Using a novel *in situ* fluorescence sensor to monitor biological contamination in the Hooghly River, Kolkata, India.

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(a) Purpose of study or research hypothesis

This aim of this study aim was to deploy a novel fluorimeter *in situ*, for the real-time detection of biological contamination and elevated microbial activity in a complex surface freshwater system.

(b) Key issue(s) or problem(s) addressed

The quality and health of our vital freshwater systems are universally poor. Current management and monitoring approaches are insufficient, especially with increasing pressures from anthropogenic and climatic changes. We must improve our water quality monitoring over space and through time, and devise and implement new water quality parameters that provide an insight into the biogeochemical processing which underpins the health of aquatic ecosystems.

(c) Methodology or approach used

Recent research has highlighted the potential for tryptophan-like fluorescence (TLF or Peak T) to monitor microbial activity in aquatic systems. *In situ* real-time fluorimeters have been adapted to detect and monitor Peak T but their application has been limited due to optical interferences and the lack of standardised reporting units The VLux TPro (Chelsea Technologies Ltd., UK) corrects for optical interferences caused by high turbidity and absorbance and reports Peak T fluorescence data, $?_{ex}/?_{em}$ 280/340-390 nm, as standardised quinine sulphate units (QSU).

The VLux TPro was deployed on the Hooghly River, a distributary of the Ganges, within Kolkata (West Bengal, India) during March and December 2019. Alongside the sensor deployment, spot sampling was undertaken to enable physicochemical analysis, bacterial enumeration and determination of nutrient (nitrate and phosphate) concentrations.

(d) Results or conclusions derived from the project

The VLux TPro identified biological contamination events, from black water inputs, *in situ* and in real-time. These events, at two sampling locations, were observed as a ten-fold increase in Peak T and were validated by the laboratory analysis of spot samples collected. The VLux TPro also measured a three-fold increase in Peak T at another sampling location. This was not reflected by the bacterial data but was seen in the phosphorous concentration, indicating elevated microbial activity related to nutrient loading.

(e) Implications of the project relevant to congress themes

This case study has demonstrated the first *in situ* deployment of the VLux TPro and its ability reliably measure quantitative fluorescence intensities in real-time. The VLux TPro successfully identified both biological contamination events and potential elevated microbial activity, related to nutrient loading, in a complex surface freshwater, without the need for expensive and time-consuming laboratory analysis.

Further work is needed to determine the feasibility of long-term catchment-wide deployment of the VLux TPro for monitoring microbial activity and pollution events in freshwater at high spatio-temporal resolutions.

Keywords : Water quality; organic matter; fluorescence; sensors; freshwater, ecosystem health