Microfacies and Depositional Environment of Limestone at Nong Lom and Ban Tham Subdistricts, Dok Khamtai District, Phayao Province

Author : Piyathida Thamlangka 650510419
Advisor : Dr.Kritsada Moonpa
Independent study in Geology 205499
Department of Geological Sciences, Faculty of Science, Chiang Mai University

1. ABSTRACT

The limestones, which are dispersedly exposed in the Nong Lom and Ban Tham Subdistricts, Dok Khamtai District, Phayao Province, aim to classify carbonate microfacies and grain components for interpreting the depositional environments. Based on the petrographic study of 21 thin sections, the carbonate rocks are classified into four main groups by using the criteria of Dunham (1962) and Folk (1962) including mudstone, wackestone, packstone, grainstone, fossiliferous biomicrite, pelmicrite, packed biomicrite, sparse biomicrite, poorly washed biosparite, pelsparite, washed biomicrite, and oosparite. The main components consist mainly of peloids, ooids, oncoids, intraclasts, and skeletal remains, including algae, unidentified bioclasts, calcimicrobes, bivalves, crinoids, and echinoderms. From the microfacies analysis, nine microfacies are identified, including bioclastic wackestone, peloidal packstone, peloidal wackestone, peloidal grainstone, bioclastic grainstone, oncoidal packstone, bioclastic packstone, bioclastic mudstone, and ooid grainstone. Based on observations and facies analysis, nine major facies, corresponding to specific depositional environments within a carbonate platform, have been established. The depositional environments are lagoon, shoal, and small-scale reef environments. These settings reflect depositional energy levels ranging from low-energy to moderate- to high-energy conditions.

2. STUDY AREA

The study area is located in Nong Lom and Ban Tham Subdistricts, Dok Khamtai District, Phayao Province, northern Thailand. It is characterized by small, isolated limestone hills forming a distinct karst landscape. The hills are aligned along N–S, NE–SW, and NW–SE structural trends, and are surrounded by low-lying plains mantled by Quaternary sediments.

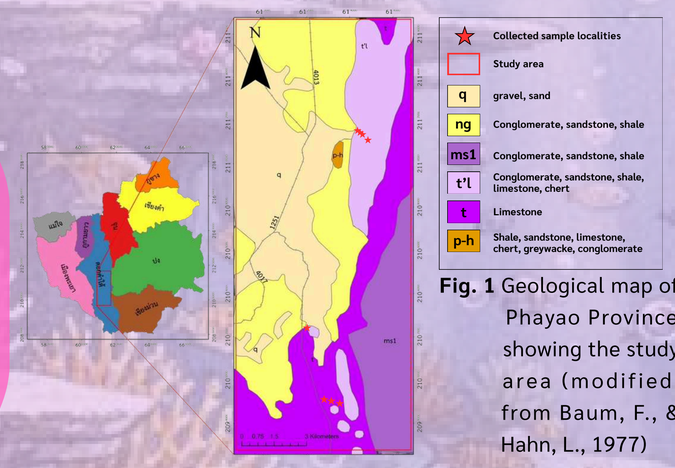


Fig. 1 Geological map of Phayao Province showing the study area (modified from Baum, F., & Hahn, L., 1977)

3. OBJECTIVES

- To examine the lithology and petrography of the limestones in the study area and establish their stratigraphy.
- To classify the limestone microfacies.
- To interpret the depositional environment of the limestones.

4. METHODOLOGY

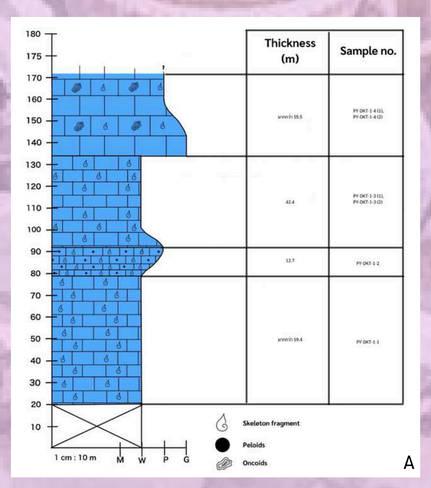
1.Fieldwork for collected 21 samples and study lithology.
2.Preparing the rock samples for analysis in the laboratory.
3.Studying the thin sections under the polarizing microscopes.
4.Limestone classification based on Folk (1962) and Dunham (1962).
5.Microfacies classification based on Flügel (2010).
6. Interpreting the environment of limestone deposition.

DEPOSITIONAL TEXTURE RECOGNIZABLE				DEPOSITIONAL TEXTURE NOT RECOGNIZABLE
Original Components Not Bound Together During Deposition			Original Components Bound Together During Deposition	Crystalline carbonate (Subdivisions based on texture or diagenesis)
Contains mud		Lacks mud and is grain-supported		
Mud-supported		Grain-supported		
< 10% grains	> 10% grains			
Mud-stone	Wacke-stone	Packstone	Grain-stone	Boundstone

Fig. 2 Carbonate Rocks Classification (Dunham, 1962)

Percent allochems	> 2/3 LIME MUD MATRIX				SUBEQUAL SPAR and LIME MUD	> 2/3 LIME SPAR CEMENT		
	0-1%	1-10%	10-50%	> 50%		SORTING POOR	SORTING GOOD	ROUNDED and ABRADED
Textural name	MICRITE and DIS-MICRITE	FOSSILI-FEROUS MICRITE	SPARSE BIO-MICRITE	PACKED BIO-MICRITE	POORLY-WASHED BIO-SPARITE	UN-SORTED BIO-SPARITE	SORTED BIO-SPARITE	ROUNDED BIO-SPARITE
Typical fabric								
Terri-genous analogs	Claystone		Sandy clay-stone	Clayey or immature sandstone		Sub-mature sand-stone	Mature sand-stone	Super-mature sand-stone

Fig. 3 Carbonate Rocks Classification (Folk, 1962)



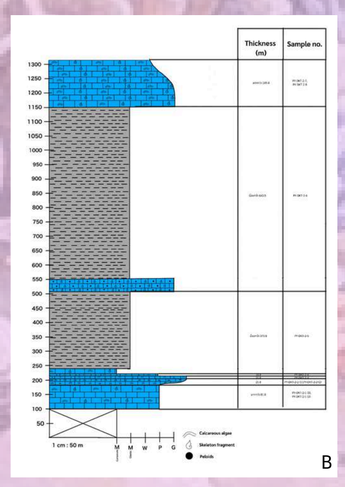


Fig. 4 Stratigraphy of the study areas A) study area 1 B) study area 2



Fig. 5 Fieldwork for collected sample

5. RESULTS

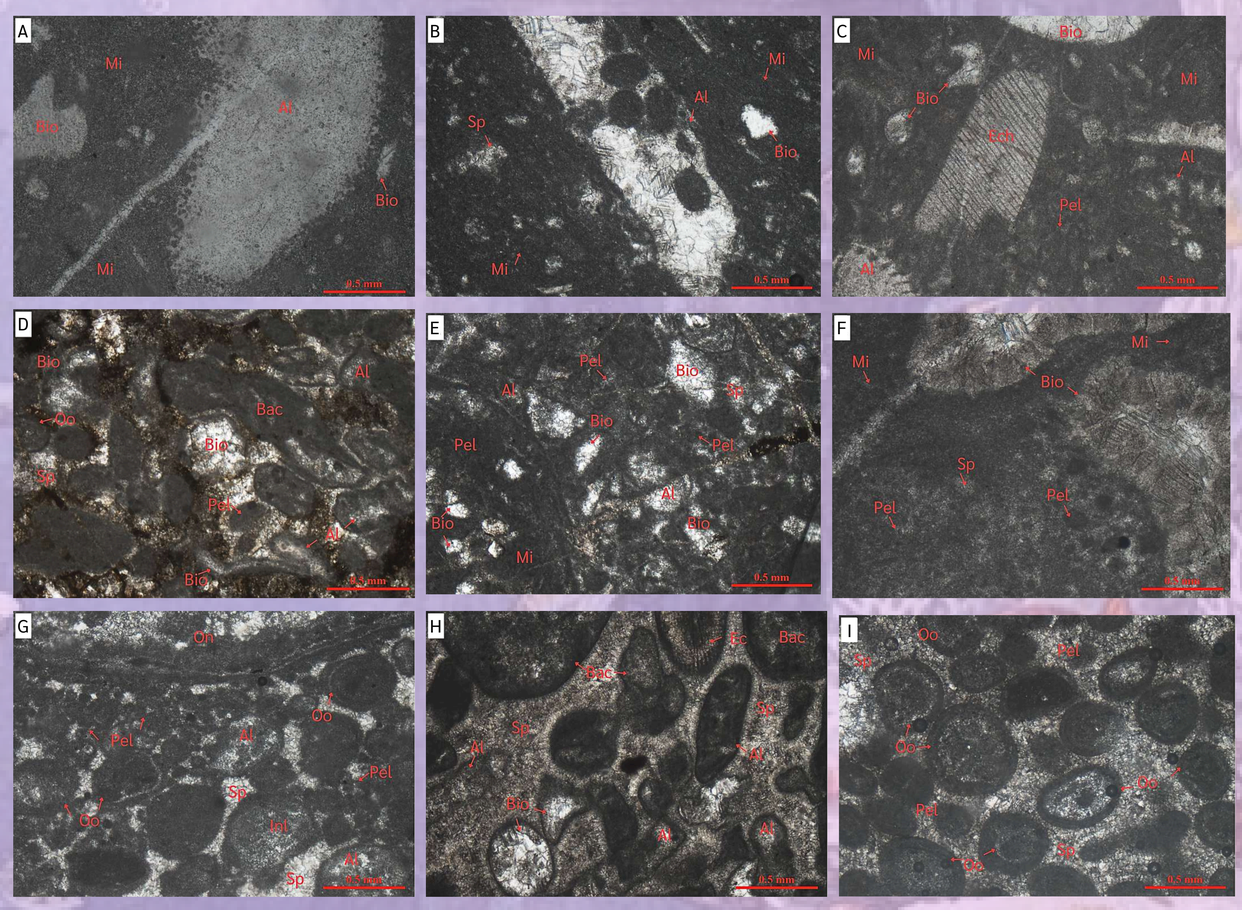


Fig. 6 Thin sections under polarizing microscopes in plane polarized light 4X A) Bioclastic mudstone B) Bioclastic wackestone C) Bioclastic packstone D) Bioclastic grainstone E) Peloidal wackestone F) Peloidal packstone G) Peloidal grainstone H) Oncoidal packstone and I) Ooid grainstone

6. CONCLUSION

Sample no.	Rocks name		Microfaices	Depositional Environments
	Dunham (1962)	Folk (1962)	Wilson (1975) and Flügel (2010)	
PY-DKT-1-1	Wackestone	Sparse Biomicrite	Bioclastic wackestone	Lagoon
PY-DKT-1-2	Packstone	Pelmicrite	Peloidal packstone	Lagoon
PY-DKT-1-3 (1)	Wackestone	Sparse Biomicrite	Bioclastic wackestone	Lagoon
PY-DKT-1-3 (2)	Wackestone	Sparse Biomicrite	Bioclastic wackestone	Lagoon
PY-DKT-1-4 (1)	Grainstone	Unsorted Biosparite	Bioclast grainstone	Shoal
PY-DKT-1-4 (2)	Packstone	Poorly Washed Biosparite	Oncoidal packstone	Shoal
PY-DKT-2-1 (1)	Packstone	Poorly Washed Biosparite	Bioclastic packstone	Shoal
PY-DKT-2-1 (2)	Packstone	Sparse Biomicrite	Bioclastic packstone	Shoal
PY-DKT-2-2 (1)	Packstone	Packed Biomicrite	Bioclastic packstone	Shoal
PY-DKT-2-2 (2)	Grainstone	Unsorted Biosparite	Bioclastic Grainstone	Shoal/Reef
PY-DKT-2-3	Grainstone	Unsorted Biosparite	Bioclastic Grainstone	Reef
PY-DKT-2-4	Packstone	Sparse Biomicrite	Bioclastic packstone	Lagoon
PY-DKT-2-5	Mudstone	Fossilliferous Biomicrite	Bioclastic Mudstone	Lagoon
PY-DKT-2-6	Grainstone	Pelsparite	Peloidal grainstone	Shoal
PY-DKT-2-7	Grainstone	Sorted Biomicrite	Bioclastic Grainstone	Shoal
PY-DKT-2-8	Packstone	Pelmicrite	Peloidal wackestone	Lagoon
PY-DKT-3-1	Grainstone	Pelsparite	Peloidal grainstone	Shoal
PY-DKT-3-2	Grainstone	Pelsparite	Peloidal grainstone	Shoal
PY-DKT-3-3	Grainstone	Pelsparite	Peloidal grainstone	Shoal
PY-DKT-3-4 (1)	Grainstone	Oosparite	Ooid grainstone	Shoal
PY-DKT-3-4 (2)	Grainstone	Oosrite	Ooid grainstone	Shoal

Table. 1 Carbonate Rocks classification based on Dunham (1962) and Folk (1962) . Along with interpretations of the depositional environments by Wilson (1975), Flügel (2010) and Nichols (2009).

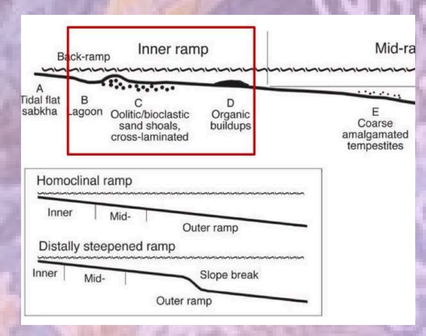


Fig. 7 Depositional Environments model of Carbornate Rocks (Wilson et al.,1975) (Flügel et.al.,2010)

REFERENCES

Baum, F., & Hahn, L., 1977, แผนที่ธรณีวิทยาภาคเหนือ มาตราส่วน 1:250,000 แผ่นที่ 3 (พะเยา), Federal Institute for Geosciences and Natural Resources, S. Grastsch: Geo Center.
Dunham, R. J., 1962. Classification of carbonate Rocks according to depositional texture.In: Ham, W. E. (ed), Classification of Carbonate Rocks: American Association of Petroleum Geologists Memoir, p 108-121.
Folk, R. L., 1959. Practical petrographic classification of limestone. American Association of petroleum Geologists Bulletin, 43, p 1-38.
Flügel, E., 2010. Microfacies of Carbonate Rocks: Analysis, Interpretation and Application, 2nd ed, Springer, Berlin, Germany, p 666, and 722.
Scholle, P. A, 2003. A color guide to the petrography of carbonate rocks: Grains, textures, porosity, diagenesis. American Association of Petroleum Geologists, p 285-287.