NOTE ON THE EXISTENCE OF *SUGIYAMAELLA* IN THE LOWER CARBONIFEROUS OF THE CHILIENSHAN, CHINHAI PROVINCE, CHINA, WITH REMARKS ON THAT CORAL GENUS.

by

Makoto KATO

(with 2 Tables and 1 text-figure)

(Contribution from the Department of Geology and Mineralogy, Faculty of Science, Hokkaido University. No. 1068)

In 1944 YABE and MINATO established the rugose coral genus *Sugiyamaella*, based on a single species, *S. carbonarium* from the Lower Carboniferous Kozubo Stage of the Ohdaira Series, at Kozubo, Sumita-cho, southern Kitakami Mountains, N.E. Japan.

The genus, still monotypic at present, is characterized by its simple, ceratoid corallum, well marked cardinal fossula and prominent columella which is solid and round in cross section. Major septa are mostly pinnately arranged and much dilated, especially in the cardinal quadrants. In early growth stage all septa are so dilated as to leave no interspaces. Minor septa are developed but are rudimentary. All septa tend to be radial in arrangement in the calicular portion of the corallite. The columella does not seem to unite with any major septa throughout most growth stages. The wall is rather thick, and dissepiments are lacking. Tabulae were described as wanting by the original authors, but they actually seem to be developed, though not numerous.

The type species is now known to occur at three places; Kobuzo (YABE & MINATO, 1944), Usagizawa (MINATO, 1947), and north of Tennanzan (MINATO in communication), all in the southern Kitakami Mountains, and all specimens appear to be from the same horizon, namely the lower Kozubo Stage (F_0 zone) of the lower Ohdaira Series (Table 1).

However, the genus has never been recorded outside of Japan, and also seems to have been generally overlooked by taxonomists.

Recently LO and ZHAO (1962) published a detailed description of corals from Chiliensham in Chinhai Province, China. In this report certain corals are described which in fact have every characteristic of *Sugiyamaella* YABE et MINATO. They are;

Lophophyllidium yini LO

L. *yini* var. *equiseptata* LO
L. *oulunbulukense* LO

Table 1. Lower carboniferous deposits in the soutnern Kitakami Mountains (after MINATO et al., 1959)

Middle Carboniferous Nagaiwa Series	
Onimaru Series	Hiishi Stage
	Hotokezaka Stage
Ohdaira Series	Kozubo Stage
	Maide Stage
Arisu Series	Jumonji Stage
	Hinozuchi Stage
Hikoroichei Series	Ohmata Stage
	Ikawa Stage
Devonian Nakazato Series	

All of these three forms have a thick wall, rudimentary minor septa, a marked cardinal fossula, and a solid columella which is round in cross section and which is independent of any major septum except in the last named species. In *L. yini* septal dilation is pronounced in an early stage. Dissepiments are lacking in all three species. Inasmuch as these are all characteristic features of *Sugiyamaella*, these species should be transferred into this genus; they thus become the first record of the genus *Sugiyamaella* outside of Japan.

According to LO and ZHAO (1962) these species of "*Lophophyllidium*" were collected at Oulunbuluk, Chinhai Province, from the *Siphonophyllia* zone of the Chenchangou Series, which they correlated to the upper Tournaisian "*Caninia*" zone in western Europe (Table 2).

Table 2. Lower Carboniferous deposits in Oulunbuluk region, Chinhai, China (after LO & ZHAO, 1962)

Namurian	
fault	limestone formation (*Yuanophyllum* zone)
Viséan Huaitoutala Series	coal bearing formation (*Orionastraea huaitoutalaensis-Dorlodotia* zone)
Tournaisian Chenchangou Series	limestone formation (*Siphonophyllia oppressa* zone)
	conglomerate formation
Ordovician	

This requires a consideration of the geological age of the Ohdaira Series, which characteristically yields *Sugiyamaella*, and has been regarded as lower Viséan. The Ohdaira Series is stratigraphically lower than, and covered unconformably by the Onimaru Series from which numerous fossil corals such as *Dibunophyllum*, *Kueichouphyllum* and *Yuanophyllum*, clearly denote the D zone of upper Viséan. In turn, the Ohdaira Series conformably overlies the Tournaisian Arisu Series with *Syringothyris*. Therefore the age of the Ohdaira Series, situated as it is between Tournaisian and upper Viséan formations, has been regarded as lower Viséan, although it lacks any significant fossils which prove this age.

From the *Siphonophyllia* zone of the Chenchangou Series LO and ZHAO (1962) described *Siphonophyllia*, *Cyathoclisia*-like corals, *Caninia* of the *subibicina* group and " *Lophophyllum* ". This assemblage suggests an age ranging from Tournaisian (C_1) to the lowest Viséan (C_2S_1). Possibly *Sugiyamaella* of the Ohdaira Series is also of upper Tournaisian to lowest Viséan age; at any rate there is no definite fossil evidence for the presence of the " *Seminula* " fauna of lower Viséan in the Ohdaira Series. Therefore the unconformity at the base of the upper Viséan Onimaru Series may represent the erosional interval which account for the absence of formations of lower Viséan age in this region as has been suggested by MINATO (1966).

A Russian species of Blastoid, *Nymphaeoblastus anosoffi* YAKOVLEV is now known to occur in the upper Tournaisian Jumonji Stage of the Arisu Series in the southern Kitakami Mountains (FAY, 1961). The present occurrence of *Sugiyamaella* thus is also of potential significance in future considerations of the affinity of the Lower Carboniferous faunas of the Kitakami Mountains to those of other regions.

The brief taxonomic history of the genus *Sugiyamaella* is as follows:

MINATO (1952, 1955) placed the genus *Sugiyamaella* in the family " Lophophyllidae ", which corresponds to the Lophophyllidiidae MOORE and JEFFORDS (1945) of present usage. KABAKOVITCH (1962) was first to correctly assign this genus to the Lophophyllidiidae.

The following genera are here referred to this family:

Lophocarinophyllum GRABAU, 1922
Lophophyllidium GRABAU, 1928
Sinophyllum GRABAU, 1928
Malonophyllum OKULITCH et ALBRITTON, 1937
Lophamplexus MOORE et JEFFORDS, 1941
Sugiyamaella YABE et MINATO, 1944
Lophotichium MOORE et JEFFORDS, 1945
Stereostylus JEFFORDS, 1947
Agarikophyllum FOMITCHEV, 1953
Khmerophyllum FONTAINE, 1961

The possibility that several of these genera may be synonyms is noted. How-

ever this is a separate problem and is not of primary concern here.

Genus *Sugiyamaella* YABE et MINATO, 1944

Sugiyamaella YABE and MINATO, 1944, p. 143
Sugiyamaella, MINATO, 1951, p. 381
Type species (by monotypy): *Sugiyamaella carbonarium* YABE et MINATO, 1944

Generic description: Corallum simple, ceratoid. Calyx deep, with prominent axial boss and deep cardinal fossula. Wall thick. Septa of two orders, but minor septa are rudimentary. Fine structure of septa may be diffusotrabecular. Major septa are pinnately arranged, gently tapering towards the axis, and much dilated, especially in cardinal quadrants. Cardinal septum very short, situated in a narrow, almost parallel-sided cardinal fossula. Counter septum is a little shorter than the other

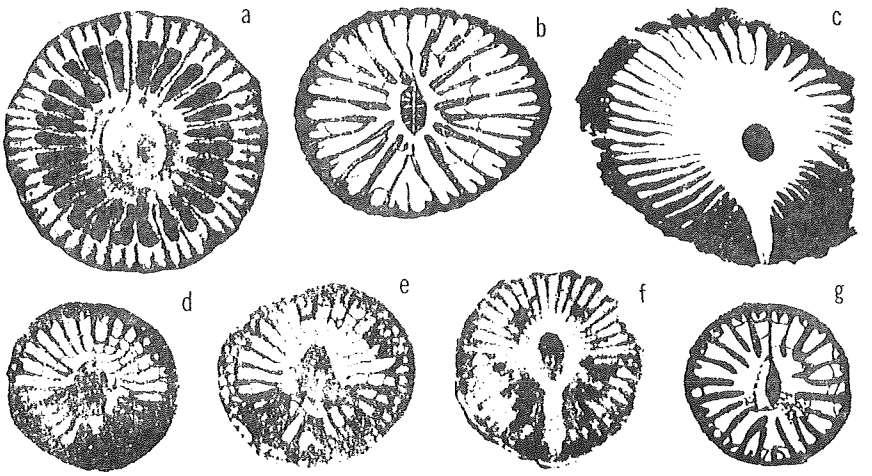

Fig. 1
Various types of Lophodhyllidiid corals for comparison
(counter sides are invariably placed on top).
a. *"Sinophyllm" pendulum* GRABAU × 4 (after GRABAU, 1928)
b. *Lophophyllidium proliferum* (MCCHESNEY) × 3 (after JEFFORDS, 1947)
c. *Sugiyamaella carbonarium* YABE et MINATO × 2 (after YABE et MINATO, 1944)
d-e. *Rylstonia benecompacta* HUDSON et PLATT × 1.5 (after HUDSON & PLATT, 1927)
f. *Sugiyamaella yini* (LO) × 2 (after LO, 1962)
g. *Stereostylus leni* JEFFORDS × 3 (after JEFFORDS, 1947)

major septa. Axial structure prominent, represented by a round, smooth and compact columella which is completely isolated from the axial ends of major septa in the ephebic stage. In young stages all skeletal elements are greatly dilated to form a " Füllmasse " stage. Tabulae ascend towards the columella. Dissepiments are absent.

Included forms:

Sugiyamaella carbonarium YABE et MINATO, 1944
S. *yini* LO, 1962
S. *equiseptatum* LO, 1962
S.? *oulunbulkense* LO, 1962

Distribution:

China and Japan; upper Tournaisian to? lower Viséan.

Remarks:

Sugiyamaella differs from the other Lophophyllidiid genera in having a large cardinal fossula, septal dilation in the cardinal quadrants, and a solid columella which is not connected with the axial end of the counter septum in the ephebic stage.

Rylstonia, from the British Lower Carboniferous superficially resembles *Sugiyamaella* in having a prominent cardinal fossula, a large, round columella, and septal dilation in the cardinal quadrants. However, in the young stages the columella of *Rylstonia* definitely originates from an axial swelling of the counter septum. Also, in *Rylstonia* dissepiments are developed in late growth stages; this genus thus must be considered as systematically quite different from *Sugiyamaella*.

Acknowledgements:

I wish to record my thanks to Prof. M. MINATO of Hokkaido University and D. C. L. ROWETT of the University of Alaska for critically reading the paper in manuscript, and Mr. S. KUMANO for his help in the preparation of text-figures.

References

FAY, R. O. (1961): *Nymphaeoblastus*, a Mississippian blastoid from Japan. Oklahoma Notes, vol. 21, no. 5, pp. 150–153, p. 1.

HILL, D. (1956): Rugosa, in Treatise on Invertebrate Paleontology, (F), F 233–324, Geol. Soc. America.

KABAKOVITCH, N. V. (1962): Polycoeliina, in " Fundamentals of Paleontology, Porifera, Archaeocyatha, Coelenterata and Vermes ", pp. 324–327 (in Russian).

LO, C. T. and ZHAO, J. M. (1962): " Lower Carboniferous rugose corals of the Chilienshan district ". " Geology of Chilienshan ", vol. 4, fasc. 3, pp. 111–199, pls. I–XXX (in Chinese).

MINATO, M. (1947): New locality of *Sugiyamaella carbonarium*. Jour. Geol. Soc. Japan, vol. 53, p. 22 (in Japanese).

MINATO, M. (1951): On the Lower Carboniferous Fossils of the Kitakami Massif, Northeast Honshu, Japan. Jour. Fac. Sci. Hokkaido Univ., ser. IV, vol. VII, no. 4, pp. 355–382, pls. I–V.

MINATO, M. (1952): A Further Note on the Lower Carboniferous Fossils of the Kitakami Mountainland, Northeast Japan. Ibid., ser. IV, vol. VIII, no. 2, pp. 136–174, pls. 2–11.

MINATO, M. (1955): Japanese Carboniferous and Permian corals. Ibid., ser. IV, vol. IX, no. 2, pp. 1–202, pls. 1–43.

MINATO, M. TAKEDA, H. and KATO, M. (1959): On the Volcanic Rocks in the Japanese Palaeozoic. 2nd Report: Carboniferous. Jour. Geol. Soc. Japan, vol. 65, ho. 762, pp. 165–170 (in Japanese with English abstract).

MINATO, M. (1966): Palaeozoic Stratigraphy in the Kitakami Mountains and the Abean Orogenic Movements in Japan. Prof. S. MATSUSHITA Memorial Volume, pp. 143–159 (in Japanese with German and English abstract) Kyoto University.

YABE, H. and MINATO, M. (1944): *Sugiyamaella carbonarium* YABE et MINATO, gen. et sp. nov. aus den unterkarbonischen Ablagerungen des Kitakami-Gebirges. Japanese Jour. Geol. & Geogr., vol. 19, nos. 1–4, pp. 143–146, pl. 1.

(Manuscript received July 10, 1957)