Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Development of a Transient Acoustic Boundary Element Method to Predict the Noise Signature of Swimming Fish[1] NATHAN WAGENHOFFER, Lehigh Unviersity, KEITH MOORED, JUSTIN JAWORSKI, Lehigh University — Animals have evolved flexible wings and fins to efficiently and quietly propel themselves through the air and water. The design of quiet and efficient bio-inspired propulsive concepts requires a rapid, unified computational framework that integrates three essential features: the fluid mechanics, the elastic structural response, and the noise generation. This study focuses on the development, validation, and demonstration of a transient, two-dimensional acoustic boundary element solver accelerated by a fast multipole algorithm. The resulting acoustic solver is used to characterize the acoustic signature produced by a vortex street advecting over a NACA 0012 airfoil, which is representative of vortex-body interactions that occur in schools of swimming fish. Both 2S and 2P canonical vortex streets generated by fish are investigated over the range of Strouhal number $0.2 < St < 0.4$, and the acoustic signature of the airfoil is quantified. This study provides the first estimate of the noise signature of a school of swimming fish.

[1]Lehigh University CORE Grant

Nathan Wagenhoffer
Lehigh University

Date submitted: 01 Aug 2015 Electronic form version 1.4