
Was there *Oxychilus diaphanellus* outside Crimea? On the variability of synanthropic *Oxychilus translucidus* in Ukraine (Stylommatophora, Zonitidae)

I. BALASHOV*, N. GURAL-SVERLOVA**

*I.I. Schmalhausen Institute of Zoology, National Academy of Sciences of Ukraine, B. Khmelnytsky str. 15, Kyiv 01601, UKRAINE. E-mail: igor_balashov@ukr.net;

**State Museum of Natural History, National Academy of Sciences of Ukraine, Teatralnaya str. 18, Lviv 79008, UKRAINE. E-mail: sverlova@pip-mollusca.org

ABSTRACT. It is established that all reports of *Oxychilus diaphanellus* outside of Crimea were based on erroneous identifications of *Oxychilus translucidus*. The differences between these two species, as well as those between *O. translucidus* and some other species of Oxychilinae in Ukraine, are discussed.

checked material collected outside Crimea belongs only to *O. translucidus*.

Material and methods

Anatomically studied material of *O. translucidus* includes: more than 10 specimens from Kyiv city, 4 specimens from Kharkiv city, 2 specimens from Zaporizhia city, 1 specimen from Vinnytsia city and 1 specimen from Vasylkiv town (near Kyiv). Similar empty shells were studied from the Khmelnytskyi, Donetsk and Mariupol cities and also from the Rybakovka village and Bashtanka town in Mykolaiv region, vicinities of Yakovlevka village in Yasynuvata district of Donetsk region. Moreover several hundreds specimens of *O. diaphanellus* from the Crimean Mountains were studied, more than 20 of them anatomically.

The studied materials are deposited in the Collection of terrestrial molluscs of I.I. Schmalhausen Institute of Zoology, National Academy of Sciences of Ukraine (Kyiv, further in text **IZ**) and in the malacological collection of State Museum of Natural History, National Academy of Sciences of Ukraine (Lviv, further in text **SMNH**)

Results and discussion

For the first time *O. diaphanellus* was reported outside Crimea in 2004 from the Zaporizhia and Kharkiv cities [Sverlova, 2004, 2006; Sverlova *et al.*, 2006]. Relative length of free oviduct was used as the single diagnostic character, since it is very long in *O. diaphanellus* [Riedel, 1999; our observations] and was illustrated as very short on some figures of *O. translucidus* [Riedel, 1966]. Later, another diagnostic character, relative length of penial sheath, was used [Balashov, 2011; Balashov, Baidashnikov, 2012; Gural-Sverlova, Gural, 2012b]. It covers at least half of penis in *O. diaphanellus* [Riedel, 1999; our observations], and was illustrat-

Introduction

The terrestrial molluscs of *Oxychilus* Fitzinger, 1833 are quite difficult in identification group of the medium-sized snails, whose systematic is based mainly on the characters of the reproductive system. Some species of this genus are synanthropic and spread anthropogenically outside their native ranges. This makes determination of *Oxychilus* species from anthropogenic environment even more difficult, since it is hard to trace their origin. The six species of *Oxychilus* were mentioned from the urban landscapes of Ukraine. Three of them are relatively large, not much problematic in identification and are known in anthropogenic environments of Ukraine basing on few reports: *Oxychilus draparnaudi* (Beck, 1837), *Oxychilus deilus* (Bourguignat, 1857) and *Oxychilus koutasianus* (Mousson, 1863) [Sverlova, 2006; Sverlova *et al.*, 2006; Balashov, 2011; Balashov, Gural-Sverlova, 2012; Gural-Sverlova, Timoshenko, 2012; Gural-Sverlova, Gural, 2012a, b]. Three other species are smaller: West European *Oxychilus cellarius* (Müller, 1774), Crimean *Oxychilus diaphanellus* (Krynicky, 1836) and Caucasian *Oxychilus translucidus* (Mortillet, 1854) [Baidashnikov, 1992; Tappert *et al.*, 2001; Sverlova, 2004, 2006; Sverlova *et al.*, 2006; Balashov, 2011; Balashov, Baidashnikov, 2012; Balashov, Gural-Sverlova, 2012; Gural-Sverlova, Gural, 2012a, b]. More detailed studies of anatomy of these molluscs showed that conclusions of some researchers, including authors of this paper, concerning these three species were erroneous. All anatomically re-

ed covering only base of penis on all available figures of *O. translucidus* [Riedel, 1966, 1989 and others]. At that time we ignored shell characters and inner structure of penis was not studied, in spite of the fact that *O. diaphanellus* and *O. translucidus* are species of two different subgenera, which are distinguished only by the inner penis structure. In the species of *Ortizius* Forcart, 1957, to which *O. translucidus* belongs, inside penis there are long axial folds spanning entire length of penis, they are not divided into series of papillae in proximal part [Riedel, 1966; Schileyko, 2003]. In the species of nominative subgenus, *Oxychilus* s. str., axial folds inside penis are divided into series of clearly separate papillae in proximal part [Riedel, 1966, 1999; Schileyko, 2003]. Attribution of *O. diaphanellus* to nominative subgenus is raising some doubts [Riedel, 1999], however in main mentioned character it differs from *Ortizius* in the same way as all species of *Oxychilus* s. str. [Riedel, 1999; checked by us]. Moreover *O. cellarius*, which was reported from Kyiv [Tappert *et al.*, 2001], is also a species of *Oxychilus* s. str. (and type species of the genus).

We checked the inner structure of penis in all specimens collected outside Crimea that were earlier identified as *O. diaphanellus*: from the Kyiv, Kharkiv, Zaporizhia cities and Vasylykiv town. All these specimens by their inner penis structure clearly belong to *Ortizius*, thus concluding that they cannot be attributed either to *O. diaphanellus* or to *O. cellarius*. At the same time this confirms earlier correct assessment on the occurrence of *O. translucidus* in the urban landscapes of Ukraine [Baidashnikov, 1992; Sverlova, Kyrpan, 2004].

Consequently, the differences in external structure of reproductive system in *O. diaphanellus* and *O. translucidus*, which were indicated by us [Sverlova, 2004; Sverlova *et al.*, 2006; Balashov, 2011; Balashov, Baidashnikov, 2012; Gural-Sverlova, Gural, 2012b], are within the intraspecific variability of *O. translucidus*. In *O. diaphanellus* a free oviduct, as well as general proportions of female part of reproductive system, is in fact relatively very elongated [Riedel, 1999; our observations]. However in *O. translucidus* a free oviduct is also often quite long [Riedel, 1989; Balashov, 2011; Balashov, Baidashnikov, 2012] (Fig. 1, B, D, F), the maximal values of its length overlap with minimal ones in *O. diaphanellus*. It is notable that even in the same population a length of free oviduct is quite variable (Fig. 1, A, B). It appeared that much shorter penial sheath in *O. translucidus* is more constant difference between species. In all studied specimens from the two locations in Kyiv a penial sheath was long [Balashov, 2011] (Fig. 1, C, D). But in all specimens from Kharkiv, Zaporizhia and Vasylykiv, sheath covers only base of penis (Fig. 1, A, B, E, F). Later the

specimens with short penial sheath were found in Vinnytsia city [Balashov, Baidashnikov, 2012] and in another location of Kyiv city [Balashov, Gural-Sverlova, 2012], these molluscs were correctly identified as *O. translucidus*. Additional material collected in one population in Kyiv, where earlier only the specimens with long penial sheath were found, also revealed typical *O. translucidus* (Fig. 1 E).

Generally, the variability of reproductive system's external structure in *O. translucidus* and *O. diaphanellus* overlap almost completely. However there are several significant differences. In *O. diaphanellus* a pervaginal gland is usually brown-orange or have a large spot of this color (it stand out against a general light coloration of reproductive system), but sometimes this coloration is absent. Among the species of *Oxychilus*, besides *O. diaphanellus*, such coloration of a pervaginal gland is known only in the some endemics of the Azores [Riedel, 1999]. In *O. translucidus* penis is frequently much narrowed in its middle part [Riedel, 1966, 1989] (Fig. 1, E), which never happens in *O. diaphanellus* [Riedel, 1999]. Although the values overlap, in *O. diaphanellus* the proportions of reproductive system are usually much more elongated than in *O. translucidus*. In all studied specimens and in all observed descriptions [Riedel, 1999 and others] a penial sheath in *O. diaphanellus* covers at least half of penis, while in *O. translucidus* it usually covers only a base of penis. But, as was indicated above, in *O. translucidus* a penial sheath is also can be quite long.

The variation of shell structure also overlap in these two species, but in most cases their identification is possible on the basis of the series of several shells. In *O. translucidus* width of umbilicus is usually about 1/8-1/10 of the shell width (but sometimes 1/7-1/12), while in *O. diaphanellus* in most cases it is 1/6-1/7 of the shell width, but sometimes somewhat smaller, in exceptional cases attains 1/10 of shell width. Width of last whorl near aperture in *O. translucidus* is about 2 times larger than penultimate whorl's visible part (but sometimes in 1.5-2.5 times), while in *O. diaphanellus* this value is often not larger than 1.5, however sometimes reaches about 2.

By the shell characters *O. translucidus* can be also distinguished from all other known species of the genus in Ukraine. Mentioned *O. draparnaudi*, *O. deilus* and *O. koutasianus* are much larger. In *O. translucidus* shell width is not larger than 9 mm, while in the adult specimens of listed species it is 12-25 mm. From the synanthropic West European *O. cellarius* and *O. alliaris* (Miller, 1822), which are not yet reliable registered in Ukraine, but already reported from the urban landscapes of Eastern Europe [Sysoev, Schileyko, 2009; Welter-Schultes, 2012] and can be expected in Ukraine, *O. transluci-*

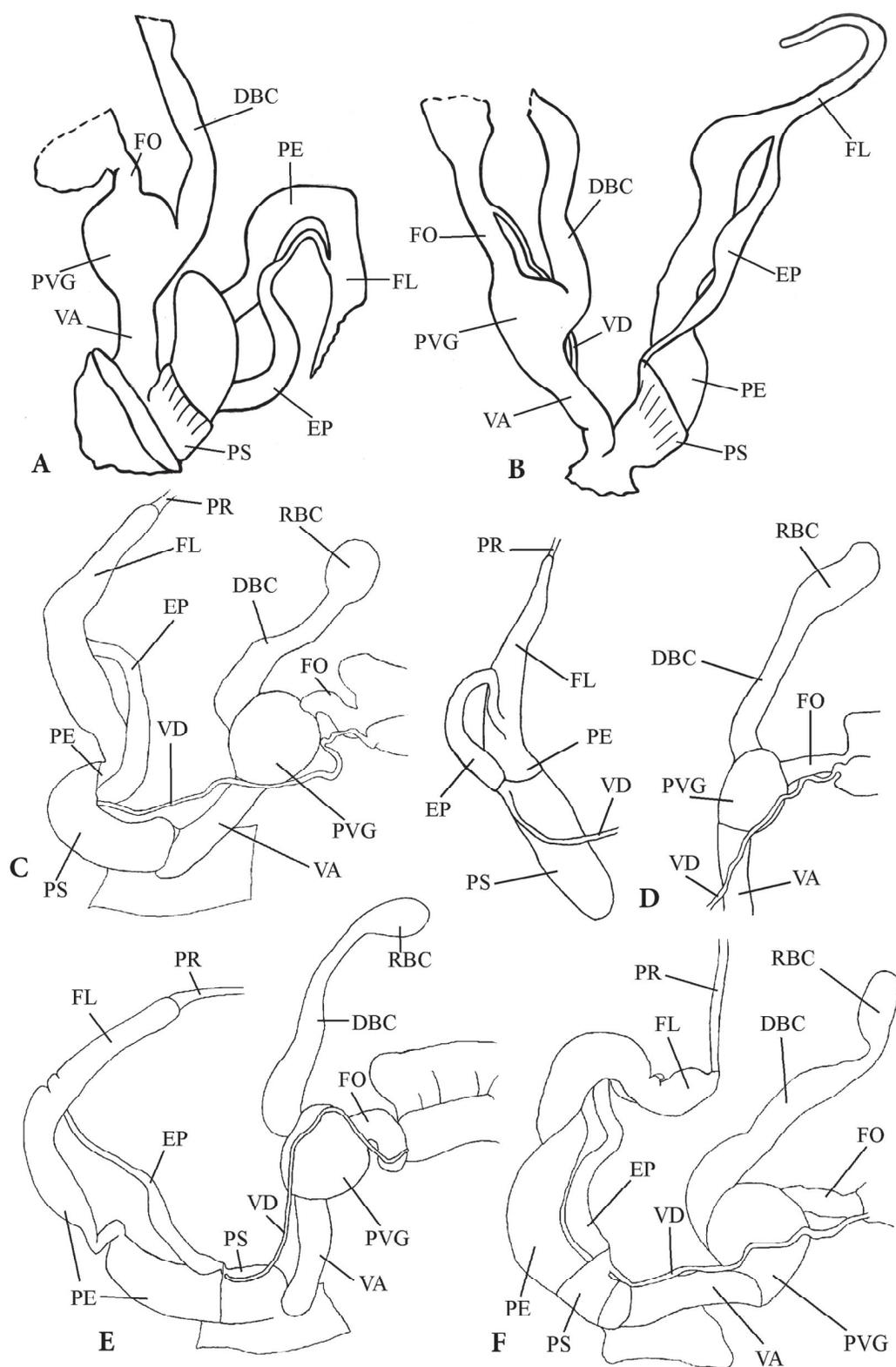


FIG. 1. Reproductive system of *Oxychilus translucidus* from Ukraine: A, B – Zaporizhia city; C-E – Kyiv city; F – Vinnytsia city. Abbreviations: DBC – duct of bursa copulatrix; EP – epiphallus; FL – flagellum (or penial caecum by some authors); FO – free oviduct; PE – penis; PR – penial retractor; PS – penial sheath; PVG – perivaginal gland; RBC – reservoir of bursa copulatrix; VA – vagina; VD – vas deferens (drawings A-B by N. Gural-Sverlova, C-F by I. Balashov).

РИС. 1. Половая система *Oxychilus translucidus* из Украины: А, В – г. Запорожье; С-Е – г. Киев; F – г. Винница. Сокращения: DBC – проток семяприемника; EP – эпифаллус; FL – флагеллум (или пениальный цэкум согласно некоторым авторам); FO – яйцевод; PE – пенис; PR – пениальный ретрактор; PS – пениальный чехол; PVG – околовлагинальная железа; RBC – резервуар семяприемника; VA – вагина; VD – семяпровод (рисунки А-В – Н. Гураль-Сверлова, С-Ф – И. Балашёв).

dus differs by much narrower umbilicus. In two mentioned species its width is 1/5-1/6 of shell width against 1/8-1/10 (sometimes 1/7) in *O. translucidus*.

Also in Ukraine there was a case of an erroneous identification as *O. translucidus* of another Oxychilinae species – native *Morlina glabra* (Rossmässler, 1836). A.V. Korniushev [1988] reported *O. translucidus* (it was determined by Prof. I.M. Likharev) from the natural forests of Kaniv Nature Reserve. Later it was shown that this report was based on an erroneous identification of *M. glabra* [Balashov, Baidashnikov, 2010; Balashov, 2011]. Latter species in Ukraine mainly occurs in the west of the country, but rarely also in its northern and central areas, sometimes it can inhabit the suburban forest parks and rarely even the city parks [Baidashnikov, 1992; Sverlova *et al.*, 2006; Balashov, Baidashnikov, 2010, 2012; Balashov, 2012; Balashov *et al.*, 2013a]. Therefore co-occurrence of *O. translucidus* and *M. glabra* is sometimes possible in Ukraine. The shell of latter species differs in a higher spire (about 1/3 of shell height against about 1/4-1/5 in *O. translucidus*), a narrower umbilicus (less than 1/10 of shell width) and a larger shell (width 12-18 mm). An external structure of reproductive system in these species is somewhat different [Schileyko, 2003; Balashov, 2012], but, similar to *O. diaphanellus*, these differences are not very demonstrative. Most reliably these species can be distinguished by their inner structure of penis. In *Morlina* there is a large bifurcated stimulator, while in the *Oxychilus* species the similar structures are never present [Schileyko, 2003].

A possibility of relatively precise identification of *O. translucidus* by shell characters allows to conclude that some of our earlier reports of *Oxychilus* sp. belong to this species: from the Khmelnytskyi, Donetsk and Mariupol cites [Sverlova, 2004; Gural-Sverlova, Gural, 2012a; Balashov *et al.*, 2013a, b]. Also there are similar shells in IZ from the Mykolaiv region: the Bashtanka town (1998, leg. S.S. Kramarenko) and Rybakovka village (2006, leg. N.V. Vychalkovskaya); and in SNHM from Donetsk region: vicinities of Yakovlevka village (1989, leg. E.G. Timoshenko). Moreover a single similar specimen was observed in Kholmilnyk town (Vinnytsia region) in 2009 by I. Balashov, but it was lost.

Consequently, it is possible to distinguish *O. translucidus* by the shell characters at least in Ukraine. However, in the cases of finding of some Oxychilinae outside their known ranges, it is insistently recommended to study their inner structure of penis for a reliable identification.

References

Baidashnikov A.A. 1992. Terrestrial mollusk fauna of the Ukrainian Polesie area. Communication 1. Spe-

- cies composition and connection with vegetative cover. *Vestnik Zoologii*, 4: 13-19 [in Russian].
- Balashov I. 2011. *Terrestrial molluscs (Gastropoda) of the forest-steppe zone of Ukraine*. Abstract of thesis for the scientific degree of candidate of biological sciences. Kyiv, 19 pp. [in Ukrainian].
- Balashov I. 2012. Terrestrial mollusks (Gastropoda) of the Slovechansko-Ovrutsky Ridge (Zhytomyr region, Northern Ukraine). *Vestnik Zoologii*, 46(6): 491-497.
- Balashov I.A., Baidashnikov A.A. 2010. Terrestrial molluscs (Gastropoda) of the forest-steppe in the Dnieper Area and their confinement to different phytocenoses. *Vestnik Zoologii*, 44(4): 309-316 [in Russian].
- Balashov I.A., Baidashnikov A.A. 2012. Terrestrial molluscs (Gastropoda) of Vinnytsia region and their confinement to different phytocenoses. *Vestnik Zoologii*, 46(1): 19-28 [in Russian].
- Balashov I.A., Baidashnikov A.A., Romanov G.A., Gural-Sverlova N.V. 2013a. Terrestrial molluscs of Khmelnytsky region (the Podolian Upland, Ukraine). *Zoologicheskii Zhurnal*, 92(2): 154-166 [in Russian].
- Balashov I., Gural-Sverlova N. 2012. An annotated checklist of the terrestrial molluscs of Ukraine. *Journal of Conchology*, 41(1): 91-109.
- Balashov I.A., Kramarenko S.S., Zhukov A.V., Shklyaruk A.N., Baidashnikov A.A., Vasyliuk A.V. 2013b. Contribution to the knowledge of terrestrial molluscs in southeastern Ukraine. *Malacologica Bohemoslovaca*, 12: 62-69.
- Gural-Sverlova N.V., Gural R.I. 2012a. *Scientific collections of State Natural History Museum. 4. Malacological fund*. Lviv, 254 pp. [in Ukrainian].
- Gural-Sverlova N.V., Gural R.I. 2012b. *Guide for the terrestrial molluscs of Ukraine*. Lviv, 216 pp. [in Ukrainian].
- Gural-Sverlova N.V., Timoshenko E.G. 2012. *Oxychilus koutaisanus mingrelicus* (Zonitidae) and *Stenomphalia ravergiensis* (Hygromiidae) – Caucasian species of land molluscs in south-east of Ukraine. *Ruthenica*, 22 (2): 135-140 [in Russian].
- Korniushev A.V. 1988. Terrestrial malacofauna of the hornbeam-oak forests in Middle Dnieper Area. *Proceedings of the Zoological Institute of USSR Academy of Sciences*, 187: 109-120 [in Russian].
- Riedel A. 1966. Zonitidae (excl. Daubardiinae) der Kaukasusländer (Gastropoda). *Annales Zoologici*, 24 (1): 1-303.
- Riedel A. 1989. Zonitidae (sensu lato) des Ostpontischen Gebirges in der Türkei (Gastropoda). *Annales Zoologici*, 42 (18): 363-424.
- Riedel A. 1999. Revision von *Oxychilus diaphanellus* (Krynicky, 1836) aus der Krim (Gastropoda: Stylomatophora: Zonitidae). *Folia Malacologica*, 7 (1): 19-27.
- Schileyko A.A. 2003. Treatise on Recent Terrestrial Pulmonate Molluscs. Part 10: Ariophantidae, Ostracolethidae, Ryssotidae, Milacidae, Dyakiidae, Staffordiidea, Gastrodontiidae, Zonitidae, Daubardiidae, Parmacellidae. *Ruthenica*, Supplement 2, Part 10: 1309-1466.
- Sverlova N.V. 2004. *Scientific collections of the State Natural History Museum. Land molluscs*. Lviv, 200 pp. [in Ukrainian].

- Sverlova N.V. 2006. On the distribution of some species of land molluscs on the territory of Ukraine. *Ruthenica*, 16 (1-2): 119-139 [in Russian].
- Sverlova, N.V., Khlus, L.N., Kramarenko, S.S., Son, M.O., Leonov, S.V., Korol, E.N., Vychalkovskaya, N.V., Zemoglyadchuk, K.V., Kyrpan, S.P., Kuzmovich, M.L., Stenko, R.P., Ferents, O.G., Shklaruk, A.N., Gural, R.I. 2006. *Fauna, ecology and intraspecific variability of the terrestrial molluscs in urban environment*. Lvov, 225 pp. [in Russian].
- Sverlova N.V., Kyrpan S.P. 2004. The role of the cities in a spreading of some terrestrial molluscs' species. *Naukovi osnovy zberezhennya biotychnoji riznomanitnosti*, 5: 107-114 [in Ukrainian].
- Sysoev A., Schileyko A. 2009. *Land snails and slugs of Russia and adjacent countries*. Sofia, Pensoft, 312 pp.
- Tappert A., Korniuschin A., Baidashnikov A.A. 2001. Zur Molluskenfauna von Kiew, Lwiw und dem Norden der Ukraine. *Schriften zur Malacozoologie*, 17: 9-28.
- Welter-Schultes F.W. 2012. *European non-marine molluscs, a guide for species identification*. Göttingen: Planet Poster Editions, 679 pp.

Встречался ли *Oxychilus diaphanellus* вне Крыма? Об изменчивости синантропного *Oxychilus translucidus* в Украине (Stylommatophora, Zonitidae)

И. БАЛАШЁВ*, Н. ГУРАЛЬ-СВЕРЛОВА**

*Институт зоологии им. И.И. Шмальгаузена НАН Украины, ул. Б. Хмельницкого, 15, Киев, 01601, УКРАИНА. E-mail: igor_balashov@ukr.net

**Государственный природоведческий музей НАН Украины, ул. Театральная, 18, Львов 79008, УКРАИНА. E-mail: sverlova@pip-mollusca.org

РЕЗЮМЕ. Установлено, что все упоминания *Oxychilus diaphanellus* за пределами Крыма базировались на ошибочных определениях *Oxychilus translucidus*. Обсуждаются отличия между этими видами, а также между *O. translucidus* и другими представителями Охучилинае Украины.

