Abstract Submitted
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Flying in Two Dimensions MANU PRAKASH, THIBAUT BARDON[1], Stanford University — It has long been proposed that insect flight might have evolved on a fluid interface. Surface of a pond provides an ecological niche which is exploited by a large number of species capable of locomotion on a fluid interface. Here we describe the discovery of constrained flight in two dimensions as a novel mode of locomotion used by water lily beetles (genus Galerucella). Because water lily beetles are also capable of three-dimensional free flight, this novel two-dimensional locomotion provides us with a unique model system to explore both the transition between two and three dimensional flight and the associated energetics. Here we present a comparative analysis of this transition in terms of wing stroke angles associated with two and three dimensional flight, as well as modeling surface tension forces on both the horizontal and vertical axes. Special attention is paid to the dynamics and energetics of flight in two-dimensions, focusing on the interaction of the wing strokes with the fluid interface and the capillary-gravity wave drag associated with two-dimensional propulsion.

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