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PERMIAN CALCAREOUS ALGAE FOUND IN THE MATSUMAE GROUP, MATSUMAE PENINSULA, SOUTHWESTERN HOKKAIDO

by

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(with 3 text-figures)

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Abstract

Permian calcareous algae *Gymnocodium bellerophontis* and *Mizzia velebitana* were found in an algal limestone bed intercalated in the Matsumae Group exposed at the upper stream of Komatagawa River, about 5 km northwest of Fukushima town, Southwestern Hokkaido. The limestone is intercalated within the alternation of greenish gray basaltic tuff and slate, and the whole sequence is continuous at least about 2 km along its strike direction. Considerable part of the Matsumae group may be assigned to Permian in age.

Introduction

In 1973 and 1974, the authors were engaged in geologic mapping project of 1/50.000 Matsumae quadrangle, in association with Dr. M. Hata of Geological Survey of Japan. They mainly investigated the areas where the Paleozoic Matsumae Group is exposed, while Dr. Hata devoted for the younger sequences. During field survey, Minoura in 1974 found in the Matsumae Group, a limestone containing abundant calcareous algae in which *Mizzia* and *Gymnocodium*, both of which apparently indicate Permian, were later distinguished by Prof. Konishi of Kanazawa University.

The Matsumae Group is composed of thick geosynclinal sequence in which only several Carboniferous but no Permian fossils have been reported. These Permian algal fossils and the geologic implications of this finding to the Matsumae Group are briefly reported.

The Matsumae Group

In the Matsumae district, southwestern corner of the Oshima Peninsula, very thick geosynclinal succession called the Matsumae Group is widely distributed. It is overlain with definite uncomformity by Neogene "Green Tuff" formations. This group, had long been considered as Paleozoic without any fossil evidence until Minato and Koonoya (1963) for the first time

discovered Upper Carboniferous coral and fusulinid from a limestone conglomerate bed at Mt. Taiheizan near Esashi town. Since this first discovery, some more Carboniferous fossils were reported.

Investigating conodont fauna of the Southwesten Hokkaido, Yoshida and Aoki (1972) reviewed the geologic age and stratigraphy of the Matsumae Group at the same time. According to this review, the Matsumae Group is assumed to attain up to 8.000m in thickness.

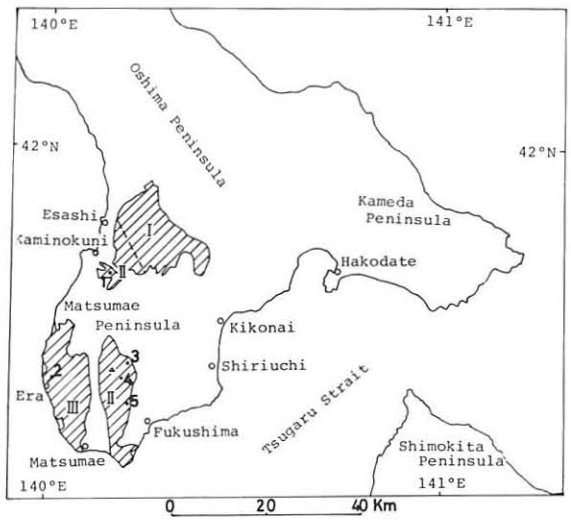

Fig. 1 Distribution of the Matsumae Group in the Oshima Peninsula, Southwestern Hokkaido (Modified after Yoshida and Aoki, 1972).
I. Eastern Esashi Area. II. Mt. Taiheizan – Mt. Daisengendake Area. III. Era-Matsumae Area.
● Fossil locality (1. Mt. Taiheizan; 2. River Nikoshigawa, northeast of Era; 3. River Sumikawa, east of Mt. Daisengendake; 4. River Shiriuchigawa, east of Mt. Maesengendake; 5. Upper stream of River Komatagawa of the present study).

Lithologically slate, sandstone and chert are dominant in the group with subordinate amount of conglomerate, limestone, dolomite and volcanic rocks and is subdivided into three areas, namely 1) the eastern Esashi area, 2) the Mt. Taiheizan-Mt. Daisengendake area and 3) the Era-Matsumae area (Fig. 1). Among these three areas the former two areas actually are continuous geographically. No fossils indicative of geologic age have been found in the eastern Esashi area.

Minato and Koonoya (1963) reported a coral and a fusulinid from the western foothill of Mt. Taiheizan and suggested its age as Pennsylvanian. Lately Sumi et al. (1970) found *Fusulinella* sp. and *Chaetetes* sp. from the same locality of Minato and Koonoya (1963). Yoshida and Yamaguchi (1967)

collected Middle Carboniferous fauna, from River Sumikawa, about 5 km northeast of Mt. Daisengendake, including *Carinthiaphyllum yezoense, Chaetetes* sp., *Fusulinella* sp., all of which were systematically described by Minato and Rowett (1967). These two fossil localities above mentioned are included in the Mt. Taiheizan-Mt. Daisengendake area where such varieties of lithology as alternations of clayslate, chert, basaltic lava and tuff, sandstone, conglomerate, limestone, dolomite, and conglomeratic limestone (limestone pseudobreccia) is characteristic.

Yoshida and Kakimi (1970) reported *Chaetetes* sp., *Pseudopavona* sp. and an unidentifiable fusulinid fragment, which apparently indicate Upper Carboniferous, from limestone conglomerate in alternation of limestone and chert in the Era area. They stressed lithologic resemblance of this locality to those of Mt. Taiheizan and River Sumikawa and suggested that they are correlatable with each other. At this locality on the River Nikoshigawa, about 4 km northeast of Era, is in the Era-Matsumae area where the Matsumae group is composed of thick accumulation of clayslate and chert, intercalated with local basaltic lava and limestone or dolomite.

It was pointed by Yoshida and Aoki (1972) that all of the above fossils actually were obtained from limestone conglomerate or limestone breccia of which a doubt on the critical age had been raised (Minato and Koonoya, 1963). Nevertheless, Yoshida and Kakimi (1970) stressed that the limestone breccia is not external origin but comtemporaneous.

Yoshida and Aoki (1972) tried to extract conodont from limestones of 23 localities in the Matsumae group, including the above Carboniferous fossils localities, and 6 more in the Toi formation of the Kameda Peninsula. Among these 29, they successfully obtained considerable conodont fauna from 5 localities, 4 in the Matsumae group, including Mt. Taiheizan and River Nikoshigawa and 1 in the Toi formation. They interpreted that all conodonts fauna of the Matsumae group well coincide with the Upper Carboniferous *Profusulinella-Fusulinella* zone of the Atetsu limestone. Also it is the conodont fauna of the *Fusulinella biconica* zone of the Akiyoshi limestone. Accordingly they concluded that, as a whole, the greater part of the Matsumae group indicates possibly the Upper Carboniferous (Pennsylvanian) in geologic age.

Subsequently Aoki and Yoshida (1974) reported three more localities of Carboniferous conodont in the vicinities of Mt. Maesengendake and Mt. Hyakkendake, where one of these localities seems to be same as that of the present algal fossils.

Occurrence of the fossil bearing limestone

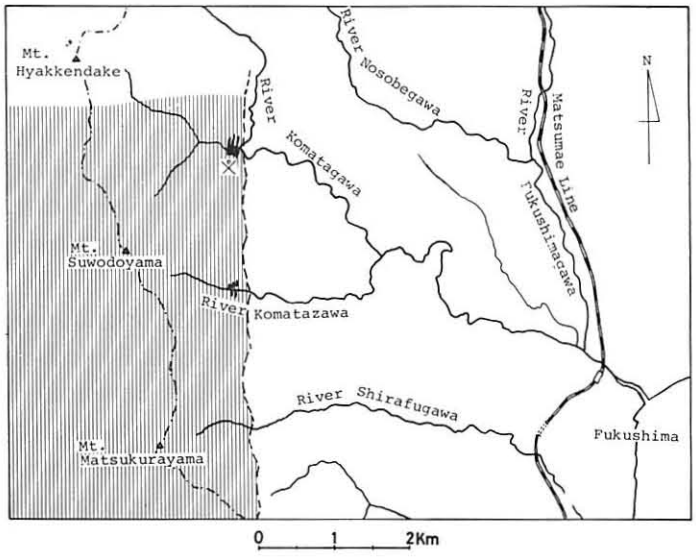

Fig. 2 Locality of the *Gymnocodium* and *Mizzia*.
The Matsumae group is stippled. Rest of the area is Neogene Tertiary. Solid lines and dots at River Komatagawa and River Komatazawa are representing limestones.

The algal fossils were found in a limestone slab collected at the upper stream of the River Komatagawa, about 5 km northwest of Fukushima town (Fig. 2). The Matsumae Group in this area is composed of alternation of thinly laminated grayish black slate and greenish gray basaltic tuff (schalstein) of 5–20m thick. Banded chert of less than 0.5m thick is locally intercalated here and there. This lithology continues at least 2 km along the River Komatagawa.

Near the top of the above sequence, several rather thick (1–3m) banded chert beds occur as if they are forming a zone of about 300m wide. Some of these thick chert accompany 1–2m thick massive limestone beds. Three such limestone beds are found, although small limestone lenses of 0.1–0.5 x 0.5–2m are sporadically scattered in the zone. This zone seems to extend NS direction, coincides with general trend of this area. Lateral distribution of the limestone beds are not apparent since no such bed appears in the upper stream of the River Komatazawa, about 2.5 km south, where small limestone lenses of the same zone are sporadically found. Northern extension of this zone is not traced.

Limestones found in this zone are commonly more or less crystalline and are cut by numerous calcite veinlets. Some limestones are so intensively recrystallized that no fossil evidence is apparent. Many limestones, however, contain abundant calcareous algae and echinoderm fragments, although more or less obscured by recrystallization.

Algal fossils

Gymnocodium bellerophontis (Rothpletz) (Fig. 3, 1): Although this species is represented by cylindrical, oval or cone-shaped segment, the figured specimen may be regularly waving and is cut nearly longitudinally, thus appearing as a line of three ovoids. Segment is about 6.3 mm long and its diameter measures about 2.0 mm. Perforation on the wall is indistinctly seen. Inside the segment is filled with traces of the plant fibers. Accordingly the segment appears as if double-walled.

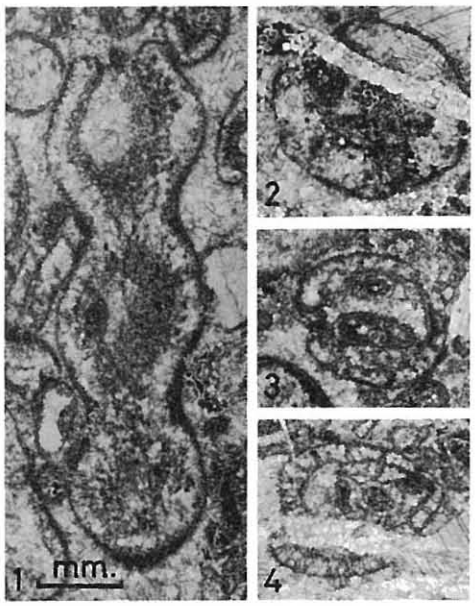

Fig. 3 Calcareous algae *Gymnocodium* and *Mizzia*.
1. *Gymnocodium bellerophontis* (Rothpletz), nearly longitudinal section of a segment.
2-4. *Mizzia velebitana* (Schubert)
2. Rather obscured cross cut specimen which internal space is mostly recrystallized. 3. Well preserved specimen with distinct thickning of branches. 4. Another well preserved specimen of pyriform is revealed.

Mizzia velebitana (Schubert) (Fig. 3, 2-4): Although more or less obscured by recrystallization and calcite veinlets, expanded ends of branches between central stem and outer periphery is clearly seen. Shape of the segment seems to be pyriform or egg-shaped. Outer diameter of the segment reaches no less than 2.1 mm. Inner diameter is about 1.6 mm. These morphologic features mostly diagnostic to those of *M. velebitana*.

Geologic ranges of both genera above mentioned are restricted to Permian

according to Johnson (1963). *Mizzia* is known only from Middle and Upper Permian; *Gymnocodium* is said to be particularly abundant in Middle and Upper Permian. Consequently the authors are sure that this part of the Matsumae group is Permian probably of Middle Permian.

Discussions

The locality of these algal fossils is actually the same as that from which Aoki and Yoshida (1974) reported Carboniferous conodonts. They reported two fragments of *Gondolella clarki* Koike from a small limestone nodule collected at upper stream of the River Komatagawa (locality No. 5). Comparing these conodonts with those of Mt. Taiheizan and the River Sumikawa (Yoshida and Aoki, 1972), they concluded that this part of the Matsumae group also is Upper Carboniferous and is correlatable to the latter two areas. Their result is in conflict with ours in the consideration of the geological age of the concerned part of the Matsumae Group.

There are two possibilities: One is that the geological range of algae and/or conodonts should be further extended. The other is that Carboniferous conodonts are reworked.

Discussing the geotectonical aspects of the Matsumae Group, Yoshida et al. (1970) included this group to the Northern Kitakami zone, which is considered as mainly Permian in age. It is not unreasonable, therefore, that the Matsumae Group contains Permian strata at least certain extent. Also this suggests that the Northern Kitakami zone was continuously eugeosynclinal depositional basin through Late Carboniferous to Late Permian.

However, there arises another problem that, as far as the authors surveyed no lithologic nor tectonic distinction could be distinguished between the Upper Carboniferous and the supposed Permian succession of the Matsumae Group.

Conclusion

The geologic age of the Matsumae Group has been ascertained mostly as Upper Carboniferous by the evidences of corals, fusulinids and conodont. Certain part of this group however can be Permian from the evidence of newly found calcareous algae *Gymnocodium* and *Mizzia,* though conflict evidence still exist. Reexamination of calcareous algae, which were rather commonly found in the Matsumae Group but no attension generally has been given (Aoki and Yoshida, 1974), may led resolution of age and detailed stratigraphy of the group.

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