

# Two permianellids (Brachiopoda) from the Middle Permian of the Southern Kitakami Mountains, Northeast Japan

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**Abstract.** Two species of permianellid brachiopods, *Permianella typica* He and Zhu and *Laterispina parallela* Shen, Fan, Zhang and Zhang, are described from the Middle Permian (Kubergandian) Kanokura Formation of the Southern Kitakami Mountains, Northeast Japan. This is the first description of permianellids from the Japanese Permian.

**Key words :** Brachiopoda, Kanokura Formation, Middle Permian, permianellid, Southern Kitakami Mountains

## Introduction

Permianellids are aberrant, bilobate brachiopods belonging to the superfamily Lytonioidea Waagen, 1883. Termier *et al.* (1974) first described a permianellid species, *Dicystoconcha lapparenti*, from the lower Murgabian (*Neoschwagerina* Zone) of Wardak, central Afghanistan as a species of lytoniid. Afterwards, the genus *Dicystoconcha* was assigned to the family Permianellidae by He and Zhu (1979) when they established the family Permianellidae and the genus *Permianella*, with *Permianella typica* He and Zhu, 1979 from the Upper Permian Longtan Formation of Jiangxi and Sichuan Provinces, South China as the type species. Since then, several permianellid species have been described or figured from the Chihsian to Changhsingian of South China (He and Zhu, 1979; Wang *et al.*, 1982; Yang, 1984; Mou and Liu, 1989; Liang, 1990; Zhu, 1990; Wang and Jin, 1991; Shen *et al.*, 1994), the Lower and Upper Permian of Thailand (Grant, 1976; Yanagida *et al.*, 1988), the Midian of South Primorye, Far East of Russia (Likharew and Kotljar, 1978), the Dzhulfian of the Transcaucasus (Shen and Shi, 1997), the Maokouan of Northeast China (Wang and Jin, 1991) and the Middle Permian of the Southern Kitakami Mountains, Northeast Japan (Tazawa, 1987). These data indicate that permianellids are distributed in the Lower Permian (Artinskian) to Upper Permian (Changhsingian) of the eastern Tethys and surrounding regions.

Twenty permianellid specimens were collected by K. Nakamura, H. Araki and the second author (J. Tazawa) from shale and sandstone cropping out at six localities (Locs. 1-6) in the Setamai, Imo and Kamiyasse districts, Southern Kitakami Mountains, Northeast Japan (Figure 1). The fos-

siferous shale and sandstone with a fusulinacean *Monodiexodina matsubaishi* (Fujimoto) are safely assigned to the lower part of the Kanokura Formation (Choi, 1970, 1973; Tazawa, 1973, 1976).

The brachiopod specimens described here are all housed in the Department of Geology, Faculty of Science, Niigata University, with the designation of \*NU-B for the registered number of the specimens.

## Systematic descriptions

Order Productida Waagen, 1883  
Suborder Strophalosiidina Waagen, 1883  
Superfamily Lytonioidea Waagen, 1883  
Family Permianellidae He and Zhu, 1979

Genus *Permianella* He and Zhu, 1979

*Type species.*—*Permianella typica* He and Zhu, 1979, from the Upper Permian Longtan Formation of Jiangxi and Sichuan Provinces, South China (He and Zhu, 1979, p. 132, 137, pl. 1, figs. 1a, b; pl. 2, figs. 1-3; pl. 3, figs. 1-3).

*Diagnosis.*—Shell medium in size, elongately bilobate in outline, concavo- or plano-convex, with ventral sulcus, dorsal fold and anterior incision; incision extremely deep, attaining more than half of shell length; marginal brim well developed along lateral commissure.

*Remarks.*—The present genus is characterized by its elongately ovate shell with deep anterior incision and irregular marginal brim along the lateral commissure. The genus *Dicystoconcha* Termier, Termier, Lapparent and Marin, 1974 differs from *Permianella* in its smaller and wider shell, shal-

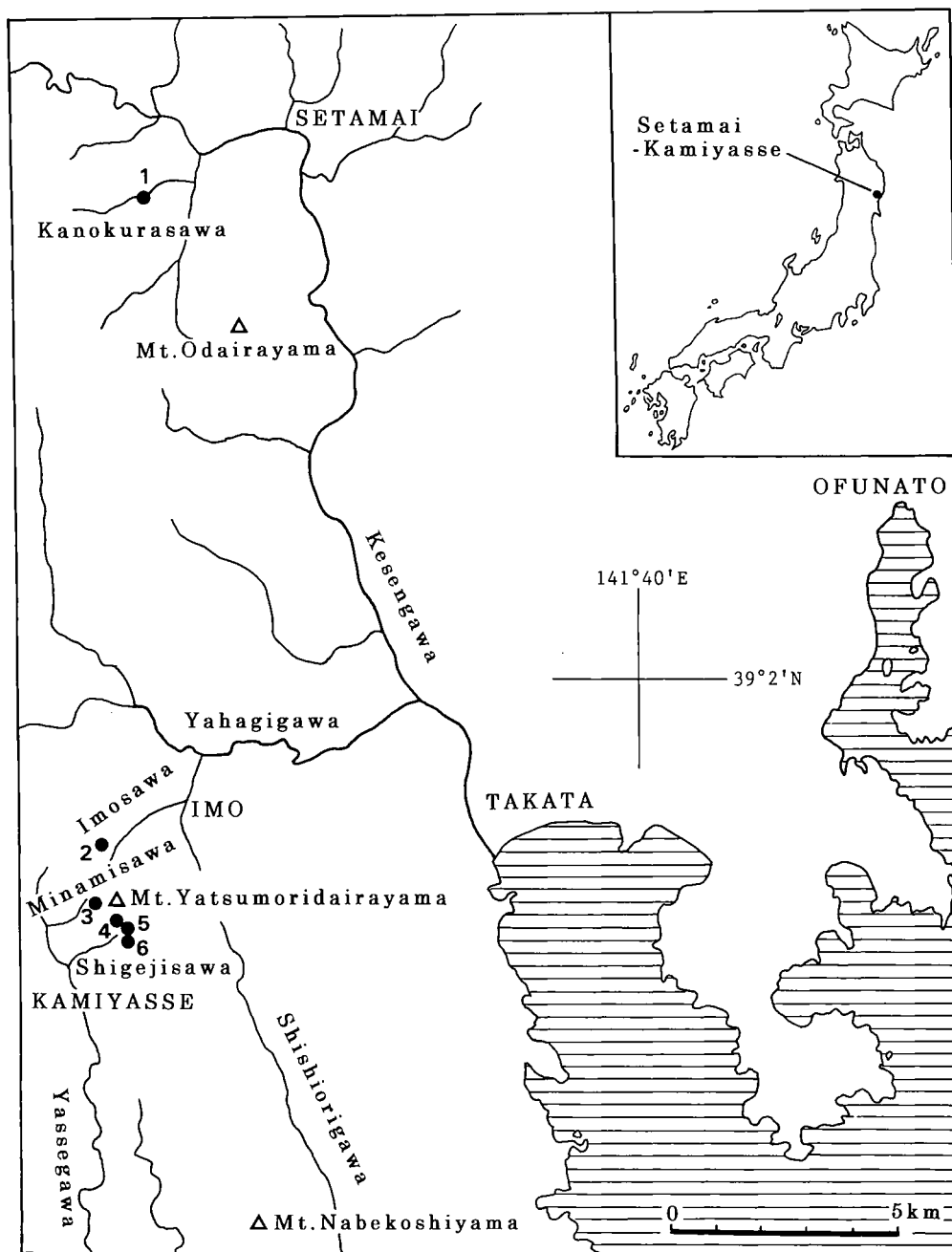


Figure 1. Map showing the fossil localities (Locs. 1-6).

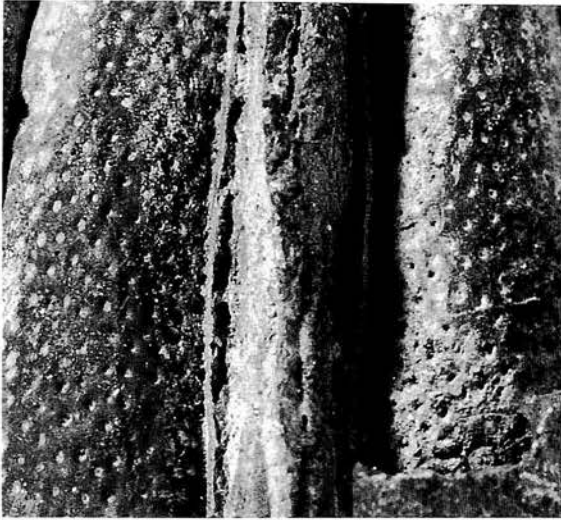
lower incision, having two lateral septa on central platform and lacking lateral marginal brim. *Laterispina* Wang and Jin, 1991 also has an elongately ovate outline, deep incision and median septum on central platform, but this genus differs from *Permianella* in having a fence-shaped marginal brim (see Wang and Jin, 1991, p. 497, pl. 2, figs. 8, 9, 12).

The genera *Dipunctella*, *Tenerella* and *Paritisteges*, proposed by Liang (1990), have elongately ovate outline, deep incision and lateral marginal brim, all of the characters common with the genus *Permianella*. According to Liang's description (p. 371), these three genera differ from *Permianella*

in their coiled or asymmetrical shells. However, we consider that differences of their internal structures are more important for their classification. All of the genera *Dipunctella*, *Tenerella* and *Paritisteges* have two lateral septa on the central platforms, whereas *Permianella* has a median septum on the central platform.

*Species other than type species assigned to the genus.*—*Permianella grunti* Shen and Shi, 1997, from the Upper Permian Dzhulfa Formation in the Dorasham II section, Transcaucasus (Shen and Shi, 1997, p. 22, pl. 1, figs. 1-7).

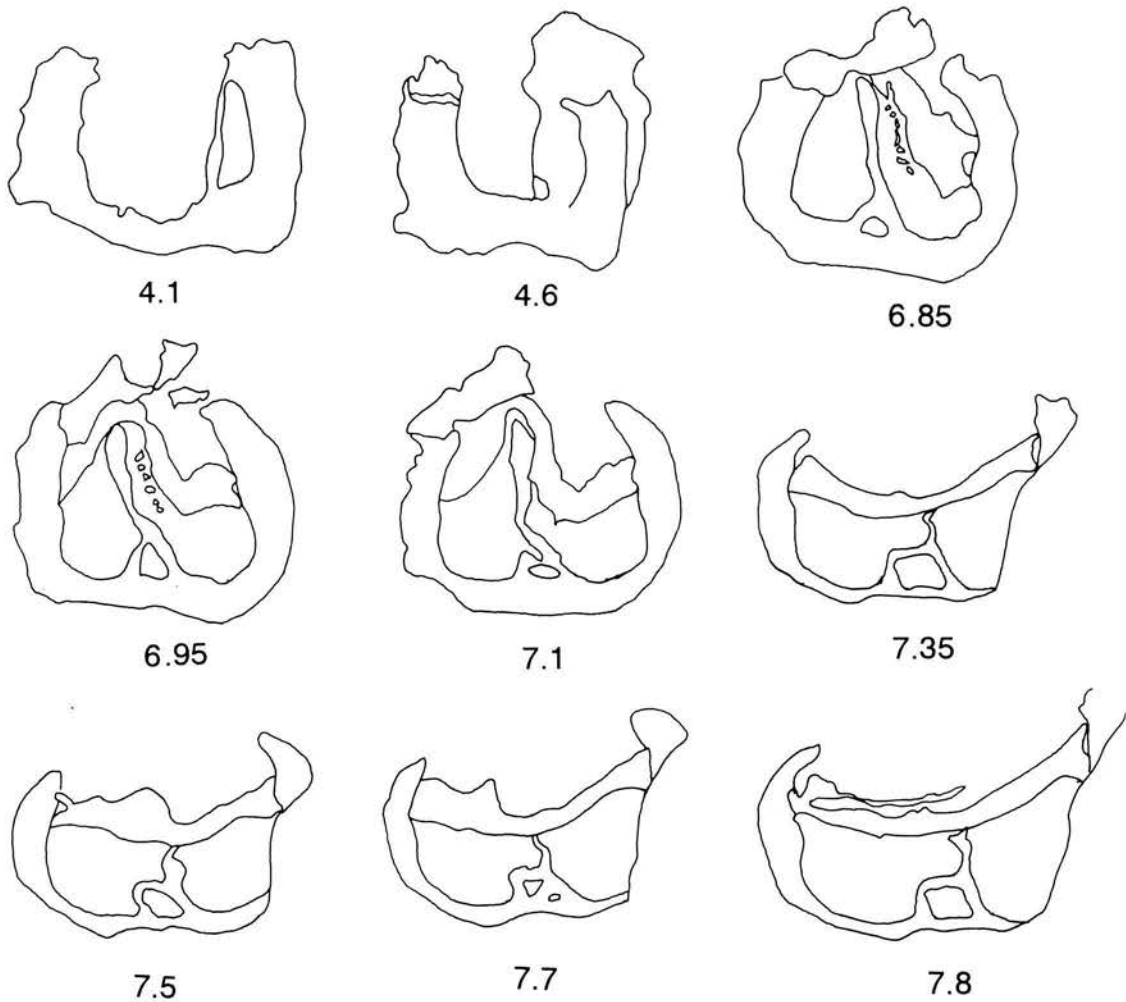
*Occurrence.*—Middle and Upper Permian; Trans-



**Figure 2.** External surface of a ventral valve of *Permianella typica* He and Zhu, showing pseudopunctae of outer shell layer (NU-B63,  $\times 8.5$ ).



**Figure 3.** One section (6.95 mm anterior to the posterior margin) of *Permianella typica* He and Zhu, showing pseudopunctate outer shell layer, laminate inner shell layer, central platform and a distorted median septum (NU-B51,  $\times 12.5$ ).



**Figure 4.** Serial sections of *Permianella typica* He and Zhu. The numbers indicate the distance in mm from the posterior margin (NU-B51,  $\times 7.5$ ).

caucasus, Thailand, South China, and Northeast Japan.

***Permianella typica* He and Zhu, 1979**

Figures 2–4, 5-1–14

*Permianella typica* He and Zhu, 1979, p. 132, 137, pl. 1, figs. 1a, b; pl. 2, figs. 1-3; pl. 3, figs. 1-3; Wang and Jin, 1991, p. 496, pl. 2, figs. 1-3.

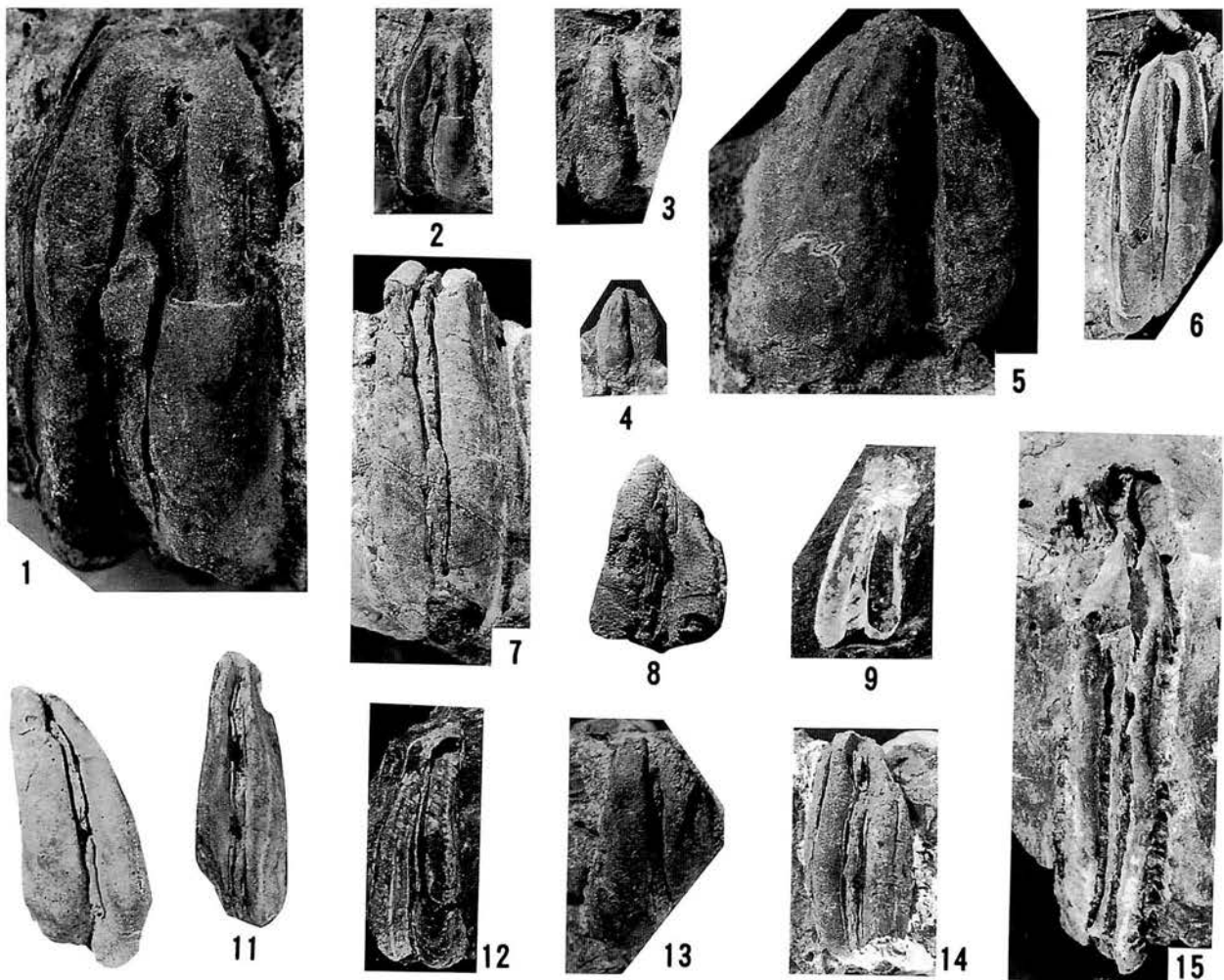
*Permianella* sp. He and Zhu, 1979, p. 133, 139, pl. 1, figs. 2-3.

*Permianella* sp. Tazawa, 1987, fig. 19-10.

**Material.**—Nineteen specimens: (1) two conjoined valves, NU-B51, 59; (2) a ventral valve, NU-B52; (3) external and internal moulds of three ventral valves, NU-B58, 62, 63; (4)

internal moulds of ten ventral valves, NU-B53, 54, 55, 56, 61, 64, 65, 66, 68, 69; (5) external moulds of four dorsal valves, NU-B50, 57, 60, 67.

**Description.**—Shell large in size for genus, elongately ovate in outline, maximum width occurring near anterior margin; length 49 mm, width 17 mm in the largest specimen (NU-B64). Shell concavo-convex in anterior profile, flat to strongly curved dorsally in lateral profile. Shell having a deep anterior incision, attaining more than a half of shell length. Posterolateral sides of shell convergent posteriorly at an angle of about 30–50°. Lateral sides of shell slightly divergent or nearly parallel anteriorly. Attachment ring developed on posterior margin. Ventral sulcus originating at umbo, slightly widening anteriorly. Irregular marginal brim



**Figure 5.** 1-14. *Permianella typica* He and Zhu. 1, 2: external mould of a dorsal valve with a part of ventral valve, showing marginal brim along lateral commissure and deep incision, NU-B60 (1:  $\times 3$ ). 3: internal mould of a ventral valve, NU-B55. 4, 5: internal mould of a ventral valve, NU-B61 (5:  $\times 4$ ). 6: ventral view of a shell, NU-B63. 7: internal mould of a ventral valve, NU-B64. 8: external mould of a dorsal valve, NU-B50. 9: ventral view of a shell, NU-B59. 10: internal mould of a ventral valve, NU-B65. 11: internal mould of a ventral valve, NU-B56. 12: ventral view of a shell, NU-B51. 13: internal mould of a ventral valve, NU-B58. 14: external mould of a dorsal valve, NU-B57. 15. *Laterispina parallela* Shen, Fan, Zhang and Zhang, internal mould of a ventral valve, showing fence-shaped marginal brim along lateral commissure, NU-B70. All figures are natural size unless otherwise indicated.

observed along lateral commissure. Shell consisting of two layers, pseudopunctate outer layer and laminate inner layer (Figures 2, 3).

Ventral central platform well developed, trapezoid in transverse section. Median septum stout and slightly distorted, elevated on right side of central platform and knife-edged at anterior part, but elevated at middle part of central platform and top-thickened at posterior part (Figures 3, 4). Dorsal interior with a long brachial ridge in each lobe; brachial process not observed.

**Remarks.**—*Permianella typica* He and Zhu is characterized by its large size, elongately ovate outline, deep incision, irregular marginal brim and nearly parallel anterolateral sides. The present specimens quite agree with the type specimen of *P. typica* in external and internal characters except for a slightly curved lateral profile. *Permianella* sp. from the Longtan Formation of Jiangxi Province, South China (He and Zhu, 1979, p. 133, 139) has no substantial differences from *P. typica*.

*Permianella grunti* Shen and Shi, described and figured by Shen and Shi (1997, p. 22, pl. 1, figs. 1-7) from the Upper Permian of the Transcaucasus, is clearly distinguished from the present species by its smaller shell, inconspicuous marginal brim and very short median septum.

The Chinese species *Dipunctella stenosulcata*, *Tenerella usualisa*, *Parististeges equilateialis* and *Parististeges pisiformis* described by Liang (1990, p. 372, 374, 379, 380) resemble *P. typica* in their parallel lateral sides, elongately ovate outline and deep incision. However, their two lateral septa on the central platform suggest that they belong to the genus *Dicystoconcha*.

**Horizon and locality.**—Lower part of the Kanokura Formation; Imosawa (Loc. 2), Imo, Yahagi-cho, Rikuzentakata City, Iwate Prefecture, and Minamisawa (Loc. 3) and Shigejisawa (Locs. 4-6), Kamiyasse, Kesenuma City, Miyagi Prefecture, Northeast Japan.

#### Genus *Laterispina* Wang and Jin, 1991

**Type species.**—*Laterispina liaoi* Wang and Jin, 1991, from the Upper Permian Changhsing Formation of Guangxi and Sichuan Provinces, South China (Wang and Jin, p. 496, 500, pl. 2, figs. 4-12).

**Diagnosis.**—Shell large in size, bilobate, triangular or belt-like in outline, with ventral sulcus; anterior incision extremely deep; lateral commissure bearing fence-shaped marginal brim. Ventral interior with a median septum and a complicated central platform having internal septa. Dorsal interior with brachial processes and long brachial ridges.

**Remarks.**—*Laterispina* differs from *Permianella* and *Dicystoconcha* in having a complicated fence-shaped marginal brim along the lateral commissure. *Permianella* usually has an irregular wing-shaped marginal brim, but *Dicystoconcha* has a very shallow incision and no marginal brim.

**Species other than type species assigned to the genus.**—

*Laterispina parallela* Shen, Fan, Zhang and Zhang, 1994, from the Upper Permian Changhsing Formation of Nantong, Sichuan Province, South China (Shen et al., 1994, p. 478, pl. 1, figs. 1-12; pl. 2, figs. 1-11, 14).

**Occurrence.**—Middle and Upper Permian; South China and Northeast Japan.

*Laterispina parallela* Shen, Fan, Zhang and Zhang, 1994

Figure 5-15

*Laterispina parallela* Shen, Fan, Zhang and Zhang, 1994, p. 478; pl. 1, figs. 1-12; pl. 2, figs. 1-11, 14; text-figs. 1-5.

**Material.**—One specimen, external and internal moulds of a ventral valve, NU-B70.

**Description.**—Shell large in size for genus, bilobate, very long, belt-like shape; length 55 mm, width 14 mm in the single ventral valve specimen. Shell concavo-convex in anterior profile, slightly curved dorsally in lateral profile. Anterior incision extremely deep, attaining more than two thirds of shell length. Lateral sides of shell nearly parallel. Marginal brim developed along lateral commissure and being fence-shaped. Attachment ring grasping a crinoid stem on posterior margin. Other external and internal characters unknown.

**Remarks.**—Although only one specimen is available for description, the fence-shaped marginal brim along the lateral commissure and parallel belt-like outline well represent the characters of *Laterispina parallela* Shen, Fan, Zhang and Zhang. It is only a minor difference between the Kitakami and the Chinese specimens that the former has a slightly curved profile.

**Horizon and locality.**—Lower part of the Kanokura Formation; Kanokurasawa (Loc. 1), Setamai, Sumita-cho, Kesenuma, Iwate Prefecture, Northeast Japan.

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