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Fusulinids from the Maizuru Zone, Southwest Japan
Part 1. Ozawainellinae, Schubertellinae and Neoschwagerininae

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Abstract

The present writer is intending to publish reports on his studies of the fusulinids from the upper Permian Maizuru group in the Maizuru zone. The present paper is the first report and it deals with the species belonging to *Ozawainellinae, Schubertellinae* and *Neoschwagerininae,* among which one species and one subspecies are new.

Introduction and Acknowledgment

The Maizuru zone situated in the northern part of the Kinki Region is composed of the Maizuru group (upper Permian), the Yakuno group (lower to middle Triassic), the Nabae group (upper Triassic) and others. Many papers concerning these strata were already published by K. NAKAZAWA and others. To their excellent works the present writer wants to add the description of the fusulinids from the Maizuru group.

The Maizuru group, more than 1000 metres in thickness, is composed of shales, sandstones and conglomerates, rarely intercalating small lenses of limestone. The group yields many fusulinids in which three forms, viz. *Lepidolina-Yabeina* faunule, small fusulinids and derived fusulinids, are distinguishable. The first one, whose assemblage is almost identical with that of *Lepidolina* fauna described by K. KANMERA from the Kuma formation of southern Kyushu, is found mostly in the matrices of the conglomerates and very rarely in the small lenses of black muddy limestone. The second one obtained from the small limestone-lenses of reef-origin is rather characteristic and differs from any previously described species. The third one is found in the limestone-pebbles of the conglomerates.

Part 1 deals with three subfamilies in the former two forms, *Ozawainellinae, Schubertellinae* and *Neoschwagerininae.* The remaining subfamilies and the derived fusulinids will be described in Part 2 and Part 3, which will be published in the near future.

Before continuing, the writer wishes to express his most sincere thanks to Prof. S. MATSUSHITA of Kyoto University and Assist. Prof. K. NAKAZAWA of the same

University for their kind guidance. He is indebted to Mr. T. SHIKI and Mr. D. SHIMIZU for their kindly offering many samples at his disposal. Lastly he expresses his gratitude to Assist. Prof. K. KANMERA of Kyushu University, Lect. K. ISHII of Ōsaka City University and Lect. N. YAMAGIWA of Ōsaka Gakugei University for their kind advice in the study of the fusulinids.

Description of Species

Family FUSULINIDAE MÖLLER, 1878

Subfamily OZAWAINELLINAE THOMPSON et FOSTER, 1937

Genus **Nankinella** LEE, 1933

Nankinella sp. A indet.

plate 1, figs. 3, 4.

Numerous incomplete specimens of this form have been obtained. They are so highly replaced by secondary mineralization that the detailed characters cannot be determined with certainty.

Shell is small, lenticular in shape. Periphery is angular throughout the shell. Most specimens of 8 1/2 to 10 1/2 volutions are 2.2 mm. long and 1.9 to 3.2 mm. wide; with form ratio of about 0.69.

Spirotheca is very thin in inner four or five volutions, but it thickens gradually to maturity where it does not exceed 70 microns. Spirotheca seems to be composed of tectum and lower less dense layer with parallel lines.

Septa are numerous and not fluted. Septal count of the last volution is 24 or more. Chomata are low and slightly asymmetrical.

Remarks: This form is closely allied to *Staffella chaupti* CIRY from Turkey described and illustrated by CIRY in shape, rate of the growth, angle of the periphery, development and position of the chomata and thickness of the spirotheca. But the present specimens are in so ill a state of preservation that the identification will be avoided until better specimens are obtained.

Occurrences: This form occurs commonly in the lenses of black muddy limestone and rarely in the matrices of the conglomerates; associated with *Yabeina columbiana*, *Lepidolina kumaensis*, *L. toriyamai*, *L. toriyamai maizurensis* subsp. nov. and others.

Reg. Nos.: JPF-10006, JPF-10007.

Nankinella sp. B indet.

plate 2, figs. 6, 7.

Shell is minute, lenticular; with sharply angular periphery. Most specimens of 3 to 4 volutions are 0.56 to 0.63 mm. long and 0.85 to 0.93 mm. wide; with form ratio of about 0.6.

Spirotheca is thin and does not exceed 17 microns in thickness. Its structure cannot be determined with certainty. Chomata are low and somewhat asymmetrical.

Remarks: This form differs from any described species of *Nankinella* and *Staffella*.

Occurrences: The present species is rarely found in the lenses of black muddy limestone and has the same association as that of *Nankinella* sp. A indet..

Reg. Nos.: JPF-10008, JPF-10009.

Genus **Reichelina** ERK, 1941

Reichelina matsushitai sp. nov.

plate 1, figs. 11-22.

Shell is minute; with slightly umbilicate polar ends, flat to somewhat convex lateral slopes and short axis of coiling. Most specimens of 3 to 4 1/2 volutions are 0.14 to 0.19 mm. long and 0.72 to 1.19 mm. wide; with form ratio of 0.14 to 0.21.

Proloculus is minute, spherical to subspherical in shape; with outside diameter of 32 to 45 microns. The first volution is subdiscoidal, evolute; with narrowly rounded periphery. Following three volutions are discoidal, involute; with rather sharply angular periphery. The last one half volution is uncoiled, highly expanded; with height of 0.32 to 0.86 mm..

Spirotheca is very thin and decreses poleward from median portion in thickness. Its structure cannot be determined with certainty, but spirotheca is probably composed of two layers, tectum and lower less dense layer.

Septa are thin, not fluted, but strongly convex anteriorily in outer volutions. Septal counts of the first to fourth volution are 7-9, 13-16, 16-18 and 22-26, respectively.

Chomata are rather high, slightly asymmetrical. Axial filling is somewhat strong.

Remarks: The present species resembles *Reichelina chichibuensis* MORIKAWA and *R. simplex* SCHENG, but it can be easily distinguished from the former by the slenderer shell and the higher last one-half volution, and from the latter in having more numerous volutions and more tightly coiled inner volutions.

Occurrences: This new species is fairly abundant in the small limestone-lenses of reef-origin at Kawahigashi and Yakuno, Kyoto Prefecture. It occurs together with *Schubertella*? sp. indet. and bryozoas.

Reg. Nos.: JPF-10010 to JPF-10021.

Subfamily SCHUBERTELLINAE SKINNER, 1931

Genus **Codonofusiella** DUNBAR et SKINNER, 1937

Codonofusiella cuniculata KANMERA

plate 2, figs. 10, 11.

Codonofusiella cuniculata KANMERA, 1954, Mem. Fac. Sci. Kyushu Univ., Ser. D, vol. 4, no. 1, pl. 3, figs. 12, 14-19.

Shell is minute, elongate subtriangular in shape. Most specimens of 4 1/2 volutions are 2.5 mm. long and 0.50 to 0.64 mm. wide; with form ratio of about 4.0. Height of the last volution is 0.13 to 0.22 mm..

Proloculus is minute; with outside diameter of 66 to 97 microns. Spirotheca is very thin, composed of tectum and lower less dense layer. Thicknss of spirotheca is 10 to 15 microns in the last volution.

Remarks: The present specimens are closely allied to the type-specimens of KANMERA in height of the last volution, thickness of the spirotheca, degree of the septal fluting and development of the cuniculi, but the former differ from the latter in having slenderer shell and somewhat larger proloculus. These slight differences, however, may be within the limit of the specific individual variation.

Occurrences: This form has been obtained from the matrices of the conglomerates; associated with *Yabeina columbiana*, *Y. yasubaensis*, *Lepidolina kumaensis*, *L. toriyamai*, *L. toriyamai maizurensis* subsp. nov. and others.

Reg. Nos.: JPF-10022, JPF-10023.

Genus **Schubertella** STAFF et WEDEKIND, 1910

Schubertella ? sp. indet.

plate 2, figs. 12-16.

Several specimens have been found in the collections. Most of them are poorly oriented and in an ill state of preservation, so the detailed characters of this form cannot be determined with certainty.

Shell is minute, subspherical in shape; with almost straight axis of coiling, slightly umbilicate polar regions and highly convex lateral slopes. Most specimens of 2 1/8 to 3 volutions are 0.27 to 0.33 mm. long and 0.19 to 0.27 mm. wide; with form ratio of about 1.2.

Proloculus is large for the size of shell. Its outside diameter is 39 to 53 microns.

Spirotheca is extremly thin, probably composed of tectum and lower less dense layer. Thickness of both layers does not exceed 10 microns even at the thickest portion of outer volutions.

Septa are exceedingly thin and hang almost normally from spirotheca. Septal counts of the first to third volution are 7-8, 10-14 and 20-22?, respectively.

Chomata occur throughout the shell, and in the last volution they are highly asymmetrical.

Remarks: Because of the poor orientation and ill state of preservation, generic and specific affinities of this form cannot be determined with certainty. This form, however, differs from any previously described species.

The present form resembles the type-species of *Schubertella* in structure of the spirotheca, but differs in mode of the coiling in the inner volutions. It is also allied to the type-species of *Eoschubertella* in general shape of the shell, degree of the

septal fluting and size of the proloculus, but differs in structure of the spirotheca. However the present form will be referred tentatively to the genus *Schubertella* until better specimens are obtained.

Occurrences: The present form is rarely found in the small limestone-lenses of reef-origin; associated with *Reichelina matsushitai* sp. nov. and others.

Reg. Nos.: JPF-10024 to JPF-10028.

Subfamily NEOSCHWAGERININAE DUNBAR et CONDRA, 1928, emend. KANMERA, 1957

Genus **Neoschwagerina** YABE, 1903

Neoschwagerina cfr. **margaritae** DEPRAT

plate 1, fig. 7.

cfr. *Neoschwagerina margaritae* DEPRAT, 1913, Mém. Serv. Géol. Indochine, vol. 2, fasc. 1, mem. 2, p. 58, pl. 8, fig. 10; pl. 9, figs. 1-3.
Neoschwagerina margaritae, HUZIMOTO, 1936, Sci. Rep. Tokyo Bunrika Daigaku, Sect. C, no. 2, pp. 117, 118, pl. 22, figs. 16, 17; pl. 24, figs. 1-4.
For further references see HUZIMOTO, 1. c.

Shell is rather large, subellipsoidal. As several outer volutions are crushed away, length and width of mature shell cannot be measured. But shell at the fourteenth volution is 4.8 mm. long and 3.5 mm. wide; with form ratio of 1.4.

Spirotheca is thin, composed of tectum and relatively thin keriotheca with fine alveoli. Thickness of both layers is 5-8 microns in the first to second volution, 10-16 microns in the third to sixth volution and 14-24 microns in the seventh to last volution.

Primary transverse septula occur throughout the shell and are rather loosely spaced. Secondary transverse septula first appear in the eighth volution and rarely one septulum occurs between adjacent primary septula from the eighth to last volution.

Remarks: The present form has many important characters found in *Neoschwagerina margaritae* DEPRAT. But it is represented by only one specimen whose several outer volutions are crushed away, so the detailed characters cannot be determined with accuracy. Until more sufficient and better specimens are obtained, the identification will be avoided.

Occurrences: A single specimen has been obtained from the matrix of the conglomerate at Gujyo, Kasa-gun, Kyoto Prefecture. Its association is the same as that of *Codonofusiella cuniculata*.

Reg. No.: JPF-10029.

Genus **Yabeina** DEPRAT, 1914

Yabeina columbiana (DAWSON)

plate 1, figs. 9, 10.

Loftusia columbiana DAWSON, 1879, Quat. Jour. Geol. Soc. London, vol. 35, pp. 69-75, pl. 6, figs. 1-7.

Yabeina columbiana, KANMERA, 1954, Mem. Fac. Sci. Kyushu Univ., Ser. D, vol. 4, no. 1, pp. 16–18, pl. 3, figs. 1–7.
For further references see KANMERA, 1. c.

Shell is large, highly inflated fusiform. Several outer volutions are missing or replaced by black materials, so the largest length and width of mature shell cannot be precisely measured. But specimens of 15–17 volutions are 5.7 to 7.6 mm. long and 4.0 to 5.1 mm. wide; with form ratio of 1.6 to 1.7.

Proloculus is small; with outside diameter of 69 to 159 microns. Average height of the first to fifteenth volution of seven specimens are 38, 46, 60, 74, 89, 101, 118, 137, 152, 157, 173, 188, 201, 206 and 228 microns, respectively.

Spirotheca is very thin, composed of tectum and thin keriotheca with very fine alveoli. Thickness of spirotheca is 8–12 microns in the first to fifth volution and 7–15 microns in the sixth to last volution.

Septa are somewhat irregularly and rather widely spaced. Septal counts of the first to fourteenth volution of one typical specimen are 9, 12, 15, 15, 16, 16, 17, 19, 19?, 21, 22, 22, 23 and 24, respectively. Axial septula occur throught the shell, and there are one septulum between adjacent septa in the first two volutions, 1–2 septula in the third to fifth volution, 2–5 septula in the sixth to eighth volution and 4–7, sometimes 8–9, septula in outer volutions.

Primary transverse septula are present throughout the shell. Secondary transverse septula first appear in the fifth or sixth volution, and there is one septulum in the most cases, but sometimes two septula occur in outer volutions.

Remarks: In many important characters this form is closely allied to *Yabeina columbiana* from the Marble Canyon limestone by THOMPSON, WHEELER and DANNER, and that from the Kuma formation by KANMERA. This form, however, differs from the former in having slightly more inflated shell, and from the latter in having somewhat smaller proloculus. Probably these slight differences are within the limit of the specific individual variation.

Occurrences: This species occurs fairly abundantly in the matrices of the conglomerates and in the lenses of black muddy limestone. It has the same association as that of *Codonofusiella cuniculata*.

Reg. Nos.: JPF–10030, JPF–10031.

Yabeina yasubaensis TORIYAMA

plate 1, fig. 8.

Yabeina yasubaensis TORIYAMA, 1942, Jap. Jour. Geol. Geogr., vol. 18, no. 4, pp. 246, 247, pl. 25, figs. 8–13.
Yabeina yasubaensis, KANMERA, 1954, Mem. Fac. Sci. Kyushu Univ., Ser. D, vol. 4, no. 1, pp. 18, 19, pl. 2, figs. 10–13; pl. 5, figs. 14–19.

Shell is large, highly inflated fusiform; with nearly flat lateral slopes and rounded polar ends. Several outer volutions are missing or replaced by dark

materials. Most specimens of thirteen volutions are 6.7 to 7.1 mm. long and 4.0 to 4.1 mm. wide; with form ratio of 1.6 to 1.7.

Proloculus is large; with outside diameter of 290 to 395 microns. Average height of the first to thirteenth volution are 88, 92, 103, 117, 141, 154, 174, 189, 190, 205, 198, 206 and 225 microns, respectively.

Spirotheca is thin, composed of tectum and thin keriotheca with fine alveoli. Thickness of spirotheca is 8–10 microns in inner volutions and 13–15 microns in outer volutions.

Septa are rather loosely spaced. Septal counts of the first to tenth volution are 8, 10, 12, 13, 15, 16, 17, 18, 18 and 20, respectively. Axial septula are present throughout the shell; 1–3 septula occur in inner volutions and 3–7 septula in outer volutions.

Primary transverse septula are present throughout the shell. Secondary transverse septula first appear in the second volution; one septulum occurs between adjacent primary ones in inner volutions and one or two septula occur in outer volutions.

Remarks: The present specimens are closely allied to the type-specimens described by TORIYAMA in almost every important feature, except for size of the proloculus.

KANMERA has already stated that *Yabeina yasubaensis* TORIYAMA and *Y. shiraiwensis* OZAWA resemble each other closely in many important characters and evolutionary development of both species is of almost the same degree. Accordingly, it is highly probably that these two species are conspecific. The writer is also inclined to agree with KANMERA. But here, this form is temporarily referred to *Yabeina yasubaensis*.

Occurrences: The present species has been gathered abundantly from the matrices of the conglomerates. It occurs together with *Yabeina columbiana*, *Lepidolina kumaensis*, *L. toriyamai* and others.

Reg. No.: JPF–10032.

Yabeina gubleri KANMERA

plate 1, figs. 5, 6.

Yabeina gubleri KANMERA, 1954, Mem. Fac. Sci. Kyushu Univ., Ser. D, vol. 4, no. 1, pp. 19–21, pl. 4, figs. 1–13.

Numerous specimens referred to *Yabeina gubleri* have been found, but most of them are poorly oriented.

Shell is large, highly inflated fusiform. Several outer volutions are missing or replaced by black materials. Specimens at the eighth volution are 4.7 to 5.4 mm. long and 2.2 to 3.3 mm. wide; with form ratio of about 1.8.

Proloculus is large; with outside diameter of 356 to 759 microns. Average height of the first to ninth volution of five specimens are 90, 94, 91, 117, 130, 145,

161, 167 and 171 microns, respectively.

Spirotheca is very thin for the genus, composed of tectum and very thin keriotheca with very fine alveoli. Thickness of spirotheca is 7–12 microns in the first two volutions, 5–12 microns in the third to fifth volution and 5–8 microns in the sixth to last volution.

Septa are thin, rather loosely spaced. Septal counts of the first to seventh volution are 9, 12, 13, 14, 16, 16 and 18, respectively. There are 1–4 axial septula between adjacent septa in inner three volutions, 3–6 septula in the fourth to sixth volution and 4–7, sometime 8, septula in outer volutions.

Primary transverse septula are present throughout the shell. Secondary transverse septula appear even in the first volution, and there is one septulum between adjacent primary ones in most cases, but sometimes two septula occur in outer volutions.

Remarks: Except for the structure of the spirotheca, this form is identical with the type-specimens of KANMERA in every important character. The spirotheca of this form is composed of a very thin keriotheca and a tectum throughout the shell, while that of the type-specimens is composed, for the most part, of a thin layer in the outer volutions. This difference may have been caused by the discrepancy of microscopic magnification, as will be stated in the remarks for *Lepidolina kumaensis*.

Occurrences: This species occurs commonly in the matrices of the conglomerates; having the same association as that of *Yabeina yasubaensis*.

Reg. Nos.: JPF–10033, JPF–10034.

Genus **Lepidolina** LEE, 1933

Lepidolina kumaensis KANMERA

plate 2, figs. 8, 9.

Lepidolina kumaensis KANMERA, 1954, Mem. Fac. Sci. Kyushu Univ., Ser. D, vol. 4, no. 1, pp. 22–24, pl. 5, figs. 1–13.

Shell is large, elongate subcylindrical fusiform. A few outer volutions are crushed away or replaced by dark materials. Specimens of twelve volutions are 8.0 to 8.8 mm. long and 2.9 to 3.4 mm. wide; with form ratio of about 3.0.

Proloculus is large; with outside diameter of 350 to 542 microns. Average height of the first to thirteenth volution of eight sepecimens are 66, 61, 69, 78, 92, 98, 113, 115, 125, 129, 140, 147 and 159 microns, respectively.

Spirotheca is very thin, composed of tectum and very thin keriotheca with very fine alveoli in inner three or four volutions where thickness is 4–9 microns. Beyond the fifth volution spirotheca is partly composed of a single layer, but for the most part keriotheca remains. Thickness of spirotheca is 2–6 microns in outer volutions.

Septa are thin, extending forward at a small angle. Septal counts of the first

to fifth volution are 8, 11, 13, 15 and 16, respectively. Axial septula are rather irregularly in shape and length, and present throughout the shell.

Primary transverse septula occur throughout the shell. Secondary transverse septula first appear in the second or third volution ; one septulum occurs between adjacent primary ones in inner volutions and two, rarely three, septula occur in outer volutions.

Remarks. This form has many important features found in the type-specimens of KANMERA. As far as the structure of the spirotheca is concerned, however, the former differs from the latter. Namely the spirotheca of the former is composed of a tectum and extremly thin keriotheca, while that of the latter is of a single layer.

Under 50 times magnification of microscope the spirotheca of this form may be observed as if it were composed of a layer, but under 150 times magnification a tectum and exceedingly thin keriotheca are seen for the most part. So the differnce in the structure of the spirotheca may have been caused by the discrepancy of microscopic magnification.

Because of the absence of the keriotheca and the perfect consolidation of the septula and septa, LEE proposed the new genus *Lepidolina* with *Neoschwagerina multiseptata* DEPRAT as the type-species. Recently SKINNER and WILDE, however, reported the presence of the thin keriotheca and the incomplete consolidation of the septula as clearly seen in their figures. Therefore the differences between *Yabeina* and *Lepidolina* are not qualitative, but quantitative. In regard to the evolutionary development, however, it may be suitable to retain *Lepidolina* as a subgenus in *Yabeina*, although *Lepidolina* is tentatively treated as a genus in this paper.

Occurrences: This form has been found abundantly in the matrices of the conglomerates. Its association is the same as that of *Yabeina yasubaensis*.

Reg. Nos.: JPF-10035, JPF-10036.

Lepidolina toriyamai KANMERA

plate 1, figs. 1, 2.

Lepidolina toriyamai KANMERA, 1954, Mem. Fac. Sci. Kyushu Univ., Ser. D, vol. 4, no. 1, pl. 6, figs. 1-12.

There have been found many specimens of the present form in a good state of preservation.

Shell is large, elongate subcylindrical in shape. Most specimens of 12-16 volutions are 9.6 to 12.9 mm. long and 2.7 to 3.5 mm. wide ; with form ratio of 3.2 to 4.0.

Proloculus is large ; with outside diameter of 208 to 495 microns. Average height of the first to thirteenth volution of ten specimens are 62, 59, 64, 70, 88, 102, 110, 113, 133, 131, 152, 166 and 170 microns, respectively.

Spirotheca is very thin, mostly composed of tectum and exceedingly thin keriotheca. But spirotheca is partly composed of a single layer in outer volutions.

Thickness of spirotheca does not exceed 10 microns in inner volutions and 7 microns in outer volutions.

Septa are thin and numerous. Septal counts of the first to eleventh volution are 8, 10, 12, 14, 14, 17, 18, 19, 20, 20 and 22, respectively. Axial septula are present throughout the shell; 1–4 septula occur between adjacent septa in the first to fifth volution and 4–9 septula occur in outer volutions.

Primary transverse septula occur throughout the shell. Secondary transverse septula first appear in the third volution. There is one septulum in inner volutions, but beyond the seventh volution there are two, rarely three, septula.

Remarks: Except for two features, the structure of the spirotheca and height of the volution, this form agrees well with *Lepidolina toriyamai*. Namely this form has the spirotheca which is mostly composed of a tectum and extremly thin keriotheca, but the spirotheca of the type-specimens is of a single layer. This difference may have been caused by the discrepancy of microscopic magnification and preservation, as stated in the remarks for *Lepidolina kumaensis*.

Occurrences: This form occurs fairly abundantly in the matrices of the conglomerates and abundantly in the small lenses of black muddy limestone; having the same association as that of *Yabeina yasubaensis*.

Reg. Nos.: JPF-10037, JPF-10038.

Lepidolina toriyamai maizurensis subsp. nov.

plate 2, figs. 1–5.

Shell is large, elongate subcylindrical fusiform in shape; with nearly straight axis of coiling. The first volution is spherical to subspherical, the following two or three volutions are highly inflated fusiform; with slightly convex lateral slopes. Beyond the fourth volution shell becomes elongate fusiform; with slightly convex to nearly flat lateral slopes and bluntly pointed poles. Most specimens of 15–17 volutions are 8.8 to 10.3 mm. long and 4.0 to 4.5 mm. wide; with form ratio of 2.2 to 2.6.

Proloculus is large, spherical to subspherical in shape; with outside diameter of 114 to 308 microns, averaging 254 microns for 18 specimens. Average height of the first to fifteenth volution of 10 specimens are 47, 54, 60, 74, 84, 91, 111, 112, 126, 136, 156, 168, 185, 198 and 209 microns, respectively. Chambers increase in height slowly and uniformly poleward from median portion.

Spirotheca is very thin, mostly composed of tectum and extremly thin keriotheca, but partly of a single layer. Thickness of spirotheca is 12–14 microns in inner two volutions, 6–12 microns in the third to fifth volution and 5–10 microns beyond the sixth volution.

Septa are very thin. Septal counts of the first to ninth volution are 7–8, 11–13, 12–14, 13–14, 12–15, 13–15, 15–16, 16–17 and 17–21, respectively. Axial septula are

Measurements (in micron)

Nankinella sp. A indet.

specimen	L.	W.	P.	1	2	3	4	5	6	7	8	9	10	11
ax. sect.	3170	2171	83	185	349	527	740	949	1221	1635	1959	2351	2916	3170
ob. sect.	1905		118	229	356	499	655	799	1004	1258	1647	1905		
ob. sect.	2514		93	288	505	726	972	1235	1509	1898	2311	2514		
ob. sect.	2052		97	263	429	599	820	1041	1296	1648	2052			

Nankinella sp. B indet.

specimen	L.	W.	1	2	3	4
tg. sect.	559	925	255	586	925	
tg. sect.	628	1152	237	508	846	1152
tg. sect.	571	848	236	559	848	

Reichelina matsushitai sp. nov.

specimen	L.	W.	P.	1	2	3	4	5	n.v.
tg. sect.	184	1186		63	110	187	322	1186	4 1/2
tg. sect.	170	797				183	317	797	
tg. sect.	137	966					457	966	
ax. sect.	171	364	37	86	144	246	364		3 1/2
sg. sect.		198	34	64	102	158	198		3 1/2
ob. sect.		339	37	83	153	254	339		4
ob. sect.		247	36	81	147	248			3

Neoschwagerina cfr. *margaritae* DEPRAT

W.	161	254	342	498	659	902	1137	1498	1737	2087	2402	2741	3097	3467
L.	163	271	424	598	863	1105	1372	1762	2109	2660	3168	3711	4253	4785
V.	1	2	3	4	5	6	7	8	9	10	11	12	13	14

Schubertella ? sp. indet.

specimen	L.	W.	P.	1	2	3	n.v.
ax. sect.	270	224	42	69	127	224	3
sg. sect.		219	53	83	162	219	2 1/2
ob. sect.		271	37	101	157	271	3
ob. sect.		237	48	81	161	237	2 1/2
ob. sect.		201	50	97	147	201	2 1/2

of bar-like shape and present throughout the shell; one septulum occurs between adjacent septa in the first two volutions, 2–3 septula in the third to fifth volution and 3–6 septula beyond the sixth volution.

Primary transverse septula are thin, especially at the junction with spirotheca, and present throughout the shell. Secondary transverse septula first appear in the third volution in some specimens, and becomes distinct in the fourth to fifth volution. One septulum occurs rarely between adjacent primary ones in the third to fourth volution, one always occurs in the fifth to sixth volution. Beyond the seventh volution two septula are sometimes present and two, rarely three, septula occur in the thirteenth to last volution. Secondary transverse septula are of bar-like shape.

Remarks: The present subspecies differs from *Lepidolina toriyamai* in having more thicker spirotheca, more primitive juvenile volutions and more inflated shape of the shell.

The spirotheca of this subspecies is 5–10 microns thick in the outer volutions, while that of *Lepidolina toriyamai* is 4–6 microns thick. Especially in the inner three or four volutions the spirotheca of the former is composed of a tectum and relatively coarse keriotheca for the genus, and the keriotheca may be observed clearly under 15 times magnification of microscope, but that of the latter appears, under the same magnification, as if it were composed of a single layer.

The present subspecies attains 4.0 to 4.5 mm. in width and 2.1 to 3.2 in form ratio, while *Lepidolina toriyamai* is 2.7 to 3.2 mm. wide and has a form ratio of 3.3 to 3.8. Namely the former has more inflated shell than the latter.

This subspecies also has less numerous axial and secondary transverse septula than *Lepidolina toriyamai*.

Occurrences: The present subspecies has been obtained abundantly from the matrices of the conglomerates and from the small lenses of black muddy limestone throughout the Maizuru zone. It occurs together with *Yabeina columbiana*, *Y. yasubaensis*, *Lepidolina kumaensis*, *L. toriyamai* and others.

Reg.: Nos. JPF-10039 to JPF-10043.

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Plate 1

Explanation of Plate 1.

Figs. 1, 2. *Lepidolina toriyamai* KANMERA
1. axial section ×10; 2. sagittal section ×10.

Figs. 3, 4. *Nankinella* sp. A indet.
3. axial section ×13.6; 4. sagittal section ×13.6.

Figs. 5, 6. *Yabeina gubleri* KANMERA
5. sagittal section ×10; 6. axial section ×10.

Figs. 7. *Neoschwagerina* cfr. *margaritae* DEPRAT
tangential section ×10.

Figs. 8. *Yabeina yasubaensis* TORIYAMA
axial section ×10.

Figs. 9, 10. *Yabeina columbiana* (DAWSON)
9. sagittal section ×10; 10. axial section ×10.

Figs. 11–22. *Reichelina matsushitai* sp. nov.
all figures ×50.
11. tangential section of the holotype; 12, 20. axial sections of paratypes; 13. oblique section of a paratype; 14, 15. parallel sections of paratypes, 16–19, 21, 22. tangential sections of paratypes.

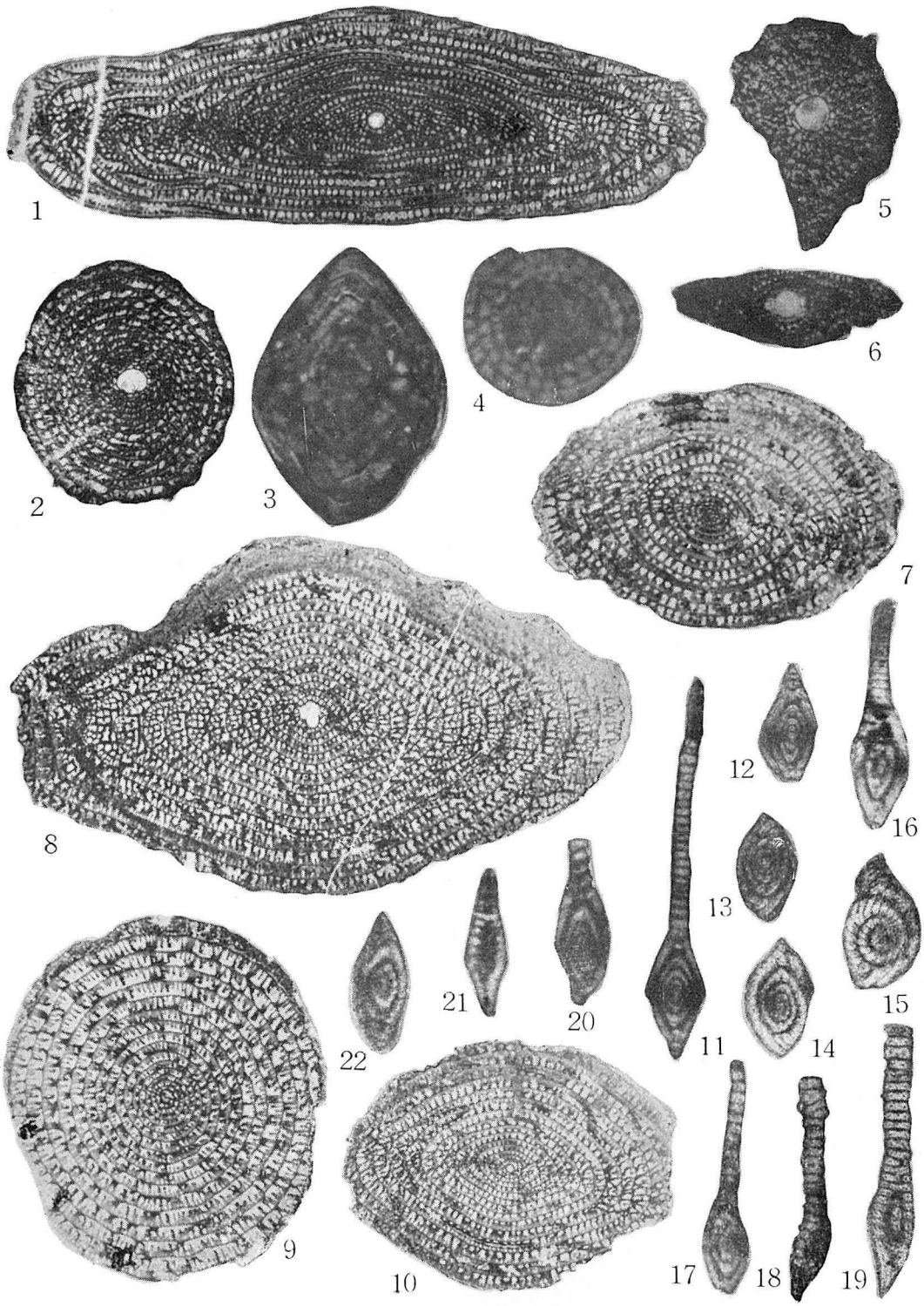
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Plate 2

Explanation of Plate 2.

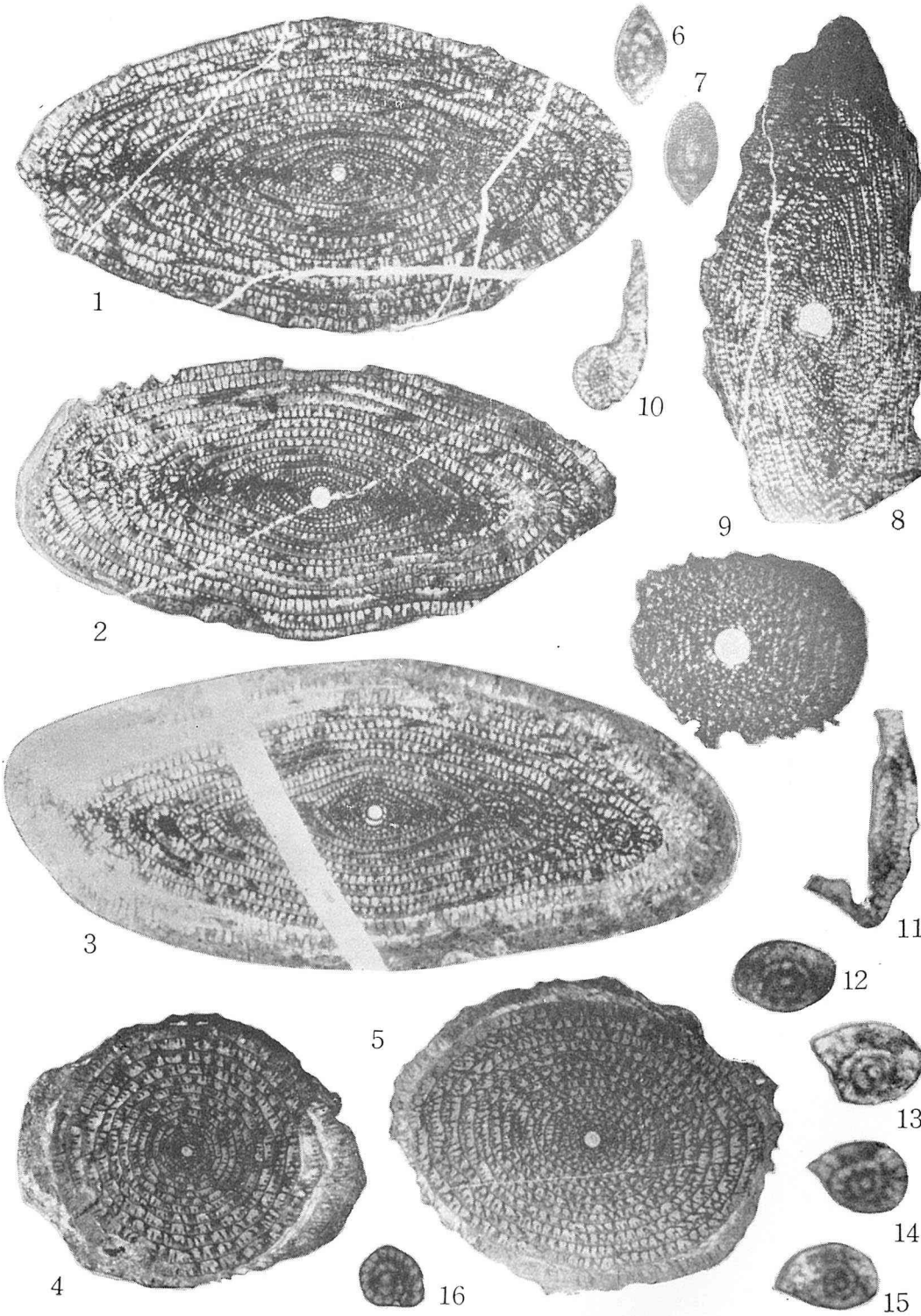
Figs. 1–5. *Lepidolina toriyamai maizurensis* subsp. nov.
all figures ×10.
1. axial section of the holotype; 2, 3. axial sections of paratypes; 4, 5. sagittal sections of paratypes.

Figs. 6, 7. *Nankinella* sp. B indet.
6, 7. tangential sections ×13.6.

Figs. 8, 9. *Lepidolina kumaensis* KANMERA
8. axial section ×10, 9. sagittal section ×10.

Figs. 10, 11. *Condonofusiella cuniculata* KANMERA
10. sagittal section ×13.6, 11. axial section ×13.6.

Figs. 12–15, 16 (?) *Schubertella*? sp. indet.
all figures ×50.
12. axial section, 13–15. oblique sections, 16. sagittal section referred with question to this form.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