Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

A theoretical framework for fish-eddy interactions ALINE COTEL, PAUL WEBB, University of Michigan — The natural habitats of fishes are characterized by water movements driven by a multitude of physical processes of either natural or human origin. The resultant unsteadiness is exacerbated when flow interacts with surfaces, such as the bottom and banks, and protruding objects, such as corals, boulders, and woody debris. There is growing interest in the impacts on performance and behavior of fishes swimming in "turbulent flows". The ability of fishes to stabilize body postures and their swimming trajectories is thought to be important in determining species distributions and densities, and hence resultant assemblages in various habitats. Understanding impacts of turbulence on fishes is also important as human practices modify water movements, and as turbulence-generating structures ranging from hardening shorelines to control erosion, through designing fish deterrents, to the design of fish passageways become common. A new theoretical framework is proposed to quantify fish-eddy interactions. Dimensionless parameters are derived based on a common element: eddy circulation. A set of variables defines the flow field whereas a second set quantifies fish characteristics as an embedded body in the flow. By comparing both sets of variables, different regimes are predicted describing fish responses to a wide range of physical perturbations.

Aline Cotel
University of Michigan

Date submitted: 06 Aug 2007 Electronic form version 1.4