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CARBONIFEROUS AND PERMIAN FUSULINIDS FROM FUKUJI, CENTRAL JAPAN

by

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(with 3 text-figures and 14 plates)

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Abstract

Altogether sixty species of fusulinids are described from the Carboniferous Ichinotani Formation and the Permian Mizuyagadani Formation, Fukuji, Gifu Prefecture, Central Japan. Of them six species are new. They are *Pseudostaffella minatoi, P. subrotunda, Fusulinella rhomboidalis, Triticites katoi, T. ichinotaniensis* and *T. elongatus.*

The following fusulind zones are established; Zone of *Eostaffella,* Zone of *Profusulinella,* Lower Zone of *Fusulinella-Fusulina,* Zone of *Beedeina,* Upper Zone of *Fusulinella-Fusulina,* Zone of *Triticites,* Zone of *Pseudoschwagerina,* and Zone of *Pseudofusulina.*

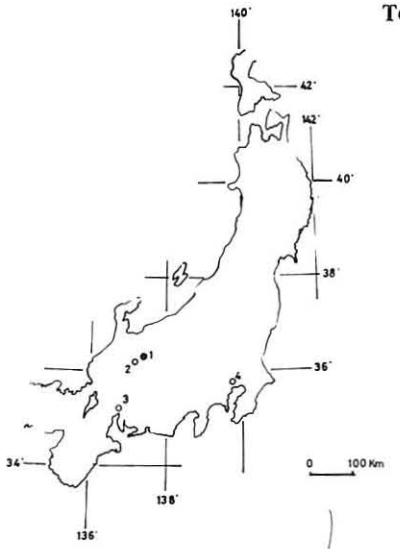
As a whole fusulinids treated in this paper show similarity to those of China, Korea, and especially to those of the USSR.

Lithologic sequence and fusulinid succession suggest that the fusulinid fauna in Fukuji ranges continuously from the Upper Viséan to the Sakmarian, although evidence for Namurian, Vereyan, and Upper Uralian is not at all clear.

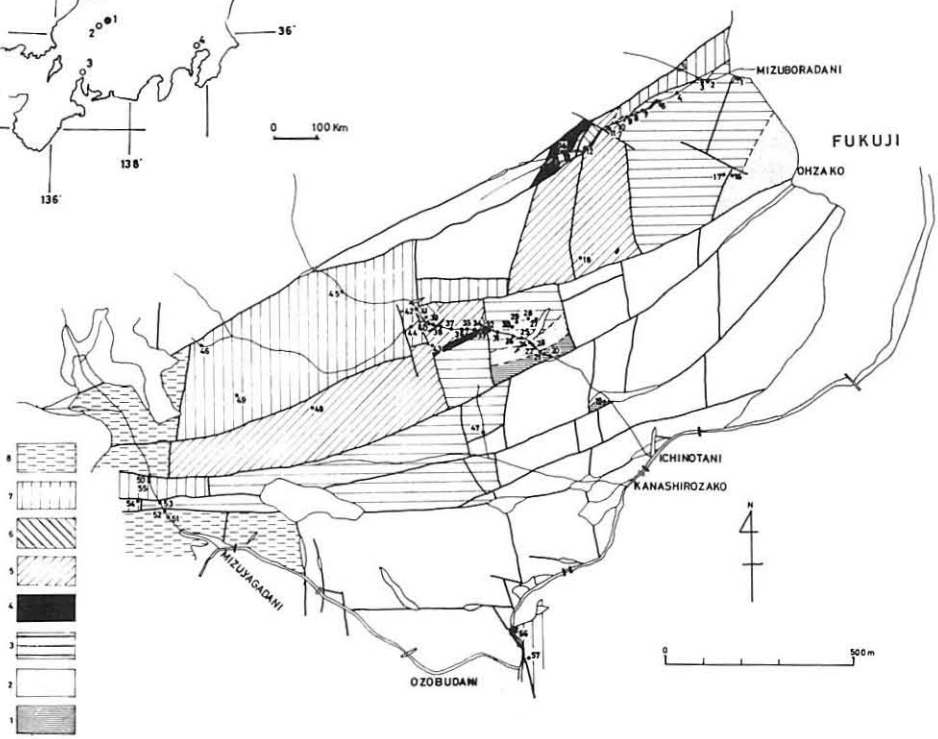
Introduction

Fukuji is a small hot spring spa, some 5 km west of an active volcano, Mt. Yake on the border between the Nagano and Gifu Prefecture, Central Japan. In a relatively narrow strip around Fukuji, such diverse rocks as Silurian, Devonian, Carboniferous, Permian, Cretaceous, and Tertiary deposits, crystalline schist, granite, serpentinite, dyke rocks contact by either faults or thrust to form complex tectonic terrain, the so-called Hida Marginal Tectonic Belt. This belt is encircling the southern margin of the Hida Metamorphic Terrain. And to the south of the Marginal Belt there develops a wide Palaeozoic-Mesozoic terrain called the Mino-Tamba Zone. The Fukuji district is important in deciphering tectogenetic history of Central Japan. Also fossils are relatively abundant and well preserved in the district, so that it has attracted geologists and amature collectors alike.

Kamei was the first to make a detailed geological mapping on the Palaeozoic of Fukuji district, and he introduced the name of Ichinotani



Text-figure 1. Index map, showing the location of Fukuji. 1: Fukuji. 2: Takayama. 3: Nagoya. 4: Tokyo.



Text-figure 2. A map showing the distribution of Fusulinid zones and fossil localities. 1: The Zone of *Eostaffella*. 2: The Zone of *Profusulinella*. 3: The Lower Zone of *Fusulinella-Fusulina*. 4: The Zone of *Beedeina*. 5: The Upper Zone of *Fusulinella-Fusulina*. 6: The Zone of *Triticites*. 7: The Zone of *Pseudoschwagerina*. 8: The Zone of *Pseudofusulina*.

Formation (Kamei, 1952), which was later defined by Igo (1956) to be a limestone formation of Carboniferous age.

The Ichinotani Formation is best exposed in the Ichinotani valley, and also along the Mizuboradani valley of Fukuji. In general the formation consist of gray to black, bedded limestone with the intercalations of red shale at horizons.

It is almost vertically dipping and is extending from Fukuji village to the WSW. The formation yields rich fusulinid and coralline fossils, and is in fault contact with the Devonian to the Permian formations. The Lower Permian Mizuyagadani Formation (Igo, 1956), also steeply dipping, consists of sandstone and slate with two conglomerate beds, and with lenses of limestone which yield some fusulinids.

The author has been working on geology and palaeontology of the Fukuji district since 1974. For years he worked on fusulinids which were found plentifully in the formations above mentioned.

Although fusulinids from the Fukuji district were already described by Igo (e.g. 1957) in detail, the author arrived at somewhat different conclusion with that obtained by Igo in respect to fusulinid taxonomy, fusulinid zonation and its correlation. And it is the aim of the present paper to describe a part of his achievements.

General account of geology of the district will be presented in another opportunity. Locality and horizons of fusulinids to be described below are indicated in the accompanied text-figures 2 and 3.

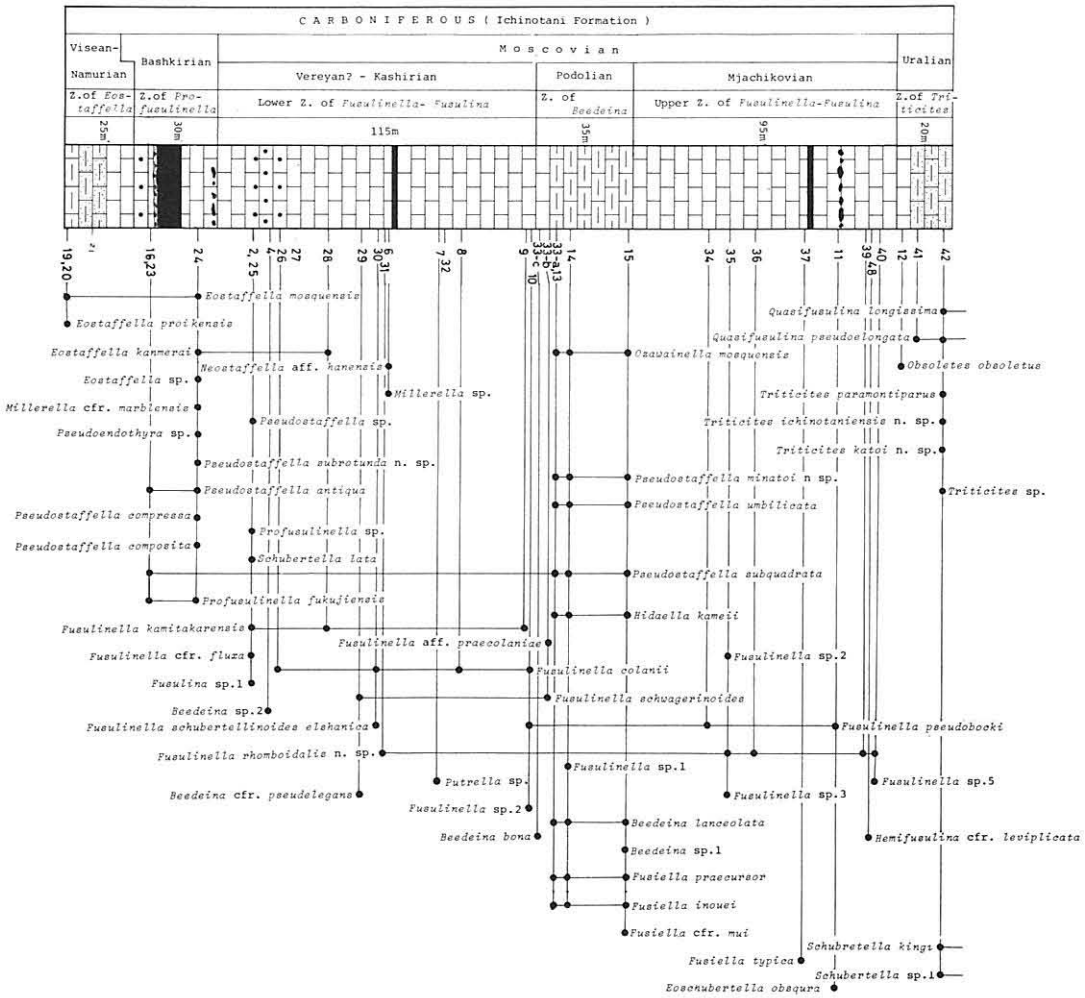
Before stepping into the description the author acknowledges with many thanks Prof. M. Minato of Hokkaido University for his guidance and supervision to the present study which formed a part of the Master's thesis by the author.

Acknowledgement is also due to Dr. M. Kato of Hokkaido University, Prof. T. Kamei of Kyoto University, Prof. K. Ishii of Himeji Industrial University, Prof. Y. Hasegawa of Niigata University for their comments and discussion on a number of stratigraphical and taxonomical problems. Miss E. Mima technically assisted the author, and Mr. S. Yamakoshi of Fukuji kindly helped him in various ways. To all of them the author's cordial thanks are offered.

Systematic Description

Order Fusulinida Fursenko, 1958
Family Ozawainellidae Thompson & Foster, 1937
Subfamily Ozawainellinae Thompson & Foster, 1937
Genus *Eostaffella* Rauser-Chernoussova, 1948
Eostaffella proikensis Rauser-Chernoussova
Pl.1, figs.1-4

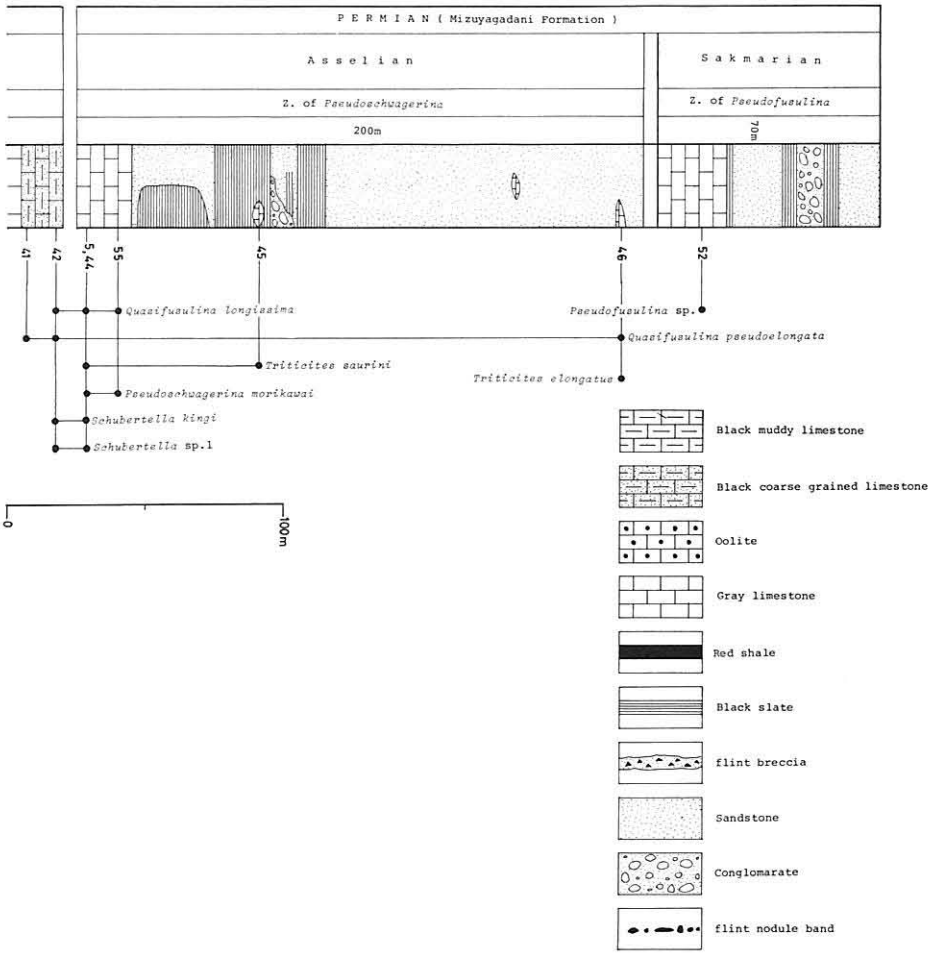
1962 *Eostaffella proikensis,* Bogush & Juferev, p.166, pl.6, figs.15-16.
1957 *Millerella bigemmicula* Igo (partim), p.172-174, pl.1, figs.1-4, non pl.1, figs.5-9, 15-17, 27.



Text-figure 3. Composite stratigraphical ranges of fusulinid fossils yielded from the Fukuji district.

Material and Locality: UHR. 30211, 30212, 30213, 30214. All from Loc.19 in the Ichinotani valley, Fukuji.

Description: The shell is minute and lenticular, having bluntly pointed periphery, convex lateral slopes, and slightly umbilical or arched poles. Mature specimens of 3 to 4 volutions are 0.19 to 0.22 mm long and 0.35 to 0.47 mm wide. The form ratio is 0.40 to 0.53. The shell is compactly and somewhat evolutely coiled in inner volutions, and expands gradually and involutely in outer ones. The proloculus is minute and spherical, and its outside diameter is



20 to 40 microns. The spirotheca is very thin and composed of 2 layers, tectum and lower tectorium. The septa are plane. The chomata are poorly and asymmetrical developed but the presence is doubtless. The tunnel is very low and narrow.

Remarks: From the characteristics above described, the present species is identical with *Eostaffella proikensis* Rauser-Chernoussova described by Bogush & Juferev (1962) from the USSR. Igo (1957) described *Millerella bigemmicula* from the present area. However, his illustration for that species shows that it actually includes two forms. One is typical for the genus *Millerella* and the other should be classified as a species of *Eostaffella.* The latter appears to be synonymous with *E. proikensis.*

Eostaffella mosquensis Vissarionova

Pl.1, figs.5-7, 15

1963 *Eostaffella mosquensis,* Rozovskaya, p.93-94, pl.16, figs.16-17; pl.17, figs.1-5.

Material and Locality: UHR. 30215, 30216 in Loc. 24 in the Ichinotan valley; UHR. 30217, 30225 from Loc. 19 in the Ichinotani valley, Fukuji.

Description: The shell is minute and lenticular with bluntly pointed periphery, convex lateral slopes, and umbilical poles. Mature specimens of 4 to 4-1/2 volutions are 0.19 to 0.25 mm long and 0.52 to 0.60 mm wide. Form ratio is 0.31 to 0.44. The shell is lenticular with slightly vaulted poles in inner 2 volutions and involutely coiled through outer volutions. The proloculus is minute, spherical and its outside diameter is 25 to 60 microns. The spirotheca is very thin and composed of protheca in inner volutions and 3 layers in outer ones. The septa are plane. The chomata are generaly only poorly developed, and sometimes asymmetrical, when present. The tunnel is low and narrow.

Remarks: Eostaffella mosquensis is similar to *E. prisca* Rauser-Chernoussova. However, the shell is larger in the former than the latter. *Eostaffella mosquensis* resembles *E. chomatifera* Kireeva. However, the former has a large shell with less umbilical poles.

Eostaffella kanmerai (Igo)

Pl.1, figs.11-12

1957 *Millerella kanmerai* Igo, p.175-177, pl.1, figs.20-26; pl.2, fig.14.
1964 *Eostaffella kanmerai,* Sada, p.230-231, pl.21, figs.8, 16, 17.
1967 *Eostaffella kanmerai,* Sada, p.144-145, pl.12, figs.1-10.
1969 *Eostaffella kanmerai,* Sada, p.120-121, pl.12, figs.1-13; pl.13, figs.1-2.
1973 *Eostaffella kanmerai,* Reitlinger, p.62, pl.10, figs.18-19; pl.11, figs.5-6.

Material and Locality: UHR. 30221, 30222. All from Loc. 24 in Ichinotani valley, Fukuji.

Remarks: The present form is characterized by small and lenticular shell with bluntly pointed periphery, slightly umbilical poles, minute proloculus, very thin and undifferentiated spirotheca, and poorly developed chomata. From these characteristics, the present species is quite identical with *Eostaffella kanmerai* described by Igo (1957) from the same area.

Eostaffella kanmerai is very similar to *E. acutissima* Kireeva described from the Russian Platform and from the Donetz by Potievskaya (1964). However, the former is distinguished from the latter in having larger shell with rounded periphery and smaller proloculus.

Eostaffella sp.

Pl.1, figs.13-14

Material and Locality: UHR. 30223, 30224. All from Loc. 24 in the Ichinotani valley, Fukuji.

Remarks: The present form characterized by minute and lenticular shell with bluntly pointed periphery and straight poles, very thin spirotheca with 3 layers, very poorly developed chomata, and unfluted septa. From these characteristics, the present species is included in the genus *Eostaffella.*

Genus *Millerella* Thompson, 1942

Millerella cfr. *marblensis* Thompson

Pl.1, figs.8-9

Compared with: 1942 *Millerella marblensis* Thompson, p.405-407, pl.1, figs.3-14.
1942 *Millerella marblensis,* Thompson, p.76, pl.23, figs.1-12; pl.24, figs. 1-9.
1957 cfr. *Millerella marblensis,* Igo, p.178-179, pl.1, figs.13-14.

Material and Locality: UHR. 30281, 30219. All from Loc. 24 in the Ichinotani valley, Fukuji.

Remarks: The present form possesses minute and discoidal shell with rounded to bluntly pointed periphery and umbilical poles, involutely coiled inner volutions and evolutely coiled outer ones, minute proloculus, unfluted septa, and very thin spirotheca with tectum, upper and lower tectoria. From these characteristics, the present species is included in the group of *Millerella marblensis* Thompson described from the U.S.A.

Millerella sp.

P.1, fig.10

Material and Locality: UHR. 30220 from Loc. 6 in the Mizuboradani valley, Fukuji.

Remarks: The present form is characteristic in minute and lenticular shell with umbilical poles, small proloculus, evolutely coiled outer volutions, very thin spirotheca with tectum, upper and lower tectoria. From these characteristics, the present species is included in the genus *Millerella,* but specific identification is at present difficult because of scanty material.

Genus *Ozawainella* Thompson, 1935
Ozawainella mosquensis Rauser-Chernoussova
Pl.1, figs.16-19

1951 *Ozawainella mosquensis* Rauser-Chernoussova, p.136, pl.10, figs.14-16.
1957 *Ozawainella angulata,* Igo, p.181-182, pl.3, figs.1-3.
1962 *Ozawainella mosquensis,* Ross & Dunbar, p.8-9, pl.1, figs.1-7.

Material and Locality: UHR. 30226 from Loc. 33 in the Ichinotani valley, UHR. 30200, 30227 from Loc. 14; UHR. 30228 from Loc. 15 in the Mizubora-dani valley, Fukuji.

Description: The shell is small and lenticular, having pointed periphery, straight to convex or concave lateral slopes, vaulted shell from with or without umbilicus. Mature specimens of 5 to 6 volutions are 0.38 to 0.47 mm long and 0.97 to 1.17 mm wide, and the form ratio is 0.36 to 0.54. In axial section the shell is slender, rhomboidal in inner volutions and becomes lenticular in outer volutions. The height of the chambers increase gradually. The proloculus is spherical and its outside diameter is 30 to 35 microns. The spirotheca is thin and composed of tectum, upper and lower tectoria, but the upper tectorium and chomata are both homogeneous and it is difficult to distinguish one from the other. The septa are unfluted. The chomata are massive, relatively high, and ribbon-like form. They extend to the poles of all volutions except penultimate volutions.

Remarks: Ozawainella mosquensis is very similar to *O. vozhgalica* Safonova. However, the former is distinguished from the latter by a smaller shell, weak developement of umbilicus of poles, and less pointed periphery. *Ozawainella mosquensis* also resembles *O. fragilis* Safonova in the shell form and form ratio. However, the former has a more compactly coiled shell and the well developed chomata in the last volution. *Ozawainella mosquensis* is distinguished from *O. lorentheyi* Safonova by a narrower shell, concavo-convex slopes, and smaller chomata.

Sumfamily Pseudostaffellinae Putrja, 1956
Genus *Pseudostaffella* Thompson, 1942
Pseudostaffella antiqua (Dutkevich)
Pl.2, figs.12-13

1951 *Pseudostaffella antiqua,* Rauser-Chernoussova, p.97, pl.5, fig.6.
1962 *Pseudostaffella antiqua,* Bogush & Juferev, p.183, pl.7, fig.10.
1964 *Pseudostaffella antiqua,* Potievskaya, p.52, pl.4, figs.1-4.
1965 *Pseudostaffella antiqua,* Ginkel, p.69-70, pl.16, figs.22-25.
1973 *Pseudostaffella antiqua,* Kobayashi, p.210-211, pl.31, figs.1-6.

Material and Locality: UHR. 30261 from Loc. 24 in the Ichinotani valley,

UHR. 30262 from Loc. 16 in the north ridge of the Ohzako valley, Fukuji.
Description: The shell is minute and subspherical to spherical, having arched to straight periphery and slightly umbilical poles. Mature specimens of 4 to 5-1/2 volutions are 0.54 to 0.85 mm long and 0.54 to 0.78 mm wide. The form ratio is 0.91 to 1.06. The inner 2 or 3 volutions are compactly coiled and at a high angle to the axis of coiling of the outer volutions. The outer volutions rapidly expand the height of their chambers. The proloculus is small and subspherical. Its outside diameter is 45 to 60 microns. The spirotheca is thin and composed of 3 layers which consist of tectum, thin upper and lower tectoria. The septa are very thin and unfluted. The chomata are relatively large, asymmetrical, and prominent to take hillock form. The tunnel is relatively high and narrow. The tunnel path is irregular.
Remarks: Pseudostaffella antiqua is similar to *P. sofronizkyi* Safonova. However, the former can be distinguished from the latter in having a small and rounded shell, less volution numbers, larger proloculus, and wider tunnel. *Pseudostaffella antiqua* resembles *P. minor* Rauser-Chernoussova. However, the former has a large shell, many volutions, and wide tunnel.

Pseudostaffella compressa (Rauser-Chernoussova)

Pl.2, figs.14-15, 16?

1938 *Staffella compressa* Rauser-Chernoussova, p.103-104, 154-155, pl.2, figs.2, 8-10.
1951 *Pseudostaffella compressa,* Rauser-Chernoussova, p.99-100, pl.5, fig.11.
1967 *Pseudostaffella compressa,* Brazhinikova et al, pl.21, fig.24.

Material and Locality: UHR. 30263, 30264, 30265. All from Loc. 24 in the Ichinotani valley, Fukuji.
Description: The shell is minute and subspherical with arched periphery and umbilical poles. Mature specimens of 5 to 5-1/2 are 0.48 mm long and 0.68 to 0.79 mm wide. The form ratio is 0.89. The inner 2 volutions are coiled at a high angle to the axis of coiling of the outer volutions. The inner 3 volutions are tightly coiled and the other volutions expand rapidly. The proloculus is spherical and minute, and its outside diameter is 30 to 40 microns. The spirotheca is very thin and composed of 2 to 3 layers. The inner 3 volutions consist of tectum and lower tectorium which sometimes is observed undifferentiated layer. The other volutions are composed of tectum, and upper and lower tectoria, although they are occasionally consist of only 2 layers. The septa are thin and unfluted throughout the volution. The chomata are developed in the 3rd to 4th or 5th volution. They are prominent and pointed. The tunnel is low and relatively wide, and the tunnel path is irregular.
Remarks: Pseudostaffella compressa is closely resembled *P. paracompressa*

Safonova. However, the former has compact coiling in inner volutions, narrower tunnel, and smaller and prominent chomata.

Pseudostaffella compressa also resembles *P. korobezkikh* Rauser-Chernoussova & Safonova. However, *P. compressa* has weakly umbilical poles, straight lateral slope, wide tunnel, and low and small chomata. *Pseudostaffella compressa* is similar to *P. irinovkensis* Leonotovich. However, *Pseudostaffella compressa* is distinguished from *P. irinovkensis* in having a small radius vector, weakly umbilical poles, and symmetrical shell form in outer volutions.

Pseudostaffella composita Grozdilova & Lebedeva

Pl.2, figs.17-18

1962 *Pseudostaffella composita,* Bogush & Juferev, p.184, pl.7, fig.12.
1973 *Pseudostaffella composita,* Reitlinger, pl.13, fig.12.

Material and Locality: UHR. 30266 from Loc. 16 in the north ridge of the Ohzako valley, UHR. 30267, 30268 from Loc. 24 in the Ichinotani valley, Fukuji.

Description: The shell is small and subspherical to nautiloid, with arched periphery and umbilical poles. Mature specimens of 5 volutions are 0.67 to 0.77 mm long and 0.73 to 0.83 mm wide. The form ratio is 0.85 to 0.92. The inner 2 volutions are coiled compactly and at a high angle to the axis of coiling of the outer volutions. In outer volutions the shell expands relatively uniformly. The height of chambers gradually increases from inner to outer. The proloculus is spherical and medium for the size of mature specimens. Its outside diameter is 60 to 75 microns. The spirotheca is relatively thick and composed of 3 layers, tectum, upper and lower tectoria. Diaphanotheca is not observed. The septa are unfluted throughout the length of the shell. The chomata are well-developed, large, and asymmetrical. Their tunnel side is very steep, vertical, or overhanged. The height of chomata reaches 1/2 to 2/3 the height of the chambers. The tunnel is high and narrow. The tunnel path is irregular.

Remarks: Pseudostaffella composita is similar to *P. gorskyi* (Dutkevich). However, the former can be distinguished from the latter in having more nautiloid shell, smaller and prominent chomata. *Pseudostaffella composita* is distinguished from *P. antiqua* (Dutkevich) in having a larger shell, more nautiloid shell, and larger chomata.

Pseudostaffella subquadrata Grozdilova & Lebedeva

Pl.3, figs.1-4

1951 *Pseudostaffella subquadrata,* Rauser-Chernoussova, p.109-111, pl.6, figs.10-11.

Material and Locality: UHR. 30269 from Loc. 23 in the Ichinotani valley, UHR. 30270 from Loc. 15, UHR. 30271, 30272 from Loc. 13 in the Mizuboradani valley, Fukuji.

Description: The shell is small and ortho-cylindrical to subspherical, with faintly umbilical to flat poles, arched to straight periphery, and straight axis of coiling. Mature specimens of 5 to 5-1/2 volutions are 0.93 to 1.07 mm long and 1.01 to 1.26 mm wide. The form ratio is 0.78 to 0.86. The shell is compactly coiled in inner 3 volutions and the height of volution gradually expands in outer volutions. The shell is nautiloid in inner volutions and gradually becomes to quadrate towards outer. The proloculus is spherical and its outside diameter is 55 to 90 microns. The spirotheca is relatively thick and composed of 3 layers, which consist of tectum, upper and lower tectoria. The diaphanotheca is not observed in all volutions. The septa are thin and unfluted. The chomata are relatively large and asymmetrical with somewhat variable forms. They are longer in inner volutions than in outer ones. The tunnel is relatively low and narrow, and the tunnel path is relatively regular.

Remarks: Pseudostaffella subquadrata resembles *P. minatoi* n. sp. However, *Pseudostaffella subquadrata* can be distinguished from *P. minatoi* in having a rounded shell, small form ratio, large and irregular chomata. *Pseudostaffella minatoi* has diaphanotheca in the spirotheca, however in *P. subquadrata* diaphanotheca has not observed.

Pseudostaffella subquadrata is similar to *P. ettrainensis* Ross in some respects. However, the former can be distinguished from the latter in having a smaller proloculus and tight coiling of the shell, and more irregular and asymmetrical chomata. Diaphanotheca is not observed in *Pseudostaffella subquadrata* but *P. ettrainensis* has distinct diaphanotheca in the spirotheca.

Pseudostaffella umbilicata (Putrja & Leontovich)

Pl.4, figs.1-5

1951 *Pseudostaffella umbilicata,* Rauser-Chernoussova, p.117, pl.7, figs.7-9.

1957 *Pseudostaffella spheroidea,* Igo, p.197-199, pl.5, figs.9-18.

Material and Locality: UHR. 30276, 30278 from the float in the Kanashirozako valley, UHR. 30277 from Loc. 15, UHR. 30279 from Loc. 13 in the Mizuboradani valley, UHR. 30280 from Loc. 33-a in the Ichinotani valley, Fukuji.

Description: The shell is small and subspherical, with broadly arched periphery and slightly umbilical poles. Mature specimens of 6 to 7-1/2 volutions are 0.92 to 1.16 mm long and 1.04 to 1.50 mm wide. The form ration is 0.76 to 0.86 in

most specimens, and the maximum form ratio is 0.94 and minimum is 0.70. The axis of coiling is straight. All volutions coil uniformly and subspherically. The shell expands gradually throughout growth of the shell. The proloculus is large and its outside diameter is 50 to 130 microns. Its shape is spherical. The spirotheca is thin and commonly 20 to 30 microns in its thickness and its maximum thickness is 60 microns. It is composed of tectum, upper and lower tectoria. The presence of a lighter layer below the tectum in part is suggested that it may be diaphanotheca. The septa are thin and unfluted. The chomata are large and reach one half to two-thirds the height of the chambers. They are prominent, asymmetrical, and prolonged to the polar regions. The tunnel is high and narrow, and tunnel path is regular.

Remarks: Pseudostaffella umbilicata is one of the largest species of this genus. It resembles *P. larionovae* Rauser-Chernoussova & Safonova. However, the former can be distinguished from the latter in having more quadrate shell in inner volutions, smaller chomata, and narrower tunnel.

Pseudostaffella umbilicata is similar to *P. latispiralis* Kireeva in general shell development. However, the former has a larger and more rounded shell, more massive chomata, and narrower tunnel. *Pseudostaffella umbilicata* can be distinguished from *P. sphaeroidea* (Ehrenberg) by the differences of shell development and chomata. Igo (1957) described *Pseudostaffella sphaeroidea* from Fukuji. However his illustrated specimens are actually assignable to *P. umbilicata.* They do not show quadrate shell form and elongated chomata to poleward as typical of *P. sphaeroidea.*

Pseudostaffella subrotunda Niikawa, n. sp.

Pl.2, figs.1-11

Material and Locality: UHR. 30250, 30252, 30253, 30254, 30255, 30256, 30257, 30258, 30259, 30260. All from Loc. 24 in the Ichinotani valley, Fukuji.

Type Specimen: UHR. 30250 (Pl.2, fig.1) is designated as the Holotype.

Description: The shell is minute and subspherical to nautiloid with arched periphery and slightly umbilical poles. Mature specimens of 4-1/2 to 5-1/2 volutions are 0.38 to 0.68 mm long and 0.51 to 0.98 mm wide. The form ratio is 0.58 to 0.84, with the average of 0.66 to 0.68. The inner 2 volutions are coiled at high angle to the axis of coiling of outer volutions. The first to second volutions are slightly evolute and compactly coiled. The other volutions expand gradually. The proloculus is spherical and minute. Its outside diameter is 25 to 45 microns. In most specimens it is 30 to 40 microns. The spirotheca is thin and measures about 20 to 30 microns in thickness of outer volutions. It is

composed of tectum, upper and lower tectoria. Tectum can be observed distinctly from the third volution. The septa are thin and unfluted. The chomata are well-developed and asymmetrical. They are subtriangle in shape with vertical, very steep, and overhanged sides. They reach one-half the height of the chambers. The tunnel is relatively low, and narrow in inner 3 volutions and relatively broad in outer volutions. The tunnel path is somewhat irregular.
Remarks: Pseudostaffella subrotunda is one of the primitive species of the genus. The species is distinguished from the other primitive forms of this genus in its shell shape, coiling of juvenarium, and large chomata.

Pseudostaffella minatoi Niikawa, n. sp.
Pl.3, figs.5-7

Material and Locality: UHR. 30273 from Loc. 33-a in the Ichinotani valley, UHR. 30275 from Loc. 14 in the Mizuboradani valley, Fukuji.
Type Specimen: UHR. 30273 (Pl.3, fig.5) is designated as the Holotype.
Description: The shell is small and subquadrate, possessing straight axis of coiling, gently arched periphery, and slightly umbilical poles. Mature specimens of 5-1/2 to 6 volutions are 0.83 to 1.10 mm long and 0.87 to 1.13 mm wide. The form ratio is 0.86 to 0.99. Maximum form ratio is obtained at the third volution. The form ratio in inner 3 volutions gradually increases except one specimen, and gradually decrease from the third to the last volutions. The proloculus is spherical and large for the size of mature specimen in this genus. Its outside diameter is 95 to 125 microns. The spirotheca is relatively thick and commonly 20 to 35 microns. It is composed of 4 layers, tectum, upper and lower tectoria, and diaphanotheca. The diaphanotheca is very thin and partly undiscerning. The spirotheca of the last volution is composed of 2 thin layers. The septa are unfluted throughout the length of the shell. The chomata are present in all volutions except the last volution. They are well-developed, massive, and asymmetrical. Their tunnel sides are very steep to vertical. Poleward slopes of chomata nearly reach the pole. The tunnel is high and narrow in inner volutions, but is variable in height and relatively wide in penultimate volutions. The tunnel path is relatively straight.
Remarks: Pseudostaffella minatoi is similar to *P. ettrainensis* described by Ross from northern Yukon. However, the former is distinguished from the latter by rounded shell, smaller chomata and larger form ratio. *Pseudostaffella minatoi* resembles *P. subquadrata* Grozdilova & Lebedeva. However, the former is distinguished from the latter in having a rounded shell and larger chomata.

The specific name is after Professor Masao Minato of Hokkaido University, under whose supervision the present study was carried out.

Genus *Neostaffella* Miklucho-Maclay, 1959
Neostaffella aff. *hanensis* Cheong
Pl.10, figs.11-12

Compare with: 1973 *Neostaffella hanensis* Cheong, p.64, pl.3, figs.10-13.
1974 *Neostaffella hanensis,* Cheong, p.68, pl.1, figs.14-21.

Material and Locality: UHR. 30334, 30335 from Loc. 6 in the Mizuboradani valley, Fukuji.

Description: The shell is small and drum shaped, showing butterfly or X-letter shaped in axial section. The periphery is concave and the poles are widely and deeply umbilical. The concave periphery appears from the 5th volution. Mature specimens of 7 to 8 volutions are 1.28 mm long and 1.42 mm wide. The form ratio is 0.90. The shell is subquadrate with straight periphery and slightly umbilical poles in inner 4 volutions, and drum shaped with concave periphery and umbilical poles in outer volutions. The proloculus is small and spherical, and its outside diameter is 70 microns. The spirotheca is thin and composed of tectum, upper and lower tectoria, but sometimes diaphanotheca is observed partly. The septa are unfluted. The chomata are very well-developed and extend to polar regions. They are very large, very high, asymmetrical, and square-shouldered in shape. The tunnel is narrow and low, and the tunnel path is regular.

Remarks: At a first glance the present form reminds the form of genus *Xenostaffella* Cheong. However Cheong's genus is distinguished from *Neostaffella* in showng the outer volutions completely evolute. And the present form is still in the category of *Neostaffella.* Amongst species of *Neostaffella* the present form is in the group of *N. paradoxa.*

Neostaffella hanensis Cheong is the closest ally to the present form, from which it is only distinguished by having small proloculus and well-developed, massive chomata.

Family Fusulinidae Möller, 1878
Subfamily Fusulinellinae Möller, 1878
Genus *Profusulinella* Rauser-Chernoussova & Beljaev, 1936
Profusulinella fukujiensis Igo
Pl.6, figs.1-2, 5

1957 *Profusulinella fukujiensis* Igo, p.199-201, pl.4, figs.16-25.

Material and Locality: UHR. 30281 from Loc. 24; UHR. 30285 from Loc. 23 in the Ichinotani valley, UHR. 30282 from Loc. 16 in the north ridge of the Ohzako valley, Fukuji.

Remarks: The present form is characterized by small and short fusiform shell

with subspherical inner 2 volutions, small proloculus, well-developed chomata, thin and unfluted septa, and thin spirotheca with tectum and upper and lower tectoria. From these characteristics, the present species is quite identical with *Profusulinella fukujiensis* described by Igo (1957) from this field. *Profusulinella fukujiensis* is strongly resembed *P. beppensis* Toriyama (1958) from Akiyoshi, Yamaguchi Prefecture. However, the former is distinguished from the latter in having smaller proloculus, thicker spirotheca, and more developed chomata.

Genus *Fusulinella* Möller, 1877

Fusulinella colanii (Lee & Chen)

Pl.6, figs.10-13

1930 *Fusulinella (Neofusulinella) colanii* Lee & Chen, p.128-129, pl.11, figs.8-14.
1944 *Fusulinella colanii,* Toriyama, p.72-73, pl.6, fig.9.
1951 *Fusulinella colaniae,* Rauser-Chernoussova & Safonova, p.217, pl.30, figs.1-2.
1953 *Fusulinella colanii,* Kanuma, p.29-30, pl.33, figs.13-16.
1961 cfr. *Fusulinella colanii,* Kanuma, p.113-114, pl.14, fig.8.
1965 ex. gr. *Fusulinella colaniae,* Ginkel, p.158-159, pl.XLVII, figs.6-22.
1966 *Fusulinella colaniae,* Sheng, p.31, pl.4, fig.4.
1976 *Fusulinella colaniae,* Sheng, Min & Wang, p.II, figs.6-7.

Material and Locality: UHR. 30290 from Loc. 26 in the Ichinotani valley, UHR. 30291 from Loc. 10; UHR. 30293 from Loc. 8 in the Mizuboradani valley, UHR. 30292 from Loc. 47 in the Kanashirozako valley, Fukuji.

Description: The shell is small and subellipsoidal, having flatly arched periphery, and straight to slightly convex lateral slopes, and bluntly pointed poles. Mature specimens of 5 to 6 volutions are 2.78 to 3.85 mm long and 1.07 to 2.00 mm wide. The form ratio is 2.08 to 2.81. The shell is spherical and tightly coiled in the first or second volution and gradually becomes from ellipsoidal to subellipsoidal forms in outer volutions. The height of the chambers in outer 4 or 5 volutions increases gradually. The proloculus is small except one specimen and subspherical, and its outside diameter is 60 to 70 microns in general. The maximum outside diameter of it is 130 microns. The spirotheca is thin and composed of 3 layers, tectum, upper and lower tectoria in inner 3 volutions. The diaphanotheca first appears from the fourth volution. While in the last volution the spirotheca is composed of tectum and lower tectorium. The septa are unfluted or slightly wavy in inner 3 or 4 volutions, and fluted in polar regions of outer volutions. The chomata are commonly low, massive, and asymmetrical. The tunnel sides are steep to vertical and lateral slopes of chomata become lower gradually toward poles. The tunnel is narrow and low in inner 2 or 3 volutions, and relatively high in the third to fouth volution. In the penultimate volution the tunnel is low. The tunnel path is

regular.

Remarks: *Fusulinella colanii* has close similarity with *F. paracolaniae* Safonova. However, *Fusulinella colanii* is still distinguished from *F. paracolaniae* by having a large and more elongate shell, slightly larger form ratio, and wider tunnel.

Further, *Fusulinella colanii* also resembles *F. vozhgalensis* Safonova. The former has however more elongate shell, tightly coiled and spherical juvenarium, and the more rapidly increased height of chamber in outer volutions.

Fusulinella kamitakarensis Igo

Pl.6, figs.4, 6-7

1957 *Fusulinella kamitakarensis* Igo, p.201-202, pl.6, figs.1-3.

Material and Locality: UHR. 30284, 30286, 30287. All from Loc. 9 in the Mizuboradani valley, Fukuji.

Remarks: The present form is quite identical with *Fusulinella kamitakarensis* described by Igo (1957) from this field in shell form, poorly developed diaphanotheca, and unfluted septa. Similarity between *Fusulinella kamitakarensis* and *F. rjasanensis* Rauser-Chernoussova (1951) from the Russian Platform in great. However, the former is different from the latter in having larger and more ellipsoidal shell and higher chomata.

Fusulinella kamitakarensis is also distinguished from *F. schubertellinoides elshanica* Rauser-Chernoussova (1951) from the Russian Platform in possessing smaller shell, unfluted septa, and higher chomata.

Fusulinella aff. *praecolaniae* Safonova

Pl.6, fig.3

Compare with: 1951 *Fusulinella praecolaniae* Safonova, p.215-216, pl.29, figs.4-5.

Material and Locality: UHR. 30283 from Loc. 33-b in the Ichinotani valley, Fukuji.

Description: The shell is small and oval with broadly arched periphery, convex lateral slopes, and rounded poles. Mature specimen of 5-1/2 volution is 1.59 mm long and 1.00 mm wide, and the form ratio is 1.59. The first volution is coiled at high angle to the axis of coiling of outer volutions. The shell is tightly coiled and subspherical in inner 3 volutions. The proloculus is spherical and its outside diameter is 80 microns. The spirotheca is thin, and generally composed of 4 layers, tectum, thin upper and lower tectoria, and thick indistinct diaphanotheca except inner 2 volutions and in the last one. It is composed of tectum, upper and lower tectoria in inner 2 volutions and tectum,

diaphanotheca, lower tectorium in the last volution. The septa are thin, and unfluted in inner volutions and fluted in polar regions of outer volutions. The chomata are well-developed, asymmetrical, and relatively high. The tunnel is relatively high and broad, and the tunnel path is relatively regular.
Remarks: The present form resembles *Fusulinella praecolaniae* in many respects. However, the present species is much smaller than the former. The present species rather resembles *Hemifusulina nataliae* Rauser-Chernoussova, 1951. However, both species are easily distinguished from each other by the differences of spirothecal structure.

Fusulinella rhomboidalis Niikawa, n. sp.

Pl.8, figs.1-9

Material and Locality: UHR. 30305 from the float; UHR. 30306 from the float in the Kinmanichi; UHR. 30307, 30311 from Loc. 39; UHR. 30308 from Loc. 35; UHR. 30309 from Loc. 40; UHR. 30310 from Loc. 31; UHR. 30312 from Loc. 36; UHR. 30313 from Loc. 40 in the Ichinotani valley, Fukuji.
Type Specimen: UHR. 30313 (Pl.8, fig.9) is designated as the Holotype.
Description: The shell is moderately large and inflated fusiform to rhomboidal with arched periphery, straight to somewhat concave lateral slopes, and bluntly pointed to rounded poles. Mature specimens of 6-1/2 to 7-1/2 volutions are 3.875 to 4.15 mm long and 1.26 to 2.08 mm wide, and the form ratio is 1.60 to 1.91. The measurement of the shell in sixth volution is 2.22 to 3.92 mm long and 1.26 to 2.08 mm wide, and the form ratio is 1.50 to 2.00. The shell is relatively tightly coiled and spherical to subspherical in inner 2 or 3 volutions, and inflated to rhomboidal and expands gradually in outer ones. The proloculus is small to medium in size, spherical to subspherical, and its outside diameter is 60 to 160 microns. The spirotheca is thin to relatively thick and composed of generally 4 layers, tectum, upper and lower tectoria, and diaphanotheca, but 3 layers which are tectum and upper and lower tectoria in inner 2 volutions. The upper tectorium generally is thicker than the lower one. The septa are irregularly and weakly fluted in polar regions. The chomata are well-developed, massive, asymmetrical, and their tunnel sides are vertical to overhanged and poleward slopes are either abruptly or gradually lower. The tunnel is narrow, and high. The tunnel path is regular.
Remarks: The new species is characterized by possessing large rhomboidal shell, concave lateral slopes and weakly fluted septa near poles. But young specimens and inner volutions of the mature shells show some similarity to *Fusulinella bocki* which appears to be a very variable species. Therefore a number of

subspecies and variety have been proposed for forms of *F. bocki.*

As a matter of fact, some specimens in the author's collections would fit for such forms of *Fusulinella bocki.* For example a figured specimen (pl.9, fig.3) may be named as *Fusulinella bocki timanica.* Yet it is indeed difficult to define these formae since their skeletal elements are all within the range of continuous growth variation of the present new species. In inner volutions the shell shape is inflated fusiform, but it finally becomes rhomboidal as above described. No directly comparable species are known to the author, although its similarity to *Fusulinella bocki* group can not be overlooked.

Fusulinella schubertellinoides elshanica Rauser-Chernoussova

Pl.6, figs.8-9

1951 *Fusulinella schubertellinoides elshanica* Rauser-Chernoussova, p.214-215, pl.28, figs.8-9

Material and Locality: UHR. 30288 from Loc. 30 in the Kinmamichi of the Ichinotani valley, Fukuji.

Description: The shell is small and subellipsoidal, having arched to straight median region, convex lateral slopes, and rounded poles. Mature specimens of 5-1/2 volutions are 2.67 to 2.95 mm long and 1.12 to 1.20 mm wide. The inner volutions are tightly coiled. The first volution is coiled at a high angle to the axis of coiling of outer volutions. The shell in nautiloidal in the second and third volutions and subellipsoidal in the following outer volutions. The height of chambers expands rapidly in outer volutions. The proloculus is spherical and small, and its outside diameter is 40 to 60 microns. The spirotheca is thin, and it is composed of 4 layers which consist of tectum, upper and lower tectoria, and diaphanotheca. However, in inner 3 volutions it is composed of 3 layers, tectum, upper and lower tectoria. The septa are thin and unfluted except polar regions, but they are weakly fluted in polar regions. The chomata are small, low, but prominent and asymmetrical. The tunnel is low and relatively wide, and the tunnel path is regular.

Remarks: Fusulinella schubertellinoides elshanica is very similar in some respects to *F. rjasanensis* Rauser-Chernoussova. However, the former has large shell, acute chomata, narrow tunnel in outer volutions.

Fusulinella schwagerinoides (Deprat)

Pl.7, figs.5-6

1913 *Neofusulinella schwagerinoides* Deprat, p.42-44, pl.7, figs.17-22.
1927 *Fusulinella (Neofusulinella) schwagerinoides,* Lee, p.19-20, pl.2, fig.18.

1930 *Fusulinella (Neofusulinella) schwagerinoides,* Lee & Chen, p.124-125, pl.10, fig.12, pl.11, figs.1-2.

Material and Locality: UHR. 30300 from Loc. 29, UHR. 30301 from Loc. 33-b in the Ichinotani valley, Fukuji.

Description: The shell is small and fusiform with arched periphery, slightly concave lateral slopes, and bluntly pointed poles. Mature specimens of 5 to 6-1/2 volutions are 3.18 to 3.30 mm long and 1.15 to 1.42 mm wide. The form ratio is 2.14 to 2.48. The shell is spherical in inner 2 volutions, short fusiform in the following 2 volutions, and fusiform to elongate fusiform in the other volutions. And inner 4 volutions are very tightly coiled, and the height of chambers rapidly expand in outer volutions. The proloculus is small and spherical, and its outside diameter is 70 to 80 microns. The spirotheca is thin and composed of 3 layers in inner 2 volutions which consist of tectum, upper and lower tectoria. In outer volution it is composed of 4 layers, tectum, upper and lower tectoria, and thick diaphanotheca. The last volution is composed of 2 layers. The septa are weakly fluted but they are rather strongly fluted in polar regions. The chomata are very small, low, asymmetrical. The tunnel is relatively narrow in inner 3 or 4 volutions, but is broad in outer volutions. The tunnel path is regular.

Remarks: Fusulinella schwagerinoides shows similar shell form of *F. pseudo-schwagerinoides* Putrja. However, the former can be distinguished from the latter in having larger shell, more volutions, smaller chomata, and stronger septal fluting.

Fusulinella schwagerinoides resembles *F. valida* Bogush. However, the former has large form ratio, small proloculus, and the inner shell of the former are more inflated than the latter. *Fusulinella schwagerinoides* also resembles *F. kalendai* Bogush. The former has however tight coiling in juvenarium and smaller chomata.

Fusulinella pseudobocki (Lee & Chen)

Pl.7, figs.1-4

1930 *Fusulinella (Neofusulinella) pseudobocki* Lee & Chen, p.122-123, pl.9, figs.10-14; pl.10, figs.1-7.
1938 *Fusulinella pseudobocki,* Huzimoto, p.275, pl.8, figs.14-15.
1947 *Fusulinella pseudobocki,* Toriyama, p.34-35, pl.9, fig.1.
1951 *Fusulinella pseudobocki,* Rauser-Chernoussova, p.227-228, pl.32, figs.8-9.
1953 *Fusulinella pseudobocki,* Kanuma, p.28-29, pl.3, figs.1-12.
1957 *Fusulinella pseudobocki,* Igo, p.207-209, pl.8, figs.1-12.
1958 *Fusulinella pseudobocki,* Sheng, p.91, pl.8, figs.6-10.
1958 *Fusulinella pseudobocki,* Sakagami, p.80-81, pl.1, figs.19-21.
1960 *Fusulinella pseudobocki,* Grozdilova & Lebedeva, pl.154-155, pl.24, figs.4-5.

1963 *Fusulinella pseudobocki,* Bogush, p.84-85, pl.5, figs.7-8.

Material and Locality: UHR. 30296 from Loc. 10; UHR. 30297 from Loc. 11 in the Mizuboradani valley, UHR. 30298, 30299 from Loc. 34 in the Ichinotani valley, Fukuji.

Description: The shell is moderately large and elongate fusiform with arched periphery, concave lateral slopes, and bluntly pointed poles. Mature specimens of 5 to 6 volutions is 4.22 to 4.27 long and 1.37 to 1.72 mm wide, and the form ratio is 2.22 to 2.72. The proloculus is small, spherical, and its outside diameter is 70 to 80 microns. The spirotheca is generally of 4 layers, tectum, upper and lower tectoria, and diaphanotheca. The septa weakly fluted in extremely polar regions of outer volutions. The chomata are massive, asymmetrical and prominent. The tunnel is low and relatively narrow in inner volutions, and low and broad in outer ones.

Remarks: Fusulinella pseudobocki is similar to *F. provecta* Sheng (1958). However, the former may be distinguished from the latter in providing larger and more fusiform shell, smaller and lower chomata in outer volutions.

Fusulinella cfr. *fluxa* (Lee & Chen)

Pl.7, fig.9

Compare with: 1930 *Fusulinella (Neofusulinella) fluxa* Lee and Chen, p.123, 124, pl.10, figs.8-11.
1951 *Fusulinella fluxa,* Rauser-Chernoussova et al, p.229, pl.33, fig.3.
1958 *Fusulinella fluxa,* Sheng, p.94-95, pl.10, figs.5-6.

Material and Locality: UHR. 30304 from Loc. 2 in the Mizuboradani valley, Fukuji.

Description: The shell is moderately large and subellipsoidal with slightly arched periphery and bluntly pointed poles. Mature specimens of 5-1/2 volutions are 4.65 to 6.75 mm long and 1.85 to 2.05 mm wide, and the form ratio is 2.59 to 3.17. The shell is subspherical and tightly coiled in first volution. The proloculus is medium in size, spherical, and its outside diameter is 100 to 120 microns. The spirocheca is somewhat undulated, and thin in inner volutions and relatively thick in outer ones. It is composed of tectum, upper and lower tectoria in inner 2 or 3 volutions, and 4 layers, tectum, upper and lower tectoria, and diaphanotheca in outer ones. The septa are weakly fluted in polar regions of outer volutions. The chomata are massive, but irregular in height. Their tunnel sides are steep to nearly vertical and polewards slopes are low. The tunnel is relatively low, narrow in inner 3 volutions and broad in outer ones. The tunnel path is regular.

Remarks: The present species is very similar to *Fusulinella helenae* Rauser-

Chernoussova (1951). However, the former is easily distinguishable from the latter in having more inflated shell, more rounded poles, and weaker septal fluting.

Fusulinella cfr. *fluxa* resembles *F. pseudobocki* (Lee et Chen), 1930. However, the former has elongate shell, rounded poles, fluted septa, and irregular chomata.

Fusulinella sp. 1.

Pl.7, fig.7

Material and Locality: UHR. 30302 from Loc. 14 in the Ichinotani valley, Fukuji.

Remarks: This form is characterized by a large and very elongate fusiform shell with massive and asymmetrical chomata. Mature specimen of 6 volutions is 1.62 mm wide and 4.29 mm long. Form ratio is 3.04. Height of volution increases gradually. The spirotheca is relatively thick and generally composed of 4 layers, tectum, thin diaphanotheca, upper and lower tectoria, but diaphanotheca is lacking in inner 2 volutions. The septa are weakly fluted in polar regions. From the characteristics above described, the present species is similar to *Fusulinella chuanshanensis* Lee et Chen, 1930. However, the former is specifically distinct from the latter in having smaller and inflated shell and less massive chomata.

Fusulinella sp. 2.

Pl.7, figs.8

Material and Locality: UHR. 30303 from Loc. 17 in the north ridge of the Ohzako valley, Fukuji.

Remarks: The present form is characterized by a large and subellipsoidal shell with massive chomata, very small proloculus, and weakly fluted septa in polar regions. Mature specimen of 6 volutions is 2.14 mm wide and 5.32 mm long. Form ratio is 2.48. Height of volution increases gradually. The spirotheca is relatively thick and composed of 4 layers tectum, thin and indistinct diaphanotheca, thick upper and lower tectoria, but in inner 2 volutions only 3 layers, tectum, upper and lower tectoria. The septa are unfluted or weakly fluted in inner 3 volutions and fluted in polar regions of outer volutions.

From the characteristics above described, the present species seems to be allied to *Fusulinella rara* Shlykova described from Russian Platform, 1951. However, this species has large and ellipsoidal shell and small form ratio.

Fusulinella sp. 3.

Pl.8, fig.10

Material and Locality: UHR. 30314 from Loc. 35 in the Ichinotani valley, Fukuji.

Description: The shell is medium in size and fusiform with arched periphery, slightly concavo-convex lateral slopes, and pointed poles. Mature specimen of 8 volutions is 4.44 mm long and 2.20 mm wide. The form ratio is 2.02. The shell is spherical to subspherical and very tightly coiled in inner 4 volutions. The proloculus is relatively large and subspherical, and its outside diameter is 130 x 100 microns. The spirotheca increases its thickness from inner to outer. It is composed of 4 layers, tectum, diaphanotheca, upper and lower tectoria. Lower tectorium is partly perforated in outer volutions. The septa are thin and somewhat complicated in polar regions and very weakly fluted even near the median region. The chomata are well-developed, high and asymmetrical. Their tunnel sides are vertical, and poleward slopes are gentle in inner volutions, but are steep in outer ones. The tunnel is high and relatively narrow, and the tunnel path is regular.

Remarks: The present form is characterized by having numerous volutions, very tightly coiled inner volutions, and septal fluting along lateral slopes.

From the characteristics above described, the present form may be a new species of *Fusulinella.* However, the specimen at the author's disposal is only one oblique thin section. We have to wait until more favourable material is obtained in future.

Fusulinella sp. 4.

Pl.6, fig.14

Material and Locality: UHR. 30294 from Loc.53 in the Mizuyagadani valley, Fukuji.

Remarks: This form is characterized by small and inflated fusiform shell with bluntly pointed poles, fluted septa in polar regions, large proloculus, massive and long chomata, and thin spirotheca with diaphanotheca. From these characteristics, the present species is safely included in the genus *Fusulinella.* But no identical species hitherto proposed in *Fusulinella* have been found. The present form is represented by only one specimen from the Mizuyagadani valley.

Genus *Hidaella* Fujimoto & Igo, 1955

Hidaella kameii Fujimoto & Igo

Pl.10, fig.13

1955 *Hidaella kameii* Fujimoto & Igo, p.45, pl.7, figs.1-7.

Material and Locality: UHR. 30336 from Loc. 15 in the Mizuboradani valley, and Loc. 33-a in the Ichinotani valley, Fukuji.

Remarks: The present form is characterized by cylindrical shell with broadly rounded poles, irregularly undulated spirotheca, weakly developed chomata, and feebly fluted septa in central portion. The spirotheca is thin and composed of 4 layers, tectum, upper and lower tectoria, and diaphanotheca. From the characteristics above described, the present species is quite identical with *Hidaella kameii* Fujimoto & Igo (1955) described from the present field.

Subfamily Fusulininae Möller, 1878

Genus *Fusulina* Fischer von Waldheim, 1829

Fusulina consobrina Safonova

Pl.10, fig.9

1951 *Fusulina consobrina* Safonova, p.293-294, pl.48, fig.8; pl.49, fig.1.

Material and Locality: UHR. 30332 from Loc. 18 in the north ridge of the Ichinotani valley.

Description: The shell is large and cylindrical, having slightly convex to straight lateral slopes, and rounded poles. Mature specimens of 6 volutions are 6.25 mm long and 1.90 mm wide. Form ratio is 3.12. The shell is subspherical in the first volution, ellipsoidal to inflated fusiform in the following volutions and cylindrical in the last volution. The shell expands relatively uniformly. The proloculus is spherical and its outside diameter is 130 microns. The spirotheca is relatively thick and composed of 4 layers, except in the last volution, which consist of tectum, diaphanotheca, upper and lower tectoria. The upper tectorium is thicker than the lower one in inner 3 volutions and is sometimes absent in the 4th to 5 th volutions. In the last volution it is composed of tectum and lower tectorium. The septa are strongly fluted throughout the shell. The chomata are well-developed, high, asymmetrical. They are columnar in inner volutions. The tunnel is narrow and high in inner volutions, and broad and low in outer volutions. The tunnel path is regular.

Remarks: *Fusulina consobrina* is closely allied to *F. innae* Rozovskaya. However, the former has a more cylindrical shell in outer volutions and more loosely coiled inner volutions. *Fusulina consobrina* much resembles *F. kulikiana* Rauser-Chernoussova (1951). However, *F. consobrina* is distinguished from the latter in having less rapid expanding the shell along the coiling axis, and lower and weaker septal folding.

Fusulina sp. 1.

Pl.10, fig.8

Material and Locality: UHR. 30331 from Loc. 25 in the Ichinotani valley, Fukuji.

Remarks: This form possesses small elongate fusiform shell with arched periphery, faintly concave lateral slopes, and bluntly pointed poles, weakly fluted septa, massive, asymmetrical chomata, and relatively thick spirotheca with tectum, and less dense lower layer. From these characteristics, the present species is included in the genus *Fusulina* and is closely related to *Hemifusulina.* However, this species is generically distinguished from *Hemifusulina* in some differences of the spirothecal structure. The form is represented by only a tangential section, but is described and figured here because it is the earliest occurrence of the genus *Fusulina* in this region.

Genus *Beedeina* Galloway, 1933

Beedeina lanceolata (Lee & Chen)

Pl.9, figs.1-9; Pl.10, fig.2

1930 *Fusulina (Girtyina) lanceolata* Lee & Chen, p.134-135, pl.13, figs.5-6.
1957 *Fusulina ichinotaniensis* Igo, p.218-220, pl.9, figs.1-3, 8, 10-12.
1957 *Fusulina* aff. *ichinotaniensis* Igo, p.218-220, pl.11, figs.1-5.
1957 *Fusulina ichinotaniensis* var. *rotundata* Igo, p.220-222, pl.9, figs.4-7, 9, 13-16.
1957 *Fusulina cheni* Igo, p.216-218, pl.10, figs.11-15.
1957 *Fusulina lanceolata,* Igo, p.214-215, pl.10, figs.1-10.
1963 *Fusulina elegans,* Bogush, p.105, pl.9, fig.11.
1976 *Beedeina cheni,* Sheng, pl.3, fig.1.

Material and Locality: UHR. 30315, 30318, 30319, 30321 from Loc. 14; UHR. 30317, 30322 from Loc. 13; UHR. 30320 from Loc. 15 in the Mizuboradani valley, UHR. 30316, 30323 from Loc. 33-a in the Ichinotani valley, UHR. 30325 from the float in the Kanashirozako valley, Fukuji.

Description: The shell is medium in size and fusiform with highly inflated median regions, slightly concave lateral slopes, and bluntly pointed poles. Mature specimens of 5-1/2 to 6-1/2 volutions are 1.60 to 2.05 mm wide and 3.20 to 4.45 mm long. The form ratio is 1.62 to 2.15. Inner 2 to 3 volutions are ellipsoidal to fusiform with relatively compact coiling, and outer volutions are fusiform and uniformly coiled. The proloculus is medium to large and spherical to subspherical. Its outside diameter is 0.13 to 0.24 mm. The spirotheca is relatively thick and composed of 4 layers, which consists of tectum, diaphanotheca, upper and lower tectoria. The diaphanotheca is indistinct or partly absent in inner 2 volutions. In last volution the spirotheca is composed of 3 layers but diaphanotheca is partly developed. Thickness of

upper and lower tectoria are irregular and sometimes inner tectorium is absent. The septa are relatively strongly fluted from polar regions to median regions. The chomata are well-developed, massive, relatively symmetrical, and columella-like to subquadrated in shape. The tunnel is high and narrow, and the tunnel path is regular.

Remarks: Igo (1957) described from this region several allied forms of *Beedeina.* They are *Fusulina lanceolata, F. cheni, F. ichinotaniensis, F. ichinotaniensis* var. *rotundata* and *F.* aff. *ichinotaniensis.* The author collected a great many specimens of *Beedeina* (*sensu* Ishii, 1958) that are assignable to forms Igo described. However the author considers all of them is forming a continuous, cognate group which belongs to the species group of *Fusulina elegans* of Rauser et al. (1951) having rhomboidal shell, massive and well-developed chomata through volutions. Specimens in the author's collection are best placed under *Beedeina lanceolata* (Lee & Chen), one of the early described species of *Beedeina* (Ishii, *op. cit.*). It true to say, as Igo classified, that there are several forms recognizable in that species which appears to be somewhat variable in the shape of shell, in the mode of septal fluting, etc. It is morphologically in between the Russian *"F." elegans* and *"F." samarica.* Several forms of *Beedeina schellwieni* described from China are as Igo previously noticed, different from *Girtyina schellwieni* Staff (1912) and are much related to *Beedeina lanceolata.* For example *"Fusulina" schellwieni* described by Sheng (1958) from N.E. China is close to the author's specimens. *"F." schellwieni* would be better belonging one of the variety of *Beedeina lanceolata.* Ishii (1958) figured *Beedeina higoensis doii* (MS) from Shikoku, Japan. The form seems to the author to be more related to the category of *B. higoensis* (Kanmera).

Beedeina bona (Chernova & Rauser-Chernoussova)

Pl.10, fig.3

1951 *Fusulina bona* Chernova & Chernoussova, p.281-282, pl.44, figs.7-9.

Material and Locality: UHR. 30326 from Loc. 33-c in the Ichinotani valley, Fukuji.

Description: The shell is small and fusiform to rhomboidal, having arched periphery, straight to faintly concave lateral slopes, and pointed poles. Mature specimens of 5 volutions are 1.92 to 2.44 mm long and 1.06 to 1.12 mm wide. The form ratio is 1.18 to 2.00. The shell expands uniformly and becomes gradually short fusiform to fusiform or rhomboidal in its growth. The proloculus is spherical and its outside diameter is 110 to 130 microns. The spirotheca is thin and composed of 4 layers except the first and the last

volutions, which consist of tectum, diaphanotheca, and upper and lower tectoria. In the first volution, it is composed of 3 layers, lacking in diaphanotheca. The septa are strongly, narrowly, and irregularly fluted except in inner 2 volutions where are unfluted. The chomata are well-developed, massive, and symmetrical. Their tunnel side is vertical and poleward slope is low in inner 2 volutions, and they are columnar in outer volutions.

Remarks: Beedeina bona is similar to *Fusulina (=Beedeina) schellwieni* Staff. However, the former is distinguished from the latter in possessing acute poles and long shell in mature stage.

Beedeina cfr. *pseudoelegans* (Chernova)

Pl.10, fig.7

Compare with: 1951 *Fusulina pseudoelegance* Chernova, p.282-283, pl.44, fig.10; pl.45, figs.1-3.
1963 *Fusulina pseudoelegans,* Bogush, p.103, pl.9, fig.8.

Material and Locality: UHR. 30330 from Loc. 29 in the Ichinotani valley, Fukuji.

Description: The shell is medium and fusiform, with broadly arched to arched periphery, straight lateral slopes, and bluntly pointed poles. Mature specimens of 5 volutions are 4.12 mm long and 1.45 mm wide. The form ratio is 2.57. The first volutions is subspherical and tightly coiled. In outer volutions, the shell expands gradually and it is normal to thick fusiform. The proloculus is subspherical and its out side diameter is 130 microns. The spirotheca is thin and composed of 4 layers, tectum, thick diaphanotheca, and thin upper and lower tectoria. The lower tectorium is sometimes observed to have very fine fibrous structure. The septa are highly and regularly fluted. The chomata are massive, asymmetrical, and irregular. They are mashroom-like, or columnar in form. The tunnel is high and broad in general, but narrow in inner volutions. The tunnel path is relatively regular.

Remarks: The present form differs from *Beedeina bona* in having larger, elongated shell and loosely coiled inner volutions compared to the latter. It is also distinguished from *Beedeina elegans* in which chomata is less prominent and less compact in inner volutions.

"Fusulina" dunbari has more larger shell compared to the present form. The present form is comparable to *Beedeina pseudoelegans,* especially to its variety *keltmensis* (Rauser et al., 1951). But the author reserves to finally identify the present form with *Beedeina pseudoelegans* because of scanty material.

Beedeina sp. 1.

Pl.10, fig.1

Material and Locality: UHR. 30324 from Loc. 15 in the Mizuboradani valley, Fukuji.

Remarks: The present form is characterized by having short inflated fusiform shell with high chomata and large proloculus. Mature specimen of 5 volutions is 2.28 mm long and 1.74 mm wide. Form ratio is 1.31. The spirotheca is thick and composed of 4 layers, tectum, diaphanotheca, upper and lower tectoria. The septa are irregularly fluted. The tunnel is regular and narrow.

The present form is definitely distinct from *Beedeina lanceolata* in having short and inflated shell. The present form, in general appearance, is rather similar to *Beedeina schellwieni* (Staff, 1912) from Donetz. But *B. schellwieni* has distinct chomata and weak septal fluting. Accordingly the present form may be more close to *Beedeina elegans* species group. In all probability this may be a new species.

Beedeina sp. 2.

Pl.10, fig.4

Material and Locality: UHR. 30327 from Loc. 4 in the Mizuboradani valley, Fukuji.

Remarks: The present form is identical with *Fusulina* sp. A described by Igo (1957) from Fukuji in having a short fusiform shell with massive and high chomata, somewhat strongly fluted septa, and relatively thick spirotheca with 4 layers. Nevertheless specimens at hand are too ill preserved to identify with any species belonging to the genus *Beedeina* with certainly.

Beedeina sp. 3.

Pl.10, fig.5

Material and Locality: UHR. 30328 from Loc. 18 in the north ridge of the Ichinotani valley, Fukuji.

Remarks: The present form is characterized by ellipsoidal shell with small chomata, large proloculus, and irregularly fluted septa. Mature specimen of 5 volutions is 2.46 mm long and 1.34 mm wide. Height of volutions in inner 3 volutions increases gradually, but last 2 volutions increase uniformly. The spirotheca is thin and composed of 4 layers, tectum, thick diaphanotheca, thin upper and lower tectoria.

The present form seems to be specifically different from hitherto known

species of *Beedeina* from this region, although it is doubtless that it belongs to the genus *Beedeina.*

Genus *Hemifusulina* Möller, 1878
Hemifusulina cfr. *leviplicata* Bogush
Pl.12, figs.3-4

Compare with: 1963 *Hemifusulina leviplicata* Bogush, p.111-112, pl.10, figs.9-10.
Material and Locality: UHR. 30370, 30371 from Loc. 48 in the north ridge of the Kanashirozako valley, Fukuji.
Description: The shell is small and elongate fusiform, having straight or slightly arched periphery, and bluntly pointed poles. Mature specimens of 4-1/2 to 5 volutions are 1.80 to 2.21 mm long and 0.53 to 0.71 mm wide, and the form ratio is 2.54 to 2.89. The shell is subspherical in the first volution and ellipsoidal to elongate fusiform in the following outer ones. The shell expands gradually. The proloculus is spherical and its outside diameter is 30 microns. The spirotheca is very thin and composed of tectum and perforate protheca. The septa are unfluted in inner 3 volutions and somewhat regularly fluted in polar regions and on lateral slopes of outer ones. The chomata are well-developed, massive, asymmetrical, and high in inner volutions and low in outer ones. The tunnel is high and narrow in inner volutions, and low and relatively wide in outer ones. The tunnel path is regular.
Remarks: From the characters of septal fluting and the spirotheca which is composed of tectum and perforate protheca, the present species is assignable to the genus *Hemifusulina.*

The present species is similar to *Hemifusulina moelleri* Rauser-Chernoussova (1951), however the former has small and elongate fusiform shell with more pointed poles, weakly fluted septa, and less developed chomata. *Hemifusulina* cfr. *leviplicata* resembles *H. djilandyensis* Bogush (1963). However, the former can be distinguished from the latter in more slender shell and more weakly fluted septa. Eventually the present form can be hardly identified with *H. leviplicata* because of scantly material.

Genus *Putrella* Rauser-Chernoussova, 1951
Putrella sp.
Pl.10, fig.10

Material and Locality: UHR. 30333 from Loc. 7 in the Mizuboradani valley, Fukuji.
Description: The shell is large and cylindrical, having straight lateral slopes, and

rounded poles. Mature specimen of 5 volutions in 8.25 mm long and 1.86 mm wide. The form ratio is 4.43. The shell is tightly coiled and subspherical in inner 2 volutions, and expands rapidly and ellipsoidal to cylindrical in outer volutions. The proloculus is spherical and its outside diameter is 130 microns. The spirotheca is relatively thin and composed of 2 layers, tectum and perforated lower layer. The septa are highly irregularly fluted. The chomata are very feebly developed in inner 2 volutions. The tunnel is low and narrow.

Remarks: The present forms is characterized by that the spirotheca is composed of tectum and perforated lower layer. Therefore, it may be included in the genus *Putrella* Rauser-Chernoussova (1951) from the Russian Platform.

Specimens at hand are however too scanty to identify them with any species of *Putrella.*

Genus *Quasifusulina* Chen, 1934

Quasifusulina longissima (Möller)

Pl.11, figs.5, 7, 9-10, 12

1878 *Fusulina longissima* Möller, p.59-61, pl.1, fig.4; pl.2, figs.1a-c; pl.8, figs.1a-c.
1927 *Fusulina (Schellwienia) longissima,* Lee, p.11-116, pl.19, figs.11-14; pl.20, figs.1-14.
1934 *Quasifusulina longissima,* Chen, p.46-47, pl.7, fig.7; pl.8, fig.8.
1955 *Quasifusulina longissima,* Kanmera, p.183-184, pl.11, figs.2-5.
1957 *Quasifusulina longissima,* Igo, p.224-225, pl.8, figs.13-18.
1962 *Quasifusulina longissima,* Suyari, p.10, pl.4, figs.12-13.
1973 *Quasifusulina longissima,* Kahler, p.165, pl.16, fig.1.
1974 *Quasifusulina longissima,* Wu, Chang & Ching, pl.VIII, fig.6.

Material and Locality: UHR. 30241 from Loc. 42 in the Migimatazawa creek; UHR. 30345 from the float in the Ichinotani valley, UHR. 30348 from Loc. 55 in the Mizuyagadani valley, UHR. 30343, 30346 from Loc. 5 in the Mizuboradani valley, Fukuji.

Remarks: The present form is characterized by concave or straight periphery, irregularly formed proloculus, irregular septal folding, and heavy axial fillings. Therefore, the present species is quite identical with *Quasifusulina longissima* (Möller).

Especially a number of specimens at the author's disposal are related with the Chinese specimens which were described by Lee (1927) from the north China and Chen (1934) from the south China. A number of varietal or subspecific names have been proposed for variant forms *Q. longissima.* Yet Kahler (1973) recognized all of them as valid species. *Quasifusulina longissima* in the author's collection seems to be similar to either *Q. kaspiensis* Shcherbovich (1969) or *Q. compacta* (Lee, 1927). However, *Quasifusulina kaspiensis* has a large shell, heavy axial fillings, and rounded poles; while *Q.*

compacta is characterized by a thick shell, heavy axial fillings, and strongly fluted septa. Therefore, both species are specifically distinct from *Q. longissima*.

Quasifusulina pseudoelongata Miklucho-Maclay

Pl.11, figs.1-4, 6, 8, 11

1973 *Quasifusulina pseudoelongata,* Kahler, p.22-23, pl.15, figs.4; pl.16, figs.7, 9.

Material and Locality: UHR. 30337, 30338, 30339 from Loc. 41 in the Kinmamichi, UHR. 30340, 30342 from the float, UHR. 30344 from Loc. 46 in the Hidarimatazawa creek, UHR. 30347 from Loc. 42 in the Migimatazawa creek of the Ichinotani valley, Fukuji.

Description: The shell is large and elongate cylindrical, having flat to concave median regions, rounded to bluntly pointed poles. Mature specimens of 5-1/2 to 7 volutions are 8.50 to 11.00 mm long and 2.00 to 2.45 mm wide. The specimens of 4 volutions are 5.60 to 7.40 mm long and 1.40 to 1.85 mm wide. The form ratio is 4.85 to 5.14. The proloculus is spherical and its outside diameter is 0.24 to 0.40 mm. The spirotheca is relatively thick and composed of 3 layers which consist of tectum, perforate to partly alveolar median layer, and partly opaque lower layer. Upper tectorium is not observed in all volutions. The septa are highly fluted. The levee like chomata are developed on the proloculus and absent in outer volutions. The tunnel is high and narrow in inner volutions, and low and relatively wide in outer volutions. The tunnel path is regular. The axial fillings are well-developed along the axis of coiling.

Remarks: Quasifusulina pseudoelongata is similar to *Q. longissima* (Möller). However, the former can be distinguished from the latter in having a larger shell, more numbers of volution, larger form ratio, more spherical and smaller proloculus, and lighter axitial fillings.

Family Schwagerinidae Dunbar & Henbest, 1930
Subfamily Schwagerininae Dunbar & Henbest, 1930
Genus *Obsoletes* Kireeva, 1952
Obsoletes obsoletus (Schellwien)

Pl.12, figs.1-2

1908 *Fusulina obsoleta* Schellwien, p.186-188, pl.19, figs.5-7.
1950 *Protriticites obsoletus,* Rozovskaya, p.9, pl.1, figs.1-4.
1958 aff. *Protriticites obsoletus,* Sheng, p.36-37, 95-96, pl.10, fig.12.
1963 *Obsoletes obsoletus,* Chen, pl.1, figs.2-3; pl.2, fig.3.

Material and Locality: UHR. 30372, 30373 from Loc. 12 in the Mizuboradani

valley, Fukuji.

Description: The shell is small and subellipsoidal to subcylindrical having slightly arched median regions, convex lateral slopes, and bluntly pointed poles. Mature specimens of 6 to 6-1/2 volutions are 4.98 to 6.80 mm long and 1.46 to 2.44 mm wide. Form ratio is 2.78 to 3.41. The shell is subspherical in the first volution and ellipsoidal to subellipsoidal in the other volutions. Inner 3 volutions are compactly coiled and outer volutions expand gradually. The proloculus is spherical and its outside diameter is 45 to 50 microns. The spirotheca is thin and composed of tectum, upper and lower tectoria in inner 4 volutions. It is composed of tectum, lower perforate layer, and partly upper tectorium in the penultimate volution and tectum and lower perforate layer in the last volution. The septa are slightly fluted in inner 3 volutions and fluted in polar regions of outer volutions. The chomata are small, symmetrical and prominent. The tunnel is low and relatively narrow in inner volutions, and low and wide in outer volutions. The tunnel is regular.

Remarks: According to Miklucho-Maclay, Rauser-Chernoussova and Rozovskaya (1959), the genus *Obsoletes* has spirotheca which is 3 layered and perforate. On the other hand *Protriticites* has *Fusulinella*- like inner volution with 4-layered spirotheca. The present form is thus placed under the genus *Obsoletes.* A number of species has been proposed for the genus (Rozovskaya, 1975). But the author could not refer to many of them. The form is here identified as *O. obsoletus,* although the Fukuji material has more cylindrical shell, weak chomata and loosely coiled inner volution compared to the holotype (Schellwien, 1908).

Genus *Triticites* Girty, 1904

Remarks: There have been several genera and subgenera proposed for forms allied to the genus *Triticites.* Rozovskaya (1948), for example, divided *Triticites* into 4 subgenera taking the difference in spirothecal structure as one of important diagnostic characters of them. Her subgenera were all later raised to generic rank (*e.g.* Rozovskaya, 1975). The present author, however, is unable to follow Rozovskaya's scheme, because he fails to discriminate various spirothecal structures Rozovskaya mentioned within *Triticites.* Instead the author could recognized two types of juvenarium volutions in his collection of *Triticites* from Fukuji.

Namely one has *Profusulinella*-like inner volutions and the other has *Fusulinella*-like juvenarium. Igo (1957) described several of his forms of *Triticites* from this region. Some of his forms show *Fusulinella*-like inner volutions. And Sada (1964) remarked that he observed two cases of the

development of spirothecal structure in *Triticites*, which correspond to the above mentioned observation of the author. At present the author employs the genus *Triticites* in a very wide sense to include all forms above mentioned.

Triticites paramontiparus (Rozovskaya)

Pl.13, figs.1-2

1950 *Triticites (Montiparus) paramontiparus* Rozovskaya, p.13-14, pl.1, figs.8-10.

Material and Locality: UHR. 30349, 30350 from Loc. 42 in the Migimatazawa creek of the Ichinotani valley, Fukuji.

Description: The shell is medium and short fusiform, having arched median regions, concave to straight lateral slopes, and bluntly pointed poles. Mature specimens of 6 volutions are 3.04 to 4.45 mm long and 1.92 to 2.45 mm wide. The form ratio is 1.55 to 1.58. The shell is subspherical in the first volution and ellipsoidal to short fusiform in the following volutions. The height of chambers generally increases irregularly, although they are sometimes gradually increase. The proloculus is spherical and its outside diameter is 90 to 160 microns. The spirotheca is relatively thick. It is composed of 3 layers in inner 2 volution, tectum, upper and thick lower tectoria. In the following 2 volutions, it is composed of 2 layers, tectum and fibrous, perforate, or less dense lower layer. In the 5th volution, it is composed of tectum, thin upper tectorium, and fine keriotheca. In the last volutions, it is composed of tectum and fine keriotheca. The septa are only fluted in polar regions. The chomata are high, asymmetrical and columnar form with vertical to overhanged tunnel sides and less steeply inclined poleward slopes. The tunnel is high and narrow, and the tunnel path is regular.

Remarks: The present form and the following one are within the group of *Triticites montiparus*, for which Rozovskaya (1948) proposed the genus *Montiparus*. Among this group the present form identified with *T. paramontiparus* differes from the typical *T. montiparus* in having more inflated shell form.

Igo (1957) described several species of *Triticites*, which are related to his *T. exsculptus* from this region. The present form is not very much different from *T. exsculptus* in its internal characters, but it may also be specifically distinct from the latter in having much inflated shell.

Triticites saurini Igo

Pl.13, figs.4-7

1957 *Triticites saurini* Igo, p.230-252, pl.14, figs.1-9.

Material and Locality: UHR. 30352, 30353, 30354 from Loc. 5 in the Mizuboradani valley, UHR. 30355 from Loc. 45 in the Migimatazawa creek of the Ichinotani valley, Fukuji.

Description: The shell is large and elongate fusiform, having widely arched median regions, concave lateral slopes, and bluntly pointed poles. The largest specimen of 7-1/2 volutions is 7.58 mm long and 3.85 mm wide. The form ratio is 2.66. The shell is relatively compactly coiled in inner 2 or 3 volutions and expands gradually in outer volutios. The shell is subspherical in inner 1 or 2 volutions and fusiform to elongate fusiform in outer volutions. The proloculus is spherical and its outside diameter is 110 to 160 microns. The spirotheca is thin. It is composed of 4 layers, tectum, diaphanotheca, upper and lower tectoria in inner 2 volutions, tectum, upper and relatively thick lower tectoria, and fine keriotheca in the following volutions, and tectum, distinct keriotheca in the last volution. The septa are unfluted in inner 2 volutions and fluted in the last 2 volutions except in median regions. The chomata are massive, high, and asymmetrical except the last volution. Their tunnel sides are either vertical or overhanged and poleward slopes are steep and often vertical. The tunnel is high and narrow, and the tunnel path is regular.

Remarks: The present form is identical to *Triticites saurini* described by Igo (1957) from Fukuji. The species however is definitely related *T. exsculptus,* with which it may be a variety of having more elongated shell form.

Triticites saurini resembles *T. sinuosus* Rozovskaya but is different from the latter in having more distinct chomata and less pronounced septal fluting, compared to the latter. The present form may be similar to *T. umbonoplicatus* Rozovskaya. But the Russian form is provided with large proloculus, heavy chomata, weak septal fluting compared to the author's form.

Triticites katoi Niikawa, n. sp.

Pl.14, figs.1-2

Material and Locality: UHR. 30358, 30359 from Loc. 42 in the Migimatazawa creek of the Ichinotani valley, Fukuji.

Type specimen: UHR. 30358 (Pl.14, fig.1) is designated as the holotype.

Description: The shell is medium and inflated fusiform, having arched median regions, straight to slightly concave lateral slopes, and bluntly pointed poles. Mature specimens of 7 to 8-1/2 volutions are 3.90 to 4.80 mm long and 2.62 to 3.30 mm wide. The form ratio is 1.26 to 1.44. The shell is spherical to subspherical and tightly coiled in inner 2 volutions, inflated fusiform to short fusiform in outer volutions. The height of chambers increases gradually in outer volutions. The proloculus is small and spherical, and its outside diameter is 60

to 70 microns. The spirotheca is very thick and composed of tectum, upper and lower tectoria in inner 2 volutions, and tectum, upper tectorium, and thick keriotheca in outer volutions. The under surface of keriotheca is not smooth. The septa are unfluted to very weakly fluted in polar regions in inner 3 volutions and in outer volutions fluted in polar regions. The chomata are large, high, and asymmetrical. Their tunnel sides are vertical to overhanged and their poleward sides are steep. The tunnel is high and narrow, and the tunnel path is regular.

Remarks: The present form is very unique in having much inflated shell, thick keriotheca with coarse alveoli, loose coiling and well developed chomata. The author considers these characters as sufficient to propose a new species for the present form.

The present new species somewhat resembles *T. plummeri* Dunbar & Condra in having inflated fusiform shells and thick spirotheca. However the present new species has more pronounced chomata, loosely coiled juvenarium, very thick spirotheca, and is easily distinguished from *T. plummeri.*

The specific name is after Professor Makoto Kato of Hokkaido University, under whose supervision the present study was carried out.

Triticites ichinotaniensis Niikawa, n. sp.

Pl.13, figs.8-9

Material and Locality: UHR. 30356, 30357 from Loc. 42 in the Migimatazawa creek of the Ichinotani valley, Fukuji.

Type specimen: UHR. 30356 (Pl.13, fig.8) is designated as the Holotype.

Description: The shell is relatively large and short fusiform, having arched median regions, concave lateral slopes, and rounded poles. Mature specimens of 7-1/2 to 9 volutions are 2.74 to 3.30 mm long and 2.01 to 4.80 mm wide. The form ratio is 1.25 to 1.44. The shell is spherical to subspherical in inner 2 volutions and short fusiform in outer ones. The shell expands gradually, but relatively rapidly beyond the 5th volutions. The proloculus is spherical and its outside diameter is 110 microns. The spirotheca is thick and composed of tectum, upper and lower tectoria in inner 2 volutions, and tectum, thick keriotheca, and upper tectorium in outer ones. The septa are unfluted in inner 2 volutions, and somewhat intensely in polar regions of the outer ones. The chomata are large, massive, high, and asymmetrical. Their tunnel sides are vertical to slightly overhanged and poleward slopes are low or steep. The tunnel is high and narrow, and the tunnel path is regular.

Remarks: The present new species is more or less resembled the preceeding one. However it is distinguished from the latter in having smaller shells, thinner

spirotheca, larger proloculus and more colsely coiled juvenarium volutions.

The present form also resembles *Triticites plummeri* but differs from that species in possessing small shell, well developed chomata especially in inner volutions and comparatively weak septal fluting. The new species rather closely resembles *T. wumingensis* Lin (1977) from S. China. But the Chinese form has comparatively strong septal fluting, less massive chomata, and shell more rapidly expands from the fourth volution.

Triticites elongatus Niikawa, n. sp.

Pl.14, figs.3-4

Material and Locality: UHR. 30360, 30361 from Loc. 46 in the Hidarimatazawa creek of the Ichinotani valley, Fukuji.

Type specimen: UHR. 30360 (Pl.14, fig.3) is designated as the Holotype.

Description: The shell is large and elongate fusiform, having slightly arched median regions, slightly concavo-convex lateral slopes, and bluntly pointed poles. Mature specimens of 6 volutions are 8.75 mm long and 2.00 mm wide. The shell is ellipsoidal in inner 3 volutions and elongate fusiform in outer volutions. The shell expands tightly in inner 3 volutions and rapidly in outer volutions. The form ratio is 4.30. The proloculus is small and spherical, and its outside diameter is 90 to 100 microns. The spirotheca is thin and composed of tectum and perforate to very fine keriotheca. The septa are highly fluted throughout. The chomata are small, high, and relatively symmetrical. They are columnar. The tunnel is high and narrow, and the tunnel path is regular.

Remarks: No previously proposed species is identical with the present form which is rather unique in having elongated shell, well developed chomata, strong septal fluting. Inner volutions are tightly coiling in the present form, although material is rather scanty. The author considers the present form as a new to science. It appears to be resembled *T. longus,* especially its subsp. *formosus* Rozovskaya (1950). The Russian form has elongated shell, strong septal fluting, somewhat compact inner volutions. However the Russian form cannot be conspecific with Japanese form because the former does not have well developed chomata like in the present new species.

Triticites sp.

Pl.13, fig.3

Compare with: 1936 *Triticites kagaharaensis* Huzimoto, p.52, 54, pl.3, figs.8-19.
1957 *Triticites* cfr. *kagaharaensis,* Igo, p.235-237, pl.15, figs.3-8.

Material and Locality: UHR. 30351 from Loc. 42 in the Migimatazawa creek of

the Ichinotani valley, Fukuji.

Description: The shell is small and inflated fusiform, having arched median regions, concavo-convex lateral slopes, and bluntly pointed poles. Mature specimen of 6 volutions is 2.90 mm long and 1.42 mm wide. The form ratio is 1.86. The shell is subspherical in the first volution, oval to short fusiform in the following 3 volutions, and fusiform to inflated fusiform in outer 2 volutions. The shell is tightly coiled in inner 3 volutions and expands rapidly in outer volutions. The proloculus is spherical and its outside diameter is 100 microns. The spirotheca is thin and composed of tectum and lower tectorium in inner 2 volutions, tectum, upper tectorium, and perforate to very fine keriotheca in the third volution, tectum and fine keriotheca in the 4th and 5th volutions, and thick tectum and fine keriotheca in the last volution. The septa are unfluted in inner 4 volutions and very weakly fluted in polar regions of outer volutions. The chomata are relatively high and symmetrical. Their tunnel sides are steep. The tunnel is relatively high and wide, and the tunnel path is regular.

Remarks: The present form is similar to *Triticites kagaharensis* Huzimoto (1936) especially to the form which Igo (1957) called *T.* cfr. *kagaharensis.* However the former can be distinguished from the latter in having shorter and more inflated shell, more tightly coiled juvenarium, weaker septal folding, and more well developed chomata.

Genus *Pseudoschwagerina* Dunbar & Skinner, 1936

Pseudoschwagerina morikawai Igo

Pl.14, figs.5-8

1957 *Pseudoschwagerina morikawai* Igo, p.238-239, pl.15, figs.11-17.
1958 *Pseudoschwagerina morikawai,* Kanmera, p.177-179, pl.28, figs.1-8.

Material and Locality: UHR. 30362, 30363 from Loc. 5 in the Mizuboradani valley, UHR. 30364 from the float; UHR. 30365 from Loc. 54 in the Mizuyagadani valley, Fukuji.

Remarks: The present form is quite identical with *Pseudoschwagerina morikawai* described by Igo (1957) from Fukuji. It is very similar to *Pseudoschwagerina minatoi* Kanmera described from the Yayamadake limestone of Hikawa valley, Kyushu (Kanmera, 1958). However, the present species has low height of volution in middle to outer volutions compared to *P. minatoi.*

Subfamily Pseudofusulininae Dutkevich, 1934

Genus *Pseudofusulina* Dunbar & Skinner, 1931

Pseudofusulina sp.

Pl.12, fig.5

Material and Locality: UHR. 30377 from Loc. 52 in the Mizuyagadani valley, Fukuji.

Description: The shell is large and elongate fusiform, having arched median region, straight to slightly convex lateral slopes, and bluntly pointed poles. Mature specimen of 5-1/2 volutions is 10.20 mm long and 3.10 mm wide. The form ratio is 3.44. The proloculus is large and spherical, and its outside diameter is 0.37 mm. The spirotheca is relatively thick and composed of tectum and keriotheca which has alveoli of intermediate size. The septa are intensely fluted forming closed chamberlets, the height of which reaches one half to almost to the top of the chambers. Phrenotheca is observed. The chomata are poorly developed in inner volutions and indistinct in outer volutions. The tunnel path is regular. The axial fillings are relatively poorly developed.

Remarks: The present form is characteristic in possession of a large and elongate fusiform shell, thick spirotheca with keriotheca, and phrenotheca. From these features this form is included in the genus *Pseudofusulina.*

In Japan a closely allied form to the present one is *Schwagerina* sp. E described from the Atetsu limestone (Nogami, 1961). That species is more related to *Pseudofusulina ambigua* and is distinguished from the present form in having short and fusiform shell. Likewise a similar form described by Schellwien (1908) as *Fusulina vulgaris* var. *fusiformis* transitional to *F. vulgaris* var. *exigua,* which has short and fusiform shell and no axial fillings, thus is distinguished from the present. The most closest ally to the present form is *Schwagerina vitilis* Han (1976) from North China, although the author withholds the final identification because of much confusion exists in the taxonomy of *Pseudofusulina.*

Family Schubertellidae, Skinner, 1931
Subfamily Schubertellinae, Skinner, 1931
Genus *Fusiella* Lee & Chen, 1930
Fusiella praecursor Rauser-Chernoussova
Pl.5, figs.13-16

1951 *Fusiella praecursor* Rauser-Chernoussova, p.90-91, pl.4, figs.15-17.

Material and Locality: UHR. 30245, 30247, 30248 from the float in the Kanashirozako valley, UHR. 30246 from Loc. 33-a in the Ichinotani valley, Loc. 13-15 in the Mizuboradani valley, Fukuji.

Description: The shell is minute and elongate fusiform, having arched

periphery, concave lateral slopes, and bluntly pointed to pointed poles. Mature specimens of 4-1/2 to 5-1/2 volutions are 1.03 to 1.34 mm long and 0.32 to 0.42 mm wide. The form ratio is 2.86 to 3.58. The inner 2 volutions are coiled at high angle to the axis of coiling of outer volutions. The shell expands rapidly along the axis of coiling and gradually in median region of outer volutions. The shell is subellipsoidal to elongate fusiform in outer volutions. The proloculus is minute and subspherical, and its outside diameter is 25 to 50 microns. The spirotheca is very thin and composed of indistinct layer, but sometimes tectum-like opaque middle layer is observed. The septa are unfluted, but rarely weakly waved in polar regions. The chomata are weakly developed and low, small, and asymmetrical. They are prominent with vertical tunnel sides. The tunnel is low and narrow, and the tunnel path is regular in outer volutions. The axial filling is observed weakly along the axis of coiling.

Remarks: Fusiella praecursor is similar to *F. typica* Lee & Chen. However, the former can be distinguished from the latter in having more elongate shell, more straight lateral slopes, more expanded shell in outer volutions, and weaker chomata.

Fusiella cfr. *mui* Sheng

Pl.5, fig.12

Compare with: 1958 *Fusiella mui* Sheng, p.22-23, 82, pl.3, figs.9-12.

Material and Locality: UHR. 30244 from Loc. 15 in the Mizuboradani valley, Fukuji.

Description: The shell is minute and elongate fusiform, having inflated to arched median regions, convex to concave lateral slopes, and bluntly pointed poles. Mature specimens of 4 volutions are 0.94 long and 0.32 mm wide. The form ratio is 2.94. Inner 2 volutions are coiled at a high angle to the axis of coiling of outer volutions. The spirotheca is very thin and composed of undifferentiated layer. The proloculus is subspherical and its outside diameter is 30 microns. The septa is unfluted. The chomata is faintly developed. The tunnel is very low. The axial filling is weakly developed.

Remarks: Fusiella cfr. *mui* is similar to *F. paradoxa* Lee & Chen. However, the former has a small shell and weaker chomata.

Fusiella inouei Igo

Pl.5, figs.17-18

1957 *Fusiella inouei* Igo, p.190, pl.3, figs.16-17, 19.

Material and Locality: UHR. 30249 from the float in the Kanashirozako valley,

UHR. 30378 from Loc. 15, Loc. 13-14 in the Ichinotani valley, Fukuji.

Remarks: The present form is characterized by small and inflated fusiform, with endothyroid juvenarium, small proloculus, thin spirotheca with tectum and upper and lower tectoria, weakly fluted septa in polar regions, poorly developed chomata, and light axial fillings. From the characteristics above described, the present species is quite identical with *Fusiella inouei* described by Igo (1957) from this area. Spirotheca is somewhat wavy in the present species.

Fusiella typica Lee & Chen

Pl.12, figs.6-8

1930 *Fusiella typica* Lee & Chen, p.107-108, pl.2, fig.1; pl.6, figs.1-6.
1937 *Fusiella typica,* Lee, p.80-81, pl.2, figs.7-8.
1951 *Fusiella typica,* Rauser-Chernoussova, p.87, pl.4, figs.5-6.
1963 *Fusiella typica,* Bogush, p.65, pl.3, figs.1, 4.
1974 *Fusiella typica,* Wu, Chang & Ching, pl.5, fig.14.
non: *Fusiella typica,* Igo, 1957, p.188-190, pl.3, figs.12-15, 18.

Material and Locality: UHR. 30366 from Loc. 18 in the north ridge of the Ichinotani valley, UHR. 30368, 30369 from Loc. 37 in the Ichinotani valley, Fukuji.

Description: The shell is small and elongate fusiform to elongate rhomboidal, having arched to periphery, straight to slightly concave lateral slopes, and pointed poles. Mature specimens of 4 to 6 volutions are 1.72 to 2.20 mm long and 0.48 to 0.69 mm wide. The inner 2 volutions are coiled at a high angle to the axis of coiling of the outer volutions. The shell expands uniformly in outer volutions. The form ratio is 2.60 to 3.03. The proloculus is spherical and its outside diameter is 35 to 45 microns. The spirotheca is thin and composed of undifferentiated single layer which is sometimes observed to be very opaque in its middle part, corresponding to the tectum. The septa are unfluted. The chomata are small and symmetrical. Their tunnel side is vertical to overhanged, and poleward slope is low. The tunnel is low and narrow, and the tunnel path is regular. The axial filling is weakly developed.

Remarks: Fusiella typica collected from the Fukuji region is quite identical with the type of the species first described by Lee & Chen (1930) from the Huanglung limestone of S. China. Igo (1957) described the same species from this region, but his form must be actually assigned into *Fusiella praecursor* because of having short, small shells compared to *F. typica.*

Family Staffellidae Miklucho-Maclay, 1949
Genus *Pseudoendothyra* Mikhailova, 1939
Pseudoendothyra sp.
Pl.1, figs.20-23

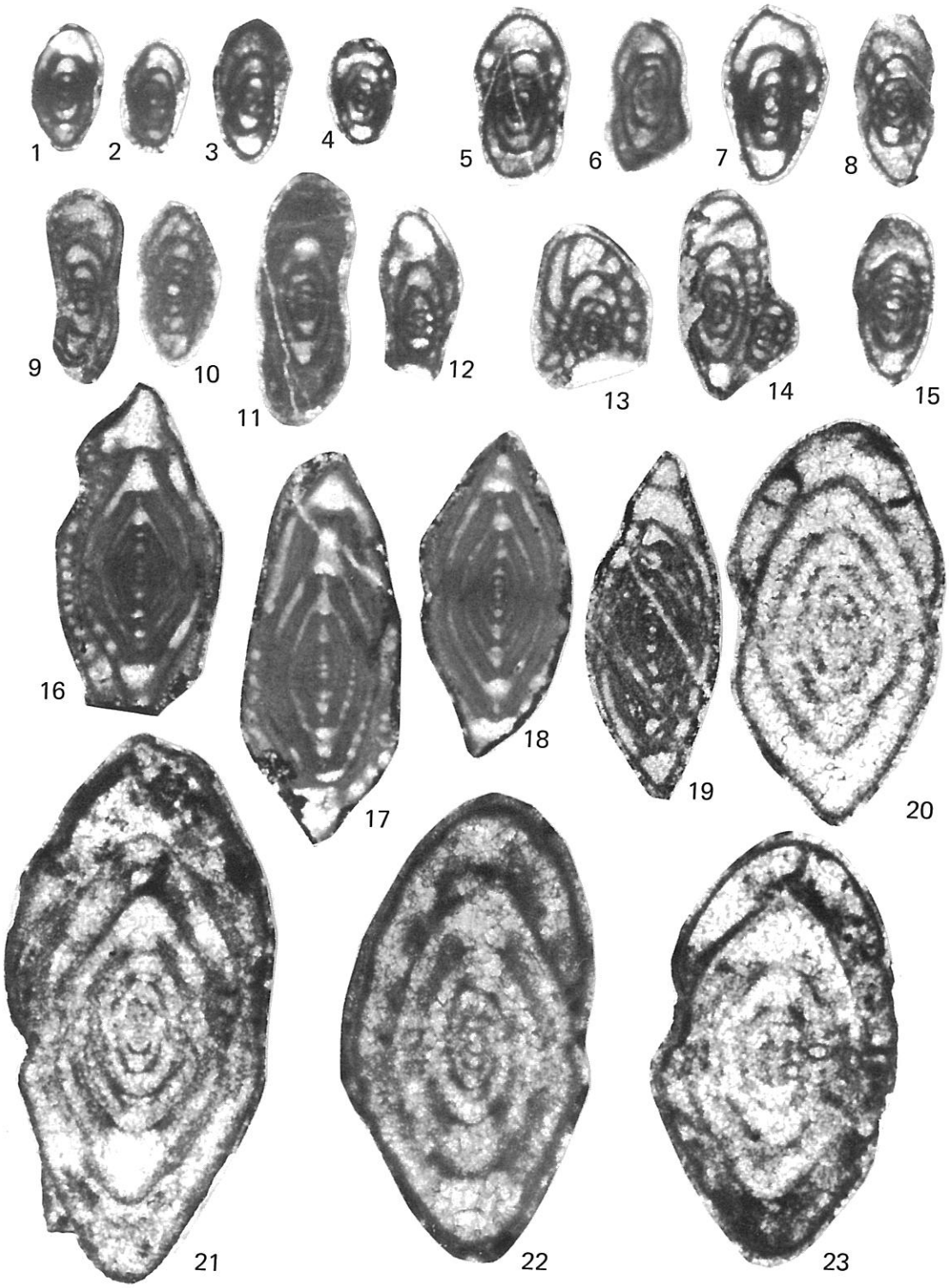
Material and Locality: UHR. 30229, 30230, 30231, 30232. All from Loc. 24 in the Ichinotani valley, Fukuji.

Remarks: The present form is characterized by having a small and lenticular shell with secondary mineralized spirotheca. The shell has bluntly pointed periphery, straight to convex lateral slopes, and concave or umbilical poles. Mature specimens of 5 to 6 volutions are 0.66 to 0.78 mm long and 1.26 to 1.79 mm wide. Form ratio is 0.43 to 0.52. The height of volution expands relatively rapidly. The spirotheca is too ill in preservation to recognize its structure. It seems however to be. composed of 4 layers with diaphanotheca. The chomata are distinctly present. The tunnel is narrow. From the characteristics above described, the present species is classified under the genus *Pseudoendothyra* Mikhailova, but the specific identification is at present difficult.

Explanation of Plate 1
(All figs. X50)

Figs. 1-4. *Eostaffella proikensis* Rauser-Chernoussova
Fig.1: Axial Section, UHR.30211 (Loc.19) Fig.2: Axial Section, UHR.30212 (Loc.19)
Fig.3: Axial Section, UHR.30213 (Loc.19) Fig.4: Axial Section, UHR.30214 (Loc.19)
Figs. 5-7, 15. *Eostaffella mosquensis* Vissarionova
Fig.5: Axial Section, UHR.30215 (Loc.24) Fig.6: Axial Section, UHR.30216 (Loc.24)
Fig.7: Axial Section, UHR.30217 (Loc.19) Fig.15: Axial Section, UHR.30225 (Loc.19)
Figs. 8-9. *Millerella* cfr. *marblensis* Thompson
Fig.8: Axial Section, UHR.30218 (Loc.24) Fig.9: Axial Section, UHR.30219 (Loc.24)
Fig. 10. *Millerella* sp.: Axial Section, UHR.30220 (Loc.6)
Figs. 11-12. *Eostaffella kanmerai* Igo
Fig.11: Axial Section, UHR.30221 (Loc.24) Fig.12: Axial Section, UHR.30222 (Loc.24)
Figs. 13-14. *Eostaffella* sp.
Fig.13: Axial Section, UHR.30223 (Loc.24) Fig.14: Axial Section, UHR.30224 (Loc.24)
Figs. 16-19. *Ozawainella mosquensis* Rauser-Chernoussova
Fig.16: Axial Section, UHR.30226 (Loc.33) Fig.17: Axial Section, UHR.30200 (Loc.14)
Fig.18: Axial Section, UHR.30227 (Loc.14) Fig.19: Axial Section, UHR.30228 (Loc.15)
Figs. 20-23. *Pseudoendothyra* sp.
Fig.20: Axial Section, UHR.30229 (Loc.24) Fig.21: Axial Section, UHR.30230 (Loc.24)
Fig.22: Axial Section, UHR.30231 (Loc.24) Fig.23: Tangential Section, UHR.30232 (Loc.24)

Plate 1



Fusulinid Zones and International Correlation

The Upper Palaeozoic deposits developed at Fukuji is divisible into two major chronostratigraphical units: Carboniferous Ichinotani Formation and Lower Permian Mizuyagadani Formation respectively. Of them the Ichinotani Formation may be divided into six biostratigraphical units by their lithology and fusulinid zonations.

The Zone of Eostaffella

This is the lowest stratigraphical unit in the mapped area, so far as observable part is concerned, although the very base of the formation is unknown, because of presence of faults. Lithologically the zone is divided into three parts: (1a) the lowermost part is composed of black muddy limestone, 5 m in thickness, which is overlain by (1b) black, coarse grained limestone, about 10 m in thickness. The uppermost part of this unit (1c) is consisting in gray limestone, also about 10 m thick.

Eostaffella poikensis and *E. mosquensis* characterize the lower part of this unit. Furthermore, a number of brachiopods such as *Striatifera, Giganto-productus,* and corals as *Heterocaninia* sp., *Siphonodendron hidense* Kato, *Arachnolasma cylindricum* Yü, *Hexaphyllia* sp., *Heterophyllia* sp., etc. are also found from the same level of (1a) by M. Kato (in Minato and Kato, 1957).

Explanation of Plate 2
(All figs. X50)

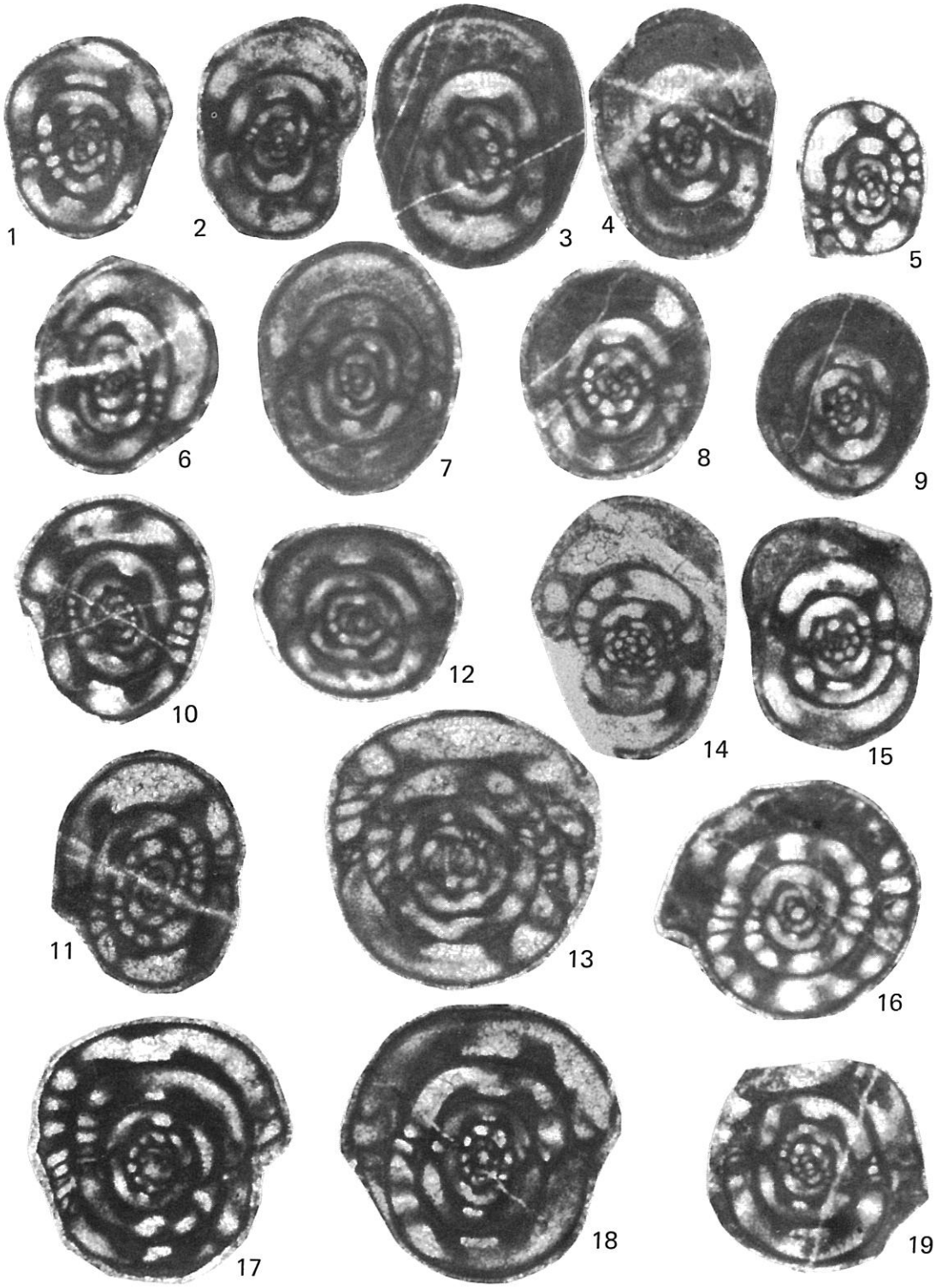
Figs. 1-11. *Pseudostaffella subrotunda* n. sp.
Fig.1: Axial Section, UHR.30250 (Loc.24) Fig.2: Axial Section, UHR.30251 (Loc.24) Fig.3: Oblique Axial Section, UHR.30252 (Loc.24) Fig.4: Axial Section, UHR.30253 (Loc.24) Fig.5: Oblique Axial Section, UHR.30254 (Loc.24) Fig. 6: Oblique Axial Section, UHR.30255 (Loc.24) Fig.7: Axial Section, UHR.30256 (Loc.24) Fig.8: Axial Section, UHR.30257 (Loc.24) Fig.9: Axial Section, UHR.30258 (Loc.24) Fig.10: Oblique Axial Section, UHR.30259 (Loc.24) Fig.11: Oblique Axial Section, UHR.30260 (Loc.24)

Figs. 12-13. *Pseudostaffella antiqua* (Dutkevich)
Fig.12: Axial Section, UHR.30262 (Loc.24) Fig.13: Axial Section, UHR.30263 (Loc.16)

Figs. 14-16. *Pseudostaffella compressa* Rauser-Chernoussova
Fig.14: Axial Section, UHR.30263 (Loc.24) Fig.15: Axial Section, UHR.30264 (Loc.24) Fig.16: Oblique Section, UHR.30265 (Loc.24)

Figs. 17-19. *Pseudostaffella composita* Grozdilova & Lebedeva
Fig.17: Oblique Axial Section, UHR.30266 (Loc.16) Fig.18: Axial Section, UHR.30267 (Loc.24) Fig.19: Oblique Axial Section, UHR.30268 (Loc.24)

Plate 2



Thus, the lowest horizon within the formation designated as the *Eostaffella* Zone, may be correlatable with the Upper Viséan in rough estimation. Meanwhile, Minato & Kato (1957) once suggested the middle (1b) and (1c) division of the chronostratigraphical units to be correlatable with the Namurian. However, so far as fusulinid remains are concerned, the author was unable to find out any positive data to indicate the Namurian time in the Zone of *Eostaffella.* Nevertheless, (1b) and (1c) are barren in fusulinds, and (1c) is comformably rested by the lowermost division of *Profusulinella* Zone (2a), gray coloured oolitic limestone which is overlain by black coloured bedded limestone (3b). (2a) is the horizon in which *Profusulinella* fauna first appears. Under such circumstances, between the lower part of the *Eostaffella* Zone and the lower part of *Profusulinella* Zone (2a), there may be a horizon indicating the Namurian.

As a matter of fact, Kato found such corals as *Lonsdaleia* aff. *duplicata* (Martin), *Lonsdaleia* sp., *Rhodophyllum? minatoi* Kato, *Neokoninckophyllum gracile nipponense* Kato (in Minato and Kato 1957), which came from the layer here named as (1b). According to Kato, these coral fauna may denote the Namurian. Furthermore, Igo in the Carboniferous Lexicon of Japan (1978) lately described the occurrence of conodonts such as *Streptognathodus noduliferus* from the horizon, probably inferred to be the upper layer (1c), and this conodonts is said to indicate Namurian time.

The Zone of Profusulinella

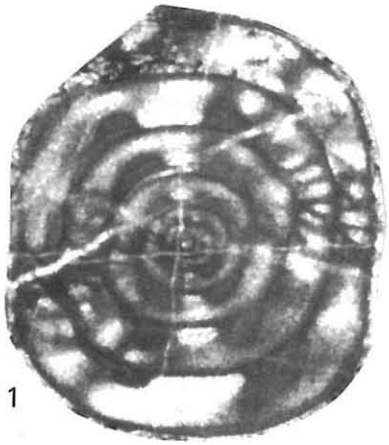
As is shown in text-fig. 3, this zone is represented by various lithologic units, which will be listed up in ascending order; (2a) gray oolitic limestone, 5 m thick, (2b) black coloured bedded limestone, about 1 m thick, (2c) red shale with flinty breccia about 2 m thick, (2d) red shale about 10 m thick, (2e) gray limestone with cherty nodules at the top, about 12 m thick. Total thickness is 30 m.

Explanation of Plate 3
(All figs. X50)

Figs. 1-4. *Pseudostaffella subquadrata* Grozdilova & Lebedeva
Fig.1: Axial Section, UHR.30269 (Loc.23) Fig.2: Axial Section, UHR.30270 (Loc.15) Fig.3: Axial Section, UHR.30271 (Loc.13) Fig.4: Axial Section, UHR.30272 (Loc.13)

Figs. 5-7. *Pseudostaffella minatoi* n. sp.
Fig.5: Axial Section of holotype, UHR.30273 (Loc.33) Fig.6: Axial Section, UHR.30274 (Loc.14) Fig.7: Axial Section, UHR.30275 (Loc.14)

Plate 3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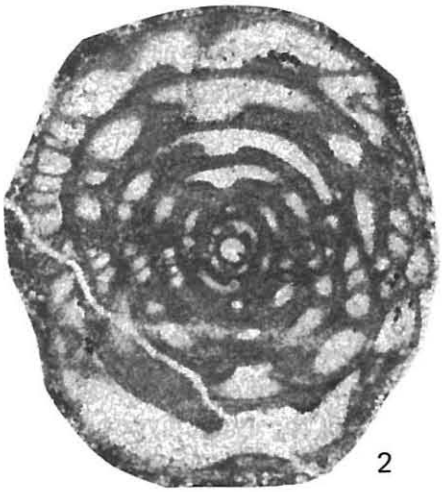
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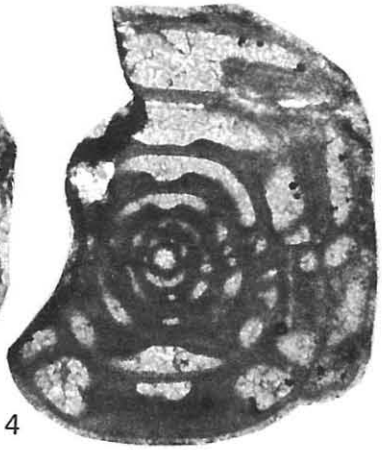
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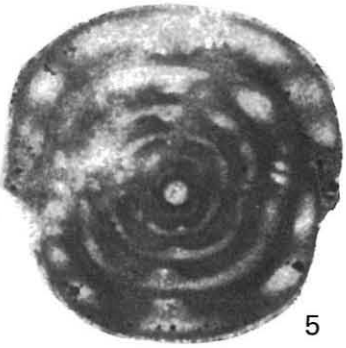
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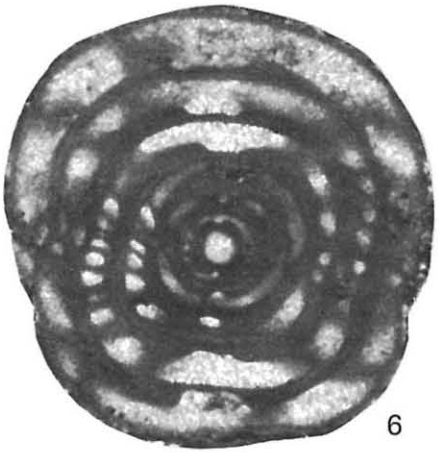
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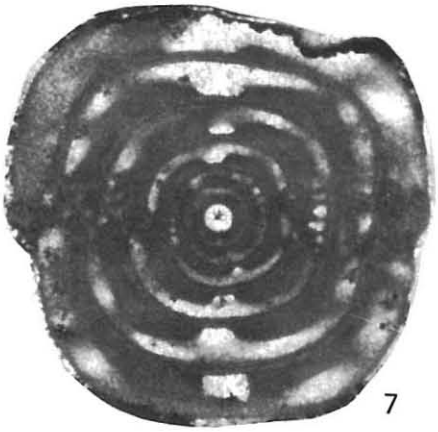
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With respect to fusulinid fossils there are two horizons in this Zone: the lower one contains *Profusulinella fukujiensis* and *Pseudostaffella antiqua,* while the upper layer contains *Profusulinella fukujiensis, Pseudostaffella antiqua, P. compressa, P. composita, P. subquadrata, P. subrotunda* n sp., *Eostaffella mosquensis, E. kanmerai, E.* sp., and *Millerella* cfr. *marblensis.* Of these fusulinids, *Profusulinella fukujiensis* is specifically not unlike *P. parva* which is a good indicator of the Bashkirian of Donetz basin: *Pseudostaffella antiqua* is also dominantly found in our *Profusulinella* Zone throughout, as is the case of the type of Bashkirian.

Accordingly, the Zone of *Profusulinella* of the Ichinotani Formation is correlatable with the Bashkirian of the USSR with certainly. It may be worth while mentioned that *Lytvophyllum, Sinopora* and *Chaetetes* are abundantly found from the upper layer of this fusulinid zone.

The Lower Zone of Fusulinella-Fusulina

The lithologic sequence of the formation may be briefly described below. Although this zone is represented by gray limestone in general, there is a bed of red shale in the middle portion and oolitic limestone is prevalent in the lower half of the formation. The zone is 115 m in thickness (see text-fig. 3). More important eleven fusulinid bearing layers are counted in this zone, and stratigraphical distribution of fusulinids is shown in the accompanied range chart, text-fig. 3.

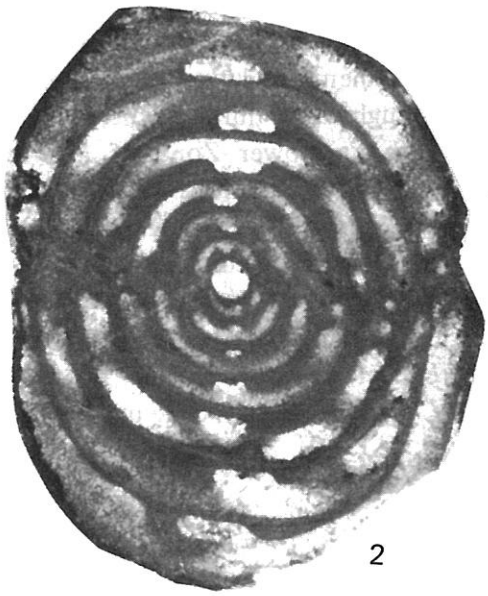
The genus *Fusulinella* and *Fusulina* sp. 1 occur simultaneously in the lower part of the present zone which is characterized by such fusulinids as *Fusulinella kamitakarensis, F. colanii, F. schubertellinoides elshanica, Beedeina* cfr. *pseudoelegans. Profusulinella* and *Pseudostaffella* are extended into the present zone. *Fusulinella kamitakarensis* resembles *F. schubertellinoides,* which in the USSR is confined in the Kashirian of Moscovian. *Beedeina pseudoelegans* and *Fusulinella colanii* ranges from the Kashirian to the Podolian. Although there is such a younger element in this zone as *Fusulinella schwagerinoides,* which ranges in the USSR from Mjachikovian onward. This zone is thus as a whole correlatable with the Kashirian.

Explanation of Plate 4
(All figs. X50)

Figs. 1-5. *Pseudostaffella umbilicata* (Putrja & Leontovich)
Fig.1: Axial Section, UHR.30276 (the float in the Kanashirozako valley) Fig. 2: Axial Section, UHR.30277 (Loc.15) Fig.3: Oblique Axial Section, UHR.30278 (the float in the Kanashirozako valley) Fig.4: Axial Section, UHR.30279 (Loc.13) Fig.5: Axial Section, UHR.30280 (Loc.33).

Plate 4

1



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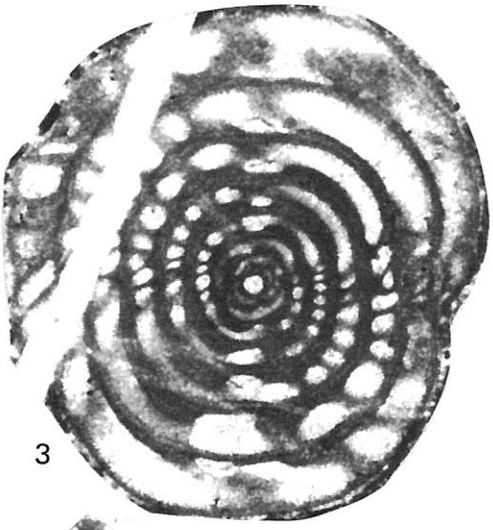

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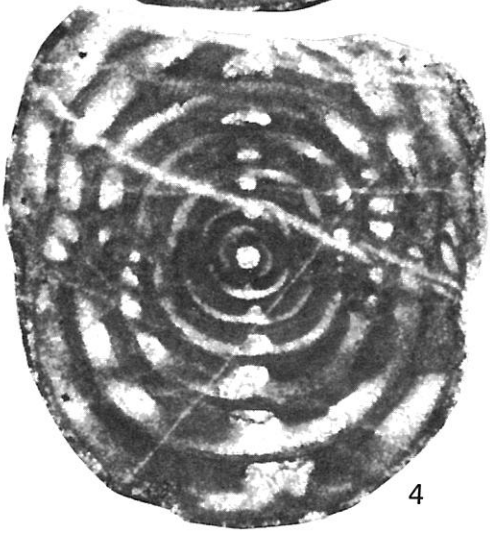

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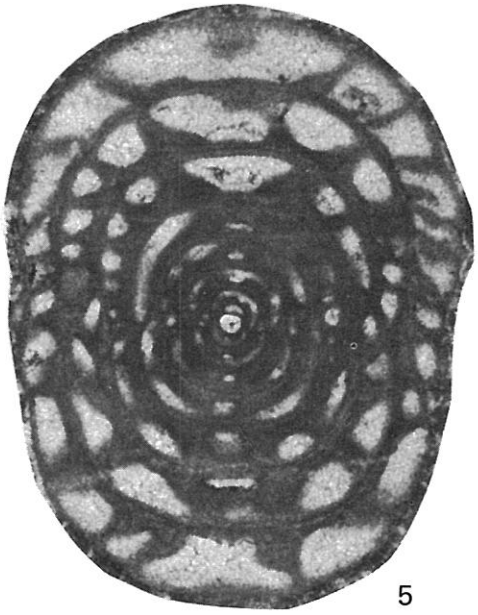


5

Now, whether the Vereyan part of Moscovian really exists in the present section or not becomes a problem. Presence of the Vereyan fauna *(e.g. Eofusulina, Verella)* is not evidently proved in the author's collection. As a matter of fact there is a gray limestone of 10 to 15 m thick below the entry of *Fusulinella* and *Fusulina* in the present zone. This part lies above the aforementioned the Zone of *Profusulinella,* and thus is possibly correlatable, though very thin, to the Vereyan of the lowest Moscovian. Therefore, the author's Lower Zone of *Fusulinella-Fusulina* may be correlated with the Vereyan? to the Kashirian of Moscovian.

Fusulinella-Fusulina fauna actually continues further upward, but there lies black limestone with abundant *Beedeina* in the middle of whole succession of *Fusulinella-Fusulina* limestone.

Other than the fusulinids shown in the text-figure 3 some corals were collected from this zone. *Ivanovia* occurs for instance in the middle part, while *Chaetetes* occurs in the upper part of the present zone.

Explanation of Plate 5
(All figs. X50)

Figs. 1-5. *Schubertella* sp. 1
Fig.1: Oblique Section, UHR.30233 (Loc.44) Fig.2: Axial Section, UHR.30234 (Loc.42) Fig.3: Oblique Section, UHR.30235 (the float in the Mizuyagadani valley) Fig.4: Oblique Section, UHR.30236 (the float in the Mizuyagadani valley) Fig.5: Oblique Section, UHR.30237 (Loc.42)

Figs. 6-7. *Schubertella lata* Lee & Chen
Fig.6: Oblique Section, UHR.30238 (Loc.25) Fig.7: Oblique Section, UHR.30239 (Loc.25)

Fig. 11. *Schubertella* sp. 2: Oblique Section, UHR.30243 (the float in the Kanashirozako valley)

Fig. 12. *Fusiella* cfr. *mui* Sheng: Axial Section, UHR.30244 (Loc.15)

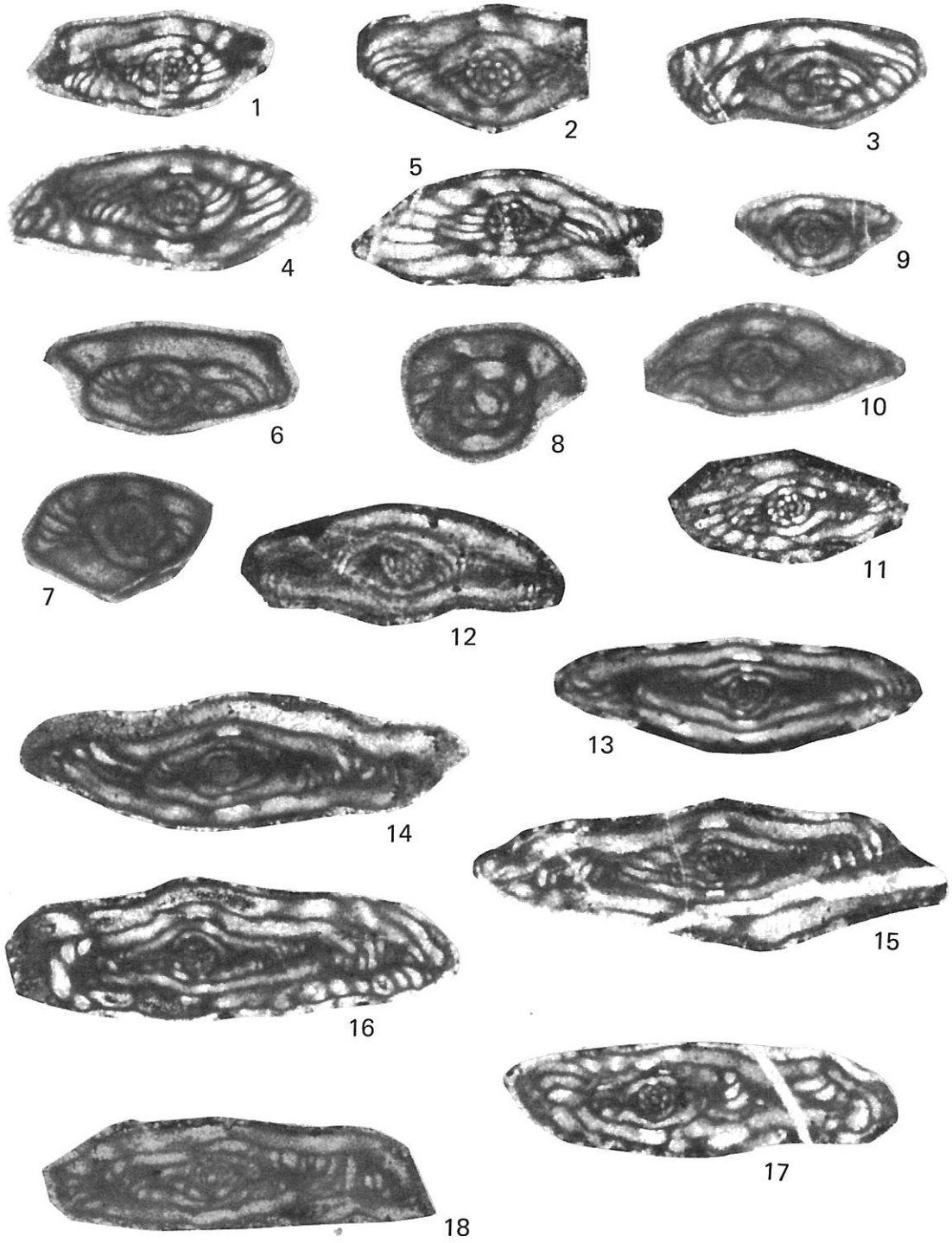
Figs. 13-16. *Fusiella praecursor* Rauser-Chernoussova
Fig.13: Axial Section, UHR.30245 (the float in the Kanashirozako valley) Fig.14: Axial Section, UHR.30246 (Loc.33) Fig.15: Axial Section, UHR.30247 (the float in the Kanashirozako valley) Fig.16: Axial Section, UHR.30248 (the float in the Kanashirozako valley)

Figs. 17-18. *Fusiella inouei* Igo
Fig.17: Oblique Section, UHR.30249 (the float in the Kanashirozako valley)
Fig.18: Oblique Section, UHR.30378 (Loc.15)

Fig. 8. *Eoschubertella obsqua* Lee & Chen: Oblique Section, UHR.30240 (Loc.11)

Figs. 9-10. *Schubertella kingi* Dunbar & Skinner
Fig.9: AXial Section, UHR.30241 (Loc.42) Fig.10: Axial Section, UHR.30242 (Loc.42)

Plate 5



The Zone of Beedeina

The zone is characterized by the abundant occurrence of rhomboidal forms of *Beedeina, B. lanceolata* for example. Such comparatively large forms of *Pseudostaffella* as *P. umblicata* and *P. minatoi* also occur from this zone together with *Hidaella.* Lithology of this zone is chiefly composed of black limestone except for the basal part which is gray limestone.

Total thickness of this zone is about 35 m. The present zone is well correlatable to the Podolian of the USSR, and the *Beedeina cheni* subzone of *Fusulinella-Fusulina* Zone of the Huanglung limestone of South China (Sheng et al., 1976).

The Upper Zone of Fusulinella-Fusulina

This zone is again characterized by the association of *Fusulinella-Fusulina,* of which a large, rhomboidal form, *Fusulinella rhomboidalis* is especially abundant, although small representatives of this species already appear from the Lower Zone of *Fusulinella-Fusulina.* In general, forms of *Fusulinella* found from the present zone are larger in size than those from the Lower Zone of *Fusulinella-Fusulina. Pseudostaffella* is absent in this zone. And *Beedeina* and *Fusulina* are less common. *Fusiella typica* is especially rich in a horizon which is found in the middle part of the Zone.

Explanation of Plate 6
(All figs. X50)

Fig. 1-2, 5. *Profusulinella fukujiensis* Igo
Fig.1: Oblique Axial Section, UHR.30281 (Loc.24) Fig.2: Axial Section, UHR.30282 (Loc.16) Fig.5: Axial Section, UHR.30285 (Loc.23)

Fig. 3. *Fusulinella* aff. *praecolaniae* Safonova: Axial Section, UHR.30283 (Loc.33)

Fig. 4, 6-7. *Fusulinella kamitakarensis* Igo
Fig.4: Axial Section, UHR.30284 (Loc.9) Fig.5: Axial Section, UHR.30286 (Loc.9) Fig.6: Axial Section, UHR.30287 (Loc.9)

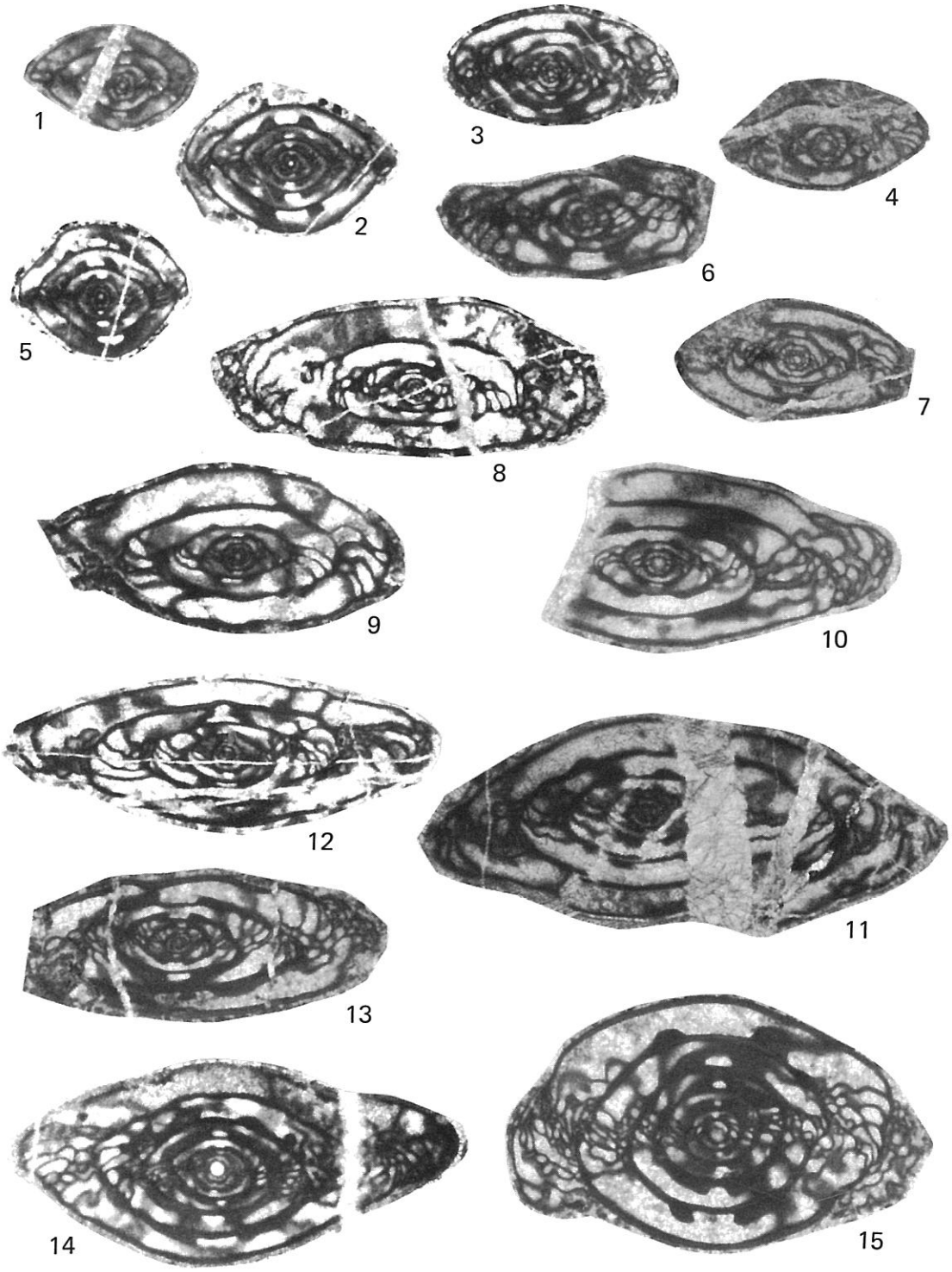
Figs. 8-9. *Fusulinella schubertellinoides elshanica* Rauser-Chernoussova
Fig.8: Axial Section, UHR.30288 (Loc.30) Fig.9: Axial Section, UHR.30289 (Loc.30)

Figs. 10-13. *Fusulinella colanii* (Lee & Chen)
Fig.10: Axial Section, UHR.30290 (Loc.26) Fig.11: Oblique Axial Section, UHR.30291 (Loc.10) Fig.12: Axial Section, UHR.30292 (Loc.47) Fig.13: Axial Section, UHR.30293 (Loc.8)

Fig. 14. *Fusulinella* sp. 4: Oblique Section, UHR.30294 (Loc.53)

Fig. 15. *Fusulinella* sp. 5: Oblique Axial Section, UHR.30295 (Loc.40)

Plate 6



Hemifusulina occurs from the upper part of the zone. *Fusulinella pseudobocki,* which is also known from the Zone of *Beedeina,* occurs from this level. Such corals as *Koninckocarinia, Carinthiaphyllum, "Corwenia"* and *Chaetetes* are found abundantly from the upper part of the present zone.

Lithologic character of the present zone is mostly of thickly bedded, gray limestone. A thin bed of red shale, about 1 m thick, is intercalated in the gray limestone in the upper part of the zone. Above this shale there is a flint nodule band. Near the top of the sequence, viz. above this nodule band, limestone becomes yellowish gray in colour, in which corals and fusulinids are commonly found. The thickness of the present zone measured along the Ichinotani valley is 95 m.

The presence of *Fusulinella pseudobocki* and *F.* sp. 2 which resembles *F. rara* in the present zone may play an important role to correlate the formation with Mjachikovian of the USSR. The absence of primitive *Pseudostaffella* in this zone seems to support this estimation. However the type Mjachikovian in Moscow basin is said to be essentially characterized by the abundant occurrence of the group of *Fusulina cylindrica,* although it is not at all present in our Upper Zone of *Fusulinella-Fusulina.* Only *Fusulina consobrina,* known from the Mjachikovian in the USSR, is obtained from an isolated Loc. 18 in the present district, the horizon of which may correspond to the middle part of the present zone.

The Upper Zone of *Fusulinella-Fusulina* in the Fukuji district is accordingly correlatable with the Mjachikovian of the USSR, the Geumcheon Formation of Korea (Cheong, 1973) and the Penchi limestone of N.E. China (Sheng, 1958).

The Zone of Triticites

The formation designated as the Zone of *Triticites* is actually contacted with the underlying formation with faults. The lowest part of the formation is

Explanation of Plate 7
(Figs. 1-8 X20; Fig.9 X10)

Figs. 1-4. *Fusulinella pseudobocki* (Lee & Chen)
Fig.1: Axial Section, UHR.30296 (Loc.10) Fig.2: Oblique Axial Section, UHR.30297 (Loc.11) Fig.3: Oblique Section, UHR.30298 (Loc.34) Fig.4: Axial Section, UHR.30299 (Loc.34)

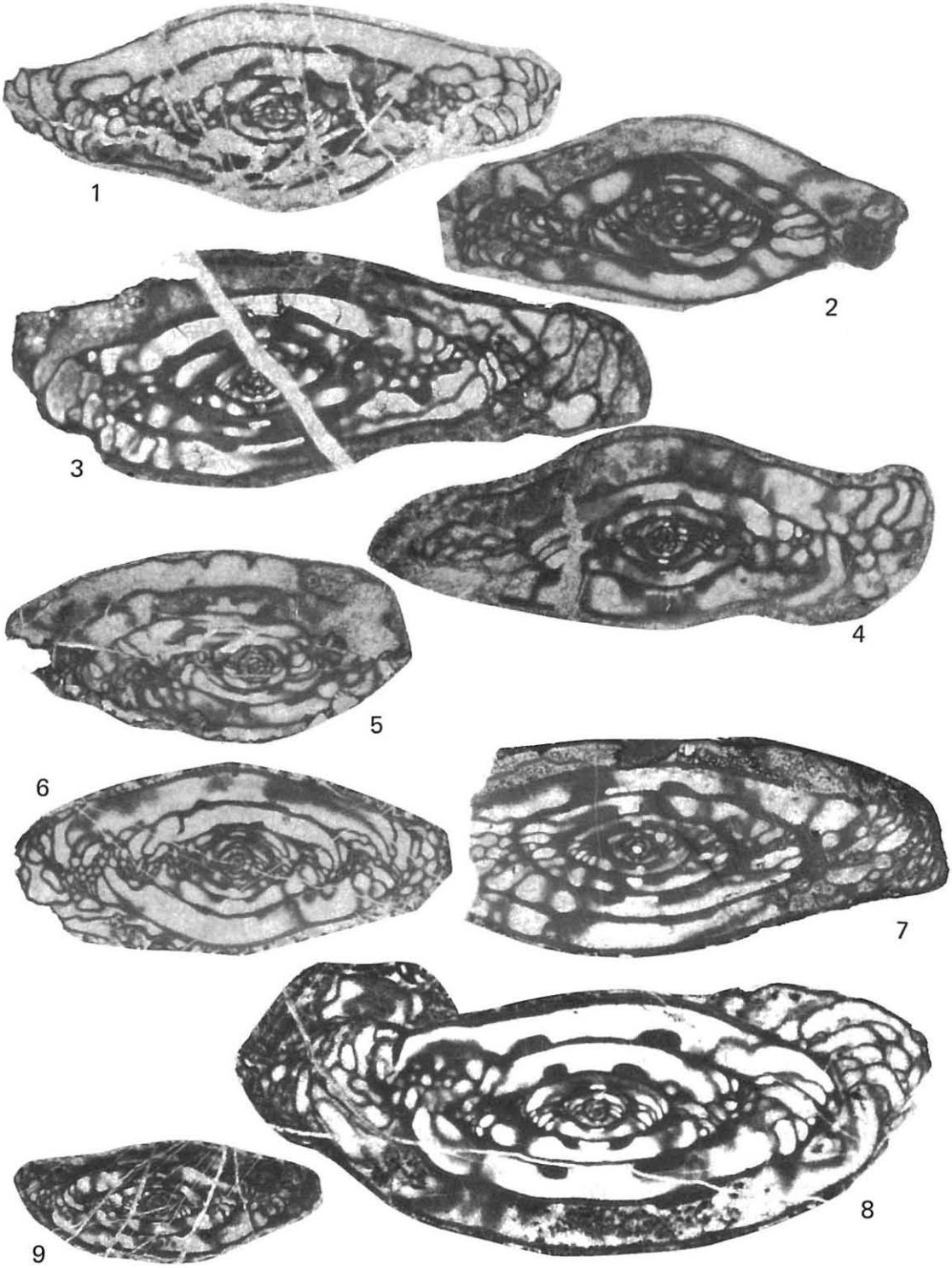
Figs. 5-6. *Fusulinella schwagerinoides* (Deprat)
Fig.5: Axial Section, UHR.30300 (Loc.29) Fig.6: Axial Section, UHR.30301 (Loc.33)

Fig. 7. *Fusulinella* sp. 1: Axial Section, UHR.30302 (Loc.14)

Fig. 8. *Fusulinella* sp. 2: Axial Section, UHR.30303 (Loc.17)

Fig. 9. *Fusulinella* cfr. *fluxa* (Lee & Chen): Axial Section, UHR.30304 (Loc.2)

Plate 7



accordingly unobservable in the field, but the author provisionally defined the beginning of the zone to be the first appearance of *Obsoletes* in this area. This lowest level is represented by gray limestone, about 5 m thick. The overlying layer, composed of black coarse grained limestone, about 15 m in thickness is very rich in fusulinids, belonging either to *Triticites* or to *Quasifusulina,* but not *Obsoletes.*

A fasciculate rugosa, tentatively placed into *Corwenia* is collected from the upper part of this zone. The upper part of this layer is contacted with the Lower Permian again by fault. Thus actual lower and upper limit of this zone is unknown at present. Although Soviet *Triticites* Zone is characterized by the association of *Obsoletes, Quasifusulina* and *Triticites (Montiparus) paramontiparus,* in our so-called *Triticites* Zone here, defined in this area, *Obsoletes* is only found in lower level and *Quasifusulina* and *Triticites* are found abundantly from slightly higher horizon.

Two vaulted new species of *Triticites (T. katoi* and *T. ichinotaniensis)* very much resemble, *Triticites plummeri* which is prevalent in the Virgilian of USA, and Gzhelian of USSR. They seem accordingly to be a little younger elements. In all probability the layer containing *Obsoletes* in our area, though very thin, would be best correlated with Kassimovian, and it should be chronostratigraphically distinct from the upper layer in which *Quasifusulina* and *Triticites* of *Montiparus* type occur namely there may be certain hiatus in between.

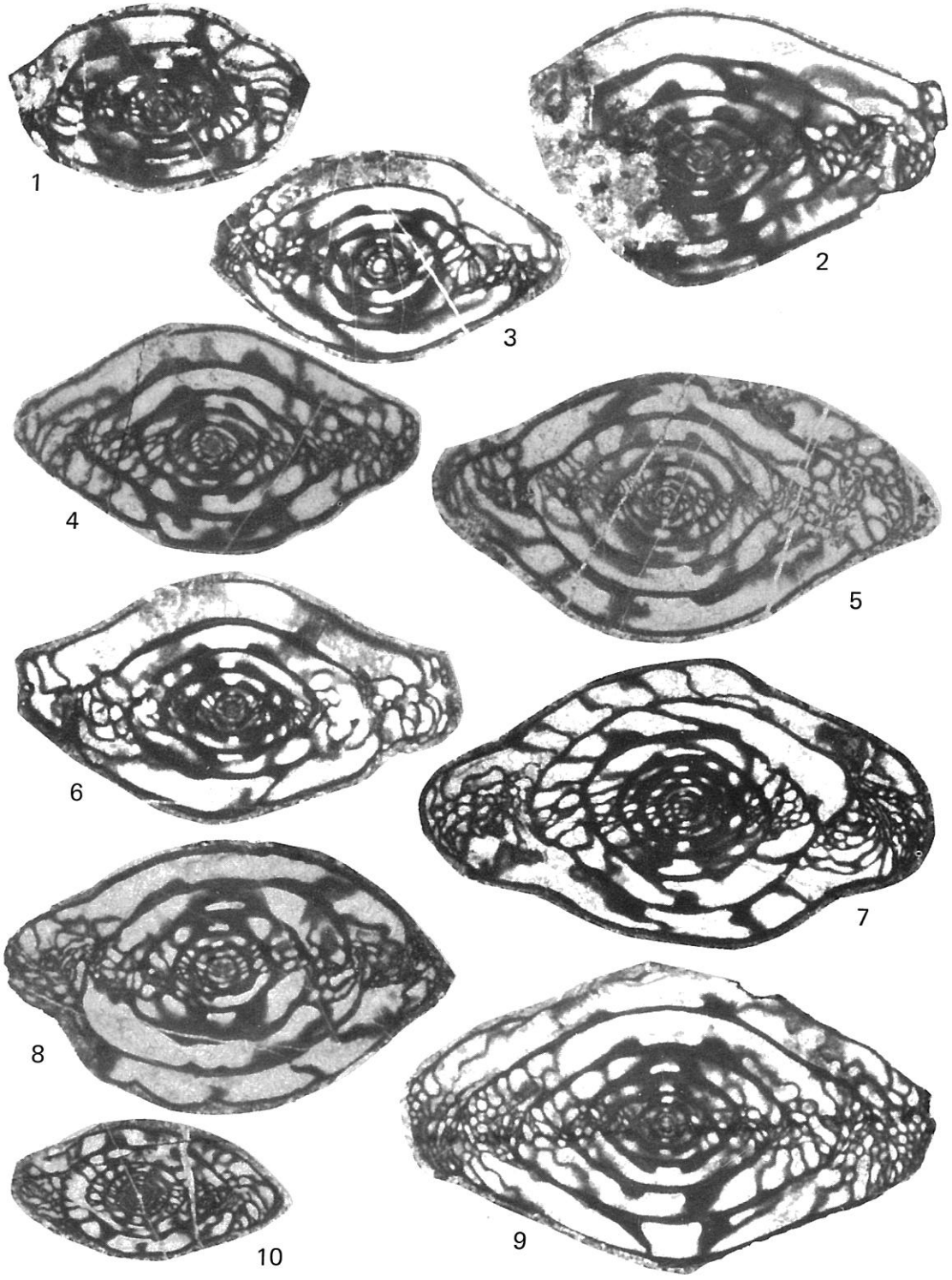
In short, our Zone of *Triticites* may range from the Kassimovian to Gzhelian, although complete sequence is not developed in the area.

Zone of Pseudoschwagerina

Remarkable lithological change is perceived between the Carboniferous and Lower Permian in this area. Although the basal part of this zone is still composed of limestone, especially gray, green to yellowish gray coloured one, the most part of this zone is represented by either thick slate or sandstone.

Explanation of Plate 8
(Figs. 1-9. X20; Fig. 10 X10)
Figs. 1-9. *Fusulinella rhomboidalis* n. sp.
Fig.1: Axial Section, UHR.30305 (the float in the Ichinotani valley) Fig.2: Axial Section, UHR.30306 (the float in the Ichinotani valley) Fig.3: Oblique Axial Section, UHR.30307 (Loc.39) Fig.4: Tangential Section, UHR.30308 (Loc.35) Fig.5: Axial Section, UHR.30309 (Loc.40) Fig.6: Axial Section, UHR.30310 (Loc.31) Fig.7: Axial Section, UHR.30311 (Loc.39) Fig.8: Axial Section, UHR.30312 (Loc.36) Fig.9: Axial Section of hollotype, UHR.30313 (Loc.40)
Fig. 10. *Fusulinella* sp.3: Oblique Axial Section, UHR.30314 (Loc.35)

Plate 8



Pseudoschwagerina and *Quasifusulina* occur from the basal part of the limestone. Lenticular limestones intercalating in non-carbonate rocks yield some fusulinids as *Triticites* and *Quasifusulina.* Base on the appearance of *Pseudoschwagerina*, it is beyong doubt that the present zone is correlated with the Zone of *Pseudoschwagerina,* Asselian of the USSR.

The Zone of *Pseudoschwagerina* is about 200 m in thickness. The upper part of this zone contacts with the limestone of the Zone of *Pseudofusulina* by faults.

The Zone of Pseudofusulina

Lithologically the present zone is composed of gray limestone, about 25 m thick, in the lower part, and non-carbonate rocks, over 45 m in thickness, in the upper part which chiefly consist of sandstone, black slate, and conglomerate of various colour.

Only *Pseudofusulina* sp. has been detected from the upper part of limestone, and which resembles *Schwagerina* sp. E from the *Pseudoschwagerina* Zone of Atetsu (Nogami, 1961) and *P. vitilis* Han (1976) from North China. The horizon of the latter species in North China may be presumably the same with that of Atetsu, since both contain *Misellina claudiae, Toriyamaia,* etc. Therefore, the Zone of *Pseudofusulina* here designated is correlated with the Sakmarian of the USSR.

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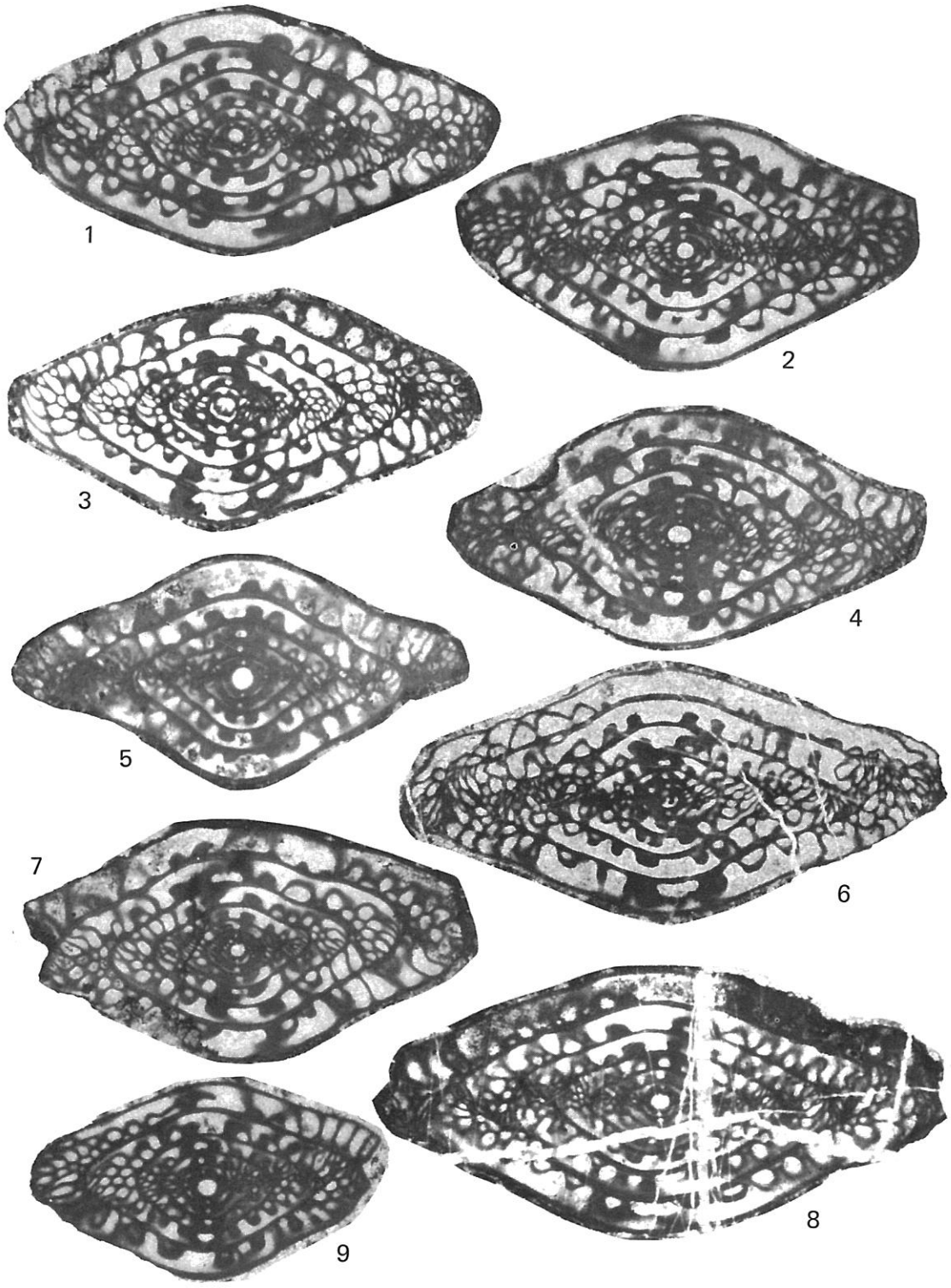
Explanation of Plate 9

(All figs. X20)

Figs. 1-9. *Beedeina lanceolata* (Lee & Chen)

Fig.1: Axial Section, UHR.30315 (Loc.14) Fig.2: Axial Section, UHR.30316 (Loc.33)
Fig.3: Axial Section, UHR.30317 (Loc.13) Fig.4: Axial Section, UHR.30318 (Loc.14)
Fig.5: Axial Section, UHR.30319 (Loc.14) Fig.6: Axial Section, UHR.30320 (Loc.15)
Fig.7: Axial Section, UHR.30321 (Loc.14) Fig.8: Axial Section, UHR.30322 (Loc.13)
Fig.9: Axial Section, UHR.30323 (Loc.33)

Plate 9



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Explanation of Plate 10

(Figs. 1-8, 11-13, X20; Figs. 9-10. X10)

Fig. 1. *Beedeina* sp. 1: Axial Section, UHR.30324 (Loc.15)

Fig. 2. *Beedeina lanceolata* (Lee & Chen)
Axial Section. UHR.30325 (the float in the Kanashirozako valley)

Fig. 3. *Beedeina bona* (Chernova & Rauser-Chernoussova)
Axial Section, UHR.30326 (Loc.33)

Fig. 4. *Beedeina* sp. 2: Axial Section, UHR.30327 (Loc.4)

Fig. 5. *Beedeina* sp. 3: Axial Section, UHR.30328 (Loc.18)

Fig. 6. *Fusulina* sp. 2: Oblique Section, UHR.30329 (Loc.10)

Fig. 7. *Beedeina* cfr. *pseudoelegans* (Chernova)
Oblique Axial Section, UHR.30339 (Loc.31)

Fig. 8. *Fusulina* sp. 1: Tangential Section, UHR.30331 (Loc.25)

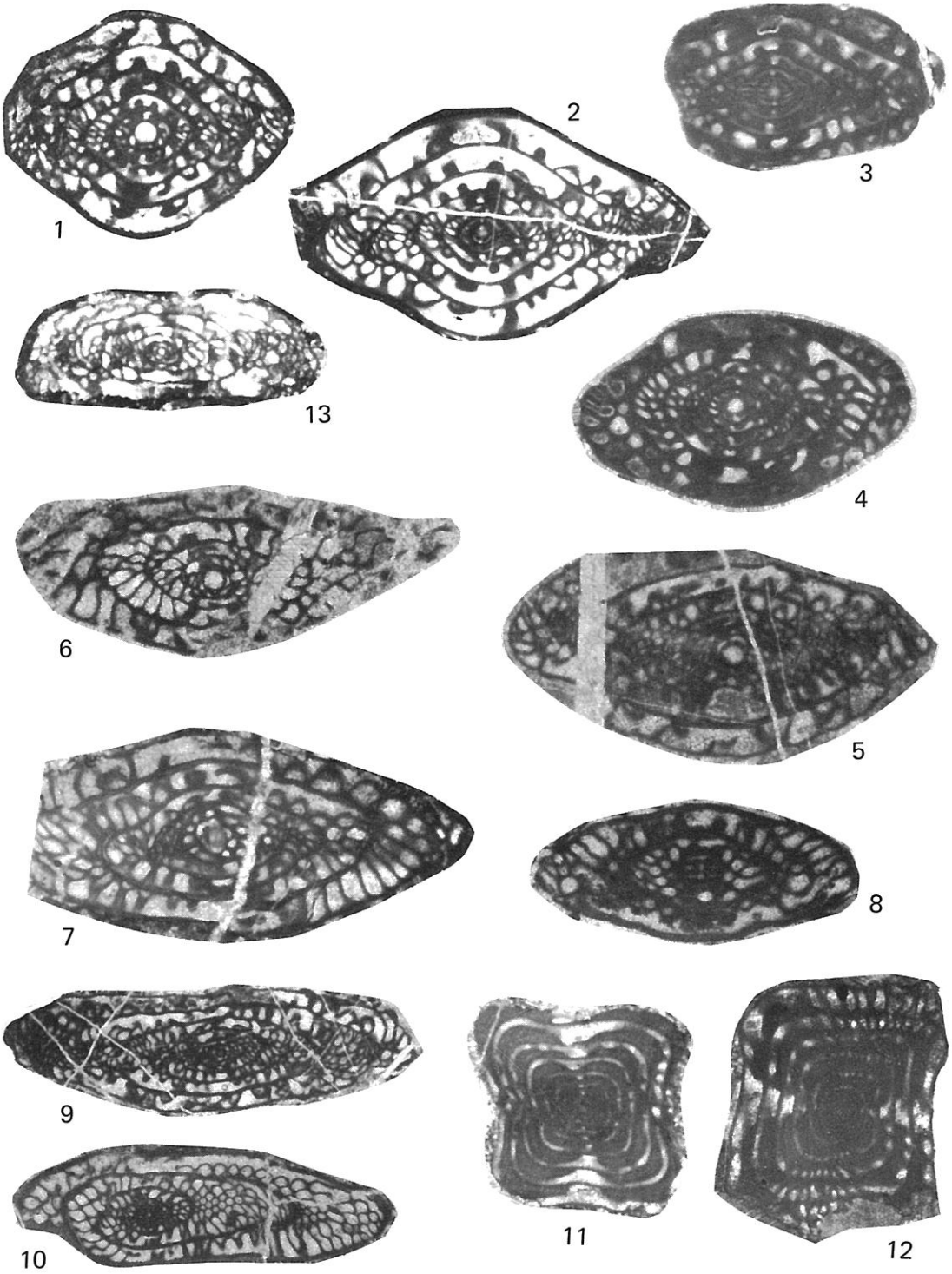
Fig. 9. *Fusulina consobrina* Safonova: Axial Section, UHR.30332 (Loc.18)

Fig. 10. *Putrella* sp. : Oblique Section, UHR.30333 (Loc.7)

Fig. 11-12. *Neostaffella* aff. *hanensis* Cheong
Fig.11: Axial Section, UHR.30334 (Loc.6) Fig.12: Oblique Section, UHR.30335 (Loc.6)

Fig. 13. *Hidaella kameii* Fujimoto & Igo: Axial Section, UHR.30336 (Loc.15)

Plate 10



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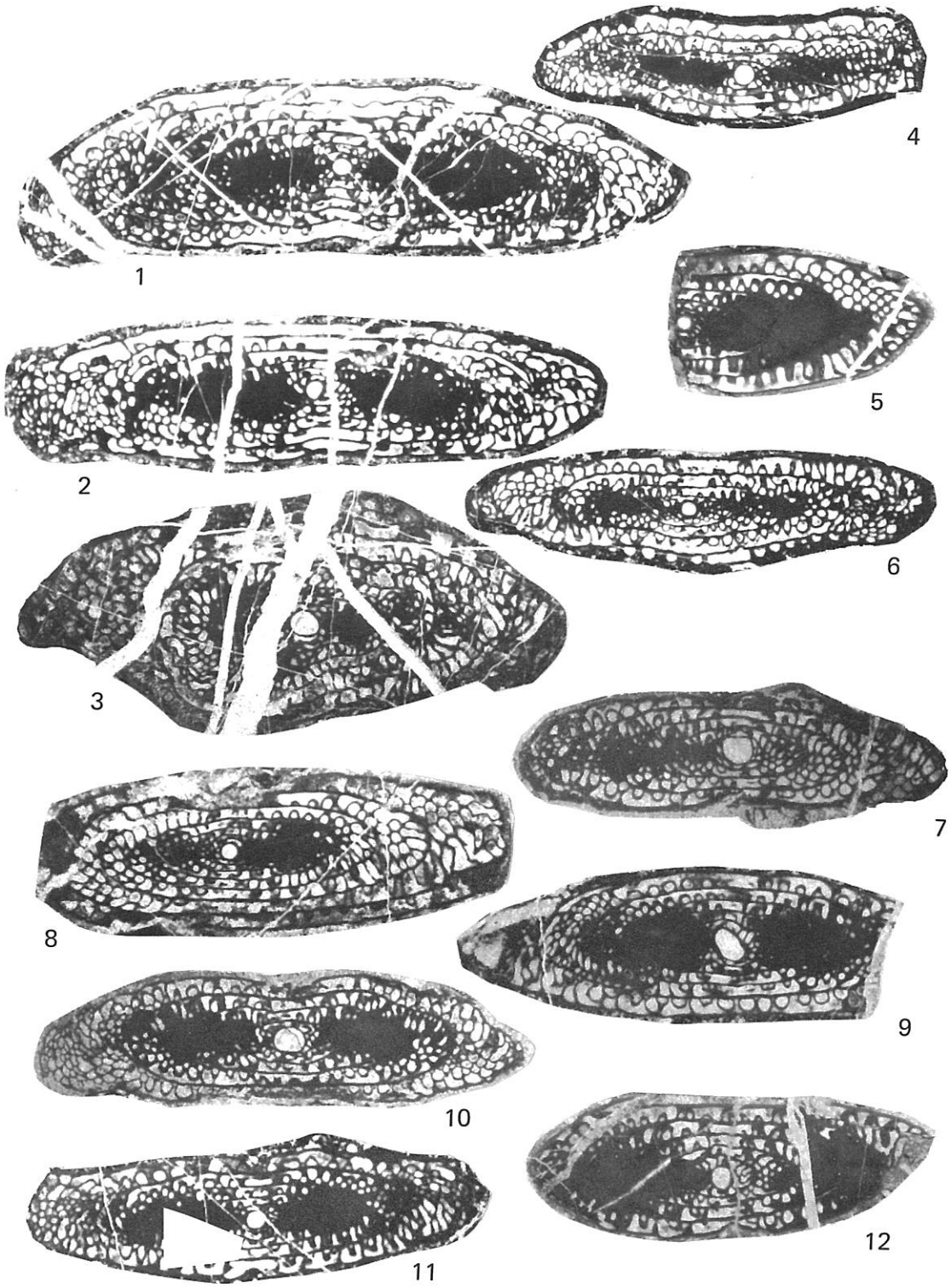
Explanation of Plate 11

(All figs. X10)

Figs. 1-4, 6, 8, 11. *Quasifusulina pseudoelongata* Miklucho-Maclay
Fig.1: Axial Section, UHR.30337 (Loc.41) Fig.2: Axial Section, UHR.30338 (Loc.41) Fig.3: Deformed Axial Section, UHR.30339 (Loc.41) Fig.4: Axial Section, UHR.30340 (the float in the Ichinotani valley) Fig.6: Axial Section, UHR.30342 (the float in the Ichinotani valley) Fig.8: Axial Section, UHR.30344 (Loc.46) Fig.11: Axial Section, UHR.30347 (Loc.42)

Fig. 5, 7, 9-10, 12. *Quasifusulina longissima* (Möller)
Fig.5: Axial Section, UHR.30341 (Loc.42) Fig.7: Axial Section, UHR.30343 (Loc.5) Fig.9: Axial Section, UHR.30345 (the float in the Ichinotani valley) Fig.10: Axial Section, UHR.30346 (Loc.5) Fig.11: Axial Section, UHR.30348 (Loc.55)

Plate 11



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Explanation of Plate 12

(Figs. 5, X10; Fig. 1-2, X20; Figs. 3-4, 6-8. X50)

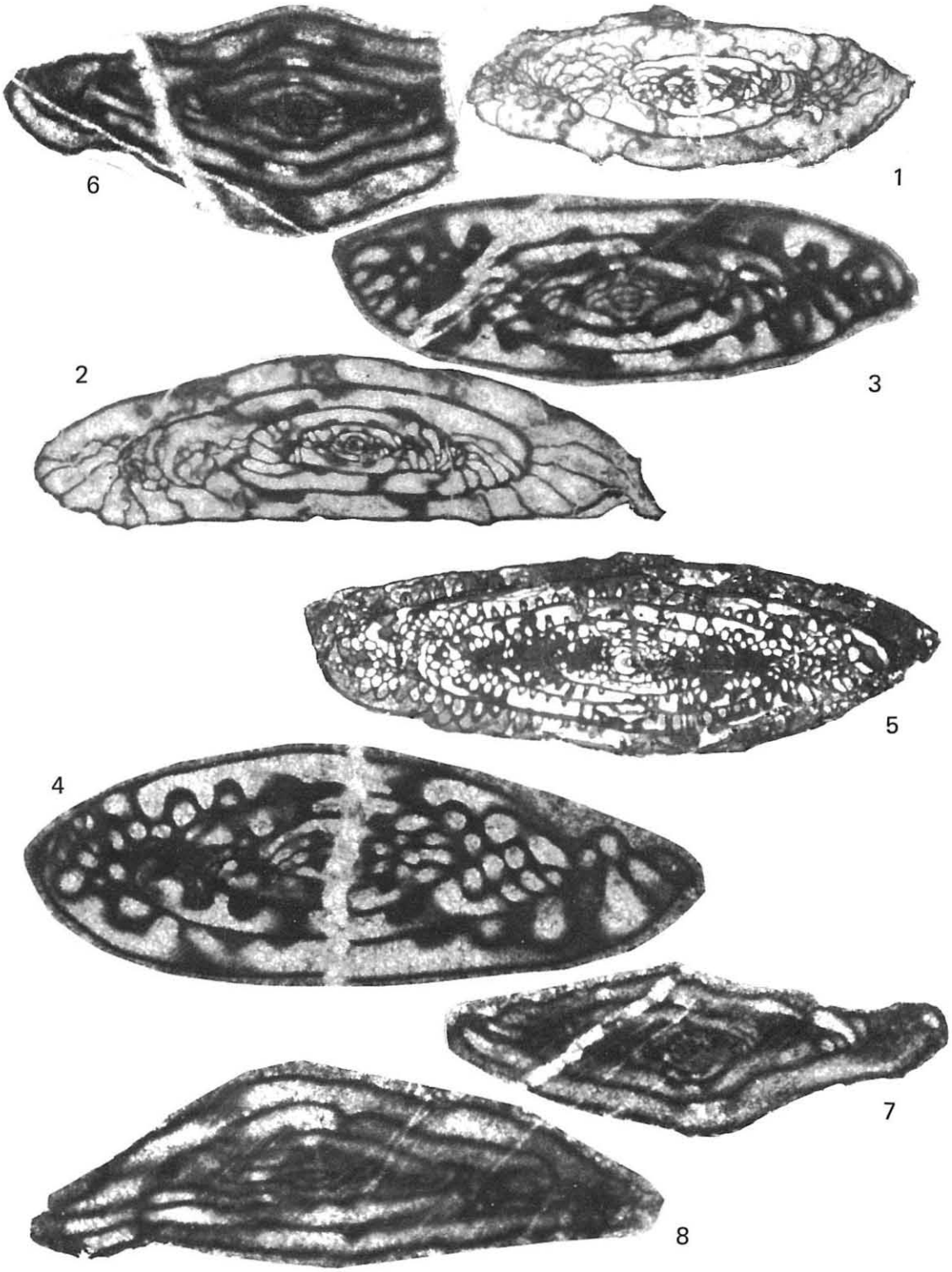
Figs. 1-2. *Obsoletes obsoletus* (Schellwien)
Fig.1: Axial Section, UHR.30373 (Loc.12) Fig.2: Axial Section, UHR.30372 (Loc.12)

Figs. 3-4. *Hemifusulina* cfr. *leviplicata* Bogush
Fig.3: Axial Section, UHR.30371 (Loc.48) Fig.4: Tangential Section, UHR.30372 (Loc.48)

Fig. 5. *Pseudofusulina* sp.: Axial Section, UHR.30377 (Loc.52)

Figs. 6-8. *Fusiella typica* Lee & Chen
Fig.6: Axial Section, UHR.30366 (Loc.18) Fig.7: Oblique Axial Section, UHR.30369 (Loc.37) Fig.8: Oblique Section, UHR.30368 (Loc.37)

Plate 12



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Explanation of Plate 13

(All figs. X20)

Figs. 1-2. *Triticites paramontiparus* Rozovskaya

Fig.1: Axial Section, UHR.30349 (Loc.42) Fig.2: Axial Section, UHR.30350 (Loc.42)

Fig. 3. *Triticites* sp.: Axial Section, UHR.30351 (Loc.42)

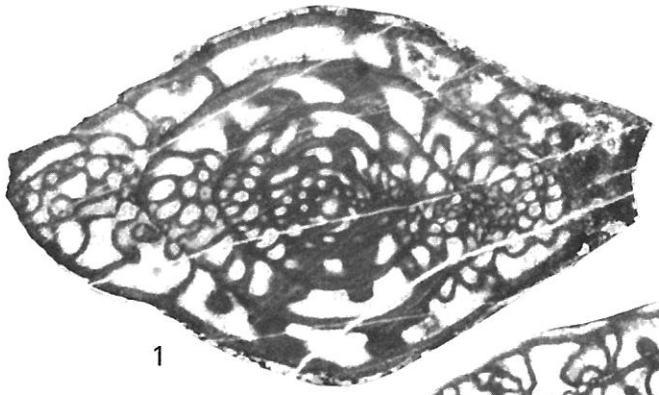
Figs. 4-7. *Triticites saurini* Igo

Fig.4: Axial Section, UHR.30352 (Loc.5) Fig.5: Axial Section, UHR.30353 (Loc.5) Fig.6: Axial Section, UHR.30354 (Loc.5) Fig.7: Tangentical Section, UHR.30355 (Loc.45)

Figs. 8-9. *Triticites ichinotaniensis* n. sp.

Fig.8: Axial Section of holotype, UHR.30356 (Loc.42) Fig.9: Axial Section, UHR.30357 (Loc.42)

Plate 13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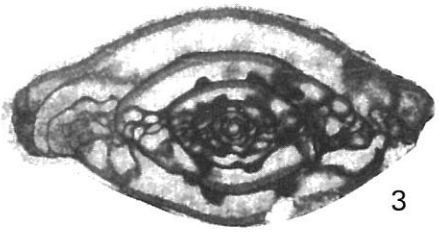
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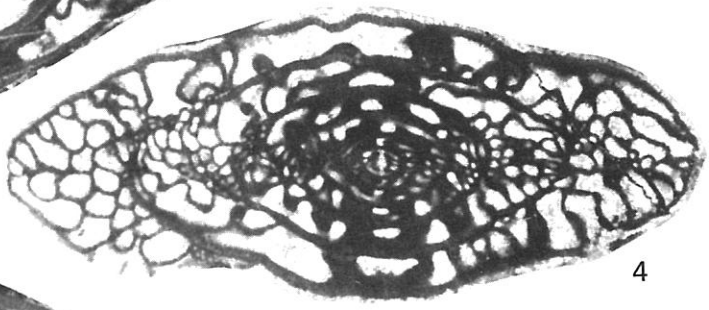
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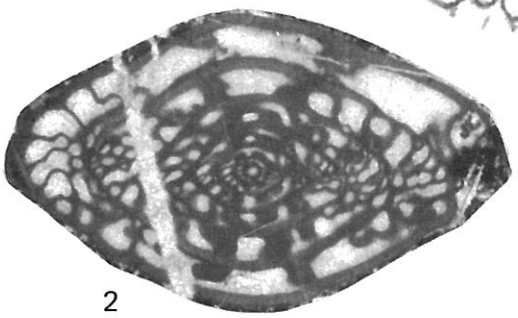
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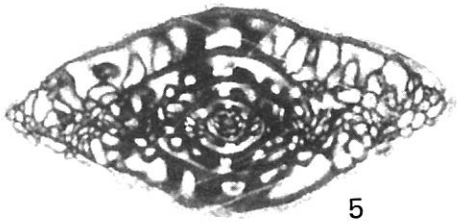
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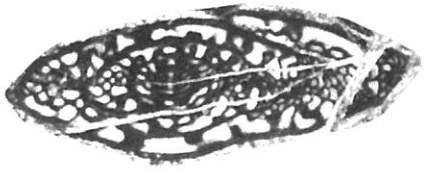
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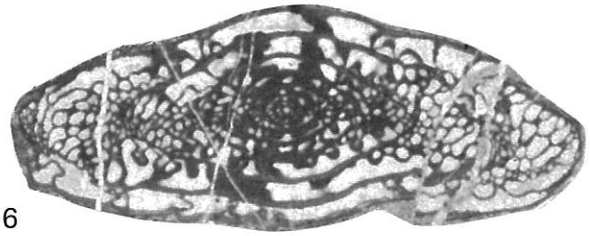
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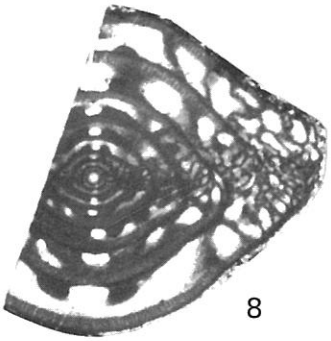
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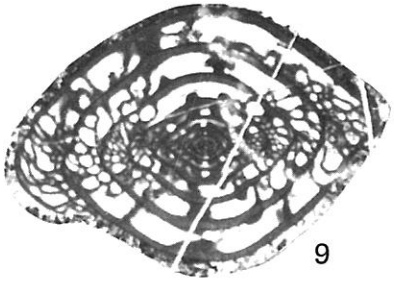
9

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Explanation of Plate 14

(Figs. 1-2, 4. X20; Figs. 3, 5-8. X10)

Figs. 1-2. *Triticites katoi* n. sp.

Fig.1: Axial Section of holotype, UHR.30358 (Loc.42) Fig.2: Axial Section, UHR.30359 (Loc.42)

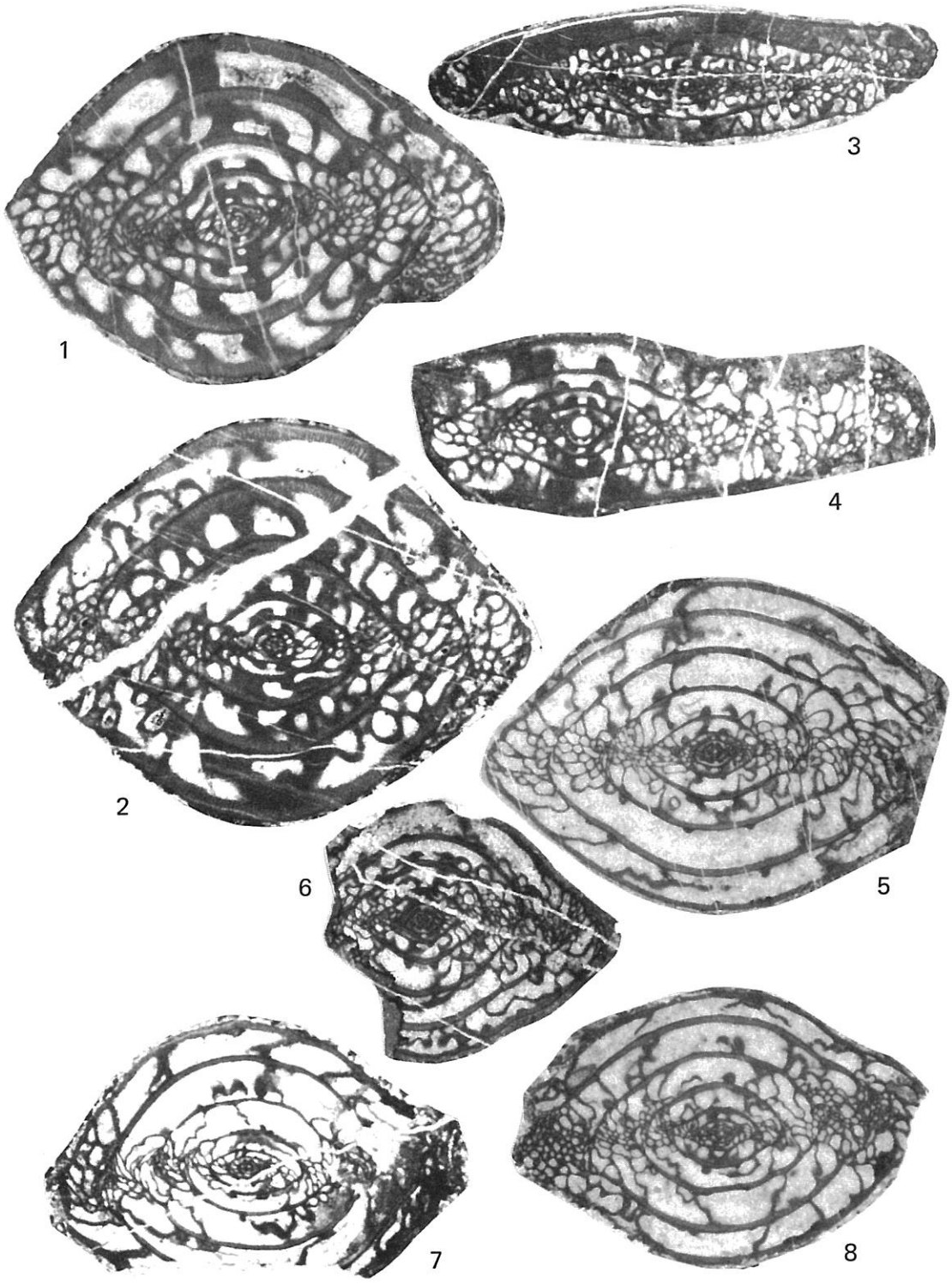
Figs. 3-4. *Triticites elongatus* n. sp.

Fig.3: Axial Section of holotype, UHR.30360 (Loc.46) Fig.4: Axial Section, UHR.30361 (Loc.46)

Figs. 5-8. *Pseudoschwagerina morikawai* Igo

Fig.5: Oblique Axial Section, UHR.30362 (Loc.5) Fig.6: Axial Section, UHR.30363 (Loc.5) Fig.7: Axial Section, UHR.30364 (the float in the Mizuyagadani valley) Fig.8: Axial Section, UHR.30365 (Loc.54)

Plate 14



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(Received on June 29, 1978)

Appendix Measurements of fusulinid species

(Radius vector, Half length and thickness of spirotheca in millimeters; whereas tunnel angle in degree)

Speciemens registered at the Department of Geology and Mineralogy, Faculty of Science, Hokkaido University are given by numbers with the prefix, UHR.

Eostaffella proikensis Rauser-Chernoussova

				Radius Vector				Half Length				Form Ratio				Tunnel Angle				Thickness of Spirotheca			
	Pl.	fig.	UHR.	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	1	1	30211	.025	.060	.110	.205	-	.055	.075	.100	-	0.91	0.68	0.49	-	-	17	-	.005	.005	.11	.005
2	1	2	30212	.06	.11	.18	-	.03	.06	.095	-	0.50	0.54	0.53	-	-	-	-	-	.005	.01	.01	-
3	1	3	30213	.06	.14	.235	-	.045	.085	.095	-	0.75	0.61	0.40	-	-	-	-	-	.01	.015	.01	-
4				.055	.11	.205	-	.04	.07	.11	-	0.73	0.63	0.53	-	-	-	-	-	.01	.015	.015	-

Eostaffella kanmerai Igo

				Radius Vector				Half Length				Form Ratio				Tunnle Angle				Thickness of Spirotheca			
	Pl.	fig.	UHR.	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	1	11	30221	.055	.110	.205	.350	.030	.060	.090	.120	0.54	0.54	0.44	0.34	-	-	-	-	.010	.015	.010	.015
2	1	12	30222	.040	.095	.190	.350	.020	.050	.080	.130	0.50	0.52	0.42	0.37	-	-	-	-	.005	-	.015	.020

Millerella cfr. marblensis Thompson

				Radius Vector				Half Length				Form Ratio				Tunnel Angle				Thickness of Spirotheca			
	Pl.	fig.	UHR.	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	1	19	30219	.050	.105	.165	.300	.020	.040	.070	.110	0.40	0.38	0.42	0.36	-	-	-	-	.005	.010	.020	.015

Fusiella cfr. mui Sheng

				Radius Vector				Half Length				Form Ratio				Tunnel Angle				Thickness of Spirotheca			
	Pl.	fig.	UHR.	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
	5	12	30244	.040	.070	.105	.160	.030	.100	.360	.470	.075	1.43	3.43	2.94	-	16	18	-	.005	.005	.010	.015

Fusiella inouei Igo

				Radius Vector				Half Length				Form Ratio				Tunnel Angle				Thickness of Spirotheca			
	Pl.	fig.	UHR.	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	-	-	-	.060	.095	.150	.215	.065	.160	.330	.715	1.08	1.68	2.20	3.32	-	13	40	-	.005	.015	.010	.010
2	5	18	30378	.040	.080	.110	.175	.040	.150	.440	.515	1.00	1.87	4.40	2.94	-	12.5	19	-	.005	.015	.010	.015
3	5	7	30249	.035	.045	.080	.170	-	.070	.310	.750	-	1.55	3.87	4.41	-	-	-	-	.005	.005	.010	.015

Eostaffella mosquensis Vissarionova

			Radius Vector					Half Length					Form Ratio					Tunnle Angle					Thickness of Spirotheca				
Pl.	fig.	UHR.	1	2	3	4	5	1	2	3	4	5						1	2	3	4	5	1	2	3	4	5
1	5	30215	.040	.065	.110	.155	.295	.015	.035	.070	.095	.125	0.37	0.54	0.63	0.61	0.42	-	-	15	21	-	.005	.005	.01	.01	.015
1	7	30217	.045	.090	.160	.260	-	-	-	.085	.115	-	-	-	0.53	0.44	-	-	-	-	-	-	-	.005	-	.01	-
1	15	30225	.060	.110	.195	.300	-	.040	.055	.080	.095	-	0.66	0.50	0.41	0.31	-	-	-	-	-	-	.005	.005	.020	.015	-

Eostaffella sp.

				Radius Vector					Half Length					Form Ratio					Tunnel Angle					Thickness of Spirotheca				
	Pl.	fig.	UHR.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1	1	13	30223	.02	.055	.105	.210	.340	.020	.040	.065	.105	.014	1.00	0.73	0.62	0.50	0.41	-	-	-	-	-	-	.010	.015	0.02	.01
2	1	14	30224	.03	.055	.095	.175	.290	.025	.040	.060	.105	.017	0.83	0.73	0.63	0.60	0.58	-	-	-	-	-	.005	.010	.015	.015	.010

Pseudostaffella composita Grozdilova & Lebedeva

				Radius Vector					Half Length					Form Ratio					Tunnel Angle					Thickness of Spirotheca				
	Pl.	fig.	UHR.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1	2	18	30267	.055	.110	.185	.310	.455	.065	.095	.160	.290	.390	1.18	0.86	0.86	0.93	0.86	17.5	19	23	30	-	.010	.015	.015	.020	.030
2	2	17	30266	.080	.135	.210	.325	.450	.060	.190	.240	.290	.385	0.75	1.41	1.41	0.89	0.85	16	16	13	18	-	.015?	.020	.030	.025	.020
3	2	19	30268	.050	.080	.150	.245	.365?	.025	.080	.145	.225	.335	0.50	1.00	0.96	0.92	0.92?	-	25	24	31	-	.005	.015	.020	.020	.010?

Hidaella kameii Fujimoto & Igo

			Radius Vector					Half Length					Form Ratio					Tunnel Angle					Thickness of Spirotheca				
Pl.	fig.	UHR.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
11	13	30336	.075	.125	.165	.285	.425	.120	.335	.440	.670	1.21	1.60	2.68	2.66	2.45	2.85	17	30	40	-	-	.02	.01	.01	.025	.03

Beedeina bona (Chernova & Rauser-Chernoussova)

				Radius Vector					Half Length					Form Ratio					Tunnel Angle					Thickness of Spirotheca				
	Pl.	fig.	UHR.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1	11	3	30326	.120	.200	.320	.440	.061?	.140	.310	.620	.840	1.22?	1.16	1.55	1.94	1.91	2.00	16	14.5	17	17	-	-	.020	.030	.030	.040
2	-	-	-	.100	.180	.270	.400	.530	.190	.300	.460	.750	.960	1.90	1.66	1.76	1.87	1.81	15	15	25	-	-	.010	.030	.040	.030	.030

Beedeina cfr. pseudoelegans (Chernova)

			Radius Vector					Half Length					Form Ratio					Tunnel Angle					Thickness of spirotheca				
Pl.	fig.	UHR.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
11	7	30330	.180	.290	.410	.600	.800	.170	.580	.850	1.32	2.06	0.94	2.00	2.07	2.20	2.57	21	14	29	61	-	.020	.020	.030	.040	.020

Beedeina sp. 1.

			Radius Vector					Half Length					Form Ratio					Tunnel Angle					Thickness of Spirotheca				
Pl.	fig.	UHR.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
11	1	30324	.19	.32	.46	.66	.87	.23	.43	.58	.90	1.14	1.21	1.34	1.26	1.36	1.31	12	16	14	19	-	.05	.04	.04	.02	.04

Beedeina sp. 3.

			Radius Vector					Half Length					Form Ratio					Tunnel Angle					Thickness of Spirotheca				
Pl.	fig.	UHR.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
11	5	30328	.15	.23	.33	.50	.67	.16	.41	.55	.92	1.23	1.06	1.78	1.66	1.84	1.83	18	23	24	-	-	.01	.01	.02	.03	.04

Hemifusulina cfr. leviplicata Bogush

				Radius Vector					Half Length					Form Ratio					Tunnel Angle					Thickness of Spirotheca				
	Pl.	fig.	UHR.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1	13	3	30370	.045	.080	.140	.200	.285	.055	.225	.360	.555	.825	1.22	2.87	2.57	2.77	2.89	28	25	45.5	50	-	.005	.005	.010	.015	.010
2	13	4	30371	-	.075	.160	.255	.370	-	.245	.465	.570	.940	-	3.26	2.90	2.23	2.54	-	42	67	69	-	-	.010	.020	.020	.015

Putrella sp.

			Radius Vector					Half Length					Form Ratio					Tunnel Angle					Thickness of Spirotheca				
Pl.	fig.	UHR.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
11	10	30333	.150	.260	.450	.660	.930	.225	.350	1.225	2.725	4.125	1.50	1.34	2.72	4.19	4.43	27	23	-	-	-	.03	.03	.05	.06	.05

Quasifusulina longissima (Möller)

				Radius Vector					Half Length					Form Ratio					Tunnel Angle					Thickness of Spirotheca				
	Pl.	fig.	UHR.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1	12	12	30348	.36	.52	.69	.87	1.14	.45	1.04	1.90	2.775	3.475	1.25	2.00	2.75	3.19	3.05?	31	31	35	-	-	.04	.04	.04	.06	.06
2	12	9	30345	.35	.475	.675	.850	1.10	.600	1.55	2.275	3.00	4.00	1.71	3.26	3.37	3.53	3.63	35	32	-	-	-	.02	.04	.03	.06	.05
3	12	5	30341	.25	.375	.55	.75	1.05	.900	1.375	2.15	2.80	3.80	3.6	3.66	3.91	3.73	3.62	-	-	-	-	-	.025	.025	.025	.02	.075
4	12	10	30346	.375	.525	.725	.900	-	.750	1.875	2.600	3.700	-	2.00	3.57	3.58	4.11	-	35	-	-	-	-	.03	.04	.04	.05	.04
5	12	7	30343	.325	.400	.550	.675	.900	.350	1.125	1.625	2.325	3.250	1.07	2.81	2.95	3.44	3.61	-	54	74	53?	-	.02	.05	.05	.05	.06

Pseudofusulina sp.

			Radius Vector					Half Length					Form Ratio					Tunnel Angle					Thickness of Spirotheca				
Pl.	fig.	UHR.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
13	5	30377	.300	.475	.675	1.05	1.35	.725	1.225	2.30	3.225	3.44	2.41	2.58	3.41	3.07	3.44	31.5	50	50	-	-	.025	.050	.075	.100	.100

Beedeina sp. 2.

			Radius Vector					Half Length					Form Ratio					Tunnel Angle					Thickness of Spirotheca				
Pl.	fig.	UHR.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
11	4	30327	.13	.24	.35	.47	.62	.11	.45	.54	.78	1.04	0.84	1.07	1.54	1.66	1.68	-	10.5	13	19	40	.04	.04	.03	.05	.05

Fusulinella sp. 2.

			Radius Vector						Half Length						Form Ratio						Tunnel Angle						Thickness of Spirotheca					
Pl.	fig.	UHR.	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
5	7	30302	.07	.13	.22	.37	.57	.81	.15	.26	.49	.88	1.44	2.46	2.14	2.00	2.23	2.38	2.52	3.04	11	19	25	35	43	-	.01	.02	.02	.04	.05	.05

Fusulinella sp. 3.

			Radius Vector						Half Length						Form Ratio						Tunnel Angle						Thickness of Spirotheca					
Pl.	fig.	UHR.	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
8	8	30303	.06	.12	.23	.41	.72	1.07	.09	.31	.59	1.25	1.92	2.66	1.50	2.58	2.56	3.05	2.66	2.48	23	38	49	59	58	-	.01	.02	.03	.05	.06	.04

Fusulina consobrina Safonova

			Radius Vector						Half Length						Form Ratio						Tunnel Angle						Thickness of Spirotheca					
Pl.	fig.	UHR.	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
11	9	30332	.140	.250	.390	.560	.730	.960	.190	.410	.710	1.39	2.57	3.10	1.36	1.64	1.82	2.48	3.50	3.12	19	25	25	54	61	-	.030	.060	.030	.050	.050	.040

Beedeina lanceolata (Lee & Chen)

				Radius Vector						Half Length						Form Ratio						Tunnel Angle						Thickness of Spirotheca					
	Pl.	fig.	UHR.	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
1	10	6	30320	.180	.270	.400	.630	.850	1.04	.230	.420	.990	1.46	1.83	2.08	1.28	1.55	2.47	2.32	2.15	2.00	13	17	21	25	56?	-	.020	.020	.050	.040	.050	.040
2		-	-	.130	.220	.340	.490	.690	.920	.150	.240	.400	.670	1.08	1.58	1.15	1.09	1.17	1.37	1.56	1.72	9	17	20	20.5	28	-	-	.030	.030	.040	.030	.020
3		-	-	.150	.240	.350	.500	.700	.900	.190	.380	.640	.780	1.23	1.72	1.26	1.58	1.83	1.56	1.76	1.91	9	11.5	15	21.5	23	-	.030	.030	.030	.040	.060	.030?
4	10	5	30319	.210	.320	.470	.660	.930	-	.300	.510	.220	1.24	1.77	-	1.43	1.59	1.53	1.88	1.90	-	11	14	17	20.5	-	-	.020?	.030?	.040	.060	.030	-
5	11	2	30325	.120	.170	.270	.420	.600	.840	.120	.210	.340	.590	.940	1.36	1.00	1.23	1.26	1.40	1.56	1.62	14	14	16	23	20	-	.010	.010	.040	.020	.020	.020
6	10	9	30323	.190	.290	.410	.610	.810	-	.330	.510	.630	1.11	1.44	-	1.73	1.76	1.53	1.82	1.78	-	11	18.5	25	34.5	-	-	.010	.020	.030	.020	-	-
7	10	7	30321	.120	.220	.300	.450	.620	.850	.230	.330	.580	.880	1.32	1.76?	1.91	1.50	1.93	1.95	2.13	2.07	13	13.5	22	27	29	-	.020	.030	.020	.040	.060	.030
8		-	-	.100	.240	.360	.440	.610	-	.370	.490	.720	1.13	1.40	-	3.70	2.04	2.00	2.57	2.29	-	22	22	26	32	-	-	.020	.030	.030	.040	.030	-
9	10	2	30316	.160	.260	.390	.570	.750	1.00	.190	.320	.600	.960	1.28	1.78	1.19	1.23	1.54	1.68	1.70	1.78	17	24.5	25	25.5	20	-	.020	.020	.040	.040	.030	.030
10	10	4	30318	.170	.250	.380	.540	.740	.950	.280	.460	.690	.950	1.53	1.94	1.65	1.84	1.81	1.76	2.07	2.04	15	14.5	13	22.5	31	-	.050	.050	.050	.040	.040	.030
11		-	-	.160	.240	.350	.510	.250	.850	.220	.360	.530	.890	1.26	1.83	1.37	1.50	1.51	1.74	1.68	2.15	14	19.5	22	28	33.5	-	.010	.020	.020	.040	.040	.020
12	10	1	30315	.150	.240	.360	.520	.730	.950	.310	.510	.690	1.21	1.62	1.98	2.06	2.12	1.91	2.32	2.22	2.08	15	15	21	27.5	30	-	.020?	.020	.030	.040	.050	.030
13	10	8	30322	.180	.270	.380	.580	.790	1.04	.280	.500	.850	1.10	1.61	2.20	1.55	1.85	2.23	1.89	2.04	2.11	17	14	22	27	37	-	.030	.030	.040	.040	.050	.030
14	10	3	30317	.140	.240	.340	.490	.750	.930	.090	.380	.590	.930	1.50	1.92	0.64	1.58	1.73	1.90	2.00	2.06	9	15	20	24	29	-	.040	.030	.020	.030	.020	.040

Triticites paramontiparus (Rozovskgya)

				Radius Vector						Half Length						Form Ratio						Tunnel Angle						Thickness of Spirotheca					
	Pl.	fig.	UHR.	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
1	14	2	30350	.100	.190	.320	.500	.650	1.05	.150	.400	.630	.940	1.25	1.63	1.50	2.13	1.97	1.88	1.92	1.55	12	18	15	32	-	-	.010	.040	.040	.060	.092	.080
2	14	1	30349	.130	.310	.460	.700	.980	1.28	.180	.310	.550	.830	1.56	2.02	1.38	1.03	1.19	1.18	1.59	1.58	13?	14	15	18	31?	-	.060?	.060	.080	.070	.100	.090

Triticites elongatus n. sp.

				Radius Vector						Half Length						Form Ratio						Tunnel Angle						Thickness of Spirotheca					
	Pl.	fig.	UHR.	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
1	15	3	30360	.090	.130	.200	.340	.570	.900	.070	.250	.360	.700	1.700	3.875	0.78	1.92	1.80	2.06	2.98	4.30	13	19	26	37	38	-	.010	.020	.030	.040	.060	.040

Triticites sp.

				Radius Vector						Half Length						Form Ratio						Tunnel Angle						Thickness of Spirotheca					
	Pl.	fig.	UHR.	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
	14	3	30351	.07	.12	.19	.32	.51	.79	.09	.16	.29	.45	.79	1.47	1.28	1.33	1.52	1.40	1.55	1.86	34	32	34.5	45	-	-	.01	.02	.05	.07	.08	.08

Fusiella praecursor Rauser-Chernoussova

				Radius Vector						Half Length						Form Ratio						Tunnel Angle						Thickness of Spirotheca					
	Pl.	fig.	UHR.	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
1	5	14	30246	.060	.140	.190	.290	.420	-	.010	.350	.500	1.05	1.45	-	1.66	2.50	2.63	3.62	3.45	-	-	19?	36.5	43.5	-	-	.005	.010	.010	.020	.020	-
2	5	15	30247	.030	.040	.080	.110	.170	-	.025	.070	.170	.395	.010	-	0.83	1.75	2.12	3.59	3.58	-	-	30	39	-	-	-	.005	.005	.005	.005	.010	-
3	5	13	30245	.035	.055	.080	.125	.175	-	.045	.075	.305	.430	.515	-	1.28	1.36	3.81	3.44	2.94	-	-	18	26	-	-	-	.005	.005	.010	.015	.025	-
4	-	-	-	.040	.065	.080	.120	.185	-	.035	.045	.230	.420	.530	-	0.87	0.69	0.87	3.50	2.86	-	-	-	24	-	-	-	.025	.005	.005	.010	.005	-
5	5	16	30248	.025	.065	.085	.115	.170	.235	.030	.055	.110	.325	.630	.755	1.20	0.84	1.29	2.82	3.70	3.21	-	10	17	25	-	-	.005	.005	.010	.010	.010	.020

Fusiella typica Lee & Chen

				Radius Vector						Half Length						Form Ratio						Tunnel Angle						Thickness of Spirotheca					
	Pl.	fig.	UHR.	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
1	13	6	30366	.045	.070	.100	.155	.230	.330	.045	.115	.250	.445	.625	.860	1.00	1.64	2.50	2.87	2.72	2.60	-	20	16	24	28	-	.005	.010	.010	.020	.020	.030
2	-	7	30369	.035	.090	.120	.175	.280	-	.075	.120	.150	.400	.800	-	2.14	1.33	1.25	2.28	2.86	-	-	12	17	35	-	-	.010	.010	.015	.020	.025	-
-	-	-	-	.055	.090	.125	.215	.300	-	.100	.145	.275	.485	.910	-	1.82	1.61	2.20	2.25	3.03	-	-	26	28	-	-	-	.015	.010	.010	.025	.020	-
4	-	8	30368	.050	.145	.225	.330	-	-	.190	.395	.740	1.03	-	-	3.80	2.72	3.29	3.12	-	-	-	44	-	-	-	-	.010	.020	.020	.020	-	-

Pseudoendothyra sp.

				Radius Vector						Half Length						Form Ratio						Tunnel Angle						Thickness of Spirotheca					
	Pl.	fig.	UHR.	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
1	1	21	30230	.085	.155	.250	.450	.610	.895	.045	.090	.150	.210	.300	.390	0.53	0.58	0.60	0.46	0.49	0.43	-	-	27	-	-	-	-	-	-	-	-	-
2	1	20	30229	.055	.130	.200	.470	.630	-	.030	.070	.125	.225	.285	.330	0.54	0.54	0.62	0.70	0.60	0.52	-	-	-	-	-	-	-	-	.03	.04	.02	-
3	1	22	30231	.060	.155	.280	.495	.710	-	.045	.060	.160	.245	.370	-	0.75	0.39	0.57	0.49	0.52	-	-	22	25	18	-	-	-	.005	-	.025	.04?	-

Ozawainella mosquensis Rauser-Chernoussova

				Radius Vector						Half Length						Form Ratio						Tunnel Angle						Thickness of Spirotheca					
	Pl.	fig.	UHR.	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
1	1	16	30226	.025	.055	.110	.200	.320	.425	.020	.025	.050	.095	.140	.230	0.8	0.45	0.45	0.47	0.44	0.54	-	-	5	4.5	8.5	-	.005	.010	.020	.020	.025	.020
2	1	17	30227	.055	.110	.140	.250	.380	.505	.020	.040	.080	.135	.195	.230	0.36	0.36	0.57	0.54	0.51	0.41	-	11	10	-	13	-	.010	.020	.015	.020	.015	-
3	1	18	30228	.075	.160	.270	.485	.635	-	.040	.095	.170	.195	.235	-	0.53	0.59	0.63	0.40	0.37	-	-	7	10	12?	-	-	-	-	.010	-	.015	-
4	1	19	30229	.045	.095	.170	.225	.330	.490	.015	.035	.070	.100	.160	.190	0.33	0.37	0.41	0.44	0.48	0.38	-	-	-	6	5.5	-	-	-	-	-	.015	.015
5	-	-	-	.035	.080	.155	.240	.395	.600	.025	.055	090	.110	.175	.220	0.71	0.69	0.58	0.46	0.44	0.36	-	-	5.5	7.5	7	-	-	-	-	.020	.020	.015

Pseudostaffella antiqua (Dutkevich)

			Radius Vector						Half Length						Form Ratio						Tunnel Angle						Thickness of Spirotheca					
Pl.	fig.	UHR.	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
2	12	30261	.055	.105	.180	.300	-	0	.075	.135	.210	.290	-	-	1.36	1.28	1.16	0.96	-	-	25	26	26	-	-	-	.010	.020	.010	.020	-	-
2	13	30262	.040	.080	.120	.200	.305	.455	.015	.055	.145	.190	.300	.415	0.37	0.69	1.21	0.95	0.98	0.91	-	26	15	20	33	-	.010	.010	.010	.015	.010	.010

Pseudostaffella compressa (Rauser-Chernoussova)

				Radius Vector						Half Length						Form Ratio						Tunnel Angle						Thickness of Spirotheca					
	Pl.	fig.	UHR.	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
1	2	15	30264	.030	.070	.120	.210	.315	-	.050	.085	.135	.180	.280	-	1.66	0.94	1.12	0.86	0.89	-	-	23	38	-	-	-	.005	.010	.010	.015	.010	-
2	2	14	30263	.050	.075	.095	.205	.270	.395	.025	.055	.100	.140	.195	-	0.5	0.73	1.05	0.68	0.49	-	-	-	16	35	-	-	.006	.005	.010	.015	.020	.020

Pseudostaffella subquadrata Grozdilova & Lebedeva

				Radius Vector						Half Length						Form Ratio						Tunnel Angle						Thickness of Spirotheca					
	Pl.	fig.	UHR.	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
1	3	4	30272	.080	.130	.205	.300	.450	.645	.095	.140	.225	.280	.405	.505	1.19	1.07	1.10	0.93	0.90	0.78	5	9	15	18	24	-	.025	.025	.030	.030	035	.035
2	3	3	30271	.095	.140	.220	.340	.450	.590	.090	.135	.215	.340	.405	.480	0.95	0.96	0.98	1.00	0.90	0.81	13	15	14	18	21	-	.020	.020	.030	.045	.030	.020
3	3	3	30270	0.10	.130	.225	.350	.480	.630	.100	.170	.270	.350	.440	.545	1.10	1.31	1.70	1.20	1.00	0.91	14	14	15	18	18	-	.020	.055	.040	.040	.030	.030
4	3	1	30269	.055	.110	.180	.305	.450	.600	.075	.120	.190	.300	.410	.495	1.36	1.09	1.05	0.98	0.91	0.82	8	23	21	27	-	-	.010	.030	.030?	.020	.025	.020

Pseudostaffella subrotunda n. sp.

				Radius Vector						Half Length						Form Ratio						Tunnel Angle						Thickness of Spirotheca					
	Pl.	fig.	UHR.	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
1	2	1	30250	.035	.055	.105	.165	.275	-	.025	.040	.080	.120	.190	-	.71	.73	.76	.73	.69	-	-	11	16	20	-	-	.005	.010	.020	.025	.025	-
2	2	2	30251	.04	.070	.120	.215	.350	-	.025	.060	.090	.155	.205	-	.62	.86	.75	.72	.58	-	-	13.5	24	57	-	-	.005	.010	.020	.020	.010	-
3	2	10	30259	.055	.100	.140	.25	.370	-	.020	.070	.110	.185	.27	-	.36	.70	.78	.77	.73	-	-	-	15	42	-	-	.010?	.015?	.015	.030	.020	-
4	2	7	30256	.045	.090	.160	.265	.420	-	.035	.060	.135	.210	.285	-	.87	.66	.84	.79	.68	-	-	17	27	-	-	-	.0.0	.020	.010	.015	.030	-
5	2	4	30253	.030	.070	.120	.195	.305	-	.015	.025	.090	.135	.210	-	.50	.36	.75	.69	.69	-	-	19	14	45	-	-	.005	.010	.010	.020	.020	-
6	2	9	30258	.040	.075	.135	.215	.330	-	.020	.065	.080	.155	.250	-	.50	.86	.59	.72	.76	-	13?	14	32	-	-	-	.010	.015	.010	.020	.005?	-
7	2	5	30254	.030	.065	.095	.165	.265	-	.015	.020	.065	.140	.200	-	.50	.31	.68	.85	.75	-	-	-	25	26.5	-	-	.005	.005	.020	.020	.015	-
8	-	-	-	.030	.055	.090	.165	.255	-	.025	.030	.095	.155	.215	-	.83	.54	1.05	0.94	.84	-	-	-	26	28.5	-	-	.010	.015	.020	.125	.020	-
9	2	3	30252	.050	.080	.160	.225	.390	-	.015	.065	.105	.185	.260	-	.30	.81	.65	.72	.66	-	-	13	22	-	-	-	.005	-	.020?	.015	.010	-
10	-	-	-	.030	.090	.160	.255	.460?	-	.040	.080	.145	.215	.340	-	.33	.89	.90	.84	.74	-	-	20	30.5	-	-	-	.005?	.015	.020	.020	.030	-
11	2	6	30255	.040	.100	.165	.225	.355	-	.030	.075	.100	.165	.260	-	.75	.75	.60	.73	.73	-	-	25	35	-	-	-	.005	.010	.015	.015	.010	-
12	-	-	-	.045	.065	.125	.190	.300	-	.020	.070	.080	.120	.205	-	.44	1.07	.64	.63	.68	-	-	14?	30	28	-	-	.005?	.010?	.015	.015	.010	-
13	2	8	30257	.040	.080	.130	.220	.360	-	.025	.055	.125	.190	.290	-	.62	.69	.96	.86	.75	-	-	21	21	44	-	-	.005	.010	.015	.015	.015	-
14	2	11	30260	.045	080	.115	.170	.270	.405	.025	.050	.105	.145	.215	.295	.55	.62	.91	.85	.79	.73	-	14	25	27	43	-	.005	.010	.010	.015	.025	.015

Pseudostaffella minatoi n. sp.

				Radius Vector						Half Length						Form Ratio						Tunnel Angle						Thickness of Spirotheca					
	Pl.	fig.	UHR.	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
1	3	5	30273	.080	.125	.190	.275	.375	.490	.070	.115	.185	.260	.350	.425	1.13	1.06	0.86	1.06	0.98	0.88	10	15.5	18.5	19	22	-	0.30	0.20	0.25	.025	.035	.020
2	3	7	30275	.095	.135	.195	.285	.405	.515	.100	.145	.255	.315	.400	.510	0.87	0.92	0.97	0.94	0.93	0.86	-	11	13	15	16.5	-	-	-	.025	.030	.030	.020
3	3	6	30274	.115	.170	.250	.350	.470	.620	.130	.180	.215	.370	.450	.545	1.05	1.07	1.31	1.10	0.99	0.99	10	8.5	13	15	11	-	.010	.015	.025	.030	.035	.030

Profusulinella fukujiensis Igo

				Radius Vector						Half Length						Form Ratio						Tunnel Angle						Thickness of Spirotheca					
	Pl.	fig.	UHR.	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
1	7	5	30285	.07	.14	.24	.38	.55	-	.05	.18	.30	.48	.02	-	.71	1.28	1.25	1.26	1.13	-	21	22	25	49	-	-	.01	.02	.04	.03	.03	-
2	7	2	30282	.07	.13	.20	.31	.43	-	.07	.16	.23	.40	.64	.82	1.00	1.23	1.15	1.29	1.49	-	11	16	22	26	37	-	.02	.03	.02	.02	.04	.04
3	7	1	30281	.075	.105	.17	.27	.42	-	.045	.07	.21	.31	.55	-	0.60	0.66	1.23	1.15	1.31	-	-	28	26	23?	-	-	.01	.01	.01	.01	.02	-

Fusulinella colanii (Lee & Chen)

				Radius Vector						Half Length						Form Ratio						Tunnel Angle						Thickness of Spirotheca					
	Pl.	fig.	UHR.	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
1	7	12	30292	.060	.090	.160	.250	.410	.570	.060	.160	.280	.470	.900	1.38	1.00	1.18	1.75	1.88	2.19	2.42	-	22	32	49.5	-	-	.010	.010	.020	.020	.040	.030
2	7	10	30290	.100	.160	.250	.420	.610	-	.130	.260	.450	.770	1.39	-	1.30	1.62	1.80	1.83	2.28	-	29	36.5	54	61	-	-	.020	.020	.020	.040	.060	-
3	-	-	-	.120	.200	.340	.450	.650	-	.170	.380	.790	1.24	1.83	-	1.41	1.90	2.32	2.75	2.81	-	60	63	54	50	-	-	.020	.020	.040	.040	.060	-
4	7	11	30291	.060	.140	.250	.400	.600	.810	.090	.200	.350	.660	1.08	1.69	1.50	1.43	1.40	1.65	1.80	2.08	11.5	18	32	52	-	-	.010	.020	.020	.020	.040	.020
5	7	13	30293	.060	.100	.170	.250	.390	.600	.050	.140	.300	.550	1.01	1.55	0.83	1.40	1.76	2.20	2.59	2.58	16	21	35.5	36.5	53	-	.010	.010	.020	.030	.050	.060

Fusuinella kamitakarensis Igo

				Radius Vector						Half Length						Form Ratio						Tunnel Angle						Thickness of Spirotheca					
	Pl.	fig.	UHR.	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
1	7	7	30287	.07	.12	.18	.29	.46	-	.06	.11	.28	.48	.81	-	0.86	0.91	1.55	1.65	1.76	-	-	31	47.5	61.5	-	-	.01	.02	.02	.05	.05	-
2	7	6	30286	.10	.19	.27	.45	-	-	.11	.24	.55	1.10	-	-	1.10	1.26	2.04	2.44	-	-	22.5	33.5	48.5	-	-	-	.02	.02	.03	.05	-	-
3	-	-	-	.09	.13	.18	.24	.36	.54	.05	.12	.22	.49	.75	1.19	0.55	0.92	1.22	2.04	2.08	2.20	-	-	-	24	-	-	.01	.02	.02	.02	.03	.02
4	7	4	30284	.08	.16	.19	.31	-	-	.10	.17	.40	.62	-	-	1.25	1.41	2.10	2.00	-	-	15	22.5	39	-	-	-	.01	.01	.01	.02	-	-

Fusulinella aff. praecolaniae Safonova

				Radius Vector						Half Length						Form Ratio						Tunnel Angle						Thickness of Spirotheca					
	Pl.	fig.	UHR.	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6							1	2	3	4	5	6
	7	3	30283	.065	.110	.160	.275	.345	.500	.040	.095	.225	.335	.510	.795	0.61	0.86	1.40	1.22	1.48	1.59	-	14	20	25	34	-	.005	.010	.015	.020	.020	.025

Fusulinella schubertellinoides elshanica Rauser-Chernoussova

				Radius Vector						Half Length						Form Ratio						Tunnel Angle						Thickness of Spirotheca					
	Pl.	fig.	UHR.	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
1	7	8	30288	.060	.090	.140	.210	.400	.650	.050	.110	.210	.430	.900	1.53	0.83	1.22	1.50	2.05	2.25	2.35	-	-	40	60	60?	-	.010	.020	.010	.060	.070	.040
2	7	9	30289	.060	.090	.160	.300	.480	-	.050	.160	.360	.620	.110	-	0.83	1.78	2.25	2.06	2.29	-	22	37	57	-	-	-	.010	.010	.020	.030	.040	-

Fusulinella pseudobocki (Lee & Chen)

				Radius Vector						Half Length						Form Ratio						Tunnel Angle						Thickness of Spirotheca					
	Pl.	fig.	UHR.	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
1		4	30299	.050	.090	.180	.300	.490	.810	.080	.190	.370	.690	1.16	2.07	1.6	2.11	2.05	2.30	2.37	2.55	21	21	35	49	49	-	.001	.001	.030	.050	.060	.040
2		1	30296	.090	.170	.300	.560	.860	-	.100	.450	.800	1.34	1.91	-	1.11	2.65	2.66	2.39	2.22	-	19	58	65	65	-	-	.030?	.020	.030	.040	.020	-
3		3	30298	.060	.100	.160	.290	.470	.720	.100	.150	.460	.800	1.08	2.92	1.66	1.50	2.87	2.76	2.30	4.05	16	22	24	25	54	-	.001	.020	.020	.060	.060	.020
4		2	30297	.090	.150	.260	.420	.650	-	.100	.220	.430	.106	.177	-	1.11	1.46	1.65	2.52	2.72	-	13.5	22	35	45	-	-	.010	.020	.030	.040	.030	-

Fusulinella cfr. fluxa (Lee & Chen)

				Radius Vector						Half Length						Form Ratio						Tunnel Angle						Thickness of Spirotheca					
	Pl.	fig.	UHR.	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
1	8	9	30304	.090	.150	.240	.400	.670	.860	.110	.240	.650	1.180	1.640	2.230	1.22	1.60	2.71	2.95	2.45	2.59	18	19	35	66	73	-	.01	.01	.02	.04	.06	-
2	-	-	-	.060	.120	.260	.450	.600	.860	.125	.375	.775	.130	2.215	2.725	2.08	3.12	2.98	2.89	3.54	3.17	24	33	33	72	83.5	-	.01	.02	.06	.04	.09	.04

Fusulinella schwagerinoides (Deprat)

	Pl.	fig.	UHR.	Radius Vector 1	2	3	4	5	6	7	Half Length 1	2	3	4	5	6	7	Form Ratio 1	2	3	4	5	6	7	Tunnel Angle 1	2	3	4	5	6	7	Thickness of Spirotheca 1	2	3	4	5	6	7
1	8	6	30301	.080	.120	.180	.280	.420	.640	-	.090	.170	.290	.450	.800	1.37	-	1.12	1.41	1.61	1.61	1.90	2.14	-	15	22	21	28	48	-	-	.010	.010	.030	.010	.040	.040	-
2	8	5	30300	.070	.110	.170	.260	.430	.640	.910	.060	.150	.260	.500	1.380	1.59	-	0.86	1.18	1.53	1.92	3.21	2.48	-	14	20	38	43	70	-	-	.010	.010	.020	.020	.020	.030	.020

Fusulinella sp. 4.

Fusulinella sp. 4.

	Pl.	fig.	UHR.	Radius Vector 1	2	3	4	5	6	7	Half Length 1	2	3	4	5	6	7	Form Ratio 1	2	3	4	5	6	7	Tunnel Angle 1	2	3	4	5	6	7	Thickness of Spirotheca 1	2	3	4	5	6	7
	7	14	30294	.11	.17	.25	.36	.54	.72	.81	.11	.25	.32	.55	.76	1.40	1.86	1.00	1.47	1.28	1.53	1.41	1.94	2.29	13	15	11	24	30	-	-	.01	.01	.03	.04	.06	.05	.01

Quasifusulina pseudoelongata Miklucho-Maclay

	Pl.	fig.	UHR.	Radius Vector 1	2	3	4	5	6	7	Half Length 1	2	3	4	5	6	7	Form Ratio 1	2	3	4	5	6	7	Tunnel Angle 1	2	3	4	5	6	7	Thickness of Spirotheca 1	2	3	4	5	6	7
1	12	1	30337	.250	.375	.550	.750	.975	1.05	-	?	2.025	2.725	3.075	3.975	5.400	-	-	5.4	4.95	4.10	4.07	5.14	-	40	55	60	40	40	-	-	.025	.025	.075	.075	.050	.050	-
2	12	2	30338	.250	.350	.470	.620	.850	1.02	-	.500	1.257	2.275	3.025	3.425	4.95	-	2.00	3.57	4.84	4.88	4.09	4.85	-	56	27	30	55	70	-	-	.025	.025	.025	.075	.075	.050	-
3	12	8	30344	.225	.300	.425	.600	.775	1.00	1.225	.350	.600	1.125	1.725	2.250	3.100	4.250	1.55	2.00	2.65	2.87	2.90	3.10	3.47	32.5	59	45	45	78	-	-	.025	.025	.025	.025	.050	.050	.050
4	12	11	30347	.200	.325	.450	.625	.925	-	-	.600	.925	1.925	2.600	3.625	-	-	3.00	2.84	4.28	4.16	3.92	-	-	34	315	31	57	-	-	-	.025	.025	.025	.020	.020	-	-
5	12	6	30342	.260	.460	.740	.890	-	-	-	.800	1.625	2.60	3.70	-	-	-	3.07	3.53	3.51	4.16	-	-	-	41	52	-	-	-	-	-	.030	.060	.050	.050	-	-	-
6	12	4	30340	.240	.350	.480	.700	-	-	-	.500	1.200	2.225	3.275	-	-	-	2.08	3.43	4.63	4.68	-	-	-	37	43	50	-	-	-	-	.030	.020	.040	.040	-	-	-

Obsoletes obsoletus (Schellwien)

	Pl.	fig.	UHR.	Radius Vector 1	2	3	4	5	6	7	Half Length 1	2	3	4	5	6	7	Form Ratio 1	2	3	4	5	6	7	Tunnel Angle 1	2	3	4	5	6	7	Thickness of Spirotheca 1	2	3	4	5	6	7
	13	1	30373	.07	.13	.23	.43	1.18	1.22	-	.100	.275	.525	.825	1.675	3.40	-	1.43	2.11	2.28	1.92	1.42	2.78	-	27	36	40	57	61	-	-	.01	.03	.02	.04	.05	.04	-
	13	2	30372	.05	.09	.13	.20	.32	.50	.73	.060	.100	.210	.460	.840	1.85	2.49	1.20	1.11	1.61	2.30	2.62	3.70	3.41	-	-	36	55	75	-	-	.005	.01	.01	.02	.02	.03	.03

Pseudostaffella umbilicata (Putrja & Leontovich)

	Pl.	fig.	UHR.	Radius Vector 1	2	3	4	5	6	7	8	Half Length 1	2	3	4	5	6	7	8	Form Ratio 1	2	3	4	5	6	7	8	Tunnel Angle 1	2	3	4	5	6	7	8	Thickness of Spirotheca 1	2	3	4	5	6	7	8
1		4	30279	.070	.125	.205	.235	.400	.540	.690	-	.115	.190	.245	.355	.455	.535	.630	-	1.64	1.52	1.19	1.51	1.14	0.99	0.91	-	8	11	9	13	16	17	-	-	.020	.025	.020	.050	.050	.060	-	-
2		5	30280	.075	.110	.175	.250	.345	.480	.640	.800	.045	.065	.160	.245	.305	.335	.460	.525	0.6	0.50	0.91	0.98	0.88	0.70	0.72	0.72	9	14.5	11.5	17	15	17	23	-	.015	.030	.030	7	7	.040	.030	.020
3		2	30277	.055	.125	.265	.350	.495	.635	.810	-	.110	.145	.270	.390	.500	.540	.650	-	2.00	.16	1.02	1.00	1.01	0.85	0.80	-	17	11	13	17	16	14	-	-	.025	.030	.030	.045	.040	.030	.050	-
4		-	-	.055	.110	.170	.245	.315	.415	.560	-	.050	.090	.115	.210	.270	.375	.470	-	0.91	0.81	0.67	0.94	0.92	0.90	0.84	-	15	15	16	19	17	18	-	-	.010	.020	.020	.030	.015	.020	.020	-
5		3	30278	.055	.085	.135	.205	.290	.405	.545	.730	.050	.110	.160	.225	.310	.425	.470	.525	0.91	1.29	1.18	1.10	1.07	1.05	0.86	0.79	-	13	16	15	17	15	22	-	.010	.015	.025	.030	.035	.030	.030	.025
6		-	-	.085	.135	.200	.280	.390	.515	-	-	.060	.140	.195	.280	.380	.445	-	-	0.70	1.04	0.97	1.00	0.97	0.86	-	-	-	12.5	14	16	19	-	-	-	.025?	.025?	.025	.025	.030	.020	-	-
7		-	-	.075	.125	.185	.265	.365	.465	.625	-	.080	.125	.180	.290	.355	.420	.530	-	1.14	1.00	0.97	1.09	0.97	0.90	0.85	-	13.5	8.5	13.5	12	16.5	25	-	-	.010	.020	.020	.030	.020	.010	.015	-

Neostaffella aff. hanensis Cheong

	Pl.	fig.	UHR.	Radius Vector 1	2	3	4	5	6	7	8	Half Length 1	2	3	4	5	6	7	8	Form Ratio 1	2	3	4	5	6	7	8	Tunnel Angle 1	2	3	4	5	6	7	8	Thickness of Spirotheca 1	2	3	4	5	6	7	8
1	11	11	30334	.080	.130	.200	.260	.350	.450	.560	.710	.110	.160	.210	.260	.410	.460	.550	.640	1.37	1.23	1.05	1.00	1.17	1.02	0.98	0.90	15	13	11	11	18	19	22	-	.010	.010	.030	.030	.020	.020	.020	.010

Fusulinella rhomboidalis n. sp.

				Radius Vector								Half Length								Form Ratio								Tunnel Angle								Thickness of Spirotheca							
	Pl.	fig.	UHR.	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
1	9	9	30313	.080	.130	.210	.360	.540	.800	1.14	-	.070	.140	.350	.540	.810	1.26	1.83	-	0.87	1.07	1.66	1.50	1.50	1.57	1.60	-	10	21	22	24	29	31	-	-	.01	.02	.04	.06	.07	.07	.07	-
2	9	6	30310	.080	.110	.220	.350	.490	.740	1.10	-	.070	.130	.220	.500	.710	1.110	1.72	-	0.87	1.18	1.00	1.43	1.45	1.50	1.56	-	-	21	19	20	34	-	-	-	.01	.02	.03	.04	.08	.08	.03	-
3	-	-	-	.060	.100	.180	.290	.480	.740	1.05	1.37	.060	.140	.240	.340	.690	1.20	2.01	2.51	1.00	1.40	1.33	1.17	1.44	1.62	1.91	1.83	-	21	21	24	33	36	-	-	.01	.03	.05	.04	.06	.09	.07	.04
4	-	-	-	.060	.100	.150	.250	.420	.630	.950	-	.050	.110	.270	.500	.800	1.26	1.91	-	0.83	1.10	1.80	2.00	1.90	2.00	2.01	-	-	26	23	28	41.5	59	-	-	.01	.01	.01	.03	.04	.05	.04	-
5	9	3	30307	.11	.18	.28	.43	.64	.86	-	-	.14	.30	.52	.86	1.08	1.40	-	-	1.27	1.66	1.86	2.00	1.69	1.63	-	-	27	23	27	38	-	-	-	-	.02	.02	.04	.04	.04	.03	-	-
6	9	8	30312	.10	.18	.29	.46	.70	.97	-	-	.13	.24	.44	.73	1.14	1.70	-	-	1.30	1.33	1.52	1.58	1.63	1.75	-	-	26	29	28	30	43	-	-	-	.02	.04	.04	.05	.06	.06	.06	-
7	9	7	30311	.11	.19	.30	.43	.62	.83	1.14	-	.12	.25	.45	.65	.92	.138	1.84	-	1.09	1.31	1.50	1.51	1.48	1.56	1.61	-	21	28	20	35	36	43	-	-	.02	.03	.06	.06	.05	.05	.07	-
8	9	4	30308	.10	.15	.28	.45	.64	.90	-	-	.12	.24	.41	.74	1.25	1.60	-	-	1.20	1.60	1.46	1.64	1.95	1.78	-	-	24.5	34	30	40	34.5	-	-	-	.01	.03	.04	.04	.06	.04	-	-
9	9	2	30306	.16	.24	.38	.58	.88	1.60	-	-	.18	.37	.54	.88	1.47	1.96	-	-	1.12	1.54	1.42	1.52	1.67	1.63	-	-	23	23.5	26	33	-	-	-	-	.02	.04	.03	.05	.05	.06	.03	-
10	-	-	-	.12	.21	.37	.51	.67	1.04	-	-	.14	.32	.52	.90	1.25	1.92	-	-	1.16	1.52	1.40	1.76	1.86	1.84	-	-	23	21	22.5	35	53	-	-	-	.02	.03	.04	.04	.04	.04	.03	-

Fusulinella sp. 1.

			Radius Vector								Half Length								Form Ratio								Tunnel Angle								Thickness of Spirotheca							
Pl.	fig.	UHR.	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
9	10	30314	.06	.12	.18	.27	.39	.54	.80	1.10	.09	.12	.20	.39	.51	.80	1.56	2.22	1.50	1.00	1.11	1.44	1.31	1.48	1.95	2.02	24	15	15	14	26	35	437	-	.01	.02	.03	.04	.04	.05	.05	.07

				Radius Vector								Half Length								Form Ratio								Tunnel Angle								Thickness of Spirotheca							
	Pl.	fig.	UHR.	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
1	14	6	30354	.120	.200	.310	.490	.700	.970	1.30	1.53	.200	.390	.580	.830	1.28	2.255	3.575	4.075	1.66	1.95	1.87	1.69	1.83	2.29	2.75	2.66	14	16	15	18	21	33	-	-	.040	.040	.060	.090	.130	.080	.120	.100
2	14	4	30352	.120	.190	.310	.450	.640	.910	-	-	.150	.260	.470	.660	1.00	1.70	-	-	1.25	1.37	1.51	1.46	1.56	1.87	-	-	11	20	17	20	37	-	-	-	.020	.020	.040	.050	.070	.080	-	-
3	14	5	30353	.090	.170	.310	.500	.750	-	-	-	.100	.250	.460	.570	1.46	-	-	-	1.11	1.47	1.48	1.14	1.94	-	-	-	19.5	20	20.5	23	-	-	-	-	.020	.030	.060	.070	.060	-	-	-

Triticites saurini Igo

				Radius Vector								Half Length								Form Ratio								Tunnel Angle								Thickness of Spirotheca							
	Pl.	fig.	UHR.	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
1	15	2	30359	.075	.150	.250	.525	.850	1.375	1.550	-	.100	.150	.450	.675	1.975	1.525	1.950	-	1.33	1.00	1.80	1.28	1.26	1.11	1.26	-	-	22	21.5	18	23	23	-	-	.020	.020	.040	.080	.120	.160	.180	-
2	15	1	30358	.060	.090	.160	.260	.0430	.690	1.05	1.43	.060	.130	.270	.560	.800	1.10	1.54	2.02	1.00	1.44	1.69	2.15	1.86	1.59	1.46	1.41	-	18	19	18	18	19	25	-	.005	.010	.020	.060	.070	.090	.100	.120

Pseudoschwagerina morikawa Igo

				Radius Vector									Half Length									Form Ratio									Tunnel Angle									Thickness of Spirotheca								
	Pl.	fig.	UHR.	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
1	15	8	30365	.08	.14	.24	.41	.80	1.25	1.825	2.175	-	.08	.19	.39	.77	1.16	1.95	2.75	-	-	1.00	1.36	1.62	1.88	1.45	1.56	1.50	-	-	14	20	29	21	21	27	-	-	-	.01	.02	.05	.11	.10	.08	-	-	-
2	15	7	30364	.07	.10	.16	.28	.58	1.05	1.72	2.24	-	.075	.175	.35	.625	1.35	1.525	2.25	2.95	-	1.07	1.75	2.18	2.23	2.33	1.45	1.31	1.31	-	-	35	45.5	43.5	42	45	45	-	-	.01	.01	.02	.04	.09	.08	.10	.15	-
3	15	5	30[illegible]	.08	.10	.15	.425	.775	1.225	1.925	2.425	-	.04	.120	.22	.39	.60	1.10	1.875	2.625	3.575	0.50	1.20	1.46	1.50	1.41	1.42	1.53	1.36	1.47	14	20	20	35	31	36	40	-	-	.02	.01	.02	.04	.08	.09	.11	.13	.09
4	15	6	30363	.075	.15	.225	.375	.70	1.175	1.70	2.125	-	.10	.175	.40	.575	.925	1.425	2.075	2.875	-	1.33	1.16	1.78	1.53	1.32	1.21	1.22	1.35	-	-	9	16	18	20	28	-	-	-	.025	.025	.025	.10	.10	.10	.125	.075	-

Triticites ichinotaniensis n. sp.

				Radius Vector									Half Length									Form Ratio									Tunnel Angle									Thickness of Spirotheca								
	Pl.	fig.	UHR.	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
1	14	8	30356	.08	.12	.18	.28	.42	.57	.82	1.09	-	.08	.18	.34	.42	.65	.95	1.25	1.37	-	1.00	1.50	1.89	1.50	1.55	1.66	1.52	1.25	-	-	23	23.5	17	15	20	20	-	-	.01	.02	.03	.09	.10	.07	.08	.08	-
2	14	9	30357	.05	.08	.16	.36	.41	.65	.95	1.36	1.77	.095	.19	.35	.55	.785	1.13	1.4[illegible]	2.145	2.56	1.90	2.40	2.19	1.53	1.91	1.74	1.52	2.58	1.44	-	23	10.5	16.5	15.5	23	35	28	-	.01	.01	.02	.04	.07	.16	1.4	.13	.11