

The systematic position of *Lymnaea vulnerata* (Küster, 1862) and *L. occulta* (Jackiewicz, 1959) (Mollusca: Gastropoda: Lymnaeidae)

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The systematic position of two species of Lymnaeidae, *Lymnaea vulnerata* (Küster, 1862) and *L. occulta* (Jackiewicz, 1959), is discussed. On the basis of anatomical features, *Lymnaea vulnerata* is included in the subgenus *Corvusiana* Servain, 1881, the section *Kuesterilymnaea* sect. n. A new synonymy is established: *Lymnaea terebra* (Westerlund, 1884) = *L. occulta* (Jackiewicz, 1959), **syn. n.** (not syn. of *L. vulnerata*).

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Introduction

In the 1990s two large revisions of the Palaearctic Lymnaeidae have appeared (Kruglov & Starobogatov, 1993a, 1993b; Jackiewicz, 1998a). Nevertheless, many problems remain unsolved. Both the newly published classifications are distinct from the classical one of Hubendick (1951), and even more they are differing from each other. In some aspects these are in contradiction. So, Jackiewicz (1993, 1998a) assumes only 11 species of Lymnaeidae in the European fauna, while Kruglov & Starobogatov (1993a, 1993b), nearly 60. The basic difference lies in the species criteria used by the authors. Evolution of taxonomists' views on the species concept in freshwater molluscs would be the subject of a separate study; for the present, I agree with the opinion of Korniushin (1999) that there is a need for a critical comparison between these classifications on the basis of anatomical features of molluscs. Since the revision of North American Lymnaeidae by Baker (1911), examination of characters of the genitalia is regarded as comparatively easy and effective method of taxonomic practice.

In this paper, I consider the taxonomic position of two species of Lymnaeidae, *Lymnaea vulnerata* (Küster, 1862) and *L. occulta* (Jackiewicz, 1959), which were differently interpreted by Kruglov & Starobogatov (1993a) and Jackiewicz (1998a).

Genus *Lymnaea* Lamarck, 1799

Subgenus *Corvusiana* Servain, 1881

This subgenus is divided by me into two sections (see Discussion under *Lymnaea vulnerata*).

Section *Corvusiana* s. str.

= *Kazakhlymnaea* Kruglov & Starobogatov, 1984.

Type species: *Helix corvus* Gmelin, 1791.

Diagnosis. Shell highly conical or turriculate. Prostate with many (5-10) unbranched folds inside.

Included species. Four recent species: *L. corvus*, *L. guertiniana* (Servain, 1881) and *L. curta-corvus* Kruglov & Starobogatov, 1984, all distributed in Europe, and *L. kazakensis* Mozley, 1934, distributed in Kazakhstan (Kruglov & Starobogatov, 1993a).

Section *Kuesterilymnaea* sect. n.

Type species: *Lymnaeus vulneratus* Küster, 1862 (sensu Jackiewicz, 1988, non Jackiewicz, 1962).

Diagnosis. Shell ovate conical. Prostate with two unbranched folds inside.

Included species. Only the type species, distributed in Europe except its eastern part (Jackiewicz & von Proschwitz, 1991; Jackiewicz, 1998a).

Etymology. Named after H. Küster, who de-scribed the type species.

***Lymnaea vulnerata* (Küster, 1862)**

Discussion. The species *Lymnaeus vulneratus* was described by Küster (1862) from the Cetina River in Central Dalmatia (Croatia). Later (Clesin, 1884; Westerlund, 1885; Geyer, 1927), it was regarded as a distinct variety within the polymorphic species *Lymnaea palustris* (Müller, 1774). In the monograph by Hubendick (1951), *Lymnaeus vulneratus* was given as a synonym of *Lymnaea palustris*. Several years later, Jackiewicz (1959, 1962) analyzed *L. palustris* sensu Hubendick (1951) and divided it into several species, in the first paper placed in *Galba* Schranck, 1803, but later all considered as *Lymnaea*: *L. corvus* (Gmelin), *L. turricula* (Held) [actually, *L. palustris*; see Jackiewicz (1998a)], *L. occulta* Jackiewicz, and, at last, *L. vulnerata* [actually, *L. turricula*; see Jackiewicz (1998a)]. Kruglov & Starobogatov (1986, 1993a) included *L. vulnerata* in the subgenus *Stagnicola* Leach in Jeffreys, 1830 (the section *Ladislavella* B. Dybowski, 1913) and regarded *L. occulta* as its junior synonym based on a similarity in the shape of shell. This synonymy was neither confirmed nor disproved by other authors.

In the meantime, Jackiewicz (1988) published the redescription of *L. vulnerata* from locus typicus, the Cetina River in Yugoslavia. Based on newly obtained data on the morphology of reproductive organs, she removed this species to the subgenus *Lymnaea* s. str., in which *L. corvus* also was included (Jackiewicz, 1988, 1998a). In my opinion, the taxonomic position of *L. vulnerata* should be discussed again.

The data on the conchological and anatomical features of *Lymnaea vulnerata* were obtained from papers by Jackiewicz (Jackiewicz, 1988, 1998a; Jackiewicz & von Proschwitz, 1991).

The prostate of *L. vulnerata* has a unique for

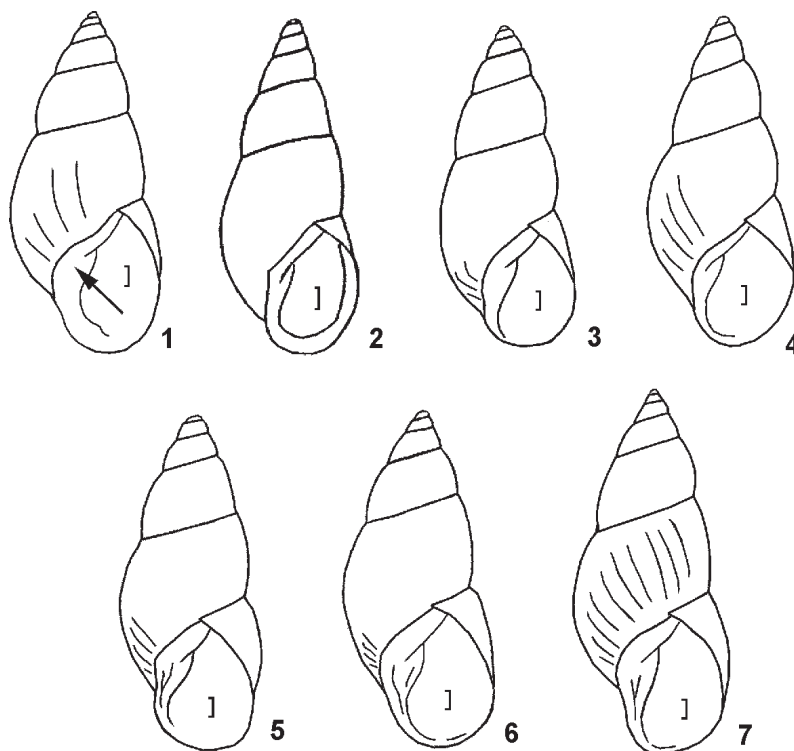
the family Lymnaeidae feature, two unbranched inner folds. In other representatives of the genus *Lymnaea*, this character was not registered (Kruglov & Starobogatov, 1993a). Most of subgenera have one fold inside the prostate, or have no fold (the subgenus *Omphiscola* Rafinesque, 1819), and only some primitive subgenera (*Lymnaea* s. str., *Corvusiana* Servain, 1881, *Cerasina* Kobelt, 1880) have the prostate with many (5-10) inner folds. There are five structural types of the prostate (Kruglov, 1985), and that of *L. vulnerata* corresponds to "many-folded prostate with unbranched folds" type, which is characteristic of the subgenus *Corvusiana*, although all recent species of *Corvusiana* have the prostate with more than two inner folds. The nominotypical subgenus is also characterized by the prostate with many folds, but these are branched. It makes us to suspect that *Lymnaea vulnerata* belongs neither to the subgenus *Lymnaea* s. str. nor to the subgenus *Stagnicola* and must be included in the subgenus *Corvusiana*.

The presence of a ring-like swelling on the penis of *L. vulnerata* (Jackiewicz, 1998a) is an additional support for this conclusion. This feature is characteristic of the most archaic subgenera, as *Lymnaea* s. str., *Polyrhytis* Meek, 1876 and *Corvusiana* (see Kruglov & Starobogatov, 1984; Kruglov, 1985), and unknown in *Stagnicola*. On the other hand, *L. vulnerata* is much more similar in the shape of the shell to the subgenus *Stagnicola* than to the nominotypical one (see Table).

According to Kruglov & Starobogatov (1984), the many-folded state of the prostate is the primitive one in Lymnaeidae; in further evolution of this organ, the number of inner folds was decreasing up to the complete loss. Therefore *L. vulnerata*, with two folds inside the prostate, is the most phylogenetically advanced species of *Corvusiana*

Table. Some diagnostic features of the subgenera *Lymnaea* s. str., *Corvusiana* and *Stagnicola*

Subgenus, section	Prostate	Ring-like swelling on penis	Shape of shell
<i>Lymnaea</i> s. str.	with 5-10 branched folds	present	highly conical with acute spire or auriculate
<i>Corvusiana</i> (sect. <i>Corvusiana</i> s. str.)	with 5-10 unbranched folds	present	highly conical or turriculate
<i>Corvusiana</i> (sect. <i>Kuesterilymnaea</i> sect. n.)	with 2 unbranched folds		ovate conical
<i>Stagnicola</i>	with 1 unbranched fold	absent	highly conical, ovate, cylindrical or turriculate



Figs 1-7. *Lymnaea* (*Stagnicola*) shells [1, 3-7, original; 2, after Korniuschin, 1999]. 1, *L. occulta* (paratype from Poland: Rawicz Prov., env. of Golaszin, 24.VIII.1955, leg. M. Berger); 2, *L. occulta* (from Western Ukraine); 3-7, *L. terebra* (3-4, from marsh, env. of vill. Kalugino; 5, from marsh, env. of Lake Bodachi; 6-7, from pond in Omsk city). Scales: 1 mm. Arrow shows the position of the columellar lip.

and links this group and the daughter one, *Stagnicola*. All recent *Stagnicola* have one unbranched fold inside the prostate (Kruglov & Starobogatov, 1993a) and retain the shape of the shell resembling that in the subgenus *Corvusiana*.

Thus, *Lymnaea vulnerata* seems to be a quite distinctive species among *Corvusiana*, and so, the new section is erected for this species.

Subgenus **Stagnicola** Leach in Jeffreys, 1830

Lymnaea terebra (Westerlund, 1884)

= *L. occulta* (Jackiewicz, 1959), **syn. n.** (not synonym of *L. vulnerata* Küster, 1862).

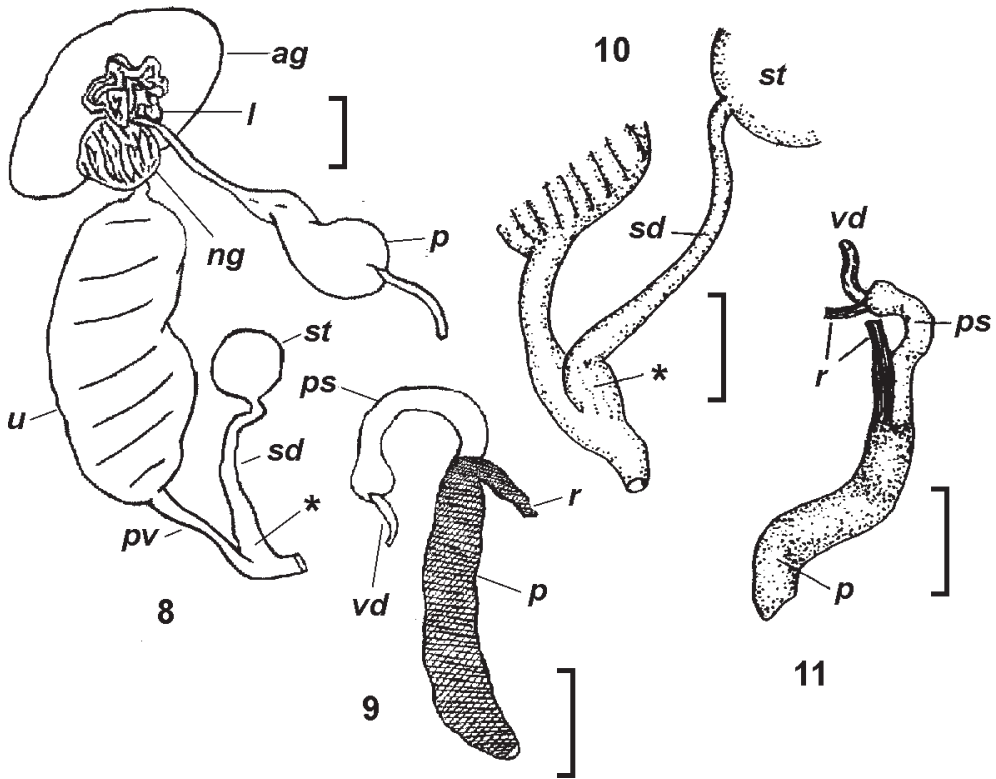
Material examined. Paratypes of *Galba occulta* Jack. from Poland, kept in the collection of the Zoological Institute, Russian Academy of Sciences (St. Petersburg), and material of *L. terebra* (West.): (1) specimens collected by the author in 1999-2003 from various waterbodies of the southern part of West Siberia, and (2) specimens from the collections of S.I. Andreyeva and N.I. Andreyev (from the northern part of Kazakhstan), and that of V.N. Dolgin (from the lower Ob' basin). Identification of specimens was carried out by comparative method (Kruglov & Starobogatov, 1985; Shikov & Zatravkin, 1991) and confirmed by the dissections. The material for dissections (a total of 62 specimens of *L. terebra*) was collected in Omsk Prov. (4 specimens, marsh, env. of vill. Kalugino, 6.VII. 2001; 28 specimens, marsh, env. of Lake Bodachi, 12.VII.

2001 and 26.VII.2002; 30 specimens, unnamed pond, Omsk city, 4.V.2003); it was fixed in 70% ethanol. Dissections and drawings were made using a stereomicroscope MBS-9 with a camera lucida.

Discussion. *L. vulnerata* being included in the subgenus *Corvusiana* according to distinctive anatomical features (see above) cannot be a senior synonym of *L. occulta*, which belongs to the subgenus *Stagnicola*. Therefore the systematic position of the latter species should be discussed again.

The examination of paratypes of *L. occulta* from Poland has shown they are conspecific with specimens of another species of the subgenus *Stagnicola*, namely *L. terebra* (Westerlund, 1884), widely distributed in Siberia (Figs 1-7). The latter species was first described in detail by Kruglov & Starobogatov (1986). *L. occulta* and *L. terebra* cannot to be distinguished by the conchological features, even by the use of the comparative method. Both the species have cylindrical or turriculate shell, with flat or weakly convex whorls. A "wide thick chalky white" columellar lip, which, according to Jackiewicz (1997), is a good diagnostic feature of *L. occulta* (Fig. 1), does exist in *L. terebra* as well.

The structure of the reproductive system of the Siberian species *L. terebra* closely resembles that of *L. occulta*, as it was described by the author of



Figs 8-11. Reproductive system of *Lymnaea (Stagnicola)* [8-9, original; 10-11, after Korniushev, 1999]. **8**, *L. terebra*, fragment of proximal genitalia; **9**, *L. terebra*, distal part of male genitalia; **10**, *L. occulta*, distal part of female genitalia; **11**, *L. occulta*, distal part of male genitalia.

Abbreviations: *ag*, albumen gland; *l*, labyrinth of oviduct; *ng*, nidamental gland; *p*, prostate; *ps*, penis sheath; *pv*, provagina; *r*, retractor muscles; *sd*, spermathecal duct; *st*, spermatheca; *u*, uterus; *vd*, vas deferens; *, swollen basal part of the spermathecal duct. Scales: 1 mm.

the species (Jackiewicz, 1959, 1998a) and others (Piechocki, 1979; Korniushev, 1999). According to Kruglov & Starobogatov (1986, 1993a), the most remarkable details of the genitalia of *L. terebra* are dark-pigmented praeputium, which is a little thicker than the sheath of penis, and swollen basal part of the spermathecal duct (Figs 8-11). These features are characteristic of *L. occulta* as well (Jackiewicz, 1959; Korniushev, 1999). The ratio of the praeputium length to the penis sheath length is regarded as an important diagnostic feature in Lymnaeidae, especially in the subgenus *Stagnicola* (Kruglov & Starobogatov, 1986). In *L. occulta*, this ratio is equal to 1.0 (Jackiewicz, 1959). The same ratio in *L. terebra* (measured in two specimens from the lower Yenisei basin) is 1.13 (Kruglov & Starobogatov, 1986). The value of this index in *L. terebra* from West Siberia, which are dissected within the scope of my study (62 specimens), is, in the average, 1.10 ± 0.02 (mean \pm standard error); limits are 0.77-1.39,

i.e. the ratio does vary around the value given by Jackiewicz (1959) for *L. occulta*.

Thus, neither conchological nor anatomical features were found to distinguish the two forms discussed. In our opinion, such a close resemblance between *L. occulta* and *L. terebra* indicates these are conspecific. This synonymy is indirectly confirmed by the recent records of *L. occulta* from Eastern Siberia: near Yeniseisk (Jackiewicz, 1992) and in the mouth of the Selenga River (Jackiewicz, 1998b). There is no doubt that specimens of *L. terebra* are depicted in the photos given in the latter work. According to Jackiewicz (1998b), European and Siberian populations of this species differ from each other in the shape of the pyriform body. Such a distinction is not enough to account these geographically separated populations as good species.

Lymnaea terebra (= *L. occulta*) has a rather wide distribution. It is known from the eastern

(Poland, Croatia, Ukraine, former Czechoslovakia) and northern (Sweden) parts of Europe (Jackiewicz, 1997, 1998a, 1998b; Korniuszin, 1999). On the other hand, it inhabits Siberia, from the Urals to the Lena basin. In the European part of Russia, it is still unknown. Possibly, the range of *L. terebra* is a disjunctive one.

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