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Tipping the balance: the impact of eelgrass wasting disease in a changing ocean

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Eisenlord, Morgan; Burge, Colleen; Dawkins, Phoebe D.; Yoshioka, Reyn; Tran, Tyler; Rivlin, Natalie; Winningham, Miranda; Jensen, Clio; Van Alstyne, Kathy; and Harvell, Drew, "Tipping the balance: the impact of eelgrass wasting disease in a changing ocean" (2018).  
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**Speaker**
Morgan Eisenlord, Colleen Burge, Phoebe D. Dawkins, Reyn Yoshioka, Tyler Tran, Natalie Rivlin, Miranda Winningham, Clio Jensen, Kathy Van Alstyne, and Drew Harvell

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Tipping the balance: the impact of eelgrass wasting disease in a changing ocean

Salish Sea Ecosystem Conference
April 5, 2018
Eelgrass Wasting Disease

• Widespread, common disease
• Does not necessarily kill host*
• Affects a vital temperate foundation species
• Incredibly tractable marine disease system
Eelgrass Wasting Disease: The Players

Host: Eelgrass
Zostera marina

Pathogen: Lz
Labyrinthula zosterae
Porter & Muehlstein
Zostera marina

Labyrinthula zosterae
Research Questions

• What is the prevalence and severity of eelgrass wasting disease in the Pacific Northwest?
• What biotic and abiotic factor drive *Labyrinthula zosterae* virulence?
• How does eelgrass wasting disease impact *Z. marina* health?
Scoring Eelgrass for Disease...

**Severity** – the area or proportion of the blade that is lesioned

**Prevalence** – the proportion of blades that have a lesion
Quantitative PCR of *Labyrinthula zosterae*: pathogen cells/mg

Eisenlord, Burge, Rivlin, Dawkins, et al. *in prep*
Case Inlet, Puget Sound, WA
Nisqually Reach, Puget Sound, WA
South Slough, Coos Bay, OR
False Bay, San Juan Island, OR
Shoal Bay, Lopez Island, WA
Ship Bay, Anacortes, WA
North Bay, Waldren Island, WA
Indian Cove, Shaw Island, WA
San Juan Chanel, Lopez Island, WA
Mosquito Pass, San Juan Island, WA
Picnic Cove, Shaw Island, WA
Port Gamble, Puget Sound, WA
Willapa Bay, Outer Coast, WA
Padilla Bay, WA
Beach Haven, Orcas Island, WA
Skokomish, Hood Canal, WA

Eisenlord, Yoshioka, et al. *in prep*
Hours spent under 11C during June and July decreased EGWD disease prevalence and severity in the wild.

Eisenlord, Yoshioka et al., in prep
In lab studies, *Labyrinthula zosterae* cell growth and virulence is moderated at 11°C.

Dawkins, Eisenlord, Winningham et al. *in revision*

Groner, Eisenlord, Burge, et al. *in prep*
Impact of LZ infection on *Z. marina* growth and phenol production

- Mesocosm experiment conducted in experimental units in the University of Washington Friday Harbor Lab’s ocean acidification lab

- Wild-collected *Z. marina* kept in 11° C flow through, filtered sea water for 20 days. Half individuals exposed to $1 \times 10^4$ cells/ml *L. zosterae* for 24 hours (N=144)

- Shoots sampled at 7 time points after initial exposure: 4 hours, 24 hours, 48 hours, 3 days, 6 days, 12 days, 20 days
Eisenlord et al. *in prep*

- **Average # lesions/plant**
- **% Lesion Area/plant**
- **New Leaf Growth (mm²)**
- **% Phenols/mg leaf tissue**
% Change in bed density (shoots/m^2)

% Change in bed density 2013-2015

- Beach Haven
- False Bay
- Fishermans Bay
- Indian Cove
- Mosquito Pass
- North Cove
- Padilla
- Picnic Cove
- Shallow Bay
- Ship Bay
- Shoal Bay

Site
Conclusions to date...

- Eelgrass wasting disease is widespread in pacific northwest eelgrass beds - found at every site surveyed

- High variation in eelgrass wasting disease impact between sites - but ~3rd of surveyed sites had >80% prevalence

- Evidence of a low temperature threshold moderating infectivity and virulence

- Lab experiment shows infection reduces shoot growth and increases phenols
Thank you!

Drew Harvell                Colleen Burge               Natalie Rivlin   Allison Tracy

Miranda Winningham, Olivia Graham, Francesca Giammona, Evan Fiorenza, Morgan Eisenlord, Bella Bledsoe, Maya Groner, Phoebe Dawkins, Reyn Yoshioka, Clio Jensen
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