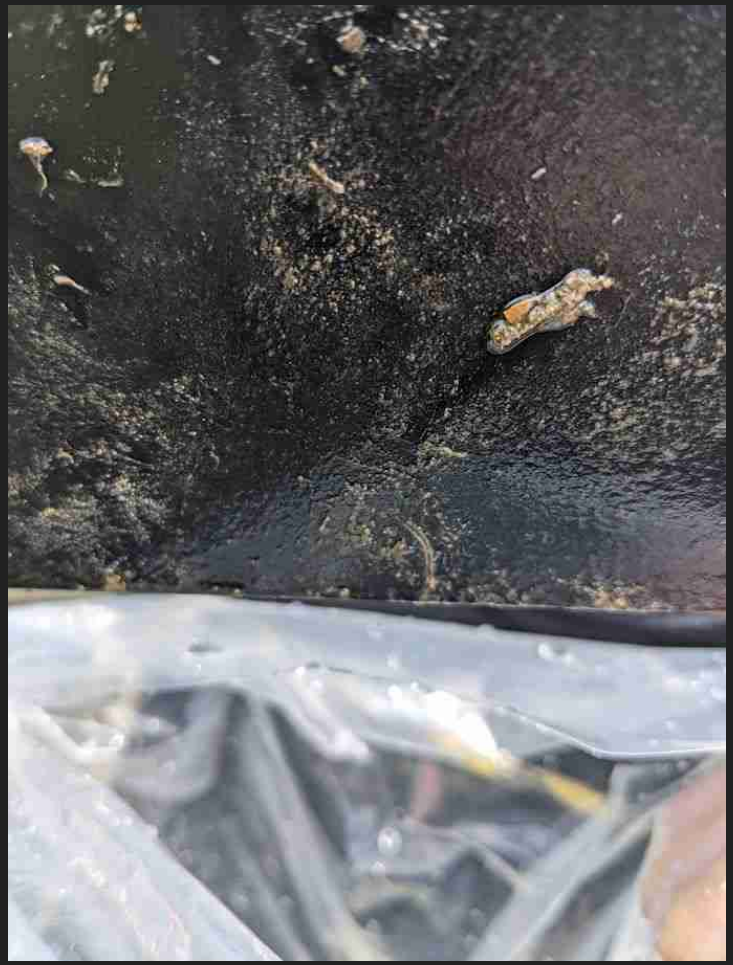
Exploring the Use of Bacterial Colonies as Indicators of Estuarine Habitats & Health

By: Motunrayo Okubanjo




07/16
2W, B


07/16
SW, B


07/16
3W,F

Overarching Research Question:

- Are the bacterial communities on the plates indicative of the habitat in the surrounding environment?

Sub Research Question:

- Can I identify differences in the bacteria that grow on marsh grass plates (Phragmites and Spartina) and control plates?
- Can I identify differences in the bacteria that grow on plates exposed to pollution and anti-fouling paint?

Hypotheses:

H_O: There is no difference between the bacterial communities in different estuarine habitats.

H_A: Bacterial communities differ between estuarine habitats.

H_O: There is no difference between the bacterial communities in the presence of pollution or toxins.

H_A: Bacterial communities differ in the presence of pollution or toxins.

Methods:

Plate Collection and Swabbing

- Agar plates with LB nutrients were made for bacterial cultures.
- We collected plates once a week from a total of every Tuesday between the hours of 10 AM to 4 PM.

- I used the 2 days after the original collection of the plates to take laboratory pictures of each collection plate.
- After I was done taking pictures of the collection plates each day, I put them in the fridge to slow down bacterial growth.
- On Fridays, I swabbed the plates using a sterile plastic inoculating loop.

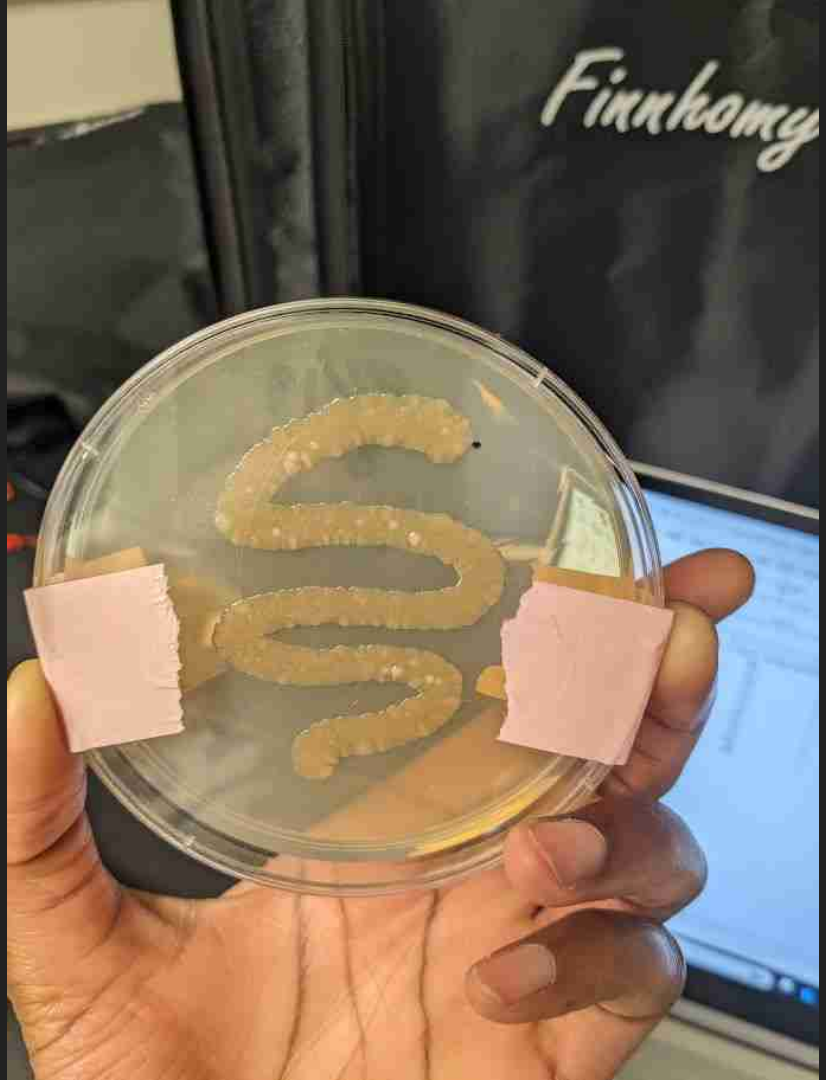
Data Recorded

I distinguished the bacteria types using the following parameters:

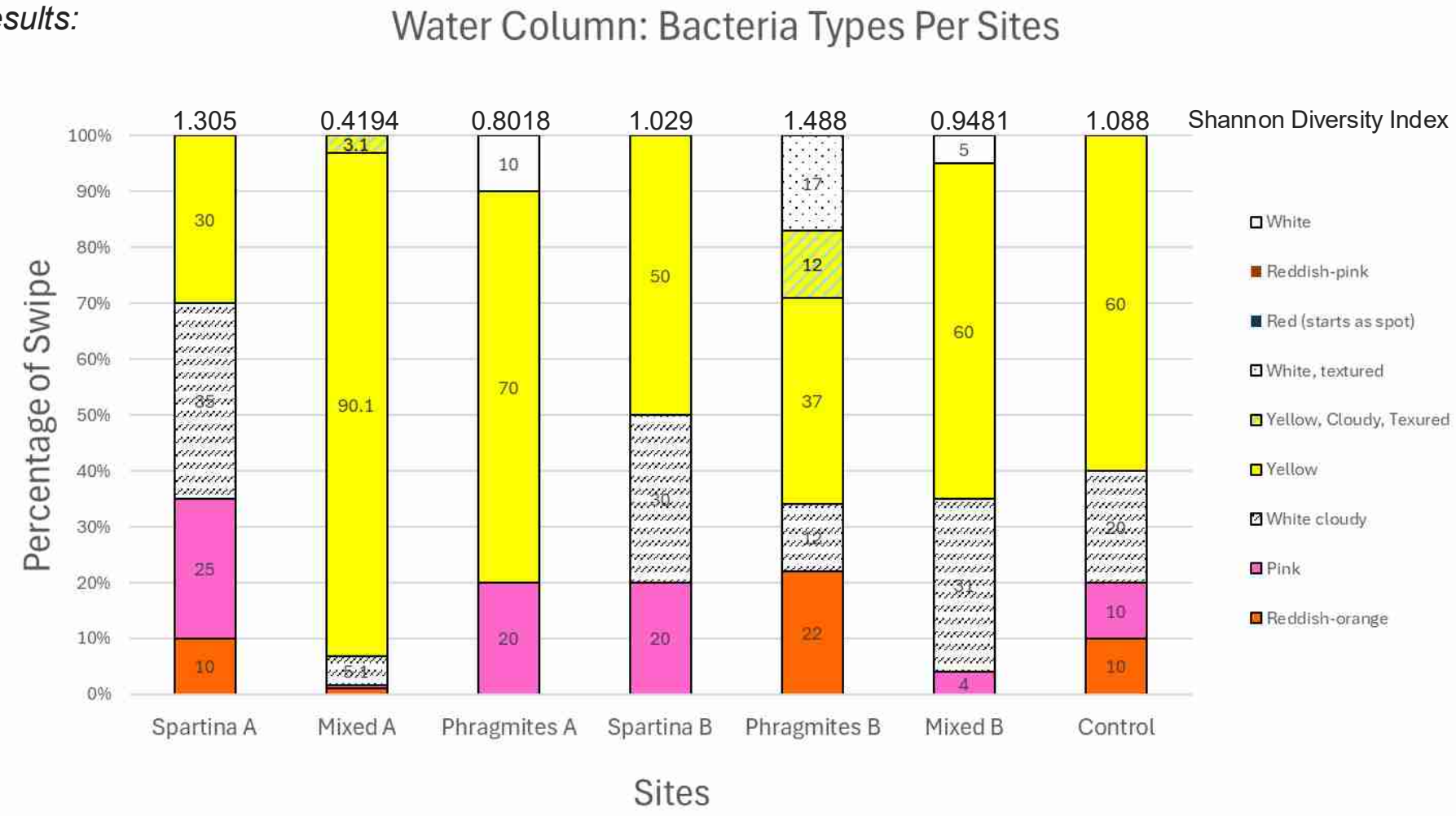
- Size (estimated percentage of swipe covered)
- Color
- Shape (inc.: texture, cloudy)

Data Recorded

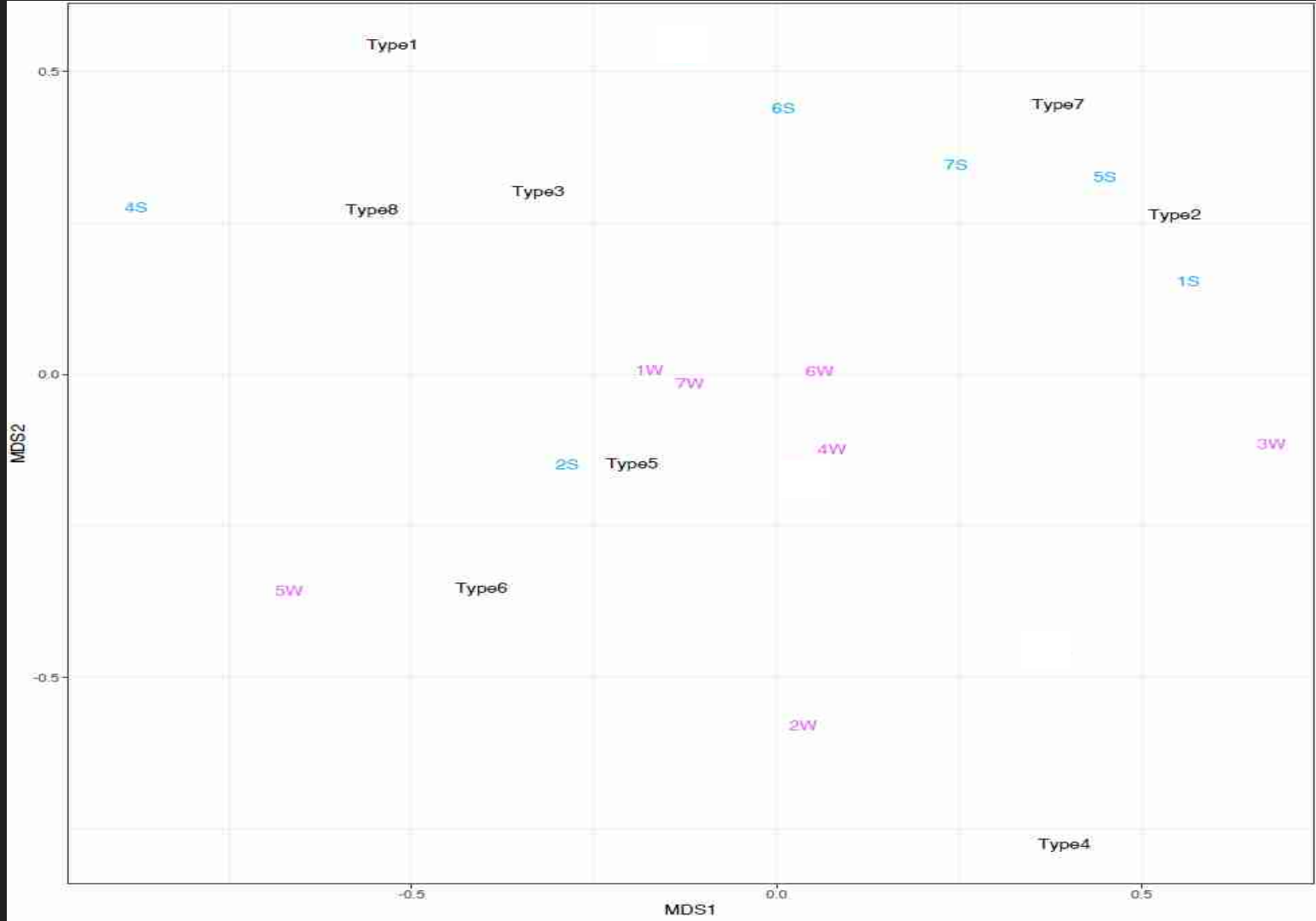
- Total number of colonies per plate
  - I counted the total number of colonies per plate using a cell counter and an external light
- Number of colony types per plates
- Estimated percentage covered by bacterial type (visual estimation)


Finnhomy

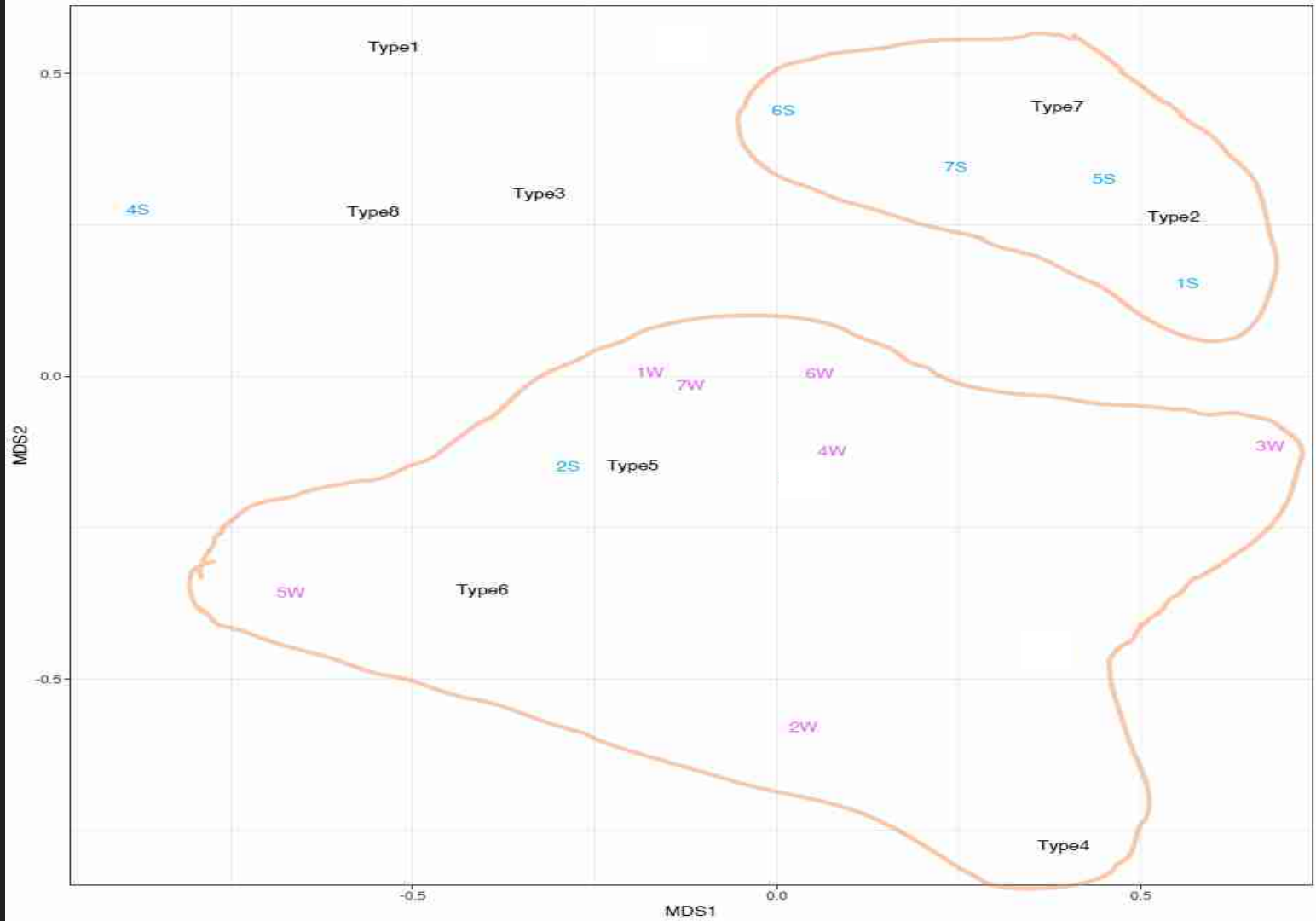
Results:


Water Column: Bacteria Types Per Sites
Shannon Diversity Index
1.305
0.4194
0.8018
1.029
1.488
0.9481
1.088
Percentage of Swipe
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
30
35
25
10
3.1
90.1
5.1
10
70
20
50
30
20
17
12
37
12
22
5
60
31
4
60
20
10
10
Spartina A
Mixed A
Phragmites A
Spartina B
Phragmites B
Mixed B
Control
Sites
White
Reddish-pink
Red (starts as spot)
White, textured
Yellow, Cloudy, Texured
Yellow
White cloudy
Pink
Reddish-orange

Results:


Key
Water
Shoreline
Type1
Type7
Type3
Type8
Type2
Type5
Type6
Type4
1S
2S
3W
4S
4W
5S
5W
6S
6W
7S
7W
1W
2W
0.5
0.0
-0.5
MDS2
MDS1

Results: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4W
3W
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5W
2W
0.5
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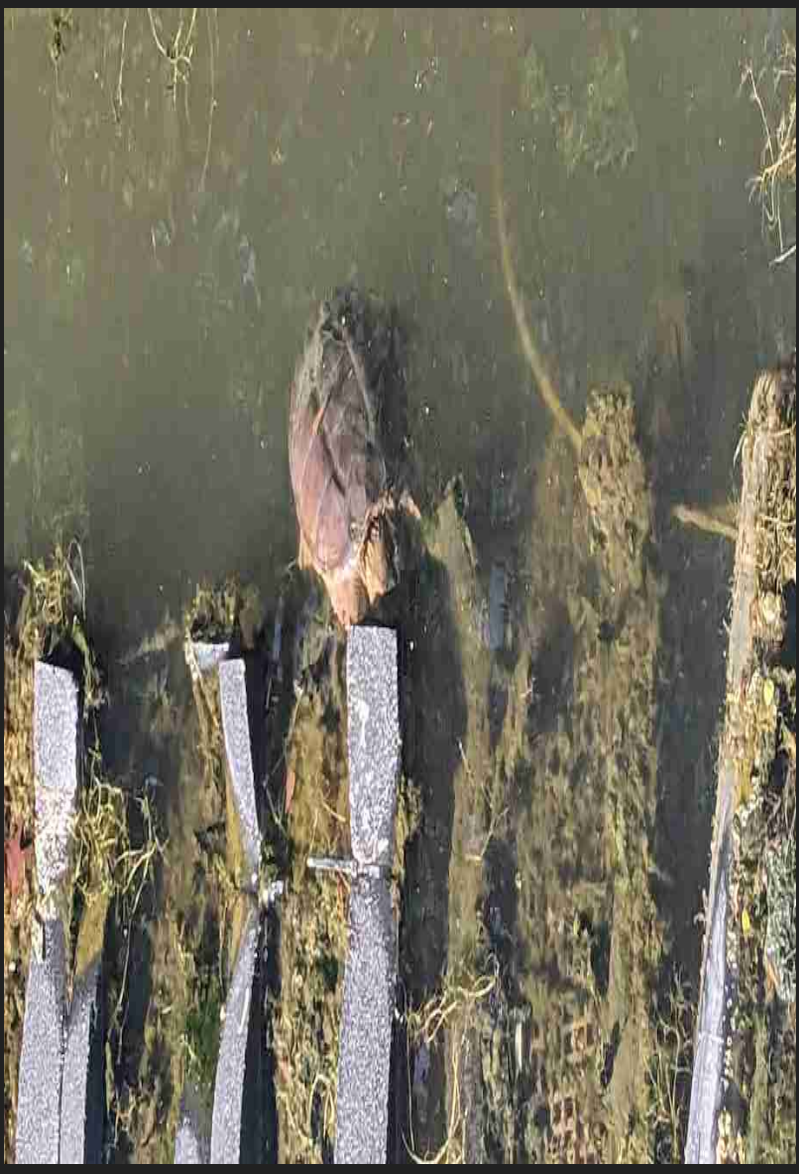
MDS1



Discussion - Summary:

- Yellow bacteria, white, textured bacteria, and pink bacteria were the most common bacterial type found on the agar plates.
- Yellow bacteria might be useful as an indicator of Phragmites.
- Yellow, Cloudy, Textured (Type 5) and White, Textured (Type 6) were mostly found on the water column plates.
- The Pinkish (Type 2) and Red (Type 7) bacteria were mostly found on the shoreline plates.

Future Direction for Estuarine Biofouling Research

- Are the bacterial communities found here specific to marsh grasses along the Patuxent River or can they be found along other coastal habitats?
- Put out collection plates for longer periods of time, continuing to swab and make new agar plates every week.

Discussion - Next Steps:

Future Direction for Estuarine Biofouling Research

- Relate bacteria grown on plates to environmental data (i.e salinity, D.O. temperature).
  - *It might also be helpful to note the impact different seasons might have on the development of bacterial colonies and what bacterial colonies are found.
  - (Jewett et al., 2022)

- Using different media to grow bacteria.
- Genetic sequencing of bacterial types

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Citation

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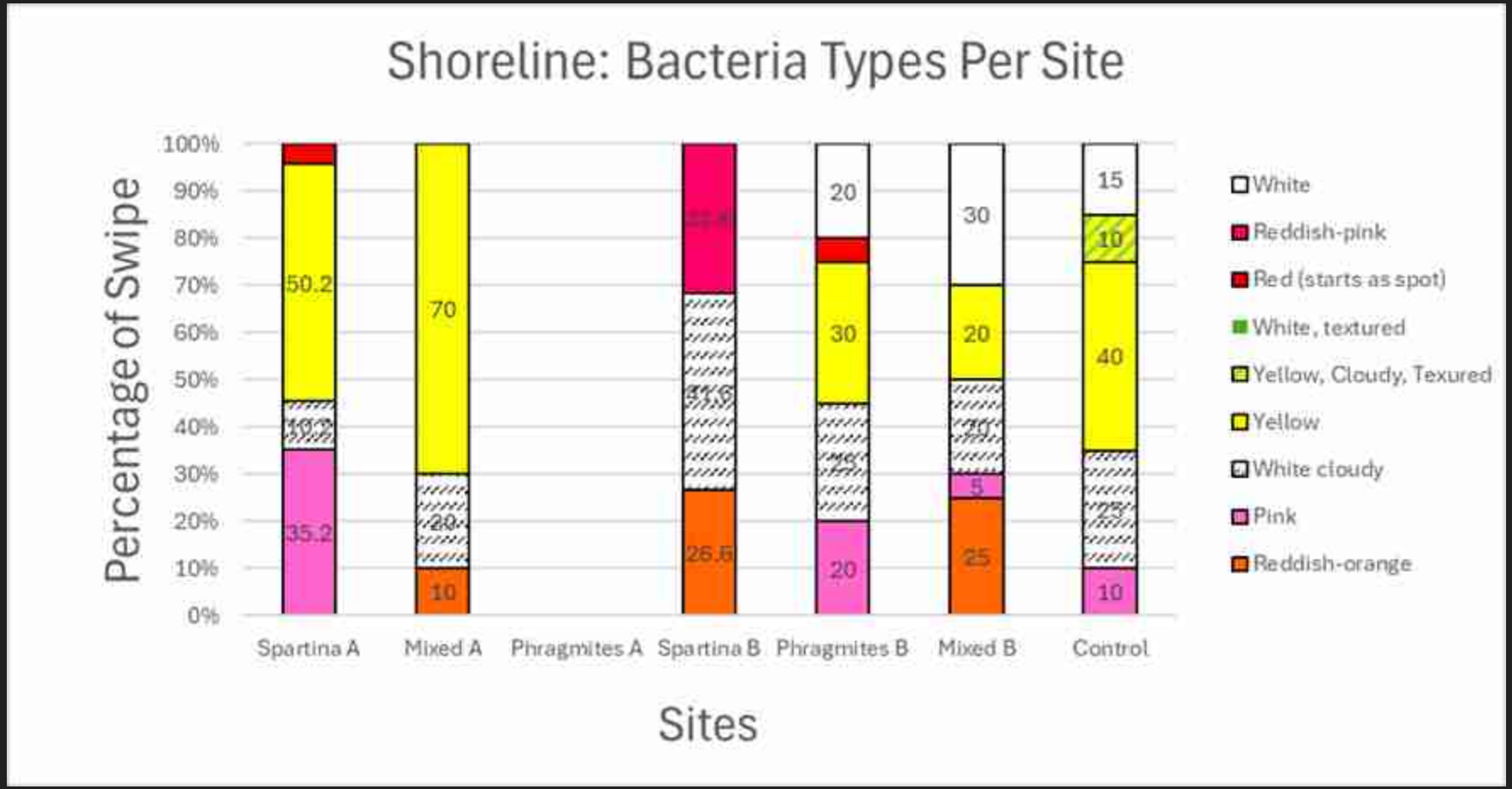
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Percentage of Swipe
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
50.2
35.2
70
10
20
26.5
20
30
20
5
25
15
10
40
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Spartina A
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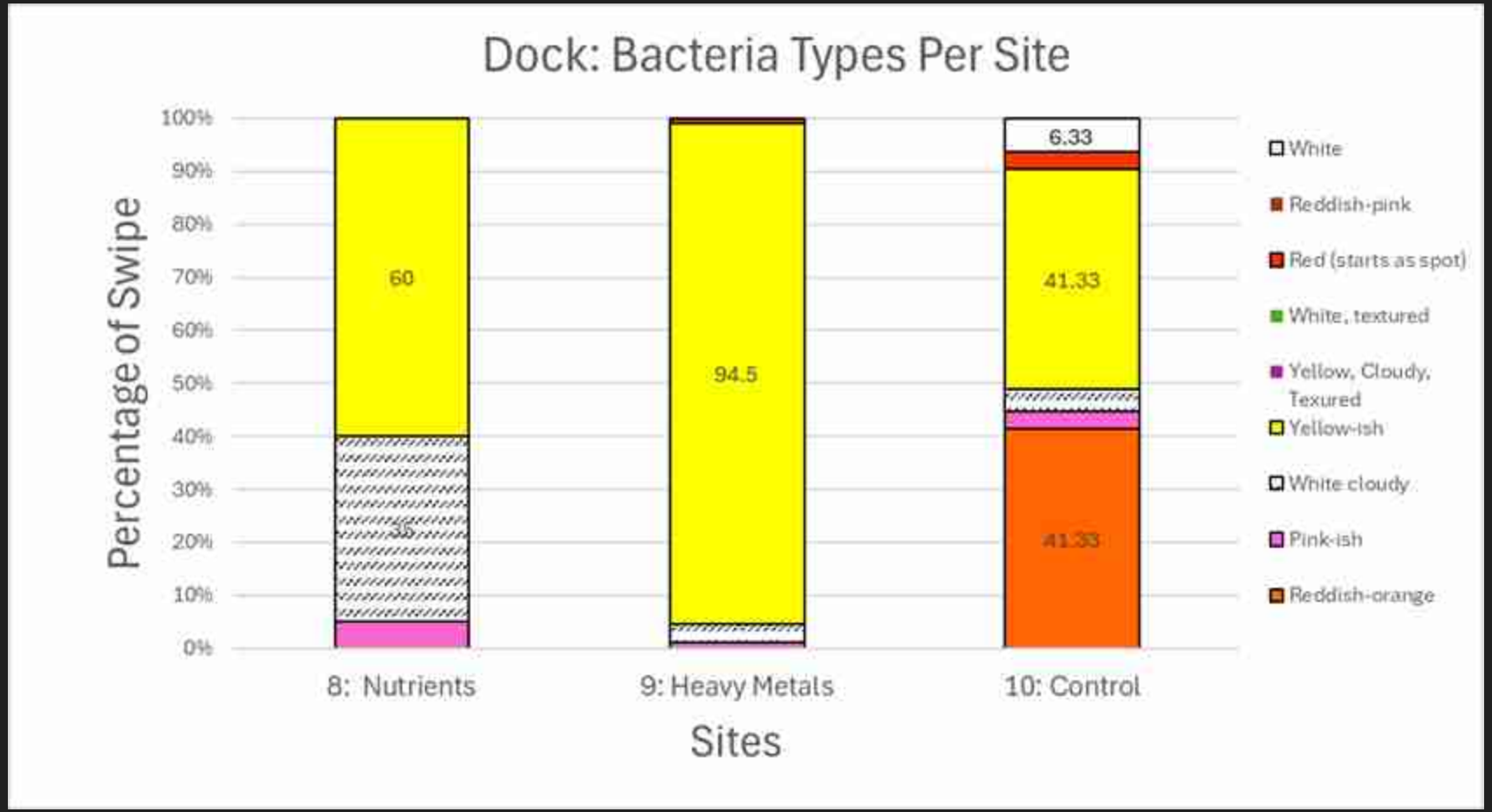
Dock: Bacteria Types Per Site
Percentage of Swipe
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
60
94.5
6.33
41.33
41.33
8: Nutrients
9: Heavy Metals
10: Control
Sites
White
Reddish-pink
Red (starts as spot)
White, textured
Yellow, Cloudy, Texured
Yellow-ish
White cloudy
Pink-ish
Reddish-orange

The End