

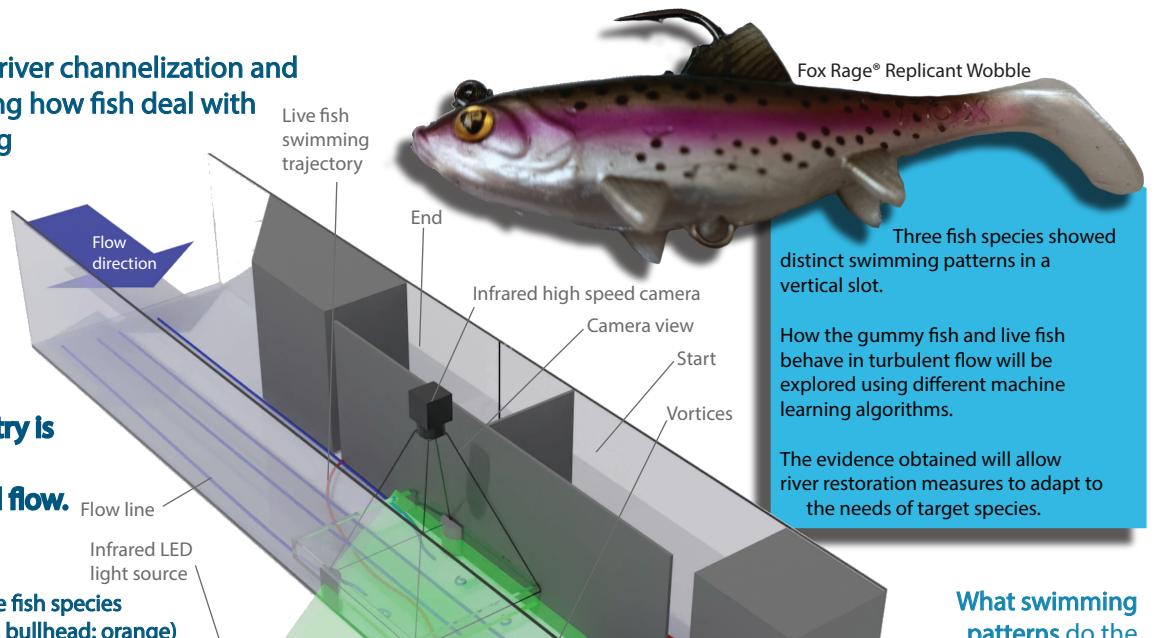


# Lessons from a gummy fish: How do fish modulate their swimming trajectories when swimming through critical flow?

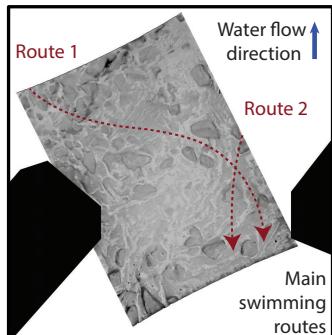
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Fish migration is affected by river channelization and fragmentation. Understanding how fish deal with challenging flow fields during upstream migration may allow for adaptation of restoration measures to the hydraulic needs of migrating species.

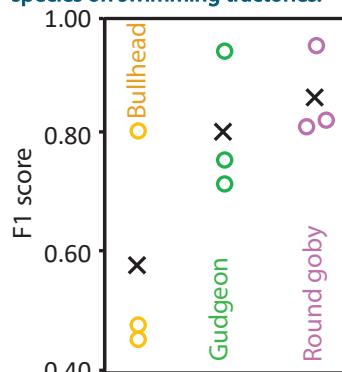
**A combination of Machine Learning, Video Tracking, and Particle Image Velocimetry is applied to understand fish swimming patterns in critical flow.**



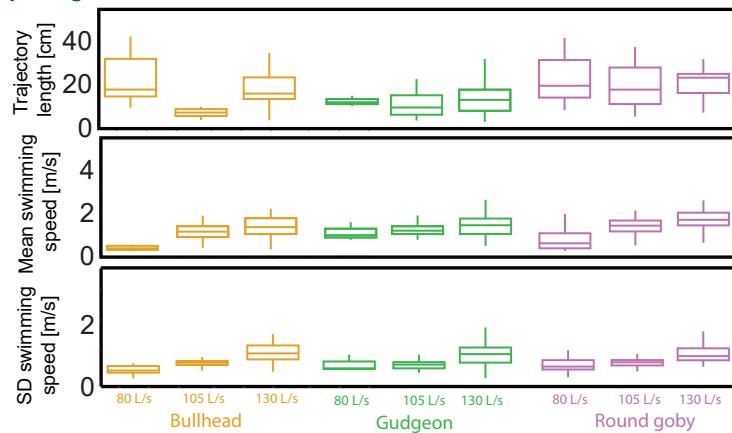
1. Two main swimming routes of three fish species (round goby: violet, gudgeon: green, bullhead: orange) were observed while passage of a vertical slot using video tracking (Wieglob et al. 2023).



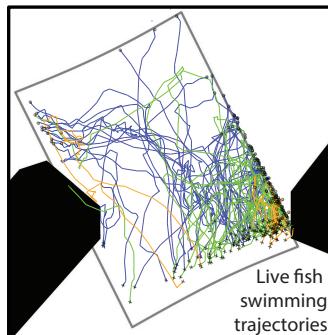
2. F1 scores (mean: X, cross validation: O) indicate that Neural Networks can predict the fish species on swimming tracjectories.



3. The fish increased swimming speed at larger water discharge while passing the vertical slot.



What swimming patterns do the fish exhibit in critical flow fields?



5. Three flow fields will be tested in the main experiments to describe the dependency of live fish swimming trajectories from water flow while swimming upstream.

How do the swimming patterns relate to the flow conditions?

Can Artificial Intelligence predict the swimming routes of fish based on flow data?

4. We perform trial experiments to describe the behaviour of a gummy fish in turbulent water.

