ZooSize - Crustacean zooplankton community size distributions across a worldwide set of freshwater lakes

Project Phase

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Framework of the study

Body size is a key trait that plays a significant role in determining the functioning of size-structured freshwater communities (e.g., predator-prey interactions, energy transfer). In aquatic ecosystems, size is regulated by food and habitat availability, predation pressure, and temperature. To date, most studies have either focused on local, regional or continental scales, considered average sizes for each species instead of individual body size measurements limiting our ability to unravel spatial patterns in both intra- and interspecific size variation.

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

The **ZooSize** project will assemble individual-scale crustacean zooplankton body length measurements for freshwater lakes across **global lake thermal regions** to gain insights on the following research questions:

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 **biotic and abiotic factors** (e.g., fish predation, resource availability) modulate changes in zooplankton size structure globally?

Methods

To contribute to the project, collaborators need to submit community composition and individual body size measurements from one sampling date, at the time of peak seasonal biomass. We also ask for some characteristics of the lake (coordinates, altitude, depth…) and some limnological variables (temperature, chlorophyll-a concentration, etc.). Scan the provided **QR code** for more information on the currently open **Data Call** (Fig. 1), and help us spread the word!

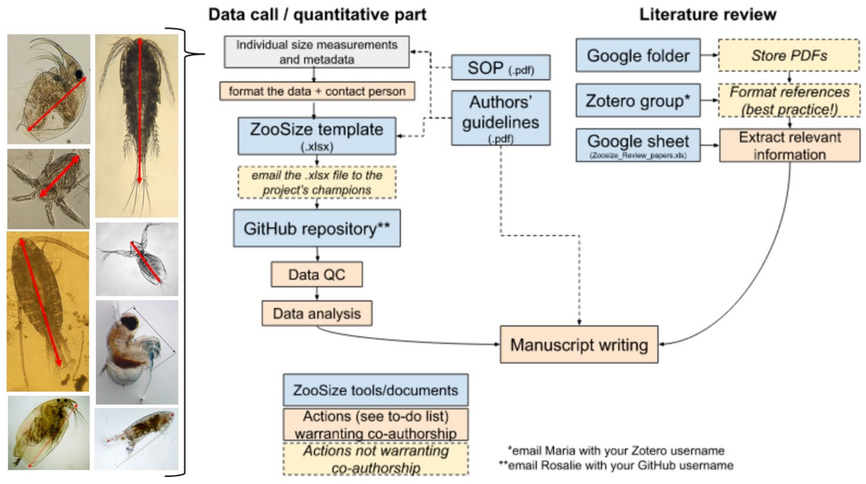

Figure 1. *Project organization. We are leading several tasks in parallel, related to data management (data call, harmonization, and analysis), and writing (literature review and manuscript drafting).*

Preliminary Results

As of October 2022, 77 out of 100 submitted datasets have **60+ individual measurements**. The availability of potential explanatory variables varies among datasets and may constitute another filter for sites inclusion in subsequent analysis (Fig. 2). We are still accepting data contributions until December 2022, especially for lakes in underrepresented thermal regions such as NF, NC, TH, SW, and ST (Fig. 3)!

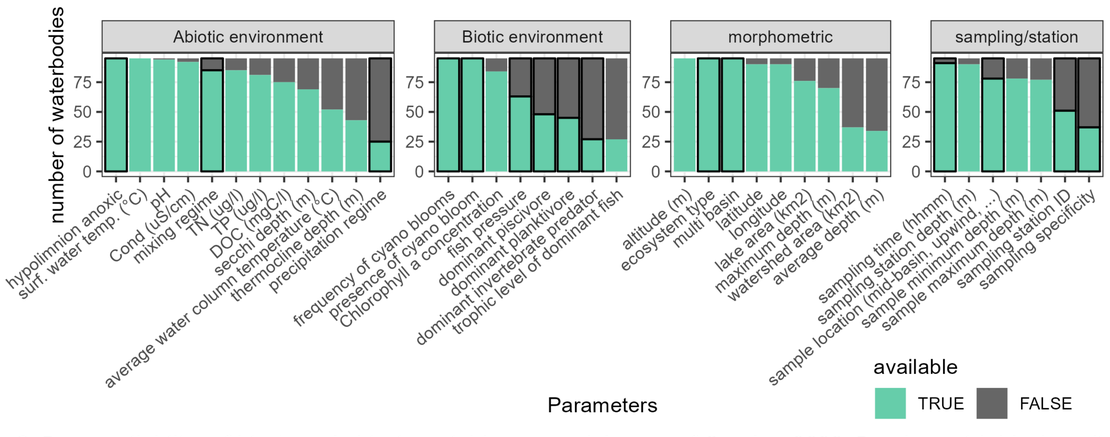

Figure 2. *Data availability of biotic and abiotic variables across lakes, as of October 2022. Barplots with black outline are discrete variables that will be used as factors, other variables are continuous.*

Perspectives

Our next steps are to (1) add datasets for **underrepresented areas** (Fig. 3), (2) continue data **harmonization** and define criteria of data inclusion according to data quality, (3) calculate **size metrics** (Fig. 4), and (4) draft the **manuscript** (Fig. 5).

If thermal regions alone are good predictors of zooplankton size structure, it may indicate that ecosystem functioning might shift with future trends of climate change, not least because up to two-thirds of lakes may dissociate from their current thermal regions under the most pessimistic climate scenario at RCP8.5.

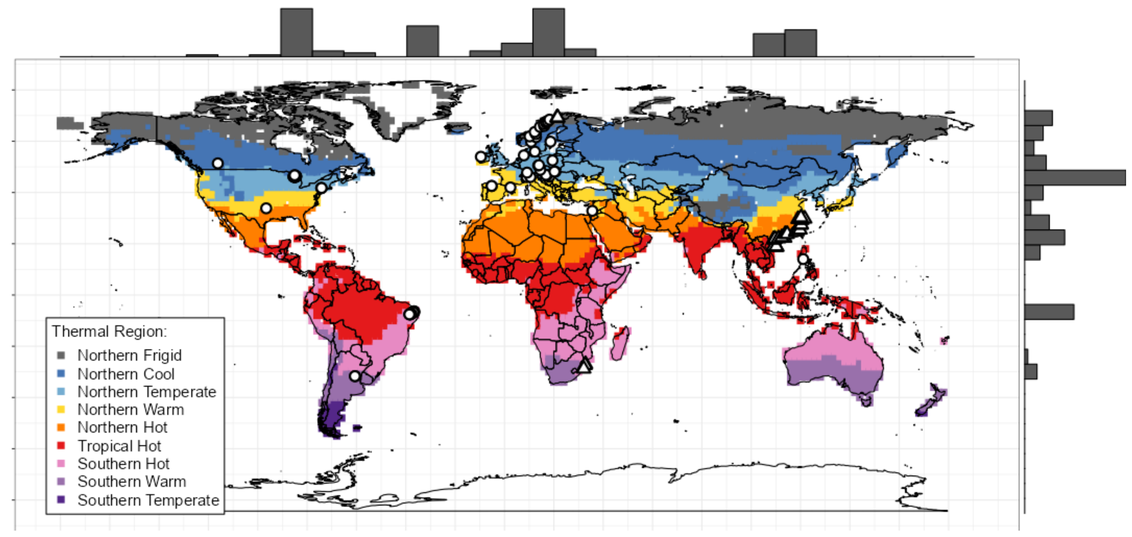

Figure 3. *Global map of submitted (points) and expected (triangles) data across lake thermal regions. Histograms on the top and right margins indicate the number of lakes per longitude and latitude, respectively. Map modified from Maberly et al. (2020)*

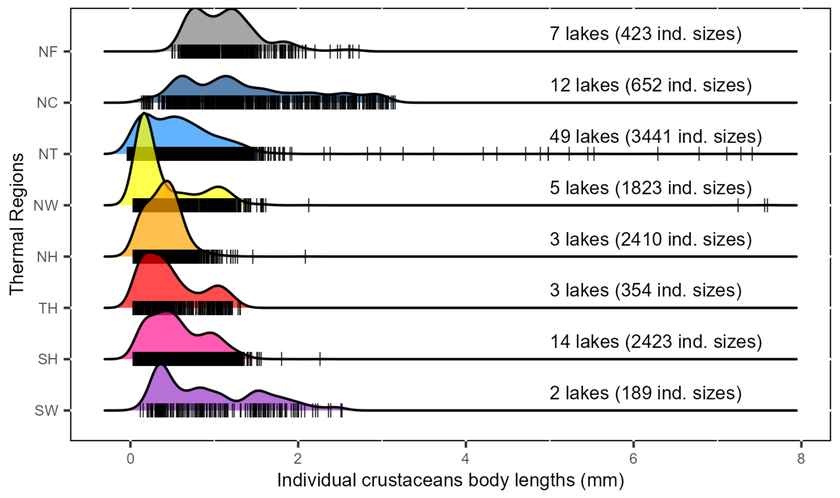

Figure 4. *Size distributions of crustacean communities per thermal region. Number of lakes and number of individual size measurements are shown for each thermal region*

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2021	Meetings with co-authors	x	x				x			x			
	Data template creation (x) and collaborators feedbacks (o)			x	x	x	x	o	o				
	MS literature review				x	x	x	x	x	x	x	x	x
	Open Data Call								x	x	x	x	x
	Project's tools: website (x), zotero (o), and git (g)							o	x				g
2022	Meetings with co-authors	x				x					x		
	Open Data Call	x	x	x	x	x	x	x	x	x	x		
	MS literature review	x	x	x	x	x	x	x	x	x	x		
	Data treatment	x	x	x	x	x	x	x	x	x	x		
	Creation of core writing team										x		
2023	Meetings with co-authors												
	Data treatment												
	Write MS sections												
	MS final versions and submit												

Figure 5. *Project timeline*

Acknowledgements

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GLEON global lake ecological observatory network

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