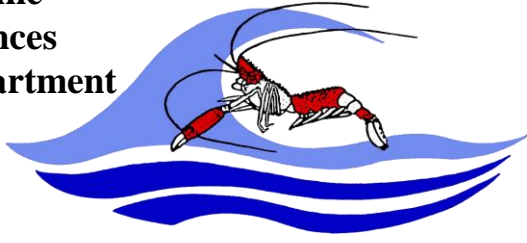


Fecal Contamination in Playa Santa, Guánica, Puerto Rico



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Introduction



Fig. 1. The five beaches exceeding the *Enterococcus* levels more frequently in Puerto Rico.

1. Biological waste carried by rivers.
2. Biological waste carried during intense rain events.
3. The absence of a sewer system for the adjacent communities close to the beaches.
4. Septic tanks bad designed and installed.
5. Illegal discharges in the stormwater systems

Fig. 2. The main sources contributing to the fecal contamination in Puerto Rico beaches.

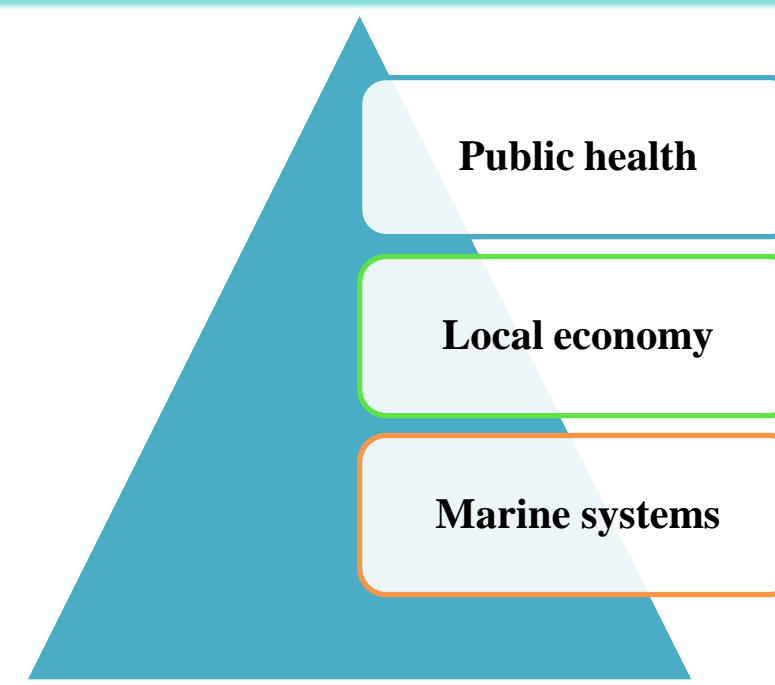


Fig. 3. The effects of fecal contamination in Puerto Rico beaches.

1. Prevent epidemic diseases caused by fecal contamination.
2. Identify, eliminate or control the fecal contamination source
3. Help to protect near shore ecosystem

Fig. 4. The importance of the bacteriological monitoring in Puerto Rico beaches.

1. Evaluate the spatial and temporal distribution of *Enterococcus* levels in Playa Santa
2. Determine if the *Enterococcus* levels compliance with the *Enterococcus* standard level recommended by EQB.
3. Evaluate links between *Enterococcus* levels and environmental parameters. Such relations could allow for forecasting compliance

Fig. 5. The objectives of this research in Playa Santa.

Methodology



Fig. 6. Sample collection in Playa Santa.



Fig. 7. Equipment used for seawater sample analysis.

Fig. 8. Sample results after 24h of incubation in 41°C.



Study area, *Enterococcus* levels for each station and other results in Playa Santa



Validation of EQB Status for Days Sampled in this Project

Assumed results	Amount of assumed Results	Assumed results percentage
Positive assumed results	11	3%
Negative assumed results	2	<1%

Table 1. Assumed sampling results (positive and negative) during 2016-2017.

<i>Enterococcus</i> Monitoring Results	EQB Data	CariCOOS Data	All Data (EQB + CariCOOS)
Unsuitable days (closed days)	51	16	27
Suitable days	302	337	326
Total of Sampling Days	38	81	119

Table 2. Unsuitable and suitable days for recreational activities in Playa Santa for 353 days of public notifications during 2016 to 2017.

Stations	# of sampling events	Number of positives	Percentage positives with rain (%)	Percentage positives without rain (%)
1	82	3	67	33
2	81	3	33	67
3	79	16	44	56
4	64	22	50	50
5	80	26	31	69
6	74	29	59	41
All Stations (1-6)	460	99	46	54

Table 3. Positive sampling percentage with and without rain within 24 hours.

Conclusion

- While stations 1 and 2 exceeded the threshold on few occasions during May, June, July, September and October, stations 3, 4, 5 and 6 exceeded the threshold with higher frequency during all sampling months indicating the existence of a point source in the vicinity of the stations 5 and 6.
- The relationship between *Enterococcus* levels and the rain within 24h was stronger for St.6 while for Stations 3 and 4 was weak. No significant relationship was not found between rain and *Enterococcus* levels on stations 1, 2, y 5.
- There was found a strong inverse relationship between *Enterococcus* levels and salinity in St. 6.
- A weak relationship was found between *Enterococcus* levels at all stations and wind speed (mph) or wave direction (°).
- 4% of all samples within swimming area in Playa Santa exceeded EQB allowed threshold and 31% of all samples out of swimming area exceeded that threshold. This results can indicate the possible existence of a point source in the southeast of Playa Santa that are contributing to the fecal contamination in the designated swimming area, because in this area was found the higher positive sampling percentage.
- The reliability of the public notifications and suitable days for recreational activities in Playa Santa increases with a higher frequency of sampling due to quick changes of the sea conditions.
- Low frequency sampling increase the risk of a gastrointestinal disease and while negatively affecting the local economy.

References and Acknowledgements

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The Caribbean Coastal Ocean Observing System (CARICOOS) is gratefully acknowledged for financial support for this research. Website: <https://www.caricoos.org>