Indicators of the Occurrence of *Vibrio* in the Winyah Bay, SC Estuary

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Concept

Field sampling
for *Vibrio*

This project

Forecast future
*Vibrio* in the
study area

This project

PRISM2
model

Prior project
Research Objectives

• Quantifying the distribution of *Vibrio vulnificus* and *Vibrio parahaemolyticus* in the Waccamaw River/Winyah Bay estuary

• Correlate *Vibrio* occurrence with environmental parameters
  – Especially salinity / conductivity

• Potential trends of *Vibrio* for the years 2055-2068 under future sea level and streamflow
Methods

• Monthly sampling in the Waccamaw River/Winyah Bay
  – Surface/bottom water
  – Field parameters measured
  – April – October 2012
  – Special Sandy sample

• Filter and incubate
  – CHROMagar
  – Focus on *V. vulnificus* and *V. parahaemolyticus*

• Statistics
  – Correlations of Vibrio spp with temperature, conductivity, and turbidity
  – Regression models

• Couple with PRISM2
Methods

• PRISM2 overview
  – Developed by USGS and ADMi
  – Neural network model
  – Uses streamflow, sea level, and tide stage
  – Predict conductivity in the Waccamaw River and Intracoastal Waterway

• PRISM2
  – Trained using historic data
  – HSPF model predictions of future streamflow
  – Used 1, 2, 3 ft. sea level rise
  – Predict future conductivity

• This project
  – Predict impact on Vibrio distribution
Results

- **Vibrio** found at all sites
  - Highest concentrations within known optimal salinity range
- **PRISM2 predicts conductivity increases**
  - Sea level is stronger driver of salinity trends than river flow
  - 90th percentile conductivities 2X – 15X depending on location and SLR
  - Peaks more frequent and longer duration
- **V. vulnificus**
  - More common in upriver sites
  - High concentrations more frequent and longer duration
  - Depends on SLR
Implications

• Greater opportunity for exposure
  – Geographic range increase
  – Temporal expansion

• Exposure risk based on occurrence of optimal conductivity range
  – Increase as much as 36X
  – Wound infections only

• Other factors
  – Temperature not included in this study
  – Optimal range is 15-30°C → *V. vulnificus*
  – Estuarine water is warming
  – Expect more days per year in range
Summary and conclusions

1) *Vibrio* spp. occur throughout the Waccamaw River/Winyah Bay estuary
   1) Even fresh water reaches
2) Salinity predicted to rise in the future
   1) Higher salinities, greater frequency, and longer duration of conditions that favor *Vibrio* growth
3) Potentially significant public health implications
4) Future work:
   1) Look at virulence
   2) Integrate temperature into the model
Questions?

PRISM2 report


Deeb thesis