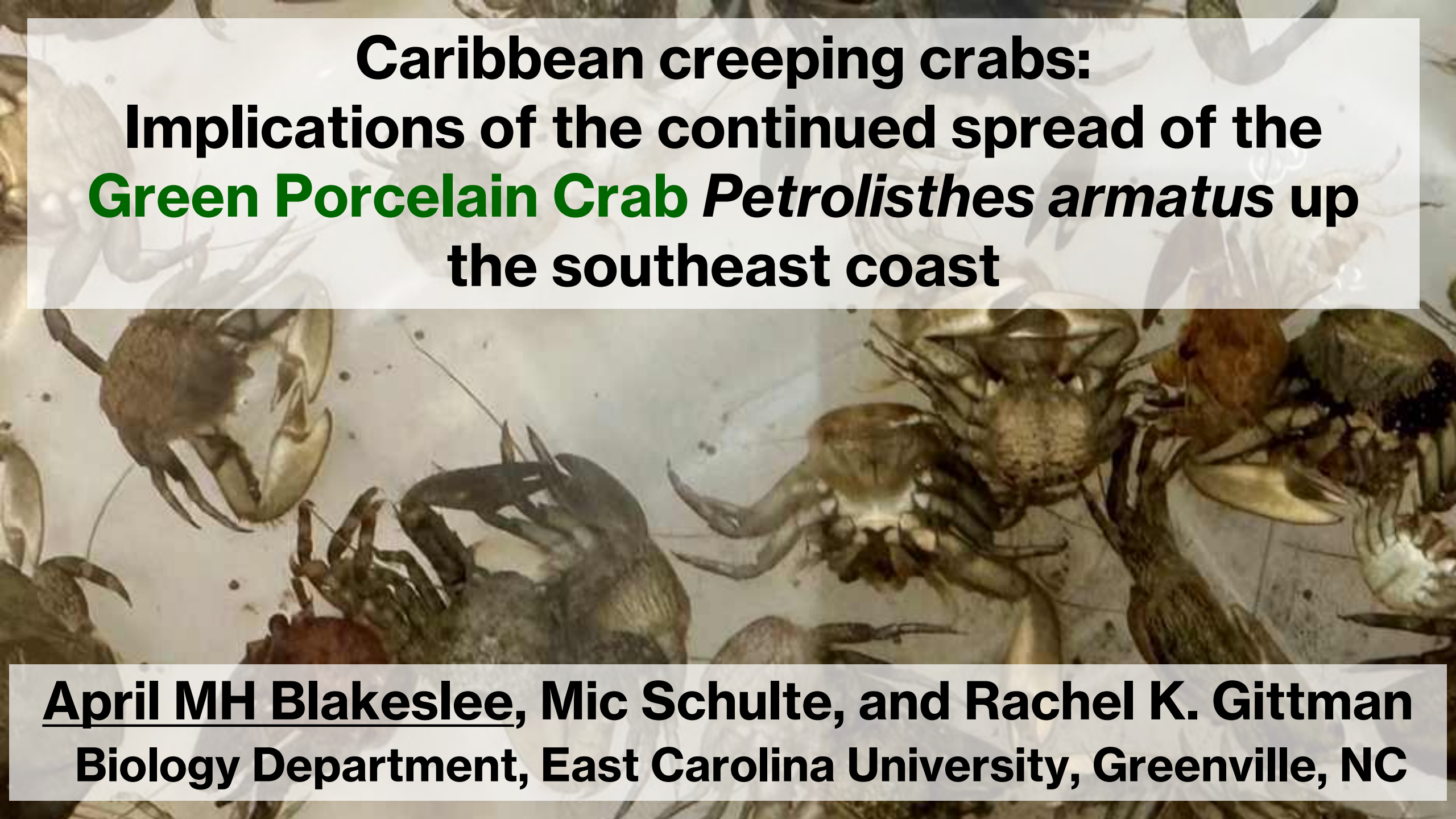
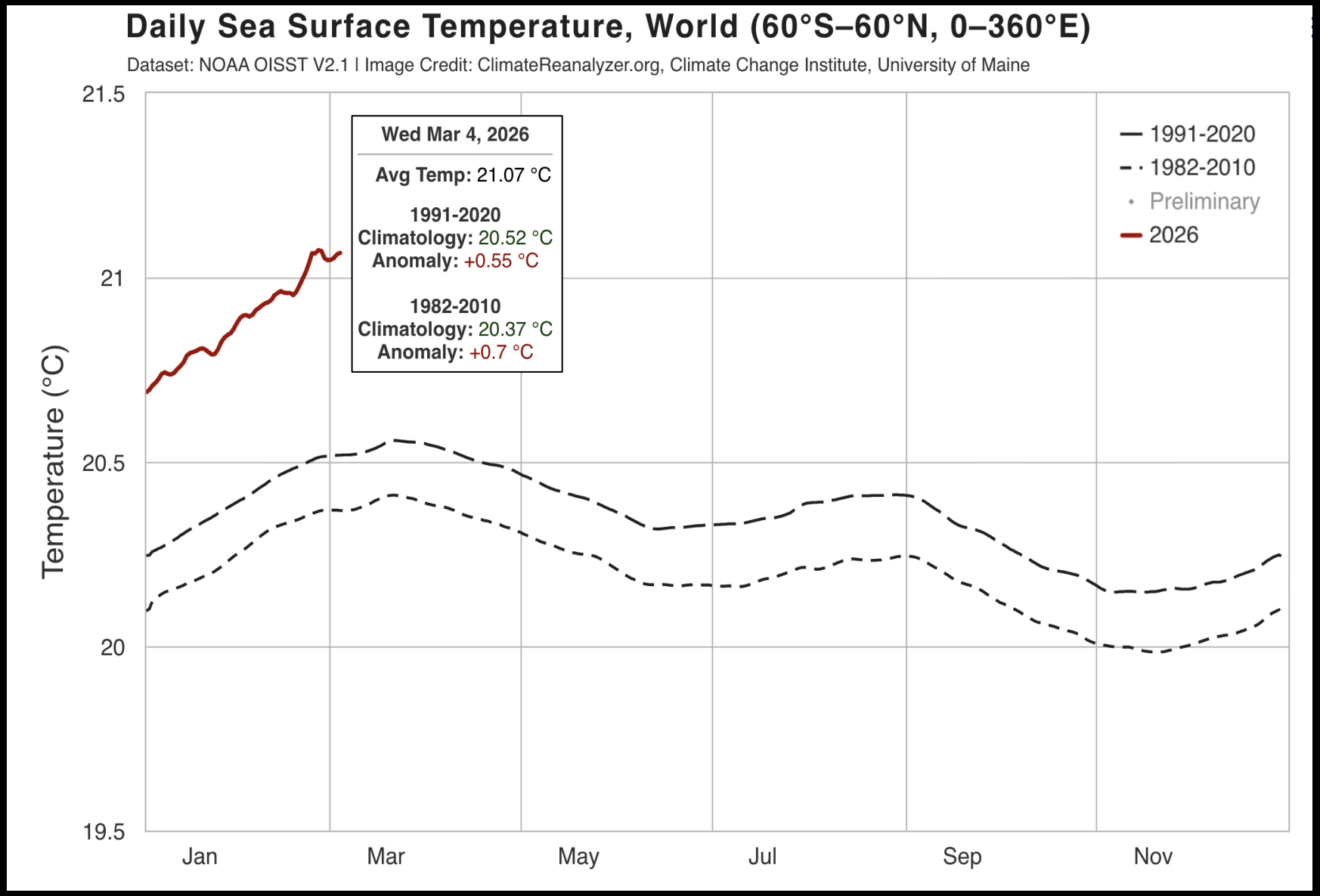
Caribbean creeping crabs: Implications of the continued spread of the Green Porcelain Crab *Petrolisthes armatus* up the southeast coast



April MH Blakeslee, Mic Schulte, and Rachel K. Gittman

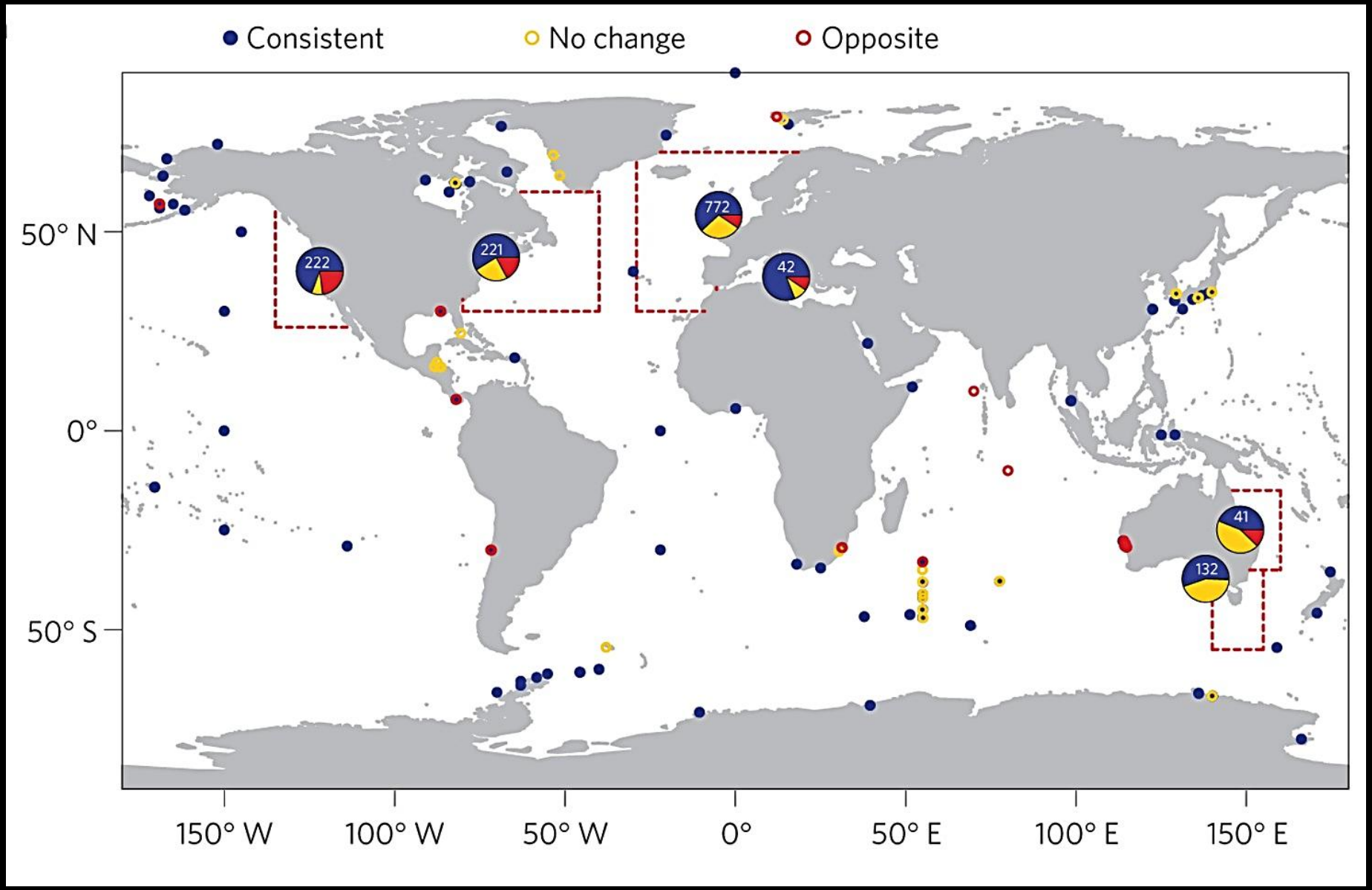
Biology Department, East Carolina University, Greenville, NC

Climate change and species distributions



- Climate change is increasing global ocean and sea-surface temperatures (SST).
- Warming oceans are facilitating more rapid range expansions in marine systems.
- Species previously restricted to lower latitudes are expanding poleward via natural (currents) and anthropogenic (ships) mechanisms.

Poleward shifts in species distributions



In global meta-analysis (n=1735 records), Poloczanska et al. (2013) found >80% observations showed poleward shifts consistent with climate change scenarios.

“African Creep”

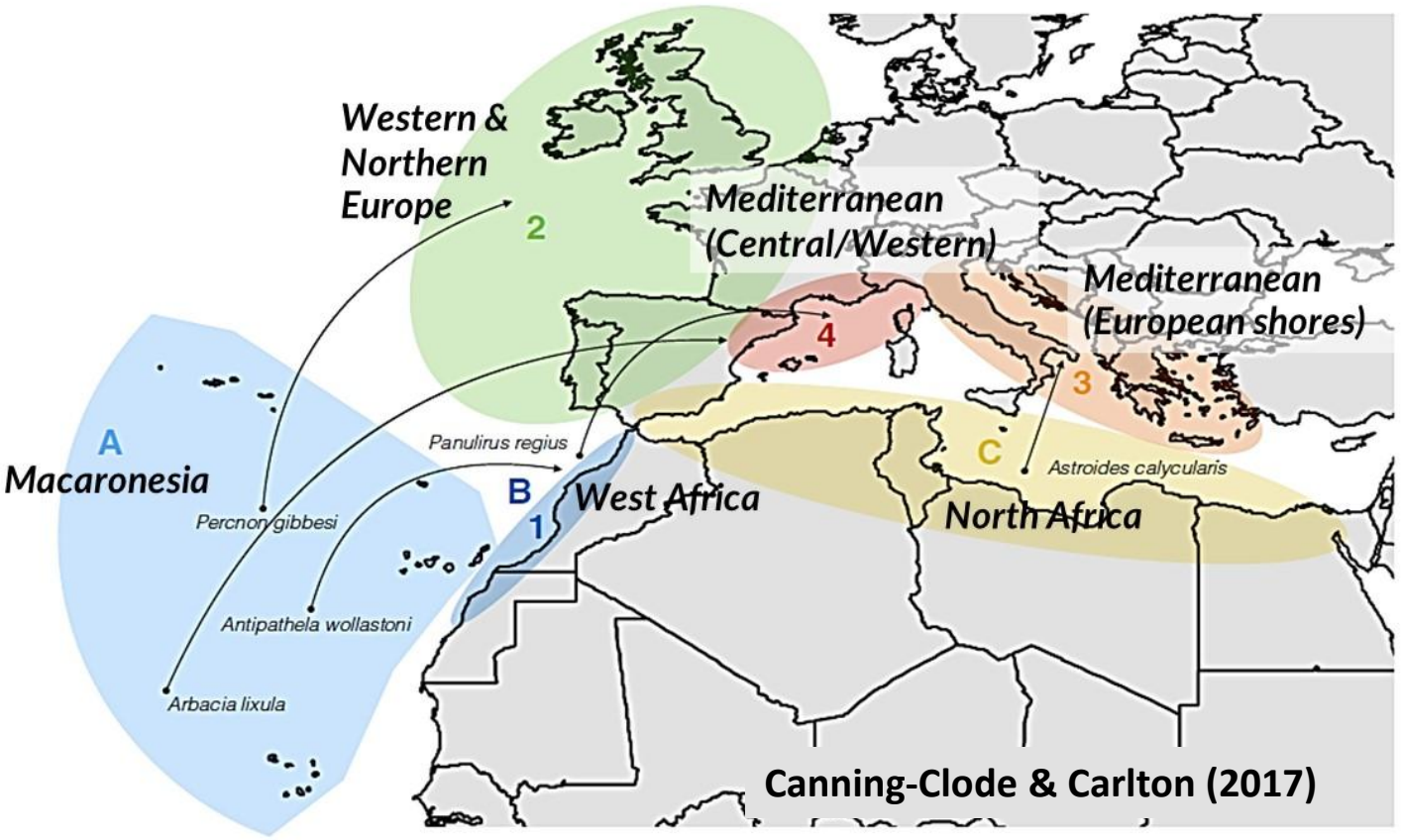


FIGURE 1 The African creep biogeographic model is based on the origin and destination of the movement of macroinvertebrates and fish; examples are shown along the defined routes (Table 1)

“African Creep”

“Caribbean Creep”

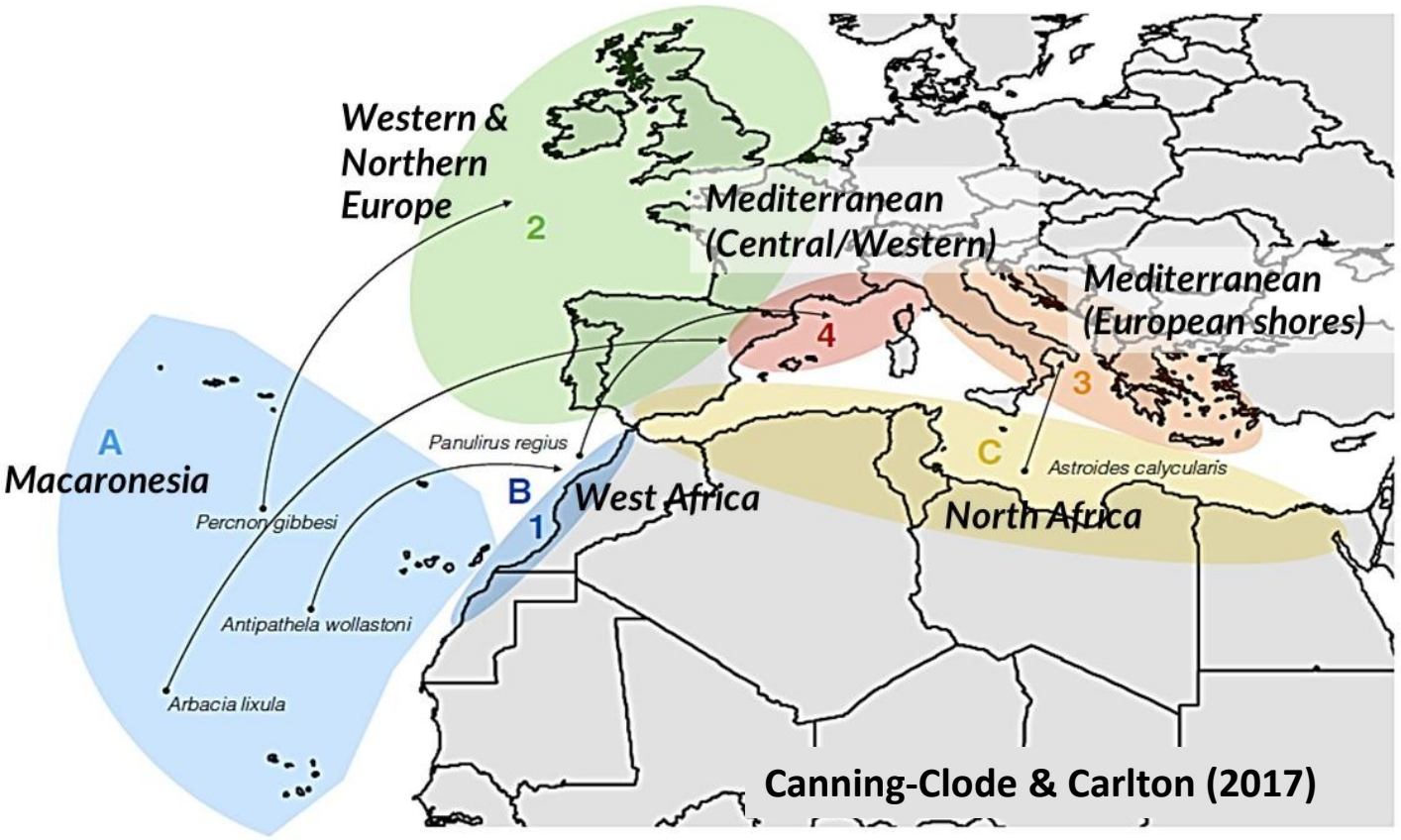
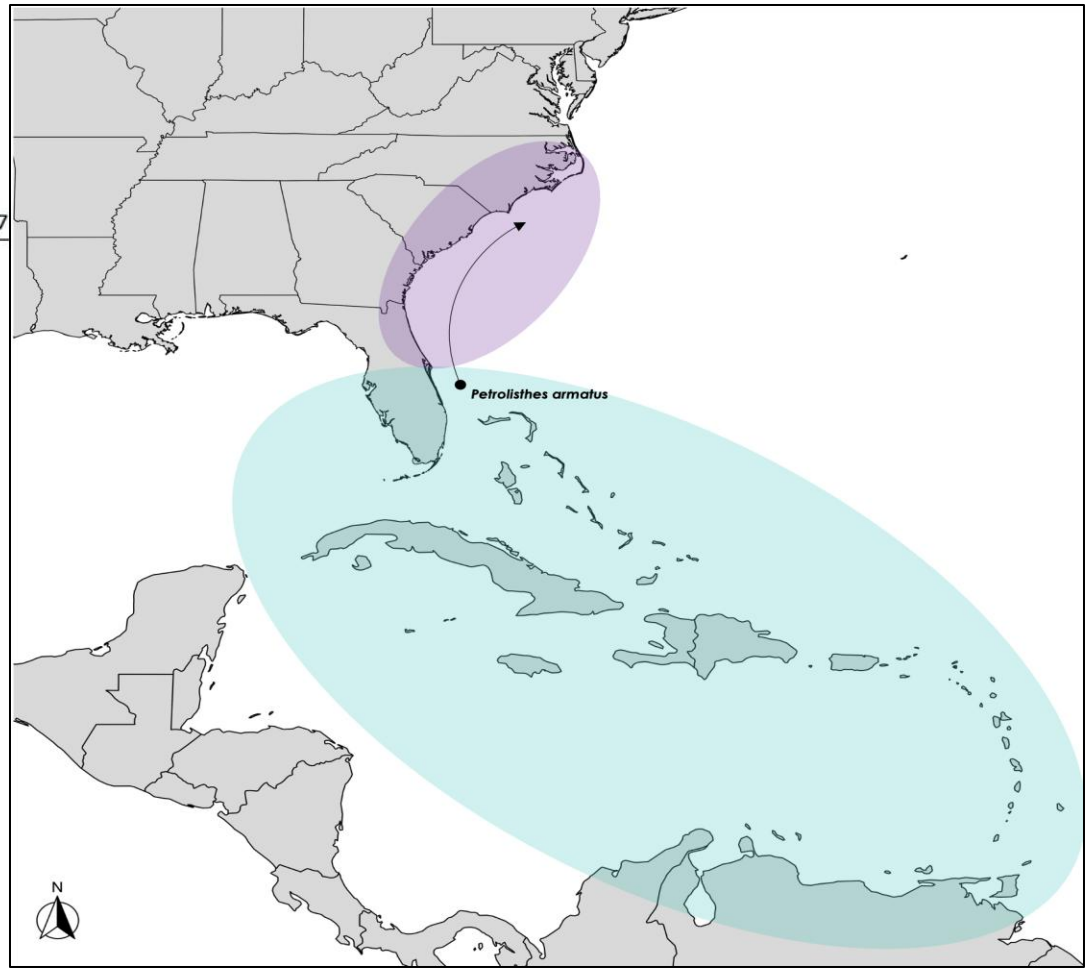
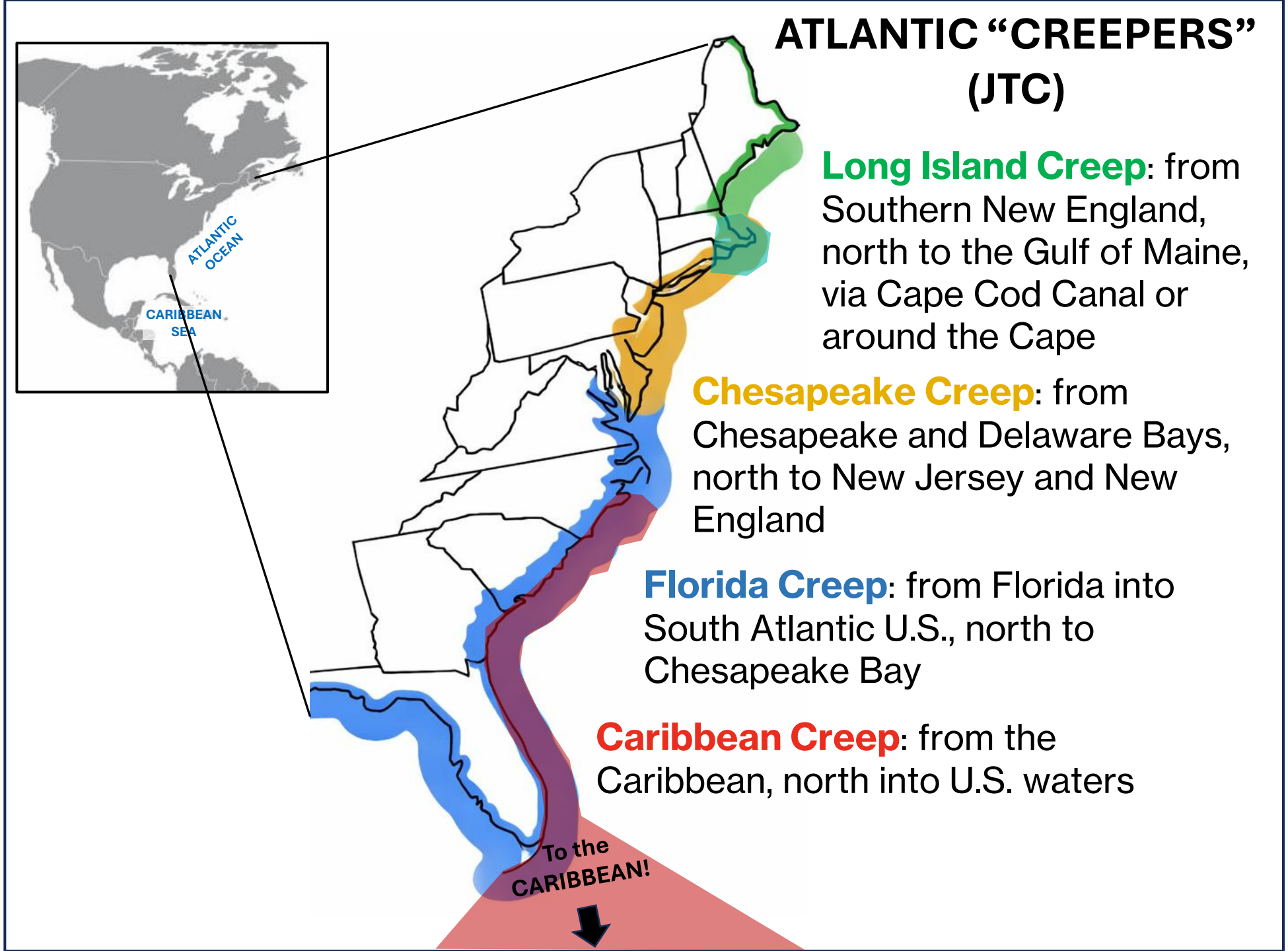


FIGURE 1 The African creep biogeographic model is based on the origin and destination of the movement of macroinvertebrates and fish; examples are shown along the defined routes (Table 1)



Caribbean Creep: expansion of coastal species from the tropics/subtropics into temperate regions along the SE U.S. coast (Canning-Clode & Carlton 2017)

From: **2025 US Report** delivered to ICES Working Group on Biological Invasions (WGBIONV): Sete, France – March 5, 2026



CARIBBEAN CREEPER: *PETROLISTHES ARMATUS*

Species: **Green porcelain crab** (*Petrolisthes armatus*)

Zone: Intertidal/subtidal

Habitat: oyster reefs, mangroves, riprap/rocky substrate, manmade structures

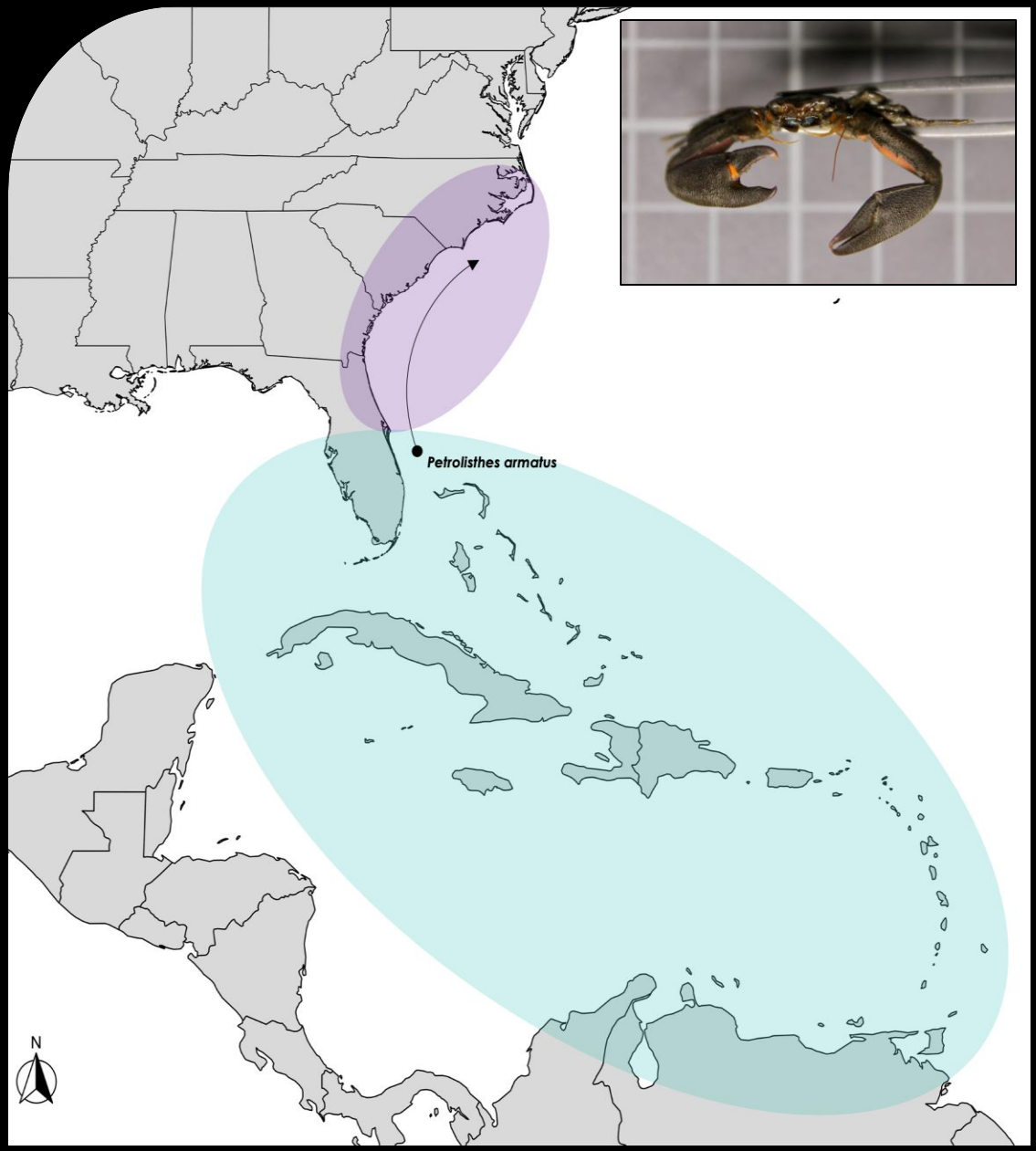
Temperature: 6 – 40°C

Salinity: Euryhaline (15 PPT – 44 PPT)

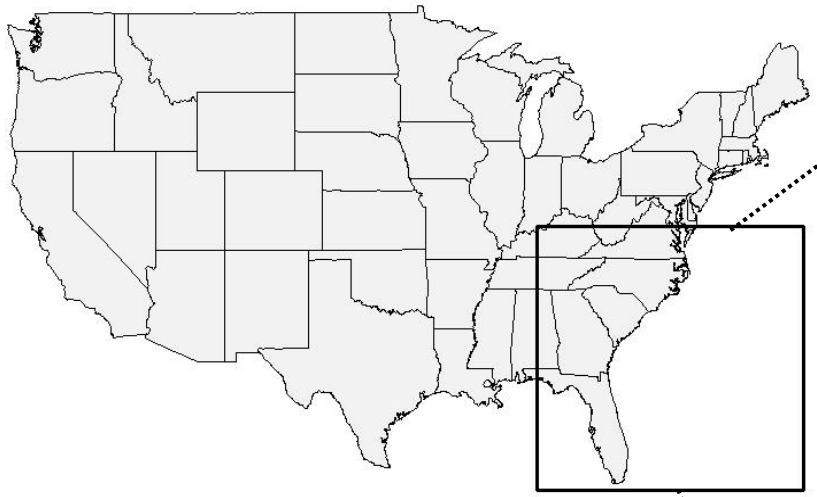
Feeding guild: Primarily filter-feeding, capable of scavenging

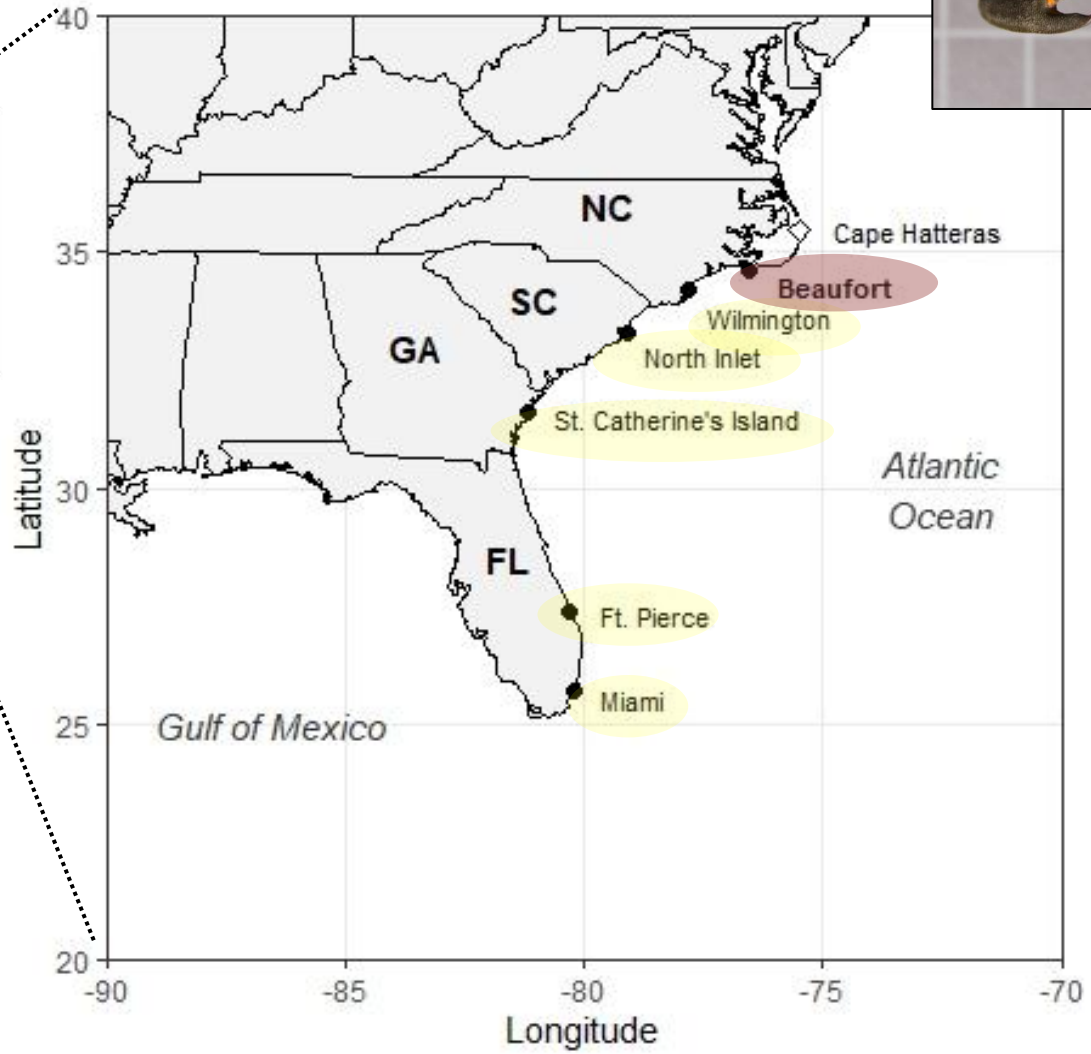
Petrolisthes armatus Non-NATIVE DISTRIBUTION

- In the 1990's, green porcelain crabs began expanding their range up the southeastern U.S. coast.
- They were detected north of Cape Canaveral, Florida in 1994.



P. armatus southeast Atlantic range expansions





Documented occurrences of *P. armatus*:

- Miami (1930s)
- Indian River Lagoon (1970s)
- St. Catherine's Island, Georgia (1990s)
- North Inlet (late 1990s)
- Wilmington (early 2000s)
- **Beaufort, NC (2018)**

From: Fofonoff et al. 2018; Blakeslee et al. 2024

BioInvasions Records (2024) Volume 13, Issue 1: 109–120

Rapid Communication

Caribbean Creeping Crabs: northward expansion of the green porcelain crab in North Carolina, USA

April M.H. Blakeslee[1], Christopher S. Moore[1,2], Carter K. Stancil[1], Nina C. Woodard[1], Megan E. Geesin[3], Chloe Manning-Moore[1], Robert Aguilar[4], Matthew B. Ogburn[4], Scott Smith[5] and Rachel K. Gittman[1,3]

[1] *Department of Biology, East Carolina University, Greenville, NC 27858, USA*
[2] *Florida Atlantic University, Harbor Branch Oceanographic Institute, 5600 US1 North, Fort Pierce, FL 34946, USA*
[3] *Integrated Coastal Programs, East Carolina University, 850 NC 345 Wanchese, NC 27981*
[4] *Fisheries Conservation Lab, Smithsonian Environmental Research Center, Edgewater, MD, 21037, USA*
[5] *North Carolina Department of Environmental Quality, Division of Marine Fisheries, 3441 Arendell St. Morehead City, NC 28557, USA*

Corresponding author: April M.H. Blakeslee (blakesleeap14@ecu.edu)

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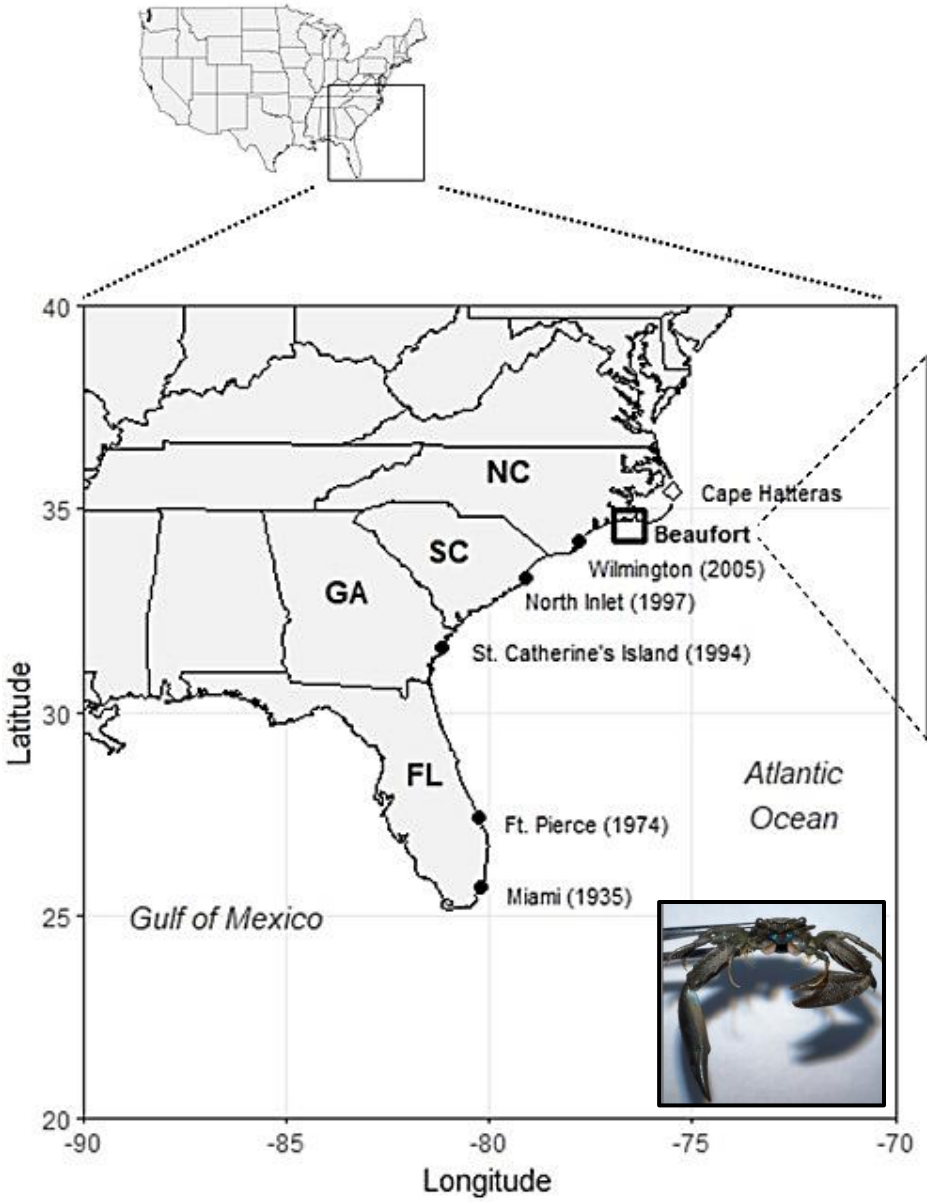
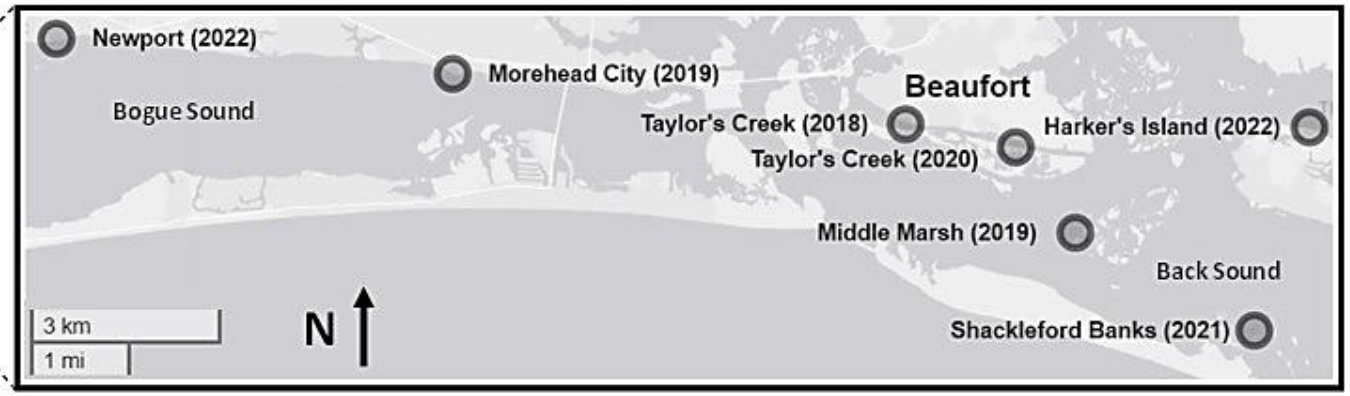
Abstract

Marine species are expanding polewards with rising temperatures. In the Northwest Atlantic, tropical/subtropical species native to the Caribbean have been documented as spreading into temperate regions. One such species, the green porcelain crab (*Petrolisthes armatus*), has been migrating up the southeastern United States coastline from Florida since the 1990s. Until 2018, the species had not been detected north of Wilmington, North Carolina (NC). Here, we document the establishment of *P. armatus* populations along the NC central coast. During biodiversity monitoring, we detected the first record of *P. armatus* in 2018 in Beaufort, NC, and subsequent records of the crab were detected at multiple locations in the region over a four-year time period (2018–2022), often at relatively high abundances. Morphological and genetic evidence confirmed the identity of *P. armatus* in this region and distinguished it from its less abundant native congener, *P. galathinus* (banded porcelain crab). While cold winter temperatures have likely limited the species' ability to spread northwards in

P. armatus detections along central NC coastline



"CRAB CONDO":
Sampler dimensions:
19 x 22 x 16 cm

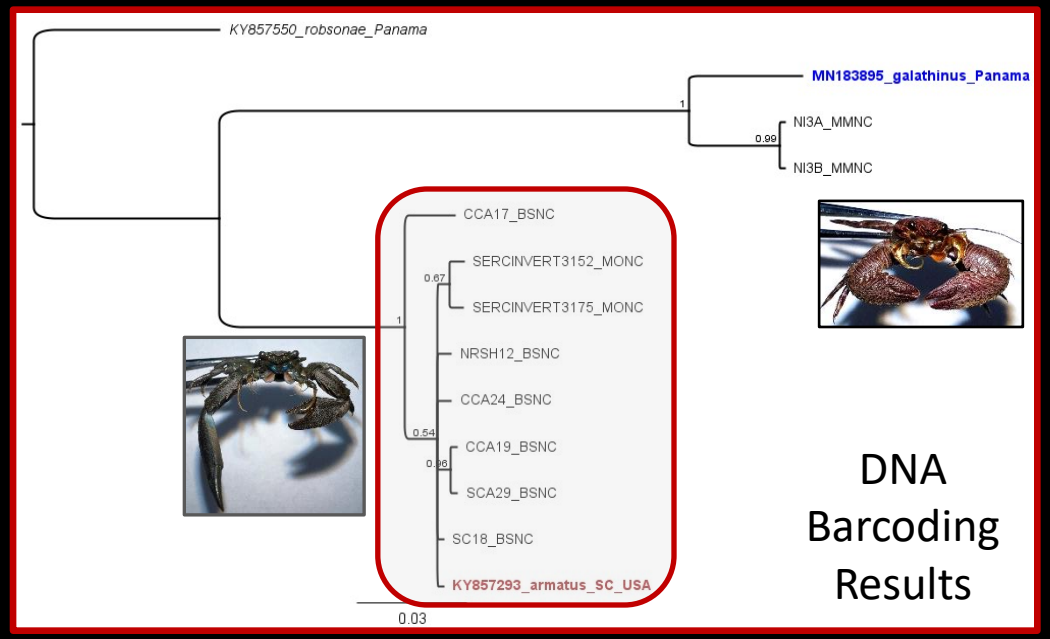


Confirmation of *P. armatus*: Morphology & Genetics

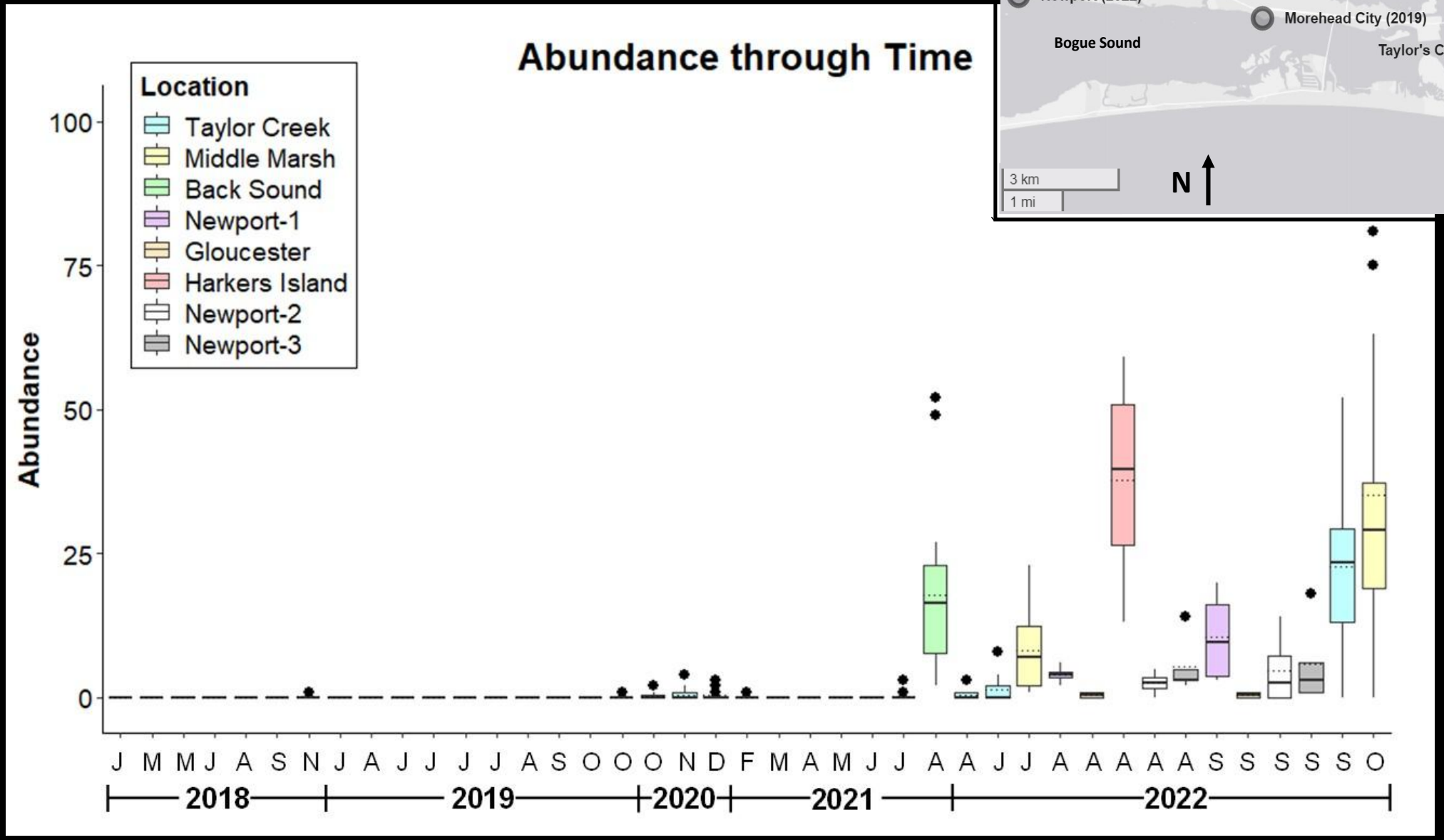
A: *P. armatus*: Orange spot on claw

B: *P. armatus*: Blue mouthparts

C: *P. galathinus*: banded carapace; orange mouthparts



Petrolisthes armatus NC Detections & Abundance



From: Blakeslee et al. (2024)

Mic Schulte, MS student, ECU

Mic Schulte research goals:

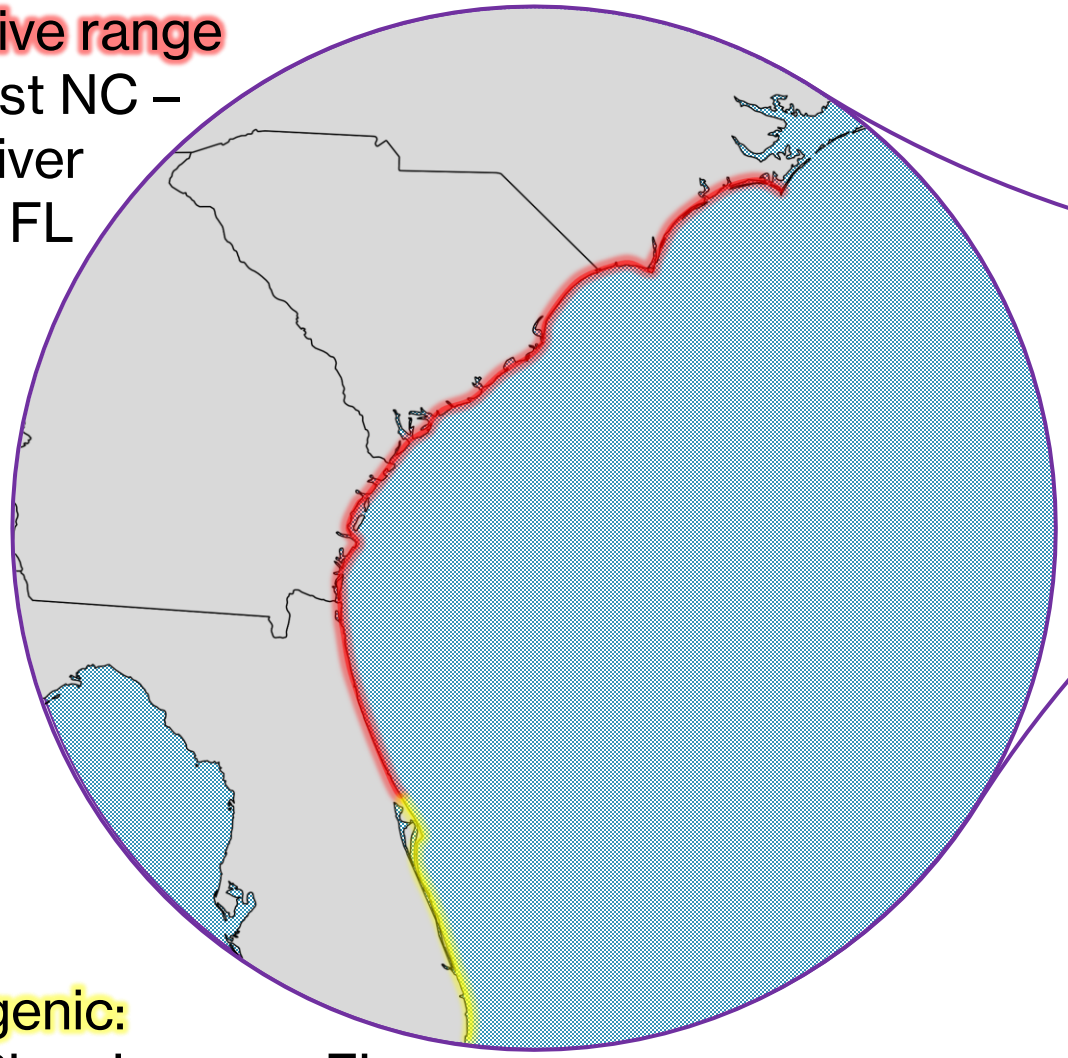
(1) Reproductive performance along latitudinal gradient (sites in FL, GA, SC, NC)

(2) Prevalence and probability of infection along latitudinal gradient

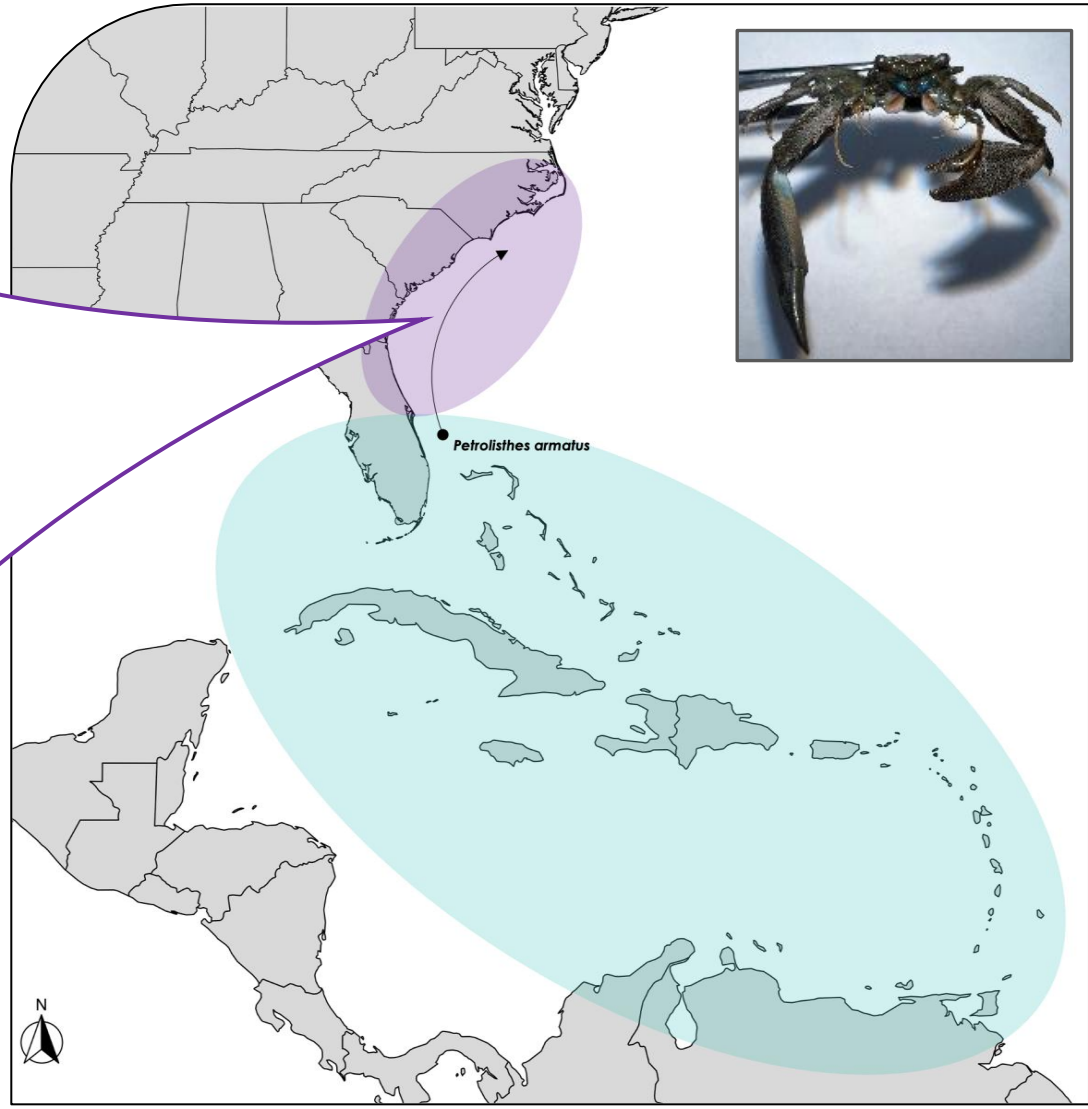
All forthcoming slides prepared by M. Schulte.

Petrolisthes armatus Non-NATIVE DISTRIBUTION

Non-native range
Mid-coast NC –
Indian River
Lagoon, FL



Cryptogenic:
Indian River Lagoon, FL



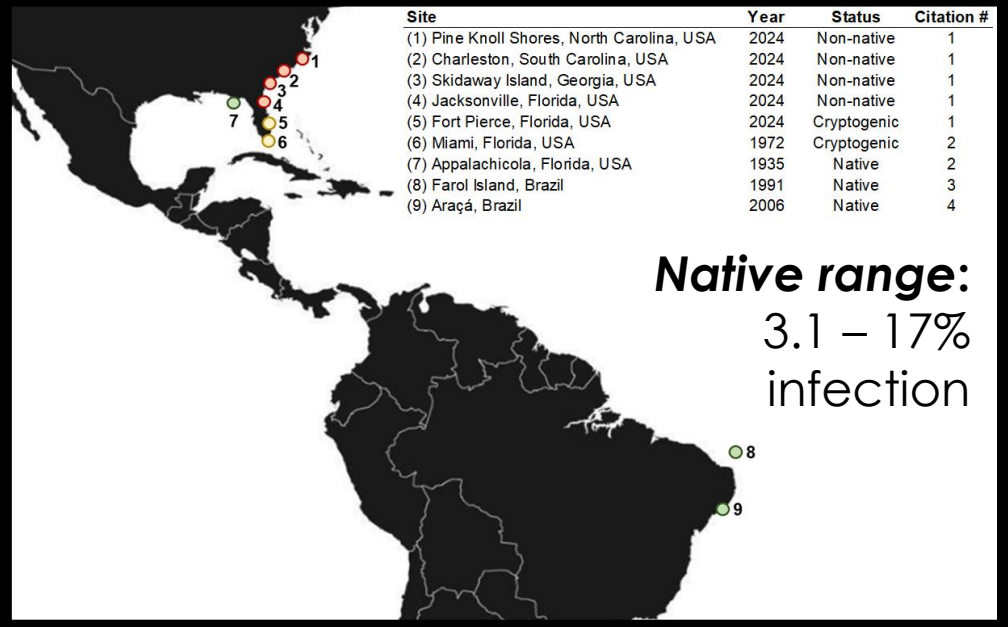
(Blakeslee et al. 2024), (Fofonoff et al. 2018)

REPRODUCTIVE PATTERNS IN *PETROLISTHES ARMATUS*

- Many crustacean species exhibit variability in growth, size at maturity, and reproductive output across regions and environmental conditions.
- *P. armatus* demonstrates high fecundity and propagule pressure in non-native communities.
- *How does size at ovigery change with latitude?*

(Flores et al. 2009), (Hollebone and Hay 2007), (Mack et al. 2019), (Miranda and Mantelatto 2010), (Ventresca 2021), (Vina-Trillos et al. 2023), (Wassick et al. 2017)

PARASITISM IN *P. ARMATUS*



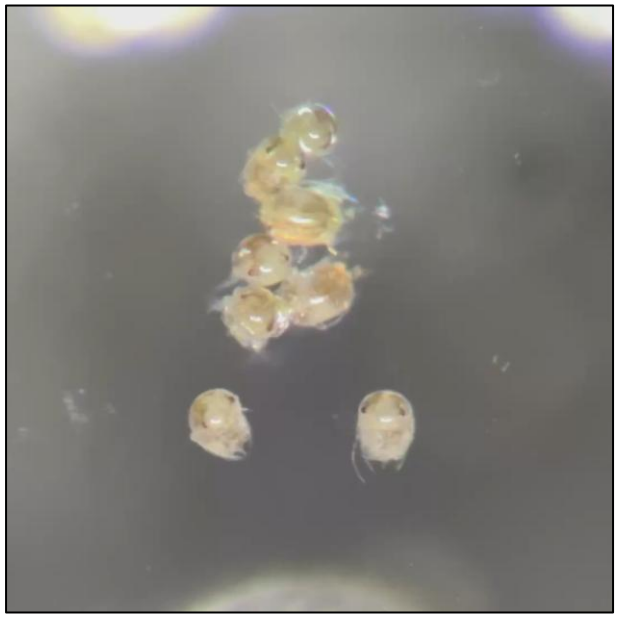
Site	Year	Status	Citation #
(1) Pine Knoll Shores, North Carolina, USA	2024	Non-native	1
(2) Charleston, South Carolina, USA	2024	Non-native	1
(3) Skidaway Island, Georgia, USA	2024	Non-native	1
(4) Jacksonville, Florida, USA	2024	Non-native	1
(5) Fort Pierce, Florida, USA	2024	Cryptogenic	1
(6) Miami, Florida, USA	1972	Cryptogenic	2
(7) Appalachicola, Florida, USA	1935	Native	2
(8) Farol Island, Brazil	1991	Native	3
(9) Araçá, Brazil	2006	Native	4

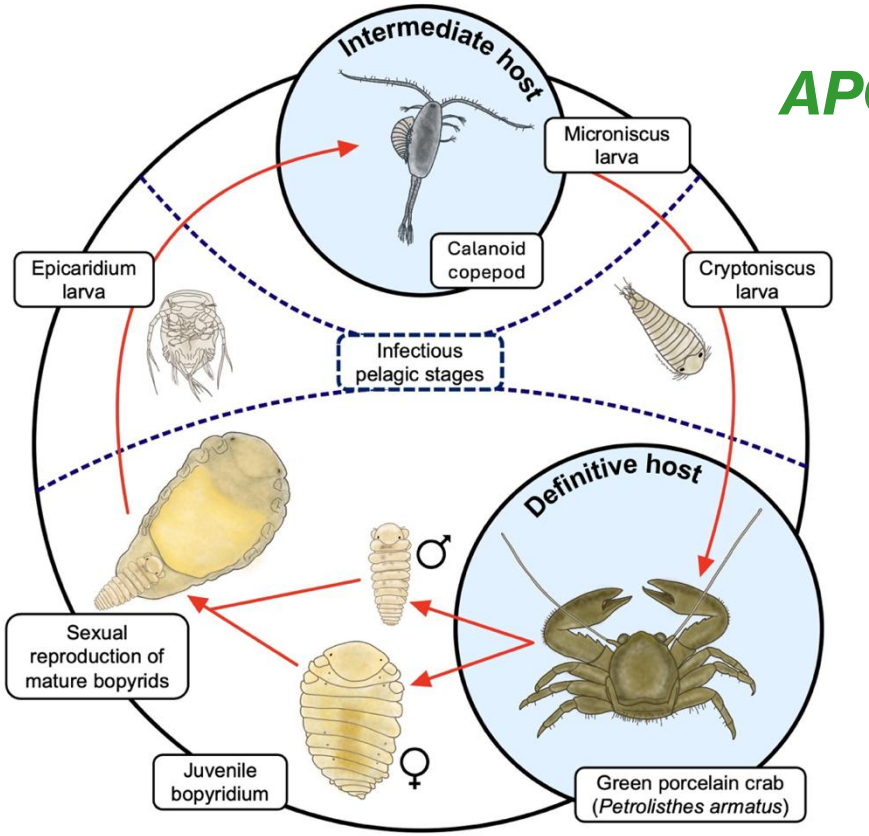
***Native range*:**
3.1 – 17%
infection

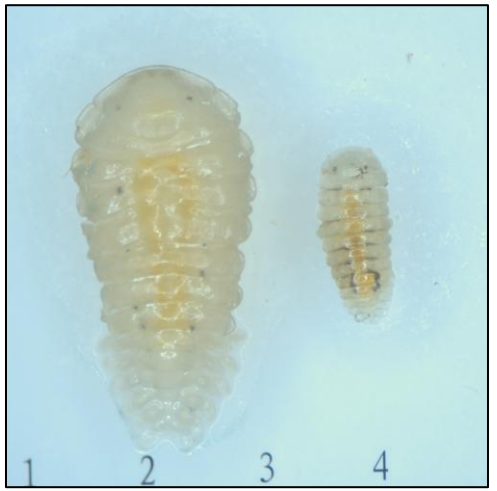
- In their native range, *P. armatus* is known to host a ***single*** parasite: ***Aporobopyrus curtatus*.**
- There is **no record** of bopyrid infection in the non-native range of *P. armatus*.

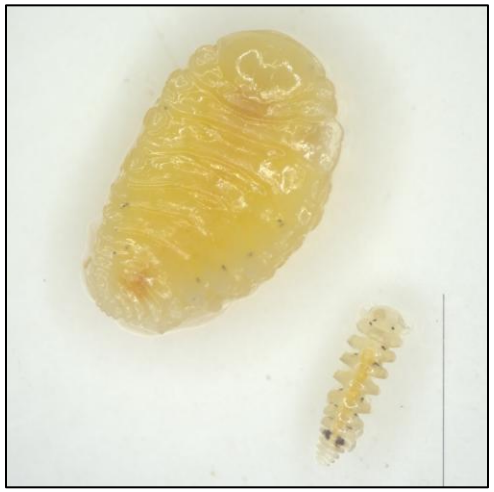
(Fowler et al. 2026), (Boyko et al. 2012), (Miranda and Mantelatto 2010), (Moore et al. 2025; Moore, pers. comm.), (Oliveira and Masunari 1998)

LIFE CYCLE OF *APOROBOPYRUS CURTATUS*





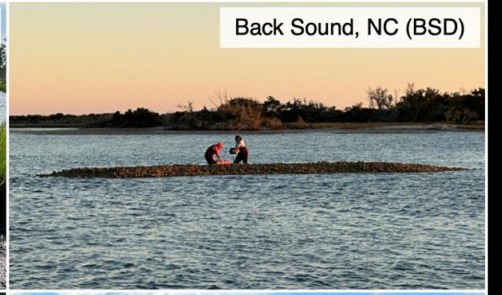


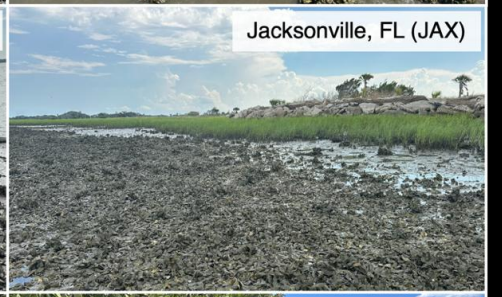


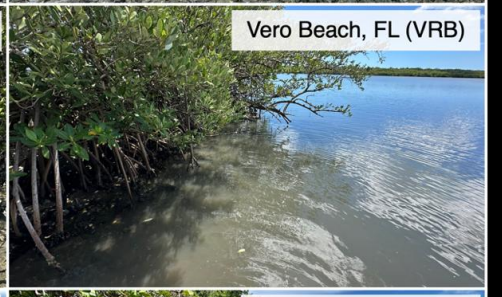
(Miranda and Mantelatto 2010), (Williams and Boyko 2012)

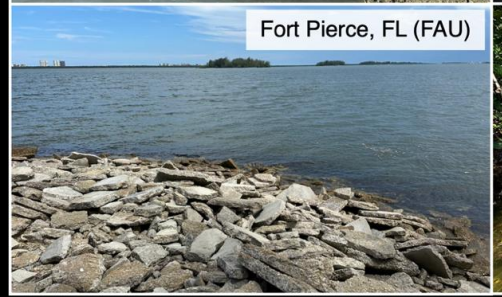
FIELD METHODOLOGY

- Habitat varied along the gradient:
  - Oyster reef dominant: ≥ ~30°N
  - Mangrove dominant: ≤ ~30°N
- Passive sampling units (“crab condos”): milk crates (19 × 22 × 16 cm) filled with oyster cultch, deployed 6–8 weeks.
- Haphazardly sampled by hand as needed.



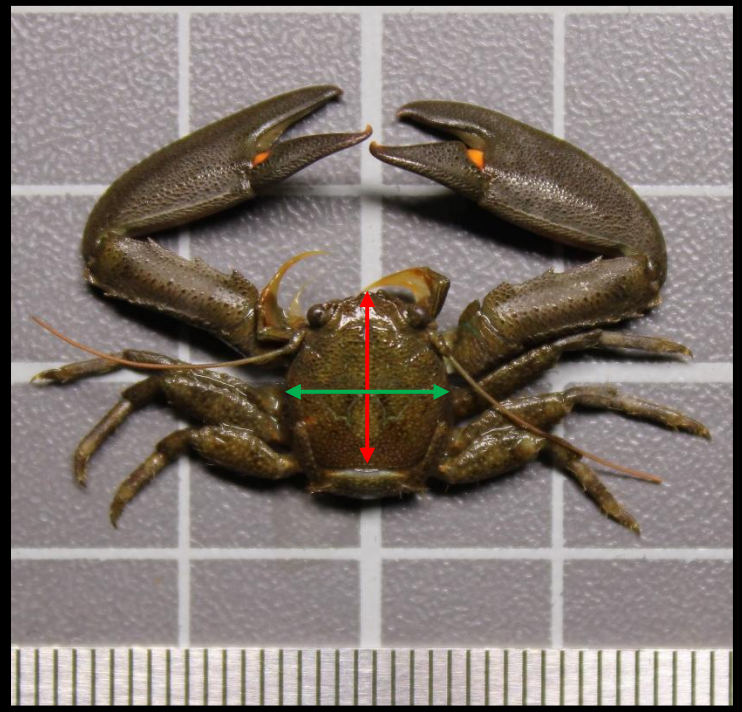






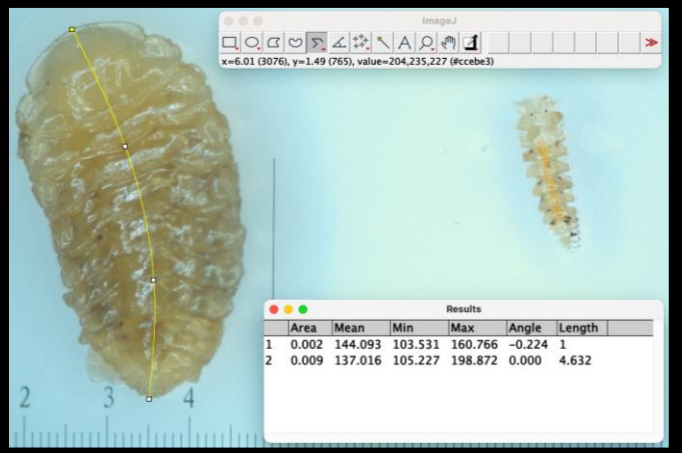
LAB METHODOLOGY

- Sex/reproductive status determined by pleopod morphology and presence of eggs/embryos
- Carapace length (CL) and width (CW) were measured using digital calipers to nearest 0.01 mm.



Dissections

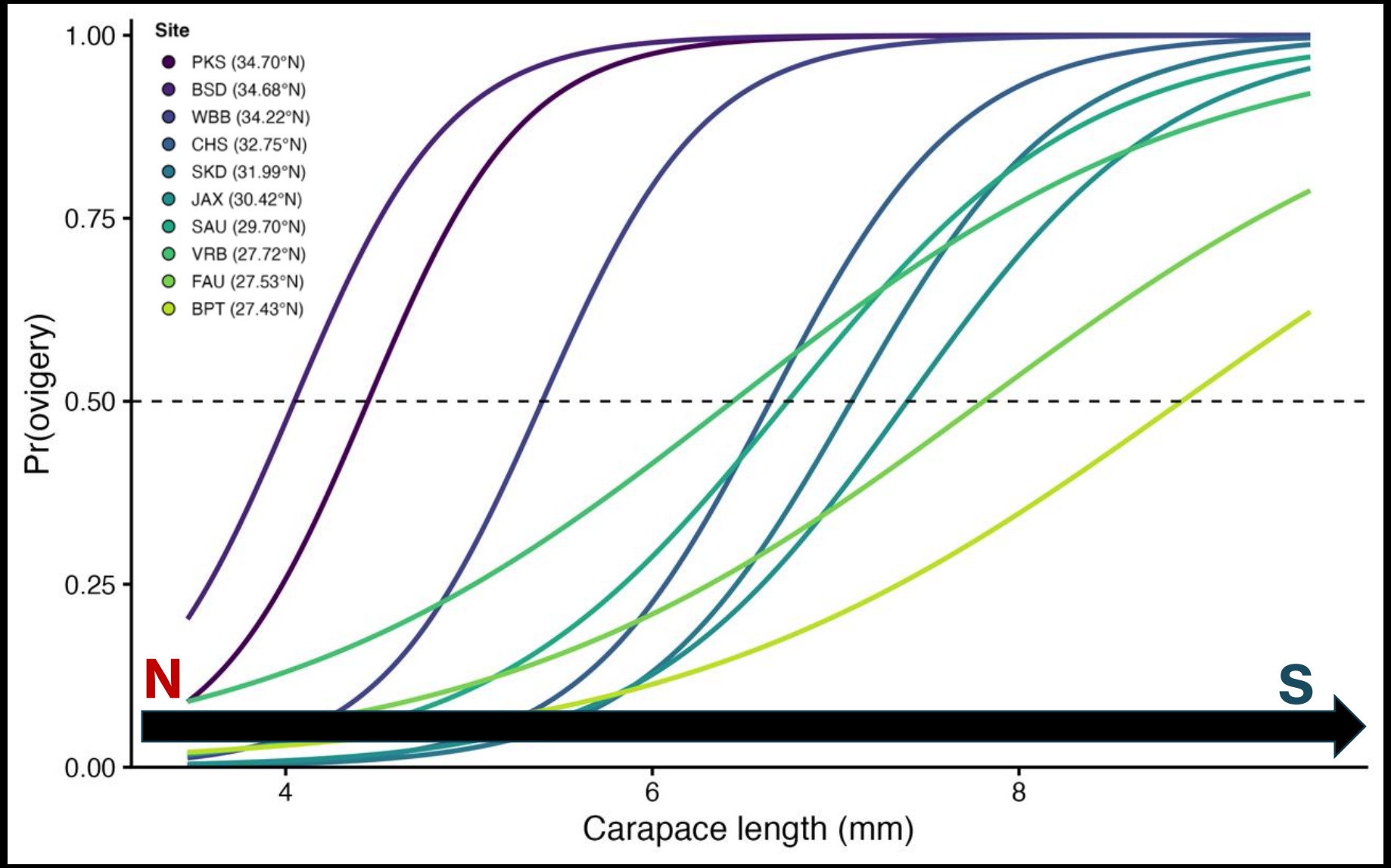
- All crabs were dissected using a stereo microscope and bopyrid infection status recorded.
- Bopyrids classified by sex and developmental stage (F, M, O, JF, JM) using morphology.
- Parasites photographed on calibrated micrometer slide then measured in ImageJ.



(Blakeslee et al. 2024), (Hiller et al. 2006), (Markham 1975), (Miranda and Mantelatto 2010b), (Pinheiro et al. 2017), (Romero-Rodriguez and Alvarez 2019), (Wassick et al. 2017a), (Werding and Hiller 2015), (Williams and Boyko 2012)

How does probability of ovigery in female green porcelain crabs shift with latitude?

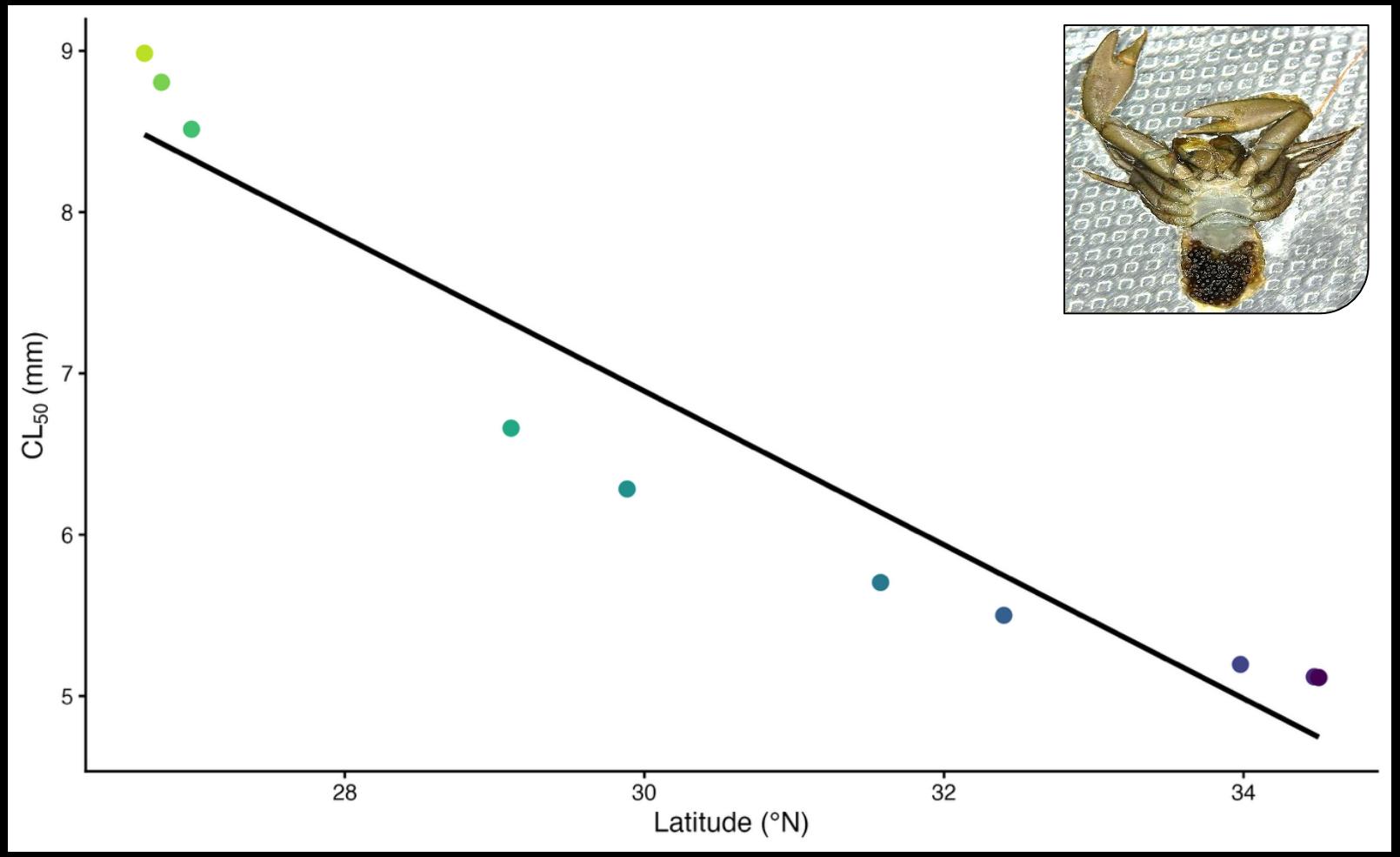
RESULTS: PROBABILITY OF OVIGERY



Probability of ovigery increased with body size (CL) and varied with latitude (n = 895).

How does probability of ovigery in female green porcelain crabs shift with latitude?

RESULTS: PROBABILITY OF OVIGERY

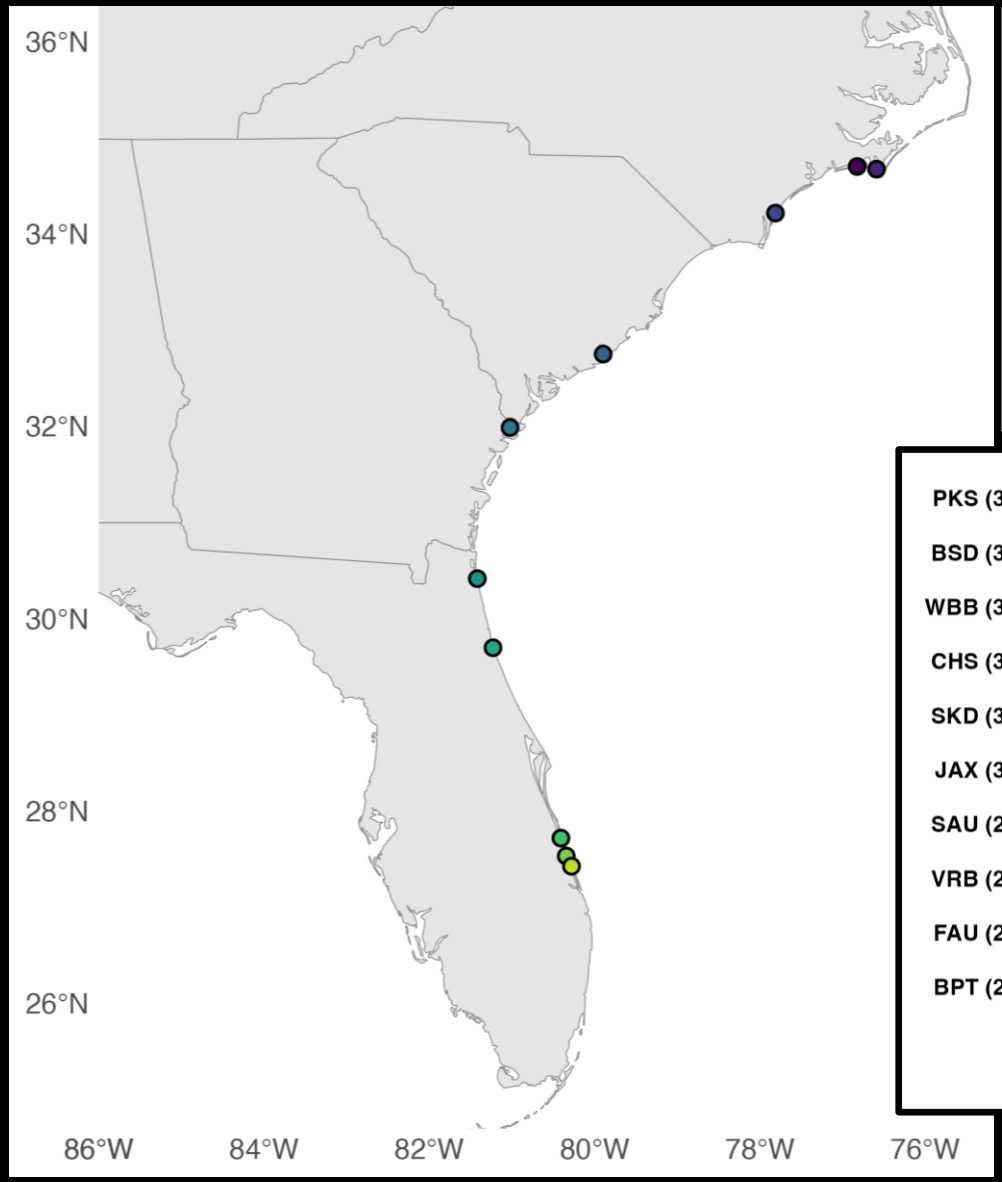


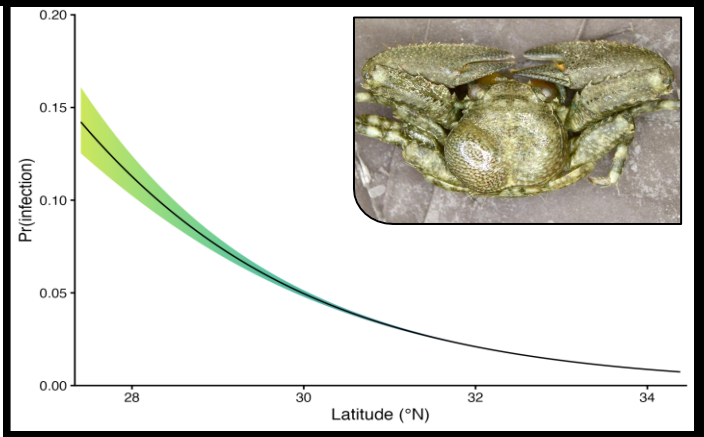
- CL_{50} declined significantly with increasing latitude ($p<0.001$).
- Southern sites ~9.0 mm; northern sites ~5.1 mm.
- Higher-latitude females reached maturity at smaller sizes.

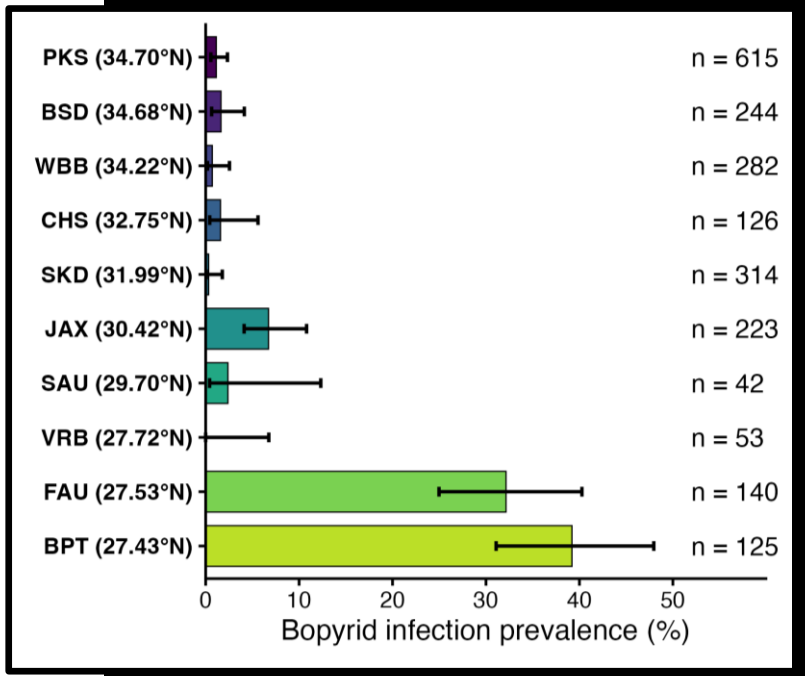
How does bopyrid infection prevalence and infection probability vary with latitude?

RESULTS: BOPYRID INFECTION

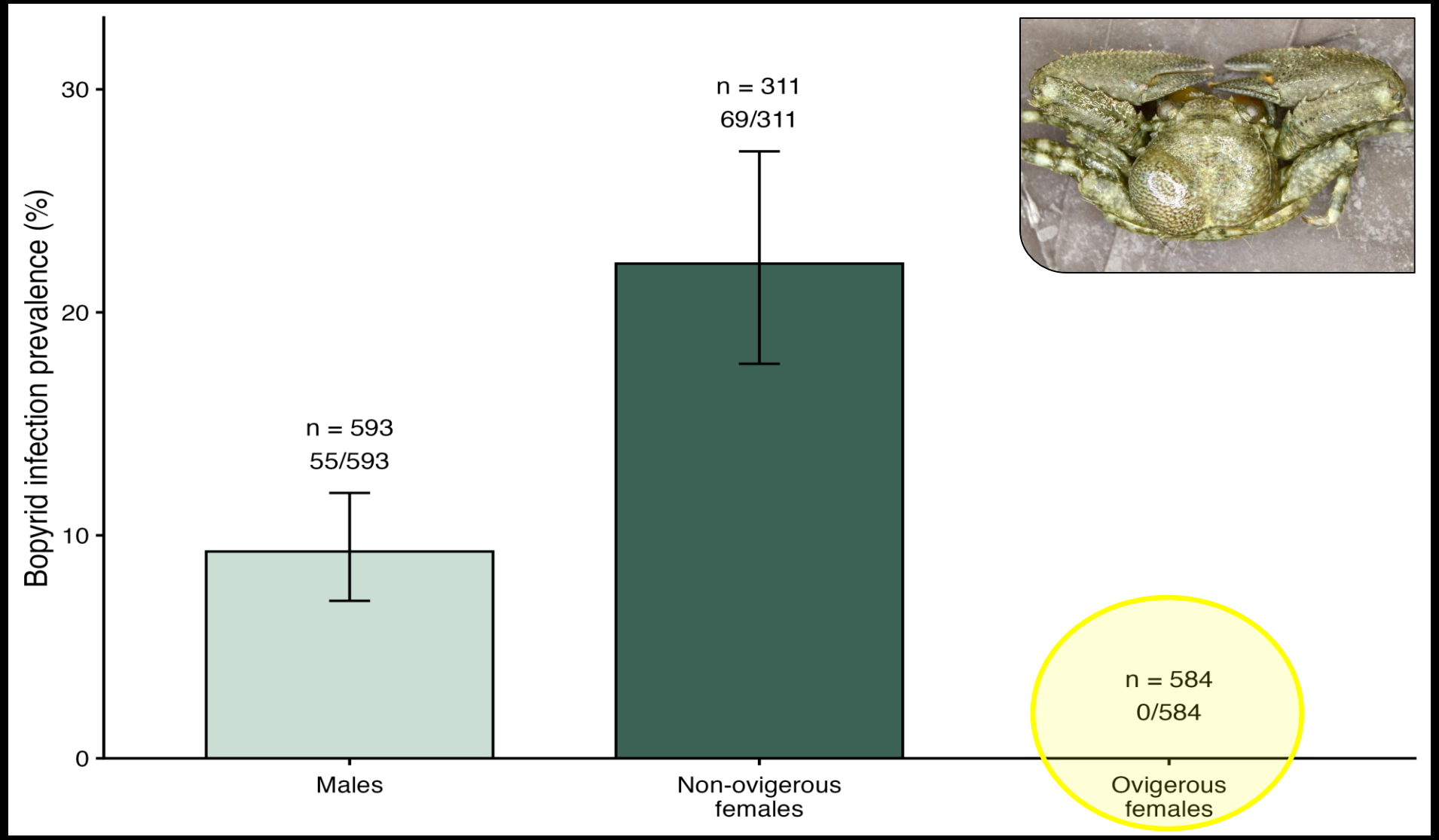
- Infection prevalence and infection probability decreased with increasing latitude.
- 97.1% reduction from southernmost (BPT: 39.2%) to northernmost (PKS: 1.14%) site.
- Notable decline at ~30°N (tropical–temperate transition zone), with all northern sites below 2% infection prevalence.







RESULTS: No ovigerous females were infected – evidence of female castration?



CONCLUSIONS

- Size at maturity decreased with increasing latitude.
- Patterns in ovigery and infection may suggest female castration in this host-parasite relationship.
- Bopyrid infection declines strongly with latitude (correlated with time since introduction – enemy release?)
- Latitudinal gradients shape both host-parasite interactions and reproductive strategies in *P. armatus*.

ACKNOWLEDGEMENTS

Jim Morley (ECU) & Chris Moore (UF)

Members of the Blakeslee and Gittman Labs: Garrett Maggio, Carter Stancil, Terry Papavasilis, Meghan Nadzam, Emma Saddison, Amelia Magee, Chloe Gabriel, Grace Loonam, Dylan Whitt, Megan Geesin, Georgette Tso, & Mary-Margaret McKinney

Former undergraduate students: Enrique Zamudio-Jimenez, Cameron Bolles, & Billy Hinson

Collaborators: Laura Lukas, Erik Sotka (CofC), John Carroll (GSU), Ann Wassick, Wilson Freshwater (UNCW)

Funders: ECU Water Resources Center, American Museum of Natural History, NC Sea Grant, & NC Water Resources Research Institute

Sea Grant NORTH CAROLINA

wrri

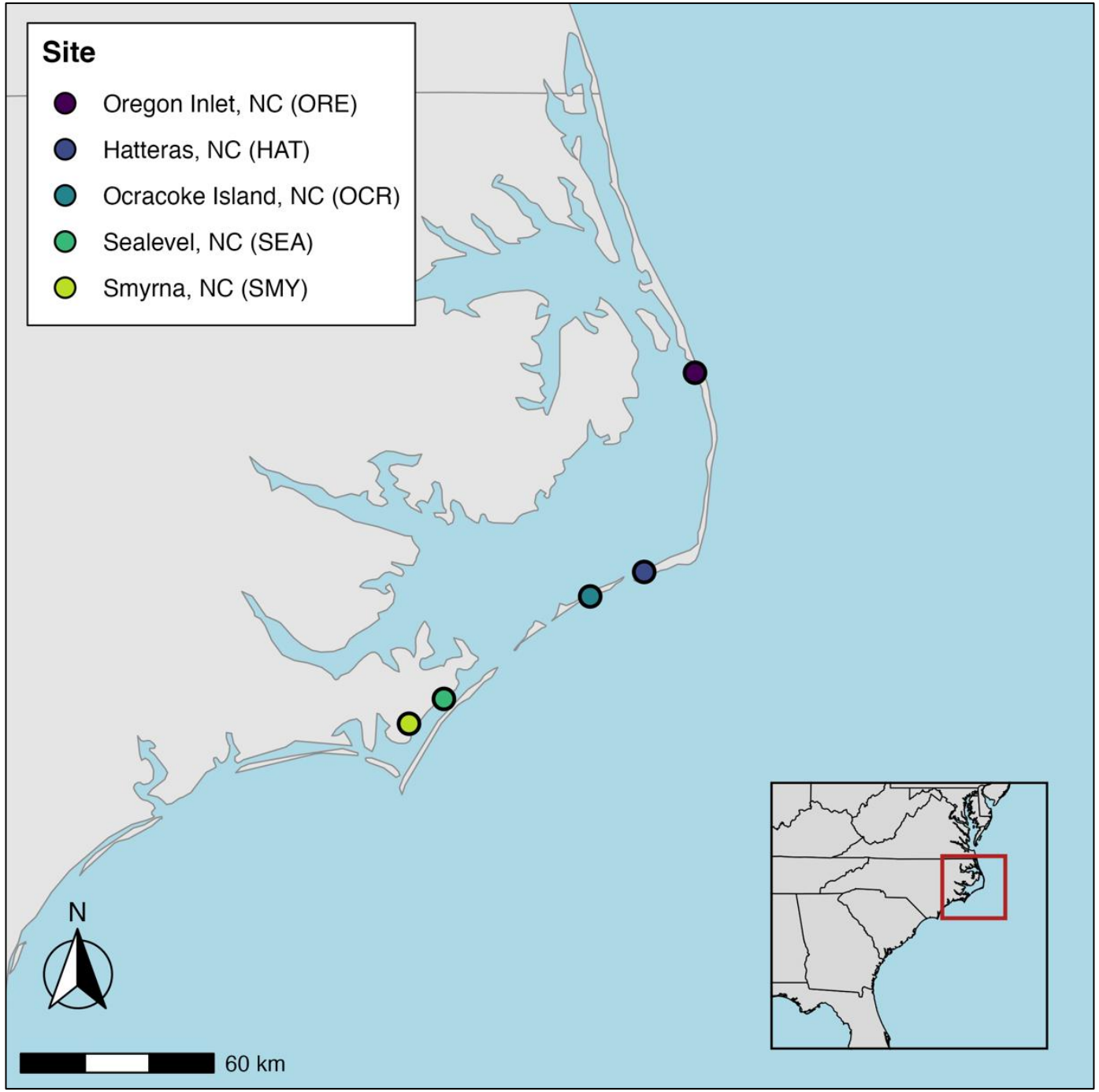
American Museum of Natural History

ECU WATER RESOURCES CENTER

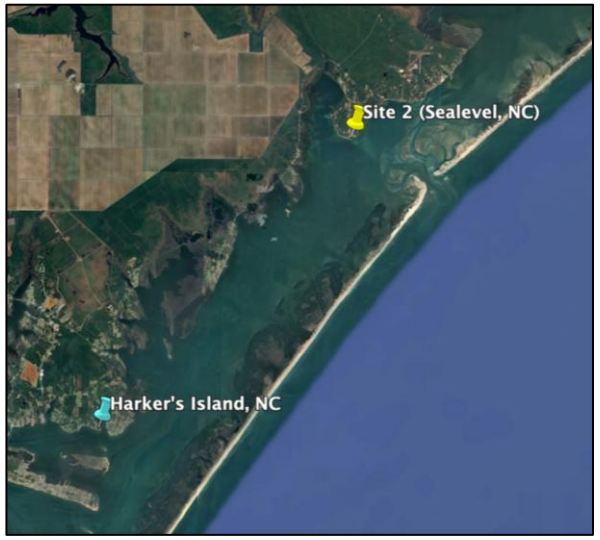
FUTURE DIRECTIONS

Question: Since their detection at the leading edge of the non-native range in late 2018, has *P. armatus* continued expanding further north?

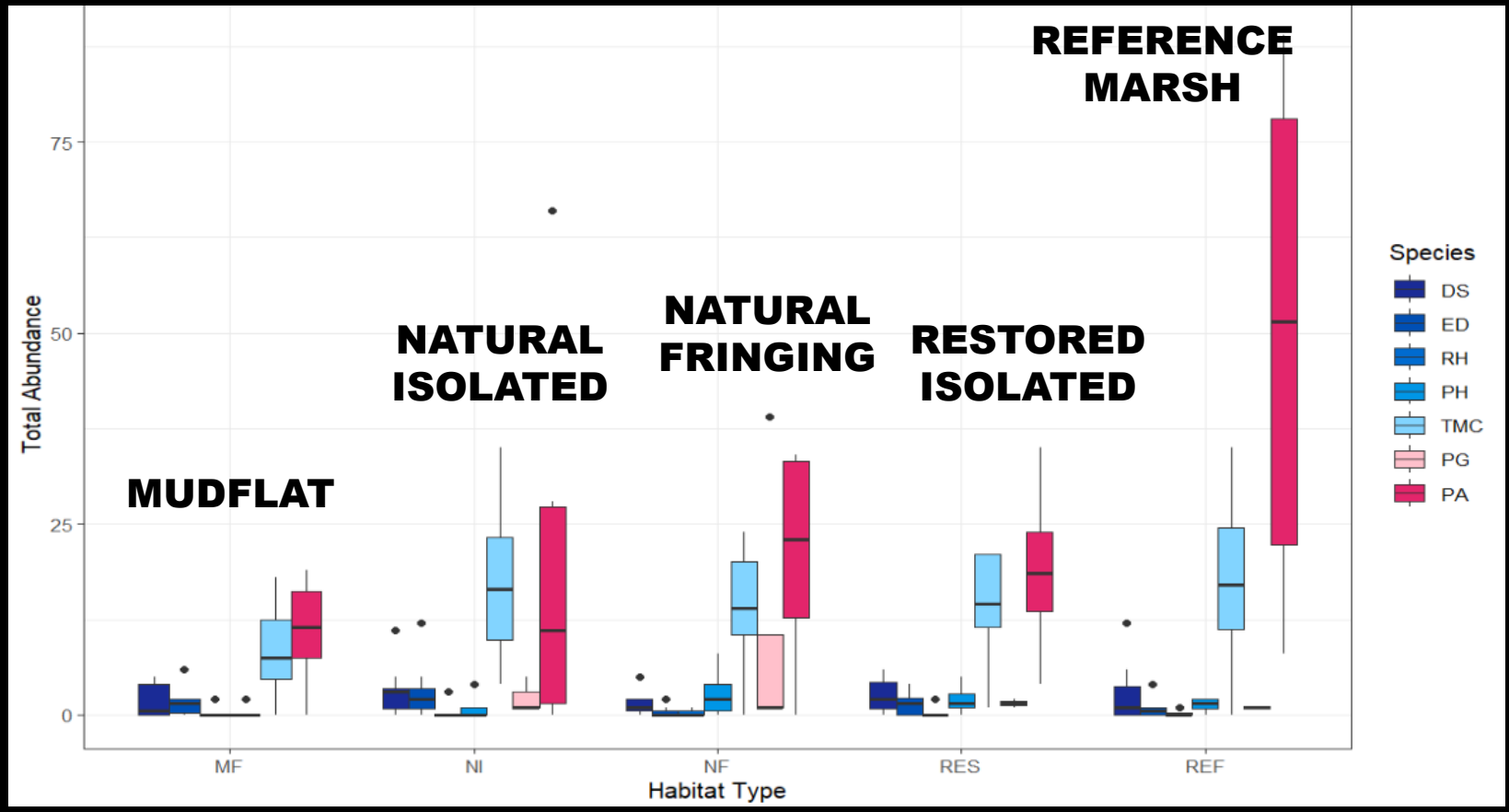
- In September 2025, we conducted the NC Decapod–rapid biodiversity surveys at 5 sites along the inner and outer banks of NC.



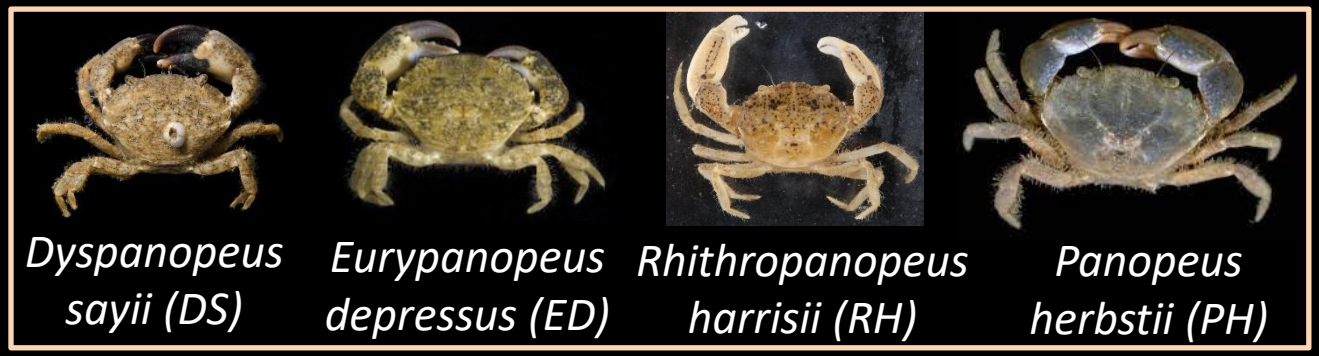
Approximately **20.3 km (12.6 mi) NE** of the previously established leading edge of the non-native range, we detected ***Petrolisthes armatus***!



Crab Abundance Data from Crab Condos (Middle Marsh, 2022)



Images from: iNaturalist, MD Biodiversity Project, and SC DNR



Dyspanopeus sayii (DS) *Eurypanopeus depressus (ED)* *Rhithropanopeus harrisii (RH)* *Panopeus herbstii (PH)*

Petrolisthes armatus (PA)

Petrolisthes galathinus (PG)