

Plankton Ecology and Aquatic Ecosystem Dynamics



Uncovering the secret life of plankton for a sustainable management of changing lakes

[AQUASCOPE – Integrating high resolution monitoring and trait-based modelling to understand and predict phytoplankton dynamics](#) -> Have a look!

Overview

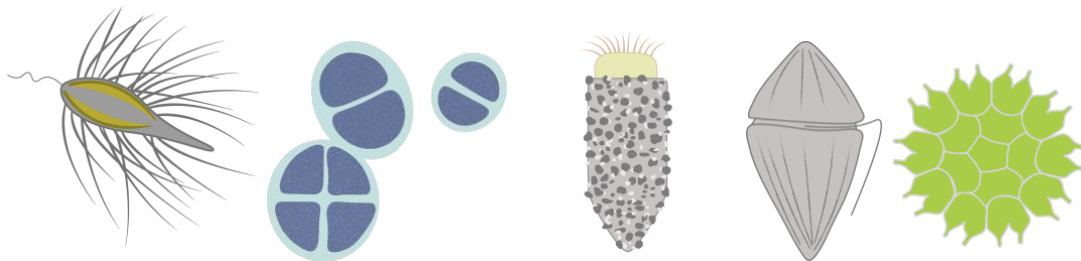


Plankton are the invisible foundation of aquatic life. These microscopic organisms sustain lake food webs, shape water quality, and contribute to the oxygen we breathe every day. Though often overlooked, plankton display extraordinary diversity and remarkable beauty: intricate geometries, delicate structures, and dynamic movements that unfold in the microscopic world.

Our research group explores plankton communities directly in their natural environment, seeking to understand how biodiversity emerges, how species interact, and how these communities respond to environmental change. Lakes are rapidly transforming under the pressure of climate change and pollution. Understanding how plankton respond to these changes is essential to protect freshwater ecosystems and the services they provide.

By combining ecological theory, innovative monitoring technologies, and data-driven models, we aim to reveal the mechanisms that govern plankton dynamics and to anticipate future changes in lake ecosystems, including harmful algal blooms. At the same time, we remain inspired by the hidden beauty and complexity of these microscopic worlds — we are, quite simply, plankton lovers.

Our interdisciplinary group collaborates with researchers and public authorities locally and internationally to better understand and sustainably manage freshwater ecosystems.





Research topics

Our research focuses on revealing the diversity and dynamics of plankton communities across space and time.

- **Innovative tools to observe the invisible**

To capture the rapid dynamics of plankton, we use automated monitoring systems combining *in situ* imaging and environmental sensors. While traditional monitoring typically samples lakes once per month, our systems observe plankton communities hourly, revealing who is present and how communities change in near real time. These high-frequency observations provide a unique dataset worldwide and open a new window into understanding the hidden dynamics of plankton ecosystems.

[Latest Data Greifensee – AQUASCOPE](#)



- **Exploring microbial diversity through metagenomics.**

Freshwater microbial communities include phytoplankton, zooplankton, bacteria, and viruses, forming an enormously diverse ecosystem. Using metagenomics, we investigate not only which organisms are present but also their genetic diversity, metabolic capabilities, and evolutionary dynamics. By analysing time series of samples, we aim to understand how microbial populations evolve, how their interactions change over time, and how their functional potential shifts in response to environmental conditions.

- **Understanding interactions in complex plankton communities.**

Plankton biodiversity is maintained by a dense network of interactions among hundreds of species and their environment. Using trait-based approaches, we investigate how individual organisms respond to environmental conditions and how these responses scale up to shape community structure and aquatic food webs.

- **Understanding and predicting cyanobacterial blooms**

Harmful cyanobacterial blooms are increasing worldwide and threaten water quality and ecosystem health. Our research seeks to understand the ecological and evolutionary mechanisms that trigger these events within lake ecosystems and their food webs. We combine information across multiple levels — from genes and metabolites to populations,

communities, and ecosystem dynamics, and integrate these data into mechanistic models to predict when and why blooms occur.

- **Predicting future ecosystem change**

Through statistical models and machine learning, we analyse large ecological datasets to forecast plankton dynamics, cyanobacterial blooms, and water quality.

Why collaborate with artists?

Much of plankton life unfolds beyond human perception. Microscopes and sensors reveal forms, patterns, and movements that are both scientifically meaningful and visually striking. Collaborating with artists offers an opportunity to explore these hidden worlds from new perspectives. Artistic interpretations can help translate complex ecological processes into sensory, intellectual and emotional experiences, bringing the invisible life of lakes closer to people.

An artist in residence would join our research environment, interacting with scientists, observing plankton through microscopes and imaging systems, exploring ecological data, and visiting lake monitoring site on Greifensee and laboratories. As a group, we are also very interested to learn from the perspective of other disciplines than science, to critically reflect our own practice.

Beyond our research, we are a welcoming and open-minded team that genuinely enjoys working together. We are all a little bit passionate, -perhaps even a little bit obsessed- about plankton and the questions we study. This shared curiosity creates a collaborative and supportive atmosphere where ideas flow freely and people help each other. We strive to build an inclusive and respectful research culture in which different backgrounds, perspectives, and experiences are valued. For us, science is not only about discovering how ecosystems work, but also about creating a community where creativity, curiosity, and collaboration can thrive.

