Developing a Molluscan Biotic Index for Establishing Geohistorical Baselines of Benthic Conditions

Matthew J. Pruden[1], John C. Handley[2,3], Gregory P. Dietl[1,2]

[1]Cornell University, Ithaca, NY, USA
[2]Paleontological Research Institution, Ithaca, NY, USA
[3]University of Rochester, Rochester, NY, USA

An essential prerequisite to the use of biotic indices for assessing the condition of estuarine benthic macroinvertebrate communities is the establishment of relevant, location-specific baseline conditions that correspond with the restoration or remediation objectives, and that accounts for natural temporal and spatial variability. Unfortunately, without long-term monitoring records, it can be difficult to establish sound baseline conditions and therefore assess where the ecosystem is along the path towards recovery. A solution could be the use of the molluscan geohistorical record, which comprises dead shell remains preserved in the sediment that are time-averaged on the scale of decades to centuries, thereby providing a location-specific, long-term record of benthic conditions. However, the formation of the molluscan geohistorical record introduces potential biases that need to be accounted for before using the records to establish baseline conditions for biotic indices, including the preservation of species abundance, increased richness, and increased evenness. Here we outline the development of a molluscan biotic index that can account for the effects of time-averaging and preservational bias. We modified the nationally adopted Multivariate-AZTI Marine Biotic Index by substituting metrics known to provide greater concordance between the live, real-time monitoring and geohistorical records, such as fractional Hill numbers and abundance transformations. Using coastal condition survey data from the Atlantic and Gulf Coasts of the United States, sample sites were grouped by salinity and sediment type, and metrics were selected based on the effectiveness of the metric to distinguish degraded and minimally impacted sites, which were designated a priori based on sediment contamination, eutrophication, and hypoxia. The development of a molluscan biotic index geared towards application to the geohistorical record would facilitate the establishment of relevant, location-specific baseline conditions, especially in areas without prior monitoring records.

Contact Information: Matthew Pruden, Cornell University, 112 Hollister Dr., Snee Hall, Ithaca, NY, USA 14853, Phone: 607-273-6623, Email: mjp368@cornell.edu