



Innovations for a Sustainable Future in the Face of Climate Change

by Katrin Attermeyer

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We keep hearing and are witnessing more and more extreme weather events—from parts of Austria to Spain that were both recently hit by unprecedented floods. These events do not just disrupt lives temporarily but also underscore the urgent need for solutions that prioritize the health of the environment and people. Here at WasserCluster Lunz, we are addressing these challenges with innovative tools and research to promote a sustainable future. Our approach? We combine cutting-edge technology, immersive outreach, and robust field studies to tackle the climate crisis from multiple angles. We want everyone, from scientists to school kids, to understand the issues we're facing. Hence, we here develop interactive games and virtual rooms to explain complex environmental issues to people of all ages. Field research is another focus of our work. We have launched a new study on fish movement of native and invasive fish species, vital to understanding how our aquatic ecosystems are adapting—or

struggling—to cope with shifting conditions. A portable greenhouse gas analyzer explains the challenges of gathering real-time data across Europe and shares its adventures. But it is not just about fish moving between habitats. The role of aquatic life extends beyond ecosystem functions to the dinner plate. In our research on fishponds, we are diving deep into how plankton diversity affects both fish quality and human health. In this way, the small worlds beneath the water's surface link directly to global concerns about food security and public health. Each of these projects touches on a critical facet of climate science, with practical applications and the potential to drive real-world change. As floods, fires, and storms continue to "flood" the news, our work at WasserCluster Lunz focuses on ensuring that solutions flood in to meet them. From technology-based public relations to practical field research, we are trying to pave the way for a future where humanity and nature thrive together. ☐



Radio Telemetry Study in the Ois

Libor Závorka | SCIFISH

Wildlife telemetry enables us to track and locate animals in their natural environment using radio direction finding.

The tagging of fish is done under complete anesthesia. The procedure is carefully monitored and is permitted with the approval of the Federal Ministry of Education, Science and Research after ethical criteria have been reviewed.

FWF: Austrian Science Fund
WCL: WasserCluster Lunz



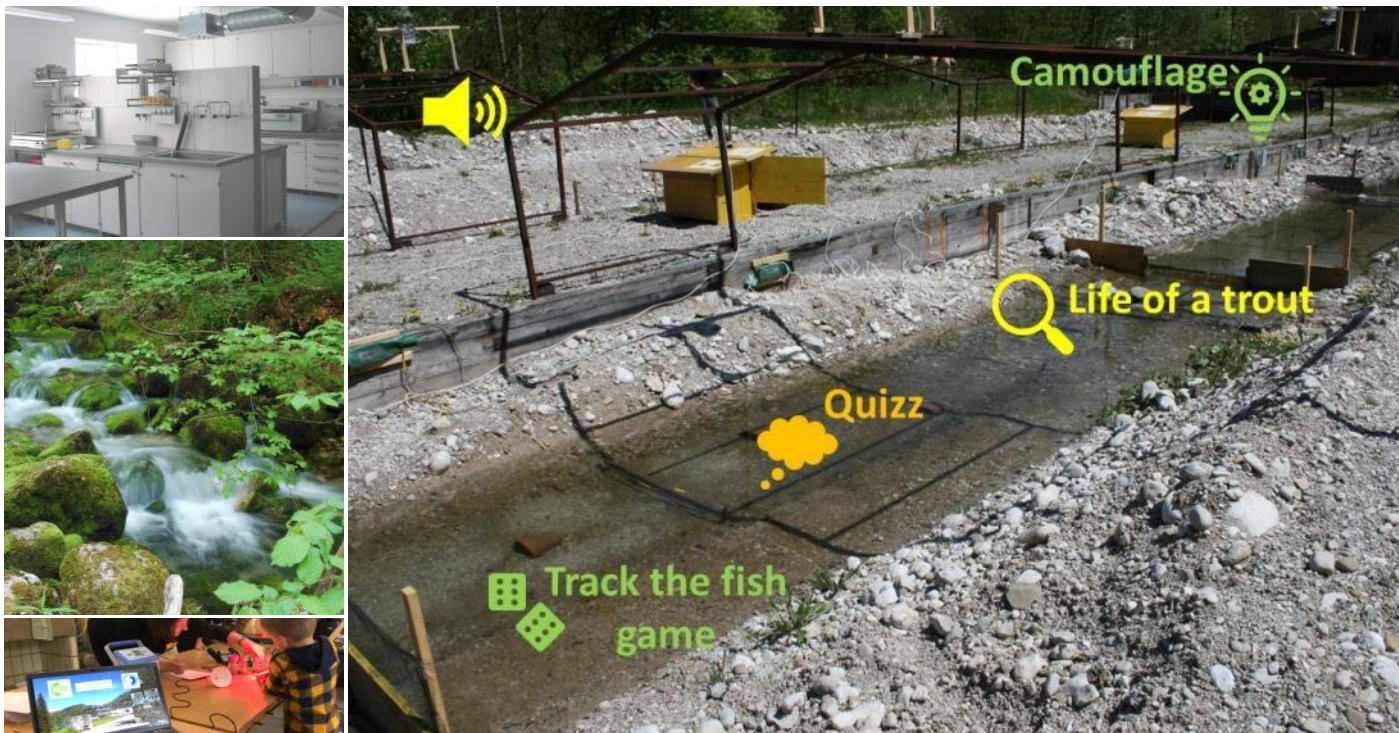
In collaboration with the University of Natural Resources and Life Sciences (BOKU, Vienna), members of the SciFish group have just launched a new study investigating fish behavior and ecology as part of the 4FatQs project. This study uses radio telemetry to locate preferred habitats and track fish movements. Researchers tagged 60 adult trout in the River Ois with electronic transmitters (fish size ranged from 200g to 880g). They will monitor the movements of the fish weekly for the next 8 months, until June/July 2025. The study's findings will enhance our understanding of how native brown trout and non-native rainbow trout use different habitats during and outside their spawning season, as well as improve our knowledge of how climate change may impact interactions between native and non-native species.

This study represents the final work package of the 4FatQs project, which is funded by FWF and aims to investigate the importance of omega-3 fatty acids for brain development and cognition in

fish. We will use habitat preference and migration behavior data from the telemetry study and combine it with information on diet, sex, and brain quality of individual fish. We already have data on the sex of our tagged individuals, and we will estimate their diet quality from a small fin sample that we have collected during tagging using stable isotope analysis.

However, for obvious reasons, we could not extract brain from the fish before conducting the telemetry study. Thus, our main challenge in early summer next year will be to try to retrieve our tagged individuals by tracking their telemetry signals in the stream and catching them using targeted electrofishing.

Experience shows that this method enables us to retrieve 50 to 80% of the tagged fish, which would provide a unique dataset linking wild behavior with diet quality and neurophysiological traits. So, please keep your fingers crossed and wish us good luck on the hunt! 🍀



Speak Fish!

Gabriele Weigelhofer | FLUVICHEM

BrainFood is a new project of WasserCluster Lunz (WCL) in the field of science communication.

Funding: FWF (Austrian Science Fund)

Partner of WCL:

-BOKU: University of Natural Resources and Life Sciences, Vienna)


-Haus der Wildnis, Lunz

Does poor food quality affect intelligence? The research project *4FatQs* investigates how the decrease in food quality caused by climate change affects fish health, fitness, and cognitive performance. To communicate the results of this work to the public and make it accessible to a wide audience, we use modern forms of scientific communication to explain which scientific methods and approaches are applied to study this urgent ecological issue and its societal implications:

With our new FWF project *BrainFood*, we will develop a digital semi-immersive learning environment that uses 360° images to show different research settings: a laboratory, our outdoor experimentation facilities in Lunz, and the natural aquatic environment.

Each area offers platform visitors interesting content for exploration and discovery – short explanatory videos, animations, and texts are complemented by quizzes and interactive games. In this engaging way, a deeper insight into our research work can be gained – for example, knowledge about the monitoring technologies used to track fish.

When developing the learning environment, it is important that end users are involved from the very beginning to optimize the structure, clarity, and appeal of the platform. Starting in autumn/winter 2025, we will showcase a prototype of the learning environment for testing at the "Haus der Wildnis" in Lunz am See, a long-standing partner of the WCL. The final version will be accessible through touchscreens and VR headsets as part of school projects, at research festivals, and activities at "Haus der Wildnis." Additionally, the information will also be available online via QR codes, accessible on various devices such as tablets, smartphones, and laptops.

We hope that *BrainFood*, through its interactive scientific experience, will enhance understanding of how high-quality ecological research is conducted and emphasize its importance to society. The project is a collaboration between Libor Závorka (WCL), Gabriele Weigelhofer (BOKU, WCL), and Andreas Zitek (BOKU). 



The Yellow Suitcase Chronicles: Tracking Greenhouse Gases Across Europe

Los Gatos | CARBOCROBE

Restore4Cs, a project led by the University of Aveiro (Portugal) with the participation of CARBOCROBE, focuses on management and restoration measures to preserve and enhance the ability of European wetlands to mitigate and adapt to climate change. The project emphasizes coastal wetlands and provides innovative tools and methods for decision-making, as well as for planning and implementing restoration actions.

Funding: EU



If you've ever wondered what it's like to be an ultraportable gas analyser travelling across Europe, let me, Los Gatos, tell you: it's a mix of science, adventure, and a lot of mud. Over the past year, I've journeyed across Europe measuring greenhouse gases—slogging through thick wetland mud. Benjamin Misteli, my PostDoc human, carried me through every bit—though I did get lost twice at airports when he ran ahead to catch his next plane.

For a year, through all seasons, we journeyed between Lunz, Portugal, Spain, France, Romania, Lithuania and the Netherlands. Each morning, Benj pulled on his leaky waders, and off we went—sometimes, we waded through mud so deep only the upper half of our colleagues was visible. For a suitcase, that kind of mud is no joke! Other times, we trekked across bone-dry wetlands. Turns out, not all wetlands are wet!

My job, though, was always clear: measuring gas exchange, no matter the conditions. With my chic yellow exterior and high-tech internals, I looked like some

thing out of a sci-fi movie. Benj carried me around, and I felt the curious stares—not just from people. Flamingos watched us in the Camargue, pelicans soared over the Danube, and a moose peeked from the shoreline in the Curonian Lagoon. It felt like I was the star of my own nature documentary.

Being an ultraportable gas analyser has challenges, but I wasn't alone. I was supported by an incredible team of experts and local guides who helped me to measure CO₂ and CH₄ fluxes. Together, our work aimed to quantify how wetland restoration affects greenhouse gas emissions and enhances carbon storage, ultimately highlighting the potential for climate mitigation.

After a year of adventures with Benj, I'm proud of the data I've collected for the RESTORE4Cs project. I hope my fellow travellers can turn these numbers into insights that make a difference. And who knows, perhaps one day I will even solve the greatest mystery of all: what's the soup of the day? ☐

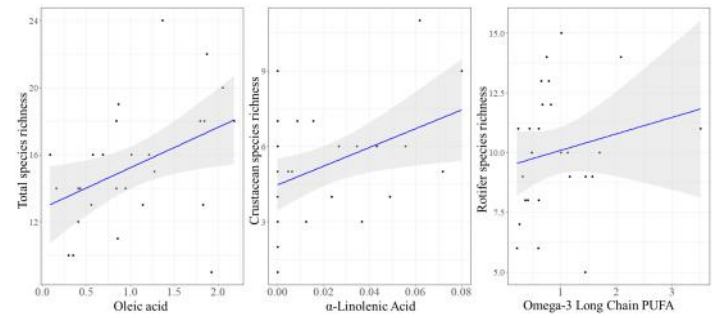
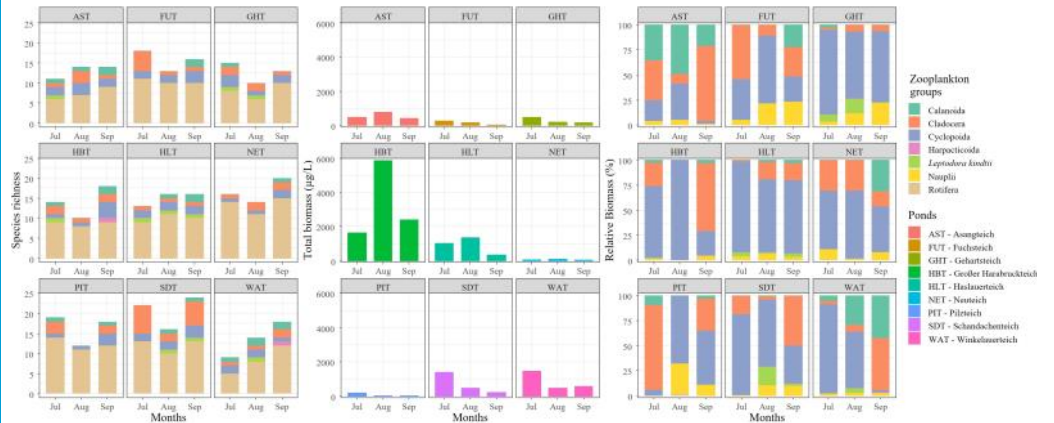


Fig. 1 top right: Relationships between phytoplankton PUFA and species richness of zooplankton.

Fig. 2 right: Species richness, total biomass, and relative biomass of zooplankton groups in the studied ponds.



TeichFit: Investigating pond landscapes of the Waldviertel

Cihelio Amorim & Martin Kainz | LIPTOX

The research project *TeichFit* aims at investigating food webs, their biodiversity and nutritional composition of fishponds in the Lower Austrian district of Gmünd to eventually support sustainable fish production and to provide healthy fish for human health. We focus on understanding how biodiversity of phyto- and zooplankton impacts the food quality and availability of polyunsaturated fatty acids (PUFA) for higher trophic levels, including humans.

In freshwater ecosystems, PUFA produced by phytoplankton play a crucial role in food webs, they provide dietary energy and essential nutrients for zooplankton, fish, and eventually humans. They are particularly important for cell regulation, membrane permeability, somatic growth and reproduction. When consumed by zooplankton, PUFA become bioavailable for other trophic levels, such as fish, which can be eaten by humans, and improve brain function and cardiovascular health.

We hypothesize that higher biodiversity of primary producers (phytoplankton) at the base of the food web enhances the dietary supply of essential lipids in mostly fishponds and promotes a more efficient energy transfer to fish and humans. We are quantifying several biodiversity and community structure metrics for both phyto- and zooplankton. Preliminary results indicate a positive correlation between oleic acid of phytoplankton and total species richness of zooplankton, between α -linolenic acid and crustacean species richness, and between omega-3 long-chain PUFA and rotifer species richness (Fig. 1). Data of summer 2024 show that the fishpond *Großer Harabruckteich*, ‘the’ pond in the center of the city Gmünd, had the highest biomass, mostly consisting of cyclopoids and *Daphnia* species, while the remote pond *Schandachteich* had higher species richness (Fig. 2). Results of this project will continue to improve pond management and inform the general public and school kids about the food quality in ponds. ☐

The Waldviertel pond landscapes are a globally unique model region for sustainability, climate-friendly habitats and health.

Project: **TeichFit**

Funding: FWF (Austrian Science Fund)

Partner of WCL:
 -BOKU (University of Natural Resources and Life Sciences, Vienna)
 -Secondary school for music and ecology Gmünd





Das Projekt **SCIBORG** is being developed with Share Education (RO) and Dracon Rules Design Studio (GR).

Project leader:
 Laura Coulson,
 (FLUVICHEM)

Funding: ERASMUS, OEAD
 (Agency for Education and Internationalisation)

SCIBORG: The science literacy board game

The *SCIBORG* project is fostering science literacy with a new board game designed to engage youth in learning how science works. Recognizing that civic science literacy—understanding how scientific knowledge is generated—is vital for navigating today’s world, *SCIBORG* makes learning fun and accessible.

Created with partners across Europe, the game uses examples from different fields of research to guide players through the scientific method, teaching skills transferable across disciplines. The first playtest was recently held in Greece, and the final game will launch next spring. Stay tuned!



New PhD Candidate: Charlotte Doebke

In August 2024, we were pleased to welcome a new member to our team: PhD candidate Charlotte Doebke joined the CARBOCROBE group at WasserCluster Lunz. Following the completion of her bachelor’s degree in Göttingen, she pursued her academic development at the University of Vienna, where she obtained a master’s degree in environmental sciences. A subsequent internship at the Institute of Marine Sciences in Barcelona further reinforced her aspiration to embark on a career as a researcher in aquatic microbial ecology.

Under the supervision of Katrin Attermeyer, her PhD research focuses on methane emissions resulting from bubble formation and release in streams, as well as the underlying microbial processes within stream sediments.

Her passion for nature extends beyond her fieldwork in flowing waters, making Lunz am See an ideal setting for both her research and personal interests. Over the next few years, it will serve as the center of her academic and professional endeavors.





Team Up – Clean Up!

Setting out for a shoreline cleanup, a motivated WasserCluster team, equipped with waders and snorkeling gear, collected bagfuls of trash from the shoreline near the two institute buildings at Lake Lunz.

The idea, quite literally, surfaced for two lab technicians during one of their regular sampling



sessions for long-term monitoring. It was met with enthusiastic support, organized by the coordinators of the sustainability initiative, and brought to fruition by many helping hands. The event also provided a perfect opportunity to combine the cleanup effort with a summer barbecue. The collection, some of it decades old, ranged from hefty metal barrels to transparent fishing lines, with curiosities such as an old motorcycle tank, gardening tools, and dishware among the finds.

Open Day 2024



Every two years, WasserCluster Lunz opens its doors to give interested visitors a glimpse into the latest developments in the institute's research work.

This time, the event kicked off on Friday, August 23rd, with a public lecture series presented by the research groups, followed by a discussion session and guided lab tours. Key topics included current questions about the impacts of climate change and heat stress on aquatic eco-

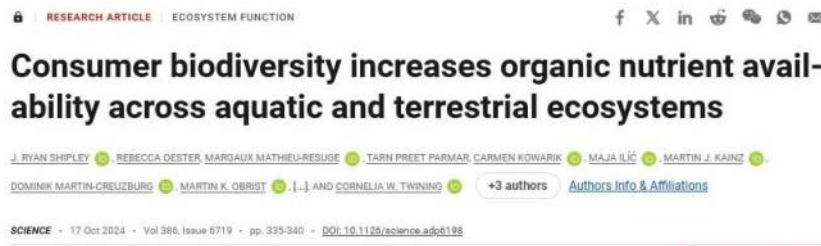
systems, as well as the biomass dynamics in Lake Lunz. The latter was explored in an engaging way using the mascot of the "Find Lunzi" theme trail as a thought-provoking example.

The following Saturday featured an exciting family program with interactive activity stations, guided tours, and plenty of background information about the experimental facilities, historical events, regional connections, and international scientific collaborations. Again, the program's primary focus was to make scientific questions and methods accessible to a broad audience. Highlights included exploring how understanding water chemistry helps unravel complex processes, examining whether aquatic systems "breathe," discovering the organisms living in streams, and uncovering the science behind surface tension.

If you are interested in learning about the interrelationships in nature from experts, there are regular offers at the Lunz Haus der Wildnis, where you can book exciting group offers in the W3 laboratory in cooperation with WasserCluster Lunz:

<https://www.wildnisgebiet.at/haus-der-wildnis-gruppenaktivitaten/workshops-im-w3-labor>





With the co-authorship of Margaux Mathieu-Resuge and Martin Kainz, a publication was featured for the first time with an affiliation to WasserCluster Lunz in the renowned journal *Science* (386th issue, October 18th, 2024):

J. Ryan Shipley, Rebecca Oester, Margaux Mathieu-Resuge, et. al.: Consumer biodiversity increases organic nutrient availability across aquatic and terrestrial ecosystems. [doi: 10.1126/science.adp6198](https://doi.org/10.1126/science.adp6198)

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The Association of Austrian Limnologists (SIL Austria) held its annual meeting, titled “Freshwater Ecosystems in a Changing World,” in Salzburg from October 2 to 4. The conference provided a comprehensive platform for professional exchange through lectures and poster presentations.

The best poster presentation was honored with a prize, which was awarded to Mourine Yegon. She is a doctoral student at WasserCluster Lunz, affiliated with the University of Natural Resources and Life Sciences in Vienna (BOKU). Her research focuses on the relationships between biodiversity and ecosystem functionality in the decomposition of leaf litter in streams.

(Pictured at the award ceremony with Alexandra Pitt).



The practical transfer of knowledge through cooperation with local schools is an important concern of WasserCluster Lunz. The entire team is always happy to celebrate special successes with the trainees, such as the excellent graduation of two talented young people from the region last summer:

As students of the HBLFA Francisco Josephinum Wieselburg, Johannes Kühberger (left), and Johannes Spieler (right) completed an internship of several weeks at the WCL last year, during which they received significant guidance and support from our technical assistant Samuel Karl Kämmer (center). For their diploma thesis "Fatty acid extraction from environmental samples in the context of long-term research at Lake Lunz", which resulted from this collaboration, the two received an award from the Board of Trustees of the Francisco Josephinum in Wieselburg. Congratulations and all the best for the future!



The next WCL-Newsletter will be published in June 2025.