

1 **Geology, Palynomorphs distribution, Stratigraphy and Depositional Environments of**
2 **Lewumeji and Idogun wells, Eastern Dahomey Basin Southwestern Nigeria**

3
4 **Abstract**

5 Selected composited samples from Lewumeji (0-111m) and Idogun (0- 54m) Abeokuta, Eastern
6 Dahomey Basin, Nigeria, were subjected to detailed lithologic and palynological studies. The
7 studies aimed at determining the lithological sequence, relative age, palynological zone and
8 paleoenvironments of deposition. The lithological description was done using a hand lens, visual
9 examination and dilute HCl. The palynologic sample preparation went through sample digestion,
10 flotation and mounting on glass slides in order to determine palynomorphs contents such as
11 pollen, spore and dinoflagellates present.

12 The lithologies from both wells consist of brownish clay, reddish to brown colour sandstone and
13 dark grey shale denoting marine, fluvial, brackish and lagoonal environment. A total of 31 well
14 preserved low to moderate diverse palynomorphs were recovered from the studied area. The
15 palynomorphs frequency percentage distribution shows that both wells have a higher ratio of
16 land-derived pollen and spores to the marine dinoflagellates; (75%, 25% and 61%, 39%) for
17 Lewumeji and Idogun wells respectively. The microfloral assemblages include abundant
18 *Cyathidites* sp., *Cyathidites minor*, *Tubistephanocolpites cylindricus*, *Proteacidites* sp., Trilete
19 spore, *Foveotrilletes margaritae*, *Monocolpites marginatus*, *Monoporites annulatus*, *Pteris* sp,
20 *Distaverrusporites simplex* and *Laevigatosporites* sp. The dinoflagellates recovered were
21 characterized by the likes of *Leiosphaeridia* sp., *Senegalinium* sp., *Oligosphaeridium* sp.,
22 *Paleocytodinium* sp., *Cerodinium* sp. and *Subtilisphaera* sp. The wells fall within *Cyathidites*
23 *Minor* zone, characterized by the diagnostic occurrence of *Cyathidites minor*, *Cyathidites* sp. and
24 *Monocolpites marginatus* dated upper Maastrichtian to early Paleocene. Paleoenvironmental
25 interpretations based on the abundance of freshwater swamps pollen and Spores, diagnostic
26 dinoflagellates cyst and the Palynomorphs Marine Index (PMI) indicated a continental to
27 brackish to the shallow marine environment with the minor influx of freshwater.

28 Keywords: Dahomey Basin, lithostratigraphy, palynology, paleoenvironment,

29 **Word counts: 269**

30 **1 Introduction**

31 The applications of biostratigraphy in the palynological studies have become valuable tools for
32 evaluating the stratigraphy and source rock potential of sedimentary basins. These microfossils
33 include the modern and fossil pollen, spores and dinoflagellates cysts. This marker species gives
34 reliable and accurate information about paleoenvironments. When these markers are efficiently
35 utilized, many of the hindrances encountered in paleoenvironmental synthesis can be avoided
36 (Adegoke, 2012). The study area, Lewumeji and Idogun wells, falls within the Abeokuta group
37 of the Eastern Dahomey basin (Fig.1, Fig. 2). The Abeokuta group is the oldest formation in the
38 Dahomey Basin, southwestern Nigeria, lying non-conformably on the basement (Jones and
39 Hockey, 1964) and it is the thickest group within the basin, with an average thickness of 200m
40 (Fayose, 1970). The basin is a pre-cratonic basin that was developed during the initiation of
41 rifting associated with the opening of the Gulf of Guinea in Cretaceous to Jurassic (Whiteman,

42 1982; Kingston *et al.*, 1983). Agagu, (1985) illustrated and described the lithostratigraphy of the
43 basin to be dominated by the monotony of alternating sand and shale with minor proportions of
44 limestone and clay.

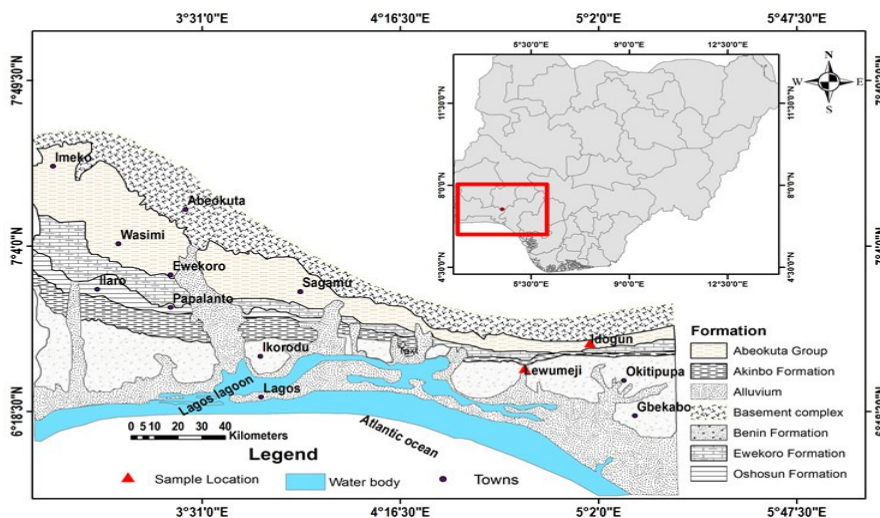
45 Several reports are there to deduce the age of the sediments in the basin. (Omatsola and
46 Adegoke, 1981; Salami, 1987; Obaje and Okosun, 2013, Adeigbe and Amodu, 2015). The
47 stratigraphy of the Dahomey Basin has been well established by various authors (Jones and
48 Hockey, 1964; Omatsola and Adegoke, (981; Coker *et al.*, 1983; Biliman 1992; Enu, 1990.

49 The studied wells are situated between latitudes $06^{\circ}30'0''$ N - $06^{\circ}37'0''$ N and longitude $04^{\circ}45'0''$ E
50 - $05^{\circ}00'0''$ E. and falls within the Abeokuta group of the Eastern Dahomey Basin (Fig.1 and
51 Fig.2)

52 The present study focuses on using palynological and lithostratigraphic data to enhance the
53 detailed general lithological descriptions, estimates of age, and variations in depositional
54 environment, as well as to interpret the biostratigraphy (biozonations) of Lewumeji (0 – 111m)
55 and Idogun wells (0 – 54m).

56 2 Sampling and Methods

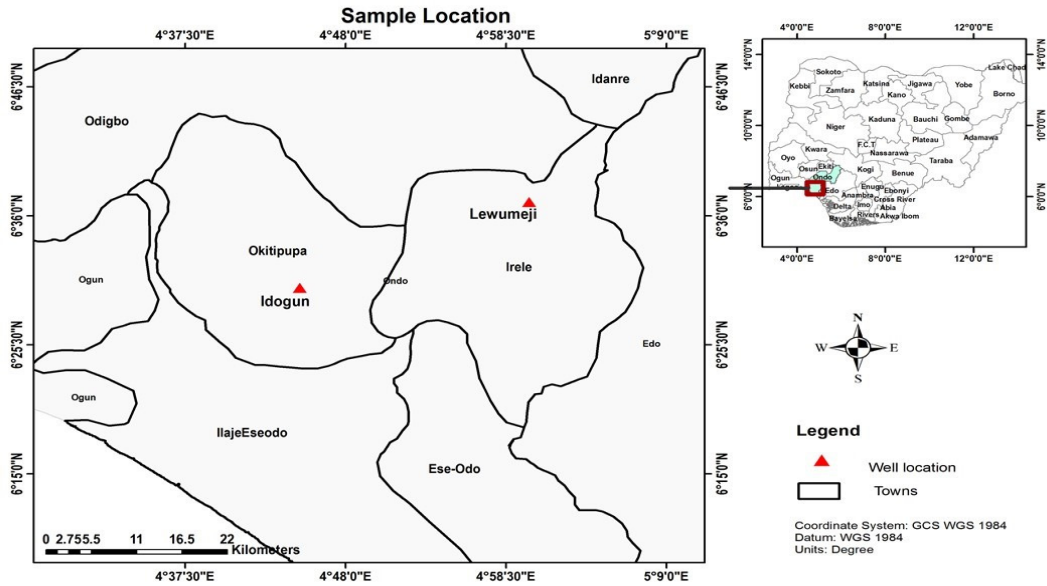
57 The core samples used for this study were collected from the Bitumen project base Ore in Ondo
58 state, Nigeria. The cores were sampled at every 3.0 meters interval from top to bottom of the
59 Boreholes. A total of four composited samples from the Lewumeji well and five composited
60 sample from Idogun well were used for this study.



61

62 Figure 1: Location of Dahomey Basin and the study wells and geological scheme of the area

63 (modified after Biliman, 1992)



64

65 Figure 2: Location map of the exploration wells for this Study, Eastern Dahomey basin,
 66 Southwestern Nigeria. (Inset map illustrates the position of Dahomey basin in Nigeria)

67 **2.1 Lithologic description**

68 Detailed lithologic descriptions were made for the core samples, using following the standard
 69 methods: magnifying lens, reaction with dilute HCl, and physical examination. The description
 70 was based on rock texture, fissility, colour, and fossil content. **2.2 Palynological Analysis**

71 The purpose of palynological preparation is to separate the fossil palynomorphs from the rock or
 72 sediment matrix. A standard extraction method was used. 10g of each sample was weighed,
 73 gently crushed to avoid deforming the palynomorphs, and poured into a well-labelled plastic
 74 beaker and placed in a fume cupboard. Each sample was digested with 10% hydrochloric acid
 75 (HCl) for about 15minutes for carbonate removal and soaked overnight with 40% hydrofluoric
 76 acid (HF) for the removal of silicate. From the preceding preparatory stage, a drop of potassium
 77 chlorate (KClO₃) was added, which was stirred and left for about 5 minutes so as to react, it is
 78 then rinsed twice to remove the KClO₃. A 5-micron sieve was then used under a Branson
 79 sonifier to wash out the inorganic matter (mud and clay). A drop of Norland Optical Adhesive
 80 was then deposited on the slides to be used. The slides were studied under a transmitted light
 81 microscope to obtain the palynomorphs images.

82

83 **3.0 Results**

84 **Interpretation and Discussion**

85 **3.1 Lithostratigraphy**

86 The 9 (nine) composited samples of the studied sections of Lewumeji and Idogun wells were
87 carefully studied based on their Lithology, three (3) litho units were identified in the study wells.
88 All the Three (3) unit occur in Idogun well with the alternation of shale and sandstone while two
89 (2) units occurred in Lewumji well with a little clay intercalation. The three litho-units are
90 sandstone, clay and shale. The descriptions of the facie units are presented below, the lithology is
91 shown in Fig. 3 and Fig.4

92 **Lewumeji well**

93
94 Litho unit 1 (0-15m)

95 This unit is on the topmost layer. The sandstone is reddish brown at the upper part of the unit
96 then a light brown at the base of the layer. It has a fine to medium size grains. The unit is 15m
97 thick and was deposited in a fluvatile environment. This is further confirmed by the
98 palynological study carried out which revealed the presence of an angiosperm pollen
99 Tubistephanocolpites cylindricus

100 Litho unit 2 (15 – 111m)

101 This unit is 96m thick. It is composed of dark to greyish, fissile to non- fissile, carbonaceous
102 shale. Also, the occurrence of micro foraminiferal wall lining and Laevigatosporites sp. within
103 the interval suggests that it could have been deposited in a marine environment.

104 **Idogun well**

105
106 Litho unit 1 (0 -9m)

107 This unit is 9m thick, it is reddish brown, non- carbonaceous clay. This litho unit portrays a
108 mixed depositional environment in which there is a strong influence of fluvial on the lagoonal
109 environment.

110 Litho unit 2 (9 – 15m)

111 This interval is composed of fine to medium grain sandstone with evidence of shelly whitish
112 material in some horizons. It is 6m thick and reddish brown to brown in colour. The sediment
113 was deposited in a fluvial environment.

114 Litho unit 3 (15 – 24m)

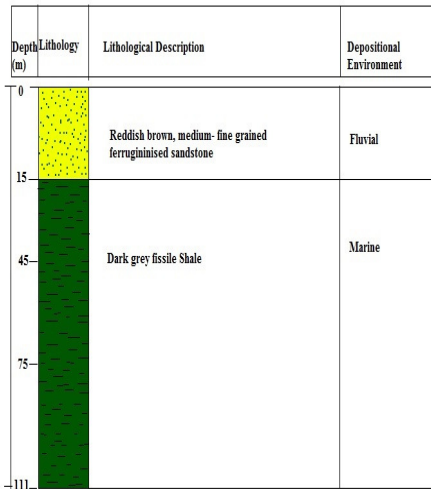
115 This unit which is about 9m thick is shaley, dark grey in colour, non- fissile and could have been
116 deposited in a marine environment.

117 Litho unit 4 (24 – 42m)

118 This unit is made up of grey coloured sandstone. Fine to medium grained. The occurrence of
119 Monocolpite marginatus, Tubistephanocolpites cylindericus also suggests deposition in a
120 fluvatile environment.

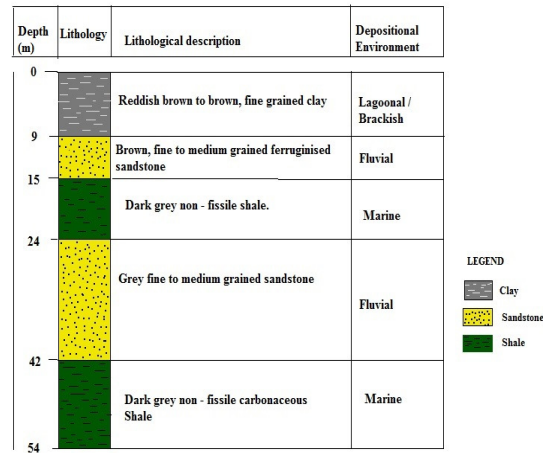
121 Litho-unit 5 (42 -54m)

122 This interval consists of a dark to greyish non- fissile shale. It is carbonaceous. The units are
 123 about 9m thick and the high occurrence of dinoflagellates cysts like *Senegalinium* sp,
 124 *Paleocytodinium* sp, *Subtilisphaera* sp. a marine setting.



125

126 **Figure 3: Lithology of the studied interval of**
 127 **Lewumeji well, Dahomey Basin, Nigeria.**



128 **Figure 4: Lithology of the studied interval of**
 129 **Idogun well, Dahomey Basin, Nigeria**

128 3.2 PALYNOLOGICAL STUDIES

129 Analytical breakdown of the palynomorphs showed that the samples are well preserved with a
 130 low to moderate occurrence and moderately diverse pollen, spores and the dinoflagellates. Some
 131 of the palynomorphs recovered in Lewumeji well are *Tubistephanocolpites cylindricus*,
 132 *Proteacidites* spp., *Monocolpites marginatus*, *Cyathidites* spp., *Laevigatosporites* spp., *Cyathidies*
 133 *minor*, *Leiosphaeridia* spp.. and marine diagnostic specie micro foraminiferal wall lining was
 134 recorded, palynomorphs recovered in Idogun well are *Monoporites annulatus*, *Monocolpites*
 135 *marginatus*, *Proteacidites* spp., *Foveotriletes Margaritae*, *Mauritiidites lehmani*,
 136 *Tubistephanocopites cylindricus*, *Cyathidites* spp., *Laevigatosporites* spp., trilete spore,
 137 *Distaverrusporites simplex*, *Pteris* spp., *Leiosphaerida* spp., *Cerodinium* spp.,
 138 *Oligosphaeridium* spp., *Paleocystodinium* spp., *Senegalinium* spp. *Subtilisphaera* spp. and
 139 marine diagnostic specie micro foraminiferal wall lining. The marine dinoflagellates cyst makes
 140 up to 39%, while the pollen and spores make up to 27.77% and 33.3% respectively of the total
 141 palynomorphs in Idogun well while the marine dinoflagellates cysts make up about 25%, while
 142 the pollen and spores makes up to 33.33% and 41.66% respectively of the palynomorphs in
 143 Lewumeji well.

144 3.2.1 Palynological zones and Correlation

145 The erection of biozonations is dependent on the evolution, extinction and quantitative
146 occurrence of marker forms present in the sediments (Ola- buraimo, 2012). The palynological
147 interpretation of the analyzed interval was based on diagnostic marker species. For the entire
148 section of the Lewumeji (0 – 111m) and Idogun (0 -54m) wells, the recovered palynomorphs
149 enabled the delineation of one major zone which is the *Cyathidites minor* Assemblage zone,
150 based on the abundance of *Cyathidites minor*, *Cyathidites* sp and *Monocolpites marginatus* this
151 erected zone can also be correlated with *Spinizonocolpites bacculatus* zone of Lawal and
152 Moullade, (1987). The details of the palynological zones recognized for Lewumeji and Idogun
153 well are discussed below and shown graphically in the palynology distribution chart (Fig. 5 to
154 Fig. 8). The chart shows the ages of the recovered palynomorphs and the Index palynomorphs
155 which marked the zones as recorded in the bio-event section of the chart. The basis of
156 characterizations of Lewumeji and Idogun wells are given below:

157 **Zone:** *Cyathidites minor* Assemblage zone

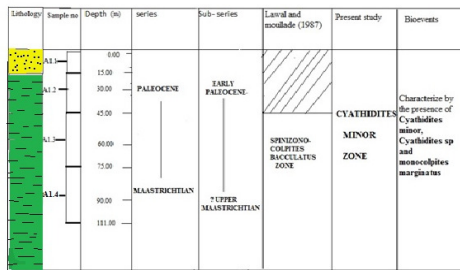
158 **Interval:** 0.00m – 111.0m; 0.00m – 54.0m

159 **Age:** Upper Maastrichtian –Paleocene

160 **Characteristics**

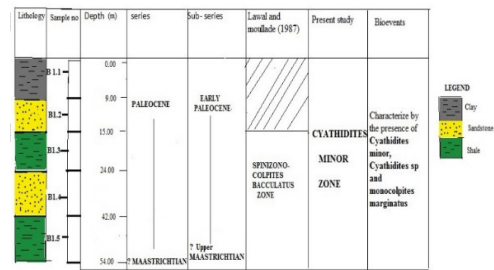
161 For the Lewumeji well, the zone is marked at the base (75.00-111.00m) by the abundance
162 *Cyathidites* sp, *Cyathidites minor*, *Tubistephanocolpites cylindricus*, and the acritarch
163 *Leiosphaeridia* Sp. The part near the base (45.00- 75.00m) is characterized by the new
164 appearance of *Monocolpites marginatus*, *Laevigatosporites* spp., Microforaminiferal wall lining
165 and continuous occurrence of *Leiosphaeridia* Spp.. Close to the top of the well (15.00- 45.00m)
166 is the new appearance of *Proteacidites* sp, continuous occurrence of *Laevigatosporites* sp and
167 *Cyathidites* sp. while the topmost part (0.00-15.00m) is very sparse in spores and dinoflagellates
168 cyst but marked by the single occurrence of an angiosperm pollen which is
169 *Tubistephanocolpites cylindricus* (table 1). Many of the palynomorphs found in this well have
170 been reported for late Maastrichtian to Paleocene sediment in the basal part of Araromi (Salami
171 1984, Adeigbe and Amodu, 2015), for the Paleocene sediment of Pan tropical area (Germeraad
172 *et al.*, 1968), for the Cretaceous sediment of upper Benue trough (Lawal and Molluade, 1986;
173 Awad, 1994), Major forms present in the upper Maastrichtian facies are often present in
174 Paleocene sediments. (Ola-Buraimo, 2012; Ayinla *et al.*, 2013).

175 For Idogun well, the study interval also belongs to the *Cyathidites minor* assemblage zone.
 176 Dinoflagellates cysts dominate the basal part (42.00-54.00m) of the well, which is an indication
 177 of more marine influence., These microfossils include *Senegalinium* sp, *Oligosphaeridium* sp,
 178 *Subtilisphaera* sp, *Cerodinium* sp and relatively high frequency of *Paleocystodinium* sp. The
 179 diagnostic marker forms present are *Cyathidites* sp., *Monoporites anulatus* and *Monocolpites*
 180 *marginatus*. At depths 24.00 to 42.00m there is re-occurrence of *Monocolpites marginatus* and
 181 new forms that are diagnostics of late Maastrichtian age, emerged, they include *Mauritiidites*
 182 *lehmani*, *Tubistephanocolpites cylindricus*, and *Pteris* sp. the overlying interval (15.00 –
 183 24.00m) is characterized by occurrence of new forms *Distaverrusporites simplex* which supports
 184 the late Cretaceous age (Durugbo and Aroyewun, 2012). The overlying interval 9.00 – 15.00m is
 185 relatively rich in palynomorphs, it is composed of continuous occurrence of *Cyathidites* sp.
 186 Miospores and dinocysts that appear for the first time are *Leiosphaeridia* sp, trilete Spore,
 187 Microforaminiferal body-wall lining, *Foveotriletes margaritae*, and *Laevigatosporites* sp. The
 188 topmost interval 0.00m -9.00m is characterized by the reoccurrence of *Cyathidites* sp. and new
 189 appearance of *Proteacidites* sp. as shown in table 2

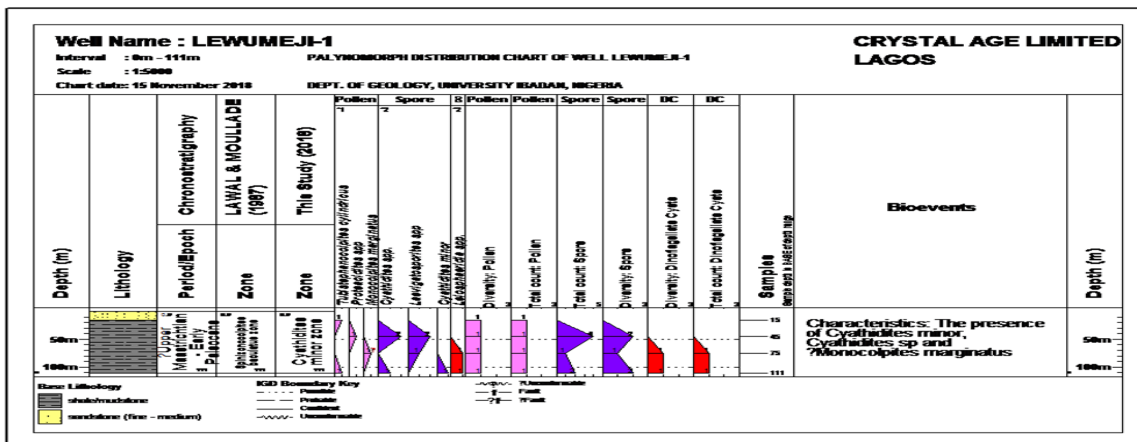


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191 Fig 5: Palynomorphs zones recognised in
 192 Lewumeji well.

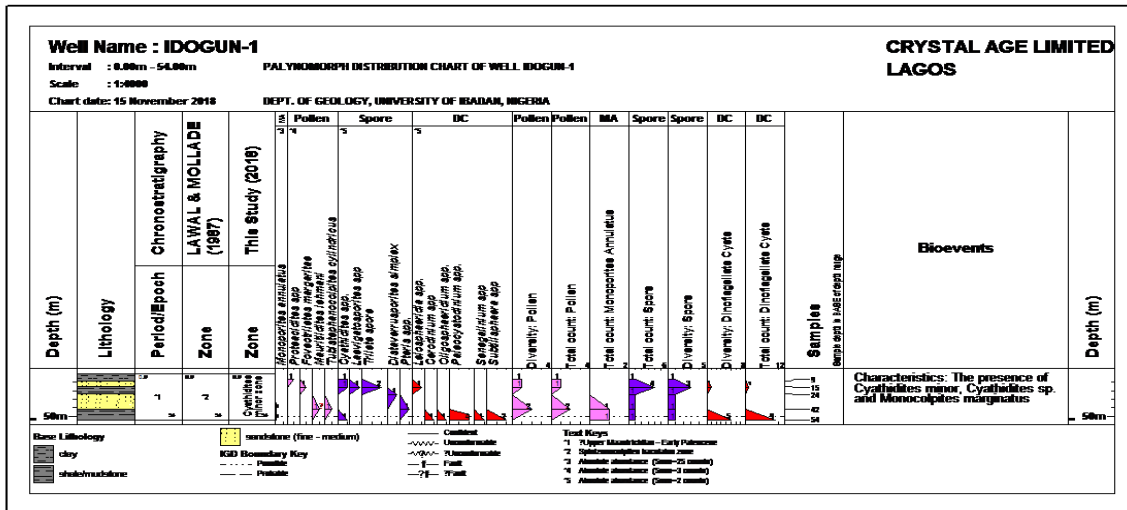


193 Fig 6: Palynomorphs zones recognised in
 194 Idogun well.



193

194 Figure 7: Palynomorph distribution in Lewumeji well (0.00 – 111m).



195

196 Figure 8: The palynomorph distribution Chart of Idogun well (0.00 – 54m).

197 Table 1: The distribution of palynomorphs species recovered in Lewumeji well and the number
198 counts for specie type

SAMPLE NO	Depth (m)	Lithology	Palynomorphs recovered	Counts/Species Type
A1.1	0 - 15.00	Sandstone	<i>Tubistephanocolpites Cylindricus</i>	1 (P)
A1.2	15 - 45	Shale	<i>Cyathidites</i> sp <i>Proteacidites</i> sp <i>Laevigatosponites</i> sp	2(S) 1(P) 2(S)
A 1.3	45 -75	Shale	<i>Monocolpites Marginatus</i> <i>Leiosphaeridia</i> sp Microforaminiferal wall lining <i>Laevigatosponites</i> sp	1 (S) 1 (DC) 1 (DC) 1(S)
A 1.4	75 -111	Shale	<i>Leiosphaeridia</i> sp <i>Cyathidites</i> sp <i>Cyathidites Minor</i> <i>Tubistephanocolpites Cylindricus</i>	1 (DC) 1 (S) 1(S) 1(P)

Legend
P - Pollen
S - Spores
DC - Dinoflagellates

Sandstone
Shale

199

200 Table 2: The distribution of palynomorphs species recovered in Idogun well and the number
201 counts for species types.

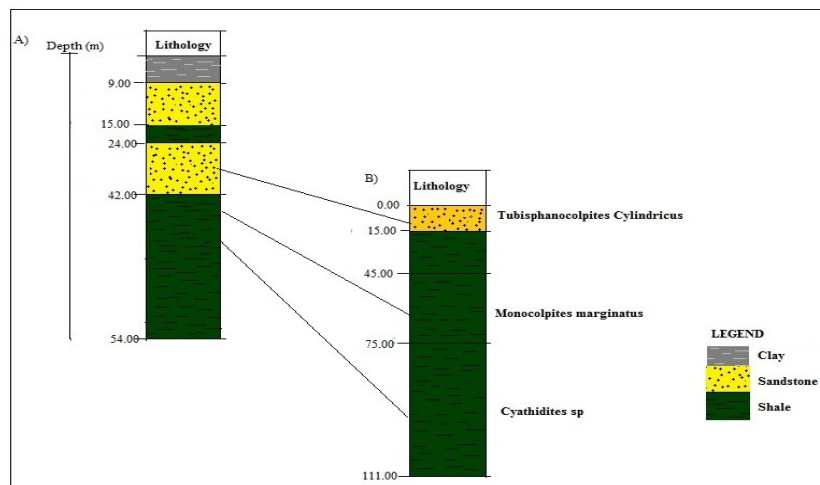
Sample no	Depth (m)	Lithology	Palynomorphs Recovered	Counts/ Species Type
B1.1	0 - 9.00	Clay	<i>Cyathidites</i> sp <i>Proteacidites</i> sp	1(S) 1(P)
B1.2	9.00 -15.00	Sandstone	<i>Leiosphaeridia</i> sp , Trilete spores Microforaminiferal wall lining , <i>Cyathidites</i> sp <i>Foveotriletes Margaritae</i> , <i>Laevigatosponite</i> sp	1 (DC) , 2(S) 1 (DC) , 1 (S) 1(P) , 1 (S)
B1.3	15.00 - 24.00	Shale	<i>Distaverusponites simplex</i>	1 (S)
B1.4	24.00 - 42.00	Sandstone	<i>Monocolpites Marginatus</i> <i>Maunitidites Lehmani</i> <i>Tubistephanocolpites Cylindricus</i> <i>Ptenis</i> sp	1(P) 1(P) 1(P) 1(S)
B1.5	42.00 - 54.00	Shale	<i>Senegalinium</i> sp <i>Paleocyrodinium</i> sp <i>Subtilisphaera</i> sp <i>Cyathidites</i> sp <i>Monocolpites Marginatus</i> <i>Cerodinium</i> sp <i>Oligosphaeridium</i> sp <i>Monoponites Annulatus</i>	1 (DC) 4 (DC) 2(DC) 1 (S) 1(P) 1 (DC) 1(DC) 2(P)

LEGEND
S - Spore
P - Pollen
DC -Dinoflagellates cysts

Clay
Sandstone
Shale

202

203 Correlation of intervals (fig.9) within both wells using terrestrially sourced spores and pollen
 204 shows a lot of similarities, this suggests that the sediments were deposited under the same
 205 conditions and the miospores might have come from the same origin during the same period and
 206 sediments were partly deposited under the same condition.



207

208 Figure 9: Correlation chart of the study sections using the recovered palynomorphs from both
 209 wells (a) Idogun well (b) Lewumeji well

210 3.2.2 Environment of deposition

211 Interpretation of the depositional paleoenvironment was carried out using different means based on
 212 the preferable environment of deposition of environmentally indicative forms, palynomorphs
 213 frequency distribution, and comparison of land-derived forms to marine source. The
 214 palynomorphs frequency percentage distribution shows that both well has a higher frequency of
 215 land-derived miospore to the marine dinoflagellates; (75%, 25% and 61%, 39%) for lewumeji
 216 and Idogun well respectively. This suggests that the source of organomacerals are plants and
 217 environment of deposition is likely to be from continental to brackish environment of deposition
 218 (Adeigbe et al., 2013).

219 The occurrence of environmentally indicative forms in lewumeji and Idogun well such as
 220 Leiosphaeridae Sp indicative of neritic environment (Ayinla et al., 2013), monocolpites
 221 marginatus suggestive of coastal plain habitat (Adeigbe and Amodu 2015), foraminifera wall
 222 linings suggestive of nearshore environments. However, the moderate records of fern spores such
 223 as Cyathidites sp, Cyathidites minor are indicative of open freshwater swamps (Lawal and
 224 moullade 1987). And the presence of marine loving forms such as Cerodinium sp,
 225 Paleocystodinium sp, and Senegalinium sp and subtilisphaera sp in Idogun well is indicative of

226 shallow marine environments. This suggests a depositional environment that varies from
 227 continental to brackish to shallow marine environment with the minor influx of freshwater.

228 The Palynomorphs Marine Index which is a semi-quantitative interpretation technique was
 229 employed to further determine the Interval of Idogun (0.00-54.00m) and Lewumeji well (0.00-
 230 111.00m). This method depends on the amount of terrestrial and marine palynomorphs
 231 separately, to deduce the paleoenvironments of fossil forms in respect of the fluvial and marine
 232 environment. Helenes *et al.*, 1998 define PMI (Palynological Marine Index) as:

233 $PMI = R_m/R_t + 1 * 100$

234 Range of classification follows

235 >100 = Fluvial environment

236 100-200 =Fluvial/ marine environment

237 >200 = Marine environment.

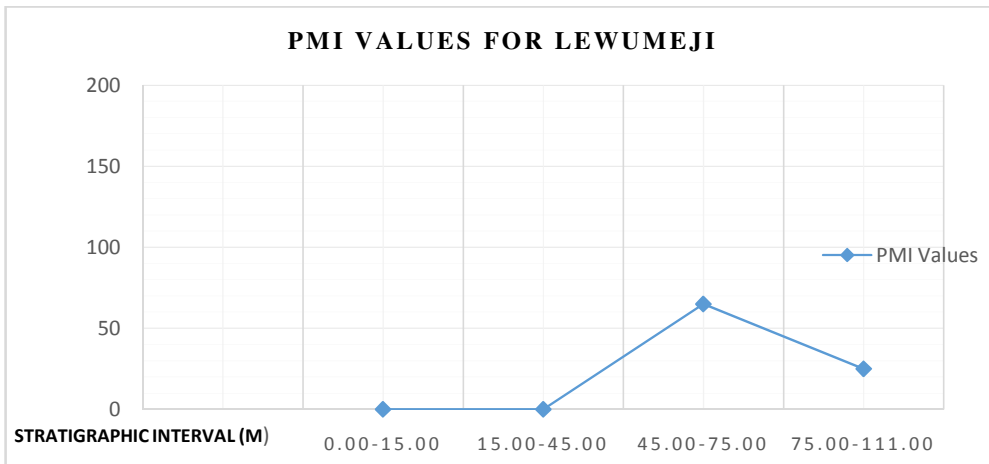
238 Where R_t = Richness/number of terrestrial palynomorphs (pollen + spores + Fungal remains)

239 R_m = Richness/number of aquatic palynomorphs (dinoflagellates+ acritarch + **foraminifera wall**
 240 **linings** + Prasinophytes). High, low and nil values of palynomorph marine index (PMI) indicate
 241 marine, brackish and freshwater environments respectively (Chukwuma-Orji *et al.*, 2017).

242 Quantitative interpretation technique applied using Palynomorph Marine Index (PMI) values
 243 show that in Lewumeji well (table 3) PMI value of about 100, indicative of interval 0.00-
 244 111.00m which are equivalent to fluvatile deposit due to the dominance of land-derived
 245 palynomorphs. The PMI values (table 4) show that in Idogun well, intervals with PMI values of
 246 about 100, indicative of interval 0.00-9.00m, 9.00-15.00m, 15.00-24.00m, and 24.00 -42.00m are
 247 equivalent to fluvatile deposits, while the lowermost part with the depth range of 42.00 –
 248 54.00m has a PMI value between 100-200 which is indicating an alternation of continental and
 249 marine deposits. Therefore, from the general view of the PMI values against analyzed
 250 stratigraphic interval (fig 10, fig.11), a brackish to Shallow marine environments with minor
 251 freshwater incursions is suggested for the study area.

252 Table 3: Paleoenvironment Interpretation of Lewumeji well from P.M.I. Value of the Palynomorphs Distribution.

Sample No	Depth (m)	Pollen	Spores	Dinoflagellate Cyst	Total	PMI	Paleoenvironment
A1.1	0.00 - 15.00	1	0	0	1	0	Fluvial Deposit / Freshwater environment
A1.2	15.00 - 45.00	4	1	0	5	0	Fluvial deposit /Freshwater environment
A1.3	45.00 - 75.00	1	1	2	4	67	Fluvial deposit /Brackish environment
A1.4	75.00 - 111.00	1	2	1	4	25	Fluvial deposit/ Brackish environment



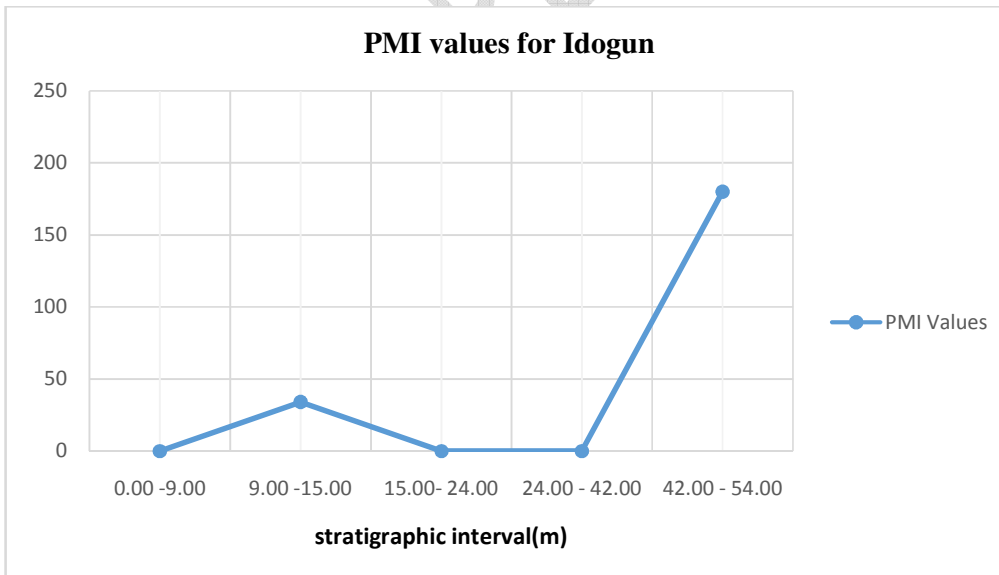
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255 Figure 10: Palynomorphs Marine Index (PMI) chart of Lewumeji well

256 Table 4: Paleoenvironment Interpretation of Lewumeji well from P.M.I. value of the
257 palynomorphs distribution.

Sample No	Depth (m)	Pollen	Spores	Dinoflagellate Cyst	Total	PMI	Paleoenvironment
B1.1	0.00 - 9.00	1	1	0	2	0	Fluvial Deposit / Freshwater environment
B1.2	9.00 - 15.00	1	4	2	7	34	Fluvial deposit/ brackish environment
B1.3	15.00 -24.00	0	1	0	1	0	Fluvial deposit / Freshwater environment
B1.4	24.00 -54.00	1	2	1	4	0	Fluvial deposit/ freshwater environment
B1.5	42.00 - 54.00	3	1	9	13	180	C/Marine deposit/ marine environment

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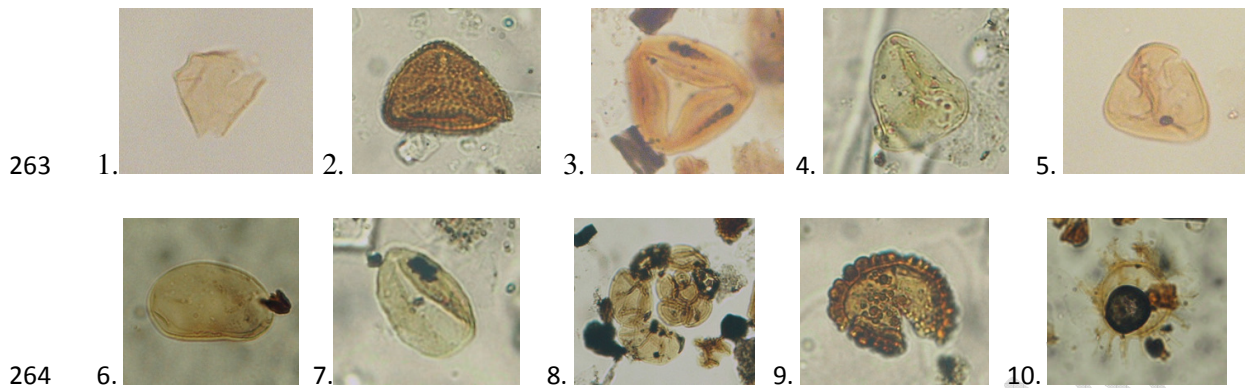


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260 Figure 11: Palynomorphs Marine Index (PMI) chart of Idogun well

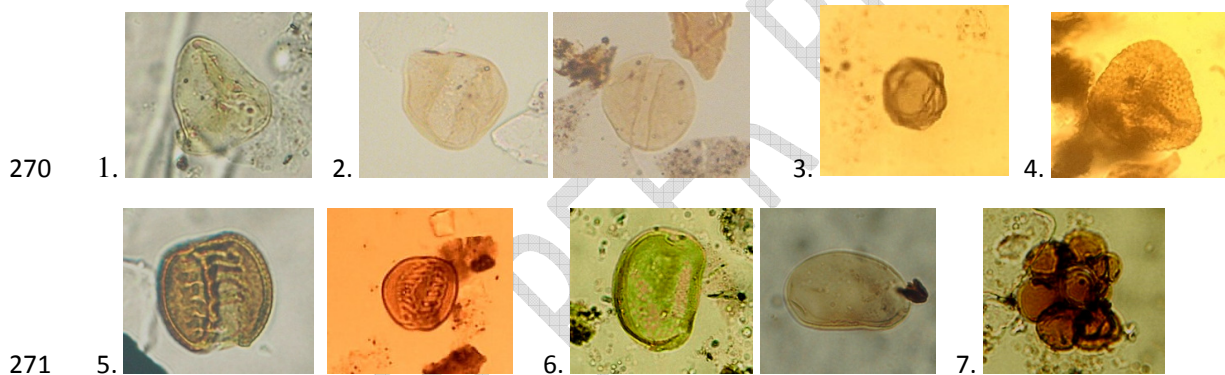
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262 **Plate 1: Some selected palynomorphs taken from the samples of Idogun well**



- 265 1. *Proteacidites* sp 2. *Foveotriletes margaritae* 3. *Pteris* sp 4 & 5. *Cyatidites minor* 6.
266 *Laevigatosporites* sp 7. *Monocolpites marginatus* 8. Microforaminiferal wall linings
267 9. *Distaverrusporites simplex* 10. *Oligosphaeridium* sp.

268
269 **Plate 2: Some selected palynomorphs recovered from Lewumeji-1 well**



- 272 1. *Cyatidites minor* 2. *Monocolpites marginatus* 3. *Leiosphaeridia* sp 4. *Foveotriletes*
273 *margaritae* 5. *Tubistephanocolpites cylindricus* 6. *Laevigatosporites* sp 7. Microforaminiferal
274 wall linings.

275 **Conclusions**

276 The lithological and palynological studies have been appropriately employed to study the sediments
277 of Abeokuta group a part of Eastern Dahomey basin through the use of nine (9) composited core
278 samples from Lewumeji and Idogun well with a depth ranging from 0 -111m and 0-54m
279 respectively.

280 The wells were examined lithologically and five units were delineated which can be further
281 grouped into three for Idogun well two units of shale, two units of sandstone and a clay unit
282 while the Lewumeji well has a lithology of sandstone and shale. Both wells are dominated by
283 fissile to blocky, light to dark grey colour shale and the sand grain varies from medium to fine-
284 grained texture and the clay unit covers a small interval having a reddish brown colouration. This

285 lithology denotes Marine, fluvial and Lagoonal or brackish environment respectively. The thirty-
286 one (31) palynomorphs recovered within the two wells are well preserved with low to moderate
287 diverse pollen, spores and the dinoflagellates cysts. The microfloral assemblages include
288 abundant *Cyathidites* sp, *Cyathidites minor*, *Tubistephanocolpites cylindricus*, *Proteacidites* sp,
289 *Trilete* spore, *Foveotriletes margaritae*, *monocolpites marginatus*, *monoporites annulatus*, *Pteris*
290 sp, *Distaverrusporites simplex* and *Laevigatosporites* sp. The dinoflagellates recovered were
291 characterized by the likes of *Leiosphaeridia* sp, *Senegalinium* sp, *Oligosphaeridium* sp,
292 *paleocytodinium* sp, *Cerodinium* sp and *Subtilisphaera* sp. The palynological assemblage zone
293 identified within the two wells is the *Cyathidites minor* zone, this zone is correlative with the
294 *Spinizonocolpites bacculatus* zone of Lawal and Moullade, (1987). The zone is characterized by
295 the presence of *Monocolpites marginatus*, *Cyathidites minor* and *Cyathidites* Sp. The studied
296 sediments from the wells were deposited in continental to brackish to shallow marine
297 environments with minor freshwater incursions during the upper Maastrichtian – early Paleocene
298 period based on environmental diagnostic species, palynomorphs marine index and frequency
299 distribution of palynomorphs.

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