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Hydrodynamic interactions between laterally-spaced undulating "fish" JEANY L. ZHANG, JEFF D. ELDREDGE — It is generally accepted that fish achieve hydrodynamic benefits by swimming in schools, though the mechanisms used to achieve these benefits are not completely understood. In particular, the influence of lateral separation between fish has not been well characterized. In this work, it is shown that substantial increases in thrust can be obtained by fish swimming in parallel with no streamwise separation. The target of study is a two-dimensional fish-shaped profile generated about an undulating backbone. The fluid dynamics of single and multiple fish, tethered in a free-stream flow, are simulated with the viscous vortex particle method. The Reynolds number is maintained relatively low at 100. The Strouhal number of a single fish is varied to determine the value at which mean net force on the fish is zero. Then, with Strouhal number fixed, the relative distance and phase of two fish are systematically varied. It is found that the largest increase in overall thrust occurs when the fish undulate with mirror symmetry. With mirror symmetry maintained, the overall thrust decreases monotonically, but in a complex manner, as distance is increased. Systems with three fish are also studied. Finally, some preliminary results of free-swimming fish are examined.

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