Abstract Submitted
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Investigation of Thunniform Swimming Using Material Testing, Biomimetic Robotics and Particle Image Velocimetry[1] RUIJIE ZHU, VISHAAL SARAIYA, JIANZHONG ZHU, GREGORY LEWIS, HILARY BART-SMITH, University of Virginia — Thunniform swimming is well recognized as an efficient method for high-speed long-distance underwater travelers such as tuna. Previous research has shown that tuna relies on contraction and relaxation of red muscle to generate angular motion of its large, crescent-shaped caudal fin through its peduncle. However, few researchers conduct deep investigation of material properties of tuna caudal fin and peduncle. This research project is composed of two parts, first of which is determining mechanical properties of components such as spine joints, tendons, fin rays and cartilage, from which the biomechanics of tuna tail can be better understood. The second part is building a robotic system mimicking a real tuna tail based on previously retrieved information, and testing the system inside a flow tank. With the help of PIV (Particle Image Velocimetry), fluid-structure interaction of the biomimetic fin is visualized and data such as swimming speed and power consumption are retrieved through the robotic system. The final outcome should explain how the material properties of tuna tail affect fluid dynamics of thunniform swimming.

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