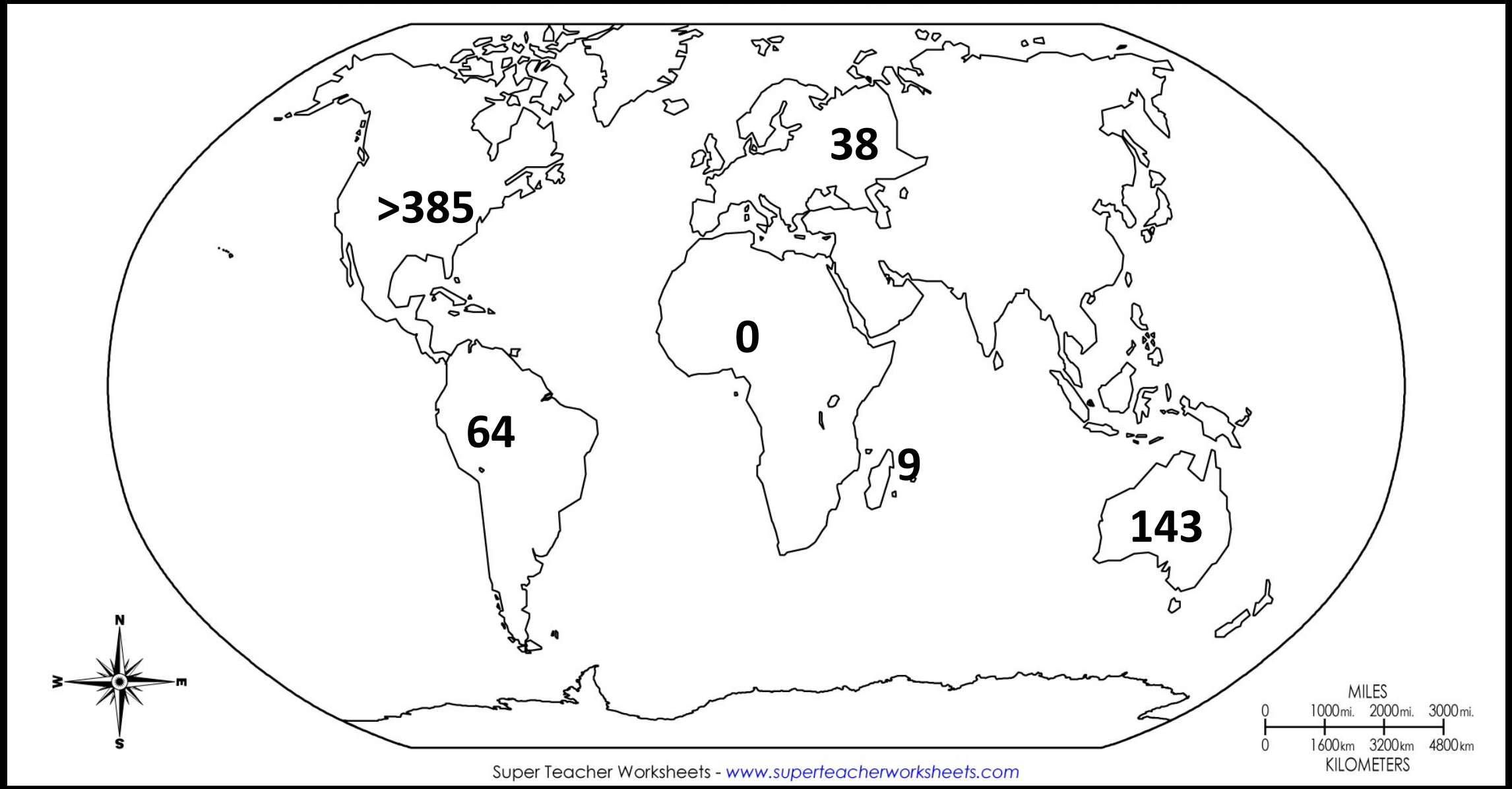
Recent research into invasive crayfishes of the Carolinas

Michael Kendrick
South Carolina DNR
kendrickm@dnr.sc.gov

SOUTH CAROLINA DEPARTMENT OF NATURAL RESOURCES

DNR



>385

38

0

64

9

143

N

W

E

S

MILES

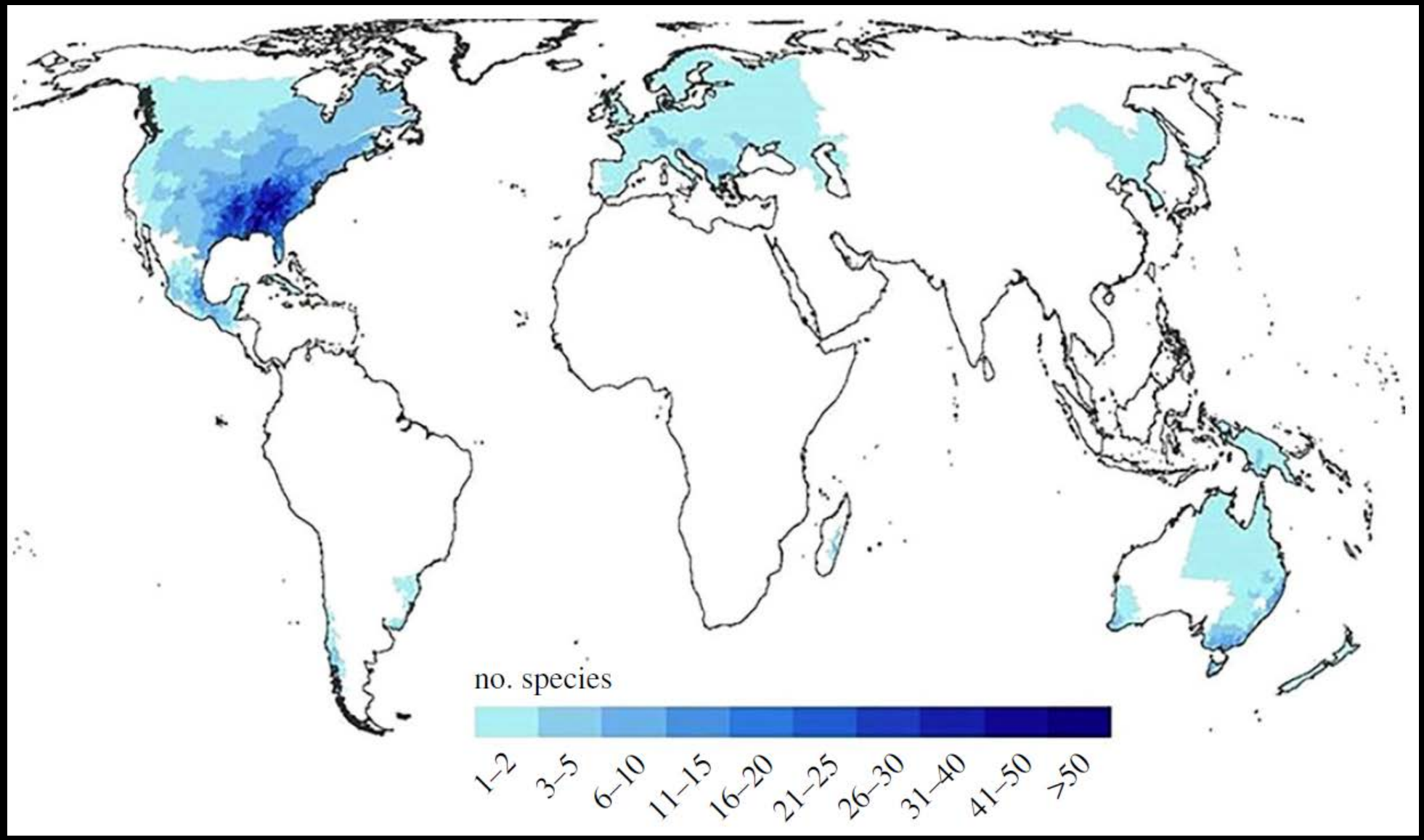
0 1000mi. 2000mi. 3000mi.

0 1600km 3200km 4800km

KILOMETERS

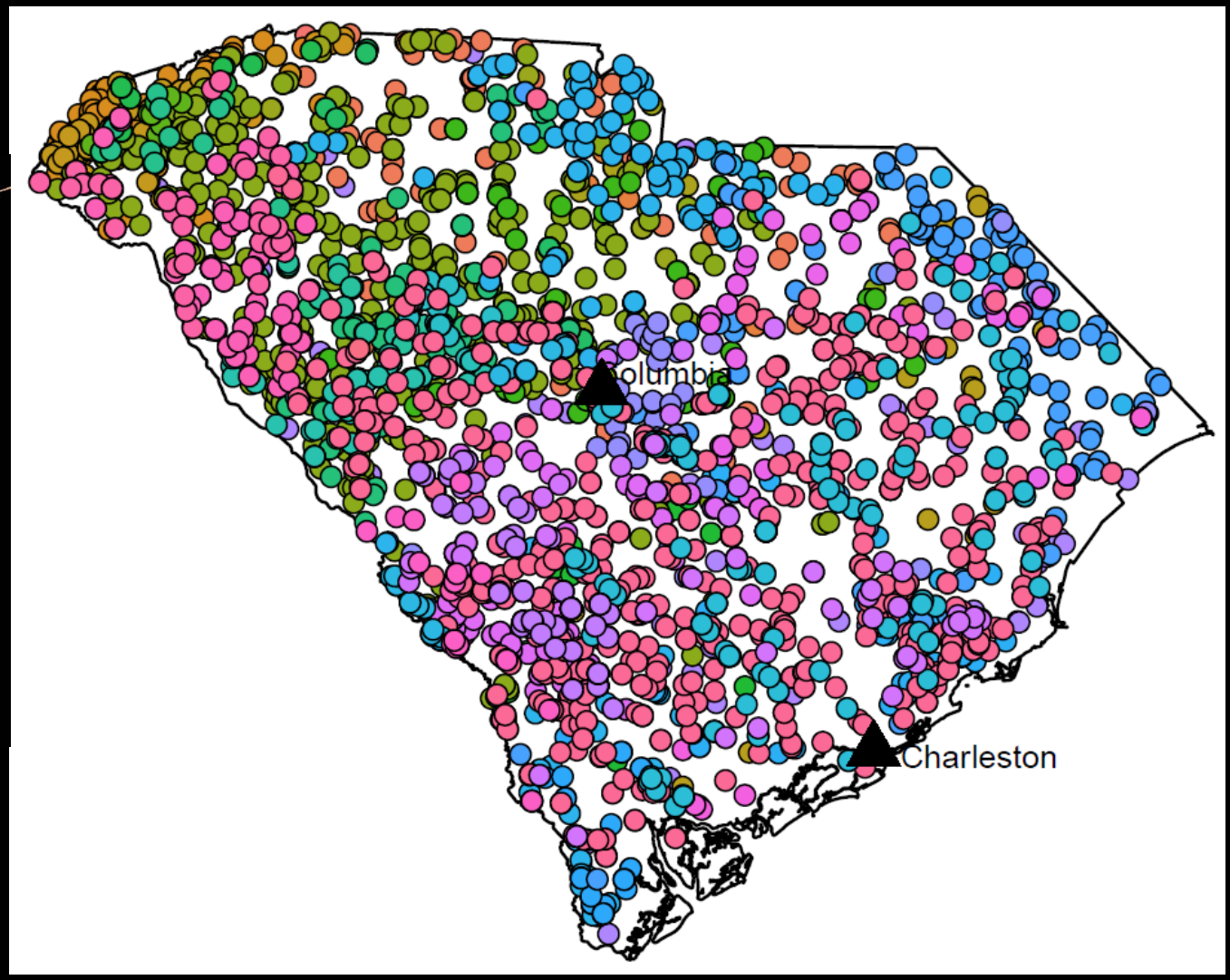
Super Teacher Worksheets - www.superteacherworksheets.com

High diversity centered in southeast US



40 Species of Crayfish in South Carolina

Procambarus acutus



Creaserinus fodiens

Data: updated from Eversole & Foltz 2015

Spread and impacts of non-native crayfish

1. Spread:
    1. Current distributions of key invasive crayfish
2. Impacts:
    1. Potential for hybridization
    2. Disease vectors

Native crayfish transplants in the US

1. Rusty crayfish
2. Virile crayfish
3. Red swamp crayfish
4. Cajun dwarf crayfish
5. Cumberland crayfish
6. Longnose crayfish
7. Big water crayfish
8. Ditch fencing crayfish
9. Western plains crayfish
10. Spiny stream crayfish
11. Belted crayfish
12. Woodland crayfish
13. Calico crayfish
14. Kentucky river crayfish
15. Golden crayfish
16. Ringed crayfish
17. Gap ringed crayfish
18. Allegheny crayfish
19. Creole painted crayfish
20. Northern clearwater crayfish
21. Sanborn crayfish
22. Conchas crayfish
23. White River crayfish
24. Everglades crayfish
25. Straightedge crayfish
26. Seminole crayfish
27. Southern white river crayfish

Source: USGS NAS Database

Native crayfish transplant threats to SC

1. Rusty crayfish
2. Virile crayfish
3. Red swamp crayfish

Rusty crayfish

Virile crayfish

Red swamp crayfish

Source: USGS NAS Database

Virile crayfish (Faxonius virilis) in the U.S.

- Prefer streams with moderate flow
- Bait introduction and intentional stocking for forage

USGS
science for a changing world

Rusty crayfish *(Faxonius rusticus)* in the U.S. (near SC/NC border)

- **I**nhabits lakes, ponds, and streams.
- Bait introduction and school pets
- Out-compete and displace native crayfish and reduce resources

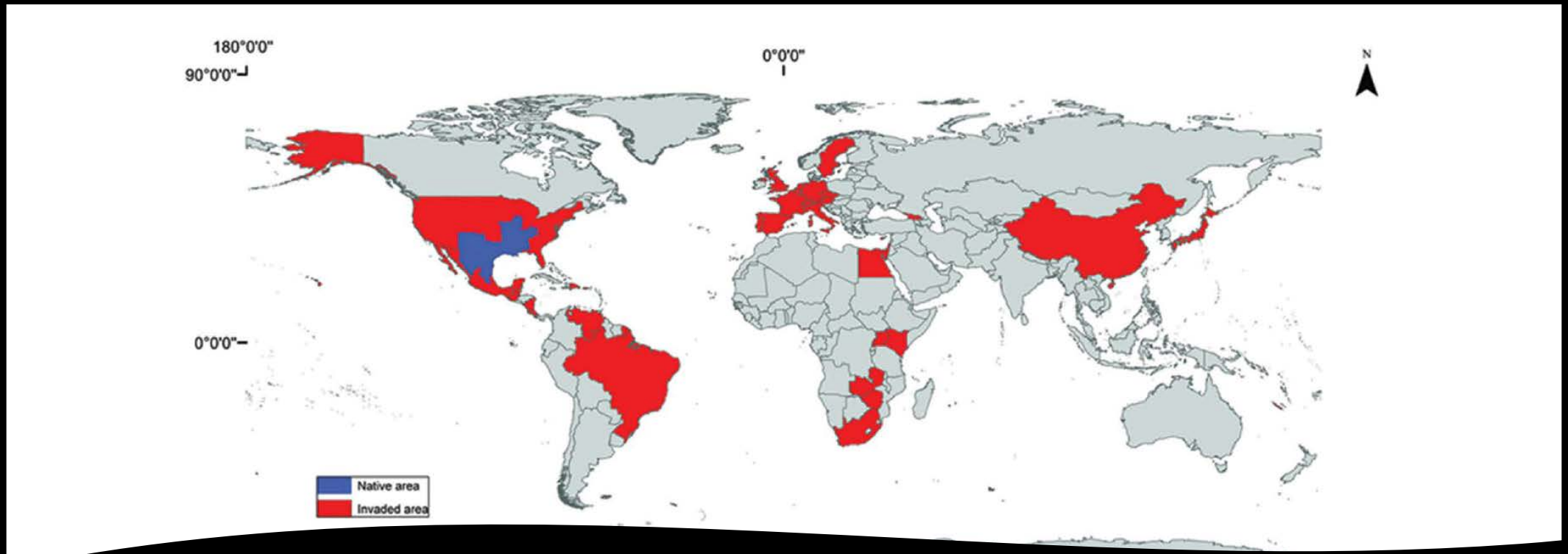
USGS
science for a changing world

Red swamp crayfish (*P. clarkii)* in the U.S.

- Rivers, lakes, ponds, streams, canals, seasonally flooded swamps, marshes, and ditches
  - prefer low flow

Red swamp crayfish

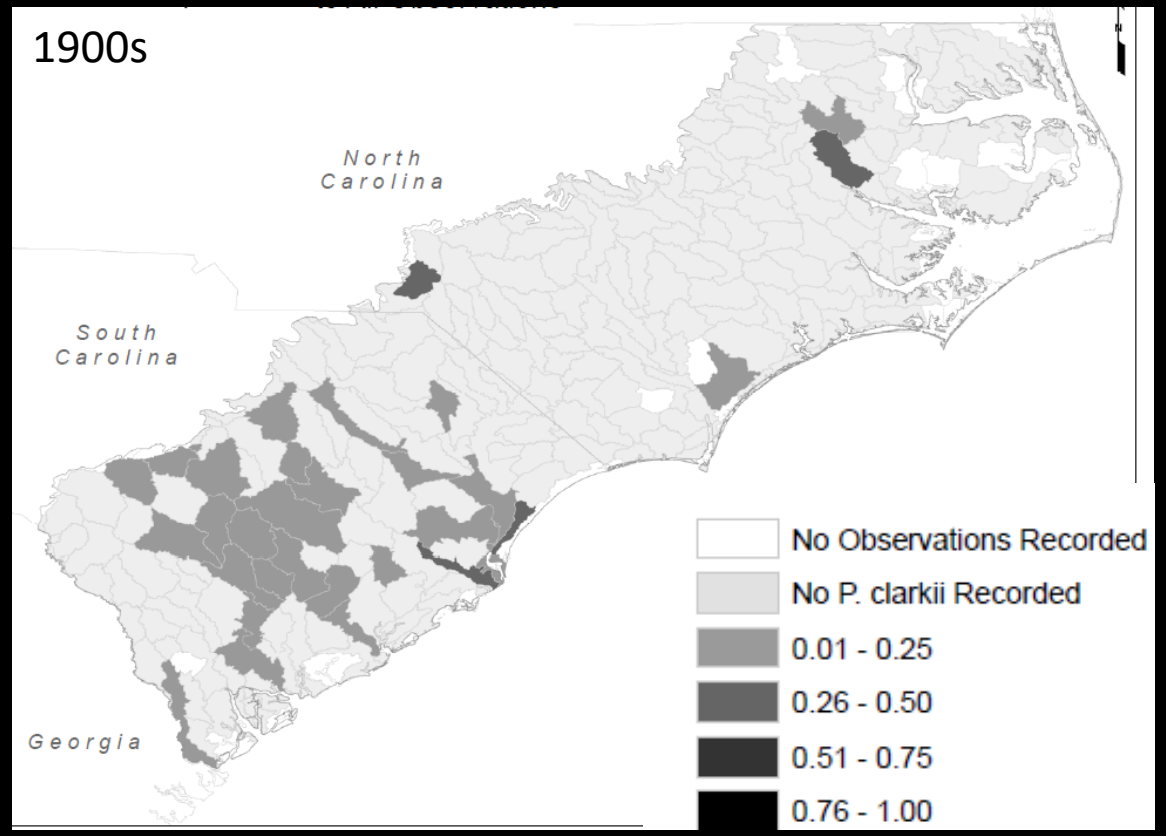
USGS
science for a changing world



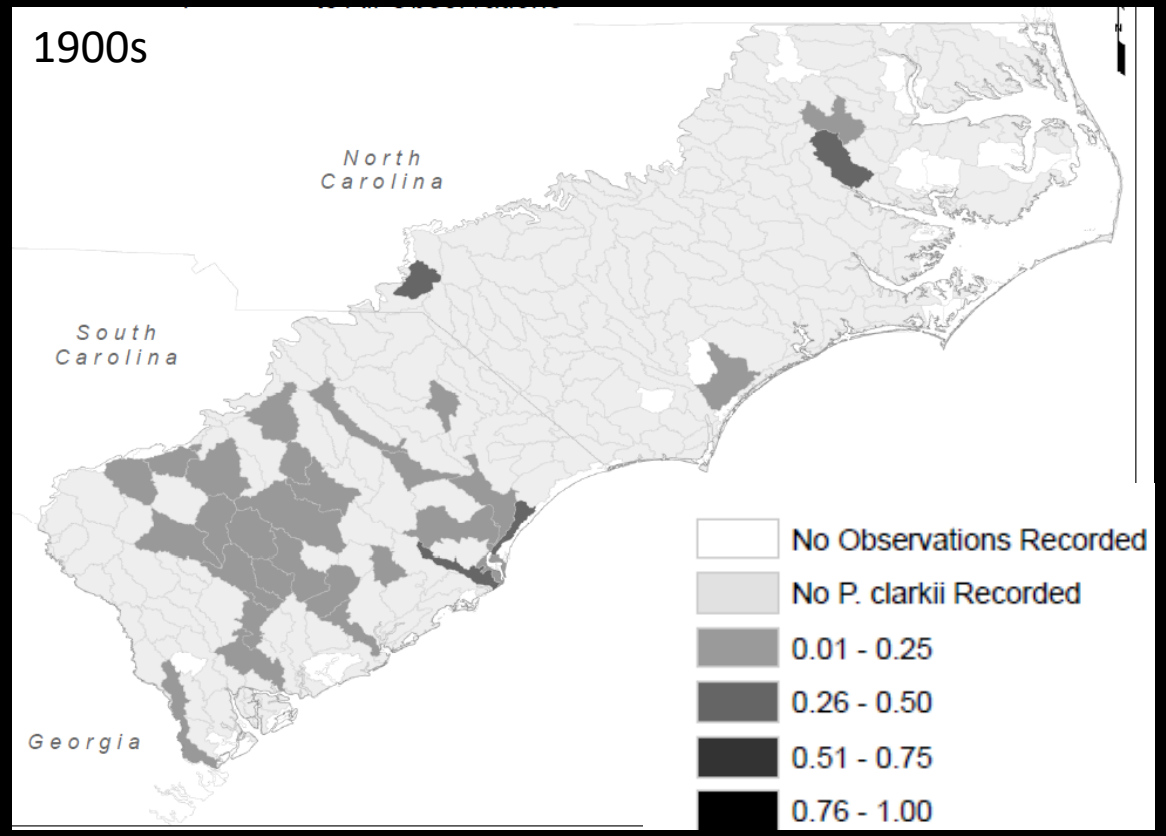
Procambarus clarkii: A global invader

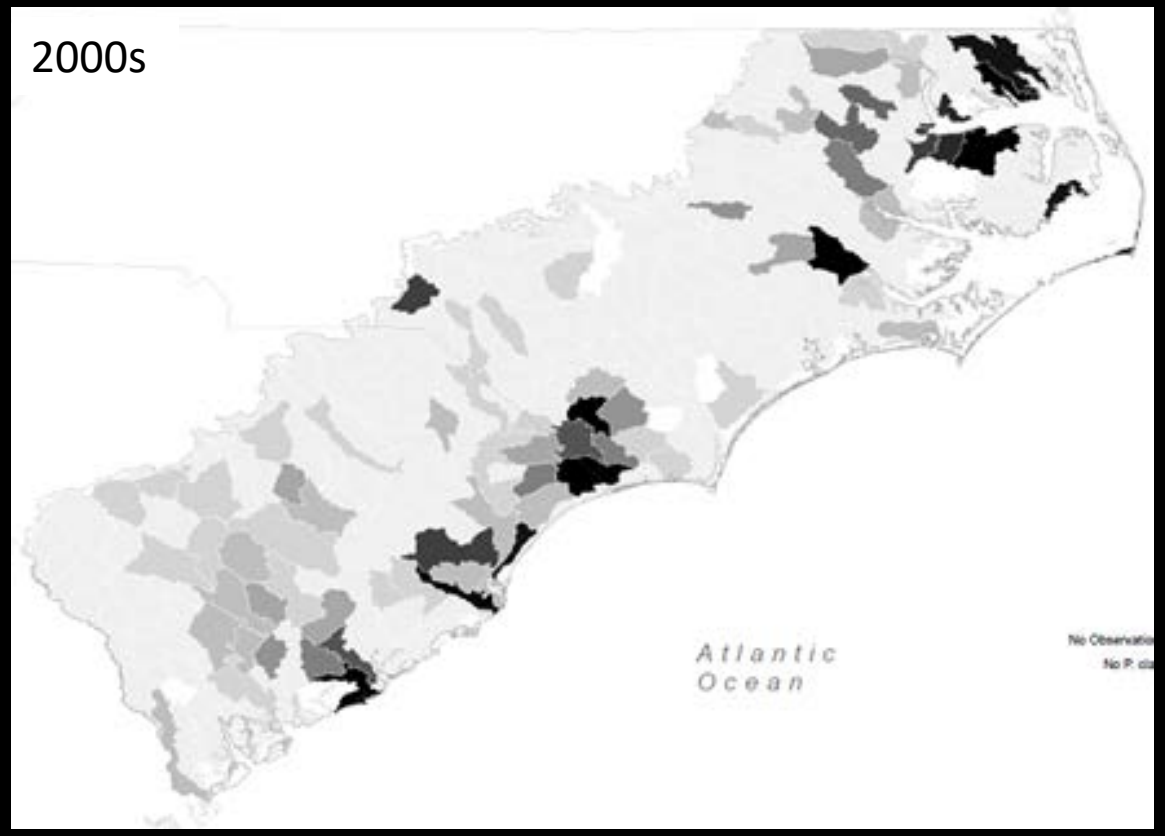
- Impacts:
  - Reduce macrophyte density
  - Outcompetes native animals
  - Vector for spreading parasites and other species
  - Agricultural and infrastructure (e.g., dam) pest
- Dispersal
  - release from aquaculture, aquarium trade, and schools

The spread of *P. clarkii*



The spread of *P. clarkii*





How is *P. clarkii* affecting native species?

- Current SIANSMP funded projects:
  - Potential hybridization with native crayfish
  - Vectors of disease for crayfish and other crustaceans

Is *P. clarkii* a vector for white spot syndrome virus?

- WSSV is highly pathogenic and Infects a range of crustaceans including white shrimp and blue crab

Photo credit: Aquaculture Pathology Laboratory, University of Arizona.

Is *P. clarkii* a vector for white spot syndrome virus?

- WSSV is highly pathogenic and Infects a range of crustaceans including white shrimp and blue crab
- Is found in wild and farmed *P. clarkii* in Louisiana.

Photo credit: Aquaculture Pathology Laboratory, University of Arizona.

Baumgartner et. al. 2009

Is *P. clarkii* a vector for white spot syndrome virus?

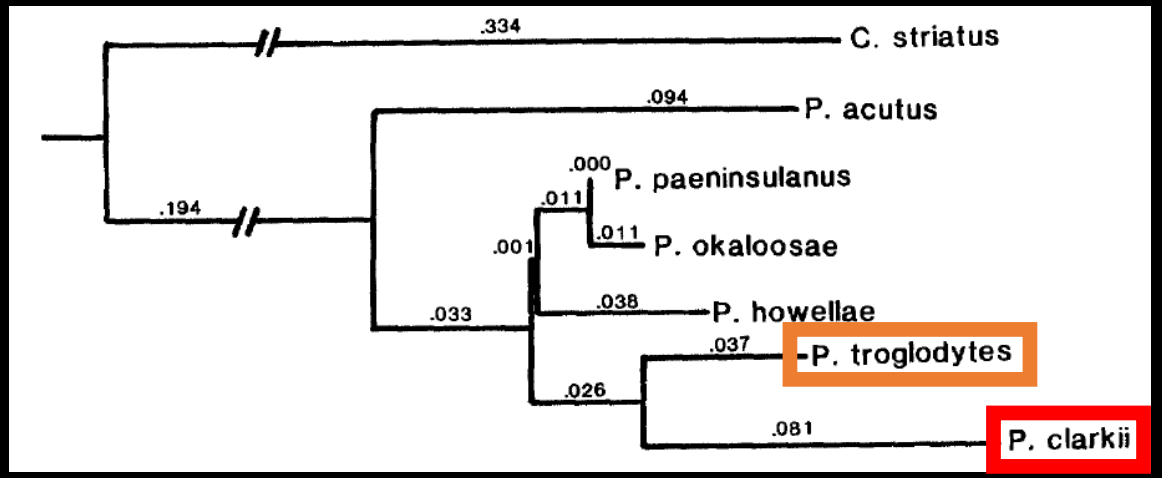
- WSSV is highly pathogenic and Infects a range of crustaceans including white shrimp and blue crab
- Is found in wild and farmed *P. clarkii* in Louisiana.
- SCDNR is testing *P. clarkii* near brackish water for WSSV
  - If present, represents significant threat to shrimp and blue crab

Photo credit: Aquaculture Pathology Laboratory, University of Arizona.

Baumgartner et. al. 2009

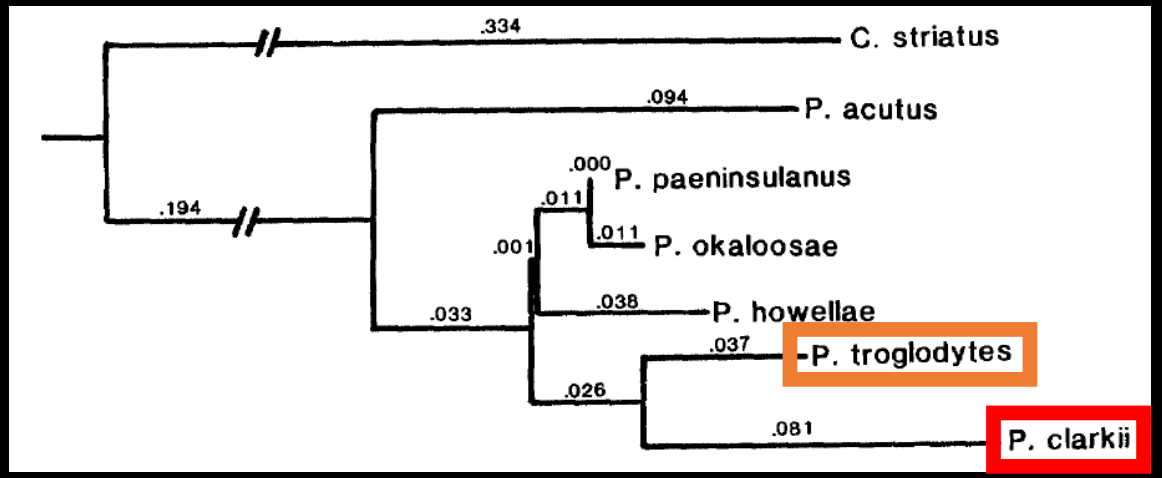
Does the invasive *P. clarkii* hybridize with native *P. troglodytes*?

- Many crayfish hybridize, but little is known about the process in *Procambarus*



Does the invasive *P. clarkii* hybridize with native *P. troglodytes*?

- Many crayfish hybridize, but little is known about the process in *Procambarus*
- SCDNR's genetic section is developing microsatellite markers to test for hybridization



Next steps for understanding non-native crayfish in the Carolinas

- Improve our understanding of introduction and dispersal events
- Better understand impacts of non-native crayfish on natural environments

NORTH CAROLINA
Museum of Natural Sciences

Acknowledgements

- SCDNR Crustacean Research and Monitoring Section
- Peter Kingsley-Smith
- Tanya Darden
- Bronwyn Williams
- Matt Walker
- Funding
  - USFWS SIANSMP
  - SC-State Wildlife Grant

Questions?

Michael Kendrick
South Carolina DNR
kendrickm@dnr.sc.gov

Procambarus troglodytes

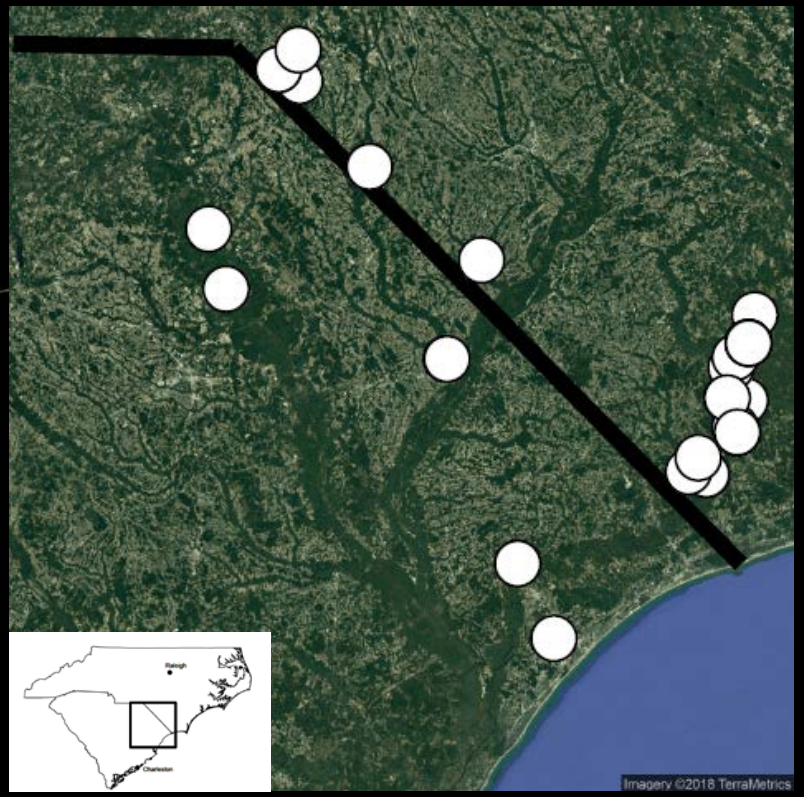
Procambarus acutus

Procambarus braswelli

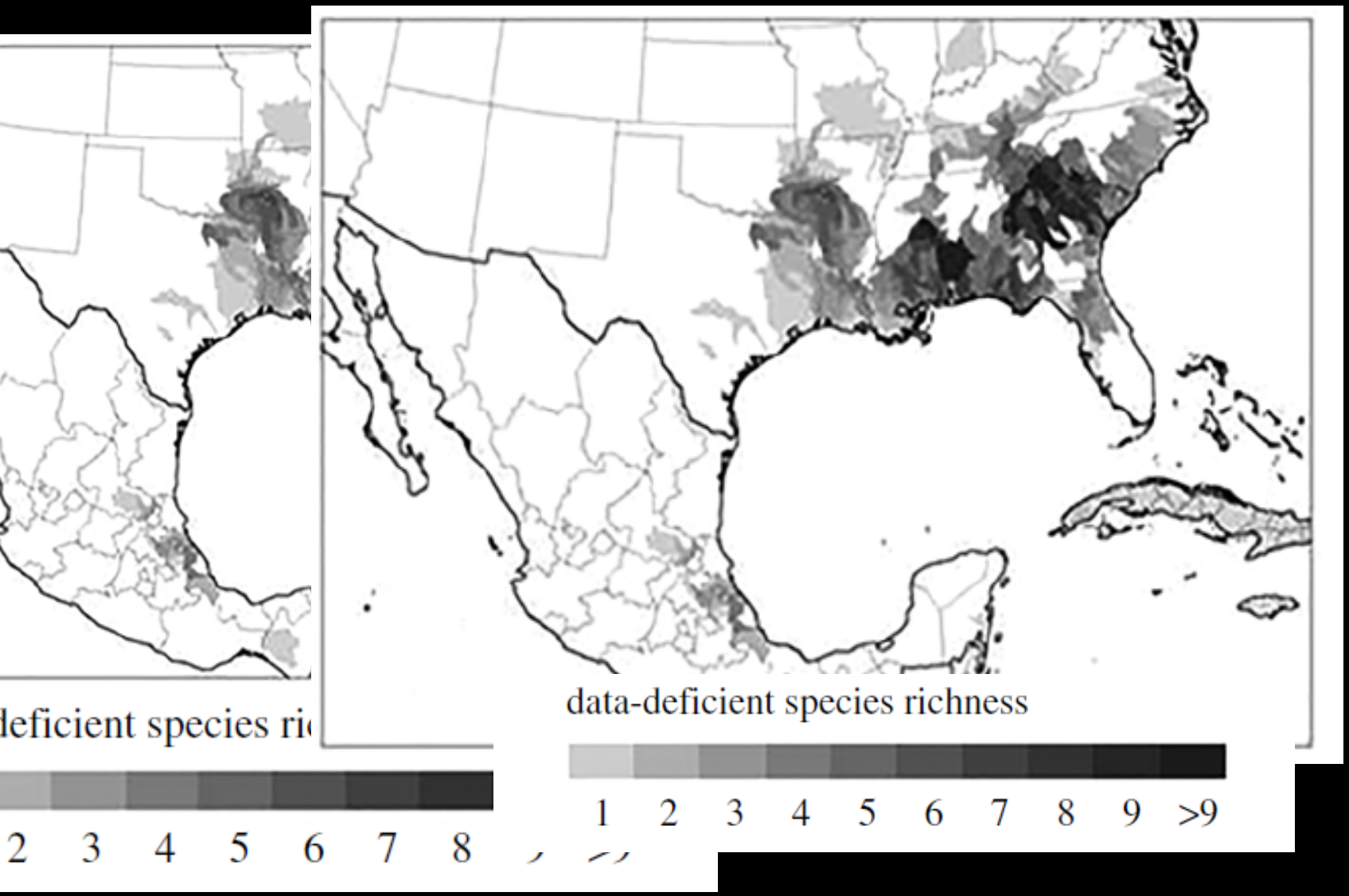
Procambarus lunzi

Creaserinus fodiens

Previously-documented locations for the Waccamaw Crayfish



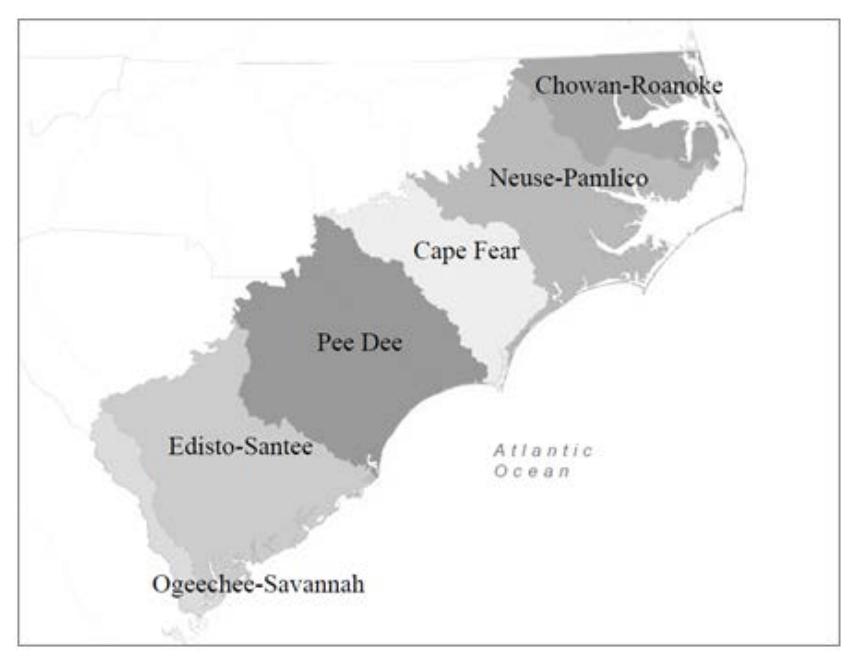
Coastal plain hold many data-deficient species

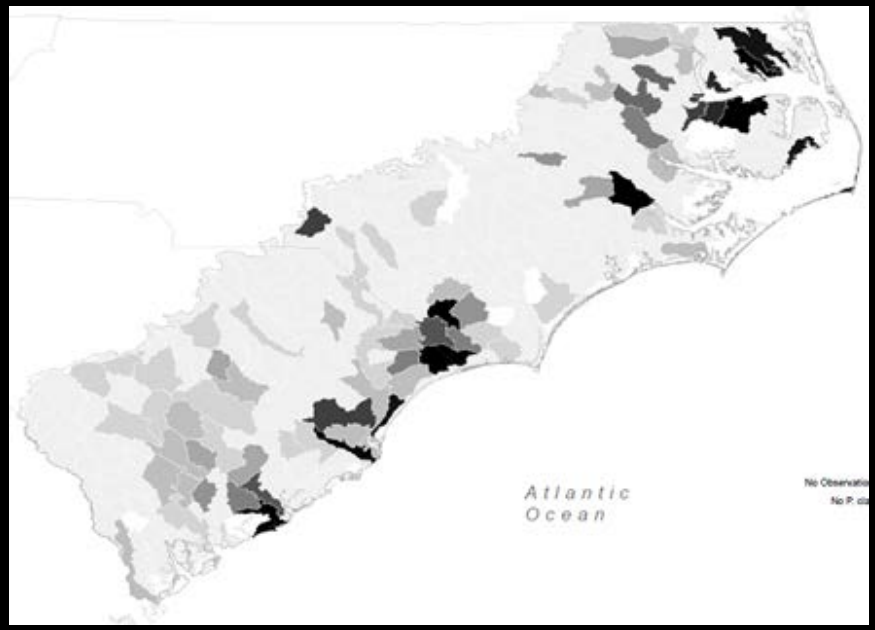


Richman et al. (2015)

Watershed approach

HUC4 -> HUC10





Objectives

1. Distribution of Faxonius in the Carolinas

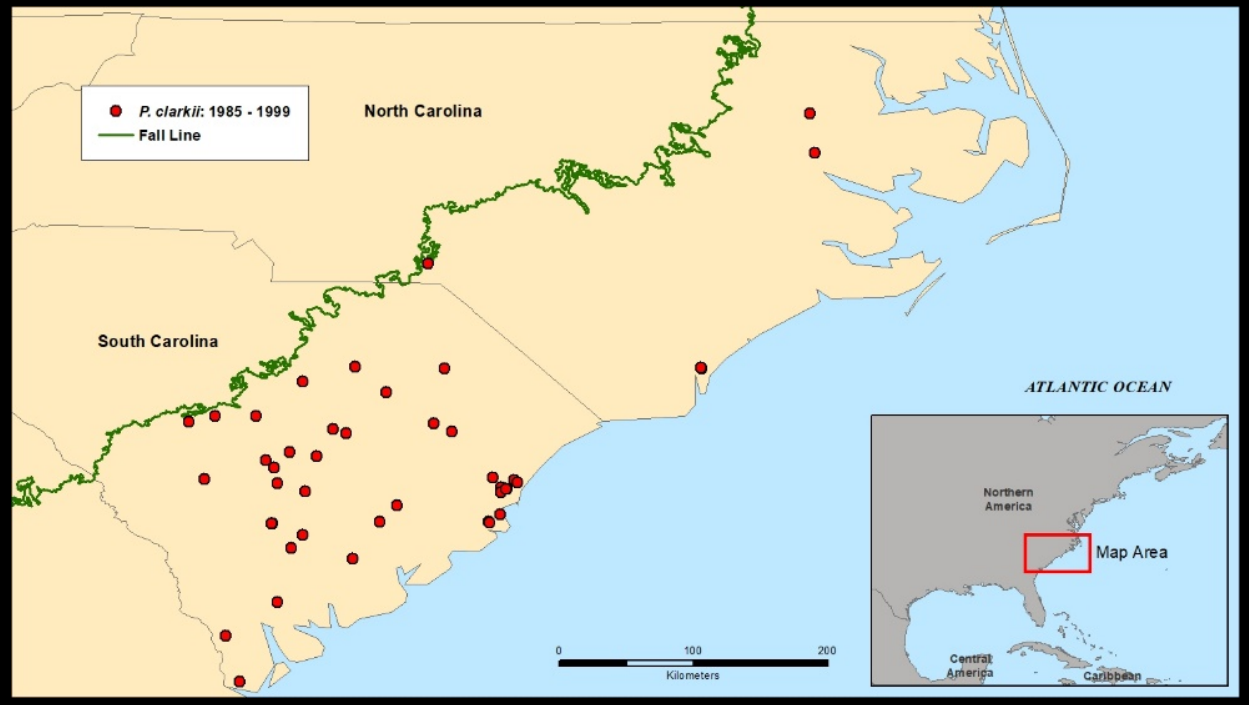
2. Compare temporal changes in the distribution of *P. clarkii* across watersheds.

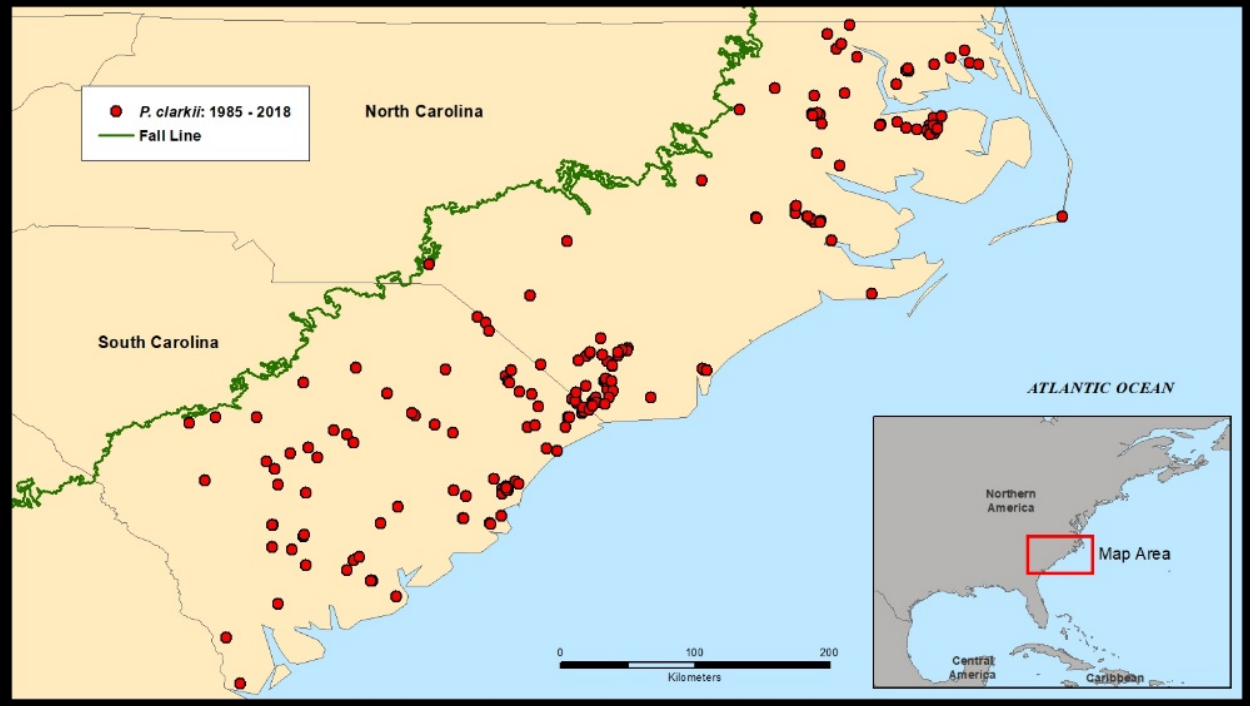
3. Pee Dee case study: Assess recent changes in crayfish community structure and associated declines in species of conservation concern

Objectives

1. Compare relative abundance of *P. clarkii* between the 1900s and 2000s.
   - Published, museum, and state records for coastal plain
2. Compare temporal changes in the distribution of *P. clarkii* across watersheds.
   - Mixed-effects logistic regression model
3. Pee Dee case study: Assess recent changes in crayfish community structure and associated declines in species of conservation concern
   - Ordination and tracking of the Waccamaw crayfish

The spread of *P. clarkii*



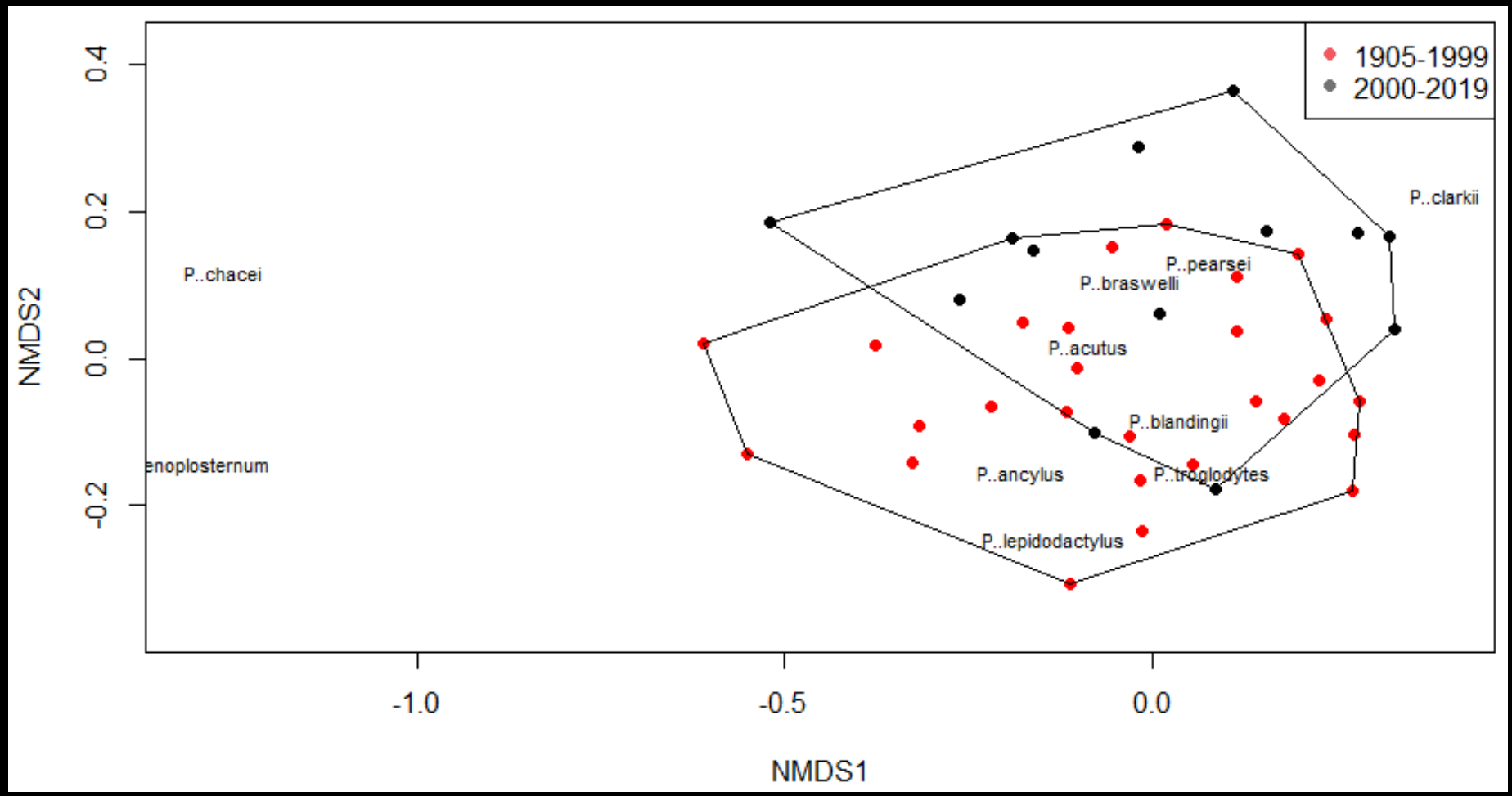


How do *P. clarkii* influence native crayfish assemblages?

Significant changes in crayfish assemblage structure in Pee Dee Basin

Procambarus braswelli

Procambarus acutus



Red swamp crayfish

PERMANOVA; p=0.003