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PALEOPHYTOGEOGRAPHY OF THE ANGIOSPERM POLLEN GRAINS DURING THE UPPER CRETACEOUS AND THE TERTIARY II

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Abstract

Continuing a previous paper recently mostly Longaxones pollen grains and tetrads were investigated from the point of view of regional and time scale distribution. The form-taxa studied are as follows: *Pistillipollenites, Psilatricolporites parmularius, Nyssapollenites, Cyrillaceaepollenites, Ilexpollenites, Tetracolporopollenites, Ericipites* and *Droseridites*. Each pollen type is firstly of Eurasian distribution. Occurrences from the Southern Hemisphere are: *Pistillipollenites* from Australia, *Cyrillaceaepollenites* from Indonesia, *Ilexpollenites* from Indonesia, Australia, New Zealand and from the Falkland Islands, *Tetracolporopollenites* from Australia and New Zealand, *Ericipites* from South America, Africa, Australia and New Zealand. But all appearances from the Upper Cretaceous are from the Northern Hemisphere.

Key words: Palynology, Paleophytogeography, Cretaceous — Tertiary.

Introduction

In a previous paper (KEDVES, 1987) it was pointed out, that apart from the Normapolles and *Aquilapollenites* group other kinds of angiosperms pollen grains as Postnormapolles, and further ones from other morphological groups are or may be important in paleophytogeographical respect during the Cretaceous — Tertiary period. Following the first such synthesis in this paper I have chosen angiosperm pollen grains of heterogeneous type in morphological, taxonomical and ecological respect for paleophytogeographycal evaluation. The method of collecting and elaborating the bibliographical data correspond to that essentially used in the previous paper (KEDVES, 1987).

Results

Fgen.: *Pistillipollenites* ROUSE 1962 (Fig. 1)

ELSIK (1968) emended this form-genus and included also colpoidorat pollen grains here. ROUSE and SRIVASTAVA (1970) have not accepted this emendation, and completed the knowledge of these pollen grains with SEM data. The earliest occurrence, the appearance of this form-genus (Upper Cretaceous) is in North America in the *Aquilapollenites* province, and in the so-called intermediate region. There are data until the Oligocene, this latter, being the most recent occurrence, is

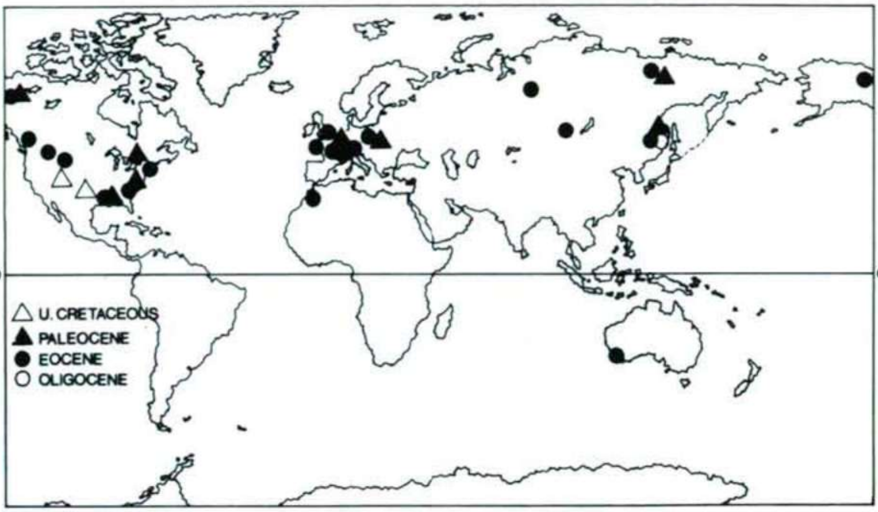

Fig. 1. Regional distribution of *Pistillipollenites* ROUSE 1962 during the Upper Cretaceous and the Tertiary.

also known from the *Aquilapollenites* province, but from the Far East of Asia. The acme of these pollen grains was during the Eocene, but we have several data from the Paleocene, too. On the basis of our up-to-date knowledge this is the microfossil of the Northern Hemisphere, but it is known from Australia, too. Till this time we have no data from South America, Africa, India, and from China. As regards Europe, today we have no data from the Mediterranean Region. In this way in all probability at least in European relation this kind of pollen grain is the component of the spore-pollen assemblages of the Boreal Region.

Fgen.: *Psilatricolporites* (VAN DER HAMMEN 1956) VAN DER HAMMEN et WIJMSTRA 1964

Ps. parmularius (R. POT. 1934) KDS. 1978 (Fig. 2) ·

Basionym: 1934, R. POTONIÉ. — *Pollenites parmularius* n. sp., p. 52, tab. 2, fig. 7, tab. 6, fig. 11.

Syn.: 1953, THOMSON et PFLUG. — *Tricolpopollenites parmularius* (R. POT.) n. comb., p. 97, Taf. XI, 152—162.

1960, KRUTZSCH (in KRUTZSCH, PCHALEK ET SPIEGLER). — *Tricolporo pollenites parmularius* (R. POT. 1934b) n. comb., p. 140, fig. 94.

1960, Potonié. — *Cornaceoipollenites* (al. *Pollenites) parmularius* (R. POT. 1934) R. POT. 1951, p. 93.

1974, ANANOVA. — *Eucommia parmularia* (R. POT,) ANAN. comb. nov., p. 174.

The botanical affinity of this pollen type is the Eucommiaceae, genus Eucommia. This was pointed out in several publications, but it was ANANOVA (1974) who

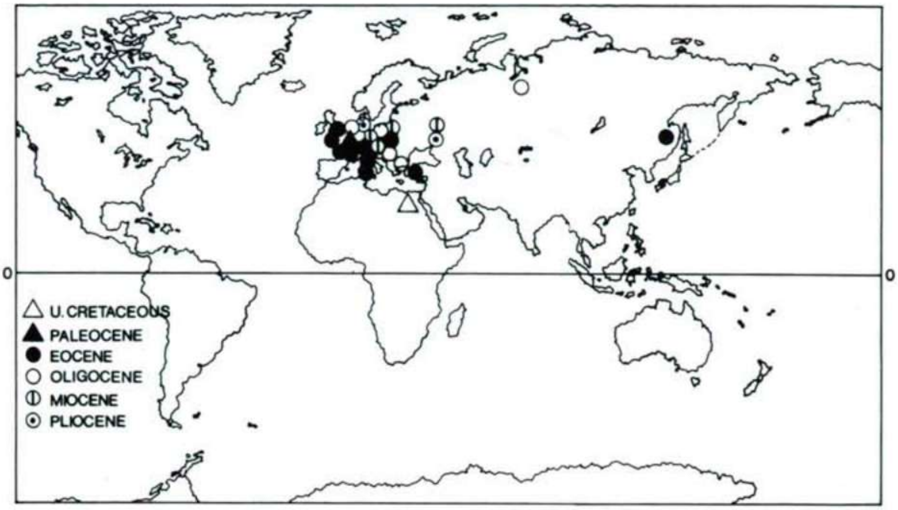

Fig. 2. Regional distribution of *Psilatricolporites parmularius* (R. POT. 1934) KDS. 1978 during the Upper Cretaceous and the Tertiary.

emphasized it definitely. Taking into consideration the book of KUPRIYANOVA (1965), this statement seems to be without doubt. But the pollen grains of genus *Eucommiidites* from the Jurassic, originate from gymnospermous tree; cf. BRENNER (1976).

The appearance of Ps. parmularius is in the Upper Cretaceous in Egypt, and this is at the same time the single occurrence apart Eurasia. In Europe it occurs till to the Pliocene, in Siberia *(Aquilapollenites* province) occurs in the Eocene and Miocene. On the basis of our present day knowledge, this pollen species is firstly the element of the European Eocene, or Paleogene spore-pollen assemblages, and is useful for stratigraphical purposes only in a restricted region. But the restricted occurrence outside Europe may not be taken as decisive; with further data essential changes may be presumed.

Fgen.: *Nyssapollenites* THIERGART 1937 (Fig. 3)

The botanical affinity of this pollen grain is the Nyssaceae or Mastixiaceae. The earliest occurrence is in the Upper Cretaceous: North America (Normapolles and *Aquilapollenites* province), Europe, Egypt, and China. This form-genus is largely widespread over the whole Asia. This distribution is characteristic for further geological ages up to the Quaternary. From Africa (Equatorial part) we have data from Miocene and Pliocene layers. In spite of the fact that the number of publications concerning this kind of pollen grain is large, with further investigations on African, South American and Australian localities this question may be put in another light, the regional distribution of the Nyssaceae (v. Mastixiaceae) in the geological past.

Fgen.: *Cyrillaceaepollenites* (MÜRRIGER et PFLUG 1951) R. POT. 1960 (fig. 4)

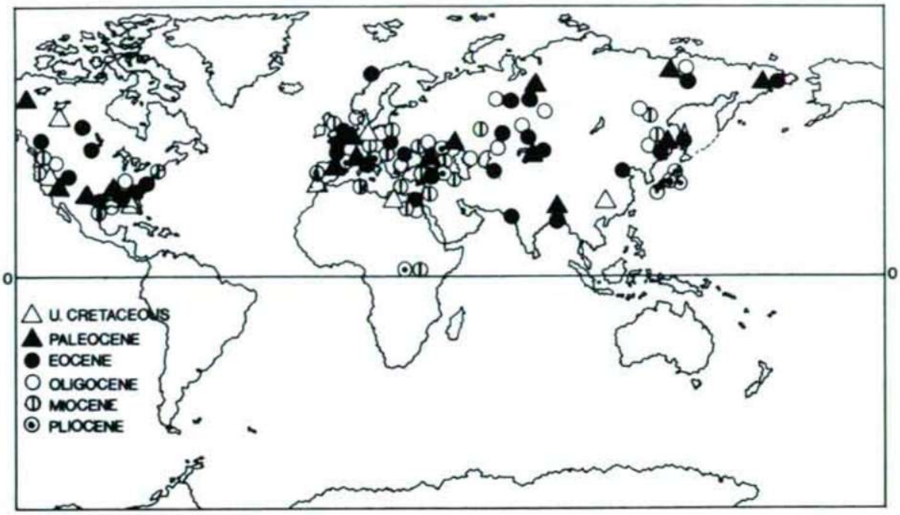

Fig. 3. Regional distribution of *Nyssapollenites* THIERGART 1937 during the Upper Cretaceous and the Tertiary.

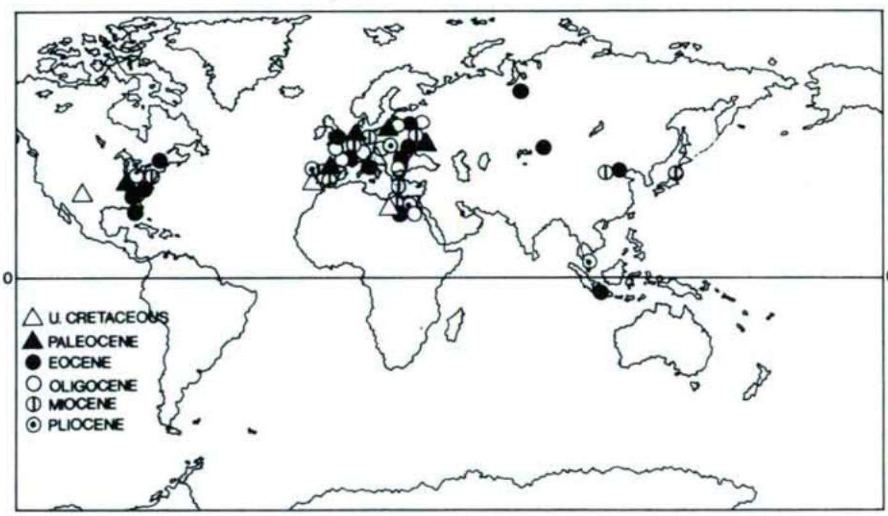

Fig. 4. Regional distribution of *Cyrillaceaepollenites* (MÜRRIGER et PFLUG 1951) R. POT. 1960 during the Upper Cretaceous and the Tertiary.

The earliest, Upper Cretaceous occurrence is in North America in the *Aquilapollenites* province, and in North Africa. From the Paleocene we have data only from Europe, and North America. The largest distribution was during the Eocene, in this period beyond the above mentioned localities occur in the Normapolles province of North America, and in Asia. During the Miocene Cyrillaceae — Clethraceae (or Theaceae) was one of the elements of the brown-coal forming vegetation zonation.

Fgen.: *Ilexpollenites* (THIERGART 1937) R. POT. 1960 (Fig. 5)

The appearance of this pollen type is in the Upper Cretaceous of the Northern Hemisphere, where there are data from several localities. At the present day we have relatively few data from the Southern Hemisphere, except Australia. On the basis of the distribution map several restrictions may be established during the Pliocene, and in the relation of Africa a migration in the southern direction.

Fgen.: *Tetracolporopollenites* PF. et TH. 1953 (Fig. 6)

The appearance of this pollen form-genus is in the Upper Cretaceous, in Europe in the Normapolles, in North America in the *Aquilapollenites* province. These pollen grains were extremely widespread during the Eocene, whereas except South America occur in all continents. This was the beginning of the golden age of the fossil Sapotaceae pollen grains, which extend up to the Pliocene. At the end of the Tertiary a reduction may be established. Concerning the Eurasian distribution it is worth of mentioning that at this moment we have no data from Siberia.

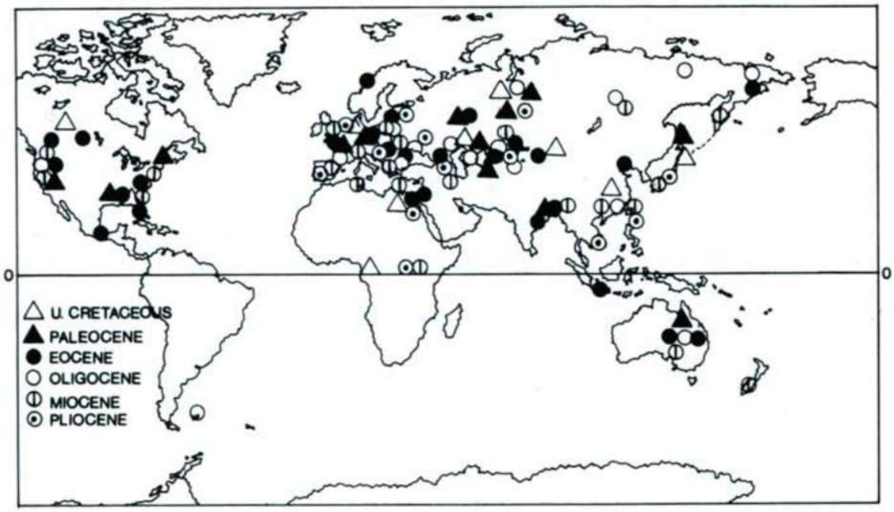

Fig. 5. Regional distribution of *Ilexpollenites* (THIERGART 1937) R. POT. 1960 during the Upper Cretaceous and the Tertiary.

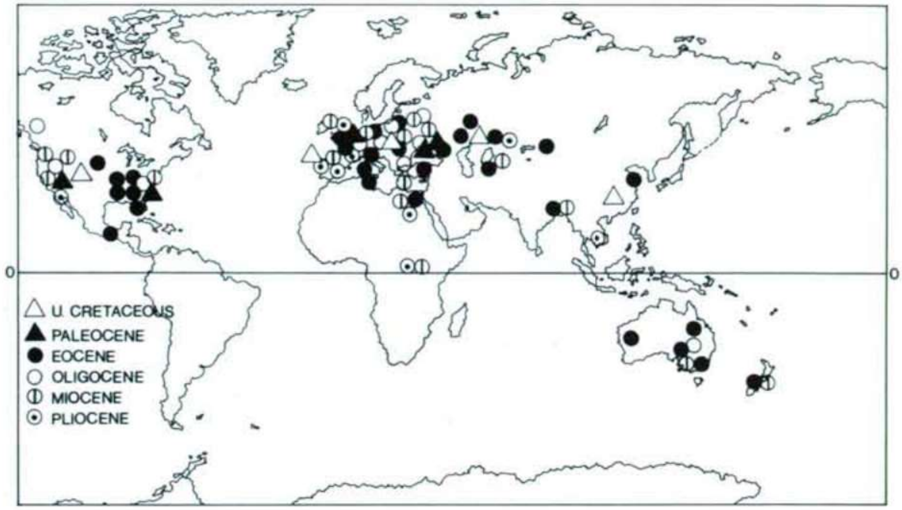

Fig. 6. Regional distribution of *Tetracolporopollenites* PF. et TH. 1953 during the Upper Cretaceous and the Tertiary.

Fgen.: *Ericipites* WODEHOUSE 1933 (Fig. 7)

This pollen type was very widespread in the Northern Hemisphere during the Upper Cretaceous. In contrast to this, from the regions of the southern part of the present day Equator the first data are known from the Paleocene of Africa, Aust-

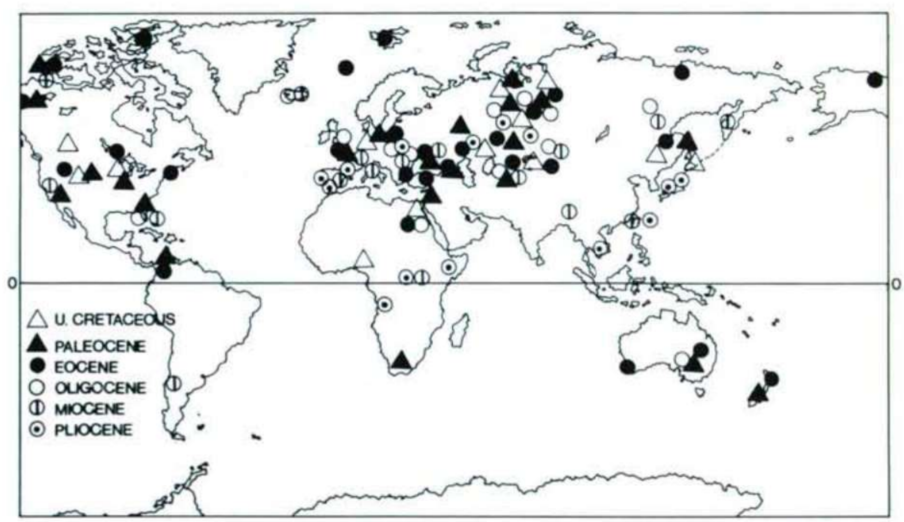

Fig. 7. Regional distribution of *Ericipites* WODEHOUSE 1933 during the Upper Cretaceous and the Tertiary.

ralia and New Zealand. The palynological data suggest a migration in the southern direction during the Tertiary period of Africa and the Far East. From South America till this time we have relatively few data.

Fgen.: *Droseridites* COOKSON 1947 (Fig. 8)

Relatively rare pollen type, on the basis of our up-to-date knowledge we have data from Eurasia and Africa. Appearance in the Upper Cretaceous of Africa and of the Iberian Peninsule. During the Eocene this was relatively largely widespread. Worth of mentioning is its paleoecological importance.

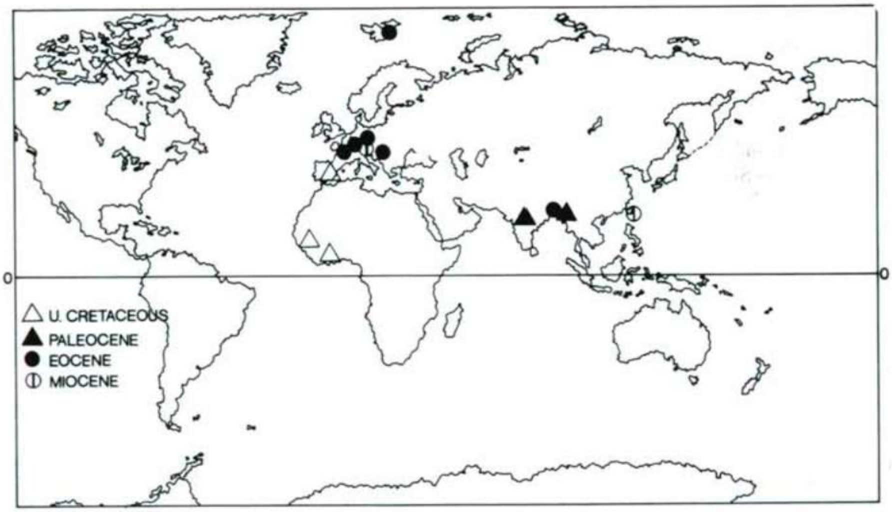

Fig. 8. Regional disribution of *Droseridites* COOKSON 1947 during the Upper Cretaceous and the Tertiary.

Conclusions

The paleophytogeographical evaluation of the spore-pollen groups, which were neglected till this time need long time and a lot of energy. But the changes of the regional distribution during the geological past of the pollen types give opportunity to construct new synthesis and conclusions. Moreover several new problems arise as well which in some cases indicate new researches in this field. Naturally we must stress again and again that in some cases it must be taken into consideration that our knowledge is not sufficient, during the evaluation of the data. Taking into consideration the regional distribution of the up-to-date elaborated taxa it may be established that investigation and publications are centered firstly to the Northern Hemisphere. It is necessary to study this problem, based on the types for the taxa, which are characteristic for the Southern Hemisphere.

Appendix

The data of the following publications were used for the distribution maps.

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