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Enhanced swimming performance of tapered plates[1] ALEXANDER ALEXEEV, ERSAN DEMIRER, Georgia Institute of Technology — In nature fish rely on different type of swimming motion to propel themselves. On the one hand anguilliform fish (eel-like) generate travelling waves while ostraciiform fish utilize standing waves for propulsion. Different type of fish swimming can be formally characterized by investigating the nature of the wave propagation in terms of the standing wave ratio (SWR). Although standing wave based propulsion yields higher swimming velocity, creating a travelling wave enabling efficient swimming is not trivial. The acoustic black hole (ABH) effect is a phenomenon arising in tapered structures that prevents wave reflection thereby leading to traveling waves. Through three-dimensional fully coupled fluid structure interaction simulations, we show that ABH is an efficient passive solution to maintain travelling waves in finite-sized structures that can be used for efficient underwater propulsion. We explore the effects of different tapering shapes on the SWR and demonstrate that the SWR is a critical metric relating to the hydrodynamic efficiency of tapered plates.

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