

ARSENIC DISTRIBUTION IN KALLONI BAY, ISLAND OF LESVOS, GREECE

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Abstract

Arsenic levels were studied in seawater, sediments and bivalves from Kalloni Bay, island of Lesvos, Greece. The concentrations of As in dissolved phase of seawater showed a uniform distribution (1.00 to 1.68 ppb), while in sediments they ranged from 10.9 to 32.9 mg/kg, showing slight enhancement in some coastal stations. The mean concentrations per dry weight in four bivalve species of the Bay were relatively increased compared to literature data (28.7 mg/kg for *Venus Verrucosa*, 40.8 mg/kg for *Modiolus Barbatius*, 20.9 mg/kg for *Chlamys Glabra* and 41.8 mg/kg for *Arca Noe*), suggesting possible contamination from geological formations in the drainage basin of the Bay.

Keywords : Aegean Sea, Trace Elements, Bivalves, Sediments.

Arsenic is a ubiquitous element in earth crust and natural waters, which is known to be carcinogenic. Elevated natural concentrations of As are usually related to local geology and the presence of hydrothermal fields [1]. In Kalloni Bay, Lesvos island, Greece, the presence of hydrothermal springs at the eastern basin of the Bay and igneous rocks at the western - northern basin, as well as sparse data on elevated As concentrations in water from deep irrigation boreholes at the area [2], suggested possible As contamination. To investigate possible impact on the marine environment, As concentrations were determined in seawater, sediments and bivalves from Kalloni Bay.

Seawater and sediment samples were collected during July 2006 from fourteen sampling stations (Figure 1). Dissolved As in seawater was determined by Hydride Generation Atomic Absorption and As in the sediments (<1 mm), was determined by Graphite Furnace Atomic Absorption (GFAAS) after a high-pressure microwave digestion in teflon bombs, with a mixture of HCl - HNO₃ - HF. Bivalve species (*Venus Verrucosa*, *Modiolus Barbatius*, *Chlamys Glabra* and *Arca Noe*) were collected during February 2006 from the station K3. Composite samples of the selected species were produced by the homogenization of the edible part from 3 to 9 individuals and digested in teflon tubes, with a mixture of HNO₃ and H₂O₂. Arsenic was determined by GFAAS. The quality assurance of the analytical results was controlled with the use of appropriate reference materials. Arsenic concentrations in dissolved phase of seawater ranged from 1.00 to 1.68 ppb and showed uniform distribution. These values are considered normal worldwide [3]. The concentrations of As in sediments ranged from 10.9 to 32.9 mg/kg. Higher concentrations were found at stations K7 (29.4 mg/kg), K10 (32.9 mg/kg) and K14 (27.0 mg/kg), and were comparable to values found in coastal sediments influenced by an As rich geological background [4]. However, the natural variation of As in marine sediments worldwide is wide [1] and therefore no conclusive comments can be made before further investigation on the possible land-based sources of As in the area. In the selected bivalve species, As concentrations were as follows: for *Venus Verrucosa* 25.8-31.5 mg/kg (dry weight - d.w.) (mean 28.7 mg/kg), for *Modiolus Barbatius* 35.2-46.3 mg/kg (mean 40.8 mg/kg), for *Chlamys Glabra* 20.7-21.1 mg/kg (mean 20.9 mg/kg) and for *Arca Noe* 41.8 mg/kg (mean). The As levels in bivalves of the Bay were relatively higher than those found in *Mytilus galloprovincialis* from the Aegean Sea (8.8 to 34.1 mg/kg d.w. [5]), the Adriatic Sea along the Croatian coast (mean 12.80±2.85 mg/kg d.w. if we assume moisture 80% [6]), or the Venice lagoon (12 to 18 mg/kg d.w. [7]). The above data suggest a possible As contamination of the bivalve species in the Bay, probably related to local geology (presence of igneous rock formations and thermal springs). This contamination process needs further investigation to draw more definite conclusions on the As pollution sources in the drainage basin of the Bay.

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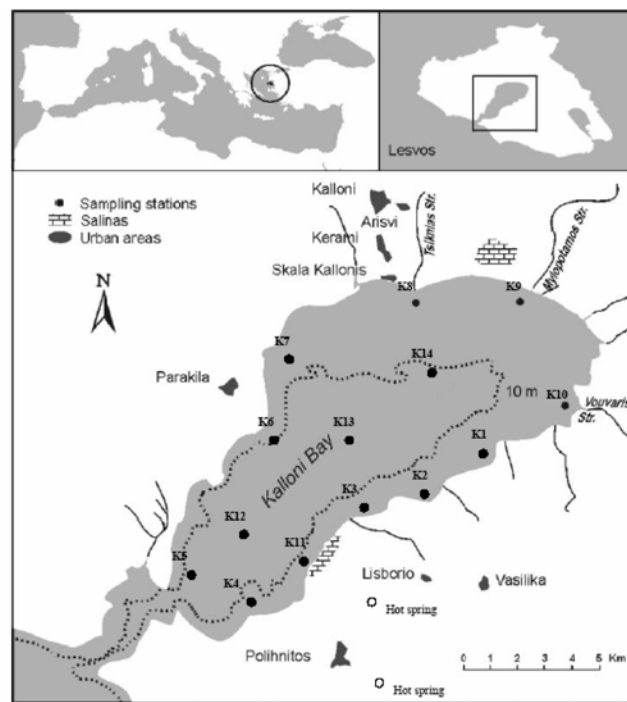


Fig. 1. Study area and sampling stations.

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