

MERCURY IN WATER AND ORGANISMS FROM SOME SELECTED ANCHIALINE CAVES, EASTERN ADRIATIC COAST (CROATIA)

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Abstract

This preliminary study examines mercury levels in the water columns and tissues of organisms from four anchialine caves (Bjejjajka, Mandalina, Čapljina and Bicina) on the eastern coast of the Adriatic Sea.

Keywords: Mercury, Nutrients, Central Adriatic Sea, Anoxia

Introduction

The anchialine environment, redefined as “tidally-influenced subterranean estuary located within crevicular and cavernous karst and volcanic terrains that extends inland to the limit of seawater penetration” [1], is characterized by sharp physical and chemical stratification and merges with a marine system at the coast and a groundwater system inland. The anchialine ecosystem supports a relatively diverse biotic assemblage of stygobiotic species of marine origin, dominated by members of Crustacea, both numerically and by species richness. Anchialine caves are a common phenomenon in the Croatian karst. Due to systematic work of a group of Croatian speleologists and scientists more than 100 anchialine caves have been registered along the coast and on the islands. Anchialine systems are particularly susceptible to elevated heavy metal concentrations due to water stratification, restricted water exchange and long residence times of waters in the caves, as well as due to isolation of endemic populations. However, in waters from some anchialine caves naturally elevated metal concentrations were found [2-4]. Of greatest concern were the substantially elevated mercury concentrations found in water from Bjejjajka cave, in comparison with nearby sea water. In order to determine the impact of elevated mercury concentration on anchialine ecosystems, we examined four anchialine cave environments located on the Croatian coast: Bjejjajka, Mandalina, Bicina and Čapljina, where different mercury concentrations were expected. In addition to mercury concentrations, the main physico-chemical parameters and nutrients concentrations were determined.

Study area & methodology

The anchialine caves presented here are located near the central and southern part of the Croatian coast (Fig. 1).

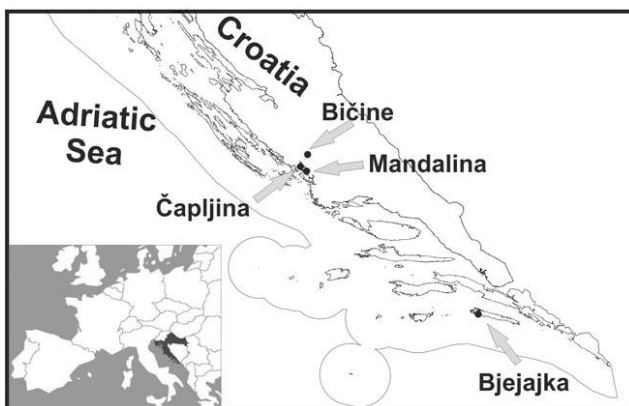


Fig. 1. Locations of researched anchialine cave

Cave waters were sampled at the surface, above and below the halocline and at the bottom by a scuba diver. Specimens were caught at same locations by traps and by hand. Mercury concentrations were determined by CV-AAS (Mercury Monitor 3200, Thermo Separation Products, USA). The concentrations of nitrogen species, phosphate and silica were measured by Perkin–Elmer Lambda 25 UV–Vis spectrometer.

Results

Total mercury concentrations (THg) were the highest in Bjejjajka cave waters. The highest concentration was found below the halocline (110 ng L^{-1}), and was considerable lower to that previously reported (920 ng L^{-1}) [4]. Meanwhile, in Čapljina and Mandalina caves the highest THg levels were found at the bottom (55.0 and 50.0 ng L^{-1} respectively), while in Bicina cave THg concentrations were the lowest ($<3 \text{ ng L}^{-1}$). In the specimen tissues, THg levels ranged between 156 and 450 ng g^{-1} in Bjejjajka cave, between 109 and 538 ng g^{-1} in Mandalina cave and between 49.0 and 74.5 ng g^{-1} in Čapljina cave, while in Bicina cave the concentration in the tissue remained uniform ($\approx 210 \text{ ng g}^{-1}$).

Conclusion

As a result of the endemic nature of the populations and different trophic structure of the four anchialine caves, it is still too early to determine the influence of higher mercury concentrations on the cave communities. Nevertheless, this preliminary set of data serves as a baseline for future researchers and multidisciplinary collaboration since these caves with current elevated mercury levels served as a valuable source of potable water during human history in that area.

References

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