

Interactions between turbulence, vegetation and fish habitat use in rivers

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In river ecosystems, turbulence plays an essential role in the life cycle of plants and animals generating benefits but also significant threats for aquatic organisms. Despite this, river habitat assessment protocols tend to focus on spatially and temporally averaged flow velocities rather than the more complex descriptors of turbulence such as turbulence intensity, and the periodicity, orientation and scale of coherent flow structures that are known to directly influence aquatic organisms. This research focuses on the links between turbulence, vegetation and fish habitat use at the patch scale. To explore these interactions, three dimensional high frequency flow velocity was captured using an Acoustic Doppler Velocimeter (ADV) and used to compute key parameters describing the intensity, periodicity, orientation and scale of turbulence in the river Tagliamento (Italy). Experimental research combining flow measurement with underwater videography reveals that more sophisticated turbulence parameters provide a better explanation of fish behaviour and habitat use under field conditions than traditional hydraulic variables used in habitat assessment. The findings therefore provide important insights that may help to improve river assessment and sustainable restoration design.