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Andrew S. Kough
Claire B. Paris
Mark J. Butler IV
Old Dominion University, mbutter@odu.edu

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CORRESPONDENCE

The spatial context of “winning” in MPA network design: Location matters

Andrew S. Kough1 | Claire B. Paris2 | Mark J. Butler IV3

1Daniel P. Haerther Center for Conservation and Research, John G. Shedd Aquarium, Chicago, IL 60605, USA
2Rosenstiel School of Marine and Atmospheric Sciences, University of Miami, Miami, FL 33149, USA
3Department of Biological Sciences, Old Dominion University, Norfolk, VA 23529, USA

Correspondence
Andrew S. Kough, Daniel P. Haerther Center for Conservation and Research, John G. Shedd Aquarium, 1200 S Lake Shore Drive, Chicago, IL, 60605, USA.
Email: andrew.kough@gmail.com


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Chollett et al. (2017) make the case that a local network of marine protected areas (MPAs) enhances fisheries for Caribbean spiny lobster (Panulirus argus) off the coast of Honduras. However, their simulation focused on one ecoregion where self-recruitment is predicted to be among the highest in the Caribbean (Cowen, Paris, & Srinivasan, 2006). The shallow banks and scattered cays of the Honduran-Nicaraguan Rise, separating the Cayman and Colombian basins, create an obstacle to the powerful southern Caribbean jet (Richardson, 2005), fostering an ideal location for topographically steered eddies and larval retention. Local management, whether based on traditional techniques or MPAs, is indeed likely to be successful in sustaining the lobster population in that region. But the authors go too far in promoting local management based on a best-case scenario where the population is largely self-recruiting, and they downplay the need for international cooperation in managing one of the most economically important species in the Caribbean (Kough, Paris, & Butler IV, 2013).

Caribbean spiny lobsters are widely distributed throughout the west-central Atlantic from Brazil to Bermuda, a remarkable distribution promoted by their lengthy pelagic larval duration. Truelove et al. (2017) recently found a perceptible but weak genetic structure among P. argus populations in the Caribbean and those genomic patterns correlated well with biophysical modeling results (Kough et al., 2013). The picture formed by those and numerous other studies is that recruitment of P. argus is best described as a metapopulation dominated by widespread larval connectivity punctuated by a few regions where larval transport interacts with local habitat structure to enhance self-recruitment.

We revisited the larval transport of Chollett et al. with a similar simulation, including increased temporal resolution, to estimate P. argus larval exchange within their Caribbean-wide habitat bounds (Supporting Information). In only three ecoregions, The Bahamas, Belize, and the Windward Lesser Antilles, is self-recruitment predicted to exceed 50%. The Honduran-Nicaraguan Rise also has high self-recruitment (39%), yet, unlike the rest of the Caribbean besides the Windward Lesser Antilles, receives larvae from relatively few outside sources. This is an unusual best-case stock-recruitment scenario. We fear that readers, particularly those tasked with managing P. argus fisheries, will glean from Chollett et al. the mistaken notion that local management of adult stocks are likely to successfully sustain levels of larval recruitment. International connectivity trumps local sources in larval exchange in most of the Caribbean.

Management requires consideration of a species' biology as well as the ecological and spatial context within which that biology plays out. Effective local management of fishery stocks and nursery habitats is crucial for sustaining and
rebuilding over-fished populations. Importantly, Chollett et al.
provide an excellent pathway forward for a sustainable fish-
ery reserve network in Honduras. But in only a few regions
are such actions sufficient to sustain the local recruitment of
the widely dispersing P. argus, a species whose metapopula-
tion dynamics demand greater cooperation among manage-
ment units: location matters.

ORCID
Andrew S. Kough http://orcid.org/0000-0001-8732-6588

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