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Diatom diversity and response in metal-polluted river environment: preliminary reports from Gromolo Torrent (Liguria, Italy)

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Mineral content and physico-chemical properties of the freshwaters are the main factors affecting both algal assemblages and distributions, while presence of dissolved silicon, low water conductivity, and rocky-mountain habitats host benthic diatom assemblages of high species richness.
It is shown that diatoms are sensible to the freshwater acidification (used as pH indicators in acid waters), environmental and climate changes, river organic load, and heavy metal water pollution. For this characteristic, diatoms are among the major biological markers for a variety of environmental and stratigraphic applications. In particular, qualitative and quantitative analyses (assemblage analyses) together with biotic indices as well as morphological and ultrastructure parameterisation provide tools for detailed environmental control and paleo-environmental reconstructions.
Severe environmental problems are typically caused by “abandoned mine” and are consequences of the cessation of the mining activity with a lack in infrastructure maintenance. The mine waters which flow into the Gromolo Torrent are almost acidic (pH varying from 2.4 to 5) and enriched in heavy metals and SO42-. This pollution is caused by Acid Mine Drainage (AMD) processes that interest the Libiola mining area, known as a typical example of active AMD processes.
The aim of this work is: 1) to characterise the local benthic diatom assemblages along the acidic mine effluents that discharge from Libiola mine, the entire Gromolo torrent course, and in the marine area off the torrent mouth; 2) to identify the main diatom biomarker taxa; 3) to highlight striking situations of equilibrium-disequilibrium in the algal communities, and 4) to point out types and frequency of some teratologies affecting specific diatom taxa as a response to environmental stressors (such as metal-metalloid enrichment).
A total of 17 diatom samples was collected and examined, including some marine samples. Diatoms were collected in the riverbed from the hard surface of selected cobblestone by scraping.
In laboratory all the samples were washed (by digestion with hydrogen peroxide) and mounted according to the protocol used by the DISTAV Laboratories (University of Genoa). Identification and enumeration of diatom valves was performed using an LM Reichert Jung-Polyvar microscope with 1000x oil-immersion lens. Moreover, a representative subsample of each preparation was observed using SEM images providing an interesting iconographic dataset.
Preliminary results show that diatom assemblages are characteristic (in both quality and quantity) in the three different environmental conditions highlighted: a) in AMD environment diatoms are quantitatively scarcely, represented by both typically pioneer and highly tolerant species; b) in the Gromolo torrent diatoms are well represented with fairly well-structured communities, but present specific types and different frequencies in teratological frustula, whereas c) in marine environment they are very poorly represented.