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Taxonomic Notes on Some Species of Genus *Globigerinoides* from Kafe Field, Offshore Western Niger Delta, Nigeria

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Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

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ABSTRACT

The aim of the study is to identify and record the taxonomic notes on species of Genus *Globigerinoides* from the study area located in Kafe field of the offshore western Niger Delta area of Nigeria. 550 ditch cuttings samples were retrieved at 18.29 metres intervals from the five wells studied (Kafe-1, Kafe-2, Kafe-4, Kafe-5 and Kafe-6). The standard micropaleontological preparation technique for foraminiferal samples was employed. The foraminiferal contents were identified under binocular microscope and recorded. The species of the Genus *Globigerinoides* identified are *Globigerinoides obliquus* BOLLI, *Globigerinoides extremus* BOLLI and BERMUDEZ, *Globigerinoides quadrilobatus* D'ORBIGNY, *Globigerinoides subquadrilobatus* (BRÖNNIMANN), *Globigerinoides trilobus* REUSS and *Globigerinoides sacculifer* BRADY and their taxonomic notes were documented accordingly.

Keywords: Taxonomic notes; *Globigerinoides*; Kafe field; Western Niger Delta; Nigeria.

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1. INTRODUCTION

The area of study is located in the Kafe field of the offshore western Niger Delta area of Nigeria (Fig. 1). The Niger Delta is situated in the Gulf of Guinea on the west coast of Central Africa. Niger Delta lies between latitudes 4° and 6° N and longitudes 3° and 9° E in the south-south geopolitical region of Nigeria [1]. The Cenozoic Niger Delta is situated at the intersection of the Benue Trough and the South Atlantic Ocean where a triple junction developed during the separation of South America and Africa in the Late Jurassic [2]. The aim of the study is to identify and record the taxonomic notes on Genus *Globigerinoides* in the study area.

2. GEOLOGICAL SETTING

Three main formations have been recognized in the subsurface of the Niger Delta [3,4,5,6,7].

These are the Akata, Agbada, and Benin Formations. These formations were deposited in marine, transitional and continental environments, respectively; together they form a thick, overall progradational passive-margin wedge [3]. The Akata Formation is Paleocene to Pliocene in age and it is the basal unit composed mainly of marine shales believed to be the main source rock within the basin. The Agbada Formation is made up of alternating sandstone, siltstone and shale sequences that constitute the petroleum reservoirs of the basin. Agbada Formation is Eocene to Quaternary in age (Figs. 2 and 3). On the other hand, the Benin Formation is Oligocene to Recent in age and it is mainly made up of non-marine fine to coarse-grained sands with a few mudstone and shaly intercalations[3].

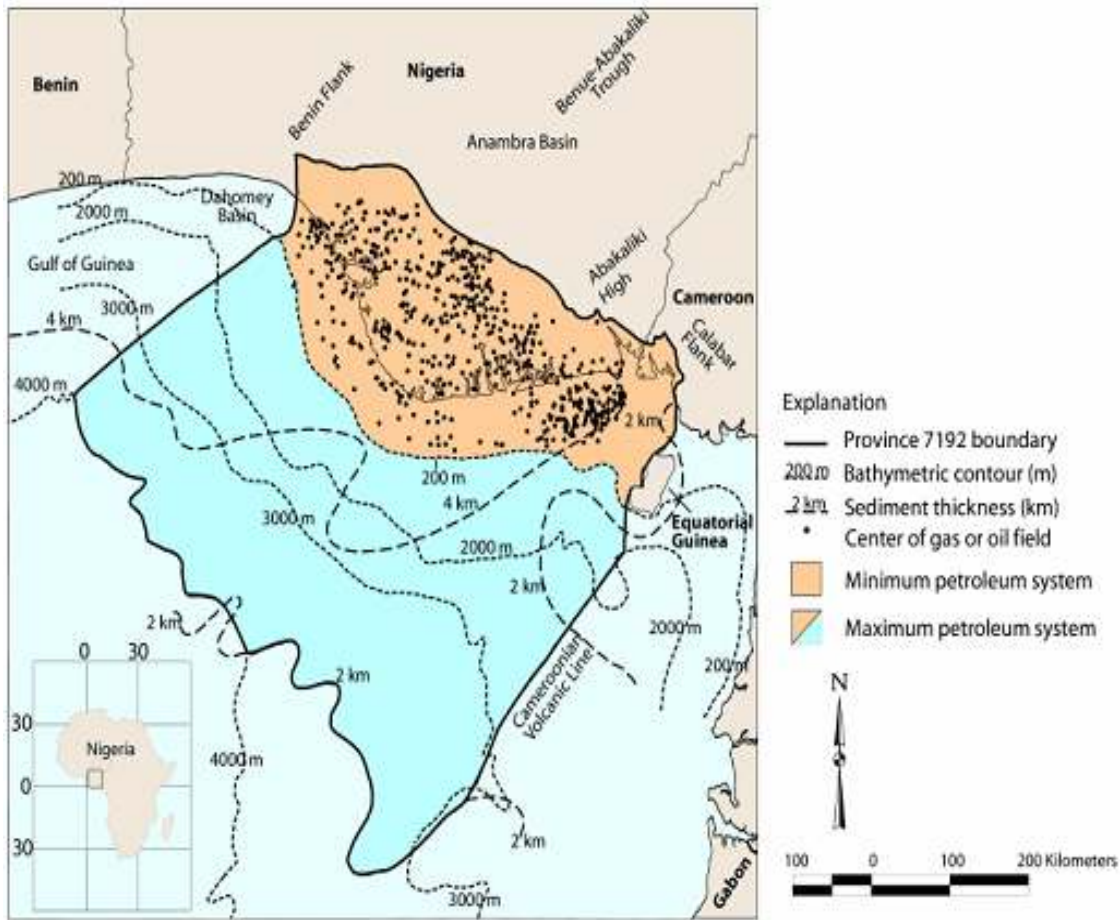


Fig. 1. Location map of the study area [7]

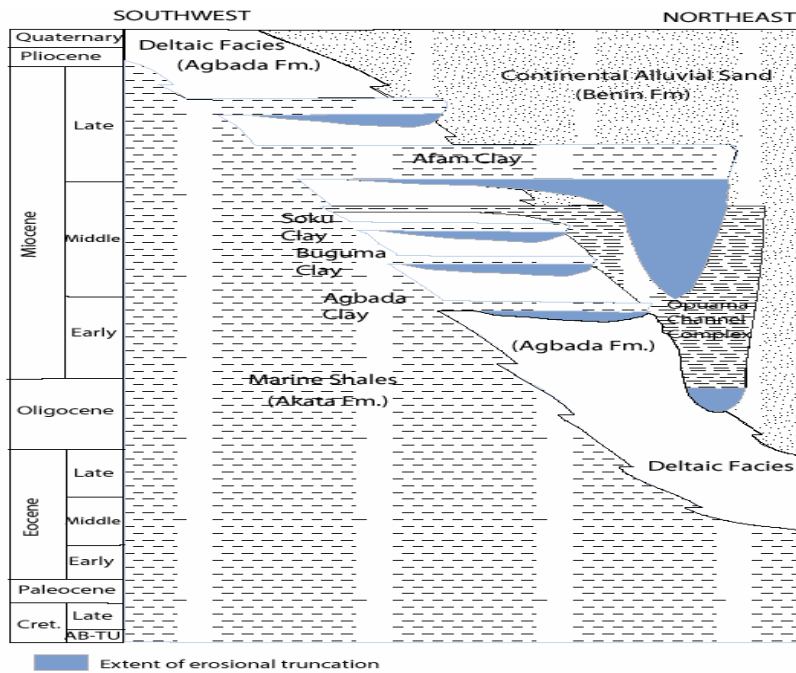


Fig. 2. Stratigraphic column showing the three formations of the Niger Delta [7,8]. Foot note indicates extent of erosional truncation in Agbada Formation

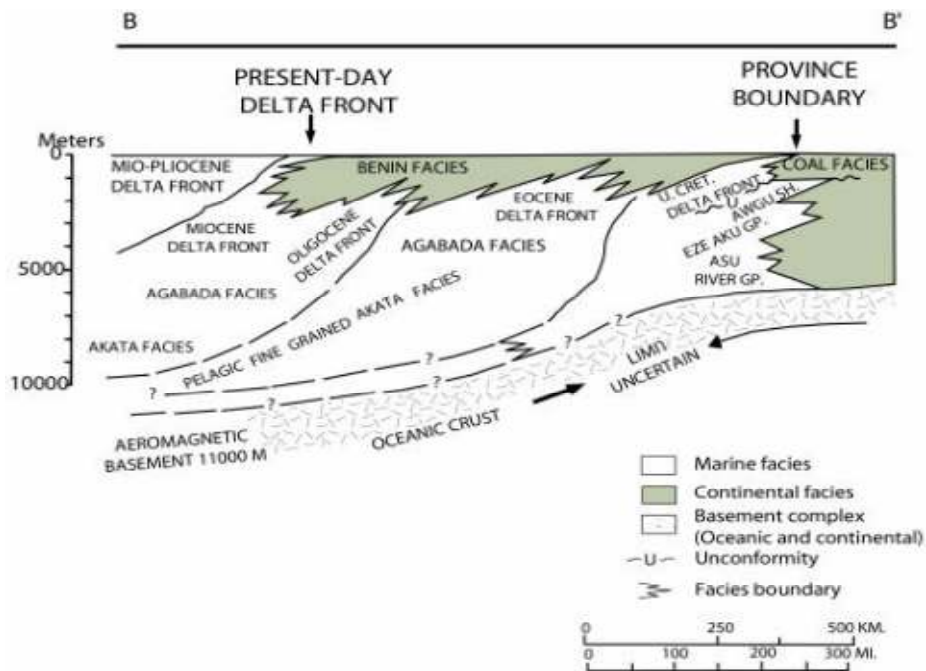


Fig. 3. Southwest-Northeast (B-B') cross-section through the Niger Delta [2]

3. METHODS OF STUDY

Total of 550 ditch cuttings samples were retrieved at 18.29 meter intervals from five wells labelled Kafe-1, Kafe-2, Kafe-4, Kafe-5 and Kafe-

6. The standard micropaleontological preparation technique for foraminiferal samples was employed. The unwashed ditch cutting samples were initially rinsed to remove drilling mud and then dried. Twenty grams of each dried sample

was soaked for four hours in kerosene and then detergent solution water overnight. The disaggregated samples were then washed under running faucet water on a 63 µm sieve. The washed residues were then dried over a hot electric plate, and then sieved into three size portions: coarse (2 mm), medium (600 µm) and fine (63 µm). They were then put in labelled sample bags. Their foraminiferal contents were then identified under binocular microscope and recorded.

The systematics and taxonomic notes used in this study are based on the published methods [9-16]. The listing of synonyms and detailed descriptions of species were omitted because the encountered species are well described in published literature some of which have been mentioned in this paper. *Globigerinoides obliquus* BOLLII, *Globigerinoides extremus* BOLLII and BERMUDEZ, *Globigerinoides quadrilobatus* D'ORBIGNY, *Globigerinoides subquadrilobatus* (BRÖNNIMANN), *Globigerinoides trilobus* REUSS and *Globigerinoides sacculifer* BRADY are the species of the Genus *Globigerinoides* that were identified and the taxonomic notes on them are presented below together with their fossil images, which are shown in Figs. 4-9. The class, order, family and sub-family names are in bold font, while the genus and species names are given in italic font in line with international standards.

4. RESULTS AND DISCUSSION

The identified species of the genus *Globigerinoides* are important for biostratigraphic and paleoenvironmental studies in the Niger Delta area. Because they were planktonic and free-floaters, they had wide geographic coverage and coupled with their quick extinction and short stratigraphic range further made them to be very useful geological research tools.

4.1 Taxonomic Notes

Subphylum Foraminifera: [17]

Order Foraminiferida: [18]

Test is planispiral or trochospiral in early stage, microperforate or macroperforate, smooth, muricate or with spines. Apertures are terminal, umbilical, intra-extraumbilical or peripheral. Walls are calcitic but early forms may be aragonitic [19].

Age Stratigraphic Range: Jurassic (Late Bajocian) to Holocene.

Super family Globigerinacea: [20]

Test is trochospiral calcitic with chambers that are rounded or angular with a peripheral keel or an imperforate band surrounded by a double keel. Accessory apertures or supplementary sutural apertures may be present. The wall is microperforate or macroperforate surface that may be smooth with or without perforation cones, muricate or spinose and sometimes encrusted or coated with smooth cortex. The aperture is interiomarginal, umbilical or intra-extraumbilical bordered by a lip with portici or covered by tegilla with accessory apertures [19]. Age Stratigraphic Range: Cretaceous to Holocene [19].

Family Globigerinidae: [20]

Test is trochospiral. The chambers may be subglobular or radially elongate. Smooth wall with macroperforate with perforations (up to 10 mm in diameters) regularly and geometrically arranged (when not obscured by encrustation), or with perforation pits which may coalesce to form medium cancellation and with delicate radiating spines from the surface of the adult test or spine bases. Dorsal supplementary apertures are present. The primary aperture is a simple arch and umbilical, which may have bullae or conspicuous portical structures to extra-umbilical and rimless or with a narrow lip [19]. Age Stratigraphic Range: Eocene to Holocene [19].

Subfamily Globigerininae: [20]

Genus *Globigerinoides* [10]

Species *Globigerinoides obliquus* [21] (Fig. 4).

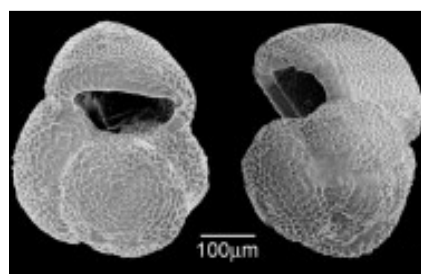


Fig. 4. Dorsal and ventral views of *Globigerinoides obliquus* BOLLII

Test is trochospiral with spherical chambers and it has interio-marginal primary aperture. The last chamber is compressed obliquely [16]. Age Stratigraphic Range: Early Miocene to late Early Pliocene [12,16].

Species *Globigerinoides extremus* [22] (Fig. 5)

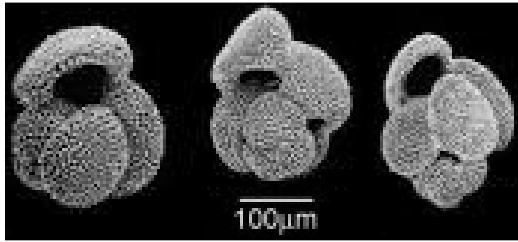


Fig. 5. Views of *Globigerinoides extremus* BOLLI and BERMUDEZ

Test is trochospiral with last chambers clearly compressed and the last whorl asymmetrical and flattened. Age Stratigraphic Range: Late Miocene to Middle Pliocene [12,16].

Species *Globigerinoides quadrilobatus* [23] (Fig. 6)

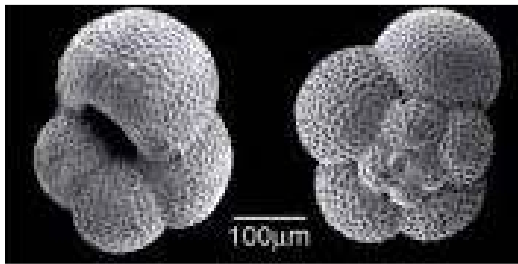


Fig. 6. Views of *Globigerinoides quadrilobatus* D'ORBIGNY

Test is trochospiral, spinous, honeycomb-like and it has spiral arched secondary aperture. Age Stratigraphic Range: N10-N12 (Middle Miocene) [12,16].

Species *Globigerinoides subquadrilobatus* [24] (Fig. 7)

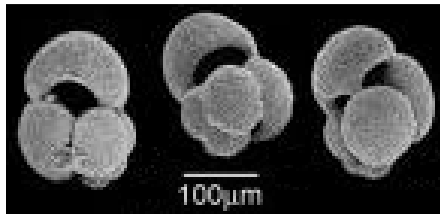


Fig. 7. Views of *Globigerinoides subquadrilobatus* (BRÖNNIMANN) (Scale white bar = 100 µm)

The test is trochospiral with three chambers making final the whorl. It has highly arched asymmetrical apertures located above sutures of

previous chambers. Age Stratigraphic Range: N10 to N13 (Middle Miocene) [12,13,16].

Species *Globigerinoides trilobus* [25] (Fig. 8).

Trochospiral test with last three chambers as final whorl. The aperture is arched, interiomarginal and asymmetrical. Age Stratigraphic Range: Early Miocene to Holocene [12,16].

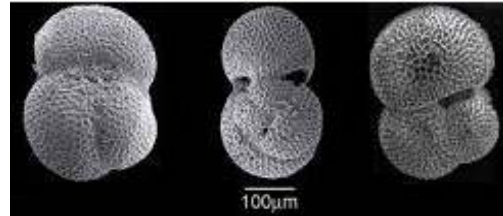


Fig. 8. Views of *Globigerinoides trilobus* REUSS

Species *Globigerinoides sacculifer* [26] (Fig. 9).

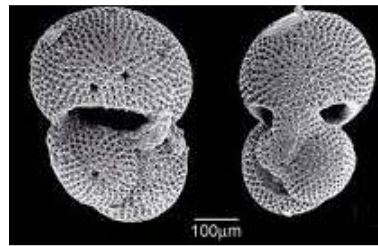


Fig. 9. Fossil image of *Globigerinoides sacculifer* BRADY (Scale white bar = 100 µm)

Test has three to four chambers in last whorl. Aperture is extraumbilical and surrounded by small rim. Test is spinous, honeycomb-like with sac-like last chamber. Age Stratigraphic Range: Early Miocene to Holocene [12,16].

5. CONCLUSION

Six species of *Globigerinoides* specimens, namely: *Globigerinoides obliquus* BOLLI, *Globigerinoides extremus* BOLLI and BERMUDEZ, *Globigerinoides quadrilobatus* D'ORBIGNY, *Globigerinoides subquadrilobatus* (BRÖNNIMANN), *Globigerinoides trilobus* REUSS and *Globigerinoides sacculifer* BRADY were identified in the study area. Taxonomic notes on them were erected. This paper will help in deepening the knowledge of these species and reduce ambiguity in their identification.

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COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES

1. Ojo EA, Fadiya LS, Ehinola OA. Biozonation and correlation of BDX-1 and BDX-2 wells of deep offshore Niger Delta using calcareous nannofossils. Search and Discovery Article (AAPG). 2009; 50194:8.
2. Whiteman A. Nigeria- Its Petroleum Geology, Resources and Potential, London, Graham and Trotman. 1982;394.
3. Esan AO. High resolution sequence stratigraphic and reservoir characterization studies of D-07, D-08 and E-01 sands, Block 2 Meren Field, Offshore, Niger Delta.' Publ. M.S. Geology Thesis, Texas A and M University, Texas, USA. 2002; 115.
4. Short KC, Stauble AJ. Outline of Geology of Niger Delta, American Association of Petroleum Geologists Bulletin. 1967;5(51): 761-779.
5. Weber KJ, Daukoru E. Petroleum Geology of the Niger Delta. Proceedings of the 9th World Petroleum Congress, Tokyo. 1975; 2:202-22.
6. Avbovbo AA. Tertiary lithostratigraphy of Niger Delta. AAPG Geol. Notes. 1978; 296-300.
7. Tuttle LWM, Charpentier RR, Brownfield EM. The Niger Delta petroleum system: Niger Delta province, Nigeria Cameroon, and Equatorial Guinea, Africa, U.S. Geological Survey Open-File Report 99-50-H, Denver, Colorado. 1999;70.
8. Doust H, Omatsola E. Niger Delta. In Edwards, J.D. and Santogrossi, P.A. (Eds.), Divergent/Passive Margin Basins, American Association of Petroleum Geologists Memoir. 1990;48:201-239.
9. Cushman JA. An outline of re-classification of the foraminifera. Cushman Lab. Foram. Res. Contrib. 1927;3(4):1-105.
10. Cushman JA. Foraminifera: Their classification and economic use, 4th ed., revised and enlarged with illustrated key to the genera. Harvard Univ. Press, USA. 1969;604.
11. Loeblich AR, Tappan H. Treatise on invertebrate paleontology, part C: Protista 2, Sarcodina chiefly: Thecamoebians and Foraminiferida. Univ. Kansas Press for Geol. Soc. Amer., Lawrence. 1964;1-2:900.
12. Bolli HM, Saunders JB. Ologocene to Holocene low latitude planktic foraminifera, *in*: Bolli HM, Saunders JB, Perch-Nielsen K (eds.). Planktonic stratigraphy: Plankton foraminifera, calcareous nannofossils and calpionellids. (Cambridge Earth Sciences Series), Cambridge University Press. 1989;1:155-262.
13. Ozumba MB, Amajor LC. Middle-to-Late Miocene biozonation of the western Niger Delta. Nig. Assoc. Petrol. Expl. Bull. 1999; 14(2):168-175.
14. Okosun EA, Liebau A. Foraminiferal biostratigraphy of eastern Niger Delta, Nigeria. Nigerian Assoc. Petrol. Expl. Bull. 1999;14(2):136-156.
15. Okosun EA. Taxonomic review of SPDC Niger Delta benthic foraminiferal type collection. Unpubl. SPDC Records. 2003; 62.
16. Obaje, SO, Okosun, EA. Taxonomic notes on some marker planktic foraminifera from tomboy field, offshore western Niger Delta, Nigeria. International Journal of Science and Technology. 2013;2(9):622-627.
17. d'Orbigny AD. Tableau méthodique de la classe des Céphalopodes: Ann. Sci. Nat. Paris, Crochard (Paris), 1826;1(7):245-314:10-17.
18. Eichwald EV. Lethea Rossica ou Paléontologie de la Russie, Premier session del; ancience période, 1830;1(xix): 681,59.
19. BouDagher-Fadel MK. Biostratigraphic and geological significance of Planktonic foraminifera, 2nd edition, OVPR UCL, London. 2013;217-218.
20. Carpenter WB, Parker WK, Jones TR. Introduction to the study of foraminifera. Hardwicke, London. 1962;319.
21. Bolli HM. Planktonic foraminifera from the Oligocene-Miocene Cipero and Lengua Formations of Trinidad. B.W.I. Bull. Nat. Museum. 1957;215:97-123.
22. Bolli, HM, Bermudez, PJ. Zonation based on planktonic foraminifera of Middle Miocene to Pliocene warm-water sediments. Boletin Informativo Asociacion

- Venezolana de Geologia, Minería y Petróleo. 1965;8(5):119-149.
23. d'Orbigny, AD. Foraminifères fossils du bassin Tertiaire de Vienne (Autriche), Gide et Comp (Paris). 1846;21:312.
24. Br nimmann P. *Globigerinita naparimaensis* n. gen., n. sp., from the Miocene of Trinidad, B.W. I. Contrib. Cushman Found. Foram. Res. 1951;2:16–18.
25. Reuss, AE. Neues foraminiferonaus den Schichten des & sterreichischen terti&rbeckens: K. Akad. Wiss. Wien, Math.-Naturwiss. Cl., Denkschr. 1850;1:365-350, 46-51.
26. Brady HB. Supplementary notes on the foraminifera of the Chalk of the New Britain Group, Geo. Mag., new series. 1877;4:534-536. Decade 2.

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