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An underwater robo-leader for collective motion studies YAIR SANCHEZ, MONICA M. WILHELMUS, Univ of California - Riverside — A wide range of aquatic species, from bacteria to large tuna, exhibits collective behavior. It has long been hypothesized that the formation of complex configurations brings an energetic advantage to the members of a group as well as protection against larger predators or harmful agents. Lately, however, laboratory experiments have suggested that both the physics and the behavioral aspects of collective motion yield more complexity than previously attributed. With the goal to understand the fluid mechanical implications behind collective motion in a laboratory setting, we have developed a new device to induce this behavior on demand. Following recent studies of lab-induced vertical migration of Artemia salina, we have designed and constructed a remotely controlled underwater robotic swimmer that acts as a leader for groups of phototactic organisms. Preliminary quantitative flow visualizations done during vertical migration of brine shrimp show that this new instrument does induce collective motion in the laboratory. With this setup, we can address the hydrodynamic effect of having different swarm configurations, a variable that so far has been challenging to study in a controllable and reproducible manner.

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