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TITLE: Hydrodynamic Connectivity of Habitats of Deep-Water Corals in Corsair Canyon, Northwest Atlantic: A Case for Cross-Boundary Conservation

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ABSTRACT:

Deep-water corals are significant ecosystem engineers that provide habitat complexity in the deep sea. They are indicator species of vulnerable marine ecosystems because of their slow growth and longevity, characteristics that can prolong recovery from disturbances such as fishing. For populations with discontinuous distributions, such as aggregations of deep-water corals, population connectivity is critical in regulating persistence and recovery and is one of the recommended elements in the design of area-based conservation measures. In this study, we assessed potential pathways of connectivity in the Corsair Canyon Conservation Area, off Nova Scotia, Canada, for populations of the deep-water corals Paragorgia arborea and Primnoa resedaeformis discovered in 2014 and afforded protection in 2016. Corsair Canyon located in the Canadian EEZ, ~ 20 kilometres from the border between Canada and the USA, is potentially receiving larvae from either the Canadian or US EEZ. In Corsair Canyon, P. arborea was very abundant at depths 484-856 m and some colonies of P. arborea were > 2 m high. These are the locally densest aggregations of P. arborea we have detected on the continental slope off Nova Scotia. We also recorded P. resedaeformis at similar depths. Colonies of both species were most often seen attached perpendicularly to a rock face, and into the current. We assessed hydrodynamic connectivity between Corsair Canyon and other canyons to the northeast and southwest along the continental slope with known occurrences of the two corals, using the ocean model Finite-Volume Community Ocean Model (University of Massachusetts-Dartmouth). Our results indicate that estimated hydrodynamic connectivity originates consistently from canyons to the southwest of Corsair Canyon, particularly Georges, and Heezen Canyons. Of these, only Georges Canyon is within Canada?s EEZ and based on our data has very sparse populations of corals that can supply potential recruits. Predicted connectivity with the Northeast Channel Coral Conservation Area occurs in winter and spring, but the complexity of circulation in those seasons needs to be resolved to confirm the strength of this connection. Our results strongly suggest cross-boundary coordination is essential in the conservation of deep-water corals in the northwest Atlantic, by ensuring larval exchange and connectivity.

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