Seagrass response to *in situ* trace element contaminations

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Introduction

The endemic Mediterranean seagrass ***Posidonia oceanica*** has been successfully used since the mid-1970s in the biomonitoring of trace elements (TE) in coastal areas (1, 2). However, there is still a **lack of knowledge** regarding **contamination kinetics** in this species (3).

Material and methods

This study was conducted in the Calvi Bay (Corsica, NW Mediterranean) in June 2009. *Posidonia* were isolated in a 410 L PVC mesocosm anchored at 10m depth in the meadow (Photo 1, Fig. 1). The **contamination** lasted for 6 days and was performed using a **cocktail of 15 trace elements** (TE: Cu, Pb, Al, V, Cr, Mn, Fe, Co, Ni, Zn, As, Mo, Ag, Cd and Bi). Pollutant levels within the mesocosm were similar to those measured in contaminated areas. Bioavailable dissolved TE were monitored with DGTs (chelex-type resins). TE concentrations were measured by DRC-ICP-MS in leaves and rhizomes (Fig.2) sampled at regular time intervals.

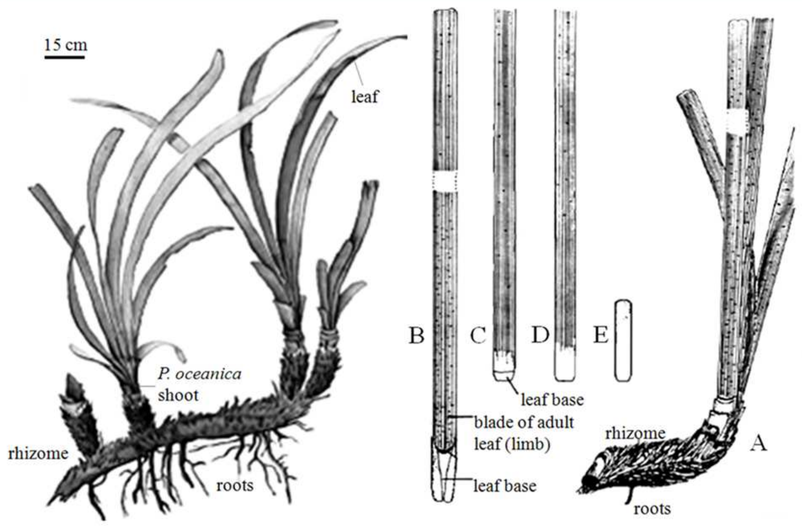


Fig. 2: *Posidonia* shoots - A. leaves inserted on rhizome; B, C. adult leaves; D. intermediate leaf; E. juvenile leaf.

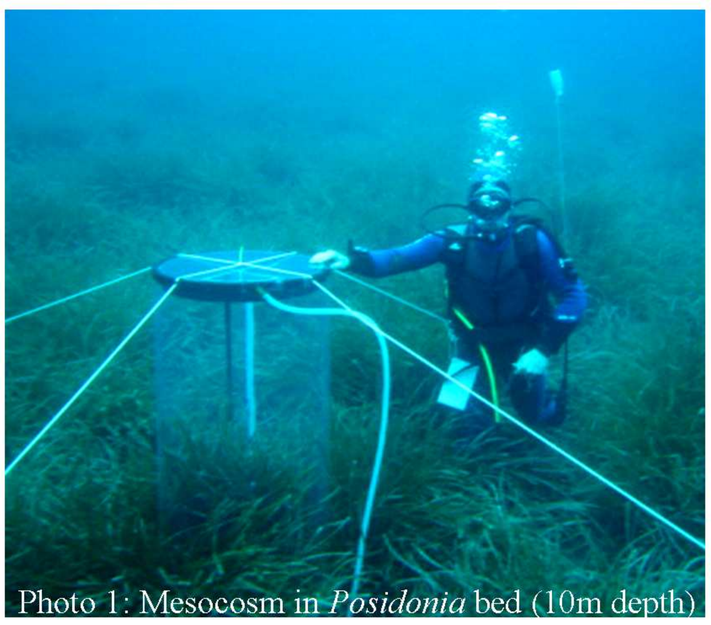
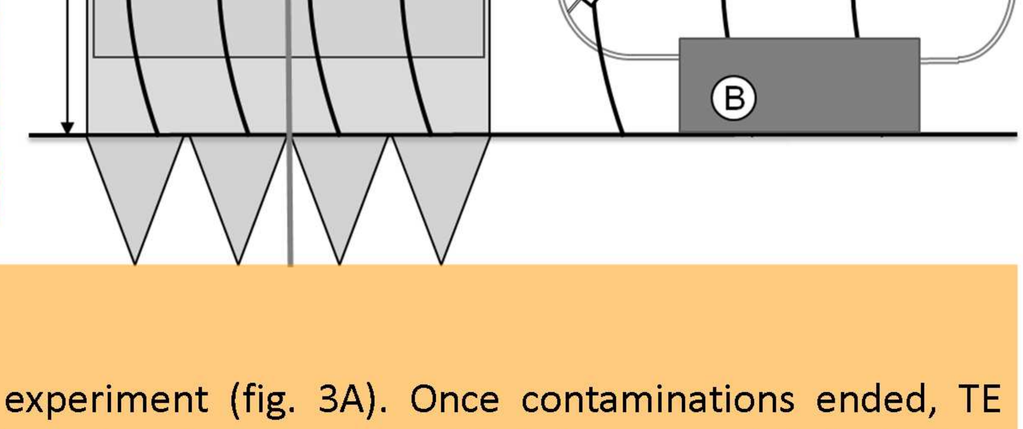


Photo 1: Mesocosm in *Posidonia* bed (10m depth)

Fig. 1: PVC bell-shaped mesocosm. Rounded letters - A. *Posidonia* shoots; B. pump; C. DGT; D. temperature probe. Pollutants added twice a day at 9 am and 9 pm.



Results and Discussion

Posidonia **shoots immediately accumulated pollutants** at the beginning of the experiment (fig. 3A). Once contaminations ended, TE concentrations felt to their background levels within a 2 weeks delay, or at least showed a clear decrease. Likely because of their distinct metabolism, shoot **compartments showed clear differences in uptake and detoxification kinetics** (fig. 3B): intermediate young growing leaves (IL) incorporated chemicals faster than the old senescent ones (AL); rhizomes did not show any clear trend (excepted for Cu, Zn, Bi).

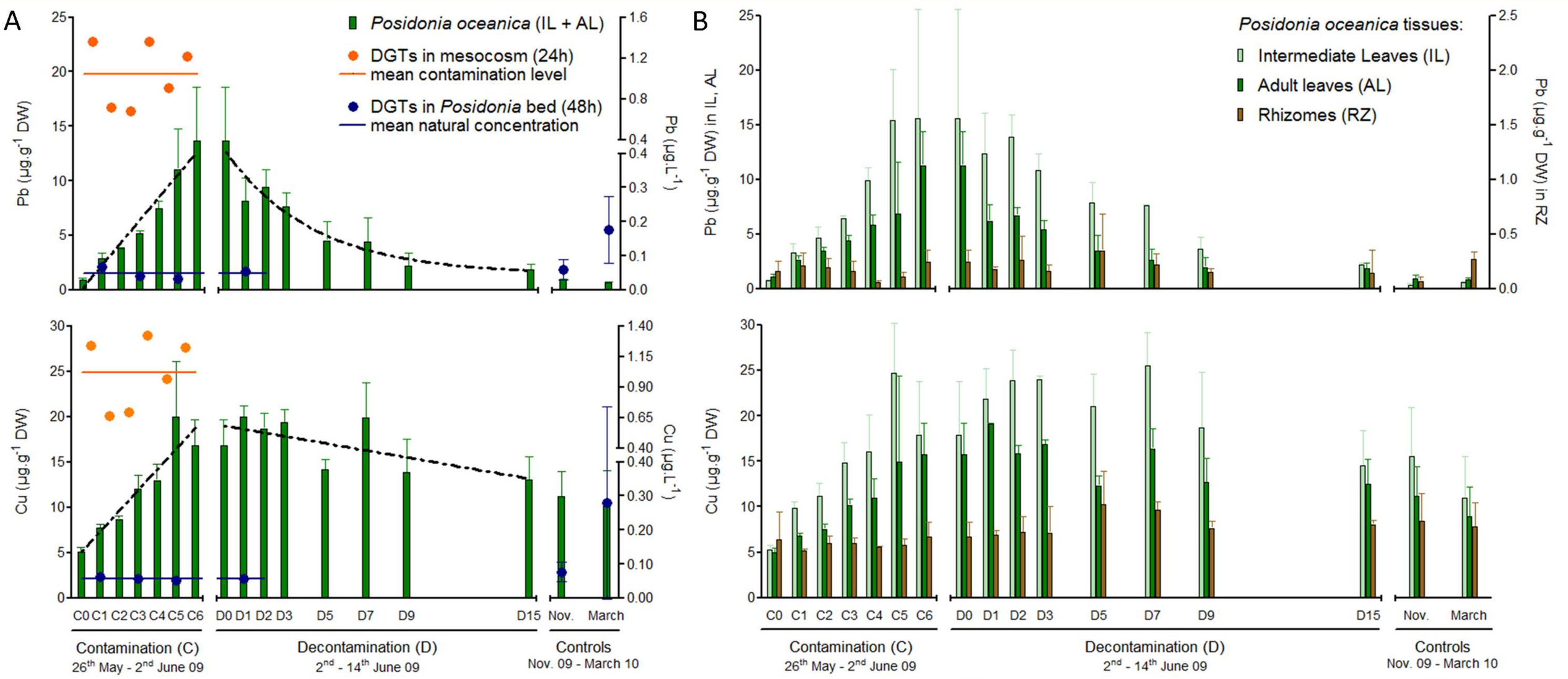


Fig. 3: Representative profiles of (A) Pb and Cu kinetics in leaves and (B) tissue compartmentalization. Concentrations in *Posidonia* tissues are given in $\mu g.g^{-1}$ of dry weight (DW). For Fig. A, right y axis refers to concentrations in seawater measured with DGTs in $\mu g.L^{-1}$.

Conclusions

Posidonia **is a sensitive sentinel** to delineate punctual pollutions. The good response of leaves to short term contaminations confirms their great reliability for **routine monitoring purpose**. The use of rhizomes allows to bypass both the deciduous character of *Posidonia* leaves and their ability to detoxify rapidly. They also provide additional informations regarding long term pollutions.

References:
1. Luy *et al.* (in press). Ecological Indicators. **2.** Pergent *et al.* (2005) - Ecological Indicators. 5:213-230. **3.** Warnau *et al.* (1996). Marine Environmental Research. 41:343-362.

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