HAB Toxins in Seafood

- Shellfish poisonings in FL first reported in 1880
- Florida’s Biotoxin Contingency Plan includes:
  - *Karenia brevis*, NSP (early 1970’s)
- No documented HAB-related illnesses from legally harvested bivalves
- No cases of PSP or ASP
Seasonality and overlap of Florida’s three primary HABs

![Graph showing seasonal and overlap of Florida’s three primary HABs: Pseudo-nitzschia spp., Karenia brevis, Pyrodinium bahamense.](image-url)
Domoic acid (DA) in seawater samples with *Pseudo-nitzschia* cell densities $\geq 100,000$/L (2015-2020)

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

<table>
<thead>
<tr>
<th>Region</th>
<th># DA pos/total tested</th>
<th>Range ($\mu$g DA/L)</th>
<th>samples $&gt; 1$ $\mu$g/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>NW FL</td>
<td>217/313 (69%)</td>
<td>trace - 12.5</td>
<td>34 (11%)</td>
</tr>
<tr>
<td>SW FL</td>
<td>1791/3220 (56%)</td>
<td>trace - 13.4</td>
<td>48 (1.5%)</td>
</tr>
<tr>
<td>IRL</td>
<td>5/130 (4%)</td>
<td>trace - 0.02</td>
<td>0</td>
</tr>
</tbody>
</table>

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

Data points show the concentration of Pseudo-nitzschia spp. and domoic acid (DA) in seawater and Oysters, with specific action limits indicated.
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.
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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).

![Image](http://en.wikipedia.org/wiki/User:Laban712)
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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.
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.
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?