

## THE PALYNOLOGY OF THE PONTIAN FROM BATOȚI – MEHEDIȚI (SOUTH-WESTERN ROMANIA)

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**Abstract:** A section from the Lower Pontian that occurs on the left side of the Danube, in the Batoți village area (Mehediți County, southwestern part of Romania) was studied from palynological point of view. The list of sporomorphs is presented in table 1. In the second part of paper, the authors analyzed the paleoclimatic conditions during formation of the Pontian deposits (when a temperate-warm climate dominated) and made a comparison between the microflora from Batoți and other Pontian microfloras from Romania and some countries of Central Paratethys.

**Keywords:** Lower Pontian, Palynology, Paleoclimatology, Batoți, SW<sup>m</sup> Romania.

### GEOLOGICAL DATA

The studied section is located on the left side of the Danube, in the Batoți village area (Deveselu Commune, Mehediți County) (Figure 1).

Four samples were collected from the grey clays that preserved a diversified microflora. Besides, the calcareous sandstones preserved the foliar imprints (currently under study), with: *Taxodium dubium* (Sternb.) Heer, *Glyptostrobus europaeus* (Brongn.) Heer, *Alnus kefersteinii* (Goepp.) Ung. s.a., *Salix varians* Goepp., *Fagus pliocaenica* Sap., *Quercus pseudocastanea* Goepp.

From the studied section, we recovered only one fragment of *Valenciennius*. The study of ostracods is close to be finalized. Ghenea & Ghenea (1962) mention the presence of **Lower Pontian** between Turnu Severin and Batoți. The compact blackish marls and grey clays considered as Lower Pontian preserve the imprints of *Paradacna abychi* Hoern. and *Valenciennius anulatus* Rous. (l. c. p. 200).

### PALYNOLOGICAL STUDY

A diversified microflora was well preserved in all the four samples of grey clays, that were collected from the vertical section at about 5 m high (Figure 2a, b). The content of microflora is

presented in Tabel 1. We could not establish a qualitative differentiation between the samples, the palynological content being similar (the differences might be due to specific local environmental conditions).

**Dinoflagellata** is present in the spectrum but these forms are not the subject of this study.

**Chlorophyta** is represented by well-preserved colonies of *Botryococcus braunii*.

**Pteridophyta** (5%) is well diversified, being dominated by spores belonging to *Laevigatisporites haardti* and *Leiotriletes wolffi*.

The spores of **Bryophyta** (Musci), even if they show a low frequency (not exceed 2%), quantitatively are well represented as part of *Stereisporites* forma-genus.

**Coniferopsida** (40-55%) is clearly dominated by pollen of Pinaceae family. Rarely, the pollen of Taxodiaceae + Cupressaceae + Podocarpaceae exceeds 3%.

As it can be remarked in Table 1, the pollen of *Cedrus*, *Abies*, *Tsuga* is well diversified; the pollen of *Picea* and *Pinus* sg. *Diploxylon* is well represented.

**Chlamidospermopsida** is represented by pollen of *Ephedra*, but have sporadic participation in the spectrum (less than 1%).

**Angiospermatophyta** (45 – 60%). The pollen of **Monocotyledons** is quantitatively subordinated (3%), qualitatively it shows a slight diversification.

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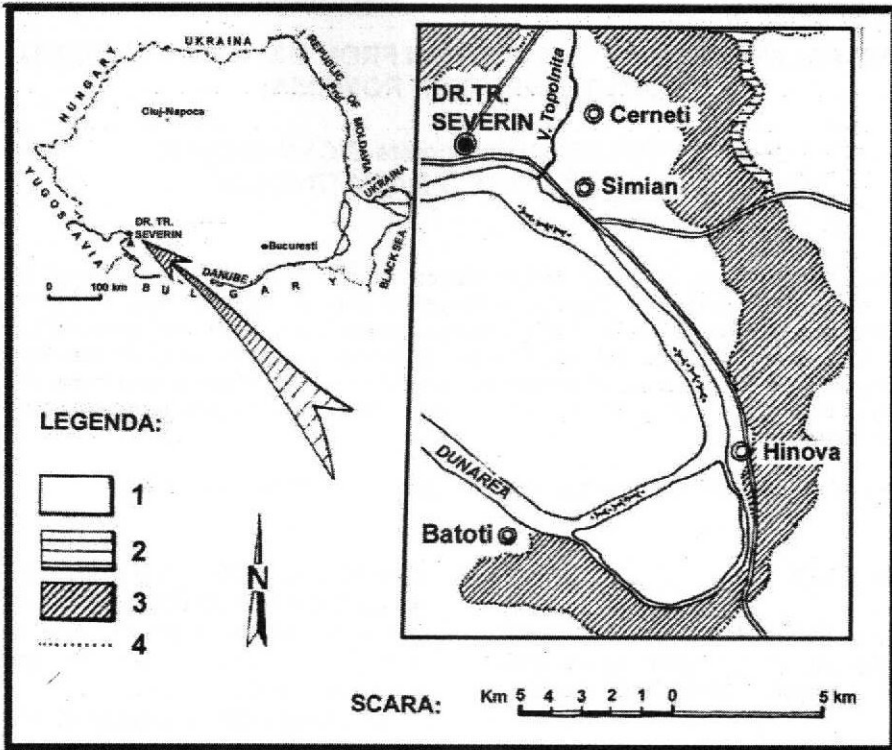


Figure 1. Location of the studied area (1 – Quaternary, 2 – Dacian 3 – Pontian, 4 – geological boundary) (after the geological map of Romania, scale 1:200.000, with modifications).



Figure 2a, b. The location of Lower Pontian samples, that were analyzed from palynological point of view.

The pollen of **Dycotiledons** is very numerous in all the samples (42 – 58%) and of a large diversity.

The pollen of Juglandaceae, Betulaceae, Fagaceae, Ulmaceae, Compositae, etc. is very frequent.

Tabel 1 - List of pollen-spores taxa identified in the Pontian deposits from studied area and their frequency.

TAXA	FREQUENCY
<b>DINOPHYTA</b> div. sp.	••
<b>CHLOROPHYTA.</b>	
<i>Botryococcus braunii</i> Kutz. 1949	••
<b>PTERIDOPHYTA</b>	
<i>Laevigatisporites haardtii</i> (Pot. et Ven. 1934) Th. et Pf. 1953	•••
<i>Laevigatisporites gracilis</i> Wilson & Webster 1946	•
<i>Laevigatisporites nutidus</i> (Mamczar 1960) W. Kr. 1967	○
<i>Leiotriletes</i> asp. <i>microsinuosoides</i> W. Kr. 1962	••
<i>Leiotriletes wolffi wolffi</i> W. Kr. 1962	••
<i>Leiotriletes wolffi brevis</i> W. Kr. 1962	••
<i>Leiotriletes neddenioides</i> W. Kr. 1962	○
<i>Undulatisporites structuris</i> W. Kr. 1962	○
<i>Torioisporis</i> (T.) sp.	○
<i>Verrucatisporis</i> gr. <i>tekerensis</i> Nagy 1969	○
<i>Polyodiaceoisporites spiniverrucatus</i> Trevisan 1967	•
<i>Polyodiaceoisporites</i> gr. <i>gracillimus</i> Nagy 1963	○
<i>Polyodiaceoisporites cyclocingulatus</i> W. Kr. 1967	○
<i>Laevigatisporites haardtii</i> (Pot. et Ven. 1934) Th. et Pf. 1953	••
<i>Foveotriletes verrucatooides</i> W. Kr. 1962	○
<i>Verrucatosporis alienus</i> (Pot. 1931) Th. et Pf. 1953	○
<i>Verrucatosporis favus</i> (Pot. 1931) Th. et Pf. 1953	○
<i>Verrucatosporis balticus</i> (W. Kr. 1962) <i>balticus</i> W. Kr. 1967	•
<i>Verrucatosporis arctotertiarius arctotertiarius</i> W. Kr. 1967	○
<i>Verrucatosporis megafavus</i> W. Kr. 1967	○
<i>Verrucatosporis</i> cf. <i>bockwitzensis</i> W. Kr. 1967	○
<i>Verrucatosporis clatriformis</i> (Mur – Pf. 1952 ex.Th. – Pf. 1953) W. Kr. 1967	○
<i>Perinomoletes pliocaenicus</i> W. Kr. 1967	•
<i>Perinomoletes goersbachensis</i> W. Kr. 1967	○
<i>Extrapunctatosporis miocaenicus</i> W. Kr. 1967	•
<i>Extrapunctatosporis goersbachensis</i> W. Kr. 1967	•
<i>Extrapunctatosporis oblongioides</i> W. Kr. 1967	○
<i>Extrapunctatosporis</i> cf. <i>megapunctos</i> W. Kr. 1959	○
<i>Echinosporis microechinatus</i> W. Kr. 1967	○
<i>Baculatisporites primarius</i> (Wolff 1934) Th.-Pf. 1953	•
<i>Baculatisporites nannus</i> (Wolff 1934) W. Kr. 1979	○
<i>Echinatisporis</i> cf. <i>longechinus</i> W. Kr. 1959	○
<b>BRYOPHYTA. MUSCI</b>	
<i>Stereisporites</i> div. sp.	••
<b>GYMNOSPERMATOPHYTA.</b>	
<b>CONIFEROPSIDA</b>	
<i>Sequoiapollenites polyformosus</i> Thg. 1937	•
<i>Inaperturopollenites verrupapillatus</i> Trevisan 1967	•
<i>Inaperturopollenites hiatus</i> (Pot. 1931) Th et Pf. 1953	○
<i>Inaperturopollenites concedipites</i> (Wodeh. 1933) W. Kr. 1971	○
<i>Cupressacites bockwitzensis</i> W. Kr. 1971	•
<i>Sciadopityspollenites serratus</i> (Pot. et Ven. 1934) Thg. 1937	•
<i>Sciadopityspollenites verticillatiformis</i> (Zauer 1960) W. Kr. 1971	○
<i>Podocarpidites nageaformis</i> (Zaklinskaja 1957) W. Kr.1971	○
<i>Podocarpidites libellus</i> (Pot. 1931) W. Kr. 1971	○
<i>Cedripites crassiundulicristatus</i> (Stelmak 1960) W. Kr. 1971	••
<i>Cedripites taxoidiformis</i> (Nagy 1969) Nagy 1985	•
<i>Cedripites crassus</i> Nagy 1989	○
<i>Cedripites maximus</i> Nagy 1985	○
<i>Cedripites deodaraesimilis</i> (Nagy 1969) Nagy 1985	○

<i>Cedripites lusaticus</i> W. Kr. 1971	○
<i>Abiespollenites absolutus</i> Thg. 1937	○
<i>Abiespollenites cedroides</i> (Thomson 1953) W. Kr. 1971	○
<i>Abiespollenites crassus</i> Nagy 1969	○
<i>Abiespollenites dubius</i> (Chlonova 1960) W. Kr. 1971	○
<i>Abiespollenites latisaccatus</i> (Trevisan 1967) W. Kr. 1971	●
<i>Abiespollenites microsacoides</i> W. Kr. 1971	○
<i>Abiespollenites sibiriciformis</i> (Zakl. 1957) W. Kr. 1971	●●
<i>Pinus</i> sg. <i>haploxylon</i>	●●
<i>Pinus</i> sg. <i>diploxylon</i>	●●●
<i>Piceapollis planoides</i> W. Kr. 1971	●●●
<i>Piceapollis tobolicus</i> (Panova 1966) W. Kr. 1971	●●
<i>Zonalapollenites igniculus</i> (Pot. 1931) Th. et Pf. 1953	●
<i>Zonalapollenites maximus</i> (Raatz 1937) W. Kr. 1971	●●●
<i>Zonalapollenites gracilis</i> W. Kr. 1971	●●
<i>Zonalapollenites spinulosus</i> W. Kr. 1971	●
<i>Zonalapollenites rueterbergensis</i> W. Kr. 1971	○
<i>Zonalapollenites neogenicus</i> W. Kr. 1971	●
<i>Zonalapollenites multispinus</i> W. Kr. 1971	○
CHLAMIDOSPERMOPSIDA	
<i>Ephedripites</i> (D.) <i>tertiarius</i> W. Kr. 1970	○
<i>Ephedripites</i> (D.) <i>fusiformis</i> (Shakmundes 1965) W. Kr. 1970	○
ANGIOSPERMATOPHYTA.	
MONOCOTYLEDONATAE	
<i>Graminiidites subtiliglobosus</i> (Trevisan 1967) W.Kr. 1970	○
<i>Sparganiaceapollenites polygonalis</i> Thiergart 1937	○
<i>Monocolpopollenites</i> sp.	●
<i>Arecipites</i> sp.	○
DICOTYLEDONATAE	
<i>Nupharipollenites</i> cf. <i>kedvesi</i> Nagy 1969	○
<i>Nupharipollenites</i> sp.	○
<i>Liriodendropollis verrucatus</i> W. Kr. 1970	○
<i>Triatriopollenites myricoides</i> (Kremp 1950) Th. et Pf. 1953	●
<i>Triatriopollenites rurensis</i> Pf et. Th. 1953	○
<i>Triatriopollenites bituitus</i> (Pot. 1931) Th. et Pf. 1953	○
<i>Engelhardtoidites microcoryphaeus</i> (Pot. 1931) Thomson et Thg. ex Pot. 1960	●
<i>Momipites punctatus</i> (Pot. 1931) Nagy 1969	●●
<i>Juglanspollenites verus</i> Raatz 1937	○
<i>Caryapollenites simplex</i> (Pot. 1931) W. Kr. 1960	●●●
<i>Pterocaryapollnites stellatus</i> (Pot. 1931) Thg. 1937	●
<i>Platycaryapollenites miocaenicus</i> Nagy 1969	○
<i>Plicatopollis plicatus</i> (Pot. 1934) W. Kr. 1962	○
<i>Ulmipollenites undulosus</i> Wolff 1934	●●
<i>Zelkovaepollenites potonieii</i> Nagy 1969	●
<i>Celtipollenites komloensis</i> Nagy 1969	○
<i>Trivestibulopollenites betuloides</i> Pflug 1953	●●
<i>Alnipollenites verus</i> (Pot. 1931) Pot. 1934	●●
<i>Carpinipites carpinoideus</i> (Pf. 1953) Nagy 1985	●
<i>Tripoporopollenites coryloides</i> Pf. 1953	○
<i>Caprifoliipites andreanszkyi</i> Nagy 1969	●
<i>Umbeliferoipollenites tenuis</i> Nagy 1985	○
<i>Intratripoporopollenites cordataeformis</i> (Wolff 1934) Mai 1961	●
<i>Intratripoporopollenites insculptus</i> Mai 1961	●
<i>Intratripoporopollenites instructus</i> (Pot. 1931) Th. et Pf. 1953	●
<i>Malvacearumpollenites bakonyensis</i> Nagy 1962	●
<i>Reevesiapollis triangulus</i> (Mamczar 1960) Kr. 1970	○
<i>Porocolpopollenites vestibulum</i> (Pot. 1931) Th. et Pf. 1953	○
<i>Corsinipollenites oculusnoctis</i> (Thg. 1940) Nakoman 1960	○
<i>Iteapollis augustiporatus</i> (Schneider 1965) Ziembinska 1974	○

<i>Scabiosaepollenites minimospinosus</i> Nagy 1969	○
<i>Periporopollenites stigmaticus</i> (Pot. 1931) Th. et Pf. 1953	○
<i>Persicarioipollis franconicus</i> W. Kr. 1962	●●
<i>Persicarioipollis welzowense</i> W. Kr. 1962	○
<i>Tubulifloridites granulosus</i> Nagy 1969	●
<i>Tubulifloridites anthemidearum</i> Nagy 1969	○
<i>Tubulifloridites grandis</i> Nagy 1969	○
<i>Tubulifloridites</i> cf. <i>macroechinatus</i> (Trevisan 1967) Nagy 1985	○
<i>Cichoreaacidites gracilis</i> (Nagy 1969) Nagy 1985	●●
<i>Artemisiaepollenites sellularis</i> Nagy 1969	●
<i>Tricolporopollenites macrodurensis</i> Pf. et Th. 1953	○
<i>Quercopollenites granulatus</i> Nagy 1969	○
<i>Quercopollenites petraea</i> Nagy 1969	●●
<i>Quercopollenites robur</i> Nagy 1969	●●
<i>Faguspollenites verus</i> Raatz 1937	●●
<i>Faguspollenites crassus</i> Nagy 1969	●
<i>Faguspollenites gemmatus</i> Nagy 1969	○
<i>Faguspollenites minor</i> Nagy 1969	○
<i>Faguspollenites subtilis</i> Nagy 1969	○
<i>Nyssapollenites kruschi</i> (Pot. 1931) Nagy 1969	○
<i>Ilexpollenites margaritatus</i> (Pot. 1931) Thg. 1937 ex. Pot. 1960	○
<i>Cyrrillaceapollenites megaexactus</i> (Pot. 1935) Pot. 1960	○
<i>Ericipites callidus</i> (Pot. 1931) W. Kr. 1970	○
<i>Ericipites ericius</i> (Pot. 1931) Pot. 1960	○

## Frequency.:

- - very rare (1 – 2 grains);
- - rare (3 – 9 grains);
- - frequent (10 – 20 grains);
- - very frequent (21 – 30 grains).

From **paleoclimatic** point of view, the mixed composition of microflora can be noticed: the thermophile elements continue to be present, but they are subordinated to mesotherme and temperate elements.

The thermophile elements of all the botanic groups (Ferns: *Verrucatosporites favus*; Conifere: *Podocarpidites libellus*; Monocotiledons: *Arecipites*, *Monocolpopollenites*; Dicotiledons: *Platycaryapollenites miocaenicus*, *Plicatopollis plicatus*, *Reevesiapollis triangulus*, *Iteapollis augustiporatus*, *Cyrrillaceapollenites megaexactus*, s. o.), are always very rare in the spectrum and they are in a categorical regress in comparison with older prepontian microfloras. The growth of these warm elements was due to specific geomorphological configurations: they developed as swamp associations nearby sedimentary basin.

The mesotherme elements (*Cedripites div. sp.*, *Abiespollenites* pr. p., *Caryapollenites*, *Pterocaryapollenites*, *Zelkovaepollenites*, s. a.) are frequent to very frequent.

The temperate elements (arctotertiary) dominate the pollinic spectrum in all the analyzed samples. The arctotertiary conifers (*Picea*, *Tsuga*, *Pinus* sg. *diploxylon*) are

distributed in clearly outlined mountain belts. The *Fagus*, *Quercus* (temperate forms), *Ulmus*, *Carpinus* etc., trees were frequent, too. There is no doubt that the pollen of *Ephedra* and *Compositae* pointed out a climatological continentalization inwards the land.

Generally, the studied (Lower Pontian) climate was warm-temperate. The raising of the Carpathian clines from close proximity encouraged an evident distribution of the forest vegetation according to altitude. The belts of temperate oaks (*Quercus*), beeches (*Fagus*) respectively the belts of conifers with *Cedrus*, *Abies*, *Pinus* pr.p., *Tsuga*, *Picea*, etc. prove the presence of various types of climatic environments – from warm-temperate to temperate.

The prevalence of temperate elements (both as part of conifers – Pinaceae family - and dicotyledonous angiosperms) permitted us to conclude that in the Lower Pontian, in this part of Central Paratethys, an evident fall of thermic average took place. In the second part of the Pontian, arctotertiary elements regressed, this fact being clearly established in the section on the Vişenilor Valley situated at about 20 kilometers north-east of Batoți locality, too (Petrescu et al., 2001).

## THE RELATION BETWEEN MICROFLORA FROM BATOȚI AND OTHER PONTIAN MICROFLORAS FROM ROMANIA AND ABROAD

Evidently, the (Lower) Pontian microflora from Batoți, proves to be very rich and conclusive due to over 125 pollen-spores forms contained. Further, some relations between this microflora and other Pontian microfloras from Romania and some countries of Central Paratethys will be presented.

First of all, it is worth to mention the paper of Roman & Papaianopol (1982), concerning the Pontian that occur between Cricovul Sărat Valley (west) and Tohăneasca Valley (east). This is the only palynological paper concerning the Pontian deposits from southern part of Romania. The Lower Pontian (Odessian) consists of marls and clayey marls with *Paradacna abichi*, *Limnocardium*, *Congerina*, *Valenciennius*, s.o. From palynological point of view, it is characterized by an association in which *Quercus*, *Carya*, *Pterocarya*, *Zelkova*, *Ulmus* prevail. The conifers are represented mainly by pollen of *Pinus* and *Picea*. The pollen of herbaceous plants belongs to *Chenopodiaceae* and *Artemisia*. The presence of dinoflagellates indicates a brackish-eurihaline environment (Roman & Papaianopol 1982, p. 83).

In the Middle Pontian (Portaferrian), the percentage of *Abies* and *Tsuga* pollen (in comparison with the Lower Pontian) increased. Both, the pond herbaceous plants (*Typha*, *Sparganium*) and the pollen of *Chenopodiaceae* – *Artemisia* decreased (in comparison with the Lower Pontian). Generally, the composition of deciduous angiosperms was similar to that of the Lower Pontian.

In the Upper Pontian (Bosphorian) the microflora generally, corresponded to that which characterized the Middle Pontian, but an increase of *Pinaceae* percentage in comparison with dicotyledonous angiosperm trees appeared. Also, the percentage of herbaceous plants pollen (*Chenopodiaceae*, *Artemisia*) increased.

Recently, the Upper Pontian from Mehedinți was investigated from palynological point of view (Petrescu, Mălan, 1991).

It can be noticed, most of the microflora is common for both Lower and Upper Pontian (Petrescu *et al.*, 2001).

The Pontian from the western part of Romania is relatively well known because of the lignite deposits situated mainly in the upper half of this geological stage.

Both, in coal pit exploitations from Banat: Visag, Sinersig, Darova – Lugoș Basin

(Petrescu *et al.*, 1982; Petrescu, Kolovos, 1982), and in those from Bihor: Roșiori (Oradea - north), Voievozi (Oradea - east) (Maxim & Petrescu, 1968; Petrescu *et al.*, 1979; Petrescu, Nicorici, 1979) or Sălaj: Sărmășag (Petrescu *et al.*, 1982) the studied Pontian microfloras contained many elements that generated lignites in the ancient peat-bog. (Note that the Pontian under study from Mehedinți lacks coal bed at all its stratigraphic levels).

Further, concerning the Pontian from Central Paratethys, we appeal to the results of palynological analyses published in the "Chronostratigraphie und Neostatotypen – Ponzien" volume.

The paper of Pantic (1989) contains a general review of the palynological studies of the Pontian from the former Yugoslavia. The author outlined that palynological studies are related to the exploitations of Pontian lignites from different areas belonging to Serbia, Croatia, Bosnia etc. Pantic concludes that the peat bogs from the Upper Pontian are similar to "the subtropical swamps in the U.S.A.: Dismal-Swamp in North Carolina, Everglades in Florida, Okefenokee – Swamp on the Georgia - Florida border, and the mangrove swamp on the southern coasts of Florida".

In the same volume, Nagy (1989) presented the results of palynological analyses from some boreholes from Hungary. In the synthetic paper on Pontian, Nagy (1992), established the PN11 palynological zone, characterized by numerous spore forms belonging to *Stereisporites*, *Persicariopollis franconicus*, *P. welzowense*, *Valerianaceipollenites neszmelyensis*, *Intratropipollenites cordataeformis* accompanied by a great variety of conifers. In the paleoclimatic curve presented by Nagy (1992) at page 227 it can be remarked that at the base of Pontian, the temperate sporomorphs had a very clear maximum; the subtropical ones are in a strong regress, while the tropical ones were eliminated.

Planderova & Papsikova (1989) characterized the Pontian from western part of Slovakia from palynological point of view. The authors concluded that, in the studied Pontian, it came out that the Miocene thermophile elements are in regress; on the other hand, arctotertiary elements proliferated. The forest swamps (with *Taxodiaceae*, *Alnus*, *Salix*, ferns etc.) lead to the formation of the peat bogs that generated coals. The mountain forests were dominated by *Abies*, *Picea*, *Tsuga* etc. "The climate in the time of sedimentation of the Pontian horizons was probably mild and relatively humid" (l.c.p. 911).

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## PLATES

## Plate I (1000x)

1. *Leiotriletes wolffi wolffi* W. Kr. 1962
- 2., 3. *Leiotriletes wolffi brevis* W. Kr. 1962
4. *Polypodiaceoisporites spiniverrucatus* Trevisan 1967
5. *Verrucatosporis alienus* (Pot. 1931) Th. et Pf. 1953
6. *Verrucatisporis* gr. *tekerensis* Nagy 1969
7. *Polypodiaceoisporites cycloingulatus* W. Kr. 1967
- 8a, b. *Perinomoletes pliocaenicus* W. Kr. 1967
9. *Toroiosporis* (T.) sp.
10. *Extrapunctatosporis oblongioides* W. Kr. 1967
11. *Extrapunctatosporis goersbachensis* W. Kr. 1967
12. *Extrapunctatosporis* sp.
- 13, 14. *Leiotriletes* asp. *microsinuosoides* W. Kr. 1962
15. *Leiotriletes neddenioides* W. Kr. 1962
16. *Laevigatisporites haardti* (Pot. et Ven. 1934) Th. et Pf. 1953

## Plate II (1000x)

1. *Foveotriletes verrucatooides* W. Kr. 1962
2. *Baculatisporites nannus* (Wolff 1934) W. Kr. 1979
3. *Baculatisporites primarius* (Wolff 1934) Th.-Pf. 1953
4. *Verrucatosporis clatriformis* (Mur – Pf. 1952 ex.Th. – Pf. 1953) W. Kr. 1967
5. *Verrucatosporis favus* (Pot. 1931) Th. et Pf. 1953
6. *Verrucatosporis balticus* (W. Kr. 1962) *balticus* W. Kr. 1967
7. *Sciadopityspollenites serratus* (Pot. et Ven. 1934) Thg. 1937
8. *Sciadopityspollenites verticillatiformis* (Zauer 1960) W. Kr. 1971
9. *Inaperturopollenites verrupapillatus* Trevisan 1967
10. *Sequoiapollenites polyformosus* Thg. 1937
11. *Inaperturopollenites hiatus* (Pot. 1931) Th et Pf. 1953
12. *Cupressacites bockwitzensis* W. Kr. 1971
13. *Abiespollenites cedroides* (Thomson 1953) W. Kr. 1971
14. *Abiespollenites microsacoides* W. Kr. 1971

## Plate III (1000x)

1. *Zonalapollenites maximus* (Raatz 1937) W. Kr. 1971 (900x)
2. *Zonalapollenites multispinus* W. Kr. 1971
3. *Piceapollis tobolicus* (Panova 1966) W. Kr. 1971 (900x)
4. *Zonalapollenites igniculus* (Pot. 1931) Th. et Pf. 1953
- 5., 6. *Piceapollis planoides* W. Kr. 1971
7. *Pterocaryapollenites stellatus* (Pot. 1931) Thg. 1937
8. *Caryapollenites simplex* (Pot. 1931) W. Kr. 1960
9. *Alnipollenites verus* (Pot. 1931) Pot. 1934
10. *Quercopollenites robur* Nagy 1969

## Plate IV (1000x)

1. *Cedripites deodaraesimilis* (Nagy 1969) Nagy 1985 (900x)
2. *Cedripites taxoidiformis* (Nagy 1969) Nagy 1985
- 3., 4. *Cedripites crassiundulicristatus* (Stelmak 1960) W. Kr. 1971
5. *Cedripites crassus* Nagy 1989
6. *Podocarpidites libellus* (Pot. 1931) W. Kr. 1971
7. *Malvacearumpollenites bakonyensis* Nagy 1962 (900x)
8. *Corsinipollenites oculusnoctis* (Thg. 1940) Nakoman 1960 (900x).

