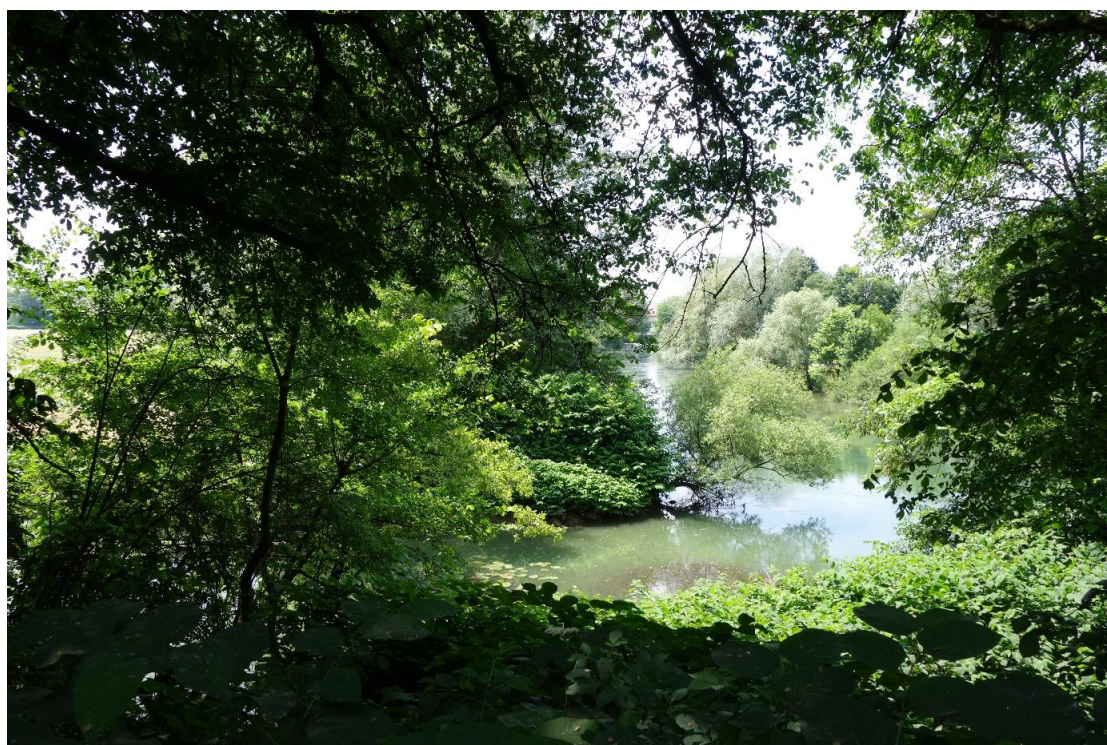




# THE RIVER CONNECTIVITY CONFERENCE

LIFE project LJUBLJANICA CONNECTS

## BOOK OF ABSTRACTS



22 and 23 October 2015, Ljubljana, Slovenia

### **The river connectivity conference**

International conference of LIFE project Ljubljanica connects – Book of abstracts  
October 22 - 23, 2015  
Ljubljana (Slovenia)

#### **Organization committee**

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# PRESENTATION OF LIFE PROJECT LJUBLJANICA CONNECTS

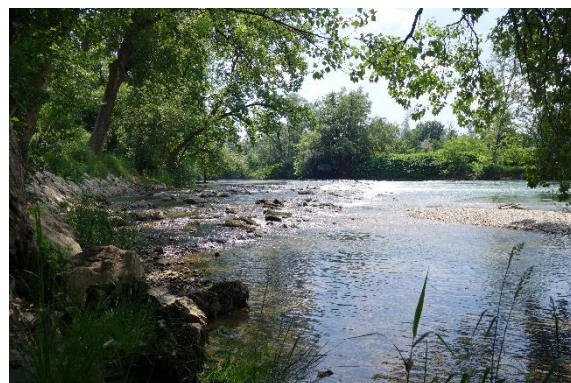
## THE RIVER CONNECTIVITY CONFERENCE



The project Ljubljana connects has started in year 2012 and is implemented by Faculty of Civil and Geodetical engineering, University of Ljubljana and two partners (Geateh d.o.o. and Purgator d.o.o.). Its goal is to improve the living conditions of endangered fish populations of Danube Salmon (*Hucho hucho*), Danube Roach (*Rutilus pigus*) and Striped Chub (*Leuciscus souffia*) which are also the targeted species of Natura 2000 area.

The project consists of three sets of activities: concrete restoration actions, monitoring of fish migration and ecohydrological parameters, and raising of public awareness. The concrete restoration actions include improvement of sill in Zalog, two fish passages in Fužine and Ambrožev trg and lifting system of the barrier on Ambrožev trg.

Above the **sill in Zalog** there is an oxbow which was disconnected with main river channel during the low flows. Interrupted inflow of fresh water caused very poor living conditions for animals in the oxbow. The raise of the sill helped to improve this situation.



The **fish passes** included in the project are very old and protected as cultural and technical heritage. None was working properly and due to the protection no big and drastic measures were allowed. With smaller improvements such as reconstruction of damaged steps in the interior and installation of element for preventing entry of floating debris at the inflow we managed to re-establish their operation.



A **lifting system of the barrier** at the Ambrožev trg gate was outdated and did not allow the precise regulation which is important for regulating the water level through the city centre all the way up to Ljubljansko barje. Too fast raising of the barrier instantly caused deterioration of ecohydrological conditions downstream. With modernization of the electromechanical equipment the situation is improved.





**Monitoring of fish migration** is performed on two different ways. We monitor the situation of fish population with marking the fish with Visible Implant Elastomer (VIE) tags. Regarding the location of catch we implant tags beneath transparent or translucent tissue combining different tag locations (dorsal fin, post ocular tissue) and colours (red and yellow). The success of restoration of fish passes is monitored with the use of on line connected cameras installed on the fish passes. Records from the camera are analysed to evaluate number and type of fish using the fish passes.



The **ecohydrological conditions** are monitored with 17 measurement stations installed along the whole river corridor and with occasional measurements of water discharge with remote controlled boat and water temperature with optical cable.



We would like to **present our activities** and results of the project **to a broader public** so that they would be aware of what is happening around them. Therefore we are organising various thematic presentations and field workshops for school children and students and publish informative papers in journals.



# SCHEDULE

## THE RIVER CONNECTIVITY CONFERENCE



### THURSDAY, 22 October 2015

- 13:30 - 14:00 Arrival, registration and welcome drink
- 14:00 - 14:30 Opening of the conference
- 14:30 - 16:00 Session 1: Huchen and its status in Europe  
Session 2: Designing the fish passes
- 16:00 - 16:30 Coffee break
- 16:30 - 18:00 Session 3: River revitalisation
- 18:00 - 20:00 Conference dinner

### FRIDAY, 23 October 2015

- 9:00 - 9:30 Arrival and coffee
- 9:30 - 10:30 Presentation of the project Ljubljana connects and introduction to field trip
- 10:30 - 13:00 Visit of project sites
- 13:00 - 15:00 Lunch on boat on Ljubljana river
- 15:00 Closure of the conference

If you are going on a field trip with us, please bring along appropriate clothing and footwear.

# ABSTRACTS

## SESSION 1: Huchen and its status in Europe

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#### Connectivity Solution for huchen *Hucho hucho* (L.) in human-altered habitats

*Predrag Simonović, University of Belgrade, Faculty of Biology, Belgrade, Serbia*

*Danilo Mrdak, University of Montenegro, Faculty of Science and Mathematics, Podgorica, Montenegro*

*Marina Piria, University of Zagreb, Faculty of Agriculture, Department of Fisheries, Agriculture and Special Zoology, Zagreb, Croatia*

*Karol Hensel, Comenius University, Department of Zoology, Bratislava, Slovakia*

Considering huchen globally endangered (E), and the largest, endemic salmonid fish species, threatened severely by high dams construction, there is a strong need for stopping of its recent decline. Contradiction about the huchen migratory behaviour and consistent records about their lacking from the fish ladders impose considering other solutions compensating the deleterious effects (decline in reservoir sections due to comprehensive alteration of environment; suppression of natural spawning in downstream sections due to hydropeaking; river bed siltation by flushing of reservoirs and decrease in general productivity of the riverine ecosystem; river bed erosion, sinking of the river bed and destroying of gravel bars and sand banks, the habitats and spawning grounds) of high dams on them. Establishment of hatcheries revealed only limited success due to making them feral instead of native and due to decrease of genetic variability in fragmented populations. Still remains the strong need for extensive research about the type of fish ladder, slope, flow rate and quality of feeding water and hydraulic signals appropriate for huchen to enter into the ladder in downstream and upstream directions. However, it is also necessary to think about the preconditions that constructors of future high dams and those who runs the recent ones should fulfil to make them more environment-friendly. Those preconditions are related to minimal length of flowing riverine stretches, the least number of tributaries there appropriate for huchen natural spawning, as well as the management measures that are to be applied to minimize the harmful effects of high dams (e.g., accessibility to spawning sites in tributaries, providing of sufficient amount of the water of appropriate quality in them during the spawning season, catch of young-of-the-year huchen and the way of their dispersal throughout the catchment in concern, etc.).



## Elaboration of expertise for huchen (*Hucho hucho*) habitat and population conservation in the middle Sava River – Target Research programme

*Daša Zabrc, Fisheries Research Institute of Slovenia, Ljubljana, Slovenia*

The huchen - *Hucho hucho* (Linnaeus, 1758) is the largest species of trout living in Slovenia. To date research estimates the huchen population in the middle Sava River (Sava-Medvode-Kresnice) as the most vital population in Slovenia. This population was protected in 2003 with the establishment of Natura 2000 site within its distribution area. The main threat to the huchen population in Slovenia is the habitat deterioration and the modifications of river flow resulting from the construction and operation of hydropower plants. Due to the obvious conflict of interests- protection of the huchen populations on the one hand and the use of hydroelectric potential of the Sava River on the other-we want to prepare a scientific foundation, based on ichthyologic and genetic research of the huchen in the Sava River, and to assist in decision-making on the energy utilization of the Sava River with respect to the conservation of the habitat and the populations of the huchen.

The project will yield new information on the population of the huchen in the middle Sava River such as new data on its occurrence, a rough estimate of its abundance and size distribution, a more recent geographical distribution and new information on spawning grounds. We will assess the viability of the population and its reproductive capacity, investigate the impact of stocking and the relationship between natural and stocked populations, prepare a check-list of water obstructions on the middle Sava River with assessment of their passability and present an overview of the mitigation measures on other European rivers with hydropower plants. In addition, we will evaluate the adequacy of existing and propose new measures for recovery of the huchen in the wild and create an action plan to preserve this species in Slovenia. We will examine the impact of reduced water flow on the primary riverbed and the impact of an accumulation on the habitat suitability for the huchen in the selected section of the middle Sava River by means of habitat modelling.

In the presentation the goal and the main objectives of the project are presented, methods are described.

# ABSTRACTS

## SESSION 2: Designing the fish passes

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#### Brush-baffle fish pass: a fish - friendly design

*Serhat Kucukali, Cankaya University, Ankara, Turkey*

The flow characteristics of a new baffle-brush type fish pass were investigated experimentally in a 2 m wide rectangular flume which has a bed slope of 4% for discharges ranging between 100-550 l/s. The baffle-brush-fish way combines the properties of a super active baffle (Larinier) fish pass with the features of the brush-furnished fish way. Both types mark the extremes of the hydraulic spectrum in fish passes. The baffle fish way exposes a high turbulence flow with a mean velocity around 1,1 m/s while the brush-type fish way provides a multiple-structured migration corridor with low velocities. There are different migration corridors with typical hydraulic conditions and, very important for the fish, this corridors are continuing through the complete fish pass. No obstruction have to be overcome. Once a fish has selected a migration corridor, it can be sure that the hydraulic situation does not change along this corridors goes through the complete fish pass. The main advantage of the proposed hydraulic design is that it can be scaled-up all the parts of this type in order to adjust it to almost any demand based on the physical model test results.





## Fish passes in Bosnia and Herzegovina

*Avdul Adrović, Faculty of Science, University of Tuzla, Tuzla, Bosnia and Herzegovina*

The flows of almost all major river streams in Bosnia and Herzegovina are intersected by dams, and parts of these flows have been transformed into aquatic accumulations. On the river Drina there are four large hydro accumulations, and only on the dam at Mali Zvornik there is a fish pass that opens during the fish spawning period every year in the spring so that fish from the lower course can move upstream and successfully spawn. So the dam of the hydroelectric power plant "Zvornik" is the only one in the country that has a fish pass. This fish ladder was designed in 1948 along with the hydro power plant "Zvornik", and was put into operation in 1955. It is made of cascading pools so that fish can more easily move upstreams. The dimensions of the fish ladder allow it to pass fish weighing from 1 to 1.5 kg, while the big fish like catfish and huchen cannot pass. The pass is long 160 meters of which 89 meters are inside the tunnel part. This pass has been regularly opened since 2003.

Erected dams, especially those in the upper reaches of the Drina River, where have not been built fish ways, as well as the continuous degradation of water quality have adversely affected the condition of the local fish population. The anthropogenic influence has especially negative impact on populations of salmonid species, and particularly on huchen (*Hucho hucho*).

The situation is similar with huchen from the River Vrbas on which were also built three large dams without fish passes.

The natural migration of fish, especially salmonids, are extremely endangered also in the Neretva River where the dams without fish passes were built. Particularly exposed to adverse effects of built dams are the populations of endemic Neretva salmonids such as *Salmothymus obtusirostris* and *Salmo marmoratus*.

On the river Spreča near Lukavac there is a large concrete dam without fish passes. A large number of small hydro-energy facilities exist in Bosnia and Herzegovina with various dams built without fish passes. The reasons for the lack of fish passes are included in the legal regulations that were in force at the time of the construction of dams. Any negative effects of building dams without fish passes on fish populations can only be speculation because they never conducted researches profiled so to show their overall negative effects.



### **The concept of ecological restoration of subalpine river in Slovenia**

*Lidija Globevnik, TC Vode, Ljubljana, Slovenia*

*Luka Snoj, TC Vode, Ljubljana, Slovenia*

*Neven Verdnik, TC Vode, Ljubljana, Slovenia*

The purpose of hydro technical objects and regulation of channels is to reduce flood risk, ensure good ecological and chemical water status and secure legally binding water supply for usage (water rights). Reconstruction of existing or building new objects in a river network should therefore guarantee the above mentioned purpose but also provide development opportunities. Comprehensive plans are needed on the river basin level in considering existing hydrodynamic conditions and the primary purpose of objects, facilities and arrangements. The concept of an ecological restoration is developed for the sub-alpine river and its tributaries in Slovenia, the Mislinja River. Each of the hydro technical objects should be prepared so that it fulfils three main goals. First is to reduce flood risk by preventing rapid drainage of water from river basins and hinterland areas and retain large quantities of water in the areas with minimum potential flood damage and threat. The second goal is to maintain adequate riverbed flow capacity through settlements and the expansion of sustainable parts of the riverbed outside the settlements. The third goal is to improve living conditions for aquatic flora and fauna. The risk of flooding can be reduced by ensuring rapid drainage of the water through the settled areas and retaining it above or below the settlements in wet and dry reservoirs and natural retention or inundation areas. Existing hydro technical or water facilities are renovated in a way that is not just ensuring sufficient flow capabilities, but also improving hydrological and morphological processes. Underwater spurs are installed in the embankments, local depression and forest edges of the channels are kept and at the same time wherever possible islets and meander formations are allowed. Existing sills and dams are restored whereas damaged embankments are transformed into ecological niches. Channel stone spurs and ducts for redirection of main water flow are installed on the regulated uniformly shaped watercourse sections. Fish shelters and wooden consolidations are installed in the river banks. The main task in implementing the measures is to ensure that the design of the facilities is adjusted to bed-load discharge conditions and high flow velocities. There must be enough bed material for sediment transport, while excessive sediment deposition must be constrained.



## From research to restoration, from conflict to cooperation – conserving nature at the lower Drava River in Slovenia

*Damijan Denac, DOPPS – BirdLife Slovenia, Ljubljana, Slovenia*

Natural dynamics of the Drava River was heavily altered after the building of hydro-power plants. Most of the water was diverted into channels, whereas discharges in the old riverbed were reduced drastically, causing the degradation of river branches and gravel bars. Concrete solutions for these problems that we carry out within the project “Riparian ecosystem restoration of the lower Drava River in Slovenia LIFE11 NAT/SI/882” and will be presented are: creating breeding banks, opening closed river branches, cleaning encroached gravel bars, preventing disturbance at gravel bars. Results of the actions are very promising as populations of endangered Natura 2000 qualifying species significantly increased. All the works in the riverbed are hydraulically modelled to achieve the best results. Moreover, water maintenance works for anti-flood protection are analysed considering both anti-flood and nature conservation aspect. Using the results from the analysis, concrete actions, experiments carried out in the field and through cooperation with relevant stakeholders we were able to prepare guidelines for water maintenance works considering the obligatory nature conservation requirements. Guidelines are site-specific for the lower Drava River and are directly useful as detailed water management plan (slo. *podrobni NUV*). With them we are introducing an example of best practice for future management of Slovenian rivers.





## LIFE project AQUAVIVA

*Marjana Hönigsfeld Adamič, Lutra, Institute for the Conservation of Natural Heritage, Ljubljana, Slovenia*

*Tatjana Gregorc, Lutra, Institute for the Conservation of Natural Heritage, Ljubljana, Slovenia*

The LIFE+ project AQUAVIVA (2011 -2014) was using the otter (*Lutra lutra*) as a flagship species and representative of aquatic life for effective public campaign which aims to attract public attention to biodiversity loss in freshwater ecosystems. We related water biodiversity with human treatment of water environment. Through information, communication and education at all levels the project aimed to raise public attitude towards water environment and to improve everyday praxis. The necessity of preserving freshwater ecosystems as the living environment of different species important for everyday ecosystems services available to humanity was stressed. The project supported the implementation of European environmental policy and nature conservation legislation exposing their mutual positive impacts. The principles of Integrated Water Resources Management (IWRM) were explained to target audience and supported by assistance of the otter as a top predator and an ambassador of freshwater biodiversity. In the scope of the project With the otter through the Capital (2011) supported by Municipality of Ljubljana the otter was found also in Ljubljansko barje, the doorstep of Ljubljana. We have presented the water habitat corridor connecting Ljubljansko barje via Ljubljanica River and Gruberjev prekop to Sava River and proposed mitigation measures for animal species to enable them to overcome the barriers in the corridor.

# ABSTRACTS

## Presentation of the project Ljubljana connects

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### Ljubljana connects – overview of the project

*Katarina Zabret, Faculty of Civil and Geodetic Engineering, University of Ljubljana, Ljubljana, Slovenia*

The project Ljubljana connects has focused on improving connectivity and living conditions in Ljubljana River which flows through capital city of Slovenia, Ljubljana. It represents living environment for endangered and Natura 2000 targeted fish species Danube Salmon (*Hucho hucho*), Danube Roach (*Rutilus pigus*) and Striped Chub (*Leuciscus souffia*).

To enable fish migration the concrete restoration measures were performed. The reconstructions of sill and two fish passes on the Ljubljana River have been implemented and barrier's lifting system on the weir was modernized. Used solutions were quite simple but still effective. The fish monitoring which helps us to evaluate success of concrete restoration actions is being performed in two different ways, with marking the fish with Visible Implant Elastomer (VIE) tags and with the use of on line connected cameras installed in the fish passes. Records from the camera are analysed to evaluate number and type of fish using the fish pass. In addition for further evaluation of living conditions the ecohydrological monitoring of water temperature and its level, oxygen concentration and discharge is continuously implemented on 17 measurement stations. The project results are presented to experts on conferences or workshops while the non-scientific general public participates on various field workshops and science days.

### Cost effective system for monitoring fish migration with a camera

*Matej Sečnik, Faculty of Civil and Geodetic Engineering, University of Ljubljana, Ljubljana, Slovenia*

Within the project Ljubljana connects we have developed a cost-effective solution for the monitoring of fish migration through fish passages with the camera. The system for the fish monitoring is made from two parts. First is the waterproof box for the computer and charger and the second part is the camera itself. We used a Sony analogue camera. The advantage of this camera is that it has very good sensitivity in low light conditions so it can take good pictures even in poor light. For the night recording we used additional IR reflector to illuminate passing fishes. The camera is connected to an 8-inch tablet PC with a Windows operating system. We decided to use a tablet PC because it is quite small, cheap, it is relatively fast and has low power consumption. On the computer we installed software called Yawcam. Yawcam is a free software that has quite advanced motion detection capabilities, which is very important if we want to detect passing fishes. When the Yawcam detect movement, it captures an image and save it locally to disk. We are also using Google drive which allow us to have a real-time image backup in the cloud.