

Seasonal monitoring and health risk assessment of polybrominated diphenyl ethers in a River system, Eastern Cape Province, South Africa

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ABSTRACT

The occurrence of polybrominated diphenyl ethers (PBDEs) in Chatty River (CHA) was evaluated in this study. CHA is a major tributary discharging into Swartkops Estuary in Eastern Cape Province, South Africa. The sum of six $\sum_6$ PBDEs in water and sediments ranged from 0.01-0.10 $\mu\text{g/L}$ and 0.40-7.00 $\mu\text{g/kg dw}$ respectively. The hazard quotient due to PBDEs was estimated as 2.0×10^{-3} - 8.0×10^{-3} . The pollutants levels in this River could be linked to municipal wastes from surrounding informal settlements. There is need for immediate remediation of this waterbody.

Key words: Polybrominated diphenyl ethers, congeners, remediation.

INTRODUCTION

- PBDEs are a class of organobromine compounds used as flame-retardants in different manufactured products to curtail fire-related accidents (Stiborova et al. 2015).
- PBDEs are harmful to environment and human wellness; their levels in humans could be from food ingestion (Babalola and Adeyi 2018), dust inhalation or dermal contact (Harrad et al. 2016).
- PBDEs adverse impacts on biota, human neurodevelopment, endocrine/reproductive systems and cancer risks have been reported.

OBJECTIVE

The main objective of this research is to determine CHA pollution status.

METHODS

Physicochemical parameters (PPs) were determined following standard methods. PBDEs in water and sediments were extracted with solid phase extraction (SPE) and soxhlet methods as described by Barco-Bonilla et al. (2015) and Covaci et al. (2005)), respectively. Quantification of the congeners were determined using GCMS.

RESULTS

All the water PPs are within the acceptable limits except electrical conductivity, total dissolved solids, salinity and turbidity. The temperature was least in winter when compared with other two seasons.

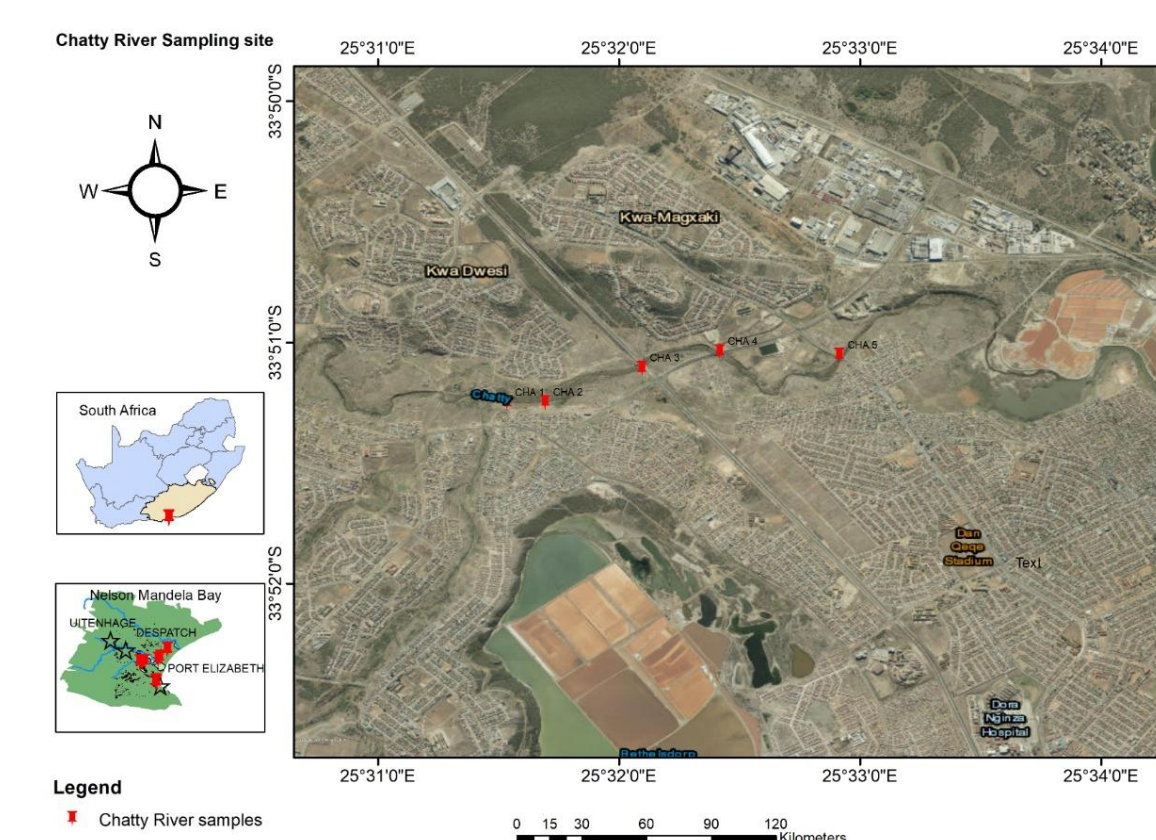


Figure 1: Map of Chatty River

Seasonal variations in CHA water PBDEs levels

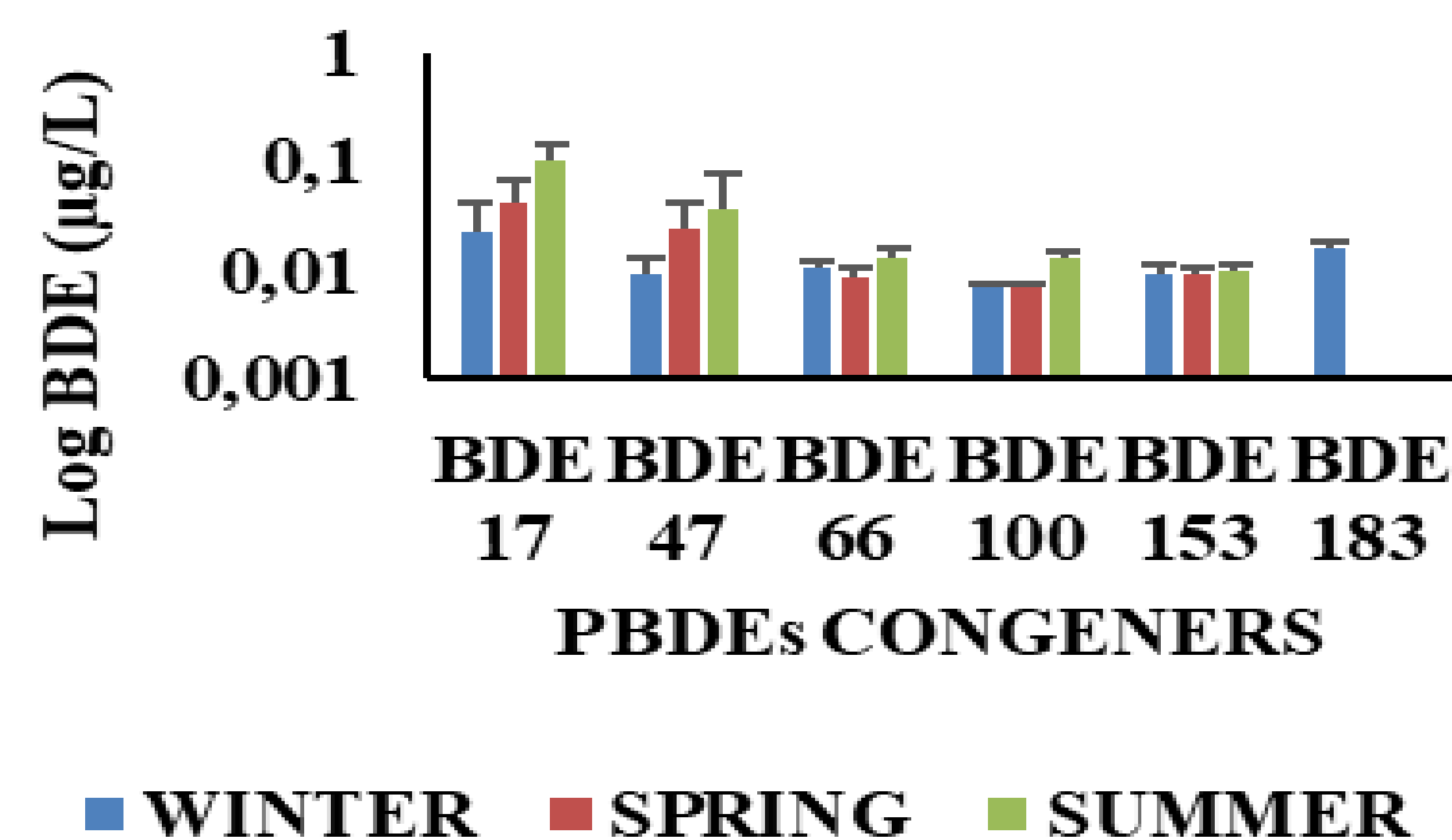


Figure 2: Seasonal variations of PBDEs in CHA water samples

CONCLUSIONS

- ❖ The results from this study have established the pollution status of this River in relation to PBDE concentrations.
- ❖ Seasonal evaluations showed that both water and sediment samples composed of elevated PBDEs during summer. High PBDEs in summer could have emanated from PBDE residues in the soil being drained into the waterbodies by the rainfall (Lv et al. 2015).

Seasonal variations in CHA sediment PBDEs levels

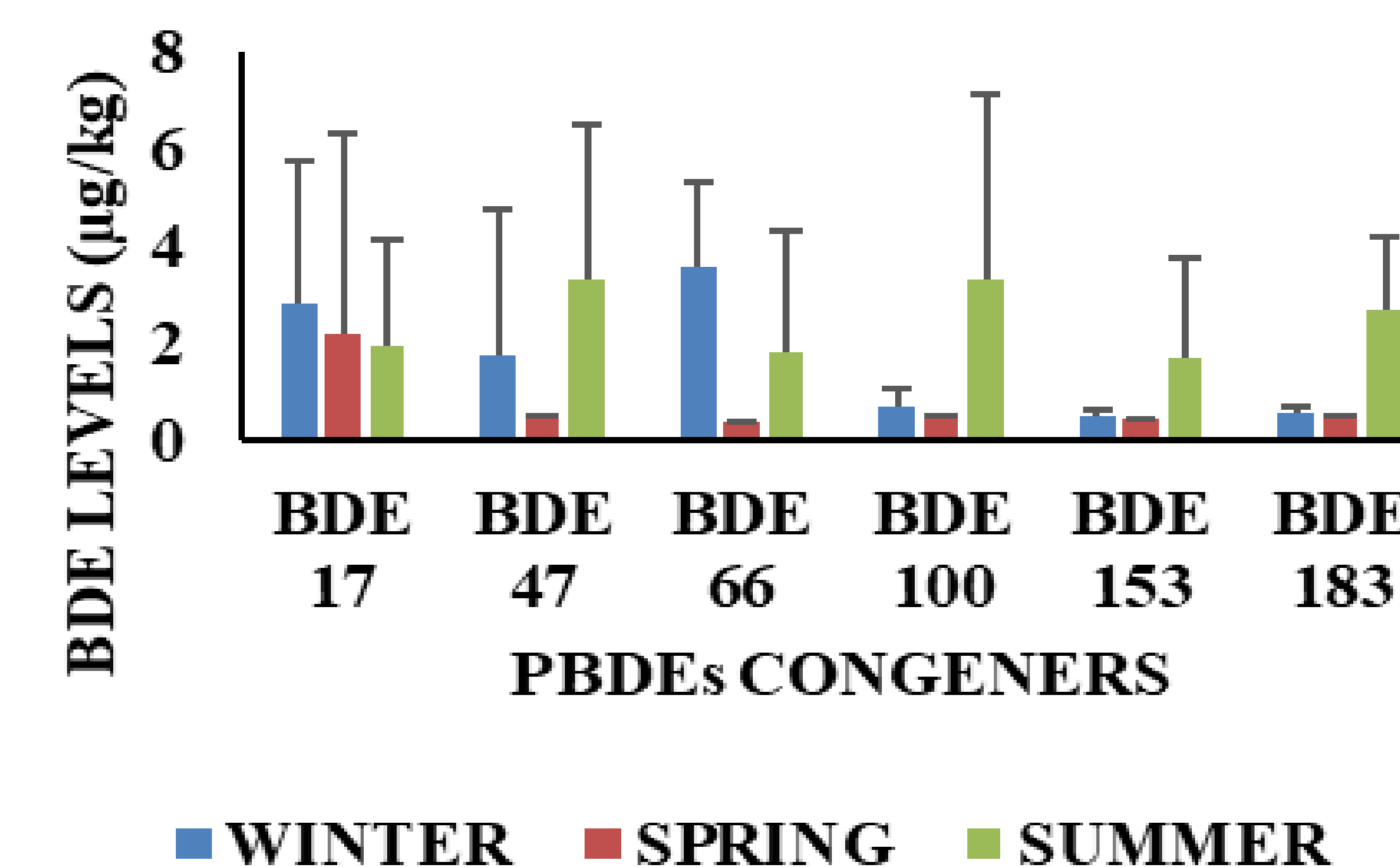


Figure 3: Seasonal variations of PBDEs in CHA sediments

It is believed that this study is in line with one of the United Nations Sustainable Development Goals; which is clean water and sanitation. The United Nations has emphasized that access to pure water and sanitation is every individual's fundamental right.

REFERENCES

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