Global freshwater microcrustacean zooplankton body-size distributions across environmental gradients: from a macro-ecological question to an interoperable data resource

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Project phase

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SCAN ME

ZooSize

A scientific question motivated the creation of a global data resource; **building** this resource will allow us to **answer** the original question while **enabling** future studies beyond it.

ORIGIN

BUILD

2020: Initiate
The idea was developed during GLEON 2020 meeting. Goals and policies (authorship/data) were discussed.

↓

2021-2023: Mobilize
We built two data templates (single and multiple lakes) and advertised the data call.

↓

2023-2026: Build the resource
Harmonization, QC, integration.
Factors considered: preservative, body-length measurement protocol, length-weight regressions.

ANSWER

Body size is a key functional trait in aquatic ecosystems (e.g., predator-prey interactions, metabolic rate) and is regulated by factors such as resource and habitat availability, predation pressure, and temperature.
The **ZooSize** project assembled individual-scale microcrustacean body length measurements for freshwater lakes across **global lake thermal regions**[1] to gain insights on macroecological patterns of size-structured zooplankton communities. Specific questions include:

(1) How do **zooplankton size structure metrics** (e.g., size diversity, mean size, and metrics describing size distributions) change across lake thermal regions?
(2) How do **other local biotic and abiotic factors** (e.g., fish predation, resource availability) shape variations in zooplankton size structure globally?

[1] The **thermal regions scheme**, introduced by Maberly et al. (2020, Nat. Comm.) to classify the thermal behavior of lakes according to their annual surface temperature, provides an opportunity to investigate the size structuring of zooplankton along gradients in temperature and climate.

ENABLE

In **2019**, the **ZIG project** launched a data call for time-series of freshwater zooplankton. Because size is not routenely measured, few dataset included this parameter. We viewed ZooSize as a complementary dataset.

From **2021**, we worked alongside with ZIG to maximize interoperability.

August 2026: The ZIG dataset was released! The wealth of biological and environmental data will allow for the analysis of long-term ecological changes and of how biological communities interact with shifting environmental conditions across a wide range of lake types.

Figary et al, 2026. **The Zooplankton International Geospatial dataset**: A global repository of spatiotemporal freshwater zooplankton community composition data from lakes and reservoirs to support ecological research. *Limnology and Oceanography Letters*, **11**(5) https://doi.org/10.1002/lol2.70152

NOW

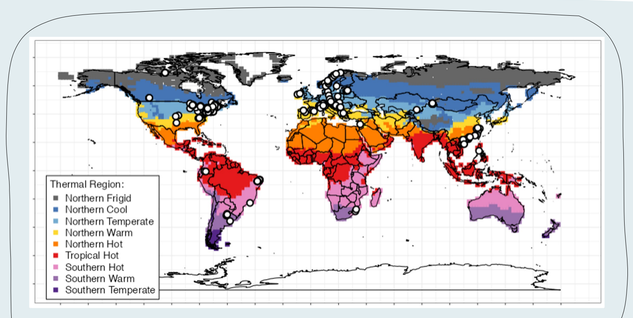

Figure 1. World map with waterbodies location

ZooSize dataset

468 lakes (Figure 1) • **50+ data providers**

Global coverage • Individual zooplankton crustacean sizes • Environmental covariates

67% snapshot data (11 waterbodies with long time-series available)
8 tables, several merger helpers:

- *zoosize_id*: unique ID identifying data contributor and lake.
- *sampling_id*: unique ID for a sampling date and time
- *flex_sampling_id*: close sampling ID allowing to merge dates within 5 days of each other

Our preliminary results suggest that mean body size of zooplankton communities follows the **temperature-size rule** (larger individuals in colder environments). In contrast, **size diversity exhibited the opposite pattern** (greater size diversity in warmer regions) (Figure 2).

These results are consistent with broader macroecological patterns observed in communities across latitudinal gradients (e.g., greater species diversity at lower latitudes) and highlight the importance of regional environmental gradients on zooplankton community structure.

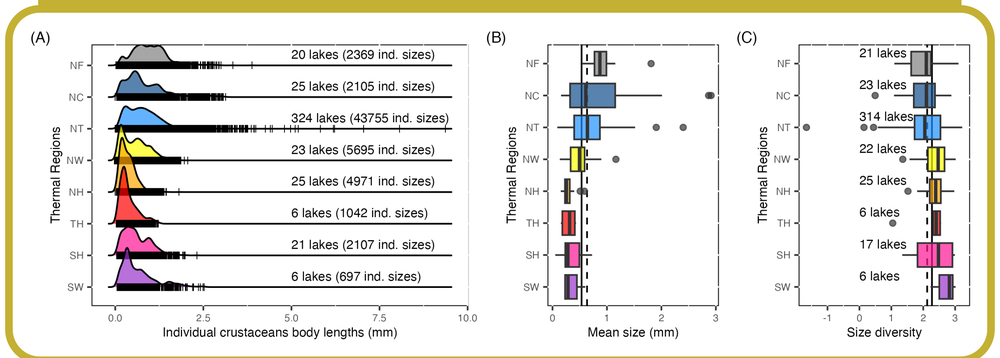

Figure 2. (A) Size distributions of crustacean communities per thermal region. Number of lakes and number of individual size measurements are shown for each thermal region. (B) Community weighted mean size and (C) size diversity per thermal region. The vertical full line and the vertical dashed line represent the mean across thermal regions and across lakes, respectively.

In 2025, a subgroup started working on a Shiny App to explore ZIG. **We participate in the development of the ZIG Shiny App and are working toward integrating ZooSize once the dataset is ready** (Figure 3).

Figure 3. Screenshot of the ZIG/ZooSize app under development.

NEXT

We are currently working on a **data paper** describing the dataset (Figure 4; data from ~460 waterbodies will be published in open-access in a repository).

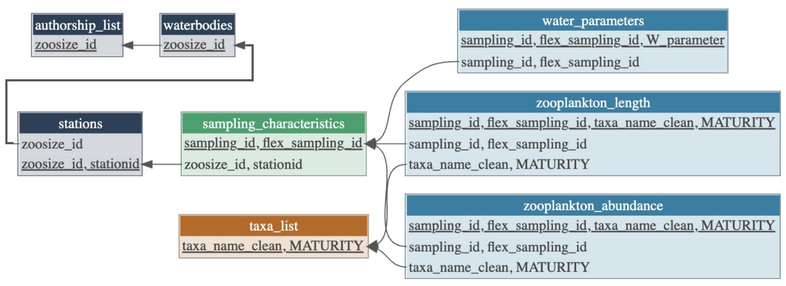

Figure 4. Relational graph between the 8 tables in the dataset.

We chose to focus on finishing the dataset first — the main analysis has been on hold.

Next steps include:

- Re-running the analyses,
- Re-convening the co-authors,
- Testing the main hypotheses,
- Interpreting ecological implications.

A growing ecosystem to ask new questions

- Complementary datasets on biological (e.g., ZIG) and hydrological components (e.g., HydroLAKES) for new analyses
- Emerging data resources (e.g., Shiny app)

Shared standards • Integrated analyses • New knowledge
ZIG + ZooSize + Other datasets
Reuse • Interoperability with other dataset

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