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Title	A Reticulate Spiriferid from the Devonian Nakazato Formation of the Kitakami Mountains, Japan
Author(s)	Minato, Masao; Kato, Makoto
Citation	Journal of the Faculty of Science, Hokkaido University. Series 4, Geology and mineralogy, 17(4), 619-627
Issue Date	1977-08
Doc URL	https://hdl.handle.net/2115/36076
Type	departmental bulletin paper
File Information	17(4)_619-628.pdf



A RETICULATE SPIRIFERID FROM THE DEVONIAN NAKAZATO FORMATION OF THE KITAKAMI MOUNTAINS, JAPAN

by

Masao Minato and Makoto Kato

(with 1 plate)

(Contribution from the Department of Geology and Mineralogy,
Faculty of Science, Hokkaido University, No. 1492)

Abstract

A reticulate spiriferid found from the Middle Devonian Nakazato Formation, in the Kitakami Mountains, Japan would be best classified as a member of a new subgenus of *Undispirifer* Havlíček. Thus, *Undispirifer* (*Nakazatothyris*) *vandercammeni* nov. is here proposed. The new Japanese species may be grouped in subgeneric rank, with *Undispirifer transversa* (Wang), described also by Hou and Xian (1975) from the Emsian of Kwangsi, and with *Undispirifer rzhonitzkajae* Mamedov (1961) from the Eifelian and Givetian of ASSR.

Introduction

Only two Devonian reticulate spiriferids were described or illustrated from Japan till now. Okubo (1956) described and figured *Elytha fimbriata* (Conrad) from the Nakazato formation in the Kitakami Mountains together with a few trilobites and brachiopods. Kamei (1961) figured *Elytha* or *Undispirifer* from the Fukuji Formation in the Hida Mountains, under the suggestion of the senior author. But both forms are unfavourably preserved and generic and/or specific determination may be only provisional.

While engaged in geological mapping in the Hikoroichi region of Ohfunato, Iwate Prefecture in 1961, Kato found some fossils from the Devonian Nakazato Formation at a locality on the ridge north of the Higuchizawa valley. Among them there is a peculiar spiriferid with reticulated ornamentation on the surface of shell and a few costae. This will be described and discussed below.

Superfamily Reticulariacea Waagen, 1883

Minato's proposal (1953) to classify reticulate spiriferids into two major groups, based upon the character of spine bases which ornament shell surface, seems to have been widely accepted.

Namely in the present day sense, one is Family Reticulariidae with uniramous spine bases and the other is Family Elythidae with biramous spine

bases for the surface sculpture of the shell.

However, for generic level classification little agreement has been achieved in spite of a number of recent contributions on the group (Havliček, 1959; Ivanova, 1960; Pitrat, 1965; Pavlova, 1969). This is partly due to inadequacy of the knowledge on some type materials, and partly due to the difference of opinions as to the importance or weight of certain biocharacters.

In practice, for example, *Undispirifer* is housed in reticulate spiriferids by Havliček (1959) and Pavlova (1969), and by Pitrat (1965) with query; but it is put into Delthyridae by Ivanova (1960).

At any rate our material reveals distinct uniramous spine bases on the surface of shell, and thus is safely concluded to belong to Family Reticulariidae.

Family Reticulariidae Waagen, 1883

A number of genera have been assigned to this family.

Our form has ventral valve with distinct sulcus, quite a few costae on slope and long dental plates which are a little diverged. No distinct septa are observable.

Therefore it may be included in the genus *Undispirifer* Havliček.

However, in the present form costae are only to be seen in the beak region of both valves, especially near the sulcus and fold. They do not extend to the anterior margin of the shell.

In the poor development of costae the present form may be related to the genus *Reticulariopsis* Fredericks, 1916 which has rather strong bounding costae in sulcus and a fairly strong fold with narrow sulcating line in the middle, but in cases plications seem to be almost obsolete in the flank. *Tingella* Grabau, 1931, has many similarities with *Reticulariopsis* and may be synonymous with the latter. The internal structure of the shell of *Reticulariopsis* is said to be same as the genus *Undispirifer* Havliček, 1957.

Genus *Undispirifer* Havliček, 1957

1957 *Plectospirifer*, Vandercammen, p.1. (non *Plectospirifer* Grabau, 1931)

1957 *Undispirifer*, Havliček, p.439, 440

1959 *Undispirifer*, Havliček, p.168.

1960 *Undispirifer*, Ivanova, p.273.

1965 *Undispirifer*, Pitrat, H.721.

1969 *Undispirifer*, Pavlova, p.40.

Type species: Spirifer undiferus Roemer, 1844

Original generic diagnosis (Havliček, 1957): "The genus of the subfamily

Reticulariinae, having brachythyrid shells and well developed non-ribbed sinus and fold. The surface of the valves on both sides of the sinus and fold bears very low and flat ribs which are often perceptible only in the closest proximity of the anterior margins of the valves. The fine ornamentation is composed of concentric rows of simple small spines, lying on growth lines. The margins of the delthyrium are supported by long dental plates. The middle septum is not developed."

Included species: Havlíček (1957, 1959) included only three species, which are *undiferus* (Roemer), *transiens* Barrande, and *microspinosus* (Khalfina) in the present genus.

The authors consider the following forms to be members of the genus.

Undispirifer undiferus (Roemer), 1844

Undispirifer subundiferus (Meek et Worthen), 1868

Undispirifer transiens (Barrande), 1879

Undispirifer sublaevigatus (Khalfina), 1940

Undispirifer minor Stainbrook, 1940

Undispirifer johnsonensis Stainbrook, 1940

Undispirifer microspinosus (Khalfina), 1950

Undispirifer transversa (Wang), 1956

Undispirifer rzhonnitzkajae Mamedov, 1961

Undispirifer? trypherus Tjazheva, 1962

Undispirifer spinulatus Mc'Kellar, 1966

Undispirifer multifarius Pavlova, 1969

Undispirifer ovata (Wang), 1974

Pavlova (1969) considered also *Spirifer urbana* Calvin, 1892 to be a member of *Undispirifer*. But according to Stainbrook (1940) who studied the species in detail and classified it under the genus *Elytha*, the species possesses no distinct plication, besides its internal characters are little known. We, therefore, exclude the species in concern from *Undispirifer*.

Geological distribution: Devonian (Emsian, Eifelian, Givetian and Frasnian). Two Chinese species assigned here to *Undispirifer* are said to occur from the Yükiang Formation in south China, and the formation is correlated to Emsian (Wang, Yü & Wu, 1974). They may be the oldest representatives of the genus.

Remarks: Seemingly varied forms have been ascribed to *Spirifer undiferus*, the type species of *Undispirifer* (see for example Davidson, 1862, p.36, pl.7, figs.1, 1a, 1b; Scupin, 1900, p.63, pl.5, figs.12-13; Vandercammen 1967, p.6, pl.2, figs.5-9).

Fortunately Vandercammen (1967) restudied and illustrated Roemer's original material stored at the University of Bonn. We must, therefore, base our interpretation on the type species and generic characteristic of *Undispirifer*

upon his revision. But Vandercammen (1957, 1971) himself concluded that there existed a wide range of variation in the type species, either in shell form or degree of development of costae.

See extensive synonymy given by Vandercammen (1957) for his "*Plectospirifer*" *undiferus*.

In the present paper, we follow Havlíček (1957, 1959), Vandercammen (1957, 1971) and Pavlova (1969) that *Undispirifer undiferus* is a reticularid, and not a delthyrid, and thus *Undispirifer* is a member of Reticulariidae.

Although *Undispirifer* seems to include various forms in concern to plications on flank and configuration of shell, the genus may be distinguished from such other genera as *Reticulariopsis*, *Eoreticularia* and *Tingella* since the former has distinct costae on the slope. Pitrat (1965) incidentally merges all the latter three genera into *Reticulariopsis*.

Undispirifer resembles *Elytha*, but is distinguished from the latter in having uniramous spine bases along the growth line, while the latter possesses biramous spine bases.

When Grabau (1931) proposed *Plectospirifer*, he included *Spirifer undiferus* in his genus. But his *Plectospirifer* actually contained various divergent forms. Hou and Xian (1975) reassigned forms of "*Plectospirifer*" as follows.

Plectospirifer heimi Grabau = *Howellella papaoensis* (Grabau)

Plectospirifer papaoensis Grabau = *Howellella papaoensis* (Grabau)

Plectospirifer undiferus (Roemer) = *Undispirifer undiferus* (Roemer)

Plectospirifer fongi Grabau = *Xenospirifer fongi* (Grabau)

At any rate the genus *Plectospirifer* is not available for forms of Reticulariidae.

Although Havlíček (1959) originally mentioned that brachythyrid shells were diagnostic for *Undispirifer*, but this character did not always hold true to the genus, as implied by the study of Vandercammen (1957).

In general, however, shells are of medium to large in size in *Undispirifer*, and are covered mostly by costae extending from umbonal region towards the anterior margin, although costae are usually few, low, flat and wide. Further there is almost non-costate forms.

Such being the case, the morphological range of the genus *Undispirifer* is considerably wide in many points.

The Japanese specimens to be described below may be accordingly placed into *Undispirifer*, since they are fundamentally similar with the latter both in the internal structure and ornamentation.

Nevertheless they are rather distinct from the hitherto known species of *Undispirifer* in having less numerous and a few costae developed only in the umbonal region, on both sides of sulcus and fold.

This may be remarkable and the authors wish to propose a new sub-generic name, *Nakazatothyris*. According to the authors' view, *Undispirifer transversa* (Wang) described from the Emsian of Kwangsi may be grouped with the Japanese form in subgeneric rank. Also *Undispirifer rzhonitskajae* described by Mamedov (1961) from the Upper Givetian of Nakhichevan ASSR, is a member of the new subgenus.

Subgenus *Undispirifer* (*Nakazatothyris*) nov.

Type species: Undispirifer (Nakazatothyris) vandercammeni nov. to be described below:

Derivation of the subgeneric name: Type locality of the Nakazato Formation is situated a little distant from the locality where the present brachiopods were collected by the junior author. But it is sure that the formation with these fossils is correlatable to the Nakazato Formation. Hence the formation name with the fossils is adopted for the subgeneric name.

Diagnosis: *Undispirifer* with shells being brachythyrid in form. Fold and sulcus are relatively distinct. A few short costae are only developed near the sulcus and fold, but wide portion of flank is non-costate.

Included species:

Undispirifer transversa (Wang), 1957

Undispirifer rzhonitskajae Mamedov, 1961

Undispirifer (Nakazatothyris) vandercammeni sp. nov.

Pl. 1, figs. 1-9.

Derivation of the specific name: After Dr. A. Vandercammen of Institute Royal des Sciences Naturelles de Belgique, in recognition of his great contribution to spiriferids.

Material: External mould of a dorsal valve together with beak region of ventral valve, UHR. No.18904 (Holotype): External and internal moulds of a ventral valve; UHR. No.18908 (Paratype): External mould of a dorsal valve and a part of a ventral valve, UHR. No.18906 (Paratype).

All three specimens were collected from slate exposed at a locality on top of the ridge north of the Higuchizawa valley, Ohfunato City, Iwate Prefecture, by M. Kato in 1961. Horizon is the Devonian Nakazato Formation. Associated fossils are some brachiopods including "*Leptaena*", a Heliolitid coral, a large Cyathophylloid coral, etc. all represented by moulds only.

Description: Shell, large, biconvex, much convex in the ventral valve than the

dorsal one. Shell brachythyrid in form. Hinge line is shorter than the greatest width of shell which is measured at about the mid-length of the shell. The dimensions of three individuals are as follows.

		Length	Width
Reg.no.18904 (Holotype)	ventral valve	31 mm	50 mm
	dorsal valve	27 mm	50 mm
Reg.no.18908	ventral valve	31 mm	48 mm
Reg.no.18906 (much deformed specimen)	dorsal valve	20 mm(+)	51 mm

Ventral valve is strongly inflated, its maximum convexity lies at posterior to the middle, the surface curving gently from the umbonal region to the cardinal margin and more gently to the anterior and lateral margins. The cardinal margin is a little obtuse. Sulcus begins to develop at the umbonal region, and considerably wide and deep from the middle portion towards anterior commissure. Costae of the ventral valve are only observable in the external mould of the umbonal region. They may be two costae bounding the sulcus from the flank and their neighbouring one on each outside of the sulcus. There are wide space of flank lacking plications. Beak of the ventral valve is larger than the one in the dorsal valve, and the former is slightly incurved. Cardinal area is relatively large, concave, towards the beak. Dethyrium is comparatively narrow, delthyrial angle may be roughly 75 degree.

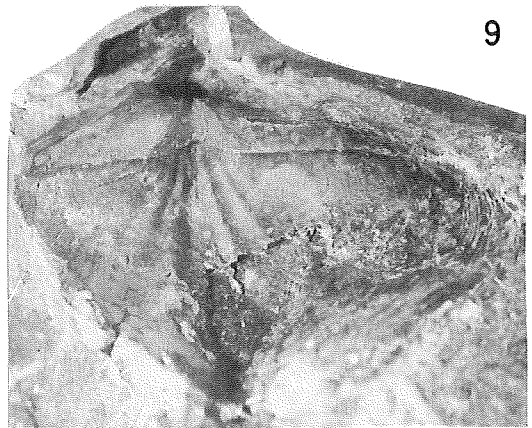
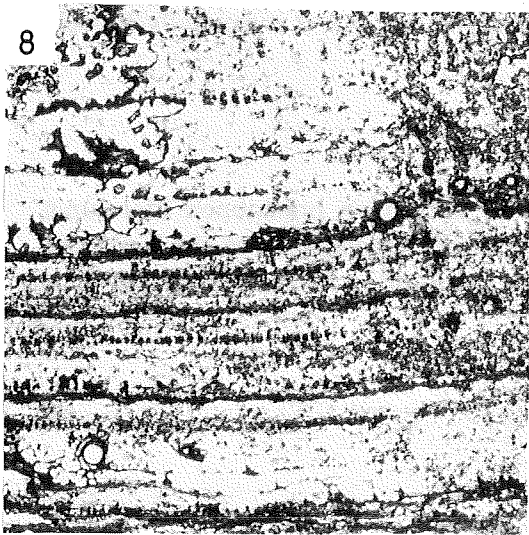
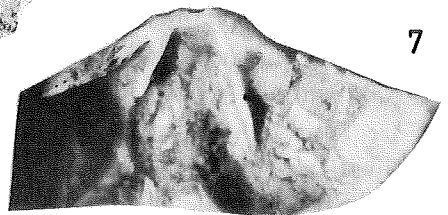
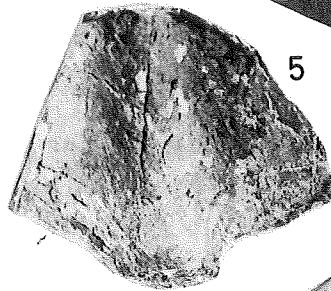
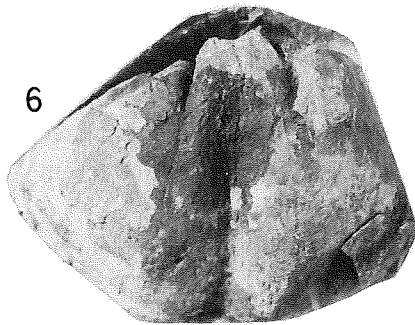
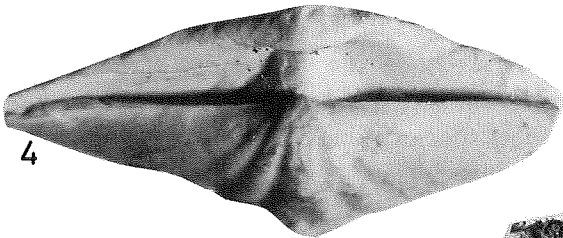
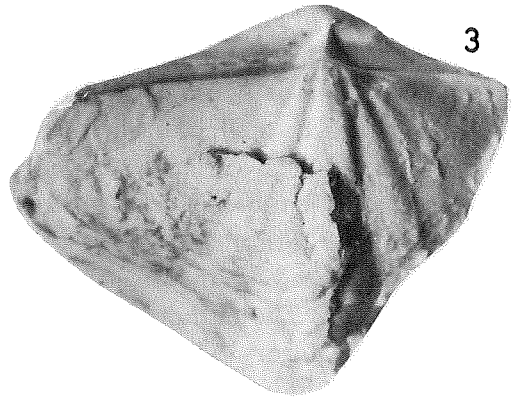
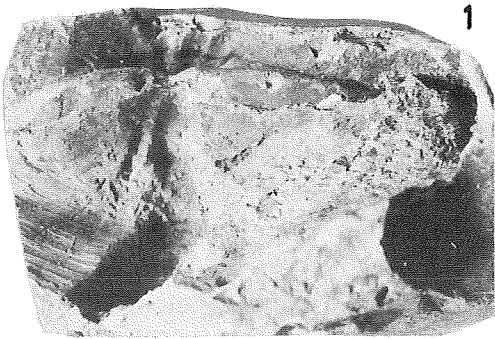
Explanation of Plate 1

Figs. 1-9. *Undispirifer (Nakazatothyris) vandercammeni* Minato & Kato

1. External mould of dorsal valve and beak portion of ventral valve, UHR 18906 (Paratype) (x1.5): The specimen is a little squashed.
2. Silicon rubber cast of the above specimen (x1.5).
3. Silicon rubber cast of dorsal valve, and beak of ventral valve, UHR 18904 (Holotype) (x1.5).
4. Cardinal view of the same cast (x2).
5. External mould of ventral valve, UHR 18900 (Paratype) (x1.3).
6. Internal mould of the same ventral valve (x1.2).
7. Rubber cast of the same ventral valve showing strong dental plates (x1.6).
8. Replica of the surface of dorsal valve (Holotype). Showing growth lines and faint trace of uniramous spine bases (x15).
9. External mould of Holotype specimen (x1.5) from which cast shown in fig.3 was taken.

RETICULATE SPIRIFERID FROM THE DEVONIAN

Plate 1



Internally, fairly long (12 mm) dental plates are well developed which are a little divergent anteriorly, but septum is lacking.

The dorsal valve is less convex than the ventral, and possesses rather narrow fold, and one or two indistinct, costae on both sides of the fold. These costae do not reach the anterior commissure and thus wide portion of flank is non-costate. The cardinal margin of this valve is definitely obtuse. Internal structure is unobservable. The entire surface of the valve is ornamented by regular fine concentric growth lines with uniramous spine bases, densely arranged. Locally fairly long spines are well preserved.

Comparison: The authors believe that the present form may be belonging to the same category with the Chinese species, *Undispirifer transversa* (Wang) in concern to the fact that only a few more or less shorter costae are developed only near the fold and sulcus, as it was stated in the subgeneric diagnosis. However, the Chinese species is definitely smaller and transverse in form and specifically distinct from the Japanese new species. The Chinese species is said to occur from the Emsian of Kwangsi (Hou and Xian, 1975, p.75, pl.17, figs.1, 3).

Another species *Undispirifer rzhonitskajae* Mamedov closely resembles the present Japanese form. We believe that this Russian species is also a member of the new subgenus here proposed.

However, the former species differs from the latter Japanese form in possessing relatively high beak of the ventral valve and a little less transverse shell configuration compared to the latter. Also folding is more strong in *Undispirifer rzhonitskajae* than the Japanese form.

The Russian species was described from Eifelian to Upper Givetian of the Nakhichevan ASSR.

Thus at present, *Nakazatothyris* is known to range from Emsian to Givetian. The Japanese form is not precisely dated, but it is generally thought broadly as Middle Devonian.

Acknowledgement

Dr. K. Nakamura instructed the junior author on brachiopod literatures. Mr. S. Kumano and Mr. I. Niikawa kindly took photographs of the specimens given in plate, and Miss E. Mima typed the manuscript. Thanks are due to them for their assistance.

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(Received on May 27, 1977)