MINIȘ RIVER (NERA/DANUBE BASIN) ICHTHYOFAUNA DYNAMIC OVER ONE CENTURY

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ABSTRACT

Compared to older data sources, 13 new fish species for the Miniș River were found: *Phoxinus phoxinus*, *Hucho hucho*, *Barbus balcanicus*, *Rutilus rutilus*, *Carasius gibelio*, *Leucaspius delineatus*, *Ameiurus nebulosus*, *Pseudorasbora parva*, *Cottus gobio*, *Rhodeus amarus*, *Alburnus alburnus*, *Chondrostoma nasus*, *Cobitis elongata*. Eight species known here from the past were still found: *Salmo trutta*, *Squalius cephalus*, *Alburnoides bipunctatus*, *Gobio obtusirostris*, *Barbatula barbatula*, *Eudontomyzon danfordi*, *Sabanejewia balcanica*, *Romanogobio banaticus*. The unnatural structure of the fish communities and the identified changes of the fish zonation along Miniș River reveal a complex set of impacts from human activities on this lotic ecosystem.

RÉSUMÉ: Rivière Miniș (Bassin de la Nera/Danube) dynamique des connaissances sur l'ichtyofaune sur un siècle.

13 nouvelles espèces de poissons ont éte trouvées dans rivière Miniș, en comparison avec des sources de données plus anciennes: *Phoxinus phoxinus*, *Hucho hucho*, *Barbus balcanicus*, *Rutilus rutilus*, *Carasius gibelio*, *Leucaspius delineatus*, *Ameiurus nebulosus*, *Pseudorasbora parva*, *Cottus gobio*, *Rhodeus amarus*, *Alburnus alburnus*, *Chondrostoma nasus*, *Cobitis elongata*. Huit espèces connues ici du passé ont encore été trouvées: *Salmo trutta*, *Squalius cephalus*, *Alburnoides bipunctatus*, *Gobio obtusirostris*, *Barbatula barbatula*, *Eudontomyzon danfordi*, *Sabanejewia balcanica*, *Romanogobio banaticus*. La structure non naturelle des communautés de poissons et certaines des modifications identifiées dans la zonation des poissons le long de la rivière Miniș révélent un ensemble complexe d'activités humaines ayant un impact sur cet écosystème lotique.

REZUMAT: Râul Miniș (bazinul Nera/Dunăre) dinamica cunoașterii ihtiofaunei de-a lungul unui secol.

Au fost găsite 13 specii noi de pești pentru râul Miniș, în comparație cu datele unor surse mai vechi: *Phoxinus phoxinus*, *Hucho hucho*, *Barbus balcanicus*, *Rutilus rutilus*, *Carasius gibelio*, *Leucaspius delineatus*, *Ameiurus nebulosus*, *Pseudorasbora parva*, *Cottus gobio*, *Rhodeus amarus*, *Alburnus alburnus*, *Chondrostoma nasus*, *Cobitis elongata*. Opt specii cunoscute aici din trecut au fost încă regăsite: *Salmo trutta*, *Squalius cephalus*, *Alburnoides bipunctatus*, *Gobio obtusirostris*, *Barbatula barbatula*, *Eudontomyzon danfordi*, *Sabanejewia balcanica*, *Romanogobio banaticus*. Structura nenaturală a comunităților de pești și unele dintre modificările identificate ale zonelor ihtiologice de-a lungul râului Miniș dezvăluie impactul unui set complex de activități umane asupra acestui ecosistem lotic.

INTRODUCTION

The 27 km long Miniș River (its drainage basin covers an area of 244 km²) springs in the Romanian south-west Carpathians in the Rolului Peak (963 m) area, crossing the Aninei Mountains in its middle course through Miniș Gorges, and meets the Nera River on the territory of Bozovici Commune; the Nera Basin to which the Miniș basin belongs, being a very complex and relatively isolated geographical area (*; **; ***; Posea, 2006; Ujvari I, 1972; Diaconu, 1971).

The particular environmental characteristics of this geographical region push the evolutionary processes in founding and preserving valuable fish species communities in this zone (Bănăduc et al., 2023).

The ability, devotion, and perseverance of ground-breaking and revolutionary academic, historical famous scientists like Grigore Antipa and Petru Mihai Bănărescu, to indicate only two of the most iconic Romanian ichthyologists, as well as the succeeding generations of experts in fish biology and ecology, headed to the launch and developing in Romania a remarkable ichthyology school with outstanding scientific results. The nearly three centuries of extensive fish-related field work and analyses have led to the accumulation of some useful information in this respect, and novel research can take the comparative advantages in principle from the previous results obtained in different sampling campaigns.

The geographically remote and isolated hydrographic basins of the Carpathian Mountains are more or less known but in general are characterised by relatively numerous conservative and economic valuable fish species communities (Curtean-Bănăduc et al., 2019; Koščo et al., 2014; Bănăduc et al., 2013) in the more and more numerous cases when anthropogenic impacts are not a major driving force there (Bănăduc et al., 2023, 2021, 2020; Bănăduc 2010; Popa et al., 2019; Curtean-Bănăduc et al., 2014).

This paper intends to refresh and fill a gap between the past and present, namely between the relatively far away in time ichthyological data (Antipa, 1909; Bănărescu, 1964), and the present, in this geographicaly remote and relatively isolated watershed, regarding fish fauna composition and distribution dynamic in the Miniș River.

MATERIAL AND METHODS

This ichthyofauna research was conducted between 2022-2024, mainly in the project "Îmbunătăţirea stării de conservare a speciilor şi habitatelor de interes conservativ din Parcul Naţional Cheile Nerei-Beuşniţa şi ariile naturale de interes comunitar şi naţional suprapuse prin revizuirea planului de management integrat" POIM Cheile Nerei-Beușnița/"Improving the conservation status of species and habitats of conservation interest in the Cheile Nerei-Beușnița National Park and the overlapping natural areas of European Community and national interest by revising the integrated management plan" POIM Cheile Nerei-Beușnița.

The presence/absence of diverse fish species in the Miniș River was reported based on electrofishing sampling (with a Hans Grassl IG 600 TL device), in time (45 minutes)/effort unit. The sampling was conducted at 18 sampling sections of 100 m in length every two to three kilometers starting from the river springs area to its outflow in the Nera River. After fast visual identification of the sampled fish, all of them were released unharmed in their habitat of origin.

RESULTS

The researched fish species were found in the below (Tab. 1) 17 lotic sampling stations and in one lentic station.

Table 1: (A) Fish species reported by Antipa in the study area at the end of the 19th century (Antipa, 1909). (B) Fish species reported by Bănărescu in the study area in the first part of the 20th century (1964). (C) Fish species idetifified in the period 2022-2024. (–) No historical data or no fish sampled.

Sampling stations	Location, coordinates and altitude	Sampling stations habitat characteristics	Fish species
M1	Miniș springs wetland area N45º01.190' E21º48.222' 655 m altitude	Muddy substrate, dominated by fallen vegetation from trees (leaves, branches, etc.). Abundant riparian vegetation, consisting of trees and shrubs (alders, beeches, blackberryes). The lotic sector crosses a forest. No anthropogenic changes were observed. The water was very shallow in the sampling periods to can allow the fish presence.	A – B – C –
M2	2 km downstream the springs area N45º01.320' E21º49.105'635 606 m	Substrate dominated by boulders, gravel and sand, with abundant, luxuriant riparian vegetation consisting of trees (beech, alder) and shrubby vegetation. There are small waterfalls that contribute to the oxygenation of the water. Stable banks, without signs of erosion. No anthropogenic impact was observed.	A – B *Salmo trutta* C *Salmo trutta* A – B – C *Phoxinus phoxinus*
M3	4 km downstream the springs area N45º01.815' E21º50.523' 562 m	Substrate dominated by gravel and sand, as well as boulders. There were observed vegetation depositions. The riparian vegetation is well represented and in good condition, containing trees and shrubs, stable banks, without signs of erosion. Anthropogenic impact is present as forestry roads crossing the minor bed of the Miniș River.	A – B *Salmo trutta* C *Salmo trutta* A – B – C *Phoxinus phoxinus*

Table 1 (continued): (A) fish species signalled by Antipa in the study area (A) at the end of the 19th century (Antipa, 1909), (B) fish species signalled in the area by Bănărescu in the study area in the first part of the 20th century (1964), (C) Miniș River sampling stations location, present habitat characteristics and fish species presence in the period 2022-2024; (–) no old data or no fish sampled.

Sampling stations	Location, coordinates and altitude	Sampling stations habitat characteristics	Fish species
M4	8 km downstream the springs area N 45º02.056' E 21º51.265' 530 m	Substrate consisting of boulders and gravel, and covered by organic matter. Riparian habitat in favourable condition. Abundant riparian vegetation, consisting predominantly of tall trees and shrubs. No anthropogenic impact was observed. Stable banks, without signs of erosion.	A – B *Salmo trutta* C *Salmo trutta* A – B – C *Phoxinus phoxinus*
M5	10 km downstream the springs area N 45º01.795' E 21º51.681' 513 m	Substrate consisting of gravel, sand and boulders. Substrate covered by organic matter. Riparian habitat in favourable condition. Abundant riparian vegetation consisting predominantly of tall trees, shrubs and herbaceous vegetation. No anthropogenic impact was observed. Stable banks, without signs of erosion.	A – B *Salmo trutta* C *Salmo trutta* A – B – C *Phoxinus phoxinus* A – B – C – *Hucho hucho* A – B – C – *Barbus balcanicus*
M6	Upstream Cârșa Waterfall N 45º01.612' E 21º53.152' 462 m	Substrate consisting of gravel and boulders, isolated muddy substrate. Substrate covered by organic matter. Riparian habitat in favourable condition. Abundant riparian vegetation consisting predominantly of tall trees, shrubs and herbaceous vegetation. No anthropogenic impact was observed.	A – B *Salmo trutta* C *Salmo trutta* A – B – C *Phoxinus phoxinus* A – B – C – *Hucho hucho* A – B – C – *Barbus balcanicus* A – B – *Squalius cephalus* C – *Squalius cephalus* A – B – C – *Rutilus rutilus*

Table 1 (continued): (A) fish species signalled by Antipa in the study area (A) at the end of the 19th century (Antipa, 1909), (B) fish species signalled in the area by Bănărescu in the study area in the first part of the 20th century (1964), (C) Miniș River sampling stations location, present habitat characteristics and fish species presence in the period 2022-2024; (–) no old data or no fish sampled.

M7	Upstream Gura Golumbului Lake N 45º01.125' E 21º54.264' 434 m	Substrate consisting of gravel, boulders and sand. Substrate covered by organic matter. Riparian habitat in favourable condition. Abundant riparian vegetation, consisting predominantly of trees, shrubs, and herbaceous vegetation. Anthropogenic impact present: old bridge providing access to the property. Stable banks, without signs of erosion.	A – B *Salmo trutta* C *Salmo trutta* A – B – C *Phoxinus phoxinus* A – B – C – *Hucho hucho* A – B – C – *Barbus balcanicus* A – B – *Squalius cephalus* C – *Squalius cephalus* A – B – C – *Rutilus rutilus*
M8	Gura Golumbului Lake N 45º00.781' E 21º54.900' 430 m	Substrate consisting of mud and sand with aquatic vegetation. Riparian vegetation specific to the lentic ecosystem consisting predominantly of reeds/ grassy vegetation, surrounded by trees. Stable banks, without signs of erosion. The Miniș lotic ecosystem was transformed into a lentic one by blocking the river course with a concrete dam, about 20 m high. Present fish species are characteristic of the lentic ecosystem, including the new-comer invasive species. The dam is equipped with relatively functional fish ladders.	A – B – C *Phoxinus phoxinus* A – B – *Squalius cephalus* C – *Squalius cephalus* A – B – C – *Rutilus rutilus* A – B – C – *Carasius gibelio* A – B – C – *Leucaspius delineatus* A – B – C – *Ameiurus nebulosus* A – B – C – *Pseudorasbora parva*

Table 1 (continued): (A) fish species signalled by Antipa in the study area (A) at the end of the 19th century (Antipa, 1909), (B) fish species signalled in the area by Bănărescu in the study area in the first part of the 20th century (1964), (C) Miniș River sampling stations location, present habitat characteristics and fish species presence in the period 2022-2024; (–) no old data or no fish sampled.

M9	Downspstream Gura Golumbului Lake N 45º00.709' E 21º54.962' 423 m	Substrate consisting of boulders, gravel, sand, and isolated mud. Abundant organic load present on the substrate. Riparian habitat in favourable condition. Abundant riparian vegetation, consisting predominantly of tall trees (*Salix alba*), reeds and grassy vegetation. Stable banks, without signs of erosion. The human impact is represented by the modification of the minor and major river beds, as well as the configuration of the river, through the presence of hydrotechnical construction.	A – B – C *Phoxinus phoxinus* A – B – *Squalius cephalus* C – *Squalius cephalus* A – B – C – *Rutilus rutilus* A – B – *Alburnoides bipunctatus* C – *Alburnoides bipunctatus* A – B – *Gobio obtusirostris* C – *Gobio obtusirostris* A – B – C – *Barbus balcanicus*
M10	Miniș-Poneasca rivers confluence N 45º00.607' E 21º57.266' 354 m	Substrate consisting of boulders and gravel. Riparian habitat in favorable condition. Abundant riparian vegetation consisting predominantly of tall trees, shrubs and herbaceous vegetation. Stable banks, without signs of erosion. The confluence with Poneasca stream. No anthropogenic impact was observed in the area.	A – B – C *Phoxinus phoxinus* A – B – *Squalius cephalus* C – *Squalius cephalus* A – B – C – *Rutilus rutilus* A – B – *Alburnoides bipunctatus* C – *Alburnoides bipunctatus* A – B – *Barbatula barbatula* C – *Barbatula barbatula* A – B – C – *Barbus balcanicus*

Table 1 (continued): (A) fish species signalled by Antipa in the study area (A) at the end of the 19th century (Antipa, 1909), (B) fish species signalled in the area by Bănărescu in the study area in the first part of the 20th century (1964), (C) Miniș River sampling stations location, present habitat characteristics and fish species presence in the period 2022-2024; (–) no old data or no fish sampled.

M11	Upstream trout farm Miniș N 45º00.221' E 21º58.131' 322 m	Substrate consisting of boulders and gravel. Riparian habitat in favorable condition. Abundant riparian vegetation consisting predominantly of tall trees, shrubs and herbaceous vegetation. Stable banks, without signs or erosion. The confluence with Poneasca River is here. The presence of the Miniș trout farm can represent a threat through the possible escape of invasive species or species that are not characteristic for this river sector.	A – B – C – *Cottus gobio* A – B – *Eudontomyzon danfordi* C – *Eudontomyzon danfordi* A – B – C *Phoxinus phoxinus* A – B – *Squalius cephalus* C – *Squalius cephalus* A – B – C – *Rutilus rutilus* A – B – *Alburnoides bipunctatus* C – *Alburnoides bipunctatus* A – B – *Barbatula barbatula* C – *Barbatula barbatula* A – B – C – *Barbus balcanicus*
M12	Downstream trout farm Miniș N 44º59.453' E 21º58.733' 310 m	Substrate consisting of gravel and sand. Riparian habitat in favourable condition. Abundant riparian vegetation, consisting predominantly of tall trees and grassy vegetation. Stable banks, without signs of erosion. No anthropogenic impact was observed in the area.	A – B – C – *Cottus gobio* A – B – C *Phoxinus phoxinus* A – B – *Squalius cephalus* C – *Squalius cephalus* A – B – *Alburnoides bipunctatus* C – *Alburnoides bipunctatus* A – B – *Sabanejewia balcanica* C – *Sabanejewia balcanica* A – B – C – *Barbus balcanicus*

Table 1 (continued): (A) fish species signalled by Antipa in the study area (A) at the end of the 19th century (Antipa, 1909), (B) fish species signalled in the area by Bănărescu in the study area in the first part of the 20th century (1964), (C) Miniș River sampling stations location, present habitat characteristics and fish species presence in the period 2022-2024; (–) no old data or no fish sampled.

M13	Upstream Busu Pension N 44º58.602' E 21º59.121' 297 m	Substrate consists of gravel and sand, isolated boulders and mud. Water has high organic load. On certain sections, reduced water speed, relatively laminar water flow. Riparian habitat in favourable condition. Abundant riparian vegetation, consisting predominantly of tall trees and grassy vegetation. Stable banks, without signs of erosion. No anthropogenic impact was observed.	A – B – C – *Cottus gobio* A – B – *Barbatula barbatula* C – *Barbatula barbatula* A – B – *Alburnoides bipunctatus* C – *Alburnoides bipunctatus* A – B – *Sabanejewia balcanica* C – *Sabanejewia balcanica* A – B – C – *Barbus balcanicus*
M14	Downstreamm Busu Pension N 44º57.426' E 21º59.410' 270 m	Substrate consisting of boulders and sand. Water depth from 40 cm to 1.4 m in pits. Width between 10-14 m. High turbidity of the water. Riparian habitat in favourable condition. Abundant riparian vegetation, consisting predominantly of tall trees and shrubs. High degree of water shading. Stable banks, without signs of erosion. The anthropogenic impact consists of a forestry road crossing through the minor river bed.	A – B – C – *Cottus gobio* A – B – *Barbatula barbatula* C – *Barbatula barbatula* A – B – *Alburnoides bipunctatus* C – *Alburnoides bipunctatus* A – B – *Squalius cephalus* C – *Squalius cephalus* A – B – *Sabanejewia balcanica* C – *Sabanejewia balcanica* A – B – C – *Barbus balcanicus* A – B – C – *Rhodeus amarus*

Table 1 (continued): (A) fish species signalled by Antipa in the study area (A) at the end of the 19th century (Antipa, 1909), (B) fish species signalled in the area by Bănărescu in the study area in the first part of the 20th century (1964), (C) Miniș River sampling stations location, present habitat characteristics and fish species presence in the period 2022-2024; (–) no old data or no fish sampled.

M15	2 kn upstream Bozovici locality N 44º56.900' E 21º59.895' 268 m	Substrate consisting predominantly of sand and gravel, isolated boulders. Average depth 40-60 cm to 1.3 m in pits. Width between 10-12 m. High turbidity of the water. Riparian habitat in favorable condition. Abundant riparian vegetation, consisting predominantly of tall trees, shrubs, herbaceous vegetation. High degree of water shading. Stable banks, without signs of erosion. No anthropogenic impact was identified.	A –, B – C – *Cottus gobio* A –, B – C – *Phoxinus phoxinus* A – B – *Barbatula barbatula* C – *Barbatula barbatula* A – B – *Alburnoides bipunctatus* C – *Alburnoides bipunctatus* A – B – *Squalius cephalus* C – *Squalius cephalus* A – B – *Sabanejewia balcanica* C – *Sabanejewia balcanica* A –, B – C – *Barbus balcanicus* A – B – *Romanogobio banaticus* C – *Romanogobio banaticus*
M16	Bozovici locality N 44º55.944' E 22º00.176' 260 m	Substrate consisting predominantly of cobblestones and sand. Average depth 30 cm-1.2 m. Width between 10-12 m. High turbidity of the water. Riparian habitat in favorable condition. Abundant riparian vegetation, consisting predominantly of tall trees, shrubs, herbaceous vegetation. High degree of water shading. Stable banks, without signs of erosion. The human impact is represented by household waste present on the river banks.	A –, B – C – *Cottus gobio* A – B – *Eudontomyzon danfordi* C – *Eudontomyzon danfordi* A – B – *Barbatula barbatula* C – *Barbatula barbatula* A – B – *Alburnoides bipunctatus* C – *Alburnoides bipunctatus* A –, B – C – *Alburnus alburnus* A – B – *Squalius cephalus* C – *Squalius cephalus* A – B – *Sabanejewia balcanica* C – *Sabanejewia balcanica* A – B – *Romanogobio banaticus* C – *Romanogobio banaticus* A –, B – C – *Rhodeus amarus*

Table 1 (continued): (A) fish species signalled by Antipa in the study area (A) at the end of the 19th century (Antipa, 1909), (B) fish species signalled in the area by Bănărescu in the study area in the first part of the 20th century (1964), (C) Miniș River sampling stations location, present habitat characteristics and fish species presence in the period 2022-2024; (–) no old data or no fish sampled.

M17	2 km upstream Miniș-Nera rivers confluence N 44º55.087' E 21º59.971' 250 m	Substrate consisting predominantly of cobblestones and sand. Average depth 30 cm-1.4 m. Width between 10-12 m. High turbidity of the water. Organic load deposited on the substrate, bioderma present. Riparian habitat in favorable condition. Abundant riparian vegetation, consisting predominantly of tall trees (*Alnus glutinosa*, *Salix alba*) shrubs, grassy vegetation. High degree of water shading. Stable banks, without signs of erosion. Anthropogenic impact: the presence of an access road that facilitates the passage of motorized vehicles through the minor river bed.	A – B – *Barbatula barbatula* C – *Barbatula barbatula* A – B – *Alburnoides bipunctatus* C – *Alburnoides bipunctatus* A –, B – C – *Alburnus alburnus* A –, B – C – *Barbus balcanicus* A – B – *Gobio obtusirostris* C – *Gobio obtusirostris* A – B – *Squalius cephalus* C – *Squalius cephalus* A – B – *Sabanejewia balcanica* C – *Sabanejewia balcanica* A – B – *Romanogobio banaticus* C – *Romanogobio banaticus* A –, B – C – *Rhodeus amarus* A – B – C – *Chondrostoma nasus* A – B – C – *Cobitis elongata*

Table 1 (continued): (A) fish species signalled by Antipa in the study area (A) at the end of the 19th century (Antipa, 1909), (B) fish species signalled in the area by Bănărescu in the study area in the first part of the 20th century (1964), (C) Miniș River sampling stations location, present habitat characteristics and fish species presence in the period 2022-2024; (–) no old data or no fish sampled.

M18	Miniș-Nera rivers confluence N 44º54.766' E 22º00.090' 245 m	Substrate consisting mainly of sand, gravel, and silt. Average depth 20 cm-1 m. Width between 10-15 m. Water high turbidity. Riparian habitat in favorable condition. Abundant riparian vegetation, consisting mainly of grassy vegetation with tall trees (*Alnus glutinosa, Salix alba*) and shrubs. Stable banks, without signs of erosion. Anthropogenic impact: the presence of an access road through which motorized vehicles pass through the minor riverbed. Active riverbed mineral exploitation present in the vicinity of this sampling station.	A – B – *Barbatula barbatula* C – *Barbatula barbatula* A – B – *Alburnoides bipunctatus* C – *Alburnoides bipunctatus* A –, B – C – *Alburnus alburnus* A – B – C – *Barbus balcanicus* A – B – *Gobio obtusirostris* C – *Gobio obtusirostris* A – B – *Squalius cephalus* C – *Squalius cephalus* A – B – *Sabanejewia balcanica* C – *Sabanejewia balcanica* A – B – *Romanogobio banaticus* C – *Romanogobio banaticus* A –, B – C – *Rhodeus amarus* A –, B – C – *Chondrostoma nasus* A – B – C – *Cobitis elongata*

DISCUSSION

Natural, semi-natural and human induced environmental conditions and ichthyofauna differ in space and in time in the Carpathians hydrographical net (Afanasyev et al., 2023; Bănăduc et al., 2021, 2017, 2013, 2012, 2010, 2017, Didenko et al., 2014; Popa et al., 2019, 2015, 2013; Curtean-Bănăduc and Bănăduc, 2008; Simalcsik and Bates, 1973) the ecosystems characteristics differences controlled the founding of fish zonation grounded on the key indicator fish species. The Carpathians' lotic systems springing in mountain areas, like the river studied here, have five such specific fish zones: brown trout zone, grayling and mediterranean barbell zone, nase zone, barbel zone, and carp zone (Bănărescu, 1964). Some deviations from this natural zones were identified in this study, and are commented below.

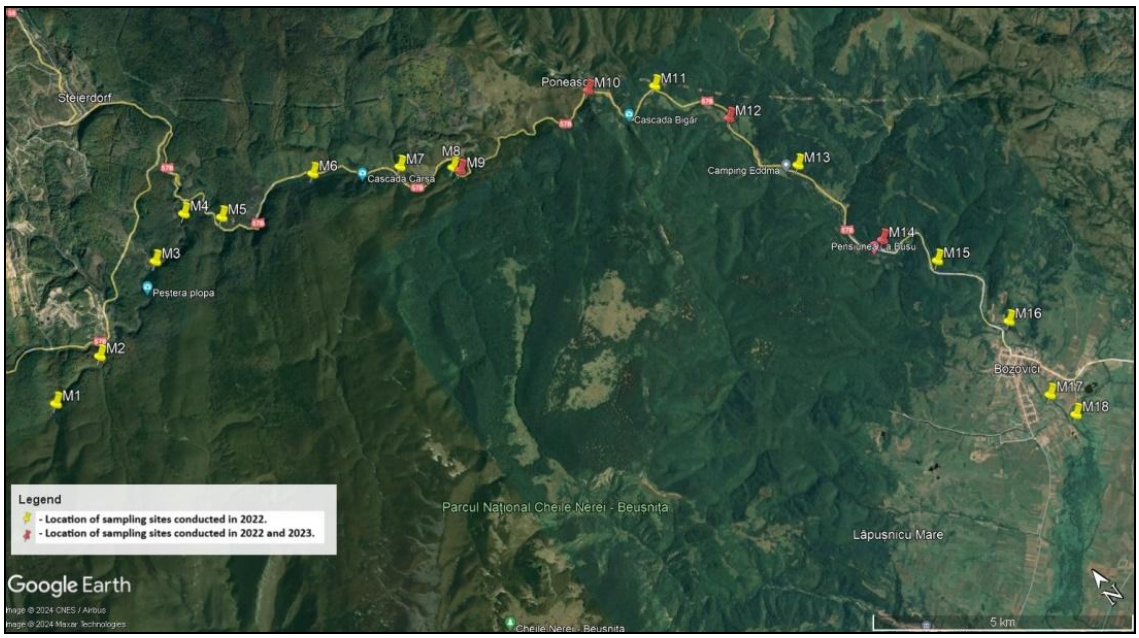

Figure 1: Sampling stations along the Miniș River.

The Miniș River springs area (**M1**) is an altitude wetland area with soft substrate and fluctuating low water levels, a good enough reason to explain the absence of fish here.

The downstream springs sector (**M2-4**) cover a mountainous habitat and the most characteristic fish species *Salmo trutta* appeared along the last century. The absence of *Cottus gobio* here can be explained by continuous introductions of trout over long periods, which in the long-term might eliminate this much less aggressive fish. *Cottus gobio* appear downstream where the variation of the habitat allows it to hide and survive. The appearance of *Phoxinus phoxinus* downstream in the last decades is interesting and can be a sign of climate change.

Downstream (**M5-7**), the significant increase of the water flow and the diversification of the habitat characteristics constantly enriched the fish diversity. *Squalius cephalus* was known here in the last century, but lately species like *Barbus balcanicus*, and *Rutilus rutilus* appeared. *Rutilus rutilus* presence can be explained from the downstream lake influence. The upstream *Salmo trutta* and *Phoxinus phoxinus* species remain in these sectors too. A totally unexpected, and unknown until now, was the appearance of *Hucho hucho*, the flagship species for the Danube Basin that has been decreasing constantly as abundance and range over the last century (Curtean-Bănăduc et al., 2019; Bănăduc et al., 2013).

In the **M8** area is the major human induced impact on the Miniș River, namely the anthropogenic Gura Golumbului Dam lake. The building of a dam here converts a free-flowing lotic sector of the Miniș River into a lentic habitat, supporting impoundment-dwelling fish that free-flowing river segments might not naturally sustain. This lake is now an efficient sediment trap; sediments wrongly managed here can adversely impact the area covered by the lake and the downstream lotic segments' fish habitats. This impoundment transformed the landscape of the Miniș Watershed, fragmenting it and modifying its water and sediment flow. This important factor impacts considerably the river ecosystems, moderately affecting the migratory fish species and the connectivity among diverse fish populations under normal water and sediment management conditions. However, these impacts become far more pronounced under "accidental" mismanagement scenarios (Bănăduc et al., 2024). Next to the over a century presence here of *Squalius cephalus* and *Gobio obtusirostris*, new species including *Rutilus rutilus, Carasius gibelio, Leucaspius delineates, Ameiurus nebulosus*, and *Pseudorasbora parva* appeared lately mainly due to the presence of the dam lake and its water mismanagement (Bănăduc et al., 2024). *Salmo trutta* disappears from here to downstream of the river. This is the first time that *Phoxinus phoxinus* was found here.

The natural changings in the lotic habitats due to increasing of the water flow and the habitat diversity, and the influence of the lake presence and its poor water and sediment management induce significant changes in fish diversity. In **M9-10,** the well known species in the last century *Squalius cephalus* remain present till the end of the Miniș River. The newly-recorded species in the last decades, *Phoxinus phoxinus,* occupies the most lower river sector. The new-comer, *Rutilus rutilus*, due to the lake proximity remain here. *Gobio obtusirostris*, well known here from the past and now more encouraged also due to the proximity of the lake, is present here too. *Barbus balcanicus* is still present now too, even if it was not known in the past. The known presence in the last century till now of *Alburnoides bipunctatus* was noted.

In **M11-16,** *Cottus gobio* unknown until the present, appears only recently in the middle part of this Carpathian stream and not like usually in upper sectors; previously unrecorded in this area, *Cottus gobio* has only recently been identified in the middle reaches of the studied river. This may be a relatively new entrance from the Miniș tributaries or the much downstream Nera River. Interesting is a new species appearance in this sector, unknown in the last century until now, namely *Eudontomyzon danfordi*, which will appear only once more in a much downstream station near the confluence with Nera River. *Phoxinus phoxinus* continues its presence only in the uppermost two stations of this sector, disappearing downstream, to reappear accidentally, in a much lower single station. In this sector the well-known species in the last century, *Squalius cephalus*, known here in the last century until now, remain present until the confluence of the Miniș River with the Nera River. The new-comer, *Rutilus rutilus,* is present due to the lake proximity; M11 being the last lower station where it was found now in the studied river. *Alburnoides bipunctatus* continues its known presence over a century all along this sector and to the end of the river. *Barbatula barbatula* continues its presence all along this sector and to the end of the river. *Barbus balcanicus* continues its presence all along this sector and to the end of the river. From M12, *Sabanejewia balcanica,* known here over a century, appears for the first time in the river and continues to be present in all this sector and to the end of this river. For the first time, *Rhodeus amarus* appears and continues to be found till the end of this sector and of the river. A new appearance in M15 is *Romanogobio banaticus*, well known in the last century here, continues to be present till the end of this sector and of the river. *Alburnus alburnus* not known until now in this river, appears here.

In **M17-18**, the lowest Miniș River sector, the well known for over a century fish species, like *Barbatula barbatula, Alburnoides bipunctatus*, *Gobio obtusirostris*, *Squalius cephalus, Sabanejewia balcanica* and *Romanogobio banaticus* continued to be present. These not known until now species are present here as in some upstream sectors: *Alburnus alburnus, Barbus balcanicus*, and *Rhodeus amarus*. For the first time, these unknown until now species appeared in this river sector: *Chondrostoma nasus* and *Cobitis elongata*. The improving of fish species richness is due to the changing of habitats and near proximity of Nera River confluence.

In summary, a series of 13 new fish species for this river watershed were identified in this study, in comparison with older reliable data sources: *Phoxinus phoxinus*, *Hucho hucho, Barbus balcanicus, Rutilus rutilus, Carasius gibelio, Leucaspius delineatus, Ameiurus nebulosus, Pseudorasbora parva, Cottus gobio, Rhodeus amarus, Alburnus alburnus, Chondrostoma nasus*, and *Cobitis elongata*. Only eight species that were known here from past records were still found: *Salmo trutta*, *Squalius cephalus*, *Alburnoides bipunctatus*, *Gobio obtusirostris, Barbatula barbatula, Eudontomyzon danfordi*, *Sabanejewia balcanica*, and *Romanogobio banaticus*.

Antipa (1909) makes a general coverage of ichtyofauna of Romania since the beginning of the 19th century without covering the Miniș River basin; this being covered in detail since the middle of the 20th century by Bănărescu (1964).

This research almost doubled the number of fish species recorded as present in the Miniș River.

Special attention should be given to some species of high conservation interest such as: *Hucho hucho, Chondrostoma nasus* and *Romanogobio banaticus*, which has a diminishing distribution (Bănăduc et al., 2023).

In the upper presented context, the alien invasive species *Carasius gibelio*, *Ameiurus nebulosus*, and *Pseudorasbora parva* (Drăgan et al., 2024; Anastasiu et al., 2017) should be continuously monitored.

The skewed structure of the fish communities and some of the identified modifications of the fish zonation along the Miniș River reveal that a complex set of human activities impact this lotic ecosystem. Based on these new data, an adjusted management plan of the Miniș Watershed should be built and integrated at the level of the Nera River watershed management plan.

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