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Lymnaea ampla (Hartmann, 1821) (Gastropoda: Pulmonata: Lymnaeidae) in northern Asia

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All available data on distribution of the lymnaeid species *Lymnaea ampla* (W. Hartmann, 1821) in Siberia and adjacent regions were analyzed. It is shown that this species mostly inhabits waterbodies of the Irtysh River basin. Scarce findings of *L. ampla* in other parts of Siberia are discussed. In northern Asia, the species occurs exclusively in permanent habitats such as small rivers, water reservoirs and large non-desiccating lakes located in river floodplains or elsewhere.

Lymnaea ampla (Hartmann, 1821) (Gastropoda: Pulmonata: Lymnaeidae) в северной Азии

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Проанализированы все имеющиеся на сегодняшний день сведения о распространении вида *Lymnaea ampla* (W. Hartmann, 1821) в водоемах Сибири и сопредельных территорий. Показано, что вид обитает преимущественно в водоемах бассейна Иртыша. Обсуждаются немногочисленные находки *L. ampla* в других районах Сибири. В водоемах северной Азии вид обнаружен исключительно в постоянных водоемах – малых реках, водохранилищах, а также крупных пойменных и внепойменных озерах.

In Western Europe, there is a long-term tradition of faunal studies of freshwater mollusks that may be traced back to the end of the 18th century. Due to relatively small area of many European countries and accessibility of most of their territories for collectors, European malacologists have an opportunity to describe distributional ranges of freshwater snails and bivalve species with a fair exactness and to create detailed maps of distributions where all known points of species' occurrences are placed. Recent works by I. Flasar [1998], P. Glöer and Z. Fehér [2004], and I. Sîrbu et al. [2006] may serve as good examples of this kind.

A quite different situation is in the Russian Federation. Many regions of this coun-

try, especially in its northern and eastern parts, have not ever been visited by malacologists, and the museum collections covers relatively small part of Russia's whole territory. On the other hand, collections available for Russian malacologists began to accumulate since the first half of the XIX century and, thus, represent an important body of faunistic data that should be used for preliminary analysis of geographic distribution of freshwater mollusks.

The lymnaeid species *Lymnaea* (*Peregriana*) *ampla* (Hartmann, 1821), also known in European literature under the binomen *Radix ampla*, is widely distributed in the Palaearctic region. In most recent keys and taxonomic surveys, the range of *L. ampla* is described as Euro-Siberian [Kruglov, Starobogatov, 1993; Glöer, 2002; Kantor, Sysoev, 2005][1]. Indeed, it occurs in waterbodies of most countries of Northern, Central and Eastern Europe, excluding the United Kingdom and Ireland [Falkner et al., 2001; Glöer, 2002; Anderson, 2005], and recently it has been recorded from countries lying southward, namely, Greece [Bank, 2006], Romania [Glöer, Sirbu, 2006], and Albania [Dhora, 2002]. However, there is still no exact information about distribution of this species in the easternmost part of its range, i.e., in Siberia and neighbouring regions. So, N.D. Kruglov [2005] believes that *L. ampla* (=*L. patula* sensu Starobogatov, 1977) occurs in Europe, Kazakhstan, and in the southern part of western Siberia. On the other hand, V.A. Gundrizer [1979, 1984] mentioned this species (as *L. patula*) from the northern part of the central Siberia (Yenisei River basin).

This note is prepared in order to summarize all available for the time being data about *L. ampla* distribution in the northern Asia waterbodies. Here, I will use the term «northern Asia» for designation of a vast territory covering all Siberia (in commonly used sense) along with adjacent parts of the Uralian region and Kazakhstan that belong to the Irtysh and Ob' river basins. I believe that presented information would be helpful for improvement of our knowledge on Palaearctic lymnaeids many of which have a great medical importance because of their role in trematode larvae transmission. Taxonomic account of the species *L. ampla* (see below) is given to provide a coordination between species' position in «European» and «Russian» lymnaeid taxonomies that are in a great contradiction in many points [Jackiewicz, 1998; Korniushin, 1999].

Material and methods

To ascertain current distribution of *L. ampla* in northern Asia, all available literature sources (including unpublished PhD theses of some Siberian malacologists) and museum collections were critically examined. As a rule, I did not use non-annotated check-lists and other reports of similar kind that contain neither species description nor shell/genitals pictures since it was impossible to verify accuracy of species identification in such cases.

[1] Since 1977, all Russian malacologists use the taxonomic name *Lymnaea patula* (Da Costa, 1778) for designation of this species following the opinion of Ya.I. Starobogatov (1977), who proposed this synonymy. Having examined the type series of *L. ampla*, Vinarski and Glöer (2007) have shown that Da Costa did not have shell of this species in his hands and, most probably, the species *L. auricularia* or *L. balthica* was described under the name *Turbo patulus* Da Costa.

Museum collections used in the study are housed in three research institutions of Russia and contain large amounts of lymnaeids collected in northern Asia:

1) Zoological Institute of the Russian Academy of Sciences (hereafter, ZIN) in Saint-Petersburg. 2450 specimens of different *Peregriana* species collected in northern Asia, including the type series of *Lymnaea tobolica* Lazareva, 1967 (=*Lymnaea ampla* auct.); 55 specimens of *L. ampla* from Siberia.

2) Zoological Museum of the Institute of Plant and Animal Ecology, Uralian Branch of the Russian Academy of Sciences in Yekaterinburg (hereafter, ZMIE). 6822 specimens of different *Peregriana* species collected in Urals and adjacent waterbodies in 1954–2007; 164 specimens of *L. ampla* from Siberia.

3) Museum of Siberian Aquatic Molluscs (hereafter, MSAM), Omsk State Pedagogical University. 10469 specimens of different *Peregriana* species collected in northern Asia in 1972–2007. My own field collections of lymnaeid species sampled from 1996 to 2007 and containing species of the subgenus *Peregriana* are kept in MSAM. 1092 specimens of *L. ampla* from Siberia.

In total, 19741 specimens of snails of the subgenus *Peregriana* were examined, and 1311 of them (or 6.6%) were identified as *L. ampla*. It is worthy to note that 686 specimens (or 52.3%) of the whole amount of *L. ampla* specimens origin from a single sample collected in a large lake in the floodplain of the Irtysh River situated in Omsk City.

Species identification was conducted with using of the original description of *L. ampla* [Hartmann, 1821, 1840–1844] and some of the most recent taxonomic surveys [Kruglov, Starobogatov, 1993; Glöer, 2002; Stadnichenko, 2004; Kruglov, 2005]. I followed the treatment of this species proposed by Vinarski and Gloer [2007], who designated the lectotype of *L. ampla*. In order to distinguish between *L. ampla* and *L. auricularia* (L., 1758) that has shell shape and proportions similar to those of *L. ampla*, both conchological and anatomical traits were used (Table 1). Also specimens of this species from European countries (Germany, Romania and Ukraine) kept in MSAM were used for the purpose of comparison.

Eight individuals of *L. ampla* from the Irtysh River basin were dissected. Dissections and shell measurements were made under the stereoscopic microscope MBS-10 (LOMO, Russia). The standard scheme of turbospiral shell measurements [Starobogatov et al., 2004] was used.

Taxonomic account

Lymnaea ampla
(Hartmann, 1821)
Figs. 1, 2

Gulnaria auricularius var. ζ *ampla* Hartmann, 1821, S. 250, Taf. II, Fig. 29.

Gulnaria ampla Hartmann, 1821: Hartmann, 1840–1844, S. 69, Taf. V, Fig. 17; Clessin, 1884, S. 371, Figs. 225–228.

Limnaea auricularia var. *ampla* (Hartmann, 1821): Moquin-Tandon, 1855, p. 463, pl. 34, figs. 5–8; Kobelt, 1870, S. 153, Figs. 3, 4; Kobelt, 1877, S. 40, Figs. 1246, 1247; Zhadin, 1933, p. 94, fig. 34.

Limnaea ampla (Hartmann, 1821): Westerlund, 1885, S. 31; Locard, 1893, p. 23.

Limnaea ovata f. *ampla* (Hartmann, 1821): Geyer, 1927, S. 136, Taf. 13, Fig. 10, a-c.

Limnaea limosa var. *ampla* (Hartmann, 1821): Germain, 1931, p. 489, pl. 14, fig. 420.
Radix ovata f. *ampla* (Hartmann, 1821): Ehrmann, 1933, S. 157, Taf. 6, Abb. 92; Grossu, 1955, p. 108, fig. 26.
Lymnaea peregra (O.F. Müller, 1774): Hubendick, 1951, p. 146, figs. 101–104 (part.).
Radix auricularia var. *ampla* (Hartmann, 1821): Zhadin, 1952, p. 168.
Lymnaea tobolica Lazareva, 1967, p. 200, figs. 4, 8.
Lymnaea peregra f. *ampla* (Hartmann, 1821): Piechocki, 1979, S. 107, Fig. 48D; Jackiewicz, 1998, p. 46, pl. II, fig. 3.
Lymnaea (*Peregriana*) *patula* (Da Costa, 1778): Starobogatov, 1977, p. 160, fig. 363; Kruglov, Starobogatov, 1993, p.166, fig. 6D; Stadnichenko, 2004, p. 254, fig. 77; Kruglov, 2005, p. 351, figs. 236 (4-5), 241, 242.
Radix ampla (Hartmann, 1821): Glöer, 2002, S. 215, Abb. 243.

Type locality: «Rhine near Rheineck», Switzerland [see Vinarski, Glöer, 2007].

Type series (lectotype and five paralectotypes) is kept in the Naturmuseum Sent-Gallen, Switzerland.

Shell description is based on the examination of the type series as well as on examination of some samples from Europe and northern Asia. Shell of auriculate shape (Fig. 2, Table 2), medium-sized (up to 30 mm heigth), fragile, includes 4.0–4.25 whorls. Spire is very small as compared with a body whorl that is extremely inflated. Aperture widely ovate and deep. Columellar fold is absent or weakly developed.

Anatomical features. The general structure of reproductive system of *L. ampla* is typical for the *Peregriana* genus [see Kruglov, Starobogatov, 1983; Kruglov, 2005]. According to N.D. Kruglov [2005], the ratio between lengths of praeputium and penis sheath is equal to 0.76. From my results, this character does vary in Siberian populations from 0.57 to 0.91 (Table 3) with the mean value equal to 0.79. This allows us to distinguish this species from another one, *Lymnaea* (*Peregriana*) *tumida* (Held, 1836), which

Table 1

The distinguishing features of *Lymnaea ampla* and *Lymnaea auricularia**

Feature	*Lymnaea ampla*	*Lymnaea auricularia*
Impression on the columellar margin of aperture	Weakly developed**	Well developed
Shape of spire whorls	Rounded and evenly inflated	Pear-shaped and unevenly inflated
Bursa duct	Short	Very long
Ratio between praeputium and penis sheath lengths	Nearly 0.76	Nearly 1.10
Juveniles look like the adults	Yes	No

*Compiled on the basis of data provided by Kruglov and Starobogatov [1983, 1993], Glöer [2002], Kruglov [2005], and Glöer and Pešić [2008].
**See Kruglov and Starobogatov [1983, fig. 1].

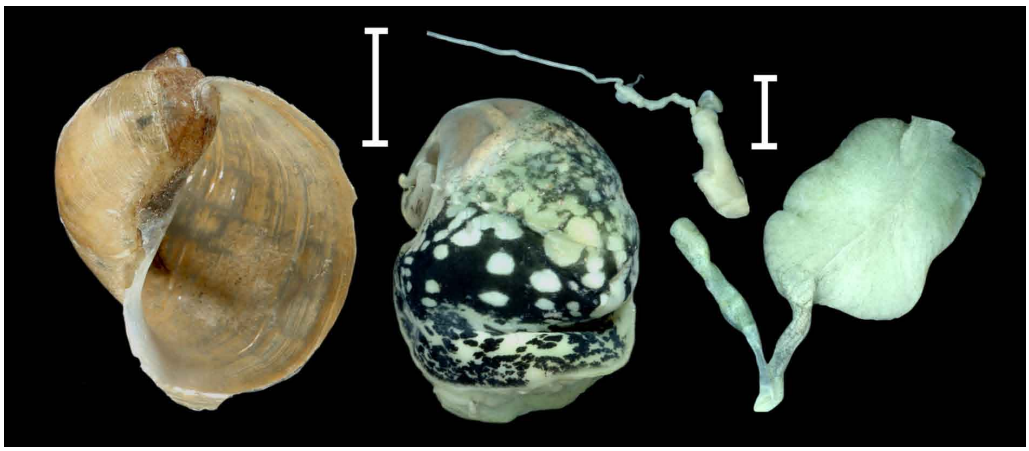

Fig. 1. An individual of *Lymnaea ampla* from the Shajtanka River (Sverdlovsk Region, Middle Urals), coll. M.E. Grebennikov and E.V. Golovanova. Dissection and photo by Peter Glöer. Scale bars: 2 mm (genitals), 5 mm (shell and intact soft body).

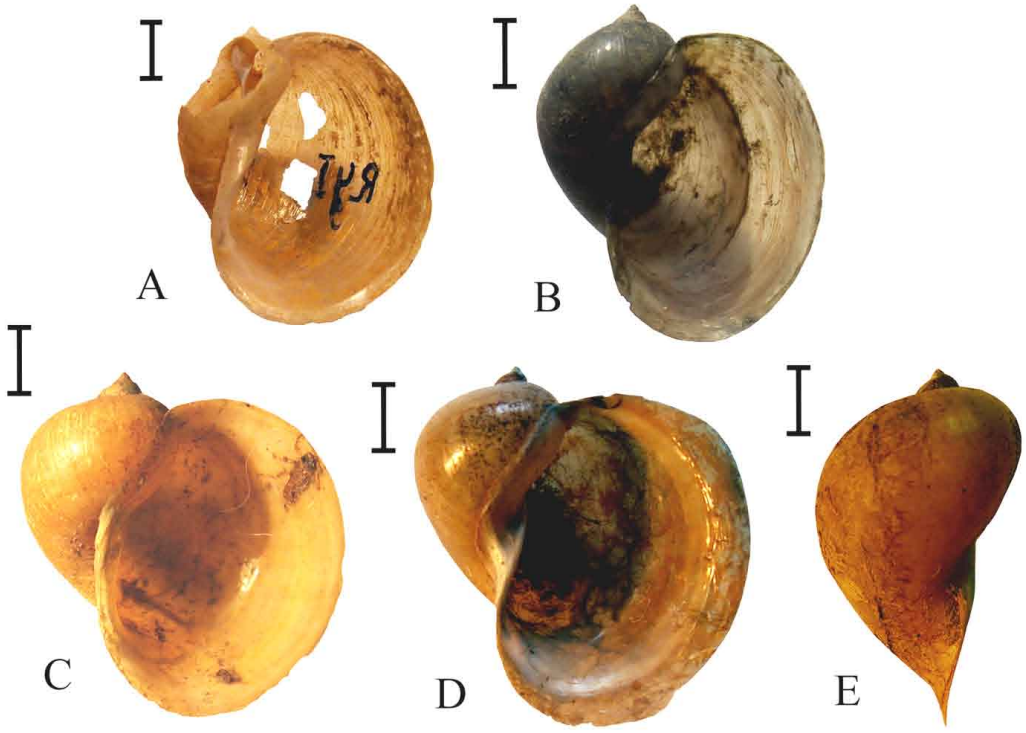

Fig. 2. Shells of *Lymnaea ampla* from different northern Asia waterbodies. **A**, Holotype of *L. tobolica* Lazareva (=*R. ampla*), upper course of the Ubagan River, Kustanay Region, Kazakhstan, coll. A.I. Lazareva; **B**, Tevriz River (Omsk Region, Russia), coll. M.V. Vinarski and A.V. Karimov; **C**, Nizhnjaja Tunguska River (Irkutsk Region, Russia), coll. M.V. Vinarski; **D**, **E**. Wet shore of the Lena River in Ust'-Kut Town (Irkutsk Region, Russia), coll. M.V. Vinarski. Scale bar – 5 mm.

Table 2

Morphometric characteristics of *Lymnaea ampla* shells from Siberian waterbodies

Character (index)	Mean	Limits	Standard deviation (σ)	Variation coefficient, %
Omsk City, a lake in the floodplain of the Irtysh River, n=60				
Whorls number	3.79	3.50–4.25	0.19	5.0
Shell height (SH), mm	18.7	16.1–26.7	1.9	10.2
Shell width (SW), mm	15.8	13.7–22.8	1.7	10.8
Spire height (SpH), mm	2.9	1.9–5.3	0.6	20.7
Body whorl height (BWH), mm	17.3	14.8–25.0	1.8	10.4
Aperture height (AH), mm	16.2	13.8–23.1	1.8	11.1
Aperture width (AW), mm	12.7	10.3–19.0	1.6	12.6
SW/SH	0.84	0.76–0.94	0.04	4.8
SpH/SH	0.16	0.11–0.21	0.02	12.5
BWH/SH	0.92	0.89–0.97	0.01	1.1
AH/SH	0.87	0.77–0.96	0.04	4.6
AW/AH	0.79	0.66–0.89	0.04	5.1
Chelyabinsk Region, Ilmeny Reserve, Bol'schoje Miassovo Lake, n=15				
Whorls number	3.81	3.50–4.00	0.15	3.9
SH, mm	19.6	16.0–24.2	2.6	13.3
SW, mm	17.7	14.8–23.3	2.5	14.1
SpH, mm	2.8	2.1–3.8	0.48	17.1
BWH, mm	18.3	14.7–23.9	2.8	15.3
AH, mm	17.7	14.8–23.5	3.0	16.9
AW, mm	13.1	10.5–17.8	2.3	17.6
SW/SH	0.91	0.83–0.96	0.04	4.4
SpH/SH	0.14	0.10–0.19	0.02	14.3
BWH/SH	0.93	0.90–0.99	0.02	2.2
AH/SH	0.90	0.84–0.99	0.04	4.4
AW/AH	0.74	0.66–0.83	0.04	5.4

Table 3

Proportions of the *Lymnaea ampla* copulative organs

Sampling site	N*	Length of praeputium (PL), mm	Length of penis sheath (PSL), mm	PL/PSL
Omsk Region, Krivoye Lake	5	4.0–6.9** 4.8±1.6	5.8–8.8 4.8±1.6	0.74–0.91 0.83±0.03
Chelyabinsk Region, Miass River near Miass Town	2	3.0–3.5	4.4–6.1	0.57–0.68
Chelyabinsk Region, Karagamchayat River	1	4.3	4.7	0.91

* N – number of snails dissected
** Ranges of variation (above line) and mean values ± SE (below line) of characters are given

possesses a similar shell shape and proportions. According to N.D. Kruglov data [2005], this value in *L. tumida* is near to 1.70, i.e. almost 2.15 times more than in *L. ampla*.

Taxonomic position. There is clear dissimilarity in malacologists' views on the taxonomic status of *L. ampla* reflected partly in the synonymy of the species given above. B. Hubendick [1951] as well as A. Piechocki [1979] and M. Jackiewicz [1998] consider it to be mere a «variety» of the polymorphic species *Lymnaea peregra* s. lato, whereas authors of most recent European taxonomic monographs and check-lists [Falkner et al., 2001; Glöer 2002; Glöer, Meier-Brook, 2003; Bank, 2006] do regard it as a distinct species. At last, Kruglov and Starobogatov [1983, 1993] believe that *L. ampla* s. lato should be split into as many as three distinct species that are similar in their conchological appearance but exhibit significant differences in the structure of reproductive organs. These species are: *Lymnaea* (*Peregriana*) *patula* (Da Costa, 1778), *L.* (*P.*) *hartmanni* (Studer, 1820) and *L.* (*P.*) *monnardi* (W. Hartmann, 1841). All specimens used in this paper correspond to the treatment of *L. ampla* species developed both in Western European [Glöer, 2002; Glöer, Meier-Brook, 2003] and Russian [Kruglov, Starobogatov, 1993; Stadnichenko, 2004; Kruglov, 2005] taxonomic literature.

Distribution of *Lymnaea ampla* in northern Asia

The examination of the literature data and museum collections has revealed that *Lymnaea ampla* in northern Asia is a rather rare species distributed mainly in a restricted area covering the Irtysh River basin (Fig. 3). Though a special quantitative analysis of its rarity has not been carried out, the portion of this species in examined collections is very low (only 1311 specimens, or 6.6% of total number of *Peregriana* individuals studied). It is relatively common in the southern and central

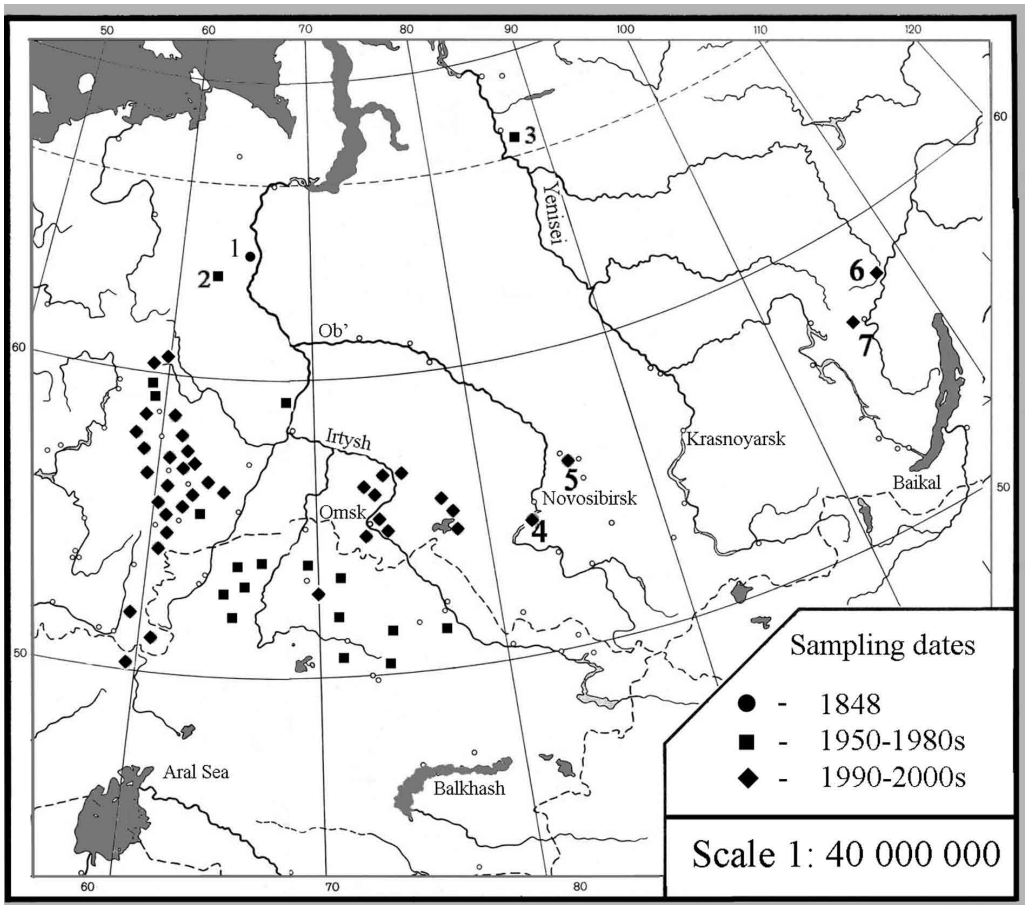

Fig. 3. Distribution map of *L. ampla* in northern Asia. Numbers correspond to findings of the species beyond the Irtysh basin discussed in the text.

parts of Urals where many large permanent lakes are situated. According to data of A.I. Lazareva [1968] and E.S. Frolova [1973], one can state the species is not rare in northern and central Kazakhstan.

To determine where is the northeasternmost boundaries of *L. ampla* distribution in northern Asia, I shall discuss briefly all four known records of this species made beyond the Irtysh River basin (see Fig. 3 under numbers).

1. Berezovo, Lower Ob' basin (ZIN). One empty shell collected in 1848 by members of the so-named «Uralian Expedition» that explored different parts of the Uralian mountain country. The information on the label is very scanty, there is only German inscription «Beresow» without exact information about the waterbody where the shell was found.

2. An unnamed oxbow lake in the floodplain of the Manja River, Lower Ob' River basin (ZMIE). Two empty juvenile shells collected by L.N. Stepanov (10.09.1988). It is the second finding of *L. ampla* in the Lower Ob' basin known to the date. Though N.D. Kruglov [2005] believes that this species occurs in the southern part of

western Siberia only, the northern part of the region is much poorly investigated by malacologists, and future explorations may bring new data about distribution of *L. ampla* in the Lower Ob' basin.

3. Kurejka River in the Lower Yenisei basin. This habitat is given here following V.A. Gundrizer [1979], who studied the malacofauna of the Lower Yenisean zoogeographic province. In his unpublished PhD thesis, he lists several European species of snails that were found by him in the Kurejka River north of the Arctic circle far from the main part of their ranges. *Lymnaea ampla*, *L. tumida*, *L glutinosa* (Müller), and *Choanomphalus rossmaessleri* (Auerswald in A. Schmidt) are among these species. Unfortunately, the Gundrizer's collections are lost now [see Vinarski et al., 2006] but there is the picture of *L. ampla* (=*L. patula* in original text) shell in his thesis (Fig. 4) that permits us to correlate it with European and western Siberian representatives of the species. Thus, it is the northernmost finding of *L. ampla* known to the date.

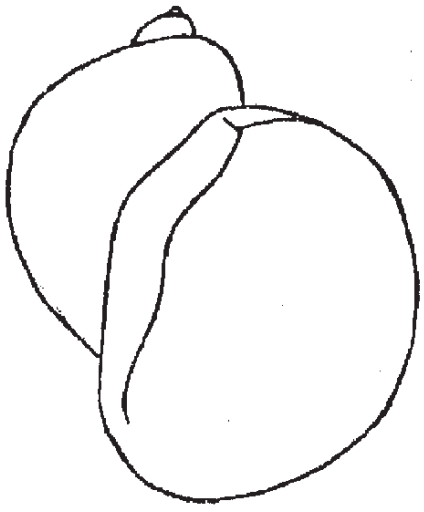

Fig. 4. *L. ampla* shell from the Kurejka River, Lower Yenisei basin [after Gundrizer, 1979]. Scale bar is absent in the original text.

4. Novosibirsk Reservoir and the mouth parts of several rivers flowing into the reservoir (MSAM).

5. Vicinity of Tomsk City (MSAM). The species was found in August of 2006 in small rivers (Tugojakovka, Basandajka and Ushajka) belonging to the Middle Ob' River basin. These findings corroborate the older one made by B.G. Johansen [1951], who reported the species *L. ampla* from the environs of Tomsk.

6. Nizhnjaja Tunguska River near Verkhnjaja Karelina Village (nearly 40 km west of the Kirensk Town, MSAM). To the date, it is the easternmost known finding of *L. ampla* (Fig. 2C).

7. The floodplain of the Lena River in Ust'-Kut Town (MSAM). Numerous empty shells of *L. ampla* were collected by me in June of 2003 on the wet shore of the Lena River (Fig. 2D, E).

The last two records are of special interest as being the first findings of the species in the eastern Siberian waterbodies. However, I have to note that species determination of these snails has been carried out on the basis of conchological features only due to absence of fixed material. It means I am not absolutely sure in its identity. Lymnaeid shells usually demonstrate a vast range of intraspecific (and even intrapopulational) variation in its shape and proportions, so in many cases the anatomical investigation is needed for exact species determination [Hubendick, 1951; Jackiewicz, 1998]. Therefore I consider these findings as demanding a further corroboration by study of the genital structure of amploid snails form eastern Siberia. Possibly, these animals represent a certain form of variation of a common Palaearctic

species *L. auricularia*. Although, relative height and shape of spire whorls of eastern Siberian snails determined here as *L. ampla* exhibit some differences from those of *L. auricularia* (Fig. 5) and, along with absence of well developed impression on the columellar margin of an aperture (see Table 1, Fig. 3E) indicate that shells collected in the Lena and Nizhnjaja Tunguska basins do not belong to *L. auricularia*.

Thus, one can conclude that *L. ampla* is more common in the south-western part of Siberia and adjacent parts of the Urals and Kazakhstan, whereas its findings in other parts of northern Asia are few in number and not always can be corroborated by the examination of original collections. Its supposed occurring in the Lena and Middle Yenisei basins is based on findings of dried shells only and is still not evidenced by anatomical inquiry. Possibly, *L. ampla* inhabits the Upper Yenisei basin as well but I could not find any reliable information on this neither from malacological collection nor from the faunistic literature. Certain another species of freshwater pulmonates have a similar type of geographic distribution. I would mention *Planorbis planorbis* (L., 1758), *Anisus leucostoma* (Millet, 1758), and *L. balthica* (L., 1758) among these.

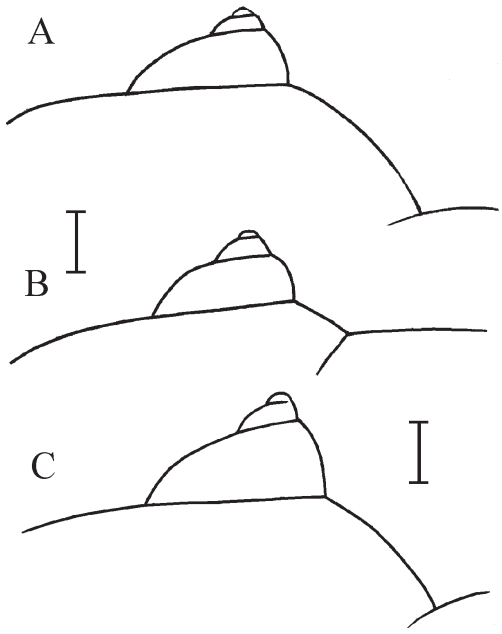

Fig. 5. Shape of spire whorls in species under discussion. **A**, *L. ampla*. Nizhnjaja Tunguska River (whole shell is illustrated in Fig. 2C); **B**, *L. ampla*. Wet shore of the Lena River (whole shell is illustrated in Fig. 2D, E); **C**, *L. auricularia*. Kuta River near Ust'-Kut Town (Irkutsk Region), coll. M.V. Vinarski. Scale bar – 2 mm.

Biotopic distribution of *L. ampla* in northern Asia

Though detailed ecological analysis was beyond the scope of my study, I would like to add some data on biotopic preferences of the species in northern Asia that can be deduced from my field observations and information from museum labels.

1311 individuals of *R. ampla* found by me in the field or in museum collections were gathered from 53 waterbodies. Information on hydrological conditions of the sampling sites allowing to classify them into categories of habitat types was available in 45 cases. It can be stated that the species occurs in a relatively narrow spectrum of waterbodies and all its findings in northern Asia were made in habitats of only four types:

1. Small rivers (23 cases, or nearly 51%).

2. Large impounding reservoirs or ponds built on small rivers (6 cases, or nearly 13.5%).

3. Permanent lakes in floodplains as well as oxbow lakes that usually have con-

nection with a main river bed during spring tide (6 cases, nearly 13.5%).

4. Permanent lakes located outside floodplains (10 cases, or nearly 22%).

Unlike most freshwater pulmonate snails, *L. ampla* avoids temporary habitats and, possibly, is not able to endure waterbody desiccation. This conclusion coincides with the data of some European authors on ecology of *L. ampla* [Jackiewicz, 1998; Glöer, 2002], whereas N.D. Kruglov [2005] believes that the species inhabits lentic habitats mainly.

In most cases, the snails were found in the shallow zone near shores, often on leaves or stems of macrophytes together with *Lymnaea stagnalis* (L., 1758), *L. auricularia* (L., 1758), *L. balthica*, *Anisus acronicus* (Férussac, 1807), and *Planorbis planorbis*. In Uralian mountain rivulets, such as stream Shajtanka situated in vicinity of Yekaterinburg, *L. ampla* lives on surface of large submerged stones along with *Ancylus fluviatilis* (O.F. Müller) [E.V. Golovanova, pers. communication]. In deep tectonic lakes of Southern Urals (Ilmeny State Reserve), *R. ampla* was found in small shallow bays with slight wave action, among macrophytes.

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