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Baikal gastropods described by W.A. Lindholm

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ABSTRACT

The molluscan fauna of Lake Baikal is currently known to comprise about 150 species of gastropods, of which approximately 70% are endemics. Baikal gastropods include 8 families: Baicaliidae, Benedictiidae, Bithyniidae (Caenogastropoda), Valvatidae (Heterobranchia), Acroloxidae, Planorbidae, Lymnaeidae and Physidae (Panpulmonata). By studying the samples collected during a three-year expedition supervised by A.A. Korotneff, professor of the Kiev University, W.A. Lindholm described 55 new species, varieties (= subspecies) and forms (= morphs) that belonged to all families of gastropods (except Physidae) living in Baikal and in the connected shallow water bodies (sors). Lindholm was the first to note a wide spectrum of conchological variability of Baikal gastropods and their heterogeneous geographic distribution in the lake. Using collection of naturalist Petr Mikhno, Lindholm described two new species from Lake Hövsgöl (= Khubsugul) in Mongolia that has the hydrological connection to Lake Baikal via the Selenga River. Despite more than a century of studying the gastropod fauna in lakes Baikal and Hövsgöl, some species and subspecies described by Lindholm are rare, with only a few specimens subsequently being reported, and some have never been found again. The present study is a brief review of 46 species, subspecies and morphs of gastropods described by Lindholm. The review includes photographs of type specimens, main synonyms and references, detailed information on the type localities, diagnoses, and information on distribution in Baikal including depth zones and substrate types. All type specimens (except those of one species) are well preserved and are currently stored in the collection of the Zoological Institute of the Russian Academy of Sciences (St. Petersburg).

Key words: Baikal gastropods, diagnoses, distribution, Lindholm, references, shell photographs, types

Байкальские брюхоногие моллюски, описанные В.А. Линдгольмом

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РЕЗЮМЕ

В настоящее время в малакофауне оз. Байкал известно около 150 видов гастропод, более 70% из них составляют эндемичные виды. Байкальские гастроподы принадлежат 8 семействам: Baicaliidae, Benedictiidae, Bithyniidae (Caenogastropoda), Valvatidae (Heterobranchia), Acroloxidae, Planorbidae, Lymnaeidae and Physidae (Pulmonata). Изучая пробы, собранные трехлетней экспедицией под руководством проф. Киевского университета А.А. Коротнева, W.A. Lindholm описал 55 новых видов, вариететов (= подвидов) и форм (= морф), принадлежащих всем перечисленным семействам (за исключением Physidae) из озера Байкал и соединяющихся с ним мелких водоемов (соров). Линдгольм был первым исследователем малакофауны, обратившим внимание на широкий спектр морфологической изменчи-

вости раковины байкальских гастропод и на их неоднородное географическое распространение в озере. На основании сборов естествоиспытателя П. Михно Линдгольм описал два новых вида из оз. Хубсугул (Монголия), имеющего гидрологическую связь с Байкалом через реку Селенга. Несмотря на более чем столетнее изучение фауны гастропод озер Байкал и Хубсгул, среди описанных Линдгольмом видов и подвидов есть редкие таксоны, найденные позднее в единичных количествах или вовсе не обнаруженные. Настоящий обзор содержит сведения о 46 видов, подвидов и морф брюхоногих моллюсков озер Байкал и Хубсугул, описанных В.А. Линдгольмом. Приведены фотографии типовых экземпляров, основная синонимия и ссылки, подробные сведения о типовых местонахождениях, диагнозы, информация о распространении в Байкале, включая типы донных отложений и зоны глубин. Все типовые экземпляры (за исключением одного вида) в хорошем состоянии хранятся в коллекции Зоологического института РАН (Санкт-Петербург).

Ключевые слова: байкальские брюхоногие моллюски, диагнозы, распределение, Линдгольм, литературные источники, фотографии раковин, типы

INTRODUCTION

Wilhelm (Vasily = Vasilij) Adolfovich Lindholm (1874–1935) was the Russian malacologist, who greatly expanded our knowledge of the taxonomic composition of Baikal molluscs (gastropods and bivalves); due to his efforts, the list of known species was expanded by more than 50%. The first Baikal endemic species and subspecies of molluscs (a total of 38) were described by Johann Georg Nikolai von Gerstfeldt (1859), Jules-René Bourguignat (1860), Leopold von Schrenck (1867) and Władysław Dybowski (1875–1910). W. Lindholm (1909, 1924a, b) described new species based on the samples collected by the Baikal Expedition (1900–1902) under the supervision of Professor Aleksei (Alexis) Alekseevich Korotneff (then at the St. Vladimir's University in Kiev). The molluscs were collected from the "Bard" and "Innokentij" vessels from different depths, often down to 1 km, using dredges operated by a hand winch. Some samples from the stone littoral were collected by diver Antipov (Korotneff 1901). During the three successive years, the expedition collected a huge number of samples from most regions of the lake (for maps of sampling sites see Figs 1–3); these samples were provided with detailed labels stating the depth and type of sediments. Some samples collected in 1900 were partly passed to K.O. Milaschewitsch, the Russian zoologist-malacologist who lived in Sevastopol; he identified 28 species, including 6 new to science, but did not give their descriptions (Milaschewitsch 1901). Later, all the samples were given to W.A. Lindholm, who described 13 new genera and subgenera, and 63 species, subspecies, and "morphs" of gastropods and bivalves. W.A. Lindholm retained the names given to the new species by K.O. Milaschewitsch and provided them with diagnoses. Having studied the composition of the Baikal malacofauna, W.A. Lindholm was first to notice the geographical heterogeneity of the molluscs in Baikal and to designate 6 main regions with different species composition (Lindholm 1909).

Most of the type specimens of the Baikal molluscs described by W.A. Lindholm are housed in the collection of the Zoological Institute of the Russian Academy of Sciences (St. Petersburg) (ZIN), some type series are kept in the Royal Belgian Institute of Natural Sciences, Brussels (RBINS), in the Academy of Natural Sciences, Philadelphia, USA (ANSP), and in Finnish Museum of Natural History, University of Helsinki, Finland (LUOMUS).

This review includes information on 46 species/subspecies/morphs described by W.A. Lindholm (1909, 1924a, b). Each taxon is provided with references (not synonymy in the strict sense), information on the type specimens and the type locality (or localities), images of type specimens (from the ZIN collection), a short diagnosis with data on shell size (according to Lindholm), distribution and habitats, and remarks (if needed). The review does not include the following species, information on which has already been published previously: *Bithynia contortrix* Lindholm, 1909 (Sitnikova and Bazova 2019), *Valvata* (*Cincinna*) *sorensis abbreviata* Lindholm, 1909 [= *Valvata* (*Sibirovalvata*) *sorensis*], *Valvata* (*Cincinna*) *korotnevi* Lindholm, 1909 [= *Valvata* (*Sibirovalvata*) *korotnevi*] (Sitnikova et al. 2015), *Valvata* (*Atropidina*) *lauta* Lindholm, 1909 (= *Me-*

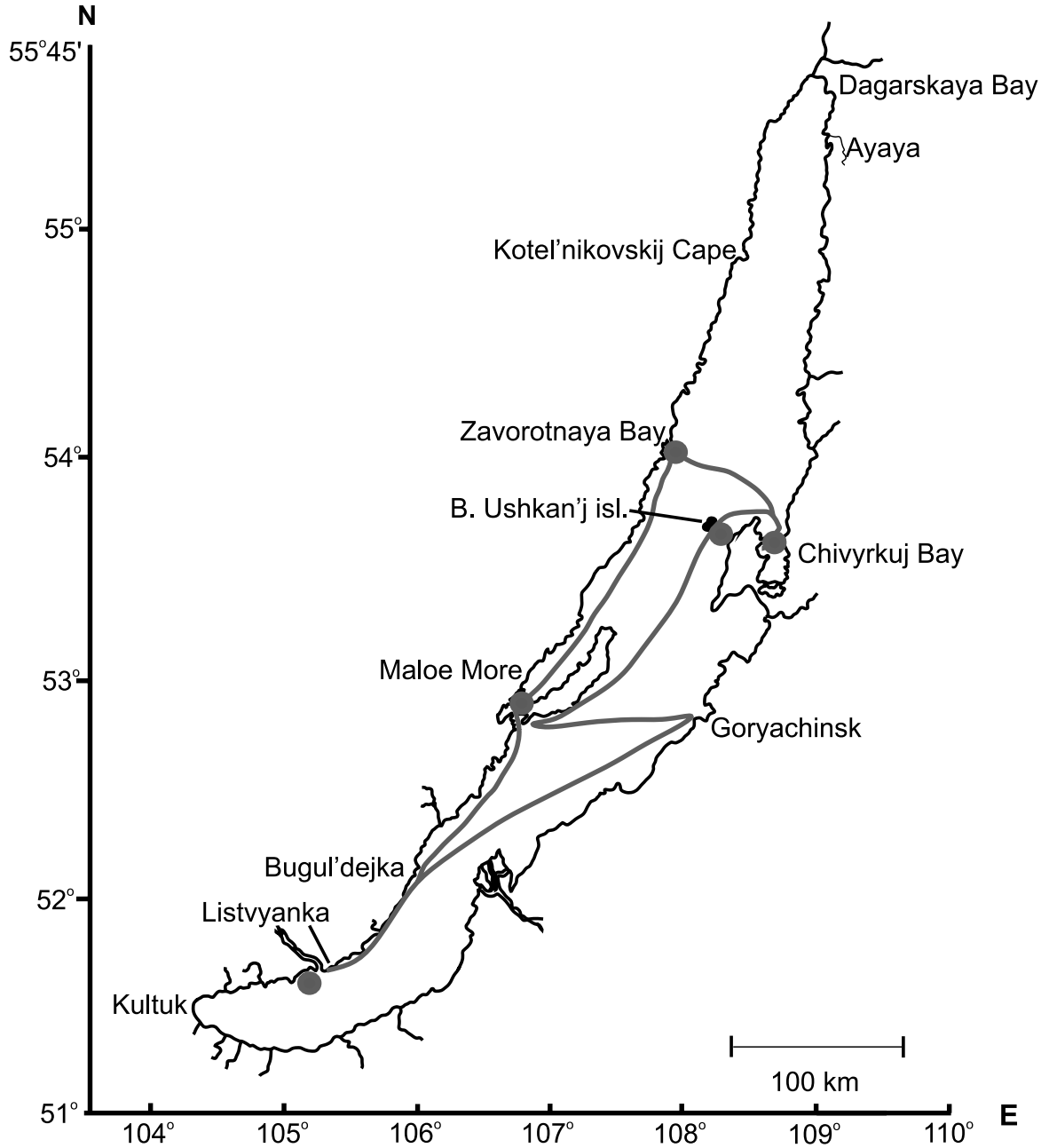

Fig. 1. Map of the collection sites and the route of the A. Korotneff's expedition in 1900 (after Korotneff 1901).

galovalvata lauta), *V.* (*Liratina*) *baicalensis* forma *minor* Lindholm, 1909 (= *Megalovalvata piligera minor*), *V.* (*L.*) *baicalensis piligera* Lindholm, 1909 (= *Megalovalvata piligera*), *V.* (*L.*) *baicalensis demersa* (= *Megalovalvata demersa*) (Sitnikova 2018), and *Baicalancylus boettgerianus* (Lindholm, 1909) (Shirokaya et al. 2017). I do not cite for each of the species the handbooks containing the general information on molluscs (Kobelt 1910; Thiele 1931; Shadin [= Zhadin] 1933, 1952; Kantor and Sysoev 2005; Kantor et al. 2010).

In a previous work (Sitnikova et al. 2004), the lectotypes of some species described by Lindholm were mentioned, without any detailed information

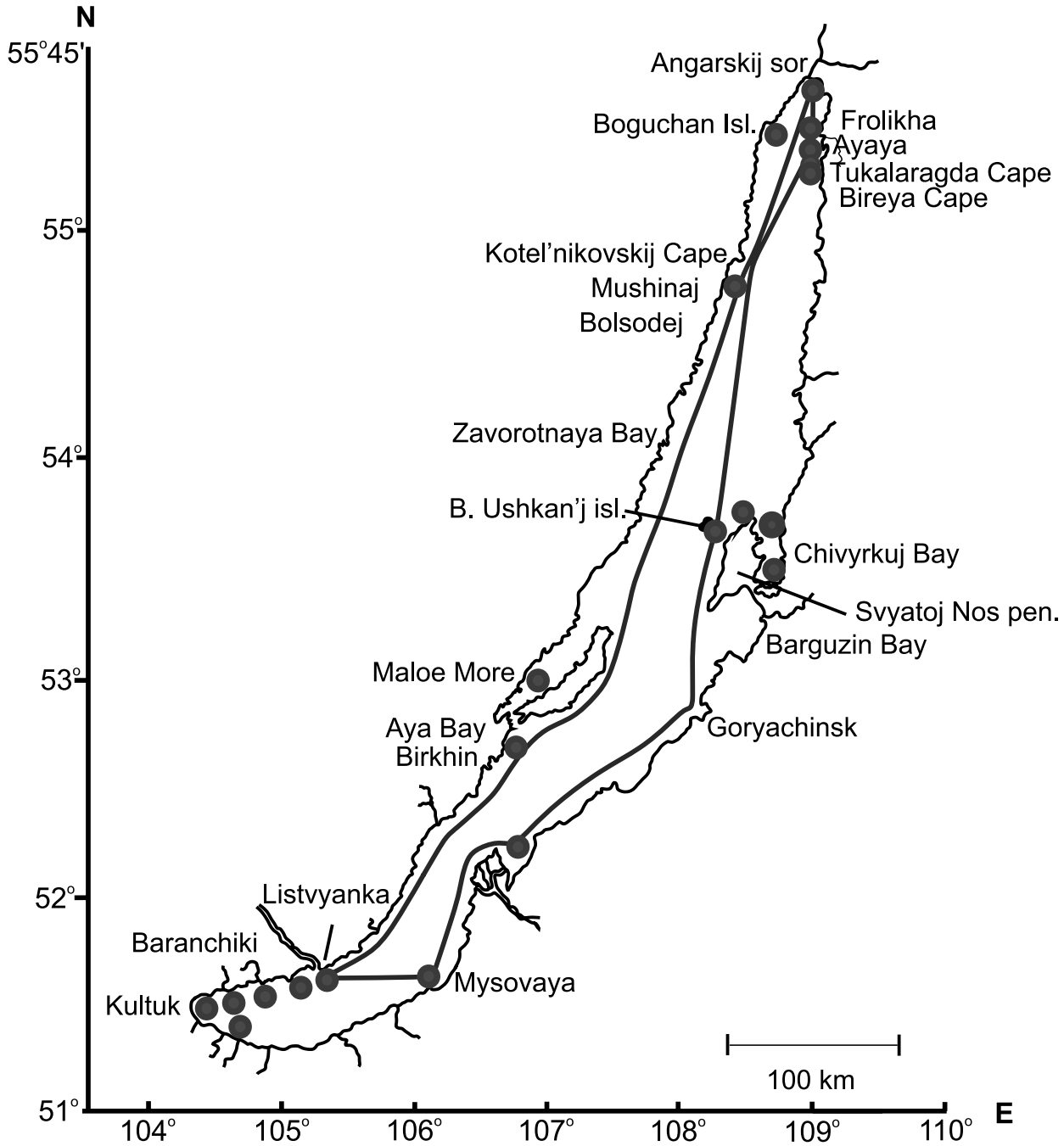

Fig. 2. Map of the collection sites (1901 and 1902) and the route of the A. Korotneff's expedition in 1901 (after Korotneff 1901).

about them and without their formal designation (in the nomenclatorial sense). Here I provide photos and measurements for some of these lectotypes, especially in cases when the type series of a particular taxon represents a mixture of specimens belonging to several different species. In my opinion, however, in some cases the designation of the lectotype was incorrect since the type series included morphologically heterogeneous shells or consisted of specimens from different geographical regions of the lake.

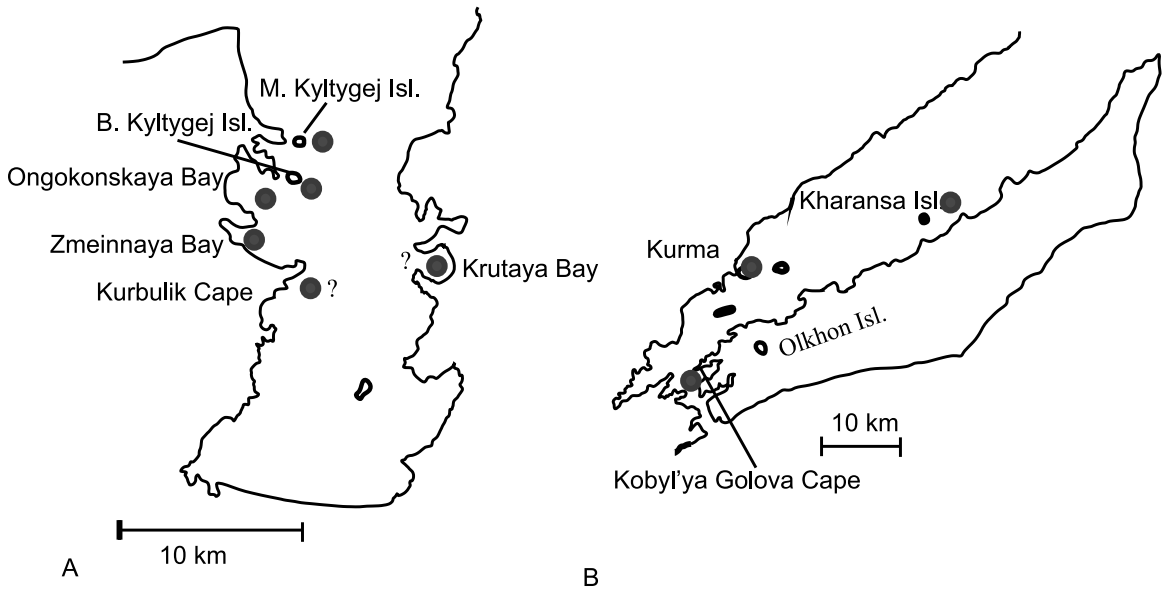

Fig. 3. Map of the collection sites during A. Korotneff's expeditions (1900–1902): A – Chivyrkuj Bay; B – Maloe More Strait (after Lindholm 1909).

Abbreviations: LD – larger diameter of shell; SD – small diameter of shell; SH – shell height; SW – shell width; UD – umbilicus diameter; SpH – spire height; AH – aperture height (or length, because I do not know the scheme of measurement used by Lindholm); AW – aperture width; NW – number of whorls. Transliteration of geographical names was made according to GOST 7.79–2000.

SYSTEMATICS

Clade PANPULMONATA Cuvier, 1814

Family PLANORBIDAE Rafinesque, 1815

Choanomphalus maacki andrussovianus Lindholm, 1909

(Fig. 4A)

Choanomphalus (*Choanomphalus*) *andrussovianus* Lindholm, 1909: 10, table II, figs 28–30 (description, photo of shell, key to identification);

Ch. andrussovianus – Dybowski B. and Grochmalicki 1925: 836 (discussion), 877 (key to identification, as *Ch. andrussovianus*? with *Ch. elatospiralis* of the Elatospirae group), figs 6, 12, 15;

Ch. maacki var. *andrussowianus* – Kozhov 1936: 162, Table IV, figs 4–6 (differences from the typical form, distribution);

Ch. maacki andrussowianus – Sitnikova et al. 2004: 978 (synonymy, erroneous information about the lectotype, data on the type locality, distribution and ecology); Vinarski and Kantor 2016: 363 (the same data).

Types. Lectotype (dry) and 63 paralectotypes (47 in alcohol and 16 dry) designated here from syntypes of ZIN collection.

Type locality. Lake Baikal: near Tolstyj Cape (Listvenichnoe, southwest part), 3–6 fathoms (= 5.5–11 m), stones.

Diagnosis. Shell large, conical with narrow funnel-shaped umbilicus, horny-brown, whitish around umbilicus. Whorls 4–5, considerably curved, rounded at periphery, last whorl rapidly increasing in diameter, basal side of the last whorl with keel situated near umbilicus. Spire wide-conic, its height almost equal to aperture diameter. Suture moderately deep, aperture semicircular, basal lip angular. Shell size (n = 3): LD = 6.25–7.0 mm, SD = 5–5.66 mm, SH = 4.8–5.75 mm, NW = 4–5 (Lindholm 1909). Shell dimension of the lectotype: SH = 5.7 mm, SW = 6.6 mm, AH = 2.8 mm, AW = 3.2 mm, UD = 1.5 mm, NW = 5.0.

Distribution and habitat. It occurs together with the typical morph of *Ch. maacki* on rocky-boulder sediments of the southwestern littoral of the lake and it was more often found near the Bol'shie Koty and Marituj settlements.

Remark. Since *Ch. m. andrussovianus* nowhere forms a stable population, it should be considered a

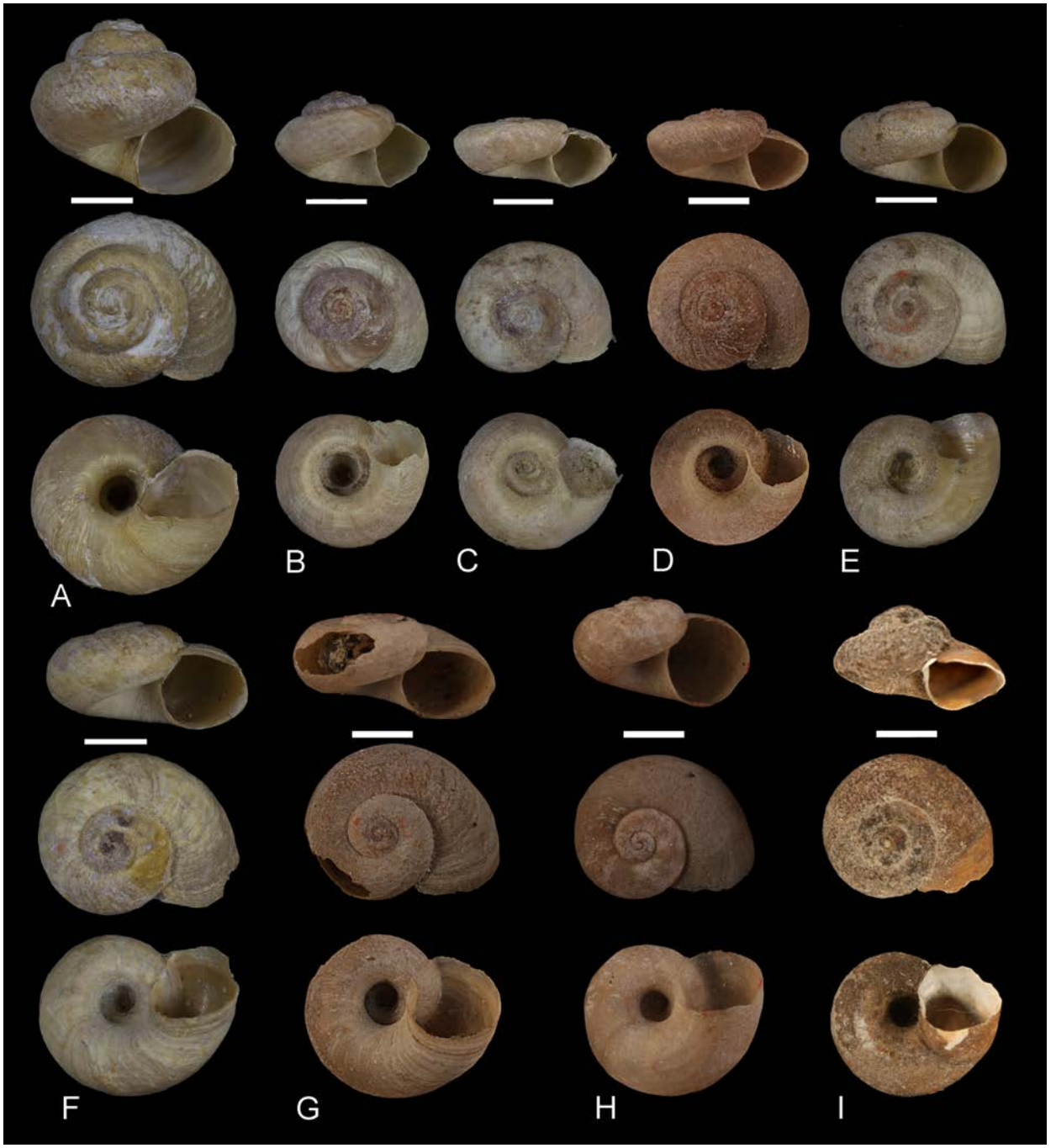

Fig. 4. Type specimens of *Choanomphalus* species described by Lindholm: A – *Ch. maacki andrussovianus*, the lectotype, Tolstyj Cape near Listvyanka (SW), 3–6 fathoms, stones, 1902; B – *Ch. maacki elatior,* the lectotype, Maloe More Strait (without indication of exact site), 2–12 yards, stones, 17–20 July 1902; C, D – *Ch. korotnevi*, the lectotype and a paralectotype, from the same sample; E – *Ch. incertus*, the lectotype, Ayaya Bay, on a sunken tree, 25 July 1901; F–H – *Ch. eurystomus*, F – the lectotype, Kultuk, 2–15 fathoms, stones, 26 June 1902; G – a paralectotype, Maloe More Strait, near Kharansa Island, 2–3 fathoms, stones, 19 June 1902; H – a paralectotype, Maloe More, near Kurma settlement, 2–5 fathoms, stones, 30, 31 July 1902; I – *Ch. westerlundianus*, a syntype, Kultuk, 17 fathoms, stones, sand, 16.07.1902. Scale bar: 2 mm.

morph of *Ch. maacki*, characterised by a larger shell with a high spire in old specimens.

Choanomphalus maacki elatior (Lindholm, 1909) (Fig. 4B)

Choanomphalus (*Choanomphalus*) *korotnevi* morph *elatior* Lindholm, 1909: 13 (differences from *Ch. maacki*); Starostin 1926: 7 (records from Peschanaya Bay and Maloe More, abundance, maximum shell height);

Ch. (*Ch.*) *maacki* var. *elatior* – Kozhov 1936: 163, table VI, figs 9–12 (differences from *Ch. maacki*, key to identification); Sitnikova et al. 2004 (information about types, type locality, distribution and ecological characteristics); Sitnikova et al. 2010: 9 (quantitative distribution in stony-rocky littoral); Vinarski and Kantor 2016: 363 (the same data).

Types. Lectotype (dry) and 1 (dry) paralectotype designated here from syntypes with a label. 'Maloe More Strait (without indication of exact site), 2–12 yards (= 1.8–11 m), stones, 17–20 July 1902', ZIN.

Type locality. Lake Baikal: Maloe More Strait.

Diagnosis. Shell small or of medium size, with raised conic spire, horny-brown, lighter around umbilicus. Whorls 4, slowly and evenly increasing, almost shouldered near deep suture, the last whorl with peripheral and basal keels. Umbilicus wider than in *Ch. maacki* (typical) and narrower than in *Ch. korotnevi*. Aperture almost rhomboid. Shell dimension of the lectotype: SH = 3.2 mm, SW = 5.2 mm, AW = 1.9 mm, AH = 2.1 mm, UD = 1.8 mm, NW = (5.0).

Distribution and habitat. It inhabits Maloe More Strait (open parts) and is widely distributed on the stony littoral in the northern basin of the lake (Kozhov 1936).

Choanomphalus korotnevi Lindholm, 1909 (Fig. 4C, D)

Choanomphalus (*Choanomphalus*) *korotnevi* Lindholm, 1909: 13, table II, figs 25–27 (diagnosis, photo of shell, records, key to identification);

Ch. bicarinatus Dybowski W., 1901 – W. Dybowski 1910: 257; table III, fig. 1a–c; fig. 2 (morphology of radular teeth);

Ch. korotnevi – B. Dybowski and Grochmalicki 1925: 848, 880 (belonged to the Angulatae group = Bicarinatae?);

Ch. korotnevi – Starostin 1926: 8 (comparison with *Ch. bicarinatus*, species validity, maximum shell size);

Ch. maacki var. *korotnewi* – Kozhov 1936: 163, table VII, fig. 46 (Russian translation of Lindholm's diagnosis, comparison with *elatior*, distribution in Olkhon Gate and Maloe More);

Ch. (*Choanomphalus*) *maacki korotnevi* – Starobogatov and Sitnikova 1998: 413 (distribution);

Ch. korotnevi – Papusheva et al. 2003: 76 (mtDNA COI nucleotide sequences); Sitnikova et al. 2004: 978 (synonymy, erroneous information about the lectotype, data on the type locality, distribution and ecology); Vinarski and Kantor 2016: 367 (the same data).

Types. Lectotype (dry) with a label: 'Maloe More (without indication of exact site), 2–12 yards (= 1.8–11 m), stones, 17–20 July 1902' and 26 paralectotypes (dry) from the locations: Maloe More Strait: near Kurma settlement, 2 fathoms (= 3.7 m), algae, the same locality, 1 fathom (= 1.8 m), stones, near Kharansa Island, 2–3 fathoms (= 3.7–5.5 m), and Maloe More (without indication of exact location), 19–22 fathoms (= 35–40 m), sand.

Type locality. Lake Baikal: Maloe More Strait.

Diagnosis. Shell small or of medium size, strongly flattened with flat or slightly towering spire, horny-brown, lighter around umbilicus. Whorls 4, slowly and evenly increasing, the last whorl with peripheral and basal keels. Suture deep. Umbilicus wide, saucer-shaped. Aperture almost rhomboid. Shell size (n = 4): LD = 5.0–5.5 mm, SD = 3.9–4.0 mm, SH = 2.3–2.7 mm, NW = 4.0 (Lindholm 1909). Shell dimension of the lectotype: SH = 2.4 mm, SW = 5.4 mm, AW = 2.1 mm, AH = 1.8 mm, UD = 1.8 mm, NW = 4.0.

Differential diagnosis. It differs from *Ch. maacki* (typical) in its flat spire and wider umbilicus.

Distribution and habitat. Kozhov (1936) believed that *Ch. korotnevi* is a local variety of *Ch. maacki* inhabiting some inlets and regions in the Olkhon Gate of Maloe More Strait, while *Ch. maacki elatior* is more widely distributed in Maloe More and the northern basin of the lake.

Remark. Lindholm (1909) described *Ch. korotnevi* from 3 localities of Maloe More, and mentioned both *Ch. korotnevi korotnevi* and *Ch. korotnevi* morph *elatior* from the same sample with a label 'Maloe More, 2–12 yards (= 1.8–11 m), stones, 17–20 July 1902'. The types of *Ch. korotnevi* from other localities mentioned in the original description are missing in the ZIN collection; therefore, I found it necessary to designate the lectotype of *Ch. korotnevi*.

Choanomphalus incertus Lindholm, 1909
(Fig. 4F)

Choanomphalus (*Choanomphalus*) *incertus* Lindholm, 1909: 12, table II, figs 31–22 (diagnosis, shell size and photo, records, key to identification);
Ch. intermedius Dybowski, 1880 – W. Dybowski 1910: 257 (as synonym);
Ch. incertus – Starostin 1926: 6 (records from the Ushkan'i Islands, Listvenichnoe; shell measurements, discussion of similarity with *Ch. intermedius*);
Ch. maacki forma *incertus* – Kozhov 1936 (records among specimens of *Ch. maacki*, possibly as a result of hybridization between *Ch. maacki* and *Ch. amauronius*);
Ch. (*Ch.*) *incertus incertus* – Starobogatov and Sitnikova 1998: 413 (distribution);
Ch. maacki incertus – Papusheva et al. 2003: 76–77 (mtDNA COI nucleotide sequences);
Sitnikova et al. 2010: 6 (quantitative distribution on south-western stony-rocky littoral); Vinarski and Kantor 2016: 366 (distribution and habitat).

Types. Three of 4 syntypes with a label: 'Ayaya Bay, on a sunken tree, 25 July 1901' actually belong to *Ch. incertus* sensu Lindholm; one of them is designated here as the lectotype (dry). The fourth specimen is similar to juvenile *Ch. eurystomus*. Twenty three paralectotypes (20 in alcohol and 3 dry) from the localities: Ayaya Bay, 5 fathoms (= 9 m), fine sand; Boguchanskaya Bay and Boguchan Island, 2–3 fathoms (= 3.7–5.5 m), stones; Bezymyannaya Bay (near Goryachinsk), 3–5 fathoms (= 5.5–12.8 m), sand, stones.

Type locality. Lake Baikal: Ayaya Bay (northeast part).

Diagnosis. Shell of medium size, with weak peripheral and basal keels, consists of 4 slowly increasing whorls, horny-brown, lighter around umbilicus. Spire slightly elevated, whorls inside umbilicus noticeably curved and not round, umbilicus narrower than in *Ch. maacki,* aperture rather round. Shell size (n = 3): LD = 5.5–6.0 mm, SD = 4.5–5.0 mm, SH = 3.0–3.5 mm, NW = 4.0 (Lindholm 1909). Shell dimension of the lectotype: SH = 3.1 mm, SW = 5.5 mm, AH = 2.2 mm, UD = 1.7 mm, NW = 4.0.

Differential diagnosis. It differs from *Ch. maacki* and *Ch. korotnevi* in having weak peripheral and basal keels and a rather straight columellar lip of the aperture, from *Ch. korotnevi* in a narrower umbilicus, and from *Ch. eurystomus* in an angulated basal lip of the aperture and more slowly increasing whorls.

Distribution and habitat. It inhabits stony and rocky littoral and co-occurs with *Ch. maacki* in Southern Baikal and with *Ch. korotnevi* in the northern basin of the lake, and with *Ch. eurystomus* everywhere.

Remark. Some examined shells of paralectotypes do not correspond completely to *Ch. incertus*. Despite the differences in nucleotide sequences of mtDNA COI found between *Ch. maacki* and *Ch. incertus* collected from the south-western littoral (Papusheva et al. 2003), the validity of *Ch. incertus* still remains to be confirmed.

Choanomphalus eurystomus Lindholm, 1909
(Fig. 4F–H)

Choanomphalus (*Achoanomphalus*) *eurystomus* Lindholm, 1909: 16, table II, figs 22–24 (diagnosis, photo of shell, records, comparison with *Ch. amauronius* and *Ch. valvatoides* Dybowski, 1875, key to identification);
Ch. bicarinatus – W. Dybowski 1910: 257, table III, fig. 5a–b;
Valvatomphalus euristomus – B. Dybowski and Grochmalicki 1925: 878;
Ch. maacki morph *euristomus* – Kozhov 1936: 167 (records among samples of *Ch. maacki*);
Ch. (*Achoanomphalus*) *eurystomus* – Starobogatov and Sitnikova 1998: 413 (distribution);
Ch. eurystomus – Papusheva et al. 2003: 76 (mtDNA COI nucleotide sequences); Sitnikova et al. 2004: 278 (synonymy, information about types, type locality, distribution and ecological characteristics); Sitnikova et al. 2010: 9 (quantitative distribution on stony-rock littoral); Maximova et al. 2012: 3 (seasonal quantitative distribution on littoral near Berezovyj Cape); Vinarski and Kantor 2016: 365 (information about the type locality, types, distribution and ecology).

Types. Lectotype (dry) designated here from syntypes with a label: 'Kultuk, 2–5 fathoms (= 3.7–9 m), stones, 26.07.1902' and 9 paralectotypes (1 dry and 8 in alcohol) from the same sample and 32 paralectotypes (21 in alcohol and 11 dry) from the localities: Southern Baikal: Solsan settlement, 1.5 fathoms (= 2.7 m), stones; Baranchiki Cape, 3–21 fathoms (= 5.5–38 m), stones and Maloe More Strait: Kobyl'ya Golova Cape; near Kurma settlement, 2–5 fathoms, stones, and near Kharansa Island, 2–3 fathoms.

Type locality. Lake Baikal (southern part): near Kultuk settlement.

Diagnosis. Shell large, light horny or grey. Spire flat or slightly rising. Whorls 3.5–4, rounded, the

last whorl much broader than penultimate one. Umbilicus moderately wide and deep. Aperture wider than high. Shell size (n = 7): LD = 6.5–7.25 mm, SD = 4.0–5.5 mm, SH = 3.5–5.0 mm, NW = 3.5–4 (Lindholm 1909). Shell dimension of the lectotype: SW = 6.3 mm, SH = 3.4 mm, AW = 2.8 mm, AH = 2.3 mm, UD = 1.6 mm, NW = (4.0).

Distribution and habitat. This species was found on stony-rocky sediments of the southwestern littoral together with *C. maacki* and *Ch. amauronius*. In Maloe More it occurred sympatrically with *Ch. korotnevi*.

Remarks. Ya.I. Starobogatov (pers. comm.) considered twenty-two paralectotypes from Maloe More (Kobyl'ya Golova Cape and near the Kurma settlement) as a separate subspecies of *Ch. eurystomus* (Fig. 4H). It differs from the southern populations in more rapidly expanding whorls and in the presence of radial threads on the shell. On the one hand, the shells of *Ch. eurystomus* from Southern Baikal are similar to *Ch. amauronius* (by lack of distinct pronounced peripheral and basal keels) and, on the other hand, to *Ch. maacki* (flat shape of the whorls inside the umbilicus); thus, *Ch. eurystomus* in the southern basin appears to be a hybrid between *Ch. amauronius* and *Ch. maacki*.

Choanomphalus westerlundianus Lindholm, 1909
(Fig. 4I)

Ch. (*Achoanomphalus*) *westerlundianus* Lindholm, 1909: 20, table II, figs 1–3 (diagnosis, photo of shell, comparison with *Ch. amauronius*, key to identification, records);
Ch. bicarinatus – W. Dybowski 1910: 257;
Ch. (*Ch.*) *amauronius* var. *westerlundianus* – Kozhov 1936: 172, table VI, fig. 29 (Russian translation of Lindholm's diagnosis, comparison with *Ch. amauronius*, distribution: sandy littoral from Kultuk to Posolsk settlement, probably it lives also in the Selenga region);
Ch. (*Achoanomphalus*) *amauronius westerlundianus* – Starobogatov and Sitnikova 1998: 413 (distribution);
Ch. amauronius westerlundianus – Sitnikova et al. 2004: 980 (synonymy, information about types, type locality, distribution); Vinarski and Kantor 2016: 364 (information about types, type locality, general distribution, ecology).

Types. Syntypes (1 dry and 2 in alcohol) in ZIN.

Type locality. Lake Baikal (southern part): near Kultuk settlement, 17 fathoms (= 31 m), stones and sand.

Diagnosis. Shell of medium size, rounded, pale yellow-brown, spire low conical. Whorls 3.5, slowly increasing, moderately convex with weak angle on periphery, flattened and angular around umbilicus. Suture deep, umbilicus around, narrow, punctured. Aperture rather triangular, columellar lip oblique or vertical, basal lip with small angle. Shell size (n = 1): LD = 5.25 mm, SD = 4.33 mm, SH = 3.5 mm, NW = 3.5 (Lindholm 1909).

Distribution and habitat. South-eastern littoral (from Kultuk to Posolsk) and possibly avandelta Selenga River. Lives in shallow zone, on sandy sediments at a depth of 2–40 m (Kozhov 1936).

Choanomphalus subrimatus Lindholm, 1909
(Fig. 5G)

Choanomphalus (*Achoanomphalus*) *subrimatus* Lindholm, 1909: 21, table II, figs 12–14 (diagnosis, photo of shell, records, key to identification);
Ch. cryptomphalus Dybowski, 1901 – W. Dybowski 1910: 258, table III, figs 8, 9a–c;
Cryptomphalus subrimatus? – B. Dybowski and Grochmalicki 1925: 879;
Ch. amauronius forma *cryptomphalus* (Dybowski, 1901) = *Ch. omphalocrypta* Tomlin, 1926 – Kozhov 1936: 165 (difference from *Ch. amauronius* in reflexed columellar lip);
Ch. (*Omphalocrypta*) *cryptomphalus cryptomphalus* – Starobogatov and Sitnikova 1998: 413 (distribution).

Types. Four syntypes in ZIN.

Type locality. Lake Baikal (southwest part): Listvenichnoe, 3–5 fathoms (= 5.5–9 m), sand.

Diagnosis. Shell small, yellowish, rather spherical. Whorls 3, rounded, umbilical side convex, last whorl rapidly increasing. Spire weakly convex, narrow umbilicus covered by columellar lip of aperture. Aperture rounded. Shell size (n = 1): LD = 4.5 mm, SD = 3.25 mm, SH = 3.0 mm, NW = 3.5 (Lindholm 1909).

Distribution and habitat. It was found on sandy sediments in the littoral of the southwestern part of Baikal (own data).

Remarks. Three of the 4 syntypes resemble shell of *Ch. cryptomphalus* illustrated by Dybowski 1910 (table III, fig. 9), but are smaller in size than indicated by Dybowski (1901) for *Ch. cryptomphalus*: LD = 6 mm, SD = 5 mm, NW = 3. One of the syntypes of *subrimatus* (Fig. 5H) belongs to a juvenile snail and is more similar to *Ch. amauronius* Bourguignat, 1860.

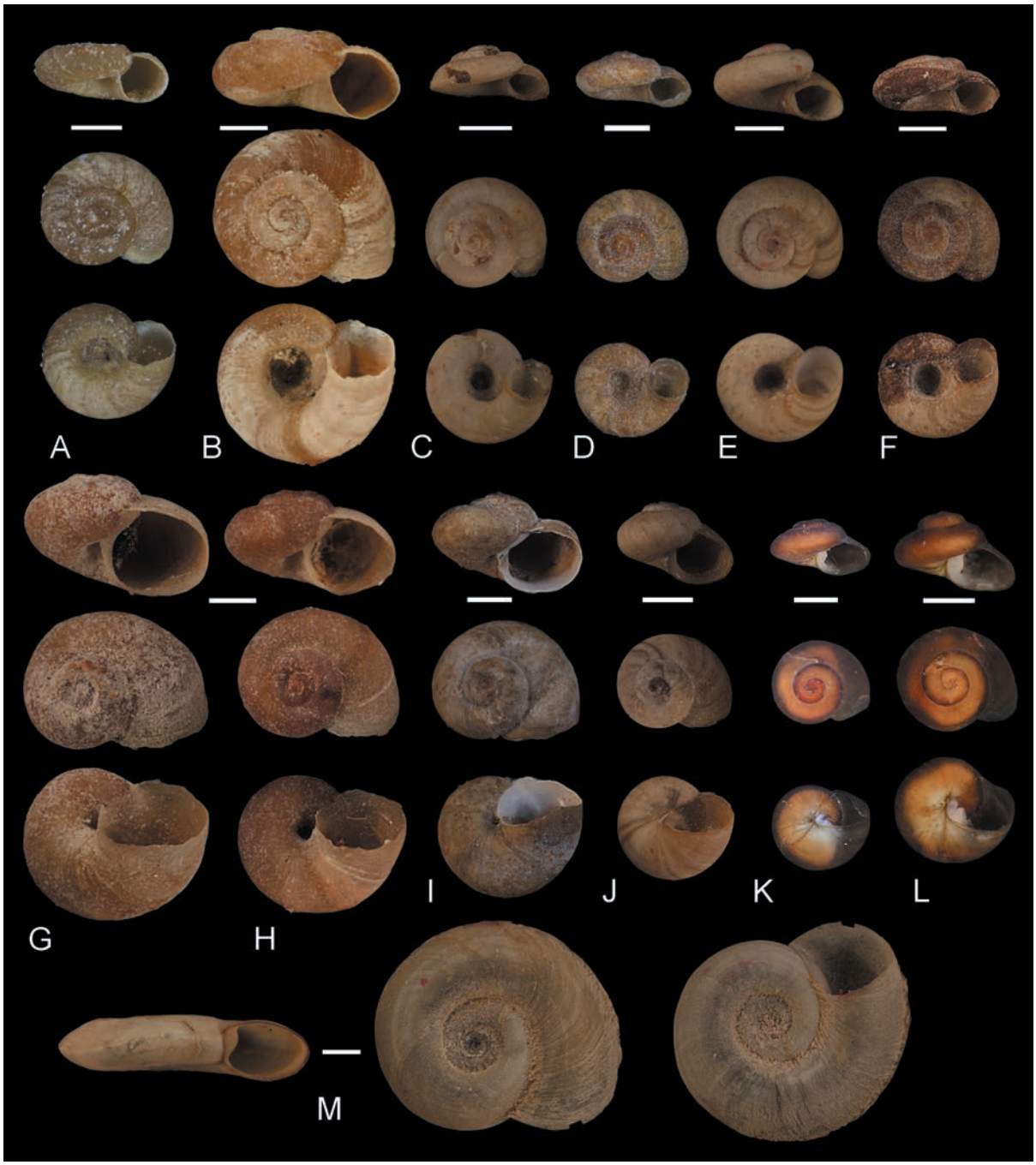

Fig. 5. Type specimens of *Choanomphalus* species described by Lindholm: A – *Ch. patulaeformis*, the lectotype, Maloe More Strait: near Kurma settlement, from 2 yards to 5 fathoms, 30–31 July 1902'; B – *Ch. patulaeformis*, a paralectotype (resembling *Ch. incertus*), Maloe More Strait, near Kurma settlement, 2 yards – 5 fathoms, stones, 30–31 July 1902; C – *Ch. patulaeformis*, a paralectotype (resembling *Ch. gerstfeldtianus*), Chivyrkyj Bay, Malye Kyltyshi (= Malyj Kyltygej) Island, 1–3 fathoms, stones, 10 July 1902; D–F – *Ch. gerstfeldtianus*, D – the lectotype, Kultuk, 1–4 fathoms, stones, 12 June 1902, E, F – paralectotypes, Solsan, 1.5 fathoms, stones, 12 August 1902; G, H – *Ch. subrimatus*, syntypes, No. 1 (G – *Ch. cryptomphalus* Dybowski, 1901; H – similar to young *Ch. amauronius* Bourguignat, 1862); I – *Ch. dybowskianus*, a syntype, Birkhin Cape, 5–25 fathoms, stones, sand, 4 August 1902 (= *Ch. anomphalus* Dybowski, 1901); J – *Ch. microtrocus*, a syntype, Ayaya Bay, 5 fathoms, sand, 25 July 1901; K–L – *Ch. pygmaeus*, Aya Bay, 20 m, sand, col. N. Zhyjkova, 07.06.2019; M – *Gyraulus rugulosus*, a syntype, Molokajskij sor, 15 July 1901. Scale bar: 1 mm.

Choanomphalus patulaeformis Lindholm, 1909
(Fig. 5A)

Choanomphalus (*Achoanomphalus*) *patulaeformis* Lindholm, 1909: 19, table II, figs 18–20 (diagnosis, photo of shell, records, key to identification);
Ch. omphalotus W. Dybowski, 1901 – W. Dybowski 1910: 258, table III, figs 6, 7a–b;
Ch. patulaeformis – Dybowski and Grochmalicki 1925: 858;
Ch. (*Choanomphalus*) *patulaeformis* – Kozhov 1936: 175, table VII, figs 40–41 (Russian translation of Lindholm's diagnosis, key to identification, comparison with *Ch. maacki, Ch. korotnevi* and *Ch. valvatoides*, distribution);
Ch. (*Choanomphalus*) *patulaeformis* – Starobogatov and Sitnikova 1998: 413 (distribution);
Ch. patulaeformis – Papusheva et al. 2003: 76 (mtDNA COI nucleotide sequences); Sitnikova et al. 2004: 979 (synonymy, information about types, type locality, distribution and ecological characteristics); Vinarski and Kantor 2016: 369 (the same data).

Types. Lectotype (dry) with a label 'Maloe More Strait: near Kurma settlement, from 2 yards (= 1.8 m) to 5 fathoms (= 9 m), 30–31 July 1902'; 30 paralectotypes (8 dry and 22 in alcohol) from the localities: Birkhin Cape, 5 fathoms (= 9 m), sand; Svyatoj Nos peninsula, 2–4 fathoms (= 3.7–7.3 m), stones; Chivyrkuj Bay – Ongokonskaya Bay, 2–3 fathoms, stones; Malyj Kyltyshi (Kyltygej) Island, 1–3 fathoms (= 1.8–5.5 m), stones; Bolshoj Kyltyshi (Kyltygej) Island, 2–4 fathoms, in ZIN, and 1 paralectotype from Svyatoj Nos peninsula in LUOMUS.

Type locality. Lake Baikal: Maloe More Strait.

Diagnosis. Shell small, horny-brown, lighter on umbilical side. Whorls 4, quite convex, compressed with an indistinct angle at periphery of last whorl. First whorls slowly increasing, the last whorl increasing a little faster and slightly descending near aperture. Spire rather flat, suture deep, umbilicus shallow, nearly saucer-shaped, all whorls visible inside. Aperture obliquely ovoid, outer lip stretched, columellar lip curved, basal lip without angle. Shell size (n = 4): LD = 4.0–4.2 mm, SD = 3.0 mm, SH = 2.0–2.3 mm, NW = 4.0 (Lindholm 1909). Shell dimensions of the lectotype: SH = 1.2 mm, SW = 2.7 mm, AW = 1.0 mm, AH = 1.0 mm, UD = 1.0 mm, NW = 4.0.

Distribution and habitat. Widely distributed species in stony-rocky littoral of Maloe More Strait, especially near islands, near Ushkan'i Islands, Svyatoj Nos peninsula and near islands of Chivyrkuj Bay.

Remarks. Among the paralectotypes, there are shells that can be identified as *Ch. incertus* (Fig. 5B) and *Ch. gerstfeldtianus* (Fig. 5C), but most type specimens are consistent with the original description, despite the differences in their spire height and umbilicus width.

Choanomphalus gerstfeldtianus Lindholm, 1909
(Fig. 5D–F)

?Planorbis (*Armiger*) *baicalensis* Westerlund, 1897: 127 (scanty diagnosis, types not traced);
Ch. (*Achoanomphalus*) *gerstfeldtianus* Lindholm, 1909: 20, table II, figs 15–17 (diagnosis, photo of shell, records, key to identification);
Ch. minitissimus W. Dybowski, 1910: 258, table III, figs. 13a–b (nomen nudum);
Ch. gerstfeldtianus – B. Dybowski and Grochmalicki 1925: 859–860 (as a small juvenile form of *Ch. patulaefromis*)
Ch. (*Choanomphalus*) *gerstfeldtianus* – Kozhov 1936: 179, table VI, figs 60–65 (Russian translation of Lindholm's diagnosis, shell variation, distribution, key to identification, comparison with *Ch. valvatoides*);
Ch. (*Baicalarmiger*) *gerstfeldtianus* – Beckman and Starobogatov 1975: 102 (as the type species of the subgenus *Baicalarmiger*);
Ch. (*Baicalarmiger*) *gerstfeldtianus* – Starobogatov and Sitnikova 1998: 413 (distribution);
Ch. gerstfeldtianus – Kravtsova et al. 2004: 197 (quantitative distribution in south-western littoral); Maximova et al. 2012: 3 (seasonal quantitative distribution in littoral near Berezovyj Cape); Sitnikova et al. 2010: 9 (quantitative distribution in stony-rock littoral); Sitnikova et al. 2004: 981 (synonymy, information about types, type locality, distribution, ecological characteristics); Vinarski and Kantor 2016: 365–366 (the same data).

Types. Lectotype (dry) with a label 'Kultuk, 1–4 fathoms (=1.8–7.3 m), 27 June 1902' and 13 (dry) paralectotypes from the localities: Baranchiki Cape, 7 fathoms (= 21.8 m), stones, 3–21 fathoms (=5.5–38.4 m), stones; Listvenichnoe, 3–12 fathoms (= 5.5–22 m), stones; near Polovinka railway Station between Listvenichnoe and Kultuk settlements, 2.2–12 fathoms (= 4.0–22 m), stones; Kultuk, 1–4 fathoms (= 1.8–7.3 m), and 6–15 fathoms (= 11–27.5 m), stones; Northern Baikal: Boguchanskaya Bay, 2–3 fathoms (3.7 – 5.5 m), stones, and Malyj Kyltyshi (Kyltygej) Island, 1–3 fathoms, stones, in ZIN.

Type locality. Lake Baikal (southern part).

Diagnosis. Shell smooth, very small with wide umbilicus, rather discoidal in shape, whitish-grey, yellowish or horny-brown. Whorls 3–4, moderately convex, sometimes compressed and with angular periphery, evenly and slowly increasing. Suture deep, umbilicus saucer-shaped, aperture obliquely ovate, outer lip elongated, basal lip straightened. Shell size (n = 4): LD = 1.8–2.3 mm, SD = 1.3–2.0 mm, SH = 1.1–1.75 mm, NW = 3.0–3.5 (Lindholm 1909). Shell dimensions of the lectotype: SH = 1.2 mm, SW = 2.5 mm, AW = 1.0 mm, AH = 0.7 mm, UD = 0.8 mm, NW = 4.0.

Distribution and habitat. Widely distributed species in the stony and rocky littoral, occurs primarily on the lower side of stones and on rocky cliffs.

Remarks. Shell characters of this species vary greatly both among co-occurring individuals and among those living in different geographical regions of the lake. Kozhov (1936) described shells from Maloe More as *Ch.* (*Ch.*) *gerstfeldtianus* var. *striatus,* which is characterised by a fine spiral sculpture. Shells with a similar sculpture were found also in the eastern littoral of the central basin of the lake.

Choanomphalus dybowskianus Lindholm, 1909
(Fig. 5I)

Ch. (*Achoanomphalus*) *dybowskianus* Lindholm, 1909: 22, table II, figs 7–9 (diagnosis, photo of shell, key to identification);
Ch. anomphalus Dybowski W., 1901 – W. Dybowski 1910: 258, table III, figs 10, 11a–b;
Ch. dybowskianus – Starostin 1926: 11 (record from Peschanaya Bay, shell measurements, comparison with *Ch. cryptomphalus* and *Ch. anomphalus*);
Ch. (*Choanomphalus*) *dybowskianus* – Kozhov 1936: 175, table VI, figs 27, 33, 34, 37–40 (Russian translation of Lindholm's diagnosis, difference from *Ch. anomphalus*, key to identification, distribution)
Ch. (*Omphalocrypta*) *anomphalus* – Starobogatov and Sitnikova 1998: 413 (distribution);
Ch. anomphalus – Papusheva et al. 2003: 76 (mtDNA COI nucleotide sequences);
Ch. anomphalus – Sitnikova et al. 2004: 980 (synonymy, information about types, type locality, distribution); Sitnikova et al. 2010: 9 (quantitative distribution in stony-rocky littoral); Vinarski and Kantor 2016: 364 (information about types, type locality, general distribution, ecology).

Types. A single syntype in ZIN.

Type locality. Lake Baikal: Birkhin Cape, 5–25 fathoms (= 9–45.7 m), stones, sand.

Diagnosis. Shell small, compressed-rounded, horny-brown. Whorls 3–3.5, weakly convex, the last whorl rapidly increasing, umbilical surface flattened. Umbilicus extremely narrow, slit-shaped, covered by columellar lip of aperture. Aperture compressed-rounded, with thickened columellar lip, outer lip slightly angular, basal lip rounded. Shell size (n = 1): LD = 3.2 mm, SD = 2.5 mm, SH = 2 mm, NW = 3.0 (Lindholm 1909).

Distribution and habitat. It is widely distributed on sandy and silted sandy sediments in the littoral of the southern basin and the north-western regions of the lake (Sitnikova et al. 2004).

Remarks. Lindholm (1909) described this species on the basis of two specimens, only one of which is housed in the ZIN collection. According to Kozhov (1936), *Ch. dybowskianus* differs from *Ch. anomphalus* Dybowski 1901 in lacking entirely the umbilicus, but this character varies significantly among snails of a single sample, with all intermediate states being observed.

Choanomphalus pygmaeus Lindholm, 1909
(Fig. 6A, 5K, L)

Ch. (*Achoanomphalus*) *pygmaeus* Lindholm, 1909: 22, table II, figs 4–6 (diagnosis, photo of shell, records, key to identification);
Ch. minutus W. Dybowski, 1910: 258, table III, fig. 1 *12* (nomen nudum);
Ch. schrenchi var. *pygmaeus* – Kozhov 1936: 181, table VI, figs 57–58, table VII, fig. 44 (Russian translation of Lindholm's diagnosis, key to identification, comparison with *Ch. schrencki* (typical) and with *Ch. dybowskianus*, distribution);
Ch. (*Sulcifer*) *pygmaeus* – Beckman and Starobogatov 1975: 103; Starobogatov and Sitnikova 1998: 413 (distribution);
Sitnikova et al. 2004: 982 (synonymy, information about types, type locality, distribution and ecological characteristics); Vinarski and Kantor 2016: 369 (the same data).

Types. Lost (the species was described from a single specimen).

Type locality. Lake Baikal: Birkhin Cape, 5 fathoms (= 9 m), sand.

Diagnosis. Shell very small, compressed-rounded, light brown or brown. Whorls 3.5, strongly convex, evenly increasing. Last whorl with weakly angular periphery. Umbilical side flattened. Spire conical, with blunt apex, suture deep. Umbilicus

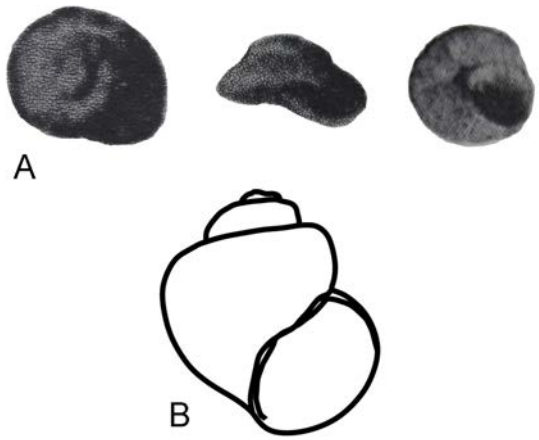

Fig. 6. Shells of species described by Lindholm: A – *Choanomphalus pygmaeus*, the holotype, SH = 1.5 mm (after Lindholm 1909); B – *Kobeltococochlea* (=*Benedicita*) *michnoi*, the holotype, SH = 12.0 mm (after Lindholm 1929).

point-shaped, covered by thickened columellar lip of aperture. Aperture compressed-rounded. Shell size (n = 1): LD = 2.3 mm, SD = 2.0 mm, SH = 1.5 mm, NW = 3.5 (Lindholm 1909).

Distribution and habitat. Western littoral of the central basin (Birkhin) and Maloe More Strait on sandy sediments (Kozhov 1936).

Remark. Kozhov (1936) thought that the species should be considered a morph of *Ch. schrencki* Dybowski, 1875. The snails collected in Aya Bay (located 10 km north of the type locality) and identified as *Ch. pygmaeus* (Fig. 5K) differ from *Ch. schrencki* in having an oval shape of the spire whorls and more rounded aperture (in *Ch. schrencki* the spire whorls are flattened and the outer lip of the aperture is obliquely straightened), and in a nearly complete lack of the umbilicus.

Choanomphalus microtrochus Lindholm, 1909
(Fig. 5J)

Ch. (*Achoanomphalus*) *microtrochus* Lindholm, 1909: 22, table II, figs 10–11 (diagnosis, photo of shell, key to identification);
Ch. minutissimus – W. Dybowski 1910: 258 (nomen nudum, both *Ch. gerstfelsdianus* and *Ch. microtrochus* as synonyms);
Ch. (*Choanomphalus*) *dybowskianus* var. *microtrochus* – Kozhov 1936: 177 (Russian translation of Lindholm's diagnosis, key to identification, comparison with *Ch. schrencki* and *Ch. dybowskianus*, distribution);
Ch. (*Sulcifer*?) *microtrochus* – Beckman and Starobogatov 1975: 103;
Ch. (*Ophalocrypta*) *microtrochus* – Starobogatov and Sitnikova 1998: 413 (distribution);
Ch. microtrochus – Papusheva et al. 2003: 76 (mtDNA COI nucleotide sequences);
Sitnikova et al. 2004: 984 (information about type, type locality, distribution); Vinarski and Kantor 2016: 365–368 (information about types, type locality, general distribution, ecology).

Types. Syntypes (10 dry and 18 in alcohol) from Ayaya, 5 fathoms (= 9 m), fine sand, and Dagarskaya Bay, 6 fathoms (= 11 m), sand, in ZIN.

Type locality. Lake Baikal (northern part).

Diagnosis. Shell very small, without umbilicus, round-conical, horny-brown. Whorls 3, weakly convex, flattened. Last whorl rapidly increasing, with rounded periphery and flattened umbilical surface. Spire conical with pointed apex. Suture slightly impressed, aperture rather round, cut by penultimate whorl, outer lip sloping down, basal lip rounded, columellar lip thickened. Shell size (n = 3): LD = 2.0–2.25 mm, SD = 1.5 mm, SH = 1.5–1.75 mm, NW = 3 (Lindholm 1909).

Distribution and habitat. Sandy littoral of the Northern Baikal. In addition to the type locality, it was found in Boguchanskaya Bay (Kozhov 1936) and along the north-eastern part of the lake up to Barguzin Bay (own data).

Gyraulus rugulosus Lindholm, 1909
(Fig. 5K)

Planorbis (*Gyraulus*) *rugulosus* Lindholm, 1909: 25 (diagnosis, comparison with *P. stroemi* Westerlund, 1881); Starostin 1926: 13 (record from Maloe More);
Planorbis (*Gyraulus*) *gredleri* var. *rugulosus* Kozhov, 1936: 147, table VI, figs 48–49, table IX, fig. 16 (synonymy, Russian translation of Lindholm's diagnosis, similarity with *P. gredleri* var. *stroemi*, distribution in Baikal inlets and bays);
Anisus (*Gyraulus*) *stroemi* – Starobogatov and Sitnikova 1998: 413 (distribution in Baikal bays and sors);
Planorbis rugulosus – Vinarski et al. 2012: 91 (mention).

Types. Two syntypes in ZIN.

Type locality. A lake connected with of Baikal (north-western part): Molokajskij sor [= Bolsodejskij sor after Kozhov (1936) or adjacent Muzhinajski Molokaj = Muzhinajskij sor].

Diagnosis. Shell flat, yellow-horn, surface rough, covered with thin felt cover, 'upper surface' deeper in

centre than 'lower surface'. Whorls 4.5, very rapidly increasing, heavily impressed, evenly and weakly protruding (or convex) on both surfaces. Last whorl with peripheral keel, often with 'leathery fold'. Suture deeper on 'upper surface' than on 'lower one'. Aperture ovate-oblique, basal lip rounded. Shell size (n = 1): LD = 8.5 mm, SD = 6.0 mm, SH = 2.3 mm, NW = 4.0 (Lindholm 1909).

Distribution and habitat. Widely distributed in bays and sors of Baikal, and adjacent water bodies at a depth of 8–10 m (Kozhov 1936).

Remark. This taxon was usually regarded as a synonym of *G. stroemi* (Westerlund, 1881), a planorbid species widely distributed in the Northern Palaearctic waterbodies. According to information from the hand-written catalogue of ZIN collection of continental Mollusca, Dr. L. Prozorova identified the type specimens of *Planorbis rugulosus* as *Gyraulus centrifugus* (Westerlund, 1897). Investigations of new samples from Bolsodejskij and Muzhinajskij sors are needed to determine the taxonomic identity of planorbid species inhabiting these sors.

Family LYMNAEIDAE Rafinesque, 1815

Radix auricularia intercisa (Lindholm, 1909)

(Fig. 7A–D)

Limnaea ovata var. *intercisa* – Milaschewitsch 1901: 65 (nomen nudum, record from Chivyrkuj Bay);

Limnaea (*Gulnaria*) *auricularia* var. *intercisa* Lindholm, 1909: 5, table I, fig. 72 (diagnosis, photo of shell, size, records); Starostin 1926: 4 (records from Chivyrkuj Bay);

Lymnaea (*Radix*) *auricularia* var. *intercisa* – Kozhov 1936: 134, table II, figs 12–13 (synonymy, corrected description, comparison with *intercisa* sensu Dybowski 1913);

Lymnaea (*Radix*) *intercisa* – Izzatulaev et al. 1983: 57, fig. 1, *17–18* (reproductive system); Kruglov and Starobogatov 1991 [1992]: 123 (egg syncapsulae morphology); Kruglov and Starobogatov 1993: 85, fig. 10F (drawings of shell and reproductive system); Kruglov 2005: 252 (shell, reproductive system and egg syncapsulae morphology, distribution – Central Siberia and north-eastern Kazakhstan); Starobogatov and Sitnikova 1998: 411 (distribution in sors and bays of Baikal);

Lymnaea auricularia – Stift et al. 2004: 101 (records in open regions of Baikal, changes in shell morphology);

Radix (*Radix*) *intercisa* – Sitnikova et al. 2004: 989 (synonymy, information about types, type locality, distribution in Baikal, ecological characteristics); Prozorova et al. 2009: 185 (distribution in waterbodies of the Baikal region);

Radix (*Radix*) *intercisa* – Vinarski and Kantor 2016: 318 (synonymy, information about types, type locality, distribution, ecology).

Radix auricularia – Rozhkova et al. 2018 (record from Listvenichnoe, stomach content).

Types. Lectotype and 10 paralectotypes with a label 'Maloe More, Lindholm' collection', in ZIN.

Type locality. Lake Baikal: Maloe More (without indication of exact site).

Other records mentioned by Lindholm (1909): near Kobyl'ya Golova Cape, silt; Chivyrkuj Bay: Ongokonskaya Inlet, on rotten, flooded wood, and 2–3 fathoms (= 3.7–5.5 m), stones; Zmeinaya Inlet, 2 fathoms, stones; Kruglaya (Krutaya?) Inlet, on shore; Perewal'nyj (Kurbulik?) Cape; and Angarskij sor (northern part of the lake), on silt and *Potamogeton*.

Diagnosis. Shell large, thin, fragile, irregularly striped, pale-white or light yellowish, with narrow umbilicus. Spire prominently elongated, apex pointed. Whorls 4–4.5, large, last whorl heavily inflated, aperture very broad, widely ovoid, outer lip strongly curved, columellar lip straight or slightly reflexed. Shell size (n = 9): SH = 19–24.5 mm, SW = 16–20 mm, AH = 15.5–20.5 mm, AW = 9.5–12.5 mm, NW = 4.0–4.5 (Lindholm 1909). Shell size of the lectotype: SH = 21.0 mm, SW = 16.3 mm, AL = 15.6 mm, AW = 11.4 mm, NW = 4.0.

Distribution and ecology. Endemic to Lake Baikal (Lindholm 1909). According to Kruglov and Starobogatov (1993), it is a separate species distributed in Siberian lakes. Until the mid-20th century, it was registered in bays and sors of Baikal; the first records of this subspecies (or a young species) in open regions of the lake are dated 1975–1980 (own unpublished data). At present, it is widely distributed in the open Baikal littoral (Sitnikova et al. 2004; Stift et al. 2004) and occupies the depth zone from 1.5 to 30 m on stony-rocky, sandy and silted-sandy sediments with or without water plants, together with endemic Baikal gastropods (own data), thereby breaking the 'law' of immiscibility of the Baikal endemic and Palaearctic fauna (see review in Timoshkin 2001). It is possible that these lymnaeids compete with *Benedictia baicalensis* (Gerstfeldt, 1859) for the place of egg attachment, because they use the same stone-rocky substrate in the littoral. Egg capsules of *R. a. intercisa* collected from the littoral of Bol'shie Koty Bay are larger in size than egg capsules collected from a small waterbody located 2–5 m off the shore

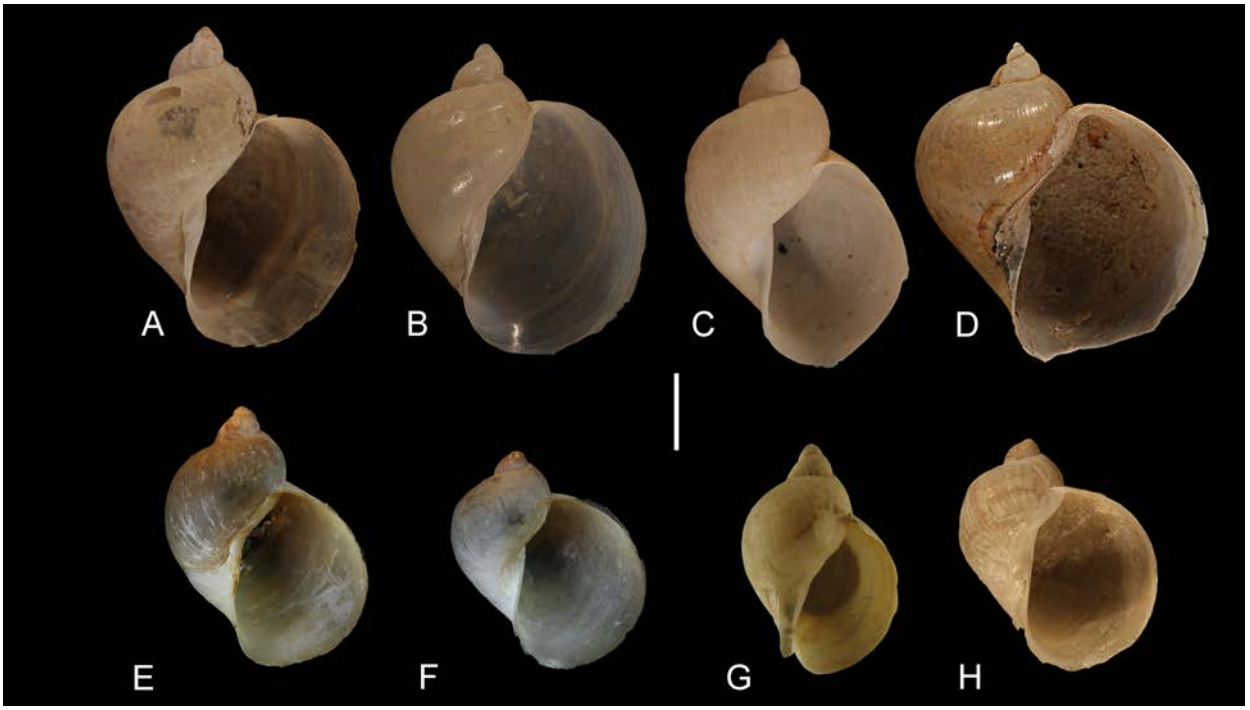

Fig. 7. Type specimens of Lymnaeidae taxa described by Lindholm: A–D – *Radix auricularia intercisa*: A – the lectotype, Maloe More, other – the paralectotypes; E, F – *R. a. lapidaria,* syntypes; G – *Peregriana balthica petricola*, the syntype, Molokajskij sor; H – *Radix kosogolensis*, a syntype.

of this littoral site. Large egg capsules occupy the syncapsulae in two layers (own data).

Remarks. In addition to *R. a. intercisa,* Lindholm (1909) also described *L.* (*Gulnaria*) *auricularia* var. *lapidaria*, mentioned for the first time by Milaschewitch (1901) as *L. ovata* var. *lapidaria*. This 'morph' was described from Chivyrkuj Bay; it was listed among other lymnaeids of Baikal (Starostin 1926; Kozhov 1936) and then was forgotten. I cannot provide any more information on this species, and present here only photos of two shells (syntypes) housed in ZIN collection (Fig. 7E–F).

Baikal snails of the *Radix auricularia* group require a special comprehensive revision to decide how many species (or morphs) inhabit Baikal bays, sors and the open littoral of different regions (for example, the snails living in some bays of Maloe More on coastal stones can be identified as *R. auricularia* and those living near Peschanaya Bay as *R. parapsilia* Glöer et Vinarski, 2009 [= *L.* (*R.*) *psilia* sensu Kruglov and Starobogatov 1993, non Bourguignat 1862]. The second question is: what were the routes of *Radix* expansion into the open Baikal littoral? Have the snails reached Baikal independently from several nearby coastal zones or was there a single source of their invasion from which they migrated to different regions of the open littoral?

Peregriana balthica petricola **(Lindholm, 1909)**
(Fig. 7G)

Limnaea (*Gulnaria*) *ovata* var. *petricola* Lindholm, 1909: 7 (diagnosis); Kozhov 1936: 136, table II, figs 9, 10, 14, 15 (description, photo of shells, with morphotypes: *kultukiana* B. Dybowski, 1913, *angarensis* Kozhov, 1936, *tschiwirkuensis* Kozhov, 1936, *sorica* B. Dybowski, 1913, distribution);

Lymnaea (*Peregriana*) *ovata* – Sitnikova et al. 2004: 986 (synonymy, distribution in Baikal bays, ecological characteristics); Prozorova et al. 2009: 183 (distribution, ecological characteristics);

Lymnaea ovata – Kantor et al. 2010: 93 (synonymy, information about types, type locality, general distribution);

Radix (*Peregriana*) *balthica* – Vinarski and Kantor 2016 (synonymy, information about types, type locality, general distribution, ecology).

Types. Two syntypes in ZIN.

Type locality. A lake connected with Baikal (northwestern part): Molokajskij sor [= Bolsodejskij sor after Kozhov (1936) or adjacent Muzhinajski Molokaj = Muzhinajskij sor].

Diagnosis. Shell thin, fragile, moderately swollen, horny-yellow, with narrow split-shaped umbilicus. Spire elongated with rather pointed apex. Whorls 3.5–4, slightly convex, last whorl swollen. Suture deepened, aperture regularly ovoid, its upper tip with prominent angle, columellar lip reflexed. Shell size (n = 3): SH = 16.5 mm, SW = 11 mm, AL = 12 mm, AW = 7.5 mm, NW = 3.5–4.0 (Lindholm 1909).

Distribution. Endemic to Lake Baikal (Lindholm 1909). According to Kozhov (1936), it inhabits bays and sors of Baikal as well as the waterbodies of the Pribaikalie region (Kozhov 1936). Huge quantities of empty lymnaeid shells were found on sandy beaches among the prolific mats of the *Spirogyra* algae near Senogda Bay (north-western Baikal) (Timoshkin et al. 2016). These shells were similar to *P. balthica* sensu lato (identified by M. Vinarski and the author).

Remark. Kozhov (1936) pointed out that the Baikal *L. ovata* differ from the European population in having smaller shell sizes and a narrower aperture, and thus should be considered a variety (= subspecies). Shells are similar to those of the *Peregriana balthica* (Linnaeus, 1758) group and may occasionally be found together with representatives of the *R. auricularia* group (for instance, in Maloe More and Chivyrkuj Bay).

Family BENEDICTIIDAE Clessin, 1880

Kobeltocochlea olchonensis (Lindholm, 1909)
(Fig. 8C)

Kobeltocochlea martensiana var. *olchonensis* Lindholm, 1909: 37 (differential diagnosis), Starostin 1926: 20 (records from nearby Ushkanyi Islands, Maloe More, Olkhonskie Vorota, Peschanaya Bay, depth 5–80 m, sand, silt, stones, vegetation, sometimes on sponges, shell measurements); Kozhov 1936: 33, table I, fig. 12 (differences from *K. martensiana*, distribution);

Kobeltocochlea (*Kobeltocochlea*) *olchonesis* – Sitnikova 1987b: 1465; fig. 2, *2*; Starobogatov and Sitnikova 1998: 407 (distribution);

Kobeltocochlea olchonensis Sitnikova, 1995: 78, fig. 9B; Sitnikova et al. 2004: 940 (information about types, type locality, distribution, ecological characteristics); Vinarski and Kantor 2016: 259 (similarly with some additional data).

Types. Lectotype (dry) in ZIN (designated by Sitnikova 1987b).

Type locality. Lake Baikal: Maloe More Strait, Olkhon Gate, 11.5 fathoms (= 21 m), sand, grass.

Diagnosis. Shell widely conic, of medium size, smooth, light-brown, 3–4 flattened whorls rapidly increasing in size. Suture shallow. Height of two whorls above aperture less than 1/2 of aperture height. Umbilicus completely closed or covered by columellar lip of aperture (Lindholm 1909 with additions; Sitnikova 1995). Shell size of the lectotype: SH = 12.85 mm, SW = 9.0 mm, AH = 8.2 mm, AW = 7.3 mm, NW = 4.0 (Sitnikova 1987b).

Distribution and habitat. It inhabits Maloe More Strait, the northern basin and occurs along the east shore of the central basin, lives on sandy and sandy-silted sediments, sometimes on stones with vegetation at a depth of 2–40 m. It was found to co-occur with *Benedictia baicalensis* (Gerstfeldt, 1859) and *B. ongurensis* Kozhov, 1936.

Benedictia pumyla (Lindholm, 1924b)
(Fig. 8B)

Kobeltocochlea pumyla Lindholm, 1924b: 217 [diagnosis, comparison with *Lithoglyphus prasinus* (Küster, 1852) and *Kobeltocochlea martensiana* (Dybowski, 1875)]; Kozhov 1936 (Russian translation of Lindholm's diagnosis);

Benedictia (*Baicalocochlea*) *pumyla* – Beckman and Starobogatov 1975: 99, fig. 3V (в) (records from southern and northern Baikal basins at a depth of 240–270 m); Sitnikova 1987b: 1971, fig. 4; Sitnikova 1995: 88, fig. 10A; Starobogatov and Sitnikova 1998: 407 (distribution); Sitnikova 2001: 106, figs 1B, C, E, 3B, 5D, E, 6A, B (morphology of shell, foot, and radular teeth, comparison with *Kobeltocochlea falsipumyla* Sitnikova, 2001); Röpstorf and Riedel 2004: 261, fig. 5A–F (protoconch and radular teeth morphology); Sitnikova et al. 2004: 946 (information about type specimen, type locality, distribution, ecological characteristics); Vinarski and Kantor 2016: 259 (the same data); Sitnikova et al. 2012a: 76 (on spirochetes found in stomach's crystalline style).

Types. Single dry shell (holotype) in ZIN.

Type locality. Lake Baikal (north-eastern part): Tukalaragda Bay, 25 and 60 fathoms (= 46 and 110 m), silt and stones [Lindholm (1924b) mentioned 2 depth zones; 25–60 fathoms is possibly more correct, if the specimen was collected using dredges].

Diagnosis. Shell ovate-spherical, fragile, smooth, yellow-green or light-brown. Shell height slightly

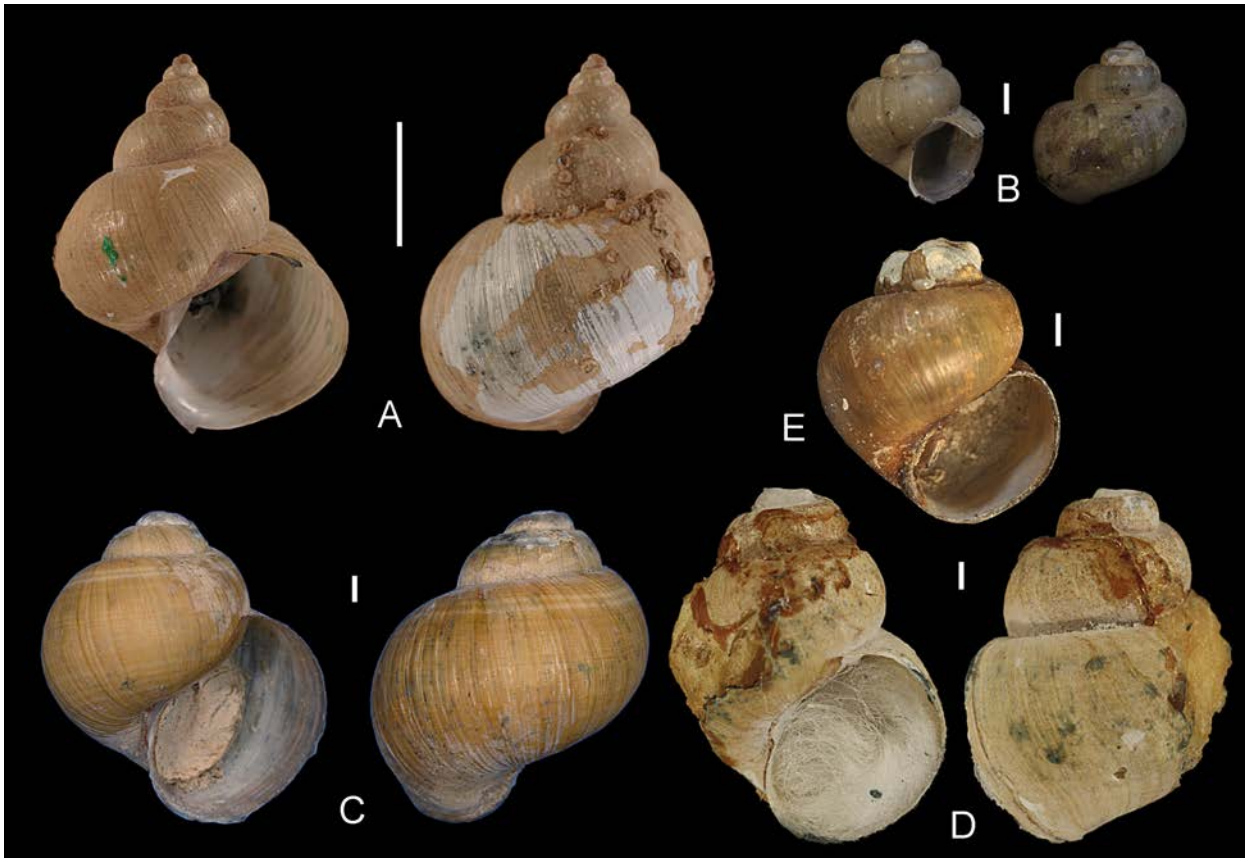

Fig. 8. Type specimens of Benedictiidae taxa described by Lindholm: A – *Benedictia distinguenda distinguenda*, the lectotype; B – *B. pumyla*, the holotype; C – *Kobeltocochlea olchonensis*, the lectotype; D – *Benedicita michnoi*, the reconstructed holotype; E – *B. michnoi* from Babuskin region, stones, sand, 18 m depth, col. Sitnikova T., 7.10.1993. Scale bar: A – 10 mm, B–E – 1 mm.

less than shell width. Spire widely conical, smaller than aperture height, apex with spirally arranged dimpled microsculpture. Whorl number about 4 (4.5), ovate-rounded, the first three whorls slowly increasing, the last whorl increases rapidly. Suture indented; umbilicus slit-like, slightly covered by columellar lip of aperture. Aperture ovate-rounded; operculum with 1.5 whorls. Shell size of the holotype: SH = 6.0 mm, SW = 5.5 mm, AH = 3.2 mm, AW = 3.0 mm, NW = 4 (Lindholm 1924b).

Distribution and habitat. Recorded from the Frolikha cold hydrothermal seep at a depth of 420 m (Sitnikova et al. 1993) and 430–463 m (Zemskaya et al. 2012), and from the Academic Ridge at a depth of 50–150 m (Sitnikova et al. 2004). In the Frolikha seep it was found on boulders and on soft sediments between boulders adjacent to bacterial mats (Zemskaya et al. 2012).

Benedictia michnoi **(Lindholm, 1929)**
(Figs 6B, 8D, E)

Kobeltocochlea michnoi Lindholm, 1929: 316, fig. 2 (diagnosis, comparison with Benedictiidae);
Kobeltocochlea (*Pseudobenedictia*) *michnoi* – Sitnikova 1987a: 1466; figs 1, *7*; 2, *4–5*; Sitnikova 1987b: 104, figs 1, 2 (drawings of shells from different regions of Baikal, radular teeth); Sitnikova 1995: 82, fig. 9D, E; Starobogatov and Sitnikova 1998: 407 (distribution);
Pseudobenedictia michnoi – Sitnikova et al. 2004 (information about type specimen = holotype, type locality, distribution and ecological characteristics in Baikal); Vinarski and Kantor 2016: 259 (the same data).

Types. Lindholm (1929) described this species from a single shell designated as the holotype (now broken and glued together), which is kept in ZIN. This shell originated from 'the samples of coastal fauna of Lake Hövsgöl (Khubsugul) in NW Mongolia, collector P. Mikhno' (Lindholm 1929: 315) and donated by

the Troitskosavsk Museum (now Kyakhta Museum) situated in a town on the boundary between Russia and Mongolia.

Type locality. Lake Hövsgöl (Khubsugul or Kosogol), Mongolia.

Diagnosis. Shell fragile, very thin, globosely conic, of medium size, smooth with fine growth lines, consists of more than 3 strongly corroded whorls. Whorls shouldered, slowly increasing, divided by deep suture. Spire height equal or slightly less than aperture height. Umbilicus absent. Aperture ellipsoidal, basal lip rounded, columellar lip rounded and slightly reflexed. Shell size of the holotype: SH = 12.0 mm, AW = 11.0 mm, AH = 7.0 mm, AW = 5.0 mm at 4 whorls (Lindholm 1929).

Remarks. The glued holotype does not match the drawing (Fig. 6B) published by Lindholm (1929) and is similar to the juvenile shell of the Baikal snail *Benedictia baicalensis*. The main reason to consider the holotype of *K. michnoi* as being originated from Baikal was the fact that this species was absent from numerous Hövsgöl samples collected by the expeditions of Irkutsk State University (1970–1972, 1977–1977) (Erbaeva, per. com. 1979; Erbaeva et al. 2006). More than 30 years ago I came to the conclusion that P. Mikhno had mixed up the labels, because he collected biological samples both from Baikal (in 1890) and Hövsgöl (in 1902) (Popov 1927). Besides, I was unable to find this species or specimens similar to *K. michnoi* during the summer expeditions to Hövsgöl in 1997–1999. Now I think that the absence of reliable findings of this species from Hövsgöl after its original description does not disprove its presence in the lake. For example, despite my numerous attempts I could not collect 3 species described by Beckman and Starobogatov (1975) from their type localities. It cannot be ruled out completely that *K. michnoi* inhabits Hövsgöl, and the Baikal snails taken for *B. michnoi* should be designated as a separate species. This species is rarely encountered in the Baikal stony littoral (except for the Maloe More Strait); it inhabits primarily the low lateral walls of boulders, and sometimes can be found on sandy sediments between stones and boulders.

In addition to *K. michnoi,* Lindholm (1929) described *Lymnaea* (*Radix*) *auricularia* morph *kosogolensis* from the same Hövsgöl samples (2 shells, photo of a larger specimen is presented in Fig. 7H). According to Vinarski et al. (2017), this morph may be identical to *Radix bactriana* (Hutton 1849).

Lindholm (1929) mentioned the numbers of Mikhno' samples for both species (No. 1210 and No. 1761), but does not indicate the compliance with the species and number of the sample.

Benedictia distinguenda Lindholm, 1924
(Fig. 8A)

Benedictia fragilis var. *distinguenda* Lindholm, 1924a: 22 (diagnosis)

Benedicita (*Benedictia*) *fragilis* var. *distinguenda* – Kozhov 1936: 48, table II, fig. 29 [difference from *B. fragilis* (Dybowski, 1875), *B. limnaeoides ongurensis* Kozhov, 1936; distribution).

Benedictia distinguenda distinguenda – Sitnikova 1987b: 1469, fig. 3, *4*; Sitnikova 1995: 82, fig. 11D; Starobogatov and Sitnikova 1998: 406 (distribution); Sitnikova et al. 2004 (synonymy, information about type, type localities, distribution, ecological characteristic); Teterina et al. 2017 (molecular analysis of the *B. fragilis* group from the northeast Baikal and Selenga shallow);

Vinarski and Kantor 2016: 365–368 (information about types, type locality, general distribution, ecology).

Types. Lectotype (dry) and 11 paralectotypes (dry) in ZIN (designated by Sitnikova 1987).

Type locality. Lake Baikal: Maloe More Strait, Kobyl'ya Golova Cape, 12 fathoms (= 22 m).

Diagnosis. Shell elongate-conical, large (usually more than 2.5 mm in height at 4.5–5 whorls), brown, light-brown or green-grey, smooth with growth lines. Whorls 4.5–6, ovate-flattened. Suture shallow. Aperture broadly oval or rounded with twisted or thickened columellar lip and rounded outer and basal lips. Umbilicus slit-shaped or funnel-like. Operculum length 2.5–4 times less than aperture length. Shell dimensions of the lectotype: SH = 30.5 mm, SW = 23.6 mm, AH = 17.9 mm, AW = 15.7 mm, NW = 5.8 (Sitnikova 1987b). (At present the aperture is partially broken and the shell size is slightly smaller).

Differential diagnosis. It differs from *B. fragilis* W. Dybowski, 1875 in having a harder shell, narrower umbilicus and rounded aperture (Lindholm 1924a).

Distribution and habitat. Maloe More Strait and Northern Baikal at a depth of 20–300 m on the sandy and silted-sandy sediments.

Remarks. A recent analysis of COI mtDNA and ITS 1 nDNA sequences of the *B. distinguenda* from Chivyrkuj Bay has revealed a short genetic distance (less than 2%) between them and *B. fragilis* living in the Selenga Shallow. These individuals of *B. dis-*

tinguenda were designated as the Chivyrkuj-Barguzin genetic group (Teterina et al. 2017).

Family BAICALIIDAE P. Fisher, 1885

Baicalia dybowskiana Lindholm, 1909
(Fig. 9A)

Baikalia (*Trachybaikalia*) *dybowskiana* Lindholm, 1909: 71, Texfigur 3;
Baikalia (*Trachybaikalia*) *dybowskiana* – Kobelt 1910: 62, fig. 2403;
Trachybaikalia dybowskiana dybowskiana – B. Dybowski et Grochmalicki, 1914: 314–316, table III, fig. 12a [= *Trachybaikalia dybowskiana lindholmi* – B. Dybowski and Grochmalicki 1914: 314–316 (shell variation)];
Baicalia (*Baicalia*) *dybowskiana* – Starostin 1926: 43 (distribution in Chivyrkuj Bay and on Ushkan'i Islands, shell measurements);
Baicalia (*Baicalia*) *dybowskiana dybowskiana* – Kozhov 1936: 119, table IV, figs 15, 47, 48 (Russian translation of Lindholm's diagnosis), table XI, figs 16–19 (radular teeth morphology) (description, shell variation, key to identification, distribution);
Baicalia dybowskiana dybowskiana – Sitnikova 1991: 290, fig. 2, *11* (morphology of the female reproductive system);
Baicalia dybowskiana – Zubakov et al. 1997: 1093 (COI mtDNA nucleotide sequences);
Baicalia dybowskiana dybowskiana – Starobogatov and Sitnikova 1998: 409 (distribution);
Baicalia dybowskiana – Sitnikova et al. 2001: 65, fig. 5c (morphology of egg capsules), 68, fig. 12A–D (protoconch morphology)
Baicalia dybowskiana dybowskiana Sitnikova et al., 2004: 963 (information about types, type locality, distribution, ecological characteristics);
Baicalia dybowskiana – Peretolchina et al. 2008: 69 (nucleotide sequences of COI mtDNA and ITS 1 nDNA); Vinarski and Kantor 2016: 185 (information about types, type locality, distribution, ecology).

Types. Lectotype (dry) with a label 'Boguchan Island, 3 fathoms (= 5.5 m), stones, 26 July 1902' and 3 (dry) paralectotypes with a label 'Maloe More, Kharansa Island, 2–4 fathoms (= 4–7 m), stones, 20 June 1902', in ZIN [Lindholm (1909) mentioned 1 specimen collected near the Kharansa Island].

Type locality. Lake Baikal (northern part).

Diagnosis. Shell without umbilicus, slender-conical, olive-green or yellowish, with bar-shaped transversal ribs and spiral cant near suture, well-developed keel on the last whorl. Spire slender, higher than aperture, apex usually broken. Whorls 6–9.5, slightly convex, apex (1.5–2 whorls) usually absent; last whorl not swollen, suture deep. Aperture oval or rounded triangular. Junction of outer and basal lips with angle, columellar lip straight. Shell dimensions of the lectotype: SH = 10.5 mm, SW = 4.5 mm, SprH = 7.4 mm, NW = (6.0) (apex and aperture broken).

Distribution and habitat. Lindholm (1909) indicated additional locations: Maloe More, Khargoj Cape, 3–4.5 fathoms (= 5.5–8 m), stones; Olkhon Gate, 11.5 fathoms (= 21 m), sand, vegetation; Birkhin Cape, 5–25 fathoms (= 9–45.7 m), stones, sand. Species was found in three basins of the lake on sandy and stone sediments at a depth of 3–80 m (Kozhov 1936; own data), together with *B. carinata* and *B. carinatocostata* on sandy substrate and with *B. rugosa* on hard substrates. The snails attach their egg capsules inside the cracks of a hard substrate (Sitnikova et al. 2001).

Baicalia rugosa Lindholm, 1909
(Fig. 9B)

Baikalia (*Trachybaikalia*) *carinata* form *rugosa* Lindholm, 1909: 69 (differences from the typical form, as a local form);
Trachybaicalia carinata var. *martensiana* subvar. *rudis* B. Dybowski et Grochmalicki, 1914: 293, table II, fig. 3a–c (description, shell variation);
Trachybaikalia carinato–costata gredneri elatella B. Dybowski et Grochmalicki, 1914: 307, table III, fig. 8a–c (description);
Baikalia (*Baikalia*) *carinata* form *rugosa* – Starostin 1926: 41 (record from 110 m depth in Maloe More);
Baicalia (*Baicalia*) *carinata* form *rugosa* – Kozhov 1936: 118, table IV, fig. 12 (difference from typical morph, occurrence);
B. carinata rugosa – Sitnikova 1991: 290 (female reproductive system); Starobogatov and Sitnikova 1998: 409 (distribution); Sitnikova et al. 2004: 963 (information about types, type locality, distribution); Korobkova et al. 2006: 161, fig. 2e (shell variation, possibly a hybrid between *B. carinata* and *B. dybowskiana* or *B. carinata* and *B. carinatocostata* in the place of their contact zone or ecotones);
Baicalia rugosa – Peretolchina et al. 2008: 69 (nucleotide sequences of COI mtDNA and ITS 1 nDNA); Vinarski and Kantor 2016: 185 (information about types, type locality, distribution, ecology).

Types. Syntypes (9 dry) from the localities: Baikal (without indication of exact location), depth 5 yards (= 4.6 m), sand, stones; and northern part of

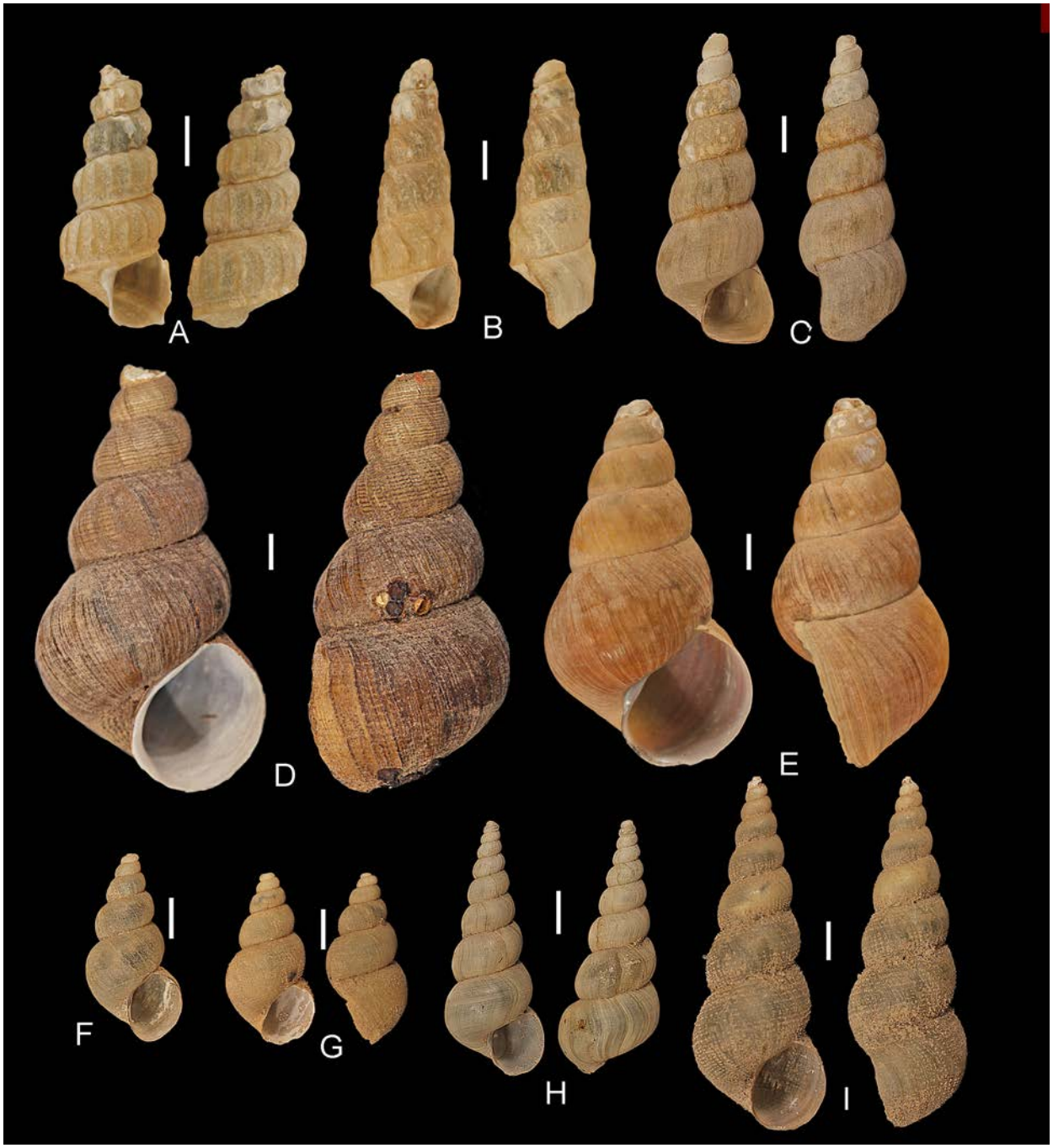

Fig. 9. Type specimens of Baicaliidae taxa described by Lindholm: A – *Baicalia dybowskiana*, the lectotype, Boguchan Island, 3 fathoms, stones, 26 July 1902; B – *B. rugosa*, a syntype, Baikal, 5 yards, 1900; C – *B. turriformis inornata*, a syntype, Kultuk, 25 fathoms, stones, 26 June 1902; D – *Parabaikalia kobeltiana*, a syntype, Birkhin Cape, 5–25 fathoms, stones, sand, 4 August 1902; E – *P. milaschewitschi*, a syntype, Bezymyannaya Inlet, 3–5 fathoms, sand, stones, 10 July 1901; F–G – *Korotnewia semenkevitschi semenkevitschi*, syntypes; F – Maloe More Strait, Ussuk settlement, 22 fathoms, sand, 31 July 1902; G – Birkhin Cape, 25 fathoms, sand, 3 August 1902; H – *K. angigyra*, a syntype, Boguchan Island, 35 fathoms, stones, silt, 28 July 1901; I – *K. korotnevi*, a paralectotype, Kotelnikovskij Cape, 25 fathoms, silt, 20 July 1901. Scale bar: 2 mm.

the lake: Svyatoj Nos, 2–4 fathoms (= 4–7 m), stones, and Ongokonskaya Inlet (Chivyrkyj Bay), 2–3 fathom (= 4–5.5 m), stones, in ZIN.

Type locality. Lake Baikal (northern part).

Diagnosis. Shell turriculate, light-yellow green or grey-horn, with 8–11 flat or weakly convex, evenly increasing whorls, with S-shaped weak transversal folds. Suture shallow with thread forming a well-developed spiral keel on the last whorl and an angle on junction of outer and basal lips of aperture. Umbilicus absent. Shell size of the illustrated syntype: SH = 13.7 mm, SW = 4.66 mm, AL = 3.6 mm, AW = 2.5 mm, NW = 6 (embryonal whorls destroyed).

Differential diagnosis. It differs from *B. carinata* in having weak transversal folds (Lindholm 1909).

Distribution and habitat. Northern and Central Baikal, including Maloe More Strait, along the marine shoreline of Olkhon Island, in Talanka Bay, and Southern Baikal – near Tankhoj town. It inhabits rocky-sand sediments primarily at a depth of 3–40 m and was found together with *Baicalia carinata* and *B. carinatocostata* on sands and with *B. dybowskiana* on rocky boulders. Like *B. dybowskiana,* these snails attach their egg capsules to the lateral sides of boulders and rocks.

Baicalia turriformis morph *inornata* Lindholm, 1909
(Fig. 9C)

Baikalia (*Godlewskia*) *turriformis* form *inornata* Lindholm, 1909: 64 (difference from the typical form);
Baicalia (*Godlewskia*) *turriformis* form *inornata* – Kozhov 1936: 123, table II, fig. 56

Types. Syntypes (3 dry) in ZIN.

Type locality. Lake Baikal (southern part): Kultuk, 2–5 fathoms (= 3.7–9.1 m), stones.

Diagnosis. Shell turriculate, grey-green or grey-horn, smooth, with 6–9 evenly increasing ovate whorls. Suture moderately deep. Umbilicus absent. The last whorl with weak peripheral keel. Aperture rather quadrangular, basal lip straightened, columellar lip oblique, outer lip rounded, extended downward.

Differential diagnosis. It differs from the typical morph in lacking entirely the transversal ribs on the shell. Shell size (n=2): SH = 16.0–17.5 mm, SW = 6.0–6.5 mm, AL = 5.0 mm, AW = 3.5–4.0 mm, NW = 8 (Lindholm 1909).

Distribution and habitat. It occurred together with the typical form (morph) (Lindholm 1909; Kozhov 1936). I have found this morph of *B. turriformis* in rocky cliff canyons and on vertical sides of boulders deeper than 10 m in some patchy locations: near Sennaya Bay (in the outskirts of Bol'shie Koty), Tishigen Bay (marine part of Olkhon Island).

Parabaikalia kobeltiana (Lindholm, 1909)
(Fig. 9D)

Baikalia (*Parabaikalia*) *kobeltiana* Lindholm, 1909: 51, Textfigure 1 (diagnosis, key to identification); Starostin 1926: 27 (record from Maloe More and Peschanaya Bay, at depth of 10–23 m, maximum shell height up to 24 mm);
Baicalia (*Parabaicalia*) *florii* var. *kobeltiana* – Kozhov 1936: 69, table V, figs 23–24 (differential diagnosis, key to identification, distribution);
Parabaikalia florii kobeltiana – Sitnikova 1991: 291 (mention); Starobogatov and Sitnikova 1998: 409 (distribution); *Parabaikalia kobeltiana* – Sitnikova et al. 2004: 958 (synonymy, information about types, type locality, distribution, ecological characteristics); Vinarski and Kantor 2016: 193 (the same data).

Type material. Syntypes (5 dry and 3 alcohol fixed) from the localities: Maloe More Strait: Kobyl'ya Golova, 10 fathoms (= 18.3 m), silt; and without indication of exact sites, 19–22 fathoms (35–40 m), fine sand, and Birkhin Cape (western part of central basin), 5–25 fathoms (= 9.1–45.7 m), in ZIN.

Type locality. Lake Baikal (central basin).

Diagnosis. Shell large with narrow funnel-shaped umbilicus, dark horny-brown or brown, with spiral sculpture and short and irregular 'hairs' at crossing points between spiral and transversal threads. Spire conic with corroded apex. Whorls 6–7, uniformly convex, rapidly and evenly increasing, suture moderately deep, oblique. Aperture broadly ovoid with rounded outer, basal and columellar lips, columellar lip thickened. Operculum does not cover aperture completely, soft body dark-grey or blackish. Shell size (n = 1): SH = 24 mm, SW = 13 mm, AH = 9 mm, AW = 7 mm, NW = 6 (apex with destroyed 1–1.5 whorls) (Lindholm 1909).

Distribution and habitat. Maloe More, western part of the northern basin, central and southern basins (from Sagan-Moryaj to Peschanaya Bay) on soft sediments (Kozhov 1936; own data).

Remark. It was initially recorded only from Maloe More and the northern basin of the lake and

was, therefore, classified as a geographical subspecies of *P. florii,* from which it differs by the sculptured shell surface. Later on, both species were found in the southern basin; they can easily be confused with each other (it is possible that they are able to interbreed).

Parabaikalia milaschevitschi (Lindholm, 1909)
(Fig. 9E)

Baikalia florii (part.) – Milaschewitsch 1901: 65 (nec Dybowski 1875);
Baikalia (*Parabaikalia*) *milaschevitschi* Lindholm, 1909: 51, Textfigure 2 (diagnosis, comparison with *B. florii*, key to identification); Starostin 1926: 27 (records from Chivyrkuj Bay, Ushkan'i Islands at depth of 6–38 m, maximum shell height 21 mm);
Baicalia (*Parabaicalia*) *oviformis* var. *milaschevitschi* – Kozhov 1936: 73, table V, figs 12, 13 (difference from *B. oviformis,* distribution);
Parabaikalia milaschewitschi – Sitnikova 1991: 291 (mention);
Parabaikalia oviformis milaschewitschi – Starobogatov and Sitnikova 1998: 409 (distribution); Sitnikova et al. 2004: 959 (synonymy, information about types, type locality, distribution, ecological characteristics); Vinarski and Kantor 2016: 193 (the same data).

Type material. Syntypes (7 shells) from the localities: Bezymyannaya Bay (eastern littoral of the central basin), 3–5 fathoms (= 5.5–9.1 m), sand, stones; and Ushkan'i Islands, 10–70 fathoms (= 18.3–128 m), in ZIN.

Type locality. Lake Baikal (central and northern basins).

Diagnosis. Shell large, not umbilicated, ovoid-conical, light olive-grey or horn-brown. Spire conical with blunt apex. Whorls 6–7, rapidly and evenly increasing, slightly convex or almost flat, last whorl slightly swollen. Suture shallow, aperture ovoid, basal lip rounded, columellar lip widened and reflexed as whitish fold. Operculum does not cover aperture completely, soft body colouration dark grey to black. Shell size (n = 3): SH = 19–21 mm, SW = 9.75–12 mm, AH = 8–9 mm, AW = 5.75–6.5 mm, NW = 6.0 (Lindholm 1909). The shells of the snails inhabiting Barguzin Bay have a slightly reticular sculpture, which is similar to that of *P. kobeltiana*.

Distribution and habitat. It was found along the eastern shore of the northern basins (Dagarskaya Bay) including Chivyrkuj and Barguzin bays, the central basin (Bezymyannaya, Gremyachinsk) and the southern basin (Murinskaya Bay) of the lake, on sandy sediments with detritus at a depth of 3–20 m (sometimes down to 120 m) (Kozhov 1936; own data).

Remarks. It has never been found together with *P. florii* (Dybowski, 1875) and *P. oviformis* (Dybowski, 1875), both of which co-occur in the western part of the lake. These closely related species differ significantly in shell size of adults. The shell of *P. milaschewitschi* is similar in size to that of *P. florii,* but differs from it in the absence of umbilicus and flattened whorls. These three species represent a good object to investigate the problem of the ecological character displacement among Baikal gastropods.

Korotnewia semenkevitschi (Lindholm, 1909)
(Fig. 9F, G)

Baikalia (*Parabaikalia*) *semenkevitschi* Lindholm, 1909: 54; table I, figs 30, 31 (diagnosis, photo of shell, distribution, key to identification); Starostin 1926: 30 (distribution in Maloe More, Chivyrkuj Bay, Olkhonskie Gate, Listvenichnoe, at depth of 4–53 m, down to 85 m, number, maximum shell height 12.8 mm);
Baicalia (*Korotnewia*) *semenkewitschi* – Kozhov 1936: 79, table V, figs 34–36, 43–44, 46–47; table XIII, figs 13–16 (Russian translation of Lindholm's diagnosis, shell variation, key to identification, distribution);
Korotnewia semenkewitschi – Sitnikova 1991: 291, fig. 2, *13* (morphology of the female reproductive system); Zubakov et al. 1997: 1093 (nucleotide sequences of COI mtDNA);
Korotnewia semenkewitschi semenkewitschi – Starobogatov and Sitnikova 1998: 409 (distribution);
Korotnewia semenkewitschi – Sitnikova et al. 2001: 76 (protoconch morphology, has two different protoconch shapes);
Korotnewia semenkewitschi semenkewitschi – Sitnikova et al. 2004: 961 (synonymy, information about types, type locality, distribution and ecological characteristics); Vinarski and Kantor 2016: 189 (the same data).

Types. Syntypes (17 dry and 54? in alcohol) from the localities: Maloe More, Kharansa Island, 2–4 fathoms (= 3.7–7.3 m), Ussuk settlement, 22 fathoms (= 40.2 m), fine sand; without indication of exact sampling sites, 19–22 and 26 fathoms (34.7–40.2 and 47.6 m); northern part, near Kotelnikovskij Cape, 19–40 fathoms (= 34.7–73 m); near Boguchan Island, 7 fathoms (= 12.8 m); and western part of central basin, near Birkhin, 25 fathoms (= 45.7 m), sand, in ZIN.

Type locality. Lake Baikal (central and northern basins).

Diagnosis. Shell of medium size, fragile, transparent, whitish-yellow or whitish-grey, with slit-like umbilicus or without it; pointy ovoid with fine transverse and dense spiral microsculpture. Spiral threads with short bristles. Whorls 6, strongly convex, slowly and evenly increasing. The last whorl weakly swollen. Suture deep, slightly oblique. Aperture regularly ovoid, basal lip ovate-rounded; columellar lip thin. Operculum does not cover aperture completely. Shell size (n = 4): SH = 8–9 mm, SW 4.3–4.5 mm, AH = 3.0–3.75 mm, AW = 2.25–2.8 mm, NW = 6 (Lindholm 1909).

Distribution. The species is widely distributed on sandy-silted sediments from 4–5 to 100 m depth, burrowing in soft substrate, co-occurs with other *Korotnewia* and *Parabaikalia* species (Kozhov 1936; own data).

Korotnewia angigyra (Lindholm, 1909)
(Fig. 9H)

Baikalia (*Godlewskia*) *angigyra* Lindholm, 1909: 64, table I, figs 56–58 (diagnosis, photo of shell, distribution, key to identification); Starostin 1926: 36 (records from Chivyrkuj Bay, near Zama settlement, Maloe More, at a depth of 9–200 m, abundance, maximum shell height 12.5 mm);

Baicalia (*Korotnewia*) *angigyra* – Kozhov 1936: 84, table V, figs 37–39 (description, key to identification, comparison with *B. korotnevi* and *B. turriformis*, distribution); *Korotnewia angigyra* – Sitnikova 1991: 291;

Korotnewia angigyra – Starobogatov and Sitnikova 1998: 409 (distribution); Sitnikova et al. 2004: 961 (synonymy, information about types, type locality, distribution and ecological characteristics); Vinarski and Kantor 2016: 189 (the same data).

Types. Syntypes (12 dry) from the localities: Boguchanskaya Bay, 40 fathoms (= 73 m), silt, near Boguchan Island, 35 fathoms (= 64 m), stones, silt, and Tukalaragda Bay, 20 fathoms (= 37 m), silt, in ZIN.

Type locality. Lake Baikal (northern basin).

Diagnosis. Shell without umbilicus, very slim, turreted, fragile, transparent, light yellow; spire 2.5–3 times as high as aperture. Whorls 9, slowly and evenly increasing, strongly convex with very fine reticulate sculpture, longitudinal threads more visible than transversal ones; last whorl slightly larger than penultimate. Suture very deep, rather horizontal. Aperture widely ovoid, outer and basal lips rounded, columellar lip thin and straightened. Operculum does not cover aperture completely. Soft body yellowish. Shell size (n = 3): SH = 10–12.5 mm, SW = 3.8–5.0 mm, AH = 2.5–3.0 mm, AW = 2.25–2.75 mm, NW = 9.0 (Lindholm 1909).

Distribution and habitat. It inhabits sandy-silted sediments at a depth of 11–200 m in the Maloe More Strait and Northern Baikal.

Korotnewia korotnevi korotnevi (Lindholm, 1909)
(Fig. 9I)

Baikalia (*Godlewskia*) *korotnevi* Lindholm, 1909: 65, table I, figs 22–24 (diagnosis, photo of shell, distribution); Starostin 1926: 37 (records from Chivyrkuj Bay, Ushkan'i Islands, at a depth of 6.5–115 m, maximum shell height 18.9 mm);

Baicalia (*Korotnewia*) *korotnewi* – Kozhov 1936: 81, table V, figs 26–30 (Russian translation of Lindholm's diagnosis, shell variation, key to identification, distribution);

Korotnewia korotnewi – Sitnikova 1991: 291, fig. 2, *12* (morphology of the female reproductive system);

Korotnewia korotnevi korotnevi – Starobogatov and Sitnikova 1998: 409 (distribution);

Sitnikova et al. 2001: 76 (protoconch morphology);

Sitnikova et al. 2004: 960 (synonymy, information about types in ZIN, type locality, distribution and ecological characteristic); Vinarski and Kantor 2016: 188 (the same data).

Types. Lectotype (dry) and paralectotype (dry) in ANSP [under the name *Baicalia* (*Pseudobaicalia*) *korotnevi* from Maloe More], 31 paralectotypes (29 dry and 2 in alcohol) from the localities: Dagarskaya, Kotelnikovskij Cape, and Maloe More Strait, from 11.5 to 45 fathoms (= 21–82 m), silt, sand and stones, in ZIN, 5 co-types (paralectotypes from Maloe More) in RBINS and 2 paralectotypes (from Maloe More) in LUOMOS.

Type locality. Lake Baikal (Maloe More Strait).

Diagnosis. Shell slender-turriculate, with narrow umbilicus, yellowish or light brown with delicate reticulate sculpture. Spiral threads densely spaced, with very short bristles breaking off easy. Spire higher than aperture. Whorls 7.5–8.5, convex, evenly and rapidly increasing. Suture moderately deep, oblique. Aperture widely ovoid. Operculum does not cover aperture completely. Soft body light-grey, with whitish mantle. Shell size (n = 11): SH = 13–19 mm, SW = 6–8 mm, AH = 3.8–5.0 mm, AW = 3.2–4 mm, NW = 7–8.5 (Lindholm 1909).

Distribution and habitat. It is widely distributed in Maloe More Strait and Northern Baikal at a depth from 10 to 120 m, in some localities down to 200 m, living buried in sandy, silted sandy and silted sediments (Kozhov 1936; own data).

Remark. According to Kozhov (1936), the species consists of three varieties (subspecies) differing from the nominal subspecies in smaller shell size, colour or absence of sculpture.

Maackia (*Eubaicalia*) *herderiana herderiana* (Lindholm, 1909)

(Fig. 10A, B)

Baikalia (*Baikalia*) *herderiana* Lindholm, 1909: 47, table I, figs 11–14 (diagnosis, shell photo, distribution, key to identification); *B.* (*Eubaikalia*) *herderiana* – Starostin 1926: 25 (records from Chivyrkuj Bay, Ushkan'i Islands, Maloe More Strait, Peschanaya Bay, at a depth of 4.5–100 m, maximal SH = 9.5 mm);

B. (*Eubaicalia*) *herderiana* – Kozhov 1936: 58, table III, figs 10, 11; table XI, figs 20–23 (Russian translation of Lindholm's diagnosis, shell variation, key to identification, distribution); Gavrilov 1953 (seasonal reproduction); Poberezhnyi 1989: 6 (chromosome number 2n = 28);

Maakia (*Eubaicalia*) *herderiana* – Sitnikova 1991: 288, fig. 2, *1* (morphology of the female reproductive system); Zubakov et al. 1997: 1093 (nucleotide sequences of COI mtDNA);

Starobogatov and Sitnikova 1998: 408 (distribution); Sitnikova et al. 2001: 63, fig. 7A–D (duration of embryogenesis, egg capsule size, protoconch morphology); Timoshkin et al. 2003: 197 (mean abundance in littoral identified from macrophotographs on different rock types, predominating on hydrolysed and destroyed granitoids); Kravtsova et al. 2004: 197 (quantitative distribution in south-western littoral);

Sitnikova et al. 2004: 951 (synonymy, information about types, type locality, distribution and ecological characteristics); Maximova and Sitnikova 2006: 97, fig. 3 (growth and age); Kulikova et al. 2007: 537 (chemical composition); Maximova et al. 2007: 45 (seasonal shell and body growth); Sitnikova et al. 2010: 6 (quantitative distribution in south-western stony-rocky littoral); Sitnikova et al. 2012a: 76, fig. 1A (smooth morph; stomach content, morphology of radular teeth, stable carbon and nitrogen isotope analysis); Sitnikova et al. 2012b: 105 (records of spirochetes in stomach's crystalline style);

Maximova et al. 2012: 3 (seasonal dynamics of abundance in littoral near Berezovyj Cape); Fazalova et al. 2010: 320 (analysis of COI sequences, expansion of population); Sitnikova et al. 2012a: 76 (morphology of radular teeth, food, stable carbon and nitrogen isotopes); Sitnikova and Maximova 2016: 263 (three eco-morphotypes distributed in different hydrodynamic zones at depth of 1.2–20 m);

Vinarski and Kantor 2016: 191 (information about type, type locality, distribution, ecology).

Types. Syntypes (31 dry) from the localities: Baranchiki Cape, 3–7, 4–21 fathoms (= 5.5–38.4 m), stones (7 samples); Listvenichnoe, 3–12 fathoms (5.5–22 m), sand; Berezovyi Cape, 2–10 fathoms (= 3.7–18.3 m) and western part of the central basin: Birkhin Cape, 1–3 fathoms (= 1.8–5.5 m), in ZIN, 1 co-type (syntype from Kultuk) in RBIMS, 2 syntypes (from Kultuk) in ANSP, and 2 syntypes (from Baranchiki) in LUOMUS.

Type locality. Lake Baikal (southwest part).

Diagnosis. Shell conical, strong, with transversal ribs, greenish or horn-brown, without umbilicus. Whorls 5.5–6.5, the first four whorls slowly increasing, strongly convex, the last whorl moderately swollen. Ribs bar-shaped, closely spaced, distance between ribs not larger than rib width. Suture deep, oblique. Aperture widely ovoid, outer lip curved, basal lip well angular, columellar lip rounded, sometimes thickened. Operculum does not cover aperture completely. Shell size (n = 3): SH = 9.0–9.5 mm, SW = 5.0 mm, AH = 3.75–4.0 mm, AW = 2.75–3.5 mm, NW = 6–6.5 (Lindholm 1909).

Distribution and habitat. It inhabits the southern and central basins (up to Aya Bay in the western part and up to Goryachinsk in the eastern part), lives in stony-rocky littoral and cliff canyons (Kozhov 1936; Sitnikova et al. 2010, 2012a).

Maackia (*Eubaicalia*) *herderiana semicostulata* (Lindholm, 1924a)

(Fig. 10C)

Baicalia (*Baicalia*) *angarensis semicostulata* Lindholm, 1924a: 22 [differences from *Baicalia angarensis* (Gerstfeldt, 1859)];

B. (*Eubaicalia*) *herderiana* forma *semicostulata* – Kozhov 1936: 59 (differential diagnosis, coexistence with the typical morph);

Maakia (*Eubaicalia*) *herderiana semicostulata* – Sitnikova 1991: 288 (mention); Starobogatov and Sitnikova 1998: 408 (distribution);

Sitnikova et al. 2004: 951 (synonymy, information about types, type locality, distribution, ecological characteristics); Vinarski and Kantor 2016: 191 (the same data).

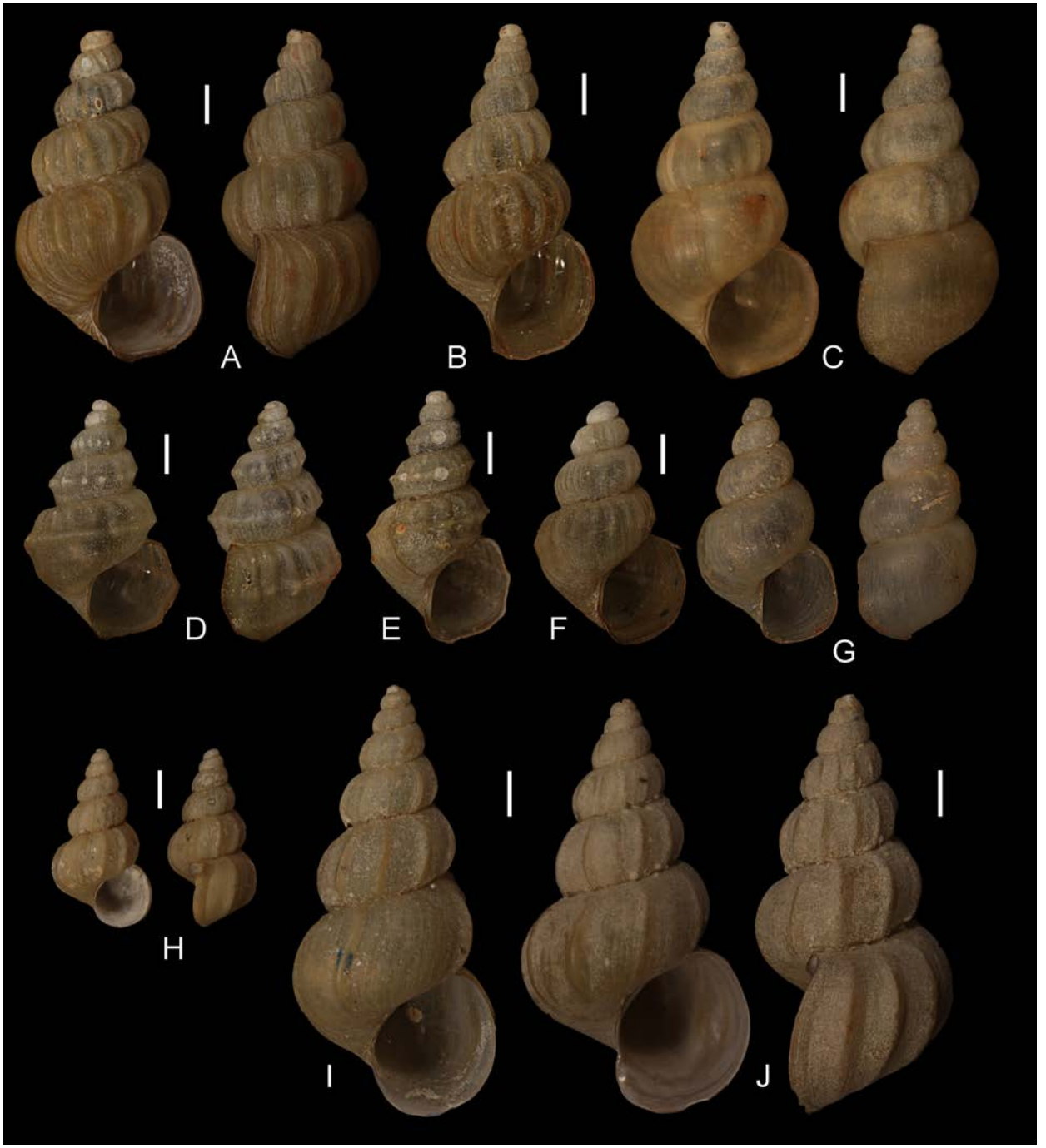

Fig. 10. Type specimens of Baicaliidae taxa described by Lindholm: A, B – *Maackia* (*Eubaicalia*) *herderiana herderiana*, syntypes, Baranchiki Cape, 7 fathoms, stones, 1902; C – *M.* (*E.*) *h. semicostulata*, a syntype, Tolstyj Cape, 3–6 fathoms, stones, 1902; D–F – *M.* (*E.*) *variesculpta*, paralectotypes, Maloe More Strait, 2–12 fathoms, stones, 17–20 July 1902; G – *M. ventrosula*, a syntype, Svyatoj Nos pen., 2–4 fathoms, stones, 7 July 1902; H – *M.* (*Maackia*) *costata exigua*, a syntype, Shabartuj Cape, 9–10 fathoms, 28 June 1902; I, J – *M.* (*M.*) *costata eximia*, syntypes, Baranchiki Cape, 9–12 fathoms, stones, 12 July 1902. Scale bar: 1 mm.

Maackia herderiana) – Sitnikova and Maximova 2016: 265 (distribution of the 'ribless' morphotype in wave-cut and wave-weakening hydrodynamic zone of stony littoral).

Types. Syntypes: 5 (dry) from the localities: Tolstyj Cape, 3–6 fathoms (= 5.5–11 m), Baranchiki, 7 fathoms (= 13 m), and Kultuk, 2–5 fathoms (= 3.7–9 m), in ZIN, kept under name *Baicalia angarensis* f. *semicostulata*.

Type locality. Lake Baikal (southwest part).

Differential diagnosis. It differs from *M. herderiana herderiana* in having a smooth last whorl and the presence of transversal ribs on the 3rd–5th whorls only (Lindholm 1924a). The size and shape of the shell are similar to those of the typical form (Kozhov 1936). The shell size of a syntype (illustrated in Fig. 10C): SH = 9.5 mm, SW = 5.4 mm, AH = 4.0 mm, AW = 3.3 mm, NW = 4.25.

Distribution and habitat. It lives in the southern and central basins of the lake on stony rocks, boulders and rock canyons, together with ribbed (typical) and smooth morphs at a depth from 3 to 15–19 m in the wave-cut and wave-weakening hydrodynamic zones.

Remark. The shells of males have a wider aperture than those of females. This difference is visible to the eye, but due to corrosion of the first whorls it cannot be confirmed morphometrically. Such a difference is characteristic of most species of Baicaliidae.

Maackia (*Eubaicalia*) *variesculpta* (Lindholm, 1909)

(Fig. 10D–F)

Baikalia (*Baikalia*) *variesculpta* Lindholm, 1909: 48, table III, figs 5–10 14 (diagnosis, photo of shell, distribution, key to identification);

B. (*Eubaicalia*) *variesculpta* – Kozhov 1936: 61, table III, figs 1–9 (Russian translation of Lindholm's diagnosis, shell variation, key to identification, distribution);

Maakia (*Eubaicalia*) *variesculpta* – Sitnikova 1991: 288, fig. 2, *2* (morphology of the female reproductive system); Zubakov et al. 1997: 1095 (nucleotide sequences of COI mtDNA); Starobogatov and Sitnikova 1998: 408 (distribution); Sitnikova et al. 2001: 63, fig. 7E–J (duration of embryogenesis, egg capsule size, protoconch morphology); Sitnikova et al. 2004: 952 (synonymy, information about types, type locality, distribution, ecological characteristics); Vinarski and Kantor 2016: 192 (the same data); Sitnikova et al. 2010: 9 (quantitative distribution in stony-rocky littoral);

Types. Lectotype (dry) and 2 paralectotypes (dry) from Maloe More in ANSP, 158 paralectotypes (46 dry and 112 in alcohol) from Maloe More Strait: 7–12 fathoms (= 13–22 m), stones; near Kharansa Island, 2–4 fathoms (= 3.7–7.3 m), stones; near Kurma settlement, 1 fathom (= 1.8 m), from 2 yards to 5 fathoms (= 1.8–9.1 m), stones; near Khargoj Cape, 3–4.5 fathoms (= 5.5–8.2 m), stones; Chivyrkuj Bay: Ongokonskaya Inlet, 2–3 fathoms (= 3.7–5.5 m), stones; Zmeinaya Inlet, 2 fathoms, stones; near Malyj Kyltyshi (Kyltygej) Island, 1–3 fathoms; Boguchanskaya Bay and Boguchan Island, 2–3 fathoms, stones; Ayaya Bay, on submerged tree; near Svyatoj Nos peninsula, 2–4 fathoms, stones, in ZIN, 2 (dry) co-types (= paralectotypes) from Maloe More in RBINS, and 2 paralectotypes (from Maloe More Strait) in LUOMUS.

Type locality. Lake Baikal: Maloe More Strait.

Diagnosis. Shell without umbilicus, pointy-ovoid, solid, green or horny-brown, with transversal small tubercles on the middle part of whorl surface. Spire conical, pointed, often with broken apex. Whorls 5–6, strongly convex, the first ones slowly increasing, the last whorl swollen, suture deep, rather horizontal or slightly oblique. Aperture widely-ovoid, outer lip angular due to presence of tubercle; basal lip also well angulated, columellar lip almost straight. Operculum does not cover aperture completely. Colour of soft body from dark grey to black. Shell size (n = 5): SH = 5.5–7.0 mm, SW = 3.3–4.25 mm, AH = 2.5–3.0, AW = 2.0–2.25 mm, NW = 5–6 (Lindholm 1909).

Distribution and habitat. The species is distributed from Aya Bay (western part of the central basin) northwards to the Maloe More Strait and to the northern basin, including Chivyrkuj Bay; it lives in littoral along both shores of Olkhon Island. In the eastern littoral of the central basin it occurs from Barguzin Bay to Turka. This species prefers to inhabit stony-rocky sediments down to 25 m depth. In shallow inlets of Maloe More the snails live on vegetation.

Remark. The shells of snails living on vegetation are smooth or very weakly sculptured. The short genetic distance (based on analysis of COI mtDNA nucleotide sequences) between closely related *M. herderiana* and *M. variesculpta* (Zubakov et al. 1997) suggests that both littoral species have diverged less than 15 kyr BP, after the formation of the recent littoral zone during the Bølling interstadial period. According to the current geological data (Osipov and Khlystov 2010), the lake level has dropped down to a depth of ~40 m about 24–18

kyr during the Last Glacial maximum. The possible ancestral species (with a smooth shell) could have migrated to the new upper littoral zone from a low (deeper) zone. The stony littoral of the central basins of both western and eastern parts appears to represent a hybrid zone between the species.

Remark. The sculpture varies from well-developed (tubercles forming 2 spiral keels) to completely lacking. The shells similar to this species occur in some southern samples of *M. herderiana* and vice versa.

Maackia (*Eubaicalia*) *ventrosula* (Lindholm, 1909)

(Fig. 10G)

Baicalia (*Pseudobaikalia*) *pulla* var. *ventrosula* Lindholm, 1909: 57, table I, fig. 32 (differential diagnosis);
Baicalia elata Dybowski, 1875 – Kozhov 1936: 95;
Baicalia (*Eubaicalia*) *werestschagini* Kozhov, 1936: 63, table III, figs 41–42 (description, records from stones of Maloe More);
Maackia (*Eubaicalia*) *ventrosula* – Starobogatov and Sitnikova 1998: 408 (distribution);
Maackia (*Eubaicalia*) *werestschagini* – Sitnikova et al. 2004: 953 (synonymy, information about types, type locality, distribution and ecological characteristics); Vinarski and Kantor 20016: 192 (the same data); Sitnikova et al. 2010: 9 (quantitative distribution in stony-rocky littoral).

Types. Syntypes (5 dry) in ZIN.

Type locality. Lake Baikal (north-eastern part): Svyatoj Nos peninsula, 2–4 fathoms (= 3.7–7.3 m), stones.

Diagnosis. Shell without umbilicus, pointy-ovoid, light-yellow or grey, smooth. Whorls 4.5–5, convex, evenly increasing, the last whorl slightly swollen. Suture moderately deep, oblique. Aperture wide-ovoid, columellar lip rounded, basal lip slightly angular, columellar lip straight. Operculum does not cover aperture completely. Shell size (n = 2): SH = 6.3–6.5 mm, SW = 4 mm, AH = 2.75–2.8 mm, AW = 2.2 mm, NW = 5.0 (Lindholm 1909).

Distribution and habitat. In addition to the type locality, it was found in the stony littoral of Maloe More Strait, the marine part of Olkhon Island, and near Shabartuj Cape (SW), on the lower surface of the stones.

Remark. Bodies and shells of the snails collected from the littoral of Olkhon Gate (Maloe More Strait) were light brown or yellowish, the shells were transparent, and the basal lip of the aperture was angular. The snails similar to the types of this species were found near Shabartuj Cape, but they had a larger shell and the colour of their shell and soft body was greyish.

Maackia (*Maackia*) *costata eximia* (Lindholm, 1924)

(Fig. 10I, J)

Baicalia (*Maackia*) *costata eximia* Lindholm, 1924a: 23 (difference from typical *costata*, shell measurements);
Baicalia (*Maackia*) *costata* – Kozhov 1936: 103.

Types. Syntypes (20 dry) from the localities: Baranchiki, 3–12 fathoms (= 5.5–38.4 m), stones; Kultuk, 0.5–4 fathoms (= 0.9–7.3 m), stones in ZIN.

Type locality. Lake Baikal (southern basin).

Diagnosis. Shell without umbilicus, conical, light-yellow or light-brown, strongly ribbed. Whorls 6.5–7.5, strongly convex and rapidly increasing, the last whorl swollen or slightly swollen. Transversal ribs S-shaped, distance between ribs larger than rib width. Suture deep, oblique. Aperture widely ovoid, outer lip curved, basal lip ovate-rounded, columellar lip thin, rounded. Operculum does not cover aperture completely. Shell size: SH = 8–10.5 mm at 6–7 whorls and SW = 4.0–5.2 mm (Lindholm 1924a).

Differential diagnosis. It differs from the typical form in a larger shell (Lindholm 1924a).

Distribution and habitat. It occurs at depths of 1.5–7 fathoms, while the typical form was reported by Dybowski to occur at a depth of 300–400 m (Lindholm 1924a).

Maackia (*Maackia*) *costata exigua* (Lindholm, 1924)

(Fig. 10H)

Baicalia (*Maackia*) *costata exigua* Lindholm, 1924a: 23 (difference from typical *costata* and *eximia*, shell dimensions);
Baicalia (*Maackia*) *costata* – Kozhov 1936: 103.

Types. A single dry syntype in ZIN.

Type locality. Lake Baikal (southwest part): Shabartuj, 2–10 fathoms (= 3.7–18.3 m), stones.

Differential diagnosis. It differs from the typical form in a smaller shell: SH = 4.75 mm and SW = 2.5 mm, NW = 6.5 whorls (Lindholm 1924a).

Distribution and habitat. It inhabits the same depth zone as the previous morph (Lindholm 1924a).

Remark. The shell of *M. costata* varies both among the individuals living in the same location and among those inhabiting different habitats and regions of the lake. The species occurs primarily in the south-western Baikal, where it occupies the lower surface of stones and rocky cliff canyons. A single population was found in the stony littoral near Elokhin Cape (NW).

Maackia (*Eubaicalia*) *bythiniopsis* (Lindholm, 1909)

(Fig. 11A)

Baikalia (*Baikalia*) *bythiniopsis* Lindholm, 1909: 45, table I, figs 1–4 (diagnosis, photo of shell, distribution, key to identification);

B. (*Eubaikalia*) *bythiniopsis* – Starostin 1926: 22 (records from Chivyrkuj Bay, Ushkan'i Islands, Maloe More Strait, Peschanaya Bay, at a depth of 2–80 m, maximal SH = 9.4 mm);

Baicalia (*Eubaicalia*) *bithyniopsis* – Kozhov 1936: 64, table I, figs 42–43; table VIII, figs 7–8; table XII, figs 1–5 (Russian translation of Lindholm's diagnosis, shell variation, key to identification, distribution); Poberezhnyi 1989: 6 [diploid chromosome number (2n) = 28];

Maakia (*Eubaicalia*) *bythyniopsis* – Sitnikova 1991: 288, fig. 2, *3* (morphology of the female reproductive system); Starobogatov and Sitnikova 1998: 408 (distribution); Sitnikova et al. 2001: 63, figs 5A, 8D–F (duration of embryogenesis, egg capsule size, protoconch morphology); Sitnikova et al. 2004: 953 (synonymy, information about the types, type locality, distribution and ecological characteristics); Sitnikova et al. 2010: 8 (quantitative distribution in stony-rock littoral); Maximova et al. 2012: 3 (seasonal quantitative distribution in littoral near Berezovyj Cape); Vinarski and Kantor 2016: 190 (information about the types, type locality, distribution and ecology).

Types. Lectotype (dry) and 12 (dry) paralectotypes from the localities: Baranchiki Cape, 3–21 fathoms (= 5.5–38 m), stones; Maloe More Strait, Kharansa Island, 2–4 fathoms (3.7–7 m), stones, and Chivyrkuj Bay, Bol'shie Kyltyshi (=Bol'shoj Kyltygej), 2–4 fathoms, in ZIN, 2 (dry) co-types (paralectotypes from Baranchiki and Maloe More) in RBINS, 2 paralectotypes (from Baranchiki) in LUOMUS.

Type locality. Lake Baikal (southwest part): Baranchiki Cape, 3–21 fathoms (= 5.5–38 m), stones.

Besides these localities taken from the labels of the type specimens housed in ZIN, Lindholm (1909) listed 30 other sites from more than 20 localities in three Baikal basins. Southern Baikal localities include Listvenichnoe, 3–12 fathoms (= 5.5–22 m), stones, vegetation; Berezovyj Cape, near Listvenichnoe, 2–10 fathoms (= 3.7–18 m), stones, sand; Tolstyj Cape near Listvenichnoe, 3–6 fathoms (= 5.5–11 m); near Polovinka railway station, 2.5–12 fathoms (4.6–22 m); Shabartuj, 2–10 fathoms (= 3.7–18 m), stones, Kultuk, 2–5 fathoms (=3.7–9 m); Solzan, 1.5 fathom (= 2.7 m), stones; Maloe More Strait – near Chargoj Cape, 3–4.5 fathoms (= 5.5–7.3 m), stones; near Kurma settlement, 2 fathoms; Northern Baikal – Svyatoj Nos peninsula, 2–4 fathoms (3.7–7 m), stones; Ushkanij Island; Kocherikovskij Cape, 3–4 fathoms (= 5.5–7 m), stones; Chivyrkuj Bay – Zmeinaya Inlet, 2 fathoms (= 3.7 m); stones; Malye and Bol'shie Kyltyshi (= Kyltygej) islands, 1–4 fathoms (= 1.8–7 m), stones; Onkogonskaya Inlet, 2–3 fathoms, stones.

Diagnosis. Shell elongated-ovoid, brown-green, smooth. Umbilicus slit-like or absent. Spire widely conical, with whitish apex. Whorls 5–5.5, evenly and rapidly increasing, strongly convex, last whorl swollen. Suture deep, slightly oblique. Aperture widely-ovoid, outer lip rounded, basal lip angular, columellar lip thin, oblique. Operculum does not cover aperture completely. Soft body blackish or dark grey. Shell size (n = 9): SH = 7.5–12.2 mm, SW = 5.0–8.5 mm, AH = 3.2–5.5 mm, AW = 3.0–4.5 mm, NW = 5.0–5.5 (Lindholm 1909). The lectotype size: SH = 10.5 mm, SW = 7.2 mm, AH = 4.8 mm, AW = 4.25 mm, NW = 5.25.

Distribution and habitat. This species is widely distributed in the stony-rocky littoral, sometimes can be found on sandy sediments between stones and boulders.

Remarks. The protoconch morphology in this species is quite similar to that of *Parabaikalia* (Sitnikova et al. 2001). Six paralectotypes, labelled 'Ayaya Bay, 5 fathoms (= 9 m), clean sand, 25 July 1902', strongly differ from other paralectotypes in shell characters: the aperture is rather ovoid and lacks any angle on the basal lip. Similar shells were found in some localities of the sandy littoral in Northern Baikal. I think that these snails (Fig. 11B) should be considered a new species belonging to the genus *Parabaikalia*.

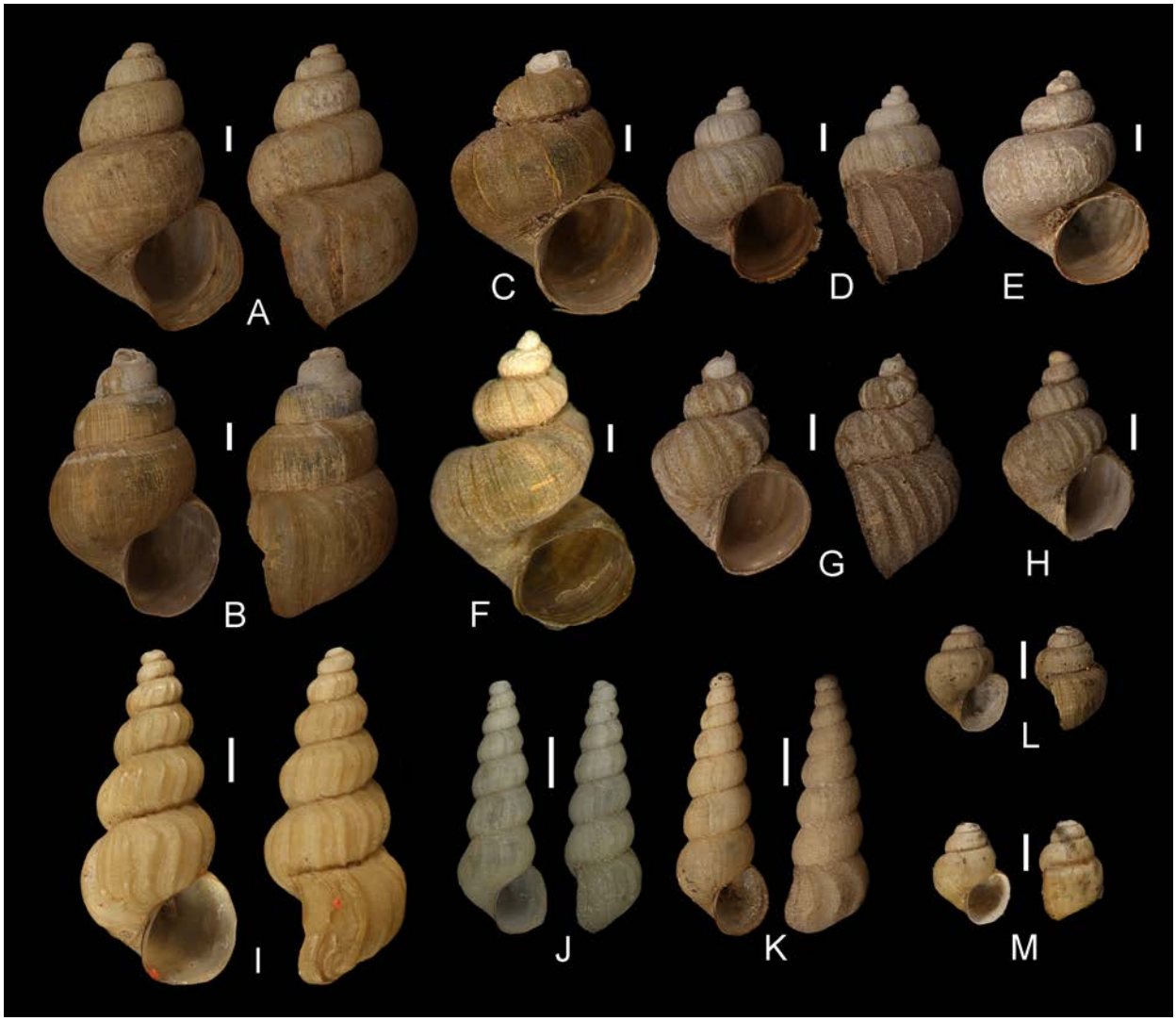

Fig. 11. Type specimens of Baicaliidae taxa described by Lindholm: A – *Maackia* (*E.*) ? *bythiniopsis,* the lectotype, Baranchiki Cape, 3–21 fathoms, stones, 12 June 1902; B – '*M. bythiniopsis*', a paralectotype, Ayaya Bay, 5 fathoms, sand, 1901 (= new undescribed species); C – *Teratobaikalia macrostoma,* a syntype, Birkhin Cape, 1–3 fathoms, stones, 4 August 1902; D, E – *T. macrostoma,* syntypes, Maloe More Strait, near Kurma settlement, down to 1 fathoms, 21 July 1902; F – *T. macrostoma* morph *lyogyra*, a syntype, Maloe More Strait, 2–12 yards, 17–20 July 1902; G, H – *T. duthiersii pachypleura*, syntypes, Kultuk, 17 fathoms, stones and sand, 16 July 1902; I – *Godlewskia wrzesnioskii profunda*, a syntype, Tukalaragda Bay, 20 fathoms, silt, 24 July 1901; J, K – *G. columella*, the lectotype and a paralectotype, Baranchiki Cape, 3–21 fathoms, stones, 12 June 1902; L – *Teratobaikalia* (*Baikaliella*) *nana*, the lectotype, Maloe More Strait, 19–22 fathoms, fine sand, 19–20 July 1902; M – *T.* (*B.*) *nana*, a paralectotype, from the same sample (= *T.* (*B.*) *producta* Kozhov, 1936, det. Starobogatov). Scale bar: 1 mm.

Teratobaikalia (*Teratobaikalia*) *macrostoma* (Lindholm, 1909)

(Fig. 11C–E)

Baikalia (*Teratobaikalia*) *macrostoma* Lindholm, 1909: 43, table I, figs 25–29 (diagnosis, photo of shell, distribution, key to identification);

Baicalia (*Teratobaicalia*) *macrostoma* form *lyogyra* – Lindholm 1924a: 22;

Baikalia (*Teratobaikalia*) *macrostoma* – Starostin 1926: 21 (record from Maloe More Strait and Peschanaya Bay, at a depth of 1.5–20 m, maximum SH = 11.9 mm);

Baicalia (*Teratobaicalia*) *macrostoma* – Kozhov 1936: 102, table I, figs 39–41, table VIII, figs 2–3 (Russian

translation of Lindholm's diagnosis, shell variation, key to identification, distribution);

Teratobaikalia (*Teratobaikalia*) *macrostoma* – Sitnikova 1991 (1992): 287, fig. 1, *6* (female reproductive morphology);

Starobogatov and Sitnikova 1998: 408 (distribution); Sitnikova et al. 2001: 63, figs 5D, 9F–G (shape and size of egg capsules, protoconch morphology); Sitnikova et al. 2004: 954 (synonymy, information about types, type locality, distribution and ecological characteristics); Vinarski and Kantor 2016: 196 (the same data); Sitnikova et al. 2010: 8 (quantitative distribution on stony-rocky littoral);

Types. Syntypes (151 shells) from the localities: near Birkhin settlement 1–3 fathoms (= 1.8–5.5 m), stones; Maloe More Strait: 2–12 yards (= ~2–11 m) without indication of exact site; near Kurma settlement, down to 1 fathom (= 1.83 m), near Kharansa Island, 2–4 fathoms (= 3.7–7.3 m), stones; Chivyrkyj Bay, near Bol'shie Kyltyshi Island (= Bol'shoj Kyltygej), 2–4 fathoms (= 3.7–7.3 m), stones, in ZIN, 1 'co-type' (syntype from Maloe More) in RBINS, 1 syntype? (fromMaloe More) in ANSP, and 2 syntypes (from Maloe More) in LUOMUS.

Type locality. Lake Baikal: Maloe More Strait.

Diagnosis. Shell swollen, rather spherical, olive-green, with fine spiral sculpture and weak, oblique, widely spaced transversal threads. Spire widely-conical, with pointed apex, it height equal to or slightly exceeds aperture height. Whorls 4.5–5, strongly convex, rapidly increasing, transversal threads on last whorl with periostracal bristles looking like comb split, up to 0.5 mm in height. Suture very deep, umbilicus narrow or wide. Aperture large and rounded, basal lip rounded, columellar lip expanded and slightly reflexed. Operculum does not cover aperture completely. Soft body monochrome, dark grey or black. Shell size (n = 9): SH = 8.75–11.5 mm, SW = 7.5–9.0 mm, AH = 4.5–5.0 mm, AW = 4.0–5.3 mm, NW = 4.5–5.0 (Lindholm 1909).

Distribution and habitat. It occurs northwards from Birkhin via the Olkhon Gate and Maloe More Strait; it is found near Ushkan'j Islands, along the marine part of Olkhon Island, Svyatoj Nos peninsula, islands of Chivyrkuj Bay, along the shoreline of NE Baikal (to Dagarskaya Bay), and in the eastern part of the central basin; this species prefers to live on stones at a depth of 1–40 m (Kozhov 1936; own data).

Remarks. Some individuals of this species, which inhabit the stone littoral along the shore of the marine part of Olkhon Island, have an almost smooth shell with 'fringed' outer and basal lips of the aperture.

Baicalia (*Teratobaikalia*) *macrostoma* form *lyogyra* described by Lindholm (1924a) is a morph with 'open whorls' (Fig. 11F). The 'open whorls' occur in local populations of many species of Baikal gastropods, especially along the eastern part of the central basin.

Teratobaikalia (*Trichiobaikalia*) *duthiersii* morph *pachypleura* (Lindholm, 1924a)

(Fig. 11G–H)

Baicalia (*Trichiobaikalia*) *duthiersii* form *pachypleura* Lindholm, 1924a: 24 (difference from the typical form); Kozhov 1936: 98 (the morph corresponds to adult snails, while the typical morph to young ones, co-existence with the typical form);

Teratobaikalia (*Trichiobaikalia*) *duthiersii pachypleura* – Starobogatov and Sitnikova 1998: 408 (distribution); Sitnikova et al. 2004 (information about types, type locality); Vinarski and Kantor 2016: 197 (the same data).

Types. Syntypes (4 shells) in ZIN.

Type locality. Lake Baikal (southern part): Kultuk, 17 fathoms (= 31 m), stones and sand.

Diagnosis. Shell small, ovoid-conical, grey-green or green-yellowish, ribbed. Whorls 4–5, convex, apex corroded, the last whorl swollen. Roller-like ribs closely spaced and often bear periostracal branched bristles. Suture deep, slightly oblique. Umbilicus absent. Aperture ovate, with expanded palatal lip, outer lip rounded, basal lip ovate, columellar lip thin, almost straight. Shell size (n=1): SH = 6.5 mm, SW = 4.5 mm, AH = 3.5 mm, AW = 2.75 mm, NW = 4.5 (Lindholm 1924a).

Distribution and habitat. This morph occurs at a depth from 10–15 to 40–50 m together with the typical morph, primarily on sand and silted sand sediments; these snails probably use stones for egg attachment. It is likely that the differences in shells between *pachypleura* and the typical morph reflect sexual dimorphism.

Teratobaikalia (*Baikaliella*) *nana* (Lindholm, 1909)

(Fig. 11L)

Baikalia nana – Milaschewitsch 1901, nomen nudum;

Baikalia (*Baikaliella*) *nana* Lindholm, 1909: 44, table I, figs 52–55 (diagnosis);

B. (*Baicaliella*) *nana* – Kozhov 1936: 96, table 5, fig. 50, table XII, fig. 23–26 (Russian translation of Lindholm's diagnosis, shell variation, key to identification, distribution); Beckman and Starobogatov 1975: 96, fig. 2B (V), Γ (G) (comparison with other *Baicaliella* species);
Teratobaikalia (*Baikaliella*) *nana* – Sitnikova 1991: 288; Starobogatov and Sitnikova 1998: 408 (distribution); Sitnikova et al. 2001 (protoconch morphology); Sitnikova et al. 2004: 956 (synonymy, information about types, type locality, distribution, ecological characteristics); Vinarski and Kantor 2016: 197 (the same data).

Types. Lectotype (dry) with a label 'Maloe More Strait (without indication of exact site), 19–22 fathoms (= 35–40 m), sand', and 1 paralectotype (dry, from Maloe More Strait, near Kobyl'ya Golova Cape without data on depth and the substrate type), in ZIN (Beckman and Starobogatov 1975).

Type locality. Lake Baikal: Maloe More Strait.

Diagnosis. Shell very small, with slit-like umbilicus, widely-ovoid, smooth, yellowish or light brown; its height slightly exceeds the width. Spire short with obtuse apex. Whorls 3.5–4.5, rapidly increasing, strongly convex, shouldered, the last whorl swollen and almost equal to spire height. Suture deep, rather horizontal. Aperture ovoid, outer lip angled above, basal lip ovoid, columellar lip rather straight. Soft body light yellow. Shell size of the lectotype: SH = 2.2 mm, SW = 4.2 mm, AH = 1.7 mm, AW = 1.1 mm, NW = 4.0 (Beckman and Starobogatov 1975).

Distribution and habitat. In addition to the localities mentioned in the original description, this species was found in Chivyrkuj and Barguzin bays, near the Sukhaya and Mysovaya settlements, Posolsk Bank and on the Academic Ridge at a depth of 10–120 m on sand and silty sand sediments (Kozhov 1936; own data).

Remark. Snails of this species are often infected with trematodes. The paralectotype (Fig. 11M) from the same sample as the lectotype (Male More, 19–22 fathoms) was identified as *Baicalia* (*Baikaliella*) *producta* Kozhov, 1936 by Beckman and Starobogatov (1975).

Godlewskia columella (Lindholm, 1909)
(Fig. 11J, K)

Baikalia (*Gerstfeldtia*) *columella* Lindholm, 1909: 67, table I, figs 46–48 (diagnosis, distribution, key to identification);
Gerstfeldtia columella, var. *typica, tumida, spicata, rufula* – B. Dybowski and Grochmalicki 1913: 301, table VI, figs 15a, 16;
Baikalia (*Gerstfeldtia*) *columella* – Starostin 1926: 39 (distribution);
Baicalia (*G.*) *columella* – Kozhov 1936: 111 (Russian translation of Lindholm's diagnosis, comparison with *B. baciliformis*, key to identification);
Godlewskia columella – Sitnikova 1991: 292 (morphology of the female reproductive system); Starobogatov and Sitnikova 1998: 409 (distribution). Sitnikova et al. 2004: 967 (synonymy, information about types, type locality, distribution, ecological characteristic); Vinarski and Kantor 2016: 187 (the same data).

Types. Lectotype (dry) with a label: 'Baranchiki Cape, 3–21 fathoms (= 5.5–22 m), 12 June 1902' and 39 paralectotypes (dry) from the localities: Listvenichnoe 3–12 fathoms (= 5.5–22, Baranchiki Cape, 3–21 fathoms (= 5.5–38 m), stones; near Shabartuj, 2–10 fathoms (= 3.7–18 m), stones; Kultuk, 1.5–4 fathoms (= 3–7 m), stones, in ZIN.

Type locality. Lake Baikal (southern basin).

Diagnosis. Shell very small, slender, spindle-shaped, light yellow, transparent, smooth, without umbilicus. Whorls 8–9, strongly convex, very slowly and evenly increasing, the last whorl sometimes bears 1–4 transversal awry folds of different length. Suture deep, slightly oblique. Aperture widely ovoid, outer lip curved, basal lip rounded, columellar lip straight. Shell size (n = 3): SH = 5.5–6.0 mm, SW = 1.7–1.9 mm, AH = 1.25–1.3 mm, AW = 0.9–1.0 mm, NW = 8.5–9.0 (Lindholm 1909). The lectotype shell dimension: SH = 5.0 mm, SW = 1.8 mm, AH = 1.3 mm, AW = 1.0 mm, NW = 7.75.

Distribution and habitat. It lives in south-western Baikal mainly at a depth zone from 7–10 to 45 m on the lower surface of stones and rocky cliff canyons.

Godlewskia wrzesniowskii profunda (Lindhlm, 1924a)
(Fig. 11I)

Baicalia (*Baicalia*) *herderiana profunda* Lindholm, 1924a: 23 (diagnosis, comparison with *B. herderiana*);
B. (*Gerstfeldtia*) *wrzesniowskii profunda* – Kozhov 1936: 109, table III, figs 24–26 (Russian translation of Lindholm's diagnosis, shell variation, key to identification, distribution);
Godlewskia wrzesniowskii profunda – Sitnikova 1991: 292 (mentioned); Starobogatov and Sitnikova 1998: 409 (distribution); Sitnikova et al. 2004: 967 (synonymy,

information about types, type locality, distribution and ecological characteristics); Vinarski and Kantor 2016: 188 (the same data).

Types. Syntypes (3 dry) in ZIN.

Type locality. Lake Baikal (northen basin): Tukalaragda Bay, 20–30 fathoms (= 37–55 m), pebbles, silt and fine sand.

Diagnosis. Shell small, elongate conical, light yellowish or horny-brown, transparent, without umbilicus. Whorls 6–6.5, strongly convex, 1.5–2 embryonal whorls smooth, other with S-shaped transversal ribs, the last whorl with 12–16 ribs. Suture deep, oblique. Aperture wide-ovoid, outer lip curved, basal lip rounded or straight, columellar lip thin, rounded. Shell size (n=3): SH = 6.5–8.0 mm, SW = 3.0–4.0 mm (Lindholm 1924a).

Distribution and habitat. In addition to the type locality, it was found in Ayaya Bay (Kozhov 1936), on Academic Ridge and Posolsk Bank at a depth of 15–150 m on silt and sand sediments (own data).

Pseudobaikalia (*Pseudobaikalia*) *jentteriana* Lindholm, 1909
(Fig. 12D)

Baikalia (*Pseudobaikalia*) *jentteriana* Lindholm, 1909: 55, table I, figs 35–37 (diagnosis, comparison with *B. elata*, key to identification, distribution);

Starostin 1926: 31 (record from Maloe More at a depth of 15–90 m, maximum SH = 8.4 mm);

Baicalia (*Parabaicalia*) *jentteriana* – Kozhov 1936: 77, table V, figs 18–21 (Russian translation of Lindholm's diagnosis, shell variation, key to identification, distribution);

Pseudobaikalia (*Pseudobaikalia*) *jentteriana* – Sitnikova 1991: 285, fig. 2, *14* (morphology of the female reproductive system); Starobogatov and Sitnikova 1998: 407 (distribution); Sitnikova et al. 2004: 947 (synonymy, information about the types, type locality, distribution, ecological characteristics); Vinarski and Kantor 2016: 194 (the same data); Sitnikova et al. 2016: 4 (nucleotide sequences of COI mtDNA and ITS 1 nDNA).

Types. Syntypes (22 dry) from the localities: Maloe More Strait, 19–22 fathoms, fine sand, Boguchanskaya Bay, including area near Boguchan Island, 7, 35 and 40 fathoms (= 13, 64 and 73 m), stones, sand, silt; Tukalaragda Bay, 20 and 30 fathoms (= 37 and 55 m), coarse silt, in ZIN, 1 (dry) co-type (syntype from Maloe More) in RBINS, and 2 syntypes (from Maloe More) in LUOMUS.

Type locality. Lake Baikal: Maloe More Strait.

Diagnosis. Shell slender-conical, transparent, light yellow, with silky gloss, without umbilicus. Spire 2–2.5 times higher than aperture, apex obtuse, often corroded. Whorls 6.0–6.5, moderately convex, slowly and evenly increasing. Suture deep, oblique. Aperture widely ovoid with rounded lips. Operculum does not cover aperture completely. Shell size (n = 5): SH = 7.0–8.5 mm, SW = 3.0–4.0 mm, AH = 2.3–3.0 mm, AW = 1.5–2.0 mm, NW 6.0–6.5 (Lindholm 1909).

Distribution and habitat. It inhabits Maloe More, northern Baikal, including Chivyrkuj Bay, and eastern part of Central Baikal (Barguzin Bay), living on sandy and sandy-silt sediments at a depth of 15–100 m.

Pseudobaikalia (*Pseudobaikalia*) *cancellata* (Lindholm, 1909)
(Fig. 12E)

Baikalia (*Pseudobaikalia*) *cancellata* Lindholm, 1909: 59, table 1, figs 33–34 (diagnosis, comparison with *B. contabulata*, key to identification);

Baicalia (*Pseudobaicalia*) *cancellata* – Kozhov 1936: 89 (Russian translation of Lindholm's diagnosis, key to identification);

Pseudobaikalia (*Pseudobaikalia*) *cancellata* – Sitnikova 1991: 285 (mention); Starobogatov and Sitnikova 1998: 407 (distribution); Sitnikova et al. 2004: 848 (synonymy, information about type, type locality, distribution, ecological characteristic); Vinarski and Kantor 2016: 194 (the same data); Sitnikova et al. 2016: 6 (photo of shell).

Types. Syntypes (2 dry) in ZIN.

Type locality. Lake Baikal (northern part): Dagarskaya Bay, 50–10 fathoms (= 91–18 m), silted sediments.

Diagnosis. Shell without umbilicus, slender-conical, transparent, light yellowish, with fine transversal folds. Spire 1.5–2 times higher than aperture, apex sharp. Whorls 6.5, slightly convex, evenly increasing. The first four whorls with thin reticulate sculpture and transversal closely spaced threads, two last whorls almost smooth. Suture moderately deep, slightly oblique. Aperture ovoid, outer and basal lips rounded; columellar lip thin, vertical. Soft body light yellow. Shell size (n = 1): SH = 6.0 mm, SW = 2.8 mm, AH = 2.0 mm, AW = 1.3 mm, NW = 6.5 (Lindholm 1909).

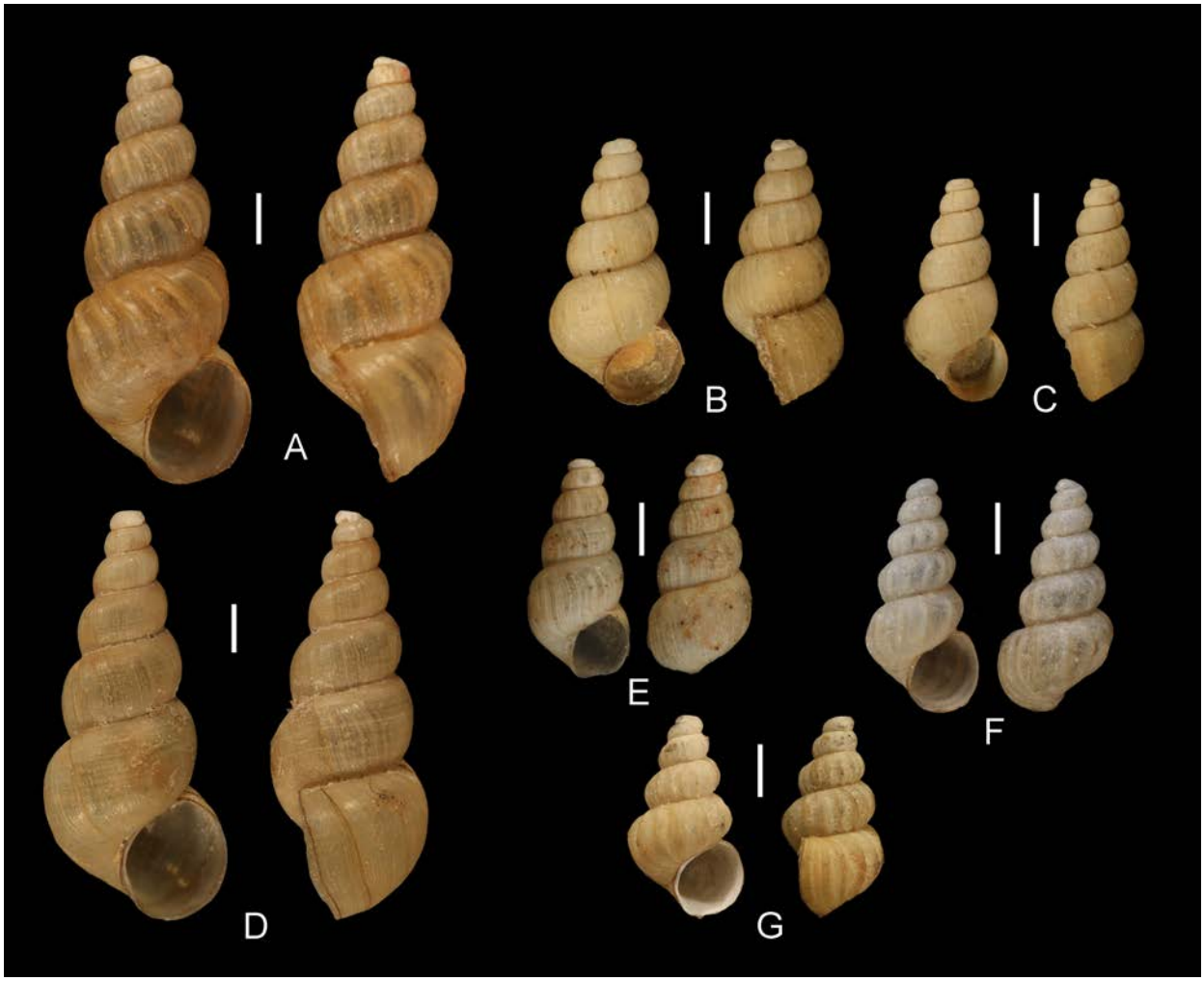

Fig. 12. Type specimens of Baicaliidae taxa described by Lindholm: A – *Pseudobaikalia contabulata semilaevis*, a syntype, Kultuk, 9 fathoms, 25 June 1902; B – *P. pulla tenuicosta*, a syntype, Birkhin Cape, 25 fathoms, sand 3 August 1902; C – *P. subcilindrica*, a syntype, the same locality; D – *P. jentteriana*, a syntype, Maloe More Strait, 19–22 fathoms, sand, 19–20 July 1902; E – *P. cancellata*, a syntype, Dagarskaya Bay, 50 and 10 fathoms, silt, 3 August 1901; F – *P. elegantula*, a syntype, Maloe More, near Kurma settlement; G – *P. pusilla*, a syntype, Maloe More, near Kharansa Island, 2–3 fathoms, stones, 19 June 1902. Scale bar: 1 mm.

Distribution and habitat. In addition to the type locality, it was found in Barguzin Bay at a depth of 25–35 m on sandy sediments.

Pseudobaikalia (*Pseudobaikalia*) *elegantula* (Lindholm, 1909)

(Fig. 12F)

Baikalia (*Pseudobaikalia*) *elegantula* Lindholm, 1909: 57, table 1, figs 41–42 (diagnosis, comparison with *B. pusilla*, key to identification, distribution);

Baicalia (*Pseudobaicalia*) *elegantula* – Kozhov 1936: 88, table III, figs 49–50 (Russian translation of Lindholm's diagnosis, key to identification, distribution);

Pseudobaikalia (*Pseudobaikalia*) *elegantula* – Sitnikova 1991: 284, fig. 1, *3* (morphology of the female reproductive system); Starobogatov and Sitnikova 1998: 407 (distribution); Sitnikova et al. 2004: 948 (synonymy, information about the types, type locality, distribution, ecological characteristics); Vinarski and Kantor 2016: 195 (the same data); Sitnikova et al. 2016: 6 (photo of shell).

Types. Syntypes (24 dry) from the localities: Maloe More Strait – near Kurma settlement, 2–5

yards (= 1.8–4.5 m) and Chargoj Cape, 3–4.5 fathoms (= 5.5–8 m), stones, in ZIN.

Type locality. Lake Baikal (Maloe More Strait).

Diagnosis. Shell very small, slender-conical, transparent, light yellow or light green, without umbilicus. Spire slender, 1.5–2 times higher than aperture, apex blunt. Whorls 6–6.5, rather slowly and evenly increasing, strongly convex or shouldered with transversal ribs, interspaces as wide as ribs. Suture very deep, slightly oblique, aperture widely ovoid, basal and outer lips rounded, columellar lip thin. Operculum does not cover aperture completely. Shell size (n = 4): SH = 4.0–5.0 mm, AW = 1.8–2.3 mm, AH = 1.3–1.75 mm, AW = 1.0–1.2 mm, NW = 6.0–6.5 (Lindholm 1909).

Distribution and habitat. Maloe More, near Ushkan'i Islands, eastern part of the central basin, on stony substrates of the littoral depth zone.

Pseudobaikalia (*Pseudobaikalia*) *pusilla* (Lindholm, 1909)

(Fig. 12G)

Baikalia (*Baikalia*) *pusilla* Lindholm, 1909: 49, table I, figs 49–51 (diagnosis, comparison with *B. herderiana*, key to identification, distribution);

Baicalia (*Eubaicalia*) *herderiana* var. *pusilla* – Kozhov 1936: 60, table III, fig. 15 (comparison with *B. herderiana*);

Maakia (*Eubaicalia*) *pusilla* – Sitnikova 1991: 288 (mention); Starobogatov and Sitnikova 1998: 408 (distribution); Sitnikova et al. 2004: 952 (synonymy, information about the types, type locality, distribution, ecological characteristics); Vinarski and Kantor 2016: 191 (similarly); Sitnikova et al. 2010: 9 (quantitative distribution on stony-rocky littoral).

Types. Syntypes (5 dry) from the localities: Maloe More Strait near Kharansa Island, 2–4 fathoms (= 3.7–7.3 m), stones, near Kurma settlement, 2 yards (= 1.8 m), stones; Onkogonskaya Bay, 2–3 fathoms (= 3.7–5.5 m), stones, in ZIN.

Type locality. Lake Baikal (Maloe More Strait).

Diagnosis. Shell very small, olive-green, opaque, with transversal strong ribs. Spire conical, with blunt apex. Whorls 5, rounded, two last whorls increasing more rapidly than the first ones. Suture deep, rather horizontal. Umbilicus absent. Aperture rounded, basal lip slightly angular or almost rounded. Operculum does not cover aperture completely. Shell size (n = 2): SH = 3.5–4.0 mm, SW = 2.0–2.1 mm, AH = 1.5 mm, AW = 1.2 mm, NW = 5 (Lindholm 1909).

Distribution and habitat. It was found in stony littoral of Maloe More Strait, including nearby islands and Olkhon Gate, the marine part of the Olkhon Island and Bol'shoj Ushkanij Island.

Baicalia (*Pseudobaikalia*) *contabulata semilaevis* Lindholm, 1924a

(Fig. 12A)

Baikalia (*Pseudobaikalia*) *contabulata* – Lindholm 1909 (partim, shell size);

Baikalia (*Pseudobaikalia*) *contabulata semilaevis* Lindholm, 1924a: 23 (difference from the nominal subspecies);

Baicalia (*Pseudobaicalia*) *zachwatkini* Kozhov, 1936: 86, table III, fig. 43 (description, distribution);

Pseudobaikalia (*Pseudobaikalia*) *zachwatkini* – Sitnikova et al. 2004: 947 (synonymy, information about the types, type locality, distribution, ecological characteristics).

Types. Syntypes (4 dry) in ZIN.

Type locality. Lake Baikal (southern part): Kultuk, 9 fathoms (= 16.5 m), sand.

Diagnosis. Shell slender-conical, light-green and green-grey, with closely spaced folds. Whorls 5.5–6.5, shouldered or rounded, evenly increasing. Suture deep, oblique. Umbilicus absent. Aperture ovate, lips rounded, columellar lip thin. Operculum does not cover aperture completely. Shell size (n = 1): SH = 7.8 mm, SW = 4.0 mm, AH = 3 mm, AW = 2 mm, NW = 6 (Lindholm 1909).

Distribution and habitat. It was found together with *B. contabulata* (Lindholm 1909: 58, locality 6). Widely distributed species, mainly on soft sediments at a depth of 2–100 m (Kozhov 1936; own data).

Pseudobaikalia (*Microbaicalia*) *pulla tenuicosta* (Lindholm, 1909)

(Fig. 12B)

Baikalia (*Pseudobaikalia*) *tenuicosta* Lindholm, 1909: 58, table II, figs 38–40 (diagnosis, comparison with *B. subcilindrica*, distribution);

Starostin 1926: 33 (distribution);

Baicalia (*Microbaicalia*) *pulla* var. *tenuicosta* – Kozhov 1936: 93, table III, figs 54–55 (description, comparison with *B. pulla pulla*, key to identification, distribution);

Pseudobaikalia (*Microbaicalia*) *pulla tenuicosta* – Sitnikova 1991: 286 (mention); Starobogatov and Sitnikova 1998: 408 (distribution); Sitnikova et al. 2004: 949 (synonymy, information about types, type locality,

distribution, ecological characteristics); Vinarski and Kantor 2016: 196 (the same data); Sitnikova et al. 2016: 6 (photo of shell, molecular analysis).

Types. Syntypes (30 dry) in ZIN.

Type locality. Lake Baikal (central basin): Near Birkhin Cape, 25 fathoms (= 46 m), sand.

Diagnosis. Shell small, slender-conical, without umbilicus, thin, transparent, light yellow, with uniform fine ribbing. Spire slender, two times higher than aperture, apex blunt. Whorls 5–6.5, slowly and evenly increasing, moderately convex, covered by dense transversal threads. Suture deep. Aperture ovoid, outer and basal lips rounded, columellar lip straight. Operculum completely closes aperture. Shell size (n = 2): SH = 5.25–5.5 mm, SW = 2.2–2.5 mm, AH = 1.75–1.8 mm, AW = 1.5 mm, NW = 5.5–6.5 (Lindholm 1909).

Distribution. It is widely distributed in Maloe More and the northern basin, including Chivyrkuj Bay and nearby Ushka'i Islands, and in the central basin of both parts – eastern (to Gremyachinsk) and western littoral (to Anga Bay), on soft sediments at a depth of 10–45 m (sometimes down to 120 m) (Kozhov 1936; own data).

Pseudobaikalia (*Microbaicalia*) *subcilindrica* (Lindholm, 1909)

(Fig. 12C)

Baikalia (*Pseudobaikalia*) *subcilindrica* Lindholm, 1909: 56, table I, figs 43–45 (diagnosis, key to identification);
Baicalia (*Microbaicalia*) *pulla* – Kozhov 1936: 93;
Pseudobaikalia (*Microbaicalia*) *subcilindrica* – Sitnikova 1991: 286 (mention); Starobogatov and Sitnikova 1998: 408 (distribution); Sitnikova et al. 2004: 950 (synonymy, information about types, type locality, distribution, ecological characteristics); Vinarski and Kantor 2016: 196 (the same data).

Types. Syntypes (11 in alcohol and 13 dry) in ZIN.

Type locality. Lake Baikal (central basin): near Birkhin settlement, 25 fathoms (= 46 m), sand.

Diagnosis. Shell without umbilicus, very small, slender-conical or almost cylindrical, thin, transparent, smooth, light yellow. Spire very slender, two times higher than aperture, apex blunt. Whorls 5.4–6, slowly and evenly increasing, strongly convex, suture deep, rather horizontal. Aperture ovoid, basal lip rounded, columellar lip straight, thin. Animal whitish, operculum slightly closes aperture. Shell size (n = 2): SH = 4.1–4.2 mm, SW = 1.8–2.0 mm, AH = 1.2–1.3 mm, AW = 1 mm, NW = 6.0 (Lindholm 1909).

Distribution and habitat. It is rarely found in Maloe More, together with *P. p. tenuicosta*.

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REFERENCES

Beckman M.Yu. and Starobogatov Ya.I. 1975. Baikal deep-water molluscs and their relative forms. In: G.I. Galazij (Ed.). News about the fauna of Baikal. Nauka, Novosibirsk. *Trudy Limnologicheskogo instituta AN SSSR*, **18**(38): 92–111. [In Russian].

Bourguignat J.R. 1860. Monographie du genre *Choanomphalus*. *Revue et Magasin de Zoologie*, Série 2, **12**: 527–531.

Dybowski B. and Grochmalicki J. 1913. Beiträge zur Kenntnis der Baikalmollusken. I: Baicaliidae. 1: Turribaicaliinae subf. nova. II. Untergattung *Godlewskia*. *Ezhegodnik Zoologicheskogo Museya Imperatorskoi Akademii Nauk* (L'Annuaire du Musee Zoologique de L'Académie Impériale des Sciences de St. Pétersbourg), **18**: 268–316.

Dybowski B. and Grochmalicki J. 1914. Beiträge zur Kenntnis der Baikalmollusken. I: Baicaliidae. 1: Turribaicaliinae. II: Untergattung *Trachibaicalia*. *Ezhegodnik Zoologicheskogo Museya Imperatorskoi Akademii Nauk* (L'Annuaire du Musee Zoologique de L'Académie Impériale des Sciences de St. Pétersbourg), **19**: 286–322.

Dybowski B. and Grochmalicki J. 1925. Przyczynki do znajomości mleszaków jeziora Bajkalskiego (Contributions á la connaissance des Mollusques du lac Baikal), Wladislawiidae nov. fam. *Kozmos,* L: 819–881, Table 1.

Dybowski W. 1875. Die Gastropoden-Fauna des Baikal-Sees, anatomisch und systematisch bearbeitet. *Memories de L'Academie Imperiale des Sciences de St. Petersbourg*, **22**(8): 1–73.

Dybowski W. 1901. Diagnosen neuer *Choanomphalus*-Arten. *Nachrichtsblatt der Deutschen Malakozoologischen Gesellschaft*, **5–6**: 119–125.

Dybowski W. 1910. Zur Synonymik der *Choanomphalus*-Arten. *Ezhegodnik Zoologicheskogo Museya Imperatorskoi Akademii Nauk* (L'Annuaire du Musee Zoologique de L'Académie Impériale des Sciences de St.-Pétersbourg), **15**: 254–266.

Erbaeva E.A., Kozhova O.M. and Safronov G.P. 2006. Chapter 17. The fauna of bottom invertebrates of Lake Hövsgöl. In: C.E. Goulden, T. Sitnikova, J. Gelhaus and B. Boldgiv (Eds). The geology, biodiversity and ecology of Lake Hövsgöl (Mongolia). Bakhuys Publishers, Leiden: 259–278.

Fazalova V., Nevado B., Peretolchina T., Petunina J. and Sherbakov D. 2010. When environmental changes do not cause geographic separation of fauna: differential responses of Baikalian invertebrates. *BMC Evolutionary Biology*, **10**(320): 1–12. https://doi.org/10.1186/1471-2148-10-320

Gavrilov G.B. 1953. The reproduction of the Baikalian mollusc *Baicalia herderiana* and other gastropods. *Zoologicheskii Zhurnal*, **32**(5): 840–843. [In Russian].

Gerstfeldt G. 1859. Über Land und Süsswasser-Mollusken Sibiriens und des Amur-Gebietes. *Zapiski Imperatorskoj akademii nauk po Fiziko-matematicheskomu otdieleniyu* (Mémoires présentés à l'Académie Impériale des Sciences de St. Pétersbourg par divers Savants et dans ses Assemblées), **9**: 505–548, 1 Pl.

Izzatulaev Z.I., Kruglov N.D. and Starobogatov Ya.I. 1983. New and little-known species of lymnaeids of the subgenus *Radix of* the genus *Lymnaea* of the USSR fauna from Central Asia. *Izvestia Akademii nauk Tadzhikskoi SSR*, 4: 53–57. [In Russian].

Kantor Yu.I. and Sysoev A.V. 2005. Catalogue of molluscs of Russia and adjacent countries. KMK Scientific Press Ltd, Moscow, 627 p. [In Russian].

Kantor Yu.I., Vinarski M.V., Schileyko A.A. and Sysoev A.V. 2010. Catalogue of the continental mollusks of Russia and adjacent territories, version 2.3.1. www.ruthenica.com

Kobelt W. 1910. Iconographie der Land- und Süswasser-Mollusken, mit vorzüglicher Berücksichtigung der Europäischen noch nicht abgebildeten Arten von E.A. Rossmässler. Neue Folge, fünfzehner Band. C.W. Kreidel's Verlag, Wiesbaden: 45–67.

Korobkova N., Sitnikova T. and Röpstorf P. 2006. Intraspecific variation of the Baikalian endemic gastropod *Baicalia carinata* (W. Dybowski, 1875) (Caenogastropoda, Baicaliidae). *Hydrobiologia*, **568**(1): 161–166. https://doi.org/10.1007/s10750-006-0319-5

Korotneff A.A. 1901. Report on the investigation of Lake Baikal in summer of 1900 and 1902. In: A.A. Korotneff (Ed.). *Pyatidesyatiletie Vostochno-Sibirskogo otdela Imperatorskogo Russkogo Geograficheskogo obschestva. Yubilejnyj sbornik*. Kul'zhenko, Kiev: 13–42, 85 (map). [In Russian].

Kozhov M.M. 1936. Molluscs of Lake Baikal – systematics, distribution, ecology, some data on genesis and history. *Trudy baikalskoj limnologicheskoj stancii* (*Travaux de la Station limnologique du lac Baikal*), **8**: 1–350.

Kravtsova L.S., Kamaltynov R.M., Karabanov E.B., Mekhanikova I.V., Sitnikova T.Ya., Rozhkova N.A., Slugina Z.V., Izhboldina L.A., Weinberg I.V., Akinshina T.V. and Sherbakov D.Yu. 2004. Macrozoobenthic communities of underwater landscapes in the shallow-water zone of southern Lake Baikal. *Hydrobiologia*, **522**: 193–205. https://doi.org/10.1023/b:hydr.0000029979.68265.3e

Kruglov N.D. 2005. Molluscs of the family Lymnaeidae (Gastropoda Pulmonata) in Europe and Northern Asia. Smolensk, SGPU Publishing, 507 p. [In Russian].

Kruglov N.D. and Starobogatov Ya.I. 1991 (1992). Unknown egg-clusters of molluscs of the genus *Lymnaea* (Gastropoda Pulmonata Lymnaeidae). In: Ya.I. Starobogatov (Ed.). Reproduction and egg-clusters of molluscs. *Trudy Zoologicheskogo Instituta AN SSSR*, **228**: 111–112. [In Russian].

Kruglov N.D. and Starobogatov Ya.I. 1993. Annotated and illustrated catalogue of species of the family Lymnaeidae (Gastropoda Pulmonata Lymnaeiformes) of Palaearctic and adjacent river drainage areas. Part 1. *Ruthenica*, **3**(1): 65–91.

Kulikova N.N., Maksimova N.V., Suturin A.N., Paradina L.F., Sitnikova T.Ya., Timoshkin O.A., Saibatalova E.V. and Khanaev I.V. 2007. Biogeochemical characteristics of dominant gastropod species from the stony littoral of Southern Baikal. *Geochemistry International*, **45**(5): 478–489. https://doi.org/10.1134/s0016702907050059

Lindholm W.A. 1909. Die Mollusken des Baikal-Sees (Gastropoda et Pelecopoda), systematisch und zoogeographisch bearbeitet. *Wissenschaftliche Ergebnisse einer Zoologischen Expedition nach dem Baikal-See unter Leitung des Professors A. Korotneff in dem Jahren 1900–1902. Zoologicheskie issledovaniya oz. Baikal*, **4**: 1–106.

Lindholm W.A. 1924a. Einige neue Gastropoden aus dem Baikalsee. *Doklady Rossijskoj Akademii nauk*, jan.-febr.: 22–25.

Lindholm W.A. 1924b. Collecteana baicalica. I. *Archiv für Molluskendkunde*, **56**: 217–225.

Lindholm W.A. 1929. Die ersten Schnecken (Gastropoda) aus dem See Kosogol in der Nordwest Mongolei. *Doklady Akademii Nauk SSSR*, **13**: 315–318.

Maximova N.V., Melnikova E.N., Shirokaya A.A., Sitnikova T.Ya. and Timoshkin O.A. 2012. Seasonal and inter-annual distribution of Gastropoda in three hydrodynamic stony littoral zones of Lake Baikal. *Ruthenica*, **22**(1): 1–14. [In Russian].

Maximova N.V. and Sitnikova T.Ya. 2006. Size, age and sex ratio in *Maackia herderiana* (Gerstfeldt, 1859) (Gastropoda: Caenogastropoda: Baicaliidae) from South Baikal lake. *Ruthenica*, **16**(1–2): 97–104. [In Russian].

Maximova N.V., Sitnikova T.Ya. and Mizandrontsev I.B. 2007. The growth of endemic baikalian snail *Maackia herderiana* (Lindholm, 1909) (Caenogastropoda: Baicaliidae). *Zoologia bespozvonochnykh*, **4**(1): 45–63. [In Russian].

Milaschewitsch O.K. 1901. List of Gasteropoda found in Baikal. In: A.A. Korotneff (Ed.). *Pyatidesyatiletie Vostochno-Sibirskogo otdela Imperatorskogo Russkogo Geographicheskogo obschestva*. Yubilejnyj sbornik. Kul'zhenko, Kiev: 65–66. [In Russian].

Osipov E.Y. and Khlystov O.M. 2010. Glaciers and meltwater flux to Lake Baikal during the last glacial maximum. *Paleogeography, Paleoclimatology, Paleoecology*, **294**: 4–15. https://doi.org/10.1016/j.palaeo.2010.01.031

Papusheva E.P., Sherbakov D.Yu., Sitnikova T.Ya., Zubakov D.Yu., Blinov A.G. and Starobogatov Ya.I. 2003. Molecular phylogeny of the genus *Choanomphalus* (Pulmonata: Planorbidae). *Ruthenica*, **13**(1): 75–80.

Peretolchina T.E., Sitnikova T.Ya. and Sherbakov D.Yu. 2008. Evolution relationships between closely related endemic gastropod species of genus *Baicalia* (Mollusca: Caenogastropoda). *Izvestia Irkutskogo gosudarstvennogo universiteta, Seria 'Biologia, Ecologia'*, **1**(2): 67–70. [In Russian].

Poberezhnyi E.S. 1989. Baikal endemic molluscs as the object of hydrobiological monitoring. Abstract of the Candidate of Biological Sciences thesis. Irkutsk State University, Irkutsk, 17 p. [In Russian].

Popov V.V. 1927. P.S. Michno as a local historian. *Buryatovedenie*: *Bulletin Buryat-Mongol'skogo nauchnogo obschestva imeni Dorzhi Banzarova*, **3–4**: 59–63. [In Russian].

Prozorova L.A, Sitnikova T., Zasypkina M.O, Matafonov P.V and Dulmaa A. 2009. Chapter 16. Freshwater snails (Gastropoda) of the Baikal Lake basin and the surrounding areas. In: O.A. Timoshkin (Ed.). An annotated list of the fauna of Lake Baikal and its watershed. (Basins and channels in the South of East Siberia and North Mongolia). Vol. 1. Novosibirsk, Nauka: 170–188. [In Russian].

Röpstorf P. and Riedel F. 2004. Deep-water gastropods endemic to Lake Baikal – a SEM study on protoconchs and radulae. *Journal of Conchology*, **38**: 253–282.

Rozhkova N.A., **Bondarenko N.A. and Sitnikova T.Ya. 2018.** Food spectrum of mollusc and caddisflies under conditions of *Spirogyra* (Zygnematophyceae, Charophyta) bloom in Lake Baikal. *Izvestia Irkutskogo gosudarstvennogo universiteta, Seria 'Biologia, Ecologia'*, **25**(4): 91–105. [In Russian]. https://doi.org/10.26516/2073-3372.2018.25.91

Schrenck L. 1867. Mollusken des Amur-Landes und des Nordjapanischen Meers. In: Reisen und Forschungen im Amur-Lande in der Jahren 1854–1856. Bd. 2. St. Petersburg, Akademie der Wissenschaften zu St. Petersburg: 256–976.

Shadin [Zhadin] V.I. 1933. Freshwater molluscs of the USSR. Leningrad, OGIS, Lensnabtekhizdat, 232 p. [In Russian].

Shadin [Zhadin] V.I. 1952. Molluscs of the fresh- and brackish waters of the USSR. In: Keys to the fauna of the USSR. Vol. 46. Moscow–Leningrad, AN SSSR, 376 p. [In Russian].

Shirokaya A.A., Sitnikova T.Ya., Kijashko P.V., Shydlovskyy I.V., Prozorova L.A. and Yamamuro M.A 2017. A review of the Lake Baikal limpets, family Acroloxidae Thiele, 1931 (Mollusca: Pulmonata: Hygrophila), based on type specimens, with keys to the genera. *Archiv für Molluskenkunde*, **146**(1): 9–64. https://doi.org/10.1127/arch.moll/146/009-064

Sitnikova T.Ya. 1987a. New data on Baikal endemic mollusc *Kobeltocochlea michnoi* Lindholm, 1929 of the family Benedictiidae (Gastropoda, Pectinibranchia) In: G.I. Pomazkova (Ed.). New research in the study of flora and fauna of Lake Baikal and its basin. Irkutsk, Irkutsk University: 104–107.

Sitnikova T.Ya. 1987b. On the classification of Baikal endemic molluscs of the family Benedictiidae (Gastropoda, Pectinibranchia). *Zoologicheskii Zhurnal*, **66**(10): 1463–1475. [In Russian].

Sitnikova T.Ya. 1991. A new system of the endemic Baikalian family Baicaliidae (Mollusca, Pectinibranchia). In: A.A. Linevich (Ed.). *Morphology and evolution of invertebrates. Proceedings of the Limnological institute SD AS USSR* (*Trudy Limnologicheskogo instituta SO AN SSSR*). Nauka, Novosibirsk: 281–295. [In Russian].

Sitnikova T.Ya. 1995. Gastropods of the family Benedictiidae from Lake Baikal. *Ruthenica*, **5**(1): 77–90.

Sitnikova T. 2001. A new species of hydrobiid mollusk from Lake Baikal. *Ruthenica*, **10**(2): 105–111.

Sitnikova T.Ya. 2018. Review of Valvatidae (Gastropoda: Heterobranchia) endemic to Lake Baikal, with taxonomic and morphological notes. *Archiv für Molluskenkunde*, **147**(2): 181–201. https://doi.org/10.1127/arch.moll/147/181-201

Sitnikova T.Ya. and Bazova N.V. 2019. Notes on *Bithynia contortrix* Lindholm, 1909 (Caenogastropoda, Bithyniidae) from the Baikal region. *Zoologicheskii Zhurnal*,

98(2): 123–129 [In Russian]. https://doi.org/10.1134/s0044513419020156

Sitnikova T.Ya., Fialkov V.A. and Starobogatov Ya.I. 1993. Gastropoda from underwater hydrothermal vent of Baikal Lake. *Ruthenica*, **3**(2): 133–136.

Sitnikova T., Kiyashko S., Maximova N., Pomazkina G., Roepstorf P., Wada E. and Michel E. 2012a. Resource partitioning in endemic species of Baikal gastropods indicated by gut contents, stable isotopes and radular morphology. *Hydrobiologia*, **682**(1): 75–90. https://doi.org/10.1007/s10750-011-0685-5

Sitnikova T., Kovalenkova M., Peretolchina T. and Sherbakov D. 2016. A new, genetically divergent species of *Pseudobaikalia* Lindholm, 1909 (Caenogastropoda, Baicaliidae). *ZooKeys*, **593**: 1–14. https://doi.org/10.3897/zookeys.593.8511

Sitnikova T. and Maximova N. 2016. On morphological and ecological evidence of adaptive differentiation among stony cliff littoral Baikal gastropods. *Journal of Natural History*, **50**(5–6): 263–280. https://doi.org/10.1080/00222933.2015.1059961

Sitnikova T., Michel E., Tulupova Yu., Khanaev I., Parfenova V. and Prozorova L. 2012b. Spirochetes in gastropods from Lake Baikal and North American freshwaters: new multi-family, multi-habitat host records. *Symbiosis*, **56**(3): 103–110. https://doi.org/10.1007/s13199-012-0167-1

Sitnikova T.Y., Prozorova L.A., Sharyi-ool M., Kyashko P. and Kupchinsky A. 2015. The *Cincinna aliena* (Westerlund 1877) species group in Russian water bodies. *Archiv für Molluskenkunde*, **144**(1): 1–22. https://doi.org/10.1127/arch.moll/1869-0963/144/001-022

Sitnikova T., Roepstorf P. and Riedel F. 2001. Reproduction, duration of embryogenesis, egg capsules and protoconches of gastropods of the family Baicaliidae (Caenogastropoda) endemic to Lake Baikal. *Malacologia*, **43**(1–2): 59–85.

Sitnikova T.Ya., Shirokaya A.A. and Maximova N.V. 2010. Distribution of Gastropoda in the littoral zone of Lake Baikal. *Hydrobiological journal*, **46**(3): 3–19. https://doi.org/10.1615/hydrobj.v46.i3.10

Sitnikova T.Ya., Starobogatov Ya.I., Shirokaya A.A., Shibanova I.V., Korobkova N.V. and Adov F.V. 2004. Gastropoda. In: O.A. Timoshkin (Ed.). *Index of animal species inhabiting Lake Baikal and its catchment area*. Nauka, Novosibirsk, **1**(2): 937–1002. [In Russian].

Starobogatov Ya.I. and Sitnikova T.Ya. 1998. List of Mollusca species. In: O.M. Kozhova and L.R. Izmest'eva (Eds). Lake Baikal. Evolution and Biodiversity. Backhuys Publishers, Leiden: 404–414.

Starostin A. 1926. Zur Kenntnis der Molluskenfauna des Baikalsees. *Archiv für Naturgeschichte*, **A**(6): 1–95.

Stift M., Michel El., Sitnikova T., Mamonova E. and Sherbakov D. 2004. Palaeartic gastropod gains a foothold in the dominion of endemics: range expansion and morphological change of *Lymnaea* (*Radix*) *auricularia* in Lake Baikal. *Hydrobiologia*, **513**: 101–108. https://doi.org/10.1023/b:hydr.0000018175.37771.d6

Teterina V.I., Maximova N.V., Sitnikova T.Ya. and Kirilchik S.V. 2017. Genetic and morphological heterogeneity of Lake Baikal endemic gastropod *Benedictia fragilis* (Dybowski, 1875). *Russian Journal of Genetics,* **53**(5): 606–613. https://doi.org/10.1134/s1022795417040135

Thiele. J. 1931. Handbuch der systematischen Weichtierkunde. Vol. 1. Zweiter Tiel (Gastropoda: Opisthobranchia und Pulmonata). Gustav Fisher, Jena, 376 p.

Timoshkin O.A. 2001. Lake Baikal: diversity of fauna, problems of its immiscibility and origin, ecology and 'exotic' communities. In: O.A. Timoshkin (Ed.). Index of animal species inhabiting lake Baikal and its catchment area. Book 1, Vol. 1. Nauka, Novosibirsk: 74–116.

Timoshkin O.A., Samsonov D.P., Yamamuro M., Moore M.V., Belykh O.I., Malnik V.V., Sakirko M.V., Shirokaya A.A., Bondarenko N.A., Domysheva V.M., Fedorova G.A., Kochetkov A.I., Kuzmin A.V., Lukhnev A.G., Medvezhonkova O.V., Nepokrytykh A.V., Pasynkova E.M., Poberezhnaya A.E., Potapskaya N.V., Rozhkova N.A., Sheveleva N.G., Tikhonova I.V., Timoshkina E.M., Tomberg I.V., Volkova E.A., Zaitseva E.P., Zvereva Yu.M., Kupchinsky A.B. and Bukshuk N.A. 2016. Rapid ecological change in the coastal zone of Lake Baikal (East Siberia): Is the site of the world's greatest freshwater biodiversity in danger? *Journal of Great Lake Research*, **42**(3): 487–497. https://doi.org/10.1016/j.jglr.2016.02.011

Timoshkin O.A., Suturin A.N., Maximova N.V., Semiturkina N.A., Galkin A.N., Kulikova N.V., Khanaev I.V. and Ropstorf P. 2003. Rock preferences and microdistribution peculiarities of Porifera and Gastropoda in the shallow littoral zone of Lake Baikal (East Siberia) as evidenced by underwater macrophotograph analysis. *Berliner Geowissenschaftliche Abhandlungen*, **4**: 193–200.

Vinarski M.V. and Kantor Yu.I. 2016. Analytical catalogue of fresh and brackish water molluscs of Russia and adjacent countries. IPEE RAS, Moscow, 544 p.

Vinarski M.V., Matafonov D.V. and Shishmareva I.I. 2012. What species of carinate *Gyraulus* (Mollusca: Gastropoda: Planorbidae) inhabits in a shallow zone of Lake Baikal? *Izvestiya Irkutskogo gosudarstvennogo universiteta, seria 'Biologia. Ecologia'*, **5**(4): 91–101. [In Russian].

Vinarski M., Palatov D. and Marinskiy V. 2017. Checklist of the freshwater snails (Mollusca: Gastropoda) of Mongolia. *Zootaxa*, **4317**(1): 45–78. https://doi.org/10.11646/zootaxa.4317.1.2

Zemskaya T.I., Sitnikova T.Ya., Kiyashko S.I., Kalmychkov G.V., Pogodaeva T.V., Mekhanikova I.V.,

Naumova T.V., Shubenkova O.V., Chernitsina S.M., Kotsar O.V., Chernyaev S. and Khlystov O.M. 2012. Faunal communities at sites of gas- and oil-bearing fluids in Lake Baikal. *Geo-Marine Letters*, **32**(5–6): 437–451. https://doi.org/10.1007/s00367-012-0297-8

Zubakov D.Yu., Shcherbakov D.Yu. and Sitnikova T.Ya. 1997. Analysis of phylogenetic interrelations between Baikalian endemic mollusks of the family Baicaliidae Clessin 1878 (Gastropoda, Pectinibranchia) based on nucleotide sequences of mitochondrial gene COI. *Russian Journal of Molecular Biology* [*Molekulyarnaya Biologiya*], **31**(6): 1092–1097. [In Russian].

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