

The use of liver histopathology, lipid peroxidation and acetylcholinesterase assays as biomarkers of contaminant-induced stress in the Cape stumpnose, *Rhabdosargus holubi* (Teleostei: Sparidae), from selected South African estuaries

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Abstract

Three biomarkers of contaminant-induced stress (liver histopathology, the lipid peroxidation (LPx) assay and the acetylcholinesterase (AChE) assay) were adapted for application to the estuarine-dependent marine fish *Rhabdosargus holubi* (Steindachner, 1881). Specimens of *R. holubi* were collected using a seine net from 3 temporarily open/closed estuaries in the Eastern Cape, South Africa, each impacted by different anthropogenic activities. The East Kleinemonde estuary has a housing settlement on the banks in the lower reaches and some agriculture in its catchment. The Old Woman's estuary has a golf course adjacent to its lower and middle reaches and is crossed by a national road in its upper reaches. The Mtana estuary is virtually pristine, with limited cattle grazing occurring along the banks of the estuary and some subsistence agriculture in the catchment. According to the biomarker results from this study, *R. holubi* from the East Kleinemonde were in good health, as reflected by low LPx and high AChE levels. The liver histopathology did, however, suggest possible previous exposure to stress (increased melanomacrophage centres, increased perivascular connective tissue and severe vacuolation). Overall, liver histopathology results did not differ significantly between estuaries. Fish from the Old Woman's recorded significantly inhibited AChE and increased LPx, while fish from the Mtana exhibited significantly increased LPx only, suggesting possible exposure to anticholinesterase contaminants in the former estuary and some form of oxidative stress in the latter. Although water samples were collected from each of the 3 estuaries and analysed for polychlorinated biphenyls, organochlorines, organophosphorous pesticides and pyrethroids, none of these chemicals were detected. As pesticide residues in water are highly variable, both temporally and spatially, future studies should focus on measuring tissue burdens of organisms in order to identify the contaminant stressor. This study has shown that while chemical analyses of water provide a 'snap-shot' of water quality at the time of sampling, biomonitoring can integrate past exposures to stress and is thus useful for identifying potential situations of concern that require further detailed investigation.

Keywords: biomonitoring, pollution, estuaries, AChE, LPx, histopathology