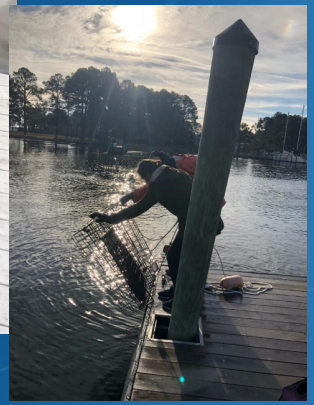
Survey of phycotoxins in oyster meat



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CBTOX collaboration between

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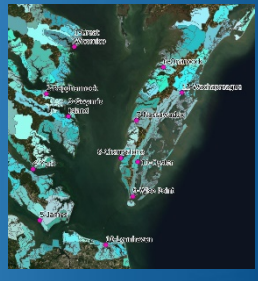

Establish baseline HAB toxin data for Virginia

Phycotoxins on SPATT 2017-2018:

OA
DTX1
PTX2
GDA
AZA1
AZA2
MC-LR (FW)
DA

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Spatiotemporal distribution of phycotoxins and their co-occurrence within nearshore waters

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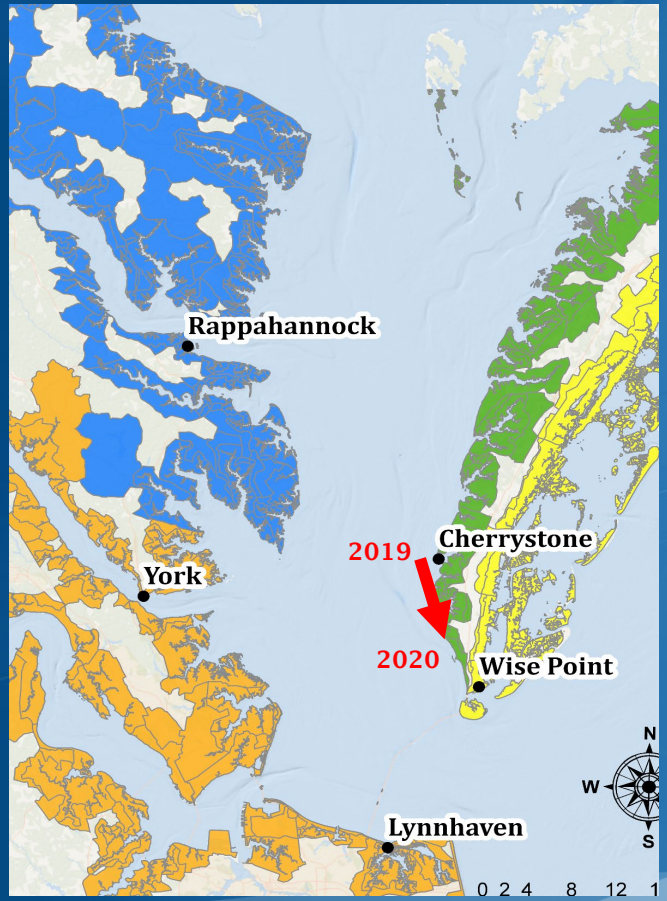
ABSTRACT

Harmful algal blooms (HABs), varying in intensity and causative species, have historically occurred throughout the Chesapeake Bay, U.S.; however, phycotoxin data are sparse. The spatiotemporal distribution of phycotoxins was investigated using solid-phase adsorption toxin tracking (SPATT) across 12 shallow, nearshore sites within the lower Chesapeake Bay and Virginia's coastal bays over one year (2017-2018). Eight toxins, azaspiracid-1 (AZA1), azaspiracid-2 (AZA2), microcystin-LR (MC-LR), domoic acid (DA), okadaic acid (OA), dinophysistoxin-1 (DTX1), pectenotoxin-2 (PTX2), and goniodomin A (GDA) were detected in SPATT extracts. Temporally, phycotoxins were always present in the region, with at least one phycotoxin group (i.e., consisting of OA and DTX1) detected at every time point. Co-occurrence of phycotoxins was also common; two or more toxin groups were observed in 76% of the samples analyzed. Toxin maximums: 0.03 ng AZA2/g resin/day, 0.25 ng DA/g resin/day, 15 ng DTX1/g resin/day, 61 ng OA/g resin/day, 72 ng PTX2/g resin/day, and 102,050 ng GDA/g resin/day were seasonal, with peaks occurring in summer and fall. Spatially, the southern tributary and coastal bay regions harbored the highest amount of total phycotoxins on SPATT over the year, and the former contained



Map: Amanda Roach | VDH

Oyster Field Sampling

Four sites each year

- 2019: January – June
- 2020: March – August

Near shellfish growing areas

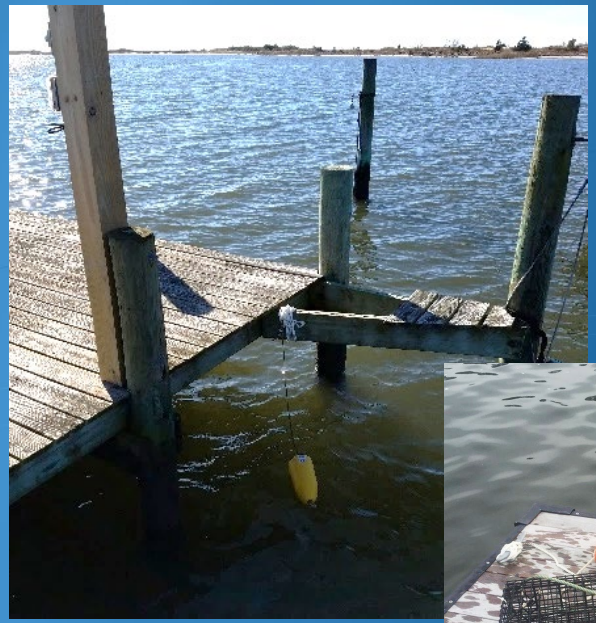
Nearshore, shallow water (≤ 3 m)

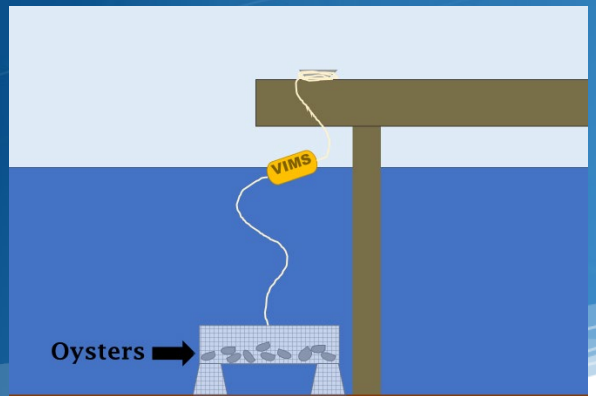
Oyster Field Sampling

Eastern oysters (*Crassostrea virginica*)

100 adult oysters at each site

~10 oysters collected every other week





Each pooled sample of oysters was homogenized

Extracted using 90% methanol (McNabb et al., 2005)

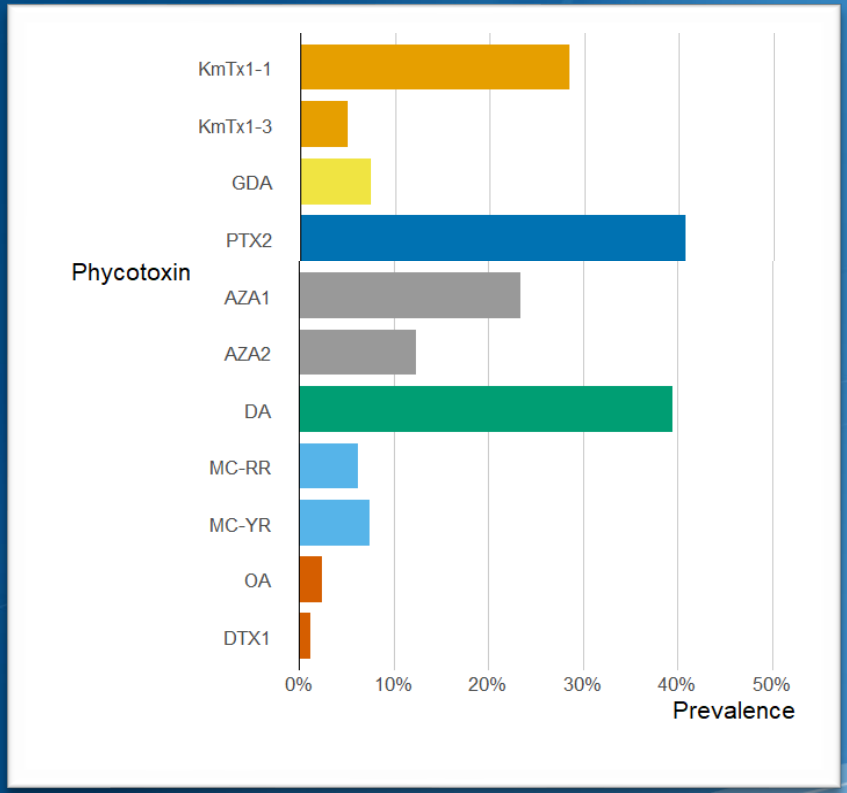
Oyster smoothie

Oyster extracts

Phycotoxins in extracts quantified by **ultra-performance liquid chromatography-tandem mass spectrometry, with a trapping dimension and at-column dilution** (UPLC-MS/MS with trap ACD, Onofrio et al. 2020)

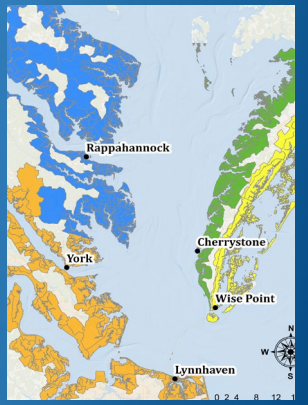
Results

% Prevalence of Phycotoxins in Oyster



Shellfish health

Human health



84% of oyster samples contained detectable concentrations of toxins

Toxins found at every site, in both years

Adult Oysters: Chesapeake Bay

Toxins associated with human health syndromes

Phycotoxin	Concentration	Prevalence
AZA1, AZA2	LOW	PREVALENT
DA	LOW	PREVALENT
OA, DTX1	TRACE	RARE
MC-RR, MC-YR	TRACE to MODERATE	RARE

Reminder:

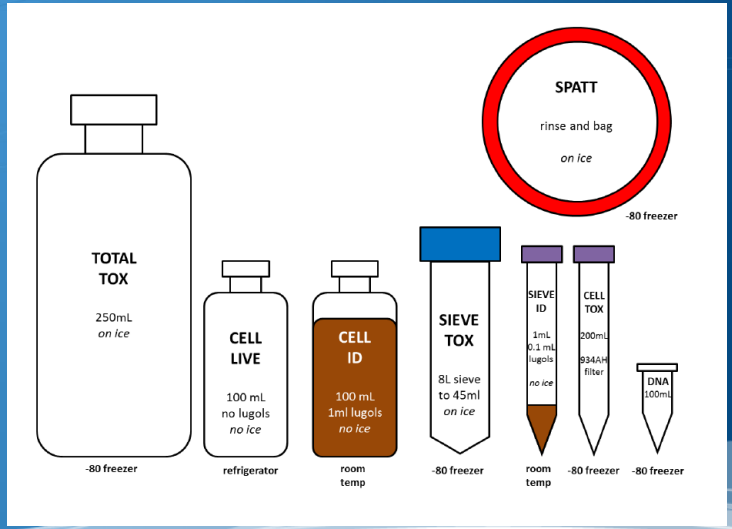
To date, no human illnesses caused by HAB toxins in VA shellfish

- Well below regulatory limits!
- Co-accumulation: domoic acid (DA) with azaspiracids (AZAs)

Toxin profiles (% composition) within oyster meat, particulate organic matter (CELL TOX), and whole water (TOTAL TOX) samples were generally in agreement - domoic acid was the dominant toxin.

The toxin profile in SPATT extracts, however, was different, with DSTs being the dominant toxin group.

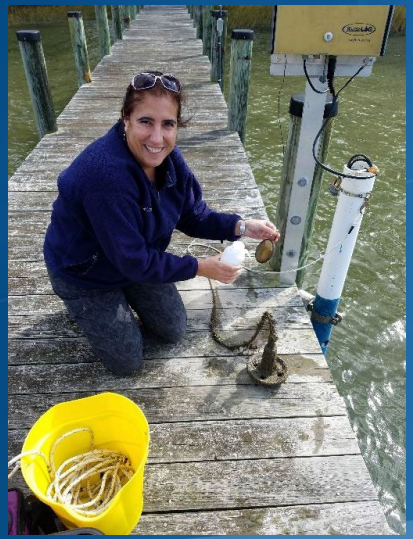
Comparison of toxin profiles between sample types

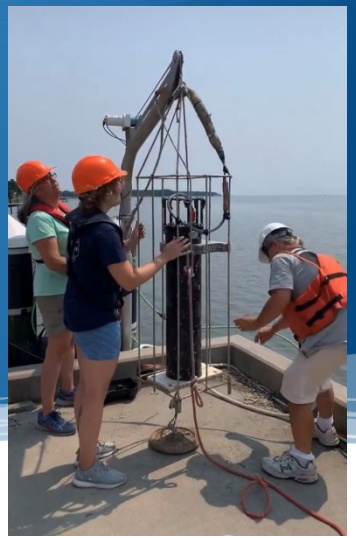


Later today…

IFCB deployment for 2022 (ECOHAB project)

Modifications to the SPATT making protocol





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