Spatial distribution of zooplankton in Willow Creek Reservoir in relation to hypolimnetic anoxia: implications for pelagic grazing

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Introduction

Zooplankton

- Densities and populations of zooplankton fluctuate in response to lake chemistry changes like hypolimnetic anoxia.
- Those fluctuations impact distribution of filter-feeding grazers, specifically *Daphnia (Hessen 1990).*
- Diurnal vertical migration may be interrupted when the hypolimnion becomes anoxic, forcing *Daphnia* out of the pelagic (Burks et al. 2002).

What do *Daphnia* do in response to hypolimnetic anoxia and how does this change their grazing pressure?

Figure 1: Map of Willow Creek Reservoir in Heppner, OR.

Study Area

Willow Creek Reservoir (WCR) in Heppner, Oregon

- Reservoir surface area of 2.3 km²
- Inflows Balm Fork and Willow Creek
- Outflow Willow Creek

Objectives

- Examine the relationship between hypolimnetic anoxia and the spatial distribution of *Daphnia.*
- Measure *Daphnia* size and track changes throughout the summer.

Hypothesis

Vertical and horizontal distribution of *Daphnia* is not related to the change in dissolved oxygen concentrations with depth in WCR.

Prediction

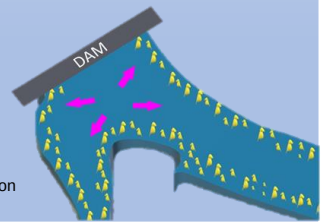


Figure 2 (right): Prediction of where zooplankton may migrate in response to anoxia.

Methodology

- Collect vertical and horizontal samples of zooplankton in triplicates along two transects from the pelagic to the nearshore and collect physico-chemical data.
- Count the sampled zooplankton.
- Photograph and measure the body size of *Daphnia.*

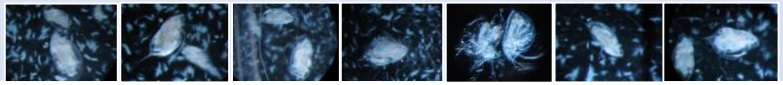
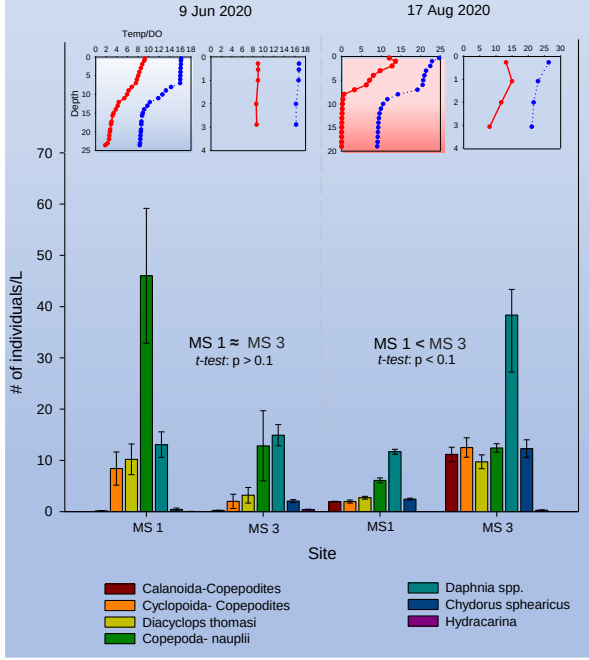


Figure 3: Map of sites for triplicate zooplankton hauls at Willow Creek Reservoir.

Results



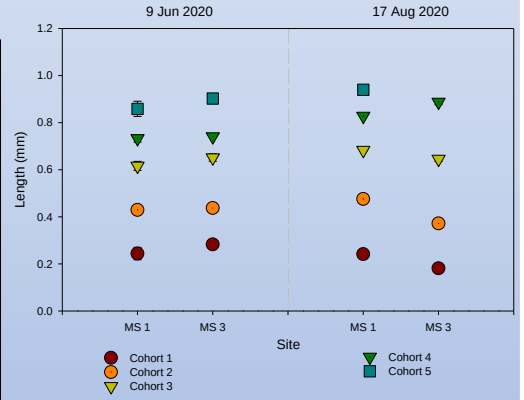


Figure 4 (above): Size distribution of *Daphnia* cohorts at MS 1 and MS 3 in Willow Creek reservoir on 9 Jun 2020 and 17 Aug 2020.

Figure 5 (right): Density of *Daphnia* and the corresponding temperature and dissolved oxygen profiles at MS 1 and MS 3 on 9 Jun 2020 and 17 Aug 2020. Data is reciprocal transformed for *Daphnia* on 17 Aug 2020.

Results (cont'd)

Table 1: P-values from *t-tests* for change in *Daphnia* density and size between MS 1 and MS 3 for 9 Jun 2020 and 17 Aug 2020.

Parameter	9-Jun-20	17-Aug-20
Density	0.36	0.07
Size	0.43	0.29

Discussion/Future studies

- Initial analysis suggests that the null hypothesis can be rejected [α= 0.1]. There was no significant difference [α= 0.1] in *Daphnia* size between the pelagic and the nearshore (Table 1).
- Going foreword, the final samples (from 27 Sept 2020) will be counted, measured, and analyzed with a *t-test*.
- An ANOVA test will be used to test if there is a significant difference between sites and dates.
- Grazing pressure will be calculated for each site. This data will highlight the difference in grazing pressures between nearshore and the pelagic sites and the implications for the growth of algal biomass in the absences of pelagic grazers.
- Our results to date strongly suggest that pelagic grazing pressure is reduced during anoxia.

Acknowledgements

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