

## Devonian Coenitid Tabulate Corals from the Fukuji Formation, Gifu Prefecture

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**Abstract** Two Early Devonian species of coenitid tabulate corals, *Coenites fukujiensis* sp. nov. and *Planocoenites ozakii* sp. nov., are described from the D4 Member (Emsian?) or the float blocks probably derived from this member of the Fukuji Formation in the Fukuji area, Gifu Prefecture. *Coenites fukujiensis* is diagnosed by its strong sinuations in the intercorallite walls, whose morphology separates it from all other species of the genus. The most similar species with *Planocoenites ozakii* is *Placocoenites* [sic] *hinganensis* Tchi, 1980 that known from Heilongjiang, Northeast China. But, the Chinese species has the much thicker coralla and the attenuated intercorallite walls. Comparable form with *Planocoenites ozakii* is also reported from the Hitoegane Formation, Gifu Prefecture.

**Key words:** Early Devonian, tabulate corals, Coenitidae, *Coenites*, *Planocoenites*, Fukuji Formation, Gifu

### Introduction

Modern systematic treatment concerning coenitid corals from the Lower Devonian Fukuji Formation is resulted in identification of two new species, namely *Coenites fukujiensis* and *Planocoenites ozakii*. Succeeding to the first one (Niko, 2001), this contribution is the second of a larger study to document the tabulate coral fauna of this formation in the Fukuji area, Gifu Prefecture, Central Japan. Specimens described herein are deposited in the Hikaru Memorial Museum (prefix HMM), Takayama or the National Science Museum (prefix NSM), Tokyo.

### Systematic Paleontology

Order Favositida Wedekind, 1937

Suborder Alveolitina Sokolov, 1950

Family Coenitidae Sardeson, 1896

Genus *Coenites* Eichwald, 1829

*Type species:* *Coenites juniperinus* Eichwald, 1829.

### *Coenites fukujiensis* sp. nov.

(Figs. 1-1–4; 2-1–4)

*Holotype:* HMM 03037, from which 29 thin sections were made.

*Diagnosis:* Species of *Coenites* with subcylindrical branches, usually 3.6–5.2 mm in diameter, and crescentic calical pits having approximately 0.51 mm in width and 0.16 mm in height; opening angle of calices usually 60°–80°; intercorallite walls exhibit strong sinuations, attain 0.36 mm in thickness; mural pores common, large; tabulae rare.

*Description:* Corallum ramose with subcylindrical branches, cerioid-like in axial zone and alveolitoid in peripheral zone of branch; diameters of branches moderate for genus, range from 3.0 to 7.6 mm, usually 3.6–5.2 mm; branching common, bifurcate to umbelliferous; total corallum diameter and growth form unknown owing to fragile nature. Corallites slender for order but moderate for genus; each corallite consists of longitudinally directed proximal portion forming axial zone of branch and outwardly curved distal portion forming relatively wide pe-

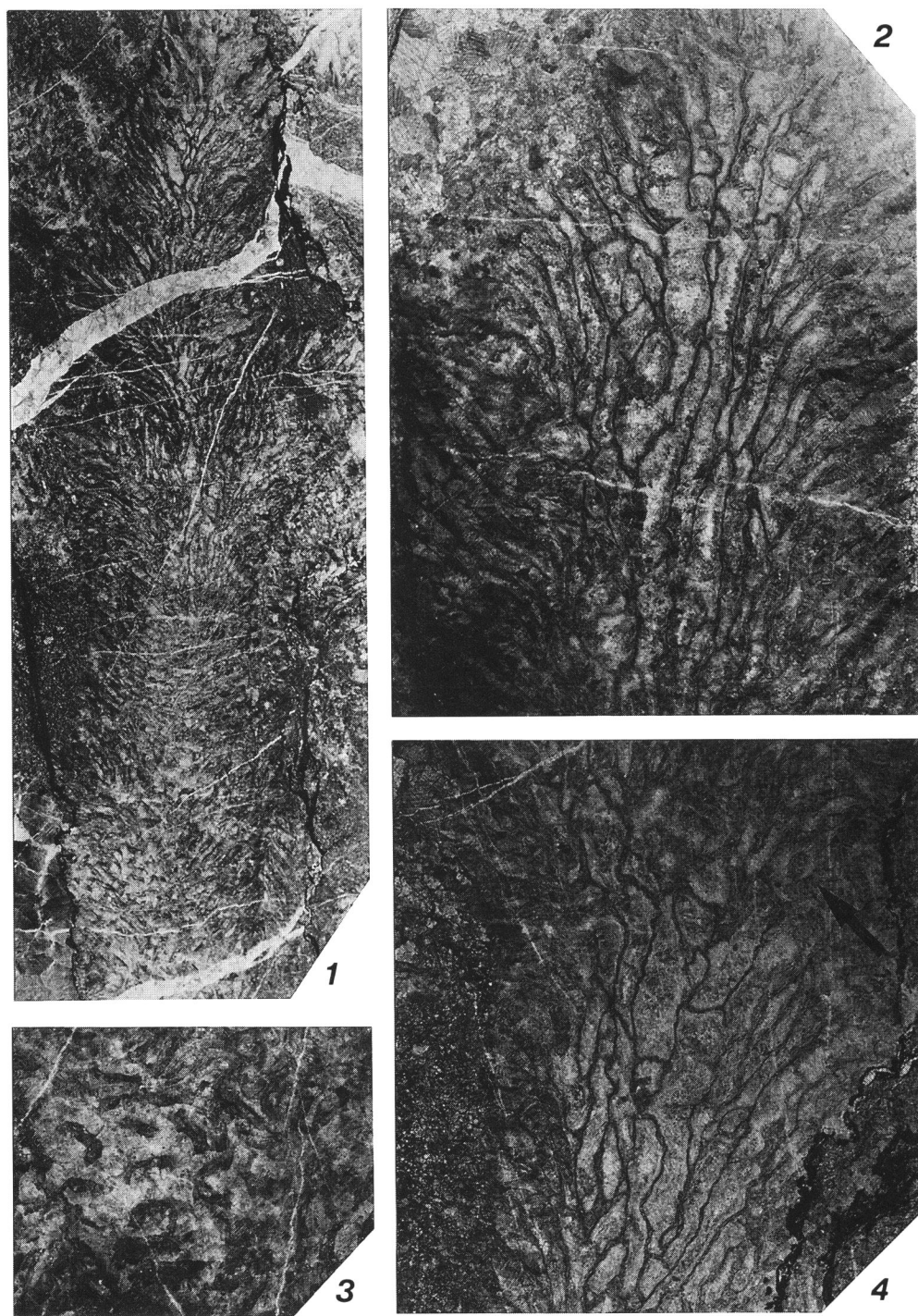


Fig. 1. *Coenites fukujiensis* sp. nov., holotype, HMM 03037, thin sections. 1, longitudinal section of branch,  $\times 5$ . 2, longitudinal section of branch,  $\times 14$ . 3, transverse sections of corallites near calical rim,  $\times 14$ . 4, longitudinal section of branch, arrow indicates mural pore,  $\times 14$ .

ripheral zone of branch; transverse sections of corallites are variable in profile with indistinct polygonal, fan-shaped, crescentic and deformed elliptical in proximal portion, and may be elliptical in distal portion; diameters of typical proximal corallites are 0.26 mm in polygonal ones and  $0.51 \times 0.20$  mm in elliptical ones; diameters of distal corallites reach approximately 0.9 mm in width and 0.5 mm in height near calical rim; increase of new corallites lateral, commonly occurs in axial zone of branch; calices deep, to open oblique upward with  $38^\circ$ – $83^\circ$ , usually  $60^\circ$ – $80^\circ$ , in angle to surface of branch; calical pits are crescentic in transverse section with 0.46–0.59 mm, 0.51 mm mean, in width and 0.10–0.23 mm, 0.16 mm mean, in height; form ratios (height/width) of calical pits range from 0.22 to 0.46. Intercorallite walls exhibit strong sinuations; structurally they differentiated into median dark line and stereoplasm in proximal corallites, but this differentiation becomes indistinct by lacking median dark line in distal corallites where thickness of intercorallite walls abruptly increased as peripheral stereozone, thus profiles of distal corallites become obscure; thickness of intercorallite walls is 0.06–0.13 mm in proximal corallites and attains 0.36 mm in peripheral stereozone; microstructure of stereoplasm is not preserved; mural pores common near corallite edges, large for genus, elliptical, usually  $0.14 \times 0.29$  mm in diameter; septal spines well-developed, but restricted in calical pit, low conical with usually 0.08 mm in length of protruded part; tabulae rare, complete, nearly rectangular to corallite.

**Discussion:** The strong sinuations in the intercorallite walls of *Coenites fukujiensis* sp. nov. are distinctive, as no other species of the genus has a similar structure. Although Hamada and Itoigawa (1983, p. 11, fig. 3) figured a specimen under the generic name *Coenites* from the Fukuji Formation, it lacks the alveoloid portion in the corallites. The cerioid corallites throughout all growth stages of this coral reject its assignment from *Coenites*.

**Etymology:** The specific name is derived from the Fukuji Formation, from which this

species occurs.

**Occurrence:** *Coenites fukujiensis* sp. nov. was collected from a float block of black limestone (bioclastic wackestone) in talus at the Kanashirozako Valley (locality FH-6 in Niko, 2001). This block is probably derived from the D4 Member (Emsian?) of the Fukuji Formation.

#### Genus *Planocoenites* Sokolov, 1952

**Type species:** *Coenites orientalis* Eichwald, 1861.

#### *Planocoenites ozakii* sp. nov.

(Figs. 2-5; 3-1–4)

**Holotype:** HMM 06702, from which three thin sections were made.

**Other specimens:** Six thin sections were studied from the two paratypes, NSM PA14958, 15008.

**Diagnosis:** Species of *Planocoenites* with thin coralla, usually 1.0–1.6 mm in thickness, and semielliptical, elliptical to crescentic calical pits, approximately 0.36 mm in width and 0.15 mm in height; opening angle of calice usually  $40^\circ$ – $50^\circ$ ; intercorallite walls abruptly thickened toward calical rim, attain 0.59 mm; mural pores relatively rare; tabulae vary rare, uparched.

**Description:** Coralla encrusting, laminar in growth form, consisting of less than four layers of corallites, alveoloid; thickness of corallum is thin for genus with 0.6–1.8 mm, usually 1.0–1.6 mm; maximum observed size of largest corallum (paratype, NSM PA14958) composed of multiple lamellae attains approximately 49 mm in diameter and 56 mm in height. Corallites reclined; each corallite consists of prostrate proximal portion with subtrapezoid, semicircular or fan-shaped in transverse section, and upwardly directed distal portion of approximately 1.3–1.7 mm in length; proximal corallite diameters 0.19–0.48 mm in width and 0.21–0.33 mm in height; increase of new corallites relatively rare, lateral; calices mostly deep, oblique to nearly perpendicular with  $21^\circ$ – $85^\circ$ , usually  $40^\circ$ – $50^\circ$ , in angle to sur-

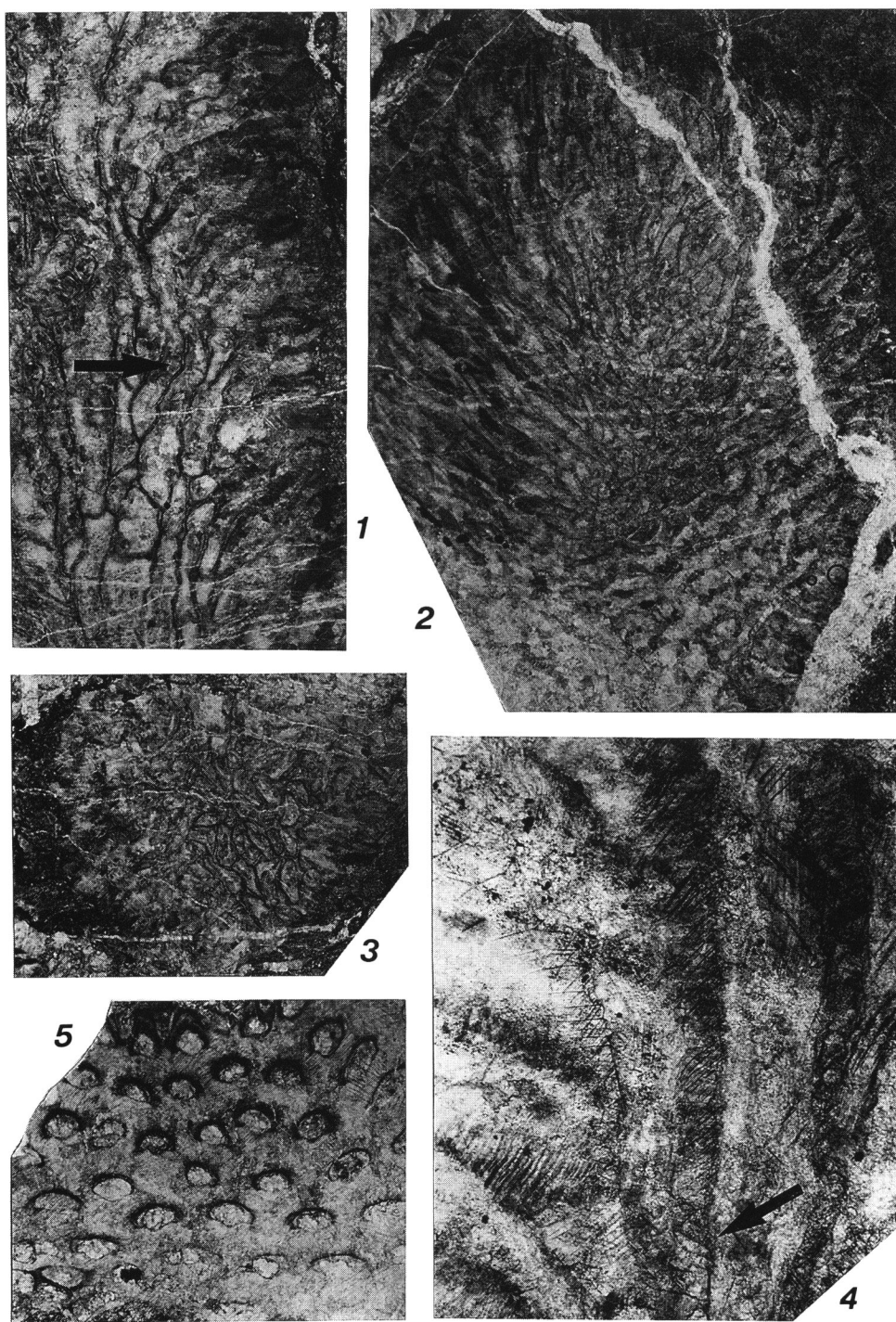


Fig. 2. 1–4, *Coenites fukujiensis* sp. nov., holotype, HMM 03037, thin sections. 1, longitudinal section of branch, arrow indicates tabula,  $\times 14$ . 2, oblique section of branch,  $\times 10$ . 3, transverse section of branch,  $\times 10$ . 4, partial enlargement to show intercorallite wall structure, arrow indicates median dark line,  $\times 75$ . 5, *Planocoenites ozakii* sp. nov., holotype, HMM 06702, thin transverse sections of corallites near calical rim,  $\times 14$ .



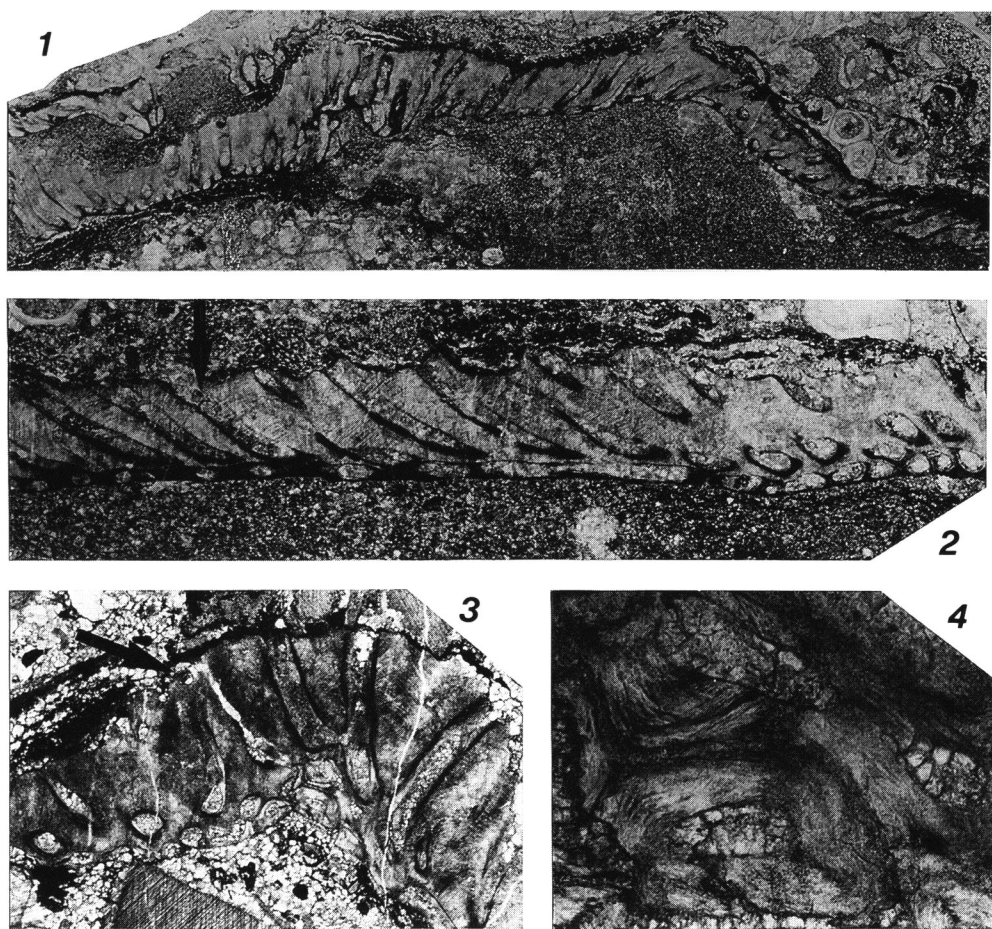


Fig. 3. *Planocoenites ozakii* sp. nov., thin sections. 1, 2, holotype, HMM 06702. 1, longitudinal section of corallum,  $\times 5$ . 2, longitudinal section of corallum, arrow indicates tabula,  $\times 14$ . 3, 4, paratype, NSM PA15008, thin sections. 3, longitudinal section of corallum, arrow indicates mural pore,  $\times 14$ . 4, partial enlargement of transverse sections of proximal corallites, to show well-preserved intercorallite wall structure,  $\times 75$ .

face of corallum; calical pits semielliptical, elliptical to crescentic in transverse section with 0.23–0.42 mm, 0.36 mm mean, in width and 0.08–0.21 mm, 0.15 mm mean, in height; form ratios (height/width) of calical pits range from 0.21 to 0.53. Intercorallite walls of proximal corallites are thin, 0.03–0.13 mm in thickness, and differentiated into median dark line and stereoplasm, then this structural differentiation becomes indistinct in distal corallites, where intercorallite walls abruptly thickened toward calical rim and attain 0.59 mm in thickness; profiles of distal corallites are obscure by lacking median dark line and abrupt thickening of intercorallite

walls; microstructure of stereoplasm is lamellar, in addition innermost dark layer partly developed in stereoplasm; mural pores relatively rare, restricted in calical pits, elliptical, usually  $0.09 \times 0.15$  mm in diameter; septal spine may be absent, but squamula-like projections rarely developed on less concave side of calical pit; tabulae vary rare, complete, weakly uparched in profile.

*Discussion:* *Planocoenites ozakii* sp. nov. bears strong similarities to *Placocoenites* [sic] *hinganensis* Tchi (1980, p. 177, pl. 82, figs. 2a, b) from the Middle Devonian of Heilongjiang, Northeast China. The latter species differs from this new species in having the much thicker

coralla (5 mm versus usually 1.0–1.6 mm in *Planocoenites ozakii*) and the attenuated intercorallite walls near the calical rims. *Planocoenites* sp. (Kamiya and Niko, 1998, p. 67, 69, text-figs. 1a–c, 2) from the Upper Silurian Hitoegane Formation, Gifu Prefecture is also similar to *P. ozakii*. However, the Hitoegane species has the well-developed mural pores.

**Etymology:** The specific name honors the late Dr. Kin-emon Ozaki in recognition of his pioneering works on the Middle Palaeozoic corals in the Hida-Gaien Belt including the Fukuji area.

**Occurrence:** *Planocoenites ozakii* sp. nov. was collected from gray crinoidal limestone (bioclastic grainstone–packstone) belonging to the D4 Member of the Fukuji Formation at locality FH-7 in the middle of the Ichino-tani Valley (latitude 36°13'2"N, longitude 137°31'28"E; NSM PA15008), and the two float blocks of black limestone (bioclastic wackestone) in the Ichino-tani Valley (HMM 06702) and the Osobu-dani Valley (NSM PA14958), whose blocks also may be derived from the D4 Member.

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types of *Coenites fukujiensis* sp. nov. and *Planocoenites ozakii*, whose specimens kept in the Hikaru Memorial Museum.

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