

Axulites higoensis, a new species of tabulate coral from the Silurian Fukami Formation, Kumamoto Prefecture, Japan

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Abstract A coenitid tabulate coral, *Axulites higoensis* sp. nov., is described from the Ludlow (early Late Silurian) limestone of the Fukami Formation in Kumamoto Prefecture, southern Japan. *Axulites notabilis* Sharkova, 1963, from the Upper Silurian of Kazakhstan is most closely related to this new species, but it has somewhat smaller diameters of corallites and more closely spaced tabulae. Because *Axulites* previously documented only from the Urals, Central Asia and south-western Australia, the present discovery extends the geographic range of the genus to East Asia.

Key words: Ludlow (early Late Silurian), Fukami Formation, *Axulites*, Coenitidae, tabulate coral

Introduction

The Fukami Formation consists of limestone, tuffaceous shale and acidic pyroclastic rocks (Matsumoto and Kanmera, 1964). Among them, limestone yields abundant marine fossils ranging from Wenlock (late Early Silurian) to Ludlow (early Late Silurian) in age (Murata, 1992). Following Niko (2015), this fascicle describes a new species of coenitid tabulate coral from the formation on the basis of material collected in the Fukami area, Kumamoto Prefecture, southern Japan.

Systematic Paleontology

Subclass Tabulata Milne-Edwards
and Haime, 1850

Order Favositida Wedekind, 1937

Suborder Alveolitina Sokolov, 1950

Family Coenitidae Sardesson, 1896

Genus *Axulites* Sharkova, 1963

Type species: *Axulites notabilis* Sharkova (1963, p. 119, figs. 1-a, b, v, g), from the Upper Silurian of Kazakhstan.

Discussion: *Axulites* was proposed by Sharkova (1963) as a new coenitid genus. Subse-

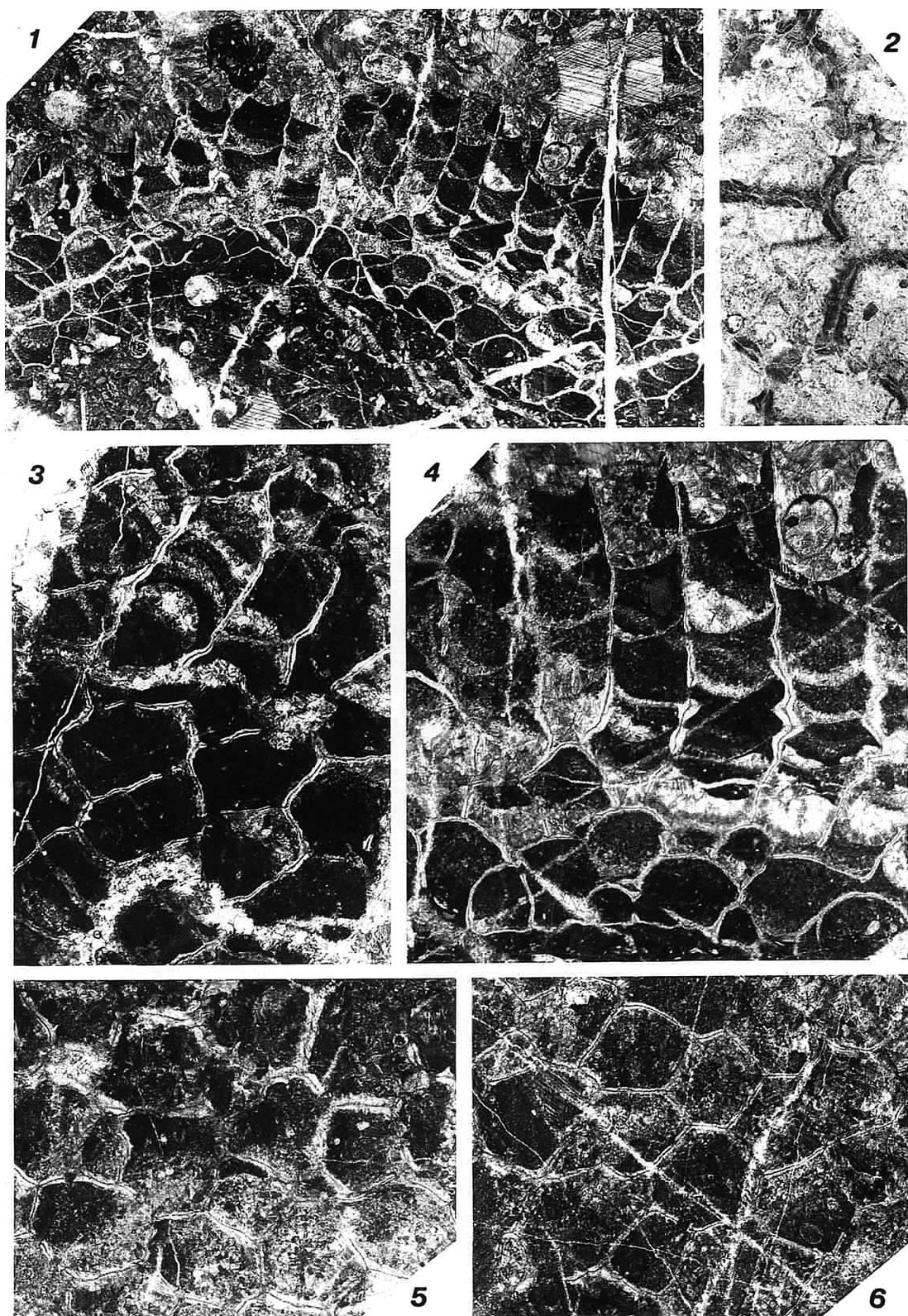
quently, Hill (1981) tentatively placed *Axulites* within the Alveolitidae in the Treatise and Lin *et al.* (1988) replaced the genus back to the Coenitidae. Because *Axulites* has several synapomorphies found in a coenitid *Planocoenites* Sokolov, 1952, the author regards the genus as a coenitid. *Axulites* differs from *Planocoenites* only in lacking visor-like projections at the calic rim.

Axulites higoensis sp. nov.

(Figs. 1–6)

Material examined: Holotype, NMNS PA18350, from which six thin sections were made. Paratypes, NMNS PA18352, 18353. In addition, a single poorly preserved specimen, NMNS PA18351, also assigned to *Axulites higoensis* sp. nov. They are repositied in National Science Museum of Nature and Science, Tokyo (prefixed NMNS).

Diagnosis: Species of *Axulites* with relatively large corallite diameters, commonly 1.4–1.8 mm in cerioid portion; intercorallite walls mostly thin, 0.05–0.07 mm, but attaining 0.25 mm in thickened part; mural pores common; septal spines sporadic, short; spacing of tabulae wide,



1–3 tabulae in 2 mm.

Description: Coralla encrusting, thick tabular in growth form; the largest fragment of corallum (holotype) attains 58 mm in diameter and 9 mm in height. Basal part of corallum is alveolitoid that composed of prostrate corallites having fan-shaped, semicircular to subtrapezoidal transverse sections; more distal corallites indicate erect and prismatic forms with transverse sections of 4–8 sided polygonal, to form cerioid part; ratios of height of alveolitoid portion per corresponding corallum height are approximately 0.3–0.4; diameters of corallites are relatively large for the genus, 0.8×0.4 to 1.7×1.2 mm in alveolitoid and 1.0–2.1 (commonly 1.4–1.8) mm in cerioid portions; form ratios (width/height) of prostrate corallites are approximately 1.2–2.0; calices very shallow; increase of new corallites is not observable. Intercorallite walls mostly thin, 0.05–0.07 mm, but partial thickening developed, where wall thickness attains 0.25 mm; structurally, intercorallite walls differentiated into median dark line and stereoplasm; microstructure of stereoplasm is not preserved; mural pores commonly occur in corallite faces and at corallite angles; diameters of pores are approximately 0.13 mm; septal spines sporadic, high conical to needle-like with short length, 0.08–0.19 mm; tabulae complete, weakly concave; spacing of tabulae is wide; there are 1–3 tabulae in 2 mm of corallite length.

Etymology: The specific name is derived from Higo, where is the historic province name of the type locality.

Occurrence: Rare in gray limestones (Ludlow; early Late Silurian) at locality 2 (NMNS PA18350) and 3 (NMNS PA18351–18353). Detailed geographic positions of these localities are given in Niko (2015).

Discussion: Among previously known three

Silurian species of *Axulolites*, the generic type, *A. notabilis*, is most closely related to *A. higoensis* sp. nov. However, *A. notabilis* has somewhat smaller diameters of corallites (1–1.5 mm) and more closely spaced tabulae (approximately 3–6 tabulae in 2 mm) than those of *A. higoensis*. *Axulolites karashokensis* (Sharkova in Litvinovich *et al.*, 1963, p. 154, 155, pl. 24, figs. 2, 3) clearly differs from the new species in having more numerous mural pores. *Axulolites borisiakae* (Chernyshev in Vasilyuk *et al.*, 1960, p. 186, 187, pl. 31, figs. 4a, b) is diagnosed by very long and well-developed septal spines.

Previous records of *Axulolites* were limited in the Urals, Central Asia including Kazakhstan and Outer Mongolia, and southwestern Australia (Sharkova, 1963; Hill, 1981). Thus, the present discovery from the Fukami Formation extends the geographic range of the genus to East Asia.

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Fig. 1. *Axulolites higoensis* sp. nov., thin sections. 1–5, holotype, NMNS PA18350. 1, longitudinal section of corallum, $\times 5$. 2, partial enlargement of Fig. 1-5 to show details of septal spines, mural pores and intercorallite wall structure, negative print, $\times 14.5$. 3, transverse to oblique sections of corallites, $\times 10$. 4, partial enlargement of Fig. 1-1 to show transverse sections of corallites in alveolitoid and longitudinal sections of ditto in cerioid portions, $\times 10$. 5, transverse sections of corallites, $\times 10$. 6, paratype, NMNS PA18352, transverse sections of corallites, $\times 10$.

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