



Leibniz-Institute of  
Freshwater Ecology  
and Inland Fisheries

# Annual Report

# 2015



Research  
for the Future  
of our Freshwaters



## Research for the Future of our Freshwaters

What drives us? A curiosity to understand all fundamental processes occurring in water bodies and the objective of deriving answers to important societal issues from this knowledge. To achieve this, we bring together the best minds from various research disciplines. At IGB, scientists from all over the world investigate how changing environmental conditions affect lakes, rivers and wetlands, and how ecosystems can be utilised sustainably and restored efficiently. They collect global data on the biodiversity of aquatic habitats, and make it publicly accessible. They focus on the re-establishment of species and on fish stocking, and develop the technologies required to operate resource-conserving aquaculture. Social stakeholders are involved in the wide range of research activities, which are carried out both locally and throughout the world in close cooperation with universities and research institutions. – All this makes us Germany's largest research centre for freshwaters.

Let us take you on a journey with us into the world of water – turn the page to discover a selection of our research results, projects and events from 2015. We hope you will enjoy reading our Annual Report and embarking on a path of discovery!

Your IGB Team



# The best of all possible worlds



I am delighted to present the IGB Annual Report 2015, giving you an impression of the latest developments and successes achieved at IGB.

Gottfried Wilhelm Leibniz once described our earth (in Leibniz's words, a world created by God) as nothing less than the best of all possible worlds. Even in those days, there were voices of warning and criticism of such optimism that put trust in man's and the world's inherent goodness. In fact, we are shaping our world in such an unsustainable manner that we are already faced with enormous societal and environmental challenges, which will be even more challenging in the future. Do we, then, live in the best of all possible worlds or do we primarily live at the expense of future generations' best worlds? In order to mark the 300<sup>th</sup> anniversary of the death of the philosopher and universal scholar Gottfried Wilhelm Leibniz, the Leibniz Association is hosting a great theme year in 2016 with the intention of bringing science and society closer together.

Independent science is as indispensable to society as freedom of the press and open access to data and information. The ability to conduct fully independent research is a valuable privilege for any research institute. However, at the same time, science must also confront society with topics that may be awkward or may simply have been overlooked. And, yes, we must even bring up "painful topics" to raise awareness of challenges that have not yet become subject of public debate. And more than ever before, we need evidence-based knowledge to meet the grand societal challenges in order to leave the "best of all possible worlds" to future generations.

One of the grand challenges we undoubtedly face is climate change. The impacts of climate change cannot be overlooked – especially in Germany. Scientists at IGB contributed to the latest IPCC report by providing data on the long-term development of freshwaters. This data play a very prominent role in the report because few time series available documenting the ecological consequences of climate and environmental change during the past. In 2015, we further enlarged our unique long-term research at IGB using in-house resources, which enabled us to include fishes and macrophytes in the unique monitoring programme. After all, our lakes and rivers represent early warning systems that react extremely quickly and severely to climate change.

And yet climate change is not the only challenge that society is facing. We are observing a concurrent erosion of biological diversity. The diversity of life includes information that has accumulated during several billion years of evolution. This unique information is lost forever every time a species or population disappears. As yet, we have no idea of the significance of a 10, 20 or even 50 per cent decline in diversity for our long-term welfare.

In this respect, freshwaters are among the most species-rich ecosystems in the world – comparable to tropical rainforests and coral reefs. In fact, freshwater ecosystems are experiencing a much greater decline in biodiversity than most other ecosystems. In order to set priorities in water and biodiversity management, we, at IGB, combine our competencies in biodiversity research and knowledge-based nature and environmental protection: we develop measures to ensure the long-term preservation of priority species (such as the European sturgeon), we provide forecasts on changes in diversity, and explore how multiple stressors may affect freshwaters and their diversity – as, for example, in the EU-funded MARS project and the BIBS project, funded by the German Federal Ministry of Education and Research, that is now being launched.

Measures intended to mitigate the rise in temperature often increase pressure on biodiversity. For instance, we are experiencing an incredible boom in the global expansion of hydropower – especially in areas of unique biodiversity and where social and policy processes are less pronounced than, say, in Europe. Since technologies and financial resources are mainly provided by industrial nations, they have the global responsibility for ensuring that hydropower is developed sustainably. It is not a matter of whether or not hydropower is desirable. It is a matter of taking evidence-based decisions on the location of dams and reservoirs and on the operation of these facilities. At IGB, researchers develop the sci-

*Independent science is indispensable to society. The ability to conduct fully independent research is a valuable privilege for any research institute. However, at the same time, science must also confront society with topics that may be awkward or may simply have been overlooked.*

entific basis for the sustainable use of hydropower. This work is increasingly being performed within international networks comprising scientists, NGOs and decision-makers.

In 2015, IGB underwent an interim audit by members of the Scientific Advisory Board. The results clearly emphasise that we have continuously made progress in recent years and have positioned ourselves very well in the international research arena. The auditors also acknowledged our major and continuous efforts to create an overall strategy for the entire institute in achieving consistency between freedom of research and social responsibility. It is a fundamental question of the role we, as scientists, actually play in society, and the role we should – and must – assume.

For this reason, I would like to thank all of our partners who support us along this path, particularly the universities that collaborate closely with us, the members of the Scientific Advisory Board, and our colleagues from the Leibniz Association and the Forschungsverbund Berlin. We are very grateful to the funding authorities, the competent Senate Administration in Berlin and the German Federal Ministry of Education and Research. Without this sound basic funding, IGB would be unable to develop its unique infrastructure, long-term research programme and innovative research to such a high level of quality, and to make a major contribution to resolving pressing social issues. Above all, I would like to sincerely thank all IGB employees, whose motivation and efforts are inarguably our institute's greatest asset.

I hope you will enjoy reading the IGB Annual Research Report 2015.

**Yours sincerely, Klement Tockner**





**innovative**

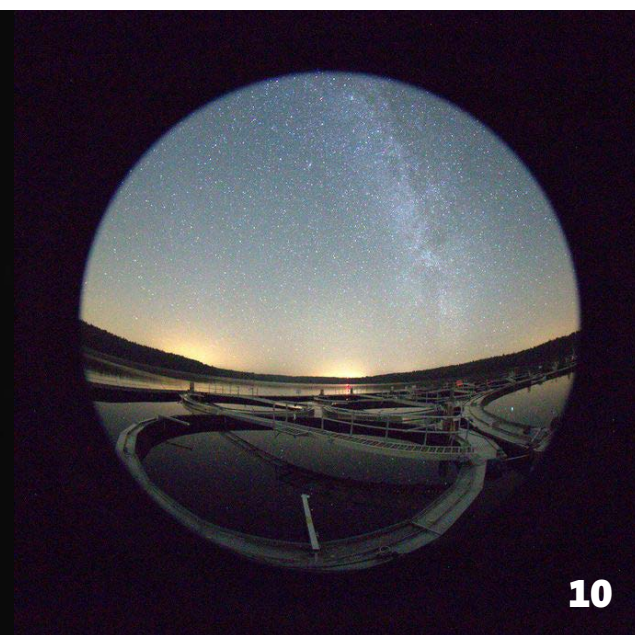
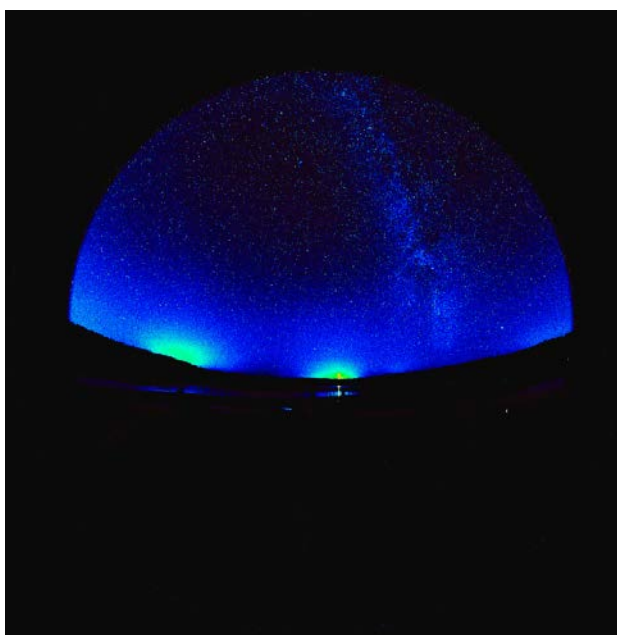
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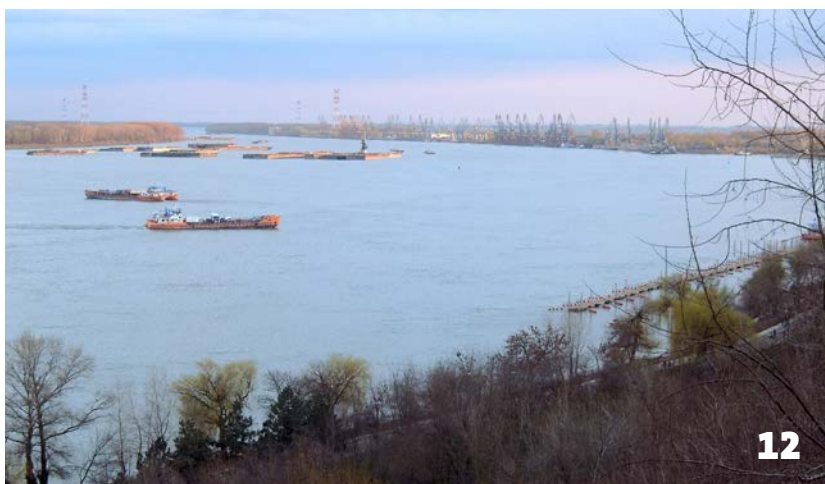
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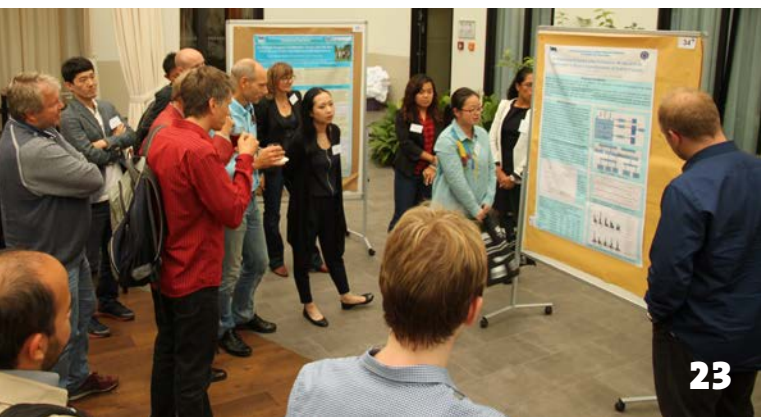


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# **innovative**

New Projects and Initiatives

# Putting Rivers and Floodplains to the Test

The 100-year floods of the Elbe and Danube in summer 2013 are recent indications that, in addition to often being densely built-up, river landscapes are also at greater risk of flooding as a result of climate change. Moreover, rivers and floodplains are supposed to constitute a network of habitats for many endangered species that have disappeared from the agricultural landscape. In the joint research project “River Ecosystem Service Index (RESI)”, which started in 2015, scientists are exploring the issue of how conflicts between different users can be mitigated in a comprehensible, sustainable manner.

River and floodplain management is planned and regulated by a variety of specialist agencies at different administrative levels. As a result, information about which fluvial and alluvial environments are best suited for which type of land use, or which land uses are complementary or produce negative interactions, is often disregarded when developing land use concepts.

The concept of ‘ecosystem services’ enables the services provided by ecosystems that contribute to human well-being to be systematically described. Conflicts between users can be anticipated before they arise, enabling optimised solutions to be developed. This makes it easier to plan flood control areas, recreation areas or protected areas for endangered species, for instance, and helps practitioners to manage river corridors.

“To achieve this, we are developing a River Ecosystem Service Index (RESI) as part of the project. This index will enable the ecosystem services provided by river corridors to be quantified in a cross-sectoral manner for the first time, and to be assessed and presented synoptically,” explained Dr. Martin Pusch. “For example, fluvial and alluvial environments man-



aged in such a way that they completely satisfy all societal objectives gain high RESI scores.” The index takes account of ecosystem services whose value can be expressed in euros as well as those for which no monetary value can be estimated at present.

Seven research institutions, four small and medium-sized enterprises (SME) and five practice partners are involved in the joint research project. Together, we are developing a framework concept to record all ecosystem services provided by rivers and floodplains. In this connection, five stretches of water in Germany serve as examples in order to undertake an interdisciplinary investigation of currently used and potential ecosystem services, as well as their positive and negative interactions. Single subprojects address topics such as matter transport, metabolism of matter, habitat provision, resource

*“We wish to better coordinate the management of rivers and their floodplains, which is why we are developing the first ever interdisciplinary data and assessment platform.”*

*Dr. Martin Pusch*

provision and cultural values. RESI is part of the “Regional Water Resources Management for Sustainable Protection of Waters in Germany (ReWaM)” funding measure of the German Federal Ministry of Education and Research (BMBF). This funding measure is included in the “Sustainable Water Management (NaWaM)” funding priority

within the “Research for Sustainable Development” (FONA3) framework programme. The BMBF provides €2.04 million in funding for the project.

**Project:** River Ecosystem Service Index (RESI) | **Duration:** 06/2015-05/2018 | **Funded by:** BMBF | **Executing agency:** Jülich (PtJ) | **Direction:** PD Dr. Martin Pusch, pusch@igb-berlin.de | **Coordination:** Simone Beichler, beichler@igb-berlin.de | **Involving:** Departments 1 and 2, Research Domain 3

[www.resi-project.info](http://www.resi-project.info)



*Floodplains of the River Spree in the Lower Spreewald during the summer flood of 2010.*



In October 2015, Marie Curie Fellows and project leaders met to participate in a joint training course in Leiden (Netherlands).

## The Successful Reintroduction of Migratory Fish Species

In the Marie Curie project IMPRESS, launched in 2015, we explore the current practice of stock enhancement and other measures involving eel, salmon and sturgeon. The aim of the project is to improve the effectivity of these measures. The IMPRESS network consists of 16 partners from the EU, Norway and Israel.

Migratory fish species are under severe threat in the wild. Some species, such as the sturgeon and the salmon, are now extinct in Germany; according to the International Union for Conservation of Nature (IUCN), the eel is threatened with extinction. To counter this development, there have been many attempts to reintroduce and support decimated or obliterated stocks by releasing juveniles produced in breeding programmes. Stocking efforts are flanked by measures to enhance habitats, provided that they are politically and financially feasible.



breeding, for which traditional methods have been modified: different 'training phases' should help prepare fish for release into the wild. Their release will then be evaluated using an experimental test. The aim of the project is to support fish using technically simple adaptations that are realistically feasible and effective in breeding. A further aim is to gain fundamental insights into the characterisation of fitness parameters and fitness tests.

In the second, socio-economic part of the IMPRESS project, we explore the level of awareness among the population in four countries (Germany, Norway, France and Sweden) as well as among selected stakeholders and organisations involved in stock restoration about the need to conserve fish species and how this is practiced; the level of acceptance for measures such as stocking or habitat conservation; and the extent to which the population is willing to pay for the conservation of salmon and sturgeon populations. Extensive, representative surveys are conducted accordingly. These surveys are complemented by qualitative investigations into case studies of current restoration measures in all four countries.

*"The project involves developing breeding technologies that enhance the fitness of fry and increase their post-release survival rates."*  
Dr. Sven Würtz

Today, fry are bred using methods adopted from food production, with a view to achieving rapid growth under controlled and often monotonic conditions. Fish are reared in a matter of months before being released into the wild; however, post-release fish are less fit, and have much lower survival rates than their wild counterparts. In hatcheries, juveniles are inadequately prepared for the challenges they face in the natural habitat (predators, living prey organisms and varying environmental conditions), severely impairing the success of their reintroduction.

For this reason, breeding technologies are to be adapted to make fish fitter, improving their post-release survival rates. The first subprogramme involves sturgeon and salmon

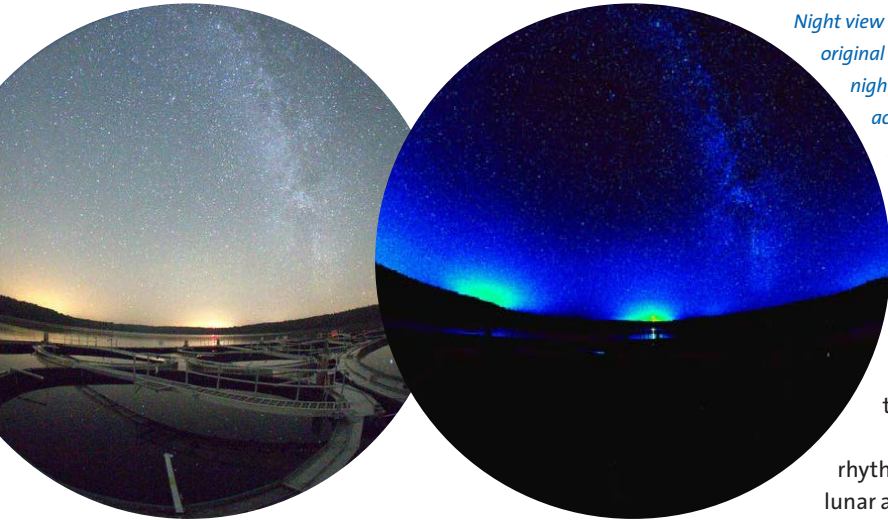
**Project:** Improved production strategies for endangered freshwater species (IMPRESS) | **Duration:** 01/2015-01/2019 | **Funded by:** EU Marie Skłodowska-Curie Actions ITN (H2020-MSCA-ITN) | **Direction:** Dr. Sven Würtz, wuertz@igb-berlin.de | **Involving:** Departments 4 (Sophia Kochalski, Professor Dr. Robert Arlinghaus, Dr. Jörn Geßner) and 5 (Bruno Reis, Dr. Sven Würtz)

[www.impress-itn.eu](http://www.impress-itn.eu)



# Brighter Night Sky, Darker Water:

## How Altered Light Conditions Affect Lake Ecosystems



Night view of the LakeLab in summer 2015, taken towards Rheinsberg. The original photo is shown on the left, a false-colour image showing the night sky brightness on the right. The Milky Way is visible as a band across the sky on the right side of the hemispheres, suggesting a low level of light pollution overall. Nevertheless, individual urban areas are visible as bright spots on the horizon even in this dark region.

Skyglow, the diffuse illumination of the night sky by artificial light, has never before been experienced during evolutionary history. Together with another feature of global change – the brownification of lakes caused by humic substances – skyglow disrupts the current light conditions in lake ecosystems. We will elucidate the ecological consequences of these phenomena and the mechanisms underlying them. This will be achieved by conducting large-scale experiments in IGB's LakeLab.

Since the introduction of the light bulb in the late 19<sup>th</sup> century, the spread of artificial light at night has dramatically increased worldwide. In recent decades, the global average light emission increased at a rate of three to six per cent a year, and sometimes by even 20 percent. This is much faster than growth rates of the global economy, the world population or greenhouse gas emissions.



*"We will experimentally change the levels of skyglow and brownification in the LakeLab to assess complex responses of lake ecosystems to skyglow and brownification. We expect that the new light conditions that affect the physiology and behaviour of key species will result in multiple indirect effects mediated by species interactions." Dr. Franz Hölker*

The resulting 'loss of the night' affects vast swathes of Europe and all other highly industrialised regions of the world.

Although the intensity of skyglow is low compared to that emitted by point sources of light such as street lamps, it covers huge areas. Therefore, the night sky affected by skyglow is hundreds of times brighter in many parts of the world than before artificial light was introduced. The consequences for aquatic ecosystems and biodiversity could be important but are poorly known at present.

In many lake ecosystems, skyglow coincides with the brownification of water caused by increased inputs of humic substances. This results in a dimming of aquatic ecosystems.

Brownification is likely to be caused mainly by increased leaching of soluble substances from soils, which can be caused, for example, by acidification and increased rainfall intensities expected in many parts of the world as a consequence of global warming and the associated intensification of the global water cycle.

In lakes, natural light is essential for triggering diel rhythms, as well as rhythms on other times scales, such as lunar and seasonal cycles. In deep lakes, one such rhythm is the diel vertical migration of zooplankton (including water fleas) and fish. Under natural conditions, water fleas reside in deep water layers during the day to avoid predation by visual predators. At night, they migrate towards the water surface to feed on algae. Skyglow can dramatically reduce this diel vertical migration, whereas brownification would have the opposite effect. However, the extent to which such behavioural changes of water fleas affect planktonic food web interactions and the productivity of freshwaters is completely unclear.

The project "Illuminating Lake Ecosystems" seeks to elucidate these phenomena. We will experimentally control the level of skyglow and brownification in the IGB LakeLab, a large experimental facility in Lake Stechlin, to assess complex responses of lake ecosystems

to these perturbations. We expect that the new light conditions affecting the physiology and behaviour of key species will result in multiple indirect effects mediated by species interactions. Consequently, the lake food web and biogeochemical

fluxes could be markedly altered. We expect our results to provide fundamentally new insights into lake ecosystems and at the same time important information for future lake management in the face of ongoing climate change and light pollution.

**Project:** ILES (SAW-2015-IGB-1) | **Duration:** 07/2015-06/2018 | **Funded by:** Leibniz Competition 2015 | **Direction:** Professor Dr. Mark Gessner, gessner@igb-berlin.de, PD Dr. Franz Hölker, hoelker@igb-berlin.de | **Involving:** Departments 1, 2, 3, 4 and 5, and Research Domains 1 and 3

[www.seelabor.de](http://www.seelabor.de)



# A Vision of the Future of Biodiversity in Fresh Waters

The large-scale collaborative research project “Bridging in Biodiversity Science” (BIBS) will be funded. That was the good news received at the end of the year 2015. IGB’s involvement focuses on investigations into aquatic-terrestrial coupling in both a large experimental facility in Lake Stechlin and numerous small water bodies that dot the landscape of north-eastern Germany. Results of the project are to enable forecasts of how biodiversity will develop in the future and, as the project title suggests, to bridge disciplines, scales and systems in biodiversity research.

After four years of intense preparatory work, the German Federal Ministry of Education and Research (BMBF) approved in December 2015 the funding of a major collaborative research project on biodiversity.

A total of €6 million will be made available within BMBF’s framework programme on Research for Sustainable Development (FONA). This is the first major project secured by the virtual “Berlin-Brandenburg



*“We combine traditional methods for assessing biodiversity with modern molecular approaches and ecological modelling. The findings of these studies will support future water management and provide the foundations for addressing consequences of land use on aquatic biodiversity in our cultural landscape.” Professor Dr. Mark Gessner*

Institute of Advanced Biodiversity Research” (BBIB), which, established in July 2013, unites universities and non-university research institutions in the Berlin-Brandenburg area to advance biodiversity science in a collaborative effort.

IGB assumes responsibility for field surveys and mesocosm experiments to explore the significance of coupled aquatic-terrestrial ecosystems for aquatic biodiversity. In cooperation with our partners in the Berlin-Brandenburg area, we intend to focus on aquatic biodiversity dynamics in multiple kettle holes, which are small water bodies of glacial origin that are embedded in the agricultural landscape of northeastern

Germany. These field studies will be complemented by mesocosm experiments in selected kettle holes and IGB’s LakeLab in Lake Stechlin.

The planned investigations focus on the impacts of land use and brownification by humic substances as a result of leaching from soils into aquatic ecosystems. A broad range of taxonomic groups will be recorded, from microorganisms to fishes. Functional aspects of biodiversity will also be considered, such as the importance of biodiversity for carbon and nutrient flow. Traditional methods of recording biodiversity will be combined with modern molecular approaches and complemented by theoretical and data-based modelling. Outcomes of the models are to enable projections of future developments of aquatic biodiversity. Overall, we expect the project to provide

a solid foundation for future water management and land use with repercussion for linkages between aquatic and terrestrial ecosystems. There are also plans to implement citizen science projects where enlisted citizens volunteer to collect

scientific data. All data generated in the project will be stored in a central database and made available to interested parties.

**Project:** Bridging in Biodiversity Science (BIBS) | **Duration:** 03/2016-02/2019 | **Funded by:** BMBF | **Direction:** Professor Dr. Klement Tockner, tockner@igb-berlin.de; Professor Dr. Mark Gessner, gessner@igb-berlin.de; Professor Dr. Hans-Peter Grossart, hgrossart@igb-berlin.de | **Involving:** Departments 1, 2, 3, 4 and 5, and Research Domains 1 and 3

[www.bbib.org/bridging-in-biodiversity-science.html](http://www.bbib.org/bridging-in-biodiversity-science.html)

# Ecosystem-Based Management of European Waters

Europe's aquatic ecosystems often provide endangered species with much-needed habitat; they also provide considerable economic and social benefits to humans. However, many of these valuable ecosystems are adversely affected by human activities and are at risk of sustaining permanent damage, e.g. due to pollution, poisoning and over-fishing. Within the recently initiated EU project AQUACROSS, IGB is involved in investigating how the management of Europe's waters can be improved despite the current variety of burdens.

In a bid to conserve European aquatic habitats, the European Union (EU) has adopted several directives, such as the Birds and Habitats Directives, the Water Framework Directive and the Marine Strategy Framework Directive. Based on these directives, EU countries have taken measures to ensure better protection of aquatic ecosystems and their biodiversity. Despite progress in some areas however, it has not been possible to stop, let alone reverse, the general disappearance of species diversity in European waters.



plication of the “ecosystem-based management” principle for all aquatic ecosystems, i.e. for freshwater, coastal and marine ecosystems. To achieve this, the research teams are developing and testing robust and cost-effective water protection measures, in particular integrated management approaches that also develop a sustainable socio-economic perspective.

Within this project, IGB leads the work package for forecasting biodiversity and ecosystem services and coordinates all activities related to freshwater ecosystems. For example, extensive data is currently being compiled on existing and newly planned hydroelectric plants in the Danube catchment area, which have seen considerable growth in this region. This data can be used to forecast future habitat availability and to compare alternative planning scenarios. In addition, scientists and technicians involved in the AQUACROSS project are undertaking work on the topics: “Drivers of Change and Pressures on Aquatic Ecosystems”, “Causalities between Biodiversity, Ecosystem Functions and Services” and “Ecosystem-Based Management Towards Policy Objectives”, as well as the project-specific Information Platform. This new platform will gather and consolidate available data and knowledge regarding all aquatic habitats into one joint web interface. Information from existing portals such as the “Freshwater Information Platform (FIP)” will also be integrated into this platform.

*“We would like to transcend the barriers between different policy objectives, concepts, knowledge, data and management approaches for aquatic ecosystems.”  
Dr. Sonja Jähnig*

In particular, as a result of the Water Framework Directive, numerous projects and studies in recent years focused on the “restoration of water bodies”. This has led to the generation of useful knowledge determining which restoration measures can be adopted in order to improve the ecological status. However, given the large number of policy objectives, concepts, data and management approaches, it is often difficult to develop practical management solutions that can be implemented across all policies. This is where the AQUACROSS (Knowledge, Assessment, and Management for AQUatic Biodiversity and Ecosystem Services aCROSS EU policies) project comes in. This project involves 17 European and international institutions, including IGB, and focuses on the further development and practical ap-

**Project:** AQUACROSS | **Duration:** 06/2015-11/2018 | **Funded by:** European Commission, DG Research & Innovation | **Coordination:** ecologic Berlin | **Direction at IGB:** Dr. Sonja Jähnig, sonja.jaehnic@igb-berlin.de | **Involving:** Department 2, and Research Domains 1 and 3

[www.aquacross.eu](http://www.aquacross.eu)



The Lower Danube plays an important role as a waterway and as a refuge for aquatic biodiversity.



# How Farmers can Adapt to Climate Change in Brandenburg

The number of heavy rainfall events and the length of dry spells are expected to increase in the Federal State of Brandenburg. We collaborate with regional stakeholders to explore the options for action within the BAUM project (Climate change and weather anomalies: Assessment of agri-environmental measures). The key objectives of the project are to improve our knowledge of the genesis of climate and weather anomalies and the impact they have on waters, and to promote a change in awareness in the region – after all, the issue of “adapting to climate change” is not accorded the respect it deserves by all stakeholders.

Heavy rainfall and dry periods are significant for the nutrient budget of freshwaters. Such weather anomalies, an element of global atmospheric events, could be exacerbated in Germany due to climate change. Farmers must respond to these developments, because the distribution and intensity of rainfall affect water and nutrient retention, and consequently productivity. However, they lack experience in distinguishing climate variability from climate change, and in responding accordingly.

The aim of the BAUM project, funded by the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety, is to initiate municipal concepts for climate change adaptation in two rural regions of Brandenburg. To achieve this, we use observation data to explore the genesis and dynamics of climate and weather anomalies in their spatio-temporal structure, and how they affect water balances and water quality. The actual situation is compared to climate and measure scenarios for the next decade. Using established models, we investigate the impact of the expected changes in meteorological parameters on the soil water balance and on nutrient inputs to waters. We assess the effectiveness of potential adaptation measures based on water and nutrient retention, and discuss the findings with regional stakeholders.

One of the key tasks is to develop and convey a detailed picture of regional climate change. In BAUM, we collaborate closely with a variety of stakeholders, including farmers and their representative organisations. We conduct surveys among experts, administrative bodies and farmers to determine their information requirements with regard to climate variability and change, soil degradation, and the selection and implementation of adaptation measures in rural areas. We therefore seek to bring about the practice-oriented portrayal and acceptance of the findings, and to help ensure that the issue of “adaptation to climate change” is actively addressed in the partner regions.

We use the MONERIS model, developed at IGB, to calculate current and future nutrient fluxes, as well as the SWIM model to assess the water balance in the Havel/Spree area. BAUM seeks to improve knowledge of the variability of nutrient inputs in freshwaters.

Andreas Gericke and Marisa Matranga are responsible for BAUM at IGB. The project partners are ASWEX from Berlin (data



*“We assess the effectiveness of potential adaptation measures based on water and nutrient retention, and discuss the findings with regional stakeholders.”*  
Dr. Andreas Gericke

analysis and climate scenarios), the Rural District of Havelland, Beeskow Town, the State Office of Environment, and the Leibniz Centre for Agricultural Landscape Research.

**Project:** Climate change and weather anomalies: Assessment of agri-environmental measures (BAUM) | **Duration:** 10/2015-03/2018 | **Funded by:** Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety | **Direction:** Dr. Andreas Gericke, gericke@igb-berlin.de | **Involving:** Department 1 and Research Domain 3

[www.baum.igb-berlin.de/index.php/BAUM\\_en.html](http://www.baum.igb-berlin.de/index.php/BAUM_en.html)



*Dr. Marisa Matranga and Dr. Andreas Gericke accompany a farmer on a tour within the enclosure areas at an agricultural holding in the vicinity of Beeskow (Rural District of Oder-Spree).*

# Ecological Novelty: Ecology in the Anthropocene

Ecological research has traditionally focused on pristine environments. Nowadays, however, ecosystems are increasingly influenced or even shaped by humans. The term ‘Anthropocene’ has been suggested for the current era, describing the dominating role that humans play today. In this era, it is increasingly important to explore humans and ecosystems in an integrated manner, rather than considering them in isolation from each other.

‘Ecological novelty’ is an umbrella term for unprecedented, human-mediated changes at different ecological levels, from organisms and populations to communities, ecosystems and landscapes. As such, this term combines different facets of ecology in the Anthropocene. Ecological subdisciplines such as urban ecology and invasion biology can be united under this umbrella term.

For this reason, ecological synthesis is also an important focus of the new *Ecological Novelty* research group led by



*“Very little is known about the long-term impacts of invasive species. Invasive and native species, and their behaviour, change over time, thus forecasting the dynamics and impacts of invasive species is a highly complex matter.”*

*Professor Dr. Jonathan Jeschke*

Jonathan Jeschke. This group, which was established at IGB and Freie Universität Berlin in late 2014, receives support from the German Research Foundation (DFG), particularly in the form of a Heisenberg Professorship. The group uses a novel method for research synthesis in order to analyse the hypotheses and concepts that exist in invasion biology and to compare them to empirical data. This work, for which Martin Enders is mainly responsible within the research group, is undertaken with numerous collaborators around the world. The ambitious goal is to make available the entire theory and empirical evidence in invasion biology, and later also in ecology as a whole, on one single internet portal.

Jonathan Jeschke and his team are intensely involved in research on invasive species and other novel organisms. The Marmorcrebs, or marbled crayfish (see photo), is a species that did not originally occur in the wild. Instead, it

emerged in the aquarium pet trade and was then released into various freshwaters in the wild, particularly in Germany and Europe. Since this species reproduces parthenogenetically, only a single individual is needed to establish a new population. Stefan Linzmaier investigates the impacts of marbled crayfish on communities and ecosystems.

In addition to exploring theoretical concepts about biological invasions, Wolf-Christian Saul investigates the introduction and impacts of invasive species – in Germany, Europe and worldwide. A project funded by the Federal Agency for Nature Conservation (BfN) in which he and Jonathan Jeschke are involved is described on [page 18](#).

Very little is known about the long-term impacts of invasive species. Invasive and native species, and their behaviour, change over time, thus forecasting the dynamics and impacts of invasive species is a highly complex matter. However, it is essential to make such forecasts if management decisions are to be taken. The DFG-funded research network InDyNet (Invasion Dynamics Network, led by Florian Ruland and Jonathan Jeschke) focuses on such questions ([page 23](#)).

*The Marmorcrebs, or marbled crayfish, is a novel organism that did not originally occur in the wild.*



[www.bcp.fu-berlin.de/biologie/arbeitsgruppen/zoologie/ag\\_jeschke](http://www.bcp.fu-berlin.de/biologie/arbeitsgruppen/zoologie/ag_jeschke)

# sought-after

Dialogue and Knowledge Transfer





*The provision of social and policy advice includes dialogue formats on topics relevant to society: at the 5<sup>th</sup> Müggelsee Dialogue on 20 November 2015, 38 decision-makers from authorities, politics, environmental associations and industry met to discuss the sulphate contamination of the River Spree with scientists (► page 17).*

## Working at the Interface: A New Exchange Concept for Science and Society

Rapid global environmental changes are among the greatest challenges faced by mankind. Water-based resources and ecosystems play a key role in this respect. “Research for the future of our freshwaters” is IGB’s mission. For this reason, one of IGB’s central tasks is to provide objective, evidence-based advice to social stakeholders from politics, authorities, associations, industry, education and the interested public. IGB is adopting an innovative approach to realign and intensify this research-based societal advice and the co-design of research issues.

In a globalised world, social issues and decision-making processes become increasingly complex. Objective scientific advice is needed more than ever before. And yet, to provide this, we must depart from our conventional paths: “Knowledge exchange and interaction with social stakeholders should not occur on a one-way street. We want to end old ways of thinking and to explore and establish new transdisciplinary forms of cooperation,” explained IGB Director, Klement Tockner.

To this end, IGB has developed a holistic strategy that is now being implemented step by step. At the interface between science and society – the “Science-Society-Interface” (SSI) – the classic areas of knowledge and technology transfer (KTT) and public relations (PR) are merged together in a new, combined team. This team will support scientists by offering internal workshops (► page 27) and engaging in practical ex-

change with social stakeholders. There are also plans to publish dossiers, fact sheets and policy briefs in which research findings and options for action are presented comprehensibly for policy-makers and society. In addition, more interactive dialogue formats on socially relevant topics are to be initiated, sometimes involving completely novel and unusual cooperation partners, such as from the realm of culture. One intention, for example, is to co-design new research issues and to develop innovative approaches.

“It goes without saying that substantive excellence and scientific freedom form the basis of our research, and are non-negotiable. But of course this freedom must always be considered in the context of our social responsibility,” explained Tockner. “The new SSI signifies teamwork, requiring personal commitment on the part of scientists. We are developing guidelines, incentives, new formats and feedback processes in order to enhance and support motivation and involvement.”

The overriding aim of SSI is to initiate a new culture of exchange inside and outside IGB, creating a “double impact” in science and society. Another major contribution will be the creation of a new IGB website in 2016, which will act as a central communication platform.

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# Dialogue on the Sulphate Contamination of the River Spree

“Iron clogging” in the River Spree, caused by iron oxide, is the most visible and well-known consequence of mining in the Lusatia lignite region, but not the only one. Sulphate also increasingly enters the Spree via its tributaries and groundwater. As yet, insufficient research has been conducted on the long-term consequences of this increased sulphate load for humans and the environment, and on the extent of its persistence. At the “5<sup>th</sup> Müggelsee Dialogue” in November 2015, decision-makers representing authorities, politics, environmental associations and industry came together to discuss the ecological impacts, possible courses of action and the current state of research with IGB scientists.

Data measured by IGB and the regional authorities shows that the sulphate content now considerably exceeds the drinking water threshold of 250 mg/L on some stretches of the Spree. This also has a negative impact on the lake Müggelsee, which is used for extracting drinking water via bank filtration. Ever since summer 2015, sulphate concentrations in the Müggelsee have constantly exceeded the threshold value. If these values continue to increase, it may become considerably more difficult to treat the drinking water.

In 2015, this development triggered intense debate in the society and the media, whereby the facts were not always incorporated correctly. “As a research institution, IGB seeks to provide society with objective scientific opinions, substantively supporting the decision-making process,” explained IGB Director, Klement Tockner. The “Müggelsee Dialogue” in November 2015 brought together stakeholders from politics, authorities, administrations, environmental associations and the water and power industry, enabling them to exchange opinions and information. Besides the drinking water issue, discussions focused primarily on ecological matters and approaches that could be taken to address them. Keynotes were given, providing inspiration for a whole day of intense exchange.

IGB’s Jörg Gelbrecht gave the participants a summary of the current state of research on the impacts on our aquatic ecosystems. Previous studies suggest that sulphate concentrations as low as 200 mg/L can considerably influence aquatic life communities. In her lecture, Elke Wittstock, Director of Friedrichshagen waterworks (Berliner Wasserbetriebe), warned

of the consequences for supplying the capital with drinking water. It would be impossible to compensate for any failure of Berlin’s largest waterworks. To make matters worse, following two dry years there is little capacity for mixing, to reduce the sulphate concentration in drinking water.

Wilfried Uhlmann from Dresden’s Institut für Wasser und Boden explained how difficult it is to forecast whether the contamination of the Spree will continue or increase, and for how long. He presented the latest data and explained the difficulties involved in making model-based predictions. Despite the loads being relatively constant, climate change and extreme weather events could lead to considerably higher concentrations.

In his lecture, Klaus Freytag from the Ministry for Economic Affairs and Energy of the Federal State of Brandenburg described which strategies are currently available for reducing mining-related entries to the Spree. His explanations were complemented by Oliver Totsche (Lausitzer und Mitteldeutsche Bergbau-Verwaltungsgesellschaft mbH), who presented first pilot projects. It became apparent that many of the tested measures have only minor or short-term effects, and that there is still a lack of integrated and economically viable schemes.

An innovative approach was presented by IGB’s Dominik Zak: “In artificial wetlands, a reverse reaction of pyrite oxidation could be introduced by microorganisms in order to reduce sulphate contamination in aquatic ecosystems in the long-term,” he stated. He suggested using degraded peat from projects involving the rehydration of calcareous fenland as a source of carbon for the microorganisms. The first such laboratory experiments are currently being prepared at IGB.

By and large, the day’s discussions revealed that there is still considerable need for action, exchange and research on the effects of the sulphate issue, and how to solve it. It also became apparent that the public needs to be informed about the causalities in greater detail. To achieve this, IGB scientists followed up the event by compiling the current state of knowledge and research and producing a dossier, which can be downloaded from the IGB website.

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Dr. Dominik Zak | [zak@igb-berlin.de](mailto:zak@igb-berlin.de)

*The Müggelsee Dialogue is a regular forum at IGB that seeks to address current and future challenges facing water management. The 5<sup>th</sup> Dialogue was integrated into the launch of the new Centre for Sustainable Landscape Development (page 22), created by Brandenburg University of Technology Cottbus-Senftenberg, IGB and Potsdam’s GFZ German Research Centre for Geosciences.*



# Germany's Contribution to the EU's Response to Invasive Species

A new EU regulation to address invasive species entered into force at the beginning of 2015. IGB is involved in a project run by the German Federal Agency for Nature Conservation (BfN) in which a method is being further developed to identify invasive species that are of particular concern in Germany in the context of this EU regulation.

Invasive species represent a major threat to the conservation of species diversity, and the risk that non-native plants and animals are being introduced to EU countries is continuously growing due to global trade and transport routes. It is very hard for individual countries to counter this development effectively, thus an internationally coordinated response is urgently required. An important milestone on this path was achieved at the beginning of 2015: the EU Member States agreed to adopt a regulation on measures to prevent and manage the introduction and spread of invasive alien species (Regulation No 1143/2014).

The core instrument of this regulation is a list of invasive alien species of Union concern. For species contained in this list, measures shall be taken at EU level concerning their prevention, early detection and control, including bans, e.g. on their import, sale, use and release. Priority should be given to the inclusion of species that are not yet present in the EU or are at an early stage of invasion, as well as those whose introduction is likely to have the most significant adverse impacts. A first version of this list has since been presented, containing

at first only 37 species (e.g. the American bullfrog, see photo). The list is to be reviewed at least every six years; in addition, EU Member States may submit proposals for the inclusion of species in the list at any time.

The BfN project, involving Wolf-Christian Saul and Jonathan Jeschke from IGB's *Ecological Novelty* research group (◻ page 14), seeks to identify additional invasive species that are of high priority for Germany and can be suggested for inclusion in the Union list. For this purpose, the requirements of the EU regulation are being incorporated into a method for assessing invasiveness that already exists at BfN. This method can then be applied to potential candidates for the list. Invasive species arrive in Germany via different routes, over different time periods and in varying numbers; these introduction pathways will also be identified and prioritised within the project, serving as a basis for action plans as required by the regulation. The project is carried out in cooperation with the Austrian Federal Environment Agency and Technische Universität München.

**Project:** R&D project "EU Regulation on Invasive Species: Listing Propositions and Prioritisation of Introduction Pathways for Invasive Species of Union Concern in Germany" | **Duration:** 07/2015-11/2017 | **Funded by:** Federal Agency for Nature Conservation (BfN) | **Direction at IGB:** Dr. Wolf-Christian Saul, saul@igb-berlin.de, and Professor Dr. Jonathan Jeschke, jeschke@igb-berlin.de | **Involving:** Department 2



*The American bullfrog: an invasive species considered to be of Union concern.*



# European Freshwaters at a Click

Four European research institutions have published an online platform, bringing together information and findings from freshwater ecosystems research. The “Freshwater Information Platform” makes data and maps freely available, offering a unique and comprehensive knowledge base for the sustainable and evidence-based management of our endangered freshwaters and the resources they provide.

We are fundamentally changing how nature works, most often irreversibly. These changes do not only endanger the natural systems on which we depend, but also, ultimately, our survival. Pollution, land use and climate change are among the factors which are increasingly jeopardising our freshwaters and their biodiversity throughout Europe. For this reason, numerous research projects have been conducted in recent years to explore the causes and consequences of these changes, and renaturation strategies for rivers, lakes and wetlands have been developed. And yet it is often difficult for the public, policy-makers, authorities and water managers to access the information and data collected. In some cases, research data is not published systematically or is embedded in a multitude of different scientific publications and project websites.

In a bid to change this, IGB joined forces with the University of Natural Resources and Life Sciences in Vienna (BOKU), the University of Duisburg/Essen (UDE) and the Royal Belgian Institute of Natural Sciences (RBINS) in Brussels to develop a new information portal: launched in 2015, the “Freshwater In-



The “Freshwater Information Platform” makes results and data generated by a variety of European research projects publicly accessible.

formation Platform” summarises the findings of completed and ongoing research projects, and makes them accessible to the public. “With this, we have created a joint research infrastructure that helps us track the manifold impacts accelerated environmental changes have on freshwater ecosystems and their biodiversity,” explained Klement Tockner.

The platform is composed of several complementary parts that either facilitate easy access to original data or offer an easily comprehensible summary of research results. All sections are continuously updated and further content keeps getting added.

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[www.freshwaterplatform.eu](http://www.freshwaterplatform.eu)

## Using Swarm Intelligence to Improve Public Safety

IGB scientist Jens Krause gave a keynote speech on the topic of swarm intelligence at the Forum on the Future of Public Safety and Security (Zukunftsforum Öffentliche Sicherheit e.V.) in October 2015. The Forum originated from a cross-party initiative of members of the Bundestag. Its aims include enhancing both the understanding of and scientific research in public security, and building a network of relevant stakeholders and multipliers from politics, public authorities, business, science and the media to engage and work on the topic of public security.

Professor Dr. Jens Krause  
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## Focus on Illegal Caviar Trade

Trade in caviar was designated a focus of monitoring throughout Germany as early as 2008. But how has the system for monitoring caviar and aquaculture stood the test in species conservation? At a workshop organised in collaboration with representatives from Berlin’s Senate Department for Urban Development and the Environment in November 2015, scientists from IGB and IZW exchanged opinions about the possibilities to monitor illegal fishing and trade in wild caviar, and the prevailing gaps, with employees from the German Federal Agency for Nature Conservation, the Federal states’ law enforcement authorities and WWF. The objective was to jointly assess the effectiveness of the current approaches and to explore if options are necessary to increase species protection.

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## IGB Reports: Created with Anglers for Anglers

The practice-oriented approach consistently adopted in the five-year research project *Besatzfisch* (Fish stocking) was continued to the very end of the project, resulting in the publication of an A to Z handbook on sustainable fish stocking. The handbook contains published and unpublished project results on the opportunities, risks, costs and benefits of fish stocking, including practical recommendations.

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[www.besatz-fisch.de](http://www.besatz-fisch.de)

Download:





# **interconnected**

Collaborations and Scientific Events



# New Research Centre on Post-Mining Landscapes



The three partners signed the cooperative agreement on 29 September 2015 on BTU's central campus in Cottbus.

IGB, BTU and GFZ established a joint Centre for Sustainable Landscape Development in Cottbus in 2015.

The utilisation of post-mining landscapes involves complex challenges not only regionally, but also throughout the world. In order to develop solutions to these challenges, IGB, Potsdam's GFZ German Research Centre for Geosciences and Brandenburg University of Technology Cottbus-Senftenberg (BTU) have initiated a joint research centre. The aim of the new Centre for Sustainable Landscape Development is to pool interdisciplinary expertise and research infrastructures at the Cottbus site. The partners make joint use of existing knowledge and infrastructures in order to develop options and recommendations for stakeholders and decision-makers in the affected regions.

The new centre, which has initially been set up for 15 years, will address the following topics:

- **Geotechnics**  
Methods of compacting subsoil in order to improve stability for added safety in case of rising groundwater levels
- **Soil technology and fertility**  
Development of new recultivation methods to increase the fertility of new soils for use in agriculture or forestry
- **Water management and freshwater ecology**  
Control and prevention of substance contamination in flowing waters and new lakes, and development of combined groundwater/surface water management
- **Ecosystems**  
Multidisciplinary long-term observations for reconstructing historic landscape development and for understanding natural and anthropogenic ecosystems
- **Design and use of land and freshwater**  
Introduction of alternatives to traditional land use, such as agroforestry systems that can also upgrade low-yield sites with little effort and create positive effects for the development of these areas.

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## Princeton-Humboldt Centre for Reality Mining

How do fish move in groups in real time and how do they react to human disturbances? Relevant insight provided by key species may help fish populations to be managed more sustainably. New methods for generating and assessing real-time position data are being developed within the partnership between Princeton University and Humboldt-Universität in cooperation with fisheries biologists from IGB. Scientists met in Berlin to attend a workshop from 20 to 21 March 2015. Concrete projects on the social behaviour of anglers in search of spatio-temporally varying fish and on fright waves of gambia were elaborated during two one-week reciprocal visits

in November 2015. The programme will be continued in 2016.

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## Summer School on Processes in the Hyporheic Zone

Scientists and PhD students from all over the world gathered at IGB in June 2015 to discuss hydrological and biogeochemical mechanisms in the hyporheic zone. Hyporheic zones are the transition zones between surface water and groundwater in the sediment of riverbeds. The "HypoBASICS" summer school took place within the EU project "HypoTRAIN", which was launched at

the beginning of 2015. In addition to the 16 HypoTRAIN PhD students, numerous other PhD students from the whole of Europe attended the event. Many internationally acclaimed scientists presented the current knowledge on the processes that occur in the flowing water sediment. A central theme of the summer school was the role played by the hyporheic zone as a hydrodynamically driven bioreactor, which is supposed to be extensively responsible for the high self-cleaning potential of rivers with regard to nutrients and contaminants. The aim of the HypoTRAIN project is to gain a better understanding of the underlying processes and mechanisms.

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# IWA DIPCON Conference

## New Concepts for User-Oriented Water Management

The 17<sup>th</sup> DIPCON Conference (IWA International Conference on Diffuse Pollution and Eutrophication), held in Berlin in September 2015, was organised by IGB and the International Water Association (IWA). In keeping with tradition, the biennial conference addresses the water and matter-fluxes between catchment and their receiving waters, as well as the resulting chemical and ecological consequences. Adopting the motto 'Diffuse your knowledge', the 2015 conference focused on building a bridge between application-oriented and basic research, and the transfer of research results to river basin management.

Climate change, intensified agriculture, pollutants and the overutilization of waters are just some of the challenges facing scientists, economists, engineers, lawyers and politicians with regard to the sustainable management of our water resources. It is already apparent that many rivers, lakes and groundwater bodies will not achieve good ecological status again in the near future. At the same time, in many places water abstraction and uses increase causing elevated pressures on our water resources. "There is a conflict of interest between anthropogenic and ecological needs; this conflict of interest has to be balanced

by applying intelligent management," stated IGB researcher Markus Venohr, who was responsible for organising the DIPCON Conference. "Since we must transcend political and scientific boundaries in order to manage our waters efficiently and successfully, we particularly wanted to use this conference to promote exchange between scientists, users and policy makers," he explained. Round table discussions gave participants the opportunity to do just that, while also providing a basis for creating a joint review paper.

In 102 talks and 38 posters, altogether 170 participants from 32 countries presented their latest findings on the sources of nutrients, sediments, pesticides and, increasingly, hormones, medicinal products and similar substances. The participants also discussed the modelling and effectiveness of measures aimed at reducing diffuse nutrient inputs, as well as socio-economic studies such as on farmers' (fertilisation) behaviour under changing climate and agricultural policy framework conditions.

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[www.dipcon2015.org](http://www.dipcon2015.org)



*Lively discussions at the speed talks during one of the poster sessions.*

### Workshop on the Long-Term Effects of Invasive Species

Florian Ruland and Jonathan Jeschke organised a workshop, financed by the German Research Foundation (DFG), in Berlin from 18 to 20 February 2015. The participants came from Berlin-Brandenburg (IGB, FU, TU, University of Potsdam), other parts of Germany and Europe, as well as the USA. Under the name of InDyNet (Invasion Dynamics Network), the group continues to work on the temporal dynamics of biological invasions and their impacts. Funding for the group comes from the DFG project "Long-term

effects of invasive species in novel communities" (led by Jonathan Jeschke) and is secured until 2017.

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### DFG Research Training Group "Urban Water Interfaces" Launched

The "Urban Water Interfaces" (UWI) research training group funded by the German Research Foundation (DFG) was officially launched on 8 September 2015. The

research training group, involving close cooperation between the Technische Universität Berlin and IGB, addresses natural and technical interfaces in the urban water cycle. The group seeks to raise education and research on this topic, which is interdisciplinary and international in nature, to a new level. The aim is to provide the foundations for future-oriented, sustainable water management in urban spaces. The research training group received around €4.7 million in funding for an initial period of 4.5 years.

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Discussions in the working groups

# Workshop on Biodiversity Research

In a bid to promote networking among biodiversity researchers inside and outside IGB, the “Aquatic Biodiversity” Research Domain hosted the workshop “The next generation of biodiversity research: theory, traits and methods” in October 2015. More than 50 biodiversity researchers from all over the world participated in the workshop.

We know very little about the current state of the world’s biodiversity – particularly in severely affected freshwaters and despite numerous research projects. One reason for the lack of solid data is the existence of methodological problems; in addition, enormous challenges arise in the synthesis of existing theoretical and empirical research, for example when different data formats are involved.

The workshop participants generated several findings, which should help improve data availability and lead to a better understanding of biodiversity in freshwaters. For example, eDNA-based methods and improved algorithms were identified as essential factors for analysing big data in a targeted manner. Trait-based concepts (based on organismic traits) that use principles from evolutionary biology and quantitative ge-

netics to describe ecosystems should enable researchers to detect many organismic and genetic traits more precisely, and to characterise them. Another finding was the recommendation to focus more closely on parasites in order to learn more about the functional biodiversity of aquatic organism communities. In addition, social and economic aspects should be better integrated in the assessment and protection of freshwater biodiversity, as is the case, for example, in the global initiative “Blueprint of Freshwater Life”, which is thought to be particularly forward-looking.

The workshop generated another output – a publication submitted by the participants containing recommendations on how to enhance the understanding of freshwater biodiversity, which has so far been overlooked. There are plans to produce further publications and to set up networking activities inside and outside of IGB.

**Project:** within Research Domain 1 Aquatic Biodiversity | **Direction:** Professor Dr. Hans-Peter Grossart, hgrossart@igb-berlin.de, Professor Dr. Jonathan Jeschke, jeschke@igb-berlin.de, Laura Tydecks, tydecks@igb-berlin.de | **Involved:** Departments 2 and 3

## Annual Meeting of the Gesellschaft für Ichthyologie (Gfi)

In November 2015, IGB hosted the annual meeting of the Gesellschaft für Ichthyologie (Gfi). In addition to the keynote lectures by Professor Dr. Klaudia Witte (University of Siegen) and Professor Dr. Walter Salzburger (University of Basel), one of the highlights was a talk by the internationally renowned 93-year-old ichthyologist Günther Sterba (with Dr. Wolf-Eberhard Engelmann).

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## 1<sup>st</sup> Plankton Chytridiomycosis Workshop

Plankton, like virtually all other species in nature, is not free of disease. Whereas viruses have been long recognised as pathogens of basic plankton organisms, recent molecular surveys have revealed a widespread, yet largely overlooked, group of aquatic fungi known as chytrids. Initial research has shown that these organisms

can dramatically affect the dynamics of phytoplankton, promote their diversity, and account for new trophic links that challenge our current understanding of aquatic food webs. With the aim of bringing together the scientific community working on this emerging topic, the IGB organised the 1<sup>st</sup> Plankton Chytridiomycosis Workshop, which was held in Berlin in July 2015. The workshop gathered 33 researchers from 11 different countries who shared ideas and methodologies, identified the most pressing research needs, and agreed on future multinational collaborations. As a result of this initiative, further editions of the workshop will be organised on a yearly basis with active IGB participation.

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## Novel Approaches to Assess and Rehabilitate Modified Rivers

This was the title of the international final conference of the EU REFORM project, held together with a summer school in Wageningen (Netherlands) from 27 June to 2 July 2015. A total of 170 participants

from 26 countries met to exchange their scientific experiences. The studies presented revealed a clear trend towards process-oriented river revitalisation, taking account of hydromorphological functionality, riparian zones and floodplains, as well as spatial and temporal changes of river landscapes. Extended summaries of the 73 presentations and 38 posters are available on the project website.

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## EcoMeetIng

In February 2015, the 6<sup>th</sup> annual EcoMeetIng (“Ecology meets Ingenieur”) took place at IGB. In total, 22 participants presented the findings of the research they conducted on abiotic and biotic aspects of rivers. The goal of EcoMeetIng is to bring together young scientists to working interdisciplinarily with engineers as well as with ecologists/biologists.

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# **committed**

Career Development and Public Engagement



# Dead Wood Creates Life Underwater

Francesca Pilotto, who completed her doctorate on the significance of dead wood in lowland rivers, was IGB's first graduate of the EU SMART research training programme in 2015.

Francesca Pilotto grew up in Northern Italy in the lake-rich region of Insubria near Lugano. Therefore, it is no surprise that the researcher is enthusiastic about lakes, rivers and the environment in general. After studying environmental sciences, she came to IGB within the Erasmus Mundus programme SMART (Science for the Management of Rivers and their Tidal Systems) to do her PhD. She explored the significance of dead wood for species diversity in flowing waters within the international cooperation programme, involving Freie Universität Berlin, Trento University (Italy) and the Queen Mary University of London (UK).

“Humans can have a major impact on ecological equilibrium in rivers,” explained Francesca Pilotto. “Unspoiled rivers are capable of cleaning themselves. Even small changes, however, can have serious consequences.” Francesca Pilotto was particularly interested in finding out which ecological interactions play a role in this. “Invertebrates, i.e. small insects that live in rivers, are important for ecological equilibrium,” added Pilotto. The Italian researcher paid particular attention to these small insects in her doctoral thesis. “Aquatic insects feed on plants and are consumed by fish. Many of these insects react very sensitively to external interferences, such as pollutants in the water,” stated the scientist. For this reason, the state of the insect population is indicative of the ecosystem as a whole. “The presence of wood that has fallen into the water seems to play an important role for these populations,” said Pilotto.

## SMART

*As an associated partner, IGB has taken an active role in the SMART Erasmus Mundus Joint Doctorate Programme. Launched in 2011, the programme has provided training in the management of river systems to approximately 40 doctoral students from all over the world. The annual Induction Week for 2015 was held in Berlin, enabling all participating students and supervisors from partner institutions in Trento, London and Berlin to discuss the initial results of their projects as well as future research activities.*

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*Many doctoral candidates on the SMART programme attended Francesca Pilotto's thesis defence at Freie Universität Berlin on 5 March 2015.*

In order to investigate these interrelations, she took samples from pristine Polish rivers on several occasions. She was provided with advice and support from her scientific supervisors at IGB and other SMART supervisors in Germany and England. During her investigation, the young scientist noticed that riparian trees that had fallen into the water have a major influence on insect populations in rivers. Humans often tend to interfere with existing ecosystems, explained Pilotto – for example, when trees that have fallen after a storm are cleared from rivers. “I wanted to find out whether it makes sense to leave these pieces of timber in the water.” The result: “The best thing is to leave everything as it is,” said the young researcher, laughing. “My research revealed that dead wood left in the water represents an important habitat for many species.”

Armed with the findings from her doctoral thesis, Francesca Pilotto now wants to advocate better management of rivers. “In particular, straightening rivers and discharging waste water into them lead to many unwanted effects. If we know how ecosystems in rivers function, we can develop proposals for how best to protect them,” stated Pilotto. The targeting addition of dead wood to the river bed could presumably help increase species diversity and restore ecological equilibrium in polluted rivers. Francesca Pilotto is now continuing her investigations into this matter within a post-doc position in Sweden, where she is exploring river restoration.

# Uncharted Waters – What Makes Politics, Business and the Media Tick?

Scientists are usually absolute specialists in their respective thematic areas. Within their specialised community, they like to share information about new findings and exciting research issues. This established system also helps to promote quality assurance in science. But what happens when scientists exchange their opinions with other areas and actors in society? To enable scientists to gain a better understanding of these sometimes “uncharted waters” of society, IGB offers a new series of workshops within the new initiative “Science Society Interface” (“SSI”, ◀ page 16). During in-house training sessions, researchers find out about the special “languages” spoken in business, politics and the media, and which logics of action these systems pursue. The aim is to encourage a more effective exchange of knowledge with these social players. Particular attention is given to external contributors from the relevant fields. The first two formats concerning business and the media took place in 2015. The intention is to continue and expand the series of workshops.

Johannes Graupner and Angelina Tittmann  
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*During in-house training sessions, practice-oriented case studies are addressed, presented and then reflected upon with external contributors.*

## Promotion of Young Researchers at IGB

In 2015, the IGB doctoral programme offered more courses than ever before: 20 courses on 13 different topics were available. These were attended not only by a large number of doctoral candidates, but also by Master and Bachelor students. Some courses had to be repeated due to the high number of participants. We were particularly pleased about the growing number of lecturers: 15 IGB scientists – from doctoral candidate to Speaker of a Cross-Cutting Research Domain – contributed to this diverse offer. The additional individual coaching was also in high demand.

In addition to the doctoral programme, we have also focused on other aspects of career development: the intense discussions of necessary changes in doctoral supervision at various levels will continue into next year. The post-

docs have organised themselves for the first time and elected representatives. We will systematically support them in the coming years in their career development.

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## “HR Excellence in Research” Award

IGB was awarded the “HR Excellence in Research” logo by the European Commission in April 2015 for its continuing improvements of all researchers’ working conditions and career development options. This international logo shows researchers that IGB offers excellent working conditions for them. “We steadily strive to optimize the working condition and individual advancement of each person at IGB. We explicitly wel-

come the increasing internationalisation of our researchers and are working on mitigating language and administrative barriers,” stated Klement Tockner, Director of IGB. In order to systematically include all relevant aspects, the institute participates in the “HR Excellence in Research” process of the European Commission’s “EURAX-ESS, Researchers in Motion” initiative. IGB formed an HRS committee, which developed a first action plan for 2014-2016. This shows a clear commitment to continuous improvements, since the accomplishments of the actions are evaluated every 2 to 3 years, and are a prerequisite to maintaining the right to use the logo.

Dr. Kirsten Pohlmann  
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*Whether amateur or pro: carbon investigators want to find out what pools, rivers and lakes have to do with the global climate.*

# Science with a Criminological Feel

Citizens Explore Rivers and Lakes Throughout Germany

In the citizen science project “Crime Scene Freshwaters” (Tatort Gewässer – dem CO<sub>2</sub> auf der Spur), more than 700 citizens adopted the role of carbon investigator in 2015. Armed with rubber boots, torches, glass tubes and test strips, divers, researchers, conservationists, school-children and amateur researchers joined the hunt in November to track down carbon dioxide and microbial diversity. Samples were taken from pools, lakes and streams throughout Germany.

“The aim of the campaign was to determine the role played by our inland waters in the context of global climate change,” explained Katrin Premke, who leads the project at IGB. “We are mainly interested in whether, and to which extent, freshwaters release climate-relevant carbon dioxide (CO<sub>2</sub>).” The research team had their sights set on almost 9,000 km<sup>2</sup> of water throughout the country. To cope with this vast area, they counted on the support of citizen scientist.

Altogether, the campaign covered 162 streams, 104 rivers, 94 small water bodies (pools and ponds) and 275 lakes. Support was provided by nature conservation associations, scientists, schools, youth clubs, diving associations, anglers and nature parks, as well as nature conservation authorities and state offices. “We were amazed by the great interest shown,” said Katja Felsmann, who coordinates the project. “Of course, this

huge level of interest presented a challenge to our small team, but the amount of data we received was fantastic.” A free sampling pack containing everything the carbon seekers needed to conduct their investigations was sent to them in advance.

“Together with citizen scientists, we were able to examine how changes in land-use, an increase in light pollution, anthropogenic exploitation and eutrophication affect our freshwaters, and the role of those in the global carbon cycle,” explained Katrin Premke. “This unique sampling event provides a snapshot of the overall picture.” We can now use this information to determine whether our inland waters tend to act as carbon sinks or sources, and which role artificial light at night and/or differences in microbial communities will play within this context.” Hence the first step involved determining the carbon content and the isotope signature of the oxygen contained in the water samples. This will now be followed by an investigation of the microbial communities in the sediment samples.

**Project:** Crime Scene Freshwaters – Tracking Down Carbon Dioxide

**Duration:** 04/2015-07/2016 | **Funded by:** IGB Seed Money Programme II | **Direction:** Dr. Katrin Premke, premke@igb-berlin.de |

**Involving:** Departments 1, 2 and 6, and Research Domain 2

[www.tatortgewaesser.de](http://www.tatortgewaesser.de)

## My Sky at Night: Our App, Our Night Sky, Our Research

Skyglow is what scientists call the phenomenon of our nocturnal sky becoming brighter due to an increase in artificial light. How skyglow affects humans and nature remains largely unexplored. It is also difficult to predict whether the use of new lighting technologies in street lighting, such as LEDs, will make the sky brighter or darker in future. Since satellite measurements are unsuitable for this, the best way to explore this development is to

invite interested people from all over the world to examine changes in their night sky. The [www.myskyatnight.com](http://www.myskyatnight.com) website, organised by GFZ and IGB, makes all citizen science data available and offers tools to visualize and analyse the measurements, allowing citizen scientists to take an active role beyond passively collecting data. Data from the “loss of the night” and two other citizen science projects concerning light pollution is pooled on the new

website. Users that provide their email in the “loss of the night” app can log in to review all their measurements. The project was funded by the European Commission under the MYGEOSS programme.

**Dr. Chris Kyba** | [kyba@gfz-potsdam.de](mailto:kyba@gfz-potsdam.de)

**Dr. Franz Hölker** | [hoelker@igb-berlin.de](mailto:hoelker@igb-berlin.de)

[www.myskyatnight.com](http://www.myskyatnight.com)

# outstanding

Awards and Honours

# Awards and Honours

**Klement Tockner** became a member of the Leopoldina in 2015. For scientists, election to the German National Academy of Sciences is considered to be one of the highest accolades awarded by a German institution. Members of the Leopoldina are scientists of international importance. ❶

**Beatrix Beisner** (Université de Québec à Montréal, Canada) won the Humboldt Foundation's Friedrich Wilhelm Bessel Research Award. Beatrix Beisner, who is expected to come to IGB as a visiting scientist in 2017, received the award for her outstanding research achievements. At the Department of Experimental Limnology, her research will focus primarily on how the stratification of lakes affects the feeding behaviour of zooplankton. ❷

**Sereina Rutschmann** (a former PhD student at IGB) and Jens Kiesel (a postdoc in Sonja Jähnig's research team) won the Schwörbel-Benndorf Young Talent Award of the German Limnological Society (DGL). Sereina Rutschmann received the award for her work on evolutionary processes in aquatic insects. Jens Kiesel won the award for developing a new approach for modelling macrozoobenthos communities. The awards were presented at the DGL conference in Essen on 24 September. ❸

The Deutscher Angelfischerverband's (DAFV) award for outstanding research at the Albrecht Daniel Thaer-Institute of Agricultural and Horticultural Sciences of Humboldt-Universität zu Berlin went to **Tonio Pieterek** for his Master's thesis "Determinanten der anglerischen Fangbarkeit von Hechten (*Esox lucius*)" (Determinants of the ability of anglers to catch perch (*Esox lucius*)). His thesis offers new knowledge for introducing management measures to inland and recreational fisheries. Robert Arlinghaus and Jens Krause supervised the thesis at IGB.

**Ivan Jarić** was awarded as winner of the Danubius Young Scientist Award 2015 by the "Institute for the Danube Region and Central Europe (IDM)" and the Austrian Federal Ministry of Science, Research and Economy, in honour of young researchers' excellent research work. The award is to enhance the visibility of the research community in the Danube Region. Ivan Jarić, a member of Jörn Geßner's research team, focuses on population modelling in fisheries management and species protection as well as scientific approaches mainly in the field of sturgeon restoration. ❹

After the initial election of the **Project on the Reintroduction of the European and Baltic Sturgeons** in 2013, the project was again honoured as an exemplary UN Decade on Biodiversity project in 2015. The expert jury acknowledged the successful collaboration between scientists, administrators and practitioners in their bid to save these endangered fish species. By conferring this award on the project a second time, the jury stressed the importance of the project for the conservation of biological diversity. ❺

In January 2015, **Jörg Lewandowski** from the Department of Ecohydrology earned his Habilitation at the Geography Department of Humboldt-Universität zu Berlin. The topic "Coupling of hydrodynamic and biogeochemical processes at aquatic interfaces" reflects the extensive work he has carried out on dynamic processes at aquatic boundaries. ❻





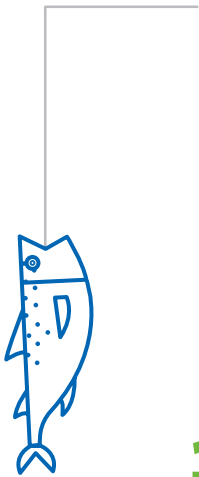
Photos: Andy Küchenmeister (1), David Ausserhofer (1), Angelina Tittmann (1), privat (3)



**annex**



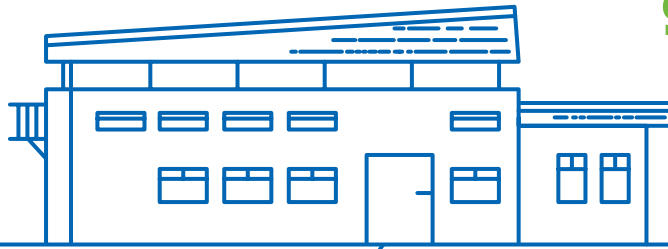
# Key Figures at a Glance



**17** Employees active in committees and expert associations



**231** Employees (including **144** scientists)



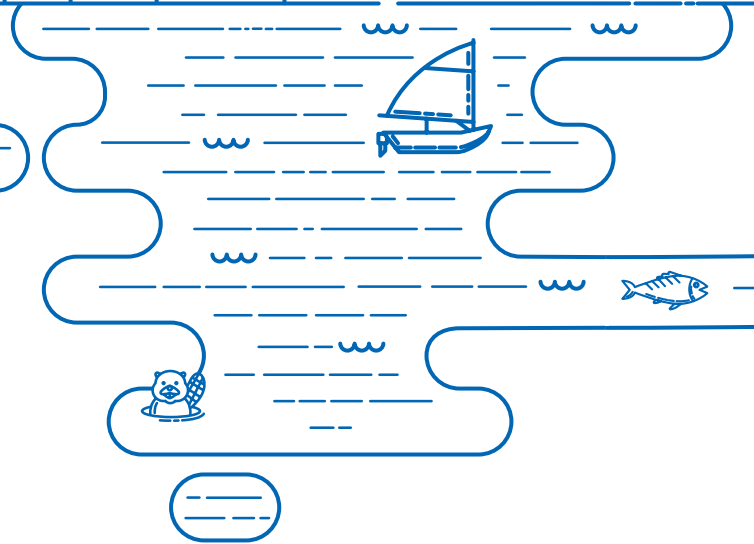
**980** Visitors



**302** Reports in daily newspapers



**262** Publications in peer-reviewed journals



**25** Scientists active in editorial and advisory boards of journals

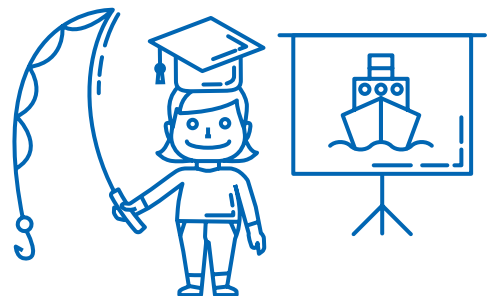
**32** Invited talks



Scientific events and workshops:

**18** with in total

**1.122** participants





**27** Employees active in teaching

**72** Doctoral students

**10** Doctoral dissertations

**38** Diplom, Master's and Bachelor's theses

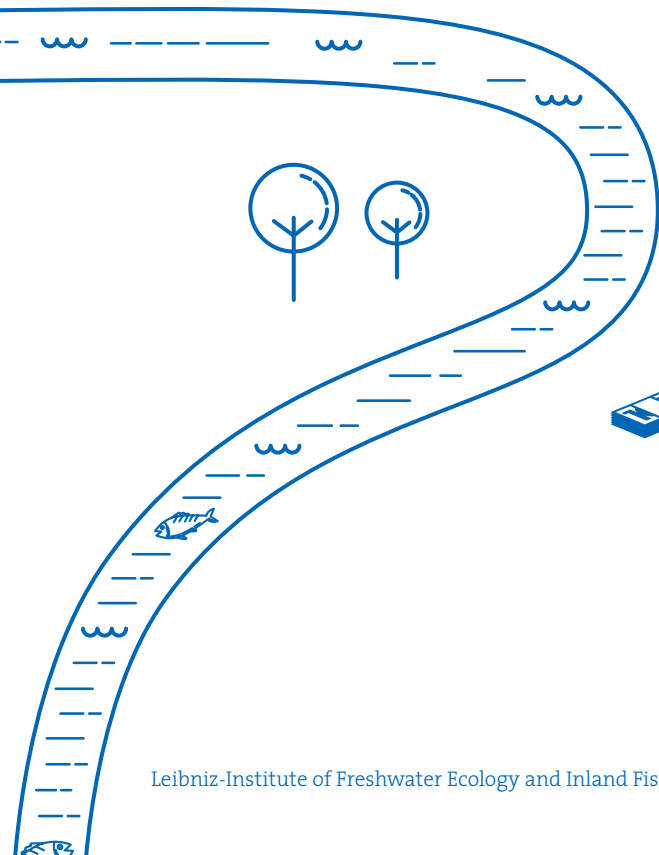
**1** Habilitation



**11** Joint professorships with universities



**30** Colloquia



External grants: **5.669.324,65 €**  
including **1.048.582,73 €** EU grants

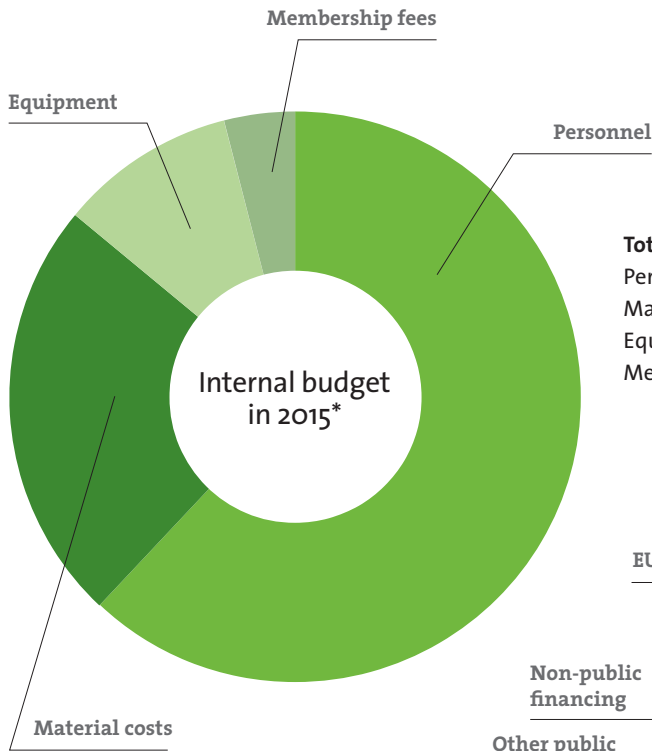
Internal budget: **13.293.278,48 €**

Overall budget: **18.962.603,13 €**

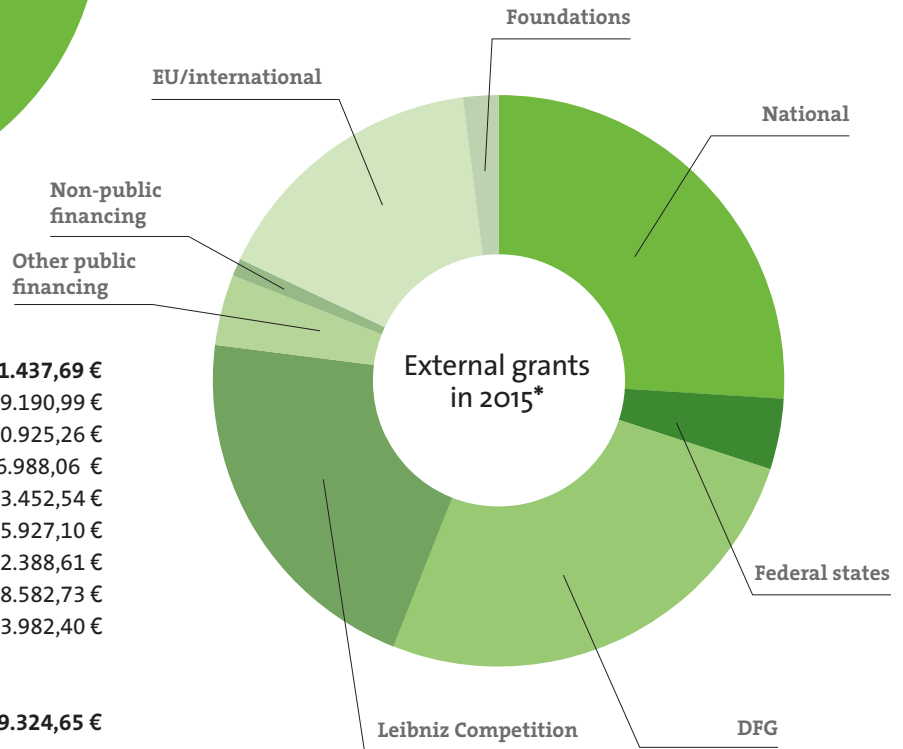
Proportion of external funding: **43 %**

# Finances

Status as of 31 December 2015



<b>Total</b> .....	<b>13.293.278,48 €</b>
Personnel.....	8.394.897,76 €
Material costs .....	3.507.664,26 €
Equipment.....	887.695,86 €
Membership fees.....	503.020,60 €

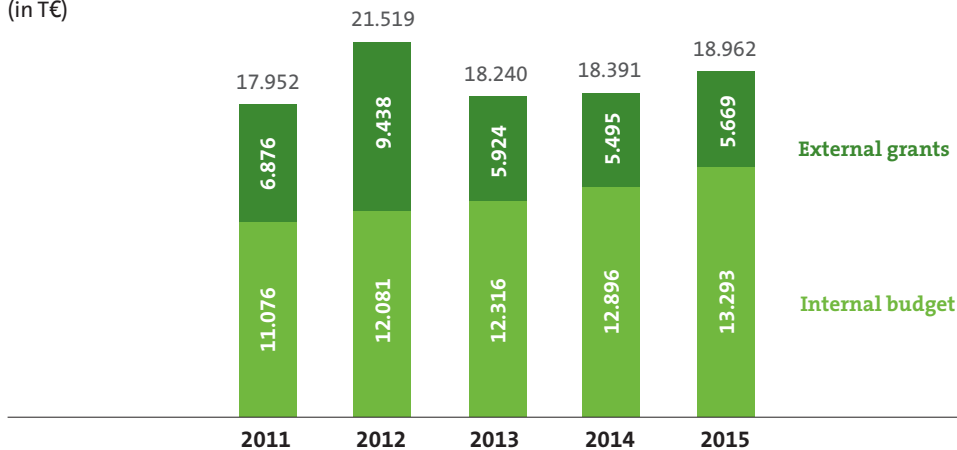


<b>Total</b> .....	<b>5.391.437,69 €</b>
National .....	1.479.190,99 €
Federal states.....	250.925,26 €
DFG.....	1.486.988,06 €
Leibniz Competition.....	813.452,54 €
Other public financing .....	255.927,10 €
Non-public financing .....	2.388,61 €
EU/international.....	1.048.582,73 €
Foundations .....	53.982,40 €

**External grants (including externally managed funds).....5.669.324,65 €**

## Budget Development 2011-2015

(in T€)



\* on expenditure basis

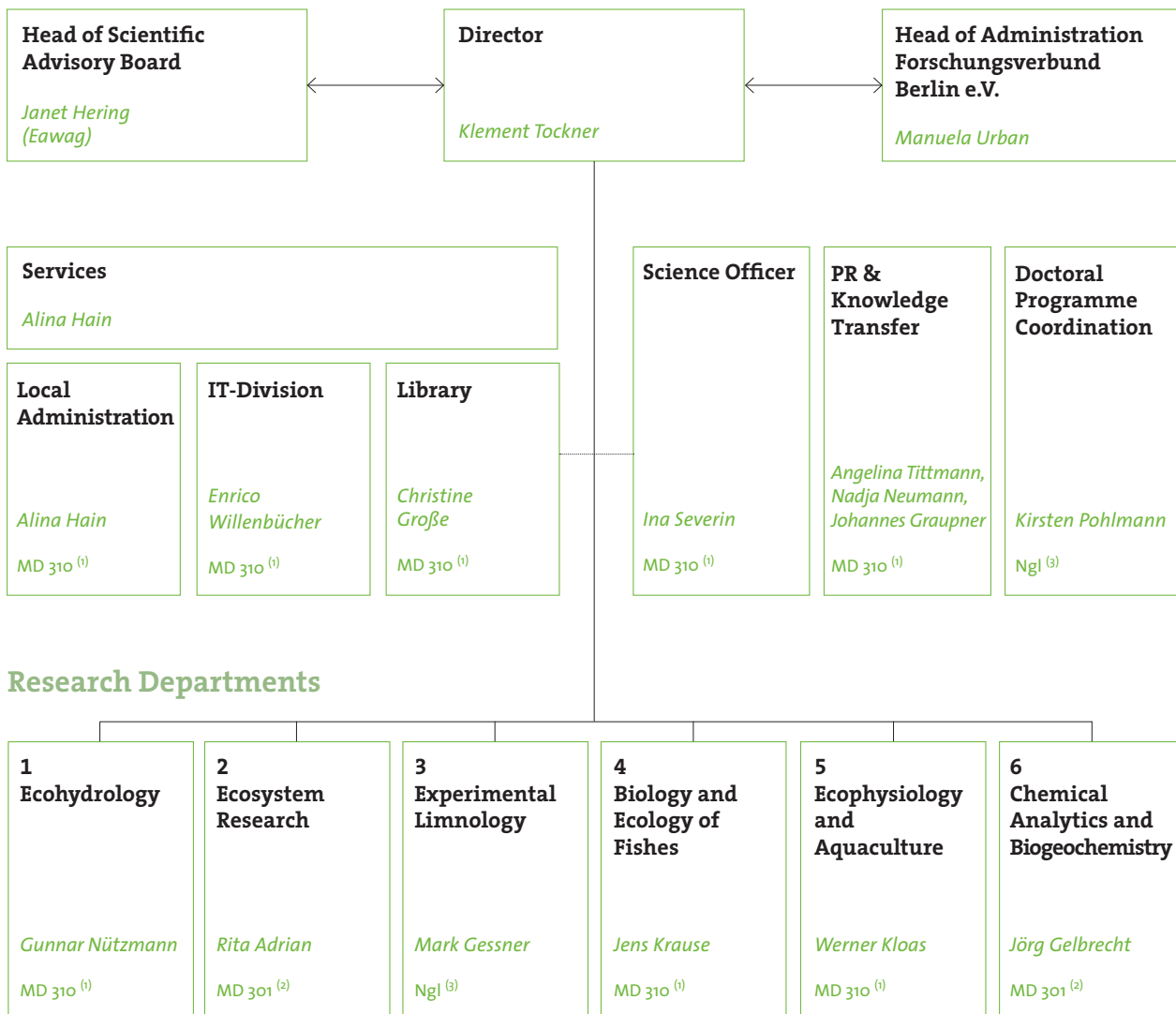
Status as of 31 December 2015



# Structure

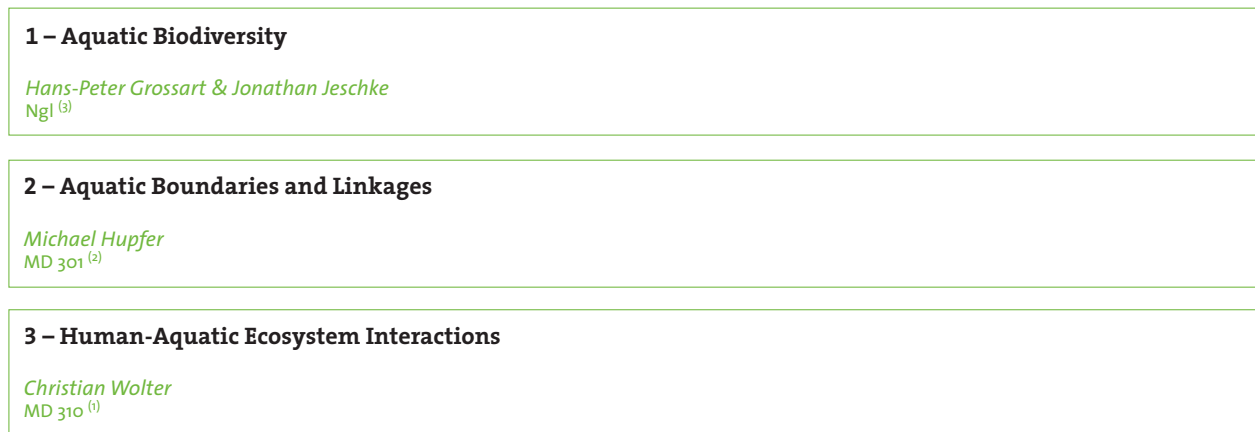
## Leibniz-Institute of Freshwater Ecology and Inland Fisheries

im Forschungsverbund Berlin e.V.



### Research Departments

### Cross-cutting Research Domains



(1) MD 310: Müggelseedamm 310, Berlin (2) MD 301: Müggelseedamm 301, Berlin (3) Ngl: Neuglobsow

# Departments

Disciplinary research is pooled in our six research departments. Hydrologists, chemists, microbiologists, limnologists, fish ecologists and fish biologists from all over the world join forces to shed light on topics from different perspectives:

## Department 1 – Ecohydrology

The overarching objective of research conducted in Department 1 is to identify fundamental physical and biogeochemical mechanisms occurring in flowing waters and lakes. We focus in particular on processes in/at aquatic interfaces and on transport and turnover between water and land. Such interfaces, or transitional zones, are particularly reactive or ecologically sensitive zones, e.g. between surface and ground water, between rivers and their riverbeds, between aquatic plants and the surrounding water, between lakes and their sediment, and even within water bodies such as in the stratification of lakes separating the epilimnion from the hypolimnion. We seek to gain a better understanding of aquatic ecosystems and to find innovative ways to manage inland waters.



**Contact:**  
**Professor Dr. Gunnar Nützmann**  
nuetzmann@igb-berlin.de

### Group Leaders:

- Dr. Franz Hölker: Light Pollution and Ecophysiology
- Dr. Jörg Lewandowski and Professor Dr. Gunnar Nützmann: Groundwater-Surface Water Interactions
- Dr. Gabriel Singer: Ecology of Stream Ecosystems
- Dr. Alexander Sukhodolov: Ecohydraulics
- Dr. Markus Venohr: Nutrient Balances in River Basins

### Associated Group Leaders:

- Dr. Georgiy Kirillin: Lake Physics

## Department 2 – Ecosystem Research

In Department 2, we investigate the effects of the trophic level, hydromorphology and climate on lake and river ecosystems, as well as their stability and long-term development. We study interactions between biotic ecosystem components (microorganisms, plankton, macrophytes, macroinvertebrates and parasites) and their physical and chemical environment as well as the key processes of physical limnology, primary production, evolution, and carbon flux. We employ techniques used in molecular biology and genomics, laboratory and field research; we exploit long-

term databases and apply statistical and deterministic models. Our research, integrated into global research on the effects of climate change and biodiversity, provides the basis for developing theoretical concepts.



**Contact:**  
**Professor Dr. Rita Adrian**  
adrian@igb-berlin.de

### Group Leaders:

- Professor Dr. Rita Adrian: Long-term Development of Lakes and Climate Impact Research
- Dr. Sabine Hilt: Ecology of Macrophytes – Aquatic-Terrestrial Coupling
- Dr. Sonja Jähnig: Global Change Effects on River Ecosystems
- Professor Dr. Jonathan Jeschke: Ecological Novelty and Theoretical Ecology
- Dr. Jan Köhler: Photosynthesis and Growth of Phytoplankton and Macrophytes
- Dr. Michael T. Monaghan: Molecular Ecology – Evolution and Biodiversity in Freshwater
- Dr. Martin T. Pusch: Functional Ecology and Management of Rivers and Lakeshores
- Professor Dr. Justyna Wolinska: Host-Parasite Coevolution

## Department 3 – Experimental Limnology

Department 3 is located north of Berlin on the shores of Lake Stechlin. We focus on assessing the consequences of global environmental change on the biodiversity and functions of aquatic ecosystems. Much of our efforts is devoted to microorganisms and processes mediated by microbial activities. In addition to investigating bacteria suspended in water and associated with sediments and organisms, we study the dynamics of algae, zooplankton, fungi and viruses. Ecological models, the analysis of long-term data and field experiments, especially in a large facility, the LakeLab in Lake Stechlin, are essential elements of the research conducted in our department. We use the knowledge gained in our research to devise concepts and methods that foster the sustainable management of lakes in the light of rapidly proceeding environmental change.



**Contact:**  
**Professor Dr. Mark Gessner**  
stechlin@igb-berlin.de

### Group Leaders:

- Dr. Stella Berger: Experimental Phytoplankton Ecology
- Dr. Peter Casper: Microbial Ecology of Sediments
- Professor Dr. Mark Gessner: Ecosystem Processes

- Professor Dr. Hans-Peter Grossart: Biodiversity and Aquatic Microbial Ecology
- Dr. Peter Kasprzak: Water Management and Zooplankton Ecology
- Dr. Jens Nejstgaard: Experimental Zooplankton Ecology
- Dr. Sabine Wollrab: Ecological Modelling

#### Department 4 – Biology and Ecology of Fishes

In Department 4, we seek to understand the ecological and evolutionary processes that structure populations and communities of freshwater fishes and affect their functions. We use this knowledge to improve the management and conservation of wild fish populations. Our work focuses on interactions between natural and anthropogenic ecological factors and their effects on the dynamics of fish populations. The methodological approaches include hypothesis-driven laboratory research, mesocosm experimentation, lake manipulation, comparative field studies and theoretical modelling.



**Contact:**  
**Professor Dr. Jens Krause**  
j.krause@igb-berlin.de

##### Group Leaders:

- Professor Dr. Robert Arlinghaus: Recreational Fisheries, Fish Ecology, Human Dimensions
- Dr. Jörn Geßner (50 percent): Reintroduction of the European Sturgeon to Germany
- Professor Dr. Jens Krause: Collective Behaviour and Social Networks
- Dr. Thomas Mehner: Evolutionary Ecology of Fish, Fish Communities and Trophic Interactions in Lakes; Linkage of Aquatic and Terrestrial Ecosystems
- Dr. Georg Staaks: Integrated Measurement and Analysis of Behavioural and Physiological Parameters of Fish
- Dr. Max Wolf: Causes and Consequences of Behavioural Types; Collective Intelligence
- Dr. Christian Wolter: Structure and Dynamics of Fish Assemblages in Large Rivers and Water-ways; River Revitalization

#### Department 5 – Ecophysiology and Aquaculture

In Department 5, we investigate the ecophysiological impacts of multiple environmental factors on aquatic vertebrates, in particular fishes and amphibians. Our goal is to create the scientific foundations for sustainable aquaculture. We seek to shed light on how biotic and abiotic factors stress or influence the various physiological functions of individual vertebrates with regard to reproduction, stress, development, growth and behaviour.



**Contact:**  
**Professor Dr. Werner Kloas**  
werner.kloas@igb-berlin.de

##### Group Leaders:

- Dr. Jörn Geßner (50 percent): Reintroduction of the European Sturgeon to Germany
- Professor Dr. Werner Kloas: Environmental Effects of Endocrine Disruptors; Aquaponik
- Dr. Klaus Knopf: Parasitology and the Immune System of Fish
- Dr. Klaus Kohlmann: Genetics and Phylogeography of Fish
- Dr. Ilka Lutz: Environmental Effects of Endocrine Disruptors
- Dr. Thomas Meinelt: Ecotoxicology in Fish – Disinfection in Aquaculture
- Dr. Sven Würtz: Fish Reproduction and Nutrition; Aquaponik

##### Associated Group Leaders:

- Dr. Matthias Stöck: Evolutionary Biology and Effects of Endocrine Disruptors on Amphibians

#### Department 6 – Analytical Chemistry and Biogeochemistry

Our research focuses on fundamental and applied research questions regarding the biogeochemical transformation of substances in aquatic interfaces (freshwater and wetlands) and of the carbon flux between terrestrial and aquatic ecosystems. This includes investigating greenhouse gas emissions from inland waters as well as developing and introducing *in situ* techniques for measuring matter flow in high temporal and/or spatial resolution. We also provide services for important parts of chemical analysis; implement measuring programmes for long-term experiments; and accompany PhD students in the analytical research involved in laboratory and field experiments.



**Contact:**  
**Dr. Jörg Gelbrecht**  
gelbr@igb-berlin.de

##### Group Leaders:

- Dr. Michael Hupfer
- Dr. Angela Krüger
- Dr. Katrin Premke
- Dr. Tobias Goldhammer (since 2016)

##### Associated Group Leaders:

- Dr. Dominik Zak



# Research Domains

Our three research domains are cross-disciplinary in nature and focus on very different thematic priorities. Within the research domains, our scientists perform cross-departmental work to explore issues with high scientific and/or societal relevance:

## Research Domain 1 – Aquatic Biodiversity

Research Domain 1 acts as a platform that enables us to systematically tackle the broad field of ‘Aquatic Biodiversity’ and develop new overarching concepts. In particular, we seek to: 1) explore genetic and species diversity on various spatial and temporal scales; 2) investigate the environmental factors that determine the structure and functions of aquatic communities; 3) improve our understanding of the structure and ecological functions of aquatic communities (biocoenosis); and 4) further develop methods and research concepts. The research domain is subdivided into the thematic areas ‘Functional Biodiversity’, ‘Genomics and Evolution’ and ‘Stress and Resilience of Ecosystems’. The aim of the research domain is to understand the mechanisms of dynamics and patterns of aquatic biodiversity on various spatial and temporal scales.



**Contact:**  
**Professor Dr. Hans-Peter Grossart**  
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**Contact:**  
**Professor Dr. Jonathan Jeschke**  
 jeschke@igb-berlin.de

## Research Domain 2 – Aquatic Boundaries and Linkages

In Research Domain 2, scientists from four departments explore the mechanisms that control the state of aquatic ecosystems and their role in matter fluxes in the landscape. In particular, our research focuses on highly reactive interfaces such as wetlands and ponds; transition zones between ground and surface water; the littoral zones of lakes; and the sediment-water interface. One important aspect of this research domain is the interdisciplinary training of young scholars achieved by initiating and managing post-graduate schools such as the International Graduate School Aqualink; the Innovative Training Network (ITN) HypoTRAIN; and the ‘Urban Water Interfaces’ Research Training Group funded by the German Research Foundation (DFG).



**Contact:**  
**Dr. Michael Hupfer**  
 hupfer@igb-berlin.de

## Research Domain 3 – Human-Aquatic Ecosystem Interactions

Waters are indispensable for meeting basic socio-economic human needs such as drinking water supply, flood protection, irrigation, inland navigation, fisheries and recreation. However, human uses often affect ecosystem functions whose importance is insufficiently known or economically underestimated in many cases. For this reason, in Research Domain 3 we investigate the (socio)ecological consequences of different human uses. Our studies on human-aquatic interactions provide an important scientific basis and recommendations for the sustainable management of rivers and lakes.



**Contact:**  
**Dr. Christian Wolter**  
 wolter@igb-berlin.de

# Scientific Advisory Board

We are extremely thankful to the members of the IGB scientific advisory board, who have supported us with their advice and involvement.

**Professor Dr. Janet Hering**

*Head of the scientific advisory board  
Eawag, Switzerland*

**Professor Dr. Gudrun Brockmann**

*Department of Animal Sciences, Humboldt-Universität zu Berlin, Germany*

**Professor Dr. Wolfgang Cramer**

*Mediterranean Institute of marine and terrestrial Biodiversity and Ecology (IMBE), France*

**Professor Dr. Peter Grathwohl**

*Hydrogeochemistry, Universität Tübingen, Germany*

**Professor Dr. Joseph Holden**

*School of Geography, University of Leeds, UK*

**Professor Dr. Patrick Hostert**

*Geography Department/Geomatics Lab, Humboldt-Universität zu Berlin, Germany*

**Professor Dr. Otomar Linhart**

*Department of Fish Genetics and Breeding, Research Institute of Fish Culture and Hydrobiology Vodnany, Czech Republic*

**Professor Dr. Margaret Palmer**

*National Socio-Environmental Synthesis Center (SESYNC), USA*

**Professor Dr. Roland Psenner**

*Institute of Ecology, Universität Innsbruck, Austria*

**Professor Dr. Rüdiger Schulz**

*Department of Biology, Utrecht University, The Netherlands*

**Professor Dr. Karen Wiltshire**

*Biol. Station Helgoland & Wadden Sea Station, Alfred-Wegener-Institute for Polar and Marine Research, Germany*

# Employee Representatives

**Workers' Council**

Christof Engelhardt (Chair)  
Marén Lentz (Vice-Chair)  
Kerstin Schäricke, Georg Staaks, Thomas Hintze,  
Sascha Behrens, Viola Schöning

**Ombudsmen**

Michael Hupfer  
Thomas Mehner (since December 2015)

**Equal Opportunity Commissioners**

Angela Krüger  
Stefanie Burkert

**Doctoral Student Representatives  
(during 2015)**

Nina Ullrich, Fabian Schäfer, Jonas Keitel  
Pascal Bodmer, Maja Grubisic, Therese Kettner  
Federico Castro Monzón, Robert Taube, Susanne Stephan

**Postdoc Representatives**

Arne Schröder  
Marie-Pierre Gosselin  
Andreas Jechow  
Björn Hermelink

# Publications

## Journal contributions

### Peer-reviewed publications with impact factor

- Alos J, Palmer M, Trias P, Diaz-Gil C, Arlinghaus R (2015) Recreational angling intensity correlates with alteration of vulnerability to fishing in a carnivorous coastal fish species. *Canadian Journal of Fisheries and Aquatic Sciences* 72 (2): 217-225
- Alos J, Puiggros A, Diaz-Gil C, Palmer M, Rossello R, Arlinghaus R (2015) Empirical evidence for species-specific export of fish naïveté from a no-take marine protected area in a coastal recreational hook and line fishery. *PLoS One* 10 (8): e0135348
- Altschuh J, Lenoir D, Rehfeldt F, Brüggemann R (2015) Applicability domain of nonlinear property-property relationships - example: estimation of vapour pressure. *Match - Communications in Mathematical and in Computer Chemistry* 73 (2): 303-326
- Andersen T, Baranov V A, Goral T, Langton P H, Perkovsky E E, Sykes D (2015) First record of a chironomidae pupa in amber. *Geobios* 48 (4): 281-286
- Annoni P, Brüggemann R, Carlsen L (2015) A multidimensional view on poverty in the European Union by partial order theory. *Journal of Applied Statistics* 42 (3): 533-554
- Apio A, Umuntunundi P, Lerp H, Bierbach D, Plath M, Wronski T (2015) Persistence of two small antelope species in the degraded Mutara rangelands (Akagera ecosystem) based on pastoralists' and farmers' perceptions. *Human Ecology* 43 (4): 613-620
- Arce M I, Sanchez-Montoya M M, Gomez R (2015) Nitrogen processing following experimental sediment rewetting in isolated pools in an agricultural stream of a semiarid region. *Ecological Engineering* 77: 233-241
- Arlinghaus R, Tillner R, Bork M (2015) Explaining participation rates in recreational fishing across industrialised countries. *Fisheries Management and Ecology* 22 (1): 45-55
- Attermeyer K, Tittel J, Allgaier M, Frindt K, Wurzbacher C M, Hilt S, Kamjunke N, Grossart H-P (2015) Effects of light and autochthonous carbon additions on microbial turnover of allochthonous organic carbon and community composition. *Microbial Ecology* 69 (2): 361-371
- Baho D L, Tavşanoğlu Ü N, Sorf M, Stefanidis K, Drakare S, Scharfenberger U, Agasild H, Beklioglu M, Hejzlar J, Adrian R, Papastergiadou E, Zingel P, Sondergaard M, Jeppesen E, Angeler D G (2015) Macroecological patterns of resilience inferred from a multinational, synchronised experiment. *Sustainability* 7 (2): 1142-1160
- Baktoft H, Zajicek P, Klefoth T, Svendsen J C, Jacobsen L, Pedersen M W, Morla D M, Skov C, Nakayama S, Arlinghaus R (2015) Performance assessment of two whole-lake acoustic positional telemetry systems: Is reality mining of free-ranging aquatic animals technologically possible?. *PLoS One* 10 (5): e0126534
- Baranov V A, Andersen T, Perkovsky E E (2015) Orthocladids from Eocene amber from Sakhalin (Diptera: Chironomidae, Orthoclaadiinae). *Insect Systematics and Evolution* 46 (4): 359-378
- Beardmore B, Hunt I M, Haider W, Dorow M, Arlinghaus R (2015) Effectively managing angler satisfaction in recreational fisheries understanding the fish species and the anglers. *Canadian Journal of Fisheries and Aquatic Sciences* 72 (4): 500-513
- Behrendt U, Augustin J, Spröer C, Gelbrecht J, Schumann P, Ulrich A (2015) Taxonomic characterisation of *Proteus terrae* sp. nov., a N<sub>2</sub>O-producing, nitrate-ammonifying soil bacterium. *Antonie van Leeuwenhoek* 108 (6): 1457-1468
- Betto-Colliard C, Sermier R, Litvinchuk S N, Perrin N, Stöck M (2015) Origin and genome evolution of polyploid green toads in Central Asia: evidence from microsatellite markers. *Heredity* 114 (3): 300-308
- Bierbach D, Sommer-Trembo C, Hanisch J, Wolf M, Plath M (2015) Personality affects mate choice: bolder males show stronger audience effects under high competition. *Behavioral Ecology* 26 (5): 1314-1325
- Bizic-Ionescu M, Zeder M, Ionescu D, Orlic S, Fuchs B M, Grossart H-P, Amann R (2015) Comparison of bacterial communities on limnic versus coastal marine particles reveals profound differences in colonization. *Environmental Microbiology* 17 (10): 3500-3514
- Blumstock M, Tetzlaff D, Malcom I A, Nützmann G, Soulsby C (2015) Baseflow dynamics: multi-tracer surveys to assess variable groundwater contributions to montane streams under low flows. *Journal of Hydrology* 527: 1021-1033
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In our Annual Report we share the outstanding performance, the many achievements and the latest developments of our Institute in the past year. To find out more, please visit our website or contact us directly at:

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We look forward to your visit!

## Imprint

Our thanks go to all colleagues who contributed to this Annual Report and gave us their support!

Leibniz-Institute of Freshwater Ecology and Inland Fisheries (IGB)  
**Responsible according to the German Press Law:** Klement Tockner, Manuela Urban  
**Editorial staff:** Angelina Tittmann  
**Translated by:** Teresa Gehrs, Lingua Connect

Unless otherwise stated, images are © IGB

**Design:** Stephen Ruebsam, unicom Werbeagentur GmbH;  
infographic Jana Eger/unicom

**Printed by:** Spree Druck Berlin GmbH  
Printed on 100 % recycled paper 'EnviroTop'  
with the Blue Angel label

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*In our citizen science project "Tatort Gewässer – dem CO<sub>2</sub> auf der Spur", more than 700 citizens adopted the role of carbon investigators. Together, they sampled rivers, lakes and ponds throughout the country. (► Page 28)*