Photo: Solvin Zankl

Inland waters

Inland waters host a fascinating diversity of life – from fish, amphibians and aquatic plants to small invertebrates, tiny algae, fungi, bacteria and Archaea. However, this biodiversity is declining rapidly, at an even faster rate in freshwater environments than in terrestrial or marine ones. Yet it is indispensable for resilient ecosystems and all the services that inland waters provide to our societies, such as clean drinking water, food resources, leisure and recreational areas.

Intensive land and water use, regulation, pollution, invasive species and climate change are particularly damaging to water bodies, their biodiversity and their functions. However, it is difficult to predict exactly how rivers, lakes and small water bodies will respond to these stressors, as they are particularly dynamic ecosystems. Complex biological, chemical and physical processes interact here – often in a non-linear manner and across different spatial and temporal scales. Disturbances such as drought, warming or excessive nutrient inputs can even suddenly and fundamentally change the status of a water body.

This makes gaining a better understanding of freshwater systems all the more important for us. This is the focus of our research.

Institute

We view the guiding principle "Research for the future of our freshwaters" as our mission. At IGB, our research focuses on the structure and functioning of inland waters, with a particular emphasis on their biodiversity, ecosystem services, and responses to global change. Our aim is to contribute significantly to improving our understanding of these ecosystems and to achieving sustainable water and water body management.

Interdisciplinary programme areas

Biodiversity in a Changing World
How life in inland waters responds to diverse challenges

Ecosystem Services for a Sustainable Future
Balancing the protection and use of freshwater systems and resources

Dimensions of Complexity of Aquatic Systems
Revealing patterns and dynamics in freshwater systems and biota

Predictive Ecology in the Anthropocene
Understanding and predicting the responses of freshwater systems to global change

Disciplinary research departments

1. Ecohydrology and Biogeochemistry
2. Community and Ecosystem Ecology
3. Plankton and Microbial Ecology
4. Fish Biology, Fisheries and Aquaculture
5. Evolutionary and Integrative Ecology

Competence and technology platforms

- Chemistry and Isotope Labs
- Fish Facilities
- Research Data Management
- Long-term Monitoring
- Molecular Genetics and Genomics
- LakeLab

Figures

Locations

3 in **Berlin** and **Brandenburg**,
2 of which are **lakeside**

Finances

€24.3 **million** total budget,

33% **external funding**

Institute members

389 **people** from
56 **nations**

of which are
244 **employees**
and
145 **guests, including scholarship holders**

Origin of institute members

North America: 16
Germany: 230
Europe (excluding Germany): 64
Asia: 51
South America: 14
Africa: 8
Australia and Oceania: 6

Professorships

7 **joint professorships** and
2 **honorary professorships** with
5 **universities**

Teaching

35 **teaching staff,** including
6 **Chamber of Commerce and Industry instructors**

Publications

398 **per year,**
75% of which are **open access**

As of 31 December 2025

Research for the future of our freshwaters

2026

IGB
Leibniz Institute of Freshwater Ecology and Inland Fisheries

FRESHWATER NEWS

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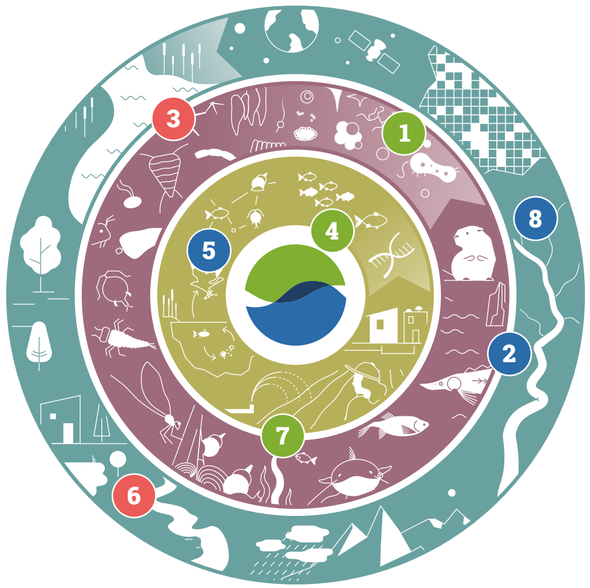
Freshwater environments are diverse. Consequently, the research conducted at IGB is also wide-ranging.

We take a holistic approach to **freshwater systems,** investigating **ecological interactions** at various temporal-spatial scales.

We explore various aspects, ranging from **genes** and **behaviour** to **populations, communities** and **complex socio-ecological systems.** We study **organisms** of all sizes, from **microorganisms** and **plankton** to **insects** and **vertebrates.**

In terms of space, our work spans **local, national** and **global scales.**



Organisational scale
from genes to socio-ecological systems

Organisms
from bacteria and archaea to vertebrates

Spatial scale
from local to global

1

The microbiome of urban waters: invisible but crucial

How does the quality of water from different sources affect the microbial communities in small water bodies in Berlin? Researchers at IGB discovered that urban watercourses such as the Panke and the Erpe, which carry almost exclusively treated effluent in summer, predominantly contain bacteria that indicate a strong anthropogenic influence. Using stable isotopes and environmental DNA, the team clearly demonstrated for the first time the extent to which treated wastewater, temperature and nutrients shape the microbial diversity of a water body, and how this influences its ecological status, water quality and biodiversity. Therefore, structural measures aimed purely at the ecological restoration of a water body may have limited effectiveness if the origin of water and its microbiome are not considered. At the same time, the study highlights the potential of urban water bodies as nature-based solutions for climate adaptation, water retention, and improving the quality of life in cities. For sustainable urban development, this means that successful revitalisation efforts must start at the source.

"In particular, smaller water bodies in Berlin are facing the consequences of reduced water quality and quantity.

Dr Maria Magdalena Warter, who conducted the study, is interested in supporting the development of water-conscious cities of the future. Since 2026, she has been leading the junior research group "Ecohydrological processes in urban ecosystems" at IGB, which is funded by the Kurt Eberhard Bode Foundation.

2

Blind spot in species protection: migratory freshwater fish fall through the cracks of the CMS

Many migratory freshwater fish cross national borders, so they rely on internationally coordinated protection. However, of the over 1,100 species listed under the Convention on the Conservation of Migratory Species of Wild Animals (CMS), only 23 are freshwater fish. Researchers from the Chinese Academy of Sciences, IGB and the University of Nevada have analysed this imbalance. A lack of basic data, gaps in research on the lifecycles of many species and low participation from countries with transboundary river basins mean that freshwater fish are a "blind spot" in the convention. This is a cause for concern, given that global populations of migratory freshwater fish have declined by an average of 81 per cent since 1970. The researchers therefore recommend including significantly more species in the CMS appendices. Furthermore, they recommend strengthening international cooperation in river basins with a particularly high diversity of migratory freshwater fish, such as the Mekong and Amazon basins.

"Many freshwater species are under immense pressure. Protecting and successfully reintroducing migratory and larger species in particular will help revitalise aquatic systems and support the diversity of numerous other animals.

Professor Sonja Jähnig thinks big: she conducts research on freshwater megafauna, which includes sturgeons, river dolphins and crocodiles. And she is committed to ensuring that these "giants" are preserved or can return to their native waters. In 2025, the Professor of Aquatic Ecogeography was appointed interim director of IGB.

3

No calm after the storm: climate change is threatening clear-water lakes

At IGB's LakeLab in Lake Stechlin, researchers have investigated the impact of extreme summer storm events on the ecology of deep, clear lakes. These lakes are particularly important for biodiversity. The researchers simulated the effects of a storm that mixes the upper, nutrient-poor layer of water with the deeper, colder, nutrient-rich layer below. This brought not only nutrients, but also phytoplankton, to the surface. As the phytoplankton found optimal light and nutrient conditions there, cyanobacteria began to proliferate, a process that lasted for several weeks. Filamentous cyanobacteria in particular dominated, while other microorganisms were consumed or sank. This experiment was the first to demonstrate under controlled conditions how physical storm events can trigger a cascade of biological and chemical responses with significant impacts on biodiversity and the function of lakes as carbon sinks.

"The LakeLab offers unique conditions: since all the mesocosms have basically identical environmental conditions, we can carry out several repetitions and control experiments with and without mixing.

Professor Hans-Peter Grossart, the lead author of the study, conducts research not only at Stechlin. The scientist is also fascinated by microorganisms in the Arctic, Antarctic and marine ecosystems. He is one of the few experts worldwide who study aquatic fungi in such a variety of ecosystems.

4

Owls and larks among fish: when internal clocks determine the daily rhythm

Whether or not fish "sleep" in the human sense is a matter of scientific debate. What can be determined beyond doubt, however, are periods of rest and increased swimming activity. An international research team, including IGB, analysed high-resolution telemetry and biologging data from 34 species of marine and freshwater fish. The researchers were able to identify chronotypes, i.e. systematic, individual activity patterns within a fish species, in at least 17 species. These are comparable to morning and evening types in humans. These differences were particularly pronounced in trout, but carp and zander also exhibited chronotypes. This large-scale meta-analysis provides evidence that chronotypes in fish can influence ecological processes in water bodies as well as anglers' success.

"The detection of chronotypes in fish depends on methodological precision: only high-resolution telemetry and biologging data make it possible to identify transitions between rest and activity phases in the natural habitat.

Professor Robert Arlinghaus, who was involved in the study, deals with various aspects of recreational fishing. Being named the 2025 National Champion of the renowned Frontiers Planet Prize is testament to his commitment to combining science with sustainability.

5

The Panama Canal as an invasion corridor: How marine predators are altering a freshwater ecosystem

Every year, 14,000 ships pass through the Panama Canal. However, it also serves as a potential passageway for invasive fish species to travel between the oceans. Researchers from IGB, Freie Universität Berlin, the Smithsonian Tropical Research Institute in Panama, and Harvard University in the US compared the fish communities of Lake Gatún in the Panama Canal waterway before and after the canal's expansion in 2016. They found that significantly more marine fish species, particularly large predatory fish, have been entering the freshwater lake since the extensive structural changes to the canal's lock system. These now account for 76 per cent of the fish biomass. This has altered the lake's food web, which has a substantial impact on local fisheries. Furthermore, there is an increasing risk that some species will pass through the canal and establish themselves in the other ocean. This study serves as an example of how technical infrastructure can facilitate biological invasions and contribute to the risk assessment of global waterways.

"The Panama Canal has the potential to connect the marine biota of the Atlantic and Pacific Oceans, which have been separated for three million years. Before the canal was expanded, this risk was relatively low.

Dr Gustavo Adolfo Castellanos-Galindo is the lead author of the study and conducted his research as a postdoctoral fellow at IGB, Freie Universität Berlin and the Smithsonian Tropical Research Institute in Panama. The Colombian is now programme area manager for coastal resources at the Leibniz Centre for Tropical Marine Research (ZMT) and affiliated with IGB as a guest scientist.

6

Water in war: the long-lasting consequences of a destroyed dam

The destruction of the Kakhovka Dam in Ukraine has demonstrated how water infrastructure is used as a weapon in armed conflicts. More than 16 cubic kilometres of water flowed into the Dnipro estuary, flooding large areas, destroying infrastructure, and spreading pollutants downstream into the Black Sea. Researchers led by IGB quantified around 83,300 tonnes of heavy metals in the exposed sediments of the reservoir, posing a long-term environmental hazard. At the same time, however, they also observed nature's remarkable capacity for self-healing. Within the former reservoir, the river quickly returned to its historical course, with 18 per cent of the former reservoir bed covered in vegetation just three months later. The researchers estimate that, within five years, floodplain vegetation could develop that is 80 per cent equivalent to that of an undammed ecosystem. This study provides a methodological framework that combines field observations, remote sensing and modelling. This framework can support risk assessments of ageing dams and the ecologically sensitive revitalisation of river systems.

"If more dams are attacked, this could have catastrophic consequences for people and the environment. The protection of water infrastructure in areas affected by military activity should be a priority of international law.

Dr Oleksandra Shumilova comes from Ukraine and has been conducting research at IGB since 2019. In 2025, the postdoctoral researcher was awarded the Caroline von Humboldt Prize by Humboldt-Universität zu Berlin for her scientific achievements.

7

Exploring river communities with all the senses: when art and research open up new perspectives

Rivers are many things at once: habitats, places of remembrance, boundaries and "common ground". In the transdisciplinary projects ODER HIVE and PEACES SO FAR, researchers from IGB are exploring the diverse relationships that shape the connection between humans and rivers, in collaboration with the artist collective FrauVonDa//. In the specially developed concert-discussion format senSONICtalk®, scientific findings are transformed into sensations and discussed directly with the audience. Sound installations, performances and dialogic formats taking place on both sides of the Oder River exemplify how art and research can jointly create new narratives, make complex environmental issues emotionally accessible, and stimulate reflection on rivers, environmental disasters, borders and the long-term consequences of human action.

"To me, art is a mediator between science and society. It can translate things into a more accessible language. At the same time, we inspire one another: collaborating with the scientists at IGB has sharpened the focus of our artistic research and prompted new questions. The real benefit, though, is that through our collaboration, people have developed a sense of connection to the Oder and its ecosystem, even if they have never visited the river.

Claudia van Hasselt and **Nicolas Wiese** lead FrauVonDa//, an intermedia ensemble for new music. Their projects explore the unheard and unseen, create multisensory experiences and actively invite the audience into a networked community.

8

Strengthening Germany's rivers: researchers recommend more river revitalisation to federal policymakers

Germany's rivers and floodplains provide valuable habitats, drinking water, food resources, flood protection, pollution retention and recreational areas for people. However, only eight per cent of German watercourses currently meet the required good ecological status. In a Policy Brief, researchers from IGB recommend giving greater priority to river revitalisation, allocating the necessary resources, and making the relevant approval processes more efficient. Multifunctional approaches can reconcile conflicting objectives and interests, while misguided incentives, such as subsidies for inefficient, ecologically harmful small-scale hydropower plants, should be abolished. Political initiatives such as the Natural Climate Protection Action Programme (ANK) and legislation such as the EU Nature Restoration Regulation (NRR) offer opportunities to implement these measures ambitiously.

"For two decades, there has been a significant practical shortfall in the implementation of improvement measures. Above all, there is a lack of money, personnel and available land.

Dr Jörn Gessner is an optimist: for a quarter of a century, he has been working to reintroduce the European and Baltic sturgeons to Germany. He does not hesitate to tackle the challenges and conflicting objectives associated with his work on rivers.