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Breathless and sensitive: groundwater copepods metabolism and response to pollutants

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Although poorly investigated, there are evidences that groundwater taxa have a lower metabolic rate if compared to their surface-water relatives. This feature allows stygobiotic organisms to be at ease in an environment where food is scarce and poorly nutrient. Moreover, the stability of chemico-physical conditions in groundwater habitats does not require continuous physiological adjustments in contrast to what happens for epigeic species in surface water. In this light, to have a fast metabolism is not a benefit but rather a waste of energy. However, what happens to groundwater populations if the chemico-physical environment begins to change rapidly? This scenario is more and more common nowadays, due to anthropogenic contaminations which are depressing groundwater quality worldwide. The effect of adaptation to groundwater environment of groundwater copepods was investigated. Metabolic rate of the stygobiotic copepod species *Diacyclops belgicus* (Kiefer, 1936) is lower than that of strictly related epigeic *Eucyclops serrulatus* (Fischer, 1851), both belonging to family Cyclopidae and co-occurring in the same habitat. Relationship of oxygen consumption as a function of body mass is allometric for *E. serrulatus*, irrespective of the ontogenetic stages, isometric for juveniles and oximetric for adults of *D. belgicus*. The constant metabolic rates observed for adults of *D. belgicus* is advantageous in oligotrophic groundwater habitats, where large fluctuations in oxygen availability also occur. On the contrary, juvenile stages of this species are able to develop faster when the trophic resources are available, so quickly reaching sexual maturity. However, these metabolic adaptations might delay the onset of defence mechanisms against toxicants. *D. belgicus* proved to be more sensitive than *E. serrulatus* to a wide range of pollutants. A review of the available data concerning ecotoxicological studies performed on stygobiotic copepods and an analysis of their sensitivity to pollutants in comparison to epigeic freshwater relatives is presented.

Keywords: copepods, stygobiotic, metabolism, sensitivity

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