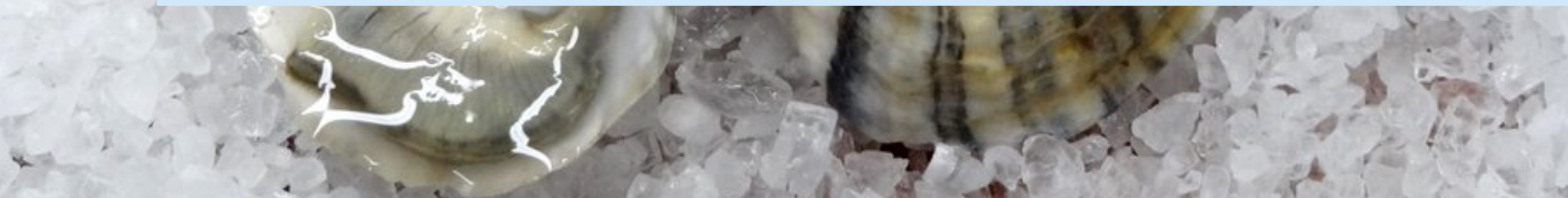
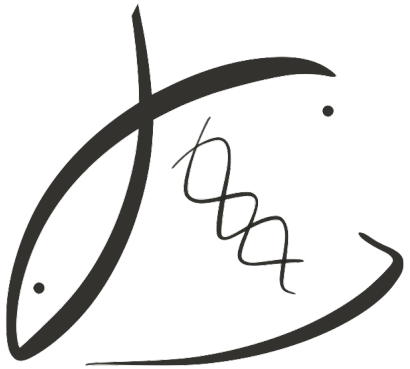
# Characterizing Physiological Effects of Multiple Stressors on the Pacific oyster, *Crassostrea Gigas*, in a Wild Setting

Yaamini Venkataraman
Roberts Lab
November 17, 2016



# Outline

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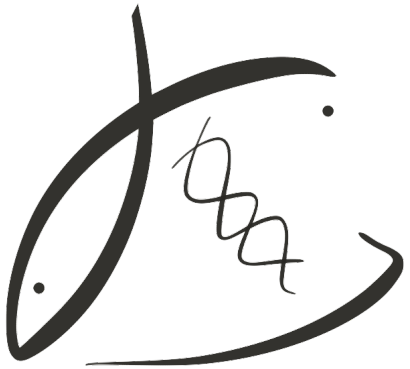
and
FISHERY
SCIENCES

Title Photo from Willapa Oysters

# Outline

- Introduction to oysters

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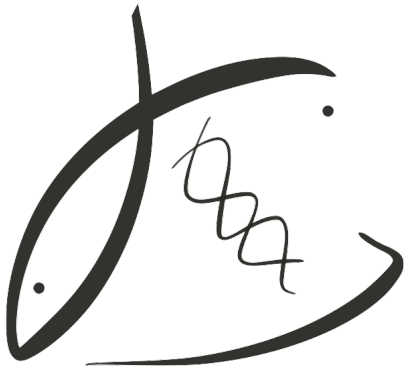
- Introduction to oysters
- Research objectives

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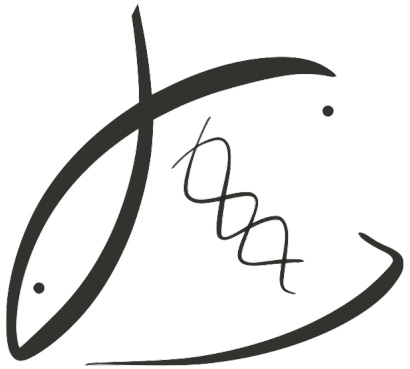
- Why?

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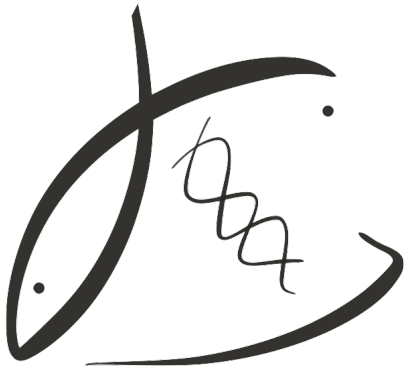
# Outline

- Introduction to oysters
- Research objectives
- Why?
- Predictions

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Title Photo from Willapa Oysters

# Oysters and the Ecosystem

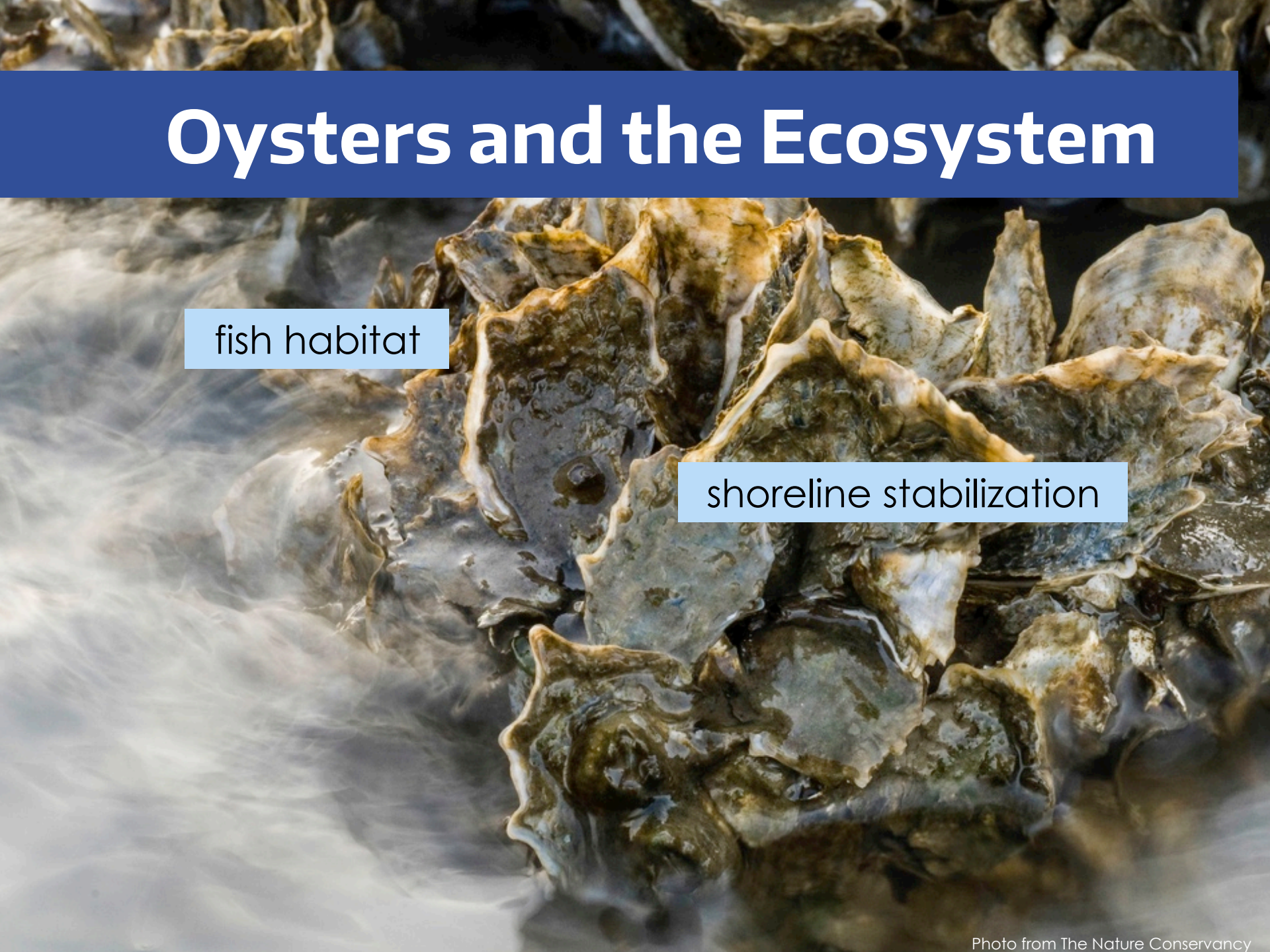
Photo from The Nature Conservancy

# Oysters and the Ecosystem

fish habitat

Photo from The Nature Conservancy

# Oysters and the Ecosystem

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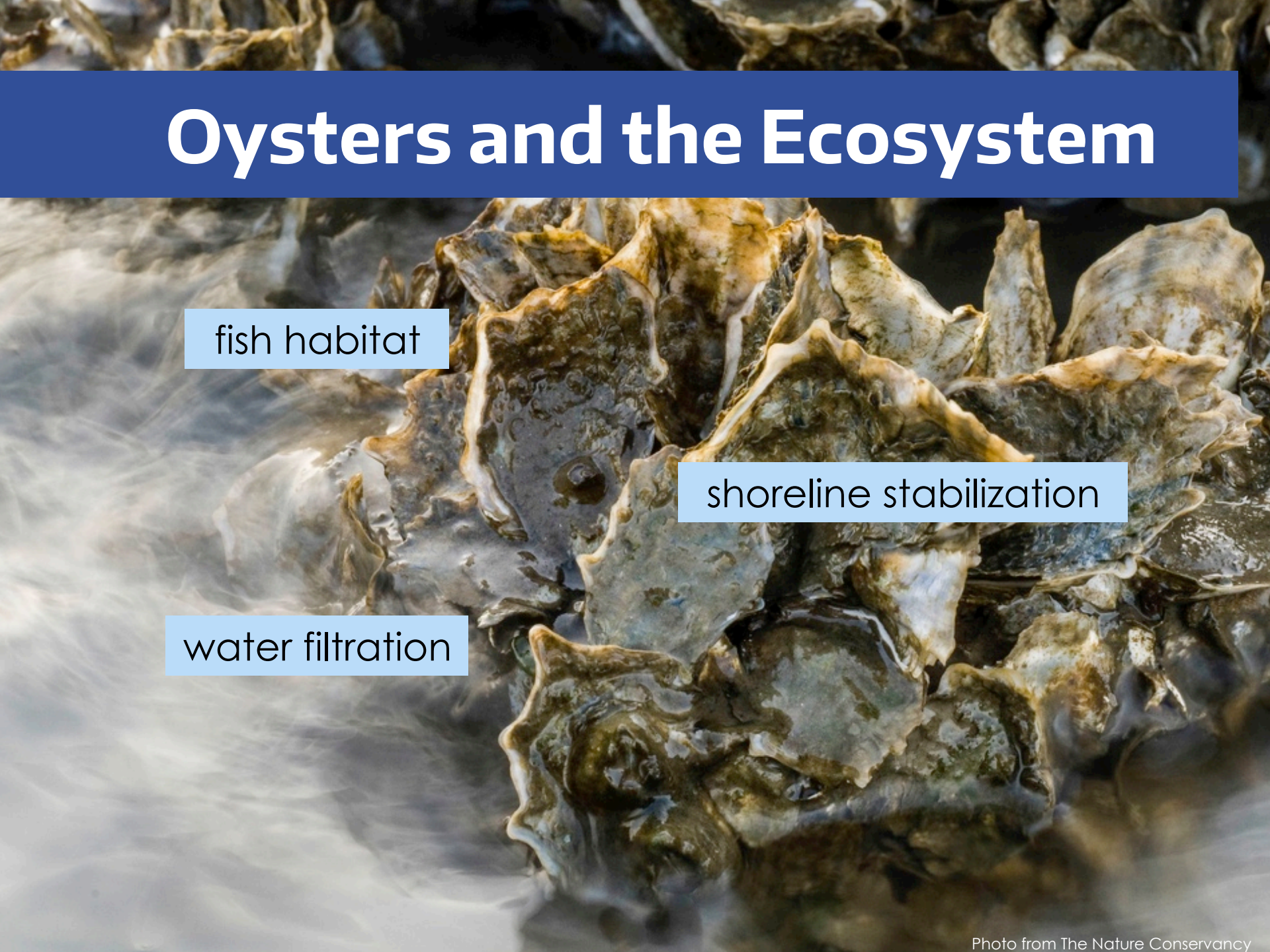


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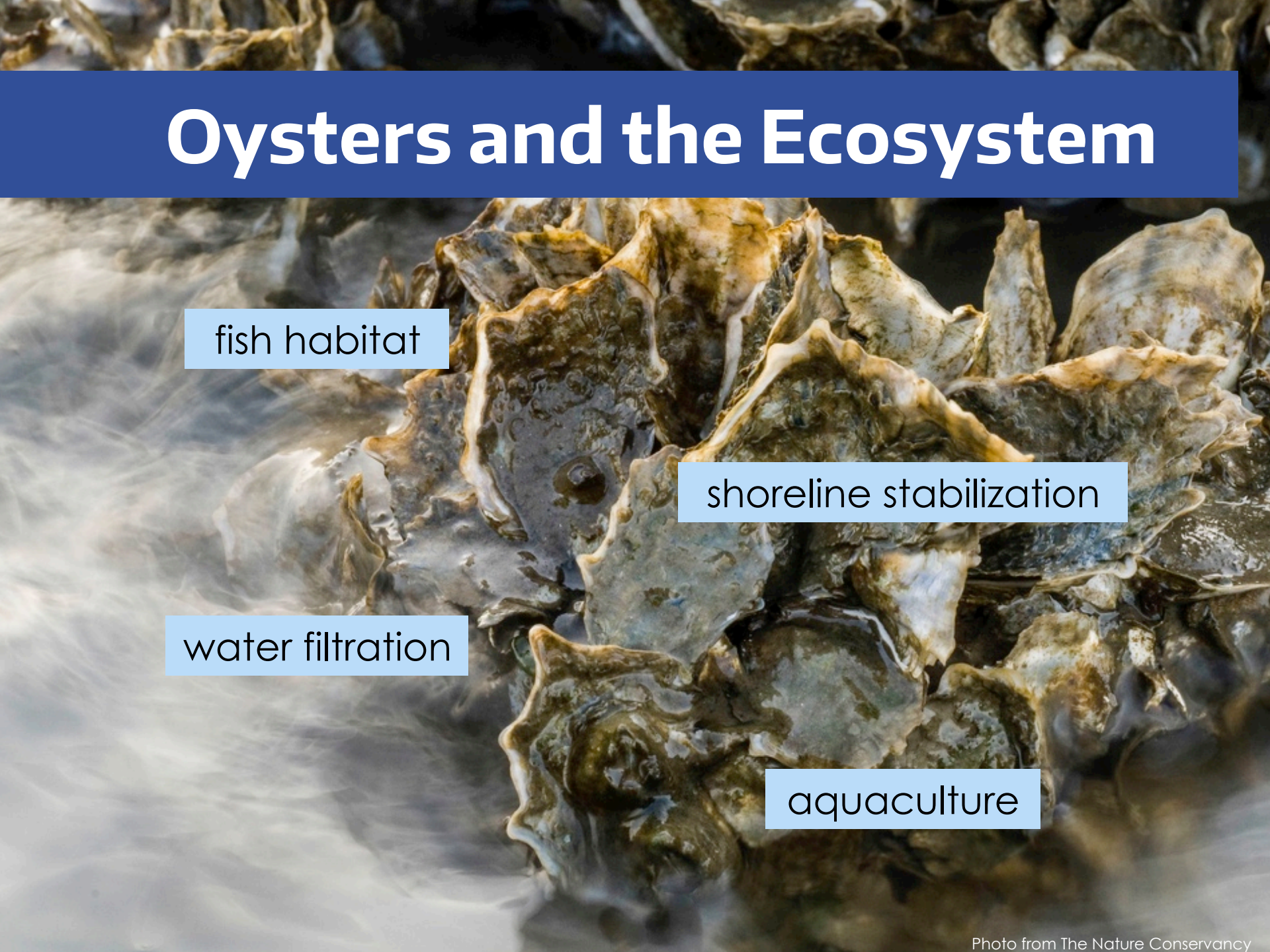


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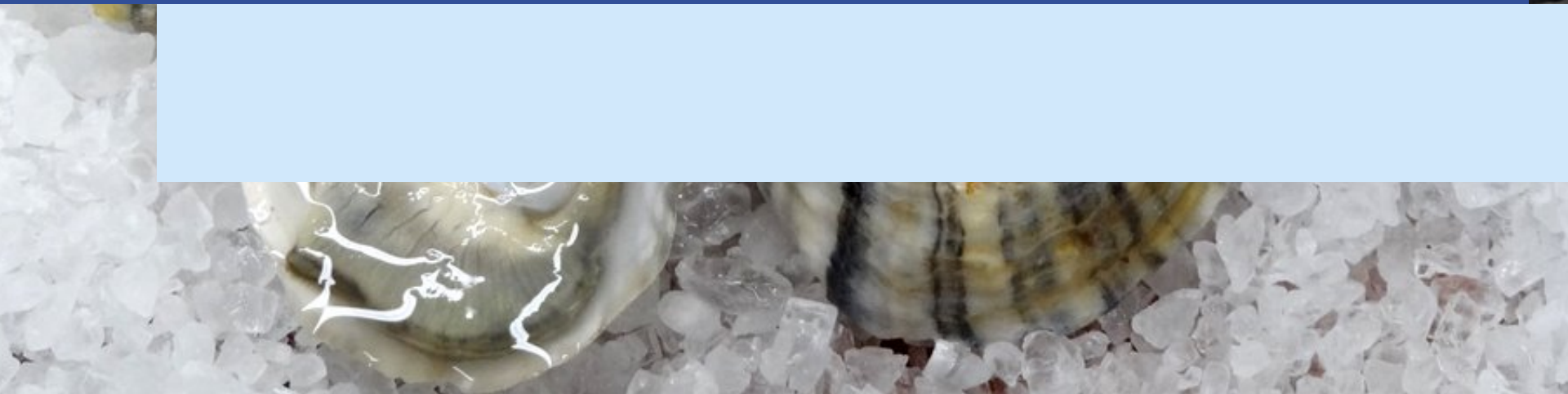
# How does environmental variability affect *C. gigas*' physiological response?



# How does environmental variability affect *C. gigas*' physiological response?

Differences in reproduction and immunity?

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Differences in reproduction and immunity?
How can eelgrass presence shape these outcomes?

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Differences in reproduction and immunity?
How can eelgrass presence shape these outcomes?
Can we detect differences in epigenetics and proteomics?

# Environmental Variability

- 5 sample sites

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  - Fidalgo Bay (FB)

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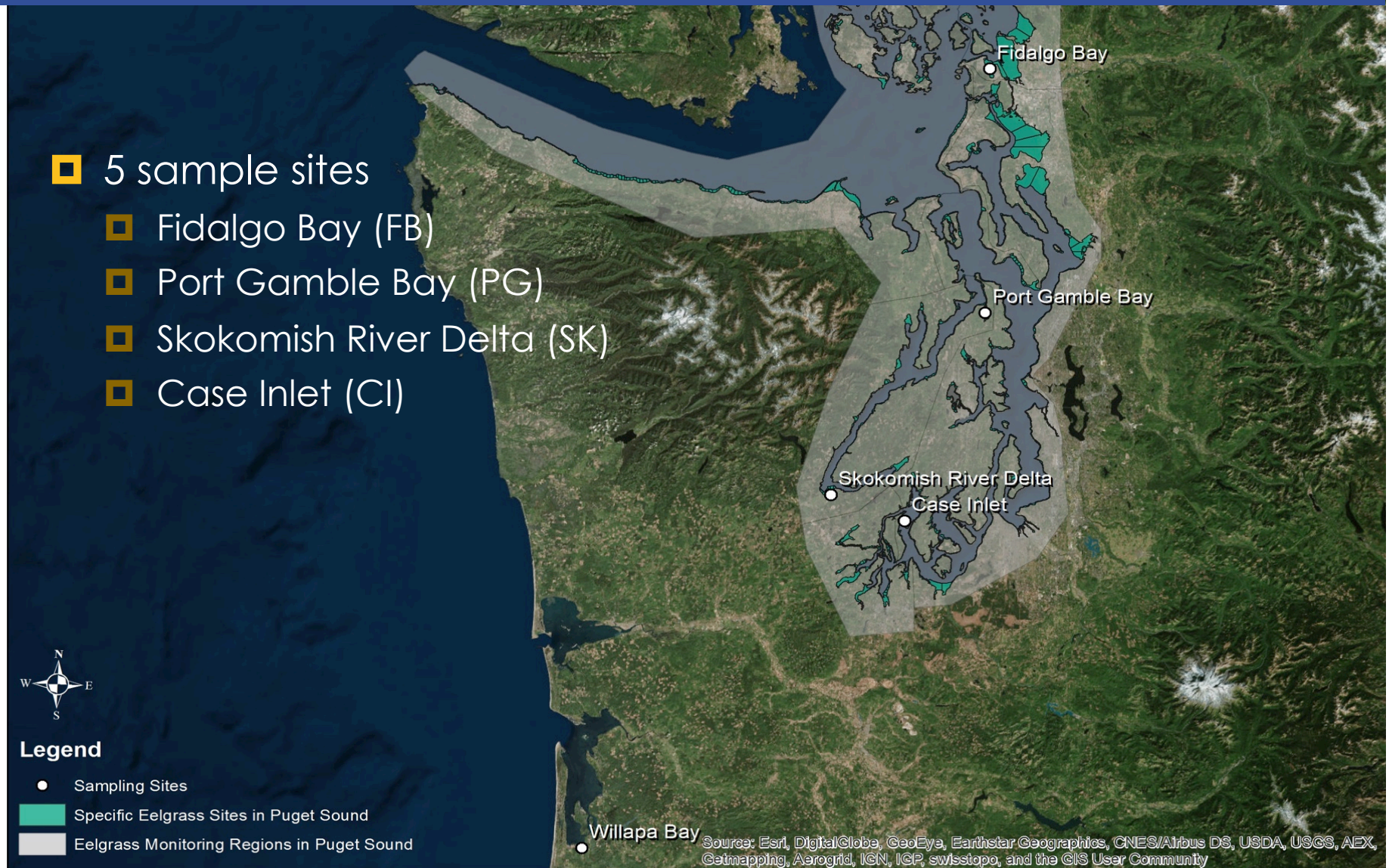
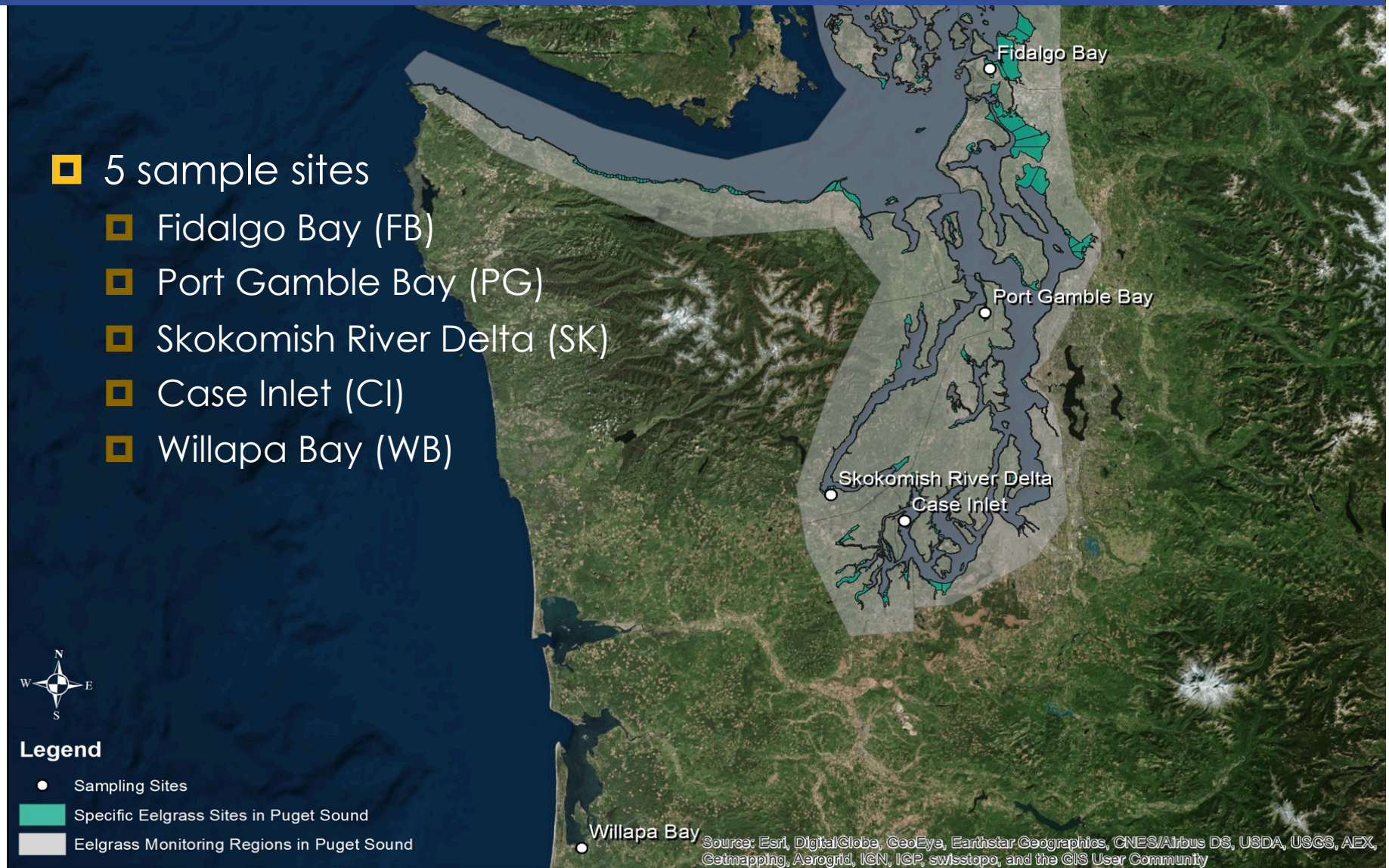


# Environmental Variability

- 5 sample sites
  - Fidalgo Bay (FB)
  - Port Gamble Bay (PG)
  - Skokomish River Delta (SK)
  - Case Inlet (CI)
  - Willapa Bay (WB)



# Experimental Overview

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150
oysters

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150 oysters

3 replicates

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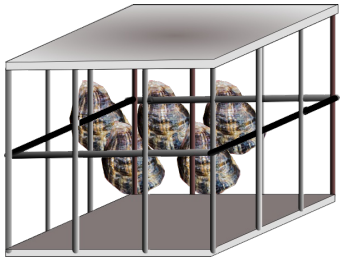

3 replicates

outplant to 5 sites

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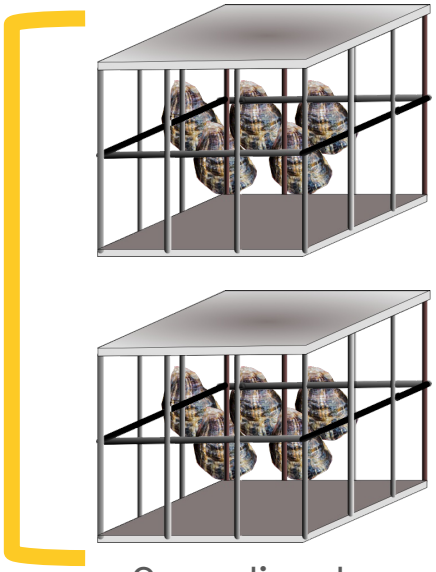

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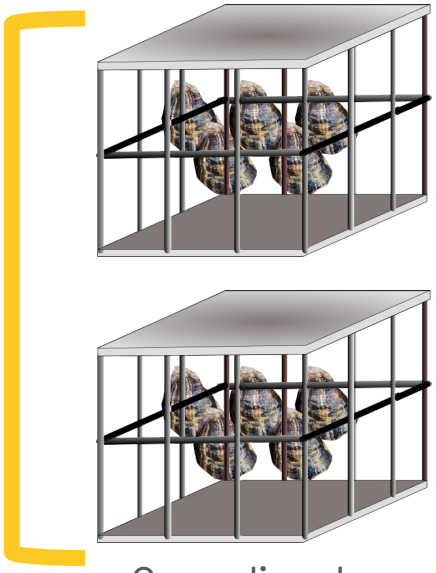

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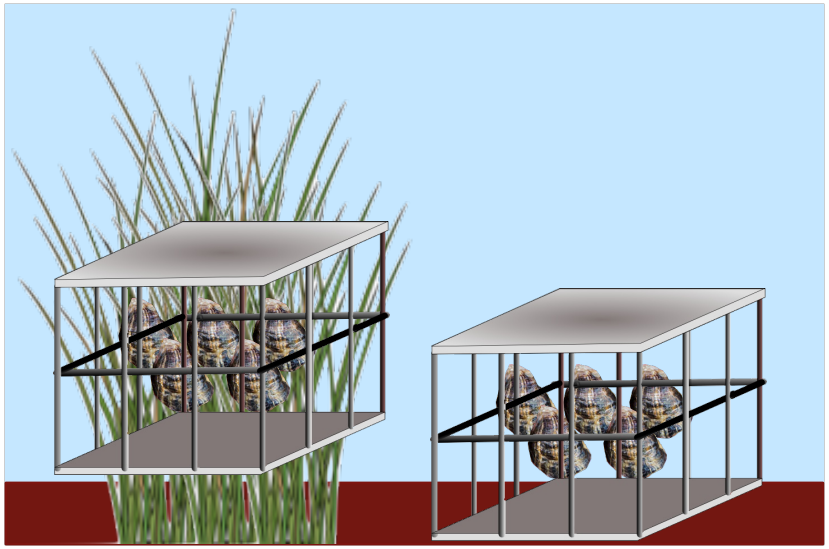

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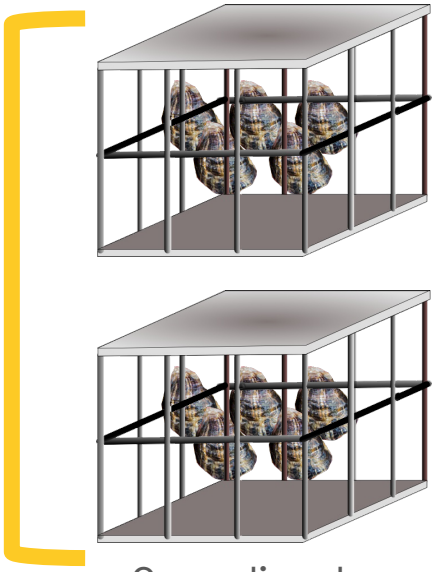
150 oysters



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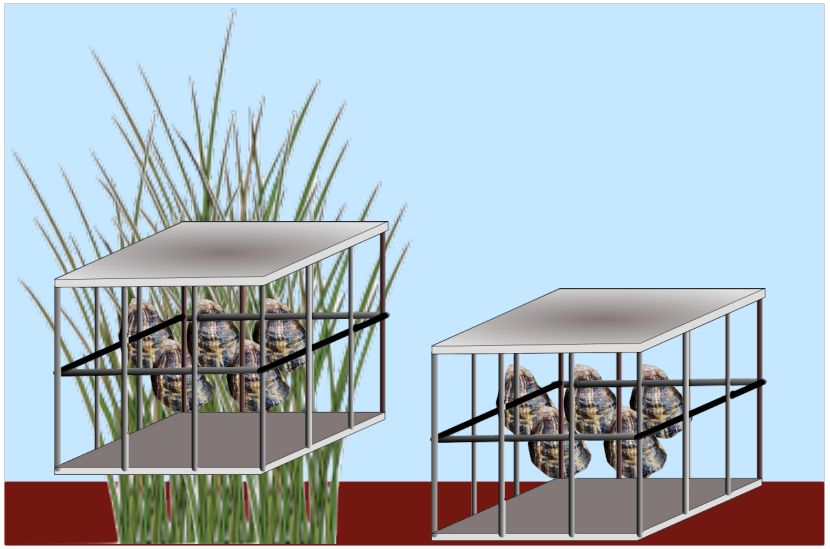
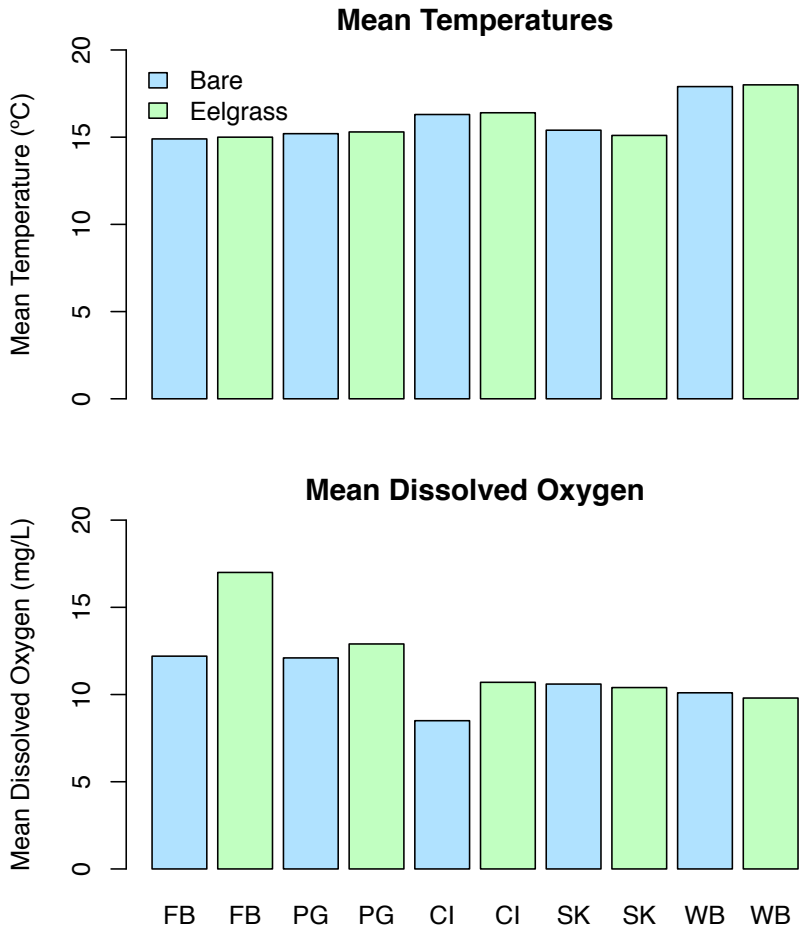


eelgrass vs. no eelgrass

# Environmental Variability



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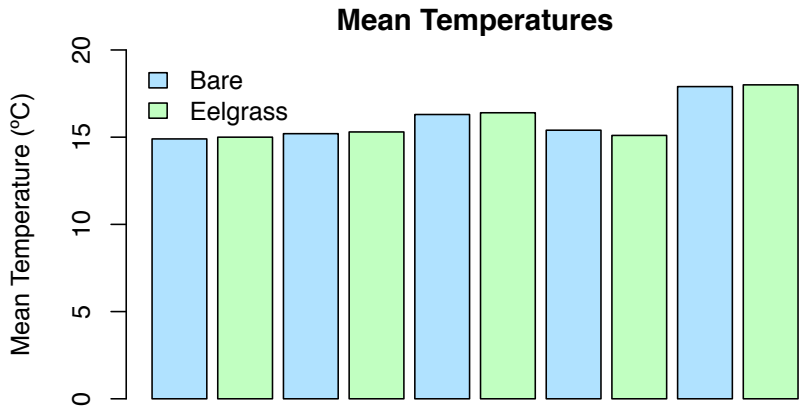
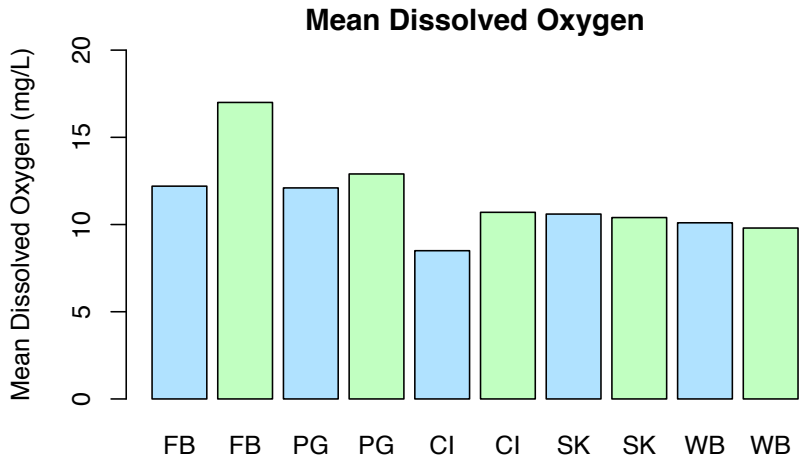
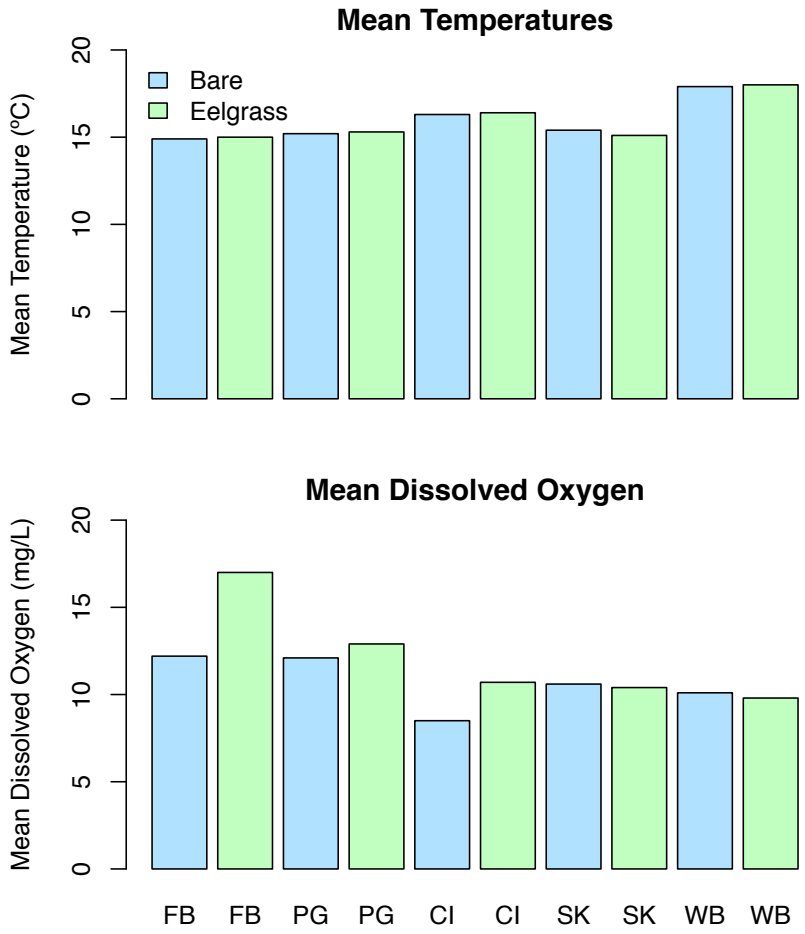


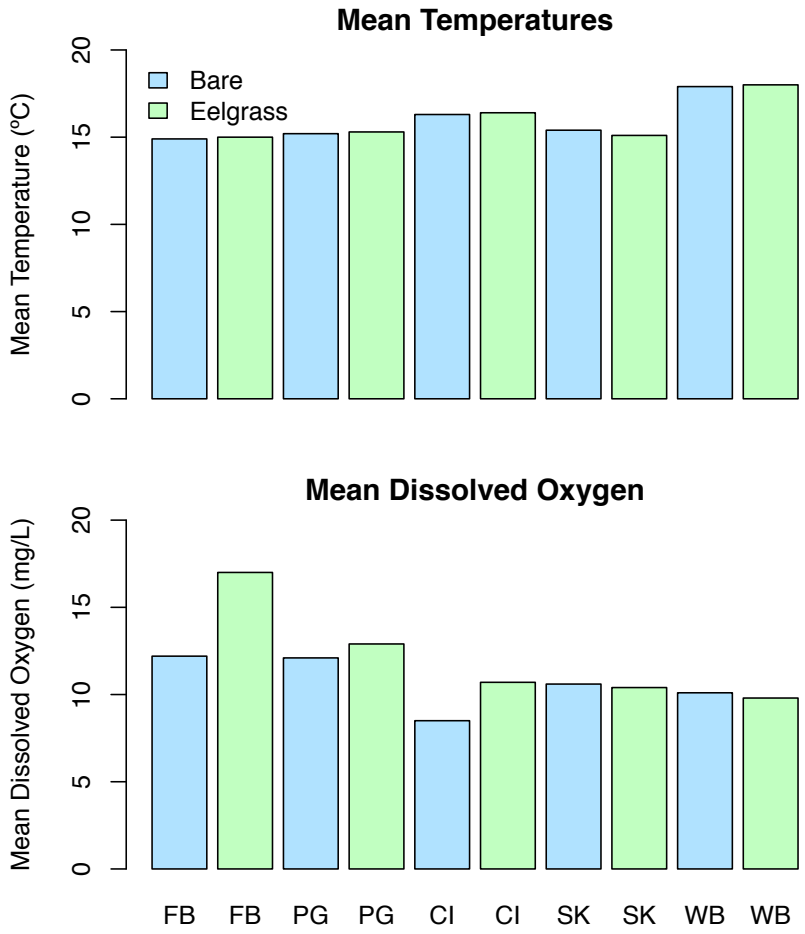

- WB warmest site (18°C)

# Environmental Variability




- WB warmest site (18°C)
- FB had highest DO
  - Bare: 12.2 mg/L
  - Eelgrass: 17 mg/L

# Environmental Variability




- WB warmest site (18°C)
- FB had highest DO
  - Bare: 12.2 mg/L
  - Eelgrass: 17 mg/L
- CI had lowest DO
  - Bare: 8.5 mg/L
  - Eelgrass: 10.7 mg/L

# Eelgrass Presence


- White: Eelgrass monitoring region
- Green: Specific eelgrass sites

# Eelgrass Presence

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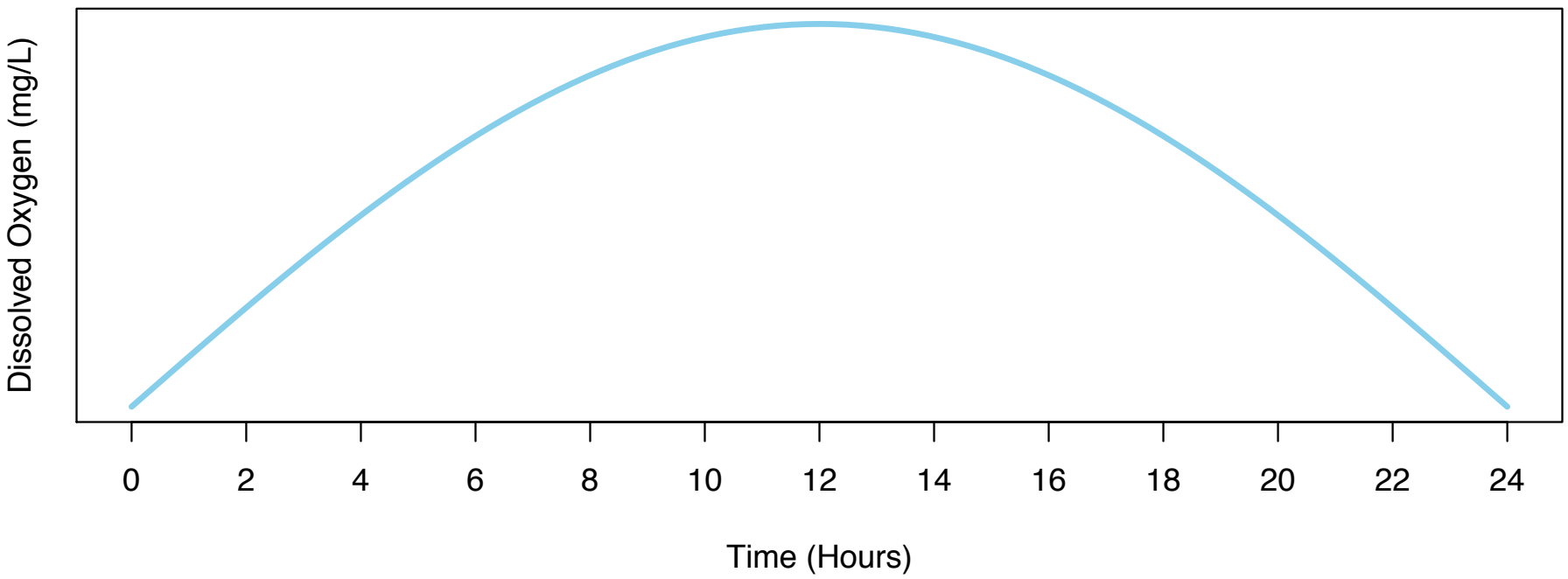

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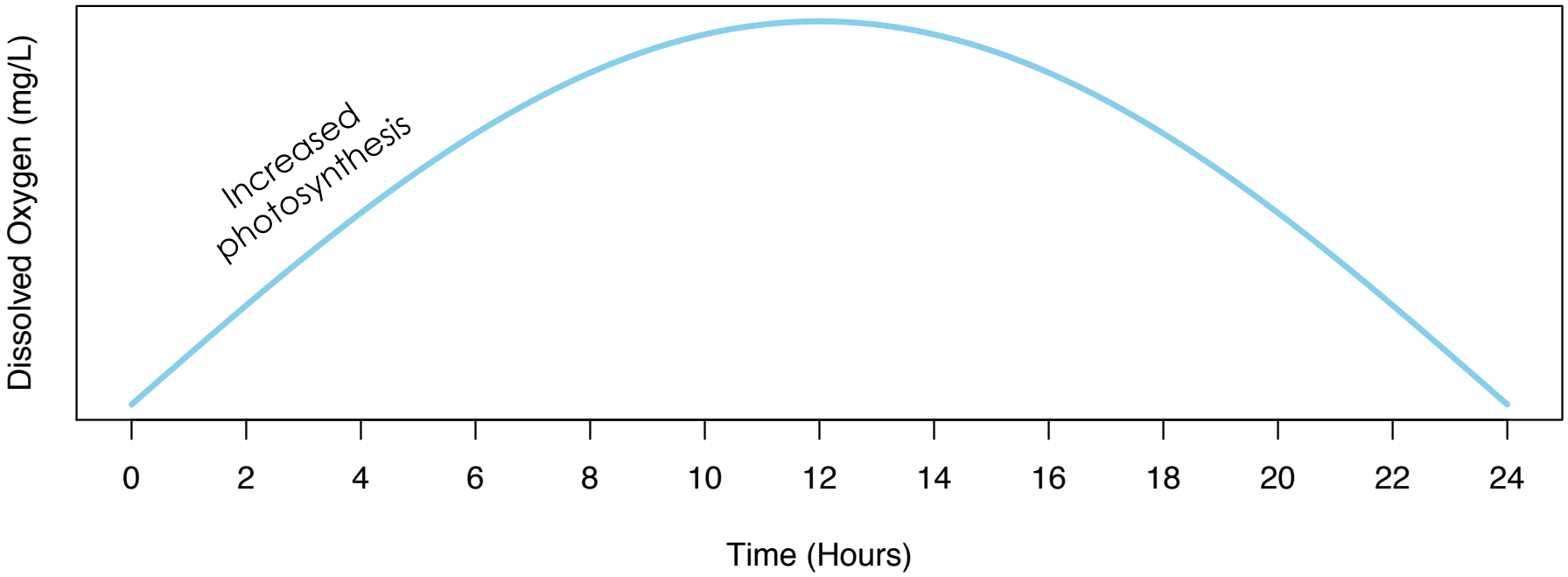

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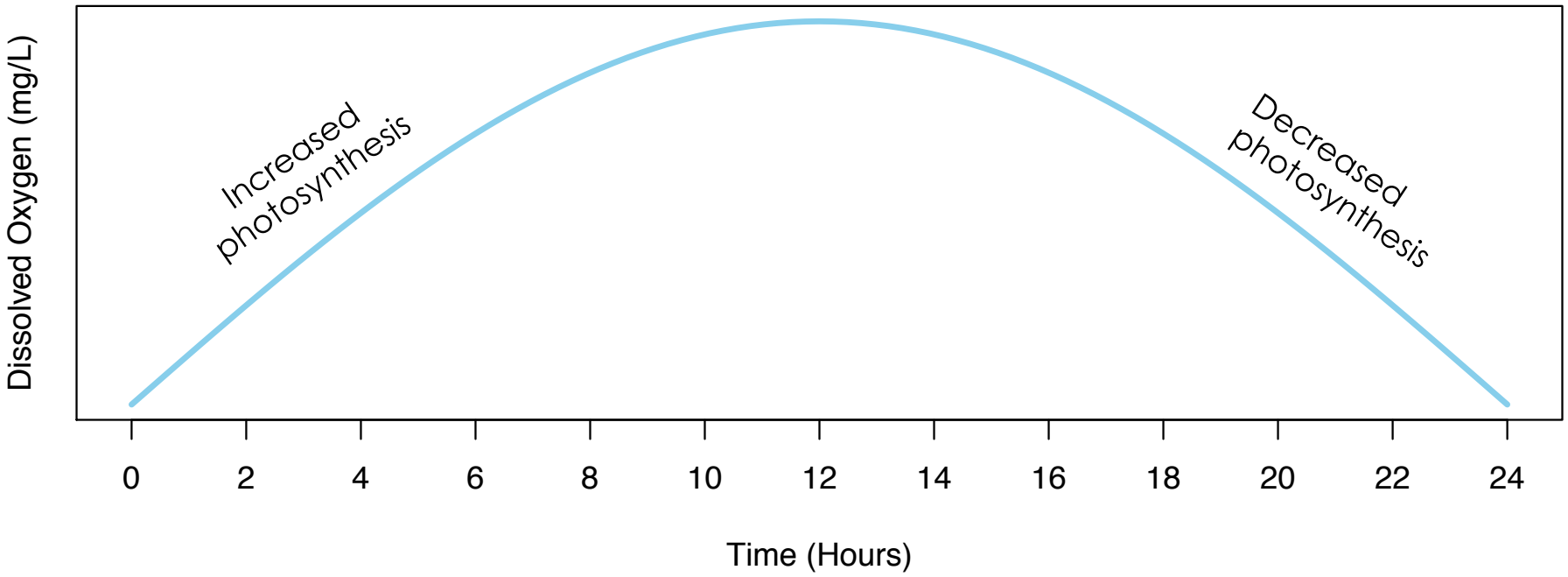

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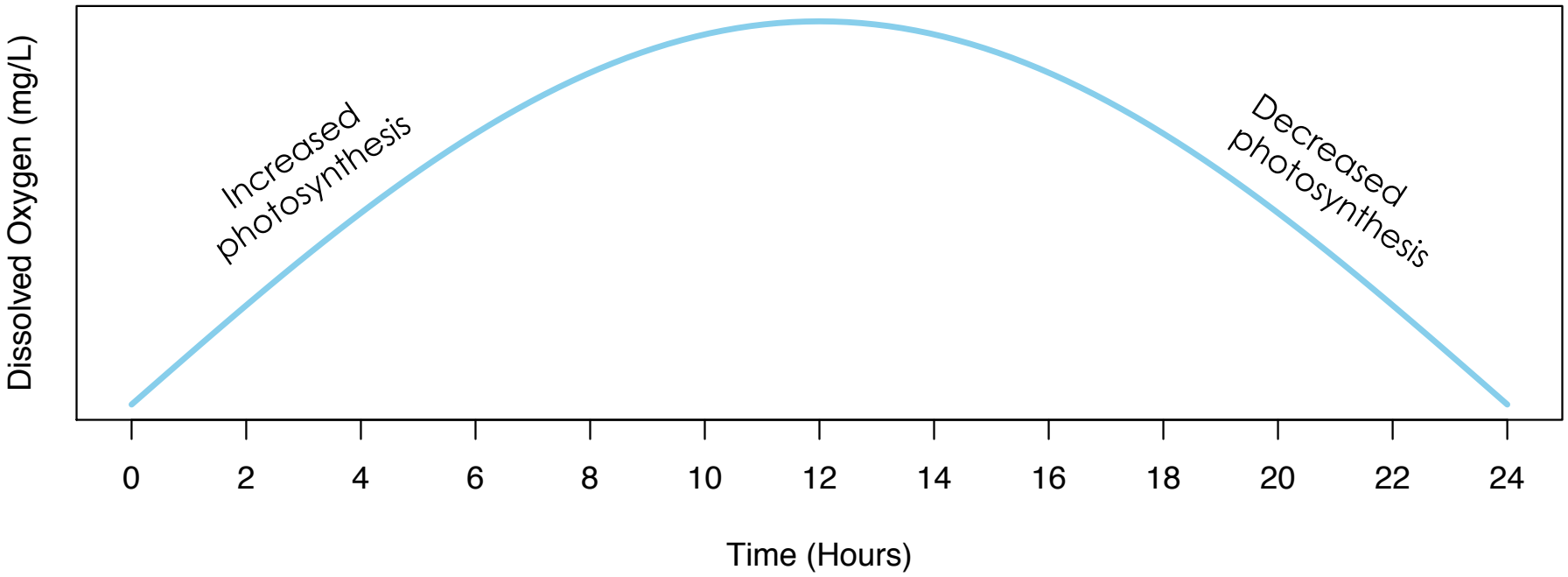


- Does eelgrass impact respiration physiology?

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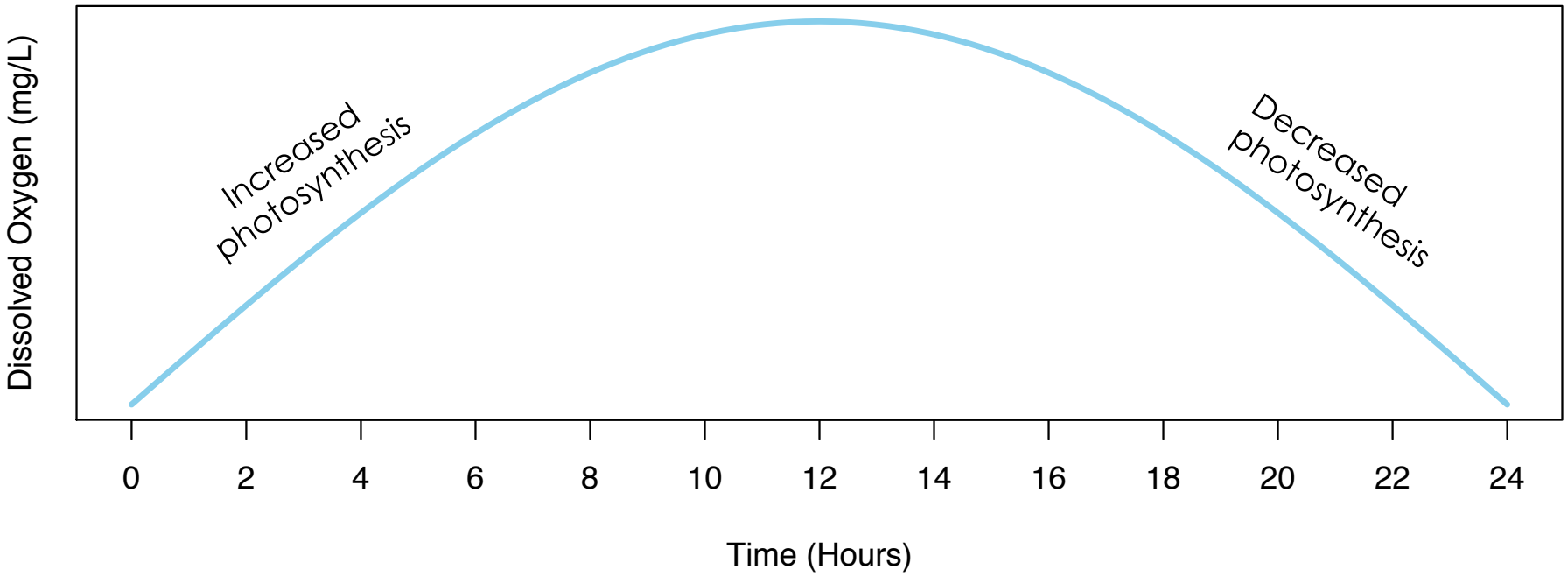
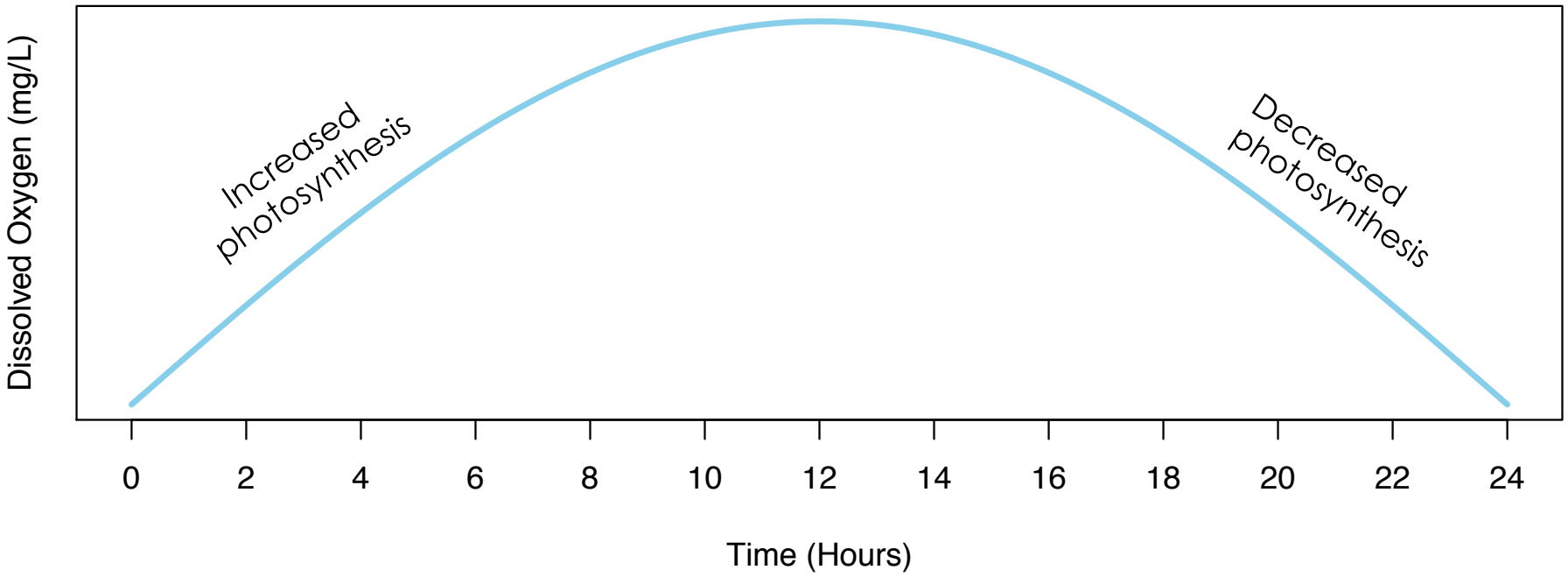
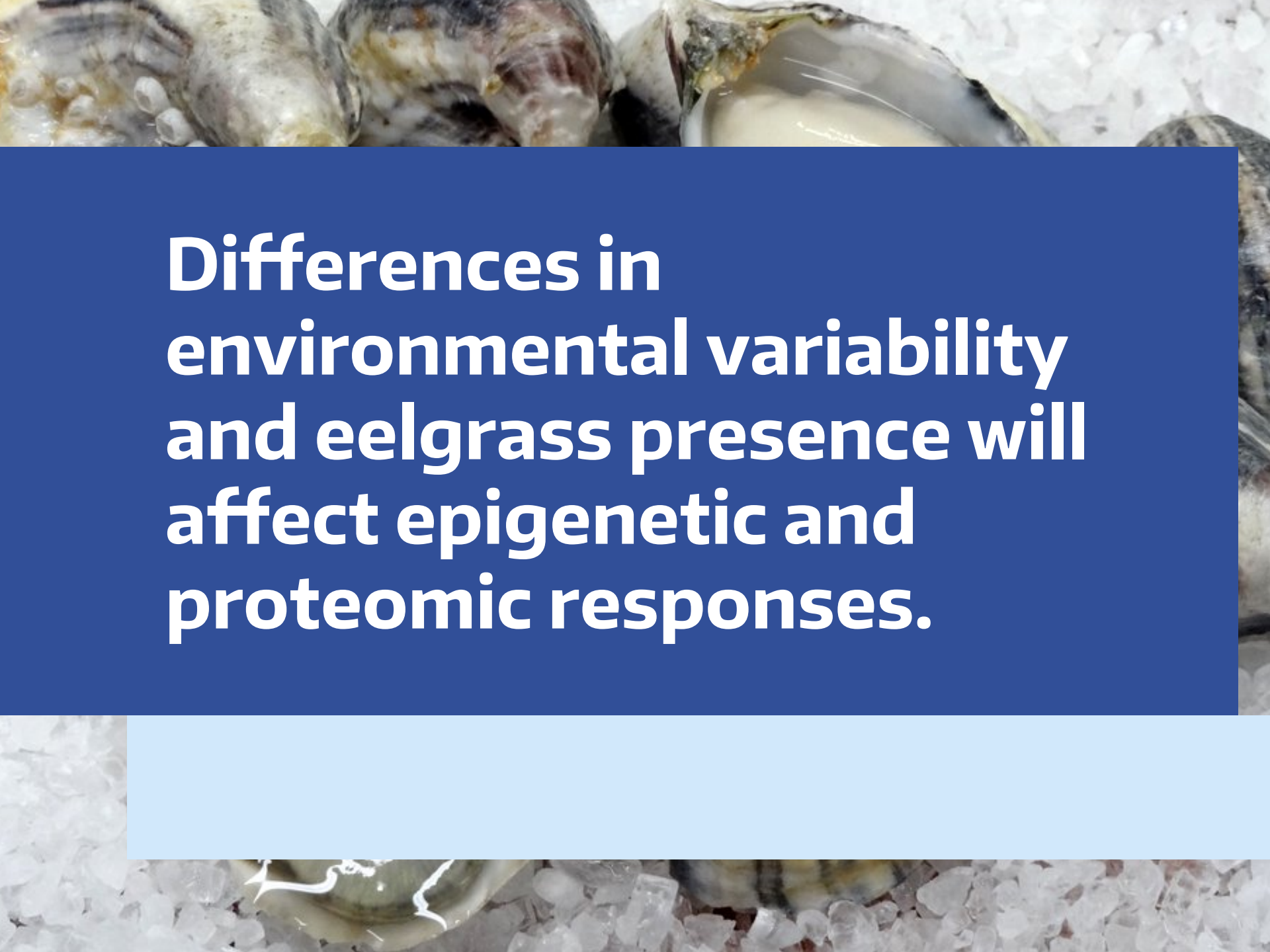



- Does eelgrass impact respiration physiology?
  - Positive: Decreased expression of proteins involved in oxidative stress

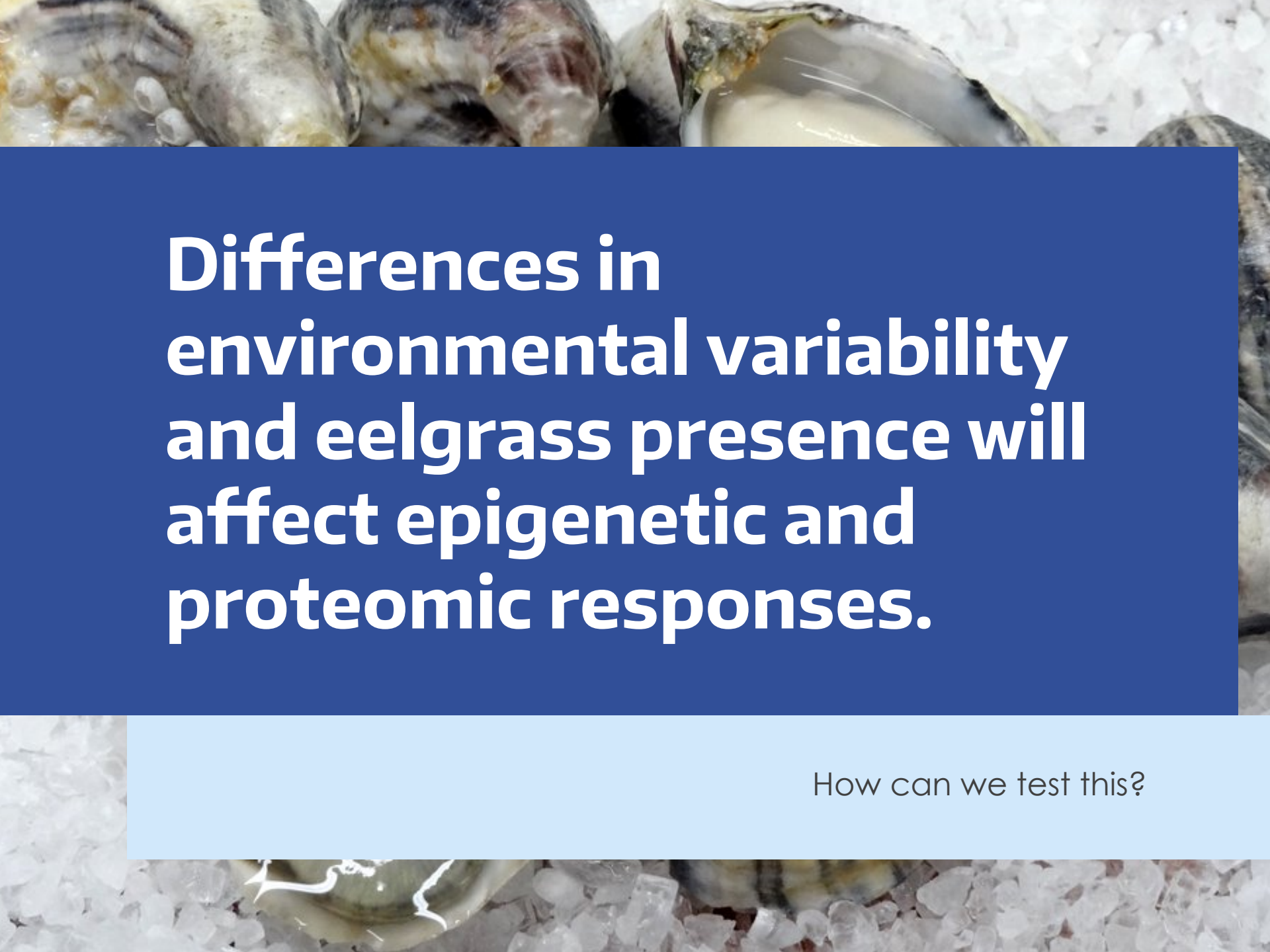
# Eelgrass Presence




- Does eelgrass impact respiration physiology?
  - Positive: Decreased expression of proteins involved in oxidative stress
  - Negative: Increased expression of proteins involved in oxidative stress



**Differences in environmental variability and eelgrass presence will affect epigenetic and proteomic responses.**



# Differences in environmental variability and eelgrass presence will affect epigenetic and proteomic responses.

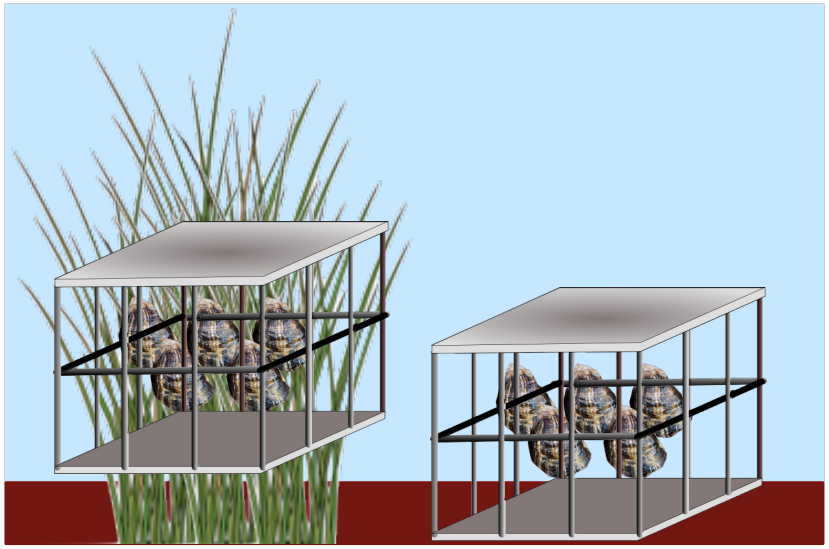
How can we test this?

# Experimental Overview

150 oysters

3 replicates

outplant to 5 sites



eelgrass vs. no eelgrass

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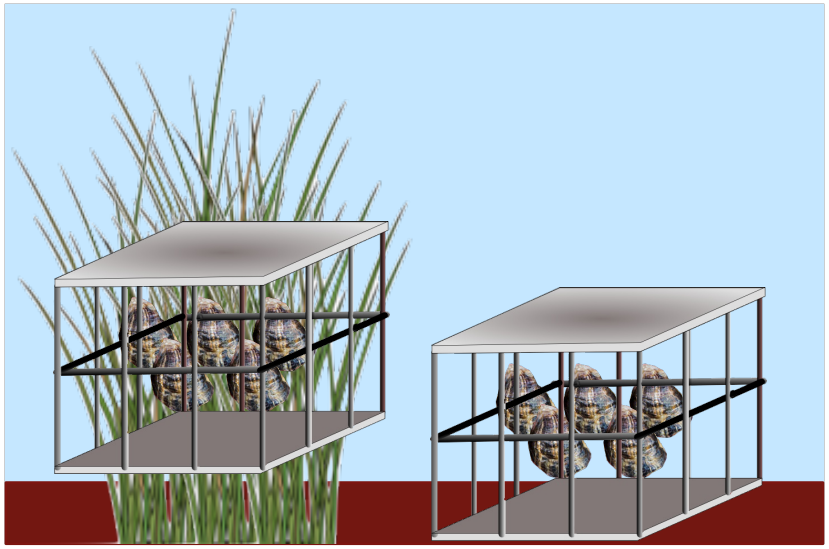

eelgrass vs. no eelgrass

Water chemistry data (temperature, dissolved oxygen)

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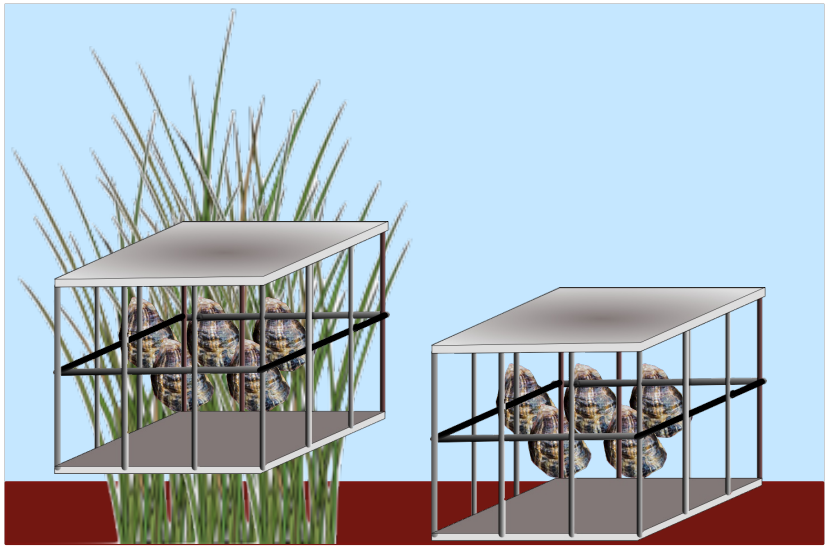

eelgrass vs. no eelgrass

DNA extraction

Protein extraction

Water chemistry data (temperature, dissolved oxygen)

# Predictions Under Stress

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- Epigenetics

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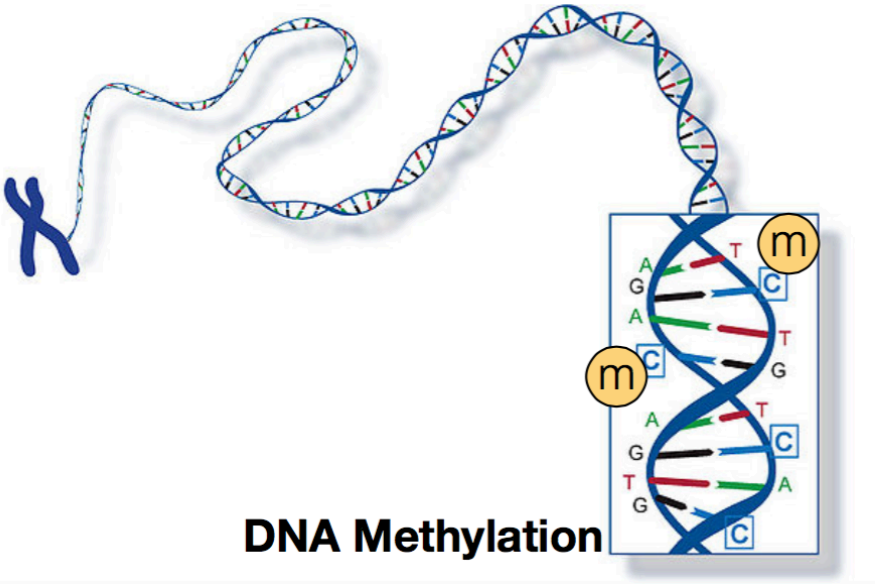


- Epigenetics

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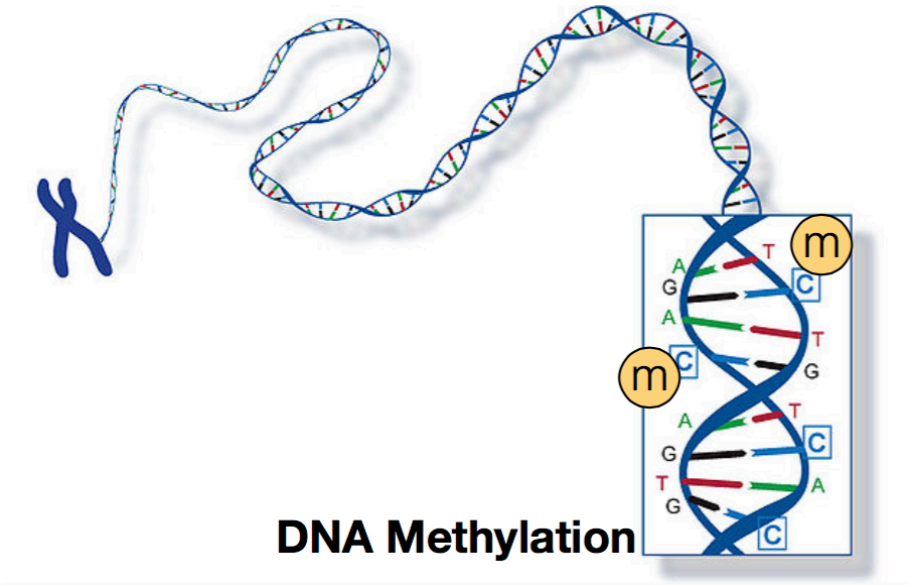
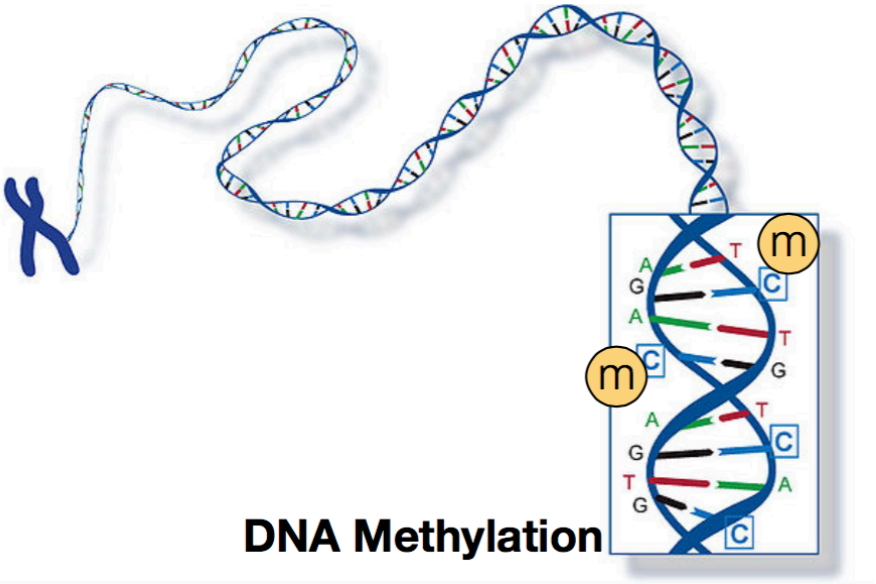



- Epigenetics
  - Decreased methylation

# Predictions Under Stress




- Epigenetics
  - Decreased methylation
- Protein expression

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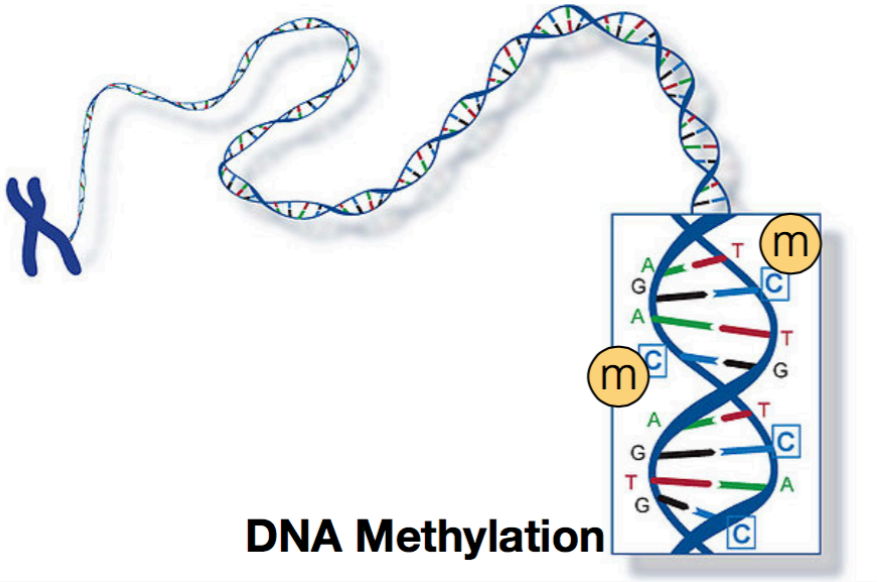
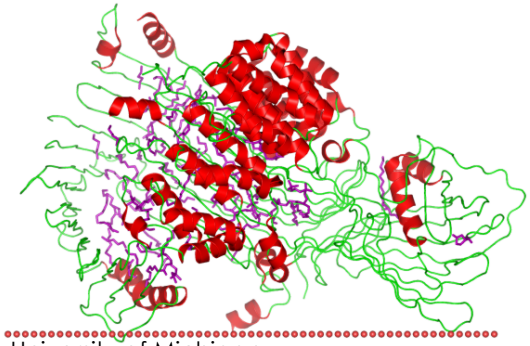



- Epigenetics
  - Decreased methylation
- Protein expression



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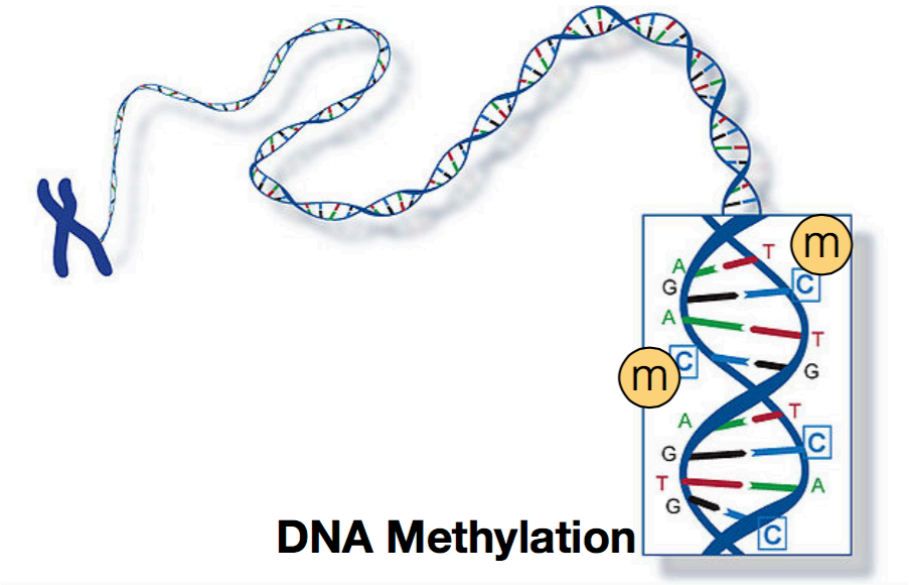
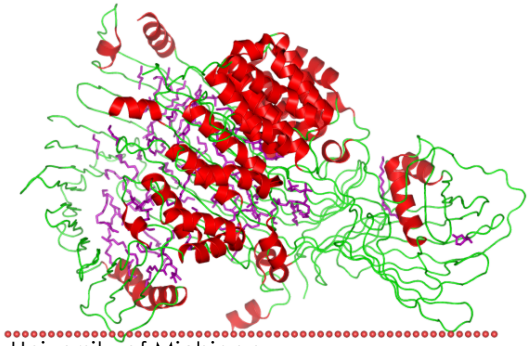



- Epigenetics
  - Decreased methylation
- Protein expression
  - Decreased Vitellogenin



University of Michigan

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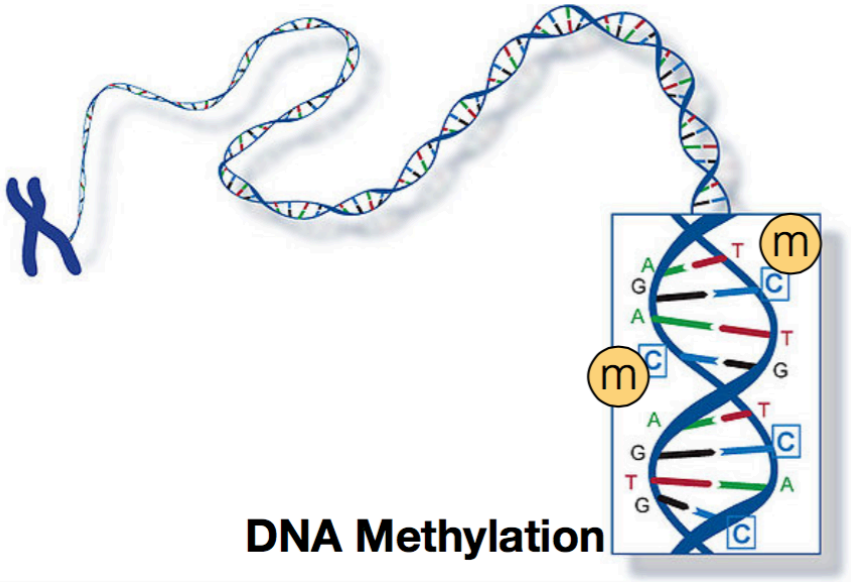


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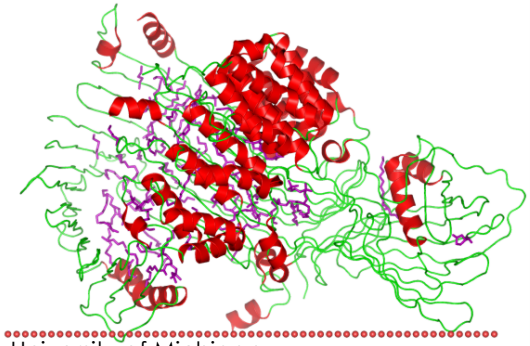
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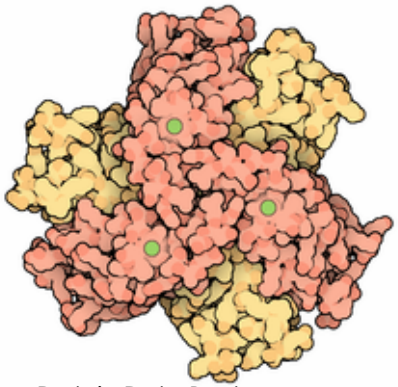
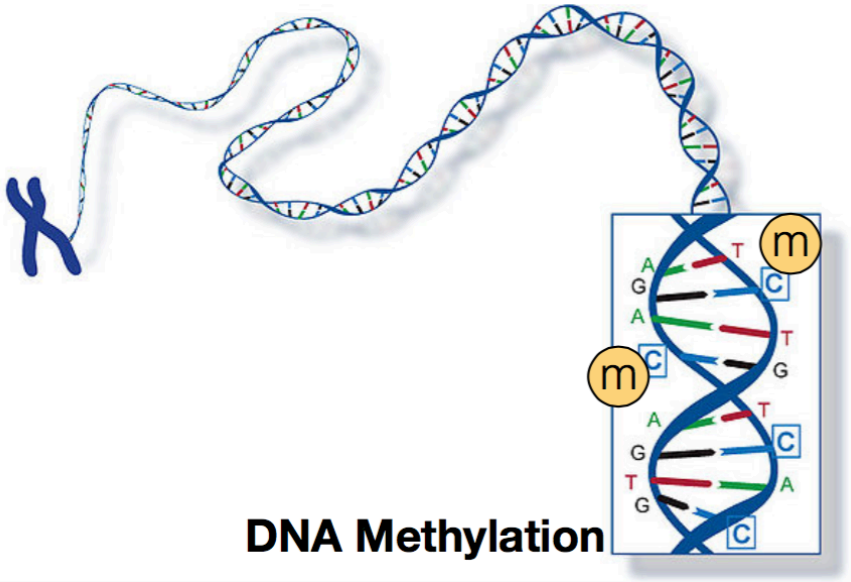
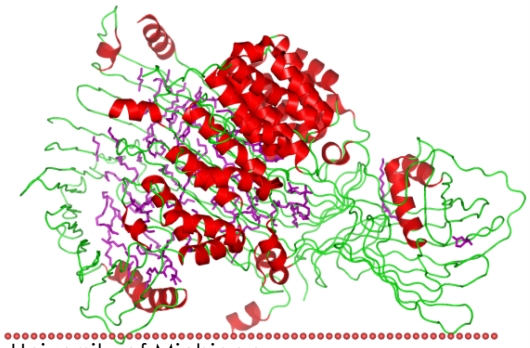

Protein Data Bank

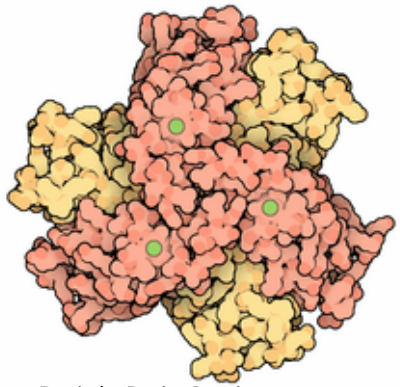
# Predictions Under Stress




- Epigenetics
  - Decreased methylation
- Protein expression
  - Decreased Vitellogenin
  - Increased Superoxide dismutase



University of Michigan



Protein Data Bank

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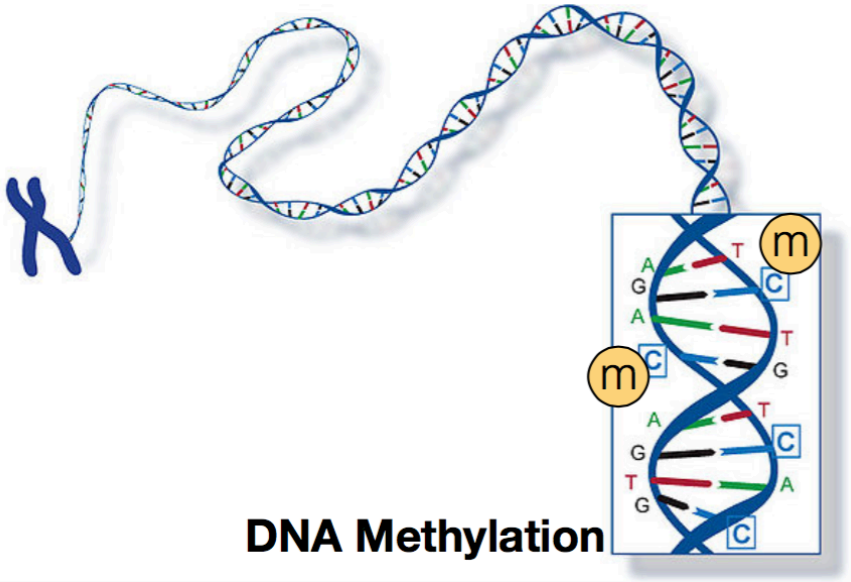
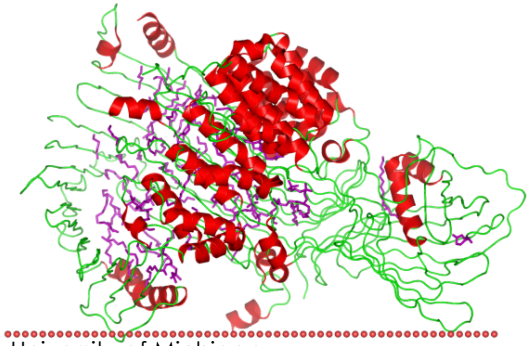



- Epigenetics
  - Decreased methylation
- Protein expression
  - Decreased Vitellogenin
  - Increased Superoxide dismutase
- Eelgrass presence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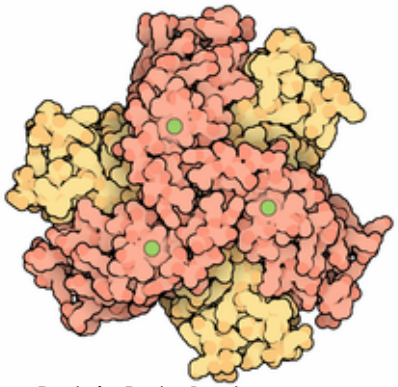
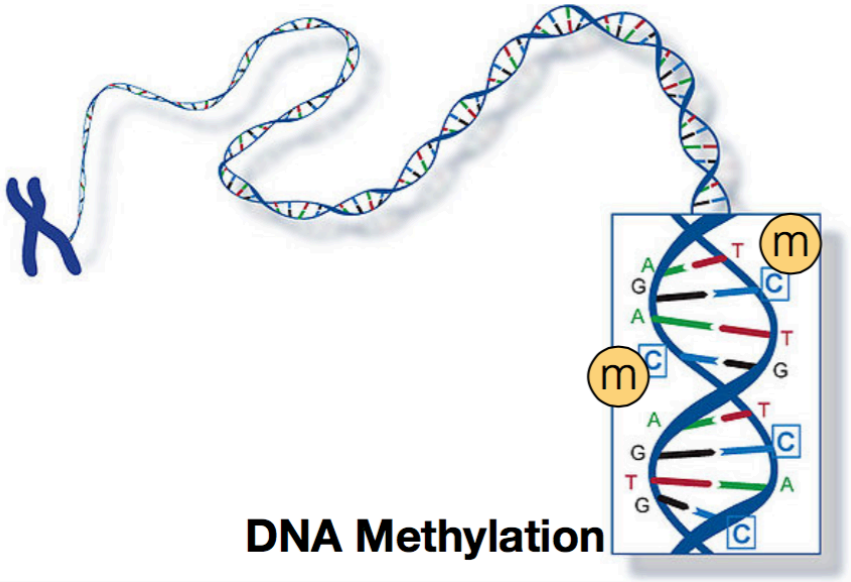
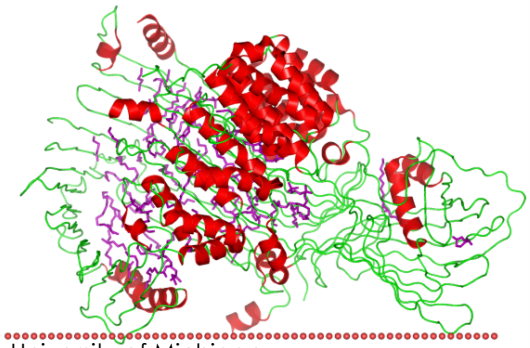
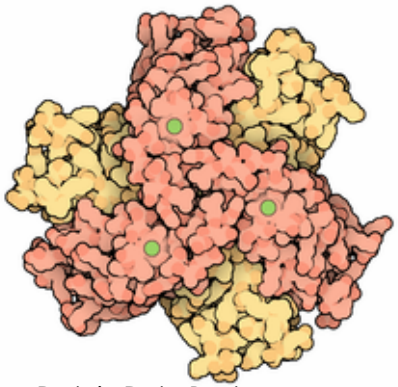

Protein Data Bank

# Predictions Under Stress

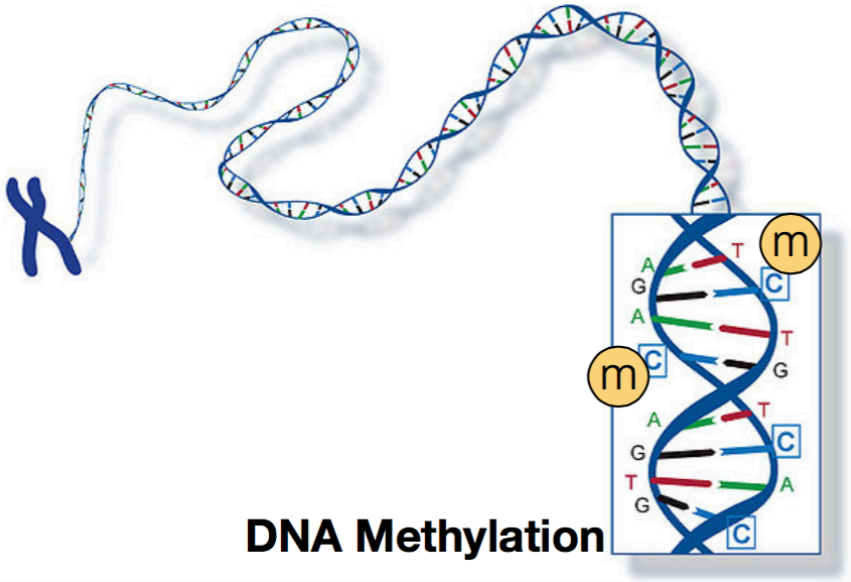




University of Michigan

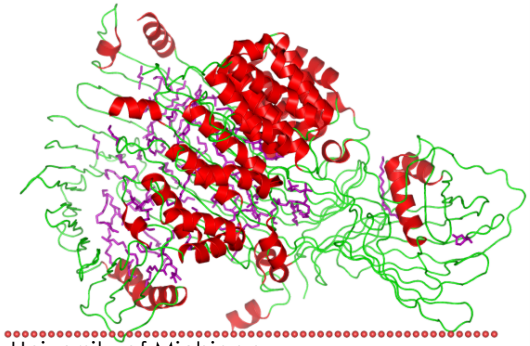

Protein Data Bank

- Epigenetics
  - Decreased methylation
- Protein expression
  - Decreased Vitellogenin
  - Increased Superoxide dismutase
- Eelgrass presence
  - Positive response

# Predictions Under Stress




- Epigenetics
  - Decreased methylation
- Protein expression
  - Decreased Vitellogenin
  - Increased Superoxide dismutase
- Eelgrass presence
  - Positive response
  - Negative response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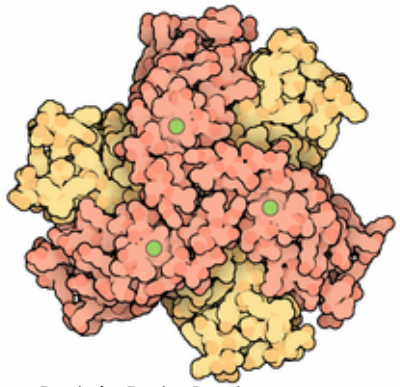
Protein Data Bank

# Looking Forward

Photo from Capital Oysters

Photo from World Media Foundation

# Looking Forward

- Study effects of several environmental conditions in one experiment

Photo from Capital Oysters

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# Looking Forward

- Study effects of several environmental conditions in one experiment
- Hypotheses
  - Epigenetics
  - Proteomics
  - Eelgrass

Photo from Capital Oysters

Photo from World Media Foundation

# Looking Forward

- Study effects of several environmental conditions in one experiment
- Hypotheses
  - Epigenetics
  - Proteomics
  - Eelgrass
- Apply findings to mechanistic lab study


Photo from Capital Oysters


Photo from World Media Foundation

# Thank You!

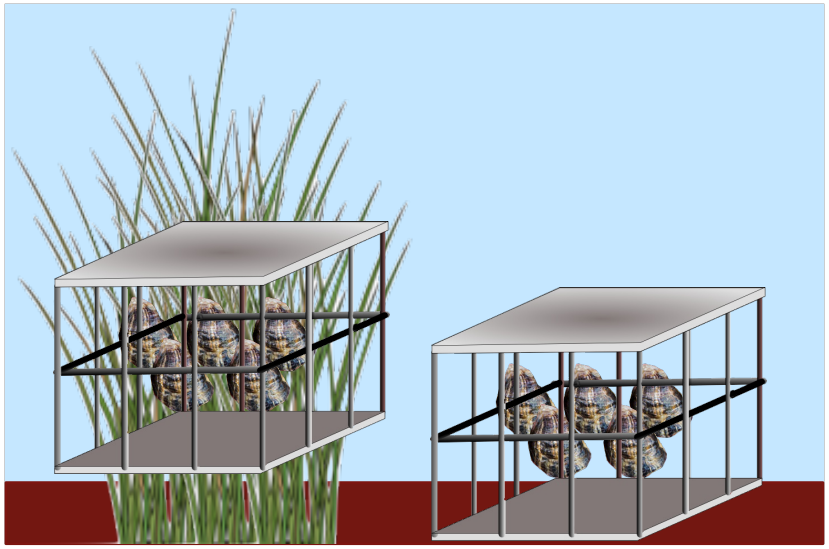
Yaamini Venkataraman
yaaminiv@uw.edu
http://bit.ly/project-oyster-oa

# Experimental Overview

150 oysters

3 replicates

outplant to 5 sites



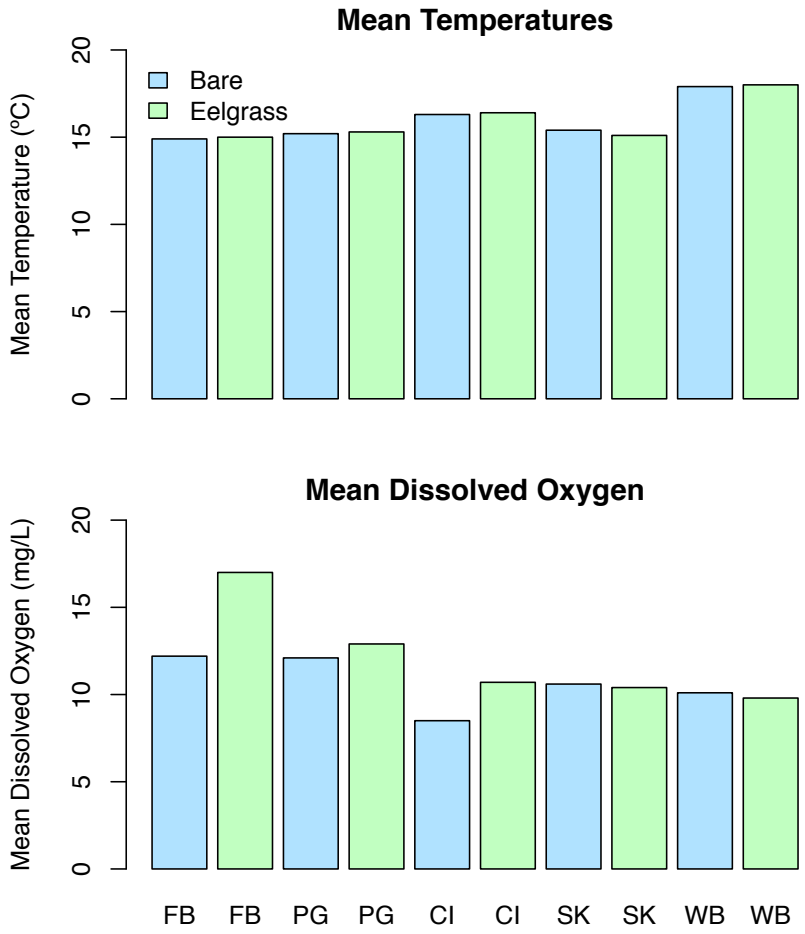
eelgrass vs. no eelgrass

DNA extraction

Protein extraction

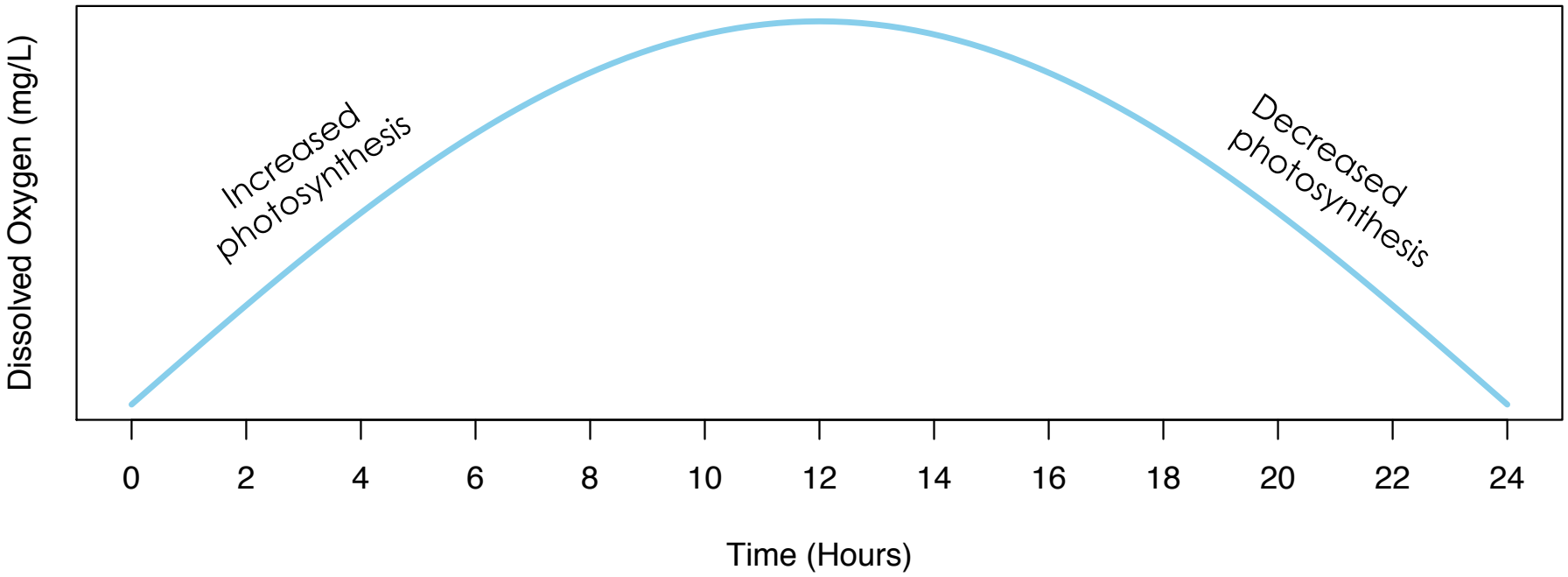
Water chemistry data (temperature, dissolved oxygen)

# Environmental Variability



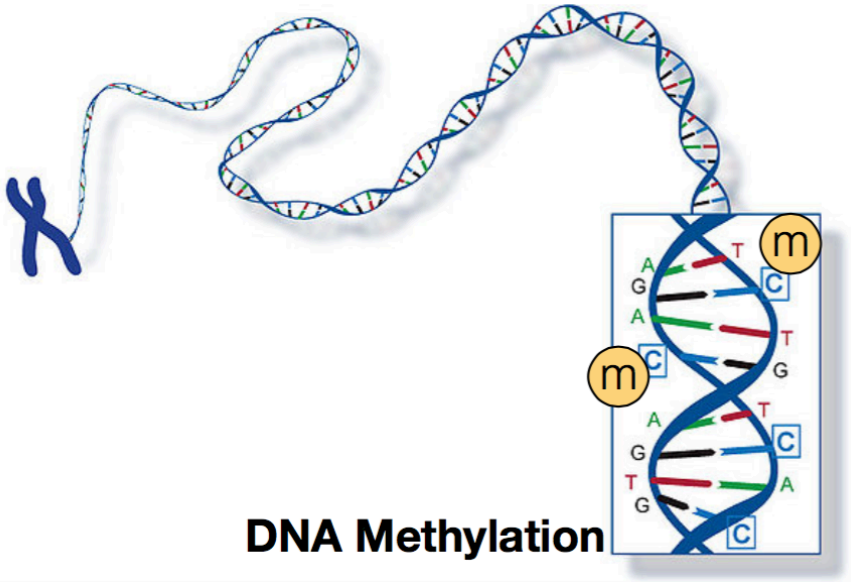

- WB warmest site (18°C)
- FB had highest DO
  - Bare: 12.2 mg/L
  - Eelgrass: 17 mg/L
- CI had lowest DO
  - Bare: 8.5 mg/L
  - Eelgrass: 10.7 mg/L

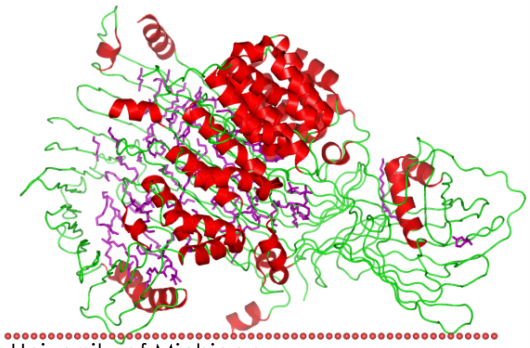
# Eelgrass Presence

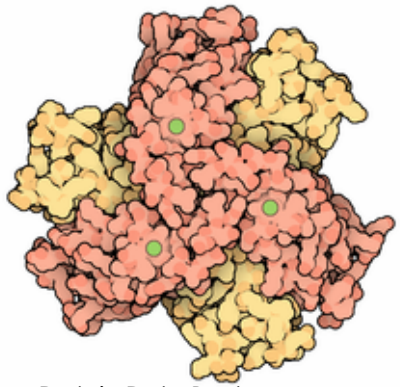



- Does eelgrass impact respiration physiology?
  - Positive: Decreased expression of proteins involved in oxidative stress
  - Negative: Increased expression of proteins involved in oxidative stress

# Predictions Under Stress





University of Michigan


Protein Data Bank

- Epigenetics
  - Decreased methylation
- Protein expression
  - Decreased Vitellogenin
  - Increased Superoxide dismutase
- Stress response amplified or dampened by eelgrass presence