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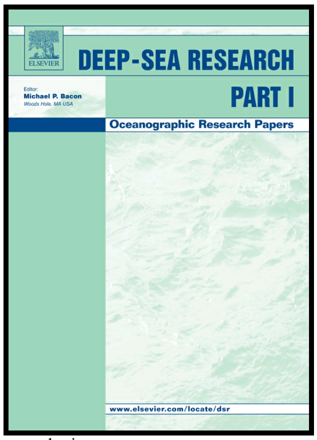

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Abstract
Many fundamental questions in marine ecology require an understanding of larval dispersal and connectivity, yet direct observations of larval trajectories are difficult or impossible to obtain. Although biophysical models provide an alternative approach, in the deep sea, essential biological parameters for these models have seldom been measured empirically. In this study, we used a biophysical model to explore the role of behaviorally mediated migration from two methane seep sites in the Gulf of Mexico on potential larval dispersal patterns and population connectivity of the deep-sea mussel "*Bathymodiolus" childressi*, a species for which some biological information is available. Three possible larval dispersal strategies were evaluated for larvae with a Planktonic Larval Duration (PLD) of 395 days: (1) demersal drift, (2) dispersal near the surface early in larval life followed by an extended demersal period before settlement, and (3) dispersal near the surface until just before settlement. Upward swimming speeds varied in the model based on the best data available. Average dispersal distances for simulated larvae varied between 16 km and 1488 km. Dispersal in the upper water column resulted in the greatest dispersal distance (1173 km ±2.00), followed by mixed dispersal depth (921 km ±2.00). Larvae originating in the Gulf of Mexico can potentially seed most known seep metapopulations on the Atlantic continental margin, whereas larvae drifting demersally cannot (237 km ±1.43). Depth of dispersal is therefore shown to be a critical parameter for models of deep-sea connectivity.

KEYWORDS

"Bathymodiolus" childressi, biophysical model, larval dispersal, methane seep, Gulf of Mexico