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TWO SPECIES OF *PROFUSULINELLA* (*P. ALJUTOVICA* AND *P. OVATA*), EARLY MOSCOVIAN (PENNSYLVANIAN) FUSULINES FROM SOUTHERN TURKEY AND SUBDIVISION OF PRIMITIVE GROUPS OF THE FAMILY FUSULINIDAE

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Key words: *Profusulinella*, Early Moscovian, Taurides, Turkey.

Abstract. Early Moscovian (Pennsylvanian) fusulines, *Profusulinella aljutovica* and *Profusulinella ovata*, from the Hadim area, southern Turkey are described systematically. They are contained in the bedded limestone (algal fusuline grainstone) of the Yaricak Formation of the Aladag Unit in the Tauride Block. Morphologic analysis of these and similar species suggests: (1) *Aljutovella* should be synonymous with *Profusulinella*; (2) *Ovatella, Depratina*, *Staffellaeformes*, *Aljutovella* (*Elongatella*), *Tikhonovichiella*, *Skelnevatella*, and *Priscoidella* proposed in 1980's and 1990's are also synonymous with *Profusulinella*; and (3) the families Profusulinellidae and Aljutovellidae are not necessary and *Profusulinella* is included in the subfamily Fusulinellinae placed under the family Fusulinidae.

Riassunto. Viene descritta la sistematica di due fusulinidi dal Moscoviano inferiore (Pennsylvaniano) *Profusulinella aljutovica* e *Profusulinella ovata*, provenienti dall'area di Hadim, nella Turchia meridionale. Le specie provengono da un calcare stratificato (grainstone algale con fusuline) della Formazione Yaricak nell'unità strutturale Aladag nei Tauridi. L'analisi morfologica di queste forme e di altre specie similari suggerisce che: 1) il genere *Aljutovella* dovrebbe essere sinonimo con *Profusulinella*; 2) *Ovatella, Depratina*, *Staffellaeformes*, *Aljutovella* (*Elongatella*), *Tikhonovichiella*, *Skelnevatella* e *Priscoidella,* generi proposti negli anni 1980 e 1990 sono ugualmente sinonimi con *Profusulinella*; e 3) le famiglie Profusulinellidae e Aljutovellidae non sono necessarie, con *Profusulinella* inclusa nella sottofamiglia Fusulinellinae, posta entro la famiglia Fusulinidae.

Introduction

Fusuline faunas of the Tauride Block in the Hadim area, southern Turkey (Fig. 1) have particular implications in relation to the paleogeographic location of the block on the Gondwana margin facing the Paleotethys Sea (Kobayashi & Altiner 2008). Devonian to Triassic interbedded carbonate rocks and siliciclastic rocks referable to the Aladag Unit are widely distributed in the Hadim area (Altiner & Özgül 2001). The Serpukhovian, Bashkirian, and Moscovian limestones of the Carboniferous Yaricak Formation of the Aladag Unit in the area are biostratigraphically subdivided into nine zones based on primitive fusulines such as *Eostaffella, Pseudostaffella, Profusulinella,* and *Fusulinella* (Altiner & Özgül 2001). *Profusulinella* is diversified in the Yaricak Formation, with four species in the upper Bashkirian and eight species in the lower Moscovian reported by Altiner & Özgül (2001). In addition to them, four species of *Aljutovella* were reported from the lower Moscovian. These fusulines from the Yaricak Formation, however, have not been systematically described or illustrated.

Profusulinella and related genera are important in the early evolution of the family Fusulinidae (e.g., Thompson 1948; Rauzer-Chernousova et al. 1951). These forms also present serious taxonomic problems (Ross 1999; Villa et al. 2001; Groves et al. 2007) mainly because Solovieva *in* Rauzer-Chernousova et al. (1996) erected many new genera and subgenera that were placed under two new families (Profusulinellidae and Aljutovellidae). Taxonomic opinions regarding these primitive fusulines vary widely among specialists.

This paper systematically describes two species of *Profusulinella*, *P. aljutovica* and *P. ovata* from lower

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Moscovian (Vereian) limestones of the Yaricak Formation in the Hadim area, southern Turkey. The taxonomy of *Profusulinella* and similar taxa are discussed in conjunction with systematic description of these two species. The limestone sample used in this paper was collected from the Hadim area on the occasion of the field excursion immediately after the conference on Paleozoic Benthic Foraminifera (PaleoForam 2001) held in Ankara 20-24 August 2001.

All the specimens herein described are registered with prefix D2- and stored in the Museum of Nature and Human Activities, Hyogo, Japan (Fumio Kobayashi Collection, MNHAM).

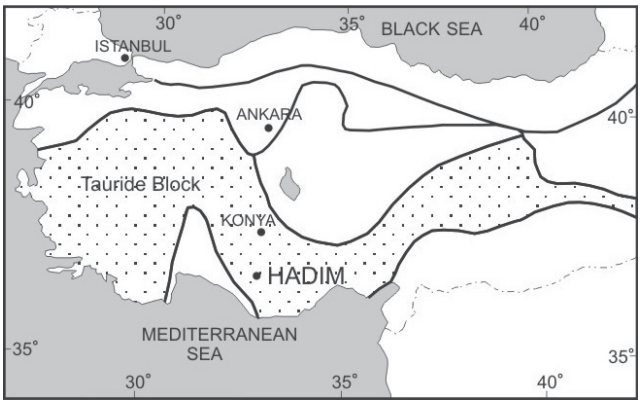


Fig. 1 - Map showing the distribution of the Tauride Block and the Hadim area, southern Turkey.

Material and foraminiferal fauna

In the Hadim area, the Serpukhovian is subdivided into three fusuline zones, the Bashkirian into four, and the Moscovian into two based on the first occurrences of zonal species (Altiner & Özgül 2001). *Profusulinella* first appears in the fourth zone of the Bashkirian (*Profusulinella* Zone) and ranges into the lower zone of the Moscovian (*Eostaffella mutabilis - Profusulinella prisca - Eofusulina* (*Paraeofusulina*) Zone). *Pseudostaffella antiqua, P. antiqua grandis, P. compressa, P. proozawai, Profusulinella bona, P. parva, P. staffellaeformis*, and *P. rhomboides* are reported from the Bashkirian *Profusulinella* Zone. In addition to three zonal indicators, *Pseudostaffella praegorski*, two species of *Neostaffella*, eight species of *Profusulinella* including *P. primitiva* and *P. subovata*, four species of *Aljutovella*, and *Eofusulina triangula* are characteristic of the lower part of the Moscovian (Altiner & Özgül 2001). *Profusulinella* and *Aljutovella* were not reported from the upper part of the Moscovian (*Fusulinella* ex gr. *bocki - Beedeina* Zone) according to Altiner & Özgül (2001).

Sample treated herein was collected from Moscovian limestone of the Yaricak Formation exposed at the point (36º 54' 44" N and 32º 23' 24"E), about 10 km SW of the town of Hadim, southern Turkey (Fig. 1). It is highly fossiliferous and consists of algal fusuline grainstone with dominant foraminifers, subordinate red algae (*Ungdarella* and *Komia*) and problematic algae, and accessory brachiopods and crinoids. Fusulines are mostly assignable to *Profusulinella aljutovica* and *Profusulinella ovata.* Other genera are *Staffella, Nankinella, Eostaffella*, and *Eoschubertella*. The Moscovian, consisting of the Vereian, Kashirian, Podolskian, and Myachkovian substages in ascending order, is biostratigraphically subdivided into 11 fusuline zones in the stratotype sections of the Moscow Syneclise (Isakova 2002). *Eofusulina* and evolved forms of *Neostaffella* that first appeared in the Kashirian in the type sections (Isakova 2002) are not contained in the present material. Non-fusuline foraminifers are assigned to *Bradyina, Endothyra, Planoendothyra, Globivalvulina, Biseriella, Palaeotextularia,* and *Spireitlina*. Based on the foraminiferal assemblage, the present sample is thought to be early Moscovian (Vereian) assignable to the lower part of the *Eostaffella mutabilis - Profusulinella prisca - Eofusulina* (*Paraeofusulina*) Zone of Altiner & Özgül (2001).

Subdivision of primitive groups of the Family Fusulinidae

Rauzer-Chernousova *in* Rauzer-Chernousova et al. (1951) proposed the genus *Aljutovella* and assigned to it seven species and varieties formerly assigned to *Profusulinella, Fusulinella*, or *Fusulina*, as well as 25 new species. *Aljutovella* was distinguished from *Profusulinella* by having characteristic "ячейки" referable to cells, meshes, alveoli, or other meanings in tangential sections that resemble the structure of the septa of the genus *Fusulina* and the partial "поры" referable to pores in the wall of the outermost whorl. The former probably corresponds not to alveolar wall but to small cells or chamberlets formed by septal folding. The latter is found in Kashirian forms (Rauzer-Chernosova et al., 1951, p. 21, Fig. 8B). A porous wall under the tectum is also recognized in some species of *Profusulinella*. Thus, *Aljutovella* in the original description is not clearly distinguished from *Profusulinella* based both on slight differences of their wall structure and of an intensity and mode of septal folding in axial and polar regions in generic rank, though it might be possible in species rank.

Aljutovella has been widely accepted by Russian workers (e.g., Rauser-Chernousova et al. 1951; Bensh 1969; Rozovskaya 1975; Leven & Davydov *in* Leven et al. 2005) and by others outside Russia (e.g., Sheng 1958; van Ginkel 1965; Villa 1995). In contrast, it has been questioned by some workers (e.g., Thompson 1964; Loeblich & Tappan 1988). Ross (1999) showed that the porous wall of *Aljutovella* is diagenetic feature commonly found in other poorly preserved fusulines in weathered zones. Disagreement concerning the generic composition and classification of the family Fusulinidae increased pursuant to the creation of many new genera and subgenera under the new families Profusulinellidae and Aljutovellidae by Solovieva *in* Rauzer-Chernousova et al. (1996).

The family Profusulinellidae was erected to accommodate six genera, *Profusulinella*, *Taitzehoella* Sheng, 1951, *Ovatella* Solovieva *in* Rauzer-Chernousova et al., 1996, *Depratina* Solovieva *in* Rauzer-Chernousova et al., 1996, *Staffellaeformes* Solovieva, 1986, and *Moellerites* Solovieva, 1986. As indicated by

Villa et al. (2001) and Groves et al. (2007), three species groups within *Profusulinella* were reorganized by Solovieva *in* Rauzer-Chernousova (1996) into *Ovatella*, *Depratina*, and *Staffellaeformes*. Groves et al. (2007) thought that *Moellerites* was erected for the transitional forms from *Profusulinella* to *Fusulinella*.

The family Aljutovellidae consists of *Aljutovella* (*Aljutovella*), *Aljutovella* (*Elongatella*), *Tikhonovichiella, Skelnevatella*, and *Priscoidella* according to Solovieva *in* Rauzer-Chernousova et al (1996). These genera and subgenera were proposed by the reorganization of known species groups of *Aljutovella. Profusulinella aljutovica elongata* Rauzer-Chernousova, 1938 *Aljutovella tikhonovichi* Rauzer-Chernousova *in* Rauzer-Chernousova et al., 1951 *Profusulinella skelnevatica* Putrya *in* Putrya & Leontovich, 1948 and *Profusulinella priscoidea* Rauzer-Chernousova, 1938 were designated as the type species of *Aljutovella* (*Elongatella*), *Tikhonovichiella, Skelnevatella*, and *Priscoidella*, respectively. Three-layered wall structure (tectum and lower and upper tectoria) is clearly expressed in the original description of these type species. A diaphanotheca is partly developed in the terminal whorl of *Profusulinella priscoidea* according to Rauzer-Chernousova (1938). Although shape and massiveness of chomata were added to the diagnostic features of the family Aljutovellidae in Rauser-Chernousova et al. (1996), *Aljutovella* and related forms are not easily distinguished from *Profusulinella*. In my opinion, differences in the development of chomata, shape of the test and intensity of septal folding are expressed within and among populations, and these differences are insufficient to warrant the recognition of multiple genera and subgenera. The recognized generic composition of Aljutovellidae by recent workers (e.g., Isakova 2002; Leven 2009) follows that by Solovieva *in* Rauzer-Chernousova et al. (1996).

Profusulinella aljutovica from the Hadim area, shown in Pl. 1, has a more elongate fusiform test and stronger septal folding than *Profusulinella ovata.* The wall consists of thin distinct tectum and lower thicker protheca comparable to the lower tectorium of previous authors. A thin layer comparable to the upper tectorium is not always present. Presence or absence, and thickness of the upper tectorium largely depend upon the state of preservation of specimens. Broad morphologic variations are recognized in every test character as well as in those of *Profusulinella ovata* illustrated in Pl. 2. For example, the specimens shown in Pl. 1, figs. 3 and 10 look like a form of "*Skelnevatella*" in their inflated fusiform tests with pointed poles and massive chomata. Furthermore, based on similar test characters, the specimens in Pl. 1, figs. 8 and 13 appear to be a form of "*Tikhonovichiella*"; and that in Pl. 1, fig. 7 appears to be a form of "*Priscoidella*". Obviously, these characters are highly variable and change continuously from specimen to specimen. Differences among the 28 specimens illustrated are considered to only represent the intraspecific variation of *Profusulinella aljutovica*.

In conclusion, primitive fusulines in the present material are assigned to *Profusulinella* and recognized as two species, *P. ovata* and *P. aljutovica*. *Aljutovella, Ovatella*, *Depratina, Staffellaeformes*, *Aljutovella* (*Elongatella*), *Tikhonovichiella*, *Skelnevatella*, and *Priscoidella* are unnecessary names erected for what amount to species groups. All of them are thought to be junior synonyms of *Profusulinella*. Given this, the families Profusulinidae and Aljutovellidae are redundant, too.

Systematic Paleontology

Suborder **Fusulinina** Wedekind, 1937
Superfamily Fusulinoidea von Möller, 1878
Family Fusulinidae von Möller, 1878
Subfamily Fusulinellinae Staff and Wedekind, 1910

Fusulinellinae Staff and Wedekind, 1910, p. 112.

Profusulinellidae Solovieva *in* Rauzer-Chernousova et al., 1996, p. 92.

Aljutovellidae Solovieva *in* Rauzer-Chernousova et al., 1996, p. 95.

Genus *Profusulinella* Rauzer-Chernousova and Belyaev, *in* Rauzer-Chernousova et al., 1936

Type species: *Profusulinella pararhomboides* Rauzer-Chernousova and Belyaev *in* Rauzer-Chernousova et al., 1936, p. 175.

Ovatella Solovieva *in* Rauzer-Chernousova et al., 1996, p. 93 (type, *Profusulinella ovata* Rauzer-Chernousova, 1938).

Depratina Solovieva *in* Rauzer-Chernousova et al., 1996, p. 93, 94 (type, *Schwagerina prisca* Deprat, 1912).

Staffellaeformes Solovieva, 1986, p. 20 (type, *Profusulinella staffellaeformis* Kireeva *in* Rauzer-Chernousova et al., 1951).

Aljutovella Rauzer-Chernousova *in* Rauzer-Chernousova et al., 1951, p. 182 (type, *Profusulinella aljutovica* Rauzer-Chernousova, 1938).

Aljutovella (*Aljutovella*) Rauzer-Chernousova; Solovieva *in* Rauzer-Chernousova et al., 1996, p. 96.

Aljutovella (*Elongatella*) Solovieva *in* Rauzer-Chernousova et al., 1996, p. 96 (type, *Profusulinella aljutovica elongata* Rauzer-Chernousova, 1938).

Tikhonovichiella Solovieva *in* Rauzer-Chernousova, 1996, p. 96 (type, *Aljutovella tikhonovichi* Rauzer-Chernousova *in* Rauzer-Chernousova et al., 1951).

Skelnevatella Solovieva *in* Rauzer-Chernousova et al., 1996, p. 96 (type, *Profusulinella skelnevatica* Putrya in Putrya and Leontovich, 1948).

Priscoidella Solovieva *in* Rauzer-Chernousova et al., 1996, p. 97 (type, *Profusulinella priscoidea* Rauzer-Chernousova, 1938).

Discussion. All genera and subgenera listed above except for *Staffellaeformes* were proposed for the typical forms of species groups of *Profusulinella* or *Aljutovella* in the systematic classification in Rauzer-Chernousova et al. (1951). *Profusulinella staffellaeformis*, type species of *Staffellaeformes* was proposed, was included in the *Profusulinella parva* group in Rauzer-Chernousova et al. (1951). In my opinion none of these listed nominal taxa differs significantly from *Profusulinella* so that all can be regarded as junior synonyms of *Profusulinella*, as discussed above. The family Aljutovellidae is accordingly unnecessary. *Moellerites* proposed by Solovieva (1986) with *M. lopasniensis* Solovieva, 1986 as the type species might be synonymous with either *Profusulinella* or *Fusulinella.* The genus *Taitzehoella* Sheng, 1951 is distinct from *Profusulinella* and is placed with *Profusulinella* in the subfamily Fusulinellinae of the family Fusulinidae. Therefore, the family Profusulinellidae erected by Solovieva *in* Rauzer-Chernousova et al. (1996) is also unnecessary.

Profusulinella aljutovica Rauzer-Chernousova, 1938

Pl. 1, figs 1-28

1938 *Profusulinella aljutovica* Rauzer-Chernousova, p. 97, 98, pl. 1, figs 10-12.

1951 *Aljutovella aljutovica* (Rauzer-Chernousova); Safonova and Rauzer-Chernousova *in* Rauzer-Chernousova et al., p. 193, 194, pl. 22, figs 1, 2.

1951 *Aljutovella conspecta* Leontovich *in* Rauzer-Chernousova et al., p. 195, 196, pl. 23, fig. 1.

1951 *Aljutovella arrisionis* Leontovich *in* Rauzer-Chernousova et al., p.196, 197, pl. 23, fig. 2.

1996 *Aljutovella* (*Aljutovella*) *aljutovica* (Rauzer-Chernousova); Solovieva *in* Rauzer-Chernousova et al., p. 96, pl. 24, fig. 1.

Material: Fifteen axial and thirteen sagittal sections illustrated, and others.

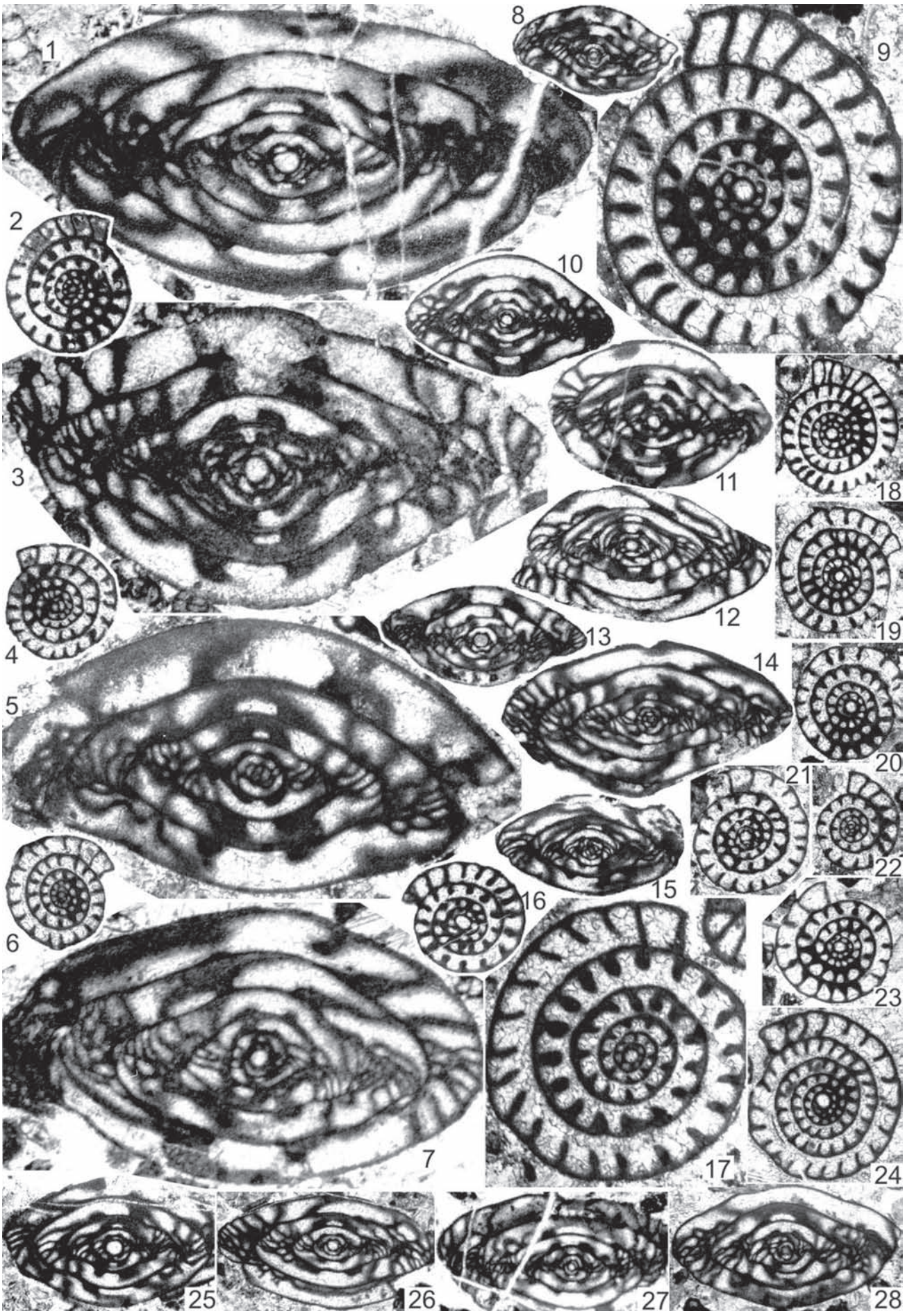
Description. Test fusiform to inflated fusiform with arched to broadly arched periphery, almost straight lateral slopes, rounded to bluntly pointed poles. Axis of coiling straight in general, but crossing at a large angle between inner lenticular and outer fusiform whorls in specimens. Mature specimens with 4.5

PLATE 1

Figs 1-28 - *Profusulinella aljutovica* Rauzer-Chernousova, 1, 3, 5, 7, 9, 17: ×50, others: × 25.
1: D2-025575, 2: D2-025601, 3: D2-025591, 4: D2-025609, 5: D2-025623, 6: D2-025620, 7: D2-025553, 8: D2-025566, 9: D2-025620, 10: D2-025562, 11: D2-025617, 12: D2-025607, 13: D2-025611, 14: D2-025562, 15: D2-025578, 16: D2-025545, 17: D2-025544, 18: D2-025523, 19: D2-025537, 20: D2-025557, 21: D2-025574, 22: D2-025616, 23: D2-025584; 24: D2-025538, 25: D2-025524, 26: D2-025584, 27: D2-025528, 28: D2-025530.

Fig. in Pl.	No. whorl	Length	Width	Form ratio	Prolo-culus	Length of whorl					Width of whorl					Number of septa				
						1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Pl. 1, fig. 1	5.5	2.24	1.08	2.07	0.11	0.23	0.49	0.93	1.47	1.99	0.14	0.26	0.43	0.64	0.93	-	-	-	-	-
Pl. 1, fig. 3	5	2.08	1.16	1.79	0.11	0.28	0.56	0.94	1.66	2.08	0.22	0.34	0.54	0.81	1.16	-	-	-	-	-
Pl. 1, fig. 5	5.5	2.13	1.04	2.05	0.06	0.07	0.25	0.56	1.24	1.69	0.12	0.18	0.31	0.51	0.81	-	-	-	-	-
Pl. 1, fig. 7	5.5	1.88	1.08	1.74	0.08	0.13	0.34	0.69	1.19	1.72	0.14	0.24	0.38	0.6	0.9	-	-	-	-	-
Pl. 1, fig. 8	4.5	1.25	0.67	1.87	0.06	0.11	0.36	0.77	1.09	-	0.13	0.2	0.34	0.55	-	-	-	-	-	-
Pl. 1, fig. 10	5	1.58	0.93	1.7	0.1	0.14	0.37	0.68	1.06	1.58	0.14	0.24	0.4	0.62	0.92	-	-	-	-	-
Pl. 1, fig. 11	4.5	1.7	1.13	1.5	0.13	0.35	0.72	1.32	1.55	-	0.22	0.39	0.64	0.94	-	-	-	-	-	-
Pl. 1, fig. 12	4.5	1.98	1.02	1.94	0.12	0.3	0.67	1.12	1.65	-	0.18	0.34	0.58	0.86	-	-	-	-	-	-
Pl. 1, fig. 13	4	1.58	0.77	2.05	0.13	0.26	0.54	1.01	1.58	-	0.2	0.32	0.53	0.77	-	-	-	-	-	-
Pl. 1, fig. 14	5.5	2.19	1.08	2.03	0.06	0.14	0.29	0.68	1.28	1.86	0.12	0.22	0.34	0.57	0.9	-	-	-	-	-
Pl. 1, fig. 15	4.5	1.45	0.75	1.93	0.06	0.14	0.39	0.86	1.27	-	0.12	0.22	0.37	0.58	-	-	-	-	-	-
Pl. 1, fig. 25	4.5	-	0.99	-	0.14	0.31	0.63	1.15	1.59	-	0.21	0.34	0.56	0.84	-	-	-	-	-	-
Pl. 1, fig. 26	4.5	-	0.85	-	0.1	0.27	0.56	1.15	1.65	-	0.16	0.26	0.44	0.7	-	-	-	-	-	-
Pl. 1, fig. 27	5.5	-	-	-	0.07	0.1	0.31	0.73	-	-	0.12	0.2	0.45	0.71	-	-	-	-	-	-
Pl. 1, fig. 28	5	1.74	0.94	1.85	0.08	0.11	0.38	0.74	1.31	1.74	0.15	0.24	0.41	0.66	0.94	-	-	-	-	-
Pl. 1, fig. 2	4.8	-	1.07	-	0.06	-	-	-	-	-	0.20	0.33	0.52	0.79	-	6	9	12	14	17>
Pl. 1, fig. 4	4.5	-	0.9	-	0.08	-	-	-	-	-	0.19	0.34	0.56	0.78	-	5	11	13	17	11>
Pl. 1, fig. 6	4.8	-	0.85	-	0.05	0.09	-	-	-	-	0.12	0.15	0.39	0.61	-	-	8	11	15	16>
Pl. 1, fig. 9	4.7	-	1.33	-	0.11	-	-	-	-	-	0.22	0.39	0.62	0.97	-	8	10	14	20	20>
Pl. 1, fig. 16	3.7	-	0.92	-	0.14	-	-	-	-	-	0.26	0.43	0.68	-	-	7	10	14	13>	-
Pl. 1, fig. 17	5.2	-	1.1	-	0.07	-	-	-	-	-	0.12	0.24	0.4	0.7	1.04	6	8	10	15	21
Pl. 1. fig. 18	4.4	-	1.03	-	0.11	-	-	-	-	-	0.24	0.38	0.58	0.85	-	8	12	16	23	13>
Pl. 1, fig. 19	4.6	-	1	-	0.1	-	-	-	-	-	0.2	0.34	0.56	0.81	-	5	11	13	18	14>
Pl. 1, fig. 20	3.9	-	0.9	-	0.12	-	-	-	-	-	0.26	0.45	0.68	-	-	7	12	16	17>	-
Pl. 1, fig. 21	4.7	-	0.98	-	0.1	-	-	-	-	-	0.19	0.33	0.5	0.79	-	5	8	11	15	14>
Pl. 1, fig. 22	4.8	-	0.74	-	0.04	0.05	-	-	-	-	0.1	0.15	0.28	0.48	-	-	6	8	10	13>
Pl. 1, fig. 23	4	-	0.93	-	0.11	-	-	-	-	-	0.21	0.39	0.61	0.93	-	6	12	14	17	-
Pl. 1, fig. 24	4.9	-	1.27	-	0.14	-	-	-	-	-	0.26	0.42	0.63	0.93	-	7	12	16	22	20>

Tab. 1 - Measurement of *Profusulinella aljutovica* Rauzer-Chernousova.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to 5.5 whorls, about 1.5 to 2.2 mm in length, about 0.9 to 1.2 mm in width, with approximate length/width ratio from 1.5 to 2.1 (Tab. 1).

Proloculus spherical to subspherical and 0.04 to 0.14 mm in its outside diameter. Inner one or two whorls fusiform to eostaffelloid, and their length and width vary depending on the size of proloculus and an orientation of thin sections. Beyond the second, whorls become fusiform with variable rate of expansion and form ratio, and shape of poles. Length and width in corresponding whorls largely variable depended upon the size of a proloculus. Length from the first to fifth whorls 0.05 to 0.35, 0.25 to 0.72, 0.56 to 1.32, 1.06 to 1.66, and 1.58 to 2.08 mm in 17 specimens. Width from the first to fifth whorls 0.10 to 0.26, 0.15 to 0.45, 0.28 to 0.68, 0.48 to 0.97, and 0.90 to 1.16 mm in 28 specimens (Tab. 1).

Wall thin, less than 0.05 mm in the thickest part of outer whorls, consisting of almost single layer in the eostaffelloid whorl, and distinct tectum, and lower thicker and upper thinner layers. Upper thin layer corresponding to upper tectorium not continuous in most specimens.

Septa closely spaced and weakly fluted in polar regions of outer whorls. Septal counts from the first to fifth whorls 5 to 8, 6 to 12, 8 to 16, 10 to 23, and 21 in 13 specimens (Tab. 1). They attain 26 to 28 in their maximum in the fifth whorl.

Chomata present in almost all whorls and also on the proloculus in specimens with a large proloculus. Their shape, size, and degree of symmetry through tunnel is variable. Axial fillings absent.

Tunnel high and in general one-thirds to one-half as high as chambers. Its path wider in outer test than in inner test in general.

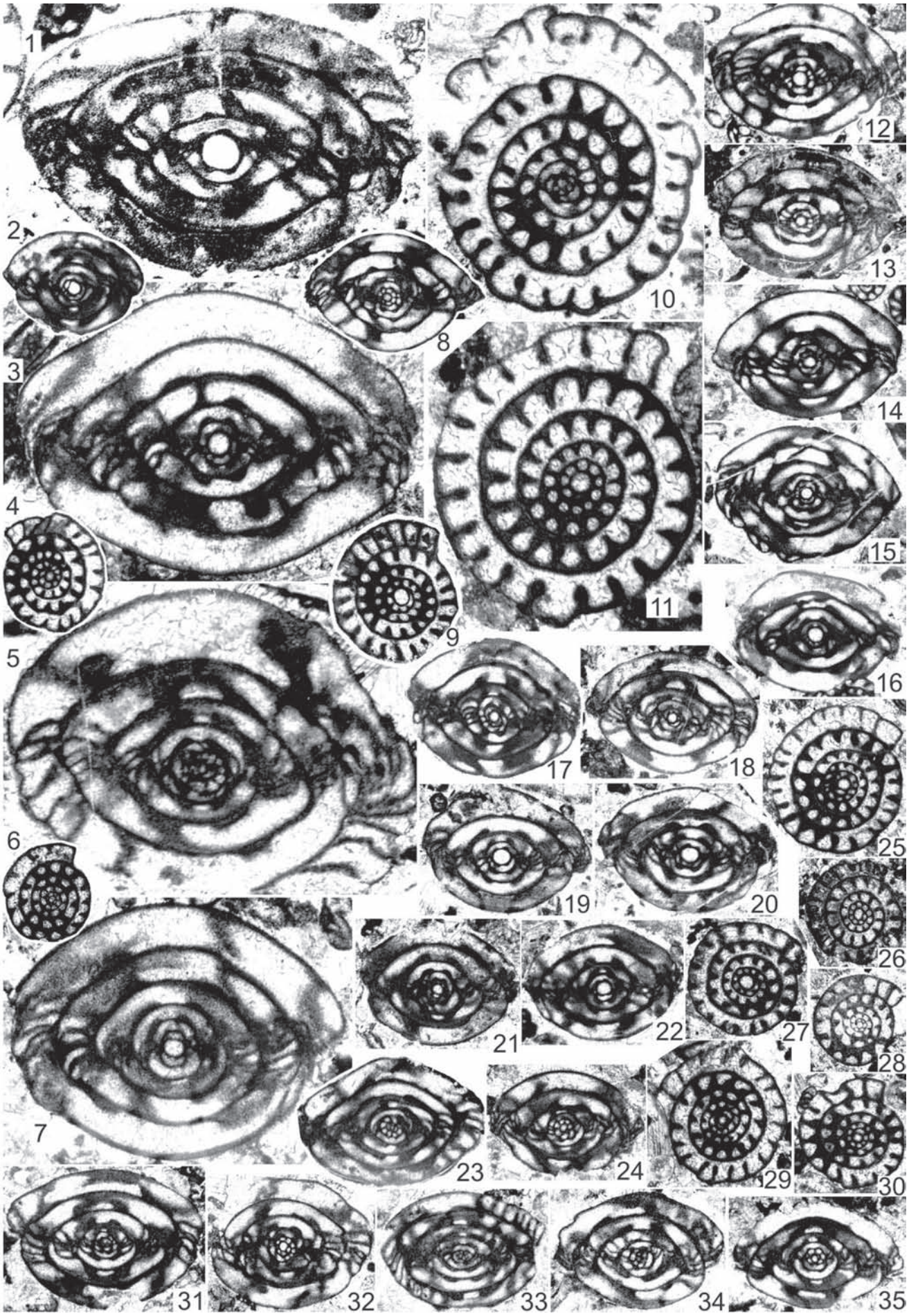
Discussion. Differences in size, shape, and expansion of the test, proloculus size, the number of septa, and development of chomata vary from specimen to specimen. Therefore, they are thought to represent the intraspecific variation of this species originally described from the wells in Samara Bend by Rauzer-Chernousova (1938).

PLATE 2

Figs 1- 35 - *Profusulinella ovata* Rauzer-Chernousova, 1, 3, 5, 7, 10, 11: ×50, others: × 25.
1: D2-025552, 2: D2-025614, 3: D2-025568,, 4: D2-025584, 5: D2-025558, 6: D2-025619, 7: D2-025541, 8: D2-025615, 9: D2-025533, 10: D2-025599, 11: D2-025604, 12: D2-025595, 13: D2-025560, 14: D2-025534, 15: D2-025555, 16: D2-025532, 17: D2-025619, 18: D2-025600, 19: D2-025548, 20: D2-025549, 21: D2-025582, 22: D2-025535, 23: D2-025528, 24: D2-025557, 25: D2-025566, 26: D2-025619, 27: D2-025621, 28: D2-025544, 29: D2-025592, 30: D2-025582, 31: D2-025603, 32: D2-025572, 33: D2-025610, 34: D2-025539, 35: D2-025540.

Fig. in Pl.	No. whorl	Length	Width	Form ratio	Prolo-culus	Length of whorl						Width of whorl						Number of septa					
						1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
Pl. 2, fig. 1	4	1.57	1.04	1.51	0.17	0.42	0.77	1.24	1.57	-	-	0.26	0.48	0.72	1.04	-	-	-	-	-	-	-	-
Pl. 2, fig. 2	4.5	1.06	0.78	1.36	0.12	0.15	0.35	0,61	0.88	-	-	0.18	0.26	0.43	0.67	-	-	-	-	-	-	-	-
Pl. 2, fig. 3	5	1.55	1.1	1.41	0.09	0.18	0.41	0.77	1.18	1.55	-	0.18	0.29	0.49	0.77	1.1	-	-	-	-	-	-	-
Pl. 2, fig. 5	6	1.53	1.18	1.3	0.05	0.08	-	0.44	0.78	1.13	1.53	0.14	0.2	0.32	0.48	0.75	1.18	-	8	-	-	-	-
Pl. 2, fig. 7	5.5	1.3	1	1.3	0.09	0.1	0.25	0.5	0.81	1.19	-	0.14	0.24	0.36	0.56	0.83	-	-	-	-	-	-	-
Pl. 2, fig. 8	5	1.31	0.89	1.47	0.08	-	0.26	0.62	0.94	1.31	-	0.15	0.24	0.37	0.61	0.89	-	7	-	-	-	-	-
Pl. 2, fig. 12	4.5	1.44	1.03	1.4	0.12	0.28	0.58	1.02	1.31	-	-	0.23	0.37	0.6	0.86	-	-	-	-	-	-	-	-
Pl. 2, fig. 13	4.5	1.45	1.01	1.44	0.1	0.24	0.44	0.81	1.23	-	-	0.19	0.32	0.55	0.85	-	-	-	-	-	-	-	-
Pl. 2, fig. 14	4.5	1.44	0.97	1.48	0.11	0.2	0.38	0.82	1.22	-	-	0.19	0.31	0.51	0.8	-	-	-	-	-	-	-	-
Pl. 2, fig. 15	5	1.4	0.99	1.41	0.1	0.18	0.37	0.68	1.08	1.4	-	0.18	0.28	0.46	0.68	0.99	-	-	-	-	-	-	-
Pl. 2, fig. 16	4	1.29	0.91	1.42	0.13	0.3	0.6	0.93	1.29	-	-	0.21	0.38	0.6	0.91	-	-	-	-	-	-	-	-
Pl. 2, fig. 17	5	1.35	1.06	1.27	0.09	0.14	0.29	0.61	0.99	1.35	-	0.19	0.32	0.38	0.75	1.06	-	-	-	-	-	-	-
Pl. 2, fig. 18	5	1.3	0.93	1.4	0.09	0.13	0.29	0.58	0.98	1.3	-	0.16	0.25	0.4	0.64	0.93	-	-	-	-	-	-	-
Pl. 2, fig. 19	4	1.22	0.94	1.3	0.15	0.25	0.52	0.89	1.22	-	-	0.24	0.39	0.61	0.94	-	-	-	-	-	-	-	-
Pl. 2, fig. 20	4	1.35	0.95	1.42	0.16	0.32	0.61	0.98	1.35	-	-	0.24	0.39	0.64	0.95	-	-	-	-	-	-	-	-
Pl. 2, fig. 21	5	1.24	0.91	1.36	0.09	0.14	0.3	0.54	1	1.24	-	0.16	0.25	0.41	0.64	0.91	-	-	-	-	-	-	-
Pl. 2, fig. 22	4	1.17	0.88	1.33	0.13	0.22	0.52	0.91	1.17	-	-	0.22	0.36	0.6	0.88	-	-	-	-	-	-	-	-
Pl. 2, fig. 23	6	1.43	0.97	1.47	0.05	0.06	-	0.38	0.71	1.05	1.43	0.1	0.18	0.28	0.46	0.69	0.97	-	8	-	-	-	-
Pl. 2, fig. 24	4.5	1.15	0.8	1.44	0.07	-	0.3	0.61	0.96	-	-	0.15	0.25	0.43	0.66	-	-	7	-	-	-	-	-
Pl. 2, fig. 31	5	1.5	1.06	1.42	0.08	0.15	0.35	0.79	1.19	1.5	-	0.16	0.27	0.48	0.74	1.06	-	-	-	-	-	-	-
Pl. 2, fig. 32	5	-	0.99	-	0.08	-	-	0.63	0.94	-	-	0.16	0.27	0.44	0.67	0.99	-	6	5>	-	-	-	-
Pl. 2, fig. 33	6	-	0.88	-	0.05	0.07	-	0.44	0.76	1.05	-	0.12	0.14	0.26	0.42	0.64	0.88	-	-	-	-	-	-
Pl. 2, fig. 34	5.5	1.29	0.89	1.45	-	-	-	0.36	0.69	1.01	-	-	-	0.29	0.47	0.72	-	-	-	-	-	-	-
Pl. 2, fig. 35	5	1.31	0.84	1.56	0.06	-	0.31	0.58	0.92	1.3	-	0.15	0.23	0.36	0.57	0.84	-	6	-	-	-	-	-
Pl. 2, fig. 4	4.1	-	0.9	-	0.09	-	-	-	-	-	-	0.22	0.39	0.62	0.89	-	-	7	11	12	18	3>	-
Pl. 2, fig. 6	4.4	-	0.76	-	0.07	-	-	-	-	-	-	0.16	0.29	0.45	0.64	-	-	5	8	10	14	6>	-
Pl. 2, fig. 9	4	-	1.07	-	0.14	-	-	-	-	-	-	0.28	0.46	0.74	1.07	-	-	6	12	16	21	-	-
Pl. 2, fig. 10	5.1	-	1.19	-	0.06	-	-	-	-	-	-	0.16	0.29	0.48	0.77	1.19	-	4	7	12	18	23	3>
Pl. 2, fig. 11	4.8	-	1.2	-	0.1	-	-	-	-	-	-	0.2	0.33	0.55	0.87	-	-	7	12	14	18	16>	-
Pl. 2, fig. 25	4.7	-	1.15	-	0.1	-	-	-	-	-	-	0.22	0.38	0.6	0.89	-	-	6	12	13	19	17>	-
Pl. 2, fig. 26	3.9	-	0.79	-	0.09	-	-	-	-	-	-	0.18	0.32	0.56	-	-	-	7	11	13	18>	-	-
Pl. 2, fig. 27	4.1	-	0.93	-	0.14	-	-	-	-	-	-	0.22	0.4	0.6	0.88	-	-	7	11	13	19	3>	-
Pl. 2, fig. 28	4.4	-	0.73	-	0.05	-	-	-	-	-	-	0.12	0.22	0.38	0.6	-	-	5	8	10	14	7>	-
Pl. 2, fig. 29	5.1	-	1.01	-	0.08	0.11	-	-	-	-	-	0.16	0.27	0.44	0.7	1	-	-	8	12	14	17	3>
Pl. 2, fig. 30	4.2	-	0.86	-	0.09	-	-	-	-	-	-	0.19	0.33	0.55	0.84	-	-	6	10	11	17	4>	-

Tab. 2 - Measurement of *Profusulinella ovata* Rauzer-Chernousova.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Considering wide morphologic variation of the present material, at least the following two species are probably conspecific with this species: *Aljutovella conspecta* Leontovich *in* Rauzer-Chernousova et al., 1951 and *A. arrisionis* Leontovich *in* Rauzer-Chernousova et al., 1951 both of which were included in the *Aljutovella aljutovica* group by Leontovich *in* Rauzer-Chernousova et al. (1951). *Aljutovella skelnevatica* (Putrya *in* Putrya and Leontovich, 1948), *A. cybaea* Leontovich *in* Rauzer-Chernousova et al., 1951, and *A. artificialis* Leontovich *in* Rauzer-Chernousova et al., 1951 were included in the *Aljutovella skelnevatica* group by Leontovich *in* Rauzer-Chernousova et al. (1951). They might or might not be conspecific with *A. aljutovica*.

Profusulinella ovata Rauzer-Chernousova, 1938

Pl. 2, figs 1-35

1938 *Profusulinella ovata* Rauzer-Chernousova, p. 101, pl. 1, figs. 14-16.

1951 *Profusulinella subovata* Safonova *in* Rauzer-Chernousova et al., p. 164, pl. 14, figs 5, 6.

1996 *Ovatella ovata* (Rauzer-Chernousova); Solovieva *in* Rauzer-Chernousova et al., p. 93, pl. 23, fig. 3.

Material: Twenty-three axial, eleven sagittal, and one tangential sections illustrated, and others.

Description. Test inflated fusiform to oval with arched to broadly arched periphery, rounded poles. Axis of coiling straight in general, but crossing at a large angle between inner lenticular and outer fusiform whorls in specimens. Mature specimens with 4 to 5.5 whorls, rarely 6. Length about 1.1 to 1.6 mm and width about 0.8 to 1.2 mm in width giving approximate length/width ratio from 1.3 to 1.6 (Tab. 2).

Proloculus spherical and 0.05 to 0.17 mm in its outside diameter. Inner one to two whorls vary from eostaffelloid to inflated fusiform, and their length and width vary depending on the size of proloculus. Outer whorls inflated fusiform to oval with variable rate of expansion and form ratio. Length and width in corresponding whorls largely variable depending upon the size of proloculus. Length from the first to sixth whorls 0.06 to 0.42, 0.25 to 0.77, 0.36 to 1.24, 0.69 to 1.57, 1.01 to 1.55, and 1.43 to 1.53 mm in 24 specimens. Width from the first to sixth whorls 0.10 to 0.26, 0.14 to 0.48, 0.26 to 0.74, 0.42 to 1.07, 0.64 to 1.19, and 0.88 to 1.18 mm in 35 specimens (Tab. 2).

Wall thin, less than 0.04 mm in the thickest part of outer whorls, appears to be thicker due to secondary coating of dark layer. It is almost structureless in the eostaffelloid one or two whorls. In later whorls it exhibits a distinct tectum, and lower thicker and upper thinner layers. Upper thinner layer is discontinuous and indistinct in most specimens.

Septa closely spaced and almost plane to very weakly fluted in polar regions of outer whorls. Septal counts from the first to fifth whorls 4 to 7, 7 to 12, 10 to 16, 14 to 21, and 17 to 23 in 17 specimens (Tab. 2).

Chomata massive, roughly symmetrical through tunnel, and well developed in inner fusiform whorls. They are present on the proloculus and eostaffeloid whorls, but tend to be indistinct or absent in outer fusiform whorls. Their shape and size are variable. Axial fillings absent.

Tunnel high and probably one-thirds to one-half as high as chambers. Its path becomes wider outwards in general.

Discussion. This species is discriminated from *Profusulinella aljutovica* by their smaller and more inflated fusiform test in general. Proloculus size, the number of whorl, height and width of inner whorls, and development of chomata vary from specimen to specimen, showing wide morphologic variation in the Hadim specimens.

Specimens having relatively small proloculus resemble Rauzer-Chernousova's (1938) original material from the upper part of the Vereian (lower Moscovian) of Samara Bend. Those with larger proloculi (e.g., Pl. 2, figs 1, 14, 15) are more similar to *Profusulinella subovata* Safonova *in* Rauzer-Chernousova et al., 1951. They are probably conspecific each other.

Those having subspherical test and tightly coiled inner whorls (e.g., Pl. 2, figs. 5, 10) appear to be more like *Profusulinella prisca sphaeroidea* Rauser-Chernousova *in* Rauzer-Chernousova et al. (1951) and *Profusulinella prisca timanica* Kireeva *in* Rauzer-Chernousova et al. (1951) than to *Profusulinella ovata*. Although the range of morphologic variation in these two subspecies is unclear, they should be included into the *Profusulinella prisca* group, as done by Rauzer-Chernosova et al. (1951).

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