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Effect of Varying the Angle of Attack of the Scales on a Biomimetic Shark Skin Model on Embedded Vortex Formation JENNIFER WHEELUS, AMY LANG, MICHAEL BRADSHAW, EMILY JONES, FARHANA AFROZ, The University of Alabama, PHILIP MOTTA, MARIA HABEGGER, University of South Florida — The skin of fast-swimming sharks is proposed to have mechanisms to reduce drag and delay flow separation. The skin of fast-swimming and agile sharks is covered with small teeth-like denticles on the order of 0.2 mm. The shortfin mako is one of the fastest and most agile ocean predators creating the need to minimize its pressure drag by controlling flow separation. Biological studies of the shortfin mako skin have shown the passive bristling angle of their denticles to exceed 50 degrees in areas on the flank corresponding to the locations likely to experience separation first. It has been shown that for an angle of attack of 90 degrees, vortices form within these cavities and impose a partial slip condition at the surface of the cavity. This experiment focuses on smaller angles of attack for denticle bristling, closer to the range thought to be achieved on real shark skin. A 3-D bristled shark skin model with varying angle of attack, embedded below a boundary layer, was used to study the formation of cavity vortices through fluorescent dye visualization and Digital Particle Image Velocimetry (DPIV). The effect of varying angle of attack on vortex formation will be discussed.

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