



## Large variability in the concentration of mycosporine-like amino acids among zooplankton from lakes located across an altitude gradient

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**ABSTRACT:** The qualitative and quantitative composition of mycosporine-like amino acids (MAAs), a family of intracellular UV-absorbing compounds, were investigated in zooplankton from 15 lakes located in the Central Alps between 913 and 2,485 m above sea level. The lakes differed in their UV water transparency (1% attenuation depth,  $Z_{1\%}$ , at 320 nm: 1.1-25.6 m) and maximum depth ( $Z_{max}$ : 3-133 m), thus offering the possibility to test the influence of different UV exposure conditions of zooplankton on the concentration of MAAs. Seven distinct MAAs were detected, but shinorine (maximum absorption: 334 nm) was the predominant compound. In the copepods *Cyclops abyssorum*, *C. abyssorum taticus*, and *Acanthodiaptomus denticornis*, the total MAA concentration ranged from 0.01 to 3.1% of the dry weight. In the rotifers *Keratella cochlearis* and *Polyarthra dolichoptera*, MAAs were also found; however, these compounds were undetectable in *Asplanchna priodonta* as well as in the cladocerans *Daphnia hyalina*, *D. longispina*, *Bosmina longispina*, and *Chydorus sphaericus*. The total concentration of MAAs in populations of *Cyclops* spp. and phytoplankton collected simultaneously was not associated ( $r^2 = 0.09$ ,  $P > 0.05$ ), suggesting a different dynamic in the accumulation of these compounds. The variability in the concentration of MAAs, however, was related with the diffuse attenuation coefficient at 320 nm ( $r^2 = 0.74$ ,  $P < 0.001$ ) and the fraction of the water column to which 1% of the surface irradiance at 320 nm ( $Z_{1\%}$ ;  $Z_{max}$ ) penetrated ( $r^2 = 0.86$ ,  $P < 0.001$ ). These relationships suggest that the prevailing UV exposure condition in the lakes is a major determinant of the concentration of MAAs found in zooplankton. Our data support the hypothesis that MAAs, together with other photoprotective compounds, play a major role in minimizing the damaging effects of solar UV radiation in zooplankton from transparent lakes.

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