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THE STATUS OF THE MELANGE COMPLEX IN CILETUH AREA, SOUTH – WEST JAVA

ABSTRACT. Pre-Tertiary exposures are known to occur in Java at three localities, namely the Jiwo Hills and Luk Ulo area in Central Java and the Ciletuh area, in West Java. The pre-Tertiary rock assemblage in Luk Ulo has been regarded as a melange complex.

In the Ciletuh area, the pre-Tertiary rocks are well exposed along the course of Citisuk river and its surrounds consisting of ultra basic to basic rocks (peridotite, gabbro, pillowed basalt), metamorphic rocks (serpentinite, schist, phyllite, quartzite) and sedimentary rocks (red clay, black shale, greywacke, limestone). These units are tectonically mixed, and the realtionship between them can not be explained by applying the law of superposition, lateral continuity and faunal assemblage as used in normal deposition.

Data at hand strongly suggest that this rock assemblage might be regarded as a melange complex.

INTRODUCTION

The Ciletuh area is located southwest of Sukabumi in Southwest Java (Fig. 1). It is bounded by the Indian Ocean on the west and Ciletuh Bay on the north.

This area is one of the three areas in Java, where pre-Tertiary rocks crop out, other areas include Luk Ulo and the Jiwo hills, both are located in Central Java.

The stratigraphy and tectonics of the Ciletuh area are very complex and nearly similar to the Luk Ulo area. Sukendar Asikin (1974) regarded the Luk Ulo area as being a melange complex.

This area has been studied previously by other geologists. Duyfjes (1940) mentioned the Ciletuh was tectonically complex. Later, in 1967, Sukamto et. al. geologically mapped the area.

Lemigas recently conducted a field investigation in this area. This investigation covered an area of $12 \times 14 \text{ km}^2$ and concentrated on ENDANG THAYYIB S. *) SAID E.L. *) SISWOYO *) SUMARSO PRIJOMARSONO *)

the occurrence of pre-Tertiary rocks. Field work lasted about two months. Topographic maps on a scale of 1 : 10,000 were used in the field for more accurate mapping. On this scale, outcrops and their weathering products were mapped. The mapping of the Citisuk River and its surrounding area and the Badal mountain area were executed in more detail. The stratigraphy and tectonics of these two areas are very complex. The lithology is a mixture of several kinds of rocks. Paleontological examination has been done by Lemigas stratigraphy laboratory and Robertson Research International Ltd. The main aim of this paper is to communicate data resulting from this new mapping.

STRATIGRAPHY

Pre-Tertiary rock group

The pre-Tertiary rocks are well exposed in the Ciletuh area. The northern part of the pre-Tertiary outcrops are located near the sea shore of Ciletuh Bay, on Badak mountain and its surrounding area (Fig. 4). In this area the pre-Tertiary rocks consist of peridotite, gabbro, pillowed basalt, phyllite, serpentinite, graywacke, limestone and shale.

Approximetaly 3.5 kilometers to the South, in the central area, pre-Tertiary outcrops are found along the entire length of Tegal Pamidangan, Beas mountain and Citisuk River. Similar outcrops are also found in Tegal Cicalung and Tegal Butak area (Fig. 4). These exposures are composed of peridotite, gabbro, pillowed basalt associated with red clays, phyllite, schist and graywacke.

The stratigraphy of the areas mentioned above is very difficult to ascertain. These

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difficulties are mainly the result of the disruption of lateral cointuity. Lack of fossils in peridotite discussed above, the distribution the sedimentary rocks of this group is a main problem in solving the stratigraphic position of the sedimentary sequence; These rocks are tectonically mixed. Hard, dark grey, sheared shales were observed in these areas acting as a matrix.

Outcrop maps and cross sections made through the areas mapped (Fig. 2, 3 and 6 to 9) show discontinuity in shape and distribution of the rock bodies. Contacts between two kinds of rocks are generally fault surfaces.

The pre-Tertiary rocks in the studied area can be divided into three groups, namely ophiolite, sedimentary and metamorphic.

a. Ophiolite group

This group is widely exposed in the Ciletuh area and consists of peridotite, gabbro and basalt.

Greenish peridotites are exposed in scattered outcrop in either the northern part or in the central area. These rocks crop out on Badak mountain and in the central area at Tegal Pamidangan East until Tegal Butak, Tegal Pamakanan and Tegal Sabuk and westward to the sea shore (Sodongparat). These rocks are easily seen in the field due to the lack of plantations and exposures in the hilly areas. Highly tectonic influences such as brecciation. mylonitization, shearing and serpentinization were generally found. In some places asbestos fills the joints found in this rock. Petrographic examination reveals a large amount of euhedral minerals, such as diopside, augite and olivine. Duyfjes (1940) has already mentioned that in some places peridotite became serpentinite as a result of high stress.

The well exposed gabbros are found on the Badak and Beas mountains and also in the Tgeal Cicalung area. These rocks are generally medium to coarse grained and dark grey coloured, however, in some places they contain very coarse grains. Gabbro is also observed at the Citisuk river as dykes, + 30 cm wide, intruding peridotite. Baking affect near this contact is visible at the Citisuk River. The petrographic examination of the rock shows that it has an ophitic texture. The phenocryst minerals are composed of plagioclase, hyperstene and olivine. As with the

lase, hyperstene and olivine. As with the of gabbros were easily drawn on the topographic map by observing the hills without plantations.

Basaltic rocks are widely exposed in the studied area. These rocks are characterized by pillow structures. In the area of Badak mountain and the Citisuk River, basalt is mixed with peridotites and gabbros. In some localities (Citisuk River) red clays are associated with the basalts suggesting they were submarine extrusions. Unlike the basaltic outcrops found in the northern area, basalts cropping out in the southern area were not influenced by high deformation. These outcrops were observed in the Cibuaya area and near the sea shore of the lower course of the Cibuaya River. Thin section examinations show fine grained, intergranular texture. The phenocryst minerals consist of hornblende and pyroxene. The groundmass is composed of micro plagioclase. Magnetite can be noticed as accessory minerals.

b. Sedimentary group

Hard, dark grey sheared shales crop out in association with the ophiolite group, metamorphic and other rocks. The shales acted as the matrix of those rock complexes. They are barren of fossils, there are neither planktonic foraminifera nor nannofossils. Nevertheless, the age of the shales are still detectable. Reworked upper Cretaceous planktonic foraminifera, namely Pseudotextularia sp. and Globotruncana so., were found in the shale of the normal sediments (Ciletuh Formation) which unconformably overlies the unit of the rock complex. These fossils might be derived from the shales of this rock complex and suggest that sedimentary rocks associated with the ophiolites in this area are of pre-middle Eocene age.

Graywackes are noticed at the area around the Koneng Hideung and Beas mountains. They crop out as boudins in a sheared shale matrix.

Limestones that underwent slight metamorphism are exposed on Badak mountain and chert is locally encountered North of Tegal Pamidangan.

c. Metamorphic group

Greenish serpentinite can be recognized at Tegal Pamidangan, Beas mountain, the Citisuk and Cikepuh Rivers and Tegal Sabuk. These rocks are usually found near the fault contact.

Relict peridotites near the serpentinite are still visible at the Tegal Sabuk area. Thus we consider that this serpentinite was derived from peridotite due to the high stress.

Glaucophane schists can be widely encountered in the middle part of the area (Pasir Luhur) (Fig. 4). They are seen to be well foliated and greenish-grey in colour. Under the microscope it can be seen that almost all of the minerals are dominated by mica, plagioclase and also glaucophane. In some places near the Koneng Hideung area are outcrops of hard, fine to medium, white quartzites. The same outcrops are also noticed at the Citisuk River. It is characterized by the presence of quartz veins.

Dark grey, well foliated phyllites are noticed on Badak mountain.

Tertiary rocks

The oldest Tertiary rocks in the studied area are composed of sandstones, limestones and clays. They transgressively overlie the pre-Tertiary rocks and were named the Ciletuh Beds by Van Bemmelen (1949), and the Ciletuh Beds (Formation) by Marks (1957). The lower part of the Ciletuh Formation

consists of well bedded, fine to coarse, white quartz sandstones intercalated with quartz conglomerates and sometimes small layers of coal. Lenses of limestone are found in the sandstones. Cross bedding and parallel lamination are the main structure of the lower part. Basal conglomerate with the pre-Tertiary fragments such as phyllite, gabbro, peridotite and basalt are found at the base of this formation.

Boulders of limestones rich in Eocene larger foraminifera such as *Discocyclina dispansa*, *Nummulites sp.* and *Asterocyclina sp.* were found at the upper course of the Cibulakan River. These boulders were possibly derived from the hills near by. These larger foraminifera associations are indicative of middle Eocene or T_{ab} in the Indonesian letter stages.

The middle part is composed of alternation

of grey clays and fine to medium grained, white quartz sandstones. The clay sample at the Cigadung River, South of the Sentul village, yields planktonic foraminifera such as Globigerina cf. tripartita, Gb. cf. pseudoampliapertuna, Gb. ampliapertura, Globorotalia cf. cerroazulensis pomeroli, an assemblage of late Eccene - early Oligocene. Another sample South West of Cibenda consists of Globigerina cf. tripartita, Gb. cf. eocaena, Gb. cf. pseudoampliapertura, Globorotalia cf. opima, also indicating late Eocene-early Oligocene age. Again the upper part of this formation is composed of fine to coarse grained, white, quartz sandstones. Thus, the foraminifera found in the Ciletuh Formation point out that the age of this formation is middle Eocene to early Oligocene.

Reworked planktonic foraminifera of Cretaceous age (*Pseudotextularia sp., Globotruncana sp.*) was found in the sample South of the Sentul village, at the Cigadung River.

DISCUSSION ON THE MELANGE OF CILETUH AREA

Melange has been widely discussed by many authors. Among the well known authors on melange, Hsu and Ohrborm (1968) have written the most detailed descriptions. They concluded that melange is a group of rocks in which each of the rocks is derived from a different environment. This group of rocks has undergone highly tectonic influences and it can be mapped. Several types of fragments ranging from centimeters to kilometers in diameter mix with each other in a sheared matrix.

Sukendar Asikin (1974) in his melange study in the Luk Ulo area, Central Java, also summed up that basic igneous sedimentary and metamorphic rocks of different size and environment are mixed in a sheared shaly matrix. These blocks came from the result of crushing, and separating, followed by tectonic mixing. No lateral continuity of these blocks can be observed.

In the geological complex in the area of Badak mountain and the area around the Citisuk River, ophiolite rocks are mixed with metamorphic rocks and sedimentary rocks of different environment suggesting this area is a melange complex. This opinion is also supported by the fact that each of the rock units are bounded by fault contacts. No continual spreading of these rocks were visible. The law of superposition, lateral continuity and faunal assemblage as used in normal deposition can not be applied in this area. The exotic blocks are composed of peridotite, gabbro, marine basalt, while schist, phyllite and graywacke appeared as the native block. These exotic blocks and native blocks are mixed with each other in sheared shale matrix. As the best outcrops are well observed at the upper course of the Citisuk River, the authors suggest the melange complex in this

CONCLUSIONS

The geology of the Ciletuh area is very complex. Field data strongly suggest that the complex of the rocks in this area is a melange. Reworked Upper Cretaceous planktonic foraminifera found in the normal middle Eocene sediments (Ciletuh Formation) which unconformably overlies the pre-Tertiary rocks indicates that the age of this melange complex is pre-middle Eocene.

area to be name "the Citisuk melange complex".

By considering the Luk Ulo area, approximately 370 kilometers East of the Ciletuh area, which was regarded as a melange complex by Sukendar Asikin in 1974, it seems that the melange complex in the Ciletuh area is the continuation of the Luk Ulo melange complex.

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Figure 3 - Outcrop map of Badak mountain complex, Ciletuh area West Java.



Figure 4 - Geological map of Ciletuh area South West Java.

AGE	Rock Units	Lithology	Lithologic discription
Recent	Ħ	00000000°	Sand and grave!
Early Gligocene Middle Eocene	Ħ		Quartz-sandstones with intercalations of quartz conglomerates, and thin coal layers, cross bedding. Alternations of shales and quartz - sandstones. (CILETUH Fm)
Pre - Middle Eocene	M		Tectonically block mixture consits of peridotite, gabbro, basalt, schist, ser- pentinite, phyllite, graywacke, lime - stone, and chert in a sheared shally matrix. (MEL.ANGE COMPLEX)

Figure 5 - Stratigraphic classification in the studied area.











Figure 8 - Geological cross section Badak Mountain Complex, Ciletuh area West Java



Figure 9 - Geological cross section Badak mountain complex, Ciletuh area West Java.