

METAPOPULATION SOURCE-SINK DYNAMICS AND STOCK ENHANCEMENT OF MARINE SPECIES

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Various biophysical systems exhibit characteristics of metapopulation and network structure. The specific type of metapopulation or network structure can have substantially different effects on metapopulation dynamics of marine species with open populations displaying varying degrees of connectivity between subpopulations, and thus can have major consequences on stock enhancement efforts. We investigate the role of connectivity in metapopulation dynamics of the blue crab, *Callinectes sapidus*, and the Eastern oyster, *Crassostrea virginica*, with three dimensional hydrodynamic models simulating advection and diffusion. In the case of the blue crab, we model a metapopulation comprised of primary (i.e. seagrass beds) and secondary (i.e. salt marsh fringed coves and shorelines) nursery habitats, and spatially distinct spawning grounds connected via migration corridors. In the model simulations, we distinguish nursery habitats that are recruitment limited, and therefore optimal candidates for stock enhancement through release of hatchery-reared or translocated juveniles. In the case of the Eastern oyster, we model connectivity between numerous oyster reefs (i.e., subpopulations) positioned according to historical observations. Model simulations produce estimates of the degree of connectivity between all pairs of oyster reefs, which subsequently permits assessment of the diversity of patterns in network connectivity. From these results we distinguish the major characteristic types of connectivity patterns among oyster reefs, we identify those reefs most suitable for broodstock enhancement, and we discuss the means by which oyster reef networks, such as those occurring throughout Chesapeake Bay, may be enhanced successfully.