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FISH MIGRATION UPSTREAM THE WEIR PLACED NEAR THE FERDINAND BRIDGE OF ORADEA CITY

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Abstract

The paper deals with an European theme of great interest, whose issue is related to longitudinal connectivity interruption of heavily modified water courses and improving the ecological status of damaged lotic systems, having as goal achieving the environmental objectives, set by the Water Framework Directive. In this respect, it is necessary to propose viable solutions for longitudinal connectivity restoration of water courses that lead to facilitate fish migration and improving their ecological potential. The aim of this work was to propose a technical solution for fish migration upstream the weir, placed near the Ferdinand (Center) bridge on the Crişul Repede River, in Oradea City, to help some economic value fish species to migrate upstream.

Keywords: fish migration, longitudinal connectivity, discharge sill, Crisul Repede

1 INTRODUCTION

The subject of the article represents a theme of interest regarding interruption of longitudinal connectivity of rivers, created by the presence of transversal obstacles, which resulted in stopping the fish migration on the analyzed reach of the Crişul Repede river.

The selected case study – Ferdinand bridge weir - is placed on the water body Crişul Repede→Bonor→ boundary (RW3.1.44_B7) that has been designated as heavily modified water body due to the presence of 15 transversal obstacles that transform the flow regime into a lentic system (Anexa 6.2…, 2007).

Based on this situation paper is focus on the possibility to restore longitudinal connectivity of Crişul Repede river presenting a case study for which was proposed a technical solution to ensure fish migration upstream the analyzed weir.

Technical data regarding the analyzed case study, data on water quality and about fish species present in the study area were collected from Crişuri Water Basin Administration and during the field campaigns.

1.1. STUDY AREA

The study area is located in the lower basin of the Crişul Repede River, west part of Romania (Figure 1).

In this place Crişul Repede riverbed is regulated and has a width of 50 m, a flow rate of 22.3 m3/s and a flow velocity of 0,4 m/s (Anexa 6.2…, 2007, Studii…., 2011-2012).

The Ferdinand Bridge weir selected as a case study is located on the Crişul Repede River, near the City Hall of Oradea, being known as the Centre Bridge or the Hall Bridge (Figure 2).

The weir selected for analyses as a case study has 50 m width and 1.5 m height with 1 m fall, being built to stabilize the river bed near the Ferdinand bridge. It consists of a weir crest, a stilling basin, end sill and a fixed risberme totally submerged under water.

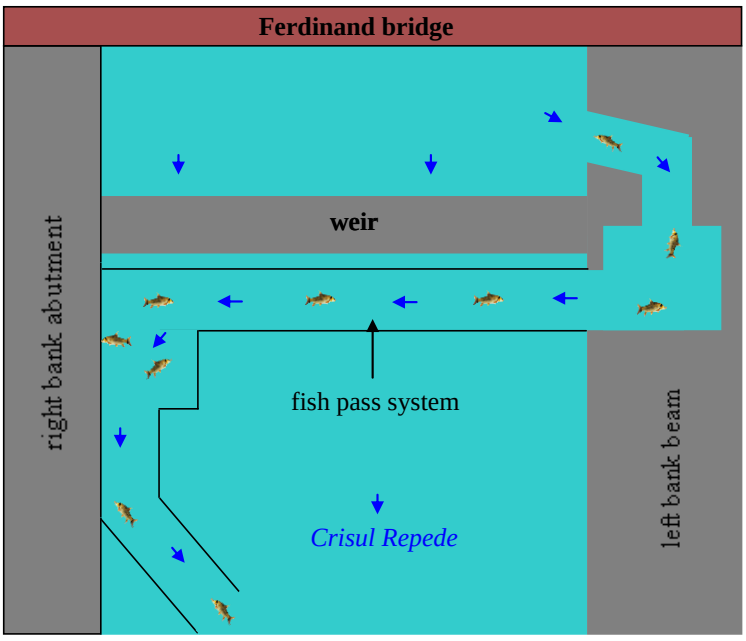
According to the reference situation (Bănărescu, 1964), the study area is situated in the nase fish zone. The targeted migratory fish species are the common nase (*Chondrostoma nasus*), the barbel (*Barbus barbus*) and the common bream (*Abramis brama*), which are protected at the national and international level (Bern Convention, Habitat Directive, Red List etc.).

Figure 1. Location of the study area

Figure 2. Ferdinand bridge weir

2 METODS

In order to provide fish migration upstream of the Ferdinand bridge weir, that impedes fish attempting to migrate upstream to spawn, authors propose a fish pass system that consists of several modules (CI- CIV) (figure 3), called parts of the fish pass channel. The proposed solution was developed in the framework of a complex research study accomplished on Crisul Repede River in 2013, at the National Institute of Hydrology and Water Management.



3 RESULTS AND DISCUSSIONS

The part CI of the proposed fish pass system is a rectangular parallelepipedic channel and will be diagonally drilled inside the concrete left bank beam, following the watercourse direction (Figure 4).

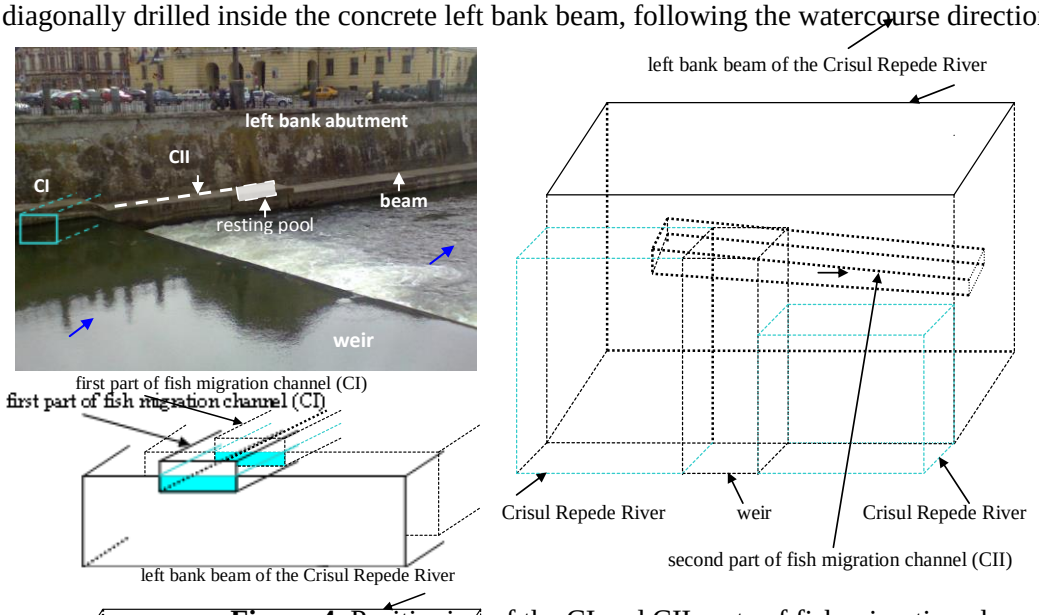


Figure 4. Positioning of the CI and CII parts of fish migration channel

In front of the CI part of the channel will be placed a metal grill in order to avoid penetration of floats inside the migration system (Figure 5). The water blade size in the fish migration canal will be of 30-50 cm in order to ensure good migration conditions for migratory species targeted, according to special environmental requirements of those.

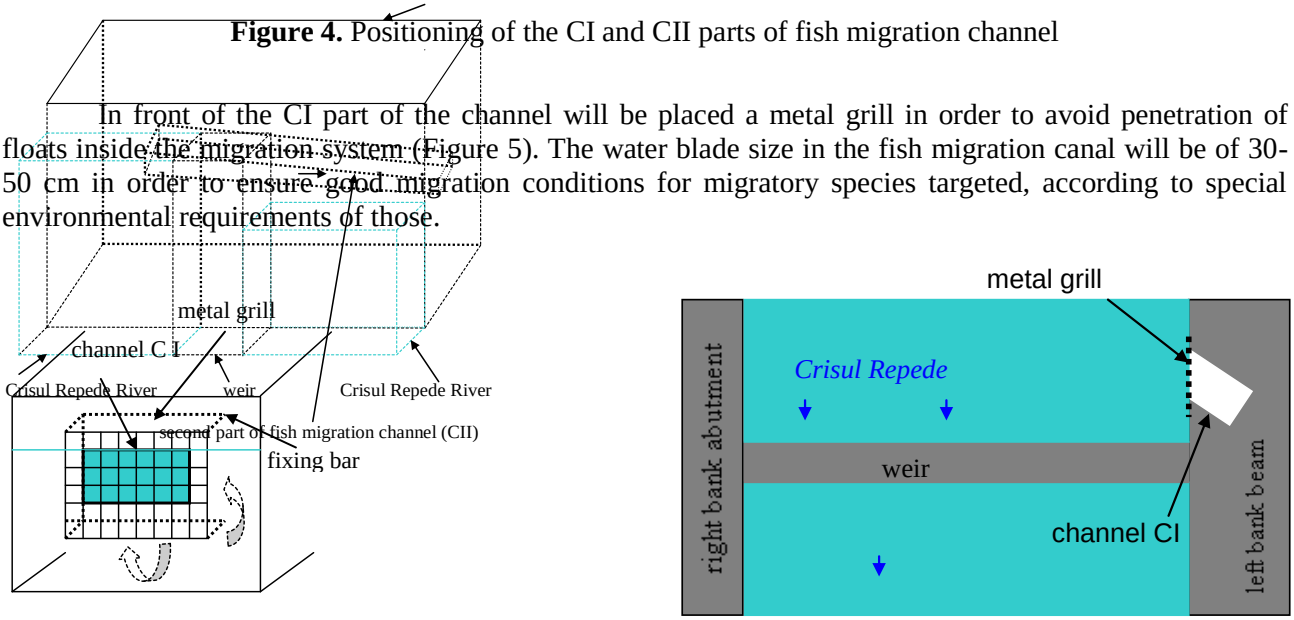


Figure 5. Scheme of metal grill positioning

Part CII of the migration canal will be further drilled, parallel to the left bank into the next beam, forming an angle of about 120° (Figure 4), so that the fish are not bothered and can easy reach in river. At the end of the CII part will be placed a resting pool for fish (Figure 6).

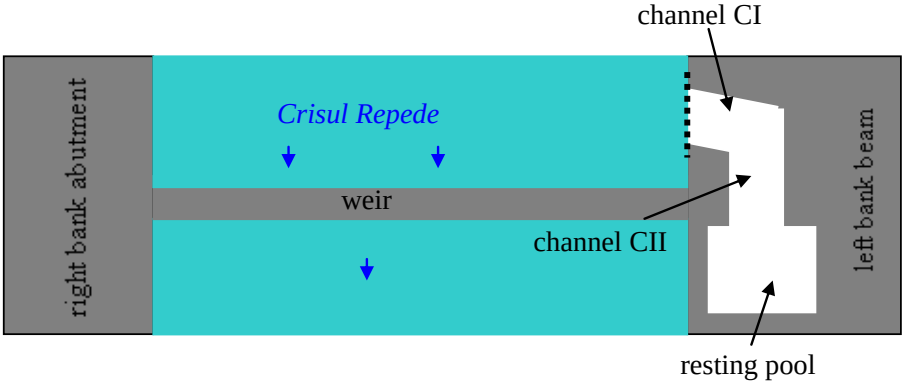


Figure 6. Resting pool and rectangular channel CII positioning

This resting pool will have 50 cm height, width and length of about 1m and will be placed parallel to the left bank abutment. For this basin will attach the third part of the fish migration channel (CIII) that will pass the river till the right bank of the Crişul Repede River (Figure 7).

The CIII part made of concrete, metal or hard plastic crossing the river will be fixed to the channel CII and will keep the slope and the same size as the first two parts.

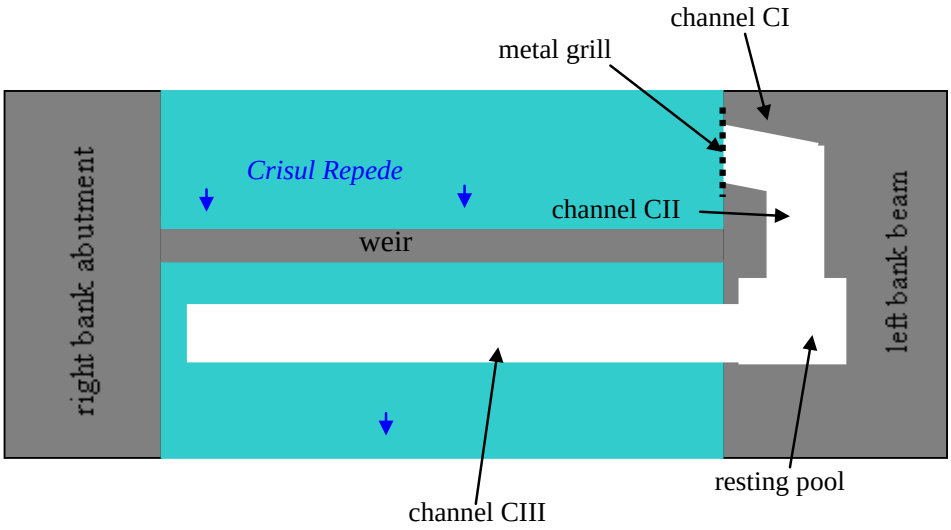


Figure 7. Scheme of CIII part of channel positioning

The CIII part of the rectangular fish migration channel will be supported by metal poles fixed in the river bed and after reaching the right bank it will finished in resting pool for fish, fixed by dowels and metal bars to right bank abutment (figure 8).

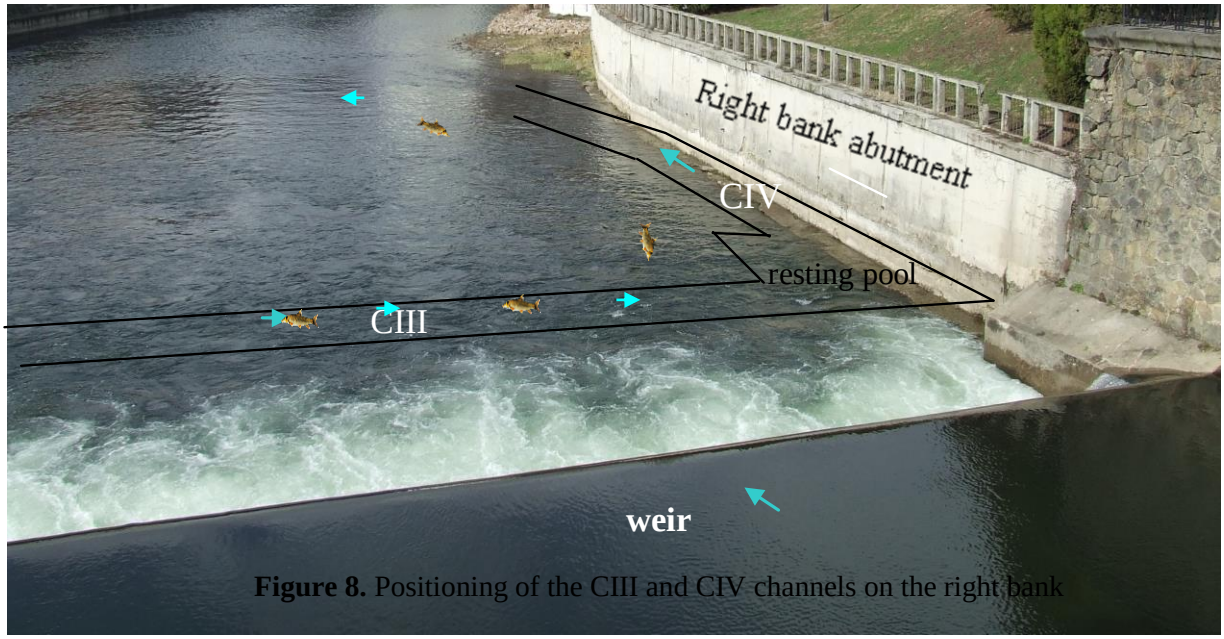


Figure 8. Positioning of the CIII and CIV channels on the right bank

After the resting pool the fish migration channel continues with the CIV part that descends to the river bed, at the 30 m distance downstream the weir (figure 8).

4 CONCLUSIONS

Taking into account that this paper tackles an important aspect of sustainable management of water, the proposed technical solution can be easily transposed into a project of longitudinal connectivity restoration, helping to meet the environmental objectives assumed by Romania.

Also, the proposed solution is characterized by high practicality because it can be successfully used in developing measure plan regarding the ensuring of longitudinal connectivity of the rivers from the Crişuri catchment, which will be updated in 2015.

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