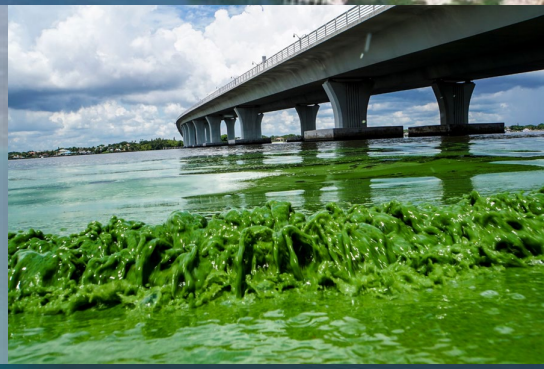
Harmful Algal Blooms in South Florida and the Indian River Lagoon



HARBOR BRANCH
FLORIDA ATLANTIC UNIVERSITY

Jim Sullivan, Ph.D., Executive Director
FAU Harbor Branch

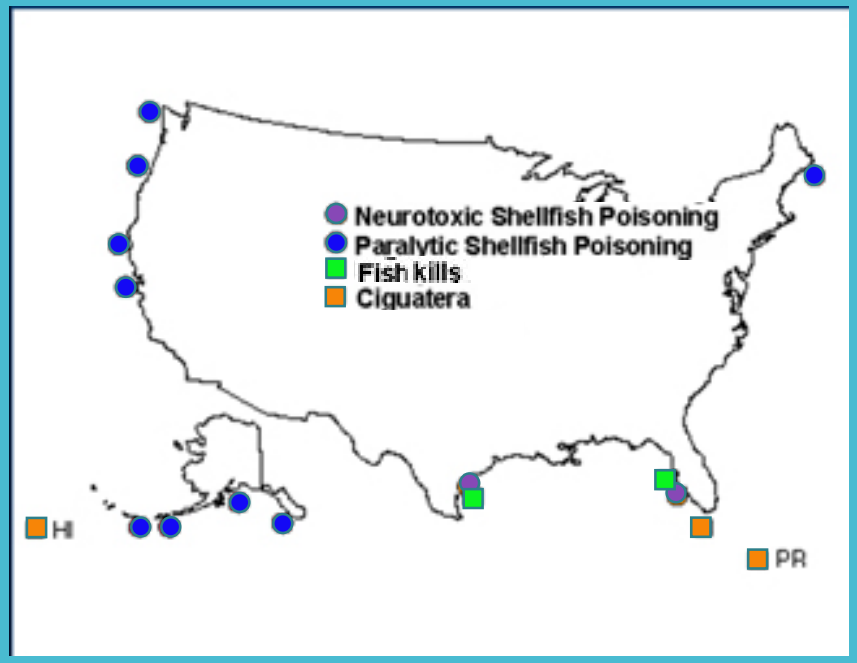
Co-authors: Malcolm McFarland, Adam Schaefer & Dennis Hanisak

Harmful Algal Blooms (HABs)

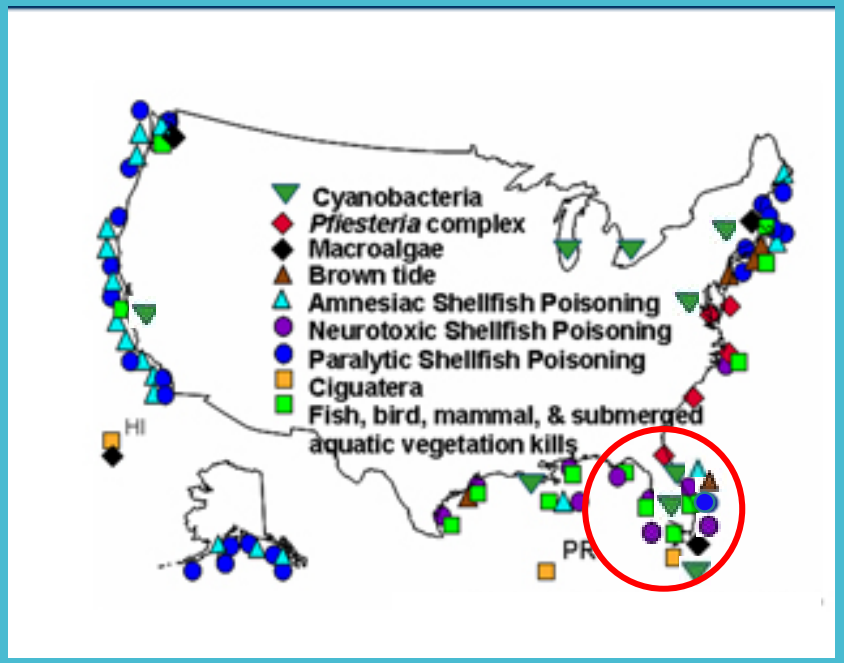
Occurrences of phytoplankton (algae) that cause negative ecosystem (or human) impacts

Worldwide, HABs are increasing not only in geographical locations, but also in type, frequency, duration and severity

Reported HAB occurrences



~1972



NOW

This is especially true for Florida waters

Florida is one of the most impacted states in the US

Why are HAB events increasing?

1. Eutrophication (nutrient pollution)
   - More nutrients – more algae biomass

2. Global warming & Climate change
   - Warming- increasing HAB ranges and growth rates
   - Changing precipitation- drought/runoff, extreme events

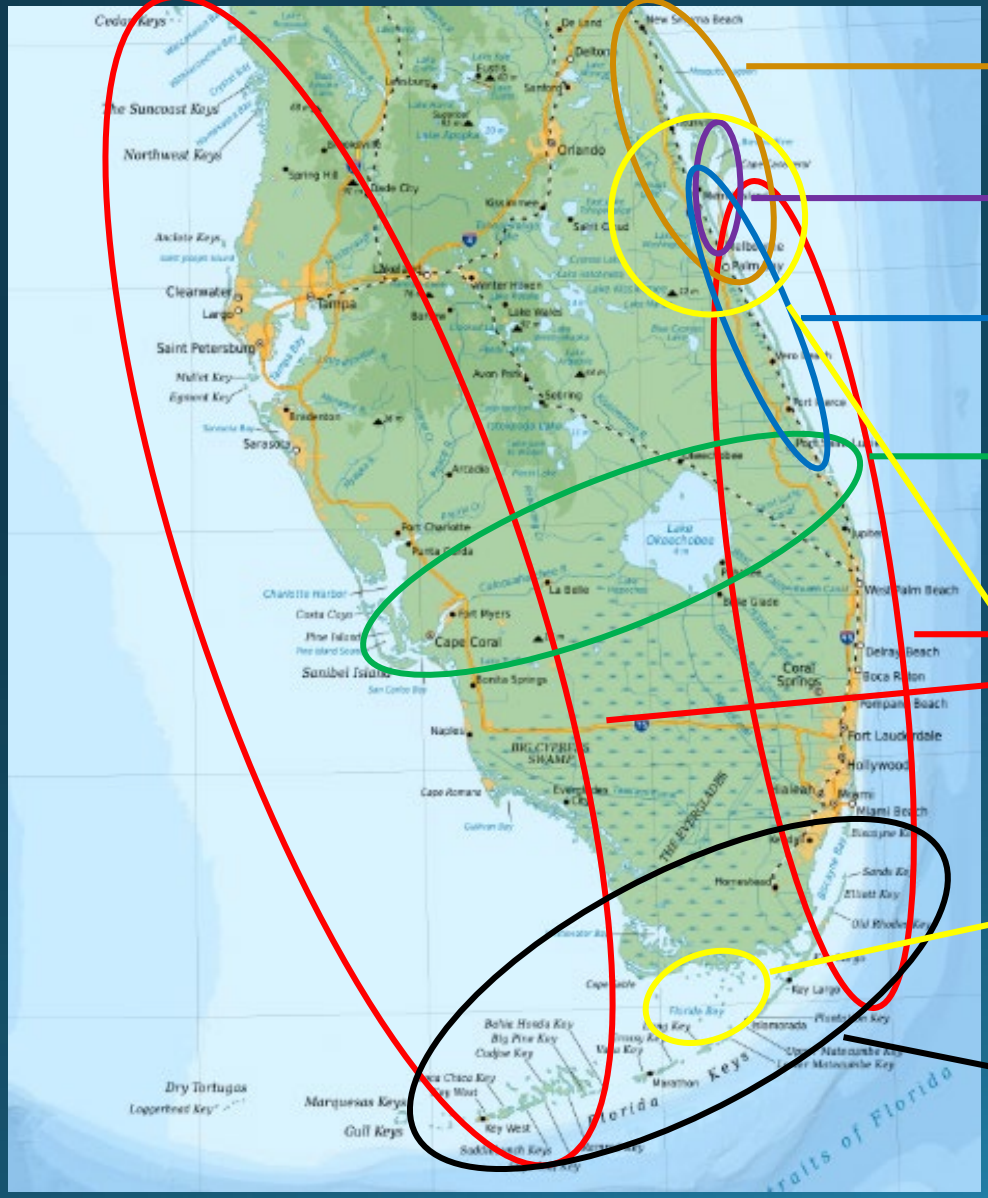
3. Human ecosystem modifications
   - Land use practices, increased runoff, dredging, transport of species, food chain effects…

IT IS FORECAST TO GET EVEN WORSE…

Government Report On Climate Change Says Red Tide Will Become More Common In Florida

November 23, 2018 at 4:50 pm **Filed Under:** Climate change, Florida, Government Report, Red Tide, Sea Life

Current HAB threats in South Florida



Aureoumbra (non-toxic?)

Pyrodinium (saxitoxin)

Psuedonitzchia (domoic acid)

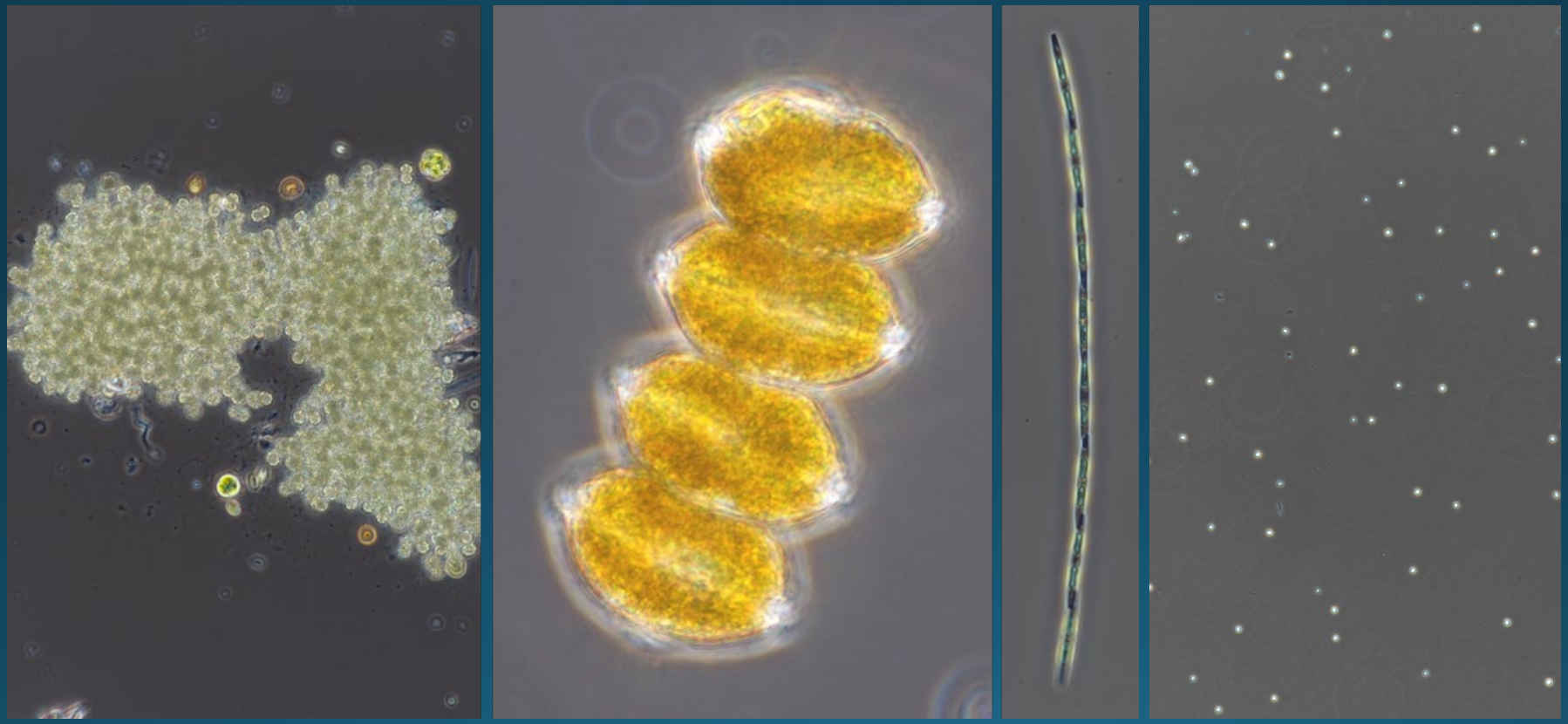
Microcystis (microcystin)

Karenia (brevetoxin)

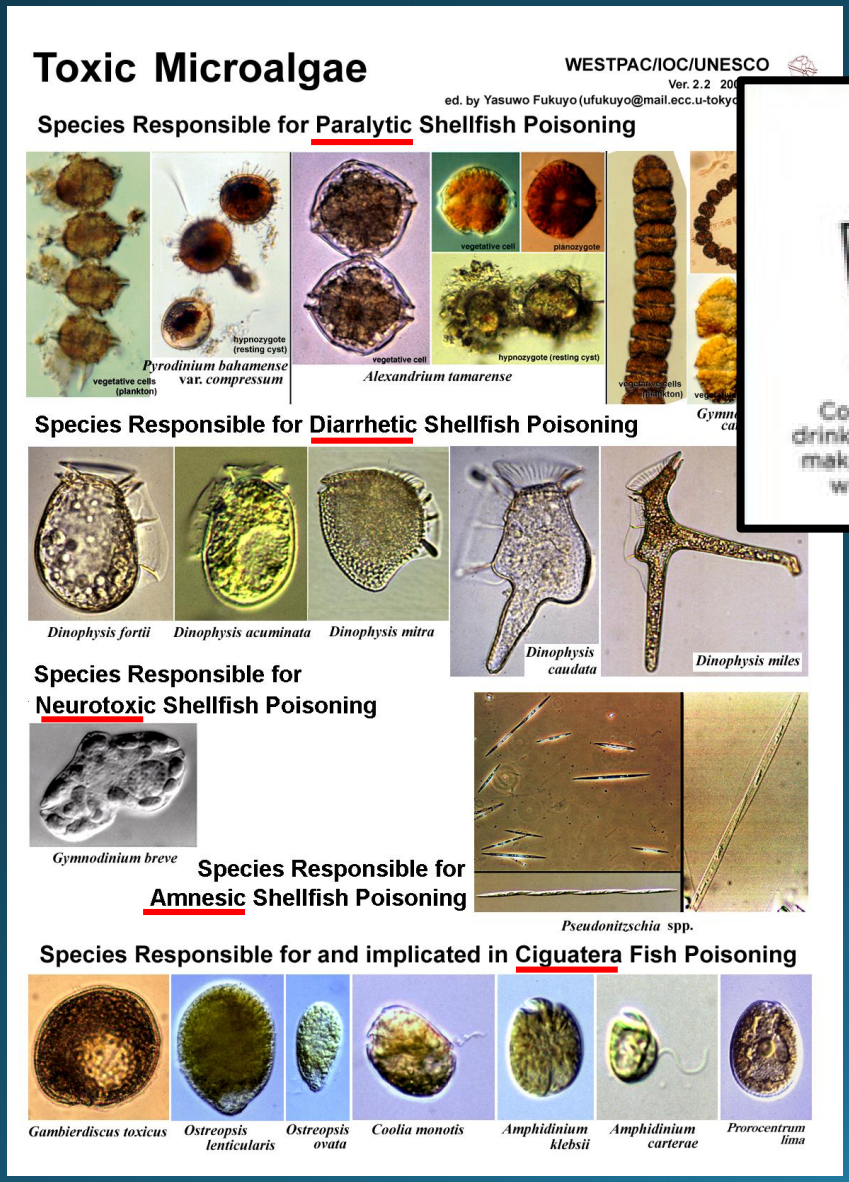
Cyanobacteria/picoplankton (non-toxic?)

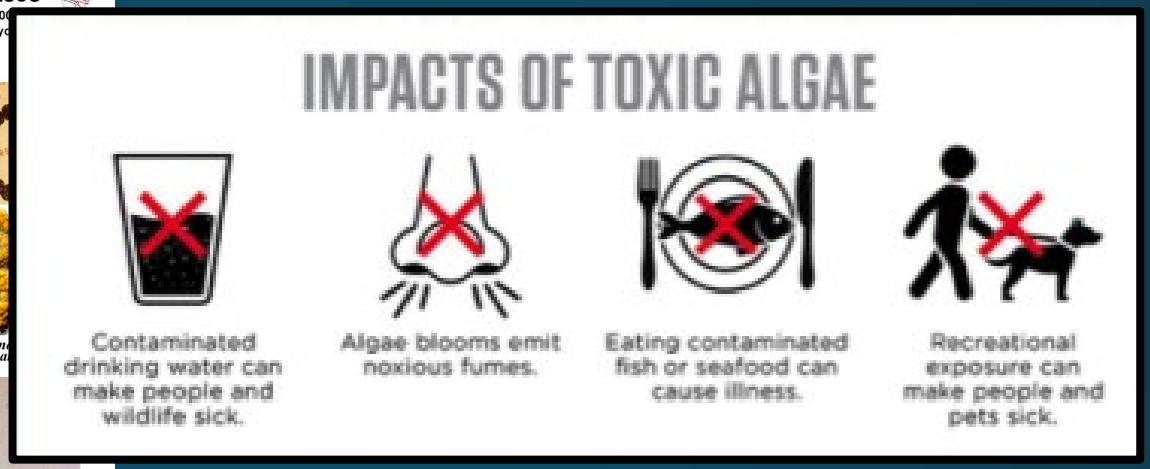
Gambierdiscus (ciguatera)

Many different types of harmful algae



Many different HAB toxins & effects





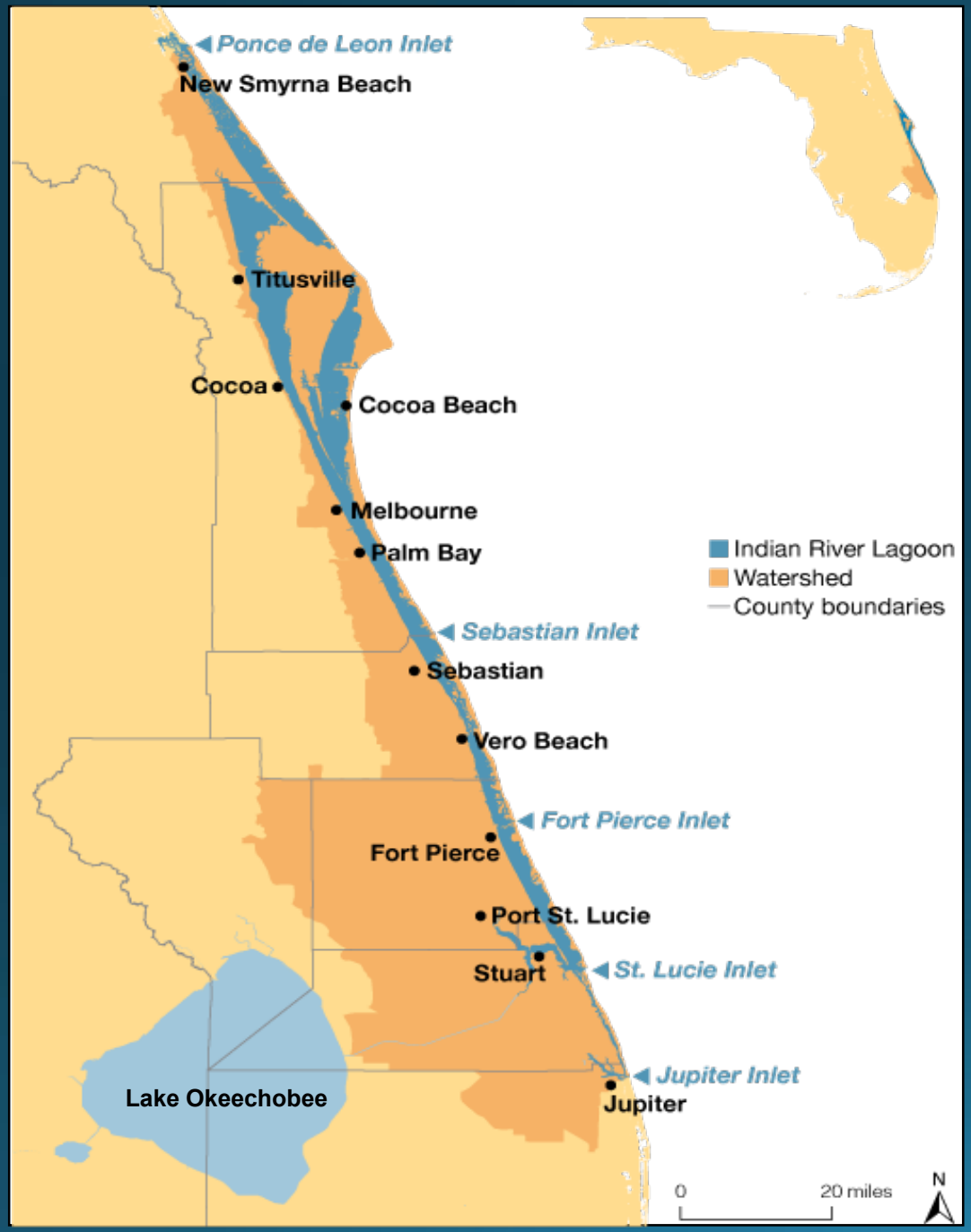
Acute impacts:

Immediate and typically severe response to toxins

Chronic impacts:

Response to toxin only realized over longer times and/or exposure

This needs much more research!



Indian River Lagoon (IRL) Ecosystem

~ 160 miles long

~ 40% of FL's East coast

45 cities and 1.6 M people

5700 km^2 watershed

High biological diversity

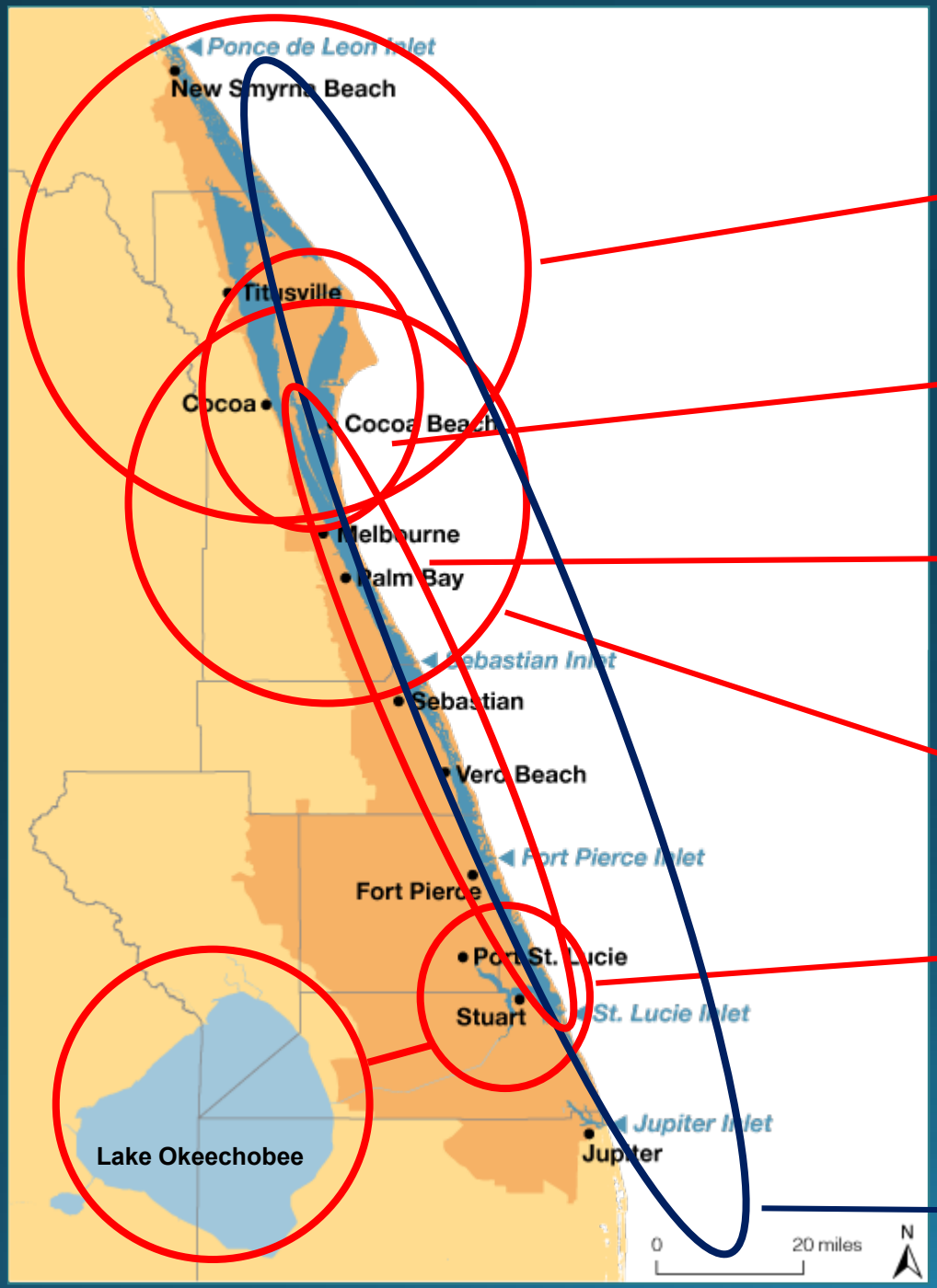
Estuary of National Significance

Spans multiple climate zones

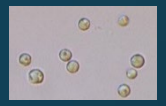
Declared impaired from nutrients

~ $8B annual economic value

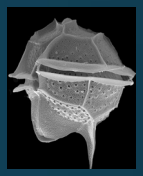
Recent and ongoing HABs (and effects) in the IRL



Aureoumbra "brown tide"
(hypoxia and anoxia, fish kills, seagrass loss)

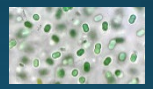


Pyrodinium "red tide"
(saxitoxin – dangerous neurotoxin, Paralytic Poisoning)

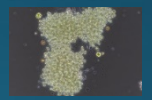


Psuedonitzchia
(domoic acid – dangerous neurotoxin, Amnesic Poisoning)

cyanobacteria and other picoplankton ("superbloom", hypoxia and anoxia, fish kills, seagrass loss)



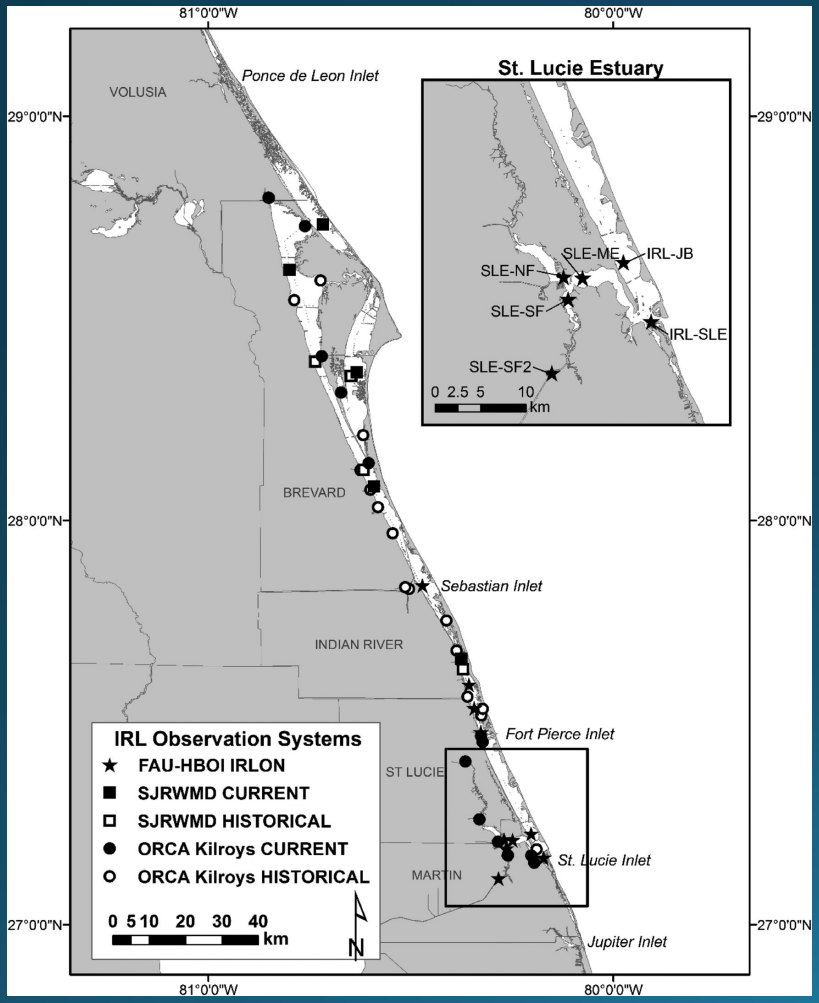
Microcystis "green tide"
(microcystins – dangerous hepatotoxins, liver & neurological damage, hypoxia and anoxia, fish kills, seagrass loss)



Karenia "red tide"
(brevetoxin - neurotoxin, Neurotoxic Poisoning, fish kills)

FL HABs: an Ecological & Economic Crisis

A complex problem… How do we deal with it?



- Leverage existing assets
- Leverage new technologies
- Collaboration, not duplication
- Integrate science and management
- Stakeholder buy-in (public/science)
- Increased support (state/federal)

Florida Center for Coastal & Human Health

Est. August 2018 at FAU Harbor Branch

FAU/HBOI & Partner Expertise

Florida HAB Crisis

Population Health Impacts

Healthy Environment & Population

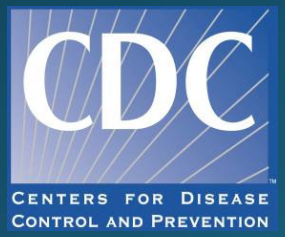
HARBOR BRANCH
FLORIDA ATLANTIC UNIVERSITY

HARBOR BRANCH OCEANOGRAPHIC INSTITUTE
FOUNDATION

Florida Center for Coastal & Human Health

Recruiting Public stakeholders

Recruiting strategic research partners



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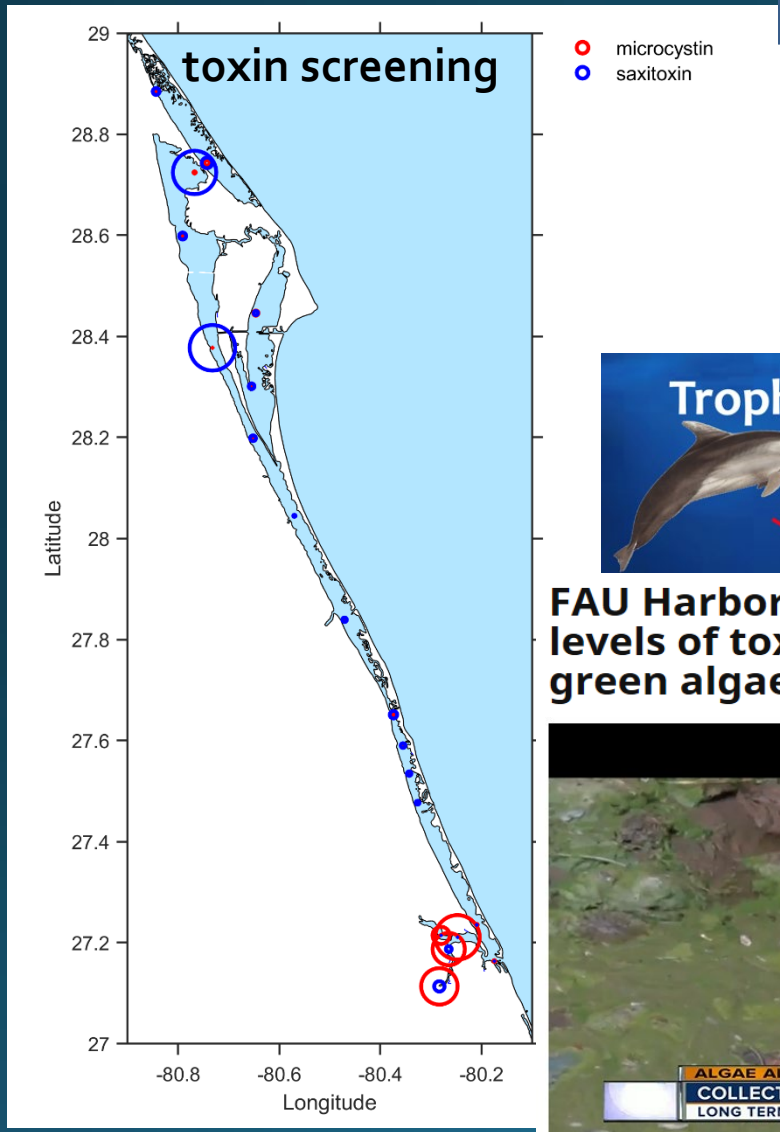
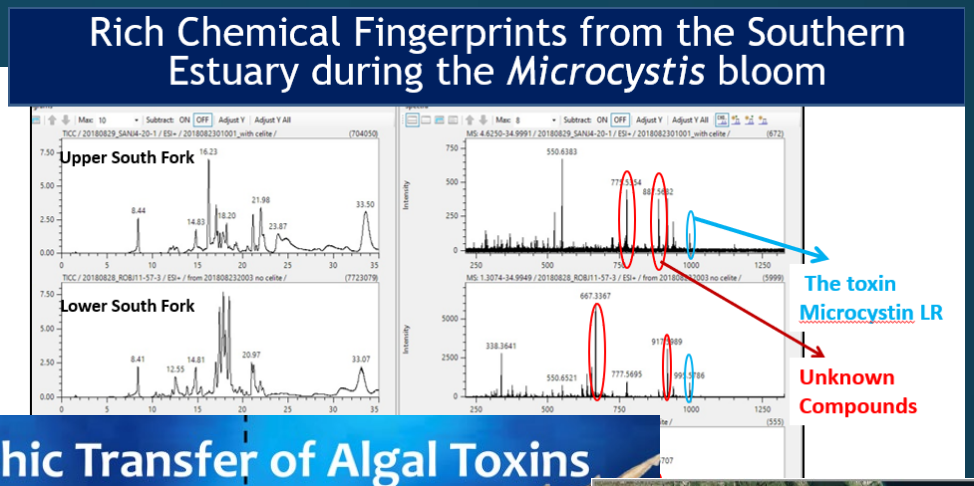
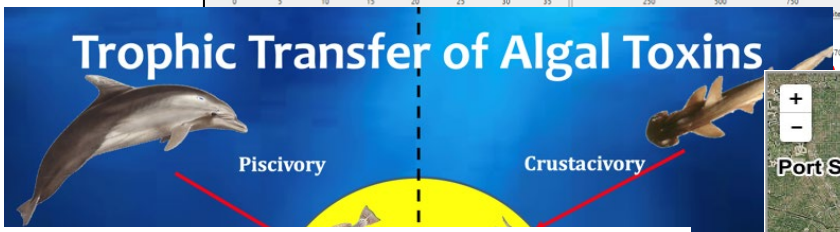
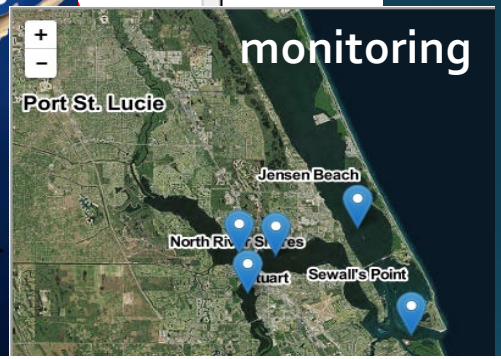
Conducting Critical Research

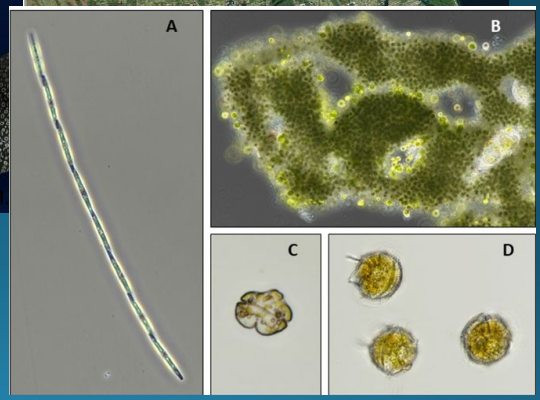








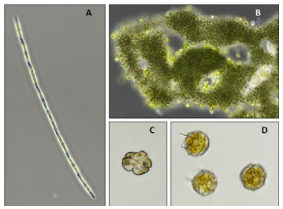
FAU Harbor Branch tests people for levels of toxin released from blue-green algae



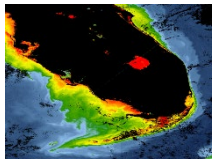
INTEGRATING SCIENCE FOR BETTER MANAGEMENT

new technologies and methods

classical observations of blooms



remote sensing

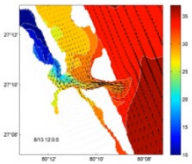


real-time water quality monitoring

new technologies and methods

Florida Center for Coastal & Human Health

new technologies and methods



modeling/prediction
risk assessment
stakeholders

biological indicators

policy

human health
ecosystem health

Hot off the press: April 2019

JOURNAL OF OPERATIONAL OCEANOGRAPHY
https://doi.org/10.1080/1755876X.2019.1606879

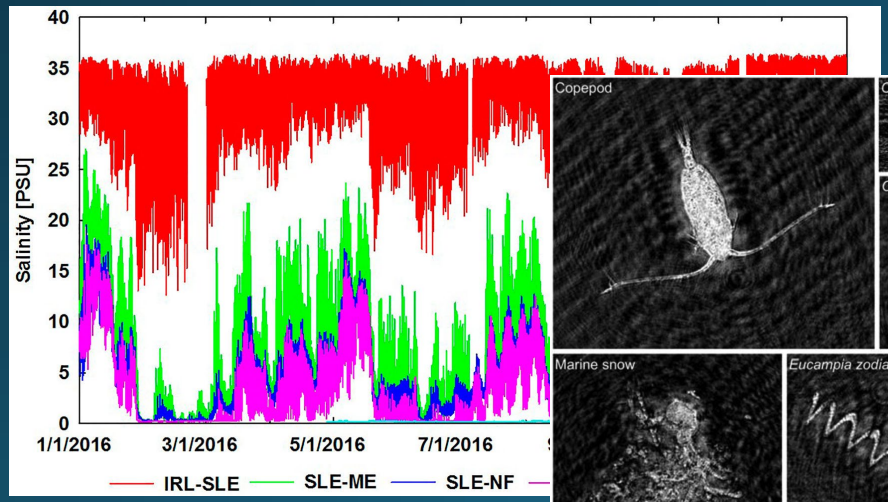
Taylor & Francis
Taylor & Francis Group

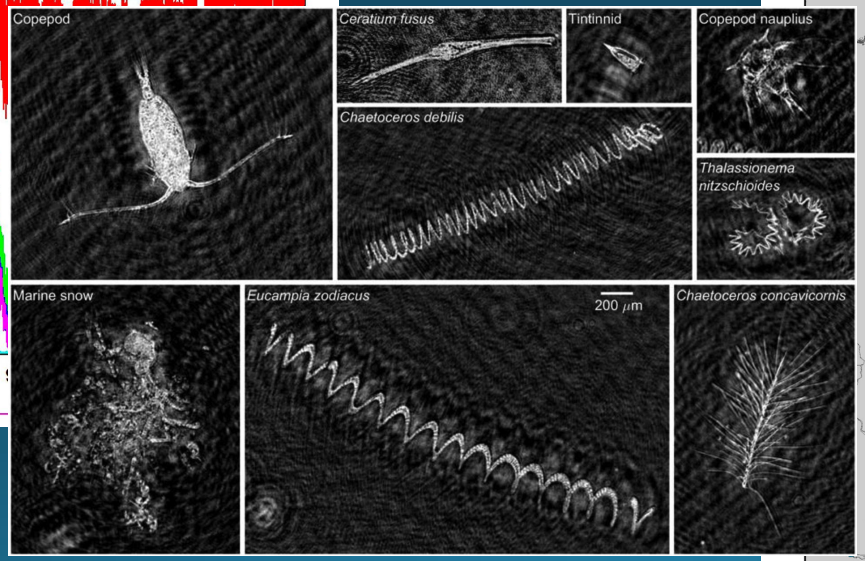
Check for updates

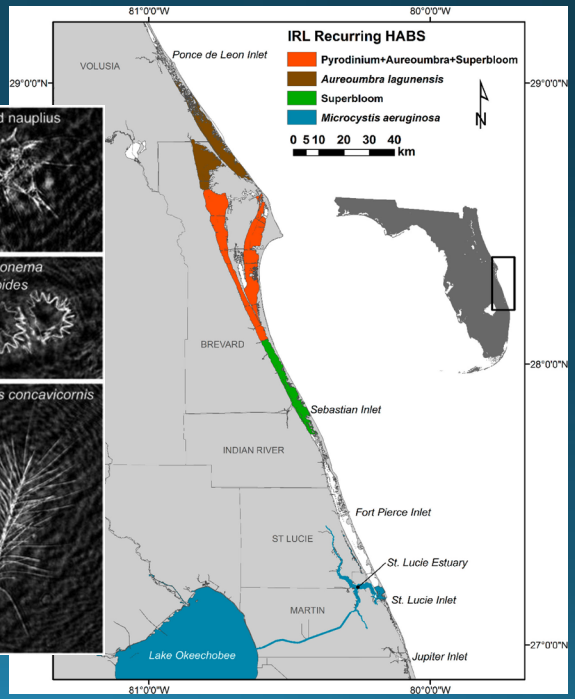
Integrated observing systems: An approach to studying harmful algal blooms in south Florida

Adam M. Schaefer, M. Dennis Hanisak, Malcolm McFarland and James M. Sullivan

Harbor Branch Oceanographic Institute, Florida Atlantic University, Fort Pierce, FL, USA








THANKS!