

Abstract Submitted
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Testing Momentum Enhancement of Ribbon Fin Based Propulsion Using a Robotic Model With an Adjustable Body IAN ENGLISH, OSCAR CURET, None — Lighthill and Blake's 1990 momentum enhancement theory suggests there is a multiplicative propulsive effect linked to the ratio of body and fin heights in Gymnotiform and Balistiform swimmers, which propel themselves using multi-rayed undulating fins while keeping their bodies mostly rigid. Proof of such a momentum enhancement could have a profound effect on unmanned underwater vehicle design and shed light on the evolutionary advantage to body-fin ratios found in nature, shown as optimal for momentum enhancement in Lighthill and Blake's theory. A robotic ribbon fin with twelve independent fin rays, elastic fin membrane, and a body of adjustable height was developed specifically to experimentally test momentum enhancement. Thrust tests for various body heights were conducted in a recirculating flow tank at different flow speeds and fin flapping frequencies. When comparing thrust at different body heights, flow speeds, and frequencies to a 'no-body' thrust test case at each frequency and flow speed, data indicate there is no momentum enhancement factor due to the presence of a body on top of an undulating fin. This suggests that if there is a benefit to a specific ratio between body and fin height, it is not due to momentum enhancement.

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None

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