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Salish Sea Ecosystem Conference

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Apr 26th, 1:30 PM - 3:00 PM

## Surveillance for Antibiotic-Resistant E. coli in the Salish Sea Ecosystem

Alexandria Vingino

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Vingino, Alexandria, "Surveillance for Antibiotic-Resistant E. coli in the Salish Sea Ecosystem" (2022). *Salish Sea Ecosystem Conference*. 178.

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# Surveillance for antibiotic resistant *E. coli* in the Salish Sea ecosystem

Presenter: Alexandria Vingino, MPH  
2022 Salish Sea Ecosystem Conference



# Background

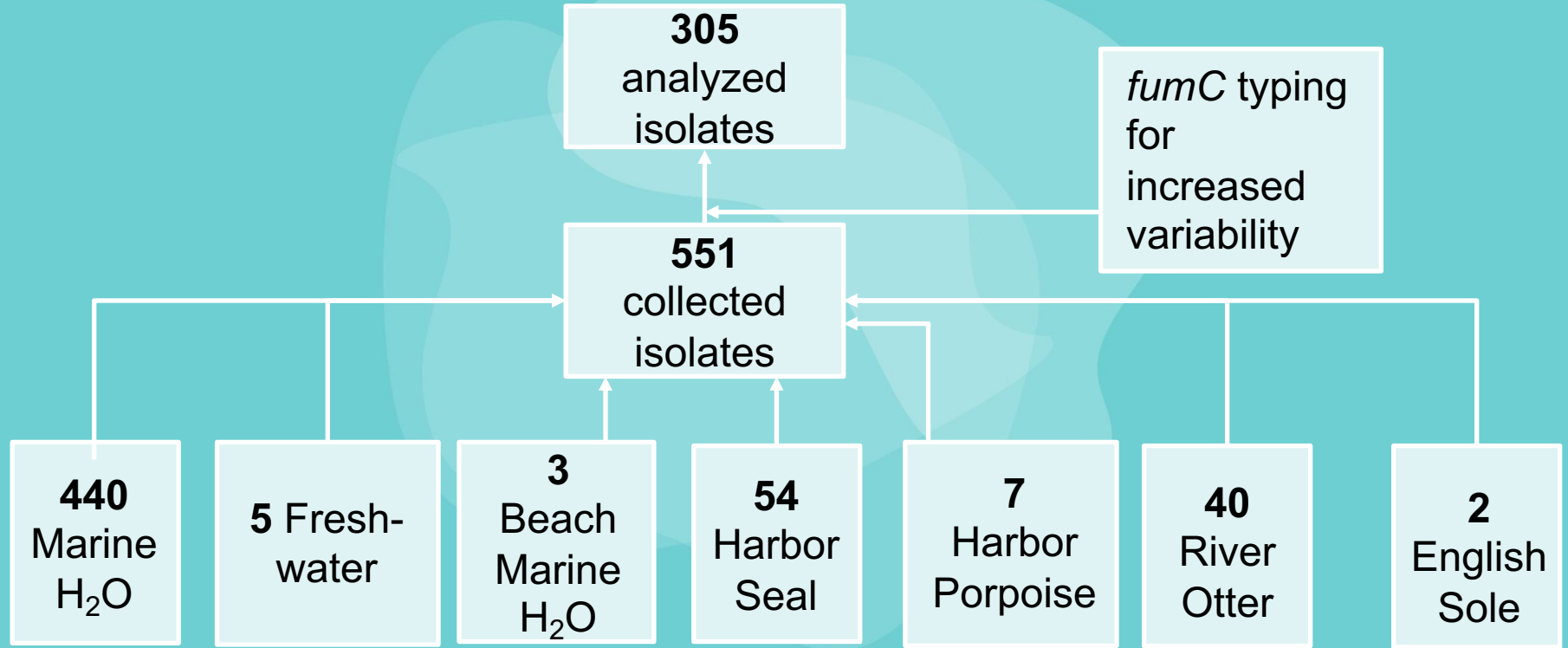
- Antibiotics and their residues → Aquatic environments → Antibiotic Resistant Bacteria (ARB)
- Surveillance can inform us of ARB contamination on aquatic ecosystems, and humans and animals that live within it



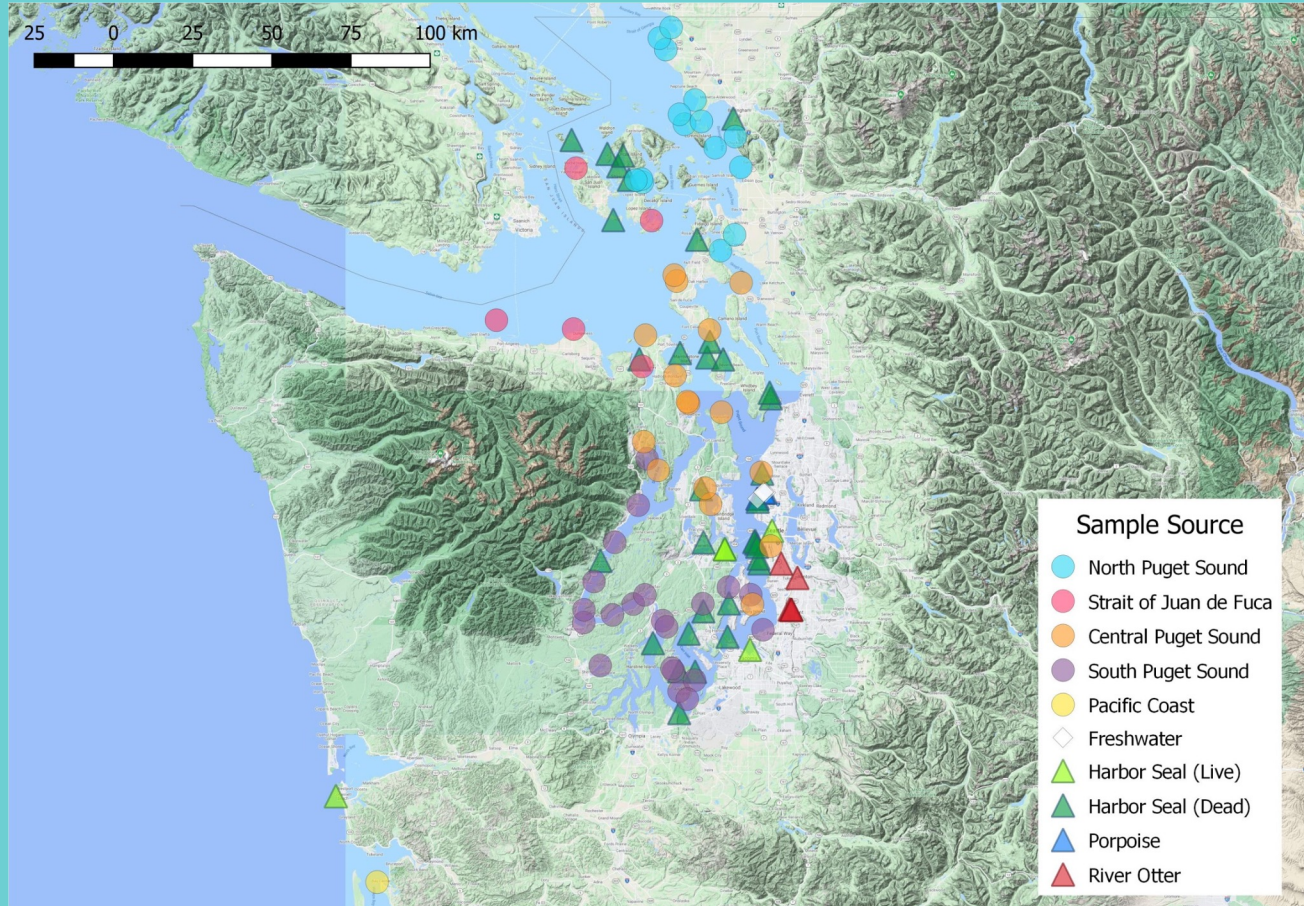
# Project Aims

- Aim 1: **Sample** marine water, freshwater, marine mammals, and fish for *E. coli*
- Aim 2: **Determine % resistance** in the *E. coli* isolated from all samples.
- Aim 3: Analyze the relationships between antibiotic resistant *E. coli* using **Whole Genome Sequencing (WGS) and Multilocus Sequence Typing (MLST)**.

# *E. coli* Samples



# Map of samples E. coli isolates by source



# Results & Discussion

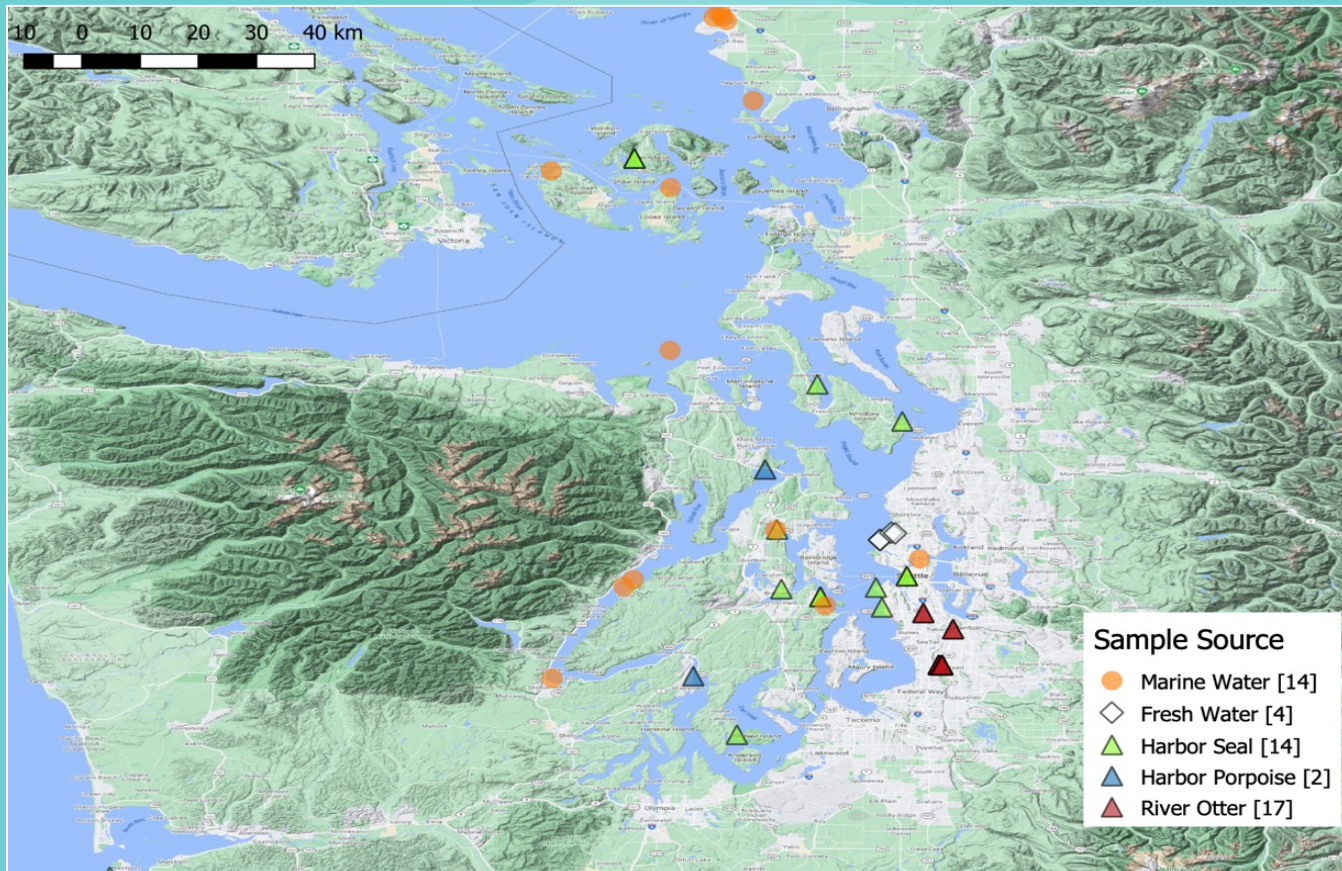


# *E. coli* Isolates and Antibiotic Resistance

Sample Source (n=305)	Isolates Characterized	Intermediate	Resistant	Susceptible
<b>Marine Water</b>	<b>212</b>	<b>7 (3.3%)</b>	<b>7 (3.3%)</b>	<b>198 (93.4%)</b>
North Puget Sound	49	3 (6.1%)	4 (8.2%)	42 (85.7%)
Central Puget Sound	55	0 (0%)	2 (3.6%)	53 (96.4%)
South Puget Sound	56	3 (5.4%)	0 (0%)	53 (94.6)
Strait of Juan de Fuca	52	1 (1.9%)	1 (1.9%)	50 (96.2%)
<b>Freshwater</b>	<b>5</b>	<b>1 (20%)</b>	<b>3(60.0%)</b>	<b>1 (20.0%)</b>
<b>Marine water by beaches</b>	<b>3</b>	<b>0 (0%)</b>	<b>0 (0%)</b>	<b>3 (100%)</b>
<b>Harbor Seal</b>	<b>52</b>	<b>6 (11.5%)</b>	<b>8 (15.4%)</b>	<b>38 (73.1%)</b>
Dead Seal	35	6 (17.1%)	3 (8.6%)	26 (74.3%)
Live Seal	17	0 (0%)	5 (29.4%)	12 (70.6%)
<b>Harbor Porpoise</b>	<b>7</b>	<b>2 (28.6%)</b>	<b>0 (0%)</b>	<b>5 (71.4%)</b>
<b>River Otter</b>	<b>24</b>	<b>4 (16.7%)</b>	<b>13 (54.2%)</b>	<b>7 (29.2%)</b>
<b>Sole</b>	<b>2</b>	<b>0 (0%)</b>	<b>0 (0%)</b>	<b>2 (100%)</b>
<b>Total</b>	<b>305</b>	<b>20 (6.6%)</b>	<b>31 (10.2%)</b>	<b>254 (83.3%)</b>



# Non-susceptibility Summary

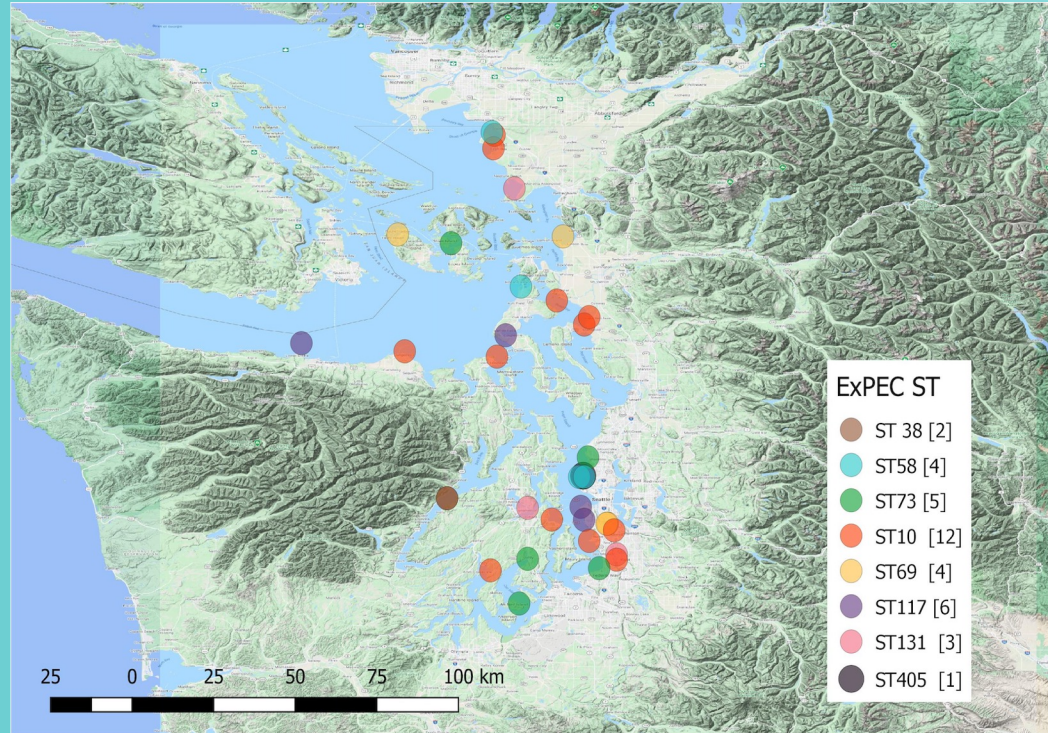


# Statistical Analysis – Six Fisher's Exact Tests

	<b>Non-Susceptible vs Susceptible</b>	<b>Resistant vs Susceptible</b>
Puget Sound Quadrants	<b>P-value = 0.148</b>	<b>P-value = 0.089</b>
Marine Mammals and River Otters vs Marine Water	<b>P-value &lt; 0.0001 OR 5.334 (99.2% CI 2.21-13.40)</b>	<b>P-value &lt; 0.0001 OR: 8.877 (95% CI: 3.52– 24.67)</b>
Marine Mammals vs Marine Water	<b>P-value = 0.005 OR 3.014 (99.2% CI: 1.04-8.58)</b>	<b>P-value = 0.01</b>

# MLST Diversity

Count of ST with # of Occurrences		
# of Occurrences	Count	%
1	139	70.92%
2	28	14.29%
3	10	5.10%
4	5	2.55%
5	7	3.57%
6	3	1.53%
7	2	1.02%
8	1.0	0.51%
12	1	0.51%
<b>Total Count</b>	<b>196</b>	<b>100%</b>



Map of Extra-intestinal pathogenic *E. coli* (ExPEC) associated ST

# Takeaways



# Takeaways



Animal have the potential to be sentinels for antibiotic resistant bacteria



Diversity of ST in samples, with ExPEC and ExPEC-associated ST



Disconnect between phenotypic and genotypic susceptibility testing



Compare animal and environmental isolates to human isolates for further research

# Thanks!

- SeaDoc Society for partial support
- Washington Department of Health – ARLN and WGS
- Dr. Stephanie Norman and Phoenix (Zoetis) Labs
  - Washington Department of Fish and Wildlife
    - Dr. Michelle Wainstein
  - Dr. Marilyn C. Roberts, UW DEOHS
  - Dr. Peter Rabinowitz, UW COHR
    - Dr. Scott Weissman, SCH
    - David No, UW DEOHS
  - Lauren Frisbie, UW COHR



Questions?