KARST AND BIODIVERSITY

One of the most important contributions of Europe to the Earth’s biodiversity is well hidden below its surface – an exceptionally rich subterranean fauna, with its top diversity hotspots in Dinaric Karst (from East Italy, Slovenia, Croatia, Bosnia and Herzegovina to Montenegro) and Pyrenees.

Vulnerability of karst groundwater

Conservation of proteus and other endemic cave animals is not only an attempt to preserve the subterranean biodiversity, it is among the top concerns of mankind: with cave animals we share the most important resource of fresh water – groundwater.

In Slovenia, proteus has been protected since 1951. Listed in the EU Habitats Directive, Bern and Ramsar Convention, the IUCN Red List of Threatened Species, proteus is one of EU priority species in need of strict protection, including the Natura 2000 network. However, proteus sill has no monitoring scheme or conservation action plan.

SOS Proteus

The Tular Cave Laboratory also serves as a Sanctuary for proteus accidentally washed-out of their subterranean habitat during seasonal flooding. Many are injured, and a veterinary inspection and animal care is conducted under guidance of the Sanctuary for wildlife Golob d.o.o.. After a successful recovery in strict quarantine, these threatened amphibians are returned back to their source population.

With Proteus we share dependence on groundwater

About 75% of EU residents depend on groundwater for their water supply. Large part of groundwater is stored in karst, which underlie nearly 35% of Europe, where many important cities, including Bristol, London, Paris, Rome and Vienna are largely dependent on karst groundwater. In Slovenia, groundwater is serving nearly all water needs.

Recent negative anthropogenic influences come from intensive agriculture, energy production (karst water damming), and unregulated urbanization (groundwater pumping and sewage disposal).

Why is Proteus vulnerable?

Proteus is threaten mostly by raising pollution of karst groundwater. Due to its longevity (up to 100 years) even low concentrations of pollutants may accumulate to lethal values in proteus body and habitat.

Karst areas are the world’s most vulnerable landscapes to environmental impacts. All toxic waste dumped on the surface is washed by precipitation into groundwater, very difficult to remediate once contaminated.
Proteus anguinus [olm, proteus, človeška ribica]

One of the world’s prime symbols of natural heritage and its history of research, is the olm (Proteus anguinus).

This blind amphibian, a dweller of the subterranean rivers, is strictly endemic to the Dinaric Karst. It is the only European cave vertebrate, and by far the largest cave animal in the world. Proteus is a relic species of a rich Tertiary fauna, and has no living close relatives.

Around 300 localities (partly interconnected caves or cave springs) of proteus have been recorded, of which 200 are in Slovenia. In some localities proteus already become extinct.

Proteus anguinus parkelj [black proteus]

The morphologically most distinct of all proteus populations, discovered in 1986, is limited to a single cave system in Bela Krajina (South East Slovenia, on less than 30 km²). Even a single local pollution incident could have a devastating impact on the entire population.

Since 2002, a colony of the extremely endangered pigmented subspecies Proteus anguinus parkelj (the black proteus) is carefully studied in Tular Cave Laboratory.

TULAR CAVE LABORATORY

Since only small fragments of the subterranean habitat can be accessed by man, most knowledge about proteus has been acquired in laboratories, away from its natural environment. One such case is the Tular Cave Laboratory.

In 1960, the cave was turned into a subterranean laboratory by speleobiologist Marko Aljančič (1933–2007), who populated it with proteus.

Research and conservation of Proteus

Tular is the only cave laboratory in Slovenia, and – apart from the Subterranean Laboratory of CNRS in Moulis, France – the only place with successful ex-situ breeding program of this highly endangered cave amphibian. Since 2007, the Laboratory and the Society have been led by Gregor Aljančič.

In the laboratory, the ecology and behaviour of proteus are studied, focused mainly around its breeding. The research is based on observations, carefully designed not to harm or stress the animals.

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Conservation of proteus and public education

The conservation of proteus and its subterranean habitat may truly be effective only by education and constant public outreach, emphasizing vulnerability of karst groundwater: the habitat of proteus is the ultimate source of drinking water.

On the trace of environmental DNA (eDNA)

The Laboratory is introducing a forensic method to detect molecular traces of proteus in groundwater. The non-invasive, DNA-based method was successfully applied to monitor the distribution of proteus. Utilizing the eDNA, new localities of the extremely rare black proteus were discovered.

Environmental DNA method is one step towards the urgently needed monitoring scheme for proteus populations and their habitat.