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Biostratigraphy Analysis in Determining The Age and Depositional Environment at Telisa Formation, Desa Tabing Kampar, Riau

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Abstract. The study area is located in Tabing village, Kampar, Riau, which is included in Telisa Formation, Central Sumatra basin. Telisa Formation is a seal or cap rock of the petroleum system in the Central Sumatra basin. Biostratigraphy analysis was determine in two stages, the first stage is field data aquisition using channel sampling analysis method by conducting lithological data of each layers and producing simple log outcrops. The second stage is data processing that has been conducted in the laboratory by washing and drying the rock sample until the analysis phase under binocular microscope. Planktonic foraminifera analysis would be given the relative age and foraminifera bentonic analysis would obtained the depositional environment of the study area. Lithology of the study area consist of shale and sandstone. Microfossil analysis from both llithology indicated that relative age of the study area is in Middle-Upper Miocene (N9-N21) and the depositional environment is in the Middle Neritic (20-100m).

1. Introduction

The study area is located in the Tabing village, Kampar, Riau. Planktonic foraminifera is widely distributed in open seas generally at more than 10m depth by way of life hovering on the water. Planktonic foraminifera were commonly used to determine the relative age of a lithological units (Bolli, 1985). Meanwhile, Bentonic foraminifera live in the sediment layer at the bottom of the sea and existing in almost all marine and transitional environments. Bentonic foraminifera can be used as an indicator of an ancient depositional environment and paleobathymetry (Pringgoprawiro and Kapid, 2000). Determination of age and depositional environment had been used in qualitative and quantitative analysis. Qualitative analysis was determined using classification based on foraminifera bentonic (Phleger, 1951). And quantitative analysis was identified by calculating the planktonic and bentonic ratios and classifying them based on interpretation of pelagic ratio, depth and bathymetry environment (Tipsword et al, 1966).

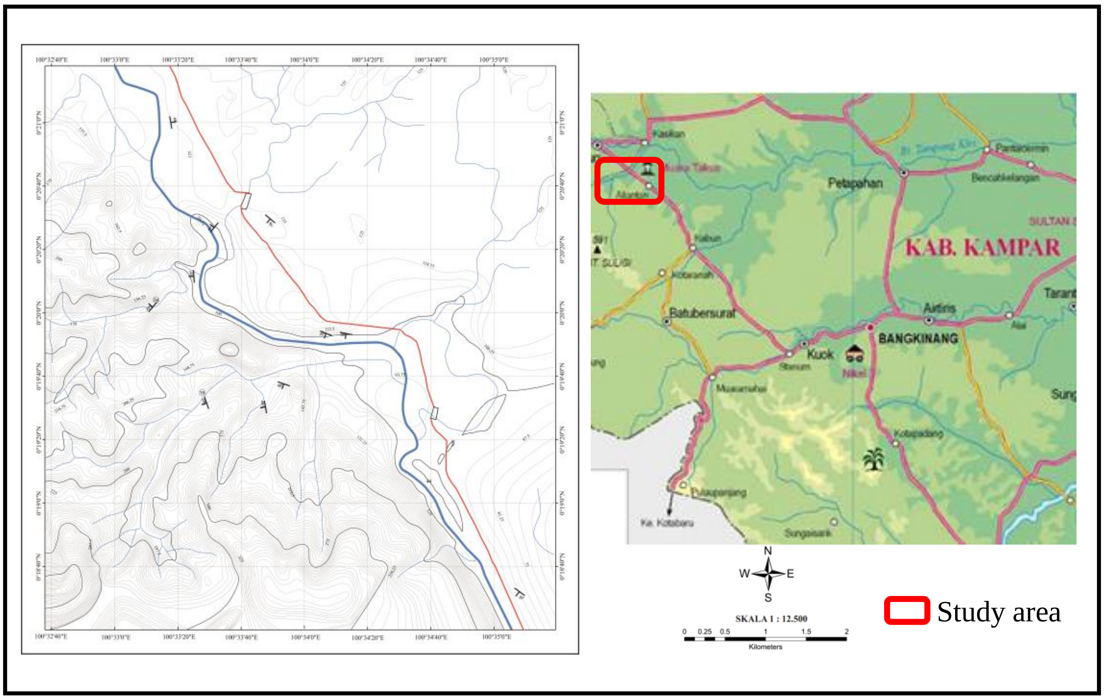

Figure 1. Administration map of Kampar Regency, Riau Province

2. Geological Setting and Regional Stratigraphy

Geologically, Kampar Regency is located in Central Sumatra Basin, which is a back arc basin that develops along the west and south coasts of the Sunda Shelf in the southwestern part of Southeast Asian. The Central Sumatra Basin consists of a succession of tertiary sediments overlying a complex pre-Tertiary lithology, bounded in the southwestern part of the basin by Barisan mountains, eastern part of the basin by Malaysian Shield and in the northern part of the basin by Asahan Arch, as the boundary at southern part of the Central Sumatra Basin is not well defined (Eubank and Makki, 1981). The traditionally accepted boundary geographic one is drawn as a north-southwest line through the Kampar High and Tiga Puluh Mountains (Heidrick and Aulia, 1993). The study area was in the Telisa formation which was deposited in the middle Miocene to upper Miocene (N9-N21) with a Middle Neritic (50-100m) bathymetry environment. The lithology is composed of sedimentary rocks dominated by shalestone with calcareous siltstone insertion, brownish gray and sometimes limestone was found. Depositional environment of study area is Middle Neritic to Upper Bathyal (Dawson et. Al., 1997). The thickness of this formation is up to 1600ft. This formation, known as cap rock from the Sihapas Group reservoir in the Central Sumatra Basin that have relationship with the Bekasap Formation in the southwest and the Duri Formation in the northeast of Central Sumatra Basin (Yarmanto, 1997).

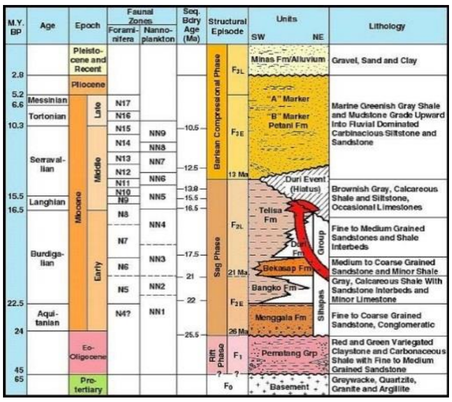

Figure 2. Central Sumatra Regional Stratigraphy (Heidrick & Aulia, 1996)

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3. Result and Discussion

There are two lithologies at the research study area, i.e. carbonate claystone and carbonated very fine sandstone.

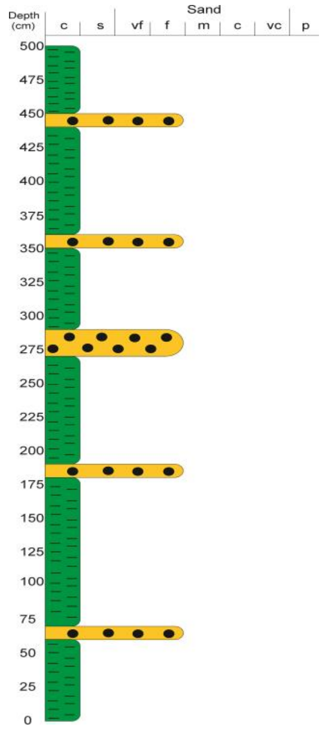

Figure 3. Photo outcrop and lithology log

In this outcrop there are 11 layers between claystone and very fine sandstone, this outcrop has 5m height and 10m length. The first layer, a claystone, has 80cm thickness, has a weathered brownish gray color, fresh blackish gray color, clay in grain size, well-rounded, well sorted, carbonate, slightly soft compactness, parallel laminated structure. In the second layer, very fine sandstone, has 10cm thickness, has a weathered gray color, fresh yellowish gray color, the grain size is very fine sand, well-rounded, well sorting, carbonate, slightly soft compactness. The third layer, claystone, has 100cm thickness, the fourth layer, very fine sandstone, with 10cm thickness, the fifth layer, claystone with 80cm thickness, the sixth layer, very fine sandstone with 20cm thickness, the seventh layer, claystone with a thickness of 60cm, the eighth layer, very fine sandstone with 10cm thickness, the ninth layer, claystone, with 80cm thickness, the tenth layer, very fine sandstone with 10cm thickness and the eleventh layer, claystone with 60cm thickness.

In the study area, there is 326 fossils of planktonic foraminifera with 6 different species, and 10 fossils of bentonic foraminifera from 3 different species.

Table 1. Range of age of Planktonic foraminifera (Blow, 1969)

Name of Fossil	Amount	Age																							
		Oligocene			Miocene															Pliocene					Quarter
					Lower					Middle							Upper								
		N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	N13	N14	N15	N16	N17	N18	N19	N20	N21	N22	N23	
Globigerina Ciperoensis	61																								
Globigerinoides Sacculiferus	41																								
Orbulina Bilobata	63																								
Orbulina Universe	82																								
Orbulina Suturalis	46																								
Globigerina nephentes	33																								

the bathymetry zone was determined using analysis of bentonic foraminifera that found in the study area. In the study area there were 3 species of bentonic foraminifera, 5 Bolivina sp, 4 Bulimina subornata, and 1 Cancris oblongus.

Table 2. Depositional Environmentdetermination based on depth of Bentonic foraminifera ratio(Tipsword et al, 1966).

Name of Fossil	Amount	Zone Bathymetri				
		Neritic			Bathyal	
		Inner	Middle	Outher	Upper	Lower
		20 m	100 m	200 m	500 m	1000 m
1. *Bolivina SP*	5					
2. *Bulimina subornata BRADYI*	4					
3. *Cancris Oblongus*	1					

From the data and analysis of planktonic foraminera, the age of the study area is at Middle Miocene-Upper Miocene (N9-N21). The analysis of Bentonic foraminifera is to determine the depositional environment. In the study area there is 3 bentonic foraminifera species, namely Bolivina sp, Bulimina subornata, and Cancris oblongus. From the abundance of the bentonic foraminifera fossil, the depositional environment can be found in 50-100m depth, Middle Shelf (Deep Middle Shelf).

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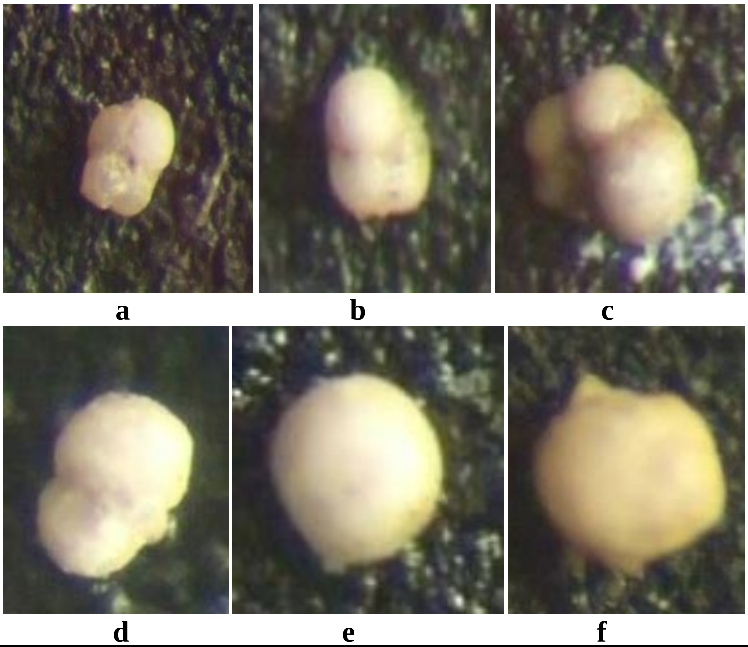
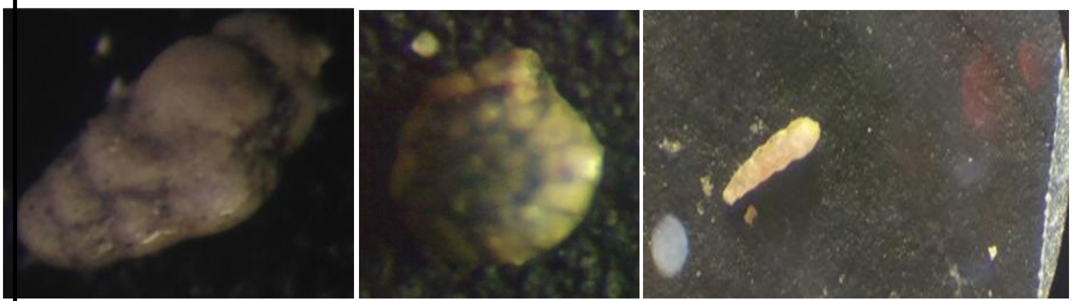


a. Globigerina nephentes
b. Globigerinoides sacculiferus
c. Globigerina Ciperoensis
d. Orbulina bilobata
e. Orbulina universe
f. Orbulina suturalis

Figure 4. Plangtonic Foraminifera



a. *Bulimina subornata* **b.** *Cancris Oblongus* **c.** *Bolivina sp*

Figure 5. Bentonic Foraminifera

4. Conclusion

The study area was in the Telisa formation, which is a cap rock in the petroleum system of central Sumatra basin with lithology very fine sandstone and claystone.The age of the study area is at Middle Miocene - Upper Miocene (N9 - N21), known from the analysis of planktonic foraminifera, Globigerina nephentes, Globigerinoides sacculiferus, Globigerina Ciperoensis, Orbulina bilobata, Orbulina universe, and Orbulina suturalis. The bathymetry environment in the study area is at depth of 50-100 m or in the Middle Neritic environment determined from the analysis of Bentonic foraminifera, Bulimina subornata, Cancris Oblongus, Bolivina sp.

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