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# Two Species of Middle Carboniferous Tabulate Corals from the Omi Limestone Group, Niigata Prefecture

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**Abstract** Two coral species, a pachyporid *Sinkiangopora kurohimensis* sp. nov. of the order Favositida and a periphaceloporid *Mandulapora yamagiwai* Niko, 1999, of the order Auloporida, are described from the Middle Carboniferous (probable late Bashkirian) bioclastic rudstone/grainstone in the Omi Limestone Group, Niigata Prefecture. They are the first described tabulate corals from this group. Discovery of this new species downwards extends the stratigraphic range of *Sinkiangopora* from the Gzhelian, and it represents the first generic occurrence outside of China. *Mandulapora yamagiwai* is common to the Hina and Akiyoshi Limestones.

**Key words:** Middle Carboniferous, tabulate corals, Pachyporidae, Periphaceloporidae, Omi Limestone Group, Niigata

## Introduction

The Omi Limestone Group (Hasegawa *et al.*, 1969, 1982; Hasegawa and Goto, 1990) is a huge (maximum ca. 12.5 km long and 2.9 km wide) allochthonous block in the Akiyoshi Terrane of a subduction complex, whose accreted limestone was accumulated as a reefal buildup on an isolated seamount during the Early Carboniferous (Visean) to Late Permian (Tatarian). In August 1999, six specimens of tabulate corals were collected from this group in Higashiyama Quarry of the Omi area, Niigata Prefecture, Central Japan (Fig. 1) under cooperation with Mr. Toshiaki Kamiya. Although diverse rugose corals have been described from this group, including Hayasaka (1924, 1932, 1939), Minato (1951, 1955), Kato (1967), Rowett and Minato (1968), Kato and Minato (1975), Yoshida *et al.* (1987), and Yoshida and Okimura (1992), previously only two tabulate coral species were listed (but not described and illustrated) by Yoshida *et al.* (1987), viz. *Pseudofavosites* sp. and *Pseudoromingeria kotoi* (Yabe and Hayasaka). Thus, the present description of *Sinkiangopora kurohimensis* sp. nov. and *Mandulapora yamagiwai* Niko based on this new martial is the first reliable documentation of tabulate corals from the Omi Limestone Group.

The specimens of tabulate corals were found in light gray massive limestone be-

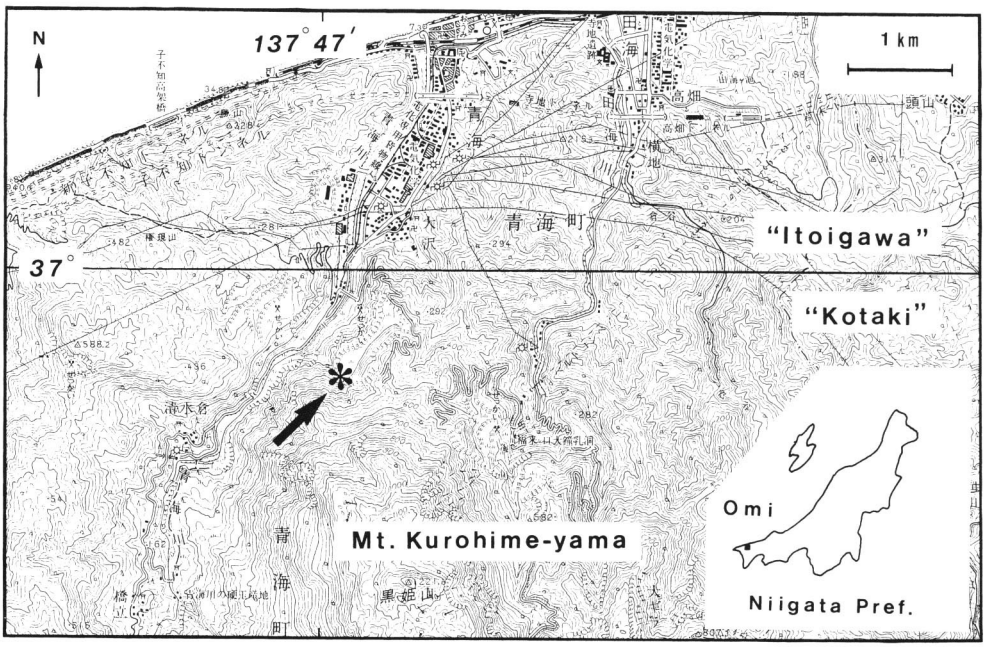



Fig. 1. Index map of the present coral locality in the Omi area, Niigata Prefecture using 1 : 25,000 maps of "Itoigawa" and "Kotaki" published by the Geographical Survey Institution.

longing to bioclastic rudstone/grainstone. Tabulate corals are not effective for dating purposes, however some of the associated foraminifers from this rock are identified as the Middle Carboniferous (probable late Bashkirian) fauna: *Eolasiodiscus* cf. *donbassicus* Reytlinger, *Planoendothyra* cf. *spirilliniformis* (Brazhnikova and Potievskaya), *Millerella* sp., *Mediocris breviscula* (Ganelina), *Schubertella* cf. *porrecta* Ivanova, and *Nankinella yokoyamai* Sada. Lithofacies of the Omi Limestone Group show apparent lateral changes. The characteristic reef structure consisting of the fore reef, reef front, reef crest, back reef to sand shoal, and lagoon facies in a east to west direction has been demonstrated by Nakazawa (1997). This tabulate coral locality may fall within the reef front facies of Nakazawa's scheme.

Repository of tabulate coral specimens studied is the National Science Museum, Tokyo.

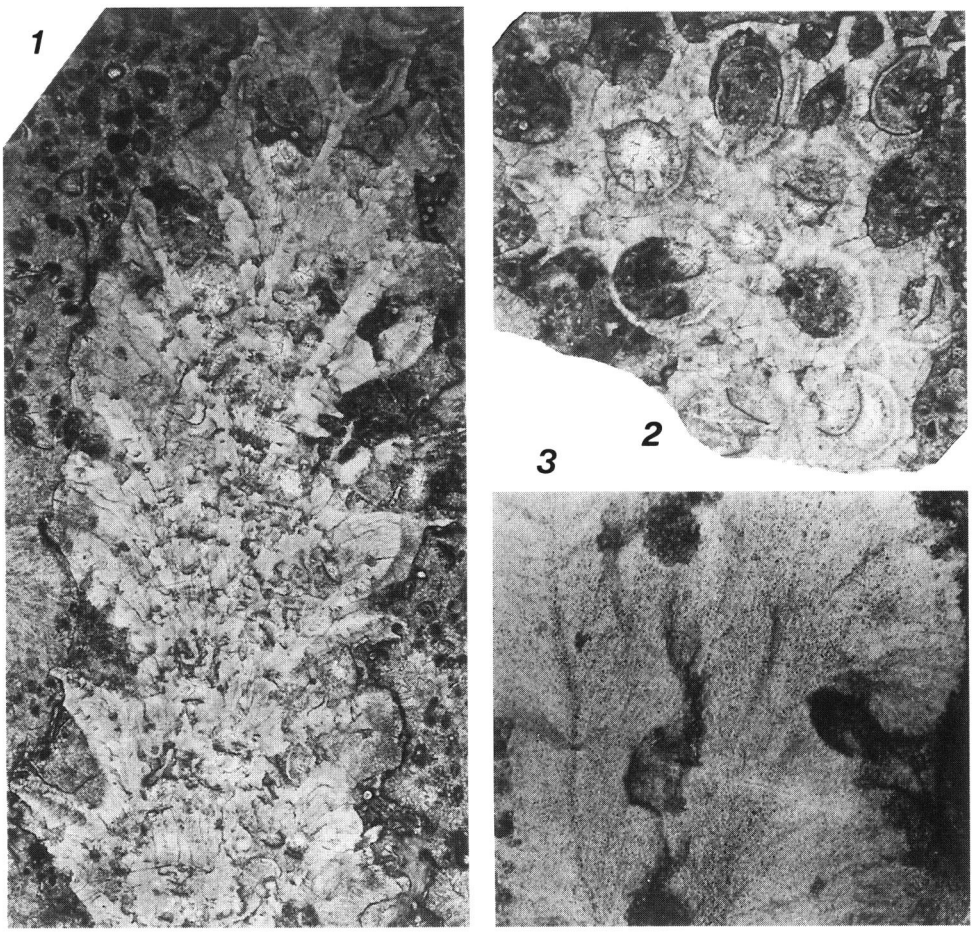
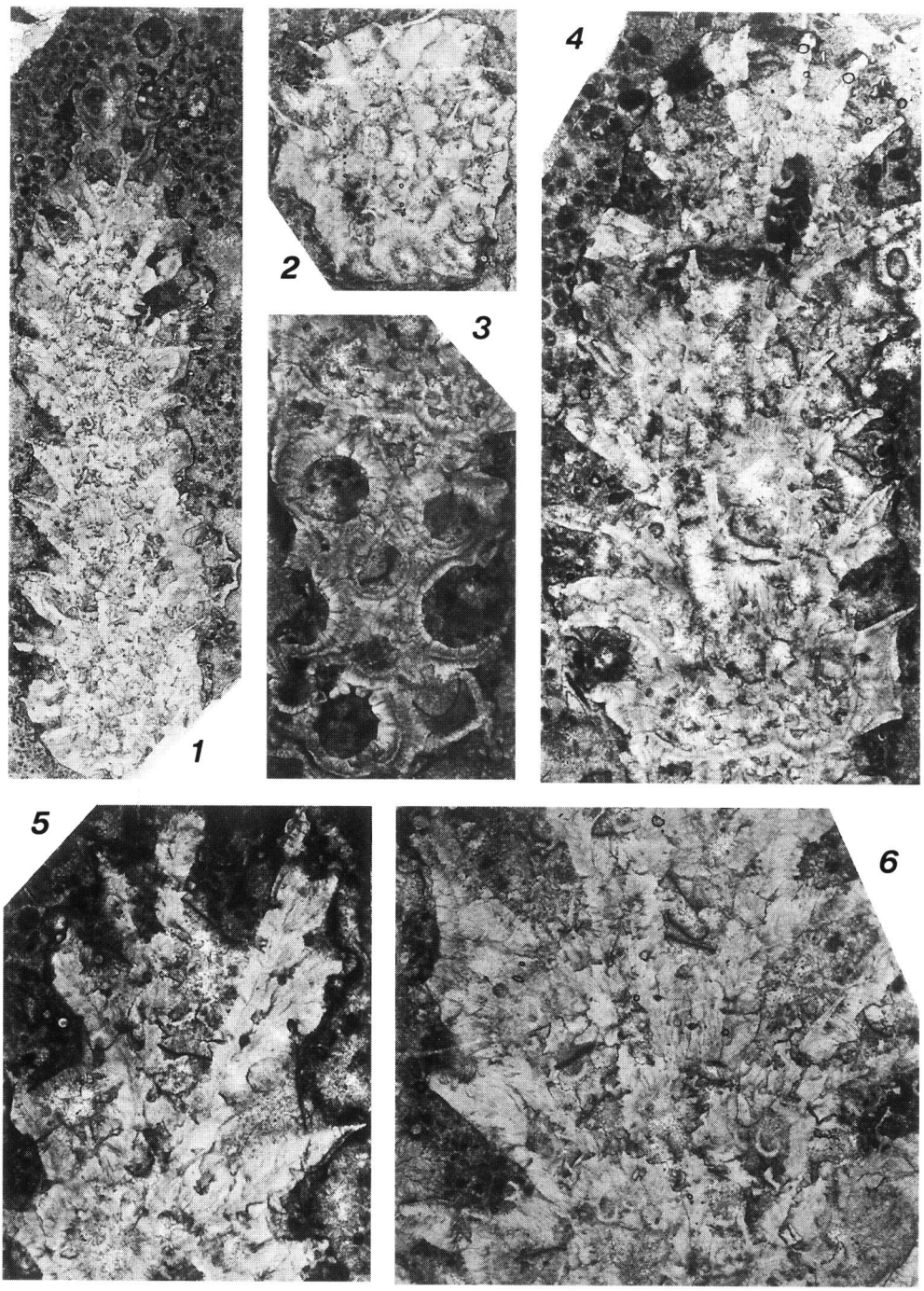



Fig. 2. *Sinkiangopora kurohimensis* sp. nov., thin sections. holotype, NSM PA14615. 1, longitudinal section, ×10. 2, transverse section, ×10. 3, details of intercorallite walls and mural pores, ×70.

## Systematic Paleontology

Order Favositida Wedekind, 1937
Suborder Favositina Wedekind, 1937
Family Pachyporidae Gerth, 1921
Genus *Sinkiangopora* Tchi, 1961

*Type species*: *Sinkiangopora sinkiangensis* Tchi, 1961.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### *Sinkiangopora kurohimensis* sp. nov.

Figs. 2; 3; 4-4

*Holotype*: NSM PA14615, from which seven thin sections were made.

*Other specimen*: Three thin sections were studied from a paratype, NSM PA14616.

*Diagnosis*: Species of *Sinkiangopora* with relatively slender branches indicating approximately 5.1 mm in diameter, usually 1.3–1.6 mm in corallite diameter, oblique calices, numerous squamulae, well-developed mural pores; intercorallite walls thick even in proximal corallites; tabulae sporadic, irregular both distribution and profile.

*Description*: Coralla ramose with cylindrical and relatively slender branches for genus, whose diameters range from 3.7 to 7.0 mm with 5.1 mm mean, cerioid; branching rare, may bifurcate; total corallum diameter and growth form unknown owing to fragile nature. Corallites prismatic, indistinct 4–8 sided; 27–32+ corallites recognized in cross section of branch; each corallite consists of narrowly divergent proximal portion and distal outwardly curved portion forming deep calice that opens obliquely upward with 45°–80°, usually 50°–60°, in angle to branch axis; corallite diameters variable even in peripheral zone of branch, range from 0.3 to 1.8 mm, usually 1.3–1.6 mm; calical apertures nearly circular, also variable in diameter with 0.3–1.5 mm; increase of new corallites is lateral, relatively rare; cross sections of tabularia are indistinct polygonal to subcircular in proximal corallites and nearly circular in distal corallites. Intercorallite walls of proximal corallites thick with usually 0.21–0.36 mm in thickness, then gradually thickened further toward distally attaining 0.61 mm in thickness; they composed of thin median dark line, that is partly disappeared, and stereoplasm with banded and radially microfibrous structure; mural pores circular in cross section with approximately 0.15 mm in diameter, well-developed, forming 1–2 row(s) in each corallite face; vermiform mural tunnels recognized in most distal intercorallite wall with diameters of approximately 0.06 mm in cross section; squamulae numerous, long and very wide, attain 0.25 mm in length and 0.36 mm in width, upturned and strongly concave; tabulae sporadic in comparing with type species, irregular in distribution, usually complete but some of them attached to squamulae or indicating dissepiment-like forms; profiles of tabulae irregular, nearly flat, strongly curved, especially some incomplete tabulae denote sharp upward bend and forming nearly vertical ends.

*Discussion*: *Sinkiangopora kurohimensis* sp. nov. has the numerous squamulae that are the most distinctive feature separating from other species of the genus. Only

←Fig. 3. *Sinkiangopora kurohimensis* sp. nov., thin sections. 1, 3–6, holotype, NSM PA14615. 1, longitudinal section, ×5. 3, tangential section near calical aperture, ×10. 4, longitudinal section, note incomplete tabulae, ×10. 5, oblique section, ×14. 6, longitudinal section, note strongly concave squamulae, ×14. 2, paratype, NSM PA14616, transverse section, ×10.

an Early Permian species, *Sinkiangopora yuquanensis* Tchi (1980, pl. 86, figs. 6 a–c, pl. 87, figs. 4 a, b) from Hei Long Jiang of North China, possesses well-developed squamulae, but differs from this new species in having the large diameters of the branch (20 mm versus approximately 5.1 mm in *S. kurohimensis*), the thin proximal intercorallite walls and the perpendicular opening of the calices. With the exception of fewer number of the squamulae and the mural pores than those of *Sinkiangopora kurohimensis*, *Acaciaporella jilinensis* Tchi (1980, pl. 87, figs. 5 a, b, 6 a, b; type and only known species of the genus) from the Lower Permian in Jilin of North China bears close resemblance to this new species. These features are not enough to classify into separate genera, thus *Acaciaporella* (Tchi, 1980) seems to be a subjective junior synonym of *Sinkiangopora*. There are 12 (or 13) previously described species referable to *Sinkiangopora* that known from the Late Carboniferous (Gzhelian) to Early Permian in Xinjiang, Xizang (Tibet), Hei Long Jiang, and Jilin. This Middle Carboniferous species, therefore, represents the oldest record of *Sinkiangopora* and the first generic occurrence outside of China.

Hill (1981) suggested a possibility that *Sinkiangopora* is synonimized with the Early to Middle Carboniferous genus *Acaciapora* (Moore and Jeffords, 1945; type species, *Michelinia subcylindrica* Mather, 1915). However, misapprehension between squamula and tabula, which is a Hill's hypothesis, is quite improbable because of their characteristic microstructure. The combination of the tabulae and the septal spines and/or squamulae appears to be distinctive of *Sinkiangopora*. The authors consider it as a valid genus diverging from *Striatopora* (Hall, 1851) or *Thamnopora* (Steininger, 1831) in the Carboniferous.

*Etymology*: The specific name is derived from Mt. Kurohime-yama. The type locality is situated on the northern flank of this mountain.

Order Auloporida Sokolov, 1947
Superfamily Syringoporicae Fromentel, 1861
Family Periphaceloporidae Hill, 1981
Genus *Mandulapora* Ding in Ding *et al.*, 1984

*Type species*: *Mandulapora permica* Ding in Ding *et al.*, 1984.

***Mandulapora yamagiwai*** Niko, 1999

Fig. 4-1–3

*Mandulapora yamagiwai* Niko, 1999, p. 38–42, figs. 7-1–3; 8-1–4; 9-1. (with earlier synonymy)

*Material examined*: Four coralla, NSM PA14611–14614.

*Discussion*: This species has been well-described by Niko (1999). Its connecting tubuli and complete tabulae are the most distinguishable respects of *Mandulapora yamagiwai* from *Pseudoromingeria kotoi* (Yabe and Hayasaka, 1915) of which

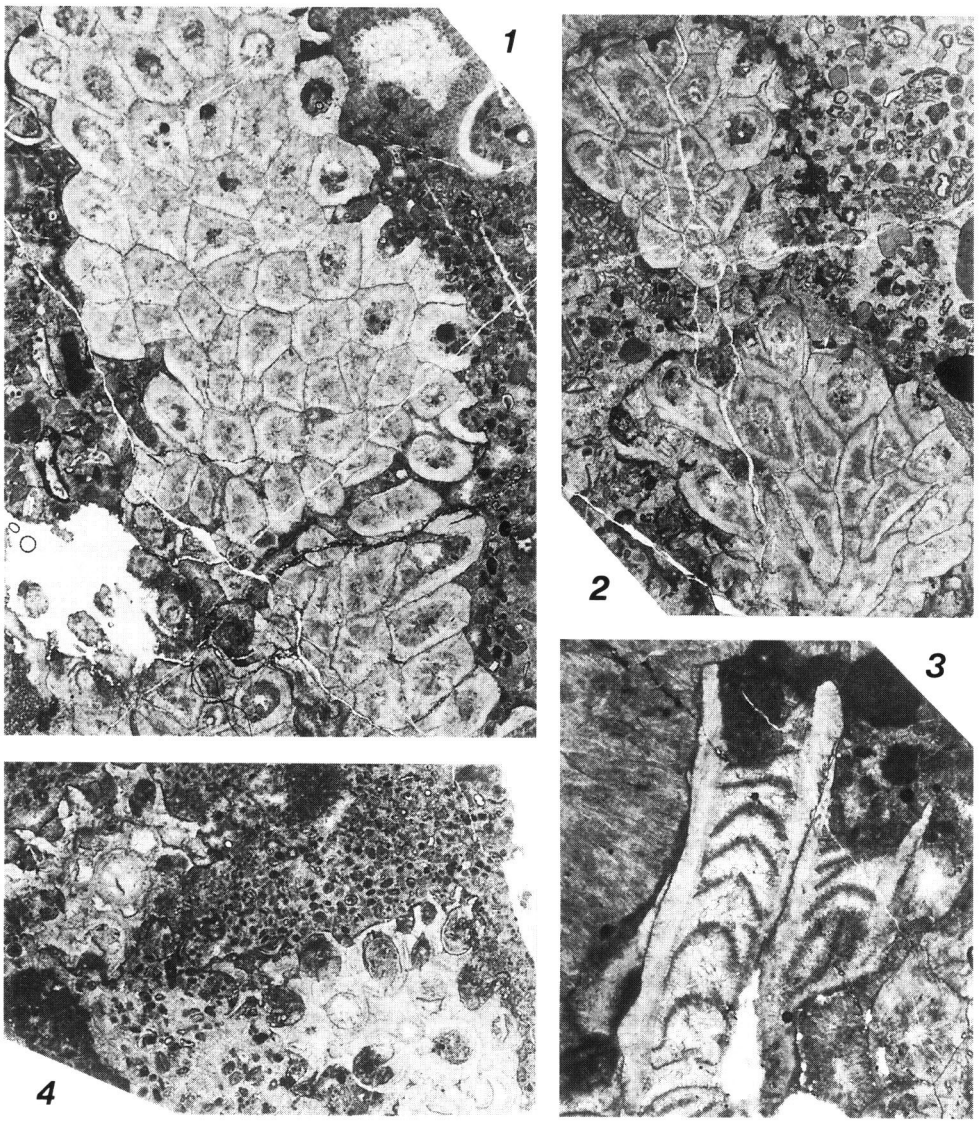


Fig. 4. 1–3, *Mandulapora yamagiwai* Niko, 1999, thin sections. 1, 3, NSM PA14611. 1, transverse section, ×5. 3, longitudinal section, showing tabulae, ×14. 2, NSM PA14614, transverse and oblique sections, ×5. 4, *Sinkiangopora kurohimensis* sp. nov., thin section, holotype, NSM PA14615, transverse sections, ×5.

species was listed by Yoshida *et al.* (1987) from the upper Visean strata of the Omi Limestone Group. The occurrence of *Mandulapora yamagiwai* is restricted to the seamount-type reefal complexes in the Akiyoshi Terrane including the Akiyoshi Limestone of Yamaguchi Prefecture, the Hina Limestone of Okayama Prefecture, and the present Omi Limestone Group.

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