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The effect of flexibility on ribbon-fin-based propulsion HANLIN LIU, BEVAN TAYLOR, EVAN LATSHAW, OSCAR CURET, Florida Atlantic Univ — Ribbon-fin-based propulsion has the potential to improve the maneuverability of underwater vehicles navigating in complex environments. In this type of propulsion a series of rays are used to send traveling waves along an elongated fin. The use of flexible rays could further enhance the propulsive efficiency of undulating ribbon fins. In this work, we characterize the mechanical behavior and performance of a robotic undulating ribbon fin with different ray flexibilities. We tested the physical model in a water tunnel. In a series of experiments we measure the propulsive force, power consumption and swimming speed of the robotic fin for different ray flexural stiffness, wave frequencies and flow conditions. We found that an increase in flexibility decreases both thrust production and power consumption. Flexible rays could improve or worsen the propulsive performance compared to a rigid counterpart depending on the actuation parameters. We present the result concerning the different performance between rigid and flexible fins.

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