An overview of Florida’s Marine Harmful Algal Blooms

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Distribution of HAB-related Poisoning Syndromes in the United States

SP = Shellfish Poisoning
FP = Fish Poisoning

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

https://www.whoi.edu/redtide/regions/us-distribution
Toxin-producing HABs present human health risks.

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<td><em>Gambierdiscus</em> spp.</td>
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Karenia brevis

- Dinoflagellate with long history of blooms in GOM
- Duration, location, and spatial extent of the bloom varies from year to year
- Produces brevetoxins, which can cause Neurotoxic Shellfish Poisoning if consumed and cause respiratory irritation when toxins are aerosolized
- Wildlife mortality during blooms (fish, marine mammals, birds, sea turtles)
- Blooms form 10-40 miles offshore at depth
- Occurs across wide range of environmental conditions

https://www.whoi.edu/redtide/
Integrating monitoring and research critical

- Bivalve testing methods expanded
- New detection technology for cells and toxins
- Lab/field efforts examine key aspects of bloom initiation, growth, and termination
- Model development for prediction

Monitoring and prediction networks continue to improve
Pyrodinium bahamense

- One of several dinoflagellates that produces PSP toxins (saxitoxins)
- 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 IRL
- First confirmation of saxitoxin in marine waters in Florida
- Permanent ban on harvest of puffer fish from the IRL
- Saxitoxin can also cause Paralytic Shellfish Poisoning

https://www.whoi.edu/redtide/
Pyrodinium bahamense

- Blooms occur annually in the Indian River Lagoon and Tampa Bay
- First PSP closure in Pine Island Sound in 2016
- Bioluminescent
- Forms cysts
**Pseudo-nitzschia spp.**

- Cosmopolitan chain-forming marine diatom with 52 species
- At least 26 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

[https://www.whoi.edu/redtide/](https://www.whoi.edu/redtide/)
Pseudo-nitzschia spp.

- Nearly year-round presence
- Approximately 50% of samples contain DA
- 3 harvest closures in Saint Joseph Bay since 2013
- At least 14 species occur in GOM
- Species often co-occur and can’t be identified by light microscopy
Seasonality and overlap of Florida’s three primary HABs

Graph showing the concentration of cells per liter of Pseudo-nitzschia spp., Karenia brevis, and Pyrodinium bahamense from 7/1/16 to 4/22/18.
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*

Historical Bloom Events

- ‘13 – ’14
- ‘16 – ’17
- ‘05 – ’08
- 90’s – present

No Bloom | Bloom
Marine Cyanobacteria

- *Synechococcus*
- *Trichodesmium*
Marine Cyanobacteria

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

• Sargassum

photo credit: Brian Cousin, HBOI
Macroalgae

• Sargassum
• Red drift algae
And others...

*Chattonella marina*

*Protoperidinium crassipes*

*Akashiwo sanguinea*

*Kryptoperidinium foliaceum*

*Prymnesium parvum*

*Fibrocapsa japonica*

*Heterosigma akashiwo*

*Takayama tasmanica*