Presentation the history of fish ladder construction in România and one concrete frontal solution that can achieve longitudinal connectivity of the Crişul Repede River. A case study

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Presentation the history of fish ladder construction in România and one concrete frontal solution that can achieve longitudinal connectivity of the Crișul Repede River. A case study.

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The fish migration over dams or discharge sills (downstream and upstream) is a challenge for an environment engineer, a professional liability for a biologist and debt of honor for a lawyer.

Răzvan Voicu
Hydrologic connectivity is globally recognized as a fundamental requirement of all healthy ecosystems and sustainability of fisheries.

Is fish migration an important thing?

- For lotic ecosystems biodiversity, yes.
- For most of people mentality, no.
- For water quality, yes.
România has a proper experience (only with romanian specialists in communism) when it comes about dam construction (750 dams and and 250 reservoirs), as there are lots of built dams built by România all around the world, but in terms of building passable migration systems for fish upstream-downstream, it can be considered a beginner.
Vidraru Dam
- arch dam -

When completed in 1966, it ranked 5th in Europe, and 9th in the world. In an average hydrological year it can generate approximately 400 GWh/year.

www.baraje.ro/baraje

The dam's height is 166 metres, the arch length 305 meters and it can store 465 million cubic metres of water. The reservoir has a total shoreline (perimeter) length of 28km.

http://en.wikipedia.org/wiki/Vidraru_Dam
The dam's height 75 metres – length crowning 750 metres.

Măneciu dam
- earth dam -

http://www.baraje.ro/baraje/pam/maneciu.htm
The dam’s height 127 metres – length crowning 430 metres.

Bicaz dam  
- gravity dam -

Poțile de Fier I dam
- gravity dam and earth dam -

The dam's height 60 metres - length crowning 1278 metres.

http://www.baraje.ro/baraje/grepam/stanca2.htm
The dam's height 120 metres – length crowning 380 metres.

Râușor dam – rockfill dam –

http://www.baraje.ro/baraje/anroc/rausor.htm
Saveh dam (Iran)-

**arch dam**

128 m height


Orantes (Liban); Rositos (Bolivia)
FISH PASSAGE EXAMPLES IN ROMÂNIA

Unfunctional fish passage
Upstream view of the upper weir on Cunftu River (a – water intake, b – fish pass, c – concrete of energy dissipator, d - Sebeş River (Cunftu),

upper weir on Cuntu fish passages
River Someșul Mic,
Mănăștur dam, Cluj-2014,
Photos: Răzvan Voicu
Functional fish passage

River Cobășel (Photo: C. Sofronie "Apele Române" Cluj)
Romanian and almost all Eastern Europe authorities say: “If you want to build a fish migration system upstream – downstream of a dam or a discharge sill you shall not alter the building itself.” Small changes in hydraulic constructions across watercourses are hardly accepted in case a system for fish fauna migration is to be developed.

BUT

Such construction (discharge sill) shall be equipped with systems for fish migration according to the Water Framework Directive (60/2000/CE).
Dimension for discharge sill near Ferdinand bridge
h=1,4m - height l= 50 metres - length, h1 (water fall )=1m
The height after discharge sill is 2,40 metres

OVERVIEW

Discharge sills near Ferdinand bridge on Crisul Repede River

The Crisul Repede River bed width is 50 m at the discharge sill, it has 25.6 m³/s flow rate and its water speed is 0.4 m/s [Source: ABA Crisuri].
nase (*Chondrostoma nasus*) protected by Bern Convention (Appendix III);

[hillfootaquaria.com](http://hillfootaquaria.com)

barbel (*Barbus barbus*)- rare species,
protected Habitats Directive (Annex V),
annex 4A of Low nr.462 and Red List of RBDD;)

[hillfootaquaria.com](http://hillfootaquaria.com)

bream (*Abramis brama*)

bream (*Abramis brama*) –
IUCN Red List of Threatened Species.

[farnhamanglingsociety.com](http://farnhamanglingsociety.com)
Parryville Dam on the Pohopoco Creek using an Alaskan Steeppass design.

http://www.tnonline.com/2012/nov/24/fish-passage-proposed-parryville-dam

Fish ladders contain baffles to slow down the velocity of water inside the ladder enough for fish to use the ladder to swim upstream.

http://oceanservice.noaa.gov/facts/fish-ladder.html
**SOLUTION**

Fish passage system for Crișul Repede River - indicative scheme
Positioning the metal parallelepiped made of metal grille.

Positioning the spacers weld to the metal frame, spacers welded to the metal semi-cylinders.
Concrete pillars positioning

Indicative scheme

Concrete pillars

Concrete platform

Metal mobile parallelepipeds

Metal cable

Fixed system for vertical glide for metal mobile parallelepipeds

Metal bar

Metal frame

Rubber drum

Metal support

Metal counterweight

Winch system

Concrete river bed
rectangular tube made of concrete or glass

- rubber drum
- metal rail
- metal cable
- cable fastening system
- mobil basin (metal parallelepiped)
- buoy

water supply pipe for concrete tube

- water drain opening window
- winch system
- metal bar
- concrete tube

- rubber drum
- water drain opening
metal fence

metal hinge timer

gate 1

gate 2

sensor for fish

metal cable

buoy

cable fastening system

mobil basin (metal parallelepiped)

rubber drum

water drain opening

metal bar

water supply pipe for concrete tube

water drain opening window

concrete tube

metal bar
River Crișul Repede

metal semi-cylinder for water redirection

discharge sill

metal hence

metal basin 2
metal frame
mobil basin

buoy

metal basin 1
electric generator

concrete pillar
winch systems

metal hence

metal hence

cement tube

metal hence

electromagnetic field
generator

the pipe for draining water out to the concrete tube

automatic valve

the pipe for water supply to the concrete tube

metal hence

metal hence
CONCLUSION

- This solution works only for discharge sills, where the water level upstream and downstream is over a meter. There is no need for the riverbed to be covered by concrete for this solution to work. All components of this system for fish migration over discharge sills are anticorrosive. This is not an expensive solution, so it can be applied in many countries around the world.
- They can work automatically, as the human intervention is required only when it comes about supervision.
- Hereby, the restrictions imposed by the authorities on the discharge sill integrity are met.
- necessary forces to operate the whole system:(gravity flow), (archimedic force) and (electricity power).
- Very important to know is that all components of the system for fish migration can be fixed to a concrete platform. Thus the system can be transported by the means of a crane or a helicopter to another location, where necessary, and therefore the neither the riverbed structure nor the discharge sill structure are affected in any way.
Yes you are right, we never cross the dam!

Because I am waiting the Conference from Madison!

Why are you so happy?

How are you?

I am bored and angry!!!
THANK YOU!

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