

A Summary of Results of IOC-BIG Benthic-TOC Study

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While organic matter in sediments is an important source of food for benthic fauna, an overabundance can cause reductions in species richness, abundance, and biomass due to oxygen depletion and buildup of toxic byproducts (ammonia and sulphide) associated with the breakdown of these materials. Moreover, increasing organic content of sediment is often accompanied by other chemical stressors co-varying with sediment particle size. In the present study, synoptic data on the structure of macroinfaunal communities and total organic carbon (TOC) content of sediment were obtained from 951 stations representing seven coastal regions of the world: northern Black Sea (Crimean and Caucasian coasts); eastern Mediterranean Sea (Greece); North Sea (Ekofisk oil field); Firth of Clyde and Liverpool Bay, UK; Seto Inland Sea, Japan; Boston Harbor and Massachusetts Bay, USA; and estuaries along the southeastern USA. Macroinfaunal and TOC data were examined to look for patterns of association consistent with conceptual-model predictions and to identify TOC critical points corresponding to major shifts in the benthic data. Species richness, Hurlbert's $E(S_n)$, was selected as the primary response parameter. Results suggested that risks of reduced species richness from organic loading and other associated stressors in sediments should be relatively low at TOC concentrations $<$ about 10 mg g^{-1} , high at concentrations $>$ about 35 mg g^{-1} , and intermediate at concentrations in-between. Predictive ability across these ranges was high based on results of re-sampling simulation. While not a measure of causality, it is anticipated that these TOC critical points may be used as a general screening-level indicator for evaluating the likelihood of reduced sediment quality and associated bioeffects over broad coastal areas receiving organic wastes and other pollutants from human activities.

Key Reference

Hyland, J., Balthis, L., Karakassis, I., Magni, P., Petrov, A., Shine, J., Vestergaard, O., Warwick, R., 2005. Organic carbon content of sediments as an indicator of stress in the marine benthos. *Marine Ecology Progress Series* (in press).