Biomonitoring of Atlantic semi-enclosed water areas using new approaches : *Zostera noltei* meadows

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INTRODUCTION

Transitional waters are considered to be highly productive ecosystems (1) playing an important ecological role by providing a broad set of goods and services (2, 3). However, their semi-enclosed situation and their proximity of the sources of terrestrial effluents made them significantly impacted by human disturbance (4). Metallic contamination is one of the most concerning (5).

The efficient monitoring is therefore fundamental for effective management of ecological quality of these vulnerable ecosystems. Previous findings showed that several seagrass species could be used as suitable organisms for monitoring marine pollution due to trace elements (TEs) (6, 7).

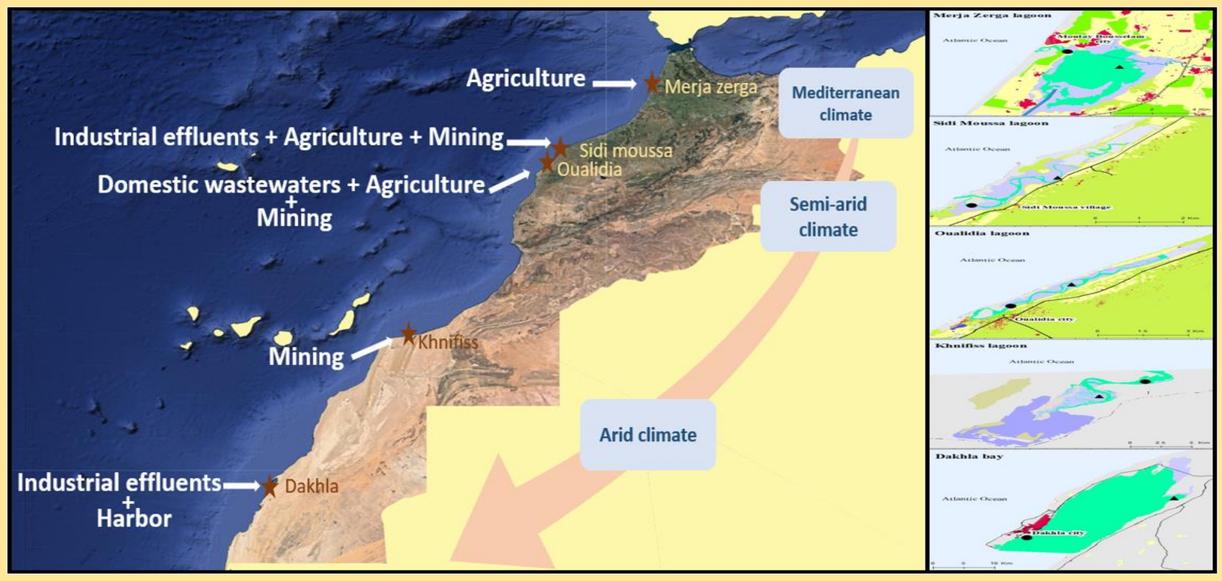
The dwarf eelgrass *Zostera noltei* Hornemann, 1832, is one of the world predominant species living in intertidal zones, thus representing the land-sea interface (8). While other seagrasses have been studied more regularly, only a few focused on *Z. noltei* and evaluated its usefulness as an indicator of coastal TE contamination.

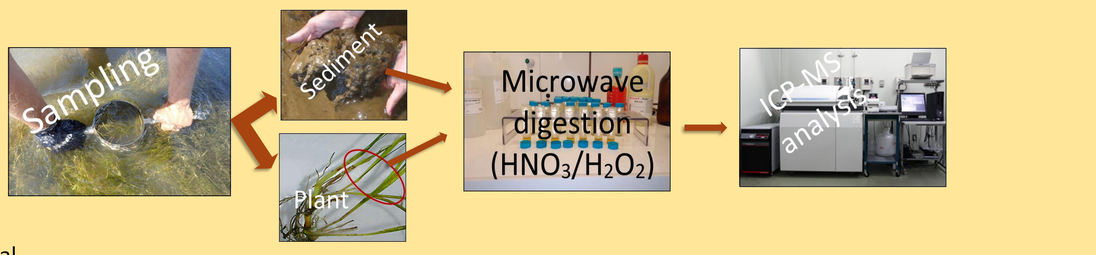
AIMS

- The first assessment of the suitability of *Z. noltei* leaves as a bioindicator of TE contamination along the full latitudinal climatic gradient of the Atlantic coast of Morocco submitted to different anthropogenic pressures.
- The first worldwide study of the ability of *Z. noltei* leaves to concentrate 27 chemical element (Fe, Al, Cr, Mn, Co, Ni, V, Cu, Zn, Sr, Li, As, Ag, Cd, Sn, Sb, Mo, Ba, Ti, Pb, U, Bi, Hg, Na, Mg, K and Ca) from its surrounding environment.

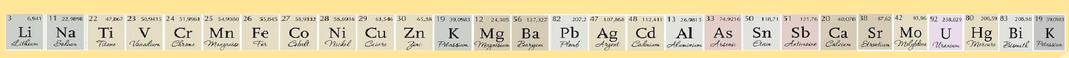
MATERIALS AND METHODS

The study was carried out at 10 seagrass beds (5 sites and 2 up- and downstream stations per site) that are submitted to different anthropogenic pressures along a latitudinal climatic gradient on the Atlantic coast of Morocco:



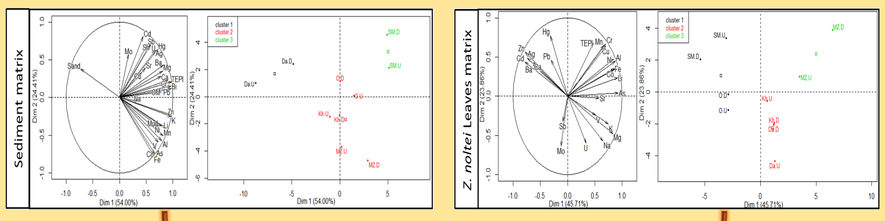


27 chemical element:



RESULTS AND DISCUTION

The dendrographic classification and ordination of studied stations using multivariate statistical analyses for the sediment and *Z.noltei* matrices:

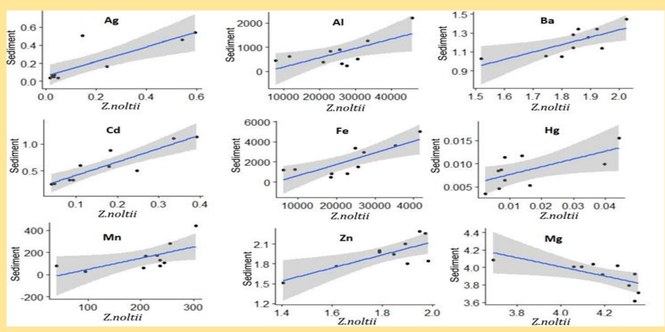


Chemical element concentrations for both sediments and *Z. noltei* leaves showed inter-site and intra-site (downstream/upstream) variability

Clear spatial distribution of chemical element concentrations in *Z. noltei* leaves along the North-South latitudinal gradient of the Atlantic coast of Morocco was founded

Seagrass leaf element uptake relied on both differences in bioavailability and environmental conditions (climatic context, hydrological conditions and anthropic pressures)

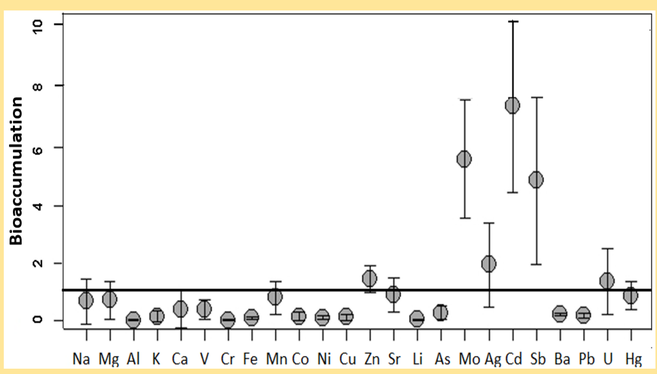
A Spearman's correlation followed by linear regression modeling for significant correlations performed to identify relationships between TE concentrations in sediments and *Z. noltei* leaves :



Significant positive correlations between *Z. noltei* leaf and sediment TE concentrations for Al, Fe, Mn, Zn, Ag, Cd, Ba and Hg

Similar contamination occurrence in both environmental matrix and its bioavailability to seagrasses

The bioconcentration of each element from sediments to *Z. noltei* :



High bioaccumulations were founded for Cd, Mo, Sb, Ag, Zn and U

Efficient uptake by *Z. noltei* from sediments

CONCLUSIONS

***Zostera noltei* is a powerful bioindicator of Cd, Mo, Sb, Ag, Zn, U, Al, Fe, Mn, Ba and Hg contamination in sediments**

Proof of principle that the seagrass system is of high application value

Implementation of conservation measures is a major priority to halt the loss of one of the world's most threatened heritages facing environmental changes and degradation processes

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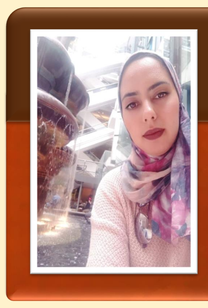
CONTACT



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