

Determination of influence of heavy metals on structure of benthic macroinvertebrate assemblages in low order Mediterranean streams by using canonical correspondence analysis

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ABSTRACT

1. The Köyceğiz-Dalyan Nature Reserve is an important wetland area in Eastern Mediterranean Region with wide variety of aquatic habitats. Its status was established as a Natural Reserve in the framework of the Barcelona Convention for the protection of the Mediterranean Sea in 1990.
2. The first and second order Mediterranean streams have cold karstic and associated waters, fed by karstic aquifers in study area. Some of them are dry in summer period.
3. The 10 collecting sites are characterised by small-sized (Kocaöz, Hamitköy and Çamlıdere Streams with 10-100 km² catchment areas) and medium-sized (Yuvarlakçay and Namnam Streams with 100-1000 km² catchment areas), calcareous with very low altitudes (< 200 m) according to System A of the EU Water Framework Directive (WFD).
4. Seventy-five species of benthic macroinvertebrates were identified. Relationships between benthic macroinvertebrate assemblages and the metal Zn, Cd, Ni, Cu, Fe, Mn and electrical conductivity, pH, Ca, dissolved oxygen and nitrate were explored by using canonical correspondence analysis.
5. While Fe, Cu, Mn, Zn and nitrate concentrations were low in all stations, Cd (between 0.217 and 0.24 mg/l), Ni (between 0.156 and 0.54 mg/l) and Ca concentrations were high in all stations.
6. According to canonical correspondence analysis, many species closely related with Cd and Ni and appear to be tolerant of high concentration of these metals because of high Ca concentrations and of high pH values of collecting sites.
7. These results emphasize the need for monitoring of heavy metals with other water quality variables in relation to conservation of the habitat quality of whole aquatic ecosystem.

KEY WORDS: Benthic macroinvertebrate, cadmium, canonical correspondence analysis, heavy metal, Köyceğiz Lake, Köyceğiz-Dalyan, nature reserve, Mediterranean stream, meromictic lake, Namnam Stream, nickel, stream order, Turkey, Water Framework Directive, water quality, Yuvarlakçay Stream.