In situ assay with chironomids for sediment assessments in the freshwater-saltwater interface

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Introduction: Within estuaries, the freshwater-saltwater interface (FSI) has long been recognized as a key site from both ecological and ecotoxicological perspectives [1]. The strong gradients in many physicochemical parameters, including salinity, temperature, pH, dissolved oxygen (DO), and redox potential, taking place in these areas influence the amount and deposition of sediment particles with potential associated contaminants, as well as the portioning of contaminants between sediments and interstitial and overlying water [1]. The objective of this study was to make available an integrated approach for ecological and ecotoxicological sediment assessments along the upper estuarine areas, from fresh and brackish waters including the FSI, using an in situ assay with the freshwater midge larva *Chironomus riparius* Meigen based on postexposure feeding feeding.

Methods: The in situ assay consisted of a 48-h exposure period followed by a short postexposure feeding period (1-h). In situ testing was carried out in the Mira River estuary, southwest Portugal (37º38'N, 8º42'W). With the exception of a dam constructed about 50 yr ago (50 km upstream of the river mouth), the estuary is relatively undisturbed and free from industrial pollution. Three field sites were selected: one located upstream in a freshwater area subjected to tidal regime (F, 37º34'55"N, 8º36'46"W), another with salinity ranging between 1.7 and 9.5 g l^{-1} during a complete tidal cycle (FSI, 37º37'02"N, 8º39'27"W), and the third located further downstream with a salinity ranging between 15.4 and 22.0 g l^{-1} (S, 37º38'35"N, 8º42'3"W). Methodologies for feeding quantification of *C. riparius* fourth instar larvae feeding were optimized under laboratory conditions using *Artemia franciscana* Kellog nauplii (less than 24-h old).

Results: Good recovery rates of *C. riparius* larvae were obtained after the 48-h field exposure; 60 and 73% at sites F and FSI, respectively. No significant difference in post-exposure feeding was observed between larvae exposed at sites F and FSI; mean ± standard deviation (coefficient of variation) feeding rates were 14.8 ± 1.8 (12%) and 9.8 ± 3.1 (33%) nauplii $larvae^{-1}$ h^{-1}.

Discussion: Given that comparable feeding rates were observed between *C. riparius* larvae exposed at both field sites (F and FSI), our results suggest that the large fluctuations in various physicochemical variables at the FSI due to the tidal regime, especially the large salinity variations and a maximum salinity of 9.5 mg/L, did not significantly influence *C. riparius* larval post-exposure feeding rates. The results demonstrate the potential use of this novel in situ assay for sediment toxicity assessments at the FSI and strongly suggest that uncontaminated freshwater sites in upper estuarine areas can be used as reference sites for *C. riparius* in situ toxicity evaluations of sediments in FSI areas.

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References: [1] Chapman and Wang (2001) *Environ Toxicol Chem* **20**:3-22.