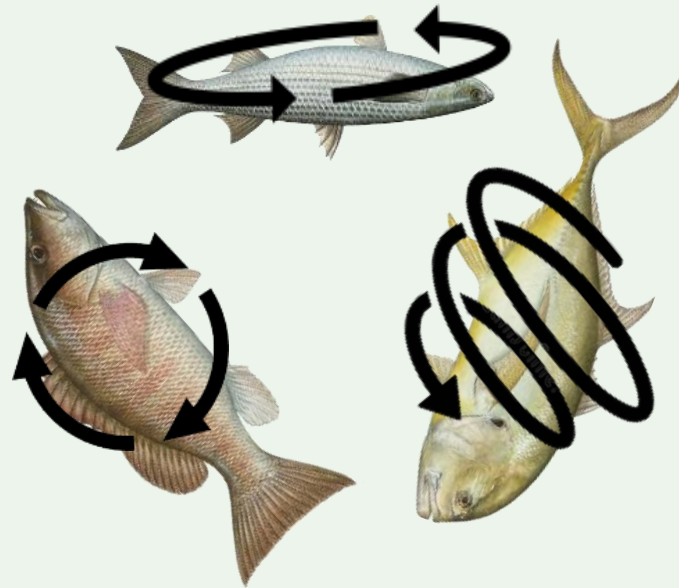


Spinning Fish Phenomenon in South Florida: Epidemiological Trends Revealed by Public Reports, Etiological Insights, and Historical Context



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Florida FWC: Fish & Wildlife Research Institute



“Keys Spinning Fish Event” (2023-2025)

Alternatively - “Keys Unusual Sawfish Mortality Event”, “The Dinoflagellate Debacle of ‘24”, or
“Toxic Spring”



Video credit: G. Furstenwirth



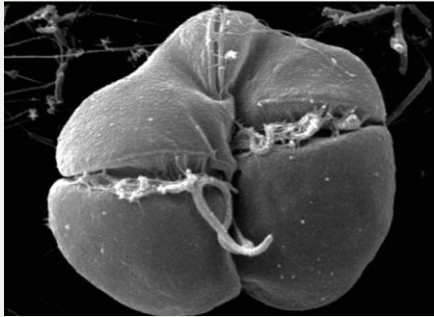
Video credit: Anonymous



Video credit: C. Caples



I'm not here to talk about Red Tide

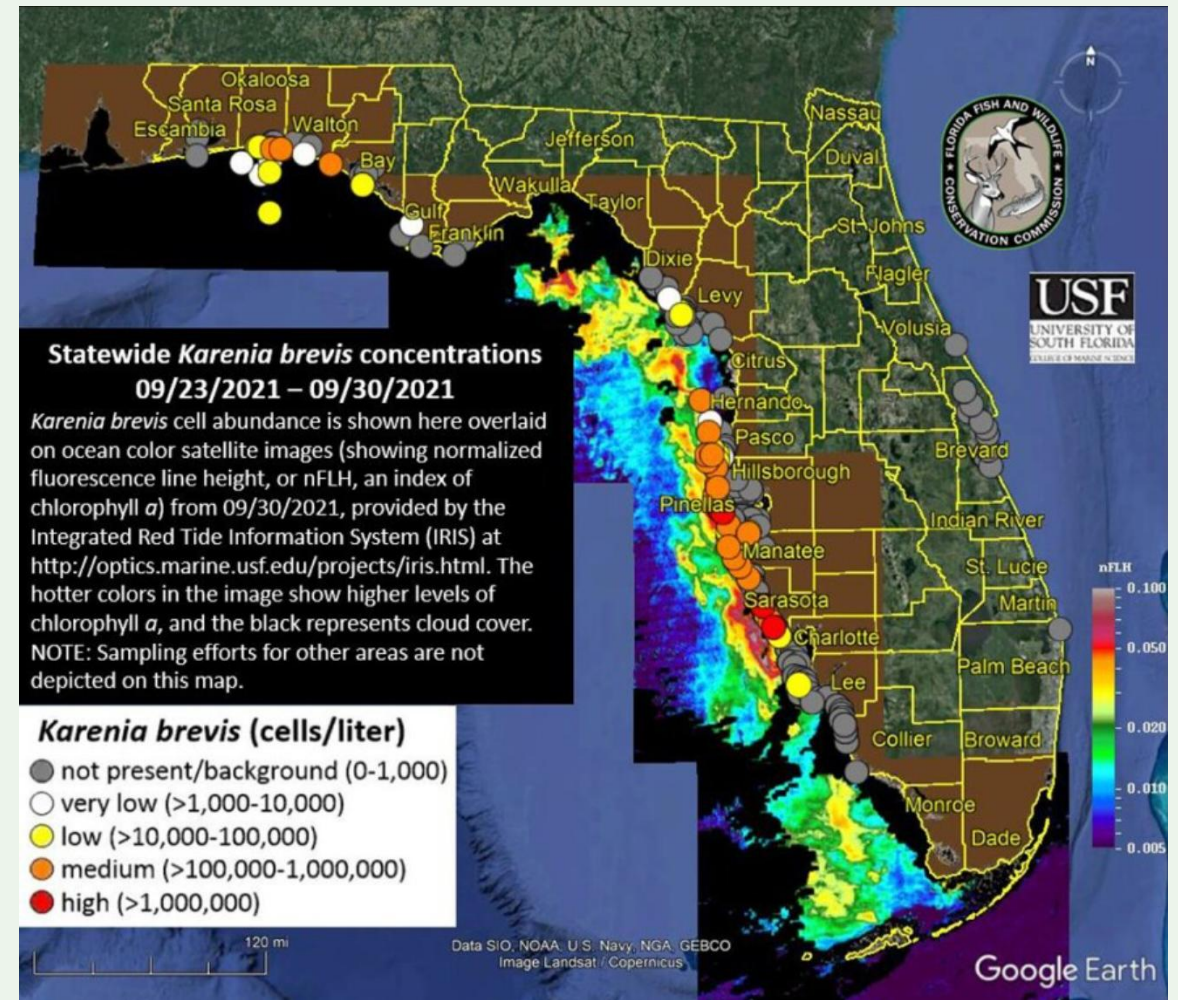


Karenia brevis

Produces neurotoxic brevetoxins



Video credit: D. Lamb



Red Tide Spinning (well known) vs. Mystery Spinning (mysterious)



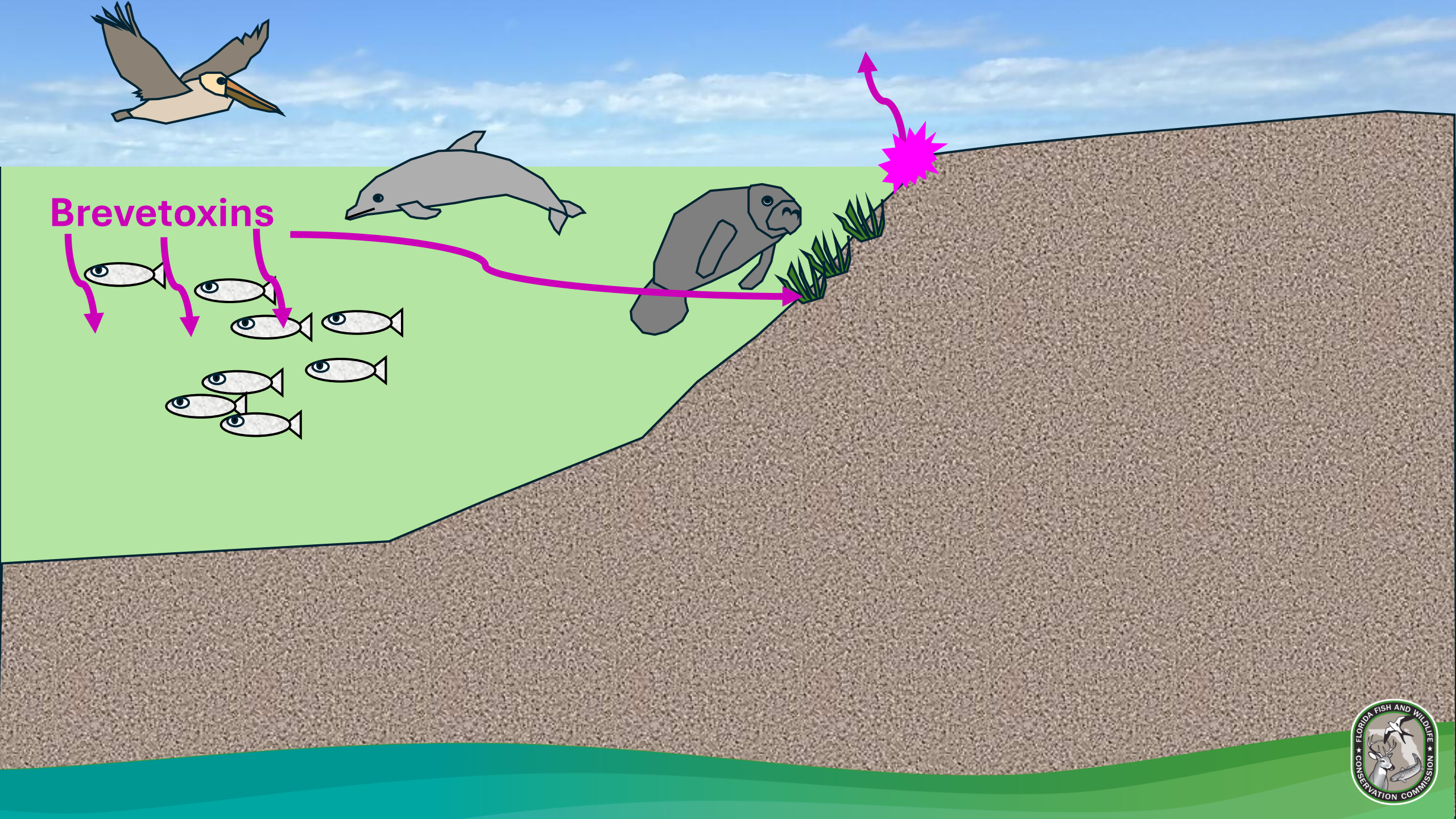
Video credit: Billy Ray

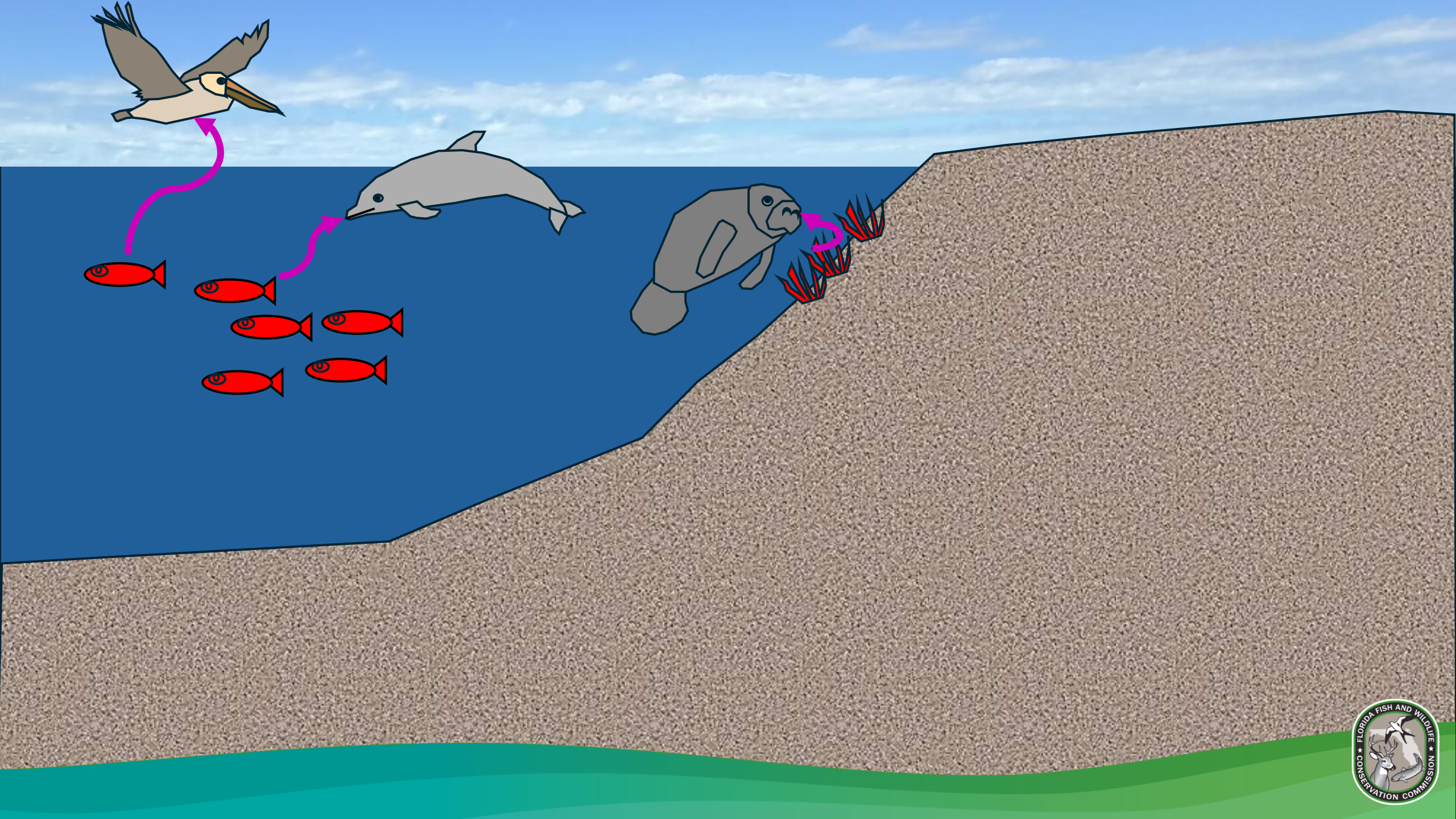


If I was talking about Red Tide...



Brevetoxins



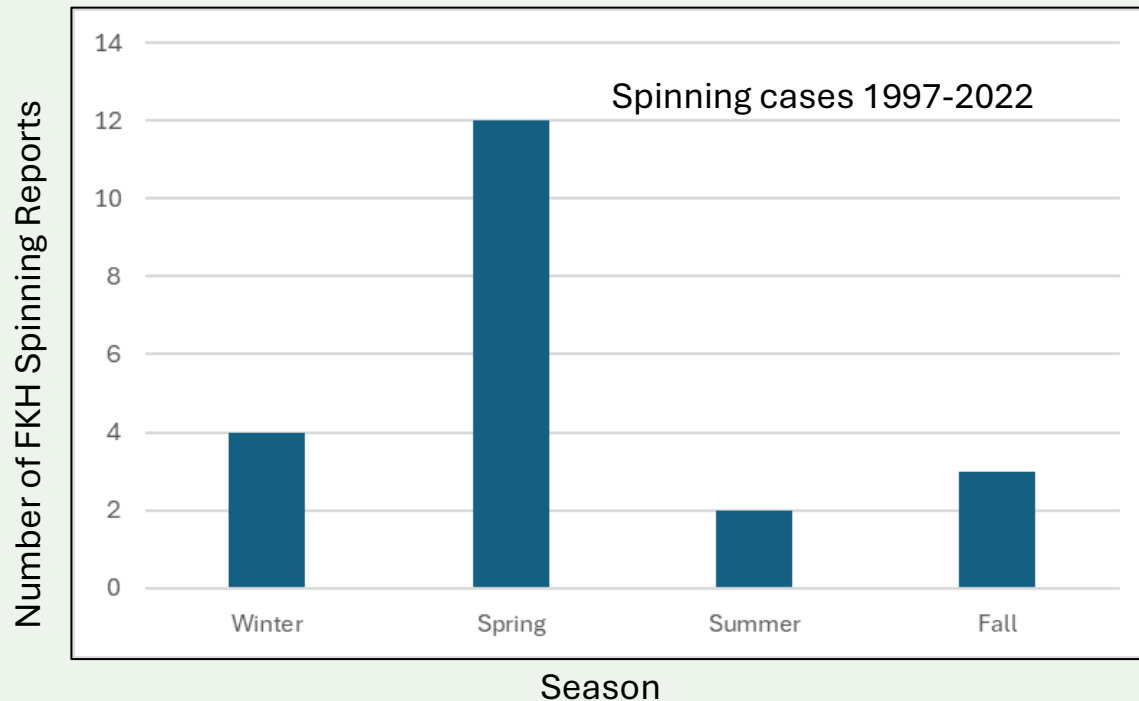


...but, I'm not here to talk about Red Tide

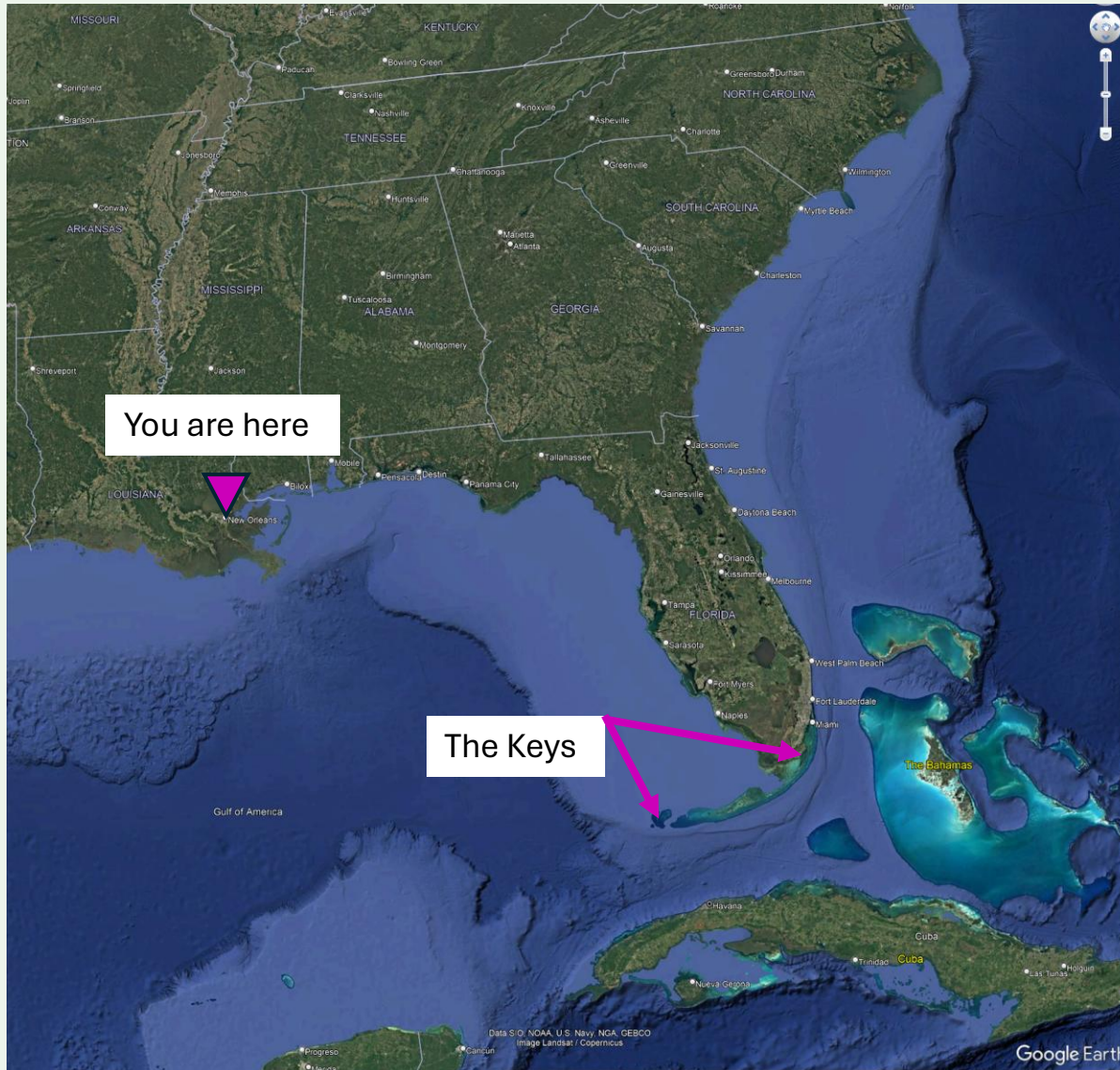


Non-Red Tide Spinning Fish in Florida: Baseline 1997-2022

- Documented 22 case reports of non-Red Tide spinning fish pre-2023
- Most common from Miami through the Keys and Florida Bay
- Occurred sporadically and generally in isolation or limited clusters
- Most common in spring, least common in summer months



The Florida Keys



- Tropical monsoonal climate with a pronounced “cool” dry season (winter), and a hot rainy season (summer).
- “Sport Fishing Capital of the World” (Islamorada)
- Recreational and tourism spending contributing >\$4.2 billion to Florida’s economy annually (as of 2017)
- Threats to natural resources here are of major ecological and economic concern
- String of spinning fish reports were immediately taken seriously, with Red Tide as first suspect



FWC Public Servants Mobilized



- Hotline monitoring and response coordination

- Field sampling of spinning fish and water

- Necropsy/pathology/microbiology/virology/contaminants

- Planktonic HAB monitoring – cell counts/remote sensing

- Toxicology – tissues/environmental (analytical apparatus built primarily for brevetoxin)

MARINE FISH KILL HOTLINE
1-800-636-0511

FWC

Sawfish Hotline

844-472-9347

Sawfish@MyFWC.com



Keys Spinning Fish Working Group

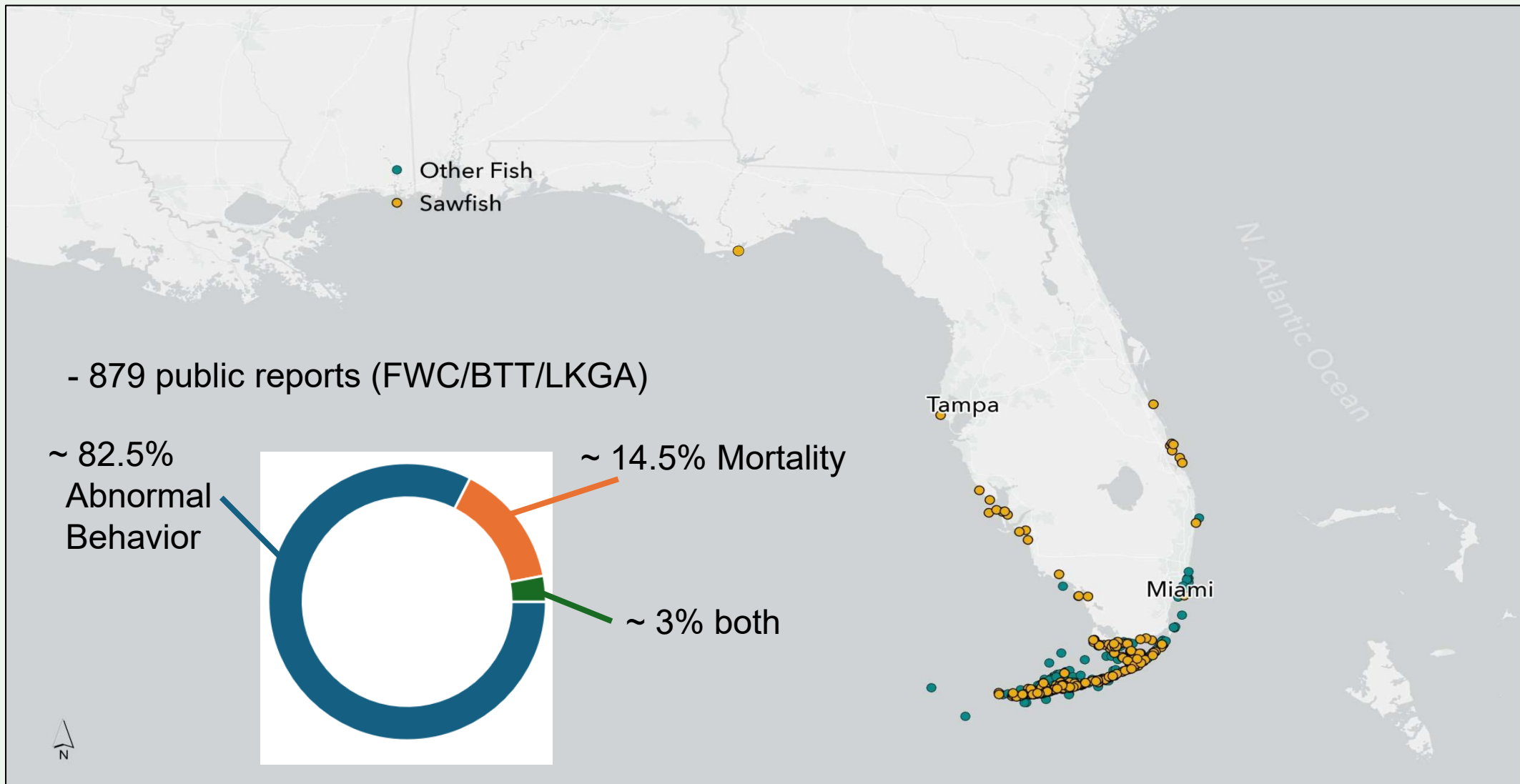
Core / Founding Entities



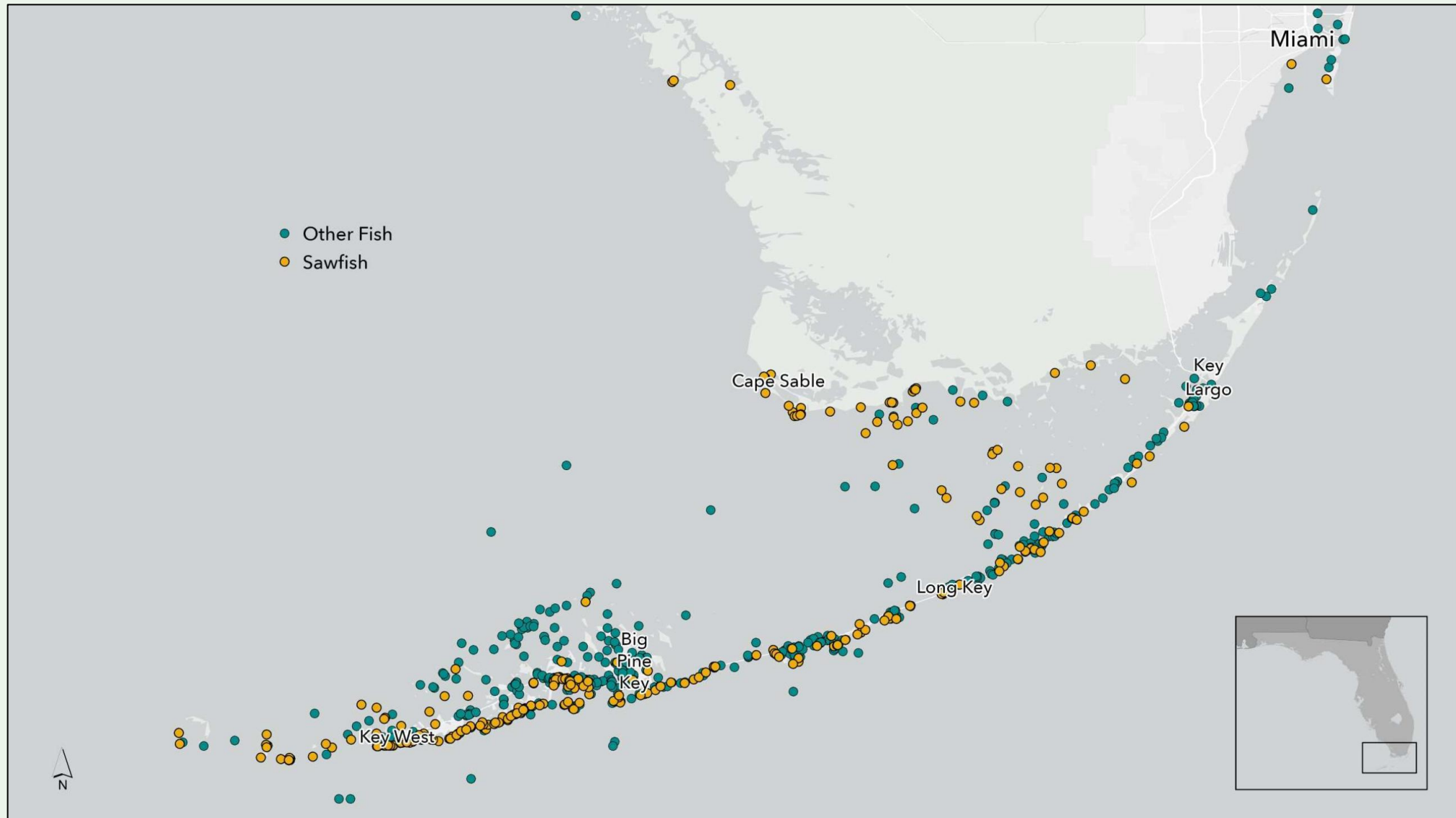
- Formed in January of 2024
- Participants represented various state, federal, academic, and private laboratories
- Florida monitoring for contaminants/sewage/human health
- BTT and LKGA field observations/support and soliciting public reports
- FGCU (Mike Parsons) benthic algal community monitoring
- USA/DISL (Allison Robertson) ecotoxicology – full spectrum algal toxin detection and exposure studies



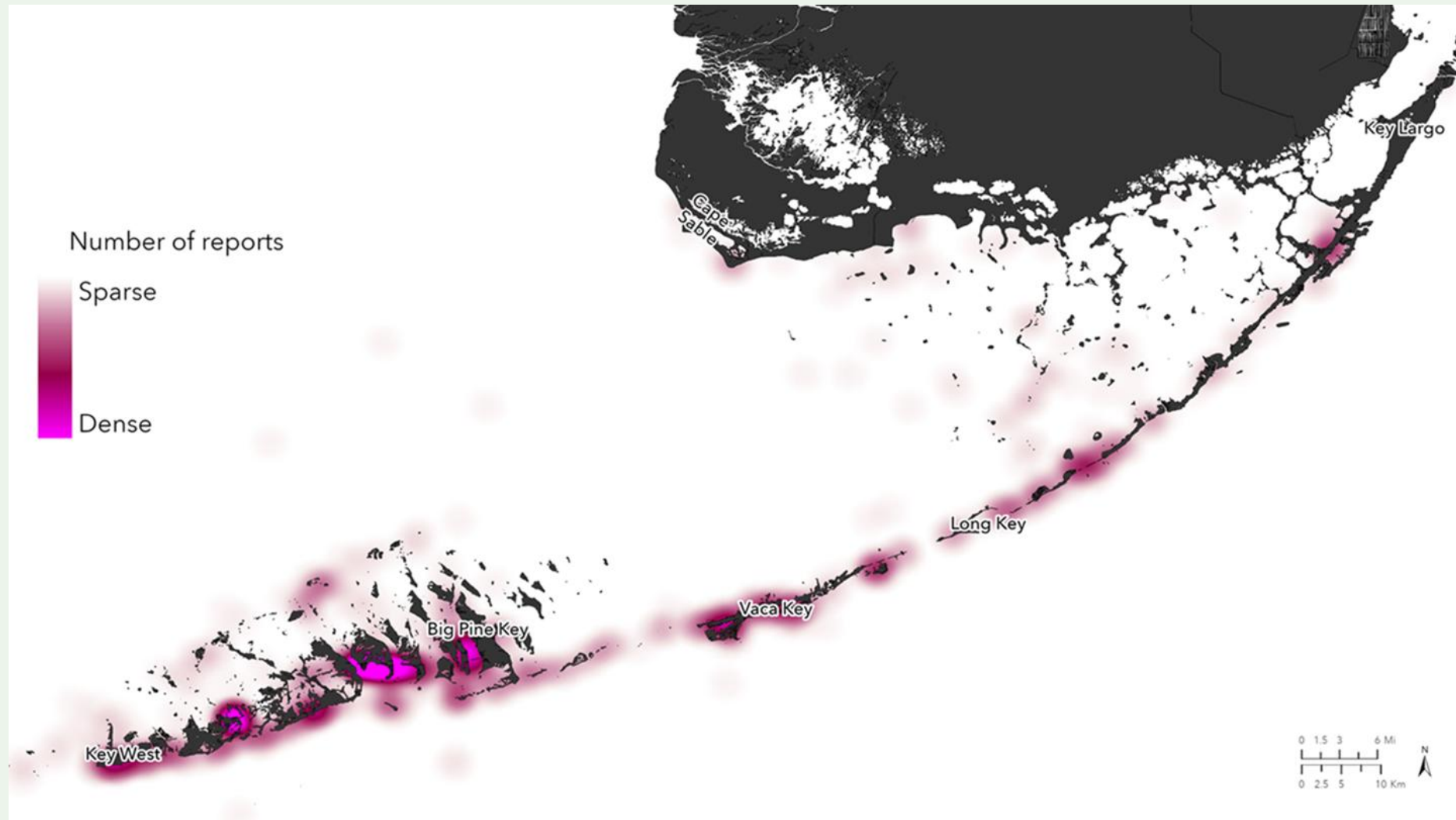
Keys Spinning Event 2023-2025: Public Report Spatial Extent



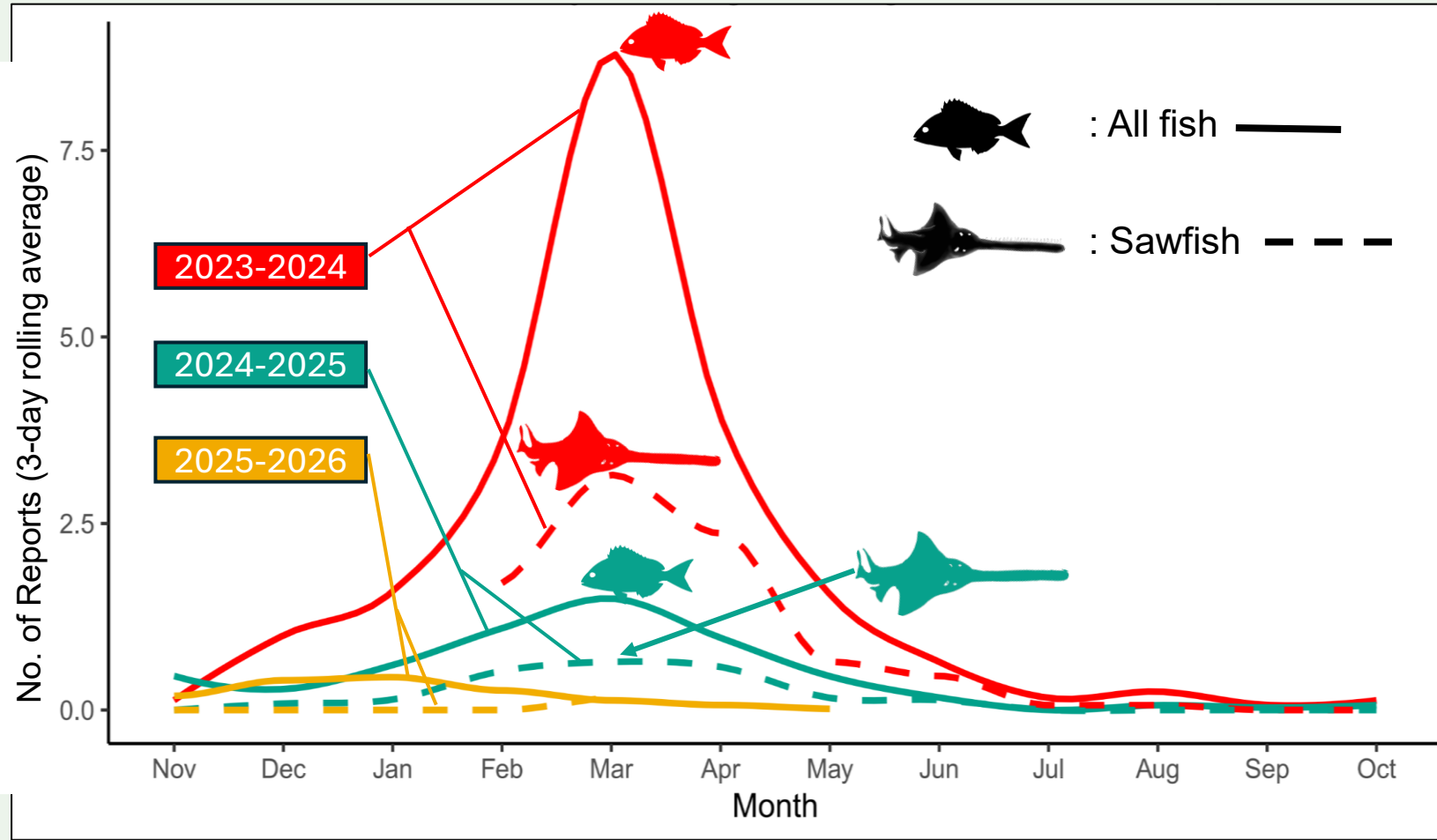
Keys Spinning Event 2023-2025: Spatial Center



Keys Spinning Event 2023-2025: Public Report Heatmap



Keys Spinning Event 2023-2025: Public Report Timeline



Keys Spinning Fish Event: Taxonomic Diversity of Affected Animals

- No marine mammals, and only a handful of invertebrates, birds, and sea turtles (not conclusively related), but at least 70 species of fish were affected, including 59 teleosts and 11 elasmobranchs



Keys Spinning Fish Event: Taxonomic Diversity of Affected Fish

- Fish species represented 47 families, reported unevenly



Core Taxa: Families Represented by ≥ 10 Reports

- Large bodied, benthic rays

- Mesopredators with piscivorous leanings



Keys Spinning Fish Event: Additional Epidemiological Trends

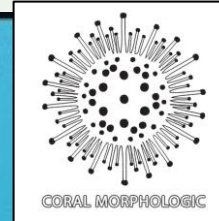
- Spinning associated with shorelines, shallow water basins, and canals, and there were “hotspots”



Video credit:
Anonymous public
submission
(Middle Torch Key)

Keys Spinning Fish Event: Additional Epidemiological Trends

- Generally, spinning and clinically normal fish cooccurred in mixed species assemblages



Video capture from Coral
Morphologic/Coral City
Camera (Port Miami)



Keys Spinning Fish Event: Spinning Influenced by External Stimuli

- Hook & line-caught affected fish would begin spinning in a live well after capture
- Captive fish might appear to recover after acclimation, but resume spinning >24 h after capture if stressed
- At night, bright artificial light could induce or exacerbate spinning



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Keys Spinning Fish Event: Working Group Findings



Mike Parsons

- There were major anomalies in the phytobenthos involving species capable of producing neurotoxins (FGCU)



Al Robertson

- Numerous algal neurotoxins were present in environmental and tissue samples (USA-DISL)
- Some mixture of those toxins, in some concentrations, caused abnormal swimming behavior when laboratory fish were directly exposed to them (USA-DISL)

- Clinical signs, epidemiological trends, and pathology suggest acute or chronic neurotoxin exposure
- No strong, consistent evidence to support other hypotheses (including red tide, pathogens, & contaminants)

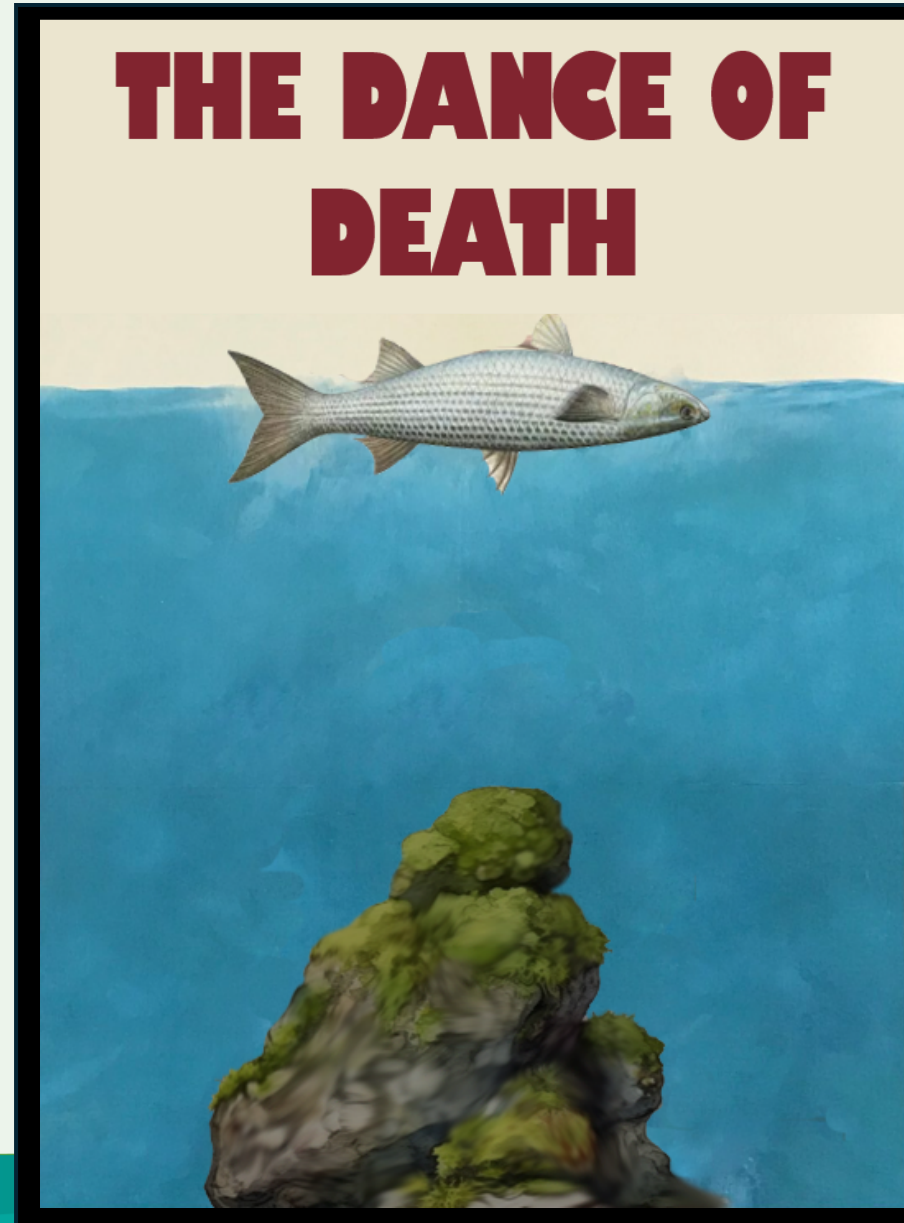


Spinning Fish Phenomenon in South Florida: Today

- Emerging picture, is one of a cool/dry season phenomenon that normally occurs in a hypoendemic pattern with periodic epizootic-like events
- Best supported hypothesis is that spinning occurs after exposure to one or more neurotoxins (TBD) generated by the phytobenthos after some environmental/ecological trigger (TBD)
- Very likely, direct environmental exposure to localized toxins in water over shallow “toxic” benthos is necessary to eliciting spinning
- However, localized toxic plumes seem unlikely to fully explain epidemiological trends (a trophic exposure component could)
 1. Not all species affected (e.g., Blennies)
 2. Simultaneous occurrence of spinning and normally behaving fish
 3. Presence of affected adult sawfish in very shallow areas where they do not normally occur



Something like this has happened before... (in Biscayne Bay 1973)



...but that's a story for another day.



Thank You Symposium Sponsors!



save our seas
foundation



All activities performed under
authorization and guidance of
NOAA Fisheries Emergency
Section 7 Consultation
#SERO-2024-00402

and

ESA Section 10 permits
to Gregg Poulakis,
Tonya Wiley, John Carlson, and
Colin Simpendorfer

