An Introduction to Biscayne Bay Benthic and Planktonic Diatoms

Thomas Frankovich and Schonna Manning
Florida International University

Greater Everglades Ecosystem Restoration Conference
Coral Springs, Florida April 21-24 2025

FIU Institute of Environment

PhycoNet

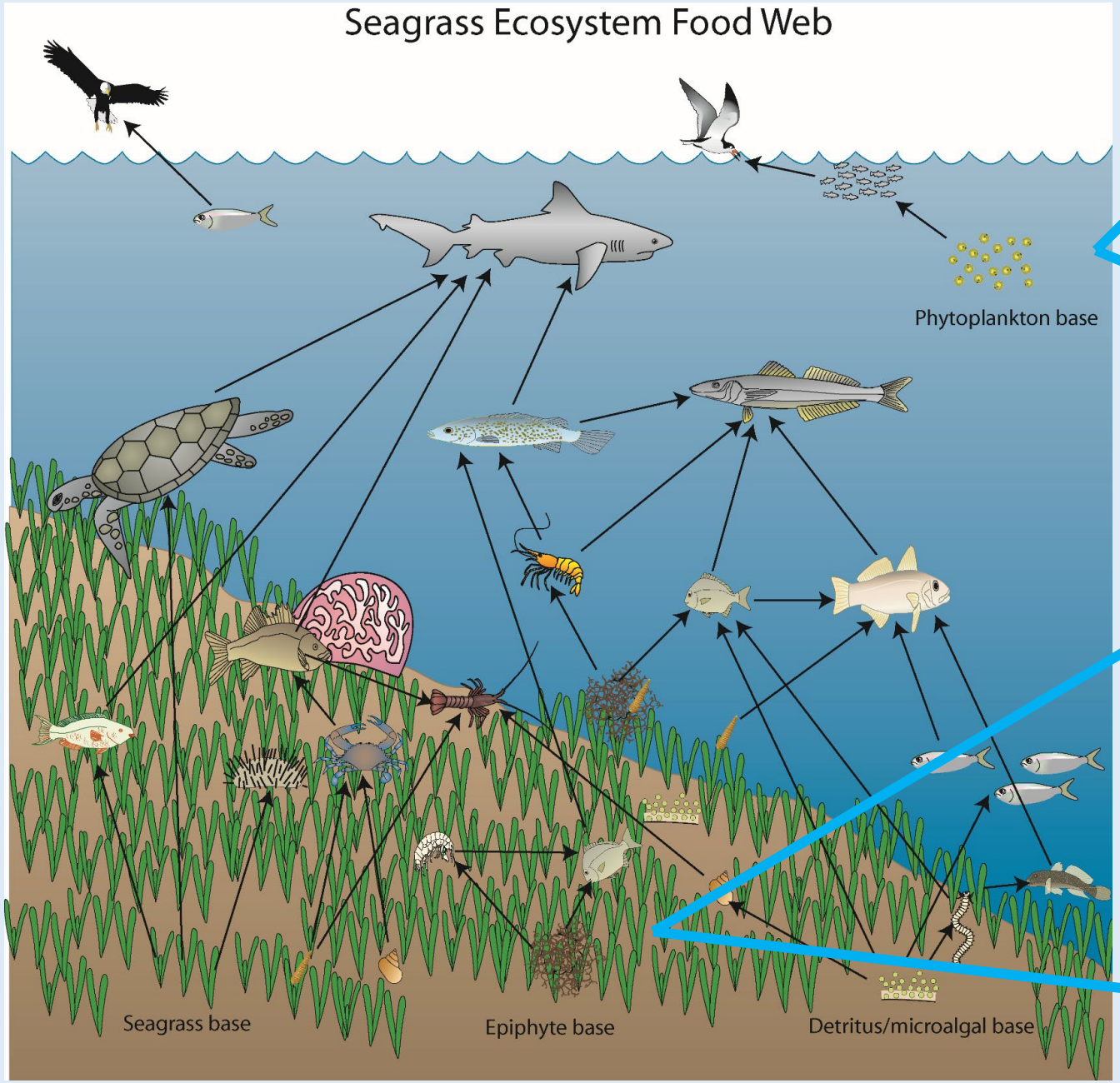
Courtesy WPLG

Dr. Joan Browder

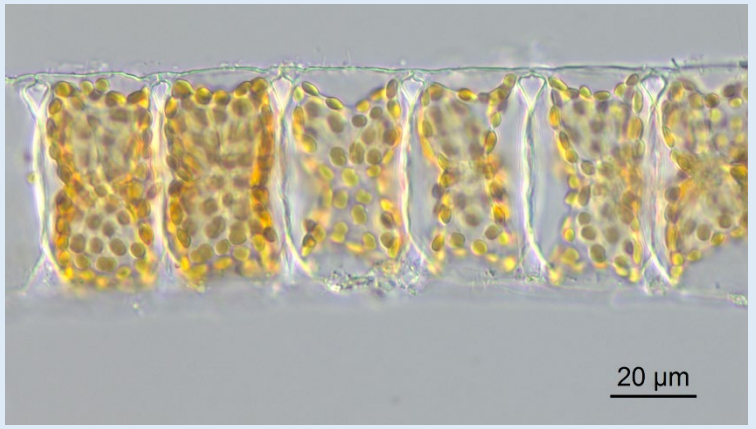
Systems ecologist

Biscayne Bay champion

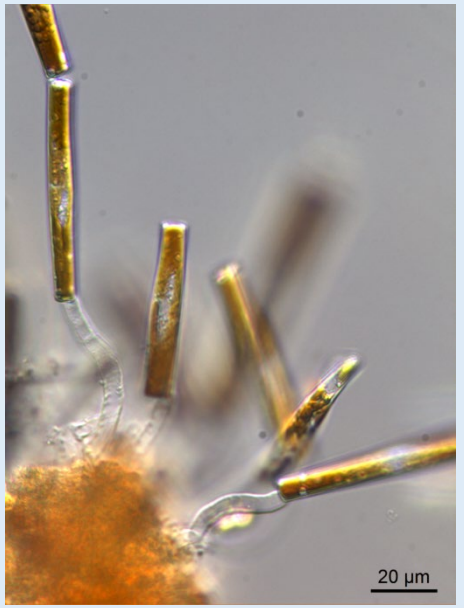
Personal connection to many



Tropical Connections 2012



Bellerochea malleus



Neosynedra provincialis

What are Diatoms?

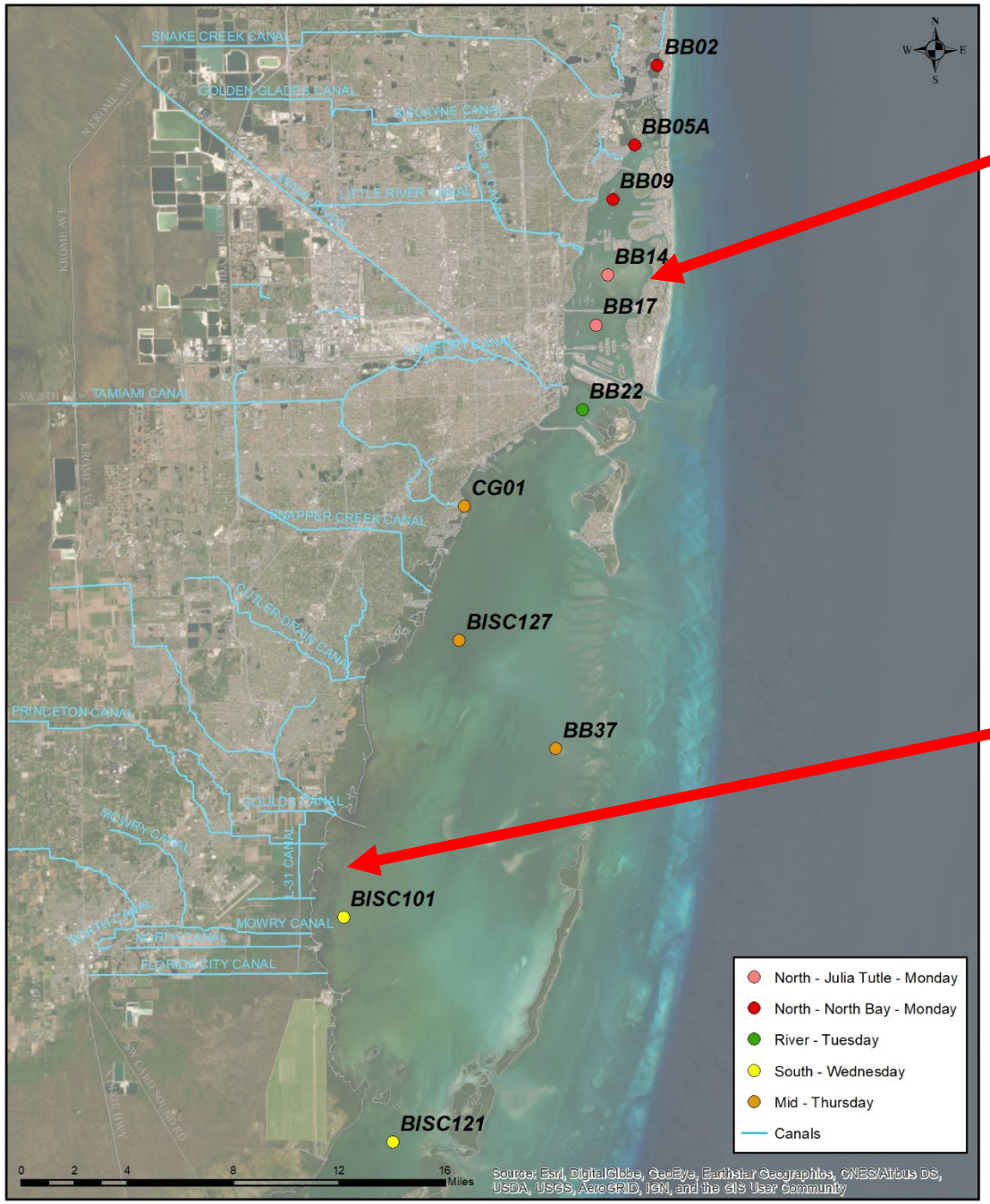
- Microalgae
  - Unicellular, but can be colonial
  - Cell wall made of silica
  - Amazingly diverse
- Variety of habitats
  - Aquatic environment
    - water column
    - benthic – epiphytic, epipelic, epipsammic, edaphic, epilithic, epizooic, on and within ice
  - Terrestrial environment - soil, aerophilic

Why Diatoms?

- Base of aquatic food webs
- Source of 20% of atmospheric oxygen
- Excellent bio-indicators
- Major players in carbon and silica cycles
- Some produce harmful algal blooms

Snail grazing on epiphytic diatoms

FIU Phytoplankton Sampling Map



North Biscayne Bay

Restricted circulation

Urban watershed

Frequent planktonic diatom blooms

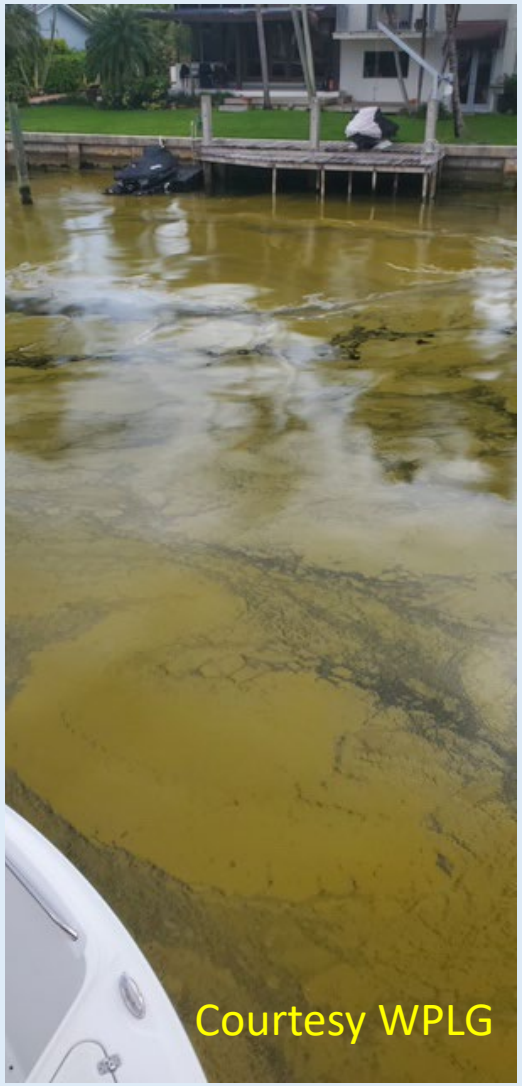
South Biscayne Bay

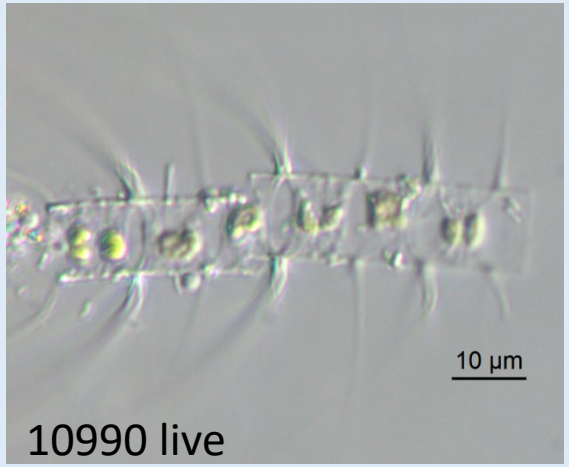
Greater connection to ocean

Suburban and agricultural watershed

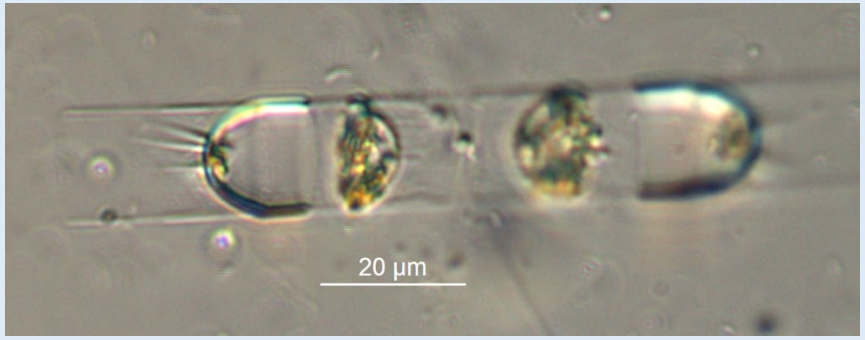
Seagrass meadows and epiphytic diatoms

North Biscayne Bay Microalgae Blooms





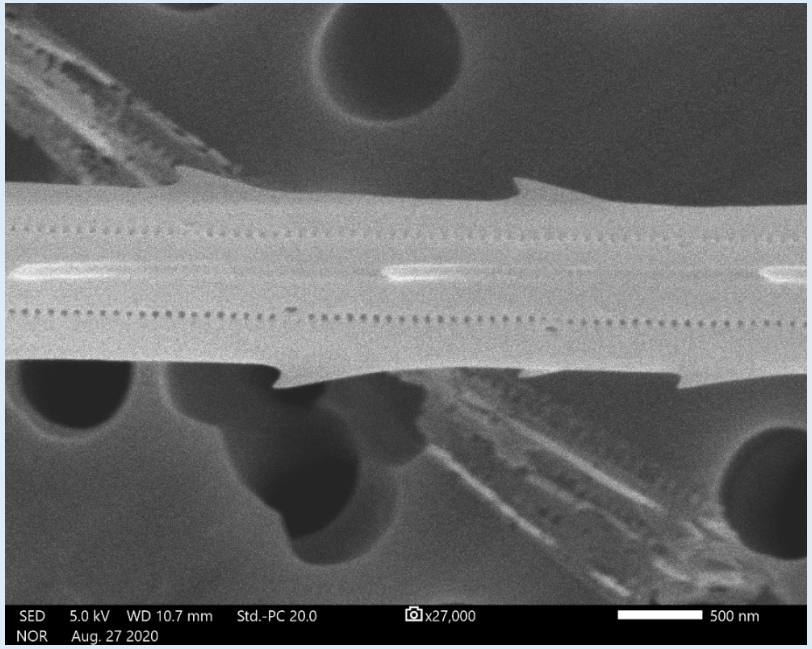
August 21 2020, Julia Tuttle Basin



Chaetoceros lauderi

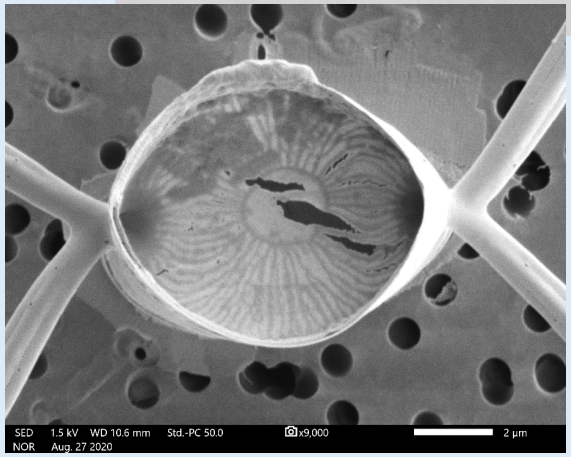
Resting spores

North Biscayne Bay Microalgae Blooms



Characteristic setae morphology

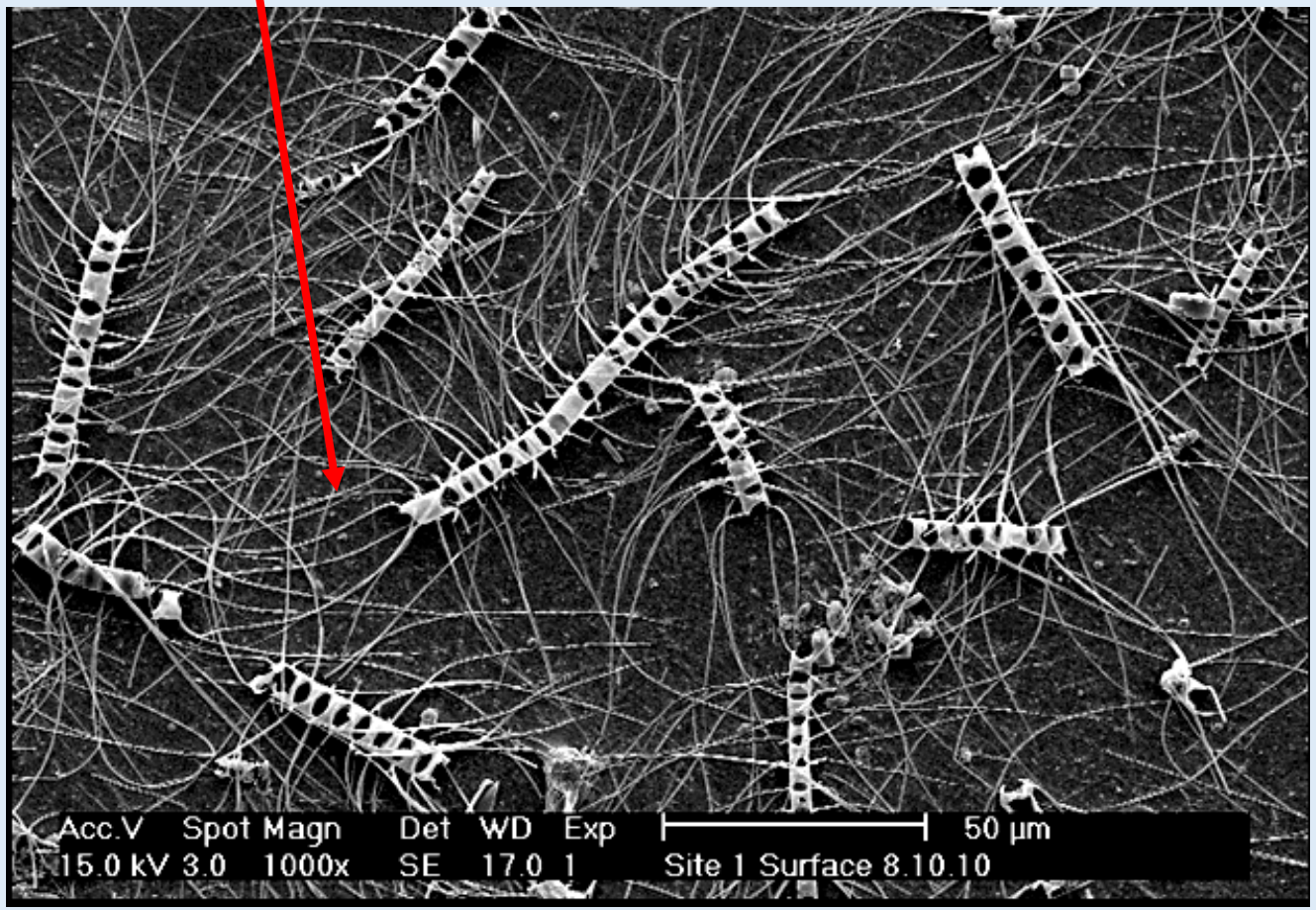
Convergent terminal setae



Chaetoceros dayaensis Y.Li & S.Zhu 2015

North Biscayne Bay Microalgae Blooms

Note convergent terminal setae



Chaetoceros dayensis

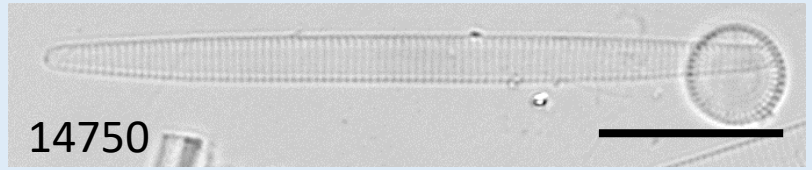
From Stamates *et al.* 2013

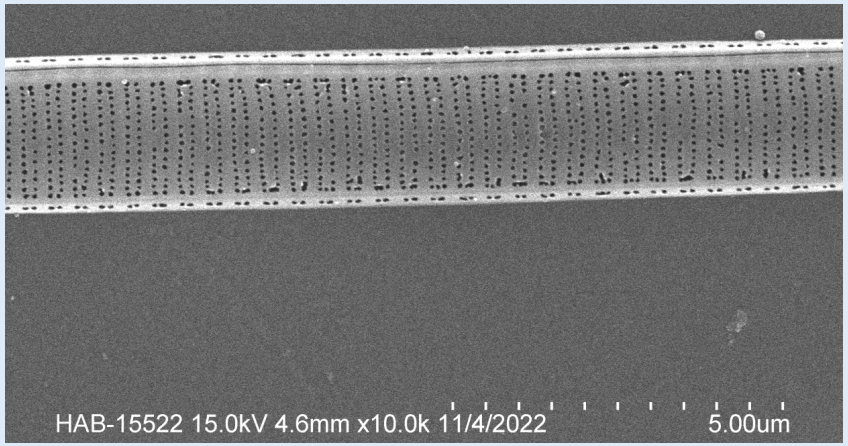
Julia Tuttle/Little River Basin

Bloom conditions

August 10 2010

North Biscayne Bay Microalgae Blooms



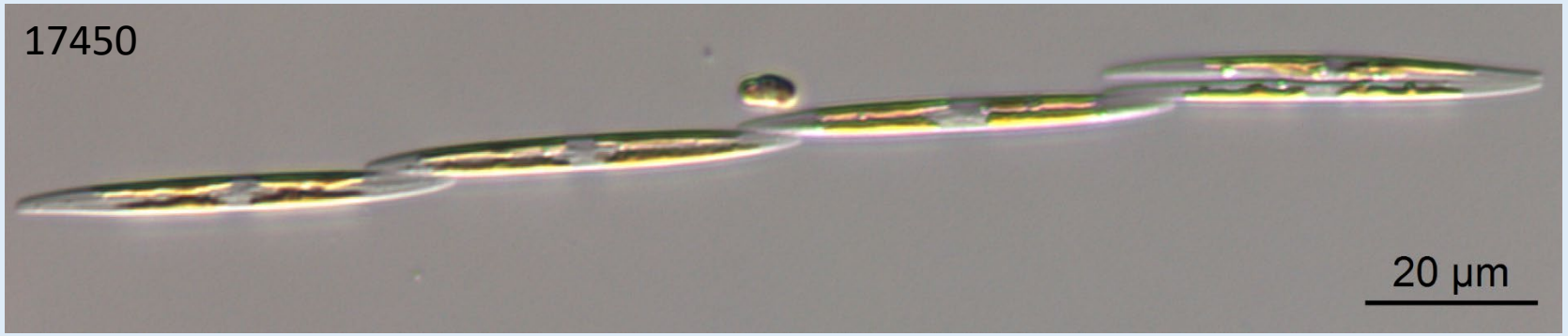


Celia Villac, FWRI

Pseudo-nitzschia brasiliana

October 2022 – Julia Tuttle Basin

10M cells/liter



Pseudo-nitzschia fraudulenta

Coral Gables Canal mouth – March 2024

Toxin producers

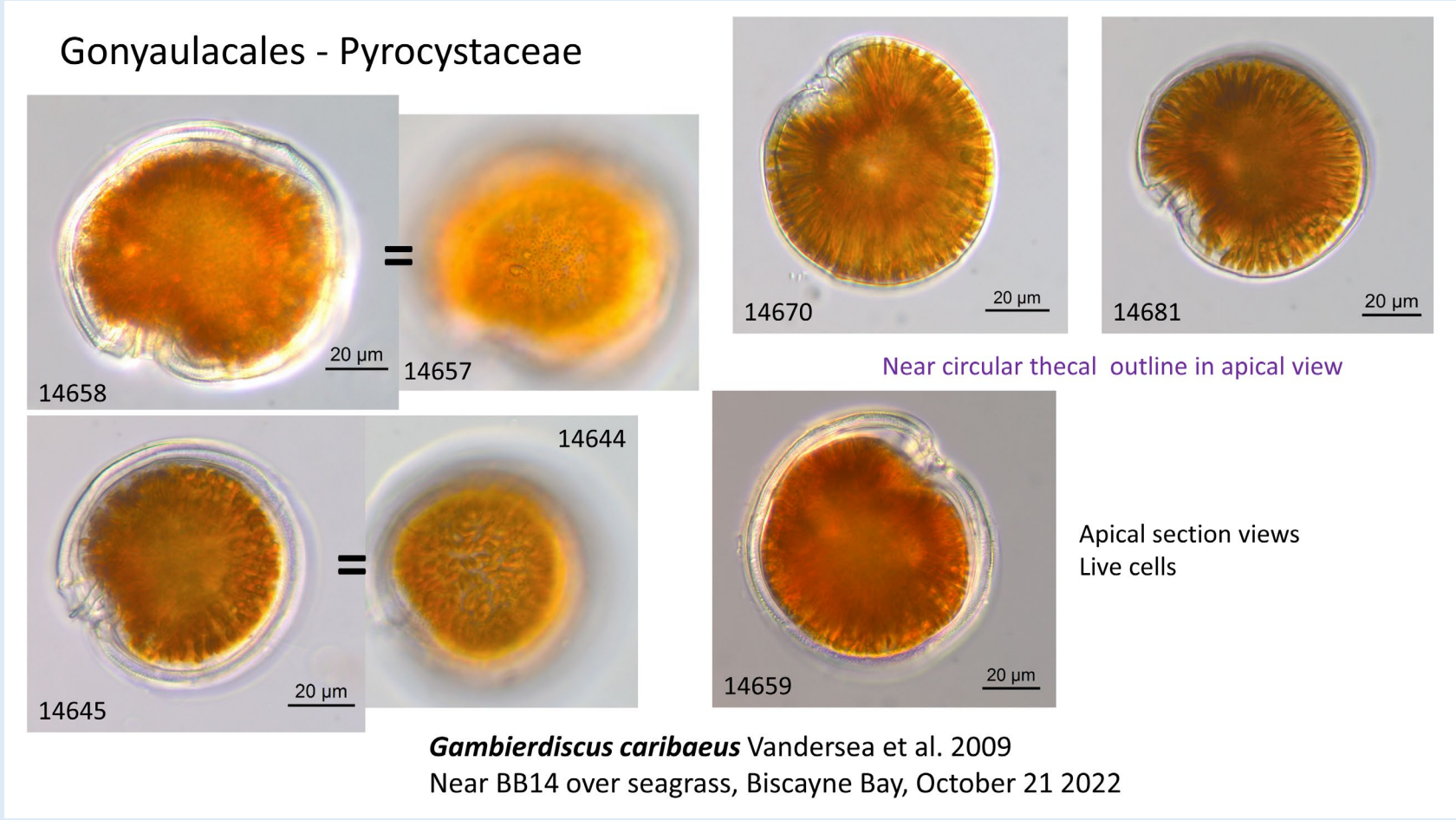
Domoic acid

Amnesic Shellfish Poisoning

North Biscayne Bay Microalgae Blooms

October 2002
Julia Tuttle Basin

Winter 2023 – 2024
Spinning Fish Syndrome
Port of Miami



Toxin producer – Ciguatoxin
Suspected contributor to Spinning Fish Syndrome

South Biscayne Bay Epiphytic Diatoms

2016 Epiphytic Diatom Examination

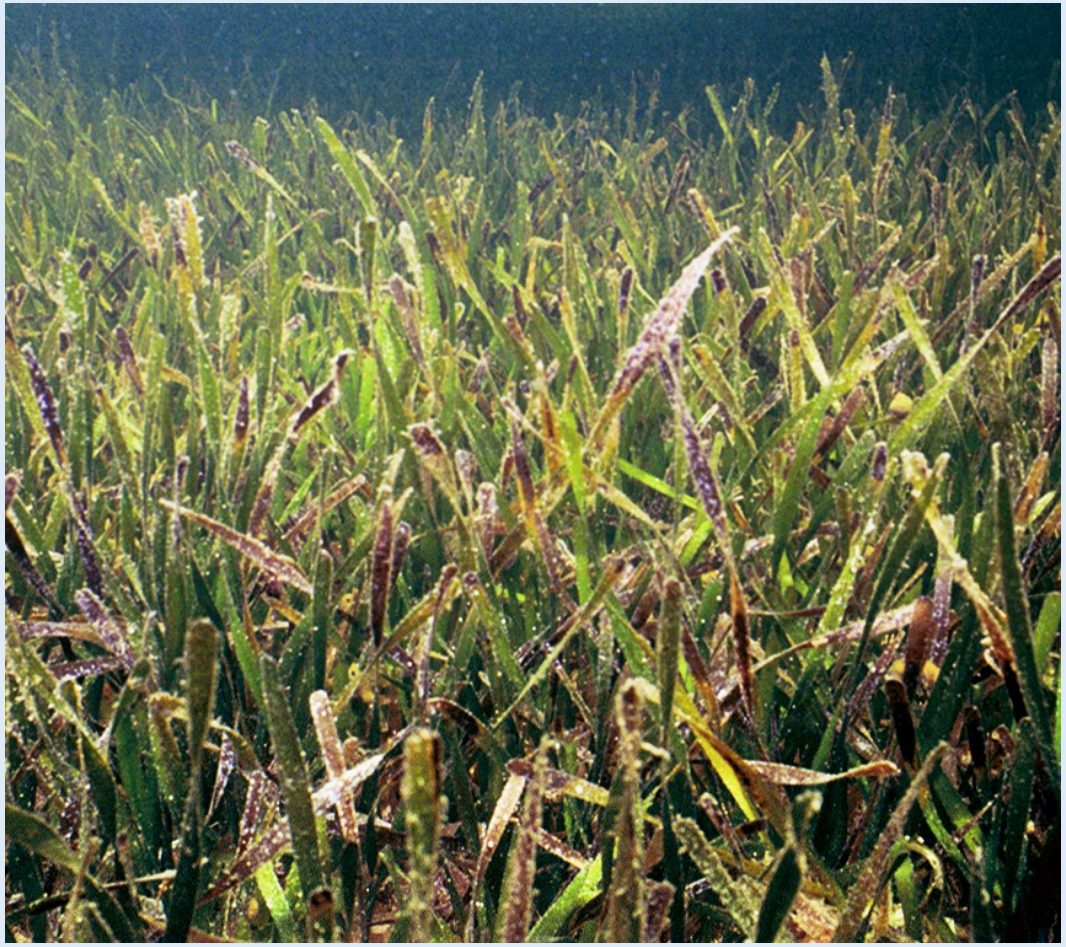
Epiphyte material from *Thalassia* leaves

47 nearshore sites in southern Biscayne Bay

Light and SEM microscopy

Determined taxon relative abundances

Additional taxonomic investigation of select taxa



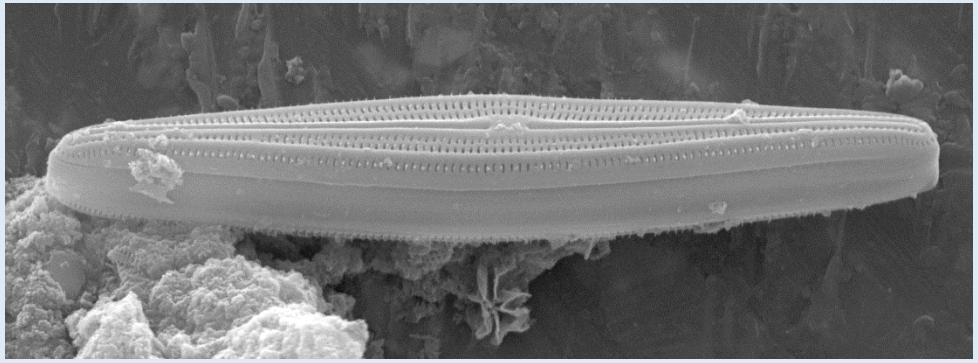
Turtle grass – *Thalassia testudinum*

South Biscayne Bay Epiphytic Diatoms

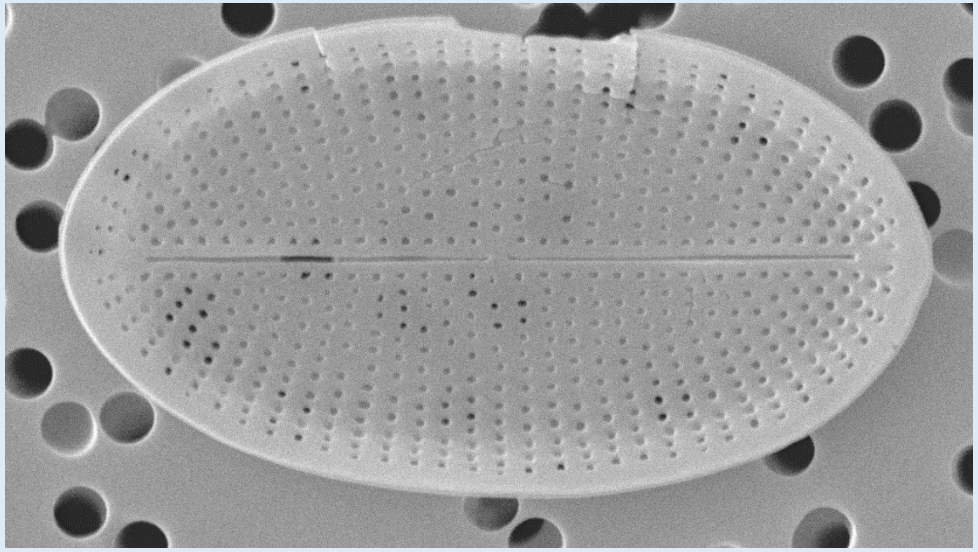
219 diatom species

Only 2 species had a mean relative abundance >10%

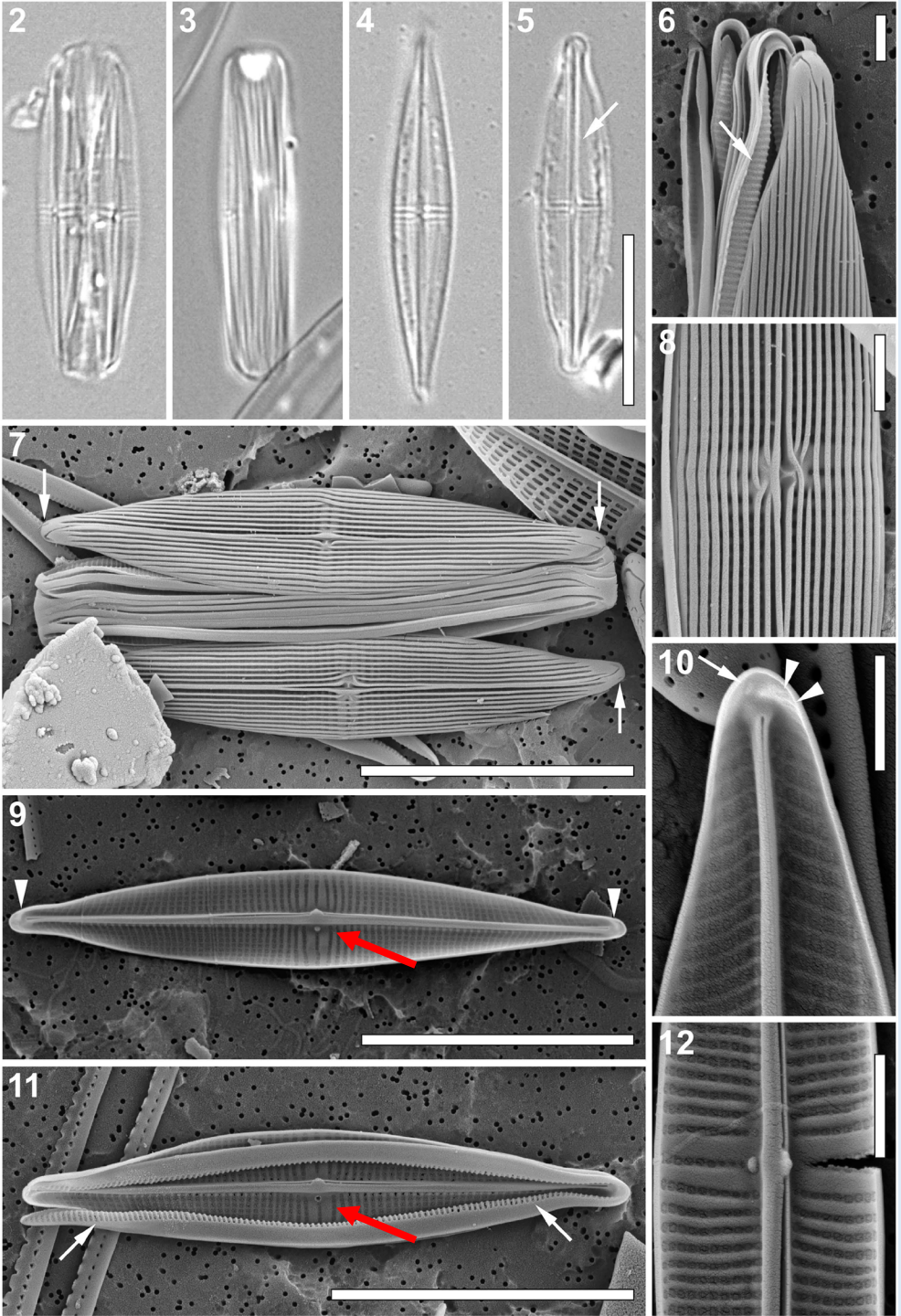
Flora most similar to Northeast Florida Bay



Brachysira aponina



Cocconeis sp.



Proschkinia browderiana

Frankovich, Ashworth and M.J.Sullivan 2019

The epithet honors Dr. Joan Browder in recognition of her decades of research on the ecology of Biscayne Bay.

Seagrass epiphyte, Fender Point

Also occurring in Florida Bay, Baja California

Hypersalinity tolerant

Majewska et al. 2019

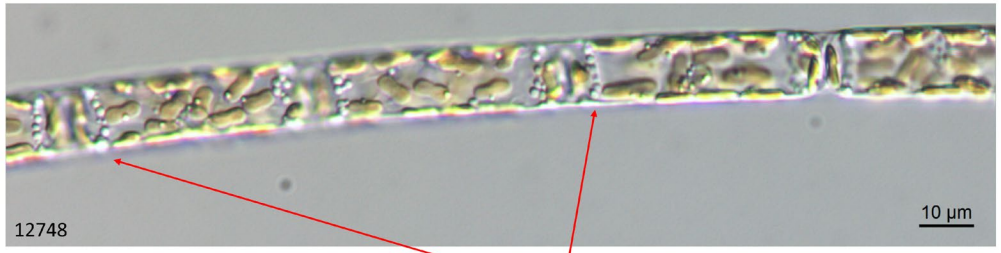
Present and Future Directions

Biscayne Bay Phytoplankton Monitoring pilot study

Biscayne Bay microalgae voucher flora library under construction, and diatoms.org!

Yilan Lin, FIU Ph.D student – Biscayne Bay benthic diatom ecology

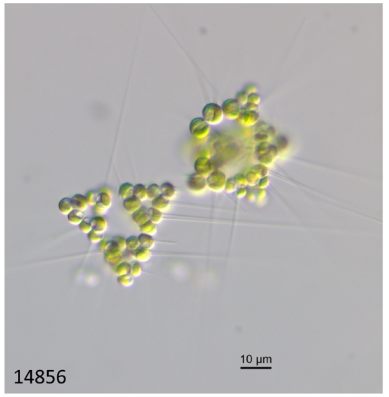
Mediophyceae - Hemiaulales

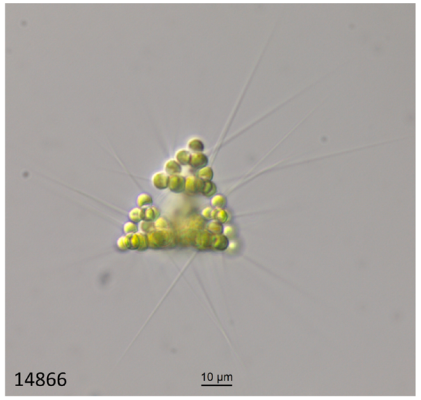


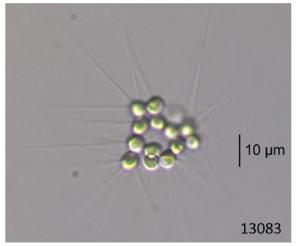
Rows of oil droplets at cell ends species characteristic
Compare with *C. bicornis*

Cerataulina pelagica (Cleve 1889) Hendey 1937
BB09, Biscayne Bay
September 8 2021

Trebouxiophyceae - Chlorellales







Miami Canal
December 13 2021

Micractinium bornhemiense (W.Conrad 1914) Korshikov 1953
Coral Gables Canal
December 3 2022