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NEW EXTINCT CARP FISH SPECIES (TELEOSTEI, CYPRINIDAE) FROM THE LATE NEOGENE OF SOUTHEASTERN EUROPE

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New Extinct Carp Fish Species (Teleostei, Cyprinidae) from the Late Neogene of Southeastern Europe. Kovalchuk, O. M. — A new extinct carp fish taxa from the Upper Neogene strata of Southeastern Europe are described in the paper. *Rutilus robustus* Kovalchuk, sp. n. from the Early Pliocene of Priozernoe (Republic of Moldova) differs from other species of the *Rutilus* genus by the massive high ceratobranchiale, long anterior non-dentiferous process, and also thick bulkheads between the septum on cavernous surface. *Scardinius ponticus* Kovalchuk, sp. n. from the Late Miocene of Odesa Pontian Lectostratotype (Ukraine) is characterized by the enormous pharyngeal teeth, and the enlarged number of cogs at their external grinding edge.

Key words: *Rutilus*, *Scardinius*, new species, Priozernoe, Odesa Pontian Lectostratotype, Late Miocene, Early Pliocene, Ukraine, Republic of Moldova.

Новые вымершие виды карповых рыб (Teleostei, Cyprinidae) из позднего неогена юга Восточной Европы. Ковальчук А. Н. — Описаны новые виды вымерших карповых рыб из отложений верхнего неогена юга Восточной Европы. *Rutilus robustus* Kovalchuk, sp. n. из раннего плиоцена Приозерного (Республика Молдова) отличается от других известных видов рода *Rutilus* массивной высокой ceratobranchiale, длинным передним неозубленным отростком, а также широкими перегородками между септами кавернозной поверхности. *Scardinius ponticus* Kovalchuk, sp. n. из позднего миоцена Лектостратотипа понта (Украина) характеризуется большими глоточными зубами и увеличенным количеством зубцов на их внешнем жевательном крае.

Ключевые слова: *Rutilus*, *Scardinius*, новый вид, Приозерное, лектостратотип понта, поздний миоцен, ранний плиоцен, Украина, Республика Молдова.

Introduction

Numerous localities with remnants of the fossil vertebrates, dated by the Late Miocene and Pliocene age, are known on the south of Eastern Europe. Odesa Pontian Lectostratotype (Late Miocene, MN 13) in Ukraine, and Priozernoe (Early Pliocene, MN 15) in the Republic of Moldova yielded a rich and various carp fish fauna. Some of these fishes were found to be different from the known extinct and recent taxa. Thus, they are described here as a new species.

Odesa Pontian Lectostratotype (= 16th Station of Bol'shoy Fontan) was discovered at the end of 1980s on the territory of Odesa, Ukraine (fig. 1). Several papers have focused on different groups of vertebrates, especially small mammals, from this locality (Topachevsky et al., 1988; Nesin, Storch, 2004; Rzebik-Kowalska, Nesin, 2010; Nesin, 2013). Bonyferous layer may be lithologically interpreted as a part of the river avandelta. Priozernoe locality is situated near the settlement of the same name, 20 km south-eastwards of Tiraspol, Republic of Moldova (fig. 1). It represents a sand pit on the high fluvial terrace of Dniester River. Priozernoe is the southernmost among the localities found in the Dniester River valley predominantly involving fossils belonging to the Kuchurgan faunal complex, which corresponds to the Early Pliocene (Chepalyga et al., 2011; Baryshnikov, Zakharov, 2013). The faunal list of Priozernoe comprises near 40 taxa of vertebrates (Zakharov, 2012; Zakharov, Redkozubov, 2012).

The present paper is based on the study of the bony fish remnants from Odesa Pontian Lectostratotype and Priozernoe localities. Description of two new fossil cyprinid taxa, belonging to *Rutilus* and *Scardinius* genera, with remarks on the formation of freshwater fish fauna in the Southeastern Europe during the final stage of the Late Miocene and Early Pliocene is in this paper.



Fig. 1. Type localities: Odesa Pontian Lectostratotype (Ukraine), Priozernoe (Republic of Moldova).

Рис. 1. Типовые местонахождения: лектостратотип понта (Украина), Приозёрное (Республика Молдова).

Material and methods

The material under study is represented by disarticulated bones. These items are housed in the Geological and Paleontological Museum of the Transnistrian State University, Republic of Moldova (collection N Prz 10–1), and also in the Paleontological Museum of the National Museum of Natural History (NMNH–P), National Academy of Sciences of Ukraine (collection N 41).

Determination of the remnants was provided by the author using diagnostic features. Recent fish bones, deposited in the NMNH–P, Zoological Museum (NMNH NAS of Ukraine), Schmalhausen Institute of Zoology, NAS of Ukraine, as well as subfossil fish remnants from archaeological sites of Ukraine were used for comparison. Ichthyologic systematics follows Movchan (2011), correlation of the Eastern Paratethys stages with European Mammal Neogene Zones — Nesin and Nadachowski (2001).

The specimens were measured with aid of a binocular microscope with an ocular micrometer. All measurements are given in millimeters with 0.01 mm precision. The following measurements were taken: DPC — diameter of the porus canalis, H crbh — height of ceratobranchiale, HPT — pharyngeal tooth height, L crbh — length of ceratobranchiale, LDS — length of the dentiferous surface, W crbh — width of ceratobranchiale, WPT — pharyngeal tooth width R — range, M — mean. Pharyngeal tooth terminology follows Rutte (1962), bone terminology — Sytchevskaya (1989) and Lepiksaar (1994). Drawings were prepared on stereomicroscope Wild M3C with mirror tube Wild TYP 308700.

Roach and Rudd remnants from the Late Miocene of Ukraine and the Early Pliocene of Moldova were found to be different from other species of the *Rutilus* and *Scardinius* genera in a number of characters and described here as new fossil taxa. Description of the new taxa was carried out on the principles of International Codex of Zoological Nomenclature (International..., 2003).

CYPRINIDAE Fleming, 1822

Rutilus Rafinesque, 1820

Genus *Rutilus* Rafinesque, 1820 includes 17 recent species (FishBase, 2014), three of which are found in the water bodies of Ukraine and Moldova (Movchan, 2011). The earliest members of the genus are known from the Oligocene of Mongolia (Sytchevskaya, 1989) and Spain (Cabrera, Gaudant, 1985). According to the molecular data, these fishes colonized the Europe near 35 mya (Ketmaier et al., 2008). Several Roach species were described from the Miocene and Pliocene strata of Europe and Asia: *Rutilus pachecri* (Gaudant, 1984), *Rutilus tungurukensis* (Sytchevskaya, 1989), *Rutilus oswaldi* (Bogachev, 1938), and also numerous

remnants of *Rutilus cf. rutilus*, *Rutilus cf. frisii*, *Rutilus* sp. (Böhme, Ilg, 2003). It is safe to say, that five species of the *Rutilus* genus have been identified in the Late Miocene and Early Pliocene of Ukraine and Moldova. Here we describe a new fossil Roach, which seems to be close to the *Rutilus frisii* (Nordmann, 1840).

***Rutilus robustus* Kovalchuk, sp. n.**

Type specimen. The holotype (fig. 2) is a complete right pharyngeal bone with one preserved tooth (Prz 10-1/12). It is deposited in the Geological and Paleontological Museum of the Transnistrian State University (Republic of Moldova).

Type locality. Priozerno (46°48.13' N, 29°55.39' E), Slobozia District, Trans-Dniester Region, Republic of Moldova.

Geological age. Early Pliocene, late Ruscinian, MN 15.

Additional material. Fragment of the right pharyngeal bone (NMNH-P 41/2342), Odesa Pontian Lectostratotype (46°28.18' N, 30°42.37' E), Odesa Region, Ukraine.

Diagnosis. New fossil *Rutilus* species is characterized by the massive high ceratobranchiale, long anterior non-dentiferous process, and also thick bulkheads between the septum on cavernous surface.

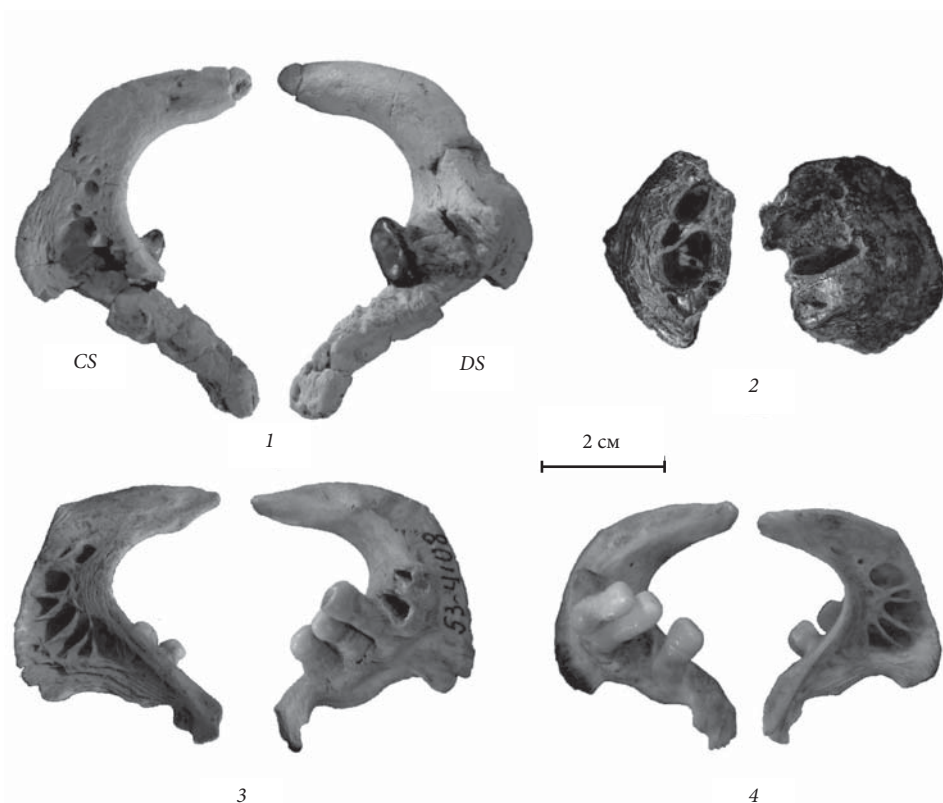


Fig. 2. Pharyngeal bones: 1 — *Rutilus robustus* sp. n., holotype (Prz 10-1/12, Priozerno); 2 — *Rutilus robustus* sp. n., fragment of ceratobranchiale (NMNH-P 41/2342, Odesa Pontian Lectostratotype); 3 — *Rutilus frisii*, subfossil (NMNH-P 53/4108, Vinogradnyi Sad); 4 — *Rutilus frisii*, recent. CS — cavernous surface; DS — dentiferous surface.

Рис. 2. Глоточные кости: 1 — *Rutilus robustus* sp. n., голотип (Prz 10-1/12, Приозёрное); 2 — *Rutilus robustus* sp. n., фрагмент ceratobranchiale (NMNH-P 41/2342, лектостратотип понта); 3 — *Rutilus frisii*, subfossil (NMNH-P 53/4108, Виноградный Сад); 4 — *Rutilus frisii*, современный. CS — кавернозная поверхность; DS — озубленная поверхность.

Description and comparison. Pharyngeal bone is broad and massive. Anterior, laterally bent non-dentiferous process is relatively long; its length exceeds the height of the front pharyngeal tooth. Ventral edge is straight to the front angle, whose value is about 95°. Ventral edge forms a flattened ledge at the anterior angle. Curved posterior edge of ceratobranchiale rises to the clear-expressed posterior angle (140°). The length of pharyngeal bone from Priozerne is 62.0 mm, restored L crbh of the item from Odesa Pontian Lectostratotype ~50 mm. Dorsal non-dentiferous branch bends anterodorsally and medially from the posterior angle. Dentiferous surface is a little bit shorter than the posterior non-dentiferous process (LDS ~32.7–34.1 mm), which is almost three times longer than the anterior one. Dentition consists of approximately 5 teeth, one of which is preserved. Wide cavernous surface has three large and one small septum (cavities) with the thick bulkheads between them. Pharyngeal tooth is massive and laterally compressed, has broad flattened pedicle with clear contraction at the neck. Arched tooth back gradually rises to top without the hook. Elongated grinding surface is smooth and convex, slightly canted to a rounded tooth belly. Height of the tooth is 7.3 mm, width of the crown — 10.2 mm. Porus canalis at the basis of pharyngeal teeth is clearly visible. Recovered fish body length is near 60 cm.

Measurements of the holotype, additional material and its comparison with related bones of the close species are shown at the table 1, pictures — at the figure 2. *Rutilus robustus* sp. n. as compared to all other known *Rutilus* species is clearly bigger. A new fossil taxon is characterized by the massive ceratobranchiale with a large anterior angle of the ventral edge, longer dentiferous surface, larger diameter of the porus canalis, and also thickened bulkheads between the septum on the cavernous surface. A general morphological similarity to the remnants of this species to *Rutilus frisii* (Nordmann, 1840) may indicate the presence of close phylogenetic relationship among them.

E t y m o l o g y. The specific name is a Latin derivation and reflects the diagnostic criteria — robustness and large size of the pharyngeal bone.

D i s t r i b u t i o n. Late Miocene of Southern Ukraine and Early Pliocene of the Republic of Moldova.

Table 1. Measurements of pharyngeal bones of the *Rutilus robustus* sp. n., subfossil and recent representatives of *Rutilus frisii* and *Rutilus rutilus*

Т а б л и ц а 1. Промеры глоточных костей *Rutilus robustus* sp. n., субфоссильных и рецентных представителей *Rutilus frisii* и *Rutilus rutilus*

n	L crbh, mm		W crbh, mm		H crbh, mm		LDS, mm	
	R	M	R	M	R	M	R	M
<i>Rutilus robustus</i> sp. n. (Priozerne), holotype								
1	–	62.0	–	21.7	–	12.0	–	34.1
<i>Rutilus robustus</i> sp. n. (Odessa Pontian Lectostratotype)								
1	–	59.2	–	20.7	–	13.5	–	32.7
<i>Rutilus frisii</i> (Vinogradnyi Sad), subfossil								
12	41.2–50.1	49.1	14.3–17.0	15.7	7.4–10.5	8.5	21.4–30.7	29.6
<i>Rutilus frisii</i> (Sokol'tsy), subfossil								
3	43.2–49.8	45.8	13.4–15.3	14.2	7.4–8.7	8.0	26.4–29.9	27.7
<i>Rutilus frisii</i> , recent								
3	36.3–43.6	40.5	13.0–16.6	14.2	5.6–9.8	7.6	21.8–25.1	23.7
<i>Rutilus rutilus</i> , recent								
10	10.6–20.6	16.3	2.9–14.4	5.1	1.3–8.2	2.8	5.3–18.8	9.2

Table 2. Measurements of isolated pharyngeal teeth of the *Scardinius ponticus* sp. n. and other representatives of the *Scardinius* genus from the Late Miocene strata of Southern UkraineТаблица 2. Промеры изолированных глоточных зубов *Scardinius ponticus* sp. n. и других представителей рода *Scardinius* из отложений позднего миоцена юга Украины

Locality	n	HPT, mm		WPT, mm	
		R	M	R	M
<i>Scardinius ponticus</i> sp. n.					
Odesa Pontian Lectostratotype	52	11.4–15.0	13.1	5.1–6.3	5.6
<i>Scardinius haueri</i> (Münster, 1842)					
Mikhailovka on Bug 1	48	2.4–5.9	4.1	1.2–2.8	1.9
Mikhailovka on Bug 2	34	2.6–6.2	4.4	1.7–3.4	2.2
Otradovo	22	2.2–5.7	3.4	1.1–2.2	1.4
<i>Scardinius erythrophthalmus</i> (Linnaeus, 1758)					
Popovo 3	384	2.4–5.8	3.3	1.2–2.1	1.5
Frunzovka 2	16	2.9–7.6	4.2	0.8–2.6	1.5
Palievo	33	2.1–4.4	3.2	0.8–2.0	1.4
Lysa Gora 2	87	2.4–8.2	4.8	1.2–3.6	2.3
Kubanka 2	10	2.4–4.2	3.5	1.4–1.6	1.5
Novoelizavetovka 2	19	2.8–4.6	3.6	1.2–2.0	1.6
Cherevichne 3	15	2.5–5.8	3.6	1.1–2.6	1.5
Tretya Krucha	4	2.6–4.2	3.3	1.1–1.6	1.4
Vasyliivka 1	30	3.1–7.8	4.7	1.5–2.9	2.1
Verkhnya Krynitza 2	279	3.7–12.0	6.9	1.5–3.6	2.4
Novoelizavetovka 3	7	2.0–4.2	3.1	0.9–1.7	1.3
Egorovka 1	10	2.9–6.2	4.0	1.1–2.8	2.0
Novoukrainka 1	21	2.8–6.1	3.9	1.0–2.7	1.9
<i>Scardinius</i> cf. <i>erythrophthalmus</i> (Linnaeus, 1758)					
Cherevichne 3	7	1.6–4.6	3.0	1.2–2.4	1.7
Protopopovka 3	4	2.6–4.0	3.6	1.2–1.5	1.3
Egorovka 2	203	2.9–5.2	4.0	1.1–2.8	2.0
Andreevka	2	2.6–4.4	–	1.0–2.1	–
Orekhovka	2	2.4–3.8	–	0.8–1.4	–
Vinogradovka 1	11	2.7–3.6	3.3	1.0–1.3	1.2
<i>Scardinius</i> sp.					
Popovo 3	4	3.8–6.8	4.8	1.7–2.2	1.9
Frunzovka 2	2	3.7–5.3	–	1.3–2.2	–
Kubanka 2	7	3.3–4.4	3.9	1.2–1.5	1.3
Novoukrainka 1	8	2.2–4.6	3.6	0.6–1.6	1.2
Odesa Pontian Lectostratotype	7	3.3–4.2	3.8	1.5–2.2	1.8

***Scardinius* Bonaparte, 1837**

Genus *Scardinius* Bonaparte, 1837 consists of 10 extant taxa (FishBase, 2014; Ketmaier et al., 2004), including one species from the territory of Ukraine (Movchan, 2011). The Rudd remnants were firstly appeared in the fossil record in the Middle Miocene — *Scardinius tchuensis* Sytchevskaya, 1989 from the Tueryk locality in Russia (Sytchevskaya, 1989), *Scardinius* sp. from the Baghmisheh-Marzadaran in Iran (Reichenbacher et al., 2011), and also *Scardinius* cf. sp. from Unggeried in Germany and Mataschen, Steiermark in Austria (Böhme, 2003; Schultz, 2004). Besides, three extinct Rudd species (*Scardinius haueri* (Münster, 1842), *Scardinius prolixus* Schtylko, 1934, and *Scardinius longipinnus* Sytchevskaya, 1989) were described from the Late Miocene strata of Europe and Asia

(Münster, 1842; Schtylko, 1934; Sytchevskaya, 1989). It should be noted, that five taxa of the *Scardinius* genus were identified in the Late Miocene of Southern Ukraine. One of them is described here as a new species.

***Scardinius ponticus* Kovalchuk, sp. n.**

Type specimen. The holotype (fig. 3) is an isolated right pharyngeal tooth (NMNH-P 41/2358), paratype — pharyngeal tooth (NMNH-P 41/2359). These items are deposited in the Department of Vertebrate Paleozoology and Paleontological Museum, National Museum of the Natural History (NMNH), National Academy of Sciences of Ukraine (Kyiv).

Referred material. Besides the type specimens, there are 50 isolated pharyngeal teeth (NMNH-P 41/2360–2409), belonging to the new species, in the collection from Odesa Pontian Lectostratotype.

Type locality. Odesa Pontian Lectostratotype (= 16th Station of Bol'shoy Fontan), Odesa Region, Southern Ukraine.

Geological age. Late Miocene, lower Pontian, Late Turolian, MN 13.

Diagnosis. New *Scardinius* species is characterized by enormous pharyngeal teeth, and enlarged number of cogs at their external grinding edge.

Description and comparison. Pharyngeal teeth have high, laterally compressed crowns. There is a clearly expressed wide belt-shaped contraction at the tooth neck. Curved tooth back rises to the top, expanding in the low convex hook, which is separated by the distinct furrow from the grinding edge. Grinding surface is relatively long, strongly flattened and almost parallel to the tooth back. The anterior grinding edge is sculpted by the 7–8 single convex cushion-shaped cogs, posterior edge is lined, with oblique hatching. Keel belly is laterally compressed and folded to the neck. Wide tooth pedicle is cylindrical in the

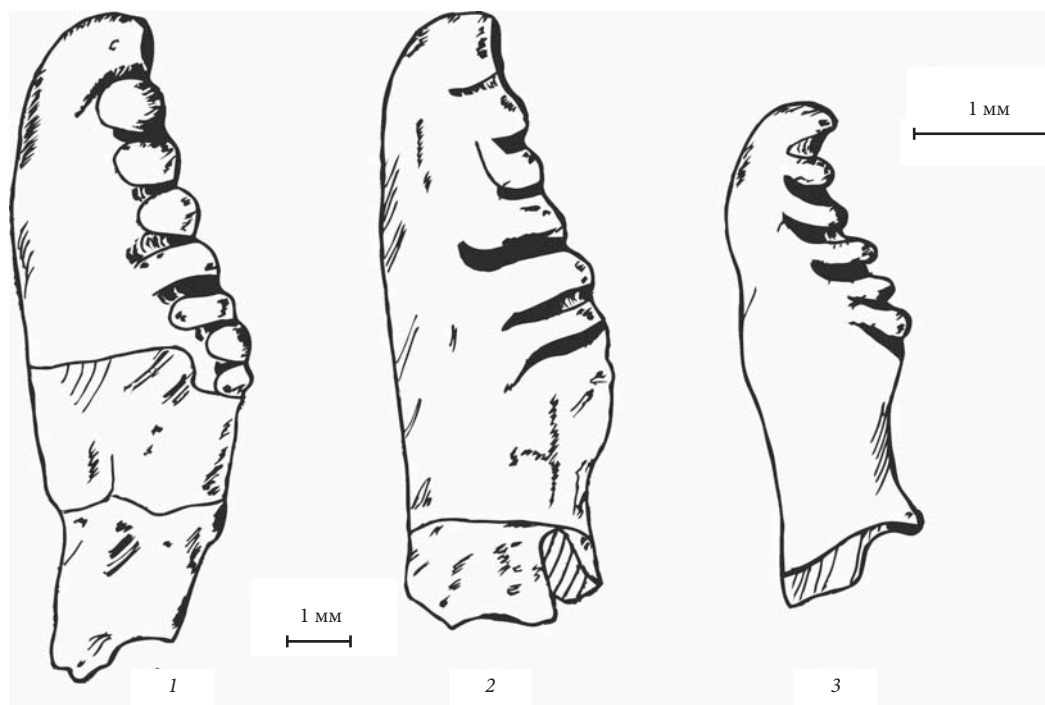


Fig. 3. *Scardinius ponticus* sp. n.: 1 — isolated pharyngeal tooth, holotype (NMNH-P 41/2358, Odesa Pontian Lectostratotype); 2 — paratype (NMNH-P 41/2359). *Scardinius erythrophthalmus*, recent (used for comparison).

Рис. 3. *Scardinius ponticus* sp. n.: 1 — изолированный глоточный зуб, голотип (NMNH-P 41/2358, лектостратотип понта); 2 — паратип (NMNH-P 41/2359). *Scardinius erythrophthalmus*, современный (использован для сравнения).

cross-section and narrowed to the crown base. Measurements of the type series and other representatives of the *Scardinius* genus from the numerous Late Miocene localities on the territory of Southern Ukraine are presented at the table 2. Height of their pharyngeal teeth is 11.4–15.0 mm (mean 13.1 mm), width of crowns — from 5.1 to 6.3 mm (mean 5.6 mm). Recovered fish body length is about 65–70 cm.

A new species, as compared with other *Scardinius* taxa, is characterized by the enormous pharyngeal tooth size, eight cogs at the grinding edge, and also the presence of belt-shaped contraction at the tooth neck. They are comparable in size to the pharyngeal teeth of *Scardinius tshuensis*, but have with a longer crown and a smaller number of cogs. Described pharyngeal teeth differ from those in the extant *Scardinius erythrophthalmus* by the presence of eight cogs at the external grinding edge and well-developed hatching at the posterior occlusal plate. Pharyngeal teeth of the *Scardinius ponticus* sp. nov. are similar to those in *Scardinius* cf. *erythrophthalmus* from the Late Miocene strata of southern Ukraine by the presence of weakly developed hook, but differ from them by the more sloped grinding surface. Representatives of the new species as compared to *Scardinius haueri*, are characterized by a wider pharyngeal tooth pedicle, and also less developed keel at the belly.

Etymology. The specific name is a Latin derivation and reflects the stratigraphic position (geological age of the corresponding alluvial layer).

Distribution. Currently, information about the geographical distribution of *Scardinius ponticus* sp. n. is limited by the type locality. According to the high similarity of taxonomic lists, it can be assumed the opportunity to find the remnants of this species in the Late Miocene strata of Moldova.

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