

Opisthobranch Gastropods from the Lower Cretaceous of the Ulyanovsk Volga Region: 1. Genus *Tornatellaea* Conrad

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Abstract—Five new species of the genus *Tornatellaea* from the Lower Cretaceous of the Volga Region near Ulyanovsk, *T. kabanovi* sp. nov. (Hauterivian), *T. densistriata* sp. nov., *T. gracilis* sp. nov., *T. volgensis* sp. nov. (Barremian), and *T. sinzovi* sp. nov. (Aptian), are described. The data on geographical and stratigraphical distribution of new taxa are provided.

Keywords: Gastropoda, Opisthobranchia, Acteonidae, *Tornatellaea*, Lower Cretaceous, Upper Hauterivian, Barremian, Lower Aptian, Ulyanovsk Region

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INTRODUCTION

Members of the genus *Tornatellaea* are known from the Middle Jurassic to Oligocene inclusive. According to Cossmann (1895), this interval is somewhat wider: Sinemurian–Miocene. The genus flourished in the Cretaceous, where the majority of species have been recorded. Species of the genus evolved rapidly, quite rather abundant, and, hence, can be considered as a promising gastropod group in regard to stratigraphy.

In the Lower Cretaceous of the Volga Region near Ulyanovsk, only one member of this genus has been recorded. It was dated Hauterivian and identified by Trautschold (1865) as *Acteon frearsianus*; later, it was reidentified by Glazunova (1973) as *A. aff. frearsianus*. During the past 15 years, I recognized a number of previously unknown taxa belonging to the genus *Tornatellaea*. Four of them and the taxon mentioned above are described here as new species. In addition, I have got other shells of *Tornatellaea*; however, insufficient preservation or incompleteness of available material prevents identification to species or establishment as new species.

To differentiate between species of the genus *Tornatellaea*, the following characters are most significant:

(1) The number of spiral grooves on the last whorl. This parameter is subject to individual variation and, in some species, changes with age. In the latter case, the secondary grooves (appearing with teleoconch development) are formed between the primary ones. Sometimes, the number of grooves decreases somewhat with age, because they are gradually flattened.

(2) Uniformity of the arrangement of spiral grooves. In the majority of species, the distances

between grooves are almost equal, but sometimes the grooves are positioned irregularly or, with the development of the teleoconch, some grooves disappear to form wide interspaces between neighboring grooves.

(3) Structure of spiral grooves. The grooves are usually cellular, because they are crossed by their col-labral bars; the cells are oval, rectangular, parallelo-gram, hexagonal; sometimes neighboring cells are fused to a greater or lesser extent to form continuous grooves. In some species, all grooves lack a cellular structure. This parameter shows significant age and individual variation. In all species, the grooves are initially continuous, usually becoming cellular on later whorls.

(4) Distance between the columellar folds. Some species are readily distinguished by the widely spaced columellar folds.

(5) The ratio of the shell height to diameter (H/D). This parameter usually considerably increases with age.

(6) The ratio of the last whorl height to shell height. This parameter always decreases with age.

Thus, reliable diagnostics of species requires comparisons of individuals of the same age, obligatory taking into account the spiral ornamentation. However, available published figures are frequently indistinct and do not provide necessary information on ornamentation.

Rosenkrantz (1970) established the subgenus *Ravniella* in the genus *Tornatellaea*; in my opinion, this is a separate genus. On the other hand, in certain works, some members of the genus *Ringinella* d'Orbigny, 1842 (family Ringiculidae) are included in the genus *Tornatellaea*. In particular, Kollmann (2005)

assigned *Ringinella lacryma* (Michelin, 1834) from the Albian of France to this genus. Members of the genus *Tornatellaea* are sometimes included in the genus *Ringicula* Deshayes, 1838 (also family Ringiculidae); for example, this concerns the species *T. matura* described by Schröder (1995) from the Valanginian of Poland. Below the differences of the genus *Tornatellaea* from the above genera are listed and its species composition is emended.

The scheme of shell measurements, explanation of accepted terminology, technique of collecting and data processing, data on the geographical position and investigated Lower Cretaceous sections, and explanation of numbering the beds were provided in the previous studies (Blagovetshenskiy and Shumilkin, 2006, 2012). The protoconch is described using the terminology by Schröder (1995). The nomenclature follows the ideas of Golikov and Kusakin (1978) and Kollmann (2005).

The gastropod shells examined here are stored in the Natural Science Museum of Ulyanovsk State University (ENM UIGU), collection no. 227.

SYSTEMATIC PALEONTOLOGY

SUBCLASS OPISTHOBRANCHIA

Order Cephalaspidea

Superfamily Acteonoidea D'Orbigny, 1842

Family Acteonidae D'Orbigny, 1842

Subfamily Acteoninae D'Orbigny, 1842

Genus *Tornatellaea* Conrad, 1860

Type species. *Tornatellaea bella* Conrad, 1860; United States (Alabama); Eocene.

Diagnosis. Shells small or medium-sized, conical oval. Protoconch ranging from medioaxial to almost coaxial, consisting of approximately one and half whorls, smooth. Last whorl more than half of shell height. Suture channel-like, frequently with small sutural area. Ornamentation composed of spiral grooves, narrower than spaces between them. Grooves crossed by transverse (collabral) bars, forming cells. Cells oval, rectangular, parallelogram, hexagonal; neighboring cells sometimes fused to greater or lesser extent, forming continuous grooves (in some species, all grooves continuous).

Aperture elongated, widened anteriorly and with small incisure. Palatal margin of aperture thickened from inside, smooth or having small denticles. Style (column) having two stout oblique folds. Columellar and parietal parts of aperture (above style) having callus.

Species composition. In addition to the type species, 46 species: *T. albensis* (d'Orbigny, 1842) from the Hauterivian of France; *T. casanovai* Calzada, 1989 from the Aptian of Spain; *T. cingillata* (Terquem et Jourdy, 1869) from the Bathonian of France; *T. cos-*

nensis (Loriol, 1882) from the Albian of France; *T. cretacea* Wade, 1926 from the Maastrichtian of the United States (Tennessee, Mississippi, Texas); *T. densistriata* sp. nov. from the Lower Barremian of Russia (Volga Region near Ulyanovsk); *T. frearsiana* (d'Orbigny, 1845) from the Callovian–Middle Oxfordian of central Russia; *T. funifera* (Loriol, 1882) from the Albian? of France; *T. gazdzickii* (Schröder, 1995) from the Valanginian of Poland; *T. globulosa* Wade, 1926 from the Maastrichtian of the United States (Tennessee); *T. gracilis* sp. nov. from the Lower Barremian of Russia (Volga Region near Ulyanovsk); *T. impressa* (Gabb, 1864) from the Upper Albian–Cenomanian of northern California; *T. kabanovi* sp. nov. from the Upper Hauterivian of Russia (Ulyanovsk Region); *T. kasei* Calzada, 1989 from the Aptian of Spain; *T. lapparenti* Cossmann, 1895 from the Barremian of France; *T. lorieri* (Herbert et Deslongchamps, 1860) from the Bathonian of Germany and Callovian of France; *T. matura* (Schröder, 1995) from the Valanginian of Poland; *T. mendozana* Gründel et al., 2007 from the Middle Tithonian of Argentina; *T. multistriata* (Rigaux et Sauvage, 1869) from the Bathonian–Callovian of northern Germany; *T. ooliticus* (Hudleston, 1896) from the Aalenian–Bathonian of Great Britain; *T. parisiensis* (Deshayes, 1862) from the Thanetian of France (Parisian Basin); *T. pinguis* (Gabb, 1864) from the Cretaceous of California; *T. plicata* Rahman, 1967 from the Upper Cenomanian of Austria; *T. pugilis* (Stoliczka, 1868) from the Upper Senonian of southern India; *T. pulchella* (Eudes-Deslongchamps, 1849) from the Bajocian of France and Bathonian of Germany; *T. quindecimilirata* Darragh, 1997 from the Upper Paleocene of Australia (Victoria); *T. sculptus* (Lycett, 1850) from the Aalenian–Bathonian of Great Britain; *T. semen* (Forbes, 1845) from the Senonian of southern India; *T. simulata* (Solander, 1766) from the Eocene of Belgium and Oligocene of Germany; *T. sinzovi* sp. nov. from the Lower Aptian of Russia (Volga Region near Ulyanovsk); *T. subsemen* Pčelincev, 1953 from the Upper Senonian of Central Asia; *T. surensis* (Gerasimov, 1992) from the Middle Callovian of central Russia; *T. tradanta* Gründel, 2005 from the Callovian of Russia (Saratov Region); *T. triplicata* Kollmann, 1976 from the Middle Albian–Lower Cenomanian of Austria (Losenstein); *T. volgensis* sp. nov. from the Upper Barremian of Russia (Volga Region near Ulyanovsk); *?T. burulcensis* Pčelincev, 1927 from the Hauterivian of Crimea; *?T. catuanensis* (Brown, 1925) from the Albian of Great Britain; *?T. incompta* Finlay et Marwick, 1937 from the Danian of New Zealand; *?T. kongieli* Abdel-Gawad, 1986 from the Maastrichtian of central Poland; *?T. lacrymaeformis* Delpy, 1948 from the Albian of Madagascar; *?T. morbosa* Finlay et Marwick, 1937 from the Danian of New Zealand; *?T. pontica* Pčelincev, 1927 from the Lower Albian of the Caucasus; *?T. saucia* Finlay et Marwick, 1937 from the Danian of New Zealand; *?T. subovalis*

(Marshall, 1917) from the Danian of New Zealand; ?*T. vacavillensis* Bryant et Palmer, 1923 from the Middle Eocene of California; and ?*T. vibrayeana* (d'Orbigny, 1842) from the Albion of France.

Comparison. *Tornatellaea* differs from the genera *Acteon* Montfort, 1810 and *Triploca* Tate, 1893 in the presence of two columellar folds (*Acteon* has one columellar fold and *Triploca* has three). It differs from the genus *Ravniella* Rosenkrantz, 1970 (initially established as a subgenus of the genus *Tornatellaea*) in the absence of the parietal fold (*Ravniella* has three folds, two columellar and one parietal).

Remarks. *Tornatellaea* differs from the genus *Ringicula* Deshayes, 1838, which also has two columellar folds, in the absence of a fold or denticle on the parietal margin, the less thickened and less complicated palatal margin of the aperture, and in the less massive columellar folds. It differs from the genus *Ringinella* d'Orbigny, 1842 in the presence of two entire columellar folds (*Ringinella* has three columellar folds or two, but with the anterior (lower) fold split into two).

Tornatellaea kabanovi Blagovetshenskiy, sp. nov.

Plate 1, figs. 1 and 2

Acteon frearsianus: Trautschold, 1865, p. 18, pl. 3, fig. 11.

Acteon aff. *frearsianus*: Glazunova, 1973, p. 81, pl. 42, figs. 6–9.

Etymology. In memory of the paleontologist K.A. Kabanov.

Holotype. ENM UIGU, no. 227/2; Ulyanovsk Region, 3 km southeast of the village of Novaya Beden'ga; Upper Hauterivian, *Simbirskites decheni* Zone.

Description. The shell is small, up to 10 mm high, conical oval, formed of five to seven slightly con-

vex and rapidly increasing whorls. The elongation index H/D ranges within 1.52–1.92. The last whorl is 0.68–0.82 of the shell height. The ratio of the last whorl width measured above the aperture to the height of the last whorl above the aperture (LWW/HAA) 2.65–3.72. The apical angle of the first three whorls is 88°–91°. At the transition to succeeding whorls, the angle between their sides decreases rapidly and, on the last whorls, the pleural angle in adults is 37°. The tangential line is strongly convex.

The protoconch is smooth, coaxial, consists of one and a half or two whorls. At the end of the second whorl, six or seven weak spiral grooves appear, three or four of them located in the middle part rapidly disappear; and the upper one located just under the suture is slightly strengthened. As a result, there is a space between the upper groove and underlying one (mostly closed by growing whorls), which is retained in later whorls. Three or four grooves are seen on the whorls of the spire, one or two of them are directly above the suture. The last whorl has 13–19 (22) grooves; they mostly occupy lower two-thirds of the last whorl. Spiral grooves are formed of circular, oval, or extended hexagonal cells. Close to the columellar margin of the aperture, they are sometimes covered with callus. The spaces between the grooves vary in width even within the same whorl. The axial ornamentation is only composed of growth lines and crossbars in spiral grooves.

The aperture is relatively narrow, oval or oval-rhombic (AH/AW = 2–2.6), narrowing upwards and slightly expanded and curved downwards. The aperture is 0.47–0.61 of the shell height. The columellar margin of the aperture has two large oblique folds. In addition, it has a thin shining callus, which covers completely the umbo and partly the last whorl surface.

Measurements in mm:

Specimen ENM UIGU, no.	H	D	LWH	AH	AW	NW	NGs	H/D	LWH/H	AH/H	AH/AW
227/1	9.7	5.2	6.7	5.2	—	5*	15	1.81	0.68	0.55	—
227/2 holotype	9.3	4.9	6.7	4.7	1.9	5	14	1.92	0.70	0.49	2.41
227/4	9.2	5.2	7.1	4.6	2.2	4.5	16	1.78	0.76	0.53	2.23
227/5	9.1	5.4	6.4	4.5	1.9	4.5	15	1.76	0.69	0.53	2.63
227/6	8.9	5.1	6.4	4.3	1.9	5	15	1.80	0.69	0.47	2.23
227/7	7.8	4.8	5.8	4.5	2.0	4	13	1.64	0.72	0.57	2.30
227/8	7.1	4.1	5.7	4.1	1.8	4	15	1.73	0.78	0.57	2.31
227/9	6.7	3.8	5.0	3.7	1.7	4.5	14	1.74	0.75	0.56	2.21
227/10	6.7	4.4	5.4	4.1	1.9	4	17	1.53	0.80	0.61	2.16
227/11	6.2	3.7	5.0	—	—	4	22	1.65	0.81	—	—
227/12	5.8	3.7	4.8	3.5	1.7	4	19	1.59	0.81	0.59	2.0
227/13	4.7	3.2	3.9	2.7	1.4	4	18	1.52	0.82	0.59	1.99
227/14	4.7	3.1	3.9	2.8	1.3	4	18	1.55	0.81	0.58	2.20

* Hereinafter: (H) shell length (height), (D) diameter, (LWH) last whorl height, (AH) aperture height, (AW) aperture width, (NW) number of whorls, (NGs) number of spiral grooves, (*) number of preserved whorls.

Age variability. The elongation index H/D (in young shells, $H/D = 1.52\text{--}1.74$; in adults, $1.76\text{--}1.92$) increases with age and LWH/H decreases, $0.72\text{--}0.82$ and $0.68\text{--}0.70$ (0.76), respectively. In the upper part of the last whorl of young specimens, the spiral groove passing directly along the suture separating the last and penultimate whorls is usually retained; in adult shells, it usually disappears.

Individual variation. The number of spiral grooves usually varies from 15 to 18, rarely up to 22 (specimen ENM UIGU, no. 227/11). The cells of spiral grooves vary from circular to oval or extended hexagonal and often are fused to form a continuous groove varying in width.

Comparison. *T. kabanovi* differs from the majority of congeners in the presence of large spaces between grooves in the upper part of the last whorl and on the whorls of the spire. It differs from *T. quindecim-lirata* (Darragh, 1997, p. 82, 83, text-figs. 5C–5H) in the sharply convex last whorl; from *T. gazdzickii* (Schröder, 1995, p. 62, pl. 11, fig. 1–6; Kaim, 2004, p. 155, text-fig. 132) in the greater number of spiral grooves on the last whorl (15–18 against ca. 10 in *T. gazdzickii*); comparison involves specimen 132 A figured by Kaim (2004). The new species differs from *T. mendozana* (Gründel et al., 2007, p. 145, text-fig. 2) in the more extended shell and smaller LWH/H .

Remarks. The assignment of this taxon by Trautschold (1865) and Glazunova (1973) to *Acteon frearsianus* d'Orbigny, 1845 (= *Tornatellaea frearsiana* (d'Orbigny, 1845)) described from the Oxfordian of Volga Region near Kostroma was incorrect, since the last obviously differs in the character of ornamentation marked above (a space between grooves in the upper part of the last whorl and on whorls of the spire is absent). It is remarkable that Kabanov included a photograph of this form in the appendix with the Mesozoic fauna from the vicinity of Ulyanovsk in the monograph by Rogozin (1961), but referred it to as *Acteon* sp., without identification to species.

Occurrence. Upper Hauterivian (*Simbirskites decheni* and *Speetonicerias versicolor* Zone) of the Volga

Region near Ulyanovsk and Chuvashia (Golovina and Guzhov, 2009).

Material. 175 specimens of good and satisfactory preservation from different Upper Hauterivian localities (25 specimens from the *Versicolor* Zone and 150 from the *Decheni* Zone); Ulyanovsk Region.

Tornatellaea densistriata Blagovetshenskiy, sp. nov.

Plate 1, figs. 3 and 4

Etymology. From the Latin *densus* (dense, thick) and *stria* (groove, sulcus); based on densely spaced spiral grooves.

Holotype. ENM UIGU, no. 227/22; Ulyanovsk; Lower Barremian, *Praeoxyteuthis pugio* Zone.

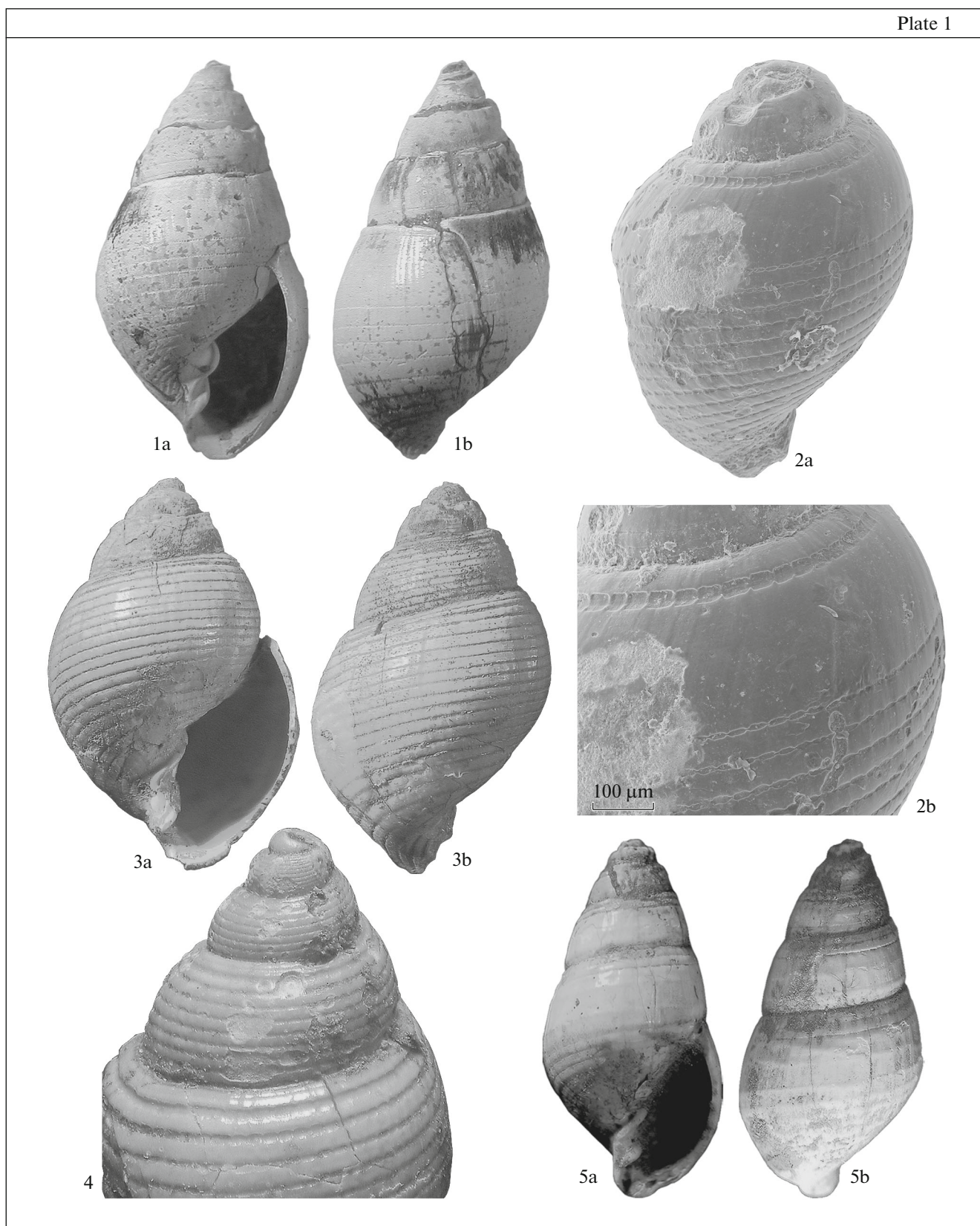
Description. The shell is small, up to 9.3 mm high, widely oval–conical, formed of five or six rapidly increasing convex whorls. The index $H/D = 1.49\text{--}1.82$. The last whorl is $0.73\text{--}0.87$ of the shell height; $LWH/HAA = 2.17\text{--}2.81$. The apical angle of first three whorls is 72° . The pleural angle in adults $50^\circ\text{--}52^\circ$. The tangential line is strongly convex.

The protoconch is smooth, coaxial, consists of at most 1.5 whorls; then, from seven to ten identical spiral grooves appear almost simultaneously. In later whorls of the spire, from eight to ten grooves are seen, of them one or two upper grooves are somewhat more massive. A total of (16) 20–22 regularly arranged spiral grooves are seen on the surface of the last whorl; they are almost equally developed; only one or two upper groove are slightly wider and deeper than the others. The whorls of the teleoconch sometimes have weaker secondary grooves. Spiral grooves are formed of rectangular or oval cells. The cells are usually fused into continuous grooves. The grooves are $0.20\text{--}0.25$ as wide as the spaces between them. The axial ornamentation is formed by growth lines and crossbars in spiral grooves.

The aperture is oval–rhombic ($AH/AW = 1.70\text{--}2.45$), $0.47\text{--}0.62$ of the shell height. The columellar margin of the aperture has two oblique, widely spaced folds.

Measurements in mm:

Specimen ENM UIGU, no.	H	D	LWH	AH	AW	NW	NGs	H/D	LWH/H	AH/H	AH/AW
227/17	9.3	5.6	6.8	5.1	—	4.5	21	1.66	0.73	0.55	—
227/18	8.4	4.7	6.9	4.9	2.0	4	22	1.82	0.80	0.57	2.45
227/19	7.8	4.7	6.0	4.1	2.1	3.9	20	1.69	0.75	0.53	1.96
227/20	7.7	4.7	6.2	4.2	2.1	3.8	20	1.67	0.78	0.53	2.02
227/21	7.0	4.2	5.5	3.8	1.9	4.0	20	1.75	0.78	0.54	2.08
227/22 holotype	7.0	4.4	5.6	4.1	1.9	4.0	20	1.64	0.79	0.58	2.20
227/23	6.3	3.9	4.9	3.6	1.6	3.5	19	1.68	0.78	0.57	2.28
227/24	4.0	2.3	3.1	1.9	0.9	4.2	16	1.79	0.77	0.47	2.10
227/25	2.5	1.7	2.1	1.5	0.9	3.7	20	1.49	0.84	0.61	1.70
227/26	1.9	1.2	1.6	1.2	—	2.5	20	1.58	0.87	0.62	—



Explanation of Plate 1

Figs. 1 and 2. *Tornatellaea kabanovi* sp. nov.: (1) holotype ENM UIGU, no. 227/2, $\times 8$: (1a) apertural view, (1b) opposite view; Ulyanovsk Region, village of Novaya Beden'ga; Upper Hauterivian, *Decheni* Zone; (2) specimen ENM UIGU, no. 227/3, juvenile shell with protoconch: (2a) general view, $\times 50$; (2b) fragment of the upper half of the last whorl, $\times 110$; Ulyanovsk Region, village of Novaya Beden'ga; Upper Hauterivian, *Versicolor* Zone.

Figs. 3 and 4. *Tornatellaea densistriata* sp. nov.: (3) holotype ENM UIGU, no. 227/22, $\times 10$: (3a) apertural view, (3b) opposite view; (4) specimen ENM UIGU, no. 227/27, young shell with protoconch, $\times 25$; Ulyanovsk; Lower Barremian Substage, *Pugio* Zone, Bed br-8.

Fig. 5. *Tornatellaea gracilis* sp. nov., holotype ENM UIGU, no. 227/29, $\times 10$: (5a) apertural view, (5b) opposite view; Ulyanovsk, Lower Barremian Substage, *Pugio* Zone, Bed br-8.

Age variability. Juvenile shells are somewhat shortened ($H/D = 1.49\text{--}1.58$) in comparison with young and adult specimens ($H/D = 1.66\text{--}1.82$) and also slightly greater value of LWH/H , $0.84\text{--}0.87$ and $0.73\text{--}0.80$, respectively.

Individual variability. The majority of the last whorls have 19–22 spiral grooves, but one specimen in the collection has 16.

Comparison. *T. densistriata* distinctly differs from the majority of congeners in the widely oval shell, densely spaced spiral grooves of fused rectangular or oval cells, and the widely spaced columellar folds. It differs from *T. albensis* (d'Orbigny, 1842, p. 120, pl. 167, figs. 10–12; Kollmann, 2005, p. 44–45, 194, pl. 6, fig. 5) in the narrower spiral grooves (in the latter species, the grooves are as wide as spaces between them) and in the rectangular or oval cells of grooves, which are usually fused (in *T. albensis*, the cells are circular). The columellar folds are invisible or only partly visible in the cited figures. The new species differs from *T. casanovai* (Calzada, 1989, p. 16, pl. 2, fig. 8) in the smaller number of spiral grooves on the last whorl (19–22 against 30 in *T. casanovai*) and the oblique columellar folds (in the latter species, they are almost parallel to spiral grooves).

The new species is similar to *T. lapparenti* (Cossmann, 1895, p. 49, pl. 2, figs. 21, 22) in the general shell outline and number of spiral grooves; however, the small figure does not provide data on the character of spiral grooves and columellar folds, complicating a more precise comparison.

Material. Forty-five specimens of good and satisfactory preservation from the *Pugio* Zone of the Lower Barremian Substage, Bed br-8; Ulyanovsk.

Tornatellaea gracilis Blagovetshenskiy, sp. nov.

Plate 1, fig. 5

Etymology. From the Latin *gracilis* (slender, narrow), based on the elongated slender shell.

Holotype. ENM UIGU, no. 227/29; Ulyanovsk; Lower Barremian, *Praeoxysteuthis pugio* Zone.

Description. The shell is small, up to 6.5 mm high, elongated oval–conical, formed of five or six slightly convex whorls. The index H/D ranges within $1.73\text{--}2.04$. The last whorl is 0.7 of the shell height; $LWH/HAA = 2.17\text{--}2.28$. The pleural angle is 29° . The tangential line is moderately convex.

The protoconch is not preserved. The spiral ornamentation is formed of straight or slightly winding continuous grooves, usual without cellular structure; only one specimen (ENM UIGU, no. 227/28) has the upper groove with slightly fused cells. The development of spiral grooves is extremely nonuniform. Whorls of the spire have six (seven) grooves, two (rarely one) upper of which are wide and deep and four lower are very small and narrow. In the last whorl, two upper grooves are retained, while three lower ones disappear, so that the grooves at the last whorl base become visible; thus, the total number of grooves on the last whorl is 10–13. In addition, the last whorl surface has bends passing in places into very low spiral riblets (eight in number). The axial ornamentation is only composed of growth lines.

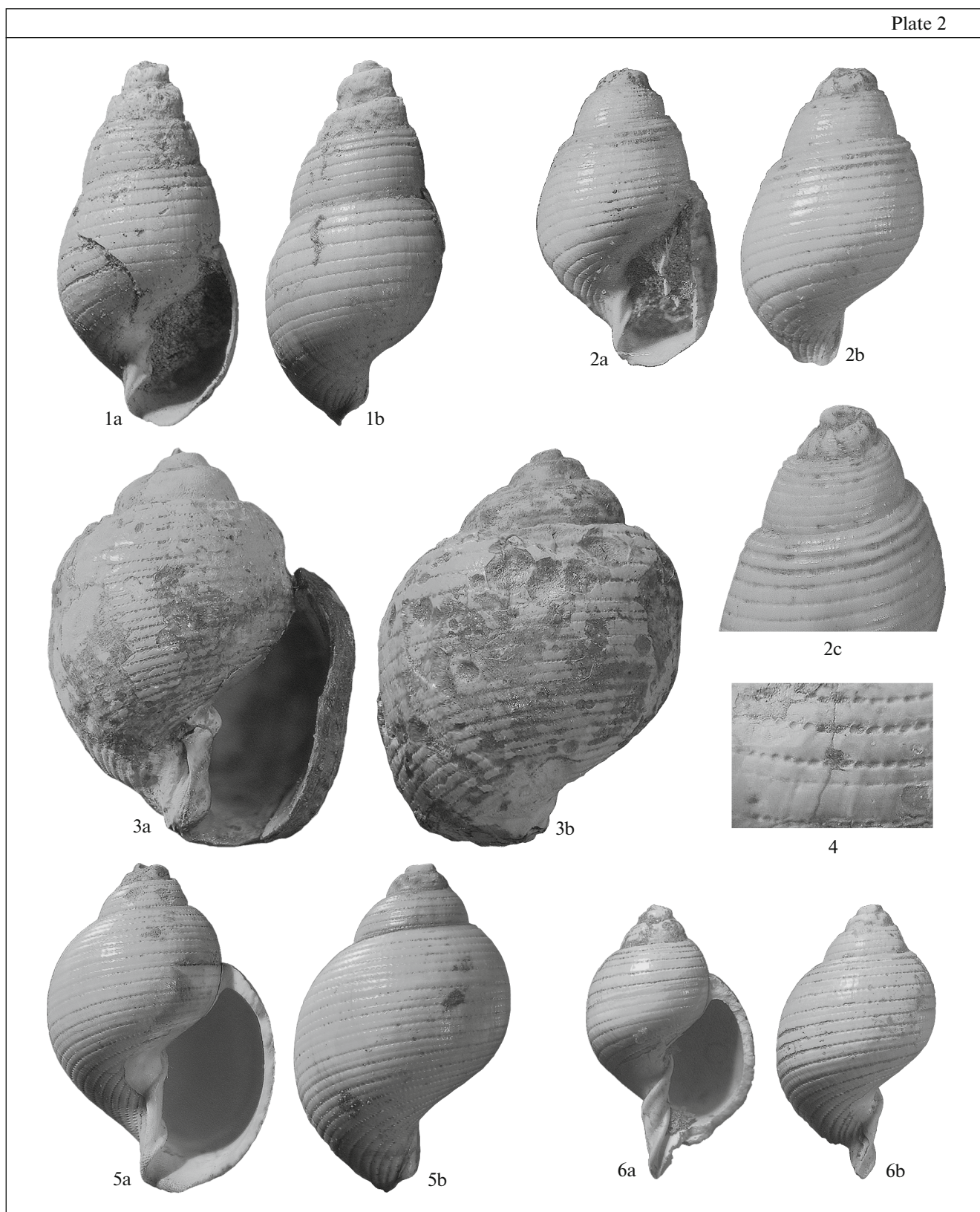
The aperture is relatively narrow, oval–rhombic ($AH/AW = 2.16\text{--}2.37$), narrowing upwards and slightly expanded and curved downwards. The aperture is $0.44\text{--}0.49$ of the shell height. The columellar margin of the aperture has two large oblique folds.

Measurements in mm:

Specimen ENM UIGU, no.	H	D	LWH	AH	AW	NW	NGs	H/D	LWH/H	AH/H	AH/AW
227/29 holotype	6.4	3.2	4.6	2.9	1.2	5	10	2.04	0.71	0.44	2.32
227/30	5.3	3.1	3.8	2.6	1.3	5	13	1.73	0.72	0.49	2.16
227/31	4.9	2.6	3.6	2.4	1.0	4	12	1.98	0.69	0.45	2.37

Comparison. The new species differs from all other species of the genus in the very nonuniform development of spiral grooves and the absence in

them of cellular structure; in addition, it differs from the majority of congeners in the more elongated shell.



Explanation Plate 2

Figs. 1 and 2. *Tornatellaea volgensis* sp. nov.: (1) holotype ENM UIGU, no. 227/36, $\times 12$: (1a) apertural view; (1b) opposite view; (2) specimen ENM UIGU, no. 227/40, juvenile shell with protoconch: (2a) apertural view, $\times 20$; (2b) opposite view, $\times 20$; (2c) top view with displacement, $\times 25$; Ulyanovsk Region, village of Kremenki; Upper Barremian Substage, *Lahuseni* Zone, Bed br-10.

Figs. 3–6. *Tornatellaea sinzovi* sp. nov.: (3) holotype ENM UIGU, no. 227/44, adult shell, $\times 8$: (3a) apertural view, (3b) opposite view; (4) specimen ENM UIGU, no. 227/43, fragment of the upper part of the last whorl with ornamentation, $\times 20$; (5) specimen ENM UIGU, no. 227/50, young shell, $\times 10$: (5a) apertural view, (5b) opposite view; (6) specimen ENM UIGU, no. 227/52, juvenile shell with partly preserved protoconch, $\times 12$: (6a) apertural view; (6b) opposite view; Ulyanovsk Region, Novoulyanovsk, clay mine; Lower Aptian, *Volgensis* Zone, *Schilovkensis* Subzone, Bed a-8.

Material. Nine specimens of good and satisfactory preservation from the *Pugio* Zone of the Lower Barremian Substage; Ulyanovsk.

Tornatellaea volgensis Blagovetshenskiy, sp. nov.

Plate 2, figs. 1 and 2

Etymology. From the Volga River.

Holotype. ENM UIGU, no. 227/36; Ulyanovsk Region, village of Kremenki; Upper Barremian Substage, *Oxyteuthis lahuseni* Zone.

Description. The shell is small, up to 7 mm high, elongated oval–conical, formed of five or six rapidly increasing slightly convex whorls. The index $H/D = 1.59–2.11$; the last whorl is 0.69–0.85 of the shell height; $LWH/HAA = 1.92–2.44$. The apical angle of the first three whorls is 75° . The pleural angle in adults is $29^\circ–32^\circ$. The tangential line is slightly convex.

The protoconch is smooth, coaxial, consists of approximately one and a half whorls; then, there are

seven or eight (rarely six) more or less equally developed spiral grooves. Succeeding whorls of the spire have three or four upper grooves, which become wider and deeper than others, then are weakened again and, on the last whorl of adult shells, only slightly differ from underlying grooves (usually only two upper grooves are slightly wider and deeper). A total of (13) 14–17 (19) spiral grooves are observed on the last whorl; they are more or less regularly distributed over its surface. Spiral grooves are formed of quadrate and oval cells or look like a rhombus and parallelogram. The cells are usually fused to some extent, forming continuous grooves. The axial ornamentation is only formed of growth lines and crossbars in spiral grooves.

The aperture is relatively narrow, oval–rhombic ($AH/AW = 1.79–2.38$), 0.46–0.60 of the shell height. The columellar margin of the aperture has two oblique folds.

Measurements in mm:

Specimen ENM UIGU, no.	H	D	LWH	AH	AW	NW	NGs	H/D	LWH/H	AH/H	AH/AW
227/32	7.1	3.6	5.0	3.2	1.5	4	14	1.97	0.71	0.46	2.14
227/33	6.9	3.7	5.1	3.4	1.7	4.2	17	1.94	0.71	0.48	2.02
227/34	6.3	3.2	4.6	3.0	1.4	4	17	2.11	0.70	0.47	2.3
227/35	5.6	2.8	4.0	2.9	1.4	4	15	2.09	0.69	0.50	2.15
227/36 holotype	5.4	2.6	3.9	2.6	1.2	4.1	14	2.13	0.69	0.46	2.18
227/37	5.3	2.9	4.0	2.7	1.1	3.5	13	1.84	0.75	0.51	2.38
227/38	4.5	2.8	3.5	2.4	1.3	3.5	16	1.71	0.75	0.51	1.89
227/39	3.5	2.1	2.8	2.0	0.9	4	15	1.69	0.80	0.56	2.1
227/40	2.7	1.6	2.3	1.6	0.8	4	19	1.63	0.85	0.60	1.98
227/41	2.6	1.7	2.2	1.4	0.8	3	18	1.59	0.84	0.54	1.79

Age variability. The ratio H/D increases with age (in juvenile and young specimens, it is 1.59–1.71; in adults it, 1.84–2.13) and LWH/H decreases (0.75–0.84 and 0.69–0.75, respectively). In juvenile shells, the number of grooves on the last whorl is somewhat greater (18–19).

Individual variability. The number of spiral grooves on the last whorl of adult shells varies from 13 to 17.

Comparison. The new species is distinguished from the majority of other species of the genus by the

more elongated shell; it differs from *T. gracilis* sp. nov., also having an elongated oval shape, in the more strongly and regularly arranged spiral grooves. It differs from *T. matura* (Schröder, 1995, p. 69, pl. 13, figs. 1–4, 15; Kaim, 2004, p. 156, text-fig. 133) in the coaxial protoconch (in *T. matura*, it is medioaxial), the strongly fused cells of spiral grooves, and in the less developed columellar folds.

Material. 109 specimens of good and satisfactory preservation from the *Lahuseni* Zone of the Upper Barremian; Ulyanovsk Region.

Tornatellaea sinzovi Blagovetshenskiy, sp. nov.

Plate 2, figs. 3–6

Etymology. In memory of the geologist and paleontologist I.F. Sintsov.

Holotype. ENM UIGU, no. 227/44; Ulyanovsk Region, Novoulyanovsk, clay mine; Lower Aptian, *Deshayesites volgensis* Zone, *Volgoceratoides schilovkensis* Subzone.

Description. The shell is small, up to 10 mm high, widely oval–conical, formed of five or six rapidly increasing convex whorls. The index $H/D = 1.33–1.48$; the last whorl is $0.79–0.85$ of the shell height; $LWH/HAA = 1.76–2.37$. The apical angle of the first three whorls is 82° . The pleural angle in adults is 89° . The tangential line is slightly convex, almost straight.

The protoconch is smooth, coaxial, preserved only partly. In the first whorl of the spire of the teleoconch, four grooves are formed; then, secondary (intermediate) grooves appear between them and above, becoming stronger on succeeding whorls of the spire; at the level of the third and fourth whorls they are already indistinguishable from the primary grooves and reach

five or six (rarely eight) in number. Further, new grooves are formed between these grooves and, in large specimens, the last whorl of the spire has up to 12 grooves. On the last whorl of subjuvenile and adult shells, the number of grooves usually varies from 26 to 30, but in young shells, intermediate grooves are less developed than the main grooves and, in adults, they are almost identical; the spaces between grooves are more or less identical in width.

Spiral grooves are formed of quadrate, circular, oval, and elongated oval cells. The secondary grooves arising during development of the teleoconch initially look like small continuous flutes, but later gradually become cellular in structure. The axial ornamentation is only composed of growth lines and crossbars in spiral grooves.

The aperture is oval rhombic ($AH/AW = 1.76–2.37$). The aperture is $0.56–0.68$ of the shell height. The folds on the columellar margin of the aperture are spaced very widely. In adults, the palatal margin of the aperture is thickened.

Measurements in mm:

Specimen ENM UIGU, no.	H	D	LWH	AH	AW	NW	NGs	H/D	LWH/H	AH/H	AH/AW
227/43	9.9	6.9	7.7	—	—	4.3	26	—	—	—	—
227/44 holotype	8.9	6.7	7.5	6.2	2.6	3.5	26	1.35	0.82	0.68	2.37
227/45	8.4	6.2	6.8	5.4	2.5	4	29	1.41	0.79	0.62	2.11
227/42	7.4	5.7	6.3	4.2	2.4	3.8	30	1.33	0.84	0.56	1.76
227/47	7.1	4.8	6.0	4.6	—	4	28	1.44	0.83	0.64	—
227/48	6.7	4.8	6.0	4.6	2.1	4.3	29	1.41	0.88	0.68	2.2
227/49	6.6	4.6	5.7	4.5	2.1	4.2	24	1.45	0.84	0.67	2.14
227/50	5.8	4.0	5.1	3.7	1.8	3.5	27	1.48	0.85	0.62	2.03
227/51	5.4	4.1	4.8	3.6	2.0	2	23	—	—	—	1.80
227/52	4.1	2.5	3.6	—	—	3	17	1.61	0.87	—	—

Age variability. The number of spiral grooves increases with age due to the formation of the secondary grooves; in a juvenile shell (specimen ENM UIGU, no. 227/52), the last whorl has 17 grooves and adults have up to 30. Initially, all grooves are smooth, but then become cellular in structure. The ratio H/D decreases somewhat with age.

Individual variation. The number of spiral grooves on the last whorl of adult and young shells varies from 23 to 30.

Comparison. The new species differs from congeners in the unusually widely spaced columellar folds, distinctive development of the spiral ornamentation, and in the widely oval shell.

Occurrence. Lower Aptian of the Volga Region near Ulyanovsk.

Material. Thirty-eight specimens of good and satisfactory preservation from the *Volgensis* (*Schil-*

ovkensis Subzone) and *Deshayesi* (*Renauxianum* Subzone) zones of the Lower Aptian; Ulyanovsk and Ulyanovsk Region.

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