Robert Arlinghaus at the Leibniz-Institute of Freshwater Ecology and Inland Fisheries and Humboldt-Universität zu Berlin, describes the research activities of his group

The Division of Integrative Fisheries Management is a research and teaching lab affiliated with three organizations - the Faculty of Life Sciences at Humboldt-Universität in Berlin, the Integrative Research Institute on Transformations of Human-Environment Systems – a transdisciplinary research centre created via the German excellence initiative at Humboldt-Universität in Berlin, and the non-university research institute the Leibniz Institute of Freshwater Ecology and Inland Fisheries within the Department of Biology and Ecology of Fishes.

The lab currently consists of 26 post-docs, graduate and undergraduate students as well as interns and student assistants, representing multiple nationalities such as USA, India, Canada, Argentina, France, Spain, Portugal, Vietnam, and ... Bavaria. We pursue an inter- and transdisciplinary research program in sustainability science aimed at understanding the social, economic, biological, ecological, evolutionary and institutional dimensions of freshwater and coastal fisheries. The lab is perhaps best known for our social-ecological work on recreational fisheries.

The goal of the group is to generate robust scientific insights on which to base recommendations for sustainable fisheries management. Research results are embedded in the teaching we do within the masters programme of Fish Biology, Fisheries and Aquaculture at Humboldt-Universität, which prepares tomorrow's fisheries managers to meet the complex challenges inherent in the governance and management of capture fisheries. Close contact is maintained to the "real world" as the team collaborates, whenever possible, with fishing associations and clubs, fisheries agencies and nature conservation groups and other stakeholders. Public outreach and science communication outside academia is an integral component of our work.

We conceptualize recreational fisheries as a coupled social-ecological system where anglers, managers, fish stocks and aquatic ecosystems strongly interact. To understand the complexity of the resulting interactions and the outcomes, together with our collaborators we apply a range of methods from fisheries biology, ecology, evolution and applied social and economic sciences. The cornerstone of our work is analysing the interactions and feedbacks of anglers and fish stocks in freshwater landscapes. We particularly emphasize the human side of the complex interaction by developing empirical models of angler behaviour and integrating them with fish population models. More recently, we have engaged in multi-national survey research among the wider public to better understand how the public perceives fisheries issues and to examine how social values affect contemporary fisheries management.

To fully understand fisheries systems, there is a need to integrate different scientific disciplines as well as science and society to arrive at robust conclusions for sustainable fisheries management. Accordingly, our work is informed by a range of theories, including those deriving from evolutionary biology, population ecology, behavioural ecology, economic theory, social-psychology, common pool resource theory, resilience theory and new institutional economics. Together with our collaborators we apply classical fisheries biological methods, but also more modern tools, such as high resolution biotelemetry, ➤

Sampling with anglers

experimental evolution, eco-genetic modelling, applied social sciences, in particular survey-based research (face-to-face, mail, telephone, online), choice experiments, behavioural modelling and integrated bio-economic modelling.

We particularly favour whole-lake experiments, to learn about the reaction to interventions of entire communities, including anglers. For example, in past projects we have conduced active adaptive management experiments using stocking or shoreline habitat enhancement in replicated lakes over multiple years, to better understand how entire systems respond to large-scale interventions. We work across scales and look at the adaptive dynamics of different biological and social-ecological levels of organization, scaling up from individuals to populations in single ecosystems up to the landscape level accounting for regionally mobile anglers and institutional dynamics. We also have ample experience with participatory research in workshop settings with anglers and continue to apply participatory methods in multi-year studies aiming at co-developing knowledge about sustainable fisheries together with stakeholders.

We prefer to work on questions that are of practical interest. These questions we want to answer with scientific methods to produce high quality publications, while leaving a legacy in local and regional fisheries management or in social discourses. The most important current projects pursued by our lab tackle the following topics:

- Analysing the effectiveness and outcomes of fisheries management actions, such as stocking, habitat enhancement or harvest regulations, on fish communities, biodiversity and fisheries
- Tipping points and regime shift dynamics and the role of dynamic fisher behaviour in both inland and coastal fisheries
- Spatial ecology of top predatory fish and their responses to harvesting in coastal fisheries
- The importance of body size for fisheries and population renewal
- Recreation ecology and the impact of recreational fisheries on ecosystems and society
- High resolution behavioural ecology of fishes and their responses to harvesting
- Fisheries-induced evolution, specifically the question whether recreational fishing selected for shy fishes
- Normative dimensions of fisheries and the “movement ecology” of anglers and fishers
- Efficacy of pedagogical interventions on anglers and water managers
- Public perceptions of fisheries and biodiversity conservation

Besides empirical research, we also engage in projects dealing with questions of synthetic environmental evidence. For example, in one current project we are evaluating the biodiversity impacts of recreational fisheries across multiple levels of biological organization. In another, more social science oriented project, we have summarized all drivers of the well-being and satisfaction of anglers and we are looking at the systematic impact of fish size on the productivity of global fish stocks.

Besides doing our own research, we also serve the scientific community as Editors of international and national journals, specifically *Fish and Fisheries* and the *Zeitschrift für Fischerei* (Journal of Fisheries). If you are interested in studying questions of applied fish biology and fisheries at the interface of ecological and social sciences, please have a look at www.ifishman.de and drop us a line. We might bite. And if you want further information, you are welcome to check out our social media channels featured under ifishman.science at Youtube, Facebook and Instagram as well as Twitter (RArlinghausFish).

Dr. Félicie Dhellemmes records data on captured, tagged and released northern pike that are equipped with transmitters to study local adaptation and homing in the Baltic lagoon ecosystem around Rügen