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The most important Romanian researches on species *Pseudorasbora parva* (Temminck & Schlegel, 1846) (Teleostei, Cyprinidae)

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Abstract. The authors present shortly some data regarding the origin and occurrence of species *Pseudorasbora parva*, then they realise an analysis of the most important papers written by Romanian authors, both in our country and abroad, concerning this species.
Key Words: *Pseudorasbora parva,* topmouth gudgeon, bibliography.

Résumé. Les autres présentent quelques dates sommaires lieés d'origine et de l'éparpillement, de l'èspece *Pseudorasbora parva* et puis ils réalisent une analise pour les plus importantes oeuvres écrites par les autres roumains, publiée en pays et/ou en étranger concernant cette èspece.
Mots clés: *Pseudorasbora parva,* Pseudorasbora, bibliographie.

Rezumat. Autorii prezintă câteva date sumare legate de originea şi răspândirea speciei *Pseudorasbora parva*, apoi realizează o analiză a celor mai importante lucrări scrise de autori români, publicate în ţară şi/sau în străinătate cu privire la această specie.
Cuvinte cheie: *Pseudorasbora parva,* murgoi bălţat, bibliografie.

Introduction. The topmouth gudgeon (or the stone moroko) *Pseudorasbora parva* is a small-sized (8.5-10.5 cm) bentophagous cyprinid fish, spread out in the entire Eastern Asia, from the Amur drainage to the South of China. The terra typica of this species is Nagasaki, Japan (Bănărescu 1964). *P. parva* is a species with a high dispersion potential, which succeeded in spreading out in almost all the countries of Europe during the almost 50 years that passed from its admission into this continent. There were several centers in Europe, out of which the *P. parva* then spread out on almost the entire continent. The two major centers where Romania and Albania, from where the species naturally spread out in the whole Danube drainage, and, respectively, in the Balkans, still naturally (Gavriloaie & Falka 2006). In the countries of the former Yugoslavia the species penetrated from both centers (Cakić et al 2004); in Hungary, Slovakia and the Czech Republic the species penetrated both naturally, from Romania, and artificially, as it was brought straight from China, together with some other species of fish of an economical interest (Bănărescu 1990). In Poland the species was seemingly brought from the Ukraine (Kotusz & Witkowski 1998), as well as in Northern Bulgaria (Boyadjiev & Bassamakov 1988). The origin of the populations in Italy is unknown (Bianco & Ketmaier 2001), as it is in France, too (Allardi & Chancerel 1988), but these populations probably come from the Danube drainage. The species arrived in Denmark from Germany (Olesen et al. 2003). We do not know how the species arrived in England (Gozlan et al 2002, Hickley & Chare 2004) and Spain (Caiola & de Sostoa 2002), but it was most likely artificially introduced from an European country.

The considerable dispersion of this species in Romania was made by the introduction of the common carp *Cyprinus carpio* and silver carp *Carassius gibelio* etc. in various places. The species actively spread out through the hydrographical network, however the dispersion with the help of human played the most important role. In many cases the species was found for the first time in aquaculture enclosures and in their linking channels and only 1-2 years later in the adjacent rivers, too (Bănărescu 1999b). The species also becomes abundant in some recreation lakes, where other species of interest are introduced by amateur fishermen, such as the Kios lake in Cluj-Napoca or the Youth Lake in Bucharest. Even the amateur or sporting fishermen contributed to the enlargement of the realm of this species in Romania. The topmouth gudgeon is used as a bait for the predator fish and we sometimes noticed that the specimens that were still alive at the end of the fishing party were simply thrown into the water, but usually into another than the one from which they had been collected (Gavriloaie & Chiş 2006).

Figure 1. Adult individuals of *P. parva* (photo by Ionel-Claudiu Gavriloaie, 2005)

We have noticed that *P. parva* was highly abundent in the aquaculture enclosures and in the natural areas only in some lakes and small hill- and plain rivers. We also found this species in the sub-mountain region, in the Gurghiu river (Mureş county), but solely isolated specimens. In the larger rivers and even lakes it is present in small amounts. It feels comfortable in polluted areas, too, where few native species of fish survive (Gavriloaie & Chiş 2006).

Materials and methods. In this article we took in consideration, in chronological order, the most important papers from Romania dealing with the topmouth gudgeon, including the papers dealing with other species, but containing important considerations regarding the topmouth gudgeon. It is also important to specify, that there are considered even those articles, which were not published in Romania, but they were writen by Romanian scientists. The aimed role of this paper is to facilitate the further researches on this species.

Results and discussions. Ionescu-Varo & Grigoriu (1963) reported intersexes among a population of the topmouth gudgeon on the fishery farm at Nucet-Dâmboviţa (Romania), the first locality in Europe where the species was recorded. The intersexuality is not functional, and mature specimens are either males or females.

Bănărescu (1964) was the first author who made a detailed description of the species, dealing with the morphometrics, size, variability, ecology and data regarding the native range of this fish.

Bănărescu & Nalbant (1965) published an article regarding the taxonomy of Gobioninae (Teleostei, Cyprinidae), also dealing with the species of the genus *Pseudorasbora.* They spoke about 3 species within this genus: *P. parva, P. pumila* and *P. elongata.* The autors consider only *P. parva parva* and *P. parva altipinna* to be valid subspecies*; P. fowleri, P. depressirostris* and *P. monstrosa* being too similar to the nominative form, while the name *parvula* was considered available only as a variety of *P. parva*. The subspecies *P. parva tenuis* might also be valid, but they found only a few minor differences from *P. parva parva.*

Rădulescu & Georgescu (1969) studied for the first time the parasites and diseases of this species in Romanian waters.

Giurcă & Angelescu (1971) published the results of an extensive study about the life history and distribution of the topmouth gudgeon in Romania. The authors studied the growth and reproduction of the species, both in wild and aquaculture, and they also suggest some methods of eradication of *P. parva* from the fisheries.

Bănărescu & Nalbant (1973) published a monography of the subfamily Gobioninae.

Taisescu (1979) worked on the genetics of several fish species from Romania, among them *P. parva* as well. In case of this species, her findings are similar with those from literature (2n = 50), each chromosome having two arms (NF = 100). On the basis of number and structure of chromosomes, *P. parva* is very similar to the species of the genus *Gobio,* a further reason to include this species in the subfamily of Gobioninae.

Bănărescu (1990) wrote about the origin and spread of *P. parva* in the freshwaters of South-Eastern Europe. In his opinion in most cases the fish was introduced together with the cyprinids imported from China. The role of natural dispersion in the expansion of its territory is considered to be of minor importance. He also points out the fact, that the topmouth gudgeon is actually scarce in natural waters (less then 5 % from the total amount of fish species) and it is more habitual in fisheries.

Bănărescu (1992) made a review of the taxonomy in case of Gobioninae, but he does not change the taxonomic position of the genus *Pseudorasbora* and its species, as established by him in his articles in 1965 and 1973.

Crăciun (1998) in his PhD thesis studied the behavior of several marine and freshwater fishes from Romania, among them some behavioral aspects of *P. parva* as well. He states that this species lives in schools (mono- and/or plurispecific) in the first year of life, but after reaching sexual maturity it forms temporary shoals only. Regarding its feeding habits, it seems to feed from time to time also with tegumentary mucus and some ectoparasites of other fishes, and so it may cause superficial injuries. This species also presents territorial behavior. During reproduction males have an aggressive behavior towards each other. Females do not participate (nor in nature or in captivity) to the nuptial parade of the male's. *P. parva* also presents a weak interspecific aggressivity. In recumbence usually it stays on the ground and leans its body on the ventral fins.

Bănărescu (1999a, 1999b) described in details the genus *Pseudorasbora* and the species *P. parva,* with biometric data, synonyms, coloration, karyotype, osteology, sexual dimorphism, variability, subspecies, geographical distribution, ecology, biology, parasites and economic importance. Actually the author made a synthesis of several studies conducted on this species in Romania and in other countries until 1999.

Gavriloaie & Angyalosi (2004) presented some interesting observations regarding the reproductive behaviour of *P. parva*. They noticed several morpho-behavioural types among males during the spawning period.

Falka et al (2006) presented an alternative method to traditional morphological studies. The method is based on digital image acquisition and image analysis, followed by a statistical analysis. These digital measurements were exemplified on a sample of the topmouth gudgeon from Romanian Plane. The authors also tried to highlight some of the positive and negative aspects related to the presented method.

Gavriloaie & Falka (2006) discussed in detail the origin and occurrence of the topmouth gudgeon in the inland waters of Europe.

Gavriloaie & Chiş (2006) discussed in detail about the origin and the occurrence of *P. parva* in Romanian inland waters, from its first introduction in the beginning of '60s of the 20th century until present. Then, they discussed about its influence upon local communities both in Europe and Romania, and finally, they give some vernacular names for the species in several areas of the country.

Falka et al (2007) made an interesting research concerning the origin of introduced population of *P. parva* in Romania, based on genetic markers. In the light of their results of the genetic analyses it seems that Romanian topmouth gudgeon populations may have not one, but two sources of origin. On one hand they were accidentally introduced with the Chinese carps from the Yangtze River drainage – in concordance with data from the literature (Bănărescu 1964, 1990, 1999b), and on the other hand the authors have also identified another possible origin, Hija and Chikuma river drainages from Japan. In author's opinion these facts do not suggest by all means an introduction from Japan; it may be explained by the genetic variability of the species in its native range and it also may be explained by geographical isolation of the Japanese population, followed by a translocation to the continent and from there to Romania together with fingerlings of Chinese carps. Anyway, the genetic similarities shown by the studied Romanian populations of *P. parva* to Japanese ones is a new fact, which opens new questions and requires further studies on this topic.

Gavriloaie (2007) made a sinthesis of his work of several years concerning this species, focusing in his paper on the aspects regarding the reproduction of the topmouth gudgeon in Romania, both in natural waters and captivity.

Burlacu et al (2008) proposed a statistic-based model of regression associations of the ratio between observed mass of specimens, their calculated mass, and four major water parameters that influence growth. The authors made that research on a population of the topmouth gugeon from Nucet (Dâmboviţa, Romania). The results, expressed in trend line formulas, are correlated in the form of the product of the parameters raised to the 1/n power, where n represents the number of parameters for which regressions are estimated.

Conclusions. *P. parva* received a remarkable scientific attention in our country. There are articles dealing with its distribution, others concerning the various aspects of its biology. The topmouth gudgeon is present even in less scientific and synthetic papers, a fact which shows the actual importance of this small fish (we did not include this kind of papers in our study).

Some aspects of its biology, like diet, ethology and ecology, especially the impact of this fish on the native communities and species, need to be studied more minutely. There are also some gaps regarding the distribution of topmouth gudgeon in Romania.

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