Road Salt's Impact on Fitness in *Daphnia ambigua*
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Road salting is a common practice that threatens Maine's lakes with high loads of chloride (Dugan et al., 2017; Rosfjord et al., 2007). Chloride pollution is a source of stress for freshwater organisms. *Daphnia*, zooplanktonic crustaceans, are especially sensitive to pollutants (Michels et. al, 1999). Their interconnected role as a keystone herbivore (Miner 2012) also means that changes in their population reverberate through the food web. These two attributes make *Daphnia* a useful sensor organism to assess water quality.

This summer, we analyzed data from a pilot experiment we ran during spring break 2020. In that study, we investigated the effect of sodium chloride (NaCl) on the health and reproduction of *Daphnia ambigua* sampled from three different Maine lakes with varying water chemistries (fig. 1). We hypothesized that *Daphnia* from high-Cl and high-Ca lakes would be more salt-tolerant, since calcium has been identified as an effective mediator of NaCl (Elphick et al., 2011). *Daphnia* were exposed to Cl- concentrations of 0, 250, 500, and 1000 mg/L in their respective lake waters for 9 days. We measured survival time, final body length, total progeny, and final embryo development stage.

Figure 1: Water chemistries of sample lakes

	Egypt	Hall	Sewell
Mg Cl-/L	4.84	2.95	112.14
Mg Ca/L	5.55	1.21	2.62

I used R for data analysis and visualization. We found that *Daphnia* from high-Calcium lakes were the most salt-tolerant, while those from the high-salt lake were moderately tolerant and those from the low-ion lake were the most sensitive (fig. 2). First, Egypt *Daphnia* were the most hardy - at 1000 mg Cl-/L, only Egypt *Daphnia* survived. All lakes had similar survival rates from 0-250 mg Cl-/L, but Hall *Daphnia* died off at 500 mg Cl-/L. Second, the body length of Hall *Daphnia* significantly decreased ($p<.0001$) from 0-500 mg Cl-/L, while Egypt and Sewell *Daphnia* remained similar in size. Finally, Sewell clones were the most prolific ($p<.0001$), but Egypt *Daphnia* produced consistent amounts of progeny through 0-500 mg Cl-/L. When Hall *Daphnia* survival was threatened at 500 mg Cl-/L, they sharply curbed reproduction ($p<.0001$). Hall *Daphnia* were consistently less fit across all three metrics. This could be due to Hall's low level of Ca, which has been shown to be a mediator for NaCl (Elphick et al., 2011). We will continue to investigate the possible mediative effects of Ca by conducting a 14-day chronic exposure study later this summer.

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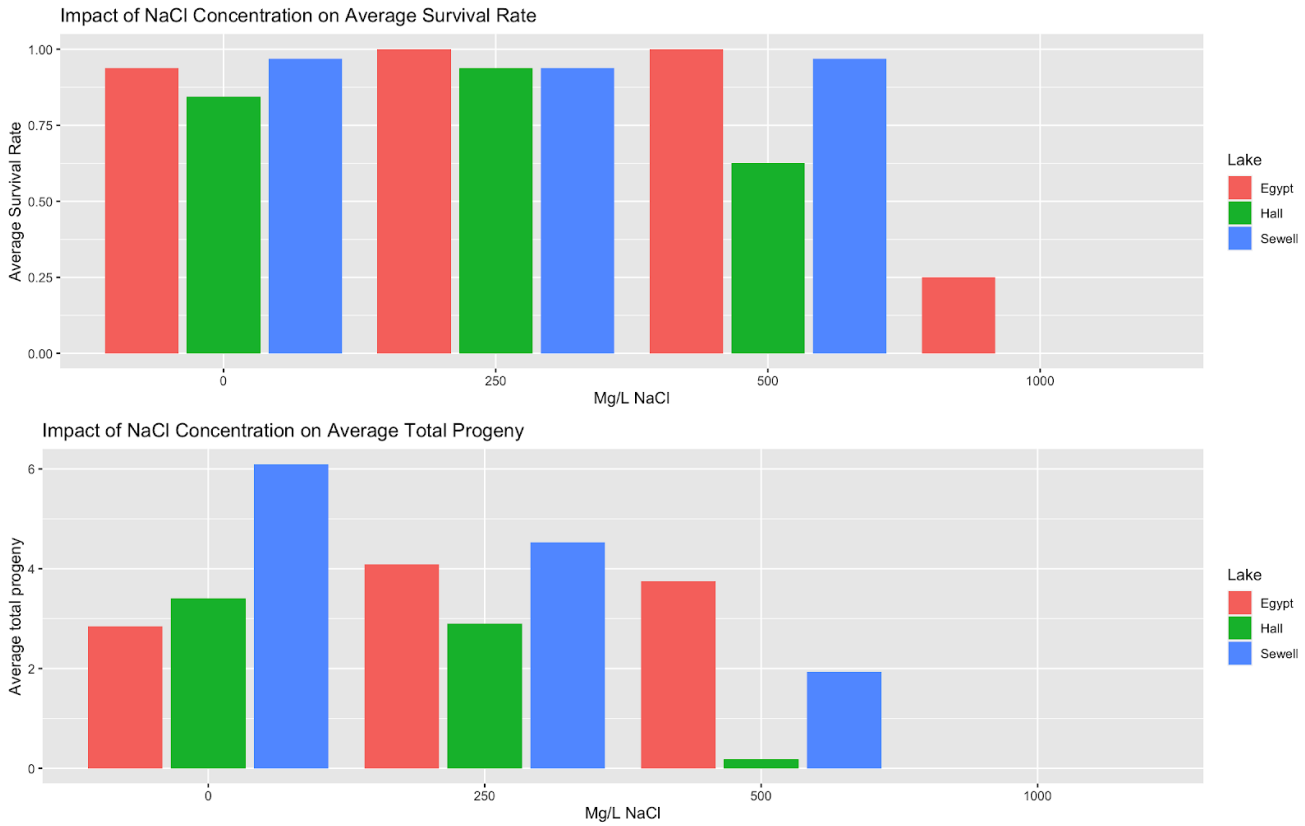

Figure 2: Chloride caused decreased survival and reproduction rates. Hall pond *Daphnia* were the most impacted, while Egypt *Daphnia* were the least impacted.