STRATIGRAPHY AND PETROGRAPHY OF ROCKS IN KARANGTENGAH VILLAGE AND SURROUNDINGS, BABAKAN MADANG SUB-DISTRICT, BOGOR DISTRICT, WEST JAVA PROVINCE

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ABSTRACT

Stratigraphy and petrography, integral components of geological science, are crucial for identifying mineral composition, rock texture, and characteristics, as well as understanding relationships between layers and layer positions. This study is located in Karangtengah Village and its Nearby Surroundings, Babakan Madang District, Bogor Regency, West Java Province. Physiographically, the study area is included in the Bogor Zone (Van Bemmelen, 1949). The research site is also incorporated in the Geological Map of Bogor Sheet, West Java. And specifically this research was conducted in the Cileungsi River. This river is included in the Jatiluhur Formation (Sudjatmiko, 1972). Stating the purpose of geological mapping, such as understanding regional geology, identifying mineral resources, or assessing geological hazards. Then, data collection in the field, such as conducting detailed field surveys to observe and record geological features, using field notebooks, GPS for plotting, and cameras for documentation, collecting rock samples for laboratory analysis (Petrography analysis and microfossil analysis). As a result of this study, there are four rock units in the Karangtengah area, with the order of formation from the oldest to the youngest. Firstly, Claystone Unit (Tmbl) consists of mudstones and sandstones, with fossils of P. transitoria and G. peripheroronda indicating an Early Miocene age (N8) and the depositional environment is the Outer Neritic. Second, the Old Andesite Intrusion (At) consists of andesite igneous rocks with Middle Miocene age and deposited in a terrestrial environment. Third, the Tuff Unit (Qt) is dominated by pyroclastic tuff rocks with Pleistocene age and deposited in a terrestrial environment. Finally, the Andesite Unit (Am) consists of andesite igneous rocks younger than the Pleistocene, penetrating the Tuff Unit (Qt) and the Claystone Unit, and deposited in a terrestrial environment.

Keyword: *Stratigraphy, Petrography, Lithologic units, Cileungsi river*

INTRODUCTION

Stratigraphy and petrography are parts of geological science that play an important role in identifying mineral composition, texture, rock characteristics, relationships between layers, the position of a layer, and others. The aim of this study is to uncover geological processes by combining field data with analyses conducted in both the studio and laboratory.

This study is located in Karangtengah Village and its Nearby Surroundings, Babakan Madang District, Bogor Regency, West Java Province. Physiographically, the study area is included in the Bogor Zone (Van Bemmelen, 1949). The research site is also incorporated in the Geological Map of Bogor Sheet, West Java. And specifically this research was conducted in the Cileungsi River. This river is included in the Jatiluhur Formation (Sudjatmiko, 1972).

RESEARCH METHOD

This research method is conducted with field activities, which begin with providing an overview of the study area, stating the purpose of geological mapping, such as understanding regional geology, identifying mineral resources, or assessing geological hazards. Then, data collection in the field, such as conducting detailed field surveys to observe and record geological features, using field notebooks, GPS for plotting, and cameras for documentation, collecting rock samples for laboratory analysis.

After the mapping is complete, laboratory analysis is carried out in the form of petrographic analysis by examining thin sections under a petrographic microscope to identify minerals, textures, and structures. And microfossil analysis, such as plantonic foraminifera for relative age determination, benthonic foraminifera analysis to determine the depositional environment. Then data interpretation and stratigraphic analysis.

RESULT AND DISCUSSION

The result of this research is the division of rock unit naming in the research area.The naming of rock units in the research area is carried out based on unofficial lithostratigraphic naming, where the naming of rock units is based on rock characteristics, rock types, combinations of rock types,

E-ISSN : 2579 – 3136

uniformity of rock lithological features and other symptoms found in the rock body in the field, so that the naming of stratigraphic units is determined by the main rock that is the most dominant constituent of the entire strata (Indonesian Stratigraphic Code, Chapter II article 14). The determination of the boundaries of the distribution of rock units is based on the contact between two units with different lithological characteristics (Indonesian Stratigraphic Code, Chapter II article 15). In rock units that cannot find contact between units because they are covered by soil, the unit distribution limit is determined based on topographic analysis and layer position. Determination of the age and depositional environment of the rock unit is based on the presence of foraminifera fossils in the rocks analysed in the laboratory. In addition, the age determination also refers to the basic principles of stratigraphy, namely the law of superposition-where the rock below has an older age than the rock above it in a normal position-and the law of cross-cutting-where the rock layer that is cut has an older age than the rock that cuts it (Steno, 1669). Based on what has been mentioned, the rock units found in the Karangtengah Village area can be categorized into four rock units, starting from the eldest to the youngest, namely : (1) Claystone Unit (Tmbl), (2) Old Andesite Intrusion (At), (3) Tuff Unit (Qt), (4) Andesite Unit (Am).

(1) Claystone Unit (Tmbl), This rock unit is spread in almost all parts of the study area except in the south and southeast. This mudstone unit is composed of mudstone and sandstone lithologies. The claystones found, dominantly have a brownish grey weathered colour with a fresh grey colour, a shale or massive structure, are carbonate and have a compactness that is classified as rather hard. The sandstones found generally have characteristics in the form of a whitish ash weathered colour and a fresh grey colour, have a very fine sand grain size with an angular shape, are moderately sorted, closed packed, and are carbonate, the compactness level is classified as moderately hard. Based on fossil analysis, P. transitoria and G. peripheroronda fossils were found which mark the age of the Early Miocene (N8 - N9 and N7 - N9) so that the age of this unit can be said to be Early Miocene (N8) and based on benthonic foraminifera analysis, foraminifera fossils were found which characterise the Middle Neritic to Outer Neritic marine environment.

(2) Old Andesite Intrusion (At), This Andesite intrusion becomes a separate area called Mount/Pancar Hill, spread in the southwest region of the research area. The constituent lithology is Andesite igneous rock (*Streickesen*, 1976). The characteristics of the igneous rocks found include blackish brown weathered colour and grey fresh colour, with mesocratic colour index, porphyritic granularity. Crystal uniformity is inequigranular, the degree of crystallisation is holocrystalline with hypidiomorphic mineral forms. The mineral composition includes plagioclase, quartz, k-feldspar and a little pyroxene along with opaque minerals. Determination of the relative age of this unit is based on stratigraphic relationships and lithological characteristics that are compared with previous studies due to the absence of foraminifera fossils in the rock body. Based on its lithological characteristics, the Old Andesite Intrusion (At) can be compared with the Andesite Intrusion in Effendi (1998) where it is mentioned that the Andesite Intrusion has a Middle Miocene age. This is reinforced by the presence of the Early Miocene aged Claystone Unit (Tmbl) which is broken by the Old Andesite Intrusion (At), causing the age of the Claystone Unit (Tmbl) to be older than the Old Andesite Intrusion (At). Based on the lithological characteristics, the determination of the formation environment of this unit can be seen from its mineral content. On microscopic observation, no minerals that characterise marine conditions were found so it can be said that the formation environment of this unit is Old Andesite Intrusion (At).

(3) Tuff Unit (Qt), This Tuff unit is scattered in the southern to southeastern part of the study area. The constituent lithology is dominated by pyroclastic tuff. Tuff found in the field has the characteristics of a reddish brown weathered colour with a brownish white fresh colour. The grain size is fine ash with a rounded shape, poorly sorted and has an open packing. Through microscopic observation, it is found that the fragments contain a lot of quartz minerals and a matrix composed of glass materials. This lithology has a hardness level that is classified as brittle. Determination of the relative age of the unit is determined through lithological characteristics and geometry similarities that are compared with previous studies and through the law of superposition. Based on the similarity of geometry and shape of the origin material, the Tuff Unit (Qt) can be compared with the Breccia and Lava units of Gunung Kencana and Gunung Limo (Effendi, 1998) which based on the results of Effendi's research (1998), this unit has an age of Pleistocene. Determination of the depositional environment of the tuff unit can be seen based on its composition which contains a lot of glass matrix, it can be said that the rock is a product

E-ISSN : 2579 – 3136

of volcanic eruptions. So it can be concluded, the deposition environment of this unit is a terrestrial environment.

(4) Andesite Unit, This rock unit is the stratigraphically youngest unit found in the study area. This unit is discovered in the southeastern part of the research area and is included in the Tuff Unit (Qt) area. This Andesite (Am) unit has an igneous lithology. The igneous rocks found among the unit area have lithological characteristics in the form of brownish grey weathered colour and grey fresh colour. It has a colour index classified as mesocratic, porphyritic granularity, hypocrystalline crystallisation degree, inequigranular crystal uniformity with hypidiomorphic mineral form. The mineral composition that has been observed microscopically indicates that the rock is composed of plagioclase, k-feldspar and has little quartz. Relative age determination is based on basic analysis of stratigraphic principles. The Andesite Unit (Am) stratigraphically breaks through the Tuff Unit (Qt) which has a Pleistocene age. Therefore, based on the cross-cutting principle (Steno, 1669), the Andesite (Am) Unit can be said to have a younger age than the Pleistocene. And on microscopic observation, no minerals were found that characterise marine conditions so that it can be said that the formation environment of this unit is a terrestrial environment.

Based on the basic analysis of stratigraphic principles and regional comparisons, the first to be formed is the Claystone Unit (Tmbl) which was deposited in the Early Miocene age. Based on the characteristics of the constituent lithology, the Claystone Unit (Tmbl) in the study area can be compared with the Jatiluhur Formation (Effendi, 1998). Furthermore, this unit is broken by the Old Andesite Intrusion (At), causing the Old Andesite Intrusion (At) to have a relatively younger age compared to the Claystone Unit (Tmbl). And then the Tuff Unit (Qt) is formed which overlaps partially the Claystone Unit (Tmbl). This is also based on the nature of pyroclastic rocks that tend to be deposited above other rocks. Furthermore, there is the Andesite Unit (Am), which is a unit that breaks through the Tuff Unit (Qt) so that based on the principle of cross-cutting stratigraphy and the law of superposition, it can be interpreted that the Andesite Unit (Am) was formed by breaking through the Claystone Unit and the Tuff Unit (Qt).

CONCLUSION

The conclusion of this research is that there are 4 rock units with the order of the oldest, namely the Claystone unit (Tmbl) which is composed of claystone and sandstone lithologies in this rock unit found fossils of P. transitoria and G. peripheroronda which mark the age of the Early Miocene (N8) and the depositional environment is the Outer Neritic Zone. Old Andesite Intrusion (At) with the constituent lithology of andesite igneous rocks of Middle Miocene age and deposited in a terrestrial environment. Tuff Unit (Qt) with the constituent lithology of pyroclastic tuff rocks of Pleistocene age and deposited in a terrestrial environment. And finally, the Andesite Unit (Am) with the constituent lithology in the form of andesite igneous rocks of younger than Pleistocene age that breaks through the Tuff Unit (Qt) and the Claystone Unit. This unit is deposited in the terrestrial environment.

ACKNOWLEDGEMENT

I would like to thank the Faculty of Geology Padjadjaran University for providing the opportunity for this research to run smoothly.

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E-ISSN : 2579 – 3136

Figure 1. Research Location (no scale)

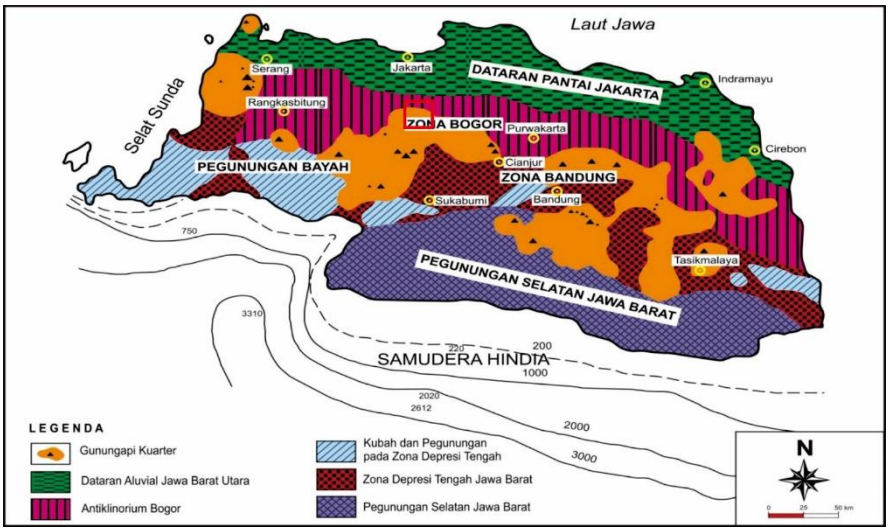

Figure 2. Regional Physiography (van Bemmelen, 1949)

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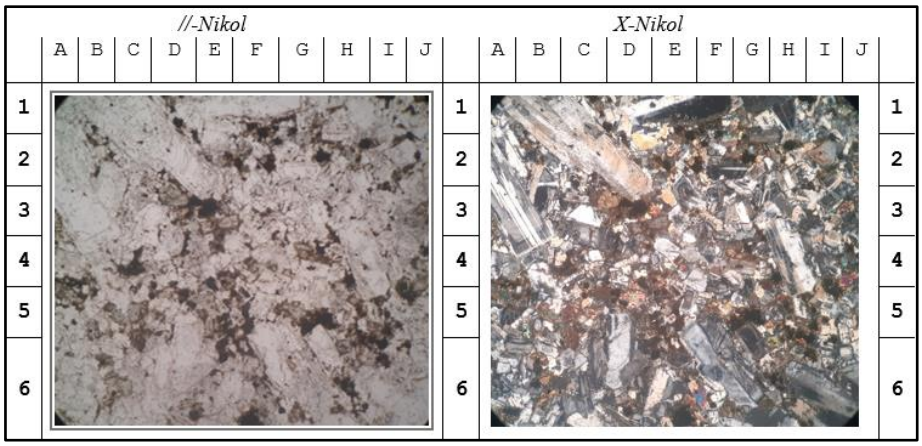

Figure 3. Petrograpich Analysis of Tuff Unit (Qt) 40x magnification

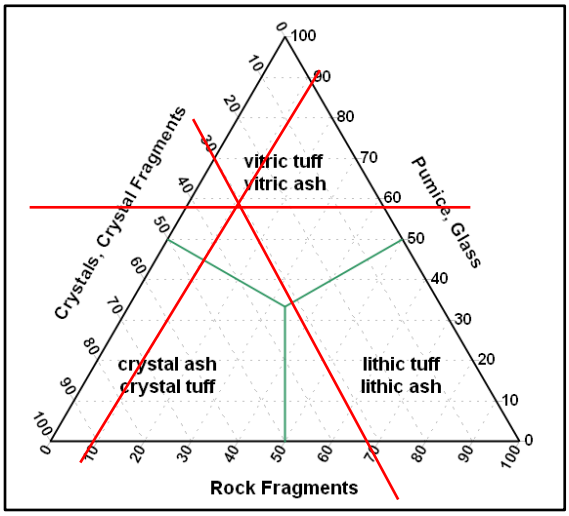

Figure 4. Vitric Tuff (Schimdt, 1981)

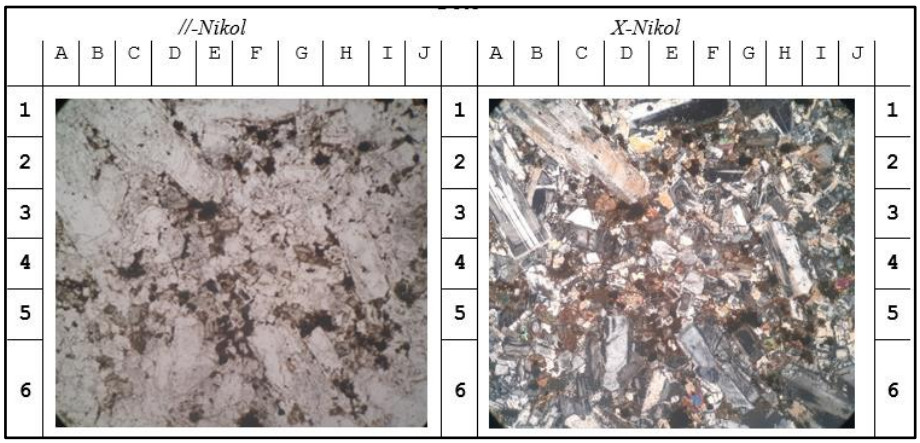

Figure 5. Petrograpich Analysis of Old Andesite Intrusion (At) 40x Magnification

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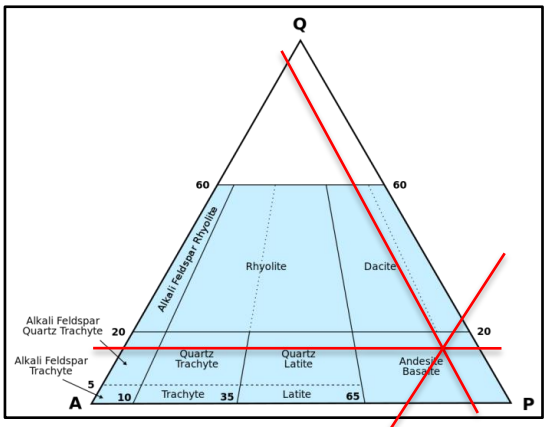

Figure 6. Andesite (Streickeisen, 1976)

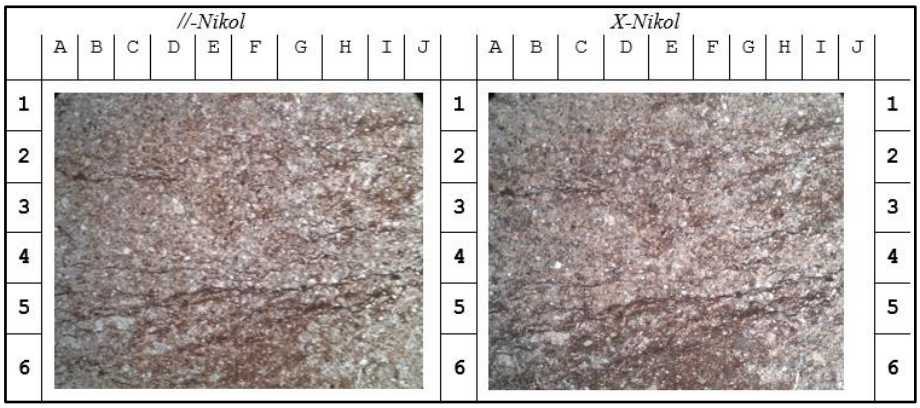

Figure 7. Petrograpich Analysis of Claystone Unit (Tmbl) 40x Magnification

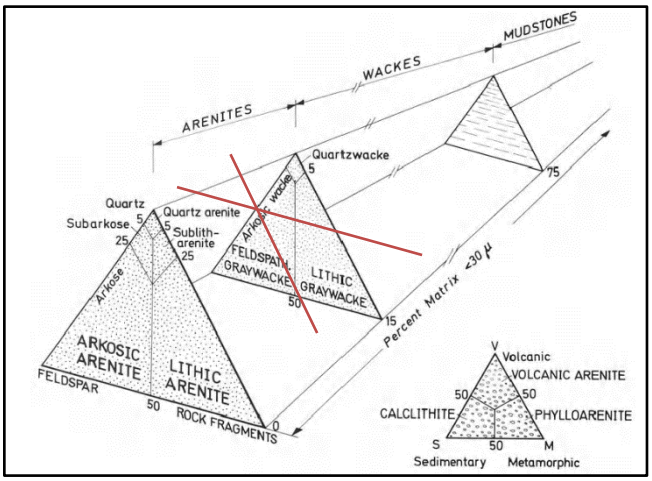

Figure 8. *Arkosic Wacke* (Pettijohn, 1975)

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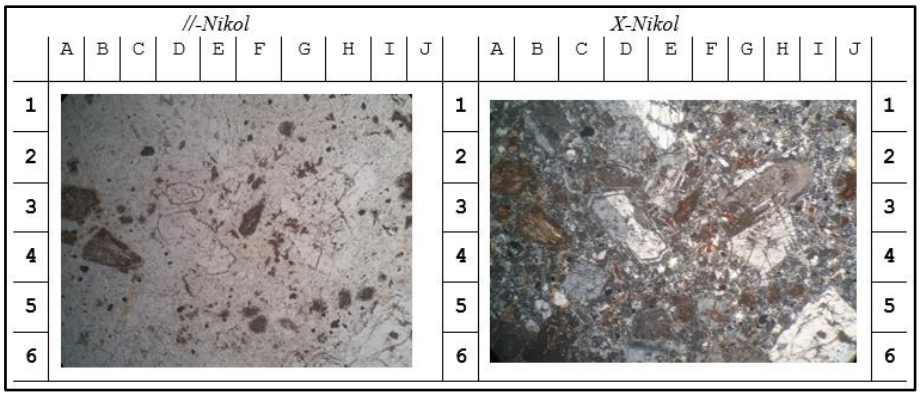

Figure 9. Petrograpich Analysis of Andesite (Am) 40x Magnification

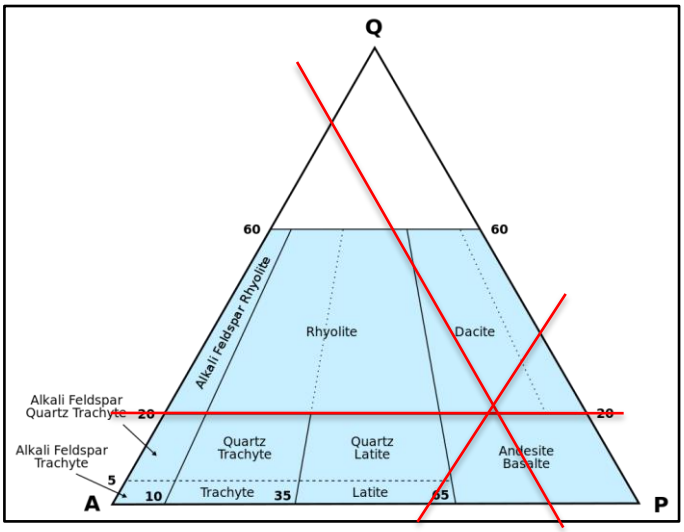

Figure 10. *Andesite* (Streickeisen, 1976)

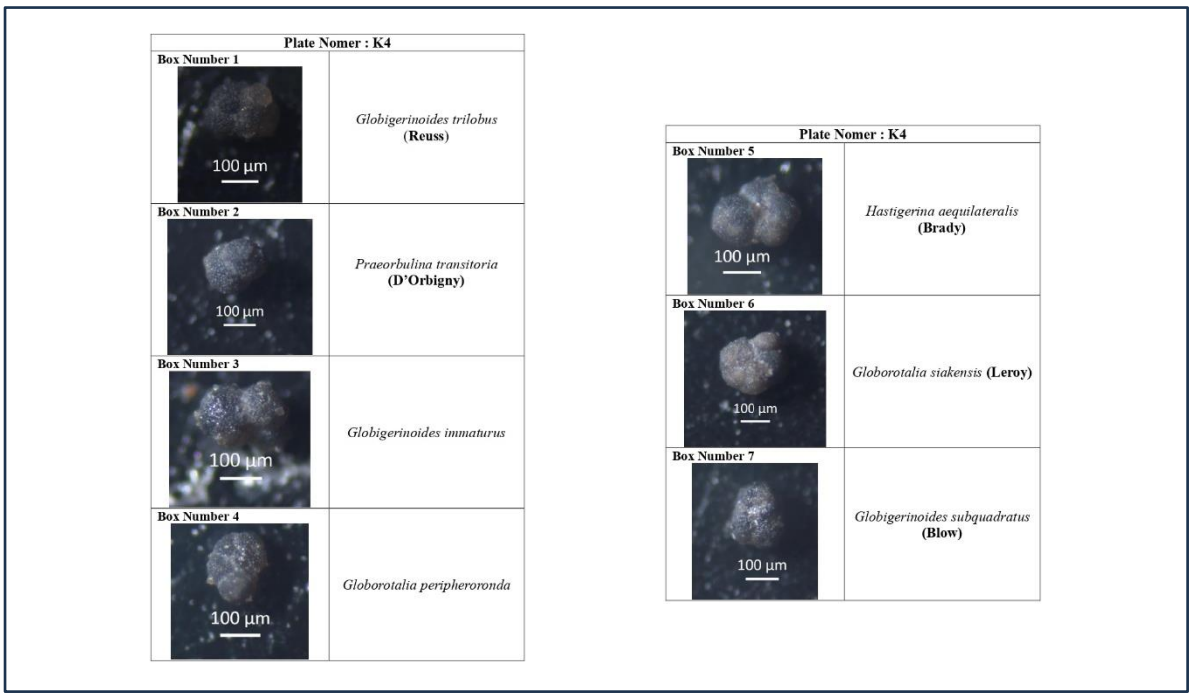

Figure 11. Photo of Plantonic Foraminifera

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Umur / Nama Foraminifera	Oligosen					Miosen												Pliosen			Kuarter	
						Awal			Tengah						Akhir								
	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	N13	N14	N15	N16	N17	N18	N19	N20	N21	N22	N23
Globigerinoides trilobus																							
Praeorbulina transitoria																							
Globigerinoides immaturus																							
Globorotalia peripheroronda																							
Hastigerina aequilateralis																							
Globorotalia siakensis																							
Globigerinoides subquadratus																							

Figure 12. Fossil analysis of Plantonic Foraminifera

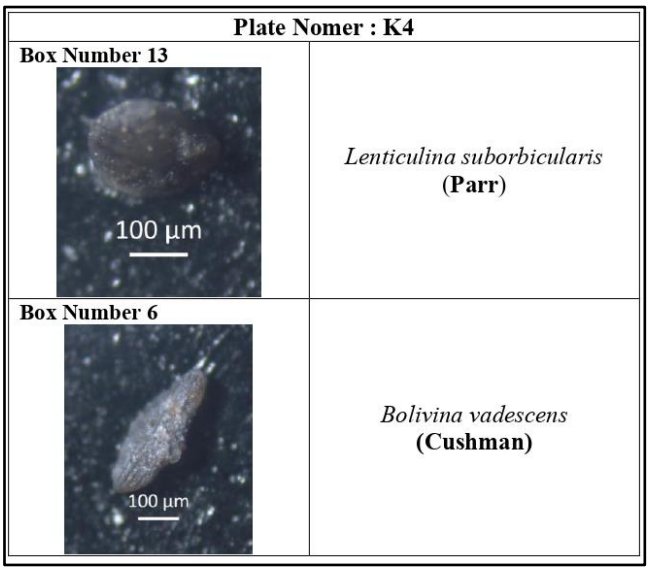

Figure 13. Photo of Bentonic Foraminifera

Nama Foraminifera	Litoral	Neritik			Batial			Abisal	
		Dalam	Tengah	Luar	Atas	Tengah	Bawah		
	0	-20	-50	-100	-200	-600	-1000	-2000	-5000
Lenticulina suborbicularis									
Bolovina vadescens									

Figure 14. Fossil analysis of Bentonic Formaminifera

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