BIOASSAYS IN SEDIMENT ASSESSMENT FOR INVESTIGATIVE MONITORING IN THE CONTEXT OF THE WFD

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Introduction

Sediments are the ultimate reservoir of many chemical pollutants from point sources (industrial or urban effluents, disused industrial sites) or diffuse (agricultural pesticides). They are thus the "memory" of contamination. Inversely, they can also be sources of contamination (MH Lamy., 2000). If the sediments have traditionally been evaluated in the context of waterways dredging, they are also clearly identified as part of the quality of the aquatic ecosystem. In this context of in situ sediment quality and size of ecosystem health, Chapman & al. (2000) propose an integrative assessment that relies on additional parameters. Ecotoxicology is used here in order to better understand the effects of the environmental quality of sediments on aquatic biota.

Materials and methods

In Wallonia (one of Belgium's 3 Regions), a monitoring using bioassays is being carried out for many years. It combines ecotoxicological and physico-chemical measurements. We use a battery of short and long term bioassays with the bacteria *Vibrio fischeri*, the alga *Pseudokirchneriella subcapitata*, the rotifer *Brachionus calyciflorus* on pore water and two long term bioassays with *Chironomus riparius* and *Heterocypris incongreans* on whole sediment.
20 sediments have been investigated in 2010 and 2011 (only one sample by station).

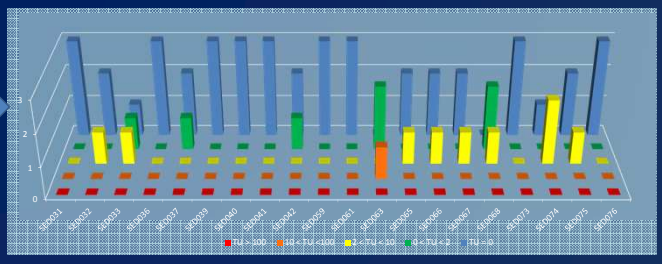
Test battery used :

Function	Species	Test type	Refering to	Incubation	End point
Decomposer	*Vibrio fischeri*	Acute	NVN 6516	30 min	Luminescence inhibition
Producer	*Pseudokirchneriella subcapitata*	Chronic	ISO 8692	48 h	Growth rate inhibition
Consumer	*Brachionus calyciflorus*	Chronic	ISO 20666	48 h	Reproduction inhibition
	Chironomus riparius	Chronic	RIZA (1993) AFNOR NF T90-339-1	7 d.	Mortality Growth inhibition
	Heterocypris incongruans	Chronic	-	6 d.	Mortality Growth inhibition

Results and discussions

Intrinsic toxicity (Toxicity Units)

Sediment classification



By using classification ranking based on *V. fisheri, P. subcapitata* and *B. calyciflorus* bioassays, the most toxic sediments are the SED063 (Ton river), SED074 (Hoegne river), SED068 (Mehaigne river) and SED033 (Sûre river) samples.

Biossays on whole sediment don't show similar results. No significant mortality has been observed for *H. incongruens* nor for *C. riparius*, In term of growth inhibition, similar responses are obtained for SED066 (Lhomme river), SED063 (Ton river) and SED076 (Train river). Differences are observed for SED040 (Eau d'Heure river) with negative impact for *C. riparius* and for SED063 (Ton river) for *H. incongruens*.
For *H. incongruens*, growth inhibition is more responsive than for *C. riparius* (probably due to a low sensitivity to metals).

Chemical analyses have been performed on the same stations and show that the lack of toxicity is also an interesting information. Thus, in the Masblette (SED059), the nickel content exceeds the maximum permitted, but none of the five test systems is responding, indicating low bioavailability.

Conclusions

These results underline the interest of using a bioassay battery to characterize sediments. Each species has a different sensitivity to pollutants in the sediment. Complementary to physico-chemical data, these bioassays give additional information (for instance for bioavailability) and are a useful tool for assessing risk posed by contaminated sediments on water bodies. Are they dangerous enough to be dredged or is the treatment worse than the disease ? They are also helpful for the elaboration of management plans and their effectiveness assessment, both imposed by the Water Framework Directive.

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