

# Swimming behavior of downstream moving fish at a bypass gate with opening

Hydropower plants (HPPs) and other barriers interrupt the longitudinal connectivity in river networks, hindering downstream movement of fish. For some species and life stages, fish guidance racks (FGRs) with adjacent bypass systems (BSs) are effective solutions for safe downstream passage. However, to reduce generation loss HPPs tend to limit bypass discharge by adding a vertical axis flap gate with local openings at the bypass inlet. Such gates create high velocity gradients and absolute flow velocities that may cause avoidance reactions of approaching fish. To investigate fish swimming behavior at bypass inlet openings, live-fish tests with brown trout and barbel were conducted for a bypass gate with bottom and top opening (Fig. 1).

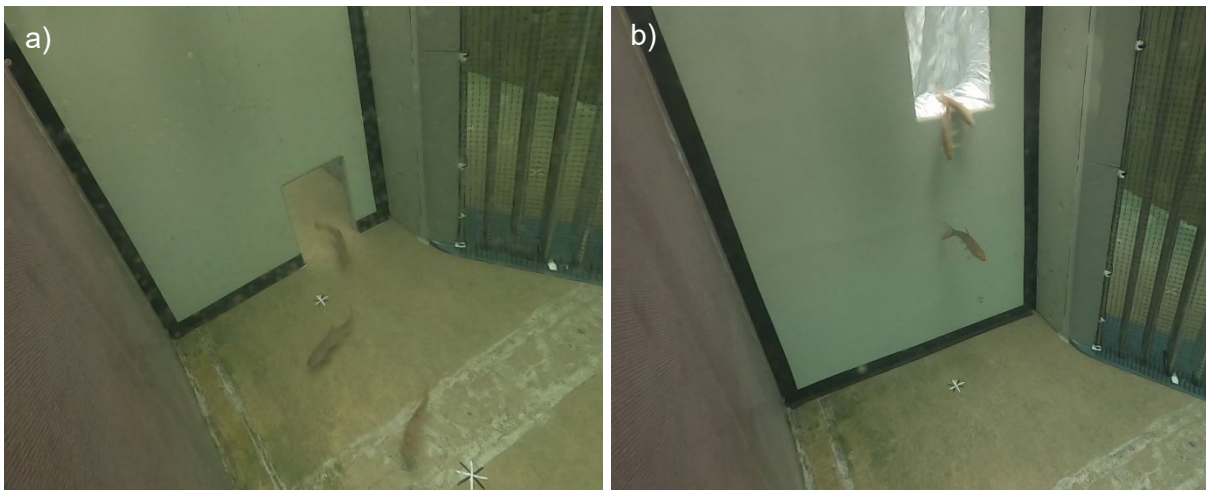


Fig. 1: Video excerpts of live-fish experiments when fish passed the bypass inlet gate with a (a) bottom and (b) top opening.

Within this Bachelor's thesis, these experiments will be further analyzed. Focus lies on fish swimming behavior upstream of the bypass inlet and during bypass passage, which will be evaluated from the available video recordings. Furthermore, the effect of different parameters on the fish behavior, such as location of the opening or approach flow velocity, will be investigated by statistical methods. The results will help to better understand the reaction of fish to high velocity gradients at bypass inlet openings and to improve the design of FGR-BS.

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Bachelor's thesis to be assigned once. Can also be conducted in German.