

Occurrence and Potential Hazard of Pharmaceutically Active Compounds in Coastal Waters in Cape Town

Brent Newman, Anisha Velayudan, Gregg Oelofse, Darryl Colenbrander, Mira Petrović, Diana Álvarez-Muñoz, Mira Čelić, Maria le Roux, Kuria Ndungu, Lawrence Mzukisi Madikizela, Luke Chimuka, Heidi Richards



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Background

- Wastewater discharge into sea via outfalls has attracted controversy
- Discharges quite near the shoreline
- Wastewater sometimes visible at sea surface
- Near popular recreational areas
- Concerns on impacts of chemicals in wastewaters, including 'contaminants of emerging concern'

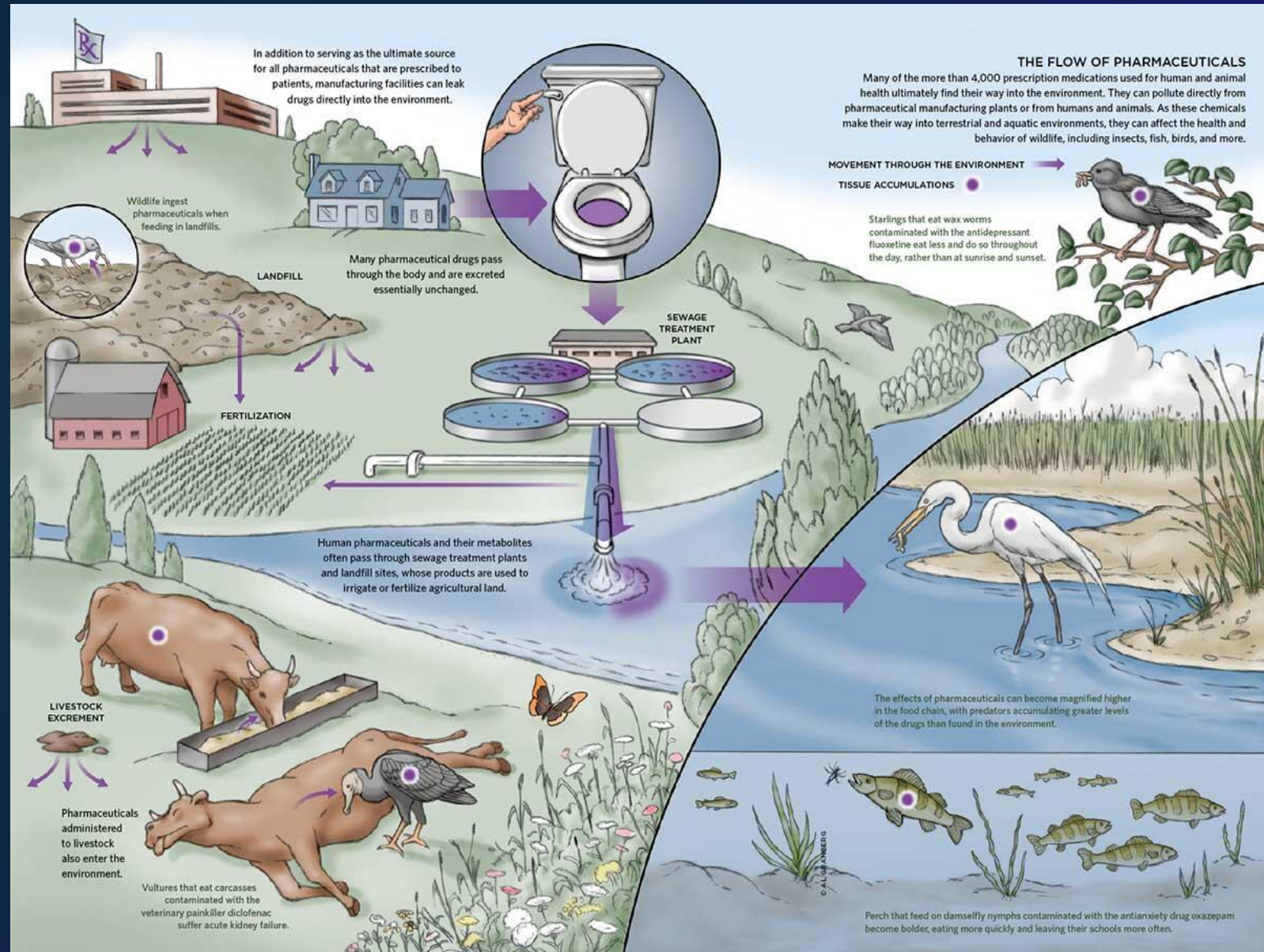
Aim

Investigate the prevalence, concentrations, and potential ecological impacts of pharmaceutically active compounds in coastal waters in Cape Town



Sources of PhAC's

- Range of sources
- Sanitary wastewater >> other sources
- Inefficiently removed by WWTW's
- Pseudo-persistency in environment





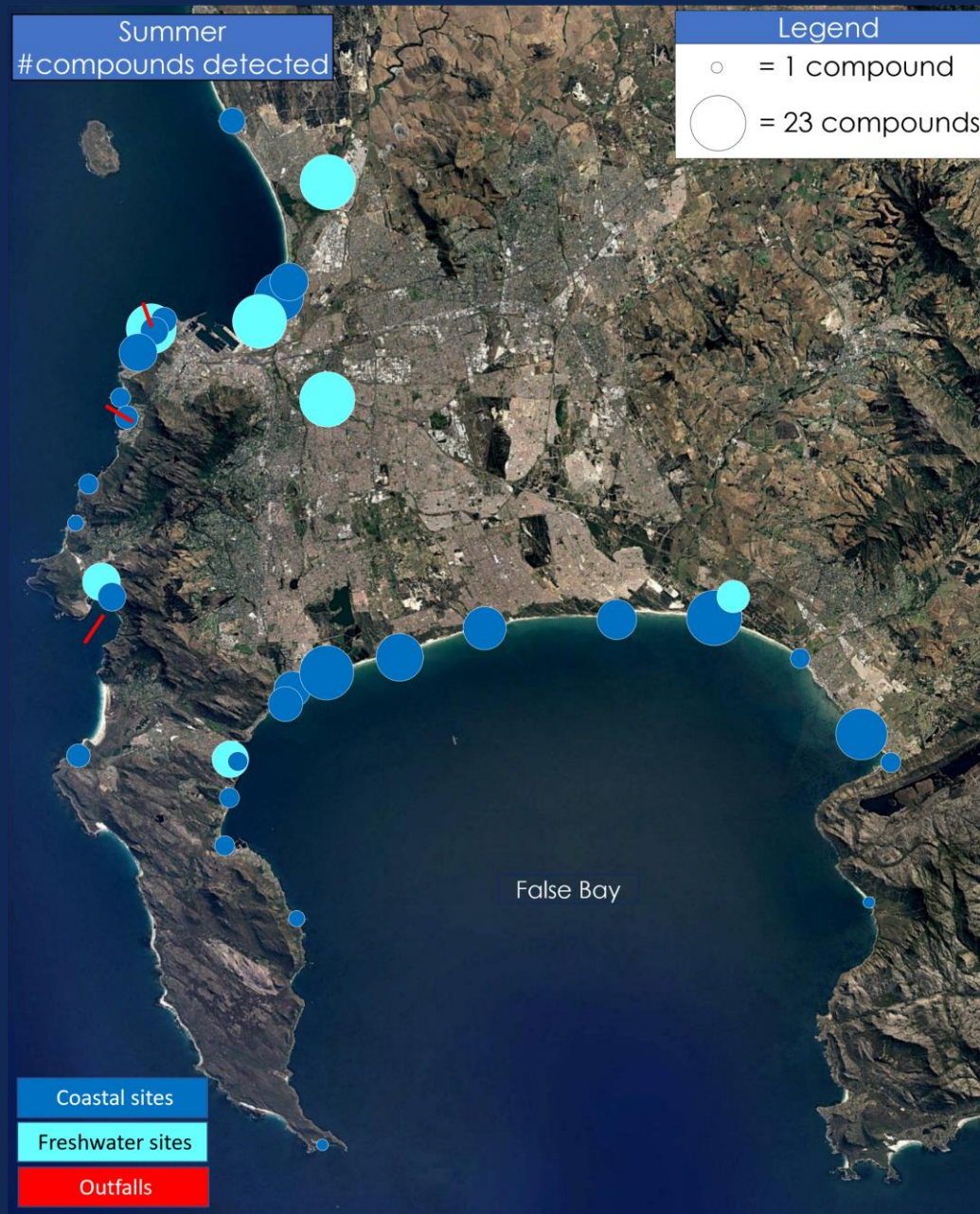
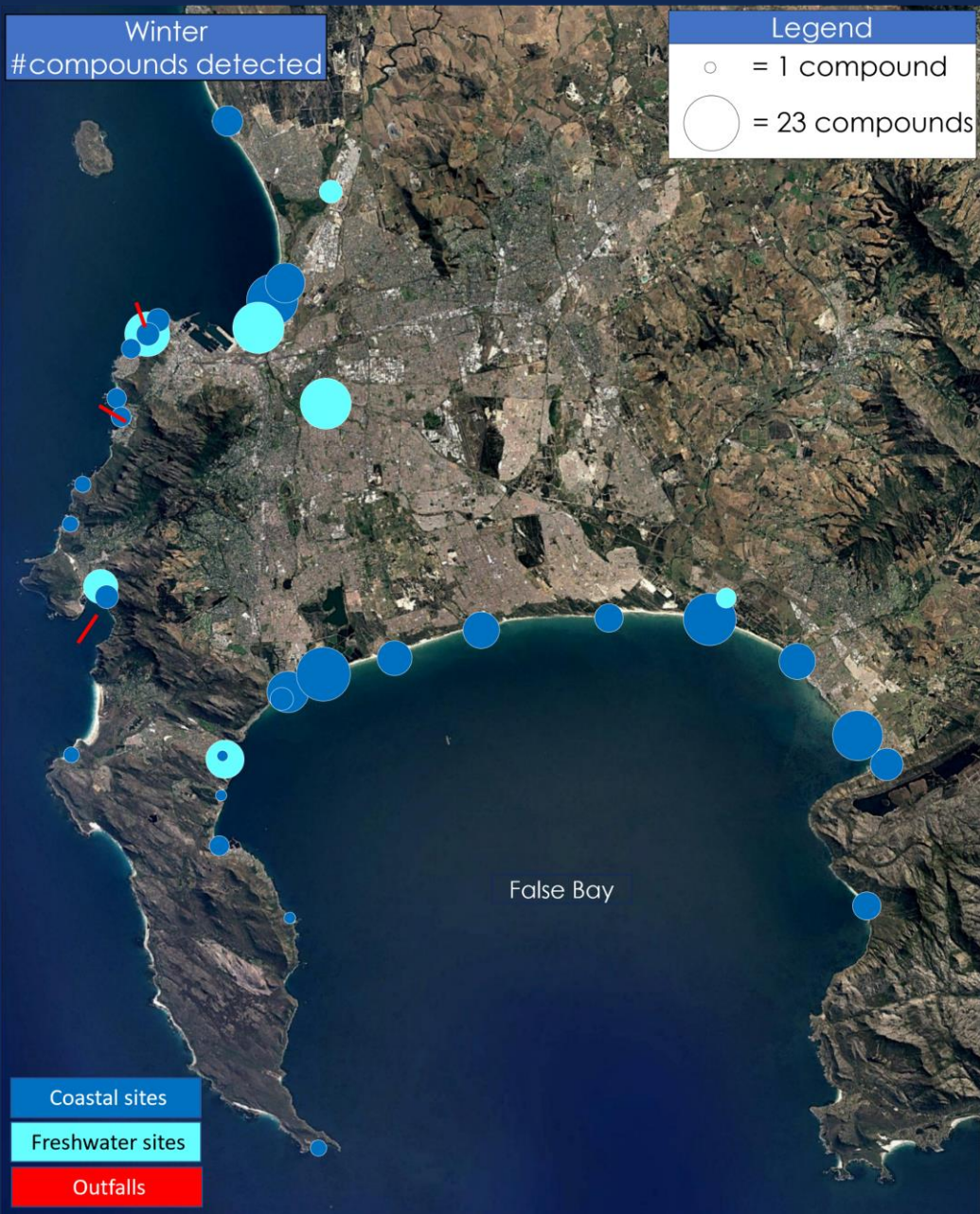
Study sites

- Winter and summer surveys
- 28 coast/beach sites
- 5 river sites
- 2 stormwater drains

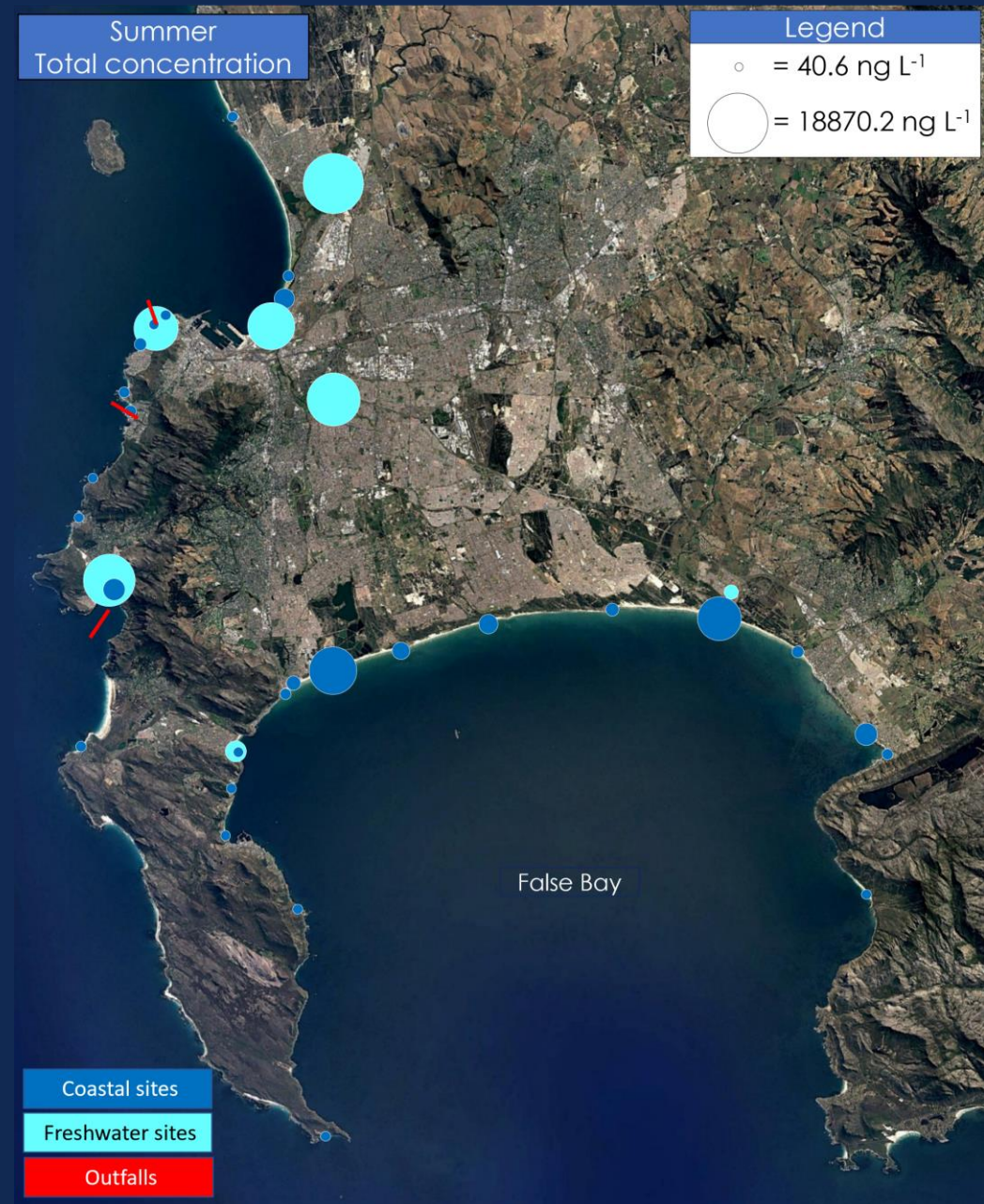
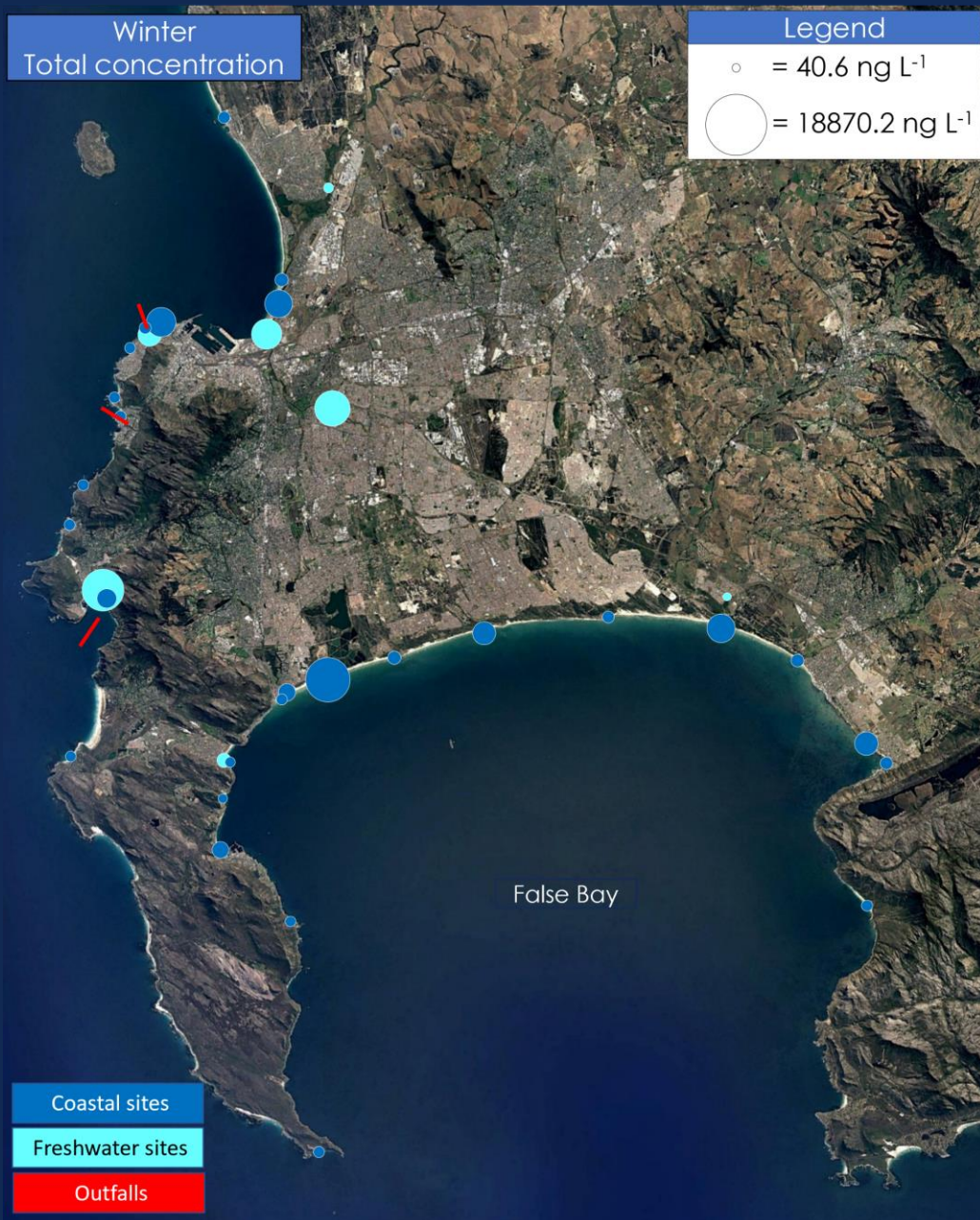
Methods

- 58 PhACs (13 groups): UPLC
- Focused on 33 PhACs

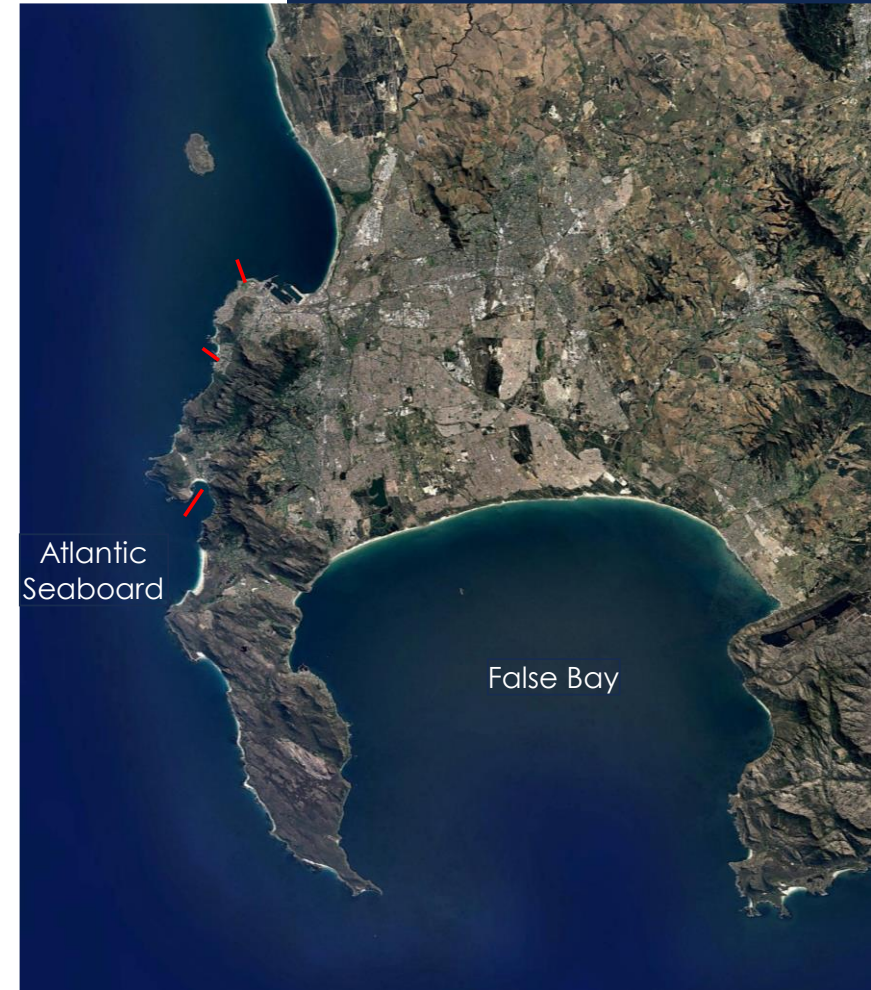
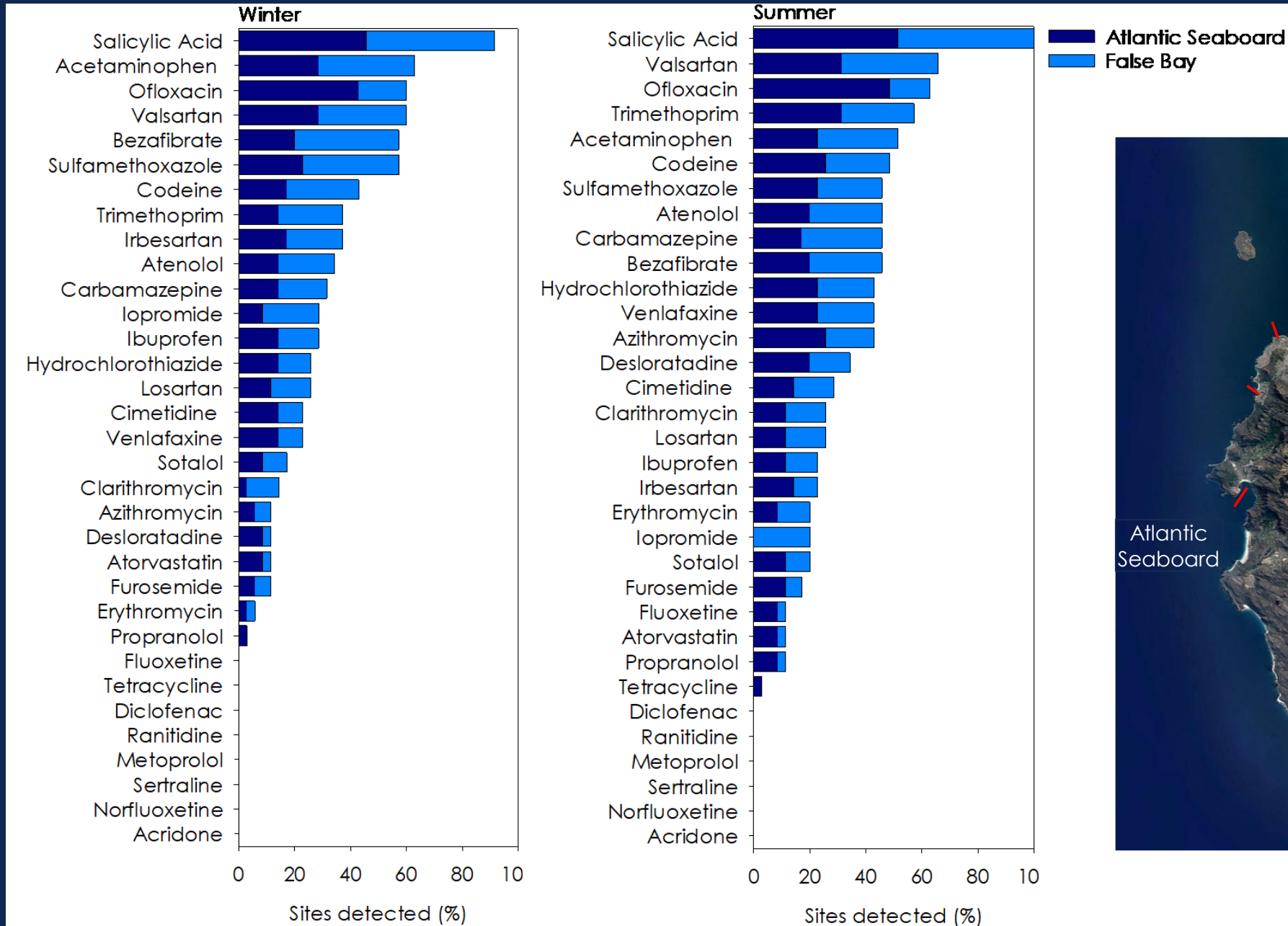
Number of PhAC's detected



Total PhAC concentration



PhACs detected

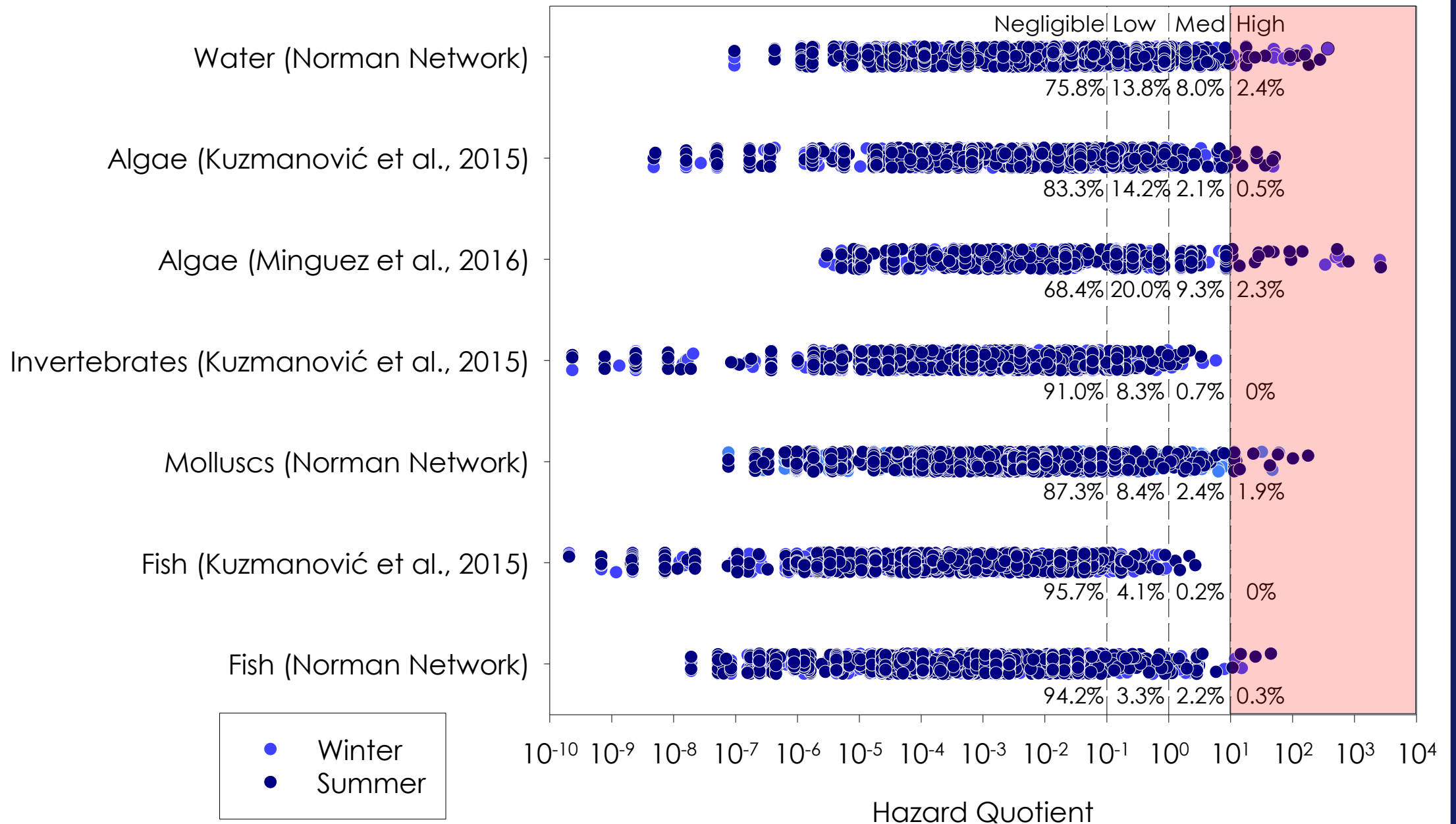


Do PhAC's pose a hazard?

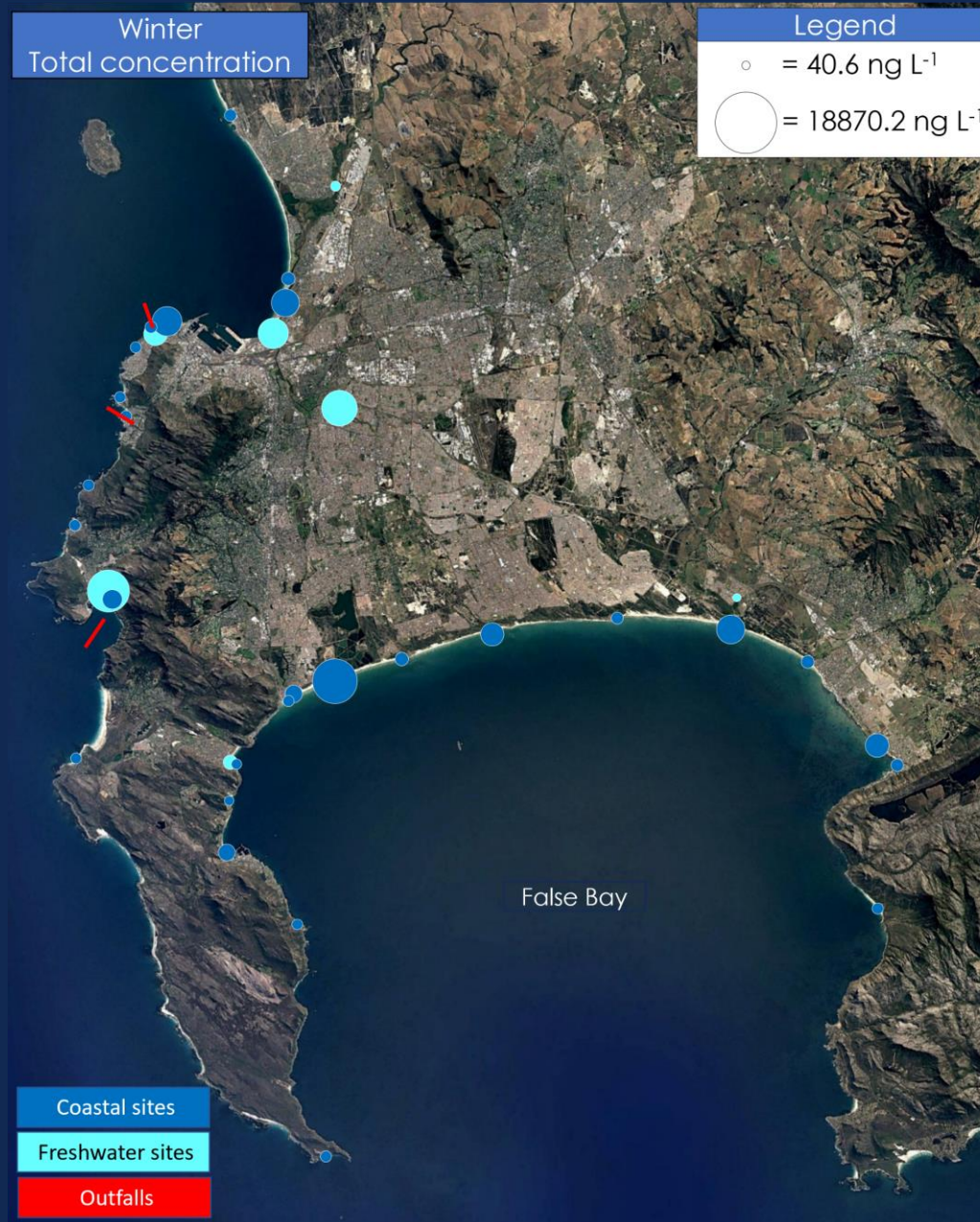
- Acute hazard estimated for algae, invertebrates, and fish using Hazard Quotients
- $HQ = MEC/PNEC$
- Used PNEC's from different sources for comparative purposes
- HQ rating:
 - negligible hazard - $HQ \leq 0.1$,
 - low hazard - $0.1 > HQ \leq 1$
 - medium hazard - $1 > HQ \leq 10$
 - high hazard - $HQ > 10$
- Chronic hazard estimated for fish using fish plasma model
 - $CR = CEC/MEC$
- PNEC's also used to estimated potential for promoting antibiotic resistance



Results: Hazard Assessment

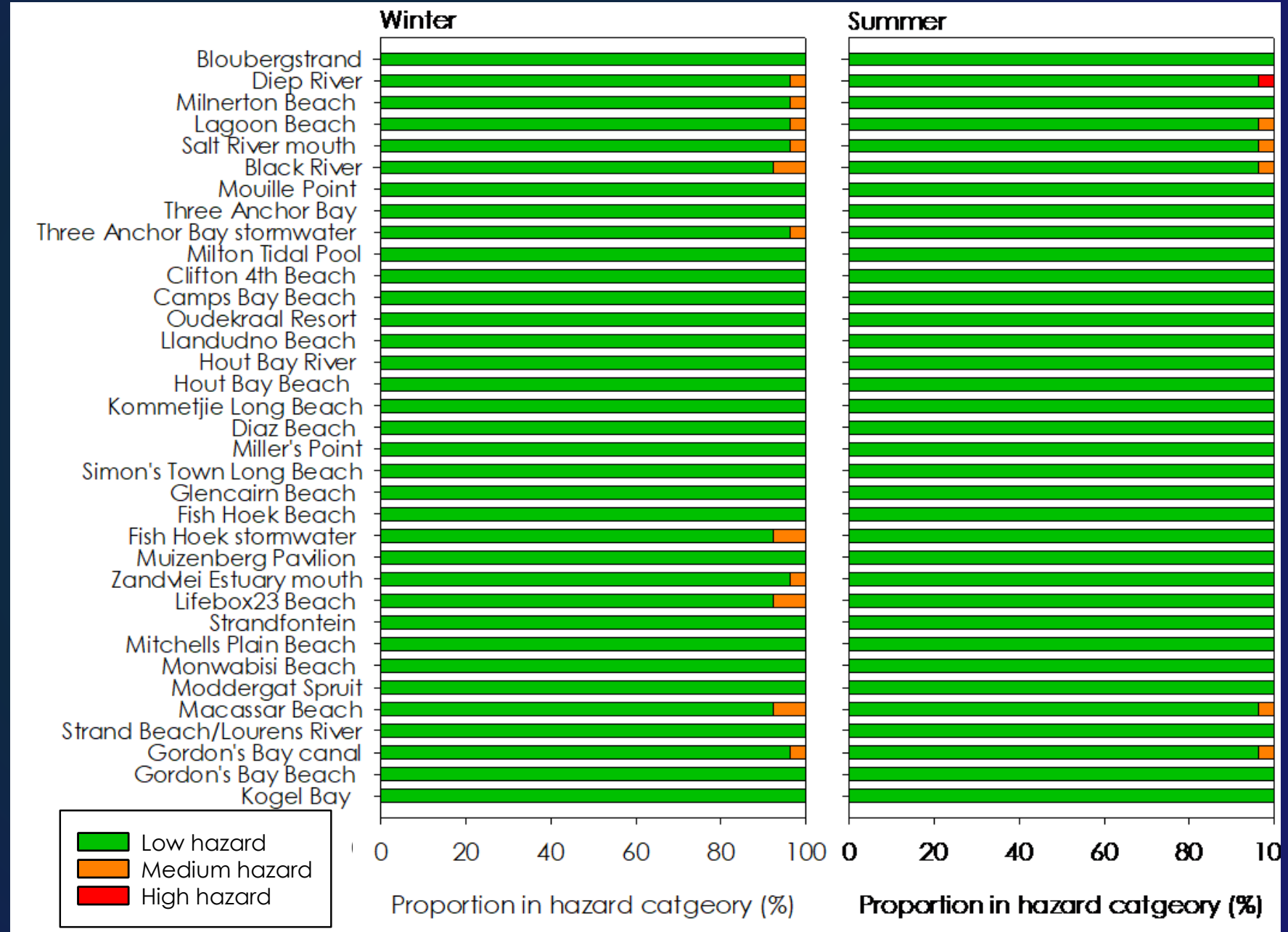


Results: Hazard Assessment



Results: Hazard Assessment

- Antibiotic concentrations too low to promote antibiotic resistance
- Low likelihood of effects in fish





Conclusions

- Cape Town no different to other large coastal cities – PhAC's were prevalent in coastal waters (essentially ubiquitous)
- At some coastal sites PhAC concentrations were higher, or amongst the highest compared to concentrations in coastal waters elsewhere, but opposite is also true
- WWTP discharges undoubtedly major source
- Surface runoff/stormwater discharges an important vector
- Potential hazard posed by most PhACs estimated to be negligible or low – but uncertainties
- No easy fix – requires overhaul of WWTPs
- People also need to change their behaviour – large amount of compounds reaching WWTW believed to be down the drain discards

Thank you

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DATA FOR THIS STUDY

Publication: <https://www.sciencedirect.com/science/article/abs/pii/S0048969724049490>

or

Email: Brent Newman (Bnewman@csir.co.za)



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