

# Pollen and Spores from the Lower Cretaceous of Central Mongolia and Their Paleoclimatic Significance

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## Abstract

The present study focuses on the Lower Cretaceous Khukhteeg Formation (Central Mongolia), which yields palynological assemblage that is used to understand the paleoclimate. Palynology samples from the Khovil opencast mine Choir-Nyalga Basin in the Central Mongolia have been analyzed for palynomorphs with SEM. The assemblage is dominated by pollen to conifers, such as Pinaceae, Podocarpaceae and Taxodiaceae, indicating the vegetation of conifer forests. The assemblage contains abundant spores Schizaeaceae, Cyathaceae, which are generally associated with wet habitats. According to the detailed analyses, the plant community indicates that warm and humid subtropical paleoclimate controlled the study area during the Early Cretaceous.

## Keywords

Khovil Opencast Mine, Lower Cretaceous, Khukhteeg Formation, Spore, Pollen, Mongolia

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## 1. Introduction

Coal-bearing strata from Central Mongolia (Khukhteeg Formation) of Aptian to Albian age contain next to dominating Pinaceae, Cupressaceae pollen [1]-[5]. The Khovil opencast mine is located in Central Mongolia southeast of Ulaanbaatar in the Choir-Nyalga Basin. The Choir-Nyalga Basin is the result of extensional tectonics that was prevalent during the Lower Cretaceous north-south trending fold and thrust belt in the central of Mongolia [6] [7]. The sediments of the Khovil

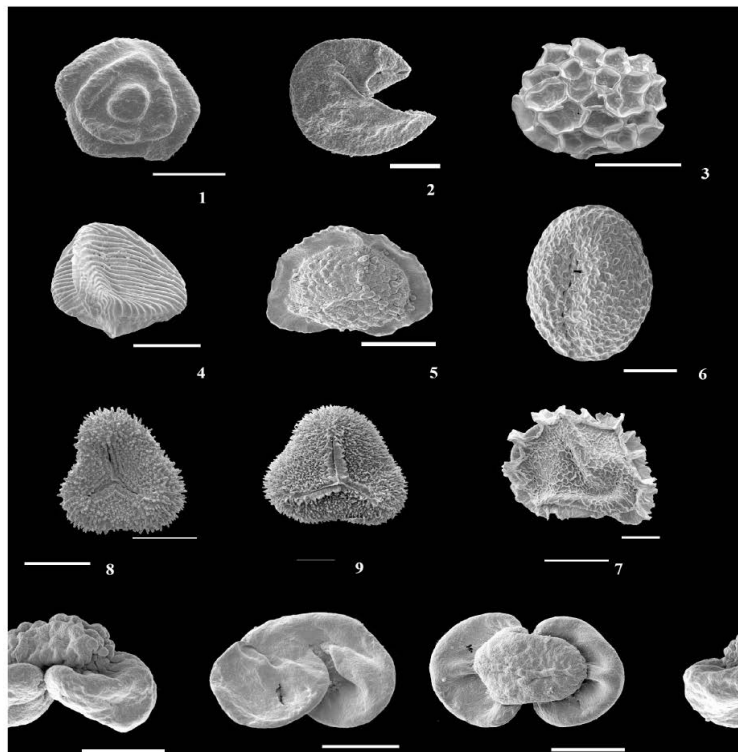
opencast mine belong to the lithostratigraphic unit of the coal-bearing Khukhteeg Formation which is, part of the Zuunbayan Group. The Khukhteeg Formation includes conglomerates, gravels, sandstones, and thick lignite coal [7].

## 2. Material and Methods

A total of 25 samples collected from Khovil opencast mine. The samples were treated with HCl and HF using standard palynological procedures then fossil pollen grains were investigated by scanning electron microscope (SEM). In **Figure 1**, SEM photos are presented.

## 3. Results and Conclusion

Palynological assemblage is characterized by the abundant of fern spores Cyathaceae and Schizaeaceae, Selaginellaceae, Lycopodiaceae and pollen Pinaceae, Podocarpaceae (**Figure 1**). In this assemblage, not observed spores *Appendicisporites*, very rare pollen *Cedripites*, contain chloranthaceae angiosperms *Clavatipollenites* and unknown angiosperm pollen *Retimonocolpites*, *Liliacites-like*, *Platanus-like*.



**Figure 1.** Spores and pollen from Khukhteeg Formation: (1) *Taurocusporites reduncus*, 5453 $\times$ , 2  $\mu\text{m}$  (2) *Taxodiaceapollenites sp.*, 8830 $\times$ , 10  $\mu\text{m}$  (3) *Lycopodiumsporites marginatus*, 6829 $\times$ , 10  $\mu\text{m}$  (4) *Cicatricosisporites dorogensis*, 5907 $\times$ , 20  $\mu\text{m}$  (5) *Aequitriradites spinulosus*, 4293 $\times$ , 30  $\mu\text{m}$  (6) *Schizosporis sp.*, 5907 $\times$ , 50  $\mu\text{m}$  (7) *Pilosisorites notensis*, 5907 $\times$ , 30  $\mu\text{m}$  (8) *Pilosisorites sp.*, 5907 $\times$ , 30  $\mu\text{m}$  (10) *Lycopodium sp.*, 6829 $\times$ , 10  $\mu\text{m}$  (10) *Podocarpites luteus* 3566 $\times$ , 10  $\mu\text{m}$  (11) *Podocarpites multisinus* 3701 $\times$ , 10  $\mu\text{m}$  (12) *Piceapollenites sp.*, 2313 $\times$ , 50  $\mu\text{m}$ .

This palynological assemblage is important for inferring paleoecological and paleoclimatic conditions of the region during the Early Cretaceous. The assemblage is dominated by pollen of conifers, such as Pinaceae, Taxodiaceae, indicating the vegetation of conifer forests. The assemblage contains abundant above mentioned pollen taxa, which are generally associated with wet habitats. The conifer plants grew on foothills at different distances from the lake, but Filicopsida dominated the lake shore. *Clavatipollenites* is also known from lower latitudinal fossil localities (Spain, Portugal, Brazil, USA) and their presence in Mongolia might be evidence for the admixture of temperate and subtropical floras [8]. The Choir-Nyalga basin, which was a periodically ever-wet (presence of algal cysts, *Botryococcus* and liverworts *Aequitriradites*), low diverse peat producing environment situated in a more northern position at higher latitudes, where newcomers arrived later than at the lower latitudes.

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### Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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