Salt Tolerance Plasticity in Local *Daphnia Ambigua*, by Maya Chandar-Kouba

In Maine, road salting is a common practice during the notoriously harsh winters. However, the combination of road salt (NaCl) and snowmelt results in high chloride concentrations (Cl-) in spring runoff (Dugan et al. 2017). These increased chloride loads threaten local freshwater ecosystems, with profound negative impacts on zooplankton populations. Research shows an inverse relationship between levels of chloride pollution and zooplankton abundance and diversity (Coldsnow et al. 2017). *Daphnia*, a zooplankton and keystone herbivore in freshwater ecosystems, is especially sensitive to chloride pollution, as it stresses these organisms and reduces their ability to cope with other environmental stressors (Celis-Seldago et al. 2016). The sensitivity of *Daphnia* and their importance to local ecosystems makes this organism a useful indicator species for chloride pollution levels (Miner 2012).

This summer, we investigated whether *Daphnia* adapt to fluctuations in chloride levels in their native ponds. In this study, we compared the effect of chloride concentrations on the fitness of *Daphnia* clones from two ponds: Hall Pond, a low-ion lake with no chloride fluctuation, and Sewell Pond, a mid-ion lake with seasonal variation in chloride concentrations. Four treatment groups with varying chloride concentrations were established: Sewell Water diluted by 50%, pure Sewell Water, Sewell Water with 250 mg/L of chloride, and Sewell Water with 500 mg/L of chloride. We hypothesized that Daphnia from Sewell Pond would be more tolerant of mid to high chloride groups (100% Sewell water, 250 mg/L chloride spike, and 500 mg/L chloride spike) and would be better adapted to a range of chloride concentrations compared to Hall Pond clones, since these conditions mirror their natural water chemistry. We also hypothesized that Hall Pond clones would be better adapted to the low ion group (50% Sewell Water) than Sewell clones, because this treatment mirrors Hall native water chemistry. Average progeny was used as response variable to determine overall tolerance to chloride ion concentrations.

We created the four different treatment groups using Sewell water. The low-ion treatment group was diluted by 50%, and the 250 mg/L Cl- and 500 mg/L Cl- treatment groups were created by adding NaCl to Sewell water. Two Sewell and two Hall *Daphnia ambigua* clones were isolated, with ten *Daphnia* from each clonal group used in each treatment group. Over the course of the 14-day trial, *Daphnia* were monitored for mortality rates and birth rates.

We used R for data analysis and figure creation. Our results show that Sewell Pond *Daphnia*

Figure 1: Plot showing the average progeny of Hall Pond and Sewell Pond Daphnia across treatment groups with varying chloride ion concentrations. In the 500 mg/L Cl- treatment, Sewell Pond Daphnia had significantly more average progeny than Hall Pond Daphnia ($p = 0.0121$). Both Hall and Sewell Pond Daphnia had significantly higher average progeny in the 250 mg/L Cl- treatment than in the 500 mg/L Cl- treatment ($p < 0.0001$, $p < 0.0001$). Data was collected

Works Cited:

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