Beyond Red Tide: An overview of Marine Harmful Algal Blooms in Florida

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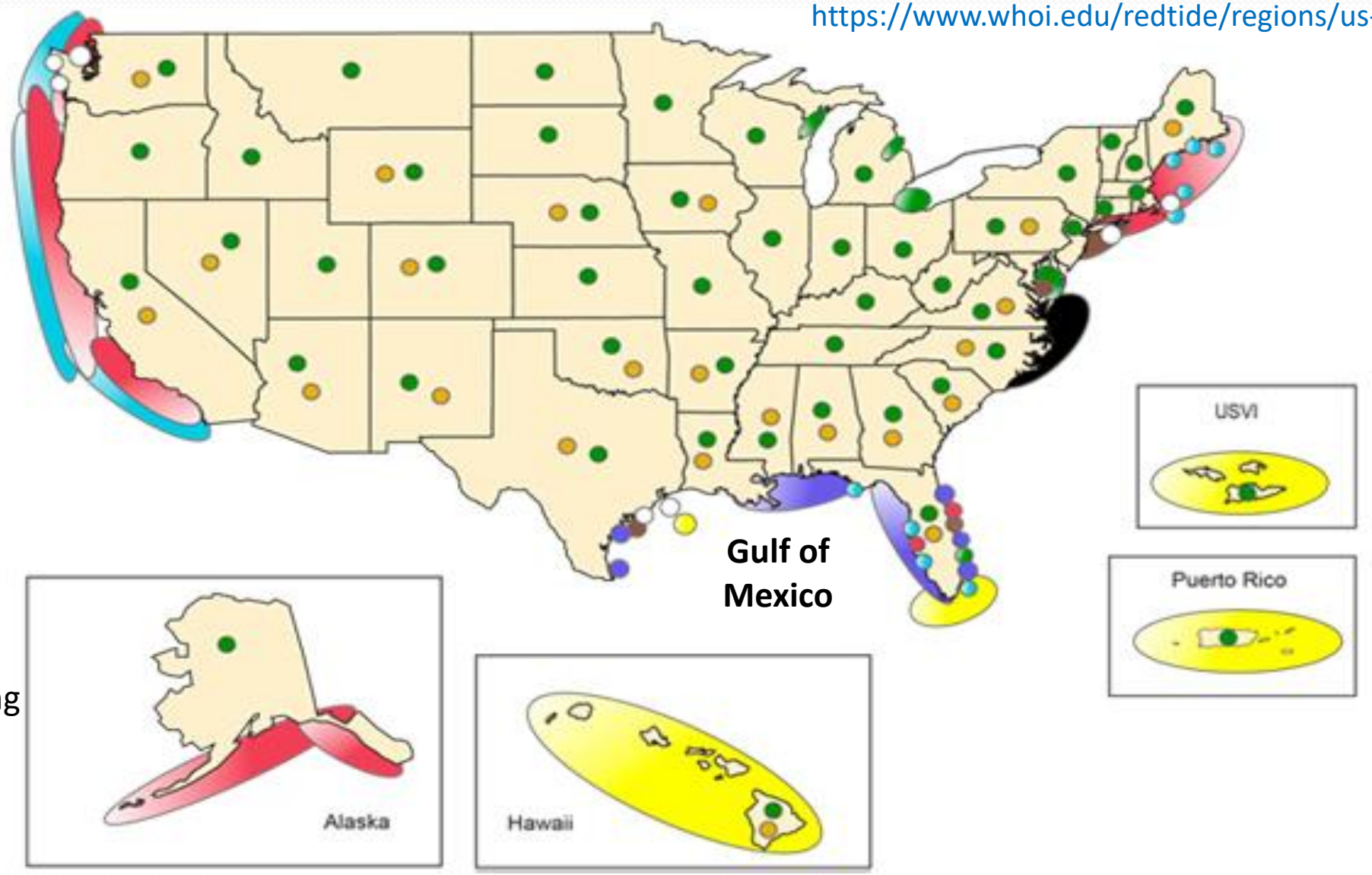
Distribution of HAB-related Poisoning Syndromes in the United States

https://www.whoi.edu/redtide/regions/us-distribution

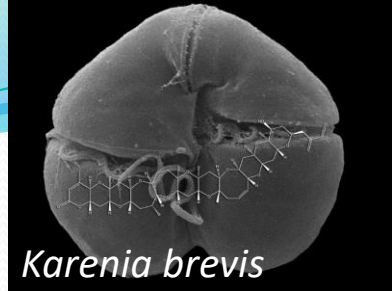
- Neurotoxic SP
- Paralytic SP
- Amnesic SP
- Diarrhetic SP
- CyanoHABs
- Ciguatera FP
- Brown tide
- Golden alga
- *Karlodinium*

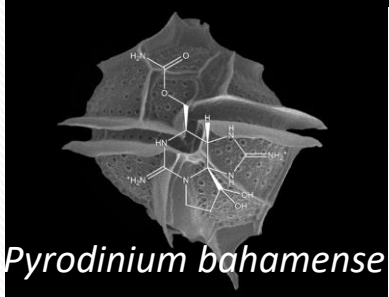
SP = Shellfish Poisoning
FP = Fish Poisoning

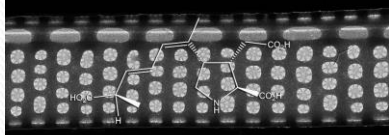


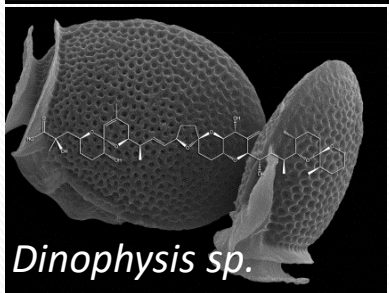
Toxin-producing HABs present human health risks.

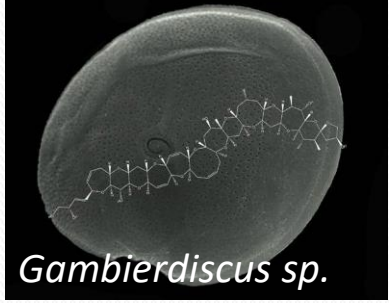
Organism(s)	Toxins	Syndrome
Karenia brevis	Brevetoxins	Neurotoxic Shellfish Poisoning
Pyrodinium bahamense	Saxitoxins	Paralytic Shellfish Poisoning Saxitoxin Puffer Fish Poisoning
Pseudo-nitzschia spp.	Domoic Acid	Amnesic Shellfish Poisoning
Dinophysis spp. *Prorocentrum* spp.	Okadaic Acid, Dinophysistoxins	Diarrhetic Shellfish Poisoning
Gambierdiscus spp.	Gambiertoxins, Maitotoxins	Ciguatera Fish Poisoning


Karenia brevis


Pyrodinium bahamense

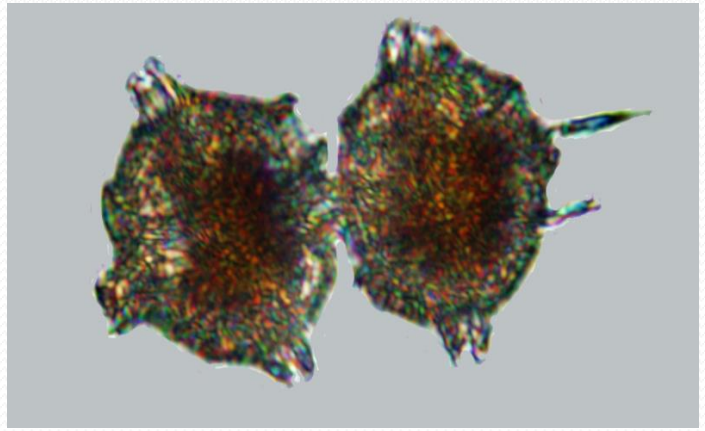

Pseudo-nitzschia sp.


Dinophysis sp.


Gambierdiscus sp.

Pyrodinium bahamense

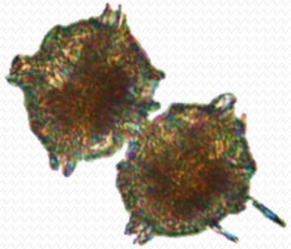
- Bioluminescent dinoflagellate
- Atlantic strain (*P. bahamense* var. *bahamense*) was not known to be toxic until 2002
- 2002-2004: 28 cases saxitoxin poisoning associated with consumption of puffer fish originating in the Indian River Lagoon (IRL)
- *Pyrodinium bahamense* in the IRL confirmed to produce saxitoxin
- First confirmation of saxitoxin in marine waters in Florida
- Permanent ban on harvest of puffer fish from the IRL

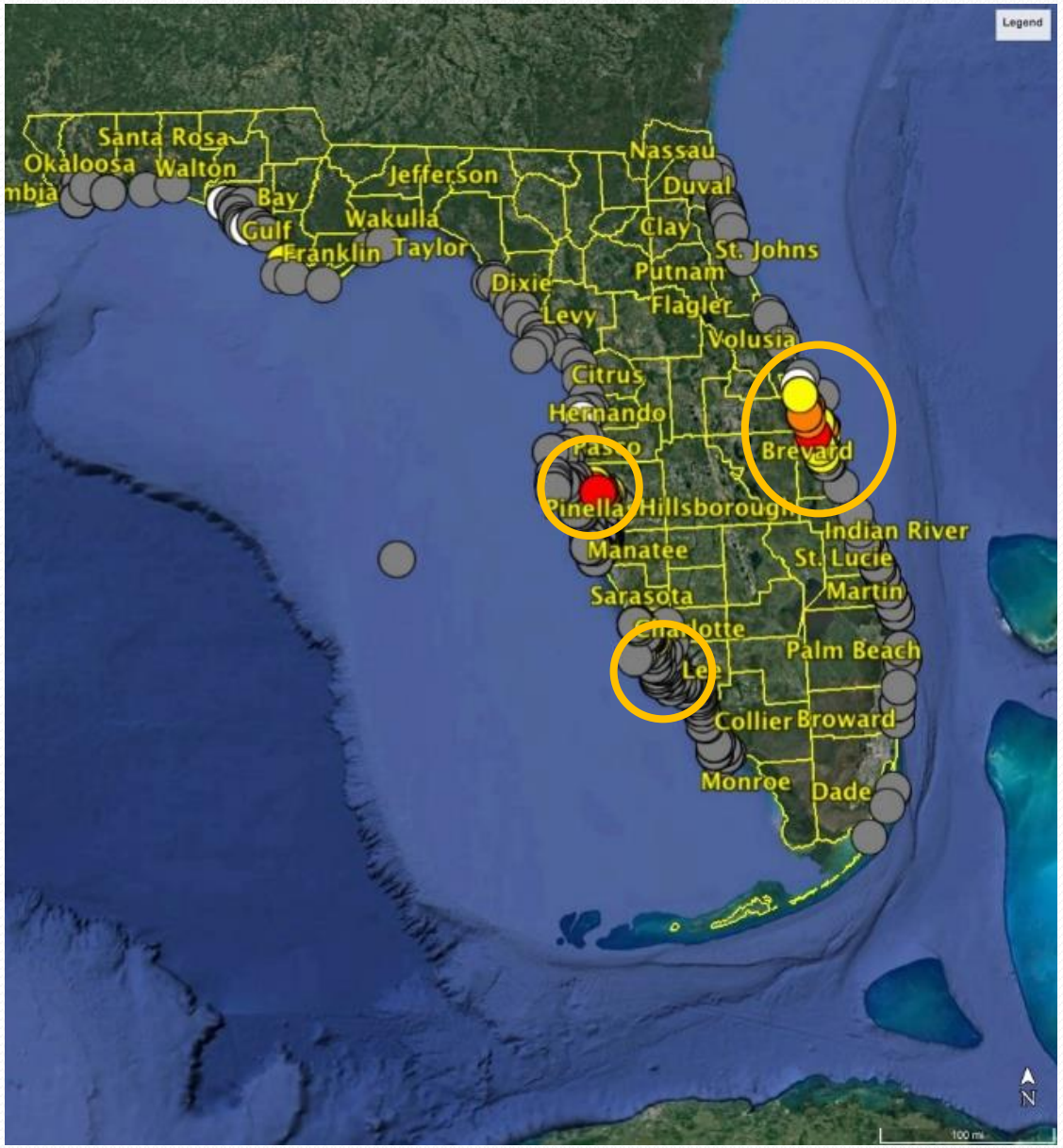


Pyrodinium bahamense

Pyrodinium bahamense

- blooms occur annually in the Indian River Lagoon and Old Tampa Bay
- first PSP closure in Pine Island Sound in 2016

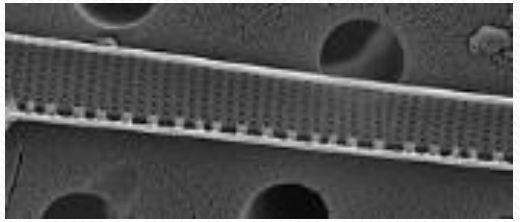


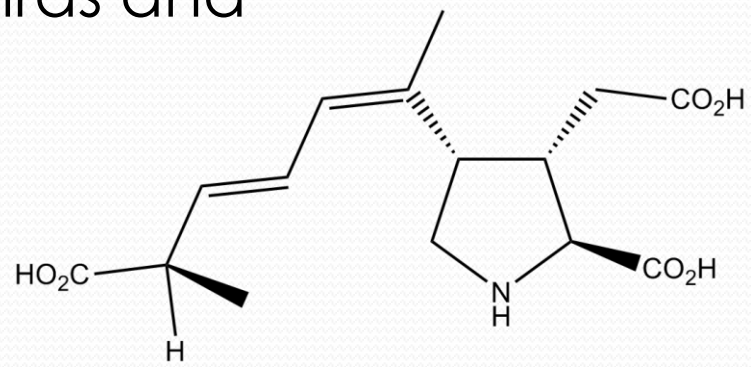


Pseudo-nitzschia spp.

- Cosmopolitan chain-forming marine diatom
- At least 14 species of *Pseudo-nitzschia* produce the neurotoxin domoic acid (DA)
- DA is the only marine algal toxin produced by diatoms
- DA can cause Amnesic Shellfish Poisoning in humans and Domoic Acid Poisoning in marine birds and mammals

www.eos.ubc.ca/research/phytoplankton/

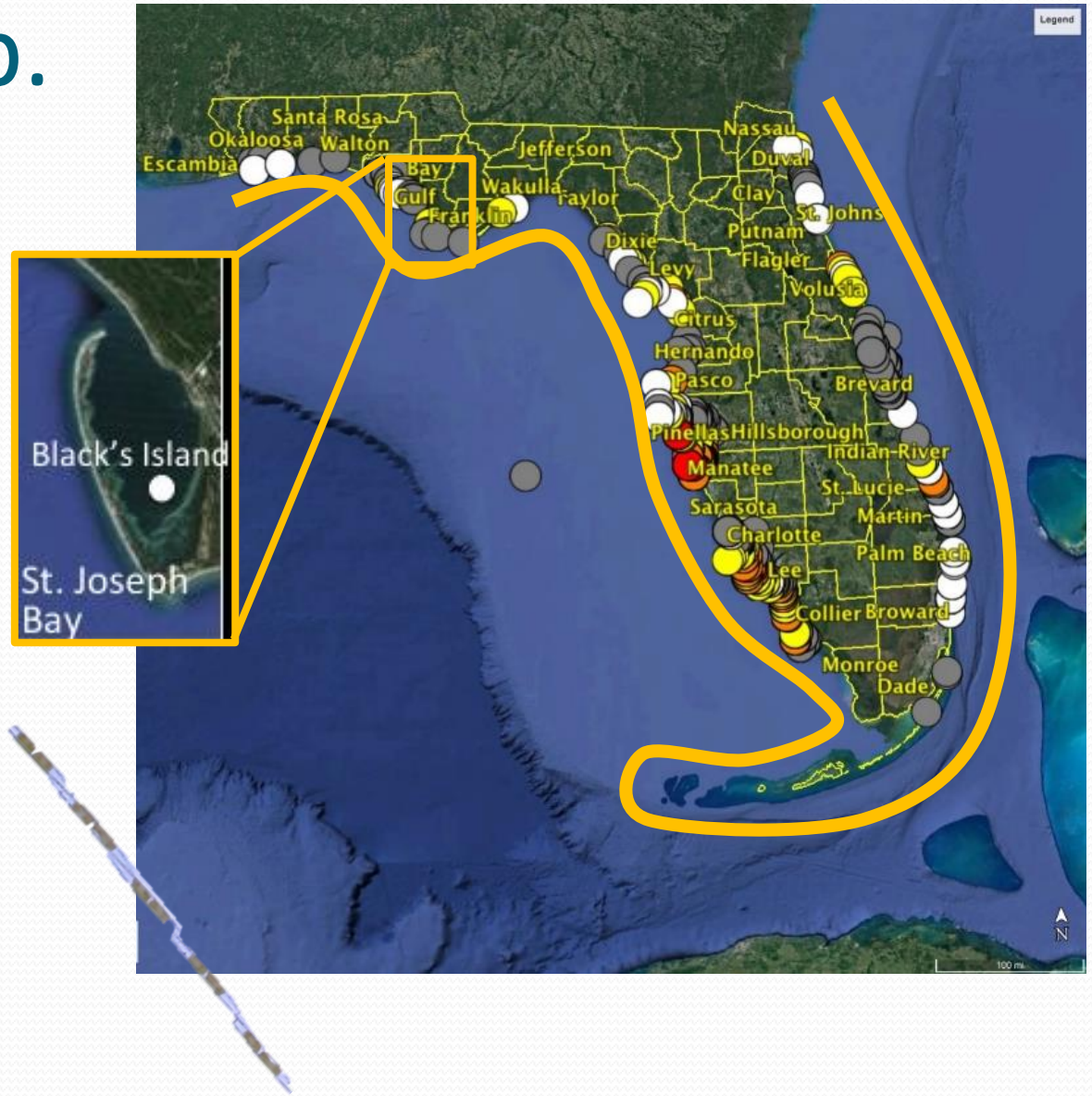




Domoic Acid

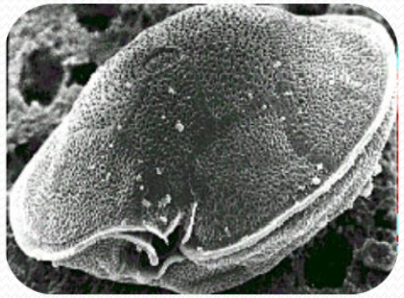
Pseudo-nitzschia spp.

- Nearly year-round presence
- Approximately 50% of samples contain DA
- 3 harvest closures in St. Joseph Bay (Gulf County) since 2013

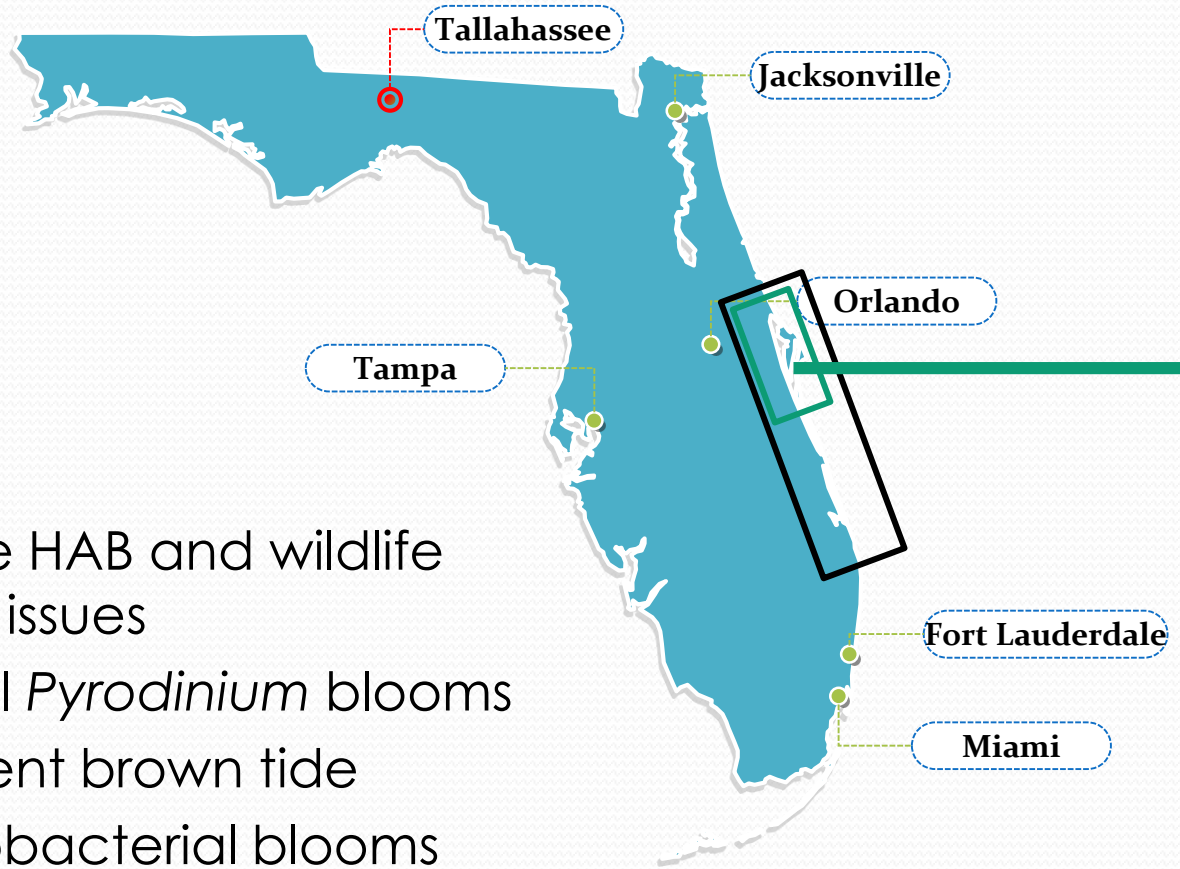


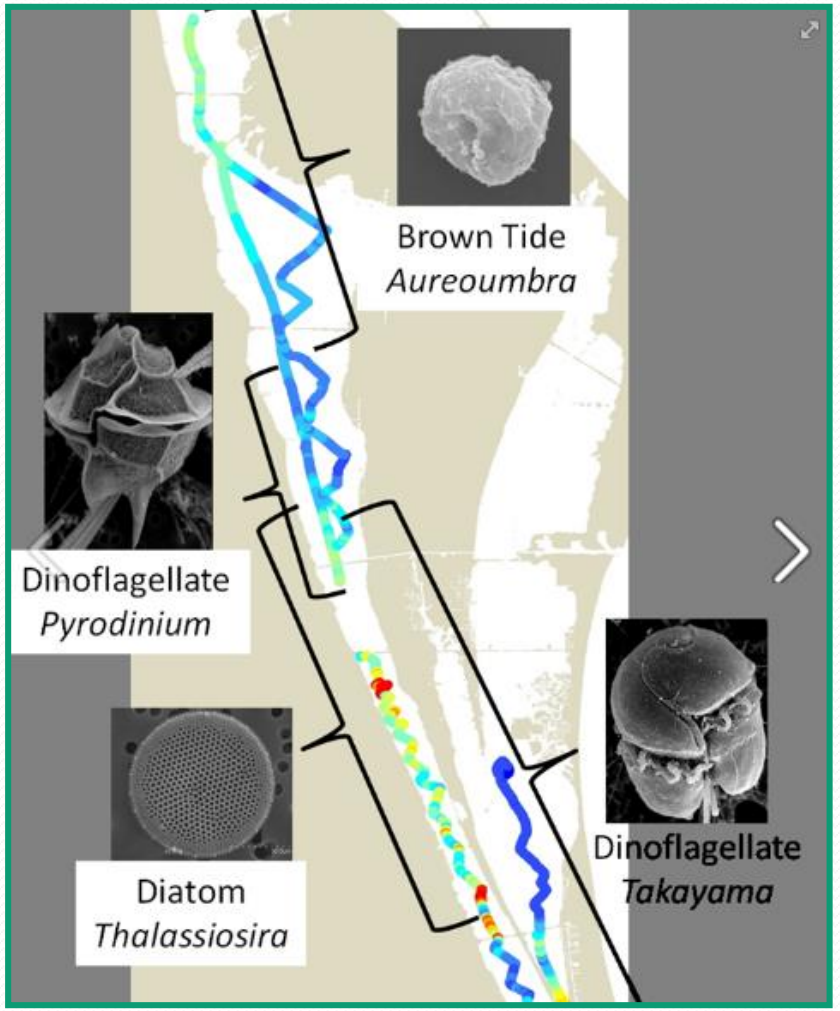
Ciguatera Fish Poisoning

- Most common seafood poisoning (affects 50,000-100,000 people each year)
- Ciguatoxin precursors produced by *Gambierdiscus* spp. (epibenthic dinoflagellate); transformed and concentrated in tropical reef fish through food web
- Neurological symptoms can persist for several months; chronic symptoms can persist for years
- Can be fatal
- Distinct forms and varying potencies in ciguatoxins from the Pacific, Caribbean, and Indian oceans
- Expanding global issue; no monitoring



Indian River Lagoon

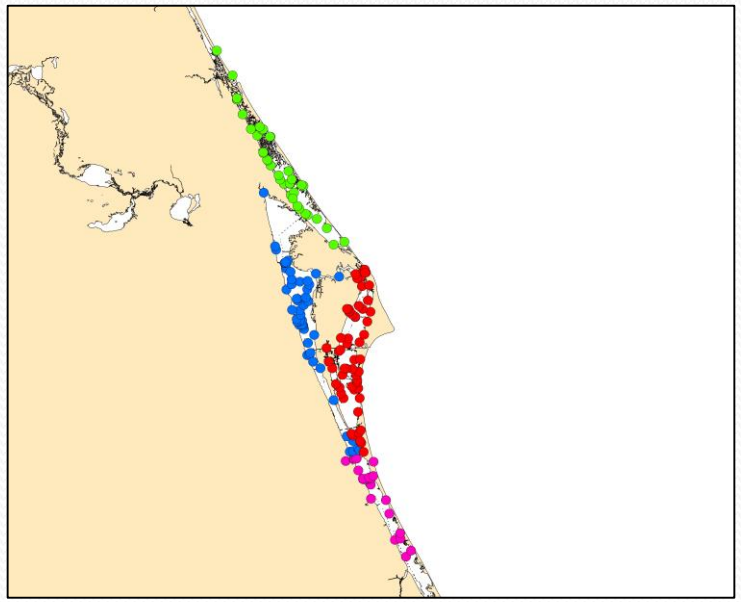


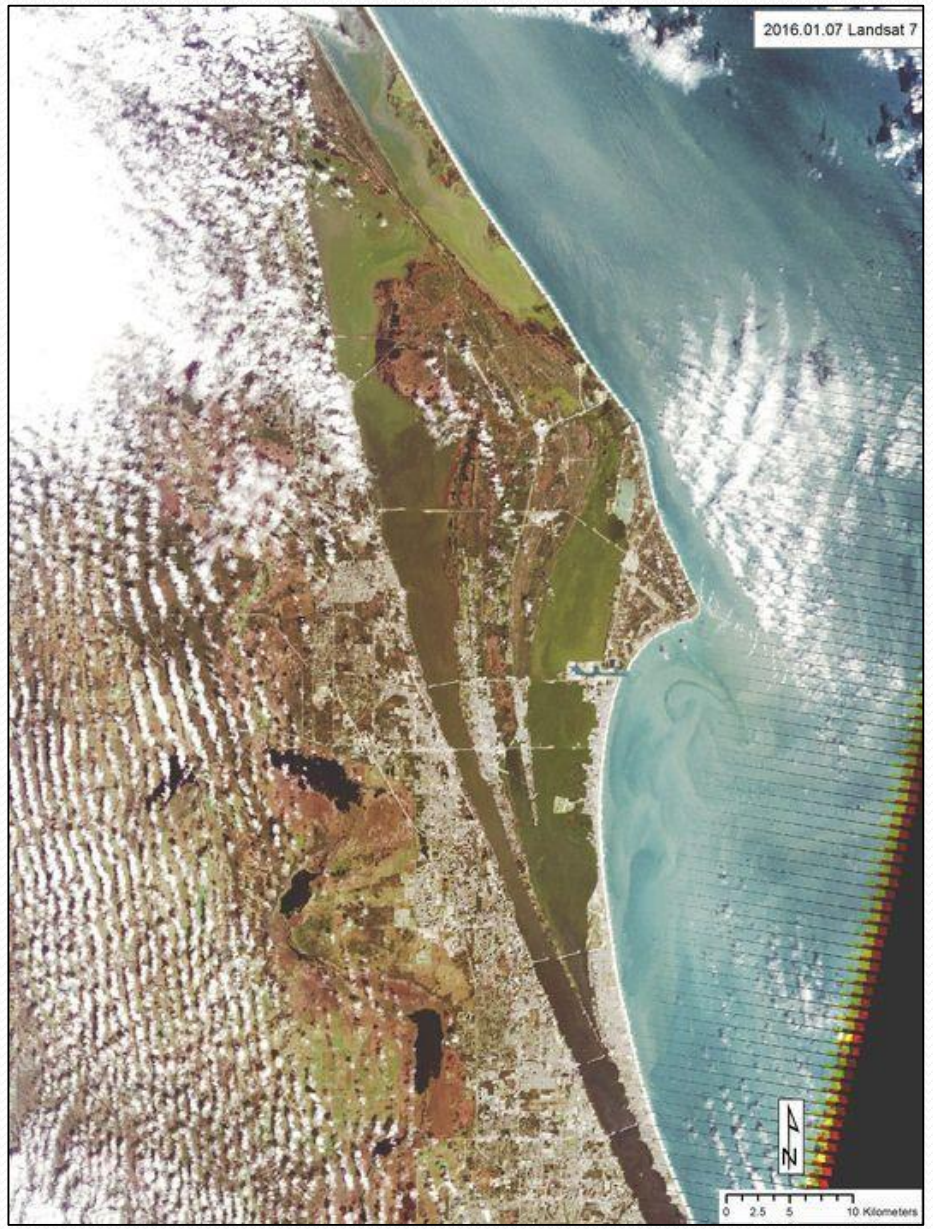


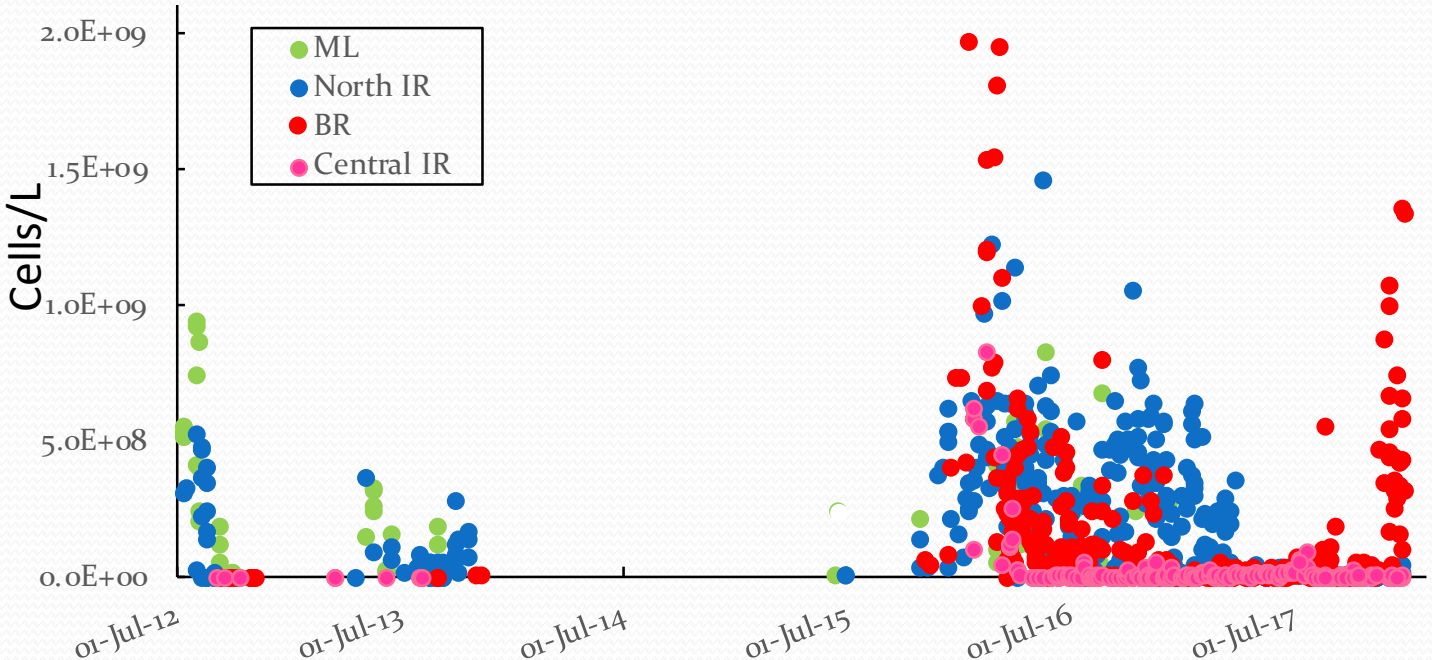
- Diverse HAB and wildlife health issues
- Annual *Pyrodinium* blooms
- Persistent brown tide
- Cyanobacterial blooms

Brown tide

- Loss of seagrasses
- Bivalve mortality
- Fish kills (low DO)

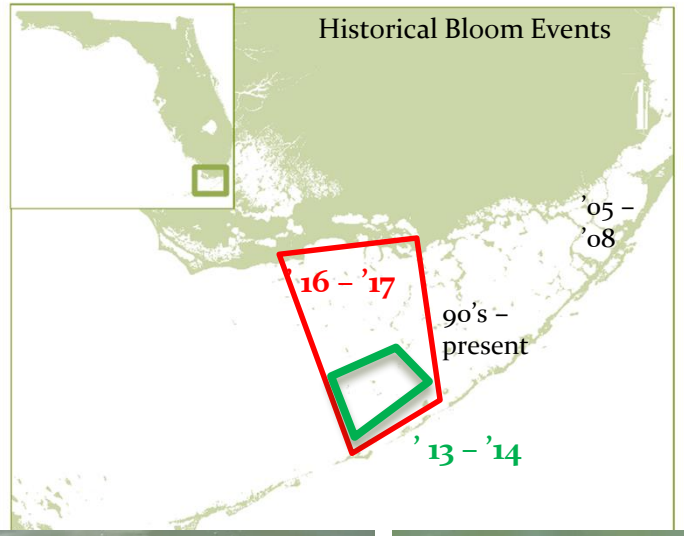






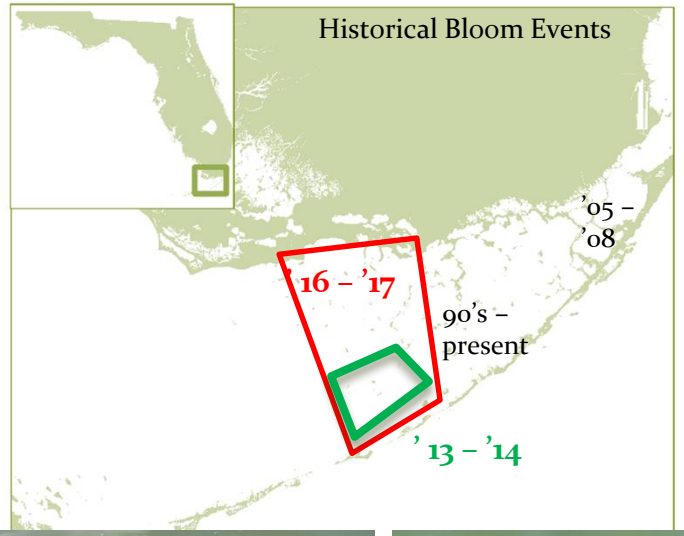
Marine Cyanobacteria

- *Synechococcus*



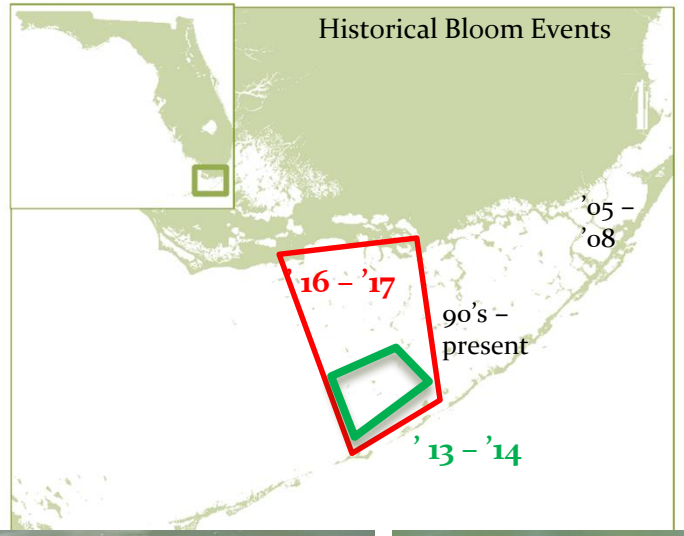
Marine Cyanobacteria

- *Synechococcus*
- *Trichodesmium*



Marine Cyanobacteria

- *Synechococcus*
- *Trichodesmium*
- *Lyngbya* and *Lyngbya*-like spp.



Tampa Bay Times

FLORIDA'S BEST NEWSPAPER | tampabay.com | ★★★★ Thursday, May 16, 2019 | $1

It's not Red Tide, but it still stinks

The nasty globs of "gumbo" rolling up in Manatee and Sarasota counties won't kill fish but will kill appetites.

Photos by TIFFANY TOMPKINS | Bradenton Herald

The sludge floating behind Mirinda Hill's home on Sarasota Bay last weekend may be mats of dead *Lyngbya*.

Macroalgae

- Sargassum

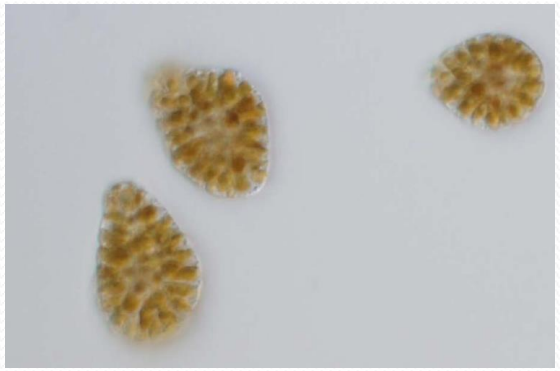
Macroalgae

- Sargassum
- Red drift algae

photo credit: Brian Cousin, HBOI

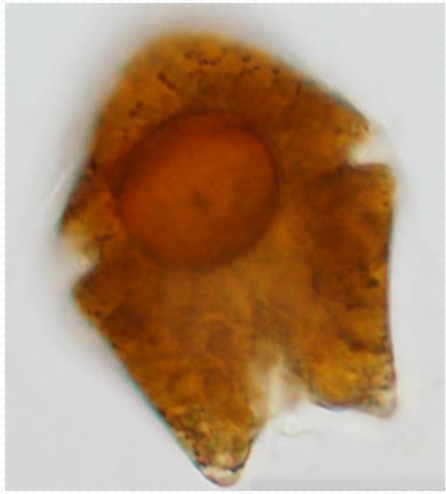
photo credit: sanibelseaschool.org

And others…



Chattonella marina

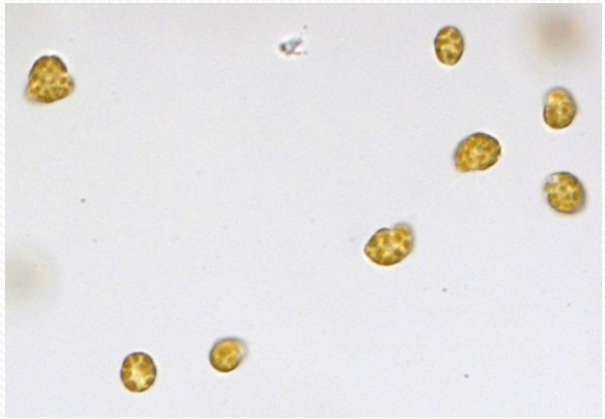
Protoperidinium crassipes



Akashiwo sanguinea

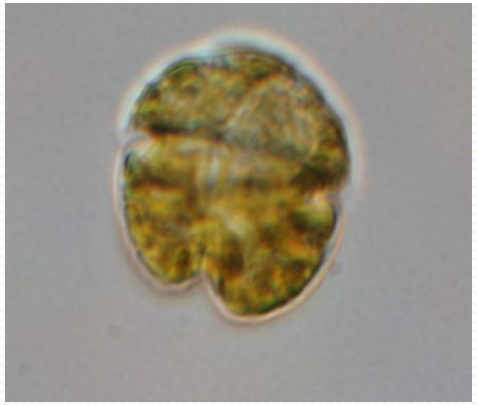
Prymnesium parvum

Fibrocapsa japonica

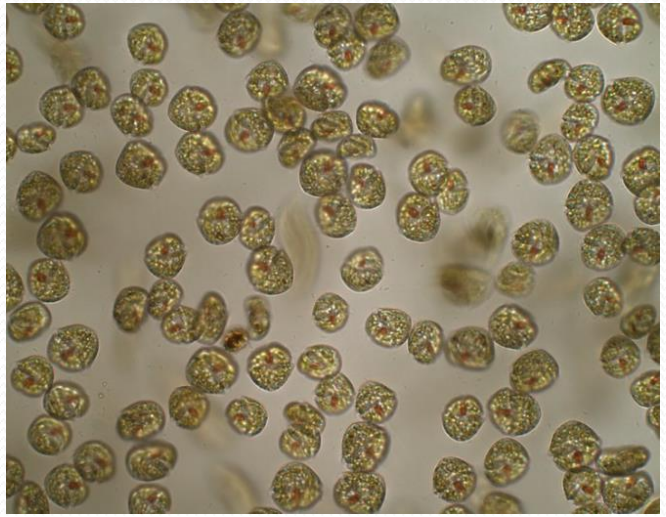


Heterosigma akashiwo

commons.wikimedia.org/wiki/File:CCMP452.jpg



Takayama tasmanica



Kryptoperidinium foliaceum