Is local adaptation a factor in planning eelgrass restoration? Initial assessment of responses to temperature by eelgrass growing across a stressor gradient

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Is local adaptation a factor in planning eelgrass restoration?

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Information for restoration planning

- Monitoring
- Modeling
- Stressor evaluations
- Site visits
- Site-specific water quality data

Thom et al. 2018
Restoration Ecology
Information for restoration planning

Thom et al. 2018
Restoration Ecology

Monitoring

Modeling

Stressor evaluations

Site visits

Site-specific water quality data
Data collected at PNNL Marine Science Laboratory (Sequim)
Physiological data collection

Graph 1: GPP(30)/GPP(x) vs. Salinity (psu)

Graph 2: GPP (mol C/mol C day) vs. Temperature (C)

Graph 3: Respiration (mol C/(mol C hr)) vs. Temperature (C)

Graph 4: GPP (mol C/mol C day) vs. Light (mol/m² day)
Range of water temp. at Port Angeles 2005-2012
Morphological variability

Large morphs (Clinton Ferry Terminal)

Small morphs (Case Inlet)
Question

Do genotypic and/or phenotypic variation affect the response of eelgrass to temperature?

Does the relationship between temperature and production vary across environmentally and geographically distinct stocks?

Restoration implications:
- Site selection
- Transplant sources/methods
- Stressor abatement
- Restoration success
Collection sites

Sample site

NOAA buoy
Methods
Whole plants collected ~3 ft MLLW and stored in outdoor flowing seawater tanks

Light/dark measurements on 8 cm leaf segments for 3 sites x 2 temperatures per trial

12° and 20° (2x)
16° and 25° (3x)
20° and 25° (1x)

~2 hrs incubation for light jars, ~3 hrs for dark

No light limitation

Measured initial and final instantaneous oxygen flux and biomass (g dry wt)
Results

Net Primary Productivity

Temperature (°C)

NPP (mg C/gdw/hr)

Sequim Bay
South Sound
Hood Canal
Results

Net Primary Productivity

Respiration

Temperature (°C)

NPP (mg C/gdw/hr)

Respiration (mg C/gdw/hr)

Sequim Bay
South Sound
Hood Canal
Results

Sequim Bay

South Sound

Hood Canal
Preliminary Conclusions

- No significant difference in short-term productivity or respiration for plants from different temperature (and light) regimes.

- Lots of variation in results.

- Notable morphological and epiphyte differences between sites.
Next Steps

- More short-term data collection to address variability
- Additional sites
- Interaction of light limitation and temperature
- Mesocosm experiments—temperature treatments, light treatments