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Locomotion of juvenile silver carp (*Hypophthalmichthys molitrix*) near the separation zone at the channel confluence

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Knowledge of locomotion of fish with significant rheotaxis at river confluences is critical for prediction of fish distribution at a river network. Recently, less silver carps observed in the Poyang Lake should be related to the hydrodynamic change at the confluence of the lake outlet and the Yangtze River. The operation of the Three Gorges Dam has largely changed the hydrodynamics at this confluence. Silver carp is one of the four major Chinese carps, and has significant rheotaxis. In this study, a series of laboratory experiments were conducted to figure out the behavioral responses of juvenile silver carps to hydrodynamics near the separation zone at the channel confluence. The separation zone at a river confluence is one of the main zones for carp habitat and feeding. The locomotion and trajectory of juvenile silver carps were recorded through infrared thermal imaging at the confluence flume. Flow velocity field near the separation zone was measured by a Particle Image Velocimetry (PIV) system. A total of 40 juvenile silver carps were released from the separation zone and swam to the upstream, among which 24 carps swam to the tributary and the other to the main channel. Almost all 24 carps moved along the beginning of the boundary of the separation zone near the corner where the flow shear was strong. It seems that instead of avoiding places with great vorticity, they preferentially chose the trajectory where the flow vorticity was large continuously. They increased the tail-beat frequency and decreased the tail-beat amplitude to maintain body stability when they encountered the flow with large vorticity. These results are beneficial for the regulation of upstream dams to adjust the hydrodynamics at the confluence and improve local ecology.