HAB Toxins in Seafood

- Shellfish poisonings in FL first reported in 1880
- Florida's Biotoxin Contingency Plan includes:
  - *Karenia brevis*, NSP (early 1970's)
  - *Pyrodinium bahamense*, PSP (2003)
  - *Pseudo-nitzschia* spp., ASP (2013)
- No documented HAB-related illnesses from legally harvested bivalves
- No cases of PSP or ASP

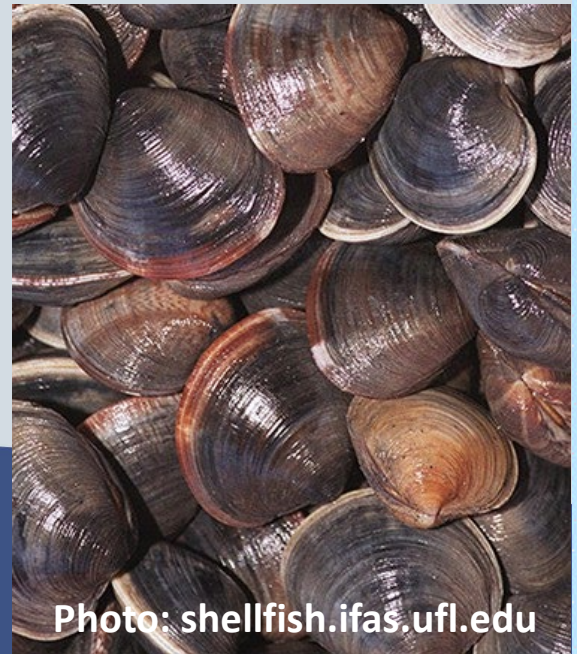
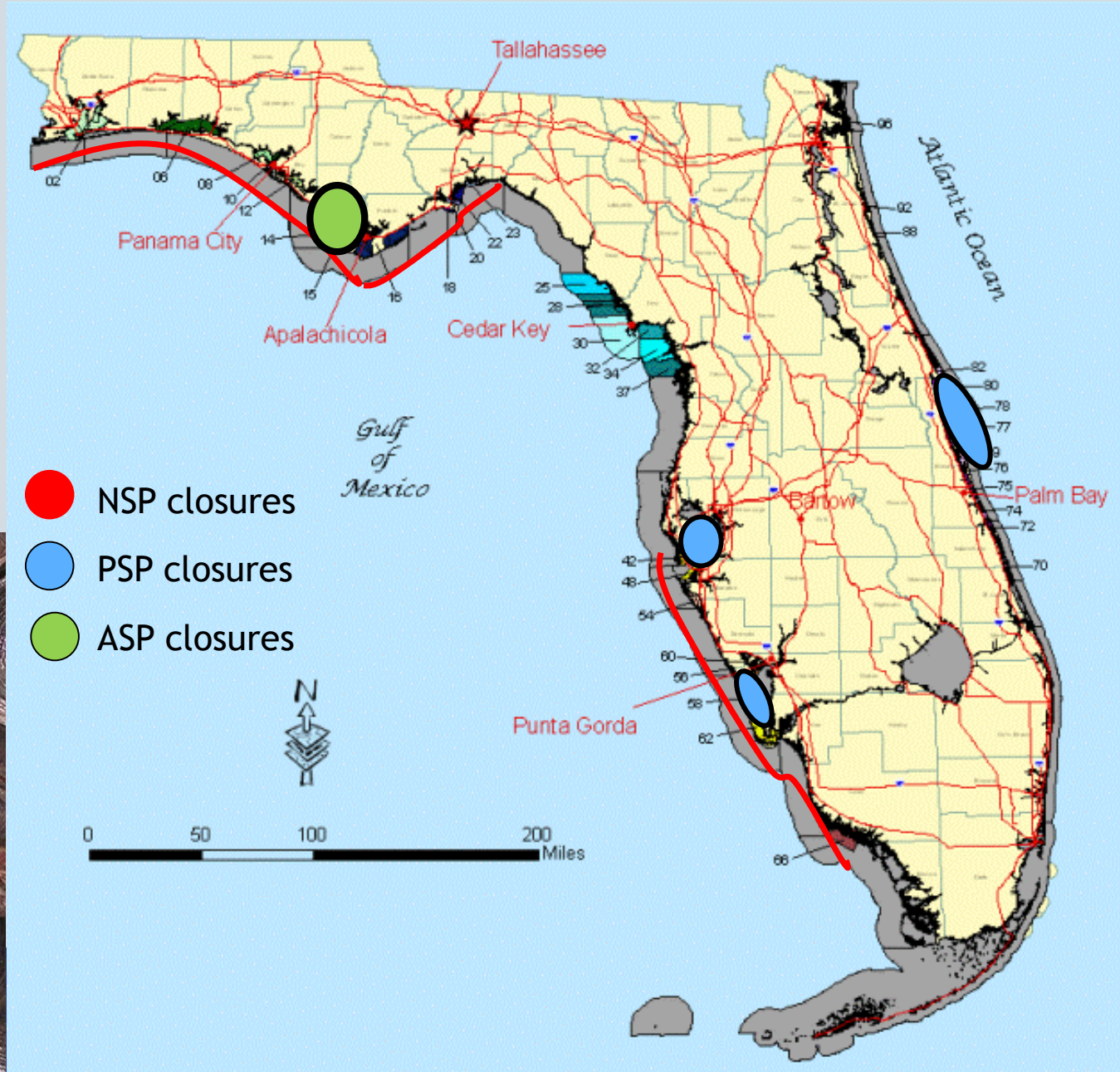
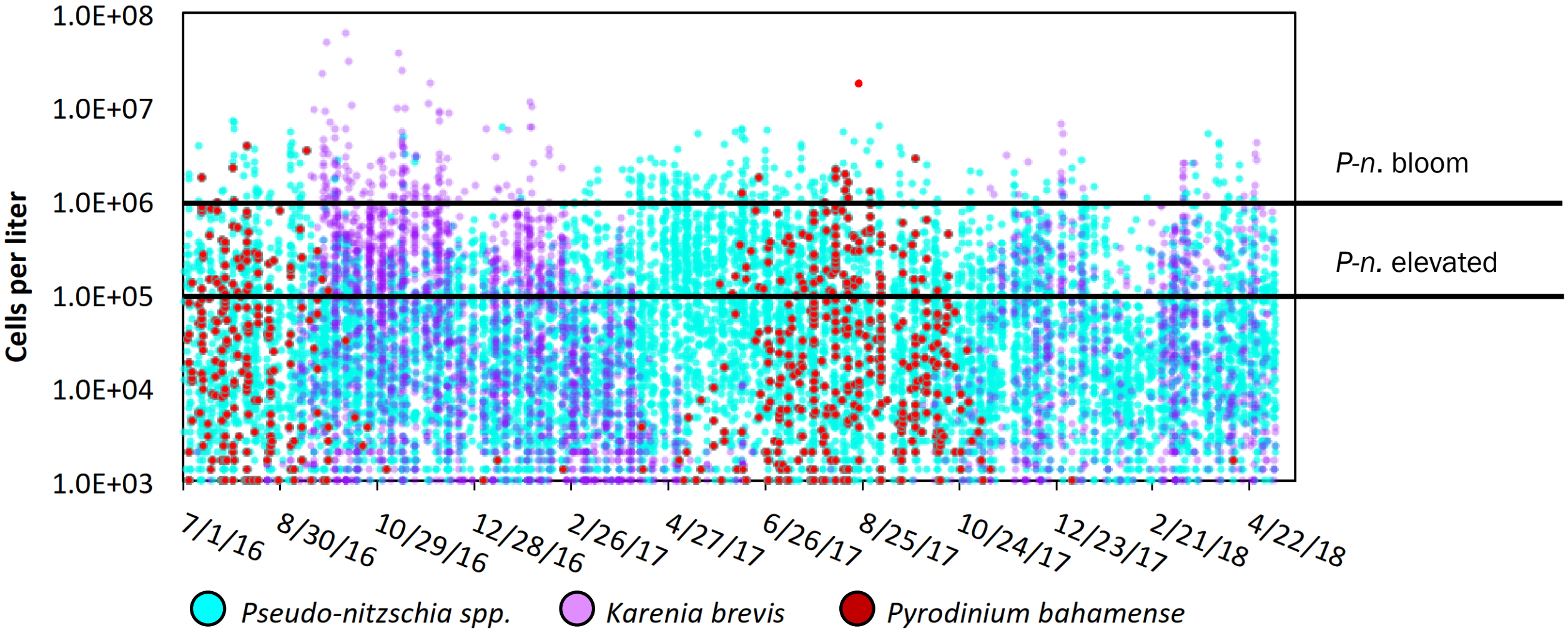


Photo: shellfish.ifas.ufl.edu



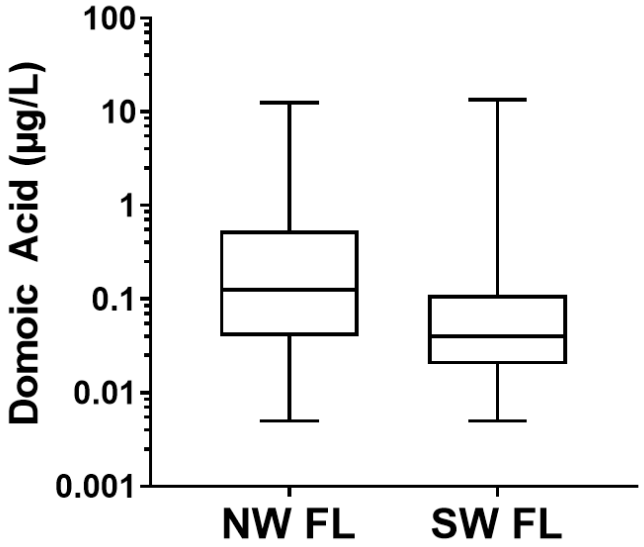
Seasonality and overlap of Florida's three primary HABs



Domoic acid (DA) in seawater samples with *Pseudo-nitzschia* cell densities ≥ 100,000/L (2015-2020)

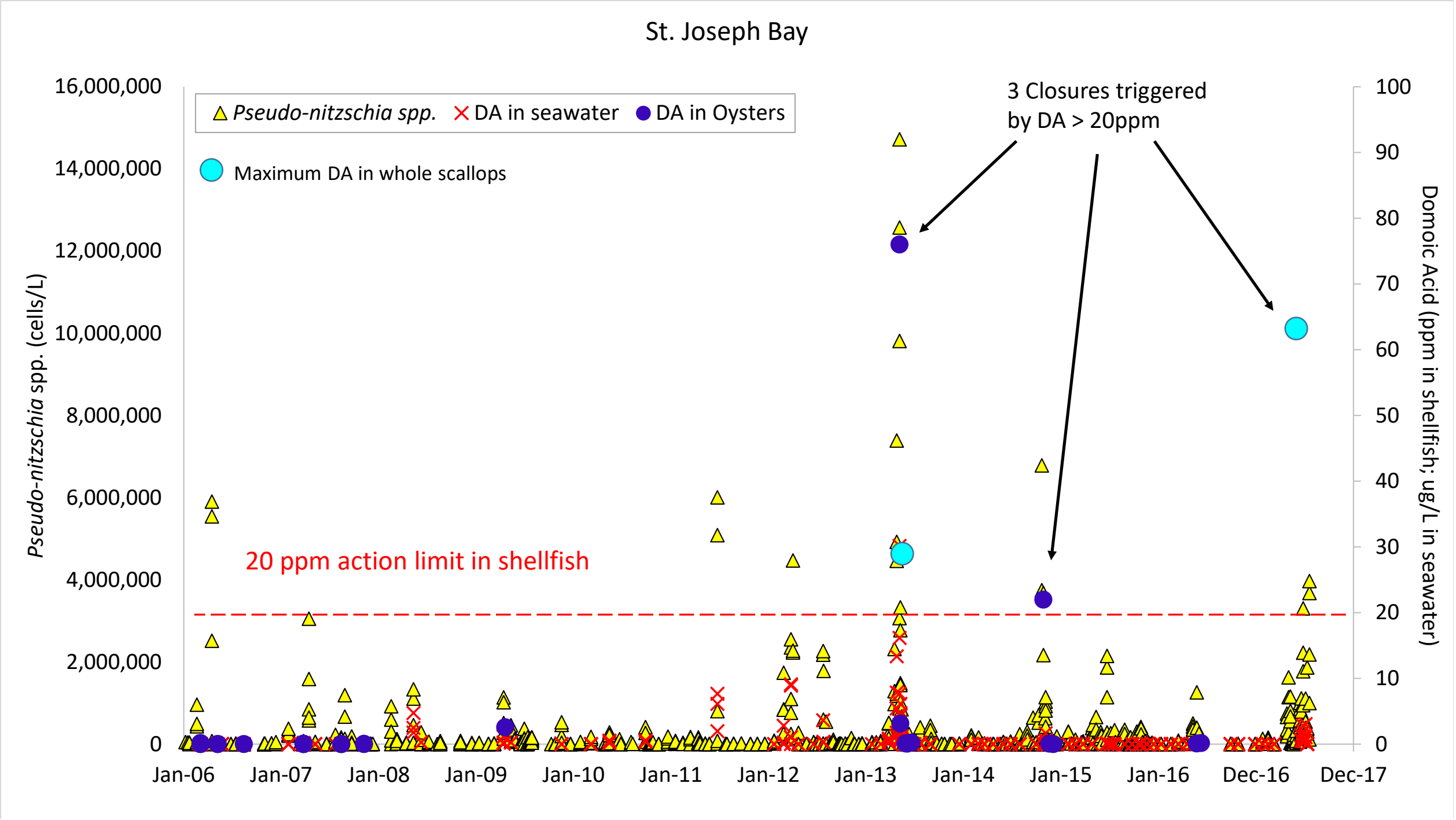
Region	# DA pos/total tested	Range (µg DA/L)	samples > 1 µg/L
NW FL	217/313 (69%)	trace - 12.5	34 (11%)
SW FL	1791/3220 (56%)	trace - 13.4	48 (1.5%)
IRL	5/130 (4%)	trace - 0.02	0

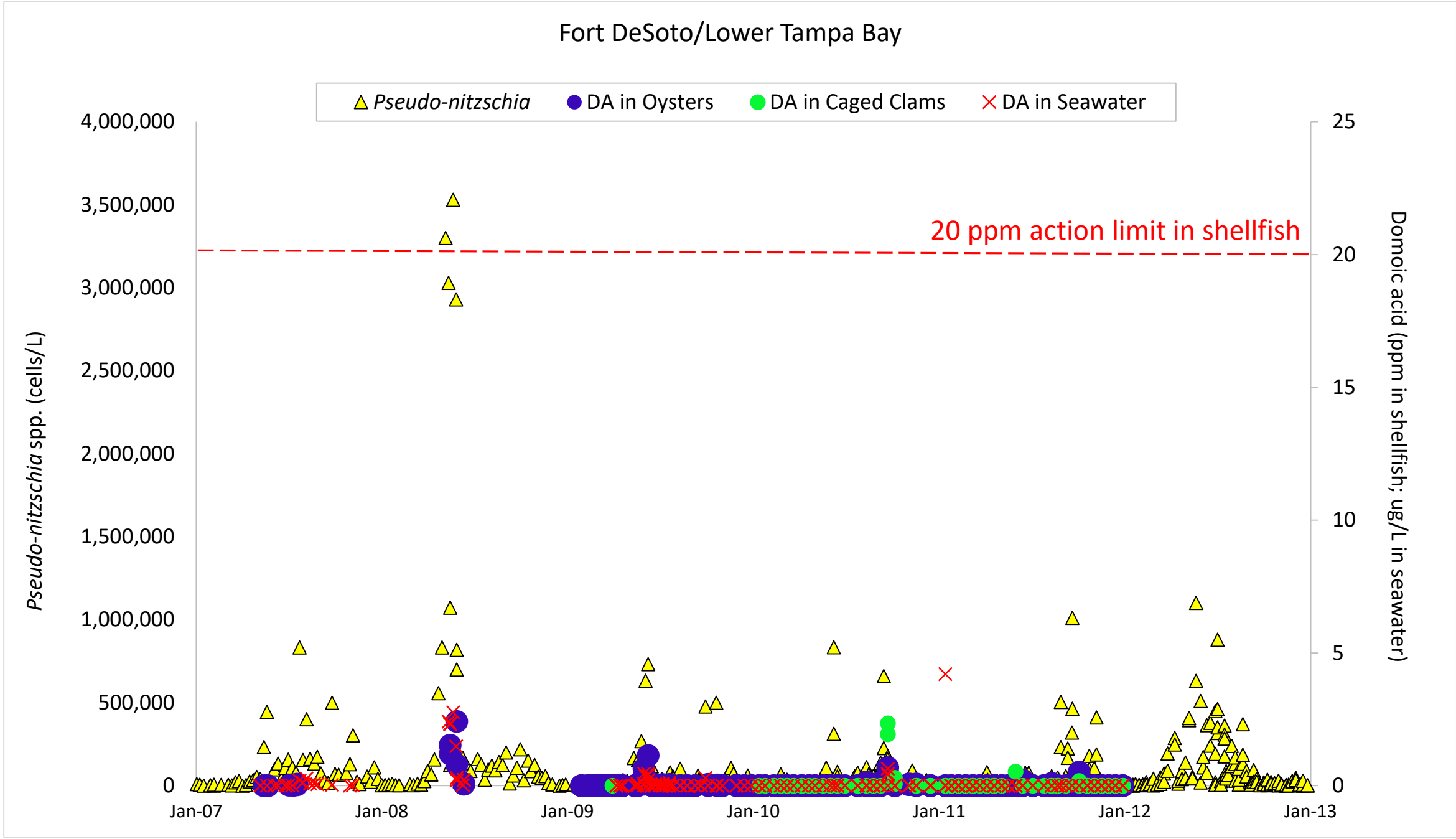

www.eos.ubc.ca/research/phytoplankton/



Distribution of DA concentrations measured in seawater samples with *Pseudo-nitzschia* cell densities ≥ 100,000/L

- Not all *Pseudo-nitzschia* blooms produce DA. DA was detected in ~54% of samples with elevated cell densities (≥ 100,000/L).
- Median DA concentrations in DA-positive samples with elevated *Pseudo-nitzschia* ranged from 0.02-0.1 ug/L.
- DA concentrations were ≥ 1 ug/L in 2% of DA positive samples with elevated *Pseudo-nitzschia.*


St. Joseph Bay
Pseudo-nitzschia spp.
DA in seawater
DA in Oysters
Maximum DA in whole scallops
3 Closures triggered by DA > 20ppm
20 ppm action limit in shellfish
Pseudo-nitzschia spp. (cells/L)
Domoic Acid (ppm in shellfish; ug/L in seawater)
16,000,000
14,000,000
12,000,000
10,000,000
8,000,000
6,000,000
4,000,000
2,000,000
0
100
90
80
70
60
50
40
30
20
10
0
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17


Fort DeSoto/Lower Tampa Bay
Pseudo-nitzschia
DA in Oysters
DA in Caged Clams
DA in Seawater
20 ppm action limit in shellfish
Pseudo-nitzschia spp. (cells/L)
Domoic acid (ppm in shellfish; ug/L in seawater)
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
25
20
15
10
5
0
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13

HAB Toxins in Seafood

Finfish

- HAB toxins are generally only present in the muscle (fillet) at very low levels *during a bloom*.
- Toxins concentrate in GI tract and organs of planktivorous fish (e.g., menhaden, sardines) and can be dangerous if consumed whole.
- Brevetoxins accumulate in organs and can persist for months following a bloom.

HAB Toxins in Seafood

Finfish

- HAB toxins are generally only present in the muscle (fillet) at very low levels *during a bloom*.
- Toxins concentrate in GI tract and organs of planktivorous fish (e.g., menhaden, sardines) and can be dangerous if consumed whole.
- Brevetoxins accumulate in organs and can persist for months following a bloom.

Exception 1: Ciguatera

- Among the most commonly reported marine food-borne illness worldwide
- Caused by consumption of reef fish containing toxins produced by *Gambierdiscus* spp.

- Ciguatoxins accumulate and persist in the fish muscle – very low levels can induce illness.
- Suite of gastrointestinal and neurological symptoms (neurological symptoms can persist/recur for months or years).

http://en.wikipedia.org/wiki/User:Laban712

HAB Toxins in Seafood

Finfish

- HAB toxins are generally only present in the muscle (fillet) at very low levels *during a bloom*.
- Toxins concentrate in GI tract and organs of planktivorous fish (e.g., menhaden, sardines) and can be dangerous if consumed whole.
- Brevetoxins accumulate in organs and can persist for months following a bloom.

Exception 2: Saxitoxin Puffer Fish Poisoning

- Puffer fish are resistant to saxitoxin (and tetrodotoxin), and the muscle can contain very high concentrations saxitoxins.
- 28 cases of human illness from Southern puffer fish caught in the northern Indian River Lagoon were reported between January 2002 and June 2004.
- FWC issued a permanent ban on harvest of puffer fish from Volusia, Brevard, Indian River, St. Lucie, and Martin counties.
- Puffer fish poisoning from fish harvested in other areas of FL may result from tetrodotoxin exposure.

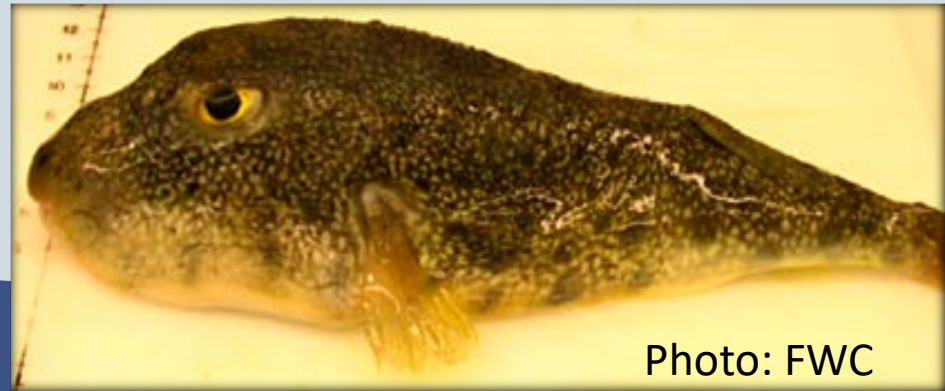


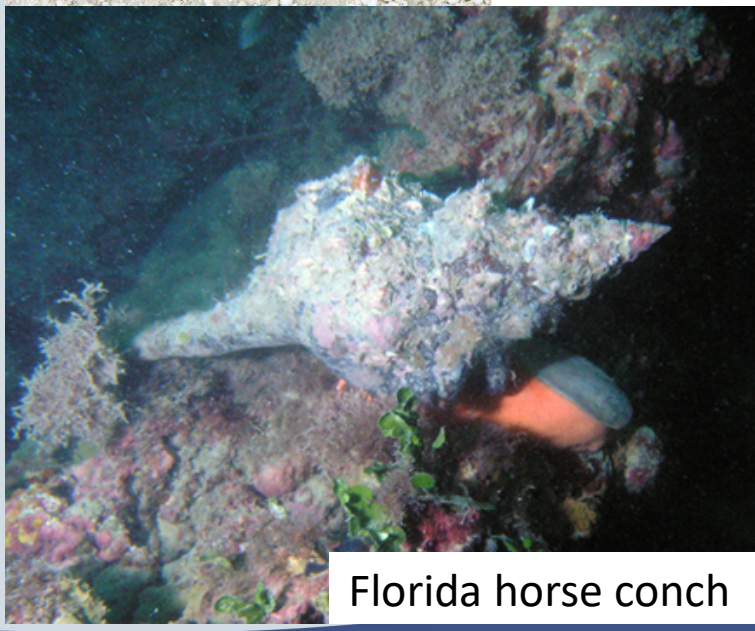
Photo: FWC

HAB Toxins in Seafood

Invertebrates

- HAB toxins generally only present in the muscle of crabs, lobster, shrimp at low levels during a bloom.
- Toxins do concentrate to at higher levels in the hepatopancreas and roe, which should not be eaten if caught in the area of an ongoing bloom.
- Gastropods (e.g., whelk, conch) can retain brevetoxins for many months and have caused NSP.

Stone crab



Florida horse conch

Photos: FWC

HAB Toxins in Seafood

Management and Research Gaps

- More effective messaging about the risks of consuming gastropods at any time in southwest Florida.
- More formalized plan for monitoring scallops for domoic acid before and during scallop season.
- Are there undiagnosed illnesses from ingestion of HAB toxins in seafood?
- Does what we “know” apply during unusually severe and prolonged red tides like the 2017-2019 bloom?