http://journal.uir.ac.id/index.php/JGEET

E-ISSN : 2541-5794
P-ISSN : 2503-216X

Journal of Geoscience,
Engineering, Environment, and Technology
Vol 04 No 01 2019

RESEARCH ARTICLE

Age and Paleobathymetry of Salodik Group in Poh–Pagimana section, East Arm of Sulawesi Based on Foraminiferal Assemblages

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Received: Jan 20, 2019, Accepted: Feb 20 , 2019, Published: March 1, 2019
DOI: 10.25299/jgeet.2019.4.1.2751

Abstract

Planktonic and benthic foraminiferal assemblages were used for age and paleobathymetry analysis of outcropping carbonate succession of the Salodik Group in Poh–Pagimana section, East Arm of Sulawesi. Twenty spot samples of carbonate rocks were collected from cut slope along the road between Poh and Pagimana. Age analysis conducted for each sample by its planktonic foraminifera assemblages and group into their age interval. The age range from Early Eocene to Pliocene. Benthic foraminiferal assemblages indicate paleobathymetry ranging from middle shelf to upper bathyal settings. Age analysis of the studied section show an older sediments (Early–Middle Eocene) overlie younger sediment (Early Miocene). This is interpreted as the evidence of thrust fault in the Poh–Pagimana section as part of thrust sheets of Batui thrust complex which imbricated on deformation zone. The youngest sediment which have suffered deformations shown by disordered age sequence is Pliocene in age (N20-21). The Eocene to Pliocene carbonate succession in the studied section was deposited relatively in the more basinward position compared to the carbonate-dominated sediments in the Tomori area which was deposited in the more landward position.

Keywords: Salodik Group, Poh–Pagimana section, East Arm of Sulawesi, Early Eocene to Pliocene

1. Introduction

Paleogene to Neogene carbonate-dominated succession outcropping in the East Arm of Sulawesi, in named of Salodik dan Poh Formations (Rusmana et al., 1993; Surono et al., 1993). The name of Salodik and Poh Formations have been redefined by Simandjuntak (1986) as Salodik Limestones, and as Salodik Group by Handiwiria (1990). The Salodik Group is deformed and imbricated with total thickness of this unit in the range of 1000 to 1200 metres (Simandjuntak, 1986).

Several previous paleontological work have been conducted in the Salodik Group. Simandjuntak (1986) with his work in Biak–Poh section, Balantak section, Nambo river, and Kolo Atas area concluded that Salodik Group is Early Eocene to early Middle Miocene (zones P7 to N12–13). It was deposited as carbonate platform of an open shelf in Eocene times and in deepening shelf environment through Oligocene to Middle Miocene times. Furthermore, Simandjuntak (1986) divided this carbonate succession into boundstone, grainstone, packstone, and wackestone facies.

Larger foraminifera analysis of the Salodik Group from Poh locality give age of middle Lutetian to Bartonian (zones Ta3–Tb), Middle Eocene (Renema et al., 2002). The Salodik and Poh Formations is dated Early Eocene to Middle Miocene in age (Husein et al., 2014). Depositional environment of Salodik Formation varied from reef to shallow marine whilst Poh Formation was deposited in lagoon and neritic to bathyal setting (Husein et al., 2014).

The simple aim of this paper is to determine the age and paleobathymetry of Salodik Group in Poh–Pagimana section (Fig. 1) based on its foraminifera assemblages to better understand the stratigraphy of the East Arm of Sulawesi carbonate succession.

2. Stratigraphy

The study area is located in the Luwuk–Banggai Basin (Badan Geologi, 2009). Two stratigraphic sequences are imbricated together in the East Arm of Sulawesi fold-and-thrust belt: a parautochthonous sequence (Banggai–Sula microcontinent); and an allochthonous sequence (East Sulawesi Ophiolite/ESO) (Charlton, 1996).

The oldest Banggai–Sula microcontinent sedimentary rocks are of Triassic age, and consist of deep water limestone and marl with shale intercalation (Tokala Formation/Lemo Beds), and terrestrial to marginal marine shale and sandstone of Meluhu Formation (Simandjuntak, 1986; Rusmana et al., 1993; Surono et al., 1993; Charlton, 1996; Milsom, 2000Milsom).

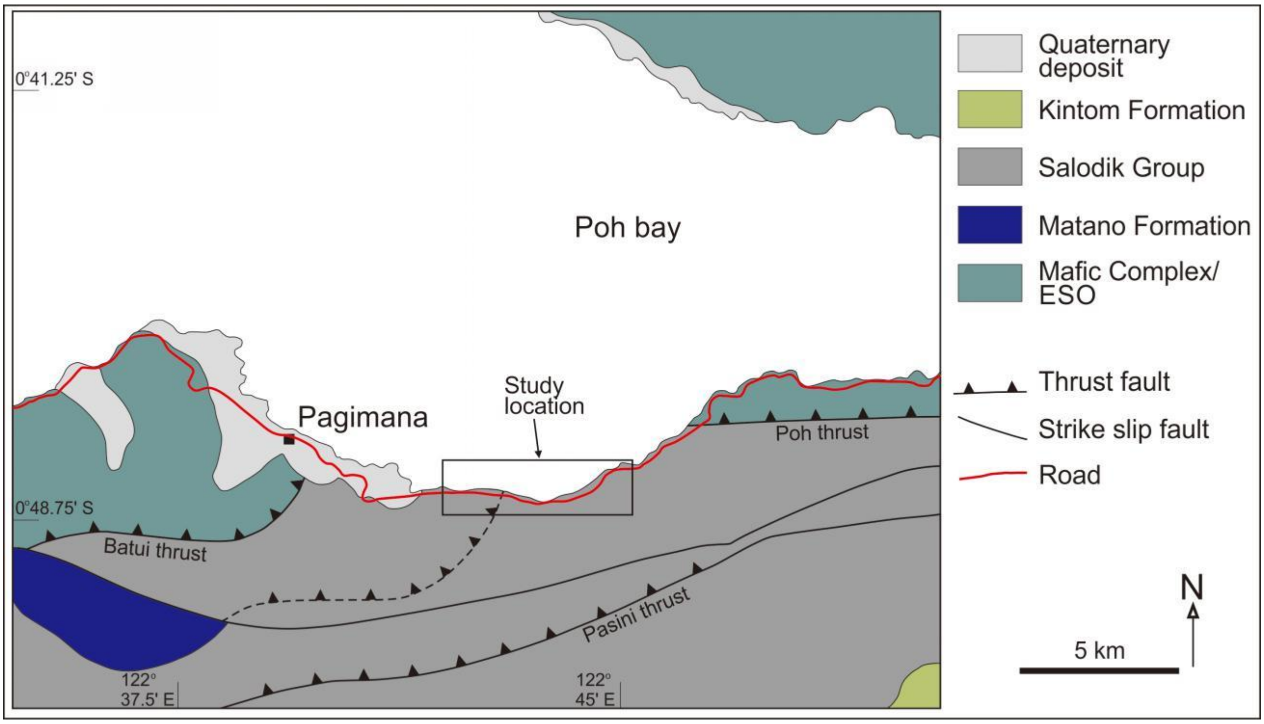

Fig. 1. Geological map of the study area, modified from Rusmana et al. (1993). Black box indicate the study location.

Early Jurassic sediment represented by inner shelf deposit of quartz-rich dominated sandstone with coal and conglomerate intercalation of Kapali Beds/Nanaka Formation (Simandjuntak, 1986; Rusmana et al., 1993; Surono et al., 1993). These are succeeded by Middle–Upper Jurassic limestone and marl with belemnite and ammonite, interpreted to be deposited in middle to outer shelf setting (Nambo Formation/Sinsidik Beds) (Simandjuntak, 1986; Rusmana et al., 1993; Surono et al., 1993; Charlton, 1996; Hasibuan and Kusworo, 2008).

During the drifting of the Banggai–Sula microcontinent in the Cretaceous and into the Cenozoic, passive margin sedimentation took place and deposited syn-drifting carbonates (Satyana and Zaitun, 2016). Sediments of the Cretaceous was deposited in relatively deep-water low energy sedimentary environment with carbonate-shale-chert sequences known as Luok Beds (more proximal facies) and Matano Formation (more distal facies) (Simandjuntak, 1986; Rusmana et al., 1993; Surono et al., 1993; Charlton, 1996). In the Early Eocene to early Middle Miocene, carbonate-dominated succession (Salodik Group) was deposited in shelf carbonate platform setting (Simandjuntak, 1986; Rusmana et al., 1993; Surono et al., 1993). The carbonate-dominated succession of Salodik Group (Tomori, Matindok, and Minahaki Formations) in Tomori area is dated as Late Eocene to Late Miocene, and was deposited in shallow water carbonate platform (Davies, 1990; Handiwiria, 1990; Charlton, 1996; Satyana and Zaitun, 2016).

The allochthonous sequence of ESO comprised of gabbro, basalt, serpentinite, dolerite, peridotite, and minor of phyllite and schist, and was dated to be ranged from Middle Cretaceous to Late Oligocene (Rusmana et al., 1993; Kadarusman et al., 2004; Husein et al., 2014).

The collision between Banggai–Sula microcontinent and ESO is probably took place from late Middle Miocene to Pliocene in submarine and open sea tectonic setting (Simandjuntak, 1986; Garrard et al., 1988; Satyana and Zaitun, 2016). Subsequent to the collision, formation and development of the melange occurred since the late Middle Miocene continued into Pliocene, named as Kolokolo Melange (Simandjuntak, 1986). It is consist of mixed fragments and blocks in sheared matrix of scally clay and marly mudstone (Simandjuntak, 1986; Surono et al., 1993).

Post-orogenic sediments derived from erosion of the obducted ophiolite is known as Batui Group and Sulawesi Group/Celebes Molasse. The Batui Group is dated as Late Miocene to Pliocene in age, and consist of deep water quartz-rich sandstones associated with pebbly mudstones (Kolo Beds), molasse type sediments conglomerate dominated coarse clastic rocks (Biak/Bongka Formation), and volcaniclastic sediments which do not contain material derived from the collision complex (Lonsuit Turbidites) (Simandjuntak, 1986; Rusmana et al., 1993; Surono et al., 1993). The Sulawesi Group (Early Pliocene to Pleistocene) comprise of flysch facies sediments of the Kintom Formation and molasse type sediments of Biak and Kalomba Formations (Abimanyu, 1990; Rusmana et al., 1993; Surono et al., 1993; Hasanusi et al., 2004). Pleistocene to present-day sedimentation is represented by carbonate sequence dominated of Quaternary coralline reefs named as Luwuk Formation (Simandjuntak, 1986; Abimanyu, 1990; Rusmana et al., 1993; Surono et al., 1993; Hasanusi et al., 2004).

3. Materials and Methods

Twenty spot samples of carbonate rocks along the road between Poh and Pagimana were sampled from the Salodik Group for foraminifera analysis. The location of each of these samples is shown in Fig. 2. Foraminifera analysis have been carried out at the GeolLabs, Pusat Survei Geologi, Bandung. The outcrop in the studied section was not continuous leading to the difficulty to determine stratigraphic position and to perform age analysis by biostratigraphic zonation. Age analysis conducted for each sample by its planktonic foraminifera assemblages and group into their age interval. Identifications of foraminifera were done based on Barker (1960) and Marcelle (2015). Age interpretation was based on planktonic zonation proposed by Marcelle (2015). Paleobathymetry interpretation of the studied samples using benthic foraminifera analysis was based on Rauwerda et al. (1984) and Holbourn et al. (2013).

4. Results and Discussions

4.1 Lithology

The studied sediment comprised of interbedded of limestone and marl. The limestone is grey in colour, partly well-bedded, containing foraminifera, mollusc, and coral. Marl is white to grey, soft, contain abundant foraminifera. Khorniawan (2013) divided sediment in the studied section by petrographic analysis into 13 types of carbonate: large bioclast packstone forams, bioclast planktonic forams packstone, bioclast planktonic forams packstone with quartz, red algae bioclast wackstone, bioclast red algae grainstone, packstone with dolomitization, ooid grainstone, ooid packstone, bioclast coral rudstone, bioclast miliolids grainstone, bioclast planktonic forams packstone with microspar, indeterminate bioclast packstone, and bioclast red algae packstone with microspar. As general, carbonate rocks in the studied section are able to group into four type: packstone, wackstone, grainstone and rudstone. Field photographs represent each of age interval of the studied section is provided in Fig. 3.

4.2. Age analysis

Foraminifera analysis indicate that the Salodik Group in Poh–Pagimana section is Early Eocene to Pliocene. Details of the foraminifera identified in each sample are presented in Table 1. The age range of each of the analyzed samples are summarized in Fig. 4. In addition, indication of reworked foraminifera was found in twelve samples (PPG03, PPG04, PPG07, PPG08, PPG09, PPG10, PPG11, PPG13, PPG14, PPG15, PPG18, and PPG19).

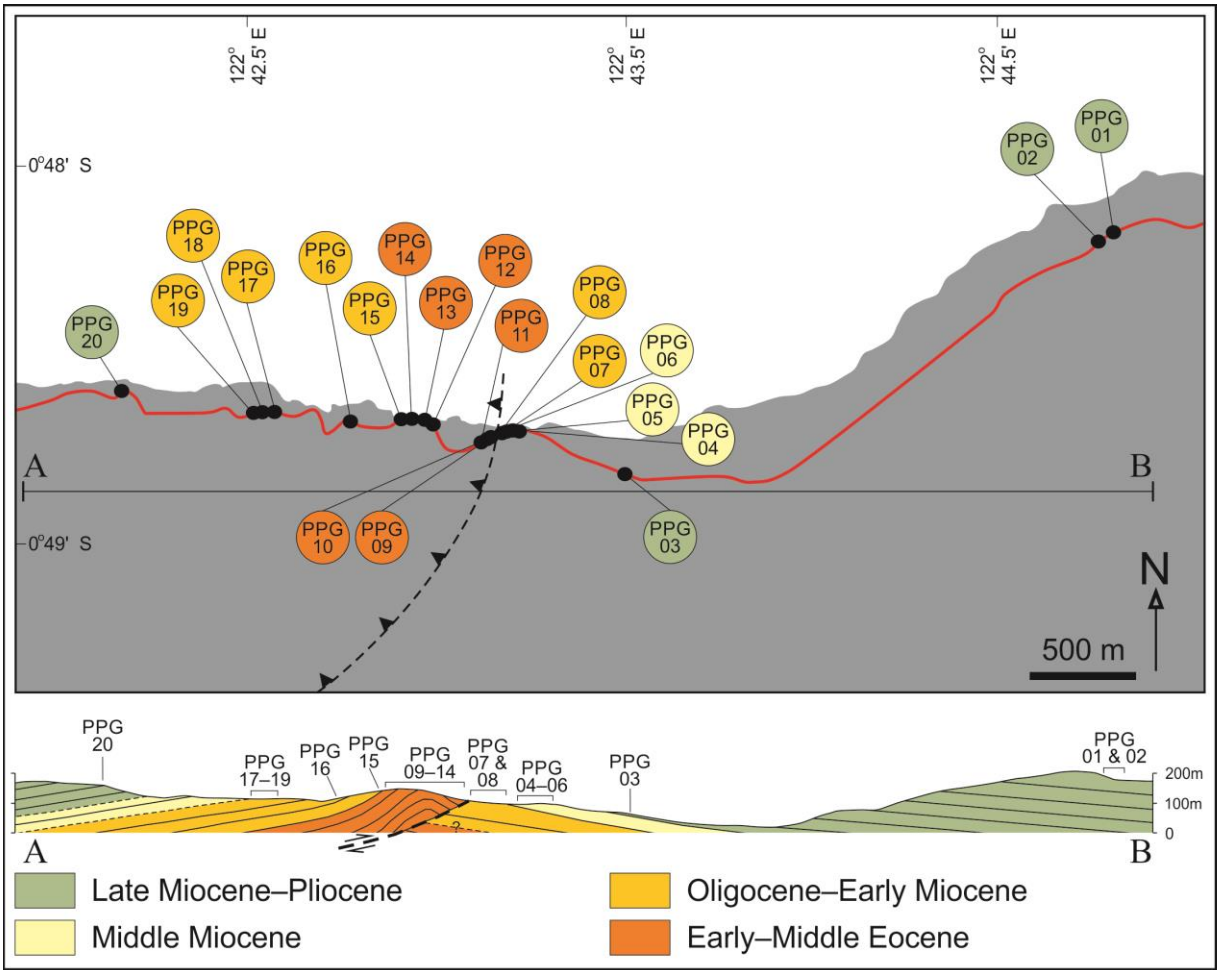

Fig. 2. Detailed map of the study area (above) and interpretation of geological cross-section (bottom). Black dots indicate sample localities. See text for further explanation of the age range for each sample.

It is interpreted by the occurrence of older foraminifera in younger foraminifera assemblages (red cross marks in Table 1). Based on planktonic foraminifera assemblages for each sample, the studied section is able to divide into four age interval:

4.2.1. Early–Middle Eocene

Foraminifera assemblages yielded an Early to Middle Eocene age are found in PPG09, PPG10, PPG11, PPG12, PPG13, and PPG14. Sample PPG09 contains *Igorina anapetes* and *Morozovella lensiformis*, suggesting zones P9–10, Early–Middle Eocene. The presence of *Morozovella aragonensis* and *Morozovella formosa* in PPG10 indicate Early Eocene age, zone P7. Based on the appearance of *Morozovella aragonensis* and *Morozovella subbotinae*, sample PPG11 is designated to zone P7, Early Eocene. Sampel PPG12 yielded a Middle Eocene age, zone P11, based on the occurrence of *Morozovella aragonensis* and *Morozovella lehneri*. Early to Middle Eocene age (zones P9–10) interpretation in sample PPG13 is inferred as shown by the presence of *Morozovella caucasica*. Sample PPG14 is appointed to zone P11, Middle Eocene, based on findings of *Igorina anapetes* and *Truncorotaloides rohri*.

4.2.2. Oligocene–Early Miocene

Seven samples of foraminifera-bearing carbonate (PPG07, PPG08, PPG15, PPG16, PPG17, PPG18, and PPG19) from the studied section have Oligocene–Early Miocene age. The occurrence of *Globigerinoides sacculifer* and *Globoquadrina binaiensis* in sample PPG07 indicates an Early Miocene age, zone N5. Sample PPG08 is inferred as zone N4, Early Miocene, as shown by the presence of *Globigerinoides primordius* and *Paragloborotalia kugleri*.

Sample PPG15 is interpreted as zone P22–N4, Late Oligocene–Early Miocene, based on findings of *Globigerina ciperoensis* and *Paragloborotalia mayeri*. The appearance of *Globigerina sellii* and *Paragloborotalia obesa* suggests Late Oligocene age, zone P21–22, for sample PPG16. An Oligocene age, zone P19–21, is designated to sample PPG17 based on the presence of *Globigerina ciperoensis* and *Globoturborotalita ouachitaensis*. Sample PPG18 yielded a Late Oligocene–Early Miocene age, zones P21–N5, suggested by the appearance of *Paragloborotalia nana* and *Paragloborotalia obesa*. Sample PPG19 contains *Paragloborotalia obesa* and *Dentoglobigerina tripartita* indicates zone P21–22, Late Oligocene.

4.2.3. Middle Miocene

Foraminifera analysis indicate that three samples (PPG04, PPG05, and PPG06) are Middle Miocene in age. Sample PPG04 contains *Globigerinoides bollii* and *Paragloborotalia peripheroacuta* suggesting a Middle Miocene age, zone N12. Sample PPG05 yielded a Middle Miocene age, zone N10–11, based on findings of *Paragloborotalia peripheroacuta* and *Paragloborotalia peripheroronda*. The appearance of *Paragloborotalia peripheroacuta* in sample PPG06 indicate zone N10–12, Middle Miocene.

Fig. 3. Field photographs of several outcrops of the Salodik Group in Poh–Pagimana section., A. Bedded limestone with marl intercalation (PPG20)., B. Unbedded marl (PPG08)., C and D. Limestone with no visible bedding (C: PPG19; D: PPG12).

4.2.4. Late Miocene–Pliocene

Late Miocene to Pliocene age range in the studied section is represented by samples PPG01, PPG02, PPG03, and PPG20. The presence of *Globorotalia merotumida* and *Globorotalia plesiotumida* in PPG01 suggest a Late Miocene age, zone N17–18.

Sample PPG02 contains *Globorotalia plesiotumida*, also provided a Late Miocene age, zone N17–18. In sample PPG03 and PPG20, similar foraminifera assemblages of *Globorotalia margaritae* and *Sphaeroidinellopsis seminulina* was found, and designated these samples to Pliocene age, zone N19–20.

Table 1. List of foraminifera identified in the samples studied. Black cross = in situ foraminifera and red cross = inferred reworked planktonic foraminifera.

Foraminifera	Sample number																			
	PPG20	PPG19	PPG18	PPG17	PPG16	PPG15	PPG14	PPG13	PPG12	PPG11	PPG10	PPG09	PPG08	PPG07	PPG06	PPG05	PPG04	PPG03	PPG02	PPG01
Planktonic																				
Acarinina bulbrooki							x													
Acarinina senni							x													
Acarinina soldadoensis							x													
Catapsydrax dissimilis						x							x							
Dentoglobigerina altispira	x													x			x	x	x	x
Dentoglobigerina tripartita		x		x		x							x	x						
Dentoglobigerina venezuelana		x			x	x								x		x	x		x	
Globigerina ampliapertura													x							
Globigerina ciperoensis		x		x	x	x							x							
Globigerina gortanii													x							
Globigerina officinalis				x																
Globigerina sellii		x			x								x							
Globigerinella praesiphonifera															x	x	x			
Globigerinella siphonifera	x																		x	x
Globigerinoides altiaperturus														x						
Globigerinoides bollii																	x			
Globigerinoides conglobatus	x																			
Globigerinoides extremus																		x		x
Globigerinoides immaturus	x														x		x	x		x
Globigerinoides obliquus																	x		x	x
Globigerinoides primordius													x	x						
Globigerinoides sacculifer	x													x				x	x	x
Globigerinoides subquadratus															x					
Globigerinoides trilobus	x													x		x	x		x	
Globoquadrina binaiensis						x								x						
Globoquadrina dehiscens																x	x			
Globorotalia limbata	x																	x	x	x
Globorotalia margaritae	x																	x		
Globorotalia merotumida																				x
Globorotalia plesiotumida																		x	x	x
Globorotalia praemenardii																	x			
Globorotalia praescitula														x						
Globorotalia scitula	x																			
Globoturborotalita angulioffinalis						x														
Globoturborotalita nepenthes																				x
Globoturborotalita ouachitaensis		x	x	x		x							x							
Igorina anapetes							x					x								
Morozovella aequa										x	x									
Morozovella angulata																				
Morozovella aragonensis							x	x	x	x	x									
Morozovella caucasica								x												
Morozovella edgari											x									
Morozovella formosa								x			x									
Morozovella lehneri									x											
Morozovella lensiformis												x								
Morozovella subbotinae										x		x								
Morozovelloides coronatus									x											

Table 1. (continued).

Foraminifera	Sample number																			
	PPG20	PPG19	PPG18	PPG17	PPG16	PPG15	PPG14	PPG13	PPG12	PPG11	PPG10	PPG09	PPG08	PPG07	PPG06	PPG05	PPG04	PPG03	PPG02	PPG01
Planktonic																				
Neogloboquadrina acostaensis	x																		x	
Neogloboquadrina humerosa																		x		x
Orbulina universa/suturalis	x															x	x	x	x	x
Paragloborotalia kugleri													x							
Paragloborotalia mayeri						x								x		x	x			
Paragloborotalia nana		x	x	x	x	x														
Paragloborotalia obesa		x	x		x	x							x	x						
Paragloborotalia peripheroacuta															x	x	x			
Paragloborotalia peripheroronda																x	x			
Planorotalites chapmani								x												
Planorotalites pseudomenardii								x												
Prosphaeroidinella disjuncta																	x			
Pulleniatina primalis																		x		
Sphaeroidinellopsis seminulina	x																	x	x	x
Subbotina inaequispira							x			x		x								
Subbotina triloculinoides								x												
Truncorotaloides rohri							x													
Benthic																				
Amphicoryna sp.											x									
Amphistegina sp.					x		x	x									x	x		
Bolivina sp.	x		x	x				x		x					x					
Bulimina sp.						x														
Calcarina sp.									x		x									
Cassidulina sp.														x						
Cibicides sp.		x		x	x		x		x		x		x						x	
Dentalina sp.			x		x												x			x
Eggerella sp.														x						
Elphidium sp.																				x
Eponides sp.				x	x		x					x		x		x			x	
Globobulimina sp.			x																	
Gyroidina sp.						x	x						x	x					x	
Karreriella sp.				x		x			x				x	x		x		x		
Lenticulina sp.			x	x		x	x	x		x	x	x				x	x			x
Nodosaria sp.	x			x		x					x	x							x	
Nonion sp.		x		x			x				x								x	
Planularia sp.											x	x								
Planulina sp.															x	x		x		
Pleurostomella sp.													x							
Pullenia sp.				x	x											x				
Quinqueloculina sp.			x						x											
Reussella sp.			x																	
Rotalia sp.														x						
Textularia sp.	x	x							x	x			x							
Uvigerina sp.			x											x						
Vulvulina sp.		x																		

4.3. Paleobathymetry

In Early Eocene (zone P7), sediments in the studied section was deposited in middle shelf environment as shown by the presence of *Cibicides* sp., *Lenticulina* sp., *Nodosaria* sp., and *Nonion* sp. in sample PPG10, and based on the appearance of *Bolivina* sp. and *Lenticulina* sp. in sample PPG11. Paleobathymetry at zone P9-10 (Early to Middle Eocene) was in the outer shelf as shown by the occurrence of *Eponides* sp., *Lenticulina* sp., *Nodosaria* sp., and *Planularia* sp. (PPG09), and in the middle shelf environment based on the presence of *Amphistegina* sp., *Bolivina* sp., and *Lenticulina* sp. (PPG13). In zone P10–11 (Middle Eocene), paleobathymetry then changed into upper bathyal setting based on the findings of *Cibicides* sp. and

Karreriella sp. in sample PPG12. In zone P11 (Middle Eocene), sample PG14 mark the shifting of paleobathymetry into outer shelf, interpreted by the appearance of *Eponides* sp., *Gyroidina* sp., and *Lenticulina* sp. In zone P19–21, Early Oligocene, the occurrence of *Bolivina* sp., *Cibicides* sp., *Eponides* sp., *Karreriella* sp., dan *Pullenia* sp. in sample PPG17 indicate upper bathyal setting.

In zone P21–22, Late Oligocene, sampels PPG16 and PPG19 represent upper bathyal and middle shelf environment appointed by the presence of *Cibicides* sp., *Eponides* sp., and *Pullenia* sp. (upper bathyal; PPG16) and the appearance of *Cibicides* sp. and *Nonion* sp. (middle shelf; PPG19). The presence of *Bolivina* sp., *Dentalina* sp., *Globobulimina* sp., *Lenticulina* sp., and *Uvigerina* sp. in sample PPG18 (zones P21–N5, Late Oligocene–Early Miocene) indicate middle shelf environment. In zone P22–N4, Late Oligocene–Early Miocene, Sample PPG15 yielded benthic foraminifera of *Bulimina* sp., *Gyroidina* sp., and *Karreriella* sp. suggest upper bathyal setting. In zone N4, Early Miocene, upper bathyal environment is inferred based on the findings of *Cibicides* sp., *Gyroidina* sp., *Karreriella* sp., and *Pleurostomella* sp. in sample PPG08. In zone N5, Early Miocene, paleobathymetry was also in upper bathyal environment as shown by the presence of *Eggerella* sp., *Eponides* sp., *Gyroidina* sp., *Karreriella* sp., and *Uvigerina* sp. in sample PPG07.

Paleobathymetry at zones N10–11 (Middle Miocene) was in upper bathyal environment, based on the appearance of *Eponides* sp., *Karreriella* sp., *Planulina* sp., and *Pullenia* sp. in sample PPG05. Sample PPG06 with the age of Middle Miocene (zones N10–11) contains *Bolivina* sp. and *Planulina* sp., is also designated to upper bathyal environment. In zone N12 (Middle Miocene), paleobathymetry was change into middle shelf as suggested by the occurrence of *Amphistegina* sp., *Dentalina* sp., and *Lenticulina* sp. in sample PPG04.

Sediment of the studied section in the Late Miocene (zone N17–18) was deposited in middle shelf environment based on the findings of *Dentalina* sp., *Elphidium* sp., and *Lenticulina* sp., in sample PPG01, and was deposited in upper bathyal environment as shown by the occurrence of *Cibicides* sp., *Eponides* sp., and *Gyroidina* sp. in sample PPG02. Pliocene time (zone N19–20) of the studied section represented by sediment which was deposited in middle shelf and upper bathyal environment. Middle shelf setting indicated by the presence of *Bolivina* sp. and *Nodosaria* sp. (sample PPG20), whilst upper bathyal environment interpretation indicated by the appearance of *Karreriella* sp. and *Planulina* sp. in sample PPG03.

4.4. Thrust fault identification

Age analysis of the studied section show an older sediments (Sample PPG09, Early–Middle Eocene) overlie younger sediment (Sample PPG08, Early Miocene). This is interpreted as the evidence of thrust fault in the Poh–Pagimana section. The thrust fault is part of thrust sheets of Batui thrust complex which imbricated on deformation zone resulted from collision of Banggai–Sula microcontinent with the East Sulawesi Ophiolite (Davies, 1990; Kadarusman et al., 2004; Satyana and Zaitun, 2006). The chaotic order of the age sequence of the studied sample (PPG09–PPG14; PPG15–PPG19; PPG03–PPG01; Fig. 4) is interpreted as the result of deformation structure. The youngest sediment which have suffered deformations shown by disordered age sequence is Pliocene in age (N20-21). This indicate that the thrusting associated with the tectonic event in studied section was still took place after N20-21, probably at N22 (Villeneuve et al., 2000; Husein et al., 2014).

4.5. Correlation with Tomori area

Lower part of Tomori Formation, aged Late Eocene–Early Oligocene, was deposited in inner sub-littoral (Davies, 1990; Handiwiria, 1990). In Eocene–Early Oligocene, Salodik Group at the studied section was deposited in the marine environment with paleobathymetry ranging from middle shelf, outer shelf to upper bathyal.

Upper part of Tomori Formation, (Early Oligocene–Middle Miocene) was deposited in littoral to inner sub-littoral with interval of supra-littoral environment (Davies, 1990; Handiwiria, 1990). Tiaka member is found in upper part of Tomori Formation with lithology of limestone, coal, and dolomite. Tomori Formation is overlay by Matindok Formation (Middle Miocene) with depositional environment in littoral to inner sub-littoral (Davies, 1990; Handiwiria, 1990). In the Poh–Pagimana section, Late Oligocene to Middle Miocene Salodik Group was deposited in the marine environment vary from middle shelf to upper bathyal.

In Tomori area, Minahaki Formation at Middle to Late Miocene time was deposited in supra-littoral and inner to outer sub-littoral environment (Davies, 1990; Handiwiria, 1990). Mantawa member of Minahaki Formation, Late Miocene in age was a carbonate pinnacle reef deposited in inner sub-littoral (Handiwiria, 1990; Gutteridge et al., 2017). At Late Miocene to Pliocene time, Salodik Group in the studied section, was deposited in the middle shelf to upper bathyal setting.

From the above description, it is inferred that the Early Eocene to Pliocene carbonate succession (Salodik Group) in the studied section was deposited in relatively deeper paleobathymetry compared to the Salodik Group (Tomori, Matindok, and Minahaki Formation) in the Tomori area. In the other words, from Eocene to Pliocene, paleobathymetry in the studied section was relatively in the more basinward position compared to the sediments in Tomori area which was deposited in the more landward position. Simplified cross section scheme between the studied section and Tomori area is provided in Fig. 5.

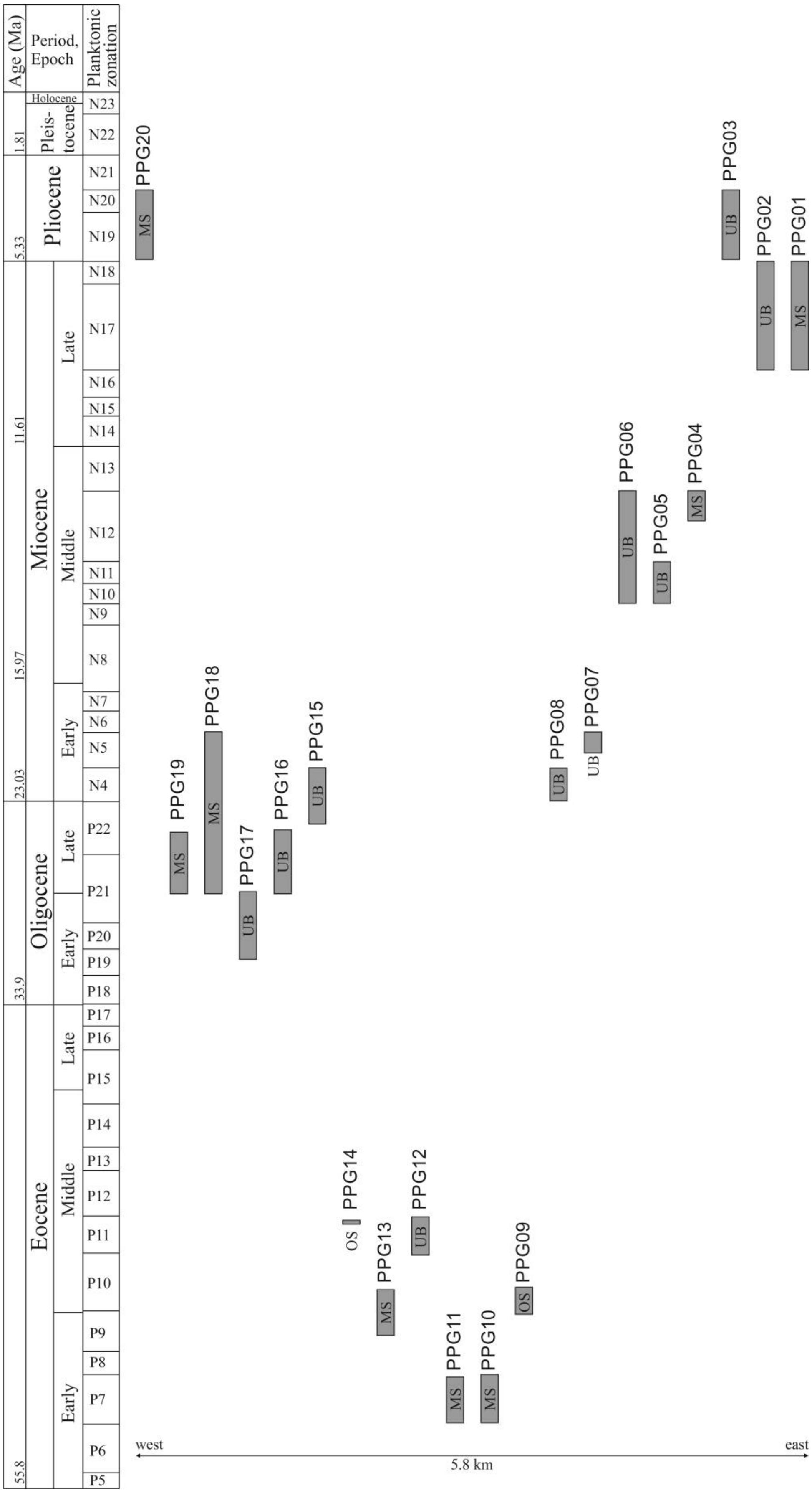

Fig. 4. Summary diagram of the age range and paleobathymetry of the samples studied. Planktonic zonation from BouDagher-Fadel (2015). Abbreviation: MS=middle shelf, OS=outer shelf, and UB=upper bathyal.

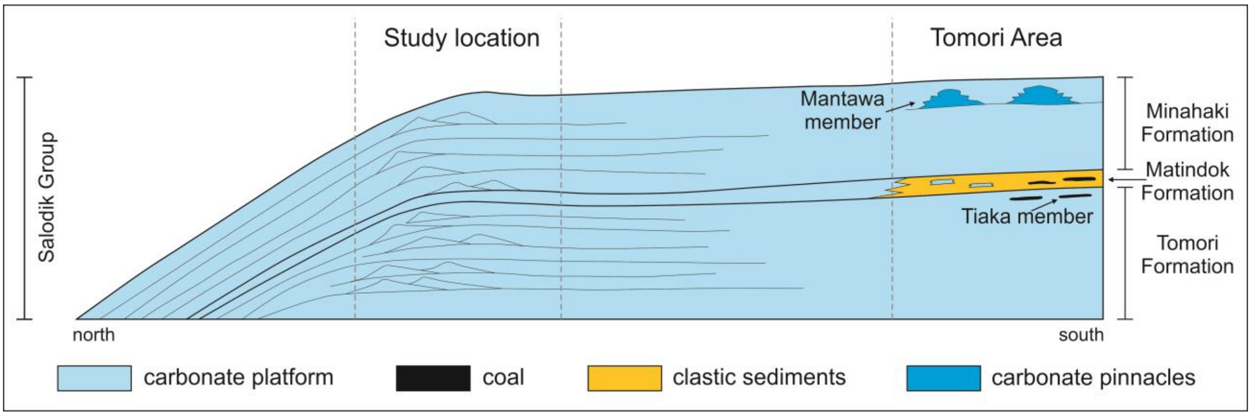

Fig. 5. Simplified cross section scheme between the studied section and Tomori area (modified from Gutteridge et al., 2017).

5. Conclusion

Twenty spot samples of carbonate succession of the Salodik Group were collected along the road between Poh and Pagimana for foraminiferal analysis. Planktonic foraminifera suggest an Early Eocene to Pliocene age whilst benthic foraminiferal assemblages indicate paleobathymetry ranging from middle shelf to upper bathyal settings. Age analysis of the studied section show an older sediments (Early–Middle Eocene) overlie younger sediment (Early Miocene), and interpreted as the evidence of thrust fault in the Poh–Pagimana section as part of thrust sheets of Batui thrust complex which imbricated on deformation zone. In addition, the Eocene to Pliocene carbonate succession in the studied section was deposited relatively in the more basinward position compared to the carbonate-dominated sediments in the Tomori area which was deposited in the more landward position.

Acknowledgements

This study was financially supported by Pusat Survei Geologi, Badan Geologi, KESDM. We thank Alexander Limbong and Supriadi for their support during the fieldwork. We are indebted to Rukman and M. Agus Rozak for their helps during the laboratory process. We are grateful to anonymous reviewers for their helpful comments the manuscript.

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