

Using regional distribution patterns of estuarine and coastal benthic invertebrates to calibrate benthic indices of ecological condition

STEPHEN S. HALE

Abstract. The biogeography of marine benthic macroinvertebrates of the U.S. Atlantic coast from Delaware Bay north to Passamaquoddy Bay, Maine, was studied to define physical-chemical factors affecting broad taxa distributions and provide information needed to calibrate benthic indices of ecological condition. Five years (2000-2004) of data from 614 non-polluted stations from the National Coastal Assessment were analyzed. Multidimensional scaling done on Bray-Curtis similarity matrices of taxa relative abundance (547 species) suggested seven clusters, or subregions: two based on salinity (oligohaline, mesohaline) and five based on latitude. Taxa distribution patterns for stations > 18 psu salinity were strongly influenced by latitude; conversely, for stations of <18 psu, salinity overrode the effect of latitude. An ordination of abiotic variables (temperature, salinity, sediment percent silt-clay, depth) correlated well with the ordination of taxa abundance data ($R = 0.77$, $p < 0.001$). The first split of a multivariate regression tree was by a summer bottom temperature of 20.8 °C at Cape Cod. Salinity and percent silt-clay led to further splits. In addition to providing information on subregions needed to calibrate ecological indicators, these results provide a baseline to address broad-scale and long-term issues such as global climate change, species invasions, and conservation planning.