

Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Fish Pectoral Fin Hydrodynamics; Part I: Kinematics and DPIV Measurements of Propulsion and Maneuvering PETER G. MADDEN, GEORGE V. LAUDER, Department of Organismic and Evolutionary Biology, Harvard University, HAIBO DONG, MELIHA BOZKURTTAS, RAJAT MITTAL, Department of Mechanical and Aerospace Engineering, George Washington University — The flexibility and shape change of fish pectoral fins gives fish a great degree of control over fluid forces. Two camera high speed (500 fps) high resolution digital video was taken and digitized to measure 3D fin conformation during steady swimming and maneuvering. During steady swimming, pectoral fins cup forward into the flow in the chordwise direction with leading edges at both the upper and lower fin boundaries. Fin surface area changes by over 25% through the course of a beat. While maneuvering, the upper and lower leading edges can move independently to adjust the direction of generated forces. Measurement of flow in a plane behind the pectoral fin using high frame rate (500 fps) stereo particle imaging velocimetry (PIV) shows strong vortices forming at both edges during both outstroke and in-stroke. The relative magnitude of the upper and lower vortices and the resultant fluid jet direction are found to vary with different maneuvering directions.

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Date submitted: 11 Aug 2005

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