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Assuming stationarity compromises understanding of the dynamics and management of open marine populations

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Abstract

Understanding connectivity of marine species is crucial for their management. This connectivity, however, is difficult to quantify; propagules of marine species are typically small, numerous, and can travel large distances. Consequently, oceanographic models are often used to simulate larval dispersal. To avoid high computational costs, these models typically use, pooled or cross-sectional data and fixed biological parameters. Here we explore how temporal and spatial variation in current velocities, and pelagic larval duration and buoyancy can alter patterns of marine connectivity of Crown-of-Thorns starfish on Australia's Great Barrier Reef. Our results reveal highly variable reef connectivity in space and time mediated by all three factors. No individual reef acted consistently as a population source or sink. It is, therefore, important to consider many factors concurrently when estimating connectivity for understanding these population dynamics, especially where such estimates are relied on for evidence-based decision making.

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