

New Species of the Genus *Filites* Počta in Barrande (Bryozoa) from the Emsian (Lower Devonian) of Salair

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Abstract—The new bryozoan species *Filites vulgaris* Udodov, *F. regularis* Mesentseva, *F. bakharevi* Mesentseva, and *F. fragilis* Udodov are described from the Akarachkino Quarry in vicinity of Gurievsk (Salair), from a series of alternating argillaceous-carbonate shale and detrital, slightly argillaceous limestones of Emsian age (*serotinus* zone). In this series there are reticulate colonies of fenestellids in rock-forming abundance (over 20 species belonging to 12 genera). The bryozoan burial is autochthonous, hence, entire colonies and rather large fragments of colonies, including members of the genus *Filites*, have been preserved.

Keywords: bryozoans, Fenestellida, *Filites*, Devonian, Emsian Stage, Salair

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INTRODUCTION

Bryozoans of genus *Filites* Počta in Barrande, 1894 (order Fenestellida) are extremely rare in the Devonian. The type species of this genus, *F. bohemicus* Počta in Barrande (McKinney and Kříž, 1986; Morozova, 2001), is described from the Lower Emsian (Zlichov Limestone) of the Czech Republic, while *Filites* sp. was described from the upper part of the Emsian Stage (*serotinus* conodont zone) of the South Tien-Shan (Nekhorosheva and Mesentseva, 2011). Only one species is known from the Middle Devonian, *F. gaetulus* Ernst and Königshof, from the Upper Givetian of Western Sahara (Ernst and Königshof, 2010).

The genus *Filites* probably includes a specimen from the Devonian of the Rudnyi Altai (vicinity of Zmeinogorsk, Melnichnye Sopki; Eifelian), described as *Pinnatopora* (?) sp. (Krasnopeeva, 1962, p. 26). Krasnopeeva's paper has a drawing of a very small fragment of a colony (Plate II, fig. 5) and a brief description including some characters of the genus *Filites*: "... Two rows of cells trapezoidal in section are present on the main and side bars. Near the base, the cells have a rounded section". However, Plate II, fig. 5 shows not only the trapezoidal section of the autozoecial chambers, but also a triangular one.

Lower and Middle Devonian (Eifelian) Deposits are exposed on the eastern slope of the Salair Ridge (Salair) (Yolkin et al., 2005). Bryozoans of the order Fenestellida are extremely irregularly represented in

the Devonian sections in the area of Gurievsk. No fenestellids have been found in Lochkovian and Pragian deposits, despite careful searching. The Lower Emsian (*kitabicus* conodonts zone) contains occasional fragments of bryozoans belonging to the genera *Hemitrypa* Phillips, 1841 and *Semifenestella* L. Nekhorosheva, 1989, and also fragments of colonies of the genera *Rectifenestella* Morozova, 1974 and *Semicoscium* Prout, 1859, unidentifiable to species. Up the section, fragments of the fenestellid fossilized reticulum (one species of the genus *Semicoscium*) were found in the *excavatus* (*Fenestella* sp.) and *nothoperbonus* conodont zones. The most favorable conditions for the habitat of fenestellids in the marine basin in the territory of Salair were in the late Emsian (*serotinus* conodont zone). Deposits of this age are exposed, in particular, in the Akarachkino Quarry in the vicinity of Gurievsk (Yolkin et al., 2005). In section 2.IIb (=E-829, Stratotipicheskie ..., 1987), located in the northeast side of the Akarachkinsky quarry, the authors collected a bryozoan assemblage prominently dominated by fenestellids (Yolkin et al., 2005).

Their generic and species diversity is very large: *Fenestella* Lonsdale, 1839, *Rectifenestella*, *Hemitrypa*, *Spinofenestella* Termier et Termier, 1971, *Filites*, *Rarifenestella* Morozova, 1974, *Eosemicoscium* Morozova, 1987, *Semifenestella*, *Reteporina* D'Orbigny, 1849, *Semicoscium*, *Septopora* Prout, 1859, *Polyporella* Simpson, 1895 (over 20 species).

Beds 3 and 5 of the 2.IIb section shows an alternation (ca. 50%) of black argillaceous-carbonate shale

Table 1. Statistics for *F. vulgaris* Udodov, sp. nov

	NM	M	3/4	L
Width of main branches	10	0.47	0.45–0.50	0.39–0.55
Width of lateral branches	10	0.30	0.28–0.31	0.25–0.35
Angle between the main and the lateral branches	15	70	65–75	60–80
Distance between the centers of adjacent lateral branches	15	0.85	0.78–1.03	0.60–1.25
Distance between the centers of autozooeal apertures along the length of a branch	10	0.28	0.25–0.31	0.20–0.35
Width of the chambers of autozooeum	10	0.12	0.11–0.13	0.10–0.14

and usually thin beds of dark gray to black fine-grained, detrital, weakly argillaceous limestone (Stratotipicheskie..., 1987). The bryozoan burial is autochthonous, as even very fragile fenestellid colonies with attachment structures are preserved. The diversity of fenestellids of this locality will be described in subsequent papers.

Below we describe four new species of the genus *Filites*, which we discovered in the *serotinus* Zone of Salair. In the tables included in the descriptions of the species, we list sizes of the main morphological characters (mm). Abbreviations: NM is the number of measurements, M is the modal value, 3/4 the interval of values included in 75%, L indicated the limits of the values of a character. The studied collection of bryozoans is housed at the Siberian State Industrial University (SibGIU), coll. no. 17.

SYSTEMATIC PALEONTOLOGY

Order Fenestellida

Family Fenestellidae King, 1849

Genus *Filites* Počta in Barrande, 1894

Filites vulgaris Udodov, sp. nov.

Plate 8, figs. 1 and 2

Etymology. From the Latin *vulgaris* (commonly known).

Holotype. SibGIU, no. 17/2; Salair, vicinity of Gurievsk; Lower Devonian, Emsian Stage, Shandian regional Substage (*serotinus* Zone).

Description (Table 1). The colony is pinnate. The slightly bent main branches in one plane, alternately, at an angle of 65°–75° give rise to numerous thinner free lateral bars. Per 5 mm on one side of the main branch, there are 5.5–6.5 lateral branches and voids between them. All branches consist of two rows of alternating autozooea. Chambers of autozooea in the median tangential section are rounded-triangu-

lar, and in the deeper section are trapezoidal in shape. The carina is zigzag-shaped; no nodes are observed. The autozooeal apertures are round, oval, 0.08–0.10 mm wide. The main branch has 2–3, sometimes one aperture of an autozooeum between adjacent lateral branches. The peristome of the autozooeal apertures contains from seven to 14 nodes with a diameter of about 0.014–0.021 mm. The frontal and dorsal surfaces of the branches are covered with rows of numerous microstyles with a diameter of 0.010–0.014 mm; on the frontal surface, the diameter of microstyles is sometimes up to 0.021 mm.

Comparison. *F. vulgaris* sp. nov. differs from *F. bohemicus* Počta in Barrande from the Lower Emsian of the Czech Republic (McKinney and Kříž, 1986) in the width of the main branches (0.45–0.50 mm instead of 0.40–2.00 mm), the lateral branches (0.28–0.31 mm instead of 0.37 mm), the angle between the main and lateral branches (65°–75° instead of about 90°), the distance between the centers of the mouths of autozooea (0.25–0.31 mm instead of 0.21 mm).

Occurrence. Lower Devonian, Emsian Stage, Shandian Regional Substage (*serotinus* Zone), Salair

Material. Apart from the holotype, three specimens (eight thin sections): SibGIU nos. 17/1–4, Salair, vicinity of Gurievsk, section 2.IIb, Beds 3–5.

Filites regularis Mesentseva, sp. nov.

Plate 8, figs. 3, 4; Plate 9, fig. 1

Etymology. From the Latin *regularis* (regular).

Holotype. SibGIU, no. 17/5; Salair, vicinity of Gurievsk; Lower Devonian, Emsian Stage, Shandian Regional Substage (*serotinus* Zone).

Description (Figs. 1a, 1b, 1c; Table 2). The colony is pinnate formed by branches of several orders. Straight main branches give rise in one plane to alternating thinner free lateral branches, at an angle of

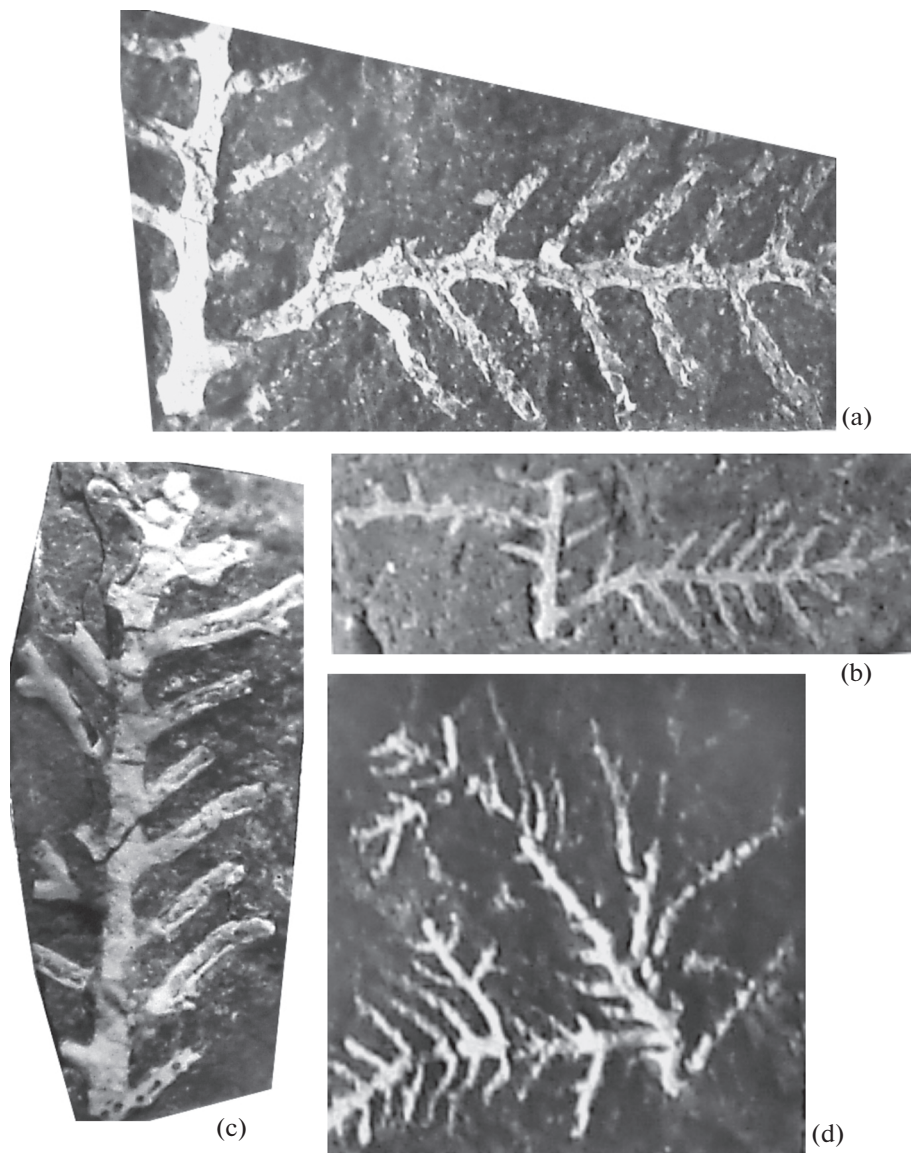


Fig. 1. Bryozoan colony form *Filites* Počta in Barrande: (a–c) *Filites regularis* Mesentseva, sp. nov., (a–b) holotype SibGIU, no. 17/5, (a) fragment of a colony $\times 10$; (b) the same, $\times 4$; (c) paratype SibGIU, no. 17/6, fragment of a colony, $\times 10$; (d) *Filites bakharevi* Mesentseva, sp. nov., paratype SibGIU, no. 17/10, fragment of a colony $\times 6$.

50° – 70° ; some are long and also have alternating lateral branches. There are 4.5–5 lateral branches and voids between them per 5 mm on one side of the main branches. The main and side branches consist of two rows of alternating autozooea. The autozooeal chambers are rounded triangular in the middle tangential section, and in the deeper section are trapezoidal. The carina is zigzag-shaped, with one row of nodes (?) measuring 0.06×0.08 mm; the distance between the nodes is 0.69 mm. The apertures of the autozooea are round, oval, 0.10–0.12 mm wide; the peristome has 18–19 nodes with a diameter of about 0.010 mm. The main branch possesses 2–3 autozooeal apertures of between adjacent lateral branches.

The frontal and dorsal surfaces of the branches are covered with rows of microstyles with a diameter of 0.010–0.021 mm. The thickness of the main branch is 0.55–0.58 mm.

Comparison. *F. regularis* sp. nov. differs from *F. gaetulus* Ernst et Königshof from the Upper Givetian of Western Sahara (Ernst et Königshof, 2010) in the complex structure of the pinnate colony, the width of the main (0.43–0.58 mm instead of 0.35–0.49 mm) and lateral (0.28–0.43 mm instead of 0.22–0.28 mm) branches and the distance between the centers of the lateral branches (0.95–1.1 mm instead of 0.66–1.05 mm), the width of the autozooeal chambers (0.110–0.130 mm instead of 0.115–0.150 mm), the dis-

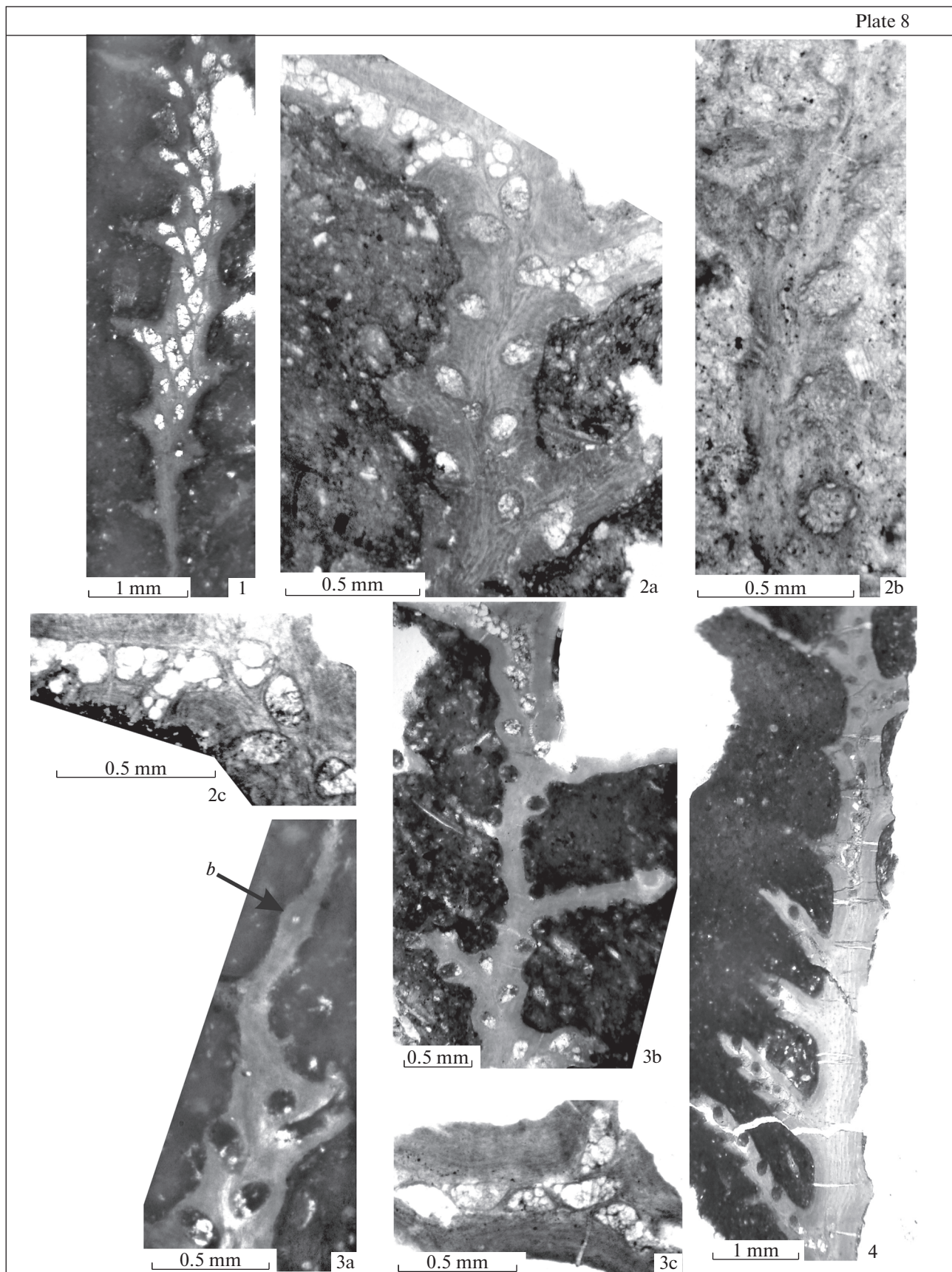


Table 2. Statistics for *Filites regularis* Mesentseva, sp. nov.

	NM	M	3/4	L
Width of main branches	25	0.48–0.53	0.43–0.58	0.40–0.78
Width of lateral branches	12	0.37	0.28–0.43	0.28–0.43
The angle between the main and lateral branches	25	60	50–70	45–88
Distance between centers of neighboring lateral branches	10	1.0	0.95–1.1	0.95–1.3
Distance between the centers of the autozooeccial apertures along the length of the branch	15	0.39	0.36–0.42	0.34–0.50
Width of the autozooeccial chambers	16	0.11	0.11–0.13	0.10–0.14

Table 3. Statistics for *Filites bakharevi* Mesentseva, sp. nov.

	NM	M	3/4	L
Width of main branches	4	0.72	0.65–0.78	0.65–0.78
Width of lateral branches	25	0.33	0.25–0.40	0.18–0.50
The angle between the main and lateral branches	16	55	50–70	45–84
Distance between centers of neighboring lateral branches	20	0.58	0.53–0.68	0.45–0.70
Distance between the centers of the autozooeccial apertures along the length of the branch	20	0.33	0.30–0.35	0.23–0.38
Width of the autozooeccial chambers	5		0.08–0.09	0.08–0.09

tance between the centers of autozooeccial apertures along the length of the branch (0.36–0.42 mm instead of 0.23–0.37 mm), as well as the fewer tubercles in the peristome of autozooeccial apertures (18–19 instead of 18–24).

Occurrence. Lower Devonian, Emsian Stage, Shandian Regional Substage (*serotinus* Zone), Salair.

Material. Apart from the holotype, four specimens (seven thin sections): SibGIU nos. 17/5–9, Salair, vicinity of Gurievsk, section 2.IIb, Beds 3–5.

Filites bakharevi Mesentseva, sp. nov.

Plate 9, fig. 2

Etymology. After the geologist and stratigrapher Nikolay Kirillovich Bakharev.

Holotype—SibGIU, no. 17/11; Salair, vicinity of Gurievsk; Lower Devonian, Emsian Stage, Shandian regional Substage (*serotinus* Zone).

Description (Fig. 1d; Table 3). The colony is pinnate, formed by branches of several orders. The main branches give rise in one plane to oppositely set thinner lateral branches of various lengths, extending at an angle of 50°–70°, the longest of which also have oppositely set lateral branches. Per 5 mm on one side of the main branches, there are 7–9 lateral branches and spaces between them. The main and lateral branches consist of two rows of alternating autozooeccia. The shape of the autozooeccial chambers is rounded triangular and trapezoidal. The carina is zigzag-shaped, and no nodes were observed. The apertures are oval, the peristome is very narrow, without nodes. The width of autozooeccial apertures is 0.07–

Explanation of Plate 8

Figs. 1, 2. *Filites vulgaris* Udodov, sp. nov.: (1) paratype SibGIU, no. 17/1: tangential section; (2) holotype SibGIU, no. 17/2: (2a) tangential section; (2b) tangential section, nodes in the peristome of autozooeccial apertures; (2c) tangential section, showing the shape of the autozooeccial chambers. Salair, vicinity of Gurievsk; Lower Devonian, Emsian Stage, Shandian Regional Substage.

Figs. 3, 4. *Filites regularis* Mesentseva, sp. nov.: (3) holotype SibGIU, no. 17/5: (3a) tangential section, frontal surface, carinal nodes; (3b) tangential section, frontal surface, shape of autozooeccial apertures; (3c) tangential section, the shape of the autozooeccial chambers; (4) paratype SibGIU, no. 17/6: tangential section; location and age are the same.

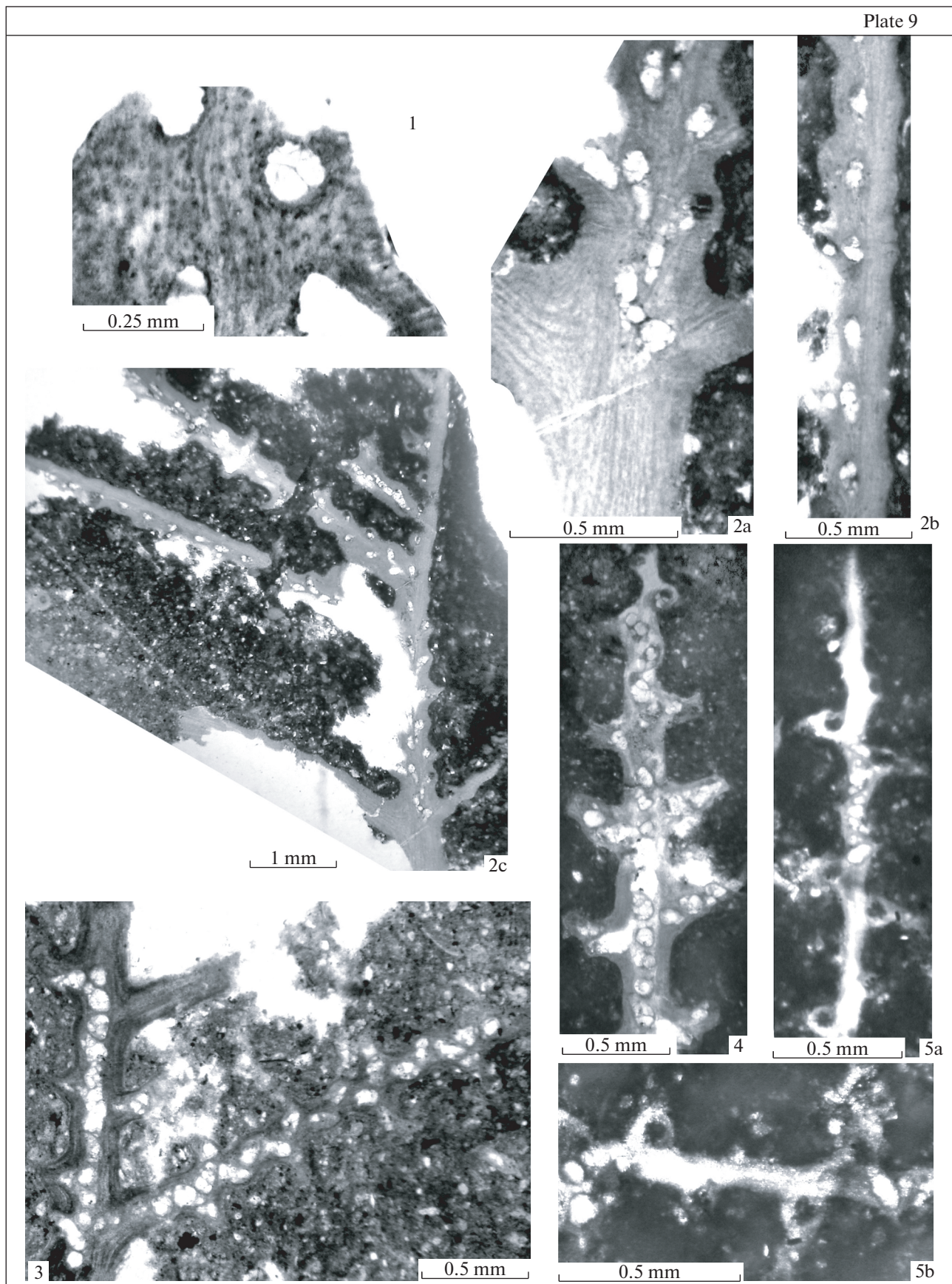


Table 4. Statistics for *F. fragilis* Udodov, sp. nov.

	NM	M	3/4	L
Width of main branches	10	0.23	0.20–0.25	0.18–0.33
Width of lateral branches	15	0.18	0.15–0.20	0.13–0.23
The angle between the main and lateral branches	6	70	60–70	60–80
Distance between centers of neighboring lateral branches	12	—	0.43–0.53	0.43–0.53
Distance between the centers of the autozooeal apertures along the length of the branch	5	0.29	0.28–0.29	0.28–0.29
Width of the autozooeal chambers	10	0.10	0.09–0.12	0.08–0.14

0.09 mm. There is one autozooeal aperture on the main branches between adjacent lateral branches. The frontal and dorsal surfaces of the branches are covered with rows of microstyles with a diameter of about 0.005 mm.

Comparison. *Filites bakharevi* sp. nov. is distinguished from other species of this genus by the complex shape of its pinnate colony (fig. 1d), by the greatest thickness of the main branches, very small autozooeal chambers, absence of nodes in the peristome of the autozooeal apertures and the smallest microstyles covering the surface of the colony.

Occurrence. Lower Devonian, Emsian Stage, Shandian Regional Substage (*serotinus* Zone), Salair.

Material. Apart from the holotype, two specimens (five thin sections): SibGIU nos. 17/10–12, Salair, vicinity of Gurievsk, section 2.IIb, Beds 3–5.

Filites fragilis Udodov, sp. nov.

Plate 9, figs. 3–5

Etymology. From the Latin *fragilis* (fragile).

Holotype. SibGIU, no. 17/13; Salair, vicinity of Gurievsk; Lower Devonian, Emsian Stage, Shandian Regional Substage (*serotinus* Zone).

Description (Table 4). The colony is pinnate. Free lateral branches extend alternatively at an angle of

60°–70° from the straight main. There are 10–10.5 lateral branches and spaces between them per 5 mm on one side of the main branch (calculated: per 2.5 mm there are five branches and spaces). The main and lateral branches are composed of two rows of distinctly alternating zooeciae. The main branch has 1–2 autozooeal apertures between two adjacent lateral branches the autozooeal chambers are trapezoidal and rounded-triangular in section. The carina is zigzag-shaped, without nodes. The autozooeal apertures are rounded, 0.10–0.11 mm in diameter. The peristomes have 8–10 nodes entering the autozooeal apertures; the nodes are 0.014–0.021 in diameter. The dorsal surface is covered with rows of microstyles, the diameter of which varies from 0.005 to 0.010 mm.

Comparison. *F. fragilis* sp. nov. differs from other species of the genus in the very small size of the colonies and their elements, distinctly alternating autozooeal forming a branch, as well as nodes in the peristomes that protrude into the autozooeal apertures.

Occurrence. Lower Devonian, Emsian Stage, Shandian Regional Substage (*serotinus* Zone), Salair.

Material. Apart from the holotype, two specimens (three thin sections): SibGIU nos. 17/13–15, Salair, vicinity of Gurievsk, section 2.IIb, Beds 3–5.

Explanation of Plate 9

Fig. 1. *Filites regularis* Mesentseva, sp. nov.; paratype SibGIU, no. 17/7; tangential section; showing nodes on the peristome and autozooeal apertures. Salair, surroundings of Gurievsk; Lower Devonian, Emsian Stage, Shandian Regional Substage.

Figs. 2. *Filites bakharevi* Mesentseva, sp. nov., holotype SibGIU, no. 17/11: (2a) tangential section, dorsal surface, microstyles; (2b) tangential section, frontal surface, autozooeal apertures; (2c) tangential section; location and age are the same.

Figs. 3–5. *Filites fragilis* Udodov, sp. nov.: (3) holotype SibGIU, no. 17/13, tangential section; (4) paratype SibGIU, no. 17/14: tangential section, shape of the autozooeal chambers; (5) paratype SibGIU, no. 17/15: (5a) tangential section, frontal surface; (5b) tangential section, nodes in the peristome of autozooeal apertures; location and age are the same.

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