

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

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## TABLE OF CONTENTS

ABSTRACT .....	iii
ACKNOWLEDGEMENTS .....	v
LIST OF TABLES .....	vi
LIST OF FIGURES .....	vii
INTRODUCTION .....	1
MATERIALS AND METHODS.....	5
RESULTS .....	11
DISCUSSION.....	24
CONCLUSION.....	28
LITERATURE CITED.....	29

## 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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LIST OF TABLES

Table	Page
1. Oligonucleotide probes used in this study .....	9
2. Mean total viable cell count; mean total direct cell count and percent culturable microorganisms for all sites .....	12
3. Mean total viable cell count; meant total direct cell count and percent of culturable microorganisms for sites sampled at surface and depth from September 2001 to August 2002 .....	12
4. Mean salinity (ppt) with total direct cell count and percent of total cells as detected by oligonucleotide probe for each site at both surface and depth from September 2001 to August 2002 .....	16
5. Mean water temperature (C) with total direct cell count and percent of total cells of all sites as detected by oligonucleotide probe for each month from September 2001 to August 2002 .....	18

## LIST OF FIGURES

Figure	Page
1.	Map of sites sampled from September 2001 to August 2002.....6
2.	Total direct cell count (cells/ml) compared with total viable cell count (cells/ml) and percent viable (%) of total direct cell count from September 2001 to August 2002. Seasons have been grouped by water temperature: fall; October, November, December, winter; January, February, March, spring; April, May, June, and summer; July, August, and September.....13
3.	Total direct cell count (cells/ml) compared to total viable cell count (cells/ml) and percent viable (%) of total direct cell count from September 2001 to August 2002. Surface and depth cell counts have been grouped for each site13
4.	Total direct cell count (cells/ml) and total probe-positive cell count (cells/ml) compared to percent probe-positive cells (%) of total cell count. Counts have been grouped from September 2001 to August 2002 .....20
5.	Percent probe-positive cells (%) of the domains; Eukarya, Bacteria, and Archaea, of the total cell count from September 2001 to August 2002.....21
6.	Percent Archaeal probe-positive cells (%) of the domain, Archaea and the subdomains, Euryarchaeota and Crenarchaeota, of the total cell count from September 2001 to August 2002.....21
7.	Percent probe-positive cells (%) of the domains: Eukarya, Bacteria, and Archaea, of the total cell count compared to water temperature (C) for twelve months sampled. ....23
8.	Percent probe-positive cells (%) of the domain Archaea and the subdomains, Euryarchaeota and Crenarchaeota of total cell count compared to water temperature (C) for twelve months sampled.....23
9.	Percent probe-positive cells (%) of the domain Archaea compared to the total percent positive cells of the subdomains, Euryarchaeota and Crenarchaeota, of the total cell count, for the twelve months sampled.....27