Fish ecological investigation of anthropogenic shore line structures in the impoundment of the run-of-river power station at the Danube in the heart of Vienna

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General thematic

In the last 150 years many heavy impacts by river regulations are been done in the Danube, e.g. river and river bed straightening, bank stabilisation, flood controlling constructions, shipping, run-of-river power station…Due to this many river engineering works at the Austrian Danube system, the river system in the Vienna area is heavily modified relating to morphological, hydrological and ecological components. This abovementioned works has a large-scale influence at the fish faunal elements of the Danube in this area.

The construction of the run-of-river power station "Kraftwerk Wien/Freudenau" was the last large river engineering works at the Austrian Danube (Figure 1). In the course of the construction of the power station several compensatory measures are been done. The previously straight shoreline of the Danube Island was reconstructed by creating backwaters, coves, gravel banks and pools. Nine different shore line structures and one gravel bank at the head of the impoundment are been constructed on the left bank of the Danube. For the verification of the fish ecological integrity of the shore line structures, fish sampling and afterwards multivariate analyses has to be done. The results of this investigation give us important basic information about the management of such habitats in a large "heavily modified" river like the Austrian Danube. These are very important for the implementation of the Water Framework Directive (WFD) (European Commision, 2000).

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Figure 1: Location of the impoundment "KW Wien / Freudenau" in Vienna; Austria:

Methods

Due to their selectivity different fishing methods are used in this project, e.g. electro fishing, long lining, beach seining and air lift fishing (Moser, 2001; Reiter 2001). For comparing the different shore line structures, electro fishing by boat (Muus & Dahlstöm, 1974) and beach seining are the two selected main sampling methods.

For comparing the different samples, catch per unit effort data (CPUE Ricker, 1975) were calculated. We had selected two different CPUE (Ricker, 1975) units for the two different sampling methods:

Electro fishing: n $(10\ min)^{-1}$ fishing activity

Beach seining: n $(100\ m^2)^{-1}$ sampling area

Further multivariate analyses were done with the statistical Software package SPSS, e.g. Cluster- and Discriminat analysis.

Results

In the sampling period 2003 and 2004 with these two main sampling methods (electro fishing and beach seining) a total number of 9695 individuals of 37 fish species were proven. As dominating fish species Bleak (*Alburnus alburnus*) and Roach (*Rutilus rutilus*) are to be called.

The Impoundment can be classified into three sections on basis of different fish communities. These are the results from the hierarchical Cluster- und Discriminant analyses which were done with the SPSS software package. The sections can be described as head of the impoundment, transition zone and central part of the impoundment. This is

the same like the hydraulic classification for an impoundment of a typical run-of-river power plant.

The head of the impoundment is characterised by the rheophilic fish species. Nase (*Chondrostoma nasus*) is to be called as an important fish species. A high number of juvenile and sub adult individuals were caught at the new constructed gravel bank. Nase (Condrostoma nasus) is one of the typical rheophilic fish species in the Austrian part of the Danube.

The transisition zone is dominated by the eurytopic fish guild. Additional ones rheophilic and a low number of stagnophilic elements can be pointed out. Roach (Rutilus rutilus) is the dominating fish species in this part of the impoundment.

Due to the occurrence of macrophytes in the shore line habitats of the central part, individuals of the stagnophilic fish guild, e.g. Tench (*Tinca tinca*), Bitterling (*Rhodeus sericeus*)…were proven. In addition these habitats are used from different juvenile and sub adult individuals of the rheophilic fish guild.

On basis of the results of the sampling period 2003 and 2004 the importance of such shore line structures in an impoundment can be shown. The investigated habitats are very important especially for juveniles and sub adult individuals of the rheophilic fish guild. Habitats for individuals of this fish guild (typical "river fish species") are very rare in such modified rivers like the Austrian Danube.

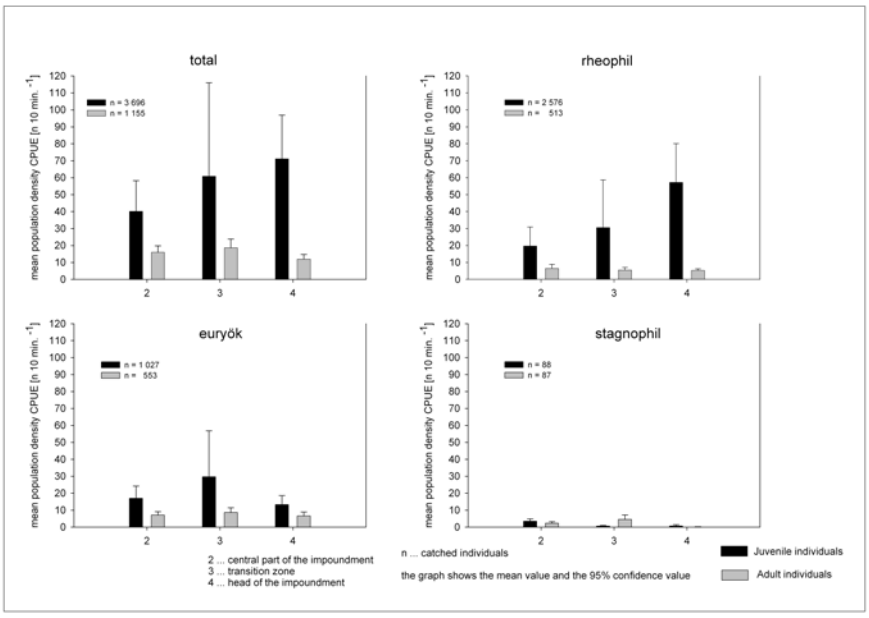

Figure 2: Comparison of the density the different fish guilds in the three sections of the impoundment

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