

QUANTIFICATION OF MARINE ARCHAEA IN THE CAPE FEAR RIVER
ESTUARY IN SOUTHEASTERN NORTH CAROLINA USING FLUORESCENCE *IN*
SITU HYBRIDIZATION

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ABSTRACT

Fluorescence *in situ* hybridization (FISH) with 16S rRNA-targeted oligonucleotide probes was used to examine the abundance and distribution of planktonic microorganisms within the Cape Fear River estuary in southeastern NC. This black water riverine system is a mesotrophic, temperate, coastal estuary with a partially mixed salinity gradient. Recent studies have shown the ubiquitous nature of marine and freshwater archaea in “non-extreme” environments with archaea being common components of marine assemblages in both shallow and deep waters. I attempted to quantify the distribution and abundance of planktonic archaea within the estuarine environment. To this end, water samples were collected monthly from three sites at surface and depth from September 2001 to August 2002. Samples were analyzed using domain-specific oligonucleotide probes to classify planktonic microorganisms to the domains *Eukarya*, *Bacteria*, and *Archaea* and the subdomain archaeal levels of *Crenarchaeota* and *Euryarchaeota* using group-specific oligonucleotide probes. Total microbial direct count was performed using DAPI. Salinity, temperature, pH, turbidity, and dissolved oxygen were collected to correlate abundance and distribution of the planktonic microorganisms to physical parameters. Using FISH, planktonic archaea was found at small but significant abundances within the Cape Fear River estuary. The domain *Bacteria* comprised the greatest proportion of the total microbial population while the domains *Eukarya* and *Archaea* were less abundant and similar in proportion. Archaea averaged up to twenty-one percent of the total microbial population with the archaeal subdomain *Euryarchaeota* being the most abundant archaea. Archaeal distribution and abundance was affected by changes in seasons and was positively

correlated with water temperature. However, depth or other physical parameters measured had no significant effect on archaeal distribution and abundance. The data indicate that while changes in season do affect total planktonic microbial abundances the proportion of planktonic microorganisms of each domain remains relatively constant within the Cape Fear River estuary.

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