

a station closer to the Mzinga River. No significant difference ($t = 0.55$ two tailed; $p = 0.59$) in PCDD/F levels was observed between the two seasons ($n = 42$). Dioxin-like PCB levels were generally low (1 to 2 orders of magnitude in BEQ; data not shown) compared to the PCDD/F levels.

The Kizinga River drains peri-urban environments, which are highly populated and have many small-scale to medium-scale industries. Oppositely, the Mzinga River drains rural environments that are less populated and have very few industries. As a result of various socio-economic activities, various materials (household scraps, plastics, vehicle tires and electronic wastes) are abundantly present in most domestic and industrial wastes. It was observed¹³ that waste burning, biomass burning (wood and charcoal) and traffic-related emissions (leaded gasoline exhausts and spills, tire wear) are the major sources of particulate matter in the Dar es Salaam atmosphere. The detected PCDD/Fs and dl-PCBs levels in the estuary can thus reasonably be associated with the open burning of waste, biomass and traffic.

The presence of sources in the vicinity of the sampling stations must be taken into account. For example, upstream station E1 in the Kizinga River is downstream to an untreated wastewater discharge point of a textile factory. A third sampling campaign (for end-members) was organized to verify the higher PCDD/F (Figure 3C and 3D) and dl-PCB levels (≤ 1 pg BEQ/g) in the Kizinga River and to assess the change of the dioxin levels downstream. Station F1, in the vicinity of a sewage factory pipe and near unauthorized human settlements, shows a high PCDD/F level of 400 pg-BEQ/g. Another upstream Kizinga River station (F2), with 21 pg-BEQ/g PCDD/Fs, is similar to the levels in the upstream Mzinga River stations. A negative concentration gradient of PCDD/Fs and dl-PCBs in sediments is observed in the downstream direction. The levels at the mouth of the Mtoni estuary are very low: 1 to 2 pg-BEQ/g for PCDD/Fs and below LOD for dl-PCBs. These additional results confirm the previous conclusions that the impact of dioxins on the Mtoni estuary is higher in the Kizinga River than in the Mzinga River and that a dilution effect is clearly noticeable in the downstream direction.

Acknowledgements

This work was supported by the Belgian Technical Cooperation (BTC) under the Belgian Development Agency through a scholarship offered to M. J. Mihale. The CALUX bioassay H1L7.5c1 cell line was developed with funding from the National Institute of Environmental Health Sciences Superfund Research grant (ES04699) to M. S. Denison.

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