The Impact of Particle Association on Temperature-Dependent Growth and Light-Induced Mortality of *Vibrio sp.* in the Hudson River Estuary

Natalia Figueredo[1], Elise Myers[2,3], Andrew Juhl[2,3]

[1]Barnard College, [2]Lamont-Doherty Earth Observatory, [3]Columbia University

Managing health risks associated with human exposure to waterborne, pathogenic bacteria requires understanding the ecological dynamics of complex bacterial communities. The Hudson River Estuary (HRE) is composed of both freshwater, from tributaries and anthropogenic inputs, and marine water, due to its tidal influence. *Vibrio sp.,* a bacterial genus that includes some pathogenic species, is highly abundant in the coastal ocean, so enters the HRE during high tides. This is in contrast to other, more commonly studied, potentially pathogenic bacteria that enter the HRE through sewer overflows or discharges. Studies have demonstrated that the viability of particular species of *Vibrio* is significantly impacted by both light-induced and dark, temperature-dependent inactivation. Particle association could impact these loss rates because microbes attached to particles can benefit from increased nutrients, stability, and protection from UV radiation. Previous research demonstrated that natural populations of *Vibrio sp.* in the HRE are about 45% particle associated; however, the effects of particle association have not been studied. In this study, we quantified light-induced loss and dark, temperature-dependent growth rates for both particle-associated, free-living and total populations of *Vibrio sp.* using culture-dependent enumeration. Incubation temperatures ranged from 5°C to 28°C to simulate the seasonality in the HRE. Our results demonstrate that particle association increases temperature-dependent growth and decreases light-induced loss of *Vibrio sp*. At higher temperatures, *Vibrio sp.* demonstrates higher growth rates, particularly in the particle-associated fraction. Despite a marine origin, when exposed to light, *Vibrio sp.* populations decay, with greater loss rates for the free-living fraction. The combined positive effects of particle association on these ecological dynamics indicate that particle association can increase the persistence of *Vibrio sp.*