76. Discovery of Lower Carboniferous Corals from the Yatusiro District in Kyūsyū.*

By Hisakatsu Yabe and Toshio Sugiyama.
(Comm. by H. Yabe, M.I.A., Nov. 13, 1939.)

In the Japanese Islands Lower Carboniferous deposits are known from the Kitakami and Abukuma Mountainlands of North-east Japan, and from the Aomi and Akiyosi districts of the Inner Zone of South-west Japan. In the former two regions, they are mostly of non-calcareous sediments, while limestones are occasionally interbedded at several horizons; in the latter two districts, on the other hand, they are thoroughly calcareous forming a part of a very thick complex of limestone which yields Lower Carboniferous fossils in its lower part and Permian fossils in the upper. In the Kitakami Mountainland the Lower Carboniferous deposits are underlain successively by Devonian and Gotlandian deposits\(^1\); in the other places, their base is not exposed.

The Lower Carboniferous limestones often abound in fossils, dominant forms being tetracorals, brachiopods and crinoid stem-joints. Of them, tetracorals are most prevailing; common colonial forms belong to the genera Lithostrotion, Lithostrotionella, Siphonodendron, Lonsdaleia, Diphyliphyllum and Thysanophyllum, and solitary forms to the genera Hexaphyllia, Heterophyllia, Dibunophyllum, Amygdalophyllum, Nagatophyllum, Kueichowphyllum? and Bothrophyllum?; besides, Syringopora and Chaetetes of the Tabulata are also common.

Renewed field researches lately undertaken by the junior writer to recover, if possible, some Older Palaeozoic fossils in Japan outside the Kitakami Mountainland was not yet successful, but his effort was awarded by a discovery of some corals of the Lower Carboniferous types in a limestone block obtained at a limestone-exposure of Tutui, Kakisako-mura, Yatusiro-gun, Kumamoto-ken, in Kyūsyū (Fig. 1). The limestone of Tutui which is typically exposed at the river-bank of the

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* The writers express their hearty thanks to the Imperial Academy for a grant-in-aid.

Hikawa and interbedded in a gray slate, is dark gray in colour, rather compact in texture and oolitic in part; the fossiliferous limestone blocks are of the same nature and are almost no doubt derived from the exposure. While no fossils were found in the limestone exposed, the two fossiliferous blocks collected contain corals and foraminifera; the former are distinguished as Diphyphyllum, Siphonodendron and the latter as Endothyra, though in rather unfavourable preservation. It is a question whether this limestone is different from that of Tutui in which Mr. T. Otani1) several years ago reported to have found some Torinosu fossils; his Tutui limestone is stated also to be dark gray in colour and partly oolitic, apparently being similar in many aspects to the former.

There is only one instance of the earlier find of Lower Carboniferous fossils in the Outer Zone of South-west Japan; namely a limestone boulder once collected by the senior writer on a road about 4 km south-west of Eribara, Isobe-mura, Sima-gun, Kii peninsula, which contains Lithostrotion. This limestone which is now stored in the Institute of Geology and Palaeontology, Sendai (Reg. No. 35240) is probably derived from a limestone exposed somewhere nearby; the precise position of its exposure is still unknown. These finds at two distant places seem to indicate an extended distribution of the Lower Carboniferous deposits in the Outer Zone of South-west Japan.

Below brief descriptions of the Tutui corals follow.

*Diphyphyllum cf. platiforme* Yü.

Figs. 2-5.

Corallum fasciculate, forming a colony over 10 cm broad. Corallites cylindrical, 4–5 mm broad, intervals variable, surface annulated; calices not preserved. Septa moderately thick, 32–34 in number, alternately long and short, major ones as long as one-third diameter of corallites and minor ones as long as one-third to one-half of majors. Central area free from septa, and surrounded by pseudo-inner wall at their distal ends and formed by vertical marginal portion of tabulae. Two narrow layers of small cells along periphery, outer layer composed of small subequal dissepiments in a single row which are convex inwards as well as somewhat upwards, and inner layer of peripheral tabulae likewise in a single row, which are similar in size to dissepiments and rather concave upwards instead of being convex. Axial tabulae broad, regularly spaced, usually not much close, 6 counted in 5 mm, flat, but abruptly descending downwards at margin and connected with the preceding one.

Closely similar to *Diphyphyllum platiforme* Yü2) described by Yü from the Lower Carboniferous of Tu-ti-kuan, Tiny-fan, and Er-ma-tsung, Wei-ning, both in Kueichou province, China. Columella is stated to be

2) C.C. Yü: Lower Carboniferous corals of China. Palaeont. Sinica, ser. B, vol. 13, fasc. 3, p. 84, pl. 15, figs. 3a-b; pl. 16, figs. 4a-b, 1933.
present occasionally in the latter, but no trace of it is found in several sections examined of the former.

Figs. 2-4. *Diphyphyllum cf. platiforme* Yu.
2, Weathered surface, nat. size; 3, a corallite on the weathered surface, $\times 4$; 4, another corallite in longitudinal section, $\times 4$.

Figs. 5 a-b. *Diphyphyllum cf. platiforme* Yu. $\times 4$

a, photograph; b, diagrammatic sketch.
There are several other corallites in transverse section which are distinguished from the others mentioned above in having more numerous (40) septa, some of which extend to near the centre of corallites (Fig. 6); in the number of septa they rather approach *Diphyphyllum gracile* (M'Coy). A similar form is common in the Lower Carboniferous Onimaru series of the Kitakami Mountainland.

*Siphonodendron* sp.

Figs. 7–8.

A single cylindrical corallite presumably of a fasciculate colony is 12 mm broad; firmly embedded in matrix, its surface feature is unknown. Major septa 37 in number, somewhat longer than one-fourth diameter of corallite, much thickened at middle and thinning out distally as well as proximally; minor septa in alternation with the major ones very short or rather rudimentary. Dissepiments probably well developed, concentrically arranged in transverse section (their disposition in longitudinal section unknown). Columella large, elongated in one direction,

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swollen at middle, pointed at ends, surrounded by 3 or 4 curved lamellae. Tabulae forming a more or less vesicular tissue?, apparently steeply raised towards columella.

Very similar to *Siphonodendron hsinanense* Yu described by Yu from the Lower Carboniferous of Ta-tung-t'in, Hsin-an-hsien, Kwangsi province, China, but differs from it by possessing septa somewhat greater in number.

1) C. C. Yu: Op. cit., p. 97, pl. 20, figs. 5a-b.