

A New Species of the Genus *Bellazona* (Gastropoda) from the Early Permian Reef Limestones of Shakhtau

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Abstract—A new species *Bellazona acuta* sp. nov., is described from the Early Permian reef limestone of Shakhtau (southern Cisuralia). This find significantly expands the geochronological range of the genus *Bellazona*, which was formerly believed to be limited to the Mississippian of the southwestern United States. The morphology of *Bellazona* and a closely related genus *Cerithioides* is discussed.

Keywords: Gastropoda, *Bellazona*, *Cerithioides*, morphology, systematic, Paleozoic, Mississippian, Permian, Asselian Stage

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INTRODUCTION

A new species of the genus *Bellazona* is described in this paper. This genus was established by Gordon and Yochelson (1987) based on the type species from the Upper Mississippian of the southwestern USA. Until recently, the genus *Bellazona* was represented by two species, *B. bella* (Walcott, 1884) and *B. polita* Gordon et Yochelson, 1987. According to the correlation scheme proposed by Korn and Titus (2011, text-fig. 4), *B. bella* occurs in the interval of the Viséan of the Chainman Formation (Utah), and also in the interval above the base of the Serpukhovian in the Diamond Peak Formation (Nevada), whereas *B. polita* occurs in the Viséan–Lower Serpukhovian interval of the Chainman Formation.

The find of the new species in the Lower Permian of southern Cisuralia essentially broadens the geochronological and geographical boundaries of *Bellazona*. The geochronological hiatus is around 32 Myr. In this case, the so-called “Lazarus effect” reflects on one hand the incompleteness of the fossil record, and on the other hand shows that the data on the taxonomic diversity of Paleozoic gastropods are clearly insufficient.

In addition, the new species described in this paper allows the diagnosis of the genus *Bellazona* to be emended.

MATERIAL

This paper is based on specimens collected by the present author in the Shakhtau Mountain open cast mine. Shakhtau Mountain is one in a chain of exposed Early Permian reefs, so-called “Bashkirian shikhans.”

A chain of shikhans extends in a north-south direction to the east of Sterlitamak (Fig. 1). Each shikhan is composed of reef limestone and represents a pinnacle reef. Prior to the beginning of the mining, the height of Shakhtau above the ground surface was about 170 m (altitude 360 m). At present, Shakhtau Mountain has been almost completely demolished by the open cast mine.

Specimens described in this paper were collected in the southern part of the quarry between the altitude marks 127 and 155 m. The preliminary estimate of the geological age based on geological exploration profiles is Late Asselian.

Aggregations of faunal remains are found sporadically in the body of the patch-reef. Despite the large amount and diversity of fossils in such aggregations, the total number of samples collected during five expeditions (fall of 2015, spring and fall of 2016, and 2017) was low due to poor preservation. Poor preservation is associated either with hard rocks and the impossibility of extracting of shell from the rock matrix, or with filling of voids left by leached shells with various minerals: most commonly crystals or crusts of calcite and/or ozokerite, less commonly aragonite, gypsum, celestine, and sulphur. Gastropods are found as fossilized shells and imprints. Interestingly, specimens of the same species can be preserved differently within the same block of rock. At present, the gastropod collection studied includes around 560 specimens (coll. no. 5538, housed in the Orlov Paleontological Museum of Paleontological Institute, Russian Academy of Sciences). The casts were made using dental latex.

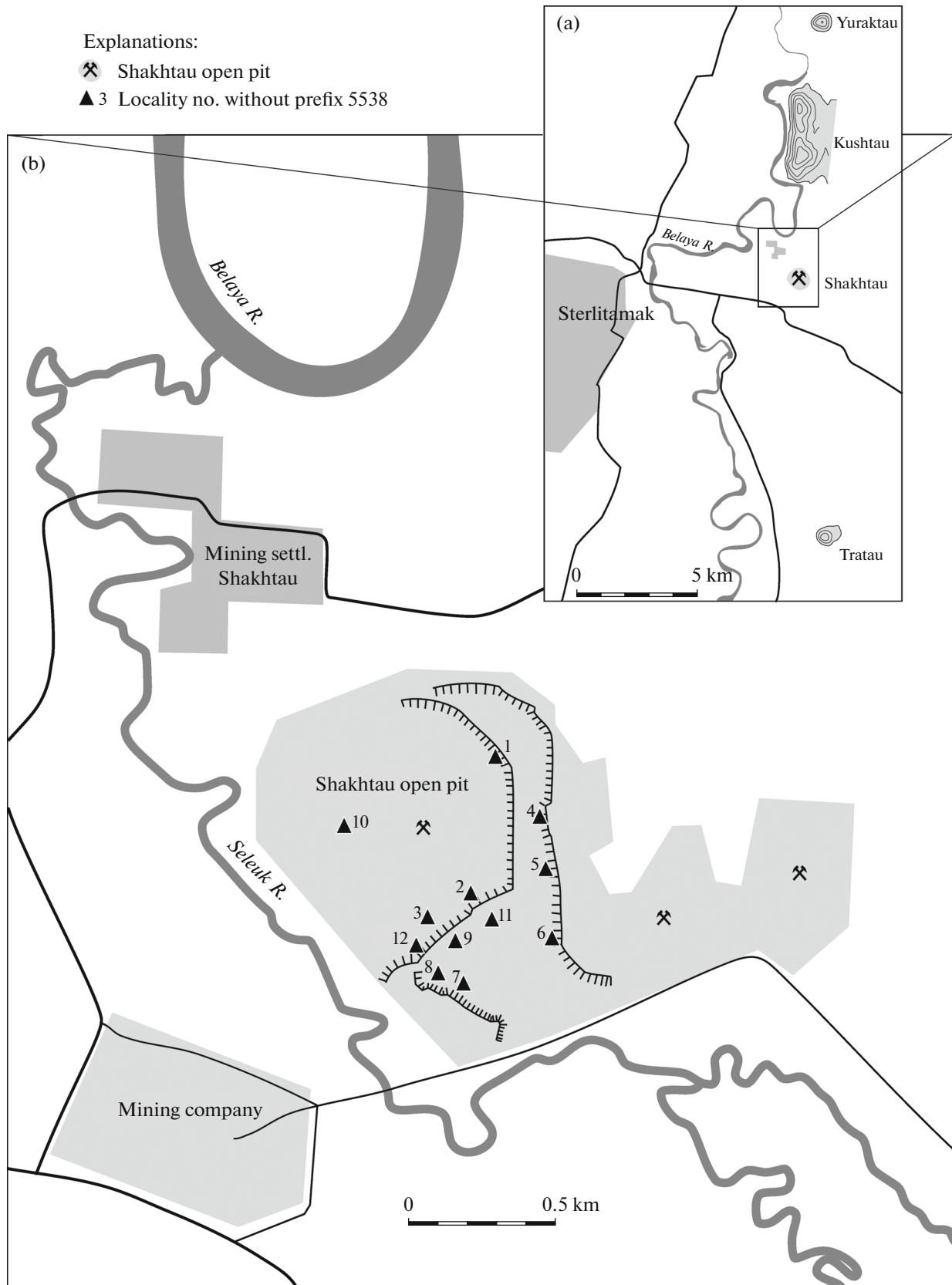


Fig. 1. Map showing the locality of *Bellazona acuta* sp. nov.: (a) position of Bashkirian shikhans: Tratau, Shakhtau, Kushtau, and Juraktau; (b) gastropod localities of the Shakhtau Quarry.

RESULTS AND DISCUSSION

The taxonomy of the genus *Bellazona* in unresolved because the morphology of its protoconch remains unknown, whereas characters of the teleoconch largely coincide with characters of *Cerithioides* Haughton, 1859. The species of *Bellazona* described by Gordon and Yochelson (1987) are distinguished from one another only by the size of the apical angle. Following the logic of the existing uncertainty in the identification of *Cerithioides*, these taxa could be considered as morphotypes of the same species, which in turn can be considered as a species of *Cerithioides*. For instance, in contrast to the diagnosis proposed by Knight et al. (1960), *Cerithioides*, which normally has spiral ornamentation on the basal surface, includes several species with a smooth shell. *Bellazona* also lacks ornamentation, and thus, differences between the genera (with this broadly understood diagnosis of *Cerithioides*) are only observed in the position of the selenizone.

For the third genus from this group *Glyphodeta* Donald, 1895, its type species, *Murchisonia zonata* Donald, 1887, the position of the selenizone as shown by Knight (1941, pl. 45, fig. 6) to be intermediate in position between *Cerithioides* and *Bellazona*, so all three type species of the genera under discussion can be placed in one morphological lineage based on the position of the selenizone.

Knight (1941, p. 132, pl. 45, fig. 6) noted that many characters of *Glyphodeta zonata* (Donald, 1887) described and figured by Donald (1887) are absent in the type material. Even though Donald (later in life Longstaff) rejected the use of *Glyphodeta* as a taxon based on "erroneous characters" (Longstaff, 1926, p. 529). Knight et al. (1960) classified it with the family Murchisoniidae. Later Batten (1966, p. 74, pl. 8, fig. 9) described several specimens of *Glyphodeta zonata* from the Hotwells Limestone. The state of preservation of the specimens he studied was much better than of the type material. They show a basal surface ornamented with wide bands separated by thin grooves. Thus, differences between the type species *Glyphodeta zonata* (Donald, 1887) and *Cerithioides telescopium* Haughton, 1859, which were also studied in detail and described by Batten (1966) are in my opinion species level characters. Furthermore, they correspond to the species-level characters indicated by Batten for the genus *Cerithioides*: "whorl and shell shape, sutural contact position and position of the selenizone on the whorl" (Batten, 1966, p. 77). As previously (Mazaev, 2011), I maintain that *Glyphodeta* is a junior synonym of *Cerithioides*.

Now, characterizing the genus *Bellazona* it is possible to note that firstly, *Cerithioides* shows variation in the position of the selenizone¹, and secondly, species

¹ With a restriction that the upper margin of the selenizone never lies above the mid-whorl.

lacking spiral ornamentation on the basal surface should be excluded from this genus. By thus defining the major characters of *Cerithioides*, it is possible to talk about the separation of *Bellazona* and emend its diagnosis.

SYSTEMATIC PALEONTOLOGY

Family Murchisoniidae Koken, 1896

Genus *Bellazona* Gordon et Yochelson, 1987

Bellazona: Gordon and Yochelson, 1987, p. 80.

Type species. *Loxonema bella* Walcott, 1884, Mississippian, interval above the base of the Serpukhovian, Diamond Peak Formation, Nevada.

Diagnosis. Shell turriform with no umbilicus. Profile of lateral side in early whorls almost straight or weakly convex; in last whorls rounded; basal surface moderately convex, smooth. Lateral surface smooth, subsutural lira developed to a varying extent or absent. Selenizone wide, smooth, straight or slightly convex in cross-section. Selenizone wide, straight or slightly convex in cross-section, delineated by two thin grooves; lying below point of whorl periphery, lower boundary of the selenizone occurring immediately above or below suture. Growth lines above selenizone inclined prosoclinally, below selenizone epistoclinally.

Composition. Two species from the Mississippian of North America, one species from the Lower Permian of Eastern Europe.

Comparison. This genus is distinguished from *Cerithioides* Haughton, 1859 by a combination of two characters: low position of the selenizone and smooth basal surface.

Bellazona acuta Mazaev, sp. nov.

Etymology. From the Latin *acutus* (acute).

Holotype. PIN, no. 5538/7-69, shell imprint. **Paratypes:** nos. 5538/7-146, 5538/6-14, shell imprints; 5538/7-185, fossilized shell: Bashkortostan, open cast mine (quarry) on Shakhtau Mountain (east of Sterlitamak), southern side of the quarry, altitude 150–167 m; Lower Permian, Asselian.

Description. (Fig. 2). The shell is turriform, formed by numerous (at least 12), slowly expanding whorls, with no umbilicus. The suture is thin, channeled, relatively deep. The protoconch is not preserved. The profile of the lateral surface in early whorls is moderately convex. In adult and terminal whorls, the profile of the lateral surface is generally evenly rounded. The transition of the lateral surface to the basal is gradual. The point of the whorl periphery is unstable, at different growth stages is either in mid-whorl, or shifted downward between the mid-flank and the suture. At a gerontic stage, the whorl profile is sharply changed: the distance between the shell axis and selenizone sharply increases, so the last quarter of the whorl, the angle of the upper part of the lateral sur-

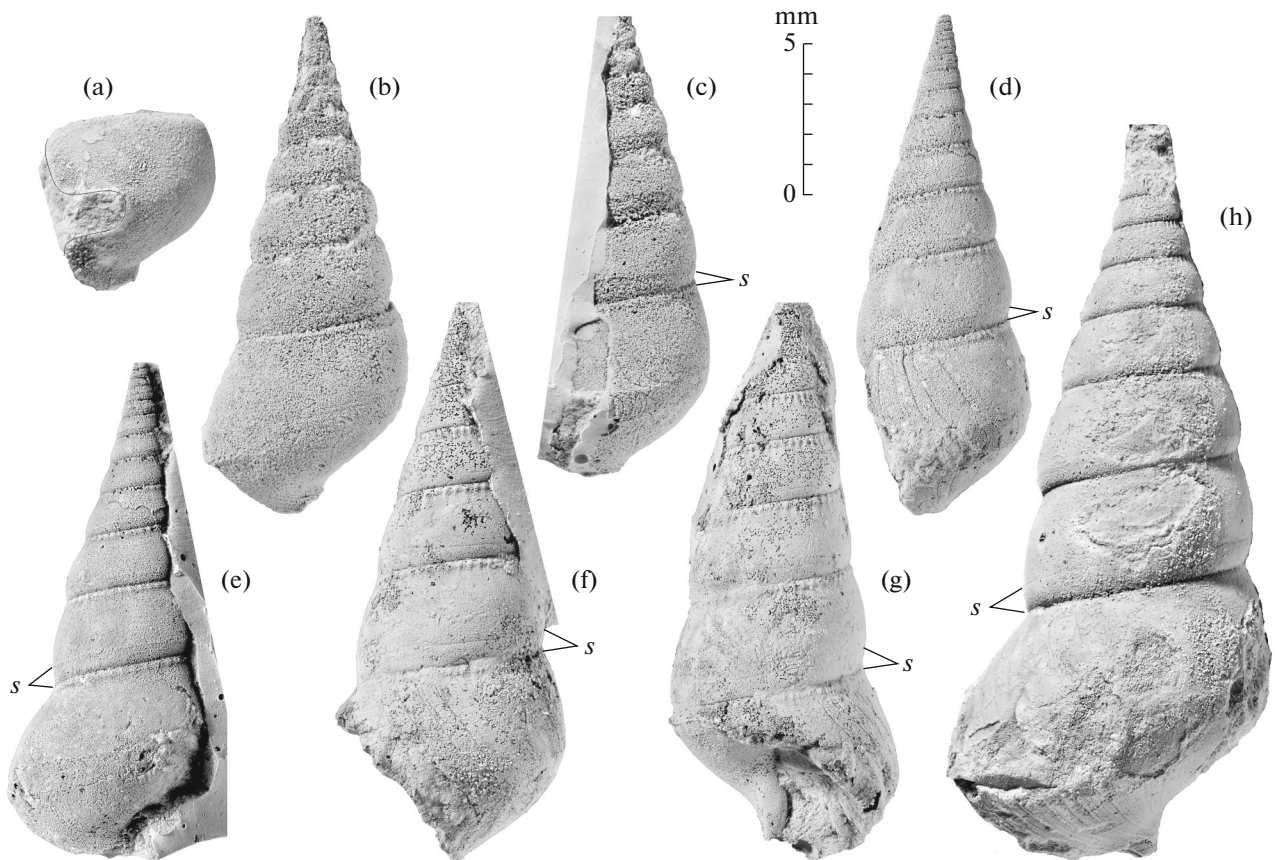


Fig. 2. *Bellazona acuta* sp. nov., x 4: southern wall of the Shakhtau Quarry; Lower Permian, Asselian; (a–c) specimen no. 5538/7-146, paratype, (a) mold with a notch imprint, (b, c) latex casts, imprint of the initial whorls is covered by small calcite crystals; (d, e) specimen no. 5538/6-14, paratype, latex casts; (f, g) specimen no. 5538/7-69, holotype, latex casts; (h) specimen no. 5538/7-185, paratype, fossilized shell. Explanations: (s) selenizone.

face becomes less steep, and the angle of the last half of the whorl changes by 20 degrees. The shell surface is ornamented by a subsutural lira and the selenizone. The subsutural lira is formed beginning approximately from the fifth whorl; it is cordlike in profile, with numerous relatively massive, mainly collabrally elongated nodes. Spaces between the nodes are approximately as wide as the nodes. In the last whorl, the nodes are weakly developed or altogether absent. In some specimens, the subsutural lira is absent in the last whorl. The selenizone is wide, straight or slightly convex in cross-section, smooth, delineated by two thin grooves. At the gerontic stage (less than $\frac{1}{4}$ of the last whorl), it is flat sharply raised over the whorl surface. The lunules are the shape of narrow, deep grooves, separated by very wide spaces. The selenizone lies below the mid-flank, the upper boundary of the selenizone is lower than the periphery point; the lower boundary coincides with the suture. The notch is wide and relatively short. Its length is approximately 1.5 times its width. The basal surface is extended downwards. The columella is long and corkscrew-like. Growth lines are generally absent, but at a gerontic

stage they are very sharp, in the shape of thin, deep grooves separated by very wide spaces; above the selenizone they are weakly convex, sharply bent near the selenizone, and are inclined at about 75° to the selenizone. Below the selenizone they are moderately convex, transiting smoothly to the basal surface, and their shape and angle form a mirror-image of the growth lines on the upper surface of the whorl.

Dimensions in mm:

Specimen no.	Shell height	Maximum diameter
5538/6-14	>16.3	>6.8
5538/7-69	\geq 19.8	>7.7
5538/7-146	>16.5	>6.8
5538/7-185	\approx 27.7	>10.9

Comparison. This species is distinguished from *B. bella* (Walcott, 1884) and *B. polita* Gordon et Yochelson, 1987 by the more strongly elongated shell with more numerous whorls, which are more rounded in cross-section, in the presence of the subsutural lira ornamented by nodes.

O c c u r r e n c e. Type locality.

M a t e r i a l. Altogether 7 specimens: 1 specimen in locality no. 5538/6 and 6 specimens in locality no. 5538/7.

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REFERENCES

- Batten, R.L., The Lower Carboniferous gastropod fauna from the Hotwells Limestone of Compton Martin, Somerset [pts I-II], *Palaeontogr. Soc. Mon.*, (1965), pub. 1966, vol. 119, pp. 1–52; vol. 120, pp. 53–109.
- Donald, J., Notes upon some Carboniferous species of Murchisonia in our public museum, *Q. J. Geol. Soc. London*, 1887, vol. 43, pp. 617–631.
- Gordon, M. and Yochelson, E.L., Late Mississippian gastropods of the Chainman Shale, West-Central Utah, *U.S. Geol. Surv. Prof. Paper*, 1987, vol. 1368, pp. 1–112.
- Knight, J.B., Paleozoic gastropod genotypes. *Geol. Soc. Am. Spec. Pap.*, 1941, vol. 32, pp. 1–510.
- Knight, J.B., Cox, L.R., Keen, A.M., Batten, R.L., Yochelson, E.L., and Robertson, R., Systematic descriptions, in *Treatise on Invertebrate Paleontology, Part I, Mollusca*, Moore, R.C., Ed., Boulder CO–Lawrence KS: Geol. Soc. Am.–Univ. Kansas Press, 1960, pp. 1169–1324.
- Korn, D. and Titus, A.L., *Goniatites* Zone (middle Mississippian) ammonoids of the Antler Foreland Basin (Nevada, Utah), *Bull. Geosci.*, 2011, vol. 86, no. 1, pp. 107–196.
- Longstaff, J., A revision of the British Carboniferous Murchisoniidae with notes on their distribution and description of some new species, *Q. J. Geol. Soc. London*, 1926, vol. 82, pp. 526–555.
- Mazaev, A.V., Pennsylvanian gastropods of the suborders Murchisoniina Cox et Knight, 1960 and Sinuspirina Mazaev subordo. nov. from the central regions of the Russian Platform: morphology, taxonomy, and phylogeny, *Paleontol. J.*, 2011, vol. 45, no. 12, pp. 1533–1599.

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