

# Potential impacts of ocean acidification on shellfish farming in BC



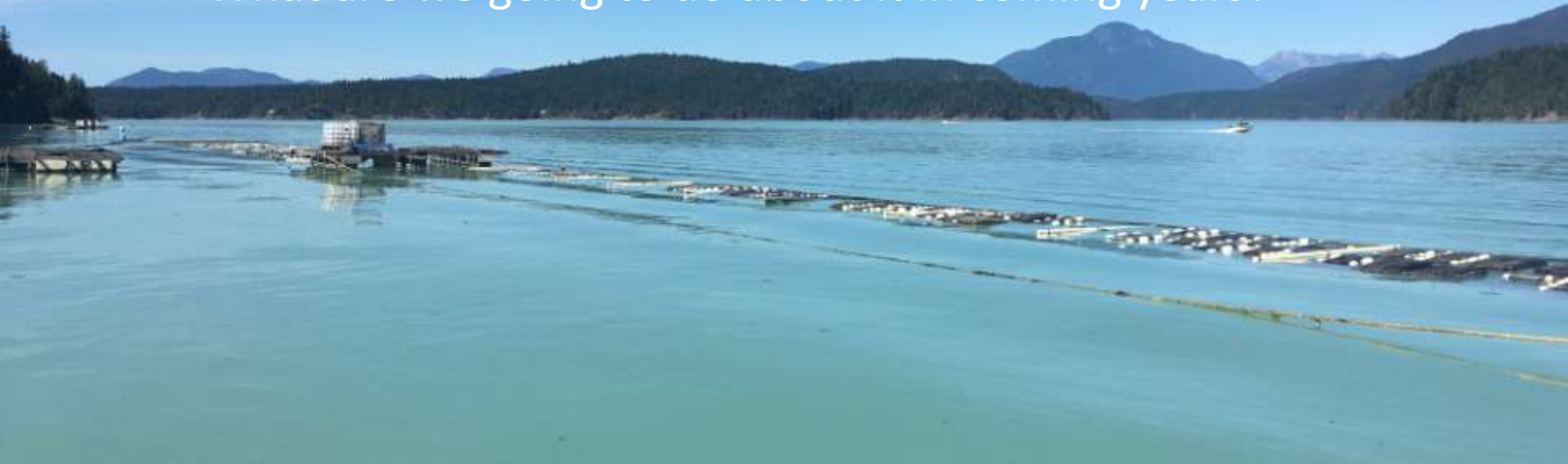
Amelia Hesketh, MSc. student  
University of British Columbia

What is ocean acidification?

How does ocean acidification affect shellfish?

What are we doing about it right now?

What are we going to do about it in coming years?



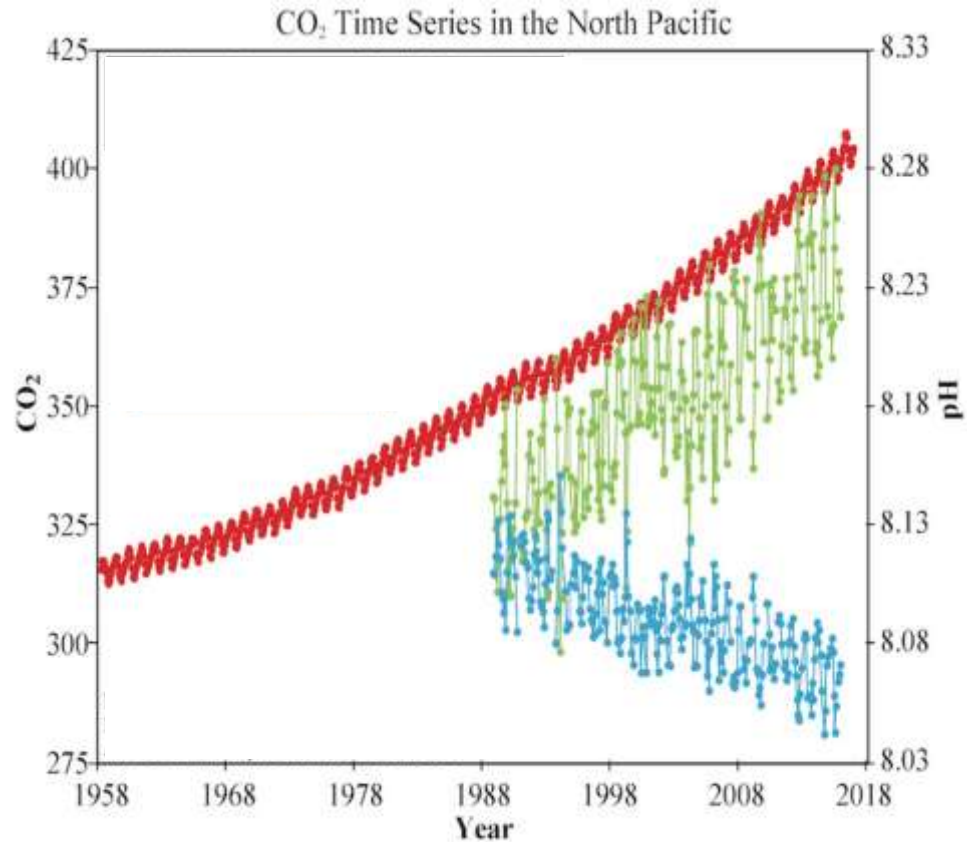
# Ocean acidification

Background

Past studies

Current research

Next steps



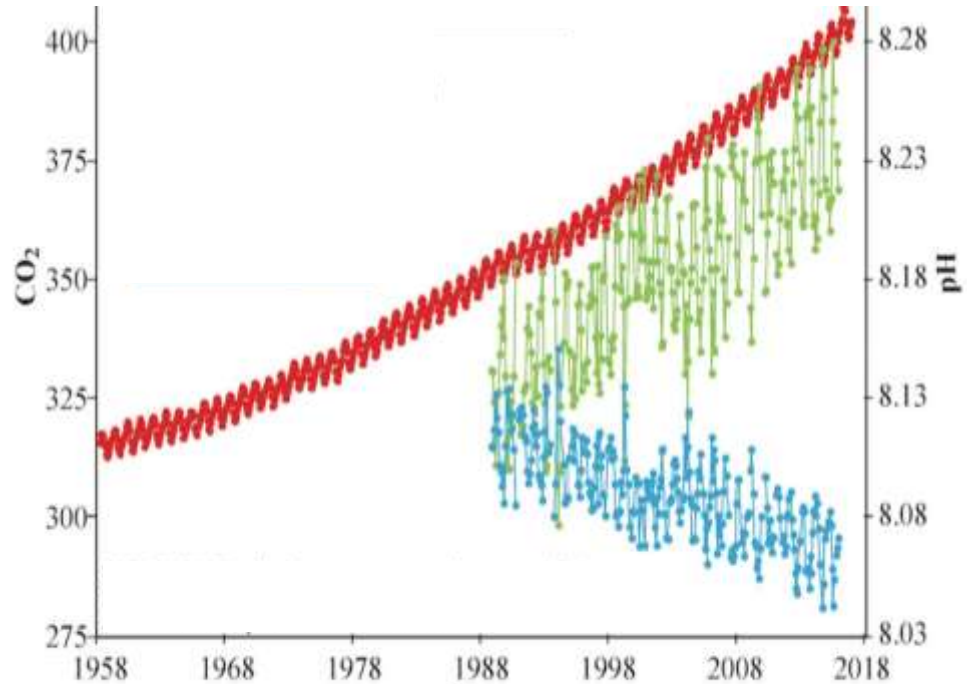
# Ocean acidification

Background

Past studies

Current research

Next steps



Strait of Georgia: 7.5 – 7.9 pH

# Ocean acidification

Background

Past studies

Current  
research

Next steps



# Effects of OA on organisms

Background

Past studies

Current  
research

Next steps

Ocean  
acidification

direct effects



Species of  
interest

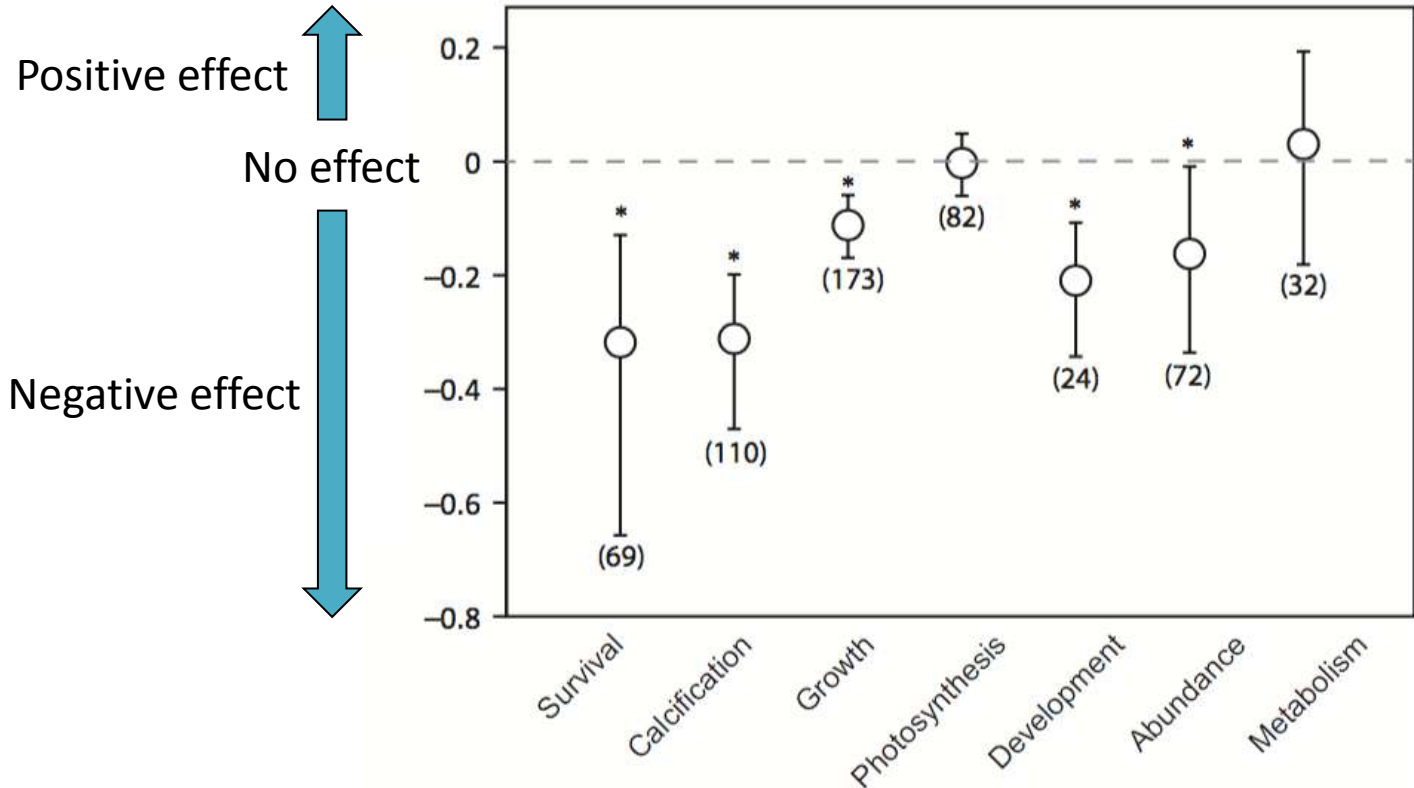
# Direct effects of OA

Background

Past studies

Current research

Next steps



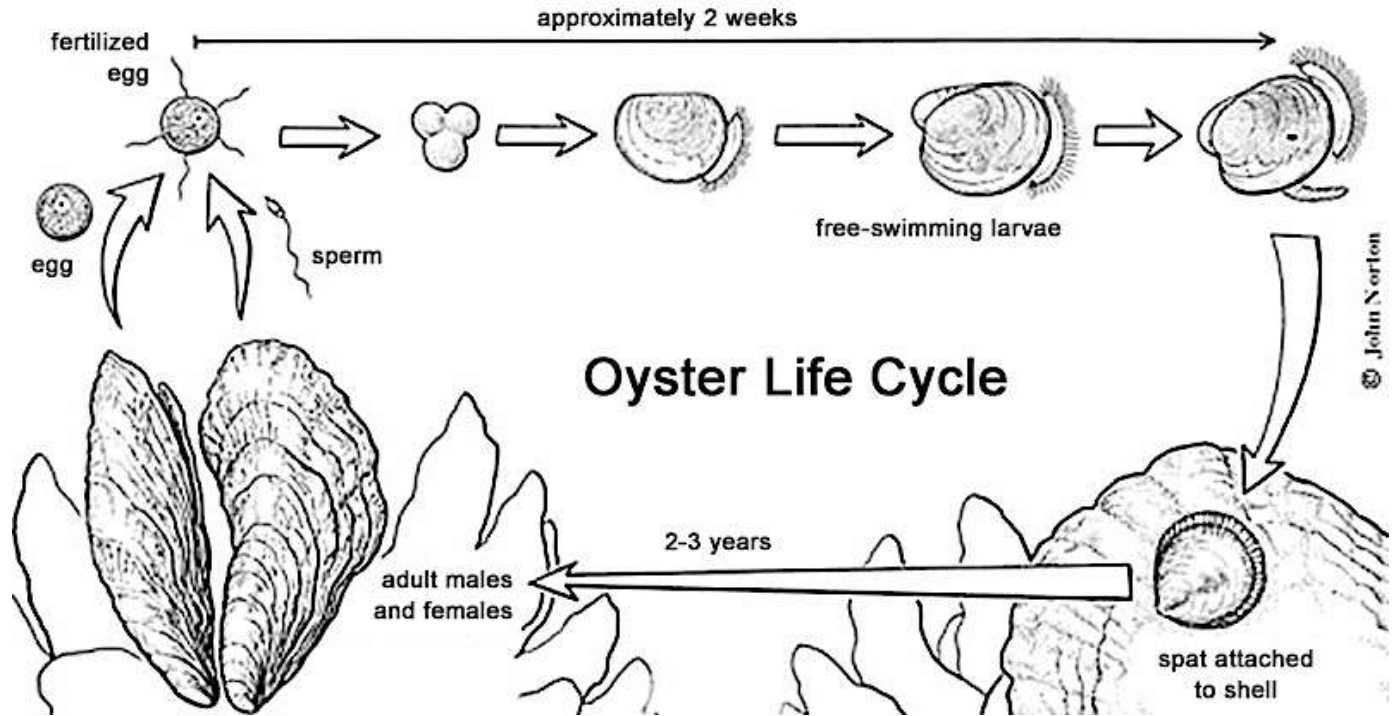
# Bivalve life cycle

Background

Past studies

Current research

Next steps





# Direct effects on larval shellfish

Background

Past studies

Current research

Next steps

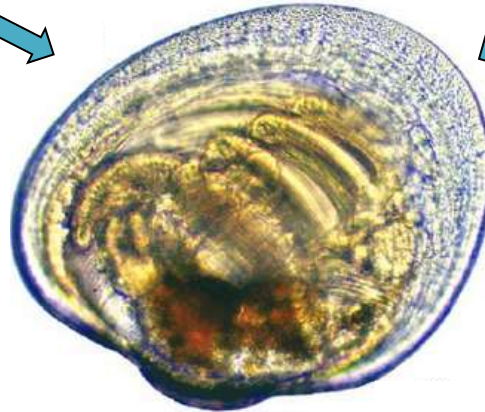
- Larvae are more vulnerable to direct effects of OA because of their higher growth/calcification requirements.

delayed/abnormal  
development

reduced survival

lower  
growth rate

decreased  
metamorphic  
success



# Direct effects on mature shellfish

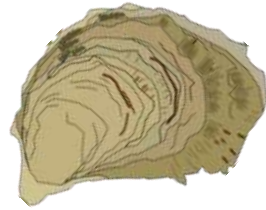
Background

Past studies

Current  
research

Next steps

- Direct effects of OA poorly characterized due to time constraints and lower growth/calcification requirements
  - Decreased calcification
  - Weaker shells
  - Physiological stress response
  - Lower reproductive output
  - Thinner shells



# Effects of OA on organisms

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acidification

direct effects



Species of  
interest

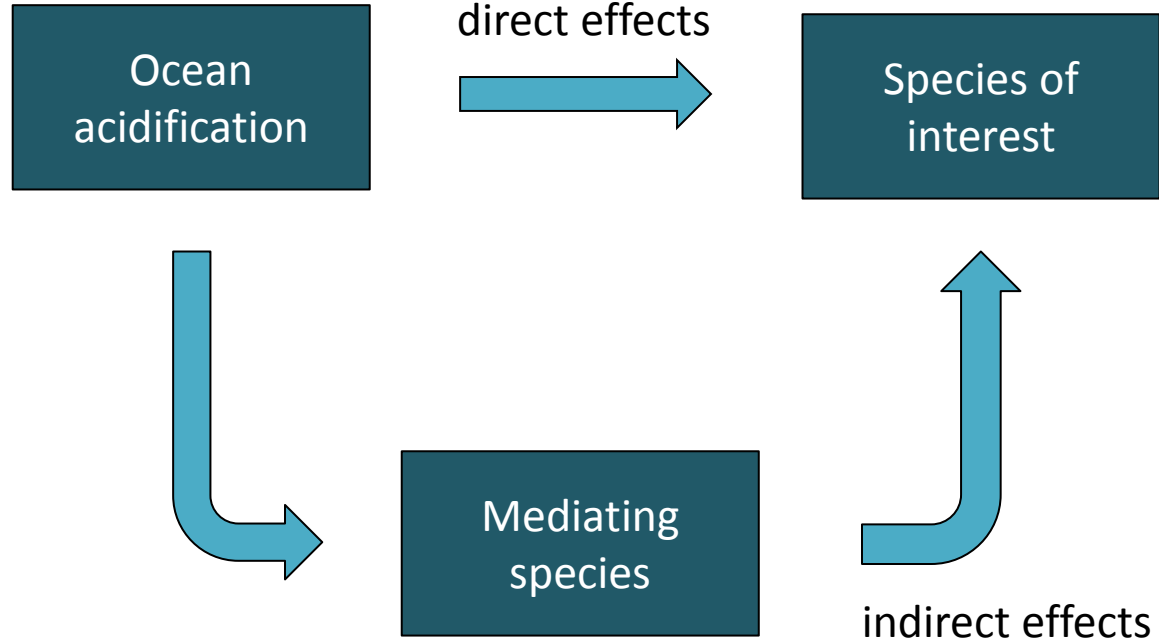
# Effects of OA on organisms

Background

Past studies

Current  
research

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# Indirect effects may dominate

- OA may compromise defense mechanisms in shellfish

Background

Past studies

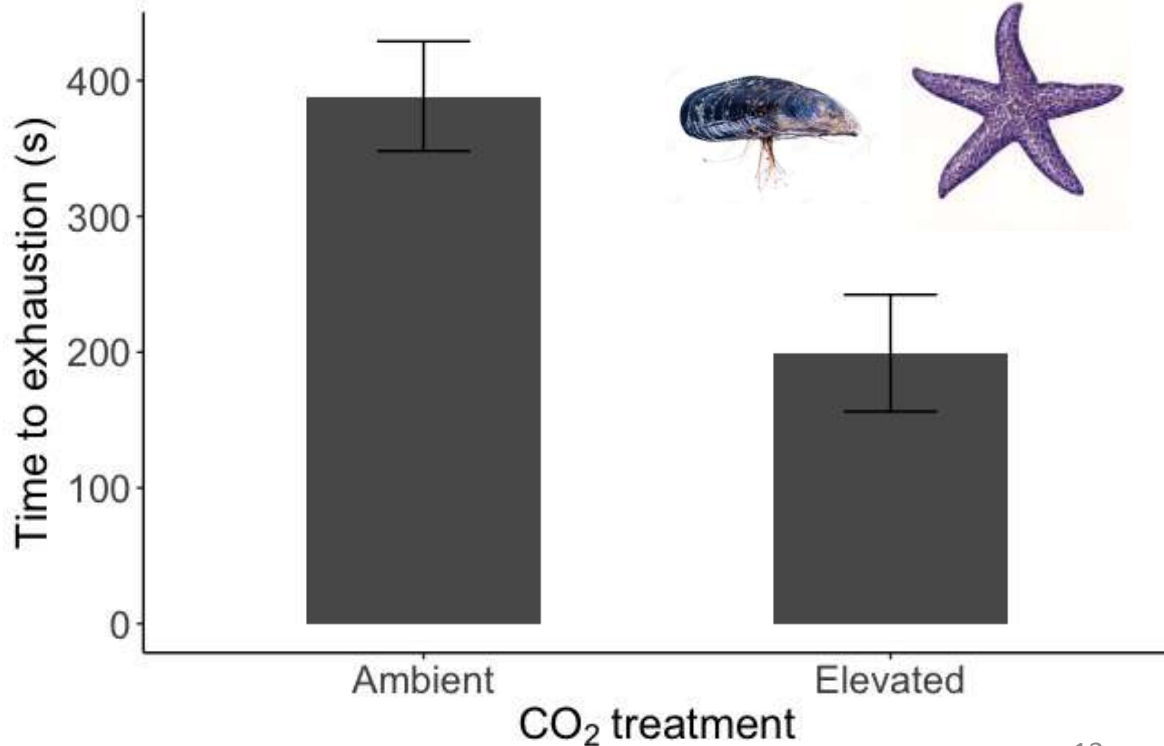
Current research

Next steps

Hard to open



Easy to open



# Indirect effects may dominate

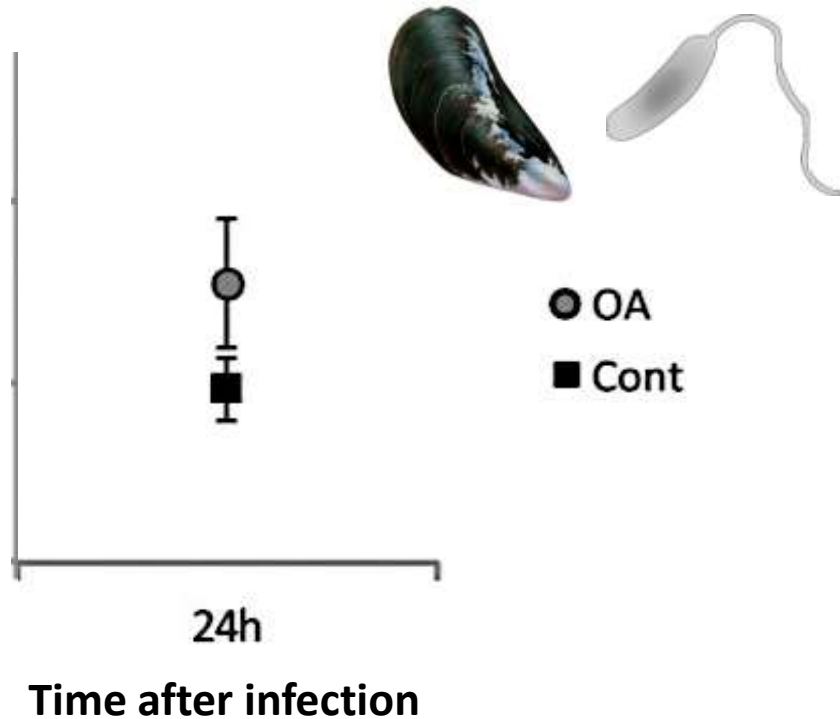
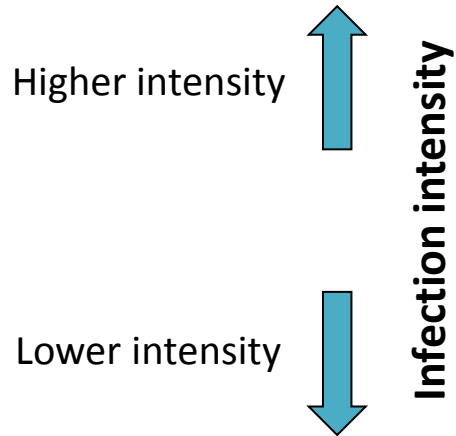
- OA may increase disease susceptibility in shellfish

Background

Past studies

Current research

Next steps



# *Crassostrea gigas* system

Background

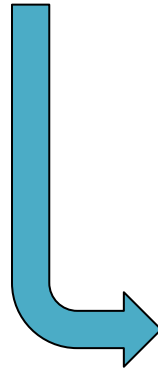
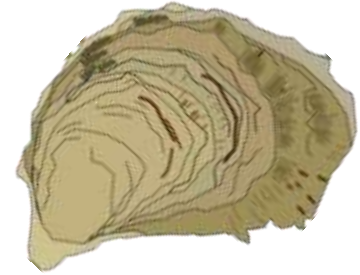
Past studies

Current  
research

Next steps

Ocean  
acidification

direct effects



indirect effects

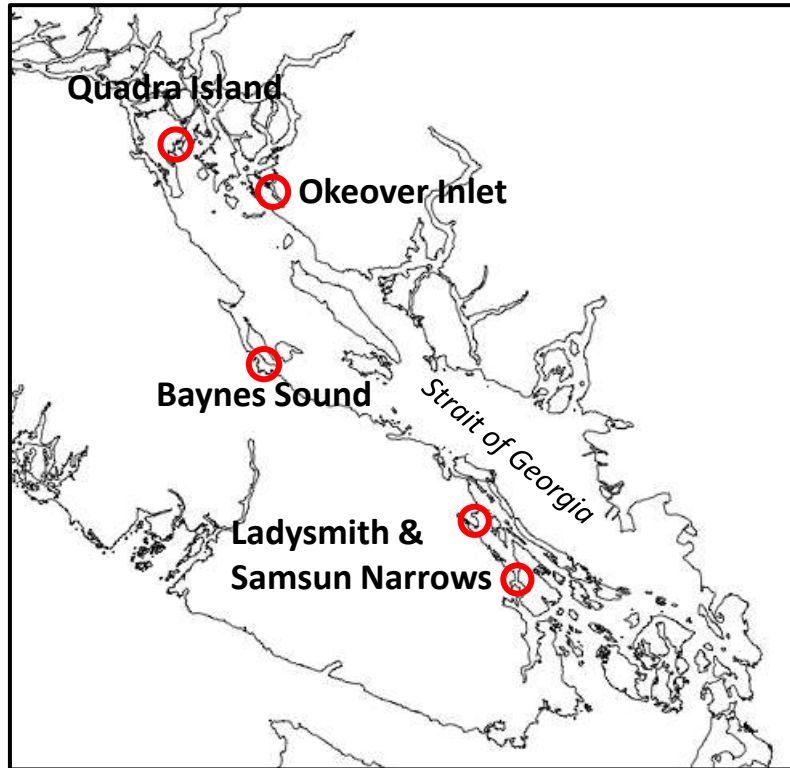
# Strait of Georgia outplant

Background

Past studies

Current  
research

Next steps





# Strait of Georgia outplant

Background

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Current  
research

Next steps

## Environmental variables:

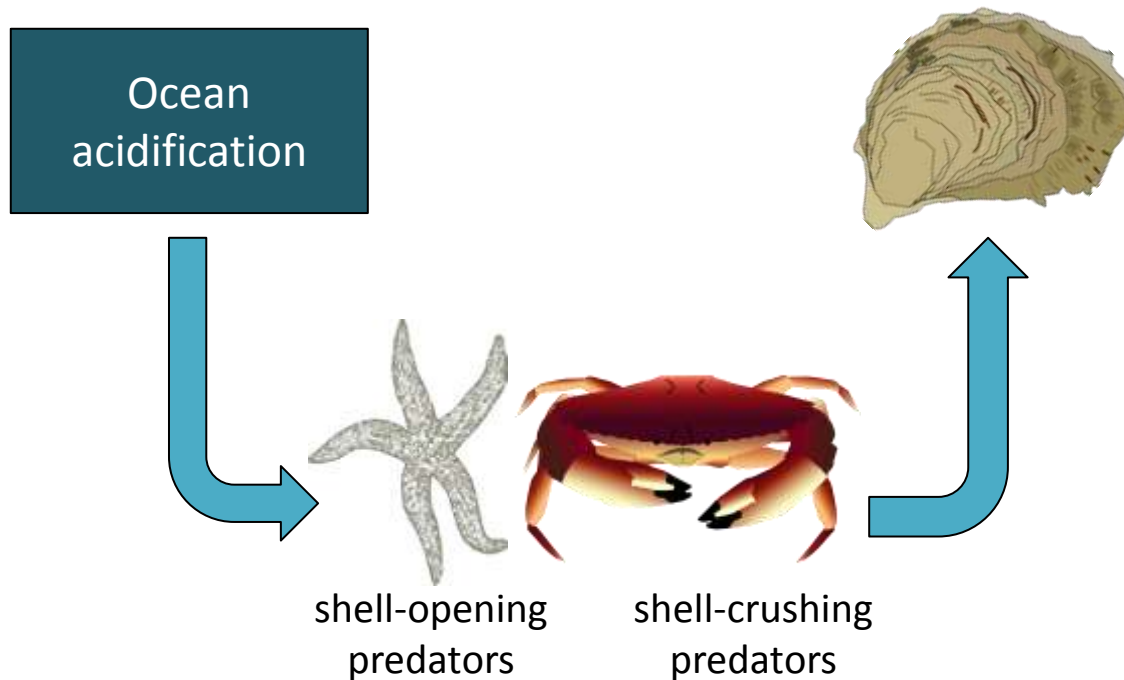
- Temperature
- Salinity
- Chlorophyll
- Nutrients
- Dissolved oxygen
- Dissolved inorganic carbon
- Total alkalinity
- pH

## Oyster responses:

- Shell length (growth)
- Shell thickness
- Condition index
- Mortality
- Shell integrity
- Metabolic rate
- Fat content
- Stress response

# Susceptibility to predation

- OA may cause energy to be reallocated from defense against predators to basal metabolic functions.



Background

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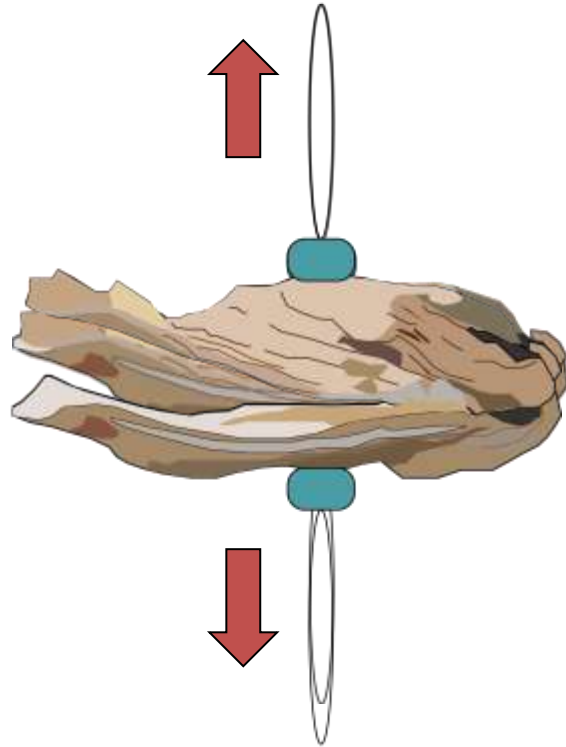
# Susceptibility to predation

Background

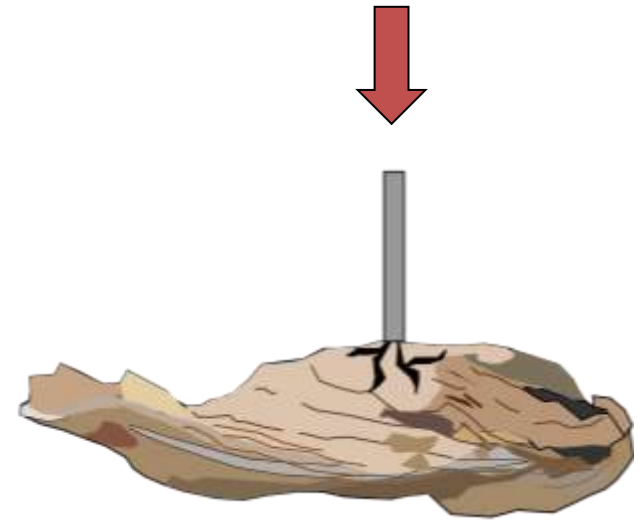
Past studies

Current research

Next steps



shell-opening predators



shell-crushing predators

# Additional projects

Background

Past studies

Current  
research

Next steps

How does OA affect oysters' ability to resist disease?

How important is genotype in determining oysters' vulnerability to OA?

GORDON AND BETTY  
**MOORE**  
FOUNDATION

**Hakai**

# Acknowledgements

Background

## Industry partners

André Comeau, Yves Perrault,  
Keith Reid, Andrew Dryden,  
Nathan Harben

Past studies

## Collaborators

Debby Ianson, Karen Kohfeld,  
Ellie Simpson

Current  
research

## Committee members

Chris Harley, Sarah Dudas, Patrick Martone,  
Colin Brauner

Next steps

## Harley lab

a place of mind



MEOPAR

MARINE ENVIRONMENTAL OBSERVATION  
PREDICTION & RESPONSE NETWORK



**NSERC**  
**CRSNG**

Hakai

Thank you

