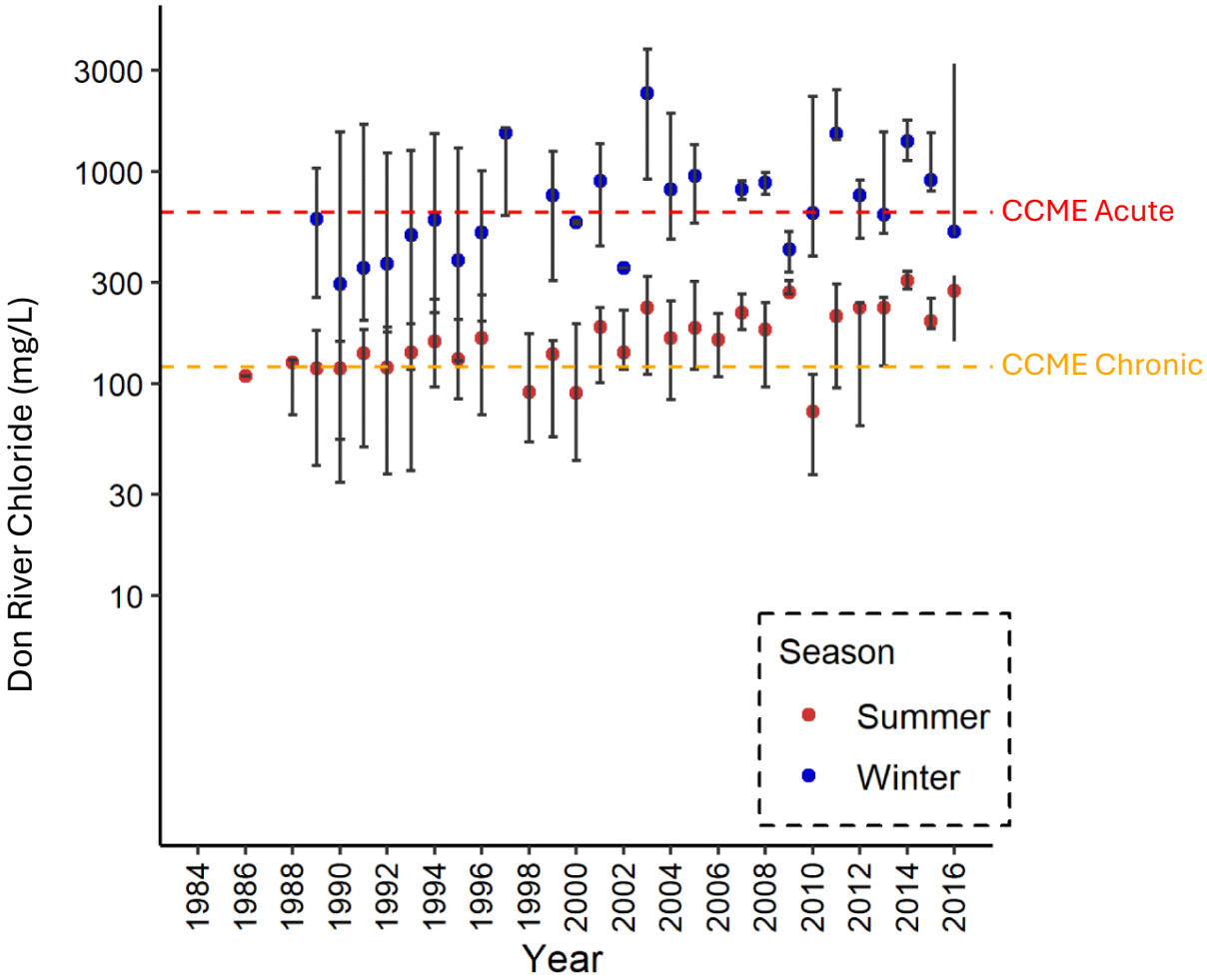
Ecological consequences of road salt for urban ponds

Charlie Loewen (charlie.loewen1@ucalgary.ca)

Department of Biological Sciences
University of Calgary

Road salt is a leading driver of salinization in urban environments with winter freezing

Decades of de-icing has contaminated shallow soils and aquifers in our cities, leading to elevated concentrations in surface waters year-round



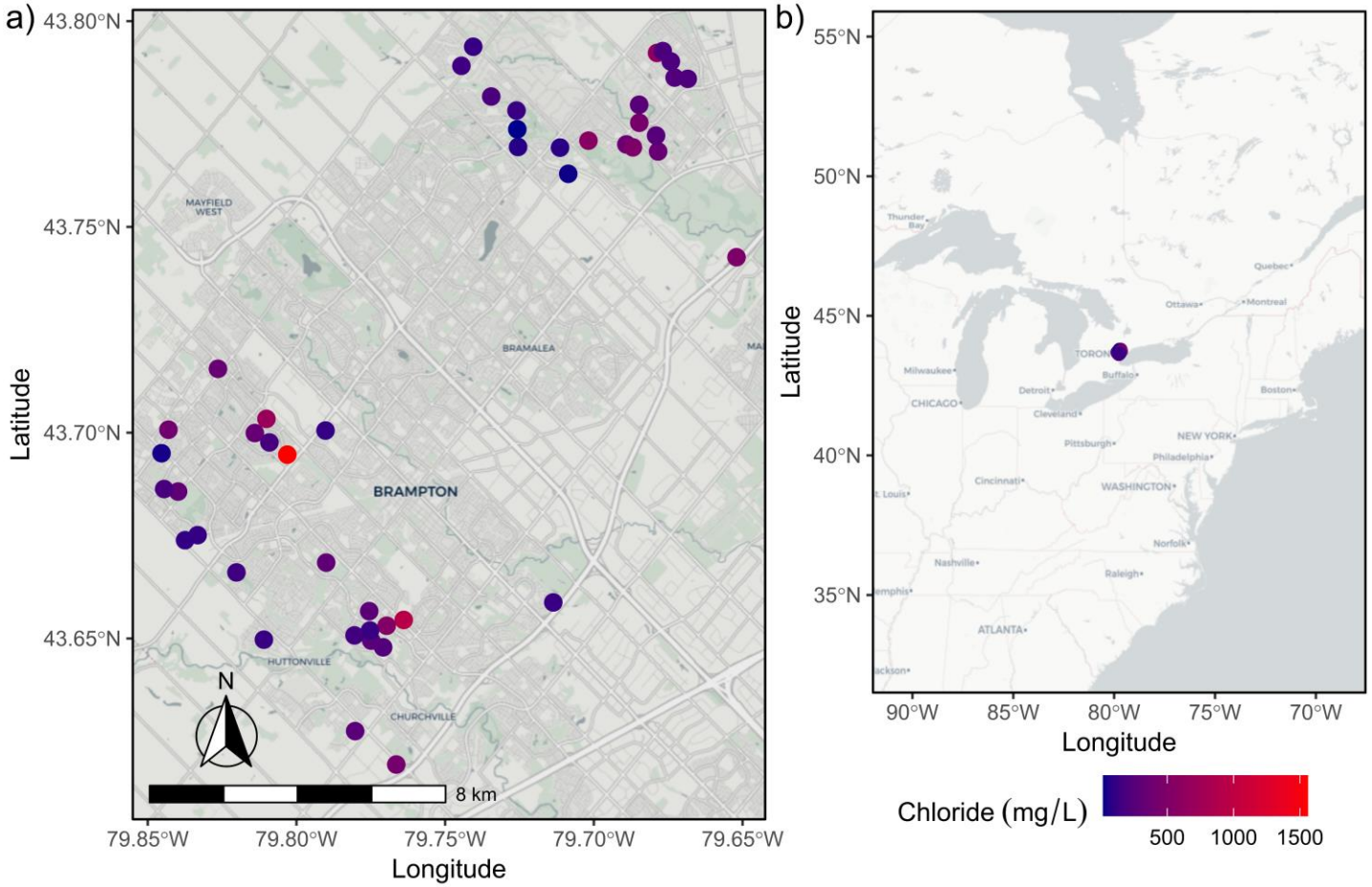
Lawson & Jackson. 2021. *FACETS*

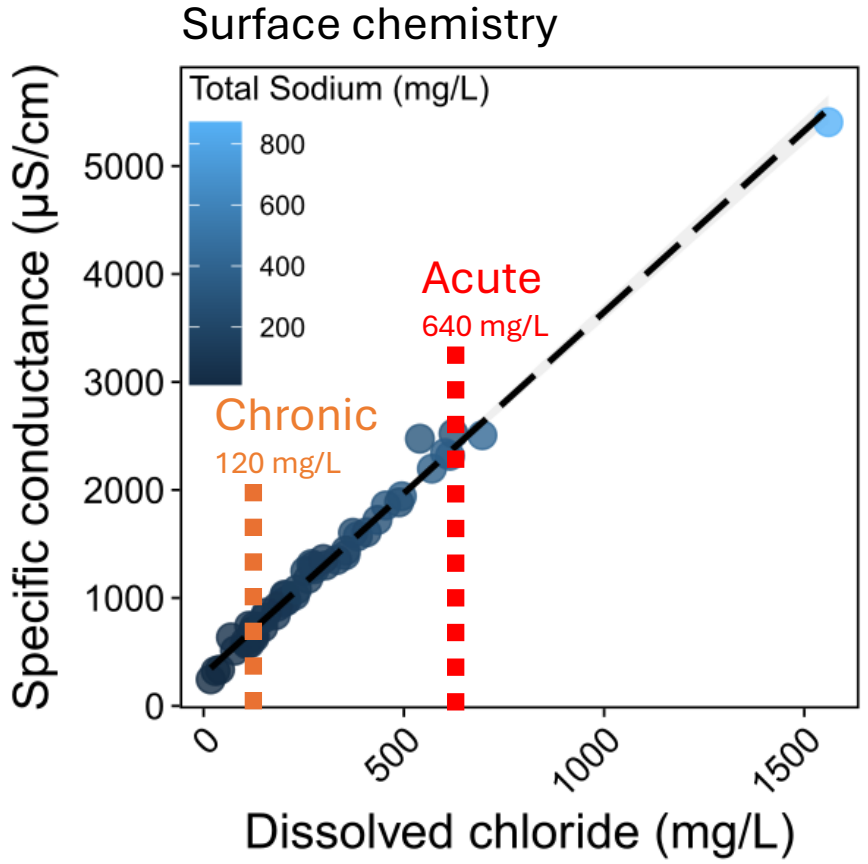
Stormwater retention ponds are potential hotspots for salinization (among other urban stressors)

But also (potential) hotspots for biodiversity

Just how salty are these urban ponds?

Fifty ponds in Brampton (Greater Toronto Area) August 2022

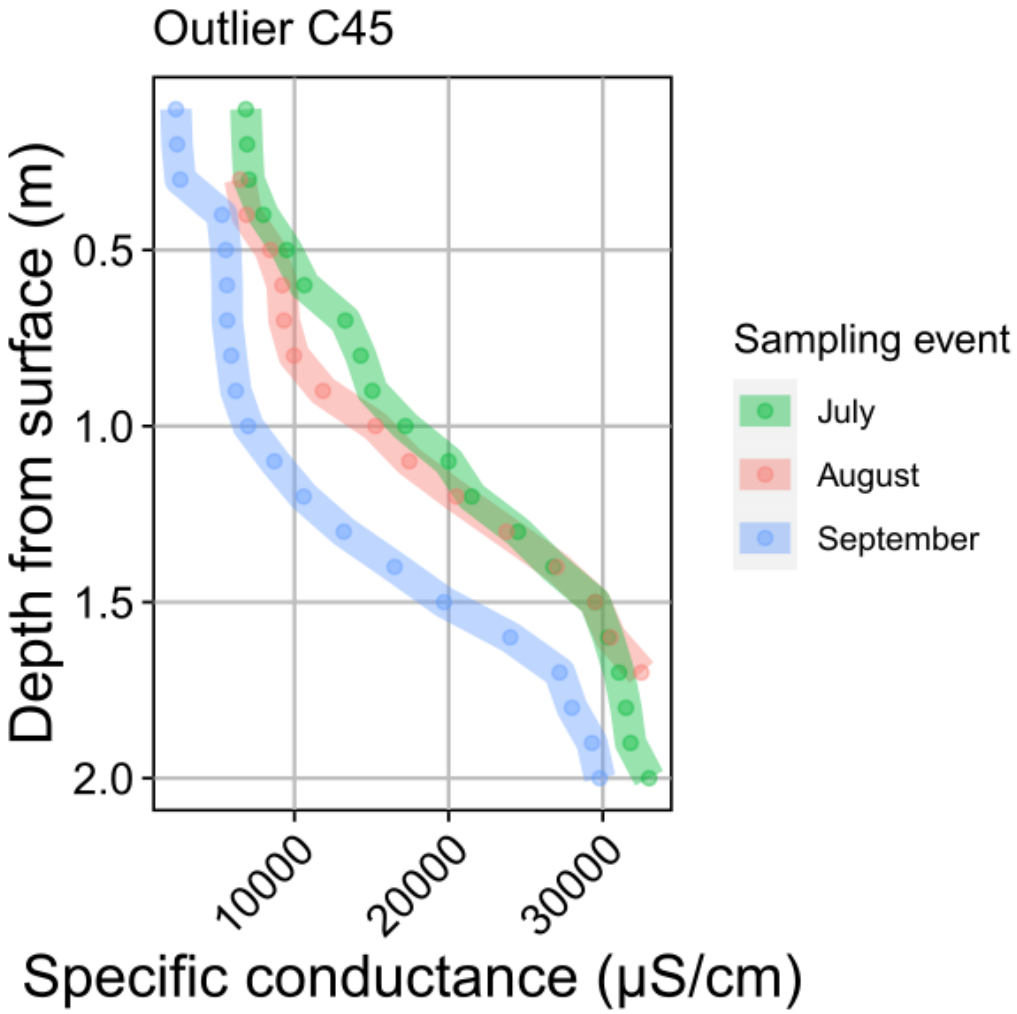




Loewen & Jackson. 2024. *Limnology and Oceanography Letters*

Loewen *et al*. 2025. *Limnology and Oceanography Letters*

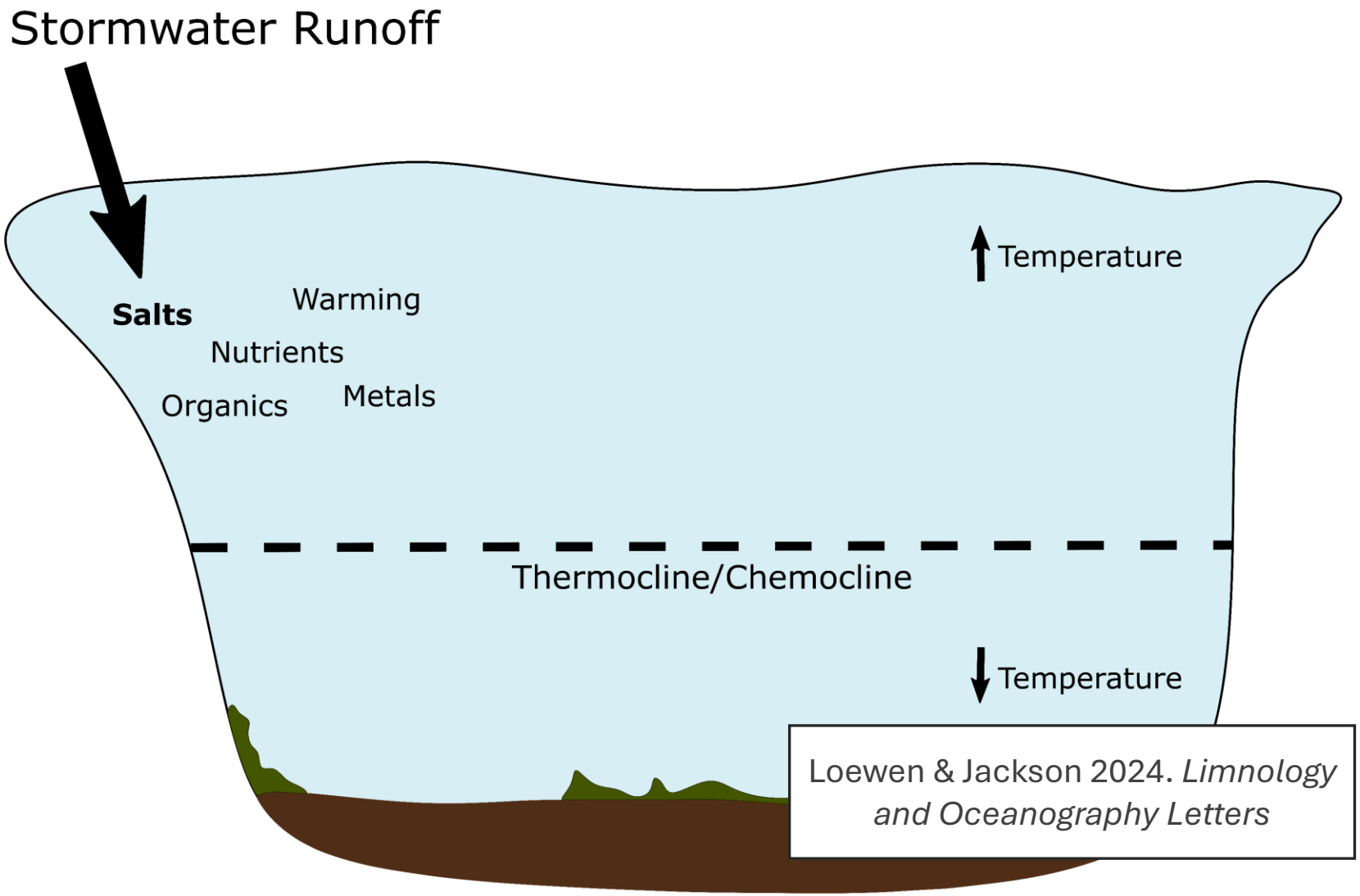
Some ponds approaching marine conditions at depth



Blue crabs reported in a Toronto creek in 2011!

What are the consequences of all this salt?

- Physical changes
  - Water density gradients



Loewen & Jackson 2024. *Limnology and Oceanography Letters*

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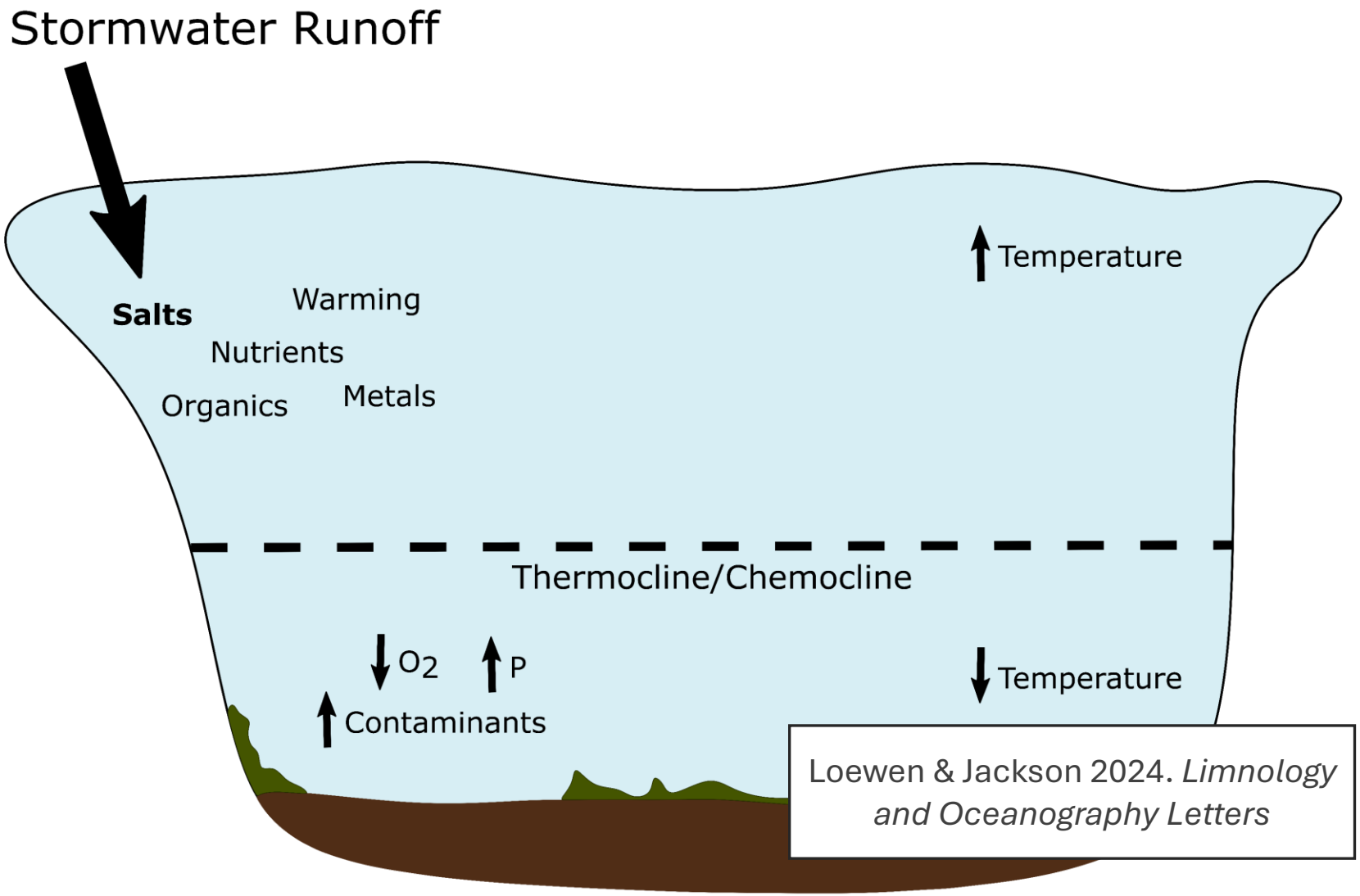

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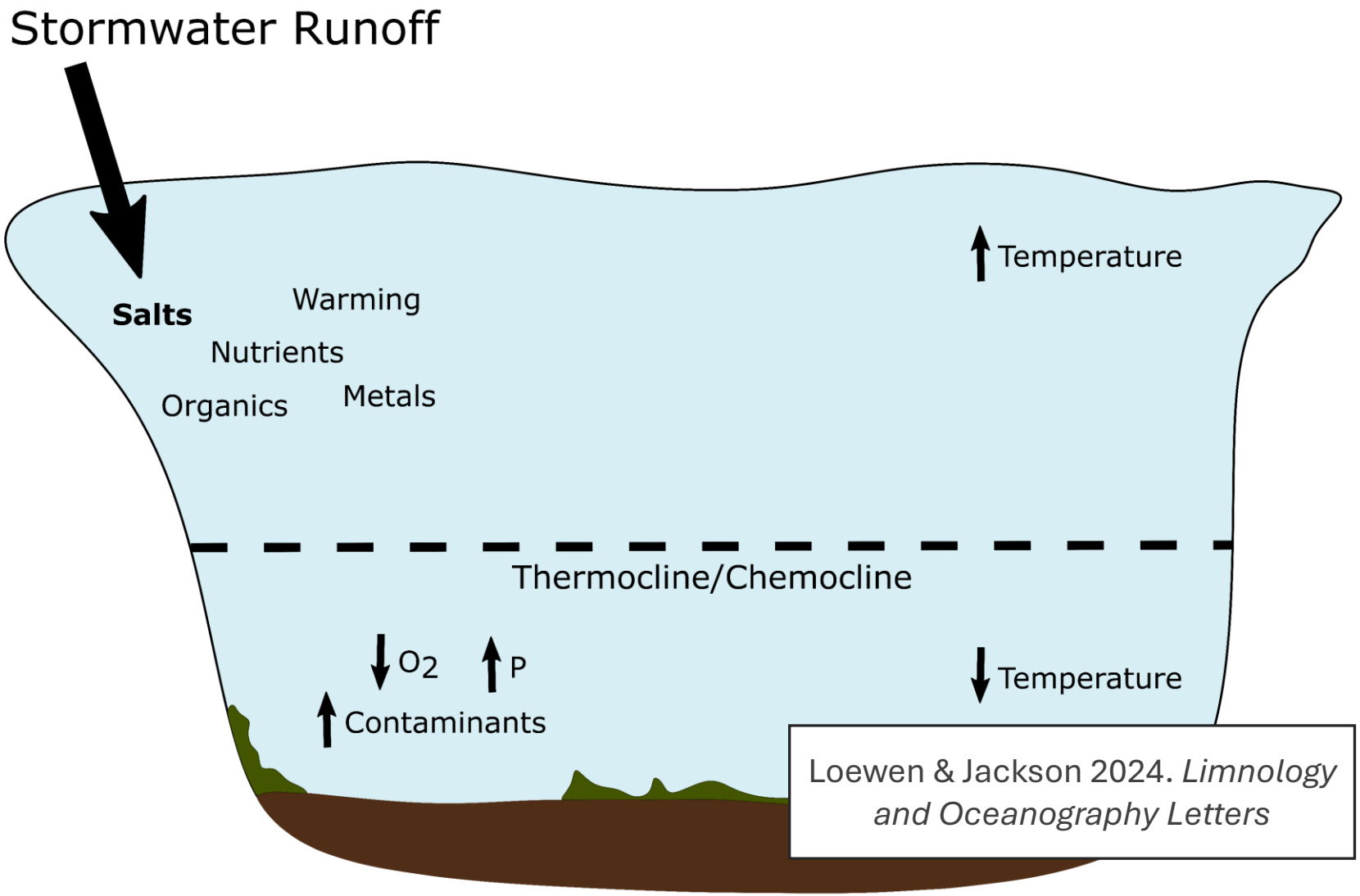

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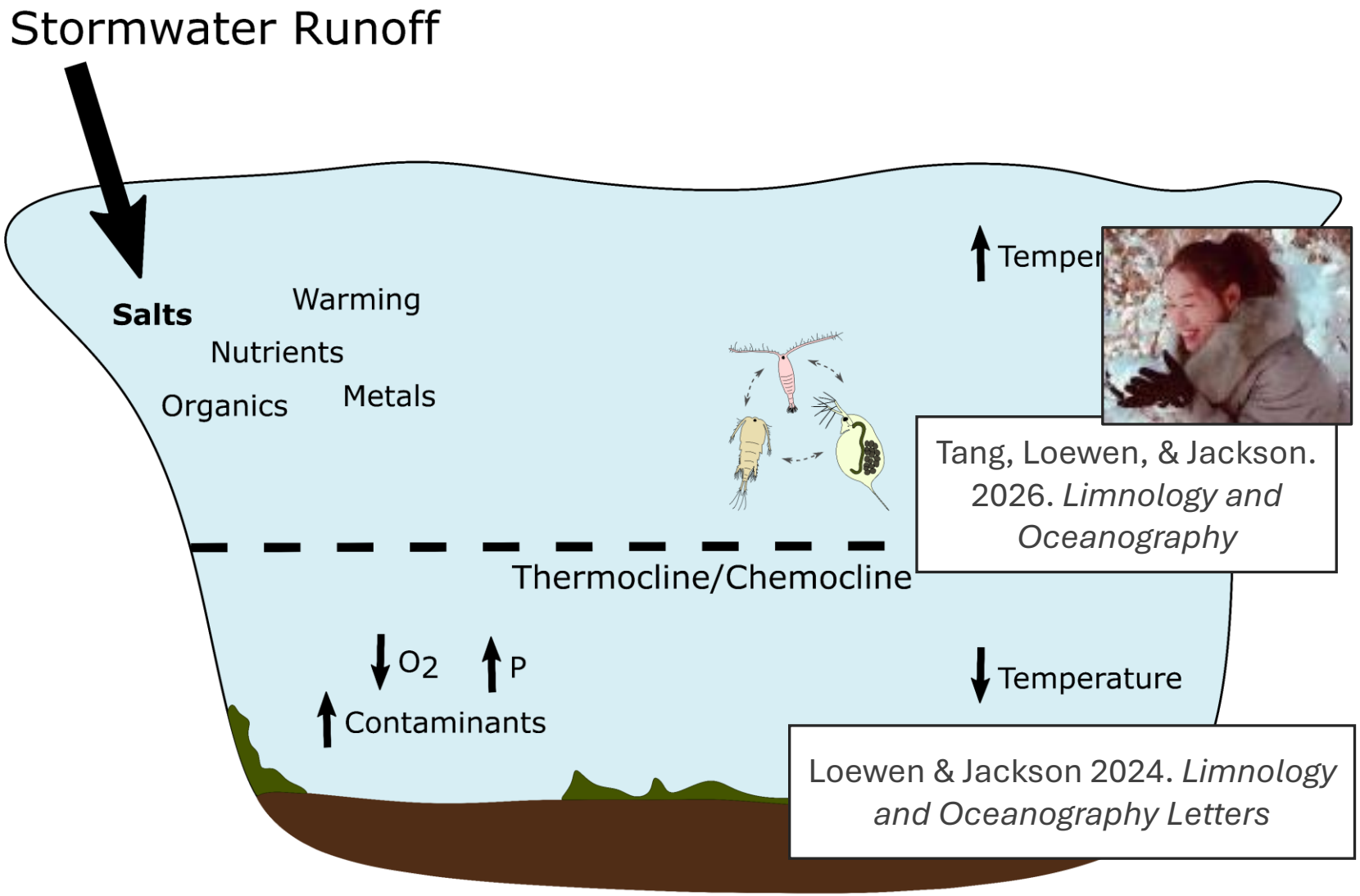

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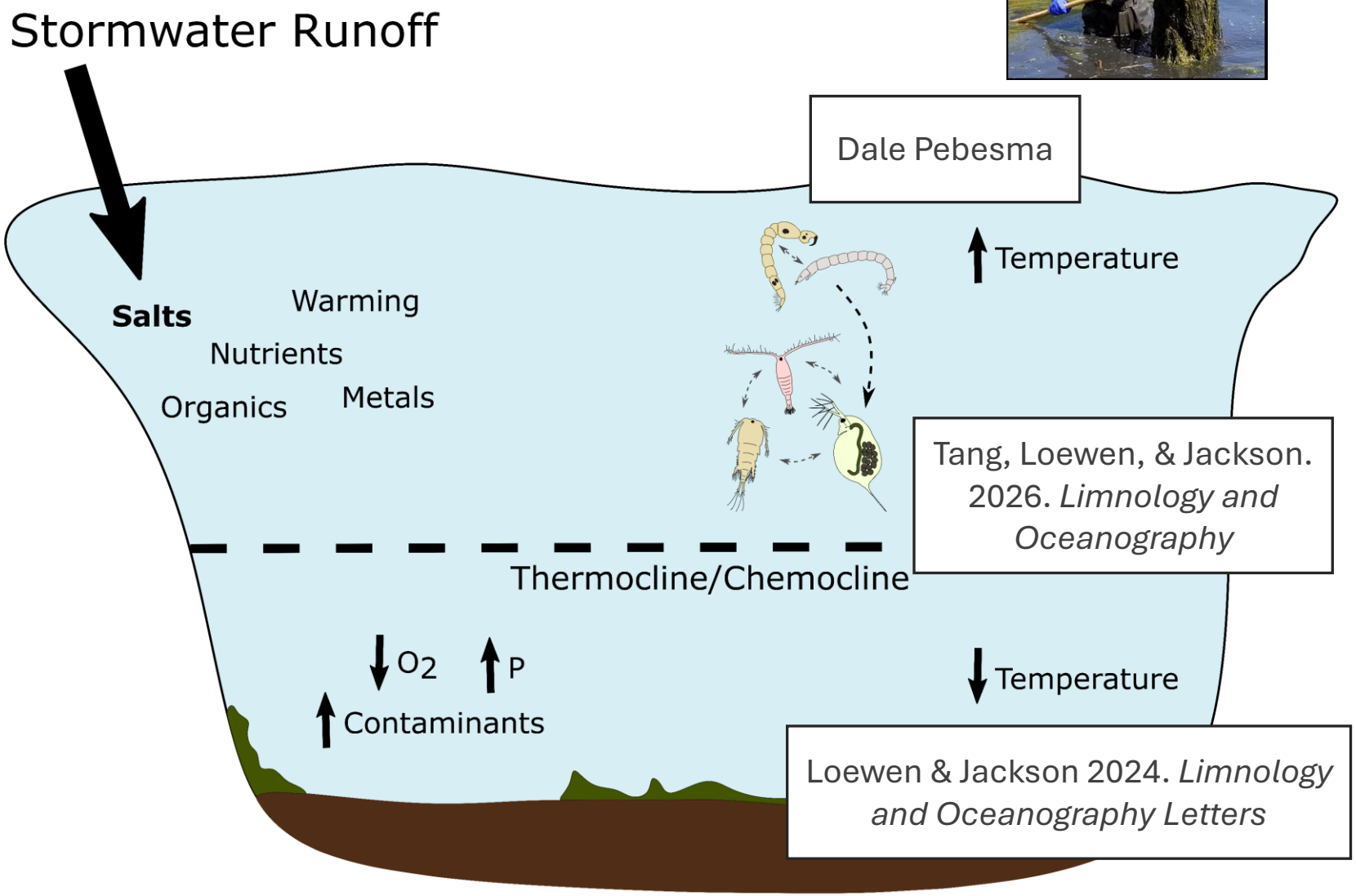

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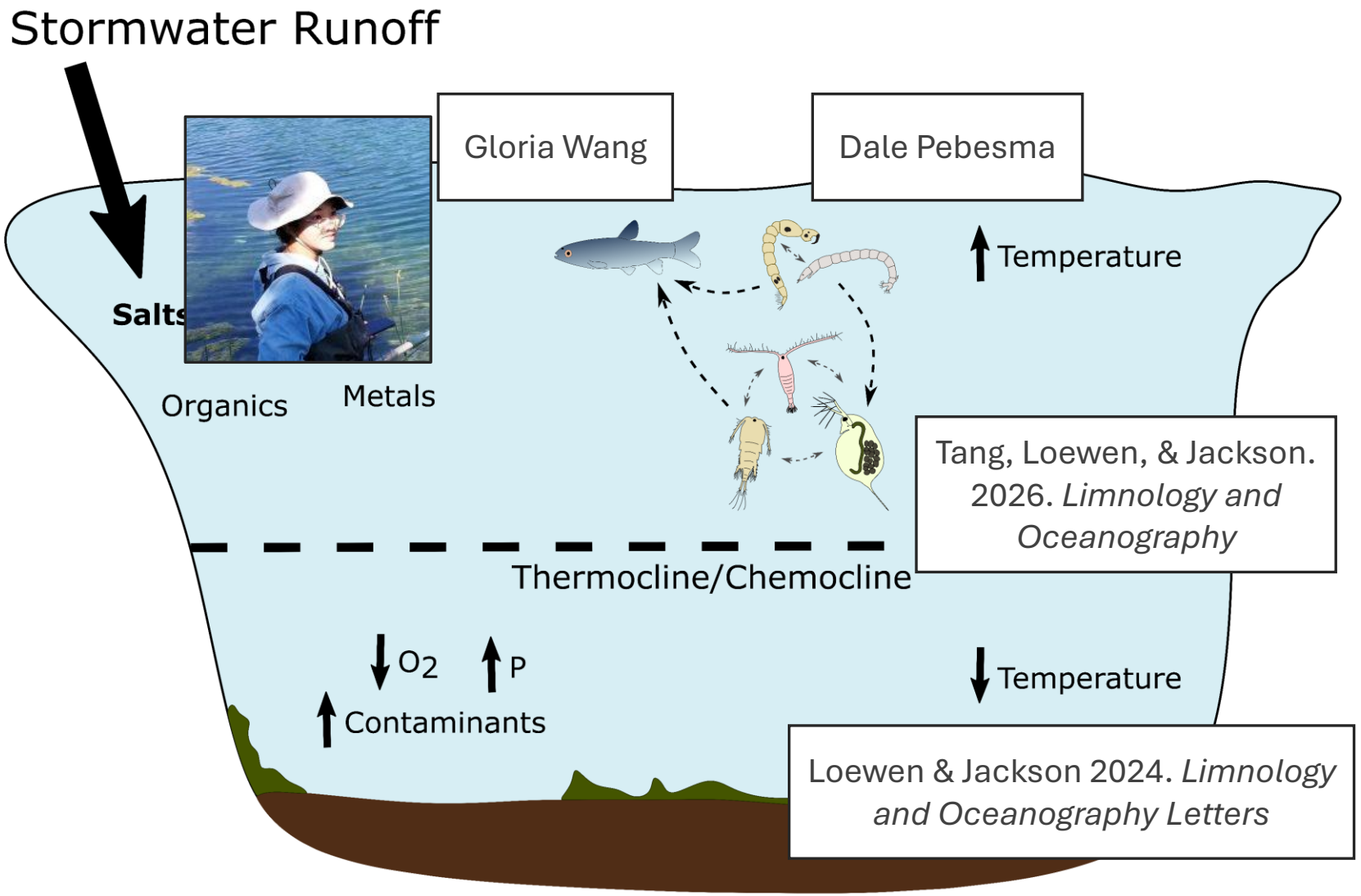

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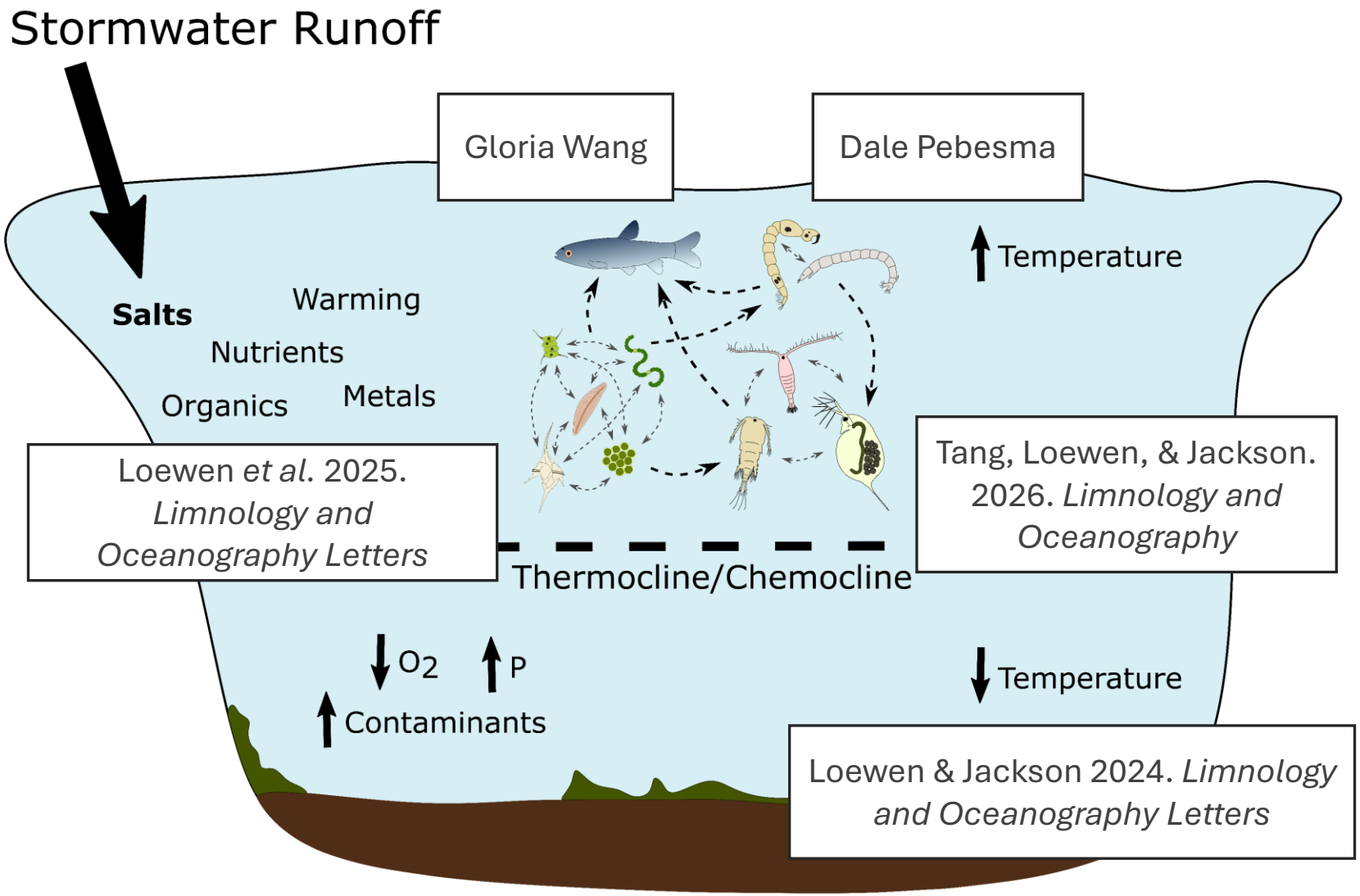
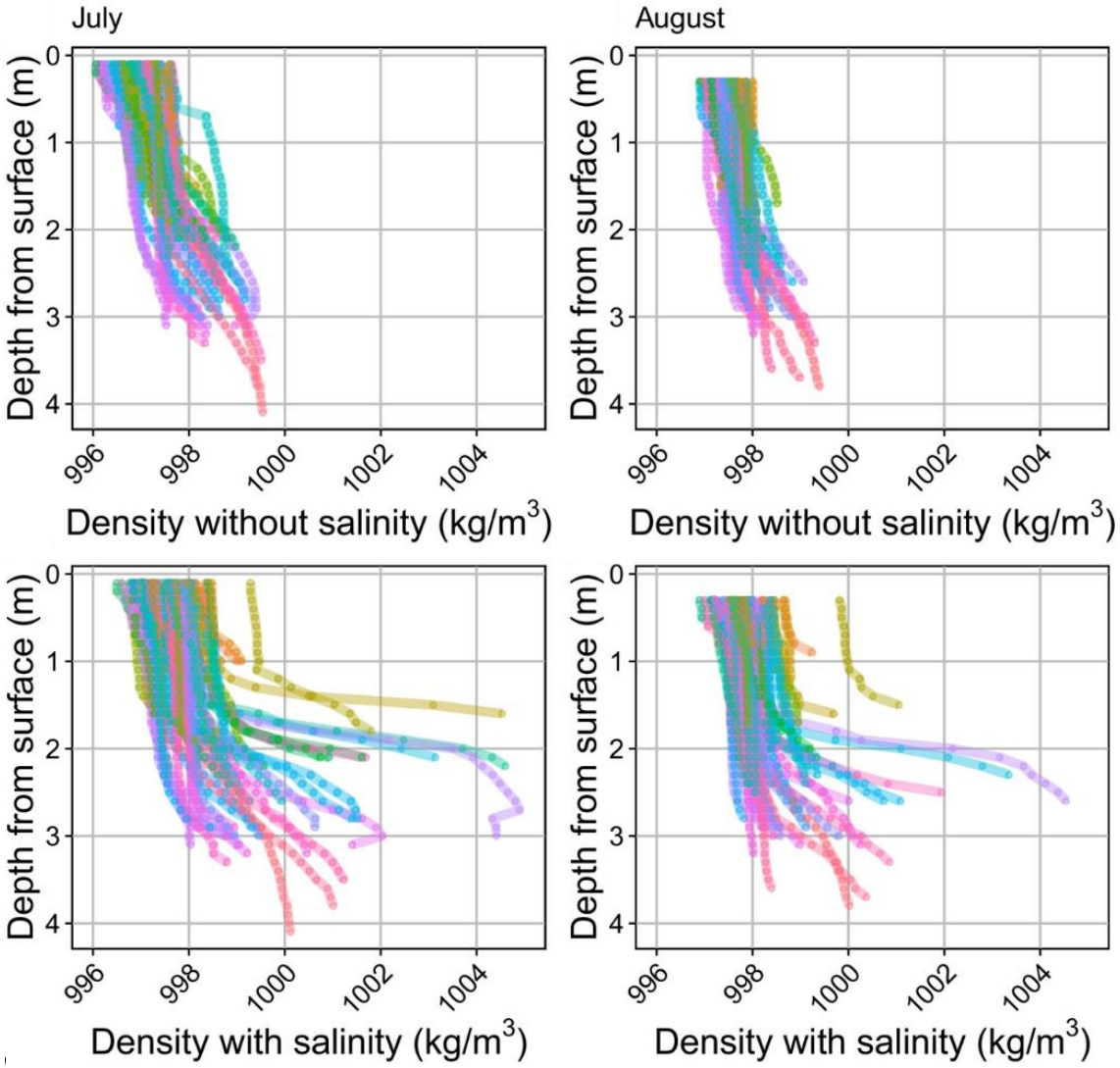
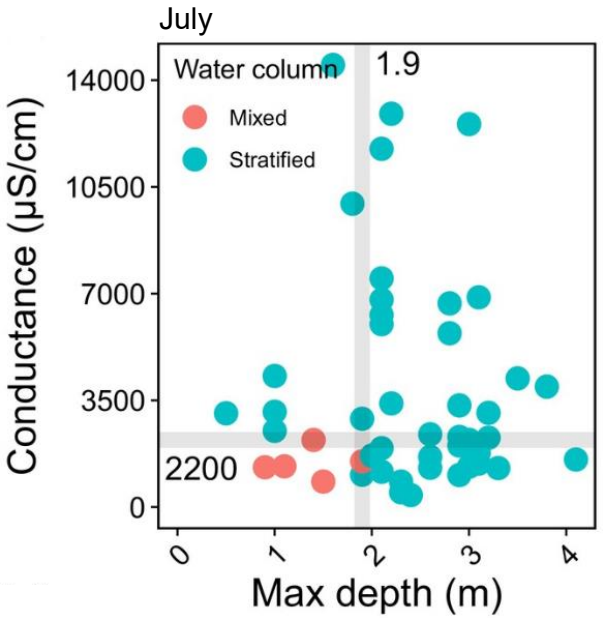
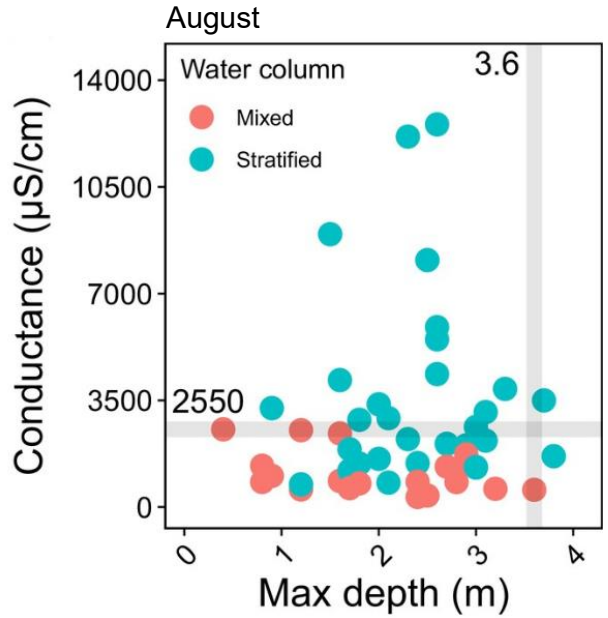


Salinity is causing even shallow ponds to stratify



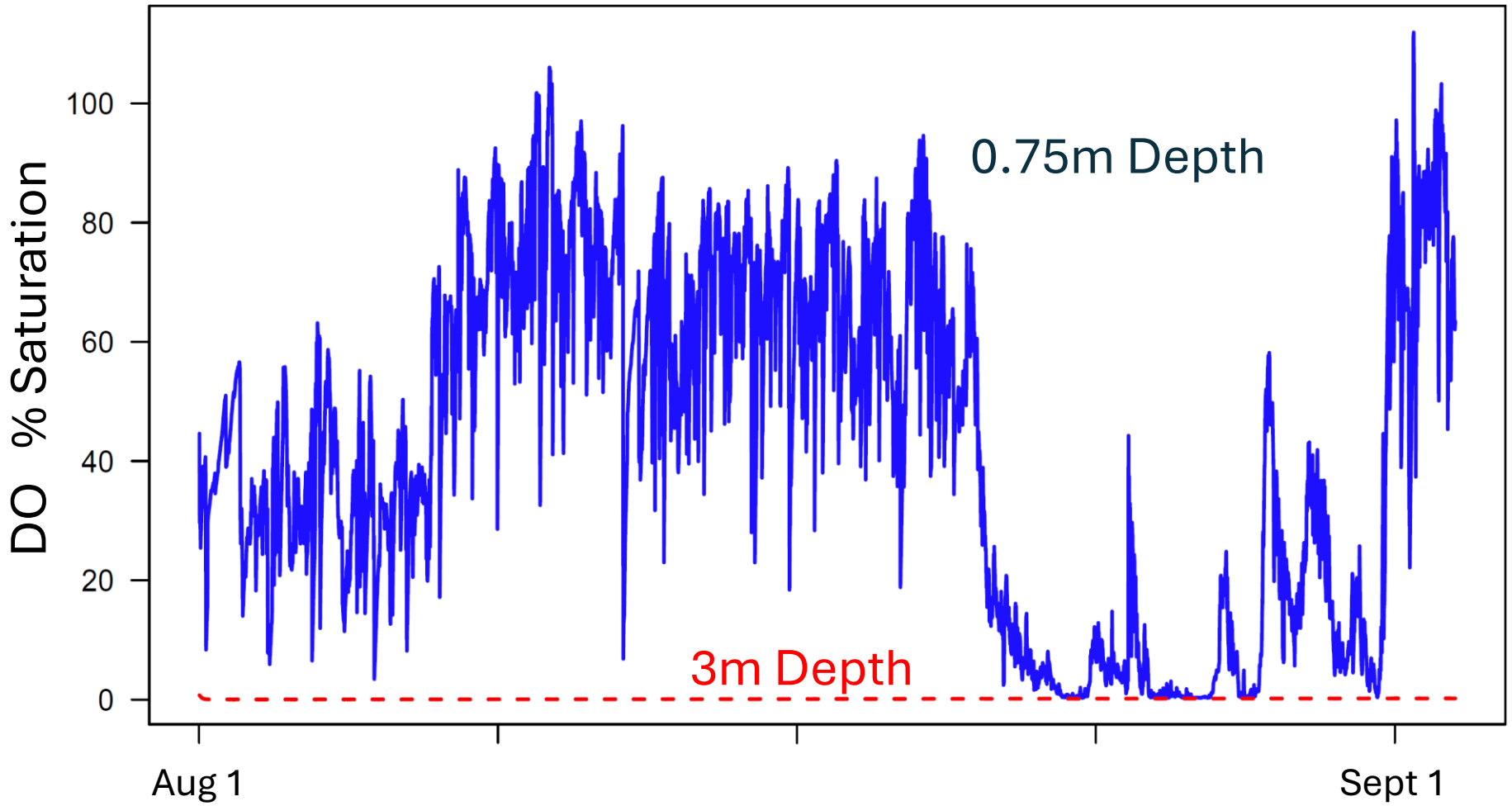




At least 34 were anoxia in bottom waters while being sampled (during the daytime)

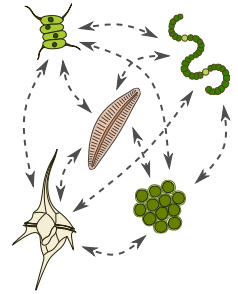
Loewen & Jackson. 2024. *Limnology and Oceanography Letters*

Some salty sites even developing anoxia near the water surface



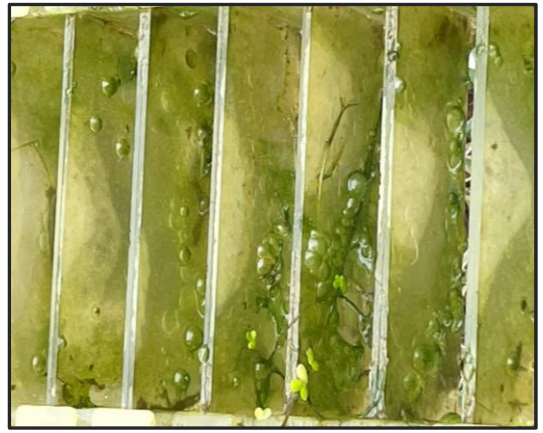
- Stable anoxia in bottom waters
- Large diurnal fluctuations
  - Productive systems

Impacts for phytoplankton, periphyton, and risk of harmful cyanobacteria?

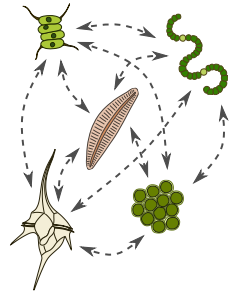


Discrete phytoplankton (and water quality) grab samples collected at 0.5-m depth

Time-integrated periphyton samples from colonization substrates deployed for 4 weeks



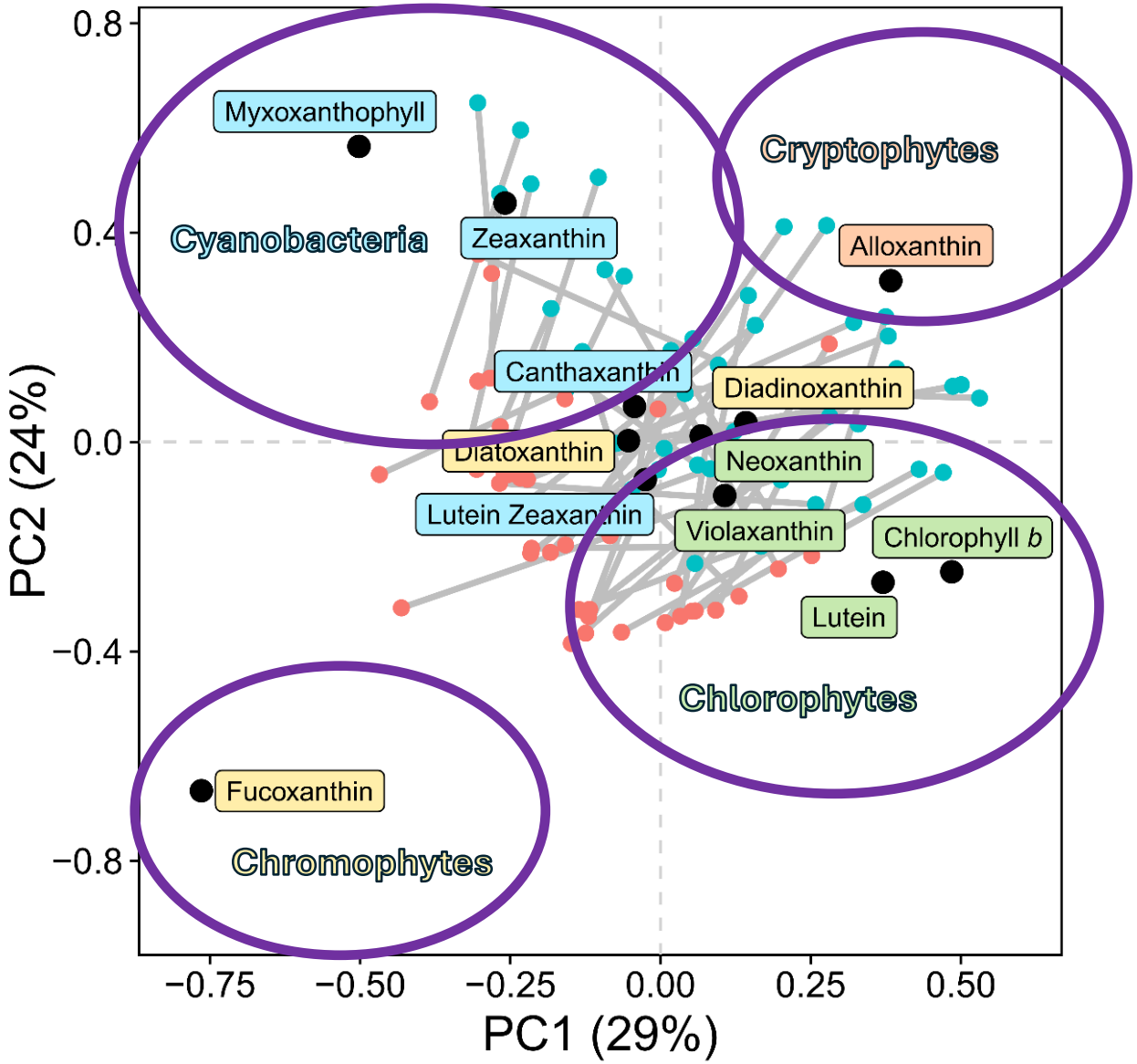
Relative concentrations of pigments used to infer taxonomic/functional groups

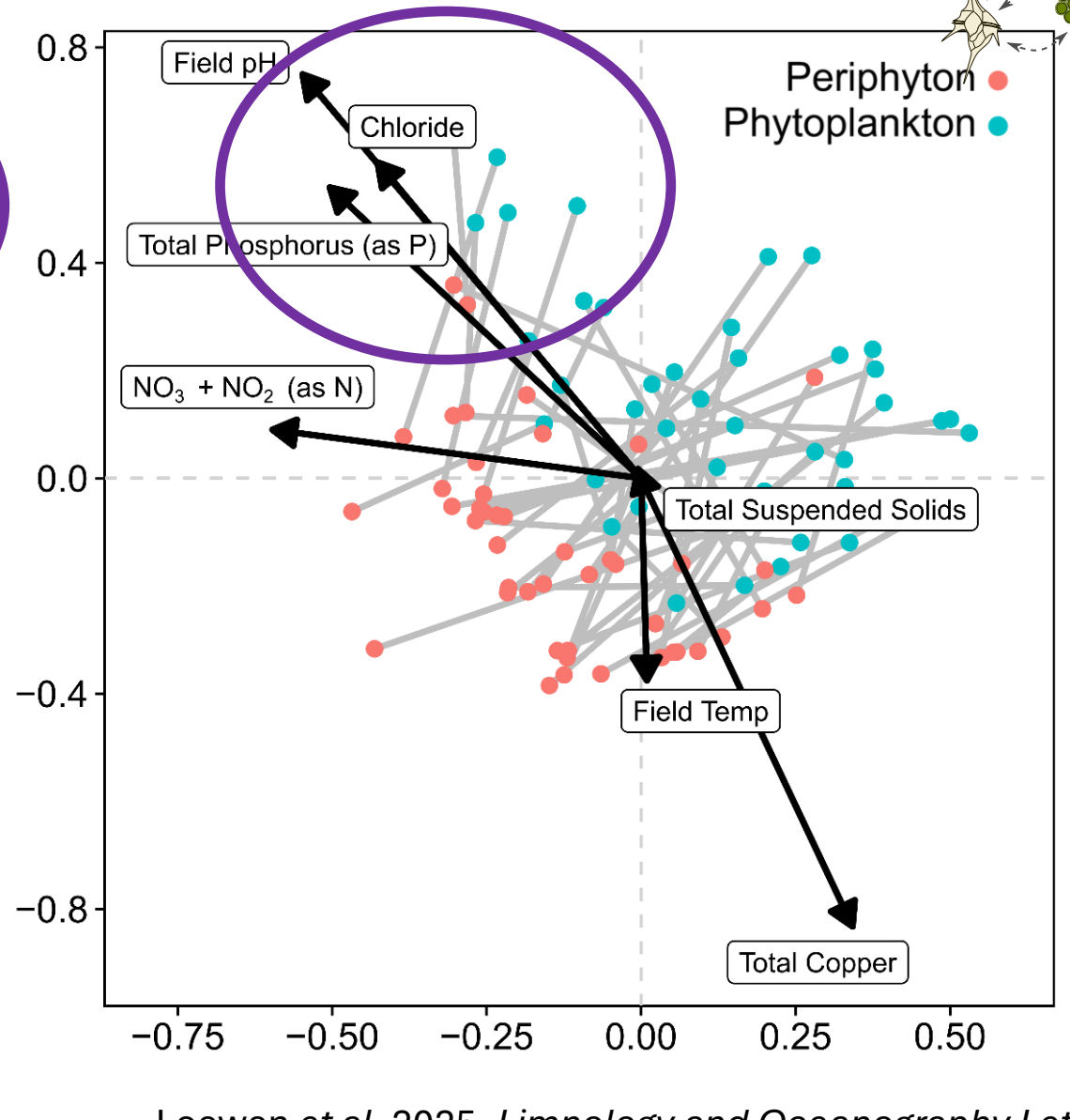


Measured by high-performance liquid chromatography

Pigment	Taxonomic Group
Chlorophyll *a*	Total community biomass
Fucoxanthin + Diadinoxanthin + Diatoxanthin	Chromophytes (chrysophytes, diatoms, and some dinoflagellates)
Chlorophyll *b* + Violaxanthin + Neoxanthin + Lutein	Chlorophytes (green algae)
Alloxanthin	Cryptophytes
Zeaxanthin + Canthaxanthin + Myxoxanthophyll + Lutein Zeaxanthin	Cyanobacteria

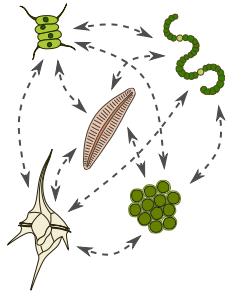
Communities vary along environmental gradients

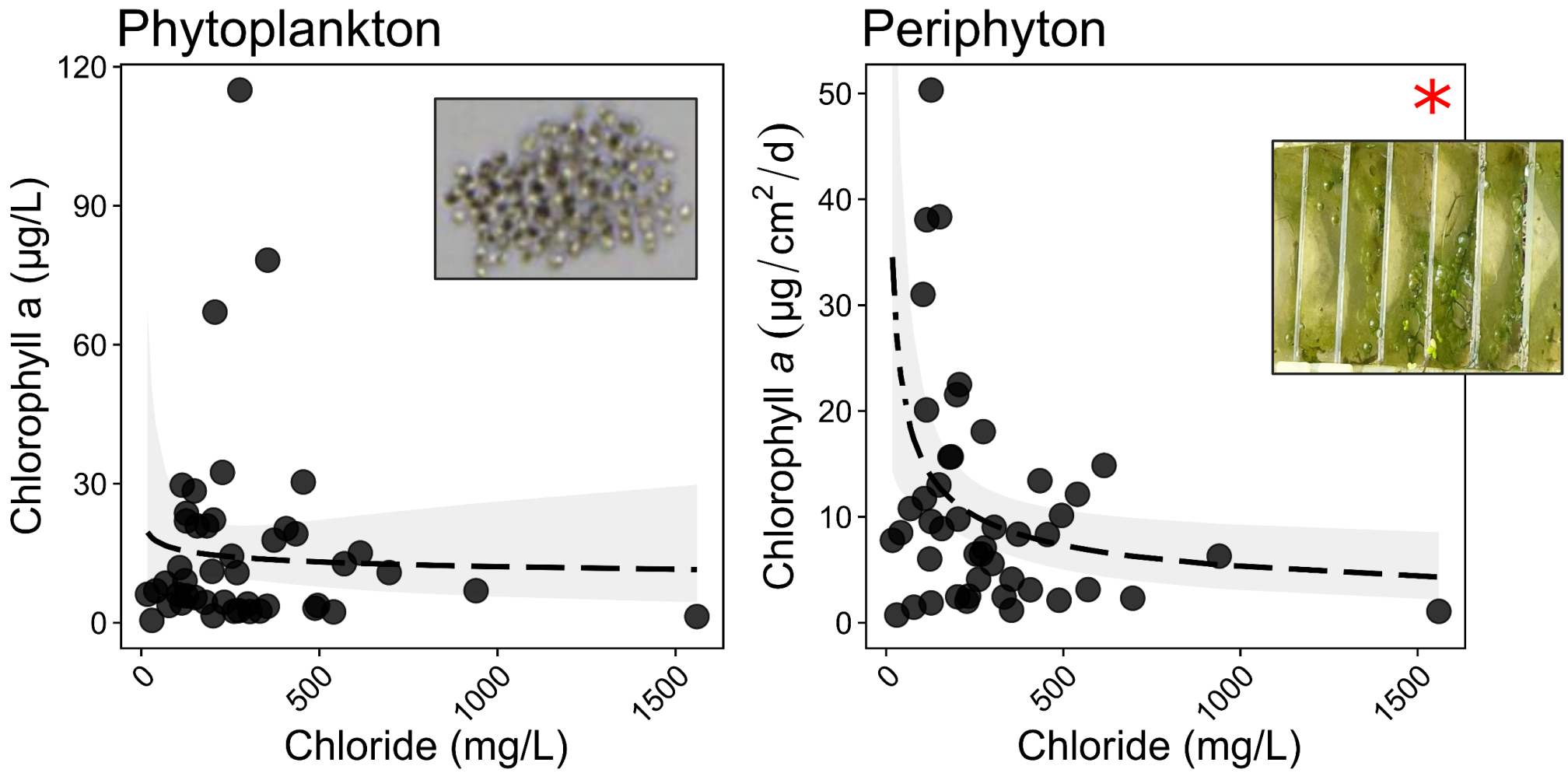




Loewen *et al*. 2025. *Limnology and Oceanography Letters*

Overall, chloride had little impact on the biomass of phytoplankton, though periphyton decreased





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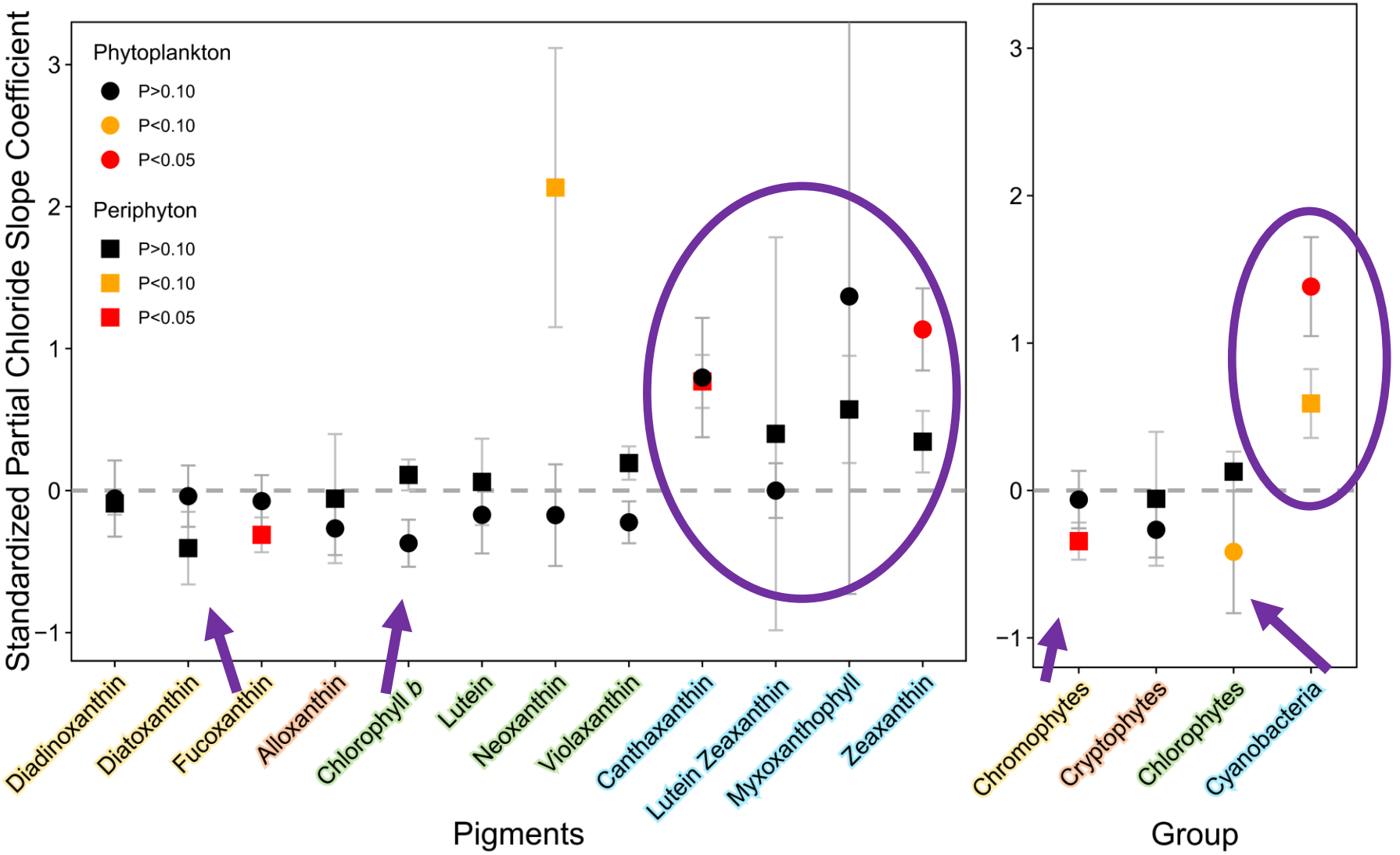
But chloride did impact community composition, increasing risk of *cyanobacterial dominance*



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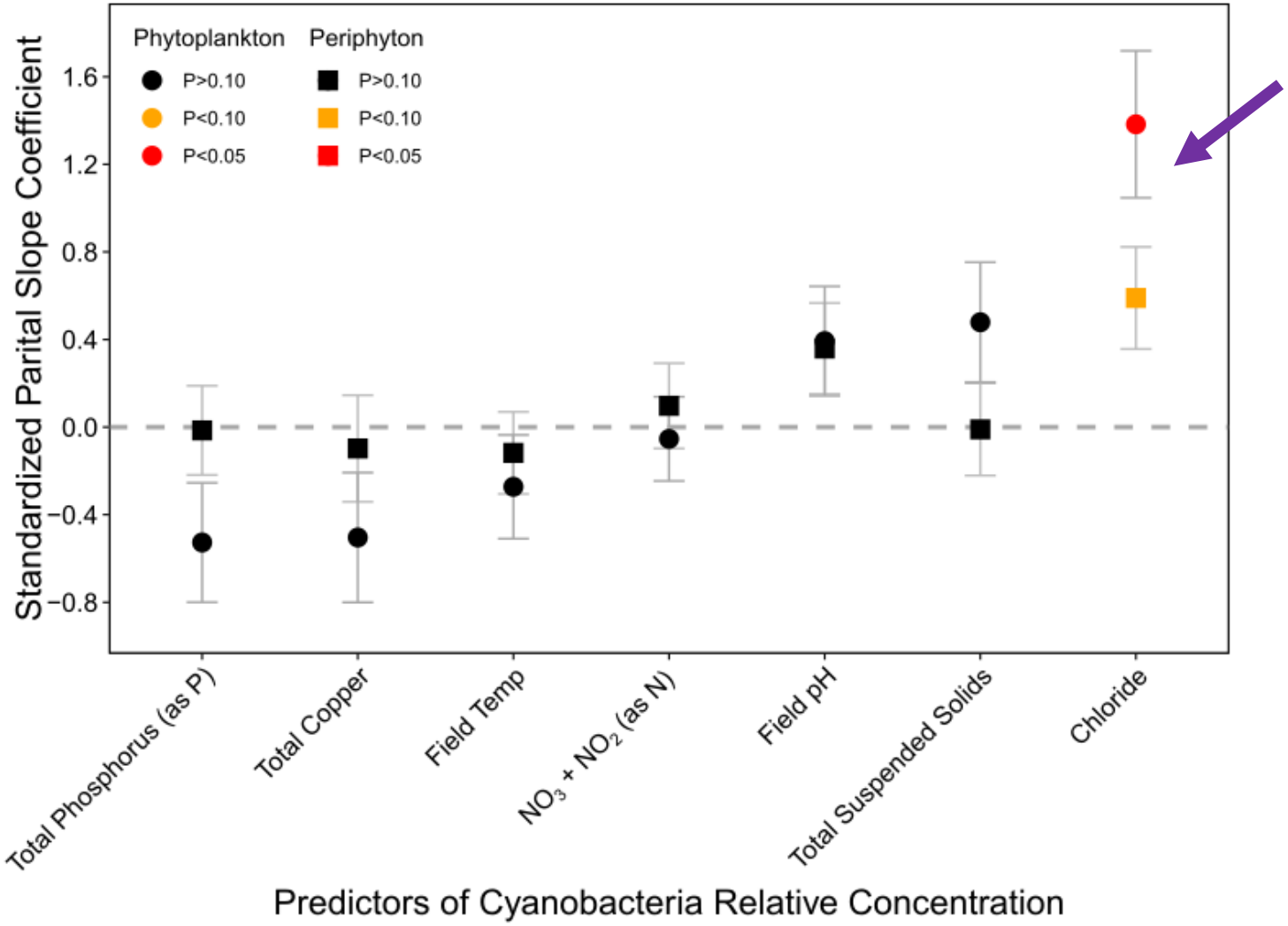
Surprisingly, the effects of chloride overrode those of nutrients and other water quality parameters



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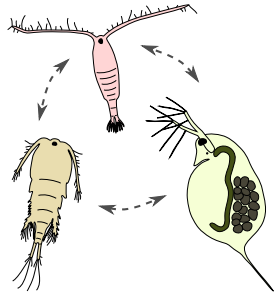
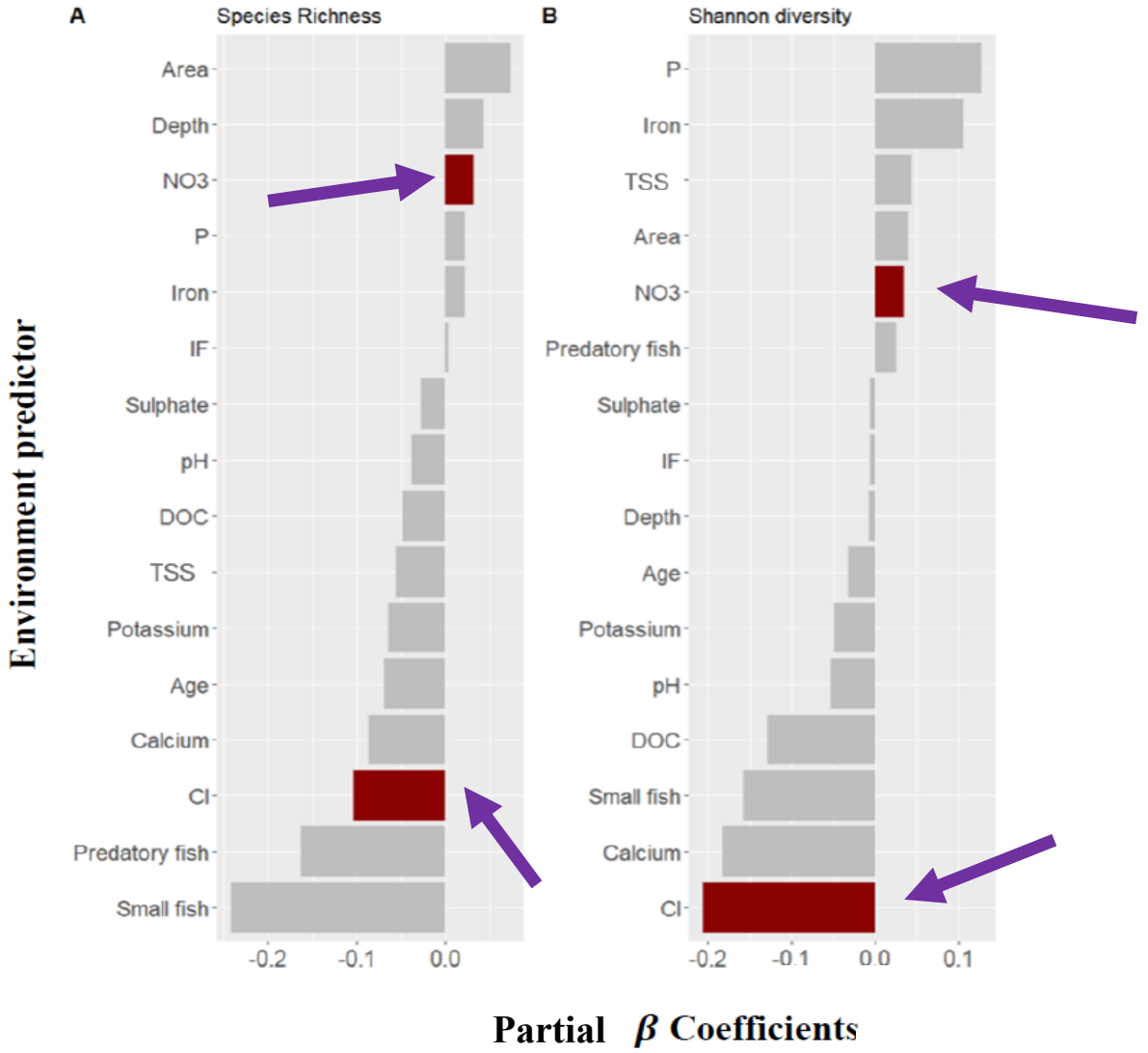
Chloride was also a leading driver of declining zooplankton diversity

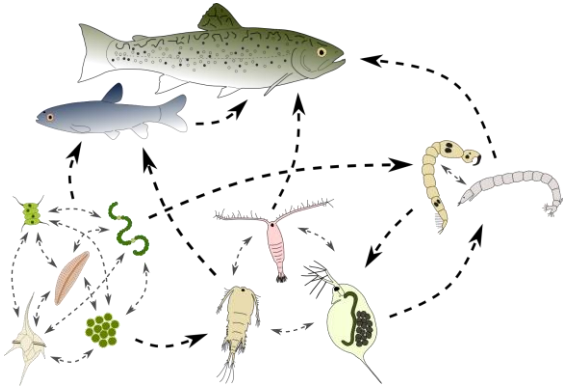


- Larger ponds with more nutrients were more diverse
- Saltier ponds with more fish were less diversity
- Repeated sampling shows significant species turnover
  - Impacts persist from year to year
    - In review…

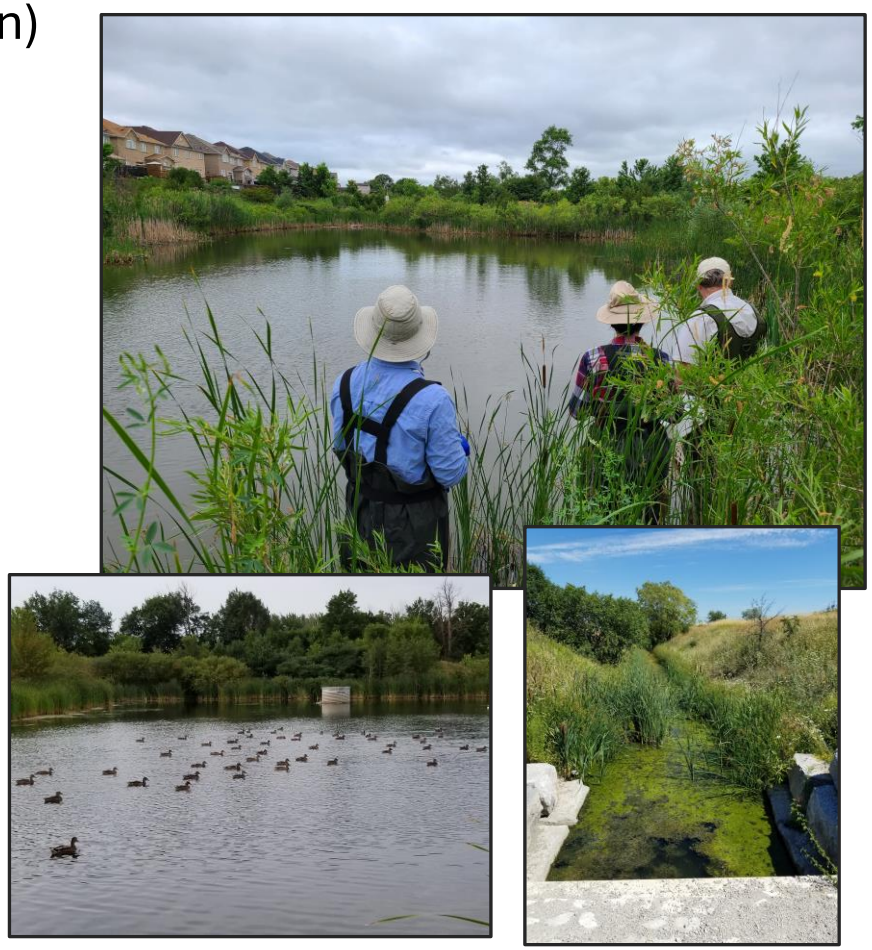


Tang, Loewen, & Jackson. 2026. *Limnology and Oceanography*

Road salt impacts multiple ecosystem processes and trophic levels

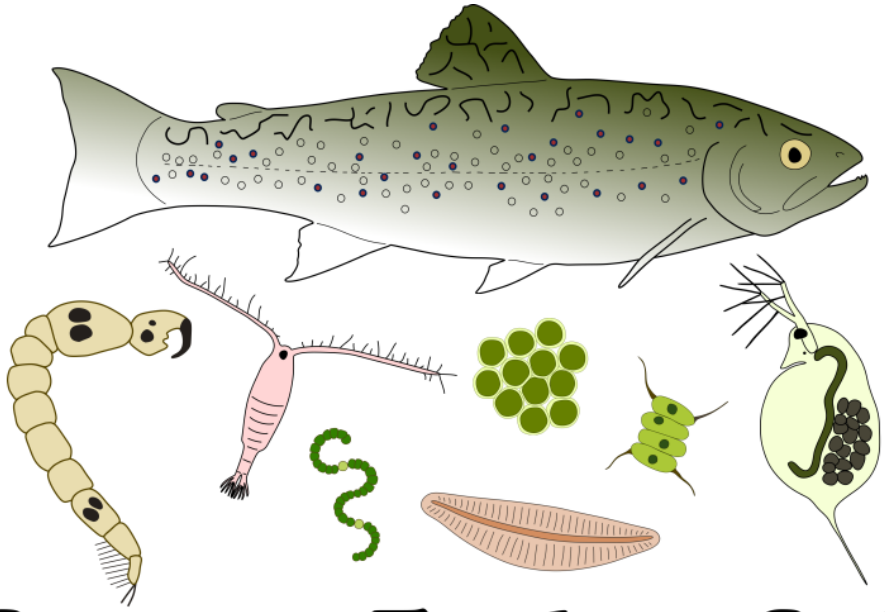


- Drives persistent summer vertical stratification
  - Consequences for oxygen availability (contaminant mobilization)
- Decreases periphyton biomass, but biggest effects on composition
  - Increasing cyanobacterial dominance (risk of HABs)
- Decreases zooplankton diversity and alters composition
  - Impacts to other taxa, including benthic macroinvertebrates, and possibly linked to occurrence of goldfish…



Questions? (charlie.loewen1@ucalgary.ca)

Donald Jackson
Xiaozhou Tang
Rolf Vinebrooke
Jenna Cook
Dale Pebesma
Gloria Wang
Alan Bui



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