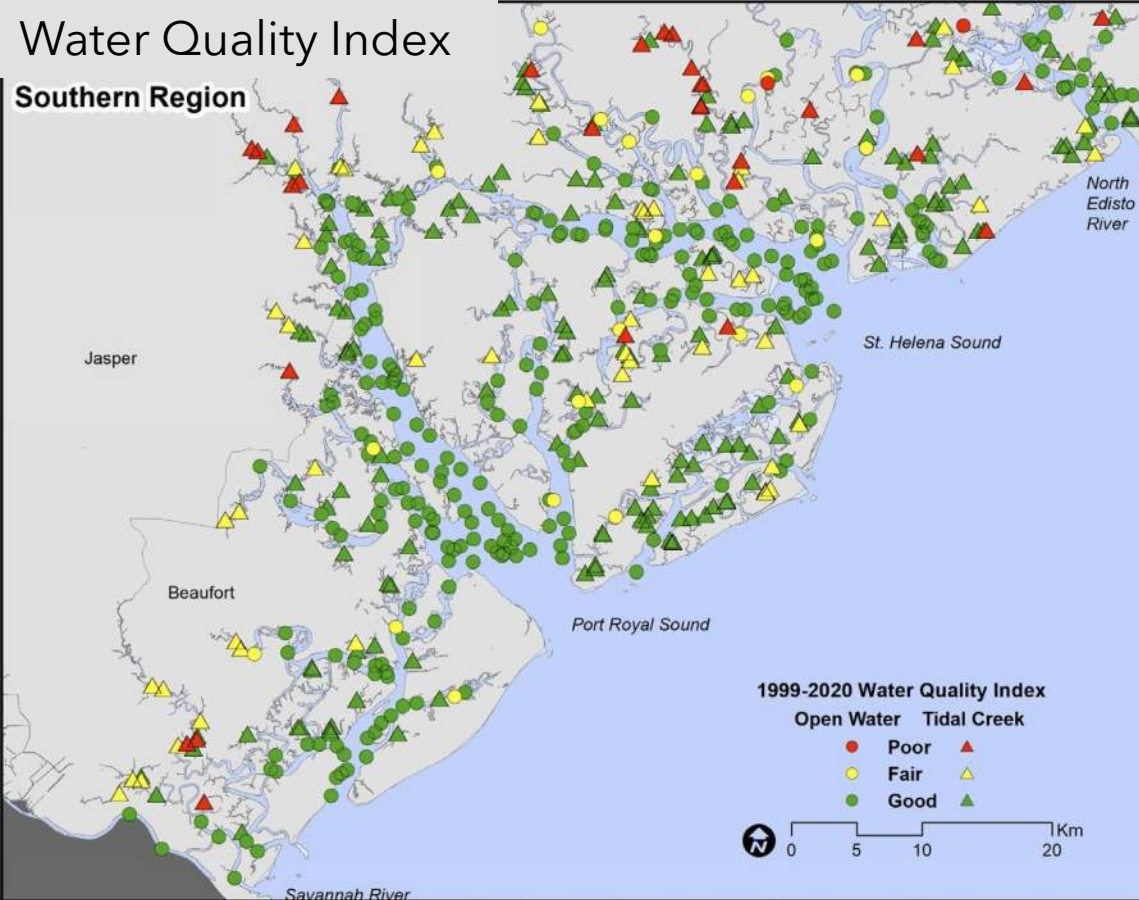
- 1) Water Quality Index
- 2) Sediment Quality Index
- 3) Biological Condition Index



<https://www.dnr.sc.gov/marine/scecap/reports.html>

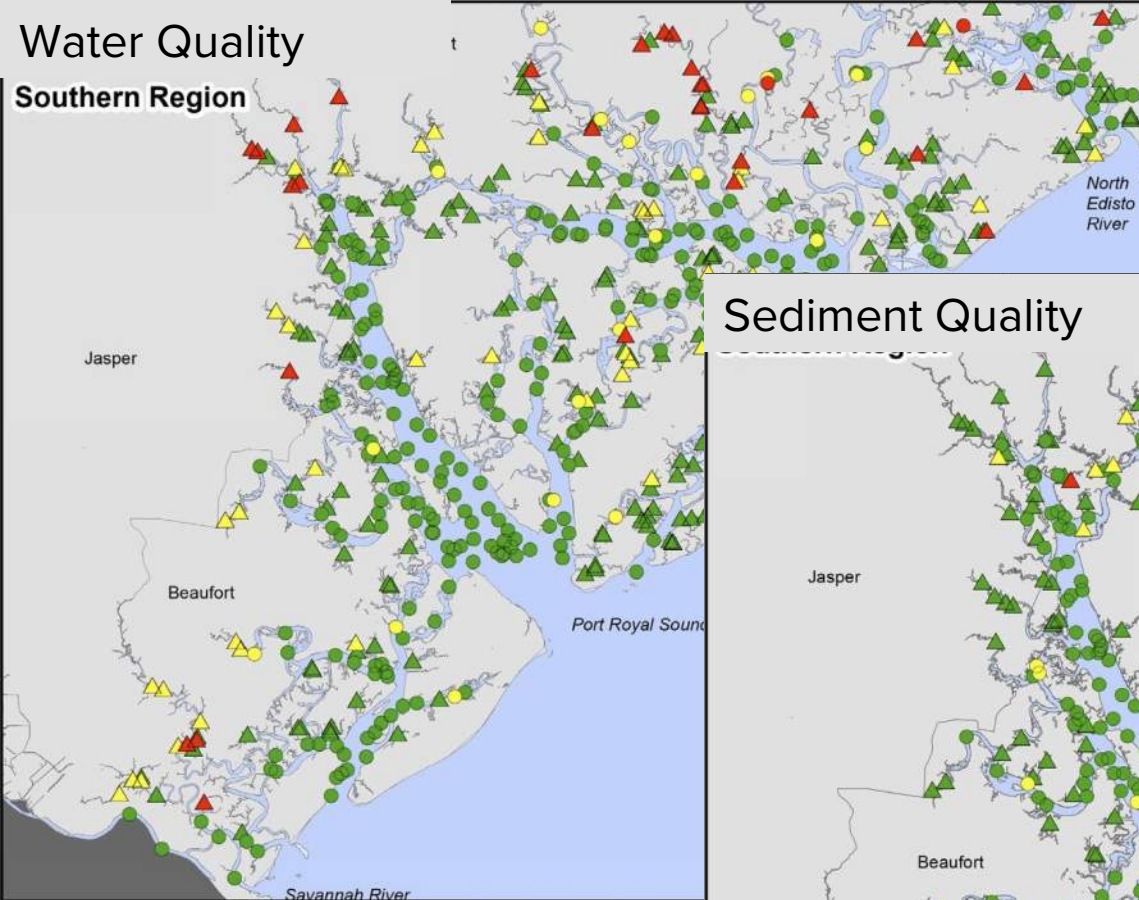
# Water Quality Index

## Southern Region

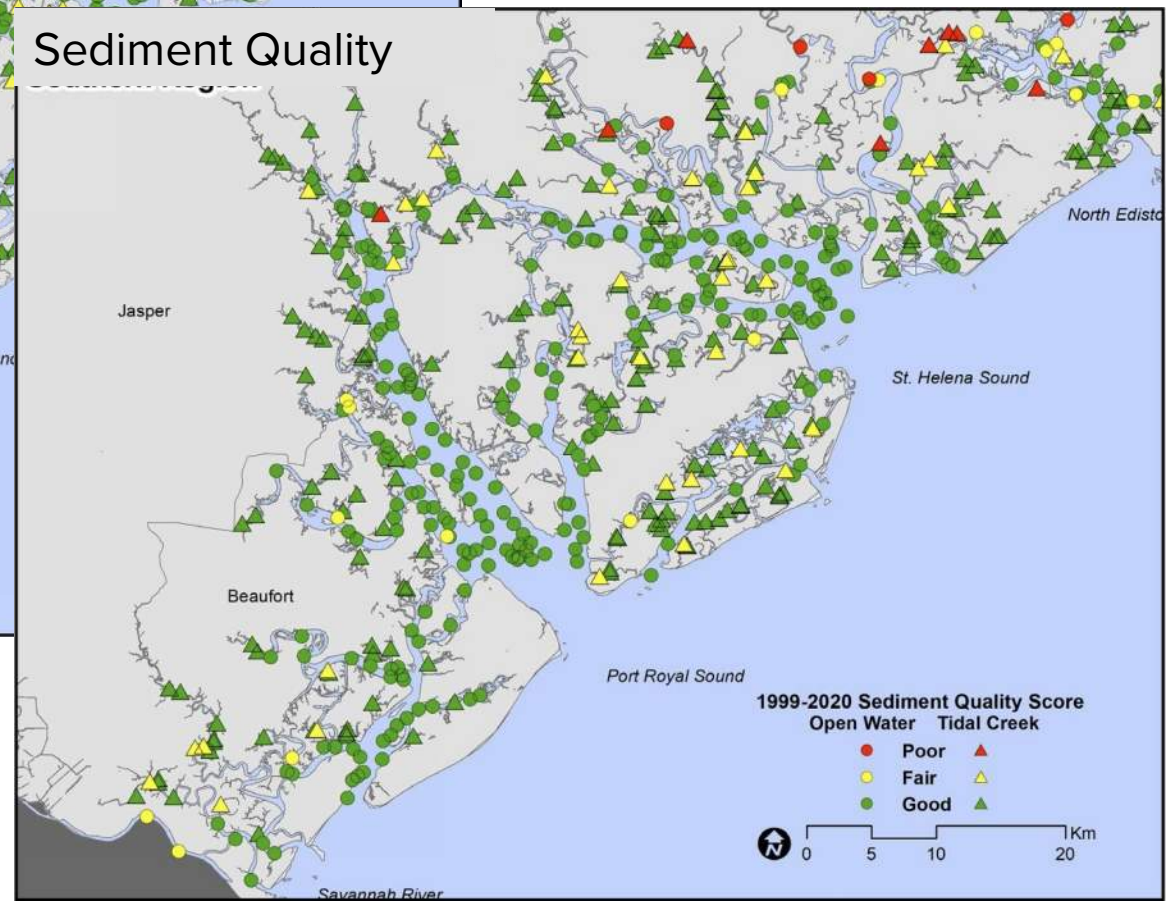


# Water Quality

## Southern Region

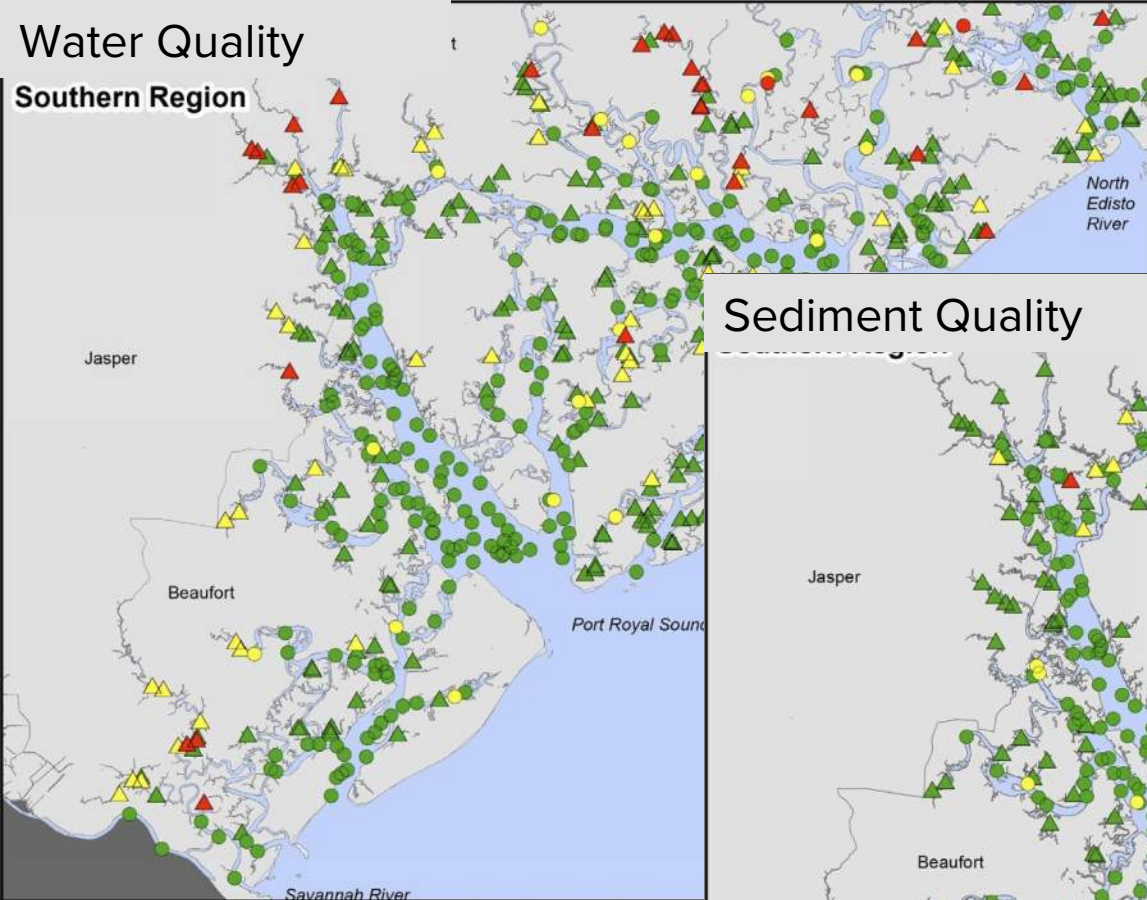


# Sediment Quality

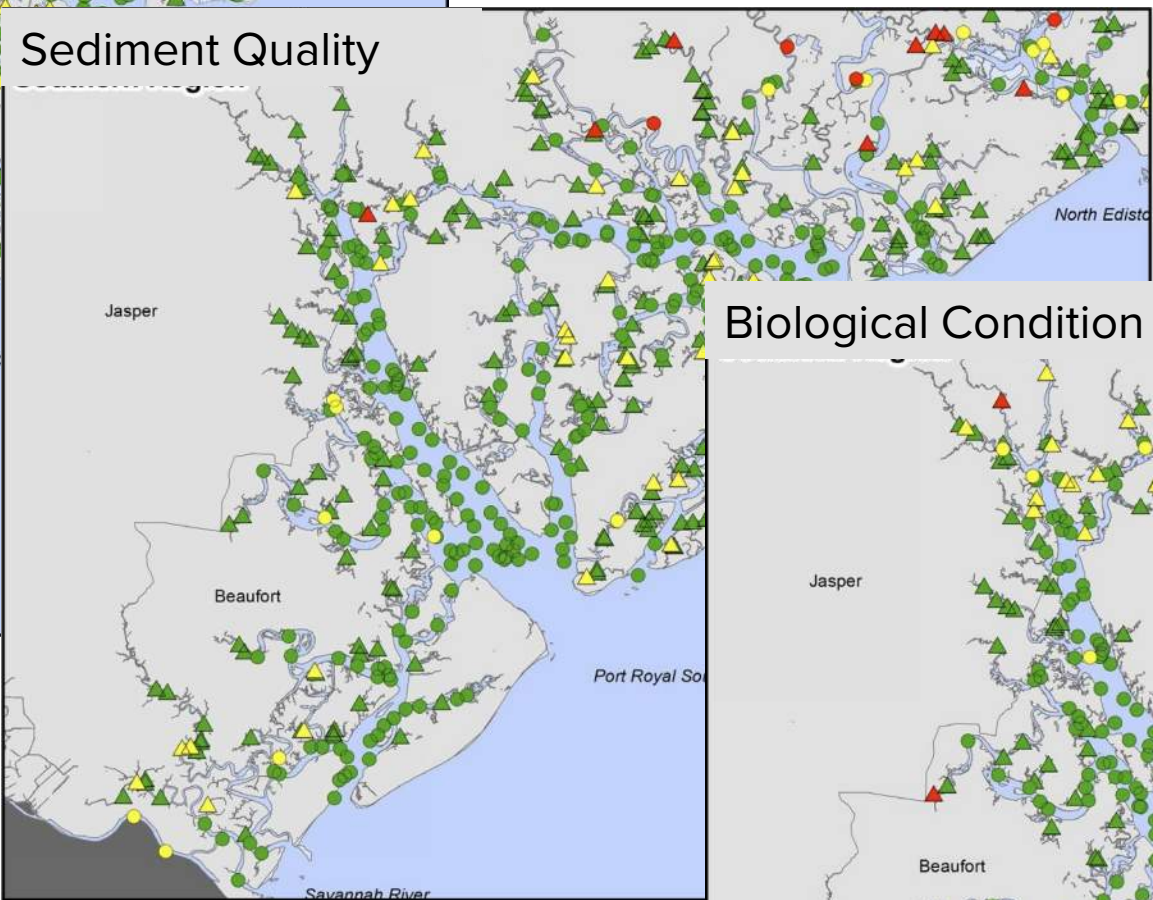


# Water Quality

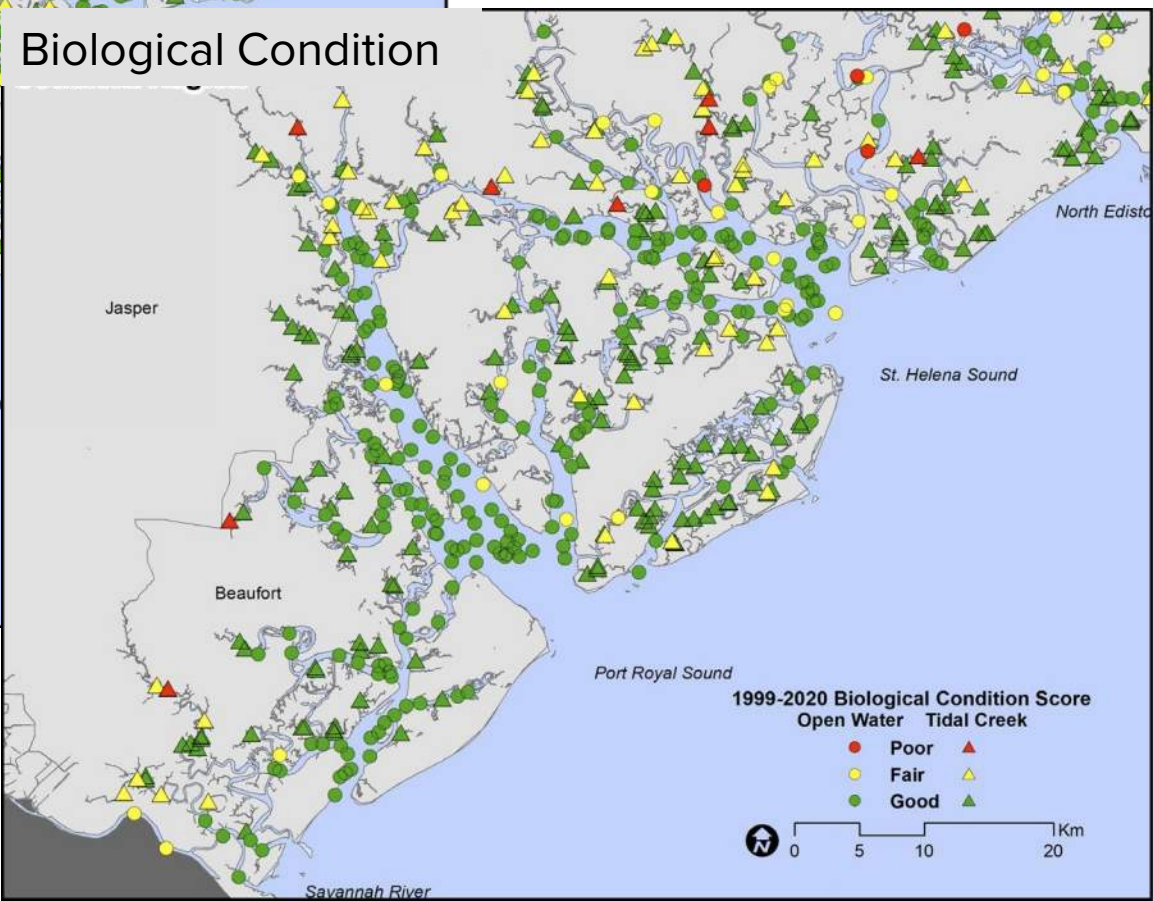
## Southern Region



# Sediment Quality



# Biological Condition



**1999-2020 Biological Condition Score**  
Open Water Tidal Creek

● Poor	▲ Poor
● Fair	▲ Fair
● Good	▲ Good

0 5 10 20 Km



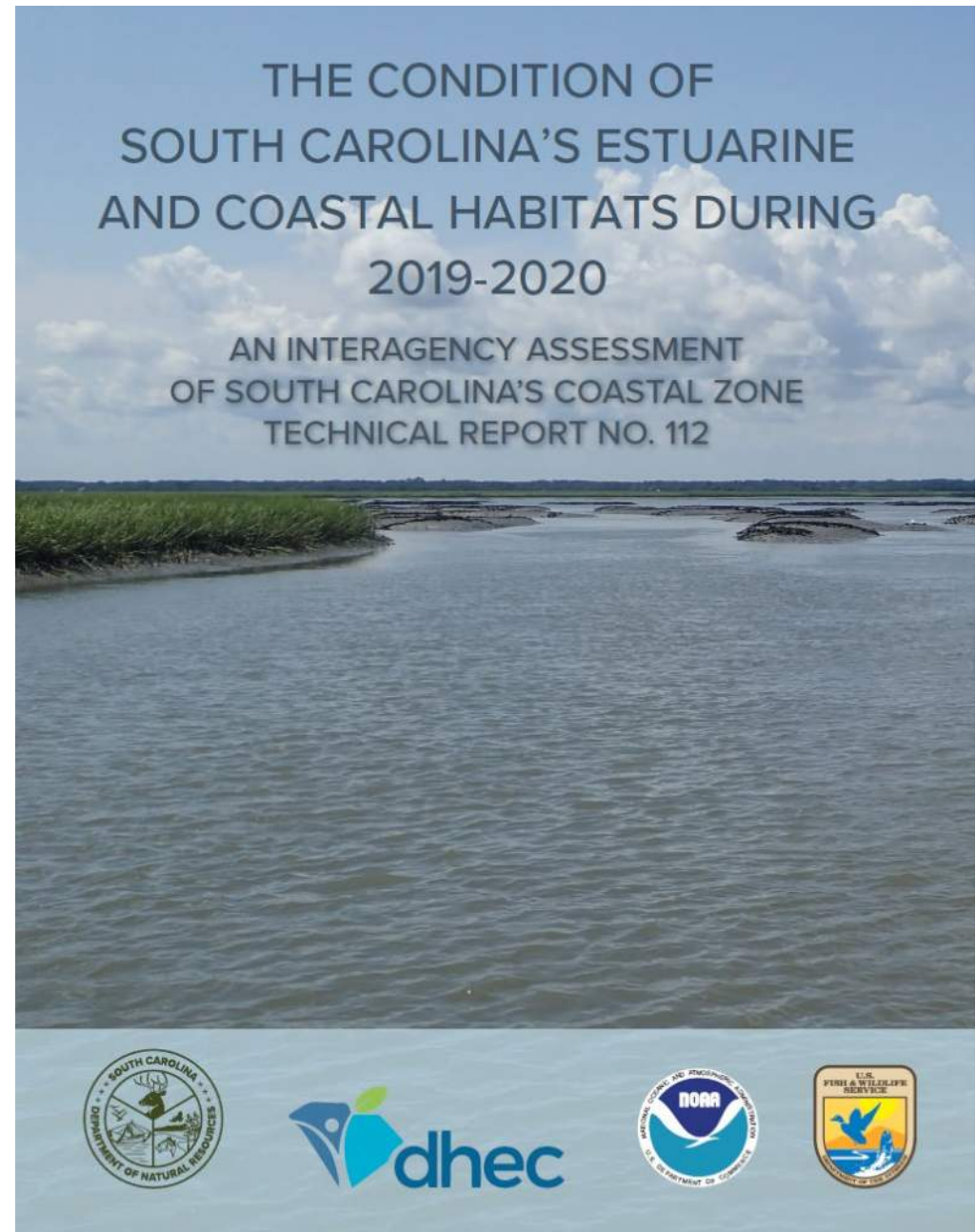
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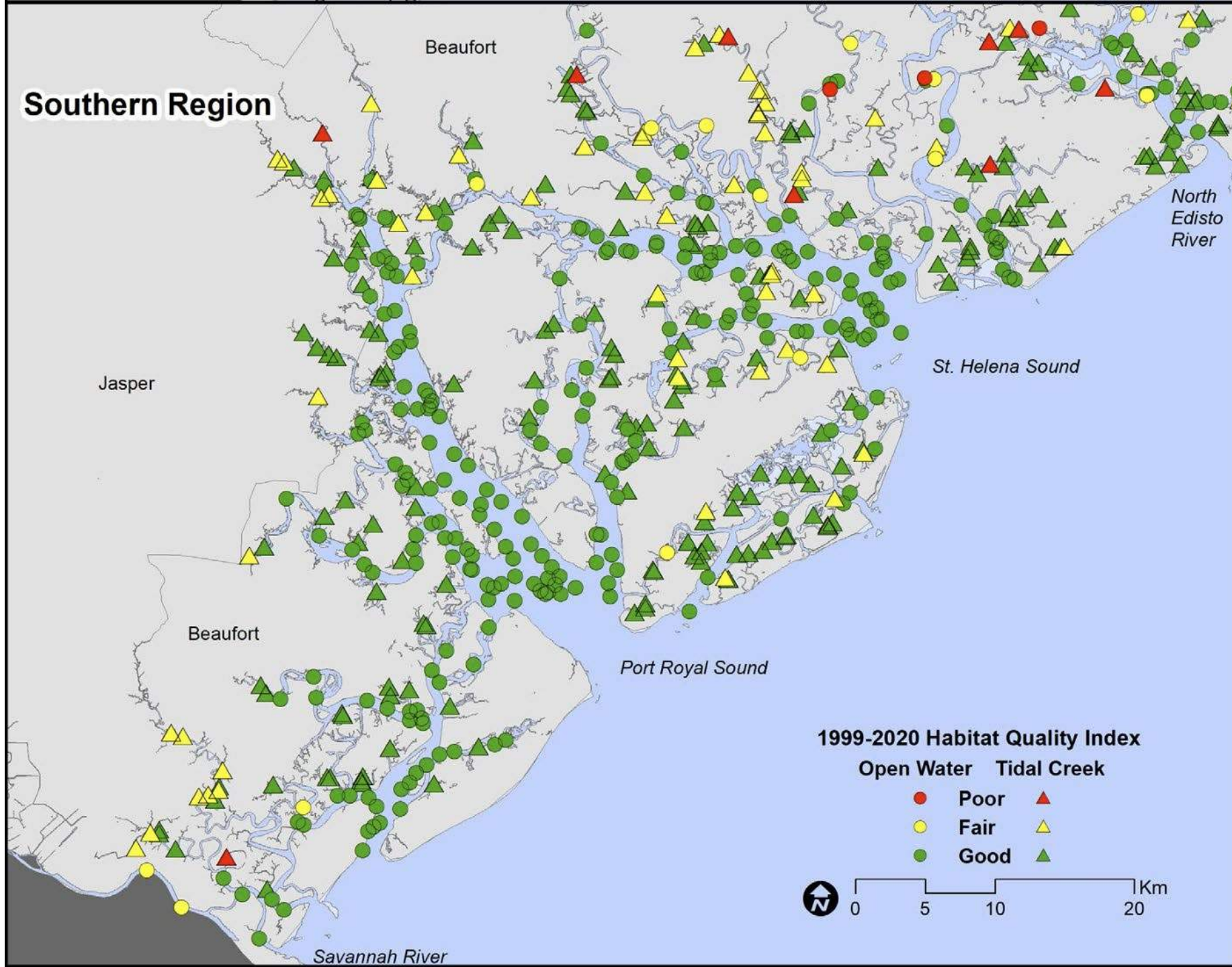
- 1) Water Quality Index
- 2) Sediment Quality Index
- 3) Biological Condition Index

These are integrated to develop an overall index of habitat quality



<https://www.dnr.sc.gov/marine/scecap/reports.html>

# Southern Region

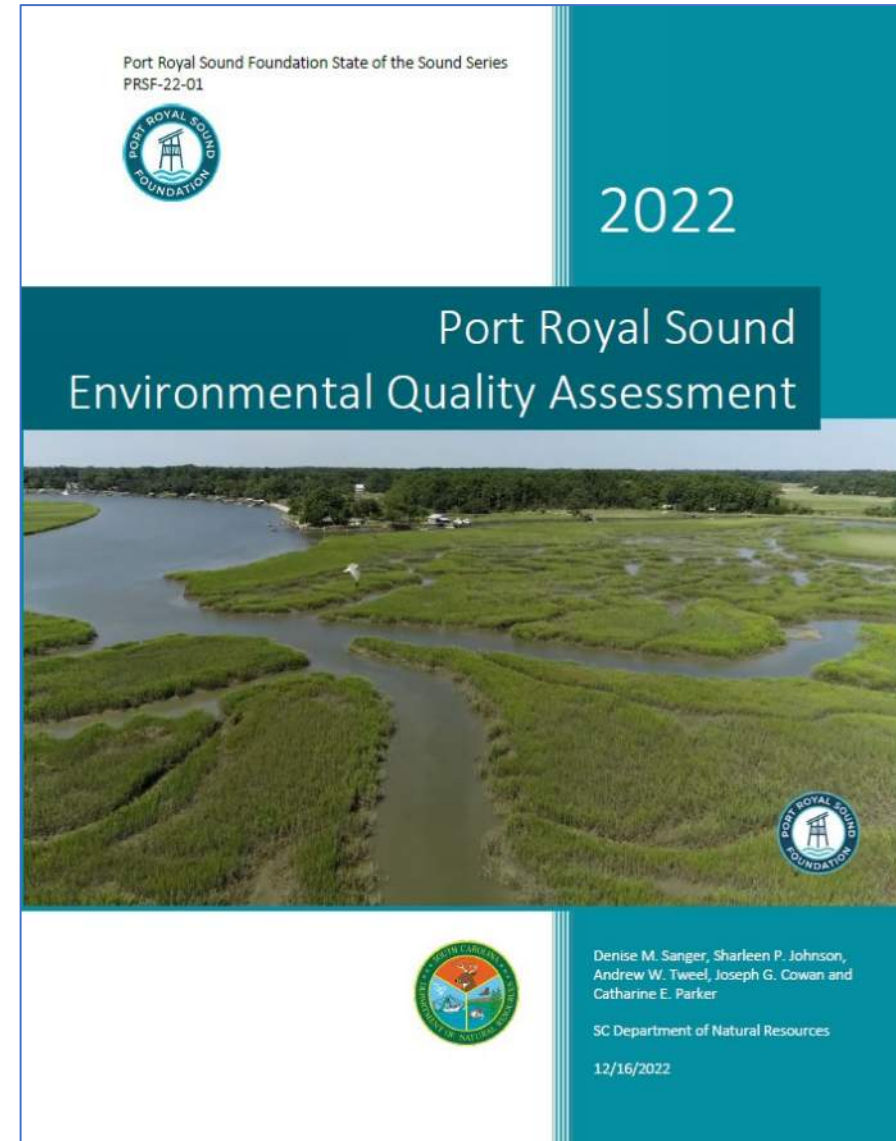


# Port Royal Sound Environmental Quality Assessment

Part of the “State of the Sound” series

Examines historic water quality data from the Port Royal Sound watershed

Provides critical baseline data



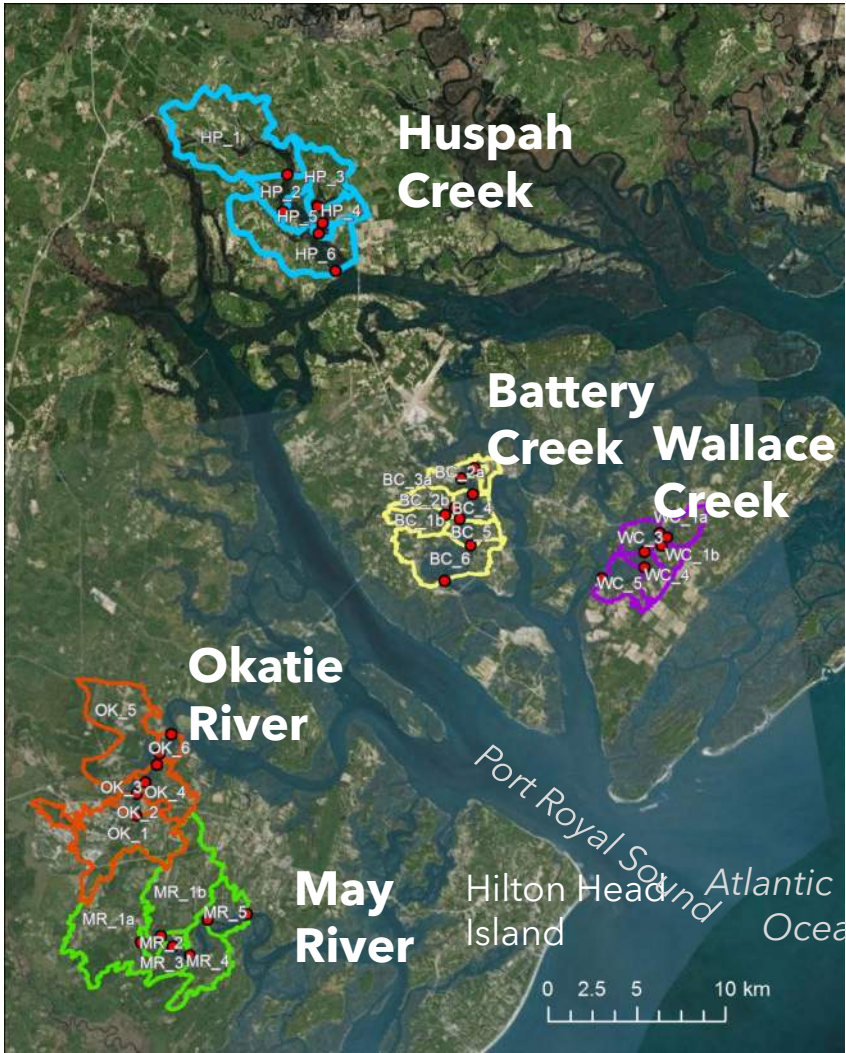
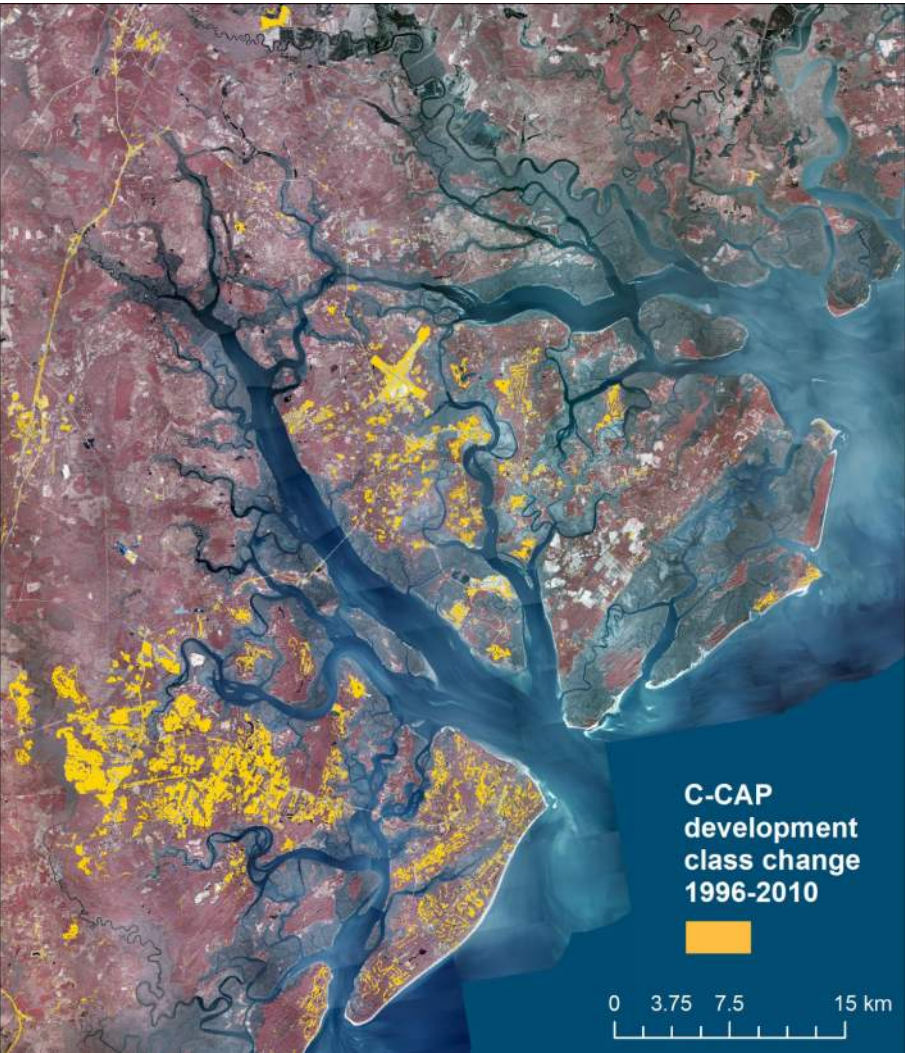
[https://portroyalsoundfoundation.org/wp-content/uploads/2023/01/PRS SCECAP FinalReport NoAppen 20221216.pdf](https://portroyalsoundfoundation.org/wp-content/uploads/2023/01/PRS_SCECAP_FinalReport_NoAppen_20221216.pdf)

# Environmental Research Section

Watershed Studies and Coastal Development



# Watershed Studies and Coastal Development



# Environmental Research Section

Tidal Creek Research



# Tidal Creek Research

2024 study will replicate 2003 project to understand how development has changed the tidal creeks in the May River



# Point of Contacts





# Point of Contacts

## Marine Resources Research Institute

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## Mariculture/Stock Enhancement

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## Crustacean & Molluscan Research Section

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Dr. Daniel Sasson ([sassond@dnr.sc.gov](mailto:sassond@dnr.sc.gov))

## Environmental Research Section

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### SCECAP Program

Dr. Andrew Tweel ([tweela@dnr.sc.gov](mailto:tweela@dnr.sc.gov))



