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Research Article

PALEOENVIRONMENTAL ANALYSIS OUTCROP IN AKPOHA AFIKPO BASIN SOUTH EASTHERN, NIGERIA

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ABSTRACT

The palynological analysis of Eleven surface outcrop sample exposures at Akpoha in Afikpo, Southeastern Nigeria yielded a very poor records of palynomorphs dominated by palm pollen, spore and fungal spore with very few acritarch ,common fungal spores and sparse records of the *Psilatricolpites sp, Cyathidites sp, Psilatricolpites crassus, Laevigatosporites discordatus, Verrucatosporites farvus, Zonocosites ramonae.*. The sequences composed of alternating successions of light to dark grey, soft to moderately hard and fissile shale and siltstones, with sand intercalations, Carbonaceous matter and non-calcareous. The recovered micro floral assemblages are very poor and common fungal spores suggest near-shore to marginal marine depositional environments. Published ranges of the palynostratigraphically important taxa enabled the delineation of the age as Paleocene thereby indicating that the exposure belongs to the Afikpo Formation.

Keywords: Palynomorphs, Palynostratigraphy and Paleoenvironment

INTRODUCTION

The Benue Trough of Nigeria is a deep linear sediments filled basin and it extends from the Niger Delta towards the North-East. It is subdivided into Upper, Middle and Lower Benue Trough. The Afikpo Basin lies in the South-Eastern part of the Lower Benue Trough. Hence, the Benue Trough is the older sedimentary rocks in Nigeria and of the Cretaceous Age. The first marine transgression in Benue Trough occurred in the Middle Albian age with the deposition of Asu River Group of sediments (Reyment, 1965). It is a purely sedimentary basin made of shale, sandstone, siltstone, limestone and mudstone, with igneous intrusive, extrusive and pyroclastics (Murat, 1972; Nwachukwu, 1972). Less than half a kilometre to the northwest, is another dolerite intrusion which was quarried for the construction of this expressway, leaving a pit from which samples for much of this work were taken. In this area, the plunge of the sediments of the Abakaliki Basin and subsequent erosion, have caused the Campanian Nkporo Shale Formation at the baseal Anambra Basin, to overstep onto the Turonian Eze-Aku Shale with the Coniacian-Santonian Awgu Shale missing. The erosional surface of the sequence boundary, reported by Nwajide and Reijers (1997) is not lithologically evident at this point. The continuous shale sequence makes it difficult to demarcate sediments of the Abakaliki Basin from those of the Anambra Basin. The sequence boundary was identified through biostratigraphic analysis and correlated to the 82 my Santonian hiatus, which is the missing Awgu Shale.The aim of this work is to use palynomorphs generated from the study area to infer on the stratigraphy, attempt the palynostratigraphy of the area and interpret paleoenvironment of deposition inthe study
area using identifiedpalynomorphs.

LOCATION OF STUDY AREA/ACCESSIBILITY:

The study area lies between latitude 6°00′ - 5° 50′N and longitude 7° 47′ 30″ - 7° 55′ 20″E within the Afikpo Basin. The area is accessible through Okigwe – Uturu major road and other minor roads that run through it.

GEOLOGIC SETTING AND STRATIGRAPHY:

Sedimentation history of the Anambra Basin is related to the Lower Benue Trough evolution which is usually linked to separation of the Gondwana during the Middle Cretaceous time Nwachukwu, (1972).The evolutionary trend of Anambra Basin is patterned by east to west shifting of the depocenters.The initial area of active sedimentation was located in the Abakaliki Trough from Aptian to Santonian. However, recent studies have shown that the active sedimentation was not restricted to the Abakaliki Trough alone but also took place within the graben of the faulted block segments of the Anambra Basin Jardine *et al*, (1965). The pre Santonian formations are the Asu River Group, Eze Aku and Awgu Formations.However, Reyment, (1965)indicated that the Anambra Basin became active after the Santonian tectonic event. Anambra Platform started prograding by depositing deltaic facies. It later subsides and an east-west prograding system developed. The deltaic system became aborted during the Maastrichtian by the commencement of major marine transgression. The Nkporo Shale and the overlying Lower Coal Measures were deposited towards the

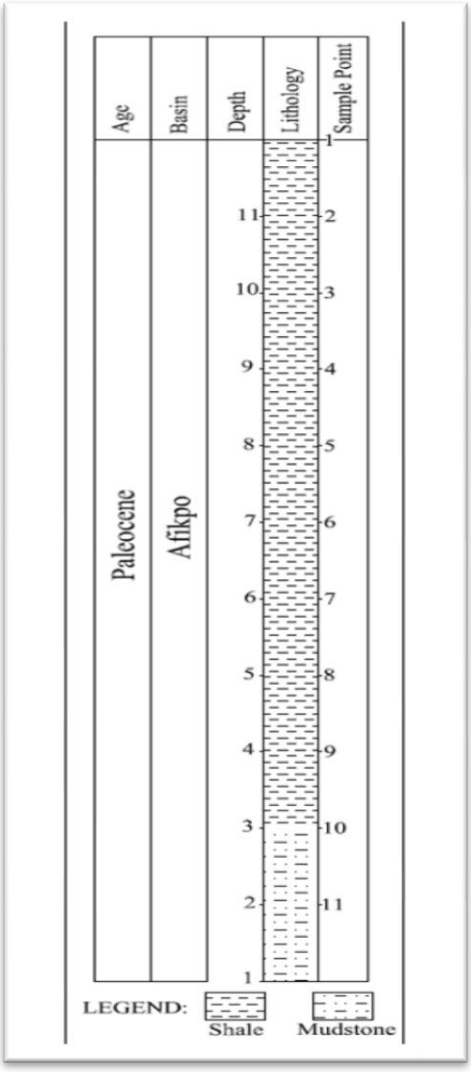
center of the basin.The deltaic system was aborted during the Maastichtian by the commencement of major marine transgression. The Tertiary period was characterized by deposition of Imo Shale (Paleocene); Ameki (Eocene); Ogwashi-Asaba (Late Miocene-Pliocene) and finally overlain by Benin Formation.

MATERIALS AND METHOD

Eleven rock samples were collected from a quarryat Akpohain Afikpo for palynological and lithological description of sample was done by examining them under the binocular microscope by noting the textural characteristics such as colour, grain size, shape (roundness), sorting, effect of ferruginization, and fossil content in terms of plant remains.The crushed samples with initially treated with dilute hydrochloric acid (10%) in order to eliminate three carbonate substance present in them. They were later soaked in 40% hydrofluoric acid for silica and silicates digestion.The samples were not oxidized in order to avoid corrosion; but were sieved with 10 mesh in order to maximize concentration of miospore grains and to achieve clean slides for easy identification and photography. The recovered residues were mounted on glass slides with Depex (DPX). The amount of palynomorph recovered is moderate to barren. Total count of grains present were noted and presented in the checklist for absolute representation of different important pollen and spores grains recovered.

RESULTS AND INTERPRETATIONS

The results have been separated into Lithology, Percentage distribution of palynomorphs and Paleoenvironment.



Descriptions
Siltstone and Shale, carbonaceous, sub-rounded to rounded, light grey to dark grey very fine grained to medium grained sub-fissile to fissile.

Figure.1: Lithologic description the study area.

The preponderance of spore and fungal spore co-occurring with moderate recoveries of organic walled microfossils especially in samples 1, 2, 4 and 5 suggests environments that fluctuated between near shore to marginal marine. Bruno *et al.* (2011) had used the percentage occurrences of fungal spore in combination with spores and pollen to infer dominantly marine settings, where the former dominated and shallow marine environments in situations where the acritarch occurred with appreciable amounts of spores and pollen respectively. The dominance of the spore and fungal spore suite by co-occurring with acritarch supported this inference. Edet and Nyong (1994) had also posited that organic walled microfossils such as dinoflagellate cysts are more common in sediments deposited in marine conditions as against terrestrial components such as pollen and spores. . In sample 6, 7, and 8 is barren of palynomorph why sample 9, 10 and 11 mark an increase in spore with abundant of fungal spore which is compose of more fungal spore

assemblage, but there is an increase in acritarch compared to sporeand fungal spore. The presence of fungal spore indicate swampy depositional environment. The presence of a few acritarch in a spore dominate assemblage probably indicate infiltration of marine water.

They used statistical data of organic walled microfossils and miospores to distinguish between marine and non-marine environments. Reijers *et al*. (1997) had earlier reported that the Imo Formation is composed of shallow marine shelf sediments. The nearshore environment is further supported by the presence of dominant palms, spores, land derived phytoclasts, common fungal elements, freshwater algae and rare structure less organic matter. High influx of terrestrial materials causing dilution could have led to the low counts of pollen.The microfloral content of the studied area outcrops show close similarities in composition and therefore appear to be a continuous chronospcific unit outcropping at various locations. However, since the base of the outcrops have not been encountered to allow a complete assessment of the Stratigraphic extent of miospore occurrence dating is based on the relative frequency and consistent association of a few stratigraphically important miospores. A synopsis of the Stratigraphic ranges of selected miospores, from data of earlier workers on coeval tropical-substropical regions (Jardine and Magloire, 1965; Jan Du Chene, 1977; Jan Du Chene et al, 1978 a & b; Salami, 1984 & 1985; Lawal & Moullede, 1968; Schrank, 1987), indicate that the recovered assemblage is very poor though the age could not be determined. The Stratigraphic overlap defined by the presence of *Psilatricolpites crassus,* if in-situ portrays the age to be not older thanPaleocene.

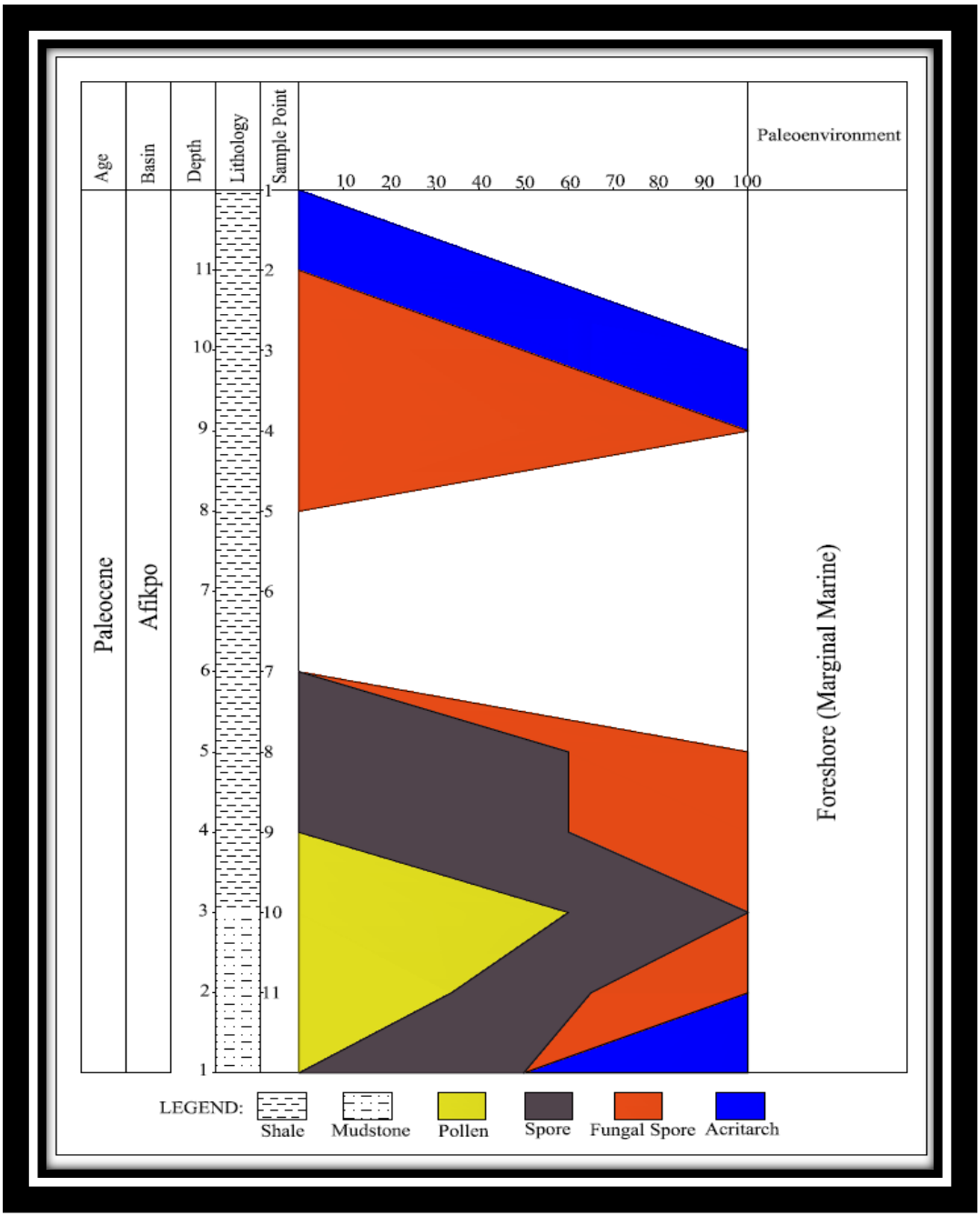


Figure.2: Percentage distribution of palynomorph of the Study Area.

DISCUSSIONS

In sample 1 consist of 50% pollen and 50% acritarch. The dominance of spore indicate terrestrial depositional environment. The low number probably indicates the environment of deposition was not favorable. Sample 2 is poor in palynomorphs and the numerical counts show that they are dominated by

fungal spore and spore with 33% pollen 33% spore 34% fungal spore. These indicate terrestrial depositional environment. The presence of fungal spore probably indicates a swamp environment with no marine indicator and sparse flora content.

Invariably sample 3 is poor in palynomorphs and of the numerical counts show that they are dominated by spore with 60% spore and 34% pollen. These indicate terrestrial depositional environment, sample 4 is poor in palynomorphs and is composed 60% spore and 34% fungal spore. These indicate a terrestrial environment. But sample 5 is devoid of pollen with 60% spore and 34% fungal spore and is rich in spore which is composed of 60% fungal spore. No comprehensive environmental interpretations are made because there are no palynomorphs counts. Sample 6, 7 and 8 is poor in palynomorphs and practically no palynomorphs.

In sample 9 is devoid of pollen and spore and is rich in fungal spore which is composed of 100% fungal spore. No comprehensive environmental interpretations are made because there are no palynomorphs counts.In sample 10 is devoid of palynomorphs and is composed of 50% fungal and 50% acritarch. These indicate terrestrial depositional environment. The presence of a few acritarch in a spore dominate assemblage probably indicate infiltration of marine water.

In sample 11 is devoid of palynomorphs and is composed 100% acritarch. The presence of acritarch indicates infiltration of marine water.

CONCLUSION

The sample collected from subsurface outcrop exposures at Akpohain Afikpo within the Anambra Basin which is a tectonic subdivision of the Benue Trough, were examined for Palynomorphs. The Stratigraphic overlap defined by the presence of *Psilatricolpites crassus,* if in-situ portrays the age to be not older thanPaleocene.For the above reasons, therefore, defined association of distinct miospore species within the assemblage has provided and informed Palynological criteria for recognizing the Palcocene, the paleoenvironment of deposition is foreshore marginal marine. The foreshore environment is further supported by the presence of dominant palms, spores, land derived phytoclasts, common fungal elements, freshwater algae and rare structure less organic matter.

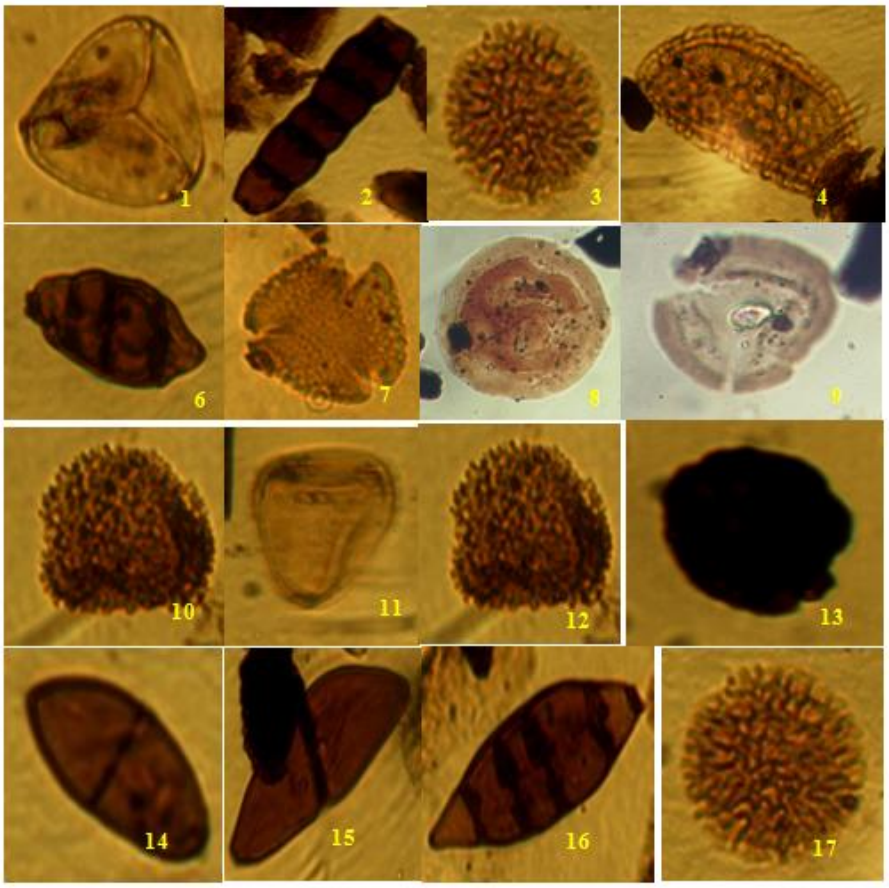


Figure 1: Cyathidites sp

Figure 2, 6, 14, 15 and 16: fungal spore

Figure 3, 10, 12 and 17: Acritach

Figure 4: Laevigatosporites discordatus

Figure 7: Psilatricolpite crassus

Figure 8: Zonocostites ramonae

Figure 9: Psilatricolporites sp

Figure 11: Verrucatosoprites farrvus

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