Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

The role of edge curvature on the thrust force in a stingray inspired plan-form RAVI CHAITHANYA MYSA, PABLO VALDIVIA Y ALVARADO, Singapore University of Technology and Design — Optimizing the geometry of stingray inspired plan-forms for propulsive performance is of interest to design bio-inspired underwater vehicles and robots. Thrust generation is characterized by an exchange of momentum from plan-form to fluid as well as generation of edge vortices. Numerical simulations are performed at a Reynolds number of 500 on various geometries of the plan-form to better understand this phenomenon for a prescribed travelling wave. The plan-form surface area is kept constant while the geometry of the plan-form is varied from a round shape to a square shape by changing the curvature of the edge. As the curvature of the plan-form decreases, the thrust coefficient decreases. The effect of stingray inspired wave motion for various plan-form geometries with respect to thrust generation is analyzed in detail. The influence of edge curvature on the shape and strength of leading-edge vortices is characterized. The suction pressure and the generation of pressure due to exchange of momentum on the plan-form is also quantified.

Ravi Chaithanya Mysa
Singapore University of Technology and Design

Date submitted: 02 Aug 2019 Electronic form version 1.4