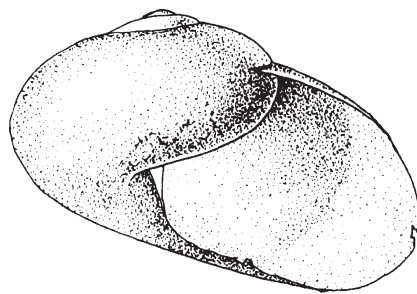


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TREASURE OF RUSSIAN SHELLS

Vol. 9



VITRINIDAE

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This volume is dedicated to the memory of my father who passed away in March of this year.

INTRODUCTION

The name vitrinids (glass snails) is due to the glassy translucent and fragile shell of those small snails (their body size is less than 20 mm).

Vitrinids are distributed mainly in Holarctic, only a few endemic genera present in Arabian peninsula and islands of East Atlantic and in North Africa. Several native vitrinid species mostly live on the ground in sufficiently humid and cool places, below decaying leaves and moss, near springs and at the side of creeks, in the mountains also in high altitudes. Vitrinids only appear above ground when the weather becomes colder and wet during autumn. They remain active during the winter and even can be found below thawing snow. Because glass snails are so indifferent to coldness, their area of distribution reaches quite far North: it extends beyond the Arctic Circle. In the mountains there are species living in altitudes above 3000 m above sea level. Many glass snail species also take profit from their resistance against coldness in feeding on other snails during their hibernation.

Vitrinidae has so called “zonitoid” type of shell, which characterized by next characters: shell generally flattened, thin-walled, transparent, with very smooth and glossy surface, sculpture of postembryonic whorls consists of fine growth lines and sometimes of narrow spiral grooves, lip and apertural armature absent. In total, the shell has tendency to reduction. The diaphanous shell of a glass snail already shows their strong similarity with a slug. Comparing for example with a pellucid glass snail (*Vitrina pellucida* (Müller, 1774)) and an ear-shaped glass snail (*Eucobresia nivalis* (Dumont et Mortillet, 1854)), it is obvious that while the pellucid glass snail still has a shell in which it is able to withdraw, the ear-shaped glass snail, hence its name, has a relatively smaller shell with less whorls, the last of which is widened in an ear-shape. And the snail is not able to withdraw into its shell.

Differences can be seen in the shape of the mantle: from the pellucid glass snail over to other glass snail species it can be seen that the mantle shield to a growing extent covers the shell from the front. Additionally a mantle flap covers the shell spire. In some species the shell may nearly be covered completely by the mantle.

Systematics and morphology of most representatives of this little group is well known and detailed described in many publications [Forcart, 1944; Schileyko, 1986; Hausdorf, 2002; etc.]. Schileyko [1986] divided the Vitrinidae into three subfamilies – Vitrininae Fitzinger, 1833 (sarcobelum and vaginal gland absent; vagina strongly reduced), Semilimacinae Schileyko, 1986 (there is short vagina and distinct, atrial sarcobelum) and Phenacolimacinae Schileyko, 1986 (there is long vagina and vaginal gland on the proximal vagina). The genus *Eucobresia* is attributed to the subfamily Semilimacinae conditionally: its representatives lacks a sarcobelum and has a vaginal papilla near the atrium possibly homologous to the spout of the sarcobelum [Schileyko, 1986: figs. 11, 12]. Hausdorf [1998] regarded this system as unacceptable, the Vitrininae being polyphyletic, the Semilimacinae paraphyletic, and only the Phenacolimacinae monophyletic. Moreover, the name Phenacolimacinae is a junior synonym of Plutoniinae Cockerell [1893], established for *Plutonia*. Shelley and Backeljau [1995: 150] are proposed spelling Plutoniinae for this taxa. The system of the family Vitrinidae in the present work follows the monograph of Schileyko [2003]. The family Vitrinidae is used for the following genera and subgenera occurring in the territory of central, eastern and southern Palaearctic: *Eucobresia*, *Phenacolimax* s. str., *Phenacolimax* (*Trochovitrina*) **stat. nov.**, *Semilimax* s. str., *Semilimax* (*Hessemilimax*) and *Vitrina*. There is only one change in Schileyko’s system: on the basis of inner morphology, for the former genus *Trochovitrina* here a subgeneric rank is determined. In total, 8 species with one subspecies were established for this area and one species included as possibly present.

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Distribution maps of representatives of the Vitrinidae in territory of Ukraine are prepared on the basis of the literature data, which were published by Dr. Nina SVERLOVA [2004] (Lviv, Ukraine) and Dr. Andrea TAPPERT (Edenkoben, Germany) & Alexei KORNIUSHIN (†Kiev, Ukraine) [2001].

Shells of Vitrinidae in natural size

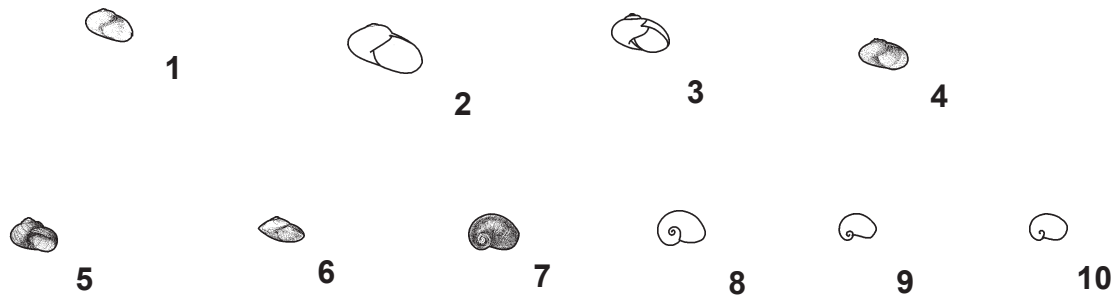


PLATE I: Shells of Vitrinidae in natural size. 1 – *Vitrina p. pellucida*; 2 – *V. p. alaskana*; 3 – *V. exilis*; 4 – *V. rugulosa*; 5 – *Phenacolimax (Ph.) annularis*; 6 – *Ph. (Trochovitrina) lederi*; 7 – *Eucobresia diaphana*; 8 – *E. nivalis*; 9 – *Semilimax (S.) semilimax*; 10 – *S. (Hessemilimax) kotulae*.

Distribution of Vitrinidae in Russia and adjacent territories

TABLE I. Distribution of Vitrinidae in Russia and adjacent territories

Species	1	2	3	4	5	6	7	8	9	10	11	12
<i>Eucobresia diaphana</i>		*										
<i>Eucobresia nivalis</i>		*										
<i>Phenacolimax (Ph.) annularis</i>		*	*	*		*	*	*				
<i>Phenacolimax (Trochovitrina) lederi</i>						*	*					
<i>Semilimax (S.) semilimax</i>		*										
<i>Semilimax (Hessemilimax) kotulai</i>		?										
<i>Vitrina exilis</i>										*		*
<i>Vitrina p. pellucida</i>	*	*	*	*	*							
<i>Vitrina pellucida alaskana</i>											*	
<i>Vitrina rugulosa</i>								*	*			

1 — Baltic States
 2 — Western Ukraine, Transcarpathian Region
 3 — Crimean Peninsula
 4 — Southern Ukraine
 5 — Western Russia
 6 — Eastern Caucasus

7 — Azerbaidjan, Talysh
 8 — Central Asia, Pamiro-Alai
 9 — Siberia, Altai
 10 — Magadan Region; Kamchatka Peninsula
 11 — Commander Ids., Bering Id.
 12 — Kurile Ids.

Systematic list

Systematic list:

- Family **Vitrinidae** Fitzinger, 1833
Subfamily **Vitriniinae** Fitzinger, 1833
Genus *Vitrina* Draparnaud, 1801
Vitrina exilis Morelet, 1858
V. p. pellucida (Müller, 1774)
V. p. alaskana Dall, 1905
V. rugulosa Martens, 1874
Subfamily **Plutoniinae** Cockerell, 1893
Genus *Phenacolimax* Stabile, 1859
Subgenus *Phenacolimax* s. str.
Phenacolimax (Ph.) annularis (Studer, 1820)
- Subgenus *Trochovitrina* O. Boettger, 1879
Ph. (Trochovitrina) lederi (O. Boettger, 1879)
Subfamily **Semilimacinae** Schileyko, 1986
Genus *Eucobresia* Baker, 1929
Eucobresia diaphana (Draparnaud, 1805)
E. nivalis (Dumont et Mortillet, 1852)
Genus *Semilimax* Agassiz, 1845
Subgenus *Semilimax* s. str.
Semilimax (S.) semilimax (J.B.L. Ferussac, 1802)
Subgenus *Hessemilimax* Schileyko, 1986
S. (H.) kotulae (Westerlund, 1883)

Abbreviations used in the text and figures

- A** – atrium
Ag – albumen gland
CL – conchyolinic layer
D – diameter of shell
E – East
FO – free oviduct
GL – glandular layer
GT – glandular tissue
H – height of shell
ML – muscular layer
N – North
OVD – orifice of vas deferens
P – penis
Pil – pilaster
PG – penial gland
PR – penial retractor
PS – penial sheath
- PSb** – papilla of sarcobellum
PT – penial tubercle
RS – receptaculum seminis (spermatheca)
S – South
Sb – sarcobelum
SD – spermathecal duct
SMF – Senckenberg Forschungsinstitut und Naturmuseum (Frankfurt am Main, Germany);
T – talon
Va – vagina
VD – vas deferens
VG – vaginal gland
VP – vaginal papilla
W – West
o.d. – original designation;
s.d. – subsequent designation.

Vitrinoidea Fitzinger, 1833

Superfamily **Vitrinoidea** Fitzinger, 1833

Shell thin, vitrinoid, auriform to almost plate-like. Mantle in semi-slug taxa large.

Sole tripartite. Caudal foss or caudal horn absent. Head wart absent. Jaw oxygnathous. Radula (“lingual membrane” in old literature) musivoglossate, with unpaired central tooth, a few laterals and many marginals.

Flagellum or epiphallus missing. Penis short, with variously developed gland in its walls. Penial caecum absent, rarely small process on penis may be present. Sarcobelum vaginal or absent; when present, with or without thorn. Vagina simple or with internal papilla. Atrium lacks appendix. Spermatophores missing. Omnivorous or carnivorous.

Holarctic; Arabian Peninsula, mountain regions of Central and N Africa, Asia to Far East and W Pacific islands, N America, East-Atlantic islands.

Family **Vitrinidae** Fitzinger, 1833

Vitrinidae Fitzinger, 1833: 91; Tryon, 1885: 132; Wenz, Zilch, 1959-1960: 235; Schileyko, 1986: 125; 2003: 1476; Kantor, Sysoev, 2005: 274; Egorov, 2008: 65; Giusti et al., 2011: 279-363.

Shell rather small, translucent, from low-conic to ear-shaped or plate-like (in semi-slugs), very thin and fragile, consists of 1.5-4.2 whorls in dependence of degree of reduce. Embryonic whorls with fine axial wrinkles or with microscopic dots which composed into spiral rows; or almost smooth. Body whorl very large, often broadly-inflated or widely elongate-plane. Sculpture consists of growth lines and, rarely, of very fine spiral striations visible only under significant magnification. Aperture very wide, margins thin, not reflected, basal and partly columellar margins often form periostracal fringe which may be resorbed.

Body of animals medium or rather large, foot up 20-50 mm in active stage (vitrinids of reviewed area not exceeds 20-25 mm in length, usually smaller). Visceral sac reduced in different degree and moved to back end of body in dependence of degree of shell reduction. Also, vanes of mantle enlarged in dependence of shell reduction and partly covers of shell. Sole trilateral. Jaw with single median projection. Female part of genitalia usually with accessory organs (vaginal gland (=“glandula amatoria” [Hausdorf, 1995]) often with vaginal papilla or sarcobelum (=“dart gland”, “love gland”, “atrial stimulator” in some authors) with one or two papillae). Sometimes accessory organs absent. Penis with gland into its widened walls and usually with well developed longitudinal pilaster. Vas deferens penetrated of penial gland. Spermatheca (=receptaculum seminis; bursa copulatrix) developed in various degree, completely reduced in *Trochovitrina*. Albumen gland comparatively small, irregular-shaped.

Representatives of family distributed in North Hemisphere (N America, islands of E Atlantic, Alpine zones of central and northern Africa, Arabian Peninsula, Europe, mountain regions of Asia to Far East and W Pacific islands).

Key to the subfamilies of the family Vitrinidae

1(4). Shell widely- or depressed-conic, consists of not less than 3 whorls.

2(3). Shell smooth, greenish or yellowish, translucent, with rounded periphery. Penial sheath present. **Vitrininae**

3(2). Shell with irregular wrinkles, dirty-yellow or brownish, with rounded or angulated periphery. Penial sheath absent. **Plutoniinae**

4(1). Shell ear-shaped, consists of not more than 2.5 whorls. **Semilimacinae**

Subfamily **Vitrininae** Fitzinger, 1833

Vitrinidae Fitzinger, 1833: 91; Adams, Adams, 1856: 119 (as subfam.); **Vitrininae** Schileyko, 1986: 142; 2003: 1487; Kantor, Sysoev, 2005: 274; Egorov, 2008: 66.

Shell thin, fragile, low widely-conic, normally developed. Basal edge of aperture without periostracal fringe. Aperture wide; peristome thin, simple, acute. Umbilicus pin-hole.

Vagina very short, practically absent, vaginal gland absent. Lower part of female section of reproductive system without any specialized organs. Sarcobelum absent. Penial sheath present.

Holarctic; alpine regions of E Africa.

Genus *Vitrina* Draparnaud, 1801

Genus *Vitrina* Draparnaud, 1801

Vitrina Draparnaud, 1801: 33, 98 (July); 1805: 23, 30, 119; Adams, Adams, 1856: 120; Binney, 1878: 135; Tryon, 1885: 132; Dall, 1905: 35-36; Forcart, 1944: 638; Likharev, Rammelmeyer, 1952: 296; Wenz, Zilch, 1959-1960: 235; Kerney, Cameron, 1979: 108; Schileyko, 1986: 142; 2003: 1488; *Vitrinus* Montfort, 1810: 238 (err. pro *Vitrina* Draparnaud, 1801); *Helico-limax*, Férussac, 1801(November): 390; *Phenacolimax* Hesse, 1923: 82 (non *Stabile*, 1859).

Shell globular, body whorl with widely rounded periphery. Mantle lobe very small.

Oviduct and spermatheca duct join at common point. Penis small, internally with large longitudinal pilaster. Penial sheath covers lower part of penis; not connected with retractor.

TYPE SPECIES – *Helix pellucida* Müller, 1774 (by monotypy).

Key to the species of the genus *Vitrina*

- 1(4). Shell consists of not less than 3 whorls.
- 2(3). Spire slightly raised, its height equal or some exceed half of apertural height. Major diameter of shell not exceed 6 mm. *V. p. pellucida*
- 3(2). Height of spire occupies half or some less of half of apertural height. Major diameter of shell usually exceed 6 mm. *V. pellucida alaskana*
- 4(1). Shell consists of not more than of 3 whorls.
- 5(6). Spire obtuse, occupies not more of 0.3 of height of aperture. $D/H = 0.57$. *V. rugulosa*
- 6(5). Spire elevated, occupies some more than 0.3 but less than 0.5 of height of aperture. $D/H = 0.4$. *V. exilis*

Vitrina pellucida pellucida (Müller, 1774)

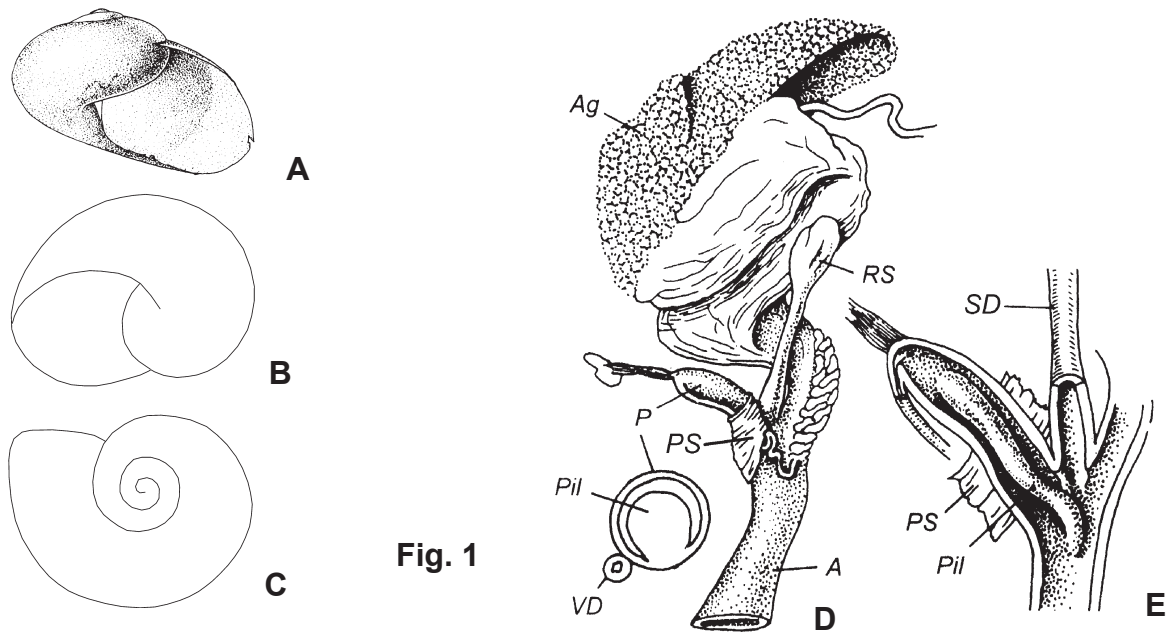


Fig. 1

Vitrina pellucida pellucida (Müller, 1774)

Helix domestica Ström, 1765: 434, Taf. 6, fig. 15;
Helix pellucida Müller, 1774: 15;
Vitrina beryllina C. Pfeiffer, 1821: 47, Taf. 3, Fig. 1;
Vitrina globosa O. Boettger, 1880a: 115, Taf. IV, fig. 4; – Tryon, 1885: 143, Pl. 30, figs. 20, 21;
Vitrina (Phenacolimax) pellucida – Tryon, 1885: 141-142, Pl. 30, figs. 12-16;
Vitrina (Phenacolimax) Bielzi Kimakowicz, 1890: 25;
Vitrina holmiensis Westerlund, 1897: 32; – Luther, 1901: 15 (as syn. of *V. pellucida*);
Phenacolimax pellucidus – Melnichenko, 1936: 3-18;
Helicolimax (H.) pellucidus – Likharev, Rammelmeyer, 1952: 297, fig. 225;
Helicolimax (H.) pellucidus var. *angelicae*, var. *globosa* – Likharev, Rammelmeyer, 1952: 297;
Vitrina pellucida – Luther, 1901: 43; Adam, 1960: 261-262, fig. 96; Schileyko, 1982: 165, fig. 46; Baidashnikov, 1985: 52, 64; Rudzite, 1999: 83, text-fig; Tappert, Korniushev, 2001: 15, 20, 23, 25, 26; Tappert, 2009: 20, 50;
Vitrina pellucida pellucida – Forcart, 1955: 159, Abb. 1, Taf. 12, figs. 1, 2, 5; Gittenberger et al., 1970: 66-67, figs. 78, 82; Schileyko, 1986: 143-144, figs. 13 A, 15; Kantor, Sysoev, 2005: 274; Sachkova, 2007: 18; Egorov, 2008: 66, Pl. XII, fig. 21.

Type material. Neotype of *Vitrina p. pellucida* – Zoological Museum of the University of Copenhagen, Denmark [Forcart, 1955: 159, Taf. 12, figs. 2, 5]; lectotype of *V. globosa* – SMF Nr. 107222 [Zilch, 1979].

Shell very fragile, translucent, widely-conic, consists of 3-3.75 rounded whorls. Spire slightly raised, its height equal or some exceed half of apertural height. Embryonic whorls ornamented with dots which form distinct spiral rows. Suture whitish. Umbilicus pin-hole, very narrow, often completely closed. (Fig. 1 A-C)

Vas deferens, thickened base of spermathecal duct, and joint of penis with atrium arranged approximately at same level. Glandular tissue in lower part of oviduct not founded. Also, ring-shaped folds between atrium and

female part of genitalia absent. Penis small, with one large and long rounded pilaster. (Fig. 1 D-E) [Schileyko, 1986].

H (in mm)	3.4	3.0	3.0	2.9
D (in mm)	6.0	5.1	5.0	4.8

Distribution. Eurasian boreal subspecies; type locality of *Helix domestica*: “Norwegen” [Forcart, 1955: 159]; type locality of *Helix pellucida*: “Fridrichsdalensis, seu Daniae” (vicinities of Copenhagen, Dania) [Schileyko, 1986]; type locality of *Vitrina beryllina*: “Bellevnegarten von Cassel” (restr. Forcart, 1955); type locality of *Vitrina globosa*: “Tbatani” (Transcaucasia); type locality of *V. holmiensis*: “Suecia ad Nackanas prope Stockholm”; type locality of *Vitrina bielzi*: “Transilvania”. See Maps 1, 2.

Ecology. Species mainly lives in litter of wet asp and oak or any deciduous forests, rarely in bushes along reservoirs and on high-grass meadows. (Figs. 11, 12)

Remarks. In northern part of area, representatives of this species had less-whorled shell. This form was determined by Likharev, Rammelmeyer [1952] as *Helicolimax (H.) pellucidus* var. *angelicae*. Early, Westerlund [1897: 32] and Luther [1901: 44] in the list of distribution for *V. angelicae* indicated “Solovetsk”. The true *Vitrina angelicae* Beck, 1837 was described from Greenland and according to Forcart [1955] differs from *V. pellucida* in next characters: the vas deferens is mostly free from the penis, but in *V. pellucida*, the vas deferens is enclosed in a large sheath of connective tissue surrounding part of the penis; additionally, the spermathecal duct of *V. pellucida* has a large swelling at its base adjacent to the atrium. Systematic position of this species is unclear. It is possible, that *V. angelicae* is synonym of *V. pellucida*.



Vitrina pellucida alaskana Dall, 1905

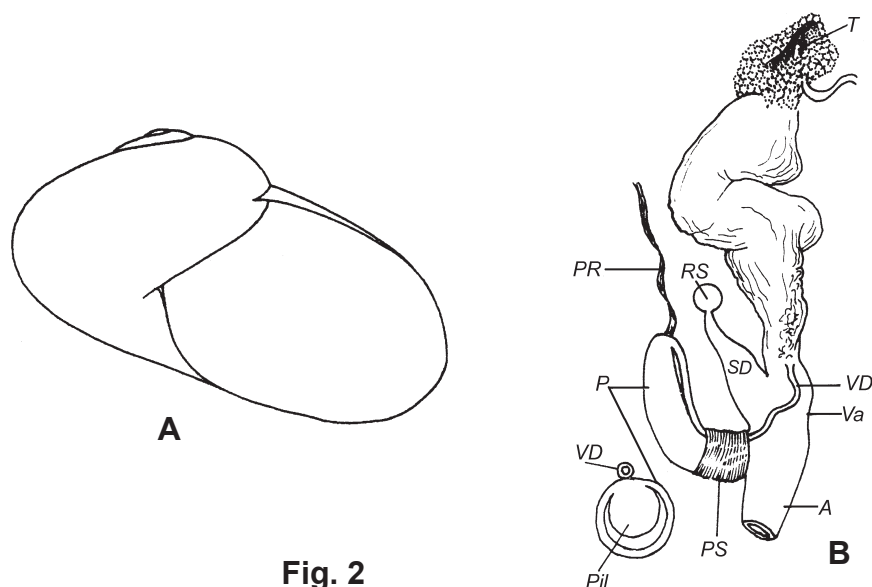


Fig. 2

Vitrina pellucida alaskana Dall, 1905

Vitrina pfeifferi Newcomb, 1861: 92 (nom. praecoc., non Deshayes, 1851);

Vitrina pfeifferi – Binney, 1878: 138, fig. 53, Pl. II, fig. A; Tryon, 1885: 144, Pl. 30, fig. 29;

Vitrina alaskana Dall, 1905: 37-38 (nom. nov. pro *Vitrina pfeifferi* Newcomb, 1861, non Deshayes, 1851);

Vitrina alaskana – Pilsbry, 1946: 503, fig. 276;

Vitrina pellucida alaskana – Schileyko, 1986: 144-146, figs. 13 B, 16; Kantor, Sysoev, 2005: 274-275; Egorov, 2008: 66, Pl. XII, fig. 22.

Type material. Unknown.

“*Vitrina Pfeifferi*. – *V.* testa sub-depr̄ssa, l̄xvigata, nitida, pellucida, virenti-albida; anfr. 3, ultimus permagnis; sutura subtillissima marginata; apertura ampla, obliqua rotundato-ovata; peristenue; columella arcuata. Diam. 5 mill. Axis. 2 mill. Hab. Carson Valley.” [original description of *V. pfeifferi*].

“This species has been referred to as *pellucida*, *limpida* and *exilis*, and when fully grown under favorable conditions the shell may reach 10 mm. in major diameter, though most of the specimens as collected are considerably smaller. The shell is translucent, with a marked greenish tinge, and not over three whorls. It is flatter than *limpida*, larger, and of a different tint, and the size of the whorls increases more rapidly. It is less flat and much larger than *V. exilis*, which is also of a different hue.” [original description of *V. alaskana*].

Differs from nominative subspecies in next shell characters: shell of adult individuals more large, body whorl significantly more inflated, embryonic whorls (up to 1.5) sculptured with dots, which form irregular spiral rows. Height of spire occupies half or some less of half of apertural height. (Fig. 2 A)

Anatomically, subspecies differs from nominative one in next characters: interval between branching of vas deferens and lower margin of penis approximately equal to length of atrium, i. e., their arranged in different levels.

Base of spermathecal duct very widened. Relative length of penis exceeds of same of nominotypical subspecies. (Fig. 2 B). [Schileyko, 1986]. “The lingual membrane has over 50-1-50 teeth, with 10 perfect laterals.” [Binney, 1878: 138].

H (in mm) 6.0

D (in mm) 10.0

Distribution. N America from Mexico to Alaska; NE Russian Far East: Commander Ids.; type locality: “Carson valley, Churchill Co., Nevada” (USA, Nevada). See Map 3.

Ecology. “It is the most common land shell on most of the islands of Bering Sea and on the continent near the sea, where it usually occurs, but as we move southward we find it occurring at continually greater elevations and entirely absent from the warm dry plains and valleys. It attains from 7,500 to 10,800 feet elevation in the Sierra and Rocky Mountains.” [Dall, 1905: 38].

Remarks. Forcart [1955] reviewed the northern species of the genus *Vitrina*, but did not treat *V. alaskana* because the reproductive anatomy was unknown to him. Later however, Bequaert & Miller [1973] placed *V. alaskana* in the synonymy of *Vitrina pellucida* stating that the reproductive anatomy of *V. alaskana* in examples they dissected agreed with that of Eurasian *V. pellucida* as illustrated and described by Forcart. Bequaert & Miller retained “*alaskana*” as the North American subspecies of *V. pellucida* on the basis of its geographical separation. Anatomical differences between both subspecies were described by Schileyko [1986] with notice that recorded differences may be bound up with seasonal changes. Schileyko also proposed to regard “*alaskana*” as subspecies of *V. pellucida* on the basis of described anatomical differences and geographical distribution.



Vitrina exilis Morelet, 1858

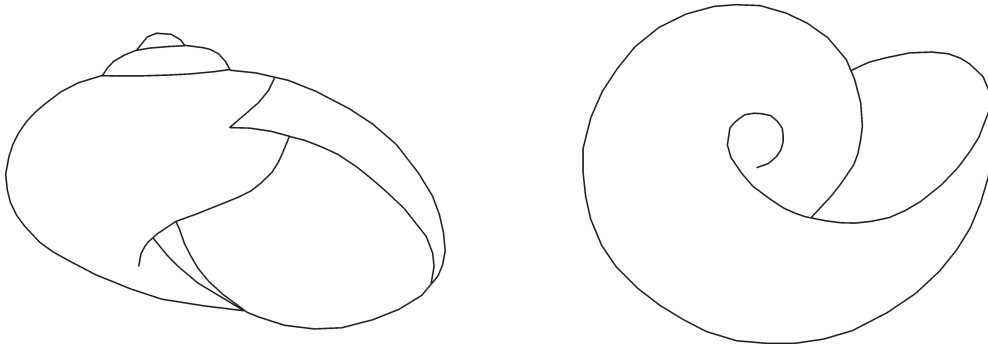


Fig. 3

Vitrina exilis Morelet, 1858

Vitrina exilis Morelet, 1858: 8;
Vitrina exilis – Binney, 1878: 138-139, fig. 54, Pl. II, fig. B; Dall, 1905: 38; Pearce et al., 2002: 94, 98; Kantor, Sysoev, 2005: 274; Egorov, 2008: 66;
Helicolimax (H.) pellucidus var. *exilis* – Likharev, Rammelmeyer, 1952: 297.

Type material. Unknown.

“Shell subperforate, rather convex-depressed, very thin, pellucid, hyaline, very lightly and distantly striate; suture impressed, margined; whorls 3, rapidly increasing, the last broad below, flattened; aperture oblique oval, the termination of the peristome membranous, that of the columella slightly reflected, giving the impression of a punctiform perforation. Greater diameter 7 S, lesser 5 mill., height, 3 mill.

Allied to *V. pellucida*, but with less broad spire and differing in the perforation.” [Binney’s [1878] translation of the original description]. (Fig. 3)

“This is a small species, of a whitish or translucent glassy hue; smaller and with a more elevated spire than its

American representative *V. alaskana*. According to Binney *V. exilis* has the jaw and radula as usual in the genus, the transverse rows of teeth numbering 37.1.37, with seven perfect laterals.” [Dall, 1905].
Anatomy unknown.

H (in mm) 3.0

D (in mm) 7.5

Distribution. Russian Far East: “Kamchatka, at Petropavlovsk; Bering Id. (Vega Expd.)” [Dall, 1905]; Kurile Ids.: Iturup, Paramushir, Shumshu, Atlasova Ids. [Pearce et al., 2002]. See Maps 4, 5.

Remarks. In Russia, this species is officially protected, and also included in the popular Red Data Book of the Magadan Region (Resolution of the Administration of the Magadan Region from June, 8th, 2007, nr. 193-па).



Vitrina rugulosa C. Koch in Martens, 1874

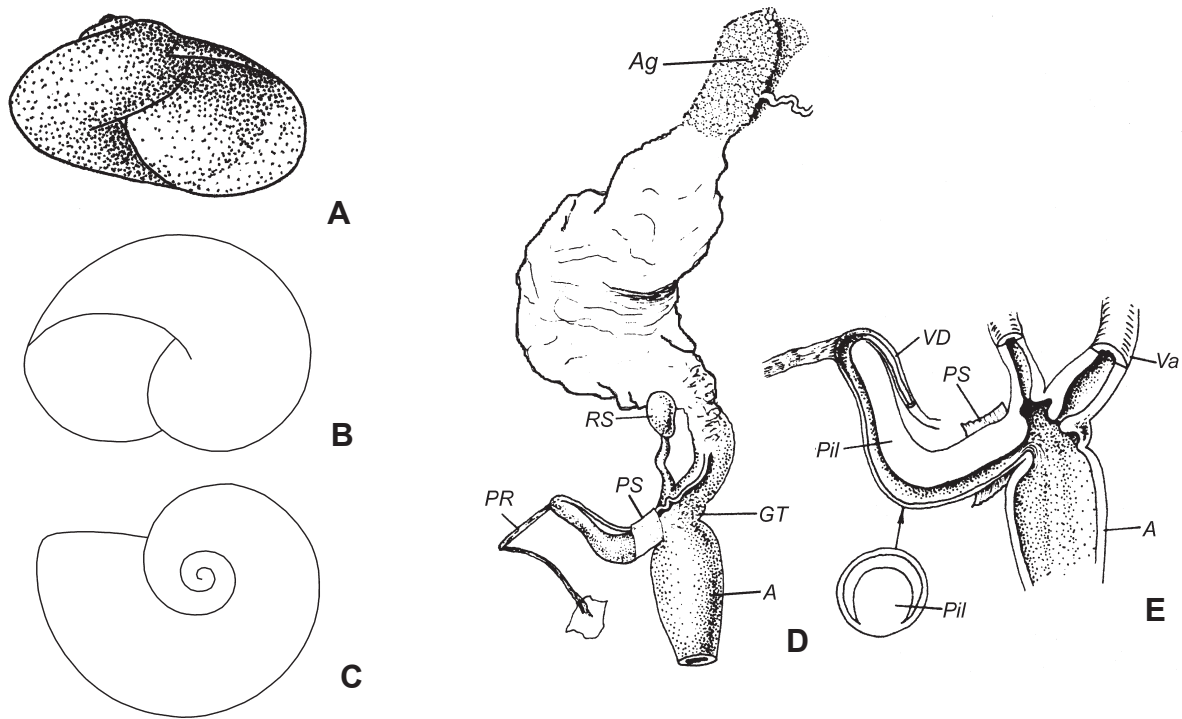


Fig. 4

Vitrina rugulosa C. Koch in Martens, 1874

Vitrina (?) *rugulosa* C. Koch in Martens, 1874: 7-8;
Vitrina (*Phenacolimax*) *rugulosa* – Westerlund, 1886: 22;
Vitrina (*Phenacolimax*) *rugulosa* var. *sibiricus* Westerlund, 1886: 22;
Vitrina (*Oligolimax*) *alexandri* Westerlund, 1896: 183;
Phenacolimax (*Semilimax*) *rugulosa* – Hesse, 1923: 93;
Helicolimax (*Helicolimax*) *rugulosus* – Likharev, Rammelmeyer, 1952: 297-298, fig. 226;
Helicolimax (*Helicolimax*) *rugulosus* var. *alexanderi*, var. *sibiricus* – Likharev, Rammelmeyer, 1952: 298
Vitrina rugulosa – Schileyko, 1986b: 142-143, figs. 13 B, 14; Kantor, Sysoev, 2005: 275; Egorov, 2008: 66, Pl. XII, fig. 23.

Type material. Unknown.

“Testa imperforata, globosodepressa, tenuis, nitida, laevis, pallide flavida; spira brevis, obtusa; anfractus 3; sutura simplex; apertura diagonalis, lunato-rotundata, $\frac{2}{3}$ diametri fere occupans; margo externus rotundatus, basalis anguste membranaceus, columellaris fere recte descendens. — Diam. maj. $6\frac{1}{2}$ — $7\frac{1}{2}$ min. 5— 6, alt. 3 — 4; apert. lat. $4-4\frac{1}{2}$, alt. 3— 4 mill.” [original description]

Shell consists of 3 rounded whorls. Spire obtuse, weakly raised, and occupies not more of 0.3 of height of aperture. Embryonic whorl covered with vague pits which not regularly arranged in spiral rows. (Fig. 4 A-C)

Oviduct short but distinctly differentiated. Duct of spermatheca branched considerable below of point of

branching of vas deferens. Base of duct of receptaculum seminis not thickened. Wall of lower part of oviduct with glandular tissue, which developed in various degree and arranged opposite of receptaculum seminis. Also, there is ring-shaped thickening in point of transition of oviduct to atrium. This thickening variously developed too at different individuals. Inner surface of vagina without constant folds. Penis small, with only one large rounded pilaster. (Fig. 4 D-E) [Schileyko, 1986].

H (in mm)	4.0	3.5	3.1
D (in mm)	7.0	6.0	5.9

Distribution. Mountain regions of Central Asia from Kopet-Dagh to Altai and SW Siberia; type locality: “in montibus Kokandensibus prope Karakasuk” (Karakasuk ravine in vicinity of Kokand, Ferghana valley, Uzbekistan). See Maps 6, 7.

Remarks. Martens [1874: 7] stated that this species described “by Dr. C. Koch from Wiesbaden”.



Plutoniinae Cockerell, 1893

Subfamily **Plutoniinae** Cockerell, 1893

Plutoniinae Cockerell, 1893: 186; Alonso et al., 2000: 44; **Plutoniinae** Schileyko, 2003: 1476; **Phenacolimacinae** Schileyko, 1986: 125 (as **Phenacolimacidus**, err. typogr.); Alonso et al., 2000: 41; Kantor, Sysoev, 2005: 275; Egorov, 2008: 65.

Shell normally developed or slightly ear-shaped, narrow umbilicate, basal margin can form thin periostracal fringe. Vagina long, consists of two parts. Upper part of vagina contained well-developed gland, usually with papilla. Sarcobelum and penial sheath absent.

Genus *Phenacolimax* Stabile, 1859

Phenacolimax Stabile, 1859: 422; Westerlund, 1902: 85; Baker, 1929: 138, Wenz, Zilch, 1959-1960: 237; Schileyko, 1986: 128; 2003: 1478, fig. 1907; *Gallandia* Bourguignat, 1880: 4; *Vitrina* Hesse, 1923: 82, 96 (non Draparnaud, 1801)

Shell widely-conic, consists of 3.5-4.2 convex whorls, spire rather high. Sculpture of definitive whorls consists of axial wrinkles and sometimes of spiral striations. basal margin without periostracal fringe.

Talon pigmented with black. Vas deferens comparatively short, enters middle part of penis and piercing penial gland. Penis short, conic or sac-like, without appendices, with 1 or 2 pilasters internally. Free oviduct short. Vagina large, internally with thick-walled papilla which has comparatively broad lumen. Peripheral layer of papilla generally consists of radial muscle bundles, inner layer – of glandular tissue. Receptaculum seminis present or absent.

Distribution. Mountain regions of Palearctic: from Pyrenees and Alps in Europe to Turkey, Caucasus and Central Asia. TYPE SPECIES – *Helico-limax major* Férussac, 1807 (s.d. Fischer in Paulucci, 1878: 24).

Key to the species of the genus *Phenacolimax*

1(2). Shell conoid-globose, whorls with rounded periphery. Receptaculum seminis present. *Ph. (Ph.) annularis*

2(1). Shell widely-conic, lens-shaped, whorls with angulated periphery. Receptaculum seminis absent. *Ph. (T.) lederi*

Subgenus *Phenacolimax* s. str.

Shell conoid-globose, whorls with rounded periphery. Embryonic whorls pitted with tiny, round depressions which more or less arranged in spiral rows. Receptaculum seminis present.

Phenacolimax (Ph.) annularis (Studer, 1820)

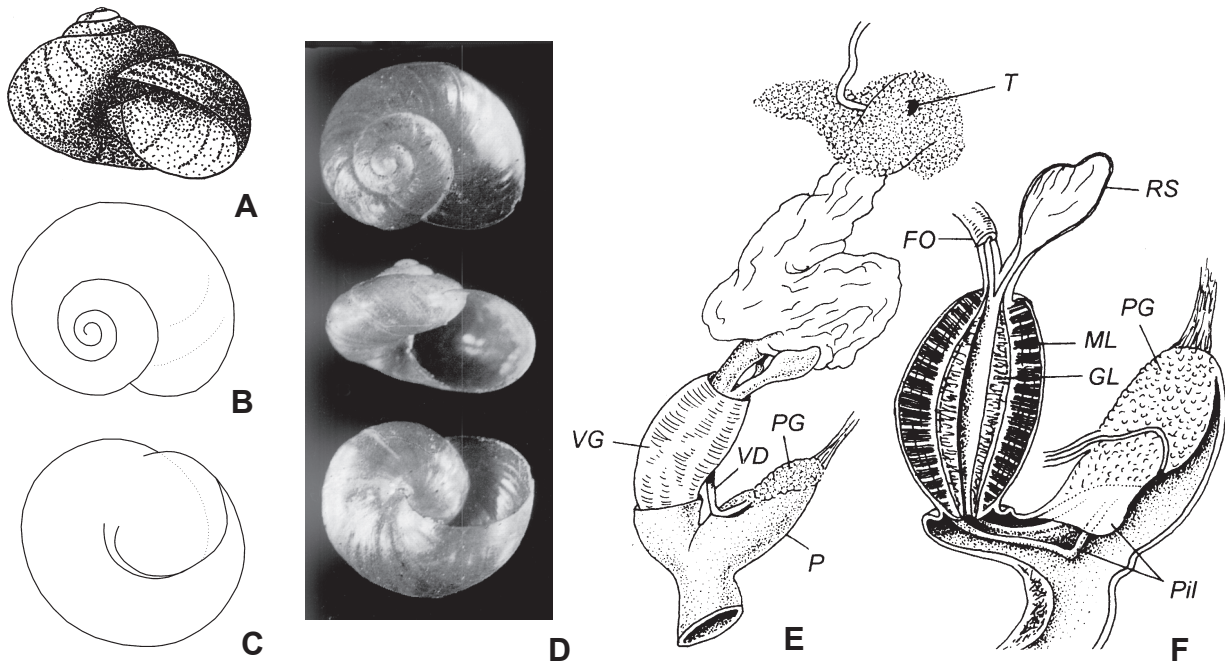


Fig. 5

Phenacolimax (Ph.) annularis (Studer, 1820)

Glischrus (Hyalina) annularis Studer, 1820: 86;
Vitrina (?) conoidea Martens, 1874: 8, Pl. 1, fig. 5;
Helicarion sieversi Mousson, 1876: 137, Pl. V, fig. 1;
Vitrina subconica Boettger O., 1878: 121; Zilch, 1979: 87, Taf. 8, fig. 15;
Vitrina (Oligolimax) annularis – Tryon, 1885: 145, Pl. 31, figs. 45-48;
Vitrina (Phenacolimax) komarowi Boettger O., 1879: 392, Taf. 10, fig. 4; Zilch, 1979: 87, Taf. 8, fig. 14;
Vitrina (Oligolimax) annularis forma *caucasica* Westerlund, 1886: 22; Zilch, 1979: 87, Taf. 7, fig. 10;
Vitrina (Oligolimax) raddei Boettger O., 1889: 936, Taf. 27, fig. 5; Zilch, 1979: 87, Taf. 8, fig. 13;
Vitrina (Trochovitrina) conoidea – Sturany, 1905: 296;
Oligolimax annularis – Forcart, 1944: 658, Abb. 11, Pl. 2, fig. 8;
Phenacolimax (Gallandia) annularis – Wenz, Zilch, 1959-1960: 237, Abb. 839; Kerney et al., 1983: 156; Schütt, 1993: 157, Abb.; *Helicolimax (Oligolimax) annularis* – Likharev, Rammelmeyer, 1952: 299, fig. 227;
Helicolimax (Oligolimax) annularis var. *conoidea* – Likharev, Rammelmeyer, 1952: 299;
Phenacolimax (Oligolimax) conoidea – Solem, 1979: 40; *Phenacolimax annularis* – Damjanov, Likharev 1975: 252; Schileyko, 1986: 128-130, figs. 1 A, 3; Schultes, Wiese, 1992: 78; Hausdorf, 1995: 64; Khokhutkin et al., 2003: 100; Sverlova, 2004: 100-101; Kantor, Syssoev, 2005: 275; Egorov, 2008: 65, Pl. XII, fig. 16.

Type material. Lectotype of *Vitrina subconica*– SMF Nr. 170220, from type locality: “Kasbeg” [Zilch, 1979]; lectotype of *Vitrina (Phenacolimax) komarowi* – SMF Nr. 170204, from type locality: “Armenia, Kipchag, Alagez” [Zilch, 1979]; lectotype of *Vitrina (Oligolimax) raddei* – SMF Nr. 170228, from type locality: “Agdag, Kopetdag” [Zilch, 1979] (Fig. 5D); lectotype of *Vitrina (Oligolimax) annularis* forma *caucasica* – SMF Nr. 160175, from type locality: “Tiflis” [Zilch, 1979]. Shell widely-conic, comparatively thick-walled, with raised spire, consists of 3.5-4.2 regularly rounded convex whorls.

Embryonic whorls with fine axial wrinkles, developed in various degree in dependence of age of molluscs. Definitive whorls covered rather thick and irregularly spaced axial wrinkles. Also, sometimes there is weak spiral striation. Height of spire exceeds 0.5 of height of aperture. Aperture wide, basal edge without periostracal fringe. Umbilicus pin-hole. (Fig. 5 A-D)

Penis short, sac-like or short fusiform. Wall of upper part of penis contains well developed gland. Vas deferens enters through of penial gland and attach to penis in its middle part. In transversal dissection, penial cavity narrow semi-moon in upper part of penis and very widened in its lower part. Penial retractor attached apically to penial gland. Free oviduct rather short, straight; not narrowed before joining with vagina. (Fig. 5 E-F) [Schileyko, 1986].

H (in mm)	4.2	4.0	3.9
D (in mm)	5.8	4.5	6.0

Distribution. Species widely distributed in mountain regions of Eurasia: from Alps across Carpathians, Crimea, Crete, Asia Minor and E Caucasus include Talysh to mountains of Central Asia; type locality for *Vitrina (?) conoidea* Martens, 1874: “in valle Sarafschan” (=Zeravshan). Type locality for *Glischrus (Hyalina) annularis* Studer, 1820: “Switzerland: Tourbillon near Sitten” [Forcart, 1957: 195, Hausdorf, 1995: 64]. Sverlova [2004: 100-101] indicated on presence of this species in Odessa (S Ukraine). See Maps 8, 9.

Ecology. Moderately humid habitats in mountain regions, scarcely overgrown rocks, rock rubble habitats, also in gorges and at creek margins. Calcareous substrate is preferred, but silicate substrate also tolerated.



Phenacolimax (Trochovitrina) lederi (O. Boettger, 1878)

Subgenus *Trochovitrina* Schacko in O. Boettger, 1880 stat. nov.

Vitrina (Trochovitrina) Schacko in Boettger O., 1880b: 379; *Trochovitrina* Wenz, Zilch, 1959-1960: 237; Schileyko, 1986: 130; 2003: 1479; *Helicolimax (Trochovitrina)* Likharev, Rammelmeyer, 1952: 299.

“Sicut Vitr. Lederi Bttg. sectioni Trochovitrinae G. Schackoi, qui nuper apparatusum lingualem inspexit, attribuenda.” [original description].

Shell widely-conic, lens-shaped, very fragile, whorls with angulated periphery. Embryonic whorls with fine radial striae. Receptaculum seminis absent.

Endemic of Central Caucasus and Transcaucasia.

TYPE SPECIES – *Lampadia lederi* Boettger, 1878 (s. d. Likharev, Rammelmeyer, 1952: 300).

Remarks. Westerlund [1902: 86] attributed the name to Schacko and gave as type *Vitrina conoidea* Martens, 1874 (junior synonym of *Phenacolimax (Ph.) annularis* (Studer, 1820)).

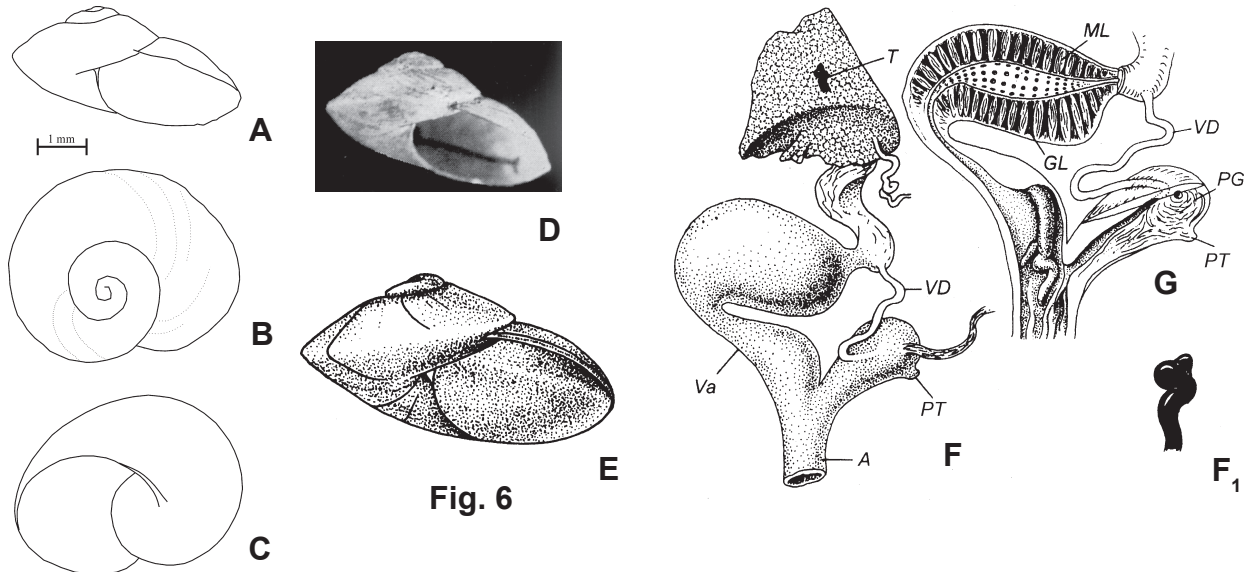


Fig. 6

Phenacolimax (Trochovitrina) lederi (O. Boettger, 1878)

Lampadia Lederi Boettger O., 1878: 121; 1879: 7, Taf. 1, fig. 2;
Vitrina (Trochovitrina) subcarinata Boettger, 1880b: 379;
Helicolimax (Trochovitrina) lederi – Likharev, Rammelmeyer, 1952: 300, fig. 228
Helicolimax (Trochovitrina) lederi var. *subcarinata* – Likharev, Rammelmeyer, 1952: 300;
Trochovitrina lederi subcarinata – Schileyko, 1967: 28, fig. 4;
Phenacolimax (Gallandia) lederi lederi – Zilch, 1979: 87, Taf. 7, fig. 11;
Phenacolimax (Gallandia) lederi ? subcarinatus – Zilch, 1979: 87, Taf. 7, fig. 12;
Trochovitrina lederi – Schileyko, 1986: 130-131, fig. 4; 2003: 1479;
 Kantor, Sysoev, 2005: 275; Egorov, 2008: 65, Pl. XII, fig. 17.

Type material. Lectotype of *Lampadia Lederi* – SMF No. 170216 from type locality [Zilch, 1979]; lectotype of *Vitrina (Trochovitrina) subcarinata* – SMF 170224 from type locality “Lenkoran” [Zilch, 1979] (Fig. 6 D).

“*Lampadia Lederi* Boettg. n. sp.

T. imperforata, perminute vix rimata, loco umbilici profunde impressa, depresso-conica, tenuissima, fragilis, pellucida, supra sericina, subtus nitidula, fuliginoso-fusca; spira brevis, conica; apex prominulus. Anfr. 3 celeriter accrescentes, supra fere plani, ad carinam subumbricati, basi convexi, sutura profunda disjuncti, superue striis distinctis, fasciculatis, fere costuliformibus, infra falciformibus ornat; ultimus acute carinatus, satis dilatatus, $\frac{2}{5}$ latitudinis testae aequans, vix descendens. Apert. perobliqua, ampla, angulato-ovata, intus nitida; peristoma acutum, tenue, margine columellari angustissime membranaceo-marginatum, membrana ad rimam perminute reflexa. — Alt. $\frac{2}{4}$, lat. 5, prof. 4 mm.

In montibus Kasbek Caucasi centralis et Suram Transcaucasiae. Proxirae affinis, ut videtur, V. annulari Ven. Helvetiae.” [original description].

Shell lens-shaped, very fragile, dirty-brownish or sandy, translucent, consists of 2.5-3.5 distinctly angulated whorls. All whorls include embryonic distinctly axially striated. Aperture ovate, oblique. Umbilicus pin-hole, often practically completely closed by inner lip. (Fig. 6 A-E)

Vas deferens short, entering middle part of penis. Penis shortly club-shaped, its thickened upper end bears small tubercle. Penial gland well developed. Internally penis without regular relief. Distal part of female section (free oviduct and vagina) long, its upper portion much enlarged, very thick-walled; walls contain numerous muscular bundles and glands which open by distinct pores into lumen of vagina. Talon rather long, twisted, darkly pigmented. (Fig. 6 F-G) [Schileyko, 1986].

H (in mm) 3.9 2.1

D (in mm) 5.5 5.1

Distribution. Endemic of Central Caucasus and Transcaucasia: Suramski (=Likhski) Ridge (Georgia), Lenkoran lowland, Talysh and Elburs Mts; type locality: “Kaukasus: Suram-Gebirge”. See Map 10.

Ecology. In Lenkoran lowland species collected in swampy thickets of bamboo.



Semilimacinae Schileyko, 1986

Subfamily **Semilimacinae** Schileyko, 1986

Semilimacinae Schileyko, 1986: 131; 2003: 1482 (part.); Kantor, Sysoev, 2005: 275; Egorov, 2008: 65; **Semilimacini** Schileyko, 1986: 131; 2003: 1484.

Shell thin, ear-shaped, basal edge of aperture with periostracal fringe.

Vagina short, not divided into parts, without gland and papilla, or papilla very short. Sarcobelum present (reduced only in *Eucobresia*), with one or two large papillae inside. Penial sheath present.

Genus *Eucobresia* H. Baker, 1929

Semilimax Hesse, 1923: 86, non Agassiz, 1846; *Vitrina* (*Eucobresia*) H. Baker, 1929: 139 (nom. nov. pro *Semilimax* Hesse, 1923; Forcart, 1944: 641; Wenz, Zilch, 1959-1960: 236, Schileyko, 1986: 138; 2003: 1485; *Helicolimax* (*Eucobresia*) Likharev, Rammelmeyer, 1952: 298.

Shell widely ear-shaped with broad or narrow periostracal fringe and large mantle lobe.

Sarcobelum completely reduced. Penis joins vagina below insertion of spermatheca duct. Vagina with short papilla. Europe, northern Asia.

TYPE SPECIES – *Vitrina diaphana* Draparnaud, 1805 (o. d.).

Key to the species of the genus *Eucobresia*

1(2). Shell consists of 2-2.25 quickly growing whorls, umbilicated. Body whorl occupies not less than 0.5 of shell diameter. Basal periostracal fringe rather wide, reach to columella. *E. diaphana*

2(1). Shell consists of 2.5 rather slow growing whorls, non umbilicated. Body whorl occupies less than 0.5 of shell diameter. Basal periostracal fringe narrow, not reach to columella. *E. nivalis*

Eucobresia diaphana (Draparnaud, 1805)

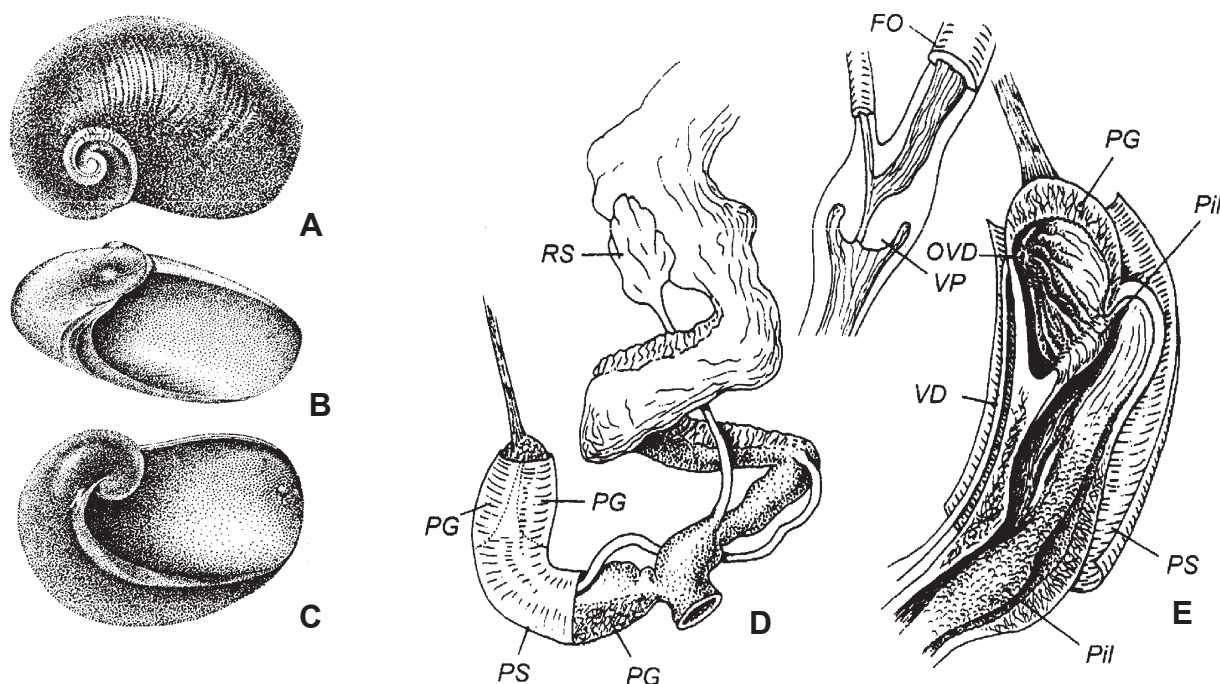


Fig. 7

Eucobresia diaphana (Draparnaud, 1805)

Vitrina diaphana Draparnaud, 1805: 120, Pl. 8, figs. 38, 39; – Adam, 1960: 263-264, fig. 98;

Vitrina Heynemanni C. Koch, 1871: 33, Taf. 1, figs. 4, 9;

Phenacolimax (Semilimax) diaphanus – Mermod, 1930: 97; Forcart, 1944: 641, Abb. 1, 2, Pl. 2, fig. 3; Wenz, Zilch, 1959-1960: 237, Abb. 837;

Eucobresia diaphana – Gittenberger et al., 1970: 67-68, figs. 81, 85; Damjanov, Likharev 1975: 250; Kerney et al., 1983: 154, text-fig., Pl. 7, fig. 1; Schileyko, 1986: 139-141, fig. 10 A, 12; 2003: 1486, fig. 1917; Falkner 1990: 172.

Type material. Lectotype of *Vitrina heynemanni* C. Koch, 1871–SMF No. 170096, Germany, Hessen-Nassau: Langen-aubach bei Haiger im Amte Dillenburg [Zilch, 1979].

Shell thin, flat, transparent, consists of 2-2.25 quickly growing whorls, umbilicated. Body (last) whorl occupies not less than 0.5 of shell diameter. Basal periostracal fringe rather wide, occupies about 35-45% of base of whorl, reach to columella. Embryonic whorls with widely spaced microscopic dots which not composed in rows. Umbilicus small, rounded. Animal dark, mantle black, in mountains light grey, cannot withdraw into shell, mantle covers apex entirely. (Fig. 7 A-C)

Spermatheca long and forms a few curves. Spermatheca with long straight duct and small reservoir. Atrium very short. Connective tissue between oviduct and vagina very weak developed. Penis long, covered by well developed

sheath. Penial gland well developed, divided into three parts: two parts symmetrically covers upper part of penis, third unpaired part lies in wall of lower part of penis. Inner space of penis divided by transversal fold into two chambers: rounded upper and rather large lower ones. Both chambers with high well developed longitudinal pilaster inside. Penial retractor attached terminally. (Fig. 7 D-E) [Schileyko, 1986].

H (in mm) 3.0 3.3

D (in mm) 6.0 6.7

Distribution. Mountain regions of W Europe: from E France (French Alps), Switzerland, the Netherlands and N Germany to Poland (Sudets), Romania (SE Carpathians), Bulgaria (W Rodopi, Vitosha, Rila and Pirin mountains). The species can be found in W Moldova.

Ecology. Humid and cool places, valley plains and mountains. In lowlands in shady and humid habitats in forests, in higher altitudes in open habitats, dwarf shrublands and grasslands with sufficient opportunities to hide. In Switzerland up to 2900 m, in Bulgaria 2600 m. Reproduction cycle presumably annual, in higher altitudes reproduction in the late summer. [AnimalBase].



Eucoberesia nivalis (Dumont et Mortillet, 1854)

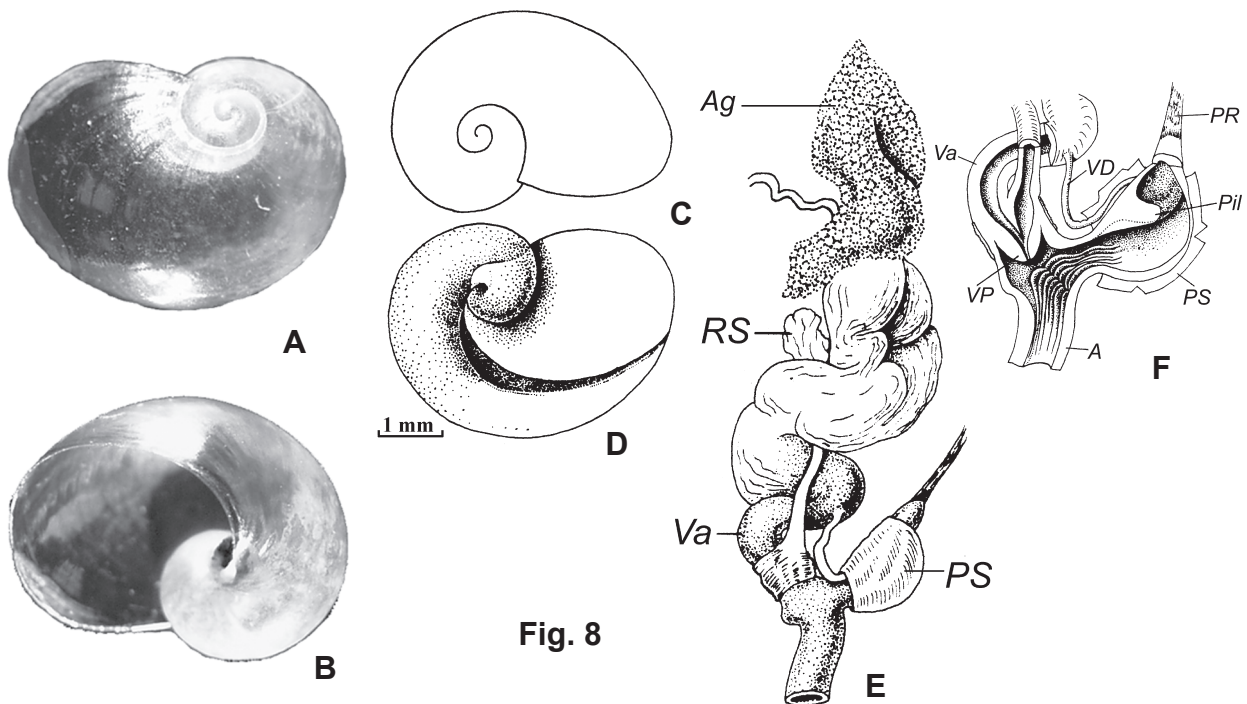


Fig. 8

Eucoberesia nivalis (Dumont et Mortillet, 1854)

Vitrina nivalis Dumont, Mortillet, 1854: 209; – Westerlund, 1886: 16;
Phenacolimax (Semilimax) alpina C. Koch in Hesse, 1923: 92, Taf. 1, fig. 5;
Vitrina kochi Forcart, 1954: 266 (non Andreae, 1884);
Helicolimax (Eucoberesia) kochi (Andreae, 1884) – Likharev, Rammelmeyer, 1952: 298;
Eucoberesia nivalis – Kerney et al., 1983: 155, Taf. 7, fig. 2a-b; Baidashnikov, 1985: 57, 64; Schileyko, 1986: 138-139, fig. 10 B, 11; Falkner, 1990: 172; Sverlova, 2004: 100-103; Pokryszko, Maltz, 2007: 8; Egorov, 2008: 65-66, Pl. XII, fig. 18.

Type material. Unknown.

Shell thin, transparent, consists of 2.5 rather slow growing whorls, non umbilicated. Body (last) whorl occupies about 0.4 of shell diameter. Embryonic whorls with microscopic dots which composed in irregular rows. Basal periostracal fringe narrow, not reach to columella. Aperture with weak parietal callus. Animal grey, mantle marbled with grayish spots, mantle appendix relatively small, not covering the apex. (Fig. 8 A-D)

Spermiduct long and forms a few curves. Spermatheca with long straight duct and small thin-walled reservoir. Lower part of oviduct and upper part of vagina covered by thin sheath. Oviduct in 1.5-2 times longer than vagina. Ducts of

oviduct and receptaculum seminis opens on top of short nipple-shaped papilla, which lacks of glandular elements and similar to enlarged sphincter. Penis rather short, almost completely covered by sheath, which almost reach to attachment of penial retractor. Penial retractor attached terminally. Penial gland weak developed. Penial cavity divided into upper and lower parts by semicircular fold. There are a few little parallel folds inside atrium, which reach to lower part of penis. Vas deferens very short, partly covered by sheath near atrium; joins into penis below upper edge of sheath. (Fig. 8 E-F) [Schileyko, 1986].

H (in mm) 2.8

D (in mm) 5.9

Distribution. European highlands, from Alps to E Carpathians. See Map 11.

Ecology. Humid mountain meadow and stony slopes above timberline, often near snow fields, also in swampy habitats in high mountain forests. In Ukrainian Carpathians species inhabits in silver fir-tree, fir-tree and alder-tree forests [Baidashnikov, 1985]. (Figs. 13, 14)



Genus *Semilimax* Stabile, 1859

Genus *Semilimax* Stabile, 1859

Semilimax Agassiz, 1846: 81 (nom. nud.); Gray 1847: 170 (no description, as synonym of *Vitrina* with designation of type species *Vitrina elongata* Draparnaud, 1805, = *Helix semilimax* Fűrussac, 1802); Stabile, 1859: 422; Westerlund 1902: 85; Baker 1929: 138; Forcart, 1944: 663; Wenz, Zilch, 1959-1960: 236; Schileyko, 1986: 132; 2003: 1484; Falkner et al. 2002: 131; *Vitrina* sect. *Semilimax* Tryon, 1885: 133; *Chlamydea* Westerlund, 1886: 15, 17; *Vitrinopugio* Ihering, 1892: 401.

Shell extremely ear-shaped, consists of 1.7-2.3 whorls, non-umbilicated, basal edge of aperture with periostracal fringe.

Sheath of sarcobelum attached to lower part of papilla, and its most part not covered by sheath. Walls of papilla glandulous, papillary duct with conchyolinic covers. Receptaculum seminis duct joins into vagina. Vaginal papilla absent.

Europe, from Pyrenees to E Carpathians.

TYPE SPECIES – *Vitrina elongata* Draparnaud, 1805 (s. d. by Fischer in Paulucci 1878: 24) = *Helix semilimax* Fűrussac, 1802.

Remarks. The difficult situation with original description and designation of the type species of the genus *Semilimax* shortly described by F. Welter Schultes at: [<http://www.animalbase.uni-goettingen.de/zooweb/servlet/AnimalBase/home/genustaxon?id=2549>].

Key to the species of the genus *Semilimax*

1(2). Shell very thin, transparent, rather glossy, consists of 2.0-2.2 quickly growing whorls. Basal wall of shell not resorbed. Penial retractor absent. *S. (S.) semilimax*

2(1). Shell very thin, flat, transparent, glossy, consists of 1.7-2.0 very quickly growing whorls. Basal wall of shell resorbed. *S. (H.) kotulae*

Subgenus *Semilimax* s. str.

Basal wall of shell not resorbed.

Papilla of sarcobelum ended with short hollow conchyolinic thorn. Vas deferens not connected with penial sheath. Penial retractor absent.

Semilimax (S.) semilimax (J.B.L. Férussac, 1802)

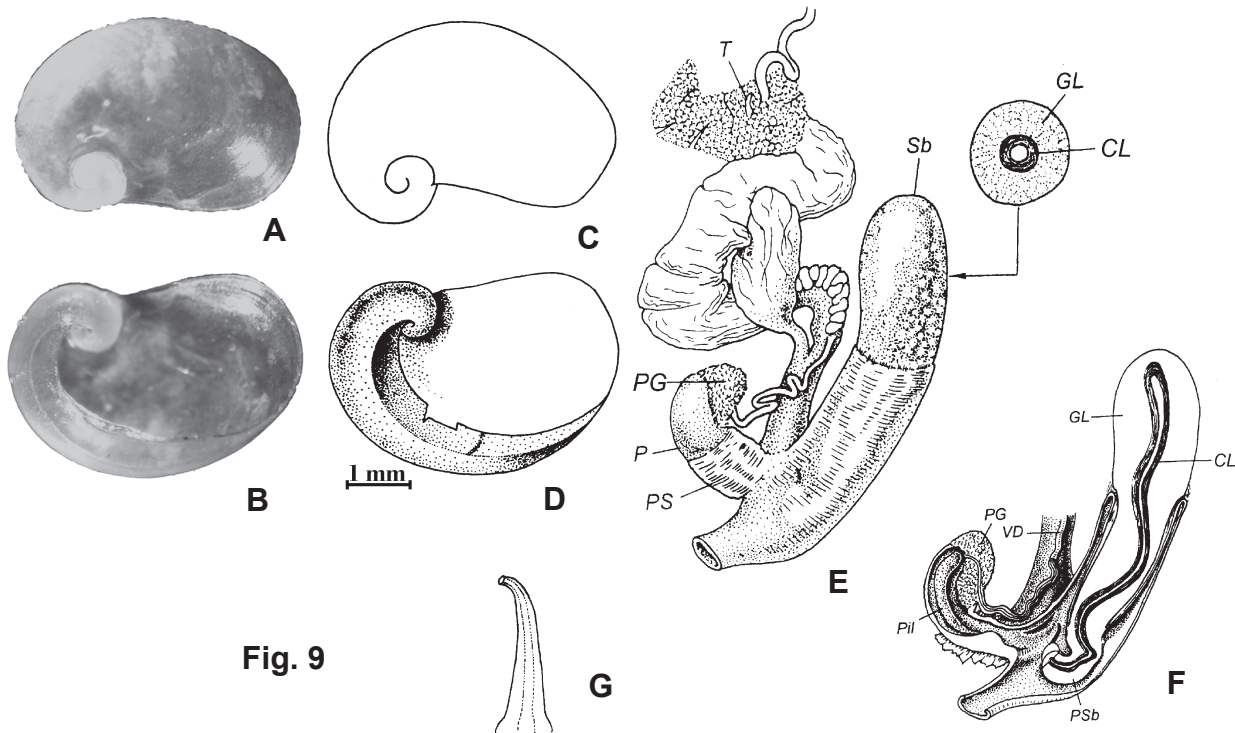


Fig. 9

Semilimax (S.) semilimax (J.B.L. Férussac, 1802)

Helix semilimax Férussac, 1802: 236, pl. 1, figs. A, B, C, D;
Vitrina elongata Draparnaud, 1805: 120, Pl. 8, figs. 40-42;
Vitrina elongata – Hesse, 1923: 104, Taf. II, fig. 11;
Vitrinopugio (Vitrinopugio) elongatus – Mermod, 1930: 106;
Vitrina (Vitrinopugio) elongata – Hubendick, 1953: 94, fig. 27;
Semilimax semilimax – Forcart, 1944: 664; Wenz, Zilch, 1959-1960:
 236, Abb. 835; Sverlova, 2004: 102-103; Kantor, Sysoev, 2005: 275;
Semilimax (S.) semilimax – Kerney et al., 1983: 152, Taf. 6, fig. 3a-c;
 Baidashnikov, 1985: 64; Schileyko, 1986: 132-133, figs. 5A,
 6;
 Falkner, 1990: 172; Egorov, 2008: 66, Pl. XII, fig. 19.

Type material. Unknown.

Shell very thin, transparent, rather glossy, consists of 2.0-2.2 quickly growing whorls. Body (last) whorl occupies more than 0.6 of shell diameter. Embryonic whorls sculptured with spiral rows, consisting of microscopic dots. Basal part of aperture with wide periostracal fringe. (Fig. 9 A-D) Alive animal's body light to dark grey (Fig. 16). Spermatophore rather long. Receptaculum seminis with large thin-walled reservoir and very short duct. Vagina not less than 4 times longer than oviduct. Sarcobelum very large, consists of long papilla which covered by thin sheath. Channel of papilla has conchyolinic covers. Channel opens in top of short and slightly curved thorn, which in texture similar to needle of syringe. Penis short,

its lower part covered by well developed sheath. Upper part of penis contains penial gland. Vas deferens fallen into middle part of penial gland. Penial cavity with long pilaster. (Fig. 9 E-G) [Schileyko, 1986].

H (in mm) 2.4

D (in mm) 5.0

Distribution. Pyrenees, Alps, Carpathians, German-Czech highlands. Type locality for *Helix Semilimax*: "Germany: Baden-Wuerttemberg, Billafingen near Ueberlingen and Stockach"; type locality for *Vitrina elongata*: "France". See Map 12.

Ecology. Humid habitats in mountain forests, under leaf litter and stones, prefers creek gorges, but also found in open habitats with high precipitations above the timberline. In Ukrainian Carpathians species inhabits in all types of forests, except purely oak [Baidashnikov, 1985]. Annual reproduction cycle. Adults lay 50-90 eggs in 6-9 clutches in the winter season (November to March), maturity is reached after 4-6 months, most animals die in spring, age 12-14 months [Kuenkel, 1933].



Semilimax (Hessemilimax) kotulae (Westerlund, 1883)

Subgenus *Hessemilimax* Schileyko, 1986

Schileyko, 1986: 133-134; 2003: 1485.

Basal wall of shell resorbed. Papilla of sarcobelum without thorn. Part of vas deferens attached to penis by penial sheath. Penial retractor present.

TYPE SPECIES – *Vitrina kotulae* Westerlund, 1883 (o. d.).

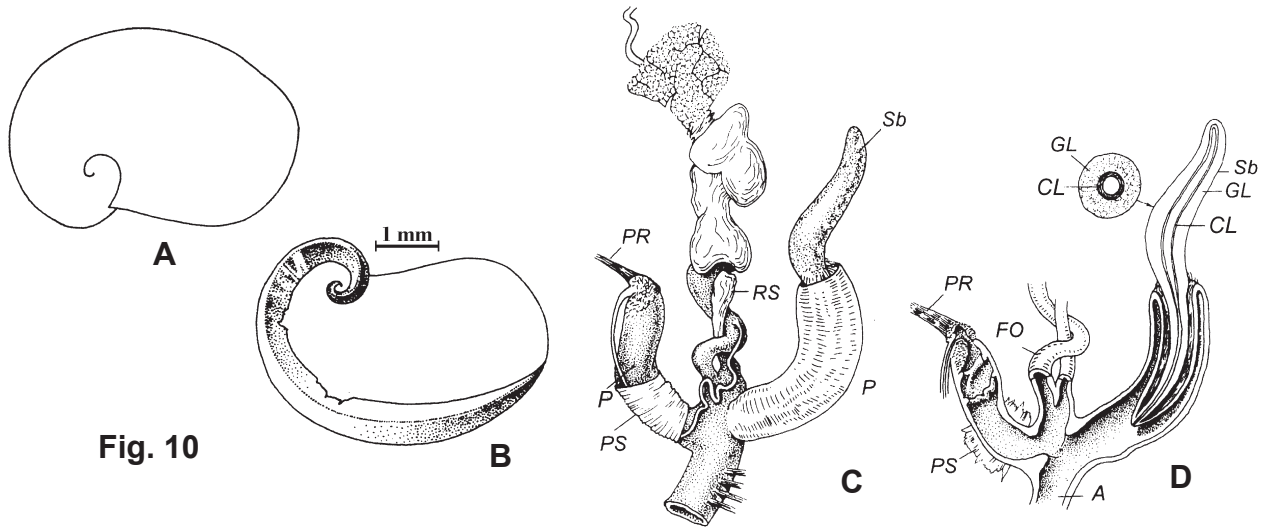


Fig. 10

Semilimax (Hessemilimax) kotulae (Westerlund, 1883)

Vitrina Kotulae Westerlund, 1883: 54-55;

Vitrinopugio kotulae – Hesse, 1923: 111; Likharev, Rammelmeyer, 1952: 300, fig. 229;

Semilimax kotulae – Forcart, 1944: 666, Pl. 2, fig. 12; Kerney et al. 1983: 153, Taf. 6, fig. 4a-b; Falkner, 1991: 102;

Semilimax kotulai – Baidashnikov, 1985: 64; Sverlova, 2004: 102-103; Kantor, Sysoev, 2005: 275;

Semilimax (Hessemilimax) kotulai – Schileyko, 1986: 134-135, fig. 5 B, 7; Egorov, 2008: 66, Pl. XII, fig. 20;

Semilax kotulai – Pokryszko, Maltz, 2007: 8 (err. pro *Semilimax*).

Type material. Unknown.

“*VITRINA KOTULAE* WESTERL. N. SP. Testa perdepessa, auriformis, tenuissima, virescente-hyalina, superne sub lente ruguloso-striata; spira planata, $\frac{2}{5}$ longitudinis aequans; anfr. 2, fortissime accrescentes, ultimus depressissimus, apertura maxima, fere $\frac{7}{8}$ testae longitudinis efficiens, antrorsum latior, margine columellari fortissime exciso usque ad apicem testae, ut infra conspecta spira tota cum vertice bene conspicua, margine superiore parum exciso, margine anteriore rotundato-subtruncato; limbus membranaceus jam ab anfractu penultimo fere ad marginem anteriorem prolongatus, medio latissimus et fere $\frac{1}{2}$ baseos occupans.

Long. 5–6, lat. $3\frac{1}{2}$ –4, alt. 2 mm.

Hab. Galicia in M. Tatra, 900–2200' s. m., praecipue in regione alpina, sub lapidibus non rara.

Hanc egregiam speciem detexit et demonstrativ amiciss. Prof. Kotula, cui scrutatori naturae meritissimo eam dedicare volui. In vicinitate *V. elongatae* locum habet, sed mox et valde ab hac et ab omnibus hucusque cognitis differt margine columellari toto fortissime arcuato et tam exciso ut spira tota usque ad apicem conspicua sit.” [original description].

Shell very thin, flat, transparent, glossy, greenish-yellow, consists of 1.7-2.0 very quickly growing whorls. Body

(last) whorl occupies more than 0.6 of shell diameter. Embryonic whorls practically smooth, without dots. Basal part of shell resorbed. (Fig. 10 A-B)

Vas deferens rather long, fallen into penis subapically. Reservoir of spermatheca rather small, slowly transited in short duct which fallen into vagina near at atrium. Vagina very short; oviduct rather long. Sarcobelum without thorn. Penis without longitudinal pilaster, but with one or two circular folds inside. Penial retractor attached to penis terminally. (Fig. 10 C-D) [Schileyko, 1986].

H (in mm) 2.0 2.4

D (in mm) 5.0 5.9

Distribution. Alpine and subalpine zones of mountains of Central Europe: Alps, Sudets, Tatra and Carpathians; type locality: “Galicia in M. Tatra, 900-2200' s. m.”. See Map 13.

Ecology. Mainly in forests, cool and humid shady habitats, in moist moss, under stones and in soil litter, only in mountains at altitudes above 600 m. Rarely above timberline in humid shrubs with mosses and on alpine pastures under stones. In Ukrainian Carpathians species lives in mountain fir-woods and in alder groves [Baidashnikov, 1985]. Also, species present in pure coniferous forests [Solymos, Pall-Gergely, 2007]. Biology fairly unknown, adult animals were found in August and September. Species may be suitable indicator for fate of montane species affected by global warming in whole Central Europe [Mueller et al., 2009]. (Fig. 15)

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Fig. 1 – A: after Schileyko, 2003; B-C: original, W Russia, Moscow, Izmailovskij forest-park, in grass under trees, coll/det: R. Egorov, 09.2008; D-E: after Schileyko, 2003.

Fig. 2 – A-B: after Schileyko, 1986.

Fig. 3 – after Binney, 1878, redrawn.

Fig. 4 – A-C: original, Kazakhstan, Yuzhno-Kazakhstanskaya Oblast' Region, Boralday Ridge, Kokboulak Mts., valley of Ul'ken-Kokboulak river, above Psteli settlement, 42°39'48"N-70°14'57"E, coll: K. Makarov, 25.03.2010, det: R. Egorov; D-E: after Schileyko, 1986.

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Fig. 7 – A-C: after Adam, 1960; D-E: after Schileyko, 2003.

Fig. 8 – A-B: original, Slovakia, High Tatra National Park, at low vegetation near ban of rivulet at Village Ztola, 2 km S of Vysne Hagy Tatranska kotlina basin at foot of High Tatra Mts, photo by J. Grego; C-E: after Schileyko, 1986.

Fig. 9 – A-B: original, Slovakia, under low vegetation at Driekyna valley 2 km S of Slovenska Lupca, Bystrica Vrchovina hills, photo by J. Grego; C-G: after Schileyko, 2003.

Fig. 10 – A-D: after Schileyko, 2003.

Alive vitrinids in natural habitats



Fig. 11. *Vitrina p. pellucida*, under low vegetation at N end of Podlavice (Banska Bystrica), on road to Laskomersks valley; Starohoske Verchy, Banska Bystrica, Slovakia; photo by J. Grego



Fig. 12. *Vitrina p. pellucida*, under low vegetation at N end of Podlavice (Banska Bystrica), on road to Laskomersks valley; Starohoske Verchy, Banska Bystrica, Slovakia; photo by J. Grego



Fig. 13. *Eucobresia nivalis*, at low vegetation near bank of rivulet at Village Ztola, 2 km S of Vysne Hagy Tatranska kotlina basin at foot of High Tatra Mts; High Tatra National Park, Slovakia; photo by J. Grego



Fig. 14. *Eucobresia nivalis*, under mossy rocks, Geravy plateau 200 m N of Top cable station from Dedinky, Slovenski Raj National Park, Slovakia; photo by J. Grego

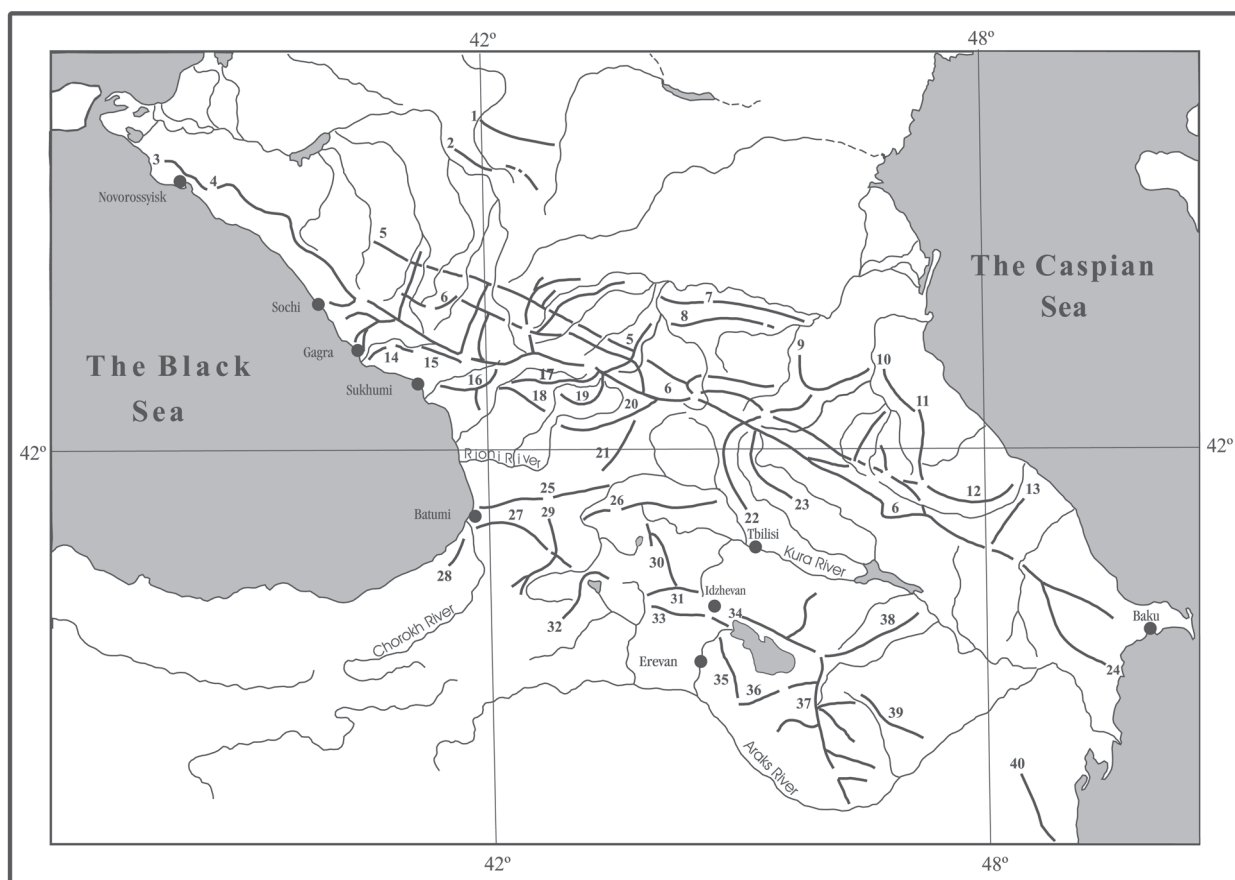


Fig. 15. *Semilimax kotulae*, among vegetation and moss at wet bank of small rivulet in forest 1 km W of Polana hotel, 1300 m, Polana Biosphere reserve, Slovakia; photo by J. Grego



Fig. 16. *Semilimax semilimax*, under low vegetation at Mouth of Vel'ke Plavno valley, at right bank of Hron river 2 km E of Zalkova, Bystricka Vrchovina Hills, Slovakia; photo by J. Grego

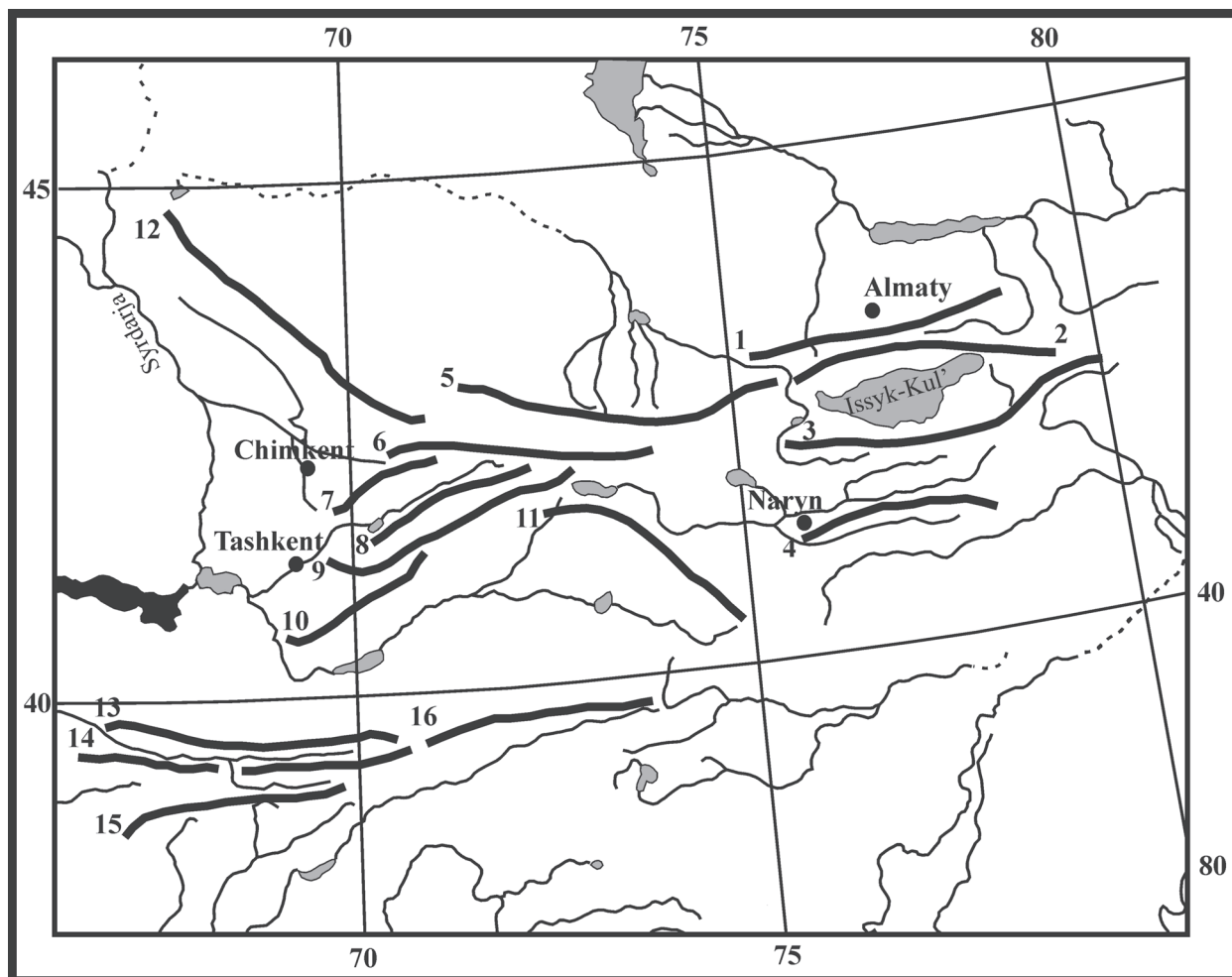
Orographic scheme of Caucasus



Orographic scheme of Caucasus:

- | | |
|------------------------------|----------------------------------|
| 1 — Stavropol'skaya highland | 21 — Likhskiy (=Suramskiy) Ridge |
| 2 — Yegorlyk'skiy Ridge | 22 — Kartliyskiy Ridge |
| 3 — Markhotskiy Ridge | 23 — Kakhetinskiy Ridge |
| 4 — Great Caucasus Ridge | 24 — Alyatskiy Ridge |
| 5 — Skalistyi Ridge | 25 — Meskhetskiy Ridge |
| 6 — Bokovoiy Ridge | 26 — Trialetskiy Ridge |
| 7 — Terskiy Ridge | 27 — Schavschetskiy Ridge |
| 8 — Sunzhenskiy Ridge | 28 — Lasistan Ridge |
| 9 — Andiyskiy Ridge | 29 — Arsiyanskiy Ridge |
| 10 — Bogoskiy Ridge | 30 — Dzhavakhetskiy Ridge |
| 11 — Les Ridge | 31 — Bazumskiy Ridge |
| 12 — Samurskiy Ridge | 32 — Kargapazary Ridge |
| 13 — Kyabyaktepe Ridge | 33 — Pambakskiy Ridge |
| 14 — Bzybskiy Ridge | 34 — Schakhdagskiy Ridge |
| 15 — Abkhazskiy Ridge | 35 — Gegamskiy Ridge |
| 16 — Kodorskiy Ridge | 36 — Vardenisskiy Ridge |
| 17 — Svanetskiy Ridge | 37 — Zangezurskiy Ridge |
| 18 — Egrisskiy Ridge | 38 — Muravdag Ridge |
| 19 — Lechkhym'skiy Ridge | 39 — Karabakhskiy Ridge |
| 20 — Rachinskiy Ridge | 40 — Talysch Mountains |

Orographic scheme of Central Asia



Orographic scheme of Central Asia:

Tien Shan:

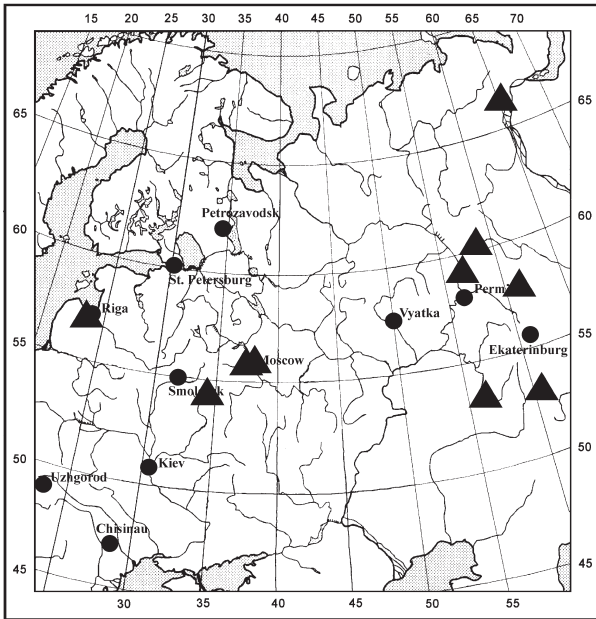
- 1 — Zailiyskiy Alatau
- 2 — Kungey Ala Too
- 3 — Terskey Ala Too
- 4 — Naryn Too
- 5 — Kyrghyz Ala Too
- 6 — Thalasskiy Ridge
- 7 — Ugamskiy Ridge
- 8 — Pskemskiy Ridge
- 9 — Chatkalskiy Ridge

- 10 — Kuraminskiy Ridge
- 11 — Ferghanskiy Ridge
- 12 — Karatau Ridge

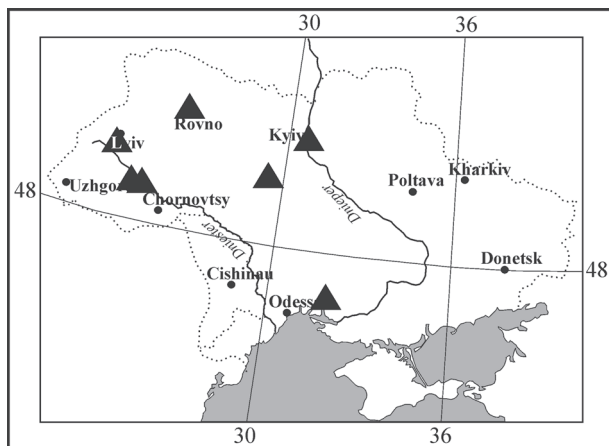
Pamiro-Alai:

- 13 — Turkestanskiy Ridge
- 14 — Zeravshanskiy Ridge
- 15 — Gissarskiy Ridge
- 16 — Alaiskiy Ridge

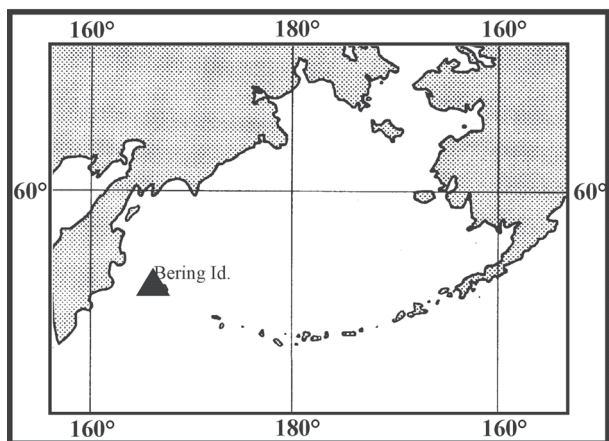
Maps of distribution



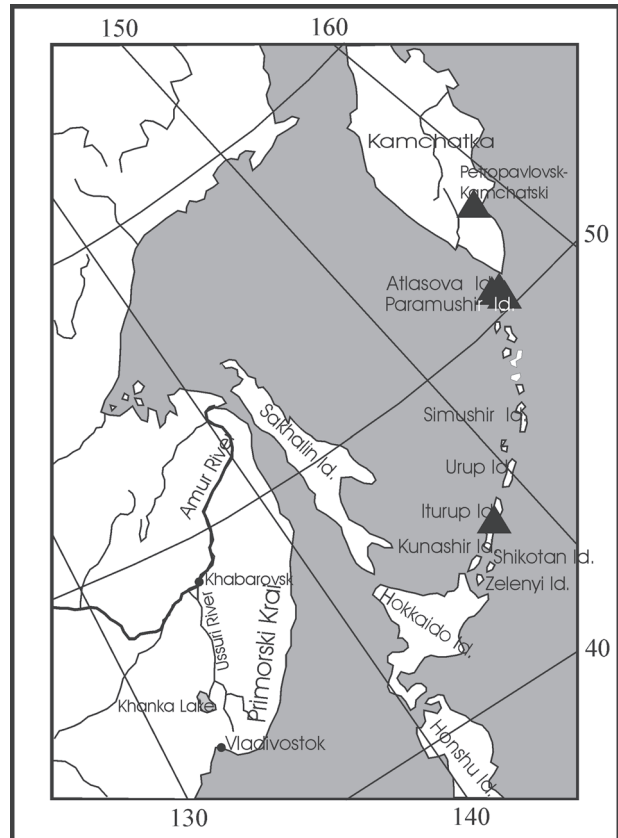
Map 1. Distribution of *Vitrina p. pellucida* in W part of Russia and Latvia.



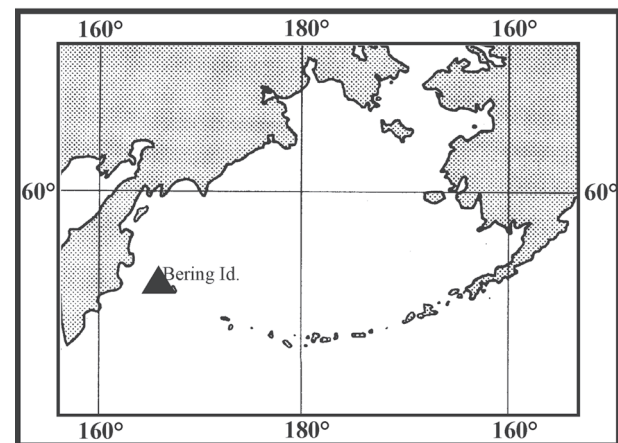
Map 2. Distribution of *Vitrina p. pellucida* in Ukraine.



Map 3. Distribution of *Vitrina pellucida alaskana*.

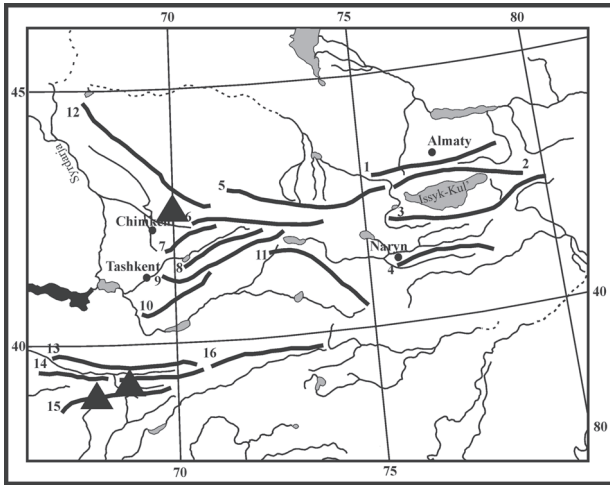


Map 4. Distribution of *Vitrina exilis* in Kamchatka Peninsula and Kurile Islands.

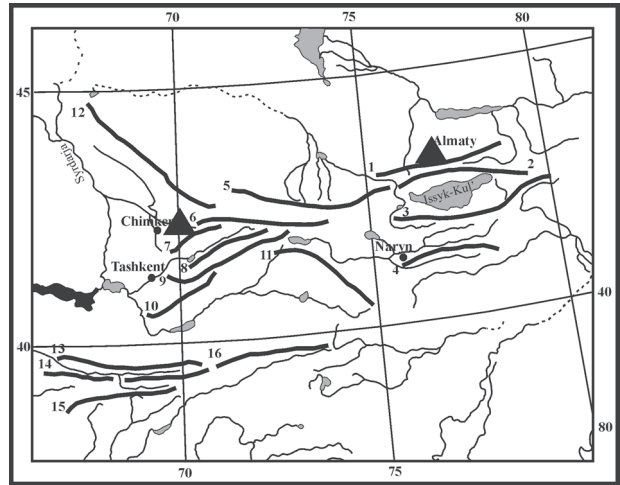


Map 5. Distribution of *Vitrina exilis* in Commander Islands.

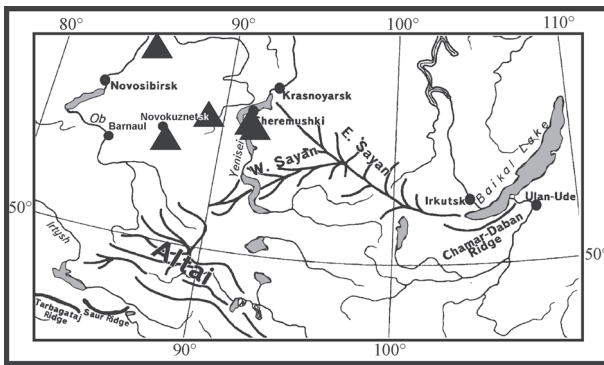
Maps of distribution



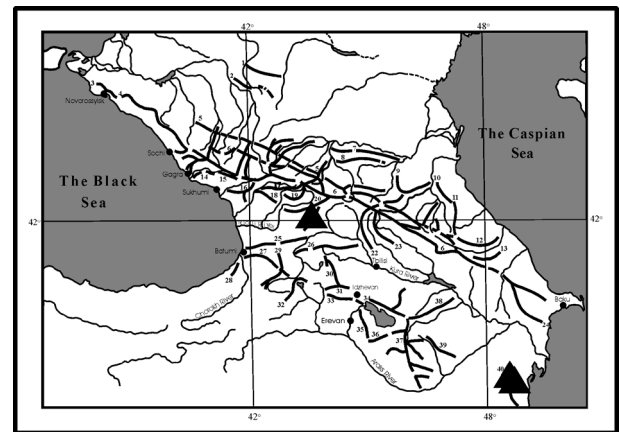
Map 6. Distribution of *Vitrina rugulosa* in Central Asia.



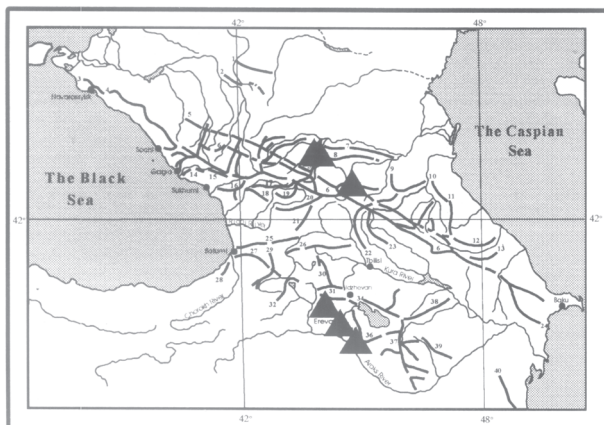
Map 9. Distribution of *Phenacolimax annularis* in Central Asia.



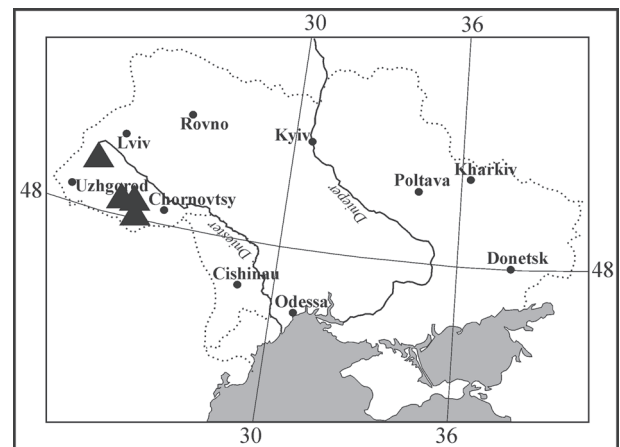
Map 7. Distribution of *Vitrina rugulosa* in Siberia.



Map 10. Distribution of *Phenacolimax lederi*.

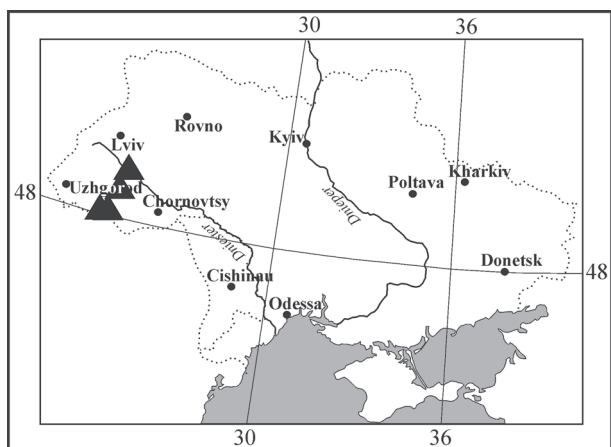


Map 8. Distribution of *Phenacolimax annularis* in Caucasus.



Map 11. Distribution of *Eucobresia nivalis*.

Maps of distribution



Map 12. Distribution of *Semilimax semilimax*.



Map 13. Distribution of *Semilimax kotulae*.

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The List of Some Internet Resources on Reviewed Vitrinids

Vitrina p. pellucida

<http://www.animalbase.uni-goettingen.de/zooweb/servlet/AnimalBase/home/species?id=1243>
<http://www.animalbase.uni-goettingen.de/zooweb/servlet/AnimalBase/home/speciestaxon?id=10412>
http://www.mollbase.de/list/index.php?aktion=zeige_taxon&id=656
<http://www.fugleognatur.dk/wildaboutdenmark/speciesintro.asp?ID=8331>
<http://arnobrosi.tripod.com/snails/vitrinidae.html>
<http://data.gbif.org/species/13779652>
http://inpn.mnhn.fr/isb/espece/cd_nom/64197/tab/taxo?lg=en
<http://www.eu-nomen.eu/portal/taxon.php?GUID=urn:lsid:faunaeur.org:taxname:431324>
http://www.faunaeur.org/full_results.php?id=431324
<http://molluscs.at/gastropoda/terrestrial/vitrinidae.html>

Vitrina p. alaskana

<http://www.livinglandscapes.bc.ca/cbasin/molluscs/vitrinidae.html>

Phenacolimax annularis

<http://www.animalbase.uni-goettingen.de/zooweb/servlet/AnimalBase/home/speciestaxon?id=14252>
<http://www.animalbase.uni-goettingen.de/zooweb/servlet/AnimalBase/home/species?id=2312>
<http://data.gbif.org/species/browse/taxon/16084600>
<http://arnobrosi.tripod.com/snails/vitrinidae.html>

Phenacolimax lederi

<http://www.animalbase.uni-goettingen.de/zooweb/servlet/AnimalBase/home/species?id=2313>
<http://www.animalbase.uni-goettingen.de/zooweb/servlet/AnimalBase/home/speciestaxon?id=14385>
<http://www.bioone.org/doi/abs/10.4002/040.053.0206>
<http://onlinelibrary.wiley.com/doi/10.1046/j.1096-3642.2002.00010.x/abstract>

Eucobresia diaphana

<http://www.animalbase.uni-goettingen.de/zooweb/servlet/AnimalBase/home/species?id=1245>
<http://www.animalbase.uni-goettingen.de/zooweb/servlet/AnimalBase/home/speciestaxon?id=11540>
<http://www.animalbase.uni-goettingen.de/zooweb/servlet/AnimalBase/home/picture?id=3718>
<http://arnobrosi.tripod.com/snails/vitrinidae.html>
<http://cat.inist.fr/?aModele=afficheN&cpsid=22242718>
<http://www.boldsystems.org/views/taxbrowser.php?taxid=312075>
<http://data.gbif.org/occurrences/207826928>
<http://data.gbif.org/species/browse/taxon/21799788>
<http://data.gbif.org/species/16074262>
<http://molluscs.at/gastropoda/terrestrial/vitrinidae.html>

Eucobresia nivalis

<http://www.animalbase.uni-goettingen.de/zooweb/servlet/AnimalBase/home/species?id=2450>
<http://www.animalbase.uni-goettingen.de/zooweb/servlet/AnimalBase/home/speciestaxon?id=14528>
<http://www.animalbase.uni-goettingen.de/zooweb/servlet/AnimalBase/home/picture?id=4712>
<http://www.eu-nomen.eu/portal/taxon.php?GUID=urn:lsid:faunaeur.org:taxname:431380>
<http://arnobrosi.tripod.com/snails/vitrinidae.html>
<http://molluscs.at/gastropoda/terrestrial/vitrinidae.html>

The List of Some Internet Resources on Reviewed Vitrinids

Semilimax semilimax

<http://www.animalbase.uni-goettingen.de/zooweb/servlet/AnimalBase/home/species?id=1244>
<http://www.animalbase.uni-goettingen.de/zooweb/servlet/AnimalBase/home/speciestaxon?id=11539>
<http://www.animalbase.uni-goettingen.de/zooweb/servlet/AnimalBase/home/picture?id=765>
<http://data.gbif.org/species/browse/provider/1/taxon/16081117/>
<http://arnobrosi.tripod.com/snails/vitrinidae.html>
<http://molluscs.at/gastropoda/terrestrial/vitrinidae.html>

Semilimax kotulae

<http://www.animalbase.uni-goettingen.de/zooweb/servlet/AnimalBase/home/species?id=2586>
<http://www.animalbase.uni-goettingen.de/zooweb/servlet/AnimalBase/home/speciestaxon?id=14748>
<http://www.animalbase.uni-goettingen.de/zooweb/servlet/AnimalBase/home/picture?id=3509>
<http://data.gbif.org/species/16533898>
http://inpn.mnhn.fr/isb/espece/cd_nom/163165
<http://arnobrosi.tripod.com/snails/vitrinidae.html>
<http://molluscs.at/gastropoda/terrestrial/vitrinidae.html>

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