

The impact of sewage from recreational boating 2011

In 2011, Tim Noyes and Rachel Parsons decided to investigate the potential impact of recreational boating sewage contamination of Bermuda's waters and sediments. Intern, Stephen Lightbourne from the Bermuda College, sampled popular boating sites before and after the Cup Match holiday. Elevated microbial abundance did correspond to increased boat traffic whilst the human strain of *Bacteroides* was detected at some of the more popular boating sites after the Cup Match holiday. Bermuda College student, Eden Richardson, repeated this project in 2012. The sites chosen are shown in Table 1 and the climate data for the sampling dates is shown in Table 2.

Background levels of microbial abundance were established from site locations in June. These were then compared to samples taken pre and post Cup Match Holiday (end of July, beginning of August). The bacterial abundance in seawater samples increased significantly after the Cup Match holiday in water samples from Riddell's bay and Paradise lakes; a popular boating destination during the summer months (Figure 1). Please note that the sea surface temperature (SST) was ~26°C in June but increased to ~29°C in July and August. Thus, the before and after Cup Match sampling times had the same SST. Since SST can cause an increase in bacterial abundance, this shows that temperature was not a factor for the increased growth seen in August. The data shown are just for marine bacteria that are naturally occurring. However, the large increase after Cup Match especially at Riddell's Bay could be attributed to increased boat traffic and swimmers and more research is needed to determine if this poses a human health risk.

Sample ID	Site Name
DM	Dockyard Marina
HOB	Horseshoe Beach
HUB	Hungry Bay
MB	Mangrove Bay
MC	Mill's Creek
PL1	Paradise Lakes 1
PL2	Paradise Lakes 2
RB	Riddell's Bay
SB	Seabright Sewage Outfall
SP	Snorkel Park
TB	Tobacco Bay

Table 1: Table showing the 2012 sampling site ID and its corresponding site location.

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Sample Date	Avg. Air Temperature (°C)	Sea Surface Temperature (°C)	Daily Precipitation (mm)
June 11	23.1	26.1	0.0
June 12	22	25.9	1.3
July 30	27.7	28.8	0.8
July 31	27.5	29.2	0.00
August 6	27.3	28.4	0.00
August 7	27.6	29.9	0.00

Table 2: Climate data including air temperature, sea surface temperature and precipitation for the 2012 sampling days.

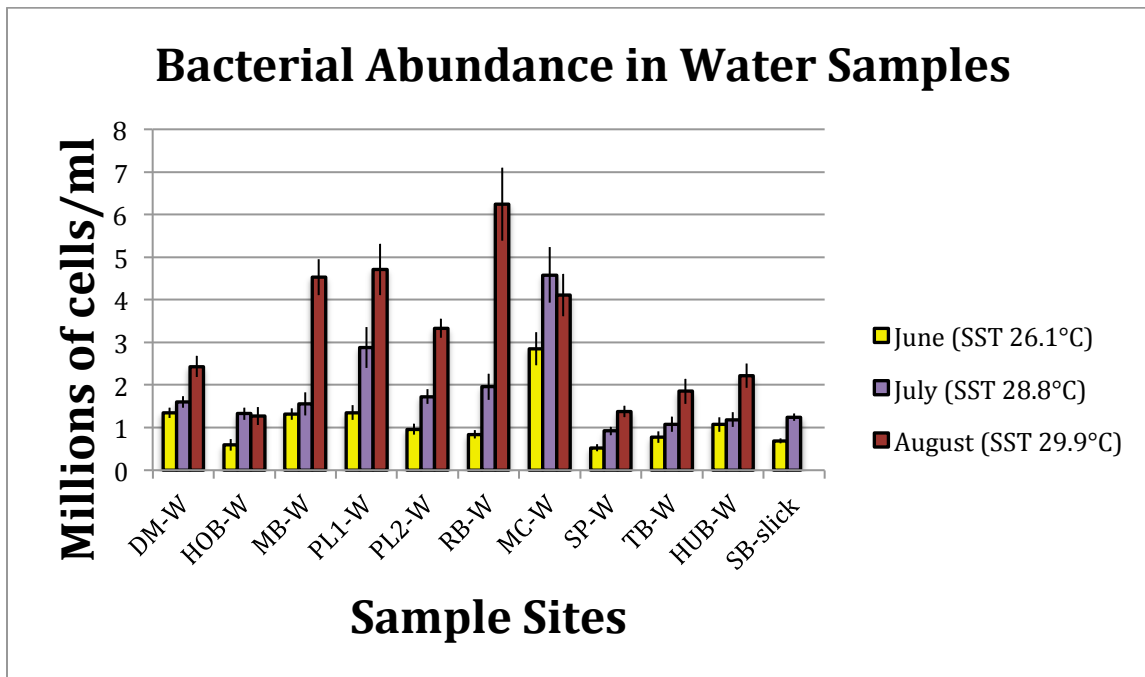


Figure 1: Bacteria counts in millions of cells per millilitre taken at popular boating sites around Bermuda in June, late July and early August 2012. The sea surface temperature (SST) is shown at the time of sampling. There was a three-fold increase in cells between July and August in Riddell's Bay (RB).