



# Scientifically Resolving and improving bacteria loads: Cowell Beach Perspective

Methods Matter



# Resolving and improving bacteria loads: Problem and response

- Iconic beach perennially listed as a bummer beach
- Cultural and economic impacts
- Laboratory Methods:
  - implicit risk management issues vs risk assessment responsibilities.
- Integrating molecular and chemical analyses
- Management responses and
- Current status and additional plans



# Resolving and improving bacteria loads: Cowell beach perspective

- BENEFICIAL USES LISTED:

1. Recreational:

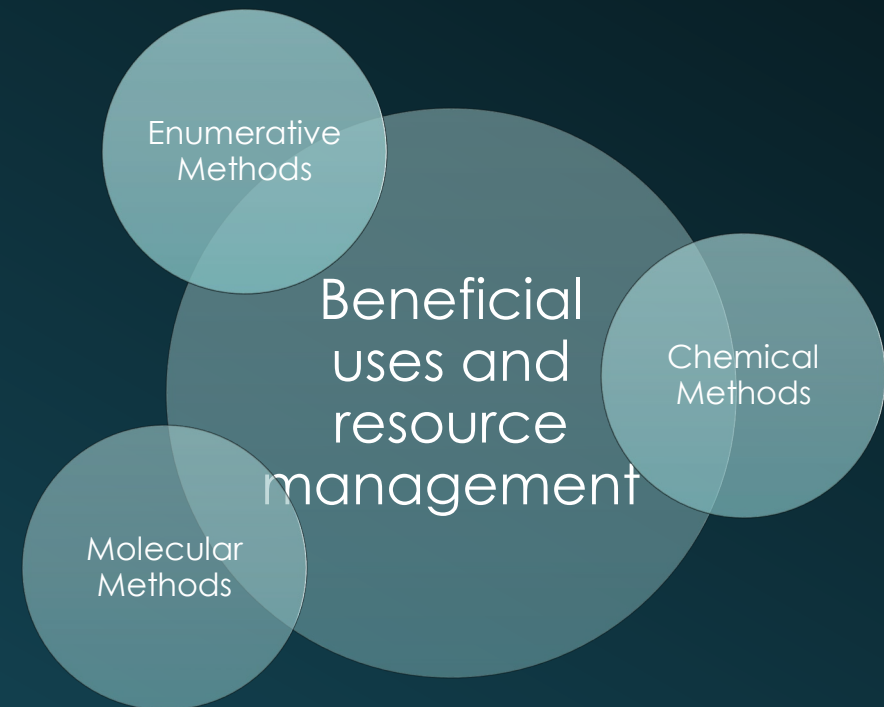
1. surfing; swimming; wading; beach uses

2. Commercial:

1. Shellfish production
2. Commercial fishing

# Resolving and improving bacteria loads

- Analyses need to avoid imposing risk Management decisions
- Enumerative methods need to NOT impose risk management decisions
- Molecular methods NEED to be specific for identifying sources
- Increasing uses of chemical methods inform sources and risks

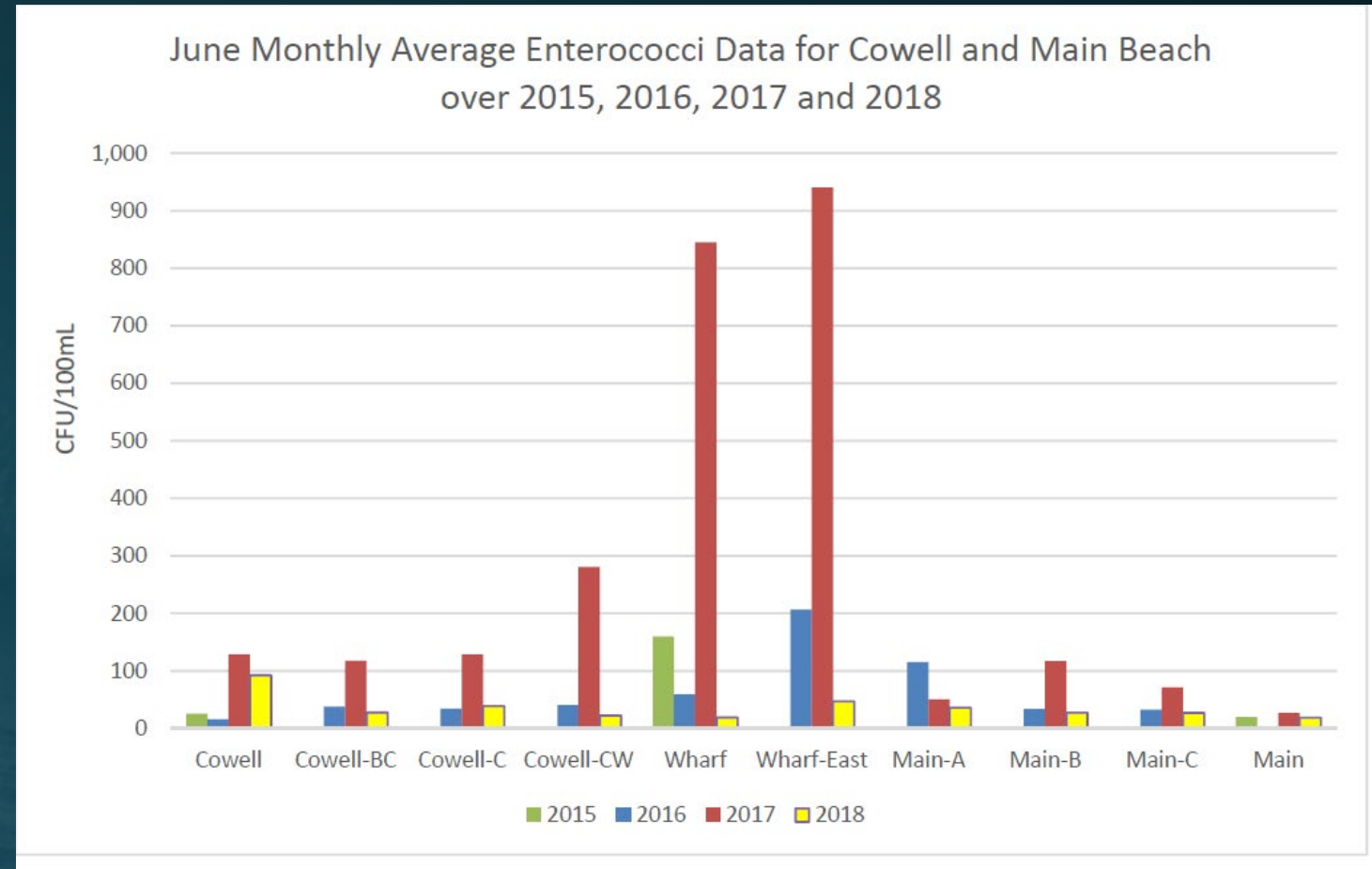


# Resolving and improving bacteria loads

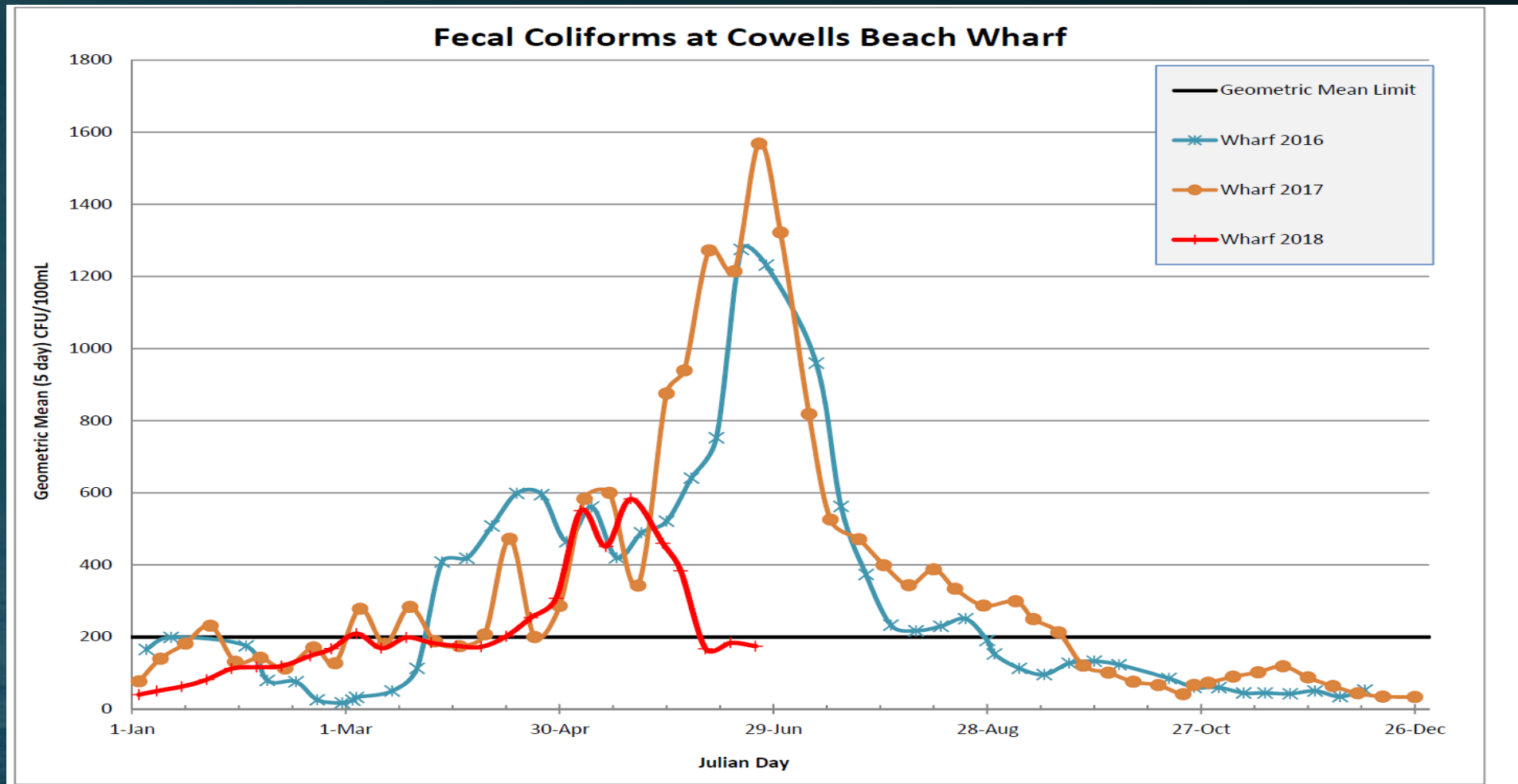
- Regulatory impetus AB411: Based upon sewage bacteria
- Historical methods of choice: Enumerative and inconclusive

Enumerative methods		Molecular	Chemical
Colilert	Membrane Filtration	qPCR/dqPCR	Caffeine/Fecal Sterol ratios
Rapid	Rapid	Rapid	Variable
Economical	Economical	Capital intensive (relatively)	Capital intensive Expensive
MPN	(CFU/100ml) Precision	May NOT reflect cell counts	Ancillary (NOT related to cell counts)
Reliable for Drinking Water	Limited in highly turbid matrix	Training+++	Training++

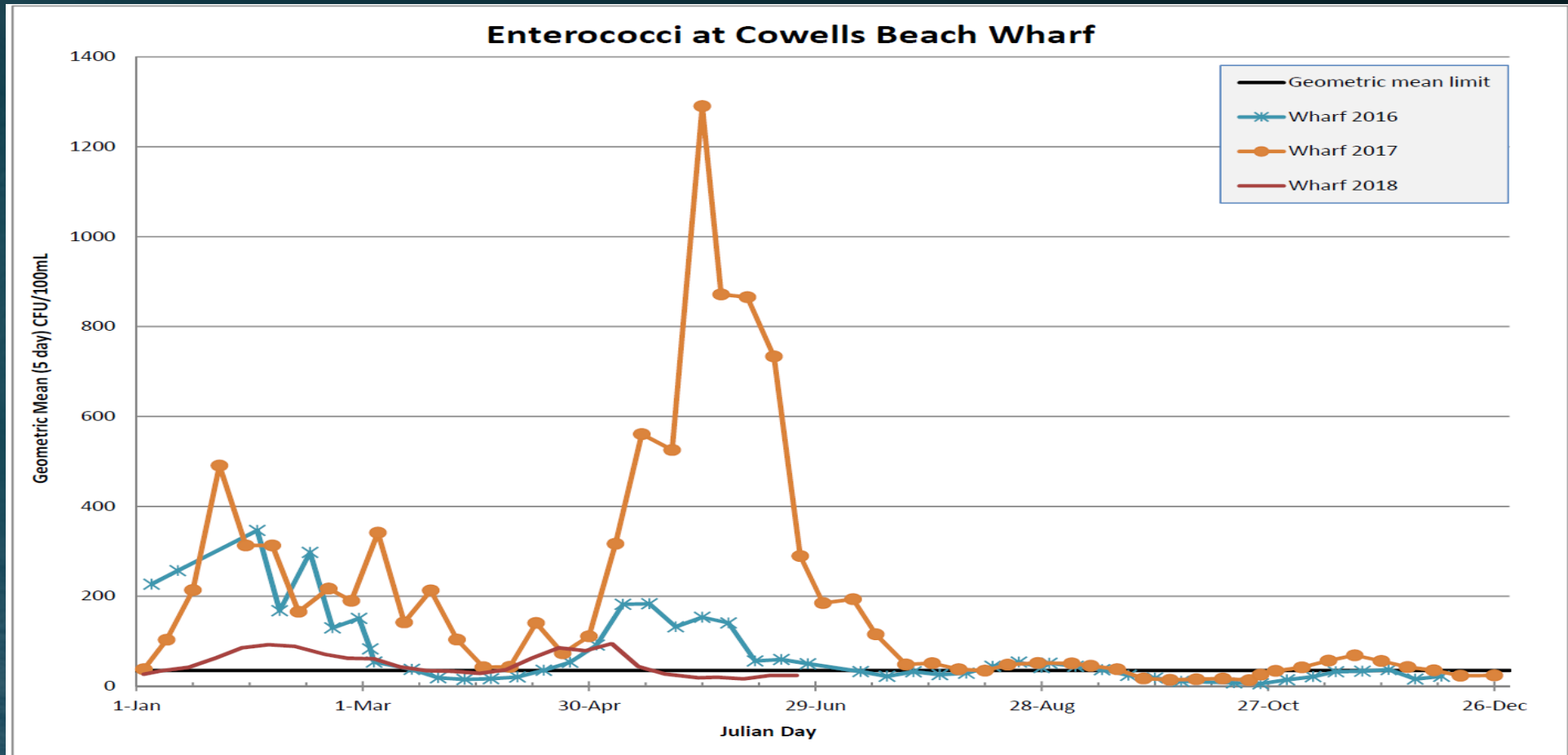
# Resolving and improving bacteria loads: Historical data



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# Resolving and improving bacteria loads: Cowell beach perspective





# Resolving and improving bacteria loads: Cowell beach perspective

**PROJECT MANAGEMENT PLAN  
AVIAN ROOSTING EXCLUSION BARRIER AT THE WHARF**

**PROJECT MANAGEMENT PLAN DOCUMENT**  
The Project Management Plan of the City of Santa Cruz Wharf Superintendent.



**Prepared on: 12/22/2016**

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Superintendent, City of Santa Cruz  
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# Resolving and improving bacteria loads



- Avian exclusion wiring at the wharf in 2017 following enumerative methods data indicating wharf as most probable node for bacteria.

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Molecular methods applied and test locations on Santa Cruz beaches under USEPA License

- Distribution of sampling sites and test locations within the city of Santa Cruz:
  - Cowell Beach (66 samples for HumM2)
  - Cowell Beach (66 samples for HumM3)
  - Cowell Beach (67 samples for DG37)
  - Wharf West (67 samples for HumM2)
  - Wharf West (67 samples for HumM3)
  - Wharf West (67 samples for DG37)
  - Main Beach (66 samples for HumM2)
  - Main Beach (66 samples for HumM3)
  - Main Beach (66 samples for DG37)

# Resolving and improving bacteria loads: Cowell Beach -Methods matter

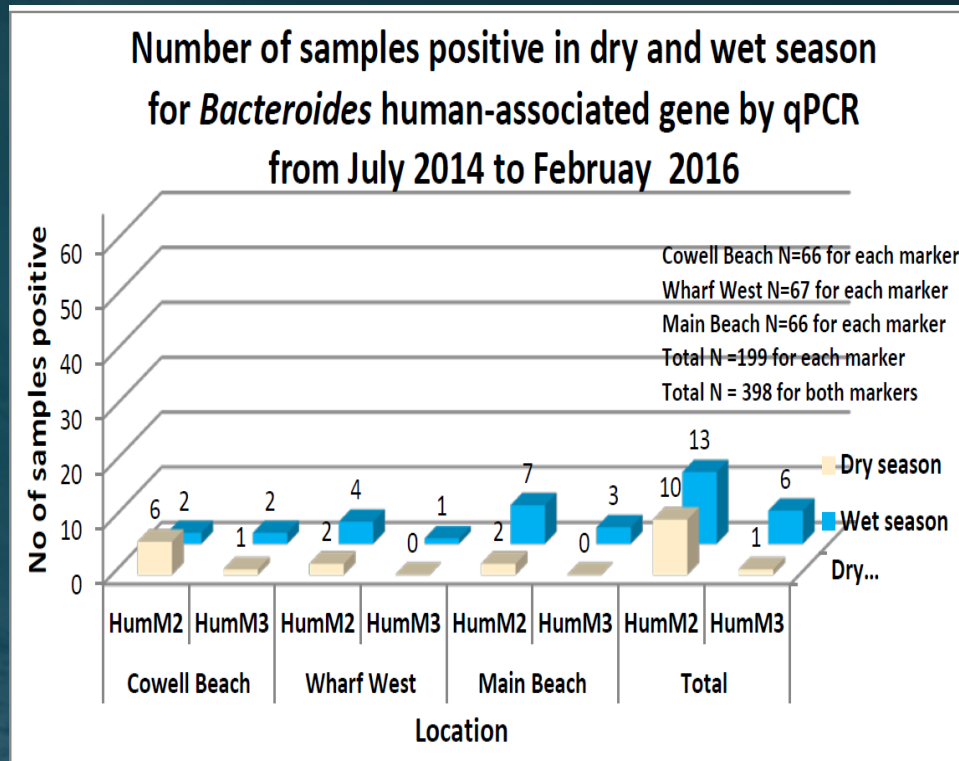


Figure 2. Total number of samples positive for Dog marker from July 2014 to February 2016

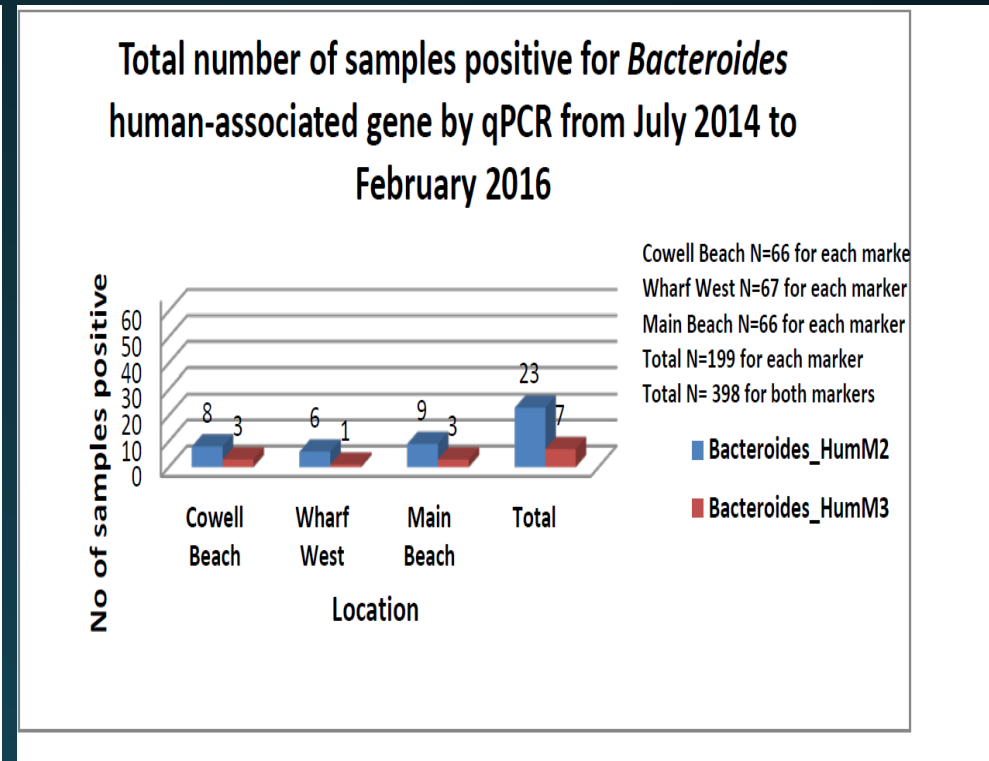


Figure 1. Total number of samples positive for *Bacteroides* human-associated gene by qPCR from July 2014 to February 2016



# Resolving and improving bacteria loads: Cowell Beach – Methods Matter

- Molecular Methods Test and Results Summary
- HumM2 and HumM3 were more reliable markers.
- Approximately 200 samples analyzed
- Very low copy numbers typically  $\lll 10^3$
- <10% detection rate
- Also low for DG37 (Dog marker)
- Chemical Methods summary
- Caffeine associated high FIB detected <1%
- Fecal Sterol ratios: Not Applicable at this site.



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## Enumerative Methods Used

- SM 9230C – Enterococcus
- SM 9222D – Fecal Coliforms

## Molecular Methods Used

- dqPCR:
- HumM2 (Human Bacteroidales)
- HumM3 (Human Bacteroidales)
- DG37 (Dog Bacteroidales)

Chemical Method Used:  
ELISA (Abraxas)



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## Contact Information

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## Questions