

## **Guidelines for Protection Subterranean Biodiversity**

The epikarst zone represents the karst stratum that is closest to the surface. It is a perched aquifer, and water is transmitted vertically either through conduits or small fissures to the saturated (phreatic) zone. Lateral transmission occurs through poorly integrated lateral openings. The epikarst is an important part of karst for several reasons. It is a major ecotone between surface water and cave water, where water is conducted by larger fractures through the vadose zone into the phreatic zone.

Epikarst is the initial transmission zone for contaminants that are stored in the overlying soil or in the epikarst and are leached by water flow. Contaminants are easily injected into karst aquifers through sinking streams, sinkholes, or through open fractures and shafts in the carbonate rock.

The epikarst zone is also the habitat for a major part of the obligate subterranean aquatic fauna. It contains both epigeal and hypogean species, but in addition it also has unique species – epikarst specialists. The most common and most abundant metazoans in the epikarst are copepod crustaceans. Some terrestrial species also find suitable microhabitat in epikarst. When they occur in drips, they provide organic input into the typically nutrient poor cave environments.

Epikarst copepods that occur in the epikarst contribute a major part to the overall species richness in caves and may exceed the diversity of other stygobionts elsewhere in the karst system. Species richness and ecological specialization of copepods that occur in the epikarst show a large range of variation, although many species are not yet discovered and their distributions are incompletely known.

The epikarst fauna should be explored indirectly by taking samples of the percolation water and from cave pools filled by water which seeps down the walls or drips directly from the ceiling. Epikarst fauna is particularly vulnerable due to its almost direct exposure to contaminants from the surface. Aquatic copepod communities in epikarst thus may be subject to severe conditions and can potentially be used as important biological indicators for the evaluation of environmental conditions.

Epikarst is a diverse habitat and harbors exceptionally rich copepod fauna with a high frequency of endemism that particularly increases the conservation value of the epikarst. Study of the epikarst zone represents a powerful tool for understanding environmental effects on fauna, as well as vertical and horizontal movement of contaminants via epikarst water.

### **Guidelines**

- i. Epikarst has enormous importance in the transport of pollutants, in its storage capacity as a perched aquifer, and as a site of the high diversity of obligate inhabitants of subterranean waters. As such, protection of the epikarst helps protect total biodiversity of stygobionts.
- ii. The restricted distribution of epikarst fauna, especially copepods, may indicate their value in determining water movement and pollutants in small areas, such as that above a single cave. The epikarst copepods could be used as potential tracers of water movement and toxic spills.

iii. Managers should protect the landscape above the entire cave. Inputs of water, organic matter and energy into the groundwater system come from the surface via epikarst interface to deep water.

iv. Managers should protect drip pools and seeps on the speleothems as they serve as the habitat of the epikarst fauna that enters the cave through drips.