

A Case Study: The deployment of a novel *in situ* fluorimeter for monitoring biological contamination within the urban surface waters of Kolkata, India.

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Aim:

- To deploy a novel fluorescence based sensor (VLux TPro, Chelsea Technologies, UK) for the first time in the field.
- To assess the ability of the VLux TPro to detect biological contamination and elevation in microbial activity in real-time within the Hooghly River, Kolkata.

Methods:

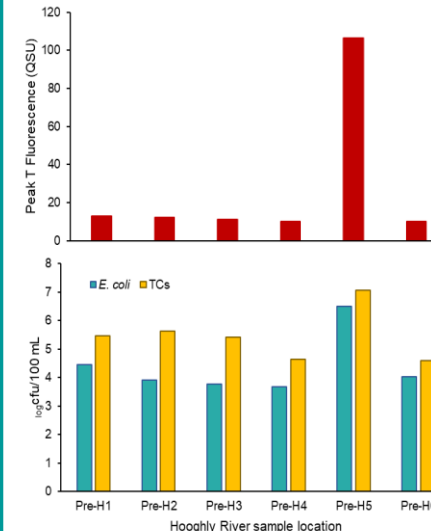
- Alongside the deployment of the VLux TPro, physicochemical parameters were measured in the field using handheld meters.
- Water samples were collected and processed to obtain nutrient concentrations and *E. coli* & total coliform (TC) counts.



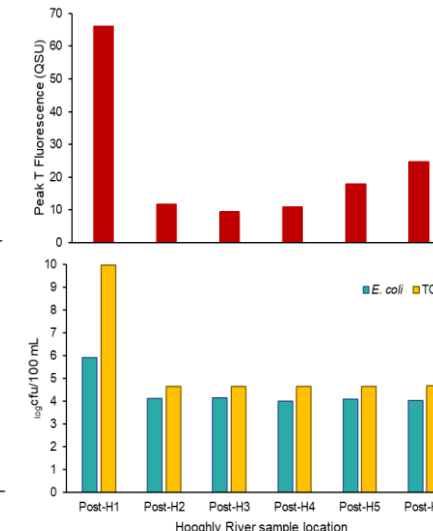
Map of sampling locations on the Hooghly River for pre-monsoon (Mar '19) and post-monsoon (Dec '19) sample collection and VLux TPro deployment.

✗ pre-monsoon ● post-monsoon

Pre-monsoon



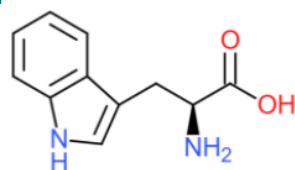
Post-monsoon



TOP: Hooghly River Peak T fluorescence intensity (QSU) data obtained from the *in situ* deployment of the VLux TPro; pre-monsoon data on the left, post-monsoon data on the right.

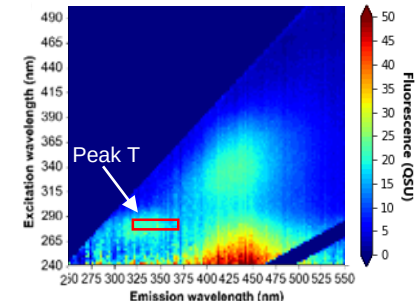
BOTTOM: Bacterial enumeration data for *E. coli* and total coliforms (TCs) for the River Hooghly samples; pre-monsoon data on the left, post-monsoon data on the right.

Peak T fluorescence is associated with biological activity, closely resembling the fluorescence signature of the amino acid tryptophan.



Chemical structure of L-Tryptophan

Technological developments mean this fluorescent organic matter can now be monitored using *in situ* optical sensors. The VLux TPro detects Peak T at $\lambda_{ex}/\lambda_{em}$ 280/340-390 nm, as well as correcting for sample absorbance and turbidity.



EEM of Post-H6; VLux TPro Peak T region labelled.

Key findings:

In situ deployment of the VLux TPro identified, in real-time, biological contamination hotspots and areas of elevated microbial activity along the Hooghly River in central Kolkata.

- The *in situ* Peak T data identified black water inputs nearby sampling locations Pre-H5 and Post-H1, verified by the microbiological, physicochemical and nutrient data.
- The elevated Peak T intensity at Post-H6 suggested increased microbial activity, supported by increased phosphorous concentrations and bacterial enumeration at this sampling location.