

Review of the current status of systematics of gudgeons (Gobioninae, Cyprinidae) in Europe

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Abstract. Systematic of the gudgeons (Gobioninae) is one of the most dynamically evolving branches of the modern ichthyology. Newly implemented methods of molecular biology, modern species concepts (i.e. phylogenetic and evolutionary) and thorough investigations in the field of internal and external morphology caused in better understand of diversity of this group of fishes. Despite some new species of gudgeons were described, diversity of gobionins still seems much underestimated. It is a serious obstacle in the field of conservation of species and habitats, which is doubtless necessary. It implies that further and consecutively investigations on diversity, phylogenetics, and systematics of this subfamily are still indispensable.

Key Words: *Gobio*, Gobioninae, gudgeons, *Pseudorasbora*, *Romanogobio*, systematics.

Streszczenie. Systematyka kielbi (Gobioninae) jest dynamicznie rozwijającą się dziedziną współczesnej ichtiologii. Zastosowanie w ostatnich latach metod biologii molekularnej, nowoczesnych koncepcji gatunku (filogenetycznej i ewolucyjnej) i precyzyjnych badań morfologiczno-anatomicznych pozwoliły na znaczne poszerzenie wiedzy na temat różnorodności tej grupy ryb. W ostatnim czasie odkryto kilka nowych gatunków, a jednak wydaje się, że bioróżnorodność kielbi wciąż jest mocno niedoszacowana. Stanowi to poważne utrudnienie dla podjęcia koniecznych działań w zakresie ochrony siedlisk i gatunków, dlatego wciąż konieczne są intensywne badania na polu systematyki tej podrodziny.

Słowa kluczowe: *Gobio*, Gobioninae, kielbie, *Pseudorasbora*, *Romanogobio*, systematyka.

Rezumat. Sistemática gobioninelor (sau a porcușorilor) este una dintre cele mai dinamice ramuri ale ihtiologiei. Nou implementatele metode taxonomice de biologie moleculară, conceptele moderne referitoare la noțiunea de specie (incluzând aspectele filogenetice și evoluționare) și investigațiile legate de morfologia internă și externă au făcut posibilă o mai bună înțelegere a diversității a acestui grup de pești. Cu toate că s-au descris câteva specii noi de porcușori, diversitatea gobioninelor pare să fie încă mult subestimată. Neglijarea acestor aspecte constituie un obstacol redutabil în calea conservării speciilor și habitatelor, conservare deosebit de necesară și de importantă.

Key Words: *Gobio*, Gobioninae, porcușori, *Pseudorasbora*, *Romanogobio*, sistematică.

Introduction. The gudgeons (Gobioninae) are subfamily of small fishes within the family Cyprinidae. It is widely accepted that this subfamily may form a monophyletic clade (Bănărescu & Nalbant 1973; Nelson 2006; Yang et al 2006; Kottelat & Freyhof 2007; but see the opposing conclusion in: Cunha et al 2002), however there is still running a debate which genera should be included or excluded, as well as which subfamily, Cyprininae or Leuciscinae, is closer related to gudgeons (Hosoya 1986; Naseka 1996a,b; Yang et al 2006). They are distributed throughout the whole northern Eurasia. The subfamily Gobioninae consists about 30 genera and 130 species (Bănărescu 1992; Bogutskaya & Naseka 2004; Nelson 2006; Yang et al 2006; Kottelat & Freyhof 2007). In Europe occur representatives of three genera: native *Gobio* and *Romanogobio*, and invasive *Pseudorasbora*. The last one is represented in Europe by only one species, stone moroko *Pseudorasbora parva*, which was accidentally introduced for the first time in 1961 with transport of stocking fishes (i.e. bighead carp *Hypophthalmichthys nobilis*, silver carp *H. molitrix* and grass carp *Ctenopharyngodon idella*) from Far East, and now forms well established populations in most European countries (Bănărescu 1964; Kottelat & Freyhof 2007). Genera *Gobio* and *Romanogobio* were traditionally considered as one,

Gobio sensu lato, in which two subgenera, *Gobio* s. stricto and *Romanogobio*, were recognised (Bănărescu 1961). In the end of 20th century the genus was definitely divided into two separate genera, *Gobio* and *Romanogobio* (Naseka 1996a,b; Naseka & Bogutskaya 1998; Naseka & Poznjak 2000; Bogutskaya & Naseka 2004), however there were some ambiguities in literature (e.g. Bănărescu et al 1999a; Naseka et al 1999a,b; Naseka & Bogutskaya 1999; Białokoz 2000; Koščo et al 2005; Lusk & Šlechta 2005; Lusk et al 2005). Irrespective, most of the newest publications dealing with the subject consecutively apply the distinction into two genera (Yang et al 2006; Kottelat & Freyhof 2007; Mendel et al 2006, 2008; Nowak et al 2006, 2007, 2008; Ruchin et al 2008).

The end of 20th and beginning of 21st century were rich in new findings in the field of systematics of Gobioninae. From the 1990s, due to implementation of modern species concepts which treat species as evolutionary lineages, i.e. phylogenetic species concept (Kottelat 1997; Kullander 1999) and evolutionary species concept (Wiley & Mayden 2000; Mayden 2002), quitting with subspecies concept (cf. Rosen 1979; Kottelat 1997), strict application of the rules of International Code of Zoological Nomenclature (International Commission on Zoological Nomenclature 1999), and large-scale comparative investigations, many of hitherto subspecies or forms were reviewed, and distinguished as separate species. Simultaneously some new species were described. All these processes are reflects of general shift in modern systematics of fishes (cf. the discussion in: Kottelat 1997). However many questions stay without answer, and taxonomic position of number of gudgeons populations is still an approach that need a solution.

Genus *Gobio*. Type species of the genus *Gobio* is the common gudgeon *G. gobio*, which was firstly described by Linnaeus (1758: 320) as *Cyprinus gobio*. Generic name is available after Cuvier (1816). Initially this genus consisted of all Euro-Asian gudgeons, which are currently distinguished within a number of genera or even belong to different subfamilies of the family Cyprinidae (Bănărescu 1992, 1999a; Kottelat 1997; Bogutskaya & Naseka 2004; Kottelat & Persat 2005). Number of species of the 'real' genus *Gobio* (sensu Bănărescu 1961, 1992) flirted about 14 (Bănărescu & Nalbant 1973) or 15 (Bănărescu 1992, 1999a). During the last years that number has arisen up to about 50 (see the checklist below).

The common gudgeon *G. gobio* was traditionally considered to be extremely polymorphic species, one of the most variable fishes in Europe, with very wide range of distribution, from Far East to the Iberian Peninsula (Berg 1949; Bănărescu 1961, 1992; Baruš & Oliva 1995; Bănărescu et al 1999a; Białokoz 2000; and many others). A number of subspecies and other intraspecific taxa (e.g. local forms) were distinguished, e.g. Berg (1949) recognised 10 subspecies and forms, Bănărescu & Nalbant (1973) – 19 subspecies, Bănărescu (1992) – 17, and Bănărescu et al (1999a) – only 5 subspecies in Europe and 6 occurring outside of Europe. Moreover, in some cases differences among the populations were tried to explain in the terms of 'lotic' and 'lentic' forms (Bănărescu 1954, 1961; Rolik 1965, 1967; Bănărescu et al 1999a; cf. the discussion and criticism in: Kottelat & Persat 2005).

As it was pointed out by some authors, this status was due to lack of necessary comparative material, usage of different species concepts, language barriers, differences in applied methods of investigation, and incomparability of data (Kottelat 1997; Naseka et al 1999b, 2006; Kottelat & Persat 2005; Kottelat & Freyhof 2007; Nowak et al 2007, 2008).

Since mid-1990s gudgeons from the Po drainage were considered as distinct species, *G. benacensis* (Bianco 1995; Kottelat 1997; Bianco & Ketmaier 2001, 2005). However in the next years it was definitely showed that it belongs to the genus *Romanogobio* (Freyhof 2002, pers. comm. in: Kottelat & Persat 2005; Kottelat & Freyhof 2007; see also below).

In the beginning of 21st century, following previous suggestions of Doadrio (2001), it was definitely concluded that Iberian Peninsula is inhabit by at least two distinct lineages of populations, i.e. *G. gobio* s. stricto and the second one, new species, *G. lozanoi* (Doadrio & Madeira 2004).

In the same year, another new species was found in the Kuban' River drainage, *G. kubanicus* (Vasil'eva et al 2004).

In 2005 Kottelat and Persat redescribed species *G. gobio* s. stricto (type locality: stream Sieg at Eitorf, Rhine drainage) and described two new species from France, *G. alverniae* and *G. occitaniae*. In addition they thoroughly discussed problems of systematics of gudgeons in Western Europe (Kottelat & Persat 2005).

In the same year Freyhof & Naseka (2005) described a new gudgeon from Crimea, *G. delyamurei*. Simultaneously Vasil'eva et al (2005) also described a new species, *G. tauricus*, from the same Chornaya River. Moreover the dates of publication of both papers were separate by only one day (Kottelat & Bogutskaya 2006), the name *G. delyamurei* seemed to be a senior synonym of *G. tauricus*, and should take precedence. Irrespective, Mendel et al (2008) speculated that designation of Freyhof & Naseka (2005) was based on the specimens of hybrid origin, contrary to the work of Vasil'eva et al (2005), who examined gudgeons of 'pure' identity. This issue is still unclear, and further investigations are necessary in order to definitely solve the problem.

One year after, Naseka et al (2006) described another two new species, *G. battalgilae* and *G. meandricus*. In the addition they showed that gudgeons from Anatolia, considered previously as subspecies or forms of *G. gobio*, belong in fact to at least eight distinct species, i.e. two new species mentioned above, *G. gobio*, *G. hettitorum*, *G. microlepidotus*, *G. gymnostethus*, *G. intermedius* and *G. insuyanus*. However, some morphometric features as important characters in distinguishing Turkish populations of *G. gobio* s. lato were pointed out in earlier work of Erk'akan et al (2005).

The 'youngest' new species is *G. volgensis*, described in 2008 (Vasil'eva, Mendel, Vasil'ev, Lusk & Lusková in: Mendel et al 2008). It is a cryptic species, hardly impossible to distinguish from *G. gobio* in the field, but clearly diagnosable using molecular methods showed by Mendel et al (2008). That paper of Mendel et al (2008) seems the most comprehensive molecular investigation that has ever been conducted. Together with the book of Kottelat & Freyhof (2007) which mainly deals with external morphology of gudgeons, they seem a compendium of current knowledge about diversity of gobionins in Europe.

Simultaneously with those findings identity of some subspecies or forms was reviewed, and in many cases they were recognised as distinct species (e.g. Nalbant 2003; Vasil'eva et al 2004, 2005; Freyhof & Naseka 2005; Vasil'eva & Kuga 2005). They are listed in the end of current paper, and most of them were comparatively characterised by Naseka et al (2006), and Kottelat & Freyhof (2007).

Nevertheless, the checklist seems not closed. The newest morphological and molecular investigations suggest that some species stay still unrecognised, and systematics of the *G. gobio* species group is still far from definite solution (Mendel et al 2005, 2008; Nowak et al 2006, 2007, 2008; Kottelat & Freyhof 2007; Szlachciak & Ząbkiewicz 2008).

Genus *Romanogobio*. Systematics of the genus *Romanogobio* seems as much complicated as the previous one, *Gobio*. Firstly it was recognised as one of three subgenera of the genus *Gobio* s. lato by combination of several external morphological features, i.e. shallower body, elongated, cylindrical or nearly cylindrical caudal peduncle, epithelial keels on predorsal scales, anus placed closer to pelvic than anal fin (Bănărescu 1961; Bănărescu et al 1999a). Naseka (1996a,b) added some internal characters, i.e. prevalence of caudal vertebrae over abdominal ones and higher number of preanal vertebrae, and suggested to treat the group as distinct genus, as it was mentioned already (cf. introduction).

Genus, initially subgenus, *Romanogobio* was designated by type species, *R. kesslerii* (Bănărescu 1961), and at the beginning consisted of six species: *R. kesslerii*, *R. albipinnatus*, *R. persus*, *R. johntreadwelli*, *R. amplexilabris* and *R. shansiensis*, among which only the first two are European (Bănărescu 1961, 1992; Bănărescu & Nalbant 1973). Naseka (1996b) added next two species, *R. ciscaucasicus* and *R. rivuloides* (from Kaukaz and Far East, respectively), which were previously considered as representatives of the genus *Rheogobio* (Bănărescu 1961, 1992).

In 1998 a new gudgeon was found in Kuban River, five-rayed gudgeon *R. pentatrachus* (Naseka & Bogutskaya 1998). It is the only one species among the European gudgeons that has only 5½ branched rays in anal fin, contrary to all others which usually have 6½.

Naseka and Freyhof (2004) described another species from Kuban River, small Kuban gudgeon *R. parvus*, and simultaneously showed that *Gobio uranoscopus* (type species of the subgenus *Rheogobio*) should also be classified as the member of *Romanogobio* (according to data of Dobrovolov 1994). Thereby the authors concluded that *Rheogobio* and *Romanogobio* are subjective simultaneous synonyms, and as first revisers they gave priority to the name *Romanogobio*. In the same paper *R. antipai*, *R. banaticus*, *R. belingi*, *R. macropterus*, *R. tanaiticus* and *R. vladykovi* were reconsidered as distinct species (Naseka & Freyhof 2004).

Conclusions. Despite all the facts and findings presented in current review, systematics of the gobionins definitely needs increased efforts in order to explain all doubts and ambiguities that are still present. Most of gudgeons still need intensive studies in the field of their morphological variability, genetics, systematics, ecological characteristics and conservation status. Systematics needs well prepared and developed investigations in both, external and internal morphology, especially in the comparative context, with precisely chosen applied methods (Naseka 1996a,b; Kottelat & Persat 2005; Bănăduc & Bănărescu 2006; Nowak et al 2006, 2007, 2008), as well as profound and large-scale molecular analyses (Mendel et al 2006, 2008).

All those difficulties and shortages cause lack of knowledge about distribution of each species within Europe. Many of gudgeons are endemic species, some of them are endangered, locally even critically (e.g. *R. uranoscopus*) (Bless 1997). One (*R. antipai*) has probably already extinct (Bănărescu 1994; Kottelat 1997; Kottelat & Freyhof 2007). They are threatened by water pollution, degradation of specific habitats and anthropogenic changes in riverine ecosystems, and for those reasons they are protected by national legislation and placed in national red lists (Balon et al 1987; Baruš & Oliva 1995; Bianco 1995; Economidis 1995; Błachuta 2001; Bianco & Ketmaier 2001, 2005; Heese 2004; Naseka & Freyhof 2004; Lusk et al 2004, 2005; Hanel & Lusk 2005; Koščo et al 2005; Nowak et al 2006; Bănăduc 2007; Kottelat & Freyhof 2007). Moreover, distinct gudgeons are often misidentified, most likely under the name *G. gobio* or, much more seldom, *R. albiginnatus* (cf. Balon et al 1987; Freyhof et al 2000; Ruchin & Naseka 2003; Naseka et al 2005; Ruchin et al 2008), what makes our opinion about freshwater fish biodiversity still strongly underestimated (Kottelat 1997; Kottelat & Persat 2005; Kottelat & Freyhof 2007).

All those mentioned shortages, and many others, imply malaise in conservation. There can not be any successful conservation without thorough knowledge about what is to be conserved (cf. Kottelat 1997; Mace 2004; Hey et al 2003). How dangerous that ignorance could be showed the case of Italy, where introduced *G. gobio* is currently depressing by competition native populations of *R. benacensis* (Bianco & Ketmaier 2001, 2005). Analogous situation took place in River Chornaya, where accidentally introduced due to melioration alien gudgeon (probably *G. caucasicus*) hybridised with native species (*G. tauricus* ?), reducing its genetic diversity (Mendel et al 2008). Even more impressive example of irreversible consequences of omitting and dismissing systematics in the field of fisheries is the case of Lake Genève, where native endemic whitefish *Coregonus* cf. *lavaretus* was probably completely eradicated (due to hybridisation) by imported *C. peled*. It was probably the case of many lakes in Europe, not only that one (Kottelat 1997). The main question is: how can we successfully protect fish species, if we do not know what they exactly are, and if we cannot identify them?

Identification of many gudgeons in the field is very difficult or even impossible in some cases (cf. cryptic species, *G. volgensis* in: Mendel et al 2008). For all mentioned reasons there is still an urgent approach for high quality investigations in the field of gobionins systematics and diversity (cf. Kottelat 1997; Mendel et al 2006, 2008; Nowak et al 2007, 2008; Kottelat & Freyhof 2007).

Checklist. Species listed below are commonly considered to be valid. However status of some of them seems questionable, those are accompanied with appropriate reference. Irrespective, systematics of the Gobioninae is still far from definite solution, and there are many doubts, as it was stressed herein already.

Genus *Gobio* Cuvier, 1816 (about 31 species in Europe including Turkey and the whole territory of Russia. Most of them were previously considered as subspecies of *G. gobio*. Vernacular names are given mainly after Kottelat & Freyhof 2007):

Gobio acutipinnatus Men'shikov, 1939. Synonym of *G. gobio* in Kottelat (1997). Valid subspecies in Bănărescu (1992). Recognised as valid species by Freyhof & Naseka (2005), Kottelat (2006), and Ocock et al (2006).

Gobio alverniae Kottelat & Persat, 2005, Auvergne gudgeon.

Gobio brevicirris Fowler, 1976, Don gudgeon. Valid species in Freyhof & Naseka (2005), and Kottelat & Freyhof (2007).

Gobio battalgilae Naseka, Erk'akan & Küçük, 2006, Battalgil's gudgeon.

Gobio bulgaricus Drensky, 1926, Aegean gudgeon. Considered as synonym of *G. gobio gobio* or *G. gobio lepidolaemus* (Bănărescu et al 1999a), or *G. gobio* (Kottelat 1997), however recognised as valid species by Vasil'eva et al (2005), Freyhof & Naseka (2005), and Naseka et al (2006).

Gobio carpathicus Vladykov, 1925, Carpathian gudgeon. Considered previously as valid subspecies (Berg 1949) or synonym of *G. gobio* (Kottelat 1997; Bănărescu 1992; Bănărescu et al 1999a). Freyhof & Naseka (2005), Kottelat & Freyhof (2007), and Mendel et al (2008) considered it as valid species.

Gobio caucasicus Kamensky, 1901. Based on infrasubspecific *G. gobio lepidolaemus* var. *caucasica*, treated as synonym of *G. gobio gobio* or *G. gobio lepidolaemus* by Bănărescu et al (1999a), but regarded as valid species by Freyhof & Naseka (2005), and Mendel et al (2008).

Gobio cynocephalus Dybowski, 1869. Valid species in Bogutskaya & Naseka (2004), Kottelat (2006), Ocock et al (2006), and Mendel et al (2008).

Gobio faraeensis Stephanidis, 1973, Thessaly gudgeon. Considered as synonym of *G. gobio* (Kottelat 1997). Valid subspecies in Bănărescu et al (1999a), and valid species in Kottelat & Persat (2005), and Kottelat & Freyhof (2007).

Gobio gobio (Linnaeus, 1758), common gudgeon. Redescribed by Kottelat & Persat (2005: 213-220). Probably still more than one species is confused under this name (Bănărescu et al 1999a; Mendel et al 2005, 2008; Naseka et al 2006; Kottelat & Freyhof 2007; Nowak et al 2007, 2008).

Gobio gymnostethus Ladiges, 1960. Considered previously as subspecies (Bănărescu 1992) or synonym (Kottelat 1997) of *G. gobio*. Naseka et al (2006) recognised it as valid species.

Gobio hettitorum Ladiges, 1960. As above.

Gobio holurus Fowler, 1976, Caspian gudgeon. Considered as synonym of *G. gobio* (Berg 1949; Kottelat 1997), *G. gobio gobio* or *G. gobio lepidolaemus* (Bănărescu et al 1999a). Valid species in Freyhof & Naseka (2005) and Naseka et al (2006).

Gobio insuyanus Ladiges, 1960. Considered as valid species by Naseka et al (2006).

Gobio intermedius Battalgil, 1943. As above.

Gobio kovatschevi Chichkoff, 1937, Verna gudgeon. Considered previously as subspecies (Bănărescu et al 1999a) of *G. gobio*. Recognised as valid species by Kottelat & Persat (2005), Freyhof & Naseka (2005), and Kottelat & Freyhof (2007).

Gobio krymensis (Bănărescu & Nalbant, 1973), Salgir gudgeon. Treated as valid species by Vasil'eva & Kuga (2005), and Kottelat & Freyhof (2007).

Gobio kubanicus Vasil'eva, 2004 (in: Vasil'eva et al 2004), Kuban gudgeon.

Gobio lepidolaemus Kessler, 1872. Considered previously as valid subspecies (Bănărescu & Nalbant 1973; Bănărescu 1992; Bănărescu et al 1999a) or synonym (Kottelat 1997) of *G. gobio*. Vasil'eva et al. (2004), Freyhof & Naseka (2005), and Mendel et al (2008) considered it as valid species.

Gobio lozanoi Doadrio & Madeira, 2004, Iberian gudgeon.

- Gobio meandricus* Naseka, Erk'akan & Küçük, 2006.
- Gobio microlepidotus* Battalgil, 1942. Synonym of *G. gobio* in Kottelat (1997) but valid species in Naseka et al (2006).
- Gobio obtusirostris* Valenciennes, 1842, Danube gudgeon. Synonym (Kottelat 1997; Bănărescu et al 1999a; Kottelat & Persat 2005) or subspecies (Bănărescu & Nalbant 1973; Bănărescu 1992) of *G. gobio*. Freyhof & Naseka (2005), Freyhof & Huckstorf (2006), and Kottelat & Freyhof (2007) recognised it as valid species.
- Gobio occitaniae* Kottelat & Persat, 2005, Languedoc gudgeon.
- Gobio ohridanus* Karaman, 1924, Ohrid gudgeon. Synonym of *G. gobio* in Kottelat (1997), valid subspecies in Bănărescu et al (1999a). Recognised as valid species by Kottelat & Persat (2005), Kottelat & Freyhof (2007), and Mendel et al (2008).
- Gobio sarmaticus* Berg, 1949, Ukrainian gudgeon. Originally described by Slastenenko in 1934, but unavailable as infrasubspecific. Treated as subspecies (Berg 1949; Rolik 1967) or synonym of *G. gobio* (Kottelat 1997). Recognised as valid species by Freyhof & Naseka (2005), Vasil'eva et al (2005), Vasil'eva & Kuga (2005), and Kottelat & Freyhof (2007).
- Gobio sibiricus* Nikolskii, 1936, Siberian gudgeon. Synonym of *G. gobio* in Kottelat (1997). Recognised as valid species by Freyhof & Naseka (2005), Kottelat (2006), and Ocock et al (2006).
- Gobio soldatovi* Berg, 1914, Soldatov's gudgeon. Valid species in Bănărescu (1992), Naseka (1996b), Bogutskaya & Naseka (2004), Kottelat (2006), and Ocock et al (2006).
- Gobio skadarensis* Karaman, 1936, Skadar gudgeon. Valid subspecies in Bănărescu (1992), however synonym of *G. gobio* in Kottelat (1997) or *G. gobio ohridanus* in Bănărescu et al (1999a). Recognised as valid species by Mendel et al (2008).
- Gobio tauricus* Vasil'eva, 2005 (in: Vasil'eva et al 2005). Taxonomic status of gudgeons from Chornaya River (Crimea) is currently under debate. Probably *G. tauricus* should take precedence before the name *Gobio delyamurei* Freyhof & Naseka, 2005, despite the argumentation of priority by Kottelat and Bogutskaya (2006) (Mendel et al 2008; cf. also the text above).
- Gobio volgensis* Vasil'eva, Mendel, Vasil'ev, Lusk & Lusková, 2008 (in: Mendel et al 2008), Volga gudgeon. Cypriot species, previously confused with *G. gobio* (Ruchin & Naseka 2003; Vasil'eva et al 2004; Vasil'eva & Kuga 2005; Freyhof & Naseka 2005).

Genus *Pseudorasbora* Bleeker, 1860 (1 species in Europe):

- Pseudorasbora parva* (Temminck & Schlegel, 1846), stone moroko. Native to the Far East, in Europe invasive, well established in many countries. Recorded in Europe since 1961 (Bănărescu 1964; Baruš & Oliva 1995; Kottelat & Freyhof 2007).

Genus *Romanogobio* Bănărescu, 1961 (about 18 species in Europe including the whole territory of Russia, 1 probably extinct):

- Romanogobio albipinnatus* (Lukasch, 1933), Volga whitefin gudgeon. Redescription in Naseka (2001a).
- Romanogobio antipai* (Bănărescu, 1953), Danube delta gudgeon. Considered previously as subspecies of *R. kesslerii* (cf. Kottelat 1997 vs. Bănărescu 1999b; Nalbant 2003; Kottelat & Freyhof 2007). Currently probably extinct (Bănărescu 1994; Kottelat 1997; Kottelat & Freyhof 2007).
- Romanogobio banarescui* Dimovski & Grupche, 1974, Macedonian gudgeon. Considered as subspecies of *R. kesslerii* by Bănărescu (1992, 1999b). Kottelat (1997) stated that it is diagnosable, independent lineage, and recognised it as distinct species (of the genus *Gobio*), the same as Bianco & Ketmaier (2005, as *Romanogobio*), but Kottelat & Freyhof (2007) did not distinguish it from *R. elimeius*.
- Romanogobio banaticus* (Bănărescu, 1960). Originally described by Bănărescu (1953) but unavailable as infrasubspecific. Subspecies of *R. kesslerii* in Bănărescu

- (1999b). Synonym of *R. kesslerii* in Kottelat (1997). Valid species in Naseka & Freyhof (2004). Kottelat & Freyhof (2007) did not recognise this species.
- Romanogobio belingi* (Slastenenko, 1934), northern whitefin gudgeon. Considered previously as subspecies of *R. albipinnatus* (Naseka et al 1999b; Naseka 2001b).
- Romanogobio benacensis* (Pollini, 1816), Italian gudgeon. Considered previously as subspecies of *G. gobio* (Bănărescu et al 1999a vs. Bianco 1995; Kottelat 1997; Bianco & Ketmaier 2001, 2005; Kottelat & Persat 2005).
- Romanogobio ciscaucasicus* (Berg, 1932), Long-barbeled Caucasian gudgeon. Redescription in Naseka & Poznjak (2000).
- Romanogobio elimeius* (Kattoulas, Stephanidis & Economidis, 1973), Greek stone gudgeon. Considered previously as subspecies of *R. uranoscopus* (Bănărescu 1992). Kottelat (1997) treated it as distinct species. There are serious doubts in identification and validity of species *R. elimeius*, *R. banarescui* and *R. stankoi* (Kottelat & Freyhof 2007).
- Romanogobio frici* (Vladykov, 1925). Considered previously as subspecies of *R. uranoscopus* (Bănărescu & Nalbant 1973; Bănărescu 1992; Bănărescu et al 1999b). Mendel et al (2008) treated it as distinct species however it was not recognised neither by Kottelat (1997), nor by Kottelat & Freyhof (2007).
- Romanogobio kesslerii* (Dybowski, 1862), sand gudgeon. Review in Kottelat (1997) and Bănărescu (1999b).
- Romanogobio macropterus* (Kamensky, 1901). Recognised as valid species by Naseka & Freyhof (2004).
- Romanogobio parvus* Naseka & Freyhof, 2004, small Kuban gudgeon. See also Naseka et al (2005).
- Romanogobio pentatrachus* Naseka & Bogutskaya, 1998, five-rayed gudgeon. The only one of European gudgeons that usually has 5½ branched rays in anal fin. See also Naseka et al (2005).
- Romanogobio persus* (Günther, 1899), Kura gudgeon. Review in Naseka et al (1999a). Valid species also in Naseka & Freyhof (2004).
- Romanogobio tanaiticus* Naseka, 2001 (Naseka 2001b), Don whitefin gudgeon. Considered previously as subspecies of *R. albipinnatus* (Naseka 2001b; Naseka & Freyhof 2004; Bogutskaya & Naseka 2004). Treated as distinct species in Naseka & Freyhof (2004), and Kottelat & Freyhof (2007).
- Romanogobio tenuicarpus* (Mori, 1934), Amur whitefin gudgeon. Considered previously as subspecies of *G. gobio* (Bogutskaya & Naseka 2004). Recognised as distinct species (of the genus *Gobio*) by Kottelat (2006), and Ocock et al (2006).
- Romanogobio uranoscopus* (Agassiz, 1828), stone gudgeon. Review in Bless (1997), Bănărescu et al (1999b), and Kottelat & Freyhof (2007).
- Romanogobio vladykovi* (Fang, 1943), Danube whitefin gudgeon. Considered previously as subspecies of *R. albipinnatus* (Naseka et al 1999b; Naseka 2001a). Redescription in Naseka (2001b).

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