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Noise Production of an Idealized Two-Dimensional Fish School NATHAN WAGENHOFFER, KEITH MOORED, JUSTIN JAWORSKI, Lehigh University — The analysis of quiet bio-inspired propulsive concepts requires a rapid, unified computational framework that integrates the coupled fluid-solid dynamics of swimmers and their wakes with the resulting noise generation. Such a framework is presented for two-dimensional flows, where the fluid motion is modeled by an unsteady boundary element method with a vortex-particle wake. The unsteady surface forces from the potential flow solver are then passed to an acoustic boundary element solver to predict the radiated sound in low-Mach-number flows. The coupled flowacoustic solver is validated against canonical vortex-sound problems. A diamond arrangement of four airfoils are subjected to traveling wave kinematics representing a known idealized pattern for a school of fish, and the airfoil motion and inflow values are derived from the range of Strouhal values common to many natural swimmers. The coupled flow-acoustic solver estimates and analyzes the hydrodynamic performance and noise production of the idealized school of swimmers.

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