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Vorticity Generation and Arrangement Behind a Two Degree-of-Freedom Fish Model[1] SETH BROOKS, MELISSA GREEN, Syracuse University — A two-degree-of-freedom fish model was investigated to understand the phenomenological relationship between simplified fish body kinematics and wake vortex dynamics. Its design, construction, and actuation provide control over frequency, tail (posterior half of body) angle, caudal fin to tail relative angle, and phase offset between the two angles. The frequency and phase offset were fixed for all cases in the current work while the tail and caudal fin angles were varied to create eight cases. Phase-averaged velocity data was collected beside the posterior half of the model as well as in the wake of the model. Data was obtained using stereoscopic particle image velocimetry at multiple planes along the entire span of the caudal fin. It was found that the body-generated vortices did not significantly interact with the caudal fin. The caudal fin leading edge vortex detaches from the surface sooner in cases with larger maximum tail angle. The total circulation generated at the caudal fin trailing edge was found to be sensitive to trailing edge velocity while being relatively insensitive to freestream velocity. Finally, the shedding of vortices from the caudal fin trailing edge was found to usually, but not always, coincide with periods of trailing edge deceleration.

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