

ABSTRACT

In most parts of the world, population is usually concentrated in urban areas. This has caused land usage to affect streams ecosystems. The question is: do we know what's in our backyards? Urban streams are a natural waterway that flows through a heavily populated area (Walsh, 2005). They usually flow right across our backyards. It is the *unknown backyard* for most people. The purpose of this project was to determine and compare the population of macro invertebrates in four urban streams in Carolina, San Juan, and Luquillo, as indicators for water quality. Macro invertebrate population can help determine how healthy or unhealthy the river is in different locations. The sites were assessed, macro invertebrates were collected and identified, water chemistry and Enterococci was tested. The data collected did not find a correlation between Enterococci colonies and macroinvertebrate abundance, but it provides a more sensitive understanding of the *unknown backyard* to help implement an effective stream rehabilitation program or any other remedies in response to urban development and urban streams problematic.

INTRODUCTION

Puerto Rico's rapid urbanization and overpopulation has continually provoked detrimental changes to the Island's streams. Crowded urbanizations near streams contribute to the constant pollution of these water bodies, granted that people often are unaware of these natural waterways. In 2016, the students conducted an investigation concerning the contamination of Puerto Rico's urban streams, in other words, the unknown part of many people's backyard. By collecting and classifying benthic macroinvertebrates, which served as stream health indicators, the students determined the state of condition for each of the streams visited. Yet, the students questioned whether another variable was affecting the amount of macroinvertebrates in a stream; and, in view of this, the students chose the *Enterococcus* bacteria to be the variable studied.

Enterococci are generally commensal inhabitants of the gastrointestinal tracts of many warm-blooded animals and are shed in feces at high densities; thus, they are easily detected in contaminated waters. (J. Bacteriol.) Hence, the amount of *Enterococci* present in a stream with relation to the quantity of macroinvertebrates will give the students a greater understanding of how dangerously contaminated a stream can be. Therefore, since urban streams in Puerto Rico do not receive adequate maintenance, it is expected that the body of water the students visit (Josefina Creek) will contain high levels of pollution. Contaminated streams cause pests, diseases and other undesirable and unfavorable conditions of living. Investigating the health of a stream and continuing to discover the unknown side of one's backyard could raise consciousness and even cause a chain of actions towards achieving healthier bodies of water in Puerto Rico.

METHODOLOGY

Stream Site Assessment

- Physical characteristics of the stream are recorded: river's width, sediment quality, impact of local land use, and riparian habitat quality.

Macroinvertebrate Sampling

- Macroinvertebrates are collected according to protocols used by the Bio-monitoring and Aquatic Studies Section of the VT Department of Environmental Conservation.

Macroinvertebrate Classification

- Macroinvertebrates are categorized into their respective groups and families, depending on their physical characteristics.

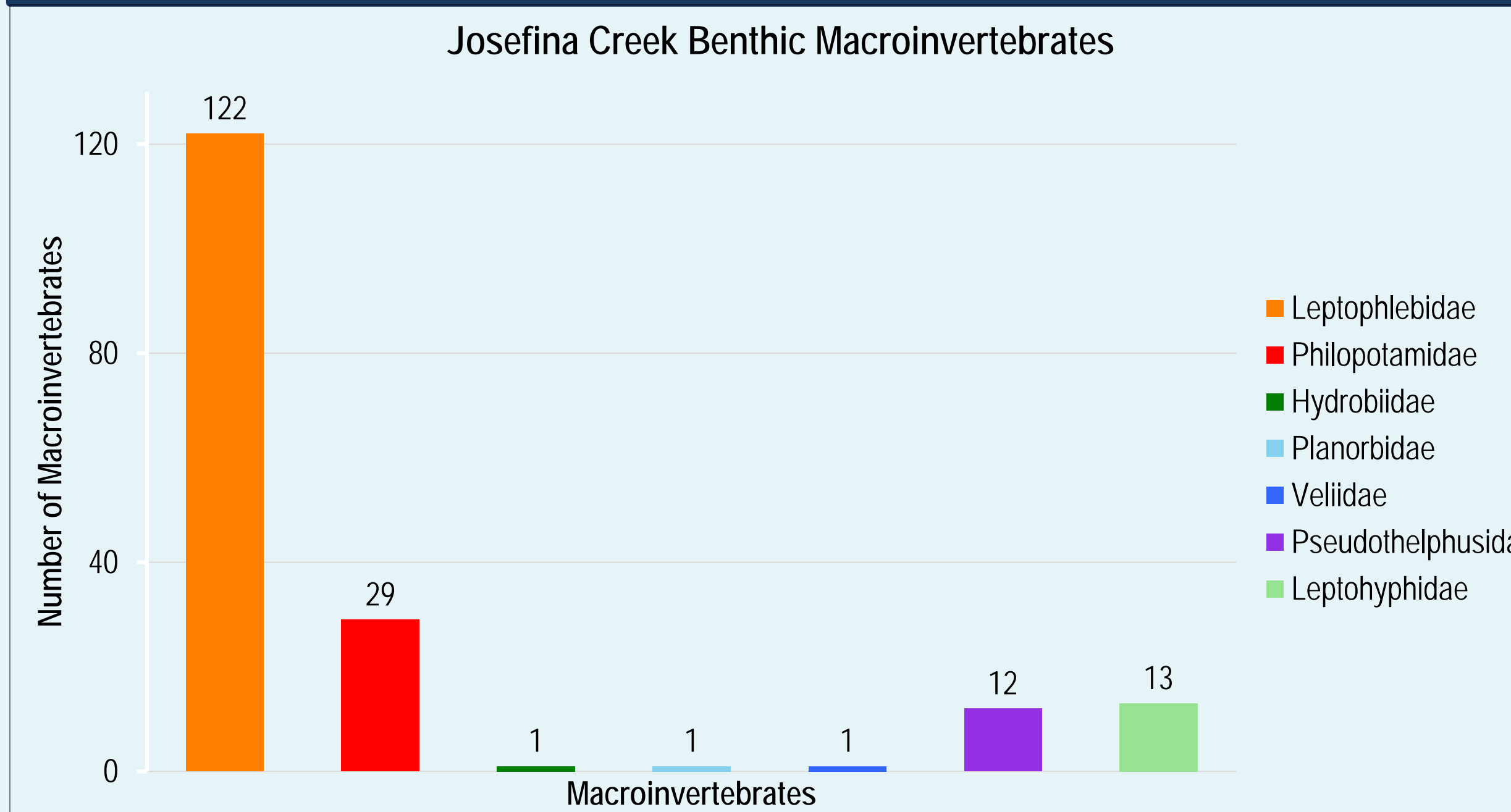
Enterococci Assessment

- Water samples are collected from Josefina Creek and brought to the lab for bacterial testing.

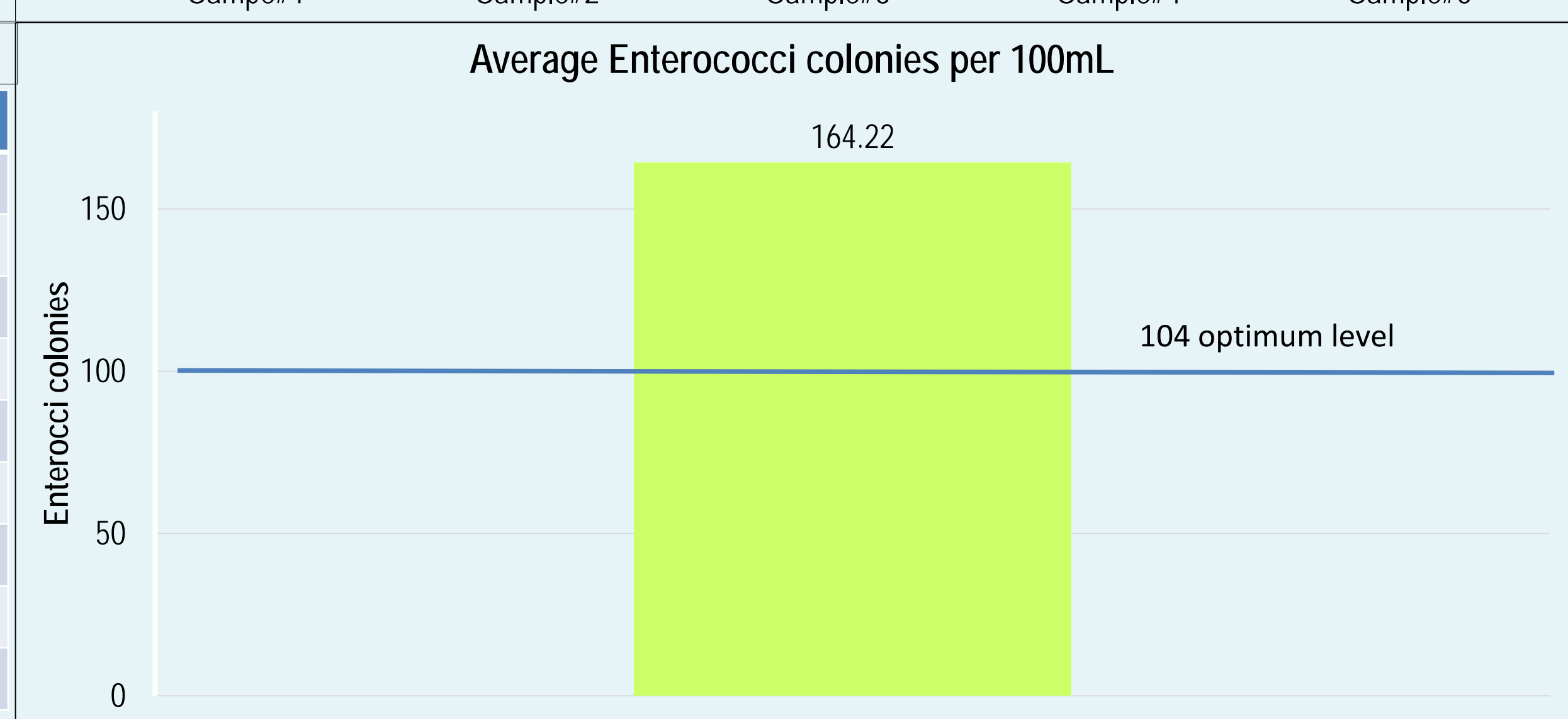
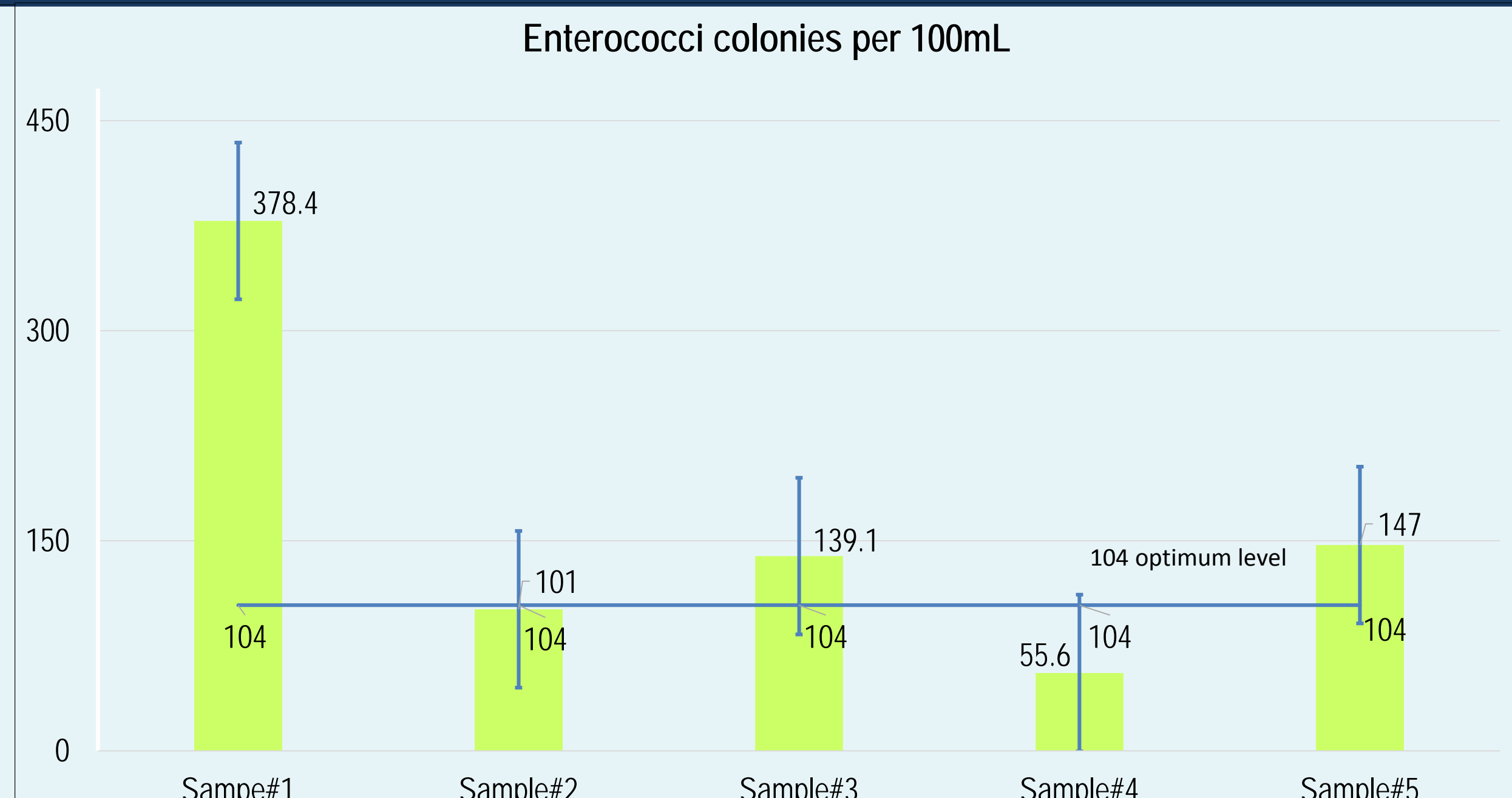
Enterococci Monitoring

- 10mL of the sample water from Josefina Creek are mixed with 90mL of sterile deionized water. Then, a packet Enterolert reagent is added and combined to the sample, and placed in a Quanti-Tray. The blank sample and sample mixture Quanti-Trays are put in the sealer, and left in the incubator for 24 hours. After removing the trays from the incubator, they are exposed to UV light; the amount of fluorescent well indicates the level of *Enterococci* colonies within 100mL of the sample water.

RESULTS



Order	Family	Count	BMWPR
Decapoda	Pseudothelphusidae	12	5
Ephemeroptera	Leptophlebiidae	122	5
Hemiptera	Veliidae	1	3
Odonata	Coenagrionidae	3	5
Pulmonata	Hydrobiidae	1	3
Pulmonata	Planorbidae	1	3
Trichoptera	Philopotamidae	29	6
BMWPR Score			
Total Count		169	30



BMWPPR	WATER QUALITY
≥97	Excellent water quality
77-96	Good water quality, not contaminated or not altered in a harmful way.
57-76	Regular water quality, eutrophic, moderate contamination.
37-56	Poor water quality, contaminated.
18-36	Poor water quality, very contaminated.
≤17	Really poor water quality, extremely contaminated.

CONCLUSION

- The amount of Enterococci and the macroinvertebrate population in the Josefina Creek can be used to determine the streams health.
- The most abundant macroinvertebrates we collected are the most tolerant to stream pollution; the least abundant macroinvertebrates are intolerant species.
- High levels of Enterococcus would not directly cause macroinvertebrate impairment. However, both indicators could be measuring a similar water quality problem like point or non-point sewage waste.
- Investigations by J. D. Maul (2003) and James Kurtenbach (2017) identified many environmental factors, other than the Enterococci colonies present, that do affect the macroinvertebrate population.
- The BMWPPR index is efficient for stream assessments in Puerto Rico. The poor BMW score reflects a low richness of macroinvertebrate taxa and this could be caused by some unknown water quality or habitat problem. The total taxa collected is a little low for what I would expect in a more healthy Puerto Rico stream.

ACKNOWLEDGEMENTS

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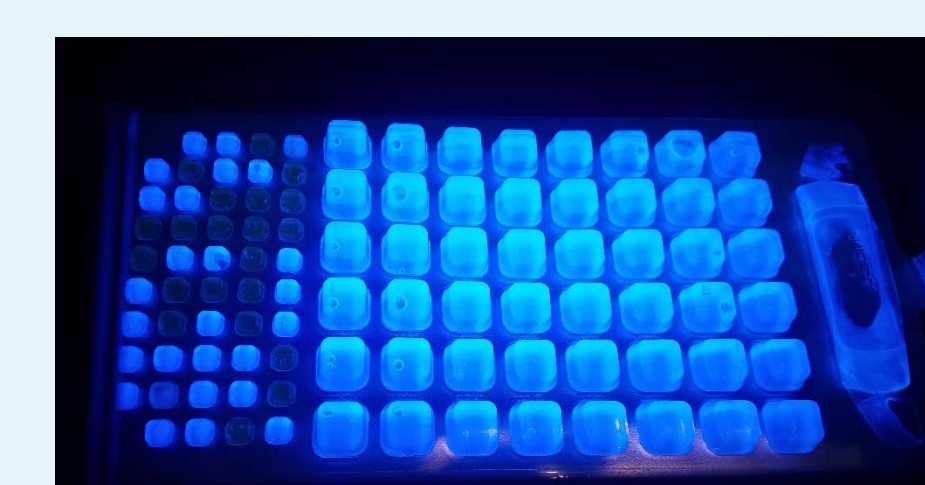


Fig. 1: Sample #1 exposed to UV light after 24 hours of incubation.

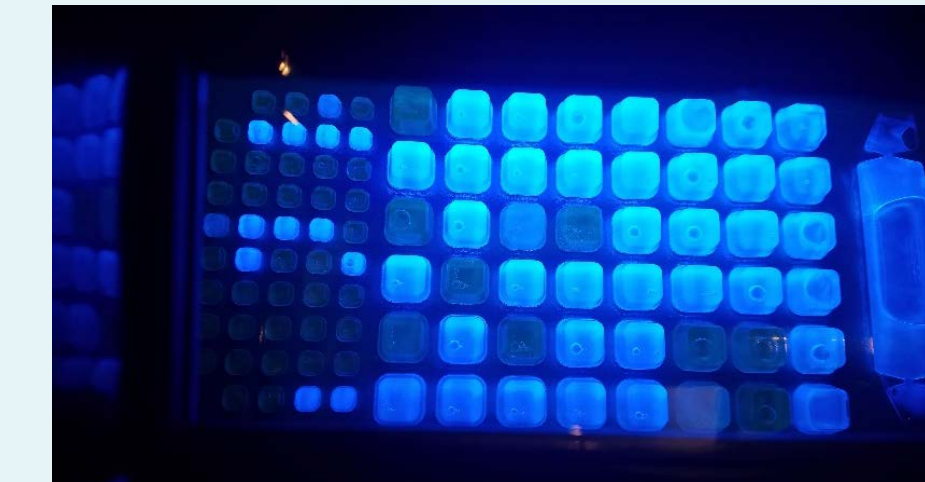


Fig. 2: Sample #2 exposed to UV light after 24 hours of incubation.



Fig. 3: Sample #3 exposed to UV light after 24 hours of incubation.



Fig. 4: Sample #4 exposed to UV light after 24 hours of incubation.

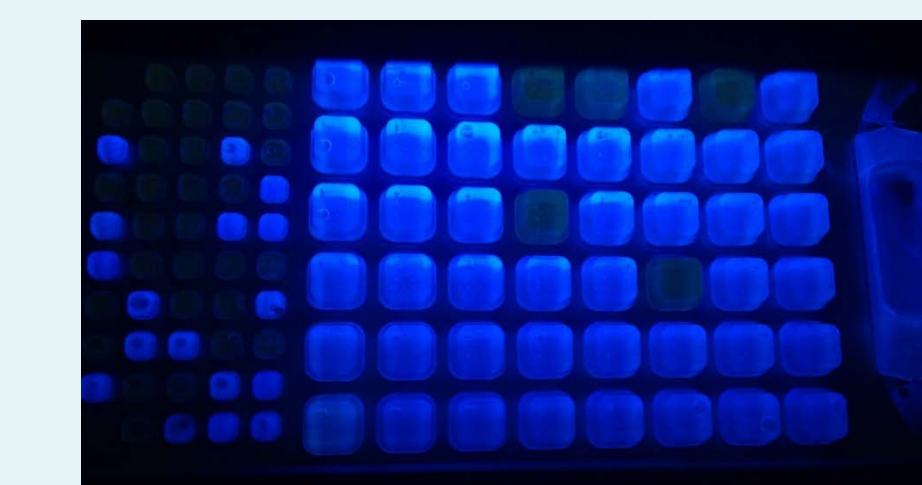


Fig. 5: Sample #5 exposed to UV light after 24 hours of incubation.