Numerical simulation of a slanted fishway with protruding boulders

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Abstract: In 2020, iRIC(International River Interface Cooperative, https://i-ric.org/) released a new standard solver named UTT(Universal Trace Tracker), in which swimming fish behavior in open channel flow can be simulated. If the fishway design can be assisted by the standard simulation model as iRIC which is freely available for anyone, it’s prospective to improve the design level of the fishway extensively. Therefore, it is important to verify the performance of simulation models as UTT in iRIC. This research simulates the fish movement inside fishways using two available solvers, the UTT and the Nays2Dh from the iRIC. The numerical simulations were compared to the experimental results of Miyazono (2003), who studied a slanted fishway with boulders, to verify the performance of the solvers. The results agree well with the experiments in terms of flow depth and velocities, except in areas where the velocity decreases considerably. Furthermore, the model successfully simulated fish behavior, showing that fish tend to rest upstream of the protruding boulders. Finally, the ratio of run-up at a given time through the fishway agreed well with the experimental results, which depends on the stream-wise interval of boulders. This research helps to validate the performance of solvers such as the UTT and presents the possibility of improving the design of fishways extensively.