

Model investigation of flow conditions and sediment transport at fish guiding structures

The extensive expansion of hydro-electric power plants in the past decades has impaired natural river systems and aquatic habitats. This includes the blocking or delaying of downstream fish migration and damage or mortality to fish when passing through turbines or over spillways. As a result, fish population can decline. The newly revised Swiss Water Protection Act (WPA) demands the revitalization of water bodies compromised by manmade structures by 2030, which includes the unharmed passage of migrating fish. These requirements represent challenges to Hydropower Plant (HPP) operators and local authorities alike due to the current lack of design standards for downstream fish protection and guidance technologies. Therefore, since 2011, the Laboratory of Hydraulics, Hydrology and Glaciology (VAW) has conducted a research program on “fish guiding structures” (FGS) to provide safe downstream fish migration (Fig. 1).

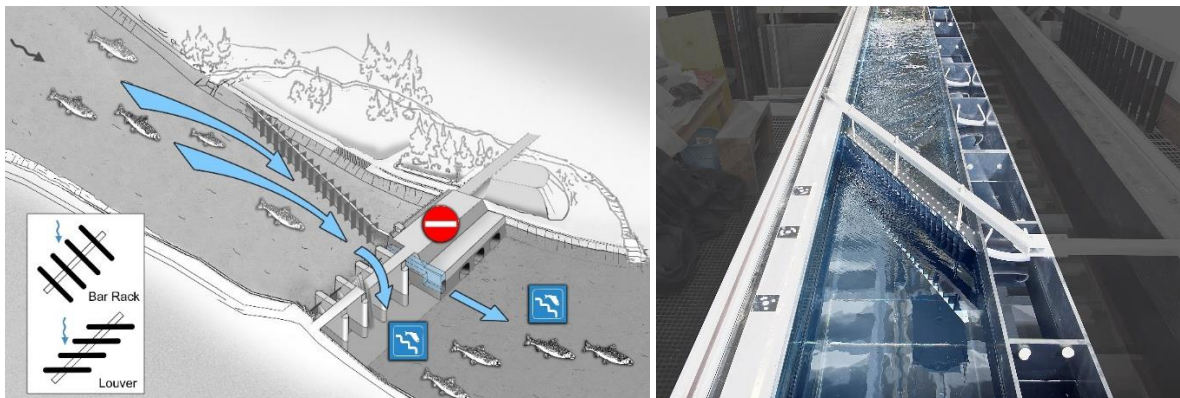


Fig. 1: Downstream fish migration concept and model flume with fish guiding structure

This master thesis is a part of two ongoing PhD studies on the hydraulics and fish guiding efficiency of different FGSs, namely horizontal and vertical bar racks. The goal of this master thesis is to investigate (I) the effects of approach flow conditions on the head losses caused by those FGSs and (II) the effects of the sediment transport and/or floating debris on the operation of the FGSs. Special operational conditions such as flood events will be considered. Velocity and water depth measurements will be conducted in a model flume at VAW as shown in Fig. 1 for various flow conditions.

Contact:

Claudia Beck
HIA C 53
044/633 38 07, beck@vaw.baug.ethz.ch

Remarks:

Physical model investigation,
Single Master Thesis