Locomotive Performance of a Two Degree-of-Freedom Fish Model[1] SETH BROOKS, MELISSA GREEN, Syracuse University — A two degree-of-freedom fish model was used to investigate the phenomenological relationship between simplified fish body kinematics and locomotive performance. Its design, construction, and actuation provide control of maximum trailing edge excursion; heave-to-pitch ratio; phase offset between the tail and caudal fin; and oscillation frequency. The model was mounted to a carriage on linear air bearings aligned with the freestream and attached to a load cell that measured thrust. The input power was measured using torque sensors combined with angular velocity. The phase-averaged power input and thrust output were measured for a parameter space spanning all parameters except oscillation frequency that was fixed at 1Hz. Quasi-propulsive efficiency is calculated using the time-averaged thrust and power. The data will be used to determine optimal kinematics for maximum thrust and efficiency. This will include trends for each parameter as well as general trends in performance. These trends will be compared with the literature on pitching and/or heaving air-foils and panels to determine the applicability of extending their findings to full three-dimensional systems.

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