Abstract Submitted
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Shark Skin Bristling: A Passive Flow-Actuated Separation Control Mechanism[1] AMY LANG, JONATHON SMITH, MICHAEL BRADSHAW, JENNIFER WHEELUS, University of Alabama, PHILIP MOTTA, MARIA HABEGGER, JESSICA DAVIS, University of South Florida, ROBERT HUETER, Mote Marine Laboratory — A collaborative experimental effort between biologists and engineers has proven the separation control capability of shark skin, with a specific focus on the shortfin mako (*Isurus oxyrinchus*) known for its high speed and agility. Biological measurements of the denticles, or scales, as a function of body location (DOI:10.1002/jmor.20047) will be presented together with data on bristling angle of scales and the morphological implications. Results show key regions of high bristling capability to correspond with those most prone to flow separation; these include the tail, flank regions aft of the gills, and on pectoral fins with scale flexibility increasing towards the trailing edge. Fresh shark skin samples were also tested in a water tunnel facility using DPIV and evidence of flow separation control was observed under laminar and tripped boundary layer conditions. It was concluded that the experiments conducted in the Re $\sim 10^5$ range resulted in sufficiently strong backflow induced close to the surface such that the shear threshold to induce bristling on the real skin sample was achieved since flow control at lower Re was not as evident. It is hypothesized that backflow initiated close to the wall in a region of adverse pressure gradient induces localized scale bristling thereby interrupting the subsequent flow development that leads to global flow separation from the surface and increased drag.

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