Current status of Apalachicola Bay, and conditions that oysters need to thrive

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Baseline Data

Definition:
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Some Elements of ABSI Baseline Data

Habitat maps

Environmental conditions

Oyster distribution

Oyster harvest data

Re-shelling/restoration

Fishery species

Non-fishery species

Hydrology

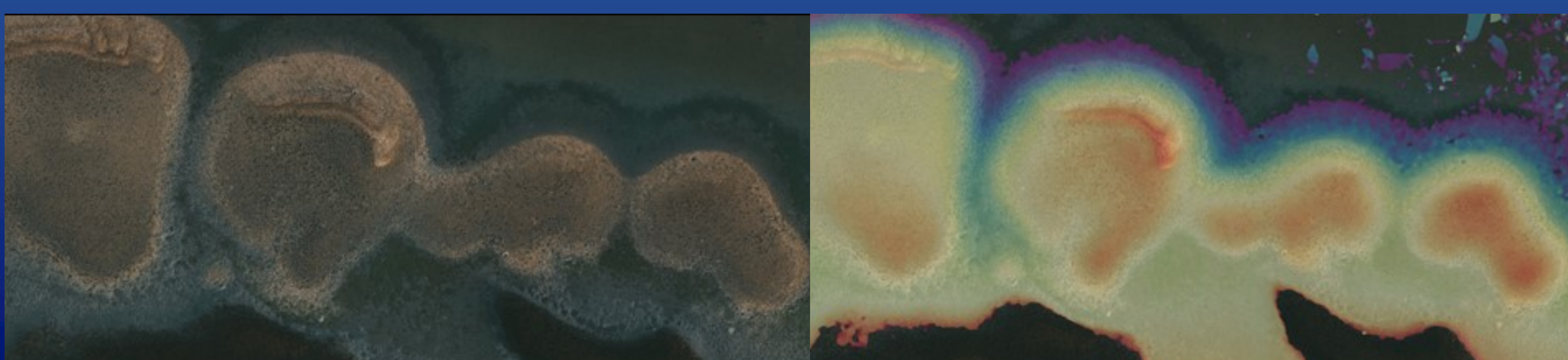
Ecological function

Ecosystem services

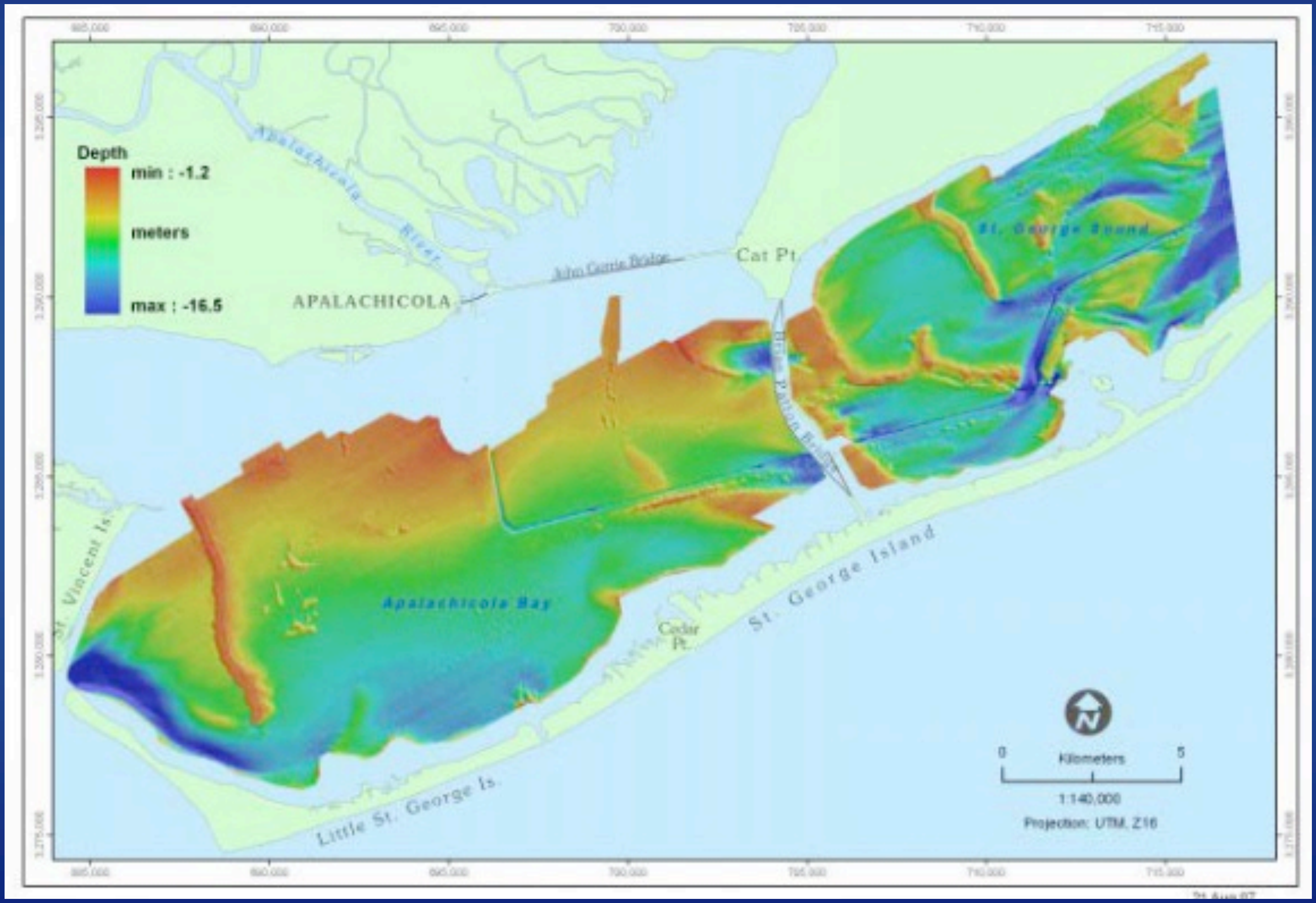
INTERTIDAL HABITAT MAPS

Grizzle et al 2018

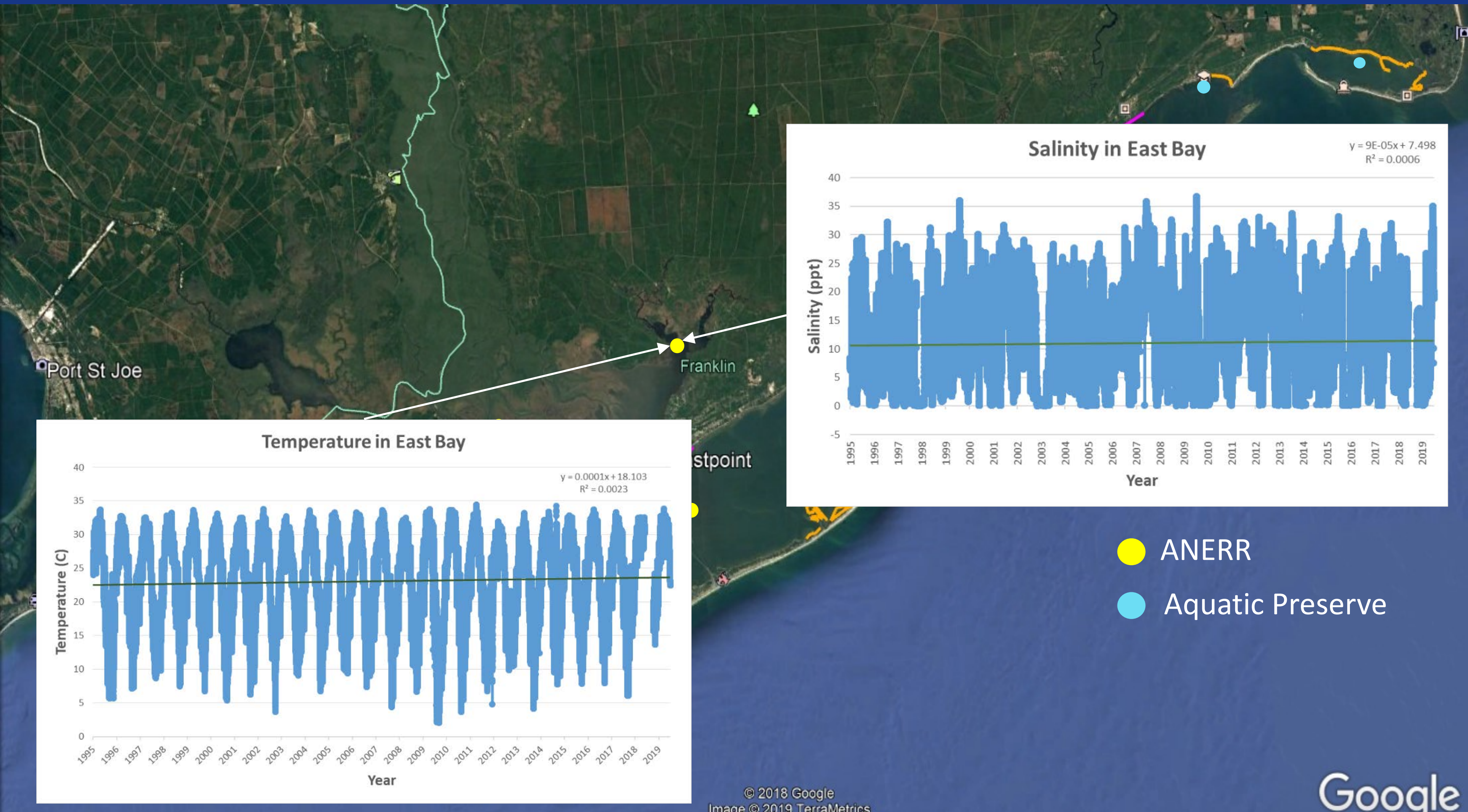
FSUCML-ABSI 2020



SUBTIDAL HABITAT MAPS



Environmental Conditions



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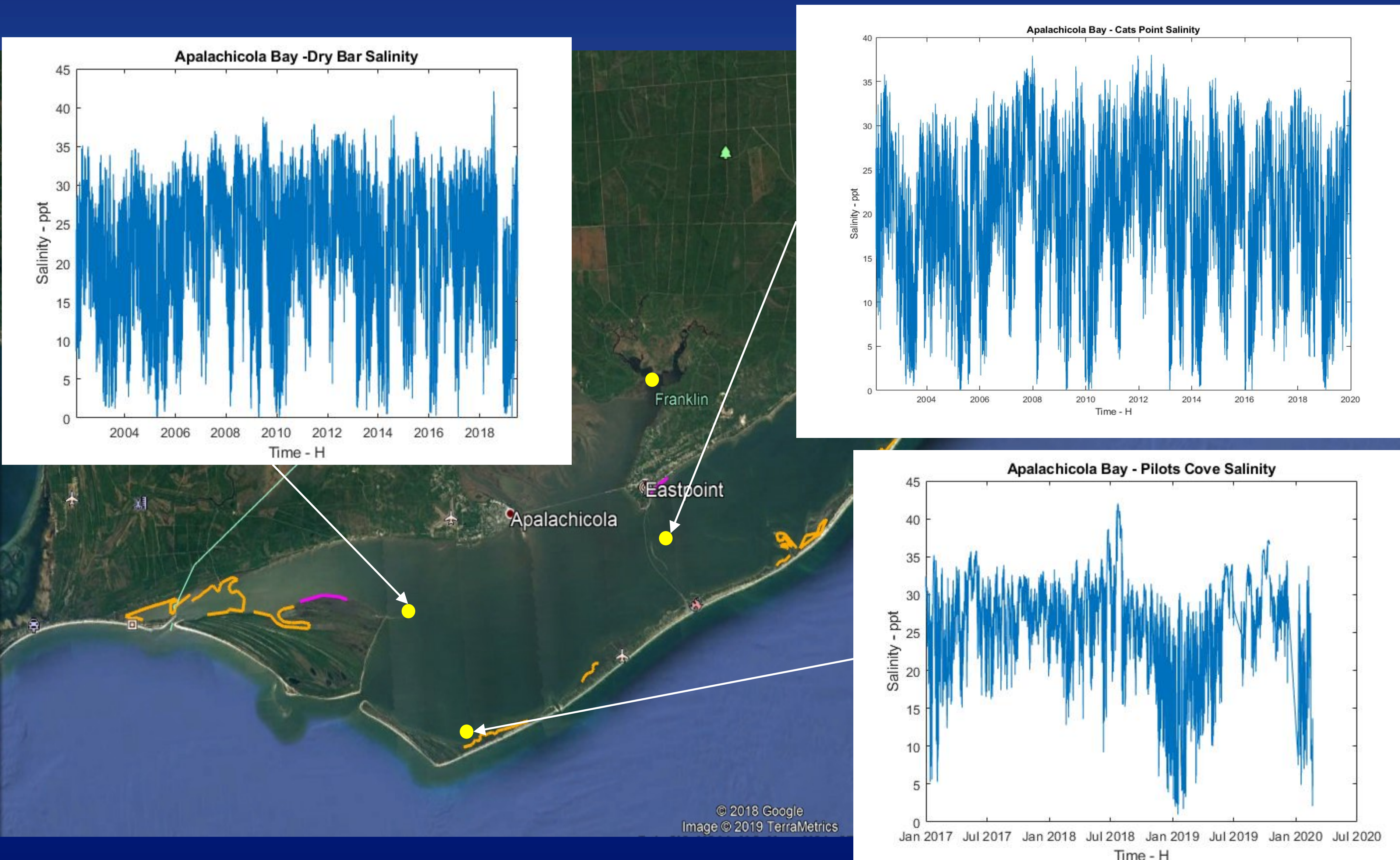
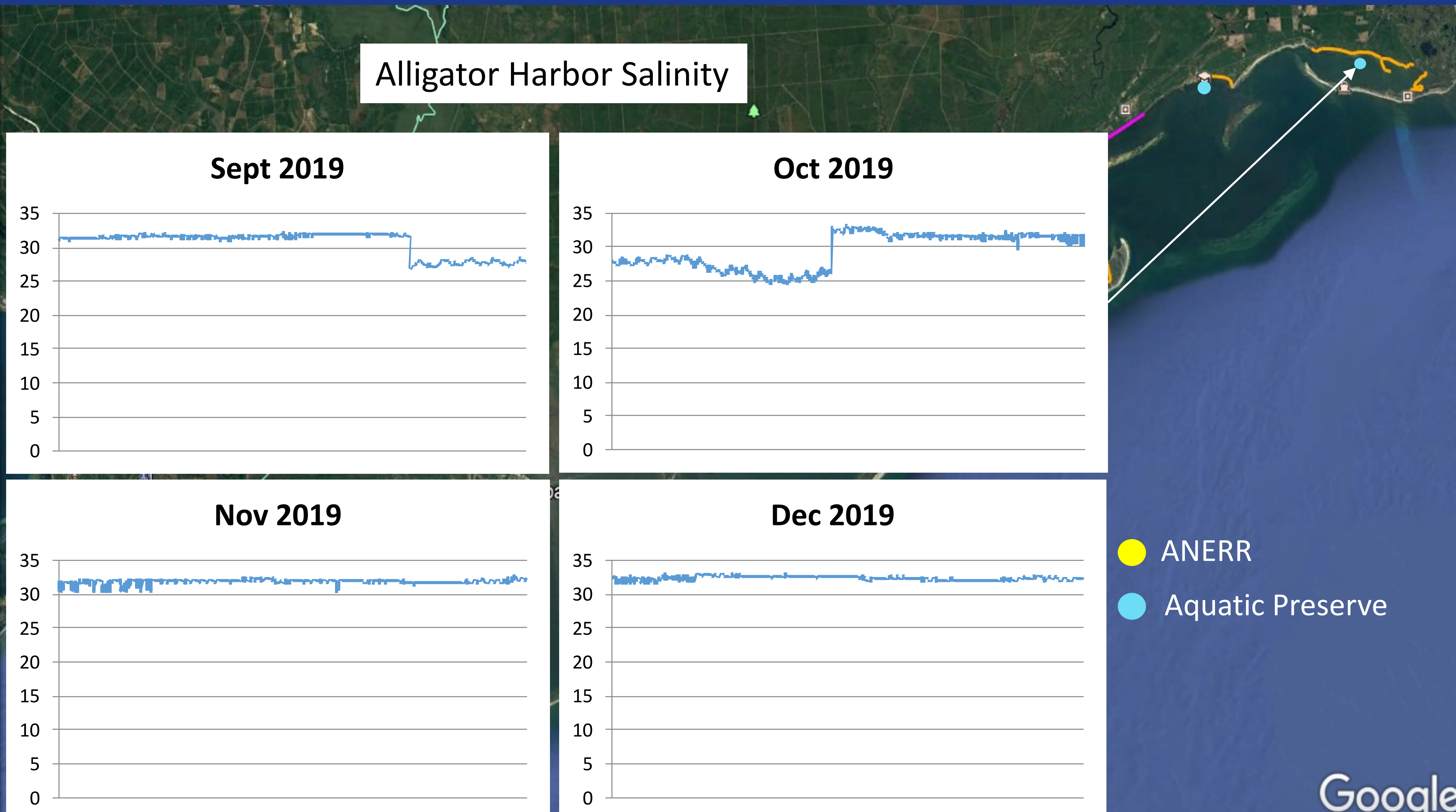


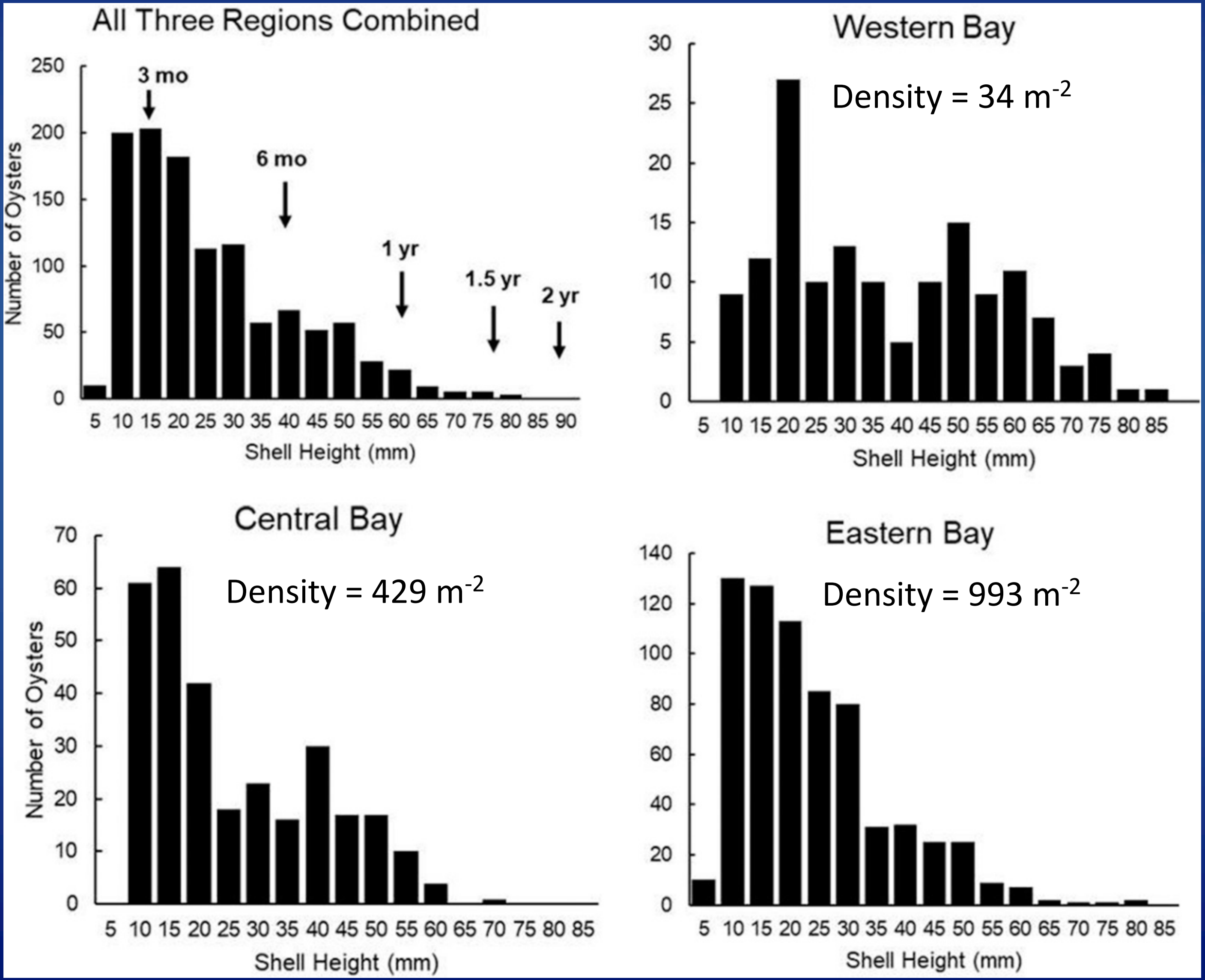
ENVIRONMENTAL CONDITIONS



Intertidal habitat maps

INTERTIDAL OYSTER DISTRIBUTION

Intertidal (Grizzle et al 2018)



Intertidal Oyster distribution

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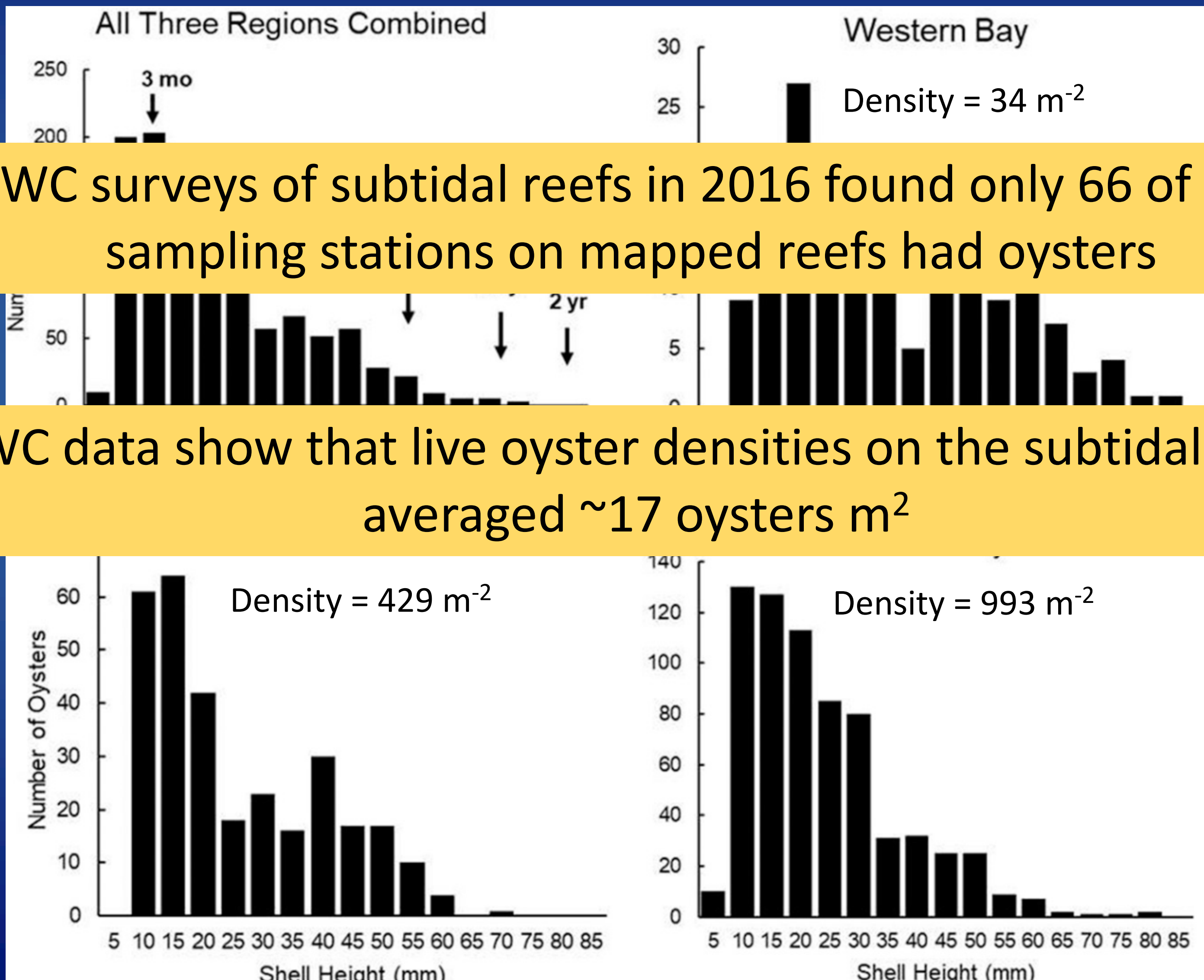
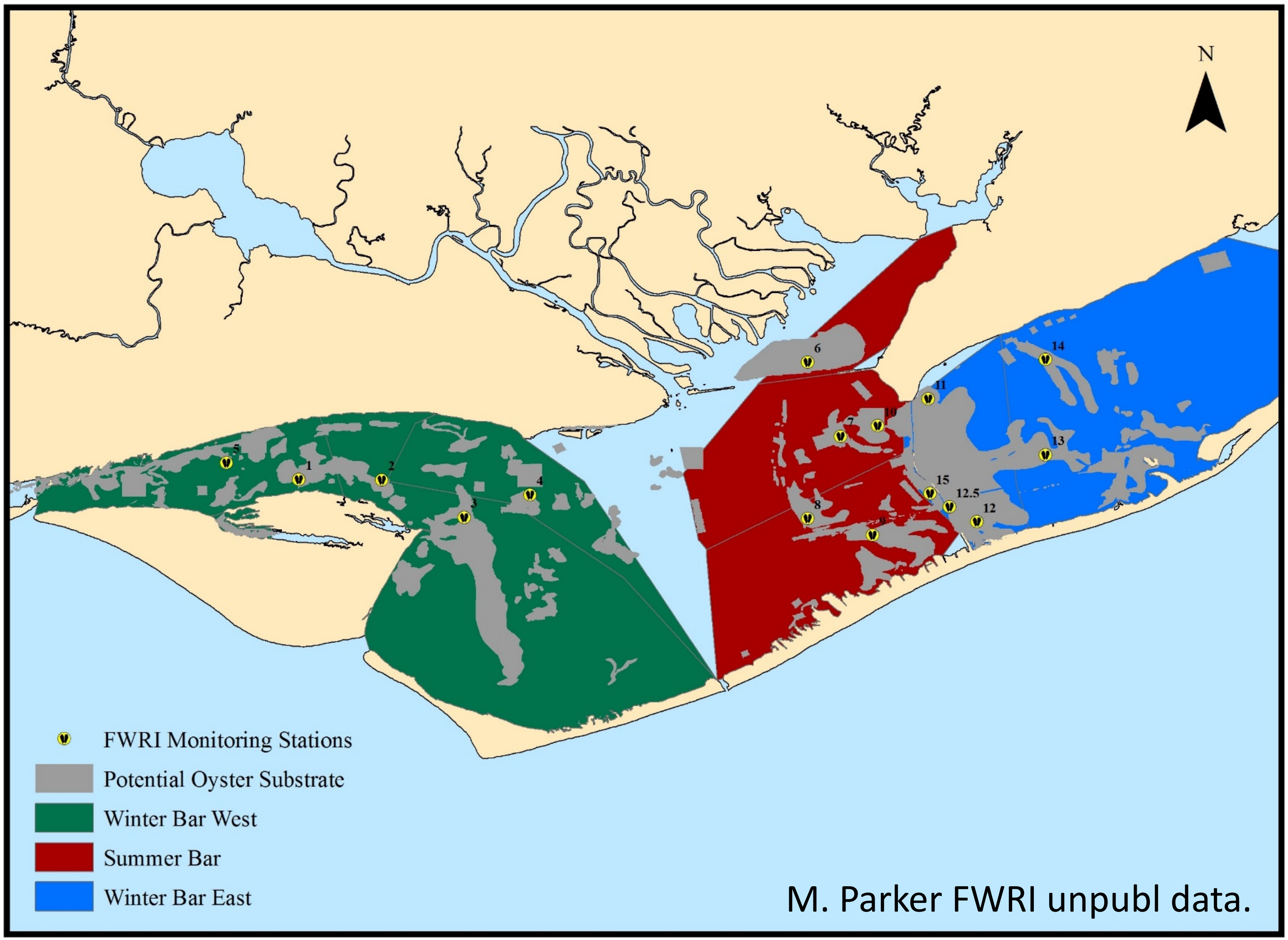


FWC surveys of subtidal reefs in 2016 found only 66 of 161 sampling stations on mapped reefs had oysters

FWC data show that live oyster densities on the subtidal reefs averaged ~17 oysters m^2

Subtidal Oyster distribution



M. Parker FWRI unpubl data.

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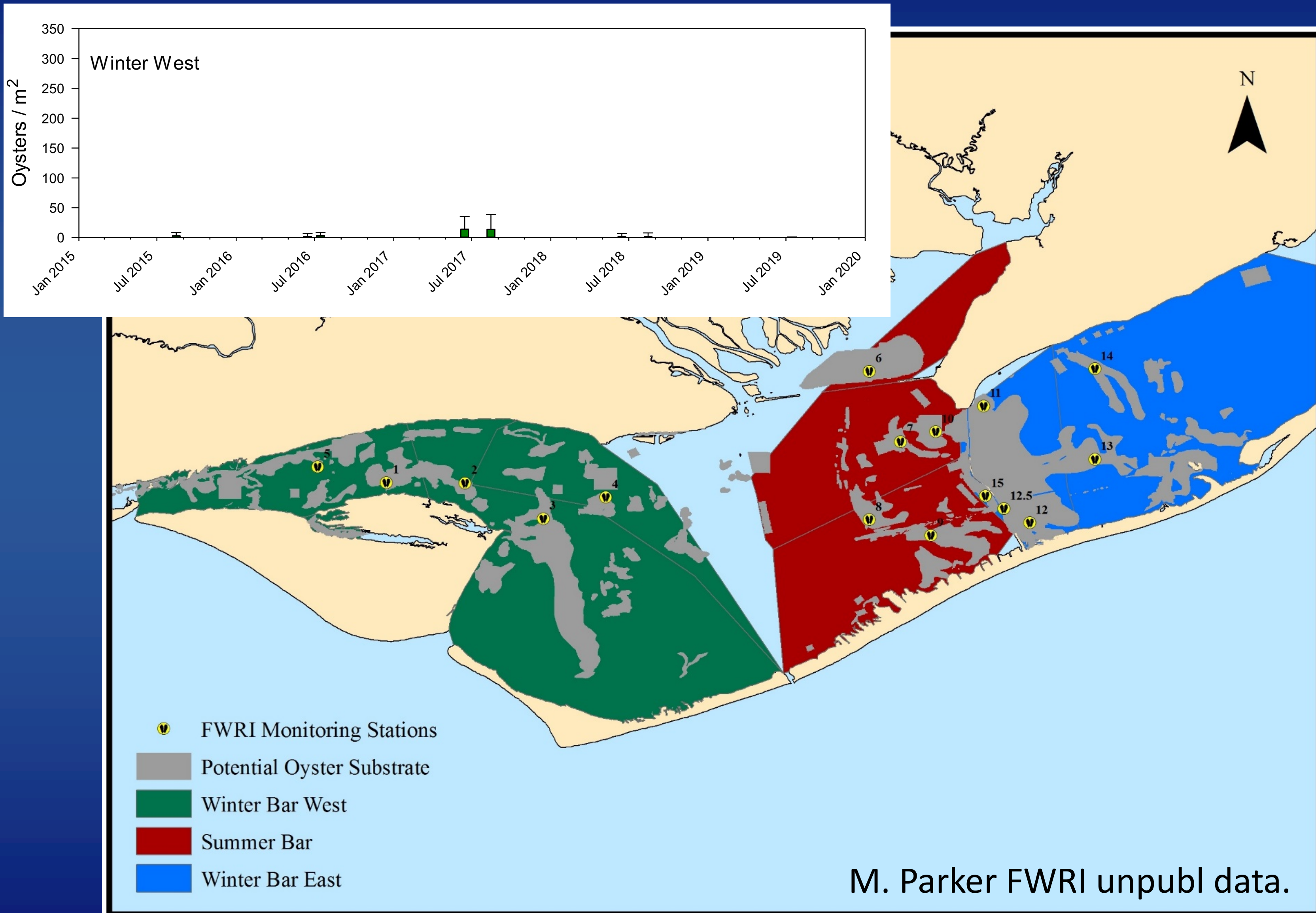

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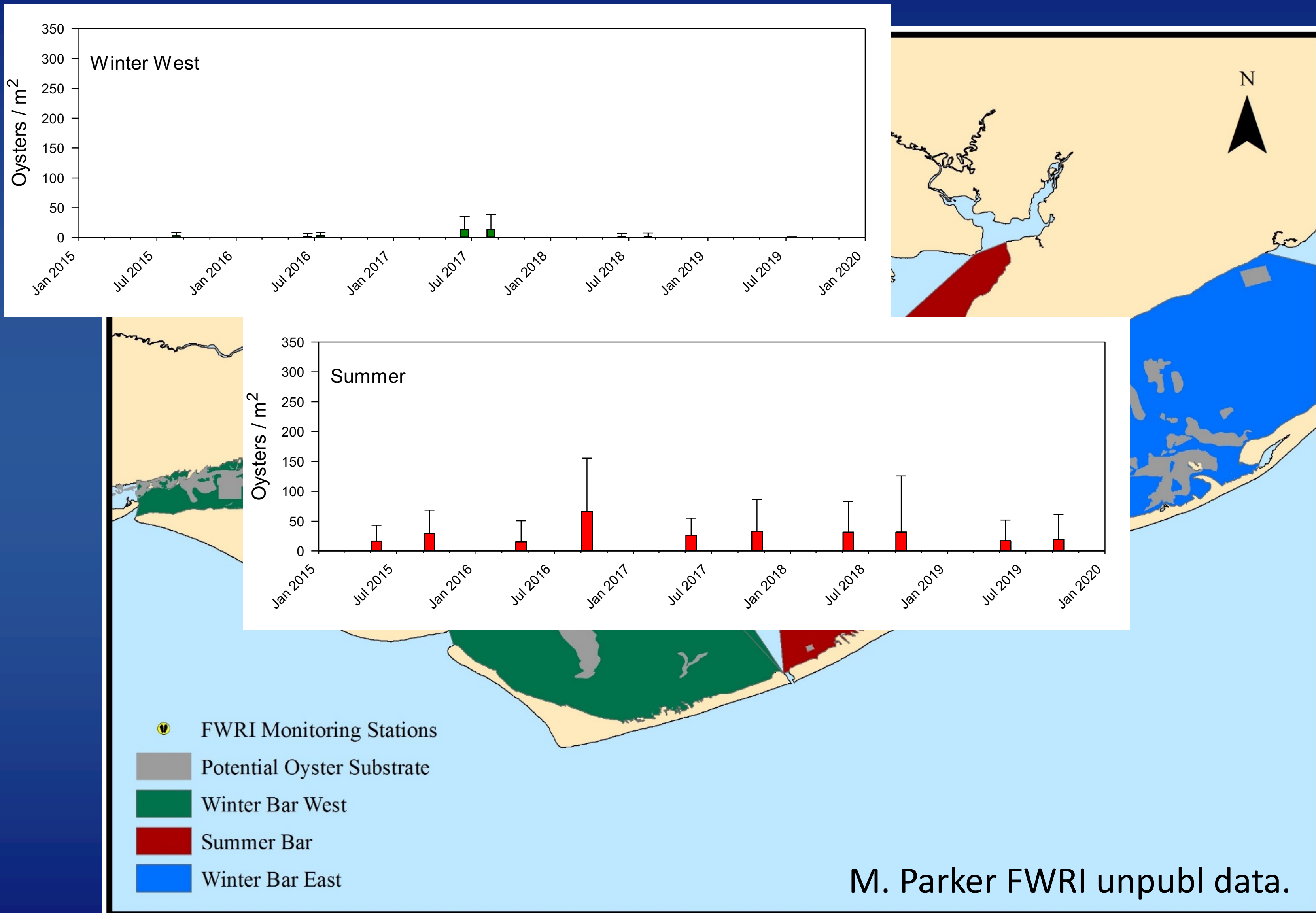
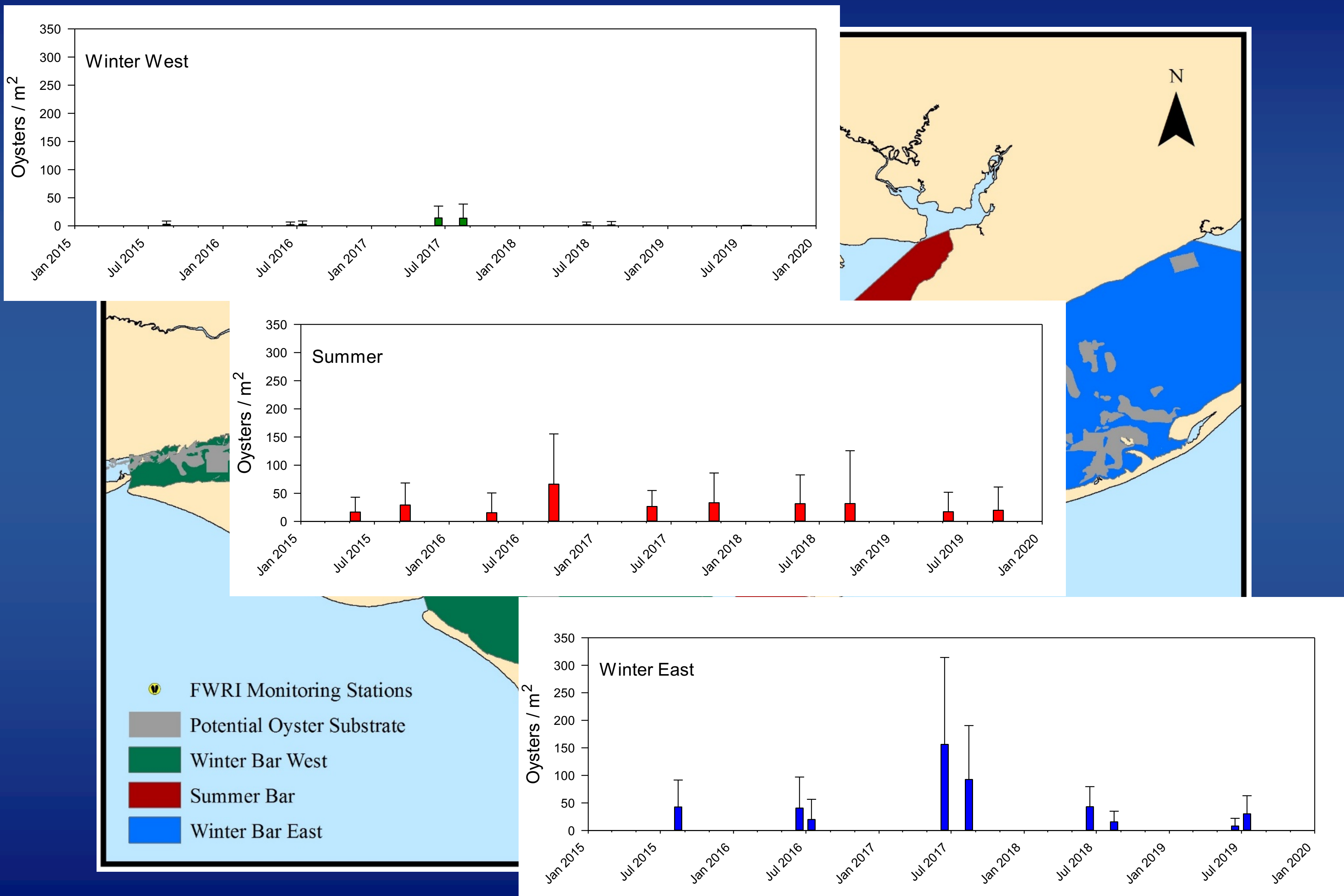
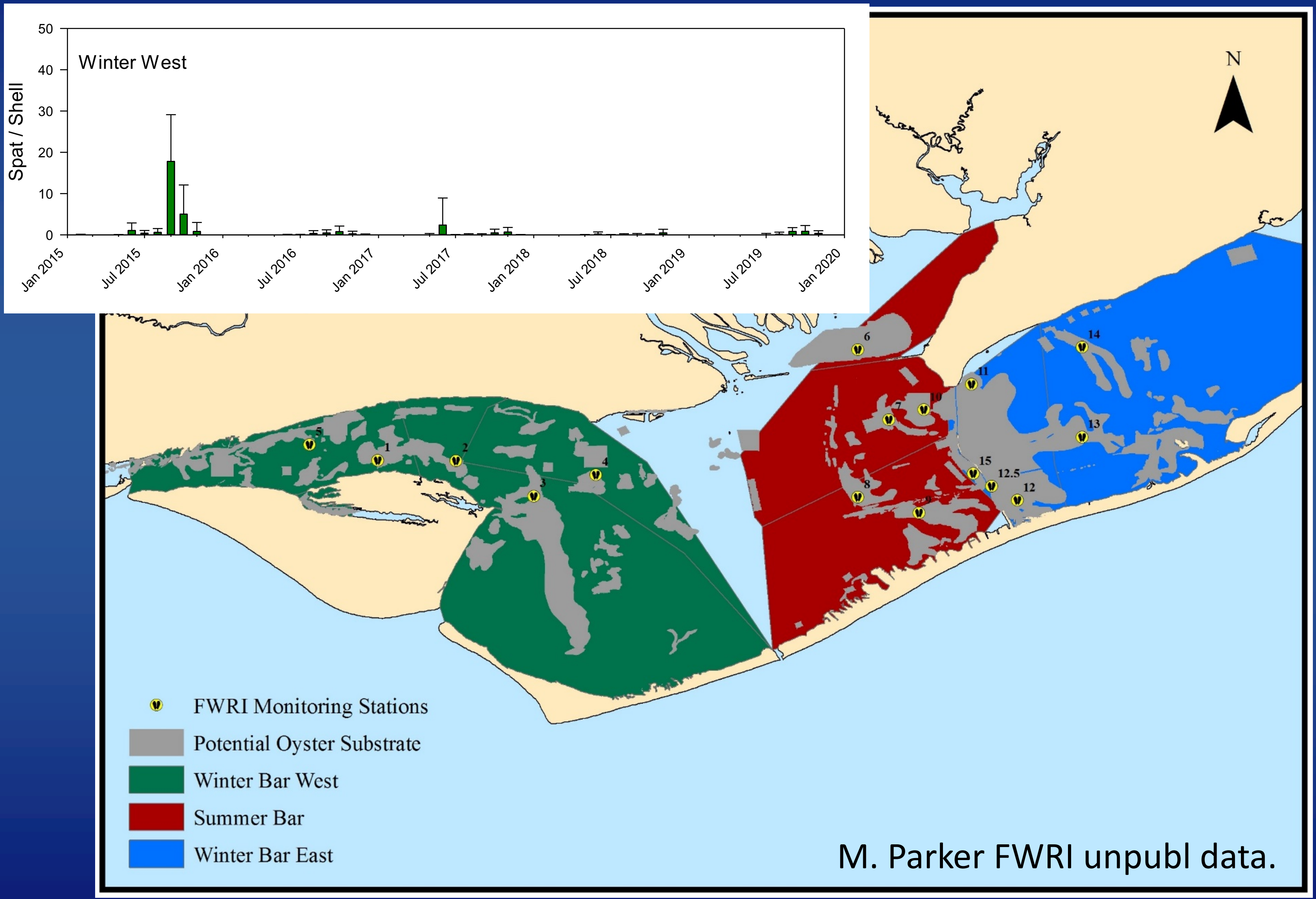


Subtidal Oyster distribution



SUBTIDAL OYSTER RECRUITS



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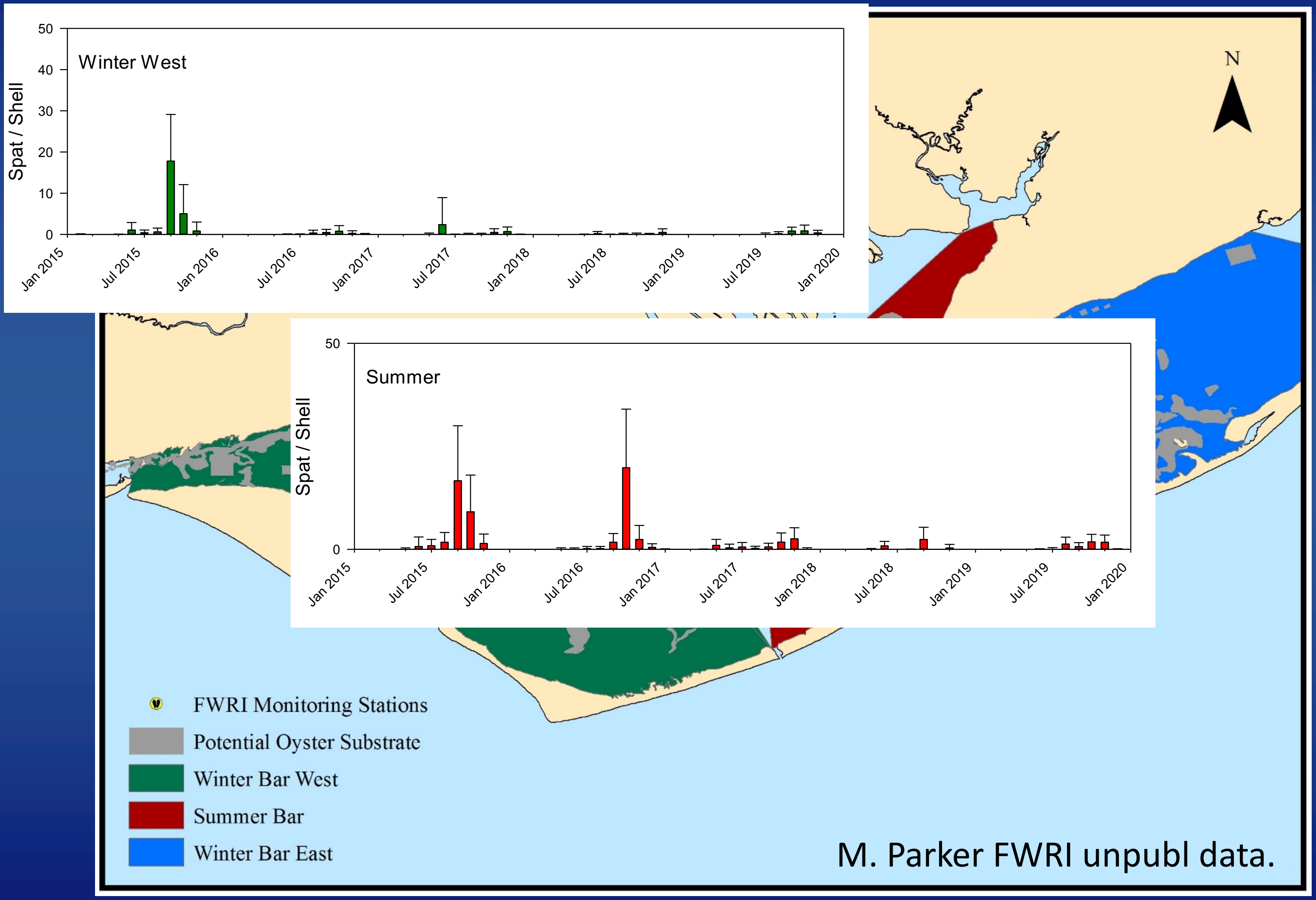
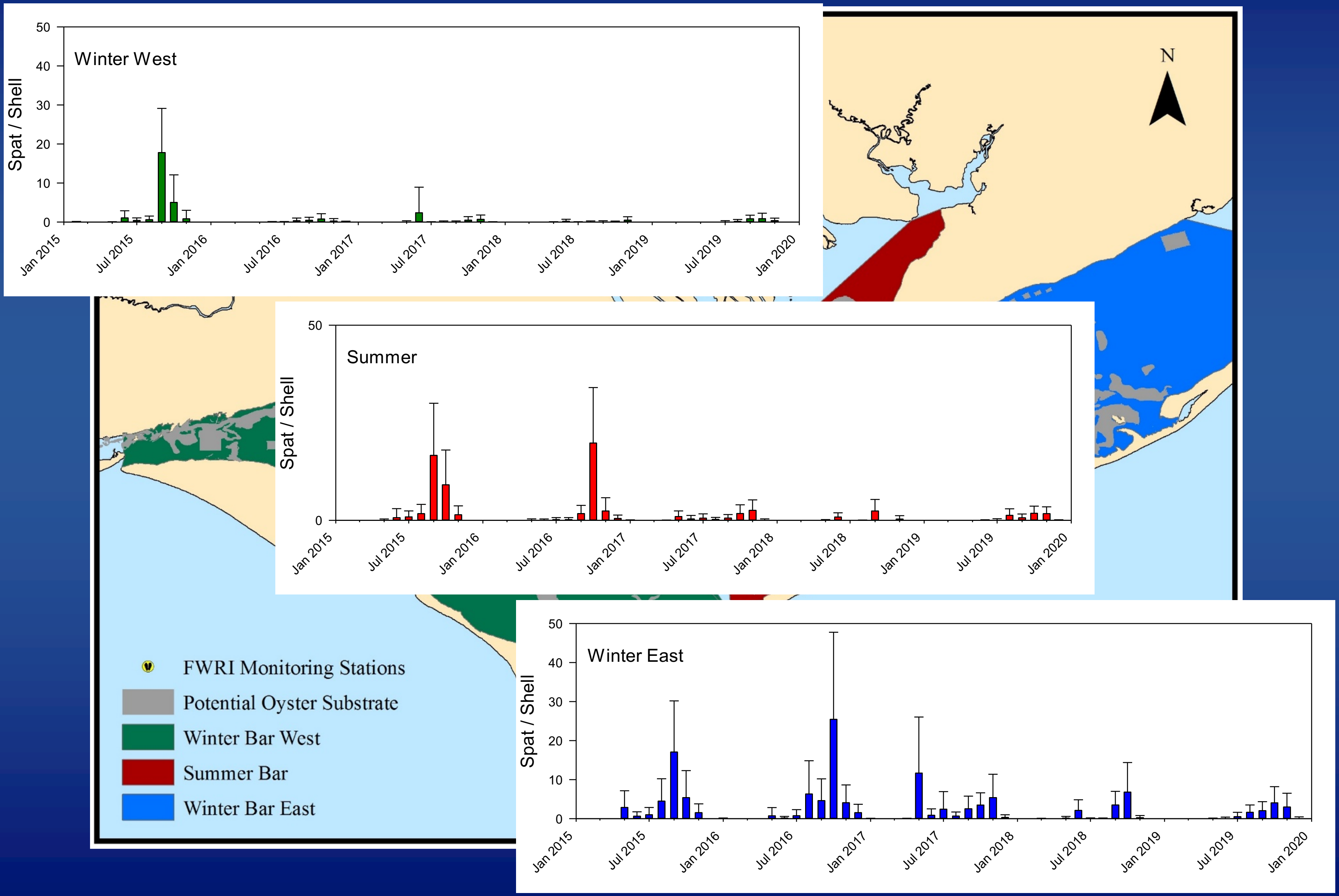
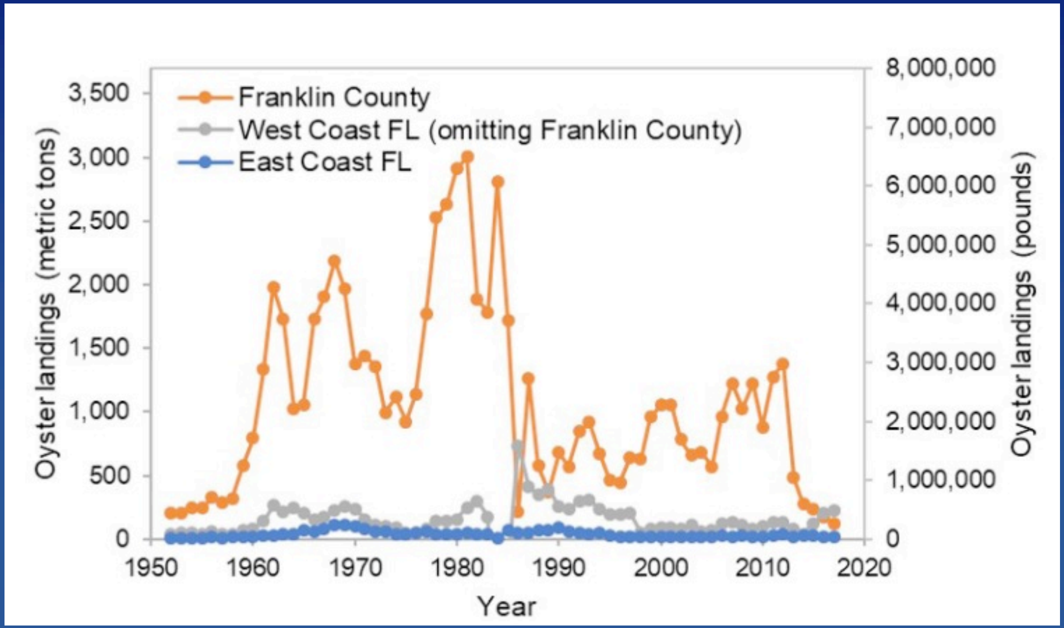
Subtidal Oyster recruits

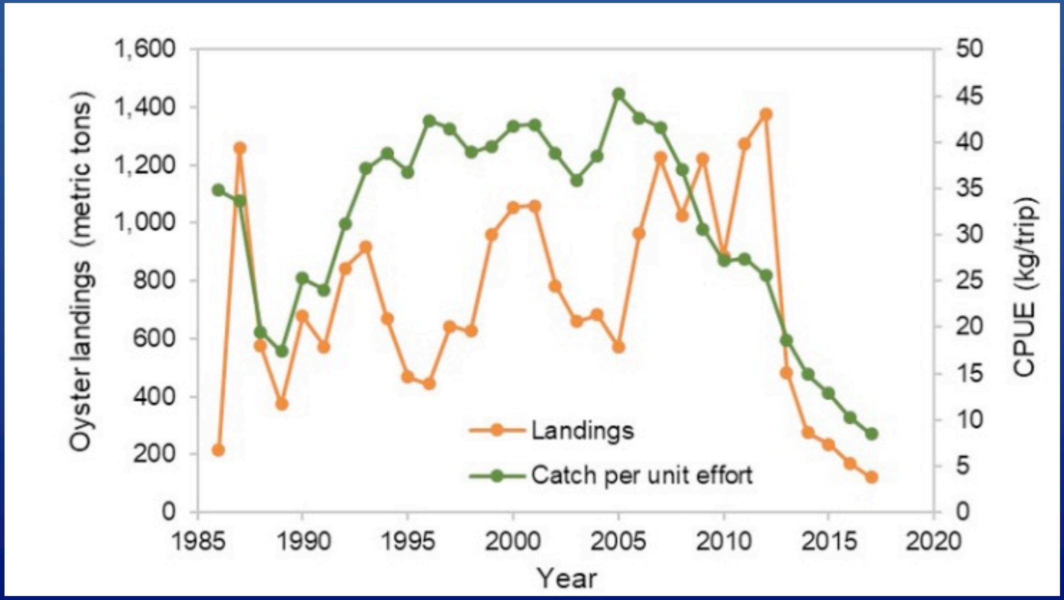


Subtidal Oyster recruits

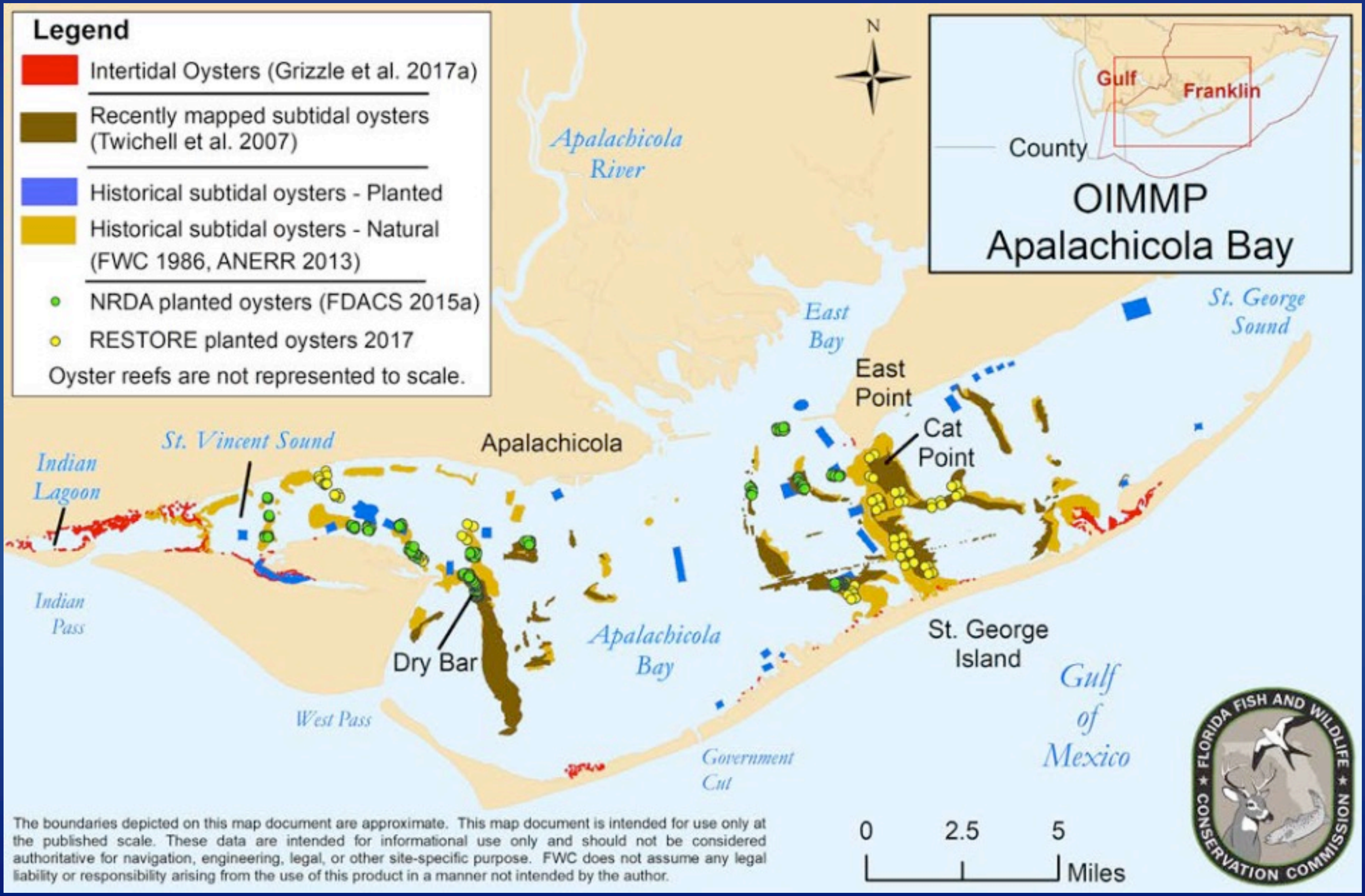


Oyster Harvest Data





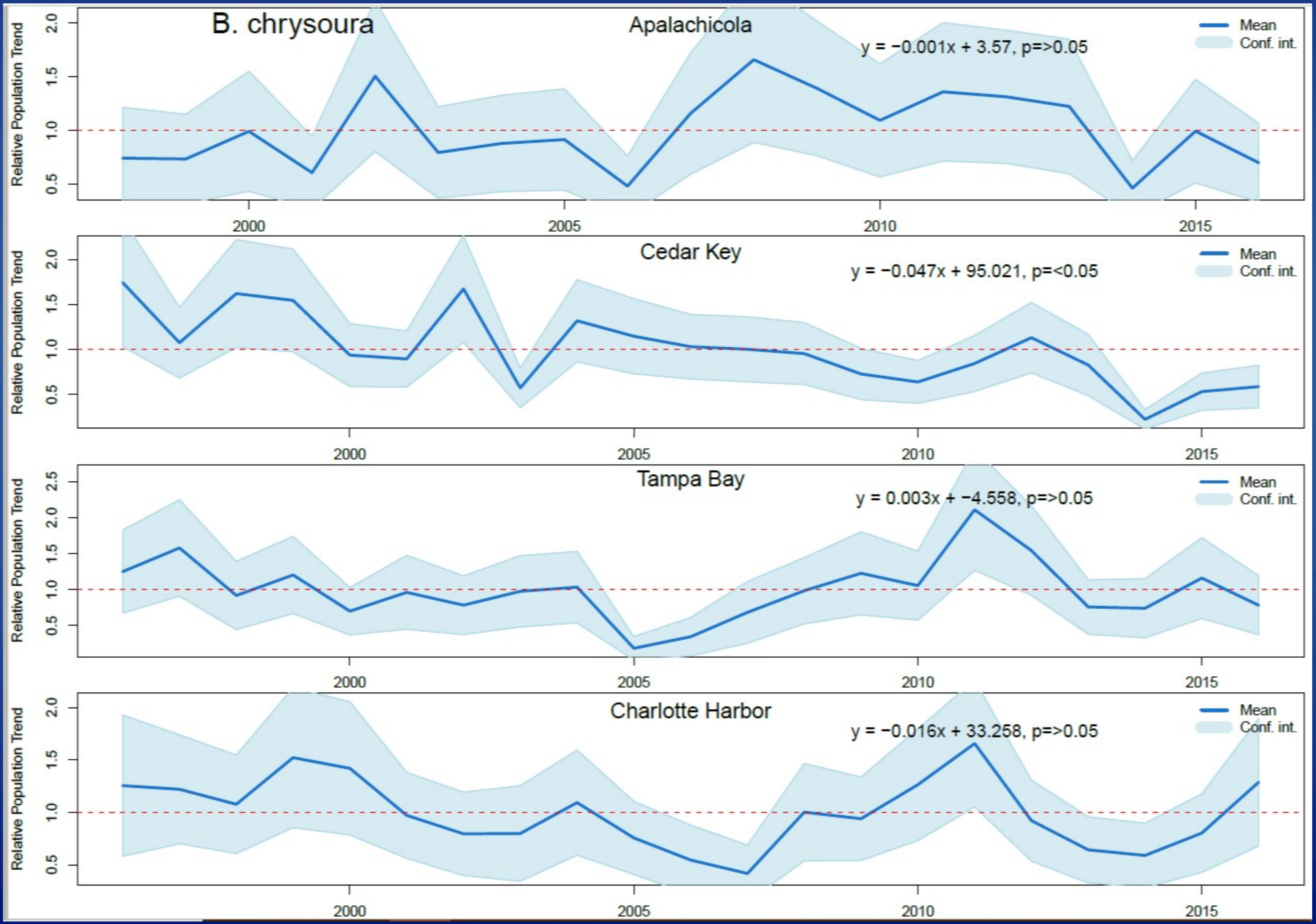
RE~SHELLING/RESTORATION



FISHERY SPECIES

Silver perch (*Bairdiella chrysoura*)

Data from FWC FIM surveys



FISHERY SPECIES

Shrimp (*Farfantepenaeus spp*)

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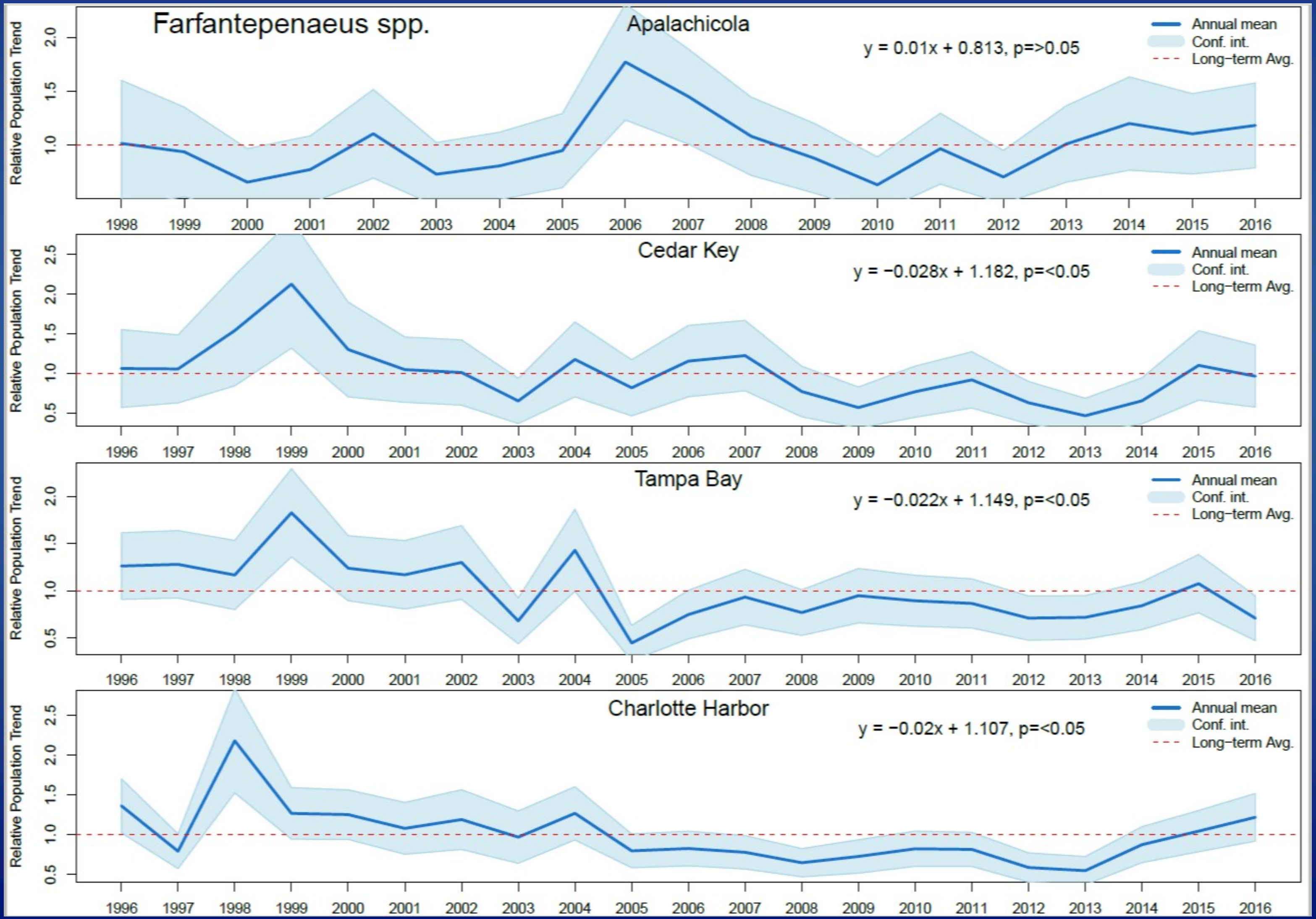

FISHERY SPECIES

Mullet (*Mugil cephalus*)

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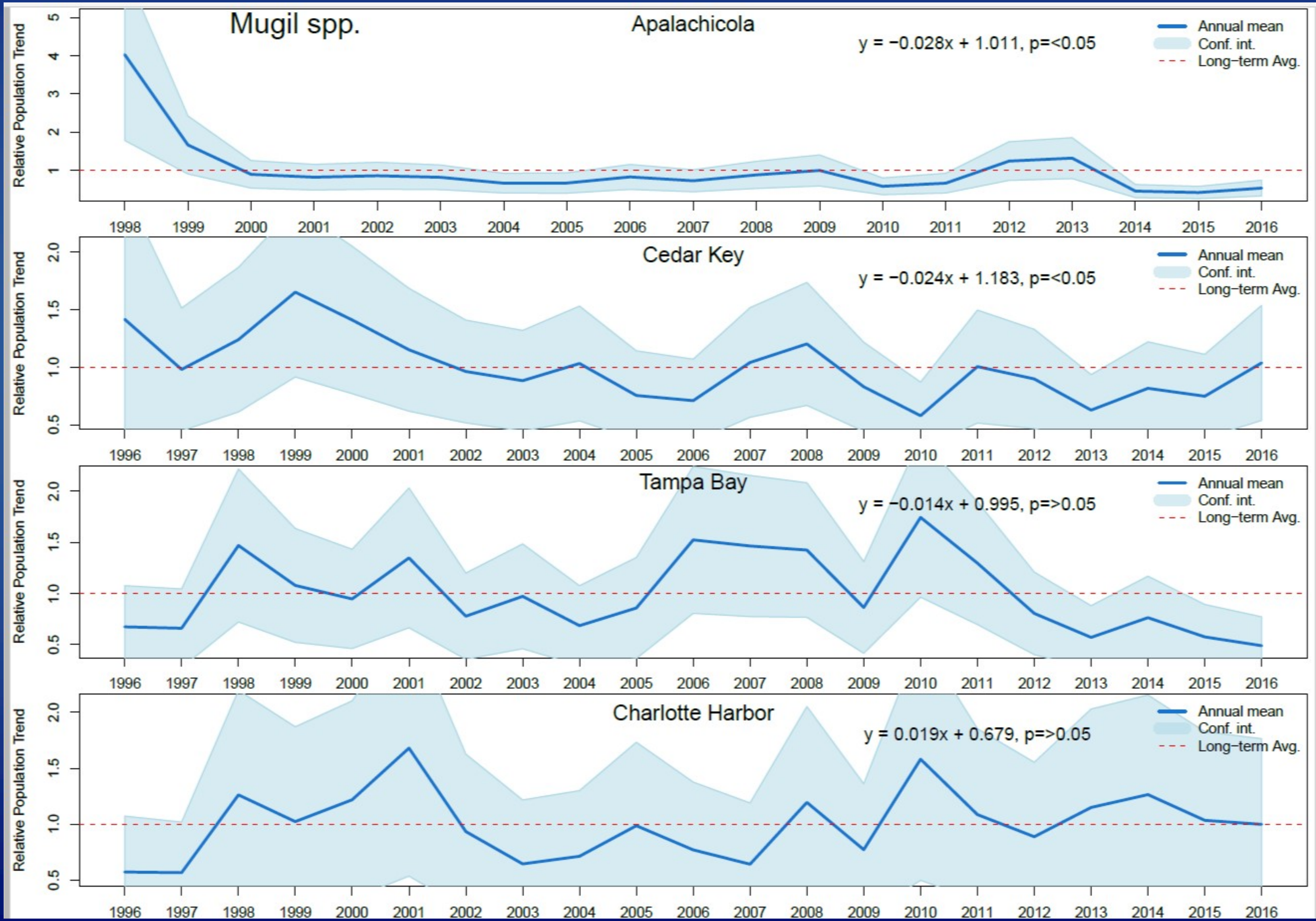

NON~FISHERY SPECIES

Pinfish (*Lagodon rhomboides*)

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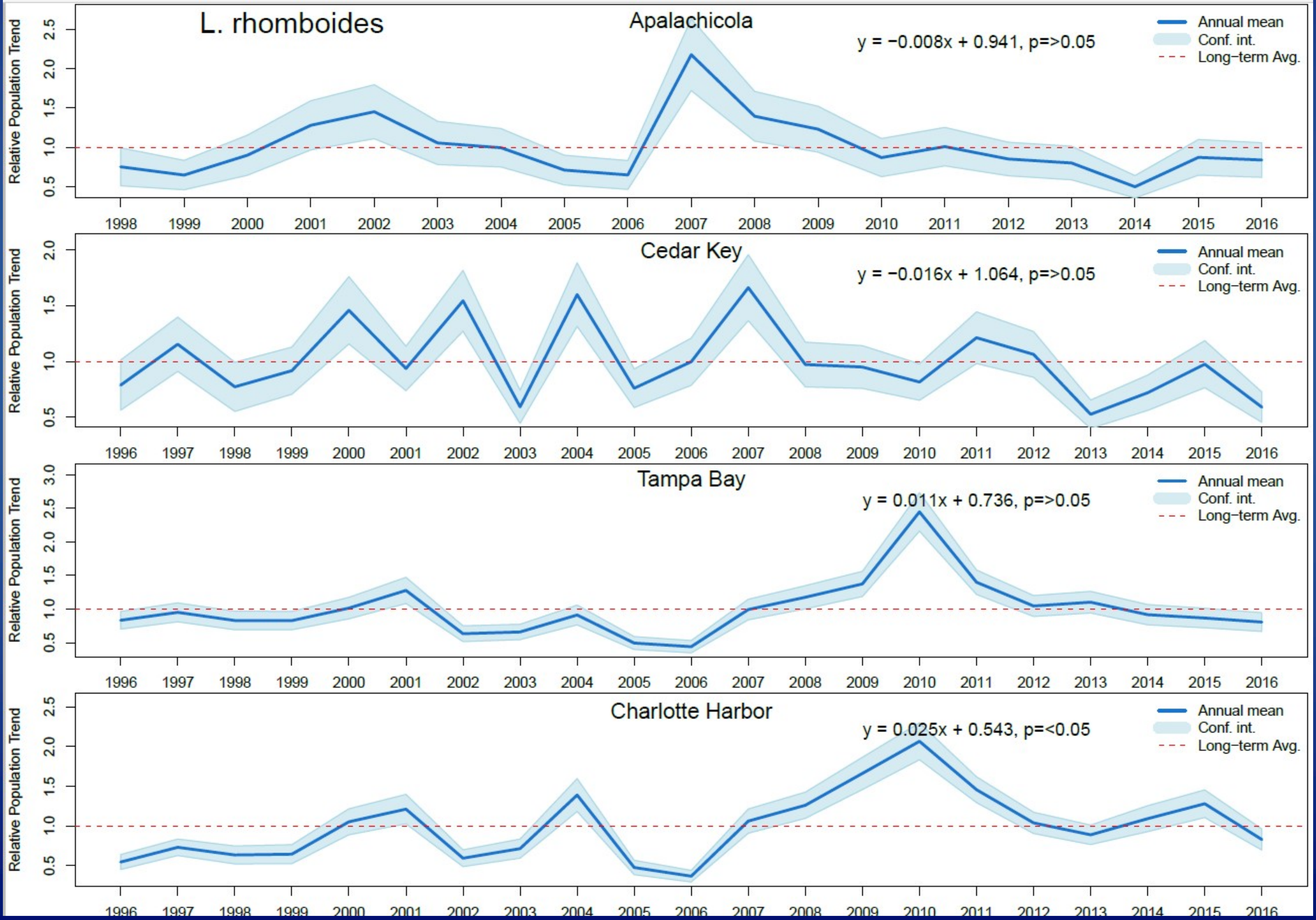
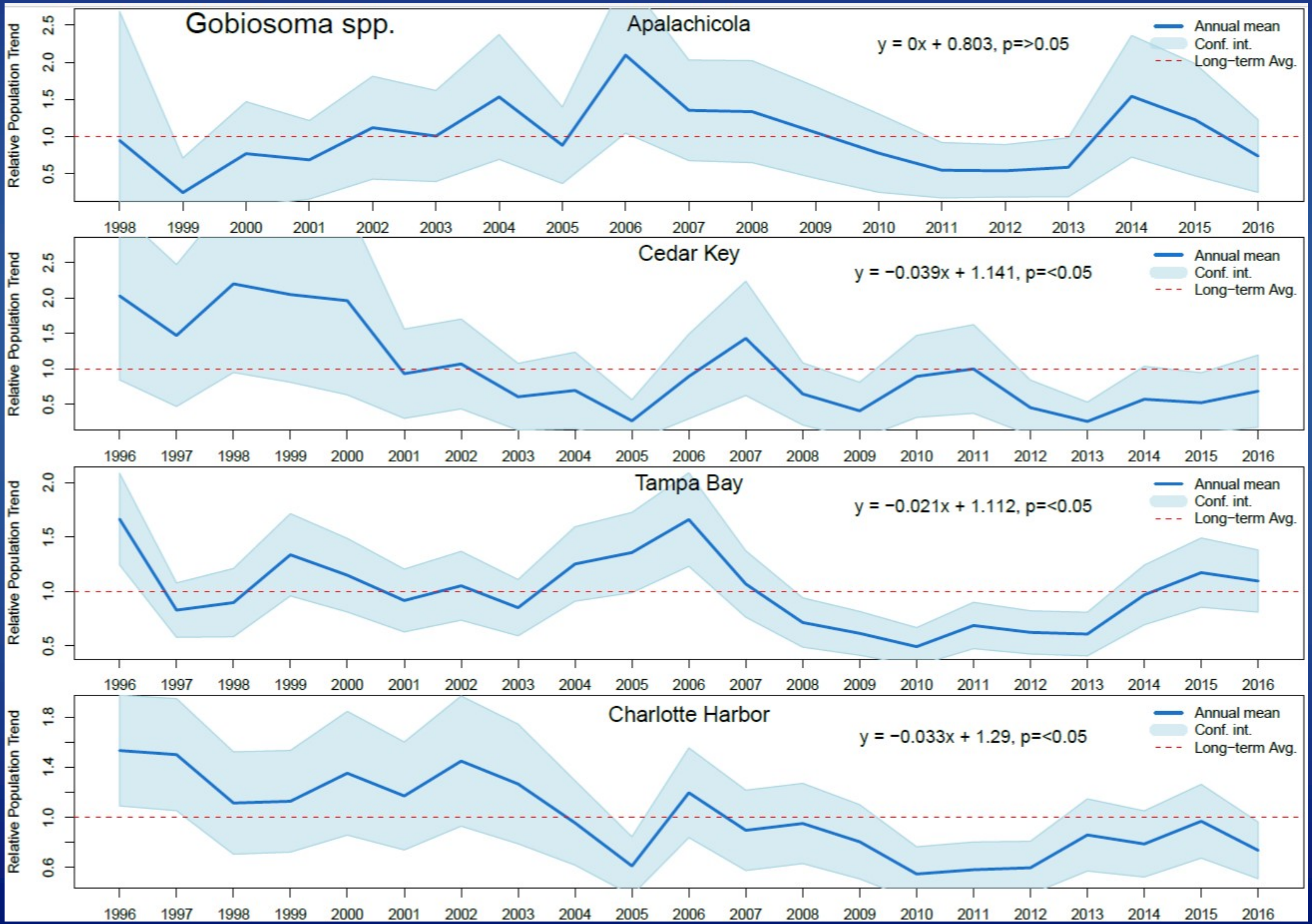


Non~fishery Species

Gobies (*Gobiosoma spp*)

Data from FWC FIM surveys



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Causes of Oyster Declines in Gulf of Mexico

- Overharvesting
- Habitat loss
- High salinities/reduced freshwater input
- Predation
- Diseases
- Climate change?

What do oysters need to thrive?

Oyster habitat suitability varies with location in an estuary

Characteristic	Estuarine location			
	Head	Middle	Lower	Mouth
Salinity (ppt) Average Range	 10 0-15	 15 10-20	 25 10-30	 30 20-35
Spat settlement	Low	Moderate-heavy	Moderate	Low
Growth rate	Slow-rapid	Moderate-rapid	Rapid	Slow
Habitat suitability	Low	Maximum	Moderate	Low
Probability of flood	High	Low-moderate	Low	Negligible
Predator abundance	Low	Low-moderate	Moderate	High
Fouling organisms	Low	Moderate	Maximum	High
Annual mortality rate	High	Low-moderate	High	High
Production potential	Low	Moderate-high	Moderate	Negligible

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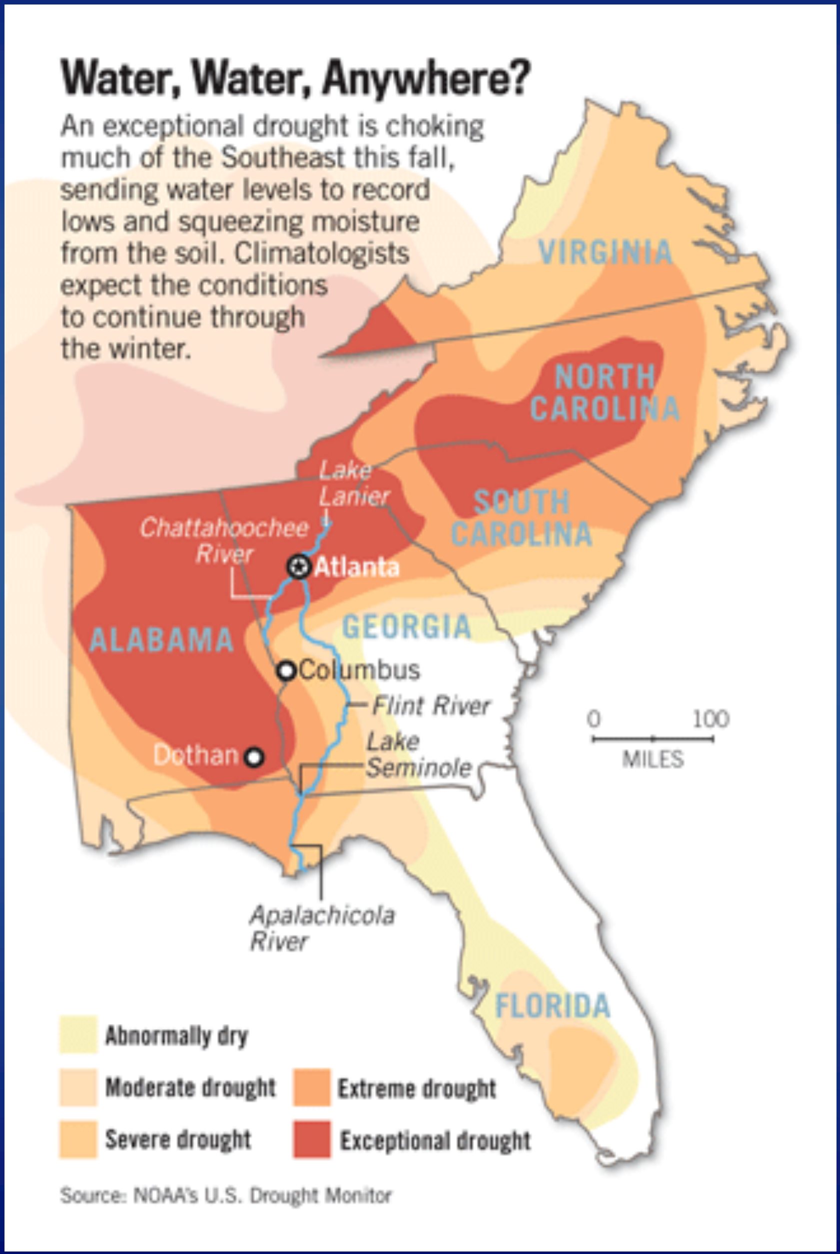
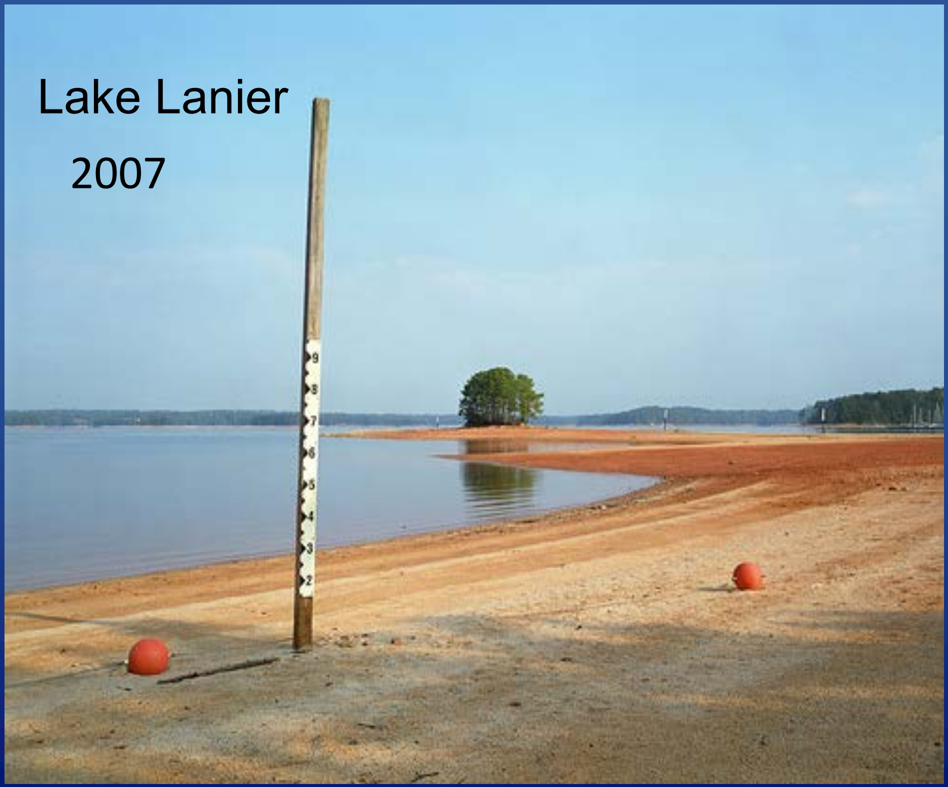
Reduced freshwater flows

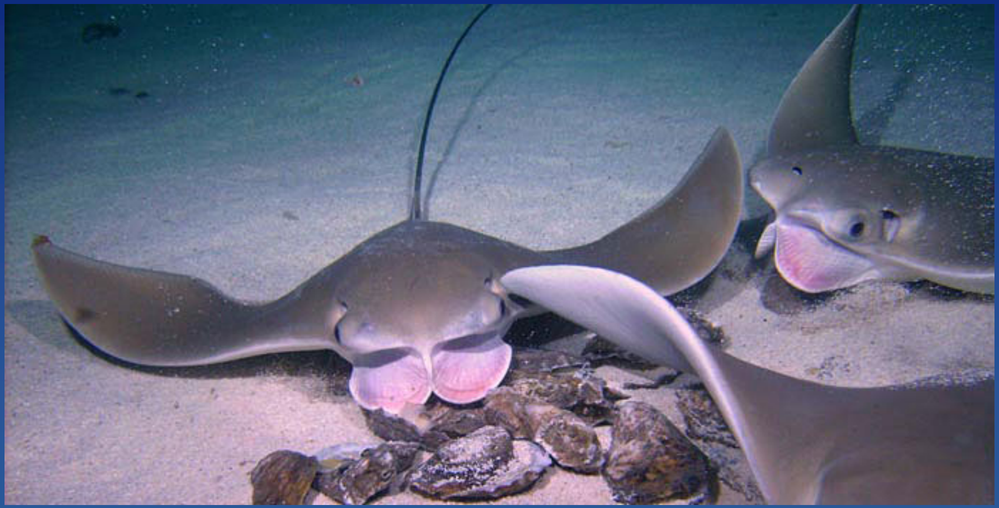


Sources of freshwater loss:

- Atlanta removes 2 billion liters/day
- Agricultural withdrawals elsewhere
- Severe drought US SE (2007-2014)



Low to moderate salinity predators



Cownose ray (*Rhinotera bonasus*)

Blue crab (*Callinectes sapidus*)

Sheepshead (*Archosargus probatocephalus*)

High salinity predators

Atlantic oyster drill (*Thais haemastoma*)

- Oyster drills are the most important oyster predators in the Gulf of Mexico
- Can destroy > 50% of a population in waters > 15 ppt
- Populations can be very high
- Drills prefer spat and small adults

Oyster 'leeches' (*Stylochus inimicus*)

- This is a flatworm not a leech.
- Enter between the mantle and shell and consume tissue.
- Oysters generate partitions to keep them away from soft tissue
- Worms can tolerate extreme high (40^{o}C) and low (1^{o}C) temperatures
- They cannot tolerate low salinity

Effects of mobile predators are more difficult to assess than more sessile predators

Predation by mobile organisms increases with high salinity.

Stone crab (*Menippe mercenaria*)

crabs consume any size oyster they can break open

Black drum (*Pogonias cromis*)

Black drum consume small-medium oysters

Boring sponge (*Cliona sp*)

- Bores into the shell and looks unattractive
- Weakened shells break apart on shucking
- Heavy infestations may cause mortality by creating pathways for predators
- Problem in > 15 ppt salinity

Shell damage reduces market value

Oyster Diseases: Dermo (*Perkinsus marinus)*

Healthy Infected with Dermo

Single-celled protozoan

Infection peaks at age 1-2 years

Causes cell death, reduced reproduction and mortality

High infestations can devastate oyster populations, especially largest. Disease may become self-limiting

Not lethal at low levels

Seasonal cycles of Dermo infection

Spring: Infective spores appear

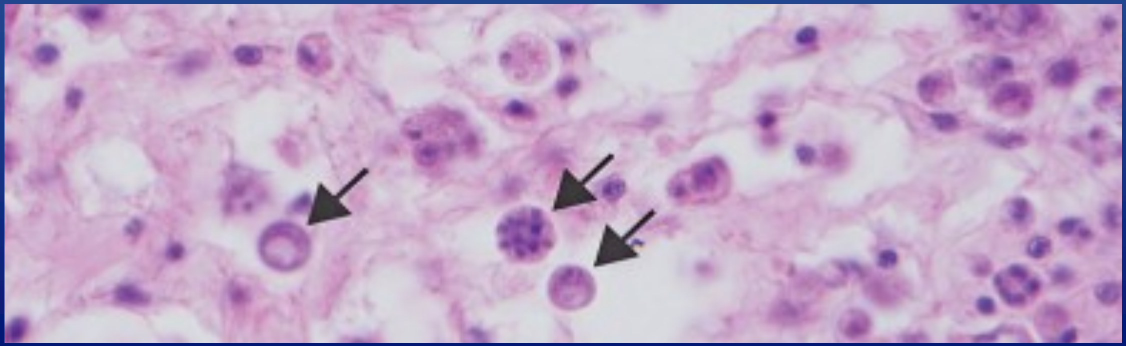
Summer: Infections observed

Fall: Peak infections and mortality

Late winter-early spring: Infections low but parasites overwinter and appear in spring

Temperature and salinity are most important factors for infection

High temp (18^{o}C/65^{o}F) and salinity (>15 ppt) – parasite increases rapidly
Low temp (15^{o}C/59^{o}F) and salinity (<9 ppt) – parasite infection is low.



Climate change

Temperature increase
Cause stress and increase disease incidence

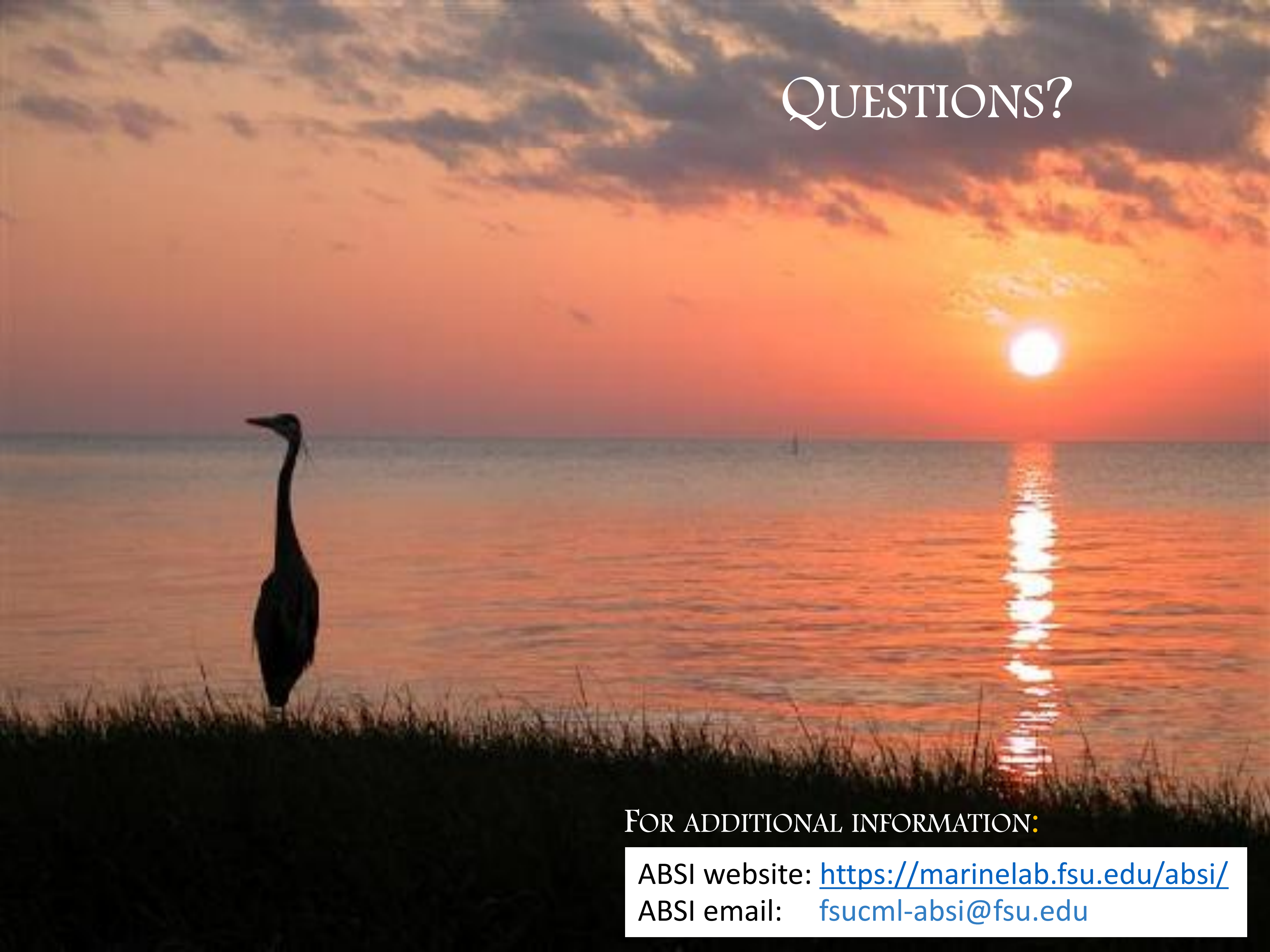
Rainfall changes
Increased storm events – periods of very low salinity
Drought – high salinity
Changes nutrient dynamics

Changes in carbonate chemistry
Carbon dioxide absorbed by the ocean affects oysters ability to build shells.
Pacific NW oyster growers bankrupted 2006-2008.

How can we help preserve oyster habitats and fisheries

Understand how shifting conditions affect oyster biology and ecology
Maintain and restore watersheds to support healthy estuaries
Continue restoration efforts for natural reefs

Remove local stressors to maintain ecosystem resilience


Questions?
For additional information:
ABSI website: https://marinelab.fsu.edu/absi/
ABSI email: fsucml-absi@fsu.edu