Shoal
Working together to conserve freshwater species

# Project Concept: Saving Critically Endangered species of the genus *Telestes*

**Project goal: To save four Critically Endangered and one Endangered *Telestes* species from extinction while also restoring and maintaining unique cave and underground ecosystems.**

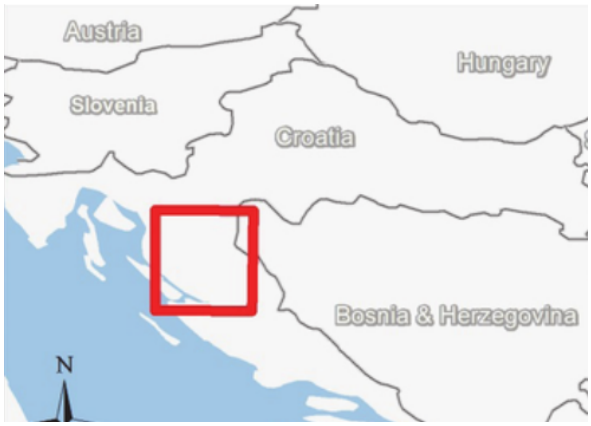
## Summary

The caves and ancient lake systems of the Dinaric Alps of the Wester Balkan Peninsula are amongst the most important centres of endemism in the world and are the most important "hotspot" for freshwater biodiversity in Europe. The Balkans harbour the highest concentration of endemic fish species in Europe. Many of the species are uniquely adapted to the limestone karst ecosystems common in this region and this includes many fish species. In Croatia, there are five species of the Telestes genus that are endemic to the Dinaric Alps and only found in a small area in Croatia and Bosnia & Herzegovina. These species are on the verge of extinction. One species, Telestes polylepis, is now down to less than 100 individuals. Unfortunately, these species are immediate threat from many sources. The region was deeply impacted during the Balkan wars (landmines are still frequently found in the area) and these ecosystems were abused and neglected. To this day, the caves are used as rubbish dumps and waste grounds despite the fact that the water supplies are important to many local people not only the fish communities. Invasive species have been introduced to supplement food supplies during the shortages of the past and these fish are now a threat to the indigenous aquatic community.

Fortunately, researchers from the Croatian Institute for Biodiversity have been working to understand the status and threats for these fishes and have been working with the local community to ensure their survival. Under this project, the Institute will take immediate action to ensure that there is no further decline of the five species and will begin the process of restoration by removing the

invasive fish species, protecting the habitat from further disruption and abuse, providing captive breeding facilities for reintroduction and by working with the local communities to build awareness of the value of the restored systems for tourism and healthy water supplies. Bringing the Telestes back from the verge of extinction will be the catalyst for the restoration of these incredible karst limestone lake and stream systems and local pride in the beauty and natural riches of their area.

## Location




The Balkans have been referred to as the great European hotspot of biodiversity, and the caves and ancient lakes of this region have been identified as hosting particularly outstanding levels of endemism (Griffiths *et al.*,2004). This project will take place in Croatia in the karstic river and cave systems of the Dinaric Alps. These habitats are oligotrophic meaning they have low levels of nutrients and are characterised by large oscillations in water level and low yearly



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*Telestes polylepis, Critically Endangered on the IUCN Red List. The estimated extant population is just 100 individuals. © Jorg Freyhof*

mean water temperatures (Jelic *et al.,* 2016). Many of the species which inhabit these systems have unique adaptations to survive here and remain underground for much of their life cycle.

**Focal species:** The proposed focal species for the project are all of the genus *Telestes*, which is endemic to the Dinaric karst habitats of the Balkan peninsula. Five species from this genus would benefit from the proposed conservation action; *Telestes polylepis, Telestes miloradi, Telestes fontinalis, Telestes turskyand Telestes croaticus*. The first four species are all assessed as Critically Endangered on the IUCN Red List and *Telestes croaticus* is assessed as Endangered – however recent studies have suggested it also meets the scientific criteria to be categorised as Critically Endangered (Jelić and Krivek 2016). For the most threatened of these species, *Telestes polylepis,* the population has fallen to only 100 individuals, and it is now found in only one location. Meanwhile another species, *Telestes miloradi*, had been presumed to be extinct for more than 50 years before being rediscovered in 2014, and is known from only a small stretch of river (Jelić and Jelić 2015).

**Threats:** The main threat to all of these species has been the anthropogenic introduction of invasive species. Approximately 23 invasive species now inhabit these ecosystems, all of which have been introduced in the past century (Jelić *et al.,* 2016). The endemic fishes of these karstic environments have evolved in isolation from these species and in the absence of competition - indeed in many of these systems fish of the *Telestes* genus were the only native fish species present. The introduction of these invasive species also increases the biomass of these low-nutrient systems which risks eutrophication and changing the environmental conditions for many other native species which have also a adapted to survive in these unique environments (Jelić *et al.,* 2016).

While invasive species are certainly the predominant threat for these species, they are not the only conservation challenge. For example, a channelization project recently removed a critical area of key habitat for *Telestes miloradi*, and for other species of the genus natural system modification as a result of infrastructure development is also listed as a threat (IUCN Red List 2018).

**Conservation action:** Policy and legislation to protect these species in Croatia does exist, however there is no targeted conservation action to save these species from their principal threat. The Croatian Institute of Biodiversity plan to develop a programme to prevent the extinction of these five *Telestes* species:

1. The first key step would be to conduct the removal of invasive species from remaining critical habitats for the Telestes species. Jelić *et al.,* (2016) have already tested the efficiency of invasive species removal and found that is does seem to provide the *Telestes* species with an opportunity to breed with greater success.

2. The Institute would also then establish captive-breeding populations of these species to safeguard against their extinction. These captive bred populations would be held at the research institutes laboratories and this work would be supported by Zagreb Zoo.

Many *Telestes* species spend important parts of their life cycle underground, which means to study these species and understake monitoring activities, the HIB team must dive down into the caves. © Dusan Jelić

3. The next phase of the programme will be to monitor the populations of *Telestes* in the wild and the efficacy of the removal of invasive species. This will then inform the development of a long-term conservation management plan for these species and planned reintroductions of the captive-bred populations back into natural habitats where invasive species have been removed.

The initial phase of the project is planned for 3 years, at which point all of the results will be analysed and the next steps of the project determined. In the first year of the project, the key objectives and outputs will be:

- At Šmitovo Lake, the key remaining site for *Telestes polylepis*, there is a visible and quantitative increase in endemic species population and a visible and quantitative decrease in the invasive species population.
- For the other Telestes species, within the first-year reliable data is gathered to inform conservation action. This will involve cave diving in known endemic fish sites and performing monitoring of the state of the population and habitat to inform the conservation intervention.
- A promotional video about the *Telestes* species is produced for the general public showcasing these wonderful species which often remain hidden from view.

**Community benefits:** Tourism is growing rapidly in Croatia and the Dinaric Alps region. Tourist interest in the wildlife of the region provides many opportunities for economic benefit where the species can be effectively conserved. The Telestes fish also have a value to local people who remember the times when there were thousands of individuals around. People used to eat these fish and they feel a special connection to them. They have also historically been a sign of clean and drinkable water.

**Implementing Partner:** Croatian Institute for Biodiversity (HIB). The Institute is a non-profit legal entity registered at the City Office for General Administration in Zagreb.

**Budget:** Funding required in the first year of the project amounts to **£42,000** for work on all five Telestes species. A more detailed budget can be provided upon request.

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