

## TRACE METALS IN ALGAE FROM THE SOUTH-WESTERN COAST OF SARDINIA (ITALY)

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### Abstract

Cadmium, Hg, Pb, and Zn concentrations were determined in 28 species of red, brown, and green algae sampled in the south-western coast of Sardinia (Italy). Elevated concentrations of heavy metals were mainly associated with the presence of smelting activities in the area.

*Keywords* : Algae, Bio-indicators, Trace Elements.

Algae have been considered a valuable indicator for the assessment of trace metals in coastal areas because of their accumulation capacity. Algae bind only free metals ions and they do not reflect total metal loads, as they do not respond to metal associated with organic or inorganic particulate matter [1]. Despite metal uptake can be influenced by several variables (e.g. season, sampling position in the shoreline, coexistence of several metals, salinity, water temperature) algae are suitable to reflect the soluble trace metal content of their ambient surroundings with a high degree of time-integration.

In this survey carried out in 2005 algae were collected in the coast of Sardinia (Italy) south of Portoscuso and in the nearby island of San Pietro. Portoscuso (39° 12' 40" N) is a site of major heavy metal contamination. Its industrial area includes a lead-zinc smelter, a plant producing alumina from bauxite and a coal-fired power generation plant. Furthermore the region was intensively mined. Extremely high concentrations of Cd, Hg, Pb, and Zn were found in the sediments of the industrial harbour [2].

Twenty-eight species of red, brown, and green algae (80 samples) were harvested. The most frequently sampled species were *Padina pavonica*, *Dictyota dichotoma*, *Enteromorpha* sp., *Ulva rigida*, and *Corallina mediterranea*. They were collected by hand in the subtidal zone up to at a depth of about 2 m. A minimum of 3 samples of each occurring species were collected from each station. All thalli were thoroughly cleaned with seawater, followed by running with distilled water to remove adhering particulate matter and epiphyte. The samples were bulked in plastic bags. Materials were oven-dried at 30°C to constant weight and then pulverised to ensure uniform distribution of metal in the samples. Algal materials were acid digested in a microwave oven. The concentrations of metals were determined by atomic absorption spectrometry. Analytical quality control was performed with reference materials NBS 1571 Orchard Leaves.

The levels of trace metals in algae varied widely depending on collection zone and algae species. Generally the order of metal abundance in the algae was Zn>Pb>Cd>Hg. *Dictyota dichotoma* and *Padina pavonia* were the algal species which accumulated more Cd, Pb, and Zn. The highest Hg concentrations were found in *Halopteris scoparia* and *Enteromorpha prolifera*. As expected, the highest levels of all metals were found in the vicinity of Portoscuso (Cd up to 58 µg g<sup>-1</sup> dry wt Hg up to 151 µg g<sup>-1</sup> dry wt; Pb up to 80 µg g<sup>-1</sup> dry wt, Zn up to 930 µg g<sup>-1</sup> dry wt). In the island of San Pietro, algae in the coast in front of Portoscuso (distance about 5 miles) contained higher levels of metals than those in the unexposed western part of the island, where reference stations were located (median values in reference stations: Cd 1.2 µg g<sup>-1</sup> dry wt; Hg 0.05 µg g<sup>-1</sup> dry wt; Pb 16.7 µg g<sup>-1</sup> dry wt; Zn 52 µg g<sup>-1</sup> dry wt). The occurrence of metals in the investigated area is high if compared with that reported in other coastal areas affected by human activities [3,4,5,6].

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