Semiplanus (Productida, Brachiopoda) from the Carboniferous limestone of Kotaki, Niigata Prefecture, central Japan

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Semiplanus (Productida, Brachiopoda) from the Carboniferous limestone of Kotaki, Niigata Prefecture, central Japan

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Abstract

An Early Carboniferous large-sized productid brachiopod species, *Semiplanus semiplanus* (Schwetzow, 1922), is described from the Tsuchikurazawa Limestone (upper Visean–Serpukhovian), a limestone block within a Permian accretionary complex, distributed in the Kotaki area, Itoigawa City, Niigata Prefecture, central Japan. This is the first record of *Semipanus* species from Japan.

Key words: Brachiopoda, Carboniferous, Kotaki, *Semiplanus*, Tsuchikurazawa Limestone.

Introduction

The genus *Semiplanus* is a large Carboniferous productid brachiopod genus belonging to the subfamily Gigantoproductinae Muir-wood and Cooper, 1960. This genus was established by Sarytcheva and Sokolskaya (1952), with *Semiplanus semiplanus* (Schwetzow, 1922) from the middle–upper Visean of the Moscow Basin as the type species. Until now 15 species of *Semiplanus* have been described from the middle Visean–Serpukhovian of England, Poland, Russia and China. Among the genera in the subfamily Gigantoproductinae, *Latiproductus* Sarytcheva and Legrand-Blain, 1977 is distinguished from *Semiplanus* by its larger size and more round outline; *Gigantoproductus* Prentice, 1950 differs in its smaller size and in having coarser costae on ventral valve.

The Tsuchikurazawa Limestone (Takenouchi, 2005) is a large exotic limestone block within a Permian accretionary complex, the Kotaki Complex, distributed in and around the

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lower Tsuchikurazawa Valley, a tributary of the Kotakigawa River, Kotaki, Itoigawa City, Niigata Prefecture, central Japan (Fig. 1). The age of the Tsuchikurazawa Limestone is assigned to a late Visean–Serpukhovian on the basis of smaller foraminifers (Nakazawa et al., 1998), corals (Kamiya and Niko, 1996; Niko and Yamagiwa, 1998), brachiopods (Tazawa, 2004; Ibaraki et al., 2008, 2010) and calcareous algae (Konishi, 1956). The following four gigantoproductid species have been previously described from the Tsuchikurazawa Limestone: *Gigantoproductus* sp. by Tazawa (2004), *Gigantoproductus tujucsuensis* Gladchenko and *Gigantoproductus meridionalis* Legrand-Blain by Ibaraki et al. (2008) and *Gigantoproductus aurita* (Bolkhovitinova) by Ibaraki et al. (2010). But none of the species of *Semiplanus* have been described from the limestone.

Brachiopod specimens described herein as *Semiplanus semiplanus* (Schwetzow, 1922) were collected by the second author (K. Sato) from the Tsuchikurazawa Limestone at the mouth of the Tsuchikurazawa Valley. This is the first described *Semiplanus* species from Japan. The age middle Visean–Serpukhovian indicated by *Semiplanus semiplanus* is consistent with the previous studies of the Tsuchikurazawa Limestone. The specimens described herein are registered with the prefix FMM and housed in the Fossa Magna Museum, Itoigawa City, central Japan.

Systematic descriptions

Order Productida Sarytcheva and Sokolskaya, 1959
Suborder Productidina Waagen, 1883
Superfamily Linoproductoidea Stehli, 1954
Family Linoproductidae Stehli, 1954
Subfamily Gigantoproductinae Muir-Wood and Cooper, 1960
Tribe Semiplanini Sarytcheva, 1960
Genus *Semiplanus* Sarytcheva and Sokolskaya, 1952

Type species.—*Productus latissimus* (Sowerby, 1822).

Semiplanus semiplanus (Schwetzow, 1922)
Figs. 2.1–2.3

Productus semiplanus Schwetzow, 1922, p. 10.
Productus (*Gigantella*) *semiplanus* (Schwetzow): Sarytcheva, 1928, p. 57, pl. 5, figs. 6–7; Rotai, 1941, p. 100, pl. 19, figs. 4–6.
Semiplanus semiplanus (Schwetzow): Sarytcheva in Sarytcheva and Sokolskaya, 1952, p. 120, pl. 23, fig. 157; Nalivkin and Fotieva, 1973, p. 50, pl. 15, fig. 3; Kalashnikov, 1974, p. 66, pl.

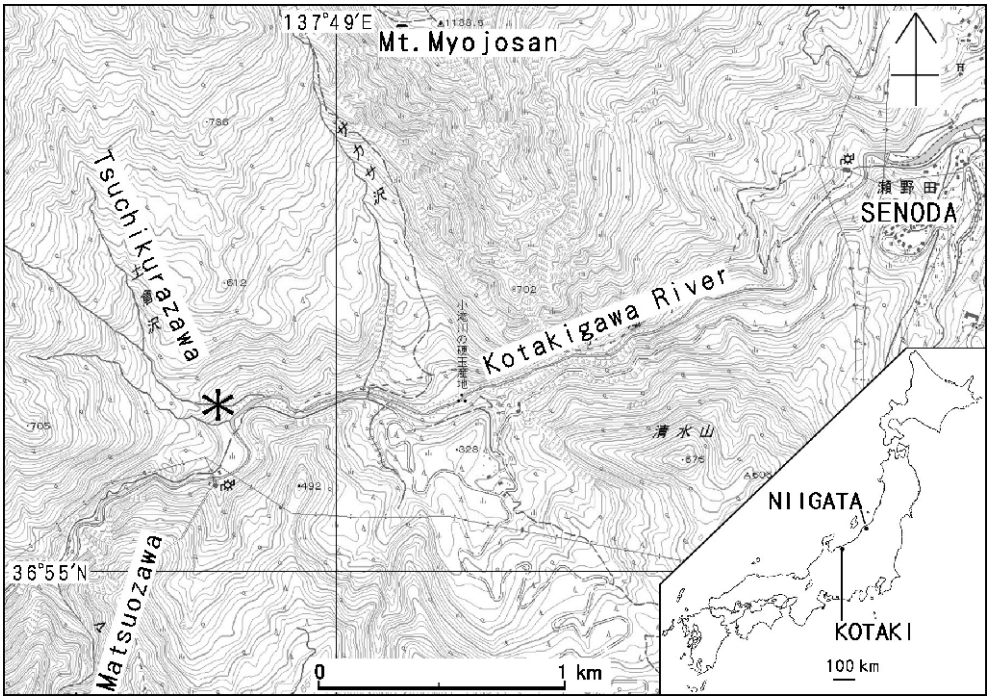

Fig. 1. Map showing the fossil locality (asterisk). Using the topographical maps of "Kotaki" and "Echigohiraiwa" scale 1:25,000 published by the Geospatial Information Authority of Japan.

18; fig. 3, pl. 19, figs. 2–7; Semichatova et al., 1975, p. 175, pl. 69, fig. 4; Sarytcheva and Legrand-Blain, 1977, p. 74, pl. 7, figs. 1–4; Donakova, 1978, p. 213, pl. 1, fig. 13; Yang, 1978, p. 119, pl. 33, fig. 4; Pattison, 1981, p. 11, pl. 2, fig. 4; pl. 9, fig. 21; Zakowa, 1986, p. 55, pl. 1, figs. 1–9; pl. 7, figs. 1–2; text-fig. 3; Tan, 1987, p. 123, pl. 17, fig. 12; Yang and Gao, 1996, p. 217, pl. 31, fig. 3; Jiang, 1997, pl. 3, fig. 3; Chen and Shi, 2003, p. 158, pl. 8, figs. 3–4, 6, 9.

Semiplanus semiplanus var. *plicata* Janischewsky: Beloussova, 1970, p. 100, pl. 3, figs. 1–2.

Material.—Three ventral valves, FMM2035, 2036, 2037.

Description.—Shell medium size for genus, transversely fusiform in outline, with greatest width at hinge; length 40 mm, width 85 mm in the largest specimen (FMM2035); length 32 mm, width about 77 mm in the smallest specimen (FMM2036). Ventral valve moderately convex in lateral profile, strongly incurved at umbo; flanks gently inclined; umbo moderately large, broad, rounded and inflated; ears small, triangular in shape and not clearly demarcated from visceral region; sulcus shallow and broad on anterior part of valve. External surface of ventral valve ornamented with numerous costae; costae regular in anterior part, numbering 8–9 per 10 mm at about midlength; spines or spine bases not

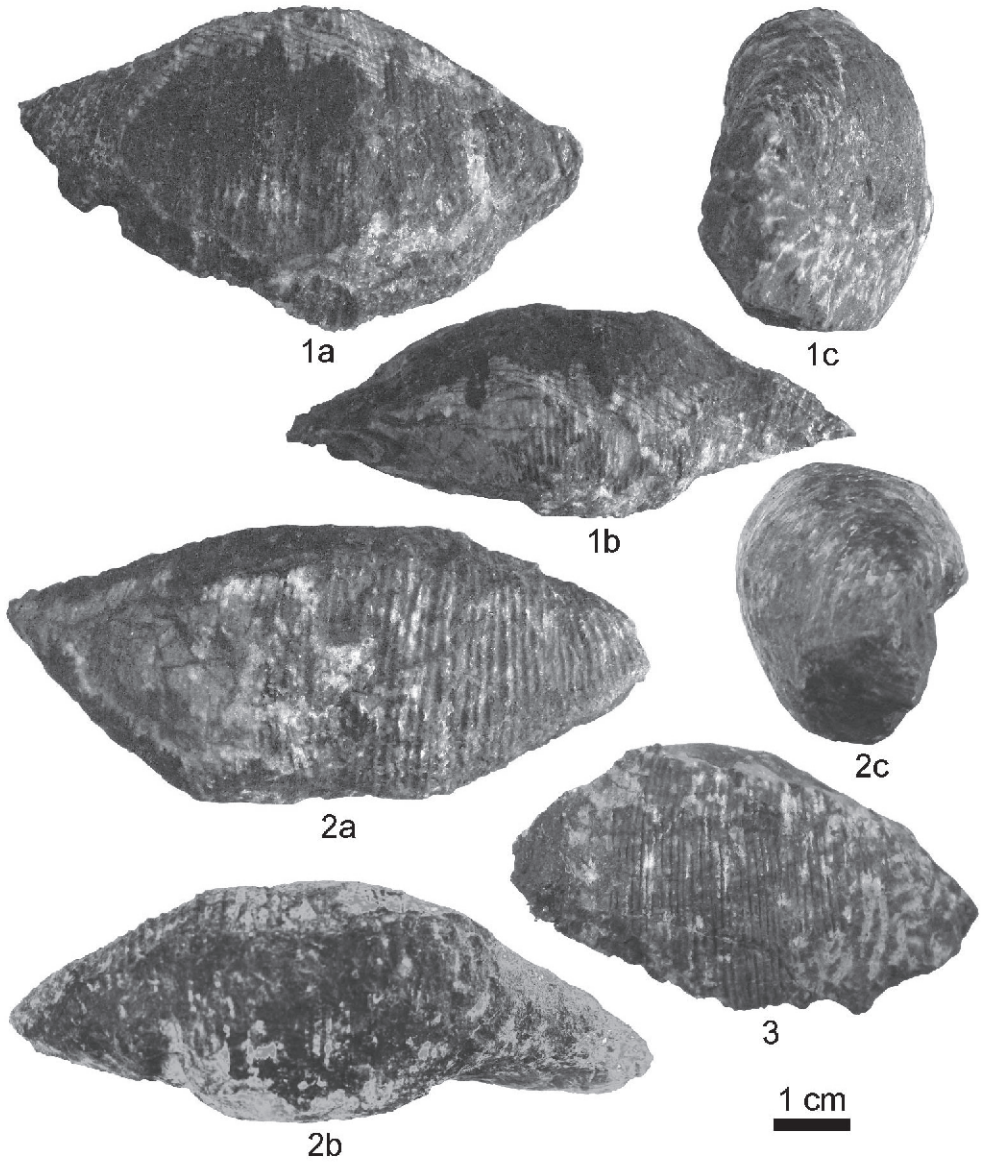

Fig. 2. *Semiplanus semiplanus* (Schwetzow, 1922), three ventral valve specimens; 1a, 1b, 1c: ventral, posterior and lateral views, FMM2035; 2a, 2b, 2c: ventral, posterior and lateral views, FMM2036; 3: ventral view, FMM2037.

preserved; shell thickness about 1 mm in both anterior and posterior parts.

Remarks.—The Tsuchikurazawa specimens are referred to *Semiplanus semiplanus* (Schwetzow, 1922), originally described from the upper Visean of the Moscow Basin, Russia, in size, shape and external ornament, especially the straight costae and small umbo in the ventral valve.

Semiplanus fragilis (Prentice, 1956, p. 246, pl. 21, figs. 1–2, pl. 22, fig. 3), from the Upper Visean of Derbyshire, England, differs from S. *semiplanus* in its more round outline, stronger convex ventral valve and slightly undulating costae.

Distribution.—Upper Visean of England (Pennine Mts.), Poland (Holy Cross Mts.), Ukraine (Prypyat), Russia (Moscow Basin, Pechora and Urals) and China (Tien-Shan Mts., Guizhou and Hunan); Serpukhovian of China (Kunlun Mts.); upper Visean–Serpukhovian of Japan (Kotaki).

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