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Escaping From Predation At Low Reynolds Number: A Compensatory Mechanism BRAD GEMMELL, University of Texas at Austin, JIAN SHENG, University of Minnesota, ED BUSKEY, Univeristy of Texas at Austin —
Small planktonic organisms such as copepods are often the first foods for many species of fish and thus, subject to high predation rates. They have developed strong escape responses to attacks from visual predators and this behavior is found even in the youngest development stage. Because of their small size (approx. 100 μm), these juvenile copepods must contend with greater viscous forces than their predators during encounters. In this study, we investigate the role of viscosity on escape swimming performance of young copepods within the context of the environmental temperatures (10C-30C) these animals experience along the Texas coast. 3-Dimensional high speed (3000 frames per second) digital holographic techniques were used to elucidate kinematics and kinetics of swimming. Here we show that although escape velocity and acceleration are reduced as a function of both increasing viscosity and decreasing temperature, total escape distance is conserved. Interestingly, we observed no difference in the number swimming strokes per escape. Instead, the animals exhibit a compensatory mechanism based on increasing power stroke duration to recovery stroke duration to counter act the increasing viscosity at lower temperature. Flow analysis shows this results in the conservation of energy expenditure, and consequently escape distance.

Brad Gemmell
University of Texas at Austin

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