2022 Virginia HABs: Estuarine monitoring summary

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VA HAB Taskforce Meeting
24 February 2023

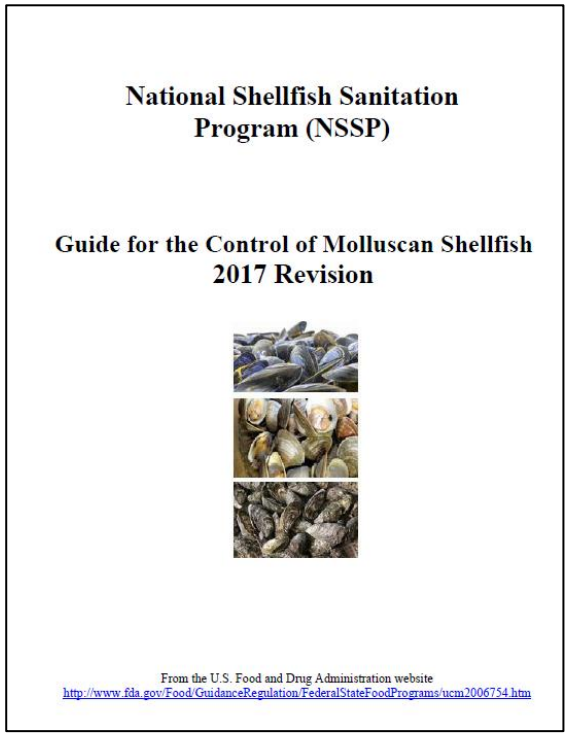
Overview

- Shellfish monitoring
- Bloom response - ODU
- Notable 2022 blooms
- Monitoring results summary
- Related projects
- 2023

VDH Shellfish monitoring

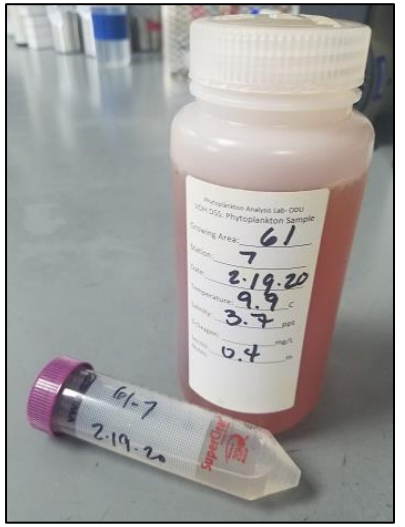
- Monthly collections- routine fixed sites
  - Lugol's solution (500mL) – phytoplankton analyses (ODU)
  - Unpreserved frozen sample (50mL)- ELISA screening (VDH)
  - 467 samples in 2022

- Bloom samples
  - Response to bloom reports or visual observation by field staff
  - VDH, CBP, HRSD, Time series site
  - 4 bloom (7 more likely blooms)

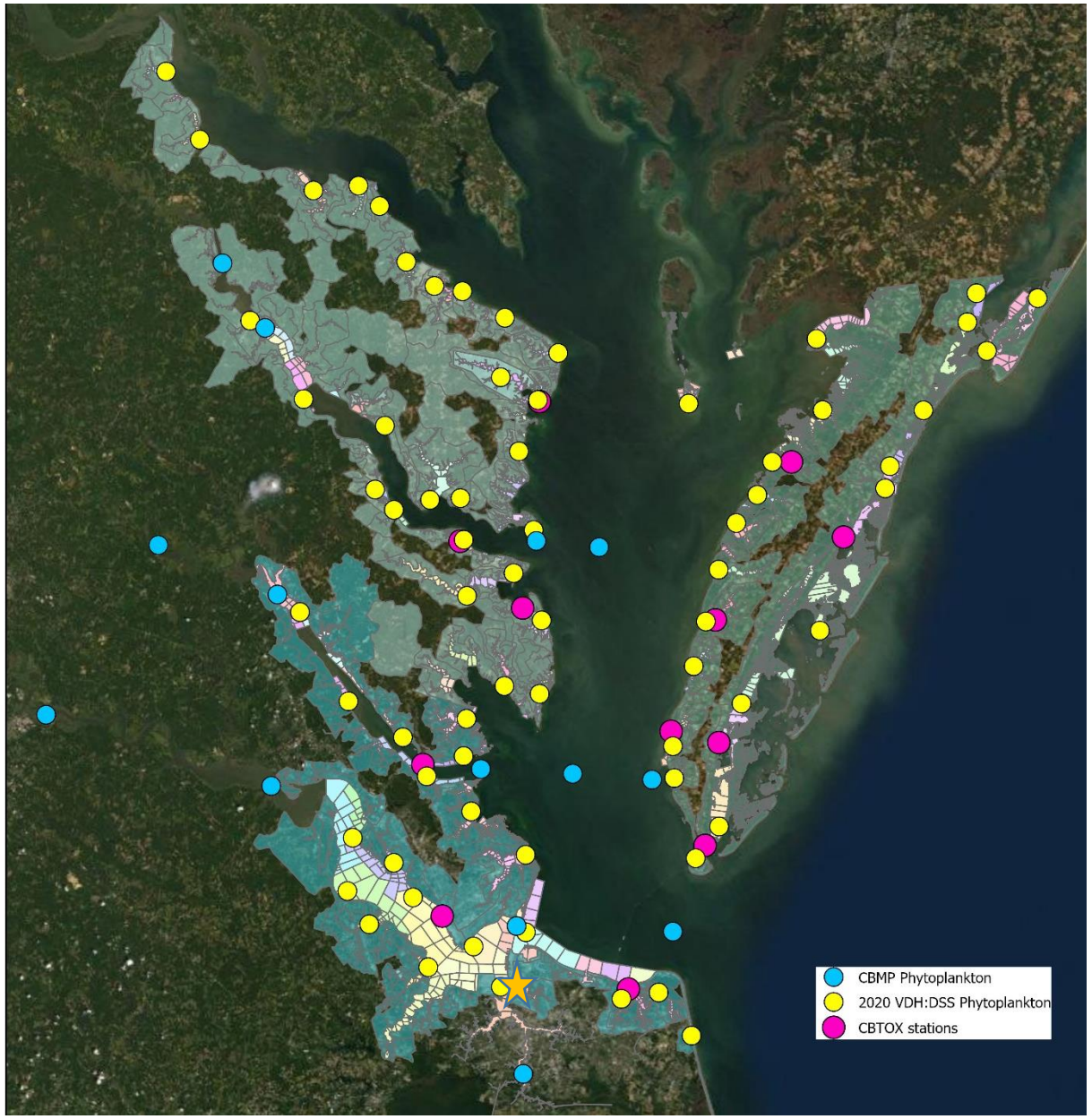

National Shellfish Sanitation Program (NSSP)

Guide for the Control of Molluscan Shellfish 2017 Revision

From the U.S. Food and Drug Administration website
http://www.fda.gov/Food/GuidanceRegulation/FederalStateFoodPrograms/ucm2006754.htm



Phyto Kit: Extra bottles, vials, lugol's, rubber gloves, marker



Virginia Estuarine Phytoplankton monitoring

Chesapeake Bay Monitoring Program (DEQ/ODU)

- 14 stations
  - 7-Chesapeake Bay monthly year-round
  - 7-Tidal tributaries monthly January - December
- Full species composition (168 samples)
- Missing data Sept-Dec (weather/ship/ongoing health issues)
- Ad hoc bloom sampling

VDH: Shellfish (DSS&WHC/ODU)

- 69 stations
- Monthly year-round
- Targeted HAB identification
- Targeted toxin screening (based on cell counts)

CBTOX (VDH:DSS/VIMS) – 6 samples to ODU

Additional monitoring:

Timeseries sites
Dataflow HRSD
HAB response

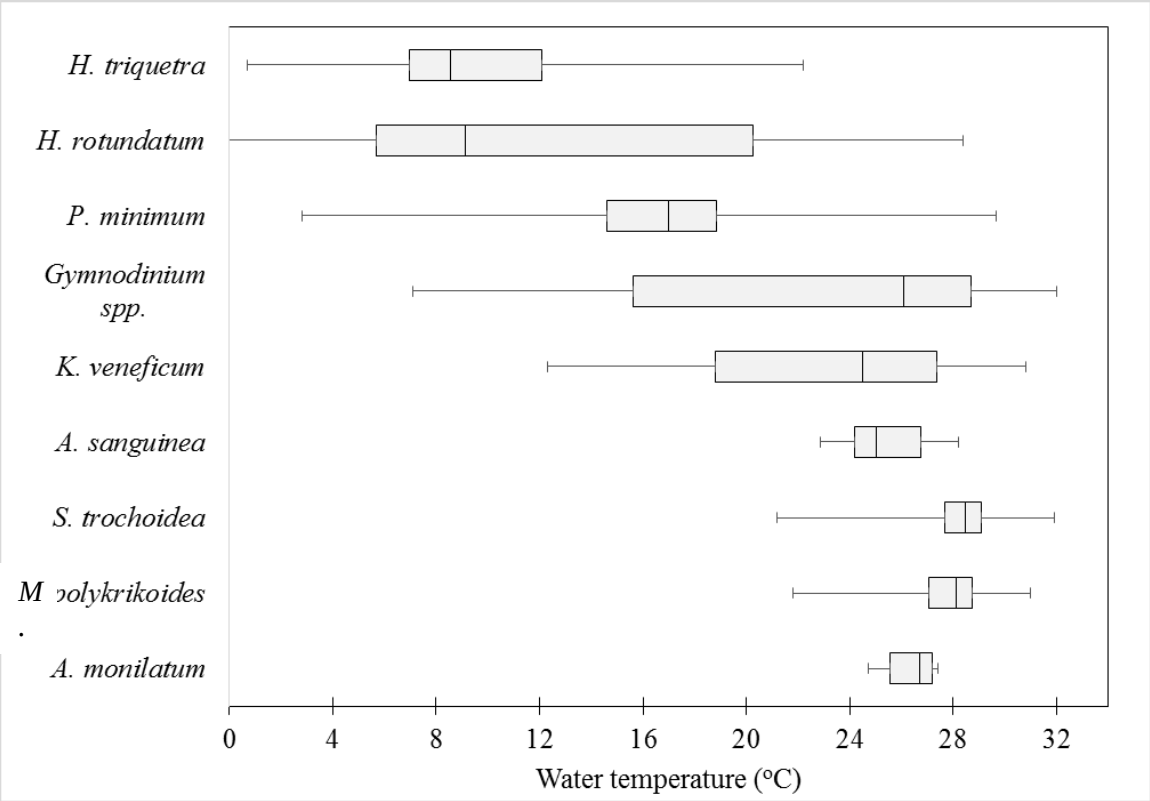
2022 sampling

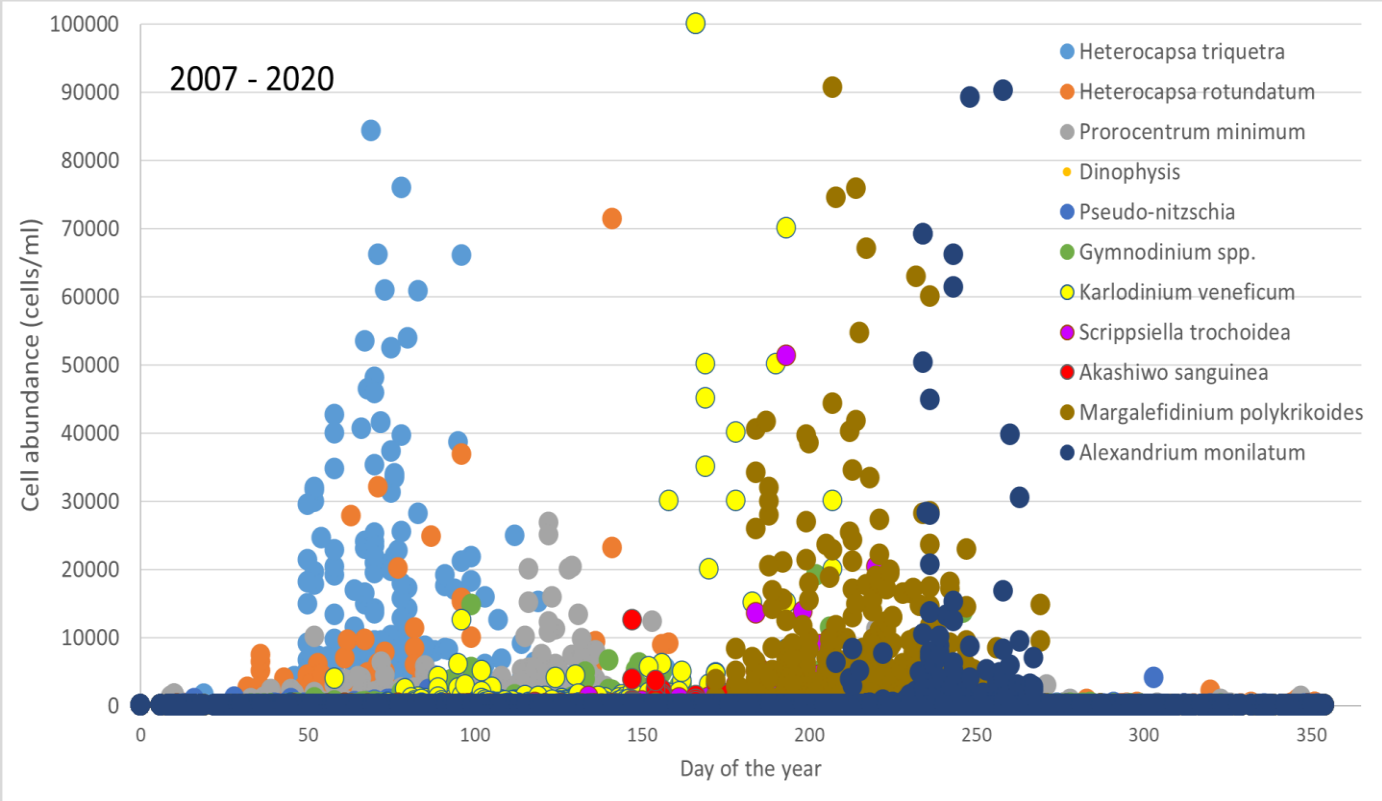
- HRSD dataflow from James River now every two weeks. Had some samples but not very many
- Received DEQ CBP samples this year year-round. *Heterocapsa* blooms were observed in 2020, requested to receive phytoplankton samples from DEQ CBP monitoring year-round
- Continued thrice-weekly sampling in the Lafayette River at our time series site during summer. Have samples we need to count
- Started a FlowCam library; can now download images and upload into EcoTaxa

2022 results

- There were blooms
- They were not well-detected using our current sampling methods.
- We observed blooms at our time series site
- Anecdotal information suggest they were in other places too
- How do we better surveille?

“Normal” bloom progression





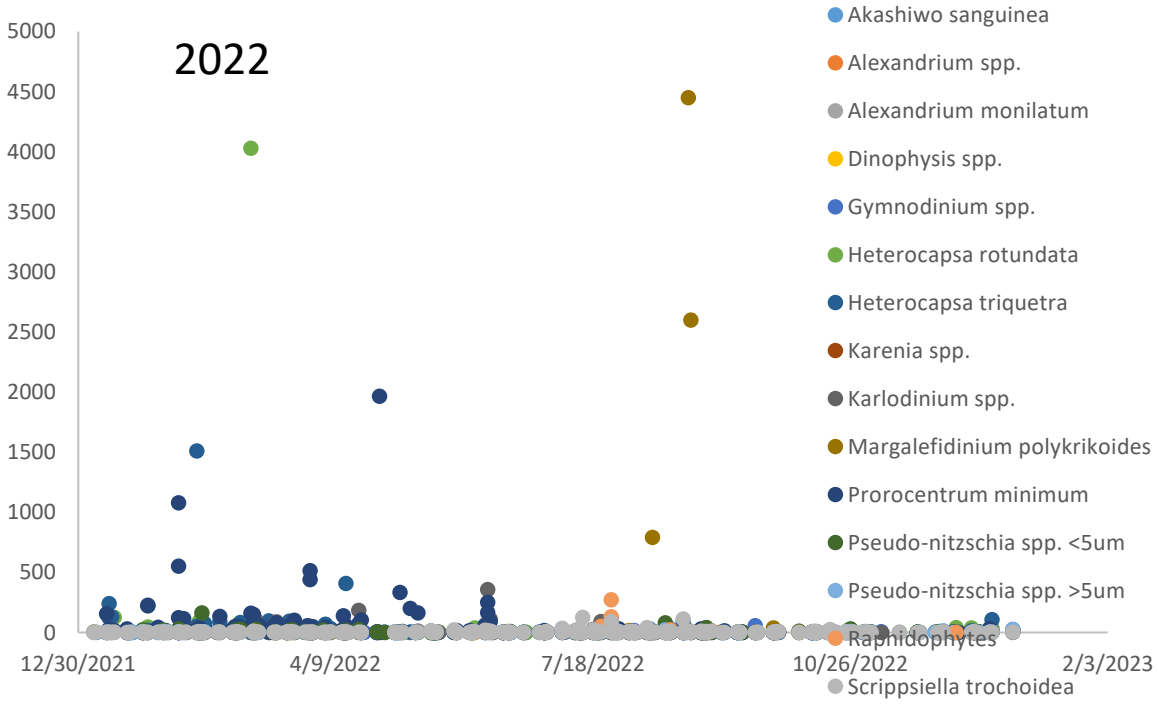
*_Pseudo-nitzschia_ and _Dinophysis_ not abundant enough to make the list

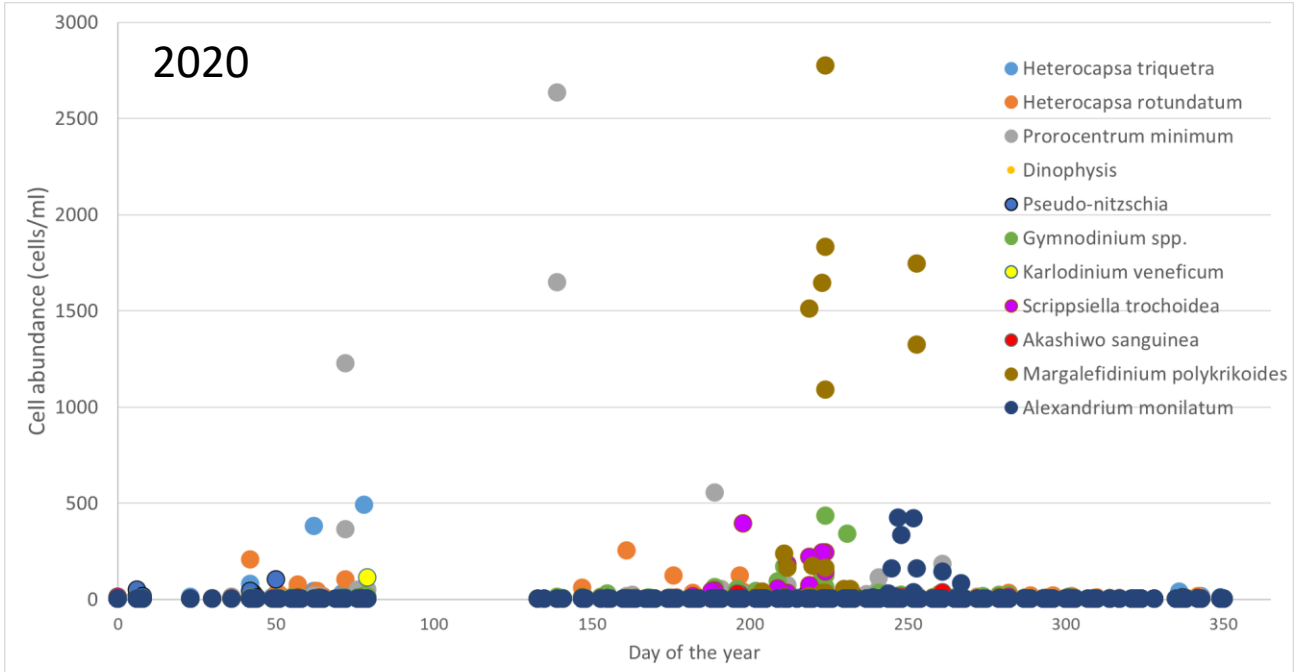
*Removed data where abundances were > 100,000 cells/ml

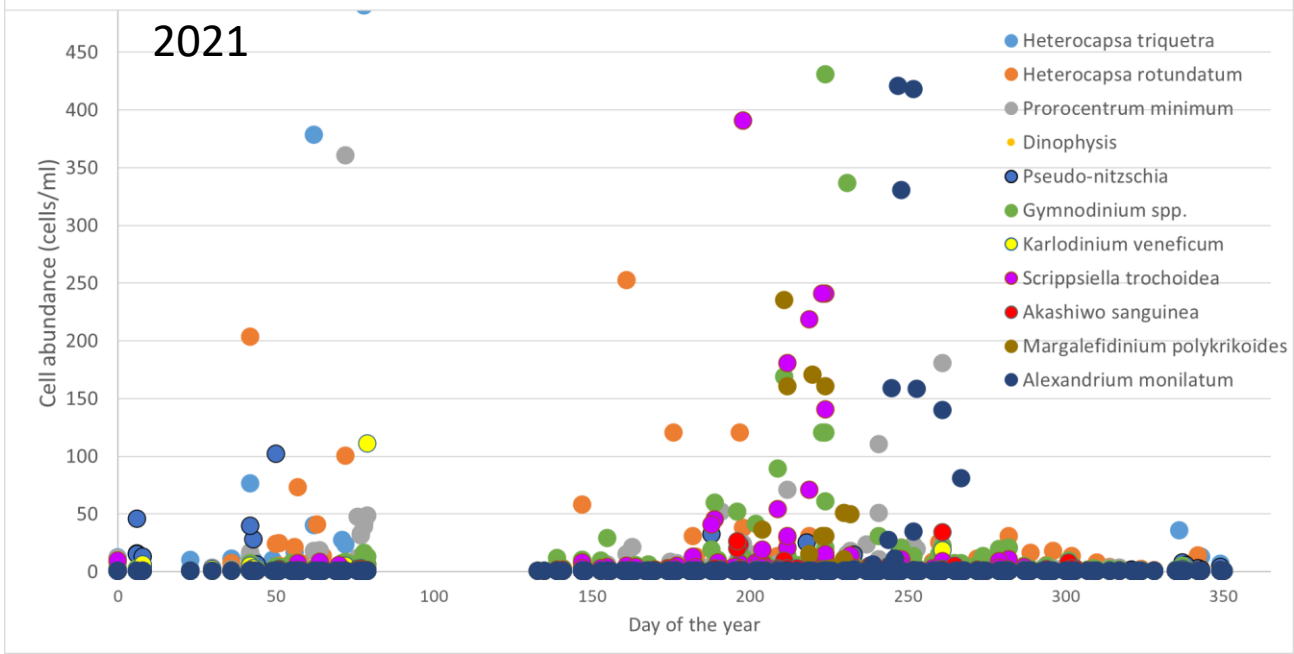
Mulholland et al. 2018

Notable 2022 cell concentrations:

Heterocapsa triquetra (January – Mar)
Prorocentrum minimum (late April – early May)
Margalefidinium polykrikoides (July – August)

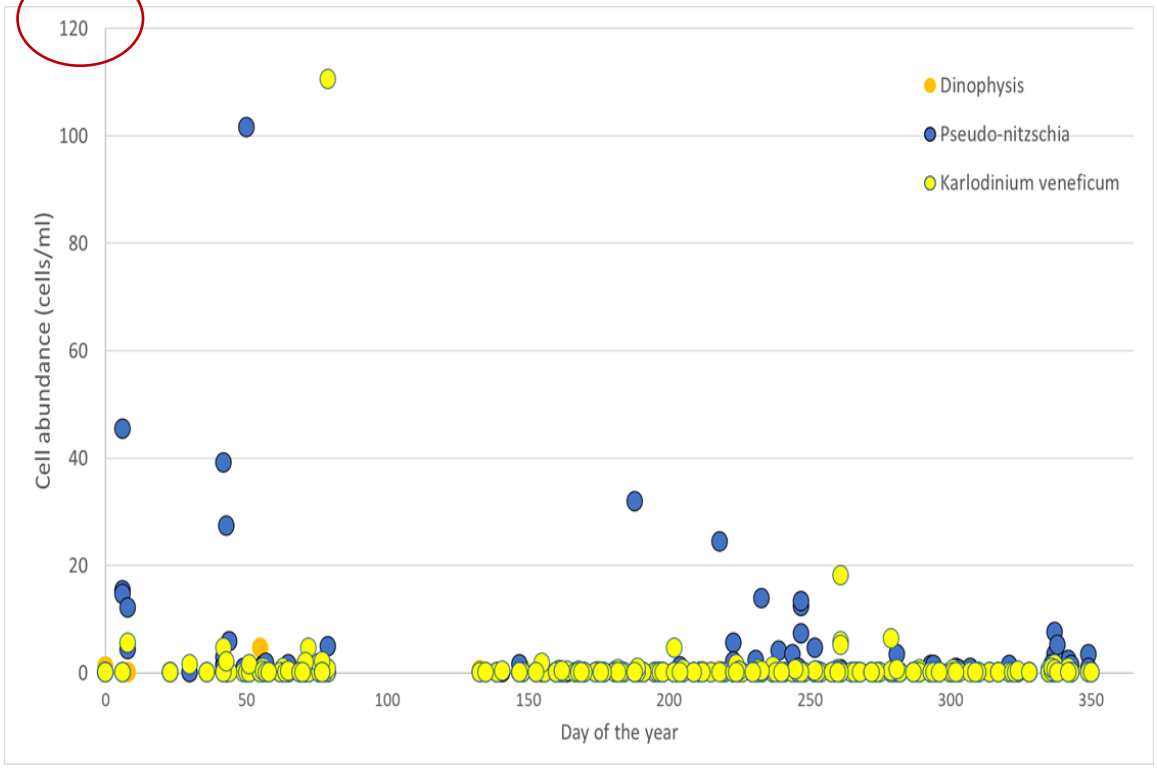




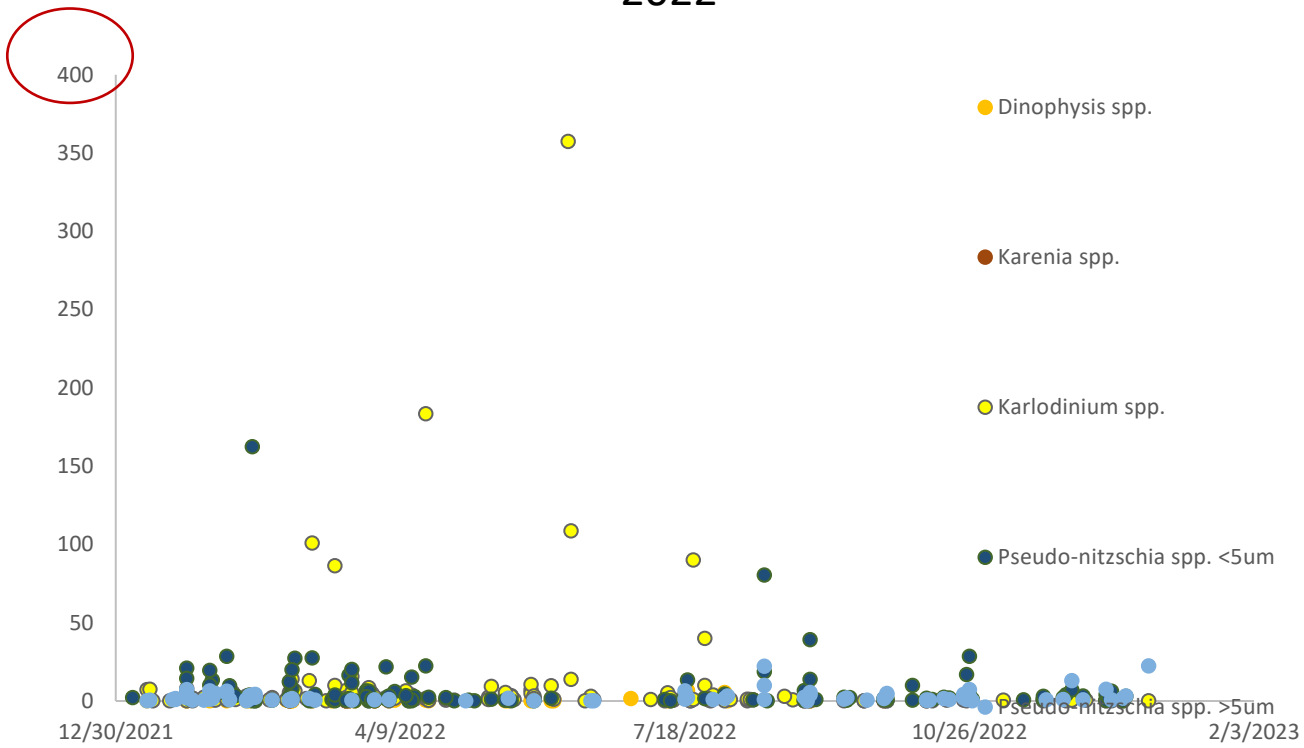


Our less abundant HAB species in 2022

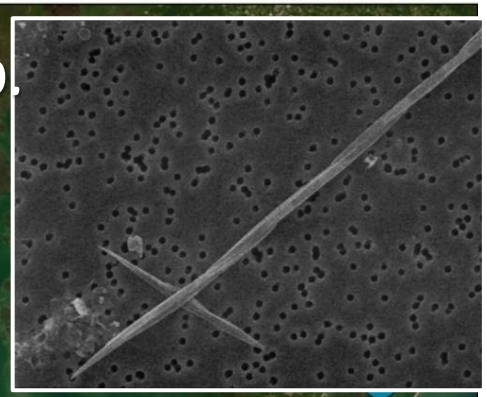
2020

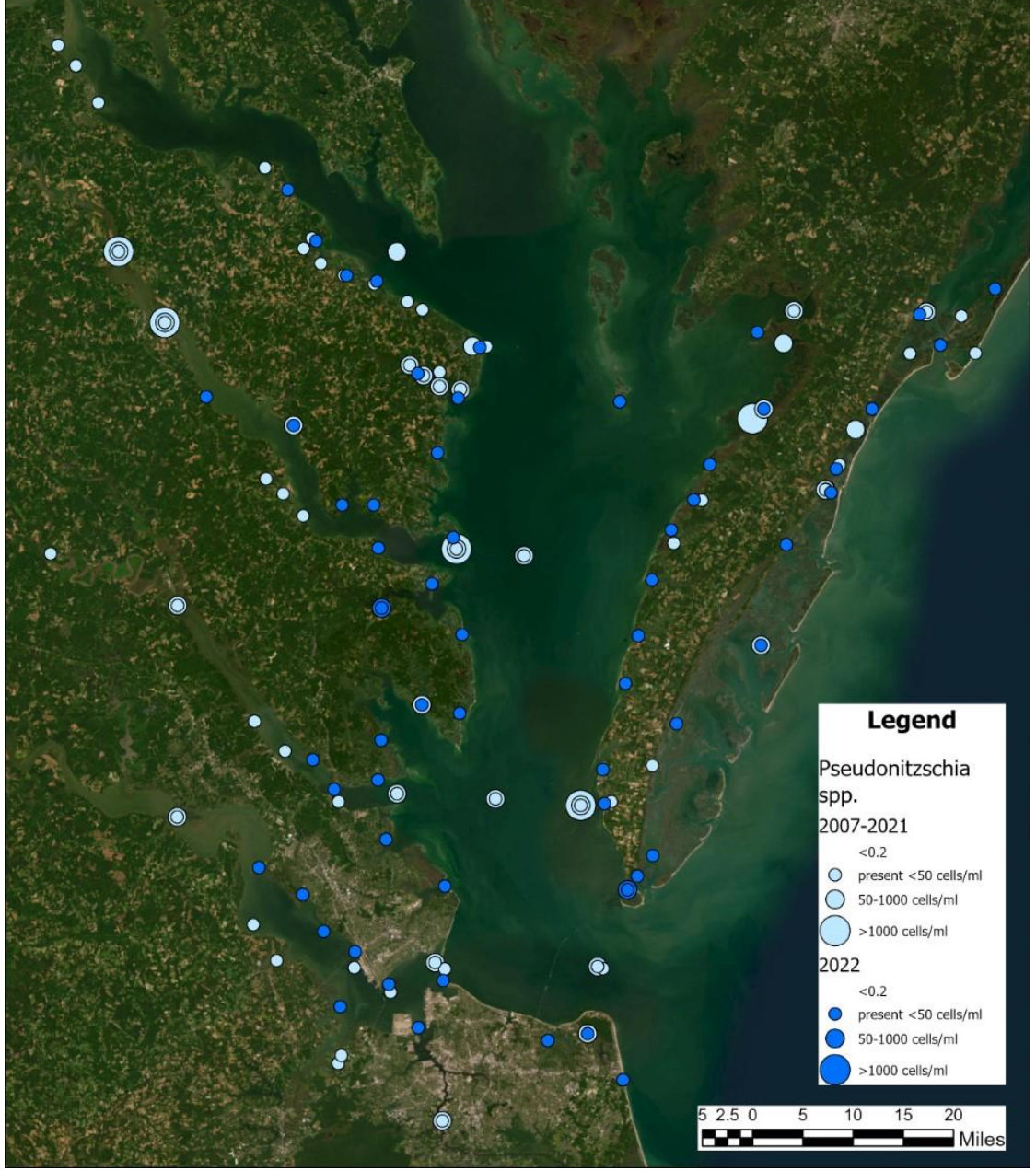


2022



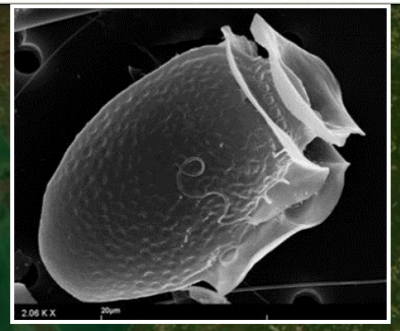
Pseudo-nitzschia spp.





- Generally low cell densities
- Widespread distribution in Chesapeake Bay and seaside Eastern Shore

Dinophysis spp.



- Generally low cell densities
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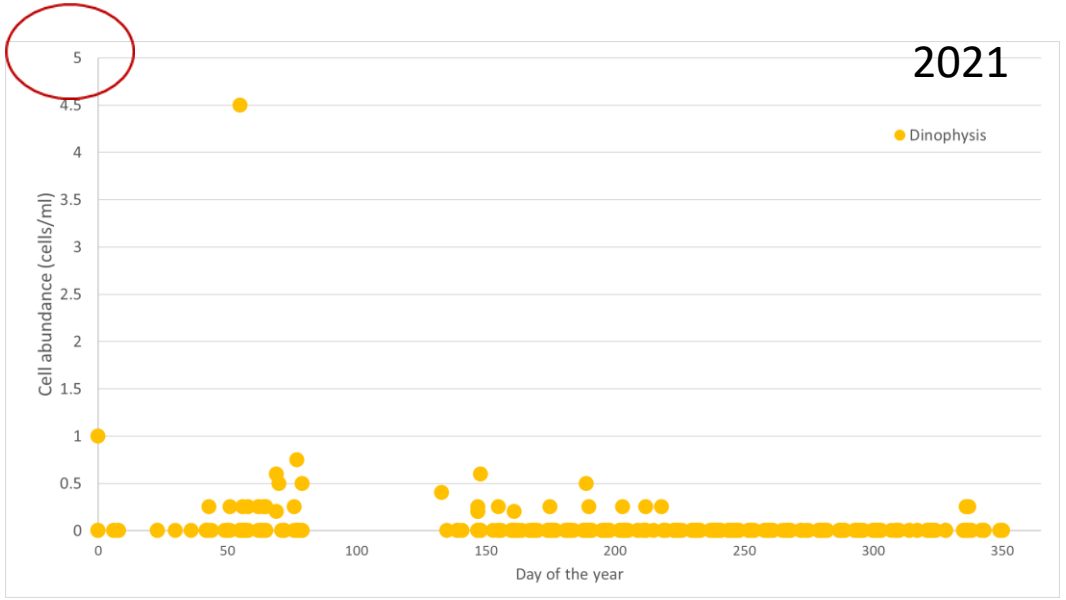
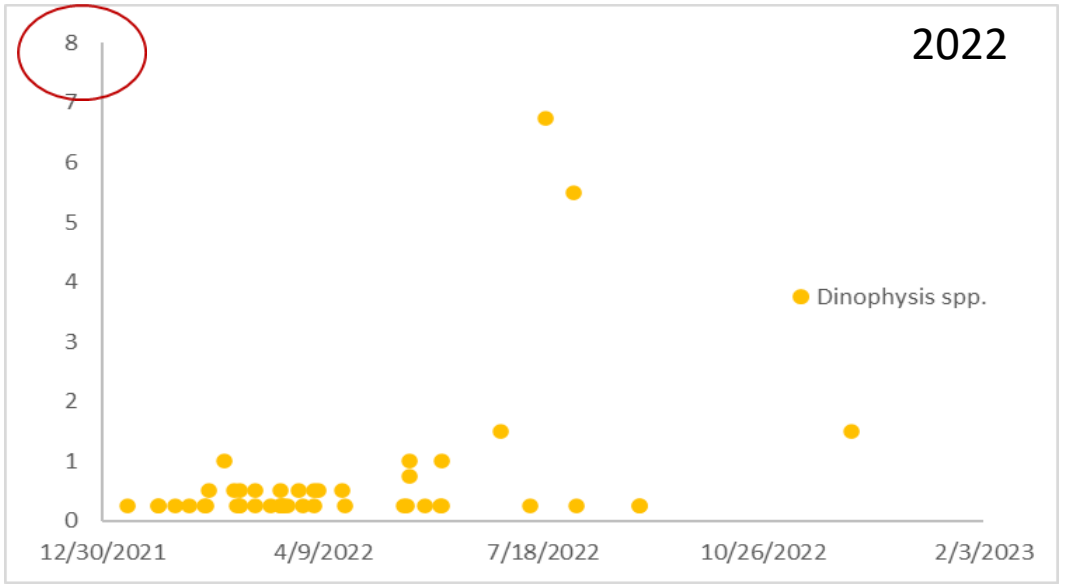
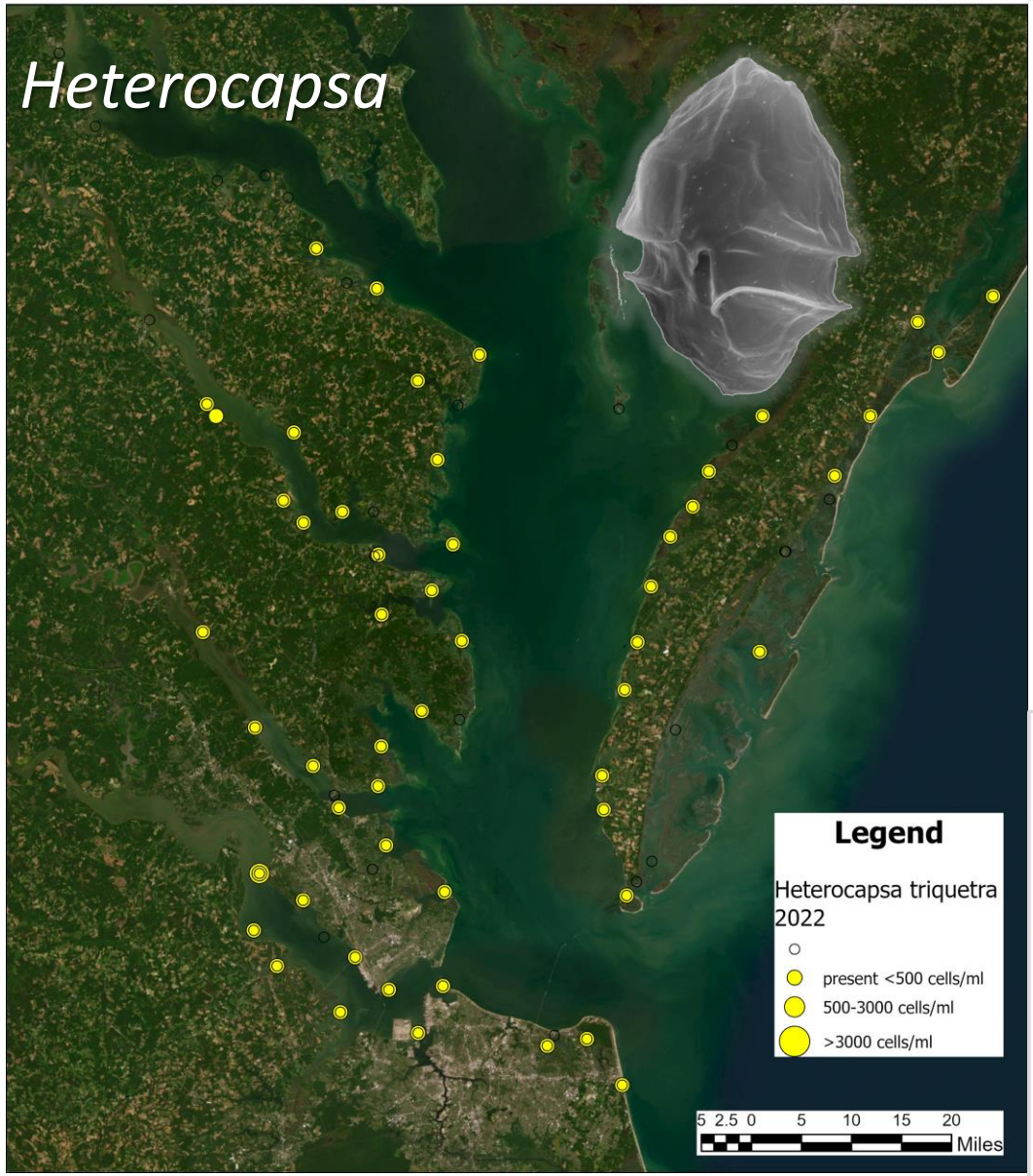
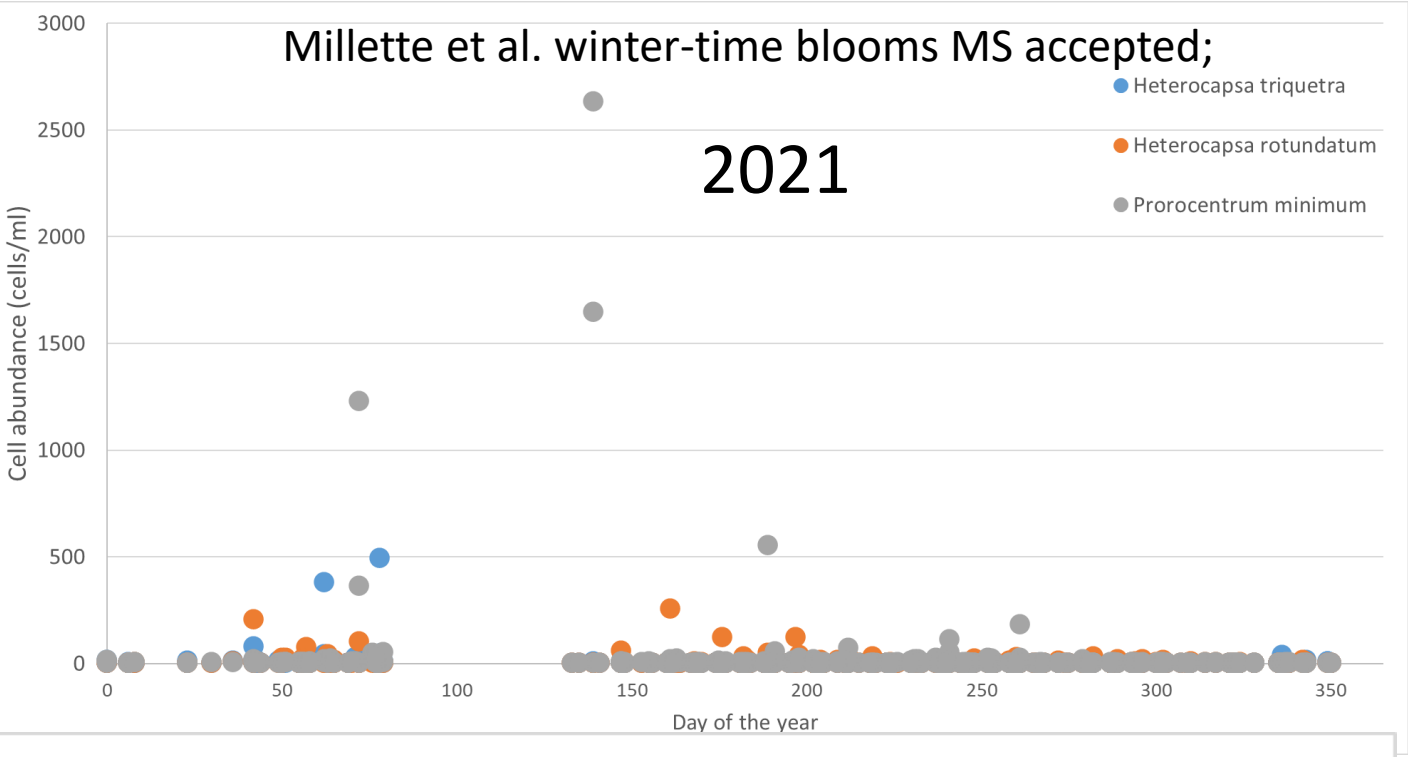
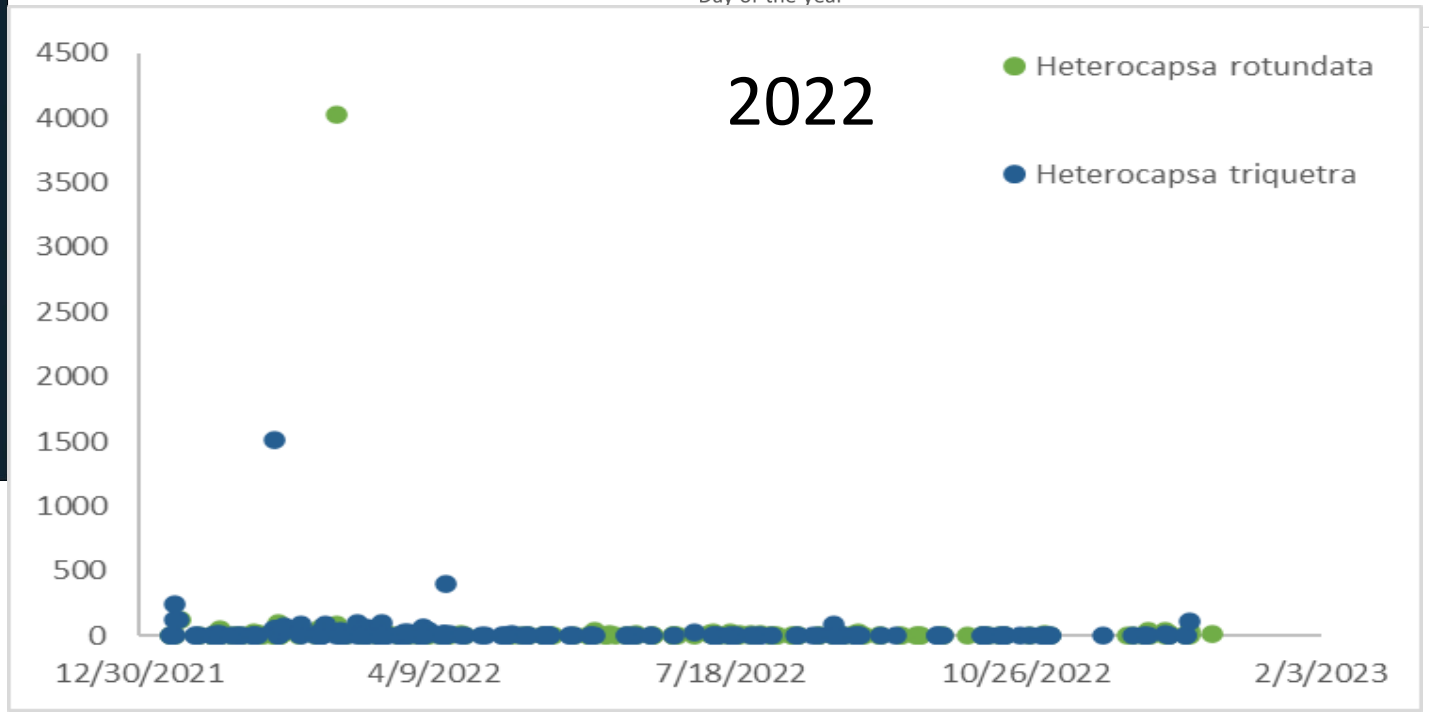




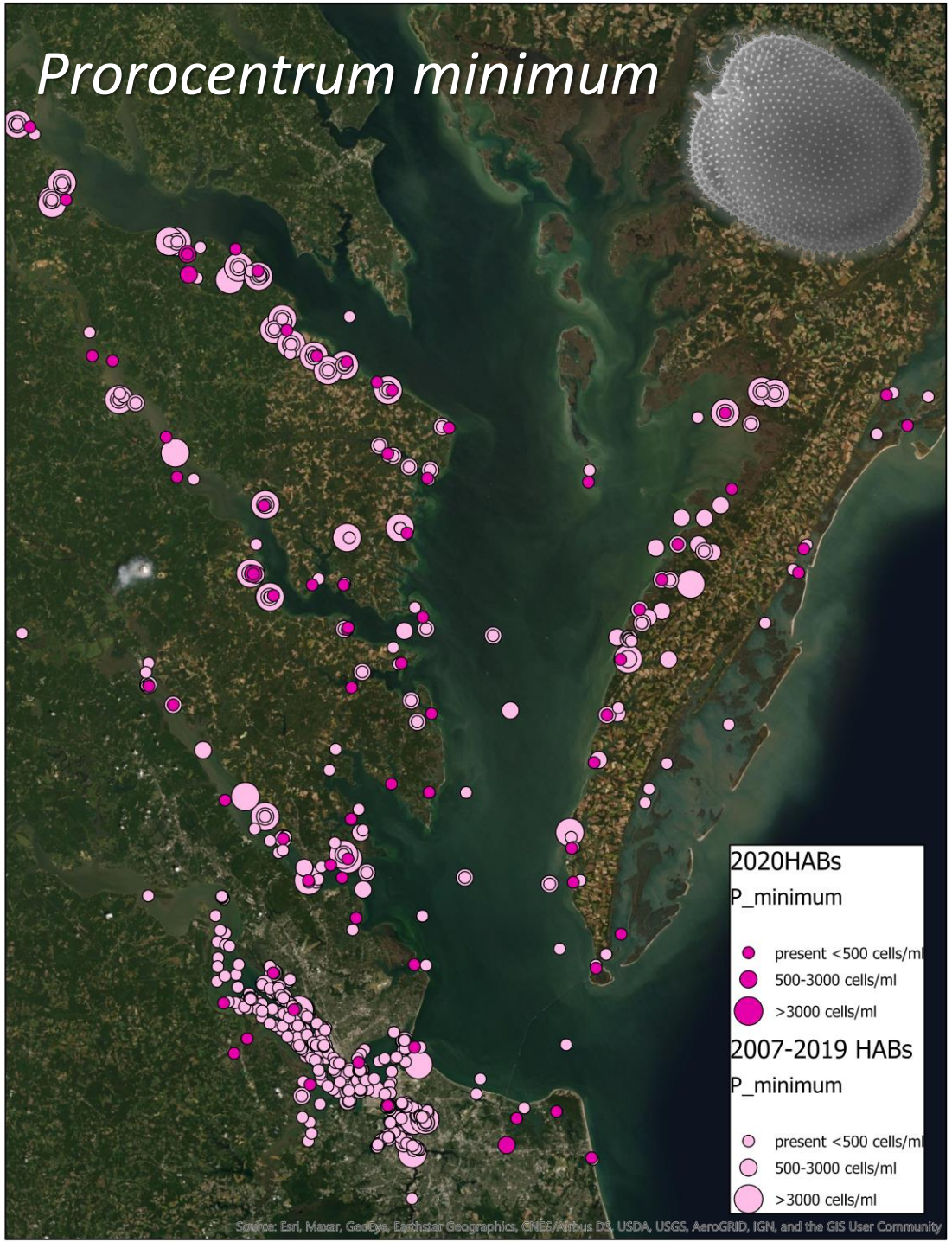


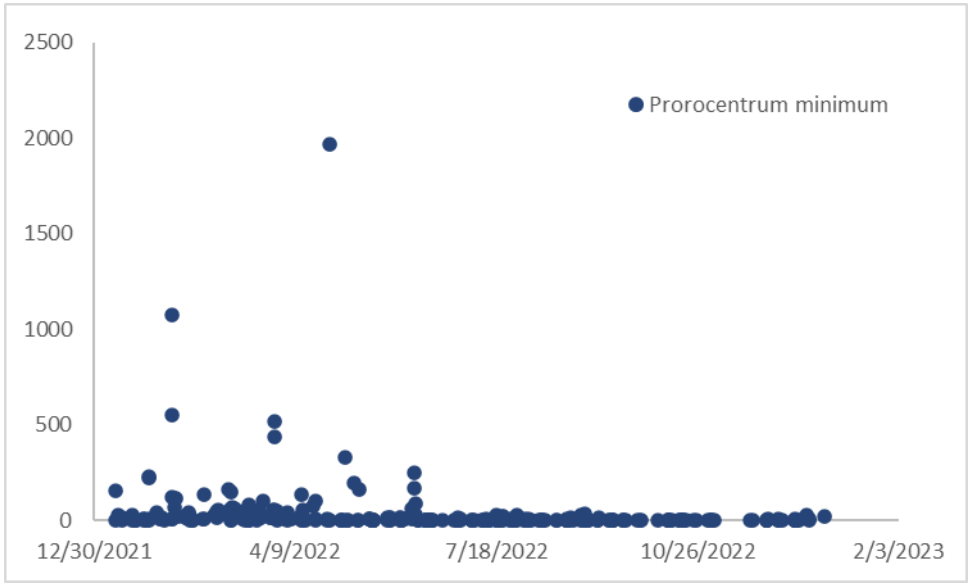


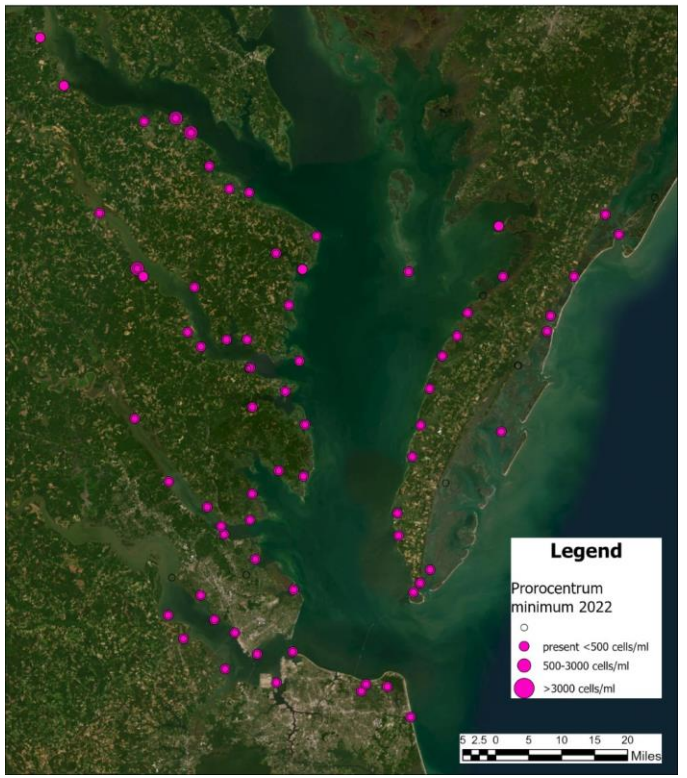


While blooms weren't reported, they happened.
We aren't looking at this time of year.

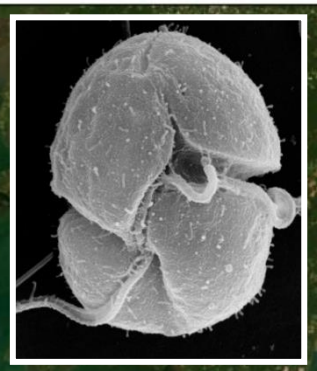
Prorocentrum minimum







Karlodinium veneficum



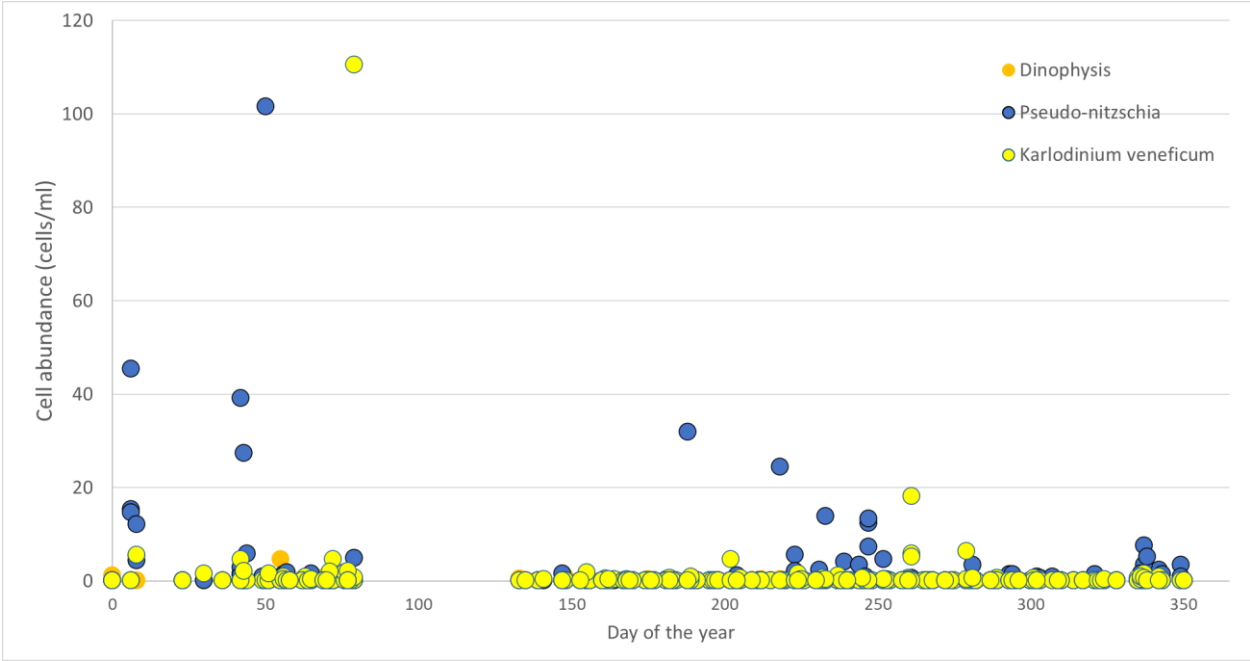
Legend

Karlodinium spp.
2022

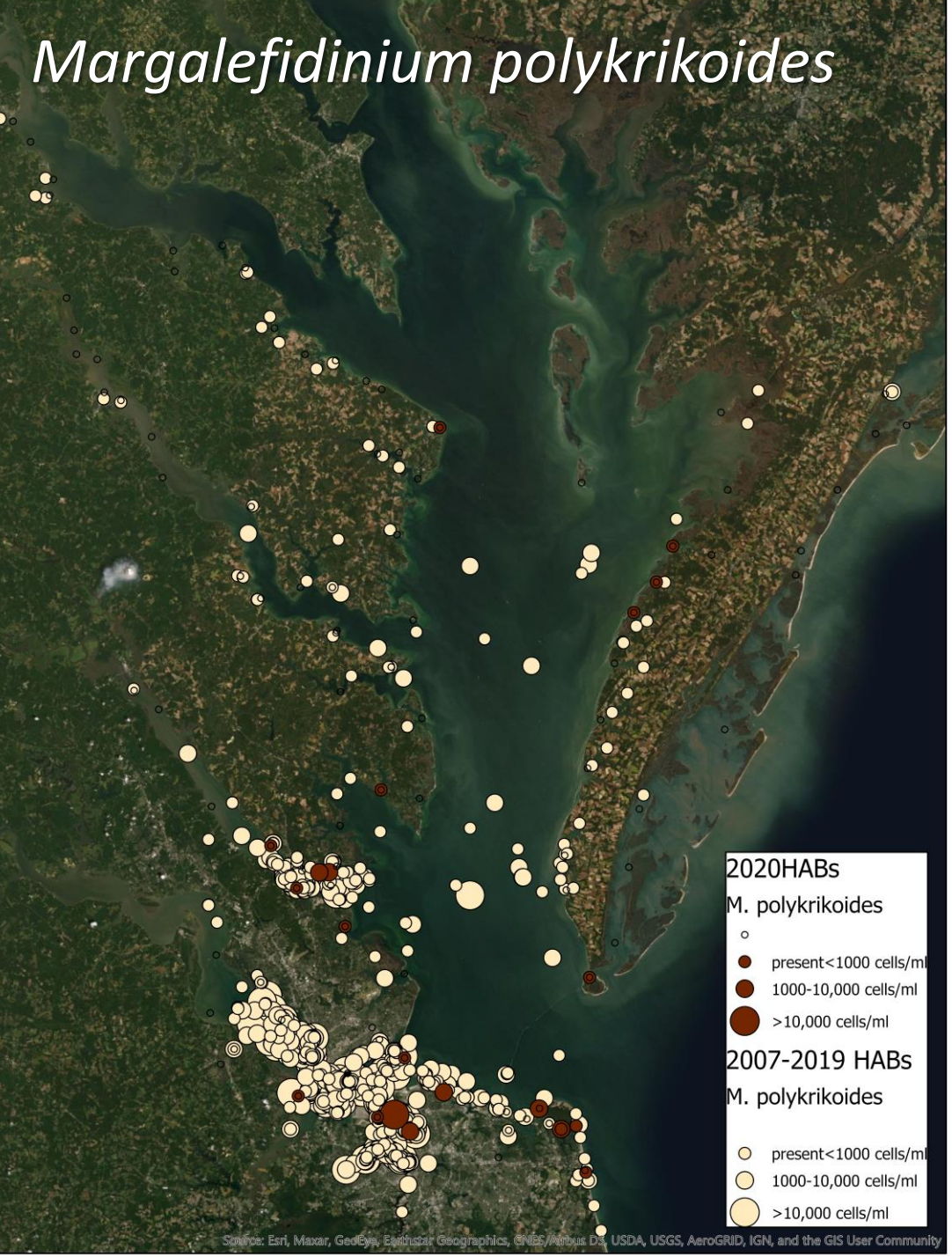
- present <500 cells/ml
- 500-3000 cells/ml
- >3000 cells/ml

5 2.5 0 5 10 15 20 Miles

Generally low abundances

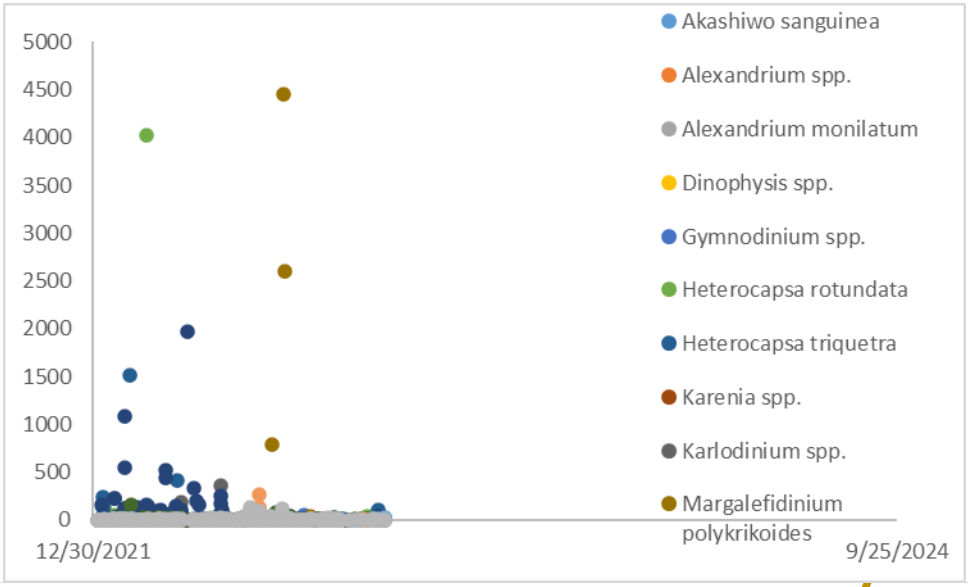


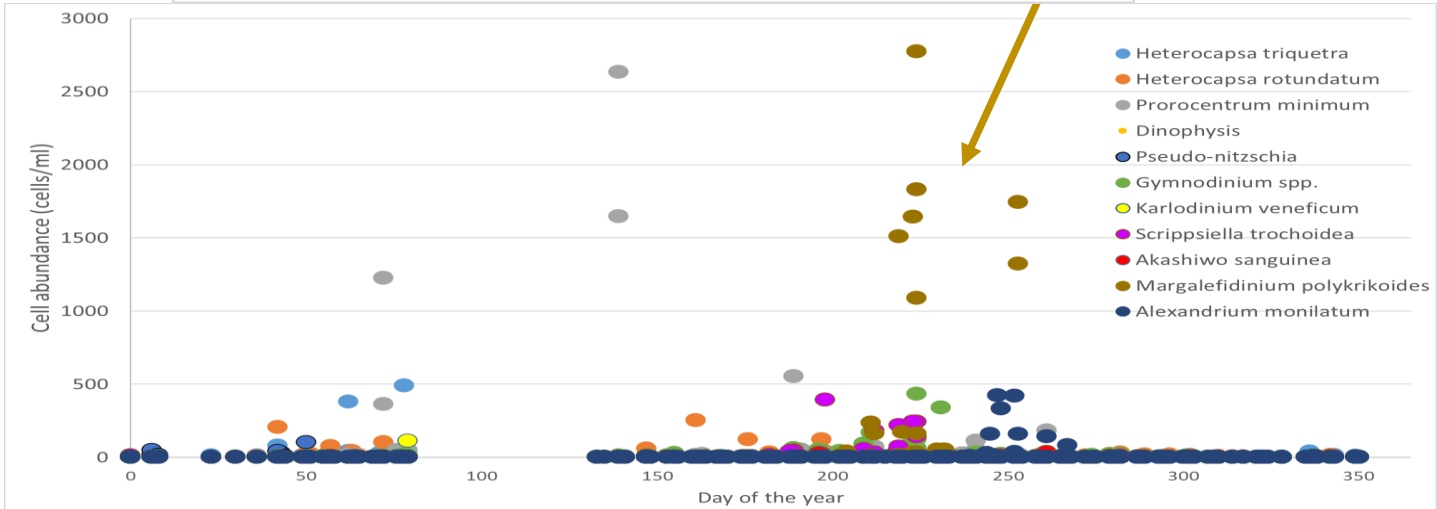
Margalefidinium polykrikoides



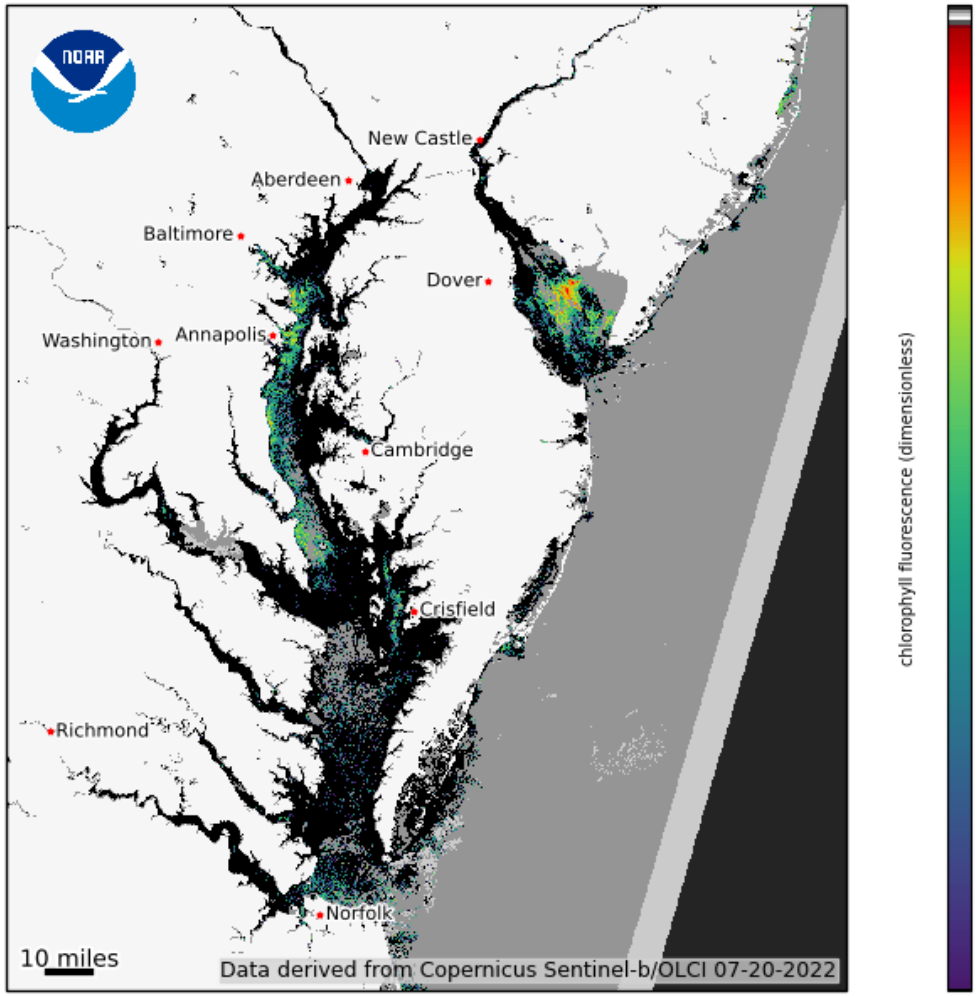
Margalefidinium polykrikoides

- It was blooming but largely undetected
- Initiated in Lafayette River July 20, 2022 & was transported to the oceanfront

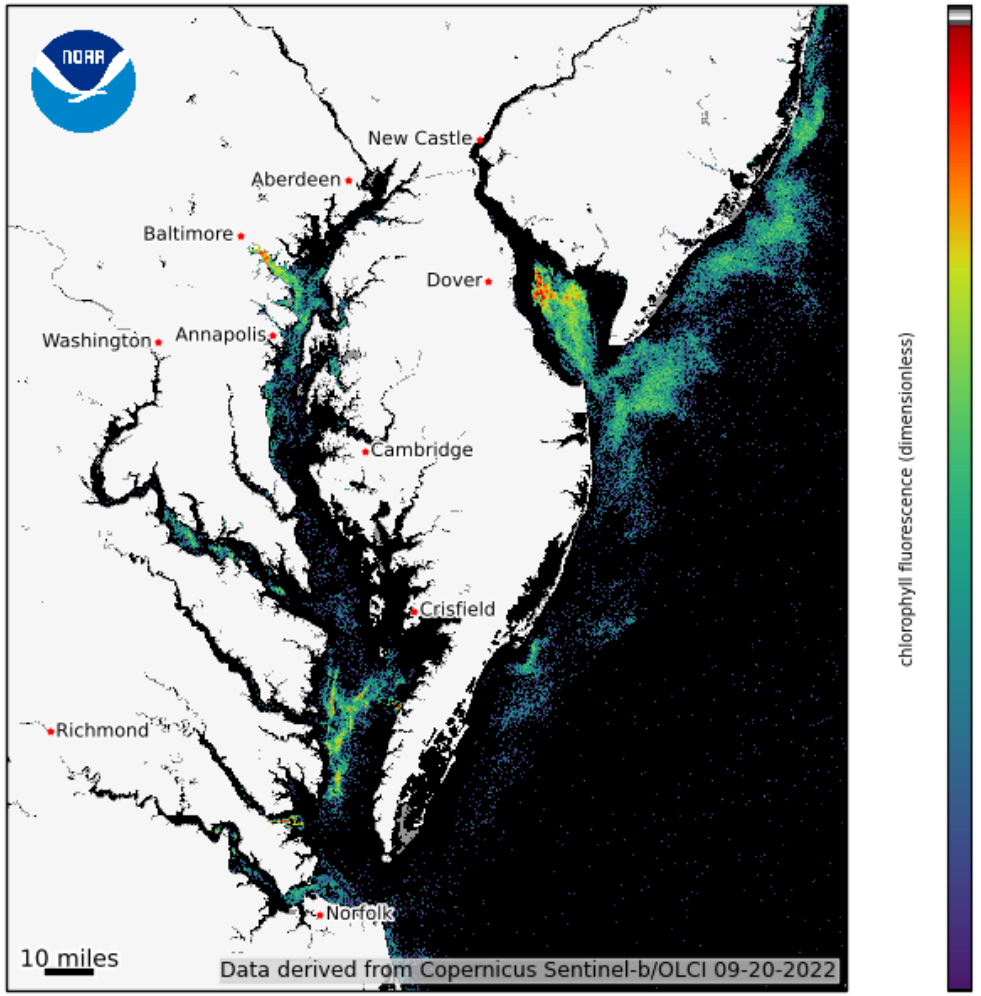




Satellites didn’t help much this year.

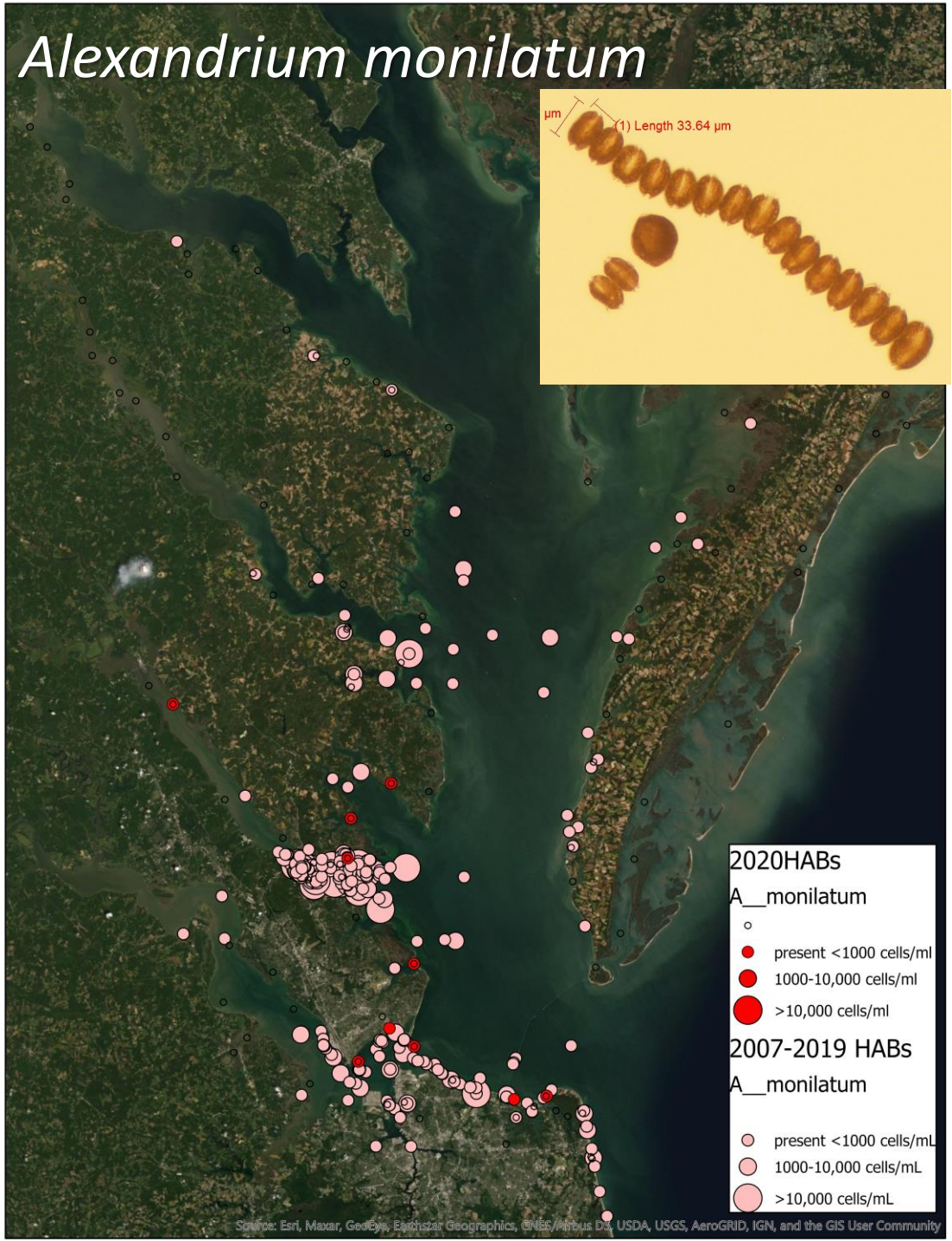


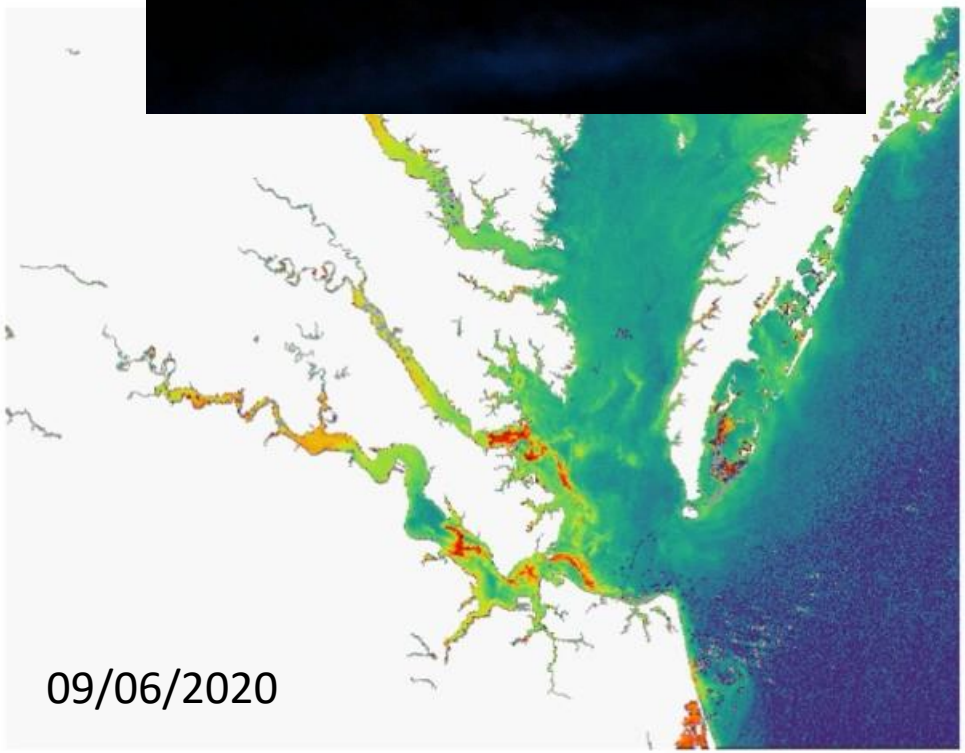
Red Band Difference (RBD) showing relative chlorophyll fluorescence from high (red) to low (violet) for Chesapeake Bay.



Red Band Difference (RBD) showing relative chlorophyll fluorescence from high (red) to low (violet) for Chesapeake Bay.

Alexandrium monilatum –2022 bloom happened but it was undersuveilled

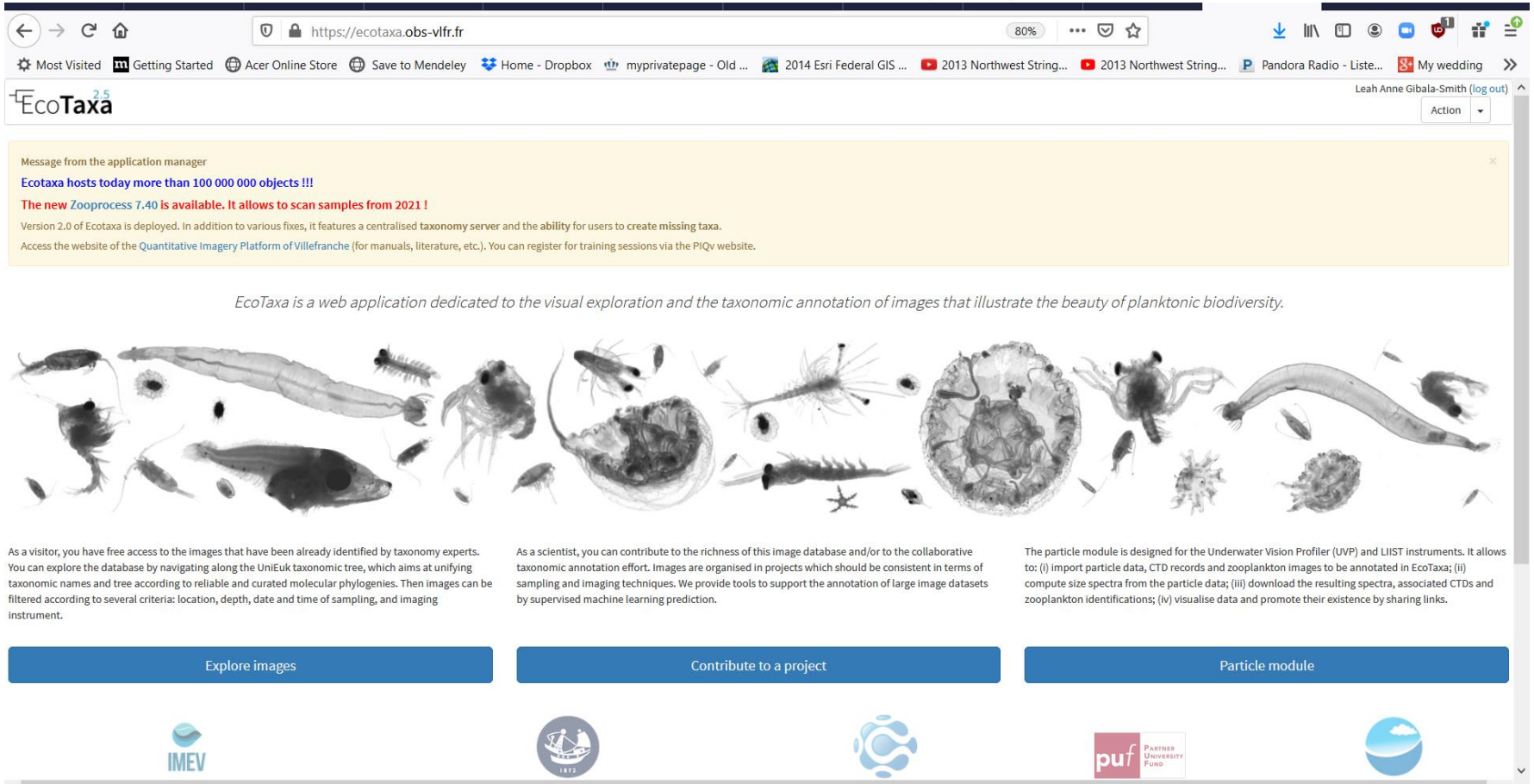




IFCB, FlowCam, PlanktoScopes & EcoTaxa

- Images everything, even detritus, in a 5 mL sample (this was just what we fed it)
- Working with MARACOOS and Maryland to build regional image libraries
- Submitted a MERHAB proposal for development of bloom forecasting system for Alex and Marg

EcoTaxa homepage



IFCB live dashboard – *Margalefidinium* bloom – images not uploaded to Ecotaxa yet

We know life stages and chain length may play an important role in the initiation and persistence of these blooms and plan to interrogate the database.

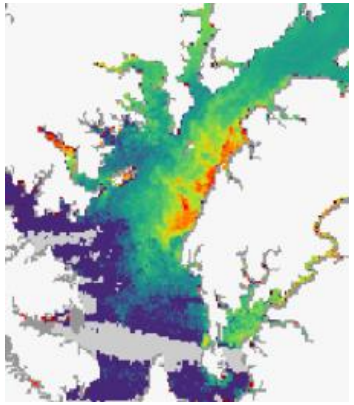
2022 program plans – how did we do?

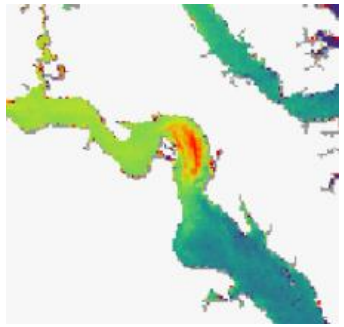
- Continue VDH & CBP sampling and merging of databases
  - Karlodinium and other emerging HAB papers
- Resume HRSD dataflow sampling after COVID hiatus – did some/do it this year
- Continue sampling at the Lafayette River time series – done/will do again
- Establish FlowCam and work with them to allow public access to images
- Building off multiple programs – VDH, CBP, HRSD, ECOHAB – continuing; work more closely with MARACOOS to develop imaging platforms
- Year-round sampling and analyses with undergrads and instruments – using OES 307 to do weekly winter sampling
- More student involvement – 3 undergrads doing projects
- Many manuscripts in preparation

New year's resolutions 2023

- Work on submitting long overdue manuscripts
- Year-round sampling and analyses with undergrads and instruments – we now have some undergraduate research opportunities at ODU
- Laboratory experiments
  - identify projects and funding
    - Aliyah Downing, Microcystis and high CO_2; undergraduate research opportunities
  - Isolation of cultures
  - Production of toxins
  - Life cycle events that influence blooms
- Funding to tie in research with the monitoring to better advise management

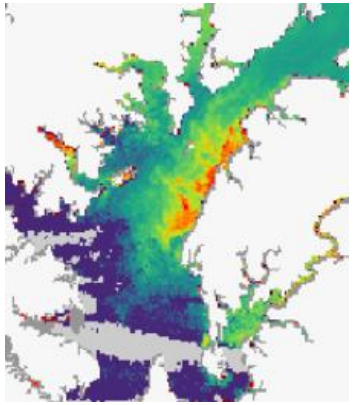
– MERHAB submitted





New year’s resolutions (cont)

GMU collaboration on SPATTS in Potomac and Lake Gaston
Graduate student projects



Thank you!

Funding:

VDH VIRGINIA DEPARTMENT OF HEALTH
To protect the health and promote the well-being of all people in Virginia

HRSD
Cleaning wastewater every day for a better Bay.

NOAA NCCOS NATIONAL CENTERS FOR COASTAL OCEAN SCIENCE

DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

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Shelly Tomlinson
Qubin Qin
Jian Shen
All the field crew at DEQ, VDH, & HRSD


Questions?