POLISH POLAR RESEARCH
vol. 25, no. 3–4, pp. 241–266, 2004

Mesozoic gastropods from Siberia and Timan (Russia). Part 1: Vetigastropoda and Caenogastropoda (exclusive of Neogastropoda)

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ABSTRACT: This publication begins series of papers on taxonomy of juvenile and little known Mesozoic gastropods from Siberia and Timan region (= Pechora Basin). First part contains general part with geological framework followed by the paleontological part on taxonomy of Vetigastropoda and Caenogastropoda (exclusive of Neogastropoda). Described are 15 species of gastropods. Three of them are new. They are *Chuelskia siberica* (Trochidae), *Ageria gankinensis* (Epitoniidae), and *Dzikella chuzikovensis* (superfamily and family uncertain). Moreover, described is a new genus *Chuelskia* (Trochidae). Eight species are left in the open nomenclature. The Siberian gastropods belong mostly to the cosmopolitan fauna while the gastropods of Timan region are the same as those already described from Novaja Zemlja Islands.

Key words: Siberia, Timan, Mesozoic, paleontology (gastropods), taxonomy.

Introduction

In spite of many years of geological fieldwork the Mesozoic gastropods from northern Russia remain rather poorly known. Although some pioneering works were done already in 19th century (*e.g.* Tullberg 1881), the more systematic treatment of the gastropods started in 1970s (Beisel 1977, 1983 and 1991). As published in Russian those papers have had only limited public usage. The material described herein comes mainly from the boreholes drilled through many years

† Kola Kurushin passed away on September 18th, 2001.

Fig. 1. Sketch map of the Western Siberia showing localities mentioned in the text (asterisks). Solid circles indicate larger cities.

for oil purposes in the Western Siberia and extracted from rock cores by paleontologists at various geological institutions in Novosibirsk. Because of that extreme inaccessibility of the material we decided to illustrate also the specimens, which are not perfectly preserved. Additional material for this paper comes from the expeditions of the United Institute of Geology, Geophysics and Mineralogy to the northernmost Siberia. The following persons provided gastropod material for this study: A.L. Beisel, N.I. Kurushin, B.N. Shurygin, A.S. Turbina and V.A. Zakharov.

The material illustrated herein is housed at the Institute of Paleobiology, Polish Academy of Sciences in Warszawa (abbreviated ZPAL). The collection of Beisel (1977, 1983, 1991) is housed at the Paleontological Museum of United Institute of Geology, Geophysics and Mineralogy, Russian Academy of Sciences in Novosibirsk (abbreviated MIGiG). The type material of Tullberg (1881) is housed at the Naturhistoriska Riksmuseet in Stockholm (abbreviated NRM).

Geological setting

The gastropod shells described in this paper have been extracted from Upper Triassic to Upper Cretaceous rocks from various sites of Western Siberia. Some additional material came also from Eastern Siberia and Timan region (= Pechora Basin). Mesozoic strata in Siberia lie usually almost horizontally, and the fossils are not significantly affected by diagenesis. The specimens were collected both from boreholes and outcrops. The gastropods came mainly from fully marine silts and clays. The contribution of gastropods to the Mesozoic fossil assemblages in Siberia is not very high and usually do not exceed 10% of the number of bivalves

During Mesozoic times the area of Western Siberia was repetitively covered by an epicontinental sea. In Eastern Siberia the marine environment prevailed in Triassic, Early and Middle Jurassic (apart from Callovian), whereas in the Western Siberia and the Pechora Basin two, largest transgressions took place in Callovian-to-Neocomian and in Late Cretaceous–Paleogene. The single Triassic species described in this paper has been found in shallow-water Ladinian limestones on the Mys Cvietkova (the Cvietkov Cape).

The Jurassic gastropods described in this paper come from the Late Jurassic of two regions. The marine shallow water, Upper Jurassic strata crop out in the northern part of Middle Siberia along the Levaja Bojarka River. The stratigraphy and facies development at these sections have been studied in detail by Saks (1969). The monograph on gastropods from this region was published by Beisel (1983). The other gastropods described from the Upper Jurassic come from western periphery of the basin at the slopes of Ural Mountains (Zakharov and Mesezhnikov 1974). The specimens under study were collected from the Yatrija River section and from the Saranpaulskaja borehole.

The Valanginian gastropods described herein come from three localities close to the eastern rim of the Ural Mountains (Fig. 1). Specimens from Chuelskaja borehole were collected from argillites of Kulomzin Formation (Kontorovich *et al.* 1975) while the ones from the Saranpaulskaja borehole and from the Yatrija River section were collected from silty clays of Khorasoim Formation (Golbert *et al.* 1972).

The gastropod-bearing section of Cenomanian to lower Turonian sediments in the Western Siberia is located along the Nizhnaja Agapa River. A gradational lithologic change from Late Cenomanian Pictus Zone to Early Turonian Labiatus Zone can be observed at that section (Zakharov *et al.* 1989). The faunistic content does not change significantly at the Cenomanian/Turonian boundary. The stratigraphy and paleoecolgy of this section has been studied by Lebedeva and Zverev (2003).

Most abundant material of the studied gastropods come from the Maastrichtian (Late Cretaceous) part of the Gankin Formation in Western Siberia. The formation is represented by greenish-grey calcareous silts and clays containing numerous

shelly fossils. The shells are usually well preserved with the aragonitic layer still present. Because of the high shell-content and good preservation the Gankin Formation is known among Russian geologists as "paleontological paradise". Regrettably, there are no outcrops of this formation, and it is known exclusively from the boreholes drilled in the 1950s and 1960s. The faunistic content is characterized by a relatively high contribution of gastropod shells (Beisel 1991). This might be explained by a relatively low-energy, shallow-water environment with a low-sedimentation rate. The biostratigraphy of Gankin Formation has been described by Podobina (2000) based on foraminiferan associations.

For more detailed information, the reader is referred to general papers on stratigraphy of oil-bearing basins in Siberia published in the last few years (Shurygin 2000; Kazakov 2002). The ammonoid biostratigraphy of the most important Mesozoic sections of Siberia has been published by Zakharov *et al.* (1997).

Systematic palaeontology

Phylum Mollusca Linné, 1758
Class Gastropoda Cuvier, 1797
Subclass Prosobranchia Milne Edwards, 1848
Order Archaeogastropoda Thiele, 1925
Suborder Vetigastropoda Salvini-Plawen and Haszprunar, 1987
Superfamily Trochoidea Rafinesque, 1815
Family Trochidae Rafinesque, 1815

Genus *Chuelskia* gen. n.

Type species: *Chuelskia siberica* sp. n. Early Valanginian (Early Cretaceous), Chuelskaja borehole 11(90) interval 1544–1550, Western Siberia, Russia.

Derivation of the name: after the type locality.

Diagnosis. — Shell-low spired, turbiniform, whorls convex. Lateral flanks of whorls ornamented with rows of acute nodes. Base ornamented with weakly noded spiral rows. Aperture lenticular, umbilicus absent, no folds on columella.

Discussion. — *Chuelskia* is most similar to *Amberleya* (see below). The latter differs in its more conical shape of shell and strong, blunt nodes.

Range. — Early Valanginian (Early Cretaceous).

Chuelskia siberica sp. n.

(Fig. 2)

Holotype: ZPAL Ga.10/1, Fig. 2.

Type horizon: Kulomzin Formation, Early Valanginian (Early Cretaceous).

Type locality: Chuelskaja, borehole 11(90), interval 1544–1550, Western Siberia, Russia.

Derivation of the name: After Siberia, the type region.

Material. — Holotype only.

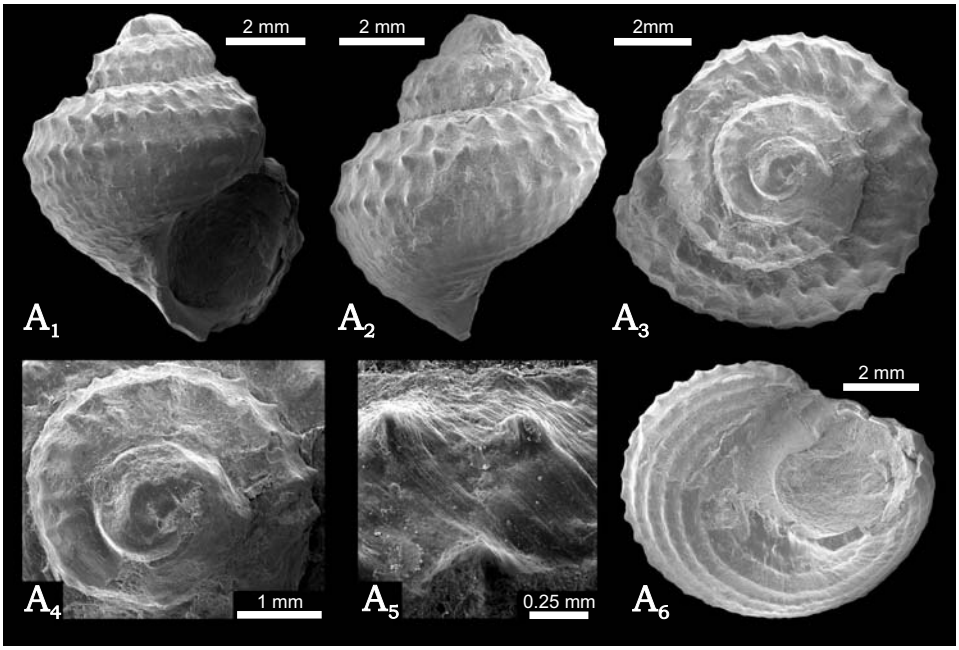

Fig. 2. Trochid *Chuelskia siberica* sp. n. from Chuelskaja, Western Siberia, Early Valanginian (Early Cretaceous). ZPAL Ga.10/1; A_1–A_2 lateral views, A_3 apical view, A_4 close-up of the apex in apical view, A_5 details of teleoconch ornamentation, A_6 umbilical view.

Measurements. — The holotype consisting of about four whorls is 8.55 mm high and 7.47 mm in diameter.

Occurrences. — Type locality only.

Diagnosis. — Shell low-spired with convex whorls. Lateral flanks of whorls ornamented with three rows of acute nodes (27–28 nodes per whorl). Base ornamented with weakly noded spiral rows. Umbilicus absent, no folds on columella.

Description. — The protoconch is not preserved. The peristome is badly preserved, lenticular.

Remarks. — See discussion to genus *Chuelskia*.

Genus *Amberleya* Morris and Lycett, 1851

Type species: *Amberleya bathonica* Cox and Arkell, 1950; subsequent designation by Cox and Arkell (1950). Bathonian (Middle Jurassic), England.

Diagnosis. — Shell littoriniform to subturricullate. Ornament nodose, columellar lip concave, its margin joining that of basal lip in even curve. Umbilicus absent (from Knight *et al.* 1960).

Remarks. — *Amberleya* is commonly synonymized with *Eucyclus* Eudes-Deslongchamps, 1860 and both names are often misused for different trochoid fossil shells (*e.g.* Hudleston 1892). Nevertheless the type species of *Amberleya* and *Eucyclus obeliscus* Eudes-Deslongchamps, 1860, which is the type of *Eucyclus*,

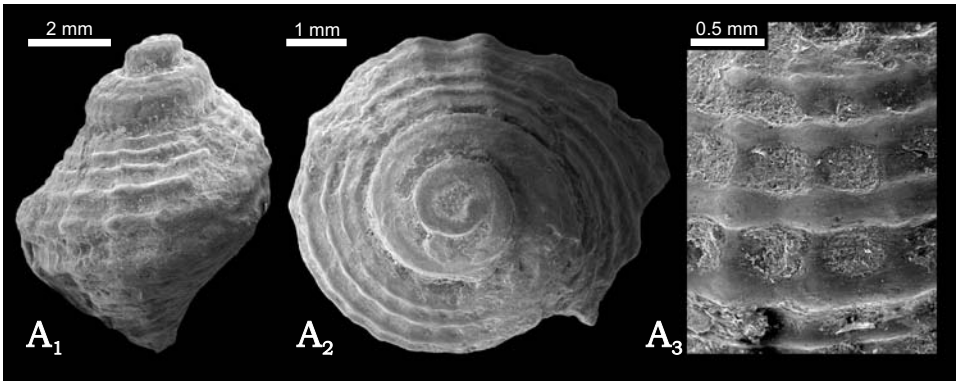

Fig. 3. Trochid ?*Amberleya* sp. from Nizhnaja Agapa River, Western Siberia, Early Turonian (Late Cretaceous). ZPAL Ga.10/2; A_1 lateral view, A_2 apical view, A_3 details of teleoconch ornamentation.

differ significantly from each other and from the species, which are usually ascribed to those genera. Most probably *Amberleya* in the common sense is a polyphyletic genus. Moreover the protoconchs of both genera have not been illustrated so far to confirm their taxonomic status.

Range. — Middle Triassic to Oligocene according to Knight *et al.* (1960) but this information needs a revision.

?*Amberleya* sp.
(Fig. 3)

Material. — One imperfectly preserved shell from Nizhnaja Agapa River, outcrop 12, stratum 45 of Lebedeva and Zverev (2003), Western Siberia, Russia, *Inoceramus labiatus* Zone, Early Turonian (Late Cretaceous).

Measurements. — The shell (ZPAL Ga.10/2) consisting of about three whorls is 7.44 mm high and 6.27 mm in diameter.

Description. — The shell is low spired and weakly convex. The protoconch is not preserved. The teleoconch is ornamented with numerous noded spiral ribs. The peristome is not preserved. The umbilicus is absent.

Remarks. — The shell under consideration is most similar to the shell illustrated by Huddleston (1895, pl. 23) as "*Amberleya* between *A. milleri* and *A. turbinoides*". Although these species most probably represent a new genus (see discussion under *Amberleya*), we provisionally classify the Siberian shell as ?*Amberleya* sp., until revision of these species is published.

Genus *Onkospira* Zittel, 1873

Type species: *Turbo ranellatus* Quenstedt, 1858; original designation. Rauracian (Oxfordian, Late Jurassic), Germany.

Diagnosis. — Shell high turbiniform. Whorls strongly convex with spiral cords, collabral ribs and either 1 or 2 series of varices almost in alignment on suc-

cessive whorls. Last varix situated behind outer lip. Inner lip rather broadly reflected. Umbilicus absent (from Knight *et al.* 1960).

Remarks. — The shell characters of *Onkospira* are also similar to that of cerithiid *Cirsocerithium* Cosmann, 1906 but the former differs in early teleoconch ornamentation. The protoconchs of both genera have not been illustrated yet so their taxonomic status remains uncertain.

Range. — Oxfordian (Late Jurassic) to Maastrichtian (Late Cretaceous).

Onkospira sp.
(Fig. 4)

Material. — Two incomplete shells from Vasjuganskij, borehole pr-1 1-k, Western Siberia, Russia, Maastrichtian (Late Cretaceous).

Measurements. — The shell (ZPAL Ga.10/3) consisting of about 4.5 whorls is 8.50 mm high and 5.10 mm in diameter.

Description. — The shell is elongated with strongly convex whorls. The protoconch is not preserved. The early teleoconch whorls are ornamented with three weak spiral ribs, which are ornamented with nodes. Numerous spiral ribs ornament the later whorls. On the fourth whorl of the best preserved shell the varices appear. The peristome is circular and slightly elongate anteriorly. In the umbilical area narrow umbilical chink is present.

Remarks. — The pattern of early teleoconch ornamentation suggests vetigastropod affinities and the elongated shell with varices is typical of *Onkospira*. As

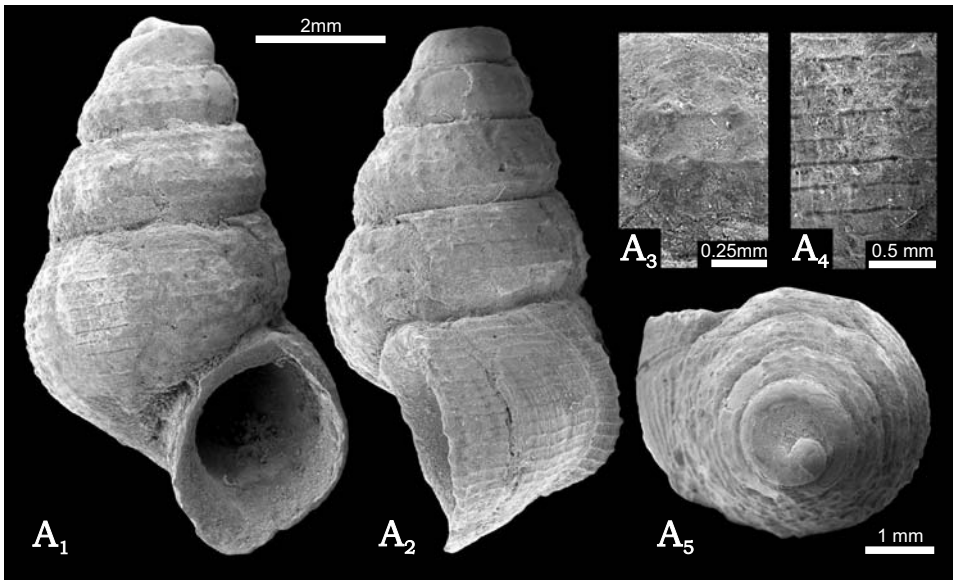

Fig. 4. Trochid *Onkospira* sp. n. from Vasjuganskij, Western Siberia, Maastrichtian (Late Cretaceous). ZPAL Ga.10/3; A_1–A_2 lateral views, A_3 details of the early teleoconch ornamentation, A_4 details of the late teleoconch ornamentation, A_5 apical view.

the accessible specimens of the species are imperfectly preserved we leave it unnamed.

Order Caenogastropoda Cox, 1959
Superfamily Cerithioidea Férrusac, 1822
Family Turritellidae Lovén, 1847
Genus *Turritella* Lamarck, 1799

Type species: *Turbo terebra* Linné, 1758; Recent, Indo-Pacific.

Diagnosis (shell). — Usually long, multispiral shell in most cases sculptured by spiral ribs or keels (from Kaim 2004).

Discussion. — There is no well-established diagnosis based on soft parts of Recent material yet. For more discussion the reader is referred to Kaim (2004).

Range. — Valanginian (Early Cretaceous) to Recent.

Turritella turbinae Beisel, 1991
(Fig. 5)

1991 *Turritella turbinae* sp. n.; Beisel, 1991: 177, pl. 28: 1–2.
Holotype: Beisel, 1991: pl. 28: 1.
Type horizon: Gankin Formation, Late Maastrichtian (Late Cretaceous).
Type locality: Suvorovo borehole 165, Western Siberia, Russia.

Material. — Five shells from Kutuzovka borehole 106, three shells from Krasnyj Agronom borehole 16, and one shell from Plodorody borehole 30—all Western Siberia, Russia.

Measurements. — The shell ZPAL Ga.10/13 consisting of about 12 whorls is 7.28 mm high and 2.72 mm in diameter.

Occurrences. — Late Maastrichtian (Late Cretaceous) of the Western Siberia.

Emended diagnosis. — Shell small 2.68 times as high as broad, multispiral. Suture incised, lateral flanks flat with 5–6 spiral ribs on adult specimens. Apical angle having about 21°. Growth lines strongly opisthocline.

Description. — The protoconch is smooth and multispiral (about 5 whorls). The demarcations between protoconch 1 and 2 as well as between protoconch and teleoconch are not preserved. The whorls of teleoconch are rounded. The teleoconch has flat flanks of the whorls, which are ornamented with spiral ribs. The spiral ornament starts with 2–3 spiral ribs and at the size 12 mm the number of ribs increases to 5–6. The surface of the teleoconch is covered by spiral microornament, which is composed of small pustules. The growth lines are opisthocline.

Remarks. — According to conchological classification of Marwick (1957) the species under consideration could be classified in the Australian genus *Colpospira* Donald, 1900. As mentioned above, there is no diagnosis of genus *Turritella* based on soft parts yet, and that is why we prefer to classify the species as *Turritella* s. l. The species under consideration differs from the other Asiatic turritellids by much smaller size (Beisel 1991) and is most similar to *T. peninsularis* Anderson and Hanna, 1935 from the Pacific Coast of United States described by Saul (1983).

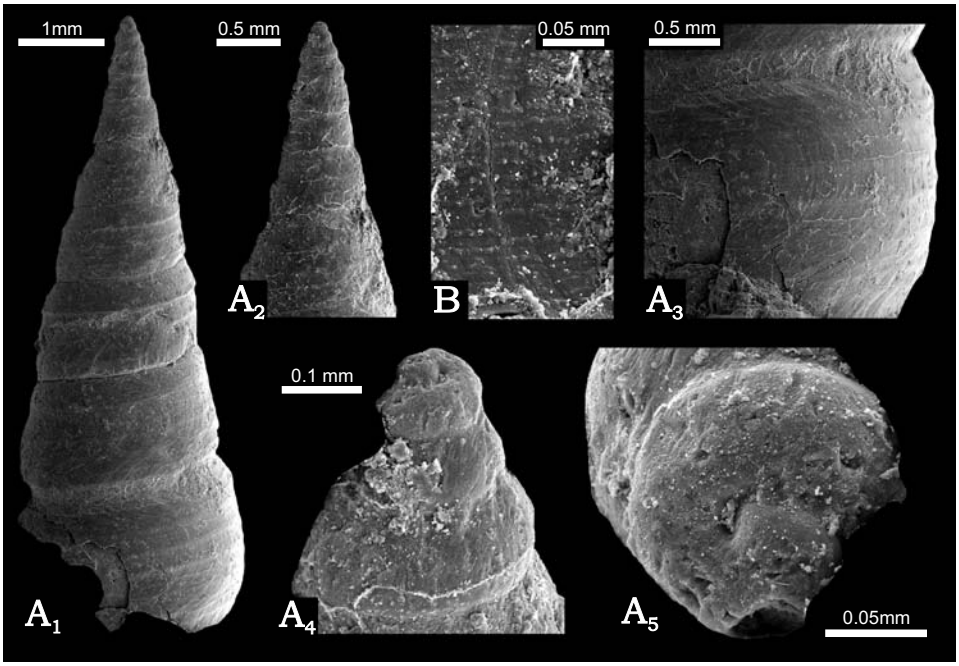

Fig. 5. *Turritella turbinae* Beisel, 1991 from Krasnyj Agronom, borehole 16, Western Siberia, Maastrichtian (Late Cretaceous). **A**. ZPAL Ga.10/13; A_1 lateral view, A_2 apex in lateral view, A_3 details of the late teleoconch ornamentation, A_4 protoconch in lateral view, A_5 initial whorl in apical view. **B**. ZPAL Ga.10/14; details of the early teleoconch ornamentation.

Superfamily Campaniloidea Douvillé, 1904
Family Ampullinidae Cossmann, 1918
Genus *Naricopsina* Chelot, 1886

Type species: *Neritopsis guerangei* (Davoust, 1855); original designation. Bathonian (Middle Jurassic), Domfront, France.

Emended diagnosis. — Shell naticiform. Protoconch consisting of two or more whorls, smooth. Demarcation between protoconch and teleoconch not thickened, orthocline. Teleoconch whorls strongly convex, smooth or with weak spiral sculpture. Growth lines more or less prosocline, sometimes thickened. Peristome broadly oval. Inner lip with callus covering or not narrow umbilicus (modified after Gründel 2001).

Remarks. — Gründel (2001) established the monogeneric family Naricopsinidae which is here regarded as a synonyme of Ampullinidae as some species of *Naricopsina* [e.g. *Naricopsina montreuilensis* (Hébert and Eudes-Deslongchamps, 1860) in Gründel 2001] has umbilical features typical of the latter family (umbilical sheath and umbilical rim; for details see Kase and Ishikawa 2003).

Range. — Bathonian (Middle Jurassic) to Maastrichtian (Late Cretaceous).

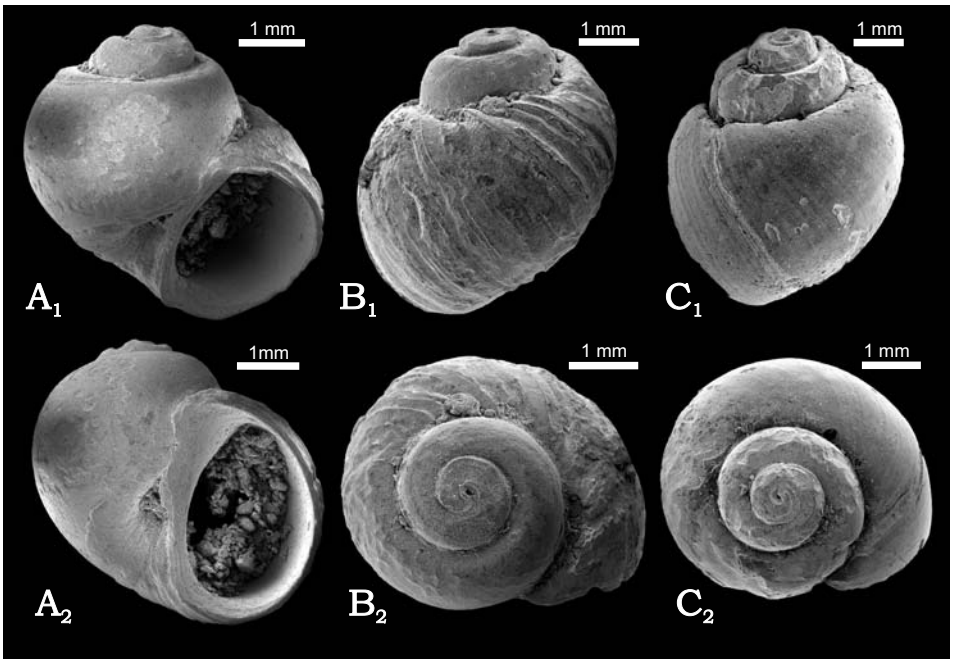

Fig. 6. ?*Naricopsina* sp. from Narymskaja, borehole 28-k, Western Siberia, Maastrichtian (Late Cretaceous). **A**. ZPAL Ga.10/16; A_1 lateral view, A_2 umbilical view. **B**. ZPAL Ga.10/17; B_1 lateral view, B_2 apical view. **C**. ZPAL Ga.10/15; C_1 lateral view, C_2 apical view.

?*Naricopsina* sp.

(Fig. 6)

Material. — Four incomplete shells from Narymskaja, borehole 28-k, Western Siberia, Russia, Maastrichtian (Late Cretaceous).

Measurements. — The shell (ZPAL Ga.10/16) consisting of about three whorls is 4.69 mm high and 4.40 mm in diameter.

Description. — The shell is naticiform. The protoconch is not preserved. The teleoconch is not ornamented apart from prosocline growth lines, which are thickened on some shells. The aperture is ovate and it bears a small umbilicus. The anterior part of the columellar lip is slightly thickened and elevated.

Remarks. — The shells described above resemble other Mesozoic ampullinids as well as the naticids but the umbilical region is more similar to the former group (compare Kase and Ishikawa 2003). Because of the imperfect preservation we left the species unnamed.

Gen. et sp. indet. 1

(Fig. 7)

Material. — One incomplete shell from Yatrija River, Western Siberia, Russia, Early Valanginian, Early Cretaceous.

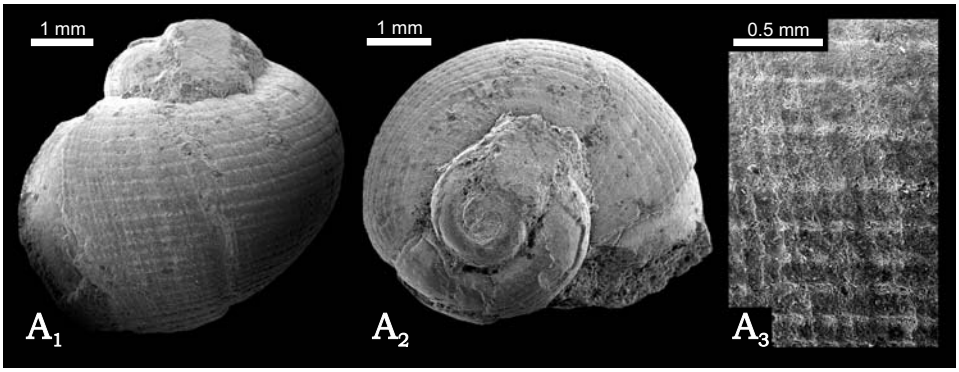

Fig. 7. Gen. et sp. indet. 1 from Yatrija River, Western Siberia, Russia, Early Valanginian (Early Cretaceous). ZPAL Ga.10/19; A_1 lateral view, A_2 apical view, A_3 details of teleoconch ornamentation.

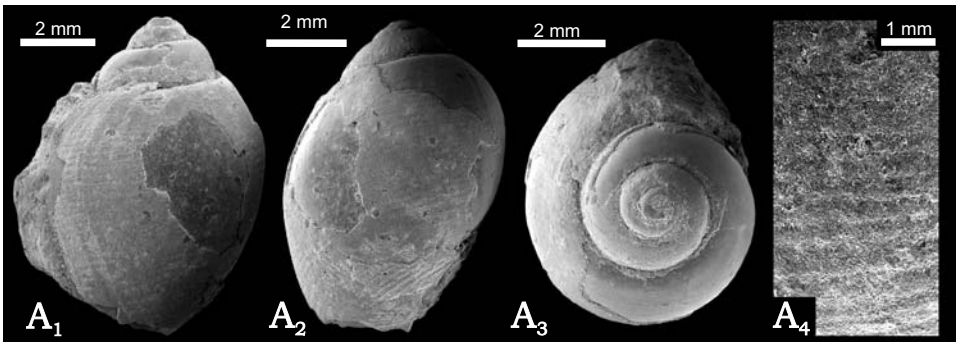

Fig. 8. Gen. et sp. indet. 2 from Yatrija River, Western Siberia, Russia, Early Valanginian (Early Cretaceous). ZPAL Ga.10/20; A_1 lateral view, A_2 lateral view, slightly oblique to show the base ornamentation, A_3 apical view, A_4 details of teleoconch ornamentation.

Measurements. — The shell (ZPAL Ga.10/19) consisting of about three whorls is 4.92 mm high and 4.05 mm in diameter.

Description. — The shell is low spired with rapidly expanding rounded whorls (1.21 times as high as broad). The protoconch is not preserved. The teleoconch is ornamented with numerous pitted spirae and weakly prosocline growth lines. The peristome is not preserved.

Remarks. — The shell under consideration (and the two following) are similar to some Eocene species of *Ampullospira* [e.g. *A. vapincana* (Bayan, 1873) and *A. garnieri* (Bayan, 1873) illustrated by Korobkov (1955)] and probably are related to them. There is also possibility that these three species may belong to actaeonelloidean gastropods. Their taxonomical status cannot be proved until the protoconchs and apertural regions are found.

Gen. et sp. indet. 2
(Fig. 8)

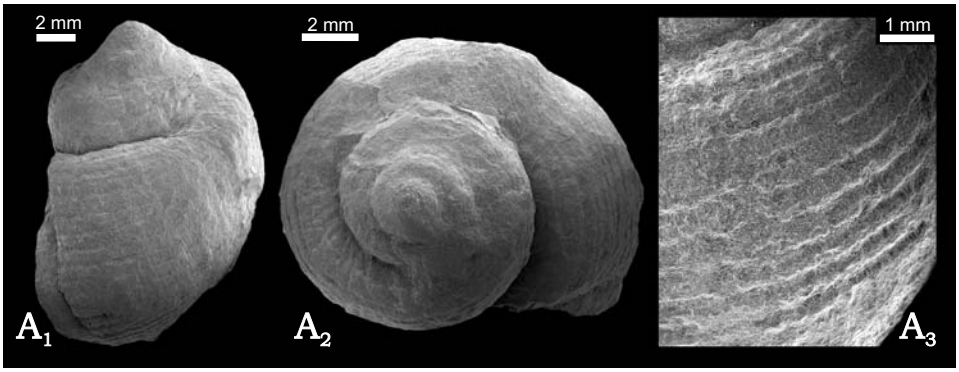

Fig. 9. Gen. et sp. indet. 3 from Mys Cvietkova, Western Siberia, Ladinian (Middle Triassic). ZPAL Ga.10/21; A_1 lateral view, A_2 apical view, A_3 details of teleoconch ornamentation.

Material. — One incomplete shell from Yatrija River, Western Siberia, Russia, Early Valanginian, Early Cretaceous.

Measurements. — The shell (ZPAL Ga.10/20) consisting of about 3.75 teleoconch whorls is 8.55 mm high and 6.67 mm in diameter.

Description. — The shell is ovate with rounded whorls (1.28 times as high as broad). The protoconch is not preserved. The teleoconch is ornamented with numerous pitted spirae and prosocyrtic growth lines. The base is ornamented with fine spiral ribs. The peristome is not preserved.

Remarks. — See remarks to gen. et sp. indet. 1.

Gen. et sp. indet. 3

(Fig. 9)

Material. — One incomplete shell from Mys Cvietkova, Western Siberia, Russia, Ladinian, Middle Triassic.

Measurements. — The shell (ZPAL Ga.10/21) consisting of about four teleoconch whorls is 15.81 mm high and 13.04 mm in diameter.

Description. — The shell is low spired with rapidly expanding whorls (1.21 times as high as broad). The protoconch is not preserved. The teleoconch whorls have small adapical ramp, which is passing continuously to weakly rounded lateral flank. The teleoconch is ornamented with strong spirae. The growth lines are not visible. The peristome is not preserved.

Remarks. — See remarks to gen. et sp. indet. 1.

Superfamily Janthinoidea Gray,1853

Family Epitoniidae Berry, 1910

Genus *Ageria* Abbas, 1973

Type species: *Ageria gaultina* Abbas, 1973; original designation. Albian (Early Cretaceous), Folkestone, Kent, England.

Diagnosis. — Shell elongated, ornament consisting of spiral cords and axial ribs. Cords frequently beaded, adapical cord strongly developed and ornamented (from Abbas 1973).

Remarks. — Abbas (1973) tentatively placed *Ageria* in family Cerithiidae. Destombes (1984) illustrated protoconch of *Ageria*, which is typically of epitoniid type. This is also confirmed by new data obtained by Tracey (in preparation, personal communication 2003).

Range. — Albian (Early Creataceous) to Maastrichtian (Late Cretaceous).

Ageria gankinensis sp. n.
(Fig. 10)

Holotype: ZPAL Ga.10/5, Fig. 10.
Type horizon: Gankin Formation, Late Maastrichtian, Late Cretaceous.
Type locality: Krasnyj Agronom, borehole 16, interval 384–390, Western Siberia, Russia.
Derivation of the name: After type formation.

Material. — Holotype only.

Measurements. — The protoconch of the holotype consisting of about three whorls is 0.68 mm high and 0.46 in diameter. The shell consisting of 14 whorls is 11.03 mm high and 4.00 mm in diameter.

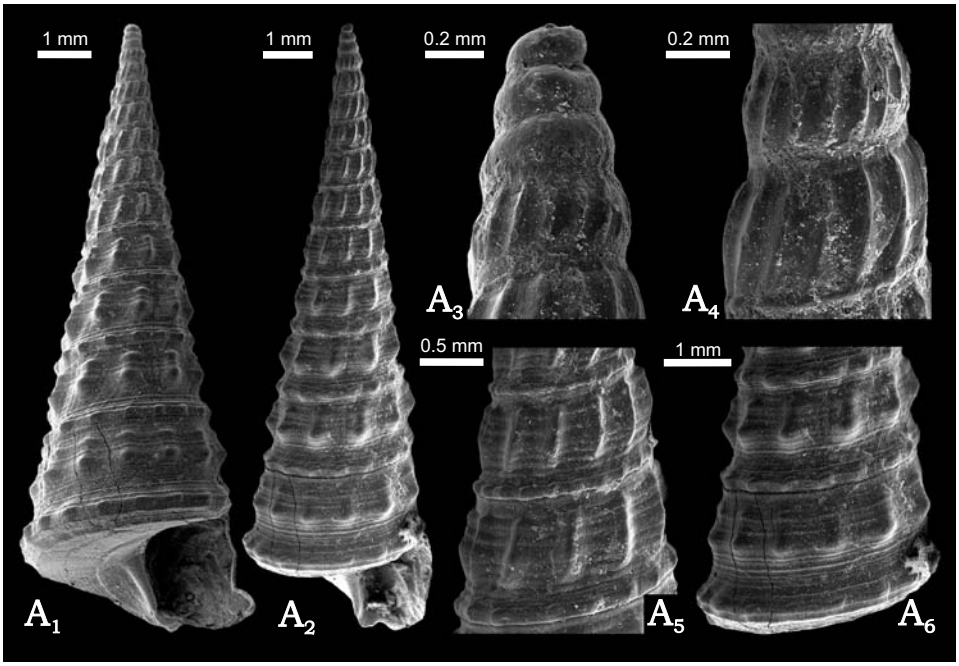

Fig. 10. Possible epitoniid *Ageria gankinensis* sp. n. from Krasnyj Agronom, borehole 16, Western Siberia, Maastrichtian (Late Cretaceous). ZPAL Ga.10/5; A_1–A_2 lateral views, A_3 apex in lateral view, A_4 details of early teleoconch ornamentation, A_5 details of mid-teleoconch ornamentation, A_6 details of late teleoconch ornamentation.

Occurrences. — Type locality only.

Diagnosis. — Shell slender 2.76 times as high as broad. Protoconch high-spired with rounded whorls. Early teleoconch whorls ornamented exclusively by opisthocline axial ribs. Adult whorls ornamented by spiral and axial ribs. Axial ribs on adult whorls composed of series of nodes.

Description. — The protoconch 1 is not preserved. The surface of protoconch 2 is smooth, eroded. The ornamentation of teleoconch is changing during ontogeny. Early ontogenetically whorl are ornamented exclusively by strong opisthocline axial ribs. On third whorl also wide and blunt spiral ribs appear. On the eight-ninth whorl the axial ribs start to change into row of nodes. On the tenth and the eleventh whorls the nodes are clearly separated from each other. The peristome is not preserved and only remnants of anterior canal are visible.

Remarks. — *Ageria gankinensis* is most similar to *Ageria weeksi* (Wade, 1926, p. 154) from Maastrichtian (Late Cretaceous) Ripley Formation (southern United States) described in details by Sohl (1960, p. 81). The later differs in having both axial and spiral whorls on the early teleoconch whorls and weaker axial nodes on the later parts of teleoconch.

Superfamily Rissooidea Gray, 1847

Family Rissoidae Gray, 1847

Genus *Hudlestoniella* Cossmann, 1909

Type species: *Pseudomelania burtonensis* Hudleston, 1892; original designation. Bathonian (Middle Jurassic), Burton Bradstock, England.

Emended diagnosis. — Shell small, elongated. Protoconch low-spired smooth or with pustulose ornamentation. Early teleoconch whorls ornamented with strong, opisthocyrtic axial ribs, absent on later ontogenetically whorls. Base convex, umbilicus absent. Peristome oval.

Remarks. — The genus *Hudlestoniella* is traditionally placed in the extinct family Pseudomelaniidae (*e.g.* Cossmann 1909; Beisel 1983). The type of protoconch and pitted microornamentation found on the shells of *H. undulata* described below suggest relation rather to rissoinids, especially genus *Zebina*.

Range. — Bathonian (Middle Jurassic) to Valanginian (Early Cretaceous).

Hudlestoniella undulata (Tullberg, 1881)

(Fig. 11)

1881 *Eulima undulata* sp. n.; Tullberg 1881: 10, pl. 2: 24–25.

Holotype: Tullberg 1881: pl. 2: 26–27.

Type horizon: Unspecified Late Jurassic.

Type locality: Skodde Bay, Novaja Zemlja Islands, Russia.

Material. — Eight juvenile specimens from Sevierno-Timanskaja, boreholes 7, 213 and 218, Timan region, Russia, unspecified Late Jurassic.

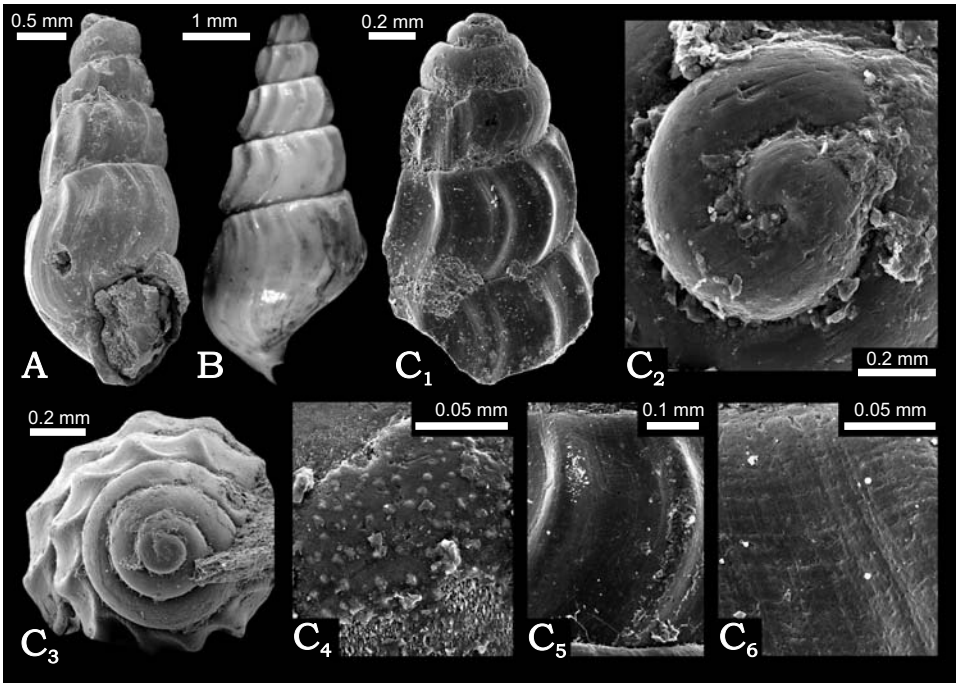

Fig. 11. *Hudlestoniella undulata* (Tullberg, 1881) from Timan region and Novaja Zemlja Island, Late Jurassic. **A**. ZPAL Ga.10/26 from Sevierno-Timanskaja, borehole 7, Timan region, Russia; lateral view. **B**. Holotype of Tullberg (1881), NRM Mo.1182 from Skodde Bay, Novaja Zemlja Island, Russia (light photograph, specimen not coated); lateral view. **C**. ZPAL Ga.10/22 from Sevierno-Timanskaja, borehole 218, Timan region, Russia; C_1 lateral view, C_2 close-up of the initial whorl in apical view, C_3 apical view, C_4 details of protoconch ornamentation, C_5 details of teleoconch ornamentation, C_6 close-up of the pitted spirae ornamenting teleoconch.

Measurements. — The protoconch, consisting of 3.5 whorls, is 0.67 mm high and 0.64 in diameter. The shell (ZPAL Ga. 10/22) consisting of about 5.5 whorls is 0.67 mm high and 0.91 mm in diameter.

Occurrences. — Late Jurassic to Early Cretaceous of northern Russia.

Emended diagnosis. — Protoconch low spired ornamented with small pustules. Demarcation between protoconch and teleoconch clearly visible. Terminal part of protoconch with dense opisthocline growth lines. Early teleoconch ornamented with strong axial ribs and fine spiral spirae composed of small pits. After fifth to sixth teleoconch whorl axial ribs being weak or absent.

Description. — The protoconch 1 is not clearly demarcated from the protoconch 2. The growth lines on the late teleoconch are weakly opisthocyrtic.

Remarks. — The specimens from Timan are very similar to the holotype of Tullberg (1881) from Novaja Zemlja (Russia). The holotype is a teleoconch without protoconch but with well visible axial ribs on the juvenile whorls (Fig. 11B). The shell shape and ornamentation of the protoconch of *H. undulata* are similar to

the ones of Jurassic *Bralitzia*. The pattern of teleoconch microornamentation composed of pitted spirae is similar to that of Early Cretaceous and Recent *Zebina* (Kaim 2004). For comparison to other species of *Hudlestoniella*, see Beisel (1983).

Hudlestoniella pusilla (Tullberg, 1881)
(Fig. 12)

1881 *Eulima pusilla* sp. n.; Tullberg 1881: 10, pl. 2: 24–25.
1983 *Hudlestonella pusilla* Tullberg, 1881; Beisel 1983: 63, pl. 2: 9–20.
Holotype: Tullberg 1881: pl. 2: 24–25.
Type horizon: Unspecified Late Jurassic.
Type locality: Skodde Bay, Novaja Zemlja Islands, Russia.

Material. — One incomplete shell from Saranpaulskaja, borehole 28-u, Western Siberia, Russia, Valanginian (Early Cretaceous); one incomplete shell from

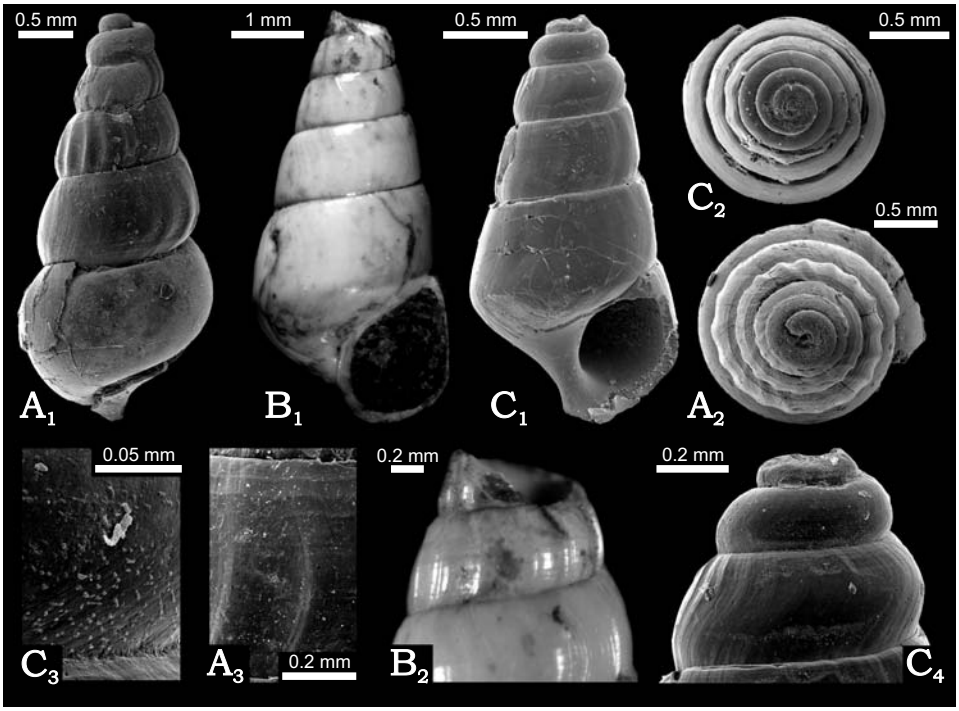

Fig. 12. *Hudlestoniella pusilla* (Tullberg, 1881) from Western Siberia and Novaja Zemlja Islands. **A**. ZPAL Ga.10/72 from Levaja Bojarka River, outcrop 25, Western Siberia, Russia, Volgian (Late Jurassic); A_1 lateral view, A_2 apical view, A_3 details of teleoconch ornamentation. **B**. Holotype of Tullberg (1881), NRM Mo.1179B from Skodde Bay, Novaja Zemlja Islands, Russia, unspecified Late Jurassic (light photographs, specimen not coated); B_1 lateral view, B_2 close-up of the apex in lateral view. **C**. ZPAL Ga.10/43 from Saranpaulskaja, borehole 28-u, Western Siberia, Russia, Valanginian (Early Cretaceous); C_1 lateral view, C_2 apical view, C_3 details of protoconch ornamentation, C_4 close-up of the protoconch in lateral view.

Levaja Bojarka River, outcrop 23 of Zakharov (1970), Volgian (Late Jurassic); two incomplete shells from Sevierno-Timanskaja, borehole 7, unspecified Late Jurassic.

Measurements. — The shell (ZPAL Ga.10/43) consisting of about 5.5 whorls is 2.43 mm high and 1.25 mm in diameter.

Occurrences. — Late Jurassic to Early Cretaceous of northern Russia.

Emended diagnosis. — Protoconch low spired ornamented with small pustules. Demarcation between protoconch and teleoconch clearly visible. Last part of protoconch with dense opisthocline growth lines. Early teleoconch ornamented with broad, weak axial ribs and fine spiral lirae. Since second-third teleoconch whorl axial ribs absent.

Description. — The shell is turriculate with weakly convex whorls. Protoconch 1 is not preserved. The growth lines are weakly opisthocyrtic. The umbilicus is absent. The peristome is incomplete preserved. The axial ribs are weakly developed or absent on some specimens.

Remarks. — *Hudlestoniella pusilla* differs from *H. undulata* in having weaker developed axial ribs and weak spiral lirae instead of spiral spirae which are present at the latter species. For differences with other species of *Hudlestoniella* the reader is referred to paper by Beisel (1983).

Superfamily Stromboidea Rafinesque, 1815
Family Aporrhaidae Gray, 1850
Genus *Drepanocheilus* Meek, 1864

Type species: *Rostellaria americana* Evans and Shumard, 1857 (= *Drepanocheilus evansi* Cossmann, 1904); original designation, Maatrichtian (Late Cretaceous), Sage Creek, Nebraska, United States.

Diagnosis. — Medium-sized high-spired shells with convex whorls. Ornament dominated by axial ribs on spire but developing two or more strong spiral cords at and below periphery on terminal whorl. Upper cord extending onto upturned narrow spur of expanded outer lip. Anterior canal short (from Sohl 1960).

Discussion. — *Drepanocheilus* differs from other aporrhaid genera by its strong spiral cords restricted to the terminal whorl. Destombes (1984) illustrated two types of protoconchs as belonging to *Drepanocheilus*. The first type (text-fig. 1: 4) looks similarly to the protoconchs of *Anchura* (see below) while the other one (text-fig. 1: 5), that is carinated at the lower portion of the whorls, is of a type unknown yet.

Range. — Aptian (Early Cretaceous) to Eocene (Paleogene).

Drepanocheilus tanamensis Beisel, 1991
(Figs. 13)

1881 *Drepanocheilus tanamensis* sp. n.; Beisel 1991: 180, pl. 28: 5–6.

Holotype: Beisel 1991: pl. 28: 5.

Type horizon: Tanama Formation, Maastrichtian, Late Cretaceous.

Type locality: Tanama River, outcrop 7, stratum 2, Western Siberia, Russia.

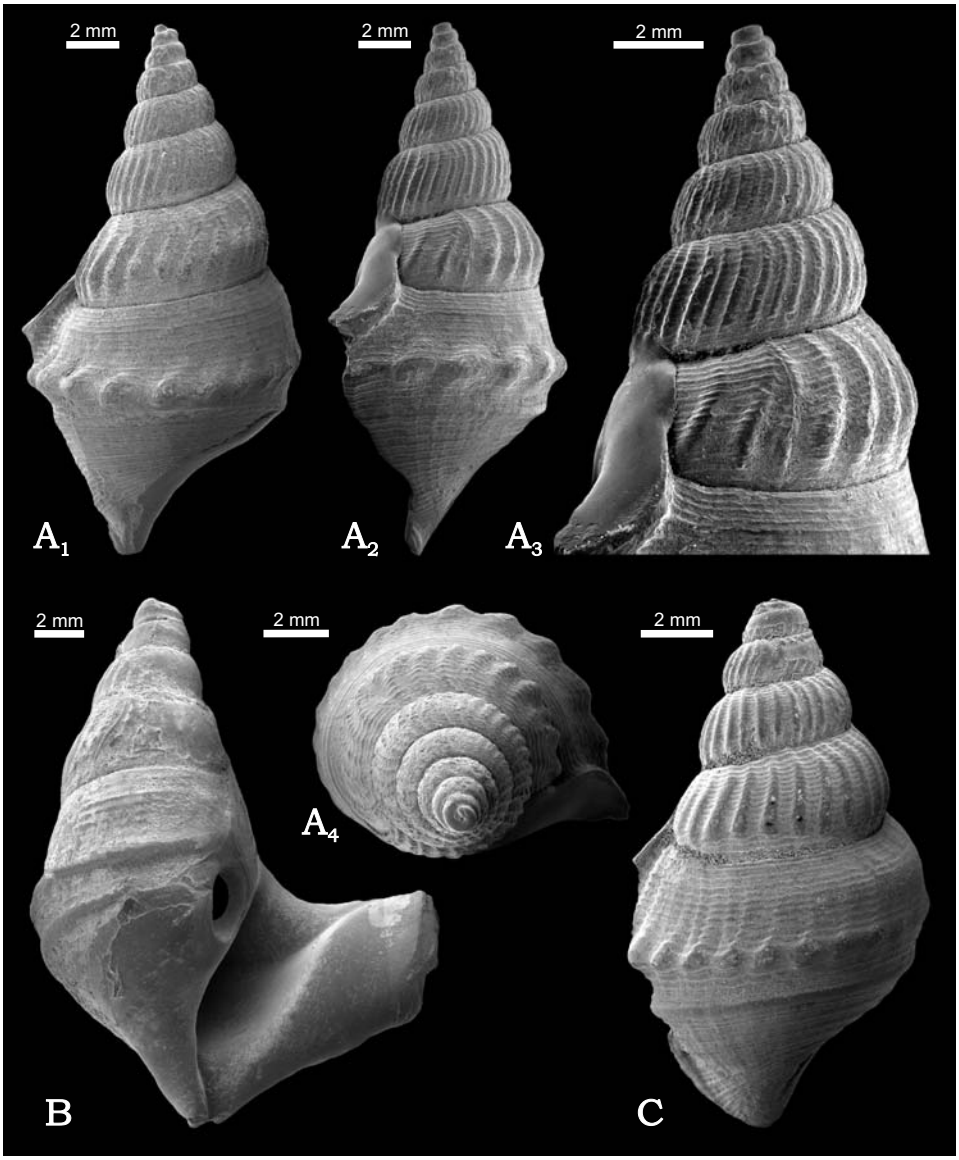

Fig. 13. *Drepanocheilus tanamensis* Beisel, 1991 from Narymskaja, borehole 28-k, Western Siberia, Russia, Maastrichtian (Late Cretaceous). **A**. ZPAL Ga.10/32; A_1–A_2 lateral views, A_3 close-up of the apex in lateral view, A_4 apical view. **B**. ZPAL Ga.10/31; lateral view. **C**. ZPAL Ga.10/30; lateral view.

Material. — Three specimens from Narymskaja , borehole 28-k, Western Siberia, Russia, Gankin Formation, Maastrichtian (Late Cretaceous).

Measurements. — The shell (ZPAL Ga.10/32) consisting of about seven teleoconch whorls is 20.15 mm high and 10.46 mm in diameter (expansion of the outer lip is not included).

Occurrences. — Maastrichtian (Late Cretaceous) of Western Siberia, Russia.

Emended diagnosis. — Shell small (up to 13 mm), whorls rounded, ornamented with strong spiral and weak axial ribs. On terminal whorl two keels appearing. Adapical one stronger and ornamented with oblique nodes transformed from axial ribs. Abapical keel weaker, smooth.

Description. — The protoconch is not preserved. The peristome has posterior extension of the outer lip. The siphonal canal is weak. The inner lip is thin, wide. The anterior channel is short.

Remarks. — The *D. tanamensis* is most similar to *D. evansi* Cossmann, 1904, the former differs in wider shell, stronger nodes on the adapical keel and weaker abapical keel.

Genus *Anchura* Conrad, 1860

Type species: *Anchura abrupta* Conrad, 1860; monotypy. Maastrichtian (Late Cretaceous) of Coon Creek Tongue, Mississippi, United States.

Diagnosis. — Medium to large, high-spired shell with ornate sculpture of strong axial and spiral elements, commonly noded. Aperture lenticular with long and narrow anterior rostrum, straight or bent anteriorly. Outer lip expanding into an anterior-posteriorly extended lateral edge with upper, posteriorly directed spine and lower, anteriorly directed lobe or blunt spine. Some taxa with medial, secondary spine on posterior margin of outer lip and in some cases also proximal spine adjacent to spire (from Dockery 1993).

Discussion. — According to Destombes (1984) at least some species of *Drepanocheilus* have carinate protoconch while the protoconch of *Achura* has rounded whorls. The juvenile teleoconch whorls of *Anchura* and *Drepanocheilus* are very similar and it may suggest common origin of both genera as already suggested by Kiel and Bandel (2002).

Range. — Albian (Early Cretaceous) to Maastrichtian (Late Cretaceous).

?*Anchura* sp.

(Fig. 14A–B)

Material. — Three juvenile shells from Narymskaja, borehole 18-k and one specimen from Vasjuganskij, borehole pr-1 2-k, Western Siberia, Russia, Maastrichtian (Late Cretaceous).

Measurements. — The protoconch with 3.5 whorls is 1.16 mm high and 1.16 mm in diameter. The shell (ZPAL Ga.10/34) with about four teleoconch whorls is 4.59 mm high and 2.70 mm in diameter.

Description. — Shell high spired with rounded whorls. Protoconch with 3.5 obtusely conical whorls, smooth. Demarcation between protoconch 1 and 2 not clearly visible. Transition from protoconch to teleoconch is gradual. Growth lines in this zone are opisthocline. Teleoconch is ornamented with weakly opisthocline axial ribs and numerous spiral ribs. Spiral ribs are flat-topped and they pass over the axial ribs.

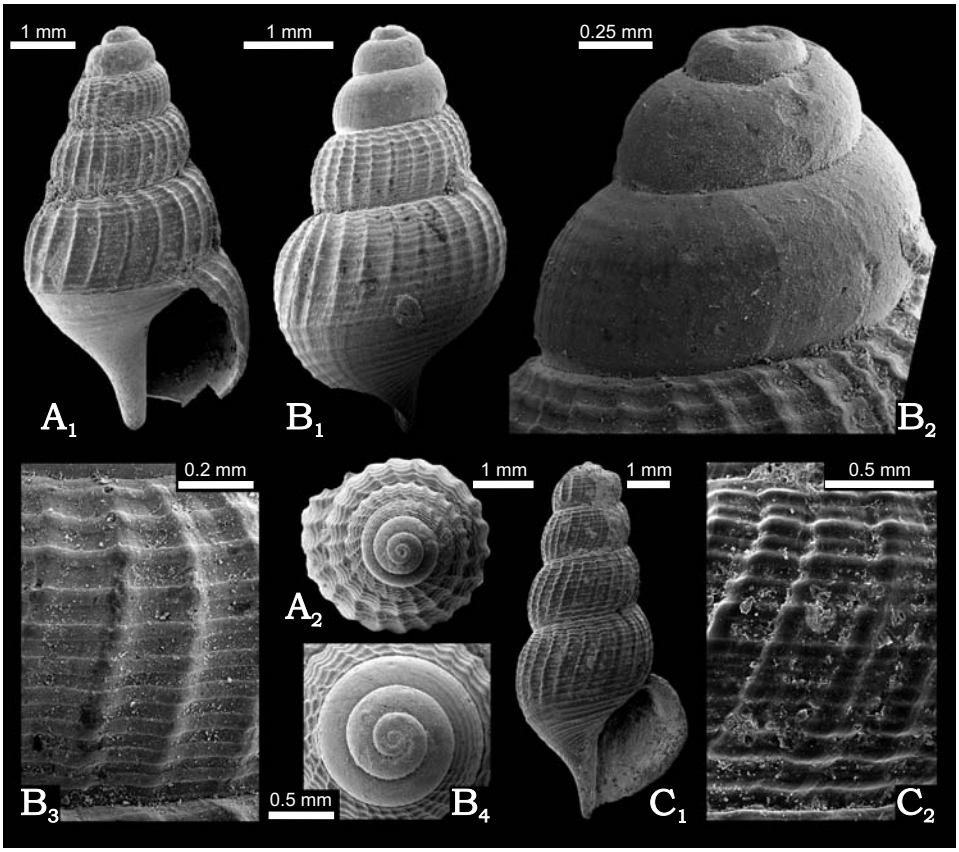

Fig. 14. ?*Anchura* sp. and Aporrhaidae gen. et sp. indet. from Western Siberia, Russia. **A**. ?*Anchura* sp. from Vasjuganskij, borehole 2-k, Maastrichtian (Late Cretaceous), ZPAL Ga.10/36; A_1 lateral view, A_2 apical view. **B**. ?*Anchura* sp. from Narymskaja, borehole 28-k, Maastrichtian (Late Cretaceous), ZPAL Ga.10/34; B_1 lateral view, B_2 protoconch in lateral view, B_3 details of teleoconch ornamentation, B_4 protoconch in apical view. **C**. Aporrhaidae gen. et sp. indet. from Nizhnaja Agapa River, Early Turonian (Late Cretaceous), ZPAL Ga.10/37; C_1 lateral view, C_2 details of teleoconch ornamentation.

Remarks. — Shell shape and pattern of ornamentation of this species are similar to many species of *Anchura* and we prefer to leave them unnamed. The early whorls of *Drepanocheilus* differ by their stronger axial ribs and by spiral ribs that do not cover the axial ribs.

Gen. et sp. indet.

(Fig. 14C)

Material. — One incomplete shell from Nizhnaja Agapa River, outcrop 17 of Lebedeva and Zverev (2003), Western Siberia, Russia, *Inoceramus labiatus* Zone, Early Turonian (Late Cretaceous).

Measurements. — The shell (ZPAL Ga.10/37) consisting of about four teleoconch whorls is 8.37 mm high and 4.09 mm in diameter.

Description. — The shell is high spired with rouded whorls. The protoconch is not preserved. The teleoconch is ornamented by opisthocline axial ribs and numerous fine spiral ribs. The axial ribs are absent at the base. The last whorl is preserved with incipient expansion of outer lip. The anterior part of the peristome is incomplete.

Remarks. — The expansion of the outer lip indicates subadult stage at small size. We could not identify the genus to which the shell belongs. Possibly it belongs to minute *Anchura* or other genus of Aporrhaidae.

Superfamily uncertain

Family uncertain

Genus *Dzikella* Kaim, 2004

Type species: *Dzikella trammeri* Kaim, 2004; monotypy. Valanginian (Early Cretaceous), Wąwał, southern Mazowsze, Poland.

Emended diagnosis. — Shell slender. Protoconch of about 2–3.5 rounded whorls with delicate, pustulose ornamentation. Demarcation between protoconch and teleoconch with thickened opisthocline outer lip. Teleoconch ornamented by strong axial ribs and weak spiral lirae (modified after Kaim 2004).

Discussion. — See Kaim (2004).

Range. — Valanginian (Early Cretaceous) to Maastrichtian (Late Cretaceous).

Dzikella chuzikensis sp. n.

(Fig. 15)

Holotype: ZPAL Ga.10/38, Fig. 15C.

Type horizon: Gankin Formation, Late Maastrichtian (Late Cretaceous).

Type locality: Parabel-Chuzik, borehole 4-k, interval 285.85–296.85, Western Siberia, Russia.

Derivation of the name: After type locality.

Material. — Five shells from the type locality.

Measurements. — Protoconch 1 of the holotype consisting of about 0.75 whorls is 0.14 mm in diameter. The protoconch, consisting of 3.5 whorls, is 0.60 mm high and 0.49 in diameter. The largest specimen found (ZPAL Ga.10/39) consists of 8.0 whorls and is 5.20 mm high and 2.00 mm in diameter.

Occurrences. — Type locality only.

Diagnosis. — Shell slender 2.6 times as high as broad. Protoconch high-spired, whorls rounded, ornamented with pustules. Growth lines of protoconch opisthocyrtic. Teleoconch whorls rounded, ornamented with strong axial ribs and weak spiral lirae. Spiral lirae bearing row of small pits.

Description. — Demarcation between protoconch and teleoconch fractured. The number of spiral lirae changes from three to eight during ontogeny. There is

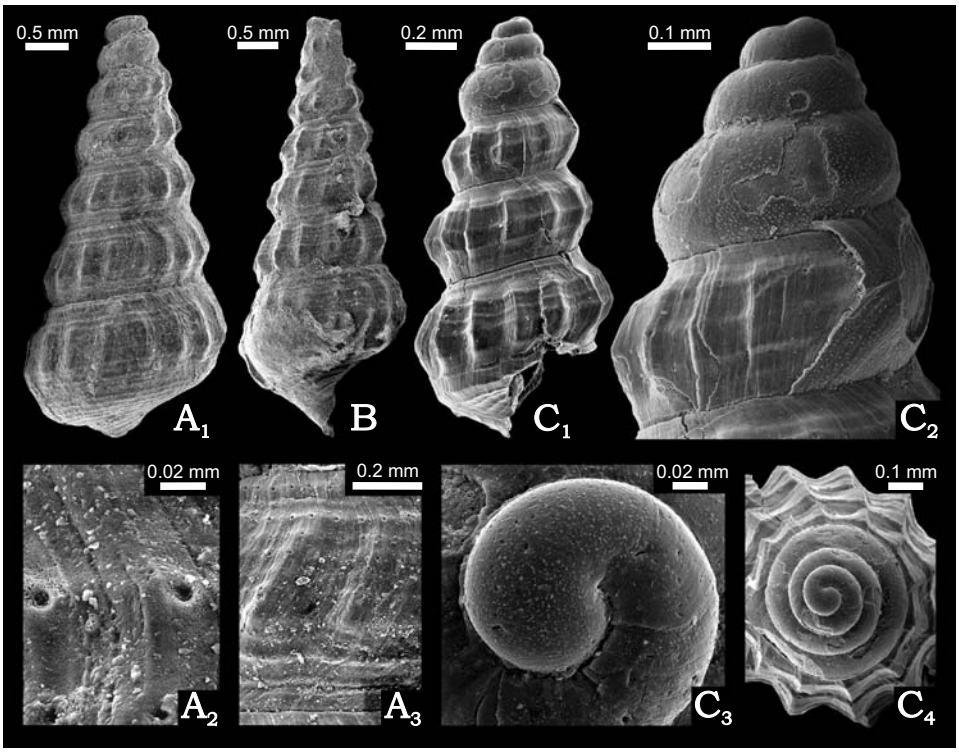

Fig. 15. *Dzikella chuzikensis* sp. n. from Parabel-Chuzik, borehole 4-k, Western Siberia, Russia, Maastrichtian (Late Cretaceous). **A**. ZPAL Ga.10/40; A_1 lateral view, A_2 close-up of the holes on teleoconch, A_3 details of teleoconch ornamentation. **B**. ZPAL Ga.10/39; lateral view. **C**. ZPAL Ga.10/38 (holotype); C_1 lateral view, C_2 protoconch in lateral view, C_3 protoconch 1 in apical view, C_4 apical view.

13–15 axial ribs per whorl. At the intersections of axial and spiral ornamentation weak nodes appear.

Remarks. — *Dzikella chuzikensis* is similar to Valanginian (Early Cretaceous) *Dzikella trammeri* Kaim, 2004 from Poland. The former differs in having more protoconch whorls, abrupt demarcation between protoconch and teleoconch, and a row of small pits on every spiral lirae of teleoconch whorls.

Discussion

The assemblage of Siberian gastropods from Late Cretaceous (mainly Maastrichtian) is of cosmopolitan character. The genera described here are known from most outcrops of this age from US Gulf Coast (*e.g.* Sohl 1960, 1964; Dockery 1993), US Pacific Coast (Stewart 1930; Popenoe 1983; Saul 1983; Elder and Saul 1996; Saul 1998), Dakota and Wyoming (Sohl 1967; Erickson 1974), Europe (*e.g.*

Table 1

A list of the species described in this paper with localities and their geological age.

No.	Species	Locality	Age
	Family Trochidae		
1	*Chuelskia siberica* sp. n.	Chuelskaja	Valanginian
2	?*Amberleya* sp.	Nizhnaja Agapa	Turonian
3	?*Onkospira* sp.	Vasjuganskij	Maastrichtian
	Family Turritellidae		
4	*Turritella turbinae* Beisel, 1991	Kutuzovka	Maastrichtian
		Krasnyj Agronom	
		Plodorody	
	Family Ampullinidae		
5	?*Naricopsina* sp.	Narymskaja	Maastrichtian
6	Gen. et sp. indet. 1	Yatrija	Valanginian
7	Gen. et sp. indet. 2		
8	Gen. et sp. indet. 3	Mys Cvietkova	Ladinian
	Family Epitoniidae		
9	*Ageria gankinensis* sp. n.	Krasnyj Agronom	Maastrichtian
	Family Rissoidae		
10	*Hudlestoniella undulata* (Tullberg, 1881)	Sevierno-Timanskaja	unspecified Late Jurassic
11	*Hudlestoniella pusilla* (Tullberg, 1881)	Levaja Bojarka	Volgian
		Saranpaulskaja	Valanginian
	Family Aporrhaidae		
12	*Drepanocheilus tanamensis* Beisel, 1991	Narymskaja	Maastrichtian
13	?*Anchura* sp.	Narymskaja	
		Vasjuganskij	
14	Gen.et sp. indet.	Nizhnaja Agapa	Turonian
	Family uncertain		
15	*Dzikella chuzikovensis* sp. n.	Parabel-Chuzik	Maastrichtian

Binkhorst 1861; Kaunhowen 1887; Holzapfel 1888; Abdel-Gawad 1986; Kiel and Bandel 2002) and other regions (Kiel 2002 and references therein). Although many of the Siberian gastropods we classify in the genera known from other regions (*Anchura*, *Drepanocheilus* and *Turritella*) but they are usually represented by endemic species.

The older, Late Jurassic and Early Cretaceous gastropods of Siberia have some common genera with European part of Russia and Europe (e.g. *Ageria*, *Hudlestoniella* and *Dzikella*) but they are represented in Siberia by endemic species. We described one new genus *Chuelskia* from Valanginian of Chuelskaja borehole.

The Late Jurassic gastropods from Timan are represented mostly by numerous specimens of *Hudlestoniella pusilla* and *H. undulata*, species which are already known from an adjacent area of Novaja Zemlja Islands (Tullberg 1881). The Upper Jurassic strata reached by boreholes in the Timan region most probably closely corresponds to the ones outcropped on the Novaja Zemlja Islands.

Acknowledgements. — The visits in 1997 and 2000 of A. Kaim to Novosibirsk were possible due to exchange programme of Polish and Russian Academies of Sciences. The examination of Tullberg's (1881) types in Naturhistoriska Riksmuseet in Stockholm, Sweden (2003) was possible due to HighLat Programme (European Community – Access to Research Infrastructure Action of the Improving Human Potential Programme) to A. Kaim, who also thanks to A. Warén for many hours of discussing the taxonomy and phylogeny of gastropods during this visit. The paper greatly benefitted from peer reviews of S. Kiel and R.L. Squires.

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Received 25 May, 2004
Accepted 3 November, 2004