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Quantifying the 3D Odorant Concentration Field Used by Actively Tracking Blue Crabs D.R. WEBSTER, B.D. DICKMAN, J.L. JACKSON, M.J. WEISSBURG, Georgia Tech — Blue crabs and other aquatic organisms locate food and mates by tracking turbulent odorant plumes. The odorant concentration fluctuates unpredictably due to turbulent transport, and many characteristics of the fluctuation pattern have been hypothesized as useful cues for orienting to the odorant source. To make a direct linkage between tracking behavior and the odorant concentration signal, we developed a measurement system based the laser induced fluorescence technique to quantify the instantaneous 3D concentration field surrounding actively tracking blue crabs. The data suggest a correlation between upstream walking speed and the concentration of the odorant signal arriving at the antennule chemosensors, which are located near the mouth region. More specifically, we note an increase in upstream walking speed when high concentration bursts arrive at the antennules location. We also test hypotheses regarding the ability of blue crabs to steer relative to the plume centerline based on the signal contrast between the chemosensors located on their leg appendages. These chemosensors are located much closer to the substrate compared to the antennules and are separated by the width of the blue crab. In this case, it appears that blue crabs use the bilateral signal comparison to track along the edge of the plume.

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