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Article

Permian foraminifers contained in limestone and conglomerate of the Maizuru Group in the Shimo-Yakuno area, Kyoto Prefecture, Japan

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Abstract

Three species of the Middle Permian (Capitanian) and 33 taxa of the Late Permian (Lopingian) foraminifers are distinguished from the Nukada Formation correlatable to the upper formation of the Maizuru Group in the Shimo-Yakuno area, Kyoto Prefecture. Capitanian foraminiferal fauna from conglomerate is less diversified in comparison with the contemporaneous ones in the Maizuru Terrane. Either Wuchiapingian or Changhsingian is not easily determinable in the Lopingian foraminifers from limestone. *Palaeofusulina sinensis* and *Colaniella parava* characteristic in the upper formation of the group in other areas are absent in the Shimo-Yakuno area. Capitanian *Lepidolina maizurensis* and Lopingian *Colaniella cuneiformis* are systematically described.

Key words: foraminifers, Capitanian, Lopingian, Maizuru Group, Shimo-Yakuno area

Introduction

Permian and Triassic formations in the Maizuru Terrane are divisible into the Middle to Upper Permian Maizuru Group, Lower to Middle Triassic Yakuno Group, and Upper Triassic Nabae Group (Nakazawa et al., 1958; Shimizu et al., 1962; Kobayashi, 2003). These three groups consist mostly of mudstone, sandstone, and conglomerate. Deep-oceanic sediments are absent and limestones are rare or absent in these three groups. Permian limestone blocks and fragments are all exotic and considered to be derived from the Akiyoshi seamount and continental margin of South China (Kobayashi, 2003).

The Shimo-Yakuno area, Kyoto Prefecture is designated as the stratotype of the Yakuno Group, and a part of the Maizuru Group in the area is named the Nukada Formation (Nakazawa et al., 1957). Although there are many papers on the Triassic bivalve faunas (e.g., Nakazawa, 1958), paleontologic works of Permian foraminifers in the area are few and confined to those by Ishii et al. (1975) and Yamagiwa et al. (1988).

As the eighth of the serial descriptive works of foraminifers from the Maizuru and Yakuno groups, Capitanian and Lopingian foraminifers found in the Shimo-Yakuno area are described in this paper. They are compared with those from other areas of the terrane. Among the distinguished 36 taxa of foraminifers, *Lepidolina maizurensis* Nogami and *Colaniella cuneiformis* Okimura are systematically described. Two hundred and twenty thin sections from the Shimo-Yakuno area are stored in the Museum of Nature and Human Activities, Hyogo, Japan (Fumio Kobayashi Collection, MNHAH).

Geologic setting

Nakazawa et al. (1957) divided Permian and Triassic formations in the Yakuno area into the Nukada Formation, Yakuno Group, and Heki Formation in ascending order. These units are faulted

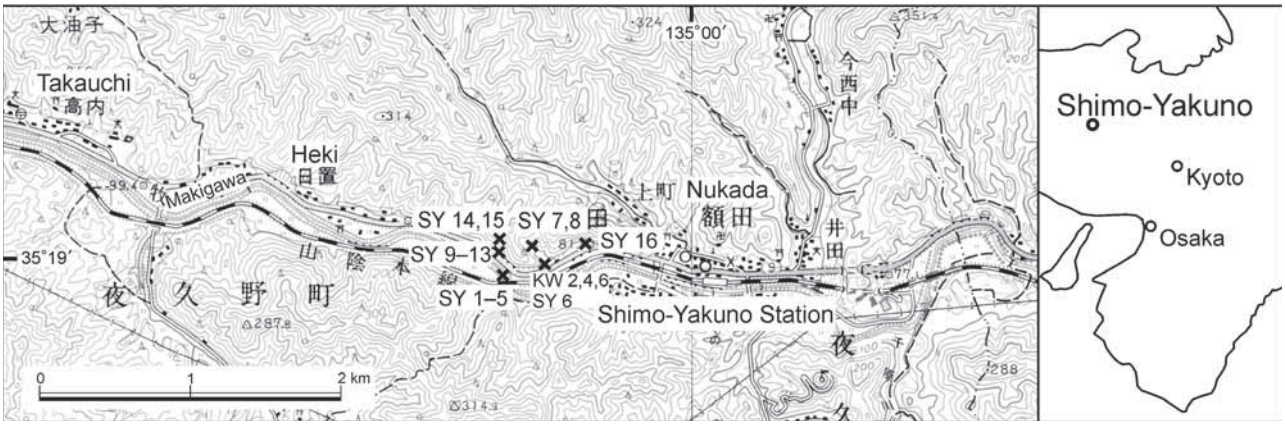

Figure 1. Location of 19 samples of limestone and conglomerate (SY 1–16, KW 2, 4, 6) in the Shimo-Yakuno area. Topographic map is from 1:50,000 map "Fukuchiyama" and "Tajima-Takeda" published by the Geospatial Information Authority of Japan.

and folded in a broad syncline that trends east to west. The Nukada Formation distributed in both southern and northern wings is fault bounded with the Yakuno ophiolitic rocks consisting mainly of gabbroic, diabasic, and sheared granitic rocks. The Heki Formation is exposed only in the southernmost part of the syncline and in fault contact with the Nukada Formation and Yakuno ophiolitic rocks.

The Nukada Formation is more than 250 m thick and correlated to a part of the Maizuru Group. The Yakuno Group is subdivided into the lower Honodani Formation of less than 600 m thick and upper Waruishi Formation of more than 270 m thick. The Heki Formation, about 60 to 180 m thick, is correlated to the Nabae Group in the type area of the eastern marginal part of the Maizuru Terrane (Nakazawa, 1957). These formations consist mostly of mudstone, sandstone, and conglomerate rapidly changing laterally and structurally complicated. Limestone and limestone conglomerate are confined to the Nukada Formation in the Shimo-Yakuno area. Age of these formations are determined by Capitanian and Lopingian foraminifers and brachiopods in the Nukada, Induan bivalves in the Honodani, Smithian and Anisian anmmonoids in the Waruishi, and Carnian bivalves in the Heki (Nakazawa et al., 1957; Nakazawa, 1958).

Occurrence of limestone and conglomerate

Limestone and conglomerate of the Nukada Formation are sporadically exposed at some localities west of JR Shimo-Yakuno Station. Nineteen limestone and conglomerate samples (SY 1–16, KW 2, 4, 6) were collected to examine foraminiferal faunas of the area and to compare them with those from other areas of the Maizuru Group (Fig. 1).

The Nukada Formation along a small river 1.5 km west of the station consists of dominant sandstone intercalating many mudstone seams and thin bedded mudstone less than 4 meters thick. Limestone blocks less than 3 meters thick are intercalated in sandstone in three stratigraphic levels. Among the three, lower two blocks (samples SY 9–13) are exposed near the entrance of the small river, and the uppermost one (SY 14, 15) lies at the level about 60 m above the lower two ones (Fig. 2A). They are gray and mostly of wackestone, lime-mudstone, and packstone. Fossil fragments are partly abundant in the lower two blocks (Pl. 1, fig. 1), but poor in the uppermost one.

Nearly continuous sequence of about 40 meters in thickness is also exposed near the entrance of a small river locally called "Kashiwadani" (Fig. 2B). Mudstone is foliated and more dominant than sandstone. Limestone blocks in two levels in this sequence are less fossiliferous, mostly recrystallized, and partly conglomeratic. There are two conglomerate beds in the lower part of this sequence. The lower one (sample KW 2) is 1 m thick and contains granules of crinoidal packstone and crinoid fragments. The upper one (samples SY 6, KW 4) is 1.5 m thick, thinly bedded, alternating with sandstone, and changing laterally to sandstone. Many crinoids, algae, bryozoans, sponges, and foraminifers are contained in limestone granules and pebbles of bioclastic grainstone and packstone in the latter conglomerate (Pl. 1, fig. 2). These conglomerates are different from those with *Lepidolina* characteristic in the Maizuru Group in their lighter color and larger size of limestone clasts.

Limestone blocks are concentrated at the river floor of Makigawa 1.5 km west of Shimo-Yakuno Station (Fig. 3). All blocks are micritic, lithologically similar each other, and fossils are less variable and poor (Pl. 1, fig. 3). They are immediately adjacent to small blocks and fragments of conglomerate. Many limestone granules and bioclasts represented by those of *Lepidolina* are contained in the conglomerate. They are remarkably abraded and well sorted, and more dominant in coarser-grained conglomerate (sample SY 3) than in finer-grained one (sample SY 4). Blocks and fragments of limestone and conglomerate are surrounded by black phyllitic mudstone and sandstone.

Moreover, limestone blocks are isolated at the road-side cliff about 900 m west of Shimo-Yakuno Station and middle course of "Kashiwadani" where samples SY 16, and SY 7 and SY 8 were collected, respectively (Fig. 1). Various kinds of foraminifers are listed from the latter by Ishii et al. (1975). Some of them are contained in sample SY 16. Foraminifers are very few or absent in SY 7 and SY 8. Stratigraphic relation between these blocks and the surrounding mudstone and sandstone is uncertain. In addition to them, Nakazawa et al. (1957) reported fossiliferous limestone conglomerate and limestone from four localities south and east of Shimo-Yakuno Station. Exposures of these localities were not confirmed in the present field work.

Based on the occurrence and lithology of limestone and conglomerate, and foraminiferal faunas described below, the Nukada Formation in the studied area is thought to correspond to a part of the upper formation of the Maizuru Group. On the other hand, throughout the Maizuru Group, there are no examples of direct contact with blocks of limestone and conglomerate with *Lepidolina* as exposed in the Shimo-Yakuno area. The former is restricted to the upper formation and the latter is commoner in the middle formation than in the upper of the group (Kobayashi, 2003).

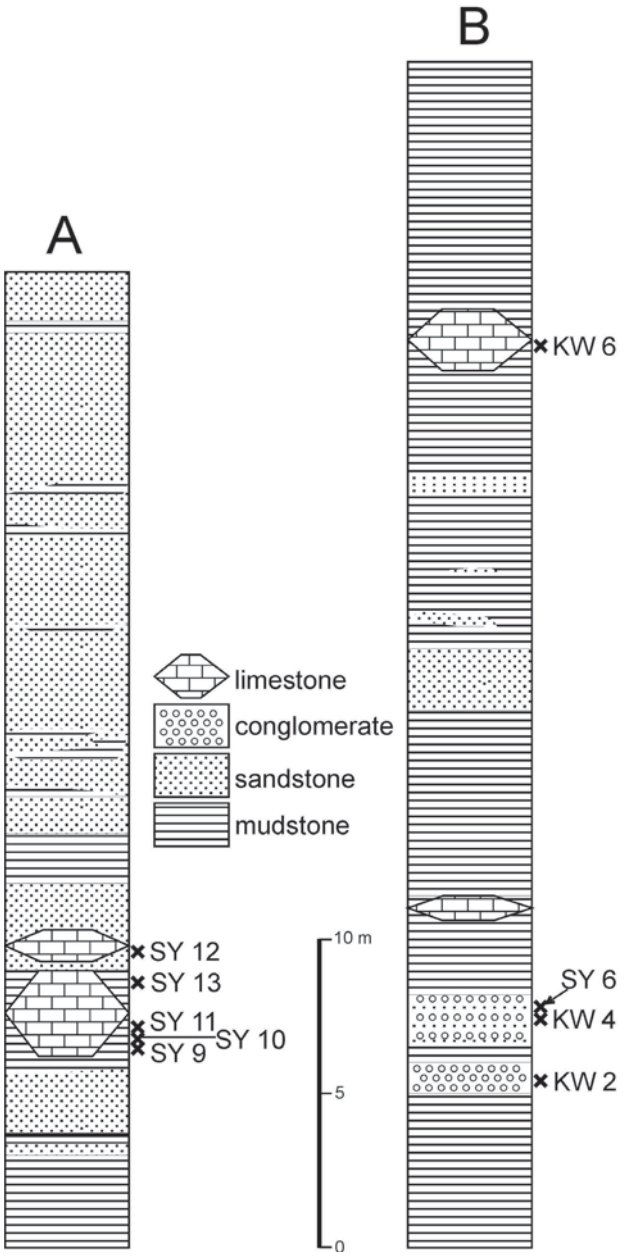

Figure 2. Columnar sections of parts of the Nukada Formation in the Shimo-Yakuno area. **A**: The section along the small river 1.5 km west of the Shimo-Yakuno Station. Two limestone samples SY 14 and SY 15, not shown in this figure, were collected from the stratigraphic level about 57 m above the limestone with SY 12. **B**: The section along the cliff behind a motel at the entrance of "Kashiwadani".

Fauna and age

Thirty-six taxa of Permian foraminifers have been distinguished in 16 samples (Table 1). Species level identification is difficult for most of them because of few well-oriented and small number of specimens available.

Two samples of limestone fragments of conglomerate at the river floor of Maikigawa (SY 3, SY 4) are apparently Capitanian in age based on an exclusive occurrence of *Lepidolina maizurensis* Nogami, *Metadoliolina gravitesta* (Kanmera), and *Parafusulina?* sp. characteristic in the Maizuru Group (Nogami, 1958; Kobayashi, 2006a, 2007). Taxonomic diversity of foraminifers is lower in the Shimo-Yakuno material in comparison with other localities in the Maizuru Group. Other species of Lepidolina such as *L. kumaensis* Kanmera and *L.*

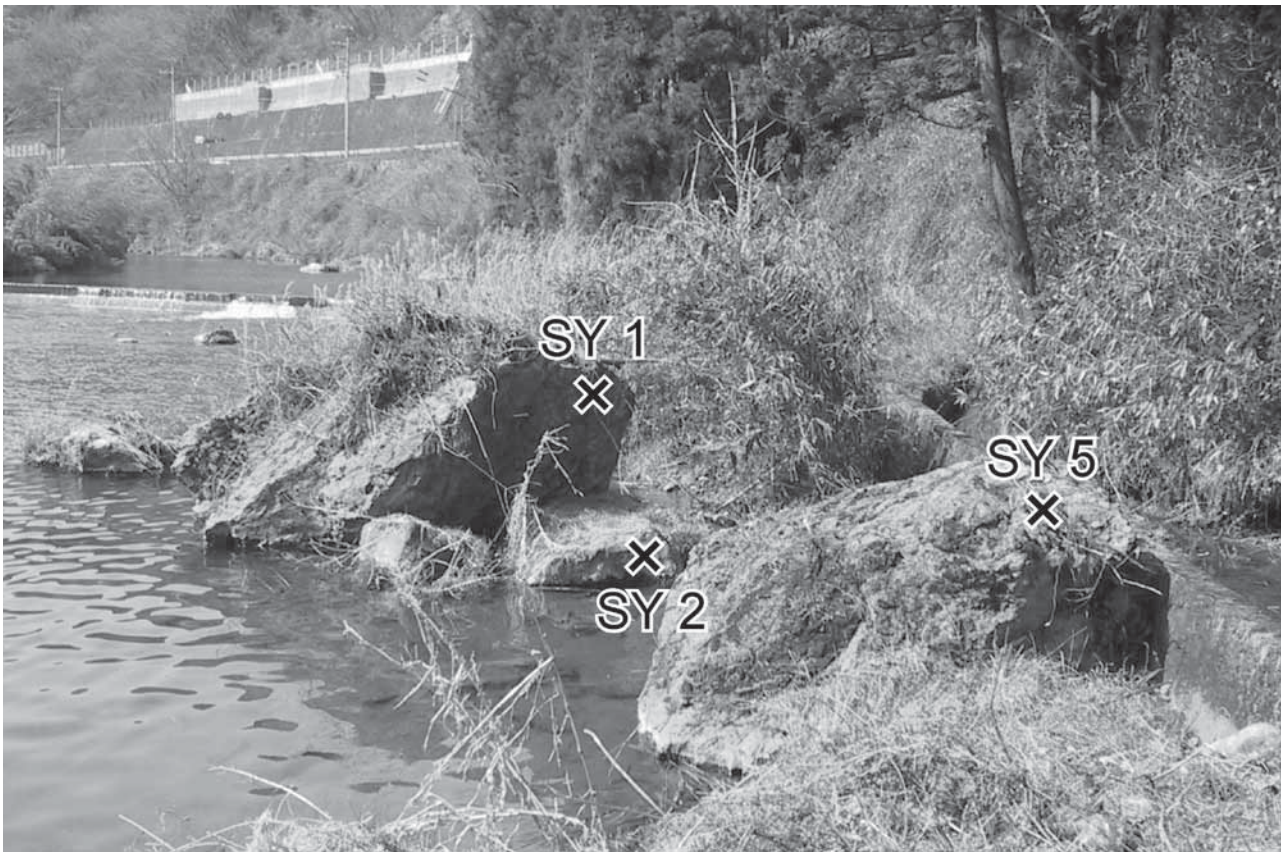

Figure 3. Limestone blocks exposed at the left bank of Makigawa 1.5 km west of Shimo-Yakuno Station. The largest block, from which sample SY 1 was collected, attains to 5.2 m length and 3 m width. Small blocks and fragments of conglomerate with *Lepidolina* (samples SY 3 and SY 4), exposed behind a limestone block, from which SY 5 were collected, are not shown in this picture.

multiseptata (Deprat), and species assignable to *Chusenella*, *Lantschites*, *Kahlerina*, *Rauserella*, and *Nankinella*, common in other Capitanian faunas from the conglomerate of the Maizuru Group (Kobayashi, 2006a, 2007, 2010) are not contained in the Shimo-Yakuno material. Moreover, non-fusuline foraminifers are almost completely lacking in the material. Lower taxonomic diversity of foraminifers in the Shimo-Yakuno is thought to be due to finer-grain size and higher sorting index of the conglomerate, and more remarkable abrasion of lithic and fossil fragments.

Almost all limestone blocks in the Shimo-Yakuno area are thought to be assignable certainly, possibly, or provisionally to the Lopingian. Certainly to the Lopingin is, however, restricted to samples SY 6, SY 9–11 and SY 16 containing taxa assignable to *Nanlingella* and *Colaniella*. Samples SY 5 and KW 4 with Reichelina changhsingensis Sheng and Chang are thought to be possibly Lopingian age, though *Nanlingella* and *Colaniella* are not found in them. Some of remaining samples, SY 1, SY 2, and SY 13 provisionally assigned to the Lopingian contain diagnostic genera to the Lopingian such as *Neodiscopsis*, *Wanganella* and *Robuloides*. Pre-Capitanian faunal elements are completely absent in them. There are no paleontologic and stratigraphic evidence to estimate the age of other samples (SY 8, SY 12, SY 15, and KW 6) absent in these genera and species of foraminifers.

One of the evolved forms of *Colaniella*, *C. parva* (Colani) is prolific in the Changhsingian limestone of Mikata (Kobayashi, 2006b) in association with *Palaeofusulina sinensis* Sheng and Chang, and the Wuchiapingian limestone of Tatsuno (Kobayashi, 2006c) in association with *Codonofusiella* cf. *kwangsiana* Sheng and *Nanlingella? simplex* (Sheng and Chang). Although *C. parva* was not found, a primitive form of *Colaniella* was recognized in three samples (SY 9, 10, 11) in association with *Reichelina changhsingensis* and *Nanlingella* sp. (Table 1). it is closest to *Colaniella cuneiformis* Okimura described from the upper part of the Kalabagh Formation underlying the Chhidru Formation in the Salt Range, Pakistan (Okimura, 1988). The Kalabagh Formation is

correlatable to the middle part of the Wuchiapingian and the Chhidru to the upper part of Wuchiapingian to the lower part of the Changhsingian (Henderson et al., 2012). On the other hand, other primitive forms of *Colaniella*, such as *C. minima* Wang are associated with both *Codonofusiella* and *Palaeofusulina* in Shaanxi, China (Wang, 1966), and occur in the Kalabagh Formation and range up to the Chhidru (Okimura, 1988). Some of these primitive forms from Shaanxi and Chhidru are probably conspecific. *Colaniella* sp. from sample SY 16 also belongs to a primitive form of the genus. However, its specific identification is impossible, since it is few and well-oriented specimens are not prepared.

In conclusion, foraminiferal faunas contained in limestone blocks of the Shimo-Yakuno area are somewhat different from those of other areas of the Maizuru Group with respect to the occurrence of a primitive form of *Colaniella*, *C. cuneiformis* and absence of *C. parva*. *C. cuneiformis* is associated with *N.? simplex* in the Shimo-Yakuno area. Although all species of *Colaniella* are restricted to the Lopingian throughout the Tethyan regions (Kobayashi, 1999), it is not easy to determine either the Wuchiapingian or the Changhsingian based independently on the occurrence of *Colaniella*. In the Maizuru Terrane, *Colaniella* is associated with the Changhsingian *Palaeofusulina* in the Mikata area (Kobayashi, 2006b) and the Wuchiapingian *Codonofusiella* in the Tatsuno area (Kobayashi, 2006c). These suggest that the *Colaniella* fauna of Shimo-Yakuno area is better dated simply as the Lopingian until presentation of more reliable biostratigraphic evidence.

Systematic Paleontology

Order FORAMINIFERIDA Eichwald, 1830
Suborder FUSULININA Wedekind, 1937
Superfamily Fusulinoidea von Möler, 1879
Family Neoschwagerinidae Dunbar and Condra, 1927
Subfamily Lepidolininae A. D. Mikulukho-Maklay, 1958
Genus *Lepidolina* Lee, 1934
Lepidolina maizurensis Nogami, 1958
Plate 2, Figures 1–6

Lepidolina toriyamai maizurensis Nogami, 1958, p. 106, 108, pl. 2, figs. 1–5.
Lepidolina maizurensis Nogami. Kobayashi, 2006a, p. 5–7, fig. 4-1, fig. 4-2; pl. 1, figs. 2 4, 8, 9.
Lepidolina maizurensis Nogami. Kobayashi, 2007, p. 22, pl. 1, figs. 1–9; pl. 2, fig. 1.
Lepidolina sp. Yamagiwa et al., 1988, fig. 2-4.
non. *Yabeina maizurensis* (Nogami). Zaw Win, 1999, p. 64, 65, pl. 13, figs. 1-4.

Discussion. Many individuals referable to this species are contained in samples SY 3 and SY 4. Most of them are abraded, especially in the latter, resulting smaller test appearance of them than that of the previously described ones. This species, originally described by Nogami (1958) as a subspecies of *Lepidolina toriyamai* Kanmera (=*L. kumaensis* Kanmera) is distinguished from *L. kumaensis* by its smaller proloculus, less developed transverse septula, and secondary transverse septula first appeared in later ontogenetic stage (Kobayashi, 2006a, 2007). Smaller proloculus of the present specimens than those of previous ones is due probably to the broad variation of prolocular size in this species. Although one specimen illustrated by Yamagiwa et al. (1988) from the same locality with the present ones is also abradeded, it is probably identical with this species. Four specimens of this species reassigned to the genus *Yabeina* by Zaw Win (1999) from the Akasaka Limestone are different from the original ones and referable to *Gifuelloides larga* (Morikawa and Suzuki) as concluded by Kobayashi et al. (2010) and Kobayashi (2011).

Suborder LAGENINA Delage and Héouard, 1896
Superfamily NODOSARIOIDEA Ehrenberg, 1838
Family COLANIELLIDAE Fursenko *in* Rauzer-Chernousova and Fursenko, 1959
Genus *Colaniella* Likharev, 1939
Type species: *Pyramis parva* Colani, 1924
Colaniella cuneiformis Okimura, 1988
Plate 1, Figures 14–16, 24–26

Colaniella cuneiformis Okimura, 1988, p. 717, 718, Fig. 6.24–6.27.
Colaniella cylindrica Miklukho-Maklay, 1954. Okimura, 1988, p.718, 719, Fig. 6.34–6.36
Colaniella minima Wang, 1966. Ishii et al., 1975, pl. 2, figs. 1, 2.
Colaniella nana Miklukho-Maklay, 1954. Ishii et al., 1975, pl. 2, figs. 5, 6.

Description. —Test minute, subcylindrical, deviating to the terminal part. Maximum width of the test about 0.25 mm, and maximum length about 0.75 mm. Apical angle as large as 30 degrees. Spherical first chamber less than 0.03 mm and succeeded by uniserially arranged, 12 to 15 chambers overlapping

and gradually increasing their length and width. Chambers are dish-shaped in outline and 0.08 mm in chamber height in the terminal part of the test

Chambers are divided into chamberlets by radially arranged, 20 or more, platy partitions of the first-order (primary platy partitions). Wall perforate with fibrous structure. Aperture terminal and radiate.

Discussion. More than 40 individuals certainly identical to *Colaniella* were discriminated. Morphologic variation of biocharacters of the test is uncertain because of few well-oriented specimens. However, the present *Colaniella* is thought to belong to a primitive group of the genus based on small test and small number of platy partitions. Second-order platy partitions appear to be absent even in the late ontogenetic stage. Furthermore, subcylindrical test and weakly overlapping chambers of the present specimens suggest their most probable assignment to *Colaniella cuneiformis* described by Okimura (1988) from the Kalabagh Formation of the Salt Range, Pakistan.

Although Okimura (1988) proposed many new forms of primitive *Colaniella*, at least some are thought to be conspecific and some should be reassigned. For example, an elongate subcylindrical form named *C. cylindrica* from the Salt Range appears to be similar to the types from the Dorashamian (=Changhsingian) of North Caucasus (Miklukho-Maklay, 1954) in their test outline. However, the latter has much larger test, more number of and more strongly overlapping chambers, and larger height of chamber. The Salt Range specimens should be reassigned to *C. cuneiformis*.

Two specimens of *C. minima* illustrated by Ishii et al. (1975) from "Kashiwadani" are closely similar to the present ones referable to *C. cuneiformis* in the test size, dish-shaped chambers, and degree of overlapping of chambers, though they are somewhat diagonal and not centered. Those identified with *C. nana* Miklukho-Maklay by Ishii et al. (1975) from "Kashiwadani" are also better reassigned to this species, though they are incomplete. These two named species from "Kashiwadani" by Ishii et al. (1975) are different from types respectively from the middle Upper Permian of South China (Wang, 1966) and the Changhsingian Nikitin Formation of the North Caucasus (Miklukho-Maklay, 1954) yielding *Palaeofusulina*, *Parananlingella*, and evolved forms of *Colaniella* (Likharev, 1926; Kobayashi, 1999; Pronina-Nestell and Nestell, 2001).

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Table 1. Permian foraminifers discriminated in the Shimo-Yakuno area.

	SY 1	SY 2	SY 3	SY 4	SY 5	SY 8	SY 9	SY 10	SY 11	SY 12	SY 13	SY 15	KW 4	KW 6	SY 6	SY 16
Palaeotextulariidae gen. and sp. indet.	×				×											×
Neoendothyra permica (Lin)															×	
Tetrataxis sp. A					×											
Tetrataxis sp. B															×	
Abadehella sp.											×		×			
Globivalvulina spp.							×									×
Retroseptellina sp.											×		×			
Biseriamminidae gen. and sp. indet.						×				?						
Reichelina changhsingensis Sheng and Chang					×		×	×	×				×		×	
Reichelina sp.					×		×	×	×							
Nanlingella sp.								×	×						×	
Nanlingella? *simplex* (Sheng and Chang)								×							×	
Nanlingella? sp.																×
Parafusulina? sp.			×													
Metadoliolina gravitesta (Kanmera)			×	×												
Lepidolina maizurensis Nogami			×	×												
Cornuspira sp. A.					×											
Cornuspira sp. B									×		×				×	
Agathammina cf. *ovata* Wang								×								
Glomomidiella? sp.					×											
Neodiscopsis sp. A	×															
Neodiscopsis sp. B									×		×					×
Hemigordiopsidae gen. and sp. indet.												×				
Geinitzina sp. A							×									
Geinitzina sp. B											×					
Colaniella cuneiformis Okimura							×	×	×							
Colaniella sp.																×
Pachyphloia sp.	×						×	×		?	×			×		
Pseudolangella sp.											×					
Wanganella sp.											×					
Nodosinelloides spp.							×	×	×		×		?		×	
Robuloides sp.		×														
Ichyofrondina sp.					×						×				×	
Icythyofrondina? sp.					×											
Ichthyolariidae gen. and sp. indet.															×	
Ichthyolariidae? gen. and sp. indet.									×							

Plate 1.

Figs. 1, 2. Bioclastic packstone 1: SY 11, ×6; 2: SY 6, ×12.
Fig. 3. Lime-mustone sporadically containing small foraminifers and fossil fragments, SY 5, ×60.
Figs. 4–10. *Nodosinelloides* spp. 4: D2-030475, 5: D2-030465, 6: D2-030454, 7: D2-030500, 8: D2-030461, 9: D2-030462, 10: D2-030471, 1, 2, 8, 10: SY 11; 3: SY 10; 7: SY 13, all ×60.
Fig. 11. *Wanganella* sp. D2-030500, SY 13, ×60.
Fig. 12. *Ichyofrondina* sp. D2-029563, SY 5, ×60.
Fig. 13. *Geinitzina* sp. A. D2-030428, SY 9, ×60.
Figs. 14–16, 24–26. *Colaniella cuneiformi*s Okimura. 14: D2-030452, 15: D2-030464, 16: D2-030443, 24: D2-030456, 25: D2-030446, 26: D2-030444;11: SY 11, others: SY 10; all ×60.
Fig. 17. *Icythyofrondina?* sp. D2-029572, SY 5, ×60.
Fig. 18. Ichthyolariidae? gen. and sp. indet. D2-030470, SY 11, ×60.
Figs. 19, 20. *Pachyphloia* sp. 19: D2-030502, SY 13; 20: D2-030455, both ×60.
Fig. 21. Ichthyolariidae gen. and sp. indet. D2-029591, SY 6, ×48.
Figs. 22, 23. *Geinitzina* sp. B. Both D2-030503, SY 13, ×60.
Fig. 27. *Glomomidiella?* sp. D2-029570, SY 5, ×60.
Fig. 28. *Robuloides* sp. D2-029523, SY 2, ×60.
Figs. 29, 30. *Neodiscopsis* sp. A. D2-029515, 30: D2-029513; both SY 1, ×60.
Figs. 31–33, 34?, 36?. *Neodiscopsis* sp. B. 31: D2-030478, 32: D2-030477, 33: D2-030502, 34: D2-030461, 36: D2-030484; 33: SY 13, others: SY 11; 31: ×36, 32:×48, others: ×60.
Fig. 35. *Pseudolangella* sp. D2-030502, SY 13, ×60.
Fig. 37. *Agathammina* cf *ovata* Wang. D2-030450, SY 10, ×60.

Plate 2.

Figs. 1–6. *Lepidolina maizurensis* Nogami. 1: D2-029551, 2: D2-029556, 3: D2-029535, 4: D2-029558, 5: D2-029532, 6: D2-029544; all SY 3, ×10.
Figs. 7, 10. *Metadoliolina gravitesta* (Kanmera) 7: D2-029535, 10: D2-029555; both SY 3, ×10.
Figs. 8, 9. *Parafusulina?* sp. 8: D2-029540, 9: D2-029533, both SY 3, ×10.
Figs. 11, 21. *Cornuspira* sp. A. 11: D2-029572a, 21: D2-029572b; both SY 5, ×60.
Figs. 12–19. *Reichelina changhsingensis* Sheng and Chang. 12: D2-030431, 13: D2-029568, 14: D2-030468, 15: D2-030464, 16: D2-030475a, 17: D2-030472, 18: D2-030475b, 19: D2-030477; 12: SY 9, 13: SY5, 10: SY 10, others: SY 11; all×60.
Fig. 20. *Reichelina* sp. D2-030468, SY 11, ×36.
Figs. 22–24. *Cornuspira* sp. B. 22: D2-030465, SY 11; 23: D2-029596, SY 6; 24: D2-030500, SY 13; all×60.
Figs. 25, 26, 31, 32. *Nanlingella* sp. 25: D2-030479, SY 11; 26: D2-030463, SY 11; 31: D2-029581, SY 6; 32: D2-030446, SY 10; all×60.
Fig. 27. *Retroseptellina* sp. D2-030500, SY 13, ×60.
Figs. 28–30. *Nanlingella? simplex* (Sheng and Chang). 28: D2-029598, SY 6; 29: D2-0300453, SY 10; 30: D2-029591, SY 6; all× 60.
Fig. 33. *Tetrataxis* sp. B. D2-0295900, SY 6, ×48.
Fig. 34. *Abadehella* sp. D2-030503, SY 13, ×60.
Fig. 35. *Tetrataxis* sp. A. D2-029573, SY 5, ×60.
Fig. 36. Palaeotextulariidae gen. and sp. indet. D2-029575, SY 5, ×60.
Fig. 37. *Neoendothyra permica* (Lin). D2-029589, SY 6, ×60..

Plate 1.

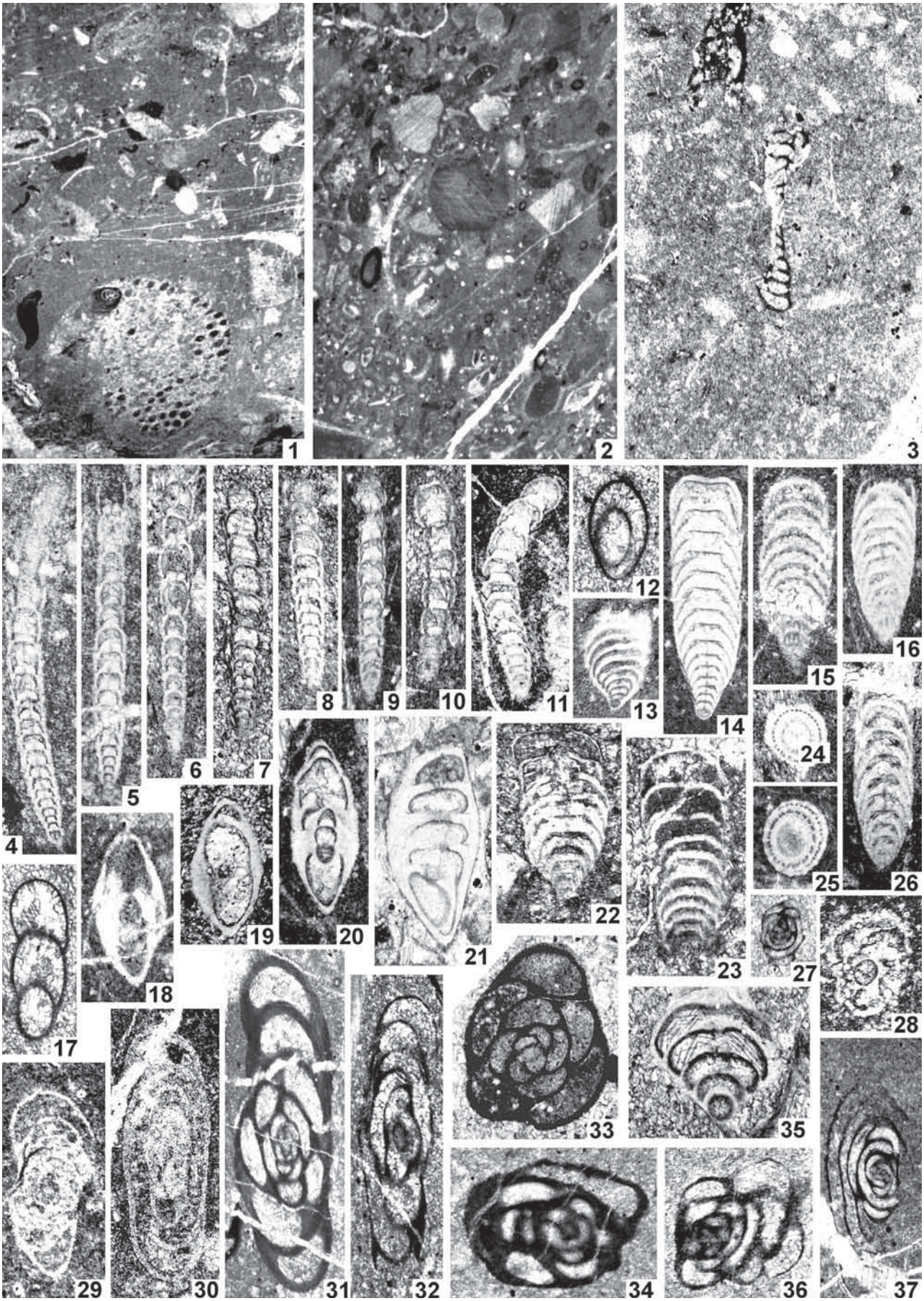
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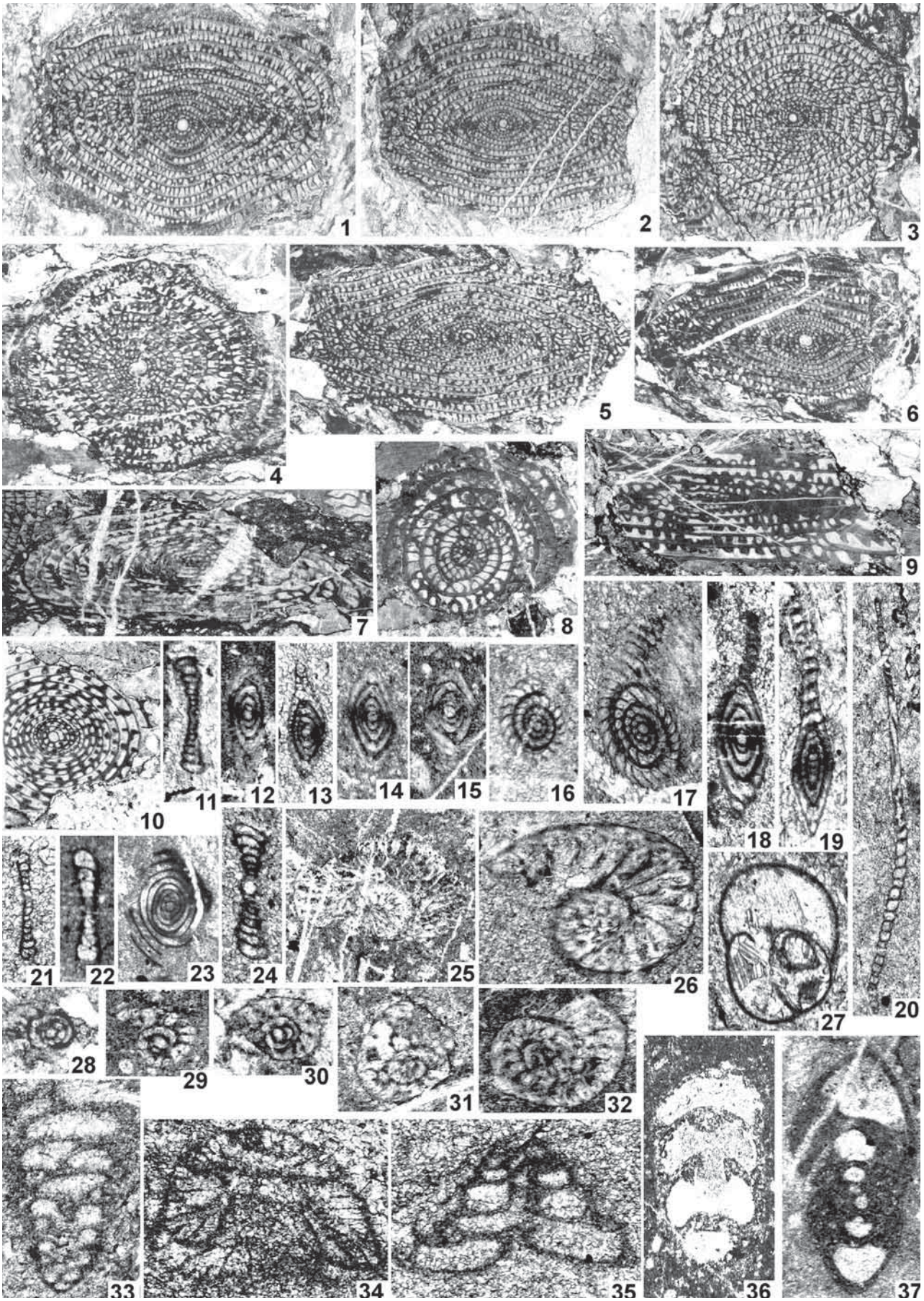
Plate 2.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京都府、下夜久野地域の舞鶴層群石灰岩・礫岩産ペルム紀有孔虫化石

小林文夫

京都府、下夜久野地域で舞鶴層群上部層に対比される額田層からペルム紀中期 (Capitanian) の 3 種とペルム紀後期 (Lopingian) の 33 分類群の有孔虫化石が識別された。礫岩産の Capitanian のものは他地域の同時代ものに比べ多様度が低い。石灰岩産の Lopingian のものでは Wuchiapingian か Changhsingian かの年代特定が難しい。舞鶴層群上部層に特徴的な *Palaeofusulina sinensis* や *Colaniella parva* は下夜久野地域では産しない。Capitanian の *Lepidolina maizurensis* と Lopingian の *Colaniella cuneiformis* を記載した。

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