



# A Survey of the Kremenski Lakes (Pirin National Park) Suggests that the Vairone *Telestes souffia* Risso, 1826 (Actinopterygii: Cyprinidae) Is Not a Native Species of the Fauna of Bulgaria

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**Abstract:** Vairone *Telestes souffia* is known from Bulgaria based on two specimens sampled from the Lower Kremensko Lake (Pirin National Park) in 1988. A survey of the fish fauna conducted in August 2021 in Lower and Middle Kremensko Lakes suggests that there are not a population of this species at these localities. The only record from 1988 is recognised as a possible consequence from an unregulated fish introduction. Therefore, this study suggests that *Telestes souffia* has to be excluded from the list of species needing conservational measures in Bulgaria.

**Key words:** Natura 2000, Pirin Mountains, *Telestes souffia*, protected species, conservation.

## Introduction

The Pirin Mountains (maximum altitude 2914 m, territory 2,585 km<sup>2</sup>, SW Bulgaria) is one of the most massive mountains in the country and in the Balkan Peninsula. Most of its territory is included in the Pirin National Park, which has been declared a UNESCO World Heritage Site in 1983. It includes three NATURA 2000 sites: BG0000209, BG0002126 and BG0001028 (MOEW 2022). Totally, 176 glacial lakes are situated in this mountain range, all of them in the Northern Pirin; of them, 119 are permanent and the remaining dry out in summer (MICHEV et al. 1980). The area is recognised for its well-preserved forest and alpine ecosystems and rich flora and fauna as well as for the presence of a number of relict species (BERON 2016).

One of the species reported from the Pirin Mountains (KARAPETKOVA & MARINOV 1991) and considered relict (BERON 2016) is the vairone *Telestes souffia* Risso, 1826. It is a lithophilic riverine cyprinid inhabiting upper reaches of rivers in the Alps and surrounding regions (SALZBURGER et al. 2003). In Bulgaria, two specimens of *Telestes souffia* were caught in 1988 in Lower Kremensko Lake (KARAPETKOVA & MARINOV 1991). This lake is one of the three Kremenski Lakes, which are situated between 2306 and 2360 m a.s.l. Both specimens appear to have been lost. The status of the species in Bulgaria remains unknown. However, it is included in the list of target species under protection of the Natura 2000 system with code 1131. Surprisingly, the species is not included in the Bulgarian Red Data Book (GOLEMANSKY 2011). However, *Telestes*

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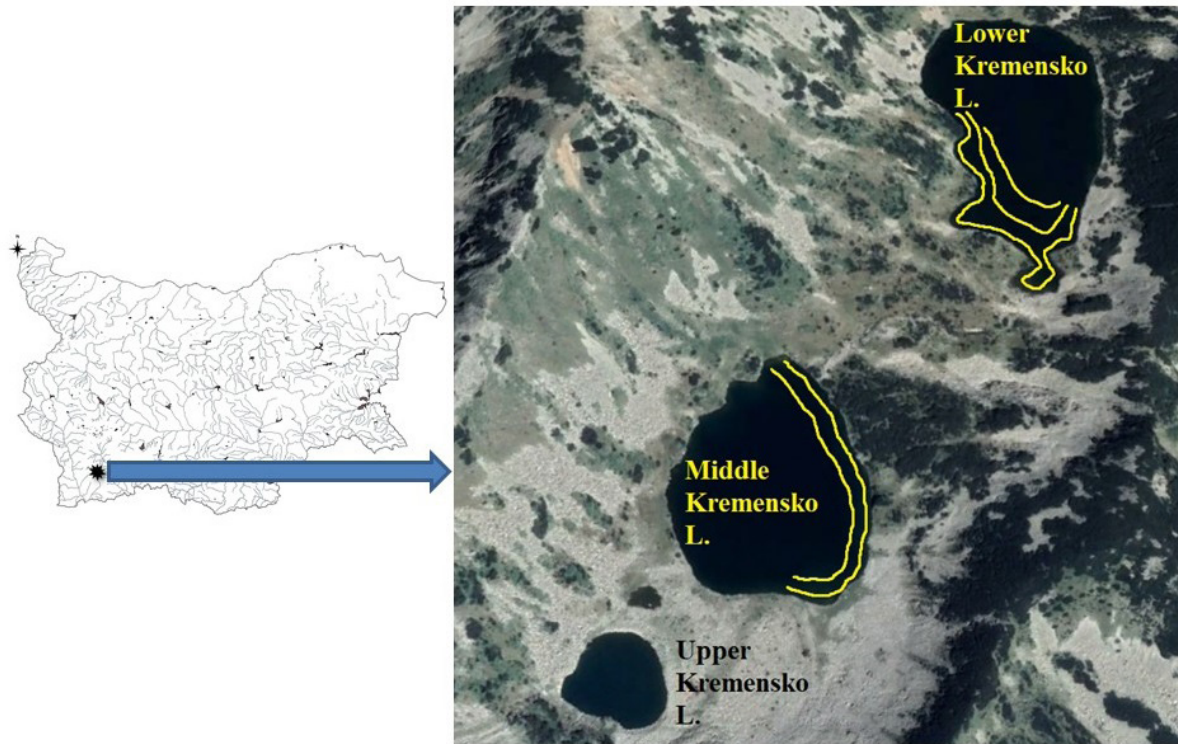


Fig. 1. Kremenski Lakes with fish sampling transects in August 2021 (Pirin Mountains, SW Bulgaria).

*souffia* is included in Annex III of Bern Convention (1979) and is categorised as a Less Concerned (LC) under IUCN (2022).

After the initial registration of these two specimens, the species has never been caught again in Bulgaria. However, it is still mentioned in some papers dealing with the fish diversity and conservation (e.g. VASSILEV & PEHLIVANOV 2005) and in national strategic documents dealing with biodiversity conservation in Bulgaria (MOEW, 2022, Biodiversity Legislation of Bulgaria). During the national sampling campaign for reporting Natura 2000 protected species in 2012–2013, *T. souffia* was not recorded. Under the Article 17 of the EU Habitats Directive (<https://nature-art17.eionet.europa.eu/article17/>) report in 2019, *T. souffia* was identified as a Data Deficient Species.

On this basis, the scope of the present study was to update the status of *Telestes souffia* from Kremenski Lakes by surveying the fish fauna of this high-mountain lake group in the Pirin National Park.

## Materials and Methods

On 27<sup>th</sup> and 28<sup>th</sup> August 2021, multihabitat sampling was performed in the Lower Kremensko and Middle Kremensko lakes. We used fishing by gillnets (Nor-

dic type) and beach seine as well as underwater census counting. All available habitats were surveyed: open water, sandy/stony shallows and rocky slopes, excluding the bathypelagic zones of the lakes (below 15 m depth) where the visibility was decreasing (Fig. 1). About one-third of each of the two lakes was examined for recoding and identifying fish specimens.

## Results

During sampling, no fish species were recorded in the Middle Kremensko Lake. Concerning the Lower Kremensko Lake, the following species (ordered by their abundance) were recorded:

1. *Phoxinus* sp., with varying abundance according to the sampling gear, up to 2000 ind./ha;
2. *Salvelinus fontinalis* (Mitchill, 1814): 50–100 ind./ha;
3. *Squalius orpheus* Kottelat & Economidis, 2006: two specimens or 200 ind./ha (Fig. 2);
4. *Barbus cyclolepis* Heckel, 1837: one specimen or 100 ind./ha;
5. *Chondrostoma vardarensense* Karaman, 1928: one specimen or 100 ind./ha.

*Salmo* sp. and *T. souffia* were not registered.

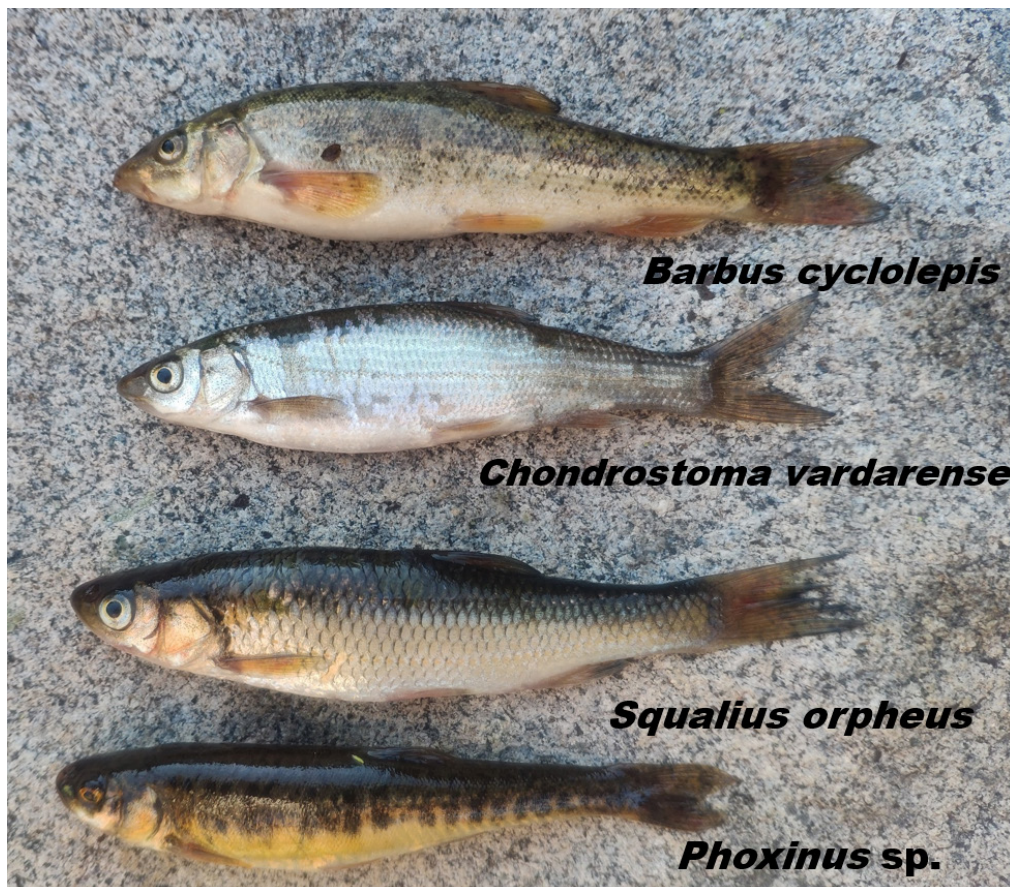


Fig. 2. Representatives of the fish community in the Lower Kremensko Lake (Pirin Mountains, SW Bulgaria).

## Discussion

The Upper Kremensko Lake was not sampled *in situ* because *Telestes souffia* was considered less likely to be found in it. This lake is several times smaller and shallower compared to the two lower water bodies. It is also called *Ice Lake* because ice form significant part of its volume through the winter and fish would have low chances of survival (Fig. 1). In addition, *T. souffia* was initially found in the lower lake only, which is further downstream and fish migration upstream could be impaired by moraine structure of the creek. Out of the five species from the Lower Kremensko Lake, only one is probably native, i.e. the minnow *Phoxinus sp.* *Salvelinus fontinalis* is an alien salmonid, and the remaining three species are rheophilic cyprinids, which are typical for the middle and lower flow of mountainous or plain rivers of the West Aegean Watershed Basin. Most probably, they have also been introduced in this particular lake, since they are not known to inhabit water bodies above 1000 m a.s.l. *Phoxinus sp.* is probably of a native origin; according to KARAPETKOVA & MARINOV (1991), it is rarely met. The recent fish community of the

Lower Kremensko Lake is obviously derived from anthropogenic activities as stockings (KARAPETKOVA & MARINOV 1991) as well as poaching, which is a common practice in some alpine lakes in Bulgaria. Non-regulated stockings by anglers also represent common reason for the appearance of certain species in new habitats. The presence of *Salmo sp.* and *T. souffia* has not been confirmed by our survey.

The origin of the reported occurrence of *T. souffia* in Lower Kremensko Lake is unclear. Some hypotheses can be proposed:

- It was a glacial relict of native origin. This hypothesis is of minor probability as far as there is no significant inflow/outflow in this particular circus of Kremenski Lakes. In other glacial lakes with inflow/outflow of the Pirin Mountains, *T. souffia* is absent. In contrast, the native *Salmo sp.* is common in other glacial lakes in the Pirin National Park.

- It was introduced by accident with salmonids or other fish species, subsequently becoming extinct due to unsuitable ecological conditions for supporting a vital population.

Kremenski Lakes have been included in the Protected Zone BG0000209 "Pirin" in 2006

(MOEW 2022). *Telestes souffia* has not been confirmed after the only report from 1988. On these assumptions, it is not relevant to keep this species in the Bulgarian checklist of the fish fauna (VASSILEV & PEHLIVANOV 2005). Therefore, measures to restore *T. souffia* in the Pirin Mountains are inappropriate as the systematic status and origin of the recorded two specimens cannot be clarified.

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