

Microfacies Analysis of some Carbonate rocks in Maing Thauk area, Nyaung Shwe Township, Shan State (South), Myanmar

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Abstract

Carbonate microfacies analysis was systematically carried out mainly focus on the sedimentological characters in the Maing-Thauk area, eastern part of the Innle Lake, Nyaung-shwe Township, Shan State (South), Myanmar. Carbonate rocks are well exposed in this area. Detailed the sedimentological analysis and interpretation are carried out for the Wunbye Formation. The Wunbye Formation falls into three different facies association: supratidal, intertidal and subtidal facies associations comprising nine microfacies and one lithofacies. The microfacies analysis of this carbonate rocks are identifying by their grain type, physical, biological characters, sedimentary structures and their environments.

Keywords: Sedimentology, Maing Thauk area, Taunggyi Township, Microfacies analysis of some carbonate rock

Introduction

Reading, 1996, proposed the term “Facies.” “Facies” is a body of rock and it is defined and classified on the basis of its distinguishable lithologic fabrics. Facies analysis and its related data are useful tool for the style of deposition, site of sedimentation, rate of sedimentation, contamination of biogenic activities, provenance or sources of rock sequences and their probable depositional environments. Than Oo, 2002; Myint Lwin Thein, 1973; Sandar Win, 2015; Although many geologists have investigated the geology, stratigraphy and paleontology of southern Shan State, the study area has not been known because it is limited accessible area in the past.

Location

The study area is situated in the south part of the Taunggyi Range and eastern part of the Inlay Lake. It is bounded between latitude 20° 35' 24"N and 20° 27' 50"N and longitude 96° 55' 32" E and 97° 3' 40" E. It occupies one inch topographic map numbers 93-D/14, 93-D/15 and 93-H/2, 93-H/3. It covers approximately 52.5 square miles. The proposed area is located in the eastern part of Inlay Lake. Only 45% is rather difficult for mountainous. The motor-roads join to each village. Some places can travels by cart road (Fig.1).

Physiography

Physiographically, the study area lies in the Shan Plateau region which is a highly rugged and mountainous province. Generally, the area is a moderately to highly rugged terrain and has a NNW-SSE trending mountain ranges which are the extension of the Taunggyi Range. The most prominent Yan-aung Range is trending in nearly N-S direction. This area can be divided into three portions. They are (1) Eastern Yan-aung Mountain Range, (2) the western mountain region and (3) the western alluvial plain. Many streams are distributed in the study area. Mostly the drainages are controlled not only by topography but also by the structural features.

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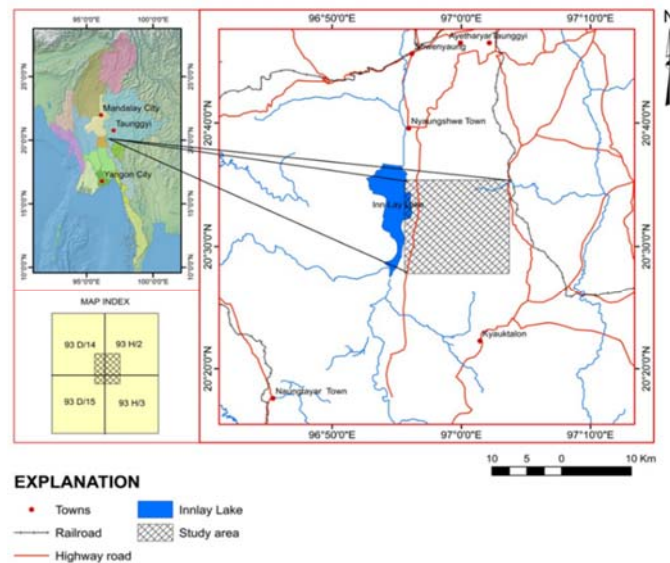


Figure (1). Location map of the study area

Methods of Study

Collecting measured section of the selected traverse line. Detailed determination of the rocks sequences. Very detailed observation on lithology, bedding, component-constituents of each layers. Classified and identified the distinguished sedimentary structures of both primary and secondary origin. Microscopic study of the thin-section of the representative samples of the measured section.

Regional Geologic Setting


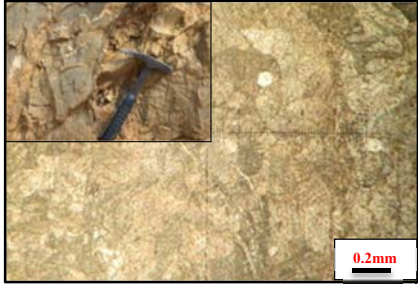
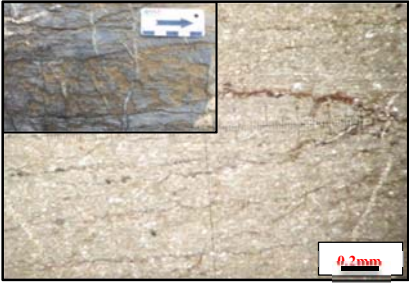
The study area lies on the western part of Eastern Highlands (Shan Thnintharyi Block or Shan-Thai Block) which is separated from the Central Lowlands by the Shan Scarp Fault Zone. The Eastern Highlands is composed of rocks ranging in age from Precambrian to Permo-Triassic with a variety of rock types. The eastern part of the study area is Hopone-Banyin-Hsihseng plain and the western part is the Inlay Lake. East of this plain is bounded by Me-ne Taung and Loimawtaung Range. These ranges are mainly composed of Upper and Lower Paleozoic rocks. The study area situated in the south of the Taunggyi Range and eastern part of the Inlay Lake. The regional structural trend is nearly NNE-SSW direction and the formations are dipping nearly east. Kyaukkyan fault is passing near the study area. In the study area, Ordovician and Silurian rocks are well exposed.

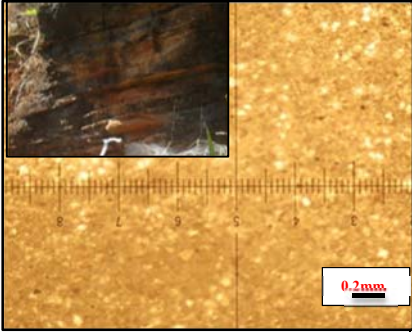



Microfacies Analysis



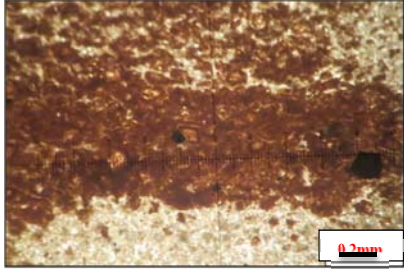
Sedimentological analysis and interpretation are carried out for the Wunbye Formation. The complete outcrops of the Wunbye Formation are found in the middle part of the study area. It is composed of thin, medium to thick-bedded, massive and light to dark grey, buff colour, compact and laminated limestone. The stratigraphic thickness of this formation at the measured section is about 786m. The rocks of Wunbye Formation can be subdivided into twelve microfacies and one lithofacie according to their texture, composition, faunal content and sedimentary structure

The Wunbye Formation falls into three different facies association: supratidal, intertidal and subtidal facies associations. The microfacies analysis of this carbonate rocks are identifying by their grain type, physical, biological characters, sedimentary structures and their environments. The most distinguishable criteria of each facies are summarized in table (1). These facies and their description illustrated in ideal section are shown in Fig (2) and Table (2). The bar graph shows the relative abundance of microfacies percent in the Wunbye section line at the Maing Thouk area (Fig.3).

Table (1). Summary on the short description of observed Microfacies in the Wunbye Formation of (Pindaya Group) of the present study area (continue).

	Microfacies	Description and interpretation
	<p>Laminated lime mudstone</p> 	<p>Description</p> <ul style="list-style-type: none"> - Laminations formed by the clay particles and silt-size carbonate mud. - Quartz grains are more or less equal and irregular rounded <p>Interpretation</p> <ul style="list-style-type: none"> - High micrite content is indicator of fairly deep and low energy condition. -Possibly deposited in the restricted circulation of marine shelf lagoons.
M F - 2	<p>Dolomitic lime mudstone</p> 	<p>Description</p> <ul style="list-style-type: none"> - Composed mainly of lime mudstone with parallel lamination, tiny bioclasts also occurred. <p>Interpretation</p> <ul style="list-style-type: none"> - Low energy Supratidal environment of restricted platform
M F - 3	<p>Algal laminated lime mudstone</p> 	<p>Description</p> <ul style="list-style-type: none"> - About 20-25% algae bind the micrite matrix <p>Interpretation</p> <ul style="list-style-type: none"> - Micrite indicate quiet water condition stromatolitic structure; is common in the intertidal zone (Wilson,1975) - Possibly deposited in the shoal and lagoonal environment

	<p>Fenestrae Lime mudstone</p> 	<p>Description</p> <ul style="list-style-type: none"> - small scale cross lamination and thin parallel lamination shows laminated structure and common occurrence of fenestrae feature. <p>Interpretation</p> <ul style="list-style-type: none"> - all fine-grained supratidal sediments within the tidal flat environment
	<p>Dolomitized wackestone</p> 	<p>Description</p> <ul style="list-style-type: none"> - Composed dominantly of micrite with irregular patches of dolomite minerals, - Minor amount of sparry calcite, terrigenous detritus and iron oxide <p>Interpretation</p> <ul style="list-style-type: none"> - Supratidal to intertidal, high energy current
	<p>Biopeloidal wackestone</p> 	<p>Description</p> <ul style="list-style-type: none"> - Allochem grains are floated in the micrite - Pellets are small, elongated and poorly sorted <p>Interpretation</p> <ul style="list-style-type: none"> - Possibly deposited in the supratidal to intertidal of restricted platform
	<p>Ostracods bearing wackestone</p> 	<p>Description</p> <ul style="list-style-type: none"> - Ostracods are most prominent bioclasts in carbonate mud, - Ostracod shells are filled with sparite. <p>Interpretation</p> <ul style="list-style-type: none"> - possibly deposited in subtidal environment.

	<p>Peloidal Grainstone</p> 	<p>Description</p> <ul style="list-style-type: none"> - Pellets constitute about 75%, bioclastic grains, and sparry calcite cement composed 25%. <p>Interpretation</p> <ul style="list-style-type: none"> - Facal pellets are produced by worms and other grazing, burrowing, or swimming - Rapid cementation and rapid sedimentation in low-energy setting. - deposition may be accumulated under the intertidal environment.
	<p>Intraclastic Peloidal packstone</p> 	<p>Description</p> <ul style="list-style-type: none"> - Intraclasts are subangular, poorly sorted; intraclasts are mainly micrite. - Pellets are poorly sorted <p>Interpretation</p> <ul style="list-style-type: none"> - Poorly sorted intraclasts indicate high energy, accumulated in the base of tidal channel - possibly deposited in intertidal to subtidal environment.
	<p>Bioclastic packstone</p> 	<p>Description</p> <ul style="list-style-type: none"> - consist of bioclasts, peloids and intraclasts. <p>Interpretation</p> <ul style="list-style-type: none"> - Large accumulations of skeletal debris - sediment were deposited in intertidal to subtidal environments

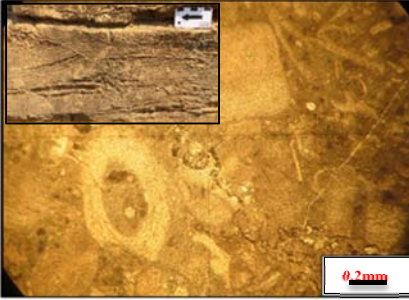

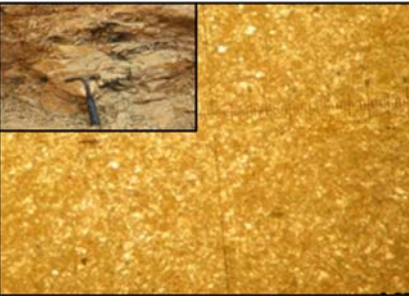
	<p>Biopeloidal packstone</p> 	<p>Description</p> <ul style="list-style-type: none"> - Bioclasts are about 45% and peloid subrounded and elongated <p>Interpretation</p> <ul style="list-style-type: none"> - are formed in low-energy settings. - Deposition may be subtidal to intertidal area
	<p>Biopelintraclastic grainstone</p> 	<p>Description</p> <ul style="list-style-type: none"> - Various species of bioclasts are occupied; they are bryozoans, gastropod, crinoids, shell fragments. Pellets are aggregate. <p>Interpretation</p> <ul style="list-style-type: none"> - Deposition may be subtidal, high energy deposits on an open shallow marine shelf.
	<p>Calcareous siltstone</p> 	<p>Description</p> <ul style="list-style-type: none"> - Friable subindurated siltstone and sandy siltstone <p>Interpretation</p> <ul style="list-style-type: none"> - Low energy, supratidal environment,

Table (2) Table showing the observed facies, its related facies association and its depositional environments

Facies	Description	Texture	Other Common Features	Wilson (1975)		Depositional Environment	Facies Association and General Environmental Interpretation
				Standard Microfacies	Facies Belt		
Lithofacies 1	Calcareous siltstone	S	friable subindurated siltstone and sandy siltstone	-	7	Supratidal	
Microfacies 1	Laminated lime-mudstone	M	laminae, micrite	SMF - 9	7	Supratidal	
Microfacies 2	Dolomitic lime-mudstone	M	abundance of micrite and dolomite minerals	SMF - 9	7	Supratidal	Supratidal facies associations
Microfacies 3	Algal laminated lime-mudstone	M	mostly algae bind in the micrite matrix	SMF - 23	8	Supratidal	
Microfacies 4	Fenestrate lime-mudstone	M	small scale cross lamination and thinly parallel laminatin	SMF - 19	7&8	Supratidal	
Microfacies 5	Dolomitized wackstone	W	micrite are altering to dolomite, sparite in occur in the vein and bioclasts	SMF - 19	8	Supratidal to intertidal	
Microfacies 6	Biopeloidal wackestone	W	pellets are small, elongated and poorly sorted	SMF - 16	7&8	Supratidal to intertidal	Intertidal facies associations
Microfacies 7	Ostracod bearing wackestone	W	Ostracod common	SMF - 19	8	Intertidal	
Microfacies 8	Peloidal grainstone	G	fecal pellet in origins, randomly orientated but some parallel oriented.	SMF - 9	8	Intertidal	
Microfacies 9	Intraclastic peloidal packstone	P	subangular, poorly sorted; mostly intraclasts are made up micrite	SMF-24	7	Intertidal to Subtidal	
Microfacies 10	Bioclastic packstone	P	Most of the bioclasts are crinid	SMF-9	7	Intertidal to Subtidal	Subtidal facies associations
Microfacies 11	Biopeloidal packstone	P	Bioclasts are about 45% and peloid subrounded and elongated	SMF-16	7&8	Subtidal	
Microfacies 12	Biopelointraclastic grainstone	G	various of bioclasts, pellets and intraclasts.	SMF-16	7	Subtidal	

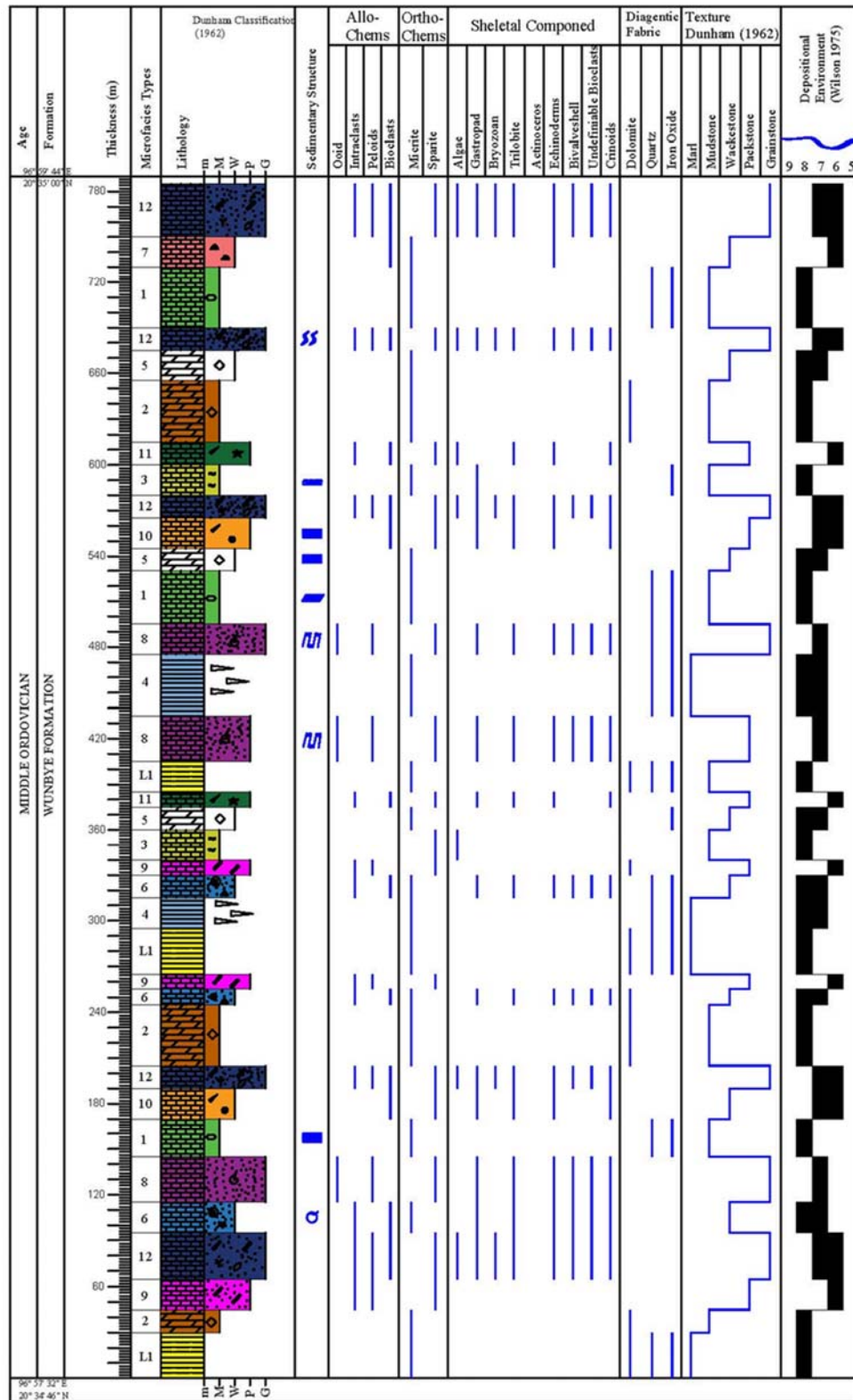


Figure (3). Lithology of the Wunbye Formation of Maing-Thauk to Bonyabut village and its Facies Interpretation.

Facies Association

On the basis of primary sedimentary structure, depositional texture, allochem constituents, the faunal content and diagenetic structure, the rock of Wunbye Formation of the study area can be compared with Wilson's (1975) classification. Distinct features of microfacies for environmental interpretation indicate that the rocks of Wunbye Formation were deposited within supratidal, intertidal and subtidal environments. Those associations are as follow;

Supratidal facies association-

- L - 1 (Calcareous siltstone)
- MF-1 (Laminated lime-mudstone)
- MF-2 (Dolomitic lime-mudstone)
- MF- 3 (Algal laminated lime-mudstone)
- MF-4 (Fenestrae lime-mudstone)

This facies association is characterized by abundant microcrystalline carbonate mud, algal mats, abundant terrigenous detritus and high content of dolomite.

Intertidal Facies Association-

- MF -5 (Dolomitized wackestone)
- MF -6 (Biopeloidal wackestone)
- MF -7 (Ostracods bearing mudstone)
- MF-8 (Bioclastic packstone)

High accumulation of lime mud, burrow mottle, common horizontal burrows, and boring organism including the algal tend to form micrite envelops reflects the intertidal environment.

Subtidal Facies Association-

- MF-9 (Fossil bearing dolomitic mudstone)
- MF-10 (Intraclasts peloidal packstone)
- MF-11 (Biopeloidal packstone)
- MF-12 (Biopelintraclasts grainstone)

The occurrence of the abundant microfauna cementing with micrite and sparite are the character of subtidal environment.

Hypothetical modal for the depositional environment of Wunbye Formation is shown in figure (4) and their characteristics are shown in (Fig.5).

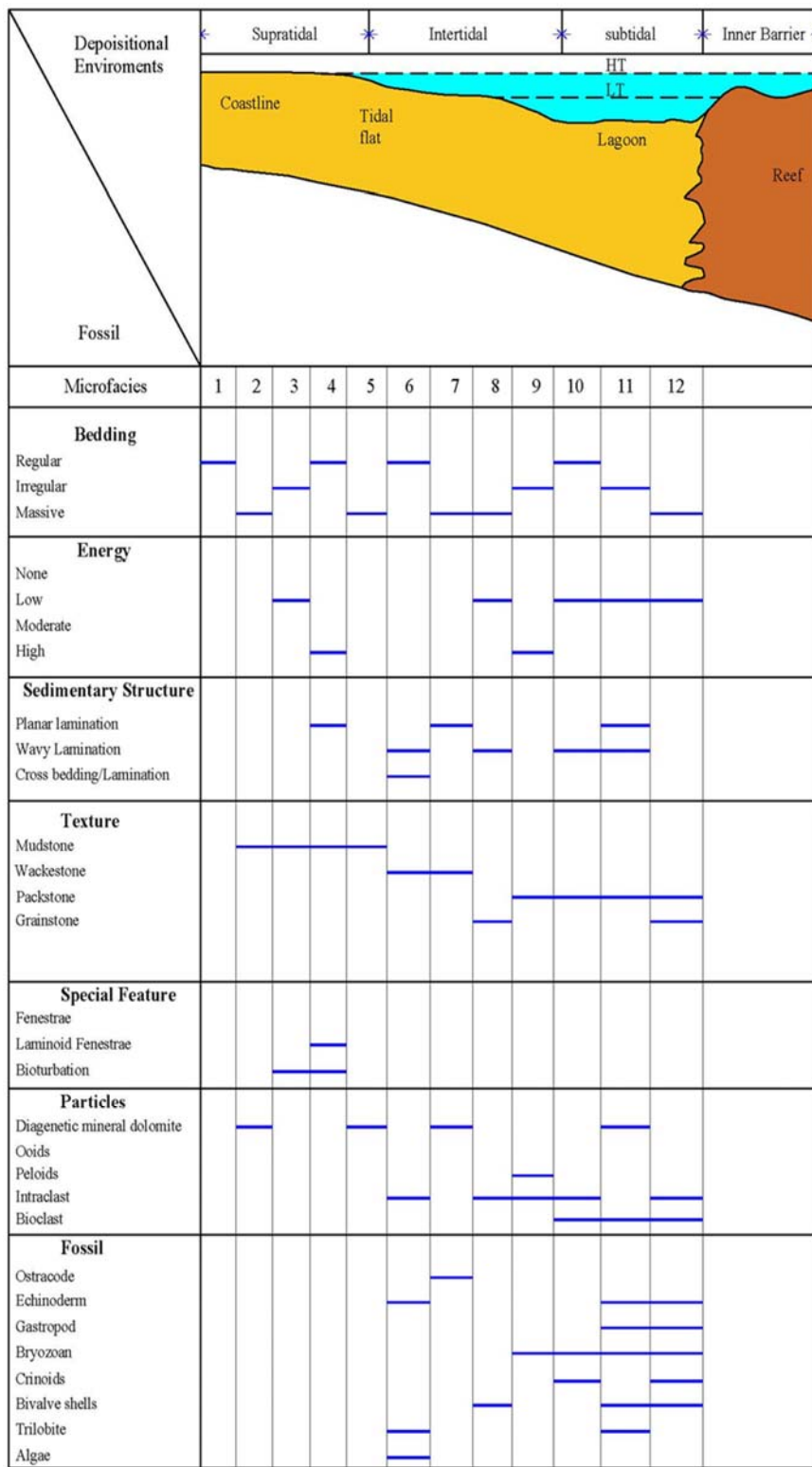


Figure (4). Block diagram showing the possible carbonate depositional environment of the Wunbye Formation at Maing Thauk Tawya Monastery (Modified after Friedman, 1981)

Conclusion

The study area is situated in the south of the Taunggyi Range and eastern part of the Inlay Lake. The eastern part of the study area is Hopone-Yan-aung range, a high north-south trending mountain range, is situated about 15 miles SSW of Taunggyi. It covers approximately 52.5 square miles. The study area occupies the south of the Taunggyi Banyin-Hsihseng plain and the western part is the Inlay Lake. The exposed rocks of the study area consist mainly of both clastic and non-clastic rocks. The study area, the Maing Thouk section is nearly 786 m thick. According to the microfacies analysis, twelve microfacies and one lithofacies. Then, they were grouped into three microfacies associations, such as supratidal, intertidal and subtidal environments.

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