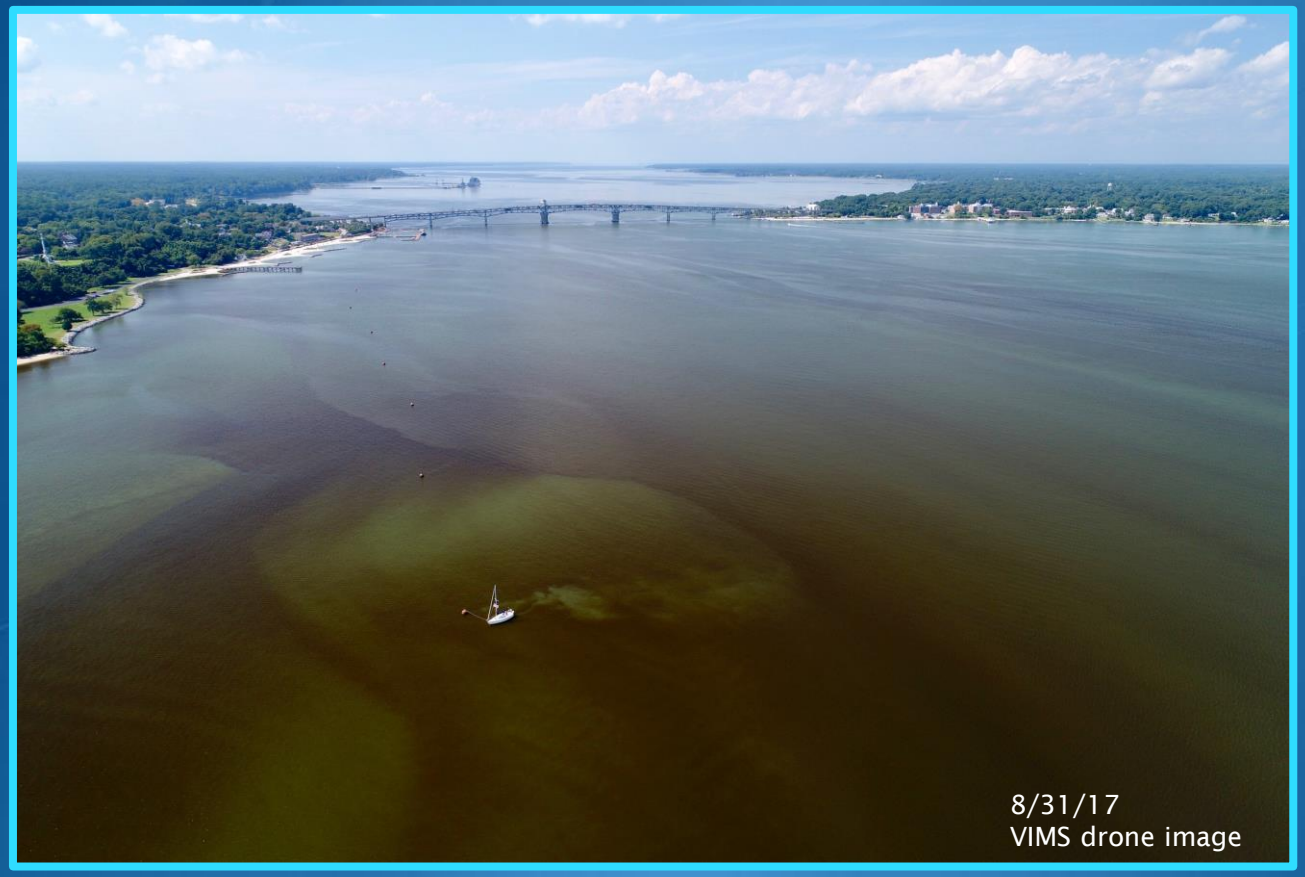
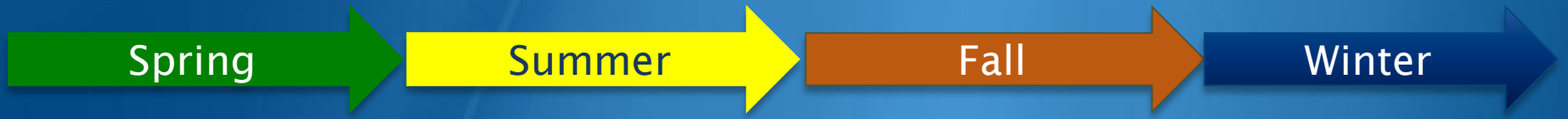
VIMS HAB Report 2017



General Bloom Pattern in VA waters



Diatoms

Heterocapsa triquetra

Pseudo-nitzschia spp.

Dinophysis spp.

Karlodinium veneficum

Prorocentrum spp.

Raphidophytes

Margalefidinium (Cochlodinium) polykrikoides

Alexandrium monilatum- toxin = goniodomins

Notable Bloom Events 2017

Date	Location	Species	Cell count (cells/ml)
Feb. 28	YR State Park	*Heterocapsa triquetra*	2,900
June 6 – July 7 (7/7)	Sarah's Creek, N Branch	*Chattonella subsalsa*	6,040 (peak)
June 13	Ingram Bay, GWR	*Prorocentrum minimum*	4,588
June 13	Locklies Creek, Rapp. R.	*P. minimum*	7,230
June 13	Gwynn's Island	*P. minimum*	1,442
June 14	Taskinas Creek, YR	*P. minimum*	3,892
June 28	Taskinas Creek, YR	*P. minimum*	2,147
June 30	Sarah's Creek, N Branch	*C. subsalsa*	1,173
July 5	Nassawadox Creek	*C. subsalsa*	1,039
July 6	York R. GP	*P. minimum*	1,631
July 7	Sarah's Creek, N Branch	*C. subsalsa*	5,728
July 11	Locklies Creek, Rapp. R.	*P. minimum*	1,029
July 27	Antipoison Creek	*C. subsalsa*	1,138
Aug. 2	Sarah's Creek, N Branch	*C. subsalsa*	4,402
Aug. 4	Sarah's Creek, N Branch	*C. subsalsa*	1.504
Sept. 22	Coan River	Copepods	

The Big Ones

Margalefidinium (Cochlodinium) polykrikoides

July 26 – Aug. 9
136,800 cells/ml (8/9/17)

Alexandrium monilatum

July 27 – Sept. 5
340,000 cells/ml (8/22/17)

Margalefidinium polykrikoides – July 27, 2017

Alexandrium monilatum (~10X lower)

York River

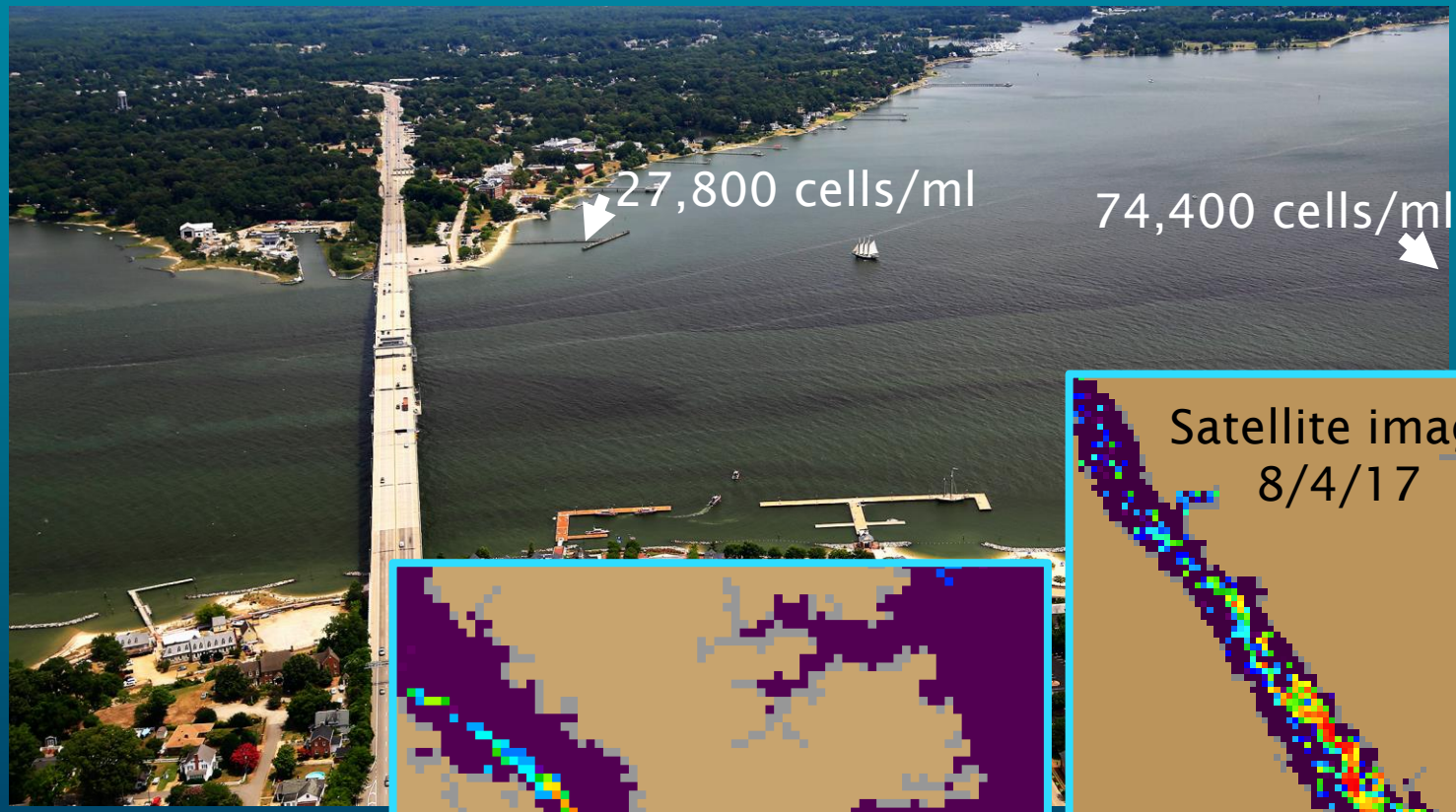
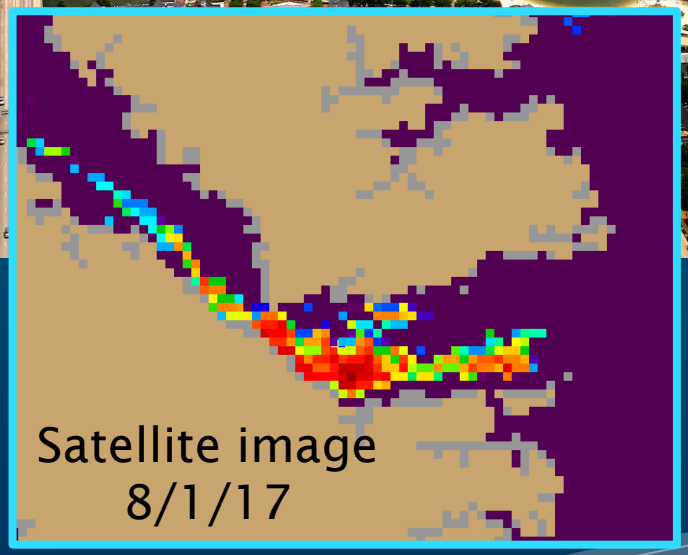
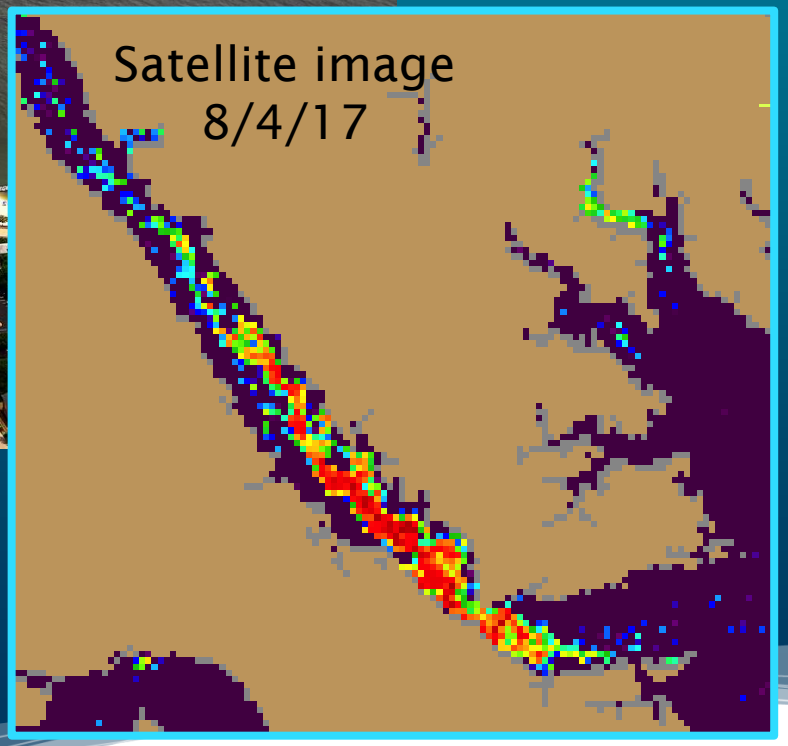


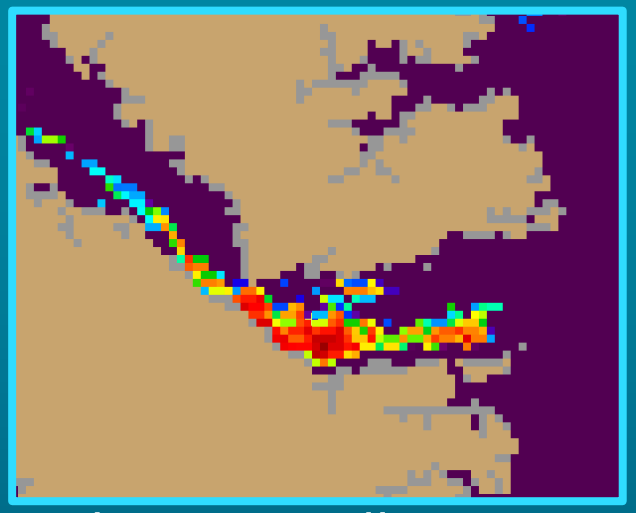
Photo by W. Vogelbein



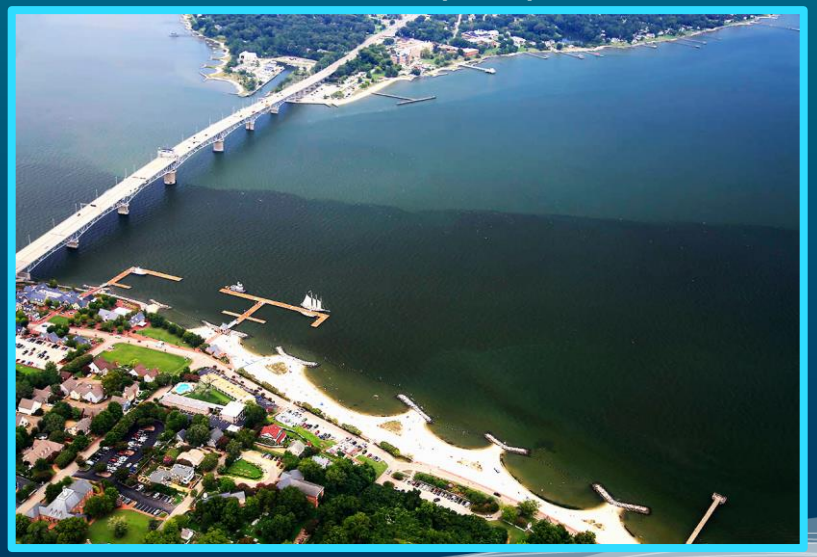


Alexandrium monilatum - Aug. 17, 2017

Mouth of North River



York River Satellite image
8/17/17



York River

Photos by W. Vogelbein

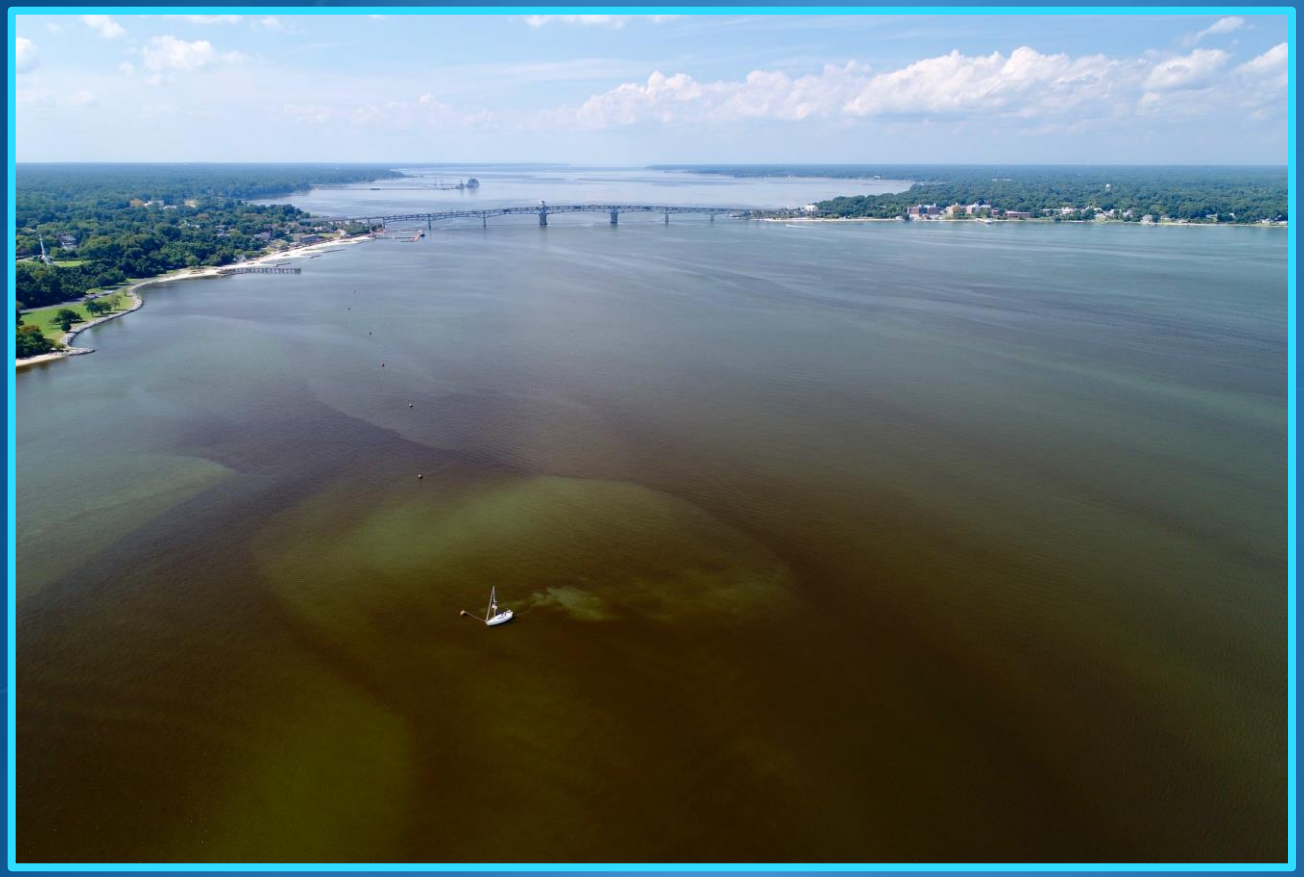
Aug. 17, 2017-South tributaries; species?


James River near Williamsburg


Lafayette River, Norfolk


Mouth of Elizabeth River, Norfolk

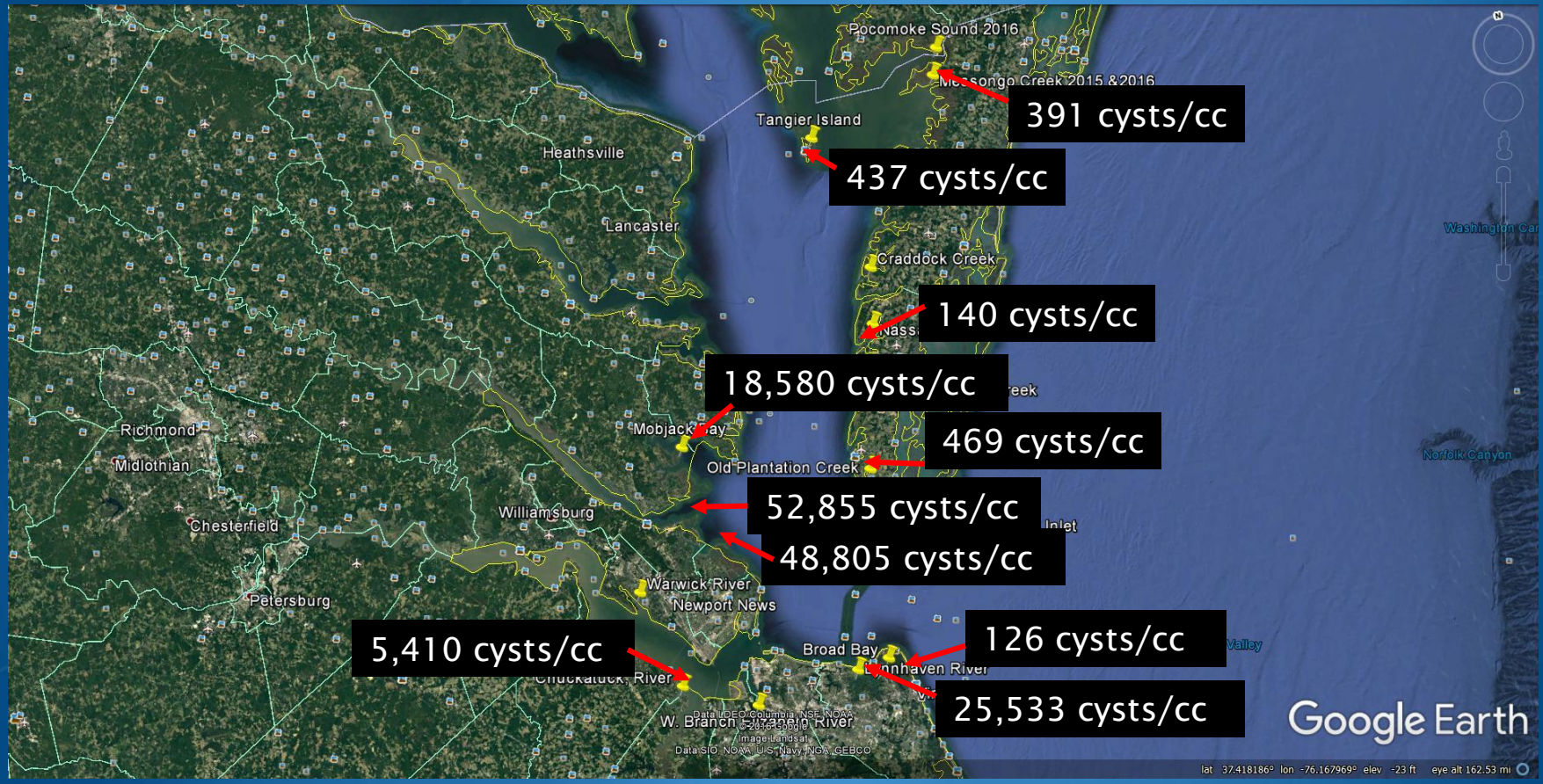
Aug. 31, 2017- *A. monilatum*



York River
Up to 168,352 cells/ml on 8/31/17

Alexandrium monilatum Cysts Established Throughout Southern Chesapeake Bay

qPCR Analysis of VIMS (S. Pease) and VDH Sediment Samples - 2016



Bloom Impacts- Review of Previous Years?

2007 *A. monilatum* bloom: ~500 VIMS *Rapana* whelks die in tanks with York River flow-through water

2008 *A. monilatum* bloom: ~6 VIMS cownose rays die in sand filtered tank with York River water being fed oysters from the York River

<u>Aquaculture Operations</u>

Numerous years- mortality reported during blooms

- 2015: York River Region- oyster growers on the north side of the York reported extremely high mortality (>70-80% of juveniles- fall/winter harvest animals)
  - Higher mortality with inter-tidal vs. sub-tidal oysters

Bioassay Results:Oyster Larvae and Spat (2-3mm)

- *Karlodinium veneficum*
  - 80-100% mortality in larvae after 72-96 hr (>1,000 cells/ml)
  - NO mortality observed in spat (diploid or triploid)

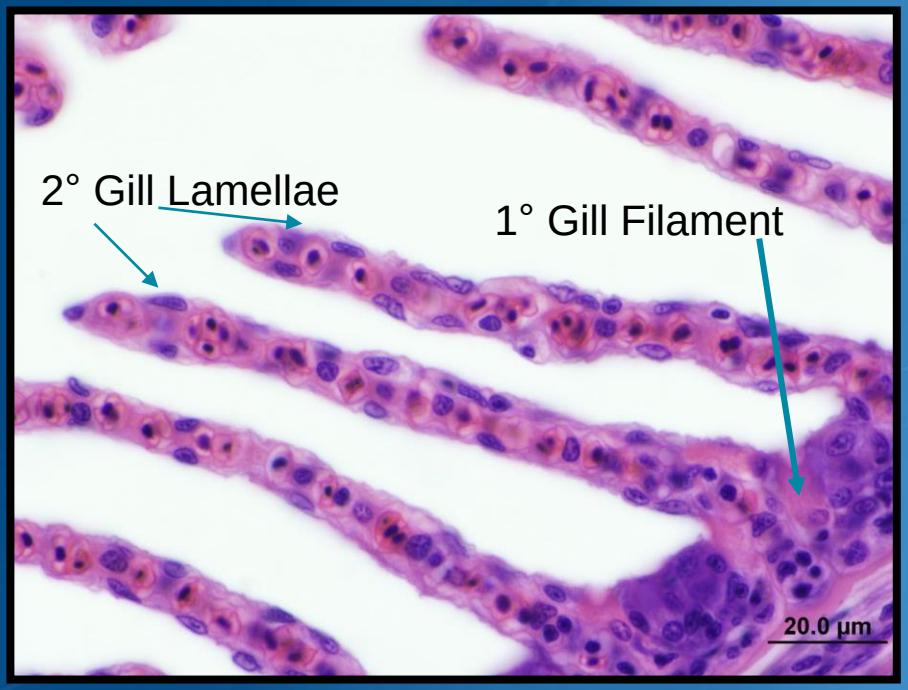
- *M. polykrikoides*
  - 80-100% mortality in larvae after 72-96 hr (>1,000 cells/ml)
  - NO mortality observed in spat (diploid or triploid)

A. monilatum: Mortality More Rapid at Lower Concentration

- *A. monilatum*
  - 80-100% mortality in larvae after 48 hr, 100% at 72 hr (>1,000 cells/ml)
  - 100% mortality observed in spat (diploid and triploid) after 72 hr at 2,000 cells/ml. 80-100% at >800 cells/ml

Laboratory Studies Fish Gill Tissues Histopathology

Normal Gill Pathology



Necrotic Gill Pathology
Exposure to 4000 cells/ml *A. monilatum*

Impacts?

2016: NOAA NCCOS HAB Event Response Project

6 Week Field Study- 3 sites

Oysters deployed in aquaculture bags
Intertidal and Sub-tidal

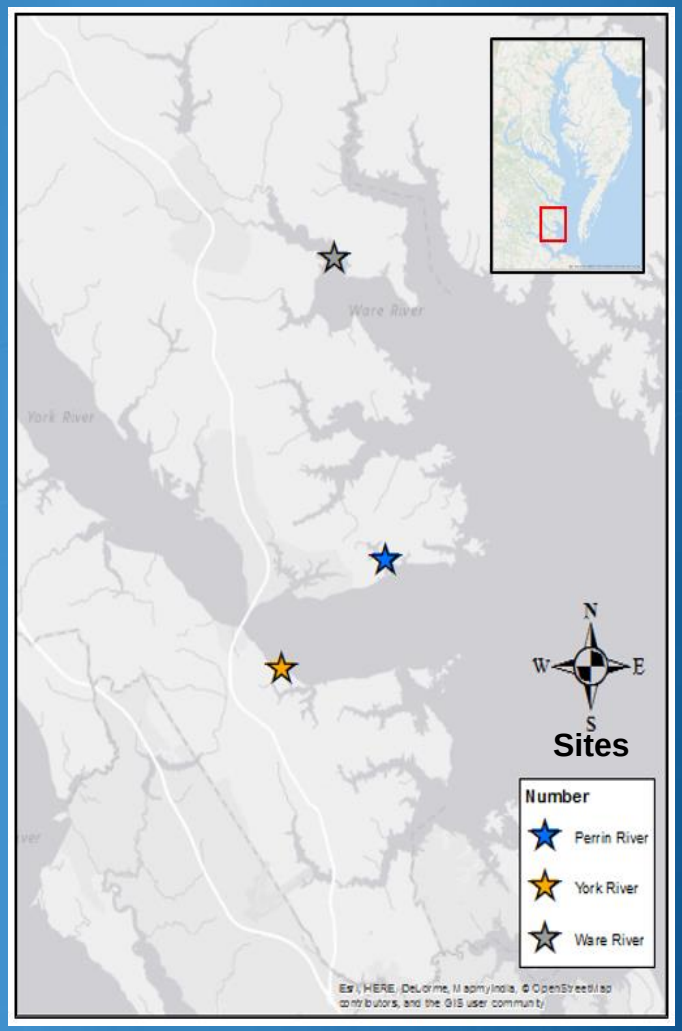
- Low energy site Perrin River- bloom
- High energy site York River- bloom
- Reference site- creek off the Rappahannock- low bloom

Results-low mortality overall

- Highest mortality was13.6%, observed at the Perrin inter-tidal oysters
- Mortality at the other sites, both intertidal and sub-tidal ranged from 2.9 – 6.3%.

2017 Field Experiments

Clara Robison VIMS Graduate Student



Experimental Sites

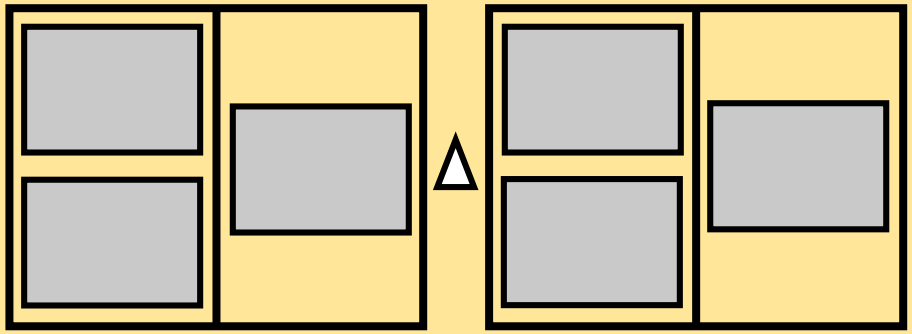
Perrin River - Low energy

York River - High energy

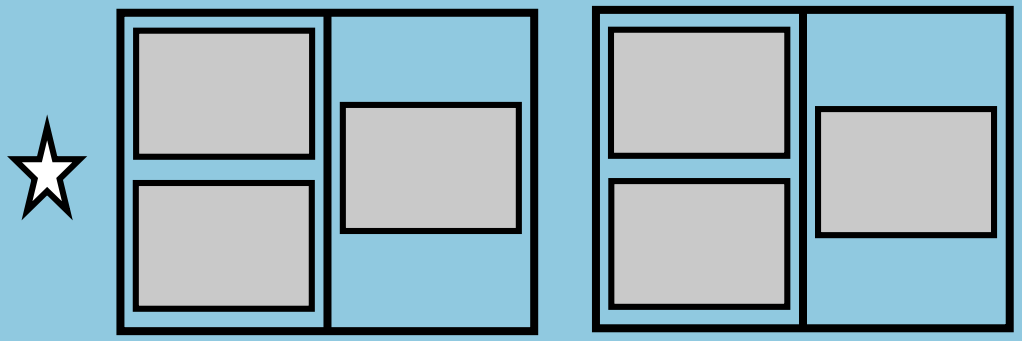
Reference

Ware River - Intermediate energy

INTERTIDAL



SUBTIDAL



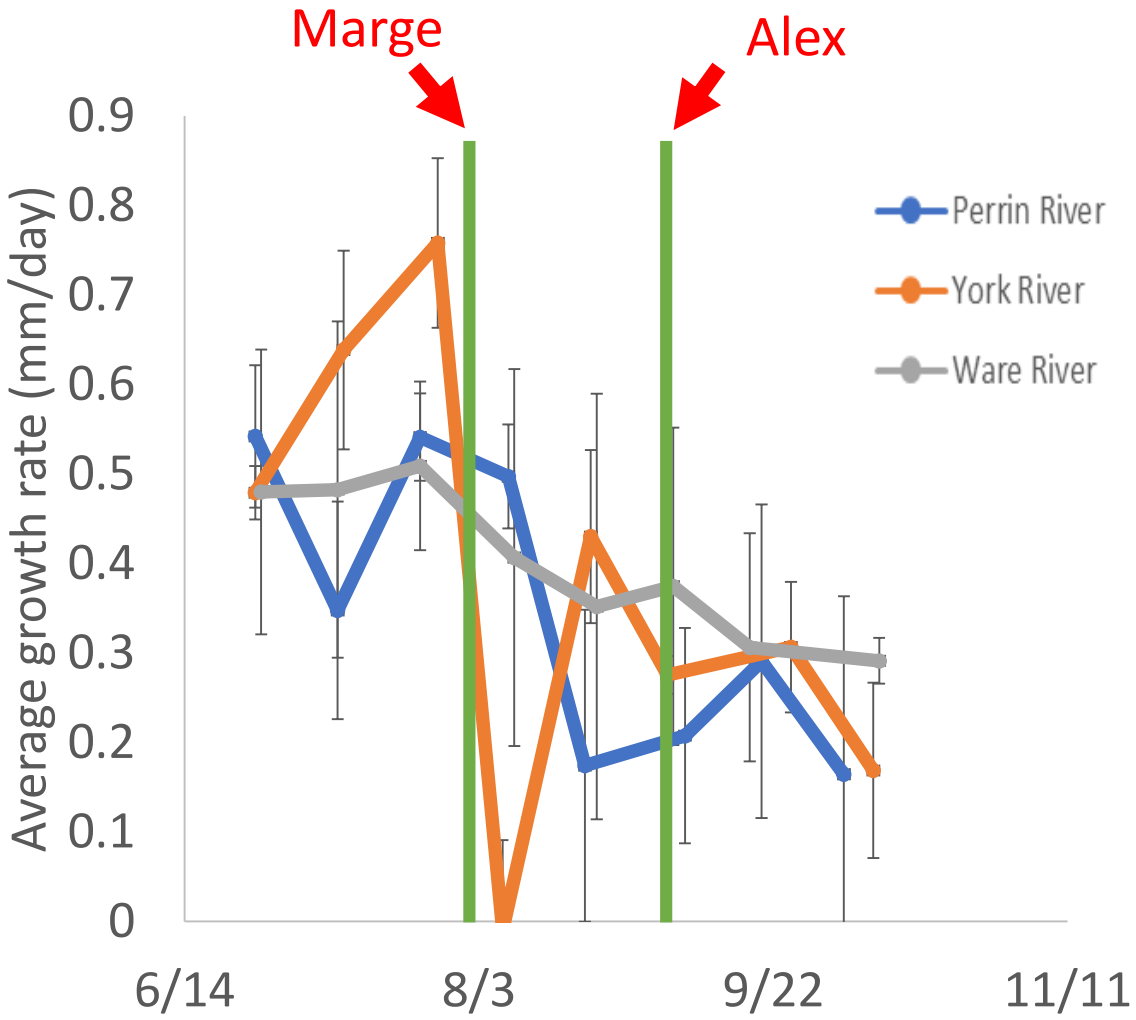
Deployed: June

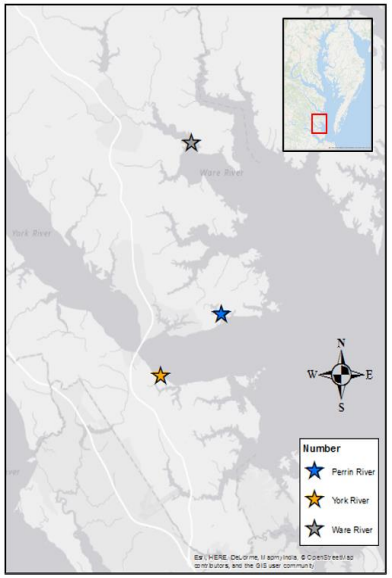
Deployed: July

HOBO: temperature and salinity

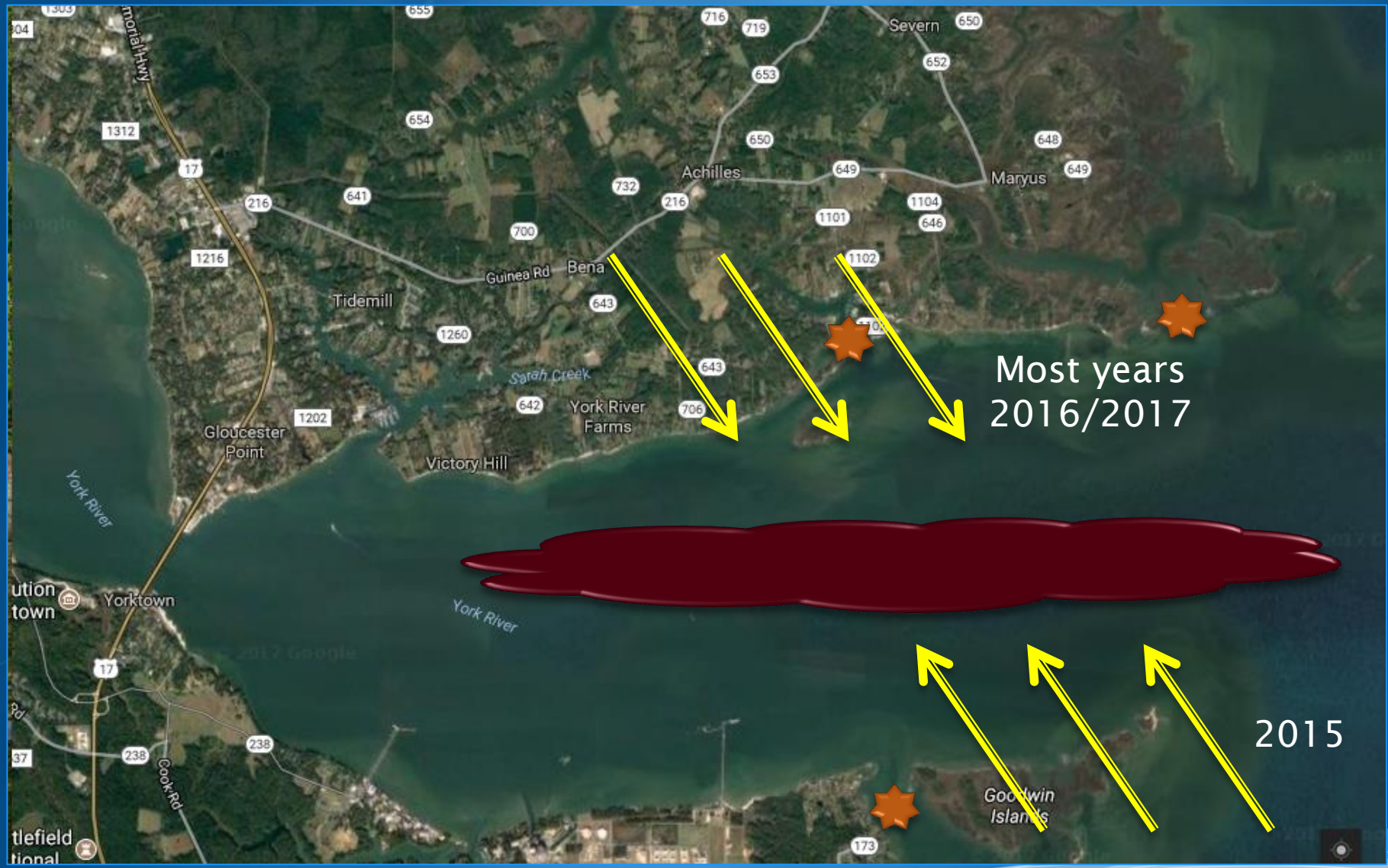
Sonde: temperature, salinity, dissolved oxygen, pH, chl *a*

Preliminary Results





North or South Shores of the York River Impacted More/Less Depending on Prevailing Winds



Summary

- Late summer bloom progression: *M. polykrikoides* consistently bloom peaks before *A. monilatum* peaks in lower Chesapeake Bay
- Historically, blooms seem to have expanded from York River region to throughout the lower bay.
- Satellite imagery is helping to guide sampling and identify bloom sites.
- *A. monilatum* cyst bed is now expanded throughout the lower bay.
- Oysters studies will continue at several sites in lower bay to examine impacts of stressors with focus on HABs, and using different grow-out techniques and sites. Goal-Provide aquaculturists with best strategies
- 2017 late summer blooms were of relatively short duration and of limited geographic range.

Dominion

Sea Grant Virginia

NOAA National Oceanic and Atmospheric Administration U.S. Department of Commerce