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Developing and applying a benthic index of estuarine condition for the Virginian Biogeographic Province

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ABSTRACT

A benthic index of estuarine condition was constructed for the Virginian Biogeographic Province (from Cape Cod, Massachusetts, to the mouth of Chesapeake Bay, Virginia) with data collected during summers of 1990 through 1993 by the US EPA's Environmental Monitoring and Assessment Program (EMAP). Forty-eight metrics, based on attributes of the macrobenthos, were considered for the index, including measures of biodiversity, community condition, individual health, functional organization, and taxonomic composition. Salinity was correlated significantly with some of the metrics. Therefore, some metrics were normalized for salinity. The data used to develop the index (the calibration data) included equal numbers of reference and degraded sites, disrupted equally across three salinity zones (<5, 5-18, >18%). An independent set of data was used for validation. Linear discriminant analysis identified combinations of metrics that could best discriminate reference from degraded sites. The targets for correct classification were 90% of the sites for the calibration data and 80% for the validation data. Six combinations from salinity-normalized Gleason's D (a biodiversity metric), and negative contributions from two taxonomic composition metrics, abundances of spionid polychaetes and of salinity-normalized tubificid oligochaetes. The index correctly classified 87% of reference and 90% of degraded sites in the calibration data and 88% of reference and 81% of degraded sites in the validation data. The index correctly classified sites over the full range of salinity (tidal-fresh to marine waters) and across grain sizes (silt—clay to sand).