LITHOLOGY UNITS WANAJAYA AREA AND SURROUNDING, BUAHDUA SUBDISTRICT, SUMEDANG DISTRICT, WEST JAVA PROVINCE.

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ABSTRACT

The research site is located in Wanajaya Village, Buahdua Subdistrict, Gunung Kidul Regency, West Java Province. Accessibility to the research location using a motorbike. The purpose of this study is to determine the geological conditions of the study area in terms of lithological units and stratigraphic order. The lithological unit of the study area is divided into 4 lithological units, namely the Mudstone Unit, the Andesite Intrusion Unit, the Volcanic Breccia Unit and the Andesite Lava Unit, namely the naming of rock units based on observable physical characteristics, including rock type, uniformity of lithological symptoms and stratigraphic position. The geological history of the first research site in the Late Miocene to Early Pliocene time was deposited by the mudstone unit. In the late Pliocene to Pleistocene volcanism activity occurred due to the displacement of the volcanic centre from the south to the centre of Java (Martodjojo, 1984) which caused the formation of the wanajaya fold and continued with the formation of the wanajaya ascending fault. As a result of the weak fault zone, the andesite intrusion unit appeared, which was the beginning of the activity of the old volcano. In Pleistocene time, namely deposition of Volcanic Breccia Unit and continued by the deposition of andesite lava unit due to volcanism activity of Tampomas volcano issued pyroclastic material.

Keyword: *Lithologic units, stratigraphic order, Wanajaya Village, Buahdua Subdistrict*

INTRODUCTION

Lithology is a branch of geology that studies the physical properties and mineral composition of rocks that make up the Earth's crust. In geology, lithology plays an important role in understanding how rocks form, develop and interact with each other in various geological environments. Lithological studies usually include identification of rock types, analysis of texture, structure, and stratigraphic relationships between rock layers. This research is intended to reveal geological processes based on field data integrated with the analysis results in the studio and laboratory. The research area is located sub-district Buahdua, District of Sumedang, West Java Province. Accessibility to the research location by motorcycle. (Figure 1.)

The study site is located in the bogor zone physiographic region. Physiographically, this zone is an anticlinorium consisting of folded sedimentary layers of Tertiary age and some shallow intrusions such as the Sanggabuana complex in western Purwakarta. The western part of the Bogor zone stretches from west to east, (Bemmelen, 1949), while the eastern part has a northwest-southeast pattern that forms a convex boundary to the north. in the research area there is a young volcano, Mount Tampomas, so the lithology type is dominated by clastic sedimentary material and volcaniclastic. (Figure 2.)

RESEARCH METHOD

The methods applied in this study include field observation, laboratory analysis, data interpretation and stratigraphic analysis. Field activities include data collection such as lithological characteristics, rock slope (strike and dip), as well as documentation in the form of outcrop photos and rock sampling.

The data collection methods used include field orientation, data mapping using GPS, and traverse method with compass and measuring tape in several locations. Petrographic analysis was conducted to microscopically observe the rocks to identify their mineral composition. Micropaleontological analysis is useful for determining the relative age of a rock unit and revealing the depositional environment of the rock deposits.

The main purpose of conducting stratigraphic analysis is to obtain the age and grouping of rock units unofficially (Sandi Stratigrafi Indonesia, 1996) and proportionality to formations in the literature.

RESULT AND DISCUSSION

Based on unofficial units naming there ae five (4) lithologic units were develop at research area, these are the order from oldest to youngest units; (1) Mudstone unit (figure 3), (2) Andesite intrusion unit (figure 4), (3) Volcanic breccia unit (figure 5) and (4) Andesite lava unit (figure 6).

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Mudstone unit, This unit is spread as much as 60% of the study area. The distribution of this unit occupies two geomorphological units namely Structural Plain Unit and Steep Structural Hills Unit. Based on the cross-section reconstruction cross-section reconstruction and stratigraphic analyses conducted, this unit is the oldest This unit is the oldest rock unit that developed in the study area. This rock unit is dominated by mudstones and sandstones. Megascopically the claysstone is fresh dark grey, weathered brownish grey, carbonate, soft. has a sedimentary structure of shale, parallel lamination. Sandstone fresh colour bright ash, weathered colour ash brownish, medium to fine size, rounded shape responsibility, closed packing, medium sorting, hard, carbonaceous. has a sedimentary structure of graded bedding, parallel lamination and wavy.

Petrographic analysis (thin section) for these units shows 9% phenocryst and 81% base mass. This rock has an ash colour brown (PPL) and blackish brown (XPL). The matrix type is clay minerals. There is cement in the form of clay minerals. Other minerals are quartz minerals (2%), carbonate minerals (9%) and opaque minerals (7%) (figure 7). Determination of relative age and depositional environment was carried out by identifying the presence of planktonic and benthonic foraminifera in leached grain samples. Based on the results of the paleontological analysis that has been paleontological analyses have been carried out, the Claystone Unit can be determined to have a relative age of Late Miocene to Early Pliocene, to be precise in the N17-N19 zonation. This determination is based on the association of planktonic foraminifera found, some of which include *Globigerinoides quadrilateral. of which include Globigerinoides quadrilobatus, Globorotalia menardii cultrate, Globorotalia acostaensis acostaensis, Globigerinoides trilobus trilobus*, etc (figure 14). The zonation of N17-N19 is reinforced by the presence of fossilised index in the form of *Globorotalia humerosa humerosa* that according to Takayanagi & Saito (1962) has a specific age range for the period. specific age range of the period. Based on the results of the analysis of the depositional environment, it was found that this unit was deposited at a depth of upper batial to outer neritic. This is obtained based on the content of small benthonic formanifera including Pyrgo sp, Bolivina sp, Bulimina aculata, Pullenia bulloides, Uvigerina sp, etc.(Figure 16) and supported by the sediment structure observed in the field which shows that the depositional environment is in the transision.

Andesite intrusion unit, This unit is spread as much as 5% of the area research area. The distribution of this unit occupies a geomorphological unit, namely the Slightly Steep Volcanic Hills Unit. Based on cross-sectional reconstruction and stratigraphic analysis carried out, this unit is the oldest rock unit after the stratigraphic analysis, this unit is the oldest rock unit after the that developed in the study area. The constituent lithology of This rock is Andesite Igneous Rock. This unit is dominated by igneous lithology andesite. Megascopically, the fresh color is dark gray and brownish black weathered color. Shows porphyritic texture with a degree of hypocrystalline crystallinity, has an inequigranular unbalance intergranular relationship, minerals are dominated with euhedral-subhedral shape. The base mass is composed of plagioclase microlites, partly replaced by clay minerals and there are plagioclase microlites. clay minerals and opaque microliths are present. (Streckeisen, 1976)

Petrographic analysis (thin section) for these units shows dominant colorless color and some strong colors in the form of dark brown to black. This rock shows a porphyritic texture with a degree of hypocrystalline crystallinity, has an inequigranular packing (relationship between grains), minerals are dominated by euhedral-subhedral shapes The base mass is composed of clay microlites (10%), Plagioclase microliths (30%), opaque microliths (12%), and there are clay minerals as the base mass Phenocrysts consist of plagioclase (23%), amphibole (2%), pyroxene (5%), quartz (2%) and opaque minerals (Figure 8). There are conditions where the base mass is transformed into clay minerals. Determination of the relative age of this unit cannot be done through fossil analysis because foraminifera fossils are not found in this rock unit. Therefore, the relative age is determined based on lithologic characteristics, geometry similarities compared to previous studies, and the application of the law of superposition. Based on the similarity of geometry and material of origin, this Andesite Intrusion Rock Unit can be compared to the Andesite Intrusion (Silitonga, 2003), which has a Quaternary age. The depositional environment of the Andesite Intrusion Rock Unit is determined through analysis of its lithologic characteristics, including its constituent mineral composition. With a mineral-rich composition and porphyritic texture, these rocks are interpreted as the result of volcanic activity. Therefore, the deposition environment of this unit is concluded to be a terrestrial environment.

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Volcanic Breccia Unit, This unit is spread as much as 20% of the study area. The distribution of this unit occupies two geomorphological units, namely the Steep Structural Hills Unit and the Volcanic Plain Unit. This unit is composed by Volcanic Breccia Rock, coarse tuff and andesite lava. Volcanic breccia is fresh brownish ash colored and blackish brown weathered, containing pebble to boulder sized fragments of andesite igneous rocks and coarse tuff, angular to angular shape, poor sorting, open pack, polymict type, with coarse tuff matrix, has compact hardness. Coarse tuff as a matrix has a fresh light ash color and a brownish ash weathered color. It has a grain size of coarse ash, angular shape, moderate sorting responsibility and open packing. The matrix is composed of dominant rock fragments (lithic) composed of igneous rock fragments of andesite igneous rock as fragments, fresh color dark ash and brownish black weathered color. Afanitic texture with hypocrystalline degree of crystallinity, has Inequigranular intergranular relationship of minerals dominated by subhedral euhedral shape The base mass is composed of plagioclase microlites. Phenocrysts consist of plagioclase quartz, k-feldspar biotite, oxide minerals and opaque minerals.

The matrix percentage in petrographic analysis (thin section) shows 55% is composed of quartz microliths, opaque microliths, plagioclase microliths and glass, and the components with a percentage of 45% are composed of crystals, lithics and vitric Crystals consist of plagioclase, amphiboles and opaque minerals, and lithics are composed of igneous rock fragments. In addition, most rock fragments have undergone oxidation characterized by the presence of oxide minerals (Figure 9). In addition, most of the rock fragments have undergone oxidation characterized by the presence of oxide minerals. The rock shows an afanitic texture with a degree of hypocrystalline crystallinity, has an inequigranular packing (relationship between butyrs), minerals are dominated by euhedral-subhedral forms. The base mass is composed of quartz microliths (13%), plagioclase microliths (5%), opaque microliths (6%). Phenocrysts consist of plagioclase (38%), amphibole (5%), pyrroxene (7%), quartz (10%) and opaque minerals (3%) There are special conditions such as vitrification and inclusion of opaque minerals in amphibole and pyrroxene, as well as additional material in the form of glass, which is the alteration of crystals with the appearance of oxide minerals around them (Figure 10). Determination of the relative age of this unit cannot be done through fossil analysis because foraminifera fossils are not found in this rock unit. Therefore, the relative age of this unit is determined based on lithologic characteristics, geometry similarity with previous studies, and application of the law of superposition. Based on the similarity of geometry and material of origin. This Volcanic Breccia Unit can be aligned with Qob and Qyu units (Silitonga, 2003), which are known to be Quaternary in age. Determination of the depositional environment of the volcanic breccia unit can be seen based on the characteristics of its lithology including the composition of the constituent rocks. From its composition which contains a lot of glass matrix, it can be said that the rock is a product of volcanic eruption. So it can be concluded, the deposition environment of this unit is an onshore environment.

Andesite Lava Unit, This Andesite Lava Rock Unit is spread as much as 15% of the study area. The distribution of this unit occupies two geomorphological units, namely the Slightly Steep Volcanic Hills Unit. This unit is dominated by andesite igneous rock lithology. This unit shows characteristics of fresh dark ash color and brownish black weathered color. Afanitic texture with hypocrystalline degree of crystallinity has an inequifranular inter-butyr relationship, minerals are dominated by subhedral euhedral shapes. The base mass is composed of plagioclase microlites. Phenocrysts consist of plagioclase, quartz, k-feldspar, pyroxene, biotite, oxide minerals, and opaque minerals. (Streckeisen, 1976).

Petrographic analysis (thin section) for these units shows weakly color in the form of gray-white. The rock shows a porphyritic texture with a hypocrystalline degree of crystallinity, has an inequigranular inter-butyral relationship, minerals are dominated by a juhedral-subhedral shape. The base mass is composed of plagioclase microlites. The phenocrysts are composed of plagioclase, quartz, k-feldspar pyroxene, biotite, oxide minerals, and opaque minerals (Figure 12). Determination of the relative age of this unit cannot be done through fossil analysis because foraminifera fossils are not found in this rock unit. Therefore, the relative age is determined based on lithologic characteristics, geometry similarities compared to previous studies, and the application of the law of superposition. Based on the similarity of geometry and material of origin, this Andesite Lava Rock Unit can be compared with the Undecomposed Young Volcano (Qyu) (Silitonga, 2003) which has a Quaternary age. The depositional environment of the Andesite Lava Rock Unit is determined through analysis of its lithologic characteristics, including the

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composition of its constituent minerals. With its mineral-rich composition and afanitic texture, this rock is interpreted as the result of volcanic activity. Therefore, the deposition environment of this unit is concluded to be an onshore environment.

CONCLUSION

Based on the unofficial naming of units, there are 4 (four) lithological units that develop in the study area, in order from oldest to youngest, namely: (1) claystone unit, (2) andesite intrusion unit, (3) volcanic breccia unit and (4) andesite lava unit.

The geological history of the first research site in the Late Miocene to Early Pliocene time was deposited by the mudstone unit. In the late Pliocene to Pleistocene volcanism activity occurred due to the displacement of the volcanic centre from the south to the centre of Java (Martodjojo, 1984) which caused the formation of the wanajaya fold and continued with the formation of the wanajaya ascending fault. As a result of the weak fault zone, the andesite intrusion unit appeared, which was the beginning of the activity of the old volcano. In Pleistocene time, namely deposition of Volcanic Breccia Unit and continued by the deposition of andesite lava unit due to volcanism activity of Tampomas volcano issued pyroclastic material.

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Figure 1. Research Location (no scale)

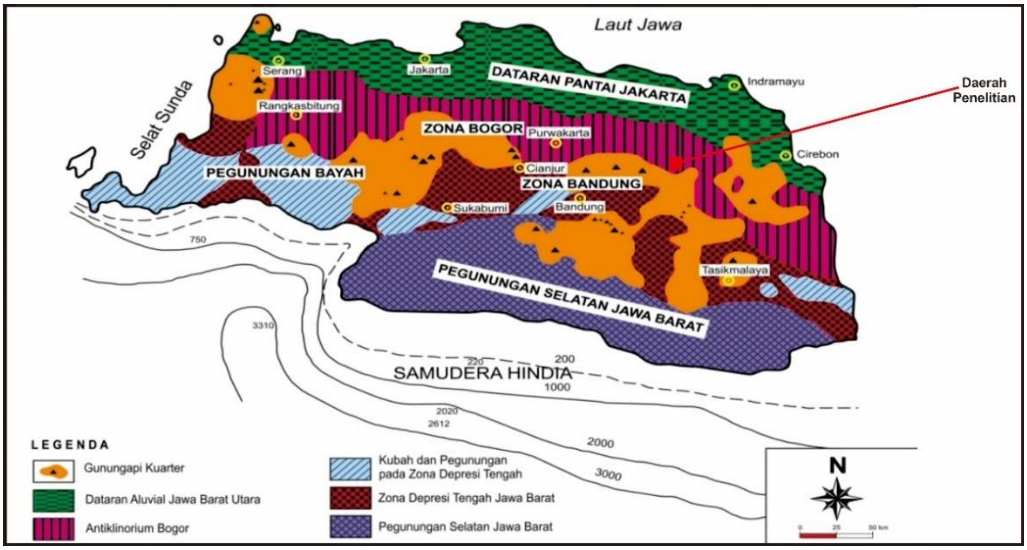

Figure 2. Regional Phisiography (Van Bemmelen, 1949)

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Figure 3. Mudstone Outdrops

Figure 4. Andesite Intrusion Outdrops

Figure 5. Volcanic Breccia Outdrops

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Figure 6. Andesite Lava Outdrops

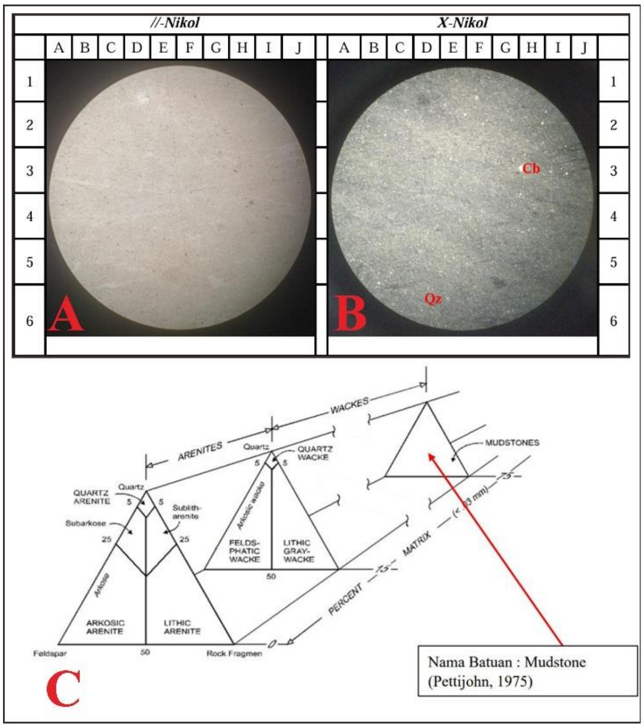

Figure 7. Petrograhic Analysis of Mudstone Unit (40x magnification)

(A.) Nicol (B.) X Nicol (C.) Mudstone (Pettijhon, 1975)

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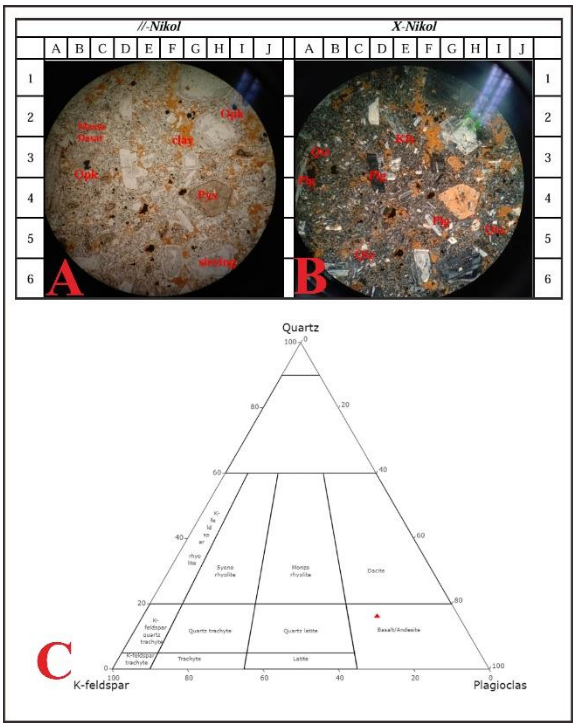

Figure 8. Petrographic analysis of Adesite Intrusion Unit (40 magnification)
(A.) Nicol (B.) X Nicol. (C.) Porphyry Andesite (Streckeisen, 1976)

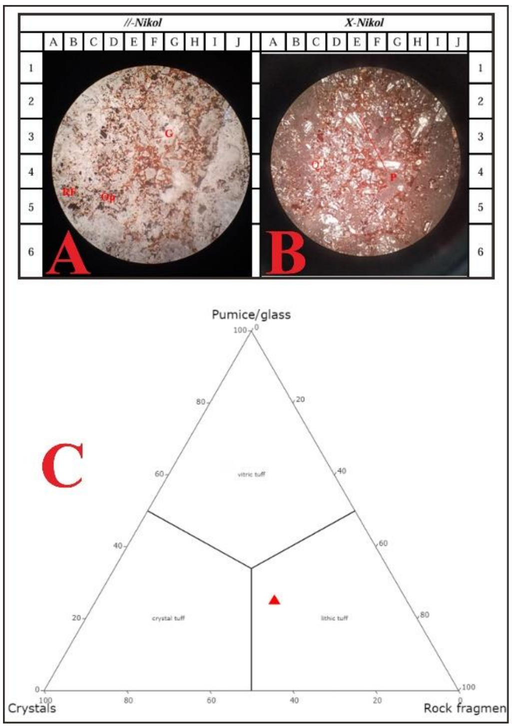

Figure 9. Petrographic analysis of Volcanic Breccia Unit (Matrix) (40 magnification)
(A.) Nicol (B.) X Nicol. (C.) Lithic Tuf (Schmid, 1981)

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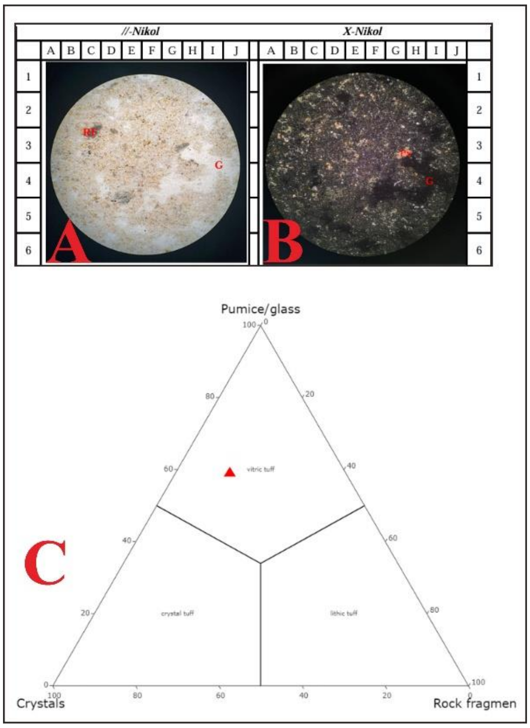

Figure 10. Petrographic analysis of Volcanic Breccia Unit (Fragment 1) (40 magnification)
(A.) Nicol (B.) X Nicol. (C.) Vitric Tuf (Schmid, 1981)

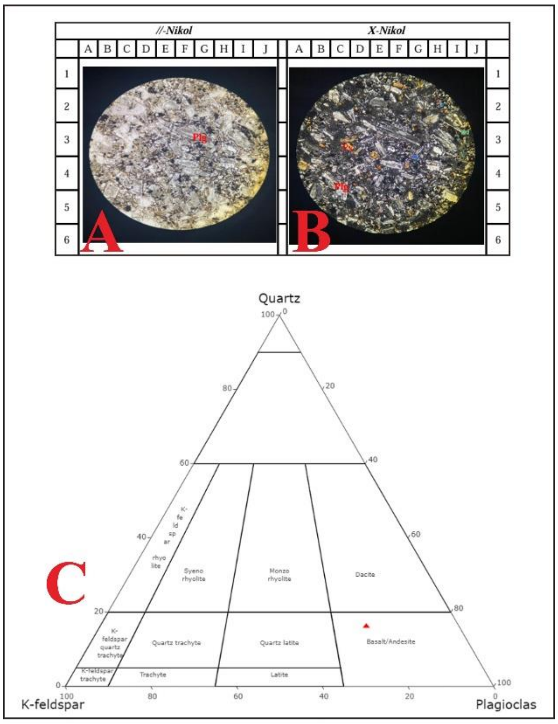

Figure 11. Petrographic analysis of Volcanic Breccia Unit (Fragment 2) (40 magnification)
(A.) Nicol (B.) X Nicol. (C.) Andesite (Streckeisen, 1976)

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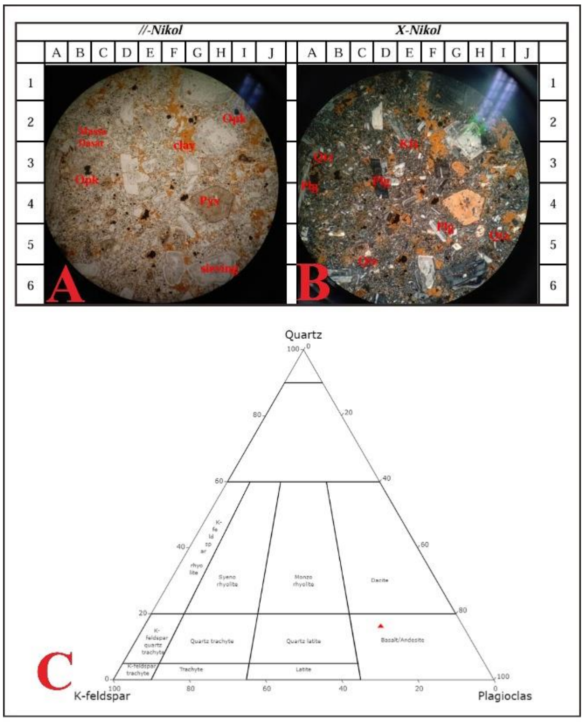

Figure 12. Petrographic analysis of Andesite Lava (40 magnification)
(A.) Nicol (B.) X Nicol. (C.) Andesite (Streckeisen, 1976)

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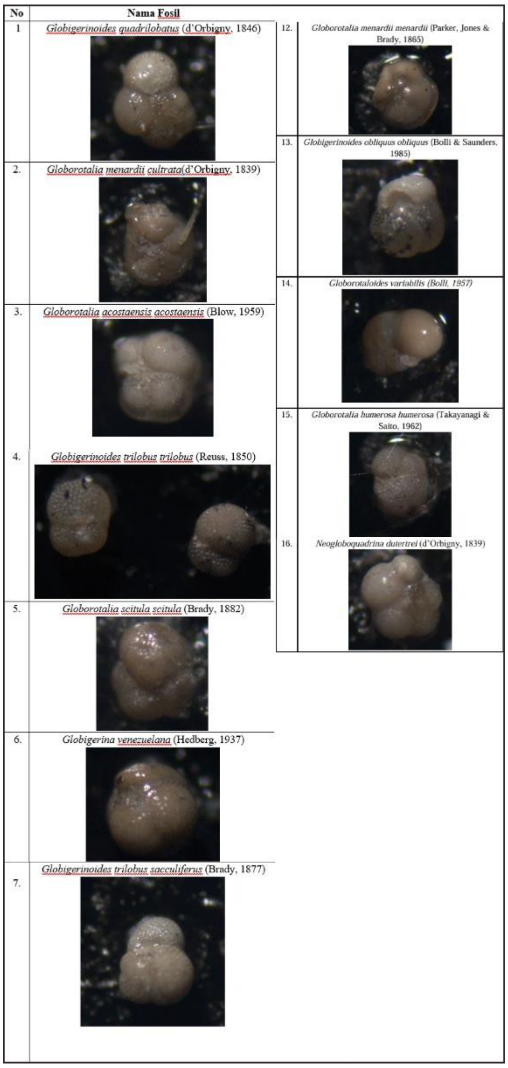

Figure 13. Photo of Plantonic Foraminifera

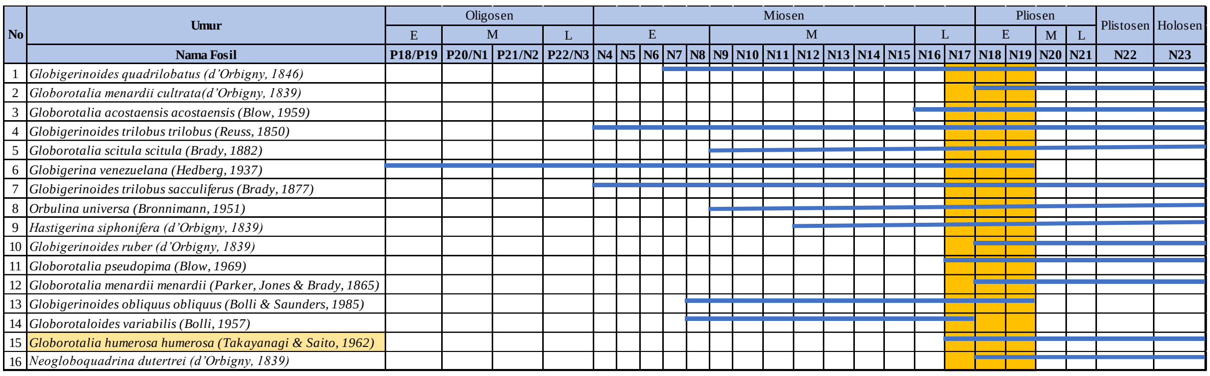

Figure 14. Fossil Analysis of Plantonic Foraminifera

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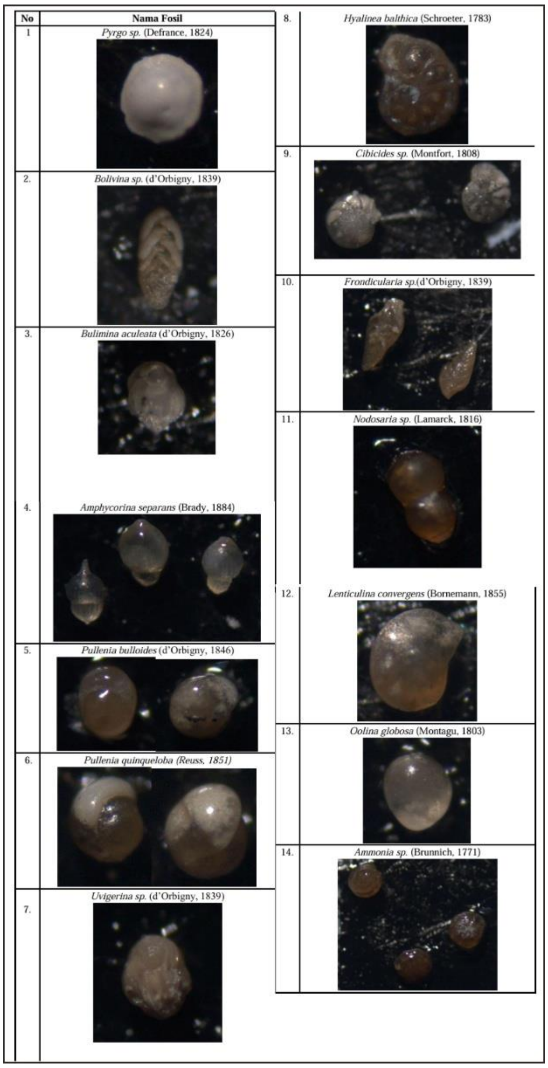

Figure 15. Photo of Bentonic Foraminifera

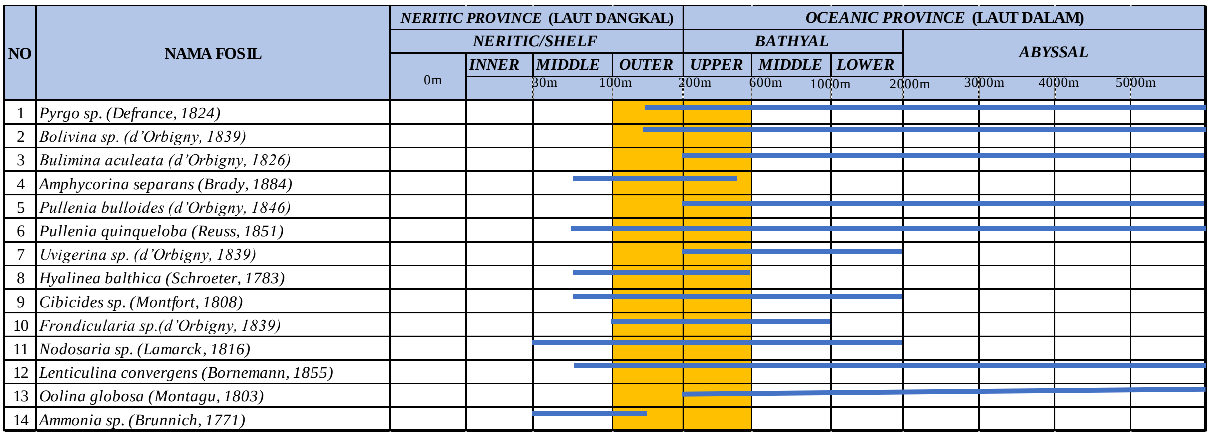

Figure 16. Fossil Analysis of Bentonic Foraminifera

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