Estuarine filter for trace metals and emerging contaminants: An example from Southampton Water, UK

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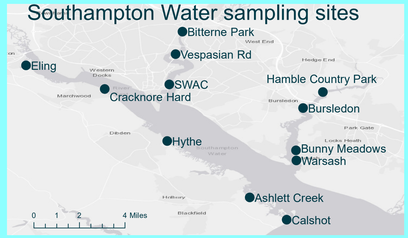
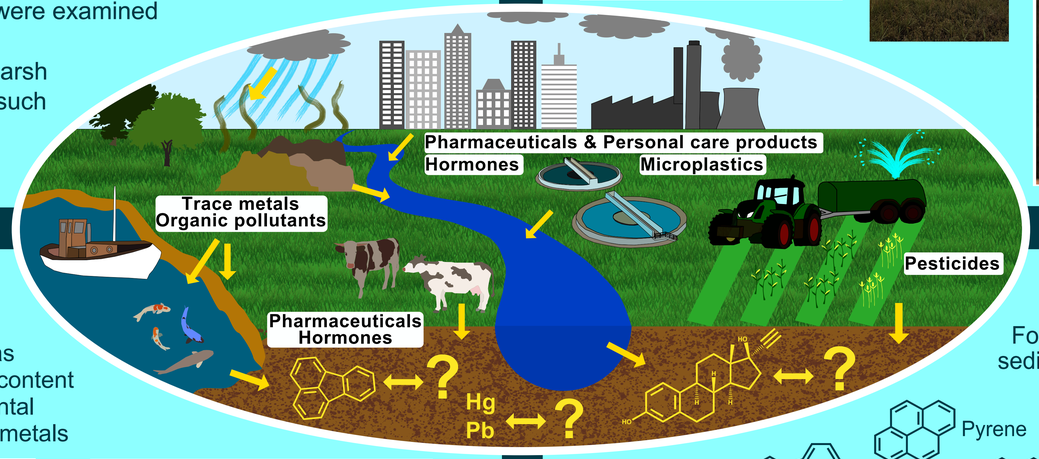
Background & Sites

- Contaminants are emitted in all sectors of anthropogenic activity and eventually reach the aquatic environment
- Estuarine and coastal sediments have shown to **sequester** certain **contaminants**, mitigating their effects on the marine environment
- Among these "trapped" contaminants are trace metals (Hg, Pb, Cu, ...), and organic contamiants (e.g., pharmaceuticals)
- Yet, for many contaminants, such as contaminants of emerging concern including hormones, the **fate and behaviour in sediments is still unclear**
- To assess the degree of pollution and toxicity, it is crucial to **understand their dynamics** in the environment
- Understanding which **sedimentary characteristics influence the behaviour** of contaminants can be used to improve wastewater management
- Here, 12 surface samples and a core from Southampton Water were examined



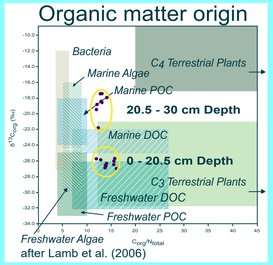
Southampton Water is a large estuarine system with many saltmarsh and mudflat areas and highly influenced by anthopogenic activity such as the second largest container terminal in the UK, an oil refinery, several marinas and Southampton City.

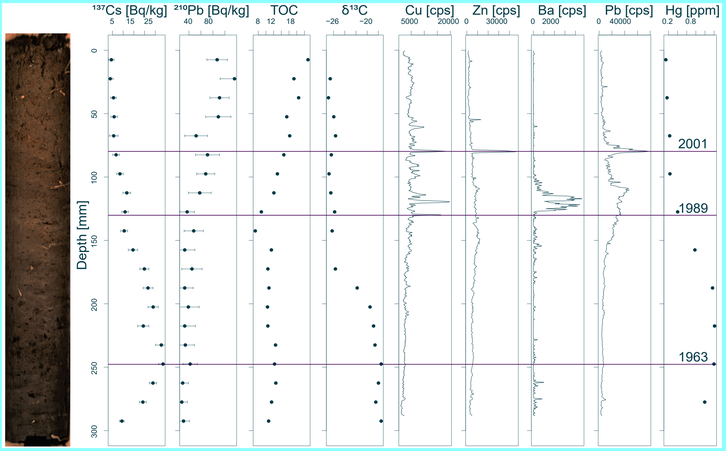


Southampton Core

The core (29 cm) was taken at the Bursledon sampling site. The elemental composition was obtained by ITRAX micro-x-ray fluorescence. After subsampling, the samples were freeze-dried, ground and sieved (2mm).

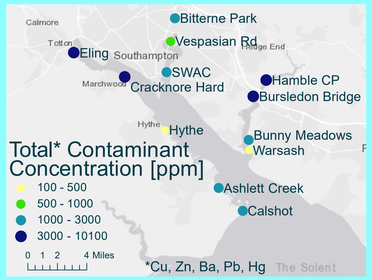
The core was dated by measuring the radionuclides ^{137}Cs and ^{210}Pb with γ-spectroscopy. Hg was measured with a DMA. Carbon content was obtained by coulometry and δ^{13}C was measured with an elemental analyzer.

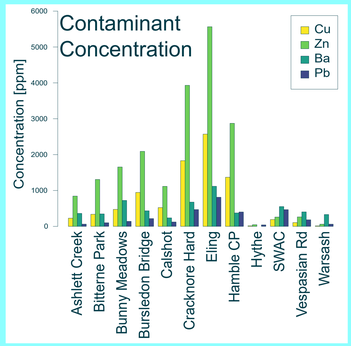


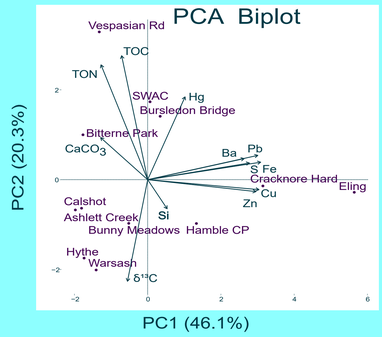


Surface samples

Samples were freeze-dried, ground and sieved (2 mm).
Major and trace elements were measured with XRF analysis, Hg was obtained by DMA. Trace metals were normalized to Al. The carbon content was obtained by coulometry and δ^{13}C was measured with an elemental analyzer. A PCA was conducted to find associations between trace metals and sediment composition.





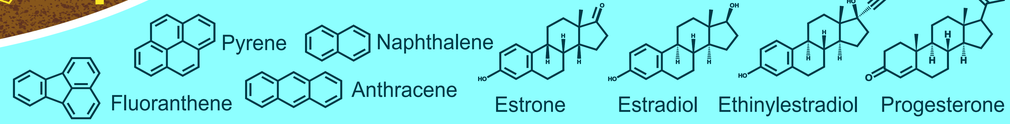


Highest concentrations are found close to contaminant sources, such as the port, or Bursledon Bridge, where a major motorway crosses.

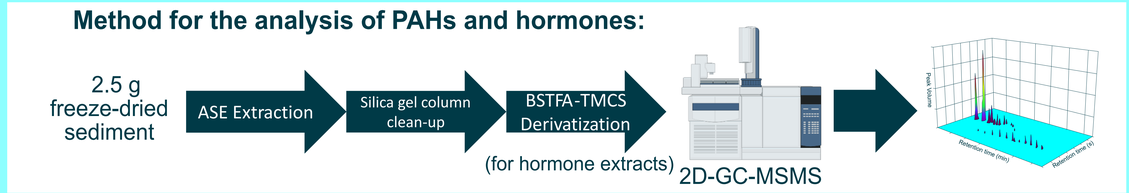
Statistical analysis rules out associations of trace metals with organic carbon, redox processes or grain size, which might indicate anthropogenic origin.

Future Work

Four steroidal hormones and four PAHs will be measured in the sediment samples via 2D-GC-MSMS



Method for the analysis of PAHs and hormones:



Furthermore, Adsorption/Desoprtion experiments will be conducted

The results will help to:

- Determine the amount of these analytes in the sediments of Southampton Water
- Compare the behaviour of organic contaminants to the behaviour of trace metals in sediments
- Identify the sedimentary factors that play a role in the environmental fate of hormones and PAHS

References and further information:

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