Optimising spoiler baffle arrangement for promoting small-bodied fish passage through culverts

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Culverts, built to support stream crossings for various road and rail networks, often create barriers for migrating fish species. A common solution for improving fish passage through culverts is the addition of baffles. However, there is currently little evaluation of baffle design (size, shape and arrangement) with respect to species-specific passage performance or negative impacts on culvert capacity. In this study, we concentrate on assessing three different configurations of spoiler baffles recommended for use in New Zealand in the national fish passage guidelines. The hydrodynamic flow field in each arrangement was characterised using acoustic Doppler velocimetry. *G. maculatus*, a representative Southern Hemisphere small-bodied fish, was allowed to move upstream through these baffle arrangements, and their movement was tracked using machine learning tools. Fish locations were then used to calculate their passage kinematics and resting behaviours. Baffle arrangement options were then compared and assessed with respect to flow fields and fish behaviours. Preliminary analysis of the results shows the suitability of smaller sized baffles arranged with medium to low aerial density. Further work will compare fish behaviour within these arrangements with other small-bodied fish species to synthesise the information required for the selection of appropriate baffle size and arrangement for retrofitting existing culverts.