

# 2019 Virginia HABs: Estuarine monitoring summary

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VA HAB Taskforce Meeting  
Richmond, VA  
2/24/2020



[www.SwimHealthyVA.com](http://www.SwimHealthyVA.com)

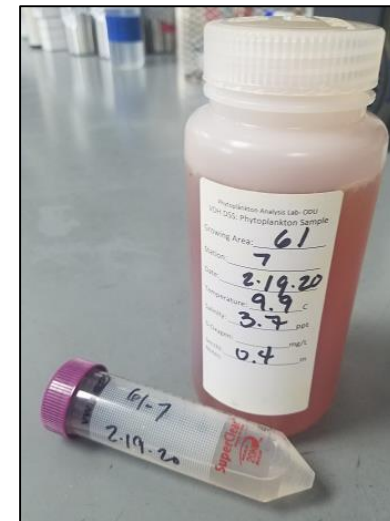
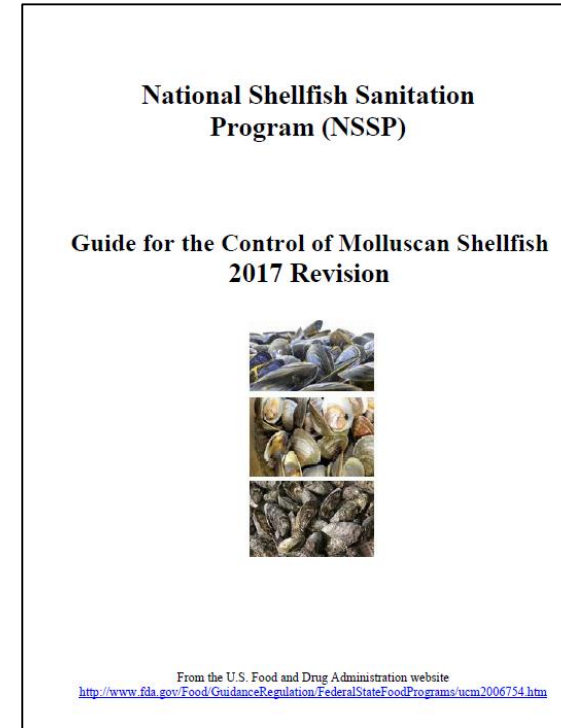
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# Overview

- Program goals
  - Marine Biotoxin Control
  - Bloom response
- Updates to monitoring / management
- Monitoring results summary
- Notable 2019 blooms
- 2020

# Shellfish marine biotoxin control

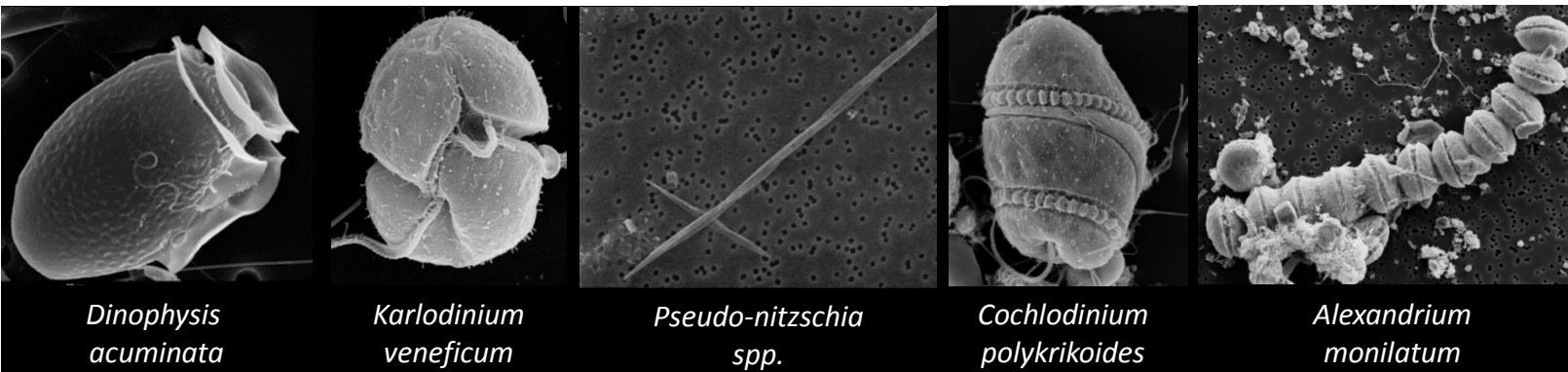
- Biotoxin contingency plan for:
  - Paralytic shellfish poisoning (PSP)
  - Amnesic shellfish poisoning (ASP)
  - Neurotoxic shellfish poisoning (NSP)
  - Diarrhetic shellfish poisoning (DSP)
  - Azaspiracid shellfish poisoning (AZP)
- VDH:DSS Biotoxin plan and flow chart:  
<http://www.vdh.virginia.gov/content/uploads/sites/20/2016/05/BiotoxinControlPlan.pdf>
- Monthly collections- routine fixed sites
  - Lugol's solution (500mL) – phytoplankton analyses (ODU)
  - Unpreserved frozen sample (50mL)- ELISA screening (VDH)
- Bloom samples
  - Response to bloom reports or visual observation by field staff



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

# 2019 Updates

- Screening for *Dinophysis* and *Pseudo-nitzschia* in each VDH:DSS field office
- Screened within days of collection (avg. 2.5)
- 4mL sample
- <1 cell/ml detection limit



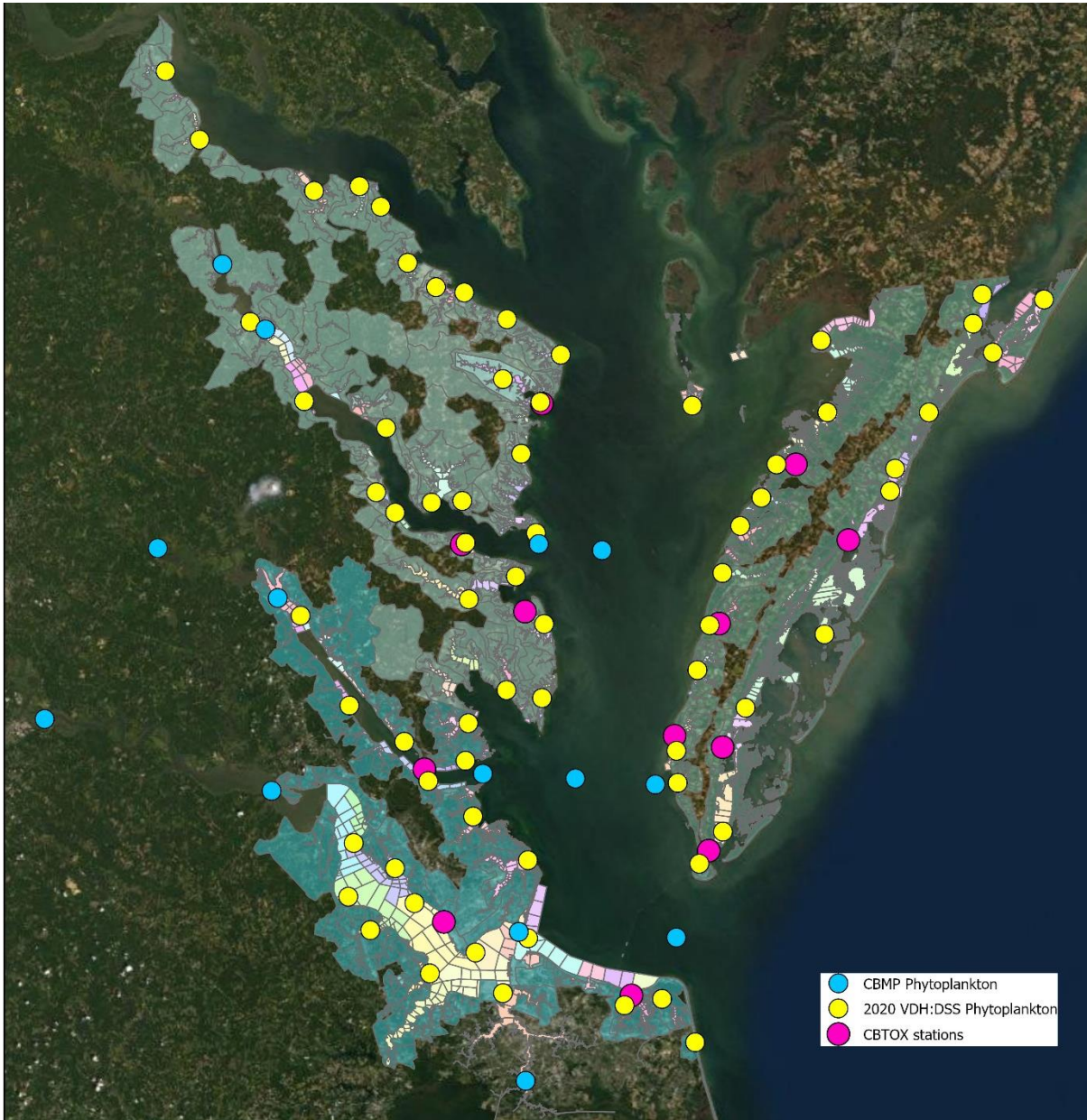
Algal species	Impacts	Main Toxin	NSSP shellfish growing area closure level (toxin w/in meat)	working regional bloom density (cell density in water column)
<i>Alexandrium tamarense</i> species complex	Paralytic Shellfish Poisoning	Saxitoxin	80µg /100g	presence
<i>Karenia brevis</i>	Neurotoxic Shellfish Poisoning	Brevetoxin	0.8mg /kg	presence
<b><i>Dinophysis</i> spp.</b>	<b>Diarrhetic Shellfish Poisoning</b>	<b>Okadaic acid</b>	<b>0.16 mg/kg</b>	<b>≥5 cells/ml</b>
<b><i>Pseudo-nitzschia</i> spp.</b>	<b>Amnesic Shellfish Poising</b>	<b>Domoic acid</b>	<b>2mg/100g</b>	<b>≥ 1,000 cells/ml *</b>
<i>Alexandrium monilatum</i>	Fish/invertebrate mortality	Goniodomin A	NA	≥ 1,000 cells/ml
<i>Cochlodinium polykrikoides</i>	Fish/invertebrate mortality	ichthyotoxin	NA	≥ 1,000 cells/ml
<i>Karlodinium veneficum</i>	Fish mortality	Karlotoxins	NA	≥ 10,000 cells/ml

\*lower for wider cells/species



Cellvis P12-1.5H-N





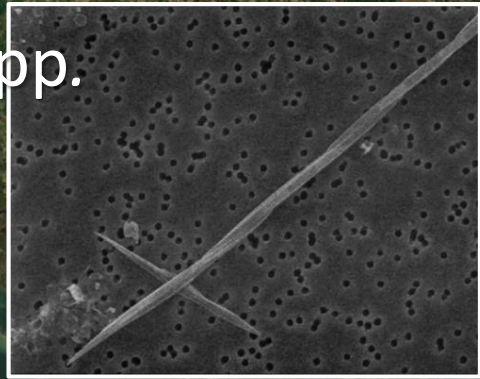
# Virginia Estuarine Phytoplankton monitoring

- Chesapeake Bay Monitoring Program (DEQ/ODU)
  - 14 stations
    - 7-Chesapeake Bay monthly year-round
    - 7-Tidal tributaries monthly March-October
- VDH: Shellfish (DSS&WHC/ ODU)
  - 69 stations
    - Monthly year-round
    - Targeted HAB identification
    - Targeted toxin screening (based on cell counts)
- CBTOX (VDH:DSS/ VIMS)
  - 12 stations (2017-2018)
  - 4 stations (2019-2020)
    - Bi-weekly sampling
    - Targeted HAB identification
    - Routine toxin analyses

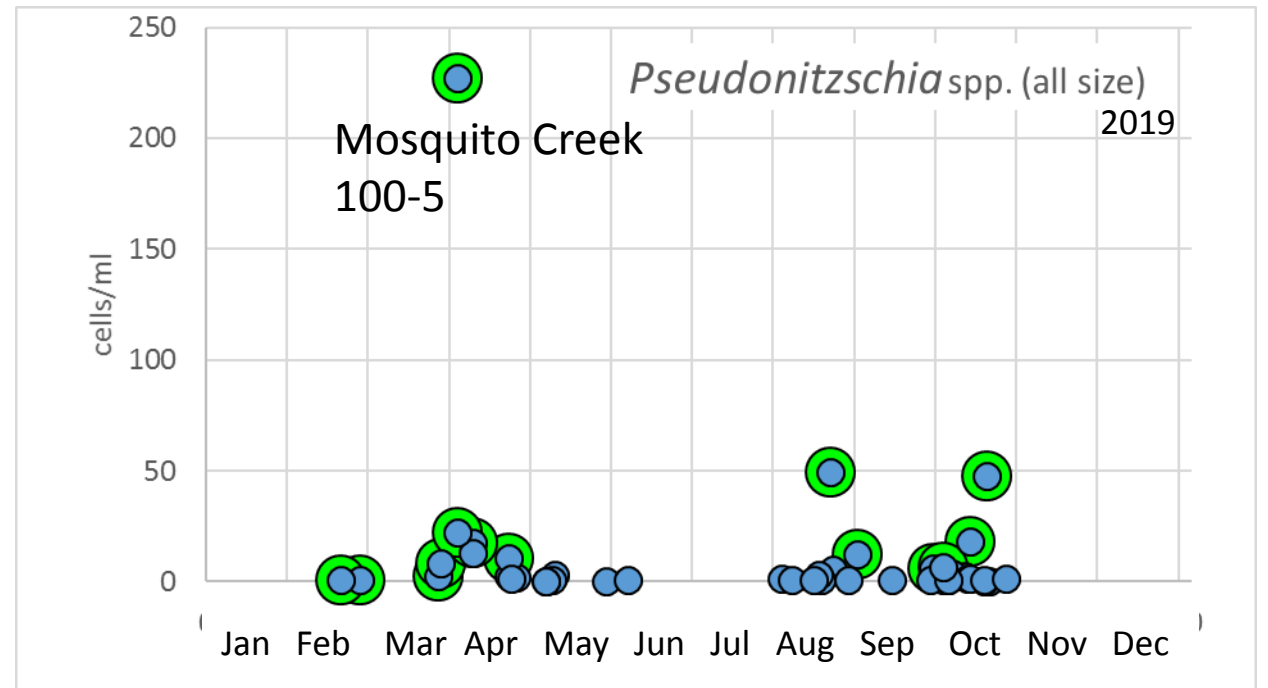
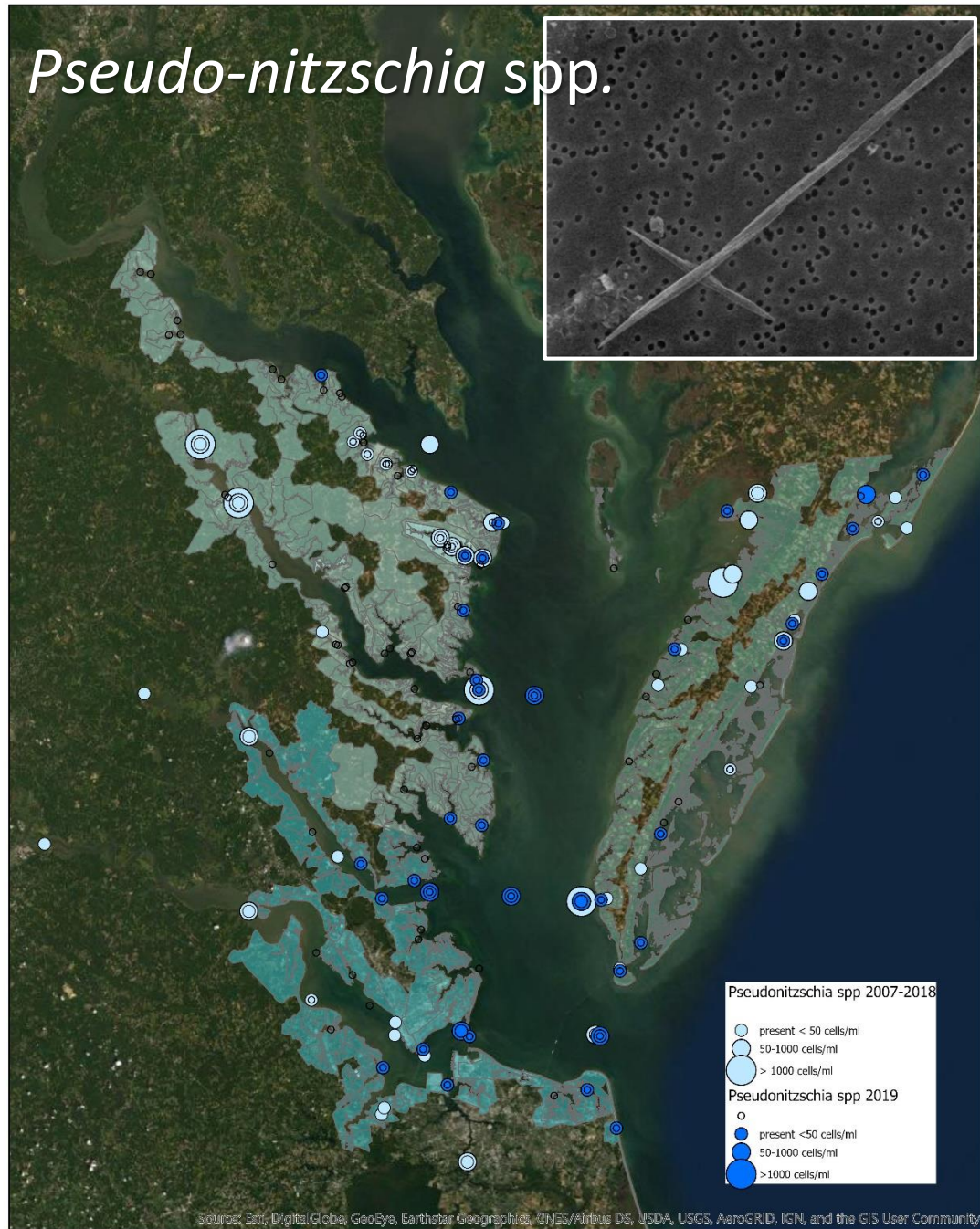
Additional monitoring: ODU and HRSD James River & research (Mulholland et al), VIMS (Reece, Smith, et al.)



# *Pseudo-nitzschia* spp.



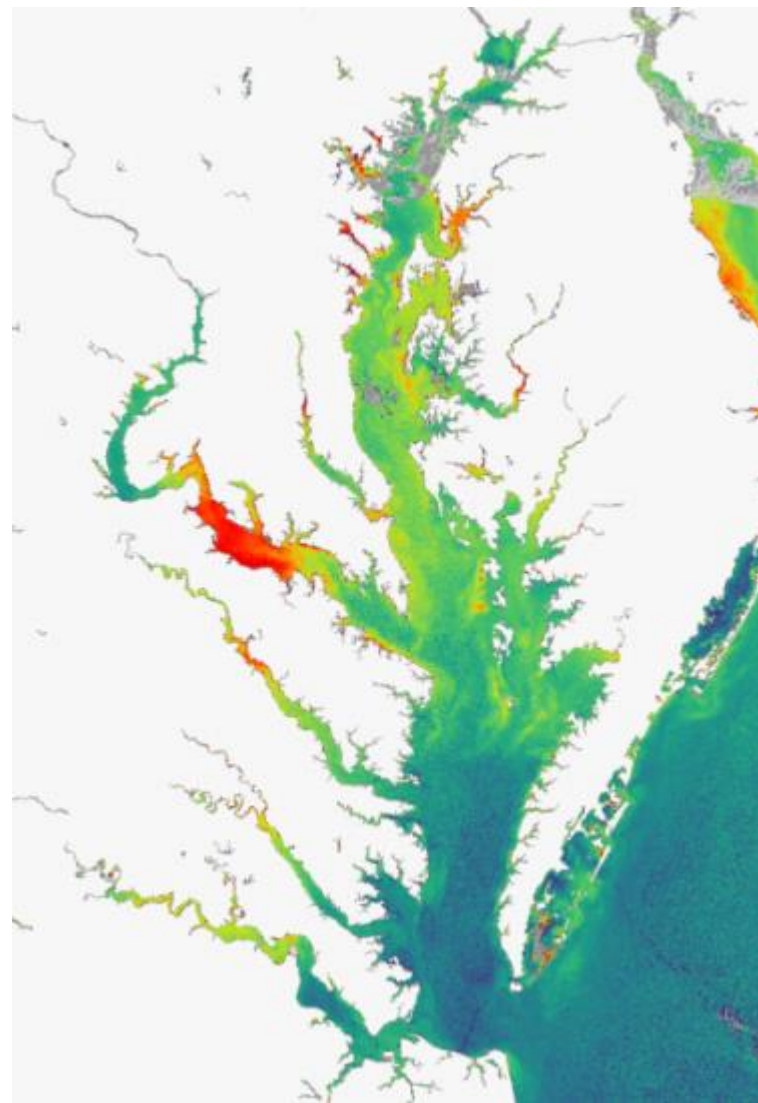
- Generally low cell densities
  - Absent in 88% of samples (<0.5 cells/ml)
  - 0.5-227.5 cells/ml
- Widespread distribution in Chesapeake Bay and seaside Eastern Shore
  
- Domoic Acid ELISA on 14 samples ●
- All samples below detection limit (<0.5ppb)
  - 2018: DA in whole water and sieve sample from Folly Creek (Eastern Shore-April)





## 2020 *Pseudo-nitzschia* spp.

- January 2020 Potomac *Pseudo-nitzschia* event  
- Mixed diatom bloom-*Skeletonema* dominant

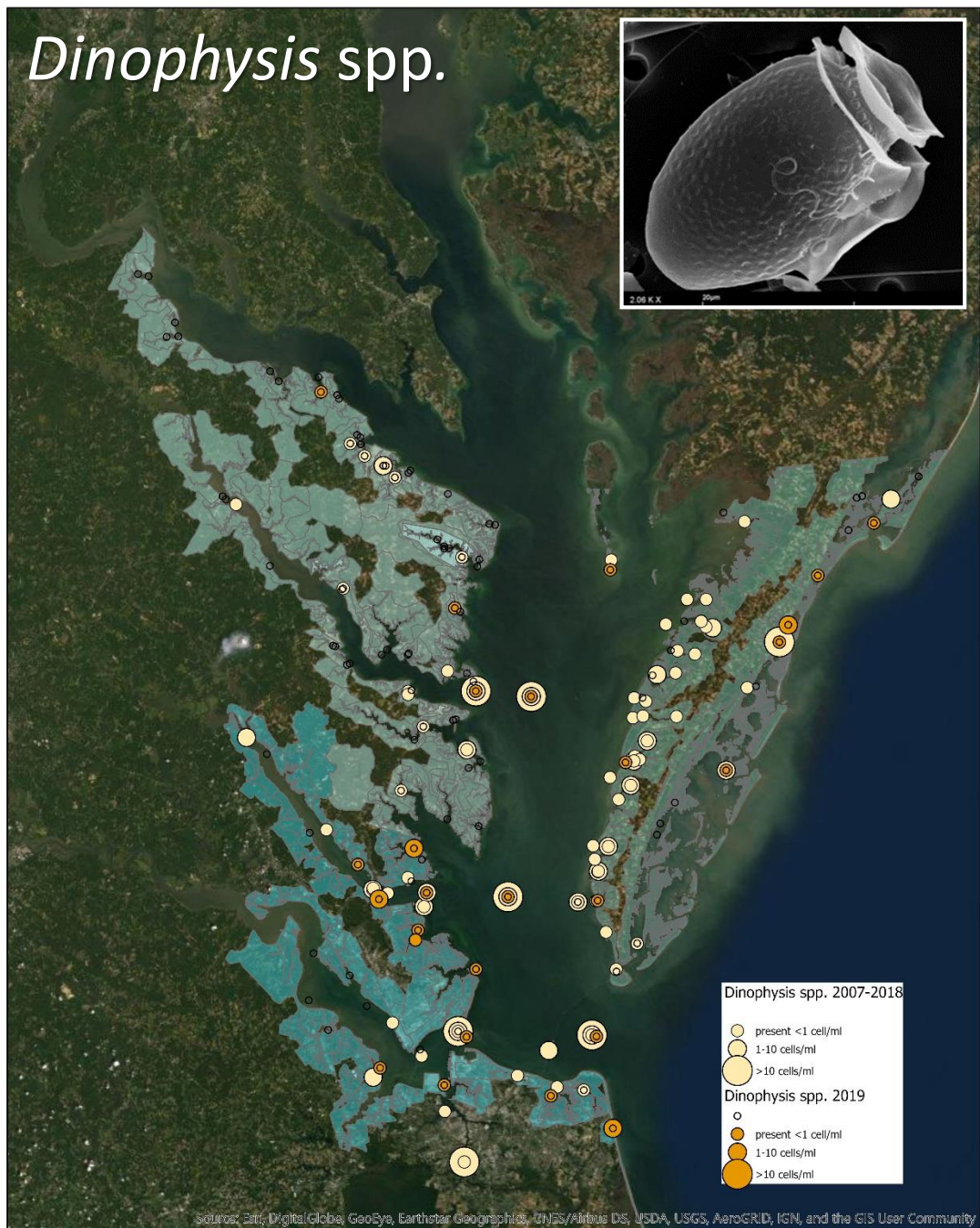
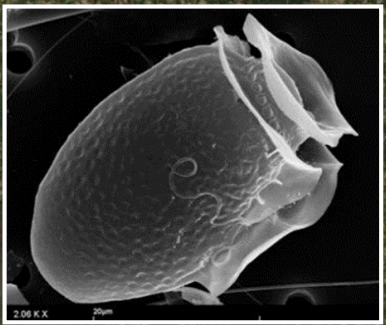


- MD DNR/MDE results
  - ~800- >1000 cells/ml
- Special sample collections  
DSS: January 6, 2020
- *Pseudo-nitzschia* densities  
52-73 cells/ml
- VDH:DSS ELISA
  - All 5 samples below  
detection limit (<0.5ppb)

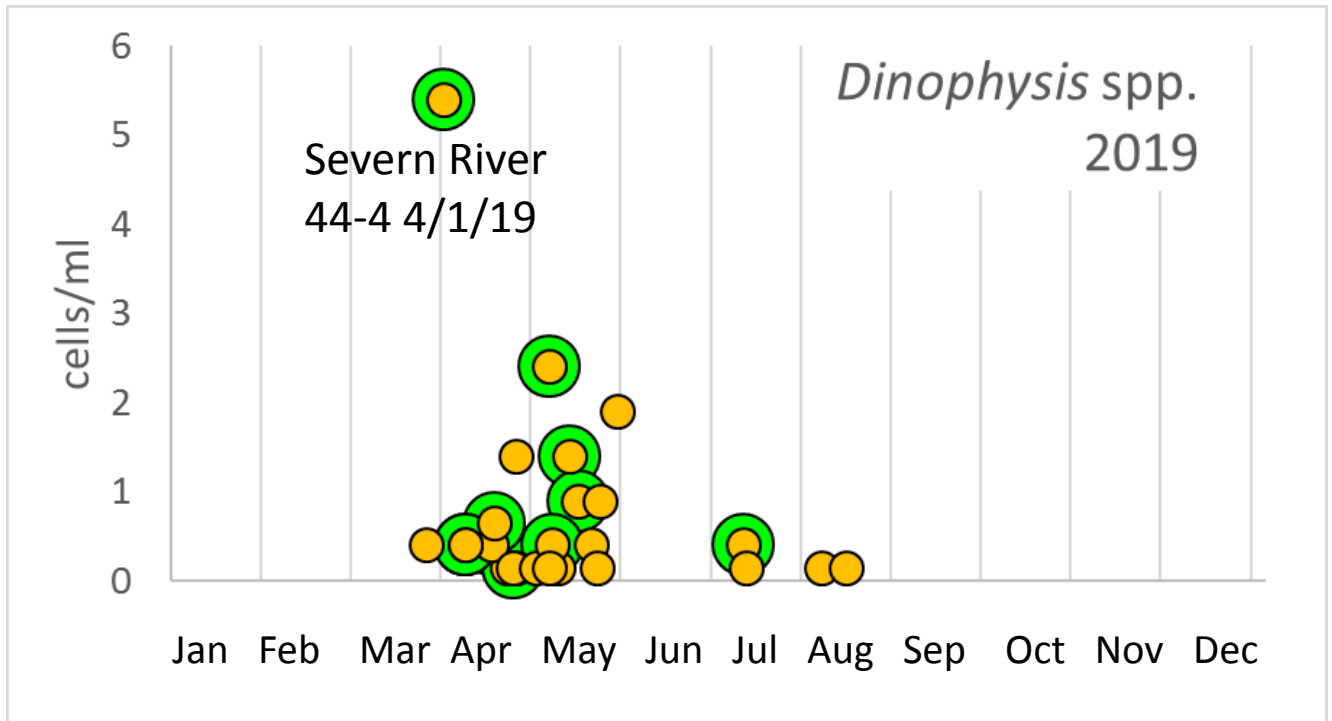
NOAA: MODIS-Sentinel imagery-1/1/2020



# Dinophysis spp.



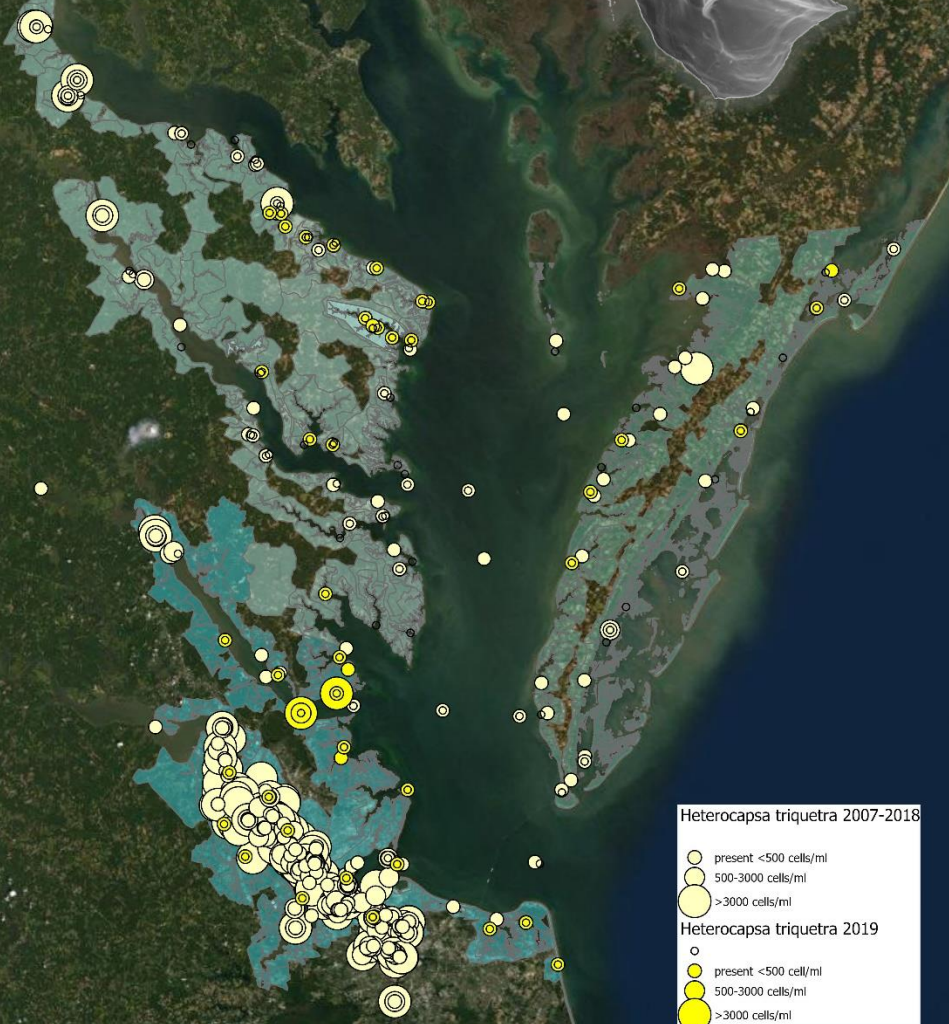
- Generally low cell densities
  - Absent in 94% of samples (<0.2 cells/ml)
  - 0.2-5.5 cells/ml
- Widespread distribution in Chesapeake Bay and seaside Eastern Shore
- Okadaic Acid ELISA on 14 samples ●
- All samples below detection limit (<0.5ppb)



Sources: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



# *Heterocapsa triquetra*



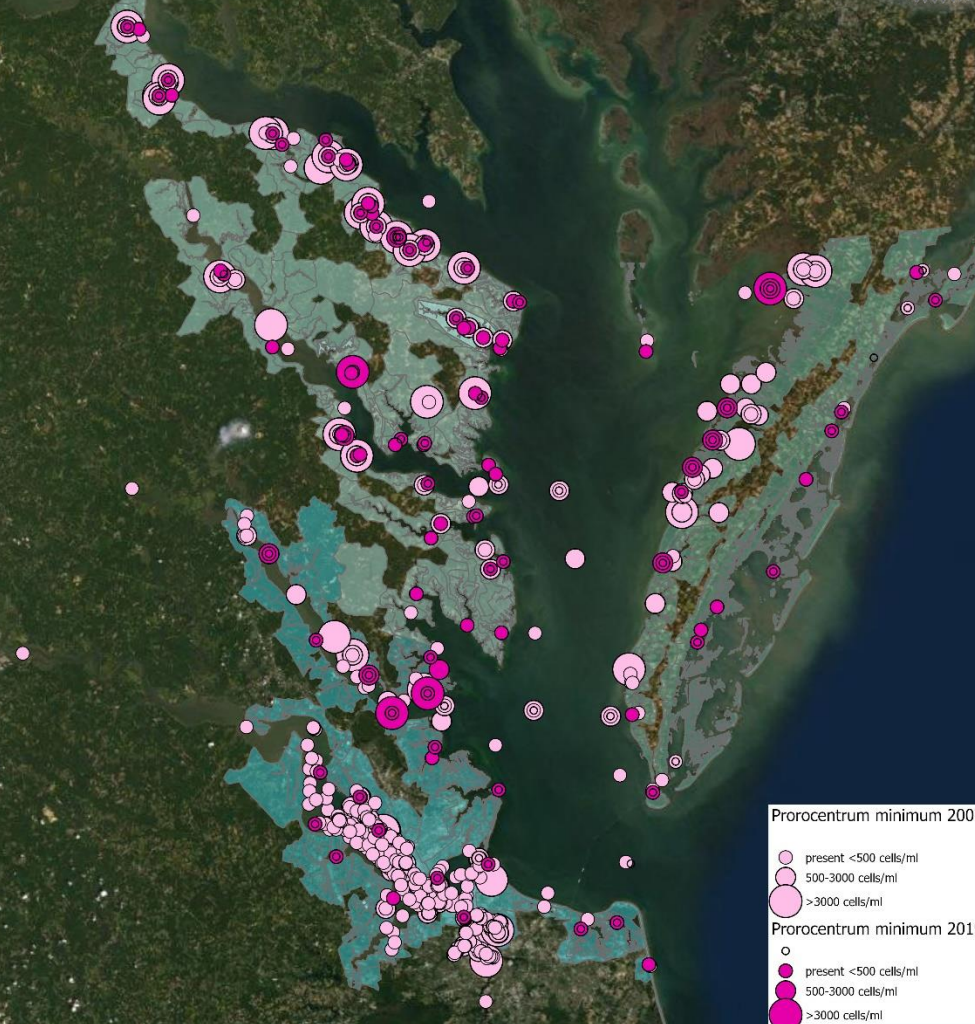
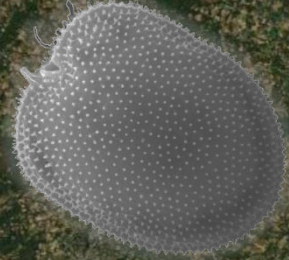
**Heterocapsa triquetra 2007-2018**

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

**Heterocapsa triquetra 2019**

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

# *Prorocentrum minimum*



**Prorocentrum minimum 2007-2018**

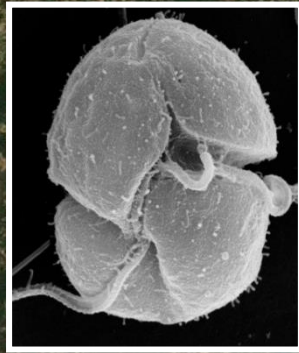
- present <500 cells/ml
- 500-3000 cells/ml
- >3000 cells/ml

**Prorocentrum minimum 2019**

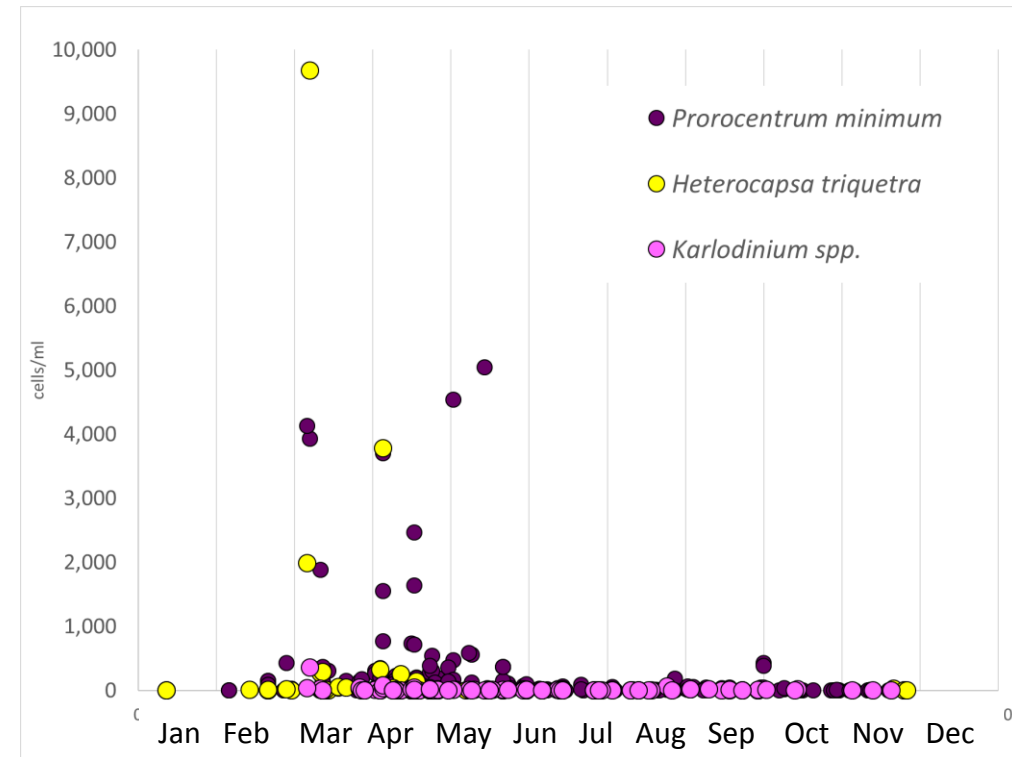
- present <500 cells/ml
- 500-3000 cells/ml
- >3000 cells/ml



# Karlodinium veneficum

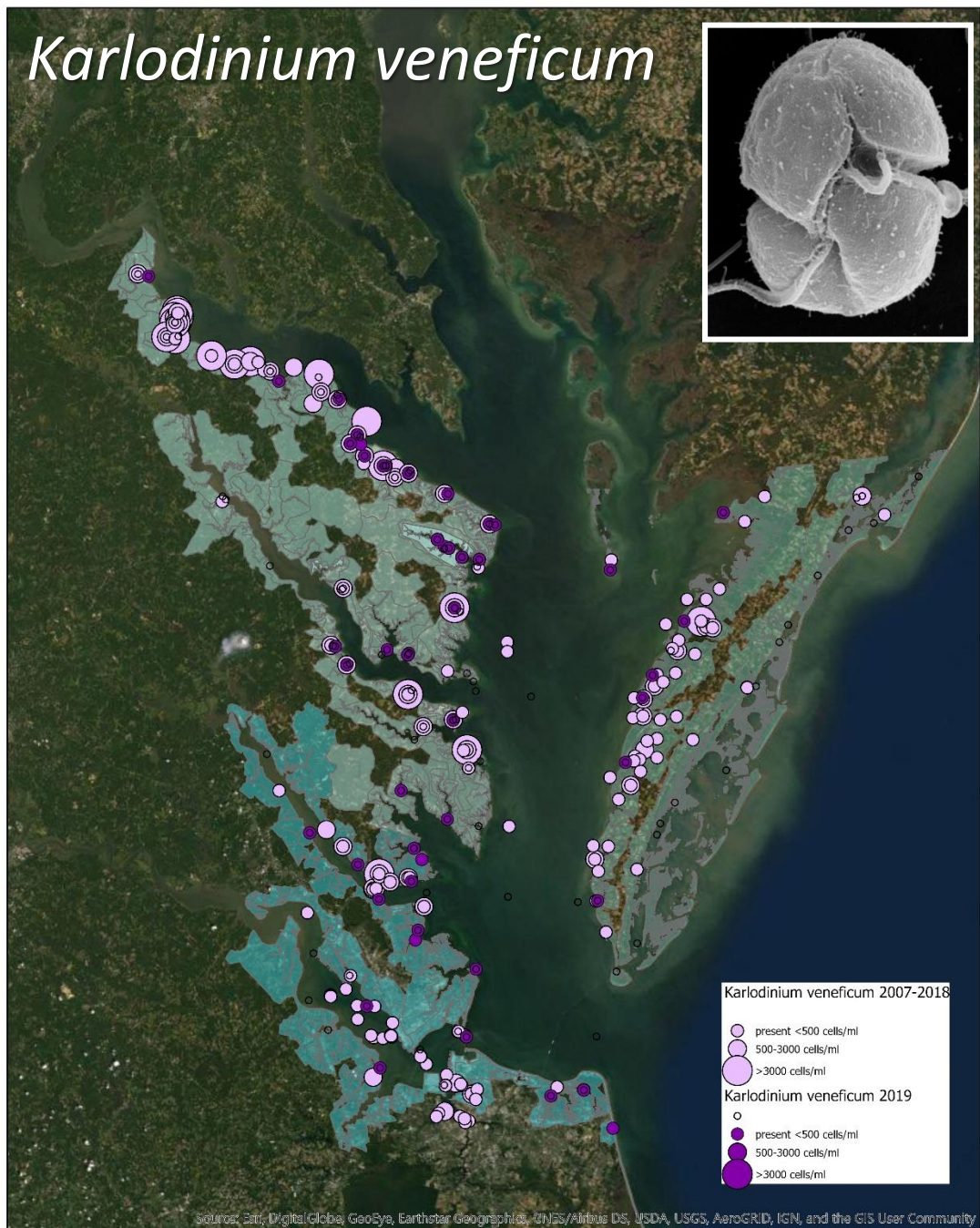


- Lower bloom activity of *Prorocentrum* and *Heterocapsa* than in prior years
- No *Karlodinium* bloom



## *Cochlodinium polykrikoides* & *Alexandrium monilatum*

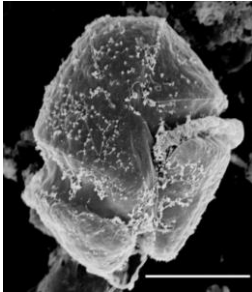
- No bloom of either species in 2019.
- *Cochlodinium*- major bloom in James R. Aug, 2018
- *Alexandrium* – no bloom in 2018 or 2019





# August 2019 Potomac River Westmoreland River bloom report

- 8/8, 8/13 bloom reports of discolored water, dead fish and crabs, and foul odor
- Westmoreland State Park
- Collection/response: DCR, DEQ, VDH, VIMS
- Surface bloom of *Levanderina fissa*
  - Non-toxic *Gyrodinium*/  
*Gymnodinium instriatum*
- Bottom water: ciliates, flagellates and bacteria



Egerton et al. 2014

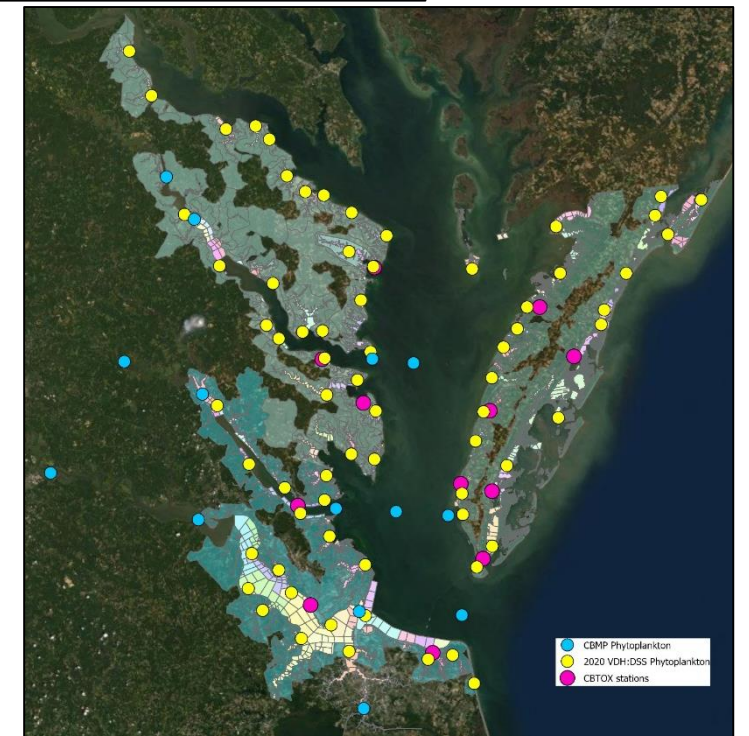
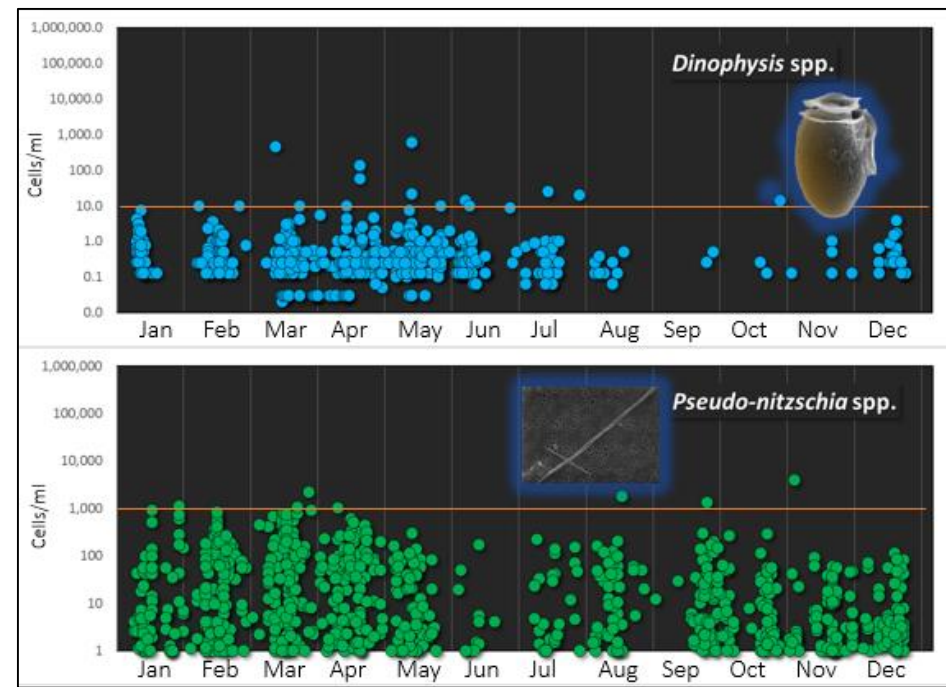
- Mixing event/ hypoxia
- Surface Chla: 196 $\mu$ g/L, DO 188%
- Bottom DO and patches of surface (grey/green) ~30% <3mg/L
- **General universal safe swimming recommendations: avoid discolored water and where there are dead fish present**



Photos: Michael Such-DCR

# 2020 program updates

- Year-round sampling and analyses
  - January-December
  - VHD:DSS screening
- Station locations
  - Additional sites, generally closer to river mouths
- Continued ELISA/RBA/PP2A screens of water
  - Contingency plan with contract lab for shellfish samples (HPLC, LC-MS)





# Ongoing efforts and goals

- Continue to build off of phytoplankton monitoring program.
- Refine relationship between phytoplankton and toxins in shellfish.
  - CBTOX 2020 (VDH:DSS/VIMS)
  - Planned continuation at 4 sites, water, SPATT and shellfish samples.
- *Azadinium* AZP
  - Microscopy screening problematic
  - Expand work with partners for molecular screening (VIMS)
  - Need for commercial toxin test
- Continued discussions with partners
  - Phytoplankton methods- toxin screenings, IFCB, remote sensing
  - Management strategies
- Tabletop exercise
  - Biotoxin event, closure, recall, re-opening

