

A Permian Rugose Coral, *Yatsengia kuzuensis*, from north of Kiryu in the Ashio Mountains, Gunma Prefecture, Japan

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Abstract A Permian rugose coral, *Yatsengia kuzuensis* (Yabe), was collected from limestone and calcareous sandstone beds exposed in Umeda, north of Kiryu City in the Ashio Mountains, Gunma Prefecture. This species was originally described as the type species of the genus *Pseudoyatsengia* Yabe, 1951 from the Kuzu Limestone, which is exposed in the Aisawa Quarry, about 30 km east of the present locality. The coral is described here because *Pseudoyatsengia* is considered to be a synonym of *Yatsengia* Huang, 1932, and the occurrence of rugose corals in the Ashio Mountains is rather rare.

Key words: Ashio Mountains, Kuzu, Permian, rugose coral, *Pseudoyatsengia*, *Yatsengia*

Introduction

The geology of the Ashio Mountains has long been studied by many geologists. In particular, the Kuzu area in the southeastern part of the mountains was attracted interest by these scientists, because there are large horseshoe-shaped limestones that yield abundant Permian fusulinaceans (e.g., Fujimoto, 1961; Kobayashi, 1979).

On the contrary, the geology of the north of Kiryu including the present fossil locality was remained uncertain, because the area is mainly underlain by intensely folded and faulted non-fossiliferous clastic sedimentary rocks, chert, and greenstone. Hayashi made regional mapping of this area and showed the overall geologic structure and distribution of Permian and Triassic strata. Hayashi's long-termed study was not well documented, but one of his results was summarized in the comprehensive report (Hayashi *et al.*, 1990). Recently, Kamata (1996, 1997) has studied the geologic structure and stratigraphy of this mountainous area on the basis of current new schemes of accretion tectonics and sequence stratigraphy.

Exotic blocks of fossiliferous limestone and coherent calcareous sandstone

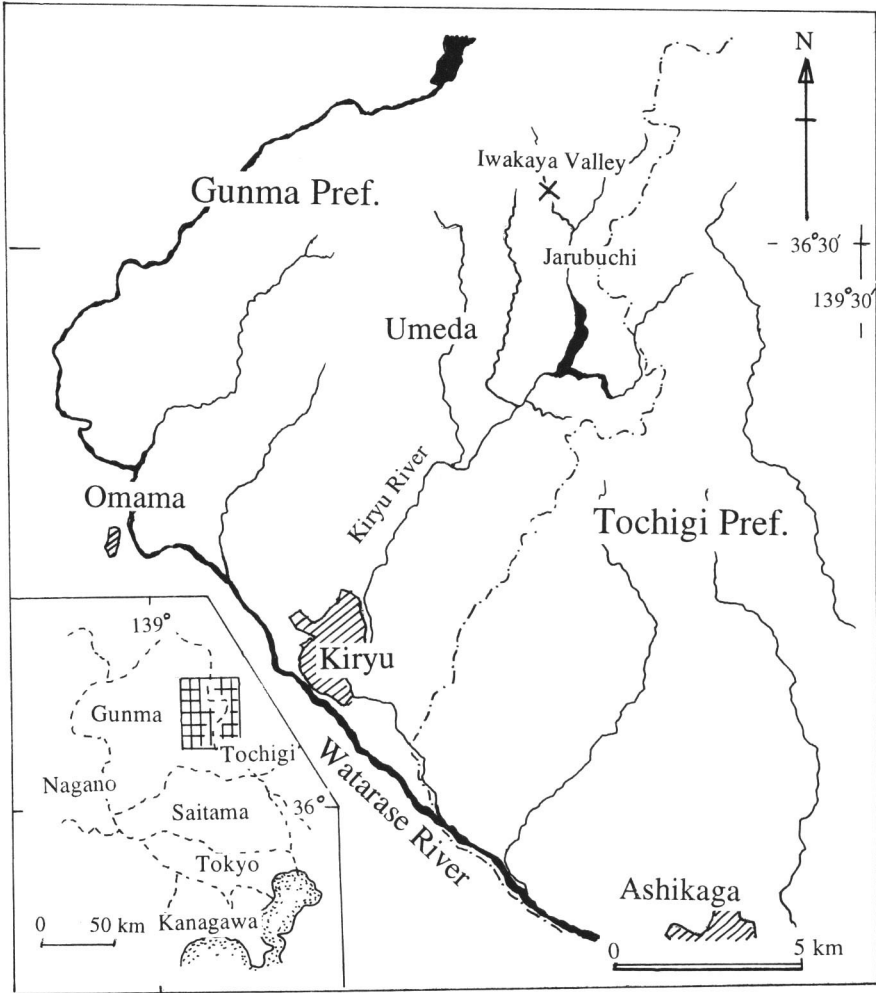


Fig. 1. Map showing fossil locality (X).

occur in greenstone and chert sequences that form a large syncline (Umeda Syncline) in the upstream basin of the Kiryu River. The present fossil locality appears in outcrops along the upstream of the Iwakaya Valley, a tributary of the Kiryu River, Umeda Town, north of Kiryu City (Fig. 1). Fossil collections were made by students of Kiryu Senior High School including the third author, T. Kaniwa, under the supervision of their teacher Minoru Kaneko. The second author, H. Koizumi, made geologic survey in this area and further collections of fossils at this locality.

These fossils include fusulinaceans, rugose corals, brachiopods, trilobites, and others. Fusulinaceans are assigned to *Parafusulina yabei* Hanzawa, which is a com-

mon species in the Kuzu Limestone exposed in the east of this area as already mentioned. Brachiopods are preliminarily identified by Koizumi to *Enteletes* sp., *Permorthotetes* sp., *Liotella* sp., *Sterochia* sp., *Linoproductus* sp., *Eolyttonia* sp., and others. Trilobites were already identified to *Pseudophillipsia kiriuensis* Kobayashi and Hamada and *P. kiriuensis subtrigonalis* Kobayashi and Hamada by Koizumi *et al.* (1988). These trilobites were previously reported from Tsukuhara near the present locality (Kobayashi & Hamada, 1984). The above-listed fossils indicate Artinskian (Leonardian) in age.

The present coral specimens were collected from both limestone and calcareous sandstone associated with the above-mentioned fossils and sent to the first author for the detailed identification. These corals are assigned to *Yatsengia kuzuensis* (Yabe, 1951). The genus *Yatsengia* is a well known Permian rugose coral, and about 20 species have been described from China, Japan, southeastern Asian countries, Iran, and Turkey. All occurrences are in Permian rocks, ranging from the upper Lower to lower Upper divisions. Although the genus had been thought as the typical Tethyan representative, Wilson (1982) reported three new species from the McCloud Limestone of northern California.

Yabe (1951) proposed the genus *Pseudoyatsengia* for corals, resembling *Yatsengia*, from the *Parafusulina* Zone of the Kuzu Limestone, exposed at the Aisawa Quarry, Kuzu Town, about 30 km east of the present locality. *P. kuzuensis* was designated to the type species, and the original specimen is now housed at the National Science Museum. The first author, Igo, examined the specimen and concluded that *Pseudoyatsengia* is a junior synonym of *Yatsengia* as discussed in the next chapter.

The present paper aims to describe *Yatsengia kuzuensis* (Yabe) that is the second occurrence of this species in the Ashio Mountains. Moreover, rugose corals in the Permian calcareous facies of the Ashio Mountains are curiously rather rare, hence the description of the present coral is worthy to note.

Description of Species

Family Lithostrotionidae d'Orbigny, 1852

Subfamily Yatsengiinae Hill, 1956

Genus *Yatsengia* Huang, 1932

Remarks: Yabe (1951) distinguished *Pseudoyatsengia* from *Yatsengia* Huang in having discontinuous thin major septa in the dissepimentarium, horizontal tabellae, and a feeble columella of the former. The genus *Pseudoyatsengia* has been accepted as a monotypic genus by subsequent authors (e.g., Minato, 1955), but its validity has been questioned by Hill (1981), Lin *et al.* (1995), and others. The first author, Igo, examined the type specimen of *Pseudoyatsengia kuzuensis*, which is housed at the National Science Museum (NSM PA11733), and confirmed that the specimen does not have any discontinuous major septa as described by Yabe. Furthermore, the specimen

shows that the horizontal tabellae and loosely constructed axial structure are variable skeletal structures even in the same individual corallite.

Yatsengia kuzuensis (Yabe, 1951)

Figs. 2, 3

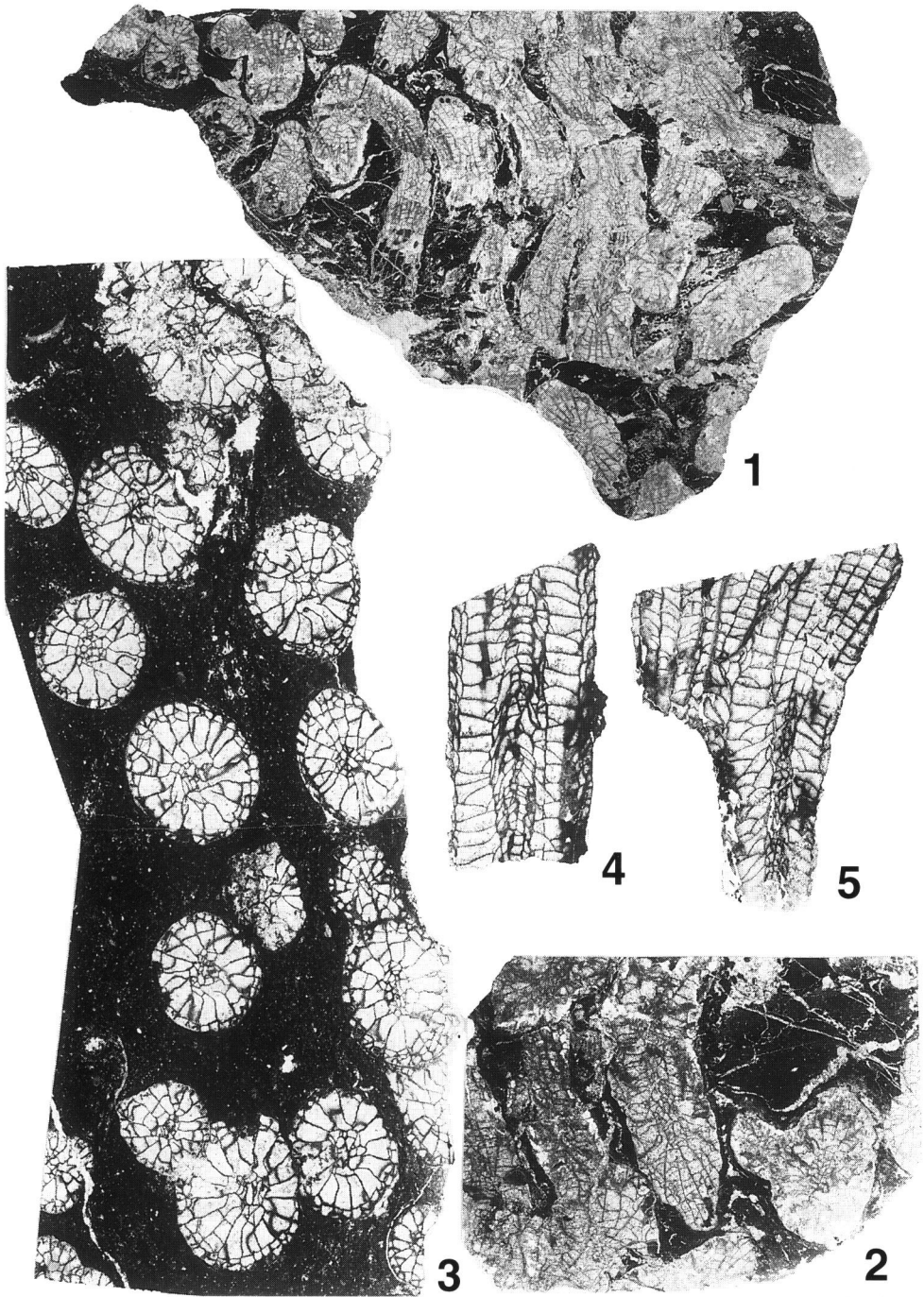
Pseudoyatsengia kuzuensis Yabe, 1951, p.201–203, figs. 1, 2; Minato, 1956, p. 121, 122, pl. 42, figs.1, 2.

Description: Corallum compound and phaceloid attaining several centimeters to 10 cm in diagonal but external shape unknown. Corallites slender, cylindrical, closely spaced, touching to as much as 4.0 to 6.0 mm apart, and generally disposed in parallel. Lateral increase of daughter corallites commonly observed. Corallite surface shows distinct growth annulation.

In transverse section, corallites rounded but not entirely circular, measured 3.0 to 7.8 mm in diameter; 6.0 to 7.0 mm in most mature corallites. External wall thin, 0.074 to 0.125 mm in thickness, with shallow septal grooves and faint interseptal ridges. Septa two orders, major and minor in regular alternation. Major septa 12 to 16 in number, thin but thickening slightly toward periphery, and straight to sinuous. In dissepimentarium some of major septa strongly flexuous. These septa extend to axial structure, connect to axial tabellae, and a few of them confluent with septal lamellae. Minor septa very short, thickened slightly, and mostly confined to narrow dissepimental zone. Microstructure of septa mostly trabecular and less commonly pseudo-trabecular. Axial structure variable, loose and irregular in construction, and its diameter about one-third of corallite diameter. Several numbers of sinuous septal lamellae and irregularly disposed axial tabellae consist main component of axial structure. In adolescent corallites and some of mature corallites, two major septa (probably cardinal and counter septa) extended, being continuous in axial structure, and form flexuous medial plate in places. Dissepimentarium narrow and restricted to periphery. Dissepiments two or one rank, mostly concentric but herringbone pattern less commonly appears.

In longitudinal section, triareal longitudinal arrangement distinct; narrow peripheral dissepimentarium, tabularium, and axial structure. Dissepimentarium occupied by two or one rank of small globose and elongate dissepiments facing inward. Tabularium comparatively wide, about two-thirds of corallite radius. Complete and incomplete horizontal or arched tabellae appear 10 to 13 per 5 mm. Arched tabellae apt to occur near branching portion of corallite. Axial tabellae of columella dome

→Fig. 2. *Yatsengia kuzuensis* (Yabe, 1951). 1–2, random section of corallum preserved in limestone, NSM PA 14568, $\times 2.0$, $\times 2.5$, respectively; 3, transverse section of corallum preserved in calcareous sandstone, $\times 3.0$; 4, longitudinal section of corallite with almost horizontal tabellae, $\times 3.0$; 5, longitudinal section of corallites with both arched tabellae and almost horizontal tabellae, $\times 3.0$, NSM PA 14567.



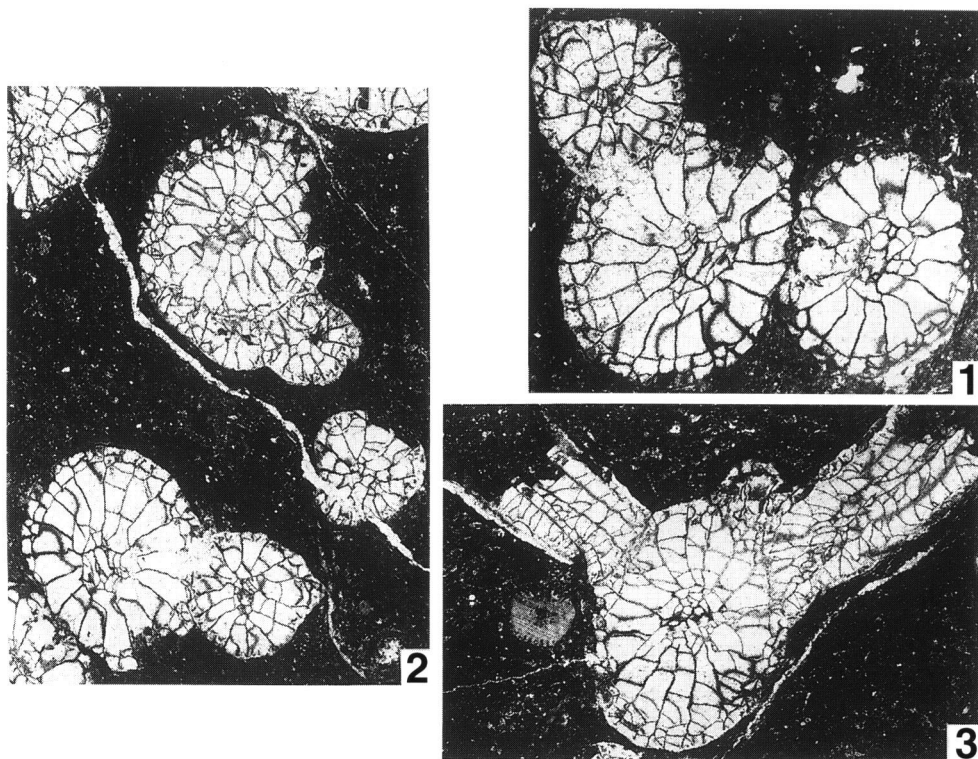


Fig. 3. *Yatsengia kuzuensis* (Yabe, 1951). 1–3, showing lateral increase of corallites, NSM PA 14567, $\times 5.0$.

shaped with steeply elevated slope and rounded top, and incorporated with septal lamellae.

Remarks: Our present specimens differ slightly from the original specimen of *Yatsengia kuzuensis* (Yabe, 1951) in number of septa and size of corallite. The construction of axial structure is also not exactly the same. These characters, however, are variable in both materials and fall within the specific variation.

Our present form resembles *Yatsengia kiangsuensis* Yoh, originally described from the type section of the Chihhsia Limestone, near Nanjing (Yoh & Huang, 1932). In the Chinese specimen, most of the major septa extend to the regularly constructed axial structure and are much thickened in periphery than those of the present species. Moreover, dissepiments are a single rank in *Y. kiangsuensis*.

Yatsengia kuzuensis is also similar to *Y. asiatica* Huang described from elsewhere in China in several respects, but the former has a loose axial structure, thin septa in periphery, and a less number of tabellae in the corresponding space. Horizontal tabellae more commonly may appear in the former species.

Yatsengia ibukiensis Minato, described from the *Parafusulina* Zone of the Ibuki Limestone of Gifu and Shiga Prefectures (Minato, 1956), is a similar species among the previously described Japanese species. *Y. ibukiensis*, however, has larger coral-lites, more numerous major septa, and one rank of dissepiments compared with those of the present species.

Occurrence: Iwakaya Valley in Umeda Town, Kiryu City of Gunma Prefecture.

Repository: NSM PA14567, 14568

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