CLIMATE CHANGE EFFECTS ON *VIBRIO* BACTERIA IN THE WINYAH BAY ESTUARY AND THE PROJECTED SPREAD OF *VIBRIO* UNDER FUTURE CLIMATIC SCENARIOS

by

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ABSTRACT

While there are several studies on the distribution of *Vibrio vulnificus* and *Vibrio parahaemolyticus* in estuarine waters around the world, there is little information on the distribution of both organisms in South Carolina waters. Monthly sampling of surface and bottom water from 9 sites in Winyah Bay was conducted over the period April-October 2012. Both organisms were enumerated on CHROMagar *Vibrio* media. The *Vibrio* counts obtained were mainly less than 20 Colony Forming Units (CFU)/ml which is typical for what was found elsewhere along the coast of the Carolinas. The *Vibrio vulnificus* counts were the highest when salinity ranged between 5 ppt and 20 ppt. *Vibrio parahaemolyticus* did not show a clear pattern with salinity, indicating the possibility of other factors that interact to control its occurrence and abundance. Turbidity on the other hand showed a positive association with both *Vibrio vulnificus* and *Vibrio parahaemolyticus.* Temperature values were within *Vibrio*'s optimal range for growth and seemed to have a lesser effect. In this study we are particularly interested in the relation between *Vibrio* and conductivity in order to couple this relation with the estimated climatic scenarios calculated by the Pee Dee River and Atlantic Intracoastal Waterway Salinity Intrusion Model 2 (PRISM2). PRISM2 integrates predictions of future streamflow and sea level in an artificial neural network model that predicts specific conductance at several locations in the Winyah Bay estuary. The specific conductance projections anticipated a higher number of spikes of higher specific conductance periods with longer duration in almost all of the sea-level rise scenarios (current condition, 1.0ft,

2.0ft, and 3.0ft sea-level rise). The estimated future conductivity upper levels did not show any substantial increase in the maximum specific conductance than the measured in the current historical records. The model derived was a conservative model which showed a projected increase in *Vibrio*'s occurrence in the future. Climate change effects potentially increasing sea level rise will consequently raise specific conductance to *Vibrio vulnificus* optimal range in Winyah Bay waters. The model was tested by predicting for post hurricane Sandy sampling date (29OCT2012). The *Vibrio vulnificus* counts fell within the predictive interval of the model. Thus, the conservative model is able to predict for *Vibrio vulnificus* under normal and post low impact storm events. In the future the increased relative risks of optimum *Vibrio* growth based on specific conductance will increase up to 36X based upon location and range of sea level rise. These increased periods of optimal growth conditions for *Vibrio*s may result in increased risk for swimmers and shellfish consumers, if Virulent forms occur with more regularity.