

Abstract Submitted
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Numerical study of hydrodynamics interactions in a diamond fish school¹ YU PAN, HAIBO DONG, Univ of Virginia — Fish school, as an archetypal collective phenomenon in nature, has been proven to provide hydrodynamic benefits to swimming. In a fish school, the spatial arrangement is believed to be one of the most important factors influencing hydrodynamic interactions among individuals. However, the hydrodynamic interactions in a dense diamond school have received little attention. In this work, an immersed-boundary-method-based incompressible Navier-Stokes flow solver is employed to quantitatively characterize the propulsive performance and the flow field of each fish in a diamond school. A parametric study is implemented to investigate the effect of spatial arrangement on the hydrodynamic performance of a dense diamond school. Force production and propulsive efficiency of individuals in a school are compared with that of a singular fish to illustrate the effect. Besides, the corresponding flow field analysis has been done to reveal the underlying fluid mechanisms. This enables us to gain more insight into the design of underwater robotic swarms.

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