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Sinkiangopora kanumai, a New Tabulate Coral Species from the Permian Mizuyagadani Formation, Gifu Prefecture, Japan

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Abstract A pachyporid tabulate coral, *Sinkiangopora kanumai* sp. nov., is described from the Sakmarian (Early Permian) deposits of the lowest Mizuyagadani Formation in the Fukuji area, Gifu Prefecture, Central Japan. The new species is characterized mainly by having thick intercorallite walls for the genus, partly free calical rims, and incomplete tabulae. Two Chinese species, namely *S. qianggongensis* Lin, 1983 from Xizang and *S. obesa* Tchi, 1961 from Xinjiang, are comparable with *S. kanumai*.

Key words: Early Permian, tabulate coral, Pachyporidae, *Sinkiangopora kanumai* sp. nov., Mizuyagadani Formation, Gifu, Central Japan

Introduction

The Early Carboniferous to Early Permian genus *Sinkiangopora* Tchi, 1961, is relatively rare pachyporid tabulate coral, and it is known endemically from East Asia, including China (Xinjiang, Xizang, Hei Long Jiang, and Jilin) and Japan (Omi and Akiyoshi). Four-teen species of *Sinkiangopora* have been recorded in the literature (Lin, 1983; Niko and Haikawa, 2008; Niko and Hasegawa, 2000; Tchi, 1961, 1980; Wu, 1975). During the field works by Messrs. Yoshihito Senzai and Yukio Miyake, an undescribed species of the genus was collected from the Permian Mizuyagadani Formation in the Fukuji area, Gifu Prefecture, Central Japan. The studied material consisting of eight coralla was recovered from the lowest strata (Sakmarian) of the formation, whose geologic setting has been compiled by Niko (2001). The aim of this study is to establish a new species, *S. kanumai*, for this newly collected material.

Systematic Paleontology

Order Favositida Wedekind, 1937

Suborder Favositina Wedekind, 1937

Superfamily Pachyporoidea Gerth, 1921

Family Pachyporidae Gerth, 1921

Genus ***Sinkiangopora*** Tchi, 1961

Type species: *Sinkiangopora sinkiangensis* Tchi, 1961.

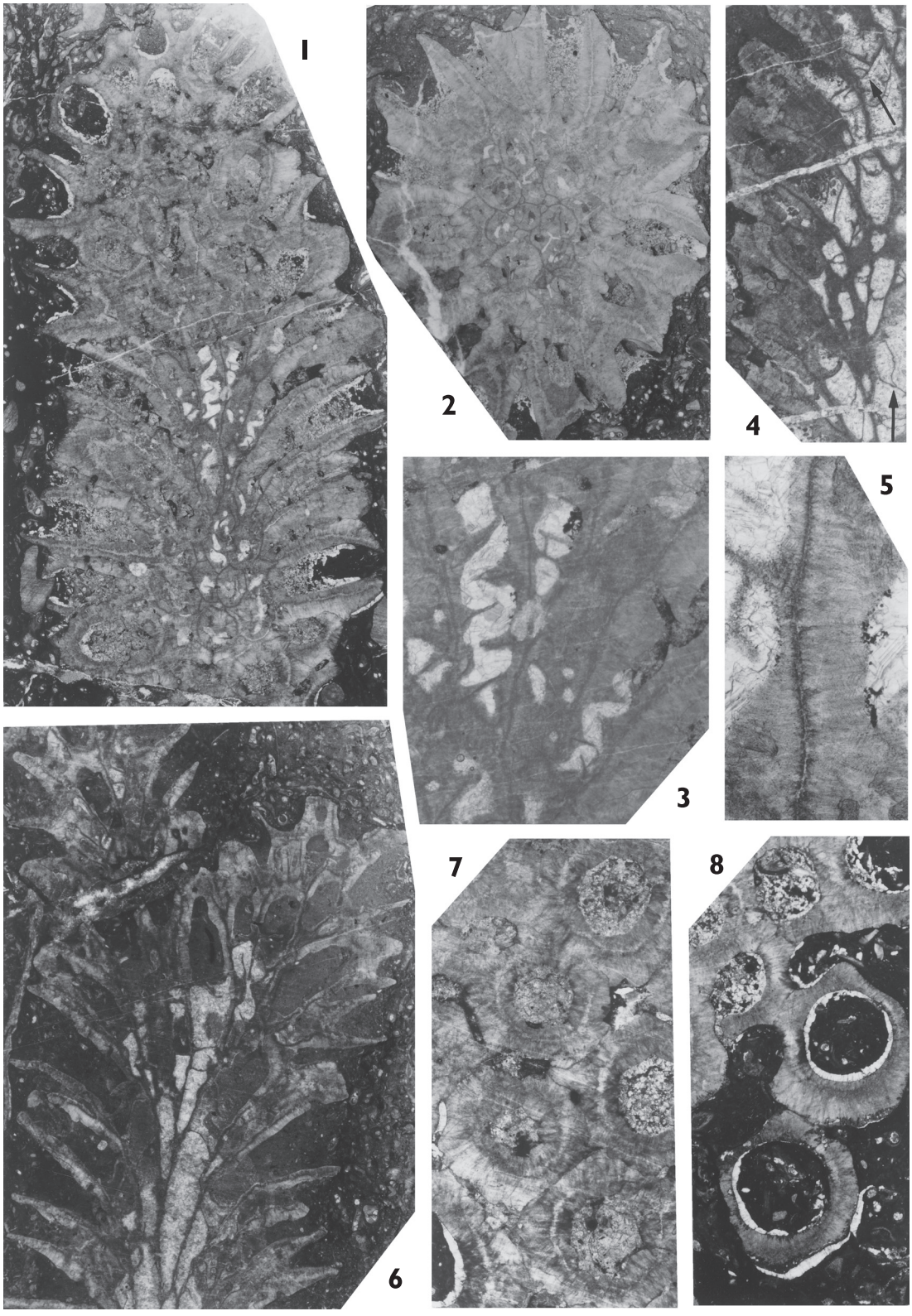
Sinkiangopora kanumai sp. nov.

(Figs. 1-1–8)

Holotype: NSM PA16717, from which 15 thin sections were made.

Other specimens: Thirty-two sections were studied from the seven paratypes, NSM PA16676–16679, 16718, 16731, 16732.

Diagnosis: Species of *Sinkiangopora* with moderate branch diameter ranging 6.0–12.8 mm (approximately 10 mm in mean) and subprismatic to nearly cylindrical distal corallites; diameters of full-grown corallites are approximately 2.2 mm; opening angle of calices 50°–90°; calical rims partly free; intercorallite walls thick for genus, attain 1.4 mm in peripheral stereozone; some squamulae strongly thickened; tabulae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complete or incomplete in rare cases.

Description: Coralla ramose with cylindrical branches, mostly cerioid; diameters of branches moderate, range from 6.0 to 12.8 mm with approximately 10 mm in mean; branching relatively rare, bifurcate; total corallum diameter and growth form are unknown owing to its fragile nature. Proximal corallites prismatic having indistinct 3–8 sides in profile, then they distally shift to subprismatic to nearly cylindrical forms; there are 37–51 corallites in transverse section of branch; each corallite consists of narrowly divergent proximal portion and outwardly curved to nearly horizontal distal portion, the former of which forms axial zone of branch; peripheral zone of branch composed by distal portions of corallites; ratios of axial zone per branch diameter are 0.2–0.3; diameters of corallites variable even at peripheral zone, range from 0.3 to 2.5 mm; mean diameter of full-grown corallites is approximately 2.2 mm; calices deep, open nearly perpendicular to oblique with more than 50° to branch surface; calical rims partly free; calical pits usually have circular in transverse section, also variable in diameter; in axial zone of gerontic branch, tabularia (lumina) almost closed by intercorallite wall thickening; increases of new corallites lateral, commonly occurs in axial zone. Intercorallite walls relatively thin, 0.09–0.17 mm, in axial zone, then rapidly thickened toward distally attaining approximately 1.4 mm to form peripheral stereozone; in gerontic branch, stereozone spreads over axial zone; they composed of thin median dark line and stereoplasm; microstructure of stereoplasm is rect-radiate fibers; mural pores indicate circular to subcircular transverse sections, well-developed on corallite faces and near corallite angles; in stereozone, mural pore shifts vermiform and rarely anastomosed mural tunnel; diameters of mural pores (and tunnels) are usually 0.10–0.18 mm; squamulae triangular, usually thin, but some of them strongly thickened attaining 0.40 mm in stereozone; mode of occurrence of squamula ranges from almost absent to numerous; crowded squamulae partly exhibit alternative arrangement; there are 0–6 squamulae in 2.5 mm of corallite length; profiles of squamulae weakly concave; length of squamulae 0.42–0.80 mm; tabulae also variable in occurrence, almost absent to well-developed with irregular spacing; most tabulae complete, but incomplete ones rarely recognized; profiles of complete tabulae are nearly flat, concave proximally, and oblique; there are 0–4 tabulae in 2.5 mm of corallite length; short diaphragms rarely occur between adjoining squamulae.

Etymology: The specific name honors the late Dr. Mosaburo Kanuma, in recognition of his contributions for the Paleozoic stratigraphy in Gifu Prefecture.

Occurrence: Calcareous shale (NAM PA16677–16679, 16717, 16718, 16732), impure limestone (NSM PA16731), and limestone (bioclastic wackestone, NSM PA16676) of the lowest part (Sakmarian; Early Permian) of the Mizuyagadani Formation. Fossil locality is identical with MZY 7 in Niko (2000).

Repository: All examined specimens are reposited in the National Science Museum, Tokyo.

Discussion: Some important characteristics, such as general corallite shape, corallite diameters, opening angle of the calices and intercorallite wall thickness, of an Early Permian species, *Sinkiangopora qianggongensis* Lin (1983, p. 82, pl. 4, figs. 2a–c, pl. 8, figs. 3a–d) from the

Fig. 1. *Sinkiangopora kanumai* sp. nov., thin sections. **1**–**3**, **5**, **7**, **8**, holotype, NSM PA16717. **1**, longitudinal to oblique section of gerontic branch, ×5. **2**, transverse section of gerontic branch, ×5. **3**, partial enlargement of Fig. 1-1 to show details of squamulae, diaphragm, and mural tunnels, ×14. **5**, partial enlargement to show intercorallite wall structure, ×50. **7**, transverse sections of distal corallites, ×10. **8**, transverse sections of distal corallites near branch surface, note partly free calical rims, ×10. **4**, paratype, NSM PA16676, longitudinal section of branch, arrows indicate incomplete tabulae, ×5. **6**, paratype, NSM PA16731, longitudinal to oblique sections of immature branches, ×5.

Langco Formation of Xizang (Tibet), agree closely with those of *S. kanumai* sp. nov. The new species, however, has the narrower branch, i.e., approximately 10 mm versus 13–14 mm in diameter of *S. qianggongensis* and the partly free calical rims. In addition, the incomplete tabulae are rarely developed in *S. kanumai*, while the tabulae of *S. qianggongensis* are essentially complete.

Sinkiangopora kanumai shows similarities, in particular the gerontic branches, to *S. obesa* Tchi (1961, p. 293, pl. 1, figs. 4a, b, pl. 2, figs. 4a–c) from the Upper Carboniferous Kangkelin Group, Xinjiang, but differs by having the thicker intercorallite walls at the peripheral stereozone (approximately 1.4 mm versus 1.0 mm in *S. obesa*) and the incomplete tabulae. Tchi (1961) described *S. sinkiangensis* and *S. irregulare* from the identical strata with *S. obesa*. The former two species also show some similarities with the immature to mature branches of *S. kanumai*. Thus, there is a possibility that they respectively represent different growth stages of a single species.

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