

Understanding non-native crayfish in South Carolina



Michael R. Kendrick, PhD

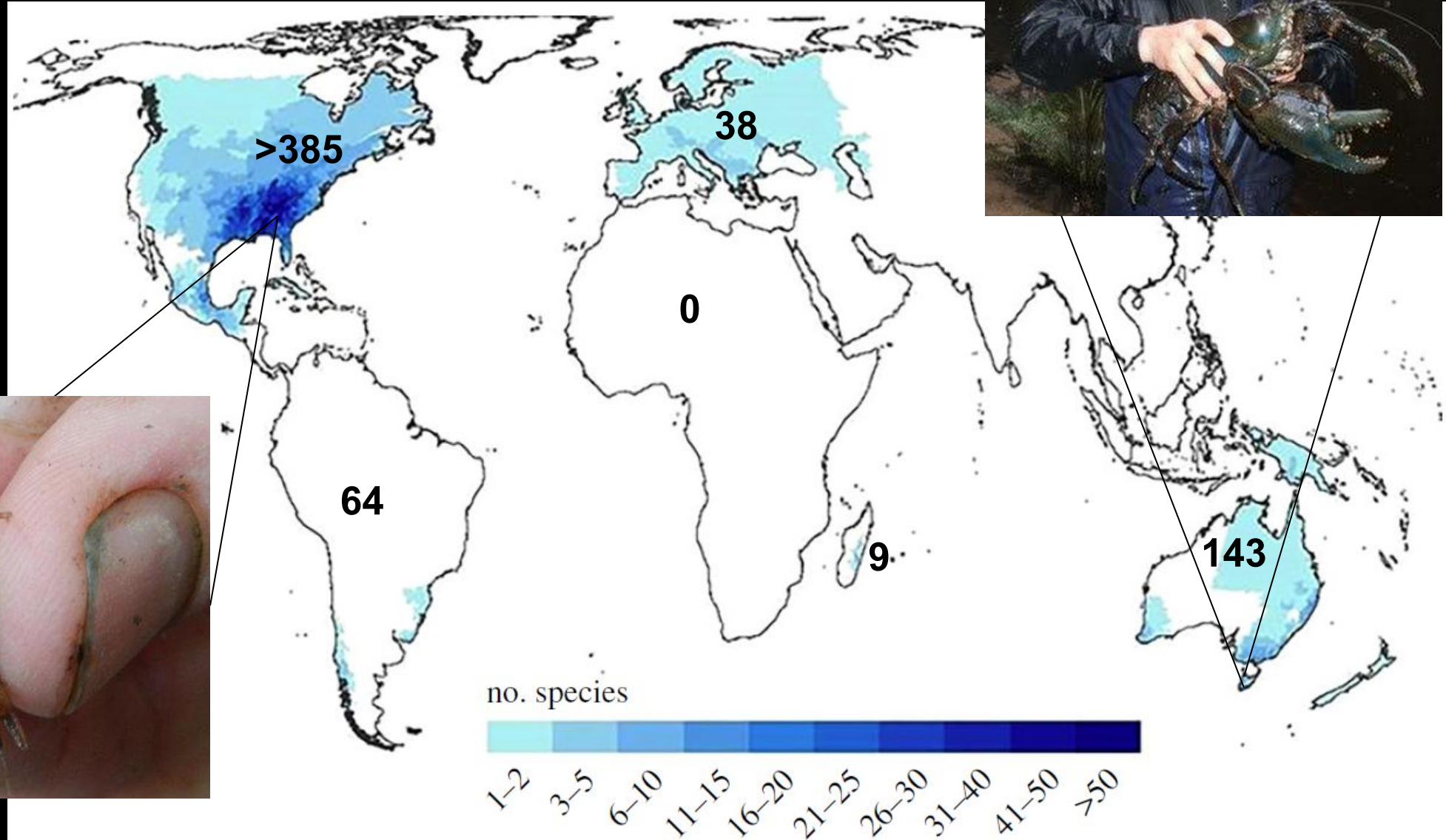
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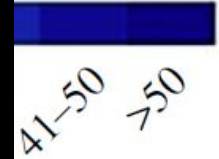
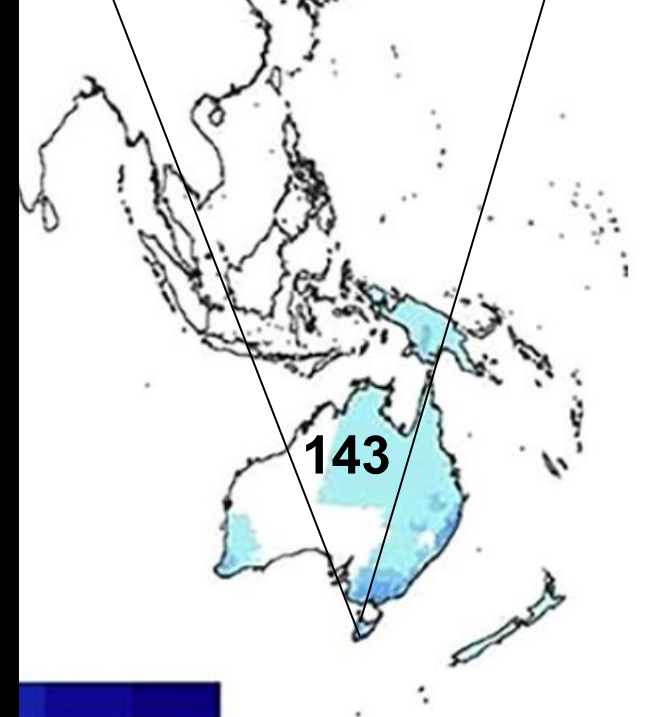
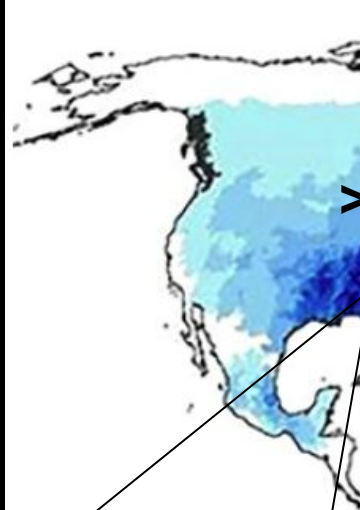


crustacean research & monitoring section

Southeastern US is hotspot of crayfish diversity



Southeastern US is hotspot of crayfish diversity



Threats to natives

- Water quality
- Data-deficiencies
- Taxonomic uncertainty
- Invasive species
 - Especially other crayfish



Objectives

1. Overview of non-native crayfish in SC
2. Assess distribution and potential impacts of Louisiana Red Swamp Crayfish in SC

Pet store surveys (Purchased from local pet stores)



Procambarus alleni
Non-native



Procambarus clarkii
Non-native

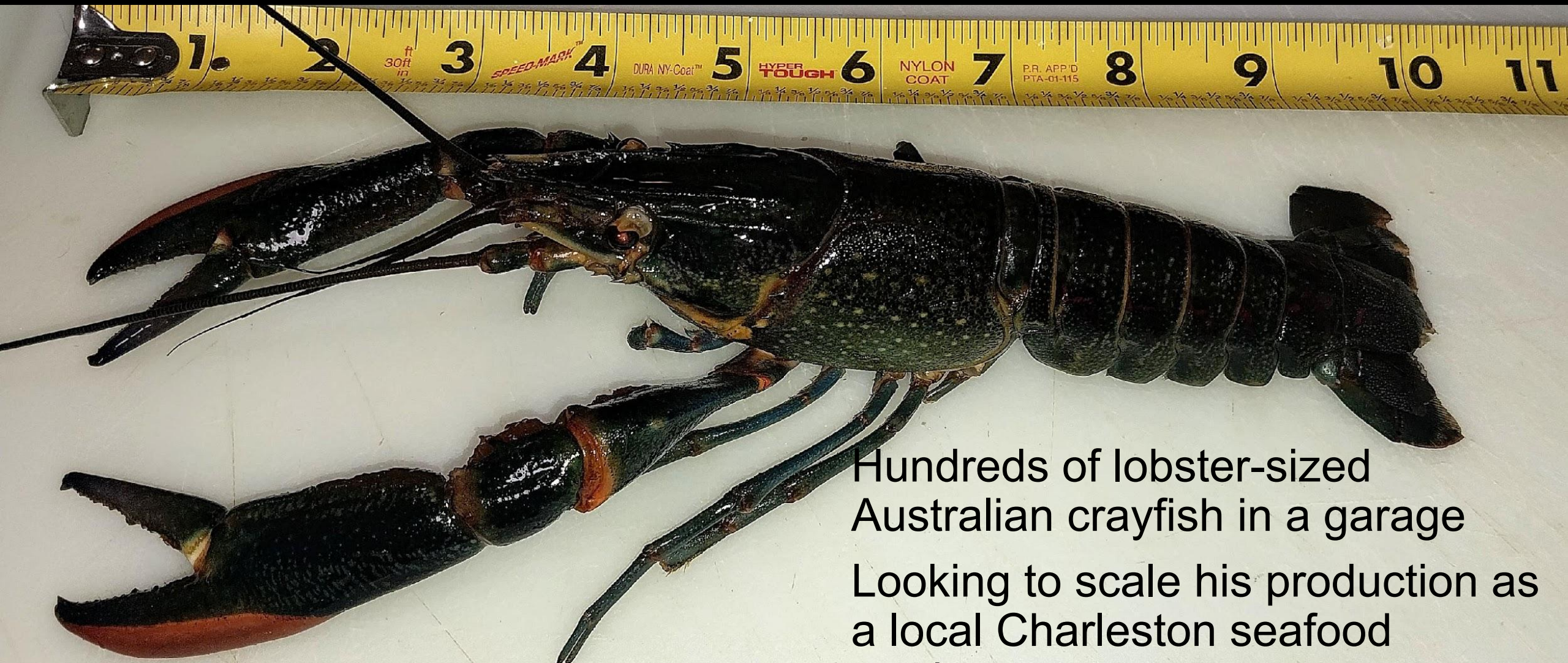


Cambarellus shufeldtii
Non-native



Procambarus chacei
Native

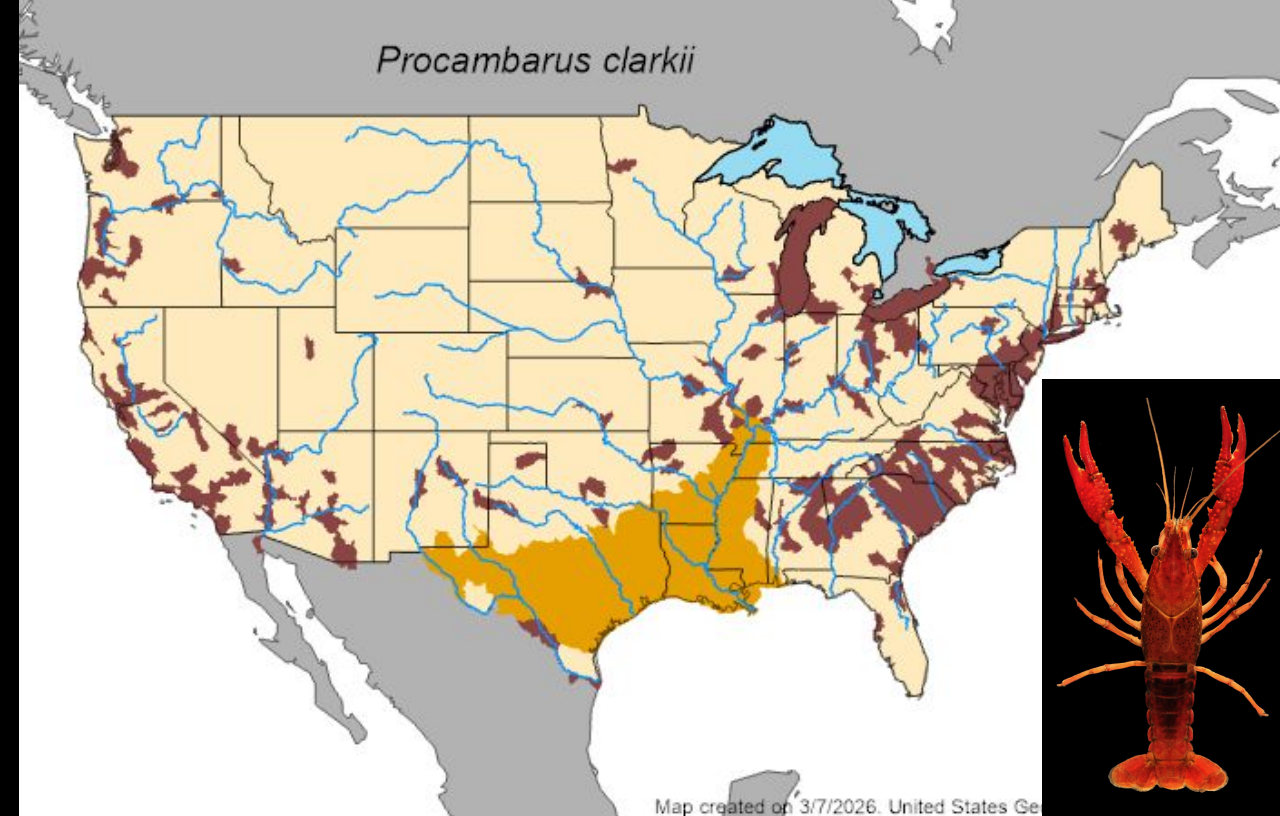
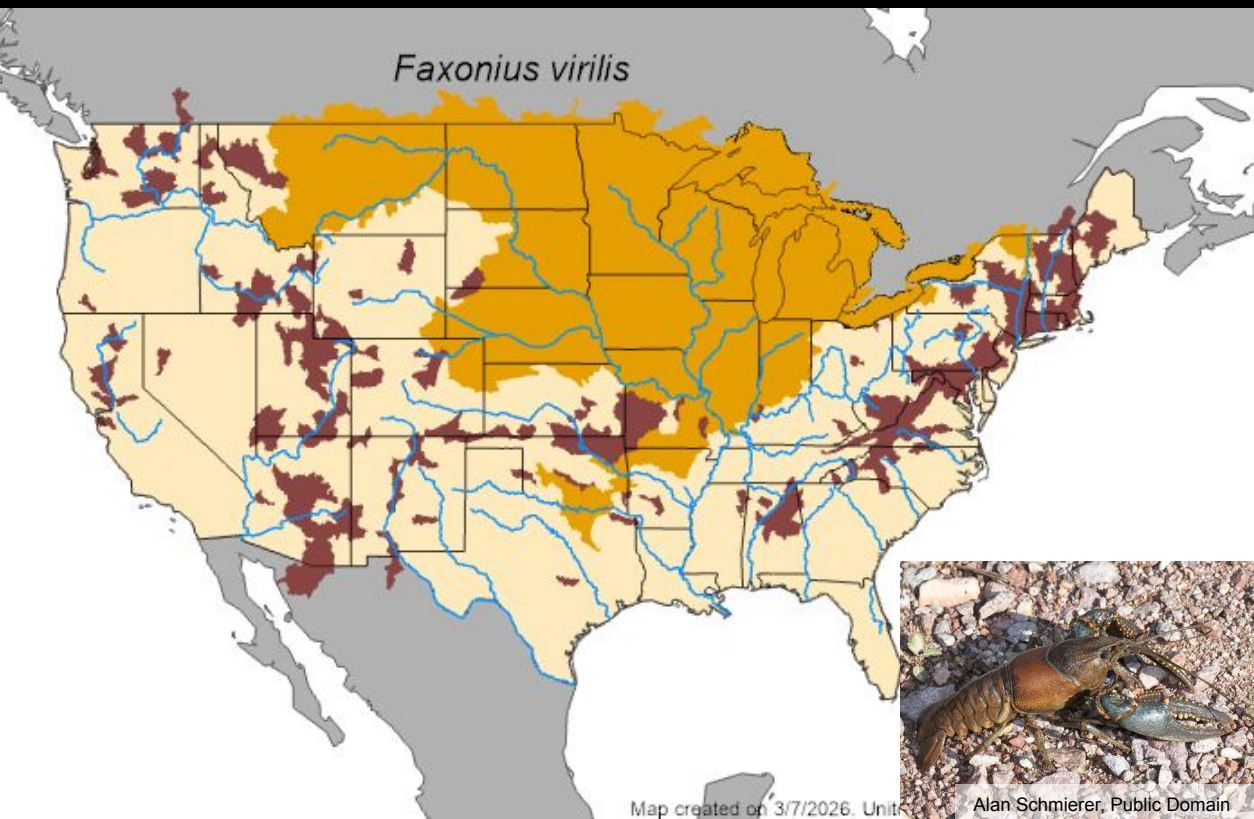
Cherax in South Carolina



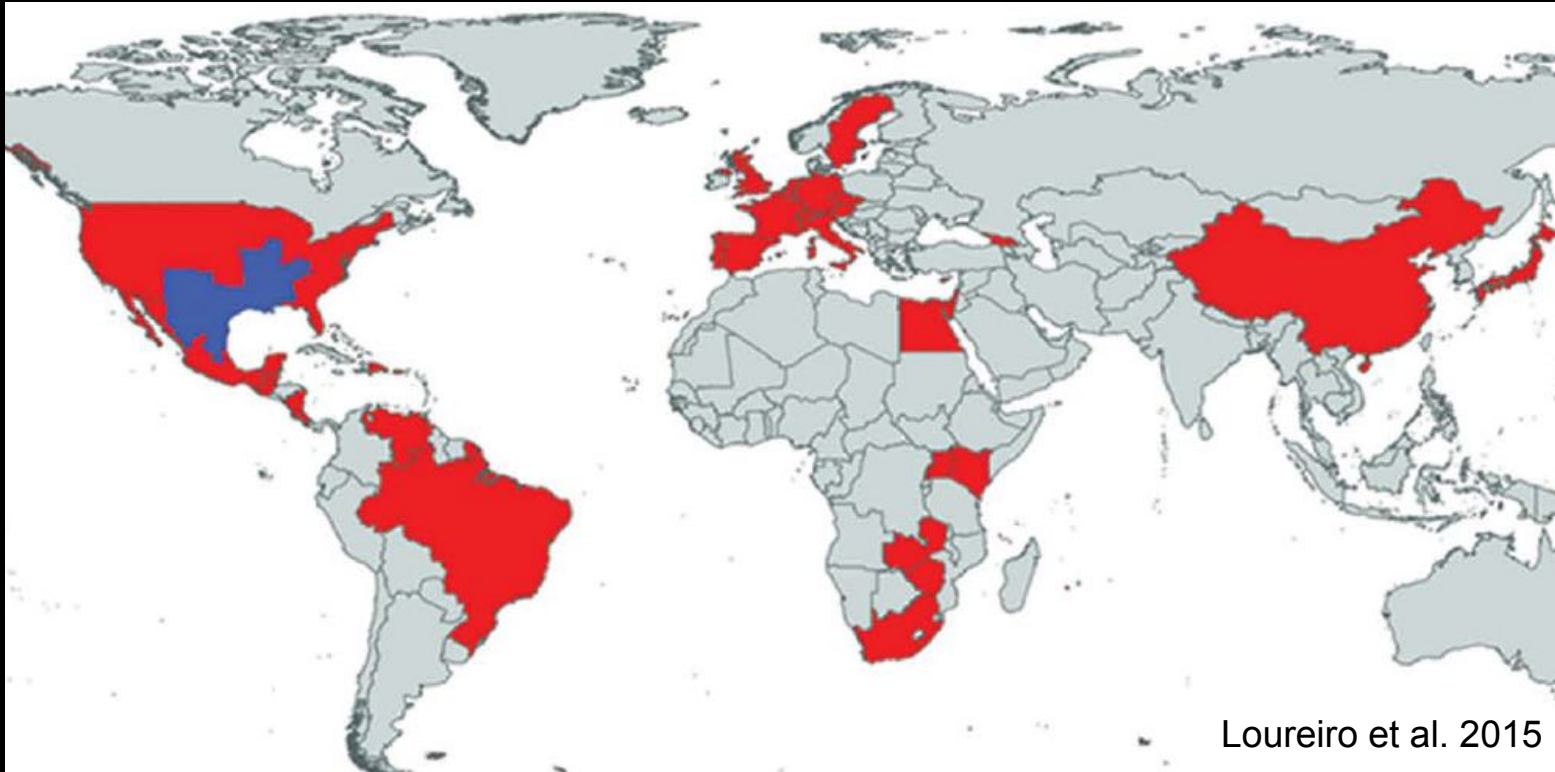
Hundreds of lobster-sized
Australian crayfish in a garage

Looking to scale his production as
a local Charleston seafood
product

Established in the wild



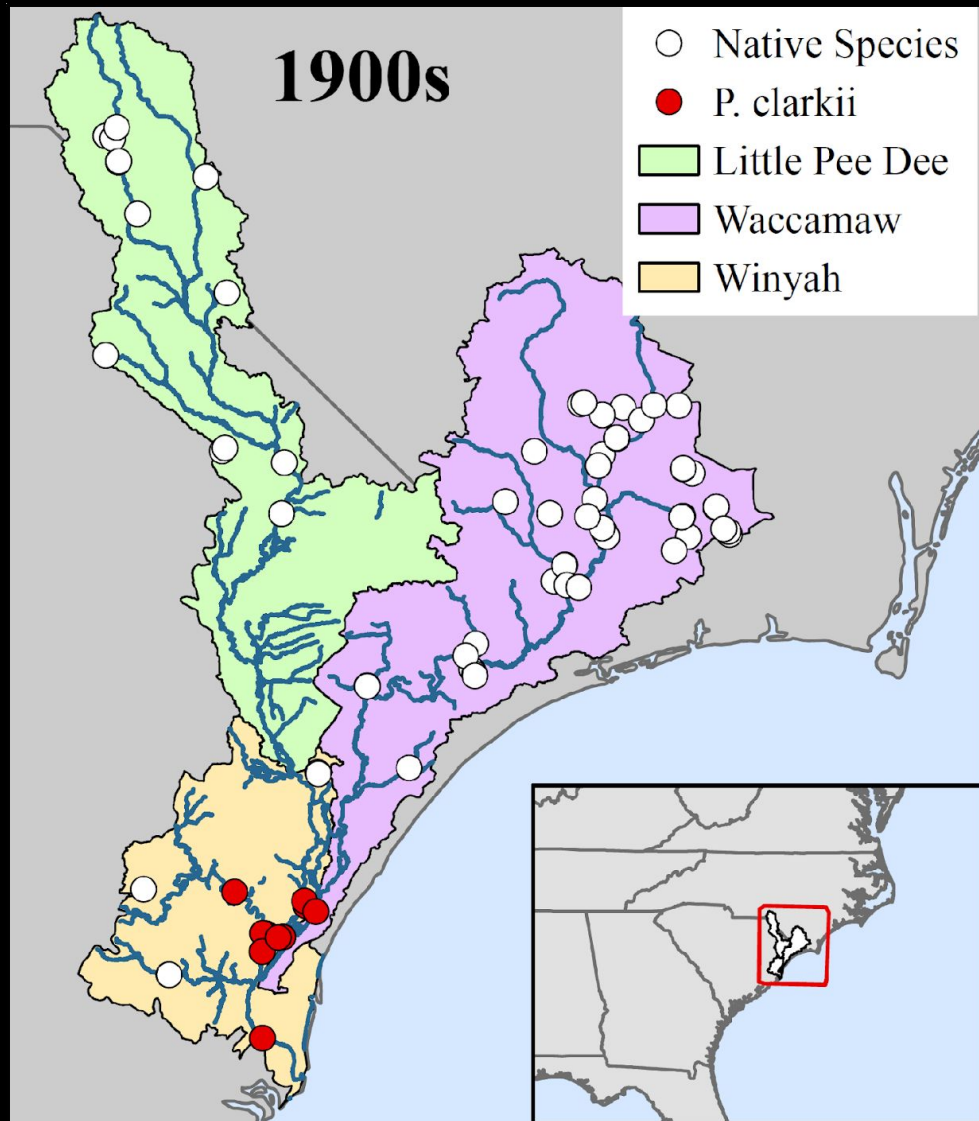
Louisiana Red Swamp Crayfish (*Procambarus clarkii*): A global invader



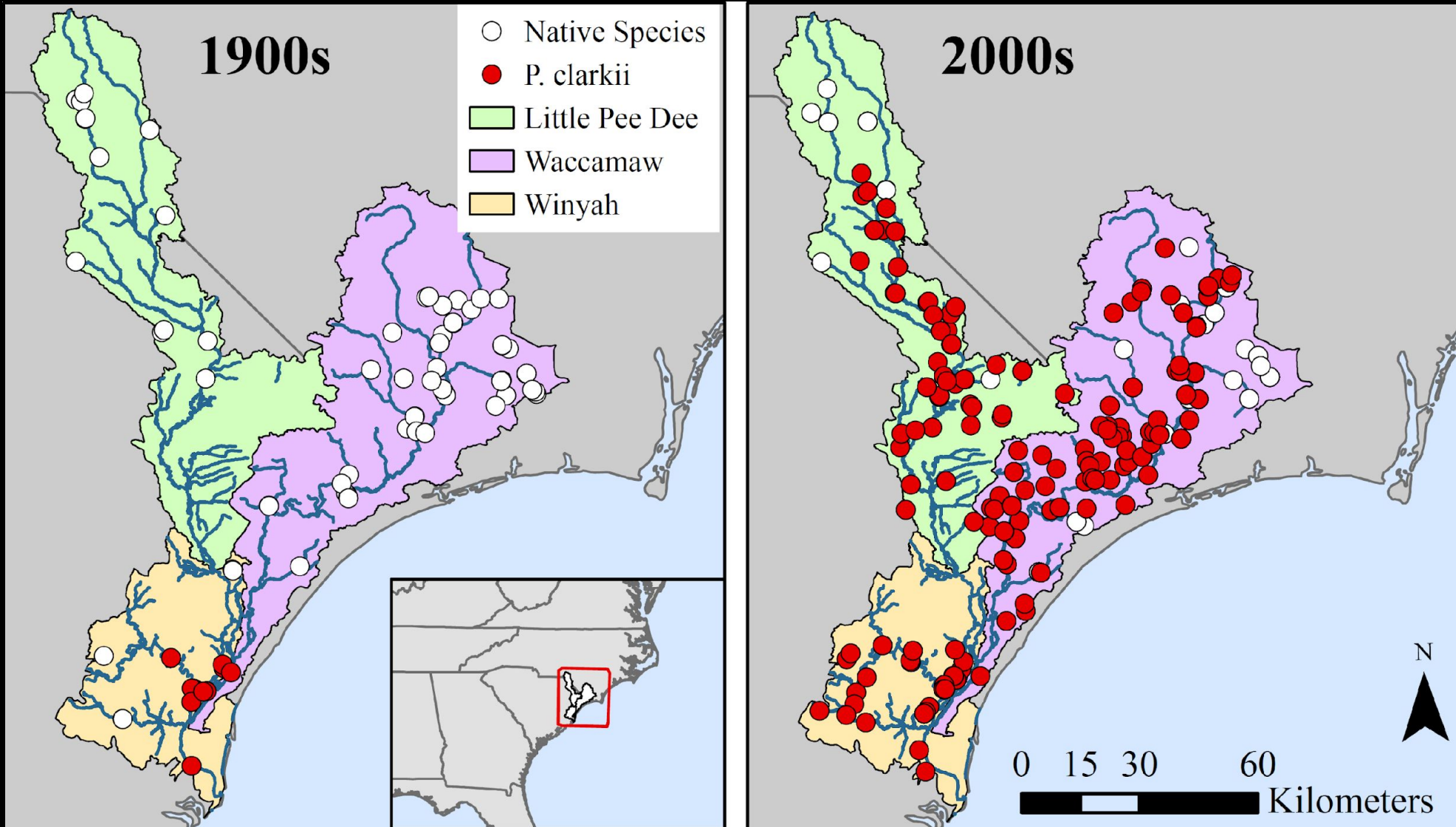


Compile historic
information and collect
new data

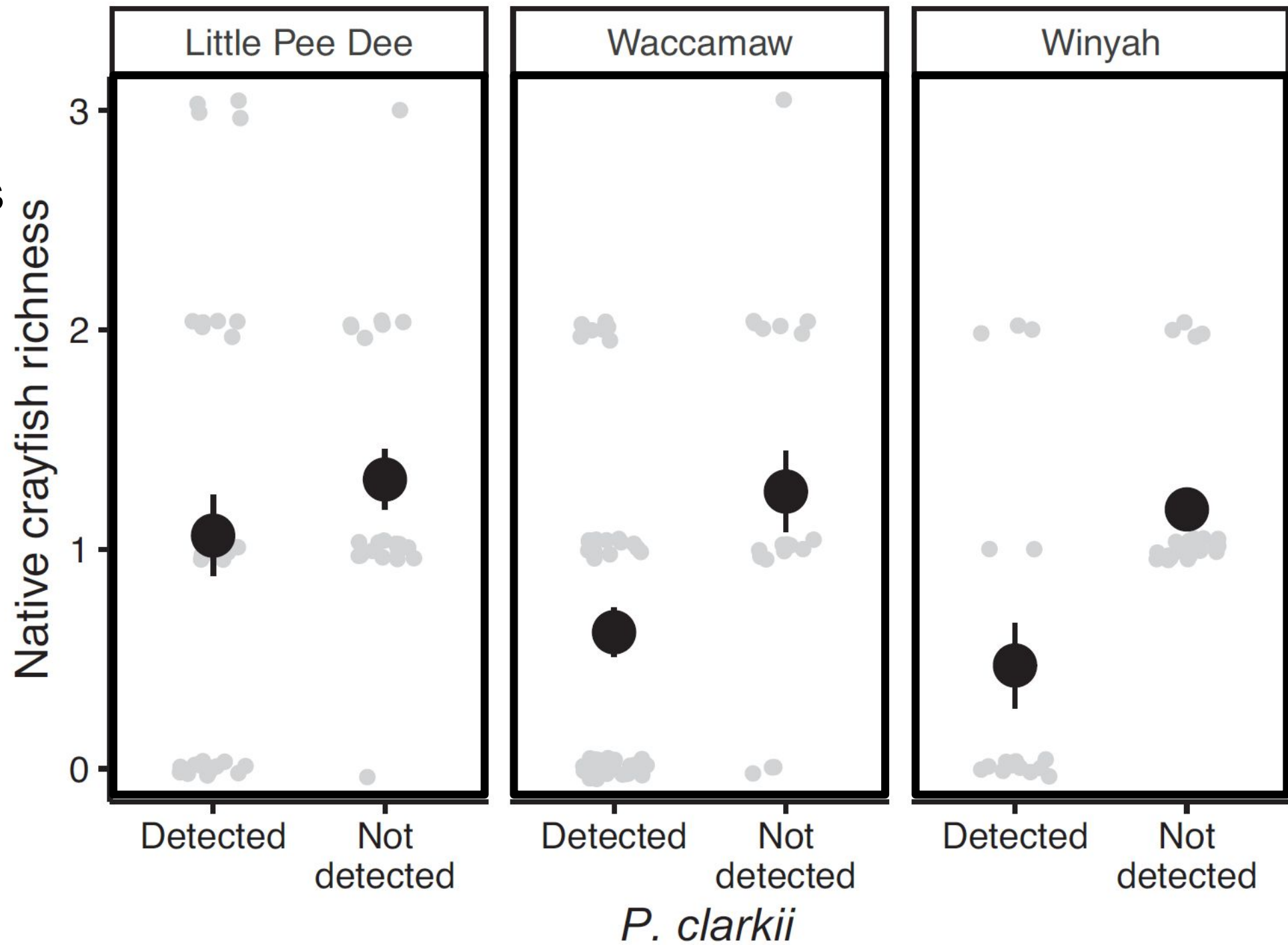
Historic distribution



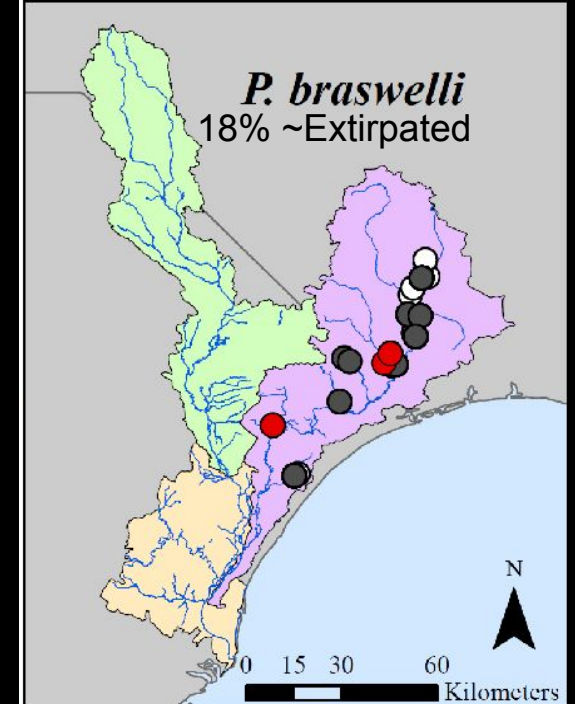
Historic distribution & rapid spread



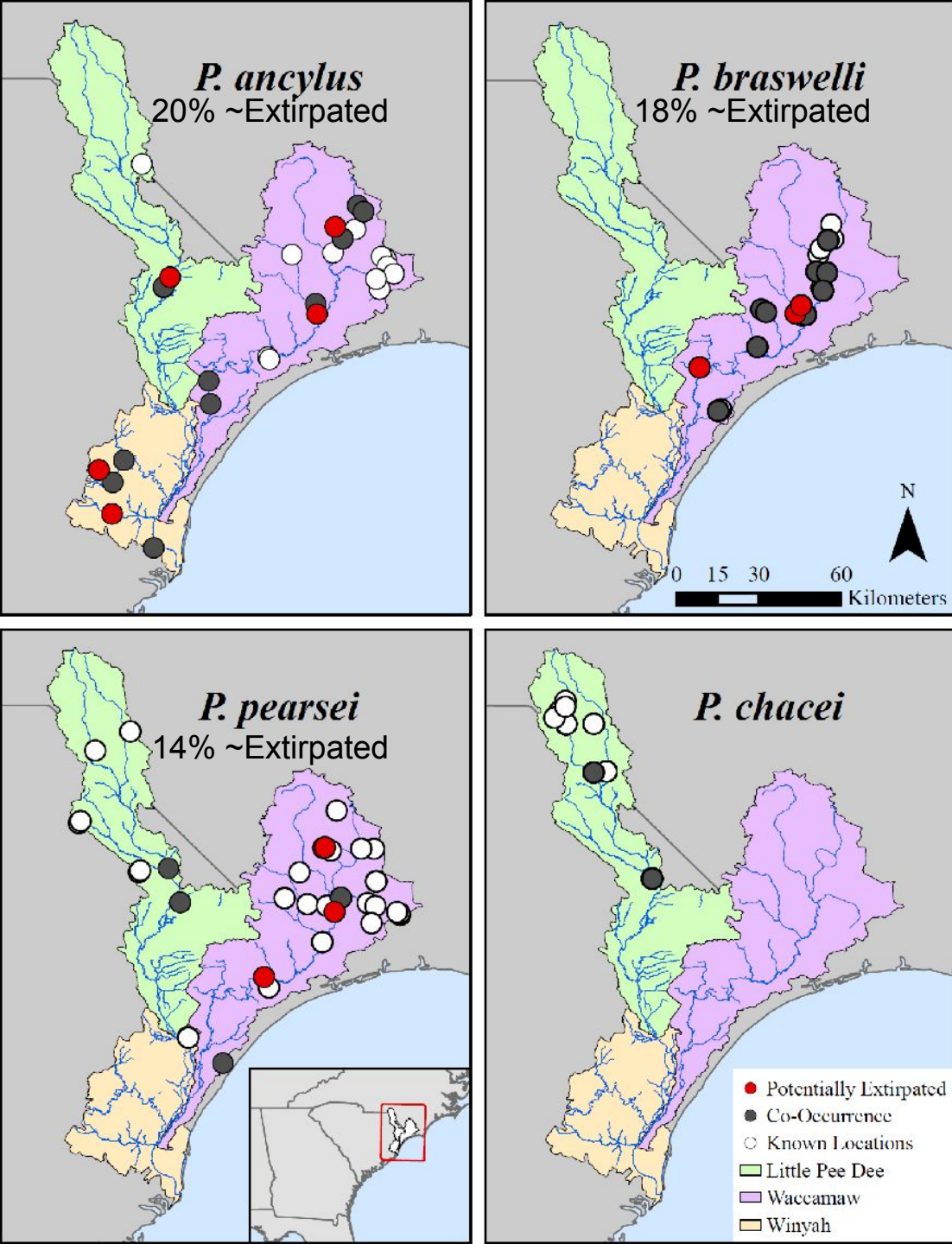
Lower native
crayfish richness
in presence of *P.*
clarkii



Is *P. clarkii* displacing native crayfishes?



Is *P. clarkii* displacing native crayfishes?



Testing for hybridization

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



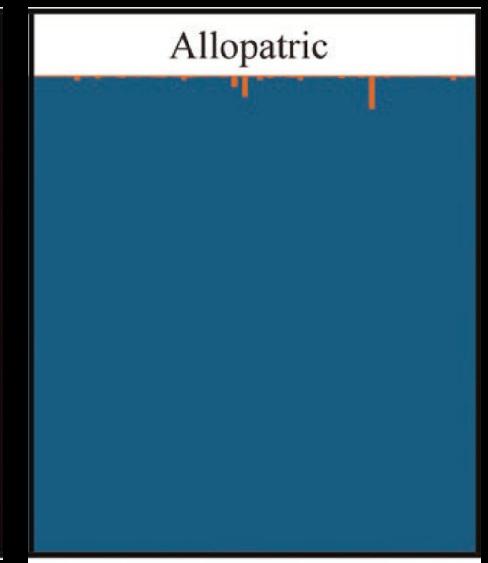
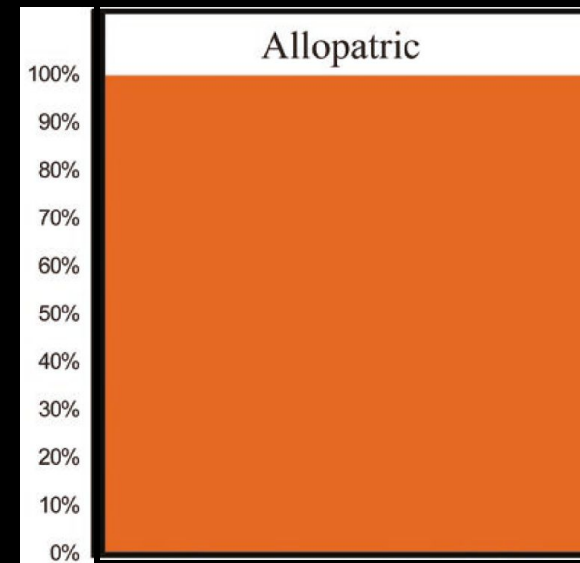
Testing for hybridization

- Many crayfish hybridize, but little is known about the process in *Procambarus*
- We tested for hybridization using microsatellite markers in 134 *P. clarkii* and 158 *P. troglodytes*



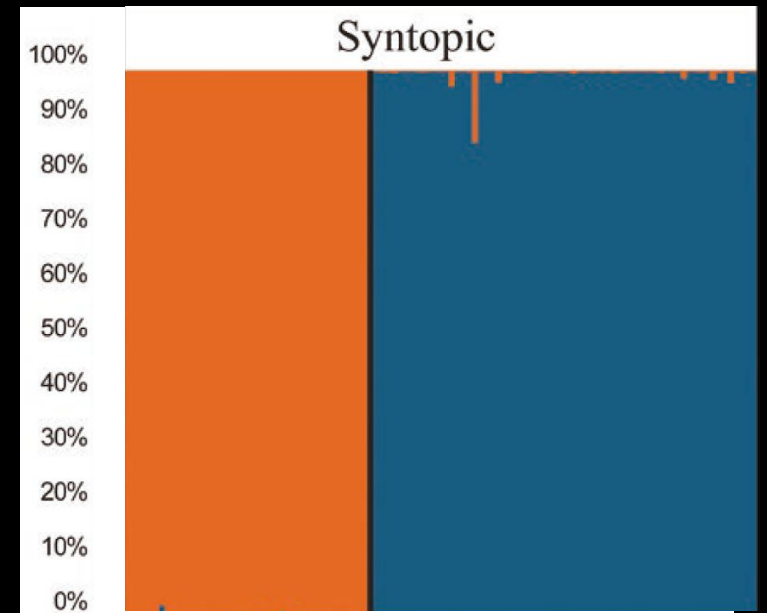
Is hybridization occurring?

- Separate locations
 - No evidence for hybridization



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 - No evidence for hybridization
- Co-occurring
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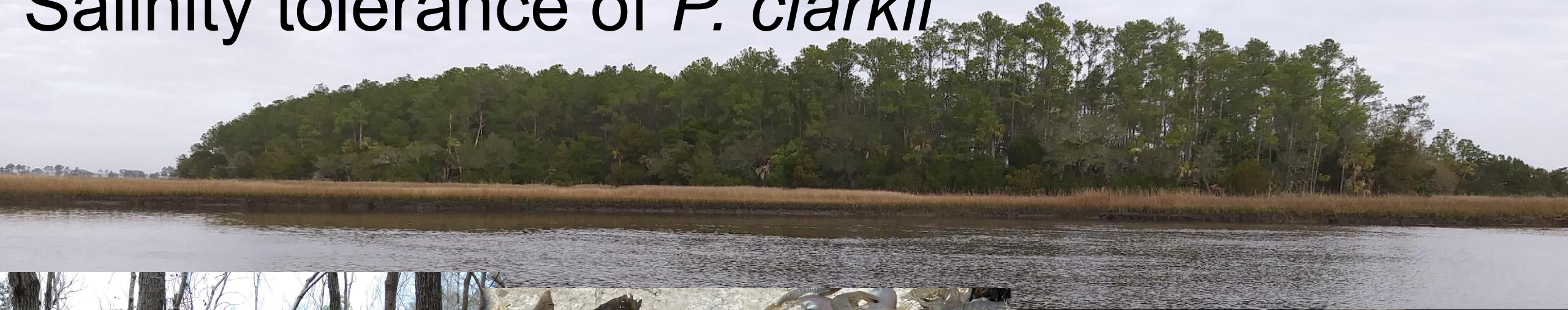
Is hybridization occurring?

- Separate locations
 - No evidence for hybridization
- Co-occurring
 - No evidence for hybridization
- Lab work
 - Potential reproductive interference by *P. clarkii*



Native *P. troglodytes* after copulation with *P. clarkii*. Eggs did not survive.

Salinity tolerance of *P. clarkii*

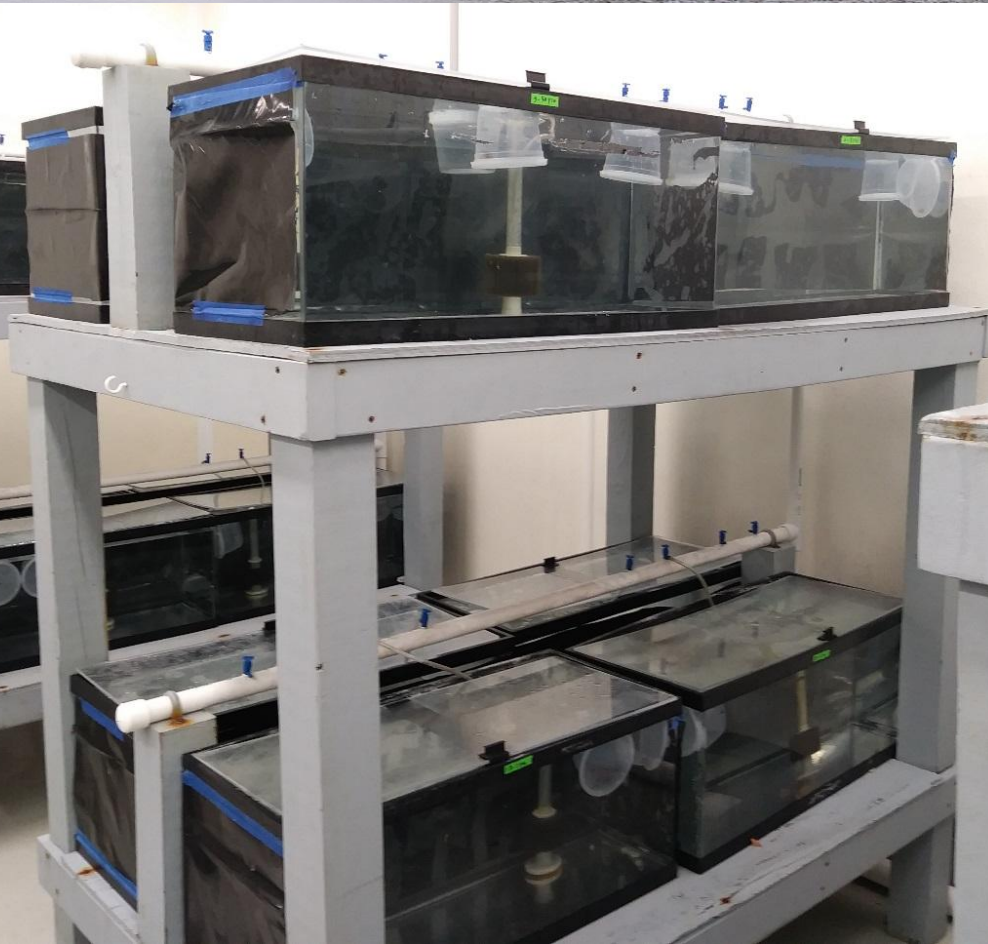


Salinity tolerance of *P. clarkii*



Lab experiment:
Test salinity tolerance of *P. clarkii*
from 0psu to 30 psu

Salinity tolerance of *P. clarkii*



93% Survival after 7 days at 30psu
(Sea Water is ~35psu)

Need more education & regulatory controls

- Prevent the release of non-native crayfishes from:
 - Aquaculture/culinary trades
 - Bait releases
 - Pet trade
 - Education supplies



Future directions

- Build preventative capabilities
- Investigate mitigation strategies
- Develop an integrative taxonomic understanding (morphology & genetics) for native taxa
- Address data deficiencies of native species
 - Life history/Ecology
 - Threats

Funding: USFWS' State Wildlife Grants and State and Interstate Aquatic Nuisance Species Management Plan (F25AP00566, F18AP00261, F19AS00117, F17AF01207, F18AF00962, and F19AF00779)



Acknowledgments

Bronwyn Williams

Tanya Darden

Greg Rothman

Matt Walker

Peter Kingsley-Smith

Elizabeth Scott

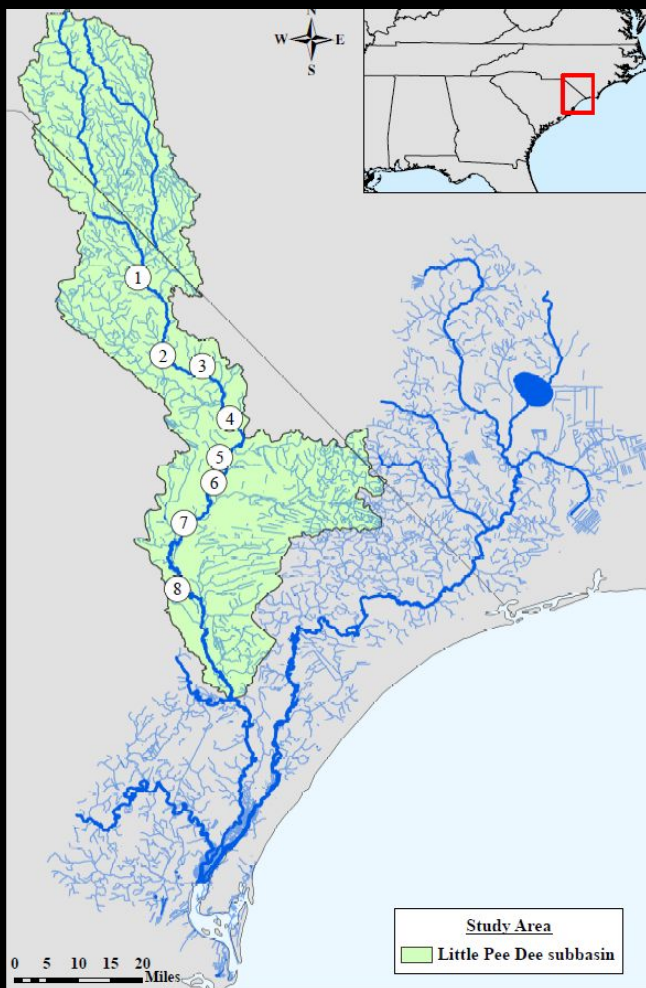
Jeanette Huber

Meagan Roy

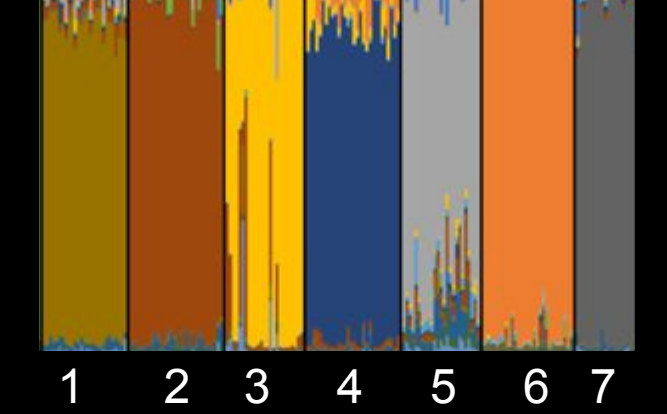
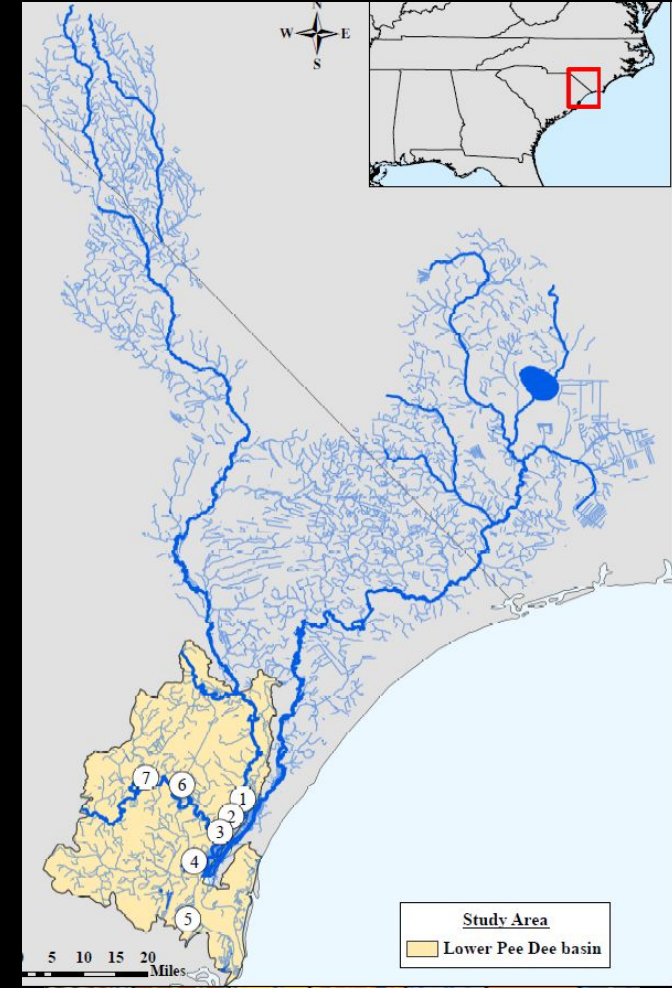
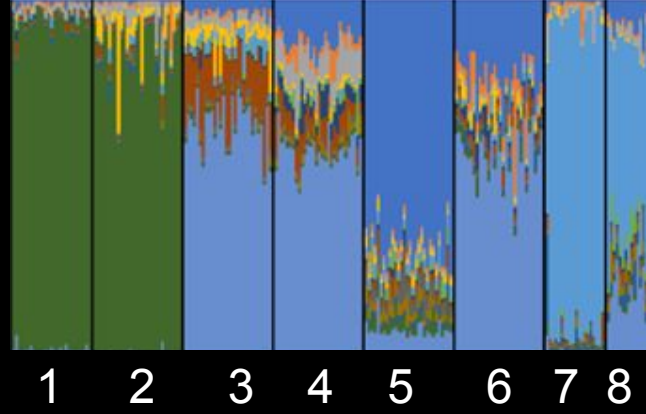
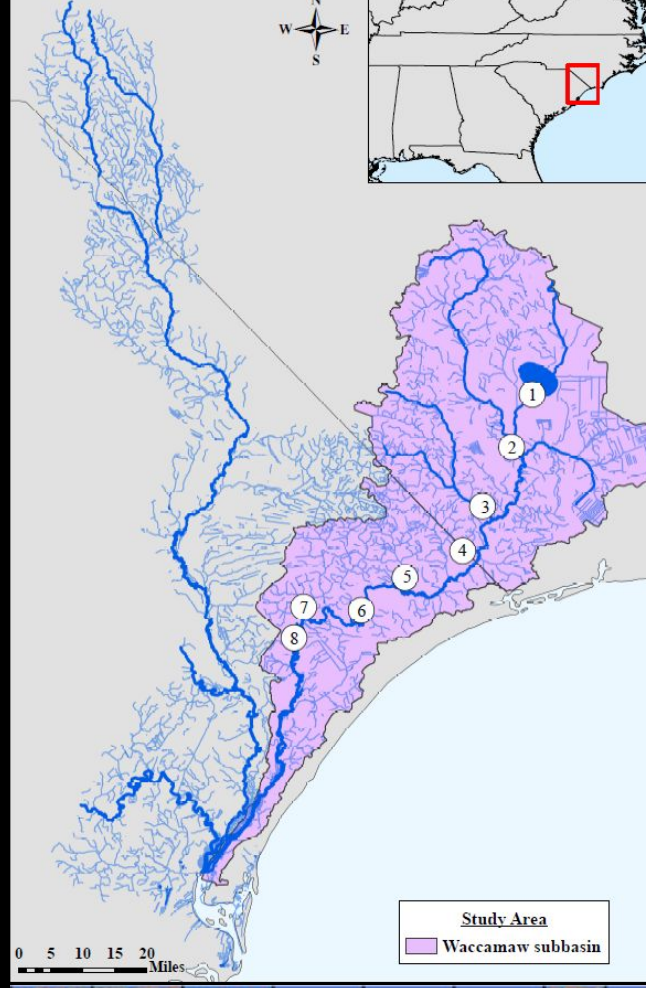
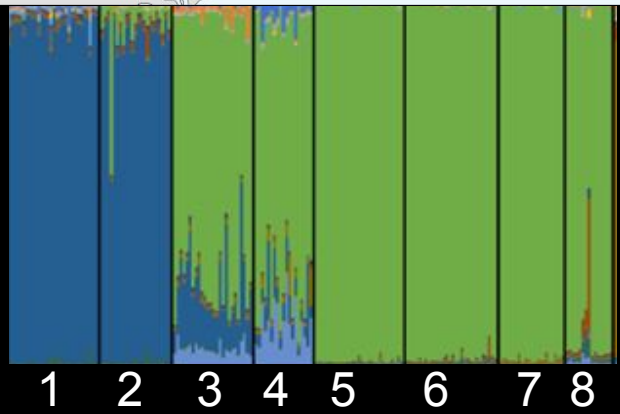
Daniel Sasson

Jackie Allen

Many many others!

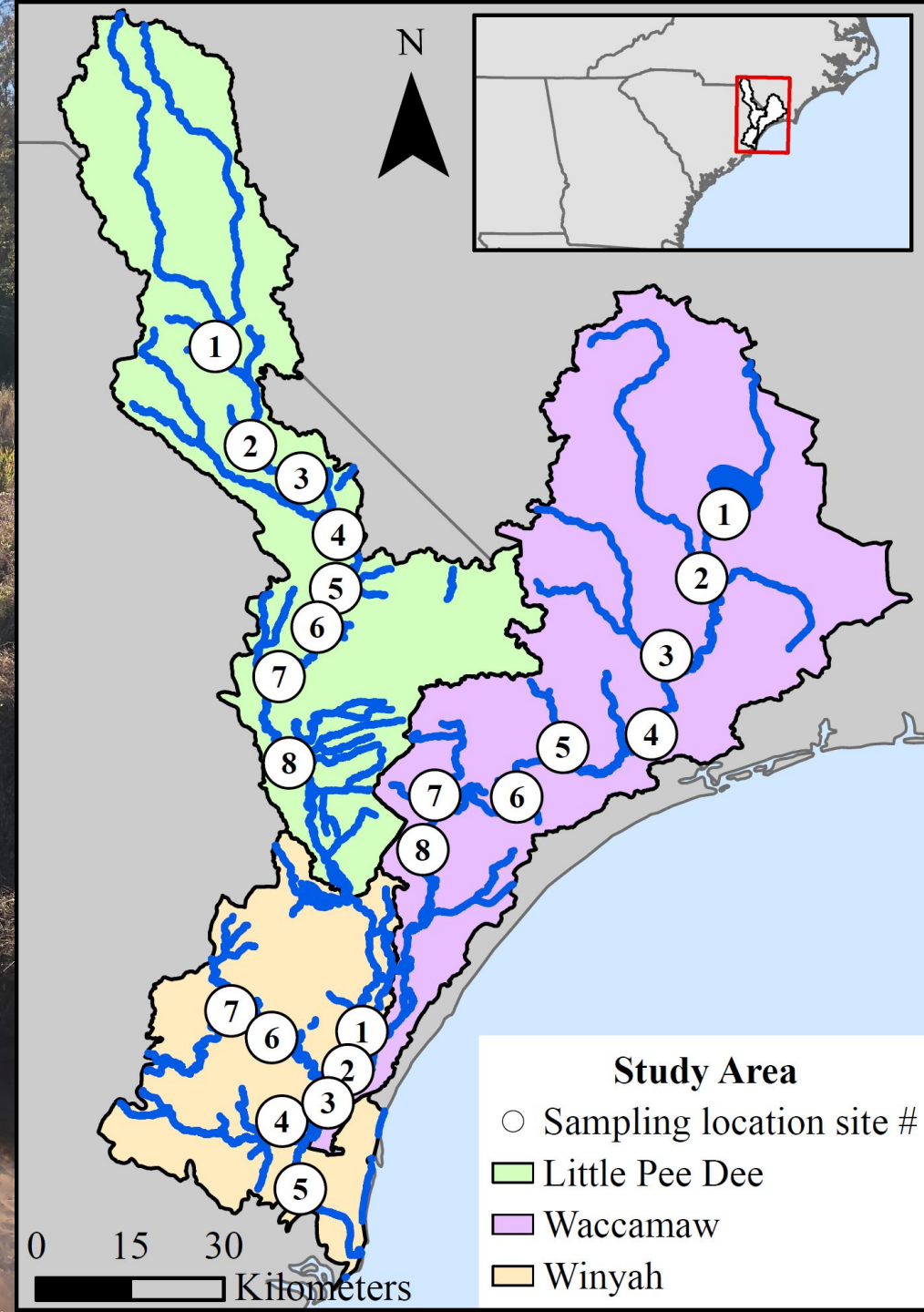


100%
50%
0%

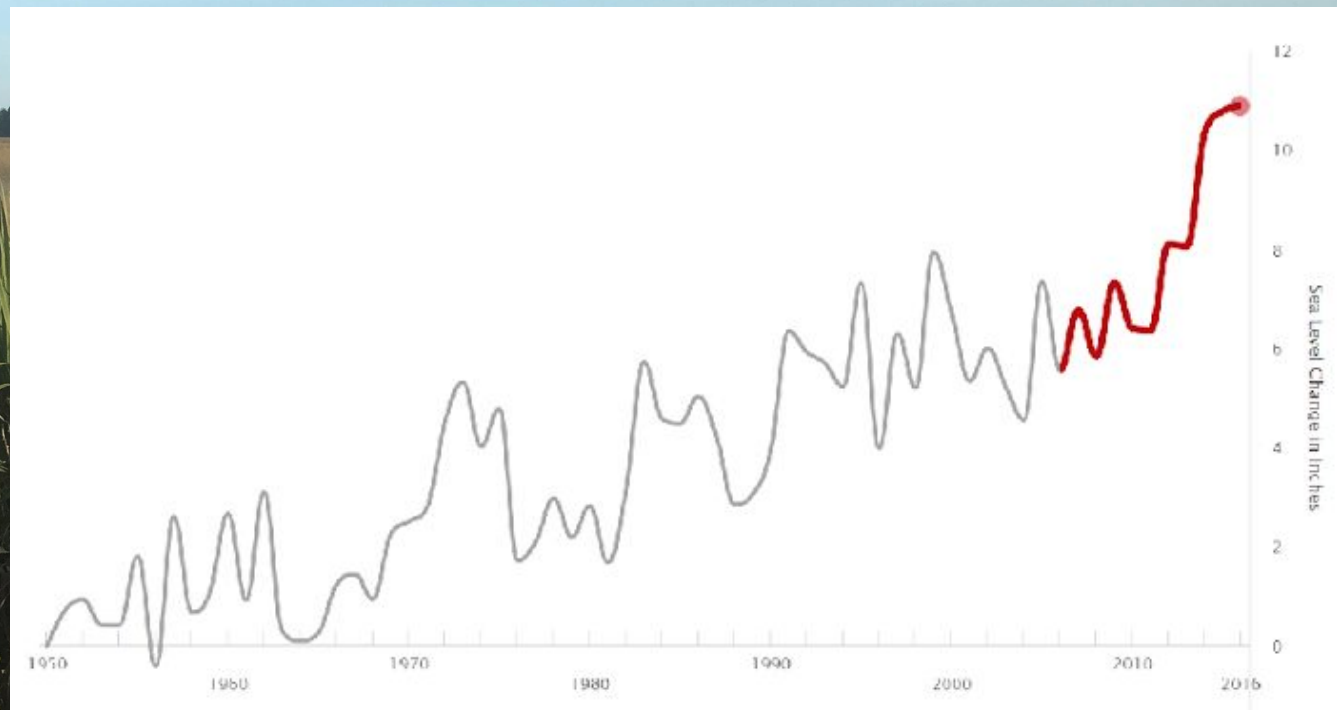


Inferring dispersal

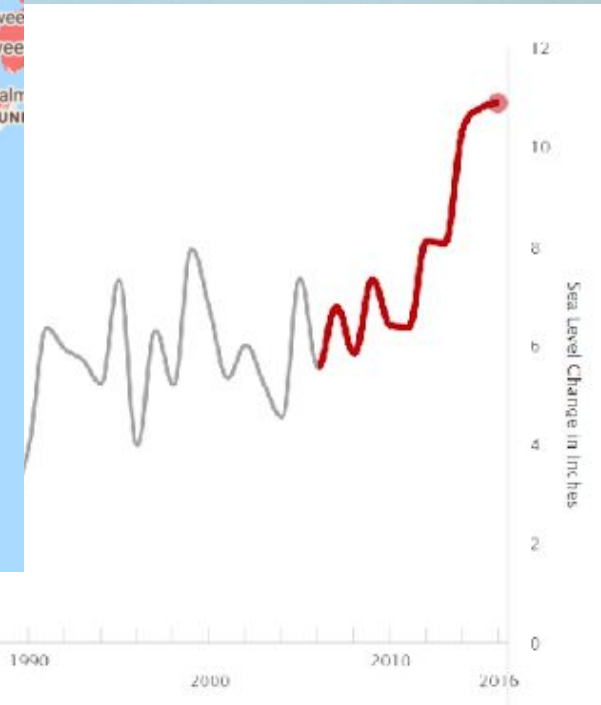
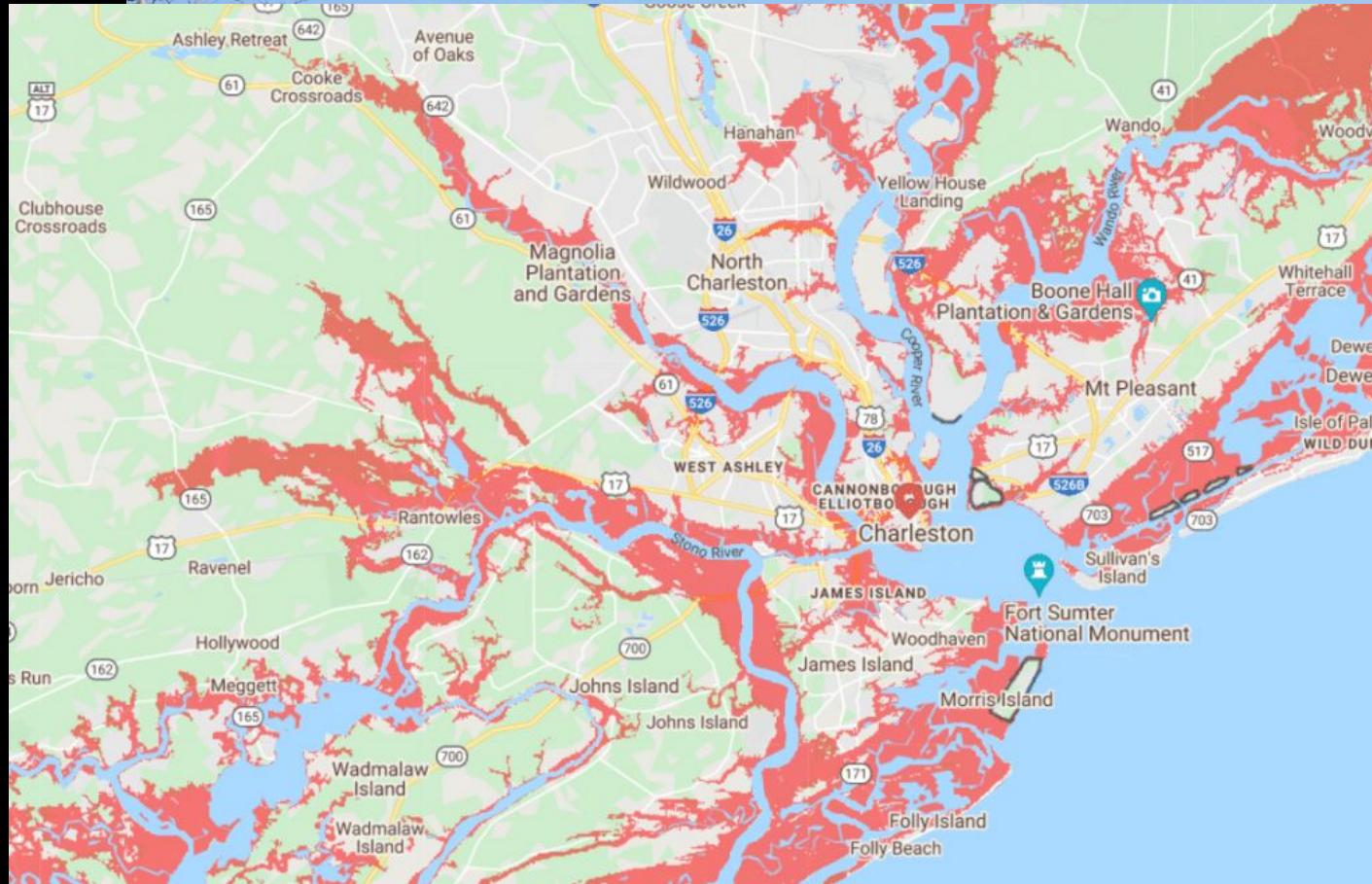
- Molecular tool development
 - Genomic sequencing
- Does genetic structure differ across watersheds?



Sea level rise and crayfish



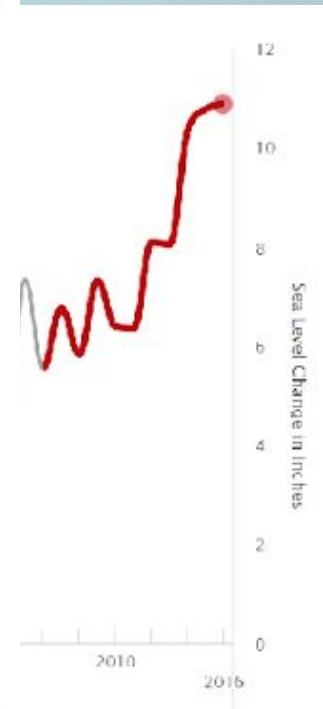
Sea level rise and crayfish



Sea

Table 3. Survival of *P. troglodytes* (n=96), *P. lunzi* (n=32, trial 1; n=16, trial 2), and *P. clarkii* (n=96) after seven days exposed to a range of salinity treatments with values for the 30 psu trial presented as Kaplan Meier survival probabilities (\pm SE). Asterisk (*) indicates that mortality was significantly affected by salinity ($p > 0.05$).

Salinity (psu)	% Survival (\pm SE)			
	<i>P. troglodytes</i> *	<i>P. lunzi</i> (Trial 1)*	<i>P. lunzi</i> (Trial 2)	<i>P. clarkii</i> *
0	100	100	100	100
6	100	-	-	100
12	100	-	-	100
8	100	-	-	100
24	100	-	-	100
30	93.8 (\pm 3.7)	59.4 (\pm 14.6)	93.8 (\pm 5.4)	92.8 (\pm 3.4)



Procambarus lunzi (Hammock Crayfish – S1/G4)

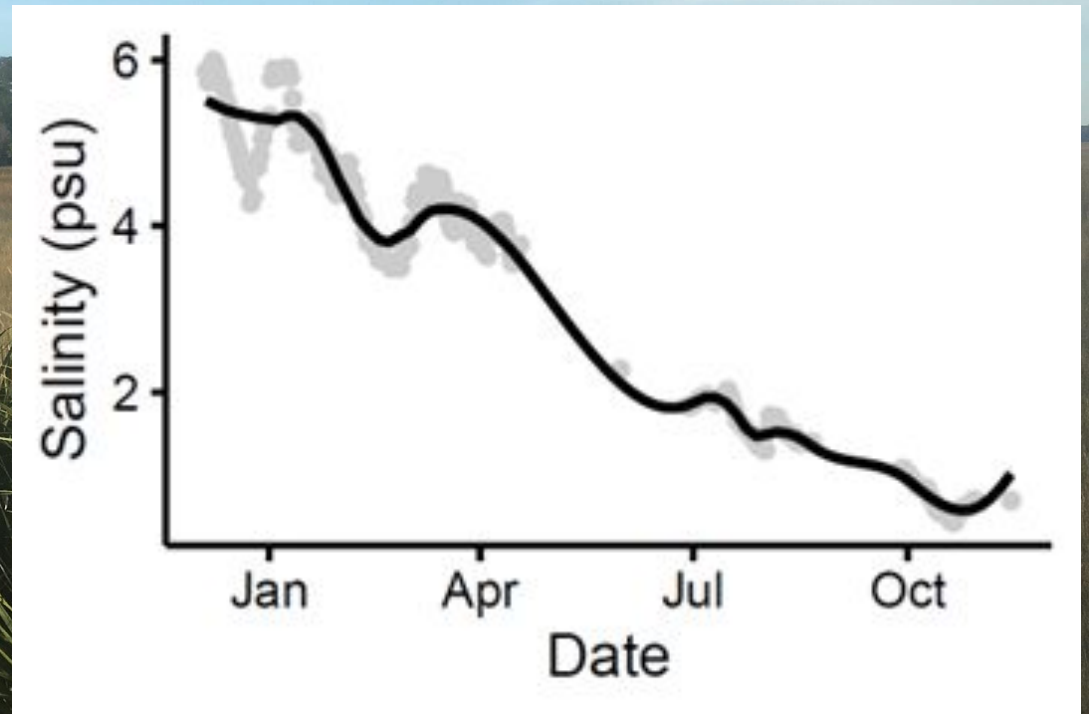
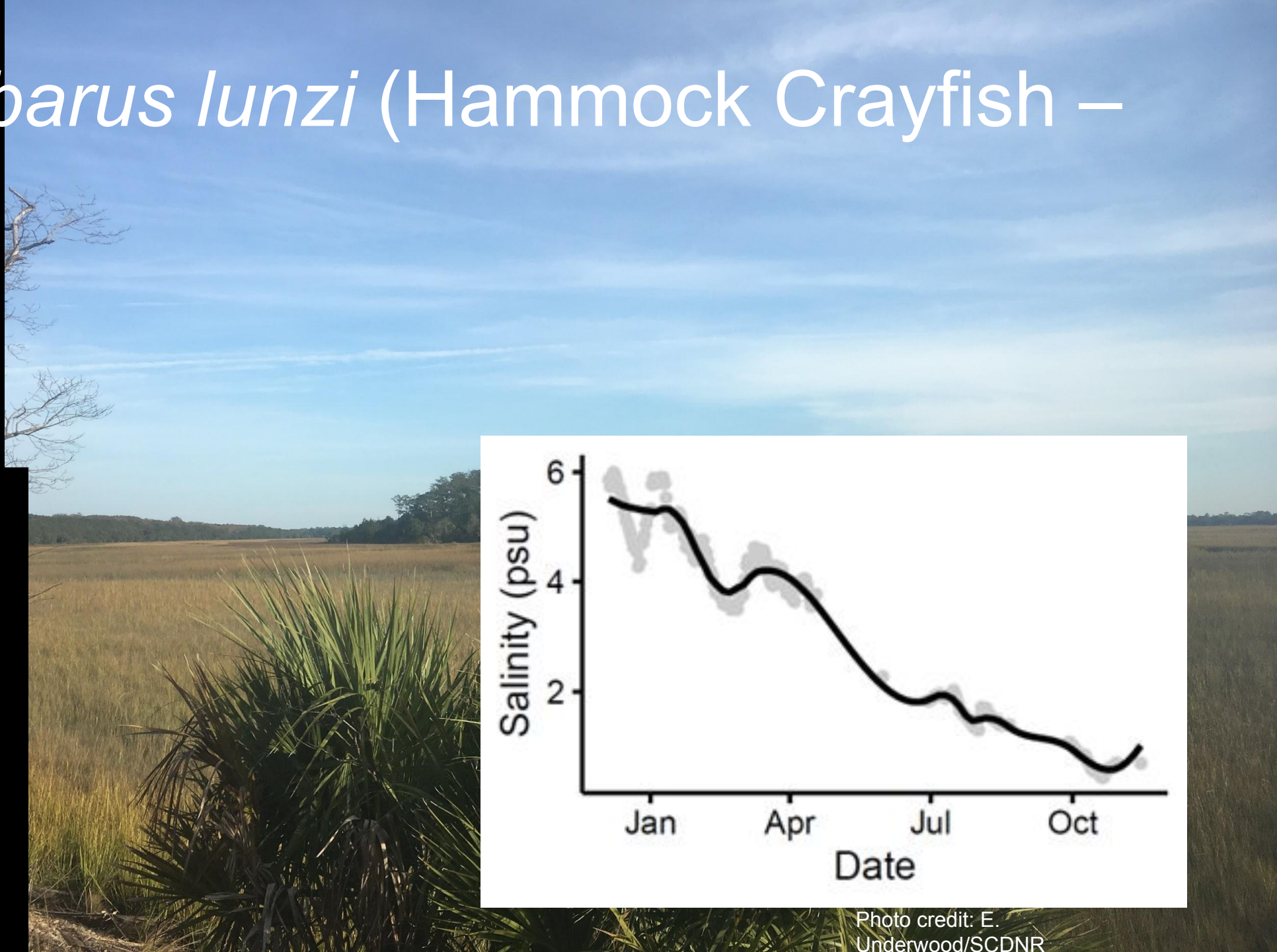



Photo credit: E. Underwood/SCDNR

Non-native species spread globally (and locally)



- Non-native species that harm natural resources
- Cost \$26.8 billion per year
 - Losses of goods/services/production
 - Costs of management
- Understanding their ecology is important for developing effective management strategies

