Report

Discovery of *Cyrtospirifer* (Late Devonian Brachiopoda) from Choanji in the South Kitakami Belt, northeastern Japan

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Abstract: Three *Cyrtospirifer* species (*Cyrtospirifer choanjiensis* sp. nov., *Cyrtospirifer* sp. 1 and *Cyrtospirifer* sp. 2) are described for the first time from Choanji, eastern part of the South Kitakami Belt, northeastern Japan. The occurrence of the Late Devonian brachiopod *Cyrtospirifer* from Choanji indicates the presence of Upper Devonian rocks in the Choanji area.

Keywords: brachiopod, Choanji, *Cyrtospirifer*, South Kitakami Belt, Upper Devonian

Introduction

Choanji (Hikoroichi-cho, Ofunato City, Iwate Prefecture), located in the eastern part of the South Kitakami Belt (Fig. 1), is a renowned fossil locality. The following marine invertebrate fossils have been previously described from sandstone at Choanji: one species of conulariid (Sugiyama, 1938, 1942); seven species of bryozoan (Sakagami, 1962); thirteen species of brachiopod (Minato, 1951, 1952); one species of pelecypod (Minato, 1951) and seven species of trilobite (Sugiyama, 1944; Okubo, 1951a; Endo and Matsumoto, 1962; Kobayashi and Hamada, 1980). The Choanji fauna has been considered the earliest Carboniferous (early Tournaisian) fauna in the South Kitakami Belt and in the whole of Japan (Minato, 1950; Okubo, 1951b; Minato and Kato, 1979).

Recently, I recognized some brachiopod specimens from Choanji belonging to the genus *Cyrtospirifer* in my brachiopod collection. *Cyrtospirifer* is one of the most widespread cyrtospiriferid genera: about 150 species (including varieties) of the genus have been described from the Upper Devonian of worldwide (Ma and Day, 2003). The range of *Cyrtospirifer* is now considered to be Late Devonian (Frasnian–lower Famennian; Johnson, 2006). Therefore, the occurrence

of *Cyrtospirifer* from Choanji indicates a Late Devonian age for the Choanji fauna and it implies the presence of Upper Devonian rocks in the Choanji area.

In this study, three *Cyrtospirifer* species (*Cyrtospirifer choanjiensis* sp. nov., *Cyrtospirifer* sp. 1 and *Cyrtospirifer* sp. 2) from Choanji are described and their stratigraphic significance is noted. The brachiopod specimens described herein are registered with the prefix NU-B, and housed in the Department of Geology, Niigata University, Niigata.

Stratigraphy

The brachiopod fossils were collected by the present author from bluish-grey, tuffaceous, fine-grained sandstone at locality CHJ1 (39°06'23"N, 141°41'21"E), an outcrop near the mouth of the Kogayosawa Valley, a tributary of the Sakarigawa River.

The fossil-bearing sandstone at Choanji was initially assigned to the basal part of the Carboniferous Tyoanji (Choanji) Group (Yabe and Sugiyama, 1937), on the basis of the presence of certain brachiopods; e.g., *Productus* cf. *semireticulatus* Martin [= *Dictyoclostus* cf. *semireticulatus* (Martin, 1809)]. Subsequently, Minato (1950) and Okubo (1951b) regarded the sandstone as being the lowest part of the Lower Carboniferous (Tournaisian) Hikoroichi Series, based on the Choanji fauna (mostly on the brachiopods) and on lithological correlations between the Devonian–Carboniferous rocks of the Choanji area and the Hikoroichi area, which is located immediately west of Choanji. Consequently, the latter proposal has been generally accepted (e.g., Minato et al., 1979; Kawamura, 1989). However, little is known about the Devonian–Carboniferous stratigraphy of the Choanji area, owing to a lack of the paleontological and stratigraphical data.

In this paper, I regard the *Cyrtospirifer*-bearing sandstone as part of the Upper Devonian (tentatively named as the Choanji Formation) which is distributed in around the fossil locality.

Systematic descriptions

Order Spiriferida Waagen, 1883

Suborder Spiriferidina Waagen, 1883

Fig. 1. Map showing the fossil locality CHJ1, at Choanji, eastern part of the South Kitakami Belt, northeastern Japan (using the topographic map of GSI).

Superfamily Cyrtospiriferoidea Termier and Termier,
1949

Family Cyrtospiriferidae Termier and Termier, 1949

Subfamily Cyrtospiriferinae Termier and Termier, 1949

Genus *Cyrtospirifer* Nalivkin in Fredericks, 1924

Type species.—*Spirifer verneuili* Murchison, 1840.

Cyrtospirifer choanjiensis sp. nov.

Fig. 2. 1

Cyrtospirifer sp. B. Tazawa, Yang and Miyake, 2000, p. 731, figs. 5.5–5.8.

Etymology.—Named after the fossil locality, Choanji.

Material.—One specimen from locality CHJ1, external and internal moulds of a dorsal valve, NU-B2236 (holotype).

Diagnosis.—Small-sized *Cyrtospirifer*, with a low flattened dorsal fold bounded by deep furrows, and micro-ornament of very fine growth lines.

Description.—Shell small in size for genus, wider than long, cardinal extremities acute; length about 23 mm, width about 33 mm in the dorsal valve of the holotype (NU-B2236). Dorsal valve slightly convex in both lateral and anterior profiles; fold low, clearly

demarcated from flanks by a pair of deep furrows. External surface of dorsal valve ornamented with numerous simple, often bifurcated costae, numbering 20 or more per flank (7–8 in 5 mm at 15 mm from umbo), and 9 on fold; micro-ornament of very fine growth lines over valve. Internal structure of dorsal valve not well preserved.

Remarks.—*Cyrtospirifer choanjiensis* sp. nov. most resembles *Cyrtospirifer gneudnaensis* Glenister (1955, p. 66, pl. 5, figs. 6–27; pl. 6, figs. 1–20; text-figs. 1.5–1.10, 4.15–4.18), from the Gneudna Formation (Frasnian) of the Carnarvon Basin, western Australia, in the small size and the flattened dorsal fold, but differs from the Australian species in having very fine growth lines and lacking radial striations on both furrows and costae. *Cyrtospirifer* sp. B, described by Tazawa et al. (2000) from the Rosse Formation of the Moribu area, Hida Gaiken Belt, central Japan, is deemed conspecific with the present species. *Cyrtospirifer thalattodonta* Crickmay (1952, p. 601, pl. 72, figs. 1–8), from the Hay River Formation (Famennian) of northern Canada, also has micro-ornament consisting of numerous fine growth lines, but differs from *C. choanjiensis* in the much larger dimensions and the highly developed dorsal fold. *Cyrtospirifer yabei* Noda and Tachibana (1959, p. 17, pl. 1, figs. 1–7, 10), most common *Cyrtospirifer* species in the Tobigamori Formation of the Nagasaka area,

Fig. 2. 1, *Cyrtospirifer choanjiensis* sp. nov., dorsal view (1a, 1b) of external latex cast and enlarged one (1c) showing concentric growth lines, and dorsal view (1d) of internal mould of dorsal valve, NU-B2236 (holotype). 2, *Cyrtospirifer* sp. 1, ventral view (2a, 2b) of external latex cast of ventral valve, and ventral view (2c) of internal mould of dorsal valve, NU-B2237. 3, *Cyrtospirifer* sp. 2, ventral view (3a, 3b) of internal mould of ventral valve, NU-B2238. Scale bars represent 1 cm, except for 1c.

western part of the South Kitakami Belt, is readily distinguished from the present species in the much larger dimensions and in having dorsal fold with a median depression.

Cyrtospirifer sp. 1

Fig. 2. 2

Material.—One specimen, external and internal moulds of a ventral valve, NU-B2237.

Remarks.—This specimen is safely referred to the genus *Cyrtospirifer* by the medium-sized (length about 18 mm, width about 45 mm), transversely subquadrate ventral valve with mucronate cardinal extremities and ornamented by numerous simple costae over the valve. The Choanji specimen resembles well the ventral valve,

figured by Sarytcheva and Sokolskaya (1952, p. 182, pl. 50, fig. 279) as *Spirifer disjunctus* Sowerby [= *Cyrtospirifer disjunctus* (Sowerby, 1840)], from the Semiluki Horizon (lower Frasnian) of the Moscow Basin, western Russia, in size and shape of the ventral valve and in having prominent cardinal extremities. However, accurate comparison is difficult owing to ill preservation of the present material.

Cyrtospirifer sp. 2

Fig. 2. 3

Material.—One specimen, internal mould of a ventral valve, NU-B2238.

Remarks.—This specimen is safely assigned to the genus *Cyrtospirifer* by the large size (length more than

30 mm, width more than 45 mm), wider subrectangular outline, and moderately convex ventral valve, with a pair of long, thick and slightly divergent dental plates. The Choanji species is large in size for the genus, and superficially resembles some large-sized *Cyrtospirifer* species, e.g., *Cyrtospirifer verneuili* var. *gosseleti* (Grabau, 1931), *Cyrtospirifer thalattodoxa* Crickmay, 1952 and *Cyrtospirifer subextensoides* Ma, 2009. But due to the poor preservation, it is not possible to assign the present material to one of these species.

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*in Japanese

**in Russian

用語対比

Choanji	長安寺
Hikoroichi-cho	日頃市町
Kogayosawa Valley	小通沢
Moribu	森部
Nagasaka	長坂
Ofunato City	大船渡市
Rosse Formation	呂瀬層
Sakarigawa River	盛川
Tobigamori Formation	鳶ヶ森層

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