



Biostratigraphy Analysis of Mars Field Offshore, Dahomey Basin, Nigeria

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ABSTRACT

The biostratigraphic interpretation of the Mars Field, located offshore in the Dahomey Basin of western Nigeria, was conducted through a detailed analysis of index fossil species identified across three wells: MARS 1, MARS 3, and MARS 5. This study leverages the occurrence and distribution of key microfossils to establish a robust chronostratigraphic framework spanning the Late Cretaceous to Paleogene periods. The presence of *Globanomalina daubjergensis* indicates a Lower Paleocene age, while the dinoflagellate *Dinogymnium acuminatum* suggests a Danian age at depths ranging from approximately 6250' to 8990', marking the transition to Cretaceous strata at 8990' (Berggren et al., 1995). Further, the occurrence of *Globotruncana gansseri* points to a Late Campanian to Upper Maastrichtian age at depths of 9080'–9420', and *Globotruncana aegyptiaca* denotes a Coniacian age at around 10750' (Bralower et al., 1995). Deeper intervals reveal an Albian age inferred from *Callialasporites* spp. at approximately 12400', and the presence of *Dicheiropollis etruscus* at about 14660' suggests a Barremian age, indicating the oldest strata penetrated in the study area (Adeigbe et al., 2013). These biozones, derived from foraminifera, palynomorphs, and calcareous nannofossils, correlate with regional unconformities and seismic markers, providing insights into the basin's depositional history. The analysis highlights variations in microfossil abundance and diversity with depth, reflecting changes in paleoenvironmental conditions and sedimentological processes within the transform margin setting of the Dahomey Basin. This biostratigraphic framework not only refines the geological timeline of the Mars Field but also supports its potential significance for hydrocarbon exploration by delineating key stratigraphic intervals.

Keywords: Dahomey/Benin basin, biozonation, biostratigraphy, index species, mars field.

1.0. INTRODUCTION

The Mars Field, located approximately 24 kilometers offshore western Nigeria along the West African Transform Margin, provides a critical window into the geological history of the Dahomey Basin (Billman, 1992). This study reviews the biostratigraphy of the Mars Field using data from three wells—MARS 1, MARS 3, and MARS 5—drilled in this offshore region. Biostratigraphy, a fundamental tool in subsurface analysis, leverages the distribution of fossil assemblages to establish the relative ages of sedimentary strata and correlate them across regions (Berggren et al., 1995). In this investigation, selected samples from the tops of the wells to various analyzable depths were examined to reconstruct the temporal and environmental evolution of the basin. The analysis integrates lithostratigraphy, micropaleontology, and palynology to provide a comprehensive stratigraphic framework.

The Dahomey Basin, also known as the Benin Basin, is a major sedimentary trough along Nigeria's western margin, shaped by Mesozoic–Cenozoic rifting and drift associated with the opening of the South Atlantic (Tella et al. 2024; Akande et al. 2021). The basin's sedimentary succession spans from the Late Cretaceous through the

Paleogene and into the Neogene, encompassing environments from fluvial-deltaic to shallow marine settings (Alege et al. 2024; Tella et al. 2024). Integrating fossil assemblages such as planktonic foraminifera, calcareous nannofossils, palynomorphs, and ostracods is central to delineating depositional sequences, identifying unconformities, and correlating lithostratigraphic units—key for both academic research and hydrocarbon exploration (Alege et al. 2024; Asadu 2020; Aturamu et al. 2024; Aigbadon & Igbiniye 2024).

Recent studies from drilling campaigns (e.g., BG-1, Uche 1, and Ewekoro-Afowo sections) analyze ditch-cuttings and core intervals. These investigations outline key lithostratigraphic units—Abeokuta (Ise, Araromi, Afowo), Ewekoro, Oshosun–Ilaro—using grain texture, fabric, and geochemical indicators to map depositional trends (Alege et al. 2024; Aturamu et al. 2024; Bamisaiye et al. 2025). Offshore well BG-1 identified seven biozones from Upper Cenomanian to Late Miocene, including *Globotruncana aegyptiaca* and *Morozovella* zones, pinpointing the Cretaceous–Paleogene (K–Pg) boundary (Alege et al. 2024). Onshore Ewekoro Formation wells revealed Paleocene–Eocene markers like *Acarinina soldadoensis* and

Morozovella conicotruncata, suggesting neritic depositional settings (Asadu 2020; Okon et al. 2025). Well Uche 1 (offshore Lagos) yielded 15 species (e.g., *Discoaster druggii*, *Triquetrorhabdulus carinatus*), defining Early Miocene NN2 biozones and identifying sequence boundaries (Aturamu et al. 2024).

Palynological studies delineated upper Eocene–lower Oligocene zones (e.g., *Verrucatosporites usmensis*, *Achomosphaera alcornu* FADs) and show oscillating fluvio-deltaic to marginal marine environments (Adegboyega et al. 2022). Ostracod analyses from Ewekoro carbonates (2024) found diverse Paleocene assemblages (18 species) indicative of dynamic neritic settings and supporting Trans-Saharan Seaway connections, enhancing reservoir–source rock predictions (Aigbadon & Igbini 2024).

Chemostratigraphy & Depositional Conditions
Elemental and trace-metal studies (e.g., V/Sc, Ni/V ratios) across eastern basin wells show alternations between oxic and dysoxic-anoxic intervals in Paleocene–Miocene strata, marked by identifiable chemostratigraphic boundaries (Adelabu et al. 2021). Tectonic and Structural Setting High-resolution aeromagnetic interpretations confirm a multi-phase structural evolution: early Cretaceous rifting, Late Cretaceous–Tertiary sag, block faulting, and horst–graben development (Akande et al. 2021; Tella et al. 2024), underlying stratigraphic discontinuities and facies changes across the basin (Akande et al. 2021; Alege et al. 2024).

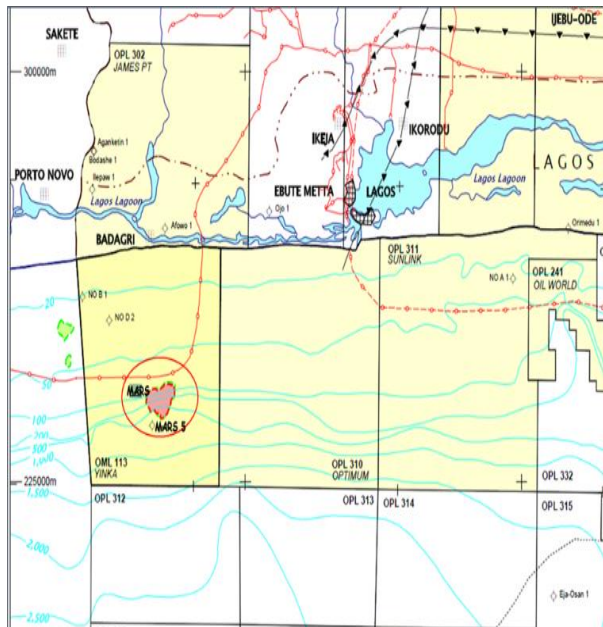


Figure 1: Map Showing Location of MARS Field

1.1 Geological settings

The Dahomey Basin, also known regionally as the Benin Embayment, is a marginal sedimentary basin located along the Gulf of Guinea, stretching from southeastern Ghana through Togo and Benin into southwestern Nigeria. As part of the West African passive continental margin, the Dahomey Basin developed during the Early Cretaceous as a result of the rifting and subsequent drift that accompanied the opening of the South Atlantic Ocean. This rift–drift transition gave rise to a complex geological framework, influenced by both tectonic and eustatic processes, and characterized by a diverse stratigraphic succession and promising, though underexplored, hydrocarbon potential.

The stratigraphy of the Dahomey Basin records a full sedimentary history from rift initiation through post-rift marine transgression to modern deltaic sedimentation. The Abeokuta Group (Albian–Cenomanian) forms the basal unit and represents the syn-rift deposits. It comprises the Ijebu Formation (continental clastics, including conglomerates and sandstones), the Afowo Formation (transitional to marginal marine sandstones and shales), and the Araromi Formation, which includes thick marine shales and siltstones with occasional limestone intercalations (Omoboriowo et al., 2019; Adepoju et al., 2021).

Overlying the Abeokuta Group is the Ewekoro Formation (Paleocene), a highly fossiliferous limestone deposited during a regional marine transgression. This unit is widely exposed in southwestern Nigeria and is considered a key marker horizon across the basin. It is succeeded by the Akinbo Formation (Paleocene–Eocene), composed mainly of dark grey to black shales, phosphatic beds, and glauconitic sandstones, deposited under deeper marine, low-oxygen conditions (Oyedele & Akande, 2020). The Oshosun Formation (Eocene) follows, with sandy clays, siltstones, and glauconitic sandstones indicating a regression to shallower marine environments. The Ilaro Formation, deposited during the Late Eocene, consists of thick cross-bedded continental sandstones, interpreted as fluviodeltaic channel and point-bar deposits. The youngest unit is the Benin Formation (Miocene–Recent), which consists of unconsolidated sands and gravels laid down in a fluvial to coastal plain setting and forms the uppermost sequence of the Niger Delta in the Dahomey area (Adebayo et al., 2020; Ojo et al., 2022).

The tectonic evolution of the basin is closely linked to the opening of the South Atlantic. Initial extensional tectonics in the Early Cretaceous produced a network of normal faults, half-grabens, and tilted fault blocks,

which controlled the distribution of early sediments. Subsequent thermal subsidence in the post-rift stage led to widespread marine transgression and sediment accumulation (Ogunbanjo et al., 2022). Structural interpretation of seismic data reveals rollover anticlines, listric faults, and subtle compressional features, particularly in the offshore segment of the basin (Ekwueme et al., 2023). Evidence of salt tectonics is absent in this basin, unlike the Niger Delta, though differential compaction and growth faulting remain important structural controls.

In terms of petroleum geology, the Dahomey Basin remains underexplored compared to neighboring basins, but several studies have confirmed the presence of a working petroleum system. The Afowo and Araromi Formations contain organic-rich shales that serve as potential **source rocks**, with Total Organic Carbon (TOC) values ranging from 1.2% to 4.5% and kerogen types II and III (Adepoju et al., 2021; Olabode & Obaje, 2020). Vitrinite reflectance data suggest that maturity increases offshore, where some parts of the basin reach the oil window (Olatinsu et al., 2021).

The reservoir rocks are primarily found within the sandstones of the Afowo and Ilaro formations. These units exhibit moderate to good porosity (15–25%) and permeability, especially where they are clean and well sorted. Petrographic analysis by Adebayo et al. (2020) indicates that the Ilaro Formation sandstones are compositionally mature and texturally submature, with quartz content exceeding 90%. These characteristics make them suitable reservoir targets, particularly in the offshore and deeper subsurface where they are less cemented.

Seals in the basin are provided by the marine shales of the Araromi and Akinbo formations, which are laterally continuous and low in permeability. The combination of interbedded sand-shale sequences allows for effective trap formation. Trapping mechanisms include fault-bounded closures, rollover anticlines, and stratigraphic pinch-outs. Recent seismic and structural modeling by Ekwueme et al. (2023) identified several potential traps, including buried hills and channel fills in the deep offshore Benin region.

Despite a relatively low level of commercial success, there have been hydrocarbon shows in wells such as the Seme Field (offshore Benin), which produced oil from the Cretaceous Afowo sands (Agagu, 1985; Ekwueme et al., 2023). More recent offshore drilling campaigns are focusing on deep turbiditic plays and basin floor fans, believed to hold untapped reserves. Geophysical

advances, including full waveform inversion (FWI) and spectral decomposition, have enabled better delineation of deep stratigraphic traps and channel complexes (Ojo et al., 2022; Adebajo & Ogunbanjo, 2024).

In conclusion, the geology of the Dahomey Basin is shaped by a complex interplay of rift-related tectonics, eustatic sea-level fluctuations, and long-term thermal subsidence. Its sedimentary fill spans from continental clastics to open marine carbonates and deltaic sandstones, offering a complete rift-to-drift stratigraphic record. Although historically overlooked in favor of the Niger Delta, the Dahomey Basin is gaining renewed interest due to improved geological understanding and advances in exploration technology. With its diverse stratigraphy, organic-rich source rocks, and promising structural traps, the basin remains a frontier area with significant hydrocarbon potential.

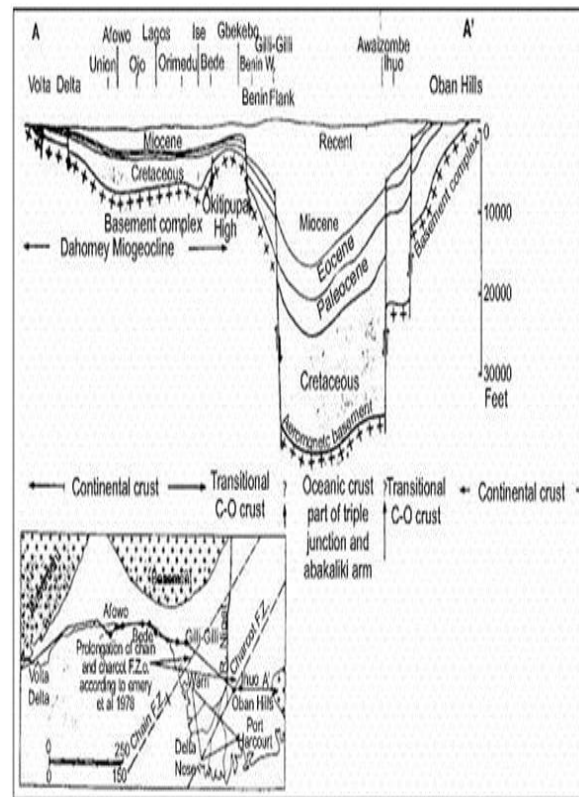


Figure 2. East-West Section Showing The Tectono-Stratigraphic Frame Work Of The Benin Basin And Upper Part Of Niger-Delta Basin (Whiteman, 1982).

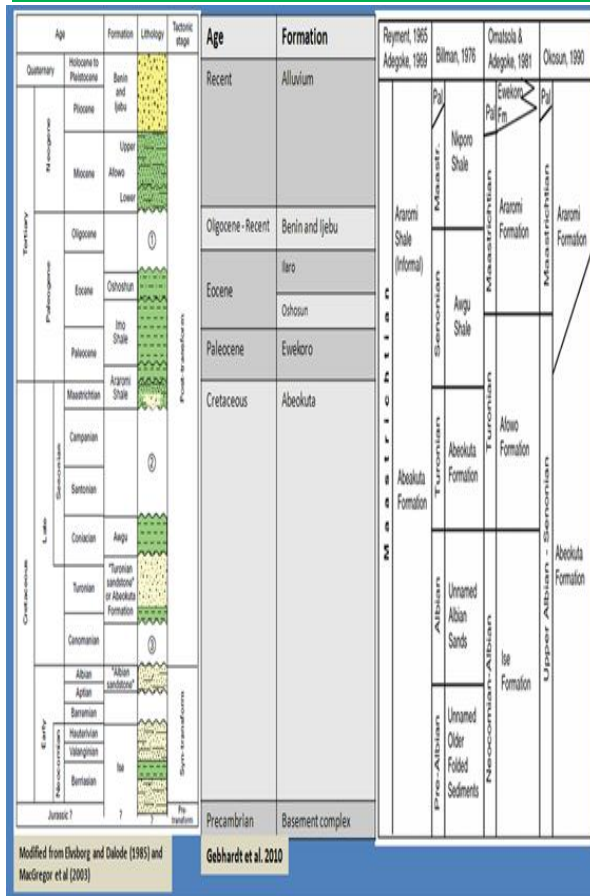


Figure 3: Stratigraphic Column Of The Benin Basin (Omatsola & Adegoke, 1981)

1.2 EXPERIMENTS AND ANALYSIS

The Biostratigraphy of Mars Field was reviewed using the Biostratigraphy of MARS 05, MARS 1 and MARS 4 Well. The samples used were about 41 calcareous nannofossils, 71 sample of Palynomorphs and 20 samples of micropaleontology. The ditch cutting was analyzed under stereo-binocular microscope for lithostratigraphic analyses.

1.2.1 Lithostratigraphic Analysis

The ditch cutting samples provided were lithological analyses under a stereo-binocular microscope, the samples was analyzed for rock type, color, texture of constituent grain, accessory minerals, fossil content, nature of cement and diagenesis.

1.2.2 Micropaleontology

The standard micropaleontology preparation techniques were followed, the contaminated samples were washed to remove drilling additives due to oil-based mud. More indurated samples were given treatment with hydrogen peroxide. The samples were then dried over a hot plate

and sieved, while the shell fragment and other biota seen were picked and counted.

1.2.3 Palynology

Samples underwent hot hydrochloric acid treatment and wet sieving, with a Branson Sonifier used to remove silt and clay. Nitric acid facilitated controlled oxidation, monitored under a palynological microscope.

1.2.4 Calcareous Nannofossil Preparation

Standard strewn mounts on glass slides were prepared. Due to sparse nannofossil populations at some horizons, two slides per horizon were made, and microflora concentration was enhanced by centrifugation.

2.0 METHODS AND MATERIALS

Three wells among the MARS Field wells (MARS 5, MARS 1 and MARS 3) was used for the biostratigraphy analysis the wells are drilled in the offshore Dahomey Basin in western Nigeria in 1996. The wells were drilled on a Kelly bushy of about 80ft to 100ft in 320 ft to 500ft water depth. The well attained a total drilled depth of 8482ft - 161,38ft. selected samples from top of the wells to base of the well were used for the biostratigraphy analysis and age dated with Calcareous Nannofossils.

The analyses carried out within the scope of the project covered the following stratigraphic aspects: Lithostratigraphy to describe the lithology of ditch cutting samples, Biostratigraphy to describe the micropaleontology using Foraminifera, Palynology to describe the Pollen, spores and dinoflagellate cysts, Calcareous Nannofossils, Sequence stratigraphy and Paleoenvironment analysis.

A description of the major organic matter types and components of the microfossil assemblages is given for each of the samples analysed at various depth. Various depth shows different abundance and diversity of microfossil assemblages. The results of this biostratigraphy can be tentatively related to a succession of Formations, generally bounded by major unconformities.

3.0 RESULTS AND DISCUSSIONS

The Biostratigraphy of Mars Field results are related to succession of Formations within the basin generally bounded by unconformities and defining time lines, these surfaces should correspond to major GR Log breaks and should also be related to the Seismic markers.

4.0 DISCUSSIONS

4.1 Biostratigraphy Analysis



4.1.1 MARS 1 Well Foraminifera Biozonation (5900' - 8482')

Morozovella trinidadensis to *Globigerina eugubina* biozones it occurs at stratigraphic interval 5900' – 6120', it indicates the age of Early Paleocene. The Formation is Upper Araromi Formation. *Globotruncana aegyptiaca*-*Globotruncanella havanensis* biozones it occurs at stratigraphy interval of 6170' – 6270', it indicates age of Early Maastrichtian. The Formation is the Lower Araromi Formation. *H. globulosa* is known from the base of the Lower Maastrichtian *G. aegyptiaca* zone. This is the youngest Late Cretaceous Zone recognized in this well, therefore Upper Maastrichtian strata are considered as missing. *Dicarinella asymmetrical*/*Dicarinella primitive* biozones it occurs at stratigraphy interval of 6170' – 6940', it indicates age of Santonian-Coniacian. The Formation is the Awgu Formation.

4.1.2 MARS 1 Well Palynological Biozonation (5900' - 8482')

Morozovella trinidadensis / *Globigerina eugubina* Biozone occur at Stratigraphic interval of 5900' – 6170' which indicate age of Eocene and Late Paleocene. *Globigerina aegyptiaca* / *Globotruncanella havanensis* biozones occur at stratigraphic interval of 6170' – 6270' which indicate age of Lower Maastrichtian to Upper Campanian. *Dicarinella asymetrica* to upper *D. primitiva* Lower *D. primitiva* planktonic foram zone occur at stratigraphy interval of 6270' - 6910' which indicate age of Santonian to Coniacian. *Hexaporotricolpites emelianovi* Palynozone: It occurs at stratigraphic interval of 6970' – 7150'. The organic residue is generally very rich, with abundant inertinite fragments from 6970', *Hexaporotricolpites emelianovi* is consistently abundant. It indicates the definitive downhole penetration of Turonian strata. *Cicatricosisporites potomacensis*-*C. berouensis* Palynozone: It occurs at stratigraphic interval of 7900' – 8482'. The biostratigraphy penetration of the Albian Sandstone and Carbonate is tentatively proposed by the successive top occurrences of *Cicatricosisporites potomacensis* at 7900.

4.1.3 MARS 3 Well Calcareous Nannofossil Biozonation (2850'-12625')

Zone NN11a/NN8: *Discoaster quinquereamus*/*Catinaster coalitus* is more abundant and diverse at depth of 2850' – 3570' together with *D. berggrenii*, *D. neohamatus*, *Minylitha convalis* and *D. loeblichii* assemblages. Zone NN7/NN5: *Discoaster kugleri*/

Sphenolithus heteromorphus is more abundant and diverse at depth 3570' – 4050', it indicates age of Middle Miocene. Zone NP25: *Cyclicargolithus abisectus*/*Cyclicargolithus floridanus* is more abundant and diverse at depth 4050' – 4080', it indicates age of Upper Oligocene. Zone NP11-NP12: *Tribrachiatus orthostylus* is more abundant and diverse at depth of 4110' – 4290', it indicates age of Early Eocene. Zone NP10: *Rhombaster bitrifida*/*Imperiaster obscurus* it occurs at stratigraphic interval of 4200' – 4290' the interval is characterized by few to common occurrence of lower Eocene nannofossils like *Sphenolithus primus*, *Neococcolithus protenus* and *Chiasmolithus oamaruensis*. Zone NP6-NP8: *Discoaster multiradiatus*/*Fasciculithus* it is characterized by paucity of nannofossils and occur at a stratigraphic interval of 4950' – 5280' it indicates age of Upper Paleocene. Zone NP5: *Fasciculithus*/*Fasciculithus tympaniformis* it is characterized by few to common occurrence of nanofossils, it occurs at a stratigraphic interval of 5280' – 5370', it indicates age of Middle – Upper Paleocene. Zone NP4 - CC26: it is barren of fossil and it is also believed that the Danian Stage (Lower Paleocene) and the Maastrichtian Epoch (Upper Cretaceous) is absent. Zone CC19: *Marthasterites furcatus* / *Watzunaria barnesae* this interval is characterized by few to common occurrence of typical Upper Cretaceous nannofossils. It occurs at stratigraphic interval of 5550'- 5640', it indicates age of Campanian (Upper Cretaceous). Zone CC18 – CC16: *Lithastrinus septenarius* / *Zeughrabdotus* spp this interval is characterized by high abundance and diversity of Upper Cretaceous nannofossils. It occurs at stratigraphic interval of 5640'- 6210', it indicates age of Campanian (Upper Cretaceous). Zone CC15: *Micula concave*/*Micula decussata* this interval is characterized by high abundance and diversity of Upper Cretaceous nannofossils. It occurs at stratigraphic interval of 6210'- 6300', it indicates age of Lower Santonian (Upper Cretaceous). Zone CC14: *Prediscosphaera cretacea* / *Micula decussata* this interval is characterized by high abundance and diversity of Upper Cretaceous nannofossils. It occurs at stratigraphic interval of 6300'- 6450', it indicates age of Upper Coniacian (Upper Cretaceous). Zone CC13: *Marthasterites furcatus*/*Zeughrabdotus erectus* this interval is characterized by high abundance and diversity of Upper Cretaceous nannofossils. This bioevents also marks the Coniacian/Turonian boundary it occurs at stratigraphic interval of 6450'- 6750', it indicates age of Coniacian (Upper Cretaceous).



Table 1: Calcareous Nannofossils Biostratigraphic Summary Of Well MARS 3 From 2850'-5550'

Calcareous Nannofossil Biostratigraphic summary of well MARS-3 (First/Last Downhole Occurrence of stratigraphically important Calcareous Nannofossils - TERTIARY)				
Depth (ft)	Epoch/Period	Age (Ma)	Zones (Martini 1971)	Significant Nannofossil datums
2850				<i>First sample analysed</i>
2850		>7.8		In: <i>Minylitha convalis</i>
3000		8.6	NN11	Base <i>Discoaster quinqueramus</i>
3150		9.1	NN10	Top <i>Discoaster bollii</i>
3210		9.4		Top <i>Discoaster hamatus</i>
3300	Upper Miocene	9.5	NN9	Base <i>Minylitha convalis</i>
3510		10.7		Base <i>Discoaster hamatus</i>
3570		10.9		Base <i>Catinaster coalitus</i>
3780		11.8	NN7	?Base <i>Discoaster kugleri</i>
3990	Middle Miocene	13.6	NN5	Top <i>Sphenolithus heteromorphus</i>
4080	Upper Oligocene	-	?NP25	In: <i>Cyclicargolithus abisectus</i> , <i>Dictyo - coccites scrippsae</i> and <i>Ilseolithina fusa</i> .
4110	Lower Eocene	>50.6	NP12	In: <i>Tribrachiatulus orthostylus</i> , <i>Toweius callosus</i> , <i>Toweius spp</i> and <i>Discoaster kuepperi</i> .
4290		53.64	NP11	Base <i>Tribrachiatulus orthostylus</i>
4590-4950	Lower Eocene – Upper Paleocene	-	NP10 – NP11	In: <i>Rhomboaster bitrifida</i> , <i>R. cuspis</i> , <i>R. claptrata</i> , <i>Ellipsolithus marcellus</i> , <i>Toweius eminens</i> , <i>Tribrachiatulus bramlettei</i> , <i>Coccolithus formosus</i> and some species of <i>Cruciplacolithus</i> , <i>Neochiastozygus</i> and <i>Chiasmolithus</i> .
4950	Upper Paleocene	-	NP9	Base <i>Discoaster multiradiatus</i>
5370	Middle Paleocene	59.7	NP5	Base <i>Fasciculithus tympaniformis</i>
5400-5550	?Lower Paleocene – Upper Cretaceous			Significant floral decline

Table 2: Calcareous Nannofossils Biostratigraphic Summary Of Well MARS 3 From 5550'-12625'

Calcareous Nannofossil Biostratigraphic summary of well MARS-3 (First/Last Downhole Occurrence of stratigraphically important Calcareous Nannofossils - CRETACEOUS)				
Depth (ft)	Epoch/Period	Age (Ma)	Zone (Sissingh 1977)	Significant Nannofossil datums
5400-5550	?Lower Paleocene – Upper Cretaceous			Significant floral decline
5580	Upper Cretaceous (Campanian)		CC19	In: <i>Cyclagelosphaera reinhardtii</i> , <i>Uniplanarius sissinghi</i> , <i>Micula decussata</i> and



Staurolithites spp.

5640	Campanian	~80.0	CC18	Top <i>Marthasterites furcatus</i>
5640-6180	Campanian – Santonian		CC18 - CC16	In: <i>Marthasterites furcatus</i> , <i>Eiffelithus eximius</i> , <i>Lucianorhabdus maleformis</i> , <i>Micula decussata</i> , <i>Micula concava</i> and <i>Micula staurophora</i> .
6210		-		Top <i>Lithastrinus septenarius</i>
6300	Lower Santonian	-	CC15	Base <i>Micula concave</i>
6450	Upper Coniacian	-	CC14	Base <i>Micula decussate</i>
6750	Lower Coniacian	86.0	CC13	Base <i>Marthasterites furcatus</i>
6780 - 7830	Turonian	-	CC12 – CC11	Floral decline
7860 - 7920	Turonian - ?Cenomanian	-	CC11	Upper Cretaceous assemblage without <i>Eiffelithus eximius</i>
8250	Cenomanian		?CC10	In: <i>Eiffelithus monechiae</i>
8280-10410	Cenomanian & older (?Albian)	Significant floral decline		
10440-10560	Albian	-	?CC8 & Older	In: <i>Eiffelithus turriseiffelii</i>
10560-11820	Albian - ?Aptian	-		Floral decline
11850	Aptian	-	CC7	In: <i>Nannoconus quadriangulus quadriangulus</i>
11880-12625	?Aptian & Older		Significant floral decline	
12625	<i>Last sample Analysed</i>			

Zone CC12 – CC9: *Eiffelithus monechiae* / *E. monechiae* this interval is characterized by a significant floral decline in a predominantly sandy sequence. It occurs at stratigraphic interval of 6750' - 8250', it indicates age of Turonian - Cenomanian (Upper Cretaceous). Zone CC9 – CC8: *Nannoconus quadriangulus* this interval is characterized by paucity of nannofossils, it occurs at stratigraphic interval of 8250' - 11850', it indicates age of Cenomanian – Albian (Upper - Lower Cretaceous). Zone CC7: *Nannoconus quadriangulus* this interval is characterized by paucity of nannofossils in a predominantly sandy section. It occurs at stratigraphic interval of 11850' - 12625', it indicates age of Albian (Lower Cretaceous).

4.1.4 MARS 5 Well Foraminifera Biozonation (6250' - 16120')

Archeoglobigerina Creatacea/Hedbergella
 Holmedelensis: Biozone occur at Stratigraphic interval of 16120' – 11310' which indicate age of Late Cretaceous (Turonian and Older), it is bounded at the top by the 89 Ma MFS at depth of 11310. *Marginotruncana sigali/Dicarinella Primitiva*: Biozone occur at stratigraphic interval of 11310' – 10750' which indicate age of Late Cretaceous (Coniacian). It is bounded by 88 Ma MFS at depth of 1070'. *Globotruncanella petaloides/Whiteinella baltica*: Biozone occur at Stratigraphic interval of 10750' - 10100' which indicate age of Late Cretaceous (Santonian/Campanian). It is bounded by 73.5Ma MFS at 10100. *Globotruncanella havanensis/Globotruncana aegyptiaca*: Biozone occur at stratigraphic interval of 10100' - 9420' which indicate age of Late Cretaceous (Maastrichtian). It is bounded by a 68.6 Ma MFS at 9420'. *Globotruncana gansseri/Abathomphalus mayaroensis*: Biozone occur at



stratigraphic interval of 9420' – 9080' which indicate an age of Late Cretaceous (Maastrichtian)). It is bounded by a 66.2 Ma at 9115'. *Morozovella trinidadensis*/*Globigerina eugubina*: Biozone occur at stratigraphic interval of 9080'-7810' which indicate an age of Early Paleocene. It is bounded by a KT boundary

at the base 9080' and at the top by 64.6Ma MFS at 7810'. *Planorotalites Pusila/Morozovella uncinata*: Biozone occur at stratigraphic interval of 7810' – 6400' which indicate an age of Middle to Late Paleocene. It is bounded by 61.1 Ma MFS at 6400'.

Table 3: Summary Of The Foraminiferal Biozonation Of MARS 5 Well (Adeigbe Et Al., 2013).

Depth	Foraminiferal Biozone	Age	Epoch/period
7810'-6400'	<i>Morozovella</i>	61.1- 64.6	Middle Paleocene
9080'-7810'	<i>Globigerina eugubina</i>	64.6-65.6	Early Paleocene
9420'-9080'	<i>Globotruncana ganseseri</i>	65.6-68.6	Maastrichtian
10100'-9080'	<i>Globotruncanella havanesis</i>	68.6-73.4	Maastrichtian
10750'-10100'	<i>Whiteinella primitiva</i>	73.4-88	Campanian/santonian
11310'-10750'	<i>Dicarinella primitiva</i>	88-89	Coniacian
16120'-11310'	<i>Archeoglobigerina creatacea</i>	89 and older	Turonian

4.1.5 MARS 5 Well Palynological Biozonation (6250'-16120')

Classopollis classoides Biozone it occurs at interval of 16100' – 11690' which indicates an age of Cenomanian. *Gnetaccaepollenites barghoonii* Biozone it occurs at interval of 11690' – 10800'. The age is Turonian to Coniacian. *Dinogymnium undulosum* Biozone it occurs at interval of 10800' – 10100'. The age is Santonian to Campanian. *Longapertites marginatus* Biozone it occurs at interval of 10100' – 8990'. The is age Maastrichtian. *Longapertites vaneendenburgi* Biozone it occurs at interval of 8990' – 6290'. The age is Paleocene.

4.1.6 MARS 5 Well Calcareous Nannofossil Biozonation (6250'-16120')

Discoaster quinquemanus is more abundant at interval of 2890' which represent an age of Upper Miocene. *Discoaster hamatus* is more abundant at interval of 4170' which represent an age of Upper Miocene. *Discoaster knepperi*/*Sphenolithus radians*, is more abundant at interval of 5930' which represent an age of Lower Eocene. 6470' has an abundant of *Tribrachiatus orthostylus* indicating lower Paleocene to Lower Eocene. Upper Paleocene assemble is characterized by *Fasciculithus involutus* and *Neochiastozygus junctus*. 7450' has more abundance of Upper Paleocene age nannofossil due to the presence of *Neochiastozygus junctus*, *Toweius eminens* and *Zygodiscus plectopons*. *Chiasmolithus sp.* was recorded at depth of 8890' showing the transition from Cretaceous -Tertiary. *Watzaueria Barnsae*, *Gartnerago obliquum* are more abundant indicating the late Cretaceous at depth of 9340'. 9830' has *Lithastrinus septenarius* and

Marthasterites furcatus nanofossils which are indicative of Santonian/Coniacian age 10330' shows the presence of *Stoverius achylosus* along with *Eprolithus floralis* nannofossil which suggest Turonian age *Lucianorhabdus maleformis* nannofossil at depth of 10780' which is indicative of age not older than Late Cretaceous.

5. CONCLUSION

Biostratigraphy analysis was reviewed within the MARS Field for Three well, MARS 5, MARS 1 and MARS 3 the result of the analysis show similarities in biostratigraphy sequence but each well may encounter the sequence at various depth due to the location of the wells away from each other.

The result of the analysis shows that the analyzed interval is characterized by fairly abundant and diverse distribution of nannofossils within the upper interval while sparse occurrence of nannofossils as well as caved forms were noticed in the lower half of the well section. The Palynomorph are moderately well preserved and highly diverse with an abrupt reduction in abundance and diversity at the Lower section of the well. The Palynomorph evidence supports Cenomanian age at the base of the wells. On the basis of the Foraminiferal, Calcareous Nannofossils and Palynological data, within this study shows that the well sequences range in age from Late Cretaceous (Cenomanian) to Middle – Late Palaeocene. Based on Calcareous Nannofossils suggest an age ranging from Eocene to Miocene.



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