

Abstract Submitted  
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**Hydrodynamic Performance of a Flexible Fish Pectoral Fin**<sup>1</sup> RAJAT MITTAL, HAIBO DONG, MELIHA BOZKURTTAS, The George Washington University, GEORGE LAUDER, PETER MADDEN, Harvard University — Numerical simulations have been used to examine in detail the hydrodynamic performance of a pectoral fin of a bluegill sunfish. The pectoral fin of this fish is highly flexible and undergoes significant shape and area change during its flapping cycle. The numerical simulations employ a 3D immersed boundary solver that allows us to examine in detail the hydrodynamics of the fin. Simulations reveal that the fish uses the fin flexibility to produce a highly complex and asymmetric stroke that does not fit any of the classic notions of “paddling” or “flapping.” The numerical simulations clearly reveal the distinct vortex structure produced by the fin and the connection between the vortex structures and hydrodynamic performance is examined. Finally, comparison between a flexible fish fin and a rigid flapping foil allows us to assess the benefits of flexibility on the hydrodynamic performance.

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