

Using the Coastal Salinity Index and predicted streamflow to forecast SC blue crab landings

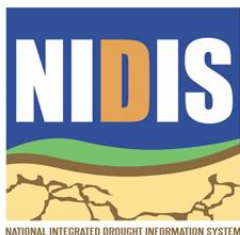
Michael Childress – Clemson University

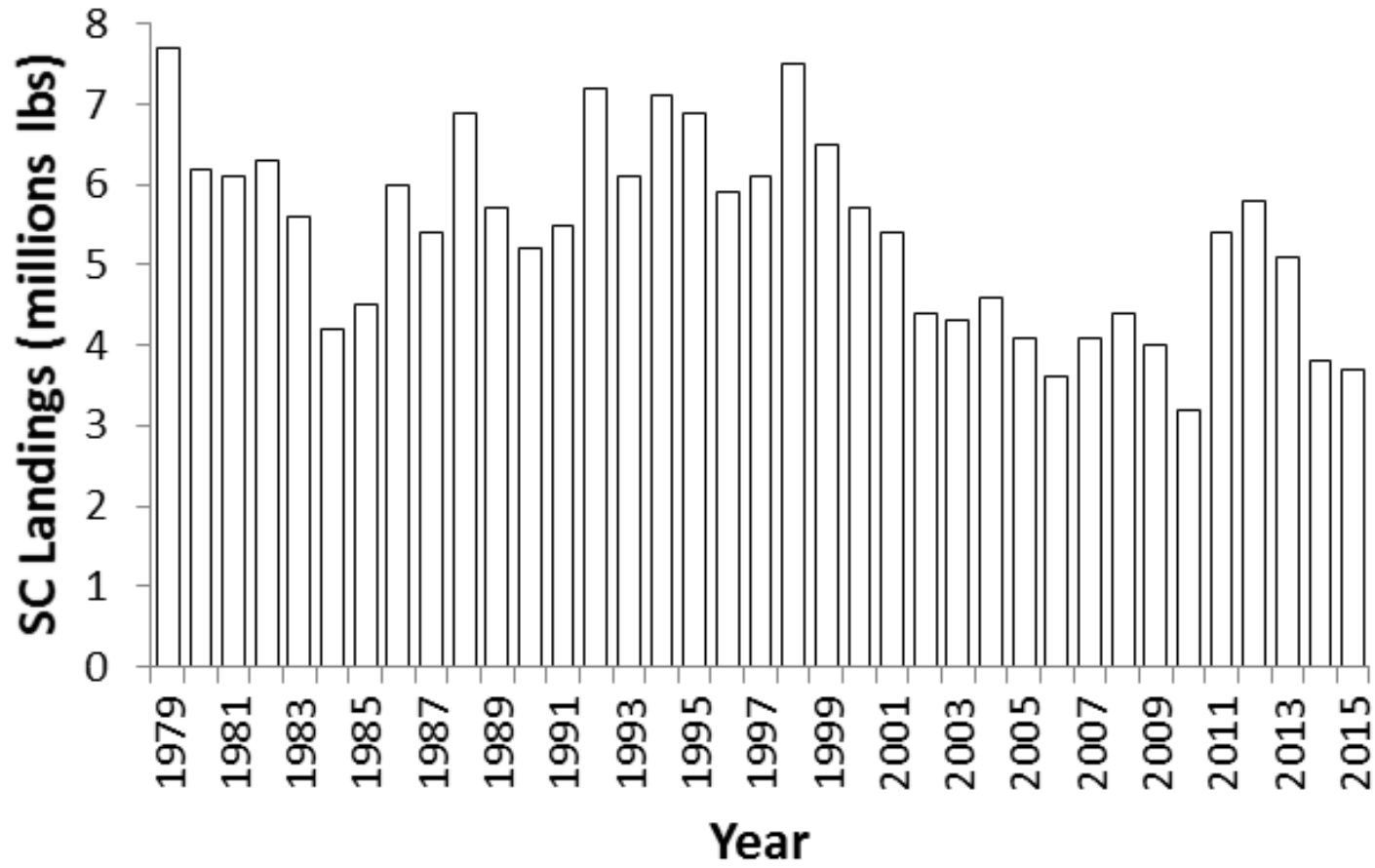
Dan Tufford – University of South Carolina

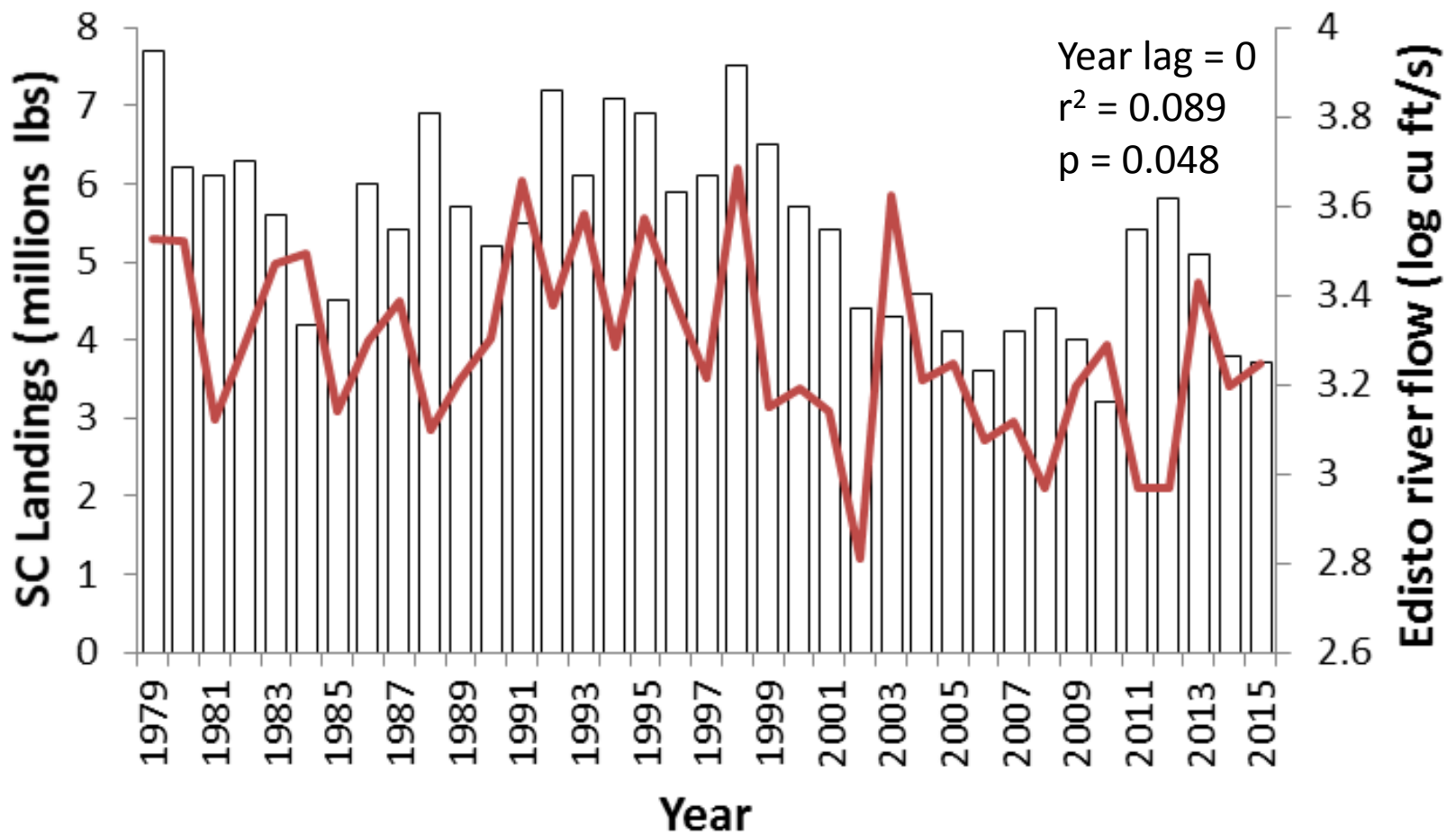
Junyu Lu – University of South Carolina

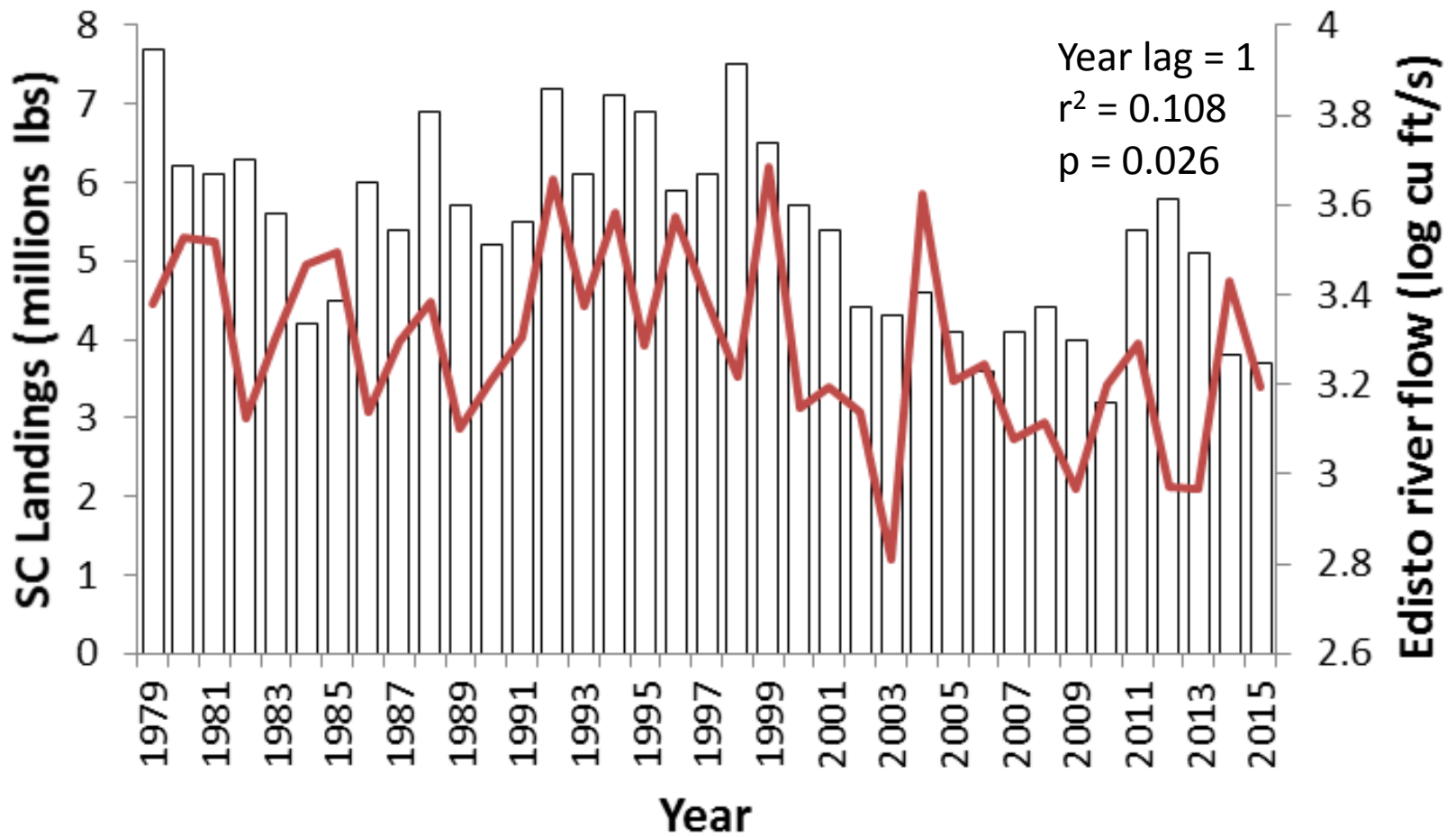
Greg Carbone – University of South Carolina

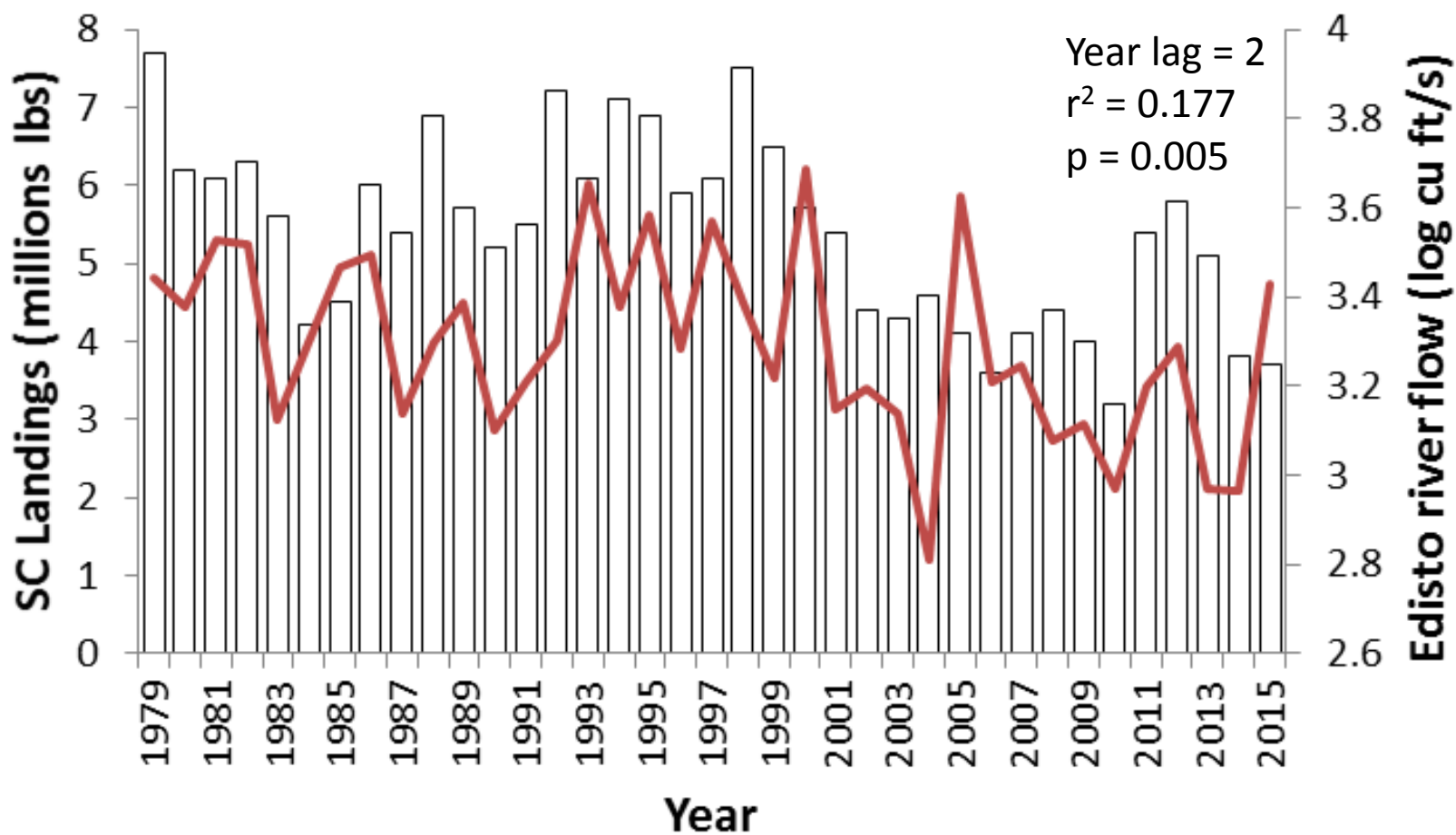
Paul Conrads – USGS South Atlantic Water Science Center

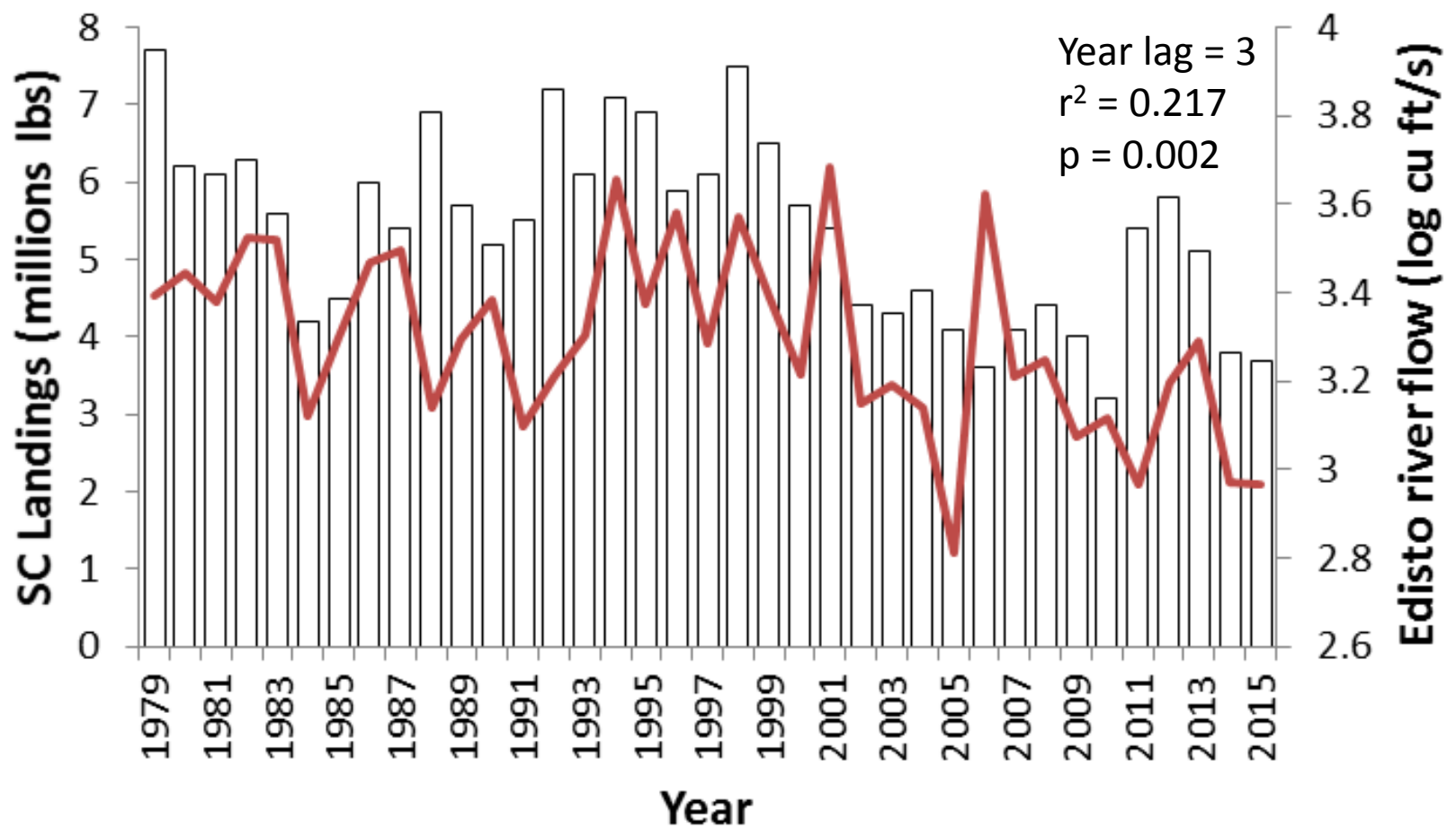




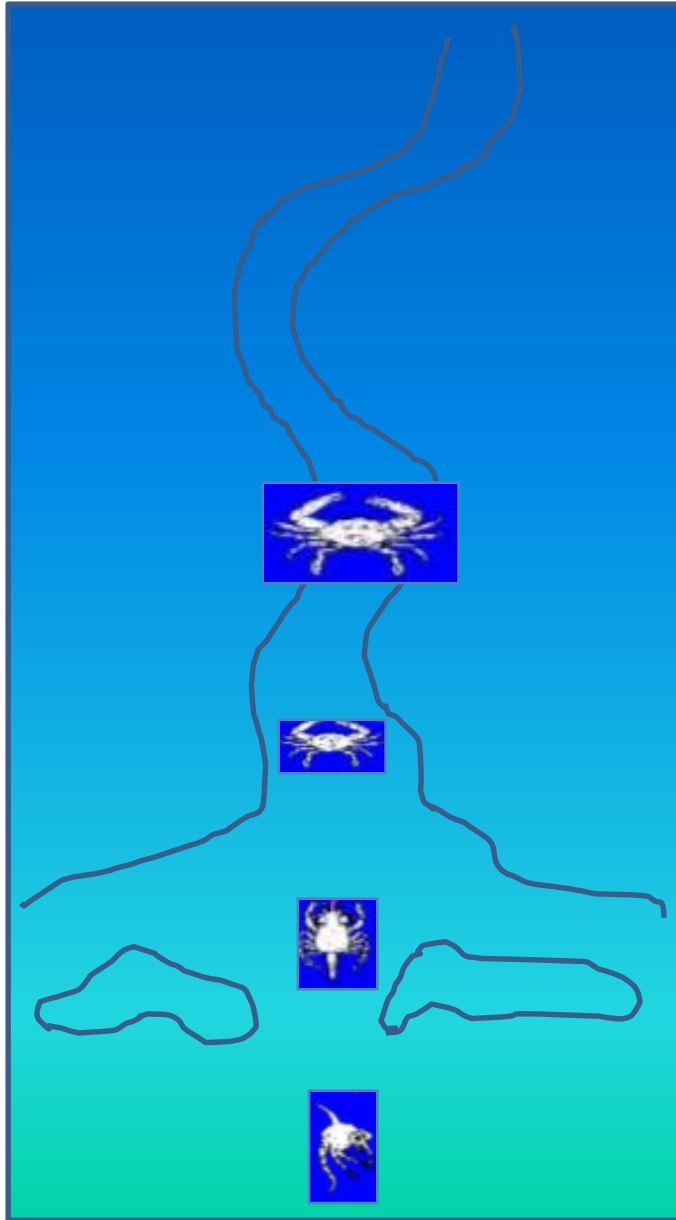




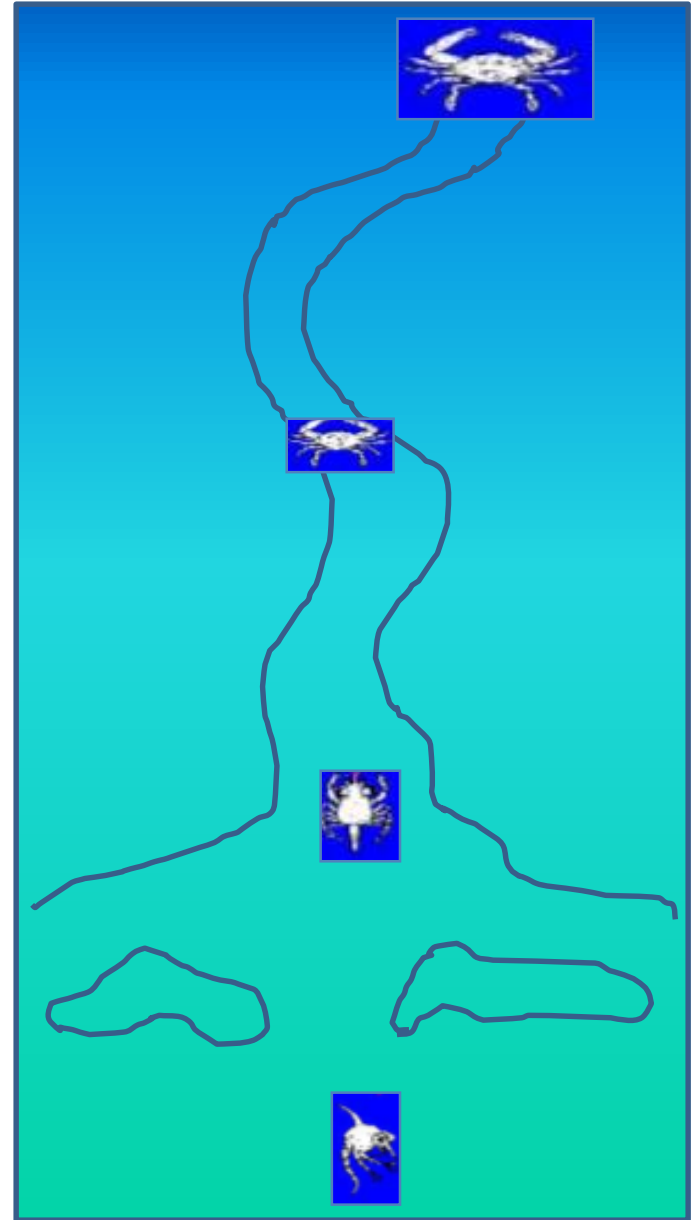




Normal Conditions



Drought Conditions

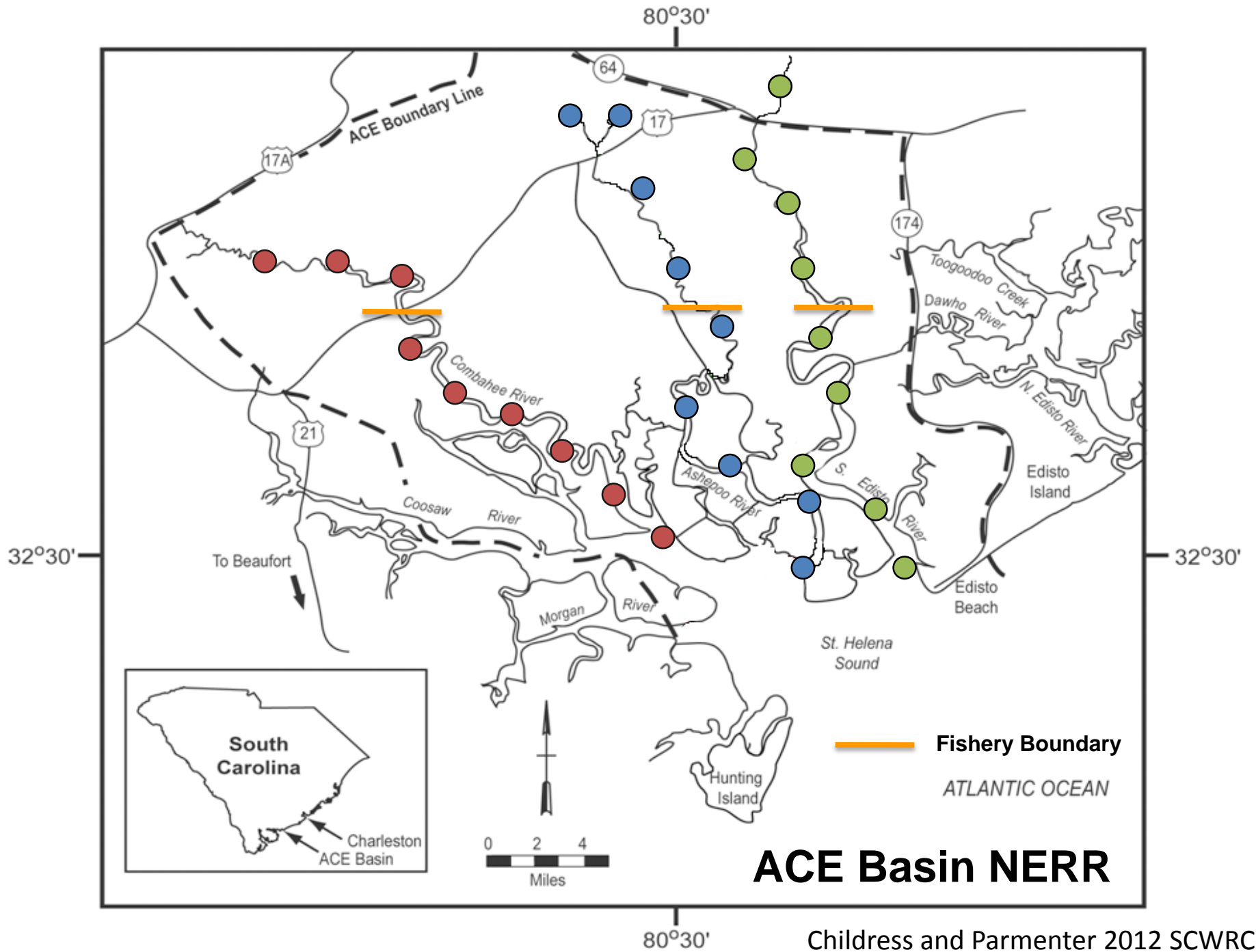


Questions

- How does drought impact blue crabs?
- Can we forecast future droughts?
- Can we use drought forecasts to predict crab landings in South Carolina?
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Water Quality



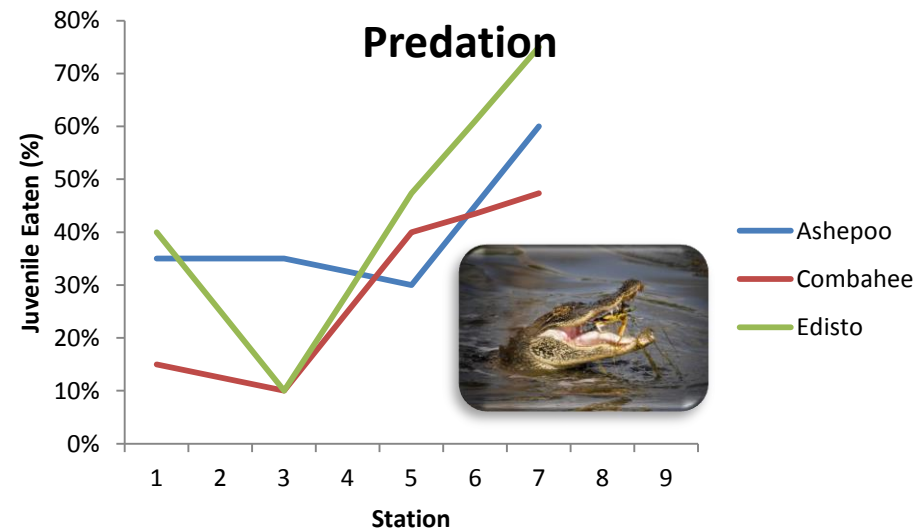
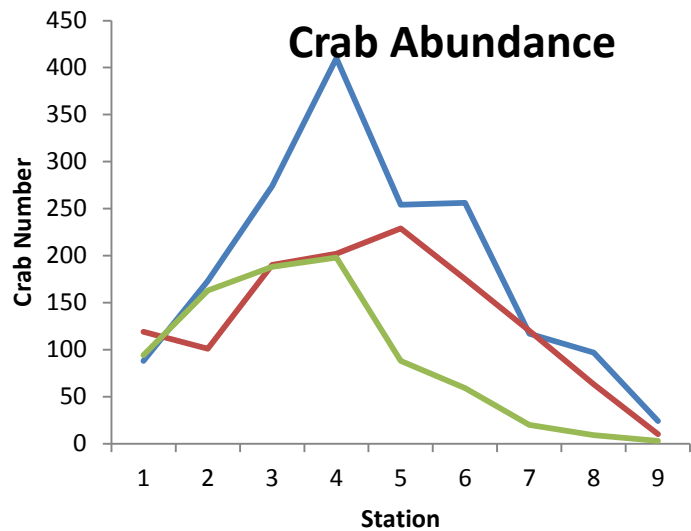
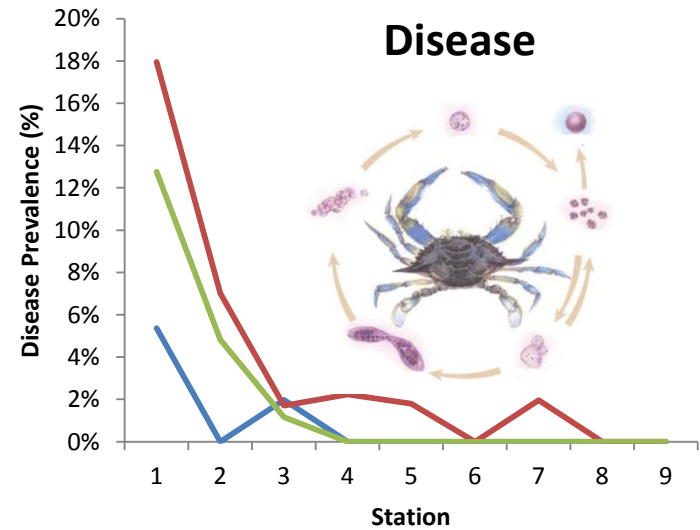
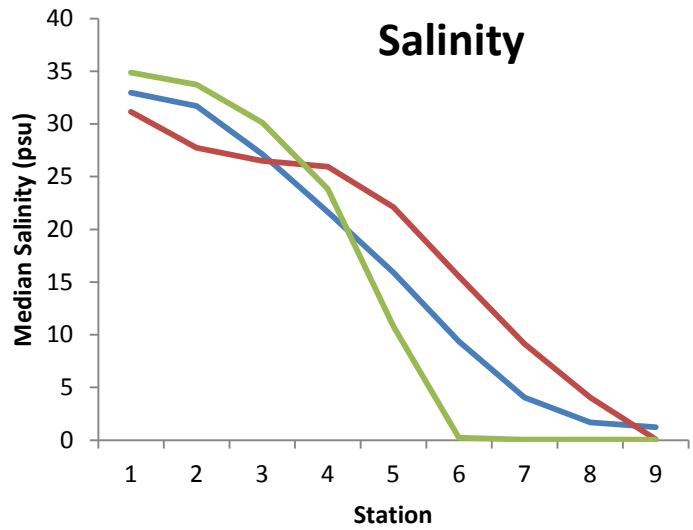
Disease



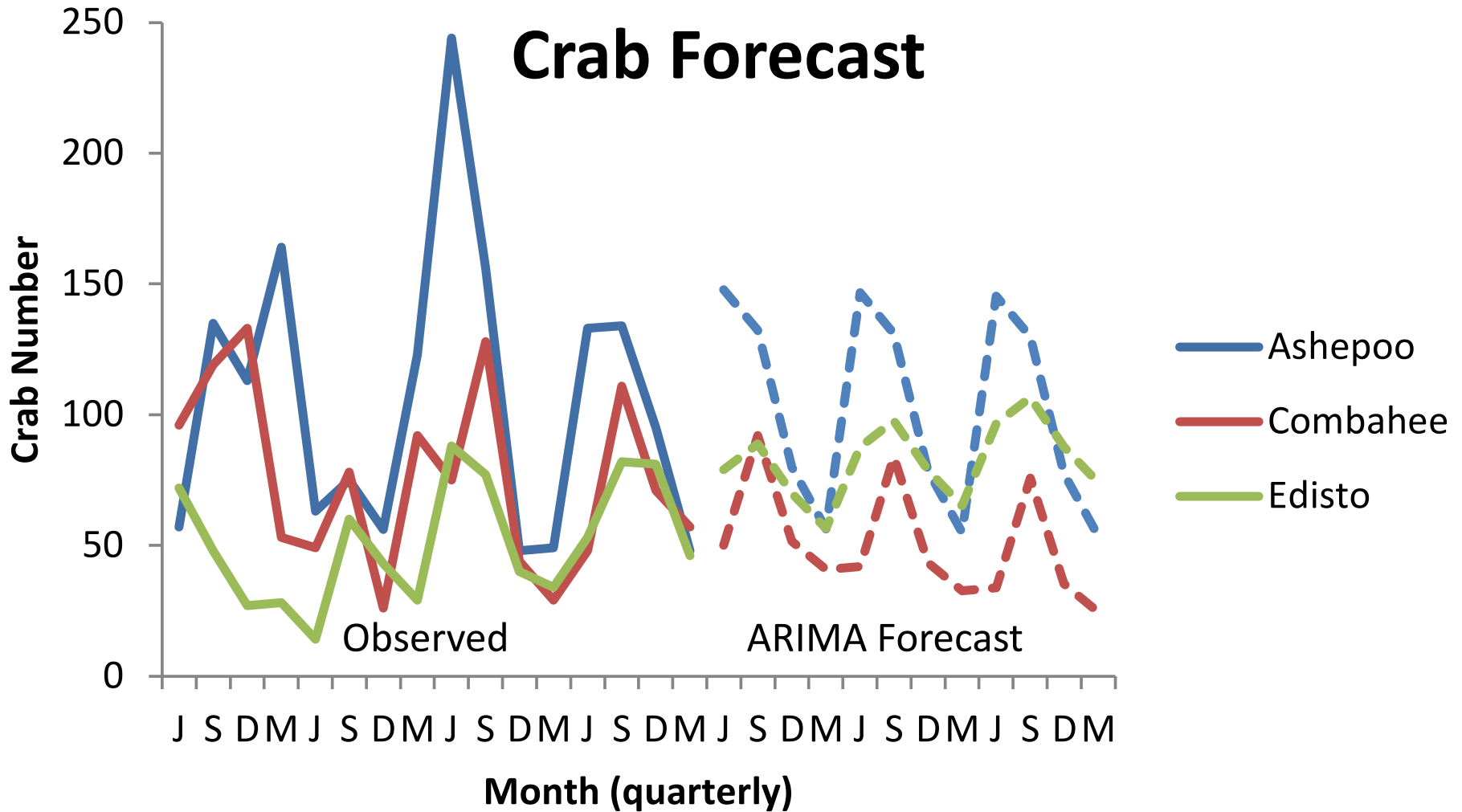
Crab Density

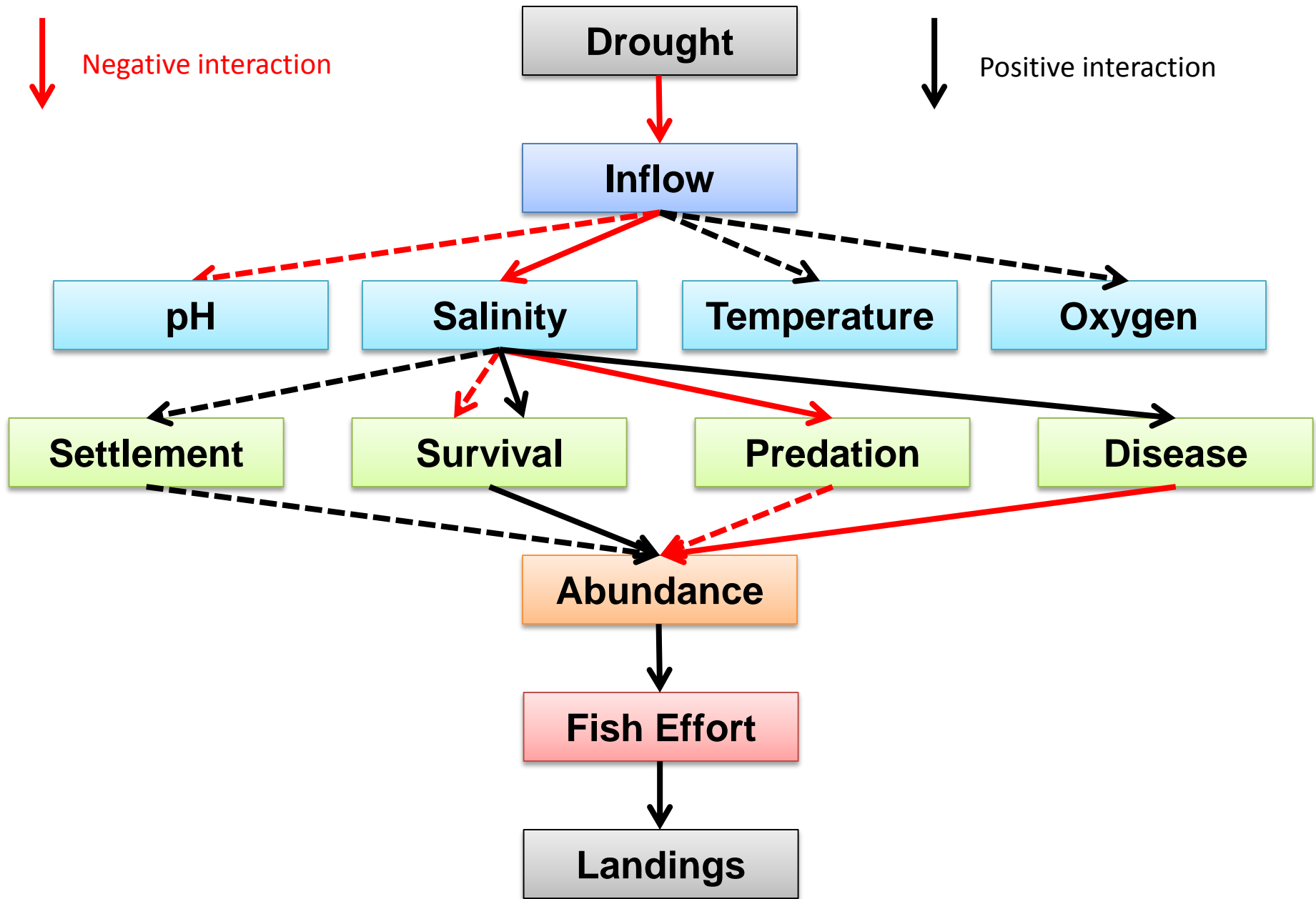


Predation

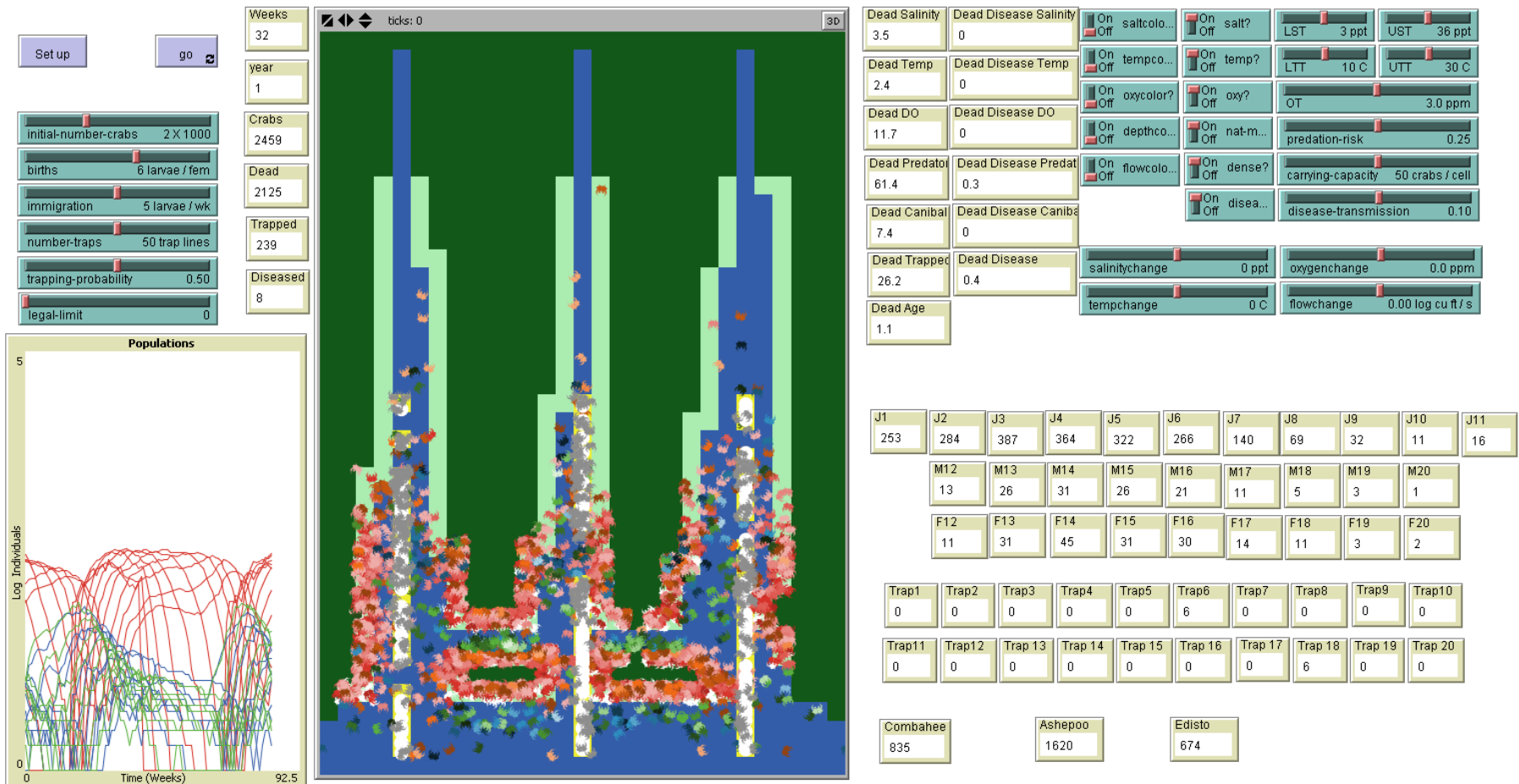


Crab Forecast





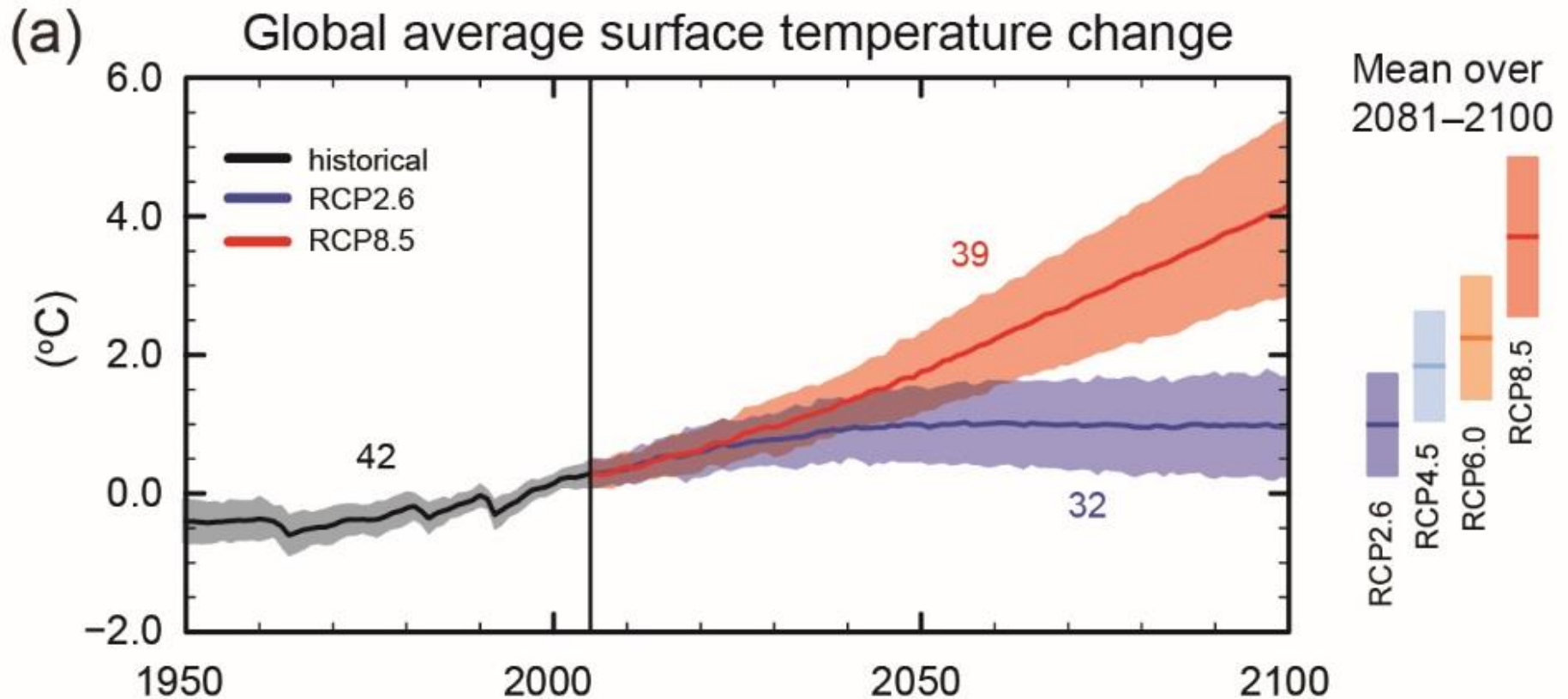
SCBCRABS Individual Based Model



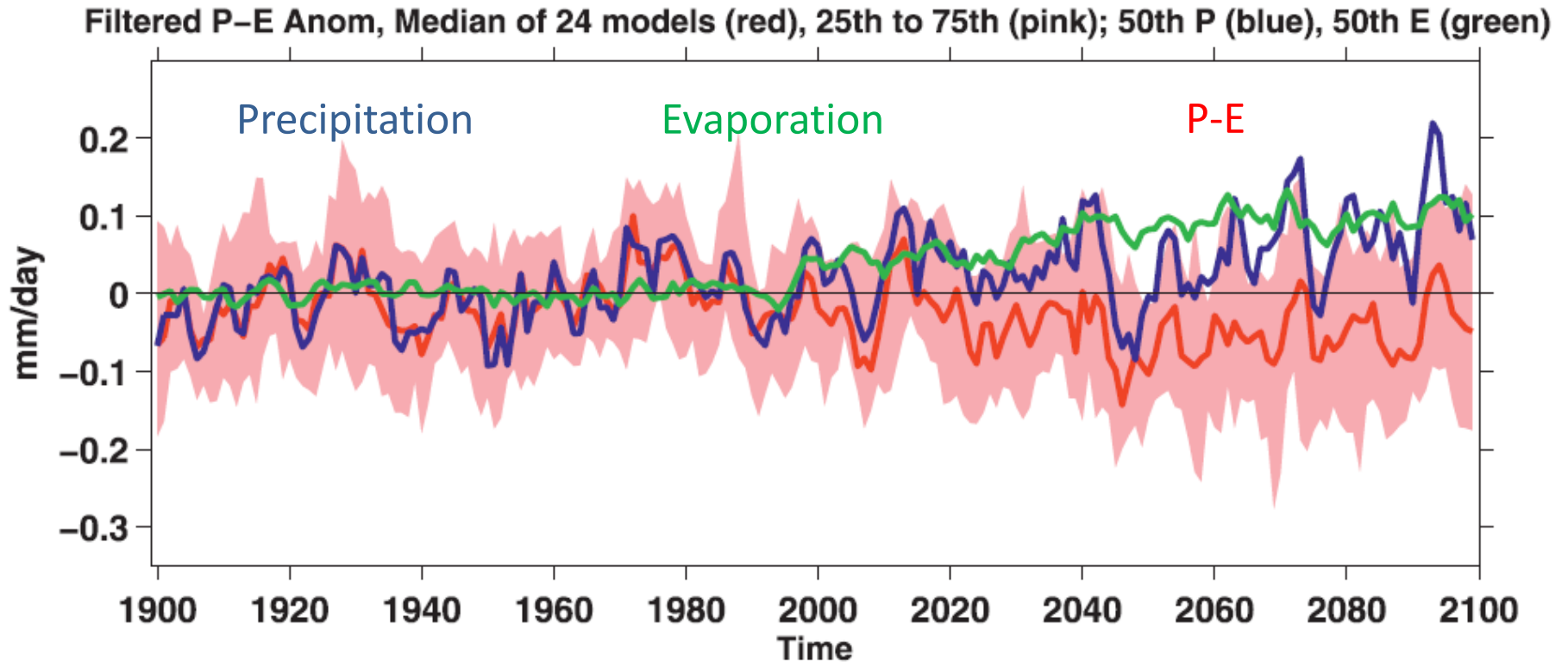
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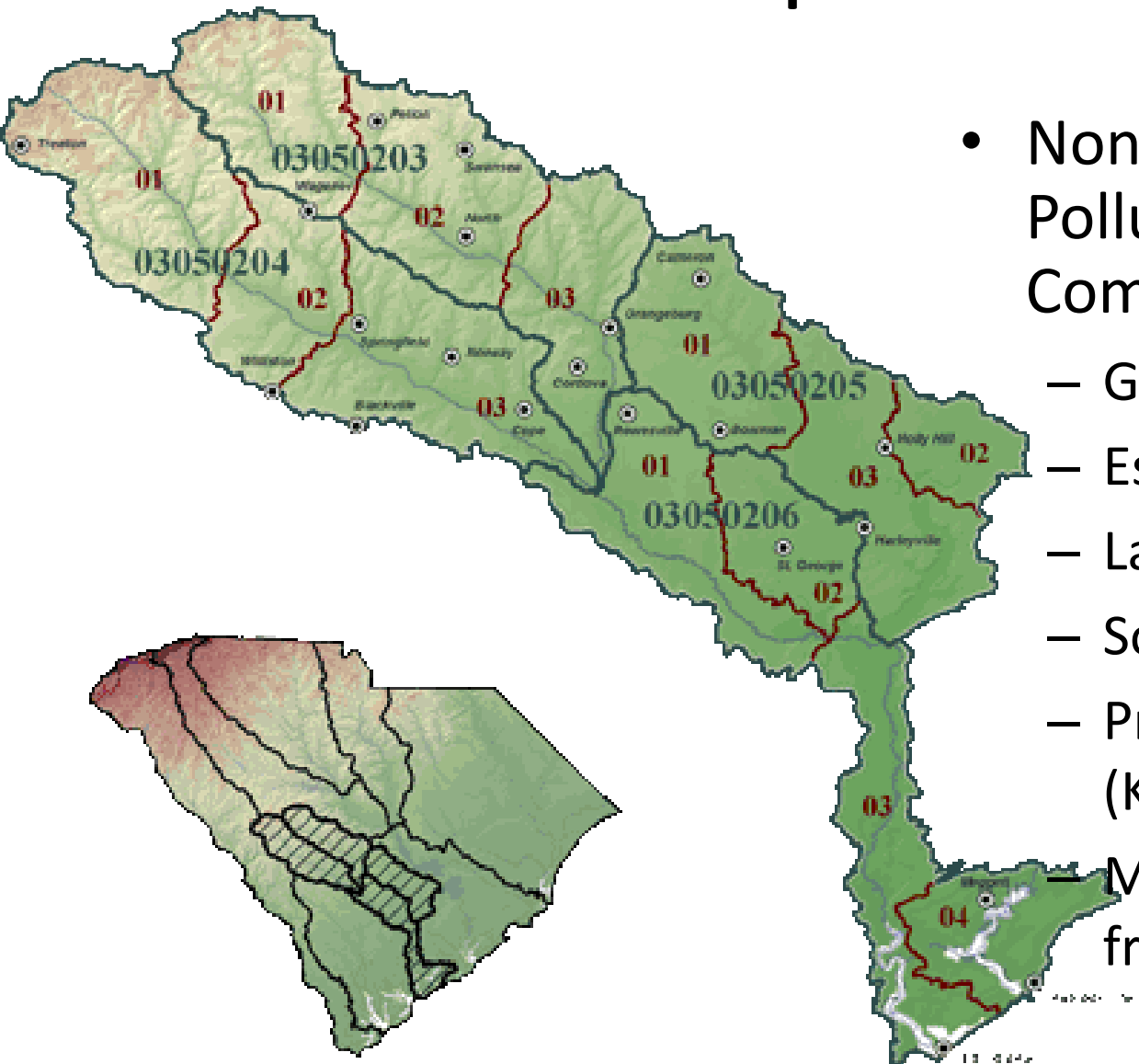
Drought Forecasting



Drought Forecasting

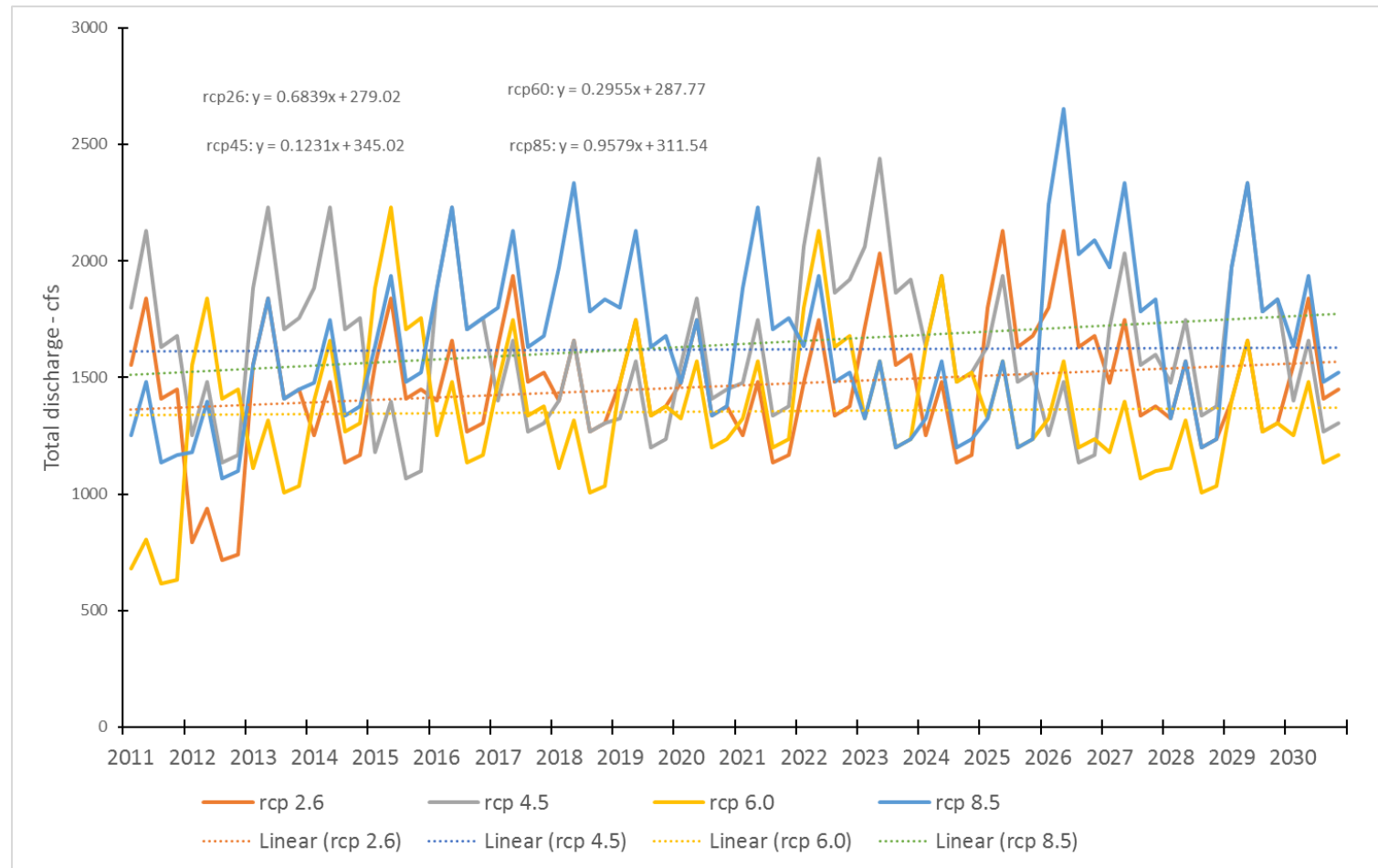


Edisto River OpenNSPECT Model



- Nonpoint Source Pollution and Erosion Comparison Tool
 - GIS-based
 - Estimates surface runoff
 - Land use from C-CAP
 - Soils from NRCS
 - Precipitation from GCMs (KMNI) using CMIP 5
 - Monthly precipitation from 2011-2030

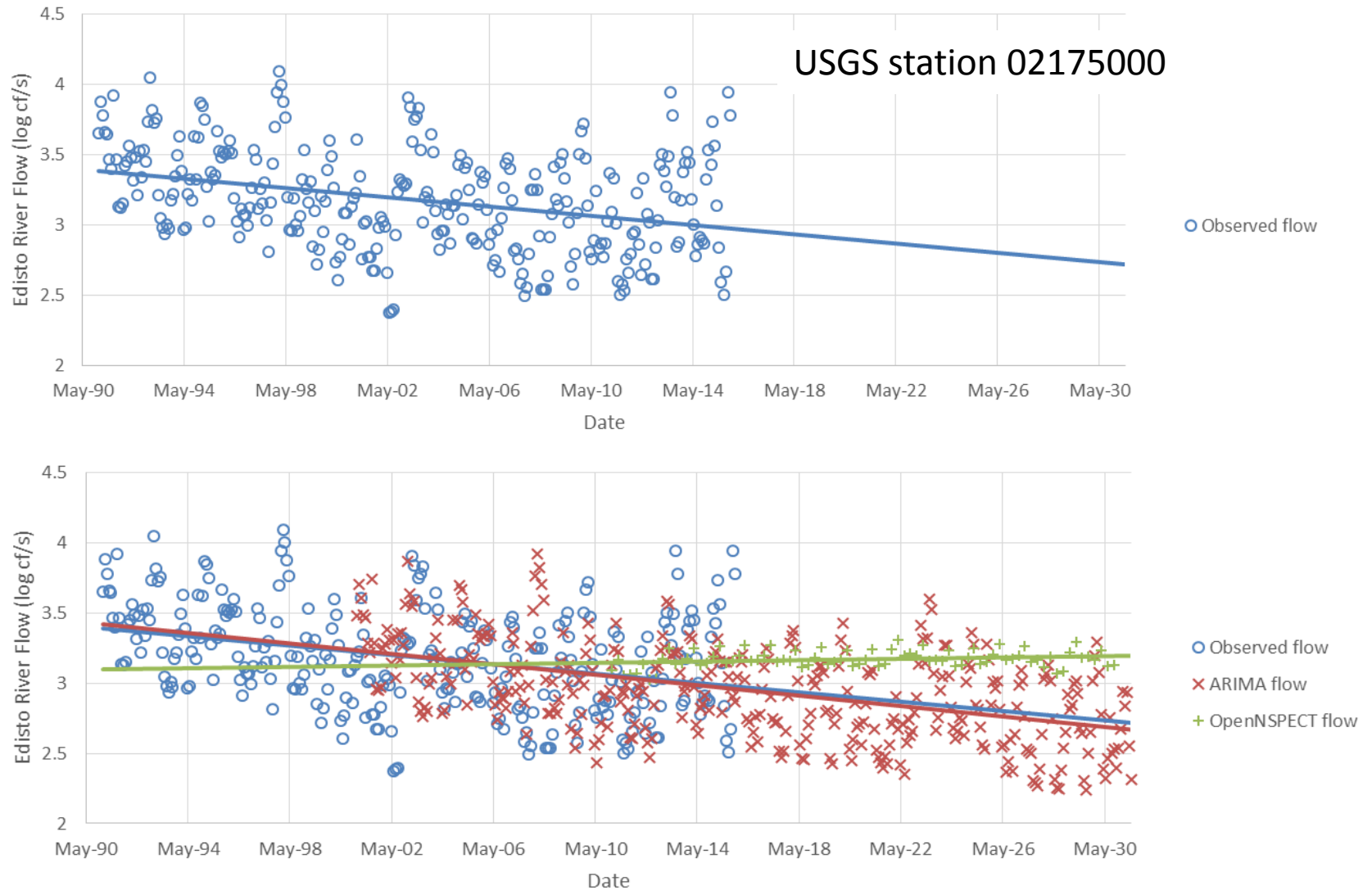
Edisto River OpenNSPECT Model



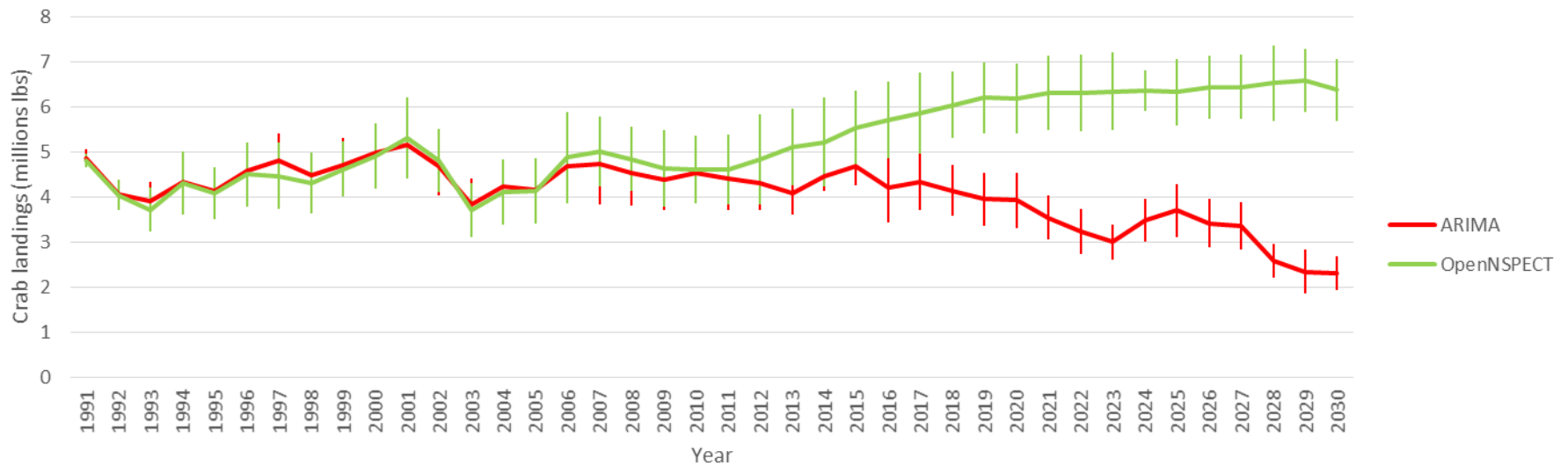
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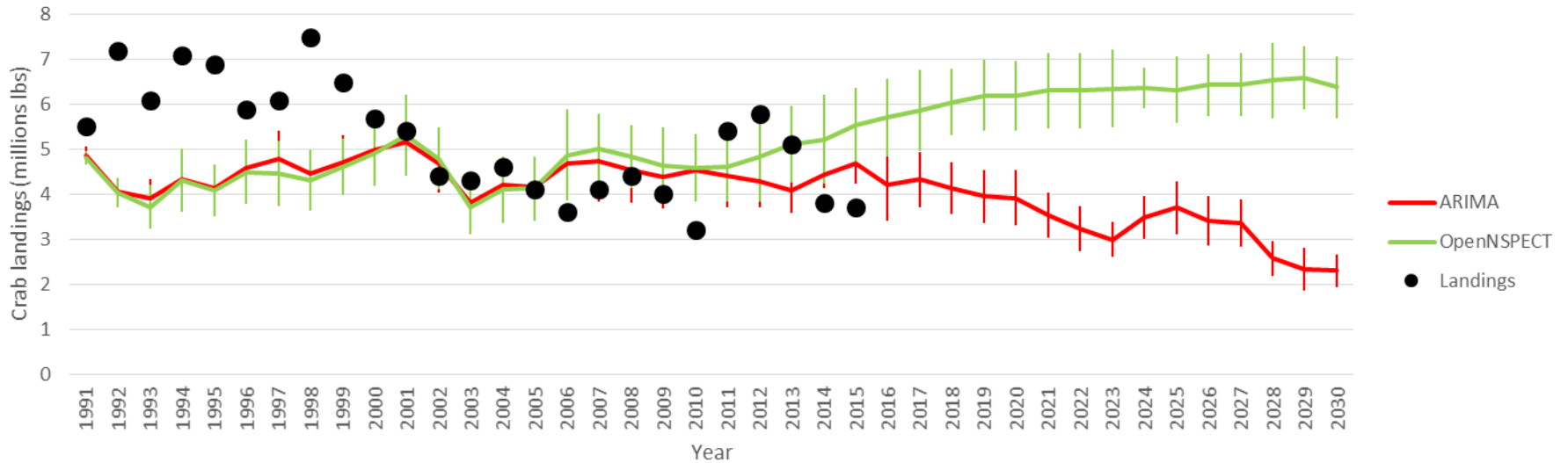
SCBCRABS Flow Input



SCBCRABS Landings Output



SCBCRABS Landings Output



Questions

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- **Can we use the Coastal Salinity Index to forecast US blue crab landings?**

Coastal Salinity Index (CSI)

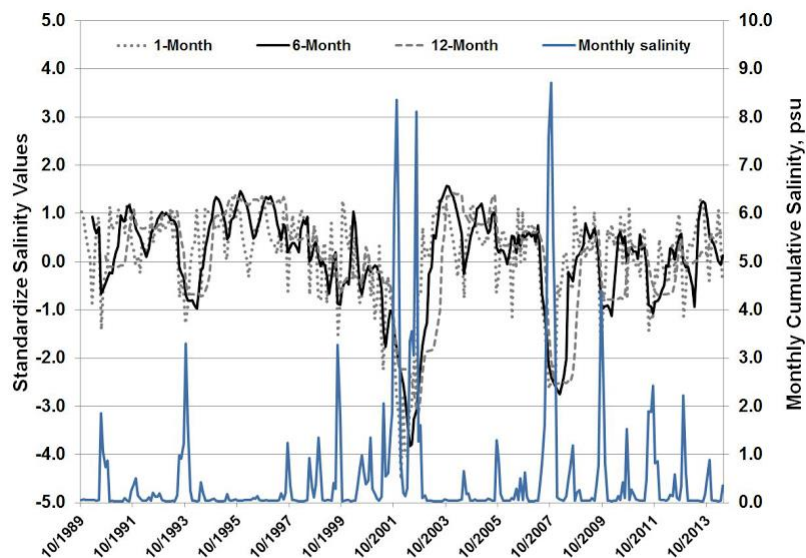


Figure 3. The 1-, 6-, and 12-month standardize salinity values for the Waccamaw River at Hagley Landing, South Carolina.

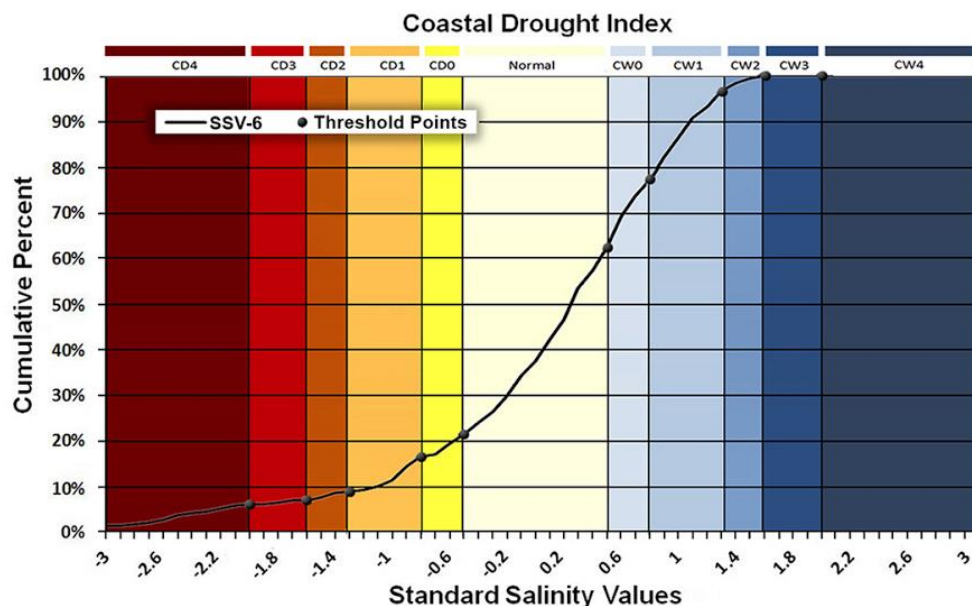


Figure 4. The cumulative frequency curve (left figure) for the 6-month standardize salinity values for the Waccamaw River at Hagley Landing, South Carolina (fig. 3), and the declarations, descriptions, and coastal drought index values (right table).

Coastal Salinity Index (CSI)

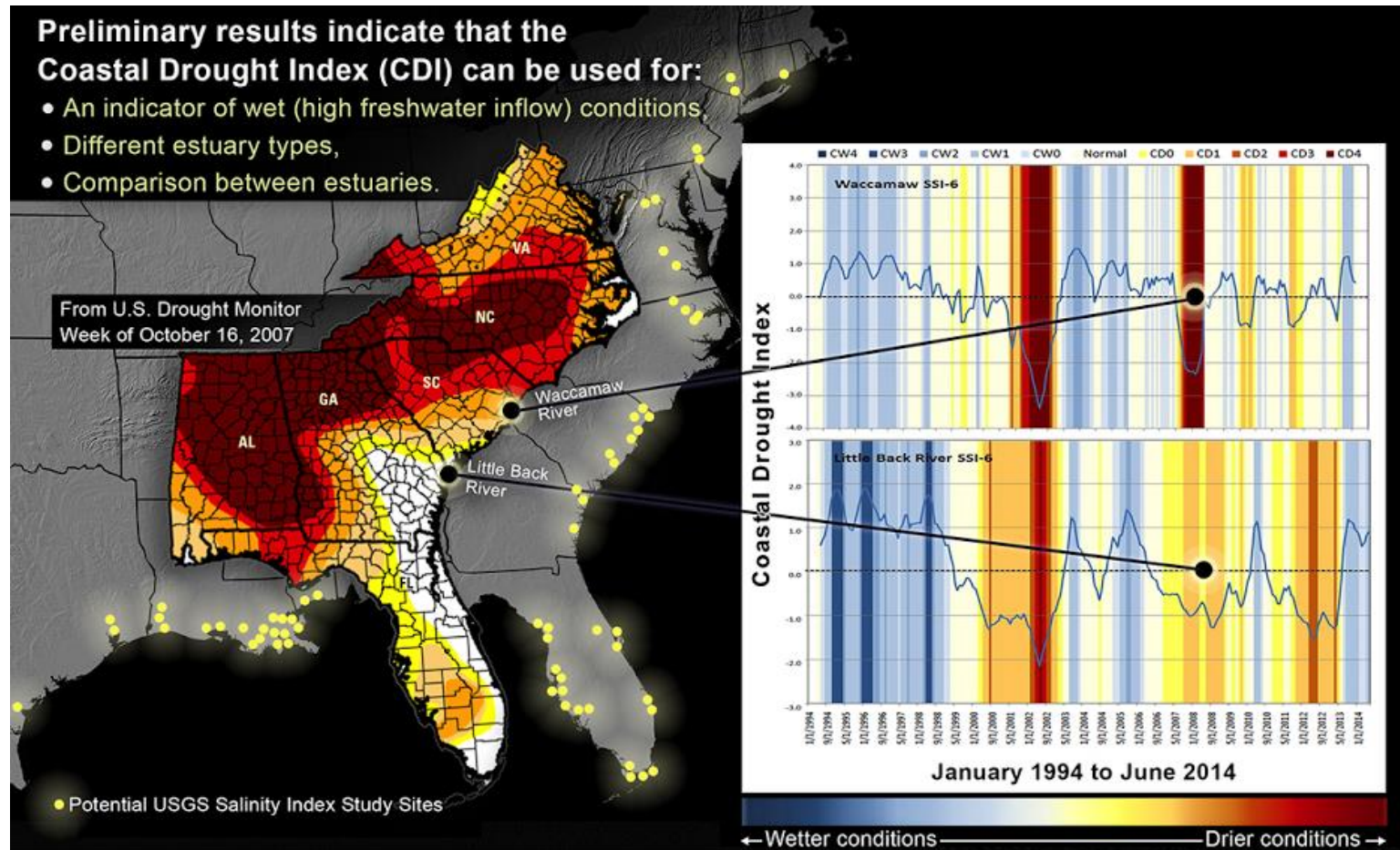
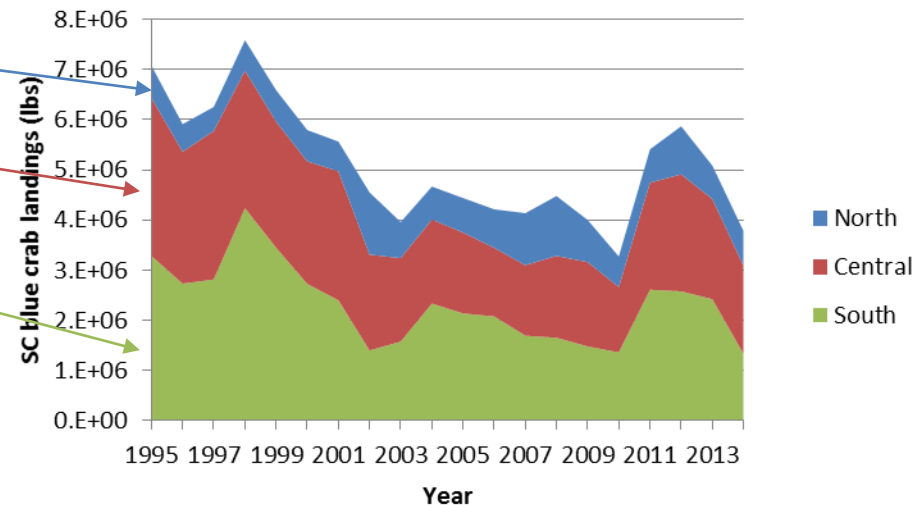
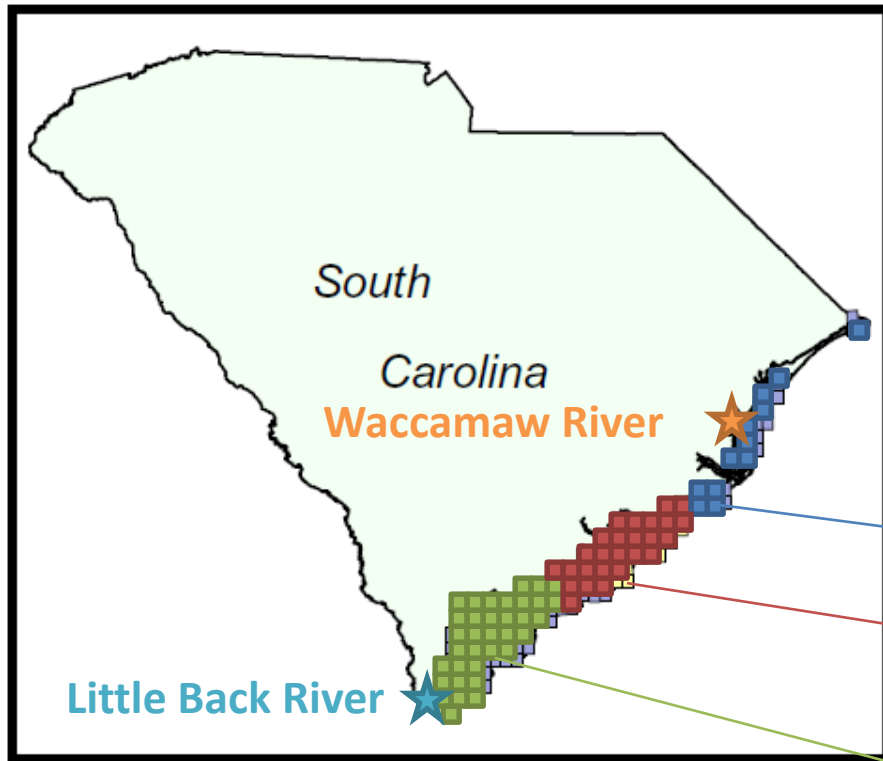
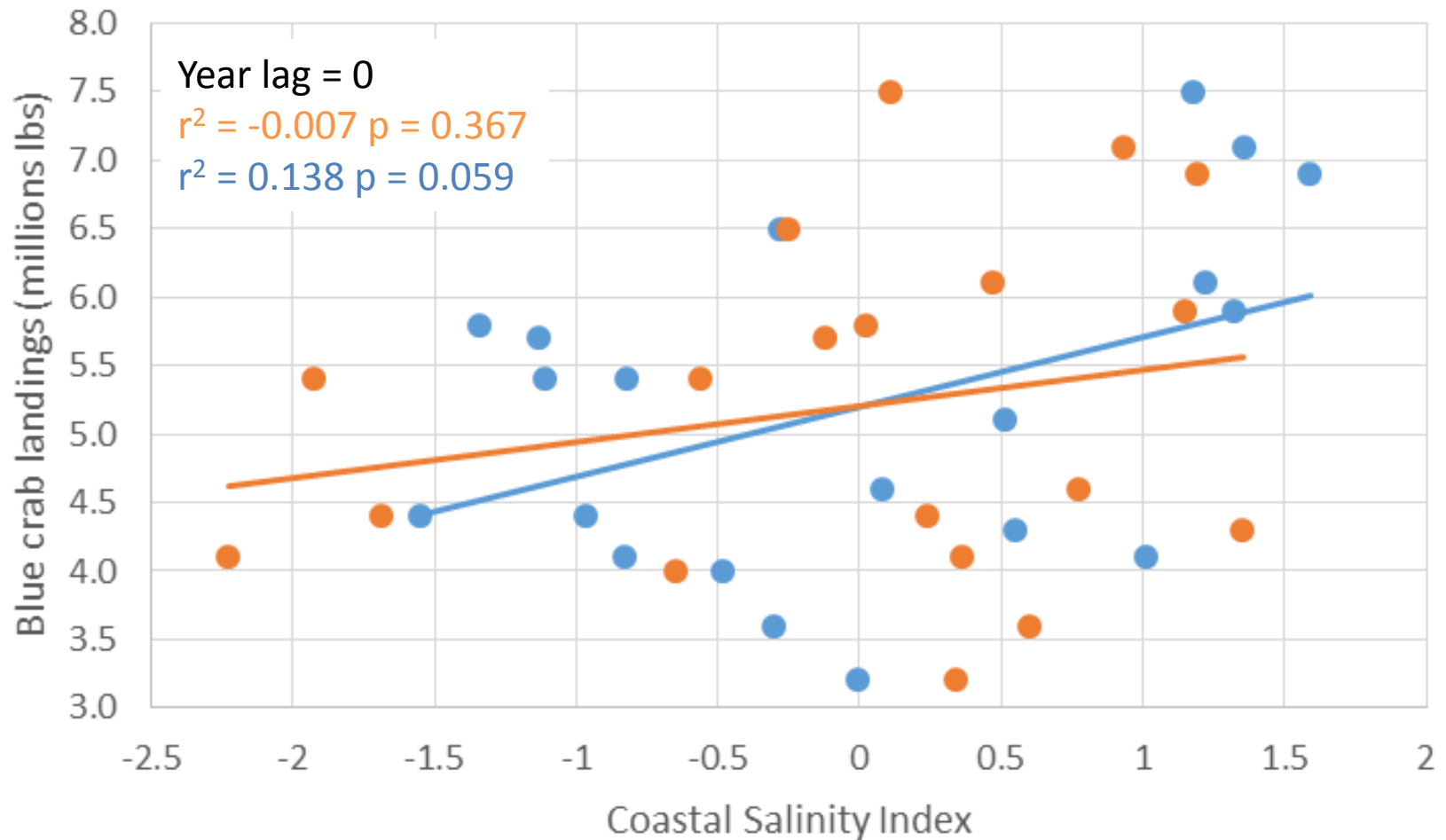


Figure 5. The Coastal Drought Index (CDI) for the Waccamaw River and Little Back River and the U.S. Drought Monitor map for the week of October 16, 2007.

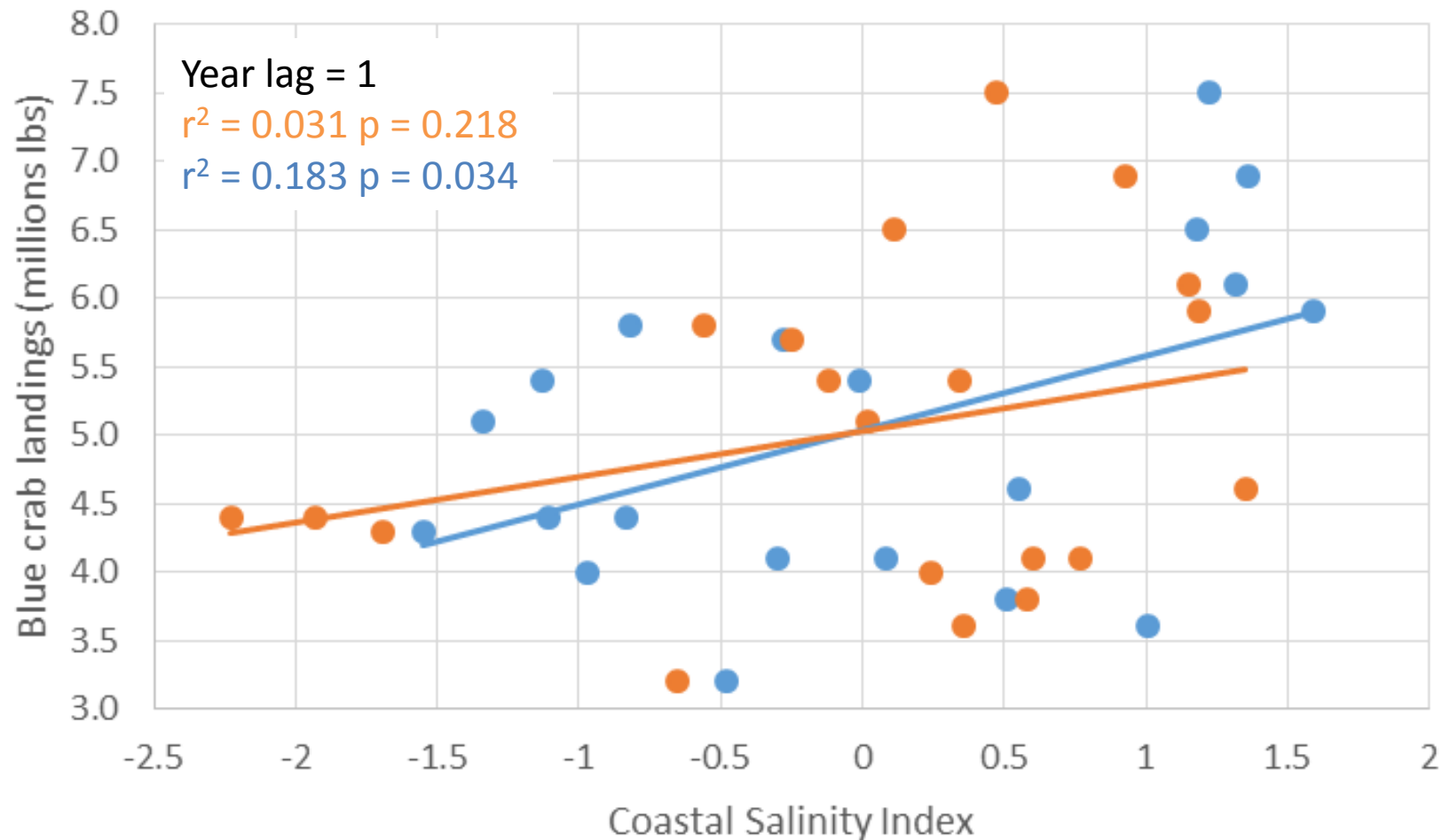
Coastal Salinity Index (CSI)



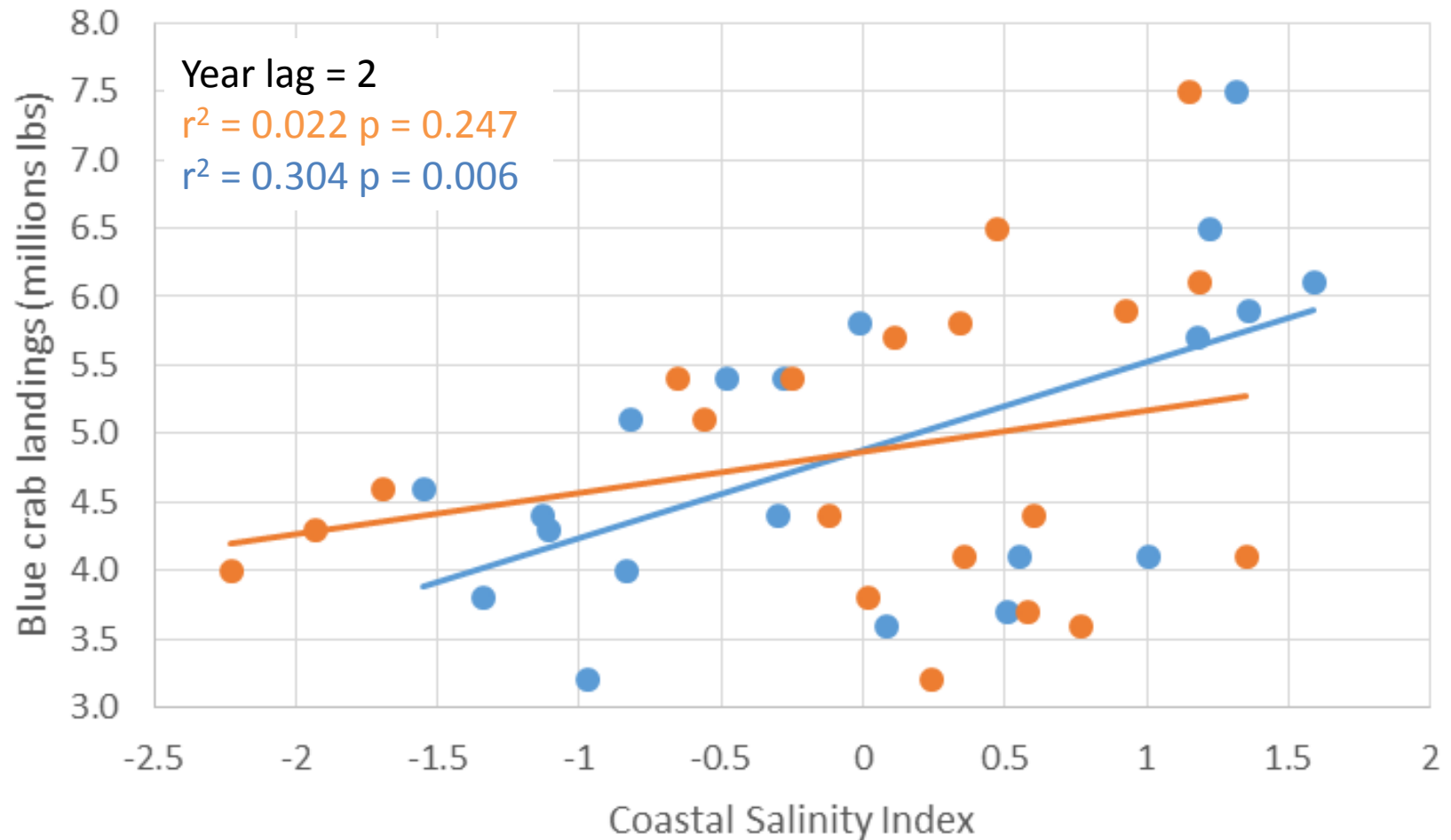
Coastal Salinity Index (CSI)



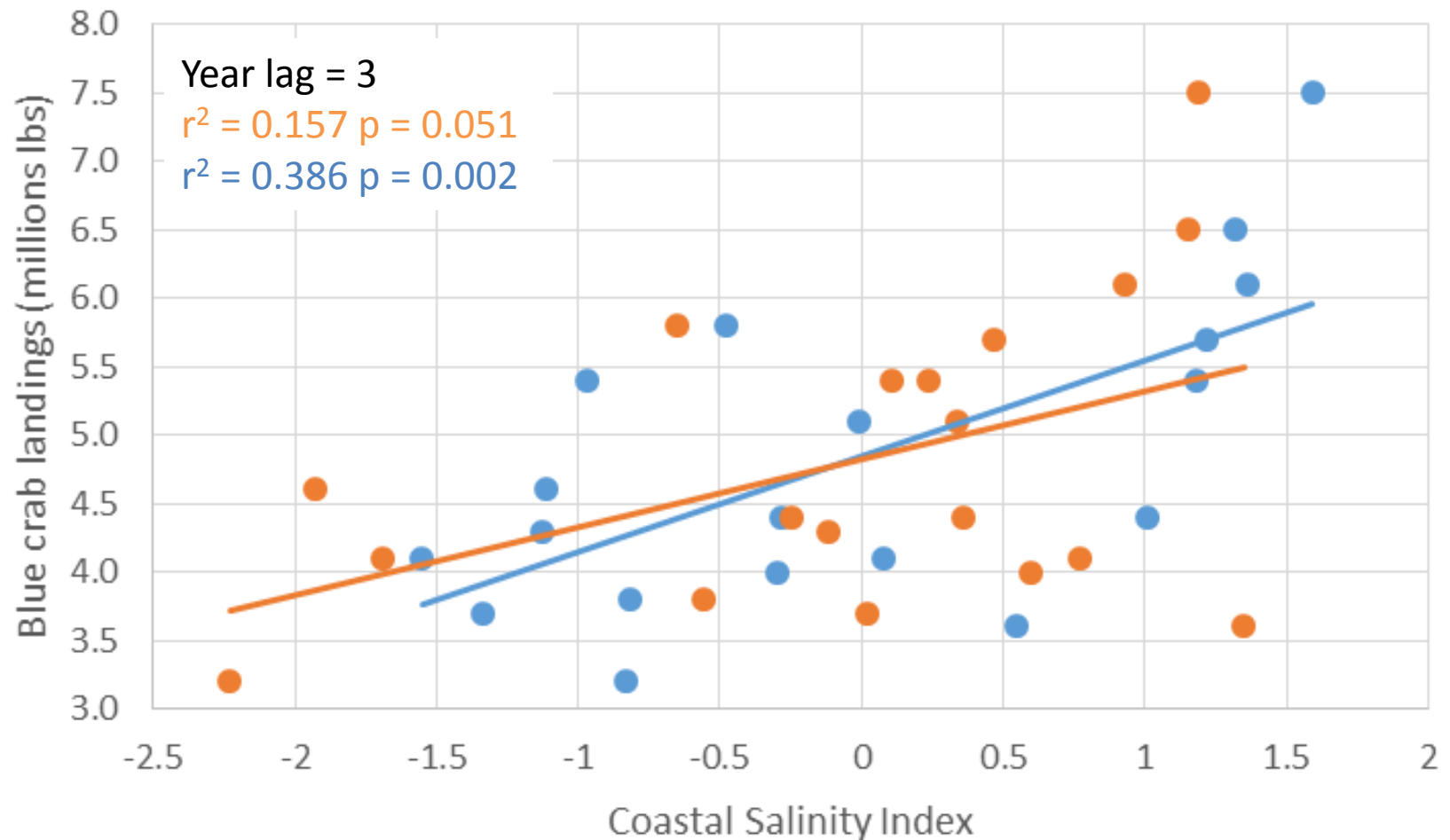
Coastal Salinity Index (CSI)



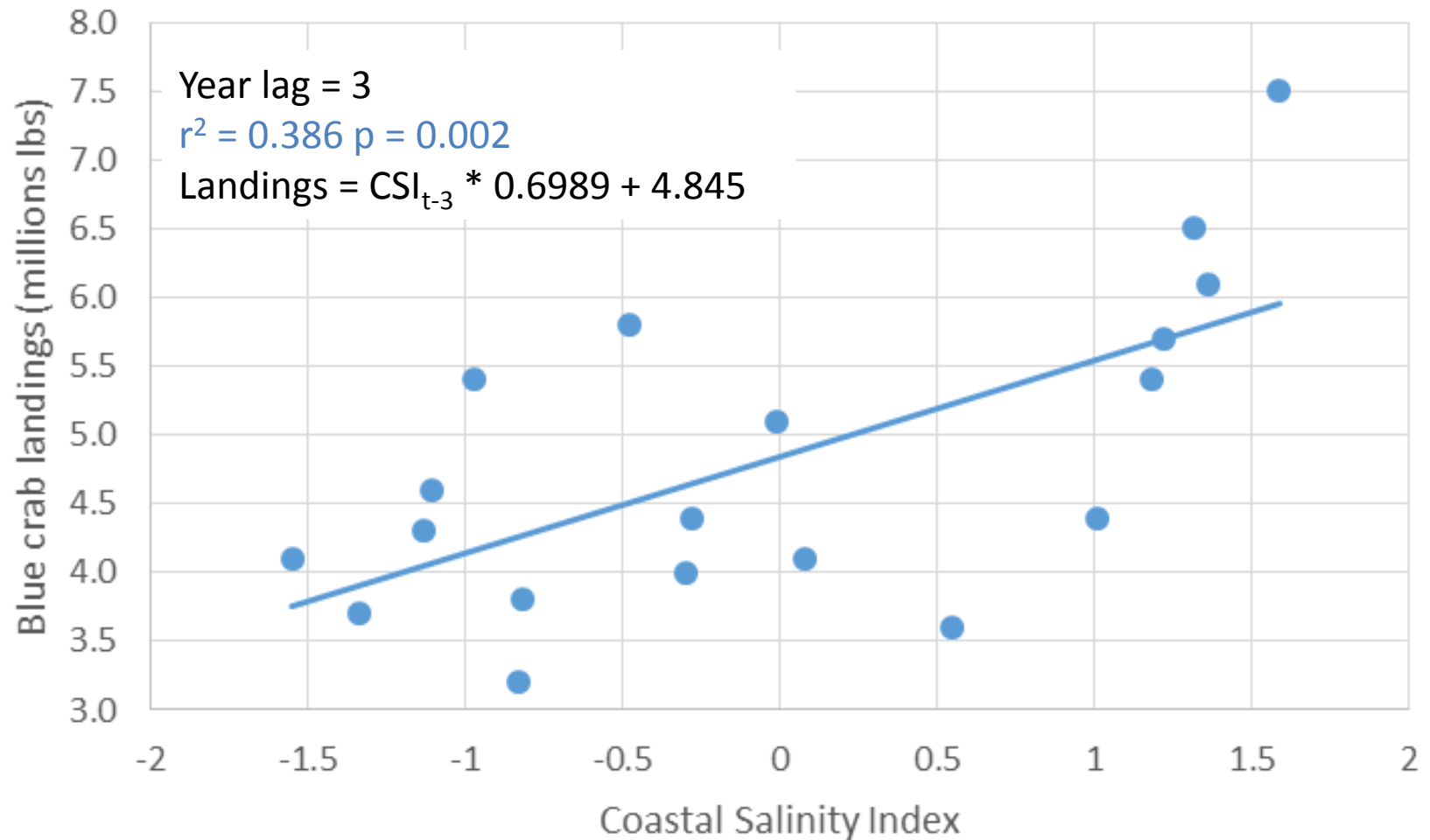
Coastal Salinity Index (CSI)



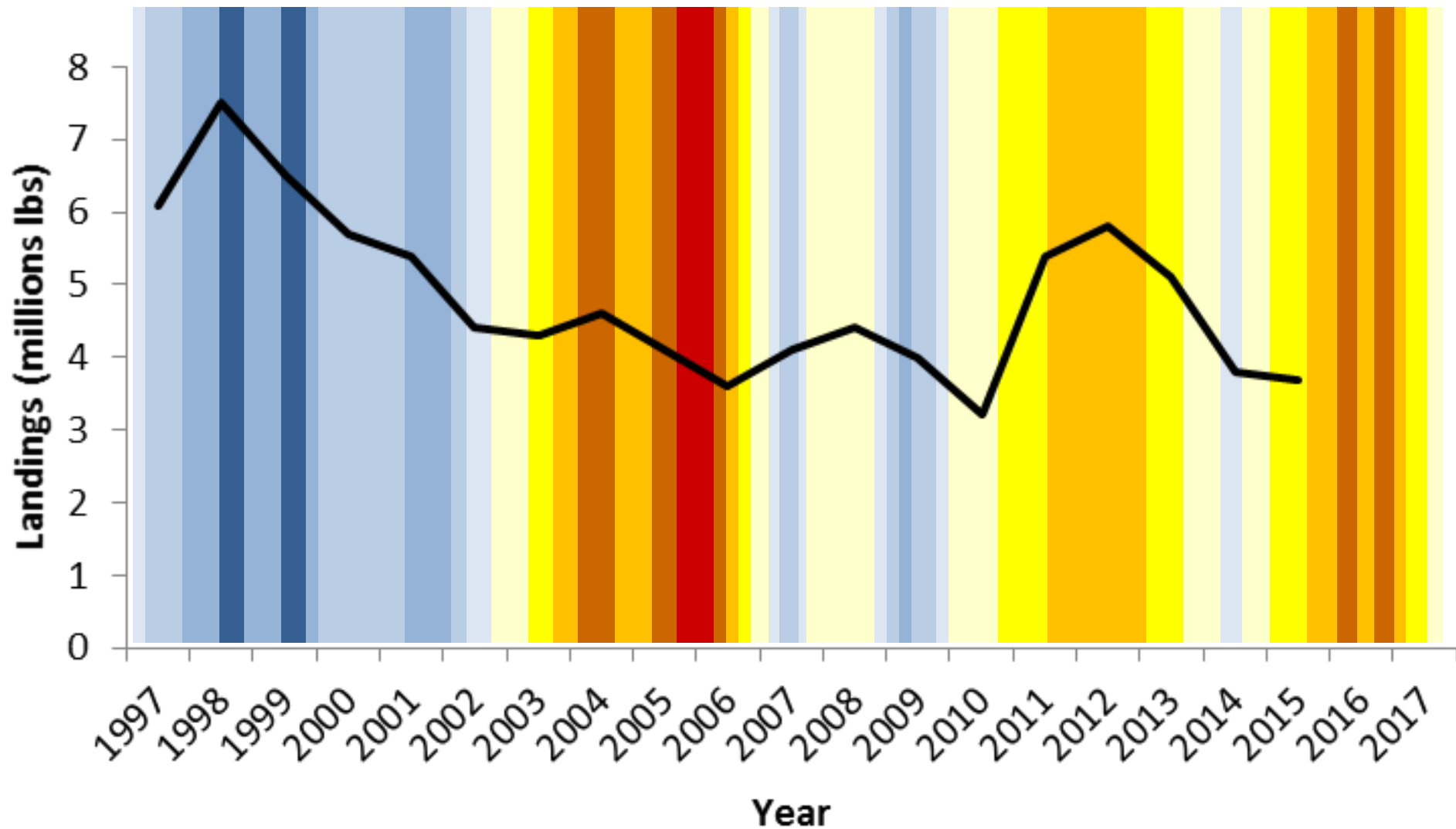
Coastal Salinity Index (CSI)



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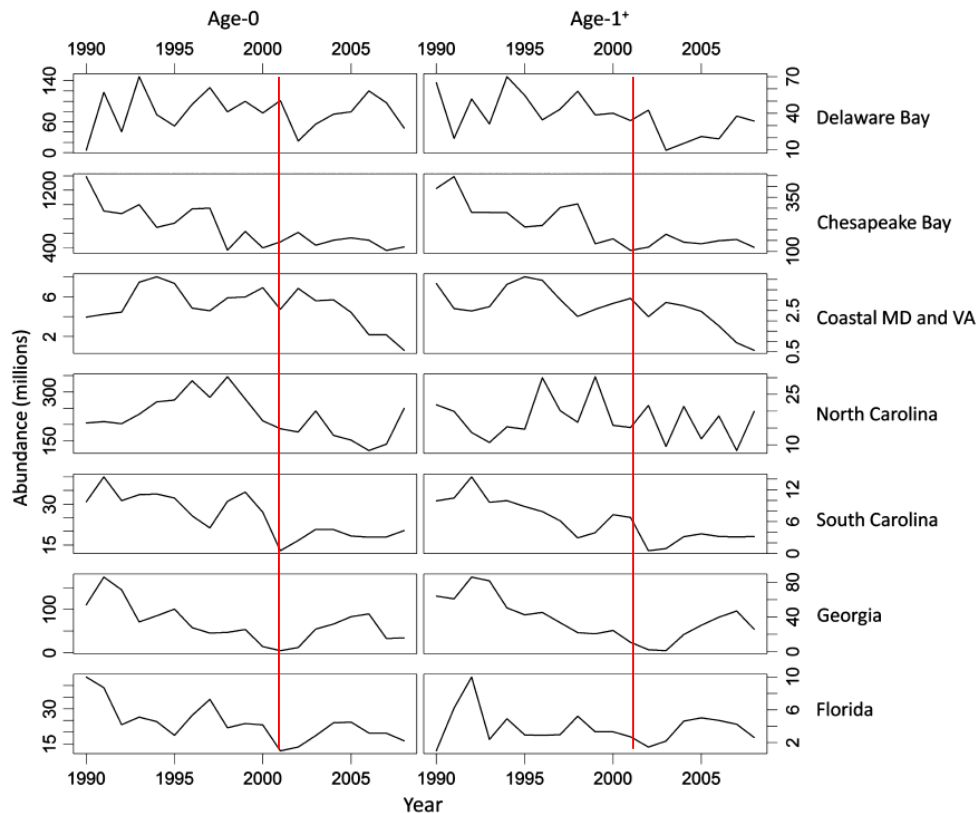
CSI Predicts SC Crab Landings



Coastal Salinity Index (CSI)

$$\text{Landings (million lbs)} = 0.6989 * \text{CSI}_{t-3} + 4.8451$$

SC Landings 2016 = 5.25 (4.73-5.72)



Conclusions

- How does drought impact blue crabs?
 - Increases disease and metabolic costs of migration
- Can we forecast future droughts?
 - Not specifically, but high degree of future occurrence
- Can we use drought forecasts to predict crab landings in South Carolina?
 - Yes, IBM model can forecast landings trends
- Can we use the Coastal Salinity Index to forecast US blue crab landings?
 - Yes, allows for extrapolation to other estuaries

Acknowledgements

- Funding

- NOAA-UCAR Subaward Z14-15056
- SC Sea Grant R/CF-10 & R/CF-15
- NERR Graduate Research Fellowship
- Clemson Research Incentive Fund

- Collaboration

- Clemson – M Ptacek
- ACE Basin NERR – A Segars, J Leffler
- SC DNR – D Whittaker, L DeLancey, A Fowler
- CISA – D Tufford, G Carbone, J Lu
- USGS – P Conrads

- Field assistants

- K Parmenter
- K Smith
- Conservation of Marine Resources Team



Questions?

