

# Biotoxin illness in BC

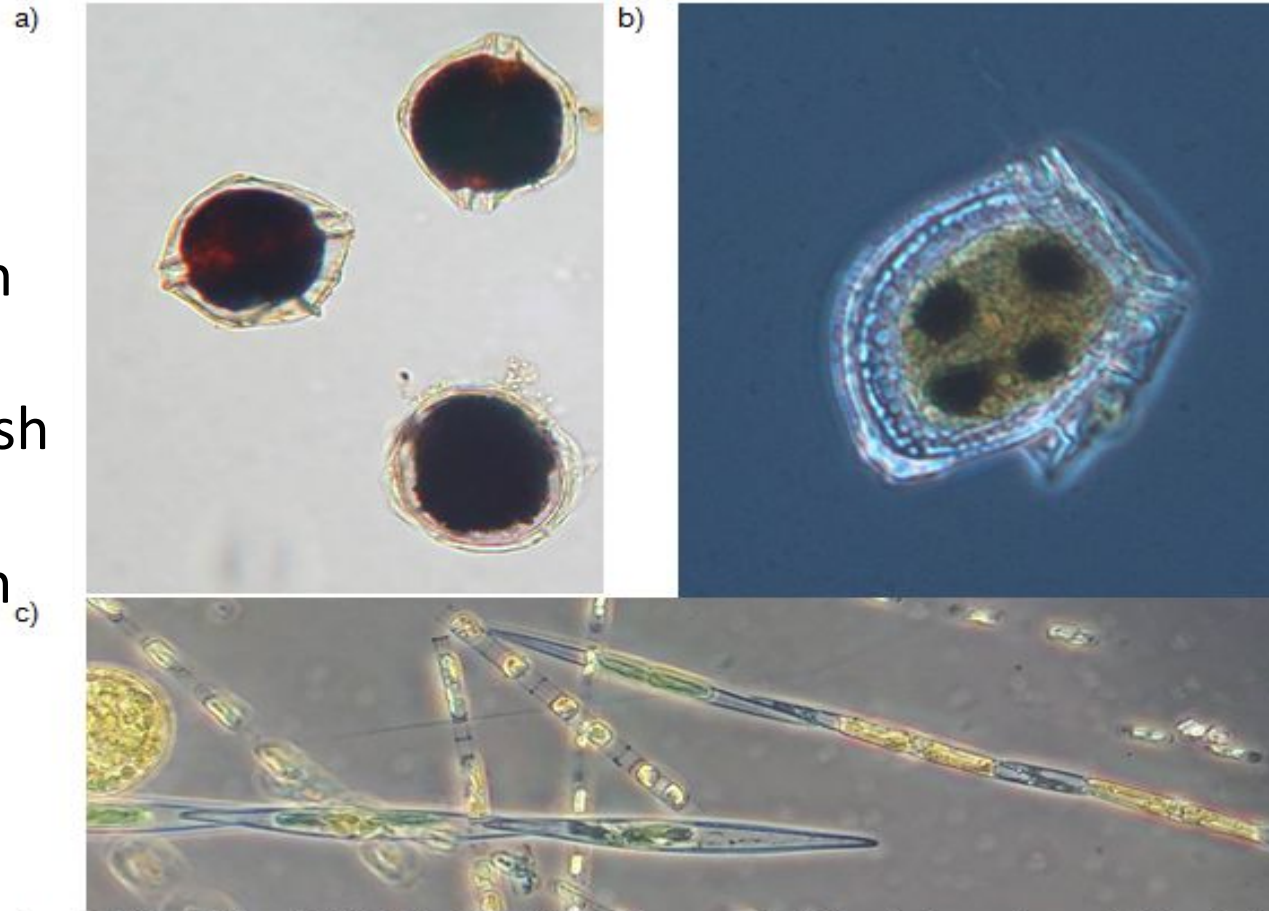
Lorraine McIntyre and Esther Tong, Food Safety and Environmental Health Specialists  
May 23<sup>rd</sup>, 2024



BC Centre for Disease Control  
Provincial Health Services Authority

# Marine biotoxin illnesses

- a) Paralytic Shellfish Poisonings
- b) Diarrhetic Shellfish Poisonings
- c) Amnesic Shellfish Poisonings



2

Harmful algae in British Columbia: a) *Alexandrium* spp.,  
b) *Dinophysis acuminata*, and c) *Pseudo-nitzschia* spp.

Slide from Nicky Haigh, Microthalassia Consultants Inc. Presentation from Oct 2016 Marine biotoxin workshop



Washington, photo Jordan Cole (2016)

# Shellfish killing phytoplankton HABs

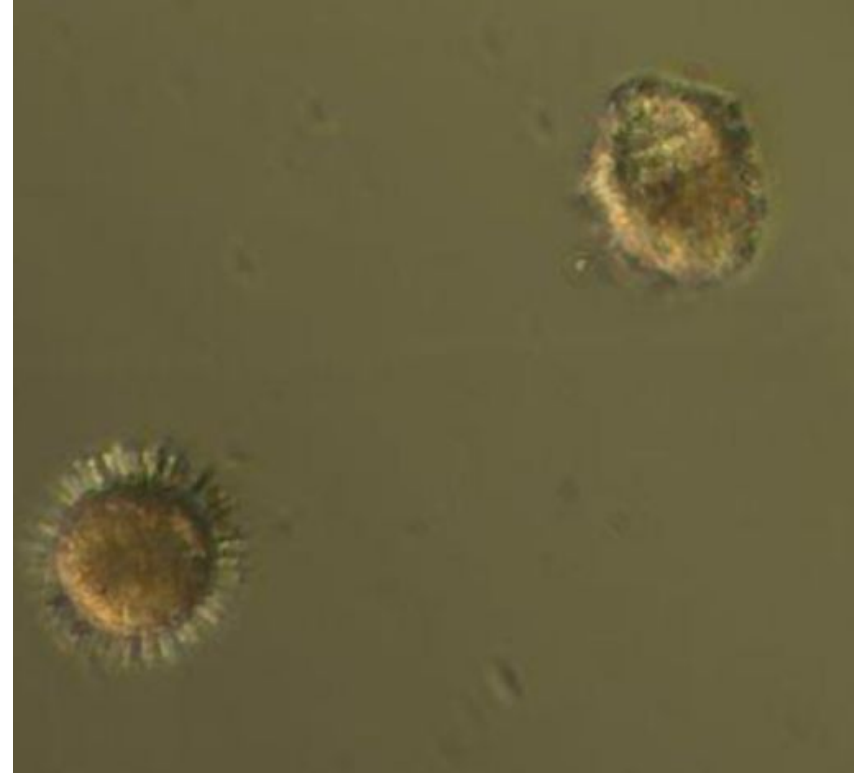
Author: Teri King et al (2021) Harmful Algae

## *Akashiwo sanguinea*



- By Minami Himemiya - Own work, CC BY-SA 3.0, <https://commons.wikimedia.org/w/index.php?curid=4975461>

## *Protoceratium reticulatum*



<https://www.sciencedirect.com/science/article/pii/S1568988321000615>



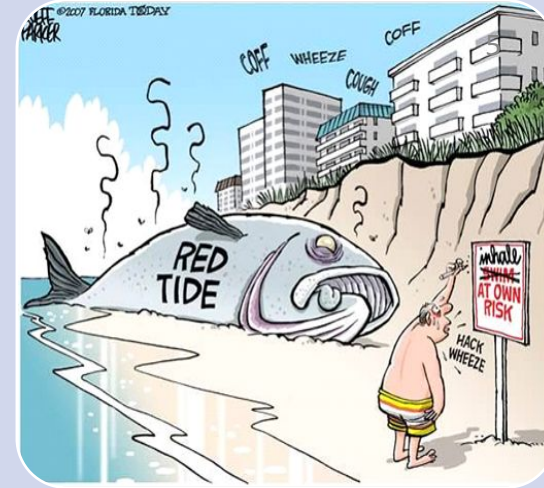
## Food

- ingestion
- fish or shellfish



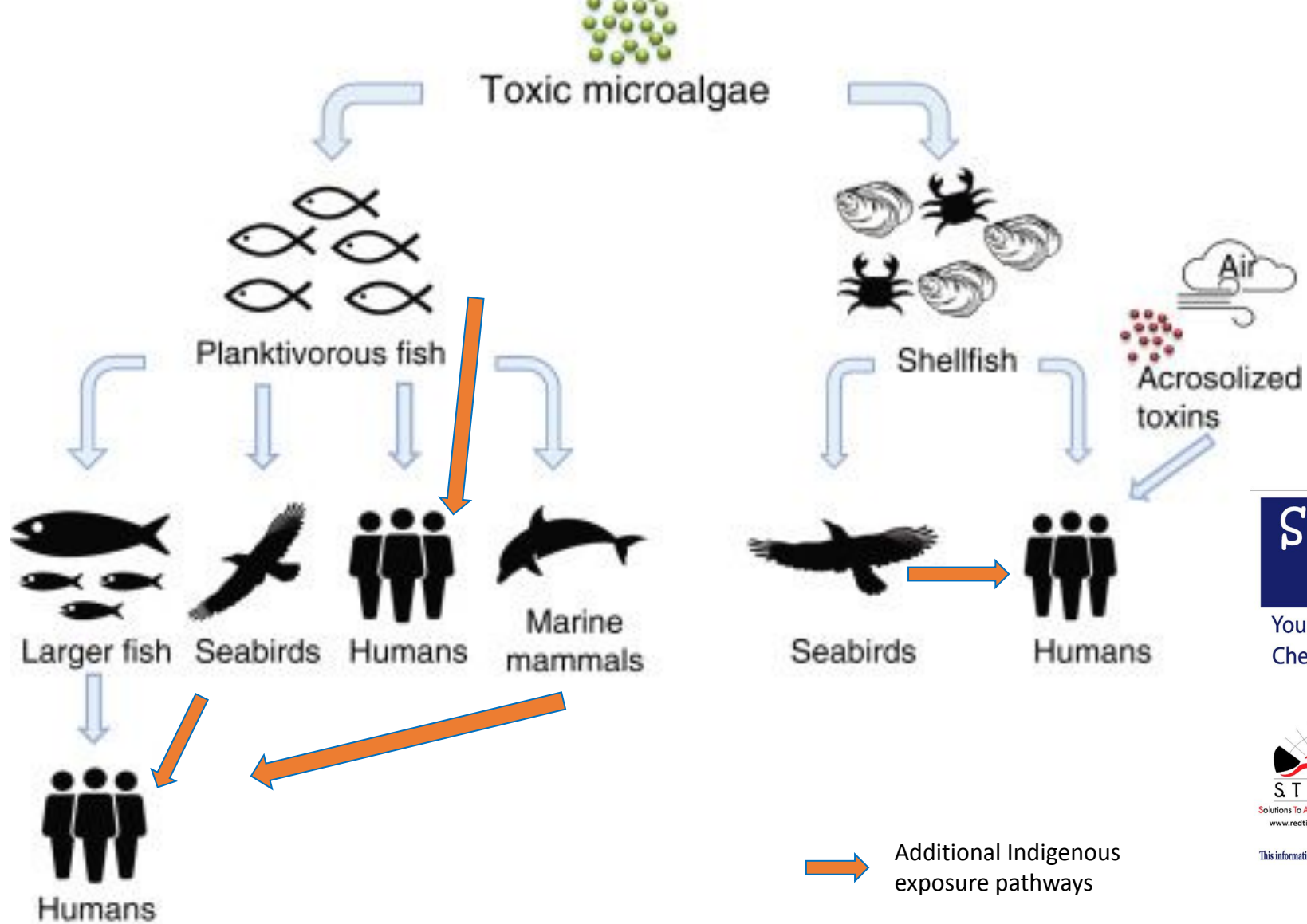
## Water

- ingestion



## Air

- inhalation



**Sneezing? Coughing?  
Watery Eyes?**

Your symptoms may be related to Florida Red Tide. Check Red Tide conditions and use common sense. Going indoors should make you feel better.

To speak to a health professional anytime, call the Florida Red Tide Health Hotline  
**1-888-232-8635** toll free  
 Breathe Easy During a Red Tide



This informational material was funded by the Florida Department of Health with cooperation from the Centers for Disease Control and Prevention.

➔ Additional Indigenous exposure pathways

Diagram adapted from Marine-Based Toxins and Their Health Risk (2018) <https://www.sciencedirect.com/science/article/pii/B9780128114421000031>  
<https://www.mdpi.com/1660-3397/5/4/208/htm> Lora Fleming et al (2007)

# Shellfish Toxins – PSP, DSP, ASP



# Paralytic shellfish toxins (PSTs)

## Paralytic Shellfish Poisoning

### Illness

- Symptoms & Onsets
  - Min (<12hr): perioral tingling and numbness (parasthesias) □ hands & feet; difficulty breathing; incoordination, paralysis,
  - Serious cases: respiratory failure and death
  - Vomiting; nausea when sitting up
  - Gastro-intestinal: diarrhea, abdominal cramps.

### PSTs

- Source
  - Dinoflagellates (*Alexandrium* spp. )
  - PST is not a single toxin: 58 analogs (e.g. saxitoxin)
  - Concentrate in shellfish
- Sodium channel blockers, disrupt nerve conduction





# Domoic acid

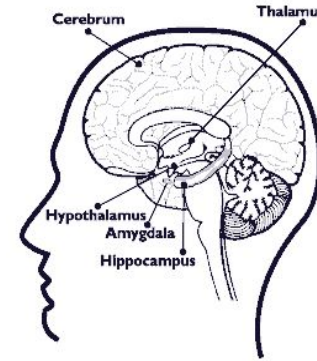
## Amnesic Shellfish Poisoning

### Illness

- Symptoms & Onsets
  - Within 24hr:  
Gastro-intestinal:  
diarrhea, abdominal  
cramps, nausea,  
vomiting,
  - Within 48 hr: Headache,  
memory loss, muscle  
weakness, disorientation
  - Severe cases: death

### Domoic acid

- Source
  - Diatoms (*Pseudo-nitzschia*)
  - Concentrate in shellfish
- Neurotoxin binds to glutamate receptors



# Diarrhetic Shellfish Poisoning

## Illness

- Symptoms & Onsets
  - Within 15 min to 12 hr (usually in 1 to 2 hr)
  - Gastro-intestinal: watery diarrhea, abdominal cramps, nausea, vomiting,
  - Resolve within 3 days

## DSTs

- Source
  - Phytoplankton (*Dinophysis* spp., *Prorocentrum* spp.)
  - Dinophysis toxins, esters, and okadaic acid
  - Concentrate in bivalve shellfish (e.g. mussels)
- Okadaic acid is an inhibitor of protein phosphatases

# Long-term health effects of biotoxin poisonings

## PSP

At risk groups, most susceptible:

Infants, children, pregnant women, developing fetus

Chronic and long-term low dose exposure:

unknown

## ASP

At risk groups, most susceptible:

Pre-existing condition renal disease, elderly, neonates, developing fetus

Chronic and long-term low dose exposure:

Negative effects on cognitive performance including memory

## DSP

At risk groups, most susceptible:

Developing fetus

Chronic and long-term low dose exposure:

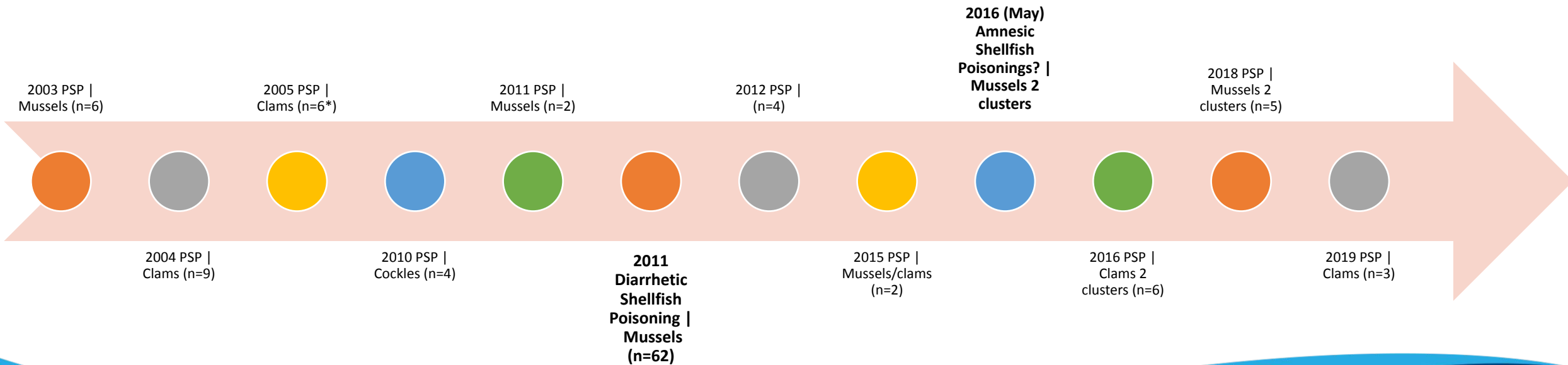
unknown

- 89.5% of reports about marine toxins are based on ACUTE events
- Very little is known about long term health effects

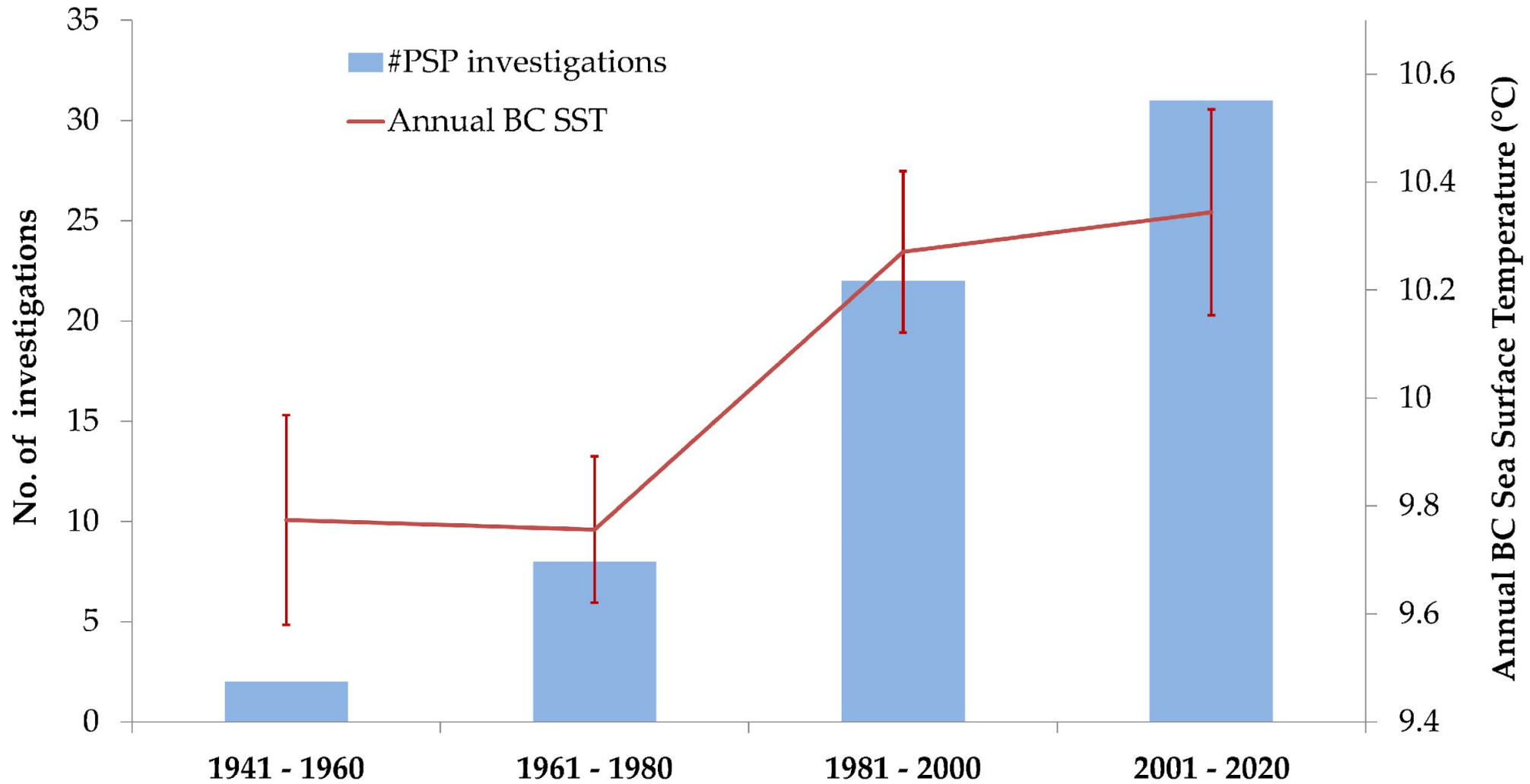
Lee et al (2024): The health risks of marine biotoxins associated with high seafood consumption: Looking beyond the single dose, single outcome paradigm with a view towards addressing the needs of coastal Indigenous populations in British Columbia

[https://www.cell.com/heliyon/pdf/S2405-8440\(24\)03177-3.pdf](https://www.cell.com/heliyon/pdf/S2405-8440(24)03177-3.pdf)

# Historical toxin associated shellfish outbreaks in BC – mainly PSP the last 20 years



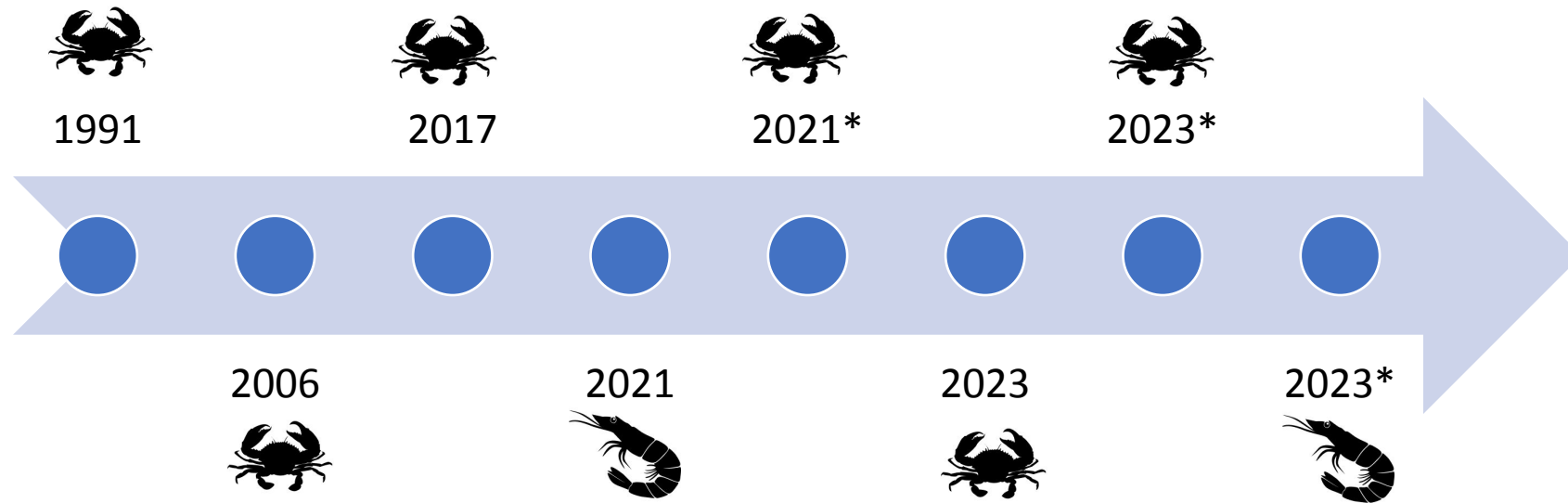
# Increasing SST temperatures and more PSP investigations



Climate change impacts

$r^2=0.76$ ,  $p<0.006$

# A concerning new trend: paralytic shellfish poisoning cases in British Columbia linked to consumption of crabs and spot prawns



\*To be verified in record

# Probable PSP in BC (2021 – 2023)

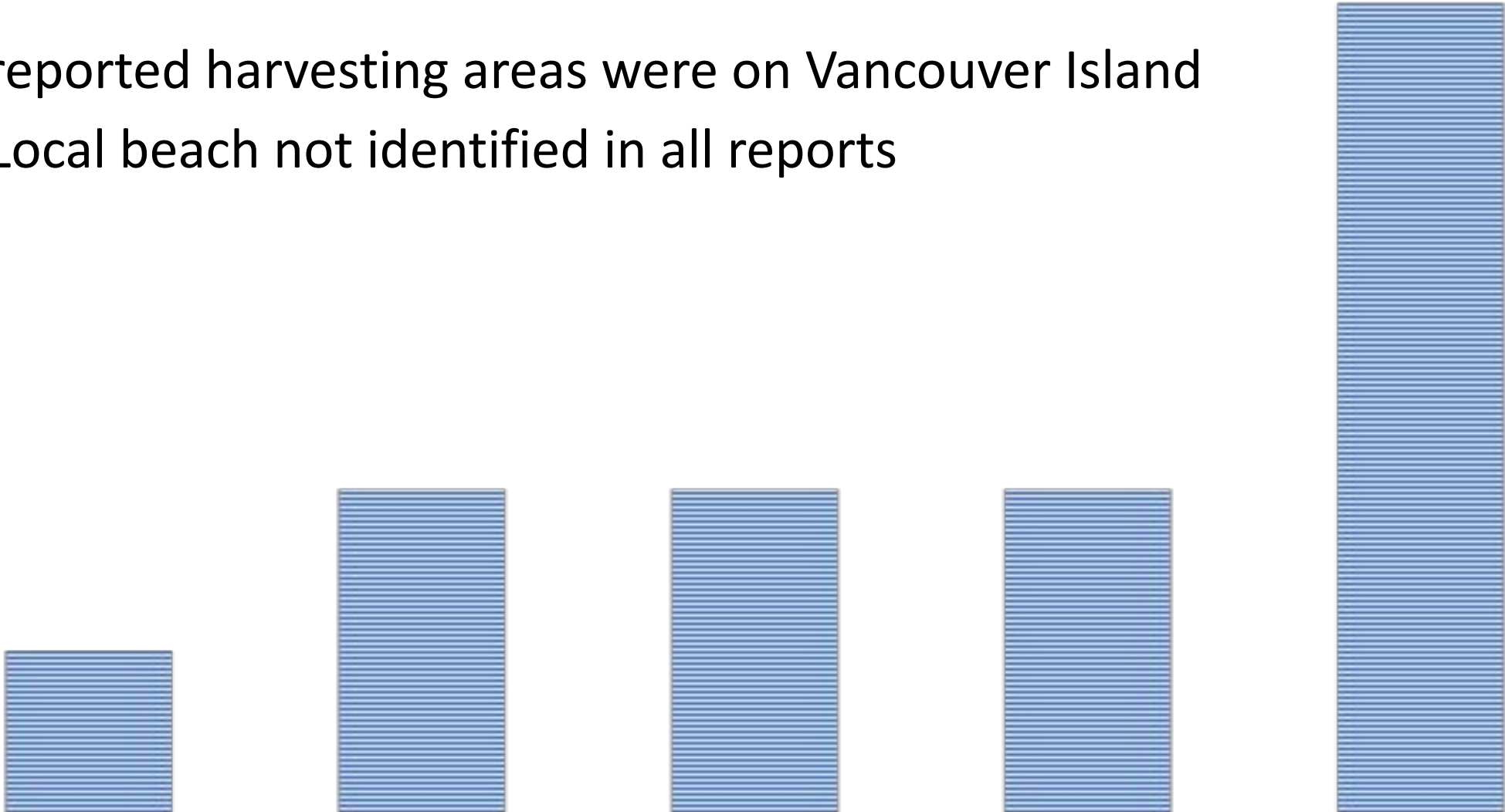
Recent review of data from January 1, 2021 – December 31, 2023

- In BC during this time there were:
  - Total of 27 individuals exposed
    - 7 individuals were asymptomatic but consumed the suspect shellfish
    - **Total of 20 probable PSP**
    - *12 were individual/single reports*
  - Majority of these (60%) were from recreational harvesters

YEAR	# Clusters (n = 2 or more)	# Probable PSP
2021	1	6
2022	0	4
2023	3	10
		<b>TOTAL: 20</b>

# Shellfish consumed by recreational harvesters

- All reported harvesting areas were on Vancouver Island
  - Local beach not identified in all reports





# Next steps

- NOTE: Data is subject to further review
  - ASP and DSP reporting to be added
- Engaging with public health partners
- Updating BCCDC Shellfish resources (Maps, educational materials etc.)

WATCH is supported by:



BC Centre for Disease Control  
Provincial Health Services Authority

FNHA's Environmental Public Health Services (EPHS)

FNHA's Indigenous Climate Health Action Program (ICHAP)

FNHA's Environmental Contaminants Program (ECP)



First Nations Health Authority  
Health through wellness



Deep Bay  
Marine Field Station



ISLAND MARINE  
**AQUATIC**  
WORKING GROUP

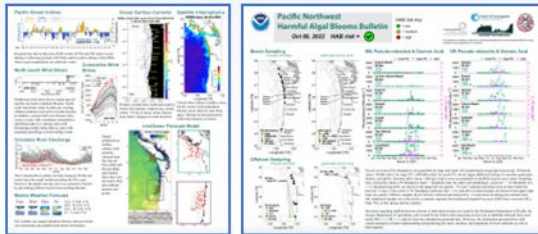


Public Health  
Agency of Canada  
Agence de la santé  
publique du Canada

# WATCH Systems Change

## COLLECT, INTERPRET DATA

- WATCH data QC and interpretation
- >>Trends, Models
- Research
- Intertidal surveys



## < HARVEST

- Alerts
- More indicators, and more timely information on shellfish maps and apps
- More real-time data (e.g., offshore AST (WA))



## ON THE BEACH

- Rapid tests Y/N (AST, cyanotoxin)



- Evidence-based, beach-specific shellfish sampling protocol

(e.g., water, phytoplankton, tissue sample sites are the same)

## IN THE LAB

- Phytoplankton monitoring to triage samples in regulatory system (WA)
- New lab capacity (consider coastline, transport)
- More species tested
- Testing on demand (AK)
- 1-2 day turnaround time (AK, WA)

