EVALUATION OF KEY STIMULI, IN PARTICULAR LIGHT, ACOUSTICS AND TEMPERATURE, INFLUENCING FISH MIGRATION INTO FISHPASSES

HELMUT MADER[1], ANDREAS BRANDL[1], BENJAMIN FILLITZ[1], SABINE KÄFER[2],

[1]*Institute of Water Management, Hydrology and Hydraulic Engineering, University of Natural Resources and Life Sciences, Muthgasse 18, 1190 Vienna, Austria*

[2]*VERBUND Hydro Power GmbH, Badstubenweg 40, 9500 Villach*

An attraction flow between 1% and 10% of the competing flow at the entrance of a fish pass is still postulated in actual European and International guidelines. The actual research project evaluates several key stimuli, in particular light, water temperature and sound which might have an influence on the attraction of fish. Besides that, the effect of attraction flow, flow in the main channel and flow in the fish pass as well as the temperature in the fish pass and in the main channel are evaluated. It was examined whether photo taxis or rheotaxis of fish will have a positive effect on the number of fish entering fish passes. The number of migrating fish has been monitored over several spring and autumn periods at the entrance of a technical fish pass in a large epipotamal river, using the well-established FishCam monitoring system. Light, as well as sound were altered over one full monitoring period 2019 in a daily rhythm. Temperature data as well as fish migration were recorded 2019 and 2020. The bandwidth of the variation of discharge in the fish pass in combination with the natural fluctuation of the discharge in the river leads to an attraction flow in the range of 0.1 to 30%. All data were collected on an hourly basis, which lead to very accurate data regarding the flow parameters, the migrating fish, and the temperature, the phonotactic and the phototactic parameters. The selection of the relevant predictor variables took place using penalized, zero inflated, negative binomial regression models due to the exceeding number of zeros and due to over dispersion in the non-zero data. To not only rely on a single model, different penalty approaches, namely LASSO, SCAD and MCP, which are all well known for their predictive accuracy and their stable algorithm in highly variant data, have been chosen for further analyzes.

As a result, the difference in water temperature between the main river and the fish pass has a significant positive effect on the findability of the fish pass entrance, whereas flow parameters do not show any significant effect. Additional phonotactic and phototactic key stimuli had no positive effect on the findability of the fish pass entrance.