



HARMFUL ALGAL BLOOMS IN SOUTH FLORIDA AND THE INDIAN RIVER LAGOON



HARBOR BRANCH

FLORIDA ATLANTIC UNIVERSITY

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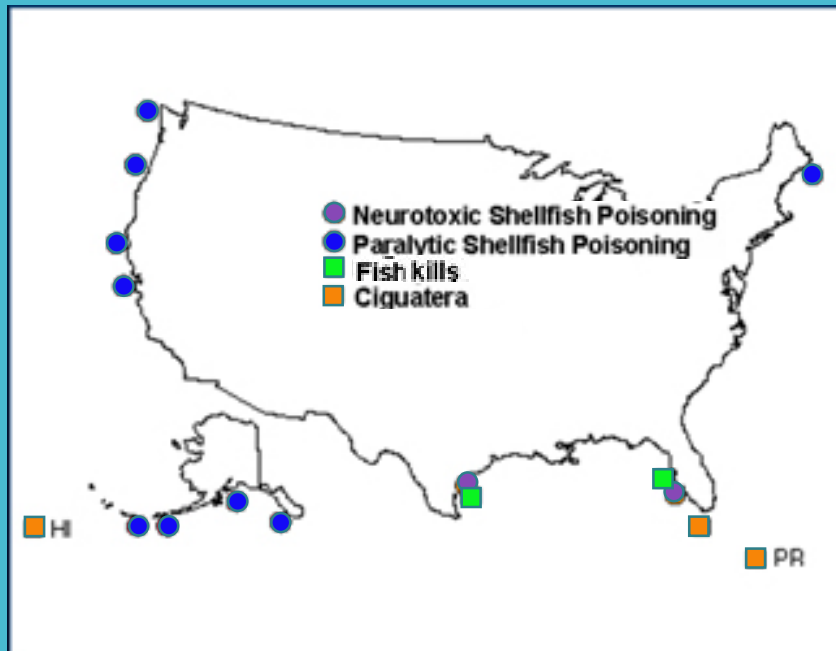
HARMFUL ALGAL BLOOMS (HABs)

OCCURRENCES OF PHYTOPLANKTON (ALGAE) THAT CAUSE
NEGATIVE ECOSYSTEM (OR HUMAN) IMPACTS

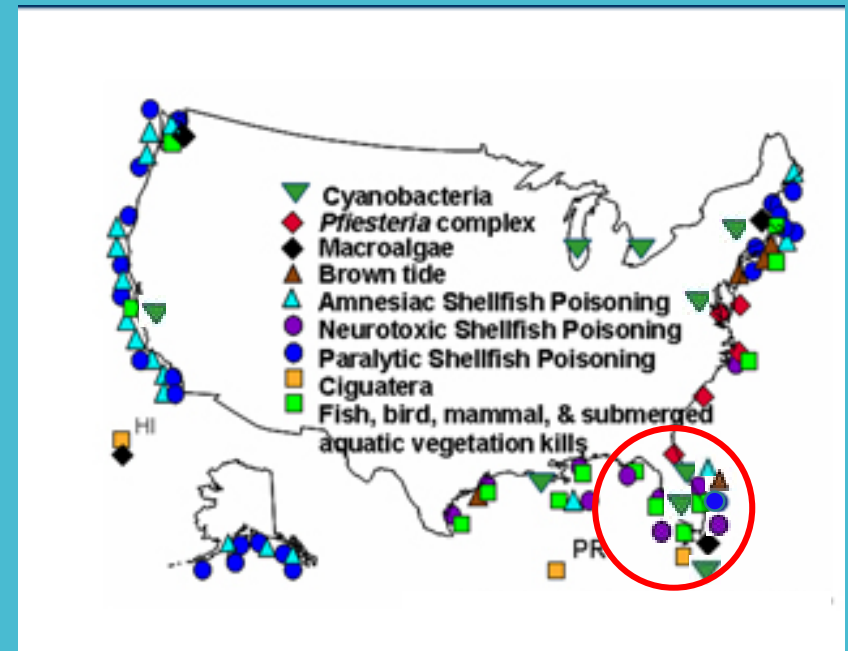


WORLDWIDE, HABs ARE INCREASING NOT ONLY IN GEOGRAPHICAL LOCATIONS, BUT ALSO IN TYPE, FREQUENCY, DURATION AND SEVERITY

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...



U.S. Global Change
Research Program

Fourth National Climate Assessment

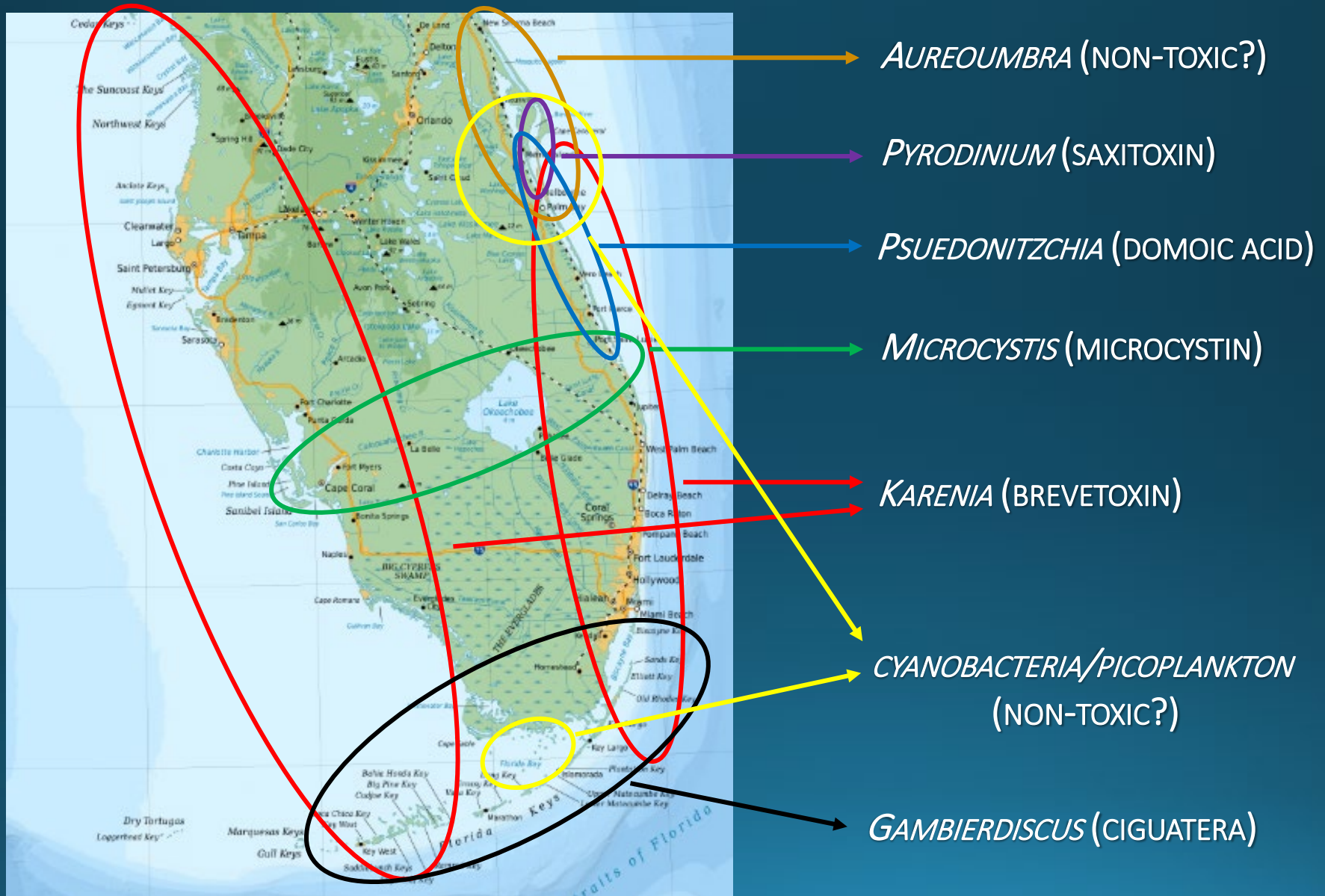
Government Report On Climate Change Says Red Tide Will Become More Common In Florida

November 23, 2018 at 4:50 pm Filed Under: [Climate change](#), [Florida](#), [Government Report](#), [Red Tide](#), [Sea Life](#)

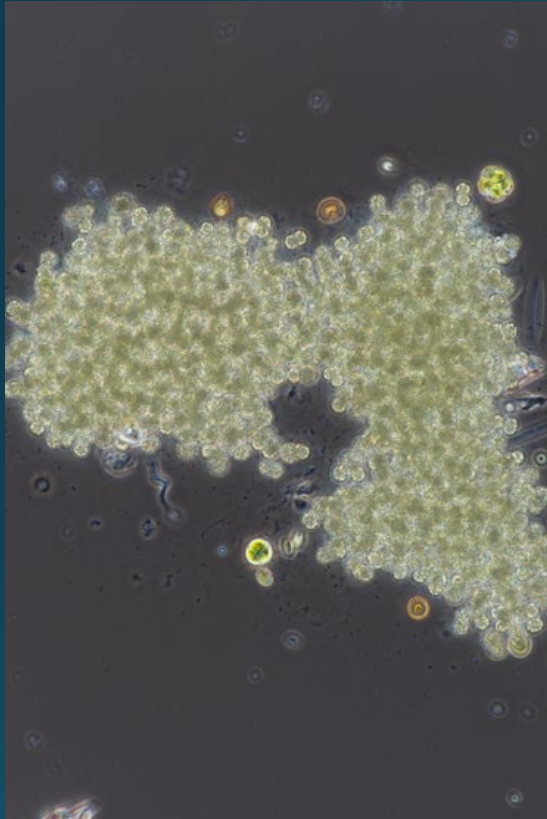
Volume II

Impacts, Risks, and Adaptation in the United States
Report-in-Brief

CURRENT HAB THREATS IN SOUTH FLORIDA



MANY DIFFERENT TYPES OF HARMFUL ALGAE



MANY DIFFERENT HAB TOXINS & EFFECTS

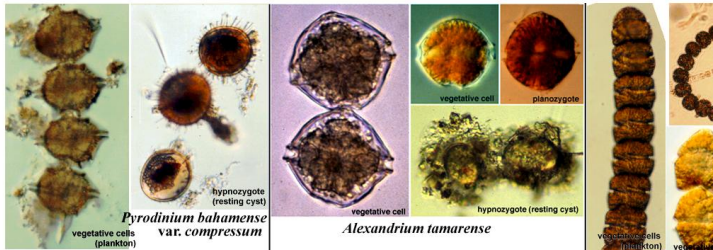
Toxic Microalgae

WESTPAC/IOC/UNESCO

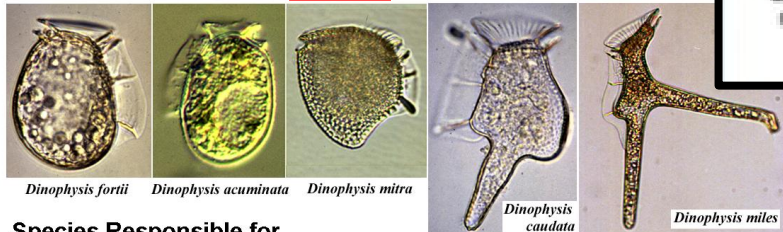
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ed. by Yasuwo Fukuyo (ufukuyo@mail.ecc.u-tokyo.ac.jp)

Species Responsible for Paralytic Shellfish Poisoning



Species Responsible for Diarrhetic Shellfish Poisoning



Species Responsible for Neurotoxic Shellfish Poisoning



Species Responsible for Amnesic Shellfish Poisoning

Species Responsible for and implicated in Ciguatera Fish Poisoning



IMPACTS OF TOXIC ALGAE



Contaminated drinking water can make people and wildlife sick.



Algae blooms emit noxious fumes.



Eating contaminated fish or seafood can cause illness.



Recreational exposure can make people and pets sick.

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 KM² WATERSHED

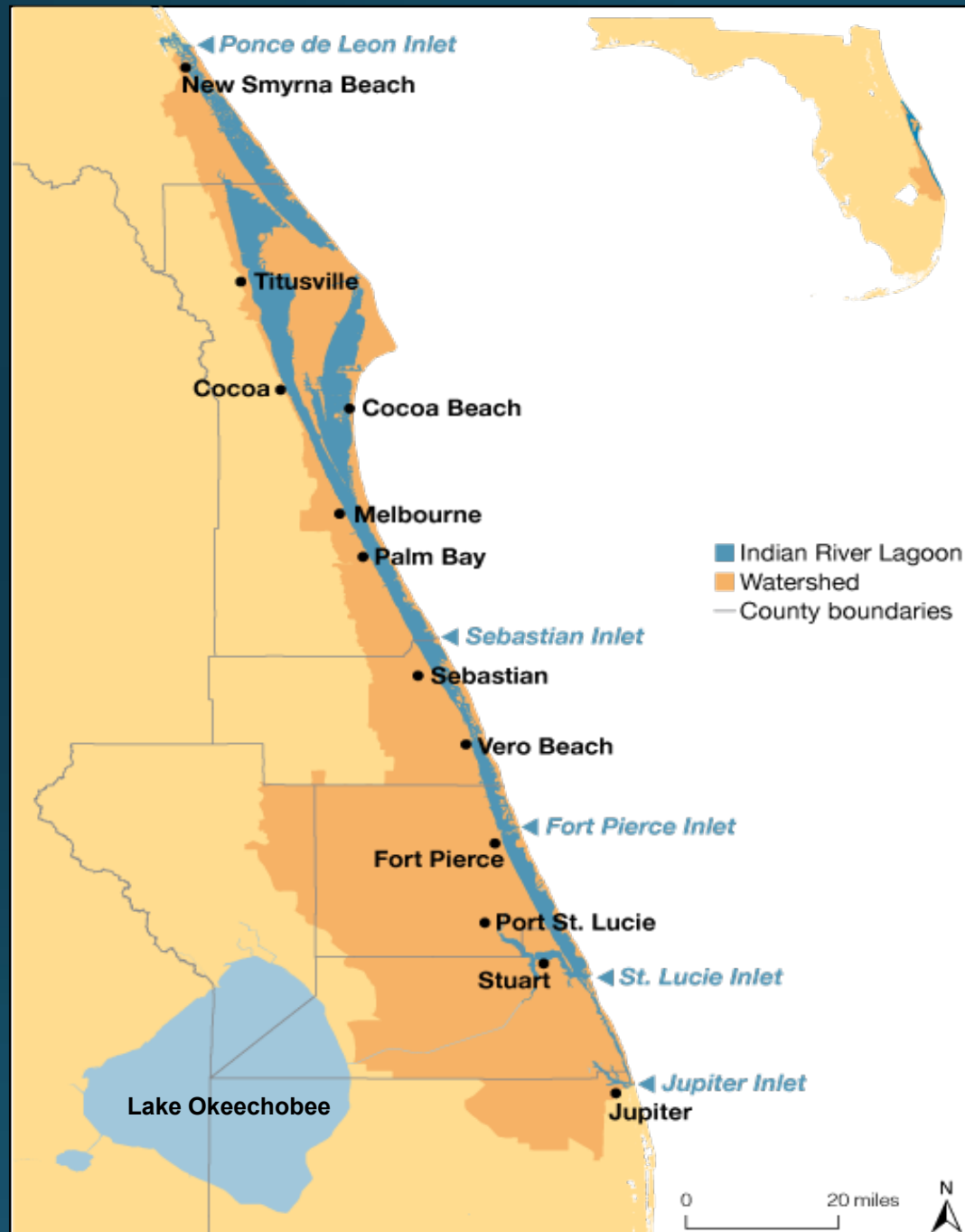
HIGH BIOLOGICAL DIVERSITY

ESTUARY OF NATIONAL SIGNIFICANCE

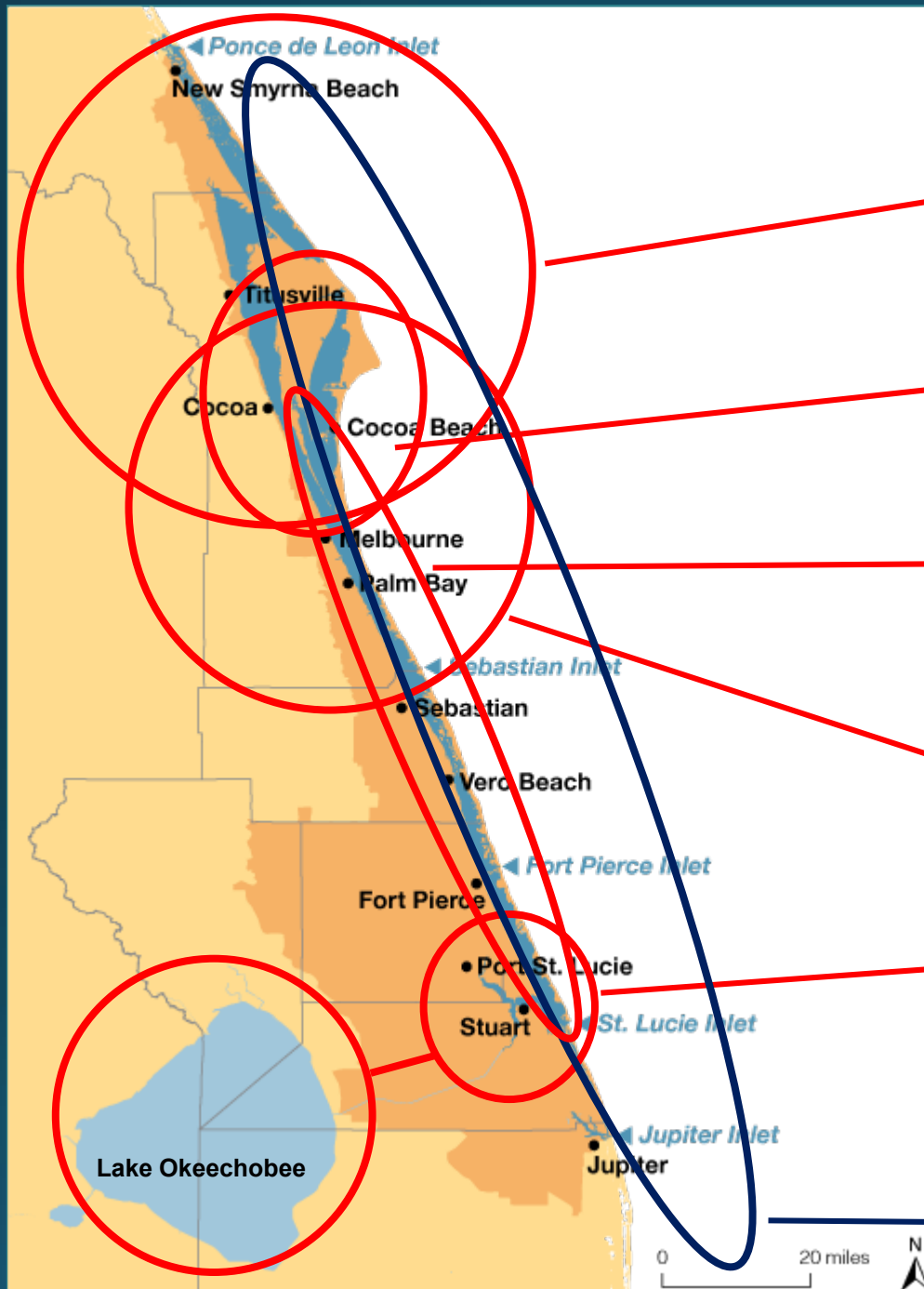
SPANS MULTIPLE CLIMATE ZONES

DECLARED IMPAIRED FROM NUTRIENTS

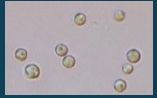
~ \$8B ANNUAL ECONOMIC VALUE



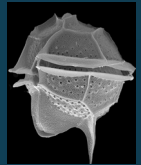
RECENT AND ONGOING HABs (AND EFFECTS) IN THE IRL



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



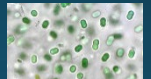
Pyrodinium “red tide”
(saxitoxin – dangerous neurotoxin,
Paralytic Poisoning)



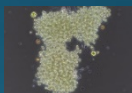
Psuedonitzschia
(domoic acid – dangerous neurotoxin,
Amnesic Poisoning)



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)

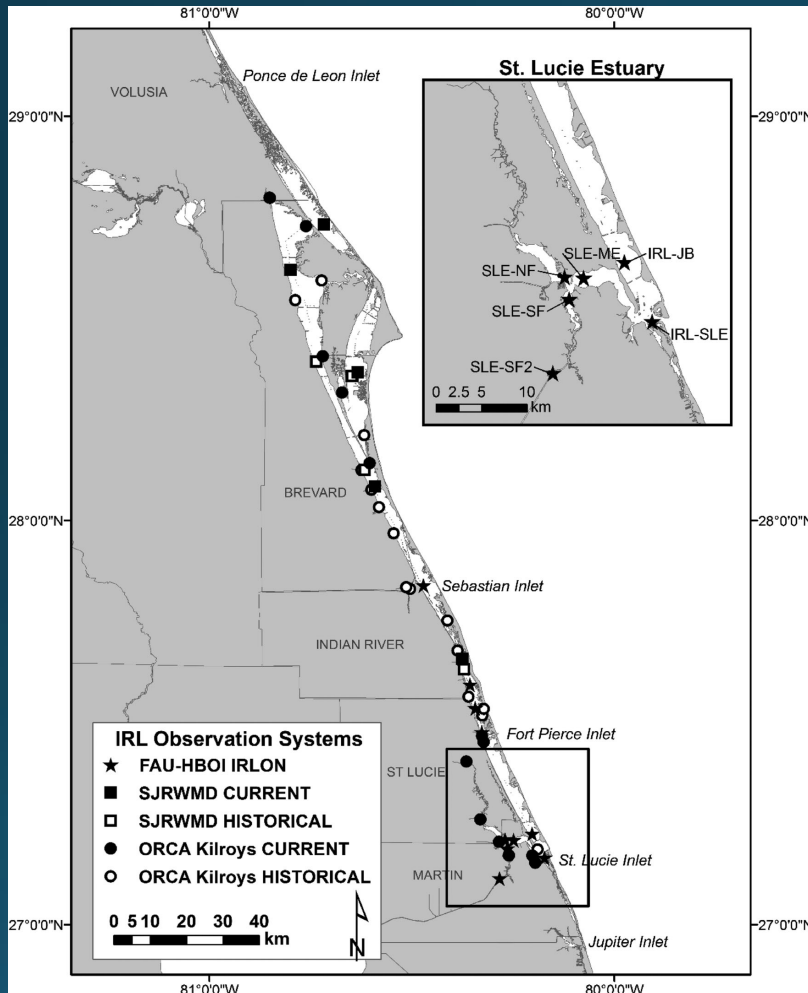


Karenia “red tide”
(brevetoxin - neurotoxin, Neurotoxic
Poisoning, fish kills)



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

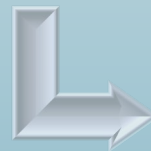
FAU/HBOI & Partner
Expertise



Florida HAB Crisis



Population Health
Impacts



Healthy Environment &
Population



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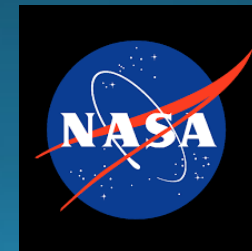
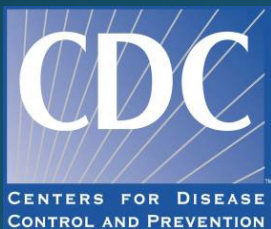
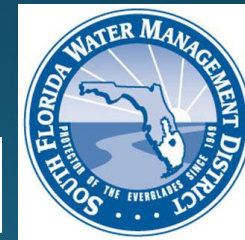
HARBOR BRANCH OCEANOGRAPHIC INSTITUTE
FOUNDATION

FLORIDA CENTER FOR COASTAL & HUMAN HEALTH

RECRUITING PUBLIC STAKEHOLDERS



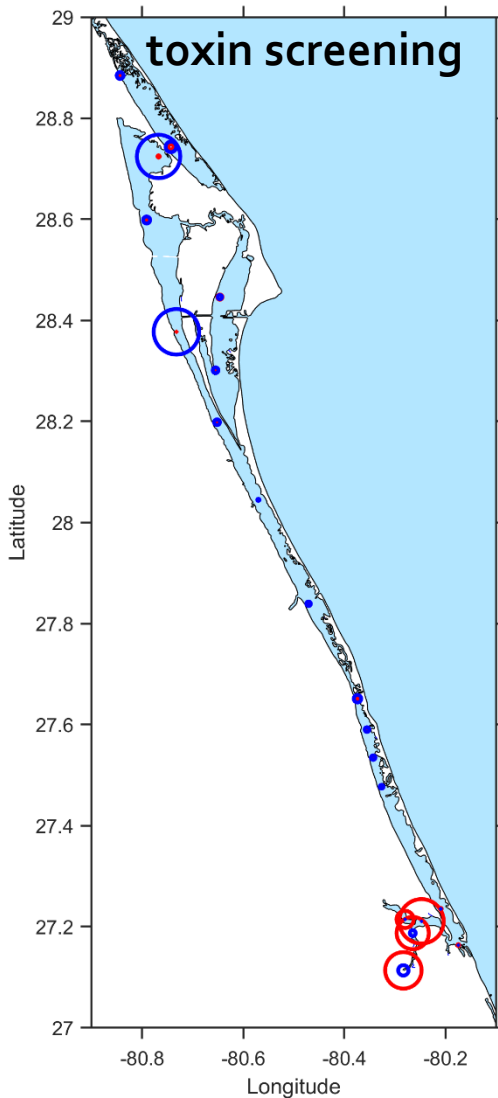
RECRUITING STRATEGIC RESEARCH PARTNERS



FAU BRAIN INSTITUTE

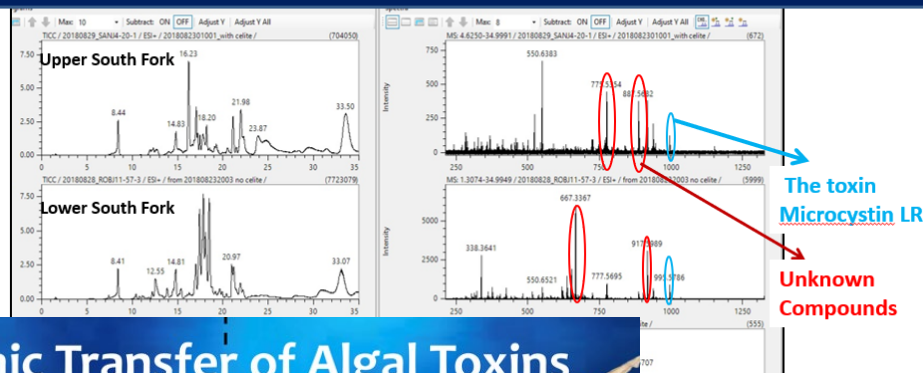
FLORIDA CENTER FOR COASTAL & HUMAN HEALTH

CONDUCTING CRITICAL RESEARCH

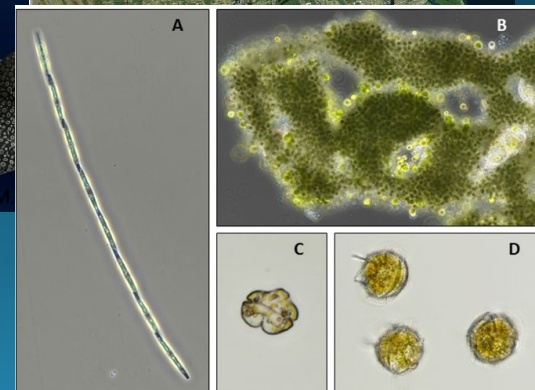
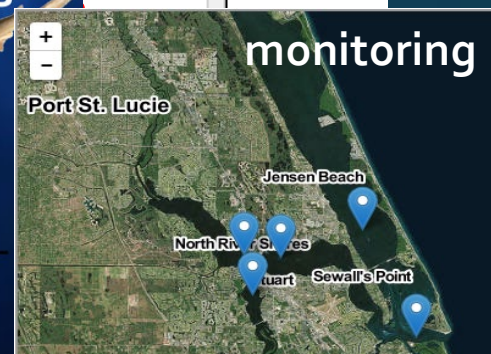


- microcystin
- saxitoxin

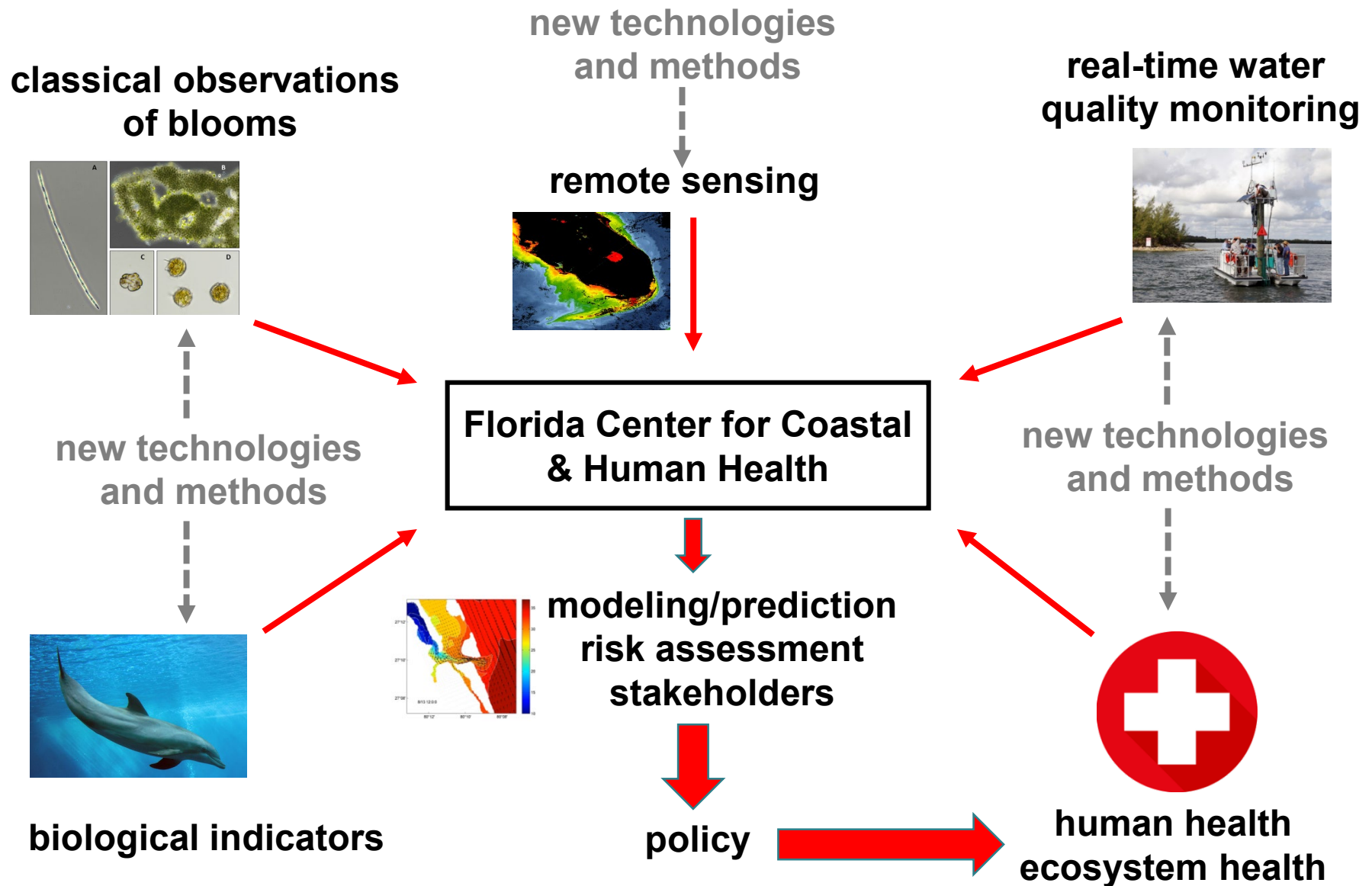
Rich Chemical Fingerprints from the Southern Estuary during the *Microcystis* bloom



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



INTEGRATING SCIENCE FOR BETTER MANAGEMENT



HOT OFF THE PRESS: APRIL 2019

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



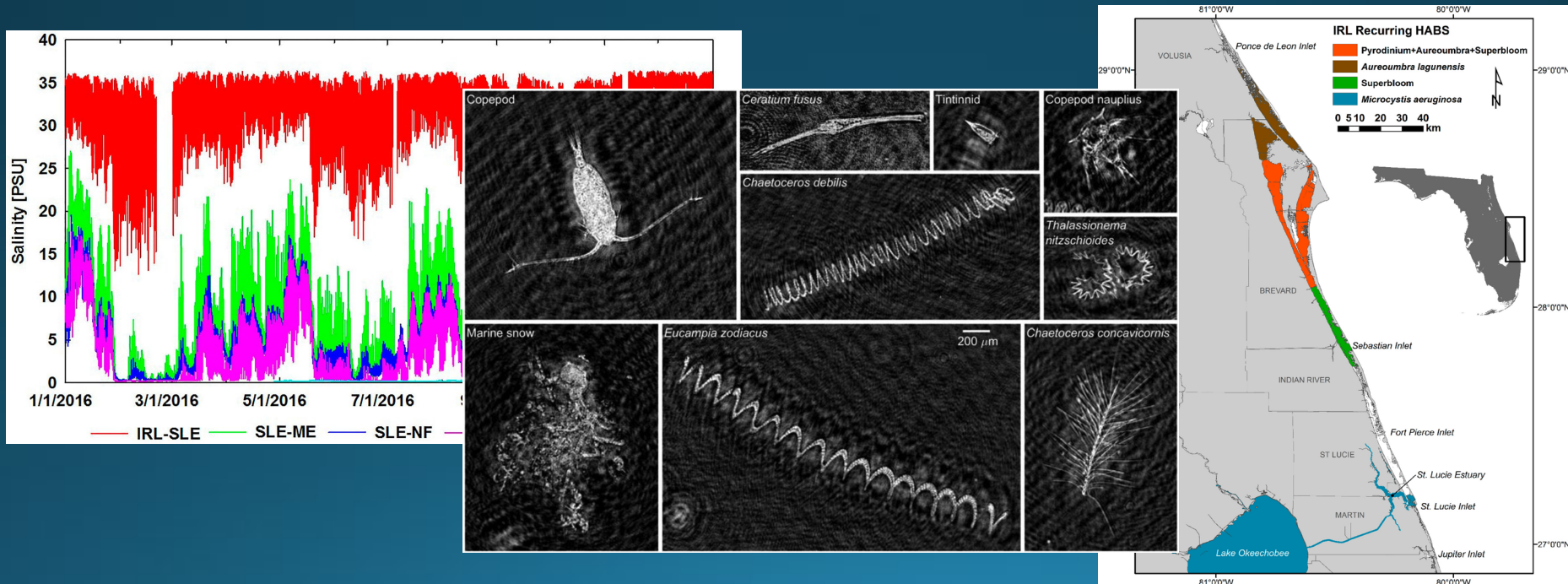
Taylor & Francis
Taylor & Francis Group



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

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



An aerial photograph of a coastal region. In the background, a city with numerous buildings and palm trees stretches across the horizon. The middle ground features a large, irregularly shaped body of water with varying shades of blue and green, indicating different depths and possibly submerged vegetation. A small, lush green island is situated in the center of the water. To the right, there's a peninsula with some buildings and a dock. The foreground shows a shallow, sandy area with patches of dark, possibly seaweed or coral, and a clear, light blue water channel leading towards the center. The word "THANKS!" is superimposed in the center of the image in a large, white, sans-serif font.

THANKS!