

Water of life and the life in water

Professor Klement Tockner, Director of the Leibniz-Institute of Freshwater Ecology and Inland Fisheries (IGB) in Germany, outlines the EU-funded BioFresh project, of which he is coordinator

What are the aims and objectives of BioFresh and where is this project placed in comparison to pre-existing research?

BioFresh is the first major international project to focus explicitly on freshwater biodiversity – a severely threatened component of global biodiversity that has been neglected in science and policy. One of the main aims of the project is to develop an open access freshwater biodiversity platform to connect global and regional databases, which are currently widely dispersed and largely inaccessible. BioFresh is linking up data and expertise located nationally to create a gear change in our ability both to ask and answer critical policy questions. One vision of the project is the development of a digital, interactive global freshwater biodiversity atlas that will serve as a pivotal information source for scientists, managers, policy specialists, consultants and the public.

Why is an integrated and accessible database considered vital in establishing effective plans for conservation and developing a better understanding of the services provided by aquatic ecosystems?

The integrated and accessible datasets provided by BioFresh will help identify freshwater biodiversity priority areas and enable future conservation and restoration planning priorities to be set at global, European, and local scales. It will be frequently updated, quality-controlled, and freely accessible. In the recent review of the work of the Intergovernmental Panel on Climate Change (IPCC) and the gap-analysis conducted for the new Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES), accessibility to the data used in its assessments was identified as a key issue; BioFresh will be instrumental in overcoming this.

BioFresh integrates the competencies and expertise of 19 research institutions. How important is cooperation in addressing freshwater biodiversity?

BioFresh can be considered a virtual international freshwater biodiversity institute that integrates the expertise of database

managers, dissemination experts, ecologists, conservationists, modellers, and biodiversity scientists. In addition, it is integrated into large global networks and initiatives outside the project consortium such as DIVERSITAS, LIFEWATCH, and GEO-BON (Biodiversity Observation Network). We are also developing links with NGOs who are interested and active in the area of freshwater biodiversity, including Wetlands International, WWF, and the Nature Conservancy. The challenging aims of BioFresh can only be achieved through international and cross-disciplinary cooperation.



How difficult is collaboration that encompasses a number of countries?

A key challenge is promoting access to data, and fortunately more and more scientists and organisations are becoming aware that publishing not only research results, but also the basic data underpinning these results, stimulates and supports their own research. Without a successful communication and dissemination strategy the impact of the research would be severely diminished.

What is BioFresh doing to prevent biodiversity loss?

While BioFresh itself can hardly be expected to prevent further biodiversity loss – at least in the short-term – it will greatly improve our capacity to collaboratively frame new

and emerging issues for policy, support the implementation of conservation and water management strategies, and track and model trends changes in freshwater biodiversity. It will highlight those processes which most threaten freshwater biodiversity and make these findings available for direct input to development and conservation planning. In this way the outputs will help planners and decision makers to minimise current and future impacts on freshwater species.

Is Biofresh concerned exclusively with the conservation of freshwater ecosystems in the EU, or does its outlook extend beyond these parameters?

BioFresh does not focus exclusively on conservation. A key goal of the project is to understand past and contemporary alterations in genetics, species, and landscape diversity, as well as to study the formation of novel communities that have no common evolutionary history. While Europe remains our major focus, the project has a much wider global ambition that incorporates data from all over the world.

The target set down by the Convention for Biological Diversity for reducing biodiversity loss by 2010 has not been met. How significant is this and what do you believe ought to be done to tackle the issue more effectively?

It was clear from the beginning that the 2010 targets could only be met through a massive investment in restoration and conservation efforts. Unfortunately, recent findings suggest that the overall rate of biodiversity loss does not appear to be slowing and that the pressures on biodiversity are continuing to increase. However, it is now well accepted that there are ecological, economic and ethical reasons for conserving biodiversity. The failure to meet the 2010 targets has served to increase policy and public awareness regarding the urgency of the global biodiversity crisis, and has underlined the need for effective, scientifically informed conservation strategies. BioFresh will support these needs and ensure that freshwater biodiversity gains the prominence it deserves in future policy.

Fresh ideas about biodiversity data

BioFresh is a 'virtual institution' that links up important freshwater biodiversity data from 19 partner organisations in a project that could potentially have a huge impact on research and policy issues

OFTEN TAKEN FOR GRANTED, freshwaters are immensely diverse habitats – covering only 1 per cent of the earth's surface, they provide the habitats of over 10 per cent of all animals and over 35 per cent of all vertebrates. Up until now, more than 125,000 freshwater animals have been described; even in a small mountain brook the number of macroscopic species can exceed 1,000. While fish and amphibians have been well documented at continental and global scales, little is known about the diversity and distribution of, for example, freshwater parasites, arthropod groups, and micro-organisms – organisms which although small, are far from insignificant to ecosystems. Moreover, much of the available data on freshwater biodiversity is scattered and not linked up. The BioFresh initiative, under the supervision of Professor Klement Tockner and Dr Jörg Freyhof at the Leibniz Institute, Berlin, hopes to address this problem. An EU-funded project bringing together 18 other institutional partners, BioFresh hopes to map the distributions of many freshwater species and to make the results of these efforts publicly available through the digital BioFresh portal.

POPULATIONS UNDER THREAT

No other major component of global biodiversity is declining at as fast a rate as freshwater species and ecosystems. Between 1970 and 2000, populations of more than 300 selected freshwater species declined by around 55 per cent while those of terrestrial and marine systems each declined by around 32 per cent.

Demographic development, economic growth and climate change will all increase the pressure on freshwater resources through a number of major drivers, such as habitat fragmentation, eutrophication and habitat loss. Changes in water management methods are needed, as Tockner explains: "We need to move from a state of competition for water between different sectors (i.e. agriculture, industry, domestic, ecosystems) to one of synergy". A key challenge for scientists is to quantify the water demands a freshwater body can withstand if it is to sustain its biodiversity and related ecosystem functions.

This needs to be considered in terms of the quality of water in a body, as well as the volume or quantities present.

BRINGING FRESHWATERS TO THE FORE

Despite their pivotal ecological and economic importance, freshwater ecosystems have not been of primary concern in policy making; until now there has been a lack of reliable data to demonstrate the changes taking place in biodiversity, particularly in the field of freshwater ecosystems. Efforts to address the loss of biodiversity need to be substantially strengthened, the economic value of biodiversity needs to be adequately incorporated into decision making, and there needs to be sufficient targeting, funding and implementation of policies to tackle biodiversity loss.

NEW NETWORKS AND INFRASTRUCTURE

BioFresh is one of a number of new science infrastructure projects that will provide more definitive, independent and credible scientific input into environmental policy. As part of a network including initiatives such as the Global Biodiversity Information Framework (GBIF, www.gbif.org) and LifeWatch (www.lifewatch.eu), BioFresh will support the newly created Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES, www.ipbes.net), and significantly enhance the evidence-base used to support the development of EU and international policies.

BioFresh will add tremendous value to the output of previous projects by making data and models available for wider application and for integration with other related outputs. The BioFresh portal will create a knowledge base greater than the sum of its parts; it will offer new analysis of freshwater biodiversity data, integrate this data with other relevant policy areas, and generate a greater public profile of freshwater biodiversity and the ecosystems upon which we rely. This is especially relevant because a key outcome of the International Year of Biodiversity will be the framing of post-2010 biodiversity strategies.

AN INTEGRATED APPROACH

The efficiency of the management and conservation of freshwater ecosystems is measured through policy-relevant indicators, most of which are complex, composite measures taking into account data from various sources. Providing access to such data will improve the precision and transparency of the indicators, and will also facilitate regular updates.

Information will be compiled and collated in the BioFresh Portal – a pivotal tool for scientists, managers and the wider public, from which trends, pressures, and conservation priorities will be identified. It will assist in the fulfilment of BioFresh's remit, which aims at:

- Better identification of the geographical distribution of species at different scales and areas where biodiversity is threatened
- Better monitoring of the state of freshwater biodiversity by providing snapshots through time, making early warning of any potential problems
- Assessments of the ability of existing and future Protected Area (PA) networks to support and protect freshwater species (which are rarely prioritised)
- The definition of global and regional concentrations of biodiversity richness and endemism to identify priority areas for conservation and to evaluate the spatial congruence of these 'hotspots' between taxonomic classes



INTELLIGENCE

BIOFRESH - BIODIVERSITY OF FRESHWATER ECOSYSTEMS

OBJECTIVES

BioFresh is an EU-funded international project that aims to build a global information platform for scientists and ecosystem managers with access to all available databases describing the distribution, status and trends of global freshwater biodiversity.

PARTNERS

- **Forschungsverbund Berlin**, e. V. FVB.IGB, Germany
- **Royal Belgian Institute of Natural Sciences**, RBINS, Belgium
- **Universität für Bodenkultur Wien**, BOKU, Austria
- **WorldFish Center (formerly ICLARM)**, WorldFish, Malaysia
- **Institute de Recherche pour le Développement IRD**, France
- **Universität Duisburg-Essen**, UDE, Germany
- **The International Union for Conservation of Nature**, IUCN, Switzerland
- **University of Oxford**, UOXF.AC, UK
- **Universitat de Barcelona**, UB, Spain
- **Helmholtz Zentrum für Umweltforschung**, UFZ, Germany
- **University College of London**, UCL, UK
- **Eidgenössische Anstalt für Wasserversorgung**, Abwasserreinigung und Gewässerschutz, EAWAG, Switzerland
- **Université Claude Bernard - Lyon 1**, UCBL, France
- **Université Paul Sabatier - Toulouse 3**, UPS, France
- **Ecologic GmbH**, Institut für Internationale und Europäische Umweltpolitik, Ecologic, Germany
- **Commission of the European Communities - Directorate General Joint Research Centre**, EC-JRC, Italy
- **University of Debrecen**, UD, Hungary
- **Naturhistoriska riksmuseet**, NRM, Sweden
- **Center za kartografijo favne in flore**, CKFF, Slovenia

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Biofresh coordinator **Klement Tockner** gained a PhD in limnology at the University of Vienna. He is titular Professor at ETH Zurich, Professor for aquatic ecology at FU Berlin and Director of the Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Berlin. He is Editor-in-chief of the journal *Aquatic Sciences*. His research focus is on biodiversity and landscape ecology.

MANAGING THE NETWORK

Administering a project the size of BioFresh is a considerable challenge. But as Tockner affirms, he and the participating institutions of BioFresh are more than adept at doing so: "Most partners involved in BioFresh have long-standing experience in collaborating within large international projects," he says. While maintaining positive internal communications between such a large number of partners and ensuring that information is passed to the various audiences of the project is a challenge, it is also key to the project's success.

RAISING AWARENESS

As endorsed in the UN's International Year of Biodiversity initiative, BioFresh is very focused on knowledge-sharing; about a third of its resources are devoted to raising awareness and improving education. In this regard, it endeavours to engage people more widely on the issues and processes of science-policy interface. BioFresh wants to move beyond a model of environmental policy developed by a small community of government policy makers, NGO advocates and scientists; it seeks to provide communication tools that will enable the emergence of more eclectic networks active in the sphere of freshwater biodiversity. The state of freshwater ecosystems is important to a wide range of stakeholders; as such, ways of securing their involvement

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in discussions and debates on future policy need to be sought. In this regard, BioFresh faces the challenge of engaging those sectors and stakeholders not normally involved in conservation issues – in particular the private sector, the development sector and major recreational groups such as fishermen.

LOOKING FORWARD

Freshwater is not just a resource for agriculture, industry, and the energy sector. Its beauty and diversity enriches culture and provides more ecosystem services than any other terrestrial or marine ecosystem type. Once scientific information is made freely available through the BioFresh portal and is channelled to those responsible for water protection, it will be easier for conservation planners to target conservation efforts effectively and to monitor the impacts of management interventions.

BioFresh will be an important tool for the new UN organisation IPBES (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services), which will conduct periodic assessments of diversity of life on earth and its ecosystem services. Tockner hopes that BioFresh will serve as an important nucleus for further activities in research and awareness-raising, as well as in bridging scattered disciplines such as science and art. He surmises: "I expect that the impact of Biofresh will go far beyond the scientific community".

