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.

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 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 Tyoanzi (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
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 Gaien 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,
Cyrtospirifer from Choanji

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 subextensoideis 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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Hikoriroichi-cho 日岡市町
Kogayosawa Valley 小倉沢
Moribu 森部
Nagasaka 長坂
Ofunato City 大船渡市
Rosse Formation 呂瀬層
Sakarigawa River 盛川
Tobigamori Formation 阿賀森層

*in Japanese
**in Russian

用語対比

Choaajin 長安寺
Hikoriroichi-cho 日岡市町
Kogayosawa Valley 小倉沢
Moribu 森部
Nagasaka 長坂
Ofunato City 大船渡市
Rosse Formation 呂瀬層
Sakarigawa River 盛川
Tobigamori Formation 阿賀森層
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