

**Permian and Triassic radiolarians from pebbles of a conglomerate
distributed in the Mae Hong Son area, Northern Thailand
-Preliminary report-**

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Extended abstract

Introduction

It is widely accepted that Southeast Asia is composed of several continental blocks, arcs and accretionary complexes, and the origin of the continental blocks is believed to be the northern margin of Gondwanaland (e.g. Metcalfe, 1996). In the current understandings, these continental blocks drifted away from Gondwanaland at different times, forming several stages of Tethys and finally amalgamated to form the Asian Continent. In case of mainland Thailand, it has been divided geologically into two continental blocks, Sibumasu on the western side and Indochina on the eastern. In order to elucidating the process of the dispersal of continental fragments from Gondwanaland, many works have been undertaken. Particularly, radiolarian biostratigraphy has contributed to the understanding of geological ages of pelagic sediments such as chert and siliceous shale, and the estimation of the ages and duration of the various stages of Tethys in the last decade (e.g. Sashida et al., 1993; Sashida and Igo, 1999; Kamata et al., 2002).

In addition to the direct age determination of siliceous rocks, it has been pointed out that radiolarian specimens are useful to give some constrains on age control of conglomerate. The extracted radiolarians from pebbles provide information to consider geologic age and provenance of the radiolarian-bearing pebbles. In this viewpoint, several studies have been carried out to infer the sourceland of Mesozoic conglomerates, considering tectonic evolution of Japan and East Asia (e.g., Kamata et al., 2000). Recently, we attempted to extract radiolarians from pebbles of a conglomerate which is distributed throughout Northern Thailand. The conglomerate has been believed to be Late Carboniferous, however, we could obtain Permian and Triassic radiolarians from the pebbles.

Our investigating of the conglomerate is preliminary, though the occurrence of the radiolarians would be of particular importance to consider the stratigraphy around the North Thailand. In this paper, we will report the geologic significance of the radiolarian occurrence.

Geologic Setting and study section

The location of outcrop corresponds to 168.7 km milestone of highway 1095, about 30 km northeast of Mae Hong Son. The study section here attains to about 15 meters, and consists mainly of bedded red sandstone and shale. The beds dip northerly with 35 degrees. In the middle part of this section, chert pebble-bearing coarse sandstone bed, 4 m thick, occurs. This bed is overlain conformably by thick red shale

interbedded with an impure carbonate bed, 10 cm thick, and is underlain by black shale with an erosional surface. The black shale intercalates dark green fine-grained sandstone, 30 cm thick. The upper part of the chert pebble-bearing coarse sandstone bed also intercalates very fine-grained sandstone to siltstone, 10 cm thick. The lithology of pebble, sometimes cobble in size, is exclusively red, green and black chert. Chert pebbles are rounded to subrounded.

According to the geological map of Northern Thailand by Baum et al., (1970), the constituents of study section belong to the Upper Carboniferous sequence. Later, Bunopas (1981) proposed the Doi Kong Mu Formation for an equivalent of this sequence consisting of red shale, sandstone and conglomerate. This sequence have been dated by conodonts and foraminifers including fusulinoideans from limestones intercalated with the clastic rocks (Hahn and Siebenhüner, 1982). They reported Carboniferous (Visean?) smaller foraminifers (*Endothyra* sp., *Lituotubella* sp., *Archaediscus* sp., *Tournayella* sp., *Brunsiina* sp., *Plectogyra* sp., *Eostaffella* sp., *Tetrataxis media*) and late Early or Middle Permian fusulinoidea (*Pseudofusulina* sp.) from limestones near the study section.

Radiolarians

Poorly to moderately preserved radiolarians obtained by acidic treatment of the pebbles as follows: *Follicucullus scholasticus* Ormiston and Babcock, *F. porrectus* Rudenko, *F. cf. dilatatus* Rudenko, *F. sp.*, *Albaillella protolevis* Kuwahara, *A. sp.*, *Pseudoalbaillella* ? sp., *Entactinosphaera* ? sp., *Triassocampe* sp., *Pseudostylosphaera cf. japonica* Nakaseko and Nishimura, *P. sp.*, *Anisicyrtis* sp., *Staurosphaera* ? sp., *Praemososaturnalis* sp., *Oertlispongus inaequispinosus* Dumitrica, Kozur and Mostler, *O. sp.*, *Falcispongus* sp. and so on. These radiolarians are cosmopolitan and diagnostic species of Permian and Triassic.

Among radiolarian species from the pebble, the genus *Pseudoalbaillella* is known to range from the Late Carboniferous to Middle Permian. *Follicucullus scholasticus* Ormiston and Babcock is a diagnostic species of the *F. scholasticus* Assemblage Zone (Ishiga, 1986), and ranges from late Middle to Late Permian (Ishiga, 1986; Kuwahara et al., 1998). *F. dilatatus* Rudenko and *F. porrectus* Rudenko were reported from the *F. scholasticus* Assemblage Zone to *Neoalbaillella ornithoformis* Assemblage Zone (Kuwahara et al., 1998), which are correlated to the Late Permian. The occurrence of *Albaillella protolevis* Kuwahara was reported from *N. ornithoformis* to *N. optima* Zones of the late Late Permian (Kuwahara, 1999).

Two genera, *Triassocampe* and *Pseudostylosphaera*, are diagnostic in the Middle to Late Triassic and Middle Triassic, respectively. A number of species of the *Anisicyrtis* were reported from European Tethys of Hungary and Italy, and their occurrence is restricted to the late Anisian and early Ladinian. The genus *Falcispongus* was minutely described by Dumitrica (1982), and its range from latest Anisian to Ladinian. *Oertlispongus inaequispinosus* Dumitrica, Kozur and Mostler was reported from northern Italy, and is assigned to the lower Ladinian by Kozur and Mostler (1994).

The above-mentioned biostratigraphic data suggest that the pebbles contain two different radiolarian faunas; one is the Late Permian and the other is the Middle Triassic. They reflect the depositional ages of the source rocks from which the pebbles are derived.

Significance of the occurrence of Permian and Triassic radiolarians

Recently, some of radiolarian occurrences are reported from Northern Thailand (Sashida et al., 1993, 2000; Kamata et al., 2002), and they contribute not only the age determination and stratigraphy of the Paleozoic and Mesozoic but also paleogeographic study. In these studies, distribution of the radiolarian-bearing pelagic strata such as chert and siliceous shale has been clarified. Sashida et al., (1993, 2000) discovered Devonian to Middle Permian and Late Permian to Middle Triassic radiolarians in the type section of the 'Fang Chert' exposing near the Chiang Mai and Chiang Dao area. Kamata et al., (2002) reported the occurrence of the late Early to early Late Triassic radiolarians from a bedded chert to shale sequence near Mae Sariang. Permian to Triassic radiolarian faunas reported by these studies are represented by the occurrence of the genera *Pseudoalbaillella*, *Albaillella* and *Triassocampe*. Due to the poor preservation, it is difficult to compare strictly the radiolarian faunas from the pebbles in this study to those from the Paleozoic and Mesozoic sequence in the previous studies. Similarity of the dominant genera between them, however, implies that the Permian to Triassic chert sequences distributed Northern Thailand are regarded as the possible source rocks of the chert pebbles in the study section.

According to the previous stratigraphic studies, the conglomerate of the study section probably belongs to the extension of the Doi Kong Mu Formation which is considered to be Upper Carboniferous by Bunapas (1981). And then, it is correlated to the Mae Tha Group and Fang Red-beds widely extending around the North Thailand. As mentioned above, however, the pebbles of the conglomerate include the Late Permian and Middle Triassic radiolarians. This indicates that deposition of the conglomerate is definitely later than the Middle Triassic. In addition, the strata exposed in the study section are dominated by various kinds of reddish siliciclastics. These lines of evidence may possibly suggest a close genetical relation between the reddish siliciclastic strata in North Thailand including those of this study and the Khorat Group widely distributed in the Indochina Block of East Thailand. As a result of this study, anyway, it is concluded that the geological age and stratigraphy of the conglomerate and regional stratigraphy of the Upper Paleozoic to Mesozoic strata distributed between Mae Hong Son to Chiang Dao area, North Thailand should be reexamined.

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