

## *Rutilus panosi*, a new roach from Western Greece (Teleostei: Cyprinidae)

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*Rutilus panosi* sp. n. is described from Acheloos River drainage, Western Greece. It is distinguished from the other species of *Rutilus* by the following combination of characters: (40)41-44(45) lateral line scales; (11)12-14(15) gill rakers; pharyngeal teeth formula 6-5; commonly 9½ branched anal rays and 9½ branched dorsal rays; snout pointed, triangular; maximum body depth 25-27% SL; dorsal fin depth 19-22% SL; anal fin depth 12-14% SL; snout length 26-32% head length; eye diameter 20-24% head length; 40-41 total vertebrae (common formulae 23+17, 23+18 and 22+18), absence of any lateral stripe. A comparison with species of *Rutilus* s. str. from the Balkan Peninsula is given.

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### Introduction

The diagnosis and composition of the genus *Rutilus* Rafinesque, 1820 (type species *Cyprinus rutilus* Linnaeus, 1758) since over 50 years are an object of debates. It was commonly given a rather vague diagnosis, which included characters with wide ranges (including plesiomorphic and apomorphic states) and a single specialization that was considered to be an autapomorphy of the genus, 6-5 pharyngeal teeth (Berg, 1949 and others). Howes (1981) even synonymized *Rutilus*, *Scardinius* and *Pachychilon*. This opinion has not been widely accepted, and the two latter genera are considered valid (Bianco, 1986; Economidis, 1995; Kottelat, 1997; Bogutskaya, 1998, etc.), *Pachychilon* with two species (*P. macedonicus* (Steindachner, 1892) and *P. pictum* (Heckel & Kner, 1858)), and *Scardinius* with some 9 species (*S. acarnanicus* Economidis, 1991, *S. dergle* Heckel & Kner, 1858, *S. erythrophthalmus* (Linnaeus, 1758), *S. graecus* Stephanidis, 1937, *S. hesperidicus* Bonaparte, 1845, *Scardinius* sp. [*S. scardafa natio ohridana* Vladikov & Petit, 1930], *S. plotizza* Heckel & Kner, 1858, *S. racovitzae* Müller, 1958, *S. scardafa* (Bonaparte, 1837)).

There was also an opinion by some authors that several Iberian species are close to *Rutilus* (Elvira, 1987), but later they were included into *Chondrostoma* based upon molecular data (Doadrio & Carmona, 2004). However, it was

shown that the Iberian species originally described as *Leuciscus lemmingii* Steindachner, 1866, *Chondrostoma lusitanicum* Collares-Pereira, 1980, *Leucos arcasii* Steindachner, 1866 and *Leuciscus macrolepidotus* Steindachner, 1866 (replaced by *Chondrostoma oligolepis*, see Robalo et al., 2005) differ morphologically from both *Rutilus* and *Chondrostoma* and deserve to be separated on the generic level (Bogutskaya, 1997, 1998).

Two species from the Kura River drainage, *Rutilus atropatenus* Derzhavin, 1937 and *Rutilus sojuchbulagi* Abdurakhmanov, 1950, were assigned to *Pseudophoxinus* (Karaman, 1972; Bogutskaya, 1996, 1998).

The comparative study of over 2000 specimens from some 50 species of the mentioned above and close genera (Bogutskaya, 1998) gave reasons to delimit the diagnosis of *Rutilus* by the following apomorphies: (1) the dorsal fin commonly has four and five unbranched rays; (2) pharyngeal teeth in one row, 5-5 or 6-5; (3) the posterior process of the pterotic is wide, laterally compressed, and the intercalar, which is considerably enlarged, is sutured to the posterior margin of this process; (4) the bones just posterior to the subtemporal fossa form a horizontal plate, which is broad and concave ventrally, providing a site of origin of the posterior section of the levator posterior muscle; (5) the masticatory plate of the pharyngeal process is relatively very large, ovate and oriented in the horizontal plane, the

anterior half of the plate is located under the basioccipital body and the base of the pharyngeal process is long; (6) the posterior part of the pharyngeal process is laterally expanded along its upper margin forming a dorsal plate, which is wide but never wider than the masticatory plate. The combination of character sets (5) and (6) is a unique apomorphy for *Rutilus*. Some other characters are not derived ones but diagnostic for *Rutilus*: (1) the shape of the suraethmoid and vomer, which are never elongated and/or attenuated anteriorly; (2) the supraorbital sensory canal never communicates with the supratemporal canal; (3) the preopercular-mandibular sensory canal always joins the temporal portion of the infraorbital canal; (4) the bones of the jaws are relatively shortened and deep but have a configuration common to *Leuciscus*-species.

Based upon this diagnosis, up to 15 species can be undoubtedly assigned to *Rutilus*. They are grouped into two subgenera. The subgenus *Pararutilus* Berg, 1912, which comprises *R. frisii* (Nordmann, 1840), *R. kutum* Kamensky, 1901, *R. meidingeri* (Heckel, 1851), *R. pigus* (La Cèpède, 1803), and *R. virgo* (Heckel, 1852), is characterized by large size in adults (up to 400–700 mm SL), high number of vertebrae (modally, 43–45 total vertebrae with 25–27 abdominal including 5 intermediate ones), a considerable supraoccipital contribution to the subtemporal fossa, and large nuptial tubercles in spawning males. The members of *Rutilus* s. str. are smaller fishes (maximum SL in all species but *R. caspicus* is 130–200 mm) with comparatively low number of vertebrae (modally, total vertebrae less than 43 with 22–24 abdominal including 3 intermediate ones), lack of supraoccipital contribution to the subtemporal fossa, and fine nuptial tubercles (absent in some species) in spawning males. *Rutilus* s. str. comprises the following species: *R. aula* (Bonaparte, 1841) (Adriatic basin from Po to Isonzo, Rasa and Riecina rivers), *R. basak* (Heckel, 1843) (Adriatic basin in Croatia and Bosnia-Herzegovina northward to Neretva drainage), *R. caspicus* (Yakovlev, 1870) (Caspian Sea basin), *R. karamani* Fowler, 1977 (Lakes Skadar and Ohrid basins), *R. ohridanus* (Karaman, 1924) (Lakes Ohrid and Skadar basins), *R. prespensis* (Karaman, 1924) (Lake Prespa), *R. rubilio* (Bonaparte, 1837) (rivers in Central Italy of Tyrrhenian and Adriatic slopes), *R. rutilus* (Linnaeus, 1758) (Europe north of Pyrenees and Alps, eastwards to Aral Sea basin and Siberia; Aegean basin from Pinios to Maritza (Evros) drainages), *R. ylikiensis* Economidis, 1991 (Kifissos drainage in Eastern Greece including lakes Yliki and Paralimni), and *Rutilus* sp. inquirenda sensu Bianco & Taraborelli, 1986 (Western Greece). The latter species is described here as new.

## Methods

Standard length (SL) is measured from the tip of the snout to the end of the hypural complex. Head length (HL) is measured including skin flap. Other measurements made point to point as explained in the table. Lateral line scales count includes all pierced scales, from the first one just behind the supracleithrum to the posteriormost on the caudal-fin base). Last two branched rays articulated on a single pterygiophore in dorsal and anal fins are noted as “1½”. Osteological characters are examined in cleared-and-stained with alizarin red S specimens and from radiographs.

Abbreviations used: CMK, collection of Maurice Kottelat, Cornol (Switzerland); NMW, Naturhistorisches Museum, Wien; PZC, collection of Primož Zupančič, Dolso (Slovenia); SMF, Senckenberg Museum, Frankfurt a. Main; ZIN, Zoological Institute, Russian Academy of Sciences, St. Petersburg; ZMH, Zoologisches Museum und Institut, Universität Hamburg.

## *Rutilus (Rutilus) panosi* sp. n. – Acheloos roach (Fig. 1)

*Rutilus* species inquirenda: Bianco & Taraborelli, 1985: 136 (Acheloos River).

*Rutilus* sp. undescribed: Economidis & Banarescu, 1991: 273, 275 (Acheloos and Louros drainages).

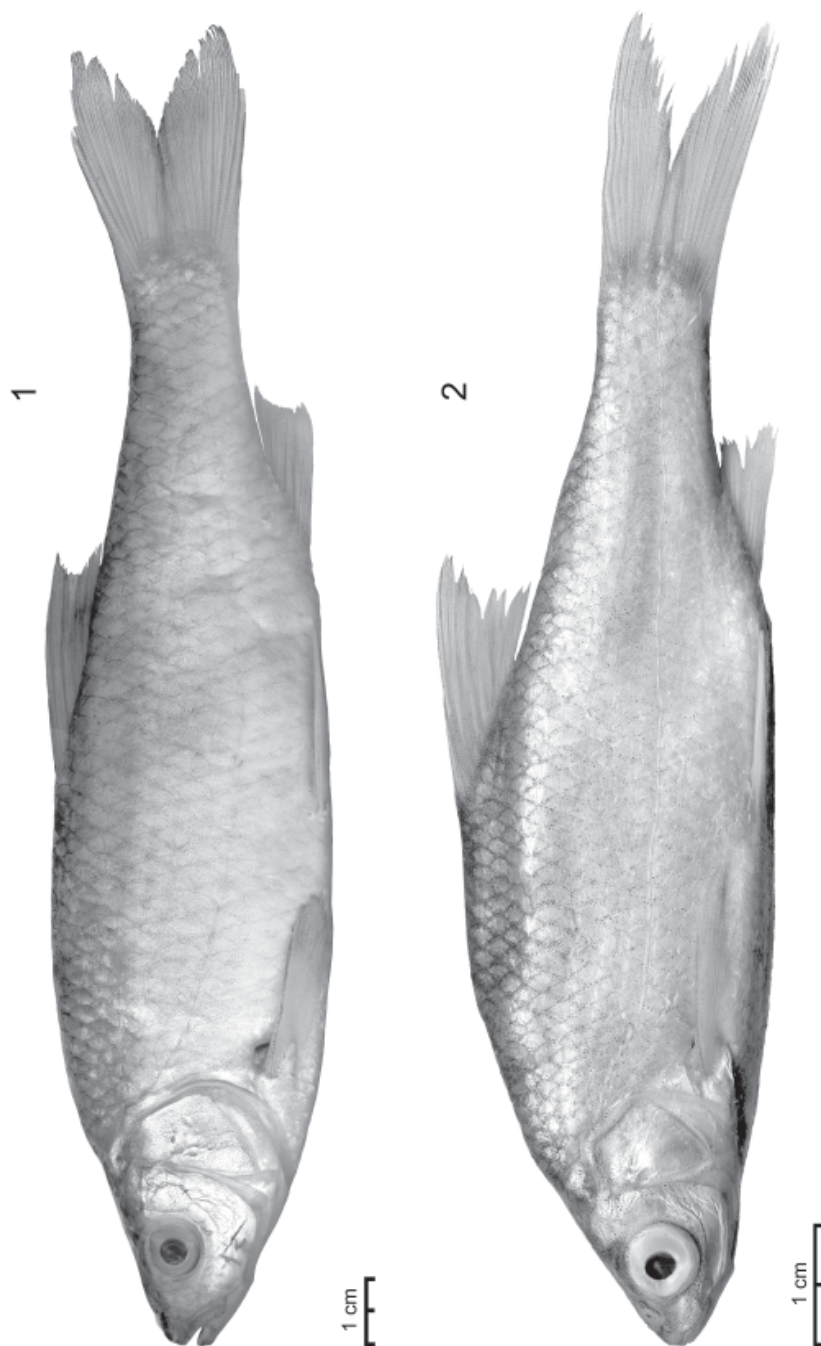
*Holotype*. ZIN 53751, SL 166.5 mm, **Greece**: Trichonis Lake, 23.VI.2000, coll. K. Iliadou.

*Paratypes*. **Greece**: 2 specs, NMW 49932, SL 155.0 and 142.3 mm, Agrinion [a town north of Lyssimachia and Trichonis lakes]; 2 specs, NMW 49931, SL 229.0 and 205.2 mm, Agrinion; 5 specs, NMW 49933, SL 91.0–102.6, Aspropotamo, Acheloos; 5 specs, NMW 49934, SL 72.8–87.9 mm, Aspropotamo, Acheloos; 35 specs, NMW 9612–46, SL 87.1–138.3 mm, Aspros; 38 specs, NMW 9717–55, SL 74.7–122.5 mm, Amvrakia Lake; 2 specs, ZMH 4458, SL 114.7 and 104.8 mm, Ozeros Lake, 1969, coll. Economidis; 9 specs, ZIN 53752, SL 114.8–159.2 mm, data as for holotype.

*Additional material* of *R. panosi* sp. n. (from non-native locality). **Greece**: CMK 16932 (4; SL 101.7–136.0 mm, Pamvotis Lake, 14.10.2001, coll. M. Kottelat).

*Diagnosis*. *Rutilus panosi* is distinguished from the other species of the subgenus *Rutilus* by the following combination of characters: (40)41–44(45) lateral line scales; (11)12–14(15) gill-rakers; pharyngeal teeth formula 6–5; commonly 9½ branched anal rays and 9½ branched dorsal rays; snout pointed, triangular; maximum body depth 25–27% SL; dorsal fin depth 19–22% SL; anal fin depth 12–14% SL; snout length 26–32% HL; eye diameter 20–24% HL; 40–41 total vertebrae (commonly, formulae 23+17, 23+18 and 22+18); absence of any lateral stripe.

*Description*. Measurements are given in Table 1. General body shape is shown in Fig. 1. Body



**Figs 1, 2.** 1, *Rutilus panosi* sp. n., holotype, ZIN 53751, SL 166.5 mm; 2, *Rutilus ylikienis*, ZIN 53754, SL 99.7 mm.

Table 1. Measurements of *Rutilus panosi*

Character	Holotype ZIN 53751	Paratypes, n = 35 NMW 9612-9646, 49931-49933, ZIN 53752, ZMH 4458		
		range	mean	SD
SL, mm	166.5	91.0-159.2		
% of standard length				
head length	26.1	24.85-27.95	26.47	0.82
maximum body depth	26.5	24.55-27.09	25.92	0.87
minimum body depth	10.4	9.85-10.68	10.24	0.25
predorsal distance	53.9	51.48-54.94	53.27	1.00
postdorsal distance	35.6	33.86-37.63	35.40	1.12
caudal peduncle length	17.3	16.36-18.86	17.74	0.77
dorsal-fin length	13.6	12.40-14.76	13.44	0.63
dorsal-fin depth	21.4	19.51-22.17	20.58	1.01
anal-fin length	9.4	9.26-11.39	10.25	0.65
anal-fin depth	13.4	12.49-14.14	13.39	0.44
pectoral-fin length	19.2	18.02-21.41	19.10	0.94
pelvic-fin length	17.3	15.56-17.84	16.66	0.65
P-V distance	24.8	23.71-26.05	25.25	0.64
V-A distance	23.8	22.34-24.80	23.89	0.80
% of head length				
snout length	29.2	25.89-31.69	28.26	1.56
eye diameter	20.2	20.23-23.76	22.27	1.18
postorbital distance	52.6	50.47-54.90	52.53	1.27
head depth at nape	70.3	65.21-73.94	69.66	2.55
head width at nape	51.0	46.60-53.61	50.18	2.41
interorbital distance	32.6	30.14-34.54	32.11	1.51

elongate and considerably compressed laterally. Head length from tip of snout subequal to maximum body depth. Head narrow, triangular in lateral view. Snout length 26-32% HL. Eye small, markedly shorter than snout its diameter 20-24% HL. Snout elongate, not stout though rounded at the tip. Mouth subterminal, with uppermost point of cleft at about the level of lower margin of pupil.

Dorsal fin with 4 (91% of specimens examined) or 5 simple rays. Number of dorsal-fin branched rays rather constant, 9½ (90%), rarely 8½. Dorsal-fin origin above origin of pelvic fin; margin slightly concave; tip pointed. Anal fin with 3 (90%) or 4 simple and 8½ (14%), 9½ (83%) or 10½ (3%) branched rays; its margin convex, but the very tip of fin markedly rounded. Following combinations of dorsal-fin and anal-fin branched rays are found: 9½/ 9½ (79%), 9½/ 8½ (9.5%), 8½/ 8½ (5.5%), 8½/ 9½ (3.5%), 9½/ 10½ (2.5%). Both the dorsal and anal fins shallow, their depth

19.5-22.2 and 12.9-14.1% SL, respectively. Caudal fin moderately forked; its lobes slightly rounded; lower lobe longer than upper.

Lateral line complete with only 1 or 2 unpored scales at posterior end of lateral series. There are 40-44, commonly 41-42, lateral line scales. Gill rakers narrowly spaced and widened at their tips. In total, 11-15, commonly 12-14, gill rakers on outer side of first left arch. Pharyngeal teeth number 6-5 in all (52) specimens examined. General topography of cephalic sensory canals and numbers of pores typical of most *Rutilus*, as described by Bogutskaya (1988). Supraorbital canal lengthened in its posterior section and has 11-15, commonly 13-14 pores. Infraorbital canal has 17-21 pores with 5 or 6 (30%) canal openings on the infraorbital 1. Preopercular-mandibular canal complete, with 16-20 pores, modally 17-19, with (4)5-7 and 9-12 canal openings on dentary and preoperculum, respectively. Supratemporal canal complete, with 7-9 pores.

**Table 2.** Distribution of characters in *Rutilus* species of the Balkan Peninsula

Species	<i>R. aula</i>	<i>R. basak</i>	<i>R. karamani</i>	<i>R. ohridanus</i>	<i>R. ylikiensis</i>	<i>R. panosi</i>
Most frequent combination of dorsal-fin and anal-fin branched rays	9½ / 9½	both 9½ / 9½ and 9½ / 8½	9½ / 8½	8½ / 8½	9½ / 9½	9½ / 9½
Lateral line scales	36-42, often 38-39	(38)39-42 (43)	36-41, often 37-39	(38-39)40-44	43-49	40-44, often 41-42
Mouth	subterminal	subterminal	terminal	subterminal	terminal	subterminal
Snout	short, rounded	short, rounded	short, pointed	elongate, rounded	short, pointed	elongate, rounded
Total vertebrae	37, 38 (39)	38-39 (40)	37, 38 (39)	(36)37-38(39)	40-41	(39)40-41
Most frequent vertebral formulae	21+16 21+17 22+16	22+16 23+16	22+16 23+15 22+15	22+15 23+15	23+17 23+18	23+18 23+17
Gill rakers	8, 9	(8)9-11(12)	8-10	8-10	(15)16-18	(11)12-14(15)
Teeth	5-5	5-5	5-5	5-5	6-5	6-5

Total number of vertebrae (examined in 46 specimens) 40 (63%) or 41 (36%) (39 vertebrae found only in 1 specimen). Number of abdominal vertebrae (including intermediate ones; pre-caudal vertebrae auctorum) 22 (39%) or 23 (61%). Number of predorsal vertebrae (anterior to first dorsal pterygiophore) 12 (12%) or 13 (87%) (14 found only in 1 specimen). Number of caudal vertebrae, including the last complex one, 17 (35%), 18 (60%) or 19 (5%). Vertebral formula 23+17 (33%), 23+18 (28%), 22+18 (30%), rarely 22+19 (6%) or 22+17 (2%).

Alcohol preserved specimens silvery, with darker back and creamy white ventral surface. Dorsal fin markedly dark in its upper part. Other fins pale. No red or orange pigment was registered in freshly caught specimens in the sample from Trichonis Lake.

**Distribution.** Aetolia and Akarnania (= Etoloacarnania) historical provinces in Western Greece: Acheloos River drainage with lakes Ozeiros, Amvrakia, Trichonis, Lyssimachia, which are the remnants of the ancestral Lake Aetoloarkarnia, which covered the Acheloos basin before the end of the Pliocene (Koussouris, unpublished, from Economou et al., 1994). The Louros River drainage is also included in the range (Economidis, 1991; Economidis & Banarescu, 1991) (we did not examine material from this river). The species is introduced in Pamvotis (Jannina) Lake (north from Louros River drainage).

**Etymology.** Named after Panos Economidis.

**Remarks.** The whole complex of *Rutilus* s. str. is clearly divided into two groups based on number of branched rays and number of vertebrae. *R. rutilus* (a large number of groups of populations and up to 13 subspecies of doubtful status), which is distributed in Europe north of Pyr-

eneas and Alps, in Aegean basin east from Pini-os in Greece, former Yugoslavian republic of Macedonia, and European Turkey and in NW Turkey in lakes and rivers of the Black Sea basin and in Sea of Marmara basin south to Bursa, is characterized by 10½-11½ branched rays in the anal fin and commonly 10½ in the dorsal fin. There are sometimes 9½ rays in the latter, but the combination of 9½ dorsal and 9½ anal has been never found. The species has usually 6 teeth on the left side (formula 6-5) and 40-43 total vertebrae. The most common vertebral formulae are 24+17, 23+17, 23+18 and 24+18. All other species of *Rutilus* s. str. distributed south-east of the range of *R. rutilus* have usually 8½-9½ branched rays in both dorsal and anal fins. The new species belongs to this group though differing in the higher vertebral counts. This and other characters distinguishing the *Rutilus* species of the Balkan Peninsula and adjacent areas are summarized in Table 2 (except for *R. prespensis*, because we examined only three small-sized specimens of this species). Besides, *R. panosi* is clearly distinguishable from the close species from central Greece, *R. ylikiensis* (Fig. 2), by the shallower body (24-27% SL vs. 27-31% SL), shallower dorsal fin (19-22% SL vs. 23-26% SL), longer snout (26-32% HL vs. 23-28% HL), smaller eye (horizontal diameter 20-24% HL vs. 26-28% HL), and fewer predorsal vertebrae (commonly 12 vs. 13 in *R. ylikiensis*).

**Comparative material of *Rutilus* s. str.** *R. aula*: NMW 50717 (9; Garda Lake), NMW 50711 (12; Milano), NMW 50722 (3; Lago di Doberdo), NMW 77714 (6; Torrent), PZC uncat. (21; Roggia Storta, N. Italy, coll. E. Miotti, II.2001), PZC uncat. (2; Soca R.), PZC uncat. (31; Bascica R.); *R. basak*: NMW 50723-25 (6 syntypes; Vergoraz, Dalmatia), NMW 49751 (3; Imotski), NMW 49939 (2; Zara), NMW 50666 (8; Imotski), NMW 50699 (11; Karin

- [Carin]), NMW 50778 (8; Metcovic), NMW 50781 (11; Metcovic), NMW 50785 (10; Imotski), NMW 87971 (5; Imotski), PZC uncat. (19; Prolosko Jezero, Imotsko region), PZC uncat. (31; Modro Oko Jezero, Neretva system); *R. caspicus*: ZIN 8651 (2; Kumbashi), ZIN 2900 (2; E. Transcaucasia), ZIN 9143 (2; Karasu R.), ZIN 2872 (2; Baku Bay), ZIN 2899 (3; Eastern Transcaucasia), ZIN 40926 (2; Ural R.), ZIN 41946 (7; Ural R.), ZIN 25724 (50; Caspian Sea at Zhilaya Kosa split); *R. karamani*: NMW 16529-569 (16; Ohrid), NMW 50654 (1; Ohrid), NMW 50663 (3; Ohrid), NMW 50677 (7; Skadar [Scutari]); NMW 50758 (10; Skadar), NMW 90722 (4; Skadar); PZC uncat. (15; Skadar, Virpazar); *R. ohridanus*: NMW 50653 (1; Ohrid), NMW 50688 (4; Skadar), NMW 50689 (3; Skadar), NMW 90722 (7; Skadar); ZMH 1462 (8; Ohrid), PZC uncat. (3; Skadar Lake, Virpazar); *R. prespensis*: NMW 91522 (1; Prespa), PZC uncat. (2; Prespa L.); *R. rubilio*: NMW 49860 (1 syntype, Lago di Nemi), NMW 50772 (1 syntype, Rome), NMW 50728-29 (3; Arno), NMW 50731 (3; Arno), ZIN 38330 (1; Cesia R.), ZIN uncat. (9; central Italy); *R. rutilus*. Eastern Europe: ZIN 1104 (3), ZIN 7196 (4), ZIN 7902 (6), ZIN 10570 (4), ZIN 11249 (9), ZIN 12071 (4), ZIN 20831 (22), ZIN 25945 (18), ZIN 33089 (29), ZIN 34598 (30), ZIN 34599 (12); *R. rutilus*, NW Turkey: NMW 49942 (1), NMW 90218 (10), NMW 90415 (3), NMW 87898 (7), ZMH 1113 (2), ZMH 1115 (9), ZMH 3907 (10), ZMH 3865 (1); *R. rutilus aralensis* Berg, 1916, Aral Sea basin: ZIN 4515 (6), ZIN 9174 (4), ZIN 5661 (3), ZIN 11303 (8), ZIN 13274 (6); *R. rutilus bucharensis* Nikolsky, 1933, Chalka-kol: ZIN 31081 (9), ZIN 31082 (11); *R. rutilus dojranaensis* (Karaman, 1928), Doirani, Koronia, Volvi lakes: NMW 49962 (1), NMW 49964 (3), NMW 49994 (3), NMW 49996 (3), NMW 49997 (2), NMW 49998 (3), NMW 49999 (4), NMW 50606 (4), NMW 50612 (11), NMW 50614 (4), NMW 50615 (13), NMW 50618 (9), NMW 50620 (6); *R. rutilus* aff. *dojranaensis*, Larissa: NMW 49936 (2), NMW 49967 (7); *R. rutilus heckelii* (Nordmann, 1840), Black Sea: ZIN 3020 (3), ZIN 3007 (3), ZIN 25810 (3); *R. rutilus lacustris* (Pallas, 1814), Ob' R.: ZIN uncat. (35); *R. rutilus mariza* Drensky, 1926, Maritza R.: NMW 8352-55 (4), NMW 8446-60 (14); *R. rutilus schelkovnikovi* Derzhavin, 1926, Kura R. system in Armenia: ZIN 37510 (7), ZIN 38805 (5); *R. rutilus uzbekicus* Berg, 1932, Top'yatan Lake: ZIN 25782 (57); *R. ylikensis*: ZIN 53754 (21; SL 82.2-99.7 mm; Yliki L.).
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