

Fusulines from the Ryukyu Islands, Part1: Amami-oshima-1 : Paleontological Study of the Ryukyu Islands-VIII

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Fusulines from the Ryukyu Islands, Part 1: Amami-oshima-1

(Paleontological Study of the Ryukyu Islands—VIII)

Takeshi ISHIBASHI

Abstract

This paper describes and illustrates some Permian fusuline fossils from the Naon Formation, Amami-oshima, the Ryukyu Islands. A new Upper Permian fusuline species, *Leella grossa* ISHIBASHI is described. This is the first paleontological record of the genus *Leella* in Japan and the species is the fifth one in the world.

Introduction

The Paleozoic foraminifers had been first reported from Okinawa-jima, the Ryukyu Islands by HANZAWA (1933). He illustrated three species such as *Verbeekina douvillei* (DEPRAT), *Neoschwagerina* sp. and *Pseudofusulina* sp. collected from a limestone near Tamagusuku, Nakasone-son, Motobu Peninsula. After World War II, occurrences of Permian fusulines have been known from such regions within the Ryukyu Islands as Tonaki-jima (KONISHI, 1964), Iheya-jima and the Motobu Peninsula of the Okinawa Islands (ISHIBASHI, 1968) and Amami-oshima (ISHIBASHI, 1969) (Fig. 1).^{*} Recently a working group on the geology of the Ryukyu Islands reported some fusulines, small foraminifers and radiolarians from the Motobu Peninsula and Amami-oshima, and has discussed the stratigraphy and geologic structure of those districts (*e.g.*, FUJITA, 1983; OSOZAWA et al., 1983; KASHIMA, 1983). Despite their contributions, I follow to the scheme of stratigraphy by HATAE et al. (1959) to avoid the stratigraphic confusion among the preceding workers. The Carboniferous fusulines have been known from the Iheya Formation in Iheya-jima (ISHIBASHI 1968) and the "Naon Formation" in Amami-oshima (OSOZAWA et al., 1983).

The Naon Formation (HATAE et al., 1959) is distributed in the southwestern part of Amami-oshima, Eteku-jima, Kakeroma-jima, Uke-shima and Yoro-jima. It mainly consists of bedded chert subordenated with basaltic rocks, slates, and lenticular limestone beds. The Permian foraminifers and algae are obtained from the limestone pebbles of a conglomeratic bed in the upper part of the limestone. Among the foraminifers, *Leella grossa* sp. nov., is first recorded from the Japanese Islands. This paper describes *Leella grossa* sp. nov. with illustrations and photographs of other associated foraminifers and algae.

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^{*} The Permian fusulines are recently found in the limestones of Iye-jima and the western cape (Sozutakasaki) of Amami-oshima.

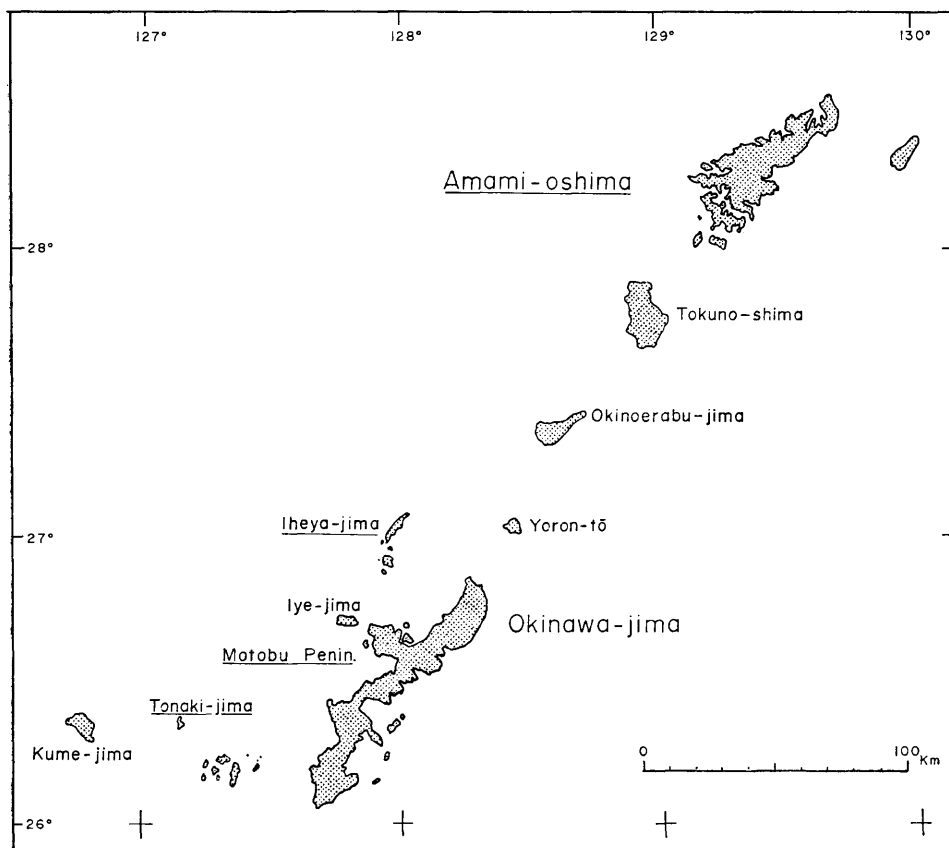


Fig. 1. Map showing the fusulinid localities (underlined) in Ryukyu Islands.

Acknowledgements

I would like to express my appreciation to Professor Ryuzo TORIYAMA of Fukuoka University for his valuable advice on foraminifers. I wish to express my cordial thanks to Professor Kenji KONISHI of Kanazawa University for advice and continuous encouragement during field survey.

Notes on *Leella* and the fusuline fauna of Amami-oshima

The fusulines, smaller foraminifers and calcareous algae occur in limestone pebbles of some conglomerate beds distributed along the coast between Odana and Imazato, Yamato-son, Amami-oshima (Fig. 2). HATAE et al. (1959) estimated the thickness of the Naon Formation to 2000 meters. The exact thickness, however, is probably much less than that. The lower part of the formation is composed of clastic sediments, chert and limestones and basaltic rocks. The upper one, on the other hand, is rich in bedded chert subordinated with conglomerate and basic rocks. No fossils have been found in the limestone layer

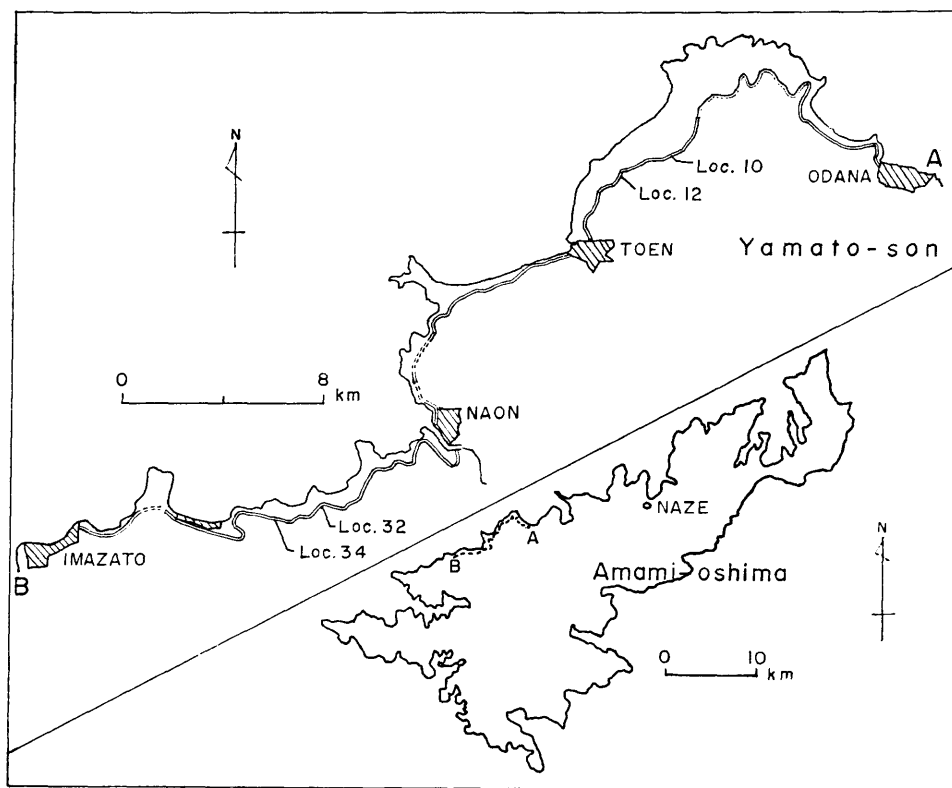


Fig. 2. Location map of Permian fusulines in Amami-oshima.

in Amami-oshima, but Upper Triassic conodonts are known in a limestone of Kakeroma-jima (IGO, 1972).

Fossils shown in this paper were collected from several localities as follows;

Locality 10:

Yabeina katoi, *Neoschwagerina craticulifera*, *N. margaritae*, *N. minoen-sis*, *Reichelina* sp. A and B., *Presumatrina neoschwagerinoides*, *Misellina* sp., *Nankinella* sp. A and B, *Dunbarula* sp., *Colaniella* sp. A, *Paleo-texturalia* sp., *Solenopora* sp. (calcareous algae)

Locality 12:

Leella grossa sp. nov., *Parafusulina* sp., *Neoschwagerina* sp., *Nankinella* sp., *Permocalculus plumosus* (calcareous algae)

Locality 32:

Neoschwagerina margaritae, *Maklay* sp., *Colaniella* sp. B.

Locality 34:

Yabeina sp., *Neoschwagerina* sp.

The common or allied fusulines excepting *Leella grossa* have been known from Okinawa-jima and Iheya-jima of the Okinawa Islands, and also from the Middle to Upper Permian of Japanese Islands.

The four species of *Leella* have been described from the Upper Permian of

Texas, U.S.A. (DUNBAR and SKINNER, 1937), Kueichow, South China (GUNG, 1966) and Armenia, U.S.S.R. (ROSOVSKAYA, 1965) as follows; *Leella bellula* and *L. fragilis* from the Carlsbad limestone of Gaudalupe Mountains and the Delaware Mountain Plateau, Texas, respectively associated with *Codonofusiella paradoxica* and *Polydixodina shumardi* and correlated to the Capu, the Upper Gaudalupian, *Leella armenica* from Ogbin, northern region of Nakhichevan, Armenia associated with several species of *Pseudofusulina* (= *Chusenella*?), *Chusenella* and *Polydixodina* and a small amount of *Reichelina*, *Yangchinia*, *Codonofusiella* and *Brevaxina* etc. and *Leella kueichowensis* from Gang District, Kueichow of South China associated with the characteristic faunal elements of the Lower Lopingian (*Codonofusiella* Zone) such as *Ozawainella* sp., *Nankinella quasihunanensis*, *Sphaerulina crassispira*, *Staffella dushanensis*,? *Codonofusiella* sp. and *Eoverbeekina ganzhaiensis*. *Leella kueichowensis* was also reported from Wuchiaping, Kueichow by LIU et al. (1978, p. 76, pl. 17, fig. 8).

As far as the occurrence of *Leella grossa* sp. nov. from Amami-oshima is concerned it has not the associated fusulines but an amounts of *Permocalculus plumosus* ELLIOTT (calcareous algae, Pl. 2, Figs. 11–12) co-occurs. This associated species was originally reported from the Upper Permian limestone of Haru, Misul Liwa, Northern Iraq (ELLIOTT, 1955). *Leella* has never been reported from Japan though the Middle and Upper Permian sediments are considerably distributed. Judging from specific elements of fusuline assemblages *Leella* occurs from the upper Middle Permian to the lower Upper Permian in the world.

Colaniella sp. from locality 10 in Amami-oshima is associated with *Nankinella* spp. and *Reichelina* sp. A and B in the same section. This species is very small for the genus and is very similar to *Colaniella minima* reported from the *Palaeofusulina* aff. *sinensis*-*Colaniella parva* zone of the Maizuru Group (Working Group, 1975; ISHII, et al., 1975). *Reichelina* sp. A also resembles *R. changhsingensis* SHENG and CHANG of the Akasaka Limestone of Southwest Japan reported by SAKAGAMI (1980) and the Changhsing and Wuchiaping Limestones in South China (SHENG and CHANG, 1958).

Description of Species

Family Ozawainellidae TOMPSON and FOSTER, 1937

Subfamily Ozawainellinae TOMPSON and FOSTER, 1937

Genus *Leella* DUNBAR and SKINNER, 1937

Type-species.—*Leella bellula* DUNBAR and SKINNER, 1937

Remarks.—*Leella* was established by DUNBAR and SKINNER, 1937 as a genus of Fusulininae, but TOMPSON (1948) treated this genus to be included in Ozawainellinae and then designated the specimen of figure 5, plate 46 illustrated by DUNBAR and SKINNER, 1937 as the lectotype. On the other hand, RAUSER-CHERNOUSOVA et al. (1959), MIKLUCHO-MACLAY (1963) and GUNG (1965) etc. classified *Leella* into Staffellinae. For the taxonomy of the fusuline families I follow the classification proposed by TORIYAMA (1970).

Leella grossa sp. nov.

Pl. 11, Figs. 1-16

Material.—All thin sections (GK. D 15001-15010) were prepared from limestone pebbles included in the lower member of the Naon Formation of Amami-oshima, the Ryukyu Islands. Abbreviation GK. D is the register number of Department of Geology, Faculty of Science, Kyushu University.

Diagnosis.—Shell moderately minute fusiform with a Staffelloid form during the first to three or fourth volutions and then elongating rapidly to become fusiform with rounded poles. Proloculus very small. Spirotheca consists of upper tectorium, tectum, diaphanotheca and lower tectorium. Comata developed and tunnel low, considerably wide.

Description.—Shell small and inflated fusiform with straight axis of coiling, periphery with gently convex slop poles rounded.

Mature shell attains usually six volutions with length of 3.2 mm, width of 2.1 mm and form ratio of 1.5 in holotype. First to third or fourth volution discoidal in form and then axis rapidly increases in length in succeeding volutions, making a fusiform shape. Proloculus very small and spherical with outside diameter of 50 microns (Pl. 1, Fig. 1) in holotype. Average ratios of half length to radius vector of first to sixth volution of two specimens (Figs. 1 and 2) 1.13 and 1.14 respectively.

Spirotheca very thick, seems to have four layers consisting of upper tectorium, tectum, relatively thick diaphanotheca and lower tectorium.

Thickness of spirotheca of second to sixth volution in specimen of Fig. 1 is 93, 142, 86, 83, 104 and 111 microns, respectively. Septa very thick and essentially same in structure with spirotheca. Chomata developed in central part of each volution, low and broad with gentle lateral slope. Tunnel low and narrow with angle of ca. 36 degrees in holotype.

Remarks.—The genus *Leella* is small in size and has a remarkable rapid change of form during growth. The staffelloid form is only recognized during the early four volutions and then it rapidly becomes to an elongated fusiform in mature shell. *Leella grossa* is new to science, having large shell, dense spirotheca and septa. It is apparently different from the four known species (Table 1) in the following points.

Leella bellula, the type species, described by DUNBAR and SKINNER (1937) was based on the well preserved holotype and is similar to *Leella grossa* in form ratio and a number of shell volution but the former is apparently distinguishable from the latter in having a smaller, thinner shell and septa and small diameter of proloculus.

Leella fragilis reported from the Delaware Mountains Plateau, Texas is easily distinguished from the present species in having a smaller diameter of shell and very larger form ratio and proloculus. This species also rapidly increases its height at the last vlution.

Though *Leella armenica* is represented by only a slightly oblique section (ROSOVSKAYA, 1965, p. 140, pl. 1, fig. 14), it is clearly distinguished from the

Table 1. Measurements (in mm) and stratigraphic horizon of known species of *Leella*.

Species	<i>Leella grossa</i> sp. nov.	<i>L. bellula</i>	<i>L. fragilis</i>	<i>L. armenica</i>	<i>L. kueichowensis</i>
Length (L)	3.2	2.6	2.6-3.0	2.52	2.16
Diameter (D)	2.10	1.5	1.0	1.99	1.35
Form ratio (L/D)	1.5	1.5	2.6-3.0	1.27	1.6
Thickness of spirotheca	0.10-0.15	0.045	?	0.015-0.005	0.015-0.045
Diameter of proloculus	0.040	0.075-0.085	0.100	0.040-0.055	0.045
Number of volution	6	5-6	4	6-7 · 1/2	6 · 1/2
Horizon	<i>Codono-</i> <i>fusiella</i> — <i>Reichelina</i> ?	Upper Guadalupean	Upper Guadalupean	Gnisik (Up. Guadalupean)	<i>Codono-</i> <i>fusiella</i> — <i>Reichelina</i>
Remarks	Holotype This paper, Pl. 11, Fig. 1.	Type species DUNBAR & SKINNER, 1937, pl. 46, figs. 5.	DUNBAR & SKINNER, 1937, pl. 73, figs. 11-15.	ROSOVSKAYA, 1965, pl. 1, fig. 14.	GUNG, 1966, pl. 1, figs. 11-12.

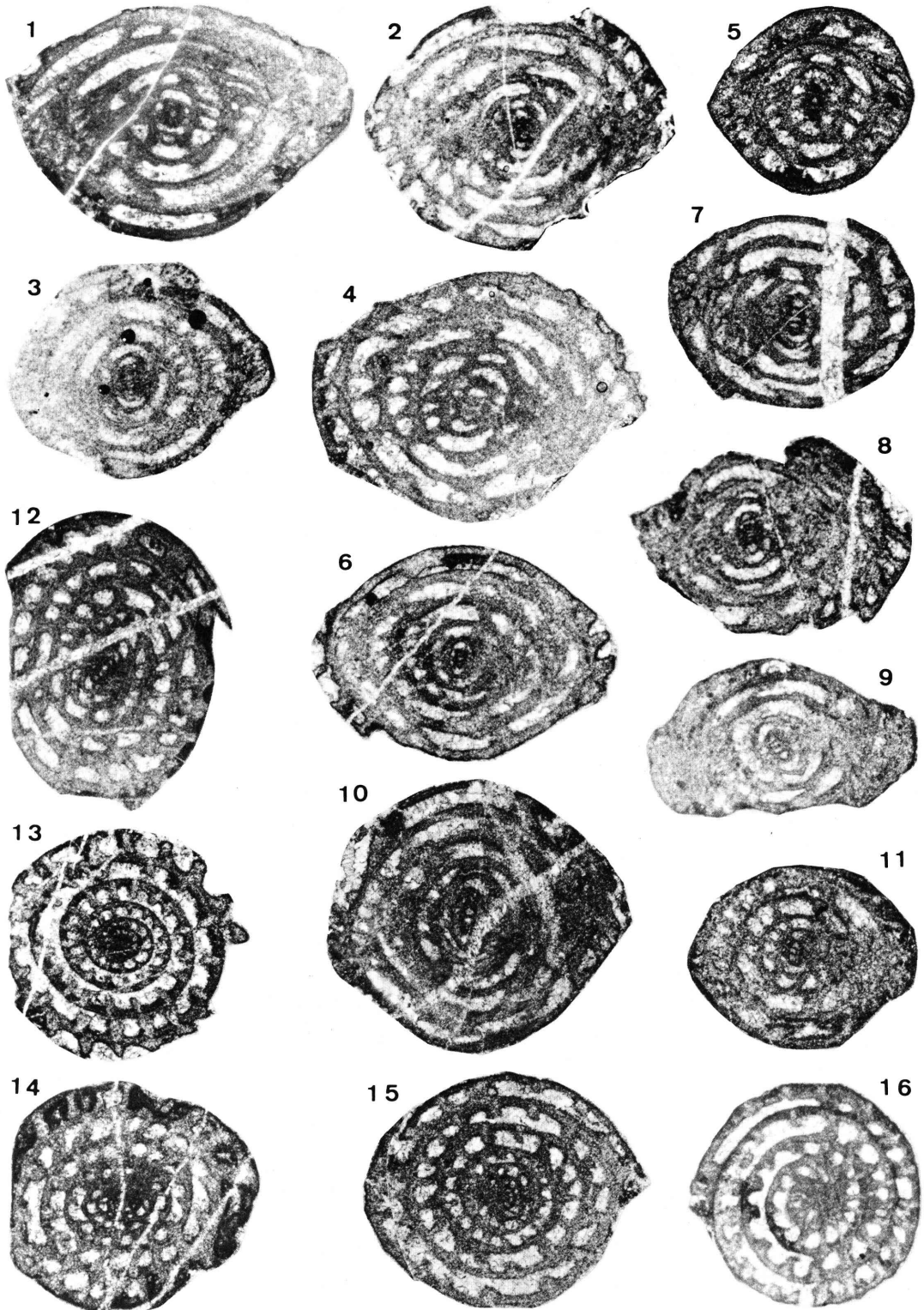
present species in having the smaller form ratio and the more globose form of shell with rounded poles.

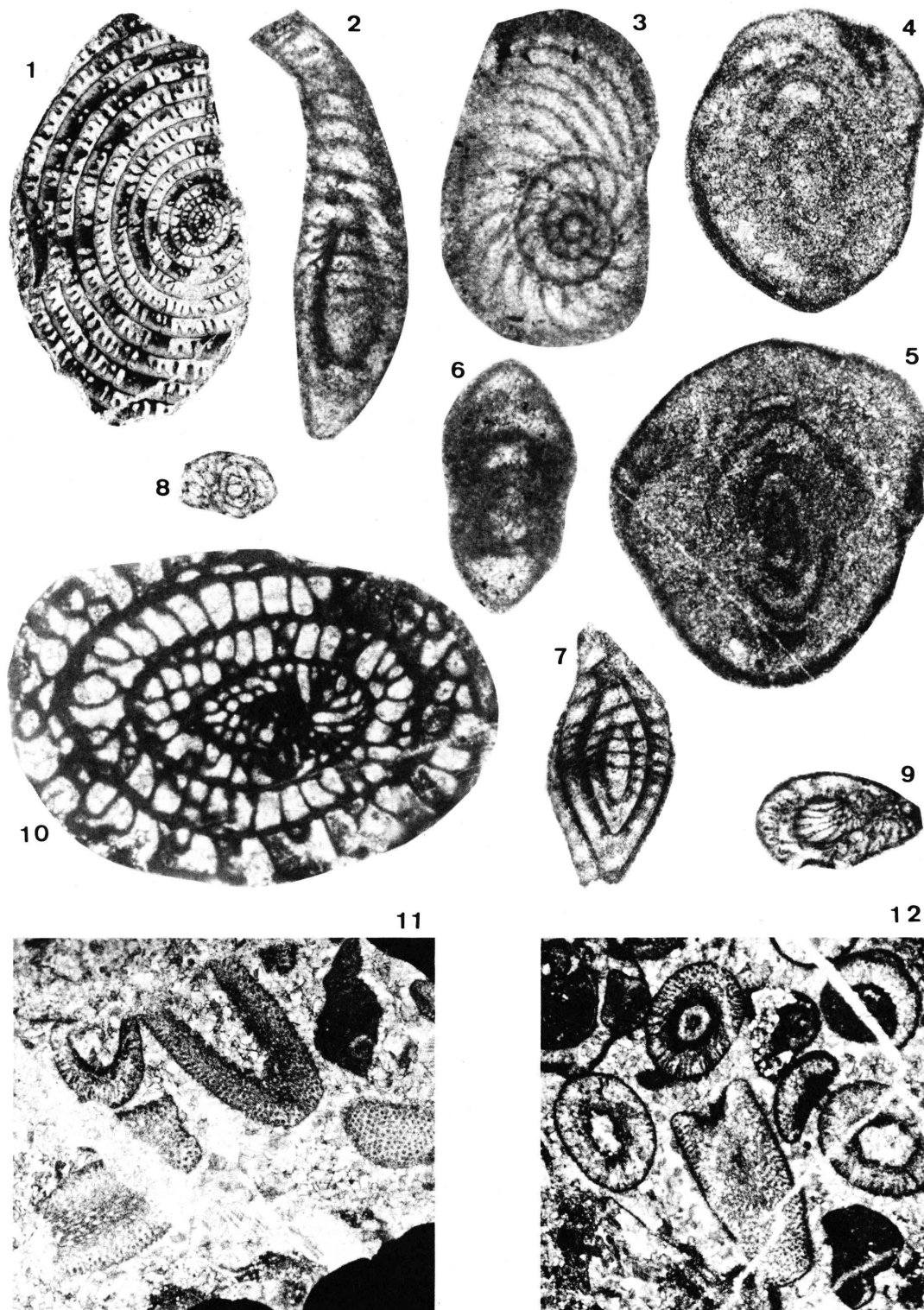
Leella kueichowensis described by GUNG (1966) from the lower Lopingian of Kueichow, South China resembles the present species in having a similar form ratio, number of volution and diameter of proloculus, but the latter has the larger shell and the thicker spirotheca. *L. kueichowensis* is represented by two poorly preserved axial sections (Internal structures might be recrystallized). The Table 1 shows the characteristics of each species of *Leella*.

Occurrence.—Limestone pebbles in the lower part of the Naon Formation. Locality 12, 10 km west of Odana, Yamato-son, Amami-oshima.

Explanation of plate 11

Figs. 1-16. *Leella grossa* sp. nov.Page 97
 1. Axial (slightly oblique-centered) section of the holotype, GK.D. 15000a;
 2. Axial (slightly oblique-tangential) section, GK.D 15001; 3. Axial (slightly oblique) section, GK.D 15001a; 4. Oblique-tangential section, GK.D 15002;
 5. Oblique-centered section, GK.D 15003; 6. Axial (slightly oblique-centered) section, GK.D 15004; 7. Oblique section, GK.D 15005a; 8. Axial (slightly oblique) section, GK.D 15001b; 9. Oblique-tangential section, GK.D 15006;
 10. Oblique-tangential section, GK.D 15007a; 11. Oblique section, GK.D 15007b;
 12. Sagittal (Slightly oblique) section, GK.D 15008; 13. Sagittal section, GK.D 150005b; 14. Oblique-centered section, GK.D 15009; 15. Sagittal (slightly oblique) section, GK.D 15009; 16. Transverse section. GK.D 15000b. All ×15. Loc. 12.





Reference

- DUNBAR, C. O. and SKINNER, J. W. (1937): The geology of Texas. Vol. 3, Part 2, Permian Fusulinidae of Texas. *Texas Univ. Bull.* (3701), 517-825, pls. 42-81.
- ELLIOTT, G. F. (1955): Micropaleontology, 1, (1), 83-90, pls. 1-3.
- FUJITA, H. (1983): The "Paleozoic" formation in the Motobu Peninsula of Okinawa-jima, Ryukyu Islands. *Mem. Geol. Soc. Japan*, (22), 3-13. (in Japanese with English abstract).
- GUNG, F. (1966): Some new species of Fusulinids from the Upper Permian of Ganze district, Pintang Province, Kueichow. *Acta Palaeont. Sinica*, 14, (1), 80-89, pl. 1. (in Chinese and Russian).
- HANZAWA, S. (1933): On a *Neoschwagerina*-limestone from Okinawa-jima, Riukiu (Loochoo) Islands. *Japan. Jour. Geol. Geogr.*, 10, (3-4), 107-110, pl. 7.
- HATAE, N. et al. (1959): *Explanatory text of the geological map of the Amami Islands, Kagoshima Prefecture* (1:200,000). Kagoshima Prefecture Office. (in Japanese).
- IGO, H. (1972): Conodonts as a new Index Fossil in Japan. *Jour. Geogr.*, 81, (3), 12-21. (in Japanese with English Abstract).
- ISHIBASHI, T. (1968): Bedrock Geology of Iheya Islands, Okinawa Islands Group. *Sci. Rep. Kanazawa Univ.*, 13, (1), 51-72.
- (1969): Stratigraphy of the Triassic Formation in Okinawa-jima, Ryukyus. *Mem. Fac. Sci., Kyushu Univ.* [D, Geol.], 19, (3), 373-385, pl. 53.
- ISHII, K. et al. (1975): On the Genus *Colaniella* and its biostratigraphic significance. *Jour. Geosci. Osaka City Univ.*, 19, art 6, 107-138, pls. 1-4.
- KASHIMA, N. (1983): Studies on the Butsuzo tectonic line of Ryukyu Arc. *Mem. Geol. Soc. Japan*, (22), 57-65. (in Japanese with English abstract)

Explanation of plate 12

- Fig. 1. *Neoschwagerina* sp.Page 95
Sagittal section, GK.D 15011, Loc. 12, $\times 15$.
- Fig. 2-3. *Reichelina* sp. A.Page 95
2. Tangential section, GK.D 15012b, Loc. 10, $\times 50$.
3. Sagittal section, GK.D 15012c, Loc. 10, $\times 50$
- Figs. 4-5. *Nankinella* sp. A.Page 95
4. Axial (slightly tangential) section, GK.D 15013, Loc. 10, $\times 50$: 5. Axial (slightly tangential) section, GK.D 15014, Loc. 10, $\times 50$.
- Fig. 6. *Nankinella* sp. B.Page 95
Axial section, GK.D 15015, Loc. 10, $\times 50$.
- Fig. 7. *Reichelina* sp. B.Page 95
Tangential section, GK.D 15016a, Loc. 10, $\times 50$.
- Figs. 8-9. *Dunbarula* sp.Page 95
8. Axial section, GK.D 15017a, Loc. 10, $\times 20$: 9. Oblique section, GK.D 15018, Loc. 10, $\times 20$.
- Fig. 10. *Parafusulina* sp.Page 95
Oblique centered section, GK.D 15019, Loc. 12, $\times 20$.
- Figs. 11-12. *Permocalculus plumosus* ELLIOTTPage 95
11. GK.D 15010b, Loc. 12, $\times 15$; 12. GK.D 15020, Loc. 12, $\times 15$.

- KONISHI, K. (1964): Geologic notes on Tonaki-jima and width of Motobu Belt, Ryukyu Islands. *Sci. Rep. Kanazawa Univ.*, 9, (2), 169–188.
- LIU, C. et al. (1978): Protozoa (in Paleontological atlas of Southwest China Kueichow-2). Geologic Press, 12–98, pls. 1–24. (in Chinese)
- MIKLUKHO-MAKLAY, A. D. (1963): *The Upper Paleozoic of Central Asia*. Leningrad State Univ., Press, 326 p. (in Russian)
- OSOZAWA, S. et al. (1983): Geology of Amami oshima, central part of the Ryukyu Islands, with special reference to effect of gravity transportation on geologic construction. *Mem. Geol. Soc. Japan*, (22), 39–56. (in Japanese with English abstract)
- RAUSER-CHERNOUSOVA, D. M. and FURSENKO, A. V. (1959): Osnovi Paleontologii. Akad. Nauk. SSSR. 482 p. (in Russian)
- ROSOVSKAYA, S. E. (1965): Development and change of marine organisms at the boundary of the Paleozoic and Mesozoic. *Akad. Nauk. SSSR., Paleont. Inst.*, 108.
- SAKAGAMI, S. (1980): Preliminary note on the Upper part of the Akasaka Limestone Group, Japan. *Proc. Japan Acad.*, 56, [B], (1), 25–29.
- SHENG, J. and CHANG, L. (1958): Fusulinids from the type-locality of the Changhsing Limestone. *Acta Palaeont. Sinica*, 6, (2), 205–214, pl. 1.
- TORIYAMA, R. (1970): *Micropaleontology*. (Ed. Asano, K.), the first vol., Asakura-shoten, Tokyo, 267 p. (in Japanese)
- Working Group on the Permian-Triassic System (1975): Stratigraphy near the Permian-Triassic Boundary in Japan and its correlation. *Jour. Geol. Soc. Japan*, 81, (3), 165–184. (in Japanese with English abstract)

Explanation of plate 13

- Fig. 1. *Yabeina katoi* (OZAWA)Page 95
Oblique section, GK.D 15021, Loc. 10, $\times 10$.
- Figs. 2–8. *Neoschwagerina margaritae* DEPRATPage 95
2 and 7. Oblique sections, GK.D 15012a and 15024; 3–6 and 8. Oblique centered sections, GK.D 15022, GK.D 15030, GK.D 15023, GK.D 15016c and K.D 15026, respectively, Loc. 10, $\times 10$.
- Fig. 9. *Neoschwagerina minoensis* DEPRATPage 95
Axial (slightly oblique) section, GK.D 15016b, Loc. 10, $\times 10$.
- Figs. 10–12. *Neoschwagerina craticulifera* (SCHWAGER)Page 95
10. Oblique section, GK.D 15026; 11. Tangential section, GK.D 15027; 12. Transverse section, GK.D 15028, Loc. 10, $\times 10$
- Fig. 14. *Presumatrina neoschwagerinoides* (DEPRAT)Page 95
Axial (slightly oblique) section, GK.D 15017b, Loc. 10, $\times 10$.

