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3D Numerical simulations of the C-start of a Bluegill Sunfish[1]
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Obtaining the 3D flow field, forces, and power produced during the fast start maneuvers of fish is essential for studying this behavior from the hydrodynamics perspective. During a typical fast start, which is typically referred to as the C-start, the fish initially bends its body in a C shape manner and then with a fast stroke bends out of the C shape. We carry out high-resolution, 3D simulations of a bluegill sunfish performing a C-start maneuver. The body geometry and motion during the C-start are obtained from the experimental. We used high-speed video and particle image velocimetry to quantify body motion and flows produced during the C-start. We carry out simulations both with the entire motion prescribed and by prescribing only the deformation of the body but predicting the motion of the fish center of mass via a fluid-structure interaction approach. The computed results are compared with experimental observations and analyzed to further elucidate dynamics and three-dimensional structure of the C-start flowfields.

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