



*A previously unknown virus associated  
with mass-mortality of BC oysters:*

*What We Know*

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*Image generated in collaboration with Microsoft Copilot*

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# *Sustainable shellfish aquaculture*

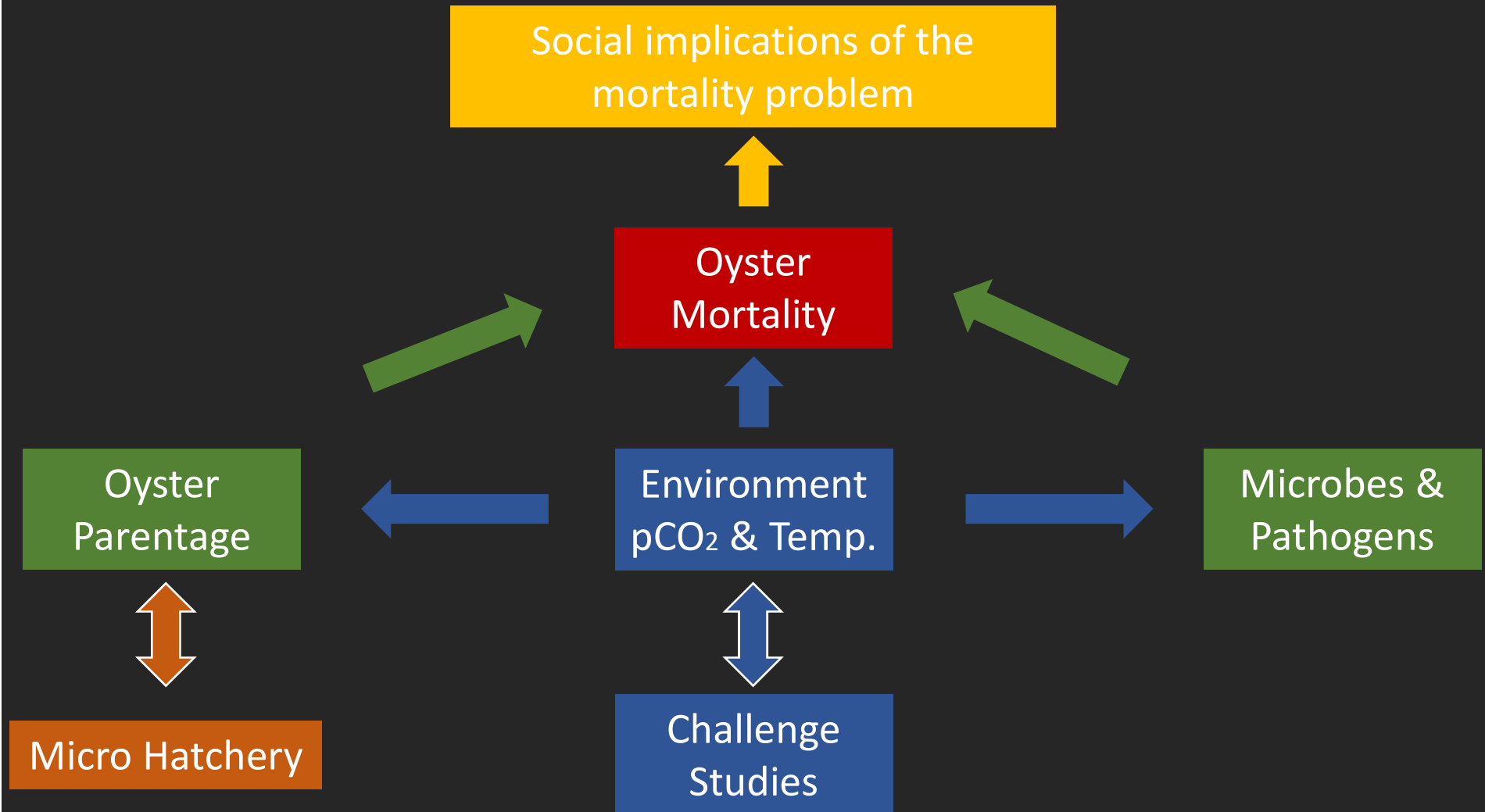


GORDON AND BETTY  
**MOORE**  
FOUNDATION

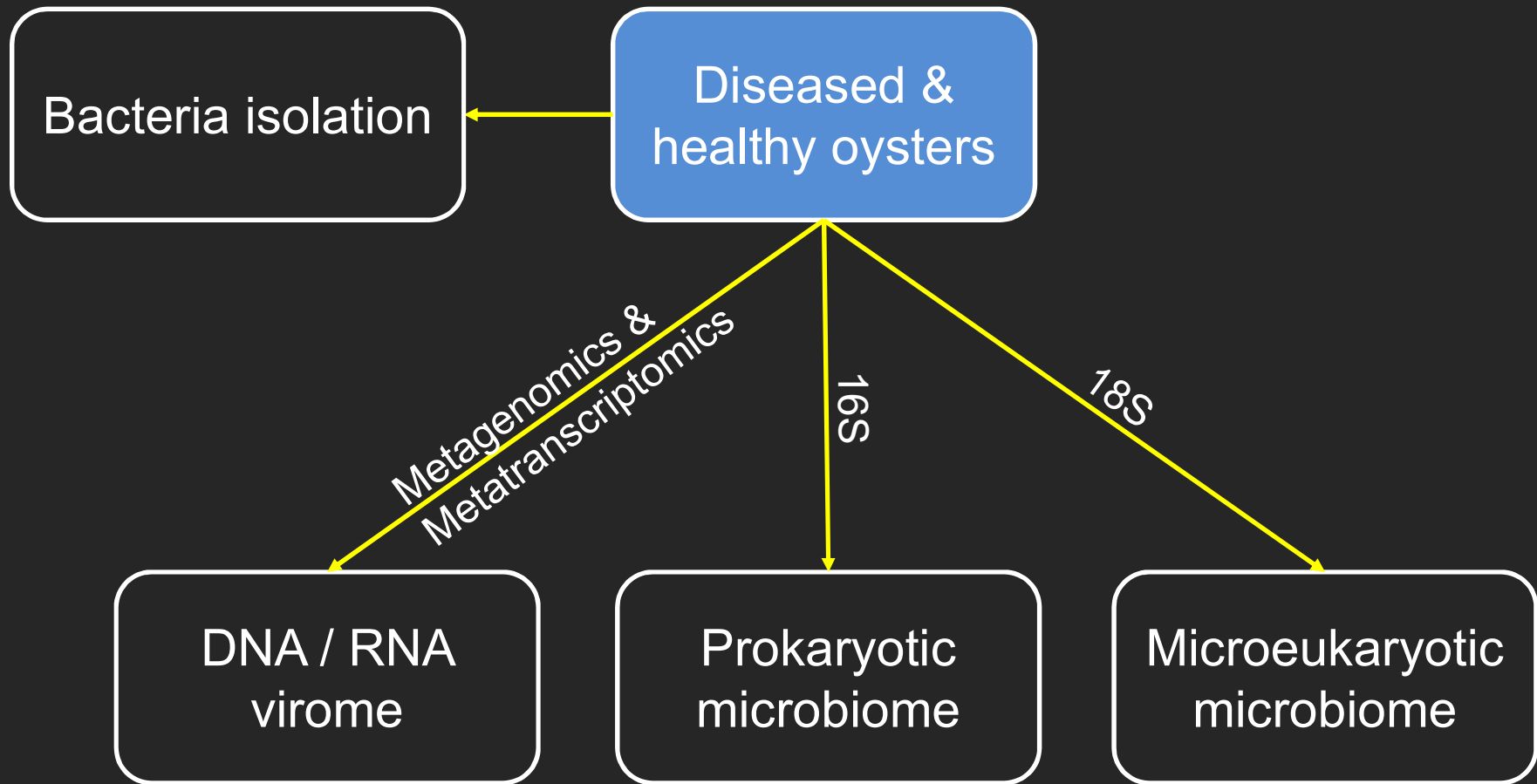
**Hakai**  
Science on the Coastal Margin



# *Sustainable shellfish aquaculture program*



# *Interrogating oysters for potential pathogens*



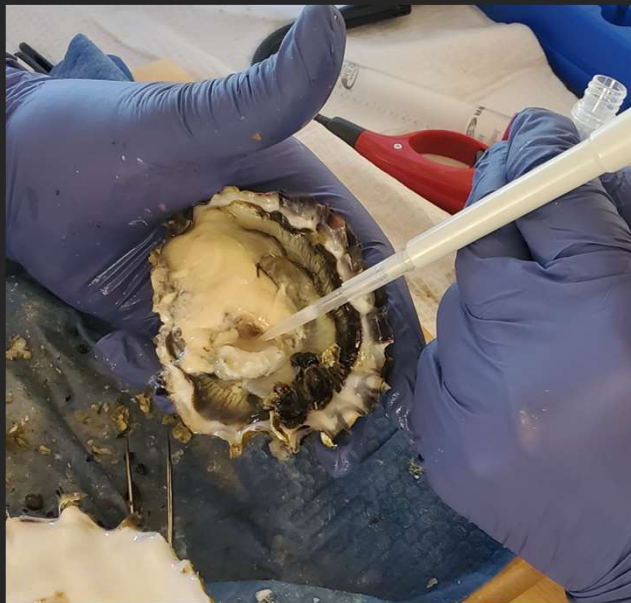
# *July and August 2020 collected and sampled oysters*



Naturalized oysters



Farmed oysters



Collect hemolymph and  
tissue samples



Amy Chan



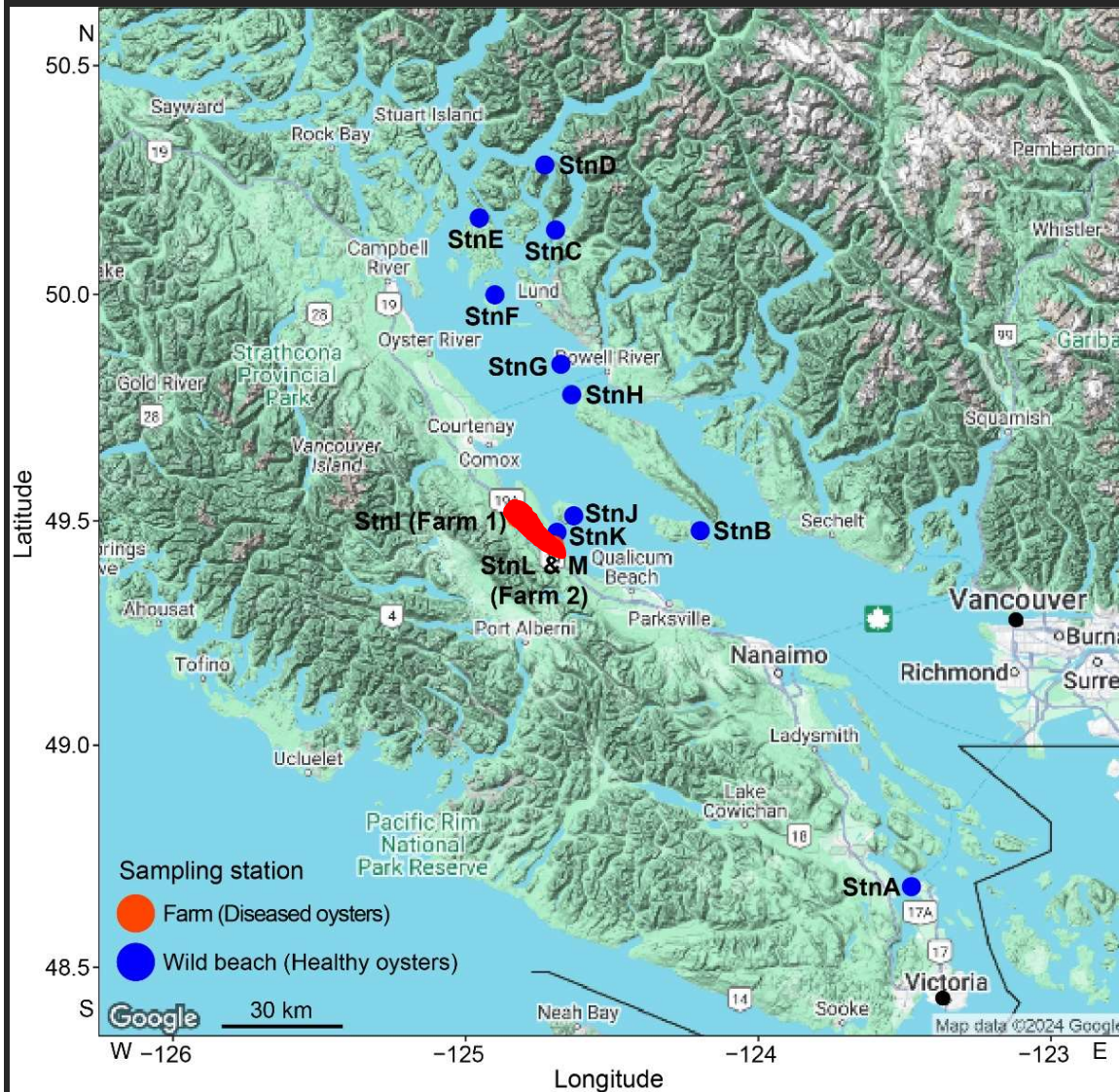
Kristi Miller



Rob Saunders



# July and August 2020 collected and sampled oysters



- Sample sites
  - ✓ 3 farm sites (diseased and dying oysters)
  - ✓ 10 beach sites (healthy naturalized oysters)
- Sample types
  - ✓ Tissue
  - ✓ Hemolymph

## *Sampling of moribund and dead farmed oysters*



Photo credit: Amy M Chan



# Previously unknown viruses infecting oysters

- We interrogated oysters that were dead and dying of unknown causes for potential viral pathogens



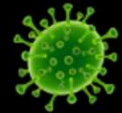
Kevin Zhong



Dead and dying oysters



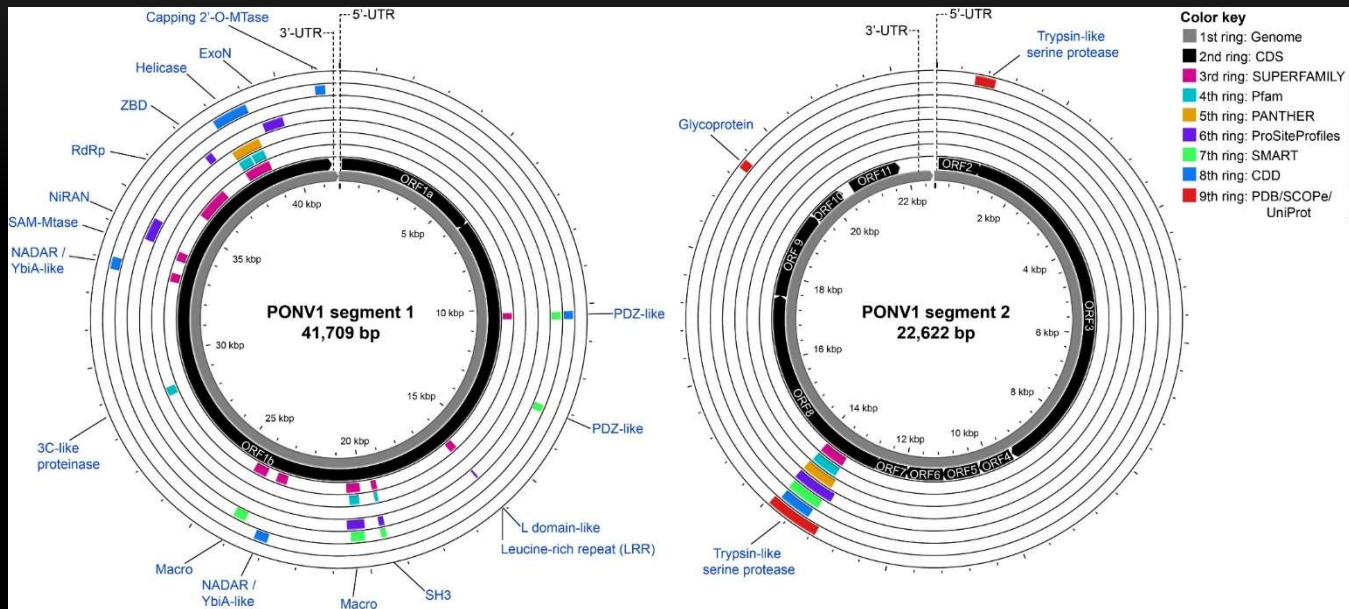
Metatranscriptomic  
sequencing and  
genome assembly



Novel virus  
genomes



# Novel virus associated with mass-mortality in oysters



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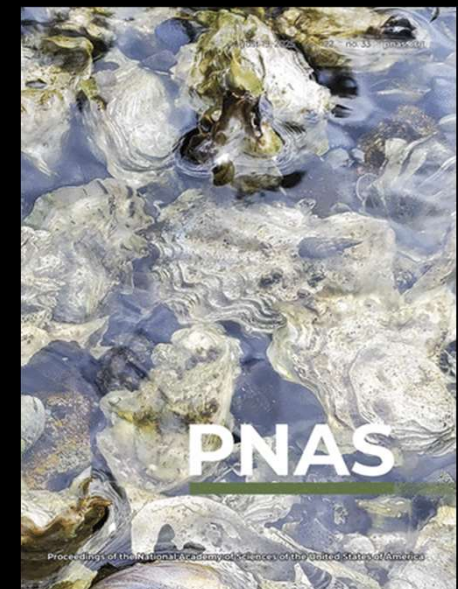
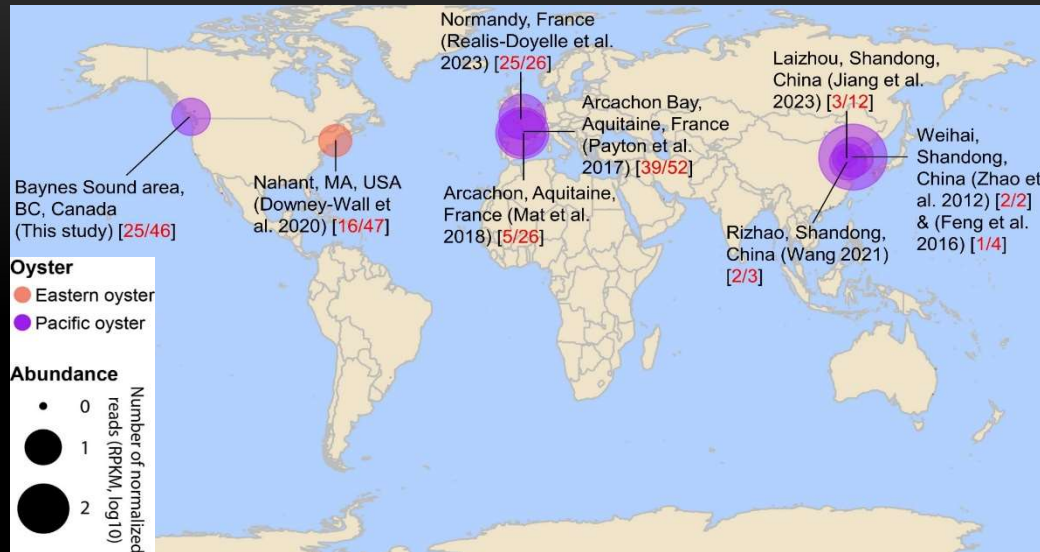


Photo credit: Amy M Chan

- Pacific oyster nidovirus 1 (PONV1) has the largest genome known for an RNA virus
- In BC, the virus was only found in oysters undergoing mass-mortality

Zhong et al. 2025. PNAS 122(33): e2426923122

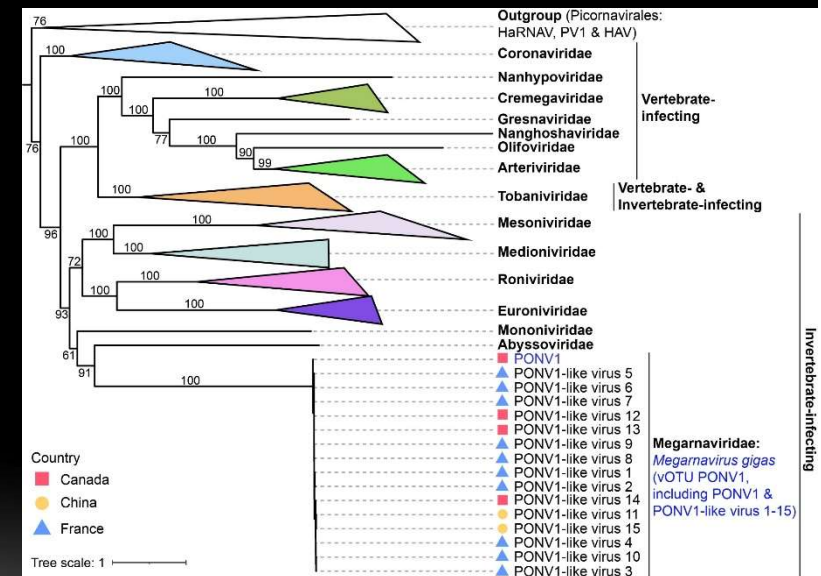
# PONV1-like viruses can be found in Pacific oysters worldwide



- Closely related viruses were found in Pacific oysters from Europe and Asia
- This suggests the virus was recently introduced across oyster populations
- PONV1 is a distant relative of the coronavirus that causes SARS CoV2
- *Bottom line:* PONV1 is a previously unknown evolutionary group of viruses associated with mass-mortality in Pacific oysters



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Zhong et al. 2025. PNAS 122(33): e2426923122

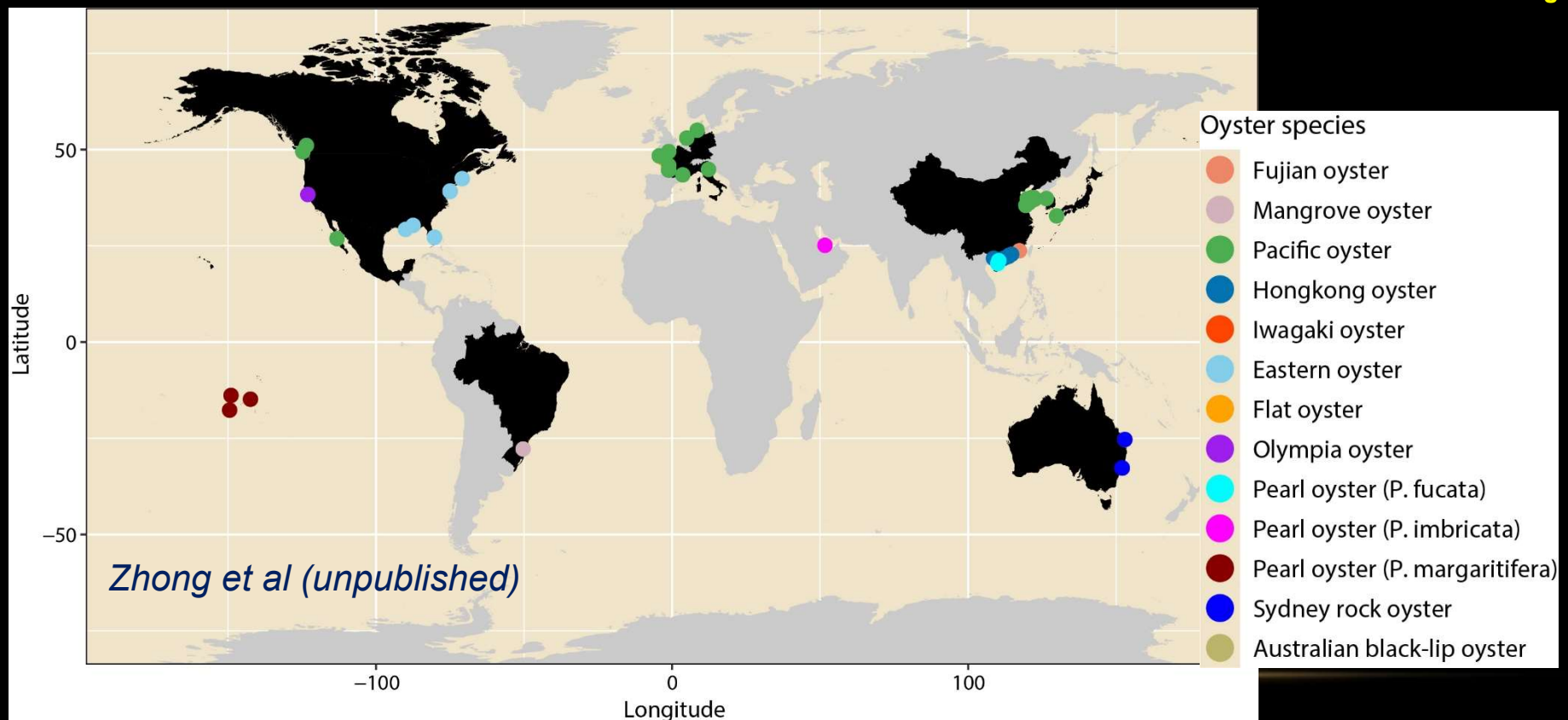


# Are *PONV1*-like viruses present in other oysters?

- Analyzed ~1000 oyster metatranscriptomes
- Representing 13 oyster species, 14 countries, and 5 continents



Kevin Zhong



# What we know about *Pacific oyster nidovirus 1 (PONV1)*

- it was only detected in farmed Pacific oysters from BC undergoing mass mortality
- is a novel RNA virus with an exceptionally large genome
- represents a new family of previously unknown viruses
- does not pose a threat to people, other animals or other shellfish
- close relatives were detected in some Pacific oysters from Europe and Asia
- high genetic identity of viruses from Europe and Asia suggests rapid dispersal
- related viruses were not detected in 13 other oyster species from 14 countries
- good news – knowing potential pathogens means that we can do something about it



Photo credit: Amy M Chan



# What we don't know about PONV1

- Where did it come from? spat?
  - only detected in farmed oysters on trays, not in nearby “wild” beach oysters.
- Not definitively shown to cause disease.
- Are there co-factors associated with the emergence of the virus?
- Is it associated with other mass mortality events in BC?
- Is it associated with mortality elsewhere?
- How is it transmitted?



Photo credit: Amy M Chan

# Next steps

- Develop an assay for PONV1
  - allows for source tracking
  - distribution of the virus
  - association with mortality
  - growers as partners
- Challenge studies for the virus
  - demonstrate causative agent of mortality
  - determine conditions for infection and transmission
- Association with other mass mortality events
  - samples of healthy and diseased oysters
- What do you think are the next steps?





*Thank you*

