"PORŢILE DE FIER/IRON GATES" GORGES AREA (DANUBE) FISH FAUNA

*Doru BĂNĂDUC *, Angela BĂNĂDUC *, Mirjana LENHARDT *** and *Gabor GUTI ****

* "Lucian Blaga" University of Sibiu, Faculty of Sciences, Department of Ecology and Environment Protection, Dr. Ioan Raţiu Street 5-7, Sibiu, Sibiu County, Romania, RO-550012, ad.banaduc@yahoo.com
** Institute for Biological Research, University of Belgrade, Bulevar Despota Stefana 142, Belgrade, RS-11000, Serbia, lenhardt@ibiss.bg.ac.rs
*** Danube Research Institute, Centre for Ecological Research, Hungarian Academy of Sciences, Karolina Street 29, Budapest, Hungary, H-1113, guti.gabor@okologia.mta.hu

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ABSTRACT

An important fisheries sector of the Danube, the "Iron Gates" area, was studied by famous naturalists along the history like Marsigli, Haeckel, Kner, Antipa and Bănărescu. After more than half a century after the last main publication in this area, the "Iron Gates" Danube sector suffered significant human impact, and an assessment of the fish fauna was needed. The paper summarizes the trend of fish species along the XIX to XXIst centuries, and reveals the appearance of new species. The study includes data from about 65 fish species, belonging to: Acipenseridae, Polyodontidae, Clupeidae, Salmonidae, Esocidae, Cyprinidae, Cobitidae, Siluridae, Ictaluridae, Anguillidae, Lotidae, Gasterosteidae, Syngnathidae, Centrarchidae, Percidae, Gobiidae, Odontobutidae, and Cottidae. The major hidrotechnical works along with pollution, overexploitation and poachery, induced major changes in the ichthyofauna structure.

RESUMEN: Ictiofauna de la región "Puertas de Hierro" (Danubio).

A lo largo de la historia, destacados naturalistas como Marsigli, Haeckel, Kner, Antipa and Bănărescu han estudiado el área del Danubio denominada como "Puertas de Hierro", que representa un importante sector pesquero regional. En virtud de que el área "Puertas de Hierro" ha sufrido impactos antropogénicos sustanciales y más de medio siglo después de haberse publicado la principal obra sobre aspectos básicos de diversidad regional, surge la necesidad de realizar una nueva evaluación. En este artículo se resume la tendencia de las especies ícticas del siglo XIX al XXI y se revela la aparición de nuevas especies. También se incluyen datos de 65 especies de peces pertenecientes a las siguientes familias: Acipenseridae, Polyodontidae, Clupeidae, Salmonidae, Esocidae, Cyprinidae, Cobitidae, Siluridae, Ictaluridae, Anguillidae, Lotidae, Gasterosteidae, Syngnathidae, Centrarchidae, Percidae, Gobiidae, Odontobutidae, Cottidae. La estructura de la fauna íctica ha sido considerablemente alterada por las enormes construcciones hidrotecnicas, la sobreexplotación y la pesca furtiva.

REZUMAT: Fauna de peşti a zonei „Porţile de Fier" (Dunăre).

O zonă importantă a Dunării pentru pescuit, zona „Porţile de Fier", a fost studiată de-a lungul istoriei de naturalişti faimoşi ca Marsigli, Haeckel, Kner, Antipa şi Bănărescu. După mai mult de jumătate de secol de la ultima publicaţie importantă despre această arie, în condiţiile în care sectorul Dunării „Porţile de Fier" a suferit un impact antropic semnificativ, a fost necesară o evaluare a ihtiofaunei. Lucrarea prezintă evoluția ihtiofaunei de-a lungul secolelor XIX la XXI şi relevă apariţia unor specii noi. Studiul include date referitoare la 65 de specii de peşti, aparţinând la: Acipenseridae, Polyodontidae, Clupeidae, Salmonidae, Esocidae, Cyprinidae, Cobitidae, Siluridae, Ictaluridae, Anguillidae, Lotidae, Gasterosteidae, Syngnathidae, Centrarchidae, Percidae, Gobiidae, Odontobutidae şi Cottidae. Amenajările hidrotehnice majore, poluarea, supraexploatarea şi braconajul au indus modificări majore în structura ihtiofaunei.

INTRODUCTION

Fish communities cannot be understood if we don't have long term data records about their dynamics, especially in terms of major ecosystems changes.

The Danube River is the second biggest European river, one of the most relevant in natural view for this continent. The length of the Danube is 2,826 km and its watershed includes parts of 19 nations from the Black Forest springs to the Black Sea. The Danube watershed expands up to 801,093 km^2. (Tockner et al., 2009) This river fish diversity is superior to other rivers of Europe. The present 115 indigenous fish species, which are about 20% of the European freshwater fish fauna (Kottelat and Freyhof, 2007), induce a high fish richness for Danube. This fact is dependent of the considerable dimensions, great variability of habitats and east to west movement corridor for migration of the Danube River.

The studied Danube sector cover over 200 km, between the Romanian localities Baziaș (km 1,072.2) and Gruia (km 851) or Ram (km 1,077) and Radujevac (km 852) localities in Serbia. The upper and middle part belong to the "Iron Gates" Natural Park/Parcul Natural "Porţile de Fier" on the Romanian Danube northern bank and Djerdap National Park on the Danube southern Serbian bank, and is one of the most spectacular Danube sectors, in terms of climate, geomorphology, hydrology, hydrobiology, zoogeography, aquatic, semiaquatic and riverine habitats and communities (Banu, 1967a, b; Băcescu, 1944; Bănărescu, 1957, 1993, 2004; Berg, 1932; Brînzan, 2012, 2013; Călinescu, 1946; Pașovschi, 1956; Posea, 1964; Ujvari, 1959, 1972; Badea and Bugă, 1992; Oancea and Velcea, 1987; Sanda et al., 1968), in comparison with other sectors.

Within the "Iron Gates" Gorge, the Danube shrinks to 150 meters in width and is flanked by limestone cliffs that go up to 300 meters. After exiting the gorge, the river widens again as it enters the Orşova Valley, where its slope is about 3-4 $cm.km^{-1}$. Within the gorge, the slope of the river bed was much higher, 240 $cm.km^{-1}$ between the 947-945 river km (Tőry, 1952). Regarding to the specific hydrogeological characteristics of the "Iron Gate" Gorge, the cascade section could be an insurmountable barrier for weak swimming smaller fish species, as the Ponto-Caspian gobies for a long period (Guti, 2000).

The interest Danube sector was well known as very rich in fish and as a consequence very important for fisheries (Giurescu, 1964). Fossils of big sturgeons were found in Palaeolithic, Mesolithic and Early Neolithic archaeological locations along the "Iron Gates" Gorge (Balon, 1964, 2004; Bartosiewicz, 1997; Dinu, 2010; Guti, 2006; Bartosiewicz and Bonsall, 2004). These evidences demonstrate the importance of fish in general and of the sturgeons in primeval diet approximately since 9,000 years ago to the antiquity. In the Middle Ages, in the 11th to 15th centuries period, sturgeon fishing also thrived in the area of interest. Numerous historic fishing locations were found in the proximity of the spawning places of anadromous sturgeon species (Guti, 2006). Moreover, the archaeological evidences of fish in the Middle Danube sectors are defined by osseous matter of big-size fish, predominantly *Cyprinus carpio*, *Silurus glanis* and *Esox lucius*, also numerous not well preserved smaller cyprinids (Dinu, 2010; Arratia and Mayden, 2004; Bartosiewicz and Bonsall, 2004; Gallik et al., 2015). It is obvious that all these fish species constituted important food and trade elements for the local communities.

The oldest fish data in the study area, are those of Marsigli (1726), Marsilius (1726) which studied the fish species of the disappeared now Ada-Kaleh Island; Haeckel and Kner (1858) describes the local fish species; Antipa (1909) studied also the local fish fauna; Bușniţă (1937) describe the local ichthyocenoses zone; Bănărescu (1964) comprehensive data including from this area.

Building and using of barrages on lotic systems is one of the major accomplishment of humans in river metamorphosis and the uppermost perturbation to streams' structures and functions, including in respect of fish fauna, both in the dam lakes and downstream lotic sectors (Olopade, 2013; Dynesius and Nilsson 1994; Humphries and Winemiller, 2009; Olopade and Rufai, 2014; Voicu and Merten, 2014; Voicu and Bănăduc, 2014; Morita et al., 2009; Normando et al., 2014; Schiemer et al., 2004). On the contrary, despite the fact that fish communities' structure is usually altered, there are cases where a decrease on fish diversity is not demonstrated (Travnichek and Maceina, 1994; Gourène et al., 1999).

The Danube is a major waterway for international trade, but the "Iron Gates" Gorge created torrents and whirlpools that made navigation difficult for centuries in the past. In 1831 a plan had already been drafted to make the passage navigable, but the engineering project was finalised in 1898. Rocks were cleared by explosion over a two km stretch in order to create an 80 m wide and three m deep navigation channel. The results of these efforts were less effective. The currents in the channel were so strong that, ships had to be dragged upstream by locomotive until the creation of the reservoir of the "Iron Gates" Dam (Tőry, 1952).

The "Iron Gates/Porţile de Fier" major hidro-energetic and navigation complex construction (1964-1972), in an important Danube sector, with a very specific fish fauna, is intriguing if induced fish fauna changes. In this respect an overview is appropriate after a half of a century of last significant data about this area.

The improvement of the upstream navigation in the "Iron Gates" Gorge in the 19th century and the construction of the reservoirs provided a migration access for the smaller Ponto-Caspian fish species to the Middle Danube (Guti, 2000).

MATERIAL AND METHODS

Historical maps and river engineering plans were evaluated to describe the geomorphologic conditions in the pristine pre-regulation conditions in the "Iron Gates" Gorge. The long-term changes on the fish fauna and occurrence of species were evaluated by scientific literature data. Acceptable records are available from the end of XVIIIth century (Antipa, 1909; Bușniţă, 1937; Herman, 1887; Marsigli, 1726; Vutskits, 1918).

Original unpublished data obtained in different projects by the authors of this paper were used: the bilateral Slovakian-Serbian project "Harmonization of methods for the monitoring of qualitative and quantitative composition of the fish stock of large rivers", 2012-2013; the Romanian "South-western Carpathian Wilderness and Sustainable Development Initiatives", 2014-2016, co-financed by a Swiss grant through the contribution to the enlarged European Union; "Fish behaviour preparatory study at "Iron Gates" Hydropower dams and reservoirs" financed by European Investment Bank, 2015; "Fishes as water quality indicators in open waters of Serbia" financed by Ministry of Education, Science and Technological Development of the Republic of Serbia, 2011-2016.

Fish samples for these projects were collected by beach seining, electrofishing, gillnets, and net traps. Fisherman captures were identified and acoustic telemetry was used for fish tracking. The captured fish were released after their identification.

RESULTS AND DISCUSSION

Each element of the fish fauna in the area of interest were evaluated by the indication of the long-term population dynamics, having regard to the major impacts of the hydroenergetic and navigation complex of the "Iron Gates/Porţile de Fier/Derdap" area.

Huso huso (Linnaeus, 1758), (Actinopterygii, Acipenseriformes, Acipenseridae, Acipenserinae), a critically endangered marine, freshwater, brackish, benthopelagic, anadromous, native fish species in the Danube Basin. It is protected under Bern Convention, Habitats Directive, CITES, CMS and IUCN (Antipa, 1909, 1910; Bănărescu, 1964, 2004; CITES, 2013; Frimodt, 1995; IUCN, 2014; Oțel, 2007; Baensch and Riehl, 1991; Kottelat and Freyhof, 2007; Liška et al., 2015).

Until the XIX century the beluga was a common species in the studied sector, but regular sturgeon fishery was terminated in the upstream (Hungarian) sector of the Danube in the XIXth century. Beluga catches started to decline along the Middle Danube from the XVIIth century due to overfishing and it disappeared at the end of the XXth century. (Antipa, 1909, 1934; Antonescu, 1934, 1957; Bacalbașa-Dobrovici, 1991, 1995; Bănărescu, 1964, 2005; Bușniță, 1960, 1964, 1994b, 2004; Guti, 2008, 2014; Karaman, 1936, 1952; Manea, 1980; Niculescu-Duvăz, 1961, 1965; Oțel, 2007; Ristic, 1963; Vasiliu, 1959; Vutskits, 1918; Bacalbașa and Petcu, 1969; Bușniță et al., 1970; Ciolac et al., 2003; Gheracopol et al., 1968; Schiemer et al., 2004). From the beginning of the XXIst century no data is available about beluga catches along the upstream of the "Iron Gates" dams due to absence of fish passages. The increasingly intense navigation on the Danube could be another disturbing factor on sturgeon migration. The beluga was harvested downstream of the "Iron Gates" II Dam by commercial fishermen in Serbia, Romania and Bulgaria till 2006 when Romania proclaimed 10 years ban on sturgeon catches, followed by Serbia and Bulgaria. Beluga still migrates to the "Iron Gates" II, fact that was confirmed by acoustic telemetry (Suciu et al., 2015) and there is information about sturgeon poaching activity.

Acipenser nudiventris Lovetsky, 1828, (Actinopterygii, Acipenseriformes, Acipenseridae, Acipenserinae) criticaly endangered species, it is in the Danube River basin a freshwater, potamodromous, migratory, native fish species in the Danube Basin. This species is protected under Habitats Directive, CITES, CMS and IUCN. (Antipa, 1910; Bauchot, 1987; Bănărescu, 1964, 2005; CITES, 2013; IUCN, 2014; Oțel, 2007; Riede, 2004)

Till the XIXth century it occurred in the studied sector, including its upstream and lower sectors of some big tributaries, as the Prut and Siret rivers. In the beginning of the XXth century it started to decrease significantly. (Antipa, 1909, 1934; Antonescu, 1934, 1957; Bacalbașa-Dobrovici, 1991; Bănărescu, 1964, 2005, 1994b; Bușniță, 1960, 1964; Guti, 2008; Karaman, 1936, 1952; Manea, 1980; Niculescu-Duvăz, 1961, 1965; Oțel, 2007; Ristic, 1963; Vasiliu, 1959; Vutskits, 1918; Bacalbașa and Petcu, 1969; Bușniță et al., 1970; Gheracopol et al., 1968; Moshu et al., 2006; Radu et al., 2008) In the XXIst century there were no more observations in the study area, the only catches were in the Middle Danube, where the last catch was recorded in a wintering hole in the vicinity of Mohács in Hungary on 2nd December 2009, it was a male specimen with body weight of 22 kg. The main reasons of the population decline were the historical overfishing, and the extensive river engineering for improvement of navigability, the river pollution and last but not least the fragmentation of the longitudinal connectivity by dam constructions ("Iron Gates" dams I and II and several other dams in the larger tributaries) without proper fish passages from the beginning of the XXth century.

Acipenser ruthenus Linnaeus, 1758, (Actinopterygii, Acipenseriformes, Acipenseridae, Acipenserinae) it is a vulnerable freshwater, brackish, benthic, potamodromous, and native fish species in the Danube Basin. This species is protected under Bern Convention, Habitats Directive, CITES, CMS and IUCN. (Antipa, 1909, 1910; Bănărescu, 1964, 2005; Birstein, 1993; CITES, 2013; Dimitriu, 1938; IUCN, 2014; Manea, 1980; Oțel, 2007; Kottelat and Freyhof, 2007; Gesner et al., 2010)

Till the XIXth century it was a common species between Coronini and Orșova localities in the sector of our scientific interest, including upstream sectors and in some big tributaries lower courses areas, for example in Mureș, Someș, Jiu, Olt, Argeș, Siret and Prut rivers. In the beginning of the XXth century it remained in the studied sector a dominant species but start to decrease in abundance at the end of this century, being still present not only in the Danube but in the lower Prut and Mureș rivers too (Antipa, 1909, 1934; Antonescu, 1934, 1957; Bacalbașa, 1991; Bănărescu, 1964, 2005; Bușniță, 1960, 1964; Karaman, 1936, 1952; Manea, 1980; Niculescu-Duvăz, 1961, 1965; Oțel, 2007; Ristic, 1963; Vasiliu, 1959; Vutskits, 1918; Bacalbașa and Petcu, 1969; Bușniță et al., 1970; Gheracopol et al., 1968; Radu et al., 2008). After the construction of the "Iron Gates" I, mass migrations of sterlet adults have been observed toward upstream regions with faster river flow rates where sedimentation processes are much less extensive than in the reservoir itself. Sterlets migrated intensively to the Danube tributaries, as the Velika Morava and the Sava River, and especially to the Tisza (Jankovic et al., 1994). Abundance of sterlet decreased in the study area mainly due to dam constructions, pollution and the extensive river engineering for development of navigation routes.

Acipenser gueldenstaedtii Brandt and Ratzeburg, 1833, (Actinopterygii, Acipenseriformes, Acipenseridae, Acipenserinae) it is a critically endangered marine, freshwater, brackish, demersal, anadromous, autochthonous fish species in the Danube Basin. This species is protected under Habitats Directive, CITES, CMS and IUCN. (Antipa, 1909, 1910; Bănărescu, 1964, 2005; CITES, 2013; IUCN, 2014; Oțel, 2007; Reide, 2004; Sokolov and Berdicheskii, 1989; Gesner et al., 2010)

Till the XIXth century this species was often found in the sector of our interest, including upstream stretch, and in the lower sectors of some tributaries for example Prut, Siret, Olt, Jiu, Someș and Mureș rivers. From the end the XIXth century its populations started to have a decreasing trend (Antipa, 1909, 1934; Antonescu, 1934, 1957; Bacalbașa-Dobrovici, 1991, 1995; Bănărescu, 1964, 1994b, 2005; Bușniță, 1960, 1964; Karaman, 1936, 1952; Manea, 1980; Niculescu-Duvăz, 1961, 1965; Oțel, 2007; Ristic, 1963, 1967; Vasiliu, 1959; Vutskits, 1918; Bacalbașa and Petcu, 1969; Bușniță et al., 1970; Ciolac et al., 2003; Gheracopol et al., 1968). This species occurance was not observed along the upstream of "Iron Gates" II from the beginning of the XXIst century due to dam ("Iron Gates" I and II) constructions and lakes formation. It should to be noted also the fact that most of the important spawning and wintering habitats of this species, as well of other sturgeons were heavily modified in the "Iron Gates" sector of the Danube. The wastewater loads and the developments of the navigation way are also threatening factors for this species.

Acipenser sturio Linnaeus, 1758 (Actinopterygii, Acipenseriformes, Acipenseridae, Acipenserinae) it is a critically endangered marine, freshwater, brackish, demersal, amphihaline anadromous, autochthonous fish species in the Danube Basin. This species is protected under Bern Convention, Habitats Directive, CITES, CMS and IUCN. (Bănărescu, 1964, 2005; CITES, 2013; Oțel, 2007; Gesner et al., 2010; Rochard et al., 1997)

Till the XIXth century there was only sporadic information about its occurrence in the Danube Basin, but more precise data are available about its presence in the Danube Delta and at the shoreline of the Black Sea. In the XXth century the last catch was recorded in 1954 in Serbian part in the study area (Ristic, 1963) and from 1960 to 1965 in Romanian part (Manea, 1980; Jaric et al., 2009). Recently it is very rare in the Danube Delta and the Black Sea (Antipa, 1909, 1934; Antonescu, 1934, 1957; Antoniu-Murgoci, 1936; Bacalbașa-Dobrovici, 1995; Bănărescu, 1964, 2005; Bușniță, 1960, 1964; Karaman, 1936, 1952; Murgoci, 1936; Oțel, 2007; Ristic, 1963; Vasiliu, 1959; Vutskits, 1918; Bacalbașa and Petcu, 1969; Bușniță et al., 1970; Ciolac et al., 2003; Gheracopol et al., 1968; Niculescu-Duvăz, 1961, 1965). In the XXIst century it was observed only in the Georgian area of the Black Sea and in the Rioni River (Kolman, 2011).

Acipenser stellatus Pallas, 1771, (Actinopterygii, Acipenseriformes, Acipenseridae, Acipenserinae) it is a critically endangered marine, freshwater, brackish, demersal, anadromous, autochthonous fish species in the Danube Basin. This species is protected under Bern Convention, Habitats Directive, CITES, CMS and IUCN. (Antipa, 1909; Bănărescu, 1964, 2005; Gesner et al., 2010; Oțel, 2007; Riede, 2004; Romero, 2002)

Till the XIXth century it was a common species in the studied sector, including its upstream stretch and the lower Prut River but it was relatively rare along the Middle Danube. Its populations started to decline during the second half of the XXth century (Antipa, 1909, 1934; Antonescu, 1934, 1957; Bacalbașa-Dobrovici, 1991, 1995; Bănărescu, 1964, 1994b, 2005; Bușniță, 1937, 1960, 1964; Karaman, 1936, 1952; Manea, 1980; Niculescu-Duvăz, 1961, 1965; Oțel, 2007; Ristic, 1963; Vasiliu, 1959; Vutskits, 1918; Bacalbașa and Petcu, 1969; Bușniță et al., 1970; Ciolac et al., 2003; Gheracopol et al., 1968; Radu et al., 2008). In the XXIst century there was not recorded catches of stellate sturgeon along the upstream of the "Iron Gates" II hydroelectric dam, but there was some acoustic telemetry data about migratory behaviour of stellate sturgeon at the downstream of the "Iron Gates" II Dam. The reasons of the decreasing abundance were the historical overfishing, the river pollution and the extensive river engineering for navigation. One catch was only registered in the upper part of the Hungarian section of the Tisa River, at Tiszajenő in 2005. Origin of this specimen is questionable, because it was about two-three years old – younger than spawning migrants.

Polyodon spathula (Walbaum, 1792), (Actinopterygii, Acipenseriformes, Polyodontidae) it is a vulnerable freshwater, demersal, potamodromous, allochthonous fish species with origin from North America (CITES, 2013; Riede, 2004; Robins et al., 1991; Simonovic et al., 2006).

The first appearance of the Mississippi paddlefish in the Danube was reported in the Serbian side of the study (Simonovic et al., 2006) was in the beginning of the XXIst century, most likely the specimens that escaped from Romanian fish ponds during floods (Lenhardt et al., 2006). It occurs most frequently in deeper, low current areas such as free-flowing river sections, side channels, backwaters lakes, and tail waters below dams.

Alosa immaculata Bennett, 1835, (Actinopterygii, Clupeiformes, Clupeidae, Alosinae) it is a vulnerable marine, freshwater, brackish, pelagic-neritic, anadromous, autochthonous fish species in the Danube Basin. This species is protected under Bern Convention, Habitats Directive and IUCN. (Antipa, 1909; Bănărescu, 1964; CITES, 2013; Kotelat, 1997; Oțel, 2007; Romero, 2002; Riede, 2004)

Till the XIXth century the Pontic shad was a common species in the studied sector to Baziaș sector and upstream, at the middle of the XXth century it started to decrease drastically in the studied area (Antipa, 1909; Antonescu, 1934, 1957; Bacalbașa-Dobrovici, 1995; Bănărescu, 1964; Borcea, 1934, 1937; Bușniță, 1953; Karaman, 1936, 1952; Oțel, 2007; Năvodaru, 1992, 1998; Niculescu-Duvăz, 1961, 1965; Vasiliu, 1959; Vutskits, 1918; Bacalbașa and Petcu, 1969; Bușniță et al., 1970; Cautiș et al., 1957; Gheracopol et al., 1968; Năvodaru et al., 1994; Schiemer et al., 2004). In the XXIst century this species individuals regularly migrate till "Iron Gates" II Dam and sometimes some specimens went through ship locks upstream. The main reason of the decreasing trend of this species in the studied Danube sector can be the dams ("Iron Gates" I and II) construction without proper fish passages.

Alosa tanaica (Grimm, 1901), (Actinopterygii, Clupeiformes, Clupeidae, Alosinae) it is a least concern marine, freshwater, brackish, pelagic-neritic, anadromous, autochthonous fish species in the Danube Basin. Is protected under Habitats Directive, CITES and IUCN. (Bănărescu, 1964; Berg, 1962; CITES, 2013; Oțel, 2007; Riede, 2004)

Till the XIX century the Black Sea shad was present in the studied sector, in the XXth. century it was found only accidentally in the study sector and in Prut River and in relatively high abundance in the lower Romanian Danube downstream the Călărași (Antipa, 1909; Antonescu, 1934, 1957; Bacalbașa-Dobrovici, 1995; Bănărescu, 1964; Borcea, 1937; Bușniță, 1953; Leonte, 1943; Moshu et al., 2006; Niculescu-Duvăz, 1961, 1965; Oțel, 2007; Vasiliu, 1959; Vutskits, 1918; Bacalbașa and Petcu, 1969; Bușniță et al., 1970; Cautiș et al., 1957; Gheracopol et al., 1968; Schiemer et al., 2004). In the XXIst century nor the authors of this paper neither other ichthyologists nor the local fisherman's did not find this species anymore. The reason can be the dams ("Iron Gates" I and II) construction without fish passages.

Salmo trutta Linnaeus, 1758, (Actinopterygii, Salmoniformes, Salmonidae, Salmoninae) a freshwater autochthonous species in the Danube Basin (Bănărescu, 1964; Svetovidov, 1984).

Until the first half of the XXth century brown trout was present only accidentally in the studied sector, at the confluences of tributaries, during periods of high floods from the local northern/Romanian tributaries (Nera, Berzasca, Sirinia, Mraconia, Eșelnița, Cerna, and Slătinicu Mare rivers) (Bușniță et al., 1970), and also on the southern Serbian tributaries in 2007 (Marić et al., 2006). It was apparently stocked in the majority of the tributaries (Pașovschi, 1956; Marić et al., 2006). Since the dam constructions it appears sometimes in this sector in some periods of year.

Hucho hucho (Linnaeus, 1758), (Actinopterygii, Salmoniformes, Salmonidae, Salmoninae) it is an endangered freshwater, benthopelagic, potamodromous, autochthonous fish species in the Danube Basin. This species is protected under Habitats Directive, CITES and IUCN. (Antipa, 1909; Bănărescu, 1964, 2005; CITES 2013; Bănărescu and Bănăduc, 2007; Kottelat and Freyhof, 2007)

At the beginning of the XXth century the huchen was present in the studied area especially in the sectors with rapids, but since the second half of the XXth century it has disappeared in the slow flowing dammed section of the Danube (Antipa, 1909; Bănărescu, 1964; Homei, 1956; Schiemer et al., 2004).

Esox lucius Linnaeus, 1758, (Actinopterygii, Esociformes, Esocidae) it is a freshwater, benthopelagic, autochthonous fish species in the Danube Basin (Antipa, 1909; Bănărescu, 1964; Bușniță, 1967; Crossman, 1996; Oţel, 2007).

The pike is a common species in the studied sector (Antipa, 1909; Antonescu, 1934; Bănărescu, 1964; Bușniță, 1967, 1964; Niculescu-Duvăz, 1961, 1965; Simonović, 2006; Vasiliu, 1959; Bacalbașa and Petcu, 1969; Bușniță and Alexandrescu, 1971; Buşniţă et al., 1970; Gheracopol et al., 1968) and its population thrived in the dammed river section in the last third of the XXth century.

Rutilus rutilus (Linnaeus, 1758), (Actinopterygii, Cypriniformes, Cyprinidae, Leuciscine) it is a freshwater, brackish, benthopelagic, autochthonous fish species in the Danube Basin (Antipa, 1909; Bănărescu, 1964; Oțel, 2007; Riede, 2004; Romero, 2002).

The roach is one of the common fish species in the studied sector (Antipa, 1909; Antonescu, 1934; Bănărescu, 1964; Bușniță, 1960, 1964; Niculescu-Duvăz, 1961, 1965; Vasiliu, 1959; Bacalbașa and Petcu, 1969; Bușniță and Alexandrescu, 1971; Gheracopol et al., 1968; Schiemer et al., 2004; Buşniţă et al., 1970). It prefers the new slow flowing and stagnant habitats since the operation of the dams.

Squalius cephalus (Linnaeus, 1758), (Actinopterygii, Cypriniformes, Cyprinidae, Leuciscine) it is a freshwater, brackish, benthopelagic, potamodromous, autochthonous fish species in the Danube Basin (Antipa, 1909; Bănărescu, 1964; Baensch and Riehl, 1991).

The chub is a frequent species in the studied area (Antipa, 1909; Antonescu, 1934; Bănărescu, 1956a, 1964; Bușniță, 1960, 1964; Oțel, 2007; Niculescu-Duvăz, 1961, 1965; Simonović, 2006; Vasiliu, 1959; Bacalbașa and Petcu, 1969; Bușniță and Alexandrescu, 1971; Buşniţă et al., 1970; Gheracopol et al., 1968; Schiemer et al., 2004). It has adapted to the new slow flowing and stagnant habitats, as well as to mesotrophy.

Leuciscus idus (Linnaeus, 1758), (Actinopterygii, Cypriniformes, Cyprinidae, Leuciscine) it is a freshwater, brackish, benthopelagic, autochthonous fish species in the Danube Basin (Antipa, 1909; Bănărescu, 1964; Oțel, 2007; Popescu et al., 1960; Romero, 2002).

The ide is one of the frequent fish species in the studied area (Antipa, 1909; Antonescu, 1934; Bănărescu, 1956a, 1964; Bușniță, 1960, 1964; Niculescu-Duvăz, 1961, 1965; Schiemer et al., 2004; Vasiliu, 1959; Bacalbașa and Petcu, 1969; Bușniță and Alexandrescu, 1971; Buşniţă et al., 1970; Gheracopol et al., 1968). It prefers the new slow flowing habitats along the dammed river section.

Tinca tinca (Linnaeus, 1758), (Actinopterygii, Cypriniformes, Cyprinidae, Tincinae) it is a freshwater, brackish, demersal, autochthonous fish species in the Danube Basin (Antipa, 1909; Bănărescu, 1964; Oțel, 2007; Romero, 2002; Riede, 2004).

The tench was a common species in the studied area, in spite of the fact that is well adapted to the new stagnant water habitats with muddy sediments, its population has declined since the middle of the XXth century apparently due to pollution and eutrophication (Antipa, 1909; Antonescu, 1934; Bănărescu, 1964; Bușniță, 1960, 1964; Vasiliu, 1959; Bacalbașa and Petcu, 1969; Bușniță and Alexandrescu, 1971; Buşniţă et al., 1970; Gheracopol et al., 1968; Niculescu-Duvăz, 1961, 1965; Schiemer et al., 2004).

Scardinius erythrophthalmus (Linnaeus, 1758), (Actinopterygii, Cypriniformes, Cyprinidae, Leuciscinae) it is a freshwater, brackish, benthopelagic, autochthonous fish species in the Danube Basin (Bănărescu, 1964; Oţel, 2007).

The rudd is a common species in the studied area (Antipa, 1909; Antonescu, 1934; Bănărescu, 1964; Bușniţă, 1960, 1964; Niculescu-Duvăz, 1961, 1965; Vasiliu, 1959; Bacalbașa and Petcu, 1969; Bușniţă and Alexandrescu, 1971; Bușniţă et al., 1970; Gheracopol et al., 1968; Schiemer et al., 2004). It prefers the new stagnant aquatic habitats, along the impoundments.

Leuciscus aspius (Linnaeus, 1758), (Actinopterygii, Cypriniformes, Cyprinidae, Leuciscinae) it is a freshwater, brackish, benthopelagic, potamodromous, autochthonous fish species in the Danube Basin (Antipa, 1909; Bănărescu, 1964; Oţel, 2007; Riede, 2004; Romero, 2002; Vostradovsky, 1973; Bănărescu and Bănăduc, 2007).

The asp is a frequent species in the studied area (Antipa, 1909; Antonescu, 1934; Bănărescu, 1964; Bușniţă, 1960, 1964; Vasiliu, 1959; Bacalbașa and Petcu, 1969; Bușniţă and Alexandrescu, 1971; Bușniţă et al., 1970; Gheracopol et al., 1968; Niculescu-Duvăz, 1961, 1965; Schiemer et al., 2004). It is a semi-reophilic species, and its population has been stable.

Alburnus chalcoides (Güldenstädt, 1772) (Actinopterygii, Cypriniformes, Cyprinidae, Alburninae) it is a freshwater, brackish, pelagic, potamodromous, autochthonous fish species in the Danube Basin. This species is protected under Bern Convention, Habitats Directive, CITES and IUCN. (Bănărescu, 1964, 1994b, 2005; Oţel, 2007; Romero, 2002; Riede, 2004)

The Danube bleak was a rare species in the east part of the studied area till the second half of the XXth century, but its occurrence has not been reported since the beginning of the XXIst century. The reason of its regress could be the change of water quality and the construction of the hydroelectric dams. (Antipa, 1909; Antonescu, 1934; Bănărescu, 1961, 1964, 1994b, 2005; Bușniţă, 1960, 1964; Niculescu-Duvăz, 1961, 1965; Vasiliu, 1959; Bușniţă and Alexandrescu, 1971; Gheracopol et al., 1968; Schiemer et al., 2004) Additional problems are the general population decline in the Black Sea tributaries (Oţel, 2007), as well as the deterioration of the river ecological status along its migratory way (pollution and dams).

Alburnus alburnus (Linnaeus, 1758) (Actinopterygii, Cypriniformes, Cyprinidae, Alburninae) it is a freshwater, brackish, benthopelagic, autochthonous fish species in the Danube Basin (Antipa, 1909; Bănărescu, 1964; Oţel, 2007; Romero, 2002).

The bleak is abundant in the studied area. (Antipa, 1909; Antonescu, 1934; Bănărescu, 1964; Bușniţă, 1960, 1964; Niculescu-Duvăz, 1961, 1965; Vasiliu, 1959; Bușniţă and Alexandrescu, 1971; Bușniţă et al., 1970; Schiemer et al., 2004; Gheracopol et al., 1968). It is a neutrophilic species, and changes of the aquatic habitats did not threat its population.

Alburnoides bipunctatus (Bloch, 1782) (Actinopterygii, Cypriniformes, Cyprinidae, Alburninae) it is a freshwater, benthopelagic, autochthonous fish species in the Danube Basin. This species is protected under IUCN. (Antipa, 1909; Bănărescu, 1964; Romero, 2002)

Till the first half of the XXth century it accidentally occurred in the studied sector, at the confluences of the northern/Romanian tributaries (Berzasca, Radimna, Sirinia, Elişeva, Plavișeviţa, Mraconia, Eşelniţa, Cerna, Bahna, Cameniţa and Liuborajdea) and the southern/Serbian tributaries (Mlava, Pek, Porečka reka, Vratna, Zamna, Rečka), when tributaries were flooded. It has not been observed in the impounded section of the Danube. (Antipa, 1909; Antonescu, 1934; Bănărescu, 1964; Bușniţă, 1960, 1964; Niculescu-Duvăz, 1961, 1965; Vasiliu, 1959; Bușniţă and Alexandrescu, 1971; Schiemer et al., 2004; Bușniţă et al., 1970; Gheracopol et al., 1968)

Blicca bjoerkna (Linnaeus, 1758) (Actinopterygii, Cypriniformes, Cyprinidae, Leuciscinae) it is a freshwater, brackish, demersal, potamodromous, autochthonous fish species in the Danube Basin (Antipa, 1909; Bănărescu, 1964; Oţel, 2007).

The white bream is abundant in the studied area. (Antipa, 1909; Antonescu, 1934; Bănărescu, 1964; Bușniţă, 1960, 1964; Niculescu-Duvăz, 1961, 1965; Vasiliu, 1959; Bușniţă and Alexandrescu, 1971; Buşniţă et al., 1970; Gheracopol et al., 1968; Schiemer et al., 2004). It prefers the new slow flowing and stagnant aquatic habitats, created by the impoundments.

Abramis brama (Linnaeus, 1758) (Actinopterygii, Cypriniformes, Cyprinidae, Leuciscinae) it is a freshwater, brackish, benthopelagic, autochthonous fish species in the Danube Basin (Antipa, 1909; Bănărescu, 1964; Oţel, 2007; Vostradovsky, 1973).

The freshwater bream was abundant in the studied area in the XIXth and XXth centuries, and still is in the XXIst century (Antipa, 1909; Bănărescu, 1964; Bușniţă, 1960, 1964; Niculescu-Duvăz, 1961, 1965; Vasiliu, 1959; Bușniţă and Alexandrescu, 1971; Bușniţă et al., 1970; Gheracopol et al., 1968; Schiemer et al., 2004). It is a neutrophilic species, and the aquatic habitat modifications resulted its more intensive growth and earlier sexual maturation in the dammed river section (Janković, 1980). This species found favourable conditions in the newly formed reservoirs and showed increase in catch (Lenhardt et al., 2004).

Ballerus sapa (Pallas, 1814) (Actinopterygii, Cypriniformes, Cyprinidae, Leuciscinae) freshwater, brackish, benthopelagic, autochthonous species in the Danube Basin (Oţel, 2007).

The white-eye bream is a frequent species in the study area (Antipa, 1909; Antonescu, 1934; Bănărescu, 1964; Bușniţă, 1960, 1964; Niculescu-Duvăz, 1961, 1965; Vasiliu, 1959; Bușniţă and Alexandrescu, 1971; Bușniţă et al., 1970; Gheracopol et al., 1968; Schiemer et al., 2004). It prefers the slow flowing river sections.

Ballerus ballerus (Linnaeus, 1758) (Actinopterygii, Cypriniformes, Cyprinidae, Leuciscinae) it is a freshwater, brackish, benthopelagic, potamodromous, autochthonous fish species in the Danube Basin (Antipa, 1909; Bănărescu, 1964; Oţel, 2007).

It is frequent in the study area (Antipa, 1909; Antonescu, 1934; Bănărescu, 1964; Bușniţă, 1960, 1964; Niculescu-Duvăz, 1961, 1965; Vasiliu, 1959; Buşniţă et al., 1970; Gheracopol et al., 1968; Schiemer et al., 2004). It uses the slow flowing habitats.

Vimba vimba (Linnaeus, 1758) (Actinopterygii, Cypriniformes, Cyprinidae, Leuciscinae) it is a freshwater, brackish, benthopelagic, autochthonous fish species in the Danube Basin (Antipa, 1909; Bănărescu, 1964; Oţel, 2007; Bănărescu et al., 1963).

The vimba bream is abundant in the study area (Antipa, 1909; Antonescu, 1934; Bănărescu, 1964; Bușniţă, 1960, 1964; Niculescu-Duvăz, 1961, 1965; Vasiliu, 1959; Bănărescu et al., 1963; Buşniţă et al., 1970; Gheracopol et al., 1968; Schiemer et al., 2004). It is a semi-reophilic species, and its population has been stable since the dam constructions.

Pelecus cultratus (Linnaeus, 1758) (Actinopterygii, Cypriniformes, Cyprinidae, Leuciscinae) it is a freshwater, brackish, pelagic, anadromous, autochthonous fish species in the Danube Basin (Balon, 1956; Bănărescu, 1964; Bănărescu and Bănăduc, 2007; Oţel, 2007).

It can be permanently found in the studied area (Antipa, 1909; Antonescu, 1934; Balon, 1956; Bănărescu, 1964; Bușniţă, 1960, 1964; Niculescu-Duvăz, 1961, 1965; Vasiliu, 1959; Bușniţă and Alexandrescu, 1971; Buşniţă et al., 1970; Gheracopol et al., 1968; Schiemer et al., 2004). It is a semi-reophilic species, preferring large rivers sectors and big lakes. The aquatic habitat changes along the dammed river section have not created problems.

Chondrostoma nasus (Linnaeus, 1758) (Actinopterygii, Cypriniformes, Cyprinidae, Leuciscinae) it is a freshwater, benthopelagic, potamodromous, autochthonous fish species in the Danube Basin (Antipa, 1909; Bănărescu, 1964; Oțel, 2007; Simonović, 2006).

The nase is frequent in the study area, but have a decreasing trend in the XXIst century (Antipa, 1909; Antonescu, 1934; Bănărescu, 1964; Bușniță, 1960, 1964; Niculescu-Duvăz, 1961, 1965; Vasiliu, 1959; Bușniță and Alexandrescu, 1971; Buşniţă et al., 1970; Gheracopol et al., 1968; Schiemer et al., 2004). It is a reophilic species, and impacts of the river engineering negatively affected its population.

Hypophthalmichthys molitrix (Valenciennes, 1844) (Actinopterygii, Cypriniformes, Cyprinidae, Xenocyprinae) it is a freshwater, benthopelagic, potamodromous, allochtonous fish species with its origin from Far East (Oţel, 2007; Riede, 2004; Skeleton, 1993; Staraș and Oţel, 1999).

The silver carp was introduced for aquaculture in Romania in the second half of the XXth century (in 1960 and 1962). It succeeded to spread in the Danube including the studied sector (Gavriloaie, 2007; Oţel, 2007; Staraș and Oţel, 1999; Schiemer et al., 2004). It prefers the slow flowing and stagnant water habitats. This species found favourable conditions in the newly formed reservoirs and showed increase in catch (Lenhardt et al., 2004).

Hypophthalmichthys nobilis (Richardson, 1845) (Actinopterygii, Cypriniformes, Cyprinidae, Xenocyprinae) it is a freshwater, benthopelagic, potamodromous, allochtonous fish species with its origin from Far East (Gavriloaie, 2007; Kottelat, 2001; Oţel, 2007; Romero, 2002).

The bighead carp was introduced for aquaculture in Romania in the second half of the XXth century (in 1960 and 1962). It is kept in aquaculture from the second half of the XXth century (in 1960 and 1962), and it successfully established in the Danube including the studied sector (Gavriloaie, 2007; Oţel, 2007; Schiemer et al., 2004). It prefers the slow flowing and lenitic habitats. This species found favourable conditions in the newly formed reservoirs and showed increase in catch (Lenhardt et al., 2004).

Ctenopharyngodon idella (Vallenciennes, 1844) (Actinopterygii, Cypriniformes, Cyprinidae, Squaliobarbinae) it is a freshwater, demersal, potamodromous, allochtonous species with Far East origin (Gavriloaie, 2007; Oţel, 2007; Riede, 2004; Schiemer et al., 2004).

The grass carp was introduced for aquaculture purposes in Romania in the second half of the XXth century (in 1960 and 1962) (Gavriloaie, 2007) and in Serbia in 1963 and spread into the Danube, but even there was one record of one year old specimens in the Danube River in investigated sector in 1991 (Jankovic, 1998) there is assumption that only acclimatization of adults is possible with no possibility for natural spawning. This species found favourable conditions in the newly formed reservoirs and showed increase in catch (Lenhardt et al., 2004).

Rhodeus sericeus (Pallas, 1776) (Actinopterygii, Cypriniformes, Cyprinidae, Acheilognathinae) it is a freshwater, benthopelagic, autochthonous fish species in the Danube Basin. This species is protected under Bern Convention, Habitats Directive, CITES and IUCN. (Antipa, 1909; Bănărescu, 1964; Romero, 2002; Oțel, 2007; Bănărescu and Bănăduc, 2007)

The bitterling was missing in the XIXth and the first part of the XXth centuries and was registered in the second part of the XXth and first part of the XXIst centuries in the studied area (Antipa, 1909; Antonescu, 1934; Bănărescu, 1964; Bușniță, 1960; Niculescu-Duvăz, 1961, 1965; Vasiliu, 1959; Bușniță and Alexandrescu, 1971; Gheracopol et al., 1968; Schiemer et al., 2004). It is advantaged by stagnant water habitats with sandy and muddy substrata along the impounded section of the Danube.

Romanogobio albipinnatus (Lukasch, 1933) (Actinopterygii, Cypriniformes, Cyprinidae, Gobioninae) it is a freshwater, benthopelagic, autochthonous fish species in the Danube Basin. This species is protected under Bern Convention, Habitats Directive, CITES and IUCN. (Bănărescu, 1964; Nowak et al., 2006; Oțel, 2007; Bănărescu and Bănăduc, 2007)

The white-finned gudgeon was and is a common species in the studied area in the XIXth, XXth and XXIst centuries (Bănăduc, 2003; Bănărescu, 1952, 1956b, 1964, 1994a; Niculescu-Duvăz, 1961, 1965; Balon et al., 1988; Buşniţă et al., 1970; Gheracopol et al., 1968; Schiemer et al., 2004). It prefers the low water flow with sandy substrata habitats.

Pseudorasbora parva (Temminck and Schlegel, 1846) (Actinopterygii, Cypriniformes, Cyprinidae, Gobioninae) it is a freshwater, benthopelagic, allochtonous fish species with origin from Far East (Bănărescu, 1964; Oțel, 2007; Kottelat and Freyhof, 2007).

The stone moroko was missing in the XIXth and in the XXth centuries in the studied area, it was accidentally introduced in the Danube Basin in the 1960s and found here in the XXIst century (Bănărescu, 1964; Cakić et al., 2004; Gavriloaie, 2007; Gheracopol et al., 1968; Schiemer et al., 2004). This invasive species was accidentally introduced in the Danube Basin in 1960s. Is advantaged by stagnant and low speed flowing water habitats, and tolerates the eutrophic water quality.

Barbus barbus (Linnaeus, 1758) (Actinopterygii, Cypriniformes, Cyprinidae, Barbinae) it is a freshwater, benthopelagic, potamodromous, autochthonous fish species in the Danube Basin. This species is protected under CITES and IUCN. (Bănărescu, 1964; Oțel, 2007; Romero, 2002)

The barbel was and is abundant in the studied area in the XIXth, XXth and XXIst centuries (Antipa, 1909; Antonescu, 1934; Bănărescu, 1964; Niculescu-Duvăz, 1961, 1965; Simonović, 2006; Bușniță and Alexandrescu, 1971; Buşniţă et al., 1970; Gheracopol et al., 1968; Schiemer et al., 2004). It prefers the deep and moderately water flowing sectors of rivers.

Barbus meridionalis Risso, 1827, (Actinopterygii, Cypriniformes, Cyprinidae, Barbinae) it is a freshwater benthopelagic, autochthonous fish species in the Danube Basin (Bănărescu, 1964; Romero, 2002; Bănărescu and Bănăduc, 2007).

Till the first part of the XXth century the Mediterranean barbel was present only accidentally in the studied sector, in the confluences with tributaries areas, coming at high floods from the local northern/Romanian tributaries (Berzasca, Sirinia, Elişeva, Tişoviţa, Plavişeviţa, Mraconia, Eşelniţa, Cerna, and Bahna rivers) (Buşniţă et al., 1970). After that period such captures in the new Danube lake environment were no more registered, both on the Romanian and Serbian banks. Its reophilic and good water oxygenation preferences explain its missing in the area of interest after the two big lakes appearances.

Cyprinus carpio Linnaeus, 1758 (Actinopterygii, Cypriniformes, Cyprinidae) it is a freshwater, brackish, benthopelagic, potamodromous, autochthonous species in the Danube Basin (Bănărescu, 1964; Gavriloaie, 2007; Oțel, 2007; Riede, 2004).

The common carp was and is frequent in the studied area in the XIXth, XXth and XXIst centuries (Antipa, 1909; Antonescu, 1934; Bănărescu, 1964; Niculescu-Duvăz, 1961, 1965; Simonović, 2006; Bușniță and Alexandrescu, 1971; Buşniţă et al., 1970; Gheracopol et al., 1968; Schiemer et al., 2004). The decreasing in many river sectors of the water flowing speed and the increasing of the water depth and temperature was an advantage for this species.

Carassius carassius (Linnaeus, 1758) (Actinopterygii, Cypriniformes, Cyprinidae, Cyprinae) it is a freshwater, brackish, demersal, autochthonous fish species in the Danube Basin (Bănărescu, 1964, 2005; Oțel, 2007; Riede, 2004; Romero, 2002).

The crucian carp was present in the studied area in the XIXth century and the first part of the XXth century with a decreasing trend in the second part of the XXth century and in the XXIst century. The concurrence of this species with *Carassius gibelio*, water eutrophication which induced the decreasing of aquatic vegetation, useful as food and for reproduction (Antipa, 1909; Bănărescu, 1964, 1994b, 2005; Bușniță, 1938; Stănicioiu, 1978; Buşniţă et al., 1970; Schiemer et al., 2004). Its decreasing trend can be explained by the competition pressure of the *Carassius gibelio* and eutrophication.

Carassius gibelio (Bloch, 1782) (Actinopterygii, Cypriniformes, Cyprinidae, Cyprinae) it is a freshwater, brackish, benthopelagic, allochtonous fish species (Bănărescu, 1964; Gavriloaie, 2007; Oțel, 2007; Riede, 2004; Romero, 2002).

The Prussian carp was missing in the studied area in the XIXth century, and appeared in XXth century and extended in the XXIst century (Antipa, 1909; Bănărescu, 1964; Bușniță, 1938; Bușniță and Cristian, 1958; Schiemer et al., 2004). The new slow flowing and stagnant habitats created by impoundments advantaged this fish species.

Phoxinus phoxinus Linnaeus, 1758, (Actinopterygii, Cypriniformes, Cyprinidae, Leuciscinae) it is a freshwater, demersal and autochthonous fish species in the Danube Basin (Riede, 2004; Romero, 2002; Buşniţă et al., 1970).

Till the first half of the XXth century the Eurasian minnow was present only accidentally in the studied sector, washed from Cerna River, in the confluence area with this tributary. After that period such captures in the new Danube lake environment were no more registered, both on the Romanian and Serbian banks. The increasing of the water temperature and the decreasing of the water oxygen content did not favourise this species after the lakes formation. Since the dams construction this species disappeared along the study area, due to significant changes of fluvial habitats.

Misgurnus fossilis (Linnaeus, 1758) (Actinopterygii, Cypriniformes, Cobitidae, Cobitinae) it is a freshwater, demersal and autochthonous fish species in the Danube Basin area (Bănărescu, 1964; Oțel, 2007; Riede, 2004; Bănărescu and Bănăduc, 2007; Buşniţă et al., 1970).

The weatherfish was and still is present in the studied area in the XIXth, XXth and XXIst centuries (Antipa, 1909; Antonescu, 1934; Bănărescu, 1964; Bușniță and Alexandrescu, 1971; Buşniţă et al., 1970; Schiemer et al., 2004). This fish species is advantaged by the presence of stagnant or slow flowing water habitats with dense aquatic vegetation and muddy substrata.

Cobitis taenia Linnaeus, 1758 (Actinopterygii, Cypriniformes, Cobitidae, Cobitinae) it is a freshwater, demersal, autochthonous fish species in the Danube Basin (Bănărescu, 1964; Nalbant, 1963, 1994b; Riede, 2004; Romero, 2002; Vostradovsky, 1973; Bănărescu and Bănăduc, 2007).

The spined loach was and still is present in the "Iron Gates" researched area in the XIXth and XXth centuries, with a decreasing trend in the XXIst century (Bănărescu, 1964; Buşniţă et al., 1970; Nalbant, 1963, 1994). This fish species prefer usually the slow-flowing and still water habitats with soft fine sandy substrate, being advantaged by the new lenitic habitats.

Sabanejewia bulgarica (Drensky, 1928) (Actinopterygii, Cypriniformes, Cobitidae, Cobitinae) it is a freshwater and demersal, autochthonous fish species in the Danube Basin (Bănărescu, 1964; Nalbant, 1963, 1994; Oțel, 2007; Baensch and Riehl, 1991, 1995; Buşniţă and Băcescu, 1946; Buşniţă et al., 1970).

This species was and still is frequent in the studied area in the XIXth and XXth centuries, with a decreasing trend in XXIst century (Bănărescu, 1964; Nalbant, 1963, 1994). This species prefer deep sectors and flowing river stretches with sandy gravel substrate.

Silurus glanis Linnaeus, 1758 (Actinopterygii, Siluriformes, Siluridae) it is a freshwater, brackish, benthopelagic, non-migratory, autochthonous fish species in the Danube Basin (Antipa, 1909; Bănărescu, 1964; Frimodt, 1995; Oțel, 2007; Romero, 2002).

The wels catfish was and still is frequent in the studied area in the XIXth, XXth and XXIst centuries (Antonescu, 1934; Bănărescu, 1964; Niculescu-Duvăz, 1961, 1965; Simonović, 2006; Buşniţă and Alexandrescu, 1971; Buşniţă et al., 1970; Gheracopol et al., 1968; Schiemer et al., 2004). It prefers the deep sectors along free flowing impounded sectors.

Ameiurus melas (Rafinesque, 1820) (Actinopterygii, Siluriformes, Ictaluridae) is a freshwater, demersal, allochtonous fish species with origin from North America which first introduction in Europe occured in the second half of the XX century (1871) (Bănărescu, 1964; Gavriloaie, 2007).

Due to the fact that this species prefers standing and muddy water, the construction of dams and formation of reservoirs contribute to the black bullhead spreading in the studied sector of the Danube River.

Anguilla anguilla (Linnaeus, 1758), (Actinopterygii, Anguilliformes, Anguillidae) it is a marine, freshwater and brackish (eurihaline), demersal, catadromous, autochthonous fish species in the Danube Basin (Antipa, 1909; Bănărescu, 1964; Oțel, 2007; Riede, 2004).

The European eel was and it is still present in the studied area in the XIXth, XXth and XXIst centuries (Antonescu, 1934; Bănărescu, 1964; Zinevici, 1967; Schiemer et al., 2004). It was also introduced to several water bodies in the Danube Basin during the second half of the XXth century. It can be found both in flowing and stagnant waters and migratory individuals may come from the upstream of the study area.

Lota lota (Linnaeus, 1758) (Actinopterygii, Gadiformes, Lotidae) it is a freshwater, brackish, demersal, potamodromous, autochthonous fish species in the Danube Basin (Antipa, 1909; Bănărescu, 1964, 2005; Oțel, 2007; Romero, 2002; Cohen et al., 1990).

The burbot was and is still present in the researched area in the XIXth, XXth and XXIst centuries. Its abundance is decreasing probably due to impoundments, water pollution and poaching. (Antonescu, 1934; Bănărescu, 1964, 1994a, 2005; Buşniță, 1960; Niculescu-Duvăz, 1961, 1965; Gheracopol et al., 1968; Schiemer et al., 2004) In the studied area it occurs in slow flowing deep sectors of the free flowing and the impounded river sections.

Pungitius platigaster (Kessler, 1859) (Actinopterygii, Gasterosteiformes, Gasterosteidae) it is a marine, freshwater, brackish, benthopelagic, autochthonous fish species in the Danube Basin (Bănărescu, 1964; Oțel, 2007; Romero, 2002).

The southern ninespine stickleback was present in the studied area in the XIXth century and the first half of the XXth century with no registrations in the second half of the XXth century and in the XXIst century (Bănărescu, 1964; Schiemer et al., 2004). This species prefers shallow stagnant water habitats.

Syngnathus abaster Risso, 1827 (Actinopterygii, Syngnathiformes, Syngnathidae) it is a marine, brackish, freshwater, autochthonous fish species in the Danube Basin (Nelson, 1994; Oțel, 2007).

The black-striped pipefish was absent in the XIXth century in the area of interest, but was found by the authors of this paper in the XIX and XX centuries, in 1997 and 1998 in Serbian part of investigated sector, when 57 specimens were caught in Tekija (km 956), Kladovo (km 934), Korbovo (km 910) and downstream of the "Iron Gates" II on km 862 and in Romanian sector in 2015 upstream of the "Iron Gates" II. (Antipa, 1909; Bănărescu, 1964; Sekulić et al., 1999; Second Joint Danube Survey Expedition)

Lepomis gibbosus (Linnaeus, 1758) (Actinopterygii, Perciformes, Centrarchidae) it is a freshwater, brackish, benthopelagic, potamodromous, allochtonous fish species with origin from North America, it was introduced in Europe as ornamental species in 1877 in France and in 1881 in Germany (Bănărescu, 1964; Riede, 2004; Romero, 2002; Buşniţă et al., 1970; Gavriloaie et al., 2007; Oțel, 2007).

The pumpkinseed was absent in the XIXth century and the first part of the XXth century and was introduced to the Middle Danube Basin at the end of the XIXth century, appeared in the studied area in the second half of the XXth century and it is present with significant abundance in the XXIst century (Antipa, 1909; Buşniţă et al., 1970; Gavriloaie et al., 2007).

Perca fluviatilis Linnaeus, 1758 (Actinopterygii, Perciformes, Percidae, Percinae) it is a freshwater, brackish, demersal and autochthonous fish species in the Danube Basin (Antipa, 1909; Bănărescu, 1964; Oțel, 2007; Riede, 2004).

The European perch was and is frequent in the studied area in the XIXth, XXth and XXIst centuries (Antonescu, 1934; Bănărescu, 1964; Bușniță, 1960; Niculescu-Duvăz, 1961, 1965; Simonović, 2006; Bușniță and Alexandrescu, 1971; Gheracopol et al., 1968; Schiemer et al., 2004). This neutrophilic fish species can be found in medium and large size lowland rivers characterised especially by low flow velocity and in several types of stagnant waters.

Gymnocephalus cernua (Linnaeus, 1758) (Actinopterygii, Perciformes, Percidae, Percinae) it is a freshwater, brackish, demersal and autochthonous fish species in the Danube Basin (Antipa, 1909; Bănărescu, 1964; Oțel, 2007; Riede, 2004; Romero, 2002; Buşniţă et al., 1970).

The ruffe was and is frequent in the studied area in the XIXth, XXth and XXIst centuries (Bănărescu, 1964; Niculescu-Duvăz, 1961, 1965; Gheracopol et al., 1968; Schiemer et al., 2004). This species prefers still freshwater of slow-flowing rivers with fine sediments, it can tolerate eutrophic waters.

Gymnocephalus schraetser (Linnaeus, 1758) (Actinopterygii, Perciformes, Percidae, Percinae) it is a freshwater, demersal and autochthonous fish species in the Danube Basin (Bănărescu, 1964, 1994a, 2005; Oțel, 2007; Romero, 2002; Bănărescu and Bănăduc, 2007; Holčik and Hensel, 1974).

The schraetzer was and is present in the studied area in the XIXth, XXth and XXIst centuries. This species was negatively affected by the water pollution and extensive river engineering (Bănărescu, 1964, 1994a, 2005; Holčik and Hensel, 1974; Schiemer et al., 2004). It is a reophilic species and avoids the stagnant water.

Gymnocephalus baloni Holčic and Hensel, 1974 (Actinopterygii, Perciformes, Percidae, Percinae) it is a freshwater, benthopelagic and autochthonous fish species in the Danube Basin (Bănărescu, 1994b, 2005; Oțel, 2007; Romero, 2002; Bănărescu and Bănăduc, 2007; Holčik and Hensel, 1974).

The Danube ruffe was identified in the studied area at the end of the XXth century and at the beginning of the XXIst century, but probably it was continuously present (Bănărescu, 2005; Oţel, 2007; Schiemer et al., 2004). It is reophilic and prefers the flowing fluvial habitats.

Sander lucioperca (Linnaeus, 1758) (Actinopterygii, Perciformes, Percidae, Luciopercinae) it is a freshwater, brackish, pelagic, potamodromous, autochthonous fish species in the Danube Basin (Antipa, 1909; Bănărescu, 1964; Oţel, 2007; Riede, 2004).

The pike-perch was and is frequent in the studied area in the XIXth, XXth and XXIst centuries (Bănărescu, 1964; Bușniță, 1960; Niculescu-Duvăz, 1961, 1965; Simonović, 2006; Bușniță and Alexandrescu, 1971; Buşniţă et al., 1970; Gheracopol et al., 1968; Schiemer et al., 2004). It is a neutrophilic species, and prefers the higher turbidity in the lowland rivers and eutrophic lakes.

Sander volgensis (Gmelin, 1789) (Actinopterygii, Perciformes, Percidae, Luciopercinae) it is a freshwater, brackish, demersal, autochthonous fish species in the Danube Basin (Antipa, 1909; Bănărescu, 1964; Oţel, 2007).

Occurrence of the Volga pike-perch was and is present in the studied area in the XXth and XXIst centuries, but probably it was continuously present in the study area including in the XIXth century too. It is sensitive to habitat modifications and deterioration, of water quality. (Antipa, 1909; Bănărescu, 1964, 2005; Oţel, 2007)

Zingel streber (Siebold, 1863) (Actinopterygii, Perciformes, Percidae, Luciopercinae) it is a freshwater, demersal and autochthonous fish species in the Danube Basin (Bănărescu, 1964, 2005; Bănărescu and Bănăduc, 2007; Oțel, 2007; Romero, 2002).

The Danube streber species was and is relatively frequent in the studied area in the XIXth and XXth centuries, with a decreasing trend in the XXIst century (Antipa, 1909; Bănărescu, 1964, 1994b, 2005; Bușniță, 1960; Bănărescu and Nalbant, 1979; Buşniţă et al., 1970; Schiemer et al., 2004). It is negatively affected by water pollution and extensive river engineering.

Zingel zingel (Linnaeus, 1766) (Actinopterygii, Perciformes, Percidae, Luciopercinae) it is a freshwater, demersal and autochthonous fish species in the Danube Basin (Bănărescu, 1964, 2005; Oțel, 2007; Romero, 2002; Bănărescu and Bănăduc, 2007; Buşniţă et al., 1970).

The zingel was and is present in the studied area in the XIXth, XXth and XXIst centuries (Antipa, 1909; Bănărescu, 1964, 1994b, 2005; Bușniță, 1960; Schiemer et al., 2004). This fish species it is negatively influenced by the water pollution and extensive river engineering.

Benthophilus stellatus (Sauvage, 1874) (Actinopterygii, Perciformes, Gobiidae, Gobiinae) it is a freshwater, brackish, demersal and autochthonous species in the Danube Basin (Oţel, 2007; Romero, 2002).

The stellate tadpole-goby was absent in the XIXth and XXth centuries in the area of interest, but the first specimen was found in the XXIst century by the authors of this paper (Antipa, 1909; Bănărescu, 1964). It is a neutrophilic species, which prefers soft muddy substrate.

Neogobius fluviatilis (Pallas, 1814) (Actinopterygii, Perciformes, Gobiidae, Gobiinae) it is a freshwater, brackish, benthopelagic, autochthonous species in the Danube Basin (Oţel, 2007; Romero, 2002).

The monkey goby was absent in the XIXth and XXth centuries in the area of interest, but the first specimen was found in the XXIst century by the authors of this paper, and his spreading in the middle Danube Basin has been known since the 1970s (Antipa, 1909; Bănărescu, 1964; Djikanović et al., 2013; Marković et al., 2015). It is a neutrophilic species, which prefers the lowland rivers and lakes with sandy bottom.

Ponticola kessleri (Günther, 1861) (Actinopterygii, Perciformes, Gobiidae, Gobiinae) it is a freshwater, brackish, benthopelagic, autochthonous fish species in the Danube Basin (Bănărescu, 1964; Oţel, 2007; Buşniţă et al., 1970).

The bighead goby was and is present in the studied area in the XIXth, XXth and XXIst centuries (Antipa, 1909; Bănărescu, 1964; Oţel, 2007; Buşniţă et al., 1970; Marković et al., 2015; Schiemer et al., 2004). It is a neutrophilic species, which prefers lowland rivers and lakes with average water depths, and rocky or gravel substrata.

Neogobius melanostomus (Pallas, 1814) (Actinopterygii, Perciformes, Gobiidae, Gobiinae) it is a marine, freshwater, brackish, demersal, amphidromous and autochthonous species in the Danube Basin (Kottelat, 1997; Kvach and Skóra, 2006; Marković et al., 2015).

The round goby was absent in the studied area in the XIXth century and the first part of the XXth century and appeared in the last part of the XXth century. It is still present. (Oţel, 2007; Marković et al., 2015; Schiemer et al., 2004) It is a neutrophilic species and prefers lowland rivers and lakes with different types of substrates from sandy gravel to rocks.

Babka gymnotrachelus (Kessler, 1857) (Actinopterygii, Perciformes, Gobiidae, Gobiinae) it is a freshwater, brackish, benthopelagic and autochthonous species in the Danube Basin (Oţel, 2007).

The authors (unpublished data) collected racer goby in October 2012 upstream of "Iron Gates" I and downstream of "Iron Gates" II. Its spreading in the studied area was induced by its preference for slow flowing habitats with muddy substrata and alteration on the riverine environment by damming (Oţel, 2007).

Perccottus glenii Dyubowski, 1877 (Actinopterygii, Perciformes, Odontobutidae) is allochthonous, freshwater, brackish, demersal and allochtonous species with Asian origin (Hegediš et al., 2007).

The Chinese sleeper first introduction in Europe dates from the XX century in 1912 (Reshetnikov, 2004), spread downstream from the Tisza River tributaries to the Tisza River and consequently, along the Danube River reach the Romanian, Serbian and Bulgarian part of the Danube (Hegediš et al., 2007; Nalbant et al., 2004; Zorić et al., 2014). Due to its preferences to stagnant water with silty substrata and dense vegetation (Nikolskii, 1956) there are records of this species in the studied area at river kilometre 1,047 (Šipoš et al., 2004).

Cottus gobio Linnaeus, 1758, (Actinopterygii, Scorpaeniformes, Cottidae) it is a freshwater, brackish, demersal and in the Danube Basin autochthonous fish species (Antipa, 1909; Bănărescu, 1964; Riede, 2004; Romero, 2002; Bănărescu and Bănăduc, 2007).

Till the first part of the XXth century the bullhead was present accidentally, washed from Cerna River, in the confluence area with this tributary. After that period such captures in the new Danube lake environment were no more registered, due to the lenitic and semi-lenitic aquatic habitats replacing the lenitic ones after the dams' construction. (Buşniţă et al., 1970)

CONCLUSIONS

In the last century, the Lower Danube aquatic environment diverseness, conservative and economic valuable fish variety and stocks abundance diminished in a considerable way and there were no signs that this tendency will end in the near future (Bănăduc et al., 2016).

The "Porţile de Fier/Iron Gates" Lower Danube sector is not an exception, at least from the qualitative point of view, the aquatic habitats and their fish fauna were seriously modified by hidrotechnical works, pollution, fish populations overexploitation and last but not least poachery.

One of the most important changes in the "Iron Gates" sector ichthyofauna is represented by the decrease of autochthonous economically and culturally important anadromous fish species (sturgeons and shads) and increase in catch of allochthonous fish species.

The "Porţile de Fier/Iron Gates" Gorge Danube area fish fauna can be still considered as a rich and complex one (65 fish species, belonging to: Acipenseridae, Polyodontidae, Clupeidae, Salmonidae, Esocidae, Cyprinidae, Cobitidae, Siluridae, Ictaluridae, Anguillidae, Lotidae, Gasterosteidae, Syngnathidae, Centrarchidae, Percidae, Gobiidae, Odontobutidae and Cottidae) with a high dynamic in the last centuries, and significant changes in this respect.

The major hidrotechnical works, pollution, fish populations overexploitation and poachery, induced drastically changes in the fish communities structure. This fact is revealed obviously by the transformation of the past lotic sterlet subzone of the carp zone (Buşniţă et al., 1970) to an actual barbell subzone of the carp zone. In this respect, the dominant species in the "Iron Gates" Gorge, the high rheophilic *Acipenser ruthenus*, was replaced by the moderate rheophilic *Barbus barbus*.

The initial significant differences among the fish communities of the "Iron Gates" area and the upstream and downstream Danube sectors of the area of interest are uniformised, in the detriment of the accentuated rheophilic species.

Improvements can be realised if the national and international authorities in this field of activities will became efficient in fish communities monitoring and management, including their habitat management.

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