

Paleozoic Stratigraphy of the Namtu-Mansam Area, Namtu Township, Northern Shan State, Myanmar

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Abstract

The Namtu-Mansam area is located in Namtu Township, at about 42 miles NW of Hsipaw Township and about 44 miles SW of Lashio Township. It is situated between North latitudes 23° 0" to 23° 7" and East longitudes 97° 21" to 97° 26". It extends about 7.5 miles from north to south and 5.5 miles from east to west and thus, the total coverage of the area is approximately 41.25 square miles. One-inch topographic map of 93-E/8 was used as a base map. It is easily accessible by car or train throughout the year. The present study area is situated in the southwestern part of the Lashio Basin. This basin lies in the northern part of Shan Plateau. The regional structural elements such as strikes of beds, trend generally NE-SW in direction. Major cross fault (Momeik Fault) trending approximately ENE-WSW is also observed. This Fault is cutting across the Namtu-Bawdwin area. The stratigraphic unit of the area can be differentiated into lithostratigraphic units such as Pangyun Formation (Late Cambrian), Taungkyun Formation (Early-Middle Ordovician), Li-Lu Formation (Late Ordovician), Panghsa-pye Formation (Early Silurian), Namhsim Formation (Late Silurian), Plateau Limestone Group (Devonian –Early Triassic).

Keywords; Paleozoic stratigraphy, Namtu-Mansam Area, Northern Shan State, lithostratigraphic units

Introduction

The Namtu-Mansam area is located in Namtu Township, at about 42 miles NW of Hsipaw Township and about 44 miles SW of Lashio Township. It is situated between North latitudes 23° 0" to 23° 7" and East longitudes 97° 21" to 97° 26". It extends about 7.5 miles from north to south and 5.5 miles from east to west and thus, the total coverage of the area is approximately 41.25 square miles. One-inch topographic map of 93-E/8 was used as a base map. It is easily accessible by car or train throughout the year.

The present study area is situated in the southwestern part of the Lashio Basin. This basin lies in the northern part of Shan Plateau. The regional structural elements such as strikes of beds, trend generally NE-SW in direction. Major cross fault (Momeik Fault) trending approximately ENE-WSW is also observed. This Fault is cutting across the Namtu-Bawdwin area. Lashio basin is an outlier basin covered by Mesozoic sediments such as Bawgyo Group of Triassic unit and Namyau Group of Jurassic unit. These Mesozoic sediments are underlain by Paleozoic units such as Pangyun Formation of Cambrian unit, Naungkangyi Group of Ordovician units, Panghsa-pye Formation and Namhsim Formation of Silurian units and Shan Dolomite Group of Permian- Triassic unit.

The study area is located in the southwestern part of the Lashio Basin, Northern Shan State. This area is mainly covered by clastic sedimentary rocks and carbonate rocks of Paleozoic to Mesozoic age is shown in figure (1). The lithostratigraphic units of the Namtu-Mansam area have been classified as follows in descending order,

6. Namyau Group

Tati limestone (Middle Jurassic)

5. Plateau limestone Group (Devonian to Early Triassic)
4. Namhsim Formation (Late Silurian)
3. Panghsa-pye Formation (Early Silurian)
2. Nyaungkangyi Group
 - (2) Li-Lu Formation (Late Ordovician)
 - (1) Taungkyun Formation (Early-Middle Ordovician)
1. Pangyun Formation (Late Cambrian)

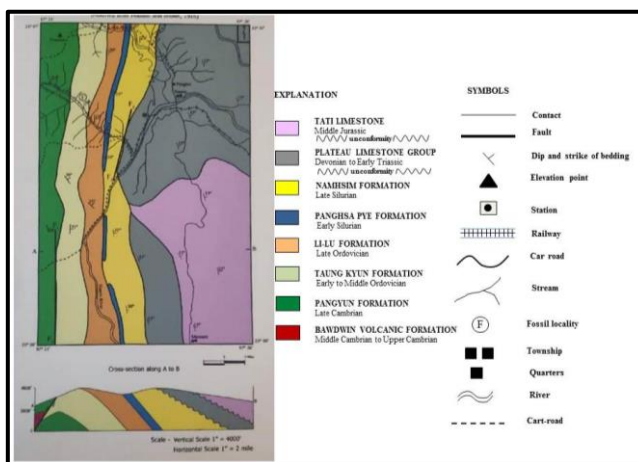


Figure 1. Geological Map of the Namtu-Mansam Area

Materials and methods

The field work of this research paper started in October, 2009 and completed February, 2010. Many rock samples of all formations and fossil specimens are collected and prepared to thin-sections. Petrographic analysis and faunal analysis are made in geological laboratory of Department of Geology, Meiktila University. Field data, arial photos and some

topographic maps are used for preparation of geological map.

Results

Stratigraphy

Pangyun Formation

The Pangyun Beds was named after the Nam Pangyun Chaung. Briekmann and Hinze (1976) designated the Pangyun Formation for the Pangyun Beds of Brown.

In the study area, the Pangyun formation is mainly exposed in the western portion of the namtu area. The classic sediments of Pangyun formation are well exposed along the Namtu – Bawdwin rail-way, about 7 miles north-west of Namtu Station and Namtu-Bawdwin car-road. This unit is generally NE-SW striking and moderately dipping to the east.

This unit is mainly composed of red to brown, fine to medium-grained, micaceous sandstone (Fig.2). Locally, the sandstone has developed as red, dense, medium-bedded orthoquartzite. Ripple marks are found in many places. Purple to red siltstone layers are exposed among the sandstones beds. These layers are fossiliferous and covered with mica flakes. In some places, white to light-grey sandstone is found and filled with limonite in small cavities.

The previous works have been the fossil fragments (genal spines of trilobites) in the Pangyun sandstone. According to the stratigraphic position, this formation may be regarded as Late Cambrian. This unit can be correlated with the Ngwetaung Group of northern Shan State (Hla Myint, 1984) and Molohein Group of Myint Lwin Thein (1973) in southern Shan State.

Taungkyun Formation

Mitchell (1977) named the Taungkyun Formation which equivalents to the Lower Naungkangyi Beds of La Touche (1913), was tentatively renamed the Sitha Formation by Hla Myint (1984).

In the study area, Taungkyun Formation is well exposed at the western part of the Namtu area. It is widely distributed along the Namtu-Bawdwin railway and car-road, about 5 miles, west of Namtu station.

Taungkyun Formation consists of thin-to medium-bedded, yellow to red coloured silty shale with medium-bedded, grey to bluish-grey coloured muddy crystalline limestone (Fig.3). The limestone is compact, hard and commonly marked with irregular silt partings. In someplace, yellow to buff coloured sandy marl is formed with silty shale.

The following fossils are found in the Taungkyun Formation.

Bryozoans : *Diplotrypa sp.*

Brachiopods : *Orthis sp.* (Fig.4)

On the basis of above faunal content and lithology, this formation can be dated as Early to Middle Ordovician age.

This formation can be correlated with the Wunbye formation of Myint Lwin Thein (1973) in Pindaya Range, Southern Shan State and Sitha Formation of Northern Shan State (Hla Myint, 1983).



Figure 2. Medium-bedded, red to brown micaceous sandstone of Pangyun Formation

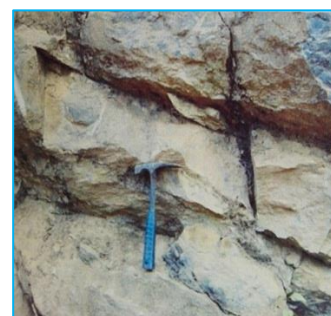


Figure 3. Medium- to thick-bedded, grey to yellowish-grey, muddy limestone of the Taungkyun Formation



Figure 4. *Orthis sp.* in yellow siltstone of the Taungkyun Formation



Figure 5. Medium- to thick-bedded, grey to reddish-brown, silty limestone of the Li-lu Formation

Li-Lu Formation

Mitchell (1977) named after Li-lu village, Namhsam Township in N.S.S. The Li-Lu Formation is equivalent

to the Upper Naungkangyi Beds of La Touche (1913) and the Kyaingtaung Formation of I.G.C.P (1980).

The Li-Lu Formation well exposed extensively the western part of the study area. It crops out along the Namtu-Bawdwin railway, at 34.1 to 34.5 milepost and car-road section.

The outcrop area of the Li-Lu Formation is much larger than the outcrop area of the Taungkyun Formation.

This unit consists of thin-to medium bedded, white, yellow and sometimes purple siltstone, mudstones and marls with occasionally bands or beds of silty limestone (Fig.5). These limestones are hard, compact and jointed. Weathered surface shows reddish to yellowish-grey in colour with sub-phacoidal structure. Thin-bedded, yellow to purple, fossiliferous calcareous siltstone is well exposed both Namtu Bawdwin car-road and railway.

In the present area, *Dinorthis* sp., *Orthis* sp. and *Caryocrinus* sp. are found in the yellow siltstone (Fig. 6 and Fig. 7). According to faunal assemblage and stratigraphic position, the Li-Lu Formation can be assigned to Late Ordovician in age.

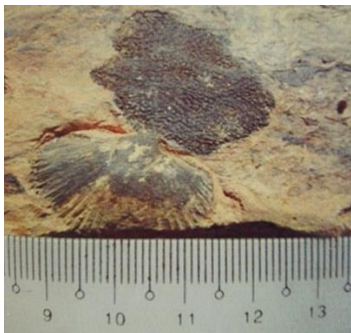


Figure 6. *Orthis* sp. in the yellow siltstone of the Li-Lu Formation



Figure 7. *Caryocrinus* sp. in the yellow siltstone of the Li-lu Formation



Figure 8. Thin- to medium-bedded, yellow sandy shale in the lower part of the Panghsa-pya Formation

It is correlated with the Upper Naungkangyi Beds of La Touche (1913), the Kyaingtaung Formation of I.G.C.P (1980) and the Nan-on Formation of Pindaya Group (Myint Lwin Thein, 1973).

Panghsa-pye Formation

The Panghsa-pye Formation was first named by La Touche (1913), after Panghsa-pye village, approximately 14 miles NW of Hsipaw, Northern Shan State. This formation is composed of shale with numerous graptolites. Pascoe (1959) subdivided into a lower or trilobite unit and an upper or graptolite unit.

This unit is well exposed along the Namtu-Bawdwin railway, about 4 miles west of Namtu, between 34.1 to 34.0 mileposts and along the Namtu-Bawdwin car-road, about 3 miles north-west of Namtu. It also crops out 2 miles west of Panghsa-pye village, 14 mileposts of Hsipaw-Namtu car-road and along the Mansam-Pan Waing section.

This formation consists of thin to medium-bedded, yellow sandy shale in the lower part and thinly-bedded, white grey to grey, sometimes black carboniferous, fissile shale in the upper part (Fig. 8). The weathered exposures of the shale are stained due to iron oxide action. Along the rail-way section, hard, thinly-laminated, dark-grey to black carboniferous, slaty shale are formed with yellowish siltstone interlayer.

The fossils collected from the yellow sandy shale and grey shale of the Pangsa-pye Formation are Trilobites ;*Phacops* sp (Fig. 9a & 9b) and *Dalmanites* sp (Fig: 9c & 9d) and Graptolites ;*Monograptus cyphus* (Fig:10a) and *Diplograptus* sp *Monograptus pridon* sp (Fig:10b) *Cytograptus cf.c.muchisoni*, Hla Thein(1991) . According to the faunal assemblages, the age of Pangsa-pye Formation may be assigned as Early Silurian age.



Figure 9(a). Cephalon of *Phacops* sp in Panghsa-pye Formation

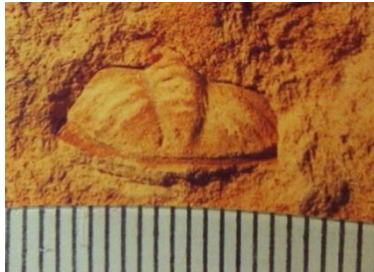


Figure 9(b) Pygidium of *Phacops* sp in Panghsa-pye Formation

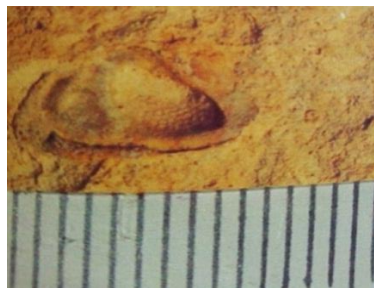


Figure 9(c) Cephalon of *Dalmanities* sp in Panghsa-pye Formation

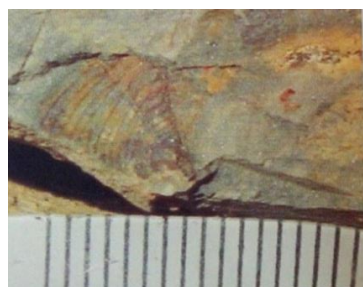


Figure 9(d) Pygidium of *Dalmanities* sp in Panghsa-pye Formation



Figure 10(a) *Monograptus cyphus* in Panghsa-pye Formation



Figure 10(b) *Cryptograptus* cfc. *muchisonis* in Panghsa-pye Formation



Figure 11. Medium- to thick-bedded, grey to yellowish grained sandstone with megaripple marks in the lower part of Namhsim Formation



Figure 12. *Spirifer* sp. in the yellowish grey sandstone of the Namhsim Formation

According to the faunal assemblages and stratigraphic relationship,



Figure 13. *Rhynchotretra* sp. in the light-grey sandstone of the Namhsim Formation



Figure 14. Medium-bedded, brecciated, light-grey to grey dolomitic limestone of Plateau Limestone Group

Namhsim Formation

La Touche (1913) first named the term Namhsim Beds after Namhsim river in Namtu valley, Northern Shan State. He divided an upper marly part (Upper Namhsim Beds) and a lower sandy part (Lower Namhsim Beds). Garson *et al.* (1976) applied the name Namhsim Formation only to the non-fossiliferous sequence of sandstone between the Panghsa-pye Forementation below and the fossiliferous overlying rocks, equivalent to the Konghsa Marl Member of La Touche (1913).

Namhsim Formation well exposed along the Namtu-Bawdwin railway, about 2 miles SW of Namtu and car-road, 3 miles NW of Namtu and 6 miles west of Man Sam. Namhsim Formation can be subdivided into two parts; the lower sandy part (Lower Namhsim sandstone) and the upper siltstone and sandy marl (Upper Namhsim or Konghsa marl).

The lower part of Namhsim Formation consists of fine to coarse-grained, compact and hard, medium to thick-bedded, white-grey to brown sandstone (Fig.11). Mega scale ripple-marks are found in massive to bold-type sandstone beds. Planar cross-beds are also formed. In someplace, medium-bedded, coarse-grained, whitish quartzose sandstone interbedded with yellowish-grey, friable silty sandstone layers.

The upper part of Namshim Formation (Konghsa Marl Member) composed of yellow, soft, thin-bedded, siltstone intercalated with sandy marl .It crops out along rail-way, about 1 mile west of Namtu station and unconformable contact with overlying Shan Dolomite Group.

Brachiopods: *Atrypa sp.* *Spirifer sp.* (Fig.12) and *Rhynchotretra sp.* (Fig: 13) are collected from yellowish moderately indurate, silty sandstone and marl of Namhsim Formation.

On the basis of the fauna content and stratigraphic position, the Namhsim Formation may be assigned as Late Silurian.

According to lithology and stratigraphic position, this unit is correlated with Wabya Formation and Taungmingyi Member of Pindaya Range, Southern shan State. (Myint Lwin Thein, 1973).

Plateau Limestone Group

La Touche (1913) first described the term Plateau limestone of thick carbonate sequence in the Shan State. He divided it into lower Plateau Limestone (dolomite limestone) of Devonian age and Upper Plateau Limestone (calcitic limestone) of permo-carboniferous age.

Amos (19750) named Shan Dolomite Group for the dolomitized part of the Plateau limestone in Northern Shan State.

This unit exposed the entire eastern part of the study area and runs NE-SW trend and moderately dips in east direction. Especially, this unit cropped out around the namtu-Panhike Quarter and along the Bawdwin-Namtu rail-way and between namtu and Namyau station.

It is mainly composed of light grey to grey, brecciated dolomitic limestone (Fig. 14). The dolomitic limestone is mostly medium to thick-bedded with craggy appearance and frequency stained red by iron oxide both on the surface and the jointed planes. In places, secondary calcite veins are developed in fractures of the rocks. This unit is well exposed along the Namtu-Bawdwin railway and car-road, about 2 miles west and north-west of Namtu. It is prominently marked by a parallel series of scarps. In some places, this unit is covered by terra-rosa. Locally; light grey sandy limestone is observed.

In the study area, the well preserved fossils have not been found. Sponge fossils have been found in this unit. On the basis of stratigraphic position and lithology, the age of this unit may be regarded as Devonian to Early Triassic.

This unit can be correlated with Nwabangyi Dolomite Formation and Thitsipin Limestone Formation of Southern Shan State (Garson, *et al.*, 1976) and Plateau Limestone of La Touche (1913).

Discussion and Conclusion

The stratigraphic unit of the area can be differentiated into lithostratigraphic units such as Pangyun Formation (Late Cambrian), Taungkyun Formation (Early-Middle Ordovician), Li-Lu Formation (Late Ordovician), Panghsa-pye Formation (Early Silurian), Namhsim Formation (Late Silurian), Plateau Limestone Group (Devonian –Early Triassic). The Pangyun Formation is mainly composed of red to brown, fine- to medium-grained, micaceous sandstone. Pangyun Formation may be deposited in shelf environment. The Taungkyun Formation consists of thin-medium-bedded, yellow to red coloured silty shale with medium-bedded, grey to bluish-grey coloured muddy crystalline limestone The Taungkyun Formation may be deposited in a warm, slightly agitated and shallow-marine environment. The Li-Lu Formation

consists of thin- to medium-bedded, white, yellow and sometimes purple siltstone, mudstones and marls with occasional bands or beds of silty limestone. It may be deposited in a warm, shallow and marine shelf environment. The Panghsa-Pye Formation consists of thin to medium-bedded, yellow sandy shale in the lower part and thinly-bedded, white grey to grey, sometimes black carbonaceous, fissile shale in the upper part. This formation may be deposited in a ramp portion of slope environment. The Namhsim Formation can be subdivided into two parts. The lower part of Namhsim Formation consists of fine to coarse-grained, compact and hard, medium to thick-bedded, white-grey to brown sandstone. This formation may be assigned as Late Silurian. It may be deposited in a tidal flat environment. Plateau Limestone Group is mainly composed of light grey to grey, brecciated dolomitic limestone. It may be deposited in a warm, shallow- marine environment.

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