IDENTIFYING NITROGEN SOURCES AND MICROBIAL HOTSPOTS IN TRIBUTARIES OF JOHNSON/CHINCOTEAGUE BAY

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UMCES
MARYLAND COASTAL BAYS - JOHNSON BAY

- Determined streams with nutrient hotspots
MARYLAND COASTAL BAYS- JOHNSON BAY

- Fecal bacteria hotspots in Johnson Bay indicate human/animal sewage

- Measurements:
  - Physical/chemical parameters of each creek
  - Total and dissolved nutrient analysis
  - Bacterial abundance
  - Antibiotic resistance as indicator of origin of nutrients
OBJECTIVES

- Characterize water quality of three creeks discharging to Johnson Bay region
- Using antibiotic resistance assays seek to identify origins of pollutants
METHODOLOGY

- Field trip in June following rain event with 3 teams via kayak and upper portions by car
- Water samples prepared and filtered for nutrient and bacterial analysis
- Assessed antibiotic resistance in isolated bacteria using chromogenic agar
- Trip in July following prolonged dry period
METHODOLOGY

- Sampling 3 teams via kayak and car
- Water samples filtered for nutrient and bacterial analyses
- Assessed antibiotic resistance in isolated bacteria using chromogenic agar
- June after rain

- July following prolonged dry period
Bacteria

Boxiron June

Enterococci (colonies/100mL)

Boxiron July

Scarboro

Powell

Boxiron June

Scarboro

Powell
ANTIBIOTIC RESISTANCE

June

% Resistance

Boxiron | Scarboro | Powell

Oxacillin | Gentamicin | Ciprofloxacin | Tetracycline

July

Boxiron | Scarboro | Powell

Oxacillin | Gentamicin | Ciprofloxacin | Tetracycline
Resistance of Enterococcus Isolates to Various Antimicrobials 2010 and 2011 Combined
Heatmap of Percent Resistant *Enterococcus* Isolates 2010 and 2011 combined

*library not from Coastal Bays*
Cluster Analysis:
Based on Antimicrobial Resistance Patterns of *Enterococcus*

2010 and 2011 combined

*library not from Coastal Bays*
RESULTS

- Powell has highest, and most consistently high N values
- Decreased nutrient and bacteria upstream in Boxiron and Scarboro from June to July indicates a decrease in rain events
- Powell input seems independent of flow; indicating groundwater source.
CONCLUSIONS AND FUTURE STUDIES

- Is Captain’s Cove sewage facility part of the issue at Powell?
- Agriculture runoff? Stream runs right through farm fields, few houses where hot spots are...
- Future studies focusing on groundwater and stable isotope analysis studies?
- Nutrient sources are focused and not all creeks are similar in loadings
- Antibiotic resistance data indicates resistance to antibiotics used in animal agriculture.
  - Future studies using antibiotics more specific to humans or animals