

LITHOFACIES AND PALEONTOLOGIC ANALYSIS OF WELL Y (1800ft-4200ft) IN NIGER DELTA

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Abstract: *The lithofacies and palaeontological analysis carried out on twenty seven (27) ditch cutting samples in well-Y in Niger Delta within depth range of 1800- 4200ft in an interval of 90ft, Bryozoa provide information on microenvironmental attributes which may be insufficient to characterize the environment as a whole. For instance, high energy environment can contain cryptic microenvironment, such as recesses in the rock or the undersides shells, where Bryozoa adapted to quiet water conditions flourish. It is therefore important to consider evidence from all sources before drawing conclusions about palaeoenvironments from bryozoan data. encrusting and massive forms are found in high-energy environments whereas delicate branching and erect forms lived in quite environments as outlined in the analysis, the age of the formation is Early to Late Miocene and there were significant regional paleoenvironmental fluctuations during this time involving changes in water depth/sea level.*

Key Words: *Paleoenvironment, Bryozoa and Niger Delta.*

1. INTRODUCTION:

Biostratigraphic analysis was carried out on twenty seven (27) ditch cutting samples cuttings retrieved from Well Y located in the region of Niger Delta environment. The Bryozoa (moss animals) are a geologically important group of small animals; some that superficially resemble corals. All bryozoans are colonial and most are marine. Bryozoans are most abundant in temperate-tropical waters that are not too turbid. They require a hard or firm substrate on to which they attach to or encrust, and clear agitated water from which they obtain their suspended food. The aim of this work is to carry out lithofacies and paleontologic, analysis of samples obtained from a well-Y in Niger Delta and to determine the available fossil and depositional environment of the study area.

2. LOCATION OF STUDY AREA:

The area of study is an oil well in Niger Delta Basin in Nigeria. The study area lies between longitude 3⁰ 61'E and 9⁰ 56'E and latitude 4⁰ 53'N and 5⁰ 45'N

3. GEOLOGICAL SETTING AND STRATIGRAPHY:

The Niger Delta Basin is the largest basin on the continental margin of the Gulf of Guinea, covering an area of about 300,000 km² Kulke et al(1995),with a sedimentary thickness of over 10 km in the basin center Kaplan et al. (1994). It lies between longitudes 4⁰E and 8.8⁰E and latitudes 3⁰N and 6.5⁰N,the basin occupies the oceanward part of a larger and older tectonic feature, the Benue Trough; hence its evolution has been linked to the Benue-Abakaliki Trough - a sedimentary complex. According to Murat et al. (1972). and Weber et al. (1975),the stratigraphic history of the Niger Delta Basin in terms of tectonic event revealed that the basin represents the third cycle in the evolution of the southern Nigerian sedimentary basins thus: (a) Benue-Abakaliki phase (Aptian - Santonian), (b) Anambra-Benin phase (Santonian - Early Eocene) and (c) Niger Delta phase (Late Eocene - Recent).

4. METHODOLOGY:

A total of 27 ditch cuttings were analysed for Well Y from interval of 1800-4200ft. These samples were processed and analysed at 90ft. interval for planktic foraminifera using the standard micropaleontological sample preparation procedures. Samples were first laid out sequentially according to their depths. Labels were prepared for each sample. Clean sample plates are laid out. About 25g of samples were placed (for ditch cutting samples) into the sample plates. The samples were dried on a hot plate at about 800⁰C for 1-2 hours. The sample plates were allowed to cool and weighed. The samples were decanted, topped with water and left overnight. The samples were washed with liquid soap and water through four sieve mesh sizes of 500, 250, 150 and 63 microns and dried. Samples were transferred into four different bags/phials and labelled accordingly. Foraminifera were picked from the packaged samples and studied with the aid of a reflected light binnocular Zeis microscope. All the planktic foraminifera recovered were analysed. Generic and species identification were based on Bolli and Saunders (1985).

5. RESULT AND INTERPRETATION:

The result got from the analysis carried out was tabulated for easier reading. The tabulated figures were further used to plot a chart for correlation and better interpretation in the study especially of sediments and the paleoenvironment.

6. LITHOSTRATIGRAPHY:

Sedimentological characteristics derived from the detailed description of the ditch cutting samples include lithology, type of rock, texture, mineralogy, fauna content and environmentally sensitive index minerals and accessories. Chemical test were carried out to determine the presence of calcareous materials by using dilute HCl

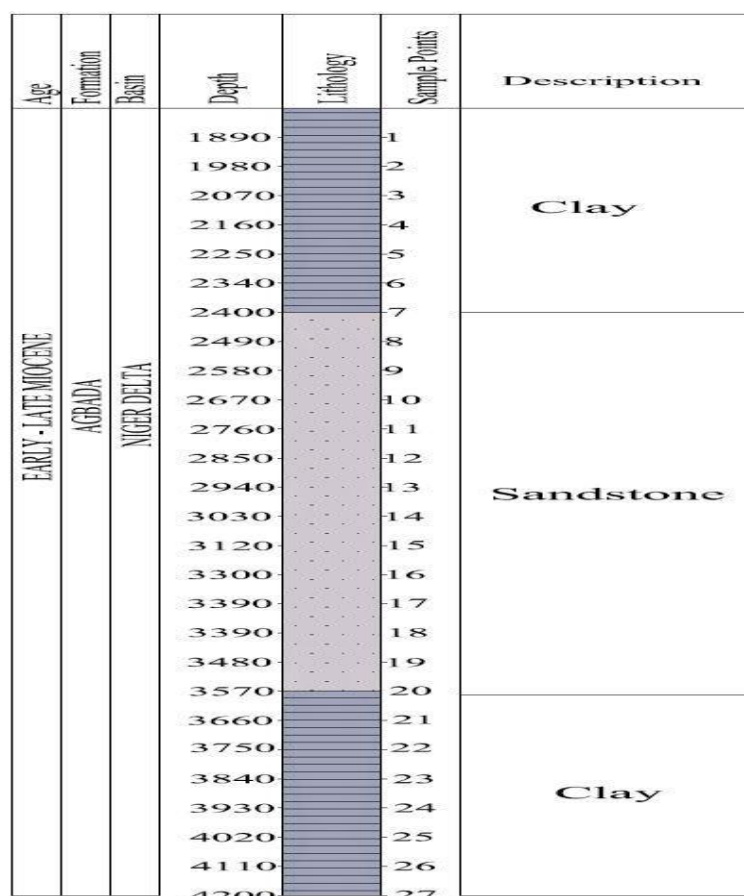


Figure.1: Lithologic Discription of the Study Area.

Table.1: Showing grain size analysis

Serial number	Depth (ft)	Original weight of sample(g)	Weight of paper	A	%	B	%	C	%	D	%
1	1890	25	0.6	7.8	31.2	1.4	5.6	0.8	3.2	15	66.4
2	1980	25	0.6	9.8	39.2	1.0	4	0.1	0.4	14.1	56.4
3	2070	25	0.6	11.6	46.4	0.2	0.8	0.1	0.4	13.1	52.4
4	2160	25	0.6	13.9	55.6	0.6	2.4	0.1	0.4	10.4	41.6
5	2250	25	0.6	13.1	52.4	2.1	8.4			9.8	39.2
6	2340	25	0.6	18.1	72.4	0.2	0.8	0.1	0.4	6.6	26.4
7	2400	25	0.6	17.1	68.4	0.1	0.4	0.3	1.2	7.5	30
8	2490	25	0.6	2.5	10	3.2	12.8	2.0	8	17.3	69.2
9	2580	25	0.6	7.3	29.2	0.7	2.8	0.6	2.4	16.4	65.6
10	2670	25	0.6	6.0	24	1.4	5.6	0.8	3.2	16.8	67.2
11	2760	25	0.6	11.6	46.4	0.5	2	0.4	1.6	12.5	50
12	2850	25	0.6	15.2	60.8	1.0	4	0.5	2	9.3	37.2
13	2940	25	0.6	7.7	30.8	0.9	3.6	0.7	2.8	15.7	62.8
14	3030	25	0.6	10.8	43.2	1.1	4.4	0.7	2.8	12.4	49.6
15	3120	25	0.6	6.6	26.4	1.7	6.8	0.9	3.6	15.8	63.2
16	3210	25	0.6	13.9	55.6	0.8	3.2	0.9	3.6	9.4	37.6
17	3300	25	0.6	7.7	30.8	0.7	2.8	0.6	2.4	16	64
18	3390	25	0.6	14.4	57.6	0.3	1.2	0.2	0.8	10.1	40.4
19	3480	25	0.6	13.3	53.2	0.2	0.8	0.1	0.4	11.6	46.4
20	3570	25	0.6	9.7	38.8	1.5	6	0.9	3.6	12.9	51.6
21	3660	25	0.6	7.5	30	1.6	6.4	1.3	5.2	14.6	58.4

22	3750	25	0.6	11.3	45.2	1.3	5.2	2.0	8	10.4	41.6
23	3840	25	0.6	8.8	35.2	0.8	3.2	1.3	5.2	14.1	56.4
24	3930	25	0.6	7.7	30.8	1.2	4.8	0.9	3.6	15.2	60.8
25	4020	25	0.6	11.1	44.4	0.7	2.8	0.1	0.4	13.1	52.4
26	4110	25	0.6	8.5	34	1.5	6	0.8	3.2	14.2	56.8
27	4200	25	0.6	10.4	41.6	0.5	2	0.4	1.6	13.7	54.8

27 Sample were wet sieved to determine the percentage of sand, silt and clay ratio, the sample was also examined for their fossils content.

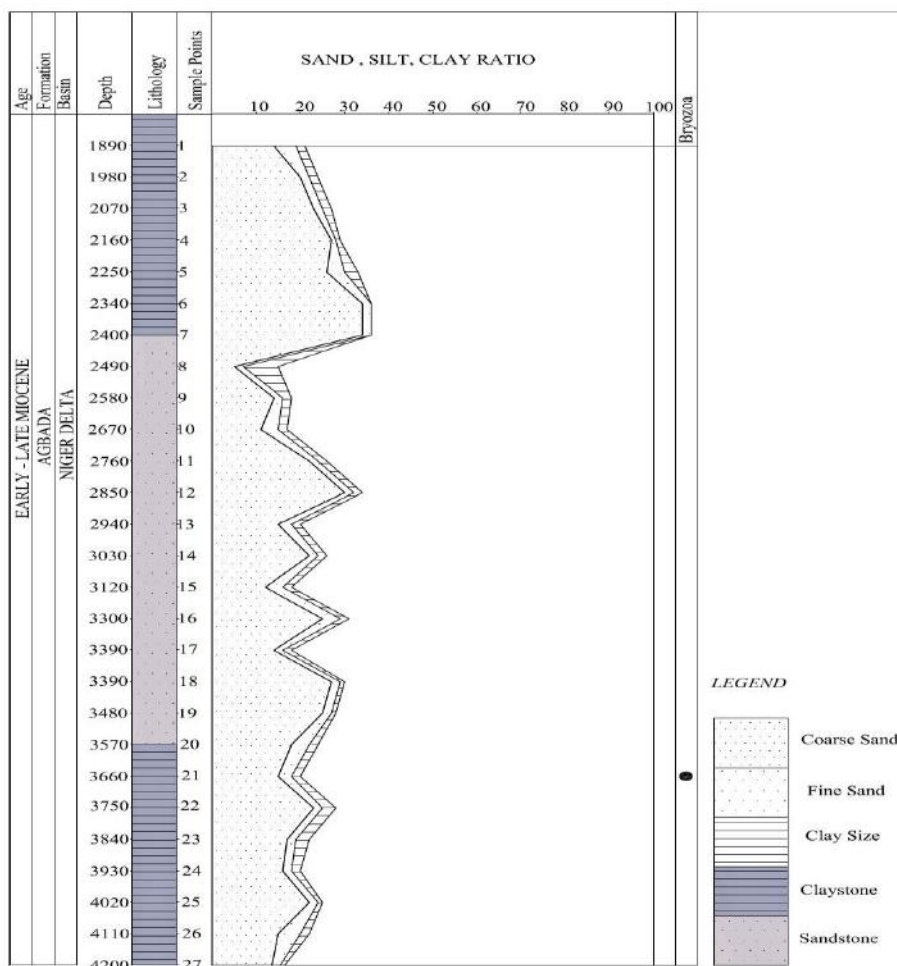


Figure.2: Percentage distributions of Sand, Silt Clay, Ratio

7. LITHOFACIES ANALYSIS:

In this analysis, percentage distribution of the rock fragment, ferruginized, quartz, mica flask, heavy mineral, rootlet, leaflet and fossils are noted. The distribution of the lithofacies component within the depth interval of 1890-4200ft of well Y is tabulated below. This tabulated value makes it easier to read and interpret the depth.

Table.2: Showing Lithofacies analysis.

Sample point	Depth (ft)	Rock fragment	Ferrogitized sandstone	quartz	mica	Heavy mineral	Rootlet	Leaflet
1	1890	45	-	28	10	17	-	-
2	1980	40	30	15	5	10	-	-
3	2070	-	55	25	-	20	-	-
4	2160	-	75	20	-	5	-	-
5	2250	-	25	65	10	-	-	-
6	2340	-	30	56	4	10	-	-
7	2400	30	-	45	10	15	-	-
8	2490	50	15	20	5	10	-	-
9	2580	44	14	20	10	12	-	-
10	2670	40	15	35	10	-	-	-
11	2760	30	16	36	10	8	-	-

12	2850	-	30	50	5	10	5	-
13	2940	-	30	40	15	-	10	5
14	3030	50	10	30	10	-	-	-
15	3120	30	23	25	14	-	8	-
16	3210	-	25	70	5	-	-	-
17	3300	30	20	30	10	-	10	-
18	3390	40	22	28	-	-	10	-
19	3480	30	15	35	10	10	-	-
20	3570	30	20	30	15	-	5	-
21	3660	30	15	30	10	15	-	-
22	3750	35	10	30	15	10	-	-
23	3840	40	15	30	15	-	-	-
24	3930	35	15	20	10	10	10	-
25	4020	-	-	30	20	-	20	30
26	4110	-	40	30	5	-	10	15
27	4200	20	20	10	5	-	20	25

8. BIOSTRATIGRAPHY:

This is the differentiation and correlation of rock units on the basis of their fossils. The foraminifera species recovered from the sample are shell fragment and *Bryozoa*. The foraminifera microfauna of the 3660ft of Well Y is predominantly of calcareous taxa. The distribution chart is as shown in Figure.3

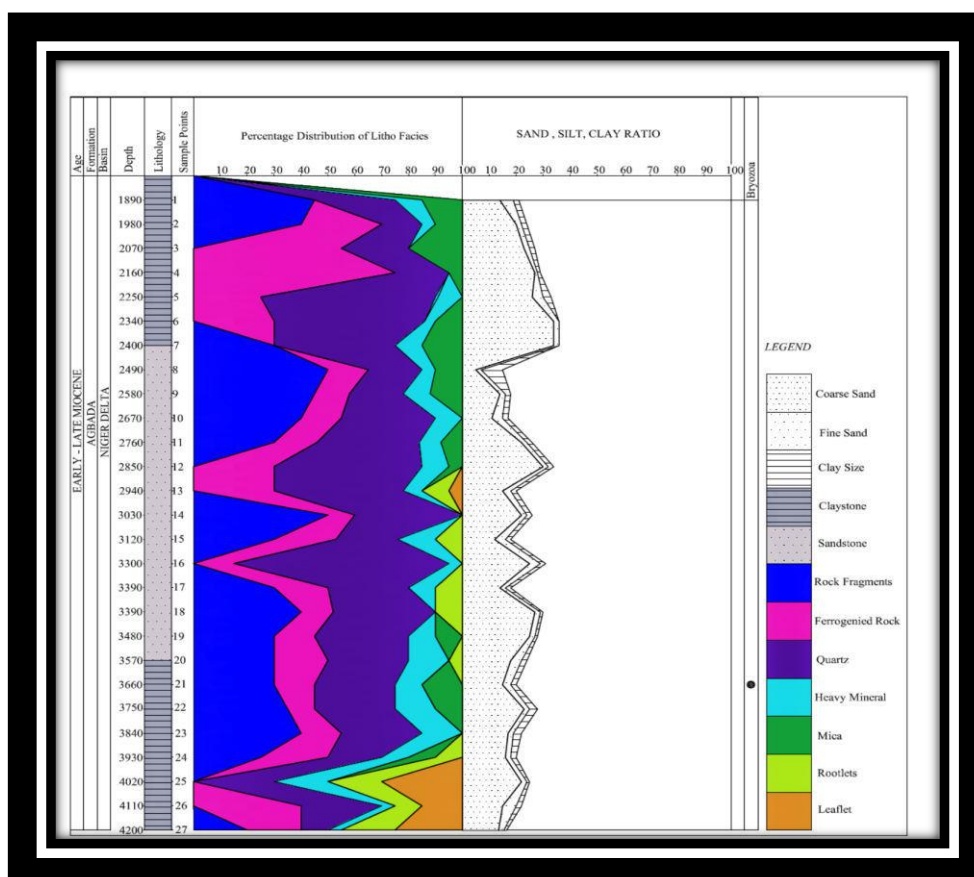


Figure.3: Percentage Distribution of Lithofacies, Grain size analysis and Fossils content.

9. DISCUSSIONS:

From the trend of the Paleontological study and lithofacies analysis that was carried out, it is obvious that from the sediment to extensive marine environment of the younger sediments. Most of the environmental interpretations here are mainly based on the affinities of minerals is also useful in determining the depositional environment.

From sample 1-7 marks a decrease in rock fragment with a little decrease in ferruginized sandstone and also an increase abundant in quartz, mica and heavy mineral is also presence within these depths on a small scale. The presence of rootlet, leaflet and some macrofauna phylum Mollusca which include Shell fragment; but an increase and decrease of the macrofauna which shows a remarkable abundant with the presence shell fragment indicate littoral

biofacies and poor benthonic marine depositional environment. The rock sample within these intervals is intercalated with sandstone, siltstone and clay.

From sample 8-14 shows a relative dominance with increase of rock fragment over ferruginized sandstone and an increase in quartz, but within sample point 12-13 there is an absent of rock fragment; and a fluctuation of mica, heavy mineral, rootlet and leaflet may indicate an infiltration of marine water/redeposition into the marine depositional environment. But within sample 15-21; shows an abundant of heavy mineral and a fluctuation of mica and rootlet present and intrude the following in decreasing order of abundance; rock fragment, ferruginized sandstone and quartz. In sample 19-21 shows an absent of leaflet. The rock sample within these intervals is intercalated with sandstone, siltstone and clay. The microfauna phylum (Phylactolamata and order Ctenostomata) include *Bryozoa* and shell fragment; *Bryozoa* provide information on microenvironmental attributes which may be insufficient to characterize the environment as a whole. For instance, high energy environment can contain cryptic microenvironment, such as recesses in the rock or the undersides shells, where bryozoa adapted to quiet water conditions flourish. It is therefore important to consider evidence from all sources before drawing conclusions about palaeoenvironments from bryozoan data. Sample 22-27 are very few in number which probably indicates that the environment of deposition was not favorable. In general, the rock fragment found within the lithofacies distribution chart indicates that volcanic rocks from a high mountainous area have been eroded and transported to the basin which is responsible for the abundances of quartz.

10. SUMMARY AND CONCLUSION:

The lithofacies and paleontological analysis of Well Y yielded a reasonable minerals affinities and bryozoa growth-habits are a function of water energy similar to corals which lived in level-bottom communities; encrusting and massive forms are found in high-energy environments whereas delicate branching and erect forms lived in quite environments as outlined in the analysis, the age of the formation is Early to Late Miocene and there were significant regional paleoenvironmental fluctuations during this time involving changes in water depth/sea level, salinity, and temperature; but an increase and decrease of the macrofauna which shows a remarkable abundant with the presence shell fragment indicate littoral biofacies and poor benthonic marine depositional environment. The rock sample is intercalated with sandstone, siltstone and clay.





Fig 10-12 Stereo photos of lithodebris coarse grains (90µm) and medium size grains (75µm) showing rock fragment, ferruginized sand stone, quartz, heavy minerals and mica. They are sub angular, angular – well rounded.

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