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The drastic decline of fish fauna in the thermal lake of "Baile 1 Mai" (Baile Episcopale, Bihor County, Romania)

A halfauna drasztikus csökkenése a Nagyvárad melletti Püspökfürdő termáltavában

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The thermal lake is located in the lower Crisul Repede drainage close to the city of Oradea in western Romania. The unique warmwater biotope of the lake is maintained by its thermo-mineral underwater springs.

A brief review of the available data on water level and temperature reveals a decreasing trend in these parameters. The studies of Kováts (1977) found that the water temperature reached as much as 42°C because of the high discharge rates of the underwater thermal springs. That is why the lake did not freeze over in the winter. Two decades later, Craciun (1997) measured the water temperatures showing that they reached only 34-35°C in summer and decreased to 26°C in winter. It can be presumed that the high water temperatures represented a natural and ecological barrier for most cyprinid fish inhabiting the middle and lower reaches of river Petea until its confluence with Crisul Repede river. This is a plausible explanation for the absence of the congener non-thermophilic species *Scardinius erythrophthalmus*, which occurs only in the lower reaches of the Petea rivulet (Bănărescu 1996, personal communication).

According to subsequent data (Craciun 1997, Telcean 1999), a number of cyprinid fish species were able to advance upstream from the Petea rivulet since the temperature of the lake has decreased. The studies of the 1990s registered the presence of some non-thermophilic cyprinids and some exotic species, i.e. *Gobio gobio, Cyprinus carpio, Carassius gibelio, Psudorasbora parva, Rhodeus sericeus amarus, Lebistes (Poecilia) reticulata, Cobitis danubialis*, *Sabanejewia aurata,* in the lake. The rheophilic species *Leuciscus cephalus, Barbus petenyi, Chondrostoma nasus* and *Vimba vimba carinata* spread from the Crisul Repede river (Craciun 1997). These species occurred mainly in the rivulet Petea, in the reach adjacent to the lake. Another non-thermophilic exotic piscivorous fish species *Ictalurus nebulosus*, which also originated from the Crisul Repede river, was added to the species list recently (Mag et al. 2008). The spreading of non-thermophilic species in the lake and close downstream is an evidence of the decrease of water temperature.

The most endangered fish species of the thermal lake is the endemic warmwater rudd *Scardinius racovitzai*. It was described as nova species by Müller in the thermal lake of Baile 1 Mai (Püspökfürdő) (Müller 1958). Taxonomically, it was initially considered to be a subspecies of *Scardinius erythrophthalmus*, but a later revision recognized it as a valid species endemic in the thermal lake of the Petea rivulet. Earlier studies on the biology of the species included some inaccurate information, from the hypothesis on its single spawning that precedes the end of its lifecycle (Müller 1958, Bănărescu 1964) to its spawning period in late winter and early spring, i.e. March (Craciun 1997, Telcean & Cupsa 2006). Our studies proved that *Scardinius racovitzai* spawns each year on submerged vegetation (Telcean

1999). This fish has been the only endemic relict species in the small thermal lake of the Petea. Currently, this endemic fish is critically endangered and may become extinct very soon. Previously the only threats were the vicinity of the village and the small dimensions of the habitat but the threats became more diversified in the last decade. The overexploitation of water sources has been identified as a potential risk for the fish fauna since its impact on the lake's water level became evident (Telcean & Cupsa 2006, 2012).

During the last years (2011–2012), the entire aquatic ecosystem was affected by the strong reduction of the discharge of thermal underwater springs caused by the overexploitation of geothermal mineral waters in the area. The successive droughty summers of the last years worsened the existing water deficit. This has drastically affected the fish fauna by now. The shrinking of the lake to a limited area above the water source forces the fish to occupy the habitat, which lacks submerged vegetation and is therefore unfavorable for feeding and spawning of the *Scardinius racovitzai*.

There are three harmful processes that lead to the drastic future decline of fish populations:

- decreasing water temperature;
- aquatic habitat loss with increasing predator pressure;
- scarcity of food resources and lack of shelter caused by habitat loss.

As a result of the decreasing temperature, the water freezes over at the edge of the remaining lake during the winter period. The bottom of the dried-up areas froze in the last winter season. The most endangered fish is *Scardinius racovitzai*, which does not tolerate cold water. From the total of 10 native species existing in the lake (Telcean 1999), only four species seem to have survived after the winter of 2011. These are *Carassius gibelio*, *Gobio gobio*, *Cobitis elongatoides* and *Scardinius racovitzai*. The few individuals of *Scardinius racovitzai* migrated close to the remaining source of thermal water. Unfortunately, this results in an increased vulnerability of the fish to predation by aquatic birds.

It can be presumed that a certain part of the fish populations will disappear in the nearby future if the rehabilitation of the water source is delayed.

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