Resilience in moving water: Effects of turbulence on the predatory impact of the lobate ctenophore Mnemiopsis leidyi

Despite its delicate morphology, the lobate ctenophore Mnemiopsis leidyi thrives in coastal ecosystems as an influential zooplankton predator. Coastal ecosystems are often characterized as energetic systems with high levels of natural turbulence in the water column. To understand how natural wind-driven turbulence affects the feeding ecology of M. leidyi, we used a combination of approaches to quantify how naturally and laboratory generated turbulence affects the behavior, feeding processes and feeding impact of M. leidyi. Experiments using laboratory generated turbulence demonstrated that turbulence can reduce M. leidyi feeding rates on copepods and Artemia nauplii by >50%. However, detailed feeding data from the field, collected during highly variable surface conditions, showed that wind-driven turbulence did not affect the feeding rates or prey selection of M. leidyi. Additional laboratory experiments and field observations suggest that the feeding process of M. leidyi is resilient to wind-driven turbulence because M. leidyi shows a behavioral response to turbulence by moving deeper in the water column. Seeking refuge in deeper waters enables M. leidyi to maintain high feeding rates even under high turbulence conditions generated by wind driven mixing. As a result, M. leidyi exerted a consistently high predatory impact on prey populations during highly variable and often energetic wind-driven mixing conditions. This resilience adds to our understanding of how M. leidyi can thrive in a wide spectrum of environments around the world. The limits to this resilience also set boundaries to its range expansion into novel areas.