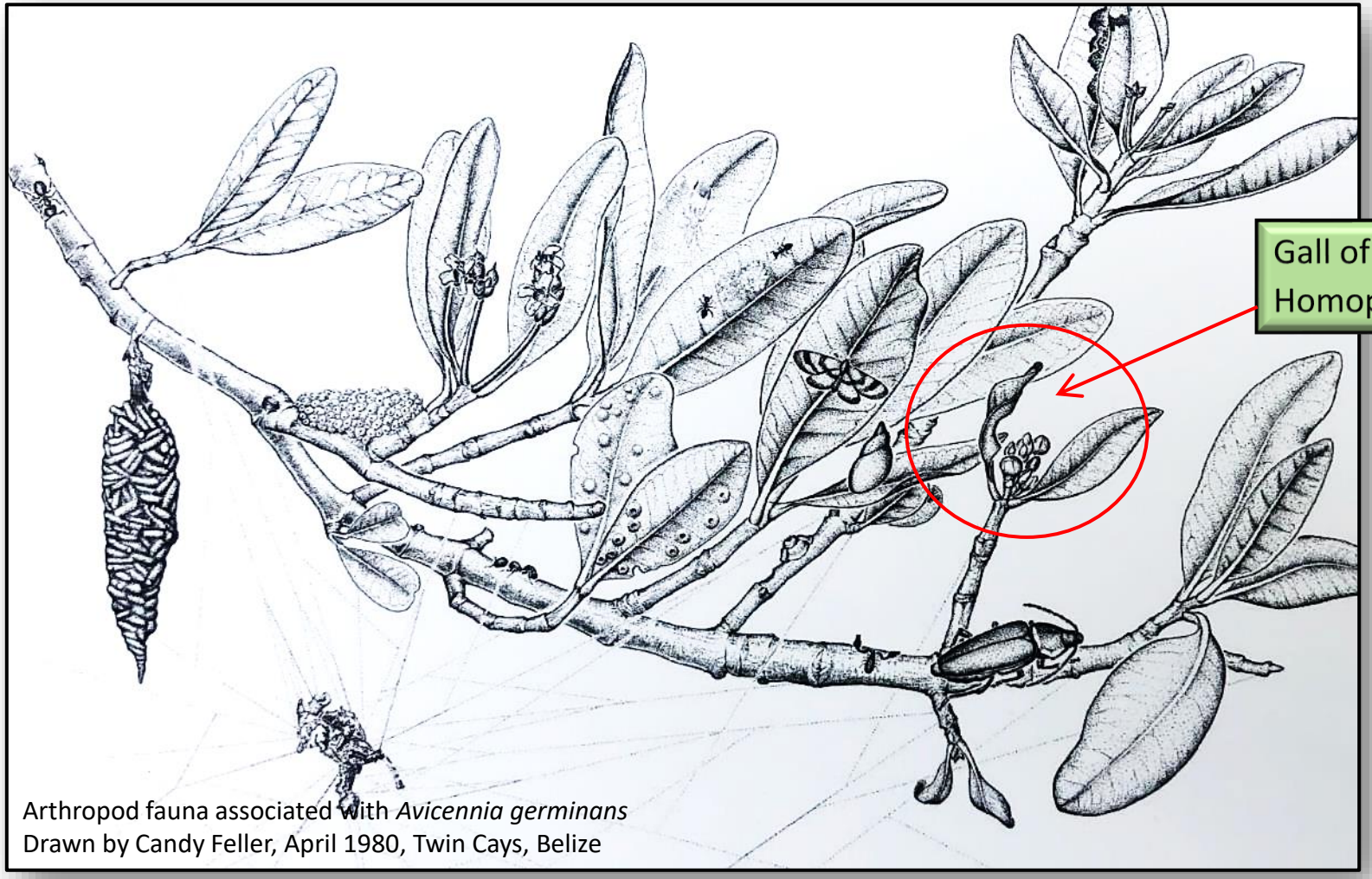


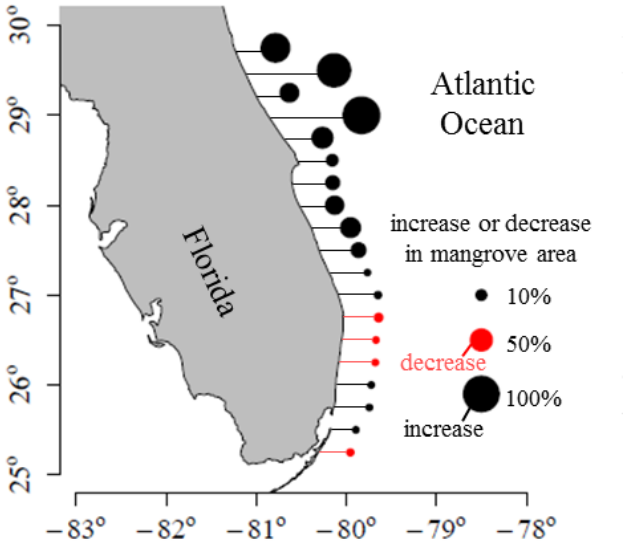
Arthropod fauna associated with *Avicennia germinans*
Drawn by Candy Feller, April 1980, Twin Cays, Belize

Mangrove Range Shifts Alter Primary Production & Have Dramatic Effects on Canopy Biodiversity & Food Web Structure, *albeit a bit cryptic…*

Candy Feller
Smithsonian Institution, Scientist *Emerita*

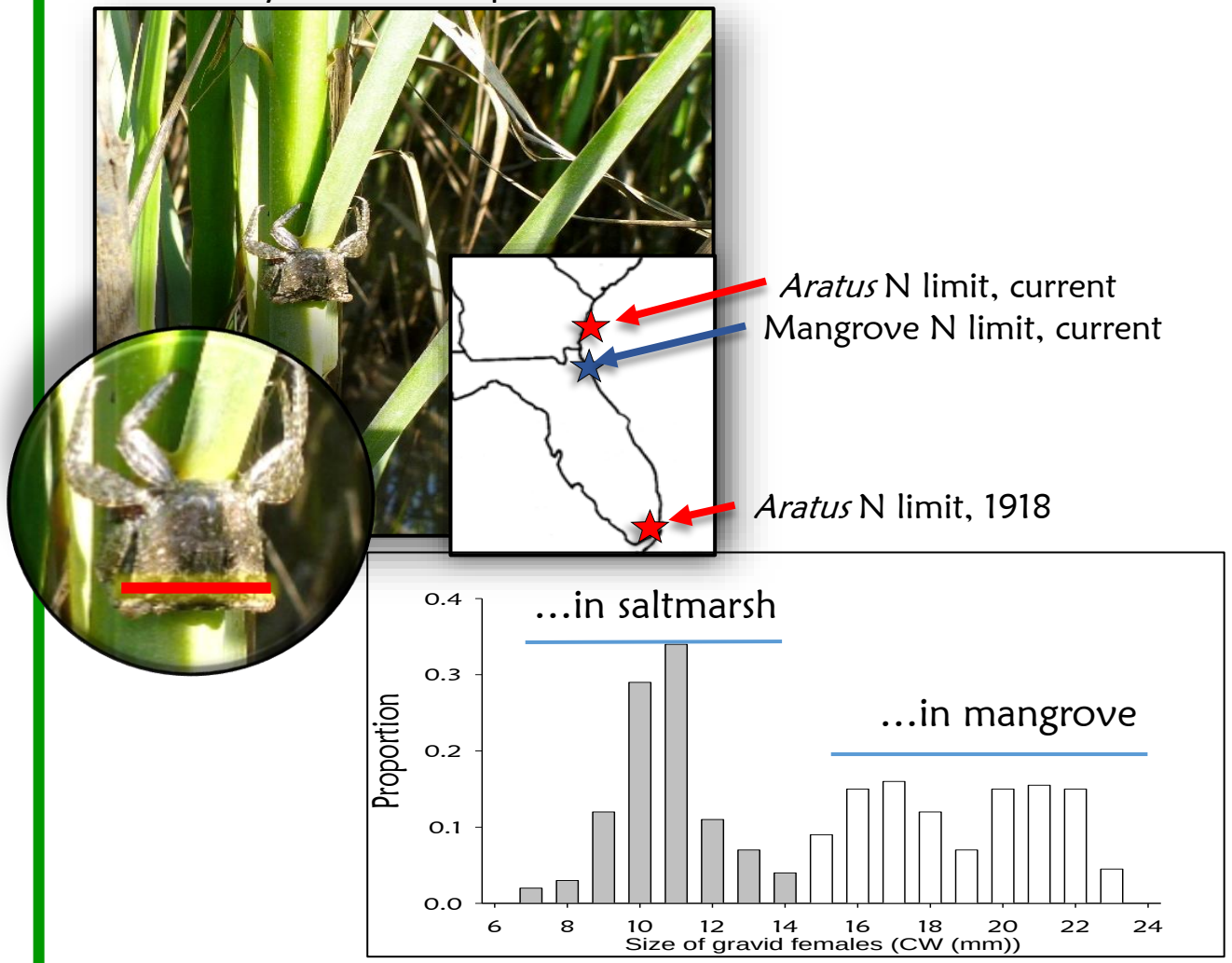
Climate change is causing range shifts of many species and altering ecological processes worldwide.

Cavanaugh et al. (2014) documented a dramatic range shift in the distribution of mangroves in Florida between 1984 and 2011, particularly in the temperate-tropical ecotone where they are replacing saltmarsh spp.



Cavanaugh et al. 2014 PNAS

Riley et al. (2014) documented a dramatic range expansion of the Mangrove Tree Crab, an iconic member of the mangrove community in this same part of Florida.



Aratus carapace width (mm)

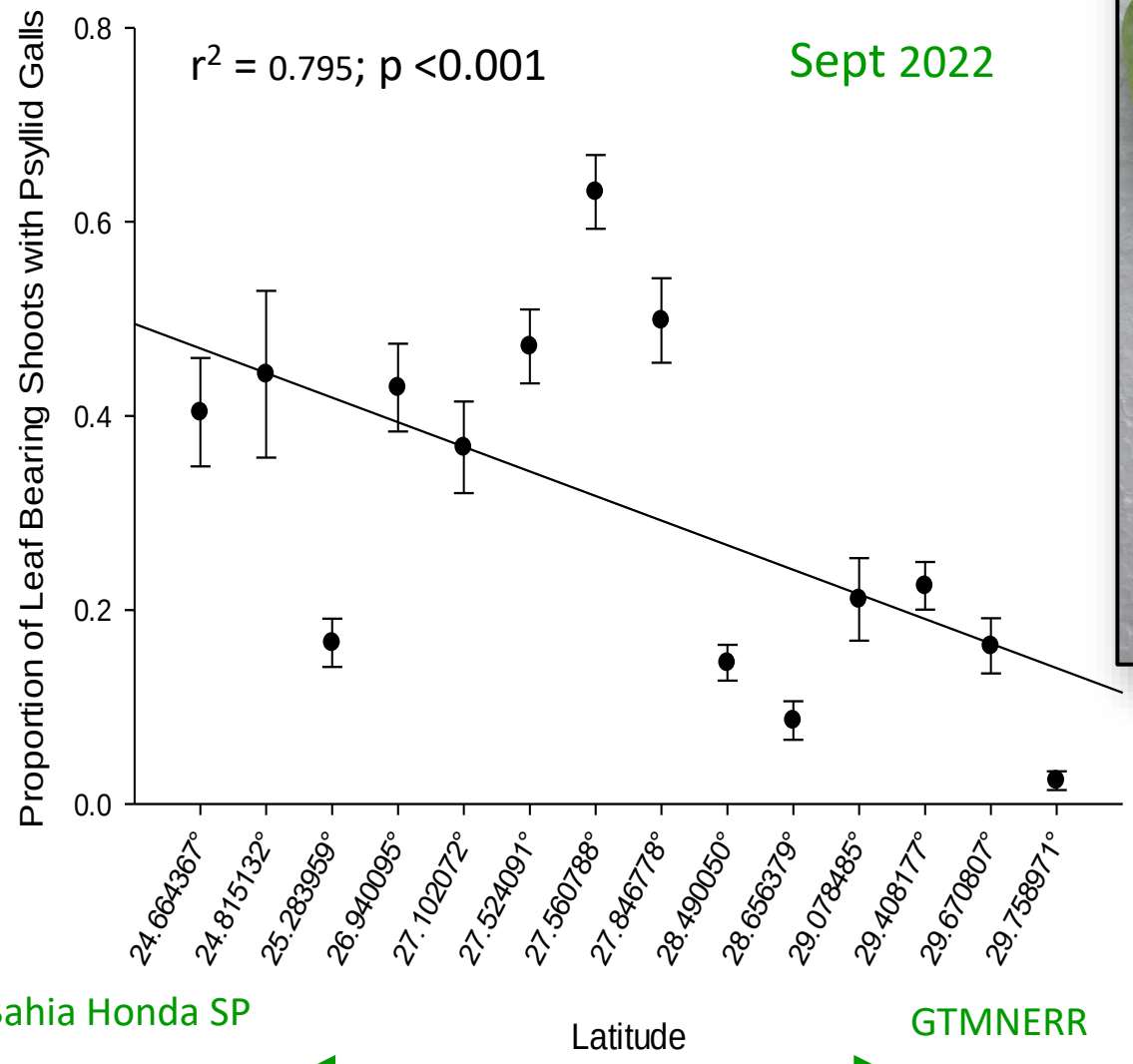
Riley M, CA Johnston et al. *2014. Southeastern Naturalist*

What are the ecological consequences of mangrove expansion on biodiversity and food-web dynamics?

- Surveys of the mangrove-fauna interactions across this latitudinal gradient from pure mangrove forests in the Keys in the south to pure salt marshes in north Florida and beyond…

  - *How is mangrove expansion affecting plant-animal interactions and community structure?*
  - *Does the mangrove foodweb vary along a climatic gradient?*

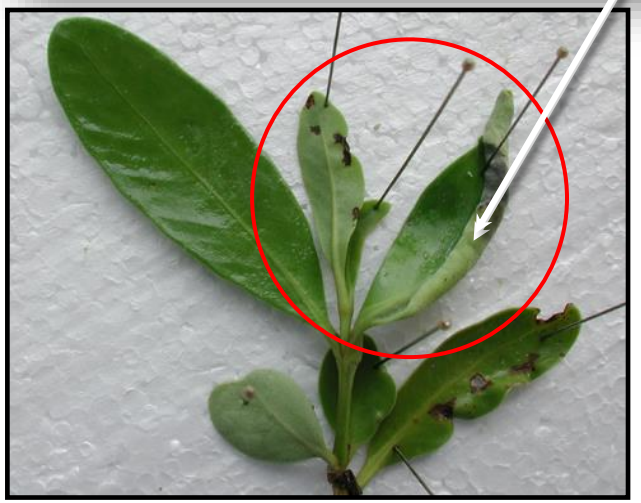
The Black Mangrove Psyllid, *Leuronota maritima*
Rolled-leaf galler, specialist herbivore/ecosystem engineer; co-evolved with *Avicennia germinans*

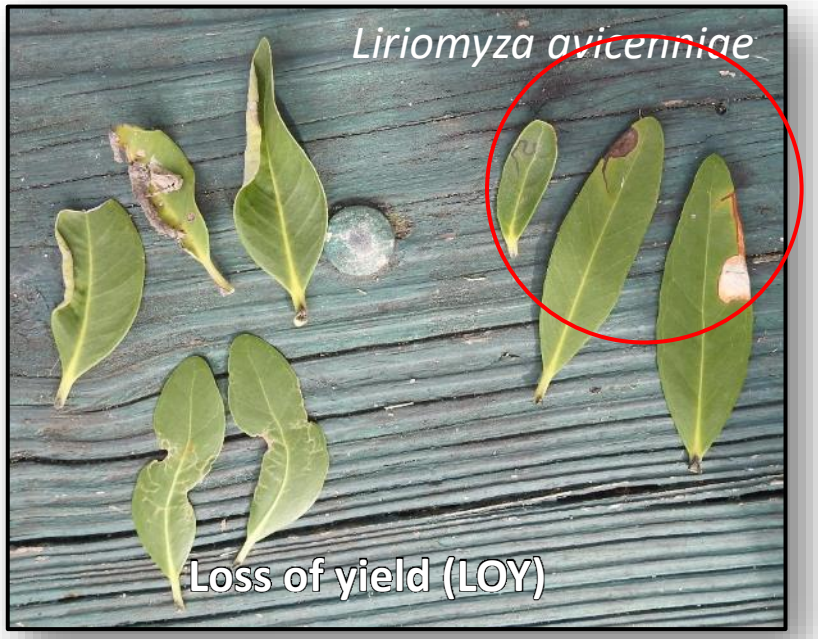


Halbert & Burckhardt 2020 Psyllids of Florida. *Insecta Mundi*

Leuronota maritima

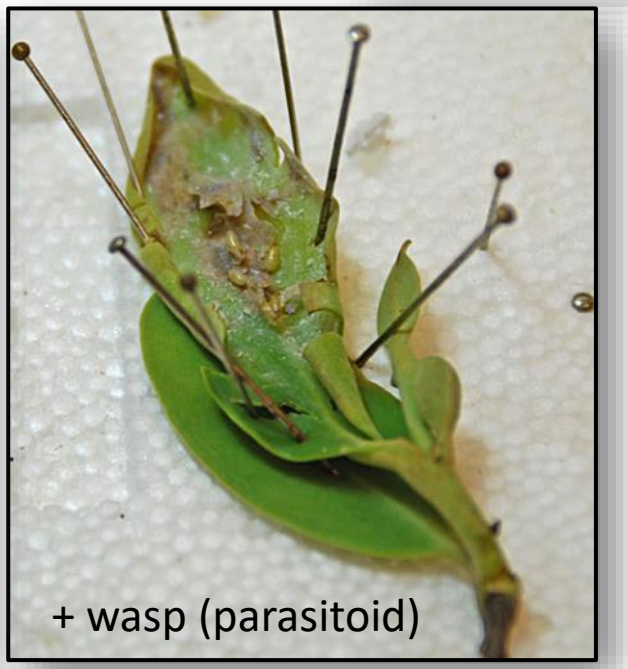
ecosystem engineer





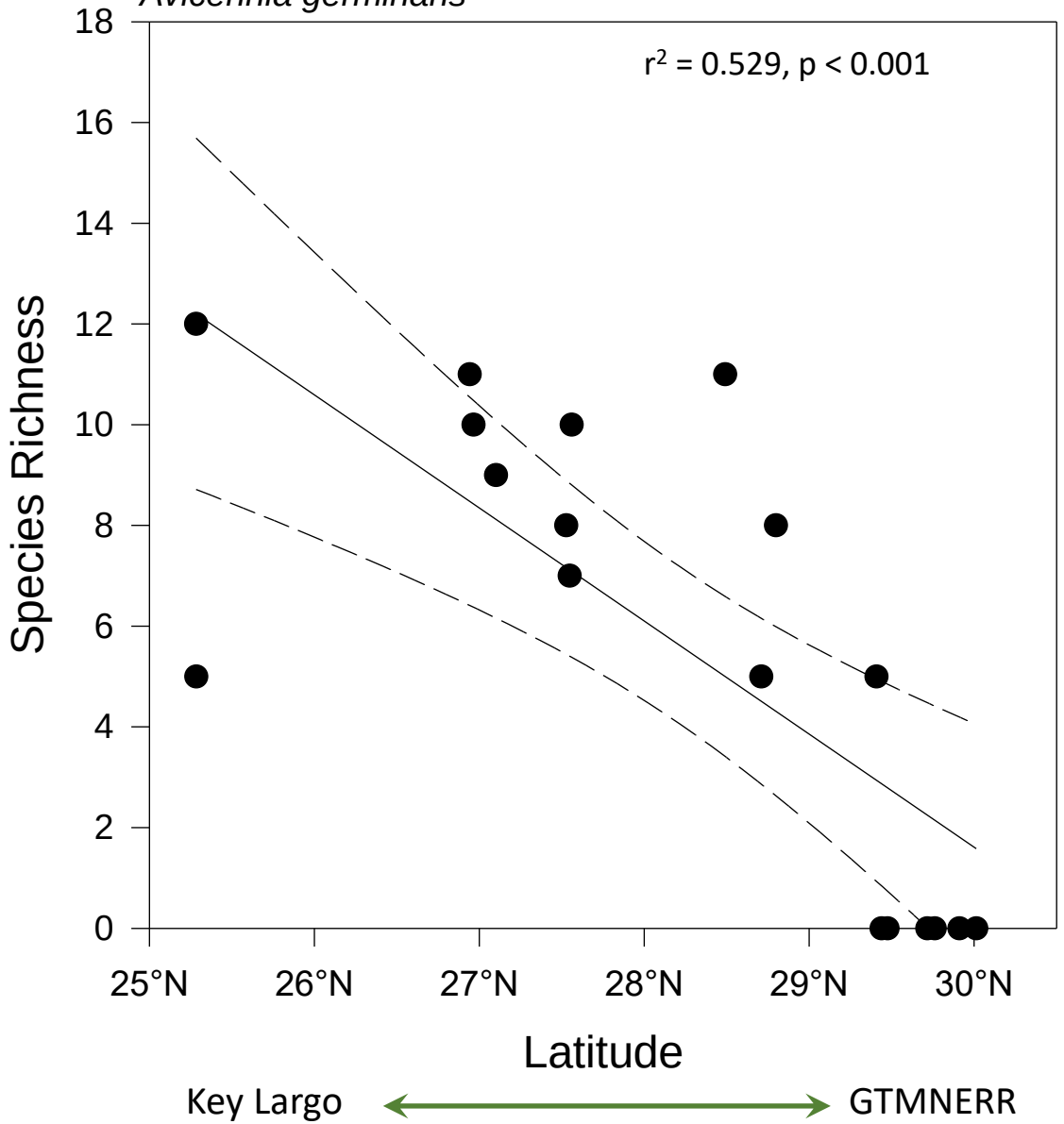
Inquilines in L*euronota* rolled-leaf galls

Photo iNaturalist ©Hope Abercrombie



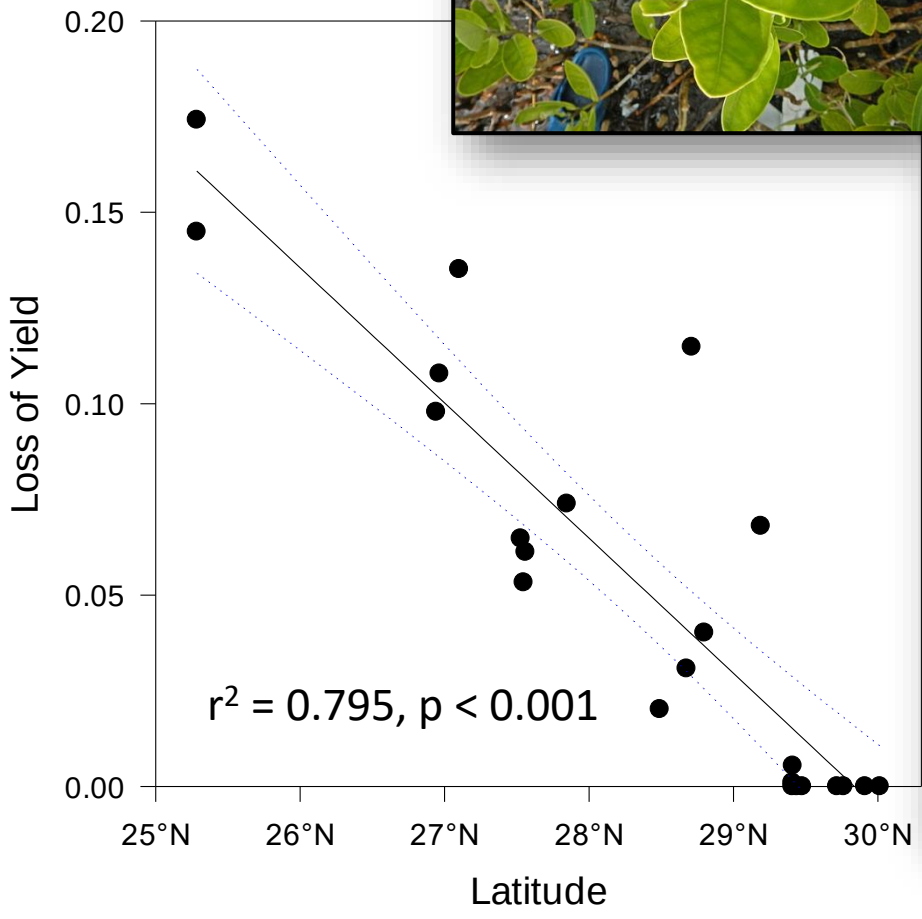
- *Leuronota maritima is an ecosystem engineer; its* galls provide prime real estate in the mangrove
  - habitat, nest site, diurnal refuge, prey site, microclimatic adjustment, etc.
- galls with 12-14 inquiline spp. at the tropical end compared to 3 at the temperate end
- correlation between latitude & species richness in the inquiline diversity and abundance

Species richness of inquilines found in psyllid galls on *Avicennia germinans*

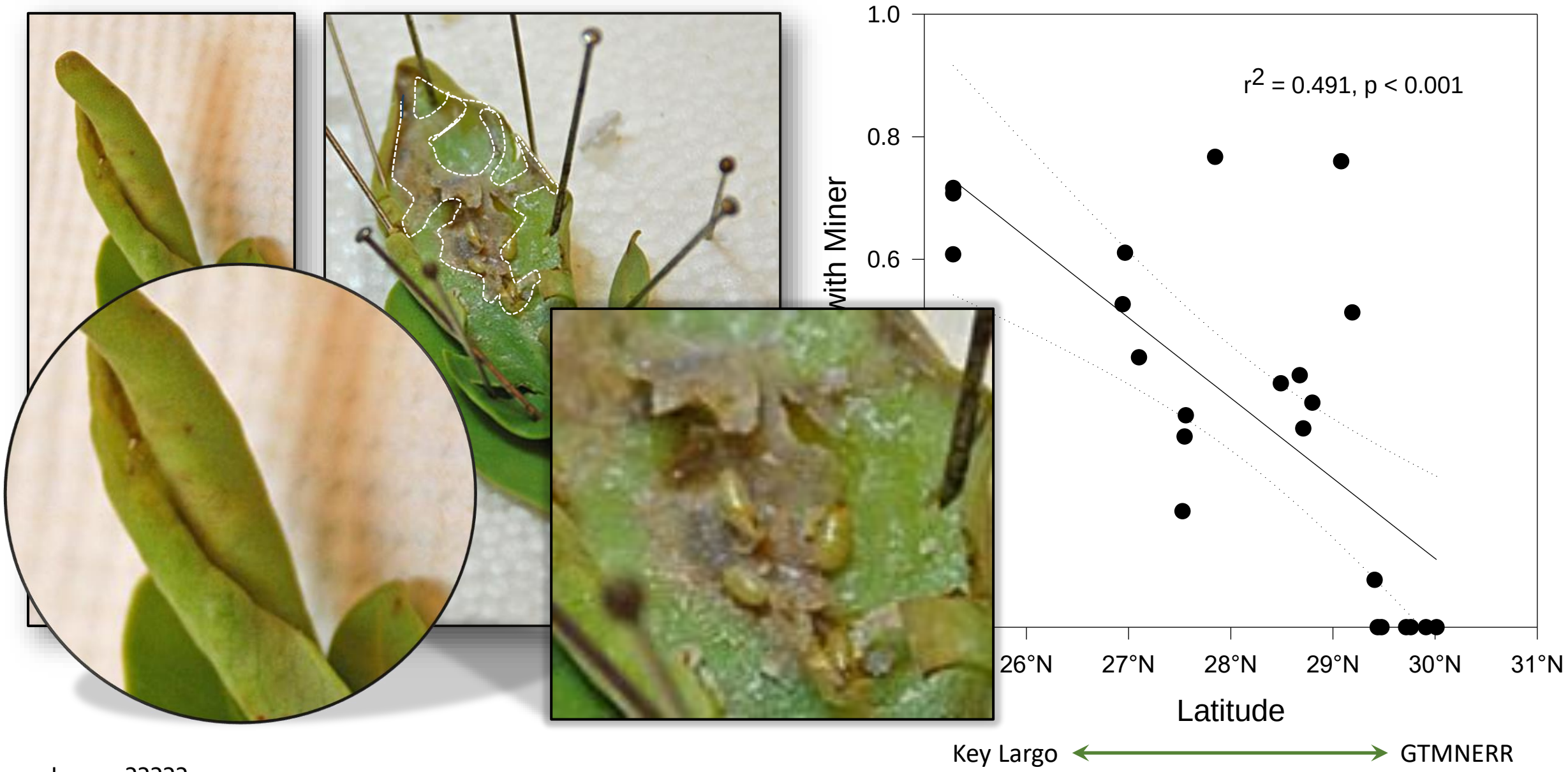


Avicennia germinans

Key Largo ⟷ GTMNERR



Key Largo ⟷ GTMNERR


Proportion of psyllid galls on *Avicennia germinans* with Agromyzid leaf miner
1.0
0.8
0.6
with Miner
r^2 = 0.491, p < 0.001
26°N
27°N
28°N
29°N
30°N
31°N
Latitude
Key Largo
GTMNERR

…phoresy?????

OVERALL… Similar for other species, climate change and extreme events are causing a poleward shift in the distribution, phenology, and abundance of mangroves and mangrove-associated species along the Atlantic coast of Florida… as well as other places around the world.

Like the mangrove plants, the mangrove fauna is also expanding poleward, but latitudinal patterns and rates of migration are not the same for all members of the associated food web.

Leuronota maritima is a habitat creator and an ecosystem engineer in mangroves; common throughout the Caribbean.

Range shifts:

Range expansion of *Aratus* has exceeded that of mangroves.

Range expansion of black mangrove host has exceeded that of gall-forming psyllid *Leuronota maritima*, a specialist herbivore and its associated inquilines.

Range of agromyzid miner, specialist herbivore that mines the inside of psyllid galls, kept pace with the psyllid.

Abundance shifts:

Abundance of psyllid galls declined significantly S to N.

Abundance and diversity of inquilines associated with psyllid galls declined significantly S to N.

Phenology/demography: size at maturity and reproductive output of *Aratus* decreased with range expansion; but, mangrove plant growth and reproduction increased with range expansion.

Herbivory: Folivory was very low & did not vary with latitude; Loss of Yield was much higher and varied with the presence of the psyllid galls.

No single pattern or mechanism describes the response by all members of the mangrove community.