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The Effects of Hypoxia on Zooplankton Population Estimates and Migration in Lakes

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Day 'N' NightZ: The effects of hypoxia on pelagic zooplankton population estimates and migration patterns

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BACKGROUND

- Hypoxia is on the rise worldwide as a result of climate change and eutrophication
- Zooplankton may switch from daily vertical migration (DVM) to daily horizontal migration (DHM) under hypoxic conditions (Fig. 1)
- Such a switch may impact zooplankton population estimates based on standard day sampling practices (Fig. 1A,B left side)
- We initiated a global collaborative effort to evaluate preliminary hypotheses about impacts of hypoxia on zooplankton migration

HYPOTHESIS

- **Zooplankton density and biomass are greater at night versus the day under hypolimnetic hypoxic versus oxic conditions.**
- Goal is to improve understanding of how global change may alter zooplankton migration behavior and patterns in lakes

METHODS

- Participants sample their local lake(s) – ideally one lake fully oxic to the bottom and one lake with hypolimnetic hypoxic
- Three replicates, full water column tows at mid-day and mid-night at same open water site
- Estimate biomass and density day and night
- Currently, expect samples from 60 lakes in 22 countries (Fig. 2)



Fig. 2. Location of study lakes involved in the study.

HOW HYPOXIA CAN INFLUENCE MIGRATION

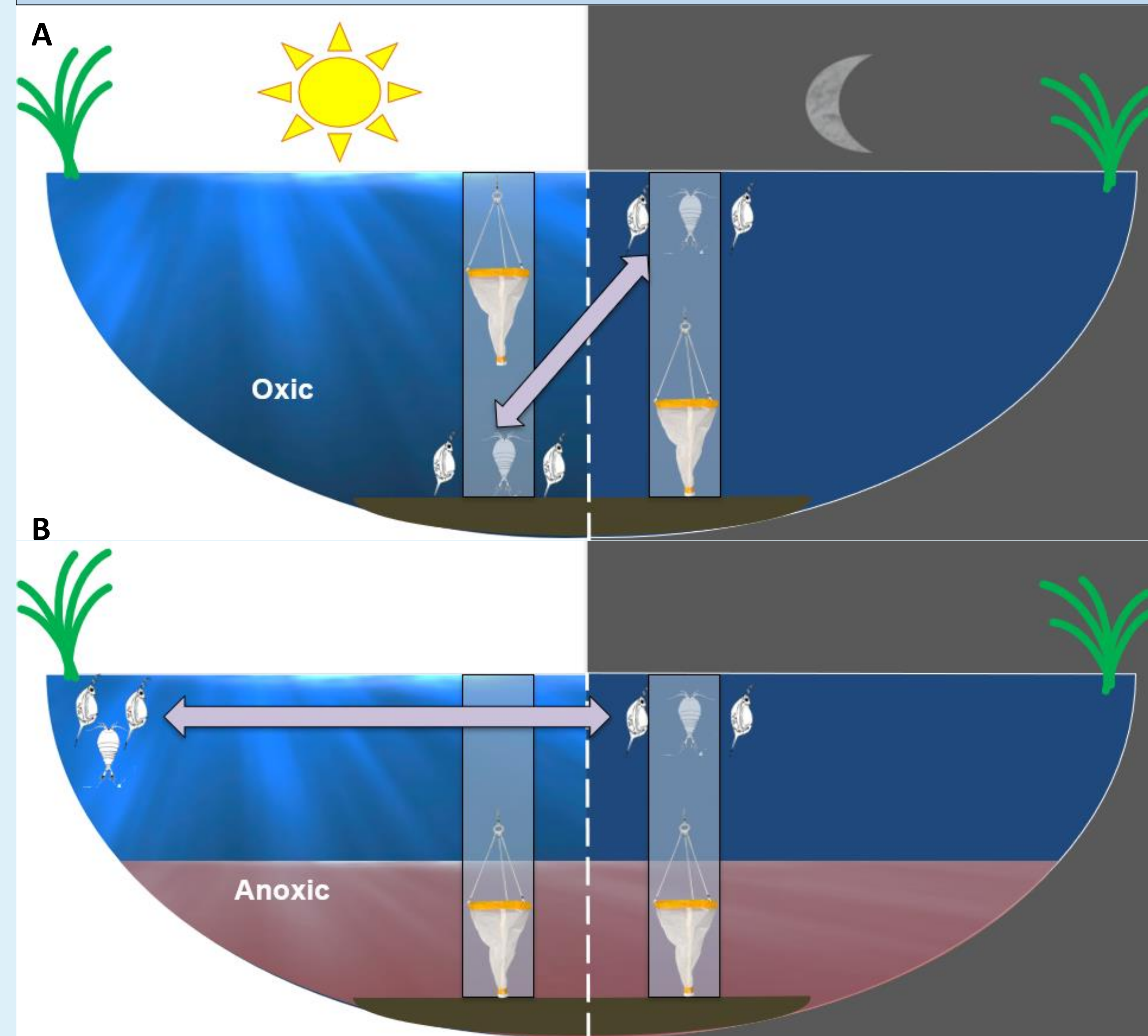


Fig. 1: (A) Under oxic conditions, zooplankton perform DVM. Full-water column samples should produce similar density and biomass estimates day versus night. (B) Under anoxic conditions, zooplankton perform DHM, and full water column samples during the day in open water will underestimate zooplankton density and biomass.

RESEARCH QUESTIONS

- How will an increase in hypolimnetic hypoxia impact zooplankton migration?
- What effect will changes in zooplankton migration have on long-standing daytime sampling practices for zooplankton?

NEXT STEPS

- We expect to have all samples in hand by March 2020 and counted by May 2020
- If notable difference is found in zooplankton biomass and density in the water column during the day vs the night, then standard practices in limnology may need to be adapted

PRELIMINARY DATA

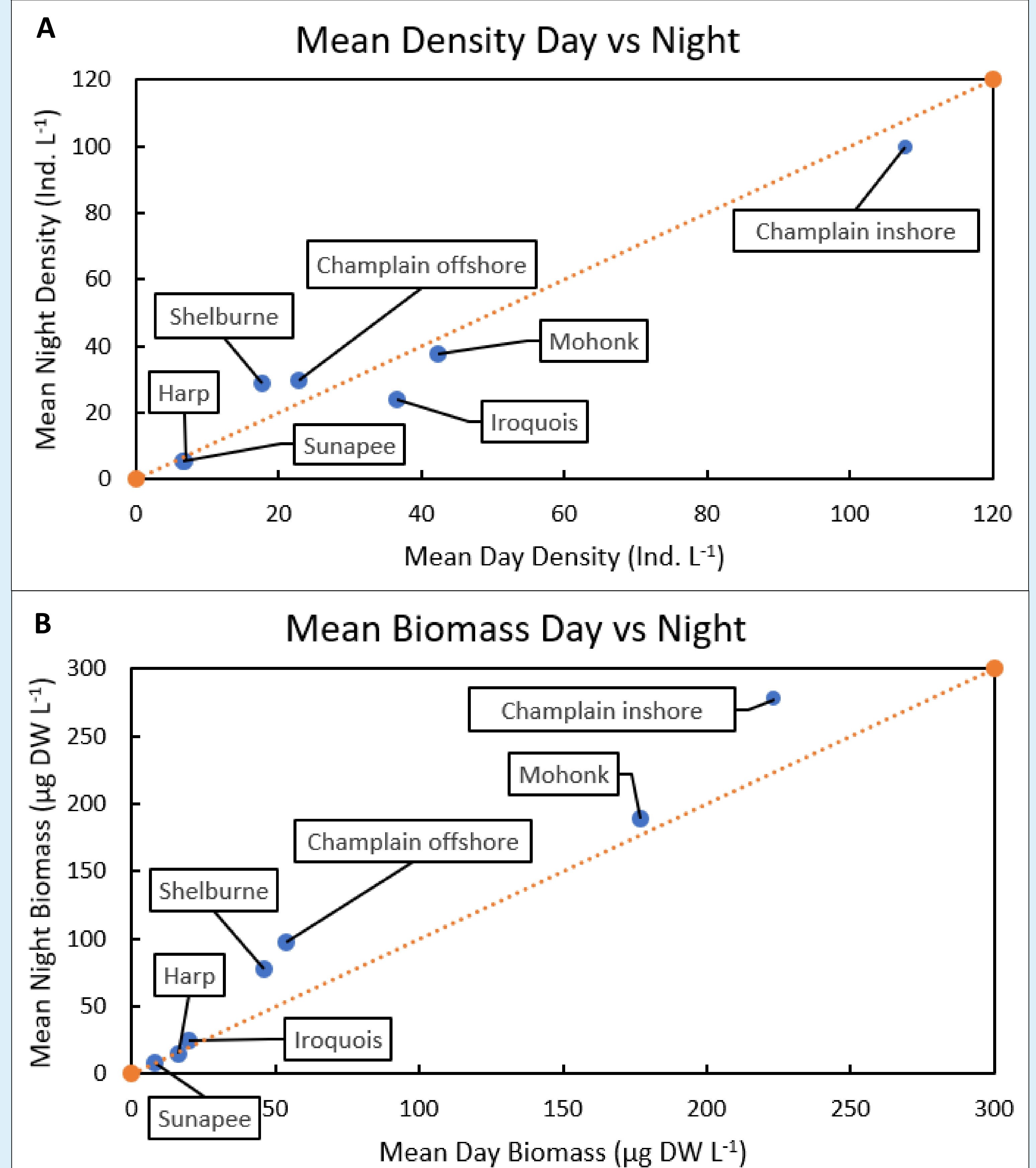


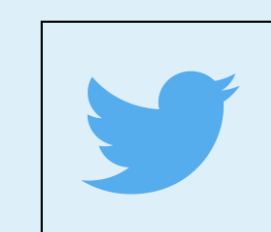
Fig. 3: (A) Mean density of zooplankton in the water column of lakes in the northeastern United States at mid-day vs mid-night. (B) Mean biomass of zooplankton in the water column of lakes in the northeast United States at mid-day vs mid-night. Samples were collected during summers 2018 and 2019.

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