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## *Elia novorossica* (Stylommatophora, Clausiliidae) in Ukraine: description, habitats, conservation status, concomitant terrestrial molluscs

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I. BALASHOV

I.I. Schmalhausen Institute of Zoology, National Academy of Sciences of Ukraine,  
B. Khmelnytsky str., 15, Kyiv-30, MSP, 01601, Ukraine. E-mail: igor\_balashov@ukr.net  
urn:lsid:zoobank.org:pub:8430D3F3-4F99-42AD-84D6-EB38B2711C5C

**ABSTRACT.** A detailed description of the shell and reproductive system of *Elia novorossica* is given and illustrated. The populations of this species on the Donetsk Upland in Ukraine are established as a new subspecies – *E. novorossica nagolnica* subsp. nov. Distribution and habitats of this subspecies are described. Three populations of *E. novorossica* are currently known on Donetsk Upland, one of which is discovered for the first time. All these populations inhabit oak forests along the small rivers in the basin of the Nagolna river, in the highest part of upland. A conservation status of *E. novorossica* in Ukraine is considered as critically endangered. Species composition of terrestrial molluscs in the locations of *E. novorossica* and on adjacent territories is adduced.

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*Elia (Caucasica) novorossica* (Retowski, 1888) is a species of Mentissoideinae [Nordsieck, 2005; Sysoev, Schileyko, 2009]. Till last years this species was known only from the type locality and adjacent territories on the north-western coastal foothills of Caucasus Mountains in the vicinities of Novorossiysk city in Russia [Retowski, 1888; Likharev, Rammelmeyer, 1952; Likharev, 1962; Sysoev, Schileyko, 2009]. A detailed shell description of *E. novorossica* was provided by Likharev [1962], but anatomy and habitats of this species were not described. In October of 2008 *E. novorossica* was found in two close locations on the Donetsk Upland in eastern Ukraine at the distance of 400 km from the type locality [Gural-Sverlova, Martynov, 2009]. Collected shells were described and illustrated, however anatomy was still not investigated and habitats of this species were poorly described (“flood-plain forest”).

Donetsk Upland is located on the steppe zone of East European Plain in the Donetsk and Lugansk regions of Ukraine and in the Rostov region of Russia. It extends about 300 km from west to east and 50-100 km from south to north. Donetsk Upland rises above surrounding lowlands to more than 100 m, with maximum height of 367 m above sea level. It is the highest point in the radius of 400 km

(nearest higher point is in Caucasus Mountains). Therefore on the Donetsk Upland mean temperature ( $-7^{\circ}\text{C}$  in January and  $+22^{\circ}\text{C}$  in July) is little lower and yearly average rainfall (about 600 mm) is little higher than on the surrounding lowlands [Burda, 1991]. Primarily landscape of Donetsk Upland was formed by the steppes on upland watershed and by the oak and alder forests in the valleys and ravines. However, this region is rich in minerals and has one of the most developed industries in the world, as a result its natural habitats are extremely constricted and transformed. On the Donetsk Upland percent of the natural associations is no more than 13% [Burda, 1991]. The surface of Donetsk Upland is deeply (down to 200 m) indented by the valleys and ravines, which provide diversity of the habitation conditions. On the territory of Donetsk Upland many interesting locations of not typical for the East European Plain plants were found. Main ranges of many of these plants are located in Caucasus and Crimea. Moreover, there are 10 endemic and 41 subendemic plant species on the Donetsk Upland [Burda, 1991]. Most of these East-Mediterranean and endemic plant species are considered as relics of Pliocene and Miocene [Burda, 1991]. Somewhat similar situation is known for the insects of Donetsk Upland – several endemics are present, many species are not typical for East European Plain, occur mostly in Caucasus, Crimea, Asia Minor and (or) Balkans and suggested as relics of Pliocene [Medvedev, 1957].

The species composition of terrestrial molluscs on the Donetsk Upland till last several years was not described at all. First information was presented by Gural-Sverlova and co-authors [Sverlova *et al.*, 2006; Gural-Sverlova *et al.*, 2009; Gural-Sverlova, Martynov, 2009, 2010; Gural-Sverlova, 2010 *et al.*; Balashov, Gural-Sverlova, 2012]. Species composition of terrestrial molluscs on the Donetsk Upland is proved to be much higher than in the other parts of steppe zone in East European Plain and more similar to northern forest-steppe zone. Moreover, some subendemics of Caucasus were found here. Such species as *E. novorossica*, *Boettgerilla pallens* Sim-

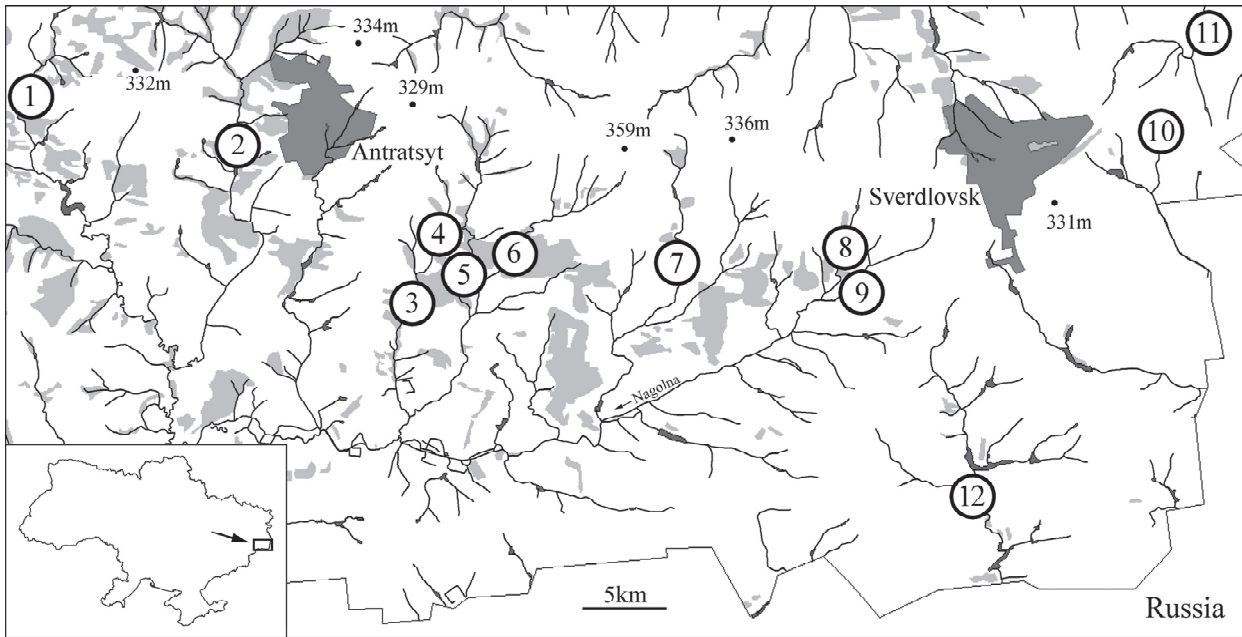


FIG. 1. Collecting cites. 1-12 – see “Materials and methods”. Light-grey spots on the map – forests.

РІС. 1. Пункты сбора. 1-12 см. “Materials and methods”. Светло-серые пятна на карте – леса.

roth, 1912, *Deroceras subagreste* (Simroth, 1892) and *Deroceras caucasicum* (Simroth, 1901) were suggested as probably native ones [Gural-Sverlova, Martynov, 2009; Gural-Sverlova *et al.*, 2009]. *Gibbulinopsis interrupta* (Reinhardt, 1876) and *Harmozica ravergiensis* (Férussac, 1835) may be native or invasive [Sverlova *et al.*, 2006; Gural-Sverlova, Martynov, 2010]. *Krynickillus melanocephalus* Kaleniczenko, 1851 is probably invasive species here [Gural-Sverlova *et al.*, 2009]. Moreover, three species of *Helicopsis* from the Donetsk Upland and its north vicinities were described as new for science [Gural-Sverlova, 2010].

## Material and methods

Material is stored in the collections of terrestrial molluscs of I.I. Schmalhausen Institute of Zoology of National Academy of Sciences of Ukraine (Kyiv, further in text – IZ) and State Natural History Museum of National Academy of Sciences of Ukraine (Lviv, further in text – SNHM).

Collecting cites (all in the Lugansk region of Ukraine): **1** – Antratsyt district, vicinities of Hrustalne urban type settlement (further in text u.t.s.), valley of Hrustalna River, flood-plain forest (24.10.2008, leg. Martynov V.V., det. Gural-Sverlova N.V.); **2** – Antratsyt district, vicinities of Bokovo-Platovo u.t.s., ravine forest (24.10.2008, leg. Martynov V.V., det. Gural-Sverlova N.V.); **3** – Antratsyt district, between Orekhove and Djakove villages, along Orekhova River, maple-poplar forest and adjacent steppe, 110-180 m, from 48°2'10"N, 39°9'35"E to 47°59'30"N, 39°8'10"E (02-03.06.2011, leg. et det. Balashov I.); **4** – Antratsyt district, north vicinities of Orekhove village, oak-maple forest along Orekhova River, 150-180 m, about 48°2'55"N, 39°10'45"E (24.10.2008, leg. Martynov V.V., det. Gural-Sverlova N.V.

and 26.04.2012, leg. et det. Balashov I.); **5** – Antratsyt district, between Orekhove and Vyshneve villages, along Juskina river, maple-oak forest and adjacent steppe, 110-190 m, from 48°0'60"N, 39°11'50"E to 48°2'55"N, 39°12'25"E (04-05.06.2011, leg. et det. Balashov I.); **6** – Antratsyt district, north vicinities of Vyshnevoe village, along Vyshnevetska River, oak-maple forest and adjacent steppe, 120-200 m, from 48°1'58"N, 39°13'30"E to 48°2'35"N, 39°14'50"E (24.10.2008, leg. Martynov V.V., det. Gural-Sverlova N.V. and 06.06.2011, leg. et det. Balashov I.); **7** – Antratsyt district, north vicinities of Uljanivka village, along Rovenjok River, oak-maple forest, 150-170 m, 48°1'10"N, 39°22'40"E (25.04.2012, leg. et det. Balashov I.); **8** – Sverdlovsk district, vicinities of Nagolno-Tarasivka u.t.s. and Kyselovo village, along right tributary of Nagolna River, oak-poplar forest and adjacent steppe, 180-200 m, from 48°1'24"N, 39°30'33"E to 48°0'42"N, 39°30'35"E (17-18.04.2010, leg. et det. Balashov I.); **9** – Sverdlovsk district, vicinities of Nagolno-Tarasivka u.t.s. and Berezovka village, along Nagolna River, oak-poplar forest and adjacent meadows and steppe, 170-230 m, from 48°0'32"N, 39°31'25"E to 48°0'31"N, 39°31'12"E (16-18.04.2010, leg. et det. Balashov I.); **10** – Sverdlovsk district, vicinities of Chervonopartizansk city, ravine forest (25.10.2008, leg. Martynov V.V., det. Gural-Sverlova N.V.); **11** – Sverdlovsk district, vicinities of Provallya village, “Provalskyj step” Nature Reserve, maple-ash forests in ravines and valleys, steppe (most species – 31.05-03.06.2004, leg. Baidashnikov A.A., det. Balashov I.; *Deroceras sturanyi* (Simroth, 1894) – 25.10.2008, leg. Martynov V.V., det. Gural-Sverlova N.V.); **12** – Sverdlovsk district, vicinities of Daryino-Ermakovka u.t.s., flood-plain forest (25.10.2008, leg. Martynov V.V., det. Gural-Sverlova N.V.).

## Results and discussion

During this investigation known locations of *E. novorossica* and some other comparable habitats in region were studied (Fig. 1, Table 1). *E. novorossi-*

Table 1. Terrestrial molluscs of the south-eastern Donetsk Upland.

Табл. 1. Наземные моллюски юго-востока Донецкой возвышенности.

Species \ Locations	Location 1*	Location 2	Location 3	Location 4	Location 5	Location 6	Location 7	Location 8	Location 9	Location 10	Location 11	Location 12
<i>Carychium minimum</i> O.F. Müller, 1774	-	-	-	+	-	-	-	-	-	-	-	-
<i>Cochlicopa lubricella</i> (Porro, 1838)	+	-	+	+	+	+	+	+	+	+	+	-
<i>Cochlicopa lubrica</i> (O.F. Müller, 1774)	-	-	+	-	+	-	+	+	+	+	+	+
<i>Cochlicopa nitens</i> (Gallenstein, 1848)	-	-	-	-	-	-	-	+	-	-	-	-
<i>Vallonia pulchella</i> (O.F. Müller, 1774)	-	-	+	+	+	+	-	-	+	-	+	-
<i>Vallonia excentrica</i> Sterki, 1893	-	-	-	-	-	-	-	+	+	-	-	-
<i>Vallonia costata</i> (O.F. Müller, 1774)	-	+	+	+	+	+	+	+	+	+	+	-
<i>Pupilla triplicata</i> (Studer, 1820)	-	-	-	-	-	-	-	+	+	+	+	-
<i>Vertigo pusilla</i> O.F. Müller, 1774	-	-	-	-	-	+	-	+	-	-	+	-
<i>Vertigo antivertigo</i> (Draparnaud, 1801)	-	-	-	-	-	-	-	-	+	-	-	-
<i>Vertigo pygmaea</i> (Draparnaud, 1801)	-	-	-	+	-	-	-	-	+	-	+	-
<i>Vertigo angustior</i> Jeffreys, 1830	-	-	-	-	-	+	-	-	-	-	-	-
<i>Truncatellina cylindrica</i> (Férussac, 1807)	-	-	-	-	-	-	-	+	+	-	+	-
<i>Truncatellina costulata</i> (Nilsson, 1823)	-	-	-	+	-	+	+	-	-	-	+	-
<i>Chondrula tridens</i> (O.F. Müller, 1774)	-	-	+	+	+	+	-	+	+	-	+	-
<i>Cochlodina laminata</i> (Montagu, 1803)	+	-	-	-	+	+	-	-	-	-	-	-
<b><i>Elia novorossica</i></b> (Retowski, 1888)	-	-	-	+	-	+	+	-	-	-	-	-
<i>Discus rudersatus</i> (Férussac, 1821)	+	+	-	+	+	+	+	+	-	-	-	-
<i>Punctum pygmaeum</i> (Draparnaud, 1801)	-	-	-	+	-	+	+	+	-	-	+	-
<i>Aegopinella minor</i> (Stabile, 1864)	+	-	+	+	+	+	+	+	+	-	+	-
<i>Perpolita hammonis</i> (Ström, 1765)	-	-	-	+	+	-	-	+	-	-	+	-
<i>Zonitoides nitidus</i> (O.F. Müller, 1774)	-	+	+	+	+	+	+	+	+	-	+	+
<i>Vitrina pellucida</i> (O.F. Müller, 1774)	+	+	+	+	+	+	+	+	+	+	+	+
<i>Euconulus fulvus</i> (O.F. Müller, 1774)	-	-	-	+	+	+	-	+	+	-	+	-
<i>Boettgerilla pallens</i> Simroth, 1912	-	-	-	-	-	+	-	-	-	-	-	-
<i>Limacus maculatus</i> (Kaleniczenko, 1851)	-	-	-	-	-	+	-	-	-	-	-	-
<i>Deroceras reticulatum</i> (O.F. Müller, 1774)	-	-	+	+	+	+	-	-	-	-	-	-
<i>Deroceras subagreste</i> (Simroth, 1892)	-	-	+	+	+	+	-	-	+	-	-	+
<i>Deroceras caucasicum</i> (Simroth, 1901)	+	-	-	-	-	+	-	-	-	-	-	-
<i>Deroceras laeve</i> (O.F. Müller, 1774)	-	-	-	+	+	-	-	-	-	-	-	-
<i>Deroceras sturanyi</i> (Simroth, 1894)	-	-	-	-	-	-	-	-	-	-	+	-
<i>Cepaea vindobonensis</i> (Férussac, 1821)	-	-	-	-	+	-	+	-	-	-	+	-
<i>Helix albescens</i> Rossmässler, 1839	-	-	-	-	-	+	+	-	-	-	-	-
<i>Fruticicola fruticum</i> (O.F. Müller, 1774)	-	-	+	-	+	+	+	-	-	-	+	-
<i>Euomphalia strigella</i> (Draparnaud, 1801)	+	+	+	+	+	+	+	+	+	-	-	-
<i>Pseudotrachia rubiginosa</i> (Rossmässler, 1838)	-	+	-	-	-	-	+	-	+	+	-	+
<i>Arion subfuscus</i> (Draparnaud, 1805)	-	-	-	-	+	-	-	-	-	-	-	-
<i>Succinella oblonga</i> (Draparnaud, 1801)	-	+	+	+	+	+	+	-	+	-	+	+
Number of species	7	7	13	20	20	24	16	17	18	6	20	6

\* – locations 1-12, see “Material and methods” and fig. 1.

ca was reinvestigated in one known locality and the third locality of this species in Ukraine was found for the first time.

In the work by Gural-Sverlova and Martynov [2009] two coordinates for the two points, where *E. novorossica* was found, were indicated. However, for one location coordinates are wrong, it is

signed as “Orekhova River”, but belongs to the neighboring Juskina River. I investigated this point on Juskina River and most part of the forest along this river and forests along Orekhova River in the south vicinities of Orekhove village down to Djakove village in 2011. However, on these territories *E. novorossica* was not found. As recognized later,

material was primarily collected in the north vicinities of Orekhove village on Orekhova River (personal communication of Dr. Martynov). This territory was superficially studied in 2012 during few hours, but the species was not found. In other location, on Vyshnevetka River, *E. novorossica* was found again in 2011. Moreover, third location was found on the neighboring Rovenjok River in 10 km eastward from the Vyshnevetka River in 2012.

Forests along three rivers, where *E. novorossica* was found, seem to be natural as far as possible for this region, where primarily a share of the forests was low and where now most part of the territory is composed by anthropogenic landscapes. In the most part of these three forest plots oak is predominant and its old trees are present. Oak is absent in majority of the remained forests in the region, where secondary maple or poplar is predominate. Moreover, along upper parts of these rivers is very specific "mountains-like" landscape: valleys (or almost ravines) are very deep with steep rocky slopes, rivers have rapids and big rocks are present (sometimes up to about 8 m), which provide specific humid microclimate. It seems that these valleys are ancient refuges and *E. novorossica* should be considered as a native relic here.

Ukrainian populations of *E. novorossica* seem to be totally isolated from Caucasus part of species range. Donetsk Upland and Caucasus are divided by the 400 km of Kubano-Azov Lowland with very homogeneous relief (up to 100 m above sea level). It is unprobable that *E. novorossica* dwells here now or in the nearest past. Probably these populations of *E. novorossica* are relics of Pliocene or even Miocene, as well as some plants, insects and other molluscs of Donetsk Upland (see above). Consequently, the populations of *E. novorossica* in Caucasus and Donetsk Upland are isolated for at least several hundred thousands of years.

Within even most adaptable and widespread species of Clausiliidae numerous subspecies are recognized [Gittenberger, 1967; Nordsieck, 2006, 2008]. Together with some differences in external characters of the shell (see below) it suggests that populations of *E. novorossica* on Donetsk Upland represent a separate subspecies.

Genus *Elia* Adams & Adams, 1855  
Subgenus *Caucasica* Boettger, 1877

*Elia (Caucasica) novorossica*  
(Retowski, 1888)

Retowski, 1888: 765 (*Clausilia (Euxina)*); Likharev, Rammelmeyer, 1952: 239-240, fig. 160 (*Laciniaria (Euxina)*); Likharev, 1962: 188, fig. 112 (*Euxina (Caucasica)*); Sysoev, Schileyko, 2009: 94, fig. 44 E; Gural-Sverlova, Martynov, 2009: 32-33, fig. 1.

**Types.** Lectotype and one paralectotype are in

Institute of Zoology of Polish Academy of Sciences (Warsaw, Poland) [Likharev, 1962].

**Type locality.** Vicinities of Novorossiysk city (Caucasus).

*Elia (Caucasica) novorossica nagolnica*  
subsp. nov.

(Figs. 2, 3, 4, 5)

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**Types.** Holotype and 85 paratypes collected in 2011-2012 are in IZ: №2849 (holotype), №2850 (34 dry paratypes), №2851 (15 not contracted paratypes in 70° alc.), №2852 (5 contracted paratypes in 96° alc.), №2898 (31 dry paratypes from location №7). Specimens collected in 2008 should also be signed as paratypes, this material is in SNHM: №2671 (50 shells) and №2672 (3 shells).

**Type locality.** Valley of Vyshnevetka River, north vicinities of Vyshneve village (Anratsyt district, Lugansk region of Ukraine), about 48°2'25"N, 39°14'40"E.

**Etymology.** From the distribution of this subspecies in the basin of the Nagolna River on the Nagolnyj Ridge.

**Description.** Shell (Fig. 2) is fusiform, somewhat obese, rather thin-walled, slightly translucent, brown, of 11-13 moderately convex whorls. Last whorl with basal keel. Apical part of shell is somewhat rounded. Embryonic whorls (about 2.25) are smooth, their diameter 1.2-1.4 mm. Postembryonic whorls irregularly weakly striated. Aperture oval-piriform, brown inside. Superior lamella high, continuous with spiral lamella, they are fully joined, has no visible conversion. Inferior lamella lying deep in aperture, usually not visible in frontal view. 4 plicae are present (Fig. 3): principal plica, upper palatal plica, middle palatal plica and lower palatal plica. They start on the right part of dorsal side and ending more or less near aperture edge, their ends usually visible in frontal view. Principal plica is always longest from both sides (starts on the same level as the keel), upper palatal plica is little shorter. Lower palatal plica is the shortest. Principal plica and upper palatal plica are almost parallel, however they little diverge to the aperture. Between upper palatal and middle palatal plica there is very clear angle. Lunella is more or less reduced, sometimes almost absent, continuous from the lower palatal plica to middle palatal plica, however joined with the last only in few specimens. In one specimen lunella is passing around middle palatal plica almost to the upper palatal plica, however not joined with both. In some specimens between upper palatal and middle palatal plica very short additional second middle palatal plica is present. In most cases such plica is placed near lunella, however in one specimen it ending on the same level with middle and upper palatal plicae near aperture edge (so there are 5



FIG. 2. Holotype (left) and 2 paratypes of *Elia novorossica nagolnica*.

РИС. 2. Голотип (слева) и 2 паратипа *Elia novorossica nagolnica*.

plicae visible in frontal view). In some specimens middle palatal plica is separated in 2 parts or strongly curved. Clausilium (Fig. 5) is spoon-like, more or less roundly pointed at distal end.

**Dimensions.** Height 15.5-20.2 mm, diameter 4.4,-5.1 mm. Holotype: height 19.1 mm, diameter 5.0 mm.

**Differential diagnosis.** Differs from the nominative subspecies by the next characters: 1) apex of shell (embryonic whorls) is wider – 1.2-1.4 mm (in nominative subspecies – 1.0-1.1 mm); 2) sculpture is weaker; 3) the angle between middle palatal plica and upper palatal plica is much bigger than in nominative subspecies, these plicae are never parallel (even partly); 4) shell is slightly larger, in nominative subspecies height of shell is 12-18.5 mm and diameter 3.8-5.0 mm [Likharev, 1962; Sysoev, Schileyko, 2009]. The first character may be especially important, Likharev [1962] used it to differ *E. novorossica* from the related species of *Elia*.

**[Описание.** Раковина веретеновидная, несколько вздутая, относительно тонкостенная, немного просвечивающая, коричневая, состоит из 11-13 умеренно выпуклых оборотов. Последний оборот с килем. Вершина довольно округлая. Эмбриональные обороты (около 2,25) гладкие, их ширина 1,2-1,4 мм. Постэмбриональные обороты неравномерно слабо исчерчены. Устье овально-грушевидное, внутри коричневое. Верхняя пластинка соединена со спиральной, они полностью слиты, не имеют видимого перехода. Нижняя пластинка глубоко в устье, обычно не видна в прямом положении раковины. Присутствуют глав-

ная, верхняя, средняя и нижняя палатальные складки. Они начинаются на правой части дорсальной стороны раковины и заканчиваются относительно близко к краю устья, их концы обычно видны при прямом положении раковины. Главная складка всегда наиболее длинная с обоих концов (начинается на одном уровне с килем), верхняя палатальная складка немного короче. Нижняя палатальная складка самая короткая. Главная складка и верхняя палатальная складка почти параллельны, но всегда немного расходятся к краю устья. Между верхней и средней палатальными складками имеется довольно большой угол. Полулунная складка в большей или меньшей степени редуцирована, иногда почти отсутствует, продолжается от нижней палатальной складки к средней палатальной складке, но редко соединена с последней. У одного из изученных экземпляров полулунная складка проходит за средней палатальной складкой почти до верхней палатальной складки, но не соединена ни с одной из них. Иногда между верхней палатальной складкой и средней палатальной складкой присутствует очень короткая дополнительная палатальная складка. В большинстве случаев такая складка расположена возле полулунной складки, но у одного из экземпляров она заканчивается на одном уровне с верхней палатальной складкой и средней палатальной складкой возле края устья и через устье видны 5 палатальных складок. Средняя палатальная складка иногда разделена на две части или сильно изогнута. Клаузилий языковидный, в большей или меньшей степени плавно заострен на дистальном конце.

**Дифференциальный диагноз.** Отличается от номинативного подвида следующими признаками: 1) вершина раковины (эмбриональные обороты) шире – 1,2-1,4 мм (у номинативного подвида – 1,0-1,1 мм); 2) Скульптура слабее; 3) угол между средней палатальной складкой и верх-



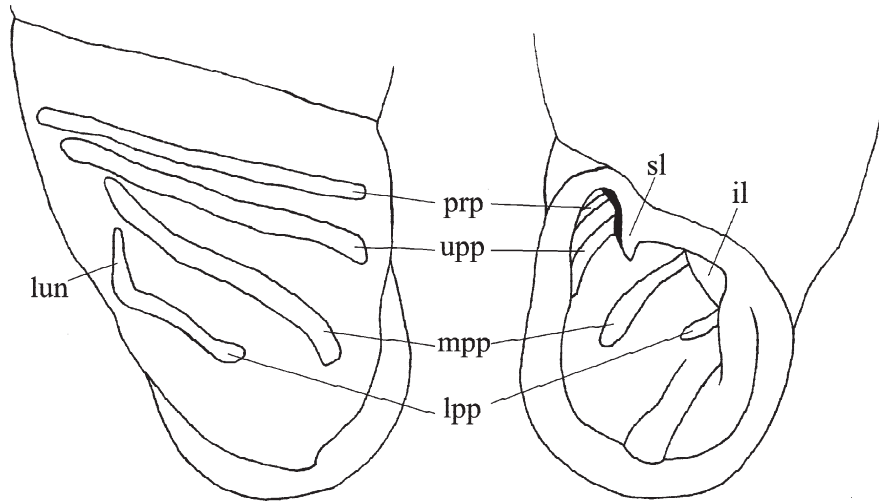


FIG. 3. Position of plicae in holotype of *Elia novorossica nagolnica*: il – inferior lamella; lpp – lower palatal plica; lun – lunella; mpp – middle palatal plica; prp – principal plica; sl – superior lamella; upp – upper palatal plica.

РИС. 3. Положение складок у голотипа *Elia novorossica nagolnica*; il – нижняя пластинка; lpp – нижняя палатальная складка; lun – полулунная складка; mpp – средняя палатальная складка; prp – главная складка; sl – верхняя пластинка; upp – верхняя палатальная складка.



FIG. 4. Clausilium of *Elia novorossica nagolnica* (paratypes).

РИС. 4. Клаузилиум *Elia novorossica nagolnica* (паратипы).

ней палатальной складкой значительно больше, эти складки никогда не близки к тому чтобы быть параллельными, даже частично; 4) раковина немного больше, у номинативного подвида высота 12-18,5 мм, диаметр 3,8-5 мм [Likharev, 1962; Sysoev, Schileyko, 2009]. Первый признак может быть особенно важным, Лихарев [1962] использовал его для отличия *E. novorossica* от близких видов рода *Elia*.]

**Reproductive anatomy** (Fig. 5). Penis is more or less short, its length and shape are variable. Penis-epiphallus junction is not pronounced. Epiphallus is longer than penis. Flagellum of medium length. Penial retractor is large, not splitted, inserted to epiphallus. Vagina is long, about same length and width as epiphallus. Free oviduct 3-5 times shorter than vagina. Bursa copulatrix is very long, much longer than vagina, its reservoir is weakly pronounced.

**Remarks.** Reproductive system seems to be comparable to that of other 2 species of *Caucasica* subgenus, whose reproductive anatomy were de-

scribed – *Elia somchetica* (L. Pfeiffer, 1846) and *Elia tuschetica* (Likharev et Lejava, 1961) [Likharev, 1962; Schileyko, 2000]. Penis-epiphallus junction is also not pronounced in these two species, however it is more or less clearly pronounced in all other subgenera of *Elia* [Nordsieck, 1975; Schileyko, 2000]. Length and shape of penis in *E. somchetica* is probably also quite variable in similar way [Likharev, 1962; Schileyko, 2000]. Vagina in *E. novorossica* is also comparable to those of other *Caucasica* species [Likharev, 1962; Schileyko, 2000] and differs from such in other subgenera of *Elia*, whose female copulatory organs were illustrated: in *Elia (Elia) moesta* (Rossmässler, 1839) and *Elia (Megaleuxina) derasa* (Mousson, 1836) vagina is much thinner than epiphallus [Schileyko, 2000].

**Distribution and habitats.** All 3 localities are in the basin of the Nagolna River on Donetsk Upland (at the distance of 5-15 km from each other): valley of Vyshnevetska River (vicinities of Vyshneve village, about 48°2'25"N, 39°14'40"E), valley of Orekhova River (vicinities of Orekhove village, about 48°2'55"N, 39°10'45"E) and valley of Rovenjok River (vicinities of Uljanivka village, about 48°1'10, 39°22'40"E). These territories are located on the south-eastern slope of Donetsk Upland. The highest part of upland is several kilometers north, the sources of Vyshnevetska and Rovenjok rivers are located in about 1 km from the maximum height of 359 m. Snails were found only in the dead wood no more than several meters from the water in riparian oak-maple forest on the bottoms of deep valleys and ravines (120-170 m above mean sea level). It is notable that snails were not found on the rocks. In addition to Vyshnevetska River itself several snails

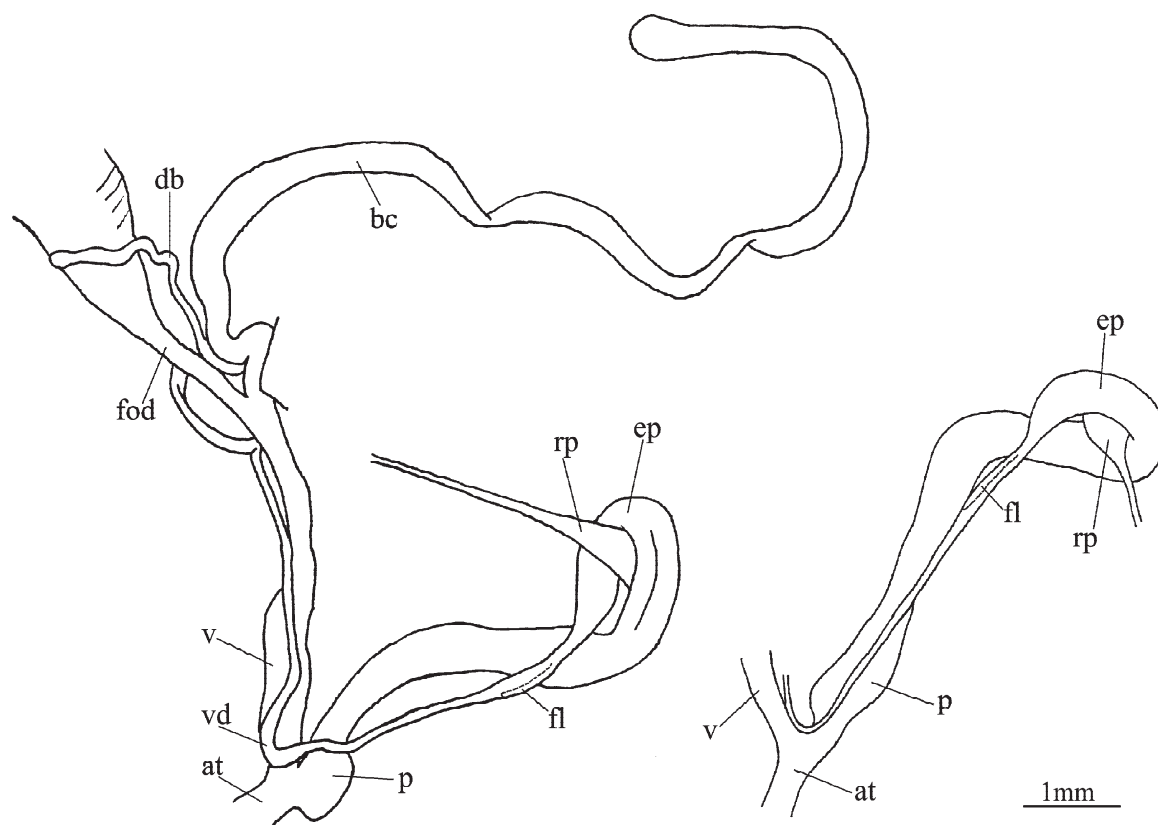


FIG. 5. Reproductive system of *Elia novorossica nagolnica* (paratypes): at – atrium; bc – bursa copulatrix; db – diverticulum of bursa copulatrix; ep – epiphallus; fl – flagellum; fod – free oviduct; p – penis; rp – penial retractor; v – vagina; vd – vas deferens.

РИС. 5. Половая система *Elia novorossica nagolnica* (паратипы). at – атриум; bc – семяприемник; db – отросток семяприемника; ep – эпифаллус; fl – флагеллум; fod – яйцевод; p – пенис; rp – пениальный ретрактор; v – вагина; vd – семяпровод.

were found along its 2 small tributaries in ravines, however snails' density is much lower along small streams. Total area of natural forest tracts (there is some adjacent dry forest plantations in watershed) along Vyshnevetska River is about 1 km<sup>2</sup>, along Rovenjok River is about 1.5 km<sup>2</sup>, and along Orekhova River is about 0,5 km<sup>2</sup> (north to Orekhove village). However, most part of these forests is not located on the bottoms of valleys and ravines. Length of this part of Orekhova River is about 5 km, of Rovenjok River is about 4 km and of Vyshnevetska River is about 3 km (about 7 km with tributaries). Consequently, on these territories total area of occurrence of *E. novorossica* is not more than 0,5 km<sup>2</sup> and probably even much smaller.

As indicated above, *E. novorossica* was not found along Orekhova River in 2011 and 2012. In 2008 only 3 empty shells were collected near Orekhove village [Gural-Sverlova, Martynov, 2009]. In the lower part of Orekhova River (location 3), in comparison with its upper part (location 4), forest is much more disturbed by regular forestry activity, oaks are almost absent, relief weaker and conse-

quently species composition of molluscs is much poorer (Table 1). The upper part of river plot between Orekhove and Girnyk villages was studied in 2012. This territory is much more similar to another two locations where *E. novorossica* is known on Donetsk Upland. But highest part of the forest along Orekhova River, near Girnyk village and above it (about 3 km), was not studied. Perhaps, *E. novorossica* inhabits the forest tract above Girnyk village and shells collected in 2008 were washed by the river to lower plot near Orekhove village. Otherwise density of *E. novorossica* here is very low and therefore species was not found during short investigation.

Terrestrial molluscs of this part of Donetsk Upland are studied quite superficially and irregularly, but available data (Table 1) indicates that *E. novorossica* is very uncommon species here. It was not discovered in most studied riparian forests. Moreover, in the forests where *E. novorossica* was found, rich species composition of molluscs is present (Table 1). Together with *E. novorossica* rare European species *Vertigo angustior* Jeffreys, 1830 and

*Truncatellina costulata* (Nilsson, 1823) were found. The record of *V. angustior* along Vyshnevetska River is especially notable. Until now this species was not registered in south-eastern Ukraine, nearest known population is found nearly 300 km to the north-west in the forest-steppe of Kharkiv region of Ukraine in "Homilshanski Lisy" National Nature Park [Balashov *et al.*, 2009]. *V. angustior* is one of the most protected species of terrestrial molluscs in Europe, it is listed in the Annex II of "Habitat Directive" and in the numerous red lists, including main IUCN Red List and recent "European Red List of Non-marine Molluscs" (as Vulnerable). This species does not inhabit anthropogenic habitats. Same thing can be said about *T. costulata*, which has never been found in settlements (at least in Ukraine). *T. costulata* is known on Donetsk Upland in 4 locations only and 3 of them are locations which *E. novorossica* also inhabits (Table 1). Consequently presence of these species in habitats of *E. novorossica* probably signifies that these forests are natural and well preserved. Such forest species as *Vertigo pusilla* O.F. Müller, 1774, *Cochlodina laminata* (Montagu, 1803), *Discus ruderatus* (Férussac, 1821) and *Punctum pygmaeum* (Draparnaud, 1801), which were collected together with *E. novorossica*, are also quite rare in the southern and south-eastern Ukraine (excluding south Crimea), where natural forests remain only in the very restricted areas. Moreover, four Caucasus subendemic slug species were found together with *E. novorossica*: *B. pallens*, *D. caucasicum*, *D. subagreste* and *Limacus maculatus* (Kaleniczenko, 1851). These species are synanthropic and live in urban habitats of some cities of Ukraine and other countries as invasive ones [Gural-Sverlova *et al.*, 2009; Sysoev, Schileyko, 2009; Balashov, Baidashnikov, 2012]. Nevertheless, in my opinion, it is quite possible that these species are native in Donetsk Upland. At least *D. caucasicum*, *D. subagreste* and *L. maculatus* outside Caucasus are native to Crimea [Gural-Sverlova *et al.*, 2009; Sysoev, Schileyko, 2009]. *B. pallens* was also found in natural habitats of Crimean Mountains and may be native there [Balashov, Baidashnikov, 2012].

Forests along the Rovenjok, Vyshnevetska, Juskina and Orekhova rivers are not protected. These territories belong to the State Forest Resources Agency of Ukraine and partly to the local village councils, so any human activity may take place here, including total transformation. Vyshneve village is in process of expanding to the north exactly along Vyshnevetska River, where *E. novorossica* lives. From the comparison of military map of 1989 with recent pictures from Google Earth and field observations, during the last 20 years Vyshneve village increased up to 0.7 km along Vyshnevetska

River by the homesteads (now along this river extension of the forest is 3 km). At the same time *E. novorossica* lives in dead wood only, and certainly totally depends on it.

As it was indicated above, on the studied territories total occurrence area of *E. novorossica* is not more than 0.5 km<sup>2</sup>. Consequently condition of this species in Ukraine is extremely hard, it corresponds to the IUCN category Critically Endangered at least by the criteria B1a,b and B2a,b [IUCN..., 2001; Guidelines..., 2003]. And for the new subspecies this category is true on the global level. It is necessary to create protected areas in all known locations of *E. novorossica*, as well as in the further locations of this species. Any forestry activity should be totally forbidden on such plots. Moreover, these territories are pertinent for the cores of a new national nature park or nature reserve. A lot of more or less natural biotopes remain in the north basin of the Nagolna River (especially as for the Donetsk Upland), including both forests and steppes, which are alternate and form a continuous passage of natural associations from the south-east vicinities of Antratsyt city to the south-west vicinities of Sverdlovsk city. So protection of these territories in the aggregate may be quite reasonable for the conservation of the Donetsk Upland biodiversity. Therefore protected cores should be created first of all in the locations 4-9 (see Fig. 1).

As indicated above, there are no published data about habitats of *E. novorossica* in Caucasus and this species was mentioned only from the territories between Novorossiysk and Anapa cities [Likharev, Rammelmeyer, 1952; Likharev, 1962; Sysoev, Schileyko, 2009]. However there are unpublished data on *E. novorossica* which were collected in Caucasus over number of years and stored in the Zoological Museum of Moscow State University (personal communication of Dr. A. Sysoev). According to label data *E. novorossica* in Caucasus inhabits various habitats: feather-grass steppe, rocks, rock slides, under stones, in humid and dry litter in oak and other deciduous and mixed forests (dead wood was not noticed). So on Donetsk Upland *E. novorossica* is much more specialized. Different ecological preferences may one more time signify the separation of Caucasus and Donetsk forms of *E. novorossica*. Furthermore, there are some unpublished locations of *E. novorossica* in Gelendzhik city council outside the territories between Novorossiysk and Anapa cities. The most far locality from Novorossiysk is in 50 km from it in the coastal territories near Praskoveevka village (3 locations around village). Moreover, there are several locations in the vicinities of Gelendzhik city and Divnomorskoye village. Thus, the known Caucasus range of *E. novorossica* is expanded more than twice.



## Acknowledgements

I am very grateful to Dr. Nina Gural-Sverlova (State Natural History Museum of National Academy of Sciences of Ukraine, Lviv) for providing data and material on the molluscs of the studied part of Donetsk Upland and to Dr. Alexander Sysoev (Zoological Museum of Moscow University, Moscow) for sharing data on the material of *Elia novorossica* of Caucasus in Zoological Museum of Moscow University.

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*Elia novorossica* (Stylommatophora, Clausiliidae) в Украине: описание, местообитания, охранный статус, сопутствующие наземные моллюски

И. БАЛАШЁВ

Институт зоологии им. И.И. Шмальгаузена НАН Украины, ул. Б. Хмельницкого, 15, Киев-30, ГСП, 01601, УКРАИНА. E-mail: igor\_balashov@ukr.net

**РЕЗЮМЕ.** Детальное описание раковины и половой системы *Elia novorossica* приведено и проиллюстрировано. Популяции этого вида на Донецкой возвышенности в Украине установлены как новый подвид *E. novorossica napolnica* subsp. nov. Распространение и местообитания этого подвида описаны. Три популяции *E. novorossica* известны на Донецкой возвышенности, одна из которых обнаружена впервые. Все эти популяции обитают в дубовых лесах вдоль небольших рек в бассейне р. Нагольная, в наивысшей части возвышенности. Показано, что *E. novorossica* в Украине находится под угрозой исчезновения. Приведен видовой состав наземных моллюсков в местонахождениях *E. novorossica* и на прилегающих территориях.