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Field testing of biohybrid robotic jellyfish to demonstrate enhanced swimming speeds NICOLE XU, Stanford Univ, JAMES TOWNSEND, Marine Biological Laboratory, JOHN COSTELLO, Providence College, SEAN COLIN, Roger Williams University, BRADFORD GEMMELL, University of South Florida, JOHN DABIRI, California Institute of Technology — Biohybrid robots incorporating self-contained microelectronic systems embedded into live animals can potentially leverage the animals' self-healing properties and offset robotic power constraints using their metabolism. Previous work has shown that a biohybrid robotic jellyfish can exhibit enhanced swimming speeds up to 2.8 times in laboratory environments, but it remains unknown whether these results also occur in natural, dynamic ocean environments. The present work demonstrates a proof of concept that biohybrid robotic jellyfish can be successfully implemented in the coastal waters of Massachusetts. We demonstrate comparable field results to prior laboratory work, with enhancement factors up to 2.3 times the baseline speed, or absolute swimming speeds up to 6.6 ± 0.3 cm s^{-1}. A theoretical model was developed to predict experimental swimming speeds with mean errors within 1 cm s^{-1}, using morphological and time-dependent input parameters from individual animals. With future work to increase maneuverability and incorporate sensors to track environmental changes, we can potentially use biohybrid robotic jellyfish as a ubiquitous and energy-efficient tool in ocean monitoring.

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