

Utilization of the seagrass *Posidonia oceanica* (L.) Delile to evaluate the spatial and temporal dispersion of metal contamination in the marine protected area of Cape Carbonara, Villasimius, Sardinia (Italy).

Alex Diana^[1] & Lieven Bervoets^[1]

[1] Department of Biology - SPHERE, University of Antwerp, Groenenborgerlaan 171, 2020 Antwerpen, Belgium.

Aims

- Analysis of spatial and temporal dispersion in seven locations
- Compare the metal concentrations in three different compartments of the plant: Roots, Rhizome & Adult leaves

Intro

Trace Metals

- Even low concentrations can be harmful [1,2]
- Risk of biomagnifications through food chains [3]
- Coastal areas are really sensitive to human activities [4,5]
- Need of bioindicators

Posidonia oceanica

- Present between 0-40 m depth
- Perennial plant
- When the leaves die, the plant loses only the blade
- *Lepidochronology* [6].

Cape Carbonara

- No previous data available
- Area of Cape Carbonara can be subjected to different sources of contaminations:
- Agriculture - Maritime traffic - Sewage waters

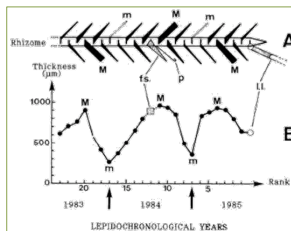


Fig. 1 Illustration of the lepidochronology (Pergent, 1987).

Sampling Design

- 15 shoots per site
- Depth 10±2 meters
- 25 meters radius
- No rinsing [7]
- Spin drying
- Conservation at -20°C

Lepidochronology

- According to Pergent (1987)
- Sheaths were removed and order per insertion rank
- Thickness variability
- 1 year

Metal Analysis

- Chemical preparation [8]
- Open microwave digestion method [9]
- ICP Mass Spectrometry
- The analytical procedures were verified using the certified reference material

Material & Methods

Results

Spatial and Temporal Dispersion

MPI (Metal Pollution Index) = $(Cf_1 \times Cf_2 \times \dots \times Cf_n)^{1/n}$; where Cf_n is the concentration of the metal n in the sample.

MPI trends for the single sites based on the values obtained from the rhizome. Increasing With ■ Decreasing MPI ■

* ($\alpha > 0.10$), ** ($0.05 < \alpha < 0.10$), *** ($\alpha < 0.5$)

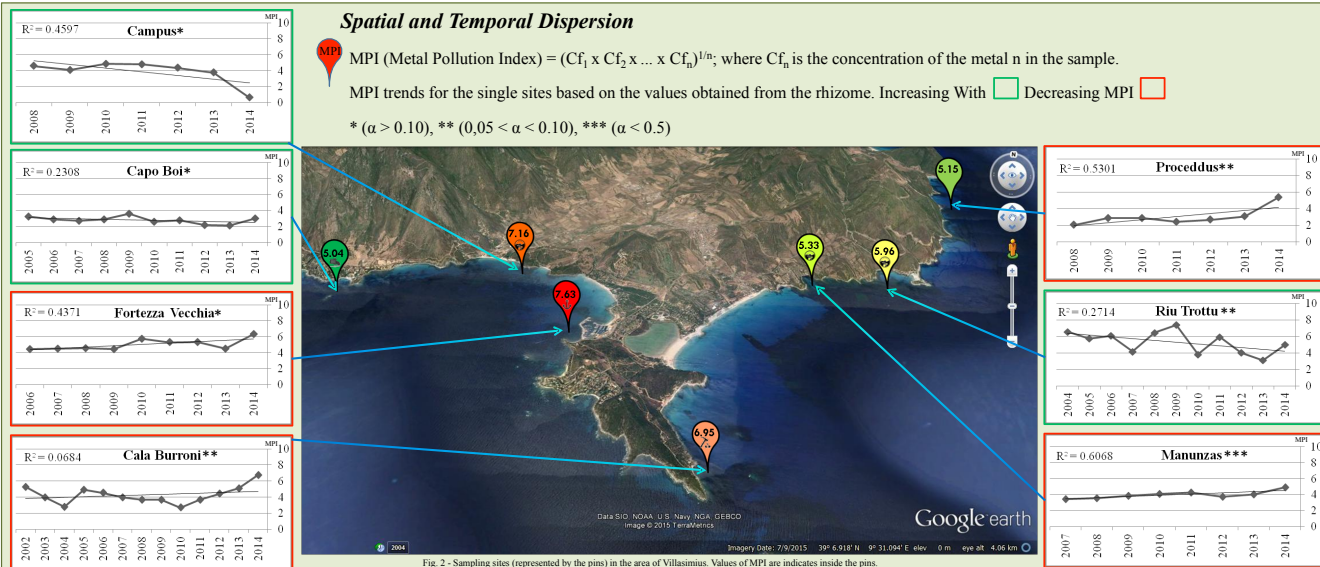


Fig. 2 - Sampling sites (represented by the pins) in the area of Villasimius. Values of MPI are indicated inside the pins.

Metal concentrations in plant tissues

- Leaves show the highest levels for Cd, Ni, Pb and Zn
- Roots show high levels for Ag, As, and Cr
- Al did not have significance difference between the body tissue
- Environmental friendly sampling done only on leaves

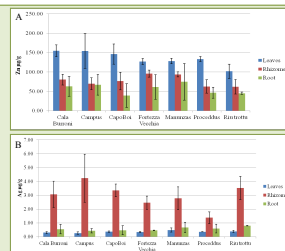


Fig. 3 - Zn (A) and Ag (B) concentrations in *Posidonia oceanica* leaves, roots and rhizomes from the selected sites.

Relative importance of metals in the different plant tissues.			
Metal	Adult Leaves	Rhizome	Roots
Ag		+	
Al	+	(+)	(+)
As	(+)		+
Cd	+		
Cr	(+)		+
Ni	+	(+)	
Pb	+		(+)
Zn	+		

+ indicates the plant part with the highest mean value of metal concentration detected and (+) indicates the ones with no significance difference.

Discussion

- Al > Zn > Ni > Ag > Pb > As > Cd > Cr
- Concentrations similar or lower to studies performed in the western Mediterranean Sea
- Pb values for Fortezza Vecchia are higher compare to other sites in the study area

Conclusions

- Posidonia oceanica* can be considered as a good bioindicator
- Posidonia* allows to recreate temporal trends
- Analysis on leaves are relevant for trace metals
- Further investigations on the sites required

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Contacts: Alex Diana – MSc Marine and Lacustrine Science and Management
Email: dianaalex@live.it Phone: +32 (0) 487328707

Discussion

AOB