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SESSION 6
MAINTAINING AND ENHANCING EUROPEAN BIODIVERSITY

Fish mesohabitat characteristics in Austrian lowland rivers

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ABOUT THE PROJECT

Climate scenarios of the IPCC (1) for the Central European area expect that the climate will warm up in all seasons. Global warming has already shown impacts on European freshwater ecosystems and the services they provide to humans. Main goal of the project is to understand and define the mitigation effect of riparian vegetation to benthic invertebrate and fish communities against adverse effects. Our task is to assess the habitat use characterisation for key fish species and their life stages. This should give a valuable contribution to support river managers in sustainable river restoration towards climate change adaptation, ecological services and socio-economic consequences.

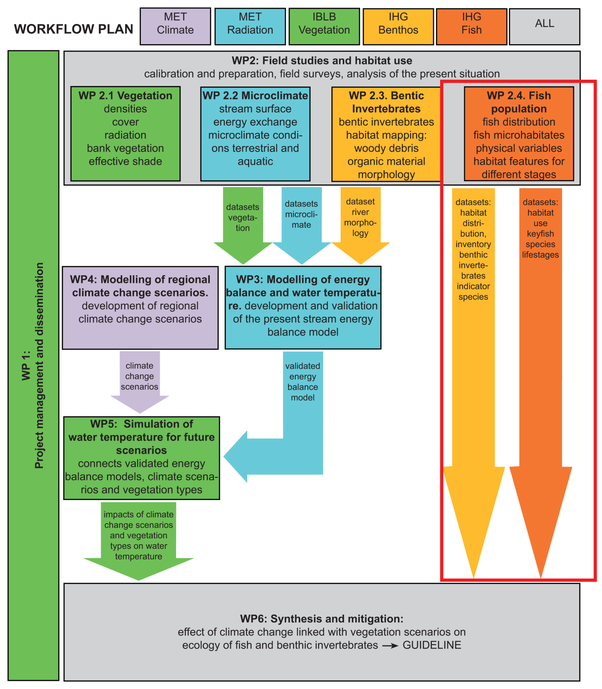

Figure 1: Project workflow plan including all work-packages. Timeframe: April 2012 - March 2015.

STUDY SITE & METHODOLOGY

The study is conducted at two rivers in the "Hungarian Plains" ecoregion, Austria, i.e. Lafnitz and Pinka. This lowland region is subject to the highest future temperature increase in Austria (2 - 2.5°C until 2040) (5).

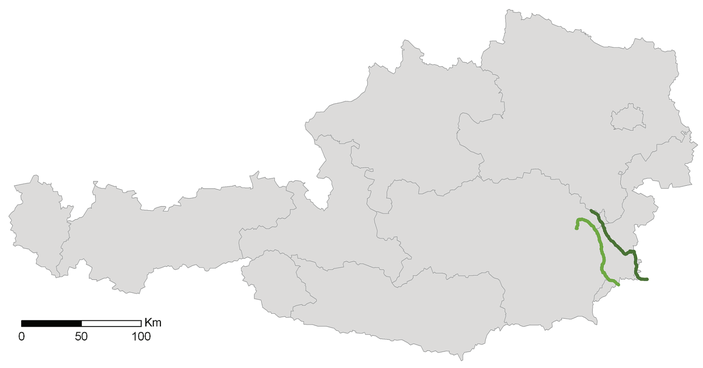

Figure 2: Location of the study site. Pinka on the left, Lafnitz on the right.

- Representative sites will be surveyed to describe the available habitat distribution. The following abiotic parameters are measured: depth, flow velocity, distance from bank, substrate type, temperature, shading, visibility- and current cover.
- Electrofishing should provide sufficient data about habitat use and biomass / abundance of the fish community, especially the key species nase and grayling.
- Descriptive statistical analyses (univariate statistics)
- Multivariate statistical analyses explaining habitat quality and quantity
- Existing data is integrated into analyses

Processes which structure fish assemblages are closely linked to water temperature (fig. 3). Preliminary projects (2,3) showed that a significant increase of water temperature within the last 30 years has happened and is likely to cause increasing pressure on fish assemblages in future scenarios.

Objectives are:
(1) determine habitat use of different fish species
(2) identify abiotic habitat variables as basic requirements
(3) investigate the explanatory power of shading, water temperature and radiation in characterising fish habitat.

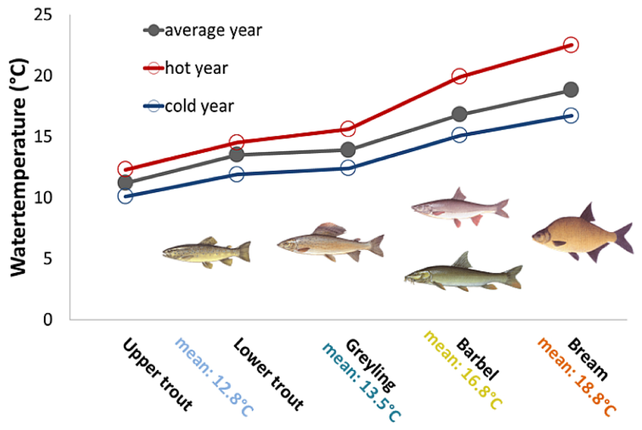

Figure 3: Fishzones and their correlation with temperature. Increasing temperature might initiate a shift of fish zones and result in stress, especially for cold-stenoecous species (3).
Data: HZB, IHG, KIS, BAW Scharfling

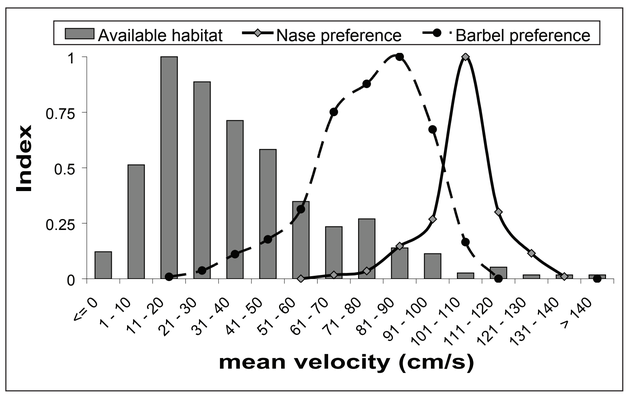

Figure 4: Utility curves of nase and barbel for flow velocity in the river Pielach, Lower Austria. Note the difference between preferred and available velocities (4).

RESULTS

First results have unveiled significant differences between the two rivers concerning main abiotic parameters.

Modelling habitat preference by logistic regression allows to calculate the potential available habitat for different fishes- and life stages. Figure 5 shows that both Lafnitz and Pinka serve only very limited habitat for Grayling. Both rivers provide habiatats for spawning of Barbel and Nase but juvenile habitats are limited, especially for Barbel resulting in a possible loss of recruitment for that species.

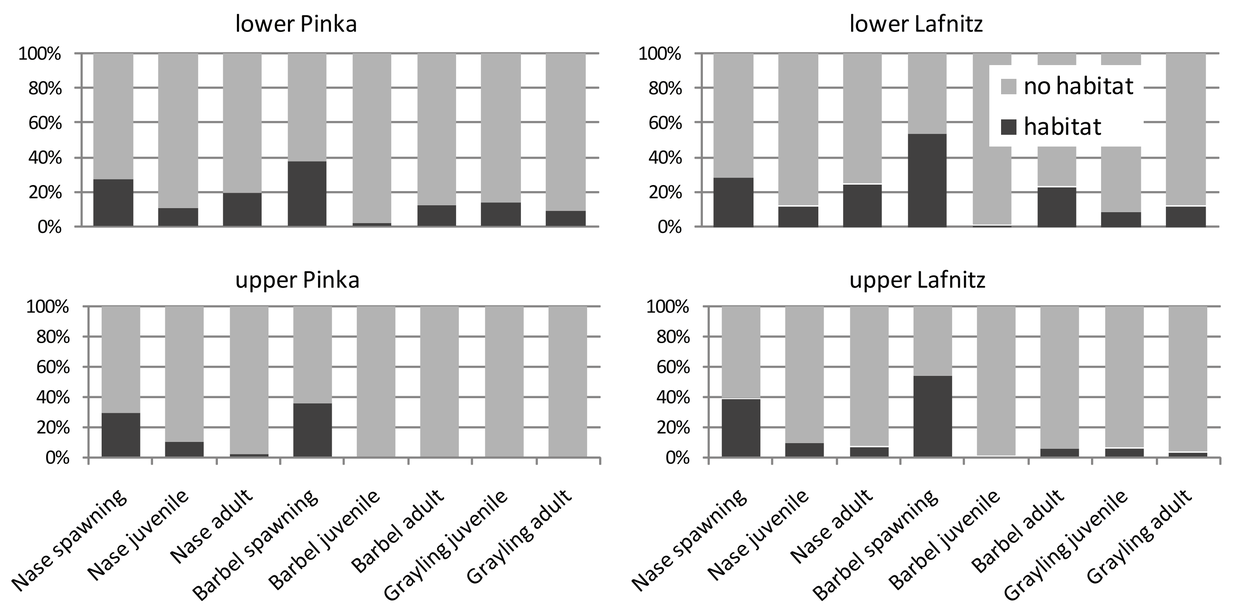

Figure 5: Potential habitat for selected species in the Lafnitz and Pinka divided into lower and upper reaches.

DISCUSSION

Temperature is a crucial factor determining the habitat useage of fish. Increasing temperature in combination may result in the loss of suitable environment for certain species and further in a decrease of biodiversity. We expect that riverstreches with a high amount of shading are more likely to buffer the expected temperature increase caused by climate change.

Suitable habitat for all life stages is essential in maintaining healthy fish stocks. Statistical tools such as logistic regression, Answer-tree or clustering methods can help to identify the typical and atypical habitats of fishes and furthermore contribute to restoration measures aiming at fish populations

1.: J. Almaco et al., Europe - Climate Change, 541-580, 2007
2.: C. Matulla et al., J Biometerology, 52, 2, 2007
3.: A. Melcher et al., ÖWAV, 135-144, 2010
4.: A. Melcher & S. Schmutz, River Systems Vol. 19/1, 2010
5.: H. Formayer et al., Proj. StartClim2004, 2009