Some Important Fauna of the Zebingyi Formation Exposed in the Kangyigon Area, Pyin Oo Lwin Township, Myanmar: Evidence for Middle Devonian (Eifelian)

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ABSTRACT

The Devonian sediments are widely distributed in Kangyigon area, Pyin Oo Lwin Township. This area forming part of the western marginal zone of the Eastern Highland, is situated about 11.26 km south of Pyin Oo Lwin. The Zebingyi Formation is identified by its stratigraphic position: the lower black shale and limestone, and the upper buff to purple shale, siltstone and quartzose sandstone. The fauna from the lower part of the Zebingyi Formation are *Meristina* sp., *Monograptus* sp., *Nowakia* sp., *Styliolina* sp., *Dalmanites* sp., *Michelinoceras* sp., and the upper part contains *Nowakia* sp., *Styliolina* sp., *Dalmanites* sp., *Phacops taungtalonensis*, *Chonetes* sp., *Atrypa* sp., *Favosites* spp., *Heliophyllum* sp., *Zaphrentis* spp., *Eridophyllum* sp., *Cystiphyllum* sp., *Calceola* cf. *C. sandalina*, *Coenites* spp., etc. Based on the stratigraphic position and faunal evidences, the Zebingyi Formation can be assigned as the Early Devonian (Pragian) to Middle Devonian (Eifelian).

Keywords; *Calceola* cf. *C. sandalina*, Pragian, Eifelian, Zebingyi Formation, Kangyigon (Myanmar)

INTRODUCTION

The Paleozoic rocks are widely distributed in the northern Shan State. The area forming part of the western marginal zone of the Eastern Highland, is situated about 11.26 km south of Pyin Oo Lwin (Figure 1). The Zebingyi Beds described by La Touche (1913) is reinvestigated by IGCP (1980) and redefined as Zebingyi Formation which consists of

various lithologic facies of limestone, siltstone and shale. Myint Thein (1983) studied and mapped the units in the Kywetnapa-Letpangon area in Patheingyi and Maymyo Townships and his Zebingyi Formation has three distinct members, black limestone and black shale interbeds in the lower, marl and siltstone in the middle and quartzose sandstone in the upper. Hang Khan Pau et al. (1993) subdivided into five lithostratigraphic units on the basic of limestone, shale and siltstone ratio. The Zebingyi Formation is reinvestigated and subdivided by Aye Ko Aung and Kyaw Min (2011), Aye Ko Aung (2012) into three members, viz., the lower Khinzo chaung Limestone Member, the middle Inni chaung Limestone Member and the upper Doganaing chaung Orthoquartzite Member.

The present study only follows up the widely accepted the stratigraphic name, "Zebingyi Formation" and subdivided into two members, viz., the lower black shale and limestone interbeds and the upper buff to purple shale, siltstone and quartzose sandstone (Zaw Min Thein, 1995).

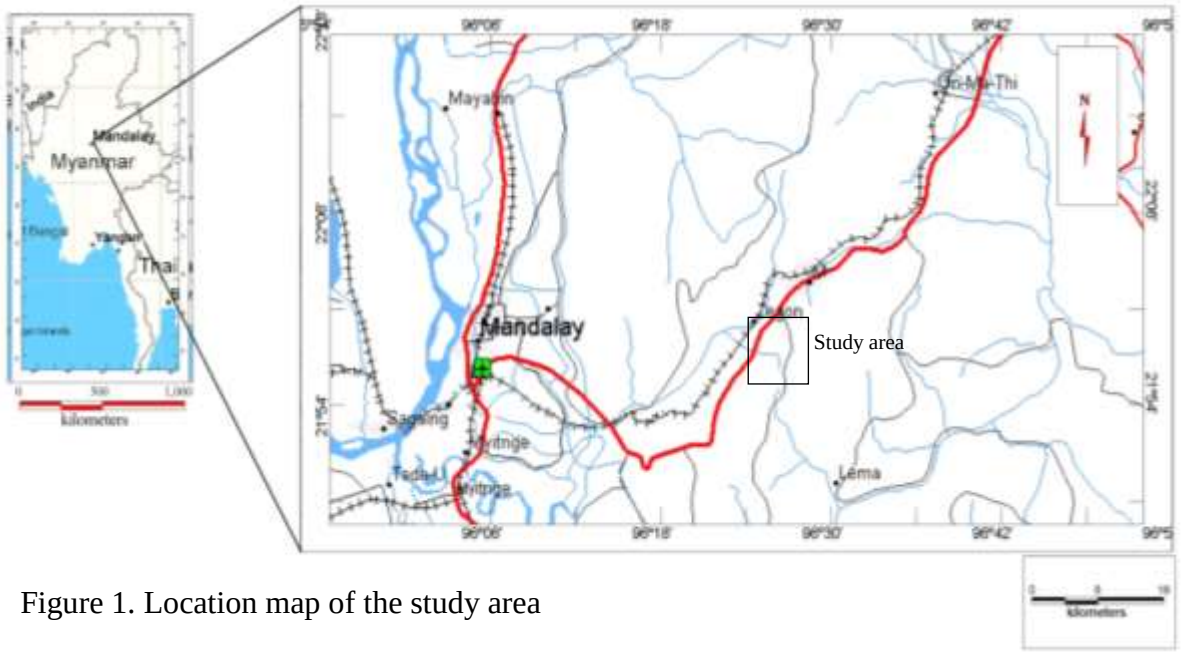


Figure 1. Location map of the study area

METHODOLOGY

The first author has taken long field investigations at the Kangyigon area and its environs. The samples were hammered out from the outcrops of shale, siltstone and limestone. Fossils-bearing samples were systematically packed with tissues and tapes as necessary. Well preserved specimens were then labeled and photographed.

GEOLOGIC SETTING

The Ordovician to Permian strata (Figure 2) is constituted of the Naungkangyi (Ordovician), Nyaungbaw Formation (Silurian), Zebingyi Formation (Early to Middle Devonian) and Maymyo Dolomite Formation (Late Devonian?). The area has distinct major structures, Nyannyintha anticline (overturn fold) and Kangyigon syncline.

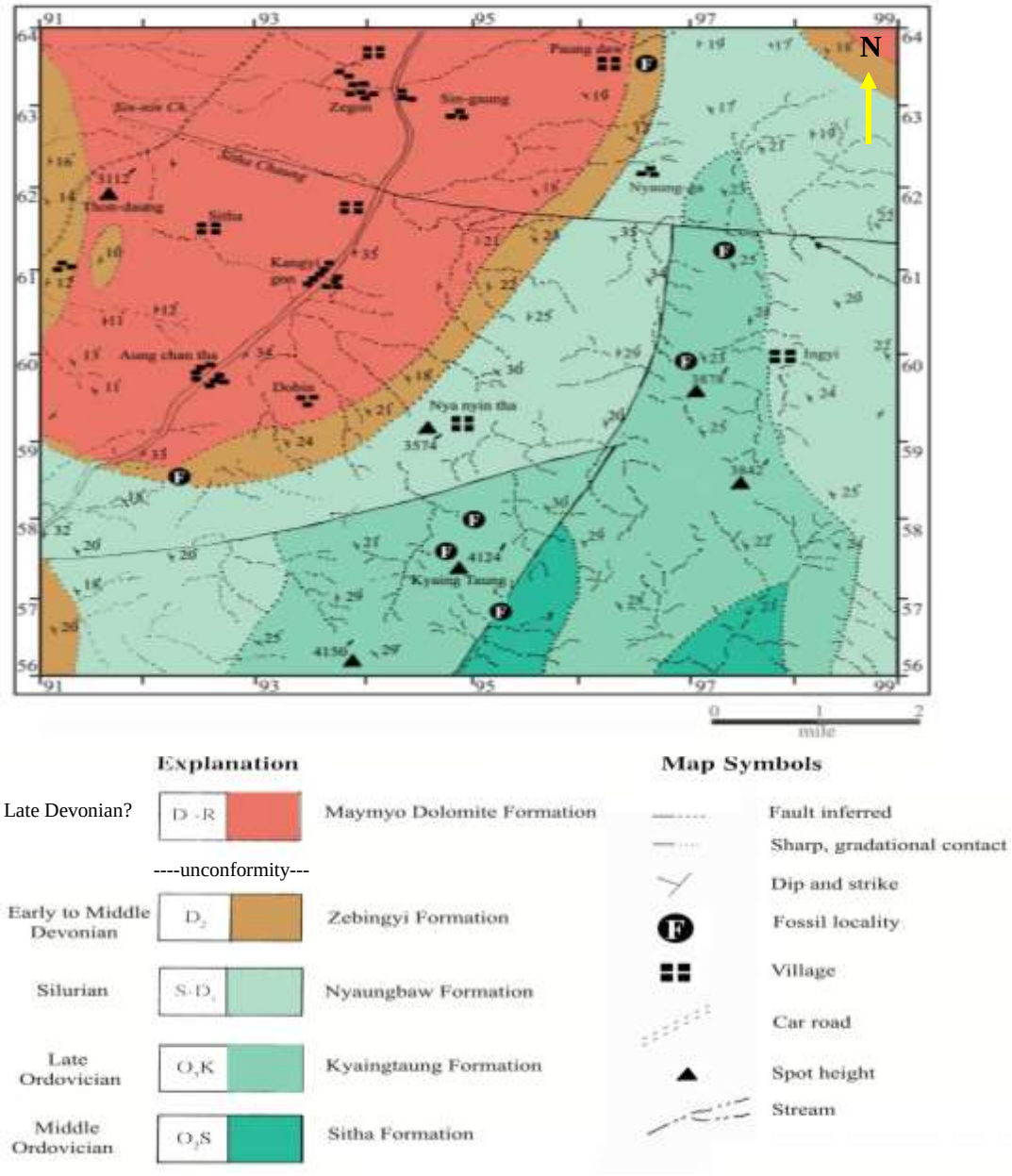


Figure 2. Geological map of the Kangyigon area (Zaw Min Thein, 1995)

RESULTS

Distribution and Thickness

The Zebingyi Formation is limited in the western part of the area. It is mainly exposed in a narrow belt, trending north-south and dips about 20° to the east. The unit is well exposed in the vicinity of Dobin, Phaungdaw, Nyaungni and Thondaung (Figure 2). The reference section of the formation, 102 m in the thickness, is located near the Kyinganaing chaung. The Zebingyi Formation has a gradational contact with the underlying Nyaungbaw Formation. It is unconformable overlain by the Maymyo Dolomite Formation of Late Devonian? age.

Lithology

The Zebingyi Formation is identified by its stratigraphic position: the lower black shale and limestone, and the upper buff to purple shale, siltstone and quartzose sandstone. The contact between the Zebingyi Formation and the underlying Nyaungbaw Formation is not observed in the Kangyigon area. The lower member comprises 58 m of fine-grained, black limestone interbedded with black or carbonaceous shale showing well bedded nature (Figure 3-4). The beds become thinner towards the top of the unit consisting tentaculites, graptolites, trilobites and brachiopods.

The sequence of the lower member is overlain by the purple shale interbedded with buff color siltstone with trilobites and brachiopods. It is succeeded by thin-bedded, reddish brown quartzose sandstone (Figure 5). It is 24 m thick and there are a lot of corals in these silicified units. The contact between Zebingyis and Maymyo Dolomite Formation is not observed in this area. It may be unconformable contact between them.

Fauna

The fossils tentaculites, trilobites (*Dalmanites*), and cephalopods are occurred throughout the whole sequence of the Zebingyi Formation. The important fossils are mollusks (*Nowakia* sp., *Styliolina* spp.), trilobites (*Phacops taungtalonensis*, *Dalmanites* sp.), Brachiopods (*Meristina* sp.**,** *Atrypa* sp., *Chonetes* sp.), graptolites (*Monograptus* spp.), cephalopods (*Michelinoceras* sp.), Corals (*Favosites* spp., *Coenites* spp., *Heliophyllum* sp., *Zaphrentis* sp., *Eridophyllum* sp., *Cystiphyllum* sp., *Calceola* cf. *C. sandalina*) (Figure 6-9).

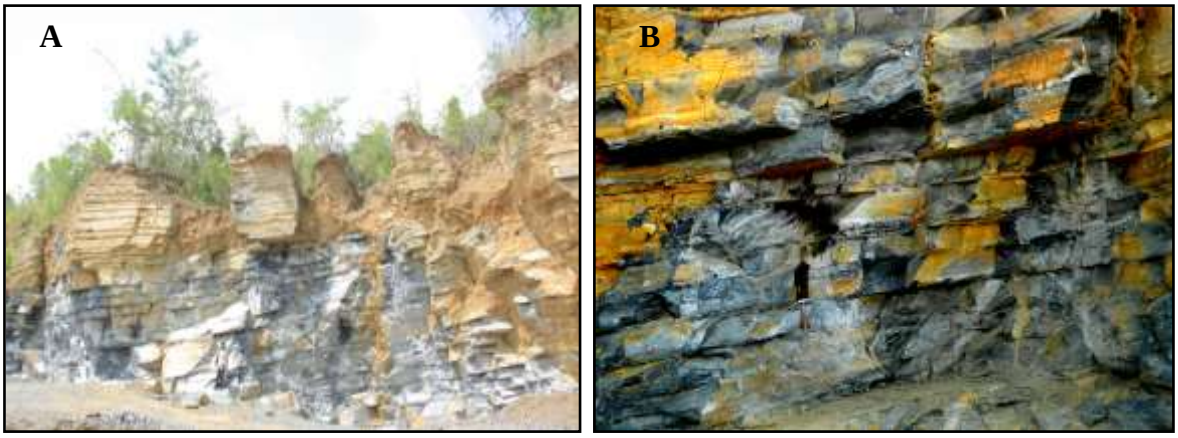


Figure 3. Thin-to medium-bedded, black shale and black limestone of the lower part of the Zebingyi Formation exposed in the Kyinganaing chaung showing thinning upward sequence

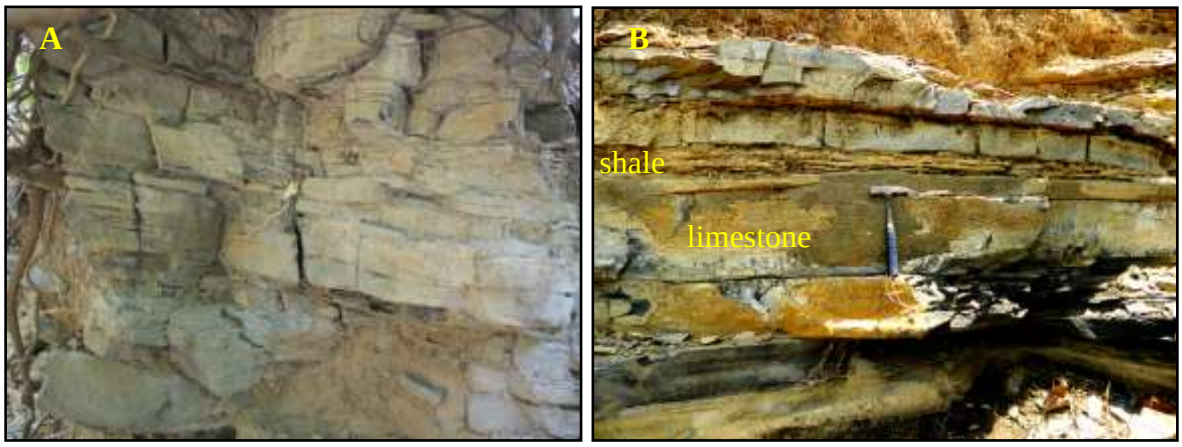


Figure 4. Black limestone interbedded with black or carbonaceous shale of the lower part of the Zebingyi Formation exposed in the Kyinganaing chaung

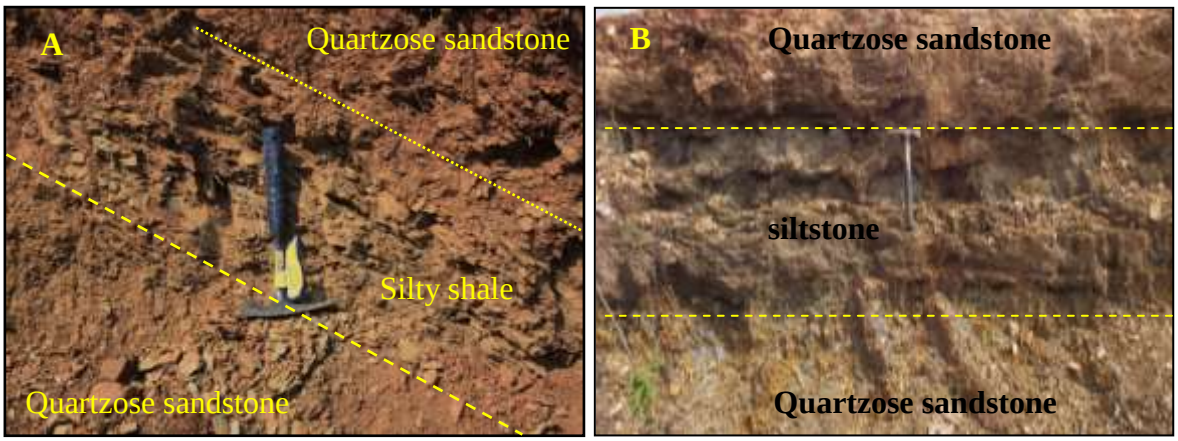


Figure 5. Thinly-bedded, buff colour siltstone or silty shale and reddish brown quartzose sandstone from the upper part of the Zebingyi Formation exposed in the Ingyi cart road

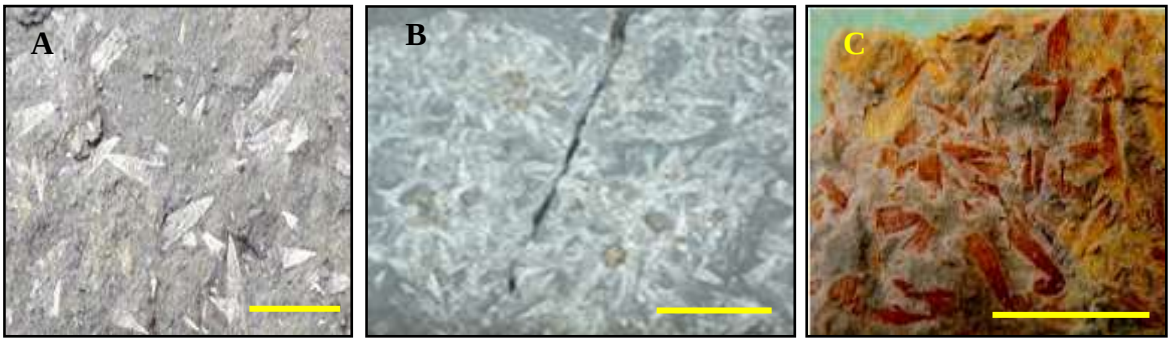


Figure 7. Fossils from the Zebingyi Formation: **A-C**. *Nowakia* sp. and *Styliolina* sp.; Scale bar is 1 cm.

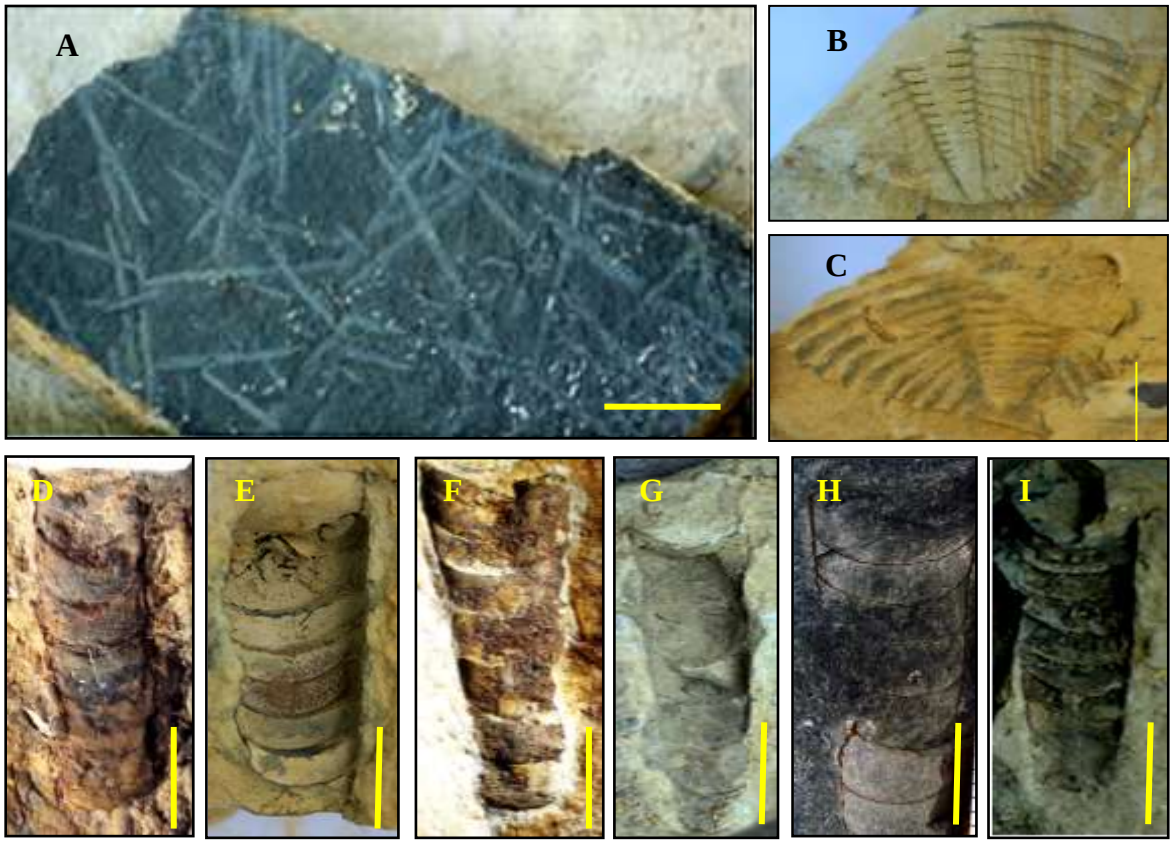


Figure 6. Fossils from the lower part of the Zebingyi Formation: **A**. *Monograptus* spp.; **B-C**. Pygidium of *Dalmanites* spp.; **D-I**. *Michelinoceras* spp. Scale bar is 1cm. (N 21° 57'10.577"; E 96° 25' 09.274").

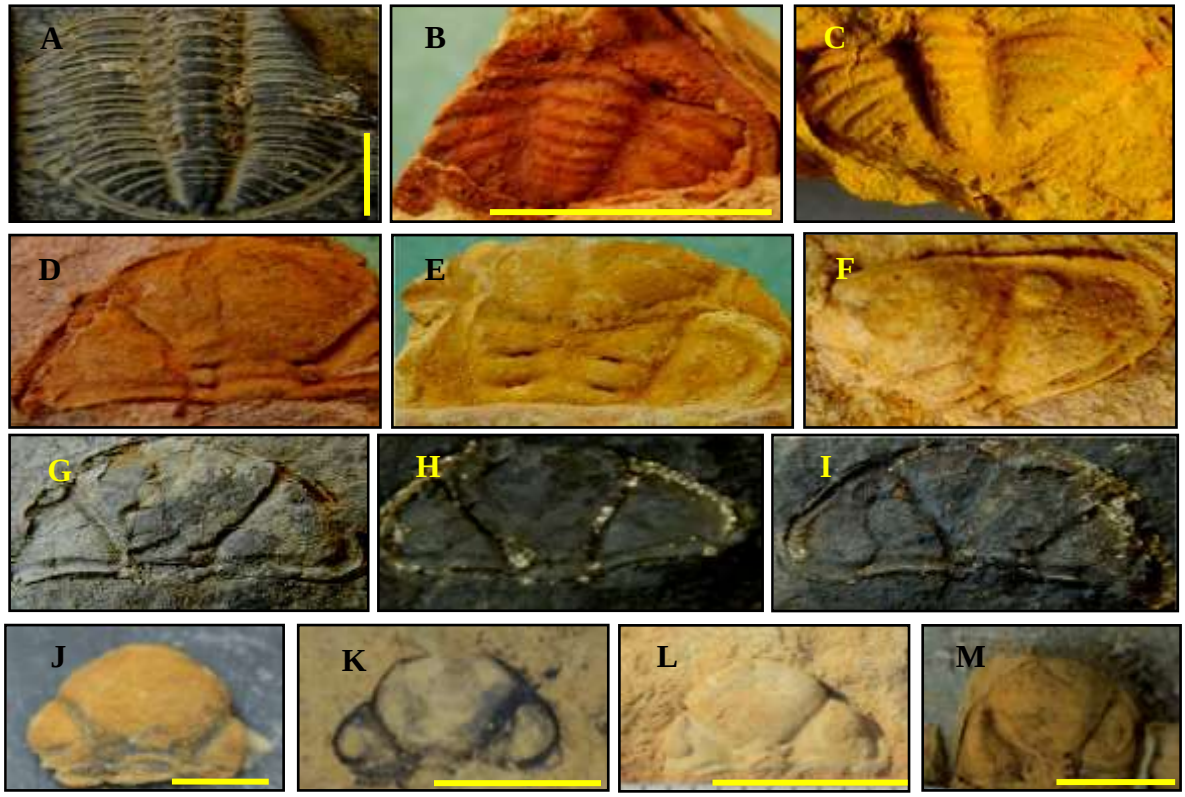


Figure 8. Fossils from the upper part of the Zebingyi Formation: **A-C.** Pygidiums of *Phacops taungtalonesis*; **D-M.** Cephalons of *Phacops taungtalonesis*. Scale bar is 1 cm.

DISCUSSION

Age

Abundant tentaculites (*Nowakia* sp. and *Styliolina* spp.) suggest an Early Devonian (Pragian) age. The graptolite fauna (*Monograptus* spp.) are suggested to the Early Devonian (Late Pragian-?Early Emsian) (Kyi Soe, 2000). The brachiopods (*Orthis* sp., *Meristina* sp., *Atrypa* sp., *Chonetes* sp.) and trilobites (*Phacops* spp., *Dalmanites* sp.) assemblages are very similar to that of the Early Devonian in age. The trilobite species *Phacops taungtalonensis* (Thaw Tint and Hla Wai, 1970) discovered in the lower part of the Zebingyi Formation from Medaw area has been reported from Siegenian to Pragian. The condonts (*Eognathodus sulcatus*) a zonal form of *sulcatus* zone was recently discovered from the lower part of the Zebingyi Formation suggests a Pragian age.

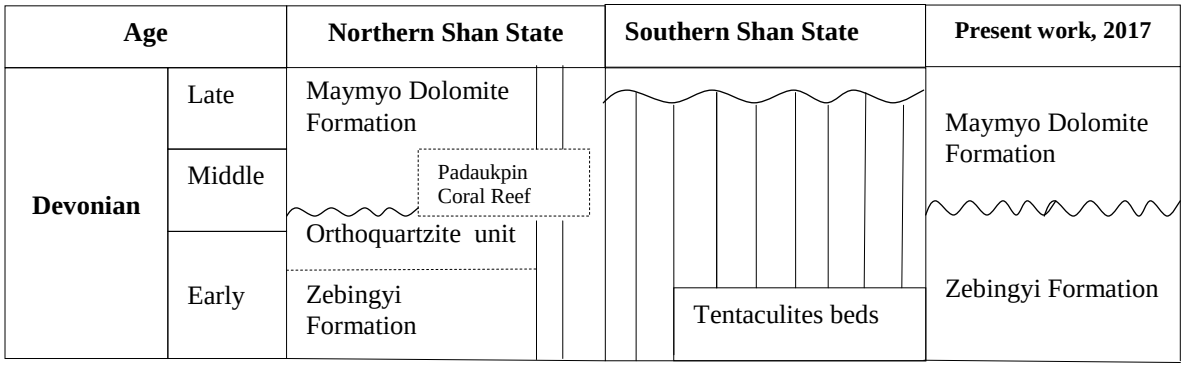
Figure 9. Fauna from the upper part of the Zebingyi Formation: **A-E**. *Calceola* cf. *C. sandalina* (**B-E** is 5 mm); **F, I, L, S**. *Helliophyllum* sp.; **G, Y**. *Calceola* sp.; **H**. *Ptenophyllidae* sp.; **N, J, K, R, T-X**. *Zaphrentis* sp. **M, O**. *Cystiphyllum* sp.; **P-Q.** ?*Pachyphyllum* sp.; **Z.** *Favosites* sp. Scale bar is 1 cm. (N 21° 57' 10.392"; E 96° 25' 12.323")

Bo San (1985, personal communication) collected the Middle Devonian assemblages indicating *Favocities sp., Zaphrentis sp. and Coenites sp.* from the silicified rock layers. Lucky, the authors also found and collected the corals *(Favosites limitaris, Heliophyllum sp., Zaphrentis sp., Coenites sp., Calceola sandalina)* from the silicified rocks exposed near the Anisakan Landing Ground (N 21° 57' 10.392"; E 96° 25' 12.323") are suggested to the Middle Devonian (Eifelian) (Zaw Min Thein, 1995).The age of the Zebingyi Formation can be assigned as the Early Devonian (Pragian) to Middle Devonian (Eifelian) by the presence of conodonts, trilobites, brachiopods, tentaculites and corals.

Correlation

The tentaculites of the Zebingyi Formation are closely compared with those from the tentaculites-bearing Devonian units of Taunggyi-Taungchun range in Table 1 (Aye Ko Aung, 2010).

Table 1. Stratigraphic correlation of the Devonian units (Maung Thein, 2014)



CONCLUSION

The Zebingyi Formation is predominantly composed of thin-to medium-bedded, black limestone and carbonaceous shale in the lower part. The upper part contains buff to purple, calcareous shale, siltstone and quartzose sandstone. Abundant tentaculites (*Nowakia* sp. and *Styliolina* spp.), graptolite (*Monograptus* spp.), brachiopods (*Orthis* sp., *Meristina* sp., *Atrypa* sp., *Chonetes* sp.) and trilobites (*Phacops* spp., *Dalmanites* sp.) assemblage are very similar to that of the Early Devonian in age. The corals (*Favosites limitaris*, *Heliophyllum* sp., *Zaphrentis* sp., *Coenites* sp., *Calceola sandalina*) from the silicified rocks exposed near the Anisakan Landing Ground (N 21° 57' 10.392"; E 96° 25' 12.323") are suggested to the

Middle Devonian (Eifelian) (Zaw Min Thein, 1995). The age of Zebingyi Formation can be assigned as the Early Devonian (Pragian) to Middle Devonian (Eifelian) by the presence of conodonts, trilobites, brachiopods, tentaculites and corals.

ACKNOWLEDGEMENTS

The authors wish to express our sincere gratitude to Professor Hla Myint (retired) and Professor Bo San (retired) for their kind helps in various ways. Special thanks are also due to Dr Myint Thein (former Lecturer) for his invaluable advice and critical discussions.

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