

Coastal eutrophication in the southeastern U.S.: Nitrogen versus phosphorus limitation and the role of organic nitrogen

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Abstract

Research into coastal and estuarine eutrophication has focused overwhelmingly on the addition and fate of inorganic nitrogen (N). Up to 90% of the nitrogen entering Georgia's coastal waters, however, is dissolved organic N (DON), with the bulk of the material being humics derived from marshes. Though this humic material has traditionally been assumed to be refractory, recent research in two Georgia Rivers (Bronk et al. 1999, unpubl. data) indicates this humic material can be a significant source of N to the plankton community. This proposal seeks funding to extend earlier Sea Grant funded research to include a study of N versus P limitation in the Altamaha and Satilla Rivers and to assess the potential for groundwater to be a significant source of N.

Based on stoichiometric ratios of N and P, we hypothesize that the production of phytoplankton biomass will be more N limited in the Satilla, relative to the Altamaha, and that the more refractory, marsh-derived humic N will make up a higher percentage of the N nutrition of the plankton in the Satilla relative to the Altamaha River because the highly labile inorganic N forms are less abundant. Based on available groundwater data, we hypothesize that groundwater will be a significant source of both inorganic and organic N to the plankton community.

The proposed study has five objectives. First, to investigate N versus P limitation using stoichiometric ratios and bioassays. Second, to measure uptake rates of organic and inorganic N substrates using ^{15}N tracer techniques. To measure these rates, field studies will be conducted at four sites along the Altamaha and Satilla Rivers in fall, spring, and summer. Third, to quantify the potential role of groundwater as a source of eutrophication. Fourth, to compare our results with colleagues working on DON utilization in more anthropogenically impacted coastal areas in New Jersey and Maryland to derive generalities across systems. Lastly, to continue to communicate our findings to local and regional shareholders.