

Abstract Submitted
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Two-dimensional study of fluid interaction with ray-strengthened fin using immersed boundary method¹ KOUROSH SHOELE, QIANG ZHU, UC San Diego — Labriform swimming is a common locomotion mode used by fish in low speed swimming, in which thrust generation is achieved through a combination of flapping and rowing motions of pectoral fins. Pectoral fins of bony fishes usually consist of a soft collagen membrane strengthened by embedded flexible rays, rendering anisotropic flexibility. We developed a fluid-structure interaction model based on immersed boundary method to simulate the kinematics and dynamic performance of an idealized 2D fin by considering the flow within one cross-sectional plane. The rays are represented as springs between target points and actual points along the fin, and the membrane is modeled as inextensible beams between the actual points. Using this model we studied thrust generation and propulsion efficiency of the fin at different combinations of parameters. Effects of Reynolds number, flapping frequency as well as different stiffnesses of the rays are studied.

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