DEPOSITIONAL ENVIRONMENT STUDY OF KASAI FORMATION LEBAN AREA AND SURROUNDINGS, RANTAU PANDAN DISTRICT, BUNGO DISTRICT, JAMBI

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Abstract— The Leban area is one of the areas in Jambi which is very interesting for conducting geological studies related to sedimentology, tectonics and paleontology. One of the interesting objects to be reviewed is the Kasai Formation, where a description of this formation still requires further research. Here the study of the Kasai formation is viewed from its sedimentology, especially regarding the Depositional Environment. The Kasai Formation in the Leban and Surrounding Research Area, Bungo Regency, Jambi Province. From the stratigraphic cross-sectional measurements, 6 facies were found in each rock unit, namely the Planar cross-turf tuff (Sp) facies, the tuff sandstone (Sm) facies, the ripples cross lamination (Sr) sandstone facies, the very fine sandstone facies (Sm) and the Tuff Claystone Facies (Fm).

Keywords: Kasai Formation, architectural elements, facies, meandering river.

I. INTRODUCTION

The research area is administratively located in Bungo Regency, Jambi Province. Travel from Bungo City requires heading to Leban Village and its surroundings with a travel time of ± 1 hour. The research area is in the western part of Jambi which is in the Barisan Hills physiographic zone. The Kasai Formation is composed of tuffaceous sandstone and claystone lithologytuff, pumice tuff rich in quartz, sandstones, conglomerates, sandy tuffs with ruditic lenses containing pumice and yellowish-gray tuffs, many plant remains and thin layers of lignite and scraped wood.

The depositional environment is the place where sediment material settles along with the physical, chemical and biological conditions that characterize the occurrence of certain depositional mechanisms [1], Nichols [2] added that what is meant by this process is a process that takes place during the process of formation, transportation and is accompanied by sediment deposition. Based on the geometry of the depositional environment, the river is divided into 4 namely straight river, braided river, meandering river and anastomosing river [3]. Lithostratigraphy [4] is one of the correlations of rock units based on similar characteristics including physical appearance, mineral composition of rocks, size of fragments or grains, texture and structure of sedimentary rocks [5]. The depositional environment of the Kasai Formation in the study area itself is still in doubt due to the lack of researchers and data relating to the sedimentation of the area. Based on the things mentioned above, it became the author's basis for carrying out geological mapping in the Leban area and its surroundings with the Study of the Kasai Formation depositional environment.

A. Regional Geology

1. Physiography and Morphology of the Research Area

Based on the division of the Sumatra island's physiographic zones according to Bemmelen [6], geographically the study area is included in the Barisan Hills zone. This zone is characterized by having a

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relatively elongated ridge topography reaching 1,650 km in a north-northwest and south-southeast direction.

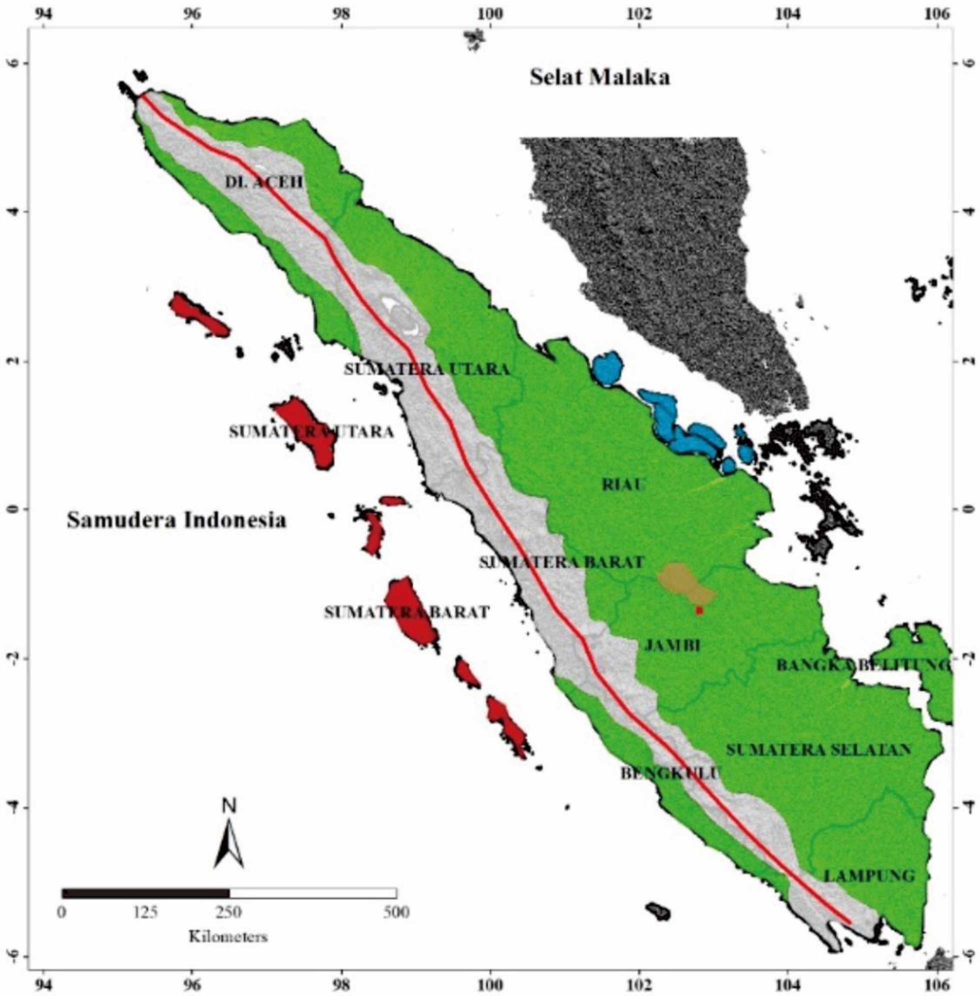

Figure 1. Division of Physiographic Zones of Sumatra Island Asral et al. [7] Modification from Bemmelen [6]

2. Regional Stratigraphy

The research location is in the South Sumatra basin, the South Sumatra basin is a Tertiary sedimentary basin formed in the northeastern part of the Barisan Magmatic Arc and is a back-arc basin. The South Sumatra backbow basin was formed by fault extension movements due to the collision of the Indian Ocean Plate with the southwestern tip of the Sunda Shelf. According to Rosidi et al. [8] the research area includes the Kasai Formation, Granite Formation and Intrusion.

II. MATERIALS AND METHODS

The study was divided into two parts, namely field data collection using the detailed geological trajectory method from selected trajectories, stratigraphic cross-sectional measurements and studio data analysis in the form of stratigraphic analysis.

III. RESULTS AND DISCUSSION

The Kasai Formation was carried out in the research area through field observations by mapping the stratigraphic sequence vertically on rock outcrops that are considered representative to understand more deeply about the sedimentation of this formation in terms of the lithofacies and the elements of the sedimentation structure.

Table 1. Classification of lithofacies [9, 13]

Facies code	Facies	Sedimentary Structure	Interpretation
Gmm	Matrix supported, massive gravel	Weak grading	Plastic debris flow (High strength, viscous)
Gmg	Matrix supported, gravel	Inverse to normal grading	Pseudoplastic debris flow (Low strength, viscous)
Gci	Clast supported, gravel	Inverse grading	Clast rich debris flow (High strength, or pseudoplastic debris flow (Low strength, viscous)
Gcm	Matrix supported, massive gravel	-	Pseudoplastic debris flow (Inertial bedload, turbulent flow)
Gh	Clast supported, crudely bedded gravel	Horizontal bedding, imbrication	Longitudinal bedforms, lag deposits, sieve deposits
Gt	Gravel stratified	Trough cross beds	Minor channel fills
Gp	Gravel stratified	Planar cross beds	Transverse bedforms, deltaic growth from older bar remnants
St	Sand, fine to very coarse, maybe pebbly	Solitary or grouped trough cross beds	Sinuous crested and linguoid (3D) dunes
S-p	Sand, fine to very coarse, maybe pebbly	Solitary or grouped planar cross beds	Transverse and linguoid bedforms (2D) dunes
Sr	Sand, fine to very coarse	Ripple cross lamination	Ripples (Lower flow regime)
Sh	Sand, fine to very coarse, maybe pebbly	Horizontal lamination parting or streaming lineation	Plan bed flow (Critical flow)
Sl	Sand, fine to very coarse, maybe pebbly	Low angle (<15°), cross beds	Scour fills, humpback or washed out dunes, antidunes
Sc	Sand, fine to very coarse, maybe pebbly	Broad, shallow scours	Scour fill
Sm	Sand, fine to coarse	Massive or faint lamination	Sediment gravity flow deposits
Fl	Sand, silt, mud	Fine lamination, very small ripples	Overbank, abandoned channel or waning flood deposits
Fsm	Silt, mud	Massive	Backswamp or abandoned channel deposits
Fm	Mud, silt	Massive, desiccation cracks	Overbank, abandoned channel or drape deposits
Fr	Mud, silt	Massive, roots, bioturbation	Root beds, incipient soil
C	Coal, carbonaceous mud	Pant, mud films	Vegetated swamp deposits
P	Paleosol carbonate (calcite, siderite)	Pedogenic features: nodules, filaments	Soil with chemical precipitation

The assessment is based on outcrop data from stratigraphic cross-sectional measurements. The model of lithofacies analysis refers to Miall's classification [9], architectural element analysis refers to Miall's 10] architectural element classification and Miall's architectural vertical element model. The application of the classification of lithofacies and architectural elements is simplified according to the lithofacies found in the field. Several new lithofacies codes are stated in this study and refer to the nomenclature in the classification of lithofacies and architectural elements (Figure 2 and Table 1). The division of lithofacies is based on the type of lithology, grain size, sedimentary structure, and sedimentary texture. Based on the physical properties of the rock bodies found in the study area.

A. The Kasai Formation Facies

The facies of the Kasai Formation as a whole consists of Planar cross-sectional tuff facies (Sp), Tuff Sandstone Facies (Sm), Ripples cross lamination Sandstone Facies (Sr), Very Fine Sandstone Facies (Sm) and Tuff Claystone Facies (Fm).

1. Planar Cross-Siur Tuffaceous Facies (Sp)

These facies are composed of white tuff lithology. The thickness of this facies is about 60 cm. planar cross-sectional structure. The degree of roundness is round, the sortation is good. These facies are equivalent to the Sp (Sand planar) facies in Miall's classification [9].

2. Tuffaceous Sandstone Facies (Sm)

The tuffaceous sandstone facies are composed of white to yellowish tuffaceous sandstone lithology. The thickness of this facies is about 150 cm. The sandstones that make up these facies are characterized by good sorting, coarse sand grain size, angular to slightly angular roundness, massive structure. These facies are equivalent to the Sm (Sand massive) facies in Miall's classification [12].

3. Sandstone Facies Ripples cross lamination (Sr.)

These facies are composed of alternating lithology of white tuffaceous sandstones and yellowish sandstones. The thickness of this facies is about 30 cm. The sandstones that make up these facies are characterized by a coarse-grained moderate, good sorting, degree of roundness at corners, Ripples cross lamination structure. These facies are equivalent to the Sr (Sand ripples) facies in Miall's classification [13].

4. Very Fine Sandstone Facies (Sm)

These facies are composed of brownish yellow sandstone lithology. The thickness of this facies ranges from 18 cm, well sorted, well sorted, with cement and matrix in the form of iron oxide, very fine sand grain size, roundness degree, massive structure. The fine sandstone facies are equivalent to the Sm (Sand massive) facies in the Miall facies classification [14].

5. Tuffaceous Claystone Facies (Fm)

The tuffaceous claystone facies are composed of tuffaceous claystone having a dark gray to yellowish color, thickness ranging from 15–130 cm with the size of clay grains, well sorted, consisting of clay minerals, massive structure. These facies are equivalent to Fm (Fine massive) in Miall's classification [15].

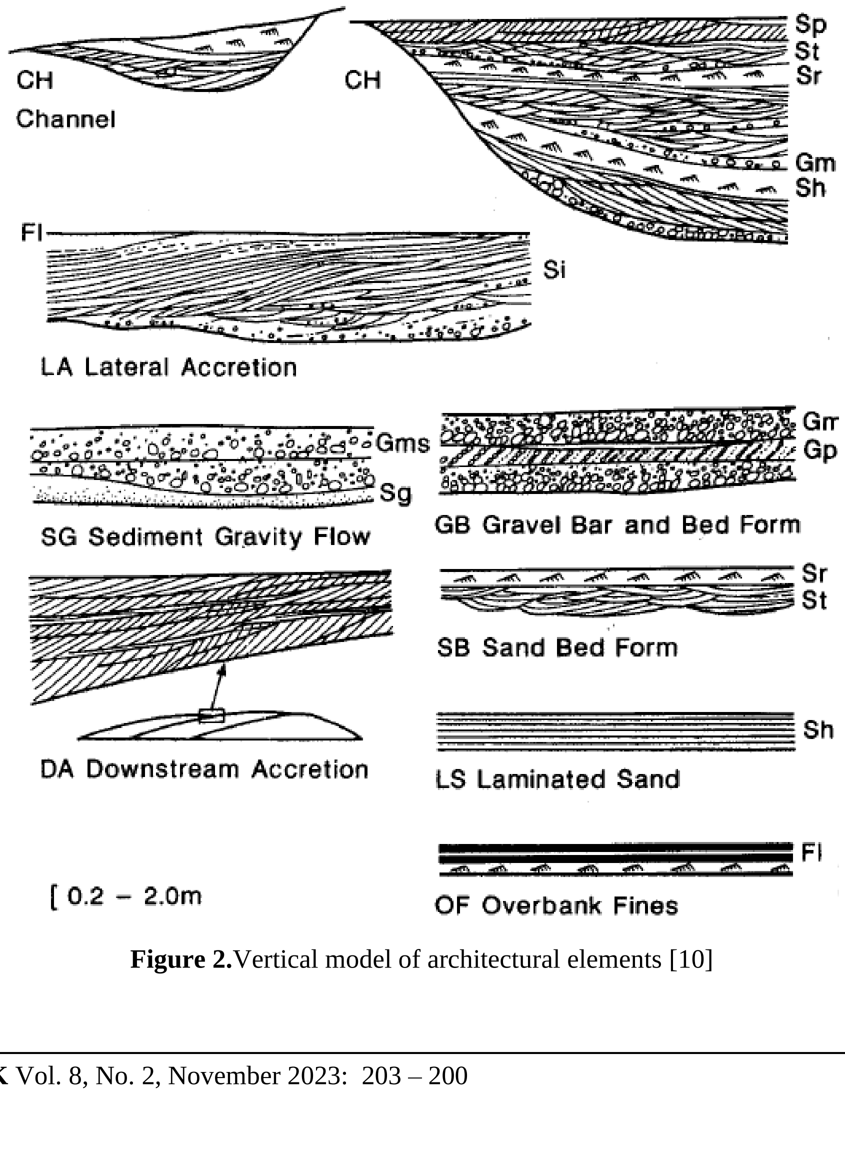

Figure 2. Vertical model of architectural elements [10]

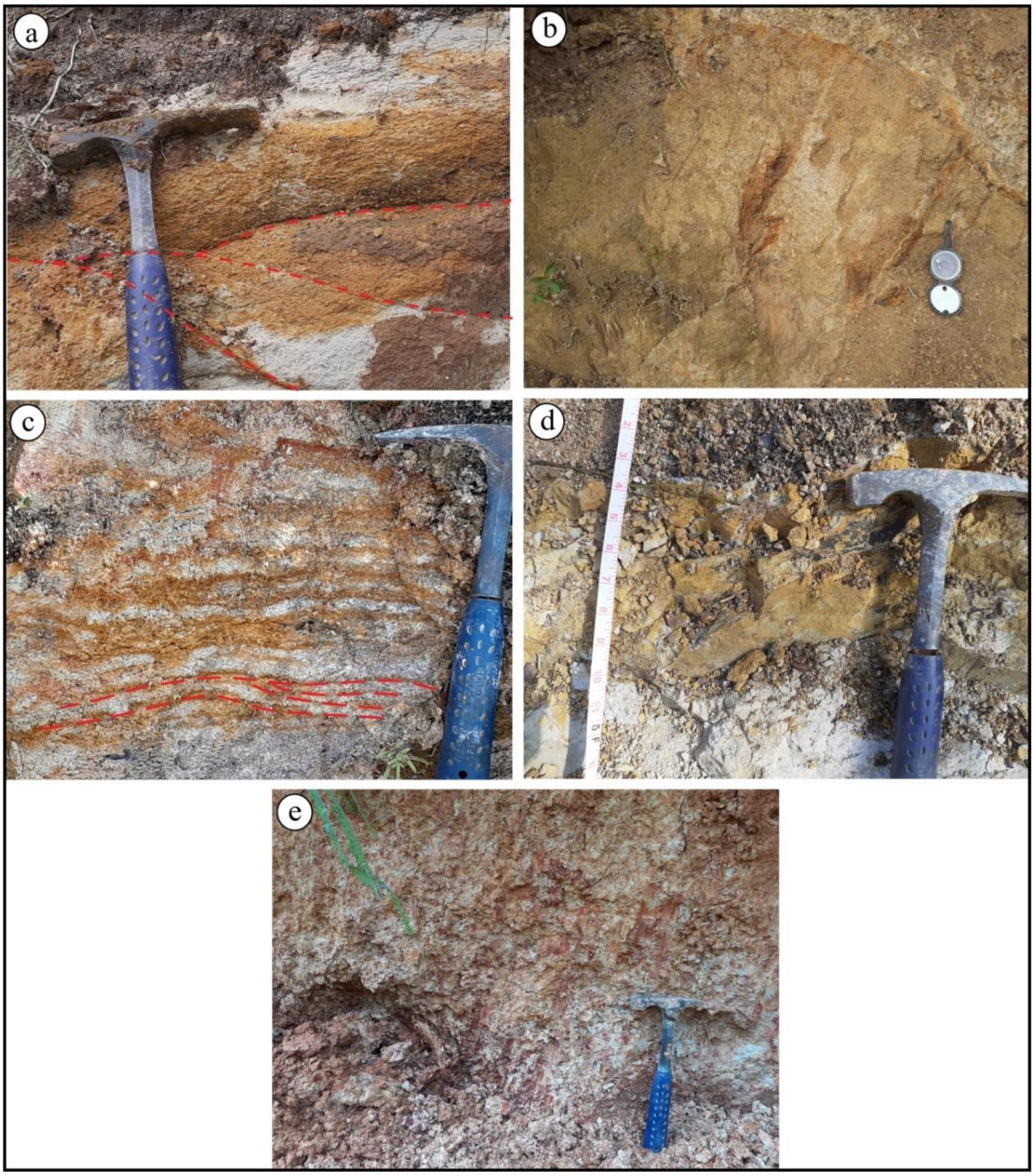

Figure 3. (a) Planar cross-crossed tuffaceous (b) Tuffaceous Sandstone with massive structure (c) Sandstone with Ripples cross lamination structure (d) Very Fine Sandstone with massive structure (e) Tuffaceous Claystone with

B. Architectural Elements of the Kasai Formation

Architectural elements are determined based on the facies and geometric associations of the outcrops Miall [10]. The architectural elements of the Kasai Formation can be grouped into Channel and Floodplain.

Channels. This facies consists of the associated, Planar cross-lamination tuffaceous facies (Sp), tuffaceous sandstone (Sm) facies, Ripples cross lamination (Sr) sandstone facies and very fine sandstone (Sm) facies. The sediments deposited in these facies are coarse fraction deposits and the presence of these deposits is strongly influenced by the strong bedload of the river. Sediments in the channel consist of collapsed river walls due to erosion by currents [11], which are better known as lag deposits. Because this channel is always moving and the river bed is always deposited with grains which are coarser. The characteristics of the channel facies in the study area can be seen in the measurements of the stratigraphic sections in the Leban and surrounding areas which have a lithological composition of coarse to fine sandstones with cross-bedding sedimentary structures. The nature of the sandstones in the study area smoothest upward starting from the coarse grain size which erodes the precipitated layers that were formed earlier. This facies association is also characterized by the presence of tuff facies and tuffaceous sandstones which are a mixture of volcanism products. Therefore, the process of deposition of the channel facies association was disrupted by volcanism.

Floodplain. The floodplain facies association is composed entirely of tuffaceous claystone (Fm) facies. This shows that the deposition of material in the area has a calm energy. The facies association which is dominated by fine-sized material has a thickness of up to 2 meters. Therefore, the architectural elements that are in accordance with the deposition mechanism are floodplains. Sedimentary structures that are present in this facies association are very rare due to massive rocks. The floodplains that form in the river environment are basically caused by the lack of capacity of the river body to accommodate the flowing water discharge. Therefore, the material that should be transported through the body of the river is blown away. This causes fine particles to be transported in suspension and then deposited on the floodplains. In addition, the presence of a tuff component in these facies indicates that there was an influence of volcanism products in that period.

Some of the descriptions that have been explained indicate that the depositional environment of the study area is a fluvial environment. Furthermore, it is suspected that the river system in the study area is a meandering river. This is indicated by the dominance of fine-sized material with good sortation.

IV. CONCLUSION

From the results of analysis on several profile trajectories in the study area, 6 facies were obtained in the Kasai Formation, namely the Planar cross-tuff Facies (Sp), Tuffaceous Sandstone Facies (Sm), Ripples cross lamination (Sr) Sandstone Facies, Very Fine Sandstone (Sm) Facies and the Tuffaceous Claystone Facies (Fm). With channel and floodplain architectural elements. From these data the Kasai Formation in the study area is included in the fluvial depositional environment, namely meandering rivers.

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ATTACHMENT

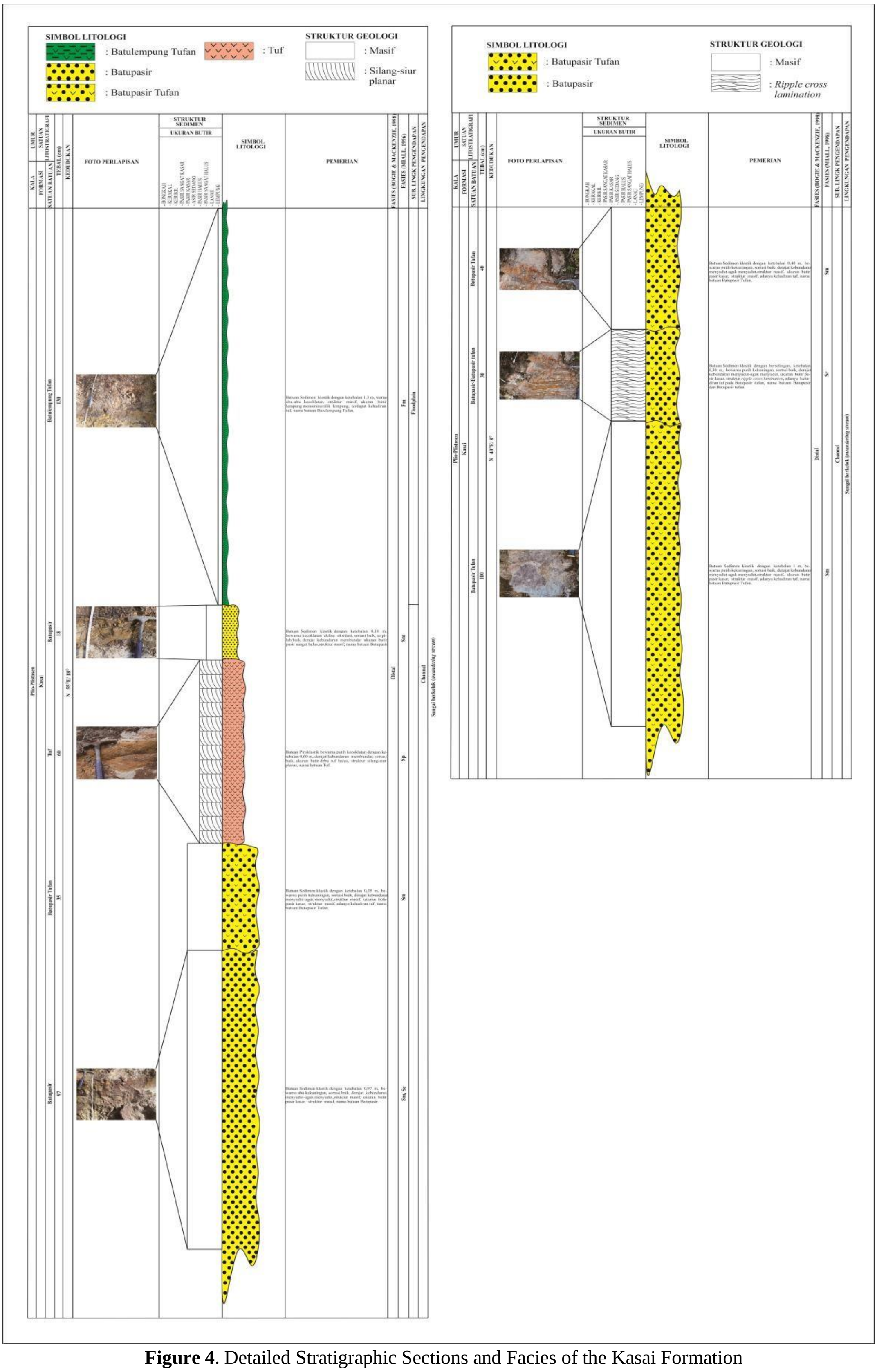

Figure 4. Detailed Stratigraphic Sections and Facies of the Kasai Formation