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Title

<u>Identifying Critical Fish Habitat and Long-term Trends in Fish Abundances in the Hudson River Estuary</u>

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Abstract

The Hudson River estuary (HRE) is a well monitored aquatic resource and much secondary data exist for this system. We developed two objectives based on accessible HRE aquatic data. The first objective was to determine if changes in HRE fish community over the time period (1974 to 2005) years are correlated to local and regional climate. We addressed this objective by employing a multivariate statistical approach. We confirmed that the HRE fish community structure has changed over the time period (1974 to 2005). These changes are correlated with local hydrology (freshwater flow and water temperature) and regional climate (Atlantic Multidecadal Oscillation or AMO and North Atlantic Oscillation or NAO). We found that abundances of striped bass larval stages are positively correlated with high freshwater flows and juvenile shad abundances are negatively correlated with the AMO or warmer sea surface temperatures (SST). This finding suggests that climate-related variability affects HRE juvenile shad abundances and current management strategies for this declining species should include the implications of climate change. The second objective was to examine whether factors such as sediment type, water characteristics and distance to nearest submerged aquatic vegetation (SAV) beds affect the occurrence or presence/absence of juvenile American shad (Alosa sapidissima) and juvenile striped bass (Morone saxatilis) in the HRE during the fall. We addressed this objective by applying geostatistics and general linear mixed effects models. We found the probability of presence for both species were commonly driven by spatial dependence or river mile, Julian day and salinity. Our results include maps depicting probability of occurrence (or presence) for both species throughout the HRE. We found the highest predicted probabilities of juvenile American shad presence are found in the Upper HRE. Conversely, highest predicted probabilities of juvenile striped bass presence are found in the Lower HRE. Habitat partitioning between these two species is present during the fall in this system but the mechanism is unclear. Future studies could address a possible predator-prey or competitive relationship between juvenile American shad and juvenile striped bass.

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