Fish passage system with variable geometry and with Flexi Baffle

fish passage engineer - PhD - Răzvan Voicu

The Flexi Baffle system is performance for fixed culvert. Most problems with fish migration systems are at 4-meter spillways located in mountain and hill areas and beyond. Another problem for the classical fish migration systems is which target species is chosen. Often, other migratory species (and other species) cannot pass through the system due to hydraulic jumps, high speeds, due to flow fluctuations in the system, etc. The proposed system can solve these systems. In the weir a rectangular crenel is created (fig. 1).

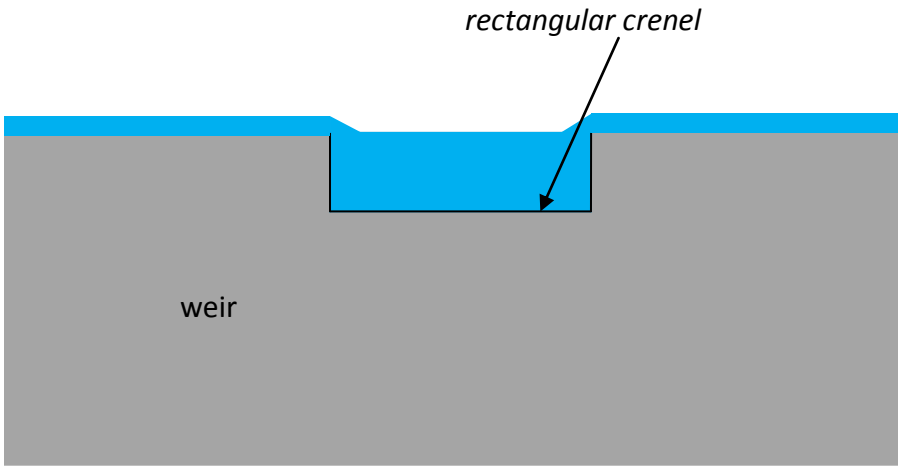

Figure 1 Positioning of the rectangular crenel in the weir - indicative diagram

Depending on the size of the weir, the flow of the river as well as the size of the migratory species, the crenel may have a width between 30cm and 100cm and a height between 30cm and 60cm. Symmetrical to the battens, a concrete basin is attached to the spillway threshold. The concrete basin has the height of the weir and is fixed by the weir with the help of concrete hollow screws (fig. 2). Above the basin is a metal grate so that the fish do not jump out of it. The vertical surface and parallel to the weir will be higher than the weir(fig. 2). The metal grid will extend over the weir(fig. 2), thus avoiding the penetration of medium and large floats that can block the system. In the horizontal surface of the concrete basin are the anti warping holes (fig.2).

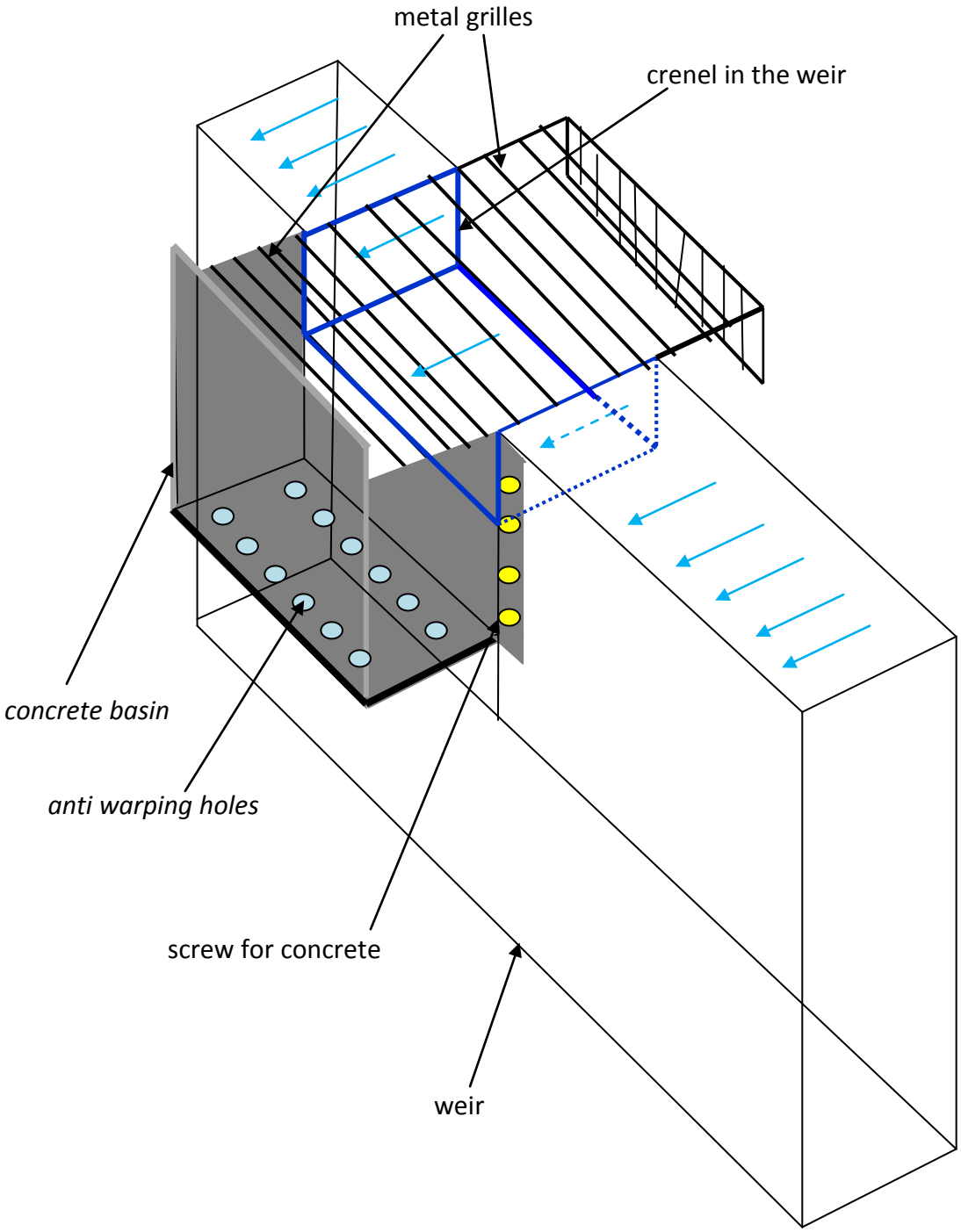

Figure 2 Positioning of the concrete basin on the overflow threshold - indicative diagram

The vertical surface and parallel to the weir will be higher than the weir and will have a space (rectangle) in the middle. In the space of the rectangular shape, a metal frame will be fixed and a metal sheet pile with a vertical slide will be fixed which will be set in motion by a manual gearbox (fig.3). The metal sheet pile can also slide inside the vertical surface, having a space in the form of a rectangular parallelepiped specially created for this purpose. The metal sheet pile will have a rectangular space (fig. 3). The rectangular space can be closed due to a metal gate fixed (on the outside) on the metal pallet, through two metal hinges (fig. 3). The closing of this door is done with a metal latch (fig. 3).

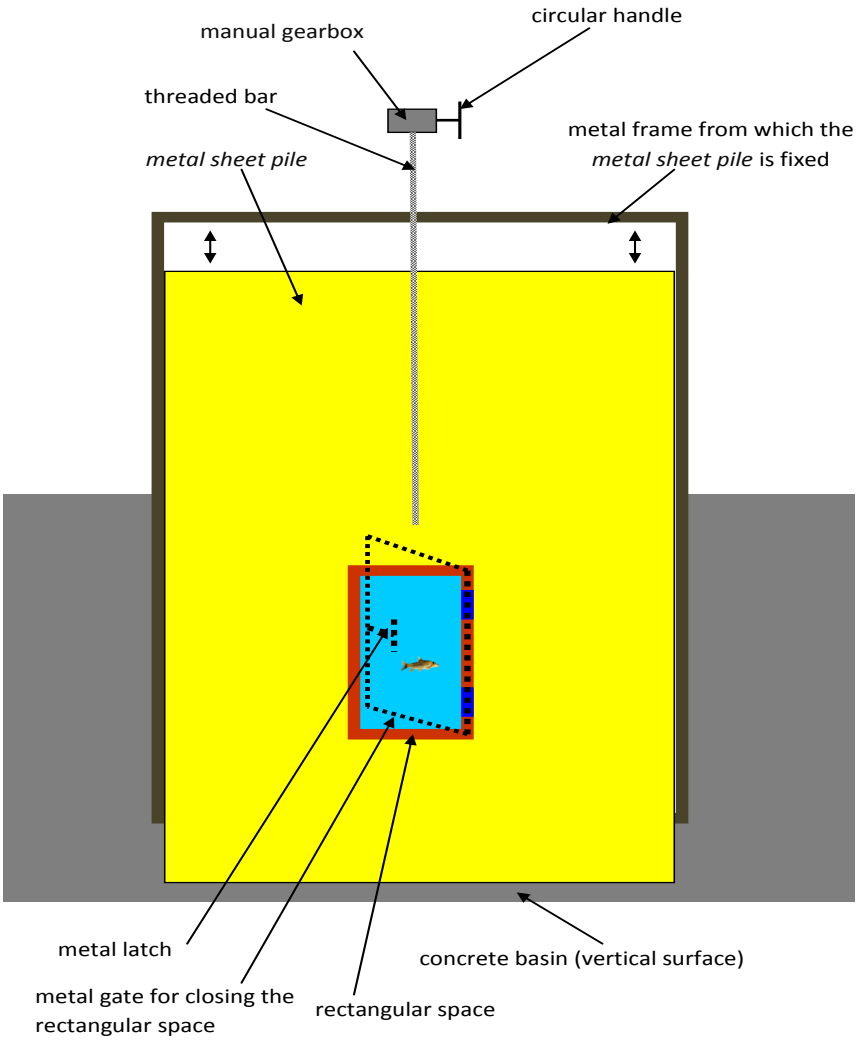

Figure 3 Positioning of the metal sheet pile on the concrete basin - indicative diagram

From this rectangle existing inside the metal sheet pile, a rectangular / tubular (membrane) surface made of resistant but elastic rubber will be fixed (fig. 4). From this tubular or rectangular surface (membrane) made of resistant rubber, a metal frame is fastened and a trapezoidal channel (fig.4) is fixed to this metal frame.

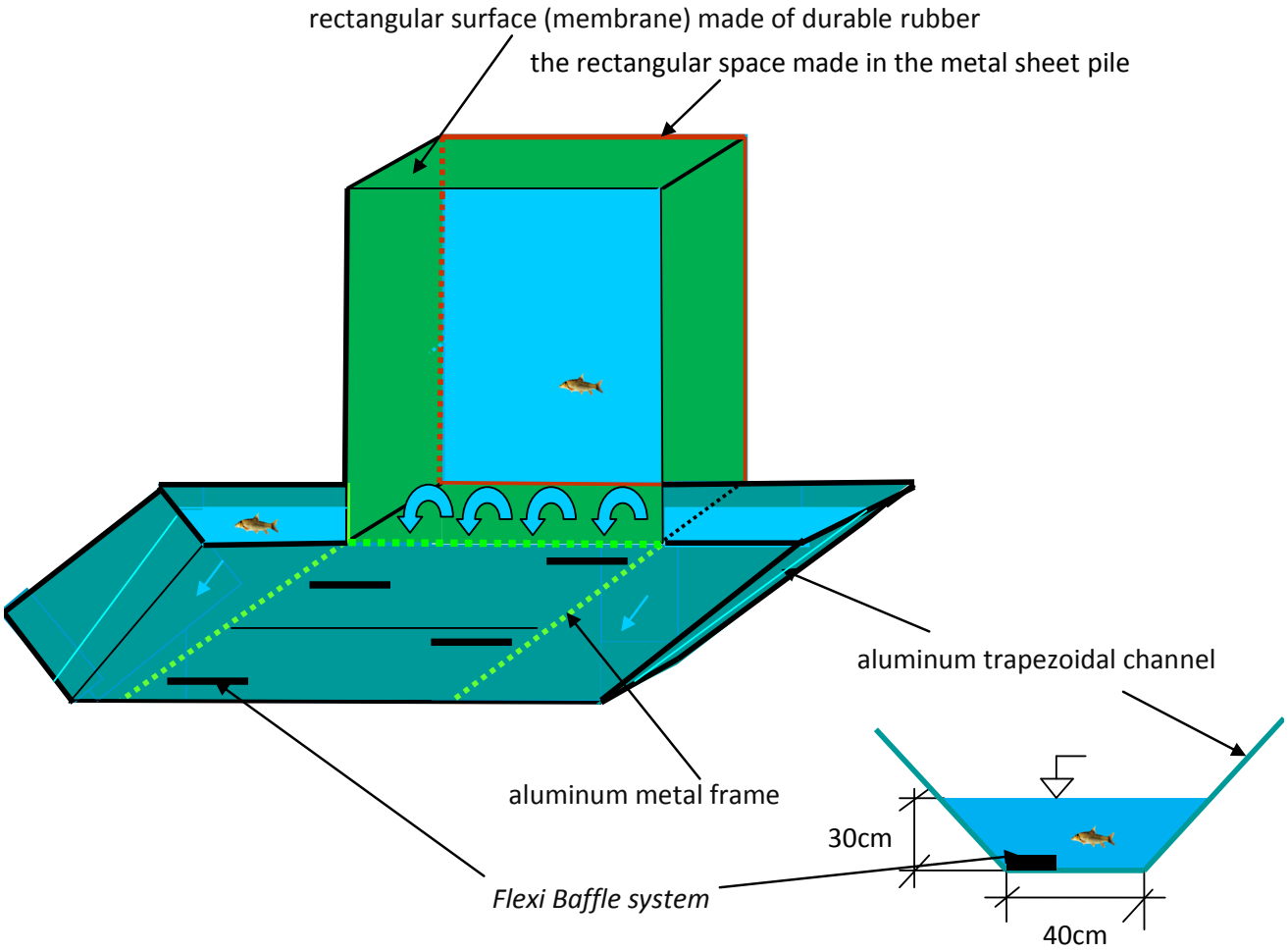

Figure 4 Positioning of the trapezoidal channel and the rubber membrane - indicative diagram

The base of the trapeze will be fixed Flexi Baffle system that will help the fish reach the concrete basin and then upstream of the spillway threshold. On the downstream ends of the aluminum bars, a very resistant metal spring will be fastened. Each metal spring will be fixed by a metal bearing with metal bars (fig.5). By the riverbed, with the help of the metal screws, two metal rails (fig.6) will be fixed on which these bearings will move, upstream or downstream.

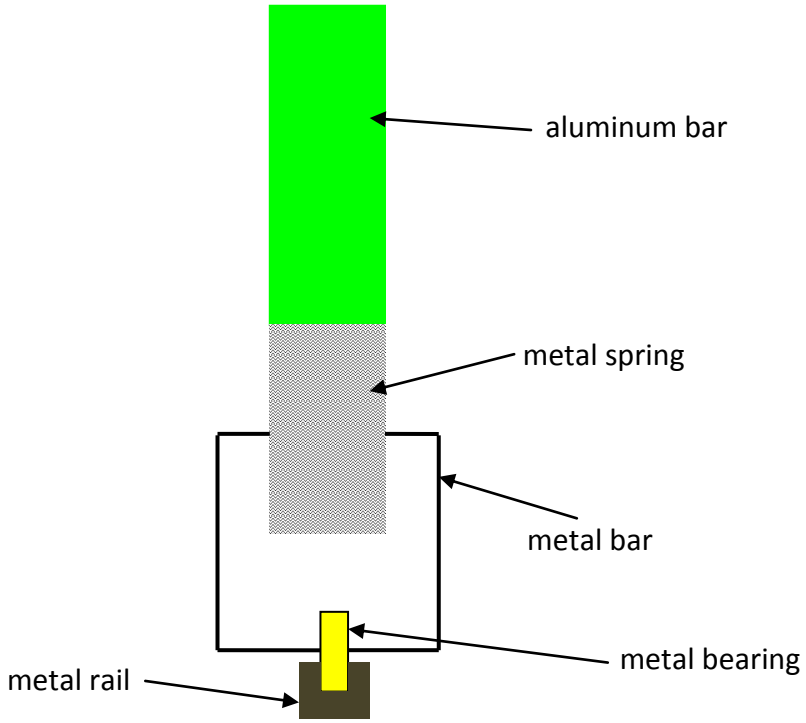

Figure 5 Positioning of the metal spring and the bearing - indicative diagram

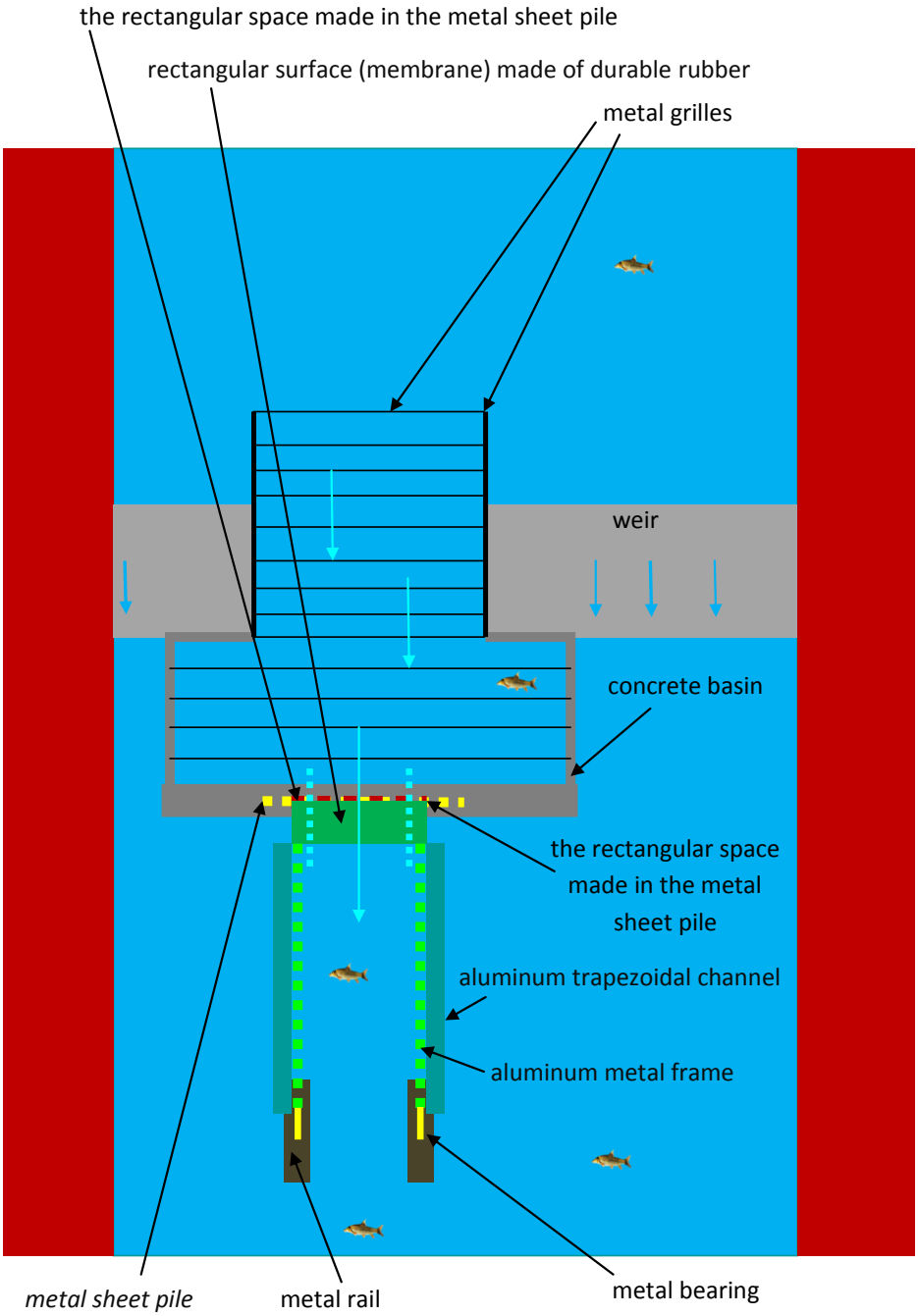

Figure 6 General scheme of the fish migration system - indicative diagram

Conclusions

All components of the system do not corrode. If we want to change the slope of the trapezoidal channel we move the metal sheet pile with the manual gearbox. The rubber membrane allows the upstream end of the trapezoidal channel to descend or climb approximately 30 cm. This means a change of slope of the channel and implicitly of speed. This allows the system to be used for older or juvenile specimens of the chosen (target) migratory species. The trapezoidal channel, due to the fact that it has both movable ends, can be adapted to many requirements: lowering the water level of the river, changing the slope of the trapezoidal channel in order to catch and other species of fish outside the target ones, etc. The classical frontal systems for the migration of fish are partially or totally destroyed at the first strongest flood, having no protection system. The concrete basin and the metal grill provide the system with protection against flooding because they function as dissipators with high resistance. Clogging another unresolved issue of traditional fish migration systems. And here the problem was solved due to the holes existing on the horizontal surface of the concrete basin. The flow so that the quantity of water is provided in the system so that the fish have about 30cm the water level in the channel which ensures the water passing through the crenel made in the spillway threshold but also the water that enters the basin on the weir. If the gate is closed all the components of the system can be repaired or changed. If the concrete basin and the metal grid are damaged, the whole system is closed by means of a metal sheet that is fixed by the spillway threshold near the upstream end of the battens. If the system is no longer useful at the initial weirselected, the whole system can be disassembled and can be assembled at another weir.

July 2019

Bucharest