

Abstract Submitted  
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**The  
Hydrodynamics of Plesiosaurs**<sup>1</sup> LUKE MUSCUTT, BHARATHRAM GANAPATHISUBRAMANI, GARETH DYKE, GABRIEL WEYMOUTH, University of Southampton — Plesiosaurs are extinct marine reptiles that existed at the same time as the dinosaurs, and are the only known animals to swim by actively flapping their four wing-like flippers. This can be viewed as a tandem flapping wing problem, where the hind wing is operating in the wake of the fore wing. Experiments using full-scale robotic plesiosaur flippers in a large flume tank have been used to investigate the kinematics and interaction of the flippers. The flippers are actuated in heave and pitch, and a combination of force measurements and flow visualization are used to analyze the characteristics of the vortex interaction between the flippers. Previous two-dimensional numerical simulations have shown that certain kinematics give an increase in thrust of the hind flipper of up to 50%. The current experiments determine if such thrust augmentation is present for a three-dimensional flowfield and determine the kinematics that give the highest possible thrust. This will help to answer paleo-biological questions about the function and evolution of the plesiosaur flippers, along with helping to determine if tandem flapping wings could be a viable propulsion system for autonomous underwater vehicles.

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