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Research Article

PALYNOLOGICAL STUDY OF SHALES IN LOKPAUKWU AREA

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ABSTRACT

A total of twelve (12) Surface outcrops in the study area were analysed for their Palynological content from Lokpaukwu area and environs. The result of the analyses shows that the samples have rich assemblage of pollen and spores the forms identified in all the sample; include *Retidiporites magdalenensis, Auriculidites reticulates, Syncolporites marginatus, Trifossapollenites sp, Psilatricolporites sp, Selaginella myosurus, Lygodiumsporites sp, Verrutricosisporites sp, Adenontherites sp. Proxapertities operculatus, monocolpopolenites sphaeroidites, Spinizonocolpites adananteus, Cingulatisponte. Ornatus, Ephedripites ambinoides, Retimonocolpites pluribaculetus, Mauritidites crassibuculatus, Constructipollenites ineffectus, Syncolporites marginetus, Echitripontes trianfuliformis, Syndemicolpites typicus, Mauritidites crassiexinus, Zonosulcites parvus, Proxaperties.* Based on the association of these forms, the assemblage is suggestive of a Campanian-Masstrichian age for the studied outcrops and this corresponds to the Nkporo shale.

Keywords: Palynology, Pollen, Spore, Benue Trough.

INTRODUCTION

A renewed interest has developed recently in Palynology,elicited interest in resolving relative age of rocks and degree of facies correlation in outcrops along the road section at Leru in southeastern Nigeria. Reyment (1965) has dated the formationin the study area as early Maastrichtian, Petters and Edet (1996) used an integrated study of foraminifera and palynology to date the Nkporo Formation in the Afikpo Syncline as early Maastrichtian based on samples from only the Asaga Amangwu outcrop section. Umeji (2006) dated the base of the Nkporo Formation in Leru, Anambra Basin as Campanian, using palynological evidence. 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.

Geological setting and Stratigraphyof the Study Area:

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 Akaegbobi, (2005).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 Akaegbobi, (2005).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 Akaegbobi, (2005).The Tertiary period was characterized by deposition of Imo Shale (Paleocene); Ameki (Eocene); Ogwashi-Asaba (Late Miocene-Pliocene Ola-Buraimo *et al*, (2012) and finally overlain by Benin Formation.

Aim and objectives of the study:

The aim of this research is to study the Palynological content of shale in Lokpaukwu area, to determine the relative age of shale in the study area and determine the environment of deposition

Location and accessibility of the study area:

The study area lies within the is within longitudes 7°51″ E to 7°55″ E and latitudes 5°2″ N to 5°23″N of the Greenwich meridian. Fig 1

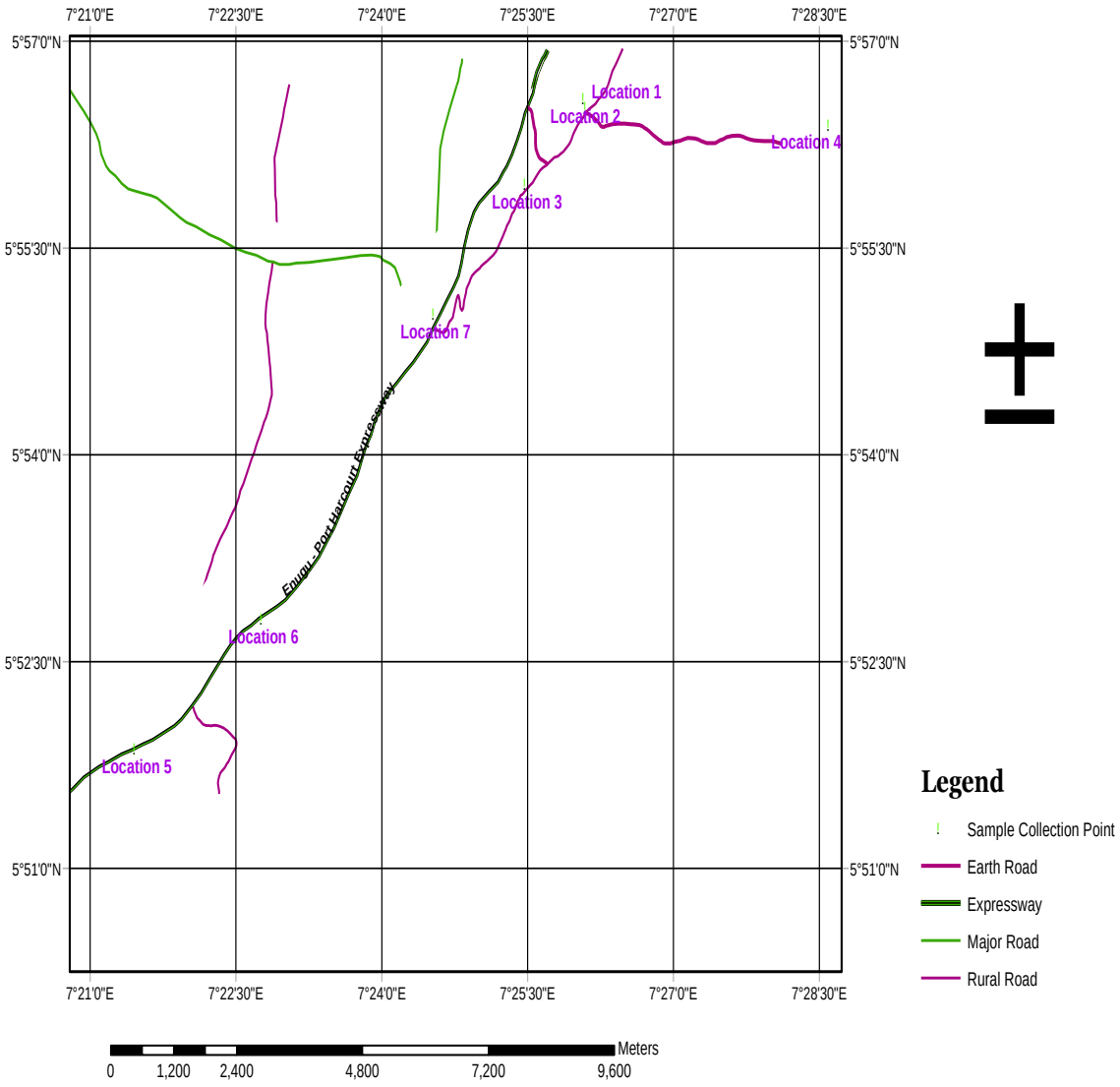

Figure 1: Showing Map of the Study Area.

MATERIALS AND METHODS

Methodology entails the procedures and materials used in carrying out a researcher analysis. Various stages were adopted in this project starting with sample collection, sample preparation to sample analysis.

(i) Field Method Field visit of studied rock outcrops was undertaken during which rock sections were logged and rock samples collected vertically form the various horizons. Sedimentary structures were noted. Graphic logs of the horizons were erected. The collected rock samples were then subjected to laboratory analysis and interpretation. See Figure 2

(ii) Laboratory Method At the laboratory a detailed lithologic description of the various sample were

described, each sample was tested with dilute hydrochloric acid. The degree of reaction of the samples with the acid was noted and expressed as calcareous, when there is effervescence and non-calcareous when there is no reaction with the acid. The steps of laboratory analysis are explained below.

(iii) Palynological Sample Preparation

Two to three grams of the samples were broken to a grain size of 4mm, and transferred to a plastic breaker cup. The beakers were then labeled according to the depth of the samples. All the samples were then treated with commercial grade hydrofluoric acid. The essence of these was to separate the fossils from the rock debris. Most of the calcareous samples showed effervescence.The length of time needed for the samples to digest varies depending on the quantity of silt and sand. But once the initial heat of reaction had been dissipated, hydrofluoric acid concentration was increased. The samples were displaced in a water bath and stirred, with plastic rods twice a day for the period of maceration. The effect of the acid was neutralized by decanting and settling method.The residual rock particle and megafossils were separated from the finer disaggregated material by passing them through a mesh of 106µm and 200µm. The filtrate was thoroughly washed with water using the 10µm mesh nylon sieve. The subsequent residue was swirled on a 24cm diameter watch glass. The lager residual was discarded while the final top material was boiled for a few seconds in water to which a few drops of concentrated hydrochloric acid were added. The residual was again washed in the 10µm mesh nylon sieve and stained with safranin- O in a mild alkaline medium stored in small glass centrifuge tubes and labeled. 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 DISCUSSION

The results and interpretation of Palynological analysis are presented on figure 2 respectively.

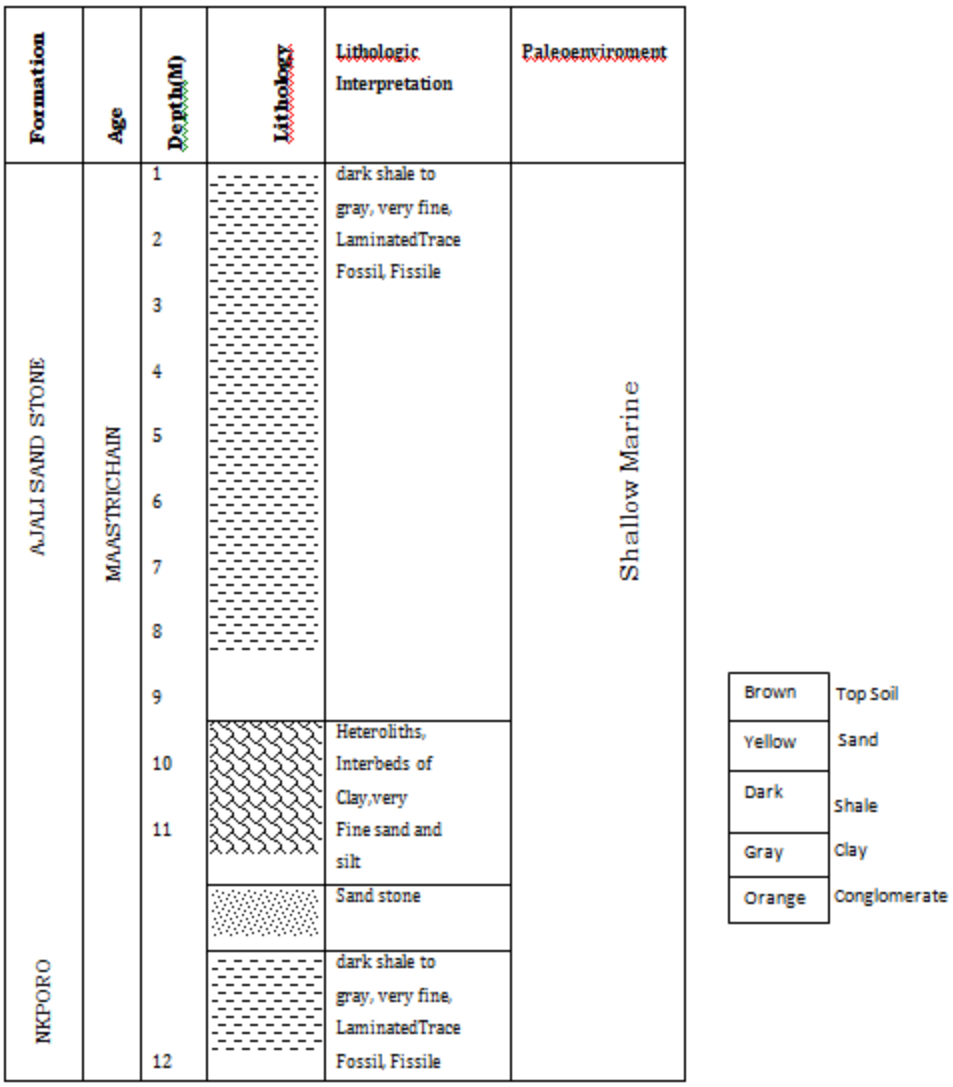

Figure.2: Lithologic Description of the Study Area

Lithostratigraphy:

The lithologic description of the relevant outcrops was based on the physical inspection of the outcrops from the locations were the samples worked on were taken. Twelve (12) samples was tested using hydrochloric acid, those that reacted with the aid-showing evidence of efflorescence/bubble were termed calcareous while those that did not react with the hydrochloric acid were classified as been not calcareous. All the samples used in the analysis were fine-grained as shown on figure 2

Location 1, 2, 3

The section is about 15mthick. It consists of 8m basal unit and a 4m upper unit. The basal unit is made up grey shales interbedded with thin sandstone band about 0.45m thick. The top shale of the basal unit is blue-black in colour and the top Sandstone band is bioturbated and contains trace fossils. The upper unit consists of weathered Sandstone-Siltstone intercations.

The content includes significant miospores such as *Longapertiles marginatus, Longapertites microforeolatus, Spinizinocalpites echniatus, Prorapertites operculatus, Ephedripites ambonoides, Microcolpopollenites sphaeroidites, Spinizinocolpite adananteus, Rebistephanocolpites cylindrical, Zonocosites parrus, Cingulatisporites arnatus.* The present of fungal spore is also recovered.

Location 4, 5, 6

The section is about 10m thick and consists of a 6m basal grey shales unit with two thin sandstone bands about 0.35m thick and a top 3m; unit of weathered Sandstone-Siltstone intercalations. This section shows almost the same association of Palynomorphs as in L5 except that the following additional forms *Retidiporites magdalenensis, Auriculidites reticulates, Syncolporites marginatus, Trifossapollenites sp, Psilatricolporites sp, Selaginella myosurus, Lygodiumsporites sp, Verrutricosisporites sp, Adenontherites sp.* Fungal spore and *Dinocystindeterminate* were recovered also.

Location 7, 8, 9

The section is a small outcrop of about 5.m thick. The basal part is a 1m thick grey shale unit overlain by about 2m weathered sandstone-siltstone intercalations. The conspicuous presence of *Retidiporitesmagdalenensis* is noted in L7 Palynomorph association.

Location 10, 11, 12

The section is about 20m thick the basal part of about 18m; Comprises fossils, carbonaceous, gypsiferous black and grey shale with marl and siltstone noodles. The sequence is capped by about 5m of residual soil cover.

The Palynomorph association of Ihube L5 shows the combined characteristics of L_1 L_2 and L_3 with the presence of *Echitripirites traingnliformis, Constructipollenites ineffectus, Syndemicolpites typicus* at the basal part and its absence towards the top.

Miospore Disscussion and Age:

The microfloral content of the studied area outcrops show close similarities in composition and therefore appear to be a continuoes 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.

The Stratigraphic overlap defined by the presence of *Proxapertities operculatus, monocolpopolenites sphaeroidites, Spinizonocolpites adananteus, Cingulatisponte. Ornatus, Ephedripites ambinoides, Retimonocolpites pluribaculetus, Mauritidites crassibuculatus, Constructipollenites ineffectus, Retidiporites magdalenenis, Syncolporites marginetus, Echitripontes trianfuliformis, Syndemicolpites typicus, Mauritidites crassiexinus, Zonosulcites parvus, Proxaperties* cursus in this association, is suggestive of Maastriclian-Paleocene age.

The resulting association comprising *Proxapertites operculatus, Retidiporites magdalenensis and Cingulatisporites ornatus*, therefore defines a Maastrichtian-Paleoccne age for the studied sections.

CONCLUSION

The sample collected from an outcrop of cretaceous surface exposures of Leru and Ihube within the Anambra Basin which is a tectonic subdivision of the Benue Trough, were examined for Palynomorphs. The samples were derived for an outcrop within the area mention above. The Campanian Maastrichtian-Palcocene has been defined on the basis of the association of *Proxapertites operculatus, Monocolpopollenites sphaerocidites, Spinizonocolpites adanateus, Retimonocolpites phuribaculetus, Syndemicolpites* typicus shows the Palynormorphs are of Campanian- Maastrichitian age. For the above reasons, therefore, L_1, L_2 and L_4 utcrops are dated Campanian- Maastrichtian while L_3 is dated Campanian- Maastrichtian conctusively, the defined association of distinct miospire species within the assemblage has provided and informed Palynological criteria for recognizing the Campanian- Maatrichtian criteria for recognizing the Campanian-Maastrichtian. Integrated Sedimentological and Palynological date has shown the paleoenvironment of deposition of the formation ranging from shallow marine.

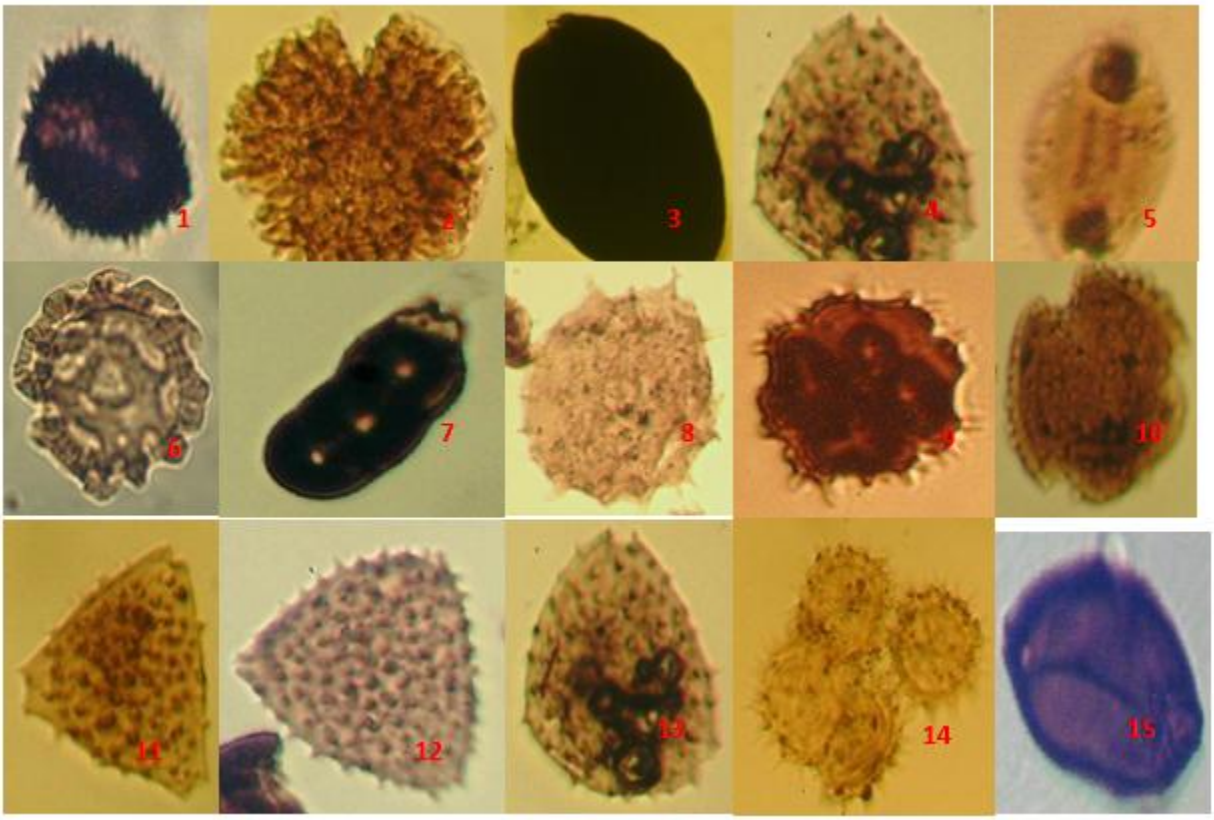

Figure 1: Aletepollenities sp

Figure 2: Retibrevitricolporites triangulates

Figure 3, 7 and 15: Fungal spores

Figure 4: Cingulatisporites ornatus

Figure 11 and 12: Echitriporites trianguliformis

Figure 10: Echimonocolpites rarispinosus

Figure 8 and 9: Ritdiporites magdalenensis

Figure 9: Proteacidites longispinosus

Figure 6: Stephanoporites echinatus

Figure 5: Zonosulcites parvus,

Figure 13: monocolpopolenites sphaeroidites,

Figure 14: Retimonocolpites pluribaculetus,

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