

Scientific breakthrough reveals evidence of 'human fish' locked away in cave system

How do you find physical evidence of a rare species when most of its habitat (the subterranean waters of limestone cave systems in the Balkans) is inaccessible to humans? The 'human fish' is the largest cave animal in the world. Despite this, *Proteus anguinus*—a blind, entirely-aquatic salamander commonly known as the olm, and endemic to the Dinaric Alps—is incredibly difficult to find.

The answer was recently provided by the Society for Cave Biology (SCB) in a project funded by the Critical Ecosystem Partnership Fund (CEPF) when they found the first physical evidence of the species in Montenegro using new techniques to sample its DNA.

In this region, activities such as water extraction, river damming and agriculture have increased the stress on *Proteus* and other aquatic cave animals. Limestone habitats like cave systems can be intricate and complex, having taken millions of years to form by natural processes. One wrong move can wipe out entire species, so urgent measures need to be taken in order to save them.

Nick-named the 'human fish' by locals because of its skin colour, *Proteus* are listed as Vulnerable on the IUCN Red List of Threatened Species and in some localities the species is already extinct. However, the extent of the decline cannot be estimated without an extensive survey of its distribution—in habitat where access is easy for the human fish, but not so easy for human beings. The purpose of the CEPF project was to solve this problem: to test a scientific method that safely, effectively and accurately determines *Proteus* presence.

Environmental DNA

SCB, experts in speleological (cave and karst) research, designed a solution based on so-called 'eDNA'. During the process of skin regeneration, *Proteus* shed fragments of epidermal cells which are carried away by water. DNA dissolved in water is called

Sampling for environmental DNA in an accessible cave
(Gregor Aljancic)



environmental DNA (eDNA), and SCB successfully tested and perfected the sensitive and inexpensive technique of identifying *Proteus* eDNA from samples of water.

After many hours in the field and thousands of water samples, the team have discovered new localities of *Proteus* in Montenegro and in Bosnia and Herzegovina. This ground-breaking research will give SCB and partners the evidence to appeal and counsel the nature conservation authorities in Montenegro to start all necessary legal actions to protect *Proteus* in their territories, and to guide the management planning of authorities in Bosnia and Herzegovina ■

BirdLife International—including its Middle East office and the BirdLife Partners DOPPS/BirdLife Slovenia and LPO (Ligue pour la Protection des Oiseaux, BirdLife in France)—is providing the Regional Implementation Team (RIT) for the Critical Ecosystem Partnership Fund (CEPF) in the Mediterranean Basin Biodiversity Hotspot (CEPF Med)

Olm, the largest cave animal in the world, are Vulnerable to extinction (Gregor Aljancic)

