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The Paleocene – Early Eocene Foraminiferal Biostratigraphy of Eastern Dahomey Basin, SW Nigeria

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Abstract - The foraminiferal biostratigraphy of the Paleocene – early Eocene strata of SW Nigeria which represents the eastern Dahomey basin has been studied from four boreholes and two outcrops. A fairly diverse planktic and benthic foraminiferal assemblage was recovered.Six planktic biozones comprising *Praemurica pseudobulloide*s, *P. inconstans, Morozovella angulata*, *Globanomalina pseudomenardii*, *Morozovella velascoensis* and *M. subbotinae* were identified. Two benthic concurrent range zones, *Anomalinoides uboniferus - Eponides pseudoelevatus* and *Planulina oyae and Uvigerina hourcqi* have been identified. These biozones will serve as useful correlation tools in the West African coastal and inland sedimentary basins**.**

Index Terms: Benthic, Biozones, Eastern Dahomey, Foraminiferal biostratigraphy, Paleocene, Planktic , SW Nigeria

1 INTRODUCTION

THE boreholes and quarry section studied are in south western Nigeria (fig. 1) which represents the eastern Dahomey basin. The Gbekebo borehole is located on the Okitipupa ridge on the western flank of the Niger delta. The Araromi and Gbekebo boreholes penetrated the Cretaceous and Tertiary strata while other two boreholes BH No's 4925 and 1582 only penetrated part of the Tertiary sequence.

Several workers have studied the geology and biostratigraphy of the Paleocene sequence in southwestern Nigeria [2],[3], [4], [5],[6], [7], [8],[9] [10], [11], [12], [13], [14], [15], [16], and [17]. And the objective of this study is to undertake a foraminiferal biostratigraphic study of the Paleocene – early Eocene strata of the Eastern Dahomey basin.

1.1 LITHOSTRATIGRAPHY

The Paleocene – Eocene stratigraphic units in SW Nigeria comprises of Araromi, Ewekoro, Oshosun Formations and Imo Shale (Table 1 below).

1.1.1 Araromi Formation

The formation comprises of dark grey to black shale, shelly shale, sandy black shale and thin intercalations of limestones and sandstone [15], [16]. This formation was found in Araromi – 1 and Gbekebo – 1 borehole at 446 m – 583 m and 880 m – 1093 m respectively. The unit is equivalent to the Araromi Shale of [19] and the Nkporo Shale of [21]. The formation has an early Paleocene (Danian) age in SW Nigeria [17].

1.1.2 Imo Shale

The Imo Shale is composed of grey, dark-grey and black shale with occasional white to brown sands [17]. Glauconite occurs sporadically in the formation. The shale is thinly laminated, and generally fissile and locally calcareous. The black shale facies was not encountered in the Gbekebo – 1 and Araromi – 1 boreholes, it appears to be restricted to the northern (inland) part of the basin. A maximum formation thickness of 178.4 m was reported for the northern part of the basin while 429m (from 421 m to 850 m) and 240 m (212 m to 454 m) have been reported from Gbekebo – 1 and Araromi – 1 borehole respectively from the coastal area [17].

1.1.3 Ewekoro Formation

The formation is exposed at the Larefag WAPCO quarries at Ewekoro and Shagamu. At the Ewekoro quarry, the unit comprises of the following lithofacies:

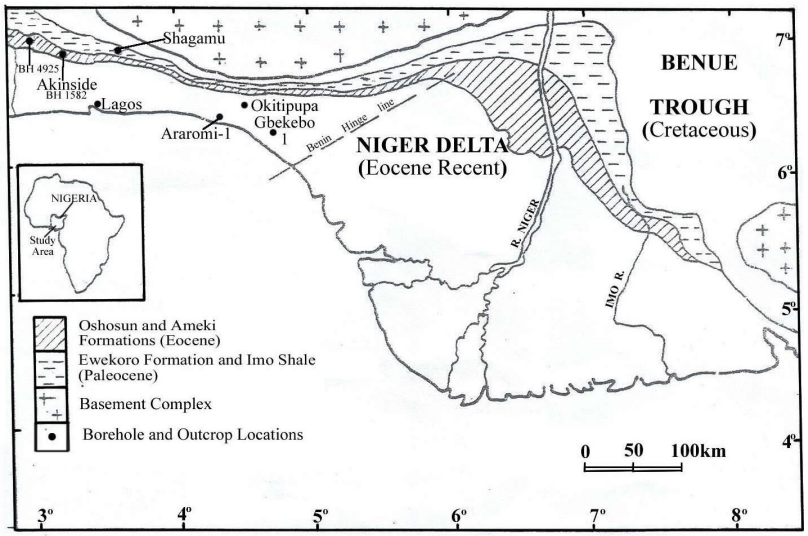


Fig. 1: Location map showing study area and the distribution of Paleocene-Eocene Sediments in Southern Nigeria

Table 1: Correlation of early Tertiary Formations in Nigeria

Series	Stage	Inland SW	Coastal SW	SE	NW	NE
Eocene	Ypresian - Lutetian	Oshosun Fm	Oshosun Fm	Ameki Fm (Nanka Fm)		
Paleocene	Thanetian	Imo Shale	Imo Shale	Imo Shale; Ebenebe Sandstone; Umunna Sandstone; Igbalu Sandstone	Kalambaina Fm	Kerrikerri Fm
		Ewekoro Fm			Dange Fm	
		Imo Shale	Araromi Fm	Nsukka Fm		

Basal sandy fossiliferous limestone, massive limestone nodular limestone and an uppermost glauconitic shale bed. The exposed section of the formation at the Shagamu quarry is composed of a basal nodular limestone bed that is followed by grey laminated shale, massive limestone, black shale and an uppermost massive fossiliferous limestone.

The formation was only encountered in the inland part of the basin. It was not found in the Araromi-1 and Gbekebo-1 boreholes. A maximum thickness of 47m has been reported for the formation. The base and top of the unit are marked by black and grey shale respectively [21].

1.1.4 Oshosun Formation

The formation comprises of green, greenish- grey or beige clay and shale with interbeds of sand. The shale is usually thickly laminated, calcareous and glauconitic. The associated sand is whitish, light brown or brownish grey in colour; it is predominantly medium to coarse grained with some fine grained horizons. The quartz grains are round, fine and clear, the sand is usually poorly sorted. Vesicular, nodular or compact phosphorites occur sporadically in the formation [17]. Thin limestone or marl beds are locally present in the formation [20], [19], [22], [23], [17] the formation becomes arenaceous and calcareous towards the top and base respectively. Vertical and laterals lithofacies variations are common. A maximum thickness if 101.5m was reported for the formation [21].

2 MATERIALS AND METHODS

Samples for the study were collected from Araromi—1 borehole (GSN), Gbekebo borehole (GSN), Akinside borehole (GSN 1582) Borehole No 4925, Ewekoro and Shagamu limestone quarries. The samples were collected at 2-3 meter intervals from the borehole core. The representatives' lithofacies samples were collected from the quarry faces.

The samples were disaggregated in a solution of 10% H_2O_2 overnight and boiled in water with a pinch of soda ash. They were then washed through a 63µm sieve. The washing procedure was repeated until foraminifera with clean surfaces were obtained. All the foraminifera recovered from the residue were counted and studied under the microscope. Generic classification was based on [28] [17] and other relevant foraminifera literature.

The species identification was based mainly on [23]. The species identification was based mainly on [23].

3 RESULTS

3.1 Biostratigraphy

A fairly diverse foraminiferal assemblage of planktic and benthic species was recovered in this study. Their stratigraphic distribution is illustrated in figs. 2-5. Majority of the foraminiferal species are illustrated in plates 1-3. From the first and last appearances of diagnostic species, six planktic foraminiferal biozones were recognized form the early Paleocene to the early Eocene (Table 2). The planktic foraminiferal zonal schemes adopted here are those by [23] and [25] for the early Tertiary. Two benthic foraminiferal biozones were recognized. The proposed biozones are arranged from base to top.

3.2 Planktic Foraminiferal Zones

*Parasubbotina pseudobulloide*s Zone

P1a + P1b sub zones [25]

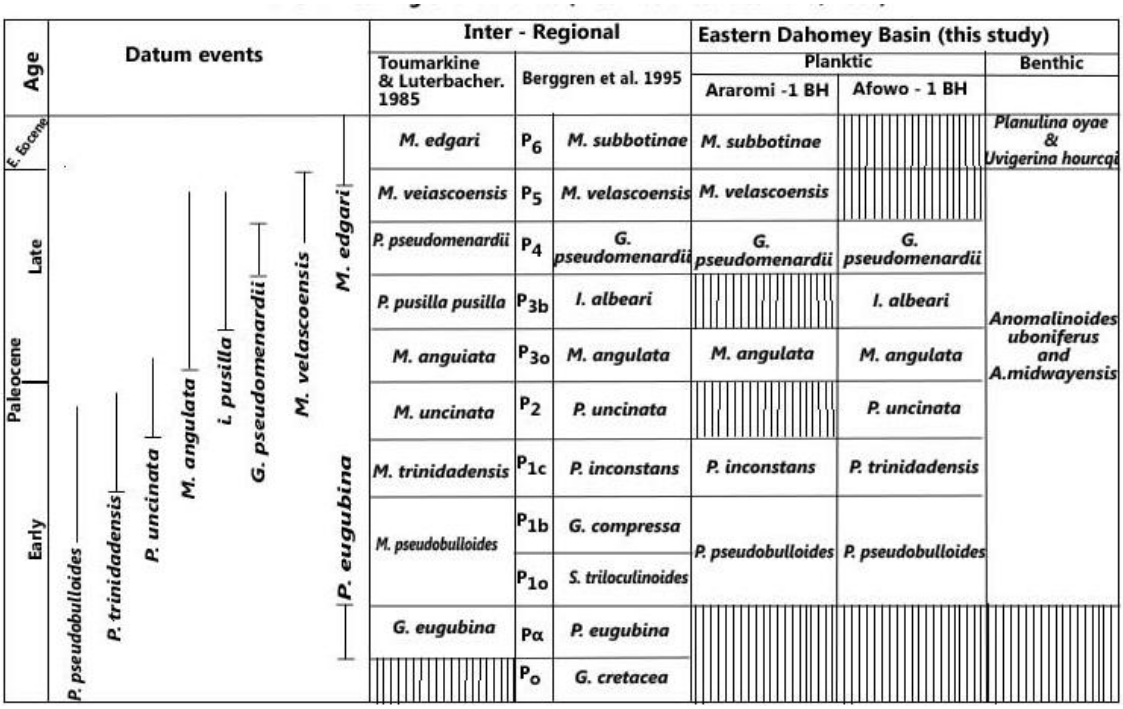
Age: Earliest Paleocene

Author: [26]

The partial range of the index taxon from its FAD to the LAD of *Praemurica trinidadensis* (Bolli) was used to define the zone (30). The upper boundary is also correlated to the FAD of *Praemurica inconstans* (Subbotina) according to [25]. *Praemurica trinidadensis* (Bolli) was not found in the study area.

The dominant species in this zone are *Subbotina triloculinoide*s (Plummer), *Globanomalina compressa* (Plummer), *Globoconusa danbjergensis* (Bronnimann) and *Eoglobigerina trivialis*. The *P. pseudobulloide*s zones occur in the Araromi – 1 and Gbekebo – 1 borehole (Fig. 2 & 3).

Table 2. Planktic and benthic foraminiferal biostratigraphy of the eastern Dahomey Basin and correlation with the inter-reginal schemes.



3.2.1 Praemurica inconstans Zone

P. trinidadensis Zone [27]

Age: Early Paleocene

Author: [25]

This zone was defined by [25] as sub-zone Pic based on the FAD of *P. inconstans* (Subbotina) to the FAD of *Praemurica ucinata* (Bolli). The dominant species in this zone are *Parasobbotina pseudobulloides* (Plummer), Subbotina triloculinoides (Plummer) and *Globanomalina compressa* (Plummer). The *P. inconstans* Zone occurs only in Araromi – 1 borehole. The P. ucinata Zones of [27] and [25] was not encountered in this study.

3.2.2 *Morozovella angulata* Zone

P3a subzone [25]

Age: Late Paleocene

Author: Hillebrandt [28]

This zone has been defined as the partial range of M. angulata (White) from its FAD to the FAD of Igorina pusilla (Bolli). The top of this zone was defined by [25] based on the FAD of Igorina albeari (Cushman and Bermudez) instead of I. pusilla. The dominant species in this zone include Morozovella acuta (Toulmin) M. aqua (Cushman and Renz), *Globigerina linaperta* (Finlay) *Globorotalia haynesis* (Fayose) and Acarinina primitiva (Finlay). The *M. angulata* Zone occurs in Araromi – 1, Gbekebo – 1, Akinside (BH 1582) boreholes. The zone also occurs in borehole No 4925 Ewekoro and Shagamu limestone quarries.

3.2.3 *Globanomalina pseudomenardii* Zone

P4 zone [25]

Age: Late Paleocene

Author: [25]

The *Globanomalina pseudomenardii* Zone is a taxon range zone defined by the total range of it's nominate species. The characteristic species include *Acarinina primitiva, Morozovella africana, M. costteina*, *Globigerina occlusa*, *Acarinina*

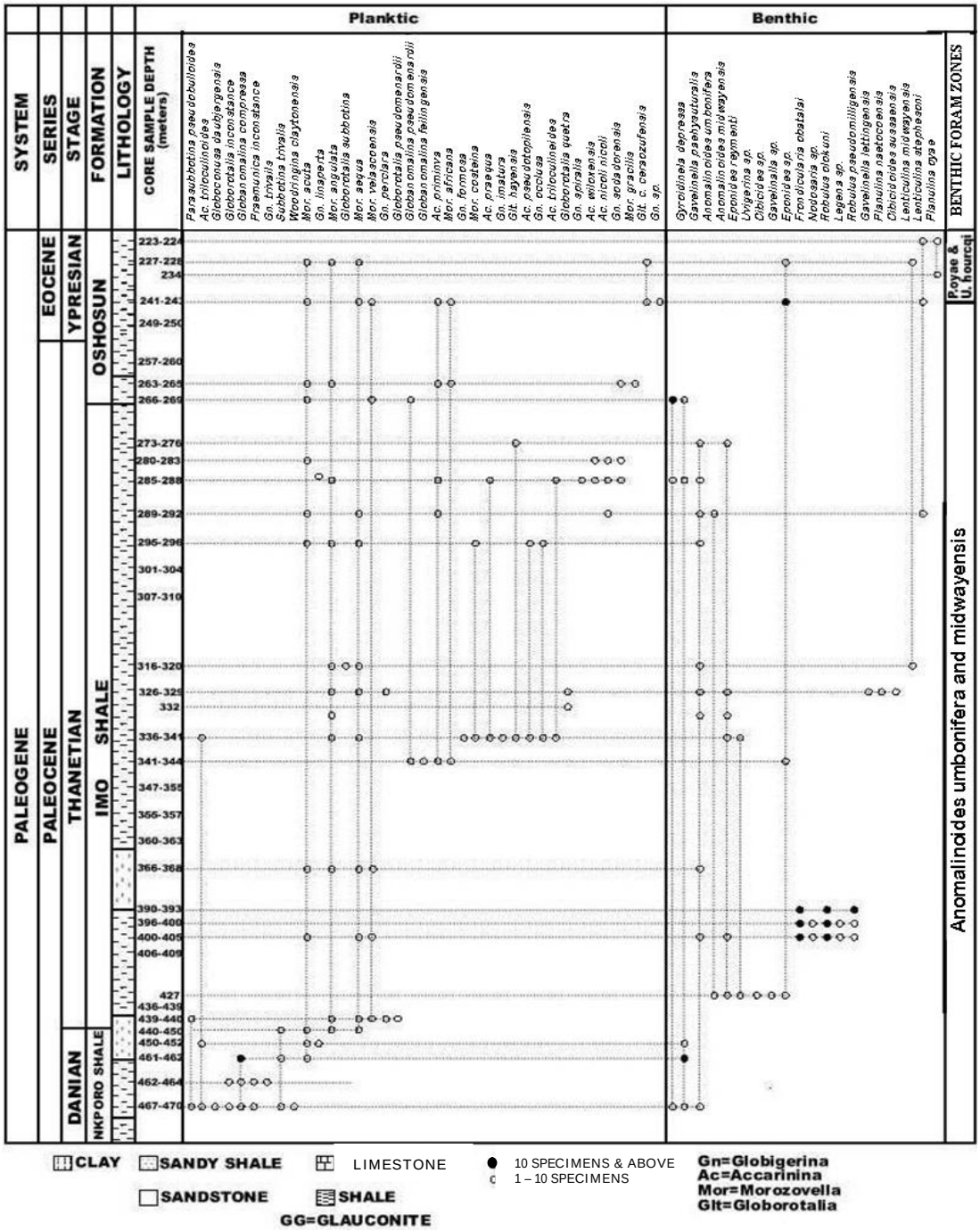


Fig. 2: Stratigraphic distribution of Araromi Borehole [GSN BH 1131]

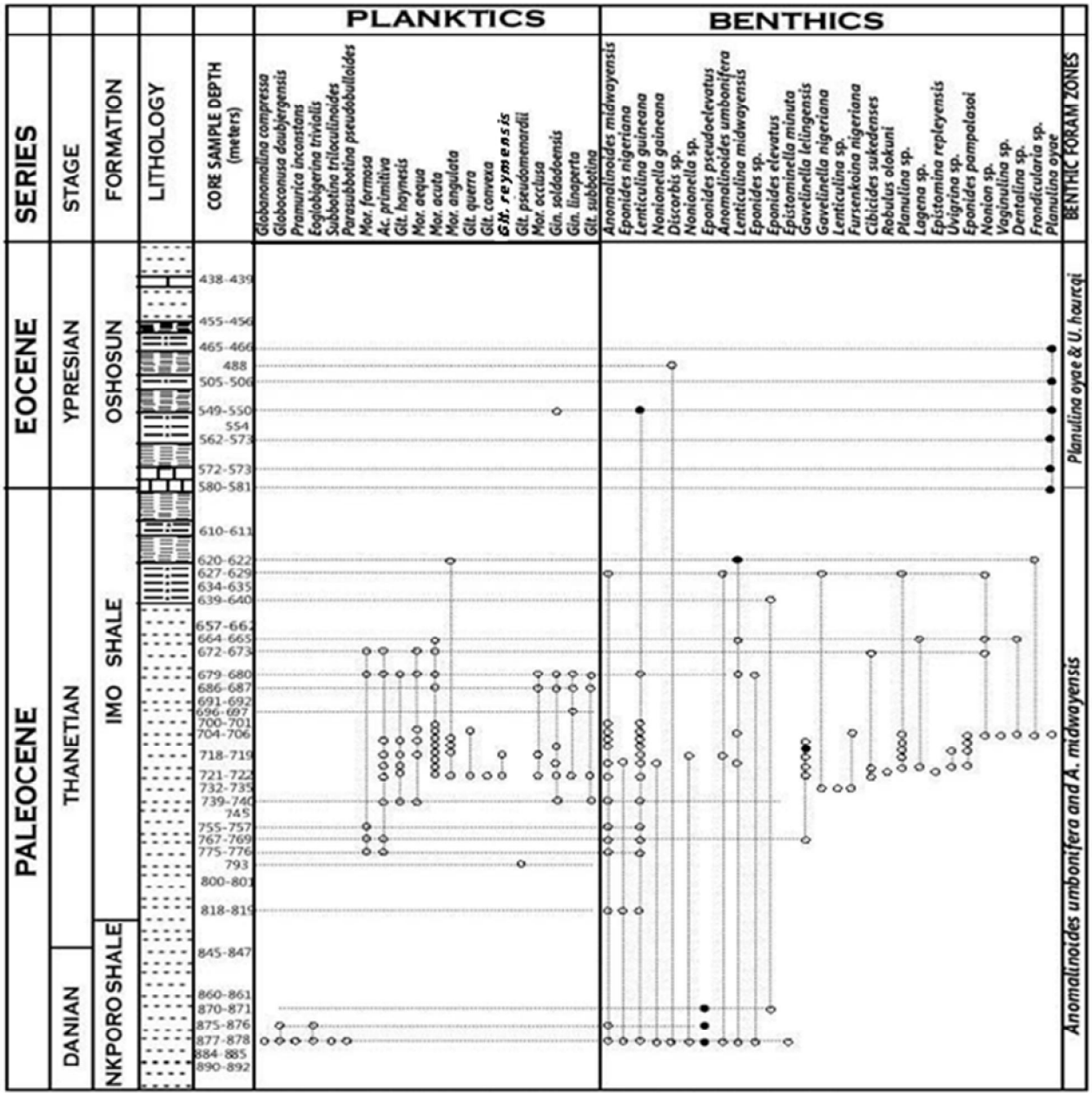


Fig.3. Stratigraphic distribution of foraminifera in Gbekebo Borehole [GSN/BH 1132], legend as in fig. 2

pseudotopilensis, M. angulata (white), *M. acuta* (Toulmin), *M. aqua* (Cushman and Renz), *M.Velascoensis* (Cushman). The *G. pseudomenardi*i Zone occurs in Araromi – 1 borehole and the Shagamu limestone quarry.

3.2.4 *Morozovella velascoensis* Zone

P5 zone [25]

Age: Late Paleocene

Author: [25]

This zone was defined as the partial range of the nominate taxon from the last appearance datum (LAD) of *Globanomalina pseudomenardii* (Bolli) to the LAD of *Morozovella velascoensis* (Cushman). The characteristic species include *Morozovella formosa, M. acuta, M. aequa, Acarinina primtiva*. The *Morozovella velascoensis* zone occurs in Araromi-1 borehole and Shagamu limestone quarry.

3.2.5 *Morozovella subbotinae* Zone

M. edgari zone [27]

Author: [25]

Age: Earliest Eocene

The M. subbotinae zone is an interval zone that was defined between the LAD of *Morozovella velascoensis* (Cushman) to the FAD of *M. aragonensis* (Nutal). The Paleocene / Eocene boundary lies near type lower boundary of the M. subbotinae zone which is placed at the LAD of *Morozovella .velascoensis* (Cushman). The characteristic species include M. gracilis (Bolli), *Globorotalia cerroazulensis* (Cole) *Acarinina soldadoensis* (Bronnimann), *A. primitiva* (Finlay), *Subbotina linaperta* (Finlay)

The *M. subbotinae* zone occurs in Araromi – 1 borehole. Although the nominate taxon *M. subbotinae* (Morozova) was not encountered in Akinside borehole (BH1582) and BH 4925 the presence of the following

species *Acarinina pseudotopilensis A. pentacamerata* (Subbotina), *A.tribulosa* (Loeblich and Tappan), *Globorotalia wilcoxensis* (Cushman and Ponto) and *A. broedemani* (Cushman and Bermudez), suggest its presence (fig 4-5).

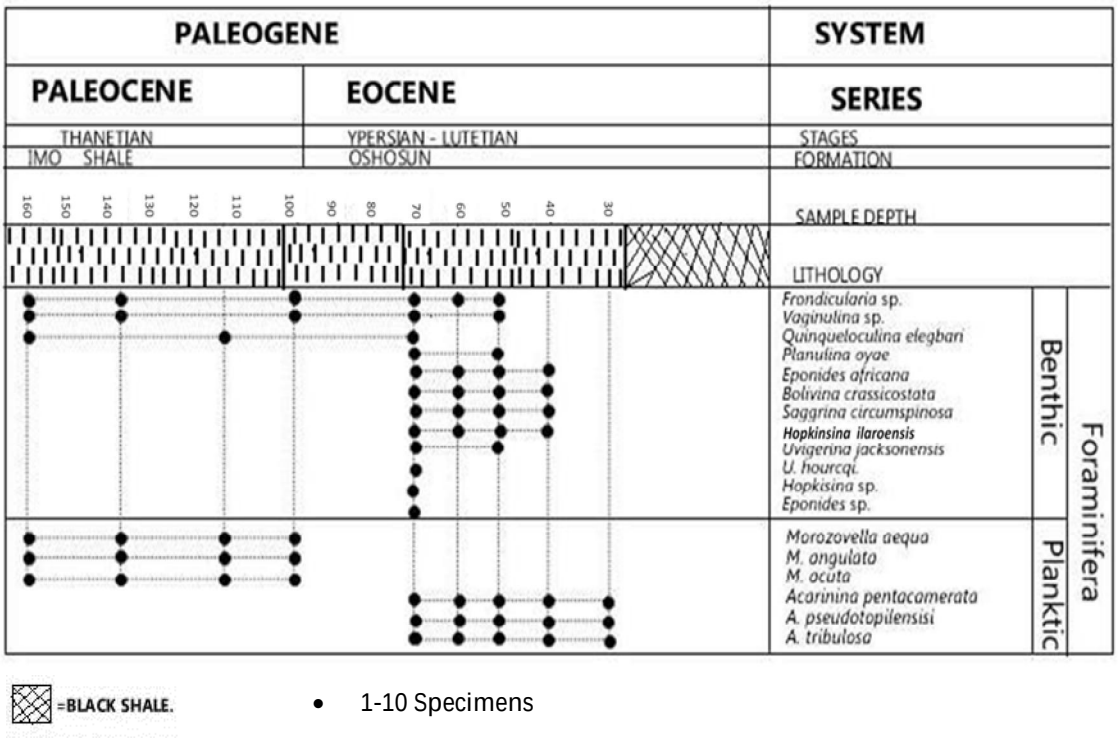
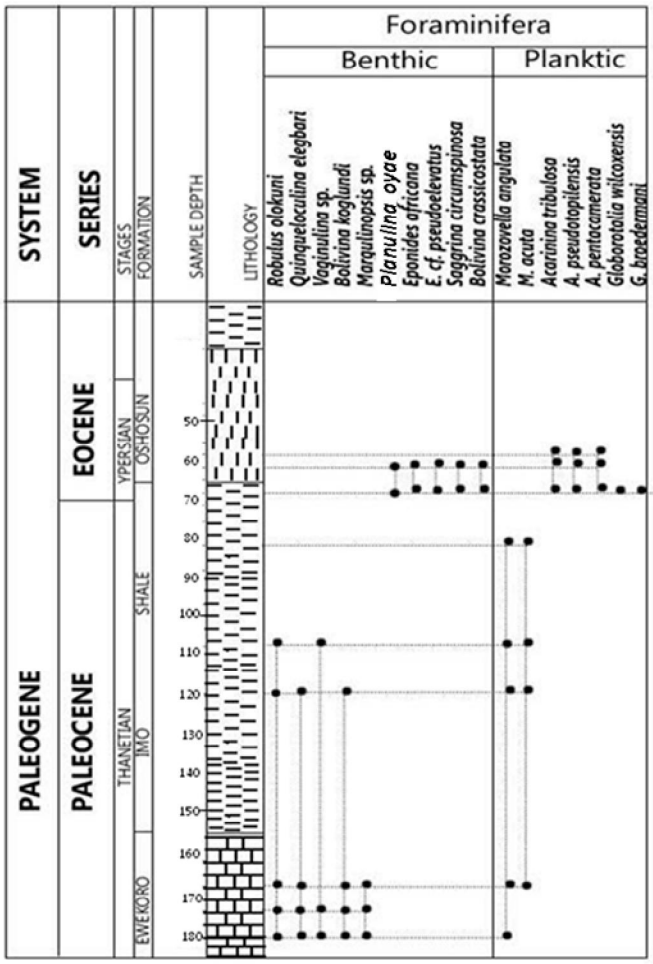


Fig. 4: Stratigraphic distribution of foraminifera in BH 4925, legend as in fig. 2



- 1-10 Specimens

Fig. 5 Stratigraphic distribution of foraminifera in Akinside Borehole [BH 1582] Legend as in fig. 2

3.3 Benthic Foraminiferal Zones

The benthic foraminiferal species recovered in this study are long ranging. Two concurrent range zones, one for the Paleocene and the second for the early Eocene have been identified. The concurrent-range-zones comprises of 2 overlapping species ranges which have time significance and possibilities of geographic extensions. This is in consonance with the international stratigraphic guide [30].

3.3.1 *Anomalinoides umboniferus – Epondes pseudoelevatus* Zone

Age: Early and late Paleocene

Author: [14]

This zone was defined by the concurrent range of the nominate taxa *Anomalinoides umboniferus* (Schwager) and Eponides pseudoelevatus Graham, de Klasz & Rerat. The base of the zone coincides with the Cretaceous Tertiary boundary which is marked by the extinction of majority of the Maastrichtian species. The top is also defined by the disappearance of the typical Paleocene species and the nominate taxa [14]. The zone embraces the Paleocene and includes the Imo shale and Ewekoro Formation in the present study.

The characteristic species include: *Anomalinoides midwayensis* (Plummer), *Gavelinella pachysuturalis*

3.3.2 *Planulina oyae-Uvigerina hourcqi* Zone

Age: Early Eocene

Author: [14]

The zone is defined by the overlapping ranges of the two nominate taxa *Planulina oyae* Reyment and *Uvigerina hourcqi* (Graham, de Klasz and Rerat). Base of the zone is marked by the abrupt appearance of the nominate taxa and other Eocene benthic foraminiferal species and the presence of endemic West African Eocene species. The characteristic species include *Sagrina circumspinosa* (De Klasz & Rerat), Eponides africana De Klasz & Rerat, *Hopkinsina danvillensis* Howe & Wallace, *Uvigerina jacksonensis* Cushman. The disappearance of the above taxa characterises the top of the zone.

The zone embraces the Eocene but was found in this study in the Early Eocene. It occurs in the Oshosun Formation.

4 DISCUSSION AND CONCLUSION

The Paleocene benthic foraminifera from the eastern Dahomey basin recorded in this study shows strong affinity to the Midway type fauna of the Midway Formation of Gulf coastal plain of North America [32] some species of the assemblage are common to the Paleocene of Tunisia [32], Libya and [33] and [34]. The Paleocene benthic foraminifera from the Sokoto basin [21] Shows similarity to the assemblage recorded in the current study. Thus the two coeval assemblages belong to different biogeography provinces. This does not support the view of a union and faunal exchange between the Tethys and the South Atlantic ocean during the Paleocene.

The six planktic foraminifera zones can be correlated to the interregional planktic foraminifera zones of [27] and [25].

Both the planktic and benthic zones will serve as useful correlation tools in the coastal and inland basins of West Africa.

REFERENCES

[1] Petters, S. W., and Olsson, R. K. 1979. Planktic Foraminifera from the Ewekoro Type Section (Paleocene) Nigeria Micropaleontology, 25, (2), pp206 – 213.

[2] Berggren, W. A., 1960. Paleocene Biostartigraphy and Planktonic Foraminiferal of Nigeria (W. Africa). Internat. Geol. Congr., 21st Copenhagen (1960), Rept. Pt.Vol. 6 pp 41-55.

[3] Jones, H. A., and Hockey, R. D., 1964. The Geology of Part of South-Western Nigeria, Geol. Surv Bull., No. 31,pp 1 – 101.

[4] Kogbe, C. A., 1972. Notes on some Upper Cretaceous and Lower Tertiary Algae From Southern Nigeria. Cont. on African Geology, Ibadan (1970). Proc., pp301 – 304.

[5] Ogbe, F. G. A., 1972. Stratigraphy of Strata Exposed in the Ewekoro Quarry, Western Nigeria. Cont. on African Geology Ibadan (1970).

[6] Ogbe, F.G.A., 1976. Some Paleocene Cora From Ewekoro, Southwestern Nigeria. Journal Min. Geol. Nigeria, 13, (1), pp1 -5.

[7] Adegoke, O. S., 1972. Macrofauna of the Ewekoro Formation (Paleocene) of Southwestern Nigeria. Conf. on African Geology, Ibadan (1970). Proc: pp269-276.

[8] Adegoke, O. S., 1977. Stratigraphy and Paleontology of The Ewekoro Formation (Paleocene) of Southwestern Nigeria. Bull. America Pal., 71 (295), pp1-379.

[9] Adegoke, O. S., Dessauvagie, T.F.J., Kogbe, C. A., and Ogbe, F.A., 1971. The type Section, Ewekoro Formation (Paleocene) of Western Nigeria: Biostratigraphy and Microfacies. African Micropal. Colloq., 4th Abidjan (1970). Proc.: 27-39.

[10] Adegoke, O. S., Dessauvagie, T.F.J., and Kogbe, C.A., 1972, Radioactive Age Determination of Glauconite from the Type Locality of the Ewekoro Formation. Conf. on African Geology, Ibadan (1970), Proc.: pp277-280.

[11] Adegoke, O. S., Ogbe, F.A., and Du Chene, R.E.J., 1976. Excursion to Ewekoro Quarry (Paleocene-Eocene) Geol. Guide Nigerian Cretaceous – Recent Loc.pp 1-17.

[12] Fayose, E. A., and Asseez, L. O., Micropaleontological Investigation of Ewekoro Area, Southwestern Nigeria.Micropaleontology, Vol.18, (3), pp369 – 385.

[13] Petters, S. W., and Olsson, R. K. 1979. Planktic Foraminif-

era from the Ewekoro Type Section (Paleocene) Nigeria Micropaleontology, 25, (2), 206 – 213. [14] Petters, S. W., 1982. Central West Africa Cretaceous = Tertiary Benthic Foraminifera and Stratigraphy. Paleontographica Abt 179; pp 1 – 104.

[15] Okosun, E.A., 1987. Ostracod Biostratigraphy from Dahomey Embayment Niger Delta and the Benue Trough in Nigeria. Geological Survey of Nigeria Bulletin No 4 I. I5I pp., 21 plates. MONOGRAPH

[16]Okosun, E.A., 1989. Eocene Ostracoda Ewekoro Formation Southwestern Nigeria Journal of African Earth Sciences. Vol.9. (3 / 4). pp669-676

[17] Okosun, E. A..1998. Review of the Early Tertiary Stratigraphy of Nigeria. Journal of Mining and Geology vol. 34,(1). pp27-35

[18] Okosun, E.A., 1990. A Review of The Cretaceous Stratigraphy of the Dahomey Embayment West Africa Cretaceous Research. Vol. 11. (1).pp17-27.

[19] Reyment, R. A., 1965. Aspects of the Geology of Nigeria. Ibadan University Press, 145p.

[20] Billmann, H. G.1976 Offshore Stratigraphy and Paleontology of the Dahomey Embayment.Proceedings 7th African Micropaleontological Colloqium, Ile- Ife, Nigeria

[21] Okosun, E. A., 1999. Late Paleocene Biostratigraphy and Paleoecology (Foraminiferal and Ostracoda) of Two Boreholes in Sokoto Basin. NW Nigeria-Journal of Mining and Geology vol. 34.(2). pp155-170.

[22] Adegoke , O. S. 1969 Eocene Stratigraphy of Southern Nigeria Bull. Rur. Econ. Geol. Min. Memo. No. 6: pp23- 8.

[23] Kogbe,C. A. 1976. Paleogeographic history of Nigeria from Albian times. In: Kogbe, C. A. (ed) Geology of Nigeria Elizabetan Publisher, Lagos, pp 15- 35

[24] Olsson, R. K., Hemleben, C., Berggren, W. A., and Liu, C., 1992. Wall Texture Classification of Planktonic Foraminifera Genera in the Lower Danian. Jour. Foram. Res., 22, (3) pp195 – 213.

[25] Berggren, W. A., Kent, D. V., Swisher, C. . Aubry, M. P., 1995. A revised Cenozoic Geochronogy and Chronostratigraphy. Society Economic Paleontologists & Mineralogists, Special Publication, Vol 54, pp129-213.

[26] Bolli, H. M., 1966. Zonation of Cretaceous to Paleocene Marine Sediments Based on Planktic Foraminifera Boletino InformativoAssociaiton Venezolana Geologia, Mineria Petroleo 9, 3

[27] Toumarkine, N., Luterbacher, H., 1985. Paleocene and Eocene Planktic Foraminifera. In: Bolli, H., Saunders, J., Peach-Nielsen, K. (Eds), Plankton Stratigraphy, Cambridge university press, pp 87– 154.

[28] Hillebrandt, A. Von. I : "Das Paleozan and Seine Foraminifera Fauna in Beckan Von Reichenhalt Salzburg " Bayer, Akad Wiss Math- Nat K. I. 108,1962. pp 1-182

[29] Bolli, H.M., 1957. The Genera Globigerina and Globoro talia in Paleocene-Lower Eocene Lizard Springs Formation of Trinidard, B. W. I. Bull of US Nat. Museum, Vol 215, pp61-81.

[30] Hedberg, H. D. 1976. International Stratigraphic Guide; A Guide to Stratigraphic Classification, Terminology and Procedure Joh: Tiley New York. P 200

[31] Berggren, W. A., and Aubert, I.,1975. Paleocenebenthic Foraminifera Biostratigraphy Paleobiogeography and Paleoecology of The Atlantic - Tethyan Regions: Midway – type fauna: Paleogeography Paleoclimatology, Paleoecology, Vol 18, pp73 – 192.-32

[32] Aubert, J., and Berggren, W.A., 1976. Paleocene benthic Foraminiferal Biostratigraphy and Paleoecology of Tunisia: Bull. du Centr. de Rech du Pau-SNPA, Vol 10, pp379-469.

[33] Berggren, W. A., 1974. Late Paleocene – Early Eocene Benthonic Foraminiferal Biostratigraphy and Paleoecology of Rockall Bank. Micropaleontology, 20, (4), pp 426 –448.

[34] Mancini, E. A., 1984. Biostratigraphy of Paleocene Strata in Southwestern Alabama. Micropaleontology, 30, (3), 268 – 291.

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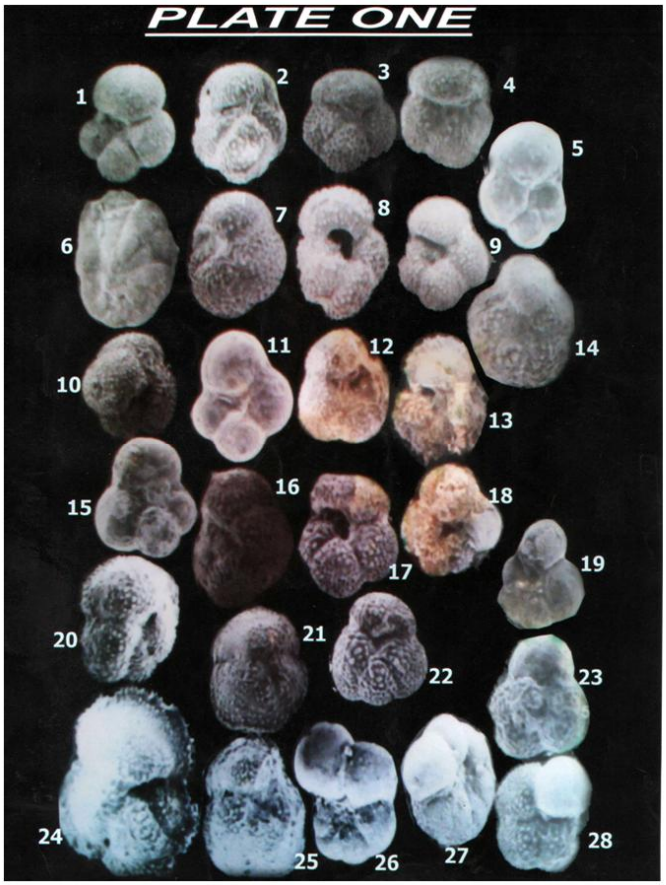
APPENDIX A

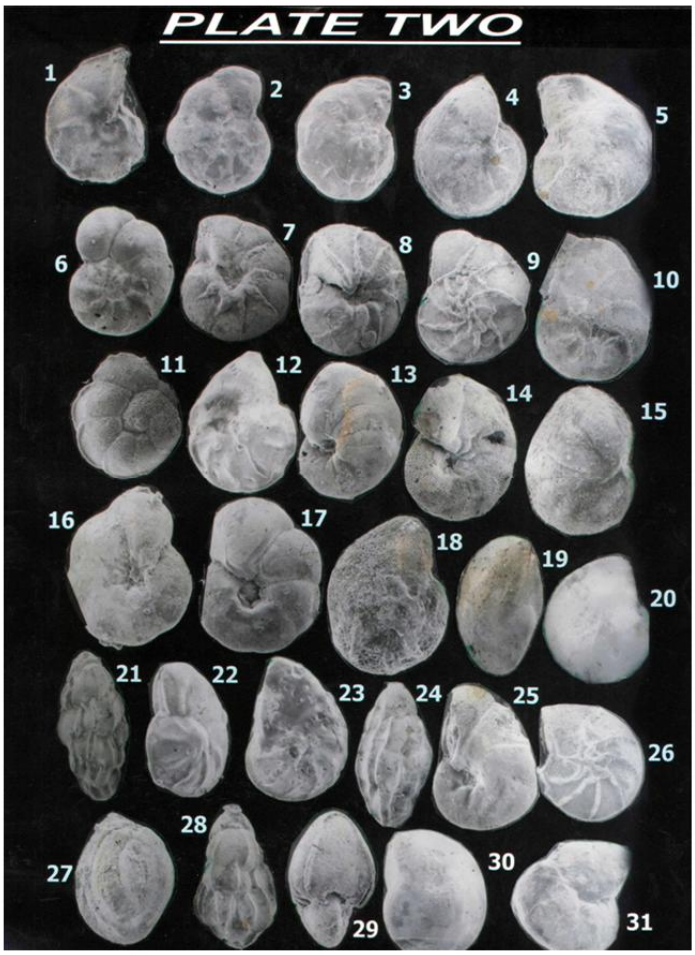


EXPLANATION OF PLATE ONE

Magnification x65

Fig.1: Parasubbotina pseudodulloides (Plummer).
Fig.2, 4: Acarinina primitiva (Finlay).
Fig. 3: Globigerina soldadoensis, angnlosa (Bolli).
Fig. 5: Globanomalina compressa (Plummer).
Fig. 6: Globorotalia haynesi (Fayose).
Fig. 7, 17: Globorotalia cerraozulensis, pomeroli (Tourmarkine & Bolli).
Fig. 8, 9, 18: Acarinina soldadoensis (Bronniman).
Fig. 10, 12: Praemurica uncinata (Bolli)
Fig. 11, 16: Parasubbotina varianta (Subbotina).
Fig. 13: Morozovella acutispira (Bolli & Cita).
Fig. 14: Morozovella angulata (White).
Fig. 19: Praemurica inconstans (Bolli).
Fig. 20: Acarinina pentacamerata.
Fig. 21, 24: Morozovella aequa (Cushman & Renz).
Fig. 23: Globigerina sp
Fig. 25: M. angulata (White).
Fig. 26: Globigerinella chipolensis.
Fig. 27, 28: Globorotalia angulisuturalis.

APPENDIX B

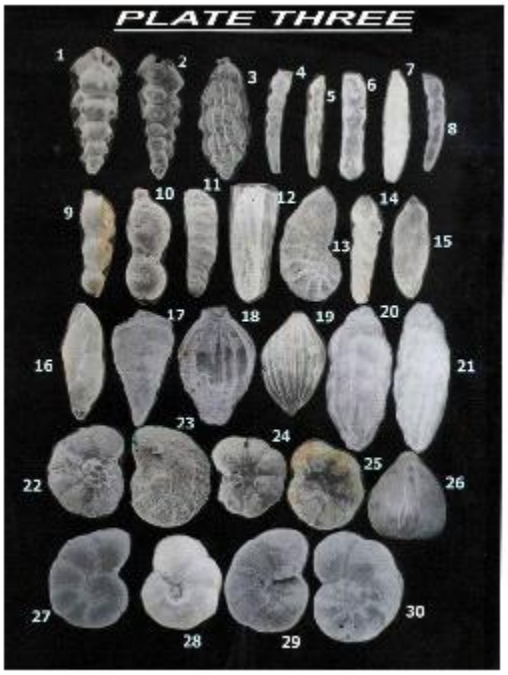


EXPLANATION OF PLATE TWO

Magnification x60

Fig. 1: Lenticulina sp1.
Fig. 2-5: Lenticulina midwayensis (Plummer).
Fig. 6: Anomalinoides midwayensis (Plummer).
Fig. 7, 8, 18: Eponides pseudoelevatus.
Fig. 9, 10, 26: Eponides pseudoelavatus.
Fig. 11: Gavelinlla sp (Petters).
Fig. 12, 23: Lenticulina pseudomamilligerus (Plummer).
Fig. 13, 29: Nonion sp
Fig. 14: Gavelinella pachysuturalis (Graham Et al).
Fig. 15: Nonionella insecta (Schwager).
Fig. 16: Valvulineria sp
Fig. 17: Anomalinoides umboniferus (Schwager).
Fig. 19, 20, 30: Lenticulina falto-limbatus (Guembel).
Fig. 21: Uvigerina sp1.
Fig.22: Lenticulina sp2.
Fig. 24: Uvigerina sp
Fig. 25: Eponides sp
Fig. 27: Spirosigmolina oligocaenica (Cushman).
Fig. 28: Uvigerina sp.
Fig. 31: Lenticulina sp

APPENDIX C



EXPLANATION OF PLATE THREE

Magnification x60

Fig. 1, 2: Sagrina circumspinosa (De Klaz & Rerat).
Fig. 3: Hopkisina ilaroensis (Haynes & Nwabufo-Ene).
Fig. 4, 8: Dentalina colei (Cushman & Dusenbury).
Fig. 5, 7: Dentalina alternata.
Fig. 9: Dentalina sp1.
Fig. 10: Dentalina sp2.
Fig. 11: Virginulina. sp
Fig. 13: Lenticulina sp.
Fig. 15, 16: Furenkoina, elongata (Petters & Adegoke).
Fig. 18: Lagena sp
Fig. 19: Pseudoglandulina sp.
Fig. 20, 21: Uvigerina hourcqi (Graham, de Klasz & Rerat).
Fig. 22, 23: Gavelinella, guineana (Petters & Adegoke).
Fig. 24, 25: Anomalinoides sp.
Fig. 26: Frondicularia sp.
Fig. 27, 28: Anomalinoides midwayensis (Plummer).
Fig. 29, 30: Anomalinoides umboniferus (Schwager).