



## Response of copepods to physical gradients associated with structure in the ocean

Woodson, C. B., D. R. Webster, M. J. Weissburg, J. Yen

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**ABSTRACT:** We studied the response of the copepods *Acartia tonsa* and *Temora longicornis* to spatial gradients of flow velocity and fluid density to determine whether the presence of physical gradients initiated local search for resources or promoted aggregation. Two additional species of copepods, *Candacia ethiopica* and *Labidocera madurae*, were also exposed to velocity gradients. A plane jet flume apparatus facilitated the isolation of physical structures that mimic those found in the ocean and permitted high-resolution behavioral observations. All four species significantly increased the proportion of time in the gradient layer region relative to the total time in the observation window (proportional residence time) in response to the velocity-gradient layer. Behavioral changes, such as increased swimming speed and turn frequency, were consistent with area-restricted search behavior. *T. longicornis* also significantly increased proportional residence time in response to the density-gradient layer, but changes in swimming speed and turn frequency were not significantly different. *A. tonsa* and *T. longicornis* appeared to contact the density gradient and swim away or along the boundary. Hence, density gradients may act as a barrier to vertical movement and not as a positive cue for area-restricted search behavior. Velocity and density gradients play important, yet different, roles in defining patterns at fine-to-intermediate scales in zooplankton ecology.

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