2022 Marine Recap-VIMS

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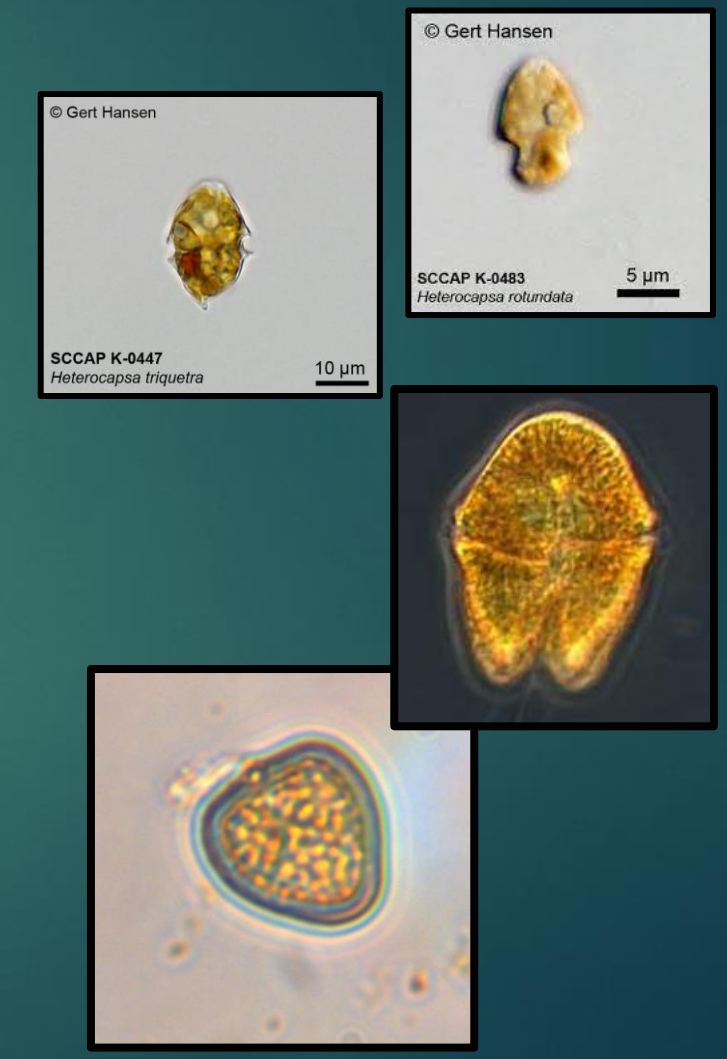
VIMS | William & Mary
Virginia Institute of Marine Science

2022 Blooms: Spring & Early/Mid Summer

- *Heterocapsa spp.*
- *Akashiwo sanguinea*
- *Prorocentrum cordatum*



Heterocapsa spp. / P. cordatum

Rappahannock River

Mid-Spring – June - *H. rotundata, Karlodinium veneficum, Prorocentrum cordatum*

York River

April - *H. triquetra* with *P. cordatum*

May -Mixed samples *H. triquetra* with, *P. cordatum, K. veneficum*

June - mixed bloom samples with *P. cordatum, Levanderina fissa, H. triquetra* with chlorophytes

July in the Rappahannock and York Rivers

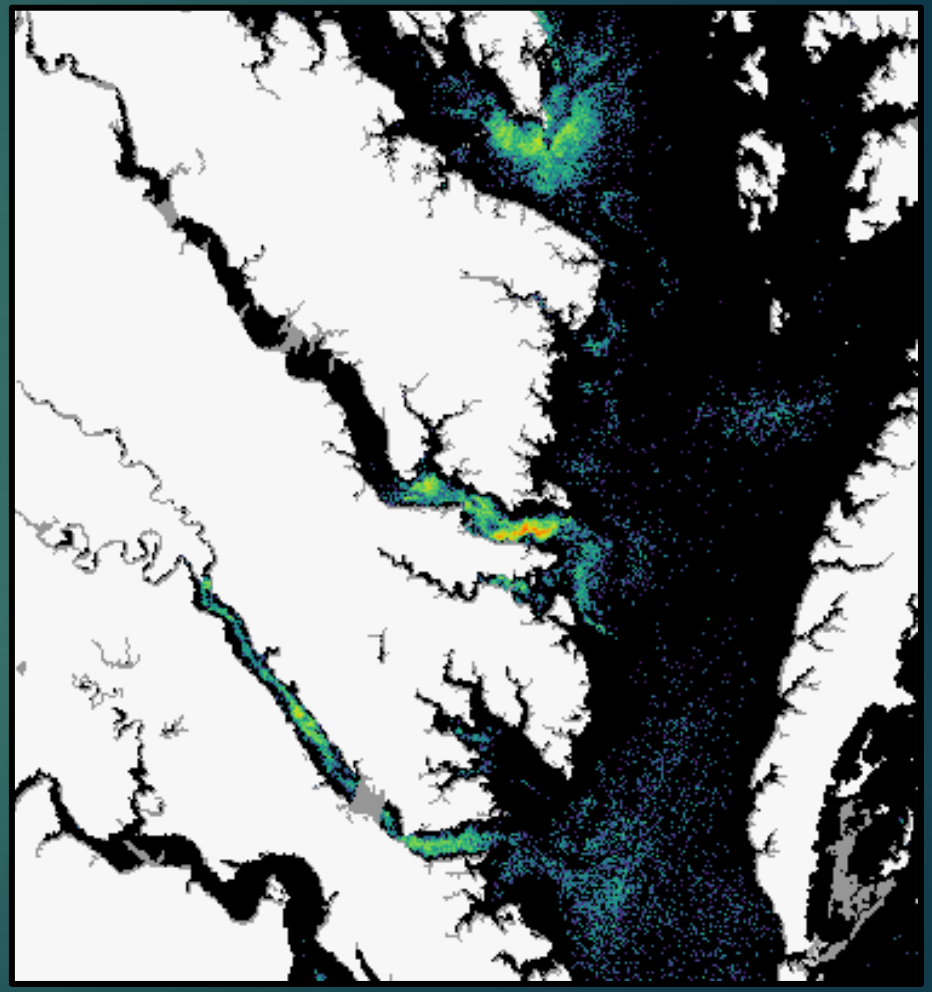
Rappahannock River

Bloom *P. cordatum, Levanderina fissa, Scrippsiella*

York River

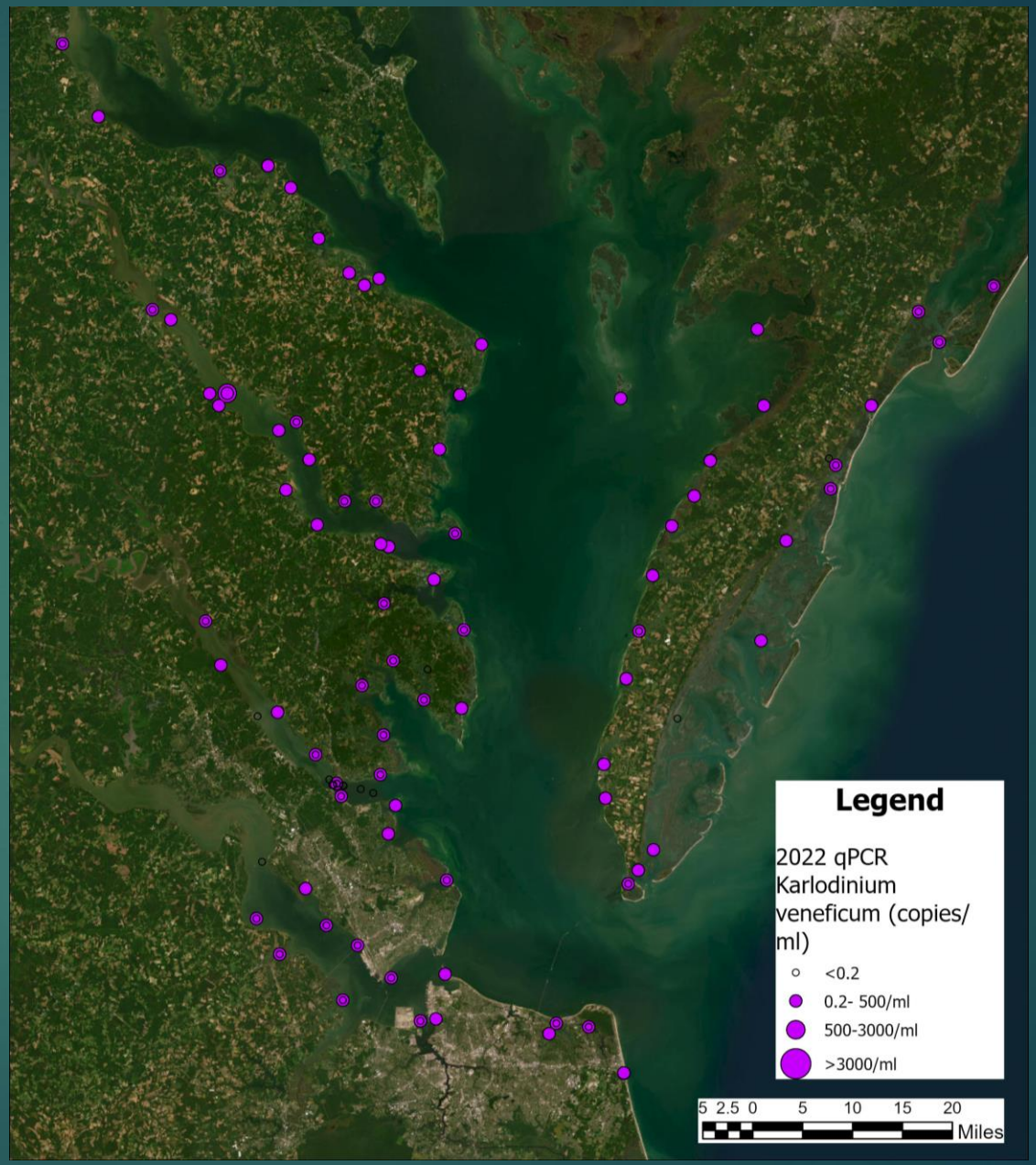
Bloom of *H. rotundata, P. cordatum, K. veneficum, A. sanguinea, L. fissa*

Switching over to Marg

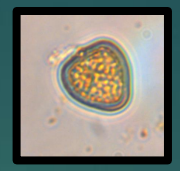


July 28th 2022

Karlodinium veneficum (qPCR)

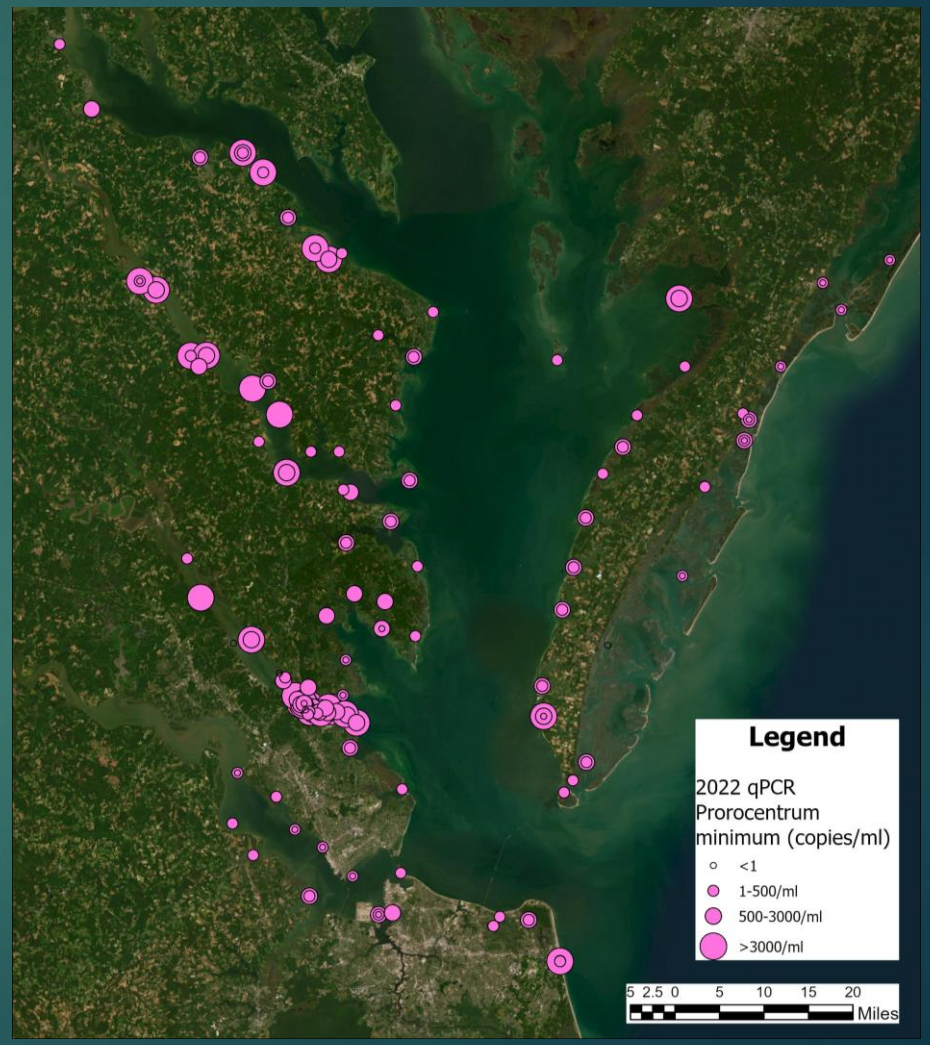


Maps from T. Egerton

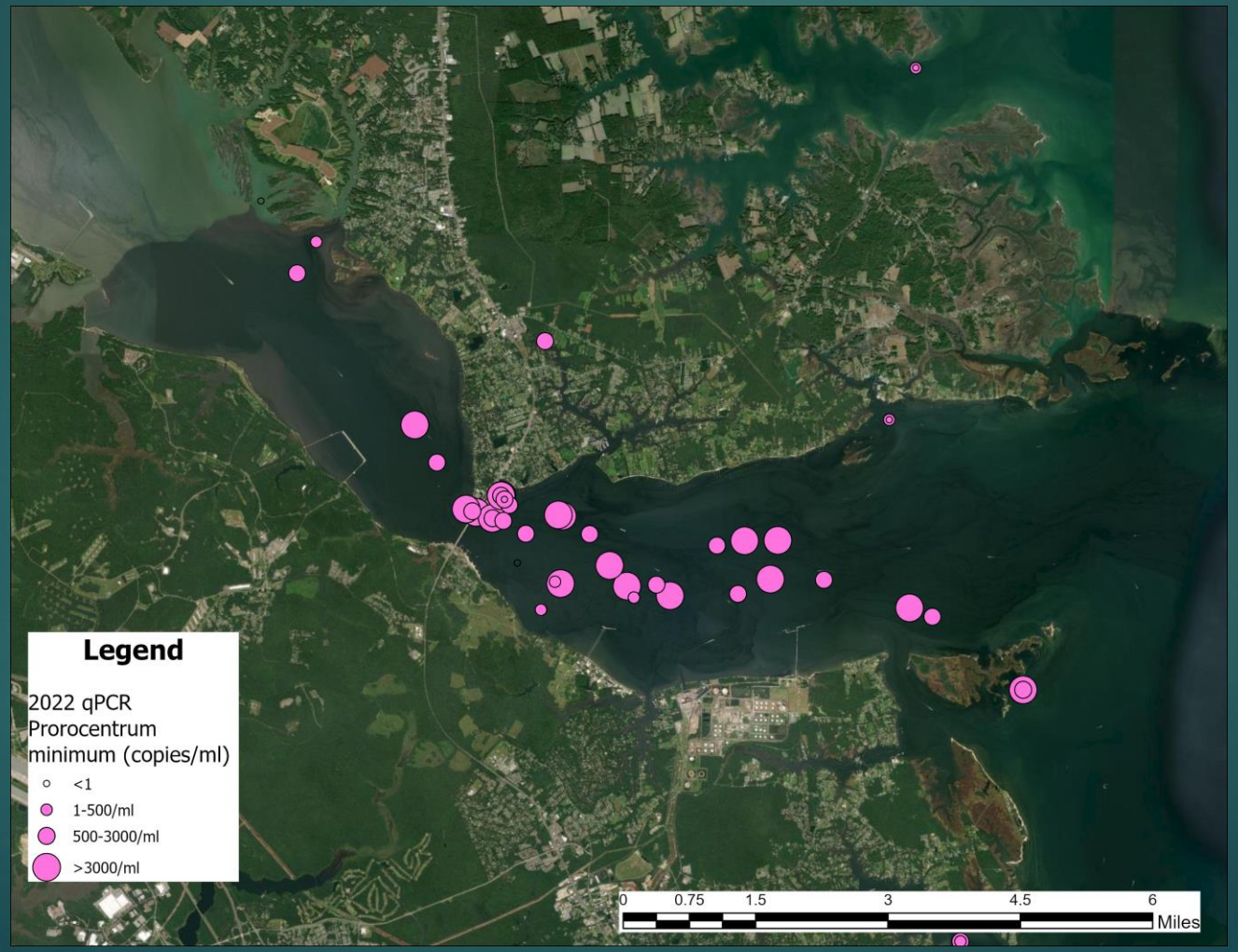


Prorocentrum cordatum

- Many bloom samples, particularly from the Rappahannock and York beginning April
- Elevated levels continued into August with Marg and Alex bloom samples

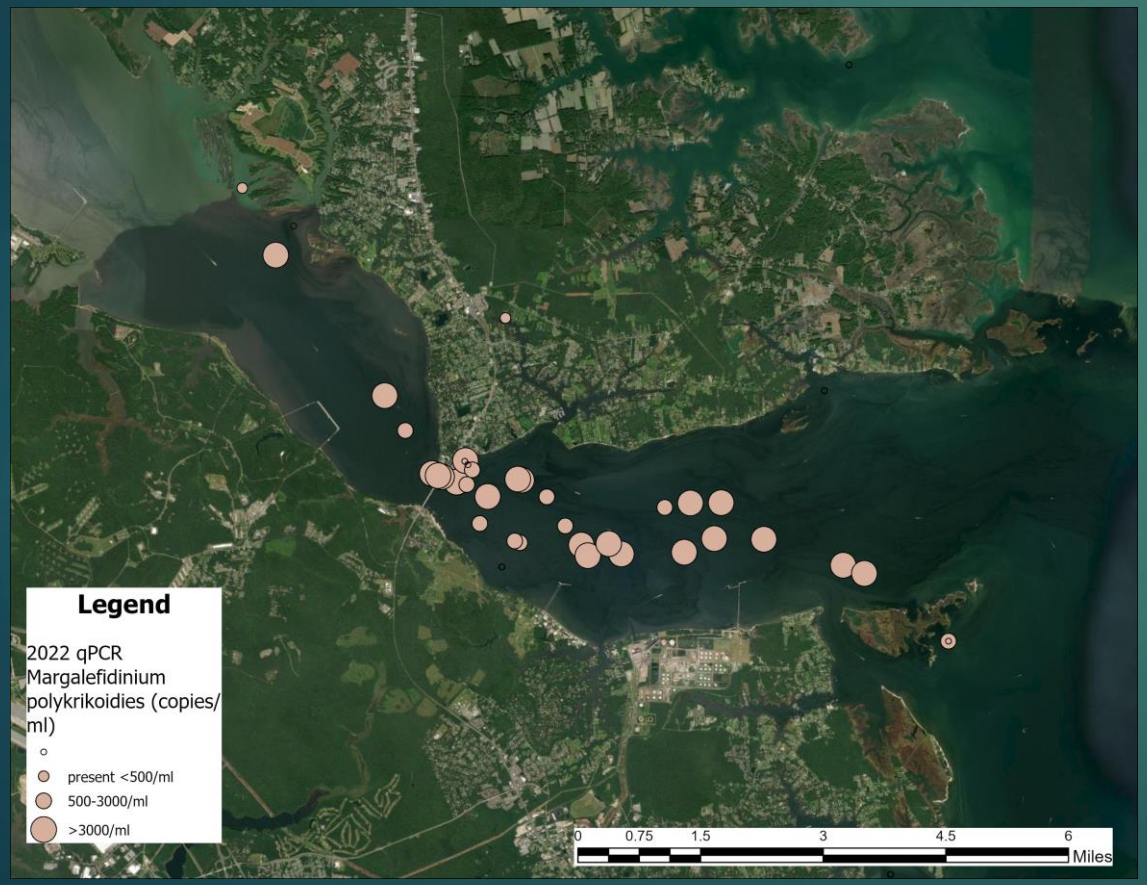


Prorocentrum cordatum in the York- 2022

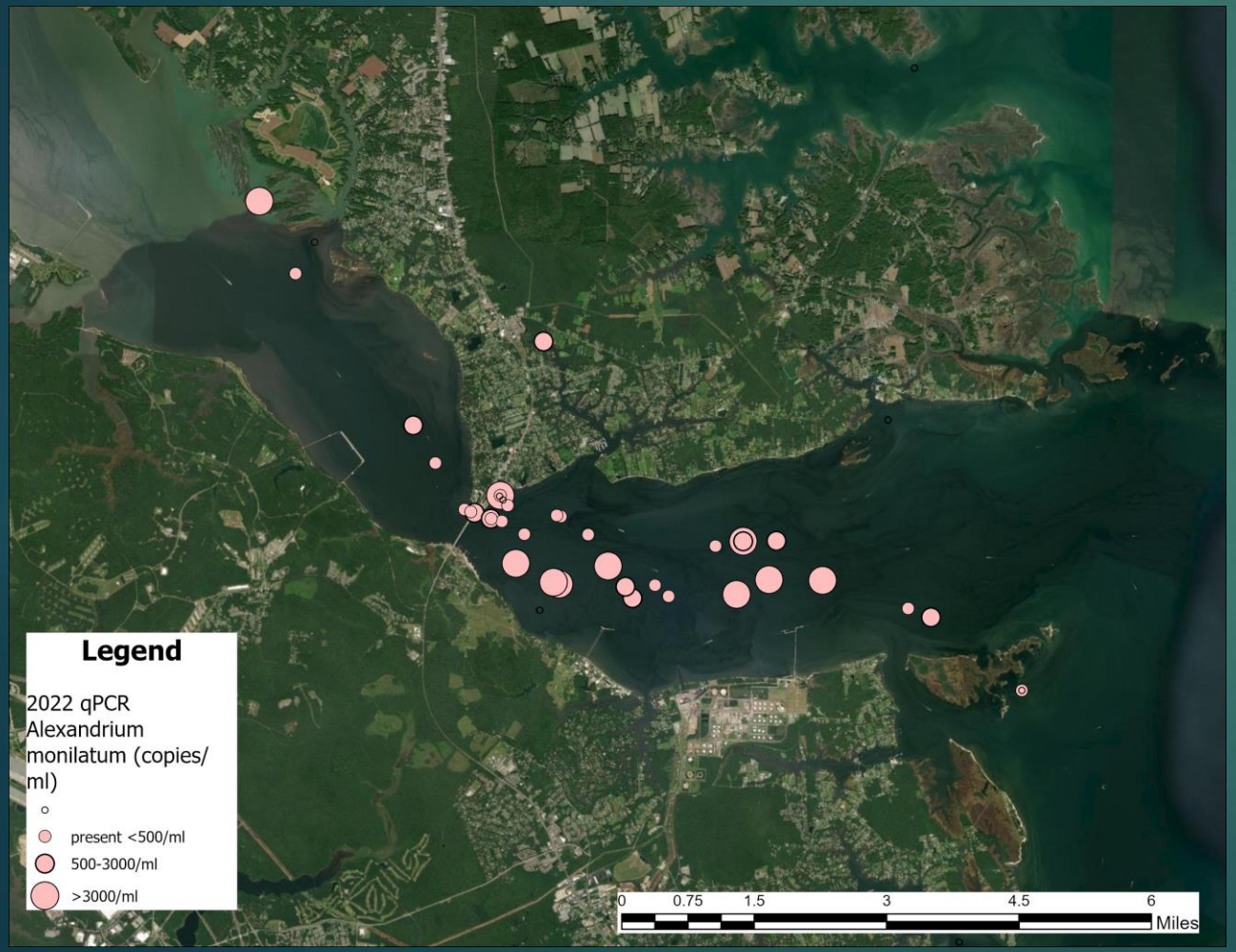


Margalefidinium polykrikoides

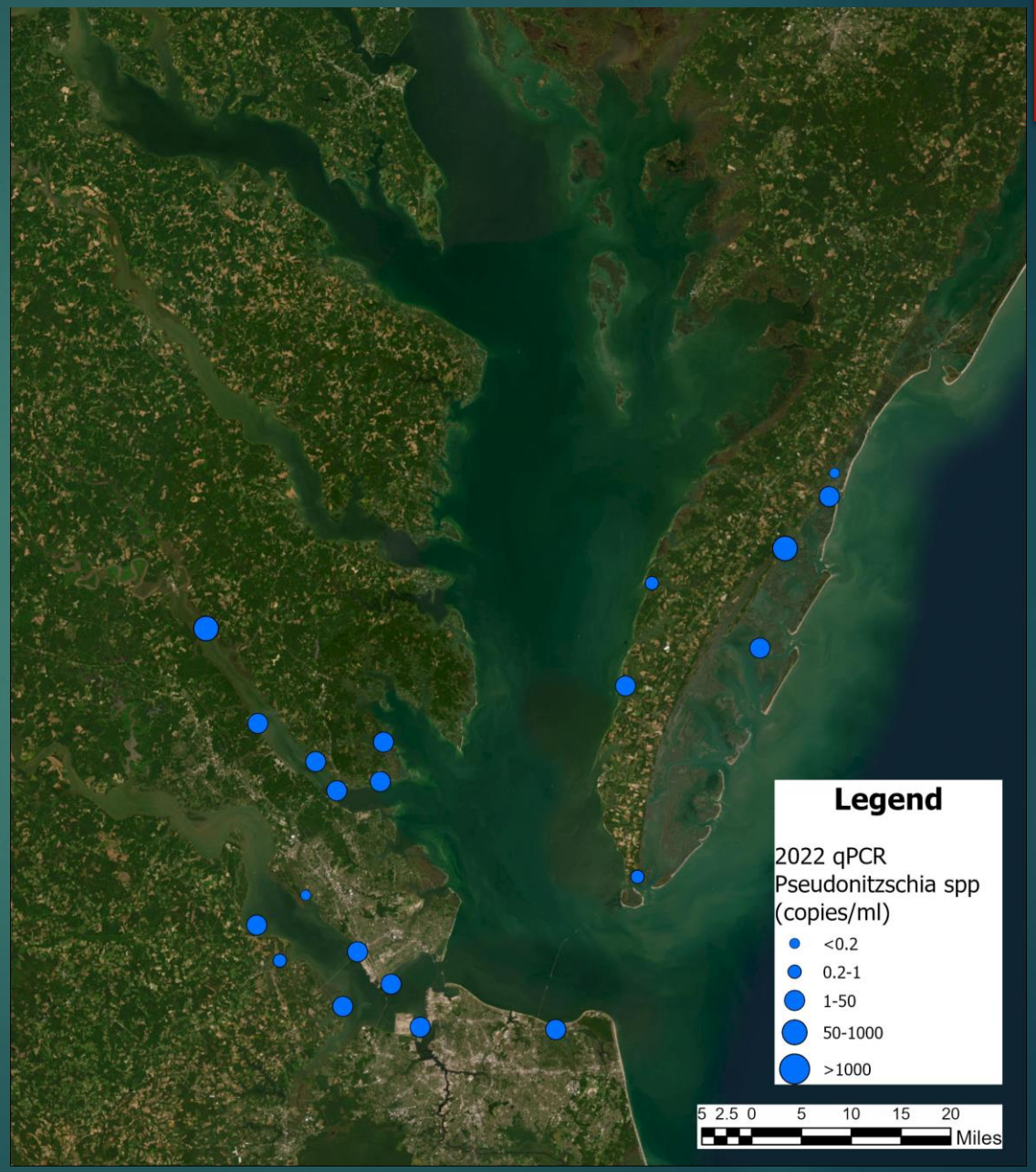
W. Jones_VIMS



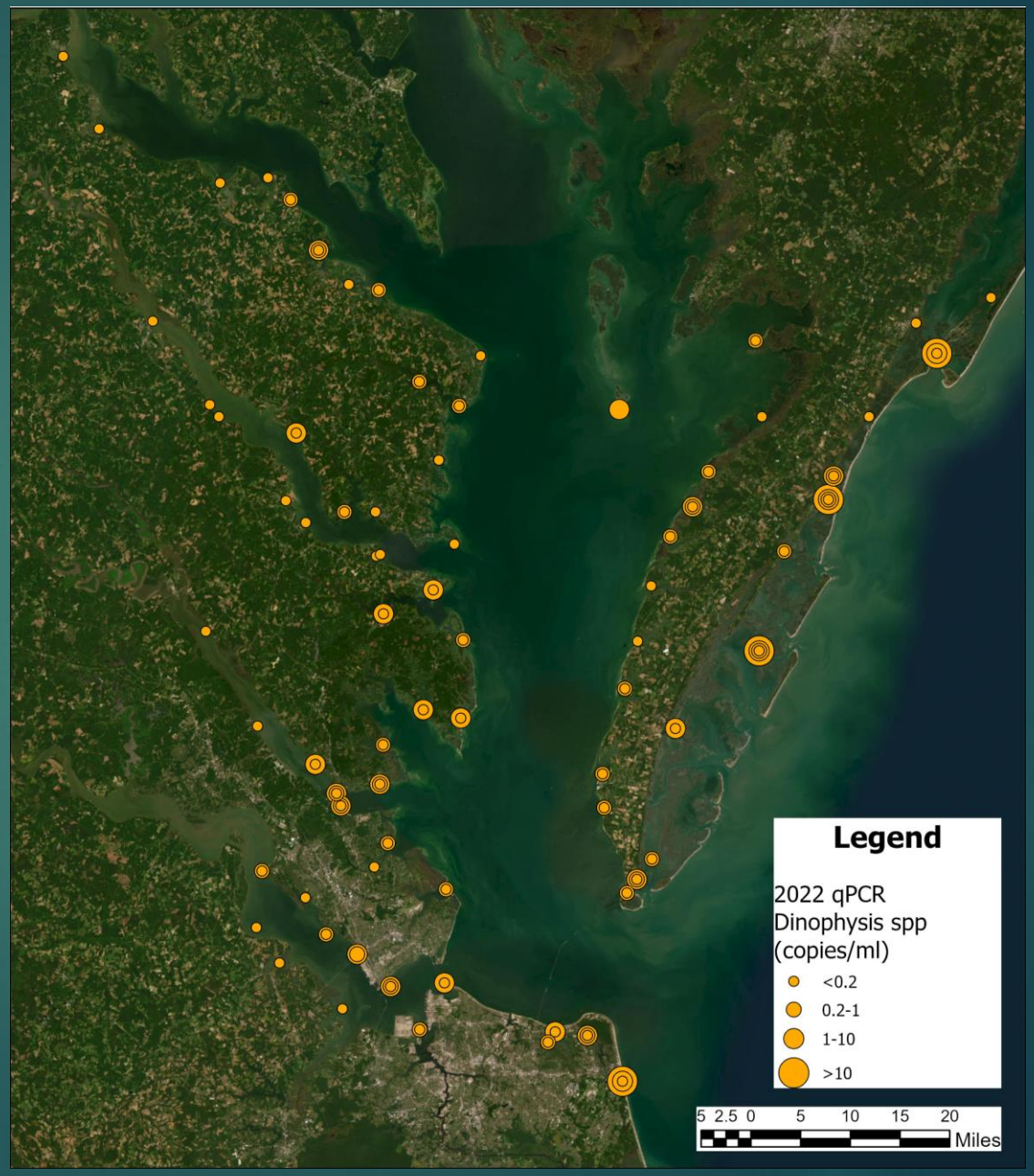
Alexandrium monilatum



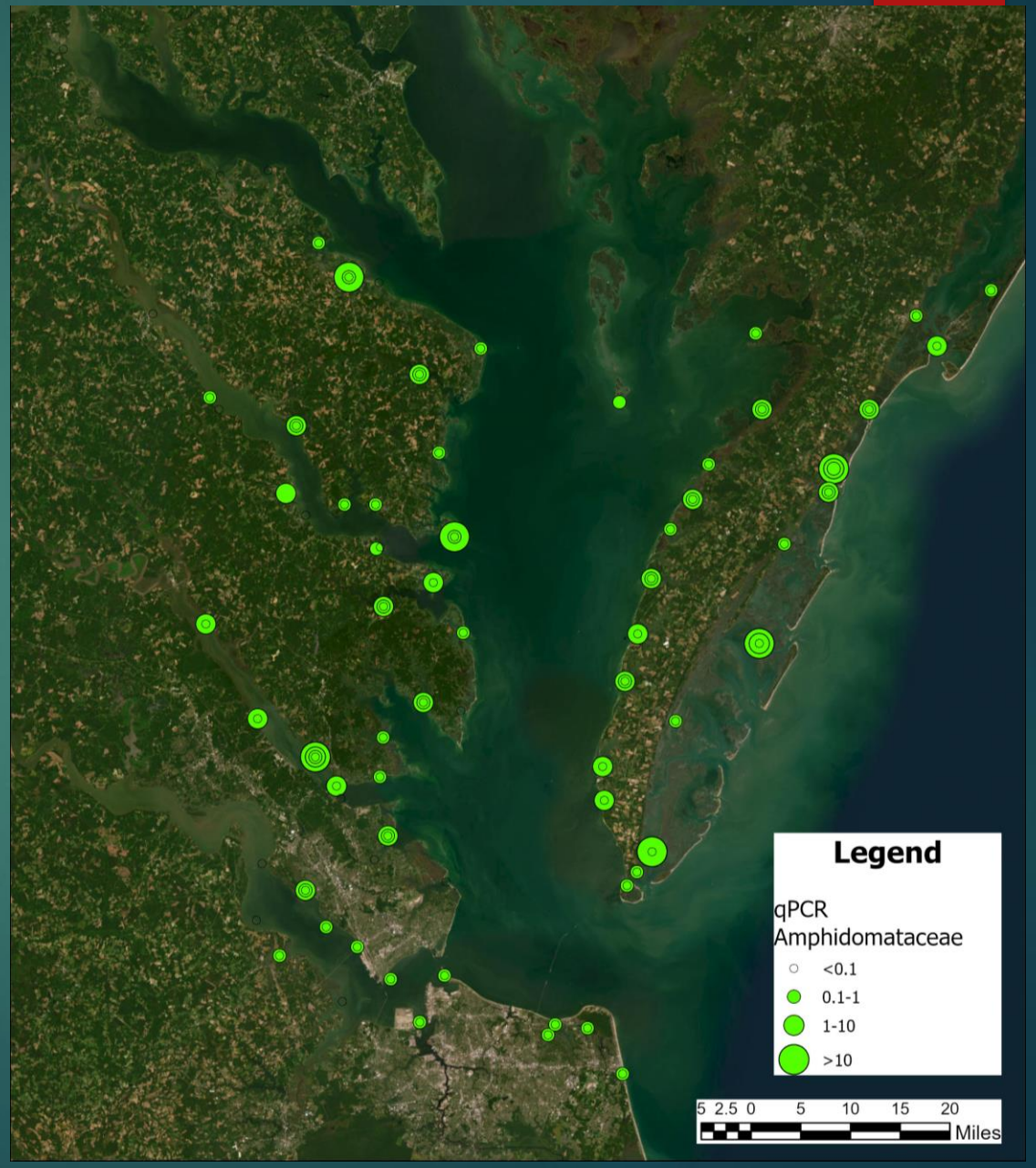
Pseudo-nitzschia spp.



Dinophysis spp.



Amphidomataceae spp.



Updates on the *Pseudo-nitzschia* spp. qPCR assays

- *Pseudo-nitzschia* spp. visual and qPCR counts were not well correlated with the previous assay we were using (Penna et al. 2007)
  - Primers not very specific
  - new sequences now in GenBank show DNA from many other taxa likely being targeted
- Another assay tested: Primers have better specificity based on GenBank searches (Fitzpatrick 2010)

P-n spp. qPCR assay comparison

- 2022 samples being run with new P-n assay
- Digital PCR will be done for some of the qPCR assays (QIAcuity Four Digital PCR System)
  - Alex
  - P-n?
  - Marg?
  - P. cordatum?

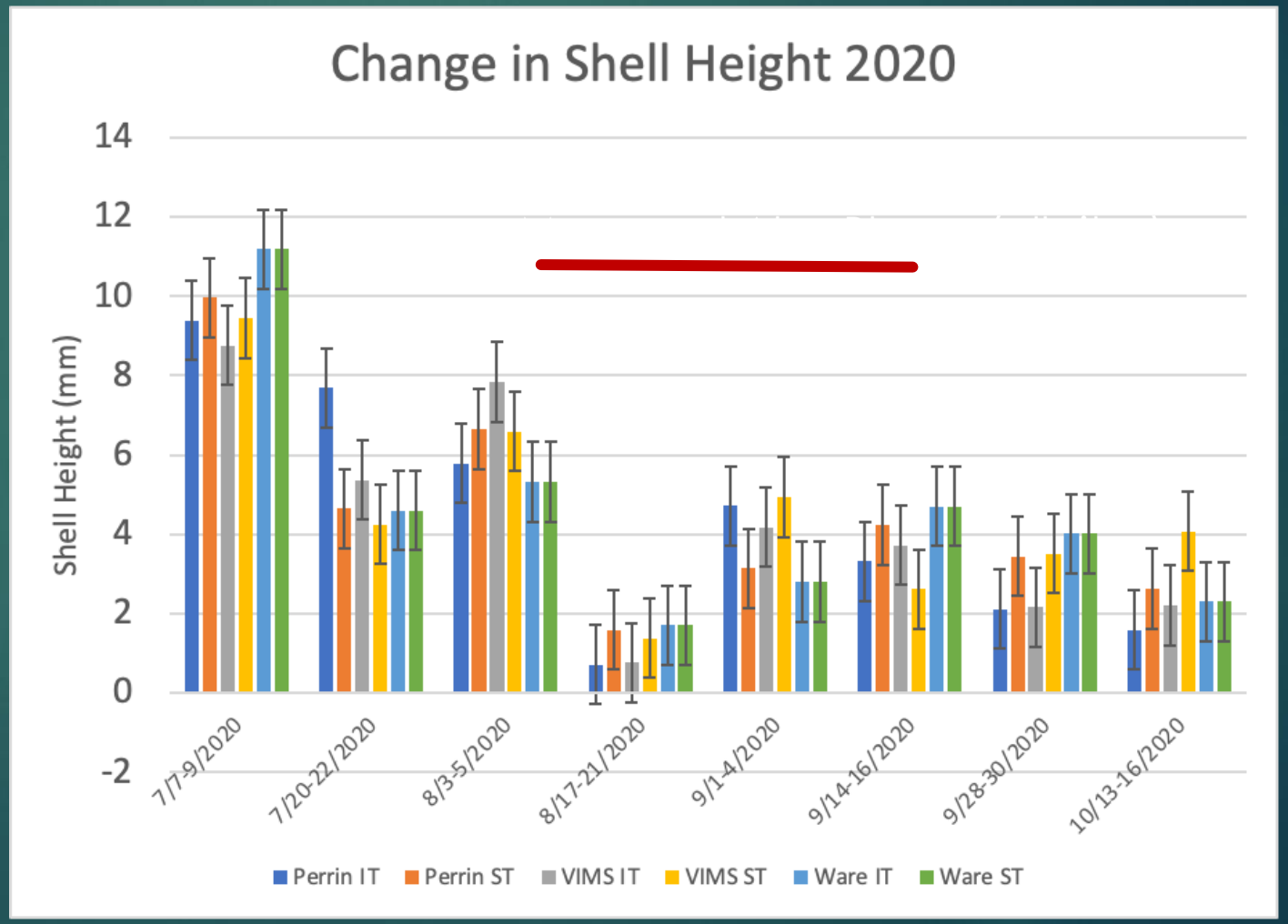
Date Collected	GA	Station	VISUAL count	count P-n spp. <5um	count P-n spp. >5um	OLD assay	NEW assay	ASP Toxin-BDL=0.49
5/26/21	99	1	0.00			163.25	1.85	0.88
7/28/21	92	6	0.75		0.75	3.83	6.24	0.97
8/11/21	97	15	5.50		5.50	119.58	36.82	1.01
8/11/21	98	1	1.25		1.25	133.66	16.13	0.67
8/23/21	96	21	138.75	10.75	128.00	172.07	46.61	1.12
8/24/21	93	6	1.75	1.25	0.50	16.23	1.95	0.90
8/24/21	92	6	1.75		1.75	51.77	9.80	1.63
10/18/21	67	U22	46.00		46.00	319.73	65.92	0.49
10/19/21	100	1	1.50	0.75	0.75	46.44	5.21	1.07
10/20/21	86	3	0.00			198.57	18.26	0.49
10/21/21	93	6	1.00		1.00	49.08	8.79	1.01
10/21/21	92	6	0.00			23.90	2.27	1.52
10/25/21	95	1	1.00		1.00	28.88	8.14	1.06
12/21/21	92	6	2.25		2.25	42.64	28.57	1.14
3/4/21	95	1	1.00		1.00	0.25	3.37	0.54
2/8/21	41	1	3.75	3.75		41.10	2.25	0.49
3/3/21	44	4	10.75	9.50	1.25	3.90	0.16	0.49
3/8/21	50	18	2.75		2.75	9.80	1.28	0.49
3/10/21	81	1	1.00		1.00	12.89	0.01	0.49
3/11/21	77	3	2.00		2.00	0.06	0.00	0.49
3/22/21	21	6	2.00	2.00		3.30	0.10	0.49
3/22/21	58	8	1.00	1.00		0.01	0.00	0.49
4/21/21	71	4	466.00	423.00	43.00	224.40	2.61	0.49

Impacts of Late Summer Blooms:

Generalized linear models:

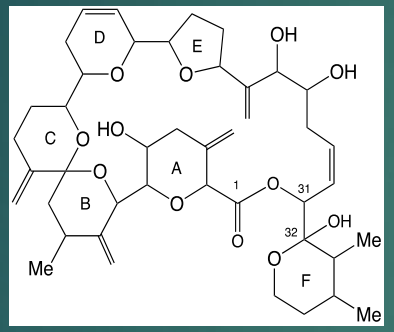
Growth rate is lower when Marg or Alex concentrations are higher

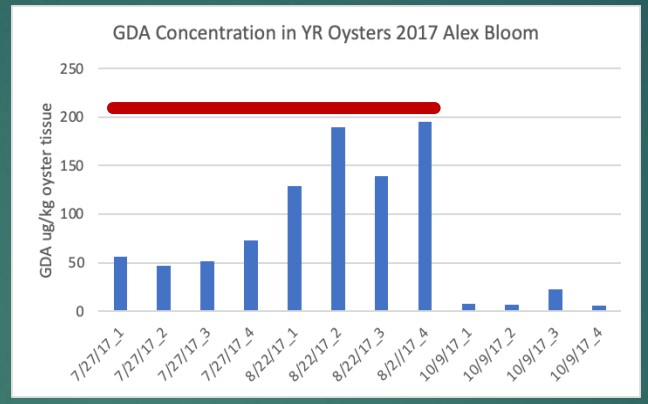
Impact lags cell count by 2 weeks



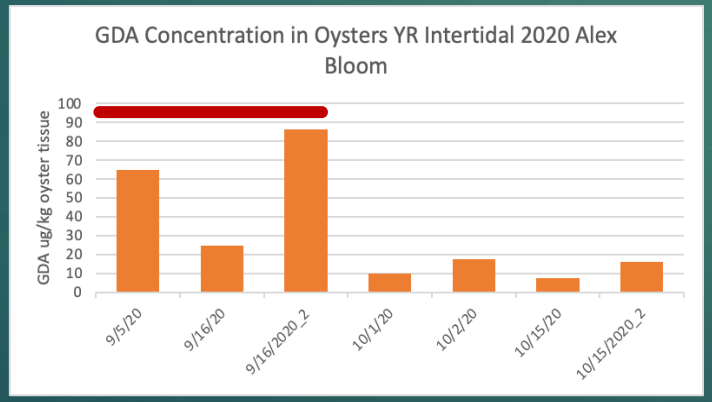
Oysters Accumulated *A. monilatum* Toxin Goniodomin A

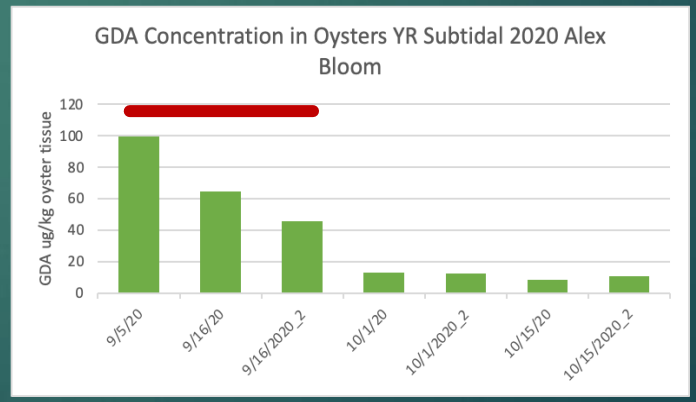
Goniodomin A (GDA)





Alex Bloom July. 27- Sept. 5, 2017 (intermittent 8/6-8/20)

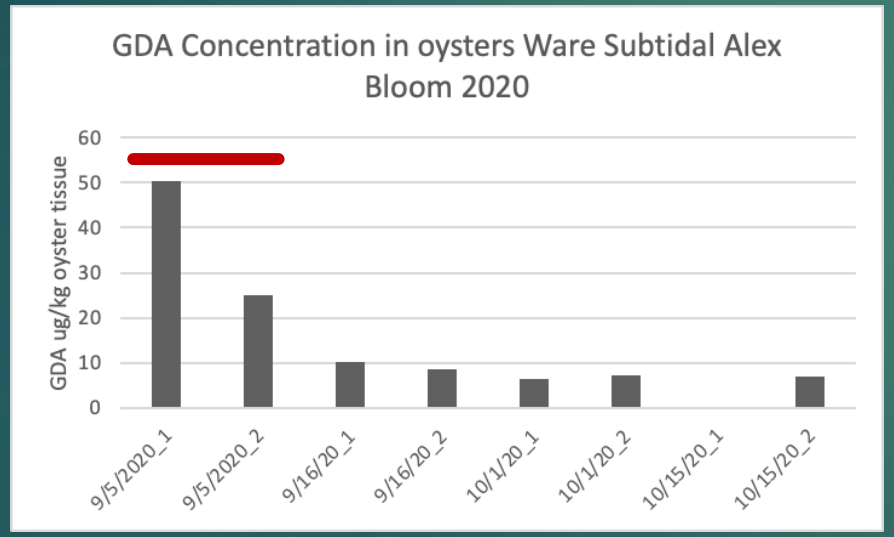


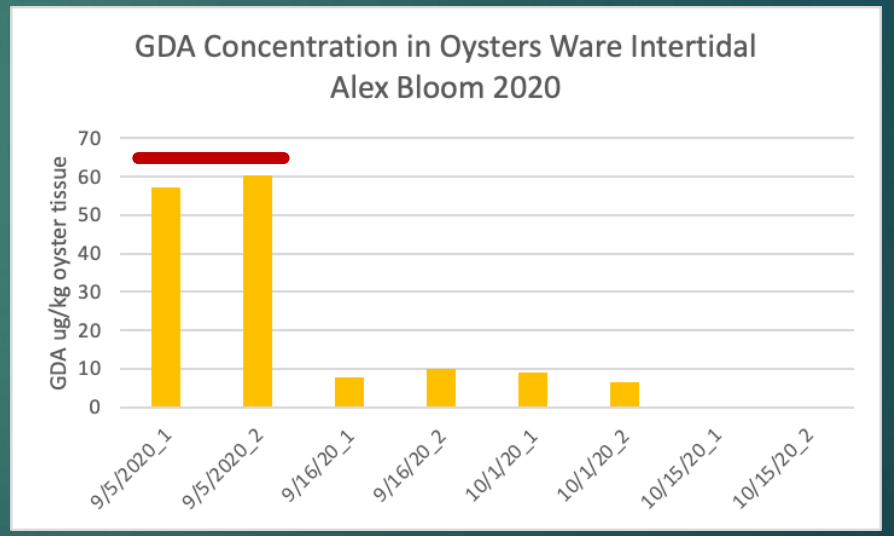


Alex Bloom Aug. 28- Sept. 15, 2020

Oysters Accumulated *A. monilatum* Toxin Goniodomin A

- Bloom of Alex at the "Reference" Site in 2020
- Oysters Accumulated GDA





Late Summer Bloom and Non-Bloom Years?

- Heavy blooms of both Marg and Alex in:
- 2007, 2008, 2009, 2012, 2017 (York River), 2013, 2015, 2016, 2020 (throughout lower Bay)
- No blooms: 2014 or 2019
- Blooms of Marg only: 2010, 2011, 2021
- Blooms of Marg only in the southernmost Bay tribs (James, Lafayette): 2018

❖ 2022: Primarily Marg, some dense Alex patches

Summary

- 2022 blooms in the York (and Rapp) were a diverse mix of species
- Marg bloom persisted for several weeks in the York- (Marg, Proro, Alex, some *Heterocapsa*)
- "New" *Pseudo-nitzschia* genus assay looks promising
- Oyster growth rate slowed after the onset of Marg and Alex blooms.
- Oysters exposed to blooms of Alex accumulated the toxin GDA and depurated it slowly after the bloom dissipated.

Funding

- VDH VIRGINIA DEPARTMENT OF HEALTH
  To protect the health and promote the well-being of all people in Virginia
- NCCOS | NATIONAL CENTERS FOR COASTAL OCEAN SCIENCE
- NOAA FISHERIES