



Biostratigraphy and Paleoenvironmental Assessments of Upper Cretaceous-Lower Tertiary Sediments from the T-Well, Eastern Dahomey Basin, South Western Nigeria.

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DOI: <https://doi.org/10.51583/IJLTEMAS.2026.150800105>

Received: 04 September 2026; Accepted: 09 September 2026; Published: 19 September 2026

ABSTRACT

Ditch cuttings of shale, siltstone and sandstone sediments penetrated by the offshore T-well in the Eastern Dahomey Basin, Southwestern Nigeria were studied to establish the Biostratigraphy and Paleoenvironment of the successions. The Siltstones are at the base of the well and overlain by shales and sandstones at the top. The Total depth of the well is approximately 2400m. Twenty shale samples were selected from the well at intervals between 1088m to 2280m for foraminifera study. The results from foraminiferal analysis show a total of 145 foraminifera species; including 125 benthonic and 20 planktonic species. Three major biostratigraphic zonation include: *Globotruncanella petaloidea*, *Morozovella angulata* and *Acrinina soldadoensis* zones were recognized which indicated the Late Cretaceous to Early Eocene age. Some of the Benthic foraminifera species include: *Bolivina afra*, *Bolivina sp*, *Cibicides sp*, *Gavelinella sp*, *Lenticulia sp*, *Lagena sp*, *Bulimina sp*, *Anomalina sp*, *Eponides sp*, *Nonionella sp*, *Textularia sp*, *Anomalinoids sp*, *Gavelinella sp*, *Dentalina sp*, *Neobulimina sp*, *Gyroidina sp*, *Nodosarella sp*, *Dorothia sp*, *Anomalina sp*, *Neorotalina sp*, *parasubbotina sp* with dominant arenaceous species. The Paleoenvironmental interpretation suggest shallow marine anoxic to dysoxic conditions due to the presence of high benthonic foraminifera species and some diagnostic benthonic species.

Keywords: Dahomey, Foraminifera, Biostratigraphy, Paleoenvironment.

INTRODUCTION

Background

The Dahomey Basin is a very extensive sedimentary basin in the Gulf of Guinea which extends from the southeastern Ghana through Togo and Benin Republic on the west side to the Okitipupa ridge/Benin Hinge line on the east side in the southern part of Nigeria (Figure 1). The basin consists of sedimentary formations (Cretaceous – Tertiary) that outcrop in an arcuate belt roughly parallel to the coastline. The tertiary sediments of the Dahomey Basin thin out to the east and are partially cut off from the sediments of the Niger Delta basin by the Okitipupa basement ridge. In general, rock outcrops are poor due to the thick vegetation and soil cover making studies in the basin to depend largely on exploratory wells and boreholes. The geology of this basin has attracted a lot of interest especially in the recent years despite the challenges of securing rock samples for needed studies. (Haack et al., 2000; Adekeye and Samuel, 2007; Akande et al., 2012, Adekeye et al., 2019). However, Foraminifera investigation of the upper cretaceous to lower tertiary Offshore Dahomey Basin was undertaken from T- well located in the offshore of the basin. The study becomes imperative because there is a little documentation on the Tertiary sediments of the basin located in the offshore part. Nearly all the research works on the southwest Dahomey Basin of Nigeria are on the Cretaceous sediment studies. Therefore, this study evaluates the biostratigraphy and paleoenvironmental settings of various foraminiferal species within Upper Cretaceous to Lower Tertiary sediments. The primary objective is to establish precise biostratigraphic zones and reconstruct the depositional history of the basin.

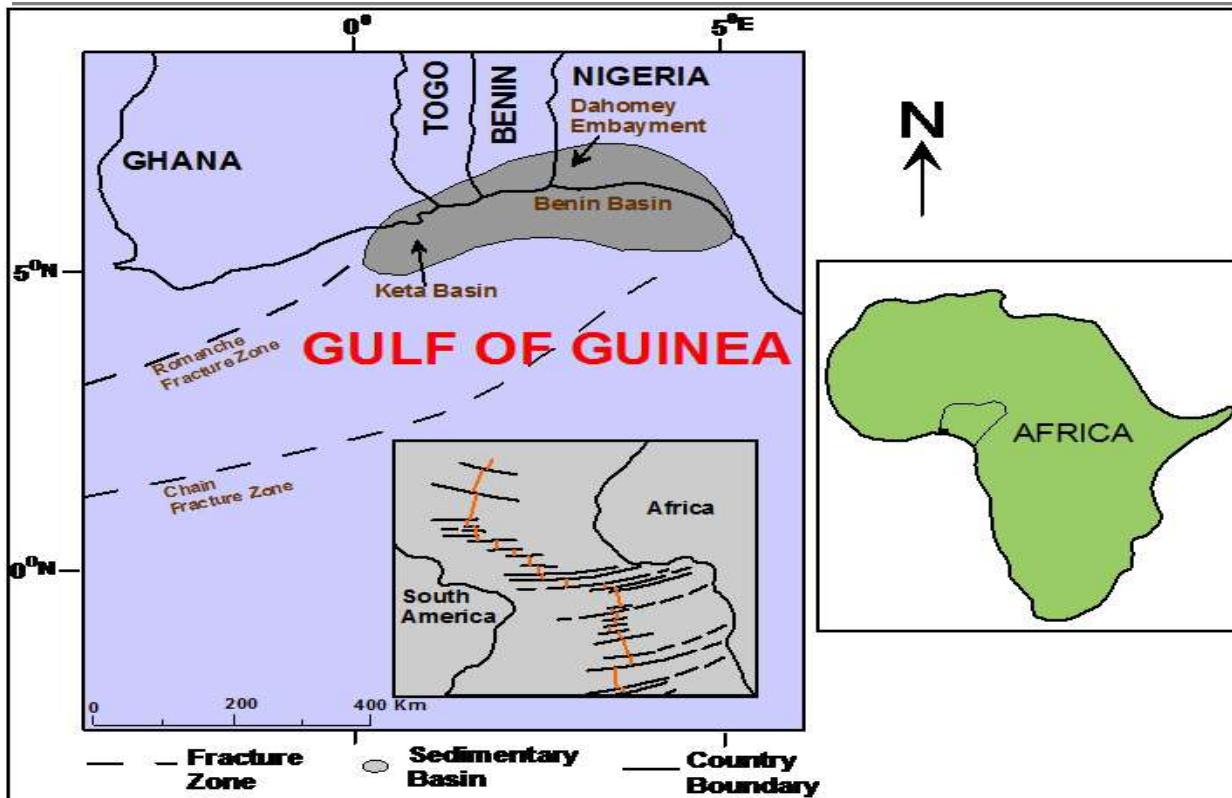


Figure 1. Regional map of four countries showing the location of the Benin (Dahomey)

Basin in the Gulf of Guinea (modified from Brownfield and Chapentier, 2006).

Geological Settings

The Nigerian sector of the Benin (Dahomey) Basin is located in the southwestern Nigeria covering three different states, namely, Lagos, Ogun and Ondo. In these three states, the Benin Basin covers both the onshore and offshore parts. The onshore part includes the areas where both the Cretaceous and Tertiary sedimentary rocks are exposed along road cuts and quarries. Detailed geology, evolution, stratigraphy and hydrocarbon occurrence of the basin are contained in publications by Jones and Hockey (1964), Adegoke (1969), Reymont (1965), Omatsola and Adegoke (1981), Coker and Ejedawe (1987), Billman (1992) and Haack et al.(2000). Most of these authors have recognized two structural elements, which comprise the Benin basin proper and the Okitipupa structure. Coker and Ejedawe (1987) identified three geoblocks; namely, the onshore geoblock (Bode Ashe, Ileppa - Ojo geoblock), the Okitipupa structure (Union – Gbekebo geoblock) and offshore geoblock. They emphasized that these three geoblocks have gone through three main stages of basin evolution. These stages are initial graben (pre-drift) phase, prolonged transitional stage and open marine (drift) phase. The break-up of the Gondwanaland as a result of “continental drift” led to the subsequent opening of the South Atlantic Ocean during the Mesozoic Era (Stoney, 1995; Mpanda, 1997). This event is also connected to the evolution of the Dahomey Basin. Several hypotheses have been developed as to the origin and evolution of the basin. The rift hypothesis is widely supported, based on several salient features characterising the basin.

During the rifting stage in the lower Jurassic – early Cretaceous, there was basement fracturing and initial separation between the African and South American plates. During this period, several marginal basins developed consequent to block faulting, fragmentation and subsidence on the central Paleozoic basement rock (Asmus and Ponte, 1973; Ojeda, 1982; Omatsola and Adegoke, 1981). The early movements were in the early Cretaceous when there was transcurrent movements on the oceanic fracture systems especially the Romanche, Chain and Charcot fractures during the drifting stages of separation of South America from Africa in the Campanian to Tertiary times. Consequent to the opening of the South Atlantic Ocean, there was landward extensional and transtensional movement (drift stage) during the upper Cretaceous to Tertiary. Horizontal movements along the oceanic fracture zones were translated to vertical movements leading to block faulting and subsequent development of horsts and grabens (Omatsola and Adegoke, 1981). Substantial amount of sediments

were deposited in fault-controlled depressions in the Dahomey Basin during the Late Cretaceous post Santonian marine transgression accompanied the subsidence and drowning of continental margins that brought about the deposition of very thick sequence of continental grits and pebbly sands over the entire basin (Lebner and Ruiter, 1977). In some places, mudstone and shales with thin limestone beds were formed. This lithostratigraphic formation is referred to as Abeokuta Group (Omatsola and Adegoke 1981). A continuation of the marine transgression during the Paleocene led to the deposition of shallow marine limestones of Ewekoro Formation and the shales of the Akinbo Formation (Ogbe, 1970. Okosun, 1990). On top of the Paleocene sequence is the Eocene shales of the Oshosun Formation and the sandstones of the Ilaro Formation (Okosun, 1990; Idowu et al, 1993) (Figure 2)

Adediran and Adegoke (1987) proposed a four stage evolutionary model for the Gulf of Guinea basin (Dahomey Basin inclusive); as follows:

Stage 1 – The deposition of thick clastic sediments mostly immature sandstones and fresh water shales in the intracratonic basin.

Stage 2 – Reworked sands and silts intercalated with shales of fluvial – lacustrine origin deposited within the grabens during a period of tectonic activity, erosion and sedimentation.

Stage 3 – Paralic sequence (in the northern basins) and evaporitic deposits (in the southern basins) marking the beginning of marine incursion into the basin after the separation of South America from Africa.

Stage 4 – Marine sediments rich in fauna and flora marking the final stage of the development of the Gulf of Guinea basins

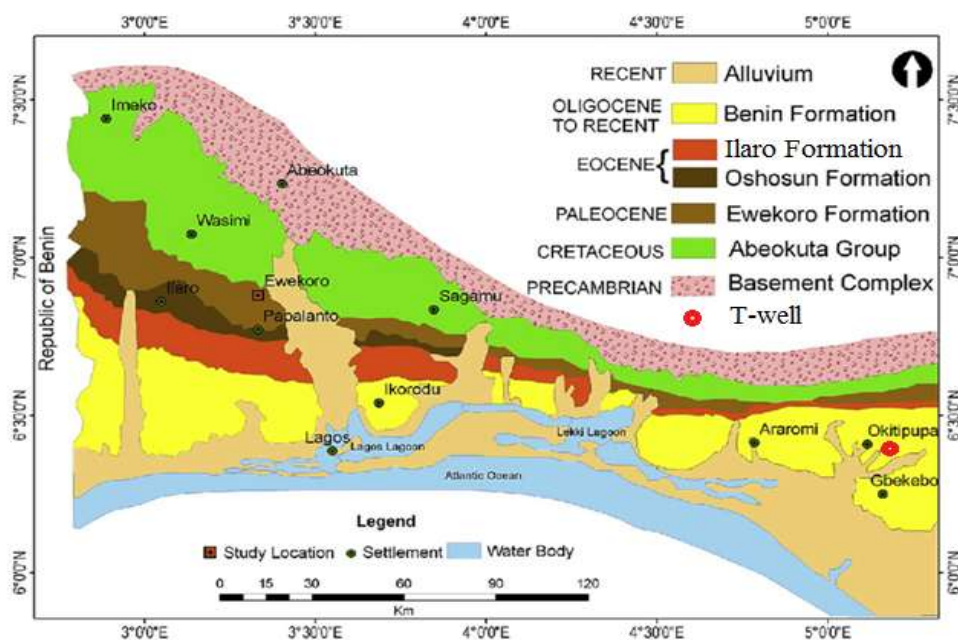


Figure 2. Geological map of the eastern Dahomey Basin (Nigeria part) showing the location of the T-Well (Modified after Gebhardt, *et al*, 2010)

The stratigraphy of the eastern Dahomey Basin has been discussed by various workers and several classification schemes have been proposed. These notably include the work of Jones and Hockey (1964); Ogbe (1972); Omatsola and Adegoke (1981); Coker et al (1983); Billman (1992), Nton (2001); Elueze and Nton (2004); Nton et al. (2006) among others. In spite of all these classification schemes, there are still controversies on age assignments and nomenclatures of the different lithological units within the basin. The stratigraphic sequence in the Dahomey Basin ranges from the Cretaceous to Neogene age. The oldest sediments, Abeokuta Group comprise of the Ise, Afowo and Araromi Formations are assigned to the Cretaceous sedimentary cycle. The

Ewekoro Formation (Paleocene), Oshosun Formation (late Paleocene to early Eocene) , Ilaro Formation, and the Pleistocene Benin Formation (Figure 3) constitute the Tertiary sedimentary cycle.

GEOLOGIC TIME		FORMATION		
PERIOD	EPOCH	Ako et al., (1980)	Omatsola and Adegoke, (1981)	Billman (1992)
QUATERNARY	HOLOCENE	Coastal Plain Sands	Benin Fm	Benin Fm
	PLEISTOCENE			
TERTIARY	EOCENE	Ilaro Fm	Ilaro Fm	Ijebu Fm
		Oshosun Fm	Oshosun Fm	Oshosun Fm
	PALEOCENE	Ewekoro Fm	Ewekoro Fm	Imo Shale
CRETACEOUS	MAASTRICHTIAN	Abeokuta Fm	Araromi Fm	Nkporo Shale
	CAMPANIAN			XXXXXXXXXX
	CONIACIAN	Abeokuta Group	Afowo Fm	Awgu Fm
	TURONIAN			Abeokuta Fm
	CENOMANIAN		Ise Fm	Folded Sediments
	BARREMIAN			

Figure 3. Generalised regional stratigraphic setting of the eastern Dahomey Basin, Southwestern Nigeria.(Modified from Adekeye et al., 2019.)

MATERIALS

The ditch cutting samples of T-well in the Eastern Dahomey Basin were collected from an indigenous oil company in Nigeria. The lithostratigraphic units penetrated by the T-well were logged. It composed of basal units of Siltstone about 120m and in turn overlain by black shale to grey shale of over 348m thick which also overlain by Marly shale of about 286m thick, overlain by black shale of about 558m followed by shaly sandstone of about 588m and top of the lithology is sandstone of about 336m thick (Figure 4).

METHODS

Paleontological analysis was carried out by the following experimental procedures; sample digestion, sieve washing, drying, picking and identificatiobn of foraminifera through the binocular microscopic and all these were done at The Department of Geology and Mineral Sciences, University of Ilorin, Ilorin, Nigeria. The identified species were selected and photographed with the Scanning Electron Microscope (SEM) at Department of Geology, University of Frankfurt am Main, Germany. However, on the basis of experimental procedures listed above, twenty (20) shale samples were digested and washed for foraminifera study. This analysis was carried out to assess the foraminifera species, occurrence, distribution and paleoecology to enable the interpretation of the depositional environments of these sediments. 200g of each sample were weighed and dried in the sunlight

to eliminate the moisture content. The procedure involves diluting the hydrogen Peroxide (H_2O_2) with distilled water in a ratio of 1:3 i.e 100ml of H_2O_2 reacting with 300ml of water. The shale sample was poured into a bowl and soaked in the prepared solution, to a level that will cover the shale samples. Reaction occurred, samples that boiled probably suggest the presence of pyrite, and a little quantity of water was added so that it does not burn the samples. The sample was left for 24 hours to allow for complete digestion. The same procedure was carried out on each of the shale samples selected. And after digestion of the samples were completed, sieve washing was carried out, using sieve size of 0.063 microns. The washing was done under gentle running water, it lasted until the water from the mixture (that is, water from the 0.063 microns sieve) was clear, which indicates that the clay fraction of the sample have been removed. The residues after washing were then gently rinsed with water into a bowl, after which the water was decanted to further remove impurities. The residues was then left for another 24 hours to air dry before it was carefully transferred into a plastic tubes(vials) for appropriate storage. Each vial containing the residues was well labeled to avoid mix up. The picking and identification method used involve the use of binocular microscope, fossil tray, picking pin, Frankler slide and a brush. The sediments were poured little by little into the tray and then viewed under the microscope. All the recognizable foraminifera species using their ornamentation, models or structure were picked. After this, the foraminifera was classified base on the criteria of benthic or planktic foraminifera using relevant literatures.

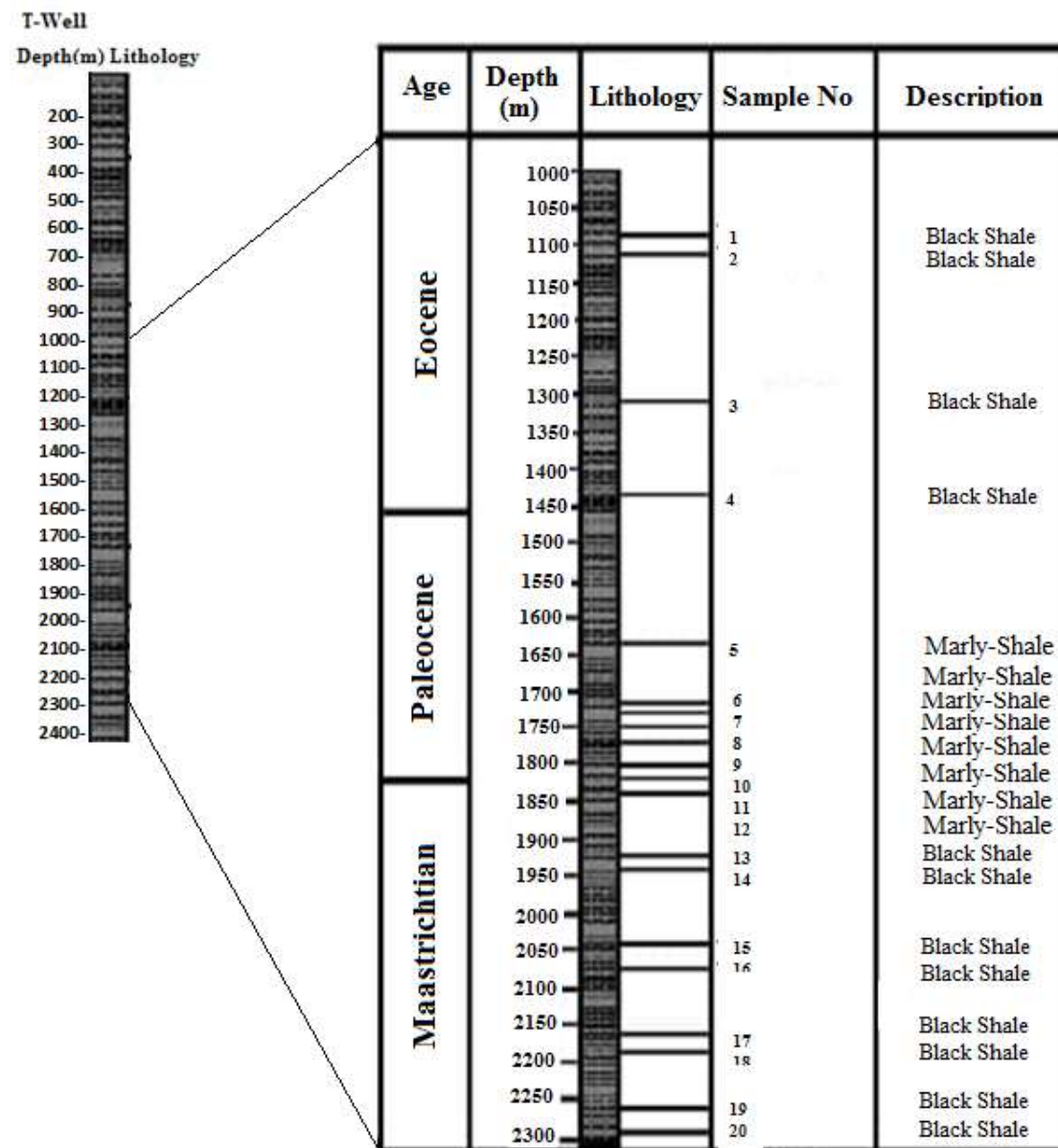


Figure 4. Lithostratigraphic Section of the Study T-well

RESULTS

Foraminifera Occurrence and Distribution

A careful examination of the occurrence and distribution of foraminiferal fauna in the T-well shows that the shales are generally fossiliferous. The following planktonic foraminifera species were identified; *Globotruncanella petaloidea*, *Guembelitra ressei*, *Heterohelix ressei*, *Heterohelix sp*, *Globigerina pseudotriloba*, *Morozovella Velascoensis*, *Morozovella angulata*, *Globigerina bulloides*, *Globanomalina champani*, *Globanomalina compressa*, *Acarinina soldadoensis* and some of these species are represented on (Figure 5 & 6). A total of 145 species were identified out of which 125 species (86.2%) are benthics and 20 species (13.8%) are planktics. The three major biozones are *Globotruncanella petaloidea*, *Morozovella angulata* and *Acarinina soldadoensis* zones.

The Benthic species identified include; *Bolivina sp*, *Bolivina afra*, *Bolivina Africana*, *Cibicides farafraensis*, *Gavelinella guineane*, *Lenticulia Olokuni*, *Lagena apiculata*, *Bulimina decurrens parallena*, *Lenticulina midwayensis*, *Anomalina umbonifera*, *Epinoides sp*, *Nonionella sp*, *Textularia farafraensis*, *Anomalinoides suturatus*, *Bulimina reussi*, *Gavelina brotzeni paleocenica*, *Epinoides simplex*, *Dentalina communis*, *Praebulimina sp*, *Bolivina incrassate*, *Gaudryina sp.*, *Nodosarella subnosa*, *Dorothyia concinna*, *Epinoides sigali*, *Bulimina prolixa*, *Anomalina grandis*, *Bolivina compata*, *Dentalina basiplanata*, *Anomalinoides sinaensis*, *Gavelina pertusa*, *Lenticulina rotulata*, *Neorotalina sp*, *Bolivina cookie*, *Cibicides nethliaus*, *parasubbotina pseudobulloides*, *Gyroinoides nitidus* and they are all arenaceous species. Some of these benthics species are represented in (Figure 7 & 8). In general, the microfauna of the T- well shows an uneven distribution and composition.

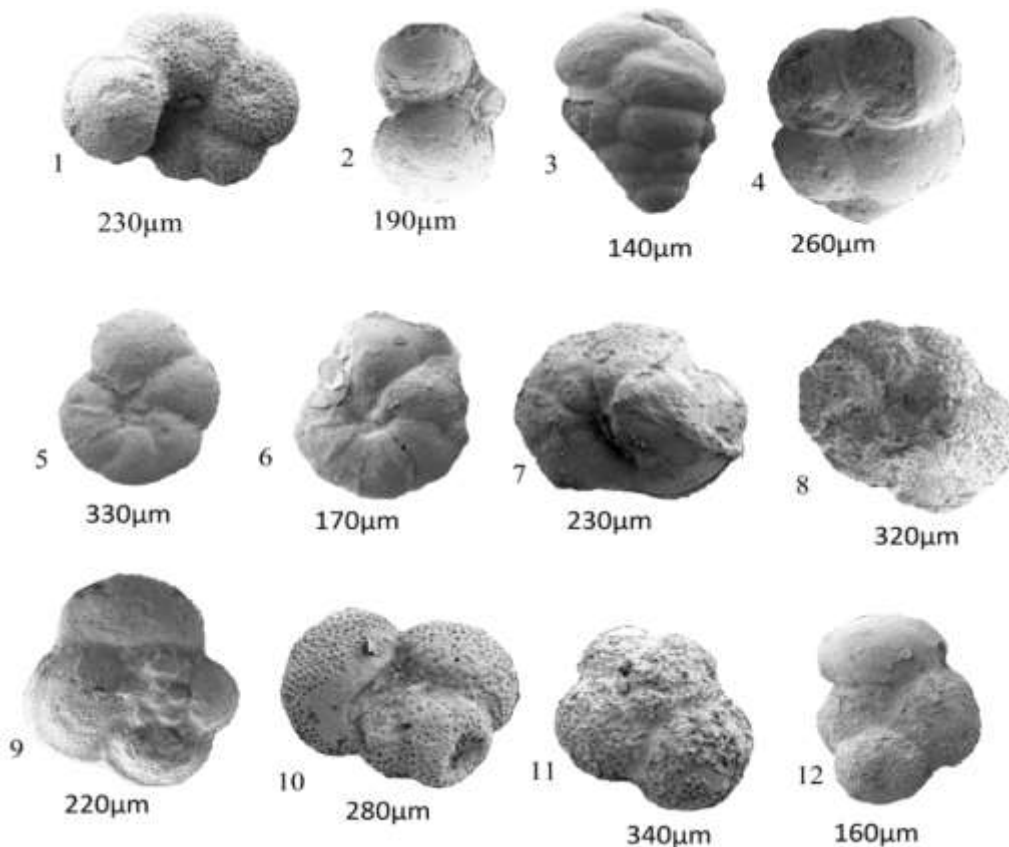


Figure 5. 1. *Globotruncanella petaloidea*, 2. *Rugotruncana subcicumnodifer*, 3. *Guembelitra cretacea*, 4. *Guembelitra sp.*, 5. *Morozovella angulata*, 6. *Morozovella sp.*, 7. *Acarinina soldadoensis*, 8. *Acarinina nitida*, 9. *Globigerina bulloides*, 10. *Subbotina pseudobulloides*, 11. *Parasubbotina varianta*, 12. *Subbotina triloculinoides*

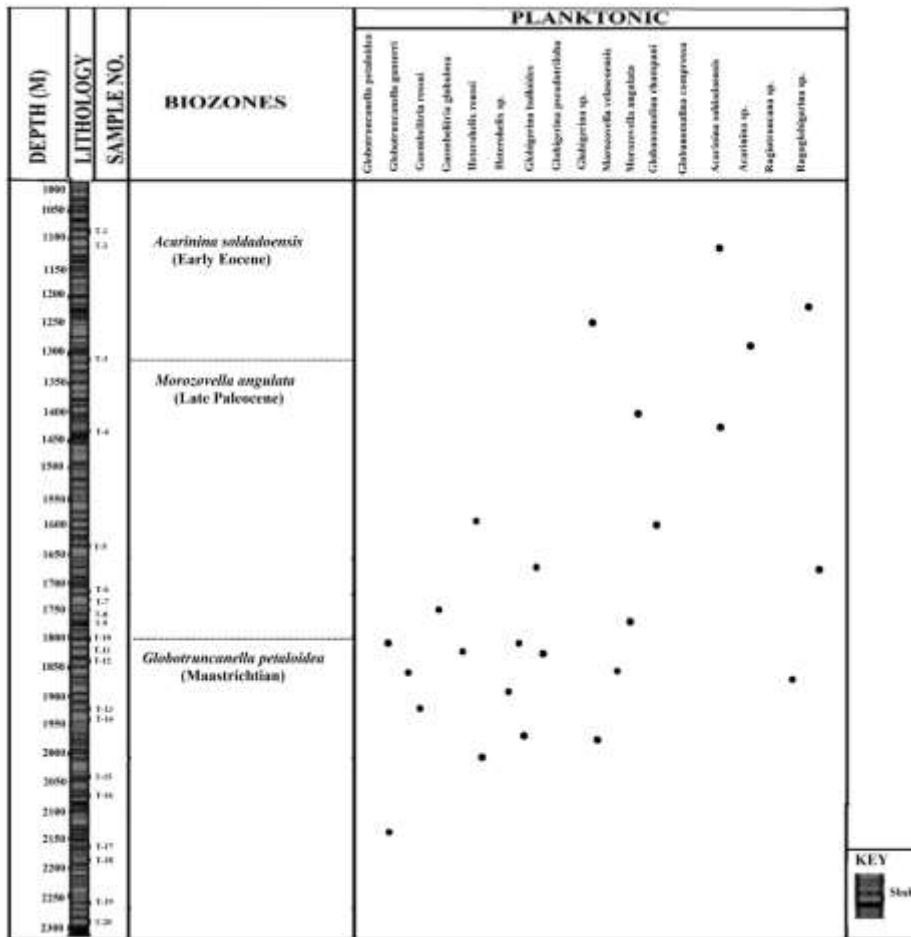


Figure 6. Stratigraphic range of the identified planktic foraminifera species in T-well

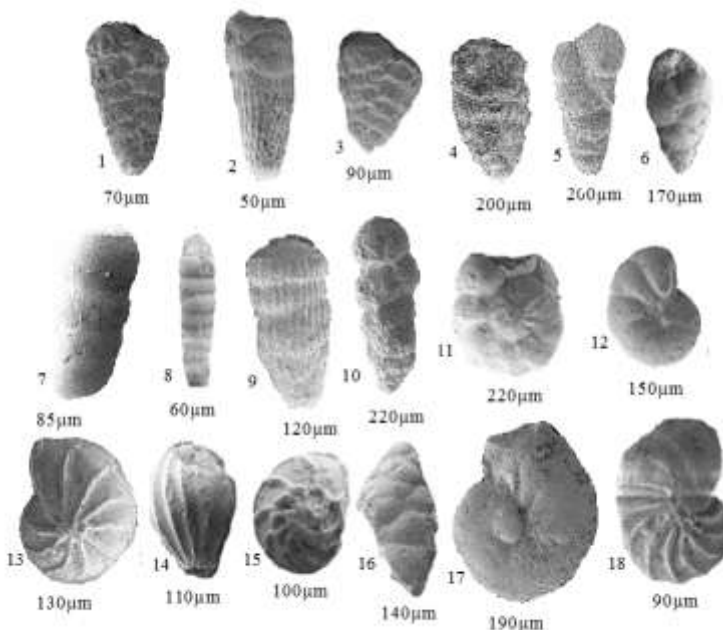


Figure 7. 1. *Bolivina cookie*, 2. *Bolivina* sp., 3. *Bolivina afra*, 4. *Bolivina simplex*, 5. *Bulimina* sp., 6. *Praebulimina* sp., 7. *Nodosaria* sp., 8. *Nodosarella subnodosa*, 9. *Orthokarstenia oveyi*, 10. *Guadryina* sp., 11. *Anomalinoidea umboniferus*, 12. *Lenticulina midwayensis*, 13. *Nonionella* sp., 14. *Lagena* sp., 15. *Eponides pseudoelevatus*, 16. *Uvigerina* sp., 17. *Gavelinella vombensis*, 18. *Gavelinella pachysuturalis*.

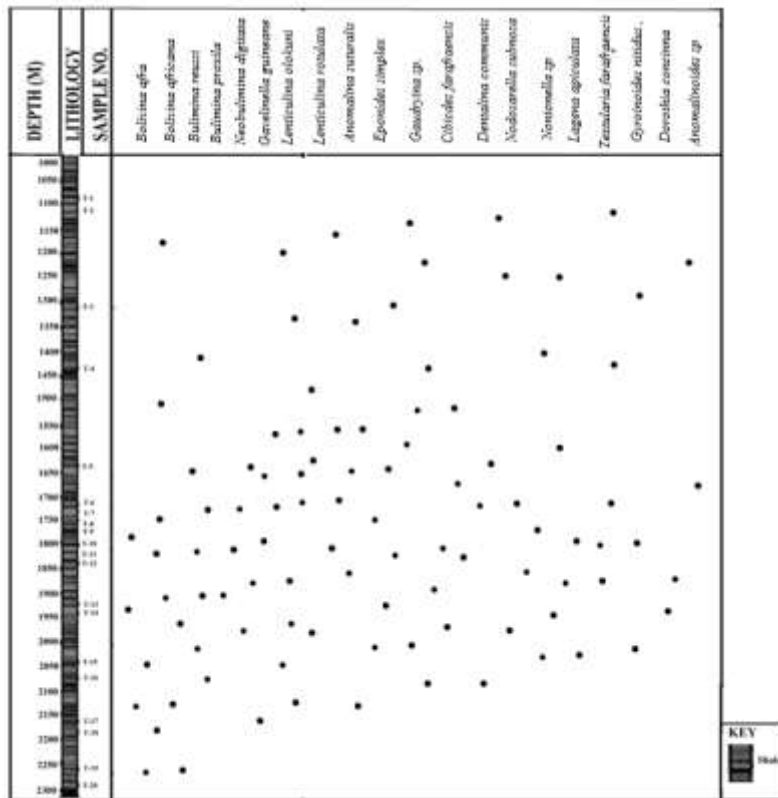


Figure 8. Stratigraphic range of the identified benthic foraminifera species in T-well

DISCUSSION

Planktonic Foraminiferal Biozones

The Cretaceous period has been subdivided into a number of planktonic foraminiferal biozones (e.g Bolli (1966); Hart et al. (1989); Postuma (1971); Premoli Silva and Bolli, 1973; Premoli Silva and Boersma, 1977, Caron (1985); Hardenbol et al. (1998) and Arenillas et al. (2000), Adekeye and Akande (2004), Adekeye (2019). The zonal schemes are characterised by a low total diversity, abundant cosmopolitan forms and the restricted occurrence of the tropical-subtropical Tethyan species (Bandy, 1967; Petters, 1982). The planktonic foraminiferal contents of twenty (20) samples covering the stratigraphical interval of the late Cretaceous – lower Paleogene was examined from the T-well section. Many cosmopolitan planktonic foraminiferal species were identified and three biozones were recorded. The most useful scheme was proposed by Caron (1985) and Hardenbol et al. (1998). Distribution of these planktonic foraminifera are plotted according to their first and last occurrences on a range of charts (Figure 9). The zonal markers and diagnostic species were photographed using a scanning electron microscope (SEM) (Figure 5). The recorded planktonic foraminiferal zones are described from the base to the top.

Globotruncanella petaloidea zone

This zone has been defined as the biostratigraphic interval from the simultaneous First Appearance Datum (FAD) of *Globotruncanella petaloidea* to the Last Appearance of *Globotruncanella* sp. A common occurrence of *Globotruncanella petaloidea* and *Globotruncanella ganserri* in this interval was noted while *praeglobotruncana* sp. and *Gumbelina* sp. are few. The age of this zone is assigned to the Maastrichtian (Figure 9).

The common species within this interval are *Globigerina bulloides*, *Heterohelix globulosa*, *Heterohelix ressei*, *Nonion oya*, *Bolivina afra*, *Praebulimina robusta*, *Praebulimina* sp., *Bolivina africana*, *Nonion* sp., *Orthokarstenia parva*, *Bolivina cookei*, *Lenticulina* sp., *Lenticulina midwayensis*, *Lenticulina olokuni*, *Lagena* sp., *Gavelinella guineana*, *Anomalinoides midwayensis*, *Gavelinella pachysuturelis*, *Nonion* sp., *Eponides*



Benthic Foraminifera Ecology

Benthonic foraminifera relatively have narrow ecologic adaptation depending on the lithotypes. It also have wide geographic distribution that makes them ideal for study of regional biogeographic and paleoecologic reconstructions (Loeblich and Tappan, 1988). Paleoecologic interpretations of the past environments with regards to paleobathymetry, paleosalinity or paleo-oxygenation can be made with the aid of benthic foraminifera at least as far back as Cretaceous time (Sliter and Baker, 1972, Murray, 1991a). Such interpretations must be based on comparisons with modern environments and their faunas, although some taxa may have changed their environmental preferences through time. The interpretations in this present work have been at generic level because some of the species identified do not exist in modern seas. The identified benthic species are; *Bolivina* sp, *Bolivina afra*, *Bolivina Africana*, *Cibicides farafraensis*, *Gavelinella guineane*, *Lenticulia Olokuni*, *Lagena apiculata*, *Bulimina decurrens parallena*, *Lenticulina midwayensis*, *Anomalina umbonifera*, *Epinoides* sp, *Nonionella* sp, *Textularia farafraensis*, *Anomalinoids suturatus*, *Bulimina reussi*, *Gavelina brotzeni paleocenica*, *Epinoides simplex*, *Dentalina communis*, *Praebulimina* sp, *Bolivinam incrassate*, *Gaudryina* sp., *Nodosarella subnosa*, *Dorothia concinna*, *Epinoides sigali*, *Bulimia prolixa*, *Anomalina grandis*, *Bolivina compata*, *Dentalina basiplanata*, *Anomalinoides sinaensis*, *Gavelina pertusa*, *Lenticulina rotulata*, *Neorotalina* sp, *Bolivina cookie*, *Cibicides nethliaus*, *parasubbotina pseudobulloides*, *Gyroinoides nitidus* and they are all arenaceous species.

The major source of information on the ecology of Benthic foraminifera is the wide data collection of Culver and Buzas (1981), Koutsoukos et al. (1990), Murray (1991a) and Gebhardt (1998) and many other authors. The ecology of some benthic foraminiferals identified in this study are discussed below.

Nonionella sp .

They are infaunal, probably detritivores, dwelling in muds of marine waters. The genus occurs from inner shelf i.e inner neritic to upper bathyal depths (Murray, 1991; Sliter and Baker, 1972). The species found is *Nonionellapanamensis*.

Gavelinella sp.

This species are typical of upper bathyal, normal marine environment. The species found is *Gavelinellapachysuturalis*, which is typical of aerobic sediments and forms an important component of the assemblage during phase of oxygen deficiency (Leckie et al., 1998). They are epifauna genus which may be allocated to dyoxic environment (Koutsoukos et al., 1990).

Lenticulina sp.

The species found include; *Lenticulina olokuni*, *Lenticulina pseudomamilligera*, which are common in non-anoxic environment. They prefer cool marine condition on the outer shelf to bathyal depths (Murray, 1991 and Adekeye, 2003)

Bolivina sp.

It colonise muddy sediments of inner-shelf to bathyal environments. They are detritivores and lives infaunally or epifaunally in marine salinities (Murray, 1991 a&b; Slitter and Baker, 1972; Adekeye and Akande, 2004a). The genus belongs to the elongated flattened morphogroup (Bernhard, 1986), whose genera are adapted to anoxic environments.

Praebulimina sp.

It belongs to the tapered morphogroup of Bernhard (1986) and Koutsoukos et al. (1990), which is characteristics of low oxygen values. Similar genera are *Neobulimina*, *Globobulimina* and *Bulimina*, all indicative of reduced oxygen levels (kaiho, 1994; Miller and Lohmann, 1982). According to Murray (1991a), *Bulimina* is a probable

an infaunal, detritivore, dwelling in muds to fine sands of marine shelves to bathyal depths. It indicates slightly enhanced phytodetritus flux and oxic or mildly dysaerobic bottom waters.

Textularia sp.

This is a species that inhabit normal marine environment ranging from lagoon to bathyal. They live epifaunally on hard substrates, muddy silts and sands (Murray, 1991a). Some Cenomanian – Turonian textulariids seem to resist reduced salinities (Koutsoukos et al. 1990). It indicates normal (low) Phytoplankton flux and possibly oxygen deficient bottom waters (Adekeye, 2003).

Paleoecology

Paleoenvironmental reconstruction of the sediment deposited within the studied interval is dependent on the environmental marker forms recovered from both planktic and benthic foraminifera present in the assemblages. These have served as relevant tools for reconstruction of paleoenvironmental studies. The ratio between planktonic and benthonic foraminifera (P/B ratio, frequently expressed as a percentage of planktonic) is one of the most reliable proxies to estimate paleo-water depths. It has been known for a long time that the percentage of planktonic foraminifera in modern sediments increase with water depth Boltovstoy et al. (1991), Gibson (1989), Van der Zwaan et al. (1990) assumed that the relative difference between the higher rate of reproduction of planktonic species in open ocean areas and the higher rate of reproduction (density) of benthic species in neritic areas is the main cause for the distribution observed. Higher proportions of agglutinated taxa in samples (T1-T20) seem to represent shallower environments or reduced paleoproductivity as the ratio correlate directly with benthic foraminifera abundance (Figure 8). In the same way, the ratio of arenaceous and calcareous species reflects the oxygen content of the bottom water since low oxygen content may cause difficulties for foraminifera calcite secretion Phleger et al. (1973). Furthermore, infaunal general dominate the entire section. Due to this faunal composition (strong dominance of opportunistic species with high tolerance against oxygen deficiency for the entire section), dysoxic conditions are assumed throughout. The ratio of infaunal to epifaunal general may reflect degree of oxygenation. In short, and related to the investigated section, zero numbers of calcareous foraminifera, small individuals and paucity of epifaunal forms all point to low level of oxygen. The strong dominance of arenaceous foraminifera, small individuals and an abundance of infaunal forms indicate oxygen depletion.

Applying the above information to the well section. The samples (T1-T20) represent dysoxic section as they contain abundant infaunal forms and numerous arenaceous foraminifera. They contain rare or no epifaunal forms and rare or no calcareous tests and calcareous foraminifera and are interpreted to indicate an intermediate, dysoxic environment. High proportion of agglutinated taxa seem to represent shallower environments of the well section or due to reduced paleoproductivity as this ratio correlates negatively with foraminiferal abundance or shows low oxygen as a result of increasing input of organic matter from the incoming fluvial systems Gebhardt (1998) while at 1100-1445m and 2164-2280m shows high oxygen with reduced input of organic matter. Other parameters such as temperature, salinity, substrate or circulation patterns may play a minor role. Variations in the P/B ratio can be described using organic matter flux-equations. Foraminifera live in all marine environments from the deepest ocean floor to the intertidal salt marshes found behind barrier islands or around the margins of estuaries. The dominance of the arenaceous benthonics with over 80% of total forms present suggests an open marine condition (Nagy et al., 1988). According to Murray (1991) and Sen Gupta (1999), the high diversity and dominance of arenaceous taxa suggests transition from brackish marginal marine habitats to open neritic conditions.

CONCLUSION

The T-well penetrated siltstone, shale and sandstone sediments in the Toju field, Eastern Dahomey basin, Southwestern Nigeria. The well was logged, measured and sampled. The total depth of the well is approximately 2400m. The base of the well is mainly siltstone which is overlain by dark shale and marl shale respectively and sandstone at the top. Twenty shale samples were selected between the interval of 1088m and 2280m for foraminiferal analysis to assess the biostratigraphy and Paleoenvironment of the sediments.



The results from foraminifera analysis revealed that the well penetrated the Araromi Formation, Ewekoro Formation and Oshoshun Formation. The three major biozones are *Globotruncanella petaloidea* zone, *Morozovella angulate* zone and *Acarinina soldadoensis* zone. The Paleocological interpretation suggest shallow marine dysoxic conditions characterized by the dominance and high number of individuals of benthic foraminifera.

ACKNOWLEDGEMENTS

We appreciate the support from Conoil plc, which provided the samples for this research work. We also acknowledge the support received from Geology and Mineral Sciences Department, University of Ilorin, Nigeria. Thank you for all you do.

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