

FISH OF THE MUREŞ (MAROS) RIVER: SYSTEMATICS AND ECOLOGY

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A brief historical sketch of the research

The main stem of the Mureş River has more than 700 km of waterway. From its source to the confluence with the Tisza River, along its main valley, there is a natural or artificial system of marshes, pools and a network of channels. Therefore, this system maintains different biotopes with lotic or lenitic aspects with a very characteristic and a diverse fish fauna. During our field work more than 50 species were collected or observed. But before our treatment, it is necessary to pay a tribute to those that increased our knowledge concerning the fish fauna of Transylvania generally and of the Mureş River specifically.

The first information on the fish of Transylvania are due to Fridvalszky (1767). He mentions only four species: *Barbones*, *Truttas*, *Mugiles* and *Thymallos* (i.e. *Barbus*, *Salmo*, *Leuciscus* and *Thymallus*). The number of species increased to 20 in the paper of Benkő (1778). Forty years later Leonhard (1818) mentions nearly the same species, presenting for the first time the description of the mottled barb or gray barb without naming it. Thirty-four years later, Heckel (1858) described this species as *Barbus petenyi*. Bielz, in three important contributions (1853, 1856 and 1888) presented a list of 39 species for all waters of the Transylvanian Basin. In his third paper (1888) he added, after Karoli (1887) and Herman (1887), contributions to the following species: *Abramis brama*, *Gobio uranoscopus* and *Cobitis elongata*. Heckel and Kner, in their monumental work on freshwater fish of the Austrian Monarchy, included a great number of species from the Mureş River. Other significant contributions were made by Steindachner (1863), Károlyi (1877), Simonkai (1887) and Vutskits (1918). The last named author synthesized all the data until 1913 completing them with original contributors. He added in his treatment the following species: *Aspius aspius*, *Blicca bjoerkna*, *Pelecus cultratus*, *Acipenser schypa*, *Lucioperca lucioperca*, *Rutilus pigus virgo* and *Chalcalburnus vhalcoides mento*. He removed *Acipenser sturio*, *Abramis leuckardti*, *Salvelinus salvelinus* and *Cobitis elongata* from the list of Transylvanian fish. Among the modern authors important contributions concerning the fish of Transylvania generally, and particularly of the Mureş River, were made by Rotarides (1944), Jászfalusi (1941, 1957), Băcescu (1947), Bănărescu (1953, 1964), Bănărescu, Müller and Nalbant (1957). A special contribution concerning the fish fauna of Transylvania was made by Bănărescu and Müller (1959). They listed 51 species with rich comments on their taxonomy and zoogeography.

Materials and methods

During the year 1991 the fish were obtained during one general collecting trip (August) and one special collecting trip (October) with an electrofishing aggregate. Altogether 42 species and more than 2100 specimens were caught.

The first cruise began August 1 and was finished August 29. A number of 18 fishing stations were made: Senetea, Faier Brook, Suseni, Joseni, Borzont, Sărmaş, Stînceni, Răstoliţa, Ruşii Munti, Gorneşti, Ungheni, Gura Arieşului, Sîntimbru, confluence with the Cugir River, confluence with the Beriu (Orăştie) River, confluence with the Almaş River, Pecica and Makó. A supplemental station was made in a channel at Nădlac near the frontier between Romania and Hungary. The specimens were collected with a hand net.

The second trip on the Mureş River was made especially for electro-fishing. This particular collecting cruise was relatively short in time, 18-22 October. Nine fishing stations were made: Sărmaş, Stînceni, Lunca Bradului, Răstoliţa, Brîncoveneşti, Gorneşti, confluence with the Cugir River, confluence with Beriu (Orăştie) River and Pecica. The specimens were fixed in a 7-8% formaldehyde solution and then transferred to a 75% ethanol solution in the scientific collection of the Department of Taxonomy and Evolution, Institute of Biological Sciences, Bucureşti. Another part of material, obtained in the October trip, was partially transported alive to the National Museum of Natural History in Madrid, Department of Zoology, for electrophoretic studies, but the majority was preserved specimens (in formaldehyde 5%). The number of specimens of all species were counted. In the table the information are not presented in exact values since the fishing process represents a stochastic choice. On the other hand, the behaviour of each species (even of the different stages of development) to the net used was very diverse. Some species (*Alburnoides bipunctatus*, *Rhodeus sericeus*, *Orthrias barbatulus*, *Cottus gobio*) and early stages were obtained without difficulty. Other species (*Leuciscus cephalus*, *Gobio uranoscopus*, *Zingel streber*, etc.) were difficult to collect. Therefore the present evaluation was made on the basis of frequency of the specimens in each sample, for each species.

Fishing stations

Twenty fishing stations were made during two collecting trips. Most of them are the same in both trips. Only two (Lunca Bradului and Brîncoveneşti) were new and added in the October trip. However, in that cruise other stations were eliminated (Senetea, Faier Brook, Suseni, Joseni, Borzont, Ruşii Munti, Ungheni, Gura Arieşului, Sîntimbru, confluence with Almaş river and Makó), we retained only those stations most important for identifying the most oxyphilic species such as *Gobio uranoscopus*, *Gobio kessleri*, *Orthrias barbatulus*, *Sabanejewia aurata*, *Sabanejewia romanica*, *Stizostedion lucioperca*, *Gymnocephalus baloni*, *Zingel streber* and *Cottus gobio*.

Stations

1. Senetea (Mureş River):

width of course 6-7 m; swift current, shallow water ca 0.25-1.5 m depth; bottom mostly stone, in a few areas near the shore sand.

2. Faier Brook near its confluence with the Mureş River:
width: 1.5-3 m; depth 0.2-1.0 m; bottom: stones, gravel and sand, sometimes submerged vegetation such as Typha, Potamogeton; current: 0.25-1.0 m/sec.

3. Suseni (Mureş River):

width: 5-13 m; current: swift, 0.50-1.50 m/sec.; depth: 0.25-1.5 m; bottom: stones, gravel, coarse sand, rarely submerged vegetation (Fontinalis).

4. Joseni (Mureş River):

width: 7-15m; current: swift, 0.5-1.5 m/sec; depth: 0.20-1.20 m; bottom: stones, gravel, coarse sand, a few zones (flooded areas) with yellow-gray silty-mud.

5. Borzont (Mureş River):

width: 10-18m, current: swift, 0.75-1.65 m/sec; depth: 0.50-2.10 m; some islands not covered by vegetation; bottom: stones, coarse gravel, coarse sand, rich in emerse vegetation such as Typha.

The following four stations--Sărmaş, Stînceni, Lunca Bradului and Răstoliţa, are situated on the Mureş River and have similar features. The river crosses a volcanic chain of mountains forming a cutoff valley.

Width: 30-90 m; current: swift, 0.50-2.0 m/sec; bottom: mostly stony, sometimes with big stones (1.5-2.5 m), sometimes with islands covered by vegetation; depth: variable, from 0.25 to 1.50 m or more.

10. Brîncoveneşti (Mureş River):

generally the river has the same features as previous stations but it has a large flood-plain which crosses a hill area. The bottom is made by small stones, gravel and coarse sand in few cases, near the slope, with fine sand. The islands were covered by vegetation sometimes made by Typha.

11 and 12. Ruşii Munti and Gorneşti (Mureş River):

width: generally a large valley, 60-100 m; current: generally swift 0.50-1.0 m/sec; depth: 0.25-1.50 m or more; bottom: made by coarse gravel, coarse sand, fine sand and sometimes a fluid mud which covers the gravel.

13. Ungheni (Mureş River):

large flood-plain and the width of the main stream is very variable (50-150 m), sometimes with islands covered by vegetation; current: relatively swift, 0.30-0.75 m/sec; depth: variable, from 0.30 to 1.75 m or more.

Between Ungheni and Gura Arieşului the river has high slopes covered by vegetation, generally Salix, in a few cases some islands, a reduced current of 0.25-0.45 m/sec, and a depth from 0.50 to 2 m or more, bottom sandy or muddy. No fishing stations were made in this part of the river.

14. Gura Arieşului (Mureş River):

width: cca 30-70 mm; current: relatively swift 0.5-1.0 m/sec; depth: 0.30-1.50 m or more; bottom: stony, gravel, coarse sand and silty-mud near the slope in few cases, sometimes small islands covered by vegetation.

15. Sintimbru (Mureş River):

generally the same features but the speed of the water in the main stream was always less than 1 m/sec.

16. Confluence with Cugir River (Mouth of the Cugir River):
width: 10-20 m; current: swift, 0.5-1.20 m/sec; depth: 0.20-0.75 m; bottom: generally stony and coarse gravel but sometimes medium and fine sand; some islands covered by vegetation (shrubs of *Salix* mostly).

17. Confluence with Beriu River (Mouth of the Beriu or Orăștie rivers):
width: 10-15 m; current: 0.30-0.75 m/sec; depth: 0.20-1.0 m; bottom: coarse and medium gravel generally, but in some places with coarse sand or a fluid mud covering the gravel.

18. Confluence with the Almaș River (Mouth of Almaș):
width: 5-7 m; current: swift 0.5-1.20 m/sec; depth: generally 0.25-0.75 m but more at the mouth; bottom: coarse sand generally, sometimes fine gravel.

19. Pecica (Mureș River):
width: 100-300 m; current: generally slow 0.25-0.50 m/sec; depth: very variable 0.30-1.5 m and more (5-6 m in few cases); bottom: mostly coarse and medium sand but a yellow or gray silty mud can cover large zones; large islands covered by very dense vegetation generally tree shrubs and bushes.

20 Makó (the Maros River in Hungary):
generally the same features as previous station.

Systematics and ecology of fishes

Generally there are no systemic or nomenclature problems concerning the fish of the Mureș River. However, in a few species of genera *Leuciscus*, *Cobitis* and *Sabanejewia* the taxonomy needs more classifications.

In the present study 56 species are treated.

1. *Eudontomyzon danfordi* Regan

In clean and rapid waters of the Mureș River from Senetea to Gornești, possibly to Ungheni.

2. *Acipenser ruthenus ruthenus* Linnaeus

Only in the interior part of the Mureș River from Aiud but apparently it is missing now between Aiud and Zam due to pollution. Isolated specimens were obtained by fishermen between Zam and Pecica.

3. *Oncorhynchus mykiss* (Walbaum)

A few specimens were recorded between Sărmaș and Răstolița, they had apparently escaped from salmoniculture stations on the Gudia River.

4. *Salvelinus fontinalis* Mitchill

Same situation as previous species.

5. *Salmo trutta fario* Linnaeus

Only in tributaries of the upper Mureș (Gudia Mare, Zebrac, Răstolița etc. (see Jászfalusi, 1947)). However a few specimens were recorded in the Mureș River at the confluence with these tributaries.

6. *Hucho hucho* (Linnaeus)

Found in the Mureş River near Stinceni, but the specimens were obtained from Ceahlău fishculture station.

7. *Thymallus thymallus* (Linnaeus)

Present only in the tributaries of the upper Mureş (see also Jászfalusi, 1947): Gudia Mare, Răstoilja, Gălăoaia but a few specimens were recorded in the Mureş River near the mouths of these tributaries.

8. *Esox lucius* Linnaeus

A species present from Senetea to the confluence with the Tisza River in Hungary.

9. *Rutilus rutilus carpathorossicus* Vladykov

From Sărmaş to the confluence with the Tisza River in Hungary.

10. *Leuciscus leuciscus leuciscus* (Linnaeus)

A very rare species in Mureş river generally recorded from Gălăoaia and Tirgu Mureş.

11. *Leuciscus cephalus cephalus* (Linnaeus)

The most common species in Mureş river, from Senetea to the confluence with the Tisza River in Hungary.

12. *Leuciscus borysthenicus borysthenicus* (Kessler)

The first record of this species in Mureş drainage, based on a single specimen, was in August this year in a channel of a fishculture station at Nădlac near the frontier between Romania and Hungary. The presence of this species in this area is extremely strange, since it is known only from the Danube Delta and recently was also recorded near Bucureşti.

13. *Leuciscus idus idus* (Linnaeus)

Known from Aiud to the Tisza River but in Mureş is a very rare species.

14. *Phoxinus phoxinus phoxinus* (Linnaeus)

In very clean and rapid courses of Mureş River from Senetea to Ruşii Munti.

15. *Tinca tinca* (Linnaeus)

A very rare species generally in the abandoned meanders (Tg. Mureş, Luduş etc.) possibly to the Tisza River in Hungary.

16. *Scardinius erythrophthalmus* (Linnaeus)

Same situation as previous species.

17. *Aspius aspius aspius* (Linnaeus)

A species known from Brîncovenesti to the Tisza River.

18. *Leucaspius delineatus delineatus* Heckel

Known from Ruşii Munti to Gura Arieşului. Then in the lower part of the river.

19. *Alburnus alburnus alburnus* (Linnaeus)

Known from Senetea to the confluence with the Tisza River in Hungary. It is one of the most common species in the river.

20. *Alburnoides bipunctatus bipunctatus* (Bloch)

Same situation as *Alburnus alburnus* but it was found as far as the confluence with the Almaş River at Zam.

21. *Blicca bjoerkna* (Linnaeus)

A very rare species known from Gorneşti and the lower part of the river.

22. *Abramis brama danubii* (Pavlov)

Also known from the lower part of the river. An extremely rare species.

23. *Abramis ballerus* (Linnaeus)

Known from Tîrgu Mureş to the Tisza River.

24. *Abramis sapa sapa* (Linnaeus)

A very rare species known around Pecica.

25. *Vimba vimba vimba*

Same distribution as *Abramis ballerus*.

26. *Pelecus cultratus* (Linnaeus)

A very rare species, known from Gorneşti to Ungheni then in the lower part of the river.

27. *Chondrostoma nasus nasus* (Linnaeus)

One of the most common species in the river, from Suseni to the Tisza River.

28. *Rhodeus sericeus amarus* (Bloch)

One of the most common species from Senetea to the Tisza River.

29. *Pseudorasbora parva parva* Nichols

Same situation as previous species.

30. *Gobio gobio obtusirostris* Valenciennes

Same as above. Possibly the subspecies *muresia* of Jászfalusi (1951) might be a valid name only for the Mureş drainage. A comparative study of populations is necessary.

31. *Gobio uranoscopus frici* Vladykov

A frequent species in swift areas of the river and always associated with stones or gravel. From Suseni to Tîrgu Mureş.

32. *Gobio kessleri kessleri* Dybowski

Same as above. It appears from Sârmaş and is present to the Tisza River.

33. *Gobio albipinnatus vladykovi* Fang

From Gorneşti to the Tisza River. Relatively common.

34. *Barbus barbus barbus* (Linnaeus)

A relatively common species from Tîrgu Mureş to the Tisza River, but present also from Lunca Bradului to Tîrgu Mureş.

35. *Barbus peloponnesius petenyi* Heckel

In very clean and rapid waters. *Barbus meridionalis* from southern France and Italy differs enough from *petenyi*. This last named appears to be very close to the Greek species *peloponnesius* Valenciennes. The location of *petenyi* is the Mureş River (see Bănărescu, 1957:72).

36. *Carassius carassius* (Linnaeus)

An extremely rare species. A few specimens were caught during the year around Pecica and Nădlac channels.

37. *Carassius auratus gibelio* (Boch)

A relatively frequent species from Tîrgu Mureş to the Tisza River.

38. *Cyprinus carpio carpio* Linnaeus

Common species, especially in clean and rapid waters generally with stony bottoms, although it was collected in sandy and even muddy areas. From Senetea to Tîrgu Mureş

40. *Misgurnus fossilis* (Linnaeus)

A rare enough species known from Tîrgu Mureş to the confluence with the Tisza River.

41. *Cobitis elongatoides* Băcescu

A relatively frequent species from Sarmas to the confluence with the Tisza River.

Note: *Cobitis taenia* was for a long time a "catch all species". In reality, in the freshwaters (both rivers and lakes) of Europe, three lineages at least can be discerned within this genus, each having two or more species. In the Danube drainage there is a species which differs greatly from *Cobitis taenia* Linnaeus, 1758, from Sweden (type locality) and Central Europe, in its colour pattern and lamina circularis (Canestrini scale). Therefore, for the majority of the Danubian populations the next available name is *Cobitis elongatoides* Băcescu, 1962, its closest relative being *Cobitis vardarensis* Karaman, 1928 from Axios (Vardar) basin, Loudias, Gallikos, lower Aliakmon and Pinios rivers (Greece) and also in the rivers of northwestern Anatolia. On the other hand, in Asia, especially in Far Eastern Asia, the genus *Cobitis* has a great number of species, many of them being distributed from Amur drainage southward to Menam Chao Phrya in Thailand and Kapuas river in Borneo. *Cobitis melanoleuca* Nichols, 1925 (= *granoei* Rendahl, 1935, = *sibirica* Gladkov, 1935) has the greatest range within the genus, from the tributaries of the Pacific slope to the Don River in Eastern Europe. Apparently this species has not reached the Danube system but its presence in a few Danubian tributaries may be possible.

42. *Sabanejewia romantica* Băcescu

A species known to inhabit the swift waters of the southern tributaries of the Mureş River (Cugir, Beriu, Strei).

43. *Sabanejewia aurata* (Filippi)

Along the Mureş River this species is known by its three subspecies: *radnensis* (Jászfalusi, 1951), in very clean and rapid water of upper courses of the Mureş River, from Sărmaş to Gorneşti, *balcanica* (Karaman, 1922) in clean and relatively swift water, from Tîrgu Mureş to its confluence with the Tisza River, and *bulgarica* (Drensky, 1928), from Periam Port (near Pecica) to its confluence with the Tisza. Between *radnensis* and *balcanica*, between Reghin and Gura Arieşului, even Sîntimbru, there are integrades. In the lower part of the Mureş River both *balcanica* and *bulgarica* has no integrades.

44. *Silurus glanis* (Linnaeus)

A species now relatively rare in the lower part of the Mureş River. It can reach 80 kg in weight.

45. *Ictalurus nebulosus* (Le Sueur)

Very rare species found in a channel connected with the Mureş River, at Nădlac.

46. *Anguilla anguilla* (Linnaeus)

One specimen was caught a long time ago between Reghin and Tîrgu Mureş.

47. *Lota lota* (Linnaeus)

A species present in very clean and fast running water from Senetca to Gorneşti.

48. *Lepomis gibbosus* (Linnaeus)

Present in the river from Sărmaş to Sîntimbru, but possibly to the Tisza River.

49. *Perca fluviatilis* (Linnaeus)

Same situation as previous species.

50. *Stizostedion lucioperca* (Linnaeus)

A very rare species caught as isolated specimens near Țirgu Mureș.

51. *Gymnocephalus cernuus* (Linnaeus)

A rare species, generally from Țirgu Mureș to lower parts of the river.

52. *Gymnocephalus baloni* Holcik and Hensel

Found only at Pecica.

53. *Gymnocephalus schraetzer* (Linnaeus)

Only on sandy bottoms in the lower part of the Pecica River. A rare species.

54. *Zingel zingel* (Linnaeus)

Same situation as previous species. However generally this was found more seldom than *Gymnocephalus schraetzer*.

55. *Zingel streber streber* Siebold

Now a rare species in the Mureș River. Although Bănărescu and Müller (1959) found it between Țirgu Mureș and Pecica, now the species apparently has disappeared in the lower part of the river. A few specimens were caught by fishermen near Gura Arieșului, all of the specimens were adults.

56. *Cottus gobio gobio* Linnaeus

Only in clean and rapid waters with stony bottoms from Senetea to Zam. At present however, this species is completely absent in the lower part of Mureș, from Țirgu Mureș. A young specimen (65 mm total length) was collected by a fisherman in a tributary of the Mureș River near its confluence at Vărădia de Mureș and seen by one of us. The common sculpin is one of the most frequent species in the upper part of the Mureș. Many specimens have striped pelvics similar to *Cottus paecilopus* Linnaeus, but in the former species all rays of these fins are long.

Remarks on the distribution of the fish species along the river

Generally every place of the river is more or less densely populated by different species, the fishes being disposed in a mosaic-like pattern. This is due to the fact that optimal conditions for each species are disposed in such a way. In the fast running waters, for instance, the slopes, especially with vegetation such as Typha, Potamogeton etc. are densely populated by early stages of different species. We have obtained by hand net, but not with electrofishing, early stages (4.5-9.0 mm total length) of *Alburnoides bipunctatus*, *Rutilus rutilus*, *Gobio gobio obtusirostris*, *Rhodeus sericeus*, *Cobitis clongatoides* and others. Other young specimens were found along the shore in crevices or under stones, etc. (*Orthrias barbatulus*, *Sabanejewia aurata*). Some *Cobitis* and *Sabanejewia* specimens that burrow in fine sand. In all these places young stages are well protected against predators and strong currents. On the other hand, adults of gregarious species as *Gobio kessleri*, *Alburnus alburnus*, *Phoxinus phoxinus*, and *Alburnoides bipunctatus* are permanently moving in search of food. Other adults (or subadults) are generally territorial (*Salmo trutta*, *Leuciscus cephalus*, *Gobio gobio*, *Gobio uranoscopus*, *Barbus peloponnesius petenyi*, *Barbus barbus*, *Zingel zingel*, *Zingel streber*).

Threatened species and proposals for protected areas

The Mureş River has only one (or perhaps two) endemic species: *Sabanejewia aurata radnensis* Jászfalusi, 1951. However, a possible second taxon described by the same author might be valid: *Gobio gobio muresia*. The location of both taxa is the Mureş River at Stînceni. On the other hand, also the Mureş River or the drainage Mureş is the location for two other species: *Barbus peloponnesius petenyi* Heckel, 1858, and *Eudontomyzon danfordi* Regan, 1913 (Sebeş River).

In the lower part of the river there are two other interesting loaches *Sabanejewia aurata balcanica* and *S. aurata bulgarica* which are living together as two different species.

In the area between Reghin and Sîntimbru there are intergrades between *S. aurata radnensis* and *S. aurata balcanica*. Such a phenomenon is present only in the Timiş River, Banat, Romania, between *S. aurata balcanica* and *S. aurata bulgarica*.

Between the source of the Mureş River and Tîrgu Mureş there is the richest fauna in the river with one, or possibly two, endemic and extremely interesting species. I suggest this area be strictly protected against human activity, especially against pollution. I also suggest this river be protected as much as possible against pollution along its whole course. It is also necessary to protect against oil spills in the channels in the area between Pecica and Nădlac.

In the last twenty years a number of species have become rare or extremely rare. This is not an astonishing thing due to serious pollution of the river, which occurred in this time period. This is the most important reason for the loss of some species in the fauna of the Mureş River. Thus, *Acipenser ruthenus*, *Abramis brama*, *Carassius carassius*, *Cyprinus carpio*, *Stizostedion lucioperca* are practically considered as disappeared species. Other species, such as *Vimba vimba*, *Abramis ballerus*, *Gobio albipinnatus vladkovi* reached the upper part of the river. For instance, *Vimba vimba* is found now near Reghin, *Abramis ballerus* near Tîrgu Mureş and *Gobio albipinnatus* near Gorneşti.

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